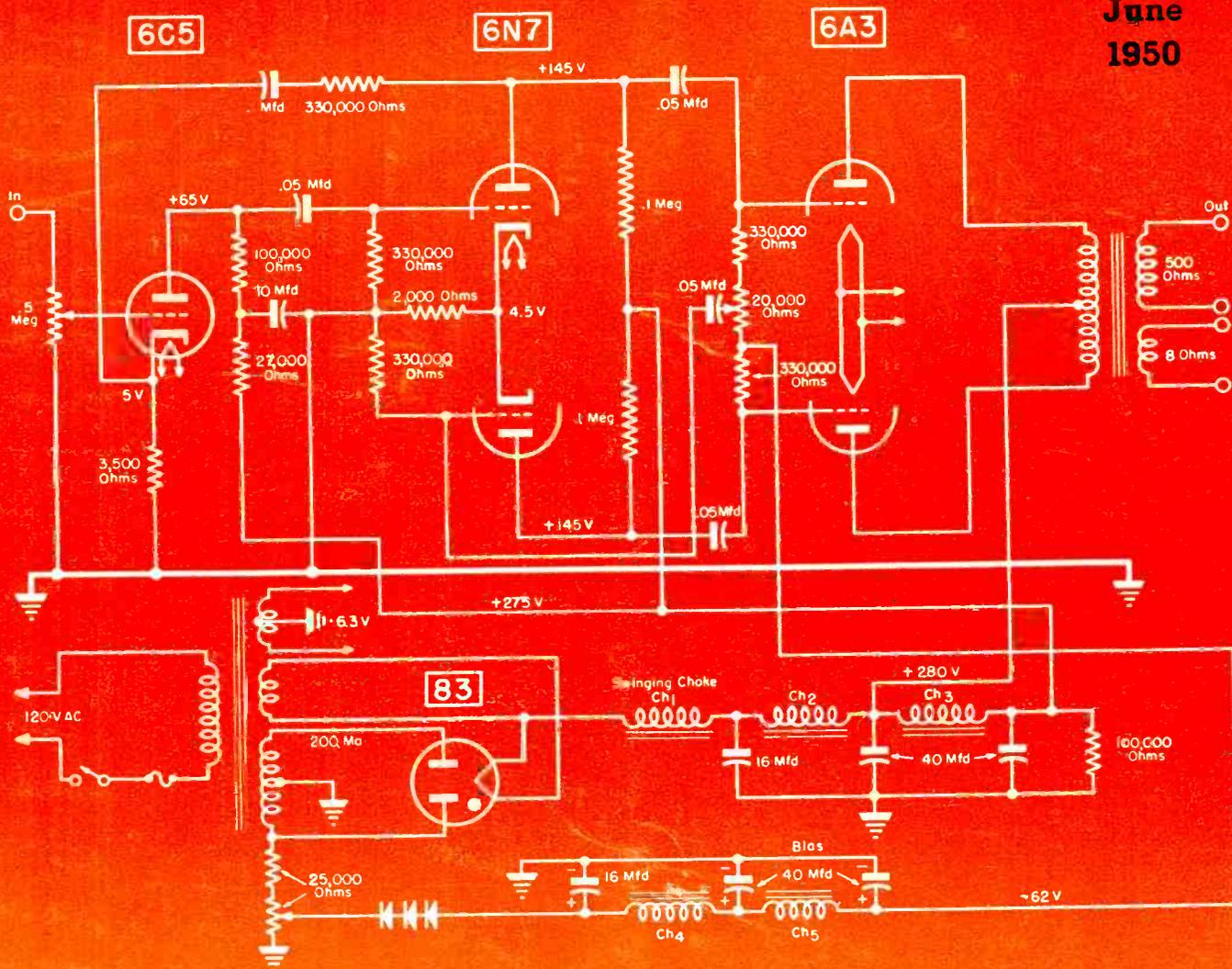


SERVICE

**June
1950**



A 14-watt push-pull triode-output-stage amplifier with a gain of 45 db.

[See page 2]

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the only electrolytic
with built-in extras



blue beavers*

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they
eliminate
comebacks

When a set comes into your shop, the chances are that the original characteristics have been changed—either by previous servicing, aging of components, or by climatic conditions. That's why it's smart to use "Blue Beavers," designed and built exclusively for servicemen.

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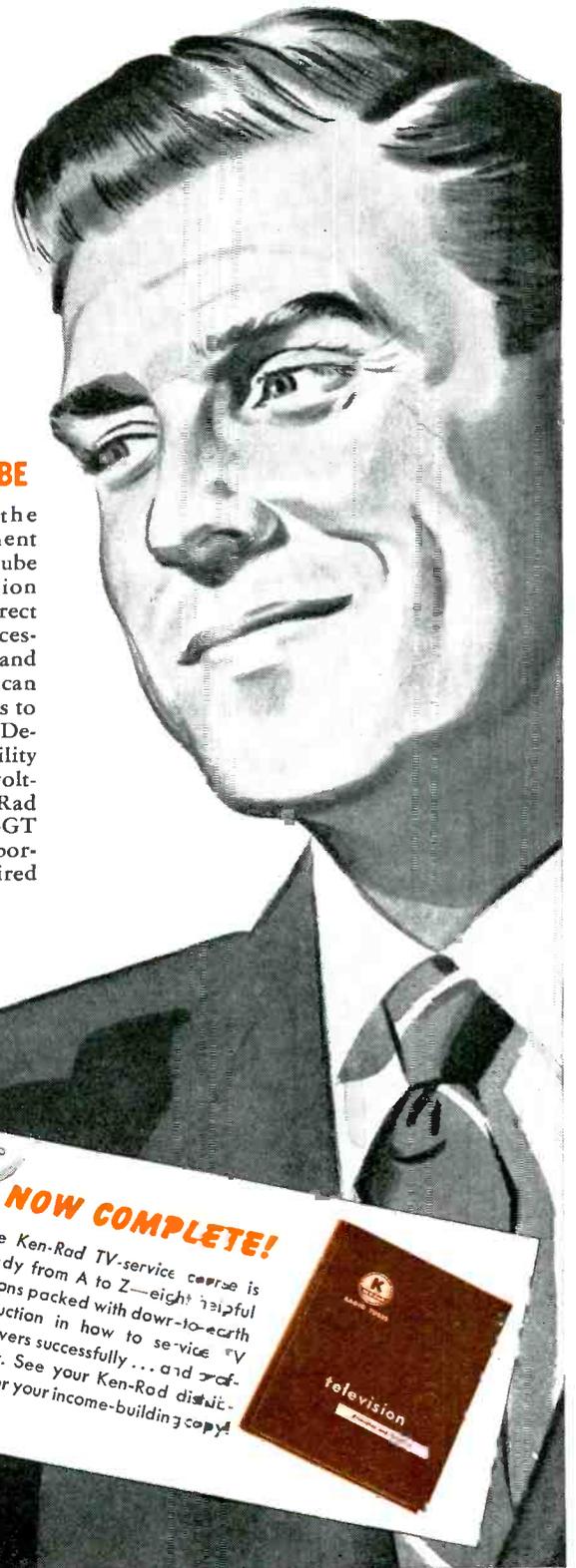
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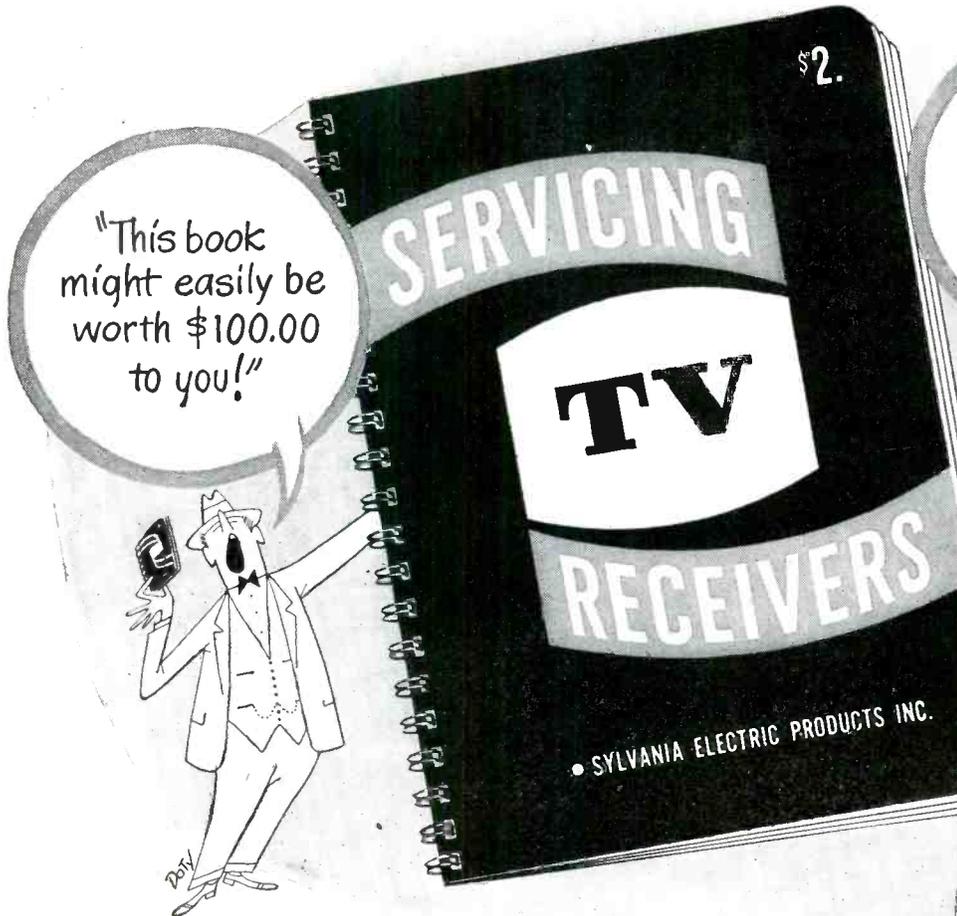
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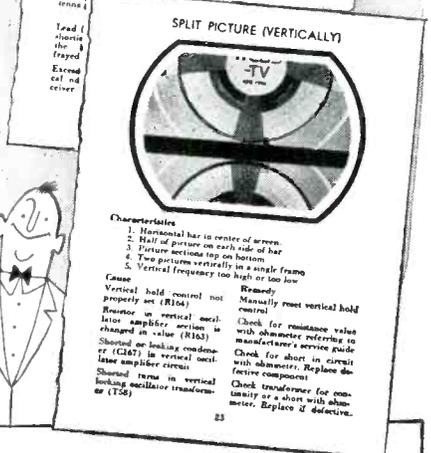
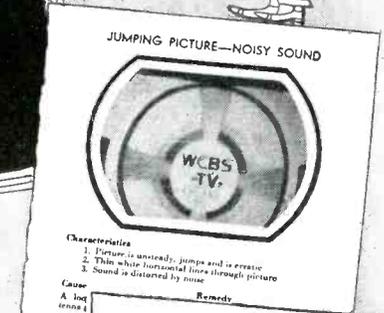
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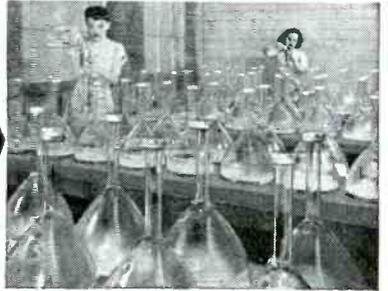
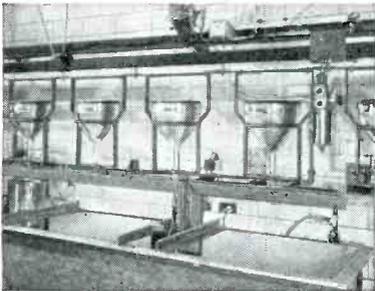
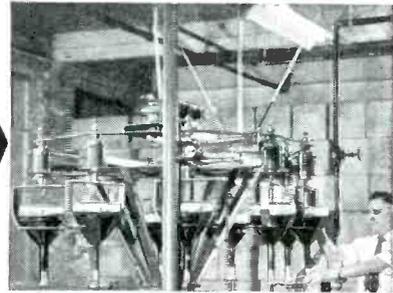
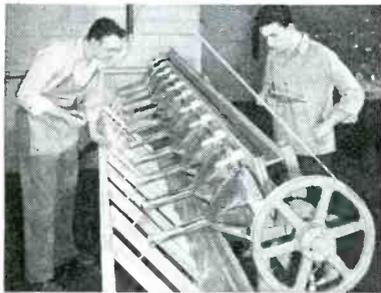
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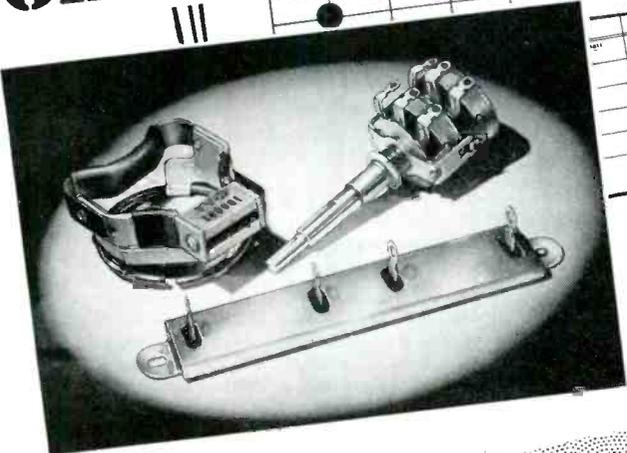
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CLAROSTAT TV REPLACEMENT CONTROLS

Model & Chassis No.	FUNCTION	VOLUME PICTURE SWITCH	VERTICAL HORIZONTAL HOLD	BRIGHTNESS	VERTICAL CENTERING	HORIZONTAL CENTERING	HORIZONTAL DRIVE	VERTICAL LINEARITY	HEIGHT	FOCUS	VIDEO BIAS	TRAP DRIVE	BRIGHTNESS & PICTURE	PICTURE	VOLUME & SWITCH	A G C	HORIZONTAL LINEARITY
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Description	R-158 R-173	R-131	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1.5 mfg. Carbon	250 W W 10-420	R-191	R-122	R-122	R-14 S-7	10,000 ohms Carbon	1.5 mfg. Carbon	200,000 ohms Carbon
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Circuit #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Stock #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Part #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Catalog #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	List Price	3.10	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Description	R-158 R-173	R-131	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1.5 mfg. Carbon	250 W W 10-420	R-191	R-122	R-122	R-14 S-7	10,000 ohms Carbon	1.5 mfg. Carbon	200,000 ohms Carbon
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Circuit #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Stock #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Part #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Catalog #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	List Price	3.10	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Description	R-158 R-173	R-131	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1.5 mfg. Carbon	250 W W 10-420	R-191	R-122	R-122	R-14 S-7	10,000 ohms Carbon	1.5 mfg. Carbon	200,000 ohms Carbon
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Circuit #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Stock #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Part #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Catalog #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	List Price	3.10	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Description	R-158 R-173	R-131	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1000 ohms Carbon	1.5 mfg. Carbon	250 W W 10-420	R-191	R-122	R-122	R-14 S-7	10,000 ohms Carbon	1.5 mfg. Carbon	200,000 ohms Carbon
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Circuit #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Stock #	72734	73150	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5	970111-4	970111-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Part #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	Catalog #	RTV-8	AM-44-5 FS-1 Cu Dual 1/4"	AM-19-5 PK 1/4"	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5	RTV-5
Model 91 W-233 Chassis KCS-30-1 RC-816H (16" tube)	List Price	3.10	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

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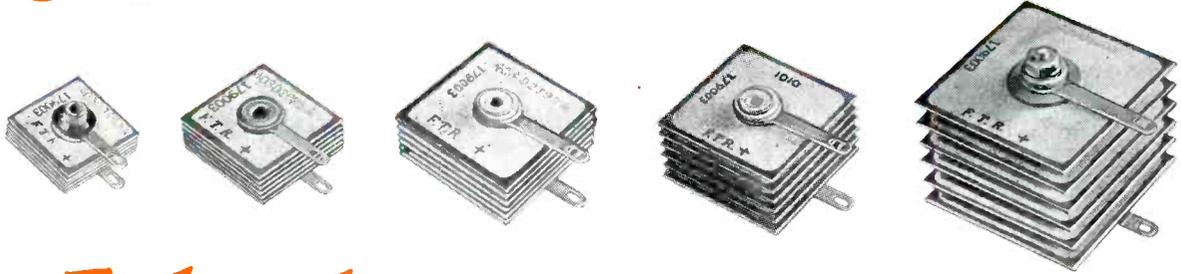
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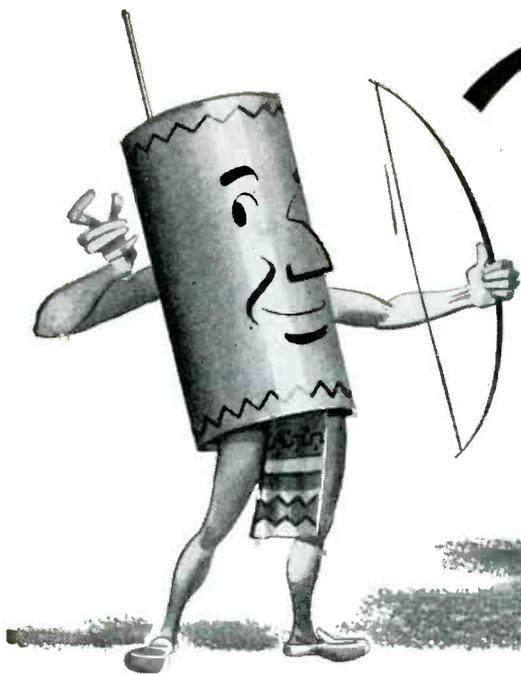
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LITTLE CHIEFTAINS YOUR GOOD FRIENDS!
MAKE REPAIR WORK EASY... FIT IN
TIGHT SPOTS... LAST LONG TIME.



Tomahawk



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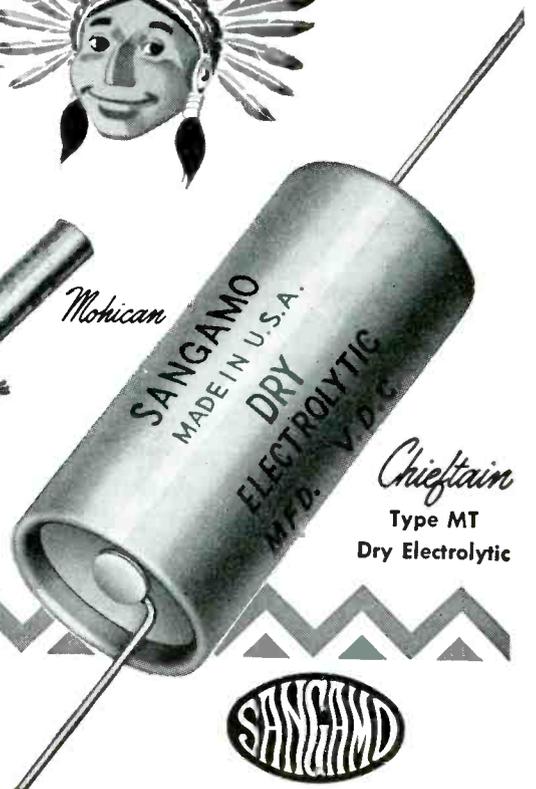
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Chieftain
Type MT
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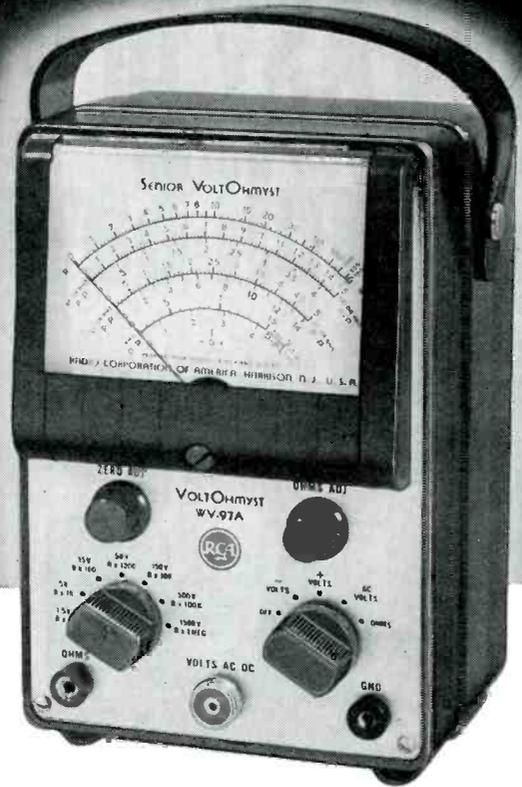
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Senior VoltOhmyst*
reading peak-to-peak voltages

ONLY \$62⁵⁰ Suggested
User Price

Includes direct probe and cable,
dc probe, ohms lead, and ground lead



TEN WAYS BETTER!

1. Reads peak-to-peak voltages directly
2. Has greater over-all accuracy
3. Reads down to 0.1 volt (1.5 volts full scale)
4. Reads up to 1500 dc volts full scale
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The WV-97A has a range of usefulness extending beyond that of any other instrument in the field. Its quality, dependability, and accuracy make it a true laboratory instrument; it is exactly what is needed for television in the design laboratory, factory, and service shop.

The new Senior VoltOhmyst measures dc voltages in high-impedance circuits, even with ac present. It reads the rms values of sine waves and the peak-to-peak values of complex waves or recurrent pulses, even in the presence of dc. Its electronic ohmmeter has a range of ten billion to one.

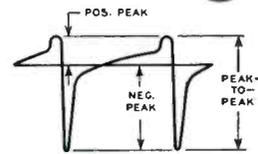
Like all RCA VoltOhmysts, it features high input resistance, electronic protection from meter burn-out, zero-center scale for discriminator alignment, molded-plastic meter case, a 1-megohm isolating resistor in the dc probe, and sturdy metal case for good rf shielding.

An outstanding feature is its usefulness as a television signal tracer . . . made possible by its high input resistance, wide frequency range, and direct reading of peak-to-peak voltages.

For complete information on the new RCA WV-97A Senior VoltOhmyst, see your RCA Test Equipment Distributor, or write RCA, Commercial Engineering, Section F56X, Harrison, New Jersey.

*Reg. U. S. Pat. Off.

The WV-97A measures peak-to-peak voltages directly. Hence, it quickly provides information essential for servicing TV receivers with their pulse-type waveforms.



SPECIFICATIONS

- DC Voltmeter:**
Seven Continuous Ranges 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts
- Input Resistance (including 1 megohm in dc probe):**
All ranges 11 megohms
Sensitivity for the 1.5 volt range 7.3 megohms per volt
Overall Accuracy $\pm 3\%$ of full scale
- AC Voltmeter:**
Fourteen Continuous Ranges:
Peak-to-peak values 0 to 4, 14, 42, 140, 420, 1400, 3400 volts
RMS values 0 to 1.5, 5, 15, 50, 150, 500, 1200 volts
- Input Resistance and Capacitance with direct cable:**
1.5, 5, 15, 50, 150-volt ranges 0.83 megohm shunted by 85 μf f
500-volt range 1.3 megohms shunted by 85 μf f
1200-volt range 1.5 megohms shunted by 85 μf f
- Frequency Response:**
With WG-218 Direct Probe and Cable within $\pm 5\%$ from 30 cps to 3 Mc
- Overall Accuracy $\pm 5\%$ of full scale**
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Seven Continuous Ranges 0.1 ohm to 1000 megohms
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- Dimensions:** 7 $\frac{3}{4}$ " high; 5 $\frac{1}{4}$ " wide; 3 $\frac{3}{4}$ " deep
- Available Accessories:**
WG-264 Crystal Probe Extends range to 175 Mc (price to be announced)
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RADIO CORPORATION of AMERICA
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... and 20,000 companies' experience proves it pays!

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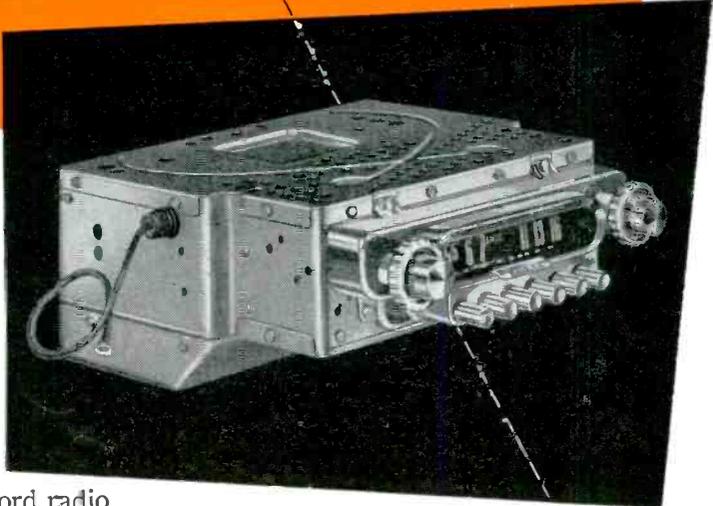
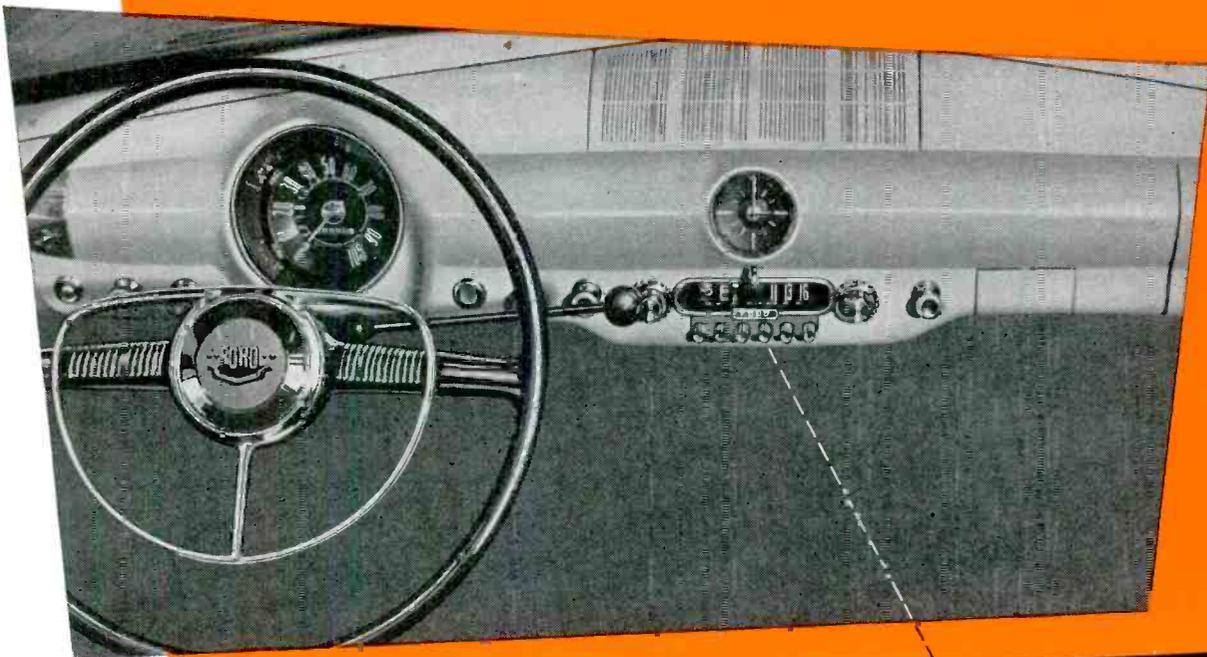
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SERVICE

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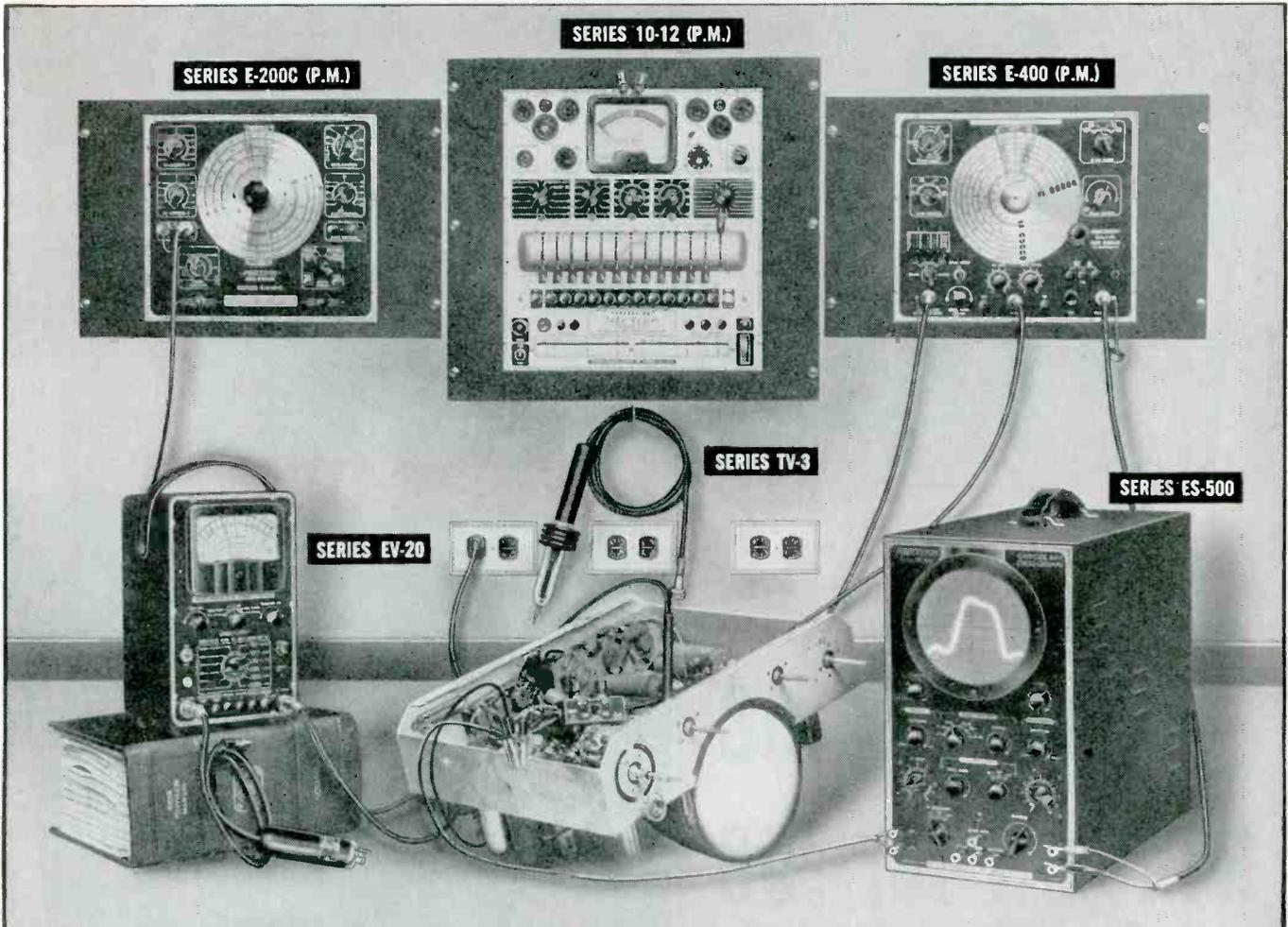


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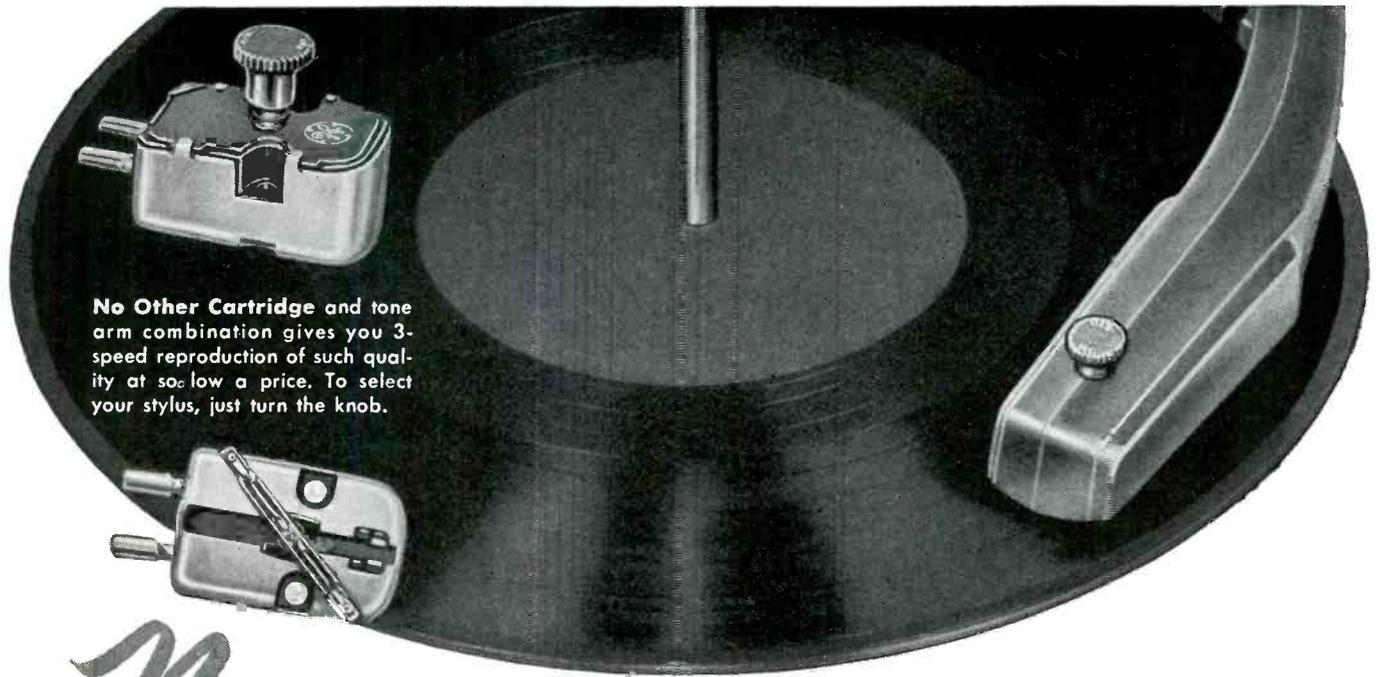
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No Other Cartridge and tone arm combination gives you 3-speed reproduction of such quality at so low a price. To select your stylus, just turn the knob.

New GENERAL ELECTRIC TONE ARM PLAYS 3 SPEEDS WITH ONE CARTRIDGE!

SUPERB QUALITY AT LOW COST!

A simple twist of the red button—*without changing the position of the cartridge in the tone arm*—and you can play 33½, 45 and 78 rpm records at a constant pressure of 6 to 8 grams!

Nothing to take apart—nothing to add... the famous General Electric Triple Play Cartridge is actually built into the tone arm for quick, simple operation. To switch from a standard to narrow groove stylus just depress and turn the red knob on top of the arm. This positions the stylus without moving the cartridge. To change from narrow groove back to standard—turn the knob again... that's all there is to it.

Complete tone arm assembly—including Triple Play Cartridge with diamond or sapphire styli—is now available to distributors and dealers *at a price so low it will rock the trade!*

Write or wire today for full particulars and ask for descriptive bulletin R78-028: General Electric Company, Section 360, Syracuse, New York.

MAKE IT EASY FOR YOUR CUSTOMERS

Demonstration of this new tone arm offers dramatic proof that it's the simplest, most economical answer to quality reproduction at low cost!

Call your distributor today and stock this merchandise!

You can put your confidence in—

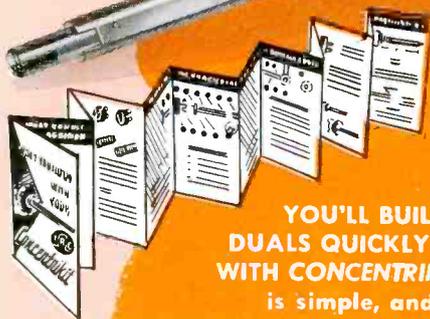
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Amazing new IRC Concentrikit is the practical answer to your concentric dual replacement problems. With this set of specially designed parts you can assemble over 90% of all concentric dual types . . . no more long searches and waits for exact duplicates. You save time, worry *and* inventory investment.



**YOU'LL BUILD CONCENTRIC
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Television has greatly increased your concentric dual requirements . . . be ready with this CONCENTRIKIT Stock Assortment on your bench. Handsome metal cabinet contains all you need to assemble quickly any of 144 different concentric duals. It covers over 500 models . . . RCA, Admiral, Air King, Belmont, Emerson, General Electric, Motorola, Philco, Westinghouse, Zenith and many others. Order from your IRC Distributor now, or send coupon for more information. International Resistance Company, 401 N. Broad St., Philadelphia 8, Pa.

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	Quantity		Quantity
Complete Concentrikits	4	B19-133X	1
Base Elements		B11-137	3
B11-108	1	B13-137	2
B11-114	1	B13-137X	1
B11-115	1	B18-137XX	1
B11-116	1	B19-137X	1
B17-116	1	B11-139	2
B11-119	1	B13-139	1
B11-120	1	B13-139X	1
B11-121	1	Inner Shaft Ends	
B11-123	2	E-187	3
B11-128	2	E-190	1
B11-130	1	E-202	2
B13-130	2	Sleeve Bushings	
B13-130X	1	S-4	1
B18-130X	1	S-5	1
B18-132X	1	Resilient Retainer Rings	10
B11-133	2	Switches	
B13-133	2	76-1	3
B13-133X	1		
B18-133X	1		

Concentrikit Stock Assortment comes in a sturdy all-metal cabinet. Four drawers and individual compartments assure efficient stocking . . . and cabinets may be stacked with IRC Resist-O-Cabinets to make a convenient and good-looking shop arrangement. METAL CABINET IS SUPPLIED AT NO EXTRA CHARGE, you pay only the regular price of the parts.

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I'm interested. Send Catalogs DC1A and DC2S with details on CONCENTRIKIT and Dealer Stock Assortment.

Enclosed find 25c in stamps or coin for my copy of IRC Concentric Dual Replacement Manual.

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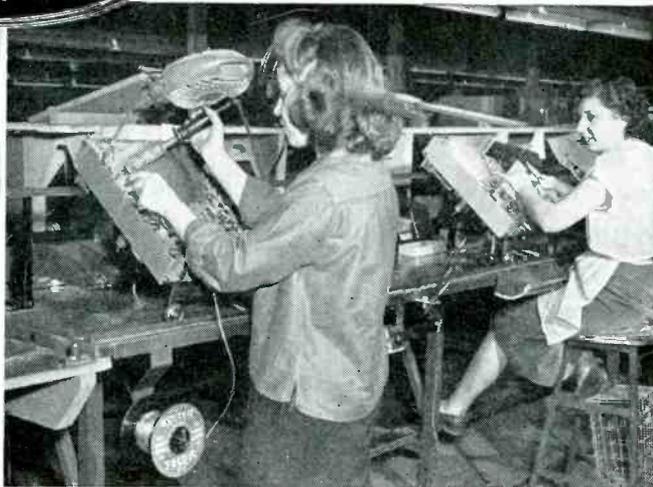
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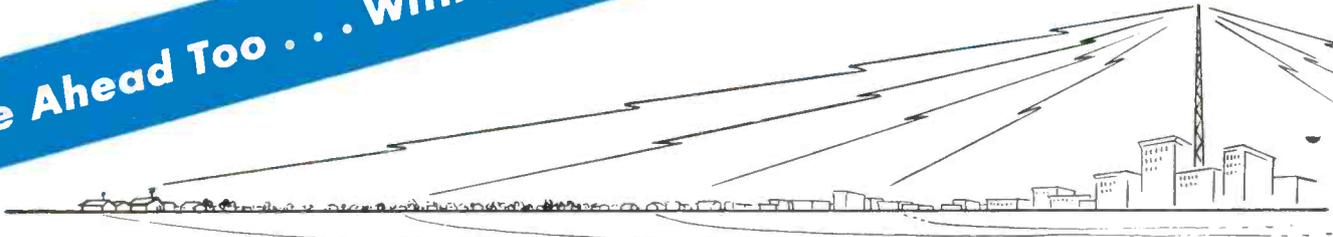
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**New 2-Stage Pre-Amplifier
Increases Original TV Signal
Strength 5 TIMES**

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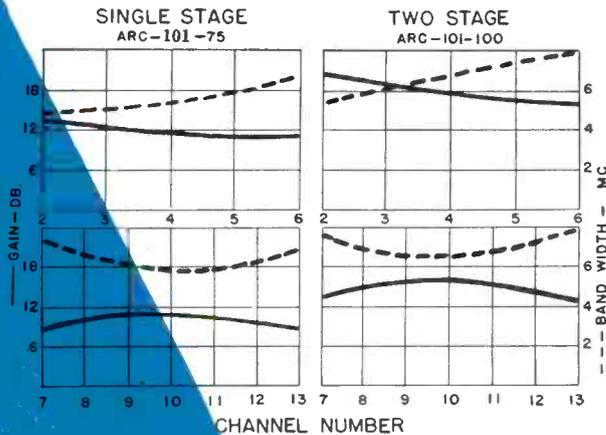
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ANCHOR'S NEW 2-STAGE BOOSTER NOW Enlarges Your TV Market for Sales to Thousands of New Suburban and Fringe Area Residents

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ANCHOR'S performance curves have never been challenged. Undisputed laboratory tests prove that the ANCHOR Two Stage BOOSTER increases the original TV signal strength 5 TIMES.



- Single Knob Construction allows switching and tuning with a flick of the wrist.
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A Rainbow Plan for Callbacks

IN THE TV SERVICE operation, there has been one particular problem that has always irked, riled and usually completely soured everyone in the shop. The problem . . . that unwarranted stream of callbacks.

The situation was with us in the early days of radio, and today with the complexities of sight reception involved, the callback annoyance has grown and become a mounting, chronic headache.

Several solutions have been suggested, but none have been too effective. A few weeks ago, though, came an announcement of a new plan which seems to have significant possibilities. Presented before a meeting of the Electric Institute of Washington, the plan provides for the free distribution of novel checkpoint cards to dealers and Service Men, for eventual distribution to those who have receivers and those who are about to become owners. The copy on the checkpoint card, which it is believed will minimize and perhaps eliminate unnecessary return trips, points out to the set owner that before a Service Man is asked to come back, seven possible sources of trouble should be investigated:

- (1)—If set is completely dead, is line cord plugged into electric outlet? If cord is plugged in, unplug and try a lamp in outlet. If lamp lights, then try set when plugged in again. . . .
- (2)—Look at antenna wire on back of set. Make sure leads are firmly connected to terminals on set and that bare leads are not touching each other. . . .
- (3)—If sound is normal, but no picture is present, turn brightness control fully on and also try another channel. . . .
- (4)—If the picture is normal, but no sound is present, adjust fine-tuning control with the volume control turned fully on. Also try another channel. . . .
- (5)—In suggestions *three* and *four*, if only one channel is affected, allow for station time to announce any technical difficulty which might have occurred. . . .
- (6)—If sound is normal and the picture tube has light with brightness control on, but the picture is rolling, tearing out, or there is no picture on all channels, adjust horizontal hold or vertical hold controls. Try reducing the contrast or picture control. . . .
- (7)—If the sound

is weak and noisy and the picture has excessive snow, see if the antenna is still installed in its original position.

One week after the plan was announced, over 15,000 checkpoint cards were distributed by not only dealers and Service Men, but the four television stations operating in the Washington area.

The plan has attracted the enthusiastic attention of associations and allied groups in other communities who feel the idea should do quite a job for them.

Congratulations to the Electric Institute of Washington for launching a plan which, it is certain, will result in rich dividends for everyone.

TVI

TV INTERFERENCE, described on several occasions in these columns, as an extremely serious factor, demanding immediate attention, has become quite a topic of debate, with members of the FCC now firing away and calling for action.

Appearing before a meeting of the Canadian radio manufacturers, FCC chief engineer, Curtis B. Plummer, criticized many for the current conditions, particularly those producing chassis with abnormally high oscillator radiation. It was pointed out that FCC engineers have measured as much as .2 volt on the antenna terminals of some receivers and 4 millivolts per meter at 100 feet in the field, certainly an unusual amount of power, when it is recognized that it takes only about one one-hundredth as much signal as the desired signal to spoil reception. Haste in producing receivers was cited by Plummer as one reason for the radiation problem. He pointed

Annual Sound Review

THAT LIVELY facet of the Servicing business, *Sound*, which many Service Men have found to be one of the healthy smile builders in the entry journal, receives a sprightly review, in this our annual *Sound* issue, with articles on such subjects as custom-built systems, p-a servicing, auto speakers, multiple-speed equipment, including changers, cartridges and needles, and trends of the day. See pages 20, 24, 26, 38 and 40 for these timely discussions.

out that if sufficient time were given to careful design, the radiation problem could be minimized, and in many instances, completely eliminated.

Service Men were also sharply rebuked by Plummer for the manner in which interference problems had been handled. Plummer revealed that . . . "We find that some complaints of interference made to dealers and Service Men had been pretty casually dismissed by poorly trained service personnel who, without analysis of the situation or any formal diagnosis, stated that the interference was caused by one of the licensed radio Services (usually hams). This type of explanation, he said . . . "gives the complainant an incomplete picture and often results in improper condemnation of the licensed stations to which this interference is attributed. . . . The dealers and Service Men will perform a much greater service to the public and to the licensed stations if they would accurately analyze the interference for what it actually is."

The severity of the problem was also highlighted by FCC headman, Wayne Coy, during an appearance before the RMA annual meeting in Chicago. Coy was particularly caustic about the situation declaring that . . . "This problem is grave enough today when we only have 104 stations on the air and more than six-million receivers. But after the freeze is lifted and hundreds of new stations go on the air and the number of receivers climbs to perhaps 30 million, this problem could become extremely magnified, unless something is done about it now."

"The need for action is urgent," stated Coy. "The question before us, today, is whether the cooperation from the industry will solve the problem, or whether it will have to be solved under the power of the Commission to license transmitters."

Several months ago, it was revealed in these columns that a comprehensive survey of this acute interference problem was being conducted, in an effort to correlate all the possible sources of trouble, and the methods which might be used to minimize or perhaps eliminate the annoying condition. The results of this interesting study will be published next month in *SERVICE*. Watch for this topical analysis in the July issue!—L. W.

Custom Building an FM-AM-Phono Combination . . .

With Receiver and Amplifiers,* and Record Changer in Separate Housings

by HERBERT G. EIDSON, Jr.

Chief Engineer, WIS and WIS-FM; Technical Director, WIST

AT HOME and in a shop, there is often a need for a radio-phono system which not only provides high-fidelity reproduction from the receiver and phono, but permits use of the *lp* home and 16" type records, as well as the standard 78s. Such a setup has unlimited possibilities, ranging from pure entertainment to demonstration of tuners, record changers, variable speed pickups, etc.

In setting up plans for this type of a combination package, it was decided to include the phono section in one cabinet with provision for the changer mechanism and records which might be of the large transcription style.

The second cabinet was prepared to house a quality speaker in its own compartment on one side and an FM-AM tuner with a hi-fidelity amplifier and a preamp-equalizer for the playback head in the remaining half. So that placement of the cabinets could

be varied, easy-rolling casters were also included.

The Radio Tuner

The first item to be considered was the tuner. The model¹ eventually selected has been found to be very satisfactory. In one series of tests the distortion was found to be less than one per cent across the audio spectrum, with frequency response ± 1 db from 30 to 15,000 cycles in the FM section. Noise level was better than 60 db below normal output.

Seven requirements were carefully considered before the tuner was chosen:

(1) Output, great enough to excite the main amplifier on FM as well as on AM.

(2) Low oscillator drift on both positions.

(3) Excellent quality on AM and FM.

(4) Low thermal noise and hum level.

(5) Phono switch; desirable, but not absolutely necessary.

(6) Band pass, good in *rf* and *if* stages; one of the main factors in good frequency response, although too great a pass on AM can result in adjacent-channel interference.

(7) High sensitivity on both bands; desirable in most cases.

Phono Preamp-Equalizer

A variable reluctance type of phono pickup, mounted in an arm of low friction, was found to be best for our system. Since this device produces an output which falls off rapidly below approximately 500 cycles due to reasons well known, an equalizer must be used to flatten the frequency response output.

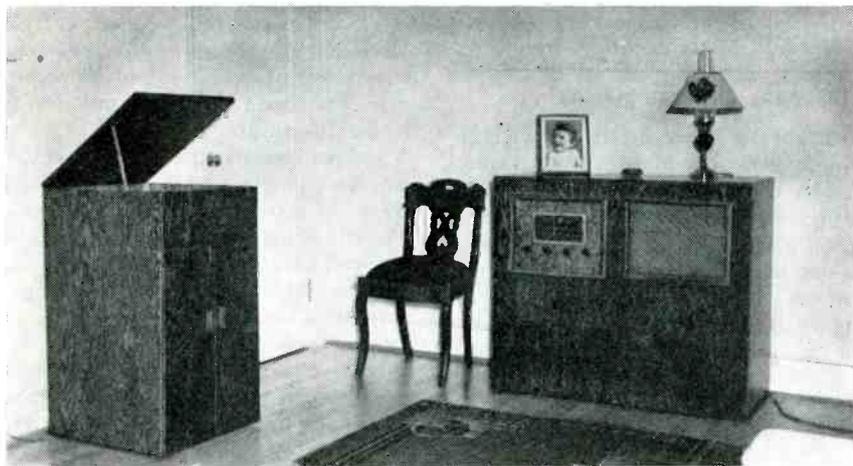
The amplifier we selected contains a low-pass filter which decreases all frequencies above 500 cycles approximately 18 db, and then amplifies *all* frequencies from 50 to about 10,000 cycles. At this point a switch serves to select one of three outputs to excite the input of the main amplifier.

Since it was felt that a remote volume control would be desirable on the playback unit, a 2,000-ohm pot was mounted in the right hand front corner of the cabinet for this purpose. A shielded lead was installed for connection to the pickup head.

In the first two stages, 6SC7s were used because of their low hum level

[*See Front Cover]

The Eidson custom-built receiver-amplifier and changer consoles.



¹Browning AM-FM Tuner.



Rear view of changer-storage cabinet.

and hiss content. Incidentally, these stages represent the *rc* low-pass filter section. In the third stage a 6SJ7 was included to provide high gain for the equalized response from the previous stages, so that level would be approximately equal to that of the FM-AM tuner output. All plate circuits were supplied with anti-motorboating filters.

The Main Amplifier

Our next problem involved the amplifier. Triode output stages were, in our camp, always believed to be the most effective, so there was no question as to what would be used to generate the power in the final stage. The use of these tubes for this application does simplify the construction and reduces cost. No special type of output transformer with a feedback loop is required. And it is possible to dispense with inverse feedback used over the last stage. Some amplifiers are constructed so that the output winding is also used as a feedback loop, but varying loading effects from the speaker will also vary the amount of inverse feedback. Thus it is difficult to determine the amount being used, for the speaker *Z* must be considered and that factor is dependent upon the frequency being passed by the amplifier.

Push-Pull Stage Operation

When a push-pull stage is composed of triodes, and driven and loaded properly, the output is a faithful reproduction of the input. Thus there is little to be gained by the addition of 180° feedback. The plate impedance is



Rear view of the receiver-amplifier console. At right are the tuner, preamp equalizer and 14-watt amplifier, while at the left is the speaker compartment with treated walls.

quite low in this type of amplifier and thus *ringing* of the speaker cone is absent. In high-impedance stages which drive an acoustic device, the cone is apt to continue its oscillation when a sharp wavefront is reproduced. The speaker therefore becomes a generator of *cemf*, this voltage being stepped up by the output transformer, and applied across the output tube in the plate circuit. If the stage has a high internal plate impedance, the cone will continue to oscillate a moment, creating sound waves which were not in the original signal. If the stage has a low internal plate impedance, then the *cemf* will die almost instantly, for the heavy dampening of the low *Z* circuit will crush its resistance. The cone will be at rest. This means that when a steep-fronted wave is reproduced by a speaker cone which is driven by a triode stage, it will return immediately to its rest position and accordingly be ready to receive the

next incoming impulse. The net result is a sharp, clean reproduction of sound. If a multi-grid stage is used, feedback is imperative, so that distortion can be brought to a passable value, and internal impedance reduced to a level where the speaker can dampen itself almost at once.

Proper baffling, of course, contributes to cone loading and affords additional dampening.

The power output of this amplifier (14 watts) has been found to be quite constant over the audio spectrum when operating into a purely resistive load. Data taken on the amount of power being generated with a speaker winding for a load (no baffle) revealed that power was constant from 15,000 cps down to approximately 300 cps. Below this figure, the I^2R dropped off. At 50 cycles, the power decreased from 14 to 1.2 watts.

When a proper baffle was used to load the speaker cone, such as a sound-

Part I of a Series Detailing the Electronic, Electrical and Mechanical Constructional Features of a Complete AM-FM Receiver, LP and Standard Phono System. Initial Installment Discloses How to Select an AM-FM Tuner, Develop a Special Phono Preamp-Equalizer for Variable-Reluctance Pickups, Build a High-Gain Amplifier (14 Watts), Check Amplifier Efficiency and Choose the Necessary Speakers.

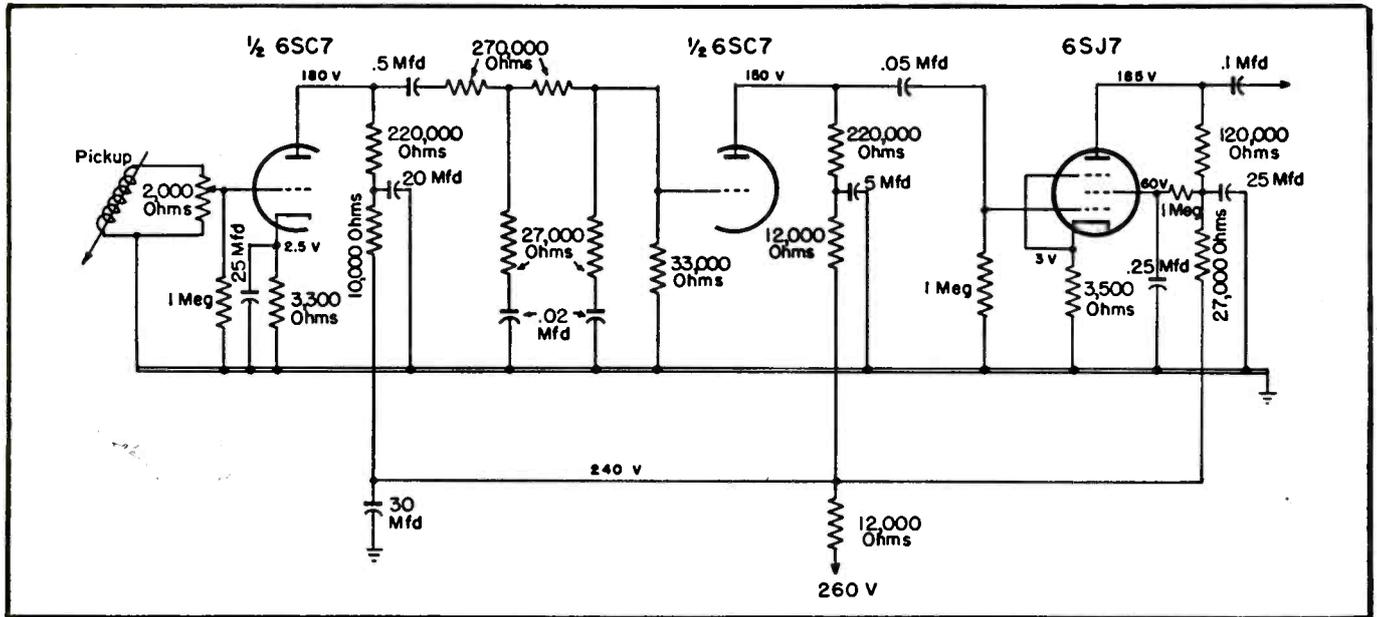


Fig. 1. Circuit of the equalizer and preamplifier designed for the variable reluctance pickup.

proofed cabinet of approximately six cubic feet, the power remained constant down to 130 cycles and then dropped slowly after this point. It is possible that inverse feedback over the final stage could have helped this condition some. However, it was not serious enough to warrant a change.

It has been found rather difficult to drive the grids of the 6A3 without resorting to an inter-stage transformer, but in the interest of keeping costs down, an attempt was made to drive the final stage by resistance coupling of the driver stage. Several types of driver tubes were tried and success was finally achieved with the system shown on the front cover diagram. One problem did appear with this type of operation. Since the 6A3s are not running strictly in class A, they do begin drawing grid current before the output of 14 watts is reached. This current flowing in the input circuit decreases the impedance,

and since this is in parallel with the plate circuit of the driver, the gain of this latter stage is reduced. We were therefore faced with the condition, where on peaks of heavy audio drive, when the 6N7 stage is needed to drive heavily the grids of the 6A3 output stage, the drive was not too apparent. However, the values were juggled until very little of this drive was found to be lost when driving the final to 14 watts. The gain will begin to fall off after the 14-watt condition is reached.

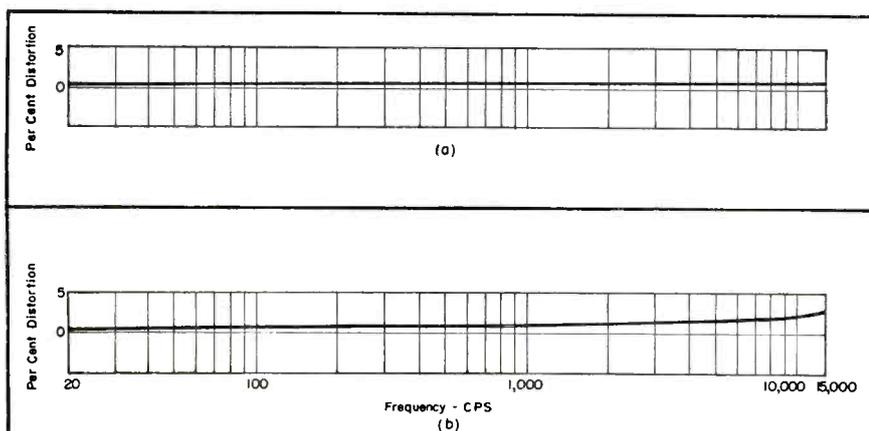
In proper amplifier design, distortion *must* occur in the final output stage; nowhere else should it be measurable. If the drive of a given audio stage is slowly increased, distortion *must* occur sooner or later, for there is a limit to its power capabilities. There appears to be only one justifiable reason for the existence of voltage stages and driver stages in the conventional amplifier, and that is

to excite the last or final audio amplifier stage. Since it is desirable to obtain the maximum power obtainable from this stage with the lowest possible distortion, it would be absurd to allow distortion to creep into any of the voltage-amplifying stages. Such a feed would modulate the power stage and the result would be poor quality.

When our amplifier was almost completed, it was decided to check this point and be positive that the waveform was distorting in the final, well before it became distorted elsewhere in the circuit. A 'scope was set up and a sine-wave pattern, slightly flattened on both top and bottom, displayed. Then the 'scope was connected to the voltage stages, and we had the pure sine wave, as it came from the oscillator, in clear form.

During the construction of an audio amplifier, proper biasing of all stages should be checked with a 'scope. The 'scope should be connected to the plate of the stage to be checked through a .1-mfd capacitor and the input wave brought up slowly, in intensity. If the lower and upper portions of the wave flatten at the same time, the proper point on the $E_k I_p$ curve is being used. If the top flattens first, the bias is too great, and if the bottom flattens initially, the reverse is true. Before this experiment is conducted, it is wise to note if the 'scope is inverting the image being checked. This can be done quite simply by connecting a 1½-volt flashlight cell to the *vertical* amplifier input in the 'scope for an instant, and noting if the *spot* jumped upward or downward. If there is no reversal, the spot will move upward when the positive terminal is connected to the open connection of the *vertical* amplifier input; the negative

Fig. 2. Response curves obtained with 14-watt amplifier, diagramed on front cover; plot (a) revealing the distortion at normal room volume (1.5 watts) and plot (b) showing the distortion at 14-watts output.



side of the cell should, of course, run to the ground side of the 'scope during the test.

In determining the proper amount of drive to the inverter stage of the amplifier the following procedure was followed: A 'scope was connected to the grid of the 6A3 which was *not* being driven by the inverted stage. The input from the oscillator was increased until fair output was realized from the amplifier. The *vertical* gain control on the 'scope was brought up until the amplitude of the excitation on the grid was exactly one-inch high. The excitation was kept on this position while the 'scope was changed over to the grid of the second 6A3, pin 3, which the inverter was driving. The variable voltage divider of 20,000 ohms was adjusted until the sine wave was also exactly one-inch high on the other half of the push-pull stage. Thus, both tubes were being driven with the same amount of voltage, but 180° out of phase, of course. A vacuum-tube voltmeter can be used for this purpose with slightly more accuracy, but it will be found that in actual practice, this adjustment is not critical.

Although the amplifier performed well without any feedback, it was decided to incorporate such feedback since the noise level was aided somewhat by its action. After testing, 17 db was found to be the amount required.

A plate filter circuit (10-mfd capacitor and 27,000-ohm resistor) was placed in the first stage to prevent low-frequency oscillation.

A heavy power transformer was selected to insure good regulation. The swinging choke, with a rating of 2-11 henries, were quite helpful in improving regulation. A heavy bleeder, normally used across the second filter, was found to be unnecessary due to the excellent voltage regulation supplied by the 83 gas-filled rectifier, the large wire in the high-voltage secondary of the power transformer, the swinging choke input, low *IR* drop in the chokes and high capacity in the low-pass brute-force filter. A light bleeder was included across the output of the supply to discharge the capacitors when the power is removed from the input. A heavier resistor at this point would have reduced effectively the filtering action of the last choke by decreasing its inductive reactance; caused by the larger amount of *dc* flowing through the winding and thus partially saturating the core.

Initially the bias voltage for the power triode tubes was furnished by

²Complete constructional details will appear next month.

³Kimsul.

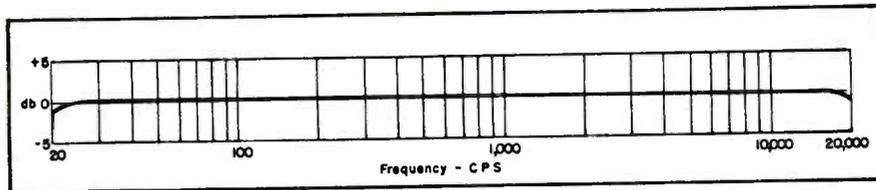


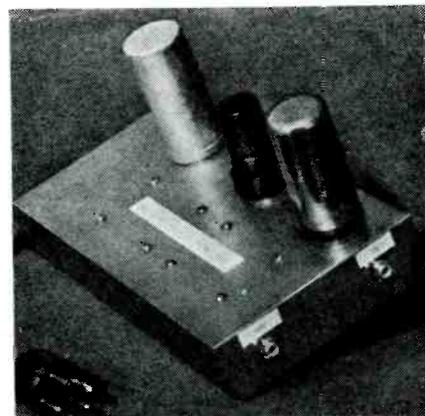
Fig. 3. Frequency response of the main amplifier.

a specially-wound power transformer which supplied 85 volts, each side of center tap. This was rectified and introduced to the second brute-force filter, now being used. It was found that the transformer ran too warm. The bias arrangement now employed consists of a half-wave dry rectifier, selenium type, with a voltage divider. This has proved quite satisfactory and quite cool running.

The Speaker

A reasonably large sound chamber of about six cubic feet was desired for accommodating the back pressure from a speaker, but a slightly smaller space had to be used to fit the cabinet we selected.² In spite of this slight chamber reduction, however, the low frequency response proved to be quite good.

(The inside of the half of the console in which the speaker was housed was lined with sound absorbing material,³ two-inches thick, so that the possibility of sharp cavity resonance was lessened. Tests showed that there was less sound radiation from the walls of the cabinet and re-radiation of the



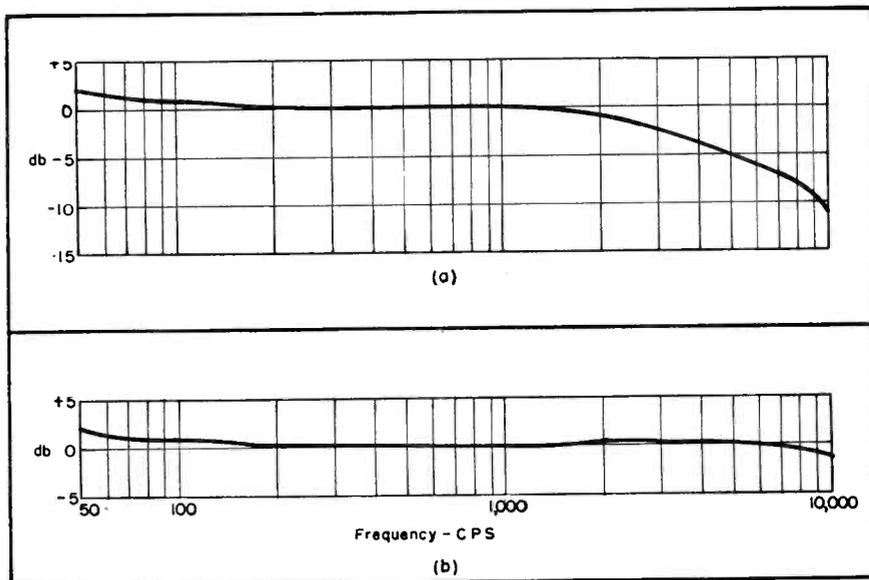
Preamp-equalizer. At the extreme left appears the filter. Female plugs at this point are identified as *in* and *out*.

sound energy back through the cone itself. Thus the speaker cone afforded good baffle-dampening by the sound insulated, completely enclosed sound lock.)

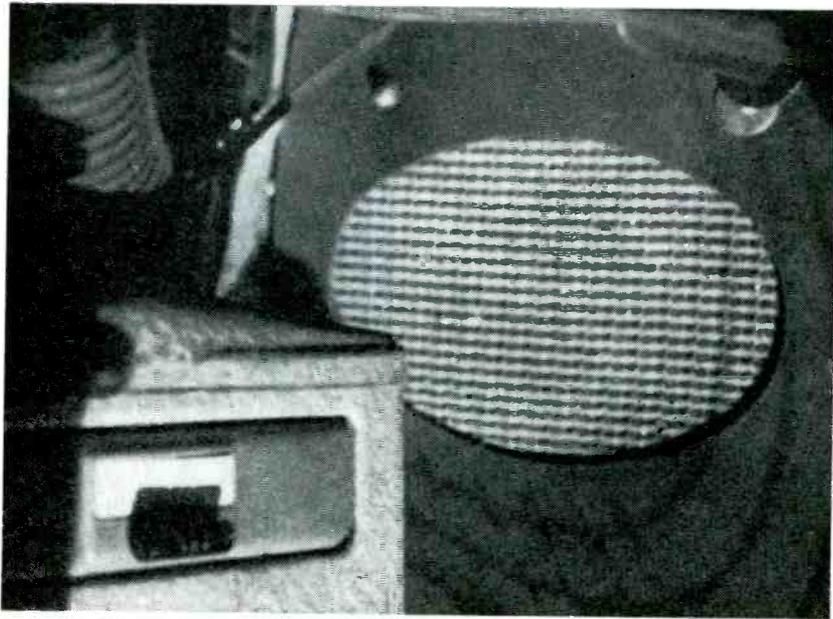
A twelve-inch speaker was mounted on a celotex baffle which measured 17½" square. This was mounted as a sub-panel, with the speaker grill placed over it.

[To Be Continued]

Fig. 4. Response curves of preamp; curve at (a) disclosing the response of the preamp using a Columbia tone-test record (10003-M), curve (b) revealing the response with preemphasis of average record added.

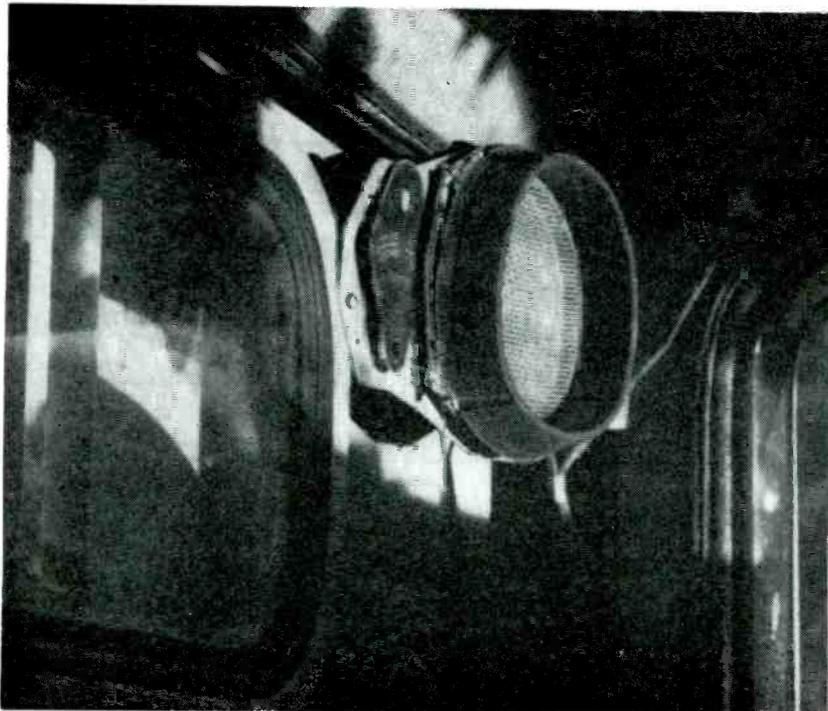


Auto Radio



Speaker installed in right kickpad of jeep station wagon.

Speaker installed above driver's head in pickup truck. Note wiring going over right door frame and down to set under dash.



WITH MORE CARS than ever on the roads and about to start purring along, and receivers more of a basic item, installation activity in many areas has spiralled. In many instances, special types of installations have become involved and the work schedule has become quite crowded.

In the special category the loud-speaker installation has been an acute factor, particularly with the two-unit type of receivers, where there is often the problem of finding a mounting for the speaker and the required bolt or bracket space for the speaker location.

It is true that most cars are equipped with an ornamental grille in the center of the instrument panel for speaker-set mounting. But, there are those *custom-built* sets of the single chassis type, which mount with a rear bracket and nuts on the control shafts, and there's usually no provision for the installation of a separate type of speaker. Separate speakers are employed in the Fords, but in the Chevrolet, Buick, Studebaker, and several others there are no separate speakers, and thus there's often quite a problem. Some Chrysler, Dodge, Plymouth cars have speaker mountings, some do not.

One of the most important aids in this phase of car-installation work are assorted speaker mounting brackets, etc. Some may have to be bought and others may be collected from unused parts of kits, etc. All of these parts should be saved, placed in a box and stored away carefully. Another must-material requirement are several pieces of fairly heavy sheet-metal, about 1" wide and 15" to 20" long, available from the tin shop. You shouldn't have to pay too much for this sheeting, since in most shops it's considered as scrap. Metal straps, left over from a chimney-mount for FM or TV antennas, are also helpful and should be put in with the tin collection.

Mounting a Speaker

In mounting a speaker, there is often the condition, as we mentioned earlier, where there are no handy bolts around, but an ashtray, located on top of the instrument panel, fastened with

Speaker Installations

Dash and Extension-Type Speaker—Mount Problems and Solutions: Fabricating Mounting Brackets for Speaker Mounts . . . Using Ash-Tray Mounts . . . Mounting in Kickpads of Jeep Cars . . . Placing Rear-Seat Speakers in Package Trays . . . Installing Selector Switches.

by JACK DARR

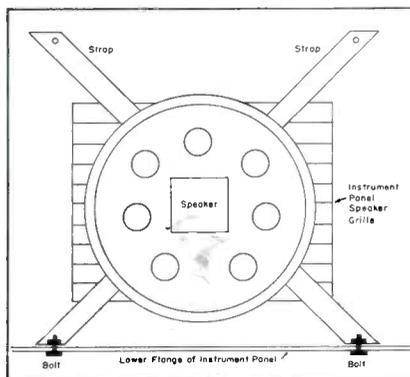
Ouachita Radio Service

four small bolts, two above and two below. These, and the bottom flange of the dash, are all the mounting help available. To mount, two sheet-metal straps are selected, and measured to the approximate length. Then they are cut and holes drilled in one end of each, to fit the bolts holding the ashtray. Now, the nuts from the two lower bolts are removed, and the straps slipped on them. Then they are bent and fitted into place, so that they come out on the bottom flange of the dash. Location is then struck and two small holes drilled through the flange. Next, the straps are held down closely, marked, and these two holes drilled. Then the speaker should be placed in about the center of the two straps, so that it will appear in the center of the grille. Again, marks are made and mounting holes are drilled in the straps, through the holes in the speaker rim. Then the straps can be fastened to the speaker with small bolts. The straps and speaker can be remounted, using the nuts removed from the ash-tray bolts, and two small bolts in the bottom. It is important to see that the straps run as nearly straight in front of the speaker as possible. They should not bow in toward the cone, as they may strike the edges of the cone on loud notes and cause a rattle. If the straps must be rather long, and the metal is light, rigidity can be increased by crossing them, making an X in

front of the speaker. These will interfere very little with the sound output of the speaker, as the area actually blocked will be very small. Also if the only available mounting places are at the sides, the straps may be run horizontally, and do just as well.

Another alternative method is to make an *angle-iron* out of fairly stiff sheet metal. It should be longer than the speaker is wide. A half-moon should be cut out of the top side, and the speaker mounted on this, fastening it to the bottom flange of the dash, and steadying the top with a rod or brace to the firewall. This can be tied down anywhere a bolt is found with which to fasten it. If you have some

Rear view illustrating strap mounting. The straps must be made of the proper length to reach any available bolts, such as those that might be near the speedometer, pockets, etc. Incidentally, the speaker need not be absolutely centered in the grille.



of the heavy rubber rings used between the face of the speaker and the grille, they should be used, as they will help the tone materially and also tend to damp out rattles and vibration.

If there is no other way out, the speaker may be mounted on the firewall, behind the grille. A U-shaped bracket should be made of heavy sheet metal. It should be long enough to place the speaker close up behind the grille, and then fastened to the sides or to the field of the speaker. If the speaker is a *pm*, a bolt or bolts can be usually passed through the space between the magnet and the frame. The bracket should be fastened to the firewall with at least two bolts, and tightened well.

In cars of the Willys jeep and *Jeepster* type, the speaker may be mounted in one of the kickpads, at the side of the front seat floor. In fact, this is the *custom* mounting for their speaker. If you have a grille that will fit, it should be used. If not, a grille should be cut from heavy screen wire *hardware* cloth, and either backed with grille cloth or it can be flocked. A hole should be cut in the kickpad large enough to accommodate the speaker, and at least four holes should be drilled for the mounting bolts. Then the speaker should be bolted directly to the cardboard kickpad. Cup-washers may be used under the bolts, (Continued on page 57)

Evolution of the Single-Tipped Stylus For 3-Speed Phono Systems

IN EFFORTS to secure optimum reproduction from phono recordings, it has been found that it is particularly important to employ a cartridge which is matched both electrically and mechanically to the record, through a stylus tip appropriate to the size of the groove.

Reviewing the problem of matching the cartridge to the record, we find that the electrical output response of a cartridge may be predicted from its mechanical circuit by resolving the mechanical elements into an equivalent electrical circuit. Elements having inertia and those having inductance are analogous; flexible elements and those having capacitance store energy, while elements working in friction, and those exhibiting resistance act alike. Thus, present in each cartridge are mechanical combinations which approximate inductive, capacitive and resistive components of an electrical circuit.

Two drive systems, one utilizing the *bimorph* crystal and the second, a more recent development, involving a single slab shear-plate crystal, dominate contemporary cartridge design.

The *bimorph* crystal consists of two slabs of Rochelle salt crystal cut and cemented together. The crystal package is suspended in a harness or in pads so that when a torsional stress is applied to a corner or edge of the crystal, its mass is twisted against the suspending members by mechanical actions, which can be resolved electrically into a resonant circuit.

Frequently this system produces a peak in the response curve and an extremely high mechanical impedance from cartridge to record through the stylus. These disadvantages are particularly troublesome in controlling the fit and wear of the tip in the record groove, when playing frequencies that are functions of the resonant frequency. The effect of the resonance may be moderated by adding resistance to lower the Q of the resonant system,

Comprehensive Report, Tracing the Development of Cartridges, of the Shear-Plate and Bimorph Type, and Styli for Multiple-Speed Changer Systems, Reveals That Several Structures Have Been Designed To Date: Two Cartridges in Individual Tone Arms, Combinations of Two Cartridges in Single Units, Dual-Tip Stylus Models, and Cartridges with Universal Tips Featuring Truncated Cone and 2.3-Mil Design.

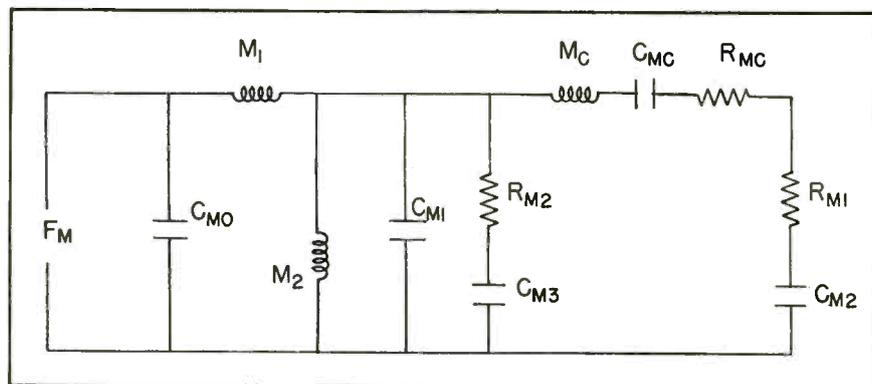
by **HOWARD M. DURBIN**

Manager, Cartridge Sales
Electro-Voice, Inc.

or tuning the peak out of the range of frequencies to be tracked. As the suspension system is stiffened to raise the resonant frequency, the mechanical impedance of the drive system becomes more capacitive and at some low frequency this stiffness (capacitive reactance) will prevent the cartridge stylus

from following the record groove. To track at the low forces recommended, it is necessary to compromise between the compliance desired for adequate tracking and the stiffness required to establish the peak frequency. In general, when mechanical impedance permits proper tracking of low frequen-

Circuit for Bimorph phono cartridge.



cies, circuit parameters fix the peak frequency between 3,000 and 5,500 cps. Beyond the peak frequency, output falls off because of inductive reactance. Sharpness of the cutoff depends upon the resistance introduced into the system.

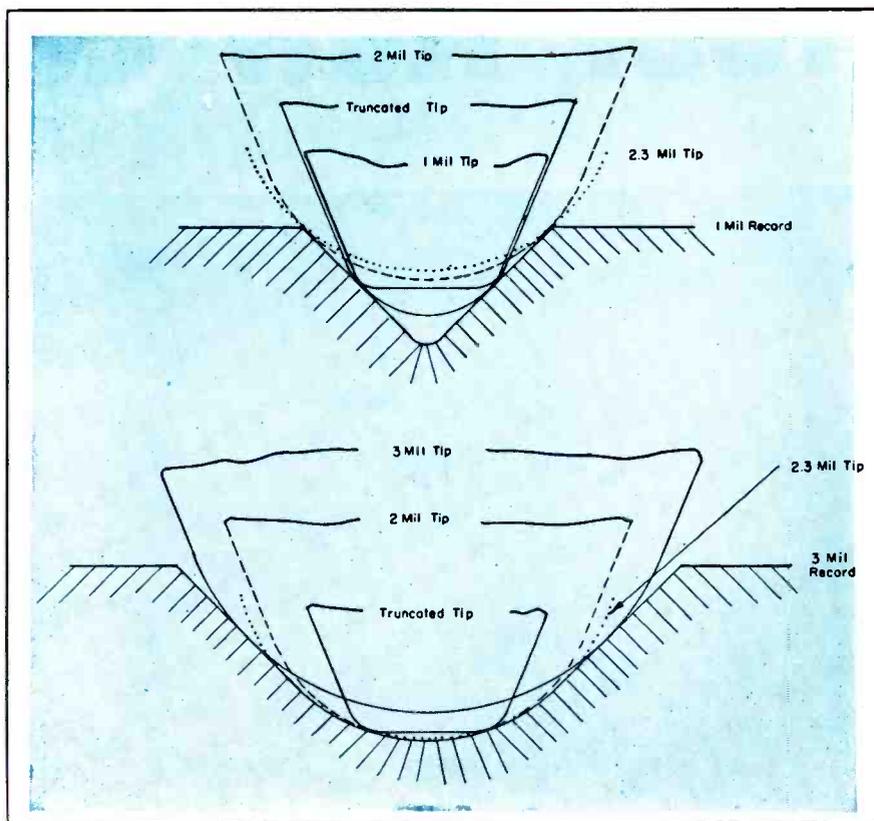
The single-slab shear-plate crystal produces a voltage when it is compressed or expanded. A torque drive harness compresses and expands converse diagonals. The direction of the expansion or contraction is determined by the direction of the stylus. The result is a balanced push-pull action from lateral groove motions. Output from vertical motions of the stylus is cancelled because pressure is directed to adjacent corners of the crystal, not along the diagonals.

There are three essential differences between the shear plate and *bimorph* systems:

- (1) In the shear-plate system, the mass moved is that of the stylus and connecting member only; in the *bimorph*, that of the chuck and crystal.
- (2) In the shear-plate system, the capacitive element that governs the peak frequency is the stiffness of the crystal, which tunes the peak beyond the range of frequencies normally reproduced. In the *bimorph*, the capacitive element is the stiffness of the suspension system.
- (3) In the shear-plate system, compliance to track low frequencies is obtained by a mechanical ratio step down; in the *bimorph*, usually by parallel and series compliances.

Early Developments for Multi-Speed Changer Pickup Systems

It has been found that the ideal relationship between cartridge and record is one in which each complements



Comparative fits of 3-mil, 2-mil, 2.3-mil and truncated tip needles in 1-mil and 3-mil record grooves.

the other. Thus, when the problem of playing both 3-mil and 1-mil records appeared, the use of two cartridges, each matched to the record type to be reproduced and mounted on a multi-speed turntable, offered an obvious solution. In one instance, the 3-mil cartridge employed a stiff drive system. To reduce the hiss produced by abrasives mixed in shellac records, the roll-off response of the cartridge was usually tuned to 3,000-4,500 cps.

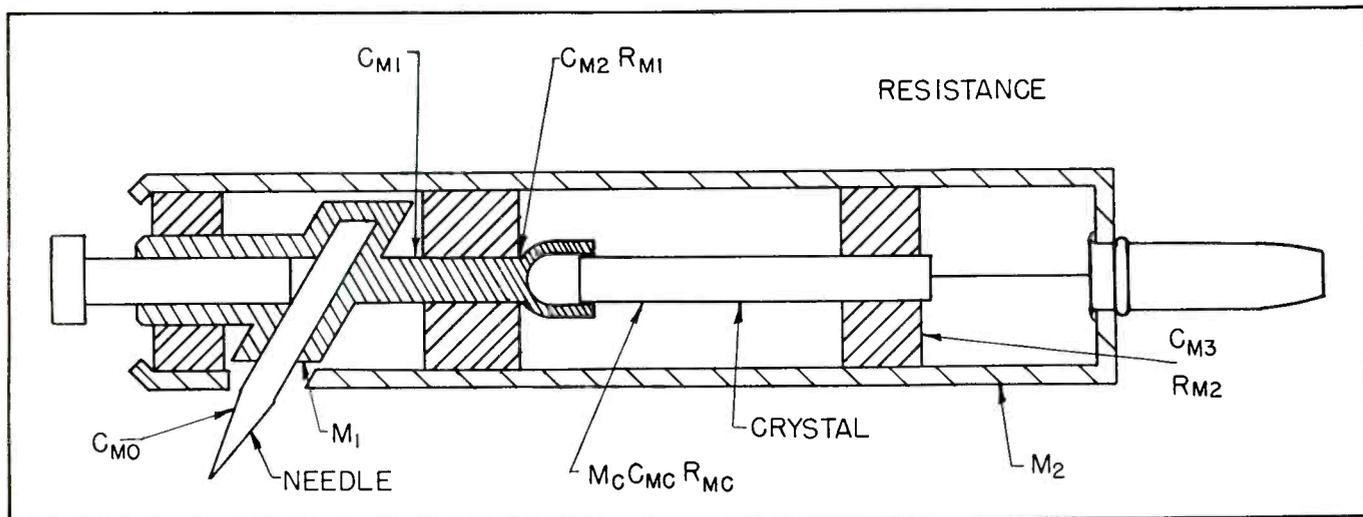
Because the 1-mil record and 1-mil

tip stylus was capable of reproducing higher frequencies, this cartridge was freed of a roll-off characteristic. In creasing the mechanical advantage or parallel compliance of the drive system provided extra compliance which permitted proper tracking at the low tracking force required.

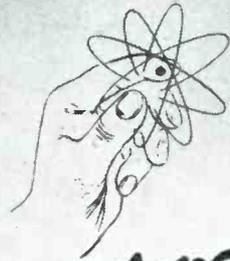
Each cartridge in this two-unit setup was mounted in an individual tone arm. The tracking force of each cartridge was established independently of the other to satisfy the requirements of 3-mil or 1-mil records. Although this system brought multi-speed changers

(Continued on page 30)

Bimorph type phono cartridge.



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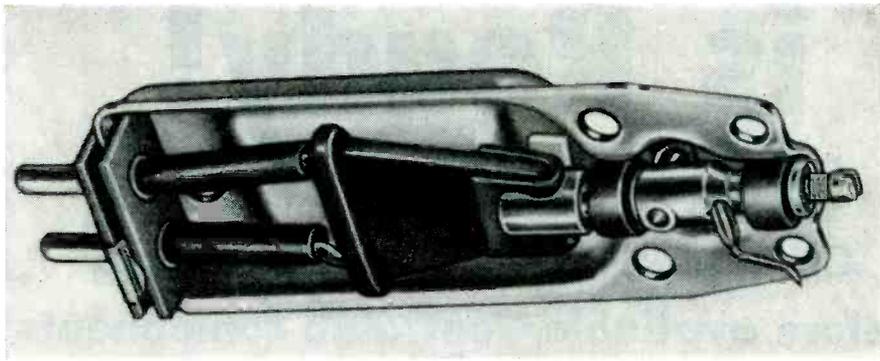
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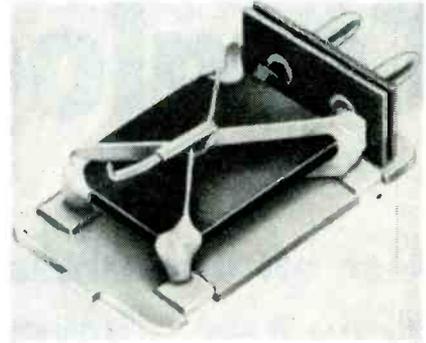
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View of a Bimorph cartridge, with case removed, showing crystal and drive mechanism.



View of torque-drive cartridge, with case removed, showing crystal and harness in place.

to the mass market, the bewildering array of tone arms and instruments did tend to discourage wide-spread acceptance.

In the search for more convenience of operation, it was found that the two cartridges could be combined into a single unit, with a 3-mil tip stylus mounted on the chuck of a 1-mil record-matched cartridge, opposite the 1-mil stylus. The development permitted the cartridge to be rotated and set down the tip appropriate to the groove size. However, the unapplied stylus was found to resonate, producing high mechanical loading and a violent dip in the response curve that eliminated most of the desirable high frequencies.

In another method a dual-tip stylus was employed. A 3-mil tip, on a short length stylus, was mounted to a conventional length 1-mil tip stylus. The added leverage of the 3-mil tip produced higher compliance for that tip, permitted tracking 3-mil records at the low tracking force possible with 1-mil records and made possible volume compensation by reducing output from 3-mil records to that available from 1-

mil records. This concept contributed substantially toward simplified operation of multi-speed changers. Resonance experienced with the single-stylus dual system was found to be negligible because of the extremely close coupling between the two tips. Mass control, an effect of the extended tip, gave a roll off at very high frequencies.

Universal Tip Styli

The exact groove-matching tip combinations produced playback systems with which the public could enjoy all three-speed records, but which still required complicated instructions for proper operation. To eliminate the nuisance of selecting a specific stylus tip, cartridge manufacturers directed their attention to the design of a single-tipped stylus capable of playing all types of records.

In studying the problem, it was of course necessary to consider the condition that no surface of a universal tip can be common to both 1-mil and 3-mil grooves, and thus tips must favor one groove size. This results in a tip that performs well on 3-mil records, but is

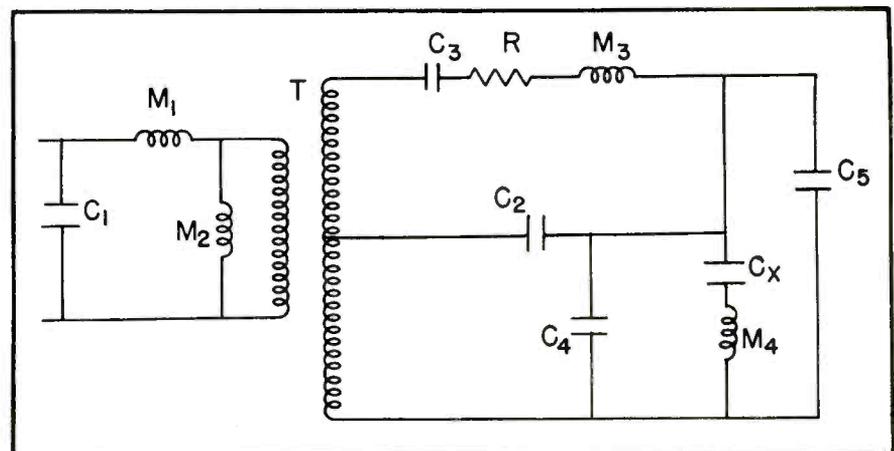
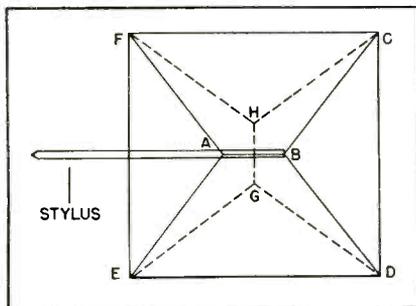
over-size, skates or fails to track high frequencies in 1-mil records; or gives excellent results on 1-mil records, but rattles and bottoms in grooves of 3-mil records.

An equal compromise between 1-mil and 3-mil tips, the 2-mil radius seemed to offer advantages as a compromise stylus. Tests indicated that it tracked well in 1-mil grooves (riding much higher in the groove than did the matching tip). However, it tended to reproduce more *pop* from scratched records. Moreover, it rattled and bottomed in 3-mil grooves.

In reproducing high frequencies, the 2-mil tip was found to be not as satisfactory as the 1-mil tip. The audible effect of this characteristic was found to be dependent upon the response of the cartridge driven by the tip stylus and cannot be distinguished in those cartridges possessing a mechanically controlled roll-off response.

To permit the tip to fit lower in 1-mil grooves and prevent it from bottoming in 3-mil grooves the truncated cone design was investigated. It was found that the size of the flat ground on the truncated cone influences the re-

Left and right: Equivalent circuits of a phono pickup using a double torque drive to actuate the crystal. C_1 is the compliance of the stylus; M_1 , the mass of the stylus; M_2 the mass of the pickup and tone arm; T , the mechanical transformer; C_2 , the compliance of the top hinge at A and B in circuit at left, which must bend before the force is transmitted to the crystal; C_3 the compliance of the bottom hinge; R , damping resistance to rotation of crystal and harness; M_3 , the effective mass of the crystal and drive mechanism for a rotating motion; C_x , the compliance of the crystal; C_4 the compliance of the legs AF , AE , BC , and BD for compressional motion; C_5 the compliance of the legs, HF , HC , GE , and GD for compressional motion; and M_4 the effective mass of the crystal for the distorting motion.



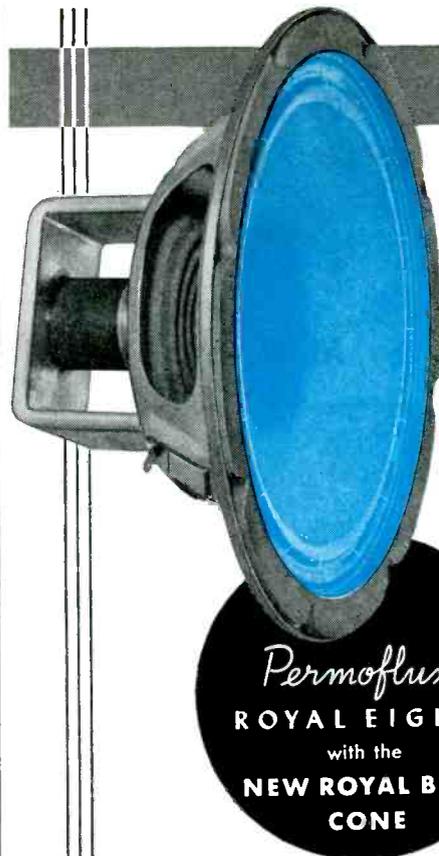
sponse if the tip is used in a free, wide range generating system. A wide flat tip approximates the performance of a 3-mil tip in 3-mil grooves and exhibits roll-off response characteristics in 1-mil grooves. If the flat is reduced to dimensions favoring 1-mil grooves, it produces wide range response from fine groove records and a roll-off on 3-mil records. The roll-off frequency depends on the relation of flat dimensions to groove dimensions.

Many cartridge manufacturers decided to hold the cone flat dimensions to a limit favoring 1-mil grooves to obtain the wider response available and because a tip favoring 3-mil grooves tends to skate on fine groove records. The truncated cone could therefore rest on the same area of 1-mil groove walls as the 1-mil tip and be less susceptible to bottoming in shallow grooves.

The performance of the truncated tip in the pinch-effect regions of a record was found to be disappointing. In the pinch-effect region or that portion of the groove cut where the recording stylus moves laterally, recorded grooves are narrower than silent grooves because of cutting stylus dimension. When the playback stylus is forced upward in the pinch effect regions, the truncated cone exerts much greater unit pressure against the groove wall than the radius tip. Cartridges in which the vertical stiffness of drive system and stylus might be extreme produce accelerated record and tip wear because the groove wall must lift the combined weight of cartridge, arm and loading of arm inertia.

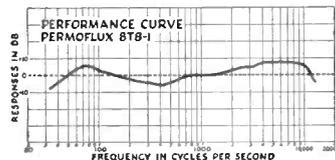
Since the truncated tip sits immediately above the bottom of 3-mil grooves, the dimensions of the flat subject it to rattling, a common source of distortion, and permit the tip to be thrown from side to side in grooves pressed by stretched stampers. Increasing the size of the flat to favor 3-mil records, may produce a tip wider than the dimension across the pinch effect region of 1-mil grooves, but poor tracking or skating on fine groove records will result.

The rattle and associated distortion caused by the truncated tip on some 3-mil records, dictated the use of a stylus tip more capable of universal application. This was found in a 2.3-mil radius tip. Performance of the tip has been found to be similar to that of the 2-mil type on 1-mil records, a characteristic to be expected because of the slight difference in tip radii. When used with vertically stiff cartridges and styli, the 2.3-mil tip reduces record and tip wear below that of the truncated tip because the radius tip



new

Permoflux ROYAL EIGHT" compares with any 12" speaker!



This averaged laboratory response curve of the Permoflux 8T8-1 proves that it compares with the finest speakers regardless of size or price.

It's Your "Springboard" to Extra Sales with Customers who want 12" performance but don't want to pay a 40% higher price.

From the resonant boom of jungle drums to the light warble of the flute, this new 8" speaker reproduces sound with superior sensitivity and fidelity. The tonal qualities of this magnificent speaker can only add to the excellence of any audio equipment.

Special processing provides extra-strong cone; allows cone to be soft-suspended from basket and held at coil-end by extra-large spider. Permits more faithful reproduction at lower frequencies. Deeper, curvilinear cone greatly extends high-frequency response.

Permoflux Royal Eight" (Model 8T8-1) is ruggedly-built, and simple to install. Provides big speaker performance in a small frame—uses smaller, more economical baffle. List Price \$15.00.

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assists in lifting the stylus in the pinch effect regions.

Players produced today are equipped with 2-mil, truncated cone, 2.3 mil and wide-angle type cone tips. Recently, the 2.3 mil tip has been accepted by manufacturers previously specifying 2-mil and truncated cone tips.

As stated earlier, for ideal reproduction qualities, the cartridge and stylus tip must be matched exactly to groove requirements. The universal tip stylus appears to offer a compromise between fidelity and ease of operation.

NEW PARTS COMPANY HEADQUARTERS



At inaugural ceremonies of opening of new quarters of A. G. Radio Parts Company, Philadelphia. Left to right: W. L. Rothenberger, assistant general sales manager (RCA Tube Dept.); Vic Williams, RCA field rep.; Amil Gumula, head of A. G. Parts; Mrs. Gumula; and Hal Bersche, RCA Tube Dept. Renewal Sales Manager.

Servicing Helps

Admiral 24D1, 24E1, 24F1, 24G1,
5B2, and 24H1

6AU6 Audio Amplifier: Increased audio gain has been obtained by using the 6AU6 circuit shown in Fig. 1. This circuit is used in late 24D1, 24E1, 24F1, 24G1 chassis (round picture tubes) in place of the 6SQ7 audio amplifier (V_{204}) which was used in early production. Circuit is used in *all* 24H1 chassis (rectangular picture tube).

Difficulty in Focusing Picture: Due to variations in tube characteristics of short-neck 16" picture tubes, it has been found necessary to add a 22,000-ohm resistor (R_{328}) to some receivers.

If difficulty in focus is encountered, need for the resistor can be determined by checking as follows:

Picture will focus only with control in extreme clockwise position; add R_{328} .

Picture will focus with control only in extreme counterclockwise position; remove R_{328} .

Replacing the 6V6GT audio output tube (V_{205}) will often change the focus point on the control.

Stromberg-Carlson TC125 (Series O)

Improving Locking-In Action of Vertical Hold Control: To make the locking-in action of the vertical hold con-

by M. A. MARWELL

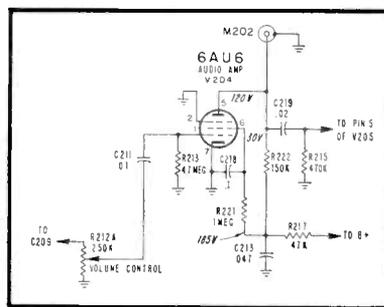


Fig. 1. Circuit providing for substitution of 6AU6 in place of 6SQ7 in Admiral receivers to improve audio gain.

trol more positive, the values of the R_{30} and R_{33} resistors, in the cathode of the 12AU7 sync clipper tube, have been changed. The R_{30} resistor has been increased from a 560-ohm value to a 1,200-ohm value, and the R_{33} resistor has been decreased from 3,300 ohms to 2,700 ohms.

Stromberg-Carlson 16T

Improving Range of Control on Focus Potentiometer: The R_{86} resistor in series with the focus potentiometer

should be a 68-ohm, 2-watt unit rather than the 220-ohm, 2-watt value specified. If the 68-ohm resistor is not in a receiver being serviced for this reason, another 220-ohm resistor can be bridged across the existent 220-ohm resistor to obtain a proper focus range. Receivers are now being produced with the lower value resistance in the R_{86} position.

Stromberg-Carlson TC-19

Improved Audio Response: The .022-mfd capacitor (C_{142}) across the primary of the audio output transformer has been changed to .0047 mfd to improve tone quality.

Horizontal Frequency Control Modifications: The .01-mfd capacitor (C_{253}), from the No. 2 pin of the 6AL5 horizontal phase detector to ground, should be changed to a .022-mfd type. The horizontal oscillator, in chassis using the .01-mfd value, has been found to shift suddenly to half frequency and cannot be returned to normal with the control. Placing another .01 capacitor in parallel with the .01 capacitor in the C_{253} position will usually remedy the trouble.

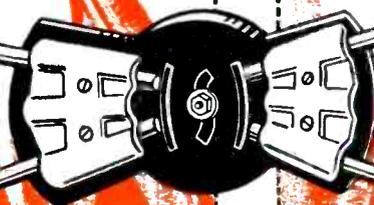
(Continued on page 64)

Stromberg-Carlson Receiver Service Hints: Improving Simultaneous Picture and Maximum Sound Reception in Remote Fringe Areas . . . Correcting Locking-In Action of Vertical Hold Controls . . . Improving Control on Focus Potentiometers . . . Stepping Up Audio Response . . . Horizontal Frequency-Control Modifications . . . Tone-Control Action Improvements . . . Vertical Size and Scanning Action Circuit Changes . . . Tube Type Substitutions in RF Position of Low-Band Section of Tuner . . . Cures for Excessive Hum . . . Noisy Volume-Control Repairs . . . Improved Signal-to-Noise Ratio at Sound Detector . . . Focus Coil Positions Improvements . . . Removing Barkhausen Lines . . . Improving Resolution . . . Securing Better Vertical Speed Range . . . Eliminating Picture Folding. Admiral Chassis Service Suggestions: Increasing Audio Gain . . . Removing Focusing Difficulties in 16" Tube Models, Removing Motorboating in Philco Sets.

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TV

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4. Hi-Tensil $\frac{3}{8}$ " Aluminum Alloy Elements



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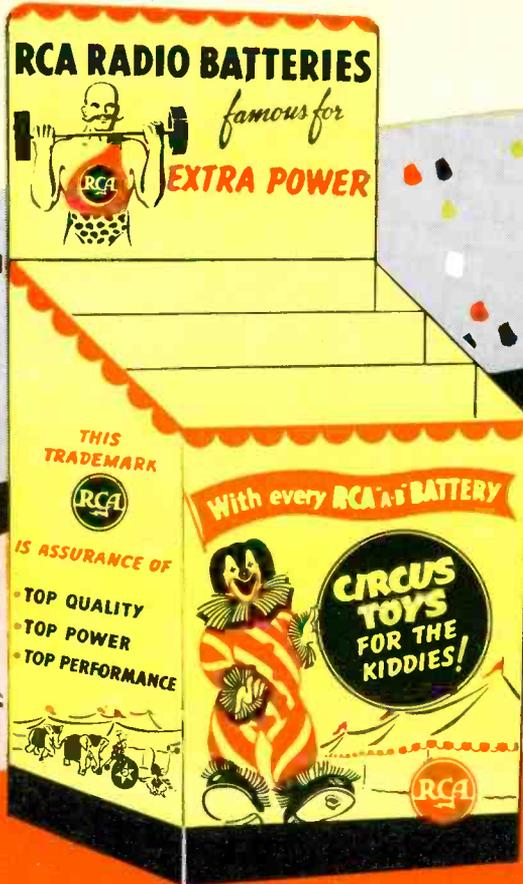
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A THREE-RING SALES

the RCA CIRCUS



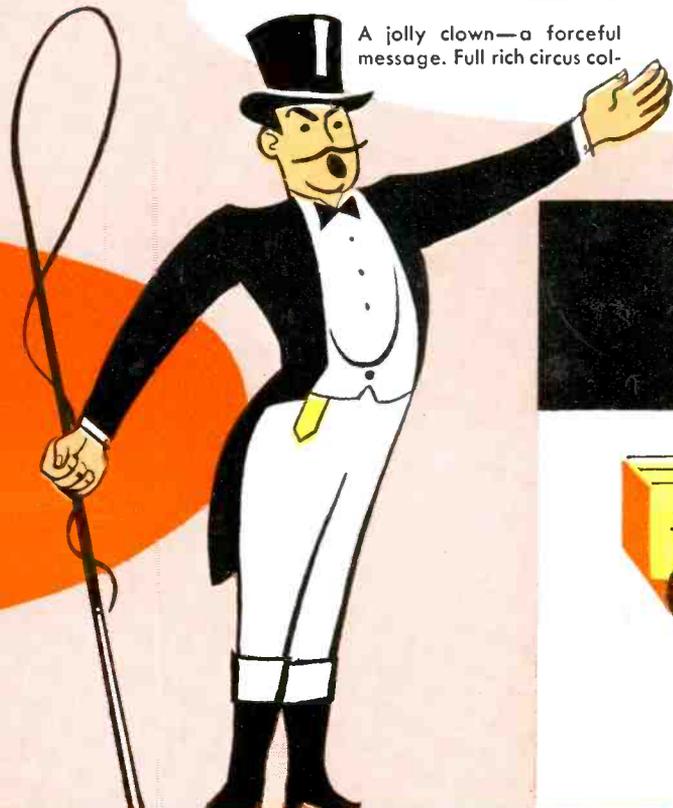
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Here's the store interior 'high-spot' of a promotion to boost your RCA Battery Sales! A Colorful, corrugated merchandiser to display a generous supply of RCA Batteries and a Portable Radio!

Height 46" — 14" deep. Ideal to keep near your counter all during your peak sales season.

ask about CIRCUS COUNTER

A jolly clown—a forceful message. Full rich circus col-



LA, FRAN & OLLIE —and Screen Directors' Playhouse

—top TV and AM Shows—will tell folks from coast to coast about high quality RCA Batteries and the new toy packaging on Portable "A-B" Packs. This national advertising will identify

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ATTRACTION... PROMOTION KIT

... with colorful circus wagon packaging on fast-moving RCA "A-B" battery packs!



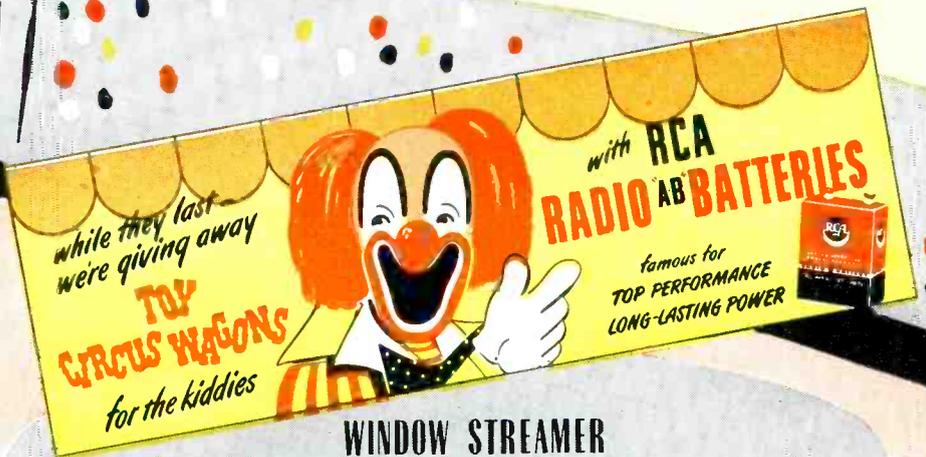
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RADIO A-B BATTERIES

famous for
TOP PERFORMANCE
LONG-LASTING POWER

WAGONS for the kiddies

OR WINDOW DISPLAY

ors make this a most appealing display. 13" x 20".



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STOP PASSERS-BY with this 35" x 11" streamer. Eye-catching in design — this streamer commands attention — gets you sales!

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Available in the following models:

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Here are two NEW accessories to the TELE-ROTOR to give it added versatility for extraordinary installations. The "Super-Structure" will "support a ton" . . . and the "Floating Guy Collar" is adequate for most guyed installations.

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TUBE News

Design and Application Features of 14", 16" and 17" Rectangular Picture Tubes, and 24" Circular Types . . . Highlights of High-Rating TV Rectifiers and Twin Triodes.

by L. M. ALLEN

RECTANGULAR AND CIRCULAR picture tubes in larger and larger sizes continue to come out of the laboratory and on to the production line.

From DuMont has come an announcement that a 17" rectangular tube, the 150, with a viewing surface of 150 square inches, is now available. This model features bent-gun construction.

And National Union has revealed that 16" and 14" rectangular tubes are now being produced at their plant.

The 16" tube, 16KP4, is a 65° type providing a 10 $\frac{1}{8}$ " x 13 $\frac{1}{2}$ " rectangular picture. Features a face plate having an integral neutral gray filter. This tube also utilizes the tilted-beam type gun. The tube is identical to the 16TP4 except for an increase in neck length to 7 $\frac{1}{2}$ ".

The 14" type, 14CP4, is also a 65° model, providing an 8 $\frac{5}{8}$ " x 11 $\frac{1}{2}$ " picture. In other respects it is similar to the 16KP4, having the 7 $\frac{1}{2}$ " neck length.

The tube has a tetrode type electron gun for use with an external, single field ion-trap magnet. External conductive coating, when grounded, functions as a filter capacitor and also serves as a shield against external electrostatic fields.

At General Electric, a 24-inch circular picture tube is now being processed.

The tube features a dark faceplate and an aluminum-backed fluorescent screen.

Special types of TV tubes are also being produced to provide, in some instances, higher voltages, and in other cases, a reduction in the number of

tubes in the average type chassis.

Hytron has developed a miniature filamentary-type rectifier, the 1X2A (said to have higher ratings than the 1X2) for use as a high-voltage rectifier supplying power to the anode of
(Continued on page 56)

J. M. Lang, left, manager of the G. E. tube divisions, and Dr. W. R. G. Baker, vice president and general manager of the G. E. electronics department, studying the sealing of glass to the metal cone of the recently-announced 24-inch picture tube.



PHONO

installation and service

WITH THE growing trend to the use of 33 $\frac{1}{3}$ and 45-rpm records, as well as 78s, has come a vigorous interest in the required multi-speed changers and particularly the possible application of such changers in older-type single-speed phono-combination setups.

Several receiver-makers have studied the problem and evolved interesting procedures which can be followed to make the change. Alterations suggested by one manufacturer¹ are shown in Figs. 1 and 2, the revisions covering new base panel cutouts. The Fig. 1 mounting-board dimensional changes indicate that the minimum height of the phono compartment from the surface of the changer mounting board should be 8 $\frac{3}{4}$ " to allow $\frac{1}{2}$ " clearance to the top record of ten to twelve-inch records stacked on the spindle. There must also be a minimum dimension of 2 $\frac{1}{4}$ " beneath the top surface of the changer mounting board to provide a $\frac{1}{4}$ " clearance to the bottom of the changer mechanism and phono motor. Other factors considered in planning the change are the vertical space available in the cabinet opening for the record-changer drawer, used in this model, and the bores (three 1 $\frac{1}{4}$ " diameter) required for the seating of the

Alterations Which Can Be Made in Single-Speed Changer Mounting Boards to Accommodate 2 and 3-Speed Changers . . . Features of Changers and Cartridges Used in Stromberg-Carlson Receiver Line . . . Hum Cures . . . Sound Equipment Design Trends As Viewed at the Chicago Parts Show.

by KENNETH STEWART

changer mounting springs, which in this case, are flat-bottomed approximately $\frac{3}{8}$ " deep. This depth provides $\frac{1}{4}$ " stock for support, with a mounting board of $\frac{9}{16}$ " thickness. With boards of less thickness, the bore depth will have to be reduced to maintain a $\frac{1}{4}$ "

supporting stock in the bottom of the bore.

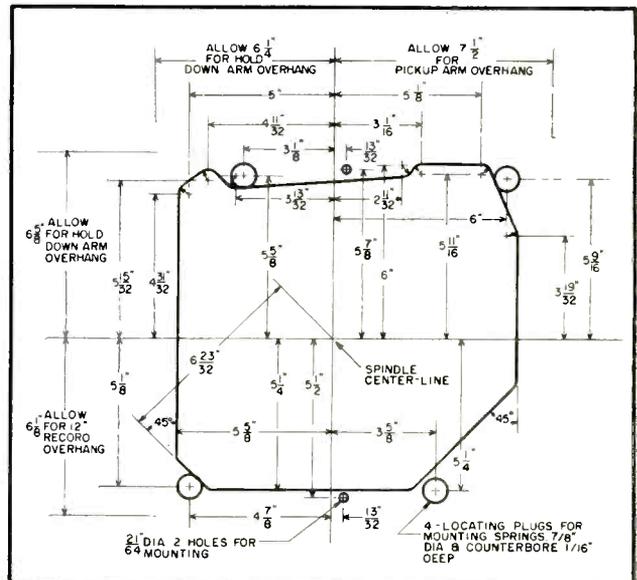
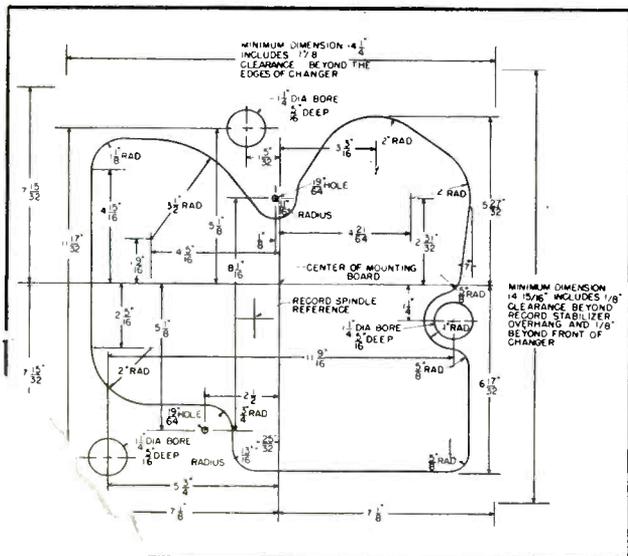
Record-Changer Types in Combinations

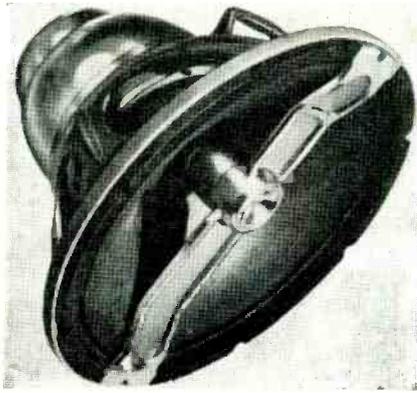
Many types of record changers are now being used in standard broadcast and TV chassis. In the Stromberg-Carlson line, for instance, models use changers made by Webster, Oak, See-

¹G.E.

Figs. 1 and 2. Panel cutouts prescribed by G.E. to convert single-speed mounting board for two and three-speed changers. Cutout at left is for P10 changer and at right, for P13 and P15. In the latter modification, all radii are $\frac{3}{8}$ ", and 5 $\frac{3}{4}$ " clearance must be allowed above the mounting panel for clearance of the hold-down arm, when it is in the vertical position. Also, 3 $\frac{1}{2}$ " must be allowed below the top surface of the panel mounting board for clearance of the motor. The minimum dimensions to allow clearance for a 12" record overhang, pickup-arm overhang and hold-down arm overhang should be 13 $\frac{3}{4}$ " wide by 12 $\frac{3}{4}$ " deep.

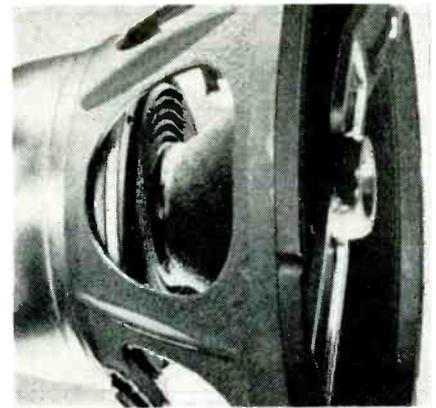
(The P-10 is a 2-speed changer and the P-13 and 15 are 2 and 3-speed units, respectively.)





(Left and right)

Front and interior views of Jensen G-610 triaxial speaker, a three-speaker system, with the high-frequency unit and horn in front, low-frequency diaphragm above the *hf* elements, mid-frequency horn below the *hf* section and feeding into the mid-frequency unit at rear. The low-frequency unit is between the mid-frequency unit and the low-frequency diaphragm.



burg, VM, Detrola, and RCA, with crystal cartridges of Astatic, Webster and RCA manufacture. A compilation of the assortment of changers and cartridges used in the current line, appears in table I.

of three separate loudspeaker units combined into one assembly, no larger than a conventional fifteen-inch speaker. Featured was an electrical cross-

over and control network, built into a separate chassis unit, which divided the input into separate bands of frequen-

(Continued on page 60)

Hum Cures

High residual hum or hum with volume control turned to full counter clockwise position encountered in Admiral combinations (models 32X26, 32X27, 32X5, and 32X36) can be minimized by effecting circuit changes in the power supply filter, as shown in Fig. 3.

To make the changes, it is necessary to remove the lead that connects pin 4 of V_{006} to center tap of the $R_{638}-R_{639}$ candohm resistor. Then the lead that connects C_{651B} to center tap of $R_{638}-R_{639}$ is removed. Next, the 270,000-ohm resistor, R_{335} , is disconnected from center tap of the candohm and reconnected to pin 4 of V_{006} . Center tap of candohm is now left disconnected. Finally a 1-watt, 22,000-ohm resistor is connected from C_{651C} to C_{651B} and a lead from C_{651B} to pin 4 of V_{006} .

This change has been incorporated in 2PA1 power supplies now in production.

Sound Equipment Design Trends

The recently concluded electronic parts distributors conference and show, held in Chicago, saw the unveiling of several unusual sound developments. One was a *triaxial*¹ speaker consisting

¹Jensen.

Fig. 3. Changes required in the 2PA1 power supply filter circuit, used in combination Admiral models, to reduce residual hum. The power supply is used with the 20Z1 chassis, in combination models 32X26, 32X27, 32X35, 32X36, using the 5B2 tuner.

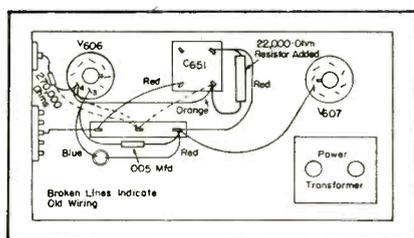


Table I

Record changers and cartridges used in Stromberg-Carlson radio and television receivers.

Broadcast Models	Record Changer	Crystal Cartridge
1020-PL	Webster 26	Astatic L-72
1020-1120-PL	Oak 6666	Astatic L-72
	Seeburg K	Astatic L-72
1101-HPW	VM 400	Astatic L-70
1110-PTW	Detrola 650	Astatic L-70
1121-PL, PF	Webster 50	Astatic L-72
		Astatic LP-6
		Astatic QT-M
		Astatic MLP-2
1121-PG, PS, M1, M2	Seeburg L	Astatic L-72
		Astatic LP-6
		Astatic QT-M
		Astatic MLP-2
1135-PL	Seeburg M	Astatic QT-M
1135-PF	Seeburg M	Astatic MLP-2
	Webster 70	Astatic QT-M
1210-PL	Seeburg K	Astatic QT-M
	Seeburg S	Astatic QT-M
1210-PG, PS	Webster 56, 156	Astatic QT-M
1210-M2, M5	Seeburg L	Astatic QT-M
1220-PL, M6A	VM 800	Astatic L-72
		Astatic LT-1M
1235-PL, M5	Seeburg M	Astatic QT-M
1235-PG	Webster 70	Astatic QT-M
1202-HPW	VM 400	Astatic LT-1M
1408-PL, M6A	VM 800	Astatic LT-1M
1407-PF	Seeburg S	Astatic LT-1M
	Seeburg S	Astatic QT-M
	VM 402 (78)	Astatic LT-1M
	VM 402 (Duo)	Webster F-14-2
1407-PL	Seeburg S	Astatic LT-1M
	VM 400 (78)	Astatic LT-1M
1409-PG, M2, M3	Seeburg S	Astatic QT-M
	VM 402 (78)	Astatic QT-M
	VM 402 (Duo)	Webster F-14-2
	Seeburg S	Astatic QT-M
	VM 800 (33 1/3, 78)	Webster F-14-2
1406-PL	VM 407	Astatic LQD-1JM
1409-3S, PG, M2, M3		
TV Models		
TV-10-P	Seeburg L	Astatic QT-M
TV-12-M5	Webster 156	Astatic LT-1M
TV-12-PG	Webster 70	Astatic LT-1M
TV-12-125-PM	VM 402 (78)	Astatic LT-1M
	VM 402 (Duo)	Webster F-14-2
	VM 402 (Duo)	Webster F-14-2
	VM 405 (Duo and 7")	Webster F-14-2
TS-15-16 M1M		Astatic LQD-1JM
TS-125-M5 and		RCA 74067
TS-16-PM		Astatic LQ
TC-19-M5M	RCA (RP 168A-M6A) (45)	
	VM 407 (33 1/3, 45, 78) (7")	

²Webster F-14-2 cartridges should be replaced with Astatic LQD-1JM cartridges.

³Astatic LP-6 and MLP-2 cartridges may be replaced with Astatic QT-M cartridges.

Public-Address

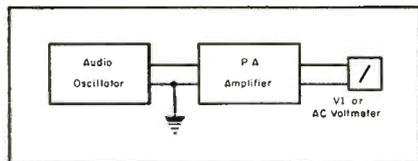


Fig. 1. Block diagram of a frequency-response system using a *db* or *vi* meter, or an *ac* voltmeter to indicate gain or loss of amplifier at various frequencies.

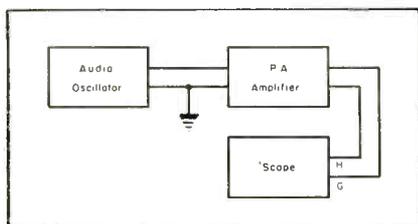
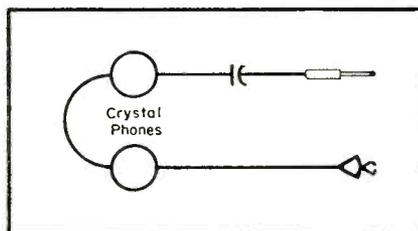


Fig. 2. Another frequency response setup, using a 'scope, which will also reveal harmonic distortion, hum, overload, etc.



Figs. 3, 4 and 5 (above and below). Three forms of signal-tracing circuits.

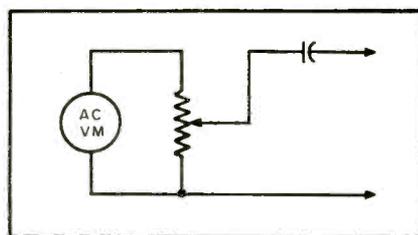
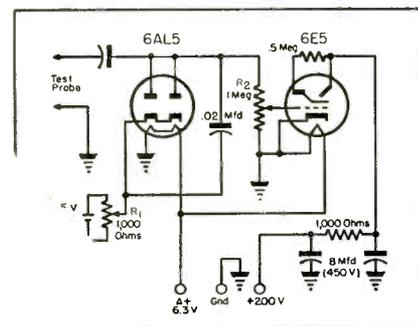


Fig. 5. Electronic type tracing system.



IN SERVICING, a great deal of time can be saved by following a definite, systematic method. The order in which various tests are made often determines the speed and accuracy of repairs. This is particularly true in amplifier-service operations.

Preliminary checking consists mainly of examining the amplifier briefly for signs of overheating, loose or broken connections, etc. If everything seems in order, the amplifier can then be turned on and the routine tests conducted.

The first step in the routine analysis should involve testing of all tubes, searching for low emission, leakage, inter-element shorts, noise and intermittents. Any tube which tests 10 per cent or more below normal must be replaced. In making short tests, all positions must be probed, particularly between cathode and heater. Gas tests are desirable in certain applications, such as *avc*, if the tube tester has these facilities. Intermittent operation, microphonics, and tube noise can be checked by vibrating or tapping the tube with a soft rubber hammer, which can be a pencil with a rubber grommet forced over one end. Often a tube will appear shorted momentarily, only to show up as normal a moment later. Such tubes frequently are responsible for future trouble and should be replaced if any doubt does exist. There are cases, of course, when a momentary short will burn or clear the obstruction and the tube will be perfectly satisfactory. New tubes have been found to be defective and should be tested thoroughly before using.

With the tubes removed, voltages *can* be measured at the sockets with a voltmeter. The readings, however, will be abnormally high due to the drop in load and will only serve to indicate shorted capacitors or open resistors in the stage being checked, or an open speaker field or output transformer in the output stage. For extreme accuracy, all voltages should be checked at the socket terminals with a 'scope or *vtrm*. Although an ordinary 1,000-ohms-per-volt meter can be used to measure *B* supply and most cathode-bias voltages, the *vtrm* is necessary for accurate measurements in *avc*, limiter and inverter circuits.

Resistors and capacitors must be checked for opens, leakage, noise, value

and over-heating. Carbon resistors are notorious for developing high internal noise, while resistors of the wire-wound type often short or open internally, due to heat expansion. It has been found that burned-out or overheated resistors are invariably the result of shorted capacitors. A shorted tube or terminal will, of course, cause the same results.

Resistors whose values do not fall within the usual tolerance limits or which change considerably with temperature must be replaced. Electrolytic and paper capacitors can be checked with a high-range ohmmeter, a capacitor bridge, or by the substitution method. The ohmmeter is preferred for a rapid check for shorted capacitors, while the substitution method often is useful in checking for open or leaky capacitors. Many Service Men have found resistor and capacitor decade boxes to be very useful in their daily work.

Special-Circuit Considerations

Critical circuits, such as *avc*, are often developed around such special considerations as the leakage in capacitors, which can be 20 megohms or higher. This factor can best be determined on a capacitor analyzer. Noise and intermittents are also problems in capacitors, and often these defects can be determined by tapping or vibrating in the same manner as noisy, microphonic tubes. Faulty pigtail connections can often be found by probing gently at the leads.

Carbon-type volume controls are another source of trouble, for in time they can become dirty, noisy and worn. If this type of control is not too noisy, cleaning might help. By removing the back cover and flushing with carbon tetrachloride, the noisy condition often can be eliminated. In worn or extremely noisy controls, replacement is, of course, necessary. If that step is required, it is important to check on the taper and value, which must be correct for that particular circuit. In repairing or replacing controls, dressing of leads should receive careful attention; all leads should be dressed as far away as possible from filament and *ac* circuits. In some cases it may even be necessary or advantageous to shield

System Servicing

Setting up Test Techniques to Check Tubes, Components and Circuits. Applying Stage-By-Stage Amplifier Gain Measurement Procedures to Determine Absolute Operating Condition of P-A Systems.

by JOHN B. LEDBETTER

Engineer, WKRC-TV

the control grid leads to eliminate hum pickup.

Transformers and Speakers

Primary and secondary windings of interstage and output transformers rarely short to each other, but sometimes develop an internal short in one of the windings. Both sections of push-pull windings must be checked for similar readings with an ohmmeter. In addition, the power and output transformers should be checked for overheating, loose core laminations, etc.

The speaker cones also require inspection. They must be checked for vibration and loose, unglued rim edges. The cones might have to be reglued. Regular speaker cement can be used. After cementing, the cones should be aligned with the aid of speaker shims. Field coils must be examined, too, the search being for evidence of overheating and corroded spots on the terminals. And the voice coil can also stand a check, the test covering defective or broken leads, loose turns on the winding, proper clearance and evidence of rubbing against the speaker frame. The speaker cable must also be checked for breaks, applying the technique used in tracing trouble in microphone cables. Terminal and plug connections should be examined for poorly soldered joints, loose fittings, etc. It is often necessary to determine phasing of speakers in a multiple-speaker installation and thus a careful series of checks must be applied for this purpose.

Amplifier System Checks

After the amplifier system has been

routined and all defective parts replaced, circuitry analysis follows and the checks now involve frequency response, harmonic distortion, operating efficiency, and quality.

Frequency response can be probed by a variable-frequency audio oscillator, connecting up as indicated in Fig. 1. An output meter is needed to control the audio output voltage which must be constant as the frequency is varied. Either a db meter, which will show directly the gain or loss of the amplifier at various audio frequencies, or an output or *ac* voltmeter can be used, the latter providing a relative indication of loss or gain.

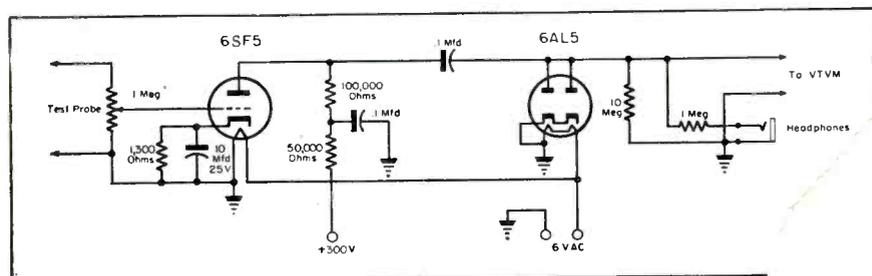
Frequency response can also be determined with a 'scope using a setup shown in Fig. 2. Harmonic distortion, hum, overload, etc., can also be seen readily on the 'scope.

Although apparent and ordinary defects will usually show up in a preliminary or routine check, there are occa-

sions when a more detailed and thorough method of testing are required. Distortion in an amplifier, for example, can be due to speaker or transformer mismatch, core saturation, leakage between windings, or other defects not readily indicated in ordinary tests. Loss in gain, in like manner, can be due to load mismatch, saturation, or internal breakdown in insulation only when normal load is applied.

One of the most effective methods of determining the operating condition and efficiency of an amplifier is through the use of one or more forms of signal tracing, often identified as *dynamic testing*, *channel analysis*, etc. The use of signal tracing resolves an amplifier analysis into nothing more than a series of point-to-point checks. The gain and loss of an amplifier system, for example, can easily be traced by feeding an *af* signal into the amplifier and measuring the signal voltage at various points in each stage with a

Fig. 6. Another signal-tracing circuit, which permits a greater degree of circuit proving flexibility. In applications where the voltage to be measured does not exceed 50 volts, a 1N34 germanium crystal can be substituted for this circuit.



in the plate circuit requires a check of individual plate voltages with a *dc* voltmeter, or a resistance check on R_8 and R_9 . If both resistances check normal, one lead of C_4 and C_5 should be temporarily disconnected. Restoration of normal plate voltage proves that there is a leaky coupling capacitor. This condition can also be indicated by overheating of the control grid or presence of positive voltage on the control grid terminals. If the coupling capacitors check satisfactorily, a new tube should be tried. Lack of gain may also be due to a faulty cathode resistor, R_7 . The amount of gain at (G) and (H) should correspond respectively to that obtained at (E) and (F). An appreciable drop indicates a defect in one of the coupling capacitors, C_4 or C_7 . A loss in gain, accompanied by bassy tone may be due to a bad tube, a partially-shortened tone control R_{13} or a leaky tone capacitor, C_6 . In abnormal readings, resistors R_{10} , R_{11} , or R_{12} may also be at fault, especially if the grid voltages at (G) and (H) are seriously unbalanced. Lack of voltage at either (I) or (J) may be due to a defective tube or a lack of plate voltage caused by an open circuit in one-half of the output transformer primary. No reading at either point indicates an open cathode resistor, R_{18} , or lack of B supply voltage. A sharp decrease in gain may be due to a defective resistor, R_{13} , or abnormal screen grid voltage. Regeneration or *motorboating* effects are usually caused by an open screen grid *bypass*. Loss of low-frequency response, with a corresponding loss of gain, indicates an open cathode capacitor. As the test probe is moved successively from one stage to the other, it will be necessary to increase the range of the vacuum-tube voltmeter. The increase in readings is a direct indication of the gain per stage. A similar method, using an audio oscillator and a db meter will give the overall gain or gain per stage in decibels. With this method, the db meter is connected across the plates of the output stage, and an audio signal injected into the grids of this stage. The level is set to give a desired reference reading as 0 db, and then left at this setting. As the audio signal is moved toward the amplifier input and injected successively into the grid of each stage the increase in db for that particular stage will be indicated. The overall gain is the sum of these readings, plus the gain in the output stage.

The phonograph input circuit (A'), comprising gain control, R_{16} , and limiting resistor, R_{15} , may be checked by connecting the audio oscillator to (A') and taking readings at (E) and (F).

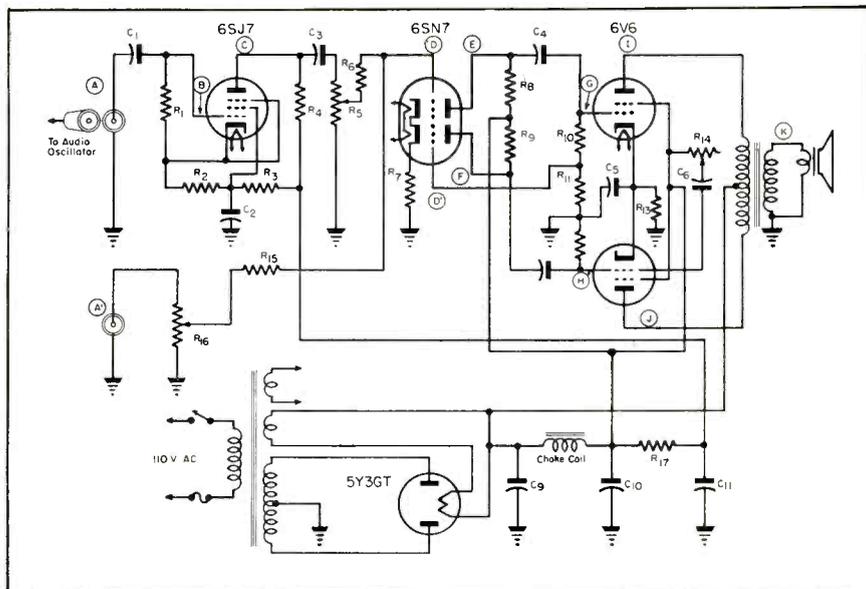


Fig. 8. Typical amplifier setup for test points in a p-a check system.

These readings will be lower since the 6SJ7 stage is being omitted, but should be identical to the amount of gain previously measured between (D) and (E), assuming the two gain controls R_{16} and R_6 to have been at maximum settings, when their respective readings were taken. A lower reading from (A') to (E) or (F) may be due to a defective isolating resistor, R_{15} , or gain control, R_{16} . If R_{16} has at one time been replaced it is possible that the resistance value or taper is incorrect. During one *af* system check, the latter condition showed up. It was found that the gain dropped sharply at the gain controls. The controls on measurement showed a resistance of less than 7,000 ohms, although the correct value should have been 500,000 ohms. These particular controls were

the original units, but they had been given a liquid graphite *coating*, presumably in an effort to cure a noisy or worn condition.

Noisy, worn controls may be checked by varying slowly and noting the effect on the voltage gain reading. The gain reading at (E) or (F) also should vary smoothly; jumpy, erratic action is caused by worn or extremely noisy controls which should be replaced. Cleaning, at best, is only a temporary compromise.

If the amplifier has checked normally up to point (K) (where, incidentally a voltage gain reading taken at (K) will be too low for practical purposes), but no signal can be heard at the speaker the trouble is either in the

(Continued on page 56)

Fig. 9. Sound system tracer permitting direct readings of gain or loss in each stage. (Courtesy RCA)



ASSOCIATIONS



TCA

TV SERVICING PROBLEMS are now being reviewed in a series of advertisements sponsored by members of the Television Contractors Association, Philadelphia.

In one piece of copy, covering the important topic of insurance, TCA pointed out that . . . "It is important to you, the TV owner, to know whether your Service Man has his vehicles and service personnel insured. . . . Property damage may result from a loose or falling antenna, and it may be your property. Injury to you might occur. . . . Stock damage may occur in the course of installation and delivery. . . . All members of the Television Contractors Association have proven that they are adequately covered by insurance as required by the association. They intend to protect the public as well as serve it competently."

Advance proofs of the recently-announced TCA *Television Service Guide Book*, sent to ye editor, were quite revealing. The boys have covered many pertinent factors in servicing and in an effective manner.

In one chapter, covering the selection of a television service contractor, the guide book declares that . . . "the selection of the service contractor is a very important part of the process when you buy television. Who he is and what he is deserves as much of your time and consideration as the purchase of the receiver. . . . If the service contractor approaches you on the basis of quality of service, business reputation, standing in the community, extent of facilities and organization, endorsement of your friends and neighbors, you can be confident of your choice in him. Should you find that he is also affiliated with an aggressive and progressive association, which requires his adherence to high standards, then you can be doubly sure of your choice. . . . The reputable service contractor is never hesitant about explaining his service contract or its price. It is usually a fair price, one which permits him to maintain a highly efficient service staff and office organization, and to invest in a modern, well-equipped service vehicle, thus enabling him to provide you with the most efficient and economical service." The article is on C.O.D. service calls, allowing interesting com-

mentary: "It is not logical or always possible for the television owner to take his receiver to a shop. It is usually too large to handle or it is a fine piece of furniture that doesn't permit such movement. Further, it would take a lot of time and require transportation facilities. Since it is not always advisable to move the receiver, it is necessary to call a Service Man. . . . To make such a service call requires that the Service Man have a vehicle that is completely equipped for almost any type of difficulty. It must be adequately insured so that the public and contractor are protected from any contingency. The time spent in traveling from, and returning to the shop, is a part of the expense involved in the service call, regardless of its nature. . . . The Service Man making the call is usually a highly-paid, highly-

trained technician, and his compensation is part of the cost. Behind him are equally highly-paid, effectively functioning business organizations that derive their revenue from his immediate efforts. . . . The years of experience and training that enable him to do a job quickly, effectively, warrants consideration of him as the professional man that he is and the compensation that he deserves."

ARTSNY

IN A PROTEST MEETING to discuss a recently proposed municipal bill involving licensing and the payment of several fees, including one of \$500 covering financial responsibility, members of the Associated Radio-TV Service Men of New York, Inc., declared that the proposed measure would solve no problems.

Discussing the bill at the meeting, John F. Rider declared that . . . "I am opposed to all licenses, but I strongly believe that there should be financial responsibility." Explaining this point he said: "The public must be protected, especially when it hands over money in advance with service contracts." Rider then added that if the industry returns to a per-call basis, in which case the handling of public funds before servicing would not be involved, there certainly would be no need for municipal policing.

Max Liebowitz, president, and Noel Payne, corresponding secretary, offering their comments on the measure, stated that ARTSNY would dedicate itself to corrective education for the service industry.

It was also revealed at the meeting that another protest meeting would be held, with the gentleman who introduced the bill, City Councilman Keegan, appearing to offer his views on the subject.

ART, BC

AT A RECENT ELECTION of the Associated Radio Technicians of British Columbia, W. Filtness was elected president, succeeding J. Baird. J. Allan Clarke was named vice president and Fred Lewis was elected secretary. Ed Mullens is the new treasurer and H. Amos, the recording secretary.

TEN YEARS AGO

From the Association News Page of
SERVICE, June, 1940

GEORGE C. CONNOR, Hygrade Sylvania commercial engineer, presented a series of talks to the servicing groups in California on FM, servicing of battery portables, *ac* and *dc* receivers, and new tubes and circuits. . . . Bill Hitt and Sandy Saunders appeared at a meeting of the Radio Technicians Association of Orange County, California, and discussed bridge and capacitor checkers. . . . Walter R. Jones, Hygrade Sylvania commercial engineer, concluded a series of meetings in the south, which were devoted to circuit analyses. Among the cities covered were New Orleans, Birmingham, Chattanooga, Knoxville and Nashville. . . . Eddie Donnelly had been elected treasurer of the Binghamton chapter of RSA. . . . A talk on antennas for FM was offered at a meeting of the Boston chapter. . . . RSA participated in a *National Radio Festival* week, co-sponsored by NAB and RMA, and designed to stimulate listening habits. Broadcasting stations throughout the country participated in this national program.

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✓✓ "Informative and extremely well written."—*R. Morris Pierce, President and General Manager, WDOK.*

✓✓ "Most complete analysis of the antenna installation problem I have seen as yet."—*A. T. Alexander, Service Manager, Motorola, Inc.*

✓✓ "First really good publication I have found on the subject."—*E. K. Jett, Former FCC Commissioner and now Vice-President, WMAR.*

✓✓ "I have just finished looking through your book . . . and find it very interesting and informative."—*A. James Ebel, Director of Engineering, Peoria Broadcasting Co.*

✓✓ "The Radio-Television Division of the Massachusetts Trades Shops Schools has just decided to incorporate the book within its curriculum. . . . The book will be issued to all future television starting classes at the school."—*Donald M. Bearse, Purchasing Agent, Massachusetts Trades Shops School, Boston.*

TV-FM Antenna Installation

by **IRA KAMEN**

Manager, TV Dept.
Commercial Radio Sound Corp.

and **LEWIS WINNER**

Editorial Director,
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CITY AND STATE

SERVICE, JUNE,

SER-CUITS

Analysis of Stromberg-Carlson TS TV Models, Featuring Automatic Black Level Diode, Automatic Frequency Control of Horizontal Sweep, Dual Function AGC Delay System and High and Low-Band Inputs.

AUTOMATIC CONTROL TV CIRCUITRY is no longer restricted to *agc*, as in the earlier days. Today, we have such circuits as the black level and the horizontal sweep also controlled in an automatic fashion. This trend is well illustrated in the Stromberg-Carlson TS-125, TS-15 and 16 series, diagrammed in Figs. 1 and 1a.

In the picture detector and video amplifier appears one of these circuit innovations, a *black-level* tube. The *lf* signal, in this circuit, is detected by one-half of a 6AL5. The signal developed across a 3,900-ohm resistor (R_{223}), the diode load, is sync pulse negative. The signal is coupled into the grid of the first video amplifier (6AU6) through a peaking coil, and a .047-mfd capacitor, C_{240} . The grid of this video amplifier is maintained at approximately $1\frac{1}{2}$ volts through the voltage divider action of a pair of 5.6-ohm resistors, R_{244} and R_{245} . This establishes a point of bias for the grid of the tube so that any noise having an amplitude greater than the signal will drive the grid beyond cutoff and clip the noise. The composite video signal is coupled from the plate of the 6AU6 through the peaking coil, L_{240} , and the .047-mfd blocking capacitor, C_{250} , into the grid of the 6K6GT video output tube, V_{25} . The grid of this tube is maintained at a fixed negative bias to prevent crushing of the video signal for a normal picture. The video signal from the plate of the tube is coupled into the grid of the picture tube through the peaking coil and a .047-mfd blocking capacitor, C_{200} . The *dc* component of the video signal which was removed by the coupling capacitors is reinserted by the action of the *automatic black level* tube, a 6AL5 which serves as a peak detector.

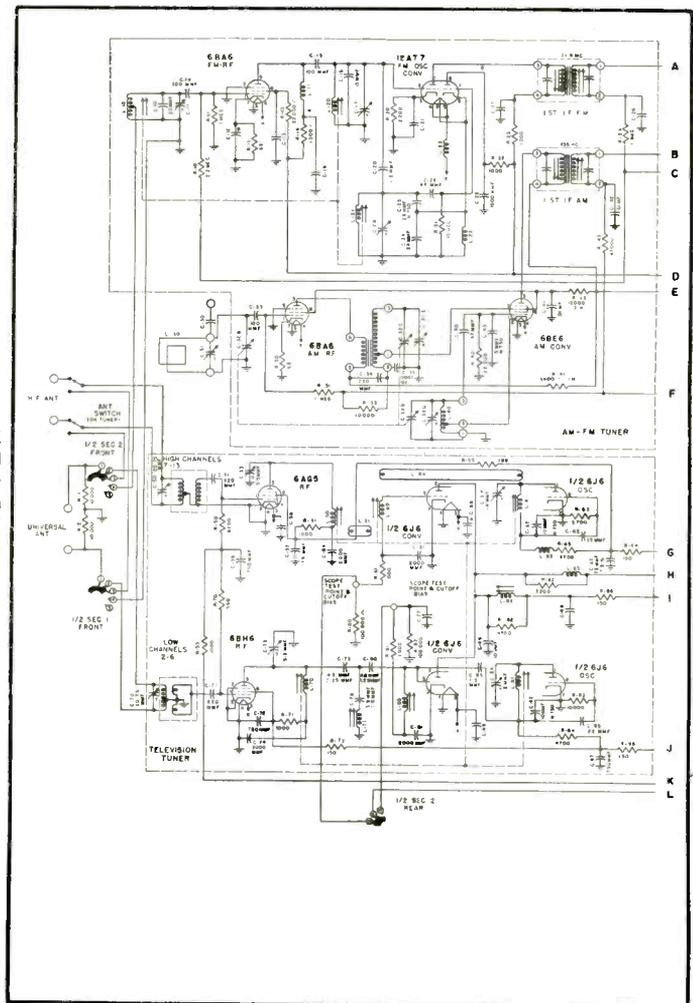
The *lf* signal is rectified by the 6AL5, V_{22} , and fed into the 6AV6 *agc* amplifier, whose diode is also essentially *or*. That is, the output

after filtering, is proportional to the input signal strength by virtue of the fact that the tip of the sync pulse represents 100% modulation. In order to have sufficient *agc* voltage to control the gain of the *if* tubes, it is necessary to amplify the *dc* voltage from the *agc* detector.

The *agc* amplifier is a typical *dc* amplifier having its cathode near -130 volts and its plate tied near ground. The *agc* voltage, after being amplified, by the 6V6, is fed to the 6AL5 *agc*

delay tube. This delay tube has a dual function; one-half acts as a *agc* limiter and the other half serves as an *agc* delay. The limiting diode section allows the *agc* voltage to increase in a normal manner, as the signal strength increases up to a predetermined level. After this amount of bias is applied to the grids of the *if* stages, any further increase in signal strength will not produce any further increase in *agc* bias. The other diode section of the 6AL5 delays the *agc* bias applied to

Fig. 1. The A-M/FM tuner and TV low and high-band front end for the Stromberg-Carlson TS-16 series, the TV chassis of which is shown at right, Fig. 1a.



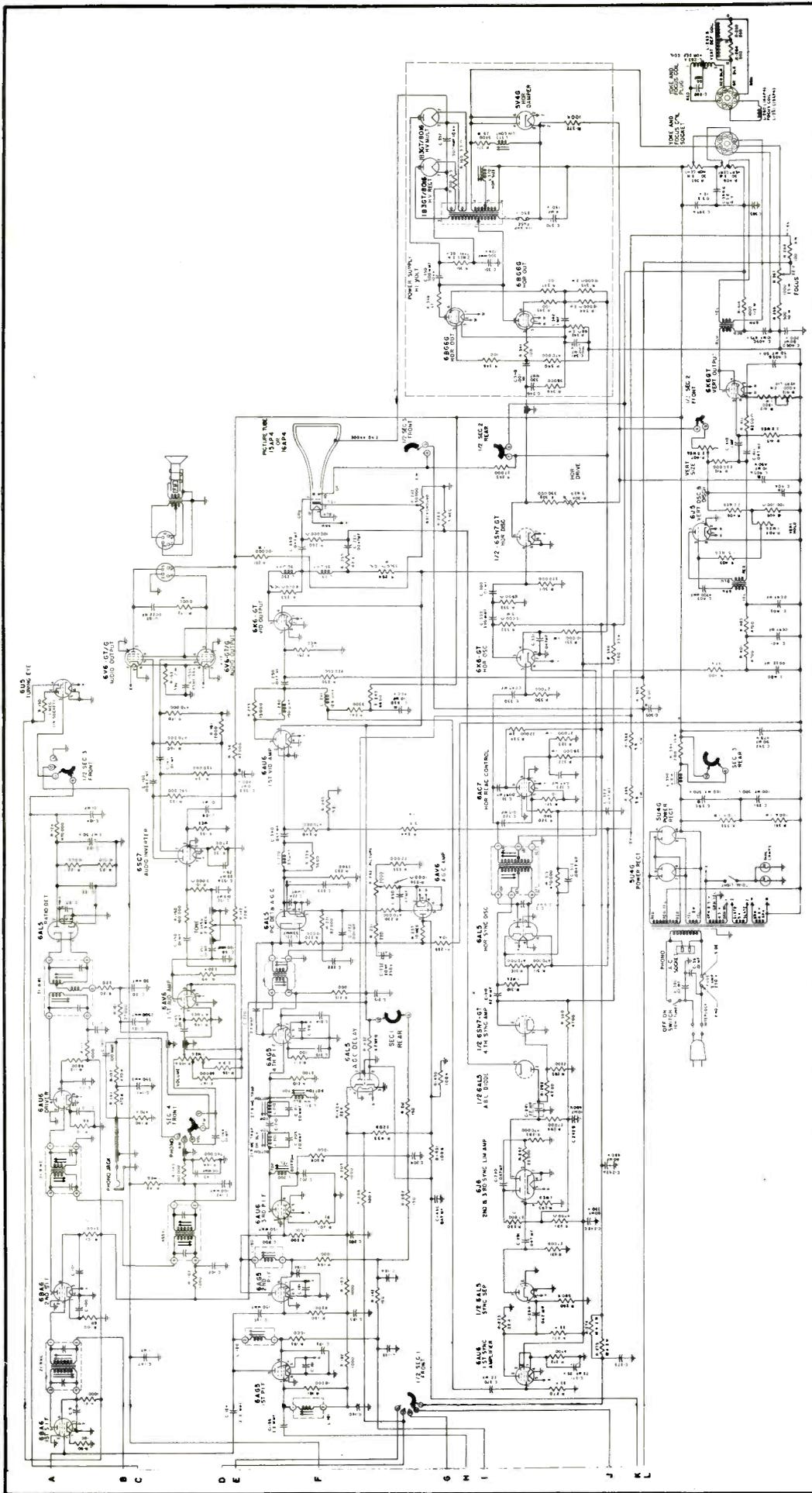


Fig. 1a. Stromberg-Carlson TS-125/15/16 TV chassis circuit: TS-125 uses a 12" picture tube; TS-15, a 15" type and TS-16 a 16" tube. Chassis also provides for AM and FM pickup, as indicated in Fig. 1.

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Ser-Cuits

(Continued from page 46)

the grids of the *rf* tubes until the amount of bias from the *agc* amplifier is such that the limiter comes into play. This limiting and delay action is necessary to provide a low signal-to-noise ratio in the *rf* amplifier on a medium and weak signal, by allowing the tube to operate at full gain. A 2,000-ohm picture control, R_{202} , in the cathode of the *agc* amplifier, varies the gain of the receiver by varying the 6V6 conduction, which in turn varies the plate voltage.

Sync Amplifiers

The sync circuit receives its signal from the plate of the first video amplifier. The signal coupled into the grid of the 6AU6 first sync amplifier through a .22-mfd capacitor, C_{270} , has video information as well as sync pulses. A portion of the video is removed in the grid circuit by grid clipping, while the sync is amplified. A sync separator, ½ of a 6AL5 (V_{28A}), in conjunction with the time constant of a .047-mfd capacitor (C_{280}) and a 560,000-ohm resistor (R_{280}), remove all of the remaining video so that only sync pulses are fed into the grid of the second sync limiting amplifier. A 6J6 second and third sync amplifier (V_{29}) amplifies and clips the sync pulse so that the output (pin 2) of the tube is a well shaped sync pulse at the grid the fourth sync amplifier, ½ of a 6SN7 (V_{30A}). The sync pulses are substantially constant in amplitude over a wide range of input signal levels. The 6SN7 further clips and amplifies the sync pulses.

Automatic Black Level Diode

The *abl* diode, V_{28B} , is used to reinsert the *dc* component of the video signal on the picture-tube grid. Since the plate of the diode is tied into the output of the third sync limiting amplifier, it detects on the top of the pedestal rather than the sync tips, as in a normal *dc* restorer circuit and the voltage developed across a 1.5-megohm resistor, R_{203} , is a function of pedestal height and not sync tips.

Horizontal Sync and Deflection

The output of the fourth sync amplifier is fed into the center tap of the primary of a horizontal sync discriminator, T_{301} . It is combined with a 15,750-cycle sine wave from the 6K6GT horizontal oscillator tube, V_{30} , which is impressed on the secondary of T_{301} . The voltages on each plate of

the horizontal sync discriminator, a 6AL5 (V_{21}), will be a sine wave 180° out of phase, having a sync pulse superimposed on it. The sine wave, with sync pulse, will cause current to flow in each diode and the resultant voltage across a pair of 470,000-ohm resistors, R_{311} and R_{312} , will be zero if the current is equal and opposite in polarity. If the frequency of the oscillator changes, the sync pulse will ride at a different point on the sine wave, causing an increase of current in one diode and a decrease in current in the other; therefore, the resultant voltage across the 470,000-ohm resistors will no longer be zero. This voltage is applied to the grid of the 6AC7 horizontal reactance tube, V_{32} , through a suitable filter network, which contains a 470,000-ohm resistor (R_{313}) and .0047 and .047-mfd. capacitors, C_{312} and C_{322} . The change in plate current changes the inductive reactance of the tube (which is connected across the tuned circuit of the oscillator) in such a way to change the frequency of the oscillator, so as to bring it back into resonance. This automatically keeps the oscillator at the horizontal sync frequency rate. The time constant of the filter circuit is such that a sudden change in voltage due to noise pulse will not be impressed on the grid of the 6AC7, and therefore, the frequency of the circuit can not change rapidly; hence the so-called *flywheel effect*.

The output from the plate of the horizontal oscillator is fed through a differentiating network consisting of a 390-mmfd capacitor and a 6,800-ohm resistor, C_{332} and R_{333} . The tips of the differentiated pulses cause the horizontal discharge tube, ½ 6SW7GT (V_{30B}), to act as a switch and discharge a 330-mmfd sweep-generating capacitor. This, in turn, is fed to the grids of 6BG6G horizontal output tubes, V_{34} and V_{42} . These tubes in conjunction with a horizontal output transformer, T_{340} , a 5V4B horizontal damper tube, V_{37} , and a horizontal deflection coil, L_{203A} , generate a saw-tooth current waveform.

NEW TUBE PLANT



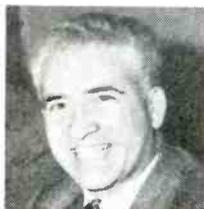
Building with 126,000 square feet of space, purchased by the tube department of RCA for expansion of tube manufacturing facilities at Harrison, New Jersey.

Rep Talk

ROBERT V. CURTIN is now with Henry Lavin Associates, P.O. Box 196, Meriden, Conn. Curtin, formerly with Burgess Battery Company, will cover the eastern New England territory and will make his headquarters at 436 Dedham Avenue, Needham, Mass. . . . *John P. Sheridan* has become Washington engineering rep. of the Sprague Electric Company, North Adams, Mass. . . . W. S. MacDonald Co., Inc., Cambridge, Mass., has appointed the *Gerald B. Miller Co.*, Highland Arcade Building, 1540 N. Highland Ave., Hollywood 28, as its rep in four western states. . . . *Conrad R. Strassner Co.*, Los Angeles reps for Precision Apparatus will stage instrument meetings in July for TV Service Men in Phoenix, San Francisco, San Diego and Los Angeles. Meetings will be conducted by Precision's touring engineers. . . . *Art Cerf & Co.*, have moved to larger offices at 744 Broad Street, Newark, N. J. . . . *The Second Annual Upper Midwest Conference* between manufacturers and dealers, sponsored by the *Gopher Chapter* of the *Representatives*, will be held this year from July 12th-15th, at Breezy Point Lodge on Big Pelican Lake at Brainerd, Minnesota. Jack Heimann is chairman of the arrangements committee. . . . *Harry Gerber* has announced that his son, *Irving Gerber*, is now a partner in the Gerber Sales Co., 739 Boylston Street, Boston, Mass. . . . *Harold H. Everett*, 490 Plandome Road, Manhasset, New York, has become Marion Electrical Instrument Co. sales rep in the New York, Long Island, Westchester area. As an associate of *Holliday-Hathaway Company*, Cambridge, Mass., Everett will represent several other companies also in the electronic component field. . . . *Mose Branum* and *J. C. Spencer*, reps in Texas, Oklahoma, Arkansas, and Louisiana for the Specialty Battery Company, Madison, Wisc., are now located at 107 Guardian Life Building, Dallas, Texas. . . . *Les Logan* of the Logan Sales Company, 530 Gough Street, San Francisco, Calif., has been named to cover northern California and northern Nevada for the Specialty Battery Co. . . . *David M. Lee* and *Joseph V. Belusko* of the David M. Lee Company, 819 Thomas Street, Seattle, Washington, have become reps in Washington and Oregon for the Specialty Battery Co. Belusko is located at 2712 N. W. Raleigh, Portland, Oregon. . . . *Don C. Wallace* and *William H. Wallace*, Bendix Building, 1206 Maple Avenue, Los Angeles 15, Calif., were at the Stevens Hotel during the recent parts show. Following the show, Will Wallace drove the southern route, calling on accounts in New Mexico, Colorado and Arizona, while Don Wallace drove the northern route, calling on accounts in Wyoming, Utah and Nevada.

W. Wallace

J. Heimann



REVOLUTIONARY



GIVES YOU

maximum replacement

WITH A minimum of cartridges!

THIS MEANS MONEY TO YOU!

ORTHOGONAL SERIES 32, 33 and 34

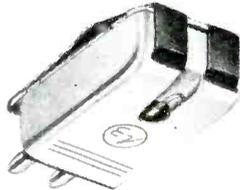
This TORQUE DRIVE* vertical-type crystal cartridge is being used more and more in original equipment and for replacement. The 32 series greatly improves 78 rpm reproduction—saves record wear. The 34 series for 33 $\frac{1}{3}$ and 45 rpm beautifully plays the new wide-range, high fidelity recordings—tracks perfectly at 5 grams pressure. The 33 series handles all three speeds, with remarkable efficiency. All specially moisture protected for extra long life. Has $\frac{1}{2}$ " and $\frac{3}{8}$ " hole spacing. Color coded. Simple to install. Replaceable osmium-tip or sapphire-tip needles.

*E-V Pat. Pend. Licensed under Brush patents.



SERIES 12 and 14

The Series 12 TORQUE DRIVE crystal cartridge replaces over 150 types in general use for 78 rpm. Saves time and work—speeds servicing. Gives better reproduction and longer record life. Series 14 for 33 $\frac{1}{3}$ and 45 rpm is performing brilliantly in thousands of record changers. Tracks perfectly at 5 grams pressure. Color coded. Replaceable osmium-tip or sapphire-tip needle.



SERIES 16 TWILT FOR ALL 3 SPEEDS

Superbly plays 33 $\frac{1}{3}$, 45 and 78 rpm records with a single twin-tip replaceable needle without weight change, with tracking pressure of only 6 grams, and does it with TORQUE DRIVE efficiency. You merely tilt the Twilt and select the 1-mil or 3-mil needle tip for fast or slow speed records. Setdown is accurate. Mounts easily in most any standard pickup arm, with nothing more required than reducing needle pressure. Also available without tilting mechanism.



SERIES 60 REPLACES OVER 20

New Econo-Cartridge for economical replacement of over 20 conventional Bimorph crystal types. Frequency response to 6000 cps. Output is 3.5 volts with compliant needle, and 4.5-5 volts with straight shank needle. Has exclusive E-V needle stop which prevents chuck from rotating excessively and damaging crystal.



Electro-Voice

INCORPORATED

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Export: 13 East 40th Street, New York 16, N.Y., U.S.A. Cable: Arla
Research-Engineered Phono Pickups, Microphones, High-Fidelity Spe

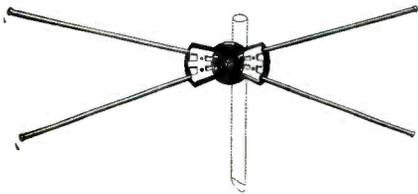
ASK YOUR E-V
DISTRIBUTOR OR
WRITE FOR
FREE BULLETINS

New TV Parts . . . Accessories

SNYDER TV ANTENNA KIT

A TV conical antenna kit, XA-1, known as the *Hot-X* model, has been announced by the Snyder Manufacturing Co., Philadelphia, Pa.

Kit includes array and universal mast clamp with four hi-tensil $\frac{3}{8}$ " aluminum alloy elements.



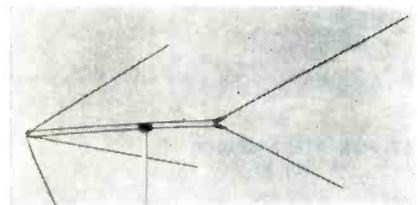
* * *

WORKSHOP ASSOCIATES DUBL-VEE

An all-channel television antenna, the *Dubl-Vee*, has been announced by the Workshop Associates, Inc., 135 Crescent Road, Needham Heights 94, Mass.

Gains up to 7.5 db are said to be possible with single bays. For a double stack, the gain is said to be 10 db with an average standing-wave-ratio, when matched to 300-ohm line, of less than 2 to 1 over the entire band. Half-power angle is claimed to be no less than 82°, on channel 2, and sharpens to 26° on channel 13.

Antenna utilizes the end-fire principle, and has two *V*'s mounted in the same plane and driven in phase.



* * *

BRACH COAX-CABLE SPLICING CLAMP

A copper clamp for splicing coaxial cable has been announced by Brach Manufacturing Corporation, Newark, N. J.

In application: (1) Two ends of coaxial cable are joined and held by splice connector; (2) vinyl sleeve is placed over the connection and taped at the ends.

* * *

RMS BOOSTER

A TV booster, SP-5, which can be peaked for any desired channel from the side of the cabinet, has been announced by Radio Merchandise Sales, 1165 Southern Boulevard, New York, N. Y.

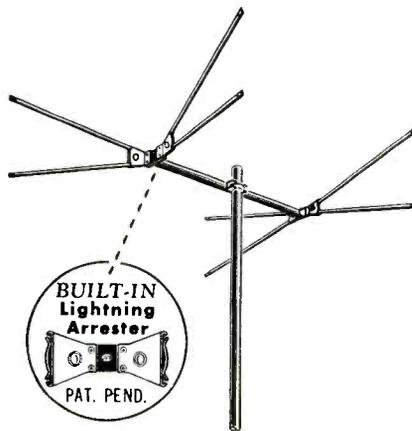
It features a gear-drive assembly, peaking with ribbon wire coils, input and output circuits, and a transformer to eliminate

distortion.

JFD TV ANTENNA WITH BUILT-IN LIGHTNING ARRESTER

Conical antennas (TA160, TA161 and TA162) with lightning arresters molded directly in the dipole bakelite insulator have been announced by JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, New York.

Lightning arrester is said to accommodate any type lead-in, be completely water-proof, not affect impedance or unbalance the line.

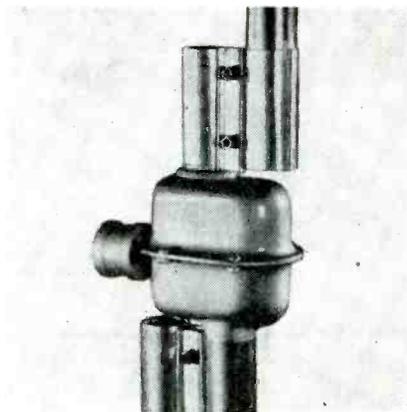


* * *

SHAW NON-ELECTRIC ANTENNA ROTATOR

A mechanically-operated, non-electric antenna rotator, the *Tele-Tuner*, has been announced by the Joseph Shaw Company, 6225 Benore Road, Toledo 12, Ohio.

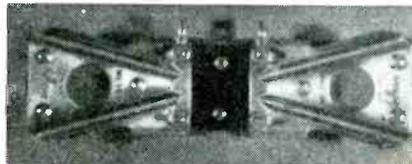
Features include an inside control with direction indicator, ball-bearings, locked antenna positions, and equal-pressure clamps to prevent damage to walls of mast.



* * *

TELREX V BEAM

An economy line of *Conical-V-Beams*, the *Metro* series, which supersedes the former *Special* series, has been announced by Telrex, Inc., Asbury Park, N. J. Includes 3" element clamping channels, reverse flanging of the *butterfly clamp* and solid dural elements.



LITTELFUSE HOLDERS

A fuse holder, Snap-On TV Fuse Holder, which snaps onto the blown pigtail within the set, has been announced by the Littelfuse Corp., Chicago.

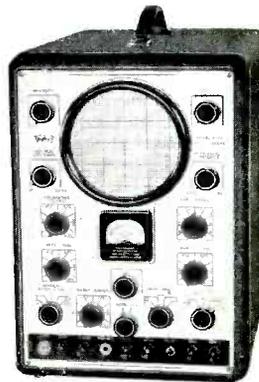
The fuse holder and the pigtail are said to become permanent attachments within the set. Each time a new fuse is needed, it can be slipped into the holder.



* * *

TRIPLETT 5-INCH 'SCOPE

A 5-inch 'scope, model 3440, for TV and general use, has been announced by The Triplett Electric Instrument Co., Bluffton, Ohio. Features include a pattern-reversing switch and a calibrated meter for peak-to-peak voltage measurements. Vertical sensitivity said to be .009 rms volts (9 mv) per inch. Operation of a switch (sync control to 0) is said to eliminate double trace in TV alignment. Also has a return trace eliminator and telescoping light shield. Linear sweep voltages up to 60 kc and frequency range, 20 cycles to over 1 mc. A demodulator probe is also available for signal tracing.



* * *

GONSET TV LEAD IN

A transmission line of open wire construction has been announced by the Gonset Company, 72 East Tujunga Ave., Burbank, Calif.

Using polystyrene spacers to minimize dielectric losses, and one-inch spacing to minimize line pick up and radiation losses, the line is said to exhibit 0.5 db loss per 100' at 200 mc.

The line is said to be particularly well adapted for fringe area, beach installations or where long runs of lead line are required.

Accessory items include standoff insulators and broad-band linear transformer for matching line to 300 ohms. Line is available in continuous lengths up to 500'.

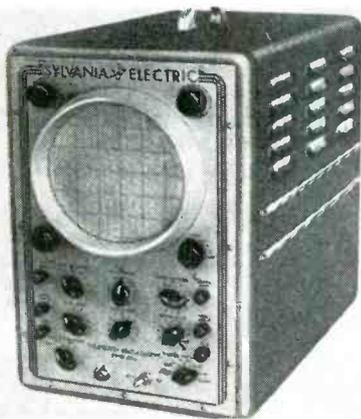
SYLVANIA TV 'SCOPE

A wide-band 7" 'scope, type 400, designed particularly for television circuit, laboratory and industrial applications, has been announced by the radio tube division of Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

The 'scope, which is supplied with a 7JP1 green cathode-ray tube, is said to provide a vertical sensitivity of ten millivolts per inch and a vertical response which is useful up to 4 mc.

Other features include: four-position frequency-compensated attenuator; vernier gain control; low internal hum level; internal 60-cycle sine wave sweep which is said to eliminate one set of leads during TV alignment operations; wide-range phasing control; internal hard tube sweep circuit, and control for synchronizing to either positive or negative signal.

The 'scope provides, also, linear sweeps ranging from 10 cycles to 50 kc; five megohm, 26-mmfid input impedance for negligible circuit loading which is suitable for any crystal, direct or special probe or with supplied lead; cathode follower input circuit; switching for direct connection to deflection plates; panel connection for intensity or Z-axis modulation; built-in 60-cycle voltage source; and low-parallax cross-lined screen.



* * *

ROTATOR-TOWER SETUP



Crown antenna rotator mounted on a Camburn jack-up TV tower. The jack-up tower is said to have a variable height of 20' 8" to 47'.

New RACON Sound Equipment for Best Performance and Highest Profits!

Only the New RACON DRIVER UNIT has all these Exclusives:

- Lowest List Price — \$37.50
- 25 Watts Operating Capacity
- 50 Watts Peak Capacity
- Completely Waterproof and Tropicalized
- Built-in Vacuum Impregnated Line Transformer
- Primary Terminals: 500, 1000, 1500, 2000 Ohms
- Secondary: 15 Ohms
- Alnico V Magnet
- Aluminum Wound Voice Coil for Maximum Efficiency
- Combined Solder Lug and Binding Post Terminals
- Frequency Range 90-6500 Cycles
- Thread Size 1 3/8" — 18



Model PM-708TR \$37.50 List

Here's Why New RACON COBRA LOUDSPEAKERS SUCCEED when ordinary speakers fail!



Model COB-1 \$46.50 List

Model COB-2 \$82.50 List

- Widest Sound Pattern (Adjustable from 120-240°)
- Designed for Voice Range: 370-6500 Cycles
- High Conversion Efficiency
- No Re-entrant Members
- 25 Watts Continuous Capacity
- 50 Watts Peak Capacity
- Completely Waterproof
- Tropicalized Driver Unit
- Vertical or Horizontal Adjustable Mounting
- Aluminum and Bronze Castings

RACON CROSSOVER NETWORKS



Model CON-20, \$22.50 List.
Highest quality LC network.

Model CON-15R, \$11.00 List.
Efficient RC high-pass filter network.

RACON TWEETER



Model CHU-2,
\$37.50 List.

Wide distribution pattern!
Clean output to 15,000 cycles!
When used with crossover network,
handles amplifiers of 25-30 watts.

SOUND TECHNICIANS AND SERVICEMEN — For full details on our complete line of Public Address and Wide Range Loudspeakers, see your favorite parts jobber, or write for Catalog S.

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HICKOK LAB TUBE TESTER

A laboratory type instrument, model 539, built to test all the latest subminiature tubes, including television types, is now available from The Hickok Electrical Instrument Co., 10521 Dupont Avenue, Cleveland 8, Ohio.

Scale reads directly in micromhos. Has a separate meter to permit adjustment of line voltage. Provision is made for inserting plate milliammeter to read plate current of the tube under test. Contains the Hickok gas test feature.

Built with two transformers to test future life of the tube. Has three *ac* signal voltages, .25, .5 and 2.5, in addition to *dc* grid bias and *dc* plate and screen voltages.

Provision is made for self bias and for vernier adjustment of bias; accomplished by a 200-ohm rheostat with calibrated dial, bypassed by 1,000-mfd capacitor, which can be inserted in the cathode circuit by operating a switch.

For additional information, write today to H. D. Johnson.



* * *

MEISSNER AM/FM CHASSIS

An AM-FM tuner chassis, complete with audio, type 9A, has been announced by Meissner Manufacturing Division, Maguire Industries, Inc., Mt. Carmel, Illinois.

Specifications include provision for phono input, temperature compensation on FM, full tone control, built-in phono switching and power outlet for phono motor. All controls are on front panel and are also operative on phono. Has a new, high *Q* die-stamped loop, and air wound FM coils.

RCP VTVM

A vacuum-tube voltmeter, model 654, which employs an electronic-balanced bridge-type push-pull circuit and is said to draw negligible current from any circuit because of the use of a high impedance of 25 megohms, has been announced by Radio City Products Co., Inc., 152 West 25th Street, N. Y. C.

Can be used for *ac* and *dc*.

A discriminator alignment scale with center is said to permit operation in directions.

meter measurements . . . 2 ohm to 20 ohms in 5 ranges; *dc* volts . . . 250-1000; *ac* volts . . . 50-1000; *db* . . . -20 to 16, to 42, 14 to 50, and 26 to 62. With isolation probe.

RCA THREE-INCH 'SCOPE

A portable TV 'scope, type WO-57A, has been announced by the test and measuring equipment section of the RCA Tube Department.

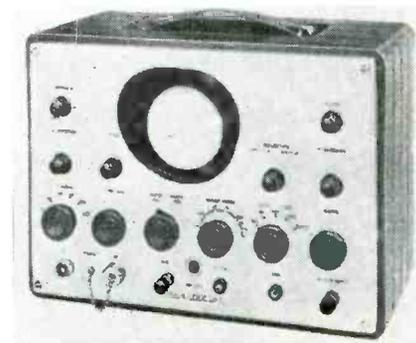
Deflection sensitivity of the instrument is said to be better than 30 millivolts per inch. Frequency response of the vertical amplifier is said to be flat within 2.3 db from zero to 500 kc, down only 6.8 db at 1 megacycle, and useful beyond 2 mc. Has a direct-coupled vertical amplifier which is used to provide flat low-frequency response, which it is said provides the proper low-frequency square-wave reproduction for correct sweep alignment. High-frequency square-wave response up to 100 kc is said to enable the 'scope to reproduce blanking and sync-pulse wave shapes with high fidelity.

Tilt, caused by low-frequency phase distortion, and *overshoot*, caused by high-frequency amplitude and phase distortion, are said to be minimized in the new 'scope. Less than 2 per cent tilt and overshoot is said to occur.

'Scope has a frequency-compensated and calibrated step attenuator. The instrument also has a vernier control and a calibrating voltage source.

An accessory kit which facilitates signal-tracing measurements in TV sets, and which was formerly supplied only with laboratory-type 'scopes, is available for the new unit. This kit, which allows waveshape observation without undue loading of the receiver circuits, consists of a direct probe and cable, a low-capacitance probe, a ground lead, and a slip-on Mueller test clip.

Other features of the 'scope include a linear sweep range from 15 to 30,000 cps with preset fixed sweep positions for viewing vertical and horizontal deflection-circuit waveforms, positive and negative synchronizing for lock-in of upright or inverted pulse waveforms, and a sweep direction-reversing switch for left-to-right or right-to-left traces. In addition, the instrument has a phase-controlled 60-cycle sweep. Traces may be expanded 2 times screen diameter for sweep-alignment applications.



EICO TUBE TESTER KIT

A tube tester kit, Eico 625K, has been announced by Electronic Instrument Co., Inc., 276 Newport Street, Brooklyn 12, N. Y. Tests conventional receiving and TV tubes, including 4, 5, 6, large and small 7, octal, loctal, noval, bantam, *vr* and magic eye, as well as pilot bulbs. Has an illuminated gear-driven *speedroll chart*, which is said to speed the location and setting up of any type tube.

Two grid caps are provided. A protective overload bulb shows any possible transformer overload and also acts as a fuse.

Also available in factory-wired form.



* * *

FEILER VACUUM TUBE VOLT-OHM-MILLIAMMETER

A vacuum-tube volt-ohm-milliammeter, TS-9, has been announced by the Feiler Engineering Co., 1601 S. Federal Street, Chicago, Ill.

Features a zero-center scale for FM and TV discriminator alignment. Provides measurement of *ac* . . . 0-5/10/100/500/-1000; *dc* volts . . . 0-5/10/100/500/1000; *db* . . . -20 to +16 db; *ohms* . . . 2 ohm to 1000 megohms in 5 steps; *dc ma* . . . 0-1 (additional ranges available by external shunts). Input impedance, 26 megohms on *dc*; 3 megohms on *ac*. Tubes used: 2-6C4; 1-6H6; 1-6X5GT. Has a *dc* polarity switch.

Two tubes are used in a balanced-bridge circuit with inverse feedback.



* * *

INDUSTRIAL DEVICES NEON GLOW LAMP

A neon glow lamp in a nylon housed screw-type electrical receptacle, model 1200, has been announced by Industrial Devices, Inc., Edgewater, N. J.

The neon glow lamp is said to have a life in excess of 25,000 hours, using less than 1/10 watt.

IRC DUAL-CONTROL ASSORTMENT

A *Concentrik* stock assortment, which contains 94 parts, and can be used to assemble rapidly the majority of concentric dual controls has been announced by the International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

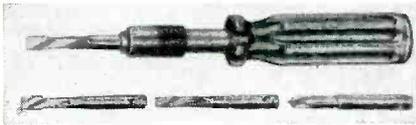
Assortment is supplied in a streamlined all-metal cabinet. Cabinet has four drawers and individual compartments marked for efficient stocking.



SELECTO 3-IN-1 SCREW DRIVER

A 3-in-1 screw driver with three bits, two of which are in the handle, permitting use for round-head, flat-head and Phillips-head screws, has been announced by Selecto Products Company, 740 Superior Ave., N.W., Cleveland, Ohio. Handle is said to be non-breakable of amber-colored plastic and fire-safe. All parts are said to be precision made to a tolerance of .001".

Screw driver is 7½" long and weighs 6 ounces.



DICKSON VARI-HOT IRON

A soldering iron, *Vari-Hot*, that is said to heat in 30 seconds and idle at 500° F whenever plugged in, has been announced by Dickson Engineering and Sales Co., 4701 Townes Road, Minneapolis 10, Minnesota. Booster button on the handle offers extra heat, which can be varied as required.

Iron has dual wire-wound heating elements within the tip which are said to reduce heat loss and thermal lag; 25 watts are said to be required to maintain a tip temperature. When the booster button is pressed, 100 watts of electrical power is provided within the tip.

Has a pistol type plastic handle and attached safety rest. Uses a ⅜" copper soldering tip-chisel or pyramid shaped.



There's a *University* Loudspeaker

RUGGED!

DEPENDABLE!

VERSATILE!

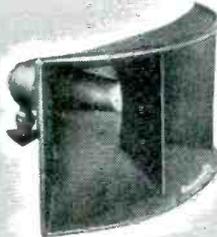
FOR EVERY COMMERCIAL AND INDUSTRIAL APPLICATION



TRUMPETS Model 7102 exemplifies the rugged construction and progressive engineering behind every University product. Model 7102 is the only loudspeaker ever approved by Underwriters' Labs for Class II Groups E, F, & G hazardous area duty. Features include re-entrant trumpet (pioneered by University) for compactness and greater efficiency, heavy duty 25 watt driver unit with exclusive University "W" shaped Alnico V magnet, and built-in line matching transformer with impedances of 16, 45, 500, 1000, 1500, and 2000 ohms. See general catalog for trumpets of all sizes.



BREAKDOWN-PROOF DRIVER UNITS Model PA-30 embodies features developed by University and never successfully imitated. Ratings are conservative, and construction is to well known University standards which have made our drivers famous for their dependable performance. PA-30 is rated at 30 watts, with response 80-10,000 cps, and is the first to have a multi-tap built-in line matching transformer. Exclusive "rim centering" construction of mechanism and use of University "W" shaped Alnico V magnet insures high conversion efficiency, permanent voice coil alignment regardless of shock or vibrations. Weatherproofed throughout.



PAGING AND INTERCOM SPEAKERS These feature reflex air columns with hermetically sealed driver units. They are widely used for intercommunication and paging of all types. Efficiency is high and reproduction exceptional at any volume level. Directional, radial, or bi-directional types available. Weather-proof finishes permit use anywhere. Typical of University pace-setting design is the Cobra-12 illustrated, which provides optimum area coverage with minimum power input. Power rating is 12 watts, frequency response 250-10,000 cps, dispersion angle 60° x 120°. Swivel mounting bracket provides full flexibility.

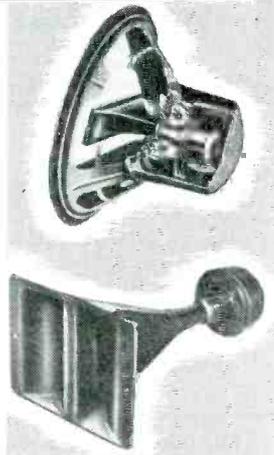


SUBMERGENCE-PROOF SPEAKERS These types are designed for use where extreme ruggedness and immunity to spray, gas, live steam or dust are essential. Function even under water, drain automatically, operate continuously regardless of exposure. Models available for directional or radial projection, wall or bulkhead mounting, swivel mount and with or without built-in line matching transformer and attenuator. Design is ideal for railroad use, shipboard, industries, docks, rough mobile work, etc. Model MM-2, illustrated, is rated at 15 watts continuous IPM, frequency 300-6000 cps, impedance 16 ohms.

FOR ALL HIGH FIDELITY REPRODUCTION REQUIREMENTS

WIDE RANGE CONE SPEAKERS Model 6201 comprises a superb 12" cone speaker with a driver type tweeter mounted coaxially. The cone speaker features a 24 oz. "W" shaped Alnico magnet and edge treated cone for distortion-free low frequency response. Tweeter has wide angle horn. A built-in LC crossover network and external high frequency attenuator are included. Capacity is 25 watts, I.P.M., response 45-15,000 cps, impedance 8 ohms. Other cone speakers for high fidelity, splashproof or blastproof service also available.

HI-FREQUENCY TWEETERS University offers a complete line of single and double tweeter units for both 2000 and 600 cycle crossover. Models are available for medium or extremely wide sound distribution. A complete line of accessories are included—crossover networks, adapter for mounting tweeter on a standard cone speaker, etc. These tweeters may be added to any standard amplifier and speaker to provide the finest in high fidelity reproduction—and at a very low cost.



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LOGUE — A COMBINED TECHNICAL MANUAL AND CATALOG — INVALUABLE FOR YOUR F!



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SERVICE, JUNE,

YOUR NEW STANCOR CATALOGS

are ready!

CATALOG OF TRANSFORMERS FOR RADIO, SOUND AND OTHER ELECTRONIC USES.

Here's a "must" for every user of transformers—serviceman, ham, experimenter, engineer. Detailed listings of more than 400 Stancor part numbers. Includes accurate electrical and physical specs, dimensions, prices, illustrations. Complete and up-to-date. Handy charts and easy-to-use indexes help to make this new Stancor catalog the book you'll want to find the part you need.

TELEVISION CATALOG AND REPLACEMENT GUIDE.

The sixth edition of the popular Stancor TV Replacement Guide (50,000 copies printed to date). Now combined in a big, 30-page book with a complete catalog of all Stancor TV components. Original part numbers, with Stancor replacements, are listed for more than 600 TV receiver and chassis models made by 64 manufacturers. Every Stancor component recommended in the guide is listed in the catalog section with complete specs, dimensions and prices. Gives you one convenient source of information. Makes your job quicker and easier.

And remember, when you buy a Stancor transformer, you get a quality product used by the country's biggest set makers as original equipment. Stancor transformers have to be good! See your Stancor distributor today for your free copies of these books. If he is out of stock, we'll be glad to send you copies. Write Standard Transformer Corporation, 3588 Elston Avenue, Chicago 18, Illinois.



Most Complete Line in the Industry

WALKER-JIMIESON CATALOG

A television, radio, and electronics parts catalog, No. 155, has been released by Walker-Jimieson, Inc., 311 S. Western Ave., Chicago 12, Ill.

Listed are capacitors, batteries, vibrators, resistors, transformers, coils, television components, speakers, microphones, cartridges and pickups, test equipment, connectors, plugs, jacks, hardware, service tools, books and manuals, television and radio receivers, television antennas, rotators, boosters, filters, magnifiers, etc.



Ralph Walker (center), president of Walker-Jimieson, Inc., and Russel Jimieson, W.J. vice president and sales manager, being presented with the first copy of the W-J 1950 Profit Guide, by David Muir, merchandise manager. The presentation was made at a dinner meeting of the entire W-J sales staff of more than 30 men, including counter men, phone salesmen, as well as outside reps.

W. S. HARTFORD NAMED WEBSTER-CHICAGO V-P

W. S. Hartford, general sales manager, has been named vice president in charge of sales, of Webster-Chicago Corp. C. B. Dale, director of research, has become vice president in charge of research.

T. A. WHITE AND L. A. KING NOW ON MUTER COMPANY BOARD

Thomas A. White, president of the Jensen Manufacturing Co., Chicago, and Laurence A. King, president and general manager of the Rola Co., Cleveland, Ohio, have been elected to the Muter Co. board of directors. Both Rola and Jensen are subsidiaries of the Muter Co.



T. A. White



L. A. King

J. G. WILSON DIES

J. G. Wilson, executive vice president of RCA, in charge of the RCA Victor Division, died recently.

RACON SOUND EQUIPMENT CATALOG

A 12-page public-address sound equipment catalog has been released by Racon Electric Company, Inc., 52 East 19th Street, New York 3, N. Y.

Products described range from the exponentially-designed re-entrant and straight trumpets to cobra-type loudspeakers, tweeters and driver units. In addition, catalog includes computation data on such factors as impedance values in a 70-volt distribution system, and amount of amplifier power required in p-a outdoor systems.



BURTON BROWNE HONORED BY HOLLYWOOD UNIVERSITY

Burton Browne, general partner of Burton Browne Advertising Agency, has received an honorary Doctor of Science degree in Business Administration from the University of Hollywood.

The honor was conferred during a dinner to Browne at the Club of Chicago.

PERMOFLUX CATALOG

A 4-page catalog covering the 8T-8-1 Royal Eight speaker line has been released by Permoflux Corp., 4900 W. Grand Ave., Chicago 39. Presented are laboratory response curves and engineering information on new and improved totally enclosed baffles for use with the speaker.

Technical data are also included on multiple loudspeaker arrangements.

CHARLEY GOLENPAUL ROUNDS OUT TWO DECADES WITH AEROVOX

Charley Golenpaul recently celebrated his twentieth year with Aerovox Corp., New Bedford, Mass., where he is now sales manager of the distributor division.

Prior to coming with Aerovox, Golenpaul had been sales manager for Clorostat.

* * *

HOWARD T. SOUTHER BECOMES MANAGER OF NEW E-V LOUDSPEAKER DIVISION

Howard T. Souther, formerly vice president of the Stephens Manufacturing Co., has become manager of the new speaker division of Electro-Voice, Inc., Buchanan, Michigan.

Souther is acting as project supervisor, in charge of engineering facilities, in the development of the E-V line of high fidelity speakers. In addition, he will direct the sales and marketing activities of the speaker division.



H. T. Souther

* * *

MALLORY NAMES J. E. TEMPLETON WHOLESALE DIVISION MANAGER

J. E. (Earl) Templeton, manager of the Los Angeles branch of P. R. Mallory & Co., Inc., Indianapolis 6, Indiana, has been appointed manager of the company's wholesale division, succeeding Walter Harvey.

Templeton is being succeeded in Los Angeles by Charles Gutheil, who has been sales manager of the company's switch division.



J. E. Templeton

* * *

UNIVERSITY HI-FI CATALOG

A six-page illustrated catalog describing cone speakers, tweeters, tweeter adapters, cross-over networks, and coaxial speaker systems, has been published by University Loudspeakers, Inc., 80 South Kensico Ave., White Plains, New York.

* * *

ROHER JOINS CHANNEL MASTER

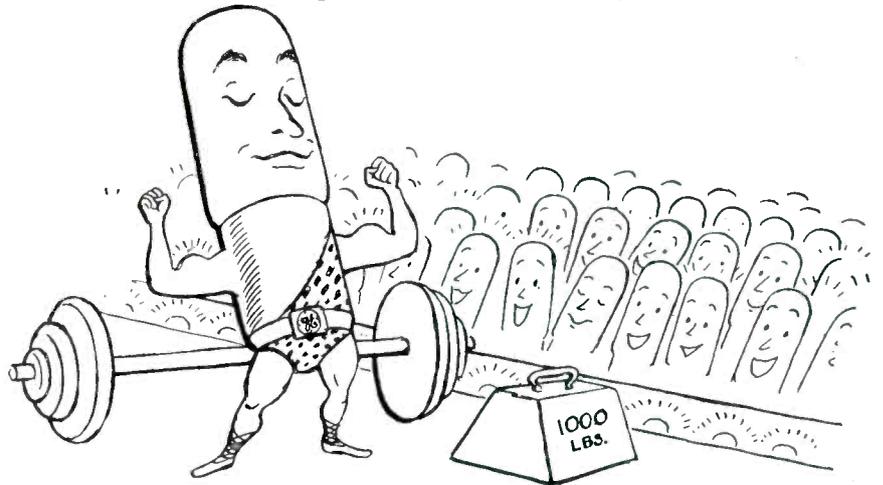
Daniel S. Roher has been appointed advertising manager of Channel Master Corporation, Ellenville, N. Y.

Roher was formerly with the Bergman-Jarrett Advertising Agency, and before that was advertising manager of Sun Radio & Electronics Co., Inc.

Sylvester Herlihy, formerly plant foreman at Channel Master, has become a member of the sales staff and will cover Central Pennsylvania and Dutchess, Sullivan, Ulster and Orange Counties in New York.

[Additional News on pages 66 and 67]

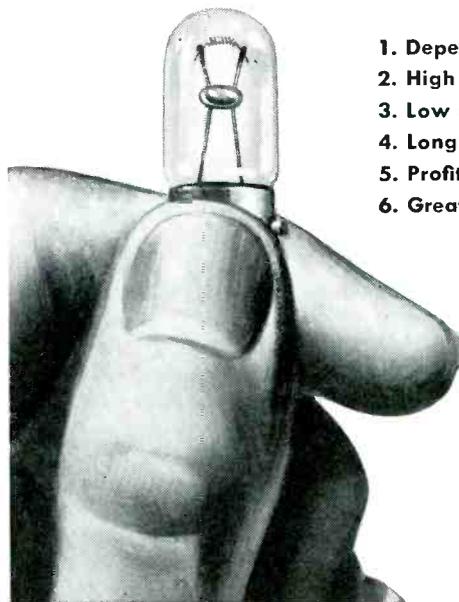
The little lamp that became the strong, silent type



LIGHTING radio dials is no job for a "weaking" lamp. Testing many old style lamps, General Electric engineers found that certain frequencies caused severe vibration that often tore the filament apart. Poor contact between the filament legs and lead-in wires also resulted in tiny arcs or changes in resistance that caused radio interference.

That's why G-E dial lamps have been made "the strong, silent type." Improved design minimizes vibration, provides positive connection between the filament and lead-in wires.

For information on prices and types of G-E miniature lamps, call your nearby G-E Lamp office. Or write to General Electric Co., Div. 166-S 6-50, Nela Park, Cleveland 12, Ohio.



1. Dependable, trouble-free performance.
2. High level of maintained light output.
3. Low current consumption.
4. Long life.
5. Profitable to handle.
6. Greater dealer acceptance.



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GENERAL ELECTRIC

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"Bonus" TV Supplements Preliminary Service Data on Hundreds of Television Models for Your IMMEDIATE USE . . . AT NO EXTRA COST!

TV set owners are calling for service within days—even hours—after installation. That's why you, the TV Technician, must have your service data *right now!* And *right now*, PHOTOFACT brings you the "rush" preliminary TV service data you need for *immediate use* to keep you going at full speed. FREE with the purchase of PHOTOFACT Folder Sets No. 91 and No. 93, you receive with each a separate 64-page Supplement containing preliminary data (in *advance* of regular PHOTOFACT coverage) on over 100 popular TV models. Place your standing order for PHOTOFACT today—it's the only way to get *without delay* the TV service data you must have *right now!*

Buy PHOTOFACT Folder Set No. 91 and get **FREE TV SUPPLEMENT NO. 91A:**
Covers 114 important Television Receiver models, produced by 11 leading TV manufacturers.

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BUY BOTH! GET THE DATA YOU WANT NOW ON HUNDREDS OF TV MODELS

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HOWARD W. SAMS & CO., INC.

Order from your Parts Jobber today or write direct to HOWARD W. SAMS & CO., INC., 2201 East 46th Street, Indianapolis 5, Ind.

My (check) (money order) for \$ _____ enclosed. Send me the following:

Photofact Set No. 91 and Supp. 91A. \$1.50
 Photofact Set No. 93 and Supp. 93A. \$1.50

Zone _____ State _____

Tube News

(Continued from page 37)

the picture tube. It is designed and rated primarily for use in fly-back type of power supplies. The 1X2A, when used within its maximum ratings, can be applied as a replacement for the 1B3GT/8016 at *dc* output potentials as high as 14 to 15 kv.

Another Hytron development is the 12BH7, a double triode, having semi-high perveance units.

The increase in perveance over tubes like the 6SN7GT or 12AU7 is said to be such as to make one section of the 12BH7 suitable for use as a vertical deflection amplifier in television receivers using picture tubes with wide deflection angles. The tube was designed to withstand relatively high peak positive plate potentials, and accordingly is specifically rated for use in the vertical deflection amplifier socket, as well as for usual class A1 applications.

A twin triode, for use as a combined vertical oscillator and vertical-deflection amplifier in television receivers, has been announced by G. E. The tube, the 6SN7GTA, is electrically and mechanically interchangeable with its prototype, the 6SN7GT.

The principal difference of the 6SN7GTA from its prototype is increased maximum ratings. The plate dissipation rating is 5 watts per plate or 7.5 watts for both plates, as contrasted with the previous rating of 2.5 watts per plate or 5 watts for both plates. The plate voltage rating has been increased from 300 to 500 volts, and the heater-cathode rating has been increased from 90 to 200 volts.

P-A Servicing

(Continued from page 43)

output transformer secondary or in the voice coil. The voice coil should be disconnected and both windings checked with an ohmmeter. A search should be made for broken voice coil leads, or shorted turns in the voice coil winding. Frequently a misaligned speaker cone will cause the voice coil to stick or short to the frame. Proper alignment will generally cure this trouble unless the frame itself has been sprung or core expansion due to heat has jammed the cone. In this event speaker replacement is the only practical solution. Some speaker frames can be disassembled and the air gap enlarged by turning the core on a lathe and dressing the frame. This takes considerable time, however, and is not recommended.

BRAND NEW PROFIT MAKER

FOR RADIO SERVICE MEN!



Model AR-3 Electro-Vibrator Analyzer & Power Supply



Model AR-3 Adapter Strip

New ELECTROX

VIBRATOR ANALYZER AND POWER SUPPLY

Here's a new ElectroX test unit that's *indispensable* for shops servicing auto radios, 2-way mobile communication systems or other equipment using 6-volt vibrators.

TWO VALUABLE TEST UNITS IN ONE! This instrument combines an adjustable POWER SUPPLY that provides smooth, hum-free direct current in any voltage needed to test auto radios, with a VIBRATOR ANALYZER that *thoroughly tests* practically all synchronous and non-synchronous vibrators found in auto radios today!

TESTS OVER-ALL VIBRATOR PERFORMANCE! Vibrator Analyzer *accurately* determines shorted and otherwise defective vibrators and predicts vibrator failures before they occur. It measures starting voltage, current consumption, output voltage and indicates irregular operation. Subjects vibrator to voltage conditions normally encountered when connected to the electrical system of the car. Over-voltage is available for starting vibrators with oxidized contacts. A standard oscilloscope can be attached for wave form observation.

It's a top quality test instrument—a *must* for every service shop. It safeguards your auto radio repairs—increases your parts sales—steps-up your efficiency and earnings. **ORDER NOW FROM YOUR DISTRIBUTOR.**

Write for Free Bulletin No. 1466, Giving Full Details

Rectifier Division
SCHAUER MANUFACTURING CORP.
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PHILCO PROMOTIONS

John F. Gilligan, Philco advertising manager since '44, has been named vice president—advertising of the corporation.

Henry T. Paiste, Jr., with Philco for 22 years and director of quality control, television and radio division, during the past year, has been appointed vice president—service and quality for Philco.

Raymond B. George, who joined Philco in 1936 and has been sales promotion manager for the past three years, has been named to the new post of vice president—merchandising of the television and radio division.

James M. Skinner, Jr., who has been vice president in charge of the service and parts division, has been named general sales manager of the refrigeration division.

Auto Radio Speakers

(Continued from page 25)

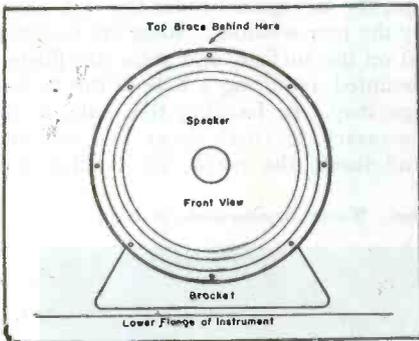
if available. This type of mount may be used in other cars, if necessary. There is usually enough space behind a kickpad to put a speaker as most auto-speakers are not over 2" in depth.

In some of the older cars, there is no grille provided for the speaker. If you have a housing or cabinet which is suitable, it can be used to mount the speaker on the firewall, by the set. If not, the speaker may be mounted on a brace under the dash, horizontally, with the cone down. A protective grille of hardware cloth should be placed over it, just in case someone kicks it! The sound will be good, and the speaker will be out of the way.

The Header-Speaker

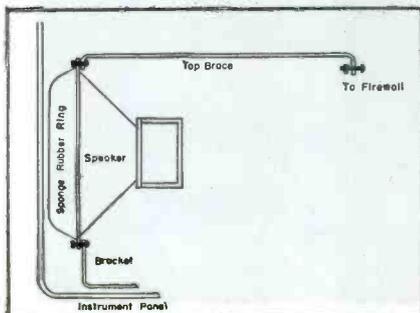
In the early days of auto-radio operations, the *header-speaker* was quite popular. These speakers were mounted above the windshield, and it was necessary to let down the headlining, take off the inside frame of the windshield, and struggle and struggle before you could even get at them. There was also the pleasant chore of fishing the large cable down a very small hole inside the left windshield post! If you should run into any of these, and there are a very few left,

(Continued on page 58)



(Above and below)

Front and side views of mount positions of speakers.



Anyone Can build a HEATHKIT



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SIGNAL
TRACER KIT**
\$19.50



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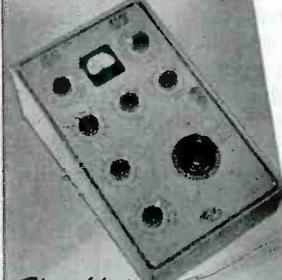
**Heathkit
TUBE CHECKER KIT**
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**Heathkit
CONDENSER
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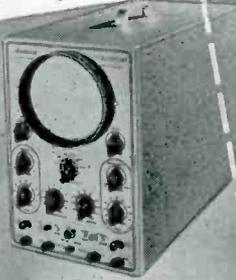
**Heathkit
IMPEDANCE
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GEN. KIT** . . . \$19.50



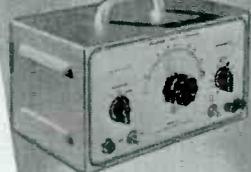
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Heathkits are beautiful factory engineered quality service instruments supplied unassembled. The builder not only saves the assembly labor cost but learns a great deal about the construction and features of the instrument. This knowledge aids materially in the use and maintenance of the equipment. Heathkits are ideal for and used by leading universities and schools throughout the United States. Each kit is complete with cabinet, 110V 60 cycle transformer (except Handitester), all tubes, coils assembled and calibrated, panel all ready printed, chassis all punched, formed and plated, every part supplied. Each kit is provided with detailed instruction manual for assembly and use. Heathkits provide the perfect solution to the problem of affording complete service equipment on a limited budget. The basic three instruments — an Oscilloscope, the Vacuum Tube Voltmeter, and Signal Generator can be purchased in Heathkits for \$83.50, about the cost of a factory-built VTVM alone. Write for complete catalog.

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PREMIUM QUALITY AT NO EXTRA COST

Sprague Black Beauty Telecap® Tubulars are different from and superior to every other molded paper capacitor because they are made by the same dry assembly process as large metal-encased oil capacitors. They cannot be contaminated by dust or moisture during manufacture.

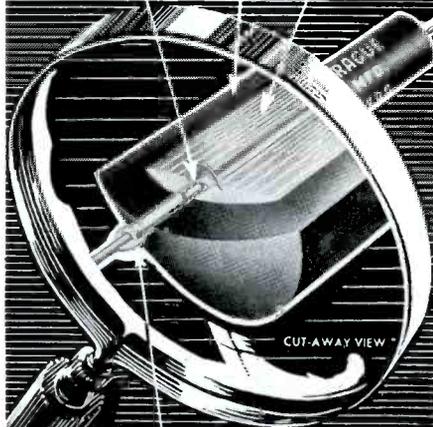
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Solder seal as in large metal-encased oil capacitors

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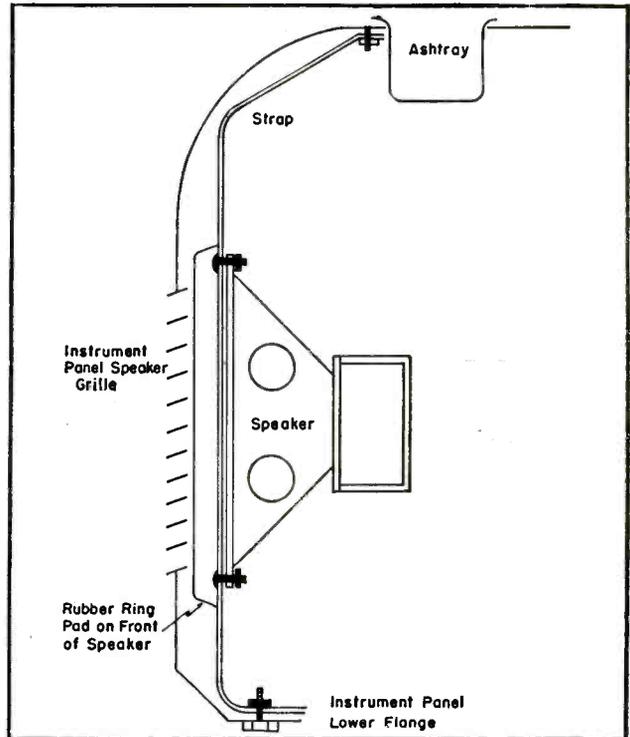
100 State Street
CAMBRIDGE, MASS.

JUNE 1950

Auto Radio Speakers

(Continued from page 57)

Speaker mounting position in Chevrolet and similar cars. The speaker is placed on one or two heavy straps, and then fastened to ash-tray bolts or any other available bolt points.



you can replace them with a firewall mounted speaker, if necessary, and if you can talk the customer into it!

Rear-Seat Speakers

A recent development has been the extension of rear-seat speakers. These are not very complicated, technically. Normally the speaker is a *pm* type connected to the set through a switch, usually a rotary, which is hooked up to allow selection of either *front*, *back* or *both*. On some of the quality

models, a resistance pad is built in the switch housing to provide a level control, whenever the speakers are switched in and out.

These speakers are usually mounted on the *package-tray*, which is, it develops, the flat space behind the back seat by the rear window. Some are mounted on the surface, and some are flush-mounted, requiring a hole in the package tray. In locating this hole, it is necessary to check from the bottom, and inside the trunk, to see that no

Rear seat speaker installed in 1942 Ford sedan. Wiring is underneath, in trunk.

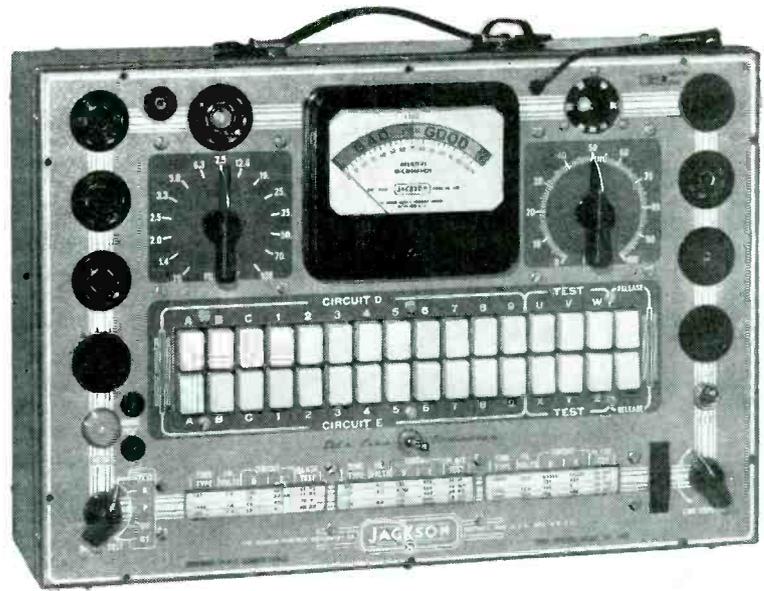
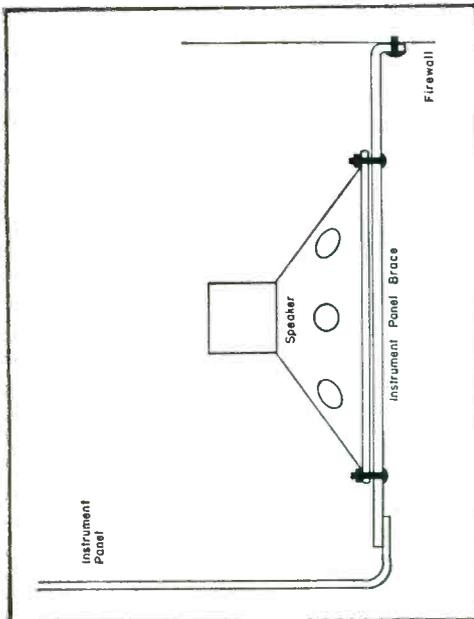


braces or other objects are in the way. Mounting should not be too close to the back, as the reardeck hinges on some cars come well inside the trunk when closed. Some cars have this tray mounted so that it may be removed by taking out several screws. This will permit taking it into the shop to do the hole-cutting, and speed up the job considerably.

After the hole is cut out, the speaker can be mounted. The connections can be made with clips. To mount these speakers, the small two-conductor plastic covered flexible wire, such as used for intercoms, etc., has been found excellent. To install, start at the switch, where the wires are ordinarily soldered on. Then, go over the top and down behind the left kick-pad, and cut a small hole at the very bottom. Bring the wires out through this point, and go under the front floor-mat, under the front seat, and along the side of the body until you reach the back seat cushion. The cushion should then be removed and the wires worked in alongside until you can push them through the crack between the back cushion into the trunk. It is important that the wires be kept down and out of the way of the fasteners of the back seat, so that they will not be crushed when the seat is replaced. From inside the trunk, wires can be pulled up and over to the speaker. Then the wires can be fastened to the body with cable-clamps at close intervals, to prevent their being caught and torn loose when put-

(Continued on page 60)

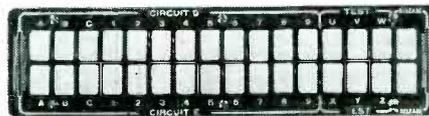
Side view of a speaker mounted on a brace under the instrument panel. These braces are usually wide and heavy enough to support speaker. It is important that a heavy screen wire grille be used to prevent accidental damage to the speaker.



Dependable—Simple—and, "Service-Engineered"

JACKSON "Dynamic" * Tube Tester

Here is the tube tester used and recommended by manufacturers, laboratories and smart service organizations. Uses the "Dynamic" principle, pioneered by Jackson. Here are just a few of its major features.



Sequence Switching—no obsolescence with this amazing switch. Simple to use. Tube elements not connected together. Each element gets the right load or the right voltage.



Complete Shorts and Noise Tests

You test every element for shorts. Because tube elements are tested separately, you get a true picture of tube operation. Switch position shows which element is shorted—helps you locate source of circuit trouble.

Life-Line Indicator

Reduces normal heater or filament voltage. Tells you if tube is approaching the end of its life. Helps avoid troublesome call-backs. Insures more satisfied customers.

There are many more advantages to this fine Jackson tube tester—big, 4" meter—sockets for every type of tube, including sub-miniatures, blanks for future types—built-in roll chart. For the complete story, fill in and mail coupon today. Available in bench, counter, or portable styles. Prices as low as

\$79⁵⁰

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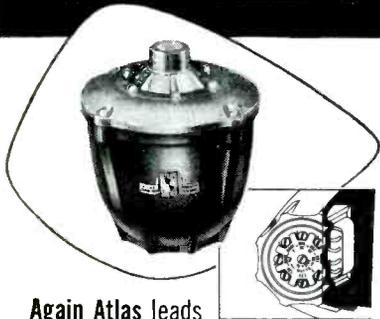
Tube Testers—Television
Oscilloscopes—AM-FM
Audio Oscillators—
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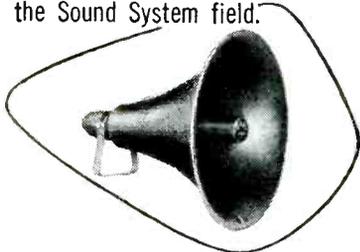
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AGAIN IN 1950... IT'S

ATLAS



Again Atlas leads the field with its new line of speakers and projectors. Again Atlas makes the news in the Sound System field.



Atlas Reproducer units continue to retain the famous "Atlas V Plus" super-efficient magnetic assembly and in addition many more "Extra Plus" features. A new reversed dome, blast proof diaphragm is now standard in the high power, high fidelity models. Built-in transformers, designed for either constant 70 volt or constant impedance audio circuits are included. Improved appearance—functionally designed for maximum convenience. Double seal weather-proofing. All this and more without any general increase in price.

Atlas projectors have a new micrometrically calculated and controlled rate of expansion. Atlas non-vibrant projectors are rugged and fine in appearance. Sound energy is not dissipated in rattle vibration, distortion or cancellation.

The new improved line of Atlas speakers are really new from the voice coil to the final lock washer. It's really the "modern look" in speakers, a new high in overall performance.

Let Atlas speakers play an important part in your SOUND PROFITS.



Write for our new catalog — the most complete line of speakers, microphone stands and sound accessories.

ATLAS SOUND CORPORATION
1442 39th Street
Brooklyn 18, N. Y.

Auto Radio Speakers

(Continued from page 59)

ting luggage or tools into the trunk. If they run close to the edge of the rear-seat floor mat, they should be fastened down there with cable-clamps.

The selector switches for these are usually mounted under the edge of the dash, like a heater switch. They should be placed in a location where they will be convenient to the driver of the car.

Phono Installation

(Continued from page 39)

cies, fed to the individual speaker units.

The frequency response was said to extend to at least 18,000 cycles.

The low frequency unit has been designed to operate in the range where its behavior is essentially piston-like. By special design of the mid-frequency system it was possible to place the acoustic cross-over at 600 cycles, which was found to be an especially favorable and unusually low transition point.

The radiating system is a 15" curved surface diaphragm, driven by means of a 3" voice coil in a magnetic field of very high energy (30 million ergs). This was found to provide high damping and good transient reproduction.

Design was found to permit termination of the mid-frequency driver unit with a *hyper* formula horn, the initial section of which passes through the pole piece of the *lf* motor, while the final section is formed by a properly curved *lf* diaphragm.

For high-frequency operation, a compression driver and small *hyper* horn combination has been placed at

Dark-blue cone eight-inch speaker recently developed. Speakers are known as the *Royal Eight* line and coded 8T8-1. Cabinet required is said to occupy one-half the space of a 12" speaker unit, for equally effective baffling: *Permoflux Corp.*, 4900 W. Grand Ave., Chicago 39, Ill.

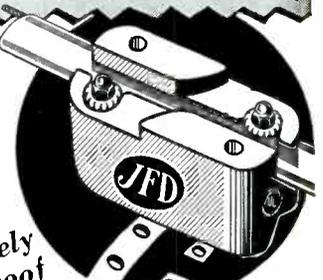


The ORIGINAL and Still the BEST LIGHTNING ARRESTER

for all weather conditions

will not absorb moisture

completely waterproof



APPROVED for OUTDOOR-Indoor Use!

Protects Television Sets Against Lightning and Static Charges

JFD SAFE TV GUARD

Fits Any Type of Twin Lead

No. AT102 for Regular Twin Lead
No. AT103 for Oval Jumbo Twin Lead
No. AT103 Also for Tubular Twin Lead
BOTH Models Conform With Fire Underwriters and National Electrical Code Requirements for OUTDOOR installations.

\$2.25 EACH

SIMPLE TO INSTALL... For maximum efficiency, arrester should be mounted outside window nearest to TV receiver, with ground wire attached to nearest grounded point. No stripping, cutting or spreading of wires necessary. Supplied complete with 4 ft. length of Ductile Aluminum Ground Wire for Wall Mounting, and Strap for Mast or Grounded Pipe Installation.

JFD MANUFACTURING CO., Inc.
6127 16th Avenue, Brooklyn 4, N. Y.
First in Television Antennas & Accessories

the front of the speaker unit. Its placement was dictated by space phasing and diffraction considerations, which become very important at such high frequencies.

Another manufacturer displayed 8" speakers⁵ which were said to provide 12" speaker reproduction.

Speakers featured a specially-treated, slotted cone edge, which was said to

Portable, 3-speed, phonograph, featuring a polyphonic selector, introduced by *Rek-O-Kut Co.* Phono plays records up to 16". Microphone input permits mixing of live music or voice simultaneously with a recording being played on phono. Can also be used as a public-address system. By connecting an FM or AM tuner in the radio input, the unit becomes a broadcast receiver. Has an 8" pm speaker.





One-inch type dynamic microphone designed by American Microphone.

provide extra soft suspension of the cone, thereby increasing the low frequency response, a response further aided by an enlarged lower suspension (spider).

Microphone Developments

Also on display at the Chicago meeting were several new types of microphones. In one line,⁶ the mike heads were one inch in diameter head to provide full vision for artist or speaker and a clear view for the audience.

Models featured omnidirectional pickup, high output levels, minus 52 db. No preamplifier was said to be required.

In another small-microphone exhibit, a lapel condenser microphone,⁷ less than one inch in its greatest dimension, was displayed.

A cable on the lapel microphone connected to a matching unit, which contained an impedance matching tube.

Lines of 10, 17, 25 and 50-watt amplifiers were also on view at the show. One model,⁸ a 25 to 30-watt affair, had inputs for two high impedance microphones and a phono, with knock-out holes in chassis to provide for conversion of mike inputs to low impedance

⁶Royal Eight; Permoflux Corp., 4900 W. Grand Ave., Chicago 39, Ill.

⁷D33, two impedances (30-50 and 250 ohms) with an adjustable jumper for changing from 30-50 to 250 ohms; D22, two impedances, low (30-50 ohms) and high (40,000 ohms) with jumper for changing; American Microphone Co., 3700 S. Fair Oakes Ave., Pasadena 1, Calif.

⁸28A, used with a 154 A matching unit; Altec Lansing Corp., 1161 N. Vine St., Hollywood 38, Calif.

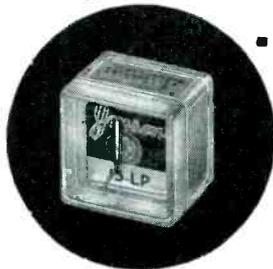
⁹Model E-25; Newcomb Audio Products Co., Hollywood, Calif.

REPLACEMENT NEEDLES by *Jensen* Manufacturers of Needles for Original Equipment

JENSEN CAT. NO.	ILLUSTRATION	ISI	CARTRIDGE NUMBERS	POINT MATERIAL	NEEDLE TYPE	USED ON	COMMENTS
A-80	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	To replace. Place blade of hole under needle and lift out. Do not touch.
A-81	[Diagram]	1.50	OT, LD, CO	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	To replace. Lift point out of hole and turn to right angle. Then lift back out.
A-82	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	Set screw hole in hole in place.
A-83	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	Commonly known as the "Wired Style". When replacing needle, press point into end of hole. Do not touch. Do not touch the hole.
A-84	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	The hole on cartridge numbers are removed. Example W228, W22, W205, W240, etc.
A-85	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-86	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-87	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-88	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-89	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-90	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-91	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-92	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-93	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-94	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-95	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-96	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-97	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-98	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-99	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-100	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-101	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-102	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-103	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-104	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-105	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-106	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-107	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-108	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-109	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-110	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-111	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-112	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-113	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-114	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-115	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-116	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-117	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-118	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-119	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-120	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-121	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-122	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-123	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-124	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-125	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-126	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-127	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-128	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-129	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-130	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-131	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-132	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-133	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-134	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-135	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-136	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-137	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-138	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-139	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-140	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-141	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-142	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-143	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-144	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-145	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-146	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-147	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-148	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-149	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	
A-150	[Diagram]	1.50	OT, LD	Osium	Standard	Andros, Belmont, Bando, Columbia Records, Decca, Emerson, General, General, Columbia, Halcyon, Hoffman, His Masters Voice, Scepter, Scepter, Columbia.	

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if needed. Individual bass and treble tone controls offered wider range of adjustment and featured bass emphasis for phono without emphasizing voice bass.

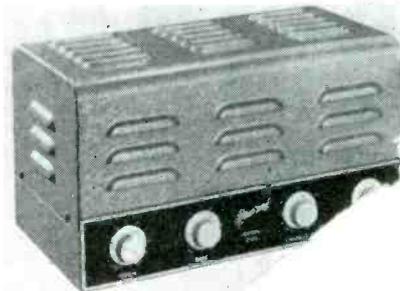
Frequency response was said to be ±2 db, 40 to 15,000 cycles; two mike inputs (2-megohm) gain, 117 db; phono input (½ megohm) gain, 77 db. Output impedances 4, 8, 16, 500 ohms. Tubes used: 6SJ7, 6SC7, 6J5, a pair of 6L6Gs, and a 5Z4.

A phono cartridge,⁹ which with the appropriate 3-mil or 1-mil needle, could be used for 78 or for 33½ and 45-rpm records was also exhibited at the Chi-

(Continued on page 62)

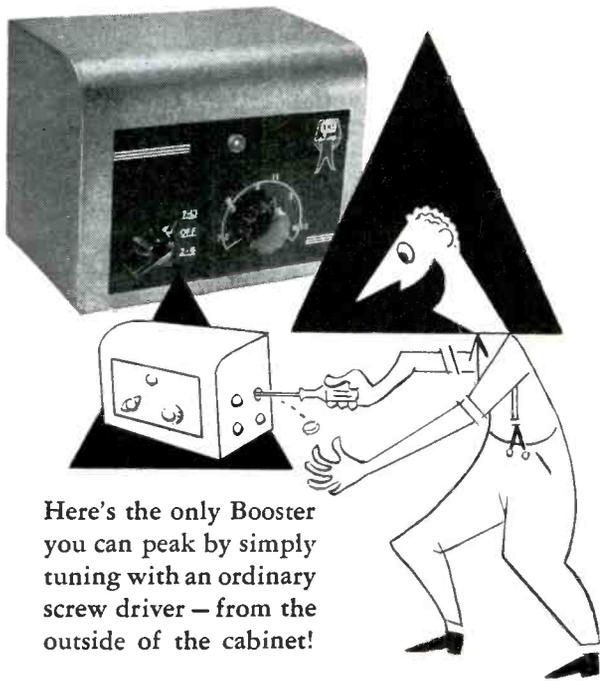
(Below)

Newcomb Audio amplifier which features inputs for two high-impedance mikes and a phono.



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Phono Installation

(Continued from page 61)

Chicago show. Tracking force was shown to be $\frac{3}{4}$ ounce on 78 rpm, and 8 grams on $33\frac{1}{3}$ and 45 rpm.

With compliant needle, the output voltage was $3\frac{1}{2}$. With straight shank needle, the output was $4\frac{1}{2}$ -5 volts.

Cartridge featured a needle stop, mounted directly on the chuck, to prevent it from rotating excessively and damaging the cartridge crystal, despite lateral pressure directed against the needle. The needle stop also serves to limit longitudinal motion of the chuck so that the crystal cannot be pulled from its harness.

A corner cabinet,¹⁰ incorporating two pm speakers and a horn and driver system was also at the Chicago show. Components included two 15" low-frequency drivers,¹¹ one 2 x 4 800 cycle horn,¹² high-frequency driver,¹³ and a crossover network.¹⁴

Cabinet dimensions were: width 41"; depth 23"; height 36".

¹⁰Models 60 and 50 Econo-Cartridge; Electro-Voice, Inc., Buchanan, Michigan.
¹¹Model 418, ¹²model 103 LX, ¹³model 824H, ¹⁴model 108, ¹⁴model 800X; Stephens Mfg. Corp., 8538 Warner Drive, Culver City, Calif.

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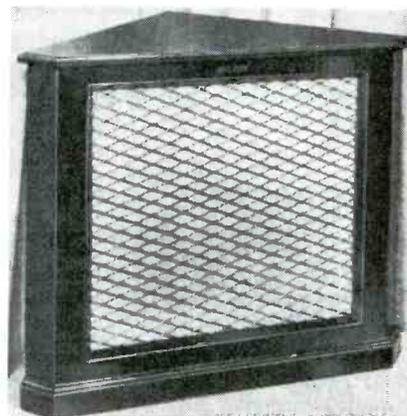
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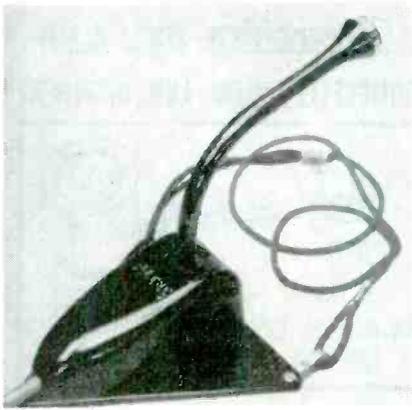
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Explosion-proof speaker recently developed by University Loudspeakers, employing a reflex trumpet speaker and integral 30-watt driver, with a built-in multi-tap matching transformer. Unit is UL approved and available in model 7101 (class 1, groups C and D) and model 7102 (class 2, groups E, F and G.)

Corner cabinet developed by Stephens to accommodate pair of pm speakers and a horn and driver speaker system.





(Above)

Altec Lansing chestplate developed for use with the miniature condenser microphone. Chestplate, which serves the same electrical purpose as the 150A base, both containing an impedance matching tube, is permanently equipped with 25' of the standard microphone cable and can be used as far away as 400' from associated equipment.

Jensen Industries balanced assortment of 26 needles (No. 5 Dealer Pack) developed to accommodate most phono needle replacements.



(Below)

Altec Lansing 18-watt amplifier designed for use with the Altec miniature condenser microphone. Power for condenser microphone impedance matching tube is obtained from the amplifier rectifiers. No input transformers or input matching transformers are said to be required. Three inputs are provided, two for the miniature condenser microphone, and one for variable reluctance phonograph pickup. Each of the three channels is provided with independent gain and bass controls. A high frequency droop control is provided for all input channels.



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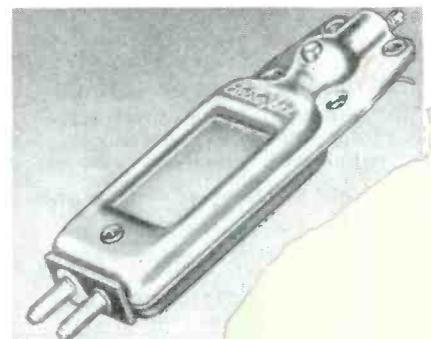
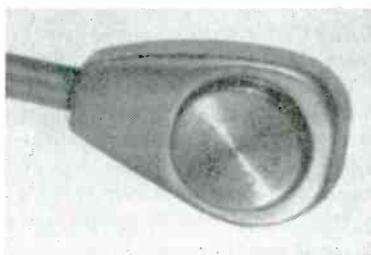
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"Can a serviceman make money and build his business by installing inferior replacement speakers?

"Suppose you install a cheap speaker in a customer's set. Because it's cheaply built, it will not stand up. In a year or two your customer has trouble again—you will replace it at your own expense—or lose a friend. Either way, you lose!

"Now, suppose you replace with a Quam Adjust-A-Cone. First—you make more money. Second—you are installing a precision built, quality-engineered speaker that will deliver top performance for years and ensure customer satisfaction. Third—it is easier to install. Fourth—it has the backing of our company which has, under the same management, built fine speakers for over a quarter of a century. Fifth—similar Quam speakers are used as original equipment in millions of fine sets.

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Servicing Helps

(Continued from page 32)

Stromberg-Carlson TC19

Improving Simultaneous Picture and Maximum Sound Reception in Remote Fringe Areas: Customary tuning procedure on these models, in most fringe areas, involves tuning for the best picture at which point audio is at maximum level. However, in some remote areas, best picture and maximum sound reception are separated on the channel tuning dial. To improve this condition, so that sound and picture reception occur at the same tuning point, the 2.2-mmfd coupling capacitor (C_{70}) going to the 21.9-mc trap in the plate circuit of the third *if* amplifier, has been decreased in value to 1 mmfd. Essentially, this increases the ratio of sound to picture sensitivity of the receiver. When making this modification in the field, the 21.9-mc trap, and possibly the *if* system, may require realignment.

Stromberg-Carlson TV-12

Cures for Excessive Hum: To reduce excessive hum in the 1220-T AM chassis used in the TV-12 combinations, a 25-mfd, 25-volt capacitor should be connected between the cathode terminal of the 6SC7 and ground. In most cases this will reduce hum to a point where it will no longer be objectionable. Because of variations in 6SC7 tubes, hum may sometimes be noted after this capacitor has been added. However, in these cases, changing tubes will invariably eliminate this complaint.

Noisy Volume-Control Repair: The addition of a 0.1-mfd capacitor between the range switch and the top of the volume control, R_{240} , has been found to keep any *dc* from flowing through the volume control and making it noisy.

If volume controls are found noisy in the field they should be replaced and the .01-mfd capacitor added so that the trouble will not reoccur.

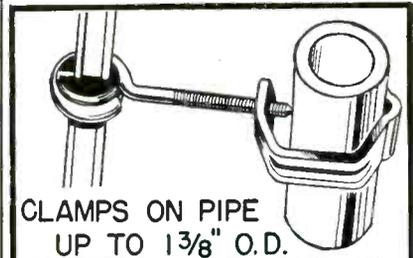
Stromberg-Carlson TC125 and 19

Improved Signal-to-Noise Ratio at Sound Detector: To improve the signal-to-noise level at the ratio-detector stage (for clearer audio reproduction), C_{133} (TC19) and C_{50} (TC125) capacitors have been increased from 1 to 5-mfd, 50 volts.

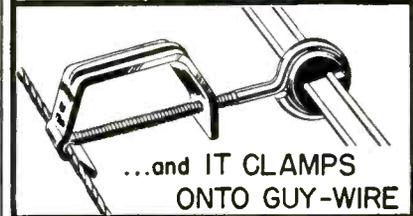
Focus Coil Position Improvement: A greater *in-focus* picture area can be obtained on TC19 models if the focus coil assembly is separated by approximately 3/4" from the deflection yoke on the picture-tube neck. The separation distance is best determined by observing the picture while adjusting the focus coil position.

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Stromberg-Carlson TC125 (Series O)

Improved Vertical Size and Scanning

Action: Vertical size ability has been improved in recent production by decreasing the value of the R_{4a} resistor in the B+ supply lead to the vertical output transformer, from 8,200 to 470 ohms, 1-watt. In addition, the value of the R_{3a1} resistor, in series with the large vertical size control, has been decreased in value from 1.5 to .5 megohm.

Stromberg-Carlson TC19 and 16

Change of Tube Type in RF Position

of Low-Band Tuner Section: The 6BH6 in the *rf* position of the low-band section of the tuner has replaced with a 6CB6, the 6CB6 having been found to improve the low channel gain of the receiver. Although no circuit modifications are required for interchanging these tube types in this *rf* position, it is recommended that the same tube type be used when making a replacement; otherwise misalignment can be introduced.

Stromberg-Carlson 16T and 16C

Improving Tone Control Action:

Action: In early production, clockwise rotation of the tone control resulted in treble response. Proper taper in the tone control potentiometer now permits it to be connected so that treble response increases with counter-clockwise rotation of the control, as is customary.

Stromberg-Carlson TS 125-TS16

Barkhausen Lines:

Vertical dark lines, at the left side of the picture area, caused by Barkhausen oscillations, can usually be eliminated by adjustment of the horizontal drive control. If the lines persist, different 6BG6s in the horizontal output stage should be tried. Often the lines are present on the raster, but disappear when the picture is present, so be sure to check under picture conditions.

Improved Resolution:

The following modifications have been made in the TC-125 models to improve apparent resolution:

Resistor R_{14} changed from 56,000 to 680,000 ohms. Resistor R_{7a} , 22,000 ohms, has been added across the secondary of the video detector transformer. Capacitor C_{3a} has been changed from .01 to .047 mfd.

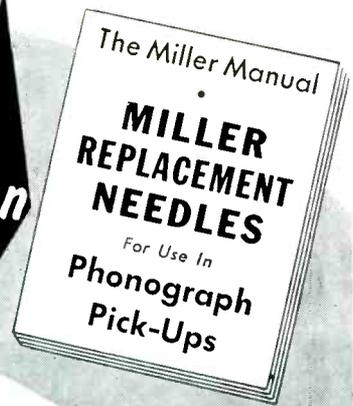
Vertical Speed Range:

To obtain a better range of vertical speed control in the TC-125 chassis, resistor R_{4a} has been changed from 1.8 to 1.5 megohms. Also, a .0022-mfd capacitor has been

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shunted across the C_{3a} , .0047-mfd capacitor when the R_{57B} potentiometer in the vertical oscillator is part No. 145078. When a 2-megohm potentiometer (No. 145101) is used, this shunt capacitor is not used.

Picture Folding: Light vertical fold lines in the pictures of TC models can usually be corrected by slight readjustment of the horizontal size control trimmer capacitor. This capacitor is located in the grid circuit of the 6BG6 horizontal sweep output tubes; C_{40} in TC10-TC125 models and C_{10a} in TC19 models. The adjustment is accessible from the underside of the chassis.

Philco Chassis

Motorboating: One cause of motorboating in the models using the 7F8 as a mixer-oscillator is the low emission in one or both sections of the 7F8. The trouble occurs when the receiver is first turned on. As it warms up, the motorboating increases in frequency, and finally disappears. When these symptoms are noted, and should be tried.

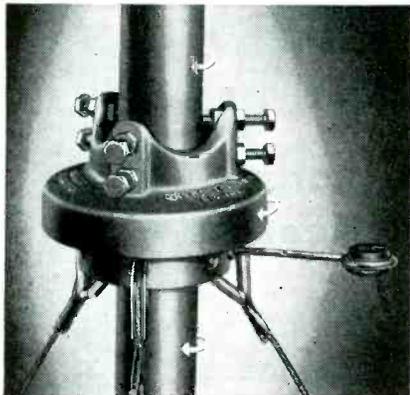
It should be under though low emission a common cause of not the only cause.

NEW...

**ALL-WEATHER
ROLLER BEARING**

GUY RING

(patents pending)



**Permits TV and FM Antenna
Masts to be Rotated
Without Touching Guy Wires**

Furnished complete with standoff insulator, nuts, and guy wire thimbles. Laughs at rain, snow, and ice. Corrosion free. For use with or without antenna rotators.

LIST PRICE **\$4.95**



**CROWN CONTROLS CO., INC.,
New Bremen, Ohio**

MMM TAPE LEAFLET

A new pocket-size folder describing Scotch brand No. 33 electrical tape has been published by Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

Illustrated are such tape applications as wrapping of TV antenna leads; wrapping a high voltage harness; and taping eye for a television lead.

Properties listed for the tape include electric strength, 7-mil thickness, resistance to sunlight, aging, acids and alkalis. It has a rubber backing that is said to have high resistance.

News

[See pages 54 and 55 for other News]

**LEVENFELD REJOINS
CONCORD RADIO**

Gerald Levenfeld has rejoined Concord Radio, 901 W. Jackson Boulevard, Chicago 7, Ill., as advertising manager.

A complete mail-order service has been centralized in headquarters at the Chicago address.

Concord's technical advisory service is under the direction of Sol Davis, W9ZIW, formerly instructor at Chicago Technical College.

Concord Radio's Atlanta branch will be maintained at 265 Peachtree St., Atlanta 3, Georgia.

* * *

**NATIONAL UNION NAMES ULRICH
RENEWAL TUBE SALES HEAD**

Vinton K. Ulrich has been appointed manager of the renewal tubes sales division of National Union Radio Corp., Orange, New Jersey.

Ulrich was formerly with Hytron where he directed sales of transmitting, special purpose, and renewal tubes.



Vin Ulrich

* * *

**GLENN HALL NOW WITH
CLAROSTAT**

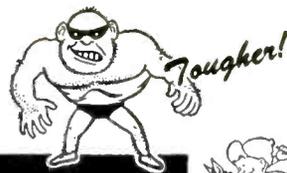
Glenn Hall has been named statistician in the jobber sales division of Clarostat Mfg. Co., Inc., Dover, New Hampshire. Hall's main duty will be the compilation of television replacement tables covering all popular makes of TV receivers. The tables will be complete in giving functions, ratings, type designation, and prices on all controls and resistors in the various chassis.

* * *

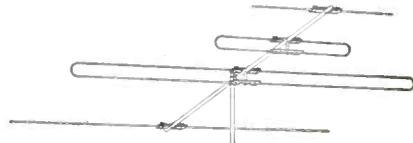
RADIO-TV SHOP SIGN



Fluorescent plastic fire-glow sign which features a three-dimensional sun-glow plastic face and a rugged polished steel case. Can be placed on counters, shelves, or window display props. Has a 72" chain to facilitate hanging. Available in a choice of two copy panels: For TV areas, a panel with television-radio service; for non-television areas, the panel reads Radio Service. (Courtesy RCA)



PHOENIX
Speed-Mounts
and
Speed-Tennas
Profitable!



Phoenix IN-LINE SPEED-TENNA PAR-3

High gain consisting of director, high and low folded dipoles and reflector. Speed-rig. Lo Loss insulation. Complete with all hardware, less mast.

**PHOENIX
ELECTRONICS, INC.**
Lawrence, Mass.

AT LEADING
JOBBER'S
Write for
folder V of
complete line
of television
accessories.

1950 PROFIT GUIDE
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TELEVISION AND RADIO
SERVICE-DEALERS'
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**SYLVANIA NAMES H. WARD ZIMMER
EXECUTIVE VICE PRESIDENT**

H. Ward Zimmer has been elected executive vice president of Sylvania Electric Products, Inc.

Zimmer, who has been vice president in charge of operations for the past two-and-a-half years, joined Sylvania in '19 in the purchasing department at Emporium, Pa.



H. Ward Zimmer

* * *

**RIDER LABS NOW DISTRIBUTING
QUIK-SHOT SOLDERING IRONS**

The national sales distribution in the United States and Canada of the *Quik-Shot* soldering iron has been taken over by John F. Rider Laboratories, Inc., 480 Canal Street, New York 13, N. Y.

The iron requires no electricity or flame to heat it to a soldering temperature, the necessary heat being developed internally by means of a patented chemical content within a *Quik-Shot* cartridge, which is inserted into the iron and fired by means of a spring operated trigger.

* * *

DEELEY NOW A C-D DIRECTOR

Paul McKnight Deeley has been elected a director of the Cornell-Dubilier Electric Corp.

Vice president of C-D since 1932, Deeley previously had been associated with Cornell Electric Manufacturing Co. since 1931.



Paul Deeley

* * *

TUBE SELECTOR-SALESMAN



Illuminated display case for tubes, 34" high, 21" wide, and 8" deep, made of 24-gage steel, and finished in gray, currently being offered by the tube division of G.E. to Service Men. Known as the *Selector-Salesman*, the unit holds as many as 200 tubes, and may be obtained only from G.E. and Ken-Rad tube distributors.

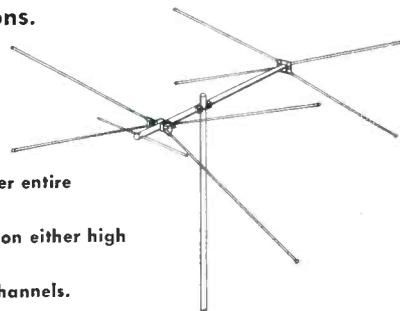
WALSCO ANNOUNCES

AMAZING NEW

NEW

SIGNAL KING ANTENNA

FINALLY, the one antenna that does more to guarantee outstanding reception, trouble-free performance in even the fringe areas. The WALSCO Signal King, with its amazing new patented design, assures longer, dependable service under the most adverse weather conditions.



- Broad response over entire TV spectrum.
- No weak channels on either high or low band.
- Extra gain on all channels.
- Marine type high tensile strength aluminum alloy used throughout on elements, cross-arms and masts.
- Elements are reinforced with metal insert and are sealed on outer end.
- Full 1 inch O.D. cross-arm.
- U-bolt assembly fits mast from 3/4" to 1 1/2" O.D. Bracket made of serrated steel that bites into the mast. All cadmium plated.

➤ **WRITE FOR FREE ILLUSTRATED CATALOG 94-D**

WALSCO

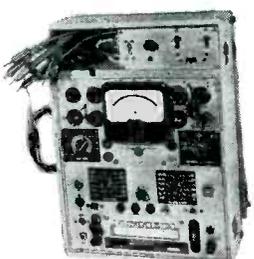
*Quality Sells
WALSCO Antenn*

WALTER L. SCHOTT CO. Beverly Hills, Calif. • Chicago 6, Ill.

RCP
POINTS THE WAY!
QUICK SOLUTION
TO YOUR SERVICE
PROBLEMS!

SERVISHOP

MODEL
8573
\$99⁹⁵
NET PRICE



TUBE TESTER • SET TESTER • BATTERY TESTER • CONDENSER TESTER • AUDIO R. F. F. M. • SIGNAL GENERATOR

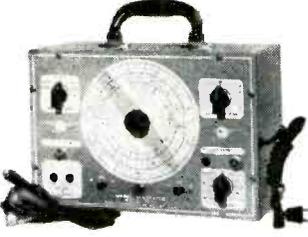
Every square inch solid-packed with value! Look what you get in this phenomenally low-priced tester: (1) A complete tube tester with over 800 listings in its famous Rollindex roll chart, (2) A battery tester indicating actual voltage under rated load, (3) A capacitor tester, (4) A fixed point calibrated AM-FM signal generator, (5) An audio oscillator; and a dozen additional features. Readable scale divisions on the ohm meter start at 0.05 ohm to 25 megohms.

DC Volts: 0, 2.5, 10, 50, 250, 1000, 5000
AC Volts: 0, 10, 50, 250, 1000, 5000
DC milliamperes: 0, .5, 2.5, 10, 50, 250, 1000
DC Amperes: 0, 10
Megohms: 0, 2.5, 25
Ohms: 0, 250, 2500, 25000
Decibels: -8 to +15, 15 to 29, 29 to 49, 32 to 55
Output Voltmeter: 0, 10, 50, 250, 1000, 5000

Complete with tubes, batteries and test leads, output leads, etc., housed in natural finish oak case; hammer-tone gray panel.

SIGNAL GENERATOR

MODEL
705A
\$39⁹⁵
NEW LOW PRICE
SAVES \$10.00



FOR FM-AM
DOUBLE MODULATION 30% & 80%

Not one—but two percentages of modulation add greater checking performance to your service tests. All exclusive feature in this low price precision generator. Fully dependable. Excellent for FM alignments.

- Range from 95 kc. to 100 mc. • Fundamental frequencies in 5 bands, continuously variable • Accurate to 2% for broadcast bands—3% for h.f. bands
- Auxiliary drive condenser with accurate double and tuning indicator • 5 step ladder attenuator controls voltages from 0 to maximum • Covers all new FM bands
- Signals can be obtained as high as 150 mc. • Minimal leakage due to complete shielding • Completely ready for the shop. Just plug in any standard Cycle A.C. line and go to work • Grey case—portable, only 11 lbs.

OUTSTANDING BUYS AT YOUR SHOPPER TODAY

PRODUCTS CO., INC.
New York 1, N. Y.

JOTS AND FLASHES

NEW TRENDS IN TV antennas and accessories, unveiled at the recent parts show in Chicago, appeared to be focused on double-V type antennas, bar-type dipoles, yagis, multiple-stage boosters, antenna-mounted pre-amplifiers and antenna-mounted trailers for rapid setups and demonstrations. A review of these interesting developments is now being prepared for early presentation in SERVICE. Incidentally, in this issue of SERVICE appears a comprehensive report on many new sound products which were also displayed at the convention in Chicago. . . . The industry's first consumer show featuring television will be held in New York at the 69th Regiment Armory, 25th St. and Lexington Ave., from September 23rd to 30th. To be known as the National Television and Electronics Exposition, the show is being promoted by Fromer-Kram Expositions, Inc. . . . Television receiver production reached a new peak during the first quarter of '50, with over 1,500,000 sets being produced. According to RMA, this is 21% higher than the previous peak period during the last quarter of '49. . . . Edgar K. Wimpy is now director of quality control at Hytron Radio and Electronics Corp. . . . Telrex, Inc., are now promoting their antenna products through an extensive newspaper, TV and radio consumer-advertising program. . . . Tele-Matic Industries, Inc., are now located at 1 Joralemon St., Brooklyn, N. Y. . . . Edward F. Weston, chairman of the board of directors of the Weston Electric Instrument Corp., recently celebrated his fiftieth year with the company. . . . Shure Brothers, Inc., celebrated its twenty-fifth anniversary recently in Chicago with a luncheon and afternoon party for its 400 employees. . . . Alfred C. Lindquist is now manager of sound products and associated electronic activities of the RCA Engineering Products Department. . . . John F. Rider's forthcoming text originally entitled *New Cathode-Ray Tube at Work* will be known as the *Encyclopedia on Cathode-Ray Oscilloscopes and Their Uses*. The book will be priced at \$9.00. . . . W. Myron Owen has been reelected president and treasurer of the Aerovox Corp. Bert Conway was named to a new executive vice president post. . . . Robert J. Cannon has been elected president and treasurer of the Cannon Electric Development Co., Los Angeles, succeeding the late James H. Cannon, who died recently. . . . Leonard Ashbach, president of the Leonard Ashbach Co., owners of Garod Radio Corp., has acquired a substantial equity interest in the Wilcox-Gay Corp., Charlotte, Michigan. Ashbach has become chairman of the board of Wilcox-Gay. . . . Al Reback is now with Federated Purchaser Inc., 66 Dey Street, New York, serving on the industrial sales staff. . . . Dr. Lloyd T. DeVore is now manager of the G.E. Electronic Laboratories at Syracuse, New York. . . . Sylvania will soon begin construction of a new tube plant in Shawnee, Oklahoma. . . . Recent issues of the *Aerovox Worker* have contained reports on TVI and simplified antenna pattern measurements. . . . A new plant at 391 Saw Mill River Road, Yonkers, N. Y., has been purchased by the Square Root Manufacturing Corp., where projection TV systems, fly back transformers and indoor and built-in antennas will be made. A line of molded tubulars and electrolytics will also be made, using facilities of recently purchased Crown Capacitor Corp.

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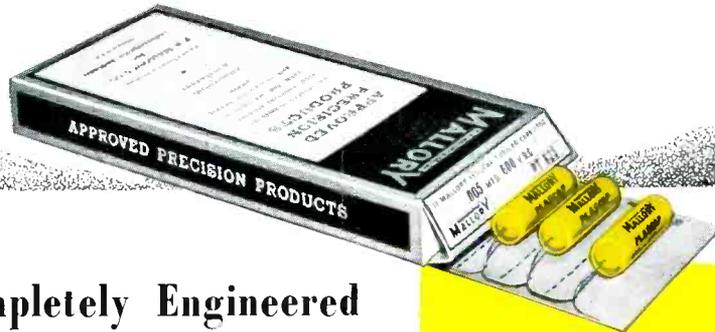
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New



Mallory Plascap*

... Made with Amazing Mallocene*!



World's First Completely Engineered Plastic Tubular Capacitor

Here's the plastic tubular that's years ahead of its time... made possible *now* by Mallocene, amazing Mallory plastic development that gives you *four exclusive* performance firsts, leaves ordinary plastic tubulars far behind!

Gone is the old bugaboo of "call-backs" due to construction weaknesses beyond your control. For the Mallory Plascap is dependable. No oil leakage, no unsoldered leads, no off-center or deformed cartridges, no messy outside wax coating, no insulation problems. The Mallory Plascap makes your service job easier! See your Mallory Distributor.

The Secret of Mallocene . . .

There is only *one* logical way to build a molded type plastic tubular capacitor... with a plastic that sticks to the metal leads! But with ordinary construction methods, this has been impossible, for such a plastic would stick to the metal mold!

Here's the secret of the Mallory Plascap. First, an extremely tough plastic shell is molded. The cartridge is carefully centered within this shell. Then, the cartridge is surrounded with Mallocene. When Mallocene hardens, it actually becomes part of the outer plastic shell, and *sticks to the metal leads!* Thus, Mallocene provides a solid plastic tubular capacitor with the *first* moisture-proof construction!



TRISEAL CONSTRUCTION—Sealed *three* ways —with moisture-free Mallotrol*... tough outer plastic shell... exclusive Mallocene!



DISTORTION-FREE WINDING — No flattened cartridges due to molding pressures... no failures due to "shorts"!



FASTITE LEADS—Permanently fastened... sealed with Mallocene... unaffected by soldering-iron heat!



TRU-CENTER CARTRIDGE—Cartridge centered every time... uniform insulation guaranteed at all points!

Plus these Top Features: Operates at 85°C... No messy outside wax coating required... Great mechanical strength... Small in size... Light in weight... High dielectric strength... Lead to outside foil clearly identified... Handsome yellow case... Legible part-numbers and ratings.

P. R. MALLORY & CO. Inc.
MALLORY

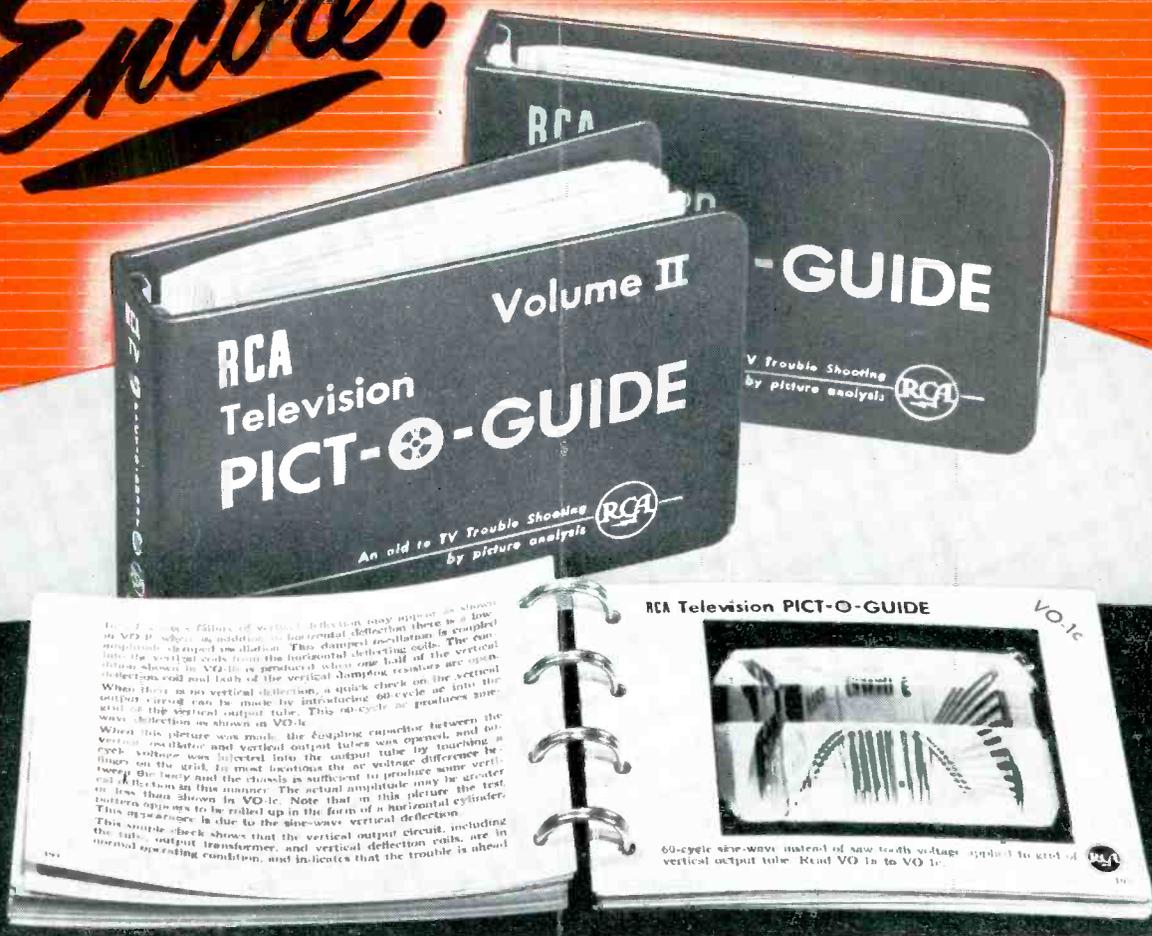
CAPACITORS... CONTROLS... VIBRATORS
SWITCHES... RESISTORS... REACTORS
VIBRAPACK* POWER SUPPLIES

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS, IND.

*Trade Mark

Encore!



Again - Yours - **by popular demand . . .**
the Famous RCA Pict-O-Guide
Volume I or II with each order
of 100 tubes or 3 kinescopes

NOW . . . another big opportunity for service technicians to get Volumes I and II of the famous, *original* RCA Television Pict-O-Guide edited by John R. Meagher, the renowned TV service authority. Place your order with your RCA Tube Distributor at once to insure delivery of your copies before the supply is again exhausted, or the offer expires.

Acclaimed as one of the greatest practical and active aids to TV receiver trouble shooting in

the field, the *original* RCA Pict-O-Guide provides eyewitness identification of many faults common to all TV receivers and gives basic, authoritative remedies—the kind of practical information that pays off on the job.

There's no substitute for the quality of service information in the RCA Television Pict-O-Guide . . . just as there's no substitute for the quality of RCA tubes. *Both* are yours at no additional cost!

Always keep in touch with your RCA Tube Distributor

RADIO CORPORATION of AMERICA

ELECTRON TUBES

HARRISON, N. J.