Successful
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REG. U.S. PAT. OFF.

Dedicated to the financial and technical advancement of electronic maintenance personnel

VOLUME 14 NUMBER 1 JANUARY, 1953

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Curtain Time

The Itinerant TV Service Technician

It has been common practice to do light TV servicing – mainly tube changing – in the home. Judging by the comments of some large service facilities of all sorts, customers' home service will be expanded in the future to where virtually all troubles will be remedied in the home. Only in extreme cases will chassis be pulled.

This approach to TV servicing will, more than likely, result in other changes too. It is going to mean a greater investment in test equipment – portable equipment which can be taken into the home. This means that test equipment manufacturers will have to design equipment specifically for this purpose.

It is going to give the small independent operator the opportunity to survive. It has been the general opinion that TV servicing set a limit on the minimum number of personnel required by a service facility because of the to-and-fro movement of a TV receiver. Doing most of the service in the home enables a TV service facility to operate with whatever number of technicians the facility wishes to place in the field – as few as one man.

Another practice associated with this kind of service is the use of the rolling parts stock, that is, the replacement parts stock will be in the truck which is driven to the job. This is being done to a limited extent today and is proving successful. In fact, the roving service truck idea was talked about years ago – at the advent of television, but it did not gather too much momentum, except as applied to receiver and antenna installations. Now it looks like it will become an everyday occurrence.

The idea will be accepted by the public. Even though the average housewife is not too happy at the prospect of having one of her rooms cluttered with servicing equipment, it still is the lesser of the two evils relative to all the possibilities of what can occur when the chassis is removed from the home. In the mind of the public anything can happen after a chassis is pulled – even to having to pay a ransom to get it back. Having it serviced in the home will reduce the period during which the receiver is inactive. It will cut the travel time cost, to say the least.

Once the practice blooms, it will be necessary for all service facilities to follow suit. This is becoming evident today in the form of the responses received by those shops that advertise service in the home. They outpull the ads which do not make the same offer.

Doing extensive TV servicing in the home will place a greater than ever premium on technically qualified men. In fact, successful operation cannot be carried on in any other way. Properly handled, it should minimize repeat calls because it is possible to demonstrate the performance of the receiver before the technician leaves; also it means freedom from the complications of operating a receiver in one location and servicing it in another, where completely different receiving conditions prevail.

All in all, major service in the customer's home offers interesting possibilities. Let's see what happens.

The OPS Price Order for TV Service

The price order covering TV service has yet to be issued by the OPS. According to reports it will be done, providing the regulatory body will remain after the new administration becomes active. We have not changed our ideas as expressed in the November, 1952 issue of SUCCESSFUL SERVICING. We feel that the problem of diagnosis of TV receiver troubles, the "bugs" which frequently develop in TV receivers – in general the behavior of electronic equipment makes it necessary to treat the repair of these devices differently than ordinary electrical and mechanical equipment.

It is reported that the contents of the proposed regulation has the approval of TV service facilities. We hope that diagnosis time was given its full due apart from the time required for the repair.

John F. Rider

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Replacement Parts in TV Receivers

Part I - Capacitors (cont'd)

This is the third in a series of articles on "Replacement Parts in TV Receivers." "Capacitors" will be continued next month.

by John F. Rider

DIFFERENCE BETWEEN CAPACITORS

The various names which appear in the capacitor family tree designate both physical and electrical differences in the components and in the behavior and suitability of the component for different classes of service. As to the physical differences in dimensions, these require no special comments other than to say that, in the final analysis, the suitability of a capacitor on this basis, is determined by its location in the receiver.

Mica Capacitors. The differences between foil mica and silver mica capacitors are manifold. The foil type, or ordinary "molded" mica is made up of alternate slabs of active surface (usually metal foil) and mica dielectric. The assembly is compressed under high pressure and housed in a molded case, usually of brown bakelite, although yellow bakelite also is used for this purpose. The uniformity of closeness of the foil to the dielectric slab determines in a great measure the electrical behavior of the device. This behavior is a function of the materials used, the pressure applied when the unit is encased, and the expansion or contraction of the casing under the influence of varying temperature. This in turn gives rise to changed spacing between the active surfaces and the dielectric, and a change in capacitance.

The variation in capacitance under varying temperature conditions is minimized by the use of yellow bakelite, but since the foil type represents a category of component, certain conditions of behavior are acceptable. Thus the usual brown bakelite mica capacitor is acknowledged to possess certain operating characteristics and is used on that basis.

The tendency toward change in capacitance with variation of temperature has given rise to a sub-classification. This is the deliberately engineered temperature coefficient mica capacitor, wherein the capacitance changes by a prescribed amount per degree C. change in operating temperature. This type was popular years ago for correcting circuit behavior with changing temperature, but, as is discussed in detail later, it has been supplanted by the ceramic dielectric unit.

The silver mica variety, whether of the "postage stamp" or "button" shape, uses a deposit of silver on the two sides of the mica dielectric. This produces a firm bond between active surface and dielectric. Moreover, the assembly is housed in either red or yellow bakelite; that is, in material which maintains its dimensional stability with changing temperature. The result is a capacitor which is very efficient electrically; is much more stable in capacitance than the ordinary mica; can be produced to a much greater degree of accuracy relative to capacitance rating; in general is much more suitable for use in all critical circuits under varying conditions of frequency (including UHF), temperature and humidity. It too is available in a variety of temperature coefficient characteristics, although in the main it is a positive temperature coefficient capacitor.

Manufacturing know-how enables producers of mica capacitors to deliver an end product which displays prescribed characteristics relative to an increase or decrease in capacitance within prescribed limits for unit changes in operating temperature. This establishes the "class" or "characteristic" of the capacitor. Since the set designer weds the characteristic of the capacitor to the circuit requirements, it is a relatively important consideration in the matter of replacement. In essence, the characteristic is a designation of the temperature coefficient of the capacitor. More about this later.

The comparative superiority of the silver mica capacitor over the ordinary foil mica type does not make the latter a bad unit. It is an excellent capacitor and enjoys a great variety of uses; it is simply that where frequency stability is a very important item, and the frequency is controlled by capacitance (as for example in oscillators and other critical tuned circuits) the silver mica unit is preferred.

The use of mica as a dielectric provides high insulation resistance. This is true for both kinds of active surface construction; hence the mica capacitor is frequently used for d-c isolation (and coupling) where d-c leakage must be kept very low. To minimize the absorption of moisture in humid atmosphere, and also to keep surface leakage between the connecting wires low, the complete capacitor often is coated with a layer of wax.

Ceramic Capacitors. Ceramic capacitors are available in a number of types. Neglecting physical differences, the ceramic unit is highly efficient electrically. Constructionwise, regardless of the shape, it consists of a metallic deposit on the opposite surfaces of a ceramic dielectric with connecting leads soldered to the active surfaces. The result is a very stable capacitor, and one in which, by selection of the ceramic dielectric material, a variety of electrical characteristics can be achieved. One of its paramount virtues is a relatively high value of capacitance in a small, compact-sized unit. In this respect it is superior to all other types of capacitors.

Another feature stemming from the easy control of the specific composition of the ceramic dielectric, is the ability to manufacture a capacitor which will *change* in capacitance in a definite direction and decrease or increase by a predetermined amount with changes in operating temperature. While this is possible with the foil type of mica capacitor, it is much more easily controlled in the ceramic, with the result that the latter variety of temperature compensating capacitor has displaced the

(Continued on page 26)

Using An A-M Signal Generator etc.

(Continued from page 3)

The height and vertical linearity controls should then be adjusted until the height of the blanking bar is uniform regardless of its position on the screen.

Although the vertical height and linearity controls can be adjusted for reasonably good linearity without a test pattern or test equipment, the adjustment of the horizontal linearity control does require some type of a pattern on the screen. An incorrect adjustment of the height and vertical linearity controls is more noticeable on the ordinary program than is an incorrect adjustment of the horizontal controls. This does not mean that the horizontal adjustments can be overlooked, however, since the owner will see a number of programs on which a circle will be used, and if this is not a reasonably true circle, a return service call will probably be required.

The signal generator can also be used to make this adjustment without removing the chassis from the cabinet. The only additional items required are a .01-μf capacitor and a piece of thin spaghetti. The location of the first video amplifier tube must also be known. This tube can, of course, be identified if a circuit diagram is available. If a diagram is not on hand, the tube layout will ordinarily indicate the video amplifier tube or this tube may be recognized by its location on the chassis.

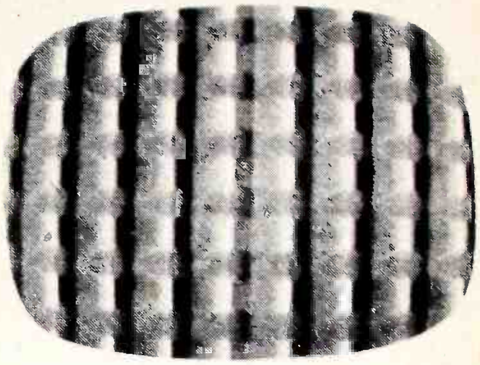


Fig. 7. Pattern produced by signal generator with 157.5 kc modulated by 400-cycle audio.

A number of manufacturers are also including test jacks located at various points in the circuit which can be used for trouble-shooting or signal insertion. One of these test jacks is usually located at the output of the video detector or the input to the first video amplifier. If a test jack is available the output of the signal generator can be connected to this point through a .01-μf capacitor by inserting one end of the capacitor, bent to make proper contact, into the test jack.

If a test jack is not available at this point in the circuit, contact can be made by connecting the .01-μf capacitor to the grid pin on the first video amplifier tube. A piece of thin spaghetti should cover both of the capacitor terminal wires so that only about one-quarter inch of wire is exposed at the end of each wire. One end can then be bent so that it will fit snugly over a miniature pin, and the other end can be bent to fit over an octal pin. Either end can then be used depending on the tube used in the receiver. The spaghetti will prevent a short either to the chassis or to some other tube pin.

The channel selector should be sent on a blank channel and the r-f output cable of the signal generator connected to the unused end of the .01-mf capacitor. The output of the signal generator should be unmodulated and the frequency adjusted for some harmonic of the horizontal sweep frequency of 15,750 cycles, such as the tenth harmonic which is 157,500 cycles or 157.5 kc. This will produce about ten vertical dark and light bars across the screen as shown in Fig. 6. The spacing of these bars can then be used to adjust the horizontal-linearity control. If more bars are preferred the frequency of the signal generator can be increased; if fewer bars are desired the frequency can be decreased. The vertical bars will sync in at harmonics of the horizontal-sweep frequency. If the audio modulation is not turned off the bars will be wavy as shown in Fig. 7.

If either a cross-hatch generator or an a-m signal generator must be used, it should be remembered that these instruments are only substitutes for the test pattern. If a pattern can be used it should be preferred although reasonably close linearity adjustments can be made with instruments.

Addition to TV 10 and TEK-FILE Pack 67

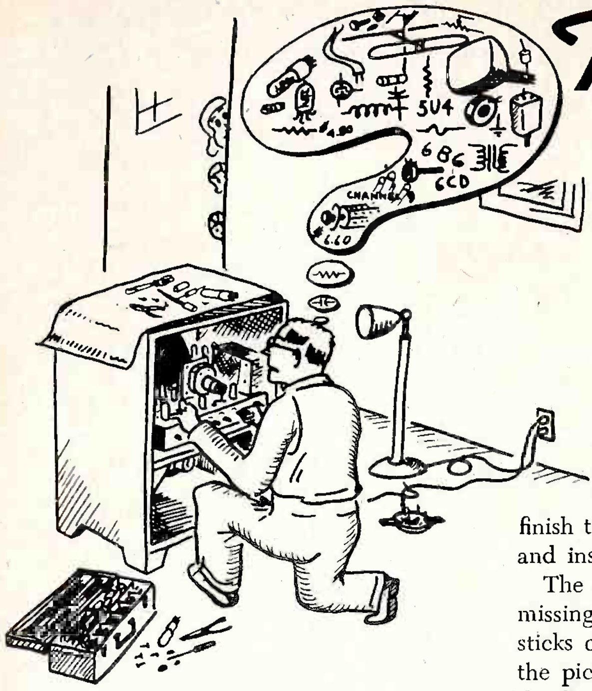
National TV Model 1701

VOLTAGE CHART

Tube No.	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V1	-.5	0	6.3 AC	0	80	80	0	
V2	96	96	6.3 AC	0	-3.5	-2.5	0	
V3	-.45	0	0	6.3 AC	90	90	.4	
V4	-.45	0	6.3 AC	0	90	90	.5	
V5	-.45	0	0	6.3 AC	90	90	.6	
V6	0	0	0	6.3 AC	90	90	.7	
V7	-2.5	-.2	0	6.3 AC	.5	0	-3	
V8	0	6.3 AC	-.4 to -2.5	-2.5	.4	160	0	115
V9	90	-9	4.5	0	0	0	0	0
V10	20	0	0	6.3 AC	20	-.6	0	
V11	0	0	6.3VAC	0	13	NC	-9	
V12	NC	NC	6.3VAC	0	320	-90	0	
V13	NC	0	350	350	27	0	6.3VAC	0
V14	25	220	13	-7	120	13	6.3VAC	0
V15	NC	6.3VAC	1.7	TP*	-18	NC	0	320
V16	HV RECTIFIER							
V17	NC	280	540	NC	360	NC	6.3VAC	6.3VAC
V18	PICTURE TUBE							
V19	0	0	0	6.3AC	88	90	.6	
V20	96	140	340	90	94	96	90	
V21	88	92	42	92	280	150	92	
V22	0	90	320	250	90	90	90	105
V23	NC	390	0	0	360	0	NC	390
V24	88	88	92	92	92	NC	80	

*Tie point

John Gigl



The Quick Diagnosis

or

Working Under Pressure

by John D. Burke

What goes on in the head of a TV repairman when he goes into a house or apartment to "take a look" at a TV set?

Within the space of a very few minutes a *torrent* of thought surges through his head. Yet, to the observer, it would seem that the repairman has little on his mind.

From years of personal experience I shall try to set down a record of such thinking. Perhaps it will be interesting to psychologists. At any rate, my fellow repairmen should be interested, amused, even compensated for their somewhat tonguetied characteristic — unable to convey to an outsider that which we of the trade undergo.

Since we are dealing with a torrent of thoughts — the only organization possible is movement. It will start at one point, and finish at another.

* * * *

"What could it be? It must be just a tube! We had all the tubes overhauled just last month! Must be just an adjustment! Maybe the aerial has blown down! Do you think it is the picture tube? What do you think of these.................sets? What kind of a set do you have? Which set would you recommend? Let the man alone! What's that? An ash tray? (Gladly they rush to bring an ash tray. Gives them something to do. Like a doctor asking for hot water.)"

". . . Hmm. They *never* think to clear the junk off the top! Where's the light? Living rooms are certainly dark nowadays since television . . . ah, at least this floor lamp still has a bright bulb. What is it? A console. Drag it out. Careful, watch out for that rug . . . remember, put something on the top . . . this paper will do. Never forget the time I accidentally burned a tiny spot on a top. So small it rubbed out easy . . . looked like they'd kill me . . . refused to take pay for the job . . . told 'em to apply it to refinish the cabinet . . . man came to my shop and insisted on paying for my work.

The back . . . oh no . . . screws mostly missing. Watch out for that tube neck . . . sticks out! If the back drops . . . bang goes the picture tube. Hey! Better take a look at the front *before* pulling off the back. What's the complaint? Plays a while — then goes crazy. Hmmm — at least this one's got the hold controls on the front . . . Ah, not enough width . . . 5U4 or more? Gee, I hope it doesn't use a 6CD . . . haven't got one with me Lousy intermittent. Picture's solid now. Try to speed up the craziness . . . rotate band switch. Turn set on and off . . . rotate hold controls. The people will think I'm ruining their set — swinging these knobs so fast. Those fix-it books — TUUUUUURN SLOOOOWLY — got everybody nuts. 'Fraid to turn a knob. Never forget the old pair that thought the set should be turned *off* before changing stations!

O.K. — there she goes. Sync. Is it both vert and hor? Vertical very unstable . . . horizontal, no sync at all. Oh, oh — breaks into multiple images sideways. Nice. Hope its just the oscillator. Nice, clean, simple — through in a wink. Maybe the horizontal amplifier, too. Hope not. Rough to explain *that* tube's price. Off with the back . . . where's my junk? Ah, ah, somebody's broken the cheater off the back. No need to use my cord . . . always forgetting them . . . such a hurry to get out after the job is done I forget the cord.

How about the controls? Marked on the chassis . . . ? Those engineers should have to work on some of their own monstrosities. What is this . . . intercarrier or conventional? Looks intercarrier. How many tubes in the sync . . . Mmmm. Horizontal oscillator — where the devil is it? The places they put tubes! Ah, at least this one has a spring mount base. That's the baby . . . oh, oh . . . wait . . . don't pull it or you'll blow a fuse!

Off with the cord . . . change tubes . . . hope this *new* one is good! Now . . . let's see . . . before turning it on . . . Where's the fuse? In the box. Good. Lucky. Better open her up before turning it on again. May see something. Some case, that last one! Somebody just laid a new fuse on top of the old one! That set sure acted crazy. How about finger smears on the tubes? Yeh, they've been in here. Just feeling to see if they are hot. Hey! How about the trap . . . have they been at it, too? Yeh! Mm . . . doesn't look like they moved it. It looked O.K. when the set did play before . . .

Would the horizontal oscillator tube being bad explain lack of vertical sync? Might. If vertical draws voltage from the damper — damper works off horizontal . . . O.K. Let's see how she works . . . look at the people watching me! Every move I make. Probably figure I'm trying to cheat them . . . they should know. If I get out of this without a shop job, or an argument, I'll be happy.

Set's two years old . . . plenty trouble due any minute now. Original picture tube . . . funny, it looked bright in spite of its age . . . O.K. . . . she holds. How's that hold control? Whoops! Got to readjust the back to permit centering of front control. Where's that mirror . . . *That's alright . . . I'll just hold my own. Thanks!* Wonder if it was just the tube? How long should I let it play to be sure? Oh-oh-look at that width jumping! In and out an inch on each side! . . . Damper? Sound seems steady . . . vertical, too. Must be the 6BG — variation in screen current, maybe . . . lucky it's not a 6CD . . . lucky if it is just the tube. Hate to put one in . . . Nobody believes a tube can be four-eighty. When they hear six-sixty for a 6CD . . . Man! . . . Ouch! That tube's hot! Pry it out with a screw driver . . . burn your fingers! . . . Alright. Try again. When they saw that second tube come up their eyebrows went up too! Width . . . good . . . steady.

Focus? Where is it? Um, um. Linearity? Just a touch—O.K. That does it. How about the glass? Not too bad. Does the front come off? No! Too bad. I'm not going to pull out the chassis for that little dirt on the face. If I did, I'd surely be blamed for every future trouble. "It was working fine till *you* pulled out the chassis!" Glad this thing wasn't a series filament job . . . hate em.

Oh! Look at that ghost on Channel 9! . . . Sneak a look at the people . . . are they

(Continued on page 29)

Here are more data that will keep your RIDER'S DEPENDABLE REPLACEMENT PARTS LISTING published in TV Volume 10 up to date. This is also to be included in TEK-FILE Packs 58, 59, 60, 61, 63, 64, 67, 68, 70, 71, 75, and 76.

ADDITIONS:

Set Mfg.	Set Mfg.'s Original Part No.	Replacement Part Mfg. Name	Dependable Replacement Part No.	Remarks
Belmont	8C-17845	C. D.	C031	
"	8C-18487	C. D.	D078*	*Omit 125mf section
"	8C-19546	C. D.	BR2015A	
"	8C-19564	C. D.	BR1015	
Hallicrafters	45B173	C. D.	C036*	*Parallel sections
Motorola	25B710925	Stancor	A-3877	
Philco	30-2417-7	C. D.	BBR2-50T	
		Mallory	TC 302	
"	30-2570-57	C. D.	D 111	
		Mallory	FP 476	
"	30-2570-66	C. D.	XA 004	
		Mallory	FP 117	
"	30-2584-9	C. D.	D 111	Parallel sections
		Mallory	FP 344.5	
"	30-2584-10	Mallory	FP 225	
"	30-2584-15	C. D.	UPT 435	
		Mallory	FP 255-TC 72	
"	32-8242-11	Stancor	A-3823	
"	32-8522	Stancor	A-3825	
		Triad	F-21A	
Starrett	CO 1050-2	Aerovox	AFH-3-44	
"	CO 1050-3	Aerovox	AFH-4-14	
Stromberg-Carlson	161030	Stancor	C-2326	
Western-Auto	12C-18743	Stancor	A-3878	
		Triad	S-8X	
"	12M-18241-1	Stancor	A-8125	
		Triad	A-97X	

CORRECTION:

Western-Auto	12M-18241	Change A-99X to A-97X in Triad Sweep Transformers column.

CORRECTIONS FOR VARIABLE RESISTANCE CONTROLS LISTINGS:

Crosley	153348	Change P 128 to P1-128 in IRC Outer Shaft column.
Emerson	390156	Transpose DS-36 from Mallory Switch No. column to Inner Shaft column.
"	390181	Transpose DS-36 from Mallory Switch No. column to Inner Shaft column.
"	390183	Transpose DS-36 from Mallory Switch No. column to Inner Shaft column.
Firestone	78X12	Change QJ-375 to QJ-418 in IRC Stock No. column.

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ATTENTION AUTHORS:

We are soliciting articles concerning radio, television, and allied electronic maintenance. All aspects are of interest. Articles of 1,000 to 2,000 words are desired. Preference is given to subject matter which reflects practical work rather than theory. The presentation should be *direct*, to the *point*, and amply illustrated. Finished art work will be prepared by us from the roughs submitted. Photographs are welcome. The rate of payment is on a word basis — and, needless to say, good writing rates good pay!

Submit all articles and inquiries to Editor, *Successful Servicing*.

JOHN F. RIDER PUBLISHER, Inc.
480 CANAL STREET
New York 13, N. Y.

TV Set Functions With Transitors*

T. R. Kennedy Jr.

A complete portable television receiver functioned perfectly here today without radio vacuum tubes. Instead, it utilized thirty-seven bits of laboratory magic known as "transistors," which even now are said to perform nearly all the functions of the ordinary radio tube, and do some of them even better.

The video receiver, which was battery operated and about one-quarter the weight and size of an ordinary home table model set, was only one of a number of familiar electronic devices such as home and automotive radios, record players and public address systems — using only transistors — demonstrated for the first time as a "transistor application progress report" in this new field by the David Sarnoff Research Center of the Radio Corporation of America.

The only conventional type of vacuum tube in the video set was its own self-contained picture tube, on which the image was created.

And even that last conventional radio tube in the home video may in time give way to a newer device patterned after the transistor. Dr. E. W. Engstrom, vice president of the R.C.A. Laboratories Division, expressed such views as the new transistor-operated devices were demonstrated for newspaper men and technical writers, who saw them for the first time.

"Even now we are thinking along such lines," he said. "Tomorrow's video screen may be something entirely different than we have in today's sets. We have seen more progress in four years of transistor development in the laboratory than in twenty for the radio tube."

Great Cost Production Seen

Dr. Engstrom explained that the small size of the viewing screen of the receiver demonstrated — five inches wide — had nothing to do, however, with the transistors inside the unit, which provided only the amplification of the signal and converted it to something the viewing screen could turn into a moving image. The laboratories had only tried to eliminate the thirty-seven ordinary tubes.

With transistors in use, however, the largest element of cost in the ordinary home video set except the viewing screen — the power needed to light twenty-four to thirty ordinary tube filaments — might be reduced almost to nil. It was Dr. Engstrom's estimate that tomorrow's video receivers with full complement of transistors and the usual cathode-ray viewing screen might be, when production is stepped up, "something about half of today's costs."

For those not familiar with transistor history, Dr. Engstrom explained that the original device was a product of the work of Dr. William Shockley and associates of the Bell Telephone Laboratories in 1948, and since then under intensive development in many electronic laboratories, including the R. C. A.'s.

In the various branches of the laboratories the visitors saw transistors being made from refined bars of metal called "germanium," which must be first purified, then contaminated with other elements to achieve the required end of being good amplifiers and generators of electric currents — "better than most radio tubes and far more versatile than many."

When the germanium bars are finished they are sliced up into minute particles, the bits, mounted in plastic holders, "cat whiskers" of fine wires applied through which small voltages are applied from batteries. The result is amplification of a radio signal, without the heated filaments in ordinary vacuum tubes.

*Reprinted through courtesy of *The New York Times.*

Rider · Tek-File Index

PACKS 1-77

HOW TO USE THIS INDEX

To locate service data instantly, all you need to know is the manufacturer's name and the model or chassis number of the set.

The index is compiled alphabetically, according to manufacturer. Note the column headings at the top of each page: MODEL, PACK-FILE, PAGES.

Model numbers run in numerical sequence, starting with the smallest number under a manufacturer's name. This applies also to model numbers using letters. (i.e. model AR precedes model CG). Model numbers starting with letters precede model numbers starting with numbers.

Under the column PACK-FILE, the first number is the TEK-FILE Pack number, and the second number is the File number.

Under the column headed PAGES, the first and second numbers indicate the page where the information starts; the last number shows where the data is concluded.

As an example, let's look up ADMIRAL model 36X36AS. It shows that the information is in (1-1) Pack No. 1, ADMIRAL, File No. 1. The data (8=23-46) starts on page 8-23 and runs through page 8-46. There is also data on the ADMIRAL record changer model RC 550. It's in (1-RC2) TEK-FILE Pack No. 1, in ADMIRAL Record Changer File No. 2. The data begins on page 21-9 and ends on page 21-16.

If you remove the pages from the TEK-FILE Files and insert them in the TEK-FILE binder, you can disregard the PACK-FILE column and refer to the PAGES only.

ADMIRAL
ANDREA

ADMIRAL CORP

MODEL	PACK-FILE	PAGES
4H15A, 4H15B, Ch. 20A1	40-2	4=1-37
4H16A, 4H16B, Ch. 20A1	40-2	4=1-37
4H17A, 4H17B, Ch. 20A1	40-2	4=1-37
4H18C, 4H18CN, Ch. 20B1	40-2	4=1-37
4H19C, 4H19CN, Ch. 20B1	40-2	4=1-37
4H126A, 4H126B, Ch. 21A1	40-2	4=1-37
4H126C, 4H126CN, Ch. 21A1	40-2	4=1-37
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4H145A, 4H145B, Ch. 20B1	40-2	4=1-37
4H145C, 4H145CN, Ch. 20B1	40-2	4=1-37
4H146A, 4H146B, Ch. 20B1	40-2	4=1-37
4H146C, Ch. 20B1	40-2	4=1-37
4H147A, 4H147B, Ch. 20B1	40-2	4=1-37
4H156C, 4H156CN, Ch. 20B1	40-2	4=1-37
4H157A, 4H157B, Ch. 20B1	40-2	4=1-37
4H165A, 4H165B, Ch. 20B1	40-2	4=1-37
4H166A, 4H166B, Ch. 20B1	40-2	4=1-37
4H166C, 4H166CN, Ch. 20B1	40-2	4=1-37
4H167A, 4H167B, Ch. 20B1	40-2	4=1-37
4H167C, 4H167CN, Ch. 20B1	40-2	4=1-37
12X11, 12X12, Ch.20Z1	40-2	4=38-62 5=8-9
14R12, 14R16, Ch. 20T1, Rev.	1-1	8=1-22
16M12, Ch. 21X1	57-4	10=29-46
16R11, 16R12, Ch. 21B1	1-1	8=23-46
20A1, 20B1, Ch.	40-2	4=1-37
20T1, 20V1, Ch., Rev.	1-1	8=1-22
20X1, Ch.	40-2	4=38-62
20X11, 20X12, Ch. 20X1	40-2	4=38-62
20X122, Ch. 20X1	40-2	4=38-62
20X136, Ch. 20Y1	40-2	4=38-62
20X145, 20X146, 20X147, Ch. 20Y1	40-2	4=38-62
20Y1, Ch.	40-2	4=38-62
20Z1, Ch.	40-2	4=38-62 5=8-9
21A1, Ch.	40-2	4=1-37
21B1, 21C1, 21D1, 21E1, Ch.	1-1	8=23-46
21H1, 21J1, Ch.	1-1	8=23-46
22X12, Ch. 20Z1	40-2	4=38-62 5=8-9
22X25, 22X26, 22X27, Ch. 20Z1	40-2	4=38-62 5=8-9
24A12, Ch. 20A1	40-2	4=1-37
24A125, Ch. 20A1	40-2	4=1-37
24A125AN, Ch. 20X1	40-2	4=38-62
24C15, 24C16, Ch. 20B1	40-2	4=1-37
24D1, 24E1, 24F1, 24G1, 24H1, Ch.	48-3	7=1-24
24R12, Ch. 20T1, Rev.	1-1	8=1-22
24X15, 24X15S, Ch. 20X1	40-2	4=38-62
24X16, 24X16S, Ch. 20X1	40-2	4=38-62
24X17S, Ch. 20X1	40-2	4=38-62
25A15, 25A16, 25A17, Ch. 21A1	40-2	4=1-37
26R12, Ch. 21B1	1-1	8=23-46
26R25, 26R26, Ch. 24H1	48-3	7=1-24
26R25A, 26R26A, Ch. 21B1	1-1	8=23-46
26R35, 26R36, 26R37, Ch. 24H1	48-3	7=1-24

ADMIRAL CORP. (Cont'd)

MODEL	PACK-FILE	PAGES
26R35A, 26R36A, 26R37A, Ch. 21B1	1-1	8=23-46
26X35, 26X36, 26X37, Ch. 24D1	48-3	7=1-24
26X45, 26X46, Ch. 24H1	48-3	7=1-24
26X55, 26X56, 26X57, Ch. 24D1	48-3	7=1-24
26X55A, 26X56A, 26X57A, Ch. 21D1	1-1	8=23-46
26X65, 26X66, 26X67, Ch. 24D1	48-3	7=1-24
26X65A, 26X66A, 26X67A, Ch. 21D1	1-1	8=23-46
26X75, 26X76, Ch. 24D1	48-3	7=1-24
26X75A, 26X76A, Ch. 21D1	1-1	8=23-46
27M12, Ch. 21X2	57-4	10=29-46
29X16, 29X17, Ch. 24F1	48-3	7=1-24
29X25, 29X26, 29X27, Ch. 24F1	48-3	7=1-24
29X25A, 29X26A, Ch. 21H1	1-1	8=23-46
30F15, 30F15A, Ch. 20B1	40-2	4=1-37
30F16, 30F16A, Ch. 20B1	40-2	4=1-37
30F17, 30F17A, Ch. 20B1	40-2	4=1-37
32X15, 32X16, Ch.20Z1	40-2	4=38-62 5=8-9
32X26, 32X27, Ch. 20Z1	40-2	4=38-62 5=8-9
32X35, 32X36, Ch. 20Z1	40-2	4=38-62 5=8-9
34R15, 34R15A, 34R16, 34R16A, Ch. 20V1, Rev.	1-1	8=1-22
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
36R37, 36R45, 36R46, Ch. 21C1	1-1	8=23-46
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
ADMIRAL RC550	1-RC2	RCH21=9-16
36X35, 36X35A, Ch. 24E1	48-3	7=1-24
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
ADMIRAL RC550	1-RC2	RCH21=9-16
36X36, 36X36A, Ch. 24E1	48-3	7=1-24
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
ADMIRAL RC550	1-RC2	RCH21=9-16
36X36AS, 36X36S, Ch. 21E1	1-1	8=23-46
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
36X37, 36X37A, Ch.24E1	48-3	7=1-24
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
ADMIRAL RC550	1-RC2	RCH21=9-16
37M25, 37M26, 37M27, Ch. 21Z1	57-4	10=29-46
39X16, 39X16A, 39X16B, Ch. 24G1	48-3	7=1-24
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
ADMIRAL RC550	1-RC2	RCH21=9-16
39X17A, 39X17B, Ch. 24G1	48-3	7=1-24
Record Changer ADMIRAL RC500	1-RC1	RCH21=1-8
ADMIRAL RC550	1-RC2	RCH21=9-16

ADMIRAL CORP. (Cont'd)

MODEL	PACK-FILE	PAGES
39X17C, Ch. 21J1	1-1	8=23-46
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
39X25, 39X26, Ch. 24G1	48-3	7=1-24
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
39X25A, 39X26A, Ch. 21J1	1-1	8=23-46
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
39X35, 39X36, Ch. 21J1	1-1	8=23-46
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
47M15, Ch. 21W1	57-4	10=14-28
47M15A, Ch. 21Z1	57-4	10=29-46
47M16, 47M17, Ch. 21W1	57-4	10=14-28
47M35, 47M36, 47M37, Ch. 21Z1	57-4	10=29-46
57M10, 57M11, 57M12, Ch. 21Z1A	57-4	10=29-46
57M16, 57M17, Ch. 21Z1	57-4	10=29-46
121K15, 121K16, 121K17, Ch. 21M1	57-4	10=14-28
121K15A, 121K16A, 121K17A, Ch. 22M1	57-4	10=1-13
121M10, Ch. 22M1	57-4	10=1-13
121M11, 121M12, Ch. 21M1	57-4	10=14-28
121M11A, 121M12A, Ch. 22M1	57-4	10=1-13
221K45, 221K46, 221K47, Ch. 21M1	57-4	10=14-28
221K45A, 221K46A, 221K47A, Ch. 22M1	57-4	10=1-13
320R17, Ch. 21J1	1-1	8=23-46
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
320R25, 320R26, Ch. 21J1	1-1	8=23-46
Record Changer ADMIRAL RC550	1-RC2	RCH21=9-16
321F65, 321F66, 321F67, Ch. 21N1	57-4	10=14-28
321K65, 321K66, 321K67, Ch. 21N1	57-4	10=14-28
321M25, 321M26, 321M27, Ch. 21Y1	57-4	10=14-28
321M25A, 321M26A, 321M27A, Ch. 22Y1	57-4	10=1-13
421M15, 421M16, Ch. 21Y1	57-4	10=14-28
421M35, 421M36, 421M37, Ch. 22Y1	57-4	10=1-13
520M11, 520M12, Ch. 22A2A	57-4	10=1-13
520M15, 520M16, 520M17, Ch. 22A2	57-4	10=1-13
521M15, 521M16, 521M17, Ch. 21Y1	57-4	10=14-28
521M15A, 521M16A, 521M17A, Ch. 22Y1	57-4	10=1-13

AFFILIATED RETAILERS, INC. (ARTONE)

MODEL	PACK-FILE	PAGES
AR-MST-14, AR-MST-16	48-3	6=1-9
AR-14-LG, AR-14-P	1-1	8=1-12
AR-14-TR	48-3	6=1-9
AR-16-ATR	48-3	6=1-9
AR-16-CD, AR-16-CD-3CR	40-2	5=1-8
AR-16-CR	48-3	6=1-9
AR-16-CX	40-2	5=1-8
AR-16-RO, AR-16-TR	48-3	6=1-9
AR-17-3D	48-3	6=1-9
AR-17-3DG	1-1	8=1-12
AR-17-CD	48-3	6=1-9
AR-17-CDG	1-1	8=1-12
AR-17-CR	48-3	6=1-9
AR-17-CRG	1-1	8=1-12
AR-17-LG, AR-17-P	1-1	8=1-12
AR-17-RO	48-3	6=1-9
AR-17-ROG	1-1	8=1-12
AR-20-3DG, AR-20-CDG, AR-20-CRG, AR-20-TRG	1-1	8=1-12
AR-112X	48-3	6=10-16
AR-114A	48-3	6=1-9

AFFILIATED RETAILERS, INC. (Cont'd)

MODEL	PACK-FILE	PAGES
AR-163-CR	40-2	5=1-8
AR-216	40-2	5=1-8
AR-316, AR-316-3CM	40-2	5=1-8
AR-816	40-2	5=1-8
AR-816-3CM, AR-816-3CR	40-2	5=1-8
AR-819, AR-819-3CM	40-2	5=1-8 7=1
AR-919	40-2	5=1-8 7=1

AIMCEE WHOLESALE CORP. (AMC)

MODEL	PACK-FILE	PAGES
117C, 117CD, 117T	57-1	10=1-10

AIR KING PRODUCTS CO., INC.

MODEL	PACK-FILE	PAGES
12C1, Ch. 700	43-1	7=1-24
12T1, 12T2, Ch. 700	43-1	7=1-24
14T1, Ch. 700-30	43-1	7=1-24
16C1, Ch. 700-1, 700-10, 700-90	43-1	7=1-24
16C2, 16C3, Ch. 700-10	43-1	7=1-24
16C5, Ch. 700-10, 700-90	43-1	7=1-24
16K1, Ch. 700-2, 700-50, 700-92	43-1	7=1-24
16M1, Ch. 700-10, 700-90	43-1	7=1-24
16T1, Ch. 700-1, 700-10	43-1	7=1-24
16T1B, Ch. 700-1, 700-10, 700-90	43-1	7=1-24
19C1, Ch. 700-40, 700-91	43-1	7=1-24
20C1, 20C2, Ch. 700-93	43-1	7=1-24
20K1, Ch. 700-95	43-1	7=1-24
20M1, Ch. 700-90, 700-93	43-1	7=1-24
700, 700-1, 700-2, 700-5, Ch.	43-1	7=1-24
700-10, 700-20, 700-30, 700-40, 700-50, Ch.	43-1	7=1-24
700-90, 700-91, 700-92, 700-93, 700-95, Ch.	43-1	7=1-24

AIRLINE

See MONTGOMERY WARD

AIR MARSHAL CORP.

MODEL	PACK-FILE	PAGES
B-17-T	43-1	7=1-4

ALLIANCE MFG. CO.

MODEL	PACK-FILE	PAGES
AB, Booster	43-1	7=1

ALLIED PURCHASING CORP. (AMBASSADOR)

MODEL	PACK-FILE	PAGES
AM17C, AM17C1M, See STARRETT Ch. 12S1	75-1	10=1-8
AM17T, AM17T1M, See STARRETT Ch. 12S1	75-1	10=1-8
AM20C, AM20T, See STARRETT Ch. 12S1	75-1	10=1-8
C1720, C2020, C2420, CD2020, See TRAD T-20E Series	54-1	9=1-16
PL17C, PL17CB, PL17CG, See STARRETT Ch. 12S1	75-1	10=1-8
PL17TG, PL17TM, PL27CD, See STARRETT Ch. 12S1	75-1	10=1-8
T1720, T2020, See TRAD T-20E Series	54-1	9=1-16
20C23P, See STARRETT Ch. 12S1	75-1	10=1-8

ANCHOR RADIO CORP.

MODEL	PACK-FILE	PAGES
ARC-101-75, ARC-101-100	43-1	7=1-3

ANDREA RADIO CORP.

MODEL	PACK-FILE	PAGES
Brewster	43-1	9=1-4
Caronia, Fleetwood	43-1	6=1-10
Gotham	43-1	9=1-4

ANDREA RADIO CORP. (Cont'd)

MODEL	PACK-FILE	PAGES
Mayfield	43-1	6=1-10
Saybrook	43-1	6=1-10
Stratford	58-2	10=1-8
Sutton	43-1	6=1-10
Warwick	43-1	9=1-4
C-VL16, Ch. VL16, Sutton	43-1	6=1-10
C-VL17, Ch. VL17, Brewster	43-1	9=1-4
CO-VL16, Ch. VL16, Fleetwood	43-1	6=1-10
CO-VL19, Ch. VL19, Caronia	43-1	6=1-10
T-VL12, Ch. VL12, Saybrook	43-1	6=1-10
T-VL16, Ch. VL16, Mayfield	43-1	6=1-10
T-VL17, Ch. VL17, Gotham	43-1	9=1-4
VL12, VL16, Ch.	43-1	6=1-10
VL17, Ch.	43-1	9=1-4
VL19, Ch.	43-1	6=1-10
VL-20, Ch.	58-2	10=1-8
2C-VL17, Ch. VL17, Warwick	43-1	9=1-4
2C-VL20, Ch. VL-20, Stratford	58-2	10=1-8

ARTONE

See AFFILIATED RETAILERS, INC.
Also See MACY'S

ARVIN INDUSTRIES, INC.

MODEL	PACK-FILE	PAGES
TE272-1, TE272-2, Ch.	43-2	6=1-9
TE276, Ch.	43-2	6=1-9
TE282, Ch.	43-2	6=13-18
TE 286, Ch.	1-1	8=4-6
TE289, Ch.	43-2	6=10-12
TE-289-2, Ch.	1-1	8=1-3
TE289-3, Ch.	43-2	7=1-4
TE290, Ch.	43-2	7=5-8
TE300, Ch.	43-2	9=1-8
TE-302, Ch.	1-1	8=6-8
TE-302-1, Ch.	1-1	8=6 8=9-10
TE315, TE315-1, TE315-2, Ch.	43-2	9=1-8
TE 331, Ch.	58-3	10=1-4
2120, 2121, Ch. TE289-3	43-2	7=1-4
2120CM, 2121TM, Ch. TE-289-2	1-1	8=1-3
2122TM, Ch. TE289	43-2	6=10-12
2123, Ch. TE289-3	43-2	7=1-4
2123TM, Ch. TE-289-2	1-1	8=1-3
2124, Ch. TE289-3	43-2	7=1-4
2124CCM, Ch. TE-289-2	1-1	8=1-3
2126, Ch. TE289-3	43-2	7=1-4
2126CM, Ch. TE-289-2	1-1	8=1-3
2160, 2161, 2162, 2164, Ch. TE290	43-2	7=5-8
3100TB, 3100TM, Ch. TE272-1	43-2	6=1-9
3101CM, Ch. TE272-1	43-2	6=1-9
3120CB, 3120CM, Ch. TE272-2	43-2	6=1-9
3121TM, Ch. TE272-2	43-2	6=1-9
3160CM, Ch. TE276	43-2	6=1-9
4080T, Ch. TE282	43-2	6=13-18
4162, Ch. TE 286	1-1	8=4-6
5170, Ch. TE-302	1-1	8=6-8
5170, Ch. TE-302-1	1-1	8=6 8=9-10
5171, Ch. TE-302	1-1	8=6-8
5171, Ch. TE-302-1	1-1	8=6 8=9-10
5172, Ch. TE-302	1-1	8=6-8
5172, 5173, Ch. TE-302-1	1-1	8=6 8=9-10
5204, 5206, Ch. TE300	43-2	9=1-8
5210, 5211, 5212, Ch. TE315, TE315-1, TE315-2	43-2	9=1-8
6175TM, 6179TM, Ch. TE 331	58-3	10=1-4

ASTORIA

See MACY'S

AUTOMATIC RADIO MFG. CO., INC.

MODEL	PACK-FILE	PAGES
TV-5217, TV-5217T	58-1	10=1-6

BELMONT

See RAYTHEON TELEV. & RADIO CORP.

BENDIX RADIO DIV.

MODEL	PACK-FILE	PAGES
Belair, Guilford	48-2	7=1-9
C172, Belair	48-2	7=1-9
OAK3	58-3	10=1-12
*C182	48-2	7=1-9
C200, Guilford	48-2	7=1-9
T170	27-1	5=1-11
*T171	48-2	7=1-9
21K3, 21KD, 21T3, 21X3	58-3	10=1-12
2051	27-1	5=1-11
2060, 2070	27-1	5=1-11
3051	27-1	5=1-11
6001, 6003	27-1	5=1-11
6100	27-1	5=1-14
7001	27-1	5=1-11

BENRAY ELECTRONICS CORP. (SURREY)

MODEL	PACK-FILE	PAGES
17T31, 20T31, 24T31, See VIDEO PRODUCTS 630 Series	69-1	10=1-12
621-20, 621-16, See TRAD T-20E Series	54-1	9=1-16

CADILLAC ELECTRONICS CORP.

MODEL	PACK-FILE	PAGES
F-16	2-1	8=1-8

CBS-COLUMBIA INC.

Also See AIR KING PRODUCTS CO., INC.

MODEL	PACK-FILE	PAGES
17C18, 17M18, 17T18, Ch. 817	59-1	10=1-5
20M18, 20M28, 20T18, Ch. 820	59-1	10=1-5
817, 820, Ch.	59-1	10=1-5

CAPEHART-FARNSWORTH CORP.

MODEL	PACK-FILE	PAGES
C-278, C-279, Ch.	27-1	7=1-13
C-281, Ch.	27-1	5=1-12
CT-27, Ch. CX-33DX	27-1	9=1-4
CT-37, CT-38, CT-39, Ch. CX-33DX	27-1	9=1-4
CT-45, Ch. CX-33DX	27-1	9=1-4
CT52, CT57, CTR68, Ch., Prelim.	59-2	10=1-10
CX-32, Ch.	27-1	7=1-13
CX-33, Ch.	27-1	5=1-12
CX-33DX, Ch.	27-1	9=1-4
CX-36, Ch., Prelim.	59-2	10=1-10
1T172M, 2C172M, Ch. CT52, CX-36, Prelim.	59-2	10=1-10
3C212B, 3C212M, Ch. CT57, CX-36, Prelim.	59-2	10=1-10
4H212B, 4H212M, Ch. CT57, CX-36, Prelim.	59-2	10=1-10
5F212M, 6F212B, 7F212M, 8F212B, 9F212M, Ch. CT57, CX-36, Prelim.	59-2	10=1-10
10W212M, Ch. CTR68, CX-36, Prelim.	59-2	10=1-10
3005-M, Ch. C-279, CX-32	27-1	7=1-13
3008-M, Ch. C-278, CX-32	27-1	7=1-13
3011-B, 3011-M, Ch. C-281, CX-33	27-1	5=1-12
3012-B, 3012-M, Ch. C-281, CX-33	27-1	5=1-12

CONRAC, INC.

MODEL	PACK-FILE	PAGES
27-M-40, 27-W-40, Ch. 40, 44	2-1	8=1-3
28-B-40, 29-P-40, Ch. 40, 44	2-1	8=1-3
30-M-40, 30-W-40, Ch. 40, 44	2-1	8=1-3
31-P-40, Ch. 40, 44	2-1	8=1-3
40, 44, Ch.	2-1	8=1-3

* See HANDY.

CORONADO

See GAMBLE-SKOGMO, INC

COVIDEO, INC.

MODEL	PACK-FILE	PAGES
T-1400	2 1	8=1-4

CROSLEY DIV. AVCO MFG. CORP.

MODEL	PACK-FILE	PAGES
DU-17CDB, Ch. 356-1	2-1	8=13-17
DU-17CDB, Ch. 356-3, 356-4	59-5	10=1-4
DU-17CDM, Ch. 356-1	2-1	8=13-17
DU-17CDM, Ch. 356-3, 356-4	59-5	10=1-4
DU-17CHB, Ch. 356-3, 356-4	59-5	10=1-4
DU-17CHM, Ch. 356-1	2-1	8=13-17
DU-17CHM, Ch. 356-3, 356-4	59-5	10=1-4
DU-17CHN, Ch. 356-1	2-1	8=13-17
DU-17CHN, DU-17CHN1, Ch. 356-3, 356-4	59-5	10=1-4
DU-17COB, Ch. 356-1	2-1	8=13-17
DU-17COB, DU-17COL, DU-17COLa, Ch. 356-3, 356-4	59-5	10=1-4
DU-17COM, Ch. 356-1	2-1	8=13-17
DU-17COM, Ch. 356-3, 356-4	59-5	10=1-4
DU-17PDB, DU-17PDM, Ch. 359	17-3	9=5-10
Record Changer CROSLEY V-950	17-RC1	RCH 9=1-16
DU-17PHB, DU-17PHM, DU-17PHN, DU-17PHN1, Ch. 359	17-3	9=11-16
Record Changer CROSLEY V-950	17-RC1	RCH 9=1-16
DU-17TOB, Ch. 356-1	2-1	8=13-17
DU-17TOB, Ch. 356-3, 356-4	59-5	10=1-4
DU-17TOL, Ch. 356-1	2-1	8=13-17
DU-17TOL, DU-17TOL1, DU-17TOL2, Ch. 356-3, 356-4	59-5	10=1-4
DU-17TOM, Ch. 356-1	2-1	8=13-17
DU-17TOM, Ch. 356-3, 356-4	59-5	10=1-4
DU-20CDM, DU-20CHB, DU-20CHM, DU-20COB, DU-20COM, Ch. 357	17-3	9=1-4
DU-20PDM, Ch. 363	17-3	9=17-22
Record Changer CROSLEY V-950	17-RC1	RCH 9=1-16
DU-21CDM1, DU-21CDN, DU-21CHM1, Ch. 357-1	59-5	10=5-8
DU-21COB1, DU-21COL, DU-21COLB, DU-21COM1, Ch. 357-1	59-5	10=5-8
EU-17COL, EU-17COLB, Ch. 385	59-5	10=9-16
EU-17COM, Ch. 380	59-5	10=17-24
EU-17TOB, Ch. 380	59-5	10=17-24
EU-17TOLa, EU-17TOLB, Ch. 385	59-5	10=9-16
EU-17TOM, Ch. 380	59-5	10=17-24
EU-21CDB, EU-21CDM, EU-21CDN, Ch. 381	59-5	10=17-24
EU-21COBa, Ch. 381	59-5	10=17-24
EU-21COLd, Ch. 386	59-5	10=9-16
EU-21COLe, Ch. 387	59-5	10=9-16
EU-21COLBd, Ch. 386	59-5	10=9-16
EU-21COLBe, Ch. 387	59-5	10=9-16
EU-21COMa, Ch. 381	59-5	10=17-24
EU-21TOL, EU-21TOLB, Ch. 386	59-5	10=9-16
S11-442M1U, Ch. 331-4	2-1	8=18-23
S11-444MU, Ch. 331-4	2-1	8=18-23
Record Changer CROSLEY V-950	2-RC1	RCH 9=1-16
S11-447MU, Ch. 321-4	2-1	8=24-29
S11-453MU, Ch. 331-4	2-1	8=18-23
S11-459MU, Ch. 321-4	2-1	8=24-29
S11-472BU, Ch. 331-4	2-1	8=18-23
S11-474BU, Ch. 331-4	2-1	8=18-23
Record Changer CROSLEY V-950	2-RC1	RCH 9=1-16

CROSLEY DIV. (Cont'd)

MODEL	PACK-FILE	PAGES
S17-CDC1, S17-CDC3, S17-CDC4, Ch. 331-4	2-1	8=18-23
S17COC1, S17COC2, S17COC3, Ch. 331-4	2-1	8=18-23
S20-CDC1, S20-CDC2, S20-CDC3, Ch. 323-6	2-1	8=30-35
9-422M-LD	17-2	5=1-13
9-423M-LD	17-2	5=14-24
Record Changer CROSLEY 700F-33/45	17-RC2	RCH 9=17-24
10-401	17-2	5=25-36
10-404MU, 10-404M1U	18-4	6=1-4
10-412MU	18-4	6=1-4
10-414MU	17-2	5=37-41
10-416MU, 10-416M1U	17-2	5=37-41
10-418MU	18-4	6:1-4
10-419MU	17-2	5=42-46
10-421MU	18-4	6=5-9
10-428MU	18-4	6=10-14
10-429MU	17-2	5=37-41
11-441MU, Ch. 320	18-4	6=15-26
11-442M1U, Ch. 331	18-4	6=27-34
11-443MU, Ch. 323	18-4	6=35-40
11-444MU, Ch. 331	18-4	6=27-34
Record Changer CROSLEY V-950	18-RC1	RCH 9=1-16
11-453, Ch. 331	18-4	6=27-34
11-454MU, Ch. 323	18-4	6=35-40
11-458MU, Ch. 323	18-4	6=35-40
11-460MU, Ch. 331	18-4	6=27-34
11-461WU, Ch. 320	18-4	6=15-26
11-470BU, Ch. 331	18-4	6=27-34
11-471BU, Ch. 320	18-4	6=15-26
11-472B1U, Ch. 331	18-4	6=27-34
11-473BU, Ch. 323	18-4	6=35-40
11-474BU, Ch. 331	18-4	6=27-34
Record Changer CROSLEY V-950	18-RC1	RCH 9=1-16
11-476BU, Ch. 325, 325-1, 325-2	18-4	6=21-27
11-483BU, Ch. 331	18-4	6=27-34
11-484MU, Ch. 323	18-4	6=35-40
17CDC1, 17CDC2, 17CDC3, 17CDC4, Ch. 331, 331-1, 331-2	2-1	8=1-6
17COC1, 17COC2, 17COC3, Ch. 331, 331-1, 331-2	2-1	8=1-6
20CDC1, 20CDC2, 20CDC3, Ch. 323-3, 323-4	2-1	8=7-12
320, Ch.	18-4	6=15-26
321-4, Ch.	2-1	8=24-29
323, Ch.	18-4	6=35-40
323-3, 323-4, Ch.	2-1	8=7-12
323-6, Ch.	2-1	8=30-35
325, 325-1, 325-2, Ch.	18-4	6=21-27
331, Ch.	18-4	6=27-34
331, 331-1, 331-2, Ch.	2-1	8=1-6
331-4, Ch.	2-1	8=18-23
356-1, Ch.	2-1	8=13-17
356-3, 356-4, Ch.	59-5	10=1-4
357, Ch.	17-3	9=1-4
357-1, Ch.	59-5	10=5-8
359, Ch., DU-17PDB	17-3	9=5-10
359, Ch., DU-17PHB	17-3	9=11-16
363, Ch.	17-3	9=17-22
380, 381, Ch.	59-5	10=17-24
386, 387, Ch.	59-5	10=9-16

DE WALD RADIO MFG. CORP.

MODEL	PACK-FILE	PAGES
FT-200	59-1	10=1-6

ALLEN B. DUMONT LABORATORIES, INC.

MODEL	PACK-FILE	PAGES
Andover	18-1	7=1-9
Ardmore	33-3	6=1-26
Banbury	60-5	10=1-34
Beverly	60-5	10=35-42
Bradford	39-4	4=5-14
Brookville	33-3	6=1-26

ALLEN B. DUMONT LABORATORIES, INC. (Cont'd)

MODEL	PACK-FILE	PAGES
Burlingame	33-3	6=1-26
Canterbury	39-4	1=31-42
		3=1-4
		4=1-4
Carlton	18-1	7=1-9
Chatham	39-4	1=31-42
Clinton	60-5	10=35-42
Devon	60-5	10=1-34
Dynasty	60-5	10=1-34
Fairfield	39-4	1=31-42
		3=1-4
		4=1-4
Flanders	60-5	10=1-34
Guilford, Hanover	33-2	5=1-25
Hastings	39-4	1=31-42
		3=1-4
		4=1-4
Mansfield	39-4	4=5-14
Milford	60-5	10=35-42
Mt. Vernon	33-3	6=1-26
Newbury	60-5	10=1-34
Park Lane	18-1	7=1-9
Putnam	33-2	5=26-43
Revere	33-3	6=1-26
Ridgewood	60-5	10=35-42
Royal Sovereign	33-2	5=1-25
		8=1-12
Rumson	39-4	1=31-42
		3=1-4
		4=1-4
Savoy	39-4	1=31-42
Sheffield	39-4	1=31-42
		3=1-4
		4=1-4
Shelburne	60-5	10=35-42
Sherbrooke	33-2	5=1-25
Somerset	60-5	10=1-34
Strathmore, Sumter	18-1	7=1-9
Sussex	39-4	4=5-14
Tarrytown	33-3	6=1-26
Wakefield	60-5	10=35-42
Wellington	39-4	1=31-42
		3=1-4
		4=1-4
Westerly	33-3	6=1-26
The Westminster	39-4	9=1-24
Westwood	39-4	1=31-42
		3=1-4
		4=1-4
Whitehall II	60-5	10=1-34
Wickford	60-5	10=1-34
Wimbledon	60-5	10=1-34
Winslow	33-2	5=1-25
Winthrop	39-4	1=31-42
RA-103, Chatham, Savoy	39-4	1=31-42
RA-103C, Winthrop	39-4	1=31-42
RA-103-D, Canterbury, Rumson, Sheffield	39-4	1=31-42
		3=1-4
		4=1-4
RA-104-A, Hastings, Wellington	39-4	1=31-42
		3=1-4
		4=1-4
RA-105-B, Sussex	39-4	4=5-14
RA-108-A, Bradford, Mansfield	39-4	4=5-14
RA-110-A, Fairfield, Westwood	39-4	1=31-42
		3=1-4
		4=1-4
RA-109-A1, Winslow	33-2	5=1-25
RA-109-A2, Hanover	33-2	5=1-25
RA-109-A3, Sherbrooke	33-2	5=1-25
RA-109-A5, Winslow	33-2	5=1-25
RA-109-A6, Hanover	33-2	5=1-25
RA-109-A7, Sherbrooke	33-2	5=1-25
RA-111-A1, Putnam	33-2	5=26-43
RA-111-A2, Guilford	33-2	5=26-43
RA-111-A4, Putnam	33-2	5=26-43
RA-111-A5, Guilford	33-2	5=26-43

ALLEN B. DUMONT LABORATORIES, INC. (Cont'd)

MODEL	PACK-FILE	PAGES
RA-112-A1, Ardmore	33-3	6=1-26
RA-112-A2, Westerly	33-3	6=1-26
RA-112-A3, Mt. Vernon	33-3	6=1-26
RA-112-A4, Ardmore	33-3	6=1-26
RA-112-A5, Westerly	33-3	6=1-26
RA-112-A6, Mt. Vernon	33-3	6=1-6
RA-113-B1, RA-113-B2, Brookville	33-3	6=1-26
RA-113-B3, RA-113-B4, Revere	33-3	6=1-26
RA-113-B5, RA-113-B6, Burlingame	33-3	6=1-26
RA-113-B7, RA-113-B8, Tarrytown	33-3	6=1-26
RA-116A, The Westminster, Series II	39-4	9=1-24
Record Changer WEBSTER 100	39-RC1	RCH21=1-10
RA-117-A1, Sumter	18-1	7=1-9
RA-117-A3, Carlton	18-1	7=1-9
RA-117-A5, Strathmore	18-1	7=1-9
RA-117-A6, Andover	18-1	7=1-9
RA-117-A7, Park Lane	18-1	7=1-9
RA-119A, Royal Sovereign	33-2	5=1-25
		8=1-12
RA-160-A1, Devon	60-5	10=1-34
RA-162-B1, Wickford	60-5	10=1-34
RA-162-B4, Banbury	60-5	10=1-34
RA-162-B5, Flanders	60-5	10=1-34
RA-162-B6, Wimbledon	60-5	10=1-34
RA-162-B7, Whitehall II	60-5	10=1-34
RA-162-B10, Flanders	60-5	10=1-34
RA-162-B11, Newbury	60-5	10=1-34
RA-162-B12, Somerset	60-5	10=1-34
RA-162-B13, Banbury	60-5	10=1-34
RA-162-B14, Dynasty	60-5	10=1-34
RA-162-B21 -- RA-162-B26, Banbury	60-5	10=1-34
RA-164-A1, Clinton	60-5	10=35-42
RA-165-B1, Milford	60-5	10=35-42
RA-165-B2, Beverly	60-5	10=35-42
RA-165-B3, Wakefield	60-5	10=35-42
RA-165-B4, Ridgewood	60-5	10=35-42
RA-165-B5, Shelburne	60-5	10=35-42

ELECTRONIC APPLIANCES INC.

MODEL	PACK-FILE	PAGES
101, 102, 103, 104, 105, 107, 110, 111, Series, Lincoln, See VIDEO PRODUCTS 630-K3C	69-1	10=1-12

ELECTRO-TECHNICAL INDUSTRIES (TELEKIT)

MODEL	PACK-FILE	PAGES
19C	3-1	8=1-10

ELECTRO-VOICE INC.

MODEL	PACK-FILE	PAGES
3000, Booster	26-1	7=1-2

EMERSON RADIO & PHONO. CORP.

MODEL	PACK-FILE	PAGES
609, Ch. 120084-B	3-1	8=1-13
614D, Ch. 120095-B	26-2	6=1-4
637A, Ch. 120095-B	26-2	6=1-4
649A, Ch. 120094A	26-2	6=5-10
650B, Ch. 120118B	26-2	6=11-19
654B, Ch. 120118B	26-2	6=11-19
661B, Ch. 120134-B, 120134-G	26-3	7=1-10
662B, 663B, Ch. 120127-B, 120128-B	26-3	7=11-19
665B, Ch. 120131-B	26-3	7=20-27
666B, Ch. 120135-B	26-3	7=28-35
667B, 668B, Ch. 120134-B, 120134-G	26-3	7=1-10
669B, Ch. 120129-B	26-3	7=36-44
674B, Ch. 120134-G	26-3	7=1-10
675B, Ch. 120129-B	26-3	7=36-44

EMERSON RADIO & PHONO. CORP. (Cont'd)

MODEL	PACK-FILE	PAGES
676B, Ch. 120140-B, 120140-G, 120140-H	26-3	7=45-57
676D, Ch. 120144-B, 120144-G, 120144-H	3-1	8=16-30
*676F, Ch. 120143-B, 120143-H, similar to 681F, 686F, 687F, 696F	3-1	8=31-39
677B, 678B, Ch. 120134-B	26-3	7=1-10
680B, Ch. 120144-B, 120144-G, 120144-H	3-1	8=16-30
680D, 681B, Ch. 120140-B, 120140-G, 120140-H	26-3	7=45-57
681D, Ch. 120144-B, 120144-G, 120144-H	3-1	8=16-30
681F, Ch. 120143-B, 120143-H	3-1	8=31-39
683B, Ch. 120141-B	3-1	8=40-45
684B, 685B, Ch. 120134-B	26-3	7=1-10
686B, Ch. 120144-B, 120144-G, 120144-H	3-1	8=16-30
686D, Ch. 120140-B, 120140-G, 120140-H	26-3	7=45-57
686F, Ch. 120143-B, 120143-H	3-1	8=31-39
686L, Ch. 120142-B	3-1	8=46-55
687B, Ch. 120144-B, 120144-G, 120144-H	3-1	8=16-30
*687D, Ch. 120140B, similar to 680D, 686D	26-3	7=45-57
687F, Ch. 120143-B, 120143-H	3-1	8=31-39
687L, Ch. 120142-B	3-1	8=46-55
688B, 689B, 690B, Ch. 120129-B	26-3	7=36-44
*692B, 693B, 694B, Ch. 120129-D, similar to 688B, 689B, 690B, Ch. 120129-B	26-3	7=36-44
696F, Ch. 120143-B, 120143-H	3-1	8=31-39
696L, Ch. 120142-B	3-1	8=46-55
*697B, Ch. 120129-D, similar to 688B, 689B, 690B, Ch. 120129-B	26-3	7=36-44
699B, Ch. 120148-B	39-4	9=9-16
Record Changer VM-950	39-RC1	RCH22=1-16
699D, Ch. 120160-B	60-6	10=1-8
700B, Ch. 120153-B	39-4	9=1-8
Record Changer VM-950	39-RC1	RCH22=1-16
700D, Ch. 120158-B	50-5	9=17-24
700L, Ch. 120153-D	61-7	10=18-27
701B, Ch. 120153-B	39-4	9=1-8
Record Changer VM-950	39-RC1	RCH22=1-16
701D, Ch. 120158-B	50-5	9=17-24
709A, Ch. 120162-A	61-7	10=9-17
711B, 712B, Ch. 120164-B	61-7	10=28-39
714B, Ch. 120153-B	61-7	10=18-27
714D, 715D, Ch. 120153-D	61-7	10=18-27
720B, Ch. 120164-B	61-7	10=28-39
120084-B, Ch.	3-1	8=1-13
120094A, Ch.	26-2	6=5-10
120095-B, Ch.	26-2	6=1-4
120118B, Ch.	26-2	6=11-19
120127-B, 120128-B, Ch.	26-3	7=11-19
120129B, 120129D, Ch.	26-3	7=36-44
120131-B, Ch.	26-3	7=20-27
120134-B, 120134-G, Ch.	26-3	7=1-10
120135-B, Ch.	26-3	7=28-35
120140-B, 120140-G, 120140-H, Ch.	26-3	7=45-57
120141-B, Ch.	3-1	8=40-45
120142-B, Ch.	3-1	8=46-55
120143-B, 120143-H, Ch.	3-1	8=31-39
120144-B, 120144-G, 120144-H, Ch.	3-1	8=16-30
120148-B, Ch.	39-4	9=9-16
120153-B, Ch.	39-4	9=1-8
120153-B, Ch., Late	61-7	10=18-27
120153-D, Ch.	61-7	10=18-27
120158-B, Ch.	50-5	9=17-24
120160-B, Ch.	60-6	10=1-8
120162-A, Ch.	61-7	10=9-17

* See Emerson HANDY No. 16, Pack 26

EMERSON RADIO & PHONO. CORP. (Cont'd)

MODEL	PACK-FILE	PAGES
120164-B, Ch.	61-7	10=28-39
470651, Tuner	3-1	8=56-62
470662, Tuner	3-1	8=63-69

FADA RADIO & ELECTRIC CO., INC.

MODEL	PACK-FILE	PAGES
R7C15, R7C25	4-1	8=1-8
Tuner 42.51 for all 'R' Series	4-1	9=1-2
R-1025, R-1050	32-2	5=1-7
S6C55, S6C70, S6T65	32-2	7=1-12
S7C20, S7C30	32-2	7=1-14
S7C20, S7C30, Rev.	32-2	9=11-18
S7C70, S7T65	32-2	7=1-12
S-1015, S-1020, S-1030	32-2	5=8-12
S-1055	32-2	5=10-14
		7=1-12
S-1055X	32-2	7=1-12
S-1060, S-1065	32-2	5=10-14
		7=1-12
S20C10, S20T20	32-2	9=11-18
7C42, 7C52, 7T32	61-3	10=1-11
721, 775T	61-3	10=1-11
42.56, 42.64, Tuners used with 'S' Series	32-2	9=3-10

THE FIRESTONE TIRE & RUBBER CO.

MODEL	PACK-FILE	PAGES
13-G-44, 13-G-45	4-1	8=10-24
13-G-51, 13-G-52	4-1	8=25-39
13-G-53, 13-G-54, Ch. 700-90, 700-96	4-1	8=40-51
13-G-55, Ch. 700-93	4-1	8=40-51
13-G-56	4-1	8=52-59
13-G-57	4-1	8=1-9
Record Changer VM-950	4-RC1	RCH22=1-16
13-G-58, 13-G-59, 13-G-79, Ch. 700-96	4-1	8=60-70
13-G-110, Code 334-2-MS31C/A	61-2	10=1-10
13-G-115, 13-G-116, 13-G-119, 13-G-120, Code 334-2-MS31C/A	61-2	10=1-10
700-90, 700-93, Ch.	4-1	8=40-51
700-96, Ch., 13-G-53, 13-G-54	4-1	8=40-51
700-96, Ch., 13-G-58, -59, -79	4-1	8=60-70

FRANKLIN AIRLOOP CORP.

MODEL	PACK-FILE	PAGES
500-A-10, Tuner	4-1	8=1-2

FREED-EISEMANN
See FREED RADIO CORP.

FREED RADIO CORP. (FREED-EISEMANN)

MODEL	PACK-FILE	PAGES
54, 55, 56, 68, Ch. 1620C	32-1	5=1-7
101, 102, 103, 104, Ch. 1900	32-1	5=8-10
110, 111, 112, Ch. 700-120	50-2	9=1-8
121	50-2	9=9-14
700-120, Ch.	50-2	9=9-14
1620C, Ch.	32-1	5=1-7
1900, Ch.	32-1	5=8-10

GAMBLE-SKOGMO, INC. (CORONADO)

MODEL	PACK-FILE	PAGES
05RA4-43-8935A	31-2	6=1-6
05TV1-43-9014A, Ch. 16AY210	31-2	6=7-16
05TV2-43-8950A	31-2	6=17-26
05TV2-43-9010A	31-2	6=17-26
05TV6-43-8935A	31-2	6=1-6
15RA2-43-9105A, Ch. 16AY210	31-2	6=7-16
15TV1-43-8957A	5-1	8=1-8
15TV1-43-8958A	31-2	9=1-8
15TV1-43-9008A	5-1	8=9-18
15TV1-43-9015A, 15TV1-43-9016A	5-1	8=1-8
15TV1-43-9020A, 15TV1-43-9021A	31-2	9=1-8
15TV2-43-9101A, 15TV2-43-9102A	5-1	8=19-27
Record Changer VM-950	5-RC1	RCH22=1-16

GAMBLE-SKOGMO, INC. (Cont'd)

GAROD RADIO CORP.

GENERAL ELECTRIC CO.

GENERAL ELECTRIC CO. (Cont'd)

GENERAL INSTRUMENT CORP.

THE HALLICRAFTERS CO.

THE HALLICRAFTERS CO. (Cont'd)

THE HERTNER ELECTRIC CO. (PRECISION)

HOFFMAN RADIO CORP.

HOFFMAN RADIO CORP. (Cont'd)

HYDE PARK

See MACY'S

INTERSTATE STORES BUYING CORP. (PLYMOUTH)

MOTOROLA INC.

MODEL	PACK-FILE	PAGES
TS-53, Ch.	36-3	6=1-15
TS-60, Ch.	47-4	7=1-16
TS-74, Ch.	36-3	6=51-64
TS-88, Ch.	36-3	6=29-41
TS-89, Ch.	47-4	7=17-34
TS-94, Ch.	47-4	7=17-34
TS-95, Ch.	47-4	7=17-34
TS-101, Ch.	47-5	7=57-65
TS-114, Ch.	36-3	6=42-50
TS-115, Ch.	36-3	6=16-28
TS-118, Ch.	47-5	7=35-45
		7=66-68
TS-118A, TS-118B, Ch.	51-6	9=25-32
TS-119, TS-119A, TS-119B, TS-119C, Ch.	9-1	8=25-38
TS-119D, Ch.	67-7	10=51-58
TS-172, Ch.	47-5	7=46-56
TS-174, TS-174A, TS-175B, Ch.	9-1	8=1-15
TS-214, Ch.	51-6	9=33-40
TS-216, Ch.	9-2	9=1-8
TS-221, Ch.	9-1	8=16-24
TS-228, Ch.	70-8	10=1-12
TS-236, Ch.	9-2	9=9-16
TS-307, Ch.	70-8	10=42-50
TS-314, Ch.	51-6	9=17-24
TS-314A, Ch.	51-6	9=41-44
TS-315, Ch.	51-6	9=17-24
TS-315A, Ch.	51-6	9=41-44
TS-325, TS-325B, Ch.	70-8	10=13-41
TS-326, TS-326A, TS-326B, Ch.	70-8	10=13-41
TS-351, Ch.	70-8	10=13-41
TS-401, Ch.	67-7	10=59-68
12K1, 12K1B, Ch. TS-53	36-3	6=1-15
12K2, 12K2B, Ch. TS-53	36-3	6=1-15
12K3, 12K3B, Ch. TS-53	36-3	6=1-15
12T1, 12T1B, Ch. TS-53	36-3	6=1-15
12T2, 12T3, Ch. TS-53	36-3	6=1-15
14K1, 14K1B, Ch. TS-88	36-3	6=29-41
14K1BH, 14K1H, Ch. TS-115	36-3	6=16-28
14T1, 14T1B, Ch. TS-68	36-3	6=29-41
14T3, Ch. TS-114	36-3	6=42-50
14T4, 14T4B, Ch. TS-216	9-2	9=1-8
16F1, 16F1B, Ch. TS-60	47-4	7=1-16
16F1BH, 16F1H, Ch. TS-89	47-4	7=17-34
16K2, 16K2B, Ch. TS-74	36-3	6=51-64
16K2BH, 16K2H, Ch. TS-94	47-4	7=17-34
16T1, 16T1B, Ch. TS-60	47-4	7=1-16
16T1BH, 16T1H, Ch. TS-89	47-4	7=17-34
17F1, Ch. TS-118A, TS-118B	51-6	9=25-32
17F1, 17F1B, Ch. TS-118	47-5	7=35-45
17F1A, 17F1BA, Ch. TS-89	47-4	7=17-34
17F2W, Ch. TS-118	47-5	7=35-45
17F2W, Ch. TS-118A, TS-118B	51-6	9=25-32
17F2WA, Ch. TS-89	47-4	7=17-34
17F3B, Ch. TS-118	47-5	7=35-45
17F3B, Ch. TS-118A, TS-118B	51-6	9=25-32
17F3BA, Ch. TS-89	47-4	7=17-34
17F4, Ch. TS-118	47-5	7=35-45
17F4, Ch. TS-118A, TS-118B	51-6	9=25-32
17F4A, Ch. TS-89	47-4	7=17-34
17F5, Ch. TS-118	47-5	7=35-45
17F5, Ch. TS-118A, TS-118B	51-6	9=25-32
17F5A, Ch. TS-89	47-4	7=17-34
17F5B, Ch. TS-118	47-5	7=35-45
17F5BA, Ch. TS-89	47-4	7=17-34
17F6, Ch. TS-118	47-5	7=35-45
17F6, Ch. TS-118A, TS-118B	51-6	9=25-32
17F6B, Ch. TS-118	47-5	7=35-45
		7=66-68
17F6BC, 17F6C, Ch. TS-174 TS-174A, TS-174B	9=1	8=1-15
Record Changer MOTOROLA RC-36A	9-RC1	RCH21=1-16
17F7, Ch. TS-118A, TS-118B	51-6	9=25-32
17F7B, Ch. TS-118	47-5	7=35-45
		7=66-68
17F7B, Ch. TS-118A, TS-118B	51-6	9=25-32

MOTOROLA INC. (Cont'd)

MODEL	PACK-FILE	PAGES
17F7BC, Ch. TS-174, TS-174A, TS-174B	9-1	8=1-15
Record Changer MOTOROLA RC-36A	9-RC1	RCH21=1-16
17F8, Ch. TS-118	47-5	7=35-45
17F8, Ch. TS-118A, TS-116B	51-6	9=25-32
17F8C, Ch. TS-174, TS-174A, TS-174B	9-1	8=1-15
Record Changer MOTOROLA RC-36A	9-RC1	RCH21=1-16
17F9, Ch. TS-118A, TS-116B	51-6	9=25-32
17F9, 17F9B, Ch. TS-118	47-5	7=35-45
		7=66-68
17F9BC, 17F9C, Ch. TS-174, TS-174A, TS-174B	9-1	8=1-15
Record Changer MOTOROLA RC-36A	9-RC1	RCH21=1-16
17F11, Ch. TS-228	70-8	10=1-12
17F12, Ch. TS-325	70-8	10=13-41
17F12A, Ch. TS-326	70-8	10=13-41
17F12B, Ch. TS-325	70-8	10=13-41
17F12BA, Ch. TS-326	70-8	10=13-41
17F12D, Ch. TS-401	67-7	10=59-68
17K1A, 17K1BA, Ch. TS-95	47-4	7=17-34
17K1BE, 17K1E, Ch. TS-172	47-5	7=46-56
17K2BE, 17K2E, Ch. TS-172	47-5	7=46-56
17K3, Ch. TS-118	47-5	7=35-45
17K3, Ch. TS-118A, TS-118B	51-6	9=25-32
17K3A, 17K3BA, Ch. TS-89	47-4	7=17-34
17K3B, Ch. TS-118	47-5	7=35-45
17K4A, Ch. TS-95	47-4	7=17-34
17K4E, Ch. TS-172	47-5	7=46-56
17K5, Ch. TS-118	47-5	7=35-45
		7=66-68
17K5, Ch. TS-118A, TS-118B	51-6	9=25-32
17K5C, Ch. TS-174, TS-174A, TS-174B	9-1	8=1-15
17K5E, Ch. TS-221	9-1	8=16-24
17K6, Ch. TS-118	47-5	7=35-45
		7=66-68
17K6, Ch. TS-118A, TS-118B	51-6	9=25-32
17K6C, Ch. TS-174, TS-174A, TS-174B	9=1	8=1-15
17K7, 17K7B, Ch. TS-118	47-5	7=35-45
		7=66-68
17K7, Ch. TS-118A, TS-118B	51-6	9=25-32
17K7BC, 17K7C, Ch. TS-174, TS-174A, TS-174B	9-1	8=1-15
17K8, Ch. TS-236	9-2	9=9-16
17K8A, Ch. TS-228	70-8	10=1-12
17K8B, Ch. TS-236	9-2	9=9-16
17K8BA, Ch. TS-228	70-8	10=1-12
17K9A, 17K9BA, 17K10, Ch. TS-228	70-8	10=1-12
17K10E, Ch. TS-314	51-6	9=17-24
17K10E, Ch. TS-314A	51-6	9=41-44
17K10M, Ch. TS-228	70-8	10=1-12
17K11, Ch. TS-236	9-2	9=9-16
17K11A, Ch. TS-228	70-8	10=1-12
17K11B, Ch. TS-236	9-2	9=9-16
17K11BA, Ch. TS-228	70-8	10=1-12
17K11C, Ch. TS-236	9-2	9=9-16
17K12, Ch. TS-325	70-8	10=13-41
17K12A, Ch. TS-326	70-8	10=13-41
17K12B, Ch. TS-325	70-8	10=13-41
17K12BA, Ch. TS-326	70-8	10=13-41
17K12W, Ch. TS-325	70-8	10=13-41
17K12WA, Ch. TS-326	70-8	10=13-41
17K13A, Ch. TS-326A, TS-326B	70-8	10=13-41
17K13D, Ch. TS-401	67-7	10=59-68
17T1, 17T1B, Ch. TS-118	47-5	7=35-45
17T1A, 17T1BA, Ch. TS-89	47-4	7=17-34
17T2, Ch. TS-118A, TS-118B	51-6	9=25-32
17T2, 17T2B, Ch. TS-118	47-5	7=35-45
17T2A, 17T2BA, Ch. TS-89	47-4	7=17-34
17T3, Ch. TS-118	47-5	7=35-45
17T3, Ch. TS-118A, TS-118B	51-6	9=25-32

MOTOROLA INC. (Cont'd)

MODEL	PACK-FILE	PAGES
17T3A, Ch. TS-89	47-4	7=17-34
17T3G, Ch. TS-221	9-1	8=16-24
17T3X1, Ch. TS-118A, TS-118B	51-6	9=25-32
17T4, Ch. TS-118	47-5	7=35-45
		7=66-68
17T4, Ch. TS-118A, TS-118B	51-8	9=25-32
17T4C, Ch. TS-174, TS-174A, TS-174B	9-1	8=1-15
17T4E, Ch. TS-221	9-1	8=16-24
17T5A, Ch. TS-214	51-6	9=33-40
17T5C, Ch. TS-228	70-8	10=1-12
17T5CA, Ch. TS-214	51-6	9=33-40
17T5D, Ch. TS-236	9-2	9=9-16
17T5E, Ch. TS-314	51-6	9=17-24
17T5E, Ch. TS-314A	51-6	9=41-44
17T5F, Ch. TS-315	51-6	9=17-24
17T5F, Ch. TS-315A	51-6	9=41-44
17T6BD, Ch. TS-236	9-2	9=9-16
17T6BF, Ch. TS-228	70-8	10=1-12
17T6C, 17T6D, Ch. TS-236	9-2	9=9-16
17T6F, Ch. TS-228	70-8	10=1-12
17T6G, Ch. TS-314A	51-6	9=41-44
17T7, Ch. TS-325	70-8	10=13-41
17T7A, Ch. TS-326	70-8	10=13-41
17T8, Ch. TS-325	70-8	10=13-41
17T8A, Ch. TS-326	70-8	10=13-41
17T8B, Ch. TS-325	70-8	10=13-41
17T8BA, Ch. TS-326	70-8	10=13-41
17T9, 17T9A, 17T9E, Ch. TS-326A, TS-326B	70-8	10=13-41
17T9EF, 17T9F, Ch. TS-401	67-7	10=59-68
17T10, Ch. TS-325B	70-8	10=13-41
17T10A, Ch. TS-326A, TS-326B	70-8	10=13-41
17T10D, Ch. TS-401	67-7	10=59-68
19K2, 19K2B, Ch. TS-101	47-5	7=57-65
19K2BE, 19K2E, Ch. TS-119, TS-119A	9-1	8=25-38
19K3, Ch. TS-101	47-5	7=57-65
19K4, 19K4B, Ch. TS-101	47-5	7=57-65
20F1, 20F1B, Ch. TS-119, TS-119A	9-1	8=25-38
Record Changer MOTOROLA RC-36A	9-RC1	RCH21=1-16
20F2, 20F2B, Ch. TS-119B, TS-119C	9-1	8=25-38
Record Changer MOTOROLA RC-36A	9-RC1	RCH21=1-16
20K1, 20K1B, 20K2, Ch. TS-119B, TS-119C	9-1	8=25-38
20K3, 20K3B, Ch. TS-119D	67-7	10=51-58
20K4, 20K4B, Ch. TS-119D	67-7	10=51-58
20K6, 20K6B, Ch. TS-307	70-8	10=42-50
20T1B, Ch. TS-119B, TS-119C	9-1	8=25-38
20T2, Ch. TS-119D	67-7	10=51-58
20T2A, Ch. TS-307	70-8	10=42-50
20T2B, Ch. TS-119D	67-7	10=51-58
20T2BA, Ch. TS-307	70-8	10=42-50
20T3, 20T3B, Ch. TS-307	70-8	10=42-50
21F1, 21F1B, Ch. TS-351	70-8	10=13-41
21K1, 21K1B, Ch. TS-351	70-8	10=13-41
21K2, 21K2B, Ch. TS-351	70-8	10=13-41
21K3, 21K3B, 21K3W, Ch. TS-351	70-8	10=13-41
21T1, 21T1B, Ch. TS-351	70-8	10=13-41
21T2, 21T2B, Ch. TS-351	70-8	10=13-41

M. P. TELEVISION

MODEL	PACK-FILE	PAGES
16T503, 17T504	9-1	8=1-4

MULTIPLE TELEV. MFG. CO.

MODEL	PACK-FILE	PAGES
EC20, Ch. 630K3B	9-1	8=1-2
HFD17, HFD20, Ch. 630K3B	9-1	8=1-2
LFD17, LFD20, Ch. 630K3B	9-1	8=1-2
OF17, OF20, OF20R, Ch. 630K3B	9-1	8=1-2
630K3B, Ch.	9-1	8=1-2

MUNTZ T-V, INC.

MODEL	PACK-FILE	PAGES
M31, Ch. TV17A2	36-1	6=1-12
M31R, Ch. TV17A3	36-1	6=1-12
M32, M32R, Ch. TV17A3	36-1	6=1-12
M33, M34, Ch. TV17A4	36-1	6=1-12
M41, M42, Ch. TV17A3A	36-1	6=1-12
M46, M49, Ch. TV17A7	36-1	6=1-12
TV17A2, Ch.	36-1	6=1-12
TV17A3, TV17A3A, Ch.	36-1	6=1-12
TV17A4, TV17A7, Ch.	36-1	6=1-12
WG2060	51-2	9=13-20
17B1, 17B2, 17B3, 17B4, Ch.	51-2	9=1-12
17B4, Carco, Ch.	67-3	10=1-10
17B5, 17B6, Ch.	51-2	9=1-12
17B6, Carco 17B6, Ch.	67-3	10=1-10
*1750, 1751, 1752, Ch. TV17A3A	38-1	6=1-12
*2053, 2054, 2055, 2056, Ch. TV17A7	36-1	6=1-12
2053-A, 2054-A, 2055-A, Ch. 17B1, 17B2	51-2	9=1-12
2055-B, Ch. 17B2	51-2	9=1-12
2056-A, Ch. 17B1, 17B2	51-2	9=1-12
2158-A, 2159-A, Ch. 17B5		
2158-A, 2159-A, Ch. 17B6, Carco 17B6, Late	67-3	10=1-10
2162-A, Ch. 17B5, 17B6	51-2	9=1-12
2162-A, Ch. 17B6, Carco 17B6, Late	67-3	10=1-10
2457-A, Ch. 17B3, 17B4	51-2	9=1-12
2457-A, 2461-A, Ch. Carco 17B4, Late	67-3	10=1-10

NATIONAL CO., INC.

MODEL	PACK-FILE	PAGES
TV1701	67-1	10=1-12

NORELCO

See NORTH AMERICAN PHILLIPS CO., INC.

NORTH AMERICAN PHILLIPS CO., INC. (NORELCO)

MODEL	PACK-FILE	PAGES
The Irvington	38-1	6=1-11
The Mt. Vernon	38-1	6=1-11
PT200, Ch.	38-1	6=1-11
PT200, Ch. PT200, The Irvington	38-1	6=1-11
PT300, Ch. PT200, The Mt. Vernon	38-1	6=1-11

OLYMPIC RADIO & TELEV. INC.

MODEL	PACK-FILE	PAGES
Broadmoor	44-1	6=1-12
Catalina	44-1	6=1-15
Challenger	44-1	6=1-12
Lancaster, Marlborough	44-1	7=1-8
Monte Carlo	44-1	6=1-12
Prince George	44-1	6=1-15
Riviera	44-1	6=1-12
Riviera Deluxe	44-1	7=1-8
Windsor	44-1	7=1-8
DX-214, DX-215, DX-216	44-1	4=1
		5=1-6
DX-619, DX-620	44-1	5=1-7
DX-621	44-1	5=1-7
		6=13-15
DX-622	44-1	5=1-7
DX-931, DX-932	44-1	5=1-7
DX-950	44-1	5=1-7
TG, Ch.	67-2	10=1-9
TH, Ch.	67-2	10=10-16
XL-210, XL-211	44-1	5=8-14
XL-612, XL-613	44-1	5=8-14
17C24, 17K31, 17K32, Ch. TG	67-2	10=1-9
17T20, 17T33, Ch. TG	67-2	10=1-9
21C28, 21D29, Ch. TH	67-2	10=10-16
21K26, 21T27, Ch. TH	67-2	10=10-16
752, Riviera	44-1	6=1-12

* See Muntz HANDY No. 8, Pack 36

PHILCO CORP. (Cont'd)

MODEL	PACK-FILE	PAGES
52-T2244, Ch. 41, D-1, Code 121	22-3	9=17-32
52-T2245, Ch. 44, D-4, Code 121	22-3	9=17-32
52-T2252, Ch. 41, D-1, Code 121	22-3	9=17-32
52-T2252, Ch. 71, G-1, Code 124	71-8	10=1-12
52-T2253, Ch. 44, D-4, Code 121	22-3	9=17-32
52-T2254, Ch. 41, D-1, Code 121	22-3	9=17-32
52-T2256, Ch. 41, D-1, Code 121	22-3	9=17-32
52-T2258, Ch. 41, D-1, Code 121	22-3	9=17-32
52-T2259, Ch. 41, D-1, Code 121	22-3	9=17-32
52-T2275, Ch. 35, F-2, Code 122	22-3	9=1-16
52-T2283, Ch. 44, D-4, Code 121	22-3	9=17-32
53-T1824, 53-T1825, 53-T1826, 53-T1852, Ch. 71, G-1, Code 124	71-8	10=1-12
53-T1853, 53-T1853L, Ch. 91, J-1, Code 126	68-7	10=35-44
53-T1883, 53-T1884, Ch. 44, G-4, Code 125	68-7	10=22-34
53-T1886, 53-T1886L, Ch. 44, G-4, Code 125	68-7	10=22-34
53-T2126, Ch. 42, G-2, Code 125	68-7	10=13-21
53-T2127, Ch. 91, J-1, Code 126	68-7	10=35-44
53-T2183, Ch. 44, G-4, Code 125	68-7	10=22-34
53-T2260, 53-T2262, 53-T2264, Ch. 42, G-2, Code 125	68-7	10=13-21
53-T2266, 53-T2268, Ch. 91, J-1, Code 126	68-7	10=35-44
53-T2269, 53-T2270, 53-T2271, Ch. 91, J-1, Code 126	68-7	10=35-44
53-T2273C, 53-T2273M, Ch. 91, J-1, Code 126	68-7	10=35-44
71, Ch.	71-8	10=1-12
76-4402, 76-5411, 76-5433, Series; Tuners	37-5	6=1-8
91, Ch.	68-7	10=35-44

PHILHARMONIC RADIO & TELEV. CORP.

MODEL	PACK-FILE	PAGES
C-6161, T-616	22-1	7=1-5
1116, 5816	22-1	7=1-5

PILOT RADIO CORP.

MODEL	PACK-FILE	PAGES
TV-125	20-1	5=1-12
TV-127	37-2	6=1-10
TV-161	20-1	5=1-12
TV-163	20-1	5=1-14
TV-164	37-2	6=1-10
TV-165	20-1	5=1-14
TV-167A	37-2	6=1-10
*TV-167B, TV-168	37-2	6=1-10
TV-191	37-2	6=1-10
*TV-191	37-2	6=1-10
TV-271, TV-273, TV-274	53-3	9=1-14
TV-293, TV-294	53-3	9=1-14

PLYMOUTH

See INTERSTATE STORES BUYING CORP.

PRECISION

See THE HERTNER ELECTRIC CO.

* See Pilot HANDY No. 1, Pack 37.

RADIO CORP. OF AMERICA

MODEL	PACK-FILE	PAGES
Ainsworth	72-12	10=64-72
Albury	72-12	10=55-63
Ashton	72-12	10=55-63
Belgrove	74-13	10=73-82
Bently	16-3	9=1-16
Brandon	74-13	10=73-82
Brett	72-12	10=64-72
Bristol	16-5	9=73-80
Bristol, Late	72-12	10=17-34
Brookfield	74-13	10=73-82
Caldwell	72-12	10=17-34
Calhoun	72-12	10=17-34
Clarendon	16-4	9=45-52
Colby	68-11	10=1-16
Covington	72-12	10=17-34
Crafton	68-11	10=1-16
Donley	16-4	9=45-52
Fairfield, Final	16-5	9=53-72
Glenside	68-11	10=1-16
Hadley	72-12	10=55-63
Hampton	16-5	9=73-80
Hampton, Late	72-12	10=17-34
Haywood	16-3	9=17-30
Highland, Final	16-5	9=53-72
Hillsdale	11-2	8=62-76
Hillsdale, Late	72-12	10=35-54
Kentwood	72-12	10=55-63
Lambert	74-13	10=73-82
Lansford	74-13	10=73-82
Lindale	74-13	10=73-82
Kendall	16-5	9=73-80
Kent, Modern, Newport; Final	16-5	9=53-72
Preston	16-5	9=73-80
Preston, Late	72-12	10=17-34
Provincial	11-2	8=62-76
Provincial, Final	16-5	9=53-72
Provincial	72-12	10=35-54
Regency, Final	16-5	9=53-72
Rockingham	16-4	9=45-52
Rutland	10-1	8=31-48
Shelley	72-12	10=55-63
Somerville	10-1	8=1-16
Suffolk	16-4	9=45-52
Talbot	16-4	9=31-44
Whitfield, Late	72-12	10=17-34
Winston, Final	16-5	9=53-72
York	11-2	8=62-76
York, Late	72-12	10=35-54
KCS31-1, Ch., S1000	20-6	5=48-64
KCS31-1, Ch., 9TW390	20-6	5=32-47
KCS34C, Ch.	34-7	5=80-110
KCS38, Ch.	34-7	5=65-79
KCS38C, Cn.	20-6	5=1-15
KCS40, KCS40A, Ch.	37-8	6=1-15
KCS40B, Ch.	46-10	7=50-64
KCS41-1, Ch.	20-6	5=16-31
KCS45, KCS45A, Ch.	46-9	7=1-16
KCS46, Ch.	46-9	7=17-32
KCS47, KCS47A, KCS47AT, Ch.	46-10	7=33-49
KCS47B, KCS47C, KCS47D, Ch.; Final	16-5	9=53-72
KCS47E, Ch.	16-4	9=31-44
KCS47F, KCS47G, Ch.; Final	16-5	9=53-72
KCS47GF-2, Ch.	16-3	9=17-30
KCS47T, Ch.	46-10	7=33-49
KCS48A, Ch.	10-1	8=31-48
KCS49B, Ch.	11-2	8=62-76
KCS49B, Ch., Late	72-12	10=35-54
KCS49BF, KCS49BF-2, Ch.	72-12	10=35-54
KCS49C, Ch.	11-2	8=62-76
KCS49C, Ch., Late	72-12	10=35-54
KCS49CF, KCS49CF-2, Ch.	72-12	10=35-54
KCS60A, Ch.	11-2	8=77-94
KCS61, Ch.	16-3	9=1-16
KCS62, Ch.	10-1	8=1-16
KCS66, Ch.	16-5	9=73-80
KCS66, Ch., Late	72-12	10=17-34
KCS66A, Ch.	16-5	9=73-80
KCS66A, Ch., Late	72-12	10=17-34
KCS66C, Ch.	68-11	10=1-16

RADIO CORP. OF AMERICA (Cont'd)

MODEL	PACK-FILE	PAGES
KCS66D, Ch.	72-12	10=17-34
KCS68C, Ch.	16-4	9=45-52
KCS72, Ch.	72-12	10=55-63
KCS72A, Ch.	74-13	10=73-82
KCS74, Ch.	72-12	10=64-72
S1000, Cn. KCS31-1	20-6	5=48-64
T100, Ch. KCS38	34-7	5=65-79
T120, Ch. KCS34C	34-7	5=80-94
T121, Ch. KCS34C	34-7	5=95-110
T164, Ch. KCS40	37-8	6=1-15
TC165, TC166, TC167, TC168, Ch. KCS40A	37-8	6=1-15
2T51, Ch. KCS45	46-9	7=1-16
2T60, Ch. KCS45A	46-9	7=1-16
2T81, Ch. KCS46	46-9	7=17-32
4T101, Ch. KCS61, Bently	16-3	9=1-16
4T141, Ch. KCS62, Somerville	10-1	8=1-16
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RCA 960282-4, 960282-5	10-RC2	RCH21=19-34
RCA RP-190-2	10-RC1	RCH21=1-12
6T53, 6T54, Ch. KCS47, KCS47T	46-10	7=33-49
6T64, 6T65, Ch. KCS47A, KCS47AT	46-10	7=33-49
6T71, Ch. KCS47A, KCS47AT	46-10	7=33-49
6T72, Ch. KCS40B	46-10	7=50-64
6T74, 6T75, 6T76, Ch. KCS47A, KCS47AT	46-10	7=33-49
7T103, Ch. KCS47B, Newport, Final	16-5	9=53-72
7T104, Ch. KCS47B, Kent, Final	16-5	9=53-72
7T104B, Ch. KCS47F, Final	16-5	9=53-72
7T111B, Ch. KCS47GF-2, Haywood	16-3	9=17-30
7T112, Ch. KCS47C, Highland, Final	16-5	9=53-72
7T112B, Ch. KCS47G, Final	16-5	9=53-72
7T122, Ch. KCS47C, Fairfield, Final	16-5	9=53-72
7T122B, Ch. KCS47G, Final	16-5	9=53-72
7T123, Ch. KCS47C, Regency, Final	16-5	9=53-72
7T123B, Ch. KCS47G, Final	16-5	9=53-72
7T124, Ch. KCS47C, Modern, Final	16-5	9=53-72
7T125B, Ch. KCS47G, Provincial, Final	16-5	9=53-72
7T132, Ch. KCS47D, Winston, Final	16-5	9=53-72
7T143, Ch. KCS48A, Rutland	10-1	8=31-48
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RCA 960284	10-RC3	RCH21=35-50
RCA RP-190	10-RC1	RCH21=1-12
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9T105, Ch. KCS49B, KCS49BF, KCS49BF-2, York, Late	72-12	10=35-54
9T126, Ch. KCS49C, Hillsdale	11-2	8=62-76
9T126, Ch. KCS49C, KCS49CF, KCS49CF-2, Hillsdale, Late	72-12	10=35-54
9T128, Ch. KCS49C, Provincial	11-2	8=62-76
9T128, Ch. KCS49C, KCS49CF, KCS49CF-2, Provincial, Late	72-12	10=35-54
9T147, Ch. KCS60A	11-2	8=77-94
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RCA 960284	11-RC3	RCH21=35-50
RCA RP-190	11-RC1	RCH21=1-12
9T256, Ch. KCS38C	20-6	5=1-15
9TW309, Ch. KCS41-1	20-6	5=16-31
9TW390, Ch. KCS31-1	20-6	5=32-47
16T152, Ch. KCS47E, Talbot	16-4	9=31-44
17T150, Ch. KCS66C, Colby	68-11	10=1-16
17T151, Ch. KCS66C, Glenside	68-11	10=1-16
17T153, Ch. KCS66, Bristol	16-5	9=73-80
17T153, Ch. KCS66, Bristol, Late	72-12	10=17-34
17T154, Ch. KCS66, Whitfield, Late	72-12	10=17-34
17T155, Ch. KCS66, Preston	16-5	9=73-80
17T155, Ch. KCS66, Preston, Late	72-12	10=17-34
17T160, Ch. KCS66, Hampton	16-5	9=73-80
17T160, Ch. KCS66, Hampton, Late	72-12	10=17-34
17T162, Ch. KCS66A, Caldwell, Late	72-12	10=17-34
17T163, Ch. KCS66C, Crafton	68-11	10=1-16
17T172, Ch. KCS66A, Covington, Late	72-12	10=17-34
17T172K, Ch. KCS66D	72-12	10=17-34
17T173, Ch. KCS66A, Calhoun, Late	72-12	10=17-34
17T173K, Ch. KCS66D	72-12	10=17-34
17T174, Ch. KCS66A, Kendall	16-5	9=73-80
17T174K, Ch. KCS66D	72-12	10=17-34
17T200, Ch. KCS72, Shelley	72-12	10=55-63
17T201, Ch. KCS72, Hadley	72-12	10=55-63
17T202, Ch. KCS72, Kentwood	72-12	10=55-63
17T211, Ch. KCS72, Ashton	72-12	10=55-63
17T220, Ch. KCS72, Albury	72-12	10=55-63
17T250DE, Ch. KCS74, Brett	72-12	10=64-72
17T261DE, Ch. KCS74, Ainsworth	72-12	10=64-72
21T176, Ch. KCS68C, Suffolk	16-4	9=45-52
21T177, Ch. KCS68C, Donley	16-4	9=45-52
21T178, Ch. KCS68C, Rockingham	16-4	9=45-52
21T179, Ch. KCS68C, Clarendon	16-4	9=45-52
21T208, Ch. KCS72A, Lambert	74-13	10=73-82
21T217, Ch. KCS72A, Brookfield	74-13	10=73-82
21T218, Ch. KCS72A, Lansford	74-13	10=73-82
21T227, Ch. KCS72A, Lindale	74-13	10=73-82
21T228, Ch. KCS72A, Brandon	74-13	10=73-82
21T229, Ch. KCS72A, Belgrove	74-13	10=73-82

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RC100A	38-2	5=1-6
RC201	15-1	8=6-9
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The Belmont	27-2	5=1-8
Catalina, Clayton	2-1	8=1-13
Commander	58-4	10=1-10
The Console	27-2	5=1-8
Constellation	2-1	8=1-13
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Highland	58-4	10=11-20
Linden	58-4	10=1-10
The Marquis	48-3	7=1-16
The Mayfair, The Mozart	48-3	7=1-16
Raleigh	58-4	10=11-20
The Rancho, The Revere	48-3	7=1-16
The Rocket	48-3	7=1-16
Roseland	58-4	10=1-10
The Rover	27-2	5=1-8
The Savoy, The Santung	48-3	7=1-16
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C-1401, Ch. 14AX21	27-2	5=9-18
C-1602, Ch. 16AX23, 16AX25, 16AX26	27-2	5=21-29
C-1602, Series C, Ch. 16AX29	27-2	5=21-29
C-1614A, Ch. 16AY211, The Marquis	48-3	7=1-16
C-1614B, Ch. 16AY28, The Marquis	48-3	7=1-16
C-1615A, Ch. 16AY211, The Mayfair	48-3	7=1-16
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1210X, Ch. 1-381	13-1	8=64-81
2221M, Ch. 1-387	13-1	8=83-98
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4130E, Ch. 1-260	23-3	7=1-23
4130M, 4130W, Ch. 1-260, 1-261	23-3	7=1-23
6110X, Ch. 1-261	23-3	7=1-23
6120B, 6120M, 6120W, Ch. 1-260, 1-261	23-3	7=1-23
6130B, 6130M, 6130W, Ch. 1-260, 1-261	23-3	7=1-23
7110X, Ch. 1-366	23-3	7=1-23
7110XB, Ch. 1-441	23-3	7=1-23 8=99-104
7110XF, Ch. 1-366-66	23-3	7=1-23
7110XFA, Ch. 1-442	23-3	7=24-37
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7111MA, Ch. 1-366	23-3	7=1-23
7120B, 7120M, 7120W, Ch. 1-366	23-3	7=1-23
7120BF, 7120MF, Ch. 1-366-66	23-3	7=1-23
7120MFA, Ch. 1-442	23-3	7=24-37
7120WF, Ch. 1-366-66	23-3	7=1-23
7130, 7130M, 7130W, Ch. 1-366	23-3	7=1-23
7130BF, 7130MF, Ch. 1-366-66	23-3	7=1-23
7130MFA, Ch. 1-442	23-3	7=24-37
7130WF, Ch. 1-366-66	23-3	7=1-23
7140MA, 7140WA, Ch. 1-437	23-3	7=24-37

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5116, Ch. 17U-A	14-1	8=1-9

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MODEL	PACK-FILE	PAGES
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K-73L, K-74, Ch. TVJ	41-1	9=1-16
KC-21, KC-21B, Ch. TVJ	41-1	9=1-16
KC-71, KC-71B, Ch. TVJ	41-1	9=1-16
KD-21M, KD-22B, Ch. TVJ	41-1	9=1-16
KD-71, KD-72B, Ch. TVJ	41-1	9=1-16
TVG, Ch.	41-1	7=1-11
TVJ, Ch.	41-1	9=1-16
172LO, 172M, Ch. TVG	41-1	7=1-11
174LO, 174M, Ch. TVG	41-1	7=1-11
202LO, 202M, Ch. TVG	41-1	7=1-11
203, 205, Ch. TVG	41-1	7=1-11
916, 916CAF, Ch. TVG	41-1	7=1-11
919, 919CAF, Ch. TVG	41-1	7=1-11
1014, 1016, Ch. TVG	41-1	7=1-11

TELEKIT
See ELECTRO-TECHNICAL INDUSTRIES

TELEQUIP RADIO CO.

MODEL	PACK-FILE	PAGES
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C617, C617B, Ch. 5050, 5050A	14-1	8=1-8
C720, C720B, Ch. 5050, 5050A	14-1	8=1-8
C820, C820B, Ch. 5050, 5050A	14-1	8=1-8
T417, T417B, T620, Ch. 5050, 5050A	14-1	8=1-8
12TR	41-2	6=1-8
14T, 14TR	41-2	6=1-8
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19T, 19TR	41-2	6=1-8
5050, 5050A, Ch.	14-1	8=1-8

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MODEL	PACK-FILE	PAGES
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TT, Ch.	41-2	6=1-8
TV-284, Ch. TT	41-2	6=1-8
TV-286, Ch. TH, TJ, Rev.	41-2	6=1-8
TV-287, TV-288, Ch. TT	41-2	6=1-8
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TV304, TV305, Ch. TW, TX	41-2	6=9-14
TV306, Ch. TZ	41-2	6=18-26
TV307, Ch. TX	41-2	6=18-26
TV314, Ch. TAJ	41-2	6=18-26 7=1-3
TV315, Ch. TAA, TAB	41-2	6=9-17
TV316, Ch. TZ	41-2	6=18-26
TV317, Ch. TAG	41-2	6=18-26 7=4-6
TV318, Ch. TAM	41-2	7=7-12
TV322, TV323, Ch. TAM	41-2	7=7-12
TV324, TV325, TV326, Ch. TAP-2	41-2	7=1-12 8=1-3
TV328, TV329, Ch. TAP-2	41-2	7=1-12 8=1-3
TV330, TV331, TV332, TV333, Ch. TAO	14-1	8=4-10
TV335, TV336, Ch. TAP-2	41-2	7=1-12 8=1-3
TV340, TV345, Ch. TAP-2	41-2	7=1-12 8=1-3
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MODEL	PACK-FILE	PAGES
S505, Booster	14-1	8=1

TRAD TELEVISION CORP.

MODEL	PACK-FILE	PAGES
C-2020, C-2420, CD-2020, Series T-20E	54-1	9=1-16
T-1720, Series T-20E	54-1	9=1-16

TRANS-VUE CORP.

MODEL	PACK-FILE	PAGES
1700C, 1700CD, 1700T	14-1	8=1-6

TRAV-LER RADIO CORP.

MODEL	PACK-FILE	PAGES
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217-10, 217-11, 217-12, 217-14, Ch. 33A2, 34A2, 35B2	69-1	10=1-10
220-9, 220-9B, Ch. 33A2, 34A2, 35B2	69-1	10=1-10

TRUETONE
See WESTERN AUTO SUPPLY CO.

VIDAIRE TELEVISION CO.

MODEL	PACK-FILE	PAGES
501	14-1	8=1-6

VIDEOLA
See TECH-MASTER PRODUCTS CO.

VIDEO PRODUCTS CORP.

MODEL	PACK-FILE	PAGES
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630-S, 630-SDX, 630-S24, 630-S24DX	69-1	10=1-12

JOHN WANAMAKER

MODEL	PACK-FILE	PAGES
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T-1720, Series T-20E	54-1	9=1-16
C2020T, C2020V, See TRAD Ch. T-20E	54-1	9=1-16
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WESTERN AUTO SUPPLY CO. (TRUETONE)

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2D1092	53-2	9=37-40
2D1094A	14-1	8=1-9
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2D1095A, Ch. 16AX27	53-2	9=1-8
2D1185A	14-1	8=20-27
2D1190A	14-1	8=28-35
2D1190B	14-1	8=28-38
2D-1191A, Ch. 20AY22	73-3	10=9-20
2D1194A	14-1	8=10-19
Record Changer GENERAL INSTRUMENT 700F	14-RC1	RCH19=1-10
2D2043A, 2D2047B, Ch. 12AX27	53-2	9=41-48
2D2049A, Ch. 16AY210	53-2	9=9-20
2D2052A, 2D2052B, Ch. 16AY210	53-2	9=9-20
2D2052C, Ch. 17AY23	53-2	9=21-28
2D2052D, 2D2052E, Ch. 17AY28	53-2	9=29-36
2D2053	73-3	10=1-8
2D2149A, Ch. 17AY212	73-3	10=21-28
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12AX27, Ch.	53-2	9=41-48
16AY210, Ch.	53-2	9=9-20
16AX27, Ch.	53-2	9=1-8
17AY23, Ch.	53-2	9=21-28
17AY26, Ch.	73-3	10=20-40
17AY28, Ch.	53-2	9=29-36
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WESTINGHOUSE ELECTRIC CORP.

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H-609T10, Ch. V-2150-94C	42-3	6=10-17
H-610T12, Ch. V-2150-136	42-3	6=18-24
H-611C12, Ch. V-2152-16	42-3	6=25-32
H-613K16, Ch. V-2150-146	42-3	6=33-40
H-614T12, Ch. V-2150-136	42-3	6=18-24
H-615C12, Ch. V-2152-16	42-3	6=25-32
H-617T12, Ch. V-2150-176	42-3	6=41-47
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H-619T12, Ch. V-2150-176	42-3	6=41-47
H-619T12U, Ch. V-2150-176U, V-2150-177U	42-3	6=41-48
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H-625T12, Ch. V-2150-197	21-2	7=9-15
H-626T16, Ch. V-2172	21-2	7=16-24
H-627K16, H-628K16, H-629K16, Ch. V-2171	21-2	7=16-24 7=34-35
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WESTINGHOUSE ELECTRIC CORP. (Cont'd)

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H-641K17A, Ch. V-2192-1	15-1	8=14-24
H-642K20, Ch. V-2178-1, V-2178-3	15-1	8=32-39
H-642K20A, Ch. V-2194, V-2194-1	15-1	8=32-43
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H-648T20, Ch. V-2201-1	21-2	9=9-16
H-649C17, Ch. V-2200-1	15-1	8=45-52
H-649T17, Ch. V-2192-4	15-1	8=14-27
H-650T17, Ch. V-2192-4	15-1	8=14-27
H-650T17, Ch. V-2200-1	15-1	8=45-52
H-651K17, Ch. V-2200-1, V-2204-1	15-1	8=45-52
H-652K20, Ch. V-2194-2, V-2194-3	15-1	8=32-44
H-652K20, Ch. V-2201-1	21-2	9=9-16
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H-658T17, Ch. V-2192, V-2192-1	15-1	8=14-31
H-659T17, Ch. V-2204-1	15-1	8=45-54
H-660C17, H-661C17, Ch. V-2203-1	21-2	9=1-8
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H-664K17, Ch. V-2200-1	15-1	8=45-54
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H-673K21, H-676T21, Ch. V-2217-1	77-6	10=11-29
H-678K17, H-679K17, Ch. V-2216-1, V-2216-2	77-6	10=11-29
H-681T17, Ch. V-2215-1	77-6	10=11-29
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H-690K21, H-691K21, Ch. V-2217-1	77-6	10=11-29
H-692T21, H-695K21, Ch. V-2217-2	77-6	10=11-29
H-699K17, Ch. V-2216-2	77-6	10=11-29
H-700T17, H-701T17, Ch. V-2216-2	77-6	10=11-29
H-702K17, H-703K17, Ch. V-2216-2	77-6	10=11-29
H-704T17, H-705K17, Ch. V-2216-2	77-6	10=11-29
H-706T16, Ch. V-2207-1	73-5	10=1-10
H-708T20, Ch. V-2220-1	73-5	10=1-10
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H-713K21, H-714K21, H-715K21, Ch. V-2217-2	77-6	10=11-29
H-718K20, Ch. V-2220-2	73-5	10=1-10
H-720K21, H-721K21, H-722K21, Ch. V-2217-2	77-6	10=11-29
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H-730C21, Ch. V-2218-1	77-6	10=30-40
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H2328RQZ, H2328RZ, Ch. 23H22Z	42-3	6=1-20
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H2352R, Ch. 23H22, Mansfield	42-3	6=1-20
H2352RQ, Ch. 23H22	42-3	6=1-20
H2352RQZ, H2352RZ, Ch. 23H22Z	42-3	6=1-20
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H2353EQ, Ch. 23H22	42-3	6=1-20
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J2053R, Ch. 20J22, Chesterton	21-2	9=1-16
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J2055R, Ch. 20J22, Carlyle	21-2	9=1-16
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Record Changer ZENITH S14029	21-RC1	RCH21=9-24
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K1820E, K1820R, Ch. 19K20	77-4	10=1-19
K1846E, K1846R, Ch. 19K20	77-4	10=1-19
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K2240E, K2240R, Ch. 21K20	77-4	10=1-19
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K2260R, K2263E, Ch. 21K20	77-4	10=1-19
K2266, K2266R, Ch. 21K20	77-4	10=1-19
K2267E, K2268R, Ch. 21K20	77-4	10=1-19
K2270H, K2270R, Ch. 21K20	77-4	10=1-19
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20H20, Ch.	15-1	8=1-8
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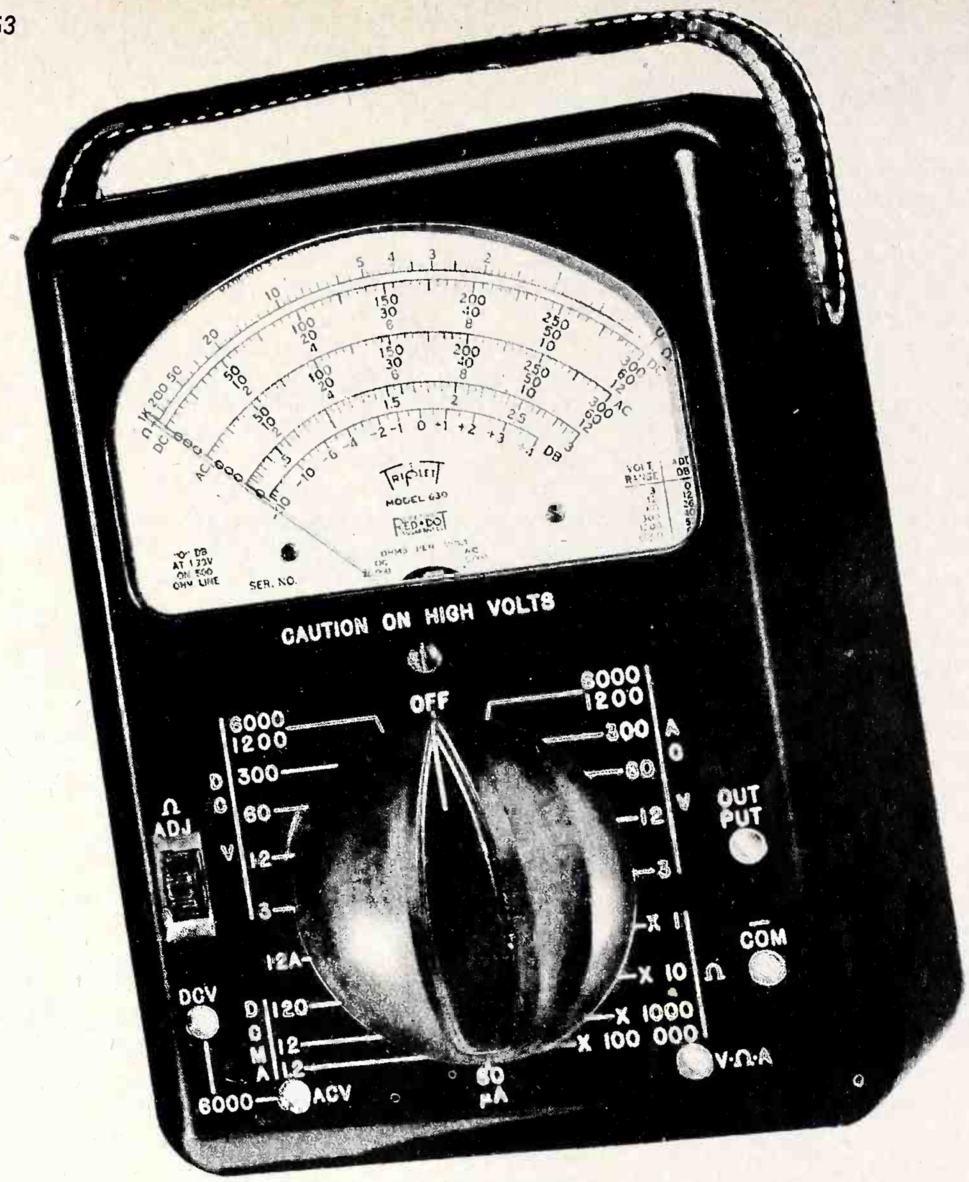
24H20, 24H21, Ch.	42-3	6=1-20



ALL RANGES WITH THIS ONE CONTROL

Model 630

Just *one* knob—extra large—easy to turn—flush with the panel, controls all ranges. This one knob saves your time—minimizes the chances of "burn-outs" because you don't have to remember to set another control. You can work fast with Model 630 with your eyes as well as your hands. Look at that scale—wide open—easy to read, accurately. Yes, this is a *smooth TV* tester. Fast, safe, no projecting knobs, or jacks, or meter case. Get your hand on that single control and you'll see why thousands of "Model 630's" are already in use in almost every kind of electrical testing

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TRIPLETT ELECTRICAL INSTRUMENT COMPANY · BLUFFTON, OHIO, U.S.A.

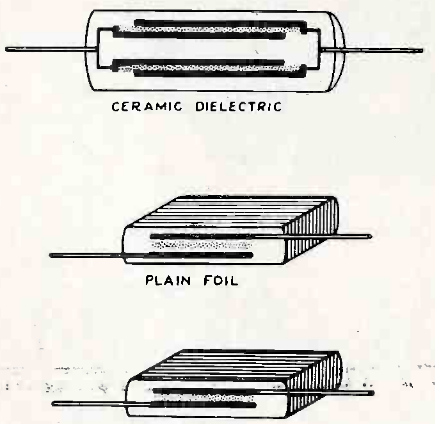
Replacement Parts in TV Receivers

(Continued from page 7)

mica type almost completely. It is interesting to note the rapid rise in the use of negative temperature coefficient ceramic capacitors in television receivers. In these, the capacity decreases with increase in temperature. They are very prominent in the front-ends and are used more and more in other parts of a tv receiver where it is desired to maintain constant circuit behavior under varying temperatures.

The ceramic dielectric capacitor offers high insulation resistance; therefore, it is used for d-c blocking, bypassing, and coupling, especially in those circuits that operate at frequencies above the audio range. Its behavior under varying conditions of frequency (including UHF), temperature, and humidity is excellent.

Another feature of the ceramic dielectric unit is the ease with which it can be produced in very low values of capacitance, with the result that the wide variety of low values of capacitance used in television receivers are prominently available in this kind of capacitor.



Construction of fixed mica and ceramic capacitors.

A high order of interchangeability between mica and ceramic capacitors exists, especially between certain ceramics and silver micas. Since the subject is somewhat elaborate, the discussion will be held in abeyance until the subject of substitution is treated.

Paper Dielectric Tubulars. Paper dielectric tubulars follow two patterns of construction. One utilizes alternate layers of foil (the active surface) and paper dielectric between. The foil and paper are wound concentrically; by making proper electrical connections to the active surfaces, non-inductive behavior is accomplished to a highly satisfactory degree. Also, any desired capacitance value and voltage rating within certain limits is achieved.

The usual limit on the minimum capacitance produced in this manner, and also on the maximum, is a low of about .001 μf and a high limit of about 50 μf. However, the upper capacitance limit of paper dielectric capacitors used in tv receivers is about .25 μf.

A second form of construction uses metallized paper, that is, metal is sprayed on the paper dielectric. The metallized strip then is rolled concentrically and the connections made to the active surfaces.

An important part of the construction of both varieties of capacitors is the impregnation. All air is drawn out of the assembly and all spaces within are filled with an impregnant that also penetrates the paper dielectric. It may be any one of a variety of substances such as mineral oil, castor oil, wax, or a synthetic substance. The impregnant ascribes certain electrical characteristics to the capacitor. Only some of the highlights can be treated here because the subject is extremely broad.

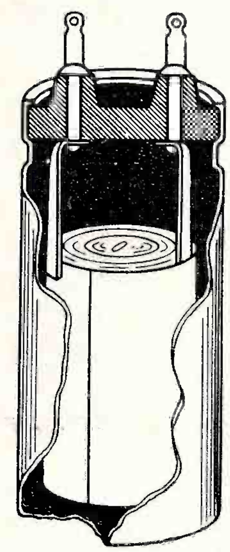
The impregnant influences the capacitance of the capacitor — whether it is going to increase or decrease relative to the nominal value with changing temperatures, and by what amount. It determines the variation in electrical losses within the capacitor with changes in operating temperature, thereby determining the suitability of the component for use at various operating temperatures. Insulation resistance on the other hand always decreases with increase in temperature.

These details are a matter of concern to the tv receiver designer, although his problem revolves more around what happens with increasing temperatures than for the opposite temperature variation. That is why design engineers specify the operating temperature of fixed capacitors used in the equipment they conceive. Fortunately, the service technician's problem is greatly simplified, in that the vast majority of paper dielectric capacitors used in television receivers bear one of two operating temperature ratings, 65° C or 85° C. Judging by specifications, the tendency is toward the higher rating. These needs are being satisfied by replacement components, but it still behooves the responsible tv service technician to make certain that he is procuring the proper part. This is one reason why the use of surplus capacitors for replacements is a very bad practice, and suggestions for replacement must be based on the original specifications.

The casing or housing used for the capacitor has a bearing on its operation with different conditions of temperature and humidity. There was a time when all these capacitors were contained in wax impregnated cardboard tubes and wax sealed. The tendency is away from these to molded plastic casings in order to improve operation under high humidity conditions. Hermetically sealed metal cases also are available, but these seldom are used as original equipment or for replacement in tv receivers.

Electrolytic Capacitors. Although the electrolytic capacitor is in a class by itself, it still conforms with the basic requirement of a capacitor; namely two conducting surfaces between which a dielectric exists. The essential difference between the electrolytic capacitor and the ordinary fixed capacitor is that the dielectric in the form is an exceedingly thin oxide film which is deposited on the metal surfaces of the capacitor. The film displays unilateral conductivity properties, that is, when the applied voltage is of one polarity, the film displays very high resistance, and relatively little current flows through the dielectric, and when the voltage is of the opposite polarity a high current would flow through the capacitor. In spite of this, the unit is still capable of storing electricity.

In view of this behavior relative to the polarity of the applied voltage, electrolytic capacitors are polarized. By this is meant the capacitor terminals bear polarity designations which must be adhered to when the d-c or pulsating voltage is applied to the capacitor. Otherwise, the unit may be damaged.



Cutaway view of an electrolytic capacitor.

The three types of electrolytics — etched foil, plain foil and fabricated — refer to the manner in which the basic metal surface is treated so as to afford maximum surface for contact with the oxide film. The plain foil presents a smooth surface and affords a unit surface area, hence a unit value of capacitance. When the metal is etched by a chemical process, the surface area is increased. This occurs because the etching process causes microscopic cavities in the surface, all of which tends to increase the surface area in contact with the film. Substantial increase in capacitance is obtained in this fashion, perhaps from 5 to 8 or more times the capacitance which is obtainable with the plain foil. In the fabricated plate type, the anode material is made by deposit-

(Continued on page 34)

Notice to All Purchasers of:

RIDER'S TV 10

We have always prided ourselves on the accurate information we have made available to the servicing industry. To live up to this tradition we wish to correct certain discrepancies that crept into the replacement parts listings published in TV 10. Because we are anxious to give you thoroughly accurate replacement parts listings, which include additions that arrived after the publication of TV 10, we ask you to do the following:

Please fill in the registration coupon on the first page of your Rider TV 10 Manual and send it to us. We will forward the replacements parts listing corrections direct to your address. Also, by returning this coupon to us, you will be assured of having your name on our mailing list for exclusive information that will be available to TV 10 owners. <u>Do</u> <u>Not</u> send us the replacement parts pages!

Look to future issues of SUCCESSFUL SERVICING for the newest additional replacement parts listings.

John F. Rider,
Publisher

DEALERS GETTING WESTINGHOUSE TUBES PROFIT FROM HEAVY LOCAL ADVERTISING AT NO COST

Service dealers are getting powerful local advertising support from new Westinghouse RELIATRON™ Tube Distributors. In cities now served by Westinghouse Distributors, dealers get local newspaper advertising, a complete kit of store display and imprinted mailing material.

All of it—local ads and kits—are designed to build TV-radio service business in the dealer's local area.

Best of all, none of it costs the dealer a penny!

You can get your store listed in two local newspaper ads at no charge, and get a kit to boot. If Westinghouse Tubes are now sold in your area, see your Westinghouse Distributor and take advantage of this $900-worth-of-advertising-at-no-cost offer.

NEWSPAPER ADS

COMING YOUR WAY

If Westinghouse Tubes are not yet distributed in your area, be patient. Distributors are being established in all market areas as fast as product availability and good service permit.

You'll soon have the chance to buy RELIATRON Tubes. Keep this tremendous opportunity in mind: you'll get newspaper advertising at no cost! Imprinted material for mailings! Imprinted signs for your window!

All of it is local advertising which sells your service in your own area where it counts.

For the name of your Westinghouse Distributor, or the approximate date when Westinghouse Tubes will be available in your area, drop a postal card to Dept. M-201 or have your regular distributor contact Dept. M-201 for information on how he can better serve you.

RELIATRON™ TUBES

ELECTRONIC TUBE DIVISION

Westinghouse Electric Corporation
Box 284, Elmira, N. Y.

YOU CAN BE SURE...IF IT'S Westinghouse

ET-95013

The Quick Diagnosis

(Continued from page 9)

used to this poor reception? Or am *I* going to be blamed? Nothing on their faces . . lucky. The times I've been blamed for *all* the ghosts and everything else after just putting in one tube . . . !

Hey! What's that noise? Picture, too? Yeh. Streaks, and flashes, once in a while. Is it aerial? Bang the cabinet! Yeh, something's loose . . . here we go again! Tap. Where's that long handled fibre screw driver? No good for alignment anymore, but swell for tapping. Watch out for that picture tube! Don't put your hand near it! Oh. This one's glass. Got so I react against any picture tube . . . got banged so hard by the metal ones without a plastic shield. Imagine, expecting a man to work on a set without that protection . . .

Boy! Like a toothache . . . this one hurts all over. Uh. Tuner? Not more sensitive than most . . . just normal oscillator response to a bang. First i.f.? No. Second . . . um . . . gee . . . everything around that tube is sensitive. Can I work without a mirror? Yeh. The flashes when I hit show through the edge of the picture tube . . . hear and see at the same time. Is it *this* tube? Doubt it . . . but, *have* to try a new one . . . I wonder . . . try another . . . Wow! Hotter'n the devil! What is it? Mmm. Oh, here it is . . . 6CB6. Where's that tube kit? The load I carry! Can't keep 'em in order . . . swell . . . here it is. They are really watching me now! Sure that I'm putting in more than necessary. Alright . . . she's hot now . . . no use banging till they are hot . . . same thing! Alright! Pull out the new one . . . put back the old. Darn these tiny pin tubes!

Ugh, ugh . . . got to be a contortionist . . . geez it's hot in here . . . O.K., turn her on again. Tap some more . . . that's the spot alright. Just like an unsoldered connection. Wonder if they had been bothered by this . . . ?

What's that? Yeh, the trouble for which you called me is fixed . . . but what I just found is another trouble which may not bother you, if you are lucky. It is apparently a loose connection under the chassis, but if the set is not jarred too much, it may hang on and you can get it fixed when the set does have to have a major repair . . .

MERIT ADDED TO RIDER'S REPLACEMENT PARTS LISTING PROGRAM

Merit Coil and Transformer Corp. is now a participating manufacturer in the Rider Replacement Parts Program.

Merit replacement parts will make their appearance with TEK-FILE Pack No. 78 and Rider's TV Manual 11. However, it is intended that supplementary information on Merit replacement parts will be made available to the servicing industry for those TV receivers covered by Rider's TV 10. This data will appear in SUCCESSFUL SERVICING.

SYLVANIA PICTURE TUBES

Lasted Longer than others tested!

Only Sylvania tubes showed NO FAILURES after 1400 hours . . . *at accelerated voltages*

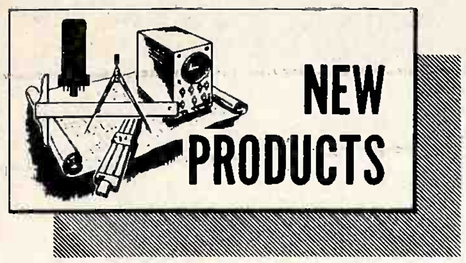
Exhaustive tests conducted under the supervision of an outside impartial laboratory, the United States Testing Company, showed Sylvania Picture Tubes lasted longer than any others tested.

These tests included the picture tubes of nine leading manufacturers. All tubes were placed in identical test racks and tested under identical accelerated voltages. At the end of 1400 hours, only the Sylvania Picture Tubes showed *no failures.*

These tests definitely establish the outstanding dependability of Sylvania Picture Tubes. They prove that these tubes will best uphold your reputation for fine performance in the sets you manufacture, sell or service. Send today for complete details about Sylvania Picture Tubes. Sylvania Electric Products Inc., Dept. 3R-1801, 1740 Broadway, New York 19, New York.

SYLVANIA

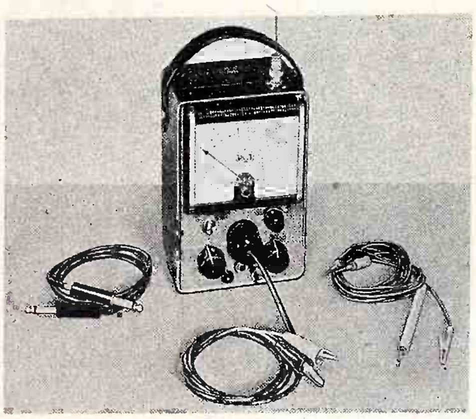
RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS



Additional literature on each of the products described in these columns may be obtained from SUCCESSFUL SERVICING. See the coupon in column three.

New Tester for Mobile Radio Systems

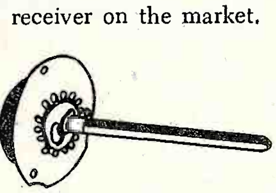
This new general purpose test meter, RCA Model 6X-7A, will measure current, voltage, and radiated power – all the electrical measurement necessary to install and service two-way radio communications systems. Tester is designed so that several related functions can be checked with a single arrangement of test leads.



Item 1

Sturdy-Tune Detents

Telematic Industries has broadened its line of Sturdy-Tune Detents so that it now includes eleven different detents to handle the replacement needs of nearly every brand TV receiver on the market.



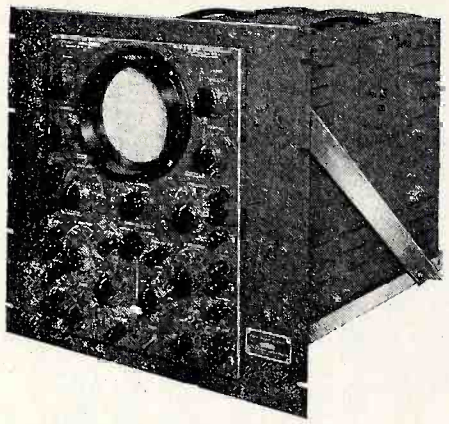
Item 2

The detents are available with or without a back plate. The availability of the Sturdy-Tune Detents without a back plate, if so desired by the serviceman, serves to cut the replacement cost.

Rack Mounting Adapter for Cathode-Ray Oscillographs

Allen B. DuMont Laboratories announces the availability of a new Rack Mounting Adapter, Type 2598, for use with DuMont Types 303, 303-A, 303-AH and 322 cathode-ray oscillographs.

Shipped dis-assembled, the Adapter provides a rigid mount for the instrument in standard 19 inch relay racks; the front opening is large enough to permit all but the front panel of the oscillograph to pass through. The Adapter has been designed so that the entire relay rack may be moved with the instrument in place.

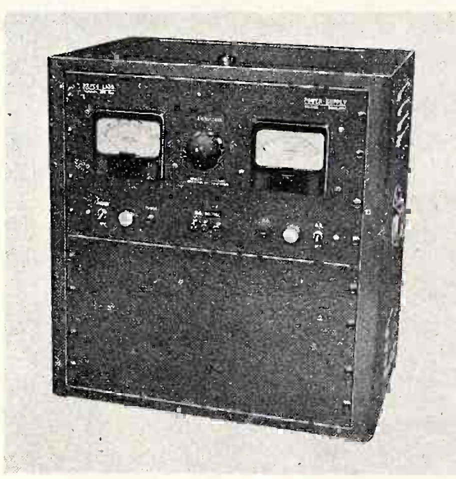


Item 3

Standard Voltage Rated Power Supplies

Kepco Laboratories has released a new group of voltage regulated power supplies, the Model 700 series. Model 700 feature one regulated d-c voltage supply, a high voltage supply continuously variable from 0 to 350 volts and a delivery of from 0 to 750 milliamperes; Model 710 delivers 1.5 amperes, 720 delivers 2.25 and Model 730 delivers 3 amperes. In the range of 30-350 volts, output voltage variation is less than ½% for line fluctuations from 105-125 volts and load variation from minimum to maximum current. Ripple voltage is less than 10 millivolts P-P.

The gray cabinet is 22¾ inches high, 21¾ inches wide and 15¼ inches deep.

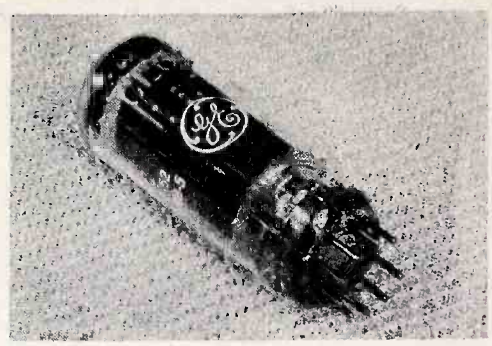


Item 4

Video Output Tube

General Electric has added a new power pentode, type 6CL6, for use in the video output stage of tv receivers.

The tube provides a high plate current at low plate voltage, giving a 40 to 45 voltage gain in wide band video circuits and being capable of supplying 132 volts peak-to-peak output across a load resistor of 3,900 ohms. This new nine-pin miniature may also be used as a wide-band amplifier in industrial and laboratory equipment.



Item 5

Low Resistance—High Accuracy Instrument Resistor

Type 245S, a new 1-watt precision wire-wound resistor for decades and other applications requiring low resistance values with close tolerances, low temperature rise, and low inductance, has been announced by the Shallcross Mfg. Co. The new resistor can be calibrated to a tolerance of ±0.1% or better and is available in values from 0.1 ohm to 1000 ohms. A single layer bifilar winding protected by a moisture resistant lacquer coating is used for all values. The Steatite bobbin and axial wire leads are at the same end for ease in mounting the resistor directly on decade switch decks or other similar equipment. Size is 1⅛ inches long by ⅜ inch diameter.

Item 6

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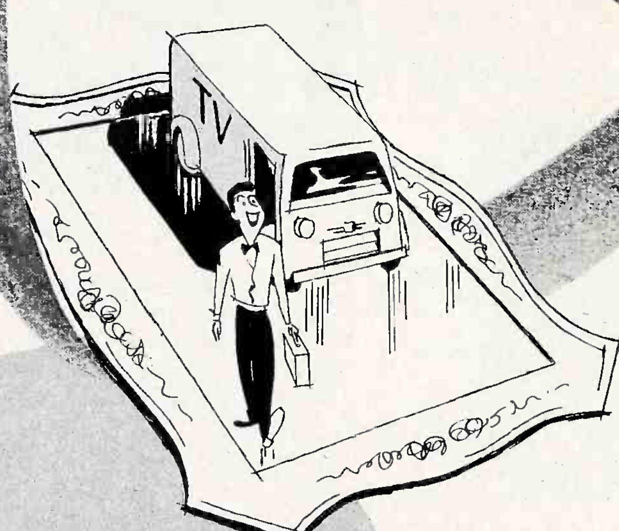

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A monthly summary of product developments and price changes supplied by RADIO'S MASTER, the Industry's Official Buying Guide, available through local parts distributors.

COMMENT: With more manufacturers reporting changes for this period, a continued emphasis is being placed on the introduction of new products, especially by manufacturers of antennas, capacitors and controls. Also evident is the continued tendency toward increased prices by the leading TV tube manufacturers.

New Items

AEROVOX—Added 3 new values to their series CP 2, 2 watt carbofilm resistors.
ASSEMBLY PRODUCTS — Added No. 2056-1, thermocouple at $2.90 net and Model C, portable pyrometer case at $1.75 net.
BAKER MFG. — Added No. 2 FM at $2.37 net to their line of TV antenna towers.
BLILEY ELECTRIC — Added TV service crystal MC9, 13,627.5 kc. at $5.50 net.
BOGEN CO. — Introduced Model R701, high fidelity FM-AM receiver at $145.20 net . . . Model DO10, high fidelity power amplifier at $37.95 net and Model RCPR, remote controller-preamplifier at $78.85 net.
CLAROSTAT — Added TV replacement controls RTV 356 to 383 inclusive.
EITEL-McCULLOUGH — Added No. HR-10 at $1.60 net to their series of heat dissipating connectors.
ELECTRONIC MEASUREMENT—Added Model 600, oscilloscope at $99.50 net, to their test equipment line.
FEDERAL TEL. & RADIO — Added kit No. 3, all purpose selenium rectifier assembly at $19.95 net.
GENERAL ELECTRIC — Added No. RPX-052 at $38.95 list and No. RPX-053 at $57.90 list to their triple play variable reluctance cartridge series. Also added 20DP4A, rectangular all-glass picture tube for TV receiver applications at $39.35 net.
GON-SET — Introduced FM radarray No. 1517 at $28.50 net . . . No. 1529, rhombic UHF antenna with 8 foot mast at $7.77 net . . . No. 1531, parabolic with 9 foot mast at $5.18 net and 5 other UHF antennas.
GREAT EASTERN MFG. — Added Model CRT, luxor emission booster at $1.95 net.
HYTRON — Introduced No. SH27, test adapter at $1.45 net. Also added special purpose tubes OA2WA at $4.50 list and OB2WA at $4.90 list.
JENSEN INDUSTRIES — Introduced a number of diamond replacement needles for the following manufacturers: Astatic, Audak, Columbia, Crosley, Electro-Voice, General Electric, Magnavox, Philco, RCA, Seeburg, Shure, Sonotone, Webster Electric and Webster-Chicago.
MALLORY & CO. — Added No. PS54010, motor starting capacitor at $4.89 net . . . No. FF45052, photoflash capacitor at $13.50 net . . . No. U-67, 5 meg. carbon control at $.75 net and WF252-T23, 2500 ohm wire wound control at $1.50 net.
MERIT TRANSFORMER — Added No. A-3100, high fidelity output transformer at $10.80 net.
MINNESSOTA MINING & MFG.—Added sound recording tape No. 111AP, plastic prof. reel, ¼" x 1200 feet.
PACIFIC TRANSDUCER — Added Model 201D at $33.00 net This model is the same as Model 201, a wide range variable reluctance cartridge with a frequency response to above 12,000 cps. with an output of 60 millivolts, with a diamond stylus instead of a standard sapphire stylus.
PERMOFLUX — Added No DHS-31B at $50.00 net to their line of monaural dynamic headsets and No. PHA-6 at $8.00 net and No. PHA-8 at $13.00 net to their line of headbands.
PREMAX PRODUCTS—Added mobile mounting CA at $6.00 net.
PREMIER METAL PRODUCTS — Introduced new series ARP, aluminum rack panels.
R.C.A. — Added 12BF6 at $1.70 list, a multi-unit minature tube of the heater-cathode type containing two diodes and one medium-mu triode in one envelope, intended primarily for use as a detector or an amplifier in auto radio receivers operating from a 12-volt storage battery. Also added 12V6-GT at $2.00 list, a beam power tube of the

(Continued on page 35)

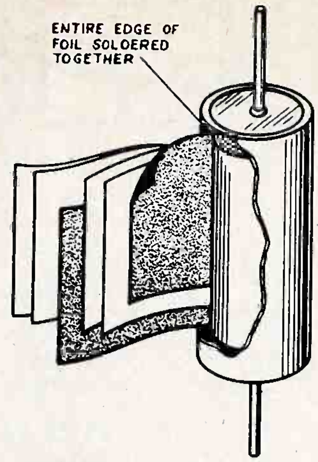
Replacement Parts, etc.

(Continued from page 26)

ing small particles of molten metal (aluminum) on a suitable carrier. This construction also provides increased surface area over that of plain foil, hence greater capacitance per unit size. This type is said to have as much as 10 times the capacitance as the plain foil type.

The varieties of foils also affect the operating capabilities of the electrolytic capacitor. Since a certain amount of current leakage is permitted in an electrolytic unit (although definite limits are set on it), and since each electrolytic capacitor is associated with a value of equivalent series resistance, power loss occurs inside the unit. This raises the operating temperature of the device, which in turn, is a limiting agency on the proper functioning of the unit and on its operating life. The plain foil type of electrolytic is capable of withstanding higher operating temperatures than the etched variety. Also, the plain foil electolytic is capable of withstanding much higher a-c ripple components than is the etched foil type.

As a general rule, electrolytic capacitors used in television receivers for a variety of



Construction of a paper tubular capacitor.

filtering and bypassing duties are of the etched foil kind. This derives from the fact that it affords the maximum capacity per unit size and per unit price, and also because the temperatures prevailing in a tv receiver are within its ratings. On occasion the tv receiver makes use of plain foil units.

The references to tubular and can electrolytics apply to the physical types. Both are contained in metal housings, except that the tubular variety has an insulating cardboard sleeve around the metal container. These are mounted in place by means of the connecting wires, or a mounting bracket. The can type is intended for above chassis mounting, to be screwed into a socket, or to be locked in place by means of twist lugs.

Like the paper dielectric capacitor, the electrolytic variety also is affected in its operation by temperature. This is especially true of the leakage current. This leakage increases with operating temperature inasmuch as heat tends to deteriorate the oxide film. Any action which tends to destroy the effectiveness of the film naturally displays an adverse effect on the capacitance of the unit. Also, high operating temperatures tend to dry out the electrolyte and so effect the capacitance and performance of the device.

Radio's Master Reports

(Continued from page 33)

heater-cathode type intended primarily for use in the output amplifier of auto radio receivers operating from a 12-volt storage battery.

RADIO MFG. ENGINEERS—Added mobile converters No. MC-55 at $69.50 net and MC-57 at $64.50 net.

REGENCY — Added UHF converter, Model RC-600 at $37.46 net.

RIDER, JOHN F. — Added No. 2010, Rider's Television Manual, Volume 10, at $24.00 net.

STANDARD TRANSFORMER — Added deflection yokes (with leads and networks added) No. DY-1A at $4.74 net . . . No. DY-7A at $5.37 net . . . No. DY-8A at $6.60 net . . . No. DY-9A at $6.60 net and No. DY-10A at $6.60 net.

SUPERIOR INSTR.—Added Model 660-A, signal tracer generator at $42.95 net.

SUPREME INC.—Added a number of "vest pocket" testing instruments; Model 402, voltmeter at $10.65 net . . . Model 403. voltmeter at $10.65 net . . . Model 404, voltmeter at $10.65 net . . . Model 410, milliammeter at $10.65 net . . . Model 411, milliammeter at $10.65 net . . . Model 420, ammeter at $10.65 net . . . Model 430, microammeter at $14.50 net and Model 440, ohmmeter at $11.50 net.

TABET—Added Model NT10, 10 foot antenna top section with guy rings at $15.38 net and Model NRB, rigid mounting base with hardware at $5.67 net.

TERADO CO.—Introduced Model 6-71160 at $37.50 list and Model 12-71160 at $42.95 list, both in the Trav-Electric super series, portable dc to ac converters designed for car use to operate other electrical devices.

UTAH RADIO PRODUCTS — Added Model SP15R at $41.70 net to their series of wide range and pa group loudspeakers.

VIDEO INDUSTRIES—Added 5 element Yagi antenna for channel three at $6.83 net.

WINCHARGER CORP.—Added Model 3095 at $11.75 net to their guyed tower series and Model 2406 at $2.97 net, screw anchor for guyed towers.

Discontinued Items

ASTATIC CORP.—Discontinued Model S-8, crystal pickup arm.

AUDIO DEVELOPMENT — Discontinued No. 111A, microphone cable.

BOGEN CO. — Discontinued Model DB10, high fidelity 10 watt amplifier . . . Model PH10, 10 watt multi-range photo-amplifier and Model PX15, 15 watt phono-amplifier.

CHICAGO INDUSTRIAL INSTR.—Discontinued Model 453, featherweight miniature volt-ohm-milliammeter.

HUBBELL, HARVEY—No. 408B32, straight plug and No. 412B42, connector are discontinued.

LENK MFG.—Discontinued Models 201 and 205, heavy duty industrial soldering irons.

RADIART CORP. — Discontinued TV booster, Model TVB-1.

R.C.A.—Discontinued No. 202S1 from their electronic components speaker (PM type) series.

RADIO MFG. ENGINEERS—Discontinued mobile converter MC-H4.

RADIO MERCHANDISE SALES—Discontinued No. STYL8-2H, 8 element Yagi antenna.

SARKES TARZIAN—Advises that their line of TV picture tubes is discontinued.

SUPERIOR INSTR. — Discontinued Model 660, ac signal generator and CA-12, signal tracer.

SYLVANIA — Discontinued subminiature tubes 6BF7 and 6BG7.

TALK-A-PHONE — Discontinued Models C-5912 and C-5920 in their "chief" universal series.

UNIVERSAL METAL PRODUCTS—Model EM-2 in their series of universal mounts is discontinued.

Price Increases

ARGOS PRODUCTS — Increased price on Model TC-2, tube caddy "junior", to $7.75 net.

BOGEN CO.—Increased price on Model CH18P-1 to $92.50 net and Model CH30P-1 to $108.80 net in their challenger sound equipment series.

BURLINGTON INSTR.—Increased price of No. A70x32 to $11.50 net in their current transformer series.

HAMMARLUND MFG. — Increased price on HQ129X, receiver without speaker to $239.50 net.

LITTELFUSE — Increased price on No. 342008, dust-proof, drip-proof in their 3 AG fuse extractor post series to $.75 list.

MERIT TRANSFORMER—Increased No. A-3080, vertical output transformer to $3.60 net and No. A-4003, vertical blocking oscillator transformer to $1.80 net.

PENN BOILER & BURNER—Increased price of the universal adaptor in their tenna-mast hardware series to $.50 net.

RADIO MERCHANDISE SALES — Increased price on the TYL8 series of 8 element Yagi antennas.

(Continued on next page)

Radio's Master Reports

(Continued from page 35)

SIMPSON ELECTRIC—Increased price on Model 476, mirroscope to $197.00 net. This oscilloscope employs a 5" cathode ray tube mounted in a vertical position, with the image reflected from a high grade mirror mounted in the adjustable cover at the top of the cabinet, bringing the viewing surface near eye level when used on work benches of normal height.

SYLVANIA—Increased price on 1N82, UHF detector crystal to $1.15 net.

VIDEO INDUSTRIES—Increased price on No. 103, fan antenna to $3.68 net and No. 106, in-line folded di-pole antenna to $4.75 net.

Price Decreases

BURLINGTON INSTR.—Decreased price on No. A70x8 to $7.80 net in their current transformer series.

CLAROSTAT—Decreased prices on their series of 160 watt adjustable wire-wound resistors, series K-160-WA.

GENERAL ELECTRIC — Decreased prices on a number of items in their Alnico 5 loudspeaker line.

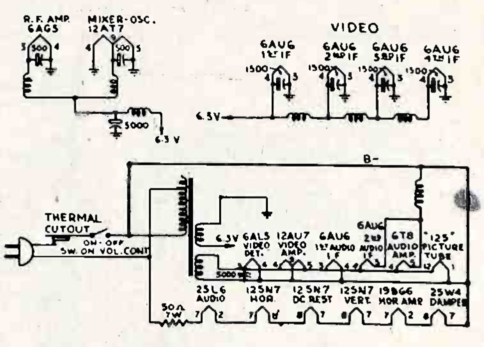
NATIONAL UNION RADIO—Decreased prices on videotron TV picture tubes NU-16DP4 to $30.00 net . . . NU-10BP4 to $21.00 net and NU-10BP4A to $21.00 net.

R.C.A.—Decreased price on portable "AB" pack VSO64 to $3.68 net.

TV Filament Circuits

(Continued from page 1)

These examples, which are representative, show the serviceman that, in troubleshooting a receiver, filament circuits cannot be taken for granted but must be checked with the wiring diagram. The fact that chokes are used in the r-f tuning and video i-f units must not be forgotten. Suppose, for instance, in Fig. 3, that the choke between the first and second i-f amplifiers should burn out, or there should be a bad connection. This means that the second, third, and fourth amplifiers would fail to function. Or, if a filament bypass capacitor should short, the heating current would no longer pass through the filament. More important than this is the fact that the transformer winding is shorted and will be damaged. An understanding, therefore, of why and how chokes and capacitors are used in the filament circuits is necessary for successful servicing.



After Capehart-Farnsworth

Fig. 3. The schematic diagram of Capehart-Farnsworth Model 300-1B filament circuits showing the use of r-f blocking chokes, bypass capacitors, series and parallel combinations, and several transformer windings.

contain many chokes and capacitors. The r-f amplifier and the mixer-oscillator have 500-$\mu\mu$f capacitors in parallel with their filaments. These bypass any high-frequency signals. There is also an r-f choke directly in series with each filament to block the r-f signals. In addition, there is a 5,000-$\mu\mu$f capacitor which is across the two-tube parallel network. This, of course, further and more completely bypasses the r-f voltage. And finally there is another r-f choke in series with the circuit across the supply which even further removes any r-f signal. Again, this is done to prevent these signals from reaching the video stages of the receiver and causing interference in the picture.

The video i-f amplifiers are also across this filament winding to ground. Each has a 1,500-$\mu\mu$f capacitor across it to bypass signals. These elements are three times the size of those across the r-f tuning unit tubes. This is so since the frequencies in the video i-f stages are reduced from the incoming carrier frequency which the r-f stages use. The r-f chokes are again used to block the r-f signals. Note also the use the filament choke used to isolate the audio amplifier and the 2nd audio i-f tube as well as the use of the 5,000-$\mu\mu$f capacitor for video and audio bypassing.

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FEBRUARY 1953

the cosine yoke

by harry e. thomas

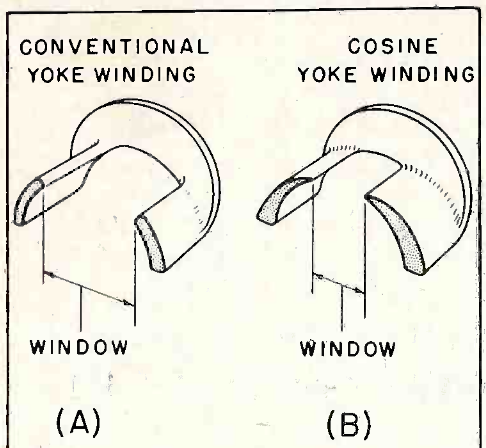

Fig. 1. Cross section of yoke winding.

In physical appearance deflection yokes for tv receivers have changed but little since the early models. However, electrically and magnetically the changes have been considerable.

In size, for instance, the first yokes were about three inches long and were designed to be used with small picture tubes having deflection angles of about 50 degrees. Present-day yokes run a maximum of two and one half inches long and are used for 66-degree and 70-degree tubes.

Electrically the old-style yokes used lower inductance horizontal coils (8 mh) while modern coils have inductances which run from 13 to 30 mh. At the same time, vertical windings have grown somewhat smaller, with inductances of about 30 to 40 mh, against the early 50 mh windings.

Magnetically, modern design employs ferrite cores in a yoke known as the *cosine yoke*. This yoke gives a notable improvement in focusing at the edges of the picture. This deficiency in performance of earlier yokes was generally ignored because of the use of smaller picture tubes. The design of these early yokes was primarily concerned with sensitivity of deflection and toward obtaining a perfectly rectangular raster with no sagging inward or bulging outward of the sides. The sagging inward is called "pincushioning" while the bulging outward is known as "barrelling."

The means employed to construct a cosine yoke involves the correct distribution of the winding. The cross section of the winding is not uniform as in the case of older yokes (see part A of Fig. 1). The turns near the inside of the winding are in a thin layer, and pile up to successively increasing thickness as the winding progresses away from the window (see part B of the figure). As a result of this type of winding arrangement, the distribution of magnetic flux threading through the neck of the tube is more uniform than with the old-style yokes. Because of this more uniform field, the focus of the spot toward the edges and the corners of the picture-tube raster is considerably improved.

As the electron beam, which has a definite thickness, passed through the nonuniform field produced by the conventional yoke, different portions of that beam experienced differing amounts of deflection force. As a result, an elongated spot was produced at the raster edges that resulted in an out-of-focus condition. By causing the beam to travel through the more uniform field produced by the cosine yoke, uniform deflection of all parts of the electron beam occur, and a 500 minimum amount of defocusing takes place.

The arrangement of the conventional windings around the picture-tube neck can be seen in part A of Fig. 2. The deflection coils are shown in cross section here. The horizontal windings produce a magnetic field with vertical lines of force. This magnetic field produces horizontal deflection. The vertical windings produce a magnetic field

(Continued on page 10)

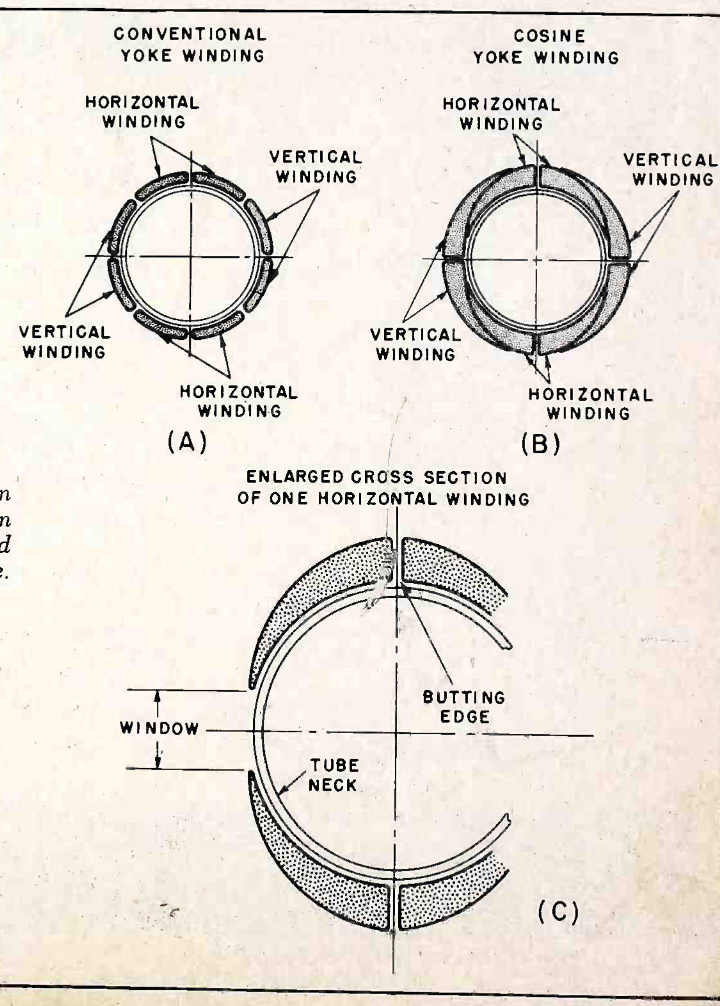

Fig. 2. Distribution of windings (shown in cross section) around neck of picture tube.

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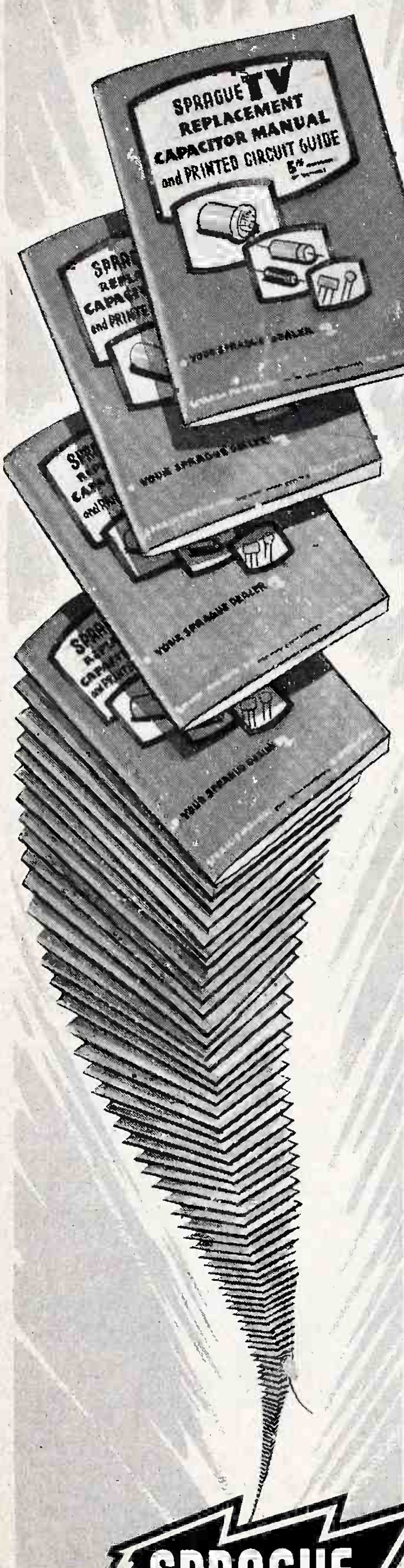

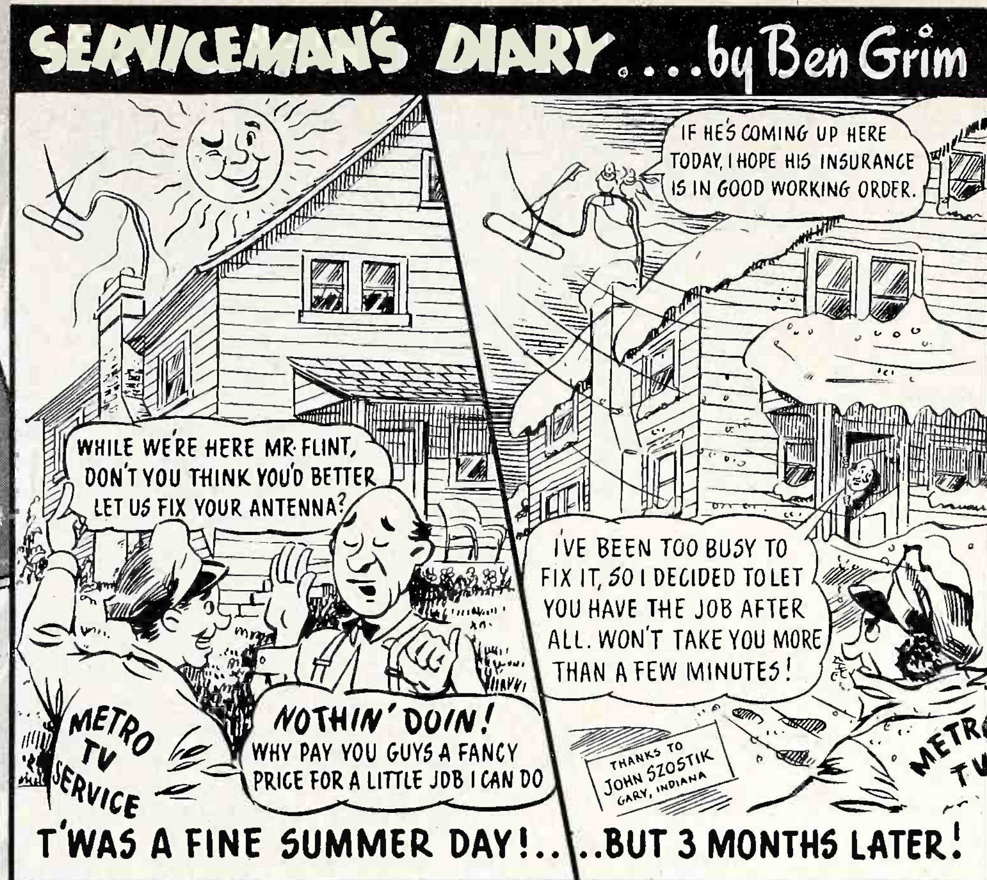

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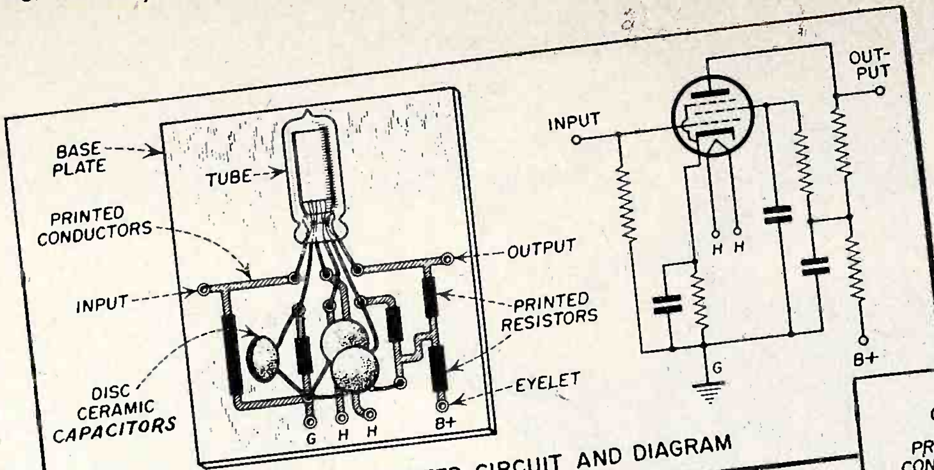
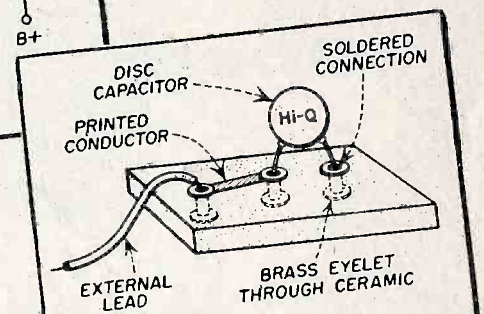
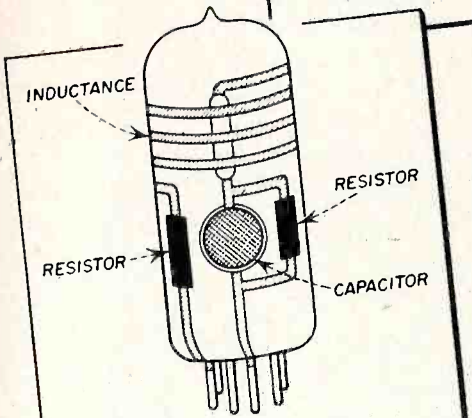


TYPICAL PRINTED CIRCUIT AND DIAGRAM
FIG. 1



METHOD OF CONNECTING WIRE LEADS
FIG. 3



PRINTED CIRCUIT ON TUBE ENVELOPE
FIG. 2

PRINTED ELECTRONIC CIRCUITS*

by the Engineering Department, Aerovox Corporation

**This material appeared originally in "The Aerovox Research Worker".*

THE reproduction of electrical circuits on insulated surfaces by various printing techniques has become a standard method of fabricating small, lightweight, economical electronic devices. The increased emphasis placed by the Armed Services and industry on miniaturization and ruggedness of electrical components has caused this innovation to assume vital importance. Printed circuitry is no longer confined to a few military devices and hearing aids, but may now be encountered in a large number of everyday equipments. These include speech amplifiers, portable receivers, citizens two-way radios, television receiver front-ends, f-m receivers, and many others. For this reason, a working knowledge of the design, production, and maintenance of such circuits will be a valuable asset to any worker in the electronics field. This article is concerned with a discussion of the general types of printed circuits, the relative advantages of each, and methods of effecting servicing repairs.

The use of printed circuitry has been revolutionary not only because it permits the fabrication of extremely small and rugged electronic components, but also because it reduces the production of such components to a simple, rapid operation which is almost completely devoid of the possibility of human error. By this method, a relatively unskilled operator can reproduce literally hundreds of complex units in the time formerly required to make one unit by old-fashioned "wire-by-wire" soldering techniques. In addition to electrical conductors, critical circuit components such as resistors, capacitors, and inductors can be "printed" into the circuit in the same operation and held to close, reproduceable tolerances. Fig. 1 shows a typical printed circuit and its schematic diagram.

Printed circuits are classified according to the method used to reproduce them. There are, at present, six general types. These processes are: painting, spraying, vacuum evaporation, chemical processing, metal stamping, and powdered metal dusting. Each of these general categories will now be discussed in some detail.

Printing Techniques

Probably the most widely used process for producing printed circuits is the *painting* technique. In this method, the conductors and other components of the circuit being fabricated are painted on the insulating surface which acts as the base for the circuit. The paint may be applied by hand with a brush, although in production operations the silk-screen stenciling process is more frequently used. Thin ceramic or plastic sheets may be employed for the base, or a metallic surface covered with an insulating lacquer may be used. In special instances, the glass envelope of a vacuum tube has been utilized as a base for its associated printed circuit. See Fig. 2.

The paint used for electrical conductors consists of a powdered metal such as copper or silver in suspension in a liquid binder. This conducting paint is applied to the surface of the insulating base to form the "wires" of the circuit. Other paint, made up of a resistive material such as carbon, may be applied in specific amounts to form resistors. Capacitors may be made by printing the plates on opposite sides of the base plate, if the required capacitance is small. Otherwise, small capacitors (such as the Aerovox Hi-Q BPD type disc ceramic) are connected to the printed circuit as in Fig. 3. It is interesting to note that these capacitors are manufacured by processes which are essentially printed circuit techniques. Inductances are produced by painting spirals of conducting paint on the surface of the ceramic or other base material. "Cross-overs" in the wiring are made by planting one conductor directly over the other with a layer of insulating material such as lacquer between, or by "detouring" one conductor to the other side of the plate for a short distance by means of metal rivets or eyelets through the insulator, as is illustrated in Fig. 4.

When all printed components have been painted in place, the entire assembly is "fired" at an elevated temperature to fuse the metal particles together and bond the circuit to the base plate. Temperatures ranging from room temperature for plastic bases to as high as 800 degrees C. for ceramics are used.

Vacuum tubes, external leads, and other components not printed are soldered to eyelets in the base plate as in Figs. 1 and 3. To take maximum advantage of the space-saving properties of printed circuits, tubes of the subminiature type are usually employed.

(Continued on page 17)

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MEMBER

Curtain Time

Transistors and Replacement Parts

The last few months have witnessed increased activity in the publicity given to transistors and other semi-conductors. In fact, almost the entire November, 1952 issue of the *Proceedings of the IRE* was devoted to this fabulous device. One manufacturer already is offering one type of transistor for sale to experimenters.

No one has any doubt about the impact of the transistor on the entire electronic industry. This will occur when there are no uncertainties about its reproducibility in large quantities and with consistent performance characteristics – application to all present uses of vacuum tubes over the full gamut of frequencies. When all of this comes to pass, the effect will be the equivalent of a revolution in electronic components and design.

The miniaturization of all equipment will be one manifestation, although this program involving subminiature vacuum tubes and transistors, has been going on for years under the impetus of the Armed Forces equipment requirements. The trend to transistors or some other devices made of materials showing similar behavior will, without question, shrink the physical dimensions of electronic equipment to a small fraction of even the smallest vacuum tube device made today.

Forgetting vacuum tubes for the moment, a tremendous effect seems likely on companion units presently being used to supply operating power to the vacuum tubes. A great portion of the energy supplied to vacuum tubes is wasted in heat. This is not so in transistors; hence those devices which supply operating power to the vacuum tubes in equipment are subject to change to a great degree – if not elimination in their present form.

All of this will not happen overnight. Engineers involved in the research of transistor and similarly behaving materials are very reluctant to forecast when the change from vacuum tubes to some semi-conductor type of device will take place; estimates range from 4 years to 8 years. But who can tell? In the meantime, present-day designed equipments are still being sold in great quantities to the public. It is not a wild guess to say that before any major engineering change takes place in electronic equipments – television receivers especially – the nation's houses will contain from 40 to 50 million units, if not more. These receivers will require replacement parts for a long time, regardless of what radical engineering change may take place at the end of four or five years.

It is said that color television is on its way. It is highly doubtful if it will be a transistor-equipped receiver when it arrives, despite the fact that such a black and white receiver equivalent to 34 tubes has been shown already. All sound evaluations contend that the arrival of color television in a year or two, will still make use of vacuum tubes and present types of complementary equipments.

All in all, a tremendous market for replacement parts exists – and is destined to increase substantially in the immediate future. The concern which need be felt by those who are producing and selling these parts is a matter of the nature of their planning. How far in the future do they look? The receivers in the field – all kinds of receivers – must be serviced, and they require replacement parts. The table model radio displaced the console radio – but those consoles which were in people's homes were not discarded. They were serviced until television came along to grab the public's interest.

The birth of a "hot" war may change some of this. If past performance is any sort of a barometer, an acceleration of technological development is a certainty. A part of this will be the transistor or its equivalent because of the unbounded interest in miniaturization of electronic devices for military uses. If this occurs, semi-conductor devices will emerge full fledged much sooner than would be the case with just a cold war in progress. But even then, public holding in electronic equipment will not be thrown away; they will require service and so, replacement part production, selling, and installation.

Summarizing the whole thing, there is every reason why all individuals affiliated with the electronic industry should take note of the progress being made in the semi-conductor phase of the art. The tube manufacturers have been doing this for a long time. But we can't see any reason for concern about inventories in parts manufacturing establishments, parts jobbers stocks, or service technician's parts stocks. Everyone will sell what they have, and what they will make and buy, for years to come.

TV Service

Questions asked here and there among those who are in a position to know indicate a definite improvement in the level of competency being demonstrated by TV service technicians. Taking into account the television receiver sales during 1952, and the total number in use across the nation, the proportion of complaints has decreased. This is especially true in the largely populated areas, where greatest density of receivers prevails.

Chassis Coding

The matter of chassis coding is still a problem in the field. In view of the practice by many television receiver manufacturers to show different schematics representative of different production runs, especially when changes have been made, it is of the utmost importance that the service technician be able to correlate correctly, with the appropriate schematic, the chassis in for service.

We don't know what the answer is, but isn't it possible to establish some common method of coding and also a common location for the coding symbol on the chassis? The former may be difficult because of the different systems firmly rooted in the factories, but the latter is not faced with the same problems. Even if the entire issue is not settled for some time, taking care of one detail at a time would help.

John F. Rider

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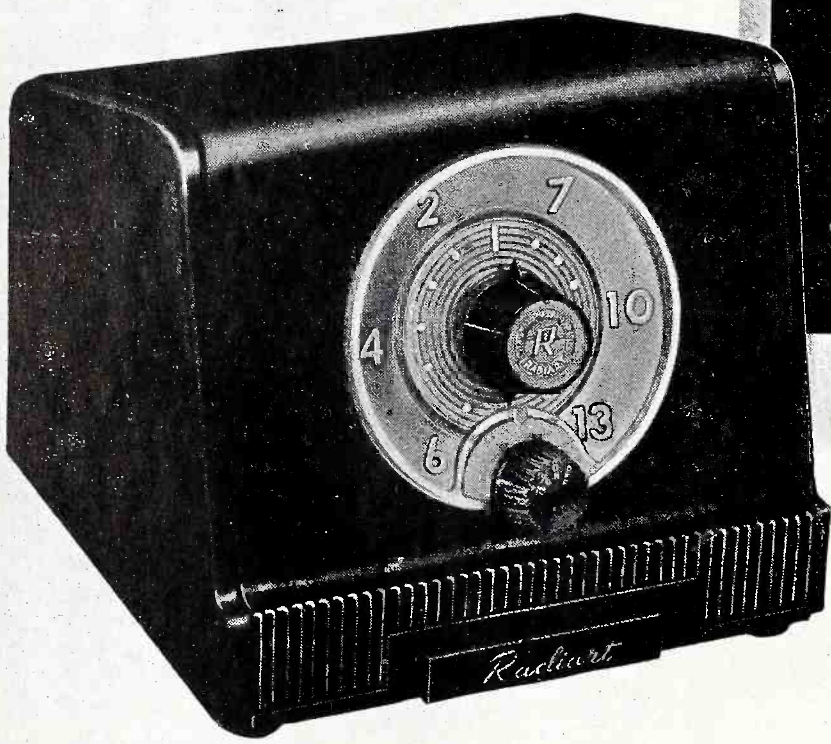

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Replacement Parts in TV Receivers

Part I - Capacitors (cont'd)

by John F. Rider

This is the fourth in a series of articles on "Replacement Parts in TV Receivers." "Capacitors" will be continued next month.

Preceding paragraphs dealt with the identification of capacitors according to their physical construction. This base gives rise to the major type categories. But in the final analysis the suitability of a capacitor for a particular use is only in part determined by its physical construction. Every capacitor within a major type group is not necessarily suitable for every application even if the function indicates the general category of type from which the selection should be made. Still another basis of selection must be applied in order to establish suitability.

For instance a mica capacitor is generally considered to be a suitable type of capacitor for use in tuned circuits. The same may be said for the ceramic dielectric unit. Yet every version of these two general types of units is not suitable for use in every resonant circuit. The same applies to the paper dielectric and the electrolytic capacitors relative to portions of the TV receiver which contain these types. The final indicator in the suitability of use are the constants of the capacitor.

Constants of Capacitors

The suitability of a capacitor for a particular application is determined by many factors. Among these are

a. physical size
b. capacitance
c. operating voltage rating
d. allowable variation in capacitance from rated value
e. required change in capacitance with temperature
f. allowable change in capacitance with temperature
g. maximum temperature for normal operation
h. permissible electrical losses
i. insulation resistance
j. resonant frequency
k. test voltage rating
l. leakage current (if applicable)

and several others.

With the exception of the physical dimensions, the other factors express the electrical qualifications of the component, and when stated in particular standardized terms, are the constants of the capacitor. Some of the terminology already listed are examples of terms which are constants, as for instance, items *a,b,c,i,j,k* and *l*. Item *d* is expressed by the constant "capacitance tolerance"; item *e* is "temperature coefficient" and item *f* is "tolerance in temperature coefficient". Item *g* is expressed by "operating temperature", and item *h* by "power factor" and several others.

Because of the limitations in capabilities imposed by physical construction, or because of the capabilities given to a capacitor by its physical construction, each main type of capacitor has its own set of constants. Some of the constants are common to all types of capacitors because of the very nature of the device. A few examples of these are the physical size, the capacitance, the operating voltage and the electrical losses. When expressed numerically, they may differ widely — again because of the constructional features — but each set of constants does include them.

The selection of a particular capacitor for a particular use is a matter of comparison of the constants of the contemplated capacitor with the requirements of the circuit where it is to be used. At first thought this may seem to be a major problem to the service technician. Actually it is not so, because it already has been done by the individual who designed the circuit. In fact the entire problem is simplified because the receiver manufacturer's service literature contains the electrical specifications for the capacitors required at every point. All of the constants are not given, but a familiarity with the general order of constants applicable to that particular type of capacitor, will, when added to the details already known, lead to the correct replacement.

In the Rider Replacement Parts Program all the electrical requirements surrounding the original capacitor used in the television receiver are known, and these are compared with the electrical constants of the replacement items; then the suitable replacement is listed, that is, if there is one. A number of different types of capacitors can satisfy some of the original design requirements, but only after consideration of all of the constants is it possible to select which particular type of capacitor is suitable, or in some instances, which types are the equivalent of each other for a particular use. Examples of these will be given in a later article.

Physical Size

The physical size requirement is listed as one of the constants. Perhaps this is taking some license with the stricter meaning of constants but it does no harm. It is one of those descriptive terms which offers substantial leeway in the selection. At the factory end the physical size relates to most convenient production, satisfying space limitations inside or around other components, electrical performance when operation is at very high or ultra-high frequencies, and finally, to some extent the matter of economy. From the service technician's viewpoint, the physical size requirement is the one with the least problem, providing that when a limitation exists, it is realized.

We have illustrated the range of physical dimensions within which capacitors of different types are generally available. It was seen that each type comes in different sizes. In some categories of units the full range of sizes is available on the replacement market; in others it is not. But fortunately the manner of use of a capacitor in a television receiver does not always demand complete conformance with the physical size specification, assuming that the electrical requirements can be satisfied.

For example, when a capacitor is located inside of some other component with fixed boundaries, such as an i-f or similar transformer can, or a deflection yoke, it is necessary that the replacement be of similar physical dimensions, or smaller, in order to fit within the same space. At the moment we are neglecting the possibility that the technician may not be interested in replacing a capacitor in an i-f transformer; he would rather replace the entire unit, which after all, does make sense when all factors are considered. Another example is the capa-

(Continued on next page)

citor which is used in a critical circuit where space is at a premium and the distributed capacitance must be kept to a minimum, or when the lead length is important. The larger the unit in these cases, the lesser is the possibility of keeping the lead length to the dimension used for the original component.

It is not beyond the realm of the imagination that a service technician may feel that the replacement of a fixed tuning capacitor inside of a transformer can be accomplished by locating the component outside the can. This is bad practice, and should not be done. The performance of the transformer can be affected adversely and feedback problems may arise.

Finally there is the case of the can type of electrolytic capacitor for which a mounting plate already exists in the receiver. It is conceivable that a new mounting plate suitable for a larger or smaller sized replacement can be used insead of the old one, but this involves the unwarranted expenditure of time and is justified only when the proper replacement is not procurable. Or, it is conceivable that a completely new mounting arrangement will be used, such as locating the replacement beneath the chassis. Of course it can be done, but we feel that in the latter cases, which are not too numerous to begin with, the physical features of the chassis should be retained by procuring the part that fits the chassis properly.

As to capacitors which are located on the underside of the chassis, the physical dimensional requirements are not of major import, providing, as we have said before, that the electrical requirements are satisfied. However, it always is best to duplicate the original size, but if there is to be a difference, it is best and most convenient to work with the smallest physical sizes rather than the reverse.

Capacitance and Capacitance Tolerance

In the list of electrical qualifications and in any list of constants of capacitors, these two items are shown individually. In reality they are closely related; hence are treated together here. Moreover, they are associated with all basic categories of capacitors being treated in this replacement parts series.

All capacitors bear some identification which states the capacitance rating of the unit. Sometimes the value is simply stated on the box which contains the unit, as usually is the case with variable capacitors. In the case of fixed units of all kinds, the value is marked on a label attached to the capacitor, or it appears as some form of coding impressed on the unit. Whether the label or coding expresses the capacitance in microfarads or micromicrofarads is unimportant because one is convertible into the other. A more important thing is the realization that the value of capacitance so shown is an *approximate* value. Frequently it is referred to as the *nominal* value.

By approximate or nominal we mean a value corresponding to the standard value within a certain leeway or tolerance. As a matter of convenience, lowest cost, and other production factors, the radio and television industry has agreed upon certain values of capacitance for each type of capacitor as being "standard" values. Design engineers try to build their equipments around these values. Capacitor manufacturers in turn build capacitors to approximate these standard values within a certain tolerance (expressed as a percentage of the rated value) and label them accordingly.

Although the standard values of capacitance are not the same for all basic categories of capacitors, at least do not begin at the same low limit and end at the same high limit, there is a range of capacitance in which the paper dielectric, mica dielectric, and ceramic dielectric afford more or less the same standard values, but not exactly the same. Such a list would begin at about 0.0001 μf and end at about 0.01 μf. It must be understood however that operating voltage ratings will tend to modify the range of standard values in all three types. As an illustration we might point out that the usual lowest standard value of capacitance in paper dielectric capacitors rated below 2000 volts working, is 0.001 μf, and even this is increased to perhaps several times that value when the working voltage is below 600 volts.

Mica dielectric and ceramic dielectric capacitors are available in like standard values from about 1 $\mu\mu f$ to about 0.01 μf, but even in this group, especially between a fraction of 1 $\mu\mu f$ and about 70 $\mu\mu f$, the preponderant selection of ceramic capacitors for many uses by design engineers has lead to the creation of standard values which differ from each other in very small steps, perhaps 2 or 3 $\mu\mu f$.

The electrolytic capacitor is in a class by itself as far as standard values are concerned. They begin at about 4 μf and extend up into the thousands of microfarads. But here too the particular type and the working voltage rating sets limits, as for example about 50 μf is the limit at 450 volts, whereas 5000 μf units are available at 6 volts.

Capacitance Tolerance. Concerning the association between standard values and tolerance, by definition, tolerance is the acceptable departure from a rated value. In the television industry, for that matter in the entire electronic industry, capacitance tolerance is expressed in two ways. One is in terms of percentage of the rated value, the other is in terms of a certain amount of capacitance. For instance when the capacitance is less than 10 $\mu\mu f$, and the unit is a ceramic dielectric capacitor, the + and − tolerance ratings may be 0.1$\mu\mu f$, 0.25 $\mu\mu f$, 0.5 $\mu\mu f$, 1.0 $\mu\mu f$ or 2.0 $\mu\mu f$, depending entirely on the degree of accuracy required by the circuit involved. As a rule, capacitors of this kind used in television receivers bear either + or − 0.25$\mu\mu f$ or 0.5 $\mu\mu f$ tolerance ratings.

In the case of mica capacitors up to and including 10 $\mu\mu f$, two minimum tolerance ratings exist. For the plain foil mica, the minimum tolerance is 1.0 $\mu\mu f$, whereas for the silver mica it is 0.5 $\mu\mu f$.

When the capacitance exceeds 10 $\mu\mu f$, the capacitance tolerance is expressed in

(Continued on page 20)

The Cosine Yoke

(Continued from page 1)

with horizontal lines of force. This magnetic field produces vertical deflection. Part B of the figure shows a cross section of the windings of the cosine yoke. Windings which produce horizontal and vertical deflections are labeled. Part C is an enlarged view of one of the horizontal windings with the window and butting edge of the winding shown.

Note that the cosine distribution must be designed into both vertical and horizontal windings, but in different amounts. This is true because the deflection components of both magnetic fields are not the same due to the raster being wider than it is high. The size of the window in both horizontal and vertical coil assemblies affects the over-all distribution and hence the spot focusing in the corners of the picture.

The cosine distribution curve is a design detail and has no direct significance to the serivce man. Suffice it to say that the winding thickness varies in a cosinusoidal manner. Some windings claim to be cosine squared in character, which means that the winding thickness increases faster than in a normal cosine yoke.

In general a cosine yoke can be distinguished from a conventional-style yoke by inspecting the size of the winding window. Cosine yokes have narrow windows. This is natural, since the winding starts nearer to the center line of the assembly, and thus has farther to spread while increasing its thickness. The horizontal winding window can be readily seen, since this winding is on the inside of the yoke and lies along the neck of the tube.

Finally, in checking an old yoke when considering replacement with a cosine yoke, note that the cosine yokes probably have higher horizontal-winding inductance than conventional designs and replacement might result in poor performance and probably give ringing in the picture. Also, another condition to watch out for is whether the shape of the raster has been changed, since better corner focus may have been obtained at the expense of pincushioning of the raster. Some cosine yokes produce pincushioning that must be removed by placing small permanent magnets (held on brackets) around the neck of the tube. These anti-pincushioning magnets must be readjusted in making a replacement. A cosine yoke with such magnets cannot be used with metal picture tubes since the cone may become permanently magnetized and thus distort the raster.

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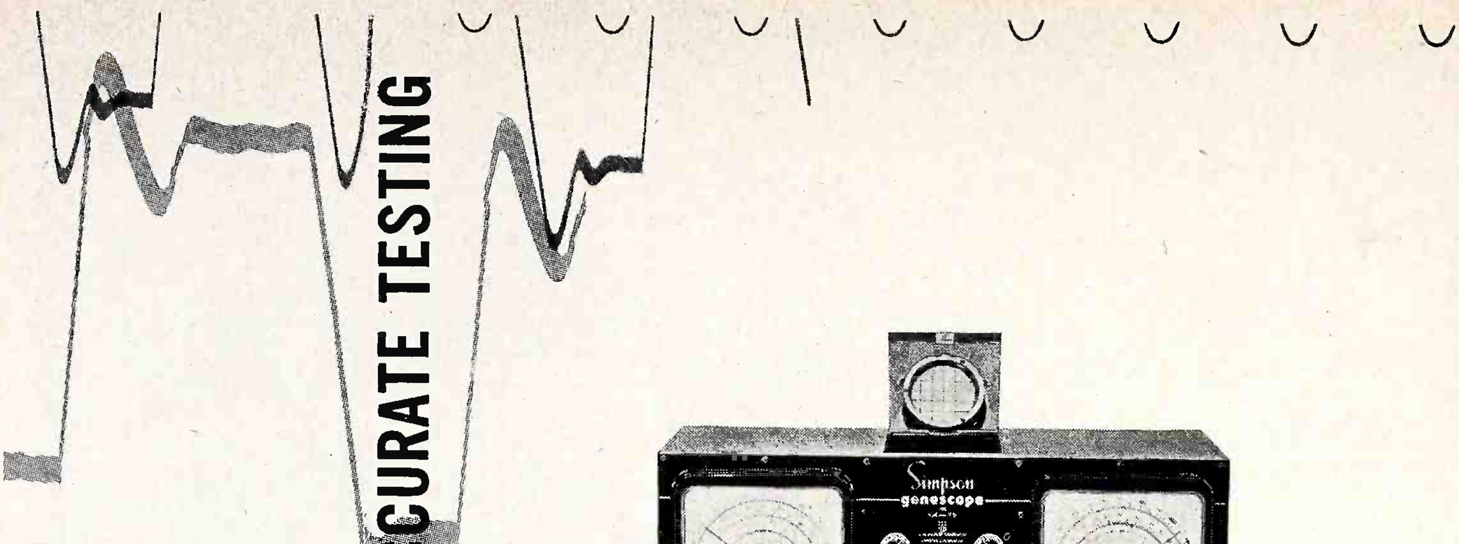

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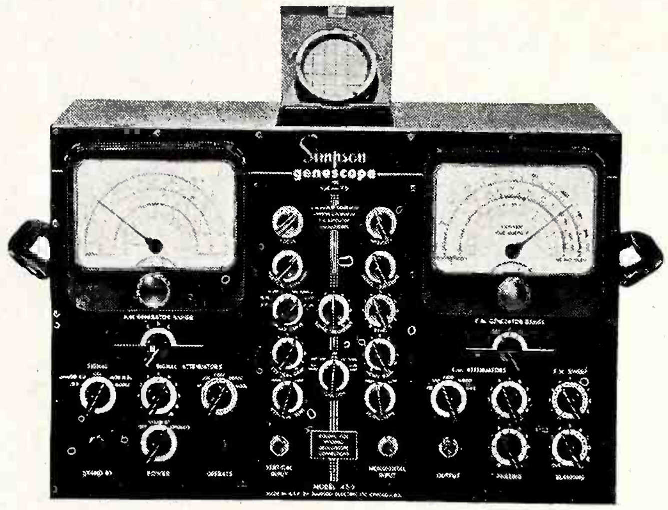

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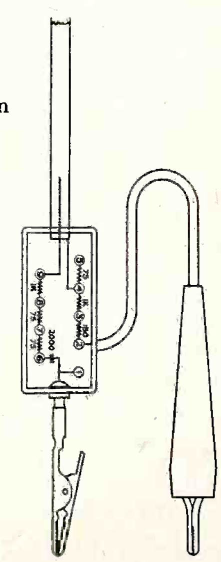

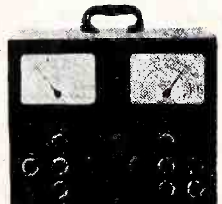

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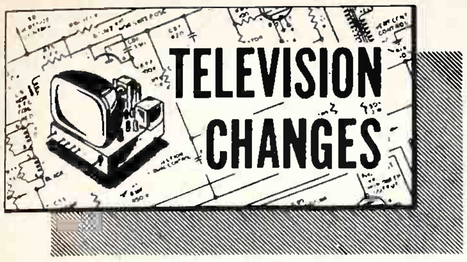

In compliance with the many requests we have received from our readers, this and future issues of SUCCESSFUL SERVICING will again contain the feature, TV PRODUCTION CHANGES.

The Rider Manual pages and TEK-FILE pack which include the original data and shematics to which the following production changes apply, appear in the index on page 24 of this issue.

ANDREA **MODEL T-VL12**
CHASSIS VL12

Service Data Addenda (Coil and Transformer Resistances)

Low-Voltage Transformer, T12, Part. No. ST-3033
- Primary: .8 ohm
- High-voltage secondary: 38 ohms, (center tap)
- 5v secondary (yellow leads): .1 ohm
- 6v secondary (green leads): .1 ohm
- 6v secondary (blue leads): .3 ohm

High-Voltage Transformer, T8, Part No. ST-3018-1
- Terminals 1-2: 90 ohms
- Terminals 2-3: 180 ohms
- Terminals 4-5: 9 ohms
- Terminals 5-6: .3 ohm

Vertical-Output Transformer, T7, Part No. ST-3030
- Blue-red leads: 600 ohms
- Green-yellow leads: 10 ohms

Vertical-Blocking Transformer, T6, Part No. ST-3029
- Blue-red leads: 150 ohms
- Green-yellow leads: 900 ohms

Horizontal-Oscillator Transformer, L18, Part No. SA-335
- Terminals A-F: 75 ohms
- Terminals C-D: 43 ohms

Deflection Yoke, L17, Part No. ST-3034
- Horizontal winding: 13.5 ohms
- Vertical winding: 70 ohms

Focus Coil, L14, Part No. ST-3032
- 1300 ohms

Horizontal-Linearity Control, L20, Part No. SA-315-1
- 35 ohms

Width Coil, L19, Part No. SA-336
- .5 ohm

Speaker Output Transformer, T11, Part No. SL-4009
- Primary: 400 ohms
- Secondary: .5 ohm

Filter Choke, L22, Part No. 3031
- 100 ohms

MAGNAVOX
CHASSIS CT-270, 271, 272, 273, 274

R-F Unit

These chassis use r-f tuner unit No. 700349.

GAMBLE-SKOGMO (CORONADO) **MODELS 05TV1-43-9014A, 15RA2-43-9105A**
CHASSIS 16AY210

Circuit Changes, Video Amplifier

The following component changes were made in the video amplifier circuit:

Ref. No.	*Old Part Number*	*New Part Number*	*Description*
R35	C-9B1-70	C-9B1-66	2,200 ohms, ½ watt, 10%
R38	C-9B2-64	C-9B-62	1,000 ohms, ½ watt, 10%
R123	C-9B4-21	C-9B2-70	4,700 ohms, 1 watt, 10%
R127	new part added	C-9B4-82	47K ohms, 2 watts, 10%
C122	new part added	C-8G-11892	22 $\mu\mu$f, ceramic
L20	A-16A-18685	A-16A-19486	240 μh peaking coil
L21	A-16A-18685	A-16A-19485	380 μh peaking coil

NOTE: Chassis code numbered 124023 or higher incorporate this change.

MITCHELL
MODELS T16-2KB, T16-2KM, T16-B, T16-M

Production Change (Tube Substitution)

In some receivers, a 6SN7 is used in place of a 12AU7 for the d-c restorer and sync separator stage. This is done by making the following wiring changes:

1. Filaments: Connect pins 5 and 9 of the 12AU7 to pins 7 and 8 of the 6SN7, respectively. Disconnect pin 4 of the 12AU7.
2. Cathodes: Connect pins 3 and 8 of the 12AU7 to pins 6 and 3 of the 6SN7, respectively.
3. Grids: Connect pins 2 and 7 of the 12AU7 to pins 4 and 1 of the 6SN7, respectively.
4. Plates: Connect pins 1 and 6 of the 12AU7 to pins 5 and 2 of the 6SN7, respectively.

HOFFMAN
MODEL 612
CHASSIS 142

Hoffman Model 612 is a 24 tube table model with a 6 inch speaker and an audio power output of 3.0 watts. A 12 inch picture tube is used. Its major components are:
- Chassis – 142
- Speaker – 6" PM (Part No. 9062 voice coil, 3.2 ohms at 400 cps.)
- Cabinet – Part No. 7533
- Escutcheon Frame – Part No. 2277
- Filter Plate Glass – Part No. 734
- Picture tube – 12KP4, 12LP4, L2QP4

SYLVANIA
MODEL 74M
CHASSIS 1-356(C05)

Sound I-F Limiter (Circuit Change)

1. Resistor R-104 (120 ohm) is removed from the cathode (pin 7) of the Sound I-F Limiter (V-10, 6AU6) and the cathode is connected directly to ground.
2. Capacitor C-104 (.2μf, 400v), connected from the bottom of T-52 (sound discriminator transformer primary) to ground, is removed from the circuit.
3. Resistors R-105 (33K, ½w) and R-106 (10K, ½w), connected to the screen grid of the Sound I-F Limiter (pin 6 of V-10, 6AU6), are removed from the circuit.
4. Pin 6 of V-10 is connected to the bottom of T-52.
5. Resistor R-107 (33K, ½w), connected between the bottom of T-52 and the +125v supply, is changed to 22K, ½w (Service Part 181-0223).

NOTE: Chassis coded C06 (Serial Nos. beginning 5606-) incorporate this change.

SYLVANIA
MODELS 22M-1, 23B, 23M, 24M-1
CHASSIS 1-387-1

3rd Video I-F Stage (Resistor Change)

Resistor R-140, in the grid circuit (pin 1) of the 3rd video i-f tube (V-5, 6BA6), is changed from 27K, ½w to 22K, ½w (Service Part 181-02235).

NOTE: Chassis coded C01 (Serial Nos. beginning 87101-) incorporate this change.

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Here are more data that will keep your RIDER'S DEPENDABLE REPLACEMENT PARTS LISTING published in TV Volume 10 up to date.

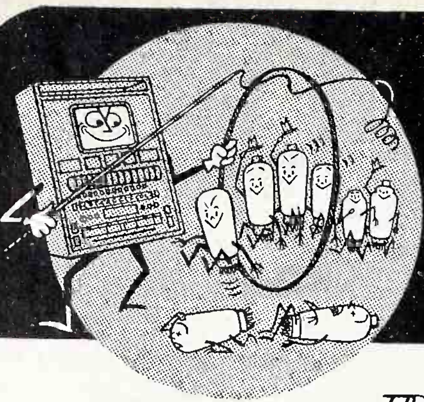
ADDITIONS TO PHILCO VARIABLE RESISTANCE CONTROLS SECTION:

PHILCO Part No.	REPLACEMENTS																	
	CLAROSTAT				IRC							MALLORY						
	Cat. No.	Kit No.	Inner Shaft	Switch No.	Stock No.	Kit. No.	Panel Elem.	Rear Elem.	Outer Shaft	Inner Shaft	Switch No.	Stock No.	Kit. No.	Panel Elem.	Rear Elem.	Outer Shaft	Inner Shaft	Switch No.
33-5546-41	A43-10K		FKS 1/4		WK-10000													
33-5546-49	A10-10K		FKS 1/4		4WK-10000							M10MP						
33-5563-42	RTV-345				QJ-391		W17-111	WR11-116	P3-129	R8-213								
33-5563-43	RTV-241				QJ-302	K-2	B11-125	B11-130	P1-200	R1-216								
33-5563-44	RTV-360				QJ-340	K-2	B12-141	B18-139X	P1-200	R1-216	76-1							
33-5563-50	RTV-358				QJ-356	K-2	B11-123	B11-130	P1-200	R1-216				UF54L	UR25AL			
33-5563-51	RTV-359				QJ-357	K-3	W17-111	B11-128	P3-131	R1-216				WF252	UR15L			
33-5564-14	AT-116		FS-3	SWA	Q18-139X							UT451						US26
33-5565-17	AG-55-S		FKS 1/4		Q11-130							SU46						
33-5565-30	AG-44-S		FKS 1/4		Q11-123							SU35						
33-5565-31	AG-85-S		FKS 1/4		Q11-14							SU67						
33-5565-32	AG-84-S		FKS 1/4		Q11-239							SU565						

ADDITIONS AND CORRECTIONS TO FIXED CAPACITORS SECTION:

Set Mfr.	Set Mfr.'s Original Part No.	
Belmont	8C-18487	Add AFH4-82 to Aerovox column.
Packard-Bell	23936	Change BPD-.0015 mf to SI-2-1500 mmf in Aerovox column.
"	"	Change K071 to G071 in Cornell-Dubilier column.
"	"	Change DC-5215 to UC-5212 in Mallory column.
"	"	Change 5HK-D15 to 5GA-D15 in Sprague column.
"	23955	Change K078 to KD077 in Cornell-Dubilier column.
"	"	Change UC-5240 to DCD524 in Mallory column.
"	"	Change 5DA-D4 to 5HK-2D4 in Sprague column.
"	23956	Change 1468L-HV 47 mmf to HVD30-47 mmf 10% in Aerovox column.
"	"	Delete 5P20Q47 in Cornell-Dubilier column. No replacement.
"	"	Delete MCL-447 in Mallory column. No replacement.
"	"	Change 60GAB-Q47K to 20GAB-Q47K in Sprague column.
"	23967	Change 1468L-HV-100 mmf to HVD15-470 mmf in Aerovox column.
"	"	Delete 5P10T47 in Cornell-Dubilier column. No replacement.
"	"	Delete MCK-347 in Mallory column. No replacement.
"	23959	Change MMA20T5 to MMC-20T5 in Cornell-Dubilier column.
Philco	30-2417-3	Add PRS50-10 to Aerovox column.
"	"	Add BR-105 to Cornell-Dubilier column.
"	"	Add TC-32 to Mallory column.
"	"	Add TVA-1304 to Sprague column.
"	30-2417-7	Add BBR-2-50T to Cornell-Dubilier column.
"	30-2570-57	Add D111 to Cornell-Dubilier column.
"	"	Add FP476 to Mallory column.
"	30-2570-66	Add XA004 to Cornell-Dubilier column.
"	"	Add FP117 to Mallory column.
"	30-2584-9	Add D111* to Cornell-Dubilier column.
"	"	Add FP344.5 to Mallory column.
"	30-2584-15	Add UPT 435 to Cornell-Dubilier column.
"	"	Add FP225-TC72** to Mallory column.
Stromberg-Carlson	111082	Change PRS 15/500 to PRS 12/500 in Aerovox column.
"	111094	Change TVL-2764 to TVL-4840*** in Sprague column.
"	"	Change FP238 to FP476*** in Mallory column.
"	111095	Change FP476* to FP238 in Mallory column. Delete "Remarks" column.
"	"	Change TVL-4840* to TVL-2764 in Sprague column. Delete "Remarks" column.

*Parallel 20 mf and one 20mf/3000VDC section to replace original 30 mf section.
**TC72 tubular electrolytic used in place of 10mf/450V section of original unit.
***Omit one 10 mf section.

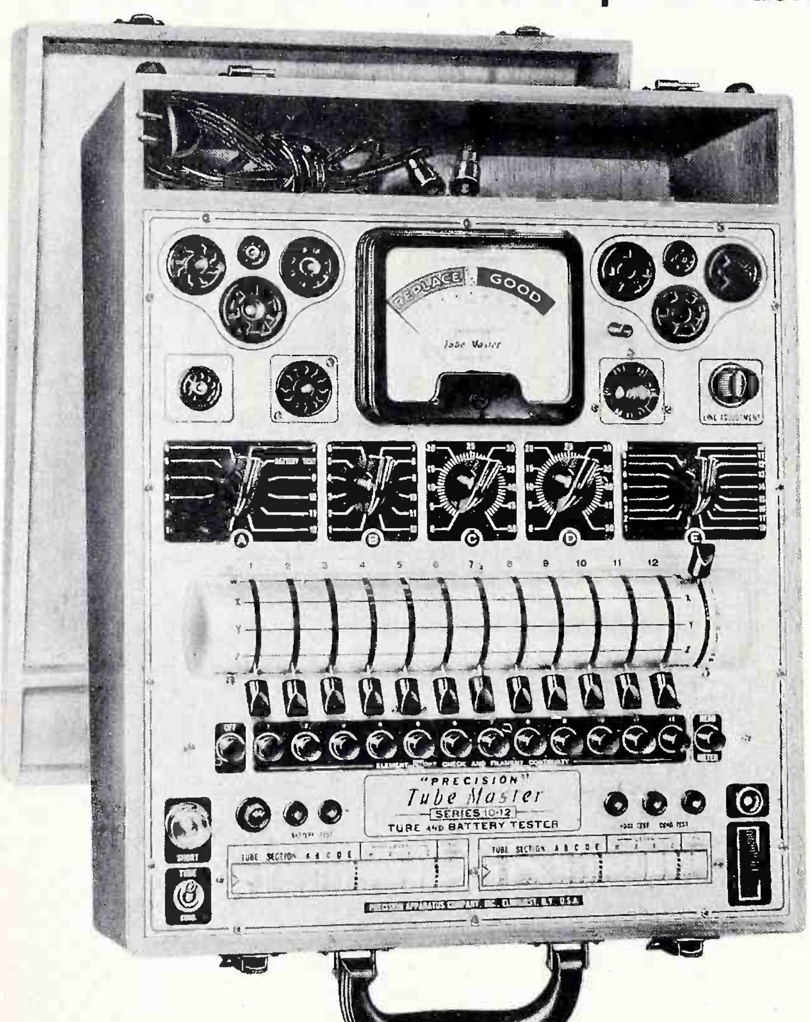


THE INSTRUMENT THAT DEMANDS OVERALL PERFORMANCE FROM THE TUBE UNDER TEST!

-PRECISION- SERIES 10-12

*Electronamic** Tube PERFORMANCE Tester

with 12 element free-point Master Lever Selector System



To test modern tubes for only one characteristic will not necessarily reveal ***OVERALL*** PERFORMANCE CAPABILITIES. **Modern tube circuits look for more than just mutual conductance or other single factor.**

It has been conclusively proven that even though a tube may work well in one circuit, it might fail to work in another—simply because **different circuits demand different relative performance characteristics,** such as amplification factor, plate resistance, power output, emissive capability, etc.

In the PRECISION "ELECTRONAMIC" Circuit, the tube under test is made to *perform* under appropriately phased and selected individual element potentials, encompassing a wide range of plate family characteristic curves. This COMPLETE PATH OF OPERATION is electronically integrated by the indicating meter circuit in the positive performance terms of *Replace-Weak-Good.*

The efficiency of this "Electronamic" test results from encompassing several fundamental tube characteristics, NOT JUST ONE. Accordingly, when a tube passes this demanding **OVERALL PERFORMANCE test,** it can be relied upon, to a very high degree, to work satisfactorily.

*REG. U. S. PAT. OFF. T. M. 438,006

MODEL 10-12-P (illustrated): in sloping, portable hardwood case with tool compartment and hinged removable cover. Sizes 13¾" x 17¼" x 6¾" **$104.50**
MODEL 10-12-C (Counter Type) **$109.25**
MODEL 10-12-PM (Panel Mount) **$109.25**

Compare these features

- ★ Facilities to 12 element prongs.
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- ★ Tests Noval 9 pins; 5 and 7 pin acorns; double-capped H.F. amplifiers; low power transmitting tubes, etc., regardless of filament or any other element pin positions.
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- ★ Simplified, High Speed, 12 element Short-Check system, uses consecutive push-button switching.
- ★ Battery Tests under dynamic load conditions.
- ★ 4½" Full Vision Meter.
- ★ Built-in Dual-Window, high speed, geared roller chart.
- ★ Free Replacement Roll Charts & supplementary tube test data service.

See *the "Precision" Master "Electronamic" Tube Testers at leading Radio Equipment Distributors. Write for new, 1952 "Precision" catalog.*

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AM · FM · TV · AM · FM · TV

PRINTED ELECTRONIC CIRCUITS

(Continued from page 3)

The painting technique has the advantage of requiring a minimum of auxiliary equipment and so has been the most popular type for experimentation and design work with printed circuits. It is also the best method to use in making repairs on printed circuits, as will be discussed later.

The *spraying* method of reproducing printed circuits differs from the painting technique in that the conductors are sprayed onto the surface of the base. Both molten metals and metallic conducting paints may be applied in this manner. In some processes, stencils are used to define the circuit conductors. In others, grooves are machined or molded in the base material where a conductor or other circuit component is desired. Grooves may also be formed by sand-blasting through a stencil. Metal is then sprayed over the entire base plate, filling the grooves and covering the spaces between. The surface is then milled off, removing the excess metal and leaving only that in the grooves. High conductivity is obtained by this method since relatively large conductors are formed in the grooves. Standard tube sockets and other components are sometimes connected to sprayed circuits by mounting them on the opposite side of the base plate so that the terminals protrude through holes into the grooves. Then, when the circuit is sprayed, connections are automatically made to the conductors. Circuit cross-overs are made in a manner similar to that employed in the painting process. Resistors, capacitors, and inductances may also be formed by spraying.

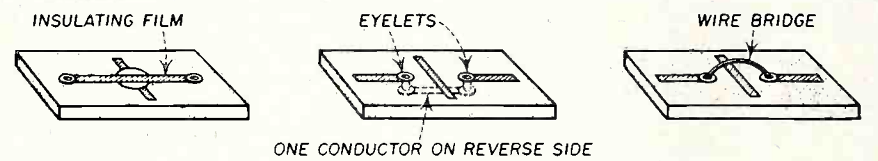
The *vacuum evaporation* process of circuit printing consists of evaporating a metal such as silver, copper, or nickel onto the surface of the dielectric material by melting the metal in a vacuum. A mask or stencil on the surface of the insulator is used to outline the circuit desired. In one such process, called "cathode sputtering", a high voltage is applied between the source of metal vapor (the cathode) and the work upon which it is to be deposited (the anode). The metal vapor is thus drawn to the work by electrostatic forces. Only a "rough" vacuum, such as can be produced by a good mechanical vacuum pump, is required for this process.

Another vacuum process used is very similar to cathode sputtering except that no voltage is applied between the cathode and the work. Metal evaporated from a heated filament, or other source of metal vapor, is distilled on the printed circuit plate placed over it. In either type of vacuum processing, it is unnecessary to further heat treat or fire the deposited metal. Only thin films are usually deposited in this manner. If greater conductivity is required, conductors may be built up by electroplating.

In the *chemical-deposition* methods of making printed circuits, the techniques employed are similar to those used in silvering mirrors. A silvering solution, consisting of ammonia and silver nitrate mixed with a reducing agent, is poured on the chemically clean surface to be coated. The confines of the solution are controlled by an adhesive stencil. The metal films obtained are usually too thin to permit direct soldering, but may be built up by repeated coatings or by plating. The chemical processes have not been applied as extensively as those discussed above.

The *metal stamping* technique has been used principally to print loop antennas on the back covers of radio receivers. However, other types of circuit wiring have been produced by this method. A die, bearing the outline of the desired circuit, is used to press a thin metal foil into the surface of a plastic or other insulator. In the same operation the sharp edges of the die cut the metal sheet to the desired shape. The metal sheet may be backed by an adhesive to insure a good bond. Circuits made in this manner have good conductivity.

The last general type of printed circuit is produced by a process known as "dusting". In this method, a powdered metal is dusted onto the insulating base plate and fired in place. The cricuit outline is defined either by coating the entire insulator with a sticky substance and applying the metal powder through a stencil, or by applying the bonding substance through the stencil and then dusting on the powder so that it is held in place by the adhesive until fired.



TYPES OF CONDUCTOR "CROSS-OVERS"
FIG. 4

Servicing Printed Circuits

As was mentioned above, the most convenient method of making repairs and replacements in printed circuits is the brush-applied painting technique. Kits of such paints, including both conductor and resistor mixtures, are commercially available.

(Continued on page 18)

PRINTED ELECTRONIC CIRCUITS

(Continued from page 17)

Most of these paints require no heat for drying, so that they may be used for repairing circuits having parts which cannot be subjected to high temperatures. This is an important precaution when working with circuits printed on certain types of plastic.

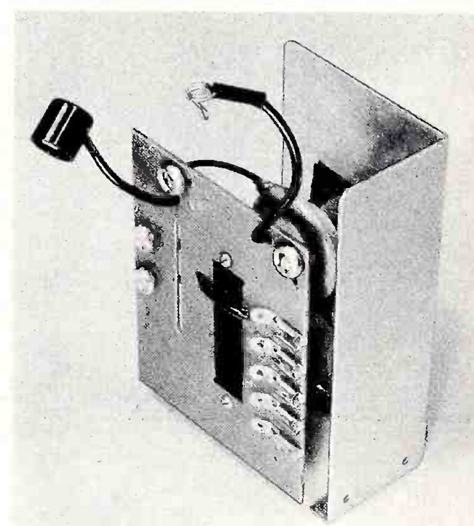
Although subminiature tube sockets are sometimes used with printed circuits, tubes are frequently connected directly to metal eyelets in the base plate, as in Fig. 1. When replacing tubes connected in this manner, care must be exercised to avoid the use of excessive heat during soldering operations. Soldered connections may also be made directly to printed conductors if the base material will stand the heat involved. A solder containing a small percentage of silver should be used for best results. Where soldering is inadvisable, connections to tube leads and other wires should be made with metallic paint.

Printed resistors which have become defective may be repaired or replaced by the painting technique. Defective resistors are located in the usual manner with an ohmmeter. If it becomes necessary to "disconnect" a printed resistor from the circuit for a resistance check, this may be accomplished by scratching through the printed conductor lead with a sharp instrument. If defective, the resistor may be repaired with resistive paint. It will usually be found to be open or high in value. In such cases, additional resistive paint should be applied over the old resistor to reduce its resistance to the proper value. Some commercial printed circuits have a protective layer of lacquer over the conductors and particularly over resistors to prevent moisture absorption. This coating must be completely removed before repairing resistors. If attempts to repair defective resistors are unsuccessful, the old coating should be removed completely and a new resistor painted in its place. The proper dimensions may be determined by trial and error, keeping in mind that the resistance is directly proportional to the length, and inversely proportional to width and thickness. The resistance material must make good contact with the printed conductors at the ends. Breaks introduced in the conductors to isolate resistors may be repaired with a bridge of conducting paint.

New Horizontal Output Transformer May Be Replaced Easily

One component with a high mortality rate is the horizontal-output transformer. Not much was done to alleviate the replacement problem. To those who have undertaken such replacement, the tedious and delicate procedure can be well appreciated.

In the new Stewart-Warner 9300 television chassis, a realistic approach has been taken to the problem. The horizontal-output transformer (shown here) is simply mounted



New Horizontal Output Transformer.

and connectors are employed rather than soldered leads. With this transformer, it is not necessary to remove the high-voltage rectifier tube socket from the chassis merely to replace the filament leads, nor is it necessary to postpone replacement of the transformer as a last resort because of the work involved.

To replace the horizontal-output transformer, it is only necessary to remove two sheet metal screws and unplug the leads. The entire replacement procedure does not require much more than five minutes, and can be done in the customer's home without removing the chassis and without the use of a soldering iron.

TV SUPPLEMENTARY SHEET NO. 1

MODEL & CHASSIS	PART #	CATALOG #	FUNCTION	DESCRIPTION	LIST PRICE
ADMIRAL					
22A2,A 22M1 22Y1	75B1-50	AG-83-S KSS-3	Tone	2 Meg. Ω carbon	$1.25
	75B11-20	RTV-327	Contrast/ Vol./Sw.	1500/1 Meg. Tap 500K Ω Conc. Dual carbon--SPST	$4.30
	75B13-3	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	75B13-7	AG-15-S FKS-1/4	Vert. Lin.	3000 Ω carbon	$1.25
	75B13-12	AG-49-S KSS-3	Bright.	100K Ω carbon	$1.25
	75B13-13	AG-40-S KSS-3	Hor. Hold	25K Ω carbon	$1.25
	75B13-14	AG-61-S KSS-3	Vert. Hold	1 Meg. Ω carbon	$1.25
	75B13-16	A43-750 KSS-3	Focus	750 Ω 2W-W.W.	$1.25
AMBASSADOR					
C1720 C2020 C2420 CD2020 T1720 T2020	131-0001	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25
	131-0002	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	131-0003	RTV-1	Contrast Vol./Sw.	10K/1Meg. Tap 200K Ω Conc. Dual carbon--SPST	$3.70
	131-0012	AG-44-S KSS-3	Hor. Hold	50K Ω carbon	$1.25
	131-0012	AG-44-S KSS-3	Bright.	50K Ω carbon	$1.25
	131-0013	AG-61-S KSS-3	Vert. Hold	1 Meg. Ω carbon	$1.25
	131-0014	RTV-10	Focus	5000 Ω 4W-W.W.	$1.85
14MT, MTS 16MT, MTS 17MC, MCS, MT, MTS 20MC, MCSMT, MTS	VC-12120B	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25
	VC-12121C	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	VC-12127B	RTV-297	Contrast. Vol./Sw.	750 Tap 500/250K Ω Conc. Dual--SPST	$4.30
	VC-12130	AG-49-S KSS-3	Bright.	100K Ω carbon	$1.25
	VC-12131	AG-44-S KSS-3	Hor. Hold	50K Ω carbon	$1.25
	VC-12132B	AG-83-S KSS-3	Vert. Hold	1.3 Meg. Ω carbon	$1.25
AM-17C, CB, C1M ET, T1M	PT-1002	RTV-252	Contrast Vol./Sw.	750 Tap 250/250K 2W-W.W./carbon Conc. Dual--SPST	$4.30
AM-20C, T PL-17CB, CG, PG, TM 20C 23P	PT-1004	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25
	PT-1005	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	PT-1007	AG-49-S KSS-3	Bright	100K Ω carbon	$1.25
	PT-1008	AG-61-S KSS-3	Vert. Hold	1 Meg. Ω carbon	$1.25
	PT-1009	AG-44-S KSS-3	Hor. Hold	50K Ω carbon	$1.25
20PC 20PCS 20PCS2	VC-12120B	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25

MODEL & CHASSIS	PART #	CATALOG #	FUNCTION	DESCRIPTION	LIST PRICE
AMBASSADOR					
	VC-12121C	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.24
	VC-12127B	RTV-297	Contrast/ Vol./Sw.	750 Tap 500/250K Ω Conc. Dual carbon SPST	$4.30
	VC-12131C	AG-44-S KSS-3	Hor. Hold	50K Ω carbon	$1.25
	VC-12132C	AG-83-S KSS-3	Vert. Hold	1.3 Meg. Ω carbon	$1.25
	VC-12135	AG-49-S FKS-1/4	Bright	100K Ω carbon	$1.25
ANDREA 2C-VL20	GRV-812-I	AG-83-S FKS-1/4	Height	2 Meg. Ω carbon	$1.25
	GRV-824	A43-2000 FKS-1/4	Vert. Lin.	2000 Ω 2W-W.W.	$1.25
CHASSIS VL-20	GRV-830	AG-60-Z FS-3/SWB	Vol./Sw.	500K Ω carbon--SPST	$1.25 .60
	GRV-831	RTV-75	Hor./Vert Hold	50K/2 Meg. Conc. Dual carbon	$3.10
	GRV-834	RTV-300	Bright./ Contrast	20K/5000Ω 4W-W.W./ carbon Conc. Dual	$4.05
ARTONE					
AR14L AR17L 17CD 17CRR 17ROG 20CD 203D 1000 1001 2nd Run	P-2	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25
	P-5	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	P-7	AG-60-Z FS-3/SWB	Vol./Sw.	500K Ω carbon SPST	$1.25 .60
	P-12	AG-8-S FKS-1/4	AM-Rejection	1000 Ω carbon	$1.25
	PD-5	RTV-146	Vert./Hor. Hold	1 Meg./50K Ω Conc. Dual carbon	$3.10
	PD-6	RTV-253	Contrast/ Bright.	2000/100K Ω Conc. Dual carbon	$3.10
MST-12 MST 14 14TR 16TR 17CD 17CRR 17ROG 20CD 20TR 112X 203D 312 819 3163CR 8163CR 8193CM 1st Run	P-2	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25
	P-5	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	P-6	A10-1500 FKS-1/4	Focus	1500 Ω 4W-W.W.	$1.85
	P-7	AG-60-Z FS-3/SWB	Vol./Sw.	500K Ω carbon SPST	$1.25 .60
	PD-4	RTV-145	Contrast/ Bright.	750 Tap 250/100K Ω 2W-W.W./carbon Conc. Dual	$3.70
	PD-5	RTV-146	Vert./Hor. Hold	1 Meg./50K Ω Conc. Dual carbon	$3.10
ARVIN 5175 5176	E22464-17	RTV-258	Contrast/ Vol./Sw.	25K/3 Meg. Tap 1 Meg. Conc. Dual carbon--SPST	$4.30
	E22464-20	RTV-259	Vert. Lin./ Height	3000/2.5 Meg. 2W-W.W./carbon Conc. Dual	$3.10
CHASSIS TE320	E22464-34	AG-49-S KSS-3	Bright.	100K Ω carbon	$1.25
	E22464-35	Order from MFR.	Tone/ Phono Sw.		
	E22464-36	AG-83-S KSS-3	Vert. Hold	1.5 Meg. Ω carbon	$1.25
	E22464-37	AG-44-S KSS-3	Hor. Hold	50K Ω carbon	$1.25

Replacement Parts

(Continued from page 8)

percentages, and sometimes in a value of capacitance, whichever is the greater of the two. As to *minimum* tolerances, they vary with the type of component. For example the minimum tolerance generally considered in ceramic dielectric capacitors and in silver mica capacitors is ± 1 percent. In the plain foil mica dielectric unit it is ± 2 percent, whereas in paper dielectric capacitors it is ± 5 percent. In electrolytic capacitors the minimum tolerance is 10 percent.

While on the subject of tolerances it is necessary to comment that the minimum tolerances quoted here are not necessarily the standard tolerances which are used for components in television (and radio) receivers. The high order of accuracy indicated by these minimum tolerances are seldom applied to household electronic equipments. The figures used are much more liberal, but none the less important as far as accomplishing a desired result, hence demanding recognition by the service technician who is making a replacement. It is because of this that television receiver manufacturers frequently list the capacitance tolerance in their service literature, and why the Rider Replacement Parts Program listings of capacitors always state the capacitance tolerance.

Each type of capacitor bears a standard tolerance figure plus and minus. The list shown below indicates the range of tolerances associated with capacitors used in household electronic appliances such as television and radio receivers. Attention is called to the fact that we have omitted the full gamut of capacitance tolerances which are *available* on request from capacitor manufacturers; instead we show only those values which appear in the capacitor specifications set by the receiver manufacturers for capacitors used in their television and radio receivers, and whatever other electronic products they make for public consumption. The list which follows applies to capacitors in excess of 10 $\mu\mu f$. Lower values of capacitance have already been dealt with.

It is understandable that every single capacitance tolerance figure which is used in the industry is not listed here. But it can be said that those which represent the vast majority are included.

It also is important to state that the letter code shown on this listing corresponds to the coding in capacitor specifications contained in capacitor manufacturers' catalogs and in *RTMA* as well as *JAN* specifications. We have however omitted the letter coding indicative of 1, 2 and 3 percent capacitance tolerances. These are F, G and H respectively, although the letter H when applied to ceramic units indicates 2.5 percent.

Finally, attention is called to the possibility of confusion between the capacitance tolerance code letters and the Temperature Coefficient as well as the Temperature Coefficient Tolerance code letters. While similar code letters apply to all of these, their meanings are completely different.

Type of Capacitor	*Standard Industry Capacitance Tolerance in Percent*	*Capacitance Tolerance Values Used in Percent*	*Letter Code*
Mica			
(Plain)	± 20	± 20	M
		± 10	K
(Silver)	± 5	± 10	K
		± 5	J
Ceramic			
(GP) #	± 20	± 20	M
		± 10	K
		± 5	J
(GMV) *	+ 100 and − 0	+ 100 − 0	
		+ 100 − 20	
(TC) **	± 10	± 10	K
		± 5	J
Paper Dielectric	± 20	± 20	M
		± 10	K
		± 5	J
		+ 60 − 25	
		+ 40 − 20	
		+ 40 − 15	
		+ 40 − 10	
		+ 20 − 10	
Electrolytic			
(Tubular)		+ 100 − 10	
		+ 150 − 10	
		+ 250 − 10	
(Can)		+ 40 − 10	
		+ 50 − 10	
		+ 100 − 10	
		+ 150 − 10	

\# General Purpose
* Guaranteed Minimum Value
** Temperature Compensating

Applications of Capacitance and Capacitance Tolerance. How are these two constants used? . . . To begin with, the capacitance required in a circuit is a function of the design of the system which uses it. Among the constants of the circuit is the amount of capacitance required. But seldom, if ever, is this value an absolutely precise one; invariably it is an approximation, although it is stated as a definite amount as that value which most closely approximates the nearest standard value. We refer to it as an approximation because the capacitance value indicated is ± a certain amount of capacitance. For instance the capacitance specified by a receiver manufacturer for a circuit may be 0.0022 μf ± 10 percent. Assuming all other conditions satisfied, any value of capacitance between 0.00198 μf and 0.00242 μf seems suitable.

The conclusions accompanying the example are correct except for one additional consideration. Suppose we deal with the 0.0022 μf unit. In order to be a suitable replacement within the stated 10 percent capacitance limits, the value must be a measured value for the replacement unit. If this is not so, but instead a capacitor labelled

(Continued on page 23)

A monthly summary of product developments and price changes supplied by RADIO'S MASTER, the Industry's Official Buying Guide, available through local parts distributors.

COMMENT: Since the last reported period, fewer manufacturers were engaged in "change activity". TV and radio receiving tube manufacturers are continuing their tendency toward increasing prices, while other product group price changes remain spotty with no apparent trend.

New Items

AEROVOX — Introduced a number of new items including AFH triple and quad electrolytic capacitors.

AMERICAN ELECTRONICS — Added No. 4-01, Code Booklet at $.50 dealer net . . . No. 103-01, Advanced Course at $6.95 dealer net and Individual Records at $1.40 dealer net.

AMERICAN PHENOLIC — Added Model 114-053, UHF bo-ty antenna at $3.00 dealer net . . . Model 114-560, UHF bo-ty reflector at $1.65 dealer net and Model 114-558, UHF bo-ty stacking harness at $.36 pr/dealer net.

BELL SOUND SYSTEM — Added Model 372MB, 30 watt mobile amplifier at $165.00 dealer net.

BRIDGEPORT BRASS — Added plastic spray Model 603 at $1.95 dealer net.

CLAROSTAT — Added TV replacement controls RTV 384 to 390 inclusive.

CORNELL-DUBILIER — Added Model V-8, VHF antenna at $25.50 dealer net . . . Model U-4, UHF antenna at $5.97 dealer net and Model 110T22, vibrator converter at $47.31 dealer net.

CREST LABS. — Added Model LVB-117, line voltage booster at $10.08 dealer net.

EBY SALES — Added laminated miniature sockets No. 49-6H at $1.35 dealer net and No. 49-7H at $1.80 dealer net.

GENERAL ELECTRIC — Added germanium transistors 4JA1A1 at $1.95 dealer net . . . 4JA1A2 at $3.85 dealer net . . . 4JA1A3 at $4.80 dealer net and 4JA2A4 at $5.30 dealer net. Also added Model UPX-009, pickup and transcription arm at $9.33 dealer net . . . Model RPX-051, triple play variable reluctance cartridge at $5.28 dealer net and Model RPX-042, variable reluctance cartridge at $4.35 dealer net.

GON-SET — Added No. 1499, UHF line at $7.08/100 ft. dealer net . . . No. 3027, cascade pre-amplifier at $19.95 dealer net and No. 3028, signal slicer at $29.95 dealer net.

ILLINOIS RESEARCH LABS. — Added Silencer in quart size at $6.50 dealer net and introduced Sta-clear, new chemical solution for keeping static attracted dust from accumulating on picture tube at $1.00 dealer net. (4 oz. bottle).

KENWOOD ENGINEERING — Added Model 12W, 12" wall bracket and Model 7W, 7" wall bracket.

MERIT TRANSFORMER — Added Model HVO-11, transformer at $5.40 dealer net.

MINNESOTA MINING — Added 7" (1200') professional reel and box (plastic) at $1.25 list.

RADIO CITY PRODUCTS — Added a number of new items including Model 345, super vacuum tube voltmeter at $47.50 dealer net and Model 8873, TV servishop at $139.95 dealer net.

R.C.A. — Added radio receiving tubes 6AR5 at $1.65 list . . . 6AX4GT at $2.40 list and 6K8G at $3.30 list. Also added electron tubes 3C45 at $17.80 list . . . 91 at $30.00 list . . . 5718 at $8.65 list and 6211 at $2.95 list.

RAYTHEON — Added 6AH6V, radio receiving tube at $3.90 list, a miniature sharp cut-off pentode having high transconductance and low input and output capacitances, and is designed specifically for television amplifier applications.

REEVES SOUNDCRAFT — Added soundcraft 45 rpm recording disc at $.66 dealer net.

STANDARD TRANSFORMER CORP. — Added deflection yokes Model DY-11A at $6.00 dealer net and Model DY-12A at $6.00 dealer net.

STROMBERG-CARLSON — Added a number of new items including No. AP-51, power amplifier at $157.50 list and TR-13, line transformer at $3.50 list.

SYLVANIA — Added radio receiving tubes 6T4 at $3.55 list . . . 1XRB at $2.65 list . . . 40B2 at $2.05 list . . . 6SN76TA at $2.20 list and sub-miniature tubes 1T6 at $2.05 list . . . 6BF7 at $1.85 dealer net and 6BG7 at $1.85 dealer net.

(Continued on page 24)

Thomas A. White

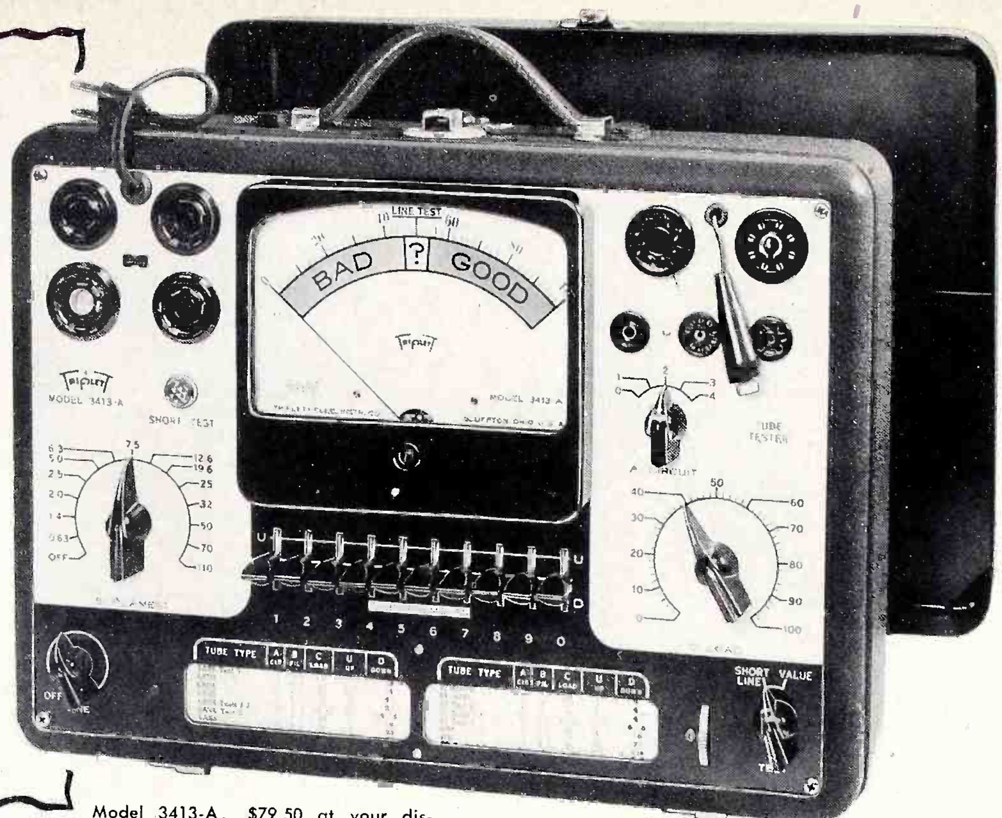
president: Jensen Manufacturing Company, Chicago, Illinois

says: "In every field there's one leader

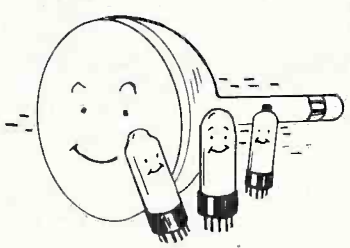
---- in boosters it's Regency"

the largest selling booster at any price

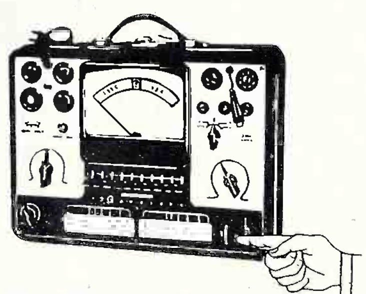
For accurate flexible and quick tube testing at low cost... model 3413-A



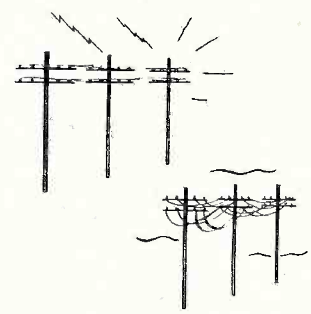
Model 3413-A . . . $79.50 at your distributor. (Price subject to change.) BV Adapter, $7.90 Add'l.



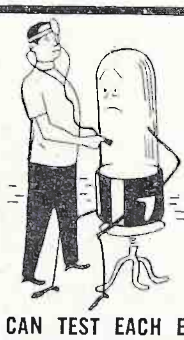
1. YOU CAN TEST MORE TYPES of tubes, also appliances for shorts and open circuits.



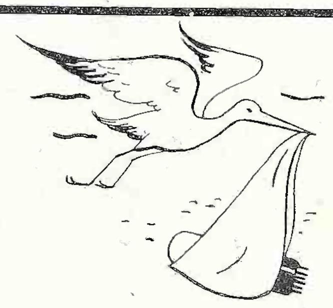
2. JUST SPIN THE KNOB—for correct, last-minute data, on the speed roll chart. Lists 700 tubes.



3. YOU CAN COMPENSATE for line voltage—just throw snap-action switch.



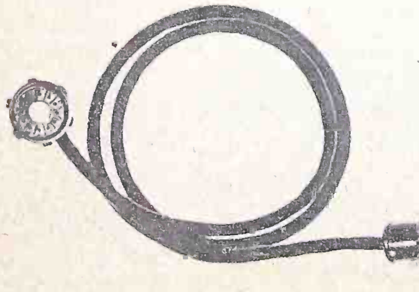
4. YOU CAN TEST EACH ELEMENT in each tube—by a simple flip of the switch.



5. YOU CAN TEST THE NEW TUBES—including those with low cathode current.

6. YOU GET NEW TUBE DATA—immediately, while it is still news. No waiting.

Nearly Half a Century of Service to the Service Man



TESTS PICTURE TUBES, TOO! *With this BV Adapter, Model 3413-A tests every tube in a TV receiver,* including *the Picture Tube—without even removing tube from receiver or carton! Saves time!*

FOR THE MAN WHO TAKES PRIDE IN HIS WORK

Triplett

TRIPLETT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO, U. S. A.

Replacement Parts

(Continued from page 20)

with the standard value of say 0.002 μf (which is within tolerance of the original) is contemplated, what must be its tolerance? If it conforms with standard industry practice, namely ± 20 percent, then it could have any value between 0.0016 μf and 0.0024 μf. Obviously it would be within tolerance on the high side but not on the low side.

Suppose that the contemplated replacement rated at 0.002 μf was within a ± tolerance of 10 percent, what then? On the low side it would have a value of 0.0018 μf and on the high side it would be 0.0022 μf. Again it is within tolerance on the high side but outside the tolerance on the low side.

Suppose we consider the next higher standard value, say 0.0025 μf for the replacement. Would any normal tolerance satisfy? With a rating of ± 10 percent, the low limit would be 0.00225 μf and the high limit would be 0.00275 μf. Now the contemplated replacement is within tolerance on the low side but beyond tolerance on the high side . . . Is there any answer?

Of course there is! But before we describe it, we might present another practical question – how important is the capacitance tolerance? . . . A simple reply is to say that it all depends on the circuit where the capacitor is used. But this is a very indefinite answer. We know that bypassing capacitance values are not as important as capacitance values related to time constant circuits, or resonant circuits or coupling circuits. But does it make sense to set up a tolerance on the tolerance in each and every particular application of a capacitor? . . . To do this involves something else – namely complete knowledge concerning the conditions established by the design engineer in every section of a television receiver which he designed . . . This is very difficult to determine. It is much easier to recognize the requirements established in the design of the receiver as indicated by the constants of the capacitor, and to satisfy these requirements of capacitance and capacitance tolerance.

To do this is simple. It means nothing more than the procurement of a capacitor rated at the same nominal capacitance and capacitance tolerance as the original. This is no problem because design engineers are using standard values, and capacitor manufacturers, are making them. We admit that procurement practice of this kind for replacement purposes is somewhat of a departure from past tactics, but to adopt it makes most sense, because it enhances the possibility of making the proper repair and attaining best performance from the receiver.

The above suggestion to follow the capacitance tolerance stipulated for the original is subject to some qualifications, especially in the case of paper dielectric and electrolytic capacitors. Some of the tolerance percentages are different for the + side than for the – side, as for example + 60 percent and – 20 percent. In that event a variety of selections is available. Assuming the same nominal value of capacitance, say 0.005 μf for the original and the contemplated replacement component, a replacement rated at any value of + tolerance between 0 and 60 percent and – tolerance between 0 and 20 percent obviously is suitable.

But the leeway for selection is even greater than described. With a 60 percent tolerance on the + side, the upper limit is 0.008 μf. On the – side, it is 0.004 μf. Under the circumstances, any standard value of capacitance which, with its rated tolerance limits falls within these two extremes of capacitance, is suitable as a replacement as far as capacitance is concerned. Naturally, any capacitor whose *measured* values fall within these limits is satisfactory capacitance-wise.

The use of + 60 percent and – 20 percent as capacitance tolerances are purely illustrative. It could just as soon be + 100 percent and – 10 percent, as in some electrolytic capacitors. The same reasoning applies to *any* other set of capacitance values established by the tolerance limits for any type of capacitor. The more liberal the capacitance tolerance figures, the easier is it to find a suitable replacement in terms of capacitance. It is only when the capacitance is relatively small, say between 10 $\mu\mu$f and 100 $\mu\mu$f and the tolerance is severe, say 5 percent or even 10 percent in both directions – that it becomes difficult to find a replacement other than one which parallels the original in nominal capacitance and tolerance. Occasionally this happens with higher values of capacitance.

Two other items warrant comment, even if not complete at this time. One of these pertains to possible misinterpretation of these references to satisfying the capacitance requirement. This should not be construed as implying that as long as this constant and the tolerance constant requirements are met, free interchangeability exists between capacitor types. This is not so, for reasons which will become evident when the other constants are discussed.

The second item is a slight elaboration of a point already raised concerning capacitors rated at 10 $\mu\mu$f and less. There isn't too much margin in these values for the selection of one standard value for another, based on the capacitance tolerance. One or two micromicrofarads do not seem like too much capacitance but when dealing with very small values to begin with, they represent high percentages. Moreover the selection of these small values is based on engineering requirement, and it is best servicing practice to comply with these needs, even if the reasons for their existence are not immediately apparent.

Radio's Master Reports

(Continued from page 20)

TRICRAFT PRODUCTS — Added Model U-1, UHF antenna at $7.50 dealer net.

TRIPLETT ELECTRICAL INSTR. — Added No. 9989, signal tracing probe at $9.50 dealer net, for use with Model 3441 TV-FM oscilloscope and BV adaptor for TV picture tube tests at $7.90 dealer net.

TV WIRE PRODUCTS — Added new series, formvar covered copperweld, at $4.72 dealer net, per 100 feet and at $47.21 dealer net, per 1000 feet.

VACO PRODUCTS — Added No. RT-14, handy service kit, complete with 7 nut drivers, 2 Philips and 3 regular drivers plus extension piece at $7.34 dealer net.

WEBSTER-ELECTRIC — Added No. 90-25, separate teletalk amplifier for paging at $120.00 list and 15 pair plastic interstation cable and junction box at $.34 list (on reel).

Discontinued Items

ADVANCE ELECTRIC & RELAY — Discontinued Model 400M, transmitter relay.

AMERICAN PHENOLIC — Discontinued Model 14-358, twin lead transmission wire . . . Model 187-072 and Model 187-079, molded polethylene rims and Model 509, rotator. Model 14-298, 100, 500, 1000 feet, remote control wire, temporarily discontinued.

CLAROSTAT — Discontinued wire wound control 43-7000.

ELECTRONIC TECHNICAL INSTITUTE — Discontinued Model 5207, Novice 80-M transmitter kit.

GENERAL ELECTRIC — Discontinued Model RPX-046, broadcast type variable reluctance cartridge. Also discontinued G-10 series of transistors.

GON-SET — Discontinued Model 3005, tri-band amateur converter and their Gonset radarray series.

KENWOOD ENGINEERING—Discontinued Model 140, 7" wall bracket.

POTTER & BRUMFIELD — Discontinued LC and LP series of plate circuit relays.

SHURE BROS. — Discontinued Model 55 and Model 556, multi-impedance, super-cardiod microphones.

SIMPSON ELECTRIC — Discontinued Model 340, signal generator.

STROMBERG-CARLSON — Model RD-22, driver unit, discontinued.

SUPREME, INC. — Discontinued Model 675, signal generator.

WEBSTER-ELECTRIC — Discontinued Model 53D50, teletalk amplifier for paging and Model 5C45, speaker microphone.

WIRT PRODUCTS — Discontinued auto radio ignition suppressors S-915 and S-918.

Price Increases

ASTATIC CORP. — Increased price on "scanafar" booster, Model CT-1 to $21.00 dealer net.

BLONDER-TONGUE — Increased price on Model MT-1, matching transformer to $3.90 dealer net.

CORNELL-DUBILIER — Increased price on Model 8BD, "hi-ball" auto aerial to $3.03 dealer net.

DUMONT LABS. — Increased price on two 12", one 16", four 17", four 20", and three 21" TV picture tubes.

FISHER RADIO CORP. — Master audio control, Model 50-C, increased to $97.50 dealer net.

GENERAL ELECTRIC — Radio receiving tube 6BA7 increased to $2.50 list. Also increased one 12", three 17", one 20" and one 21" TV picture tubes.

GON-SET — Increased price on Model 1531, rhombic UHF antenna, with 9' mast to $7.77 dealer net.

HICKOK ELECTRICAL INSTR. — Increased price on Model 605, portable all-purpose tube and set tester to $184.50 dealer net.

R.C.A. — Increased price on Model WO-88A, 5" oscilloscope to $169.50 user price. Also increased power tube fittings 202F1 to $23.85 user price . . . 211F1 to $28.20 user price and 228F1 to $67.60 user price.

STROMBERG-CARLSON — Increased price on a number of items including No. MD-38S, dynamic microphone to $70.00 list.

SYLVANIA — Increased price on three 17", two 20" and one 27" TV picture tube.

V-M CORP. — Increased price on record changers No. 150 to $33.47 dealer net . . . No. 972 to $40.17 dealer net and No. 985 to $53.57 dealer net. (West Coast prices slightly higher)

Price Decreases

CREST LABS. — Decreased price on cathode ray tube rejuvenators Model B to $3.15 dealer net . . . Model C to $2.20 dealer net and Model D to $2.60 dealer net.

ELECTRONS, INC. — Decreased price on grid control rectifier EL C6M to $31.00 dealer net.

GENERAL ELECTRIC — Decreased price on TV picture tubes 16KP4 and 16KP4A.

GON-SET — Decreased price on Gonset line to $6.24 dealer net/100 feet.

R.C.A. — Decreased price on radio receiving tube 6L6G to $3.00 list and electron tube 5654-t to $4.90 list.

WIRT PRODUCTS — Decreased price on slide switches SW 723 to SW 726.

INDEX OF CHANGES

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