March 1941

Radio SERVICE DEALER

This Month

RESETTING PROBLEMS

LOG-SCALE METER

B-C FREQUENCY LIST

NEW F-M RECEPTOR

TESTING CONDENSERS

Price 25¢

RE-SET PUSH BUTTONS THE *Rapid* WAY!

RCA Station Allocator

Covers all push-button setting and alignment work. Operates from either self-contained batteries or a-c.
Stock No. 171—Price **$17.50**

The RCA Station Allocator is an indispensable instrument for the service dealer who really plans to "cash in" on his greatest business-building opportunity in years. With it, you can handle more push button receiver re-tuning jobs in less time, with less effort and at greater profits. Moreover, it will serve as a useful shop instrument long after the present re-allocation is forgotten.

The Allocator is speedy, accurate, portable. Eight push buttons can quickly be set up to desired frequencies. Operation is with or without modulation. It then serves as an oscillator for rapid identification of desired stations during the re-tuning of receivers. Two buttons can be tuned to i-f frequencies if desired, thus providing remarkable flexibility for all alignment as well as push-button setting work. The Allocator operates from either a-c or self-contained batteries.

Only one adjustment is required for each frequency. What's more, thanks to the Allocator's magnetite core inductances and polystyrene condensers, these adjustments *stay put.* Weight is only 5½ lbs. with batteries. Size is 5" high, 8⅞" long and 3⅝" deep.

See the Allocator at your RCA Test Equipment Distributor's today. Prepare now for faster work and bigger profits!

SPECIFICATIONS

PUSH-BUTTON RANGES:

Buttons 1 and 2	(approximately)	405-825 kc.
Buttons 3, 4, and 5	"	600-1185 kc.
Buttons 6, 7, and 8	"	820-1700 kc.

TUBE COMPLEMENT:

1 RCA-1R5 as r-f oscillator, 1 RCA-6H6 for a-c rectification, 1 neon tube for a-f oscillator and pilot lamp.

Another RCA Time-Saving Money-Maker

RCA Junior VoltOhmyst

Costing only a little more than an ordinary volt-ohmmeter, the RCA Junior VoltOhmyst gives you electronic push-pull operation with all the time and money-saving features of the famous Rider VoltOhmyst circuits plus the addition of an isolated rectifier-type a-c voltmeter! Special protective features guard against meter burn-out for d-c volts and ohms measurements. It is an instrument no wide-awake technician can afford to miss!

Price, Complete **$34.95** *Stock No. 165*

RCA *Test Equipment* *YOUR KEY TO SYSTEMATIC SERVICING FOR GREATER PROFITS*

RCA BROADCAST EQUIPMENT — From microphone to antenna

RCA MANUFACTURING CO., Inc., Camden, N. J. • A Service of the Radio Corporation of America

In Canada: RCA VICTOR COMPANY, Ltd., Montreal

Radio
SERVICE-DEALER
SOUNDMAN AND JOBBER
Reg. U. S. Pat. Off.

Ad Index

Contents

Cover Photo

★ National Defense has brought on a shortage of trained personnel in all branches of radio. To relieve this condition, Lear Avia, Inc., Dayton, have inaugurated a free vocational training program for its employees. Shown is Paul H. Nelson, Lear Avia's director of education, lecturing on radio wave propagation.

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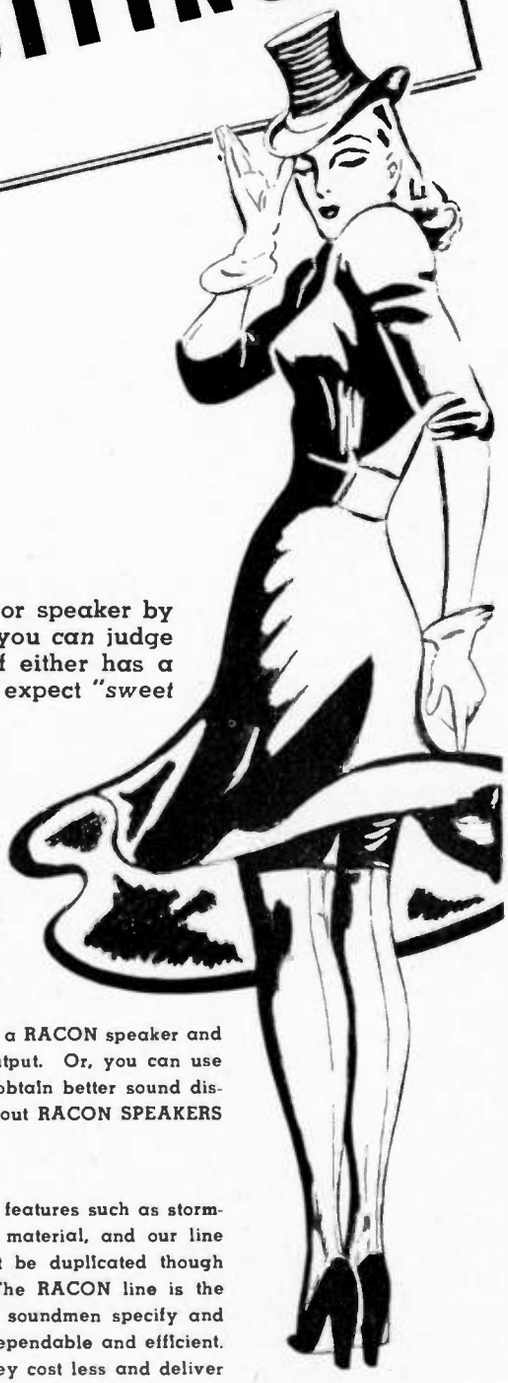
VOL. 2 No. 3 ★ MARCH, 1941

Curves are EXCITING!

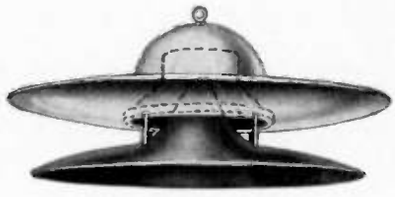


You can't judge a girl or speaker by their covering . . . but you *can* judge 'em by their curves. If either has a "sweet" curve you can expect *"sweet results."*

Many horns look like RACONS but none have comparable curves or range. Only RACON speakers deliver *maximum output* and response for the size of driving unit used. Yes, you can put less wattage into a RACON speaker and obtain greater, undistorted output. Or, you can use fewer RACON speakers yet obtain better sound distribution. Those are facts about RACON SPEAKERS that must not be overlooked.

RACON'S patented, exclusive features such as stormproof, weatherproof acoustic material, and our line of unbreakable horns cannot be duplicated though they are oft-times copied. The RACON line is the only *complete* line. Leading soundmen specify and use them because they are dependable and efficient. They cost no more, in fact they cost less and deliver more in the way of satisfaction and profit.

Ask your Jobber for a new catalog or write us direct



RADIAL CONE SPEAKERS

Types for high fidelity, giving even intensity sound projection over a circumference of 360° radially. Upper deflector made of heavy gauge aluminum, cone covering of steel, and lower deflector of RACON ACOUSTIC material stormproofed for all weather conditions. Models for 5"—6"—10"—12" cone speakers.

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A compact trumpet of the double re-entrant type. Occupies but a small space, nevertheless has a long air column enabling it to deliver highly concentrated sound of the greatest efficiency over long distances. Base and inside cone arm made of aluminum castings, outside bell of heavy gauge aluminum spinning, center section of RACON ACOUSTIC material to prevent resonant effects. Available in 6', 4½', 3½' and 3' air column units.

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RACON ELECTRIC CO. 52 EAST 19th ST. NEW YORK, N. Y.

Transients

MOVING DAY . . . The majority of U. S. broadcast stations occupying the standard band will change frequency March 29th. To assist you in making proper re-adjustments of push-button settings, and as an aid to your customers who own manually-tuned sets, we have published in this issue the complete list of stations with their present and new frequencies, arranged alphabetically by states. The list is corrected up to February 1st, 1941.

As a further aid to smooth moving, we are pleased to offer an article dealing with a few problems that may arise in your re-setting work. The article was prepared by Lynne Smeby, Director of Engineering of the National Association of Broadcasters.

Mr. Smeby's article brings up a point that may have escaped you; i.e., that some difficulties may be encountered in manually-tuned receivers. These difficulties and their cure are adequately covered.

One other point is worth keeping in mind: Some of the receivers you re-set or otherwise adjust may be equipped with wavetraps to reduce interference from a strong local. Better watch for them, as they'll require readjustment, too.

For all of the publicity Radio Moving Day has been given and will be given up to the deadline, there will be thousands of listeners who will not know of the approaching changes. Their natural impulse will be to phone the first broadcast station they cannot find in its usual place on the dial or push button. Hence, the broadcast stations are going to have their hands full explaining things to irate set owners.

The situation will be eased somewhat if you make a mailing to all regular and potential customers in your locality. May we also suggest that you advise the local broadcast stations of your existence, for it may be that they will wish to provide phoners with the names and addresses (or phone numbers) of servicemen in their neighborhood.

BACKLOG. . . Each serviceman will have to determine for himself the manner in which he will handle Moving Day calls. If there are a large number—and we suspect there will be—it will be wise where possible to check and replace poor tubes, diagnose possible receiver faults and make minor repairs on the spot, but delegate major repairs to a later date. In such cases where diagnosing and repair can be put off to a less hectic period, the serviceman can gain that much more time in which to complete his re-setting work. Repair jobs, where haste is not important, will serve as a very nice backlog for the months to follow. Let us caution you, however, to keep an accurate record of all call-back work. A forgotten customer is lost forever.

There is one other potential backlog worth cultivating. When the station frequencies are changed, some owners of push-button sets will attempt to do the re-setting themselves and make a botch of it; others will give up the push buttons and go back to manual tuning. Many listeners having manually-tuned receivers will experience i-f interference and possibly the loss of a favorite station off the high-frequency end of the dial. Hence, a clean-up campaign after the re-setting jobs are out of the way should be highly productive. The average person is curiously slow in having anything done about minor faults; therefore the necessity of going after this type of business.

★

LOOP SETS . . . We know of an instance where, for months, five owners of loop receivers on the first floor of an apartment building heated by an oil burner, suffered an ungodly racket from the ignition system because, as each thought, the receiver required no aerial. *And "radio outlets" were available in each apartment!*

Loud complaints were made to the superintendent, who finally got a "radio man" in to look over the situation. The "situation" boiled down to the simple fact that, though equipped with filters and suppressors, there was some direct radiation from the burner's electrical system which was aggravated by the loop receivers in question running wide open, due to low field strength. The "radio man" connected the receivers to the radio outlets, and now everyone is happy.

We do not believe this is an isolated case, and we attribute its cause not so much to an inclination on the part of the consumer to take all sales statements literally, but rather to his disinclination to read instruction sheets. The latter, presumably are pieces of paper to throw away with the wrappings. We can only assume that, not being technically-minded, it never occurred to a single one of these "loopers" to at least give the radio outlet a try.

We venture to say that there are any number of situations similar to the foregoing just itching to be corrected by the serviceman who will make it his business to canvass apartment buildings. They're all noise infested for one reason or another. And the radio listener is long-suffering, until cornered.

★

DEFENSE PRIORITIES . . . There is already a definite shortage of certain raw materials in the consumer-products end of the radio industry. Other shortages will most certainly develop as time passes. Production of receivers and parts for the consumer market may be drastically reduced. Some manufacturers may cease consumer production altogether, for the "duration."

Receivers may become scarce, in which case prices will rise; or they may not be available at all. In either case, present receivers will have to suffice for most people. Should this come to pass, the number of receiver failures will skyrocket.

If, at the same time, certain components become difficult to obtain in all their present replacement variations, the serviceman will have to rely upon his own ingenuity.

In any event, the servicing business will improve rather than deteriorate, no matter what the production situation may turn out to be.

EDITOR

INSTRUMENTS *that talk your language!*

Model 669
Vacuum Tube Voltmeter

Model 772
Super-Sensitive Anolyzer

Model 776
Oscillator

Model 697
Volt-Ohm-Milliammeter

Model 778
Serviset

Fundamental! Long Life! Lowest Overall Cost! More Profitable! Dependable Accuracy!

"We use WESTONS exclusively because we can make more money with fundamental instruments," says this successful serviceman. "One reason is the fact that fundamental instruments never have tc be replaced because of circuit changes or new developments. Furthermore, they remain trouble-free because they are simple, basic measuring tools, without trick circuits or troublesome gadgets. And when they are made by WESTON, you can bank on your measurements. With our group of WESTON instruments we're fixed for precise, profitable servicing for all time."

Be sure you get all the facts on the broad line of WESTON fundamental instruments for servicing radio receivers as well as communications and industrial circuits. Write to Weston Electrical Instrument Corp., 605 Frelinghuysen Ave., Newark, N. J.

WESTON
Radio Instruments

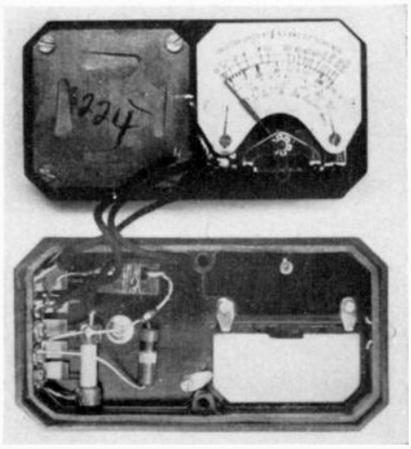
TEST IN PEACE

Logarithmic-Scale Voltmeter Requires No Switching To Read Wide Range of Voltages

By JACOB RABINOW, E. E.

WHAT are the qualities of an ideal radio service meter? That, of course, depends on the views and necessities of the one who works with it. The writer, for instance, after considerable experience, wanted to possess a voltmeter with logarithmic scales. Such an instrument could be made to require no switching for reading the various voltages commonly encountered in radio service work.

For instance, such a logarithmic volt scale could have a full-scale value of 1000 volts. It would read 100 volts at two-thirds of full scale, and 10 volts at one-third of full scale. The very bottom of the scale could be linear to give an ordinary zero reading. In this way all radio receiver voltages could be read to the *same percentage* of accuracy without



The light-meter opened out, showing placement of resistors and tip jacks.

touching a switch and without the danger of putting a high voltage on a low-voltage scale.

A current range of about 200 milliamperes would be adequate to cover the usual service needs in the same way.

THE IDEA

Now, such logarithmic meter movements are only manufactured for *linear db* meters and are not generally available. So it was that, while playing with a Weston photographic exposure meter, an idea, or a couple of ideas, struck the writer.

In the first place, an exposure meter has a modified logarithmic scale; secondly, this meter is very sensitive, and thirdly it is very compact. So the exposure meter was taken apart. As suspected, the pole pieces were shaped so as to give great sensitivity at the low end of the scale and low sensitivity at the high end. The total resistance was found to be about 2000 ohms, and the full-scale current about 200 microamperes. When the photo-cell is disconnected from the meter, the movement is not sufficiently damped. Different shunts were tried. Finally it was decided that the photo-cell itself would make the best shunt.

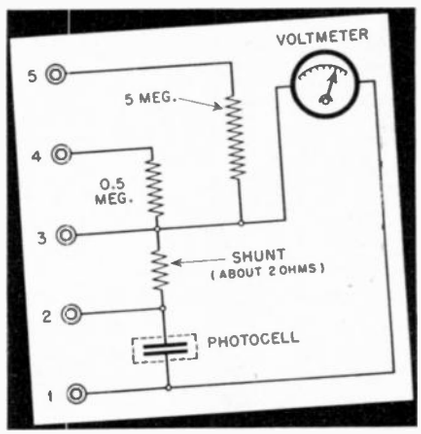
Here another bit of luck showed itself. The resistance of the cell is about 10,000 ohms in the desired direction. (The cell is a rectifier. The idea of making this an a-c meter using this photo-cell as a rectifier occurred to the writer, too. However, a bridge rectifier is necessary for this, and it was decided to leave well enough alone.) Thus the shunting action of the cell is that of 10,000 ohms, but the damping action is considerably better than that. This is so because the swing of the meter needle produces a.c. in the coil and the reverse current is shunted by 2000 ohms.

It was found that there was enough room in the meter case for the necessary multipliers and shunts to make up a versatile radio instrument.

The wiring diagram illustrates the connections. The voltage scale was calibrated only for the 500,000-ohm resistor, that is, up to 200 volts. The 5-megohm resistor gives a scale ten times that, or 2000 volts. The writer doubts that the close spacing of the contacts would tolerate such voltages, and did not wish to check up.

Thus, voltages less than 10 volts can be read with a resistance of 5 megohms.

The middle scale is from 0 to 200 mills, using a home-made shunt of about



Revised circuit of the light meter. Terminals 1 to 5 are the tip jacks.

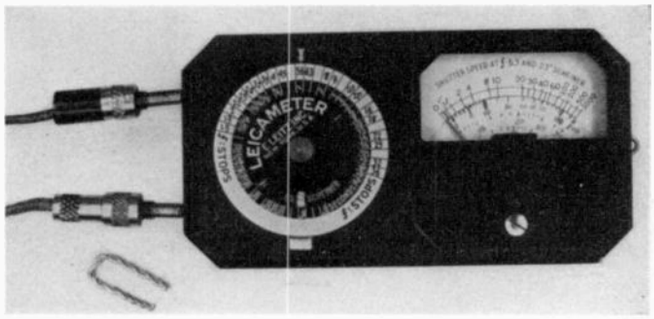
2 ohms. It was adjusted after the job was assembled. A range of 0 to 400 microamperes is also provided by the meter itself, shunted by the photo-cell.

CONSTRUCTION

Now for the actual construction. The contacts for the test leads were made of phosphor bronze strips bent into right angle shapes. The mounting screw of each fastens one leg of these angles while the test lead prods slide under the other. The holes for the test prods were drilled so that the prods lie against the inner surface of the cover.

One connection between the photo-cell and the meter movement was broken and three flexible leads were soldered or screwed down, as follows: One to the wire lead between the photo-cell and the meter, one to the photo-cell back-plate, and one to the meter. The other ends of the leads go to the components mounted in the cover.

(Turn to page 23)



The completed log-scale voltmeter with its new voltage and current calibrations. The U-shaped wire is a jumper.

Set of the Month—

MEISSNER F-M RECEPTOR

AN outstanding example of progress in the design of f-m receivers is the new Meissner Model 9-1047 Frequency Modulation Receptor. It definitely indicates a trend in engineering advancement spreading out in four directions: 1) circuit rationalization, 2) circuit simplicity, 3) ease of alignment and, 4) reduction in cost.

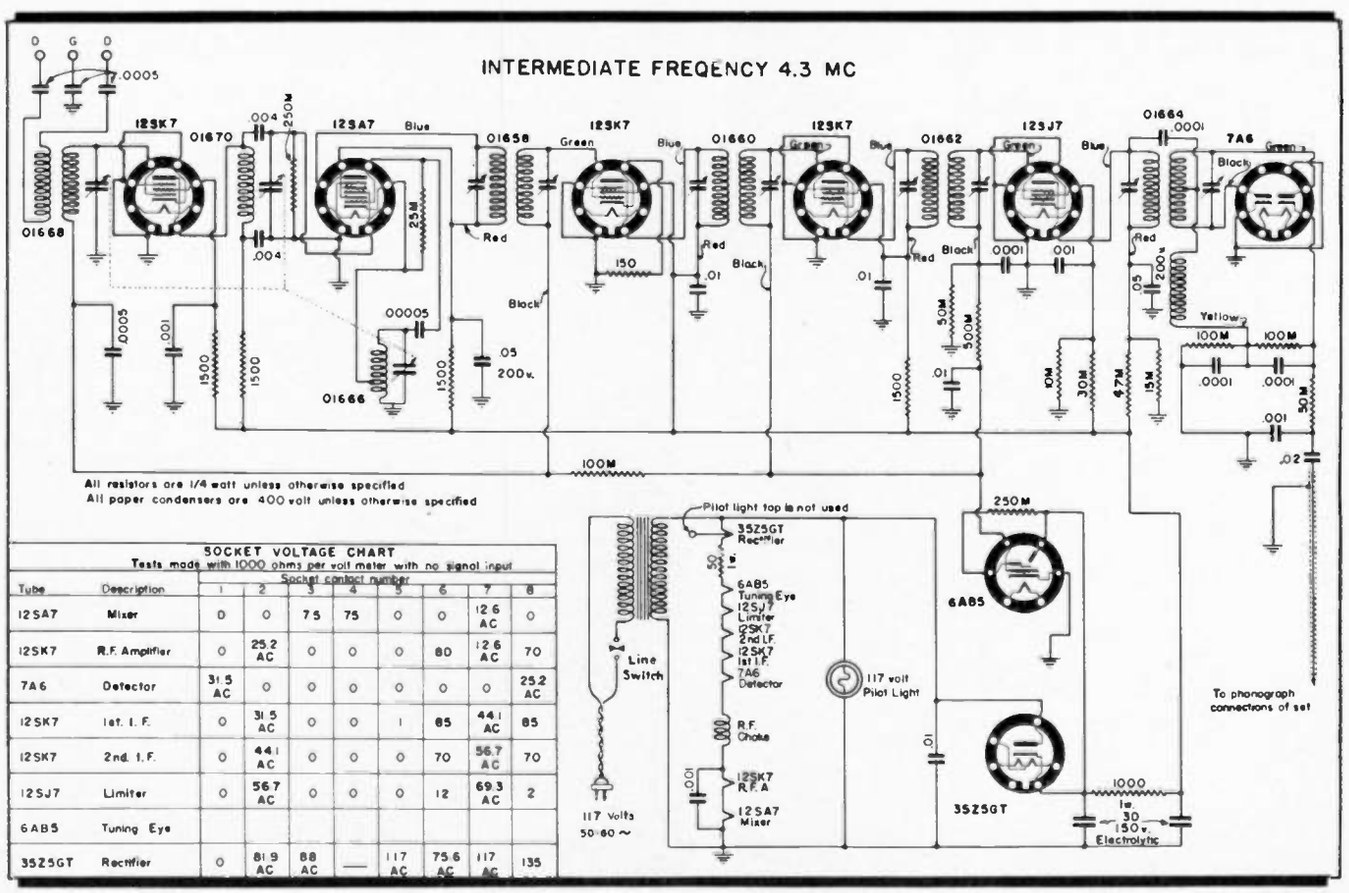
The circuit has been rationalized by using standard, inexpensive tubes with 150-ma heaters, medium gain i-f transformers with somewhat reduced bandwidth, and by operating the oscillator at a frequency below that of the r-f signal. This fundamental design eliminates a considerable amount of circuit gingerbread, such as r-f and i-f transformer loading resistors and the usual array of decoupling filters. The low-drain tubes employed permit the use of a simple power supply and series heater connections. By virtue of the reduced bandwidth—100 kc at 70 percent response—the i-f amplifier can be aligned with an unmodulated i-f signal. Furthermore, the overall simplicity in design has served to reduce the cost considerably.

The Receptor has a power consumption of 30 watts at 117 volts a.c. The tuning range is 40.5 to 50.5 mc. The sensitivity is 15 microvolts average. A tuning eye is incorporated in the dial scale, as shown in the accompanying photo.

THE CIRCUIT

Though of typical ac-dc design, the Receptor is intended for a-c operation only. The use of a 1-to-1 power transformer isolates all circuits from the line and eliminates the problems that would otherwise exist in attempting to connect an ac-dc unit to an ac or ac-dc receiver chassis. The secondary of this transformer is shunted by the heater string and a separate 117-volt pilot light. Also in series with the heater string is a 50-ohm dropping resistor which offers protection against surges, and an r-f choke which, in conjunction with the .001-mfd condenser shunting the heaters of the 12SK7 r-f tube and 12SA7 mixer, serves to eliminate hum modulation.

(Turn to page 25)



SOCKET VOLTAGE CHART
Tests made with 1000 ohms per volt meter with no signal input

Tube	Description	Socket contact number 1	2	3	4	5	6	7	8
12SA7	Mixer	0	0	75	75	0	0	126 AC	0
12SK7	R.F. Amplifier	0	25.2 AC	0	0	0	80	126 AC	70
7A6	Detector	31.5 AC	0	0	0	0	0	0	25.2 AC
12SK7	1st. I. F.	0	31.5 AC	0	0	1	85	44.1 AC	85
12SK7	2nd. I.F.	0	44.1 AC	0	0	0	70	56.7 AC	70
12SJ7	Limiter	0	56.7 AC	0	0	0	12	69.3 AC	2
6AB5	Tuning Eye								
35Z5GT	Rectifier	0	81.9 AC	88 AC	—	117 AC	75.6 AC	117 AC	135

Frequency Reallocation Servicing Problems

Moving-Day Shifts May Cause I-F Heterodynes And Other Receiver Troubles

By LYNNE SMEBY

Director of Engineering, National Association of Broadcasters

THE reallocation of the frequencies of most of the broadcast stations brings out four problems in connection with receivers. These four problems will be discussed in turn.

1A—If a station with a strong signal intensity happens to be operating on double the frequency of the intermediate frequency of a receiver, there is liable to be a heterodyne whistle. The frequency of 455 kc has been used as the standard intermediate frequency on receivers manufactured in the United States. One main reason for selecting this frequency was that the broadcast frequency of 910 kc was assigned to Canada and, therefore, the possibility of a heterodyne note being produced on a receiver in the United States was at a minimum.

Under the terms of the reallocation several American stations will be moved to 910 kc thus producing a problem in the cities where these stations are to be located. If a heterodyne note is heard due to this cause the remedy is to shift the intermediate frequency to one side or another.

Appendix 1 lists the stations that will move to 910 kc.

1B—Even though a receiver is designed for an intermediate frequency of 455 kc, the heterodyne oscillator may be off enough so as to cause the type of trouble discussed in *1A* on the station operating with a frequency of 920 kc. The remedy for this situation is the same as *1A*.

Appendix 2 lists the stations that will be moved to 920 kc.

2—In order to provide enough broadcast frequencies so that a logical broadcast allocation structure could be set up among the North American countries, it was necessary to extend the standard broadcast band from 1500 to 1600 kc. It is estimated that the percentage of receivers that will not tune to 1600 kc is not very large. It is important where a receiver is within the range of one of the stations that will be in the 1500 to 1600 kc range that the receivers be converted to accept these stations. It is recognized that in some cases it may be uneconomical to attempt to extend the range of an old receiver and in some cases it may be difficult to do so. In most cases it is probable that the range can be extended satisfactorily by shifting the intermediate frequency and by changing the padding condensers on the tuning condensers.

Appendix 3 lists the stations that will be in the range from 1500 to 1600 kc.

3—It is estimated that there are ten million push-button receivers in use in the country and it will be necessary to reset the buttons on these receivers to the new frequencies. This should be done after March 29 so that the reset can be accomplished using the broadcast stations' signals rather than using a test oscillator.

The servicemen should make every effort possible to obtain advance orders for resetting push buttons so that after March 29 they can lay out regular call routes to follow, thereby making several calls on each trip out of the shop.

4—The fourth problem deals with changing the call letters on push buttons and dials. The call letters of push buttons can easily be changed because these are usually paper inserts. Many dials have the call letters of some stations stamped on them. In some cases it may be possible for the serviceman to obliterate the call letters of stations on dials where they do not conform with the station's operating frequency.

APPENDIX 1

910 kilocycles

KLX—Oakland, California
KPOF—nr. Denver, Colorado
KFKA—Greeley, Colorado
WSUI—Iowa City, Iowa
WFDF—Flint, Michigan
WCOC—Meridian, Mississippi
WGBI—Scranton, Pennsylvania
WQAN—Scranton, Pennsylvania
WJHL—Johnson City, Tennessee
KRRV—Sherman, Texas
WRNL—Richmond, Virginia
KVAN—Vancouver, Washington

APPENDIX 2

920 kilocycles

KARK—Little Rock, Arkansas
KTKC—Visalia, California
WGST—Atlanta, Georgia
WBAA—West Lafayette, Indiana
KFNF—Shenandoah, Iowa
WJAR—Providence, Rhode Island
KUSD—Vermillion, South Dakota
KFPY—Spokane, Washington
WMMN—Fairmont, West Virginia

APPENDIX 3

1510 kilocycles

WMEX—Boston, Massachusetts
WLAC—Nashville, Tennessee
KGA—Spokane, Washington

1520 kilocycles

WHIP—Hammond, Indiana
WKBW—Buffalo, New York
KOMA—Oklahoma City, Oklahoma
WPRP—Ponce, Puerto Rico

1530 kilocycles

KFBK—Sacramento, California
WCKY—Cincinnati, Ohio

1560 kilocyles

WQXR—New York, N. Y.

1590 kilocycles

WBRY—Waterbury, Connecticut
WALB—Albany, Georgia
KITE—Kansas City, Missouri
WAKR—Akron, Ohio

1600 kilocycles

KPMC—Bakersfield, California
WCNW—Brooklyn, New York
WWRL—Woodside, New York

Serviceman's Diary

By J. P. HOLLISTER

THURSDAY—It was eight o'clock by the time I brought the truck to a skidding stop in the drifted snow in the driveway by our shop. I was cold and hungry, but highly pleased with myself after having restrung fire antennas and collected a roll of bills at the Loving Arms Apartment. The thought of a hot dinner and a bit of chinning with the Little Woman practically brought a song to my lips.

Jerry was tipped back in his chair with his feet on the desk, snoring like an old spark transmitter.

"Hi," I shouted, "so you waited up for papa."

Jerry came to with a start. "Behold!" I said. "Neither wind nor rain nor snow shall stay this Radio Doctor from his appointed rounds—and let it be said that this stormy night, with snow adrifting high in the lanes of commerce, five families completely isolated from the outside world of radio are again in touch with the inevitable boxtops. And," I added, slapping the bills on the desk, "glad to pay for the privilege."

"Fine," Jerry said, rubbing his eyes. "We-all are tremendously proud of you. Never let it be said . . . "

"Nuts," I put in. "I'm cold and hungry. Let's close up shop and hit for home before this blizzard gets any worse."

Jerry stretched and gave me a cautious look. "Unfortunately," he sighed, collaping after the exertion, "we can't quite do that at the very moment. While you were out braving the elements, an emergency call came in, and never let it be said . . ."

"I'll see you in the morning," I interrupted, and started for the door.

"Now wait a minute," Jerry yelled, springing out of his chair. "You don't get this at all. That call we got came from none other than the Big Shot up on the hill."

"Not the Crutch King—not Grimsley?" I exclaimed.

"Grimsley himself," Jerry said. "Now listen—he phoned every other service shop in town, and not one of those babies will venture forth in the storm. So, was I to tell him the same thing? Why, Joe," he purred, putting an arm around my shoulder, "we've been after Grimsley's business for years, and here's our chance for clinching it."

"But, Jerry," I said, "these other guys are right. Chances are I'd never get the car up that hill, and even if I did. . . ."

"Who said anything about the car," Jerry laughed, slapping my back. "Be bright, fella. What is it that can get there and back when a car can't? *You,* Joe—tall, strong and handsome you!"

"Now, listen," I said, shaking his arm off my shoulder, "what do you think I am—a Postman? If you think . . ."

"But you just now said that nothing would stay us in our appointed rounds," Jerry said, in an offended voice. "Besides, if you discount the hill, it's only a short walk from here. Why, man, you can be there and back before I can say conversion transconductance."

"Well—"

"That's the spirit!" Jerry interjected. "I'll phone Grimsley right now and tell him you're on the way." He ran for the phone before I had a chance to change my mind.

By the time I hit the hill, the snow had stopped. It was so quiet you could have heard a microphone clicked into circuit.

And, somehow, it was eerie. The hill is covered with large pines and their brooding branches were drooping under the weight of the thick, wet snow. In the distance I heard what sounded like the baying of a hound—deep throated and ominous.

Well, I was cold and tired and hungry. And Belly Acres, old man Grimley's estate, had the bleakness of a Transylvanian countryside where vampires are alleged to roam after dark.

My own heavy breathing was the only sound that broke the silence when I reached the crest of the hill. I trudged through the deep snow toward the gateway which opened into the walled estate of the Crutch King, stopping now and then to quiet my drumming heart.

The iron gate was closed. I pushed it open and the hinges creaked from the cold. The warm lights in the house some hundred yards from the gate, looked good. I started down the path toward them.

I had gone no more than a few yards when the night air was rent by a high, piercing scream that sent cold chills up my spine. It was followed by the terrified voice of a woman screaming, "No, no—not that!"

Holding onto my cap, I started sprinting in the direction of her voice, yelling, "I'm coming—I'm coming!" at the top of my lungs.

(Turn to page 33)

I turned on my heels and sprinted toward the house, with the hellish sound close behind me.

THE thrilling rescue of James Lorentz from the tragic fate which overtook his climbing companion Gerald Hermann on Mount Hood a year ago next month was another example of the important part radio takes in directing organized work in the National Forests.

It is significant that the U. S. Forestry Service is a steady user of RAYTHEON Tubes. Their engineers have found that RAYTHEONS can be *depended upon* even for use in portable two-way equipment carried in packs over rough mountain trails for use in EMERGENCIES!

Replacing tubes in home receivers, auto sets and amplifiers may present easier problems, but the same dependable RAYTHEONS are available and *cost not one penny more* than ordinary tubes.

No wonder the ENGINEERS among Servicemen use them exclusively.

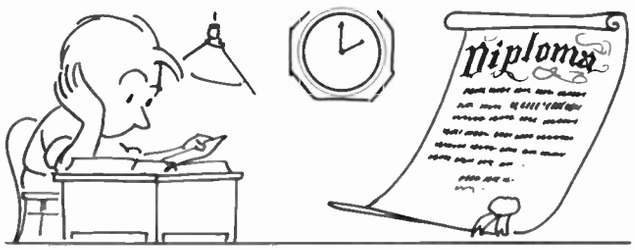
Over 9,000,000 push button radios must be reset for the new frequencies. This is a good time to replace weakened tubes with RAYTHEON and increase your service business in general.

WORLD'S LARGEST EXCLUSIVE RADIO TUBE MANUFACTURERS

IT COSTS $1000

To Service Your Radio

Unlike Topsy, your Radio Service-Dealer didn't "just grow". It cost him time and money — and plenty of study—to get where he is. For example:

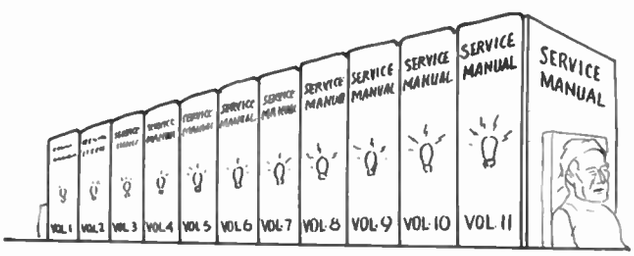


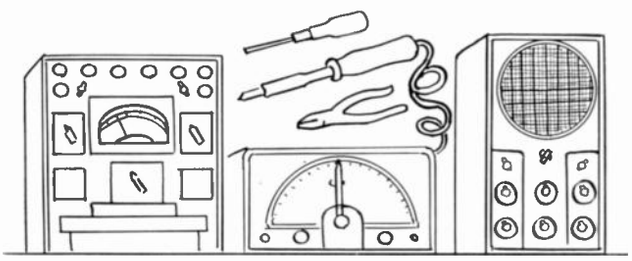
EDUCATION . . . **$250**

It cost him on the average of $250 for his preliminary education, and on the average of two years of his time to reach a point of proficiency. More than likely he served an apprenticeship after his education was completed.

SERVICING MANUALS . . . **$150**

When he first entered business, he spent an additional $150 on Text Books and a set of eleven huge Servicing Manuals containing data on the thousands of receiver models sold between 1920 and the present, any one of which he may be called upon to service at a moment's notice.



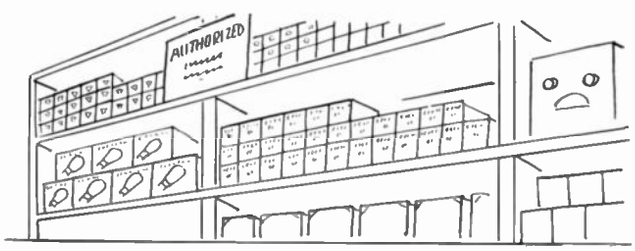


TEST EQUIPMENT . . . **$300**

Another $300 went for the tools of his trade—Set and Tube Testers, Signal Generators, Electronic Voltmeters, Cathode-Ray Oscilloscopes, etc. These, like the Servicing Manuals, were essentials.

INVENTORY . . . **$300**

On top of this, it was necessary that he invest in a stock of tubes, replacement parts and accessories adequate in numbers and types to repair the thousands of receiver models in use. This cost him another $300. Then, and only then, was he ready to "hang out his shingle" and become an established business man in your community. You can have confidence in him.



Printed in the Interests of Certified Radio Service-Dealers by RADIO SERVICE-DEALER MAGAZINE

SALES HINTS FOR SERVICERS

Fourth of a Series on the Certified Service-Dealer Plan

THREE cheers for Radio Moving Day! It arrives on March 29th and affords radio service-dealers with their greatest opportunity since the inception of broadcasting. Think of it, on March 29th over 10 million push-button type radio receivers—over a million of which are auto-radios—will require resetting if their owners are minded to obtain the full benefits of simplified push-button tuning. Of course, some set owners are going to try to reset their own receivers. Some will succeed, but the progressive radio serviceman will go after the business in an aggressive fashion and thus not lose any potential income. Here is a golden opportunity—don't let it slip by.

INVITATION

Literally speaking, Radio Moving Day will cause over 10 million set owners to open their doors to radio service-dealers, inviting them to "come in, reset the tuning device and see if everything is in order." But go a bit further, old man; clean the dirt film off the cabinet and fill in those nasty looking scratches. And, say—when you have finished up that push-button job, you might as well look at that bedroom set, and there's one in the kiddie's room, too.

Yes sir, the business will be there on Radio Moving Day, but you cannot trust to luck that it will seek you out. Much safer, *and profitable,* it is to go out after that business. Get it lined up pronto, for an actual order on the books is better than a dozen that you *may* get, if you're lucky.

Radio servicemen, taken as a whole, are more inclined to be idealists than opportunists. In other words, the average, legitimate servicer likes to do his work thoroughly, but he is rather reluctant to fight hard to get a large volume of business. In these days, one simply cannot be happy-go-lucky. You either get the job (and profit) or not. There is no in-between.

Now here is an example of how many very fine service-dealers in a Westchester, New York, community allowed the opportunity of a life-time to slip right through their fingers just one year ago.

The writer had luncheon with three radio engineers in a Westchester restaurant. Two weeks before there had been a "freeze squall." It had caused so much damage that it was reported in the newspapers as one of the most devastating industrial calamities in the history of Westchester. As the rain fell in torrents it froze. Telephone poles, thousands of trees, *and aerials* were crushed to the ground. Millions of dollars worth of damage, homes without light, heat, phone or radio service resulted.

In a short time all wire communication services were restored . . . but not radio reception that depended upon outside aerials. In fact, the several radio servicing organizations in that community simply took the storm as a matter of course and not a one of them made an effort to go after the vast amount of radio aerial reinstallation business that was so obviously at hand. In fact, during the luncheon in question, it came to light that *not once in three years* had any radio service-dealer called upon or phoned either of the three radio engineers or their friends unless they had been *invited* to do so. Many thousand dollars worth of radio repair work went undone because no one went after it. There should be no such repetition of lost profits come this Radio Moving Day.

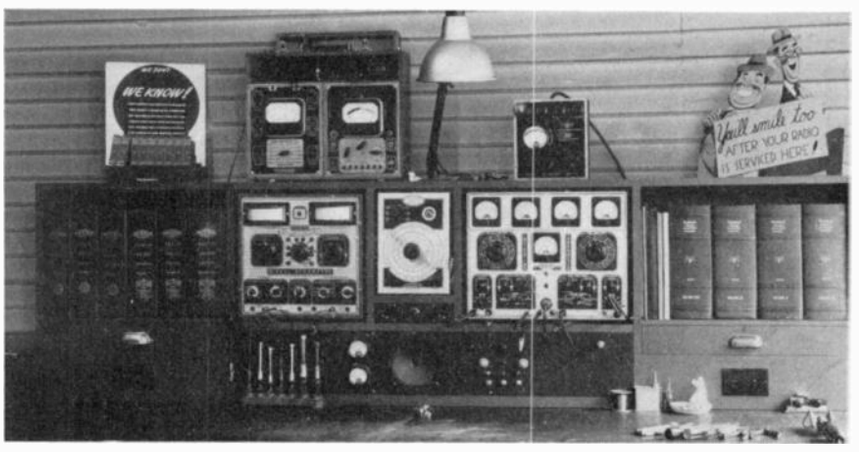
GETTING THE BUSINESS

Radio Moving Day arrives on March 29th and that is factual. But, how to go about getting the resetting business in your territory is another matter. You would feel rather silly, and you'd find it unprofitable, walking up and down streets, ringing doorbells asking whoever answered, "Got a push-button receiver that needs resetting?" That is *not* the way to get the business, for it is not systematic. Hundreds of calls would be "blanks." Either no one would be home or possibly whoever answered your ring would be afraid to let you in. On the other hand, not every one of the thirty million radio-equipped homes has a push-button type receiver.

Experts have analyzed the Radio Moving Day situation from every angle. To the National Association of Broadcasters we are indebted for much valuable assistance. Broadcast stations cannot afford to have 20% of the sets now in operation become semi-obsolete on March 29th. They will not gamble that set owners will voluntarily attend to the job of resetting of their own accord. American broadcast stations are anxious to give every legitimate radio service-dealer all possible cooperation.

The first thing that every service-dealer should do is to communicate with the Public Relations Manager of every broadcast station in or near his territory. Either phone or write. Give your name and address. Outline your business history briefly so that the broadcast

(Turn to page 34)



A town with a population of only 750 is able to support this well-equipped bench in the Brown Radio & Electric Shop, Convoy, Ohio.

RSD WINDOW PLACARD

Here is the second in a series of Placards designed to educate the consumer to a better understanding and appreciation of radio servicing as a business. Hang it in a prominent place where all your customers, and those passing your shop, can read it.

FREQUENCY REALLOCATION LIST

	KC Old	KC New
ALABAMA		
WHMA—Anniston	1420	1450
WAPI *—Birmingham	1140	1170
WBRC	930	960
WSGN	1310	1340
WMSL—Decatur	1370	1400
WAGF—Dothan	1370	1400
WJBY—Gadsden	1210	1240
WBHP—Huntsville	1200	1230
WALA—Mobile	1380	1410
WMOB	1200	1230
WCOV—Montgomery	1210	1240
WSFA	1410	1440
WMSD—Muscle Shoals City	1420	1450
WJHO—Opelika	1370	1400
WHBB—Selma	1500	1490
WJRD—Tuscaloosa	1200	1230
ALASKA		
KFQD—Anchorage	780	790
KFAR—Fairbanks	610	610
KINY—Juneau	1430	1460
KGBU—Ketchikan	900	930
ARIZONA		
KWJB—So. of Globe	1210	1240
KCRJ—Jerome	1310	1340
KSUN—Lowell	1200	1230
KOY—Phoenix	550	550
KPHO	1200	1230
KTAR	620	620
KYCA—Prescott	1500	1490
KGLU—Safford	1420	1450
KTUC—Tucson	1370	1400
KVOA	1260	1290
KYUM—Yuma	1210	1240
ARKANSAS		
KLCN—Blytheville	1290	1320
KFPW—Fort Smith	1370	1400
KTHS †—Hot Springs	1040	1090
KWFC	1310	1340
KBTM—Jonesboro	1200	1230
KARK—Little Rock	890	920
KGHI	1200	1230
KLRA	1390	1420
KELD—No. of El Dorado	1370	1400
KOTN—Pine Bluff	1500	1490
KUOA—Siloam Springs	1260	1290
CALIFORNIA		
KRE—Berkeley	1370	1400
KHSL—Chico	1260	1290
KIEM—Eureka	1450	1480
KARM—Fresno	1310	1340
KMJ	580	580
KMYC—S.E. of Marysville	1420	1450
KYOS—Merced	1040	1080
KTRB—Modesto	740	860
KDON—Monterey	1210	1240
KLS—Oakland	1280	1310
KLX	880	910
KROW	930	960
KVCV—So. of Redding	1200	1230
KFBK—Sacramento	1490	1530
KROY	1210	1240
KFRC—San Francisco	610	610
KGO	790	810
KJBS	1070	1100
KPO	680	680
KSAN	1420	1450
KSFO	560	560
KYA	1230	1260
KQW—San Jose	1010	740
KSRO—Santa Rosa	1310-CP 1320	1350
KGDM—Stockton	1100	1130
KWG	1200	1230
KTKC—Visalia	890	920
KHUB—Watsonville	1310	1340
KERN—Bakersfield	1380	1410
KPMC	1550	1600
KMPC—Beverly Hills	710	710
KXO—El Centro	1500	1490
KIEV—Glendale	850	870
KFOX—Long Beach	1250	1280
KGER	1360	1390
KECA—Los Angeles	780	790
KFAC	1300	1330
KFI	640	640
KFSG	1120	1150
KFVD	1000	1020
KFWB	950	980
KGFJ	1200	1230
KHJ	900	930
KMTR	570	570
KNX	1050	1070
KRKD	1120	1150
KPPC—Pasadena	1210	1240
KFXM—San Bernadino	1210	1240
KFMB—San Diego	CP 1420	1450
KFSD	600	600
KGB	1330	1360
KVEC—San Luis Obispo	1200	1230
KVOE—Santa Ana	1500	1490
KDB—Santa Barbara	1500	1490
KTMS	1220	1250
COLORADO		
KGIW—Alamosa	1420	1450
KVOR—Colorado Springs	1270	1300
KFEL—Denver	920	950
KLZ	560	560
KMYR	1310	1340
KOA	830	850
KPOF	880	910
KVOD	630	630
KIUP—Durango	1370	1400
KFXJ—Grand Junction	1200	1230
KFKA—Greeley	880	910
KOKO—La Junta	1370	1400
KIDW—Lamar	1420	1450
KGHF—Pueblo	1320	1350
KGEK—Sterling	1200	1230
CONNECTICUT		
WICC—Bridgeport	600	600
WNAB	CP 1420	1450
WDRC—Hartford	1330	1360
WTHT	1200	1230
WTIC	1040	1080
WNBC—New Britain	1380	1410
WELI—New Haven	930	960
WNLC—New London	1500	1490
WATR—Waterbury	1290	1320
WBRY	1530	1590
DELAWARE		
WDEL—Wilmington	1120	1150
WILM	1420	1450
DISTRICT OF COLUMBIA		
WINX—Washington	1310	1340
WJSV	1460	1500
WMAL	630	630
WOL	1230	1260
WRC	950	980
WWDC	CP 1420	1450
FLORIDA		
WMFJ—Daytona Beach	1420	1450
WPER—Deland	CP 1310	1340
WFTL—Fort Lauderdale	1370	1400
WFTM—Fort Myers	1210	1240
WRUF—Gainesville	830	850
WJAX—Jacksonville	900	930
WJHP	1290	1320
WMBR	1370	1400
WLAK—Lakeland	1310	1340
WIOD—Miami	610	610
WQAM	560	560
WKAT—Miami Beach	1500-CP 1330	1360
WTMC—Ocala	1500	1490
WDBO—Orlando	580	580
WLOF	1200	1230
WDLP—Panama City	1200	1230
WCOA—Pensacola	1340	1370
WFOY—St. Augustine	1210	1240
WSUN—St. Petersburg	620	620
WTSP	1370-CP 1350	1380
WSPB—Sarasota	1420	1450
WTAL—Tallahassee	1310	1340
WDAE—Tampa	1220	1250
WFLA	940	970
WJNO—West Palm Beach	1200	1230
GEORGIA		
WGPC—Albany	1420	1450
WALB	CP 1530	1590
WGAU—Athens	1310	1340
WAGA—Atlanta	1450	1480
WATL	1370	1400
WGST	890	920
WSB	740	750
WGAC—N. of Augusta	1210	1240
WMWH	CP 1420	1450
WRDW	1500	1490
WMOG—Brunswick	1500	1490
WRBL—Columbus	1200	1230
WMJM—Cordele	1500	1490
WBLJ—Dalton	1200	1230
WGGA—Gainesville	CP 1210	1240
WKEU—Griffin	1500	1450
WLAG—La Grange	CP 1210	1240
WBML—Macon	1420	1240
WMAZ	1180	940
WMGA—Moultrie	1370	1400
WRGA—Rome	1500	1490
WSAV—Savannah	1310	1340
WTOC	1260	1290
WPAX—Thomasville	1210	1240
WRLC—Toccoa	CP 1420	1450
WGOV—Valdosta	1420	1450
WAYX—Waycross	1200	1230
WDAK—West Point	1310	1340
HAWAII		
KHBC—Hilo	1200	1230
KGMB—Honolulu	590	590
KGU	750	760
KTOH—Lihue	1500	1490
IDAHO		
KIDO—Boise	1350	1380
KID—Idaho Falls	1320	1350
KRLC—Lewiston	1370	1400
KFXD—Nampa	1200	1230
KSEI—Pocatello	900	930
KTFI—Twin Falls	1240	1270
KWAL—Wallace	1420	1450
ILLINOIS		
WMRO—Aurora	1250	1280
WJBC—Bloomington	1200	1230
WKRO—Cairo	CP 1500	1490
WCAZ—Carthage	1070	1080
WDWS—Champaign	1370	1400
WAAF—Chicago	920	950
WBBM	770	780
WCBD	1080	1110
WCFL	970	1000
WCRW	1210	1240
WEDC	1210	1240
WENR	870	890
WGES	1360	1390
WGN	720	720
WJJD	1130	1160
WLS	870	890
WMAQ	670	670
WMBI	1080	1110
WSBC	1210	1240
WHFC—Cicero	1420	1450
WDAN—Danville	1500	1490
WSOY—Decatur	1310	1340
WTMV—East St. Louis	1500	1490
WGIL—Galesburg	1500	1400
WEBQ—Harrisburg	1210	1240
WJPF—N. of Herrin	1310	1340
WCLS—Joliet	1310	1340
WMBD—Peoria	1440	1470
WTAD—Quincy	900	930
WROK—Rockford	1410	1440
WHBF—Rock Island	1240	1270
WCBS—Springfield	1420	1450
WTAX	1210	1240
WDZ—Tuscola	1020	1050
WILL—Urbana	580	580
INDIANA		
WHBU—Anderson	1210	1240
WTRC—Elkhart	1310	1340
WEOA—Evansville	1370	1400
WGBF	1250	1280
WGL—Fort Wayne	1370	1450
WOWO	1160	1190
WIND—Gary	560	560
WHIP—Hammond	1480	1520
WJOB	1200	1230
WFBM—Indianapolis	1230	1260
WIBC	1050	1070
WIRE	1400	1430
WISH	CP 1280	1310
WKMO—Kokomo	CP 1420	1400
WLBC—Muncie	1310	1340
WGRC—New Albany	1370	1400
WKBV—Richmond	1500	1490
WFAM—South Bend	1200	1230
WSBT	1360-CP 930	960
WBOW—Terre Haute	1200	1230
WAOV—Vincennes	1420	1450
WBAA—West Lafayette	890	920
IOWA		
WOI—Ames	640	640
KFGQ—Boone	1370	1400
WMT—Cedar Rapids	600	600
WOC—Davenport	1370	1450
KWLC—Decorah	1270	1240
KRNT—Des Moines	1320	1350
KSO	1430	1460
WHO	1000	1040
KDTH—Dubuque	CP 1340	1370
WKBB	1500	1490
KVFD—Fort Dodge	1370	1400
WSUI—Iowa City	880	910
KFJB—Marshalltown	1200	1230
KGLO—Mason City	1210-CP 1270	1300
KBIZ—Ottumwa	CP 1210	1240
KFNF—Shenandoah	890	920
KMA	930	960
KSCJ—Sioux City	1330	1360
KTRI	1420	1450
KANSAS		
KVAK—Atchison	1420	1450
KGGF—Coffeyville	1010	690
KGNO—Dodge City	1340	1370
KTSW—Emporia	1370	1400
KIUL—Garden City	1210	1240

* Will operate on 1170 kc. pending adjustment of domestic problems.

† Divides time with KRLD nights on 1040 kc. and operates full-time on 1060 kc. days.

	KC. Old	KC. New
KVGB—Great Bend	1370	1400
KWBG—Hutchinson	1420	1450
KCKN—Kansas City	1310	1340
KFKU—Lawrence	1220	1250
WREN	1220	1250
KSAC—Manhattan	580	580
KOAM—Pittsburg	790	810
KSAL—Salina	1120	1150
WIBW—Topeka	580	580
KANS—Wichita	1210	1240
KFBI	1050	1070
KFH	1300	1330
KENTUCKY		
WCMI—Ashland	1310	1340
WLBJ—Bowling Green	1310	1340
WHLN—Harlan	CP 1420	1450
WHOP—Hopkinsville	1200	1230
WLAP—Lexington	1420	1450
WAVE—Louisville	940	970
WHAS	820	840
WINN	1210	1240
WOMI—Owensboro	1500	1490
WPAD—Paducah	1420	1450
LOUISIANA		
KALB—Alexandria	1210	1240
WJBO—Baton Rouge	1120	1150
KVOL—Lafayette	1310	1340
KPLC—Lake Charles	1500	1490
KMLB—Monroe	1200	1230
WNOE—New Orleans	1420	1450
WDSU	1250	1280
WJBW	1200	1230
WSMB	1320	1350
WWL	850	870
KRMD—Shreveport	1310	1340
KTBS	1450	1480
KWKH	1100	1130
MAINE		
WRDO—Augusta	1370	1400
WABI—Bangor	1200	1230
WLBZ	620	620
WCOU—Lewiston	1210	1240
WCSH—Portland	940	970
WGAN	560	560
WAGM—Presque Isle	1420	1450
MARYLAND		
WBAL—Baltimore	1060	1090
WCAO	600	600
WCBM	1370	1400
WFBR	1270	1300
WITH	CP 1200	1230
WTBO—Cumberland	800	820
WFMD—Frederick	900	930
WJEJ—Hagerstown	1210	1240
WBOC—Salisbury	1500	1490
MASSACHUSETTS		
WAAB—Boston	1410	1440
WBZ	990	1030
WCOP	1120	1150
WEEI	590	590
WHDH	830	850
WMEX	1470	1510
WNAC	1230	1260
WORL	920	950
WSAR—Fall River	1450	1480
WHAI—Greenfield	1210	1240
WHYN—Holyoke	CP 1370	1400
WOCB—nr. Hyannis	1210	1240
WLAW—Lawrence	680	680
WLLH—Lowell	1370	1400
WNBH—New Bedford	1310	1340
WBRK—Pittsfield	1310	1340
WESX—Salem	1200	1230
WBZA—Springfield	990	1030
WMAS	1420	1450
WSPR	1140-CP 1240	1270
WMAW—Worcester	CP 1200	1230
WORC	1280	1310
WTAG	580	580
MICHIGAN		
WELL—Battle Creek	1420	1400
WBCM—Bay City	1410	1440
WHDF—Calumet	1370	1400
WJBK—Detroit	1500	1490
WJR	750	760
WMBC	1420	1400
WWJ	920	950
WXYZ	1240	1270
WKAR—East Lansing	850	870
WDBC—Escanaba	CP 1500	1490
WFDF—Flint	1310-CP 880	910
WASH—Grand Rapids	1270	1300
WGRB	CP 1200	1230
WLAV	1310	1340
WOOD	1270	1300
WJMS—Ironwood	1420	1450
WIBM—Jackson	1370	1450
WKZO—Kalamazoo	590	590
WJIM—Lansing	1210	1240
WMPC—Lapeer	1200	1230
WDMJ—Marquette	1310	1340
WKBZ—Muskegon	1500	1490
WCAR—Pontiac	1100	1130
WHLS—Port Huron	1370	1450
WEXL—Royal Oak	1310	1340
WSOO—Sault Ste. Marie	1200	1230
WHAL—Saginaw	CP 950	980
WSAM	1200	1230
WTCM—Traverse City	CP 1370	1400
MINNESOTA		
KATE—Albert Lea	1420	1450
KDAL—Duluth	1500	1490
WEBC	1290	1320
KGDE—Fergus Falls	1200	1230
WMFG—Hibbing	1210	1240
KYSM—Mankato	1500	1230
WCCO—Minneapolis	810	830
WDGY	1180	1130
WLB	760	770
WLOL	1300	1330
WTCN	1250	1280
KVOX—Moorhead	1310	1340
WCAL—Northfield	760	770
KROC—Rochester	1310	1340
KFAM—St. Cloud	1420	1450
KSTP—St. Paul	1460	1500
WMIN	1370	1400
WHLB—Virginia	1370	1400
KWLM—Willmar	1310	1340
KWNO—Winona	1200	1230
MISSISSIPPI		
WCBI—Columbus	1370	1400
WJPR—Greenville	1310	1340
WGRM—Greenwood	1210	1240
WGCM—Gulfport	1210	1240
WFOR—Hattiesburg	1370	1400
WJDX—Jackson	1270	1300
WSLI	1420	1450
WAML—Laurel	1310	1340
WSKB—McComb	1200	1230
WCOC—Meridian	880	910
WQBC—Vicksburg	1360	1390
MISSOURI		
KFVS—Cape Girardeau	1370	1400
KFUO—Clayton	830	850
KFRU—Columbia	630-CP 1370	1400
KWOS—Jefferson City	1310	1340
WMBH—Joplin	1420	1450
KCMO—Kansas City	1450	1480
KITE	1530	1590
KMBC	950	980
WDAF	610	610
WHB	860	880
KWOC—Poplar Bluff	1310	1340
KDRO—Sedalia	1500	1490
KFEQ—St. Joseph	680	680
KMOX—St. Louis	1090	1120
KSD	550	550
KWK	1350	1380
KXOK	630	530
WEW	760	770
WIL	1200	1230
KGBX—Springfield	1230	1260
KWTO	560	560
MONTANA		
KGHL—Billings	780	790
KRBM—Bozeman	1420	1450
KGIR—Butte	1340	1370
KFBB—Great Falls	1280	1310
KPFA—Helena	1210	1240
KGEZ *—Kalispell	1310-CP 1430	1340
KRJF—Miles City	CP 1310	1340
KGVO—Missoula	1260	1290
KGCX—Wolf Point	1450	1480
NEBRASKA		
KORN—Fremont	1370	1400
KMMJ—Grand Island	740	750
KHAS—Hastings	1200	1230
KGFW—Kearney	1310	1340
KFAB—Lincoln	770	1110
KFOR	1210	1240
WJAG—Norfolk	1060	780
KGNF—North Platte	1430	1460
KOIL—Omaha	1260	1290
KONB	CP 1500	1490
KOWH	660	660
WOW	590	590
KGKY—Scottsbluff	1500	1490
NEVADA		
KENO—Las Vegas	CP 1370	1400
KFUN	CP 1420	1450
KOH—Reno	630	630
NEW HAMPSHIRE		
WLNH—Laconia	1310	1340
WFEA—Manchester	1340	1370
WMUR	CP 610	610
WHEB—Portsmouth	740	750
WKNE—Keene	1260	1290
NEW JERSEY		
WCAP—Asbury Park	1280	1310
WBAB—Atlantic City	1200	1490
WFPG	1420	1450
WSNJ—Bridgeton	1210	1240
WCAM—Camden	1280	1310
WAAT—Jersey City	940	970
WHOM	1450	1480
WHBI—Newark	1250	1280
WPAT—Paterson	CP 900	930
WBRB—Red Bank	1210	1240
WTNJ—Trenton	1280	1310
WAWZ—Zarephath	1350	1380
NEW MEXICO		
KGGM—Albuquerque	1230	1260
KOB	1180	1030
KLAH—Carlsbad	1210	1240
KICA—Clovis	1370	1400
KAWM—Gallup	1500	1490
KWEW—Hobbs	1500	1490
KGFL—Roswell	1370	1400
KVSF—Santa Fe	1310	1340
NEW YORK		
WABY—Albany	1370	1400
WOKO	1430	1460
WMBO—Auburn	1310	1340
WBTA—Batavia	CP 1500	1490
WNBF—Binghamton	1500	1490
WARD—Brooklyn	1400	1430
WBBC	1400	1430
WBBR	1300	1330
WCNW	1500	1600
WVFW	1400	1430
WBEN—Buffalo	900	930
WBNY	1370	1400
WEBR	1310	1340
WGR	550	550
WKBW	1480	1520
WSVS	1370	1400
WCAD—Canton	1220	1250
WENY—Elmira	1200	1230
WGBB—Freeport	1210	1240
WHCU—Ithaca	850	870
WJTN—Jamestown	1210	1240
WKNY—Kingston	1500	1490
WGNY—Newburgh	1220	1250
WABC—New York City	860	880
WBNX	1350	1380
WEAF	660	660
WEVD	1300	1330
WHN	1010	1050
WINS	1180	1000
WJZ	760	770
WLTH	1400	1430
WMCA	570	570
WNEW	1250	1280
WNYC	810	830
WOR	710	710
WOV	1100	1130
WQXR	1550	1560
WHLD—Niagara Falls	1260	1290
WSLB—Ogdensburg	1370	1400
WHDL—Olean	1420	1450
WMFF—Plattsburg	1310	1340
WKIP—Poughkeepsie	1420	1450
WHAM—Rochester	1150	1180
WHEC	1430	1460
WSAY	1210	1240
WAGE—Salina	CP 620	620
WNBZ—Saranac Lake	1290	1320
WGY	790	810
WFBL—Syracuse	1360	1390
WOLF	1500	1490
WSYR	570	570
WHAZ—Troy	1300	1330
WTRY	950	980
WIBX—Utica	1200	1230
WATN—Watertown	CP 1210	1240
WWNY	CP 1270	1300
WFAS—White Plains	1210	1240
WWRL—Woodside	1500	1600
NORTH CAROLINA		
WISE—Asheville	1370	1400
WWNC	570	570
WBT—Charlotte	1080	1110
WSOC	1210	1240
WDNC—Durham	1500	1490
WCNC—Elizabeth City	1370	1400
WFNC—Fayetteville	1340	1370
WGNC—Gastonia	1420	1450
WGBR—Goldsboro	1370	1400
WBIG—Greensboro	1440	1470
WGTC—nr. Greenville	1500	1490
WHKY—Hickory	1370	1400
WMFR—High Point	1200	1230
WFTC—Kinston	1200	1230
WPTF—Raleigh	680	680
WRAL	1210	1240
WCBT—Roanoke Rapids	CP 1200	1230
WEED—Rocky Mount	1420	1450
WSTP—Salisbury	1500	1490
WMFD—Wilmington	1370	1400
WGTM—Wilson	1310	1340
WAIR—Winston-Salem	1310	1340
WSJS	1310-CP 600	600
NORTH DAKOTA		
KFYR—Bismarck	550	550
KDLR—Devils Lake	1210	1240
WDAY—Fargo	940	970
KFJM—Grand Forks	1410	1440
KRMC—Jamestown	1370	1400
KGCU—Mandan	1240	1270
KLPM—Minot	1360	1390
KOVC—Valley City	1500	1490
OHIO		
WAKR—Akron	1530	1590
WJW	1210	1240
WICA—Ashtabula	940	970
WHBC—Canton	1200	1230

* May be moved to 1460 kc instead of 1340 kc.

	KC. Old	KC. New
WCKY—Cincinnati	1490	1530
WCPO	1200	1230
WKRC	550	550
WLW	700	700
WSAI	1330	1360
WCLE—Cleveland	610	610
WGAR	1450	1480
WHK	1390	1420
WTAM	1070	1100
WBNS—Columbus	1430	1460
WCOL	1200	1230
WHKC	640	640
WOSU	570	570
WHIO—Dayton	1260	1290
WING	1380	1410
WLOK—Lima	1210	1240
WMAN—Mansfield	1370	1400
WMRN—Marion	CP 1500	1490
WPAY—Portsmouth	1370	1400
WIZE—Springfield	1310	1340
WSTV—Steubenville	1310	1340
WADC—Talmadge	1320	1350
WSPD—Toledo	1340	1370
WTOL	1200	1230
WFMJ—Youngstown	1420	1450
WKBN	570	570
WHIZ—Zanesville	1210	1240

OKLAHOMA

KADA—No. of Ada	1200	1230
KVSO—Ardmore	1210	1240
KASA—Elk City	1210	1240
KCRC—Enid	1360	1390
KSWO—Lawton	CP 1120	1150
KBIX—Muskogee	1500	1490
WNAD—Norman	1010	690
KOCY—Oklahoma City	1310	1340
KOMA	1480	1520
KTOK	1370	1400
WKY	900	930
KHBG—Okmulgee	1210	1240
WBBZ—Ponca City	1200	1230
KGFF—Shawnee	1420	1450
KOME—Tulsa	1310	1340
KTUL	1400	1430
KVOO	1140	1170

OREGON

KWIL—Albany	CP 1210	1240
KAST—Astoria	1200	1230
KBKR—Nr. Baker	1500	1490
KBND—Bend	1310	1340
KOAC—Corvallis	550	550
KODL—The Dalles	1200	1230
KORE—Eugene	1420	1450
KUIN—Grants Pass	1310	1340
KFJI—Klamath Falls	1210	1240
KLBM—La Grande	1420	1450
KOOS—Marshfield	1200	1230
KMED—Medford	1410	1440
KALE—Portland	1300	1330
KBPS	1420	1450
KEX	1160	1190
KGW	620	620
KOIN	940	970
KWJJ	1060-SA 1040	1080
KXL	1420	1450
KRNR—Roseburg	1500	1490
KSLM—Salem	1360	1390

PENNSYLVANIA

WCBA—Allentown	1440	1470
WSAN	1440	1470
WFBG—Altoona	1310	1340
WCED—Du Bois	CP 1200	1230
WEST—Easton	1200	1400
WERC—Erie	CP 1500	1490
WLEU	1420	1450
WIBG—Glenside	970	990
WHJB—Greensburg	620	620
WSAJ—Grove City	1310	1340
WHP—Harrisburg	1430	1460
WKBO	1200	1230
WAZL—Hazleton	1420	1450
WJAC—Johnstown	1370	1400
WGAL—Lancaster	1500	1490
WKST—New Castle	1250	1280
KYW—Philadelphia	1020	1060
WCAU	1170	1210
WDAS	1370	1400
WFIL	560	560
WHAT	1310	1340
WIP	610	610
WPEN	920	950
WTEL	1310	1340
KDKA—Pittsburgh	980	1020
KQV	1380	1410
WCAE	1220	1250
WJAS	1290	1320
WWSW	1500	1490
WEEU—Reading	830	850
WRAW	1310	1340
WARM—Scranton	CP 1370	1400
WGBI	880	910
WQAN	880	910
WPIC—Sharon	780	790
WKOK—Sunbury	1210	1240
WMBS—Uniontown	1420-CP 590	590
WBAX—Wilkes-Barre	1210	1240
WBRE	1310	1340
WRAK—Williamsport	1370	1400
WORK—York	1320	1350

	KC. Old	KC. New
PUERTO RICO		
WPRA—Mayaguez	780	790
WPAB—Ponce	1340	1370
WPRP	1420-CP 1480	1520
WKAQ—San Juan	1240-CP 620	620
WNEL	1290	1320
RHODE ISLAND		
WFCI—Pawtucket	CP 1390	1420
WEAN—Providence	780	790
WJAR	890	920
WPRO	630	630
SOUTH CAROLINA		
WAIM—Anderson	1200	1230
WCSC—Charleston	1360	1390
WTMA	1210	1250
WCOS—Columbia	1370	1400
WIS	560	560
WOLS—Florence	1200	1230
WFBC—Greenville	1300	1330
WMRC	1500	1490
WORD—Spartanburg	1370	1400
WSPA	920	950
WFIG—Sumter	1310	1340
SOUTH DAKOTA		
KABR—Aberdeen	1390	1420
KFDY—Brookings	780	790
KGFX—Pierre	630	630
KOBH—Rapid City	1370	1400
WCAT	1200	1230
KELO—Sioux Falls	1200	1230
KSOO	1110	1140
KUSD—Vermillion	890	920
KWAT—Watertown	1210	1240
WNAX—Yankton	570	570
TENNESSEE		
WOPI—Bristol	1500	1490
WAPO—Chattanooga	1420-CP 1120	1150
WDEF	CP 1370	1400
WDOD	1280	1310
WHUB—Cookeville	1370	1400
WTJS—Jackson	1310-CP 1360	1390
WJHL—Johnson City	1200-CP 880	910
WKPT—Kingsport	1370	1400
WBIR—Knoxville	CP 1210	1240
WNOX	1010	990
WROL	1310-CP 620	620
WHBQ—Memphis	1370	1400
WMC	780	790
WMPS	1430	1460
WREC	600	600
WLAC—Nashville	1470	1510
WSIX	1210	1240
WSM	650	650
TEXAS		
KRBC—Abilene	1420	1450
KFDA—Amarillo	1200	1230
KGNC	1410	1440
KNOW—Austin	1500	1490
KTBC	1120	1150
KFDM—Beaumont	560	560
KRIC	1420	1450
KBST—Big Spring	1500	1490
KNEL—Brady	1500	1490
KGFI—Brownsville	1500	1490
KBWD—Brownwood	CP 1350	1380
WTAW—College Station	1120	1150
KEYS—Corpus Christi	CP 1500	1490
KRIS	1330	1360
KAND—Corsicana	1310	1340
KRLD—Dallas	1040	1080
WFAA	800	820
WRR	1280	1310
KDNT—Denton	1420	1450
KFPL—Dublin	1310	1340
KROD—El Paso	1500-CP 600	600
KTSM	1350	1380
KFIZ—Fort Worth	1240	1270
KGKO	570	570
WBAP	800	820
KLUF—Nr. Galveston	1370	1400
KPRC—Houston	920	950
KTRH	1290	1320
KXYZ	1440	1470
KSAM—Huntsville	1500	1490
KOCA—Kilgore	1210	1240
KPAB—Laredo	1500	1490
KFRO—Longview	1340	1370
KFYO—Lubbock	1310	1340
KRBA—Lufkin	1310	1340
KRLH—Midland	1420	1450
KNET—Palestine	1420	1450
KPDN—Pampa	1310	1340
KPLT—Paris	1500	1490
KIUN—Pecos	1370	1400
KPAC—Port Arthur	1220	1250
KGKL—San Angelo	1370	1400
KABC—San Antonio	1420	1450
KMAC	1370	1400
KONO	1370	1400
KTSA	550	550
WOAI	1190	1200
KRRV—Sherman	880	910
KXOX—Sweetwater	1210	1240
KTEM—Temple	1370	1400
KCMC—Texarkana	1420	1450
KGKB—Tyler	1500	1490
KVWC—Vernon	1500	1490
KVIC—No. of Victoria	1310	1340

	KC. Old	KC. New
WACO—Waco	1420	1450
KRGV—Weslaco	1260	1290
KWFT—Wichita Falls	620	620
UTAH		
KSUB—Cedar City	1310	1340
KVNU—No. of Logan	1200	1230
KLO—Ogden	1400	1430
KEUB—Price	1420	1450
KOVO—Provo	1210	1240
KDYL—Salt Lake City	1290	1320
KSL	1130	1160
KUTA	1500-CP 570	570
VERMONT		
WCAX—Burlington	1200	1230
WSYB—Rutland	1500	1490
WQDM—St. Albans	1390	1420
WDEV—Waterbury	550	550
VIRGINIA		
WCHV—Charlottesville	1420	1450
WBTM—Danville	1370	1400
WFVA—Fredericksburg	1260	1290
WSVA—Harrisonburg	550	550
WLVA—Lynchburg	1200	1230
WMVA—Martinsville	CP 1420	1450
WGH—Newport News	1310	1340
WTAR—Norfolk	780	790
WPID—Petersburg	1210	790
WBBL—Richmond	1210	1240
WMBG	1350	1380
WRNL	880	910
WRVA	1110	1140
WDBJ—Roanoke	930	960
WSLS	1500	1490
WLPM—Suffolk	1420	1450
WASHINGTON		
KXRO—Aberdeen	1310	1340
KVOS—Bellingham	1200	1230
KELA—Centralia	1440	1470
KRKO—Everett	1370	1400
KWLK—Longview	1370	1400
KGY—Olympia	1210	1240
KWSC—Pullman	1220	1250
KEVR—Seattle	1370	1400
KIRO	710	710
KJR	970	1000
KOL	1270	1300
KOMO	920	950
KRSC	1120	1150
KTW	1220	1250
KXA	760	770
KFIO—Spokane	1120	1150
KFPY	890	920
KGA	1470	1500
KHQ	590	590
KMO—Tacoma	1330	1360
KVI	570	570
KVAN—Vancouver	880	910
KUJ—Walla Walla	1370-CP 1390	1420
KPQ—Wenatchee	1500	1490
KIT—Yakima	1250	1280
WEST VIRGINIA		
WJLS—Beckley	1210	1240
WHIS—Bluefield	1410	1440
WCHS—Charleston	580	580
WGKV	1500	1490
WBLK—Clarksburg	1370	1400
WMMN—Fairmont	890	920
WSAZ—Huntington	1190-CP 900	930
WLOG—Logan	1200	1230
WAJR—Morgantown	1200	1230
WPAR—Parkersburg	1420	1450
WBRW—Welch	1310	1340
WKWK—Wheeling	CP 1370	1400
WWVA	1160	1170
WBTH—Williamson	1370	1400
WISCONSIN		
WHBY—Appleton	1200	1230
WATW—Ashland	1370	1400
WEAU—Eau Claire	1050	1070
KFIZ—Fond du Lac	1420	1450
WTAQ—Green Bay	1330	1360
WCLO—Janesville	1200	1230
WKBH—La Crosse	1380	1410
WHA—Madison	940	970
WIBA	1280	1310
WOMT—Manitowoc	1210	1240
WMAM—Marinette	570	570
WIGM—Medford	CP 1500	1490
WEMP—Milwaukee	1310	1340
WISN	1120	1150
WTMJ	620	620
WIBU—Poynette	1210	1240
WRJN—Racine	1370	1400
WJMC—Rice Lake	1210	1240
WHBL—Sheboygan	1300	1330
WLBL—Stevens Point	900	930
WDSM—Superior	1200	1230
WSAU—Wausau	1370	1400
WFHR—Wisconsin Rapids	1310	1340
WYOMING		
KDFN—Casper	1440	1470
KFBC—Cheyenne	1420	1450
KYAN	1370	1400
KPOW—Powell	CP 1200	1230
KVRS—Rock Spring	1370	1400
KWYO—Sheridan	1370	1400

TECHNICAL SERVICE PORTFOLIO

SECTION IX

Coil and Condenser Testing

UNQUESTIONABLY the most common cause of unsatisfactory receiver performance, barring tubes, is condenser trouble. And this is still true if we eliminate from consideration the difficulties arising from changes in the adjustment of tuning condensers. In fixed condensers, whether of the tubular or electrolytic type, temperature and humidity changes, together with the normal strains to which they are subject due to operating conditions, serve to produce defects which are often none too easy to check, particularly when intermittent in character. Yet, despite all these considerations, it is unfortunately true that the majority of service shops are not equipped to test for any but the simplest defects in condensers, other than by substitution.

The same situation exists with regard to troubles occurring in coils and transformers. While most defects arising in the latter are rather easy to locate, there are some (such as a decrease in Q due to moisture absorption) for which most service shops have no satisfactory means of testing.

In this discussion we are considering tests of both coils and condensers, since often the same apparatus is suitable for either. And, though we must necessarily devote some space to the measurements of fundamental quantities, such as inductance, capacity and impedance, it will be kept in mind that the primary object of any test is to determine whether or not the unit will perform satisfactorily in the circuit in which it is to be used.

Often this means that the measured value of capacitance is of very little importance—bypass condensers often may be much greater or much less than rated capacitance without affecting the performance of the circuit in which they

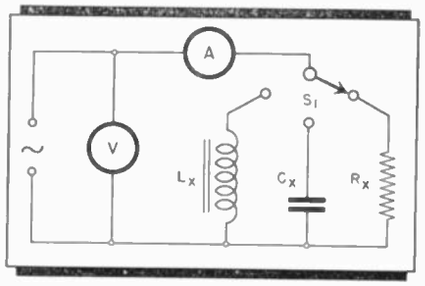


Fig. 1. Simple circuit for checking either capacity or inductance.

are used. Then, again, while we think of high capacity as providing improved bypass action, in practice we frequently find that other considerations are of much more importance. Take, for instance, the bypassing of an ultra-high-frequency circuit. A 1-mfd condenser, theoretically, would have only 1/1000th the reactance of a tiny .001-mfd mica type, yet the unavoidably higher internal resistance of the former renders it much less effective in bypassing in the u-h-f circuit.

The same situation exists with reference to electrolytics. While excellent in bypassing action in power-supply filter circuits, the electrolytic often is less efficient in radio-frequency circuits than a paper condenser of much lower capacity. That is why we often see a large electrolytic shunted by a small paper or mica condenser; the electrolytic does a swell job of filtration on the lower frequencies where the paper or mica condensers, of lower capacity, are ineffective, and the latter take care of the r-f components which the electrolytics can't handle.

COIL AND CONDENSER MEASUREMENTS

One of the simplest arrangements for checking the capacity or inductance of condensers or coils is shown in Fig. 1. In this setup, what is actually measured is the impedance of the unit under test, and this is evaluated in terms of capacity and inductance by assuming that the reactance is very large with respect to the resistance of the unit and is therefore substantially equal to the impedance. The impedance is determined by the familiar formula

$$Z = E/I \qquad (1)$$

which is Ohm's law for alternating currents. Z represents the impedance in ohms, E the voltage and I the current in amperes. For example, if the line voltage were 100 and the milliammeter showed a reading of 50 milliamperes, a.c., the impedance of the unit would be

$$Z = 100/.050 = 2000 \text{ ohms} \qquad (2)$$

Capacitive reactance is usually represented by the symbol X_C and inductive reactance as X_L. Knowing the capacitive reactance, we can determine the capacitance of a condenser from the following formula

$$C = \frac{1{,}000{,}000}{6.28\, f\, X_c} \qquad (3)$$

in which C is in microfarads, f is the frequency in cycles and X_C the capacitive reactance in ohms. If we consider X_C as being equal to Z, by substituting the result obtained in equation (2) above, we find that the capacitance C of a condenser which has an impedance of 2000 ohms at 60 cycles is

$$C = \frac{1{,}000{,}000}{6.28 \times 60 \times 2{,}000} = 1.33 \text{ mfd}$$

And, if the a-c milliammeter gave a reading of 5 milliamperes instead of 50 milliamperes, at 60 cycles, the impedance of the condenser would be 10 times as great—20,000 ohms—and the capacitance

one-tenth as great, or about 0.133 mfd.

For coils, the inductance in henries is found from the following formula:

$$L = \frac{X_L}{6.28\,f}$$

where L is the inductance in henries, f is in cycles and X_L represents the inductive reactance in ohms. Taking the same example as for the condenser, and considering the inductive reactance to be substantially the same as the impedance, we find that the inductance of a choke which passes 50 ma at 100 volts, 60 cycles, is

$$L = \frac{2{,}000}{6.28 \times 60} = 5.3 \text{ henries}$$

And, for the common 30-henry choke, the reading of an a-c milliammeter in the circuit of Fig. 1 would be about one-sixth of 50 ma, or approximately 8 ma.

Other points can be determined in like manner. In many analyzers, the copper-oxide rectifier meter is used in just this manner to measure inductance and capacity. However, and this is important, *this circuit should not be used for testing electrolytics.* Applying such a high alternating voltage without a d-c polarizing voltage might wreck the condenser instantly.

WIDE-RANGE CHECKER

An arrangement for checking a wide range of paper and mica condensers, using the same fundamental circuit of Fig. 1, is shown in Fig. 4. *T1* is a 1-to-1 isolating transformer, often omitted, and the meter is the usual 1000 ohms-per-volt copper-oxide type voltmeter, used on the 100-volt scale. Three ranges are obtained by using shunts *C1* and *C2* for the higher-capacity ranges, up to about 6 mfd. Without the capacity shunt, maximum sensitivity is obtained, enabling a check of capacities as low as .001 mfd, though of course it is none too accurate at such low values.

Another test method is shown in Fig. 2. In this arrangement, as in the circuit of Fig. 1, the impedance of the unit is determined. This is done by using a tube voltmeter, or other similar output indicator, and adjusting the calibrated resistor *Rv* until the same indication occurs on the output indicator as is obtained when the output indicator is connected across the unit under test. The applied alternating voltage may be very low—just sufficient to give a reading on the output indicator—so that electrolytics may be tested. Further, a battery and d-c meter may be hooked in series, as shown, so as to check for leakage in condensers and to supply a polarizing voltage. For chokes, the impedance may be measured while normal d-c is flowing in the circuit, so the conditions more closely approximate normal operation. For precise work, the low-pass filter *Lf-Cf* is used to attenuate harmonics of the 60-cycle test frequency so that more accurate results may be obtained.

For the output indicator an ordinary two-stage a-f amplifier may be employed, using any meter suitable for aligning purposes across the output circuit. The input to the audio amplifier is first connected to the condenser or choke by throwing the switch and the output meter reading is noted, varying the volume control of the a-f amplifier until a convenient arbitrary reading is obtained. The switch is then thrown so as to place the amplifier input across *Rv*, and *Rv* is varied until the original reference output meter reading is obtained again. The reading across the condenser or choke is again checked. When the readings are equal, the resistance of *Rv* is equal to the impedance of the unit under test. The capacity or inductance may then be determined in the same manner as was described for the circuit of Fig. 1, using the same formulas.

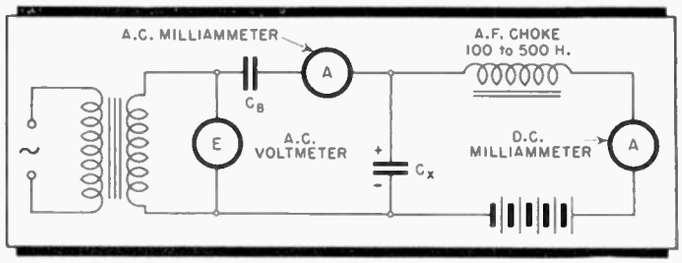


Fig. 3. Circuit arrangement for the testing of electrolytic condensers.

ELECTROLYTIC TESTER

In Fig. 3 is shown a circuit employed frequently in factory testing of electrolytics. The a-c milliammeter reads the current resulting from the applied a.c., and is thus a measure of the impedance of the condenser, and the d.c. milliammeter reads the leakage current. The purpose of the high-inductance choke is to prevent the battery and d-c meter from acting as a short circuit across the condenser under test.

In these circuits it is apparent that as the impedance of the unit under test increases, the current decreases. This means that the a-c milliammeter must be very sensitive if small values of capacity are to be tested at 60 cycles. Furthermore, it is always more desirable to check the unit at somewhere near the normal operating frequency of the circuit in which it is to be used.

One way of doing this is shown in Fig. 5-A. This is a simple broadcast-band oscillator which uses a tuning condenser calibrated in micro-microfarads. In operation, the condenser *Ct* is adjusted until the plates are well in mesh and the resulting oscillation is picked up on an adjacent radio receiver, preferably one using a tuning indicator to tune in the unmodulated oscillator signal. Alternatively, the receiver may be tuned to a broadcast station at the low-frequency end of the dial and the oscillator adjusted to zero beat with the broadcast signal. The condenser to be checked *Cx*, is then shunted across *Ct* and the capacity of *Ct* in mmfd is noted. *Ct* is then readjusted until the oscillator frequency again zero beats with the broadcast signal. The amount by which the capacity of *Ct* has to be decreased to restore the original reference frequency of oscillation is a measure of the capacity of *Cx*.

For larger values of capacitance, which are beyond the calibrated range of the tuning condenser *Ct*, the unknown condenser may be connected in series with *Ct*, as *Clx*. The capacity of

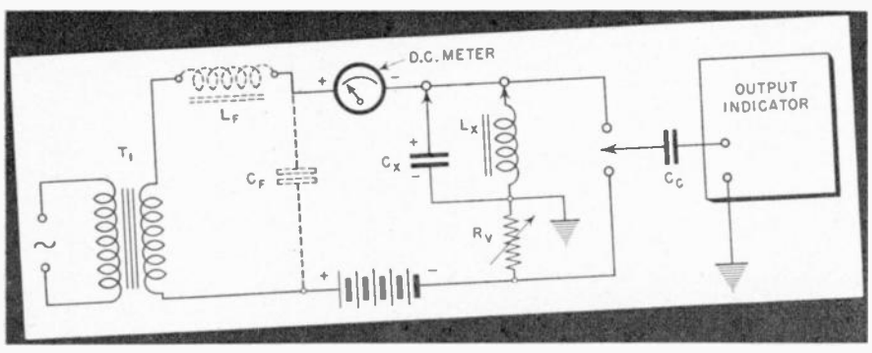


Fig. 2. Circuit for checking condenser leakage and measuring the impedance of inductances.

Clx is then determined by first tuning in the oscillator signal before connecting in *Clx*, and noting the capacity setting of the condenser. Then *Clx* is connected, as shown, in series with *Ct*. Since the addition of *Clx* in series reduces the total capacity across the coil, the tuning condenser *Ct* will have to be readjusted to a somewhat higher value of capacitance to restore the original reference frequency of oscillation. We may call the amount by which the capacity of *Ct* must be increased to restore this condition *Cr*. Then we can find the capacity of *Clx* from the formula

$$Clx = \frac{Ct}{Cr} - 1$$

For example, if the oscillator frequency were 1000 kc with *Ct* set at a capacity of 300 mmfd, and, after connecting *Clx* in series between the points *a* and *b*, the capacity of *Ct* had to be increased by 50 mmfd to restore operation at 1000 kc, the capacity of *Clx* would figure out as follows

$$Clx = \frac{300^2}{50} - 1 = 1800 - 1 = 1799 \text{ mmfd}$$

We can see from the above that we need not bother about the —1 in the formula when *Clx* is large compared with *Cr*. This method works out very well for setting up padding condensers or checking their maximum and minimum capacitances.

INTERMITTENT CHECKER

Occasionally, especially in tubular condensers, intermittent action is caused by a poor weld between the lead and the foil. This results usually in a high resistance joint at such times when the lead does make contact with the foil, but the defect is seldom revealed by usual methods of test. If an ohmmeter is employed, the high insulation resistance of the condenser—really enormous in comparison with the resistance of the defective joint with which it is in series—prevents any indication being obtained.

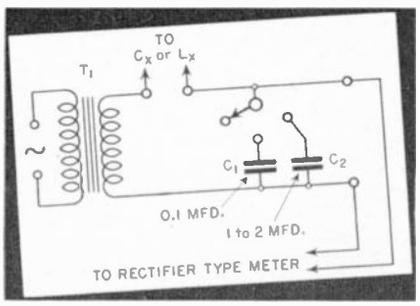


Fig. 4. Circuit for checking a wide range of paper and mica condensers.

Such conditions are readily checked by using a coupling coil to a power oscillator, as shown in Fig. 5-B. The suspected condenser is connected across the coupling coil and the alternating current which then circulates, due to the low impedance of the condenser to r.f., causes heat to be developed at the high-resistance joint. If the current is sufficiently great, the defective joint will be burned so that the joint becomes permanently open and will no longer function intermittently. For "hams", the amateur transmitter can be requisitioned for this service, connecting the suspected condenser across the antenna coupling coil.

Other methods of checking for such conditions involve tapping the condenser or moving the leads during operation to induce the defective contact to open. The danger of this practice is that the mechanical movement may cause a good condenser to develop a defective contact. The electrical test is fool-proof in that a good condenser cannot be damaged; its limitation is that unless the defective joint has pretty high resistance, considerable power from the r-f oscillator may be required to cause a burnout of the joint.

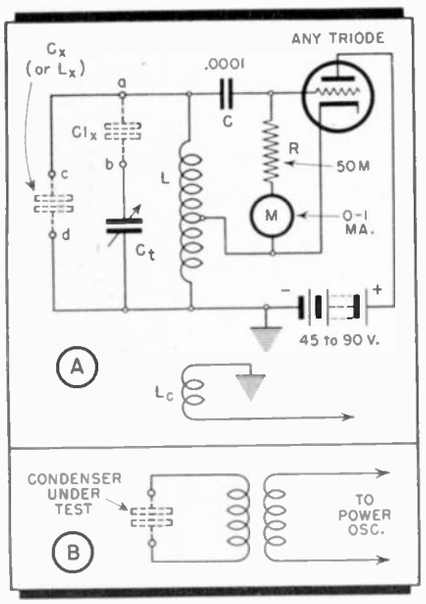


Fig. 5. Variable oscillator circuit for checking the capacity of condensers, etc.

VERSATILE OSCILLATOR

A thoroughly practical oscillator circuit which has a great many applications around any laboratory or service shop is shown in Fig. 6. The principle of operation is based on negative conductance; the feedback is accomplished electronically. This feedback method was first described in an RCA Application Note some years ago. The working design shown was evolved by the writer, and it has proved most useful.

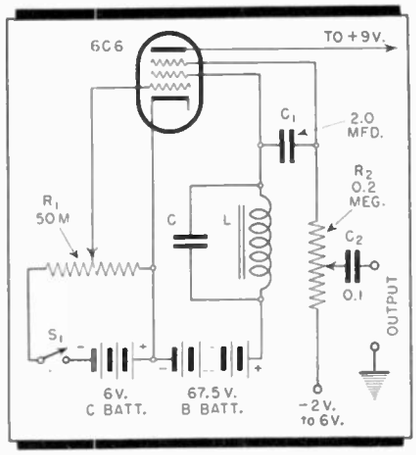


Fig. 6. A versatile single-coil oscillator with many shop applications.

The oscillator functions over an enormous frequency range, from 10 cycles to about 10 megacycles, simply by changing the values of inductance and capacity in the circuit. Capacity may be checked in this circuit in the same manner as that described for Fig. 5-A, and, in addition, it is possible to check coils. Further, an idea of the relative efficiency, or Q, of the coil or transformer under test may be obtained. And it serves as a very stable signal source for any tests which may require such an instrument.

As shown, the inductance and capacity are placed in the screen circuit, which is capacity coupled to the suppressor of the 6C6. The suppressor grid leak is an 0.2-meg. potentiometer, which serves as an output control when the oscillator is used as a signal source.

The variable control *R1* across the control grid bias is used to adjust the conductance of the tube until oscillation just commences. Under such conditions, best waveform is obtained. Since the bias voltage at which oscillation just starts is also dependent upon the Q of the tuned circuit, the better the coil, the greater the bias voltage which may be employed and still obtain oscillation. By noting the bias voltage at which oscillation is secured, using a coil known to be good, a standard for other coils of the same general type and characteristics may be obtained. Thus, tests can be made of i-f transformers, r-f coils, etc., against reference standards established in this manner. The same applies to condensers, which are best tested at low audio frequencies, if we are interested in their Q, or efficiency. Small mica and tubular paper condensers can likewise be

checked at radio frequencies by simply changing the tuning coil inductance. One of the very great additional advantages of this circuit is that no tapped coil or tickler is required to obtain oscillation, thus enabling tests of any desired form of coil.

COIL MATCHING

Matching coils is done in this circuit by taking the master coil and tuning it with a shunt condenser until oscillation at a frequency in the broadcast band is secured. This r-f signal is then picked up with a radio receiver, as described for the previous circuit of Fig. 5-A. For exact work, the zero-beat method against a reference broadcast signal is used. Then each coil to be matched is substituted in turn for the master coil, taking care that the lead positions and shunt capacity are not changed, and the coil inductance is adjusted until oscillation occurs at the same frequency as was obtained with the master coil. The coils are then alike at this frequency.

Often it is desirable to check both at a high-frequency and a low-frequency point of the coil's normal operating range in the application for which it was designed, to make certain that matching is obtained at both points. For, if the distributed capacitance of the coil under test were greater or less than that of the master, adjustment to match with a given value of capacitance at one frequency would not result in proper matching at some higher frequency.

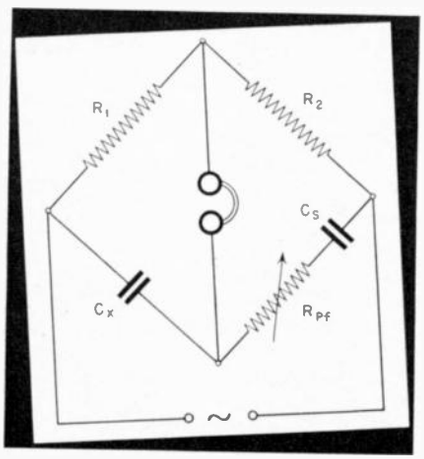


Fig. 7. Fundamental bridge circuit for small capacity measurement.

Note that battery operation is specified for the oscillator of Fig. 6. This is done advisedly; best operation is thereby secured. However, it is feasible to use a.c. for the heater. The type 57 tube functions equally well in this circuit. Smaller values of *C1* are suitable for frequencies above 30 cycles.

Before leaving this portion of the subject, there are a few pointers which may be of interest. In checking any resonant circuit, high Q will be evidenced by sharpness in tuning. Thus, if you are aligning a receiver, and one i-f transformer tunes much more sharply than another of similar design in a similar circuit, there is reason to suspect that the Q of the broader-tuning unit is subnormal. It should be remembered, of course, that the L-C ratio is also important. If an i-f transformer employs a fixed condenser shunted by a small variable across the winding, it stands to reason that the adjustment of the small variable condenser will be less critical than if the entire shunt capacity were being varied. And, in diode input stages, the loading effect of the diode tends to broaden the tuning of the input i-f transformer. In superheterodyne oscillator circuits, low Q in the oscillator coil causes a decrease in the oscillator voltage developed and therefore a lower rectified d.c. voltage across the oscillator grid leak.

BRIDGE CIRCUITS

In commercial condenser and coil testers, bridge circuits are in pretty general use. The fundamental bridge circuit for small capacity measurement is shown in Fig. 7. The two resistances *R1* and *R2* are usually made equal and of about 5000 ohms resistance. The condenser *Cs* is a high grade standard condenser, and the series resistor R_{pf} is used for power factor determination. The condenser under test is represented as *Cx* and is placed in the remaining arm of the bridge.

It is assumed that the power factor of the condenser under test will always be greater than that of the standard condenser; therefore, it will be necessary to add resistance to the standard condenser arm until its losses are equal to that of the condenser under test. When this is done, a sharp balance will be obtained on the bridge. For greatest accuracy, all arms of the bridge are made equal at balance and are carefully shielded.

Capacity measurements with bridges of this type are usually made only at audio frequencies, 1000 cycles being customary.

Another of the many types of alternating-current bridges is shown in Fig. 8. This is known as the Schering bridge. This arrangement has advantages in that high voltage may be applied across *Cs* and *Cx* in parallel and thus enables applying polarizing potentials to electrolytics, as shown. Thus, in this bridge set-up, leakage as well as capacitance may be measured. Further, it is possible to substitute a choke for the standard condenser and use the apparatus as an impedance bridge for the measurement of high inductances at audio frequencies, employing d.c. to represent dynamic operating conditions when so desired.

It is not necessary for all arms of a bridge to be equal to secure a condition of balance, though this is the most sensitive and accurate condition. In the case of the bridge shown in Fig. 7, the equations for balance are

$$Cx = \frac{R1}{R2} Cs$$

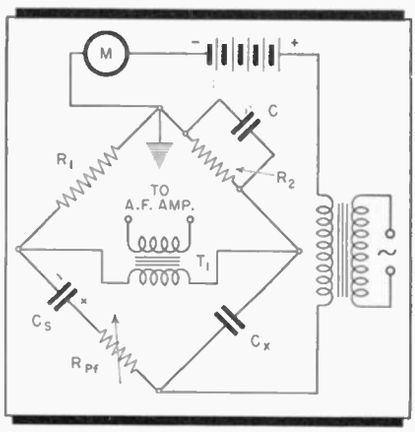


Fig. 8. Alternating-current Schering bridge. Leakage as well as capacitance can be measured.

for capacity and, for the resistance component *Cr* of the condenser under test,

$$Cr = \frac{R1}{R2} R_{pf}$$

In any event, both the resistive and the capacitive components have to be adjusted for a balance unless the condenser under test has the same power factor as that of the standard.

In the circuit of Fig. 8, note that the null indicator is not represented as a pair of headphones, as in Fig. 7. Using a coupling transformer and an a-f amplifier in the manner shown, much greater sensitivity may be obtained. If desired, the amplifier may terminate in an indicator tube, such as a 6E5, thus eliminating the need for phones. Also, using a tube indicator, there is no need to use a test frequency of 1000 cycles, which is chosen largely because headphones are most sensitive at that frequency.

Tests at either lower or higher frequencies may be made with the amplifier and indicator. In fact, frequencies above the audio range are permissible. In such cases, however, the bridge must be very carefully designed because stray capacities become more important.

Circuit Court

OSCILLATOR LIGHTS LAMP

THIS WOULD'NT be news if the oscillator were part of a transmitter; every Ham has used a pilot lamp for quick checks of his rig. But when the oscillator which does the trick is in a receiver, and the lamp is the one used for the "light-beam" method of phono-record reproduction—where the steady light source is reflected onto a photocell by way of a needle-vibrated mirror—that's different!

This innovation is employed in the new *Philco Models 41-623, 41-624* and *41-625*, shown schematically in Fig. 1. And the same oscillator, with a different set of coils, likewise functions as the regular superhet oscillator when the receiver is used for broadcast reception.

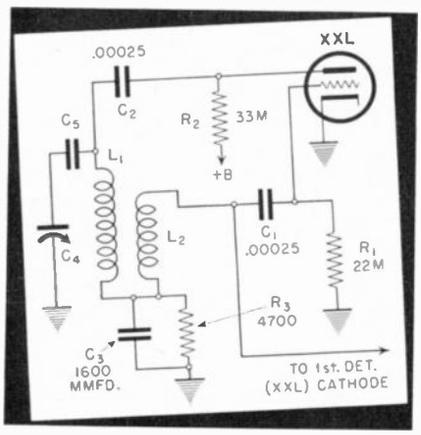


Fig. 2. Reversed feedback oscillator circuit in new Philcos.

Naturally, it takes quite some oscillator hop to light the lamp filament, so a husky beam-power output tube, the 50L6GT, is enlisted as the oscillator tube. A Hartley circuit is employed, a coupling coil feeding the oscillator energy to the lamp filament. In operation, *R2* is adjusted to shunt the excess current around the lamp filament and thus keep the filament at normal operating temperature.

Why the oscillator, rather than the usual heater supply winding on a power transformer, or the 60-cycle line in series with a resistor? Because the 60-cycle line supply would cause hum modulation at the line frequency which would be nicely amplified by the phono reproducer. Of course, if pilot lamps had heaters and light-emitting cathodes, perhaps it would be possible to eliminate hum from this source. But, since the oscillator does the trick by providing such a high r-f operating frequency that it can't cause trouble in reproduction, why bother? (Or maybe we have an idea there).

Incidentally, the problem of coupling the oscillator to the mixer, when the set is used for broadcast reception, does not exist. At least, insofar as sufficient oscillator juice is concerned. With the output developed by the 50L6GT, nothing short of armor plate would prevent an adequate oscillator signal from reaching the mixer. Fact is, we wonder how they keep it from overloading the mixer. But it works—and how!

◆

REVERSED FEEDBACK

ANOTHER INNOVATION in the *Philco 1941 Receivers* is the use of the reversed feedback oscillator circuit, shown in Fig. 2. Also, before we forget it, the use of a new triode oscillator and a triode mixer. The designation of each—XXL—represents the type of tube, not the trademark of a flour manufacturer.

In the reversed feedback circuit, note that the tuning takes place in the plate circuit instead of the grid circuit. The plate coil *L1* is shunted by the tuning condenser *C4*, with its padder *C5* in series. *C2* is a blocking condenser, to keep the B voltage from gumming up the works, and the B current is parallel-fed to the plate through the resistor *R2*. *R3*, bypassed by *C3*, provides cathode bias for the mixer XXL, which hooks on to the pickup coil *L2*. Note that *L2* serves also as the untuned feedback coupling for the oscillator transformer.

You'll find this circuit used in the Models 41-250 and 41-255, as well as others of current production.

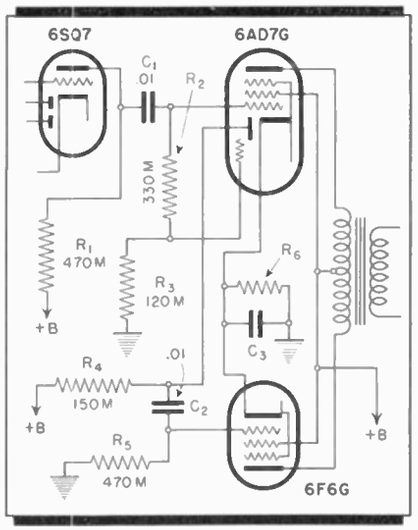


Fig. 3. The 6AD7G inverter-amplifier as used in RCA Model Q33.

INVERTER-AMPLIFIER

THE VOGUE for combining two tube types within a single envelope only recently found its way to the power output stage. There we have seen the 117-volt combinations of rectifier and power output tube. Now we find a triode phase inverter tucked in the shell with an output pentode similar to the 6F6. This new tube type is known as the 6AD7G, and is shown at work in the new *RCA Model Q33*, a partial schematic of which is shown in Fig. 3.

In operation, the audio signal voltage developed at the plate of the 6SQ7 is coupled by *C1* to the grid of the pentode section of the 6AD7G, where it is amplified and appears again in the plate circuit in amplified form across the output transformer.

The signal at the grid of the 6AD7G

(Turn to page 23)

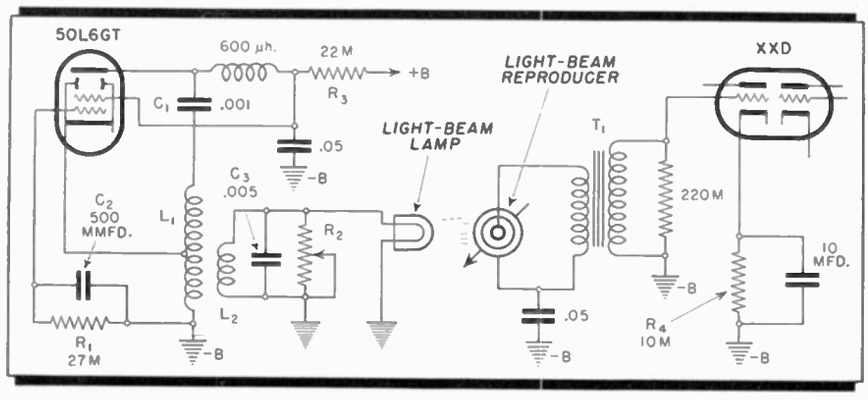
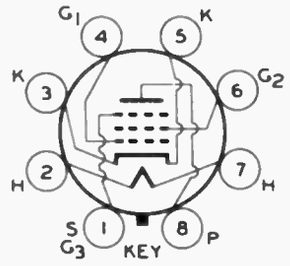


Fig. 1. Oscillator-energized lamp casts light on photocell via a needle-controlled mirror. Same tube used as converter oscillator.

Shop Notes

RCA 6SG7, 12SG7 TUBES

The 6SG7 and 12SG7 are r-f amplifier pentodes of the metal type particularly recommended for use in high-frequency receivers. They feature high transconductance (4000 to 4700 microhms) very low grid-plate capacitance, and *two separate cathode terminals.*



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Because of these features, the 6SG7 and 12SG7 offer new facilities for improving the stage gain of receivers, particularly those designed for high frequency and/or wide-band operation. At higher frequencies, the use of two cathode terminals permits of greater isolation of input and output through elimination of the coupling inductance of a common cathode return. As a result, the input conductance can be maintained at a high value at high frequencies. The low value of grid-plate capacitance minimizes regenerative effects, while the high transconductance makes possible a high signal-to-noise ratio. Furthermore, the single-ended metal construction with its self-shielding shell and short internal leads is a practical consideration in obtaining high gain with stability.

The 6SG7 and 12SG7 are alike except for heater rating. The heater of the 6SG7 is designed so that it can be operated in series with other 6.3-volt, 0.3-ampere types; likewise, the heater of the 12SG7 can be operated in series with other 12.6-volt, 0.15-ampere types.

A bottom view of the socket connections for the 6SG7 and 12SG7 is shown in the accompanying sketch.

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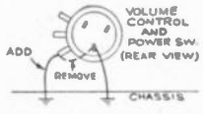
RCA 15X, 16X SERIES

Residual Hum

In some instruments the ground return of the volume control is made to a lug on the power switch, and has a mutual path through several inches of lead with



the power circuit. This introduces a certain amount of hum into the first audio stage input. Hum due to this cause can be eliminated by removing the present grounding lead of the volume control from the power switch, and connecting it directly to the chassis.

RCA RP-152D AND RP-153

Automatic Switch Adjustment

In RP-152D and RP-153, an automatic motor switch is mounted under the motorboard, near the pickup arm shaft.

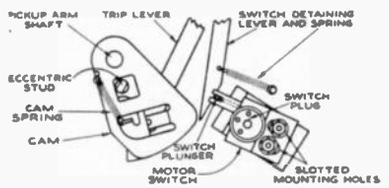
When the index lever is set at its "10-inch" or "12-inch" position, a detaining lever holds the switch plunger in and keeps the motor running.

When the index lever is set at its "manual" position, the detaining lever moves aside and the switch plunger is then actuated by a cam on the pickup arm shaft. In "manual" position, when the pickup is on its rest, the switch plunger is out and the motor circuit is open. When the pickup is moved from its rest to the edge of a 12-inch record, the cam pushes the switch plunger in and the motor starts. When the pickup needle reaches a point 1¾ inches from the centerline of the turntable spindle, the switch plunger is released by the sharp corner of the cam, thus shutting off the motor.

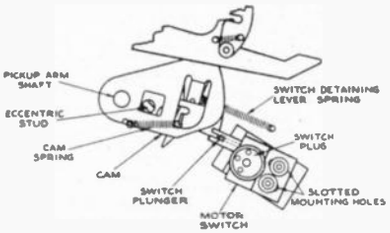
When the pickup is lifted off the record and moved to its rest, the motor starts momentarily.

Adjustments:

The slotted switch mounting holes permit positioning of the switch so that the



RP-152D & 153 AUTOMATIC SWITCH
(PICKUP ARM ON REST, AND INDEX LEVER AT 10" OR 12")



RP-152D & 153 AUTOMATIC SWITCH
(PICKUP ARM 1¾" FROM SPINDLE AND INDEX LEVER AT "MANUAL")

plunger will be pushed in by the cam.

The eccentric stud on the cam should be turned so that the switch plunger is released by the sharp corner of the cam when the pickup needle is 1¾ inches from the centerline of the turntable spindle.

◆

RCA MODELS 45X-11, -12, -13

2nd Production Changes

Service Data for these models is given on pages 233 and 234 of the 1939 Bound Volume. Two changes have been made in 2nd Production:

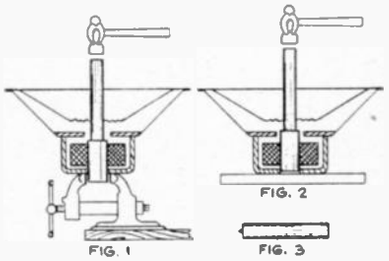
C-13 is connected to the grid of the 12SQ7 instead of to the arm of the volume control, to provide more effective i-f filtering. Diode plate No. 1 is connected to chassis instead of to diode plate No. 2, to reduce residual hum.

RCA DYNAMIC SPEAKERS

Replacing Field Coil

Many RCA electrodynamic speakers have the field core pressed into the yoke. To replace the field coil in these speakers proceed as follows, *being very careful not to damage the voice coil or cone:*

Carefully remove the front dust cover by means of a razor blade or a sharp knife.



Drive the core completely out of the yoke using a suitable piece of round steel rod as shown in Fig. 1.

Replace the field coil. Be sure that all spacers, washers, hum coil, and other parts are replaced in their original positions.

Insert the core down through the cone and field coil, and drive it in position as shown in Fig. 2.

If core is not centered in voice coil it can be driven from side to side, as necessary, with a center punch.

Cement a new dust cover in position on speaker cone.

If desired a special tool for this purpose can be made locally with the end shaped as shown in Fig. 3. It should be made of drill rod or cold rolled steel and hardened.

An alternative method of removing the core is to use a gear puller and press it out from the back of the yoke.

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RCA 14BT SERIES

Excessive Regeneration

When excessive regeneration occurs in models 14BT-1, 14BT-2, and 14BK, the following procedure should be followed:

Make certain the grounding finger for the 1N5GT tube shield is fastened to tube pin No. 1, which is grounded to receiver chassis.

Make certain that the metal rim of 1N5GT socket is soldered to the chassis.

Realign i-f transformers, using stage-by-stage procedure as specified in service notes, and do not "touch-up" individual trimmers.

Unusually high-gain 1N5GT or 1A7GT tubes should be replaced with tubes having normal gain.

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RCA V-205, V-405, VHR-207, VHR-407

Radio Break-Through on Phono

Radio break-through may occur in these models, due to capacity coupling between the i-f 6SK7 plate lead and 6F6G grid leads. When this condition exists, dress the 6F6G grid leads down against the chassis well away from the 6SK7 i.f. plate lead.

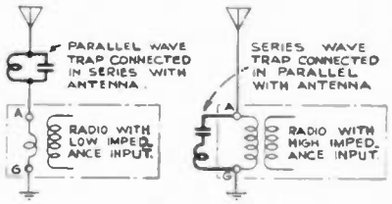
RCA WAVE-TRAP DATA

Complete electrical specifications for all available RCA wave traps are given on this page.

On sets with a low-impedance input (few turns on primary of antenna coil, with a d-c resistance usually less than 10 ohms) the trap should be connected in series with the antenna.

On sets with a high-impedance input (large number of turns on primary of antenna coil, with a d-c resistance of 10 ohms or more) the trap should be connected in parallel with the antenna.

Frequency ranges and "Q" are approximate.



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RCA PUSH-BUTTON SWITCHES

Tarnished Contacts

Proximity of rubber-covered wires may product tarnish on the silver-plated push-button switch contacts. This condition may be remedied by wiping the contacts clean, and moving any adjacent rubber-covered wires or other rubber material away from the switch.

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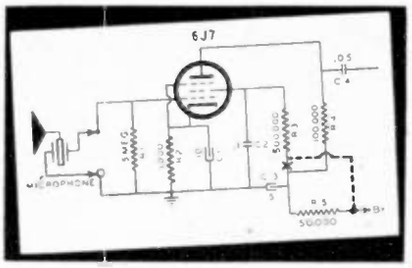
WILCOX-GAY A-72 RECORDIO

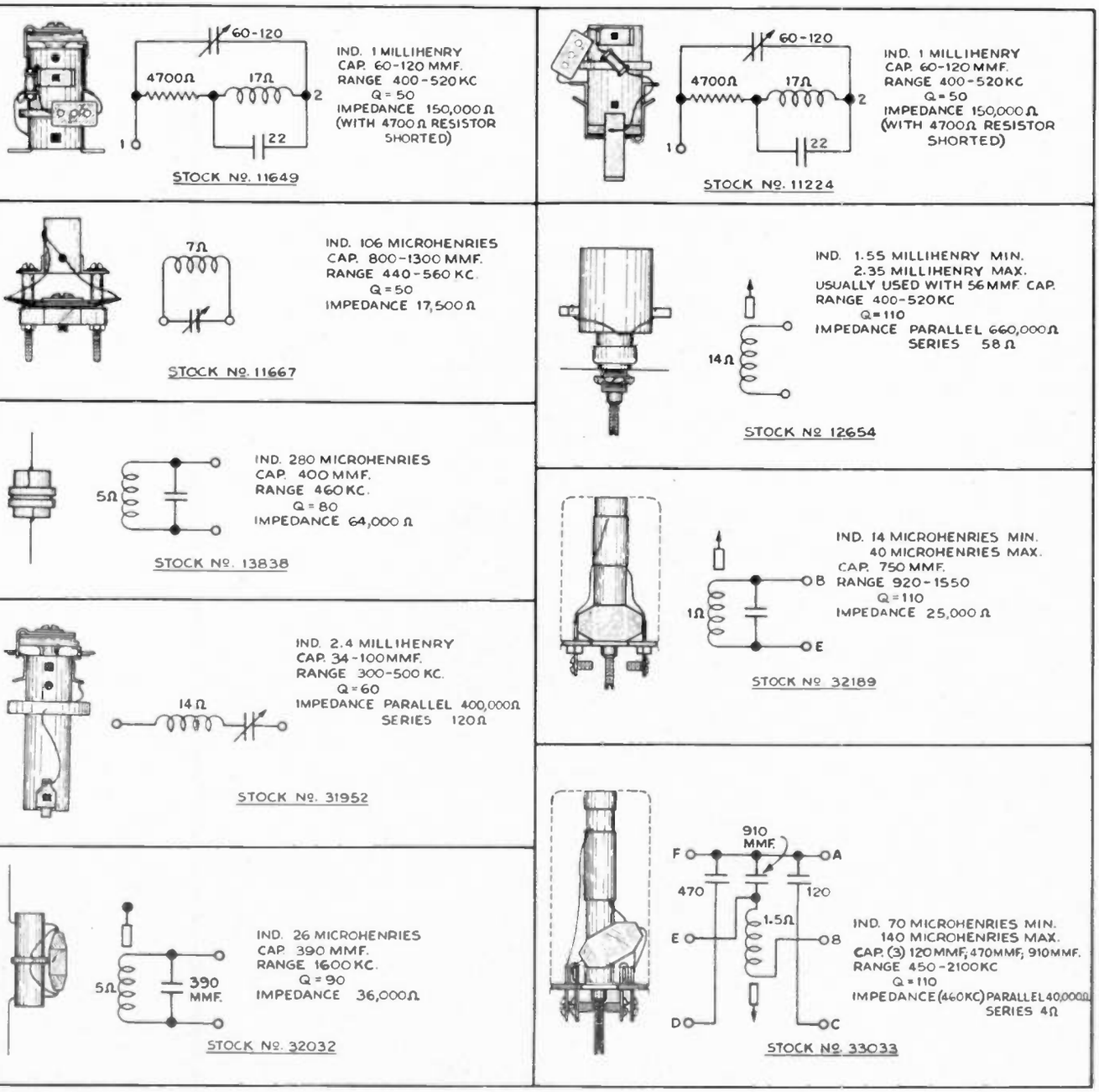
Audio Oscillation

In some of the earlier Model A-72 Portable Recordios, an audio oscillation may be noticed to occur with the volume control turned to near maximum position, when the 3-position switch is in the "Cut" position.



This oscillation manifests itself by a flickering of the 6U5 magic eye and will appear in the playback of records which have been cut under this condition, as a motorboating sound of an intensity nearly equal to that of the recorded voice or music.

To correct this audio oscillation, disconnect the 500,000-ohm 6J7 screen resistor R_3 from the hum filter composed of C_3 and R_5, and connect it directly to B plus as shown in the accompanying diagram.

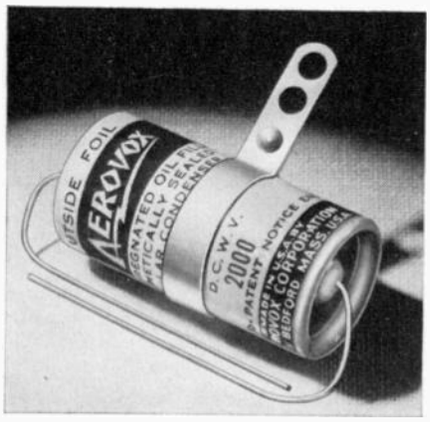


Presenting—

NEW PRODUCTS

AEROVOX

Midget Oil Condensers—The -89 Series oil-impregnated, oil filled tubular condensers have a cadmium-plated brass can for hermetic sealing, covered by a varnished-paper jacket with spun-over ends to prevent shorting or grounding of sharply-bent leads. A center mounting strap is provided.



For vibrator applications, coupling functions, low-power transmitters, etc. Available in 400 v., 600 v., 1000 v., and 2000 v. ratings, in capacities from .006 to 0.5 mfd. By Aerovox Corporation, New Bedford, Mass. RADIO SERVICE-DEALER.

◆

WEBBER

Electric Chimes—Single- and double-tone Westminster Electric Door Chimes, incorporating the feature of distinguishing, by the musical tones emitted, between back and front door circuits.

Most chime models are small enough to be easily carried to homes for demonstration purposes. Counter display board also available. By Earl Webber Co., 4348 W. Roosevelt Road, Chicago, Ill. RADIO SERVICE-DEALER.

◆

WALSCO

Recordene—A reconditioning fluid for phonograph records and a preserver for

instantaneous recordings. Comes in 2-ounce bottle with a wool-felt dauber in the cap. By Walter L. Schott Co., Los Angeles, Calif. RADIO SERVICE-DEALER.

CLAROSTAT

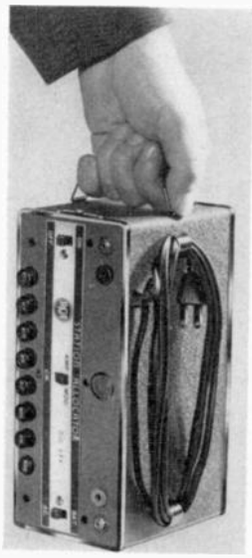
Tube-Type Resistor—Type MTG glass-insulated-element plug-in tube-type resistor for heavy-duty service such as in sets employing both 300 and 150-ma tubes served by a single voltage-dropping resistor.

The new type employs a fibre-glass core for the winding which may also be covered with a fibre-glass braiding, supported on the mica. The glass-insulated element handles over three times the wattage of the usual bare winding. Some units are made with a combination of bare winding and glass-insulated winding, supported on the same mica form. By Clarostat Mfg. Co., Inc., 285 N. 6th St., Brooklyn, N. Y. RADIO SERVICE-DEALER.

◆

RCA

Station Allocator—A compact test oscillator unit with 8 push-buttons that can be set to the frequency of any 8 stations in a given locality, making the rapid setting of push-button receivers a simple job. Operates from a.c. or from self-contained batteries. Frequency drift of tuned circuits is only .05%. The first two buttons may be set at any i-f frequencies between 405 and 825 kc, if desired. Operation may be obtained either with or without 400



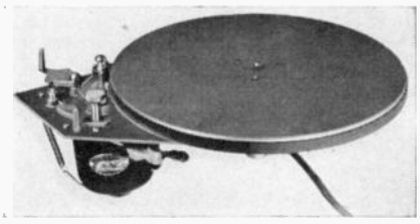
cycle modulation. By RCA Manuufacturing Co., Inc., Camden, N. J. RADIO SERVICE-DEALER.

◆

PRESTO

Phono Turntable—Type 11-A, as used in Presto K-7 Recorder, consists of the turntable and bearing, motor and drive system, with dual-speed pulley. Speed accuracy, within 0.4% at both 78 and 33⅓ rpm. Regulation within a single revolution is 0.2%. Noise level in turntable is over 35 db below program level.

Recommended for high-quality phonograph equipment, centralized sound systems, portable transcription playback



equipment, etc. Will handle records up to 16 inches. By Presto Recording Corp., 242 W. 55th St., New York, N. Y. RADIO SERVICE-DEALER.

◆

DeWALD

'41 Radios—DeWald Radio Manufacturing Corp., 436 Lafayette St., New York, N. Y., have announced their new 1941 line of Home and Portable Radios—a complete range of styles in plastics and wood featuring several 3-way portables, table and console models, phono-radio combinations, automatic record changers, home recorders, etc. RADIO SERVICE-DEALER.

◆

RCA

Aeropressure Mike—Directional characteristics may be changed at will by the use of a new "paracoustic" reflector baffle attachment. With the concave face of the circular, dish-shaped baffle toward the grille, the directional characteristics become sharpened, and feedback is reduced. When the baffle is reversed, the opposite directional effect is obtained. Without the baffle, the microphone becomes a normal pressure type.

Frequency response is 60 to 10,000 cycles. Available in both low impedance (250 ohms) and high impedance (40,000 ohms) models. Equipped with 30-foot cable. By RCA Manufacturing Co., Inc., Camden, N. J. RADIO SERVICE-DEALER.

◆

ERWOOD

P-A System—Complete, portable job with 28-watt amplifier and special case with room for two full-length floor-type mike stands with mikes. A record-playing attachment is included in the case.

The loudspeakers are contained in a bias cut, front-vented type of cabinet which eliminates rear radiation. The amplifier is a Model 3428 which has provision for using two mikes and a record player.

By Erwood Sound Equipment Co., 223 West Erie St., Chicago, Ill. RADIO SERVICE-DEALER.

(Turn to page 24)

CIRCUIT COURT

(From page 19)

divides across the resistors *R2* and *R3*. The portion of the signal voltage across *R3*, representing about one-fourth the total signal voltage across the two resistors, is applied to the grid of the triode section of the 6AD7G. At the triode plate, this signal appears amplified and reversed in phase. The signal voltage at this point is coupled to the 6F6G grid by *C2*, whence it emerges in the plate circuit and joins the other output signal component developed across the push-pull transformer primary by the 6AD7G.

Possibly we'll see this 6AD7G in other applications in sets to come. So take a good look at it now.

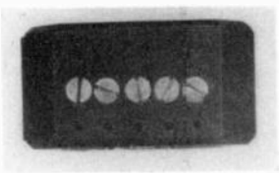
◆

TEST IN PEACE

(From page 5)

A piece of paper, suitably cut, was pushed under the pointer stops, secured with a little cement at the corners, and calibrated in place with a sharp pencil.

A jumper was made by twisting a pair of No. 20 wires. It is shown lying near the meter in the top view. After the photograph was taken, a phone tip jack was



Side of meter case, showing the five tip jacks.

soldered to this jumper for the use explained below.

As an exposure meter, the instrument functions normally without any external connections, since the addition of a 2-ohm resistance does not affect the circuit consisting of several thousand ohms. If the reader is worried about that, however, the jumper can be inserted into jacks 2 and 3.

USE

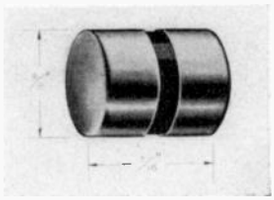
When the meter is used as a voltmeter, one test lead is plugged into jack 1 and the other into jack 4 or 5, depending on the range desired.

For the 200-mill scale, a slightly different arrangement of plugging is employed. One test prod is plugged into jack 3 and the other connected to the jumper, which in turn is inserted in jacks 1 and 2. In this way the photo-cell is

(Turn to page 25)

LITTELFUSE

Mercury Switch—A midget mercury switch 3/8" in diameter and 7/16" long, designed for use on low-voltage circuits up to 25 volts a.c. or d.c., and currents up to 10



amperes at 6 volts, and 3 amperes at 25 volts. A special baffle assures positive make or break operation, with no opportunity for a flickering action when equipment is jolted. By Littelfuse, Inc., 4757 Ravenswood Ave., Chicago, Ill. RADIO SERVICE-DEALER.

◆

WILCOX-GAY

Sound-Effects Kit—For the recordist seeking realism in his cuttings of home dramas, sound for movies, parties, etc., comes a sound-effects kit containing nine "props" with which a multitude of sound effects can be obtained, such as thunder, hoof beats, police-car siren, rain, breaking surf, crashes, etc. A folder of directions is included. Fun for the kiddies, too. By Wilcox-Gay Corp., Charlotte, Mich. RADIO SERVICE-DEALER.

◆

SOLAR

Capacitor Analyzer — New Model QCA Quick-Check Capacitor Analyzer which indicates leakage, insulation resistance, r-f impedance, power factor, capacities, and also affords a dynamic check for shorts, opens and intermittents.

Works equally well whether condenser is fully connected in circuit, has one or both leads disconnected, or even if condenser is shunted by an inductance or resistance.

Available in portable carrying case or service bench panel mount. By Solar Manufacturing Corp. Bayonne, N. J. RADIO SERVICE-DEALER.

◆

NEW LITERATURE

Replacement Coils—Four-page bulletin on adjustable-inductance antenna, r-f, oscillator and i-f coils. Included are new double-tuned replacement i-f transformers with grid lead from top or bottom of can. Write Radex Corporation, 1733 Milwaukee Ave., Chicago, Ill.

◆

Amplifiers—Amplifier Co. of America, 17 West 20th St., New York, N. Y., have issued an 8-page bulletin on their line of Master Beam Power Amplifiers. Copy on request to manufacturer.

◆

Antennas—Four-page bulletin on Flex-Angle, Bi-Flex and other type rod antennas and accessories, issued by Ward Products Corp., 205 Ward Building, Cleveland, Ohio.

◆

Parts Catalog—Available from Philco Radio & Television Corp., Philadelphia, Pa., is their new 50-page 1941 Catalog of Parts, Accessories, Tubes and Batteries. Includes reference information in the form of listings, according to model numbers, of the parts, tubes and batteries required for replacement purposes in Philco receivers.

◆

Three Catalogs—Howard announces three new free catalogs. The 490 Technical Manual has full charts and schematics on the Howard 14-tube Professional Receiver, with data on the art of receiver measurements.

Folder 103 deals with recording discs and needles. Folder 104 covers the complete line of Communication Receivers and accessories. Write Howard Radio Co., 1731 Belmont Ave., Chicago, Ill.

◆

Vibrator Manual—The Turner Company, Cedar Rapids, Iowa, have issued a 16-page Manual on Turner Push-Pull Vibrators. Manual includes replacement indexes, technical data, and a vibrator replacement chart. Copy free on request.

◆

Resistor Manual—Fourth Edition of the Clarostat Plug-In Tube-Type Resistor Replacement Manual has just been issued. It contains all previous listings covering existing set replacements, plus all the new data. Included is the new Type MTG glass-insulated resistors.

A copy may be had for 15 cents from your jobber, or from Clarostat Mfg. Co., 285 N. 6th St., Brooklyn, N. Y.

◆

Recording Catalog — National Recording Supply Co., Hollywood, Cal., has issued its 1941 catalog, illustrated in colors, for recording machines and its complete line of recording accessories. Copy on request.

New Garrard Catalog—Catalog No. 41, describing and illustrating the complete line of Garrard automatic record changers, phonograph turntables, motors, pick-ups and accessories is now available from the Garrard Sales Corp., 296 Broadway, New York, N. Y.

◆

RSC Catalog—Radio Supply Co., 711 Granby St., Norfolk, Va., distributors, have brought out a spiral-bound catalog of radio parts and accessories. Copies available to those in the trade.

◆

Supreme Book—A new book just released by the Supreme Instruments Corp., Greenwood, Miss., pictures and explains a new definite and direct servicing procedure that "makes an ailing radio talk to you just as a patient talks to his doctor." Copies are available at 35 cents each from Supreme.

◆

NEWS

Solar Appointments—Solar Manufacturing Corp., Bayonne, N. J., announces the appointments of *Harry A. Lasure,* 2216 West 11th St., Los Angeles, Calif., as district manager for that state, and the *Ambos-Jones Co.,* 1085 The Arcade, Cleveland, Ohio, as industrial sales engineers for Ohio.

◆

"Eveready" Drive—An intensive drive in behalf of "Eveready" "Mini-Max" "B" batteries for portable radios, backed by a newspaper advertising drive in key markets and including a free kit of dealer helps, is being launched by National Car-

bon Company, Inc. Dealers ordering $5.00 or more of "Eveready" "Mini-Max" batteries at dealer prices may obtain the kit, which includes a valuable premium.

Two of these "Eveready" "Mini-Max" batteries, No. 482 and No. 467, together fit more than 90% of all portable radios,

(Turn to page 28)

(From page 23)

short-circuited and the circuit is quite ordinary.

For the 400-microampere scale the test prods are pushed into jacks 1 and 3.

That is all there is to it.

Several notes may not be amiss here. The exposure meter shown has special scales made for a well-known camera manufacturer. The instrument itself is quite standard and does not differ from the "Universal" type made by Weston.

The bakelite case is quite thin and it would be much safer to use round-head screws to fasten the contact springs, instead of the flat-head screws shown. The counter-sinking weakens the case to a point where the wedge action of tightening the screws may crack it.

By using a 1-megohm resistor at the exploring end of the test lead, voltages may be measured at various points in a set operating at r-f potential. The error introduced will be 20% and may easily be corrected for.

F-M RECEPTOR

(From page 6)

The power supply is composed of the 35Z5GT half-wave rectifier and a filter circuit comprising a 1000-ohm resistor and two 30-mfd electrolytics. Since plate and screen currents are low, this simple resistance-capacity filter is adequate.

The receiver proper consists of a 12SK7 r-f stage, a 12SA7 mixer-oscillator, two 12SK7 i-f stages, a 12SJ7 limiter, and a 7A6 discriminator. The 7A6 is used since, like the other tubes, it has a 150-ma heater.

The r-f circuits are tuned by a three-gang condenser. Though not shown in the diagram, each unit of the gang has a ceramic trimmer for alignment purposes. These circuits are conventional except that single coils are used in the r-f stage and the oscillator. The former coil is capacity coupled to the mixer; the latter coil has a cathode tap to provide oscillation.

The input circuit is designed for use with either a doublet or a Marconi antenna. If a doublet is used, the transmission line leads are connected to posts *D*. If a Marconi antenna is used, the lead is connected to either *D* post, and post *G* is grounded.

The i-f and limiter circuits are conventional to the extent of their operation, but note the absence of decoupling filters and loading resistors. The voltage developed across the 50,000-resistor in the limiter grid-return circuit is applied to the control element of the 6AB5 tuning eye, and also serves as an automatic control bias voltage for the r-f and i-f tubes.

An r-f choke rather than a resistor is

employed in the return leg of the discriminator transformer. This choke is wound directly on the discriminator transformer dowel. The discriminator load circuit consists of the two 100,000-ohm resistors and .0001-mfd condensers. The 50,000-ohm resistor and the .001-mfd condenser in the output circuit form the de-emphasizer which tends to reduce the over-emphasized high-frequency response characteristic of all f-m transmitters. The output audio signal is fed to the audio amplifier of the receiver with which the Receptor is used through the .02-mfd coupling condenser which isolates the output lead from ground.

NOTES

The shielded lead can be connected to whatever audio input terminals are available on the receiver—phonograph jack or terminals, television input, etc. Audio output is adjusted by the volume control in the receiver with which the Receptor is used.

Particular care must be used in removing the 7A6 octal tube since the connecting pins are supported only by glass beads. Do not rock it out of the socket, but pry it out vertically so that no strain is placed on the pins.

Proper tuning procedure is as follows: The tuning control is turned to close the 6AB5 eye as far as possible. After this minimum shadow angle has been obtained, the tuning control is rocked very slightly either side of minimum shadow angle until the point of maximum quality of reproduction is located. This alteration in tuning should be so small that it will be accompanied by little or no change in the appearance of the tuning eye shadow angle.

VOLTAGES

The voltages that should be considered normal at each tube-socket terminal are indicated in the table at the bottom of the circuit diagram. All voltages indicated are measured between the socket terminal and ground (chassis). Readings shown are positive on the socket terminal with the chassis as the negative terminal except where a negative voltage reading is given in which case the chassis is positive.

These voltages are read with a line voltage of 117 volts and no signal being received. Readings are taken with a 1000-ohm-per-volt meter. Plate and screen voltages are read on the 250-volt scale. All readings under 50 volts are read on the 50-volt scale.

I-F ALIGNMENT

Alignment of the Receptor may be accomplished with the equipment usually used in alignment of all-wave receivers. Neither a frequency modulated oscillator nor a cathode-ray oscilloscope is necessary.

Connect the audio output leads of the Receptor to any convenient audio amplifier or "Phono" plug of any receiver, and connect an output meter (having a low range of 1 to 5 volts) across the voice coil of the speaker. Temporarily increase the gain of the 12SJ7 limiter tube by shunting a 2000-ohm resistor across the 47,000 ohms through which "B" voltage is supplied to the red wire of the discriminator transformer, No. 01664. Apply a 4.3-mc signal to the grid of the limiter tube through a .05-mfd coupling condenser.

Unlike conventional i-f systems for amplitude modulation, the output (discriminator) i-f transformer is not aligned for maximum response on its secondary, but is aligned for "balance", since it is one of the duties of this transformer to help eliminate amplitude modulation.

In tuning the secondary of the discriminator there are three places of *minimum* response; (1) out of resonance with the condenser too tight, (2) *correct,* and (3) out of resonance with the con-

(Turn to page 28)

NOTICE
INDEPENDENT SERVICEMEN

The Future Looks Very Bright

Many thousands of part-time and transient radio servicemen no longer compete with you. They have gone back to their regular jobs or are in the Defense Service. The untenable business conditions these part-timers were largely responsible for are fast disappearing.

RADIO MOVING DAY . . . March 29, 1941, when over 10 million push-button receivers will require resetting, is fast approaching. Here is one of the greatest opportunities you've ever had. Take advantage of it fully. Your customers, the broadcast stations in your territory and you will benefit. RSD shows you how to go about it. Read every issue of RSD for timely, *exclusive* technical data and for *proven* sales ideas that will surely help you make more money during the years to come.

Subscribe to RSD today—it is the *Technical Monthly With The Largest Circulation Amongst Leading Radio Service-Dealers, Soundmen and Parts Jobbers.* RSD publishes more important technical data than any other publication catering to radio servicers.

This distinctive six-inch decalcomania lithographed in four colors (red, white, blue and gold) which will help your business, available FREE to all subscribers classified as independent radio service dealers on request.

TEAR OUT AND MAIL TODAY

RADIO SERVICE-DEALER
11 West 42nd Street, New York City, N. Y.

Sirs: Here is my ☐ check (or ☐ money order) for $.... Enter my subscription order to RSD for the next ..... issues. (12 issues cost $2.—24 issues cost $3.) Canadian and Foreign subscriptions are $3 annually. The information given below is accurate. If my subscription is rejected I expect an immediate refund in full.

Name (print carefully) .....

ADDRESS .....FIRM NAME .....Est. 19....

CITY .....STATE .....YOUR POSITION .....

Please check whether firm is

☐ An independent servicing organization
☐ An independent service-dealer (engaged primarily in service work)
☐ A service-dealer (does servicing, but is primarily interested in retailing)
☐ Selling, renting or servicing Sound Equipment
☐ Jobber ☐ Any other classification
☐ Manufacturer (State it) .....

I belong to a serviceman's organization .....Yes ☐ ..... No ☐

We stock the following checked items:

☐ TUBES
☐ PARTS
☐ RECEIVERS
☐ BATTERIES, etc.
☐ SOUND EQUIP.
☐ ELEC. APP'L'S.

We own the following instruments:

☐ V-T Voltmeter
☐ Tube Checker
☐ Analyzer
☐ Oscillator
☐ Signal Generator
☐ Volt-Ohm Meter
☐ Others
☐ MANUALS

(Continued from page 26)

denser too loose. The proper minimum has the characteristic that the signal *rises* very rapidly as the trimmer is turned *in either direction*. The other two minima mentioned above *do not* have this characteristic and are incorrect. The trimmer farthest from the 12SJ7 tube tunes the secondary of the discriminator and by slowly rotating this trimmer the point of minimum audio response will be found and will indicate correct alignment of this trimmer. Now *mistune* this trimmer as little as possible but enough to hear a signal and to obtain an output meter indication with which to align the primary trimmer for *maximum* response. Leaving the secondary trimmer mistuned, to assist in the i-f alignment, move the signal input to the grid of the second 12SK7 i-f amplifier tube, and align this stage, always reducing input as sensitivity increases so as to remain below the level at which the limiter works. Unless this precaution is observed, the resonance indication is broadened. In the same way align the remaining i-f transformers, finishing with the signal applied to the 12SA7 grid. The *secondary* of the discriminator may now be retuned to *minimum* response and the 2000-ohm shunt resistor removed, completing the i-f alignment.

R-F ALIGNMENT

For reasons of stability, the oscillator in the Receptor operates on the low side of the r-f signal. Because of the high intermediate frequency (4.3 mc) there is no possibility of aligning the oscillator on the image. If there is reason to believe that the trimmers are badly out of alignment, a very practical initial adjustment would be to adjust *all three trimmers* to a position about one-fourth turn from maximum capacity. Then apply a 44-mc signal (or equivalent harmonic of some lower frequency) to the antenna terminals of the Receptor through a dummy antenna of 200 to 400 ohms, set the pointer to 44 mc and adjust the trimmer on the center (oscillator) section of the gang condenser to give the maximum response *of the tuning eye*. Align the antenna (front) and r-f (rear) trimmers for maximum response and check the sensitivity at various points within the band. When properly aligned the antenna and oscillator trimmers are about one-fourth turn from maximum capacity with the r-f trimmer about two turns from minimum.

NEWS

(From page 24)

and constitute the standard portable battery line, the company points out. The new dealer offer covers both these batteries.

First of the three items making up the dealers' kit is a mahogany plaque on which will be imprinted the name of the dealer qualifying for the offer. The plaque may be hung on the wall or placed on a window easel. A window-piece designed to sell both portable radios and batteries is the second item. Any make of radio can be displayed on it, and one section forms a blackboard on which prices may be chalked up. A portable battery replacement guide is the third item. Printed on heavy cardboard, it gives accurate, last-minute information regarding which of the "A" and "B" batteries should be sold for various portable sets.

◆

RCA Course—A special course of demonstrations and lectures for parts jobber salesmen on the use of the RCA Dynamic Demonstrator in merchandising test equip-

ment has been arranged by the RCA Tube and Equipment Division, in cooperation with RCA tube and equipment jobbers in many sections of the country.

Bill Bohlke, RCA's Director of Test Equipment Merchandising, is conducting the meetings for the entire personnel of parts distributors in the New York, Chicago, Cleveland and Kansas City areas. Gatherings are planned for other sections of the country, particularly the southwest and the west coast, before Spring.

✦

Howard Appoints —Howard Radio Co. has appointed *Delos H. White* to represent them in Georgia, Florida and Alabama on their household receivers and recording discs. Mr. White will have full authority to appoint distributors and dealers in these states.

✦

Ken-Rad Appointments —The *Herb Erickson Company,* 14 Biltmore Ave., Asheville, North Carolina, has been appointed as factory representative for Ken-Rad tubes in the states of South Carolina, Georgia, Florida, Mississippi and Alabama. Mr. Erickson's associate, *Horace C. Russell,* has headquarters in Atlanta. His mailing address is P.O. Box 1803.

C. E. Moore has been appointed district representative for Ken-Rad in the states of Missouri, Nebraska and Kansas, with headquarters at 3118 Linwood Blvd., Kansas City, Mo.

✦

Turner Appoints —The Turner Co. has appointed the *Herb Erickson Co.,* 14 Biltmore Ave., Asheville, North Carolina, as their representative in Alabama, Florida, Georgia, North Carolina, South Carolina and Tennessee.

✦

Electrovox Reduces Price—Electrovox Company, 424 Madison Ave., New York, N. Y., announces that Walsco Sapphire Needles now carry a new list price of one dollar each—a 30-percent reduction with full

trade discounts applying. The needles are now available in a new plastic package mounted on a counter-card dispenser, with 12 packages to a card.

✦

Erwood-N. U.—Effective March 1, 1941, the Erwood Sound Equipment Co. have appointed *National Union* as their exclusive distributor on all their sound equipment and accessories for the entire world.

Erwood sound equipment comes equipped with National Union heavy duty Sound X/tra Tubes.

✦

Du Mont Appoints —The appointment of the *H. E. Ransford Co.,* Fulton Bldg., Pittsburgh, Pa., as sales rep for Western Pennsylvania and the state of West Virginia, is announced by the Allen B. Du Mont Laboratories, Inc.

✦

Howard Appoints—*H. T. Ziegler,* youngest member of the "Old Timers" Club, has joined Howard Radio Co. as Advertising Manager.

Charles B. Shapiro, Executive Vice-President of Howard, has taken over the sales of Howard household receivers on the Pacific Coast, including California, Oregon, Wyoming, Utah, Washington, Arizona, Nevada and Idaho.

✦

Allied Appoints—Allied Radio Corp., Chicago, announces the appointment of *Charles S. Kiger* to the position of Merchandise Manager of the Radio Set Division. Mr. Kiger has previously been associated with Montgomery Ward, Sears, Roebuck and E. H. Scott Laboratories.

✦

PRSMA Meets—The February meeting of the Philadelphia Radio Service Men's Association constituted a program arranged by the Philadelphia Distributors who are

Stewart-Warner jobbers in Philadelphia, and the Ken-Rad Tube & Lamp Corp. A talk on "Noises in Radio Tubes" was given by *E. V. Kesheimer,* Commercial Engineer of Ken-Rad. A second talk, on "Equipment for Radio Servicing", was given by *Max Schinke,* Service Manager of Stewart-Warner. The meeting was attended by 150 members.

✦

LVRSA Meets—On Monday evening, February 17th, Bruce Burlingame braved a blizzard to address the members of the Lehigh Valley Radio Service Association, now affiliated with the RSA, 65 of whom were present at the Hotel Allen, Allentown, Pa. Mr. Burlingame gave an informative talk on the Supreme Vedolyzer, explaining how cathode-ray oscilloscopes should be used in radio service work. It became apparent that many servicemen now own 'scopes of various makes but cannot obtain full return for the money they have invested, as not enough information on the use of the equipment has been disseminated.

Sandy Cowan, of RADIO SERVICE-DEALER attended the meeting, said a few words about Radio Moving Day, and arranged to address the LVRSA next Fall.

The newly-elected officers of the Chapter are: H. H. Fillman, President; S. P. Gruitt, Vice-President; R. E. P. Abbott, Recording Secretary; Russell Buss, Financial Secretary; J. A. Muthart, Treasurer. The following were elected to the Board of Directors: Raymond Miller; T. W. Reichard, and Stanley Eisenhard.

✦

RADIO'S MOVING DAY

RCA Helps—Substantial advertising support, backed by a complete sales promotion program, has been planned by the RCA Tube and Equipment Division in connection with Radio's Moving Day on March 29, according to J. P. Allen, in charge of RCA Tube advertising. The campaign is concentrated behind the radio serviceman's once-in-a-lifetime opportunity of getting into the homes of the 10,000,000 owners of push-button radio receivers.

One of the largest guns in RCA's program is a full-page color advertisement scheduled for the March 29 Saturday Evening Post. The ad urges radio owners to have a competent serviceman retune their push-button receivers, and to "retube when you retune".

A 35-piece sales promotion kit ties in with the Post ad by featuring a reprint which may be used as a store or window display. An important feature of the kit is the inclusion of an exclusive Frequency Range Book, edited by John F. Rider, which gives the serviceman the all-essential frequency range of the push-buttons of every type of set on the market.

Other units in the kit are two different streamers, a counter card, two different direct mail cards, one duplex card, 25 log books, a "spot" announcement record with 13 radio "spots", and a catalog sheet describing the RCA Station Allocator.

✦

Sylvania Helps—To help servicemen and dealers cash in on the March 29th Radio Station Frequency change, Hygrade Sylvania Corporation is offering special promotion in the form of window streamers, postcards, door knob hangers and a new Radio Station Finder.

Paul S. Ellison, Sylvania Radio Tube Sales and Advertising Manager, addressing his statement on frequency change sales promotion to all the radio servicemen of America, said, "All push-button radios must be changed and you're the man to do the job in your neighborhood. Ordinary dial sets, too, need your master radio servicing touch. People will be more conscious of their radio reception now, than ever before. The doors of the public are unlocking and you, the radio servicing expert, can open them up, get at hundreds of radios, re-set push-buttons, tune up the whole radio, fix manual dial radios as well, and replace worn out tubes for better listening."

The two color Sylvania window poster size 14" x 22" is free. Arresting headline, "After March 29th", is printed in bold red type aimed to catch the shopper's eye from across the street, from auto, street car and bus windows, as well as the eyes of those who pass right close to the service shop window. It brings customers into the service shop where the serviceman can explain what it's all about, get names and addresses, make appointments for changing push-buttons, and doing a complete radio servicing job.

The Sylvania Radio Station Finder is the good-will gift to set owners. It is printed in two colors, green and black, and lists the old and the new frequencies for every United States station changing on March 29th. It can be folded to mail in standard envelope or used as shop or door to door handout. Sylvania offers it free without imprint through Sylvania jobbers, or imprinted at moderate prices.

Two U. S. Government stamped postal cards are an important part of the advertising promotional plan. One tells the whole story of radio frequency changeover in a friendly personal way. The other repeats the window poster message; it is worded as a follow-up to the first card offering to the customer a Free Station Finder. These government post cards are offered imprinted at the price of postage only, 1c each.

The Door Knob Hanger also repeats the window poster copy. It is a house to house canvass follow-up to the direct mail and window display effort. It is offered imprinted at a moderate price.

All free material is being offered through Sylvania jobbers. Imprinted material can be handled either through Sylvania jobbers or, for greater dispatch, direct with Hygrade Sylvania Corporation, Emporium, Pa.

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RCA PREFERRED TYPE REPLACEMENT TUBES

RCA'S trail-blazing "Preferred Type" tube program which has been endorsed by a majority of radio manufacturers, is to be extended to embrace the renewal tube market as well, it has been announced by L. W. Teegarden, Manager of the RCA Tube and Equipment Division.

The "Preferred Type" program for renewal tubes centers on a list of 66 tube types, out of the more than 500 types now on the market, which account for 66% of the total renewal demand, Mr. Teegarden said. By stocking an adequate supply of the 66 "preferred" types, he added, the dealer and distributor are in a position to supply as much as 84% of the demand by substituting "preferred" type tubes for others having the same characteristics.

Lower costs, better quality, and greater availability are but three of the many benefits the whole radio industry stands to realize from the program, he said. Further, concentration of volume means better turnover, lower warehousing and operating expenses, and fewer back orders for the distributor and dealer.

"When the first RCA 'Preferred Type' tube program was announced on January 1, 1940, a blow was struck at one of the worst evils of the radio industry—the chaos that existed in the receiving tube field," Mr. Teegarden said. "Today more than 20 of the leading radio manufacturers are using 'preferred type' tubes as initial equipment.

"The next logical step is to apply the principle of volume concentration to the renewal market, where currently some 500 tube types are in active use. Careful study of the tube types used as initial equipment in all brands of radio receivers, together with a study of the tube type movement of leading distributors and retailers, leads to the selection of the new RCA Preferred Type Renewal List of 66 types that account for 66% of the total renewal tube market."

There are so many different types of tubes required for servicing all radio receivers now in use that it is almost im-

RCA PREFERRED RENEWAL TYPE	INTERCHANGEABLE TYPE(S)*	Suggested Stock Quantities† A 150 Tube Inventory	B 250 Tube Inventory	C 500 Tube Inventory
OZ4	OZ4-G	1	2	4
1A5-GT	1A5-G	1	1	2
1A7-GT	1A7-G	2	4	8
1C5-GT	1C5-G	1	1	2
1H5-GT	1H5-G	2	3	7
1N5-GT	1N5-G	2	4	8
2A3	2A3-H	1	2	3
2A5		1	2	3
3Q5-GT		1	1	2
5Y3-G	5W4, 5Z4	3	5	10
5Y4-G		2	3	6
5Z3	83-V	2	3	6
6A7		6	8	15
6A8	6A8-G, 6A8-GT	6	10	20
6C6	77	1	2	4
6D6	78	3	4	8
6F5	6F5-G, 6F5-GT	2	3	6
6F6	6F6-G	7	12	24
6H6	6H6-G, 6H6-GT	3	5	10
6J5	6C5,6C5-G,6C5-GT, 6J5-G, 6J5-GT	3	6	12
6J7	6J7-G, 6J7-GT	2	3	6
6K6-GT	6K6-G	1	2	3
6K7	6K7-G, 6K7-GT	7	12	24
6L6	6L6-G	3	4	8
6Q7	6Q7-G, 6Q7-GT	4	7	14
6SA7	6SA7-G, 6SA7-GT	1	1	3
6SJ7	6SJ7-GT	1	1	2
6SK7	6SK7-G, 6SK7-GT	1	2	3
6SQ7	6SQ7-G, 6SQ7-GT	1	2	3
6U5/6G5		1	1	3
6U7-G		1	1	2
6V6-GT	6V6, 6V6-G	1	2	4
6X5-GT	6X5, 6X5-G	1	2	3
12A8-GT	12A8-G	1	1	2
12K7-GT	12K7-G	1	2	3
12Q7-GT	12Q7-G	1	1	2
12SA7	12SA7-G, 12SA7-GT	1	2	4
12SK7	12SK7-GT	1	2	4
12SQ7	12SQ7-GT	1	2	6
24-A		4	7	15
25L6-GT	25L6, 25L6-G	2	4	8
25Z5		4	7	14
25Z6-GT	25Z6, 25Z6-G	2	4	8
26		4	6	12
27		6	11	22
30		1	2	4
35		1	2	5
35L6-GT	35L6-G	1	2	4
35Z5-GT	35Z5-G	2	4	8
39/44		1	2	3
41		2	3	6
42		4	6	12
43		2	3	6
45		5	9	18
47		2	3	7
50L6-GT		2	4	8
56		1	1	2
57		1	1	2
58		1	2	3
75		4	8	16
76	37	2	3	6
77	6C6	1	2	3
78	6D6	3	5	10
80		9	16	34
83		1	1	2
84/6Z4		1	1	3
Totals-66		150	250	500

**Ordinarily interchangeable with preference type, but exceptions will be found, such as tube size or unusual circuit conditions.*

†In setting up suggested stock quantities, consideration has been given to renewal demand, number of each tube type in existing receivers, etc.

possible for the distributor, and certainly for the retailer, to stock every type for which he may receive a call. However, the relatively small group of types selected for the Preferred Type Renewal List will permit the servicing of most replacement requirements promptly and profitably.

Mr. Teegarden said that special care was taken in selecting a group of types which are ordinarily interchangeable with other types having less sales volume. Thus, Preferred Type Renewal Tubes can be used to take care of an additional 18% of total replacement sales. Result: the 66 types in the preference list can be made to take care of 84% of all renewal tube requirements. The importance of the program is emphasized when it is recalled that more than 400 additional types are needed to serve the remaining 16% of all renewal tube requirements.

"Just as the list of Preferred Type Tubes for initial equipment was reduced from 36 to 31 after one year of operation, so there is reason to believe that the relatively longer list of Preferred Type Renewal Tubes may be reduced from time to time," Mr. Teegarden said. "The ideal will have been reached, of course, when the Preferred Types for initial equipment and the Preferred Type for renewal requirements are identical."

RCA Preferred Type Renewal Tube Program is being introduced to tube and

Address Change?

Notify RSD's circulation department at 11 West 42nd Street, New York City of your new address 2 or 3 weeks before you move. The Post Office Department does not forward magazines sent to a wrong address unless you pay additional postage. We cannot duplicate copies mailed to your old address. Thank You!

equipment distributors and dealers. A large broadside has been prepared emphasizing demand and interchangeability of the Preferred Type Tube renewal list and is being mailed to all RCA tube and equipment distributors, dealers and service men. The broadside may be used as an inventory control and ordering guide.

SERVICEMAN'S DIARY

(From page 8)

Then, following the awful silence after that heart-rending entreaty, there came to my ears such a horrible sound that it stopped me right in my tracks. It could be only one thing and *was* only one thing—the throaty growl of a pack of hounds on the rampage. And coming fast in my direction!

I turned on my heels and made a bee line for the house, yelling for help. The hounds were gaining and I was fast losing strength. Then, ahead, I saw the door of the house open, and this gave me renewed energy. I reached the porch, bounded through the door and fell in a heap on the floor.

I think I must have passed out for a while, because I remember swimming up out of darkness crying, "The lady—the hounds—help!" and seeing a group of people standing over me in fits of laughter. One young lady pretended to be horror-stricken and kept saying, "No, no —not that!" and going into hysterics.

Then old man Grimsley came forward and helped me to my feet.

I said, "I don't get this. There was a lady . . ."

"Just a little joke," Grimsley broke in. "You're new to this place so you wouldn't know about it, but I have loudspeakers planted in those pines. Down in the basement I have record players, a p-a amplifier and—if I do say so myself —as neat a progressive switching system as you've ever laid eyes on. I can move a voice clear across my estate by fading from one speaker to another. Naturally, I have special recordings."

"Well," I said, "I guess I ought to be boiling, but it sure is a relief to know there's no lady out there. But, you didn't get me out here just to . . ."

"Oh, no," Grimsley said, raising his hand. "We were expecting someone else, and I'd clean forgotten about you. Matter of fact, the sound system goes dead at unexpected moments and I was anxious to have it set right before the remainder of my guests arrived so that—well—so that we could surprise them in a manner of speaking."

The equipment was evertyhing Grimsley said it was. There were banks of motor-controlled switches that would automatically mix, fade, alter volume and switch sound from four turntables.

Switching sequences were controlled by a paper roll with holes punched in it, the paper running between a row of contacts. Once the proper records were put on the turntables and the right paper roll selected, a whole sound show could be put on by merely pressing a remote button upstairs.

Grimsley hung around long enough to explain the outfit, then left me to my own devices. It took me about fifteen minutes to find the trouble, which was nothing more than an intermittent in the main audio feed line from the amplifier to the output switch bank. It was pure luck that I found it in so short a time and I felt pretty good.

Grimsley raised his eyebrows when I showed myself upstairs. "So soon?" he said.

"We're good," I said, smiling, "but I want to say that . . ."

"I know, I know," Grimsley cut in. "It's what everyone says. You want to say that I'm as funny as a crutch."

"Not at all," I assured him. "I can take a joke as well as the next man. And when I'm old, I'm going to look back on this night as being pretty jolly."

Grimsley laughed and slapped his thigh. "Glad you take it that way. And now, if you don't mind, I must return to my guests. Send your bill along in the morning."

"I'll do that," I said, "but I want to say—as I started to say before—that we're good, and being better than the average, we charge a bit more."

"I see," said Grimsley. "And what would you say a fair charge would be?"

"Considering everything," I said, without blinking an eye, "fifty dollars."

Grimsley stroked his chin for a while and then broke into a smile. "Yes," he said, "considering everything, I guess that's a fair charge."

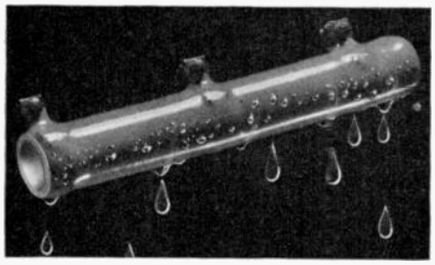
"Very fair," I said, as I headed for the door, "and I'm sure you, too, will find the whole matter very jolly when you have occasion to look back on it."

SALES HINTS

(From page 11)

station will be able to file your name and thus have it available to use when set owners begin making inquiries as to "what serviceman in my community is reliable and qualified to fix my radio."

During the week of March 23rd, the CBS, MBS and NBC networks will produce an outstanding evening program on Reallocation Day. Various commentators will give the changeover a lift. Millions of dollars worth of network time and talent will be expended, and radio service-dealers should take advantage of the opportunity by pro-



fusely distributing literature which advertises their shops. Check your record files carefully. Phone your old customers and try to line up the resetting work in advance. Then, when appointments are arranged, route your calls so that you can make "drop-in" visits to other old customers while en route to or returning from jobs. In other words, don't pass by a potential job if you can possibly help it.

PRICE SCHEDULE

In your direct-mail advertising promotion material, try to work out a fixed basic price schedule. Before doing this hold a get-together with your competitors. Try to agree on a uniform price schedule so there will be profit for all and fair treatment for the set owners. If possible, enter into a cooperative agreement, even to the extent of joint newspaper or direct-mail advertising, the cost of which would be equally distributed amongst all parties. Keep in mind the old adage, "In unity there is strength."

It is controversial, but in our opinion there should be *no* effort made to get business on a free service-call basis. Let the other fellow do the missionary work, and speculate on his time by handling free calls. But, at the same time, don't set your basic service charges too high.

Without question you will find a huge amount of replacement parts business in the field just as soon as you dig in . . . and this replacement business should be handled on a list-price basis, with a definite guarantee given to the customer. Be sure to use reliable, nationally advertised brands of replacement parts and tubes.

Try not to be complacent. In other words, don't be satisfied if you are busy. Try to line up as much *appointment* business as possible, and give these jobs immediate but superficial attention so that while the customer is attended to promptly, not too big a backlog will accumulate. Give every set you reset a thorough but hasty check-up and make a *complete* card-file record for subsequent call-back. Try to schedule your wholesale work, that is, the work you are sub-contracting from dealers, so that it does not over-balance your own original business commitments. With regards to sub-contract work, remember that a vast number of automobile service stations do *not* do radio servicing, and they are excellent prospects for recommendation business on a split-fee basis. Any sign maker will plan and execute a few display boards for you to hang up in auto service stations. They are not expensive and pay for themselves many times over. Meanwhile, the leading radio tube manufacturers are in a position to supply you

with "dealer helps," that is, direct-mail literature and broadsides, with space provided for your imprint.

When you are in a home resetting buttons and doing other incidental work, be sure to survey the premises to find out what other receivers are owned and operated, whether push-button or not, Load that card file of yours with information that will help you on future business drives during the slack season. Get the immediate tube replacement business whenever possible, for that type of profit selling can be consummated in short order and builds up your backlog of alignment work and control or condenser replacements for the immediate future.

Helen Staniland, of Quam-Nichols, draws the first capsule for space allotment in the Radio Parts National Trade Show, and hands it to E. S. Riedel, of Raytheon. Irving Kahan, of Sprague, announced the number.

For Every Need in EVERY Emergency

AXIAL LEAD RESISTORS
TYPE 710 — size 1/8" x 5/8" rated 1/2 watt
TYPE 714 — size 1/4" x 1" rated 1 watt

Centralab

AXIAL LEAD RESISTORS

Under water . . . in the air . . . under ground . . . on every "front" these famous resistors are proving their fitness in routine as well as emergency work.

Due to more exacting conditions in the industry . . . the vogue of smaller plastic models; there is an even greater need for resistors that are both small in size and positively insulated. Centralab AXIAL LEAD resistors are designed to fit into limited space without danger of shorting. Moulded bakelite CAPS through which the end leads protrude . . . complete the positive insulation afforded by the non-conducting ceramic jacket. Will withstand five times rated load without permanent change.

For further information ask your jobber or write for Bulletin No. 606.

Magnified cross section shows center core of resistance material surrounded by a non conducting shock proof ceramic.

Both core and jacket are fired together at 2500 degrees F. into a solid unit—hard and durable as stone and impervious to moisture.

Pure copper spray at extreme ends gives positive electrical and mechanical contact.

RADIAL LEAD RESISTORS

The radial leads where attached to the body of the resistor are uninsulated . . . making these resistors 90% insulated . . . in every other respect the electrical characteristics are the same as the AXIAL Lead units.

TYPE 310 — size 5/16" x 5/8" Rated 1/2 watt
TYPE 314 — size 1/4" x 1" Rated 1 watt
TYPE 316 — size 1/4" x 1 1/4" Rated 2 watts

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POPULAR CONDENSER ASSORTMENT *with* TOOL SUPPORTER

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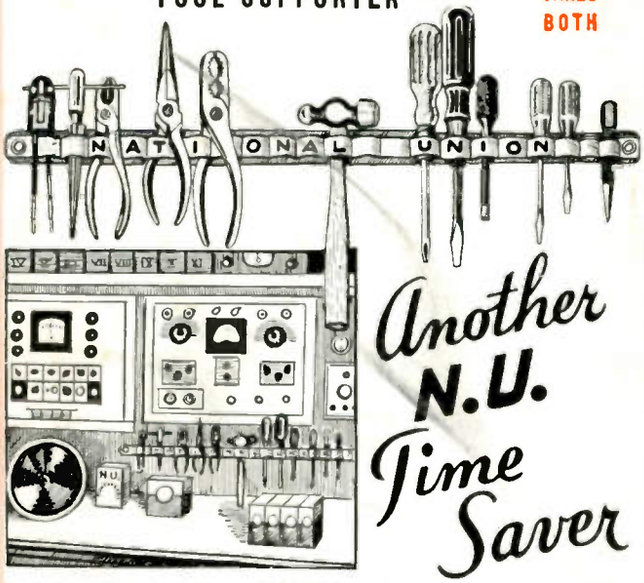

Tool Supporter is 24" long,—holds 20 tools,—sturdily constructed.

Another N.U. Time Saver

THE basic tools of your profession always at your finger-tips — No more hunting — no more wasted time — your tools are where you want them — when you want them.

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Get this POPULAR CONDENSER ASSORTMENT

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WITH TOOL SUPPORTER — $5.25
TOTAL VALUE $6.10

This fine assortment of popular type N.U. Condensers will move fast, give you a good profit and insure the good will of your customers. If you're already using N.U. condensers, you'll be sure to snap up this offer in a hurry. If you don't know yet how really good N.U. condensers are, here's a great opportunity to try them! The assortment you get on this limited offer consists of:

1—AT1025 1—AT2015 2—AT8450 1—AT2215
2—T601 3—T605 3—T610 1—T625

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Sells More Batteries
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win trade from drug stores and filling stations

- Set Switch for Voltage
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Only $8.00 Deposit

Delivery made at once on $8.00 deposit and order for $10.00 worth of batteries, dealer prices. Deposit refunded on purchase of 430 points. All purchases of N.U. tubes, condensers and batteries count as points.

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The N.U. line of radio replacement batteries has been developed exclusively for radio service specialists. All popular types are included. Batteries are attractively packaged in rugged boxes incorporating the standard N.U. color scheme—black and two shades of green.

N.U. Batteries are carefully manufactured from the finest materials obtainable and are fully guaranteed against defects in workmanship and materials. All types equipped with standard plugs for quick and easy replacement installation.

Thoroughly moisture proof for satisfactory and reliable service under all climatic conditions.

Install N.U. replacement batteries for more hours of reliable service and satisfied customers.

N.U. brings you a line of replacement batteries on which you can make your full radio service profit. It is not necessary now for you to test sets and install batteries without adequate compensation for your time and knowledge.

N.U. has been identified with the radio service dealer and his problems since the beginning. You can definitely make more money handling N.U. products.

★

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57 State Street, Newark, N. J.

☐ I am interested in your new Battery Merchandiser calling for only $8.00 deposit. Please send more information.

☐ Please have salesman call. RSD-3-41

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Over a 10 year period Servicemen have earned through their purchases of N. U. tubes, batteries and condensers, in excess of 50,000 pieces of high calibre test bench equipment.

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