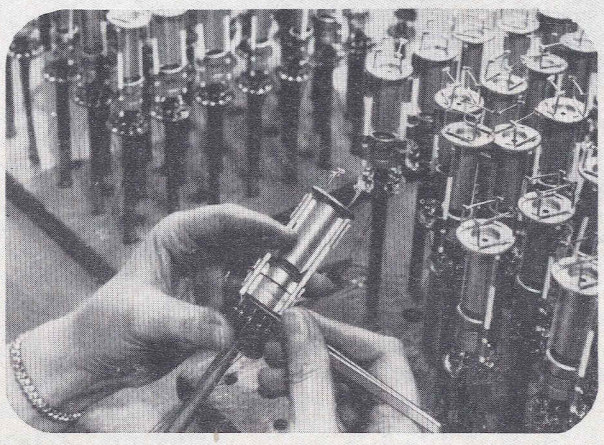
RADIO AND TELEVISION

Service News

A PUBLICATION OF THE RCA TUBE DEPARTMENT



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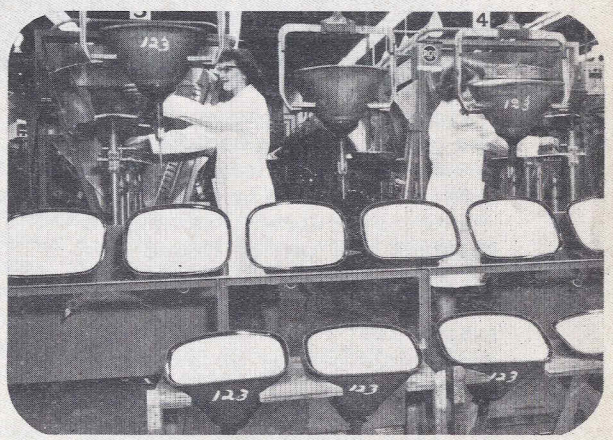

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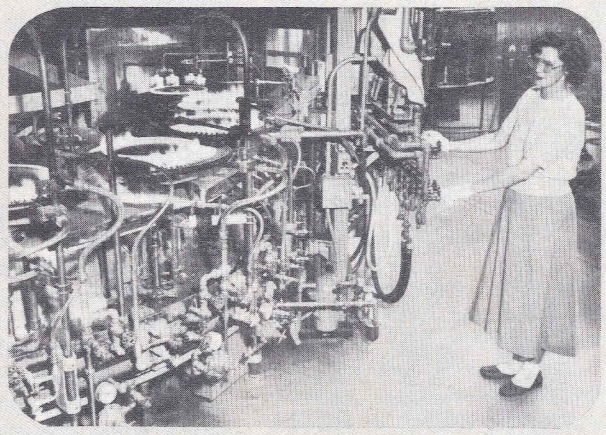

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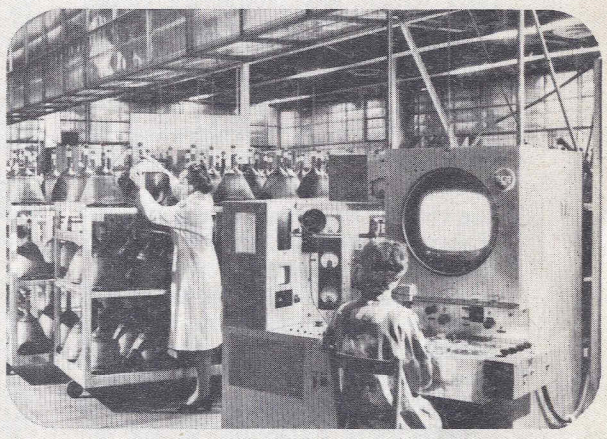
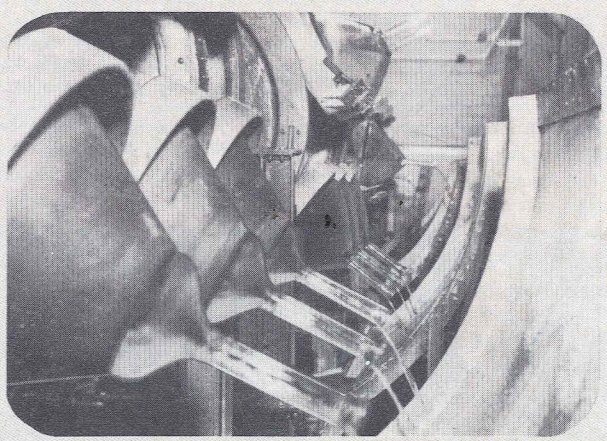


Final Inspection and Testing



Screen Coating

IN THIS ISSUE

MAY
JUNE
1952

Vol. 17, No. 2

SOME STEPS IN THE MANUFACTURE OF RCA KINESCOPES

INTERFERENCE FROM HARMONICS OF SOUND-IF AND PICTURE-IF SIGNALS

By John R. Meagher
Noted RCA Television Service Specialist

While complete in itself, this article is Part 14 in a series on TELEVISION SERVICE, by Mr. Meagher

The output signals from the sound-if and picture-if amplifiers have some harmonic content. If the harmonic signals are coupled back into the rf-input circuits in any way, and if the frequency of a harmonic happens to fall in a TV channel that is used in the particular TV service area, the harmonic can cause interference.

Harmonic frequencies of sound and picture intermediate frequencies used in RCA Victor television receivers are listed in *Table I*.

For convenience, television channels and carrier frequencies are given in *Table II*.

When there is any reason to suspect that a particular interference condition may be caused by a harmonic of a sound-if or picture-if signal, simple computation will show whether any harmonic of the picture-if or sound-if signal falls within the frequency range of a particular channel.

For example, in a receiver having a sound-if carrier of 21.25 Mc, and a picture-if carrier of 25.75 Mc, if there is interference on channel 7 (174-180 Mc), reference to the previous tables shows that the closest harmonic of the sound-if signal is the 8th, at 170 Mc, and the closest harmonic of the picture-if signal is the 7th, at 180.25 Mc. Both of these harmonics are outside of channel 7. Hence, in this example, it is very unlikely that the particular interference is caused by a harmonic of the if-carrier signals, provided that the receiver tuning control is correctly adjusted.

As another example, if there is interference on channel 6 in the same receiver, it may be caused by the 4th harmonic of the sound-if signal. The 4th harmonic is 85 Mc, which falls in channel 6 (82-88 Mc).

Sound-If Harmonics

Interference from a harmonic of the sound-if signal appears as a faint or pronounced herring-bone beat pattern that varies in step with the voice or music modulation. The beat may have any frequency ranging from zero to about 4.5 Mc, depending on the difference frequency between the harmonic and the picture or sound rf carrier of the transmitter. In receivers having a separate sound channel, the beat frequency can be changed over wide limits by relatively slight adjustment of the receiver tuning control, which alters the frequency of the sound-if carrier and produces a progressively greater frequency change for each higher harmonic. In intercarrier receivers, the beat frequency is not altered by adjustment of the receiver tuning control because the final sound-if of 4.5 Mc is not altered by adjustment of the receiver tuning control. Interference patterns produced by a harmonic of the sound-if signal are shown in *Figures 1, 2,* and *3*.

Sound-if harmonic interference sometimes resembles ordinary sound-in-picture interference (shown in *Fig. 4*), which results from incorrect adjustment of the receiver tuning control, or from incorrect alignment of the sound traps in the if and video amplifier. However, in these cases the beat frequency is always 4.5 Mc, and it is not altered by adjustment of the receiver tuning control.

There is a simple check to identify sound-if harmonic interference: Temporarily remove a tube from the sound-if amplifier. Removal of the tube "kills" the sound-if output and also the harmonics. If the interference disappears when the tube is removed,

Table I

Harmonic No.	Sound-IF (Mc)			Picture-IF (Mc)		
Fund.	21.0	21.25	41.25	25.5	25.75	45.75
2nd	42.0	42.50	82.50	51.00	51.50	91.50
3rd	63.0	63.75	123.75	76.50	77.25	137.25
4th	84.0	85.00	165.00	102.00	103.00	183.00
5th	105.0	106.25	206.25	127.50	128.75	228.75
6th	126.0	127.50	247.50	153.00	154.50	274.50
7th	147.0	148.75	288.75	178.50	180.25	320.25
8th	168.0	170.00	330.00	204.00	206.00	366.00
9th	189.0	191.25	371.25	229.50	231.75	411.75
10th	210.0	212.50	412.50	255.00	257.50	457.50

*Television Specialist, RCA Renewal Sales

Table II

Channel Number	Channel Frequency (Mc)	Picture Carrier (Mc)	Sound Carrier (Mc)
2	54-60	55.25	59.75
3	60-66	61.25	65.75
4	66-72	67.25	71.75
5	76-82	77.25	81.75
6	82-88	83.25	87.75
7	174-180	175.25	179.75
8	180-186	181.25	185.75
9	186-192	187.25	191.75
10	192-198	193.25	197.75
11	198-204	199.25	203.75
12	204-210	205.25	209.75
13	210-216	211.25	215.75

Fig. 1. An example of interference produced by a harmonic of the sound-if signal falling in the rf band. The harmonic energy was deliberately coupled from the output of the sound-if amplifier into the rf-input circuit to produce this interference. In this receiver, the sound if is 21.25 Mc and the fourth harmonic is 85 Mc, which falls in channel 6. In receivers having a separate sound channel, the beat pattern changes with adjustment of the receiver tuning control.

Fig. 2. Second example of interference produced by a harmonic of the sound-if signal falling in a TV channel. In this case, the beat between the harmonic and the rf-picture carrier is a low frequency. (The interference conditions shown in Figures 1, 2, and 3 are identical, except for a slightly different adjustment of the receiver tuning control in each case.) The receiver used in making these photographs had a separate sound channel (not intercarrier). The interference was intentionally made more severe than is usually experienced, in order to have it show up clearly in these photographs.

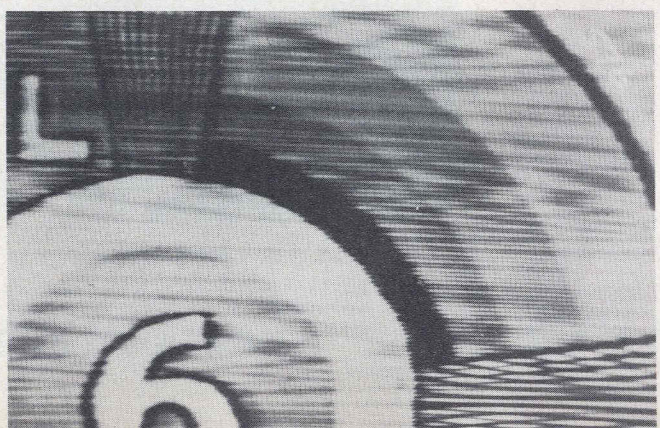


Fig. 3. Third example of interference produced by a harmonic of the sound-if signal falling in a TV channel. In this case, the beat between the harmonic and the rf picture carrier is a high frequency. If a harmonic of the 4.5-Mc sound-if signal causes interference in an intercarrier receiver, the beat frequency is not altered by adjustment of the receiver tuning control.

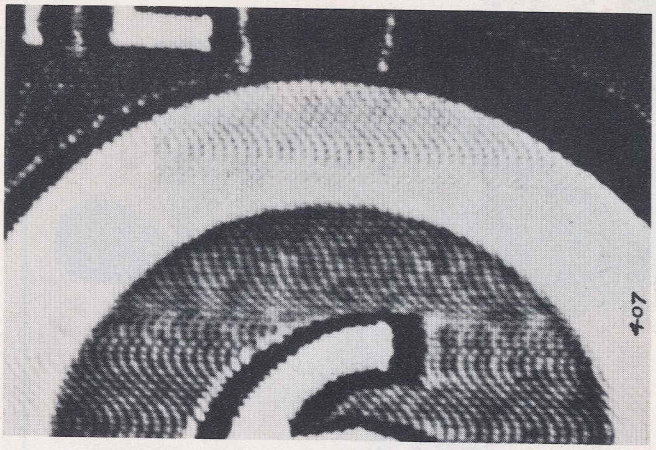


Fig. 4. The fine-line beat pattern shown above is a 4.5-Mc beat between the intermediate-frequency picture and sound carriers, which are always separated by 4.5 Mc. Normally, with correct alignment and correct tuning of the receiver, this beat is not visible. Careful observation of the 4.5-Mc beat on a picture tube will reveal that it has a slight herring-bone pattern which varies in step with the frequency modulation of the sound carrier of the TV transmitter. At moments when the carrier is not modulated, the beat pattern is plain, with no evidence of a herring-bone pattern. This enlarged section of a photograph shows a portion of the inner circle and the top of the number "6" in the WFIL Test pattern.

it may be assumed that the interference is caused by a harmonic of the sound-if signal getting into the rf circuits.

The harmonics are strongest in the last sound-if amplifier and discriminator (4.5-Mc amplifier and discriminator in intercarrier receivers). The harmonics may be coupled from these circuits to the rf input of the receiver by electrostatic coupling, by radiation, and/or by common coupling which may be through heater, B+, and other leads, or through a common chassis path.

The following remedies may be employed to eliminate sound-if harmonic interference:

1. Route the antenna transmission line away from the sound-if amplifier and discriminator in order to reduce the intensity of the harmonic signal picked up by the transmission line.

2. Use an outdoor antenna in place of a built-in or indoor antenna. If it is not possible to use an outdoor antenna, locate the antenna in the attic, or on a window, or in any location that provides stronger TV signal pickup.

The required sensitivity (gain or amplification) of the receiver depends on the strength of the TV input signal, i.e., the gain is controlled by agc action. With a weak TV input signal, the gain is greatest, and the receiver is most susceptible to interference from a harmonic of the sound-if signal. If the TV input signal is greatly increased by the use of a more effective antenna, the gain of the receiver is greatly reduced, and the harmonic of the sound-if signal is not amplified enough to show up as interference in the picture.

The use of a more effective antenna is also valuable in reducing interference from a harmonic of the picture-if signal, and in reducing interference from Barkhausen oscillation in the horizontal output circuit.

3. Determine whether better grounding of the shields on the sound-if and discriminator coils reduces the interference. If necessary, spot solder or clamp the shields to ensure good connection to the chassis. Shields should be used on the last sound-if and discriminator tubes. These shields must make good contact with the chassis. Try a temporary electrostatic shield around the components and wiring in these stages.

4. Check lead dress, bypass capacitors, and chassis ground connections in the last sound-if and discriminator circuits. Determine whether the manufacturer has issued special instructions on this subject. It has been found that certain types of bypass capacitors which have sufficiently low reactance at the sound-if frequency are ineffective for bypassing the higher harmonics of the sound-if signal. It is sometimes helpful to replace these capacitors with the type used in later-production receivers.

5. As a last resort, it is possible to shift the entire picture-if and sound-if band sufficiently in the correct direction so that the troublesome harmonic is moved outside of the particular channel. Such a shift requires complete realignment of the picture-if and sound-if amplifiers and the rf oscillator.

Picture-IF Harmonics

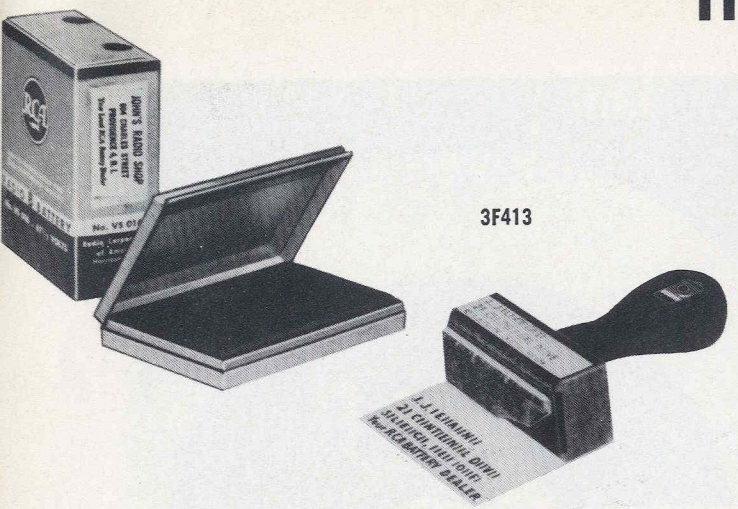
Interference from a harmonic of the picture-if signal appears as a faint or pronounced beat. The beat may be of any frequency, depending on the difference frequency between the harmonic of the picture-if signal and the picture or sound rf carrier of the transmitter. The beat frequency can be changed over wide limits by relatively slight adjustment of the receiver tuning control. The beat pattern seldom remains stationary because of drift of the picture-if carrier frequency. The drift is proportionately greater on each higher harmonic.

When computation shows that a harmonic of the picture-if carrier frequency occurs in the rf band of a particular channel, a double check (for positive identification of the interference) can be made as follows:

Provide additional temporary

(Continued on Page 11, Col. 2)

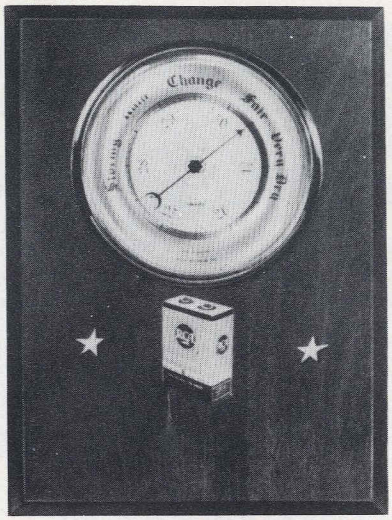
THESE PROMOTIONS DIRECT THE



3F413

REPEAT-BUSINESS STAMP and PAD

Use this stamp, with your imprint, to direct service and repeat battery replacement business *back to you.* With this Repeat-Business Stamp, personalized with YOUR NAME AND ADDRESS, you can imprint all of the top-volume, RCA portable-radio batteries that you sell. Space is now provided for this purpose on all of these leading batteries. Order your stamp and pad set today (specify Form No. 3F413). Remember, you can use it for mailings and other advertising messages.



3F420

BATTERY BAROMETER DISPLAY

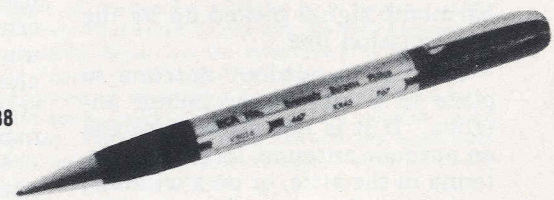
Capitalize on that most popular subject . . . the weather. Here is a superlative, precision-made instrument (imported from England) mounted on a fine-grain mahogany plaque which carries an important RCA battery product message. This useful, top-quality display (Form No. 3F420) measures 11 by 15½ inches, and has a metal easel for window, counter, or shelf display, in addition to a metal chain for wall display.

Radio dealers and servicemen are showing a great deal of enthusiasm over the big "THREE FOR ONE" RCA Battery Spring promotional campaign. This promotion helps you capitalize on the profitable portable-radio, replacement battery business. The program is headlined "Three for One" because the dealer gets: (1) fast-selling, volume-type RCA batteries; (2) a dazzling array of useful sales aids to promote repeat battery sales, and (3) an extra special bonus (See your distributor salesman.)—*all*

3F414

COMPASS MOTION DISPLAY

Smartly lithographed in full, bright colors, this action display pictures outdoor activities in which portable radios play an important part. Typical scenes are grouped around the points of a compass which is dominated dramatically by an RCA battery in motion. This striking 32 by 24-inch cardboard motion display (Form No. 3F414) comes equipped with a VS036-battery-operated motor.



3F388

INTERCHANGEABLE-TYPES MECHANICAL PENCIL

This pencil has a rotatable sleeve which selects, from a chart on the barrel, the type numbers of Burgess, Eveready, and Philco batteries, and their corresponding RCA replacements. This pencil (Form No. 3F388) will save you valuable time; it shows at a glance, the ten fastest-moving types—batteries which solve 90 per cent of the radio serviceman's interchangeability problems.

PORTABLE-RADIO BATTERY BUSINESS TO YOU

3F419

COUNTER/FLOOR MAT

This high-quality, long-wearing, natural-rubber mat will catch every customer's eye as he enters your store or shop! It is personalized with your store name, and that name can never rub off or wear out because it is inlaid by hand and then vulcanized for permanency. Order one of these 30 by 18-inch mats from your RCA Battery Distributor; specify Form No. 3F419.

3F422

FACT-FINDER PACKET

The 1952 Fact-Finder Insert Packet (Form No. 3F422) brings completely revised battery and interchangeability information to your finger tips. Use it as is—slip the insert packet into your RCA Battery Fact-Finder case, discarding the old contents. This packet contains interchangeability information on eight top battery brands, and lists RCA battery replacements for use in portable radios produced by 32 manufacturers.

for the price of the batteries alone.

To pre-sell portable-radio owners on the advantages of using RCA radio batteries, informative sales messages have been scheduled for the Spring programs of RCA's network television and radio shows. These shows, which attract audiences running into the millions, are the "Phil Harris & Alice Faye Show" (aired weekly by 185 stations of the NBC radio network), "Kukla, Fran and Ollie," and the "RCA Victor Show" (carried by 42 and 50 stations, respectively, of the NBC television network).

Because more than 11 million portable radios were produced since 1945, and because the average annual rate of sales is nearly two million, a big potential battery replacement business is available to radio dealers and servicemen. Contact your RCA Battery Distributor for full details about the 1952 RCA Battery promotional campaign. *Now is the time to capitalize on the repeat battery-replacement and portable-radio service business!*

3F404

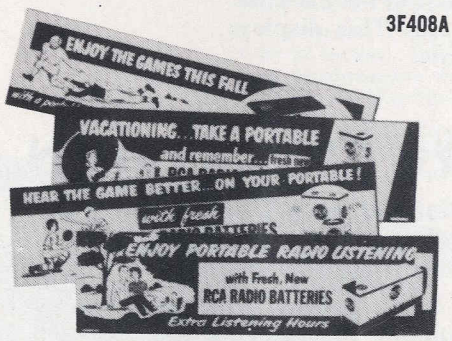
3F405

3F406 3F407

DIRECT-MAIL CARDS

Here's a low-cost, direct-mail program tailored to fit your needs. These cards remind your customers to come to you for expert portable-radio service. Mail the cards at regular intervals to your customers, or have them placed under the windshield wipers of parked cars in your area. When ordering, be sure to specify these Form Numbers: 3F404, 3F405, 3F406, and 3F407.

3F408A



WINDOW-STREAMER CAMPAIGN

Four timely, colorful, RCA battery streamers in a single kit (Form No. 3F408A) will be sent to you to help attract more portable-battery replacement business to your store. These streamers employ vacation and sporting themes to stress the role of the portable radio. Use these streamers to help spotlight your store as the local portable-radio sales and service center.

3F423

BASIC SALES-AID KIT

Get your battery season off to a good start with the new RCA Basic Sales-Aid Kit! This kit includes a new RCA Battery Dealer price list, an attractive list-price wall card, and a 6½ by 24-inch "Battery Headquarters" streamer. Order today, so that you will be prepared for the busy summer selling season; specify Form No. 3F423.

RCA UNWRAPS DYNAM

TO SPOTLIGHT YOUR SERVICE BUSINES

3F922

COMPREHENSIVE PROGRAM D

IN ON THE FAST-GROWING

Today, with many television sets approaching the three- and four-year mark, the servicing business emerges as one of the fastest-growing, most profitable industries in the country. To help you cash in on this business, the RCA Tube Department is announcing a brand-new program to help you establish your business as headquarters for dependable radio-television service . . . to drive home the fact that the RCA tubes which you install will "Bring Out the Best . . . In *Any* Set."

The new promotion material illustrated on these pages will help you to publicize your business effectively and dramatically; it will

"Picture of Quality" FLASHER-ACTION DISPLAY

Another Outstanding RCA Window Display That Makes People Stop and Take Another Look!

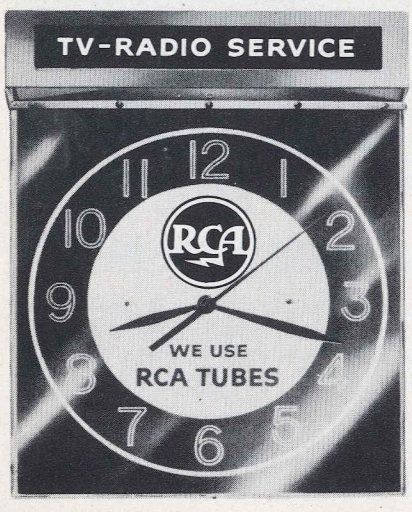
Here is one of the most dramatic and colorful displays ever offered to the radio-TV service industry. It has everything you can think of to attract the attention of your passers-by . . . ingenious movement . . . illumination . . . three dimensions . . . full color. When light is off, the sober faced clown reaches into his hat. When illuminated, the clown's face reflects triumph as he pulls a rabbit out of his hat (the flasher unit is furnished with the display). This display measures 30 inches high by 24 inches wide.

INDOOR ILLUMINATED "FIREGLOW" SIGN

Brightly Colored . . . Brilliantly Illuminated

This sign belongs in your window as a permanent part of your promotion. The copy is permanently screened in red and black against a brilliantly glowing plastic face. It has high daytime visibility, and a brilliant luminous glow at night. The Indoor Illuminated "Fireglow" Sign is designed for 110-volt, 60-cycle AC operation, only.

ILLUMINATED LUCITE CLOCK-SIGN



3F84

Distinctively Designed with Top-Quality Movement

Here is a sure-fire way to attract attention to your window. Smartly designed and well-illuminated, this clock radiates quality and distinction. This extraordinarily handsome, edge-lighted clock-sign will advertise your store day and night as headquarters for radio-TV service. This striking clock-sign is furnished complete with two tubular incandescent lamps; it has a synchronous movement which is guaranteed for one year. Order your clock-sign today — specify Form No. 3F84.

3F85

"REPE

To Remind

To make su
you for futur
peat Service"
print, on th
The cost o
three-
2000 @
5000 @ $1.8
furnished in
through you
mum order,

ORDER THESE ITEMS FROM Y

IC SPRING PROMOTION

SS AND KEEP YOU "IN FOCUS FOR '52"

ESIGNED TO HELP YOU CASH

RADIO-TV SERVICE BUSINESS

identify you as a user of RCA products — products which bear the most famous and respected trademark in the industry!

In addition, this material will attract more customers, new and old, and will speed up your servicing work. Examine each item carefully. *Every promotion described here is designed to provide extra profits.* Put this program to work now!

Your RCA Tube Distributor will be glad to supply complete information on all of these items . . . see him today, then inaugurate your own local advertising and sales promotion program.

3F73

RCA'S "TELEVISION SERVICE CAMPAIGN KIT"

Six Basic Sales Aids . . . in ONE Big Package

Establish your shop as the neighborhood headquarters for TV Servicing. This kit contains the following promotional items:

1. *Counter miniature of the "Picture of Quality" display.* A full-color replica of the large display (without the flasher unit). This display measures 15 inches high, and is suitable for use on the counter or in a companion window.
2. *"Television Tube Decal"* (12 inches wide). A lasting promotion that identifies you at a glance with television service and RCA tubes.
3. *"Television Tube Streamer"* (9½ by 22 inches). Identifies your shop as headquarters for TV service. Tubes are illustrated in full color.
4. *"The Magic Picture Tube" booklet.* A new, interesting and educational booklet suitable as a counter handout or envelope stuffer or, for distribution on your service calls. This booklet tells your customer the story of RCA picture-tube quality. Each booklet has a space for your stamp or imprint. Ten booklets are furnished with each kit; additional quantities can be ordered from your RCA Tube Distributor.
5. *RCA Kinescope Wall Chart.* A handy ready reference for information on all RCA picture tubes, their base diagrams, dimensions, and typical operating conditions.
6. *A complete set of RCA receiving tube and kinescope price sheets,* including a colorful list-price sheet suitable for tacking up near your counter.

EAT SERVICE" LABEL

l Your Customers to Call Again

sure your customers come back to re service, place one of these "Re-" labels, with your complete im-ne back of each set you repair. f these labels, complete with your npri s as follows: 1000 @ $2.85; 5 per M; 3000 @ at $2.15 per M; 5 per M. Each thousand labels is a handy dispenser-carton. Order ur RCA Tube Distributor (mini-1000 labels) ; specify Form 3F85.

3F82

"IN FOCUS, FOR '52"

FREE! . . .

New promotion plan book contains all current RCA promotions.

A complete, three-color, 16-page dealer promotion catalog of all of the sales and servicing aids currently available on RCA receiving tubes and kinescopes, including new and current items. This basic promotion plan book is as valuable as your technical literature in building your business. Obtain your free copy from your RCA Tube Distributor.

TEST LEADS, PROBES, & MISCELLANEOUS ACCESSORIES FOR RCA TEST EQUIPMENT

The following list of test leads, probes, and miscellaneous accessories for RCA Test Equipment (including corresponding stock numbers) has been especially prepared for Radio and Television Service News readers. It represents the very latest information, including several recent revisions, and supersedes all previous listings.

Description.	Stock or Type No.

OSCILLOSCOPES

WO-27A DC Oscilloscope

Power cord (including plugs)	52556
Binding post	46907
Binding post, threaded	30277
Phone plug (with leads)	46918

WO-55A Oscilloscope

Power cord (including plugs)	53678
Binding post, pin-plug type	47062
Direct Probe and Cable	WG-220
Demodulator Probe	WG-291
Jack, red	55238
Jack, blue	55239

WO-56A Oscilloscope

Direct Probe and Cable	WG-218
Low-Capacitance Probe	WG-216B**
Ground cable (with clip and pin plug)	93407
Slip-on alligator clip	35262
Green graph screen	93440
Demodulator Probe	WG-291
Binding post	34085

*When ordering, be sure to specify instrument model, code, and serial numbers.

**Supersedes WG-216A probe. Has slightly different input characteristics as described in instruction booklet for type WO-56A oscilloscope.

WO-57A Oscilloscope

Direct Probe and Cable	WG-218
Low-Capacitance Probe	WG-216B**
Ground cable (with clip and pin plug)	48996
Slip-on alligator clip	59410
Graph Screen	59235
Demodulator Probe	WG-291
Jack, red	55239
Jack, blue	55238
Binding post, pin-plug type	47062
Phone tip, black	47089

WO-57B Oscilloscope

Direct Probe and Cable	WG-218
Low-Capacitance Probe	WG-216B**
Ground cable (with clip and pin plug)	93832
Slip-on alligator clip	59410
Graph screen	59235
Demodulator Probe	WG-291
Jack, red	93875
Jack, black	93858
Binding post, pin-plug type	93855
Phone tip, black	93856

WO-58A Oscilloscope

Probe cable (4 ft long, including chassis connector & screw base)	58495
Direct-probe attachment	58496
Attenuating-probe attachment	58497
Crystal-rectifier probe attachment	58498
Clip attachment	57311
Power cord (including plug)	53678
Binding post, pin-plug type	47062
Jack, red	55238
Jack, blue	55239

WO-60C Oscilloscope

Power cord (including plug)	53678
Binding post, pin-plug type	47062
Direct Probe and Cable	WG-220
Demodulator Probe	WG-291
Jack, red	55238
Jack, blue	55239

WO-79A Oscilloscope

Input cable (low capacitance)	53842
Input cable (direct)	53843
Power cord (including plugs)	52556
Binding post, pin-plug type	47062
Graph screen	57823

WO-79B Oscilloscope

Low-capacitance probe and cable (less clip lead)	53842
Direct cable (less clip lead)	53843
Clip lead for low-capacitance probe & direct cable	53844
Transparent graph screen	57823
Power cord (with plugs)	52556
Binding post, pin-plug type	47062

158 Oscilloscope

Input cable (complete)	33873
Binding post, pin-plug type	47062
Pin plug	47089

Description	Stock or Type No.

715B Oscilloscope

Attenuating cable	48447
Direct cable	48448
Graph screen	48755
Binding post	47515
Banana-plug jack	48430
Banana plug	18728

VOLTOHMYSTS®

VoltOhmyst (Battery Op.) WV-65A

DC cable, blue (with probe & pin plug)	48994
Ohms-ma cable, red (with probe & pin plug)	51960
Common lead, black (with probe & pin plug)	48996
Crystal-Diode Probe	WG-263
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206
Jack, red	55238
Jack, black	55326
Pin plug, black	47089

Advanced VoltOhmyst WV-75A

DC cable, blue (with probe & pin plug)	48994
Ohms-ma cable, red (with probe & pin plug)	51960
Ground cable, black (with clip & pin plug)	48996
Diode probe	400275
Clip for probes	35267
Diode-probe multiplier (complete)	52817
Binding post, pin-plug type, red	47089
Binding post, pin-plug type, black	47062
"Ground" cable with tip & pin plug, black	52809
Diode-probe clip attachment	52821
Alligator clip for ground lead	35262
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206
Jack, black	56326
Jack, red	55238
Pin plug, black	47089

WV-77A Junior VoltOhmyst

Direct Probe and Cable	WG-218
DC Probe	WG-217
Ground cable (with clip and pin plug)	48996
Slip-on alligator clip	59410
1.5-volt battery	VS036
Crystal-Diode Probe	WG-264
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206

WV-87A Master VoltOhmyst

Direct Probe and Cable	WG-218
DC Probe	WG-217
Ohms cable (with probe and plug)	93859
Current cable, red (with clip and plug)	93725
Current cable, black (with clip and plug)	93726
Ground cable (with clip and plug)	93832
1.5-volt battery	VS036
Slip-on alligator clip	59410
Crystal-Diode Probe	WG-264
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206
Jack, black ("Ohms")	93858
Jack, black ("Ground")	93858
Jack, ("+ current")	93995
Pin plug, black (Ground cable)	93856
Pin plug, red (Ohms cable)	93857
Pin plug, black (Current cable)	93989
Pin plug, red (Current cable)	93988

WV-95A Master VoltOhmyst

Dc cable, blue (with probe & pin plug)	48994
Ohms-ma cable, red (with probe & pin plug)	51960
AC cable, red (with probe & 4-prong plugs)	57222
Clip for probes	35267
Power cord (including plugs)	53678
Diode probe (complete)	500275
Diode-probe multiplier (complete)	52817
Binding post, pin-plug type, red	47089
Binding post, pin-plug type, black	47062
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206
Jack, red	55238
Jack, blue	55239
Pin plug, black	47089

WV-97A Senior VoltOhmyst (code numbers 350 and 850)

Direct Probe and Cable	WG-218
DC Probe	WG-217
Ohms cable (with probe & plug)	51960
Ground cable (with alligator clip & plug)	48996
Slip-on alligator clip	59410
1.5-volt battery	VS036

Description	Stock or Type No.

Crystal-Diode Probe	WG-264
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206
Jack, blue	55239
Pin plug, black	47089

WV-97A Senior VoltOhmyst (except code numbers 350 and 850)

Direct Probe and Cable	WG-218
DC Probe	WG-217
Ohms cable (with probe & plug)	93859
Ground cable (with alligator clip & plug)	93832
Slip-on alligator clip	59410
1.5-volt battery	VS036
Crystal-Diode Probe	WG-264
High-Voltage Probe	WG-289
Multiplier Resistor for High-Voltage Probe	WG-206
Jack, black	93875
Pin plug, black	93856

Junior VoltOhmyst 165, 165A

DC cable, blue (with probe)	43915
AC/Ohms cable, red (with probe)	43913
"Common" lead, black (with clip)	43914
Clip for probes	35267
Probe for "AC/Ohms" cable	46533
Jack, black	50404
Jack, red	50403

VoltOhmyst 195, 195A

DC cable, blue (with probe & pin plug)	48994
AC/Ohms cable, red (with probe)	48995
"Ground" lead, black (with probe & pin plug)	48996
Jack, black	56326
Pin plug, black	47089

OSCILLATORS, GENERATORS

WR-39A Television Calibrator

RF-output cable (including co-ax connector and two clips)	59343
Power cord (including plugs)	53678
Binding post, pin-plug type, black	47062
.25-Mc freq-determining crystal Y1	56909
2.5-Mc freq-determining crystal Y2	56910
Jack, red	55238
Jack, blue	55239

WR-39B Television Calibrator

RF-output cable	59343
Binding post, pin-plug type	47062
Phone plug	54370
Jack, red	55238
Jack, blue	55239

WR-39C Television Calbrator (Serial Numbers below 3750)

RF-output cable	59343
Binding post, pin-plug type	47062
Phone plug	54370
Jack, red	55238
Jack, blue	55239

WR-39C Television Calibrator (Serial Numbers above 3751)

RF-output cable	59343
Binding post, pin-plug type	93855
Phone plug	54370
Jack, red	93875
Jack, black	93858

WR-53A FM Sweep Generator

Connector switch	54685
Output cable (complete)	54662
Power cord (including plugs)	53678
Clip lead for output cable	54663
Clip lead for output cable	54664
Jack, red	55238
Jack, blue	55239

WR-59A TV Sweep Generator

IF/VF-output cable (including co-ax connector and two clips)	59343
RF-output cable (including twin-ax connector and three clips)	55280
Power cord (including plugs)	53678
Binding post, pin-plug type, black	47062
Jack, red	55238
Jack, blue	55239

WR-59B TV Sweep Generator (Serial Numbers below 4501)

Binding post, pin-plug type	47062
IF/VF-output cable	59343
RF-output cable	55280
Jack, red	55238
Jack, blue	55239

WR-59B TV Sweep Generator (Serial Numbers above 4500)

Binding post, pin-plug type	93855
IF/VF-output cable	59343
RF-output cable	55280
Jack, red	93857
Jack, black	93858

(Continued on Page 9, Col. 1)

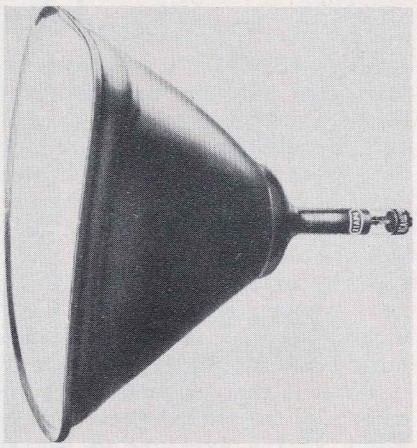
Metal-Shell Kinescopes Setting Sales Pace

Metal-shell kinescopes, introduced commercially less than four years ago, have already won such widespread acceptance in the industry that they currently account for approximately 30 per cent of the total sales of picture tubes. The RCA Tube Department, the industry's largest producer of kinescopes since 1938, currently uses metal-shell construction in approximately two-thirds of all the kinescopes it produces.

The television industry's trend toward larger picture tubes of the metal-shell variety (developed and introduced commercially by the Radio Corporation of America in 1948) indicates that time and usage have confirmed the metal tube's special features:

1. **Greater Strength.** A specially-formed steel shell provides the desirable combination of strength and light weight. The glass faceplate is fused to the metal shell by means of a unique glass-to-steel bonding technique which produces a vacuum-tight seal.

2. **Superior faceplate.** The faceplates of metal-shell kinescopes consist of high-grade, drawn sheet glass which is optically superior to, and considerably more uniform in thickness, than the molded faceplates of all-glass kinescopes. It is possible to use this type of faceplate in metal-shell kinescopes because of the strength of the metal-shell support and thus avoid the problems of mold marks, blisters, and other imperfections which may develop during the molding of faceplates for all-glass kinescopes.



The relatively flat, thin faceplate of uniform thickness permits wide-angle viewing with less picture distortion than obtainable from an all-glass tube. Furthermore, the faceplate of the metal tube is specially treated to minimize reflections. These features provide a clearer picture.

3. **Less Weight.** In larger sizes, metal tubes are as much as 13 pounds lighter than comparable all-glass types, a factor which makes such tubes easier to handle, permits the use of lighter and less-expensive supporting structures in the chassis and receiver cabinet, and reduces shipping costs.

Metal-shell kinescopes were introduced by RCA, in 1948, after more than 13 years of research and development. Realizing that picture tubes would eventually become larger, and that production problems encountered with all-glass envelopes would be magnified in the larger sizes, RCA tube engineers, in 1935, initiated a research program to develop the metal-shell tube.

In December, 1948, RCA introduced the 16AP4, the television industry's first commercially available metal-shell picture tube. This first metal tube pointed the way to low-cost mass-production of still larger kinescopes such as RCA's 21AP4, introduced last year, which is in heavy demand by set manufacturers.

You're Invited . . . A PICTURE TOUR OF RCA'S KINESCOPE PRODUCTION LINE

Ask your RCA Distributor for a copy of this three-color brochure, called "The Picture of Quality." This brochure tells the story behind the rigid quality controls and painstaking care that go into every RCA picture tube—a step-by-step story of RCA Kinescope manufacture told by 24 photographs—a picture tour of the production line. You'll enjoy reading about how RCA mass produces the finest kinescopes made—5,000,000 since 1946!

Description	Stock or Type No.
WR-59C TV Sweep Generator	
Binding post, pin-plug type	93855
IF/VF-output cable	59343
RF-output cable	55280
Jack, red	93857
Jack, black	93858
WR-67A Test Oscillator	
RF-output cable	52524
Power cord (including plug)	53678
Ground lead (for rf-output cable)	52525
WA-54A Audio Oscillator	
Power cord (including plugs)	53678
Binding post, pin-plug type, red	47089
Binding post, pin-plug type, black	47062
Jack, red	55238
Jack, blue	55239
Jack, black	55326
161 Signalyst®	
Output cable, black (complete)	35431
RF-output adapter	35434
IF-output adapter	35696
Jack, red	33890
Jack, black	33891
CHANALYSTS®	
162, 162A Chanalyst	
AF test-cable assembly, green	35263
Oscillator test-cable assembly, brown	35266
RF/IF test-cable assembly, red	35264
Voltmeter test-cable assembly, blue	35265
Clip for probes	35267
Flex. (probe) connector	35710
162B Chanalyst	
AF test-cable assembly, green	35263
Interchannel cable assembly, black	46685
Oscillator test-cable assembly, brown	35266
RF/IF test-cable assembly, red	35264
Voltmeter test-cable assembly, blue	35265
Clip for probes	35267
Flex. (probe) connector	35710
162C Chanalyst	
AF test-cable assembly, green	35263
Ground lead, black	48996
Interchannel cable, black	46685
Oscillator test-cable assembly, brown	35266
RF/IF test-cable assembly, red	35264
Voltmeter test-cable assembly, blue	35265
Clip for probes	35267
Binding post, pin-plug type, red	47089
Binding post, pin-plug type, black	47062
Flex. (probe) connector	35710
Jack, red	55238
Jack, blue	55239
Jack, black	55326
170 Audio Chanalyst	
AF-IN. & voltmeter cable (incl. probe and connector)	44842
Ground cable, black (incl. clip & pin plug)	44844
Output cable (incl. probe & conn.)	44845
Clip for probes	35267
Osc.-out. cable (incl. clips & connector)	44843
Power cable (incl. plug)	52556
170A Audio Chanalyst	
(Interchannel) shielded cable assembly, black	49320
Power cord (including plugs)	52556
Binding post, pin-plug type, red	47089
Binding post, pin-plug type, black	47062
AF test-cable assembly, green	35263
Voltmeter test-cable assembly, blue	35265
Test cable, black	49321
Test cable, red	49322
WP-23A Regulated Power Supply	
Power cord (including plugs)	53678
WV-73A Audio Voltmeter	
Input cable (with plug and clips)	53676
Power cord (including plugs)	53678
182-A Dynamic Demonstrator	
Pair of test cables	70355
Cable clip	70354
WG-260 Test-Point Adapters (MI-18760)	
8 pin octal	51354
8 pin lockin	51355
6 pin small	51356
7 pin small	51357
4 pin small	51358
5 pin small	51359
7 pin small	51360

RCA 6146

for

Ham Radio

P. A. Systems

Mobile Radio Gear

Servicemen whose interests lie in those branches of radio involving "ham" radio, P.A. systems, and mobile radio gear will welcome the appearance of RCA's 6146. This new beam-power tube has cw plate-input ratings* of 90 watts (750 v at 150 ma) for rf applications up to 60 Mc, 65 watts for its application at 150 Mc and 60 watts at 175 Mc—a dandy tube for that new 2-meter rig or for mobile communications systems.

The 6146 features a rugged button-stem construction with short internal leads, and triple base-pin connections to the cathode to facilitate effective rf grounding—so important in the elimination of parasitics and TVI.

In audio service, a pair of 6146's will deliver a maximum of 130 watts output in class AB_2 service at a plate voltage of 750 volts* and with only about 0.1 watt of driving power! This high power-output capability of the 6146 combined with its small size (1-9/16 in. diameter and 3-11/16 in. length) permit the design of a compact P.A. amplifier or modulator.

Our prediction is that the new RCA 6146 will be even more popular than the 807! For the full story on this new tube, see your RCA Distributor or, write to RCA, Commercial Engineering, Harrison, N. J.

*Intermittent Commercial and Amateur Service

That 6SN7-GT horizontal-oscillator tube is probably ok . . . . .

Many 6SN7-GT's are being returned to the tube manufacturer for adjustment because the horizontal-oscillator circuits in which they were installed failed to hold sync, or could not be brought into sync by adjustment of the horizontal-hold control.

Many of these returned tubes have been found to be well within tube limits, and suitable for horizontal-oscillator applications.

What is the explanation of the return of so many good tubes? Much of the explanation lies in the fact that horizontal-oscillator circuits are somewhat critical insofar as tube characteristics are concerned, and should be adjusted to fit the characteristics of individual tubes. These adjustments include not only the usual horizontal-hold control, but also several other adjustments provided for use at the factory and by the serviceman.

Horizontal oscillators usually employ either a blocking oscillator or a multivibrator circuit. The 6SN7-GT (or occasionally a 12AU7) is used in these circuits. Two or more factory-adjustment controls are usually provided in the receiver to accommodate normal tube variations. In addition to the horizontal-hold control, one or two frequency adjustments and a horizontal-drive adjustment are usually provided.

The blocking-oscillator circuit also has a "horizontal-locking range" adjustment and a "waveform adjustment." The latter adjustment is not affected by tube substitution, but frequency adjustments and any other adjustments are usually critical and quite interdependent.

When a TV set is first aligned, these adjustments are set to provide optimum performance for the particular set of tubes being used.

All factory adjustments should be checked before replacing a tube, and before returning any tube for adjustment.

If the horizontal-hold control is ineffective in bringing the picture into sync, readjust the frequency control.

It is important that the horizontal-frequency adjustment be made properly—that is so that the picture is in sync at the mid position of the hold control. If the adjustment were such that the hold control had to be set in either extreme position to synchronize the picture, very slight changes in the condition of the tube could require another service call. With proper adjustment of the rear-chassis controls, there is usually enough range in the hold control to accommodate reasonable changes in tube characteristics. In fact, it is a good practice for the serviceman to make routine checks of these adjustments on every service call.

NOVEL INDEX CONTAINS COMPLETE DATA ON ALL RCA SPEAKERS

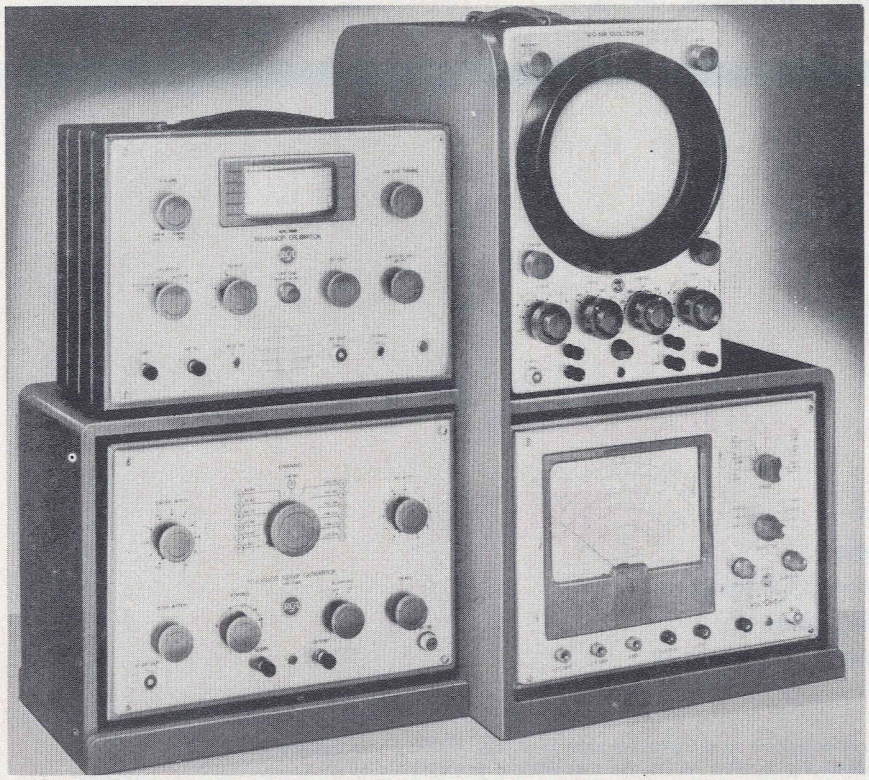
Your RCA Parts Distributor has a novel flip-up index which will help solve your speaker replacement problems.

This handy, compact index provides, at the flip of an identification tab, all the useful data required for the installation of any one of RCA's 22 quality-engineered speakers.

Each speaker is illustrated in the index by means of a physical outline drawing and a photograph. Mounting information and such basic data as voice-coil impedance, power-handling capability, resonant frequency, and magnet weight are given for each speaker.

A copy of this new Flip-Up Speaker Index should be on every service bench. Get your free copy from your local RCA Parts Distributor.

NEW RACK GROUPS INSTRUMENTS INTO A TEST POSITION



Servicemen who stack their test equipment in skyscraper fashion on a crowded service bench will appreciate the utility of RCA's new Four-Position Step Rack. In addition to conserving bench space, this rack groups your test equipment into a convenient test position. This sturdy rack is constructed of wood, attractively finished, and is designed o accommodate RCA's WR-39C (Television Calibrator), WR-59B (Television Sweep Generator), WO-56A (7-Inch Oscilloscope), and the recently announced WV-87A (Master VoltOhmyst®) . . . See the new Four-Position Step Rack at your RCA Distributor's today. He will tell you how easy it is to get one of these racks—another opportunity to increase the efficiency and professional appearance of your service shop—don't pass it up!

RCA Distributors Offering Exchange Allowances for Returned Inoperative Kinescopes

RCA Distributors are now offering an exchange allowance for the return of certain inoperative kinescopes which are free from visual defects such as cracks, chips, and scratches. Dealers can apply these allowances toward their purchases of new, top-quality RCA picture tubes.

Under the mechanics of the program, RCA Distributors are authorized to offer allowances depending upon type and size, on the following metal and all-glass types of inoperative, out-of-warranty kinescopes:

10BP4-A	16KP4	17JP4
10FP4-A	16LP4-A	17LP4
12KP4-A	16RP4	17QP4
12LP4-A	16TP4	17TP4
14CP4	16WP4-A	19AP4
14EP4	17BP4-A	19AP4-A
16AP4	17BP4-B	19AP4-B
16AP4-A	17CP4	19AP4-D
16GP4	17CP4-A	20CP4
16GP4-A	17GP4	20MP4
16GP4-B	17HP4	21AP4
16GP4-C		21MP4

RCA wants to give you full assurance that it will continue to produce and sell in the future, as it has in the past, only *one quality of kinescope — the world's finest!* All regular warranties and warranty-adjustment procedures will apply.

This step to reuse the metal shells and glass envelopes is a significant move to conserve critical materials and, at the same time, to assure RCA's ability to meet mounting market demand for both metal and all-glass kinescopes.

HARMONIC INTERFERENCE

(Continued from Page 3)

coupling between one of the rf-input terminals and the last picture-if amplifier. This coupling may be provided by

(a) touching one rf-input terminal, and holding a small piece of metal against the last picture-if tube, or by

(b) using a short length of shielded wire, with one end of the wire connected to one rf-input terminal, and the other end of the wire placed alongside the last picture-if tube (or placed near the plate lead of this tube). The shield on the wire should extend to within an inch of each end, and the shield should be clamped in contact with the chassis.

If the *intensity* of the interference is increased by the additional coupling, it indicates that the interference is probably due to a harmonic of the picture-if signal. It may be necessary to reduce the strength of the TV signal by disconnecting one side of the antenna transmission line from the terminal that is used for injecting the additional-coupling signal. The correct way to make this check is to arrange the shielded wire as outlined above, and then move the end of the wire away from the last picture-if tube or plate circuit.

The intensity of the interference should decrease when the end of the wire is moved away, and it should increase when the end of the wire is again moved close to the last picture-if plate circuit. This procedure can be used for identification of sound-if harmonic interference.

Remedies for picture-if harmonic interference are essentially the same as those given above for sound-if harmonic interference; however, the information applies to the last picture-if amplifier and the picture second detector instead of the last sound-if amplifier and discriminator.

RADIO AND TELEVISION
Service News
A PUBLICATION OF THE RCA TUBE DEPARTMENT

RCA Radio & Television Service News is published in the interest of servicemen and service dealers. It is written to assist the serviceman in providing better service, and to foster the growth of his business by supplying him with information on the latest trouble-shooting and sales promotion techniques, sales and service aids, together with invaluable data on RCA tubes, batteries, electronic components, and test equipment.

Radio & Television Service News is a bi-monthly publication of the RCA Tube Dept., Harrison, N. J.

Joseph Pastor, Jr.
Editor

How we spot "shady characters"

before they can damage your business

THE instrument you see is working for *you*. A sensitive light-measuring device, it is used like a doctor's stethoscope, to explore the surface of a picture tube for screen imperfections the unaided eye would fail to detect.

Employing a photosensitive surface and color filters, this device does two jobs. It checks not only the uniformity of brightness, but also the *color* values from center to edges of the faceplate.

Why is this important? It is important because RCA has learned, through long experience in the manufacture of picture tubes, that the best picture—the picture having superior quality—calls for unusually rigid processing controls of the phosphor and its application. The light-measuring device spots any departure from RCA's established brightness and color standards. Result? "Shady characters"—those tubes that would produce pictures lacking in fine quality—*never reach your shop*.

This constant vigilance and *quality control* at *all* stages of manufacture assure that RCA standards will be met. In this way, RCA guards its own reputation for quality . . . and *yours as well*.

With RCA Receiving Tubes, as well as RCA Kinescopes, TOP-QUALITY CONTROL makes the difference.

RADIO CORPORATION of AMERICA

ELECTRON TUBES — **HARRISON, N. J.**

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POSTAGE