



RADIO AND TELEVISION

Service News

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BATTERIES

DEALER'S NAME

SERVICE

ELECTRON TUBES



FEBRUARY

1960

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From one independent radio-TV service-dealer to another: "Heard the good news? That's right—my store's taken on a new look, inside and out . . . thanks to RCA's Store Improvement Program [featured on page 3]. Sure, you can benefit from this program, too. It's a new service of your authorized RCA tube distributor. Ask him about it!"

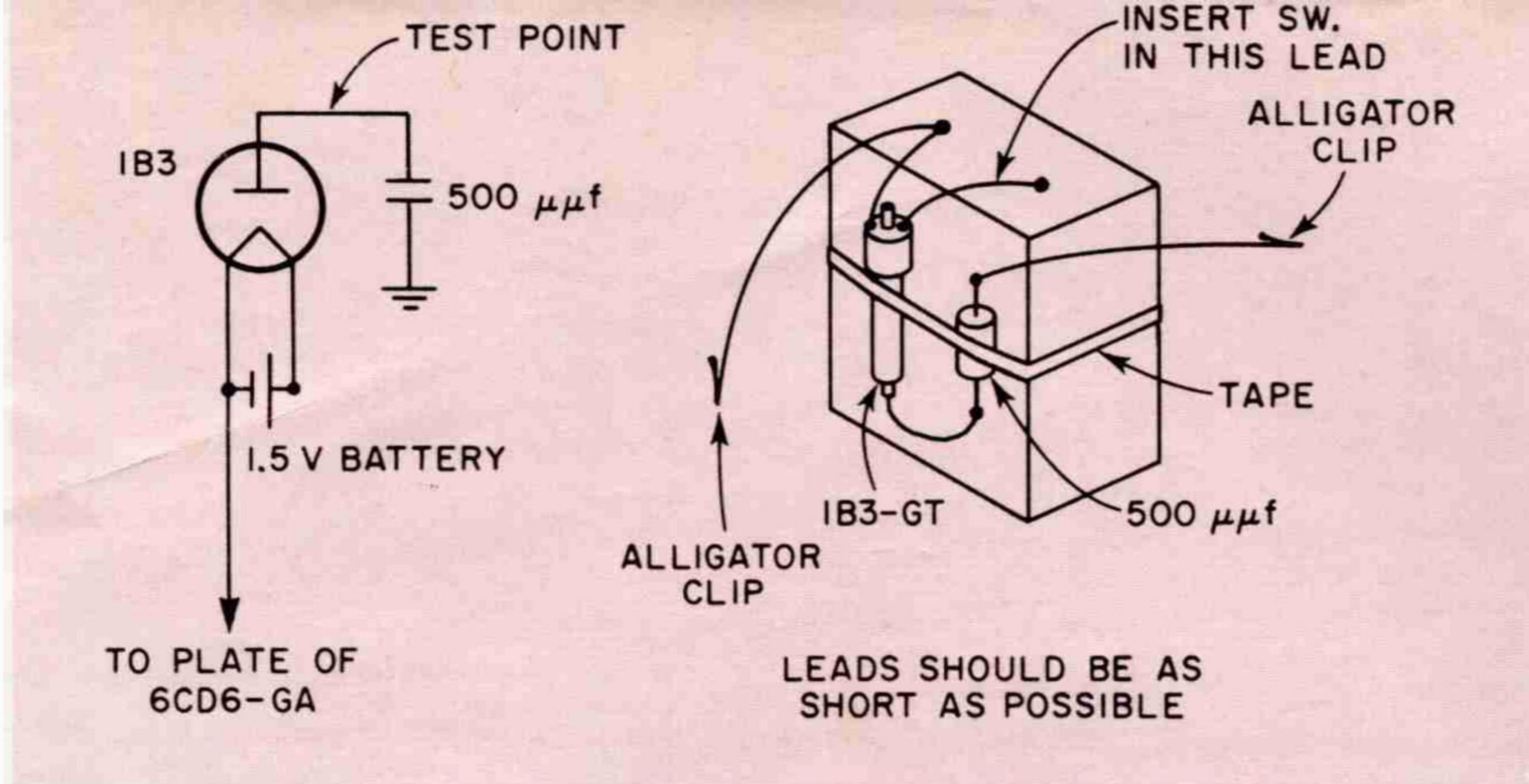


Figure 1

Service Technicians Warned Against Operating RCA-6CD6-GA Above Maximum Allowable Peak Negative Voltage

In some of RCA Victor's KCS- and KCS-81 television chassis, failures of the RCA-6CD6-GA 6m power tube have occurred because of improper operation of the horizontal-deflection circuit, according to M. Tomlin, Manager of Radio and Television Service Engineering Field Support, RCA Service Company.

Since "plate emission" may cause the 6CD6-GA to fail in some chassis when it is operated above the minimum allowable peak negative voltage of 1500 volts, Mr. Tomlin recommends that you use a device as outlined in Figure 1 to measure the peak negative voltage of this tube. As follows:

(1) Connect an RCA-1B3 1T half-wave vacuum rectifier tube and a 500 μμf ceramic capacitor (RCA Stock No. 7788) to a 1.5-volt battery (such as the RCA VS006S).

(2) Remove power from the TV chassis. Connect the lead from the filament of the 1B3- to the plate of the

6CD6-GA. Then connect the lead from the capacitor to the TV chassis under test.

(3) Apply power to the chassis. Picture must be in sync.

(4) Using an RCA VoltOhmy (or equivalent) and an RCA 289 high-voltage probe (or equivalent), measure the voltage on the plate of the 1B3-GT in the test device. Voltage should not exceed 1500 volts.

Mr. Tomlin further recommends:

If the voltage measured exceeds 1500 volts, then—as shown in Figure 2—connect a 5,000-ohm, 5-watt, 10% resistor (R_2) to capacitor C198 (KCS-81) or capacitor C206 (KCS-) of the chassis' horizontal-deflection circuit.

In chassis where the 6CD6-GA tube has failed persistently, it is important to check the horizontal-deflection circuit thoroughly; particularly, the following:

(1) Check to make certain that the linearity control and high-voltage transformer in your customer's set agree with the pins noted in the schematic diagram for this chassis.

(2) If a drive voltage not produced in the raster, measure the grid-drive voltage on pin No. 5 of the 6CD6-GA. This voltage should be between -25 and -30 volts when the drive is adjusted properly. If this condition cannot be met, then check the sweep-oscillator circuit or the 6SN7-horizontal-output tube.

(3) Check the screen-grid (grid-No. 2) voltage of the 6CD6-GA. This voltage should be approximately 165 volts. If this voltage is low, check the screen-grid resistor (composed of resistors R235, R236, and R257 in the KCS-68 chassis and resistors R222 and R223 in

the KCS-81 chassis). Total resistance value should approximate 13,000 ohms. If the resistance is found to be high in value, replace with a 13,000-ohm resistor (such as RCA Stock No. 76065 or equivalent).

(4) Check the cathode voltage and cathode-resistance value. (The value of RCA Stock No. 74015 is 100 ohms, 2 watts.)

(5) Check the total plate and screen-grid current. This current should not exceed 125 ma (KCS-81) or 145 ma (KCS-68) when the linearity coil is properly adjusted.

(6) Check the horizontal-oscillator frequency and sine-wave adjustment and, if necessary, adjust for proper pull-in. Improper drive from the oscillator circuit will affect the operation of the 6CD6-GA.

(7) Check the AGC circuit for proper operation. A 100 μμf capacitor in this circuit can cause satisfactory operation of AGC—thus calling for critical horizontal-oscillator adjustments.

As a result of improvements incorporated in the RCA-5U4-GB rectifier tube, it will be found that the dc output voltage of this tube is 10 to 15 volts higher than from the earlier 5U4-G. Therefore, it is very important that you check horizontal-deflection adjustments when you install a new rectifier tube.

For longer 6CD6-GA life, keep the filament of this tube to a minimum by adjusting the filament transformer for proper filament voltage (minimum capacitance, unidirectional rotation of the transformer). Overvoltage will produce a compressed raster. This is indicated by bright vertical bar(s) on the picture tube screen.

The plate current of the 6CD6-GA can be checked during adjustments by inserting a 20,000-ohm/volt multimeter in series with the fuse, with the meter set on the 5 ma dc scale.

Note that for proper operation of the horizontal-deflection circuit, Mr. Tomlin suggests that you follow this procedure:

• Pre-set the depth link in minimum width position (top); the depth dial in approximate mid-position; the linearity dial near the minimum inductance position.

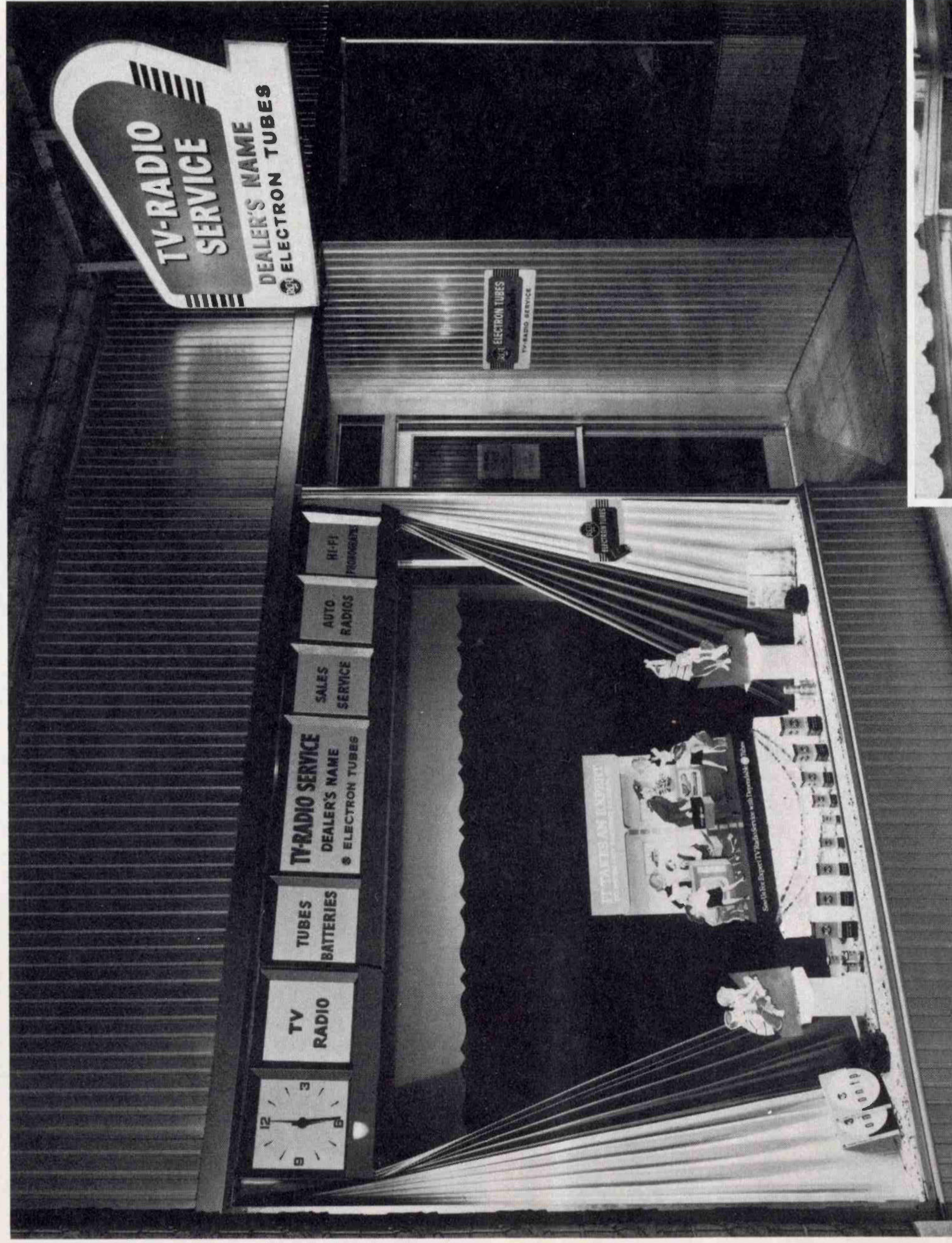
(Continued on page 13)

RCA RADIO & TELEVISION
is published by the
to assist
of their business by applying the latest trouble-shooting techniques, and together with invaluable data on resistors, transformers, and other equipment.
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© 1961
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Home Electronics

Figure 2

NOW AVAILABLE:

NEW STORE IMPROVEMENT PROGRAM FOR INDEPENDENT SERVICE-DEALERS



Window and In-Store Displays and Valances, Shelving Units, and Shop Bench Included in Service Offered by RCA Through Authorized RCA Tube Distributors

STORE IMPROVEMENT PROGRAM TO HELP YOU: Attract new customers • Display and merchandise your products and services more effectively • Utilize your present floor space to far better advantage • Increase the efficiency of your service operation



YOUR STORE—KEY TO SUCCESSFUL SALES

PROFESSIONALLY INSTALLED WINDOW DISPLAYS

As part of RCA's new Store Improvement Program, professionally dressed and installed window displays are available to independent radio and television service-dealers throughout the year. RCA has prepared three displays which tell the story of your expert service. It also has arranged with a national window dressing

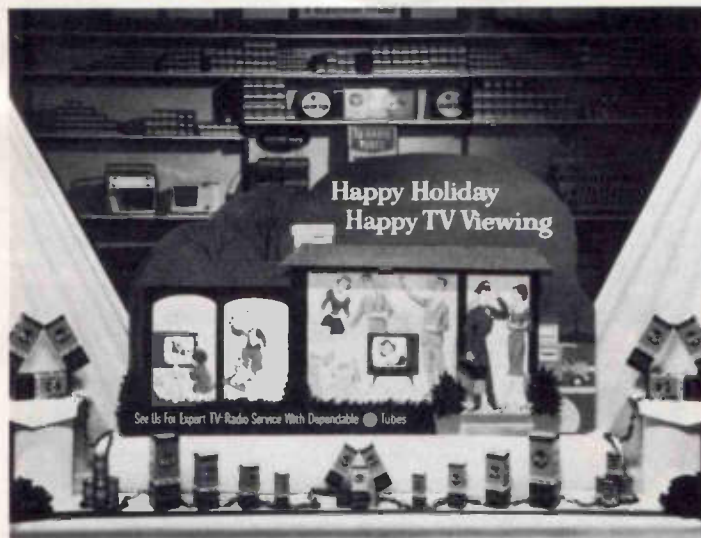
organization to have each of these displays installed in your window at regular intervals during the year. You can obtain all three or any one of these professionally installed window displays from your authorized RCA tube distributor. Displays are also available for your own installation.



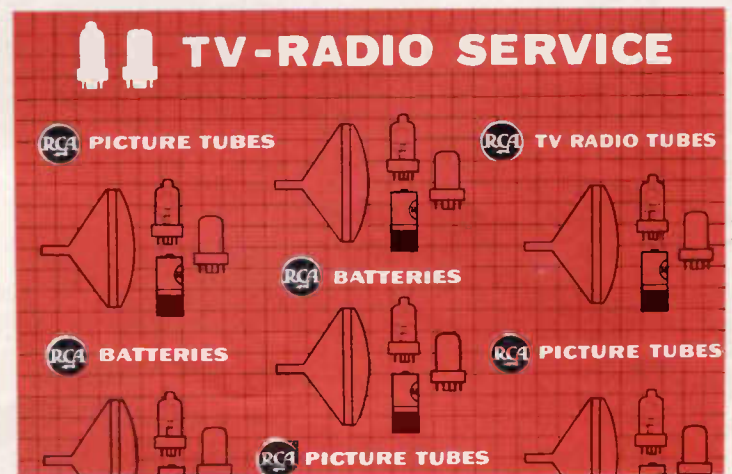
April-May-June (4F260) This is a great time of the year for television viewing—and this display fits the season by informing all your customers and prospects in view that it takes an expert to bring out the best in their TV. You're that expert!



July-August-September (4F261) The weather and baseball are at their hottest. And with cooler temperatures and football in sight, there is no better time to remind fans to see all the games—with your expert help!



October-November-December (4F262) The holiday months are here and nobody wants a "grouchy" TV, radio, or phonograph to mar high spirits. Happy holidays mean happy TV-viewing when you're in the picture!



Corrugated Window Back Drop (4F258) This new corrugated cardboard window back drop provides a fitting background for your dressed windows. It is supplied in 25-foot rolls and is perfect as a colorful filler for the back of your window. The top section can also be cut off and used as a rear window valance where required.

YOUR STORE—KEY TO SUCCESSFUL SALES

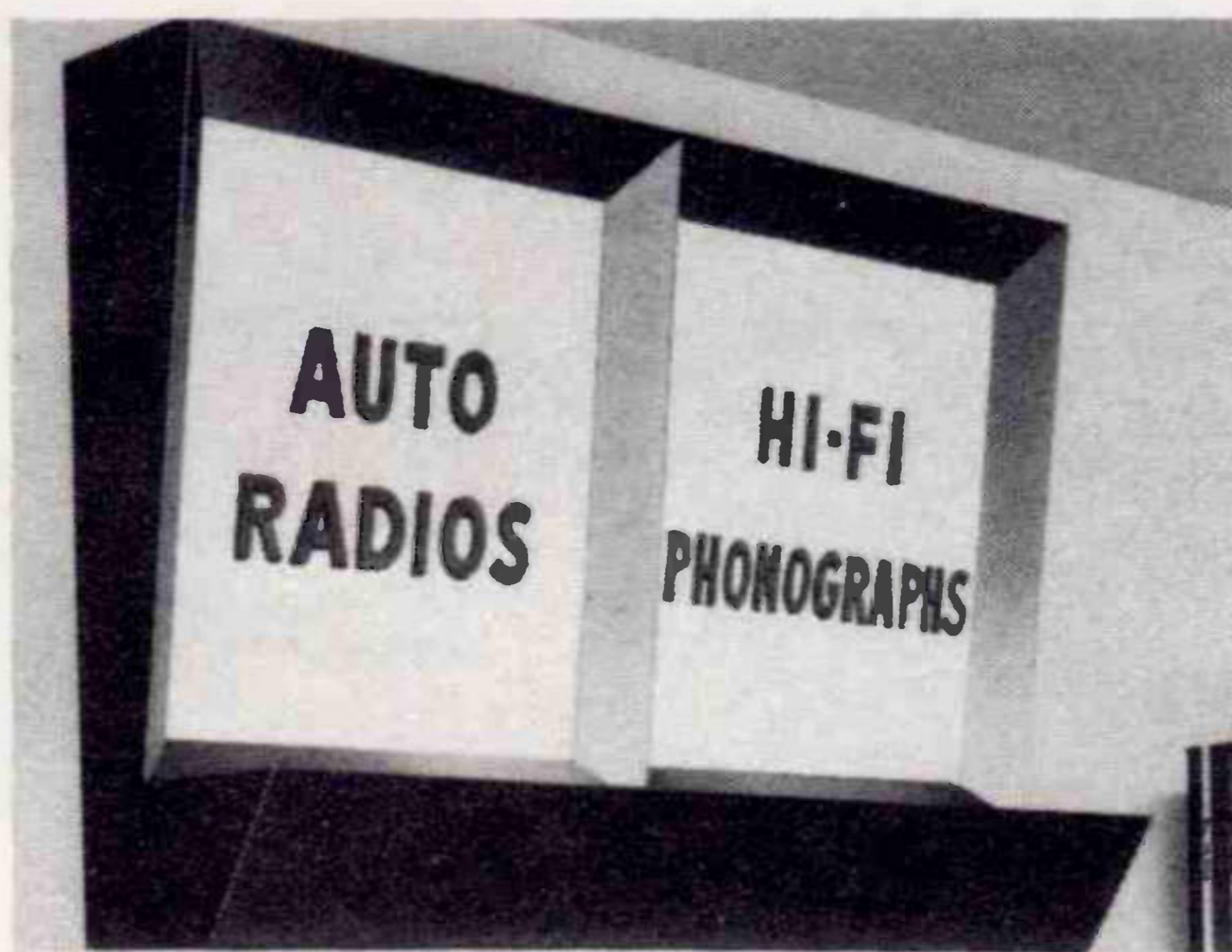
RCA ILLUMINATED WINDOW VALANCE AND IN-STORE MODULAR DISPLAY PANELS

Here is a brand-new idea in illuminated, custom-designed window valances which can also be used as individual units inside your shop. You are offered a choice of lithographed metal panels framed in gold-

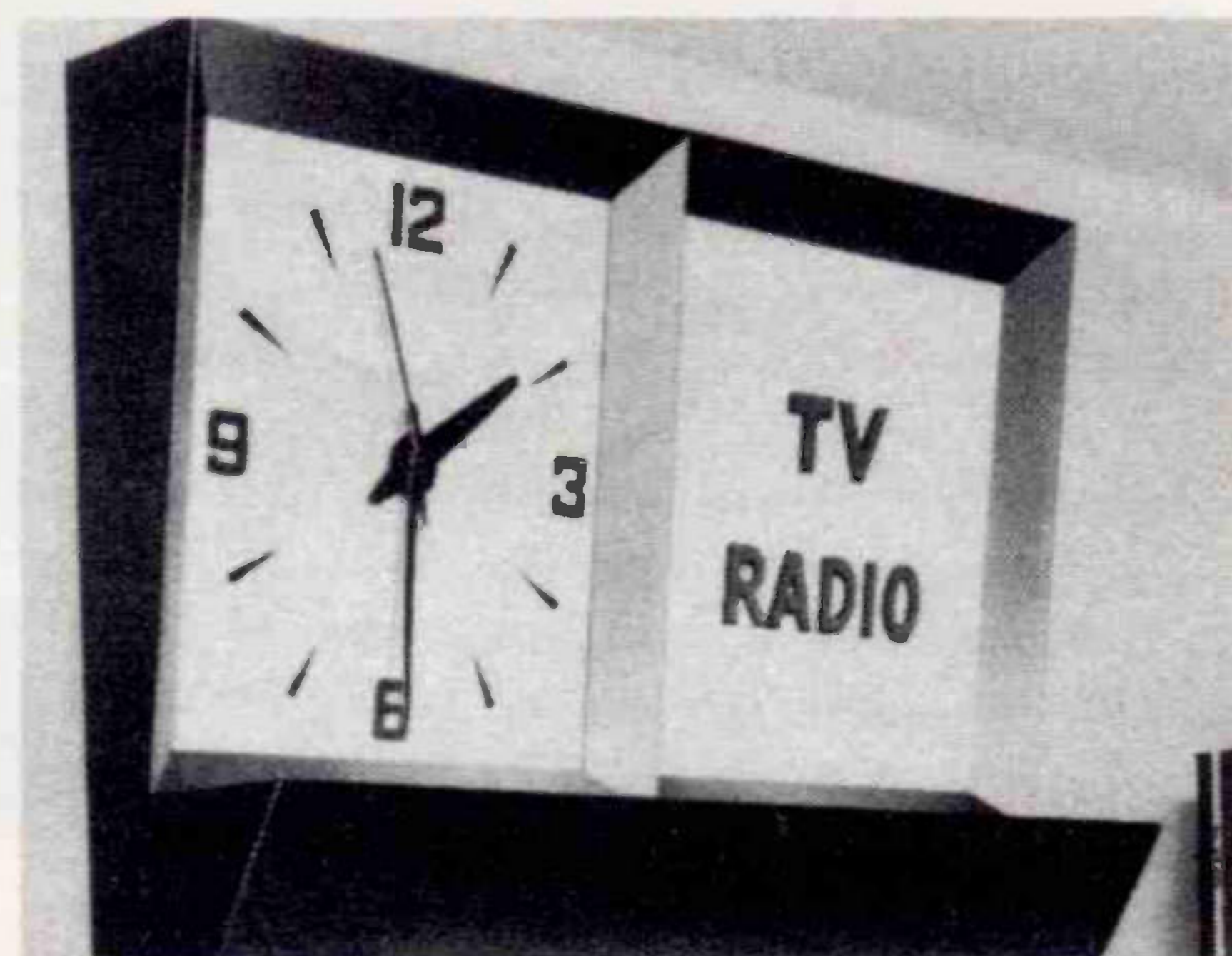
colored, satin-finished steel in either two- or four-foot units complete with hanging hardware and fluorescent lighting. Pictured on this page are the various units available from your authorized RCA tube distributor.



4F264-A is a two-foot unit with a 2' x 1' store-name panel featuring "TV-RADIO SERVICE" printed above your store name.



4F264-B is a two-foot unit with your choice of any two of the 1' x 1' product and service panels shown in this illustration.



4F264-C is a two-foot unit with a 1' x 1' clock panel featuring an easily-read face with dependable electric movement plus your choice of any one of the 1' x 1' product and service panels.

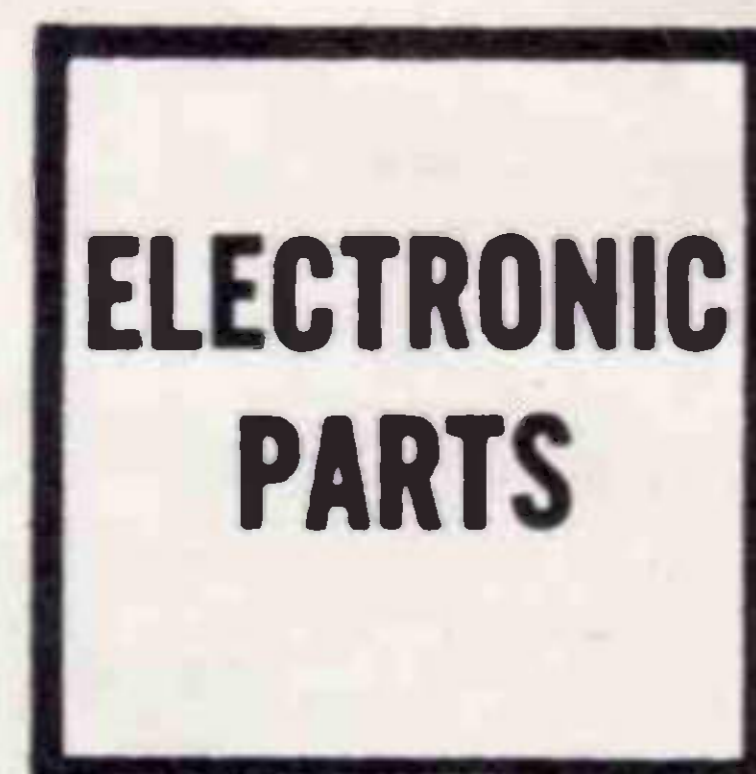
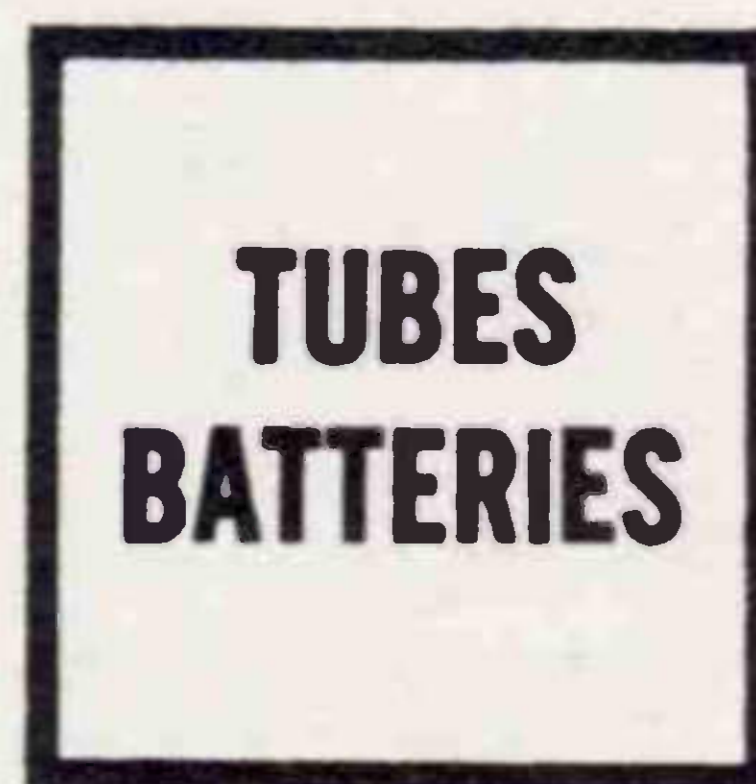
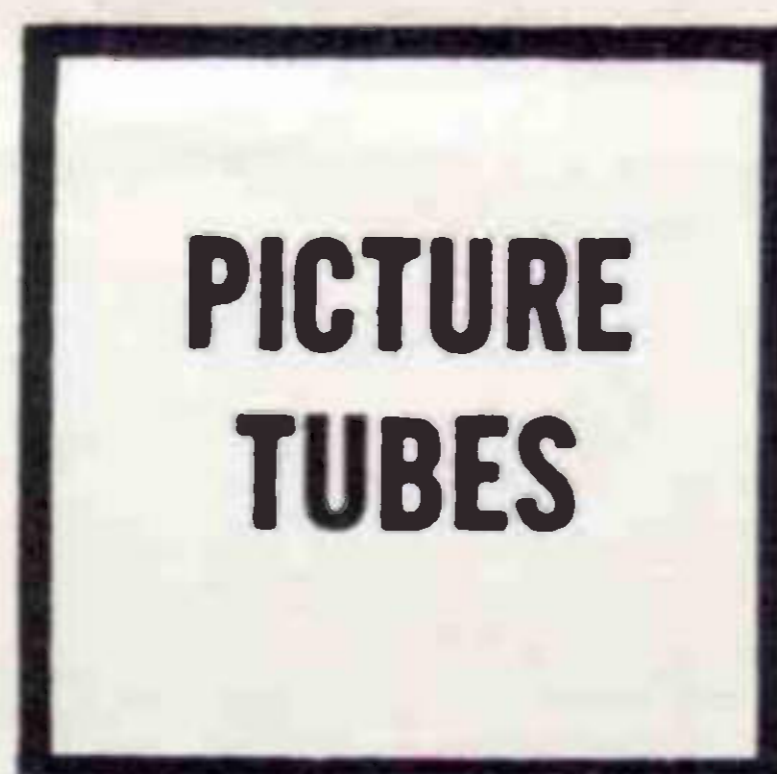


4F264-E is a four-foot unit with a 2' x 1' store-name panel flanked by a 1' x 1' clock panel and your choice of any one of the 1' x 1' product and service panels.

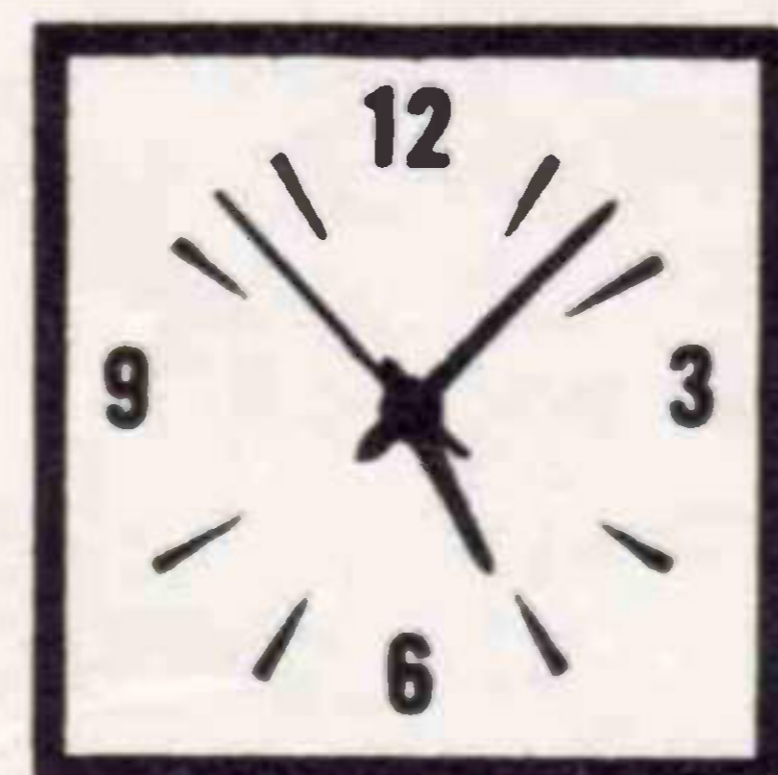


4F264-D is a four-foot unit with a 2' x 1' store-name panel flanked by your choice of any two of the 1' x 1' product and service panels.

PRODUCT AND SERVICE PANELS



CLOCK PANEL



STORE-NAME PANEL



RCA ROTATING ILLUMINATED LANTERN DISPLAY

The RCA Rotating Illuminated Lantern Display (4F236) can be mounted anywhere in your store to draw attention to the expert TV-radio services you offer. It will profitably spotlight any corner you place it in.



Add-On Shelf Unit (4F265-B)

RCA DISPLAY AND STORAGE SHELVING UNITS

Basic Four-Foot Shelf Unit (4F265-A)

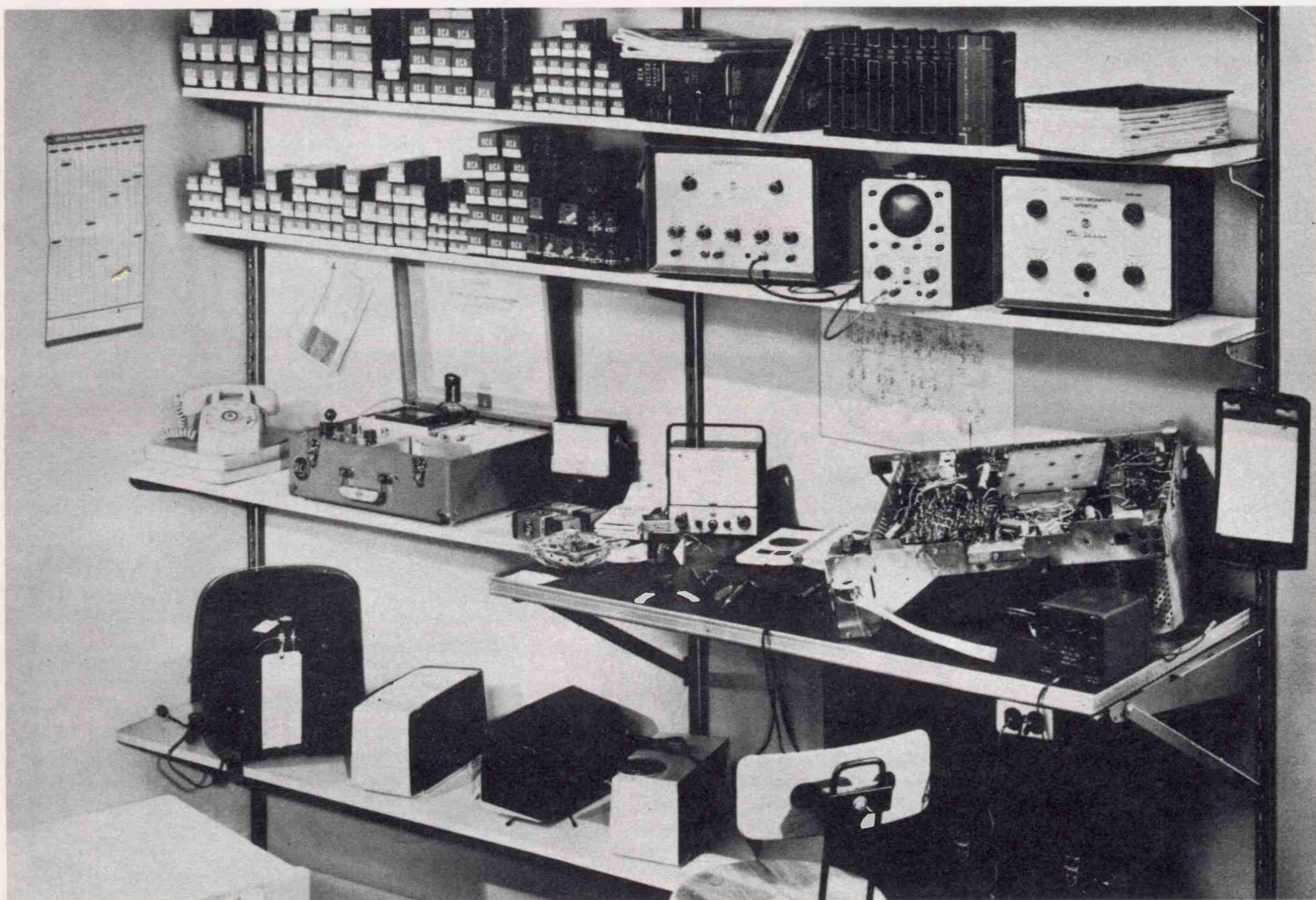
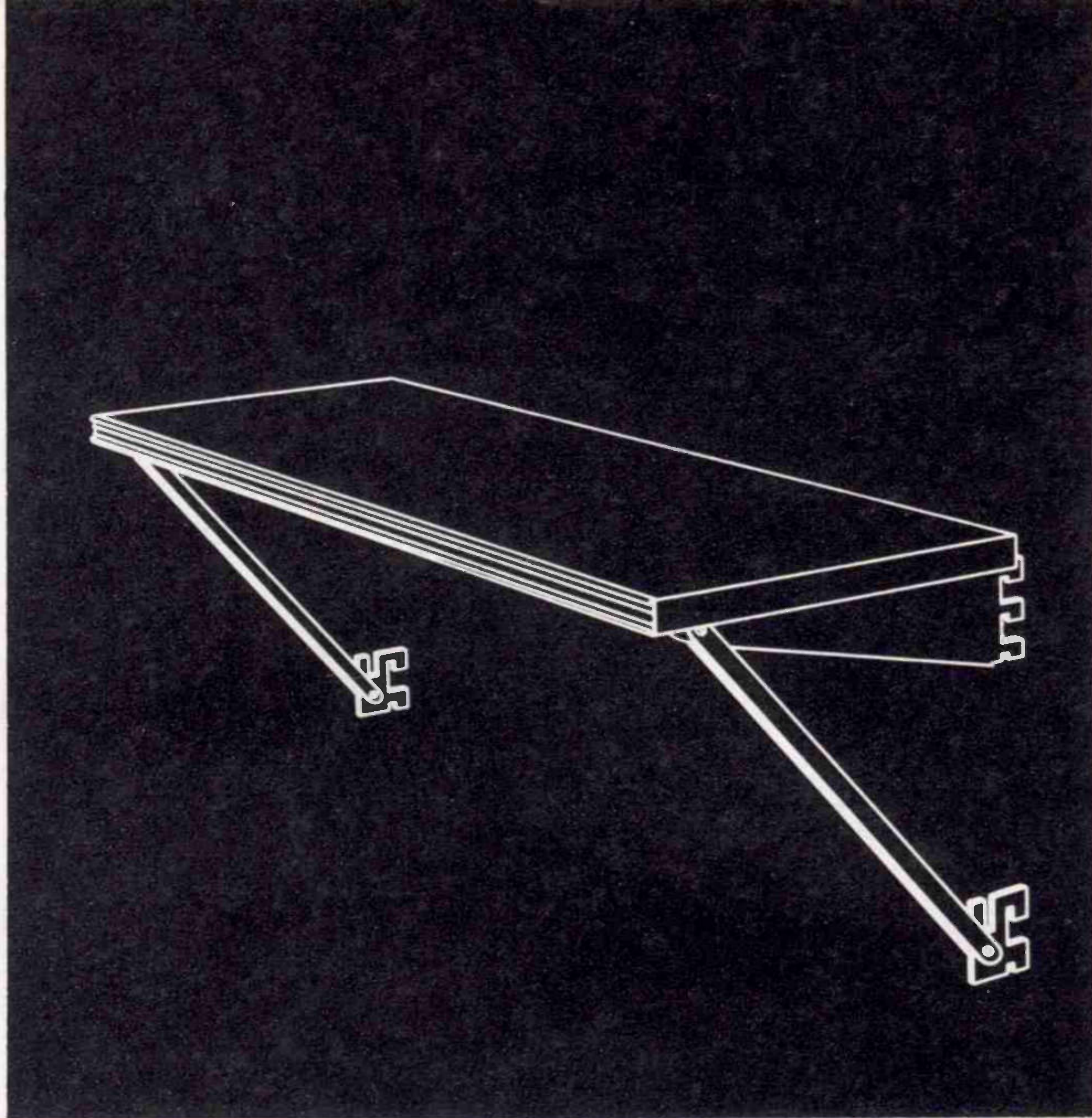
The RCA Display and Storage Shelving Units (4F265) are made of stock pressed-steel standards and brackets that may be used in many combinations and arrangements to build a wide variety of display facilities. These structural shapes provide great strength with a minimum of weight and bulk. The standards are vertical channel-shaped supports with slots for the shelf brackets. They are strong and rigid and will not twist out of shape. Many distinctive and durable fixtures can be assembled, using the same type of units in varying arrangements with the different shelf widths supplied. The units may be disassembled easily, moved and reassembled. The number of shelves, shelf spacing, and shapes can be easily changed to suit individual requirements without the use of tools.



YOUR STORE—KEY TO SUCCESSFUL SALES

RCA SHOP BENCH UNIT

This unit (4F265-C) is built to the same exacting standards as the RCA Display and Shelving Units. It is designed to be supported by the Basic Four-Foot Shelf Unit. The bench is made of 2' x 4' x 1 1/4" plywood with reversible tempered hard-board-covered top with extruded aluminum trim.



RCA and your authorized RCA tube distributor offer you the Store Improvement Program with the hope that it will help you profitably expand your business in step with the ever-increasing demand for ex-

pert TV and radio service. A booklet has been prepared which fully describes all the items in this new program (those highlighted in this issue of RADIO AND TELEVISION SERVICE NEWS, plus many others). It

also contains ordering information and order forms. Your copy is on its way to you now. Look for it and use it to help make your store a strong selling tool—an effective symbol of the technical services you provide.

YOUR STORE—KEY TO SUCCESSFUL SALES

CHART No. 4

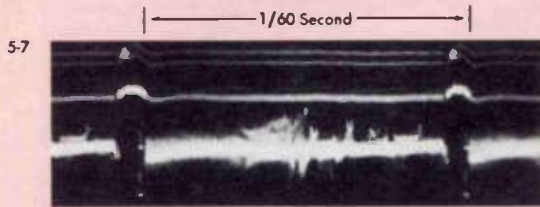
Waveforms in 1st SYNC Separator

TROUBLESHOOTING with an OSCILLOSCOPE

by John R. Meagher
RCA Electron Tube Division, Harrison, N. J.

CRO sweep rate for waveforms in left-hand column = 20 cycles.

CRO sweep rate for waveforms in right-hand column = 5,250 cycles.



5-7

Sync Signals
Picture Signals

4A. The composite (complete) TV signal, shown here, is taken from a suitable point in the video amplifier and is applied to the input of the sync separator which is designed to pass and amplify only the V and H sync pulses, without passing the picture signals.



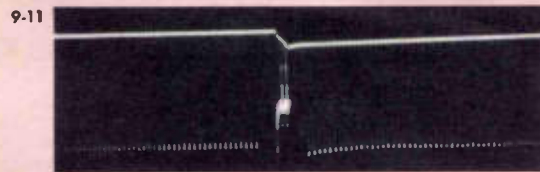
2-12

4B. With no TV input signals, low-amplitude horizontal pulses, shown here and in 4H, are normally present at the plate of the 1st sync separator.



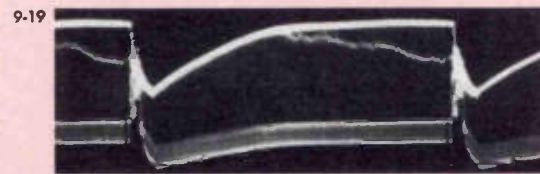
9-7

4C. When the normal TV signal, shown in 4A, is applied to the input of the sync separator, the waveform shown here is produced at the plate of the 1st sync separator. This pattern is comprised of H and V sync pulses, with only a small component of picture signals. (The vertical gain of the CRO was the same in 4B and 4C.)



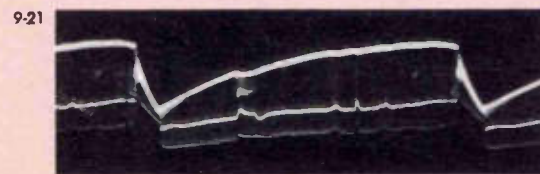
9-11

4D. Same as 4C, but with the horizontal gain control advanced to show this expanded view of the H and V sync pulses.



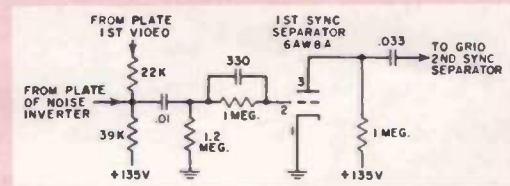
9-19

4E. When the sync pulses in the input signal are compressed appreciably, as shown in charts 2 and 3, the pattern at the plate of the 1st sync separator becomes distorted, somewhat as shown here and in 4F.

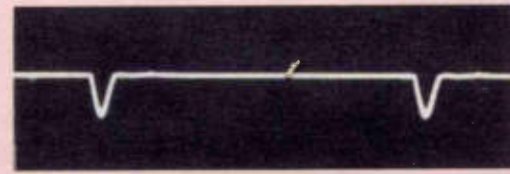


9-21

4F. Another example of the trouble in 4E. The distortion in these patterns changes on different scenes, on commercials, and also with motion in the scene, indicating that an excessive amount of picture signal is getting through the 1st sync separator. Compare 4E and 4F with the normal pattern in 4C.

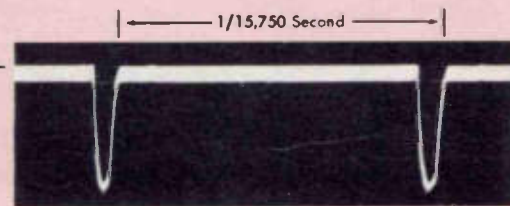


4G. This 1st sync separator circuit was used in obtaining all of the photographs in this chart. Different circuits are used in different receivers, but all are designed to do the same basic job.



4-2

4H. Same condition as in 4B, but using a CRO sweep rate of 5,250 cycles in order to show the horizontal pulses.



9-8

4I. Same normal condition as in 4C, but with a CRO sweep rate of 5,250 cycles. The lines of picture signals are all compressed in the thick horizontal line in this pattern. An expanded view of this line is shown below in 4J.



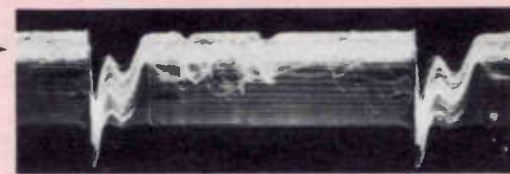
9-16

4J. The thick horizontal line in 4I is here expanded (by advancing the vertical attenuator for 10 X greater gain) in order to show the lines of picture signals. A vague image, up-side-down, of the TV picture may be seen in these lines. (The image is produced by a velocity-modulation effect.)

Normal Wave Forms at Plate of 1st Sync Separator

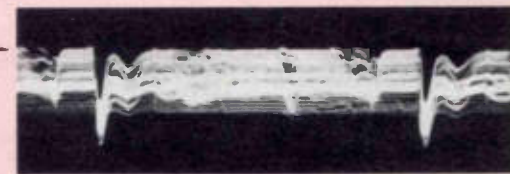
Abnormal Wave Forms at Plate of 1st Sync Separator

Abnormal Wave Forms at Plate of 1st Sync Separator



9-22

4K. Same type of trouble as in 4E, but with a CRO sweep rate of 5,250 cycles. Compare this example of "picture-signals-in-sync" with the normal pattern in 4I.



9-23

4L. Another example of the trouble in 4K. The technician is urged to duplicate these effects and observe the resulting symptoms in the TV picture. The effects may be duplicated by applying adjustable bias voltage, from a bias box, to the RF and IF amplifiers.

In this article, Mr. Meagher (nationally recognized RCA authority on practical television servicing) explains how the information in the first four waveform charts can be used to solve a typical "tough-dog" problem.

If you have had an opportunity to study the waveform patterns in the first three charts of this series, you have seen photographic evidence of two important troubleshooting facts:

(1) You have seen in charts 1, 2 and 3 that under normal conditions the amplitude of the horizontal and vertical sync pulses in the composite TV signal is approximately 25% of the total signal amplitude.

(2) You have seen in charts 2 and 3 that "overloading" or "limiting" in the picture-if amplifier acts to *compress* or *clip* the horizontal and vertical sync pulses in the composite TV signal. (Limiting action may be caused by insufficient AGC bias voltage, or other trouble.)

In addition, you see in chart 4 (Figures C, D, and I), at left, that under normal conditions the output of the first sync separator consists of "clean" horizontal and vertical sync pulses, with only a small percentage of picture signals.

You also see in chart 4 (Figures E, F, K, and L) that when the sync pulses in the composite signal are compressed or clipped, the output of the first sync separator contains an abnormally high percentage of picture signals. (A similar condition exists also at the output of the second sync separator, as will show in chart 5.)

The presence of an excessive amount of picture signal in the output of the sync separator is likely to cause unstable horizontal and/or vertical sync action. The probable cause of such trouble may appear as follows:

1. The position and extent of picture changes within different scenes, and varies with panning or motion in the scene. (In fewer words, the picture varies with picture content.)

2. The picture is distorted, such as picture pull, picture wobble, or picture jitter, and that you want to use an oscilloscope to aid you in localizing the cause of the trouble. You must proceed as follows:

1. The symptoms of horizontal picture pull, which varies with picture content, should lead you to check the possibility of excessive picture signal in the output of the sync separator.

To check your preliminary diagnosis, you would use your oscilloscope to inspect the waveform at the output of the sync separator. (If the particular separator circuit had separate outputs for horizontal and vertical sync, you would check the horizontal-sync output.) You would find, in our example (Figures 4E and 4F), that the output of the sync separator contained an excessive amount of picture signal.

This condition might be caused either by trouble in the sync separator, or by compression of sync in the composite TV signal at the input of the sync separator.

To decide this point, you would check the waveform of the composite TV signal at the input to the sync separator. You would find that the sync pulses were greatly compressed (Chart 2, Figure D, and Chart 3, Figure D). You would then know that the trouble was *not* in the sync separator but was caused by limiting action ahead of the sync-separator "take-off" point.

(The take-off point, from which the composite TV signal is fed to the input of the sync separator, may be at the output of the second detector, or at the output of the first or second video amplifiers: the location is different in different sets.)

Limiting action may take place in the picture-if amplifier or in the video amplifier.

To determine whether the limiting action is occurring in the video amplifier or in the picture-if amplifier, you would check the waveform at the output of the second detector. You would find, in our example, that the sync pulses in the composite signal at the second detector were greatly compressed. You would then know that the limiting action was occurring in the

picture-if amplifier, not in the video amplifier. Realizing that limiting in the picture-if amplifier may be caused by insufficient bias voltage from the AGC circuit, you would apply adjustable bias voltages, from a bias box, to the AGC bus points in the rf- and if-amplifier circuits. Adjusting the bias voltages carefully (while observing the TV picture and the signal waveform at the second detector) you would find that at some value of bias you could obtain satisfactory TV pictures, with good sync action, and without any compression of the sync pulses in the composite TV signal.

The trouble, therefore, is probably in the AGC circuit. However, it also could be caused by a tube in the picture-if amplifier—a tube which, for example, has even moderate grid-cathode leakage (sometimes called a "partial grid short") that will allow signals to pass but will reduce the bias voltage from a high-resistance AGC circuit. Or, it could be something simple and embarrassing, such as failure to adjust the AGC threshold control to the proper setting.

If you had *not* used an oscilloscope to localize this trouble, you might have suspected the horizontal AFC, sync separator, video amplifier, picture-if amplifier, and AGC sections. If you had scattered your efforts over all of these suspected sections, and had relied solely on voltage and resistance measurements and parts substitution, you might have created a real dog for yourself.

By using an oscilloscope, and by correctly applying your ability to interpret abnormal waveform patterns, you have *quickly* and *intelligently* localized the

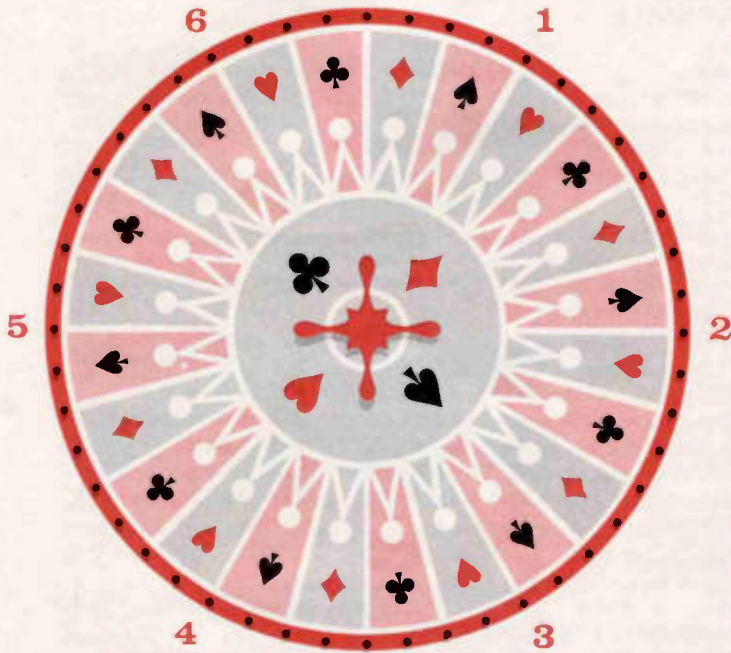
(Continued on page 14)

Intrigued "hi-fi"? Then you'll want to see your RCA distributor about obtaining *your* copy of "RCA High-Fidelity Amplifier Circuits" (Form HF-110). It highlights laboratory-tested hi-fidelity circuits which can provide superior performance at moderate cost. These systems employ RCA tubes especially designed for use in high-fidelity applications, and include recent developments in circuit design. Just look at the numerous "plus" features of RCA's latest hi-fidelity booklet, which carries a list price of only 35¢.

"RCA High-Fidelity Amplifier Circuits" discusses the performance requirements of a hi-fidelity system; describes the functions of the various amplifiers, preamplifiers, and control units which are usually employed, and contains tube data on the hi-fidelity tubes used in the circuits. In addition, this booklet includes construction hints, as well as voltage charts to facilitate checking the equipment. It contains circuits for tweeter amplifiers having power outputs of 15, 30, and 50 watts; a bass-and-treble tone-control amplifier; preamplifiers for use with magnetic-phonograph pickups; a preprocessor for use with a magnetic-tape head, and a microphone preamplifier. Also included are circuits for a tone-annul mixer, a balancing unit for stereo systems, and a low-cost "hi-fi" processor.

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RCA Presents 'Wheel of Fortune'



FOR RCA SOUND TAPE DEALER: A SURE-FIRE MONEY WINNER WITH EVERY SPIN OF WHEEL

Sound tape sales are fast reaching an all-time high. To help you capture your share of this big bustling market, your RCA sound tape distributor now offers you the six sales-provoking aids shown at right—everything from a bright new revolving counter merchandiser for displaying the complete line of RCA sound tape . . . to a colorful mobile to attract and sell your customers.

RCA sound tape in 5-inch, 7-inch, or 10½-inch reels on acetate or Mylar* bases, plus the exciting new magazine-loaded sound tape cartridge, round out a complete and profitable line of sound tape for you.

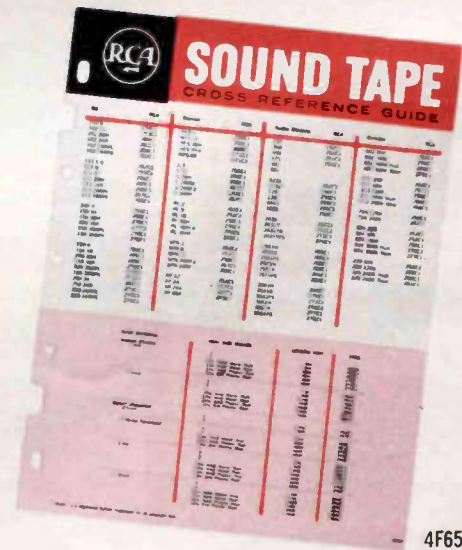
*"Mylar" is a registered DuPont trademark for its polyester film.



32" HIGH
10" WIDE

4F668

1 **Revolving Self-Service Counter Merchandiser** Here's the tape display you've been waiting for! A colorful, compact and compelling display for RCA Sound Tape reels and cartridges. Designed to hold over 12 seven-inch boxes, 6 five-inch boxes and 6 cartridge boxes, plus a quantity of give-away literature.



4F653B

4 **Facts, When You Want Them** RCA's Sound Tape Cross Reference Guide allows you to quickly and easily refer to practically any brand of tape by type number, and match it against its corresponding RCA type.

Sound Tape Promotion Program

MUSIC!
Jazz, Classical, Rock 'n' Roll... you name it! When you record on full-frequency, high-fidelity RCA Sound Tape you can be certain that you are getting sound reproduction playback your records give you. Available in 7" reels and in the 7" drop-in on RCA Sound Tape.

OWN A TAPE RECORDER?
But tired of low quality recordings? It could be you. We suggest today and a high fidelity tape. You'll find reproduction backs possible in recorder. Better so settle for it by RCA. So

DEALER NAME

MEMORIES!
Your most cherished memories spring to life sharper, clearer when recorded on full-frequency, high-fidelity RCA Sound Tape. Available here in 5" and 7" reels on splice-free Mylar or acetate bases.

DEALER NAME

SOUND LIKE YOU'VE NEVER HEARD BEFORE
Sharp, crisp, clear sound reproduction, faithful to the original, is yours for the asking when you record on full-frequency, high-fidelity RCA Sound Tape. You couldn't ask for better sound tape — so why settle for less? Get the high-quality RCA Sound Tape.

DEALER NAME

4F669

2 Spread The Quality Word
Around Here's a complete program of advertising mats for use in your local newspaper advertising. Use these mats regularly in your advertising... let your prospective customers know that you sell the quality line... RCA Sound Tape.

YOU'VE NEVER HEARD IT SO GOOD...

'til you've heard it on RCA SOUND TAPE REEL OR CARTRIDGE

RCA

4F671

3 Traffic Stopper!
This colorful, attention-compelling mobile informs your customers: "you've never heard it so good... 'til you've heard it on RCA Sound Tape." For maximum sales impact, order several mobiles for use throughout your store.

If it's worth
RECORDING

it's worth
SOUND TAPE

RCA

4F648

5 Everything They Need To Know
RCA's complete line of sound tape is outlined in this flyer for your customers' convenience. Includes helpful information on tape storage, recording volume, recorder maintenance, and tape splicing. Use it as a counter give-away or as a self-mailer.

RCA SOUND TAPE CARTRIDGE
MAGAZINE LOADED
MONAURAL OR STEREO

RCA SOUND TAPE CARTRIDGE
HIGH FIDELITY

RCA SOUND TAPE CARTRIDGE

4F647

6 All About The Cartridge
Information-packed flyer contains step-by-step procedure for editing and handling the new Sound Tape Cartridge. Designed as a counter give-away or self-mailer.

Electronics Servicing is Big Business

by **R. B. Sampson**

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As I mentioned in the last issue of **RADIO AND TELEVISION SERVICE NEWS**, service management is a control technique and, as such, the major operating areas of the business must be determined. For that purpose, I enumerated what I call "The Seven Pillars of Management" and discussed pillar number one: personnel. In this issue, let me review the six other pillars: facilities; advertising and promotion; sales revenue; payrolls; records; and credit control.

'Facilities'

In regard to facilities, the service-dealer in my community is my idea of one who shows tremendous strength in this vital area. His store is in an excellent location with ample parking space. The exterior is well identified as to who he is and what he sells. The interior is spotless with well-arranged displays. A fine array of test instruments in the rear of the store conveys the feeling that this service-dealer is well equipped to handle any servicing problem. His trucks are well identified and maintained. I can assure you, it is a pleasure to do business with this dealer.

The bad effect of a poor store location, careless store maintenance, inadequate test apparatus, and run-down, worn-out dilapidated trucks will surely cast a dark shadow over any service operation where these conditions exist. The relationship of facilities to other areas of the business is as true as the stars in the night.

'Advertising and Promotion'

In connection with advertising and promotion: good product identification, promotional displays, local advertising, and direct-mail campaigns will complement your efficiency in personnel and facilities. The bookkeeping records are also important to the advertising and promotion effort, for they contain the means to control these expenditures in proper ratio to sales revenue. Indeed, advertising and promotion is a vital factor in electronics servicing, and the relationship between it and the other pillars of management is plainly evident.

'Sales Revenue'

Sales revenue, our fourth pillar, is the main spring of any business; but



R. B. Sampson

sales are only a means to an end, not an end in themselves.

Are you making any money? The answer will be found, not in the sales level, but in the relationship that all operating areas, expressed in terms of costs, bear to the income produced by your selling efforts. If proper ratios to sales are being maintained in your electronics servicing business, then the answer to the question will surely be in the affirmative.

The key to the amount of service revenue that a service business should produce can only be determined by an analysis of all the factors as they apply to individual cases. If low sales are a problem, then the answer lies in self-analysis with respect to such basic factors as store location, number of technicians, pricing, facilities, advertising, and others—including, of course, the competitive situation. It is said that self-analysis is good for the soul. It can also be good for a business in which sales volume has not reached expectations.

Service Sources

The sources for electronics servicing revenue rest solidly on the number of television and radio sets and other electronic devices in use. Look at the background against which service-dealers in the United States can plan and guide their business to a good sales and profit position. It may interest you to know that there are 50-million TV sets in use today. That's almost as many TV sets as there are automobiles. This figure is expected to rise to 62 million by 1963. Our estimate for radios is 143

million, with a rise of 156 million in 1963.

How Service Income Is Derived

Service income as it applies to the electronics servicing industry is derived in just three ways:

- The sale of productive labor;
- Income from parts used in the repair process; and
- Sales of sundry items such as radios, record players, etc.

I estimate labor at 47% of total repair service income, with 53% for material and supplies. Sales of sundry items will vary according to the emphasis placed on them by the service-dealer.

While it is common practice in the industry to lump all service income into one sales account, it is my opinion that the books should reflect total sales from each of the three sources. The availability of this information will enable a dealer to direct his selling effort in proper relationship to the total market potential in the area served.

As a service-dealer, the big problem is to maintain a level of income which is sufficient in depth to cover all operating costs plus at least a 10% pre-tax profit. This means that all areas of the business must be maintained in proper ratio to sales. Your effort in that respect is "service management" in all that the term implies.

'Payroll Ratio'

The value of the payroll ratio, our next pillar of management, lies principally in its usefulness as a cost-control factor. The ratio is derived from the relationship of total payroll costs to service income. The ratio may vary slightly with the size of the business but, generally speaking, it should be held within 40%, particularly in an organization of four or more employees.

Why is the payroll ratio so important?

The answer is simply that with a 40% ratio, payroll costs alone will have absorbed 40¢ of each dollar of service income. With a minimum profit objective of 10% on gross income, then all other expenses—including the cost of material, travel, rent, depreciation, etc.—must be held within 50% of the sales dollar. Failure to hold the payroll in proper relationship to income indicates a weakness somewhere in the service charge or payroll cost structure. It can be one or the other or a combination of both. In either event, the sources of the trouble must be found so corrective action can be taken.

Some Examples

Let's review the following simple cases in connection with income from service calls:

At \$5.00 per call and a \$2.00 hourly wage rate, a field technician, with an average of eight completed calls per day, will maintain a 40% cost ratio. But if only seven jobs are completed, the ratio becomes 46%. At \$5.00 per call and a \$2.50 wage rate, the ratio rises to 50% for eight completed jobs.

In the first instance, the payroll ratio is satisfactory because of a high productivity rate of one completed call per hour for an eight-hour day.

In the second case, the unsatisfactory 46% ratio is occasioned by a productivity index of only seven calls for an eight-hour day. The action called for here is improvement in the productive output or an increase in the \$5.00 service charge.

In the third situation, the \$5.00 rate on a \$2.50 hourly wage creates a 50% ratio with eight calls per day. If this productivity index can be maintained, then the payroll ratio can be brought to 40% by increasing the service charge to \$6.25.

These examples are an oversimplification of an extremely important factor in a service-dealer's operation, but they do serve to illustrate the relationship of payrolls, in terms of the payroll ratio, to the other areas of the business.

'Records'

Now, let's turn to the sixth management pillar: records. A service-dealer's accounting and cost records should be simple, yet sufficient in depth and detail to provide the information needed to guide the business to a satisfactory profit position. Good records are not only a chronological recording of oper-

ations; they are also a warning system against excessive costs, low employee-productivity, loss-motion, material losses, and other operating inefficiencies.

The monthly statement of income and operating costs and expenses is the time-honored method of appraising progress, or lack of progress, to a profit position. Prepare this statement as of the end of each month. Don't wait until income-tax time to determine your profit status, for the end of the accounting year could be too late and too bad.

Daily Time Report

There are a number of supplementary records that should be maintained by a service-dealer, but none are greater in importance than the daily time report which reflects the actual performance of field and shop technicians. This report provides a record of a technician's productive and non-productive time, as well as other pertinent information dealing with the day's activity. By summarizing these individual reports into a weekly productivity report, a good index is provided for evaluating individual and overall performance against averages or standards established for that purpose.

Time reports, when used in conjunction with other cost records, will enable a dealer to detect inefficiencies in operation. In this respect, the problem of non-productive time ranks first in importance. What is your ratio of productive to non-productive hours? Or to ask it in another way: for each eight hours of paid time, how many are productive? One dealer reported only 5½ hours as an average. Another said 6.7 hours. In any case, non-productive time is a cost factor that must be controlled first by having information regarding its source and, secondly, by

corrective action to keep the ratio at a minimum.

The areas to watch in connection with non-productivity are the technicians' check-in time in the morning and evening, errors in dispatching, faulty information regarding customers' complaints, failure to have proper parts, call-backs, pickup time for parts, etc. You are familiar with all these problem areas and, in repeating them, I am only calling attention to their frequency and significance from the standpoint of their effect on your profit objectives.

In addition to the time records, material reports reflecting withdrawals from stock are important to the service-dealer as a means of controlling and preventing losses in material inventories. The hard copy of the customer repair order is also an important document for a service-dealer. It should be filed and used for customer follow-up at regular intervals, as well as for quick reference and other pertinent purposes.

Is there any doubt about the value of records as a control media? As I said earlier, they need not be cumbersome or complex; but they should be fully informative with respect to the vital areas of your business.

'Credit'

Our last pillar of management is "credit." It can be a potential source of serious trouble if not properly controlled. Some retailers can operate on a strictly cash basis; but there are many who must contend with charge customers on a large scale. In my opinion, the electronics service-dealer's position is somewhere between the two. Try as he may, he cannot completely get away from the charge customer. Al-

(Continued on page 15)

Service Technicians Warned Against Operating 6CD6-GA Beam Power Tube Above Maximum Allowable Peak Negative Voltage

(Continued from page 2)

sition (counter-clockwise); and the drive trimmer in the maximum drive position (counter-clockwise).

- If bright vertical bars are apparent, turn the drive trimmer in a clockwise direction to eliminate the compressed raster.

- Adjust the linearity coil in a clockwise direction to obtain minimum current (maximum deflection and best linearity); then adjust the linearity coil an additional one-quarter turn clockwise. This additional adjustment will make certain that there will be no ap-

preciable change in linearity as brightness is varied. When making this adjustment, readjust the drive, if necessary, to keep current at a minimum.

- Adjust the width control until the picture fills the mask. If the 6CD6-GA is weak and/or the line voltage has dropped, it may be necessary to shift the width link to the bottom position (maximum width). To produce the desired raster and keep current to a minimum, with no appreciable change in linearity when brightness is varied, readjust the drive and linearity coil, if necessary.



TROUBLESHOOTING WITH AN OSCILLOSCOPE

(Continued from page 9)

trouble to one small section of the receiver.

Oscilloscopic analysis, to give it a fancy name, may lead us up blind alleys on some occasions. The fault in such cases is not in the method, but is due to our own limitations in understanding the significance of abnormal waveform patterns.

We should not forget that while the oscilloscopic method will help us to localize troubles quickly and intelligently, *we must still depend on voltage and resistance measurements and even parts substitution in order to find the component that is responsible for the trouble.*

Unless and until some revolutionary new troubleshooting system comes along, we must endeavor to take the fullest advantage of all three of the present methods:

(1) Analysis of the visible and audible symptoms.

(2) Analysis of abnormal waveform patterns.

(3) Voltage, resistance, and capacitance measurements.

Again I urge you to duplicate all of the conditions shown in the waveform charts, and to observe the corresponding visible symptoms in the TV picture. Do this, if possible, on two or more different receivers. Become thoroughly familiar with the composite TV signal: notice how the picture signals change with changes in the scene and with changes in the brightness of the scene. Learn to identify black-levels and white-levels in picture signals, the top and bottom edges of vertical-rate signals, the left-hand and right-hand edges of horizontal-rate signals, etc. The waveforms in Chart 1 will be of help to you on these points.

[I want to express my thanks, and the thanks of RCA's Electron Tube Division, for the generous and encouraging comments that have been made by members and officials of many associations in regard to the first few waveform charts.]

| Tube Type | Hole Locations | Notes |
|--------------------------|---|-----------------------------------|
| 25B6 | A2 B7 C8 D5 E4 G3 I9 I10 J1 K6 L1 L6 L7 M5 M10 N1 N8 | — |
| 25D4 | A7 B8 C3 G5 I6 I10 K5 L4 L6 L10 M1 M9 N5 N8 | Reject if below 4 |
| 25DT5 | A4 B5 C7 D3 G1 G9 I6 I10 J9 K6 L1 L6 L7 M1 M9 N5 N8 | — |
| 25EH5 | A3 B4 C1 D2 E6 G7 I7 I10 J1 K6 L1 L6 L8 M1 M9 N5 N8 | — |
| 25U4 | A7 B8 C3 G5 I6 I10 K5 L4 L6 L10 M5 M10 N1 N8 | Reject if below 3 |
| 25Y5 | A1 B6 C3 C4 F2 G5 I6 I10 K6 L4 L6 L9 M5 M10 N1 N8 | Test P1 and P2; reject if below 4 |
| 32ET5 | A3 B4 C1 D2 E6 G7 I6 I10 J9 L1 L6 L7 M2 M10 N3 N8 | — |
| 35CD6 | A2 B7 C3 D5 E8 G10 I6 I7 J10 K5 L1 L6 L7 M5 M8 N1 N7 | — |
| 35DZ8 Pentode Unit | A4 B5 C2 D3 E7 G6 I8 I9 J2 K4 L1 L6 L7 M3 M8 N2 N7 | — |
| 35DZ8 Triode Unit | A4 B5 C8 D1 G9 I6 I9 J3 K8 L1 M3 M8 N2 N7 | — |
| 36AM3 | A3 B4 C7 G5 I6 I10 K5 L4 L6 L10 M1 M10 N5 N8 | Reject if below 4 |
| 45Z3 | A1 B7 C4 G2 I6 I10 K8 L4 L6 L10 M1 M10 N5 N7 | Reject if below 4 |
| 45Z5 | A2 B7 C8 G5 I6 I10 K5 L4 L6 L10 M5 M7 N1 N6 | Reject if below 4 |
| 50BK5 | A4 B5 C6 D3 E8 G1 I6 I10 J5 K3 L1 L6 L7 M5 M7 N5 N6 | — |
| 50CA5 | A3 B4 C1 D2 D5 E6 G7 I6 I10 J5 K1 L1 L6 L7 M5 M7 N5 N6 | — |
| 50CD6 | A2 B7 C3 D5 E8 G10 I6 I7 J10 K5 L1 L6 L7 M4 M7 N5 N6 | — |
| 50DC4 | A3 B4 C7 G5 I6 I10 K6 L4 L6 L10 M5 M7 N5 N6 | Reject if below 4 |
| 50EH5 | A3 B4 C1 D2 E6 G7 I7 I10 J1 K6 L1 L6 L8 M5 M7 N5 N6 | — |
| 50FY8 Triode Section | A4 B5 C8 D1 G9 J2 K5 L1 M5 M7 N5 N6 | See instructions for gas test |
| 50FY8 Pentode Section | A4 B5 C2 D3 E7 G6 I8 I10 J1 L1 L6 L7 M5 M7 N5 N6 | — |
| 70L7 Diode Section | A2 B7 C1 G8 I6 I10 K6 L4 L6 L10 M5 M10 N5 N7 (Card 1 of 2 cards) | Reject if below 4 |
| 70L7 Pentode Section | A2 B7 C6 D5 F4 G3 I6 I7 J1 L1 L6 L7 M5 M10 N5 N7 (Card 2 of 2 cards) | — |
| 117N7 Pentode Section | Mark present card "Card 1 of 2 cards" | — |
| 117N7 Diode Section | A2 B7 G8 K4 L4 L6 L10 M4 M10 N2 N6 (Card 2 of 2 cards) | Reject if below 4 |
| 117P7 Diode Section | A2 B7 G8 K4 L4 L6 L10 M4 M10 N2 N6 (Card 1 of 2 cards) | Reject if below 4 |
| 117P7 Pentode Section | A2 B7 C6 D4 E5 G3 I6 I10 J8 K9 L1 L6 L8 M4 M10 N2 N6 (Card 2 of 2 cards) | — |
| 5559 | (No test) | — |
| 5618 | A7 B1 C4 D6 E3 G2 I6 I10 J9 K6 L1 L6 L7 M4 M10 N2 N9 | — |
| 5651 | A8 G1 K1 L1 M5 M10 N5 N9 | Use WG-324A Adapter |
| 5696 | (No test—gas tube) | — |
| 5965 | A4 B5 C3 C8 D2 D7 F6 G1 I6 I10 J4 K5 L1 L6 L7 M2 M10 N4 N9 | Special gas test |

Punching Information You Can Use to Prepare Special

| Tube Type | Hole Locations | Notes |
|-------------------------|--|---|
| 6095 | Use 6AQ5 card | — |
| 6096 | Use 6AK5 card | — |
| 6098 | Use 6AR6 card | — |
| 6100 | Use 6C4 card | — |
| 6188 | Use 6SU7 card | — |
| 6211 | A4 B5 C3 C8 D2 D7 F6 G1 I6 I9 J2 K3 L1 L6 L7 M2 M10 N4 N9 | Test P1 and P2 |
| 6227 | A4 B5 C3 C9 D2 E8 G7 I7 I10 J1 K7 L1 L6 L8 M3 M10 N1 N9 | — |
| 6336 | A7 B7 C3 C6 D1 D4 F2 G5 I9 I10 J1 K6 L1 L6 L7 M3 M10 N2 N9 | Test P1 and P2 |
| 6939 | A4 B5 C2 D1 D3 E7 F8 G6 I7 I10 J1 K7 L1 L6 L8 M2 M10 N4 N9 | Test P1 and P2 |
| 6973 | A4 B5 C7 D3 E1 G9 I6 I10 J6 K6 L1 L6 L7 M5 M10 N2 N9 | — |
| 7025 | A4 B5 C3 C8 D2 D7 F1 G6 I6 I10 J2 K8 L1 M2 M10 N3 N9 | Test P1 and P2; see instructions for gas test |
| 7027 | A2 B7 C8 D5 E4 G3 I6 I10 J9 K6 L1 L6 L7 M5 M10 N2 N9 | This card can be used to test all 6L6 and 5881 tubes, but the 6L6 card will not test this tube. |
| EBC33 Triode Section | A2 B7 C1 C8 D10 G3 J4 K6 L1 M5 M10 N2 N9 | — |
| EBC33 Diode Section | A2 B7 C1 C8 F5 G4 K6 L3 M5 M10 N2 N9 | Test P1 and P2; reject if below 4 |
| ECC33 | A7 B8 C3 C6 D1 D4 F2 G5 J2 K2 L1 M5 M10 N2 N9 | Test P1 and P2 |
| ECC35 | A7 B8 C3 C6 D1 D4 F2 G5 J3 K8 L1 M5 M10 N2 N9 | Test P1 and P2; see instructions for gas test |
| EF40 | A1 B8 C4 C7 D5 E6 G2 J4 K7 K8 L1 M5 M10 N2 N9 | Use special socket adapter |
| EL37 | A2 B7 C8 D5 E4 G3 I8 I10 J1 K2 L1 L6 L7 M5 M10 N2 N9 | — |
| EL38 | A2 B7 C8 D5 E4 G10 I8 I10 J1 K7 L1 L6 L8 M5 M10 N2 N9 | — |
| ELC1K | (No test—gas tube) | — |
| FW4/800 | A3 B4 F2 G1 K2 L5 L6 L10 M5 M6 N1 N6 | Test P1 and P2; reject if below 4; use special socket adapter |
| OA5 | (Gas pentode—no test) | — |
| OB3 (VR90) | A8 D2 D4 D7 G5 K4 L1 L6 L8 M5 M10 N5 N8 | Regulator tube; use WG-324A Adaptor |
| OG3 (85A2) | A8 G1 K2 L1 L6 L7 M5 M9 N5 N8 | Regulator tube; use WG-324A Adaptor |

Service Is Big Business

(Continued from page 13)

though the basic policy of the service-dealer should be "cash upon completion of the work," exceptions to this rule are necessary. These exceptions must be carefully controlled to avoid a receivables problem.

The danger in receivables for a service-dealer stems from the fact that you are dealing in service, and service is an intangible item. Furthermore, there is always a risk regarding the extent of the customer's satisfaction with the service performed. The slightest degree of dissatisfaction can delay and even prevent collection of the account. These facts make it imperative that every action prior to acceptance of the call and completion of the work be directed to cash payment. If exceptions are necessary—and they will be—then be prepared to advise the customer of this fact and accept it on a "courtesy charge" basis. Many customers will respect this kind of treatment and will respond with their check within the next few days—the extent of the courtesy policy.

The customer's failure to respond to a courtesy extension of credit is an indication of possible trouble. In any event, a receivable has been created. Further action must be dictated by the collection routines which have been established for the business.

I will not attempt to outline a credit and collection procedure for you in any detail. You are familiar with the many articles written on this subject, and you have had the benefit of your own experience. Suffice it to say, the longer the account remains uncollected, the more likely the loss.

An age analysis of accounts receivable each month is the best means to keep informed regarding the status of the accounts. The firm action taken regarding those accounts in the early stages of delinquency will prevent losses that might otherwise develop.

• • •
Are you making any money? When all is said and done, electronics servicing can be a rewarding business—if you're making money.

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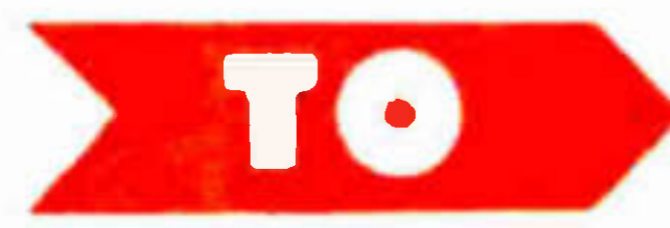
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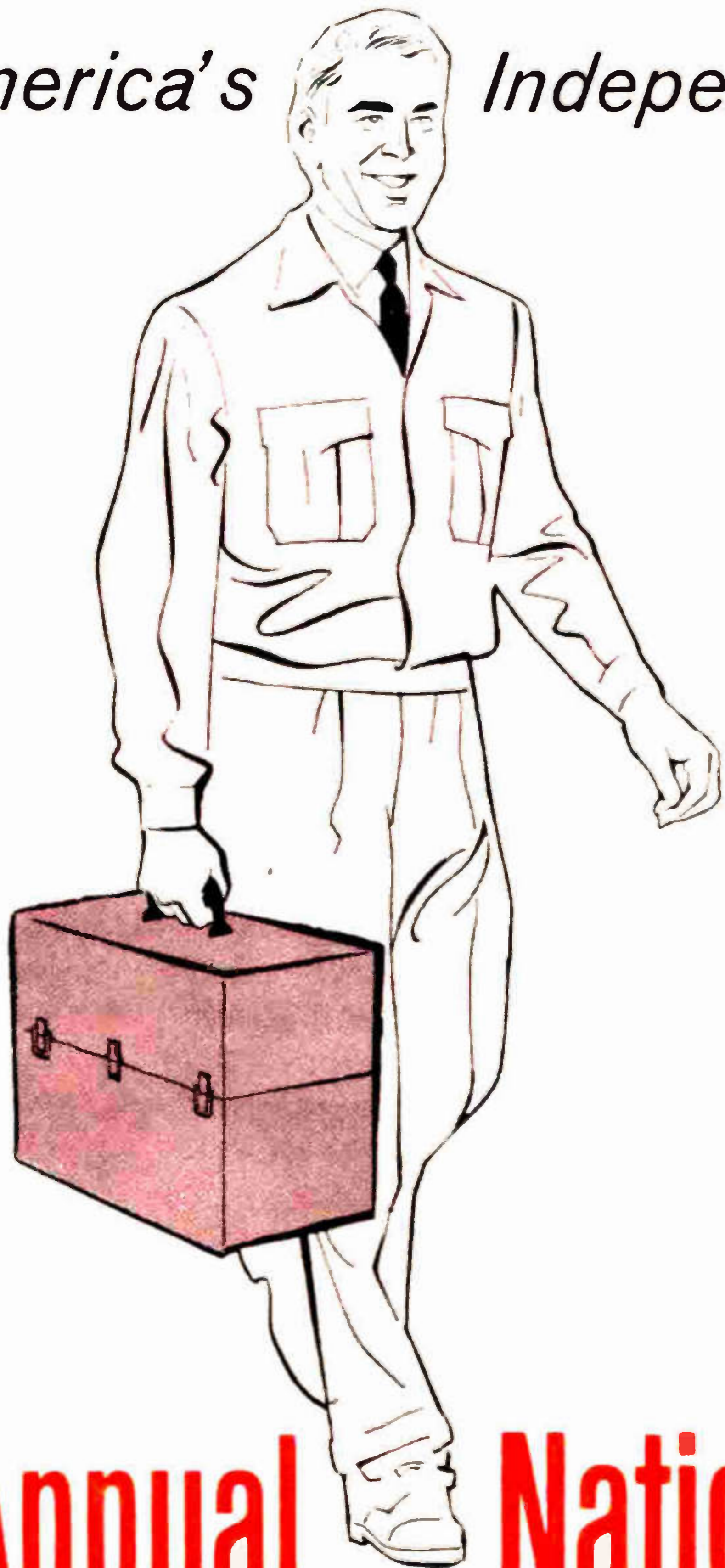
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