



RADIO AND TELEVISION

Service News

A PUBLICATION OF RCA ELECTRONIC COMPONENTS AND DEVICES

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(RCA WR-64A COLOR-BAR/ DQT/CROSSHATCH GENERATOR)



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(FAMOUS RCA INSTITUTES COLOR-TV HOME STUDY COURSE)

WINTER

1963-64

Vol. 29, No. 1

Available Through Your Participating Authorized RCA Test-Equipment Distributor (For complete details, see story on page 3)

WG-354A Probe Heightens Performance Of RCA's WO-88A, WO-91A Oscilloscopes



Owners of RCA's WO-88A, WO-91A, and similar-type oscilloscopes employing the WG-300B probe will now be able to observe and measure high-voltage waveforms with amplitudes up to 5,000 peak-to-peak volts.

These new capabilities are made possible by the new RCA WG-354A

probe, a capacitance-type voltage divider which snaps onto the front end of the WG-300B probe.

The WG-354A is particularly useful in black-and-white and color-TV servicing—for observing and measuring the pulse voltage at the plate of the horizontal-output tube and across the hori-

zontal-deflection coil in the yoke. Pulses in these circuits run as high as 5,000 peak-to-peak volts.

Two high-voltage capacitors in the WG-354A probe comprise a voltage-divider circuit which attenuates the input pulse signal voltage by a factor of 20 to 1. In its "Low-Cap" function, the WG-300B Direct/Low-Capacitance Probe has a 10-to-1 attenuation. In combination, the WG-300B and WG-354A have a 200-to-1 attenuation.

Because RCA 'scopes such as the WO-88A and WO-91A have built-in voltage calibration, it is possible to measure high-voltage TV waveforms directly on the oscilloscope screen.

Optional User price of the new WG-354A probe is only \$7.50—an altogether worthwhile investment which can repay the service technician many times in his routine troubleshooting and repair tasks.

WT-115A Designed Exclusively for Testing Color-TV Picture Tubes

From RCA—pioneer in compatible color television—comes an outstanding test instrument designed specifically for precise measurement of performance characteristics of color picture tubes.

The newly announced WT-115A Color Picture Tube Tester has been correlated with the equipment used for in-plant testing of RCA color picture tubes.

This portable tester rates—in a manner similar to the in-plant testing equipment—each gun of the color picture tube for emission quality, interelectrode leakage, shorted elements, and warmup performance.

The WT-115A features a high-sensi-

tivity meter with a 5-inch, easy-to-read, three-color scale providing quick and reliable indication of color picture tube performance. A 0-to-10 "Quality" meter scale indicates the emission capability of each gun. A separate, smaller scale is used to measure interelectrode leakage and to establish the proper cutoff point for the gun being tested.

Interelectrode shorts in the color gun are indicated by a neon lamp. This lamp also serves to protect the meter

movement against damage due to overload.

Front panel controls on the WT-115A include an adjustment to compensate for variations in line voltage, a switch to select the color gun to be tested, and a control for accurately setting the proper cutoff point for the testing of each color gun.

Readily portable and weighing only 5 pounds, the instrument is provided with a protective vinyl carrying case which has a special compartment for storing the tester socket assembly and power cord. A card explaining the basic test procedure is supplied with the WT-115A and can be stored inside the case lid for quick reference.

Equally versatile for either in-set or out-of-set testing of color picture tubes, the unit operates from an ac power source of 108 to 132 volts, 50-60 cps. Power consumption is approximately 25 watts.

Many of the color picture tube testers currently available do not have provision for adjusting the cut-off point for each gun, and do not provide accurate heater voltage. Such testers often indicate that one gun in the color picture tube is "bad," when actually, it is perfectly good. The RCA WT-115A has the essential cut-off adjustment feature and it provides accurate heater voltage.

An extremely accurate instrument for the testing of color tubes in the customer's home or in the store, the WT-115A is available through authorized RCA test equipment distributors at an Optional User price of \$89.50.



RCA's WT-115A Color Picture Tube Tester is designed specifically for the testing of color-TV picture tubes, including types 21AXP22, 21AXP22A, 21CYP22, 21CYP22A, 21FBP22, 21FJ22, and 21FKP22.

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RCA RADIO & TELEVISION SERVICE NEWS is published in the interest of dealers and service technicians. It is written to assist them in providing better service, and to foster the growth of their business by supplying them with information on the latest troubleshooting and sales promotion techniques, sales and service aids, together with invaluable data on RCA tubes, transistors, batteries, and electronic instruments.

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Famed RCA Institutes Color-TV Home Study Course

Are you one of the 10,000 technicians who have been trained in color-TV servicing at RCA-sponsored workshops?

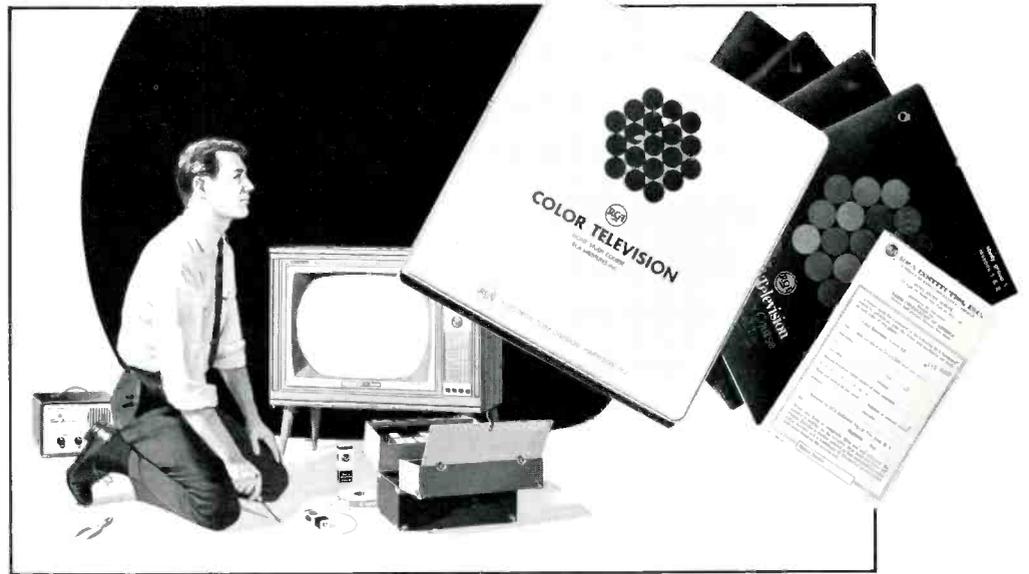
If not, there's still time to join the vanguard of dealer establishments prominently displaying "Expert Color-TV Service" signs by immediately taking advantage of the following offer now available through your participating RCA test-equipment distributor:

For a limited time only, your purchase of the popular WR-64A Color-Bar/Dot/Crosshatch Generator entitles you to free enrollment in the widely popular and proven RCA Institutes Color-TV Home Study Course.

This famous four-group, eight-lesson series is your direct entry to the most promising field of television servicing. By broadening your technical skills into this flourishing field, you can share in the wide recognition and customer acceptance of RCA as a pioneer of compatible color television.

The home-study course provides you with all the fundamentals for troubleshooting and repairing color receivers—regardless of make.

Lesson 1 offers in clear and concise form the principles of color television. Eight separate sections cover an elementary color television system; light and color; the color-TV signal; the principles of modulation; development of the color-TV transmission standards; recovering the chrominance signals at the receiver; an over-all view of the



system; and supplementary information.

Each of the seven remaining lessons is presented in equal or even greater detail with sections and sub-sections covering every aspect of the lesson's main subject. Lesson 2 tells you all about color picture tubes. Lesson 3 instructs you in the functions of the color receiver, while Lesson 4 deals with setups and adjustments. Lesson 5 introduces you to modern color-receiver circuits—with emphasis on tuners, video IF amplifiers, sync and AGC circuits, deflection and high-voltage circuits, the chrominance channel, demodulators, color synchronization circuits,

video circuits, remote control, and overall servicing features. Lesson 6 covers all aspects of receiver alignment and Lesson 7 describes the most effective troubleshooting techniques. Finally, in Lesson 8, you learn about your complete workbench needs in test equipment and accessories, including the highly regarded WR-64A Color-Bar/Dot/Crosshatch Generator.

The eight lessons are divided into four "Study Groups" of two lessons each. Included with each Study Group are examination papers which are forwarded to RCA Institutes for grading after the completion of each lesson. As each Study Group is successfully completed, you automatically receive the following Study Group. Your participating authorized RCA test-equipment distributor will be happy to cooperate in providing you with all the necessary details on how to file the Application Form and obtain the handsome white vinyl binder containing Study Group I—your first two lessons.

Your purchase of the WR-64A Color-Bar/Dot/Crosshatch Generator (available through authorized RCA test-equipment distributors at an Optional User price of \$189.50) provides you with an outstanding value. This generator is one of the "Big-5" RCA electronic test instruments which fulfill all test requirements in color-TV servicing (see story on page 4).

"Color" is already big business, and getting bigger every day. Use this extraordinary offer toward a profitable future career in "Expert Color-TV Servicing."

As an RCA-trained color-TV technician, you receive a handsome graduation certificate which can be prominently displayed in your establishment for all customers to read and remember when confronted with future servicing needs.



RCA's Mark VIII Transceiver Sets New Standards For High-Quality Performance in CB Equipment

Outstanding transmitting and receiving characteristics of RCA's Mark VIII 27-Mc Citizens' Band 2-Way Radio label this unit as a pacesetter among instruments of its type.

A 5-watt-input transmitter with over 3 watts output offers clean, crisp voice reproduction with full 100%-modulation capability.

The intermediate frequency chosen for the unit provides excellent image rejection. This feature, together with good signal-to-noise ratio, provides high audio intelligibility in the receiver. Performance of the receiver is further heightened by placement of the large speaker in the center of the front panel.

The relatively low cost and simple operating features of the Mark VIII make this highly dependable communications transceiver useful in a wide variety of industrial, marine, business, and personal applications, including vehicles, construction, farms, and warehouses.

Operation of the Mark VIII is simple, with only five operating controls on the front panel. An illuminated "transmit" channel selector has nine fixed (crystal-controlled) channel positions. A tuneable receiver dial covering all 23 channels is calibrated in both channel numbers and frequencies. The illuminated "receive" channel selector has 10 positions, nine of which are fixed (crystal-controlled) channel positions and a tenth position which switches reception to the tuneable receiver. "On/off"-volume and squelch are controlled by a dual-function knob.

One of the most important features of the Mark VIII is the inclusion of an ac power supply in the transceiver. Separate dc power supplies are available for either 12-volt dc or 6-volt dc operation. Either unit may be mounted on the firewall of the vehicle as a permanent installation. The Mark VIII then can be plugged in for mobile use, and unplugged and carried into the home or office for base-station operation. In addition to permitting a transceiver of smaller size, this arrangement results in considerably lower costs for the user who doesn't require a mobile power supply in every unit. The power supplies come complete with brackets for under-the-dash mounting of transceiver in motor vehicles; hardware for installation of the power supply; battery cable and clamps; and a fused



Offering new styling, new convenience, and new versatility, the Mark VIII in many respects represents a significant departure from ordinary Citizens' Band radio design. Its low, slim silhouette and height of only 3½ inches facilitate installation in extremely limited space, including under-the-dash mounting in many of today's smaller cars.

dc power cord for connection to the transceiver. Other features of the Mark VIII include:

- Superheterodyne receiver with one RF and two IF amplifier stages.
- Adjustable squelch circuit.
- Automatic noise limiter.
- Automatic volume control.
- TVI trap.
- PI-type-output network for most efficient antenna match.
- Electronic transmit/receive switching.
- High-impact-plastic push-to-talk ceramic microphone.
- Illuminated indicators for showing working channels.

● Rugged, compact, and lightweight construction.

The crystals are of the plug-in type, and are fully accessible through two snap-lock trapdoors in the top of the metal cabinet. One pair of precision-ground transmit-and-receive crystals for channel 7 is shipped with each Mark VIII. Additional crystals are available for other CB channels.

Combining functional styling, low cost, and high-quality performance for maximum customer appeal, RCA's Mark VIII 27-Mc Citizens' Band 2-Way Radio can be your winning item for increased sales and profits in CB equipment.



Across the Bench

By 'Doc'



If your shop was as busy as mine during the holidays, you're probably glad they're over. With all the kids home from school, the TV sets got a real workout—and so did my service bench. It seemed that every time I tried to take a voltage measurement, the telephone jingled.

On top of all this, I got the darnedest job. Like any other request you get from a steady customer, I couldn't turn it down.

It was the Friday before Christmas and I had this color set jacked-up on the bench. It had a bad case of color lockout. Right in the middle of everything, Mrs. Caldwell charged into the store with a big box and plopped it down on the counter.

"Mr. Doc," she demanded, "fix this for me right away. I'll be back in two hours."

Before I could take the pipe out of my mouth, she dashed out the door.

Being curious, I cut the twine and lifted the box flaps. Maybe it was one of those midget TV sets or (Heaven forbid) her new FM multiplex tuner. I wasn't prepared for what I saw.

It looked like a barbed-wire entanglement in living color. As I gingerly lifted the mess out of the box, two colored lamps dropped to the floor. *It was six strings of Christmas-tree lights!*

"Well, Doc," I asked myself, "what are you supposed to do with this? Fix it, I guess. Perhaps it's out of alignment. In that case, I can connect a sweep and marker generator across the line plug. Or maybe the color demodulators are out and the green lights are flashing red. Now, if I just hook up the WR-64A color-bar generator . . ."

Suddenly emerging from my flight into fantasy, I was reminded of the color chassis that needed attention by the humming noise in the back room. I bit hard on my pipe and started to work on the strings of lights.

I finally got back to the color chassis. I had pulled the set when routine tube replacements and adjustments failed to cure the trouble.

Black-and-white performance was good, and sound okay. But the set wouldn't perform on a color program. When I fed a color-bar signal from a WR-64A in the front end and adjusted the threshold control in the color-

killer circuit, it had no effect. The trouble lay in the color-sync or chrominance circuits, which lined up as shown in the block diagram below. Maybe you'll recognize the arrangement—it's from the RCA-21CT662U.

When black-and-white performance is okay but color is out, it's not difficult to localize the trouble with a good 'scope and a color-signal source. It's merely a matter of signal tracing. You can use either a color signal from a WR-64A or one from a station. I prefer the WR-64A because you can adjust levels as needed, and you're always sure of having a standard color signal when you want it.

Let's look at the layout in the diagram. Circuit functions are simple.

The bandpass amplifier is tuned to about 4 megacycles so it extracts and amplifies all the color information. This information is fed to the demodulator driver and the burst keyer. The demodulator driver provides amplified 3.58-Mc sideband information to the color demodulators; the burst keyer amplifies the 3.58-Mc color-sync signal taken from the back porch of the horizontal sync pulse. The keyer is gated by a pulse from the flyback circuit so that it conducts only during the horizontal retrace period.

The 3.58-Mc sync signal from the burst amplifier is fed to the phase detector, which compares the phase of the incoming burst signal with that of the local 3.58-Mc oscillator and feeds a correction voltage to the reactance tube. The reactance tube keeps the 3.58-Mc oscillator in correct step and phase with the 3.58-Mc signal from the station. (Remember, color hues are determined by the phase relationship of the color signals.)

That's the normal function of these stages during a color transmission. For black-and-white reception, however, these stages must be cut off to prevent

color contamination of the picture by random noise and other signal interference. The color-killer stage performs this function. Like the bandpass amplifier, the color killer is keyed by a horizontal pulse from the flyback circuit so that it conducts only during the horizontal retrace period. During this time, it "looks" for the color-burst signal. If the burst signal is absent from the incoming horizontal sync pulse, the color killer biases off the bandpass amplifier. Then, no information can get through to the color demodulators, and no color will contaminate the black-and-white picture. When burst is present, the killer relaxes and lets the color section go to work.

That's a simple explanation that covers a lot of chassis. But this basic knowledge will take you a long way when you have a defective color set. It took me only five minutes to isolate the trouble stage in that "662U." In my next column, I'll tell you how I did it. Meanwhile, here's a clue: I used a color-bar generator and a 'scope.

Oh, yes—I almost forgot. Mrs. Caldwell came back just before closing time.

"Mr. Doc," she said happily, "I want to tell you how delighted Mr. Caldwell and I are with that music equipment you put in for us. It sounds wonderful—especially on those stereo radio programs."

Now, that made me feel pretty good.

"There's just one thing," she said, hesitating.

"Here it comes," I said to myself as my happy-gear slowed down. "What is it, Mrs. Caldwell," I asked aloud. "Is anything wrong?"

"Oh my no. I was just wondering. Do you think you could install a set just like ours in my daughter's house—in time for Christmas, of course? I think it would make a nice present, don't you?"

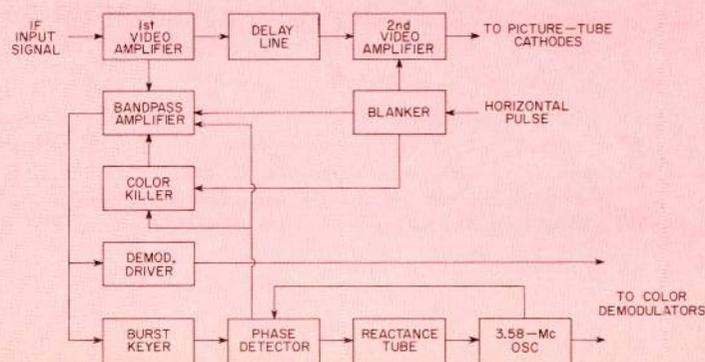
I couldn't have agreed more quickly. Who wouldn't like to get a \$600 Christmas present?

"Then it's settled," she said. "Just make sure it's in before Wednesday. Now, what do I owe you for fixing my tree lights?"

"Nothing—nothing at all, Mrs. Caldwell," I blurted. "Glad to do it."

After all, it was Christmas.

Block diagram showing portion of color circuitry in the RCA-21CT662U color-television receiver.



Five RCA Instruments Answer Complete Test-Equipment Needs For Technicians Entering New Field of Color-TV Servicing

The facts and figures point to one conclusion: "Color" has arrived—and is destined shortly to assume a major role in the television servicing industry.

The time to assure your place in this vital new market is now—through a winning combination of superior know-how and equipment—both available through RCA.

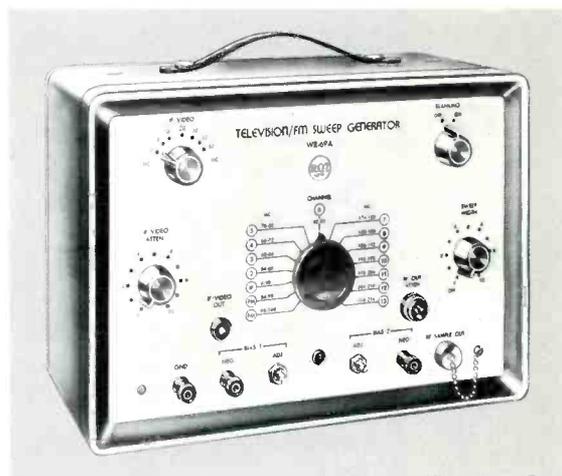
Unrivalled experience and major advancements by RCA in the field of compatible color television provide the ingredients of a successful leadership from which every service-dealer and technician can benefit.

The famed Color-TV Home Study Course of RCA Institutes offers you unexcelled training to help you realize important new sources of income (see story on page 3). Now, to supplement this knowledge with the finest work aids obtainable, RCA offers five outstanding electronic instruments which fulfill all your test-equipment needs in color-TV servicing. These instruments are the WR-64A Color-Bar/Dot/Crosshatch Generator, WO-91A 5-Inch Dual Band Oscilloscope, WR-69A Television/FM Sweep Generator, WR-70A RF/IF/VF Marker Adder, and WR-99A Crystal-Calibrated Marker Generator.

The WR-64A Color-Bar/Dot/Crosshatch Generator is a lightweight, portable instrument providing you with all the essential color-TV test patterns. Simplicity of operation is assured through such design features as a minimum number of controls (three), RF

output cable that connects directly to the antenna terminals of the receiver, and elimination of the need for external sync leads. Crystal-controlled signals assure steady color-bar, dot, and cross-hatch patterns free from "jitter" and "crawl." Optional User price (with output cables): \$189.50.

The WO-91A 5-Inch Dual Band Oscilloscope is a heavy-duty, precision instrument which is capable of checking colorburst signals and troubleshooting wideband color circuits as well as other types of circuits. A multi-scale calibrated graph screen makes measurement of peak-to-peak voltage as easy as with a VTVM. Optional User price (with direct/low-capacitance probe and cable, ground cable, and insulated clip): \$249.50.



WR-69A Television/FM Sweep Generator includes pre-set switch positions for all VHF television channels and the FM broadcast band.

output cable operating in the 19-Mc through 260-Mc range. This highly versatile instrument combines the functions of the multiple-marker generator, re-broadcast transmitter, and heterodyne frequency meter. Optional User price (complete with output cable and phone tip): \$242.50.

The WR-70A RF/IF/VF Marker Adder is designed for use with a marker generator (such as the WR-99A) and a sweep generator (such as the WR-69A), and can be employed for RF, IF, and VF sweep alignment in both color and black-and-white receivers.



WO-91A 5-Inch Dual Band Oscilloscope features a new 2-stage sync-separator circuit for stable horizontal-sweep lock-in on composite TV signals.

The WR-69A Television/FM Sweep Generator is specifically designed for visual alignment and troubleshooting of color and black-and-white TV receivers and FM receivers. The instrument is equipped with pre-set switch positions for all VHF television channels. The FM broadcast band, TV video, chrominance, and TV and FM intermediate frequencies are also available. Optional User price (including all necessary cables): \$295.00.

The WR-99A Crystal-Calibrated Marker Generator supplies a fundamental frequency RF carrier of crystal accuracy for aligning and troubleshooting color and black-and-white receivers, FM receivers, and other elec-



WR-99A Crystal-Calibrated Marker Generator combines the functions of the multiple-marker generator, re-broadcast transmitter, and heterodyne frequency meter, and contains facilities for checking calibration at 240 separate crystal checkpoints.



WR-64A Color-Bar/Dot/Crosshatch Generator provides 10 color bars for accurate demodulator alignment; a stable crosshatch pattern for adjusting linearity, raster size, and overscan; and a small-dot pattern for convergence adjustments.

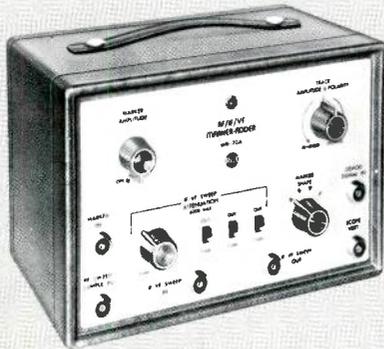
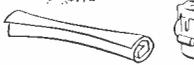
RCA 5-Inch Oscilloscope
for Color-TV

RCA Color-Bar/Dot/
Crosshatch Generator

RCA Television FM
Sweep Generator

RCA Crystal-Calibrated
Marker Generator

RCA RF/IF/VF
Marker Adder



WR-70A RF/IF/VF Marker Adder eliminates distortion of sweep-response pattern and provides very high-Q markers producing high amplitude and narrow bandwidth.

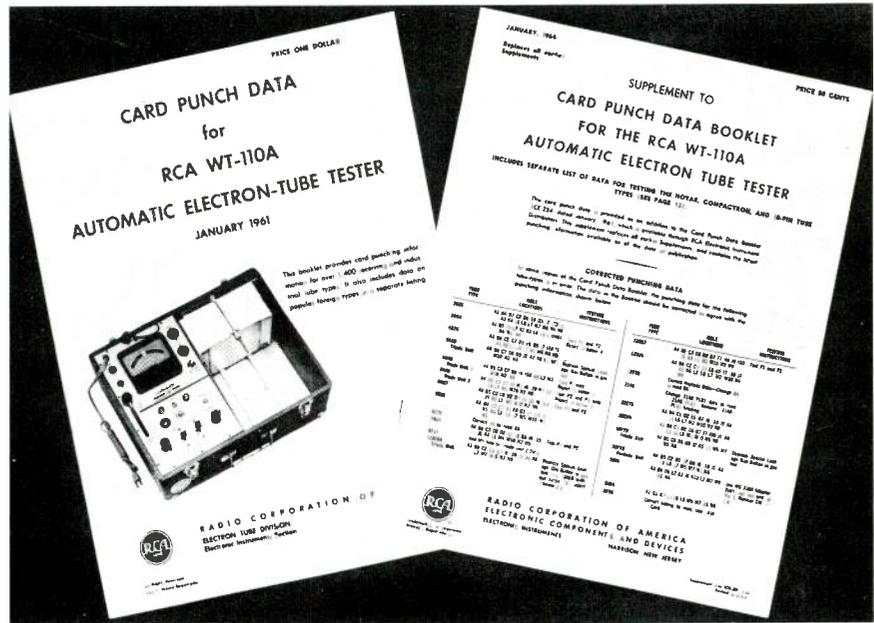
Among its numerous advantages are very high-Q markers of high amplitude and narrow bandwidth, and elimination of sweep-response-pattern distortion in visual alignment techniques. Optional User price (complete with cables): \$74.50.

Together, these five instruments can provide you with complete equipment capability for all aspects of color-TV servicing. For more detailed information on the WO-91A, WR-69A, WR-70A, and WR-99A, ask your authorized RCA test equipment distributor for catalog sheets IQ1092 through IQ1095. Further details on the WR-64A Color-Bar/Dot/Crosshatch Generator are provided in the IQ1034 flyer.

As a pioneer in compatible color television, it is only natural that RCA—through your local RCA distributor—is in the position to offer the best equipment you need to service color-TV receivers. Now's the time to decide what instruments you want for your immediate requirements and the new business that lies ahead.

Up-Dated Information Serves Users of RCA's WT-110A Tube Tester

Fourth Supplement to RCA Card-Punch Data Booklet Features 105 New Receiving Types



Service technicians employing the RCA WT-110A Automatic Electron-Tube Tester now can obtain complete card-punch data on 105 recently announced entertainment-receiving-tube types.

This information, which includes card-punch data on the latest 7-pin nuvistor, 9-pin novar, and 10-pin and 12-pin tube types, is contained in "Supplement 4" to the Card-Punch Data booklet ICE-234. The new 20-page supplement, dated January, 1964, is available through authorized RCA tube distributors at an Optional List price of 50 cents.

Altogether, over 500 tube types are listed in the new supplement, which supersedes Supplements 1, 2, and 3. Service technicians obtaining Supplement 4 as a necessary adjunct to the ICE-234 will thus be assured of up-to-date card-punch information on nearly 2,000 tube types, including foreign makes.

Data on 9-pin novars and 10-pin and 12-pin tube types is presented in a separate section. Featured in this section is a complete set of instructions, with accompanying schematic and parts list, for construction and use of the special adaptor employed for testing these tubes in the WT-110A. If desired, a simplified adaptor can be constructed using only one or two of these three tube socket types. Also in-

cluded in Supplement 4 are instructions for building a simple 7-pin nuvistor socket adaptor.

Distributors Still Offer Numerous Accessory Items For Older Test Equipment

With surprisingly few exceptions, probes, cables, and other accessory items for test instruments no longer in the RCA line are still being offered by distributors.

As a service to technicians who wish to keep advised of all currently available items, RCA periodically publishes a list that includes accessories for more than 70 current and discontinued oscilloscopes, meters and VoltOhmysts®, signal generators, Chanalysts®, and other test instruments. The most recent of these lists is Form EI-152.

Available accessories are listed directly under their related instruments, together with stock or type numbers for convenience in ordering. Wherever possible, suitable replacements have been listed for original-type accessories no longer available.

To obtain a copy of the Form EI-152, send your request to: Commercial Engineering, RCA Electronic Components and Devices, 415 South Fifth Street, Harrison, N. J.



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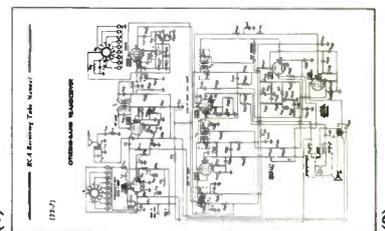
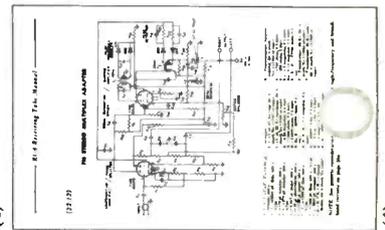
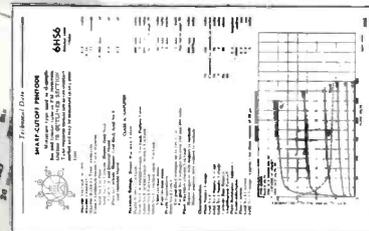
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**BETTER
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- Over 100 new tube types (1)
- An expanded and completely detailed applications guide (2)
- New circuit diagrams for:
 - Citizens' Band Transceiver (3)
 - AM-FM Radio Receiver
 - FM Stereo Multiplex Adapter (4)
 - Nuvistorized FM Tuner
 - All-Purpose Power Supply
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- Adjustable squelch circuit.
- Automatic noise limiter.
- Automatic volume control.
- TVI trap.
- PI-type-output network for most efficient antenna match.
- Electronic transmit/receive switching.
- High-impact-plastic push-to-talk ceramic microphone.
- Illuminated indicators for showing working channels.

● Rugged, compact, and lightweight construction.

The crystals are of the plug-in type, and are fully accessible through two snap-lock trapdoors in the top of the metal cabinet. One pair of precision-ground transmit-and-receive crystals for channel 7 is shipped with each Mark VIII. Additional crystals are available for other CB channels.

Combining functional styling, low cost, and high-quality performance for maximum customer appeal, RCA's Mark VIII 27-Mc Citizens' Band 2-Way Radio can be your winning item for increased sales and profits in CB equipment.



Across the Bench

By 'Doc'



If your shop was as busy as mine during the holidays, you're probably glad they're over. With all the kids home from school, the TV sets got a real workout—and so did my service bench. It seemed that every time I tried to take a voltage measurement, the telephone jingled.

On top of all this, I got the darnedest job. Like any other request you get from a steady customer, I couldn't turn it down.

It was the Friday before Christmas and I had this color set jacked-up on the bench. It had a bad case of color lockout. Right in the middle of everything, Mrs. Caldwell charged into the store with a big box and plopped it down on the counter.

"Mr. Doc," she demanded, "fix this for me right away. I'll be back in two hours."

Before I could take the pipe out of my mouth, she dashed out the door.

Being curious, I cut the twine and lifted the box flaps. Maybe it was one of those midget TV sets or (Heaven forbid) her new FM multiplex tuner. I wasn't prepared for what I saw.

It looked like a barbed-wire entanglement in living color. As I gingerly lifted the mess out of the box, two colored lamps dropped to the floor. *It was six strings of Christmas-tree lights!*

"Well, Doc," I asked myself, "what are you supposed to do with this? Fix it, I guess. Perhaps it's out of alignment. In that case, I can connect a sweep and marker generator across the line plug. Or maybe the color demodulators are out and the green lights are flashing red. Now, if I just hook up the WR-64A color-bar generator . . ."

Suddenly emerging from my flight into fantasy, I was reminded of the color chassis that needed attention by the humming noise in the back room. I bit hard on my pipe and started to work on the strings of lights.

I finally got back to the color chassis. I had pulled the set when routine tube replacements and adjustments failed to cure the trouble.

Black-and-white performance was good, and sound okay. But the set wouldn't perform on a color program. When I fed a color-bar signal from a WR-64A in the front end and adjusted the threshold control in the color-

killer circuit, it had no effect. The trouble lay in the color-sync or chrominance circuits, which lined up as shown in the block diagram below. Maybe you'll recognize the arrangement—it's from the RCA-21CT662U.

When black-and-white performance is okay but color is out, it's not difficult to localize the trouble with a good 'scope and a color-signal source. It's merely a matter of signal tracing. You can use either a color signal from a WR-64A or one from a station. I prefer the WR-64A because you can adjust levels as needed, and you're always sure of having a standard color signal when you want it.

Let's look at the layout in the diagram. Circuit functions are simple.

The bandpass amplifier is tuned to about 4 megacycles so it extracts and amplifies all the color information. This information is fed to the demodulator driver and the burst keyer. The demodulator driver provides amplified 3.58-Mc sideband information to the color demodulators; the burst keyer amplifies the 3.58-Mc color-sync signal taken from the back porch of the horizontal sync pulse. The keyer is gated by a pulse from the flyback circuit so that it conducts only during the horizontal retrace period.

The 3.58-Mc sync signal from the burst amplifier is fed to the phase detector, which compares the phase of the incoming burst signal with that of the local 3.58-Mc oscillator and feeds a correction voltage to the reactance tube. The reactance tube keeps the 3.58-Mc oscillator in correct step and phase with the 3.58-Mc signal from the station. (Remember, color hues are determined by the phase relationship of the color signals.)

That's the normal function of these stages during a color transmission. For black-and-white reception, however, these stages must be cut off to prevent

color contamination of the picture by random noise and other signal interference. The color-killer stage performs this function. Like the bandpass amplifier, the color killer is keyed by a horizontal pulse from the flyback circuit so that it conducts only during the horizontal retrace period. During this time, it "looks" for the color-burst signal. If the burst signal is absent from the incoming horizontal sync pulse, the color killer biases off the bandpass amplifier. Then, no information can get through to the color demodulators, and no color will contaminate the black-and-white picture. When burst is present, the killer relaxes and lets the color section go to work.

That's a simple explanation that covers a lot of chassis. But this basic knowledge will take you a long way when you have a defective color set. It took me only five minutes to isolate the trouble stage in that "662U." In my next column, I'll tell you how I did it. Meanwhile, here's a clue: I used a color-bar generator and a 'scope.

Oh, yes—I almost forgot. Mrs. Caldwell came back just before closing time.

"Mr. Doc," she said happily, "I want to tell you how delighted Mr. Caldwell and I are with that music equipment you put in for us. It sounds wonderful—especially on those stereo radio programs."

Now, that made me feel pretty good. "There's just one thing," she said, hesitating.

"Here it comes," I said to myself as my happy-gear slowed down. "What is it, Mrs. Caldwell," I asked aloud. "Is anything wrong?"

"Oh my no. I was just wondering. Do you think you could install a set just like ours in my daughter's house—in time for Christmas, of course? I think it would make a nice present, don't you?"

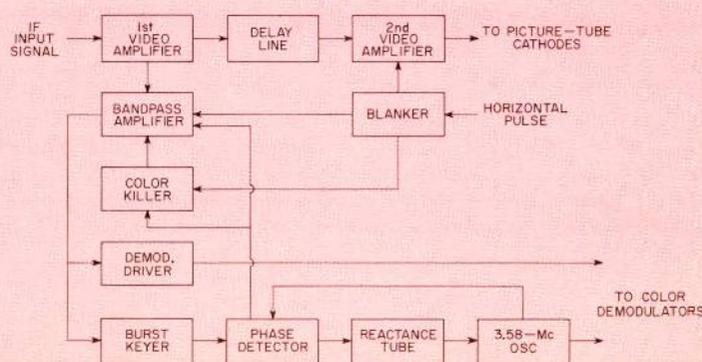
I couldn't have agreed more quickly. Who wouldn't like to get a \$600 Christmas present?

"Then it's settled," she said. "Just make sure it's in before Wednesday. Now, what do I owe you for fixing my tree lights?"

"Nothing—nothing at all, Mrs. Caldwell," I blurted. "Glad to do it."

After all, it was Christmas.

Block diagram showing portion of color circuitry in the RCA-21CT662U color-television receiver.



Five RCA Instruments Answer Complete Test-Equipment Needs For Technicians Entering New Field of Color-TV Servicing

The facts and figures point to one conclusion: "Color" has arrived—and is destined shortly to assume a major role in the television servicing industry.

The time to assure your place in this vital new market is now—through a winning combination of superior know-how and equipment—both available through RCA.

Unrivalled experience and major advancements by RCA in the field of compatible color television provide the ingredients of a successful leadership from which every service-dealer and technician can benefit.

The famed Color-TV Home Study Course of RCA Institutes offers you unexcelled training to help you realize important new sources of income (see story on page 3). Now, to supplement this knowledge with the finest work aids obtainable, RCA offers five outstanding electronic instruments which fulfill all your test-equipment needs in color-TV servicing. These instruments are the WR-64A Color-Bar/Dot/Crosshatch Generator, WO-91A 5-Inch Dual Band Oscilloscope, WR-69A Television/FM Sweep Generator, WR-70A RF/IF/VF Marker Adder, and WR-99A Crystal-Calibrated Marker Generator.

The WR-64A Color-Bar/Dot/Crosshatch Generator is a lightweight, portable instrument providing you with all the essential color-TV test patterns. Simplicity of operation is assured through such design features as a minimum number of controls (three), RF

output cable that connects directly to the antenna terminals of the receiver, and elimination of the need for external sync leads. Crystal-controlled signals assure steady color-bar, dot, and crosshatch patterns free from "jitter" and "crawl." Optional User price (with output cables): \$189.50.

The WO-91A 5-Inch Dual Band Oscilloscope is a heavy-duty, precision instrument which is capable of checking colorburst signals and troubleshooting wideband color circuits as well as other types of circuits. A multi-scale calibrated graph screen makes measurement of peak-to-peak voltage as easy as with a VTVM. Optional User price (with direct/low-capacitance probe and cable, ground cable, and insulated clip): \$249.50.



WR-69A Television/FM Sweep Generator includes pre-set switch positions for all VHF television channels and the FM broadcast band.

output cable operating in the 19-Mc through 260-Mc range. This highly versatile instrument combines the functions of the multiple-marker generator, re-broadcast transmitter, and heterodyne frequency meter. Optional User price (complete with output cable and phone tip): \$242.50.

The WR-70A RF/IF/VF Marker Adder is designed for use with a marker generator (such as the WR-99A) and a sweep generator (such as the WR-69A), and can be employed for RF, IF, and VF sweep alignment in both color and black-and-white receivers.



WO-91A 5-Inch Dual Band Oscilloscope features a new 2-stage sync-separator circuit for stable horizontal-sweep lock-in on composite TV signals.

The WR-69A Television/FM Sweep Generator is specifically designed for visual alignment and troubleshooting of color and black-and-white TV receivers and FM receivers. The instrument is equipped with pre-set switch positions for all VHF television channels. The FM broadcast band, TV video, chrominance, and TV and FM intermediate frequencies are also available. Optional User price (including all necessary cables): \$295.00.

The WR-99A Crystal-Calibrated Marker Generator supplies a fundamental frequency RF carrier of crystal accuracy for aligning and troubleshooting color and black-and-white receivers, FM receivers, and other elec-



WR-99A Crystal-Calibrated Marker Generator combines the functions of the multiple-marker generator, re-broadcast transmitter, and heterodyne frequency meter, and contains facilities for checking calibration at 240 separate crystal checkpoints.



WR-64A Color-Bar/Dot/Crosshatch Generator provides 10 color bars for accurate demodulator alignment; a stable crosshatch pattern for adjusting linearity, raster size, and overscan; and a small-dot pattern for convergence adjustments.

RCA 5-Inch Oscilloscope
for Color-TV

RCA Color-Bar/Dot/
Crosshatch Generator

RCA Television FM
Sweep Generator

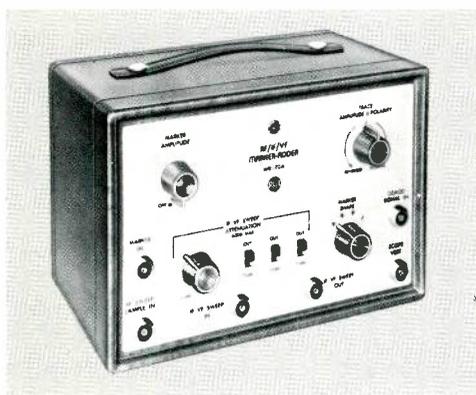
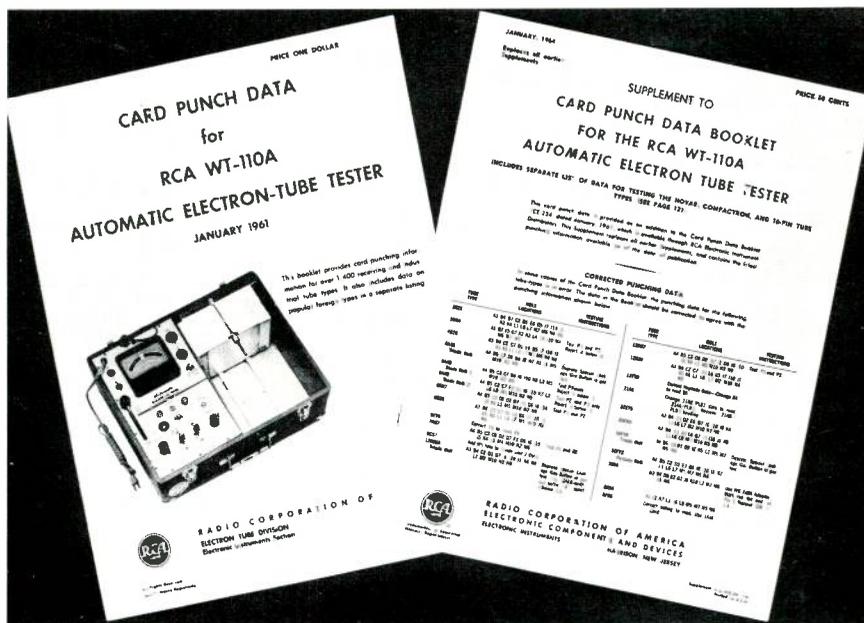
RCA Crystal-Calibrated
Marker Generator

RCA RF/IF/VF
Marker Adder



Up-Dated Information Serves Users of RCA's WT-110A Tube Tester

Fourth Supplement to RCA Card-Punch Data Booklet Features 105 New Receiving Types



WR-70A RF/IF/VF Marker Adder eliminates distortion of sweep-response pattern and provides very high-Q markers producing high amplitude and narrow bandwidth.

Among its numerous advantages are very high-Q markers of high amplitude and narrow bandwidth, and elimination of sweep-response-pattern distortion in visual alignment techniques. Optional User price (complete with cables): \$74.50.

Together, these five instruments can provide you with complete equipment capability for all aspects of color-TV servicing. For more detailed information on the WO-91A, WR-69A, WR-70A, and WR-99A, ask your authorized RCA test equipment distributor for catalog sheets 1Q1092 through 1Q1095. Further details on the WR-64A Color-Bar/Dot/Crosshatch Generator are provided in the 1Q1034 flyer.

As a pioneer in compatible color television, it is only natural that RCA—through your local RCA distributor—is in the position to offer the best equipment you need to service color-TV receivers. Now's the time to decide what instruments you want for your immediate requirements and the new business that lies ahead.

Service technicians employing the RCA WT-110A Automatic Electron-Tube Tester now can obtain complete card-punch data on 105 recently announced entertainment-receiving-tube types.

This information, which includes card-punch data on the latest 7-pin nuvistor, 9-pin novar, and 10-pin and 12-pin tube types, is contained in "Supplement 4" to the Card-Punch Data booklet 1CE-234. The new 20-page supplement, dated January, 1964, is available through authorized RCA tube distributors at an Optional List price of 50 cents.

Altogether, over 500 tube types are listed in the new supplement, which supersedes Supplements 1, 2, and 3. Service technicians obtaining Supplement 4 as a necessary adjunct to the 1CE-234 will thus be assured of up-to-date card-punch information on nearly 2,000 tube types, including foreign makes.

Data on 9-pin novars and 10-pin and 12-pin tube types is presented in a separate section. Featured in this section is a complete set of instructions, with accompanying schematic and parts list, for construction and use of the special adaptor employed for testing these tubes in the WT-110A. If desired, a simplified adaptor can be constructed using only one or two of these three tube socket types. Also in-

cluded in Supplement 4 are instructions for building a simple 7-pin nuvistor socket adaptor.

Distributors Still Offer Numerous Accessory Items For Older Test Equipment

With surprisingly few exceptions, probes, cables, and other accessory items for test instruments no longer in the RCA line are still being offered by distributors.

As a service to technicians who wish to keep advised of all currently available items, RCA periodically publishes a list that includes accessories for more than 70 current and discontinued oscilloscopes, meters and *VoltOhmysts*[®], signal generators, *Chanalysts*[®], and other test instruments. The most recent of these lists is Form EI-152.

Available accessories are listed directly under their related instruments, together with stock or type numbers for convenience in ordering. Wherever possible, suitable replacements have been listed for original-type accessories no longer available.

To obtain a copy of the Form EI-152, send your request to: Commercial Engineering, RCA Electronic Components and Devices, 415 South Fifth Street, Harrison, N. J.



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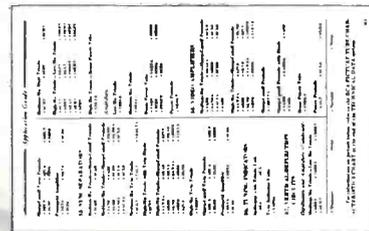
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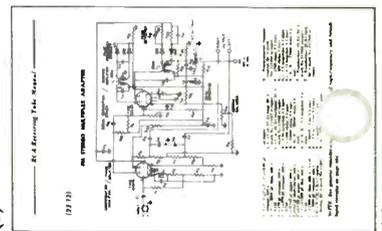
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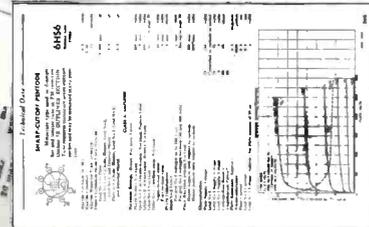
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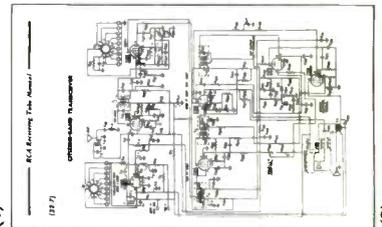
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