RADIO AND TELEVISION

Service News

A PUBLICATION OF RCA ELECTRONIC COMPONENTS AND DEVICES

SUMMER
1964

Vol. 29, No. 3

RCA's SK-Series Transistors for servicing fill over 1,900 replacement needs in transistor radios and other entertainment-type equipment (see story on pages 6-7).

'Real Pro' Window Displays Featured by Denver Dealers

The Electronic Parts Division of Ward Terry and Co., an RCA tube distributor in Denver, Colo., recently provided a real service for some of its service-dealer customers by dressing up their windows in professional style with RCA's "Real Pro" display items featuring Arnold Palmer, dynamic winner of the renowned 1964 Masters Golf Tournament.

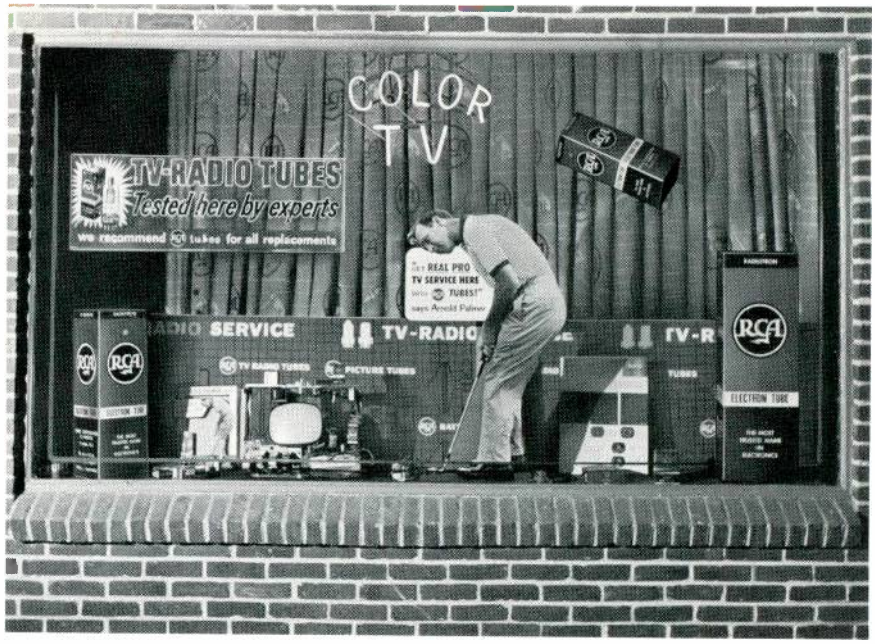
The 26 lucky dealers who lent their window space to this effort, all participants in the "Real Pro" receiving tube promotion, were visited by Ward Terry's salesmen, who went to work with a vengeance.

Such items as the colorful, easel-backed Arnold Palmer cutouts (1A-1405) and giant replicas of RCA's familiar red, black, and white entertainment-receiving tube carton (1A-1419) proved invaluable for building handsome, traffic-stopping displays.

When a top attention-getter like RCA's "Real Pro" Arnold Palmer program comes along, it pays to take advantage of every single display item—especially when they help you cash in on local interest generated by national advertising.

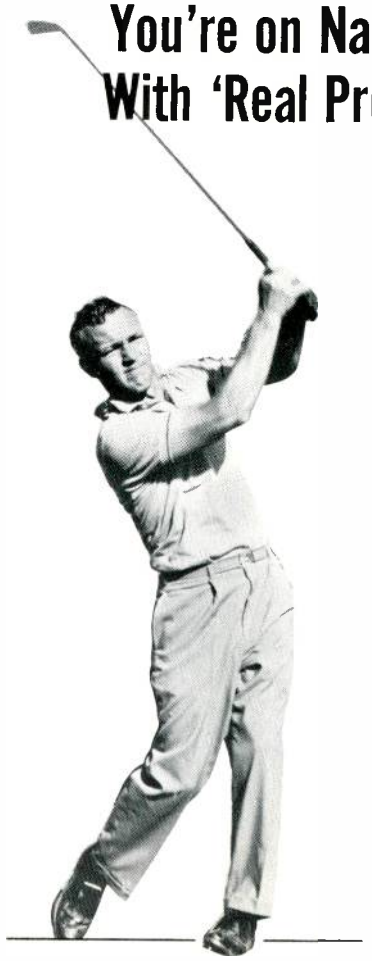
The "Real Pro" program features national advertising in TV GUIDE and on Walt Disney's NBC-TV Sunday show, "Wonderful World of Color."

All the windows installed by Ward Terry's salesmen showed that a participating RCA distributor can provide the basic materials for appealing window displays at very little cost to the service-dealer. *Are you using your available window space to draw in potential customers for your top-quality RCA entertainment-receiving tubes?*



Window of "Tommy's TV" is typical of the many handsome displays which were installed by Ward Terry and Co. using traffic-stopping items available through RCA's "Real Pro" program.

You're on National Television With 'Real Pro' Arnold Palmer



You're in the national spotlight! Your audience is the vast segment of viewers channeled in on the tremendously popular NBC-TV Sunday show, Walt Disney's "Wonderful World of Color."

Your spokesman? None other than golfing champion Arnold Palmer—a "Real Pro" to sports lovers everywhere—who's telling listeners that he likes to deal with people who are "Real Pros" in their own fields. That's why, when it comes to TV-set servicing, he selects a capable local technician like yourself—a top-flight professional who uses and recommends RCA receiving tubes.

Through this sparkling color-TV commercial—a direct testimonial to the high standards of your services and RCA products—"Real Pro" Palmer makes several appearances in May and June.

Tell your customers—friends and neighbors, too—to remain on the lookout for this exciting message.

You can get "Real Pro" displays for use in your store and shop from your participating RCA tube distributor.


RADIO AND TELEVISION
Service News
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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.

1964

RCA RADIO & TELEVISION SERVICE NEWS is a quarterly publication of RCA Electronic Components and Devices, Harrison, New Jersey.

Another typical example of how Ward Terry and Co. put "Real Pro" items to work in creating professional-style displays is shown by this window at "Capitol Radio and TV."

Lucky Denver Dealers Participating in Ward Terry & Co. 'Real Pro' Window-Display Demonstrations

AAA
2259 Kearney

Able TV
694 Peoria

AB & K TV
1459 S. Pearl

Ace Radio
2349 W. 44th

Amco TV
17425 S. Golden Road

BW & C TV and Radio Ser.
Broomfield

Bartrig Warner
2857 E. Colfax

Bomaretos Radio & TV
5558 Washington

Capitol Radio and TV
424 S. Federal

Datco
3538 W. 44th

DeWaals TV
2326 E. Exposition

Don Case Radio & TV
602 E. 20th

Eddie's TV
3434 Tejon

Efficiency TV
2090 S. Grant

Globe Radio & TV
4519 Washington

Kunkle TV
3935 W. Colfax

Magan's TV
1540 W. 70th

Mountain Radio & TV Repair
6545 Morrison Road

Modern Service
3419 E. Colfax

Ray's Appliance
251 Broadway

Rocky Mountain TV
1313 W. Alameda

Skyline TV & Radio
3101 Josephine

Tommy's TV
9th & Jersey

United Electronics
1010 S. Raritan

Valley TV
10070 W. 44th

West Park TV Sales & Service
1132 S. Sheridan

SERVICE QUIZ

Here's an opportunity to test your servicing knowledge and familiarity with oscilloscopes and their applications! Each question answered correctly counts 20 points. To pass, you need a score of 60. A score of 80 is "Good" and 100 "Excellent." For the answers, turn to page 9.

1. During TV sweep alignment, your 'scope displays two offset response curves and no base line. What is wrong?
   a. 'Scope bandpass is too narrow
   b. Blanking in sweep generator is shut off
   c. Receiver circuits are badly misaligned
   d. Ground connections are faulty
   e. 'Scope phasing is incorrect

2. The most important 'scope feature in TV sweep alignment is:
   a. Return-trace blanking
   b. Wide bandwidth
   c. Good low-frequency response
   d. Z-axis modulation
   e. Good deflection sensitivity

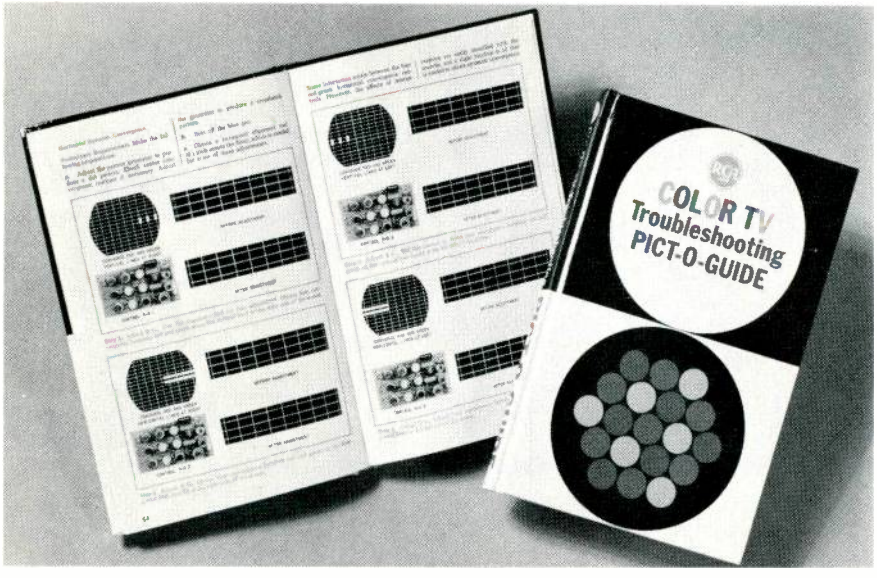
3. 'Scope deflection sensitivity is a measure of:
   a. Over-all vertical-amplifier gain
   b. Cathode-ray-tube amplification
   c. Beam deflection against input voltage at 'scope terminals
   d. Immunity to noise and line-voltage changes

4. Flat vertical-amplifier response to 4 Mc or higher is needed for:
   a. Observing color-burst signals
   b. Sweep aligning tuners and IF amplifiers
   c. Observing color-bar signals at grids of color picture tube
   d. Measuring vertical and horizontal sync pulses

5. While checking a TV receiver, you notice that the horizontal oscillator stops oscillating when the 'scope is connected to the oscillator circuit. You then immediately . . .
   a. Connect an RF crystal probe to the 'scope probe
   b. Change your test point to the grid of the horizontal output tube
   c. Switch your probe to the "low-capacitance" position
   d. Re-tune the blocking-oscillator transformer

Free With Your Purchases of Entertainment-Receiving Tubes in 'Color Parade' Program:

New RCA Color-TV Troubleshooting Pict-O-Guide



Introducing the all-new RCA COLOR-TV TROUBLESHOOTING PICT-O-GUIDE—a vital reference aid that reflects RCA's latest knowledge and experience in servicing color television! This easily understood and profusely illustrated book is the highlighted item in RCA's newly announced "Color Parade" program.

Available immediately from participating RCA distributors with your purchase of entertainment-receiving tubes, the up-dated Pict-O-Guide will prove a speedy and reliable work assistant for servicing of all contemporary-model color receivers. It will further help you to impress your customers and prospects with your know-how—providing you with another means to get them to rely on your capability for protection of their investments in "Living Color."

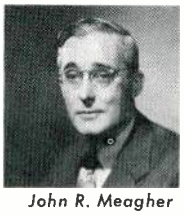
Remember, experts agree that color television is already on the business scene as a major factor in the retail economy. Programming is at an all-time high; receiver sales continue to climb at an ever-quickening pace. The knowledge you gain from the new Pict-O-Guide (described in more detail at left) can help you capitalize on the fresh servicing opportunities that this growth affords. Your participating RCA tube distributor will be happy to fill you in on the details of how to obtain all the copies you need.

Facts About the New RCA Color-TV Troubleshooting Pict-O-Guide

The RCA COLOR-TV TROUBLESHOOTING PICT-O-GUIDE (1A1389) is a 153-page, hard-bound book that presents the latest available information to simplify and speed up the installation, adjustment, and servicing of color-television receivers. Easy-to-understand, step-by-step instructions are supplemented by hundreds of charts, tables, circuit diagrams, and general illustrations—many of which are shown in true-to-life color for full description of color-receiver screen conditions, trouble symptoms, and variations.

Conceived by John R. Meagher, RCA's nationally recognized authority on practical television servicing, the new Pict-O-Guide was prepared by RCA Institutes, Inc., under Mr. Meagher's guidance, and features complete information on:

- Learning to mix colors
- RCA compatible color television
- Receiver setup
- What the operating controls accomplish
- Using color test equipment
- Using the green-stripe test signal
- Troubleshooting black-and-white defects unique to color-TV receivers
- Troubleshooting the color sections of the receivers
- AFPC checks and adjustments
- When to install a new color picture tube
- Servicing techniques
- What to do if the receiver needs alignment



John R. Meagher

This newest of RCA's reference aids on television servicing was prepared with the special aim of helping the technician to grasp the concept of "color" troubleshooting by seeing screen effects as they actually appear.

Reflecting new developments in color circuitry, the Pict-O-Guide demonstrates that some of the most dramatic improvements in receivers are related to setup procedures. Purity, convergence, and black-and-white tracking adjustments have been vastly simplified. Adjustments are more positive, interact less, and are not likely to drift off with time. Here again, the Pict-O-Guide's color photographs best depict how each setup job is done and what the results look like on the screen.

With the RCA COLOR-TV TROUBLESHOOTING PICT-O-GUIDE as a handy helper, you are duplicating the experience of watching a color-television set in actual operation. See your participating RCA tube distributor about getting your copy with the next delivery.

Smartly Styled Wrist Watches Featured as Added Attraction In Exciting Offer to Dealers

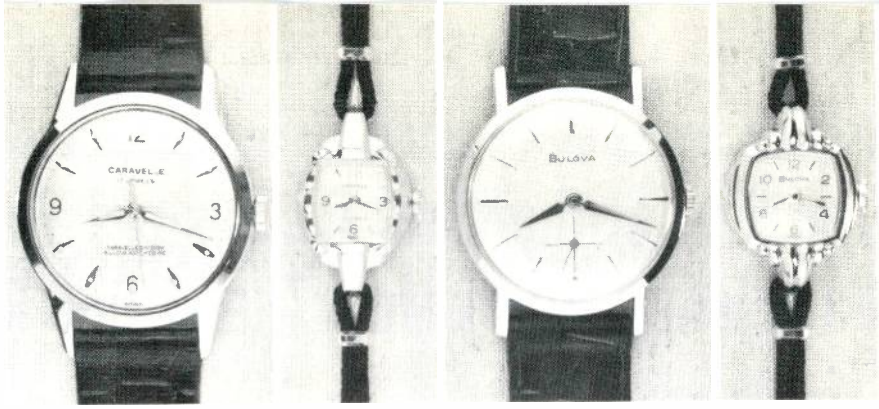
As a special added feature in RCA's exciting new "Color Parade" program, you have the choice of using your entertainment-receiving purchases towards obtaining handsomely styled, 17-jewel men's and ladies' wrist watches. These shock-resistant timepieces consist of the following models of the popular Caravelle® (made by a division of Bulova Watch Co., Inc.) and Bulova:

- **Men's Caravelle (1A1435).** Styled in a handsome, 10-micron yellow-gold-finish case with stainless-steel back, the Men's Caravelle is equipped with unbreakable mainspring, luminous dial, and sweep second hand.
- **Ladies' Caravelle (1A1436).** Like the Men's Caravelle, this model has an unbreakable mainspring and a 10-micron yellow-gold-finish case with stainless-

steel back. Wearers will thrill to its serviceability and delicate style.

• **Men's Bulova (1A1439) and Ladies' Bulova (1A1440).** Here are noted prestige timepieces offering new highs in grace and elegance! Both models are encased in 10-karat rolled-gold plate with stainless-steel back.

With the outstanding RCA "Color Parade" offers described above, you have the inside track on valuable items for your business and personal use. See your local participating RCA tube distributor for the full particulars today!



Caravelle® Men's and Ladies' Wrist Watches (made by a division of the Bulova Watch Co., Inc.) and Bulova Men's and Ladies' Wrist Watches—left to right, respectively—are 17-jewel, shock-resistant timepieces equipped with unbreakable mainsprings.

RCA Increases 1964 Color-TV Picture Tube Output by More Than 50% Over Year 1963

The Radio Corporation of America announced in March that it will increase its production of color-television picture tubes this year by more than 50 per cent over 1963, but that it will have to continue allocating the supply to set manufacturers because output will still fall short of demand.

The RCA announcement, made by Douglas Y. Smith, Vice President, RCA Electronic Components and Devices, said the company will produce 1,300,000 color tubes in 1964. On this basis, he said, an industry-wide total of 1,700,000 is a reasonable expectation for the year. In his opinion, nearly all will be the present standard RCA type of 21-inch round shadow-mask tube. A small number, he said, will be rectangular versions, but still employing the RCA three-gun, shadow-mask principle.

Mr. Smith disclosed at the same time that RCA is developing a new 25-inch, 90-degree rectangular color-TV picture tube which is expected to go into pilot production during the second quarter of this year. This tube will employ a new glass bulb especially designed for color requirements. During the second half, he said, the rectangular tube should become available in limited quantities for sampling to set manufacturers.

The RCA executive said that the new 1964 production schedule represents an increase over the number originally planned. He pointed out that the way had been opened to greater output by the development of improved assembly and control techniques. The RCA color tube is produced in two plants, one at Lancaster, Pa., and the other at Marion, Ind., each of which will turn out in excess of 500,000 color tubes this year.

"In view of the continued excess of industry demand over the supply that can be anticipated from RCA and other tube makers, steps have now been taken to incorporate the recent improvements as rapidly as possible into our production lines," said Mr. Smith.

"Demands placed upon RCA by its customers indicate that the 1964 requirements of set manufacturers will be greater than the total production potential of RCA and all other tube manufacturers together. It is therefore evident that color picture tubes will continue to be in short supply, even with RCA's expanded production, and that our present program of allocations to the set industry—and this includes the RCA Home Instruments Division—will have to be maintained at least through this year."

Mr. Smith said that the bulk of 1964 tube production will be the "high-quality, reliable 21-inch, 70-degree round shadow mask tube" developed, fully customer-tested, and currently produced in quantity by RCA. While other manufacturers have recently announced plans relating to other tube types, he said, "none of these is likely to form a significant part of the industry's output this year."

Douglas Y. Smith

Standing between stacks of phosphor-coated "saucers," Janice White checks inventory of face panels for RCA tubes that will soon produce "living color" TV pictures. Funnels for the tubes, also processed at this RCA Electronic Components and Devices plant in Lancaster, Pa., are shown in the background.

"No other type of color tube from any source, domestic or foreign, is expected to become available on the market in significant quantities during the year," he said.

Word of RCA's new 25-inch rectangular tube was at the same time conveyed to the company's set-manufacturing customers by the RCA Electronic Components and Devices organization. They were told that a fully equipped production line has now been set up for the new tube and that assembly techniques are now being refined in a pre-production program.

The notification to customers said:

"It should be pointed out that the rectangular tube will be basically more costly to manufacture than is the round tube, and therefore will be priced accordingly. It is believed that economics will play a key part in the relative acceptance of either type."

Ten 'Top-of-the-Line' Transistors Enable Technicians To Quickly Satisfy More Than 1,900 Replacement Needs

One of the surest ways for you to avoid costly delays in the servicing of auto radios and other entertainment-type electronic equipment is to have the right transistor-replacement type on hand when you need it.

Take your biggest and most practical step in this direction by immediately stocking RCA's newly announced "SK-Series" of 10 replacement transistors. Here's a "top-of-the-line" assortment of germanium p-n-p and n-p-n types that can speedily and economically fill more than 1,900 replacement needs in automobile radios, battery-operated portables, phonographs, and tape recorders.

The 1,900 transistor types that are replaceable by the 10 SK-Series transistors include U.S.A. industry-standard (EIA) types, foreign types, and types identified by device- or equipment-manufacturer part numbers.

The 10 new RCA transistor types have been given the designations SK-3003 through SK-3012. Collectively labeled "Top-of-the-Line," the SK-Series individual transistor types will provide top performance in their respective service categories, so have them handy on your workbench.

These 10 outstanding transistors can save you time and money by reducing over-all inventory requirements and eliminating those frantic last-minute searches and trips to your distributor.

Each transistor in RCA's "Top-of-the-Line" SK-Series is packaged in an individual, easily identified carton that contains a list of all the transistors that the RCA type replaces. The cartons, in turn, can be inserted in special sleeves for easier handling and storage.

Each transistor in the SK-Series is individually packaged in an attractive carton which identifies the transistor by its SK-Series number and type of service. Also enclosed in each carton is a complete list of all transistor types replaced by the RCA type.

Specifically slotted for top-quality replacement service in the field of listening enjoyment—where RCA is an acknowledged leader—the SK-Series includes three p-n-p drift-field transistors for standard-broadcast auto receivers, battery-operated portables, all-wave receivers, and FM and AM/FM receivers (see SK-3006 through SK-3008 in accompanying table).

For servicing of auto radios, you'll

RCA Type	Description of Germanium Types	Application
SK-3003	p-n-p, alloy	AF output, driver, and low-level amplifier stages (supply voltages up to 9 volts)
SK-3004	p-n-p, alloy	AF output, driver, and low-level amplifier stages (supply voltages up to 15 volts)
SK-3005	p-n-p, alloy	RF amplifier, converter, and IF amplifier stages of standard broadcast-band receivers (supply voltages up to 12 volts)
SK-3006	p-n-p, drift field	RF amplifier, IF amplifier, and converter stages of FM and AM/FM receivers (up to 108 Mc and supply voltages up to 12 volts)
SK-3007	p-n-p, drift field	RF amplifier, IF amplifier, and converter stages of all-wave receivers (up to 30 Mc and supply voltages up to 12 volts)
SK-3008	p-n-p, drift field	RF amplifier, IF amplifier, and converter stages in standard-broadcast auto receivers, and battery-operated portables (supply voltages up to 12.6 volts)
SK-3009	p-n-p, alloy	audio-output stages of auto radios, high-fidelity amplifier equipment, and communications equipment
SK-3010	n-p-n, alloy	AF output, driver, and low-level amplifier stages (supply voltages up to 15 volts)
SK-3011	n-p-n, alloy	RF amplifier, IF amplifier, and converter stages of standard broadcast-band receivers (supply voltages up to 18 volts)
SK-3012	p-n-p, alloy	audio-output stages of auto radios

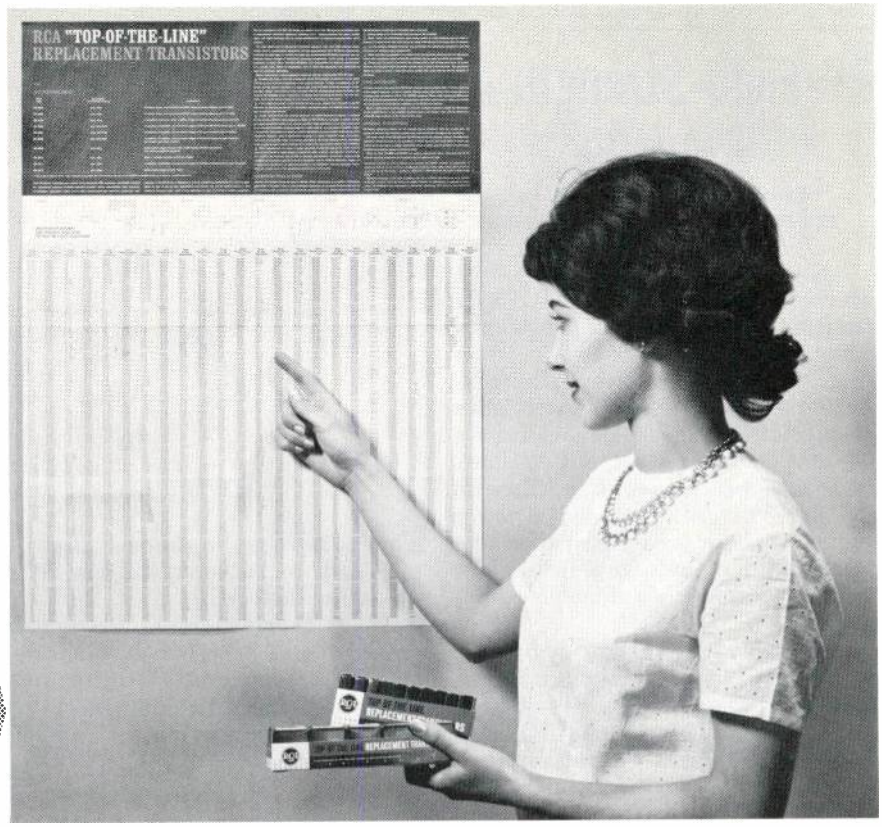
IMPORTANT

Here's your copy of RCA's new "Top-of-the-Line" transistor-series replacement chart. Post it in a convenient place for quick reference.

find that just three types (SK-3008, SK-3009, and SK-3012) will speed up repairs by providing you with replacements for a majority of transistor types used in automobile receivers.

RCA SK-Series transistors can be installed with relatively minor changes in mechanical mounting arrangements, circuit wiring, or operating conditions in most applications. And remember, virtually every transistor replacement need that you'll encounter in the servicing of entertainment-type electronic equipment can be filled by one of these famous "Top-of-the-Line" types. To enjoy the benefits of reduced inventory investment, greater work efficiency, and higher servicing profit as soon as possible, contact your RCA semiconductor distributor today for the complete details.

RCA's new "Top-of-the-Line" transistor-series replacement chart (1L1169) lists in alphabetical-numerical order more than 1,900 transistor types widely used in entertainment equipment and their RCA "Top-of-the-Line" transistor replacements. This outstanding chart also features such information as dimensional outlines for the SK-Series transistor types and special data on their installation and operation.



For Improved Fringe-Area Reception:

WG-330A TV Amplifier and Coupler

Looking to improve your customers' TV reception in weak-signal areas?

RCA's WG-330A TV Amplifier and Coupler is the ideal answer to their needs. Designed for use with a good antenna to improve fringe-area reception for either black-and-white or color TV, this nuvistorized signal amplifier and set coupler provides high-gain, low-noise performance through the use of two RCA-6CW4 nuvistor triodes.

When used with a single TV receiver, the amplifier provides approximately 13-db gain on channels 2 through 6, and 11-db gain on channels 7 through 13. The WG-330A may also be used with two TV sets to provide a signal gain to each set of 5 db on channels 2 through 6, and 2 db on channels 7 through 13.

Additional television receivers may also be connected to the TV amplifier through the use of "directional coupling." In this method of connection, one receiver is hooked up to the "Set No. 1 HI OUTPUT" terminals of the amplifier for maximum amount of signal gain. From one to six additional sets can then be coupled to the "Set No. 1" antenna line using the directional coupling technique which is fully described in the installation instructions.

The RCA WG-330A TV Amplifier and Coupler may be used with standard indoor or outdoor antennas. The unit may be conveniently located in an attic or basement, or may be mounted directly behind the TV receiver.

Power consumption of the WG-330A is about 5 watts at 120 volts, 60 cps.

Attractive counter-display card (1Q1112) for featuring WG-330A is available through all authorized RCA test equipment distributors.

RCA's WG-330A TV Amplifier and Coupler measures only 6¼ inches by 3¾ inches by 2½ inches, and is housed in a phenolic case.

Simple, Easy-to-Make Unit for Checking Mobile Equipment:

RF-Field-Strength Adapter for the RCA WV-38A V-O-M

by Rhys Samuel

Electronic Instruments Operations
RCA Electronic Components and Devices

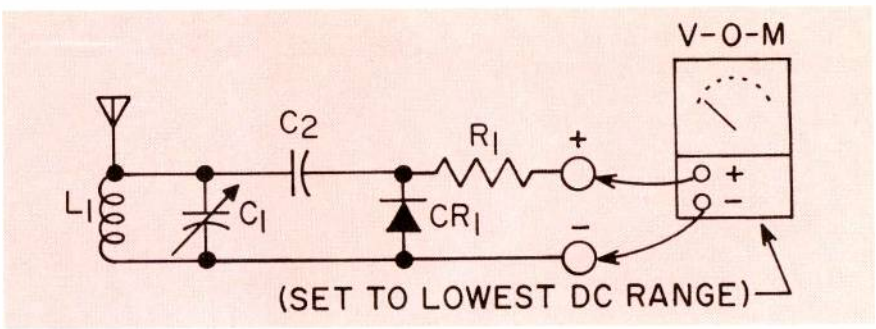
The RCA WV-38A Volt-Ohm-Milliammeter can be used as an RF-field-strength indicator when it is equipped with the simple, easy-to-make adapter described here. It can then indicate directly on the meter scales the relative amount of RF signal radiated from a Citizens'-Band, amateur, ship-to-shore, or other type of transmitter. Because the WV-38A does not need a power supply, it can be used almost anywhere in the field—a necessary feature for checking performance of mobile equipment.

Excellent sensitivity is made possible by the very low DC-voltage ranges—0.25- and 1.0-volt—of the WV-38A.

The adapter contains only five inexpensive components which comprise a circuit that tunes, detects, and filters the RF signal. In operation, the adapter is tuned to the transmitter frequency; the resulting signal is rectified, filtered, and fed into the WV-38A, where it is measured on the low DC-voltage range. The small size of the adapter permits its attachment to the instrument case.

Because no connections need be made to the transmitter or to its antenna system, the WV-38A may be located several feet from the equipment under test. The operator can make transmitter and antenna adjustments, and note their effects upon meter readings. Usable readings can be obtained from 10 to 20 feet from a 5-watt Citizens'-Band transmitter antenna.

Dick Rainboth, Electronic Instruments Operations, RCA Electronic Components and Devices, demonstrates use of RF-field-strength adapter and V-O-M for checking output of mobile Citizens'-Band equipment.



Schematic diagram of RF-field-strength adapter.

The RF adapter shown here is built around the RCA WG-352A RF Diode (available through RCA distributors) which comprises the detector/filter section. This simple circuit is easily constructed.

Construction

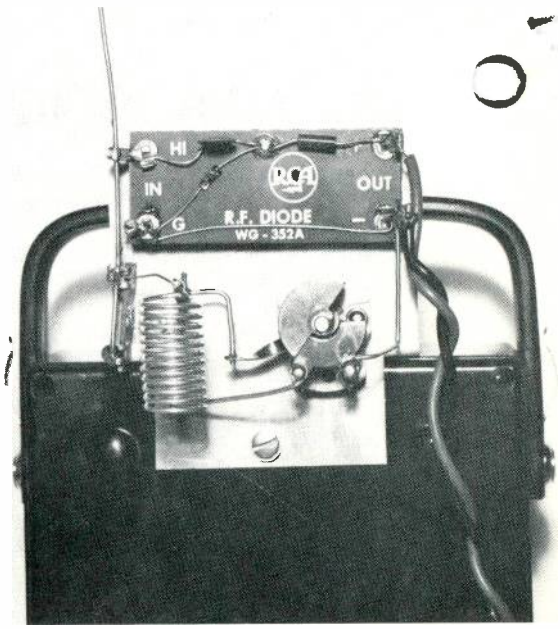
Assembly and layout are not critical, but all leads must be kept short. The leads from the adapter to the input jacks of the WV-38A should also be made no longer than necessary. The solid-wire antenna can be mounted on the adapter board.

The WV-38A and its RF adapter are shown in the accompanying photograph. The unit can be constructed on a flat piece of metal or insulating material and attached to a hole in the V-O-M with a screw, washer, and nut. The small fibreboard consolidating the resistor, diode, and disc capacitor is the WG-352A. The coil, which tunes from approximately 22 to 42 megacycles, consists of 12 turns of No. 14 solid copper wire wound on a diameter of one-half inch. The turns are then spaced to give a total coil length of 1⅛ inches. The 50-picofarad APC-type variable capacitor (screwdriver adjustment) will tune the circuit to 27 megacycles at the center of its tuning range. A long-shafted insulated alignment tool should be used for tuning to reduce hand-capacitance effects upon resonance. Sensitivity will vary with antenna length. A 2-foot vertical antenna made of No. 14 solid copper wire will be adequate for most applications.

Application

With the adapter connected by short leads to the instrument input jacks, the WV-38A should be set up for DC-voltage measurements on its lowest range. The pickup antenna must be positioned in the same plane as the transmitting antenna; i.e., a vertical position for upright whip antennas. Select a position without obstructions between the transmitter and the WV-38A.

If comparison checks of radiation are to be made, do not change the location of the WV-38A during the entire test. While watching the meter, make necessary adjustments at the transmitter or antenna and note the change in the meter reading.



Construction of RF-field-strength adapter.

Parts List

L_1	(See text)
C_1	Capacitor, APC-type; 50 picofarads (Screwdriver adjustment)
C_2	Capacitor, ceramic disc; .01 $\mu f \pm 10\%$, 500 volts
R_1	Resistor, composition; 2,200 ohms ± 10%, ½ watt
CR_1	Crystal diode; type 1N67A

Across the Bench

By 'Doc'

One of the secrets of succeeding in your own business is knowing when to lock the front door at night and go home.

Too often, it takes a few years of 60-hour weeks before this fact registers with many of us. You might be afraid of changing your "Open At All Hours" policy because of what you might miss. Then again, you might be afraid to say "No" to the set owner who needs service at 10:00 p.m. because he might take his business elsewhere.

Well, I've been through all of that. Take my word for it: it's not a practical way to run a business.

Don't misunderstand me. There are times when I'm out on servicing calls after supper; but you can bet it isn't often, and only when special problems or customers are involved. I don't have the steam I once had, and I don't like to see the evening TV shows from the socket end of the picture tube.

I figure that a fellow has to make the most of his daily time and make it pay him a good premium for each hour. This means he's got to work right along and not spend too much time on one job. His slogan should be, "Fix it, run it, and wrap it up—fast!"

To make this a rule rather than an exception, you need two things in this business: sound knowledge and good test equipment. The fellow who lacks either one is out of the race.

Consider, for example, the RCA-21CT662U color chassis I discussed in my previous column (Winter, 1963-64, issue). It worked fine on black-and-white reception, but wouldn't reproduce a color program. A clear case of color lock-out.

Here's how I tackled the problem:

In the absence of an off-the-air color signal, I connected the RCA WR-64A Color-Bar/Dot/Crosshatch Generator to the antenna terminals. As a color-signal source, the WR-64A is better than a station signal for servicing because it gives you 10 standard reference colors of constant hue. You can also adjust the input level of the bar signals as needed, trace them through the color circuits, and measure their amplitude with a 'scope. In contrast, a station signal is a constantly changing mixture of colors and can't be used for checking color circuits.

I set the function switch to "PATTERN plus SOUND" and swung the fine-tuning control back and forth. Near one end, the bars showed up as various shades of gray. I gave the fine-tuning knob a quarter turn. The RF sound carrier produced a beat pattern on the picture tube. I retuned for dim, gray bar pattern where the beat pattern just disappeared. This quick check proved an important point: the RF and IF alignment were okay. Without this sound-carrier feature, it isn't possible to set the fine tuning correctly.

Adjustment of the killer-threshold control had no effect; at one end of its range, some color was apparent but it was out of sync. I warmed up the WO-91A 5-inch oscilloscope and connected the probe to the output of the second detector load circuit.

The WR-64A signal was normal; the horizontal sync pulse looked good; and the 11 pulses from the color-bar generator looked healthy. I jumped the probe along in the circuits, following the course of that signal as it was fed into one stage, then modified, and finally fed into the next stage.

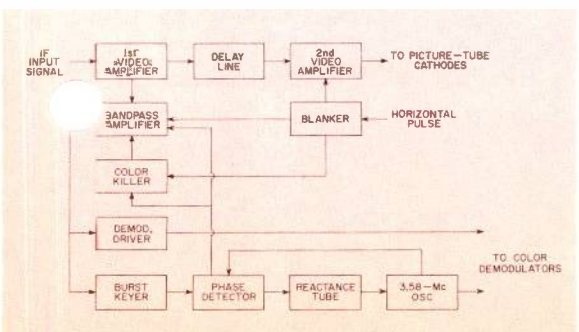
At the color take-off transformer, I still had 11 pulses. This is normal. As a quick check, I looked at the 15-Kc flyback pulses being fed into and out of the blanking amplifier. They looked fine and had sufficient amplitude—indicating that the blanker was working into the chrominance and burst circuits.

The output waveform at the bandpass transformer was also good. It looked similar to that at the color take-off transformer and was coupled directly to the cathode of the burst keyer. I checked the waveform at the cathode pin. This, too, was satisfactory. The 15-Kc horizontal pulse normally applied to the burst keyer from the horizontal circuits was present at the grid pin.

I moved the probe to the plate pin. The color-bar pattern flashed momentarily on the picture tube and disappeared. The 'scope showed nothing but a horizontal line. The signal at this point should normally be the burst signal originating from the WR-64A. I wiggled the lead at the plate pin with the probe tip. The signal appeared intermittently. I shut off the set and measured plate circuit resistance with my *VoltOhmyst*®. The primary winding of the phase-detector transformer was open.

The actual time required to pinpoint this trouble was about five minutes—exclusive of chassis pulling. Other procedures—such as voltage and resistance measurements—would likewise have narrowed down the trouble area. But when it comes to color-circuit troubleshooting, I don't think you can beat a WR-64A Color-Bar/Dot/Crosshatch Generator and a good 'scope (like the WO-91A) for speed and convenience.

I guess that's one reason why I get home on time at the end of the day. In my shop, I let the test equipment do most of the work. I just "boss it around." It's surprising how much time it helps you save.



Answers to Service Quiz

Question 1—The correct answer is "B" and "E". Blanking must be "ON" to produce a base line. Phase control must be set with blanking "OFF" so that traces coincide.

Question 2—The correct answer is "C" and "E". Sweep input signals to TV circuits should be kept low to prevent trace distortion. The 'scope should provide the major share of signal gain.

Question 3—The correct answer is "C". Example: In its highest-gain position, the RCA-WO-33A Super Portable Oscilloscope requires only 0.003 rms volt at the probe tip to produce one-inch vertical deflection.

Question 4—The correct answer is "A". Color-burst signals have a frequency of 3.58 megacycles. The frequency response required for the majority of other applications is considerably lower.

Question 5—The correct answer is "C". The 'scope is loading down the circuit. A low-capacitance probe can greatly reduce such loading. (Note: RCA's WG-300B Direct/Low-Capacitance Probe has 11-picofarad capacitance and 10-megohm input resistance in the "LOW-CAP" position.)

From the RCA Sales Corporation:

PLAIN TALK AND Technical Tips

Additional Notes on the RCA-CTC15 Color Chassis

The previous issue of RCA Radio and Television Service News (Spring, 1964) described several design innovations that have substantially advanced performance of the RCA-CTC15 color chassis over that of earlier models. The discussion covered high-voltage regulation, "boosted" boost, video peaking, focus adjustments, and checking of the "VDR" (voltage-dependent resistor).

To further aid technicians in keeping advised of important developments in RCA high-efficiency receiver chassis and the growing field of color-TV servicing as well, this column continues its coverage of the CTC15 with data on the blue lateral magnet and chroma circuit adjustments.

Blue Lateral Magnet

Adjustment of the three magnets on the convergence assembly causes the red and green dots to shift diagonally and the blue dot to shift vertically. To achieve center convergence, additional lateral motion must be imparted to the blue dot by means of another magnet. The configuration of the blue lateral magnet varies with the chassis series in which it is used. In some earlier color sets, this magnet influences all three dots in a lateral direction, hence giving rise to the term, "lateral" magnet. In the CTC15, this magnet (Figure 1) affects only the blue dot and can be referred to as a blue lateral magnet.

This new blue lateral magnet is oriented directly above the blue pole section of the gun assembly. Its exclusive, tighter control of the blue dot helps the technician lighten his setup task.

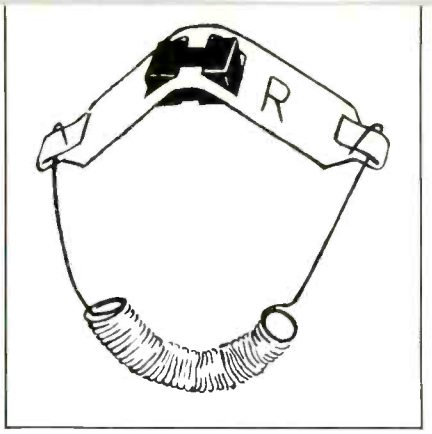


Figure 1: CTC15 blue lateral magnet.

Chroma Circuit Adjustments

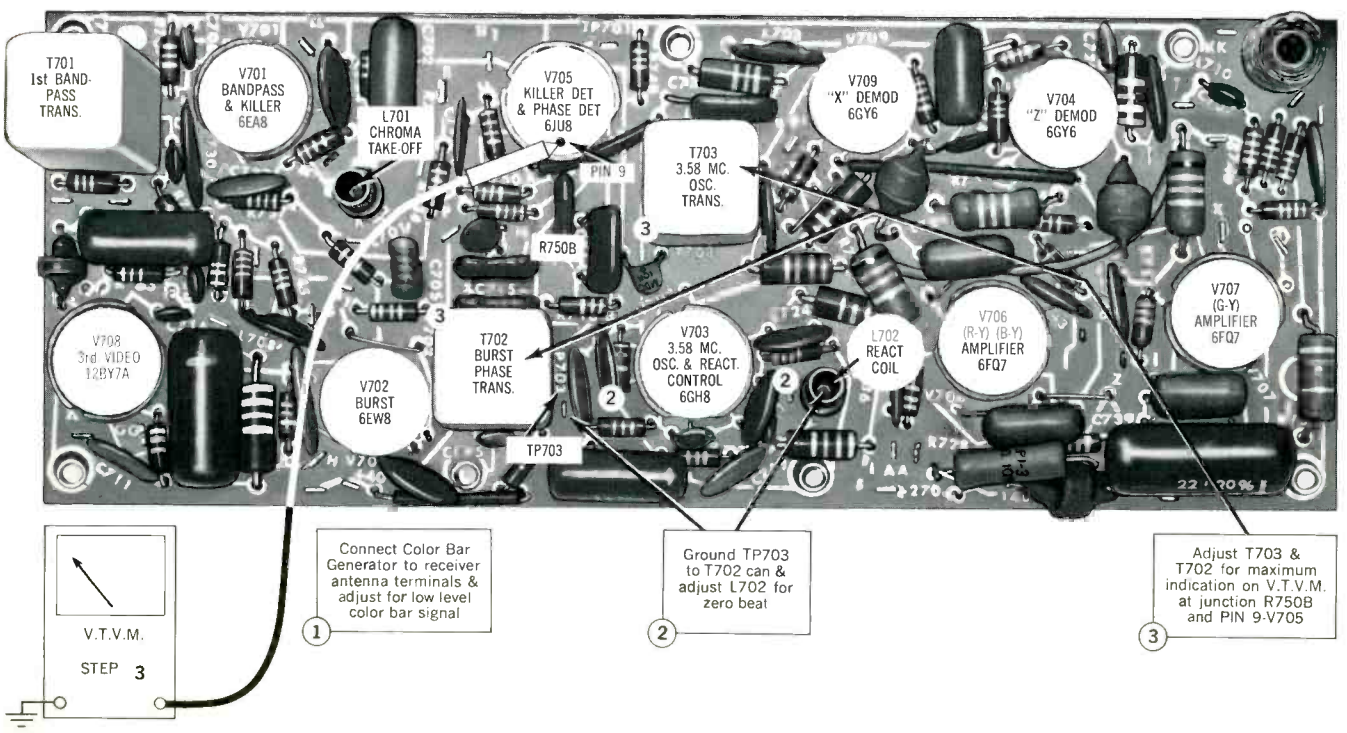
A simple approach to making chroma circuit adjustments that includes a three-step field adjustment procedure is suggested in the paragraphs that follow. However, prior to considering these adjustments, a review of the operation of the AFPC circuits might prove helpful.

Basically, there are three considerations involved in the production of a good color picture:

• **Definition**—Good definition is a function of the RF, IF, and video circuits of a receiver. The appearance of the black-and-white picture, the color picture, and an examination of the various response curves of the circuits will disclose the performance of the receiver regarding definition.

• **Automatic Frequency and Phase Control (AFPC)**—The function of the AFPC system is to enable the local 3.58-Mc CW oscillator to produce an exact replica of the 3.58-Mc signal that is being used at the source of the color program. As the color program is transmitted, a sample of the 3.58-Mc signal in use is supplied (during the horizontal blanking period) to the receiver by means of a short "burst" consisting of approximately 8 cycles of the station's own 3.58-Mc generator. The AFPC circuitry utilizes this "burst" signal to bring the local 3.58-Mc CW oscillator

Figure 3: Simplified three-step AFPC field procedure.



into agreement with the transmitter's 3.58-Mc signal.

In the CTC15, an effective system is used to lock-in the color circuits of the receiver with the incoming color sync (burst) signals.

A control loop is formed by the 3.58-Mc CW oscillator, the phase detector, and the reactance tube. In the phase detector, the incoming burst signal is compared in frequency and phase with the local 3.58-Mc CW oscillator signal. When both signals agree, zero voltage is applied to the reactance tube grid circuit. If the 3.58-Mc oscillator tends to advance or retard its phase relationship with the incoming "burst" reference signal, a condition of zero voltage no longer exists. The polarity and magnitude of the correction voltage developed depends on the direction and amount of departure of the 3.58-Mc oscillator signal from zero phase; the correction voltage provides for frequency correction.

• **Color Demodulation**—In order to obtain a color picture which represents accurately the colors being televised, the color demodulators must perform correctly. In the CTC15 color chassis, there are only two adjustments required to assure proper demodulation. The signal which appears in the secondary of the burst transformer (T702) is the primary reference signal. The phase of this signal is controlled by the setting of the core and, to a limited extent, by the tint control which is simply a phase-shifting circuit. The AFPC circuitry (and hence the sequence of colors which are displayed) "zeros in" on this signal. The adjustment of the burst transformer produces coarse variations in the phase of the reference signal, and the tint control produces fine variations in the phase of the reference signal.

The other adjustment relating to demodulation is the 3.58-Mc oscillator transformer (T703). The primary of this transformer tunes the plate circuit of the 3.58-Mc oscillator and supplies the sampling signal that is compared with burst in the phase detector. The secondary of T703 supplies the CW signal to the demodulators. Each demodulator receives a separately phased 3.58-Mc signal and the amount of phase displacement is *fixed* by the phase-shifting network consisting of L703 and C728.

In the CTC15, the various adjustments required for the correct AFPC operation are easily checked. The reactance coil (L702) determines, within limits, the operating frequency of the 3.58-Mc oscillator. Test point 703 is made accessible for the purpose of grounding the correction voltage; the reactance coil is then adjusted until a slowly moving or stationary color bar pattern is observed on the picture tube. When the ground is removed, the bar pattern should remain stationary. If the bar pattern does not remain stationary, it may indicate that the burst transformer, T702, and/or the 3.58-Mc oscillator transformer, T703, require adjustment.

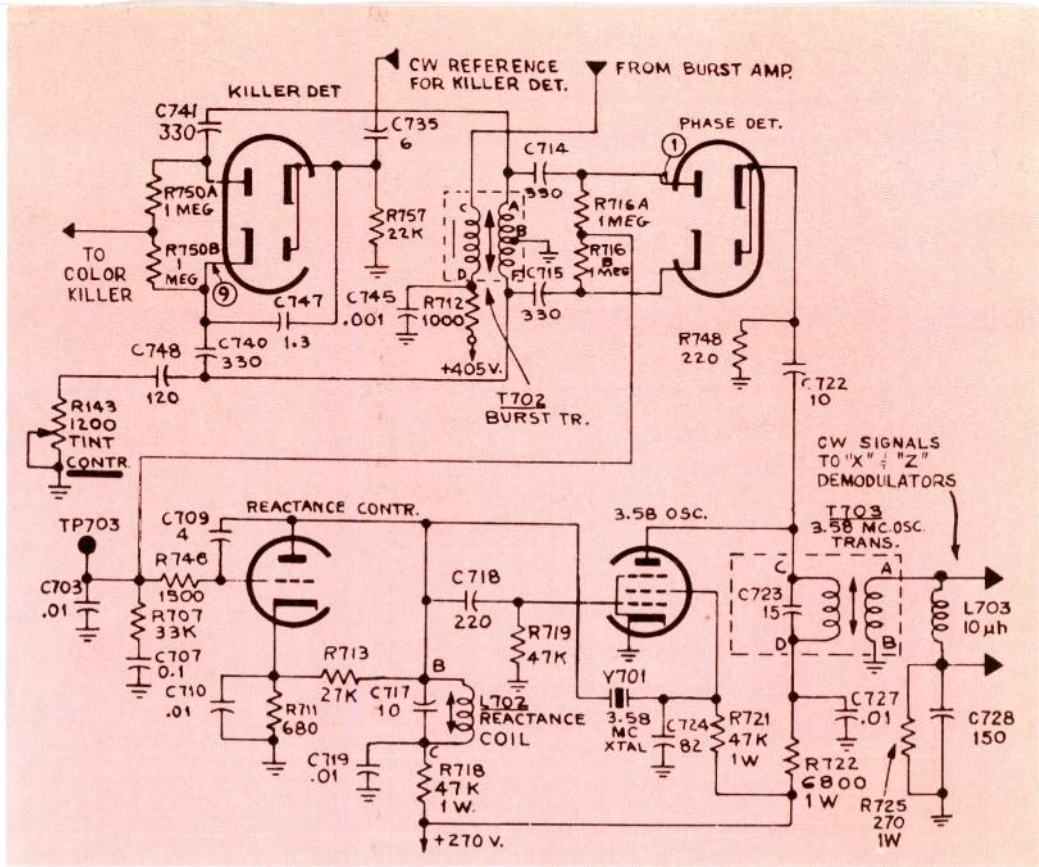


Figure 2: Partial schematic of CTC15 chroma section.

Since the burst transformer, T702, supplies the reference signal for the AFPC system, it is adjusted for maximum response to the 3.58-Mc burst signal and for proper display of the color bars with the hue control at the center of its range (third bar red, sixth bar blue, tenth bar green). Correct operation can also be verified by examining the picture-tube grid waveforms as pointed out in the service data.

Both T702 and T703 exhibit approximately maximum output when they are properly adjusted. A simple field procedure therefore can be devised that makes use of this characteristic. All that the technician requires for these adjustments is a color bar generator and a VTVM.

A simplified three-step procedure for making field adjustments of the 3.58-Mc circuitry is outlined below and illustrated in Figure 3:

Step 1 consists of connecting the color bar generator to the receiver and establishing a *low-level* color bar pattern. (The technician should make certain that the tint control is set at mid range.)

Step 2 grounds out the correction voltage and permits L702 (the reactance coil) to be adjusted for a zero beat (stationary bar pattern).

Step 3 involves adjustment of T703 (the oscillator transformer) and T702 (the burst phase transformer) for a maximum indication on the VTVM connected to pin 9 of V705 (the killer detector and phase detector).

A final correction should be made on the basis of the bar pattern displayed on the picture tube by slight adjustment of the burst phase transformer.

The phase detector or the killer detector may be utilized as a "built-in" detector for measuring the 3.58-Mc signal. Either pin 1 of the phase detector or pin 9 of the killer detector may be employed for this purpose. Pin 9 is used in the illustration because it is more accessible when the chassis is in the cabinet. (CAUTION: The oscillator transformer, T703, tunes very broadly owing to its low impedance secondary. It is also important for the technician to remember to use a *very low level* color bar signal to obtain a good peak reading. Too much color signal will cause a slight dip to occur as the reading rises toward its peak.)

Whenever service of any kind is performed on a color receiver, an evaluation of the color performance should be included. By using the field procedure as described above, the technician can make this evaluation with a minimum of test equipment. In the case of bench service on a color receiver, the procedure outlined in the associated service data can be used to check the chroma circuit adjustments.

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