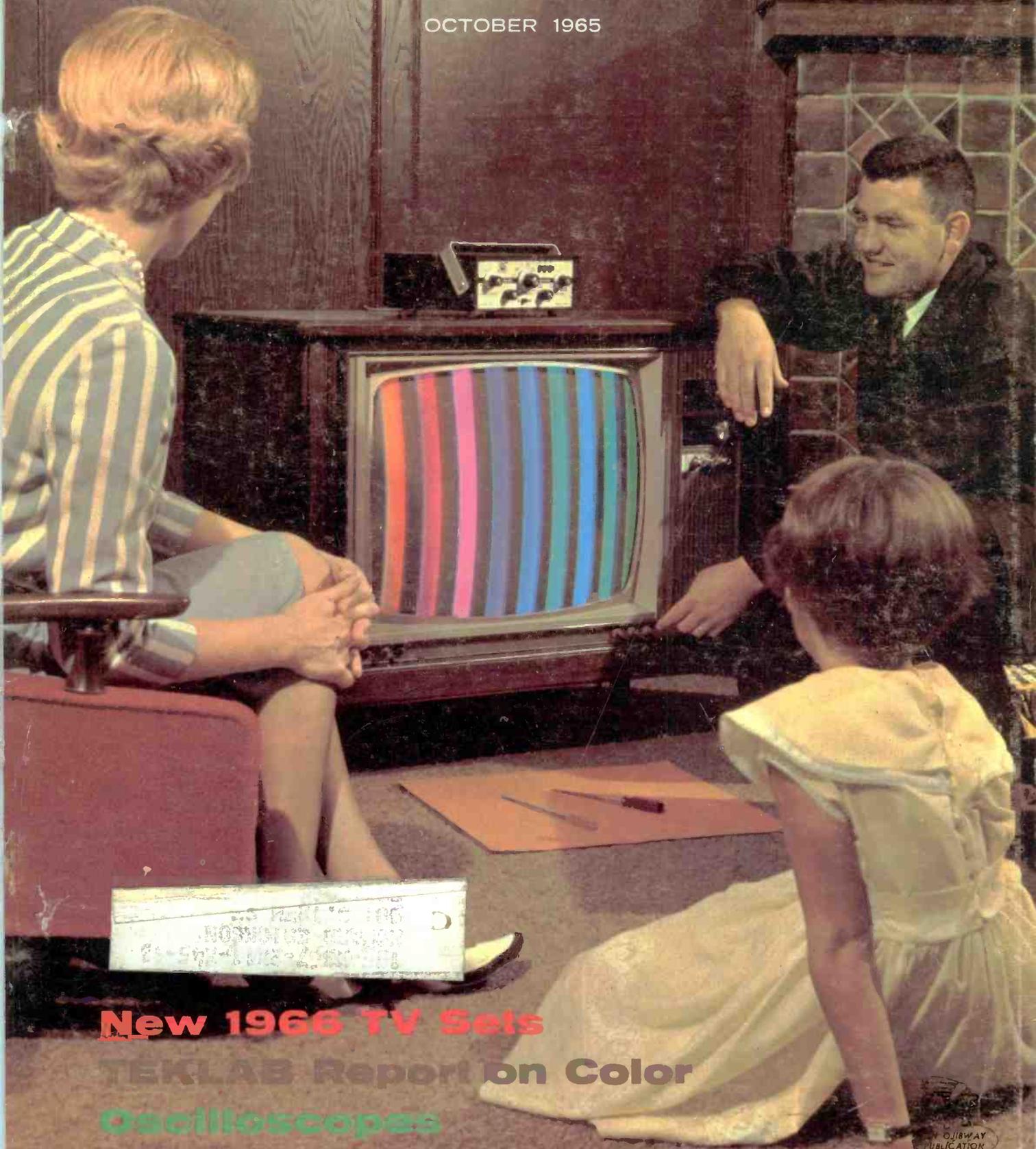


ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

OCTOBER 1965



New 1966 TV Sets

TEKLAB Report on Color

Oscilloscopes

JOHNSON PUBLICATION

Be super-critical.

Whether you're looking for the fun and economy of building quality kits or you want ready-to-use factory-wired equipment — before you buy, examine carefully. Compare

EICO with anybody else — feature for feature, chassis for chassis, part for part. The more critical you are, the more you'll see for yourself that your best buy is EICO.



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New Model 440 Scope. Lowest-priced quality oscilloscope available. Excellent for electronics teaching and home workshop. Flat 2c-500kc. 3" flat-face new CRT. Compact, light, rugged. \$49.95 kit, \$69.95 wired.



New Model 779 — Sentinel 23 CB Transceiver. 23-channel frequency synthesizer provides crystal-controlled transmit and receive on all 23 channels. No additional crystals to buy ever! Features include dual conversion, illuminated S/Rf meter, adjustable squelch and noise limiter, TVI filter, 117VAC and 12VDC transistorized dual power supply. Also serves as 3.5 watt P.A. system. \$169.95 wired.



New Model 712 — Sentinel 12 Dual Conversion 5-watt CB Transceiver. Permits 12-channel crystal-controlled transmit and receive, plus 23-channel tunable receive. Incorporates adjustable squelch & noise limiter, & switches for 3.5 watt P.A. use, spotting, & Part 15 operation. Transistorized 12VDC & 117VAC dual power supply. \$99.95 wired only.



New Model 753 — The one and only SSB/AM/CW Tri-Band Transceiver Kit. 200 watts PEP on 80, 40 and 20 meters. Receiver offset tuning, built-in VOX, high level dynamic ALC. Unequaled performance, features and appearance. Sensationally priced at \$179.95 kit, \$299.95 wired.



New Model 3566 — All Solid-State Automatic FM MPX Stereo Tuner/Amplifier. No tubes, not even nuvistors. Delivers 112 watts IHF total to 4 ohms, 75 watts to 8 ohms. Completely pre-wired and pre-aligned RF, IF and MPX circuitry, plus plug-in transistor sockets. \$219.95 kit (optional walnut cabinet \$14.95), \$325.00 wired including walnut cabinet. UL approved.



Model ST70 70-Watt Integrated Stereo Amplifier. Best buy of highest ranked stereo amplifiers according to independent testing. \$99.95 kit, \$149.95 wired. ST40 40-Watt Integrated Stereo Amplifier, \$79.95 kit, \$129.95 wired. ST97 Matching FM MPX Stereo Tuner, \$89.95 kit, \$139.95 wired.

EICO Electronic Instrument Co., Inc.
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- CB

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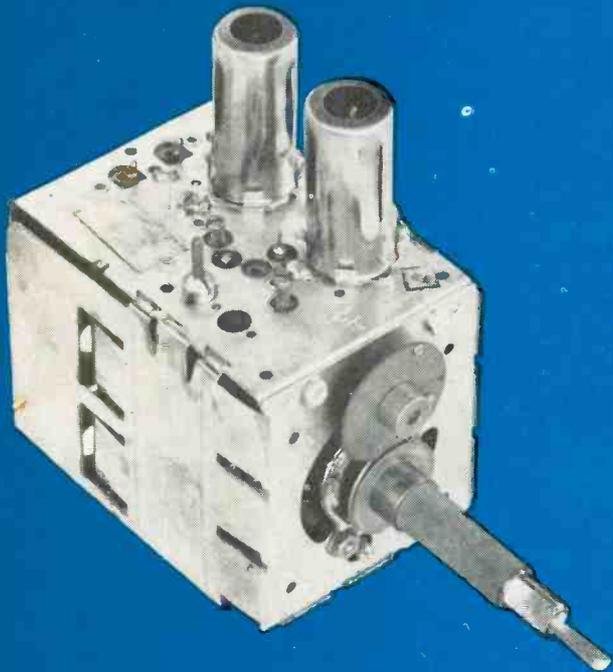
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**Includes ALL parts (except tubes)
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When inquiring about service on other than Tarzian-made tuners, always send TV make, chassis and Model number. Check with your local distributor for Sarkes Tarzian replacement tuners, parts, or repair service. Or, use the address nearest you for fast factory repair service.

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TUNER SERVICE DIVISION

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**enables Channel Master to
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Contact your nearest Channel Master Distributor.

CHANNEL MASTER

Ellenville, N.Y.

ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

OCTOBER 1965
VOL. 82 NO. 4

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Cover

The color TV boom has been underway for more than a year. But some people haven't heard about it yet. To remind them, our photographers took off recently in the wake of a fast-moving delivery truck and ended up in the home of a new color-TV set owner. While the smiling technician made final adjustments to the set — explaining it all in simple words to the female contingent of the family — our photographers made color "hay" too.

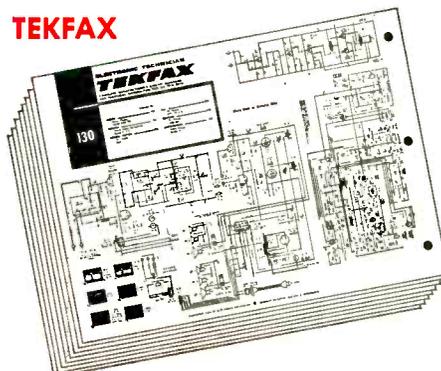
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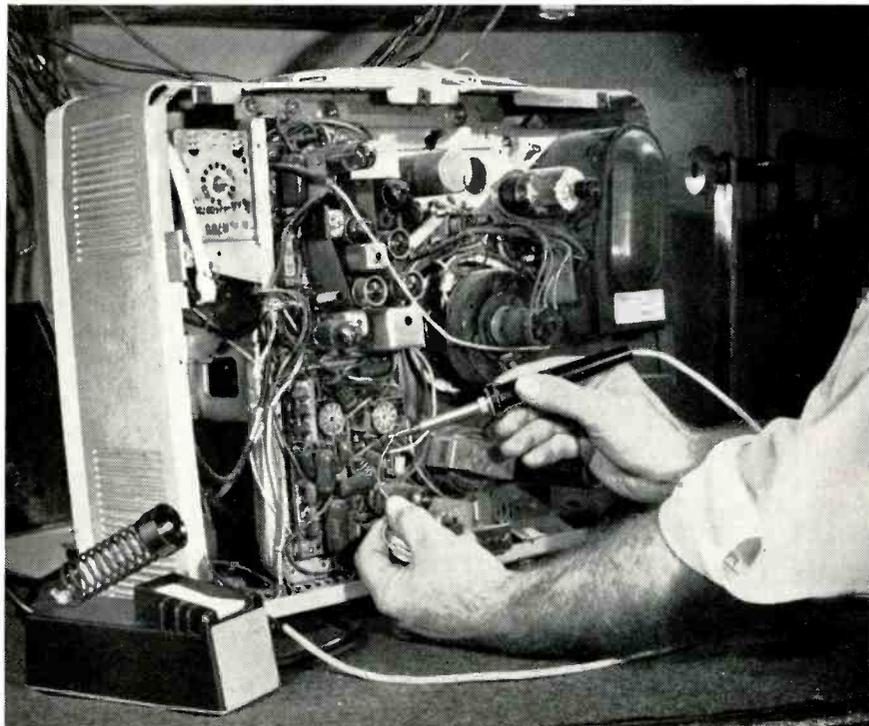
TEKFAX



Group 158 October • 1965

ADMIRAL: TV Chassis G3
MAGNAVOX: TV Chassis T-914 Series
MOTOROLA: TV Chassis TS-596
RCA VICTOR: TV Chassis KC5153
SILVERTONE: TV Chassis 456.61580,
528.61580, 529.61580, 456.61581,
528.61581, 529.61581
SYLVANIA: TV Chassis B06-1, -2, -3
WESTINGHOUSE: TV Chassis V-2485-11
ZENITH: TV Chassis 14N26

This tool solders faster, better, at lower cost



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Extremely versatile. Use it for all your bench soldering, including heavy-duty chassis work.

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Saves working space. Compact transformer has soldering pencil holder and tip cleaning sponge attached. Transformer is rated at 60 watts, 120 volts or 220 volts, 50/60 cycles.

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WORLD LEADER IN SOLDERING TECHNOLOGY

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LETTERS TO THE EDITOR

It's Not That Bad

Just a note to let you know that I have been receiving *ELECTRONIC TECHNICIAN* for years and have enjoyed it thoroughly. I was quite surprised recently at the number of letters from readers complaining about the publication — advertisements, etc. I cannot imagine what these technicians want from a magazine as complete as *ET*. The color articles are excellent. The schematics are a tremendous help. And as for the products, I am positive that you cannot go wrong in purchasing from your advertisers. Keep up the good work and improvements and thank you for a fine publication.

J. F. SCARPELLI

Spokane, Wash.

• *Relax, J. F. — it's not as bad as it looks. For each complaint we receive and print, we get hundreds of letters like yours which we don't have room to print.—Ed.*

Rebuilds Tuners

I have been reading *ELECTRONIC TECHNICIAN* for a long time and like it very much. We are in the TV tuner rebuilding business covering six southern states.

HOWARD RADIO

Lakeland, Fla.

Ten or More Years

I have been a subscriber to *ELECTRONIC TECHNICIAN* for 10 or more years. It's a fine magazine but would like to see more CB and transistor radio schematics in *TEKFAX*.

F. A. RAND

Winthrop, Maine.

Why Quit So Young?

The reason I didn't renew my subscription is because I have retired from active service work on my 70th birthday.

ROBERT GLEASON

Grover Hill, Ohio.

Needs Wilcox-Gay Schematic

I would like to buy a schematic for a Wilcox-Gay tape recorder, Constellation, Model 6F series. Understand the company is no longer in business. Perhaps a reader can help me with a schematic.

JOHN LAMA

Bronx, N.Y.

Have you tried **KWIKETTE** connectors?

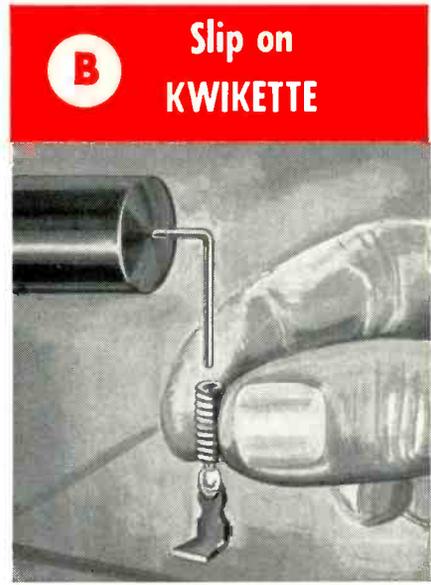
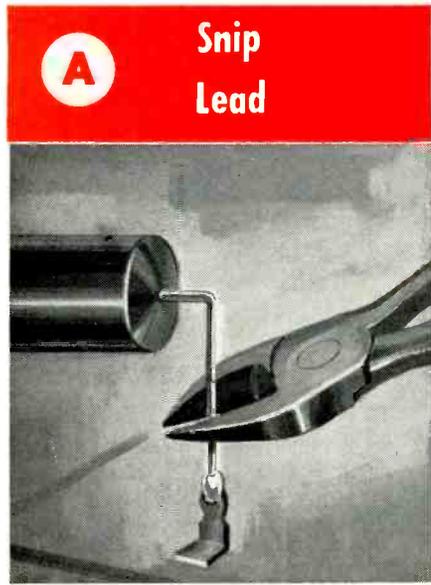
Not just another wire spring connector!
 The 3-in-1 KWIKETTE is brand new and different...
 Copperweld wire inner core, a layer of flux, and
 an outer jacket of solder... all you need is heat!
Makes one-handed soldering possible!



Ten times actual size

Once again, Sprague helps the TV-radio service industry by solving two increasingly serious problems... parts replacement in those "inaccessible" chassis nooks, such as crowded tube sockets, as well as soldering onto the delicate circuitry of printed wiring boards.

Mechanically sturdy and electrically reliable, the revolutionary KWIKETTE provides fast, expertly-soldered connections as easy as A-B-C!



**NOBODY ELSE HAS KWIKETTE CONNECTORS...
 YOU GET 'EM ONLY FROM SPRAGUE PRODUCTS!**

KWIKETTES are now being packed with Sprague Atom[®] Capacitors *at no extra cost to you!* Whenever you need tubular electrolytics, insist on pre-packaged Sprague Atoms from your parts distributor and you'll automatically get your KWIKETTE component connectors... the biggest boon to the service technician since the soldering gun!

*TRADEMARK



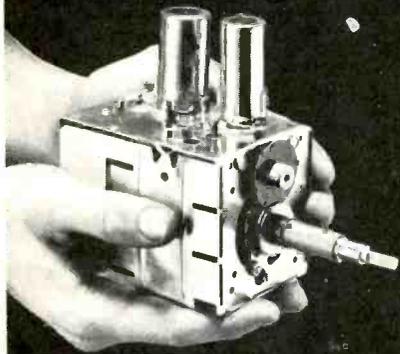
WORLD'S LARGEST MANUFACTURER OF CAPACITORS

ES 4104 RL

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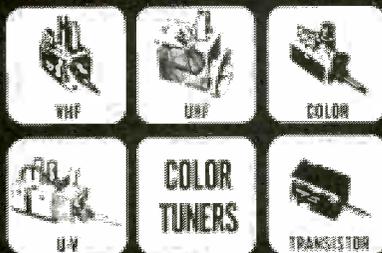
COMPLETE TUNER OVERHAUL

ALL MAKES—ONE PRICE



ALL LABOR AND PARTS
(EXCEPT TUBES & TRANSISTORS)*

9.95



Guaranteed Color Alignment—No Addit. Charge

Simply send us the defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint. Your tuner will be expertly overhauled and returned promptly, performance restored, aligned to original standards and warranted for 90 days.

UV combination tuner must be single chassis type; dismantle tandem UHF and VHF tuners and send in the defective unit only.

Exact Replacements are available for tuners unfit for overhaul. As low as \$12.95 exchange. (Replacements are new or rebuilt.)

Pioneers in TV Tuner Overhauling

CASTLE

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EAST: 41-92 Vernon Blvd., Long Island City 1, N.Y.
CANADA: 136 Main Street, Toronto 13, Ontario

*Major Parts are additional in Canada

LETTERS TO THE EDITOR

It's Happened Before

A 1957 Ford Motor radio (model number is unimportant as you will see) was brought into my shop for service. The customer's complaint was: "Blowing fuses." After checking it on the bench, I found no trouble. The customer then reinstalled the radio and it still continued to blow fuses. I checked the radio again, thinking it might be an intermittent condition. This time I checked to see if it had a polarity switch-over. It did not. It was a conventional negative-to-chassis positive-to-fuse line. I then connected an ammeter to see how much current the radio was drawing and I noticed the current was reversed. Now I checked the battery polarity and found the radio fuse line negative. I asked the customer if he had his battery removed recently. He said that he hadn't but did have it charged recently. I still could not believe my eyes, so I checked the battery to see if the polarity was reversed. The positive terminal read "negative" and the negative side read "positive."

I informed the owner that someone had charged his battery in reverse and that most likely he would need a new battery. Naturally, he thought I was crazy, but said he would take it to an auto mechanic. Sure enough, the following week he came in and told me he had to buy a new battery and after installing a new fuse the radio worked fine.

HY SCHOENBLUM

Fresh Meadows, L.I., N.Y.

• *We have received a dozen like this over the years and one was classified and printed as a 'tough dog.'*—Ed.

Likes ET

Want to let you know how much I like ELECTRONIC TECHNICIAN. To me, it is the best electronics magazine I know of. I have read several different magazines but they never have near as much helpful information as ET . . . I am also interested in industrial controls and tape controlled machines . . . Keep up the good articles and TEKFAK schematics and I'll have plenty to look forward to each month.

LEO R. MCKAY

Mercer, Pa.

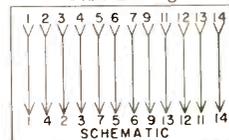
• *We expect to resume coverage in certain areas of industrial electronics sometime in the near future.*—Ed.

NEW FROM POMONA ELECTRONICS: COLOR CRT TEST ADAPTER

—for use with
Motorola 23EGP22,
RCA 25AP22, and
other CRT's with
14BE basing.



Miniature Diheptal Socket
14BE Basing



Neo-Diheptal Base
14AL/14AU Basing

This single adapter will allow you to test both the new Motorola and RCA color tubes with your present test equipment. **Keeps testers up to date**—adapts miniature diheptal socket 14BE basing (used in these 2 tubes) to standard neo-diheptal 14AL/14AU basing (found on current color tube testers).

Features—provision for accepting bases equipped with spark gaps.

Rugged, compact, easy to use. Built to Pomona Electronics' high standards of quality in materials and workmanship.

MODEL 2276

NET \$5.95

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1500 East Ninth Street, Pomona, California 91769 / Telephone (714) 623-3463

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The cover gives you the whole story.



The United Delco box tells you for sure you're getting a replacement radio part of the same high quality as the original.

And it tells you who authored it, too. Namely, Delco Radio.

So, if you'd like to hang on to your reputation and customer goodwill, just ask yourself this next time you order transistors:

Do they come individually packed in a distinctive box? (Bushel buying is for potatoes, not transistors.)

Do they carry an easy-to-read, can't-make-a-goof number?

Are the numbers—and the transistors—grouped in such a way that you can service more car radios with fewer parts?

Is there a good chance that the parts are original equipment on nearly half of the car radios on the road?

Delco Radio transistors are all of these, and you can get them from your United Delco supplier. He handles the most widely advertised, merchandised and recognized

name in the parts business—United Delco.

That's how your customers know a good part when they see it.



DELCO RADIO, Div. of General Motors, Kokomo, Ind.

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The move's on to



JERROLD

Coloraxial™

best for color . . . best for black-&-white
. . . best for FM . . . best for business

The days of twinlead are numbered. Spurred by Jerrold's introduction of Coloraxial, both the TV trade and the public are moving unmistakably towards this revolutionary shielded coaxial antenna system—not only for great color TV, but for black-&-white and FM stereo too.

And, starting this Fall, a big national advertising program in TV Guide will have your customers asking even more for the perfection in reception that only Coloraxial offers.

So important is 75-ohm Coloraxial in your future that Jerrold now offers a wider line than ever of Coloraxial products to meet every reception need from metropolitan to deepest fringe areas. On these pages are described a

complete range of Coloraxial antennas with 75-ohm output; matching transformers for converting existing 300-ohm antennas to Coloraxial operation; Coloraxial Powermate preamplifiers; and 50- and 75-foot lengths of Coloraxial cable complete with screw-on fittings. One of the easiest—and most profitable—jobs you can do is install a Coloraxial reception system.

There's a pocket-size Jerrold Blue Book waiting for you at your distributor's. It's yours to use in figuring installed Coloraxial prices for your customers. The Jerrold Blue Book is just one part of a big five-part program your distributor has ready to help you sell Coloraxial installations this Fall. Talk to him now.



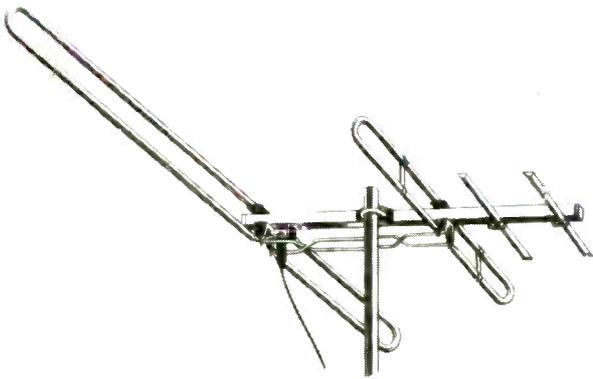
COLORAXIAL MATCHING TRANSFORMERS AND KITS Model TO-374A mast-mounting transformer converts any existing 300-ohm outdoor antenna to 75-ohm Coloraxial operation. Model T378 mounts on set to match it to 75-ohm coax. Available separately or as a set in Kit Model CAT-2.



COLORAXIAL SHIELDED CABLE Here's the heart of every Coloraxial installation—the reason for it all. Coloraxial is the highest-quality shielded RG-59/U cable, factory sweep-tested and complete with screw fittings and a weatherboot for the outdoor connection. Models CAB-50 and CAB-75 contain 50 and 75 feet of cable respectively. Model K-CAB-50 contains 50 feet of cable and one each of Model TO-374A and T378 matching transformers.

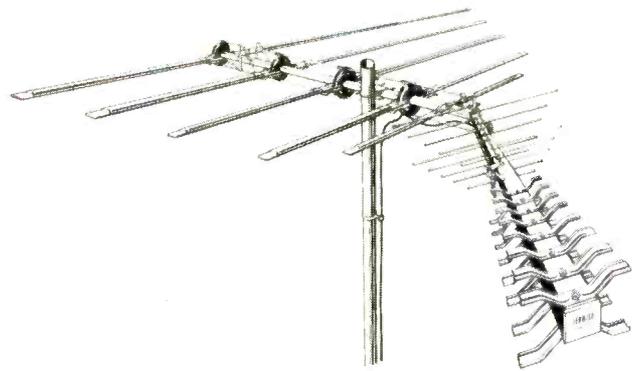


COLORAXIAL POWERMATES The coaxial versions of the transistor antenna amplifier that set an industry standard, made "fringe area" a thing of the past. Model SPC-103 has two transistors, Model SPC-132 "De-Snow" has five transistors in two-stage preamp-postamp. Both Powermates are pre-matched to antenna and receiver, making separate matching transformers unnecessary.

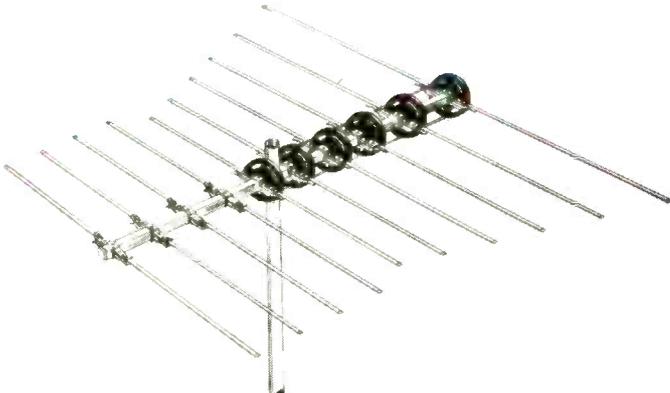


COLORAXIAL COLORGUARD ANTENNAS AND ANTENNA KITS

Like all the antennas shown here, Coloraxial Colorguards are already equipped with 75-ohm output to coaxial downlead. Three models (CAX-16, 17, and 18) for metropolitan and suburban reception areas. Model CAX-16 is also available in kit form with 5-foot mast and trimount, CAB-50 cable with fittings and weatherboot, and set-mounting T378 matching transformer—everything you need for a complete Coloraxial installation.



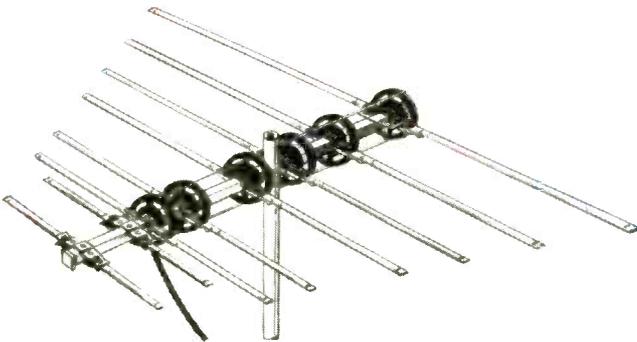
COLORAXIAL PATHFINDER VHF/UHF/FM ANTENNAS The first all-channel antennas with 75-ohm output and individual orientation of VHF and UHF sections in one hinged unit. All the flexibility of separate antennas without splitter losses. You have a choice of five PATHFINDER models, PXB-30, 45, 50, 70, 90.



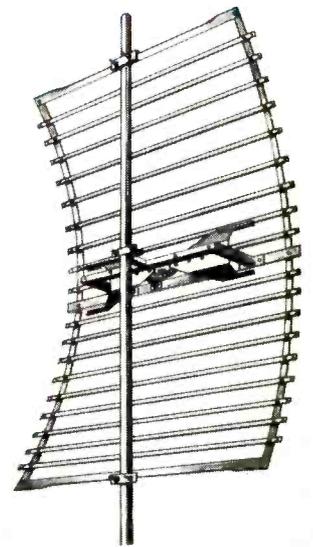
COLORAXIAL PARALOG FM ANTENNAS FM stereo needs Coloraxial too! So the outstanding Paralog FM antenna line is now offered also with Coloraxial 75-ohm output. Three models, FMPX-8, 10, and 16.



COLORAXIAL Stratophonic FM YAGI AND KIT This fine five-element yagi antenna, pre-matched to 75-ohm Coloraxial operation, keeps stereo signals in, keeps interference out. Model FAX-5, available also in kit form with mast, trimount, 50 feet of cable with fittings and weatherboot, and set-mounting matching transformer—everything you need for a complete Coloraxial stereo installation.



COLORAXIAL PARALOG TV ANTENNAS The full line of seven renowned high-gain Paralog log-periodic VHF antennas is now available pre-matched to 75-ohm Coloraxial cable. In the wide range of Paralogs (Models PAX-40, 60, 100, 130, 160, 190, and 220) you can choose the perfect antenna for metropolitan to deepest fringe reception.



COLORAXIAL PARACYL UHF ANTENNAS These five famous all-band UHF antennas, now available with 75-ohm Coloraxial output, feature an extended-resonance driver which assures effective operation over the entire UHF band (Ch. 14 to 83). Models JUX-1, 2, 3, 4, 5.

JERROLD ELECTRONICS CORPORATION

Distributor Sales Division ■ 15th & Lehigh Ave., Philadelphia, Pa. 19132

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COLOR programs this fall mean a COLOR fall year for you.

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. . . . Eliminate antenna system Call Backs

. . . . Encourage customer referrals -- Install MOSLEY TV ACCESSORIES with every antenna you sell & service.



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DESCRIBING THE COMPLETE MOSLEY LINE.

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EDITOR'S MEMO

Procrastinaitis?

It's relatively easy to sit atop an "ivory tower," look out across the big forest through high-powered binoculars, and detect the first puff of smoke that forecasts possible disaster to those down among the trees. Since none of us, as individuals, have either the time or the means to climb high above the tree tops and spot fires, we obviously need a cooperatively-supported fire tower manned with 20/20-vised and highly trustworthy watchers on continuous duty to spot the tell-tale puffs of smoke, push the alarm buttons and direct the fire brigade in action.

To be effective, an organization of this type would be manned by "tower watchers" who talk *small* and act *big*. These leaders would successfully focus total brain and brawn and financial substance in a powerful laser-like beam on the major problems of this industry.

But technicians have no national organization even remotely approximating that of the NAM (National Association of Manufacturers); AMA (American Medical Association); USCC (U. S. Chamber of Commerce), to mention only a few. And many wonder why.

Hal Chase, Television Service Association of Michigan, implied recently that he knows the reason why service-dealers are generally behind the eight-ball. Why, after 20 years, in effect, we are still talking "organization."

We quote from the August issue of TSA News: "Procrastination has caused the service-dealers to lose most of their over-the-counter tube and parts business. It has caused service dealers to pass up set sales to furniture stores, department stores and tire stores. It has caused service to do warranty work at low rates set by others. It has kept labor revenue so low that economics has held down wages so that many of the experienced, top technicians have had to leave to industrial jobs to maintain their families in today's high labor market. Thus, (he concludes) we as an industry must be procrastinators."

After working both in the forest and on top of the tower for 20 years, we are not sure that procrastinaitis is the correct diagnosis. We are not sure that fire-brigade inaction is to blame. What do you think?

ALL NEW FROM *HICKOK*

100% G_m TESTS . . .
*No Emission Tests,
 No Compromise!*

OBSOLESCENCE PROTECTION
*Realistic, Practical
 No Compromise!*

MULTI-SOCKET SPEED . . .
*No Compromise
 In Accuracy!*

MORE PROFIT
*Because You'll Sell
 More Tubes . . .
 Sell Them
 Honestly!*

**NEW HIGH-SENSITIVITY
 LEAKAGE AND
 GAS TESTS!**

MODEL 799

Mustang

\$199⁹⁵

From the laboratories of the world's leading tube tester manufacturer comes the model 799 "Mustang" —a completely new tube tester.

Multi-socket tube testers used to have two serious drawbacks: circuit limitations made them obsolete overnight and, at best, no more than 10% of their tests were actually mutual conductance. But the Hickok "Mustang" doesn't compromise; it delivers *honest* mutual conductance tests. And a unique circuit approach, together with an easily replaceable accessory socket panel, makes it "circuit ready" for

any possible new tube types.

A solid-state power supply gives increased accuracy and dependability. An all-transistorized gas and leakage test circuit sets a new standard of reliability for spotting "tricky" tube defects that can "chew up" your profit. You can actually read interelement leakage to 50 megohms; gas/grid leakage effects to 0.1 μ A!

We call it the "Mustang" because it uses fresh, new engineering ideas and because it gives you a real opportunity to break into new profits.

See it at your Hickok distributor or write for circular TT799.

Ask your distributor about the Hickok credit plan.

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THE HICKOK ELECTRICAL INSTRUMENT CO.

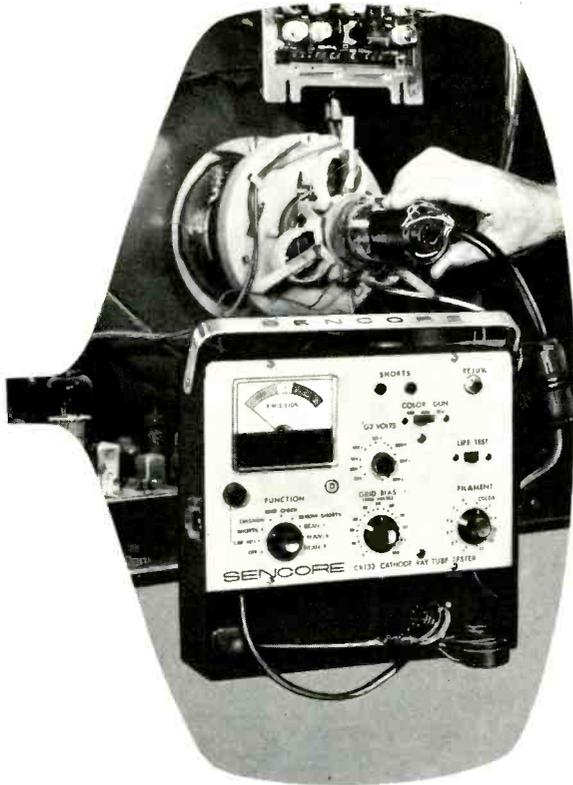
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**top money maker in
the service business**



NEW IMPROVED SENCORE CR133 CRT CHECKER & REJUVENATOR

The new, improved CR133 CRT Checker is designed to test all present picture tubes — and it's ready for future tubes too! Two plug-in replaceable cables contain all sockets required. The compact, 10 lb., CR133 checks CRT emission, inter-element shorts, control grid cut-off capabilities, gas and expected life. Checks all tubes: conventional B&W, new low drive B&W, round color tubes and new rectangular color picture tubes. Exclusive variable G2 Volts from 25 to 325 Volts insures non-obsolence when testing newly announced "semi-low" G2 CRT tubes. New Line Voltage Adjustment insures the most accurate tests possible. Uses well-filtered DC for all checks to avoid tube damage and reading errors. Color guns are individually tested as recommended by manufacturers. Exclusive automatically controlled rejuvenator applies rejuvenation (ACR) voltage as required by individual tube condition; precisely timed to prevent over-rejuvenation or tube damage. The ACR feature is most useful for color tube current equalization to insure proper tracking. Hand-wired and steel-encased for protection of meter and panel in truck or shop, the new improved CR133 is only . . . **\$89⁹⁵**

The famous CR128 CRT Checker and Rejuvenator is similar to above, but with a three position G2 slide switch and without Line Voltage Adjustment at \$69.95

professional quality — that's the difference!

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|| SYNC ON BUSINESS ||



A sales letter or ad idea file should be kept by every service-dealer and technician. And Hewig-Marvic, 861 Manhattan Ave., Brooklyn, N.Y. 11222 has a few booklets that should be in the file. Write on your letter-head . . . And while we're on this subject, Hubert Simon, of The Idea Treasury, Dept. T-102, 98 Old Broadway, Hastings-

Short Waves



by
**Bill
Brown**

Did you know that it cost \$18 million to take those pictures of the moon? Must have been the same photographer who worked on "Cleopatra!"

oOo

A soft answer turneth away few door-to-door salesmen

oOo

Most detectives wish they could earn half as much as the actors who play detectives on TV....

oOo

Sign on a street in Texas: "Last Cadillac dealer for 4 blocks."

oOo

All the Constitution guarantees you is the pursuit of happiness. You have to catch up with it yourself!

oOo

Life begins at forty—and so do fallen arches, arthritis, poor eyesight, and the chances that you will tell the same story to the same person two or three times.....

oOo

At forty, or any other age, you're entitled to sharp, static-free performance from your radio, TV or Hi-Fi. For prompt service, reliable parts and reasonable rates, call Bill Brown's Service, 32 West State, MAIn 3-2260.

on-Hudson, N.Y., has some other ideas that may shake you up — to say nothing of your customers. Simons' result-getting work is shown here. Don't forget to write on your business letter-head.

• • •

Inexpensive programed instruction courses on everything from Improving Your Written Communications to Understanding Public Relations to Cutting Office Costs are available from Argyle Publishing Corp., 605 Third Ave., New York, N.Y. 10016. Inquire on your letter-head.

• • •

An up-dated electrolytic capacitor replacement guide by Aerovox, in a handy 4 x 9 in. format, is available at your Aerovox distributor. Original part number, capacitor data, replacement number and list price are shown under alphabetically-listed TV set manufacturers' names.

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ELECTRONIC TECHNICIAN

NOW! OVER 2700 REPLACEMENTS

with only 13 RCA Top-of-the-Line transistors

With RCA's "Top-of-the-Line" SK Replacement Series, you need only 13 transistors, including two matched pairs for ready replacement of more than 2700 types. In addition, RCA's two new SK-Series rectifiers—the SK3016 and SK3017—enable you to replace virtually any selenium or silicon rectifiers having comparable ratings.

Stock the complete SK-Series—13 transistors and 2 rectifiers. They will provide the answer to many of the replacement problems you face servicing auto radios, battery-operated portable radios, tape recorders, hi-fi equipment, phonographs, black-and-white and color TV, and other entertainment-type equipment using solid-state devices.

Accurate, comprehensive replacement information is given in the new 16-page RCA "Top-of-the-Line" Semiconductor Replacement Guide SPE 202. With it you have at your fingertips information on more than 2700 transistor types, including many of foreign manufacture—which the 13 RCA "Top-of-the-Line" types replace.

See your RCA Distributor about the RCA SK-Series, and be sure to ask for your copy of the RCA Semiconductor Replacement Guide.

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

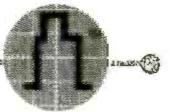


The Most Trusted Name in Electronics

"Top-of-the-Line Replacement Transistors"

SK-30C3	pnp type, A ² Driver and Output Stages (9 V Supply)	SK-3010	npn type, AF Driver and Output Stages of Broadcast Receivers
SK-30C4	pnp type, A ² Driver and Output Stages (1.5 V Supply)	SK-3011	npn type, RF, IF, and Converter Stages of Broadcast Receivers
SK-30C5	pnp type, RF, IF, and Converter Stages of Broadcast Receivers	SK-3012	pnp type, Audio Output Stages of Auto Radios
SK-30C6	pnp type, RF, IF, and Converter Stages of FM and AM/FM Receivers	SK-3013	Matched pair of SK-3009
SK-3007	pnp type, RF, IF, and Converter Stages of All-Wave Receivers	SK-3014	Drift Field type for Output and Driver Stages of Hi-Fi equipment
SK-3008	pnp type, RF, IF, and Converter Stages of Auto Radios	SK-3015	Matched pair of SK-3014
SK-3009	pnp type, Audio Output Stages of Auto Radios	SK-3016	Silicon Rectifier for color, B/W TV, Radios, Phonographs
		SK-3017	Silicon Rectifier for color, B/W TV, Radios, Phonographs





it's here! most advanced
color TV test instrument
ever developed



- OBSOLETES ALL OTHERS
- ELIMINATES ALL GUESSWORK

LECTROTECH V7*

A sensational new color generator with 4 major Lectrotech exclusives . . . plus all of the time-proven standard features . . . in one compact, portable unit. For the first time, you can install and service color TV completely, accurately and faster! Here are the facts:

EXCLUSIVE—COLOR VECTORSCOPE—Until now, available only in \$1500 testers designed for broadcast. Accurately measures color demodulation to check R-Y and B-Y plus all 10 color bars for color phase angles and amplitude. A must for total color and those hard to get skin tones.

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EXCLUSIVE—SOLID STATE RELIABILITY — Only two tubes are used in combination with fully transistorized diode-rectifier circuit.

PLUS— the V7 produces all Crosshatch, Dots, Vertical only, Horizontal only and Keyed Rainbow Patterns. RF at channels 3, 4 or 5. Video Output (Pos. and Neg. adjustable) for signal injection trouble-shooting. Red-Blue-Green Gun Killer. All transistor and timer circuits are voltage regulated to operate under wide voltage ranges. Lightweight, compact — only 8¼" x 7½" x 12½". Net. **189.50**

**Designed and produced by the men who introduced and developed the modern approach to TV testing — Bill Grossman and Bob Koret.*

For the full story on the V7, write for complete catalog or see your distributor.



V6 Complete color bar generator with all the features of the Lectrotech V7 except the Vectorscope. Only **99.50**



Distributors: Phone or Wire Collect. Dept. ET-10

LECTROTECH, INC.

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A dual-impedance antenna requires no matching transformer at the antenna itself. It's for 72 or 300Ω lead-in and designed especially for color reception. At your jobber or write Kay-Townes Antenna Co., Box 593, 1511 Dean Avenue, Rome, Ga. 30162 on your letter-head.

Technicians repairing phonos and tape recorders frequently lose jobs because tape and phono drives, belts, etc., cannot be obtained quickly. Walsco Electronics has announced a revised chart containing hundreds of new cross-references to most popular record changers and tape decks. It's free at your Walsco distributor. Ask for Form FR250W.

The replacement parts situation for Japanese-produced home entertainment equipment is sad indeed. But PANASONIC (division of Matsushita Electric) seems to be doing something about it. A replacement parts depot covering in-warranty repairs for the states of Alaska, Arizona, California, Colorado, Idaho, Nevada, New Mexico, Montana, Oregon, Utah, Washington and Wyoming is being opened at 569 South San Pedro St., Los Angeles, Calif. 90013.

A tape-recorder promotion idea may be a passing fad—like the 'hoola-hoop'—but it just may become another sound and stable business bonanza. It's a tape-recorded



"voice letters" idea for business and professional people, families, friends and acquaintances. For details, write to Dept. 220, Craig Panorama, Inc., 3412 So. La Cienega Blvd., Los Angeles, Calif. 90016.

A vest-pocket size 'pocket prompter' by Westinghouse is the neatest service-dealer and technician aid we've seen for a long time. It's about 3 x 6½ in. and has 100 pages of data covering the company's 1966 B/W, color and solid-state stereo products. It has a 10-page glossary of electronic terms besides. A section gives tips on sales demonstrations. At your distributor or direct from Westinghouse Appliance Service Co., Pittsburgh, Pa.

successful service shop beats rising costs with B&K television analyst



"As every serviceman knows, major TV repairs represent an increasingly large part of the service business and the average time per repair has increased"...

says Willard Horne of Horne Radio and Television in Evanston, Illinois.

After more than 25 successful years in the service business, twenty of them in the same location, Mr. Horne can be considered an authority on how to keep a business profitable. Mr. Horne says, "In order to be successful, our 3-man shop has to be competitive on the large jobs as well as the small ones. With the increase in bench time that we were experiencing and the limitations on what we could charge, there was a reduction of profit that had to be stopped. Then we bought a B&K Model 1076 Television Analyst."

"Now our customers get the same extra-value service on the big repairs and the small ones," said Mr. Horne. "We use the Television Analyst for troubleshooting a wide variety of complaints,* particularly for those that require touch-up align-

ment, location of IF overloads and color convergence. We are more competitive now that we use the B&K Television Analyst because we spend far less time on the jobs that used to be dogs, with benefits both to the shop and our customers."

* B&K Model 1076 Television Analyst checks every stage in a black and white or color TV receiver. Nine VHF RF channels, 20 to 45 MC IF, audio, video, sync, bias voltage and AGC keying pulse are available. The model 1076 provides its own standard test pattern, white dot, white line crosshatch, and color bar pattern slide transparencies. It includes a blank slide which can be used for closed-circuit-TV display floor promotion. Its net price is \$329.95.

Find out how you will increase your TV service profits with a B&K Model 1076. See your distributor or write for Catalog AP 22.



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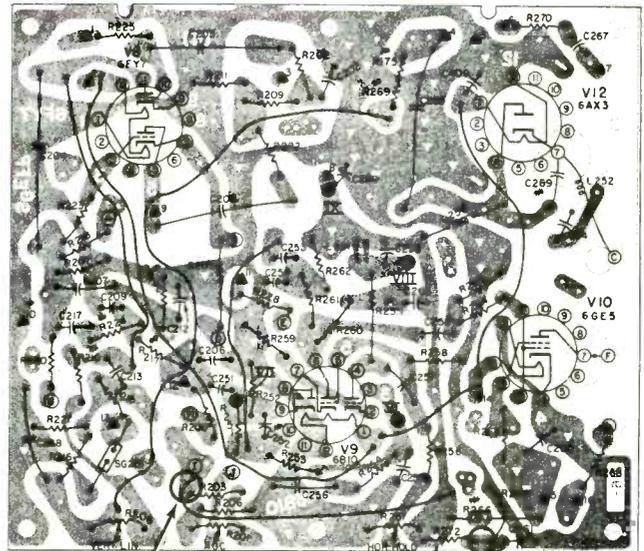
TECHNICAL DIGEST

GENERAL ELECTRIC

TV Chassis — AA, AY — Open CRT Filaments

A percentage of the 23DYP4 or 23FVP4 picture tubes which fail in the above chassis have been found to have open filaments. Investigation has shown the following cause. As in the case with any type of electrostatic focus tube, occasional arcing occurs, mainly during the early life or breakin period. This arcing is normally discharged across the spark gap from G2 to ground and no harm results. On the sweep board, there are a couple of locations in the copper pattern where the islands connected to G1 and G2 are spaced close to a B+ island. If a slight misregistration of the copper pattern occurs, the reduced spacing may allow an arc over to occur simultaneously with a discharge across the spark gap. If this should occur a heavy B+ current flows into G1 or G2 and follows the HV arc to the filament causing burnout. This type of failure may be prevented by increasing the spacing of critical conductor points according to the following instructions. We suggest you make these changes whenever an "open filament" picture tube failure has occurred in an AA or AY Chassis, to prevent a repetition of the failure. Chassis passing through your shop for other service should also be inspected for this condition. AA receivers built after Chassis Date Code 504 have the circuit corrections incorporated.

AA Chassis — (See Illustration) (Both early and late production boards)

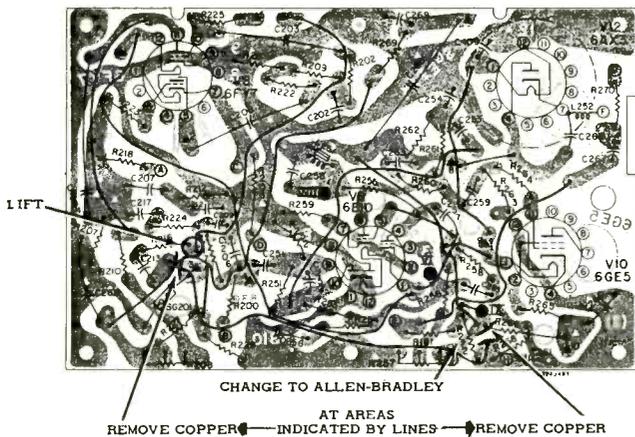


LIFT CHANGE TO ALLEN-BRADLEY LIFT

island and reconnect. This clears the island of all connections.

2. Lift R272 and lead connecting to R268 above island and reconnect. This clears island of all connections.

3. Change R272, 470K to Allen-Bradley. The Allen-Bradley has a smooth body surface.



CHANGE TO ALLEN-BRADLEY

AT AREAS

REMOVE COPPER — INDICATED BY LINES — REMOVE COPPER

1. The junction of R216 and the yellow wire to terminal 5 of the yoke should be lifted from the copper island and reconnected in open space.

2. Increase the clearance between the following two copper islands.

- Junction of spark gap and lead to pin 3 of CRT.
- Junction C213 and lead to R268.

3. Increase clearance between these two islands:

- B+ end of R266.
- Junction R268 and C272.

4. Change R272, 330K to an Allen-Bradley. The Allen-Bradley will have a smooth body surface.

AY Chassis — (See illustration)

1. Lift the junction of R203 and B+ lead from the

MOTOROLA

Color TV Chassis TS-908B — Production Changes, Revisions and Additions to Motorola TV Service Manual Part No. 68P65110A80

To increase range of BLUE HORIZONTAL PHASE control, L-216: Capacitor C215 (0.022 μ f) changed to 0.025 μ f, 10%, 200 v mylar, part No. 8R10072A14.

An additional BLUE VERTICAL TILT adjustment has been added to the convergence panel. The center arm of the blue VERTICAL AMP control, R220, and the center arm of the blue VERTICAL TILT control, R217, are now connected to a terminal strip "P5" on the panel. Reversing these wires reverses the blue dynamic convergence coil. If blue cannot be satisfactorily converged vertically, reverse the wires on the terminal strip, P5.

To improve audio AM rejection: Capacitor C314 (0.0015) in grid circuit of V8A, is replaced with a 0.01 μ f.

Design change: R116 (10K) connected across secondary of T102 changed to 3.3K Ω resistor.

To eliminate radiation from damper circuit into channel 2: Chokes, L505 and L509, in cathode circuit of damper V23 replaced with part No. 24C66772A06.

To reduce left side yoke ringing: the 260 pf, 3kv capacitor, C701, formerly tied between terminals number 3 and number 14 on yoke is now re-located to a terminal strip on bottom of chassis. One side of C701 is now connected to the unfiltered boost source, the electrical junction of C514, R521 and terminal number 2 of horizontal output transformer. The other side of C701 is returned to terminal number 14 on yoke.



B&K MODEL 970 RADIO ANALYST

SERVICE AM & FM AUTO AND TRANSISTOR RADIOS AT A PROFIT!

NEW!

Jobs that used to be unprofitable now go so quickly that you can make good money handling them! There are millions of auto radios and transistor radios in the field—portables, auto and table models, plus hi-fi and communications equipment. Instead of turning them away, you can turn them into money-makers with the B&K Model 970 Radio Analyst.

The 970 is effective because it's *accurate* and *complete*. Using the famous B&K signal injection technique, this all-in-one instrument provides the required dc power, lets you test power and signal transistors in and out of circuit; generates RF and audio signals, and includes a rugged, accurate VOM. Four functions in one compact package—with solid state reliability, B&K professional quality.

LOW INVESTMENT—QUICK RETURN

See your B&K Distributor or write for Catalog AP22-R

Net \$199⁹⁵

FEATURES:

BUILT-IN POWER SUPPLY

Auto Radios—High current, low-ripple, for transistor, hybrid, and vibrator types.

Transistor Portables—1½ to 12 volts for battery substitution—plus separately variable voltage tap for bias.

QUICK AND ACCURATE TESTING OF POWER AND SIGNAL TRANSISTORS

In-Circuit—stage by stage DC signal injection and sensitive metering of power supply current.

Out-of-Circuit—Direct Beta and Leakage meter scale readings. Easy balancing or matching.

VERSATILE SIGNAL GENERATORS

RF Generators—provide broadcast and IF frequencies for both AM and FM bands.

Audio Generator—for AM or FM modulation of the RF signals, and for troubleshooting audio circuits.

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Volt-OHM-Milliammeter—with rugged, taut band meter—provides correct ranges for easy, fast servicing of all home and auto radios, as well as transistor portables.



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at last...
instant color patterns
at your finger tips...
zero warm-up time



THE ALL NEW SENCORE CG135 DELUXE TRANSISTORIZED COLOR GENERATOR

The big push is on in Color TV. Equip yourself now with the new, solid state Sencore CG135 and cash in on the zooming volume of new service business as Color-TV booms! Instant, service-ready RCA standard color bars, cross-hatch, white dots and individual vertical and horizontal bars enable you to set up or trouble-shoot more Color TV sets per day; earn top money in this fast growing service field. It's an analyzer too: Color gun interruptors, unmodulated video for chroma circuit trouble isolation and unmodulated sync pulses to keep Zenith receivers in sync for this test, make color trouble shooting a snap. Sturdy all-steel construction for rugged, heavy duty in the field or shop. Another Best Buy in profit-building service instruments from Sencore at

\$149⁹⁵

COMPARE THESE FEATURES: SEE WHY THE CG135 IS IN A CLASS BY ITSELF

- Solid state construction employs high priced GE "Unijunctions" to develop six "jump out proof counters" that guarantee stable patterns at all times with no warm-up
- Standard RCA licensed patterns as shown on schematics throughout the industry
- Handy universal color gun interruptors on front panel
- Lead piercing clips insure non-obsolescence
- CRT adaptors optional
- Crystal-Controlled 4.5mc Sound Carrier Analyzing Signal to insure correct setting of fine tuning control
- RF output on Channel 4 adjustable to Channel 3 or 5 from front of generator when Channel 4 is being used
- No batteries to run down; uses 115 V AC
- Less than one foot square, weighs only 8 lbs.

professional quality — that's the difference!

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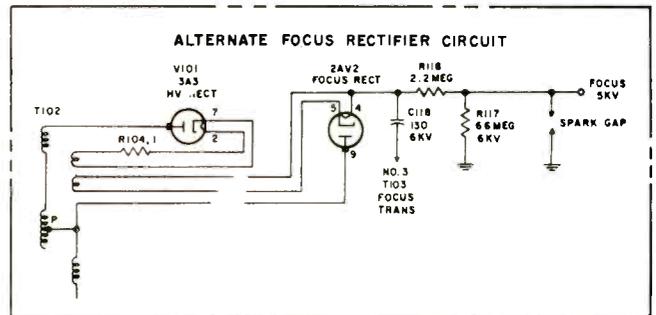
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TECHNICAL DIGEST

MAGNAVOX

Color TV Chassis 45 and 904 Series — Production Change

A production change has been made in both the 45 (21 in.) and T904 (25 in.) series color TV chassis which incorporates a tube-type focus rectifier. A partial schematic diagram illustrating this circuit is shown. Your attention is called to the fact that the high voltage transformer used in



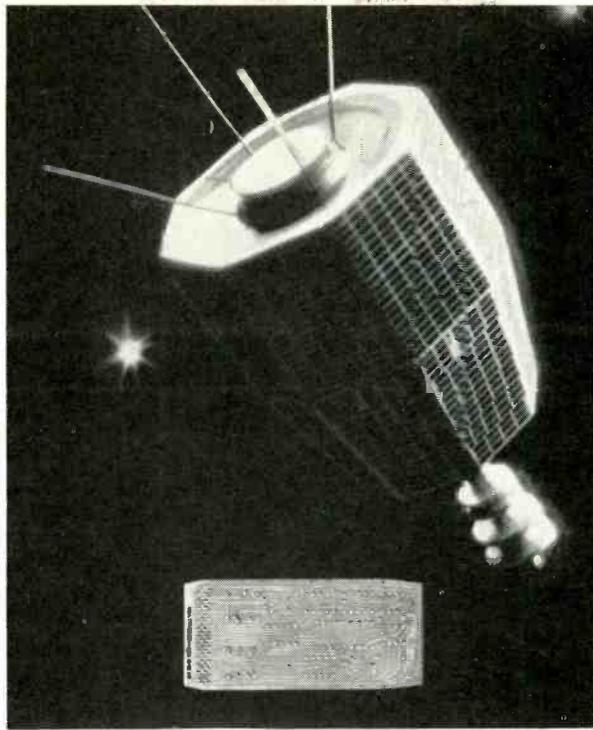
chassis with the 2AV2 focus rectifier has been changed, to provide the additional filament winding needed. Part No. for the new HV transformer used in the 45 series chassis is 361084-2. For the T904 chassis the part No. is 361138-3. These transformers can be used as service replacements in the earlier versions, if desired. Your attention is also called to the fact that some type 12HG7 tubes have been used in production on these chassis in place of the 12GN7 video output tube. These two tube types are directly inter-changeable.

PHILCO

Color TV Chassis 15M91 — Production Change and Part Omission

The 6BK4 high voltage regulator tube cap and lead assembly, used on the 15M91 color television chassis, has been changed in production to a larger type, part number 41-4367-1. This part number is now the recommended field replacement. The new cap and cable assembly is recommended for field replacement for M-line 14M90 and 14M91 chassis, L-line 13L80 and 13L80U and K-line 12L80 and 12L80U color television chassis.

It has been found that a 0.01 μ f 500v disc isolating capacitor was omitted from early production 15M91 color television chassis. The omission of the disc capacitor does not affect set performance and was intended for circuit isolating purposes. As such it adds protection to the perma circuit panel should arcing occur in the high voltage section. When servicing any 15M91 chassis check to be sure that the capacitor has been installed. The capacitor is connected to pin 8 of socket J1, the convergence coil socket. It is in series with the purple lead which runs along the copper circuit side of the chroma panel to lug M36. If the capacitor is missing, unsolder the purple lead from pin 8 of the convergence socket and insert the capacitor in series with the lead and the socket pin 8. Tape the lead end of the capacitor for insulating purposes.



SOLID RCA CIRCUIT DESIGNED FOR RELAY

RELAY uses Solid RCA Circuits.



CHROMA CIRCUIT DESIGNED FOR RCA VICTOR COLOR TV

RCA Victor Color TV uses RCA Solid Copper Circuits.

Why?

RCA Solid Copper Circuits won't come loose. Won't short circuit. Won't go haywire. They're the Space Age advance over old-fashioned "hand wiring."



"THIS MATTER'S VOICE"



The Most Trusted Name in Electronics

TM&©

"TAKING THE COUNTRY BY STORM!"

THE ALL NEW IMPROVED SENCORE TC136 MIGHTY MITE IV



Now checks them all including Compactrons, Novars, Sylvania 10 pin, Nuvistor, plus the new 10 pin tubes by Amperex and Mullard (now being used in many of the new color TV receivers) such as . . .

- 5U9, 5V9, 5X9, 6U9, 6V9, 6W9, 6X9, 6Y9, 8U9, 9V9, 11Y9, 16Y9, ECF200, ECF201, and EF1200

Plus . . . over 1200 foreign tubes, not checked by other checkers, giving you a total of more than **3,000** tubes in all. In a nutshell, the Mighty Mite is so popular because it checks . . .

- **GRID LEAKAGE** — at sensitivities of over 100 megohms or less than one half microamp of grid current. Picks out the ones other checkers miss.
- **EMISSION** — puts each tube under its full rated load, just like it's used in the TV receiver, to give you a true and accurate check on the quality of the tube.
- **SHORTS** — picks out true shorts using the Sencore "stethoscope" approach, testing each tube element individually.

With These New Exclusive Mechanical Features . . .

- New third hand plastic set-up booklet holder. Keeps the set-up booklet open to the right page for easier and speedier set-up and testing.
- New hinged cover to speed servicing; cover easily removable if desired.
- New taut band meter: gives you a burn out proof, stick proof, durable meter movement. If every check is made backwards, Sencore guarantees you can't damage the meter, Tube, or tester even with a shorted tube.

Why don't you see your Sencore distributor today for your Mighty Mite, and join the more than 30,000 Mighty Mite users that make this America's Number One portable tube checker. All these features are yours, and the Mighty Mite still sells for only . . . **\$74.50**

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RCA VICTOR

TV Chassis KCS153—Video IF Stages Circuit Operation (See TEXFAX Schematic No. 959)

The three picture IF amplifier stages of the KCS 153 employ NPN transistors in the common emitter circuit.

Standard 40 Mc frequencies are used with the picture carrier at 45.75 Mc and the sound carrier at 41.25 Mc; traps are provided at 47.25 and 41.25 Mc (adjacent sound and accompanying sound). The collector circuits are tuned and impedance-matched to the input of each succeeding stage. At the second detector approximately 1.5 v of video is developed for the video amplifiers.

A special input circuit is used in the KCS 153 which provides for coupling and matching of the tuner output to the first IF amplifier. Adjacent sound (47.25 Mc) is attenuated in this circuit by a "T" notch filter. A tuned circuit is used at the collector of the 1st IF to couple to the base of the 2nd IF transistor. This circuit is parallel resonant and matches the base of the next stage by a resistive "tap" — this transformer is referred to as an Rx transformer. A 10:1 stepdown is obtained in this transformer.

Coupling circuits between the 2nd and 3rd IFs is similar to that of the 1st and 2nd IFs. The output of the 3rd IF is tuned by a transformer with separate primary and secondary windings giving a 2:1 stepdown to match the 2nd detector to the 3rd picture IF collector.

The 2nd detector is "elevated" from ground to satisfy the base bias condition of the first video amplifier. An additional feed from the 30 v B+ supply insures that the 2nd detector is not forward biased by the "elevating" voltage.

AGC is applied to the first IF amplifier by way of the RF amplifier operating as a dc amplifier. This is reverse bias which uses the cut off characteristic of the first IF amplifier. Attenuation of about 35 db is possible from AGC action on the 1st IF and an additional 35 db is introduced on strong signals in the RF amplifier.

Basic alignment procedure is to first, set the 47.25 trap, then adjust the mixer output and IF input for correct response, then the 41.25 trap is adjusted. The inter-stage transformers are then peaked at 44.5 Mc. Over-all response is then checked with possible touch-up of the 2nd IF collector transformer T207. Bias on the first IF can be set for 3.25 v with no signal or for a condition which can be viewed on the picture tube by tuning in a medium strength signal, then adjust the bias for the appearance of noise, then back off until noise just disappears.

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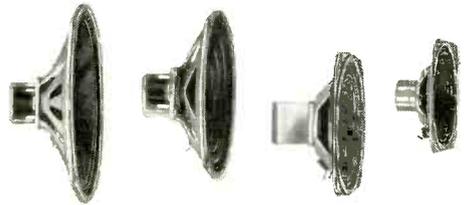


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ELECTRONIC TECHNICIAN

WHAT'S NEW IN 1966 TV SETS

Color circuit developments and solid-state
circuitry highlight advances in new-year sets

■ A larger variety of color CRT sizes and more solid-state circuitry highlight the 1966 TV lines. The color line features 19, 21, 23 and 25 in. CRTs and RCA is furnishing 15 in. samples to other manufacturers. G-E expects an 11 in. color portable on the market by Christmas. All color CRT manufacturers are using rare earth phosphors.

Increased color TV programing will probably place color CRTs in temporary short demand but this will no doubt relax as Philco, Admiral, Motorola and others increase production.

Basic 1966 monochrome circuitry is very similar to 1965 except for fully solid-state sets. A number of changes have occurred in color circuitry, however.

Although TV reliability has improved in recent times, color TV appears to offer tremendous potential for well trained and equipped technicians and the overall view indicates that the last quarter of 1965 will be another banner color period.

Emerson

Emerson's chassis No. 120771 is a transistorized 11 in. portable. It contains 19 transistors, thirteen diodes, a 1X2 HV rectifier and 11JP4 CRT.

Four transistors function in the vertical scan section (Fig. 1). An emitter follower (Q15) vertical sync amp supplies negative vertical sync pulses at a low impedance to the oscillator (Q16) base. Under no-signal conditions the oscillator transistor conducts slightly because of its high positive emitter potential (almost

24v) and the slightly less positive base potential (reduced by R118, R120 and R107). This condition continues until Q16's base current charges capacitors C72 and C75 — cutting off the transistor. The negative sync pulse from Q15 triggers Q16, causing a short across C74 which discharges through the collector circuit and reflects as a negative pulse in the collector circuit of the vertical output transistor (Q18). This pulse is fed back to Q16's base through R114 and C75, holding this transistor on until the base current again charges C72, turning the transistor off.

RC network, consisting of C74, C75, R57C, R111, R113, R57B and R117, determines the basic sawtooth waveform shape. This waveform is further modified by applying a parabolic waveform, developed by C73, to Q17's emitter through R111 and R57C. The waveform's phase and amplitude can be adjusted with R57C to obtain proper vertical linearity.

Transistor Q17 is an emitter follower which drives the output transistor (Q18). The vertical size control (R57B) in Q17's emitter circuit can vary the pulse amplitude to Q18's base. This stage provides current for the vertical deflection coils and feedback for the vertical oscillator. Choke L9 provides a collector dc component ground shunt — preventing dc picture shift. The collector circuit diode switches a 470 Ω resistor across L9 during vertical retrace to keep the pulse within collector rating. The pulse current through this resistor provides a convenient vertical blanking voltage source.

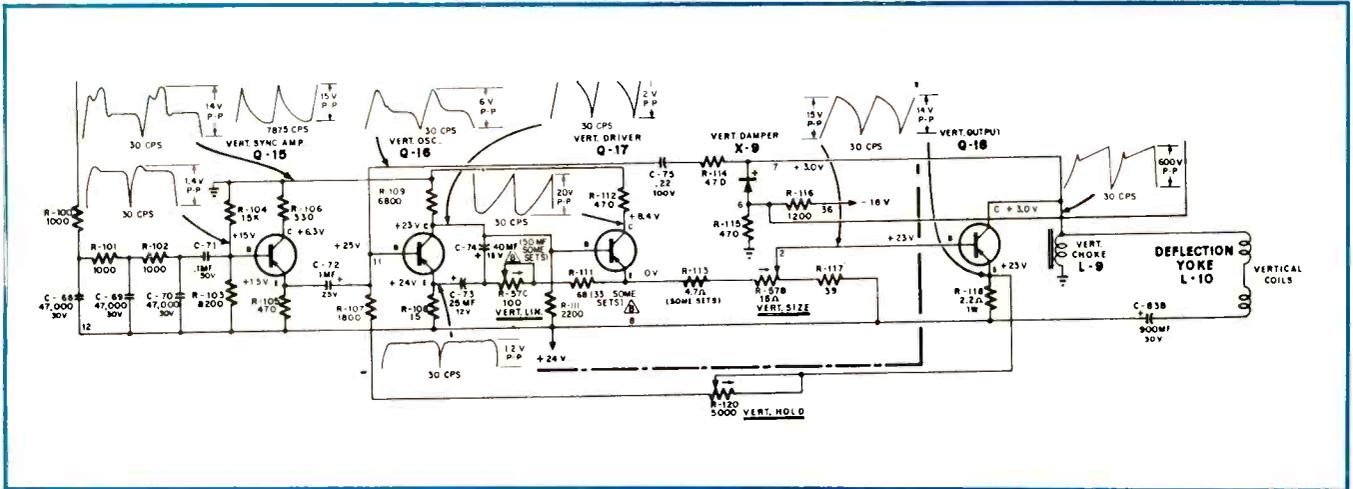


Fig. 1—Vertical deflection circuits used in Emerson chassis 120771.

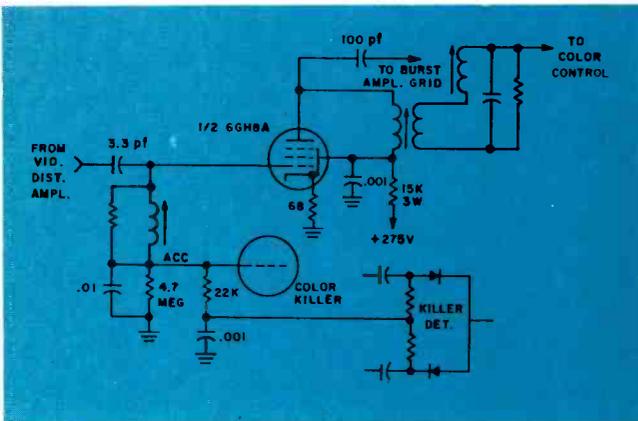


Fig. 2—First bandpass amplifier, Philco 16QT85 color chassis.

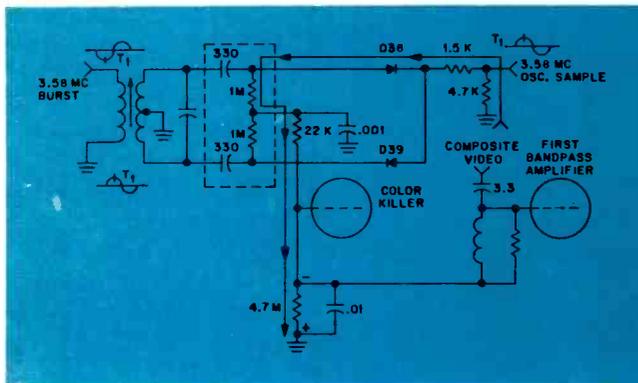


Fig. 3—Philco's automatic chroma control circuit.

Philco

The Philco line includes two hybrid color and one hybrid monochrome chassis. Tuners IF strips, the AGC and video driver stages employ transistors.

Solid state circuit descriptions given here cover color chassis 16QT85 but the same circuitry, with a few minor differences, is used in the 16JT26 monochrome chassis. The 19 in. 17KT50 color chassis is very similar to 16QT85. The 16M91 21 in. color chassis is the same as the 1965 15M91.

Most color circuit changes involve tube types. Two circuits affecting the chroma section were added, an additional bandpass amplifier and ACC (automatic chroma control).

The 16QT85 has two bandpass amplifiers. This is required because the video detector output is lower than on previous models. Input is to the distribution amplifier grid (Fig. 2). A 3.3 pf capacitor eliminates lower composite signal frequency components. The grid is returned through one tuned circuit to a dc point varied by the color signal amplitude.

In addition to the tuned grid, the output circuit double-tuned transformer improves bandpass response. Output is through the color control to the 2nd bandpass amplifier. Another output is taken directly from the burst amplifier plate.

Automatic chroma control. The automatic chroma control operates like the killer detector in previous models. The difference is that the ACC controls the first bandpass amplifier as well as the color killer.

Burst at the transformer appears as two signals of opposite phase (Fig. 3). Phase of the oscillator sample is opposite D38's anode signal. This causes current flow during the half cycle, including time T_1 , in the direction indicated by arrows in Fig. 3. This causes a voltage drop across the 4.7 M resistor — a common grid return for the color killer and the first bandpass amplifier.

During the other half cycle D39 does not conduct so long as the burst signal is present since the anode and cathode are near the same potential. The only current flowing through the 4.7 M resistor is allowed by D38 during the half cycle which includes T_1 .

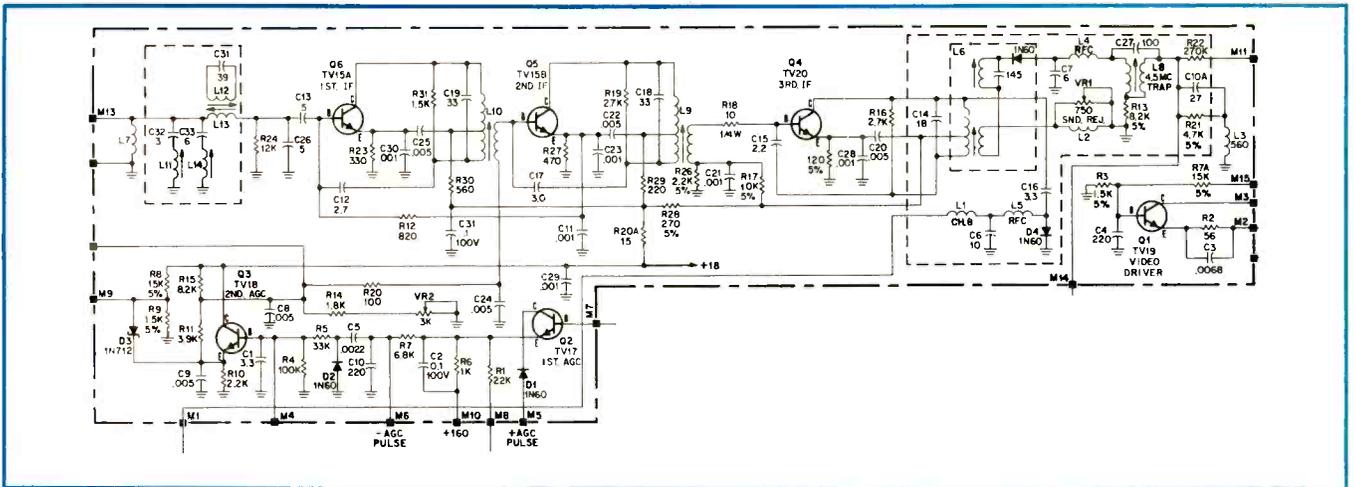


Fig. 4—IF and AGC system used in Philco's hybrid chassis.

A killer cathode circuit threshold control (not shown in Fig. 3) is used to adjust the color killer fixed bias for color signal cutoff level. At this point the first bandpass amplifier will be operating — controlled by the voltage drop across the 4.7 M resistor. This, in turn, is determined by burst amplitude.

If the burst amplitude decreases, the current through D38 will also decrease. This causes a decrease in voltage drop across the 4.7 M resistor. This reduces the first bandpass amplifier bias, increasing its gain to make up for the weaker color signal. Conversely, if the burst signal increases, the current, voltage drop and bias will increase and the gain would decrease.

With no burst, current will flow through both diodes on alternate 3.58 Mc oscillator sample half cycles. Since this is a sine wave — the only signal present — currents will be equal in amplitude and flowing in opposite directions through the 4.7 M resistor. The net result is no voltage drop. This brings the color killer out of cut-off and into operation. Since the killer function is to cut off the second bandpass amplifier, the accompanying first bandpass amplifier bias decrease is of no consequence.

IF and AGC systems. The IF amplifier and AGC systems use solid-state components (Fig. 4). All transistors are encapsulated silicon planar types.

Standard link coupling is used from the tuner and two series traps provide adjacent sound rejection. An absorption sound trap is also used.

The 1st IF is a TV15A transistor. The stage gain is controlled by a voltage developed by the 2nd IF. All stages are bifilar transformer coupled. The 2nd IF uses a TV15B. Although the first two stages use similar transistors, TV15A and B, they have somewhat different AGC control characteristics — TV15B in the 2nd stage has a higher B+ range. The AGC amplifier controls the 2nd stage directly and the third stage is designed to handle large signal levels. Signal for the 2nd sound detector is taken from the output transformer primary and the output transformer secondary contains an accompanying sound trap. Following this is the 2nd video detector and a 4.5 Mc sound trap. Both detectors use 1N60C diodes.

Gated AGC develops control voltage from true

carrier level rather than a video average and the gate stage is transistorized. A 1N60C diode AGC rectifier follows the gate. A transistorized dc AGC amplifier provides necessary control power and a zener diode tuner AGC delay.

The 3rd video IF amplifier. This stage does not depend on other stages for control. The transistor is specifically designed for low noise and high gain. Since it was not designed to be controlled by AGC, it cannot be substituted in the 1st or 2nd IF stages. It is a common emitter, tuned input and output, amplifier. The emitter is bypassed and returned to ground through a 120 Ω bias stabilization resistor. The collector B+ feed point — output primary tap — is bypassed to the emitter to provide a common ground and prevent "ground loops."

Base bias is determined by the 10K and 2.2K B+ divider resistors. The 2.2K resistor is bypassed to place the lower end of the transformer secondary at ac ground potential. A 10 Ω resistor, in series with the base, prevents parasitic oscillation. Turns ratio of the interstage coupling transformer is designed to match the output and input impedance of the stages coupled. An 18 pf capacitor tunes the primary. The 2.7K resistor loads the coil, lowering the "Q", to give the required broad response. Each IF stage is neutralized through tapped windings and small capacitors — 2.2 pf in the 3rd IF. A separate sound detector is fed directly from the collector through a 3.3 pf capacitor.

AGC control of 2nd video IF amplifier. The 2nd video IF is similar in many respects to the 3rd video IF. The coupling transformer's primary is tuned by a 33 pf capacitor and loaded by the 2.7K resistor for broad response. The collector B+ feed tap is bypassed to the emitter. Neutralization is provided by a 3 pf capacitor.

Notice that the base is not biased by the normal divider circuit. It is returned to the IF AGC through a decoupling circuit — a 100 Ω resistor and 0.005 μ f capacitor. This AGC point is now the external source of base bias. Also note that the emitter's resistor value has been increased to 470 Ω .

Let's examine the circuit under *no signal* conditions. The AGC's static value establishes a base potential of approximately 2.4v, a collector current near

4ma and emitter potential of 1.8v. This is the initial bias condition and places the transistor just about on the peak of the "gain-collector current" curve; maximum gain capability at zero signal.

These transistors are designed to operate with "forward" AGC; that is, *increasing* collector current causes a *decrease* in gain. As signal is received, the AGC voltage will rise from its static level causing an increase in base voltage, base-emitter bias and collector current. Since this transistor is operating — under no signal — at maximum gain, any change in collector current will cause a *reduction* in gain.

The range of AGC control on this stage causes the collector current to vary between approximately 4ma (at low or zero signal) to about 10ma (under strong signal at minimum gain). Thirty db gain control is achieved through control of collector current.

Several other reactions, however, contribute to stage gain reduction under AGC. As the transistor is biased to conduct heavier, because of signal increase, both input and output impedances are reduced. This causes two separate but related actions. First is a power loss caused by mismatch — the tuned circuit no longer matches the lowered impedance (or resistance) of the transistor's input or output. This power loss is greatest in the output circuit, but both contribute. A related loss is caused by the tuned circuit being shunted by the lowered transistor resistance, this causes a reduction in circuit "Q" and again a power loss.

These circuit loss factors account for an additional gain reduction of 30 db, giving a total controlled gain reduction per stage of 60 db between no signal and very strong signals.

It is true that the transistor's output capacity also varies with collector current (more accurately with collector-base reverse bias voltage). Capacitance change over the operating range is only a few tenths of one pf, however. The fairly large 33 pf capacitor, to tune the IF transformer, effectively swamps the transistor variations and prevents the pole from shifting. The bifilar coupling transformers further assist in maintaining pole stability.

Stage gain control under varying signal conditions in the 1st video IF is quite similar to the action just described. The major difference between the AGC action on the 1st and 2nd IF stages is the source of control voltage. The 2nd stage is controlled directly by the AGC. The first stage is indirectly controlled by the 2nd stage.

As forward AGC is applied to the second IF base the emitter current increases — causing an increase in emitter voltage (IR drop across the emitter resistance). This emitter voltage will be in proportion to the emitter (or collector) current, which is dependent on bias (AGC) — a function of signal strength. The 2nd stage emitter voltage, therefore, reflects the AGC condition. AGC-wise the 2nd IF acts as an emitter follower. This arrangement reduces power requirements from the AGC amplifier.

The 1st stage base is returned to, and is controlled by, the 2nd stage emitter voltage. An increase in AGC will cause an increase in 1st stage base voltage. This

causes the 1st IF collector current to increase, reducing stage gain as previously described. A further gain reduction will also be obtained by the mismatch — collector to first interstage pole — and lowered "Q" of the same transformer caused by the current increase. Approximately the same gain control range is attained — 60 db total.

The purpose of the small 5 pf input coupling capacitor to the 1st IF base, is to isolate the traps and input pole from the changing transistor parameters under different signal and AGC conditions.

RCA Victor

The monochrome line includes six chassis from last year plus three new ones — KCS153, 154 and 155. The KCS153 is fully transistorized. The chassis continued from 1965 models are KCS136, 142, 144, 148, 149 and 152. All are used in portable sets except the KCS136 which appears only in table models and consoles.

The KCS154. This chassis is used in 21 in. portables and is power transformerless with three IF stages and a 20,000v 2nd anode potential. A separate winding on the width coil provides horizontal blanking (Fig. 5). Vertical blanking is also included.

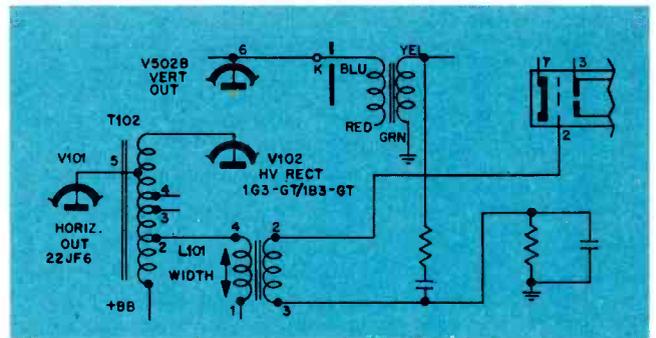


Fig. 5—Horizontal and vertical blanking RCA Victor chassis KCS154.

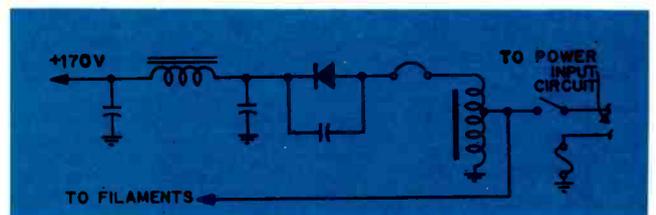


Fig. 6—Power supply, RCA Victor KCS155 chassis.

KCS155. This is a series-string filament set with an auto-transformer low voltage power supply (Fig. 6). A half wave silicon rectifier produces 170v B+. Output of a 15KY8 vertical oscillator-amplifier (Fig. 7) is coupled direct to the output transformer. Vertical and horizontal pulses are coupled to the CRT grid for vertical and horizontal blanking.

A tap on the high voltage transformer is connected to a grounded four-capacitor series wired circuit with terminals at the junction points of the network. This circuit can be adjusted to obtain proper width (Fig. 8).

KCS153. This is a fully transistorized chassis, except for HV rectifier and CRT, used in a 12 in. portable.

Most of its circuitry is mounted on a single printed board, while the power transistors and damper diode are on an auxiliary metal chassis which serves as a heat sink.

Horizontal circuits. The horizontal circuits in the KCS153 perform functions comparable to tube-type circuitry. Linear deflection current is provided in the horizontal yoke windings. In addition, high voltage is produced for the 2nd anode and intermediate voltage (240v) for the accelerating anode. Other circuit requirements — horizontal blanking, automatic frequency control and circuit component protection—are accomplished by the horizontal circuits.

Incoming horizontal sync is applied to the phase splitter NPN transistor with equal load resistors in the emitter and collector; this produces sync pulses of equal and opposite polarities for the AFC detector (Fig. 9).

The AFC circuit uses two diodes which compare the incoming sync with a reference waveform from the horizontal output. When both agree in frequency

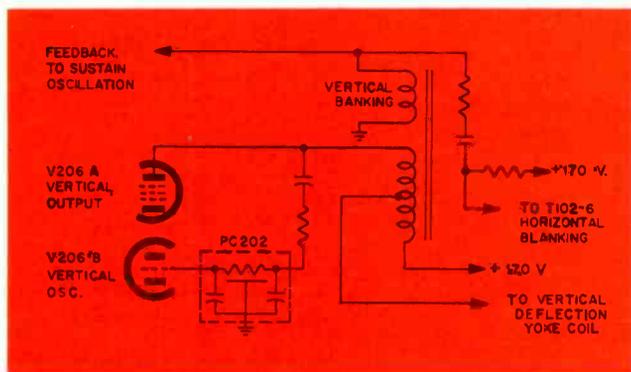


Fig. 7—Vertical output and blanking RCA Victor KCS153.

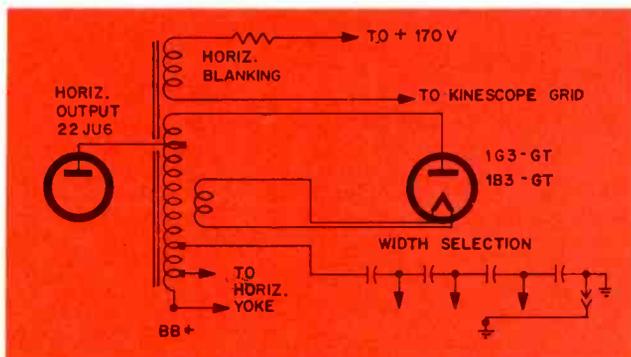


Fig. 8—KCS153 width selection circuit.

and phase, no correction voltage results; when they differ, a positive or negative voltage results and is applied to the horizontal oscillator to maintain sync.

The horizontal oscillator originates the 15,750 cps waveform to develop a sweep waveform in the horizontal output stage (Fig. 10). A grounded-emitter NPN blocking oscillator is used here and it provides a square wave output. Within certain limits, the frequency is automatically adjusted by the AFC correction voltage.

Horizontal driver. An additional stage, the "horizontal driver" (Fig. 11), takes the oscillator-produced square wave, amplifies it and shapes it to become the required waveform suitable for driving the horizontal

output stage. This waveform has a very steep rise at the start, then becomes a block 18 μ sec in duration.

Horizontal output circuit. A grounded-collector PNP is used in the horizontal output circuit (Fig. 12). The output transformer, yoke and damper form the emitter load. This stage goes into conduction at approximately the center of the sweep and produces a linear current rise for the remainder of the sweep when it is suddenly turned off by the input waveform from the driver. The familiar "flyback" pulse then occurs which constitutes retrace and brings the damper into conduction. The damper then conducts for the first half of the sweep, decaying to zero current at approximate center when the cycle repeats.

High voltage is produced by the flyback pulse occurring during retrace time. The pulse is rectified by a 2BJ2 tube and used as the CRT ultor voltage.

The flyback pulse at the output transistor emitter is rectified, filtered and used on the accelerating anode (G2).

Additional "pick-offs" from the horizontal output transformer supply the reference pulse for AFC comparison and the keying pulse for AGC.

The output transistor is protected from excessive current with a current limiting transistor. A width coil is adjusted for proper scan size and this coil affects yoke winding efficiency.

Color chassis. The color line consists of three chassis — CTC16X, CTC17X (continued from 1965) and the new CTC19. The 16X is used in 21 in. receivers and the 17 is used in 25 in. sets. CTC19 has a 19 in. rectangular CRT. All CRTs in the line contain rare earth phosphors.

Fig. 9—AFC circuit RCA Victor KCS153.

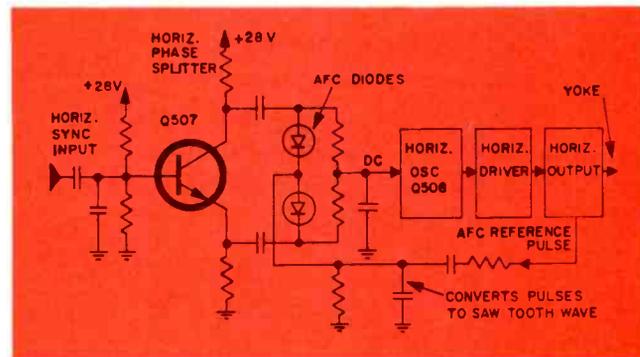
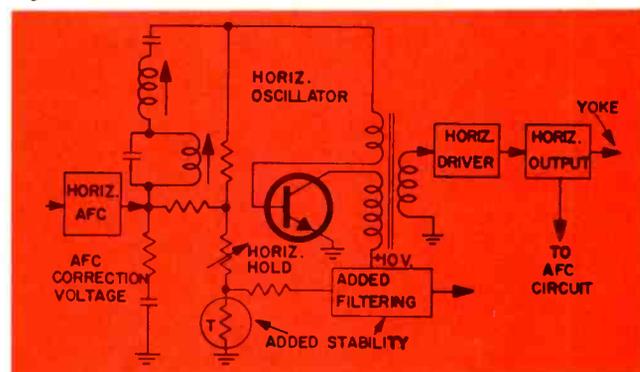


Fig. 10—RCA Victor KCS153 horizontal oscillator.



In the CTC16 chassis, 6GY6's were used as color demodulators. In the CTC16X, 6HZ6's are used.

A type 6EW6 (7-pin miniature) was used in the burst amplifier stage in the previous CTC16 color chassis. The new chassis has a 6JC6 (9-pin miniature frame-grid) tube in this stage. Circuitry is basically similar to that in the CTC16. The only change is in the screen circuit — it returns directly to the 270v B+ source to supply correct operating potential to the new tube. The frame-grid tube gives higher gain to the burst signal (approximately 50 percent more than available with the 6EW6 circuit).

The 1V2 focus rectifier (used in several previous color chassis) has been replaced by a 2AV2. The last change in the tube complement of the CTC16X, in relation to last year's CTC16, is a 3CA3 high voltage rectifier. Although both high voltage and focus rectifier tubes are different from those used previously, the circuitry is similar to that in the CTC16. With these two tubes the filament dropping resistors in both stages have been deleted since they are unnecessary.

CTC17X. Basically, this chassis follows closely the CTC17 introduced last year. A frame-grid 6JC6 is also used as burst amplifier. The 1966 line uses the chassis in nine console models.

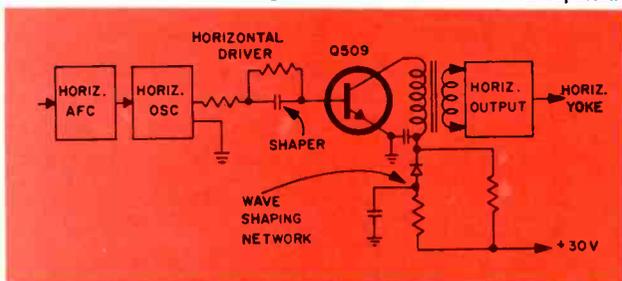
Refinement of the side pincushioning circuit makes a control unnecessary. Closer design tolerance in the side pincushioning transformer made the change feasible and fixed-value components are used in the circuit.

The focus circuit is basically that used in the CTC17. The circuit is slightly revised, however, to provide arc protection. A VDR now shunts the majority of the focus transformer windings. This component will protect the focus transformer from damage if arcing occurs in the focus rectifier.

An NPN grounded-base transistor, with the emitter functioning as the active signal input element, provides vertical blanking. (Fig. 13.) The stage works as follows: A positive vertical pulse from the vertical output transformer is coupled to the emitter. The transistor is biased to conduct during active scanning time. But during the time that the positive vertical pulse is on the emitter (during retrace) the transistor is forced into cutoff.

Since an emitter input signal is not inverted in a common base circuit, a positive pulse also appears at the collector. Hence, the transistor acts as a switch. During scanning time it conducts and during vertical retrace it is cut off. During cutoff, the collector voltage increases to near the 26v source potential.

Fig. 11—Horizontal driver stage used in RCA's transistorized portable.



The positive voltage to the diode's anode causes the diode to conduct. Current flows from ground up through R333, through the diode to the positive source, causing a voltage drop as shown.

The positive voltage increase at the 6FL8 grid causes more conduction during the time indicated by the shaded portion of the vertical pulse. (The waveform shown at the video stage input indicates the vertical blanking interval and the vertical sync pulse.) The positive swing from the blanking circuit at the 2nd video grid alters the vertical sync level in a manner similar to that shown in the waveform at the grid.

Actually, during retrace time, the station sync level is increased by blanking circuit action. The output signal available at the plate is, of course, negative going — modified to include the additional blanking level. The block insert (Fig. 13) shows the result on the CRT cathodes — after inversion and amplification in the 3rd video amplifier. The additional blanking level appears during vertical retrace time and the additional positive signal impressed on the CRT cathodes is sufficient to insure complete vertical retrace blanking. ■

Fig. 12—Horizontal output circuit, RCA Victor KCS153.

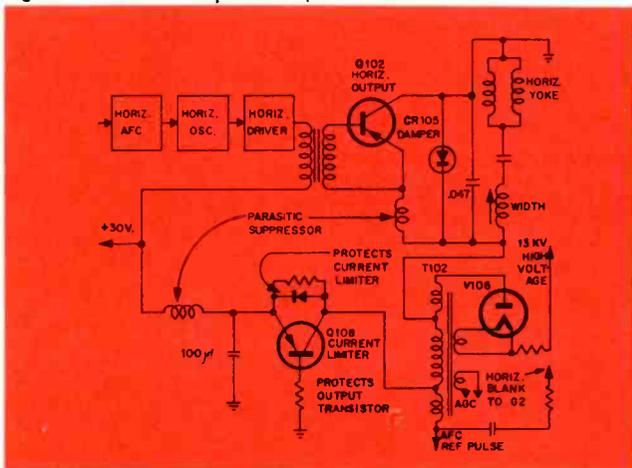
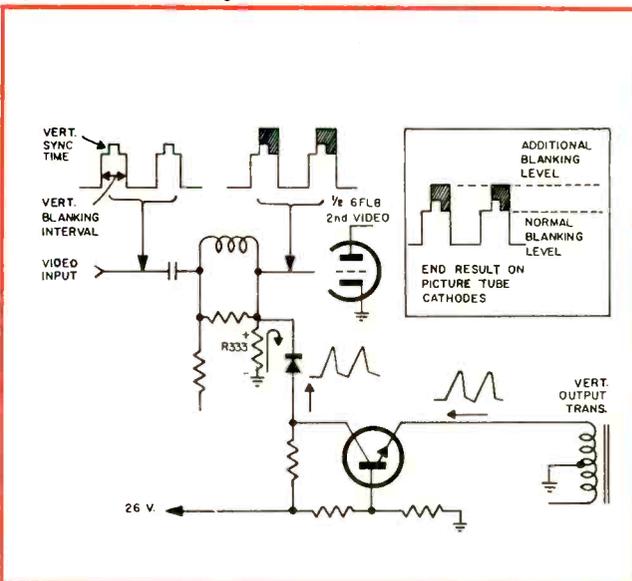


Fig. 13—Vertical blanking CTC17X RCA color chassis.



MOTOROLA'S 23 INCH TS914 COLOR CHASSIS

The first article in a continuing series covering various color TV chassis from Electronic Technician's Teklab

■ The trend toward compactness is reflected in the Motorola TS914 series. Its 19 tubes compare with 29 in previous chassis. A number of transistors and diodes also reflect another trend—toward the inevitable solid-state home entertainment package.

A 23 in. rectangular CRT, a power transformer and three IF stages make the chassis conform to average over-all modern design criteria. Nine different 1966 models use the chassis. A reference block diagram is shown in Fig. 1.

VHF and UHF Tuners

A pre-set fine tuned turret type VHF tuner is parts-referenced as TT390Y. A 6HQ5 serves as a neutralized triode RF amplifier and a 6HB7 as oscillator-mixer.

The UHF tuner, TT618, has an NPN transistor oscillator and an IN-82A diode mixer (Fig. 2). A 300Ω balanced antenna input provides a connection direct to coil L1 in the first antenna coaxial cavity. This cavity is coupled through an opening to a second antenna cavity. The mixer crystal is in the second cavity. Incoming signals are inductively coupled to the mixer circuit. A loop in the mixer circuit extends into the oscillator cavity and picks up energy from the oscillator. Capacitor C2 and coil L2 form a lowpass filter which passes the dif-

ference-frequencies through a coaxial cable into the VHF tuner.

Video IF

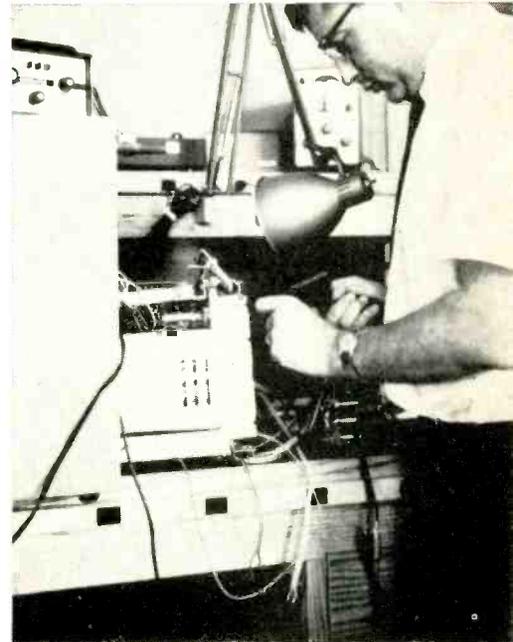
As shown in Fig. 3, the 3-stage IF has two 6BZ6's and a 6EJ7 with the first two stages stacked. B+ is applied to the 2nd IF plate and the 1st IF plate receives its B+ from the 2nd IF cathode. This allows AGC control of both stages. A sharp cutoff pentode in the 3rd stage has fixed bias without AGC control. Audio is taken from the 3rd IF plate and is fed to the 4.5 Mc 1st detector grid.

Video Amplifier

A 2-stage dc coupled video amplifier (Fig. 4) uses a 6DX8 pentode section (V6A) as a bootstrap amplifier. Output from the video detector is applied between grid and cathode. This low impedance output arrangement provides some gain and a no-phase-inverted signal. The brightness signal is taken from the cathode and fed through a delay line to the 2nd video grid.

Composite signal amplification takes place in the 1st video amplifier and sync information is removed at its plate. Transformer T104 couples the color subcarrier to the 1st color IF grid. This transformer is tuned to 4.1 Mc to produce the desired over-all color IF response.

A 6LY8 pentode section (V7A)



ET's technical editor, Quint Bocchi, 'looks-in' on the Motorola TS914 under-chassis.

performs as the video output. Contrast, brightness and video peaking are accomplished here. The tube's cathode resistance is varied by the BRIGHTNESS control and, hence, the tube bias. Contrast is obtained by varying the stage's ac gain with a large electrolytic capacitor in series with the center arm of the control.

Color temperature is set with BLUE and GREEN drive controls, connected in the plate. Vertical blanking is also applied to this stage.

Color IFs

The 1st color IF is a 6DX8 triode section (V16A Fig. 5). Signals are fed from T104, in the 1st video amp plate circuit, to the 1st color IF grid. This is a cathode follower biased through a 180Ω resistor (R901) and the ac load appearing across L900, a 3.58 Mc RF choke.

Color signals fed to the 2nd color IF stage are varied by the COLOR INTENSITY control connected from the top of L900 to

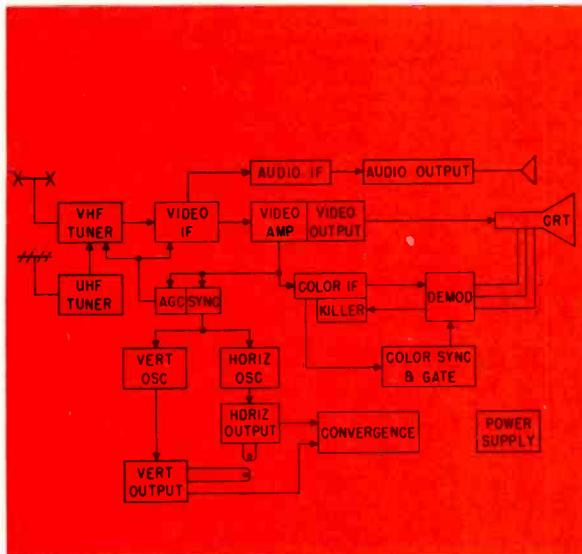


Fig. 1—Block diagram TS914 color chassis.

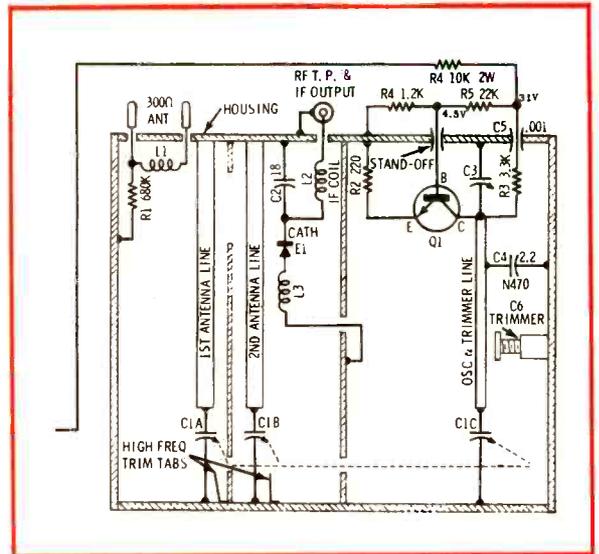


Fig. 2—UHF tuner.

ground. The plate tuning transformer assembly (T900) contains the phase shift networks which feed the color demodulators.

When the 2nd color IF tube conducts, the voltage drop across R910 is large enough to light a color indicator neon bulb.

V7B's (color killer tube) control grid is returned to the grid of the color oscillator section of the demodulator stage. Color killer bias is adjusted with the COLOR KILLER control.

When a monochrome signal is received, a negative voltage develops at the free-running oscillator grid. This voltage also appears at the color killer grid. The killer control is set so the tube will barely conduct on a monochrome signal. A 600v horizontal pulse is fed to the killer plate and when the tube conducts, C924 accumulates a negative charge. This charge is applied to the 3rd color IF tube grid—cutting the stage off. When a color signal is received, the greater negative voltage appears at the oscillator's grid. This increased negative voltage cuts off the killer stage—removing the negative voltage from the color IF grid and allowing the stage to operate normally.

A voltage divider (R908, 909 and 925) between plate load resistor, R910 and the color killer grid, gives a more positive action to the killer stake. When the 2nd color IF tube begins conducting its plate

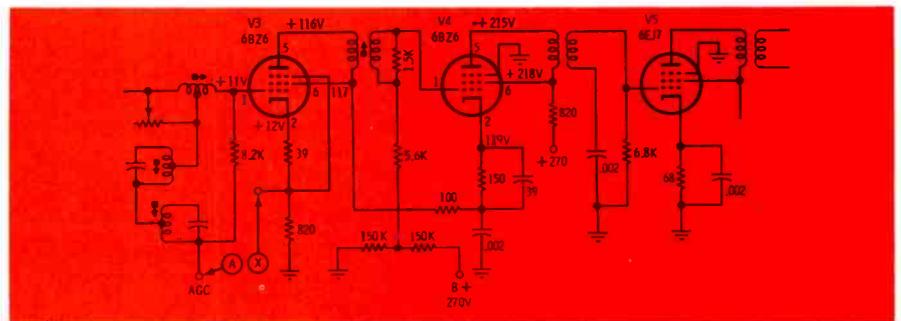


Fig. 3—Video IF stages used in Motorola TS914 chassis.

voltage is reduced. This reflects a lower voltage into the killer grid and reinforces the negative voltage received from the oscillator—resulting in a more positive killer stage action. By the same token, when the color stage is cut off, the opposite action takes place, resulting in more voltage to the killer grid. This enables the killer stage to conduct more positively.

Color Demodulators

The demodulator circuitry varies considerably from the type used in most other color sets we have checked. In demodulating the color signal, most other sets divide the carrier signal generated by the local oscillator into two phases 90 deg apart. Each carrier phase is then compared with the composite color signal which results in two distinct color signals. A different approach is used in the TS914. The incoming color composite is divided into two phases 90 deg apart and compared with a single phase of the oscillator

frequency with the same two distinct color signals obtained at the demodulator outputs.

The block diagram (Fig 6) demonstrates how the demodulation is accomplished. The cathode and the first two 6LE8 grids form the 3.58 Mc oscillator. The color sync signal is separated from the composite signal in the gating stage and is passed through the crystal filter to the oscillator grid. This sync signal locks the 3.58 Mc oscillator frequency in the proper phase relationship with the transmitted color sync. Composite color is fed in quadrature (90 deg out of phase) to the chroma grids of the tube. The R-Y output is taken from one plate and B-Y from the other. Variation in plate current in the two 6LE8 sections causes the screen current to vary at a rate dependent on both the R-Y and B-Y voltages—which results in screen grid voltage variation at the G-Y rate. The three varying voltages are applied to their respective CRT grids.

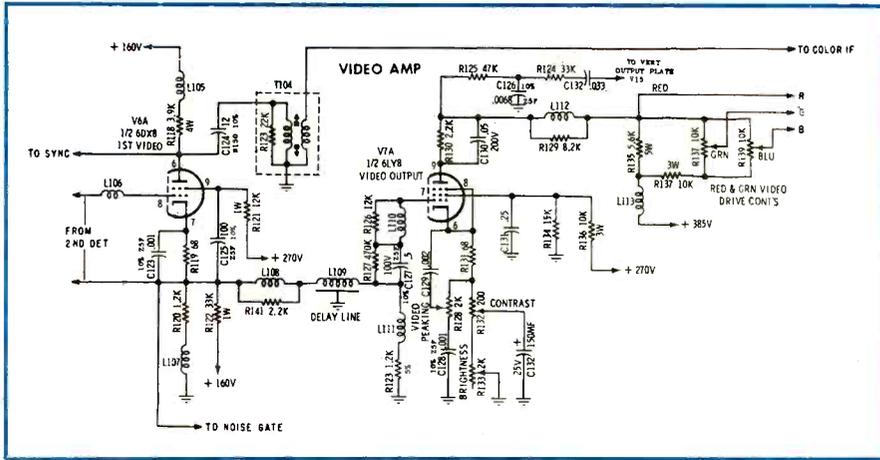


Fig. 4—Video amplifiers Motorola TS914.

Fig. 6—Block diagram color section Motorola TS914 chassis.

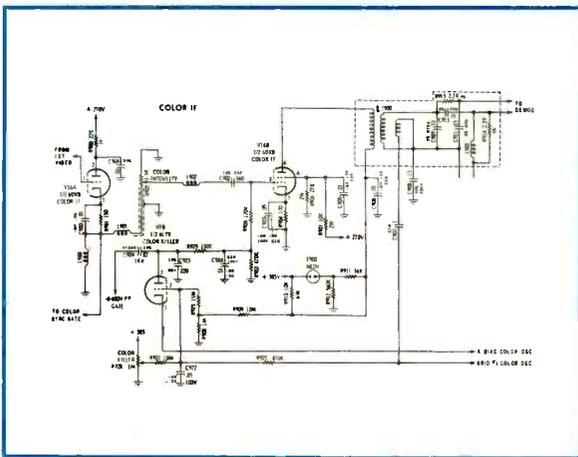
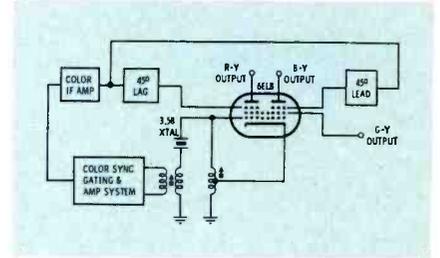


Fig. 5—First color IF and color killer.

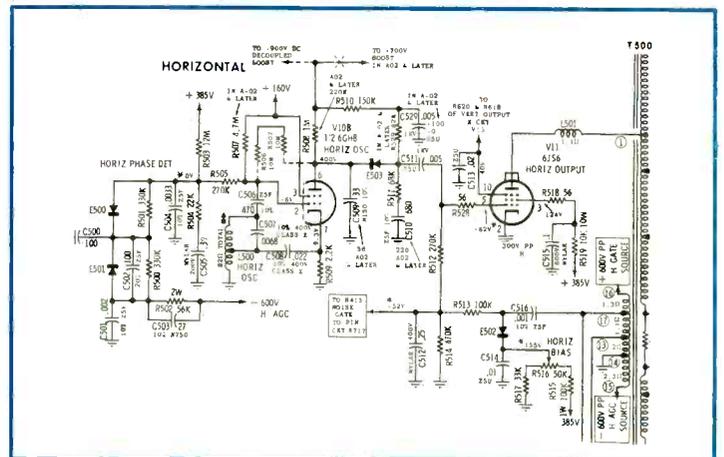


Fig. 7—Horizontal circuits TS914.

Horizontal Circuits

A sinewave horizontal oscillator (V10B) is used, with L500, C507 and C508 forming the resonant circuit (Fig 7). Capacitors C507 and C508 tune the tank circuit to resonance and provide feedback. Its output is coupled to the horizontal output grid (V11) through C511. Diode E503, connected in series with the oscillator output, cuts off the output tube during retrace. This tends to increase tube life.

No HV regulator tube is used. Regulation is obtained by controlling the output tube grid drive, hence maintaining stable picture width. This is done in the following way: A positive 300v pulse is applied to E502's anode, causing it to conduct and establish a negative voltage at the junction of R512, 513 and 514. This voltage determines the horizontal output grid bias. If the HV (27KV) tends to

increase, the pulse amplitude at the diode's anode increases and the negative voltage on the output tube increases. This reduces the horizontal output and the CRT HV in turn.

HV Circuits

A 3AT2 tube serves as the HV rectifier. Focus voltage is developed in a voltage divider network in the tube's output circuit. This method offers some regulation of focus voltage. The focus voltage will vary at the same rate as the HV and maintain good focus at any brightness setting.

Series connected diodes (E504 and 505) provide a constant voltage drop across R520, the HORIZONTAL CENTERING control. This stabilizes horizontal centering over a reasonable brightness range.

A forthcoming article will deal with some of the set's possible service and adjustment problems. ■

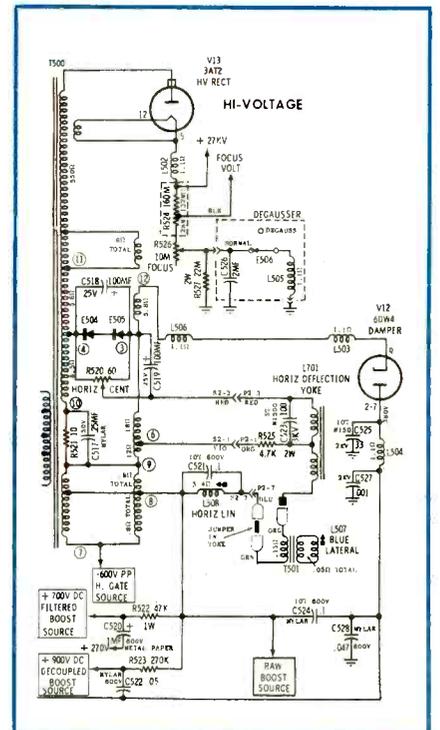
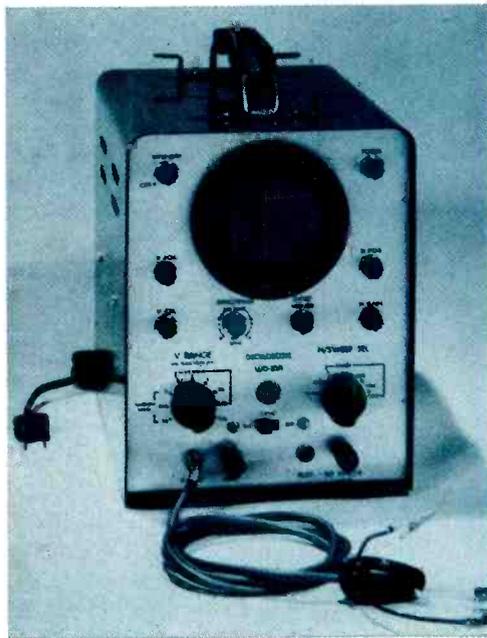


Fig. 8—High Voltage and focus circuits, TS914.

You and Your



Knight KN5005 (solid state) wideband scope lists frequency response from dc to 6 Mc. Sensitivity 0.05v/division linear over 8 divisions (2 in). It's priced at about \$425.



RCA W033A specifies a vertical frequency response (wideband) from 5.5 cps to 5.5 Mc flat within -3db. Deflection sensitivity: (Direct to vertical connector), wideband position, 0.10 RMS, 0.3 P-P v/in.

Sencore model 127 wideband scope specifies frequency response from 10 cps to 4.7 Mc and deflection sensitivity as 17 mv, plus or minus 5% volts RMS/in.



■ Last month we itemized a wide variety of jobs a scope can do and briefly reviewed, in a simplified way, some major and basic sections of the instrument. We will now probe a little deeper into some scope characteristics and qualifications—particularly those needed for color TV troubleshooting and repair.

Considerations

We have already seen that our present-day “work-horse” scope must have a vertical amplifier that gives high over-all gain and a reasonably flat, wideband frequency response — from dc or near dc to at least 4.5 Mc or higher. It could be said, then, that we are primarily concerned at this point with *gain* and *bandwidth*. To a lesser extent we are also interested in the amplifier’s input impedance, rise time, control conveniences and “extras” that make our work easier. These items will be discussed later.

Some technicians feel it is logical to ask, how much gain does a scope’s vertical amplifier need? But this question cannot be answered intelligently until we specify the input-signal amplitude and frequency — and it becomes even more complicated if the input signal is a complex waveform. Most engineering technicians would probably agree that a scope’s vertical amplifier should be able to display at least a 2-in. P-P waveform on the CRT screen when driven by the weakest input signal you plan to investigate.

Modern oscilloscope specifications seldom include vertical amplifier “gain” figures. There’s little point in specifying “gain” for a number of reasons. Hence,

Oscilloscope

PART II of a Series

Become acquainted with your scope's characteristics and if you're buying a new one, know what capabilities it must have to do the job you demand of it

by John Holmes

sensitivity appears to have become a more popular criterion. But even sensitivity must be specified over a given frequency range if it is to be significant.

Manufacturing research, development and design departments spend considerable time and money in efforts to produce high-gain, wide-band, flat-response vertical amplifiers at lower cost. But it would serve little purpose here to review the endless engineering considerations involved. Additionally, because manufacturers' specification standards vary, we must look for more immediate and practical guides to "guesstimating" our needs and the capabilities of a particular scope.

Experience tells us what a vertical amplifier that has a sensitivity between 20 and 50 mv/in. will provide adequately for most TV-radio, industrial electronic and average maintenance lab needs. The price, depending on accessories, conveniences and "extra" facilities, will run roughly from \$150 to about \$500. Manufacturing competitive factors being what they are today, what you get for your money at any point in this price range will not vary much from one brand to another. Your final choice will probably be influenced primarily by intangible factors — what you think of a given manufacturer's products based on past experience and other factors not included in specification sheets.

One technician, for example, says he'll pay a little extra money for sync stability and control range tolerance; another thinks fast warmup and no drift is a decided advantage; still another wouldn't have a scope on the bench that shows more than a slight interaction between certain controls. And so it goes — into the area of "personal preferences."

A Video Amplifier

Every knowledgeable technician knows that a

scope's vertical amplifier is, in effect (or should be), a high class video amplifier. This is true because of the nature of the signals we must observe — generally small in amplitude and complex. It has to be wideband if we are to observe video-type signals and the complex waveforms employed as sync pulses, sawtooth voltages, etc. which are made up of many sinewaves whose frequencies extend from low to high. We need to "see" these pulses in their true form — as they appear when they enter the vertical amplifier's input — not distorted by a poorly designed amplifier. We cannot tell what a TV sync pulse really looks like if its high frequency components are not properly amplified, or the low frequency components are weak, or if the phase shift of all its harmonics are out of proportion. Considering these factors, our scope's vertical amplifier needs to be a little better than "good." In a forthcoming article we will tell you how you can check your scope to find out if it is doing an adequate job in certain areas.

Modern Scopes

Photos of a few scopes and basic specifications, as reported by their manufacturers, are shown here. Others will be covered from time to time. The schematic of one medium-priced scope is shown in Fig. 1 (page 52). Note that both amplifiers, vertical and horizontal, have high-impedance cathode follower inputs. This is common in modern scopes. The frequency response of the vertical amplifier, set at *wideband* operation, is specified as "20 cps to 4.5 Mc within 10 percent." This is *sine-wave* response. Deflection factor when set at *wideband* with a 0.25v RMS sinewave input signal is 1 in. P-P.

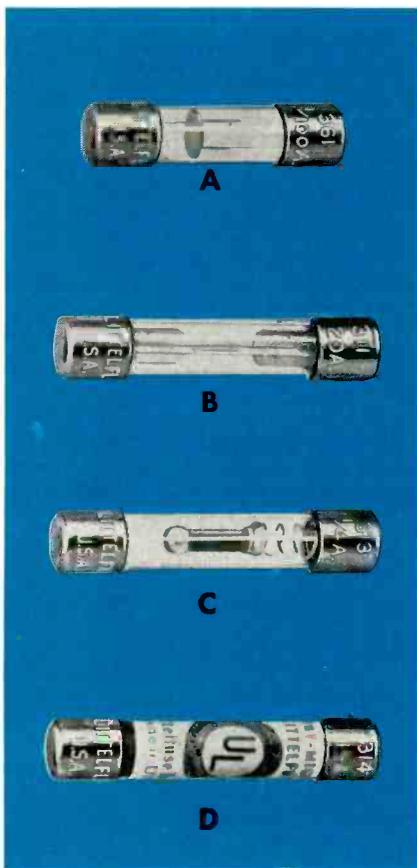
In our next article we will dig deeper into modern scope specifications and what they may or may not mean. ■

Maximum Protection Fusing

Select the correct fuse for the particular job

by John M. Borzoni

Littelfuse, Inc.



(A)—Fast acting instrument fuse. (B)—Medium acting fuse for radios, amplifiers, etc. (C)—Delayed action, long-time lag to withstand heavy surges but blows quickly on shorts. Ideal for circuits with high inductive or capacitive surges. (D)—Ceramic body fuse with medium time lag. Fuse contains filler for arc quenching.

■ Small dimension fuses — those unglamorous, inexpensive and silent watchdogs of the electronic space-age — are unquestionably the most extensively used, yet frequently misunderstood “safety valves” of the present day. Correct selection of the proper fuse by technicians can provide maximum equipment protection and minimum downtime.

Fuses for electronic equipment protection are generally referred to as “small dimension” or “supplementary” fuses. This definition (Underwriter’s Lab. UL198 fuses) covers an extensive range of different fuse sizes and types with dimensions extending to a maximum of $13/32 \times 1\frac{1}{2}$ in. Current ratings range from a few ma to 30 amp and from 32 to 600v. Many fuse varieties are available today — including micro-miniature designs, extending down to sizes so small that five of them can weigh less than 1 gram.

All fuses, regardless of size and type, have a specified current rating, voltage rating and fusing characteristic. Correct selection of fuses for safe, inexpensive and trouble-free circuit protection is possible only when these three factors are thoroughly understood.

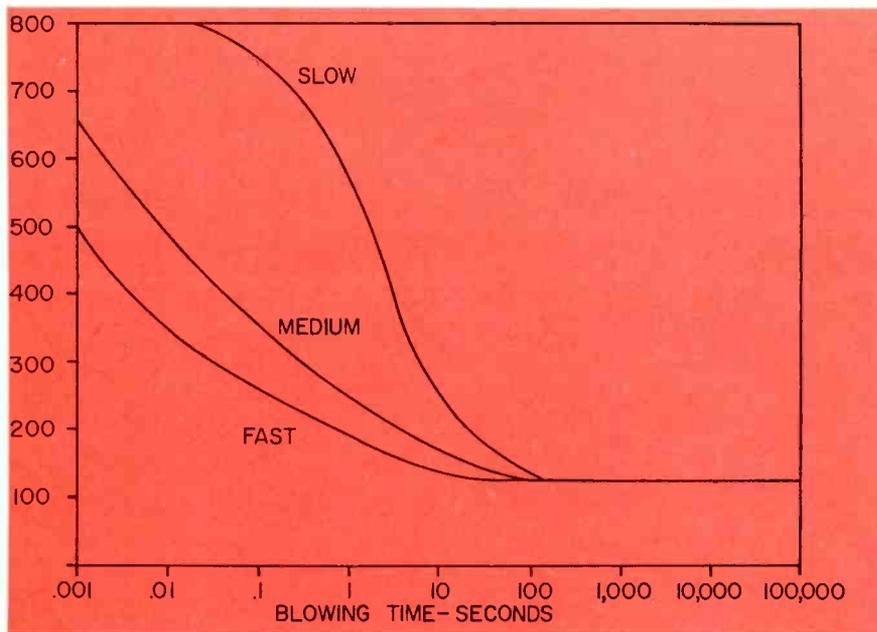
Current Rating

The current rating of a fuse is a nominal value expressed in amperes or fractions of amperes, and one that is established by manufacturers to indicate how much the fuse can safely pass. This value is based on a controlled set of test conditions. The test conditions are referenced on the Underwriter’s Laboratories, “Standards for Fuses” UL198, which has the primary objective of providing common test standards necessary for control of manufactured items intended for protection against fire, etc.

Since fuses are essentially temperature sensitive devices, small variations in the test circuit is caused by semi or fully enclosed fuseholders, contact pressures, air movement, transient spikes, diameter and length of connecting cables — all or any of which will greatly affect the predicted life of a fuse when loaded to its nominal value — usually 100 percent of rating.

It should be clearly understood that these controlled test conditions enable fuse manufacturers to maintain unified performance standards. And to adequately compensate for circuit variables, the circuit design engineer generally loads fuses to

'Time to blow' graph for typical normal opening and delayed action fuses.



not more than 75 percent of the nominal listed rating.

Voltage Rating

What is meant by "voltage rating" when applied to fuses? Simply stated, the voltage rating of a fuse indicates the fuse can be relied on to safely interrupt a prospective short circuit current, normally 10,000 amp in a circuit equal to, or less than its rated voltage. This voltage rating system is covered by National Electronics Conference (NEC) regulations and is a UL requirement as a protection against fire risk.

Voltage ratings used by fuse manufacturers for most small dimension fuses — 32, 125 and 250v — adequately cover these products in the automotive and electronic equipment fields and the interrupting capacity of 10,000 amp offers a safety factor far in excess of short circuit currents obtainable in the equipment. It is generally understood and is common practice to specify 125v fuses for secondary circuit protection to 500v or higher in equipment where short circuit currents are limited to values generally less than 10 times the current rating of the fuse.

As previously mentioned, fuses are sensitive to changes in current, not voltage. They maintain their

"status quo" at any voltage from zero to maximum rating. Not until the fuse wire reaches melting temperature and arcing occurs does the circuit voltage and available power influence fuse performance and determine safe circuit interruption. To repeat, a fuse may be used at any voltage less than its voltage rating without detriment to its fusing characteristics, and may also be used at voltages higher than its certified voltage rating if the maximum power level available at the fuse under a "dead short" condition is low enough to produce a low level non-destructive arc.

Fuse Type and Characteristics

We generally classify fuses into two basic types — those that blow quickly (open normally) and those that blow slower (have delayed action). Both operate basically the same. When a current larger than normal is applied to a fuse it begins to heat up and if this current is sustained for a certain time, the fusible element reaches melting temperature and the fuse blows. The time taken for the fuse to blow is proportional to the square of the current and the thermal inertia of the fuse and its environment.

Fuses that blow quickly or "normally" embody many design variations in fusible elements. De-

pending on mass and basic material used, this category may be divided into an additional classification: instrument, quick acting and medium acting fuses. These fuses normally employ medium to high melting temperature fusible elements made as small as possible to reduce the thermal inertia and speed blow time.

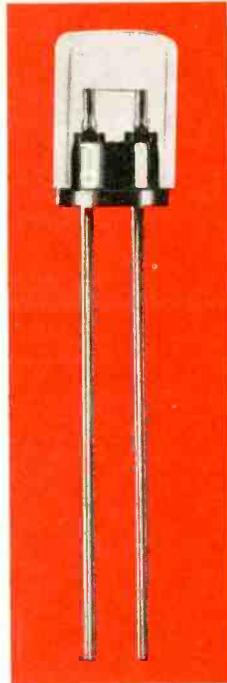
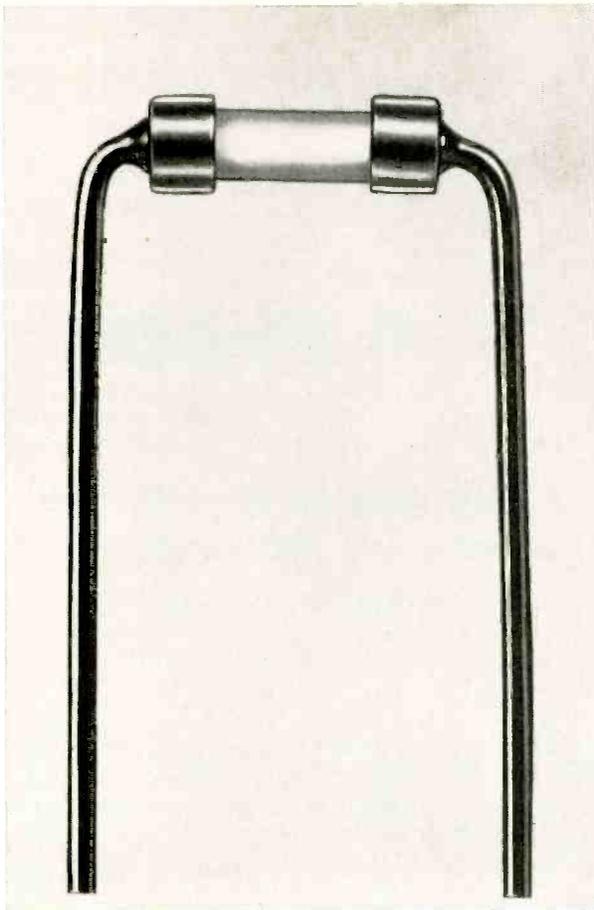
Delayed action fuses are invariably designed with compound fuse elements employing a large mass, usually a low melting point alloy, which increases the thermal inertia and slows down the blow time. The "time to blow" of typical normal opening and delayed action fuses is shown in the graph.

Considerations for Selection

1.) **Current ratings.** The amp rating stamped on the fuse should exceed the normal operating circuit current by not less than 25 percent — at 25° C. ambient.

2.) **Voltage ratings.** For secondary circuit protection where the short circuit current is not more than 50 amp or 10 times normal load current, fuses rated at 125v may be used at much higher voltage levels. For general circuit protection, the voltage rating on the fuse should be equal to or greater than the circuit voltage.

3.) **Fusing Characteristic.** The fusing characteristic, or opening



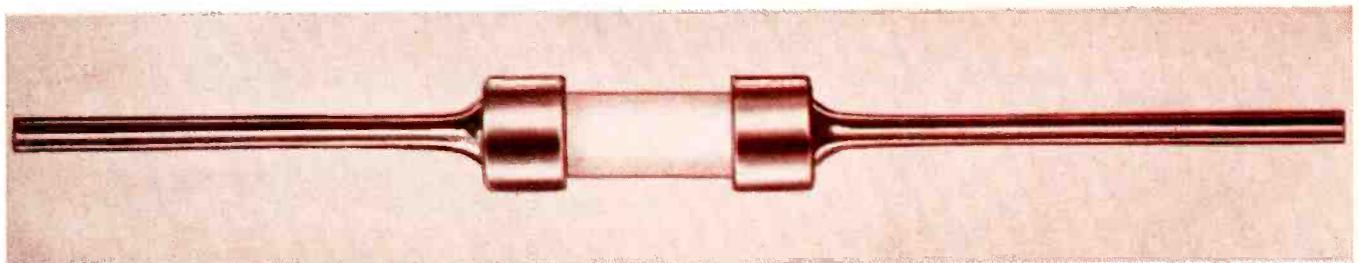
B

A

(A)—Plug-in microfuse. Plugs into a special microfuse holder—regular or indicating type. (B)—Pigtail microfuse with leads for soldering. (C)—Radial picofuse. (D)—Axial picofuse.

C

D



time versus current, must be within the safe time/temperature characteristic of the cable, appliance, motor, equipment or instrument being protected. Refer to manufacturers' time/current curves for each.

4) Use a normal-opening fuse where protection against short circuit hazard only is required, choosing the highest rating possible to avoid normal switching surges, transient spikes, etc., from causing premature fuse failure.

5) Use a delayed action fuse where protection against a sustained overload current greater than 50 percent of normal load is required and high inrush or starting loads are present.

6) Allow for environmental de-

gradation of the fuse. The higher the ambient temperature the hotter the fuse will run and the shorter its life. Fuses with low melting temperature alloys are more readily affected by changes in ambient temperature than the high temperature alloy fuses. Refer to manufacturers' recommended derating curves for adjustment in performance caused by ambient temperature variations.

7) For circuits involving vibration, high mechanical shock and acceleration, avoid using delayed action fuses with spring design. Supported filament, light weight, non-tensioned constructions as found in the subminiature fuse designs give the best performance un-

der these rigorous conditions.

A Few Final Tips

Make sure that positive contact is being made between fuseholder and fuse. This is vitally important when the normal operating current is greater than 5 amp. High contact resistance can cause the temperature at the fuse contacts to exceed that of the fuse, with a consequent loss of control over burn-out point. To prevent excessive temperatures at the fuse contacts, it is recommended that spring temper silver plated beryllium copper fuse clips be used for all 9/32 x 1/4 or smaller size fuses rated at 20 amp or more. Specify sealed fuses if wide environmental variations occur. ■

A Prolific

New dielectric materials shrink capacitor size and boost ambient temperature operating range

■ Last month we covered some factors to be considered in selecting replacement capacitors — particularly negative temperature compensating types. Power and dissipation factors were reviewed and the question of dielectric absorption was raised. This subject will now be pursued further.

Dielectric Absorption

Dielectric absorption is associated with the amount of charge retained by a capacitor after a short term discharge. When a polystyrene capacitor is discharged, it does not retain a residual charge; thus, it has low dielectric absorption. An oil filled paper capacitor, on the other hand, has high dielectric absorption. It is possible to discharge a large high voltage oil paper capacitor three and four times before it is completely discharged. In some instances, it is necessary to place a high resistance bleeder across the terminals to prevent a lethal shock to an unsuspecting technician.

Polystyrene capacitors have been used extensively in foreign electronic equipment and are relatively new in the U.S. They are inexpensive and if the ambient temperature and potential do not exceed 85°C and 500v respectively, they can be used interchangeably with paper, "Mylar," ceramic and mica capacitors.

It will be noted from the temperature curve (ET Sept. 1965) that they have less than 1 percent negative TC and are extremely stable. Some typical power factor ratings for material are shown in Table I.

Because oxide film losses of electrolytic capacitors represent only a small portion of total capacitor losses, a power factor indication for oxide film would be meaningless. Hence, aluminum oxide film is not listed in Table I.

Teflon and polycarbonate are relatively new dielectrics used in the electrostatic family. Their most important feature is the ability to operate at high temperature. Teflon can operate at ambient temperatures

up to 250°C without deteriorating. Polycarbonate exhibits an extremely high IR characteristic similar to polystyrene and can be operated at temperatures from -78°C to +125°C. Polycarbonate has very low dielectric absorption and a low TC characteristic (50 ppm°C).

Metalized Capacitors

Metalized paper and metalized Mylar have a distinct size-advantage over conventional tubulars. A 5 μ f, 100v metalized capacitor, for example, would be about the size of a 1 μ f wound type. The aluminum plate, a few tenths of a mil thick, is left out of this capacitor. A thin metal coating is sputtered on the dielectric material (paper or Mylar) in a vacuum. This metallizing process reduces the dielectric thickness — substantially increasing the capacity of a given size at low voltages.

The advantages of metallized capacitors are essentially lost at a potential above 600v because higher voltages require thicker dielectrics. But an additional advantage of metallized Mylar or paper is its self-healing property. A momentary capacitor short heals automatically. Although metallized units are smaller in low voltage types, they cost more and are not used presently in consumer entertainment products.

Every capacitor, electrostatic or electrolytic, has an equivalent circuit as shown in Fig. 1. R1 represents losses caused by electrolyte, separator, oxides and terminal system in an electrolytic capacitor or the leads, contacts and dielectric of an electrostatic capacitor. R2 represents leakage current (dc) through the oxide film in an electrolytic, through the dielectric and case encapsulation of an electrostatic. L represents inductance of the leads and windings. C represents a true or actual capacity.

Everything except the true or actual capacity is an undesirable byproduct that causes capacitor inefficiency. In fact, it's surprising that a capacitor works when we

Service Component

PART III (conclusion)

by C. C. Turnbaugh

Chief Engineer, Mallory Distributor Products
A Division of P. R. Mallory & Company

consider all the undesirable factors involved. Fortunately, modern capacitor technology does an admirable job in holding undesirables to a minimum.

A few years ago, for example, the average electrolytic had considerably more inductance than its big brother today. How can inductance be reduced, especially when it takes so many turns or coils of plate and cathode material to make a capacitor? The trick is — we use extended foil. This means that a small portion of all the cathode turns extend beyond the separators from one end of the capacitor winding or roll. By crimping or swaging this foil together so one turn is intimately contacting each additional turn, the capacitor's inductance is reduced. The capacitor does a better job bypassing RF voltages and reducing feedback.

Effective Series Resistance

Effective series resistance (ESR) is a problem in electrolytics and a big contributing factor is the electrolyte. Electrolyte research is at a feverish pitch in most manufacturers' laboratories. They strive for better low and high-temperature characteristics, higher temperature operation and lower resistance — all contributing to better quality and more capacity per size.

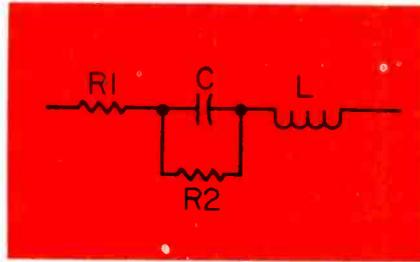
Early electrolytic capacitor types had limited operating temperature ranges. If the temperature fell much below 0°F, the electrolyte froze. Above 65°C, the oxide film on the anode deteriorated until more voltage dropped across the electrolyte (which also has resistance) than across the dielectric. This caused the

TABLE 1

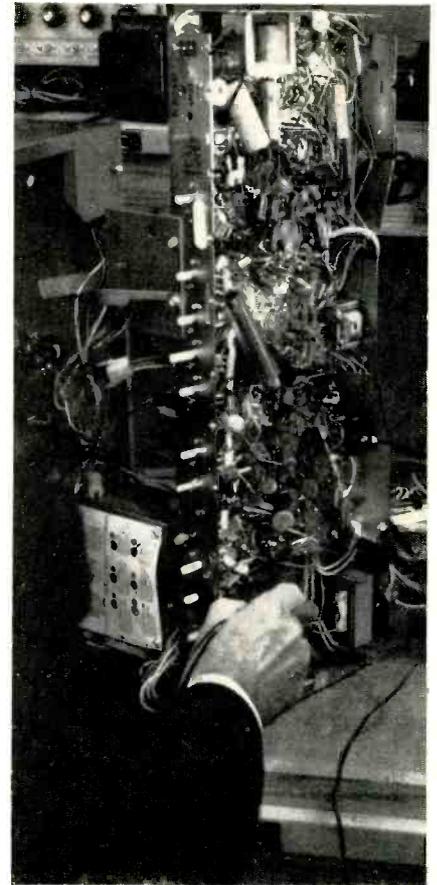
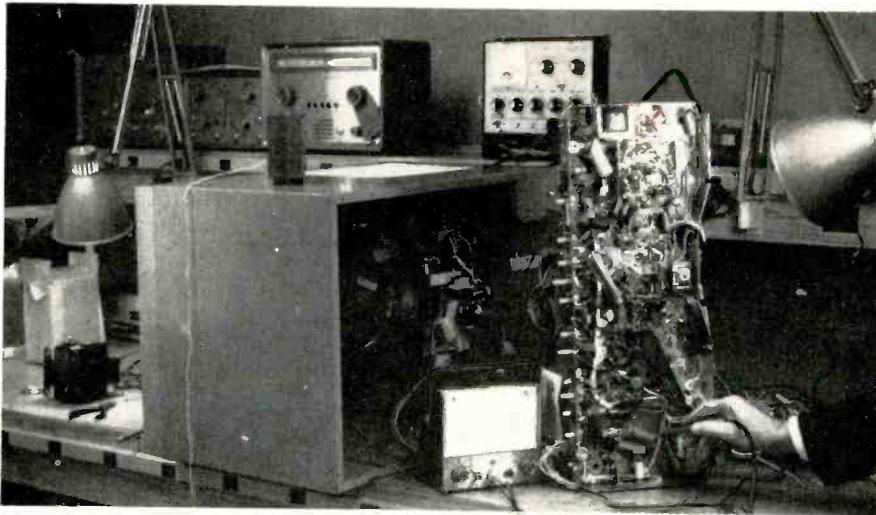
MATERIAL	POWER FACTOR (PERCENT)
Kraft Paper	0.5 to 1.0
Mylar	0.3
Mylar and Paper Combined	0.4 to 0.7
Mica	0.05
Ceramic Low "K" TC Types	0.1
Ceramic Hi "K"	1.0 to 2.0
Polystyrene	0.03
Teflon	0.02
Polycarbonate	0.01

Some typical power factor ratings for dielectric materials.

Fig. 1—Equivalent circuit of a capacitor.



Modern color TV chassis contain hundreds of capacitors.



electrolyte to scintillate (spark) which created heat and pressure — destroying the capacitor.

Modern research has created electrolytes with an operating temperature range from -55°C to $+125^{\circ}\text{C}$. The electrolytes are so good that engineers are able to seal an electrolytic in completely molded encapsulation of polypropylene.

Other Improvements

Along the way other internal improvements were made. The cathode surface area of electrolytics has been increased by an acid bath method similar to that used on the anode to produce an etched surface. Considerably more surface area is now brought into contact with the electrolyte to reduce ESR at this point of contact, thus producing longer capacitor life.

With the advent of transistorized auto radios, it was discovered that existing methods of crimping leads on terminals to the cathode and anode risers were contributing to ESR. It was especially noticeable at the lower voltages (12 v). These are now welded to prevent oxide build up and contact resistance at these points. The quality of present day capacitors is equivalent to computer and premium grades of a few years ago.

Early versions of wet electrolytics were difficult to handle. They had unsealed vents in the top, and the electrolyte would spill out and evaporation contributed to shorter capacitor life. One serious difficulty the older electrolyte capacitor had was oxide film deformation in service. If a higher voltage unit was used in lower voltage service, the plates would tend to deform to this lower

voltage. In doing so, the plate would lose some of its oxide dielectric coating exposing small pinpoint areas to direct contact with the electrolyte — permitting excessive current to flow. This generated heat which caused gas and resultant pressure build up. The pressure could become so great it was possible to rupture the metal container.

In present day dry electrolytic capacitors, however, it is only because of the high ESR interfering with proper circuit operation that it is objectionable to use a high voltage capacitor in a low voltage circuit. The oxide film of our modern electrolytic capacitor does not deform to any marked degree.

When used in low voltage application, some deformation still occurs, but it is negligible and consequently is not harmful. A 450 v capacitor can be used at any lower voltage with complete safety.

Because of the many different electrolytes used, each having their own resistive characteristics, it is possible, for example, that a 450v electrolytic could have too high an ESR for use in a 10v cathode circuit.

A low voltage circuit critical to ESR may not give ultimate performance with a high voltage capacitor in the circuit because high voltage capacitors have an inherently higher ESR than medium and low voltage units. It must be emphasized, then: *High voltage electrolytics, manufactured to present-day standards, can be used in low voltage circuits without detrimental effect.*

Tantalum capacitors have not been mentioned here because only small quantities have been used in home electronic products up to the present time. ■

LECTROTECH

V-7 Color Generator

Functions, controls, signals and circuit description

■ This is a keyed rainbow type generator. It is a hybrid tube/solid-state instrument — with silicon unijunction transistors in the frequency divider circuits.

Five different patterns — cross-hatch, dots, vertical lines, horizontal lines and color bars are provided.

The instrument's RF output is tuned to channel 4 at the factory and is adjustable to either channel 3 or 5. A frequency adjustment trimmer is located on the instrument's right side.

A video signal of about 2v P-P is available at a separate jack and amplitude is adjustable by a VIDEO LEVEL control located on the front panel. The signal is available sync positive or sync negative.

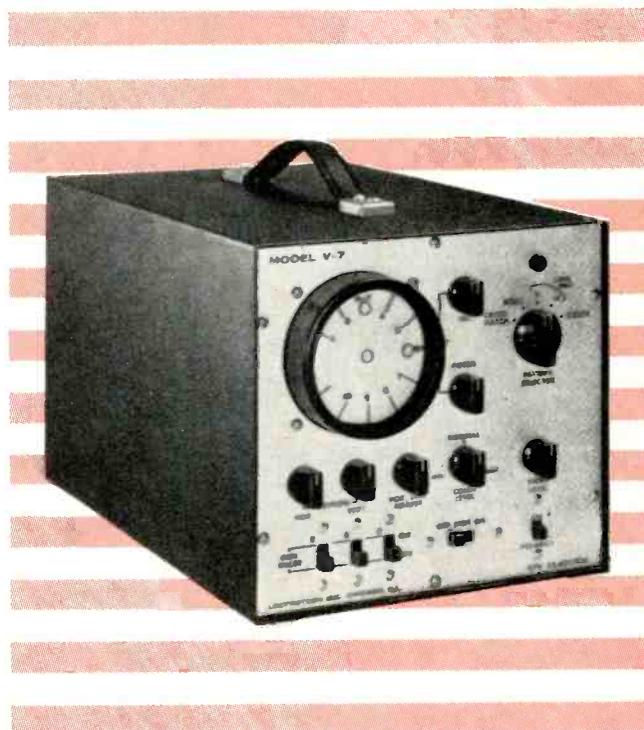
The COLOR LEVEL control adjusts the color signal strength. Normal signal is considered as 100 percent modulation. Three switches serve as gun killers.

Vectorscope

A feature of the generator is a self-contained CRT called "vectorscope." It is internally connected to receive and reproduce the color signal on its face. The vectorscope face is marked to indicate where the individual color signals (R-Y, B-Y etc.) should appear when taken from a normally operating set. Variations from this normal pattern indicate a fault in the receiver. The v-scope may be used either as an aid to troubleshooting or alignment. Additionally, it can be used to calibrate the individual counters inside the instrument. V-scope patterns are adjustable with controls similar to those on an oscilloscope.

Frequency Dividers

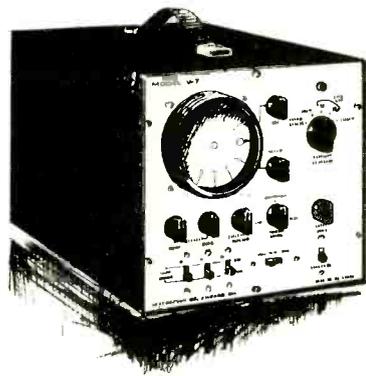
The frequency divider or timer chain originates with a 189 kc crystal controlled oscillator (Q1). This stage's output feeds in three directions. Q1's output feeds to Q2, the vertical line shaper. The VERTICAL LINE AMPLITUDE control is a trimmer capacitor in series with Q2's base and provides a method of ad-



Lectrotech Model V-7 Color Generator.

justing the signal level. Q2's output feeds to the pattern selector switch. A second output of Q1 feeds Q3, the 189 kc shaper.

Q3's output synchronizes Q4 on a division ratio of 6. Q4's output is 31.5 kc. These 31.5 kc pulses synchronize Q5, a 4.5 kc oscillator. Q-5's output feeds Q6, the 900 cps oscillator. A pulse derived from base 2 of Q6 triggers Q8 and Q9 which form a 900 cps flip-flop. Another output of Q6 synchronizes the 60 cps oscillator, Q7. Q7's output provides vertical synchron-



... LECTROTECH

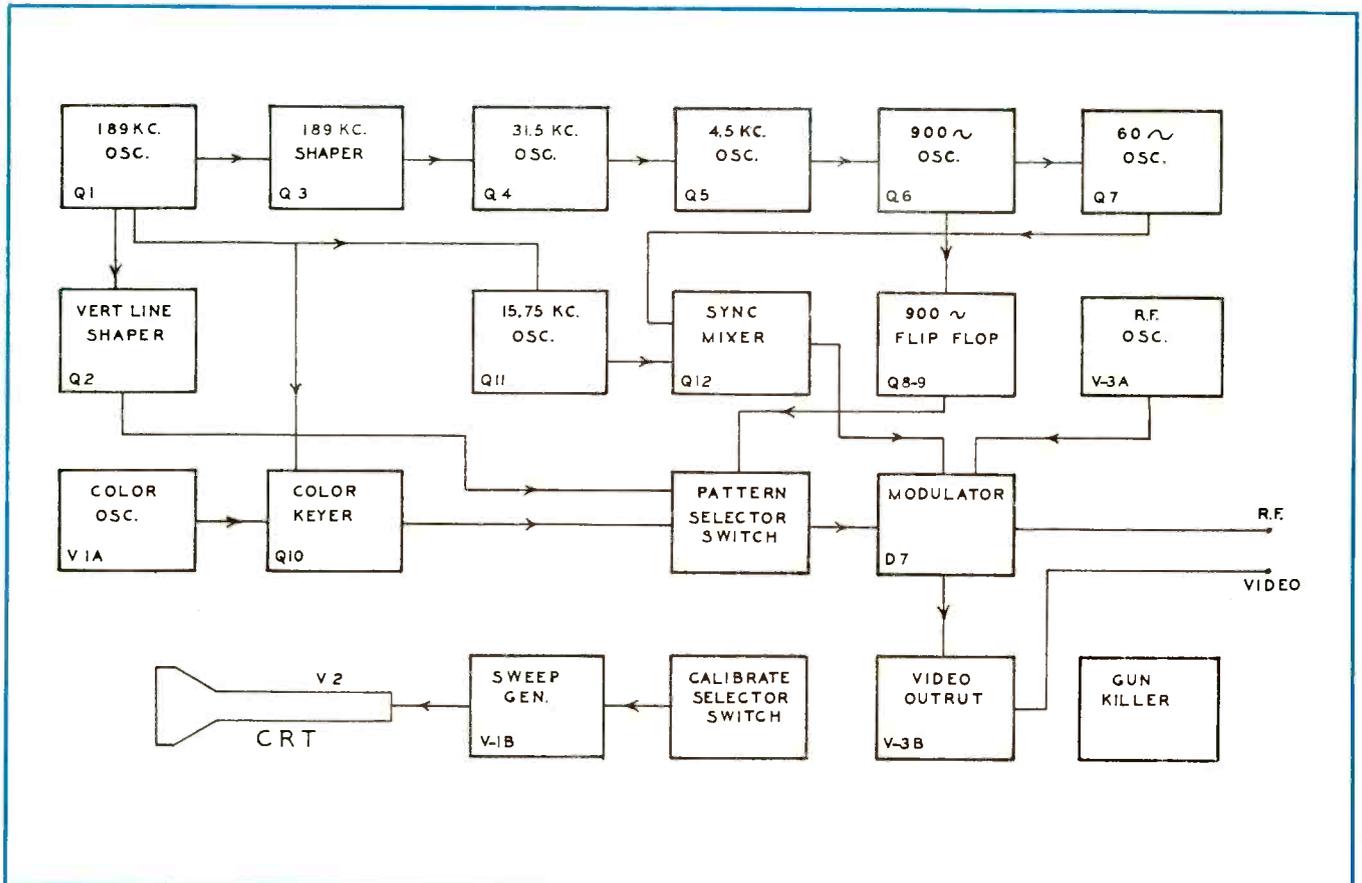
izing information which feeds to the sync mixer stage (Q12) input.

The third output of Q1 synchronizes Q11, the 15.75 kc oscillator. This represents a division ratio of 12. Q11's output also feeds to Q12's base. The sync mixer stage output is a composite sync signal having vertical and horizontal sync information.

Q4, Q5, Q6, and Q7 are silicon unijunction frequency divider stages. Silicon components are relatively immune to temperature variations and because of the unijunctions' characteristics, frequency division stability is relatively independent of external circuit parameters. The plus 18v supply is regulated.

Q4, the 31.5 kc divider, has a division ratio of 6 and when using the built-in self calibrating technique, 6 cps of sine wave must appear on the scanning tube. This adjustment is accomplished by the 5K pot in the emitter of this component. Q5, the 4.5 kc oscillator, represents a division ratio of 7 from the 31.5 kc source. When using the self-calibrating technique, the 5K emitter pot is adjusted for 7 bars on the CRT face. The 900 cps oscillator, Q6, represents a division ratio of 5. The 5K pot in the emitter is adjusted for 5 bars on the CRT face. Q7 represents a division ratio of 15 from the 900 cps source. Rather than count 15 bars, Q7's output is compared to 60 cps from the ac lines. When the pattern appears to be standing still, the proper frequency has been reached. This adjustment is made by a 5K pot in Q7's emitter. The 15.75 oscillator, Q11, represents a division ratio of 12. Stage

Block diagram of Lectrotech V-7 Color Generator.



adjustment is made by the 5K pot in Q11's emitter. It is adjusted in-sync on a TV receiver.

For each pulse at the base of Q8, 1 pulse appears at Q9's collector. Pulse width may be varied by a potentiometer in Q9's base return. This is the HORIZONTAL LINE ADJUST control and varies the pulse width or number of horizontal lines. Output of the 900 cps flip-flop is fed to the pattern selector switch input.

VIA is the 3.563 Mc oscillator which forms the offset sub-carrier color signal. The output of this stage is fed to Q10. The base signal receives a 189 kc sine-wave from Q1. The drive is sufficient to either saturate or cut off Q10, depending on signal polarity. When saturated, Q10's collector is effectively grounded and color information is absent from the output. When Q10 is cut off, the collector impedance rises and the full color signal is present. This is taken through a 1K potentiometer, the COLOR LEVEL control and the pot feeds the pattern selector switch. Proper signals are selected by the pattern switch and applied to the necessary circuits. The dot function is accomplished by diode D6 which shifts the clipping level to allow video to pass when the sum of vertical and horizontal lines are present. This results in a dot pattern. The pattern selector switch output feeds the modulator. This is the composite video signal made up of the pattern selector switch output and the sync mixer output.

V3A is the RF oscillator, frequency adjustable over channels 3, 4 and 5. Output is taken from the oscillator cathode and fed to the diode modulator. The

diode modulator's output results in a fully modulated RF signal at either channel 3, 4 or 5. A second output from the modulator is the composite video signal which appears on a cable in a rear compartment.

Gun Killer and Calibrate Switches

The gun-killer consists of three slide switches which shunt the color CRT grids to ground through a 100K resistor. The v-scope input consists of signals from the red and blue grids of the color CRT. The CALIBRATE selector switch is used to sample the sweep voltage at either Q4, Q5, Q6 or Q7's emitter — depending on the position switch.

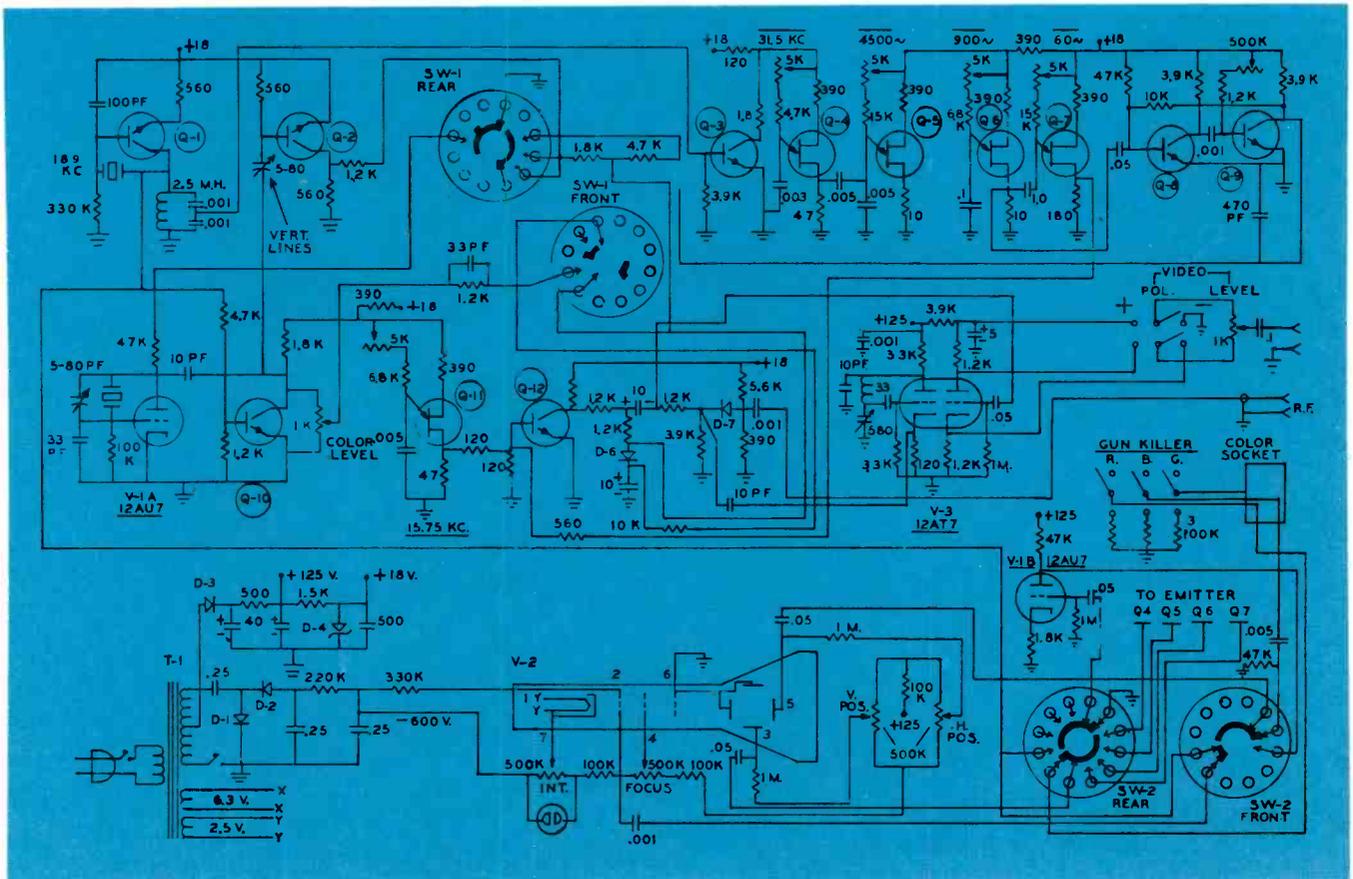
Output of the CALIBRATE selector switch is fed to V1B, a sawtooth generator, which supplies the necessary sweep voltage to the horizontal deflection plates of the internal CRT, V2.

Vectorscope Signals and Power Supplies

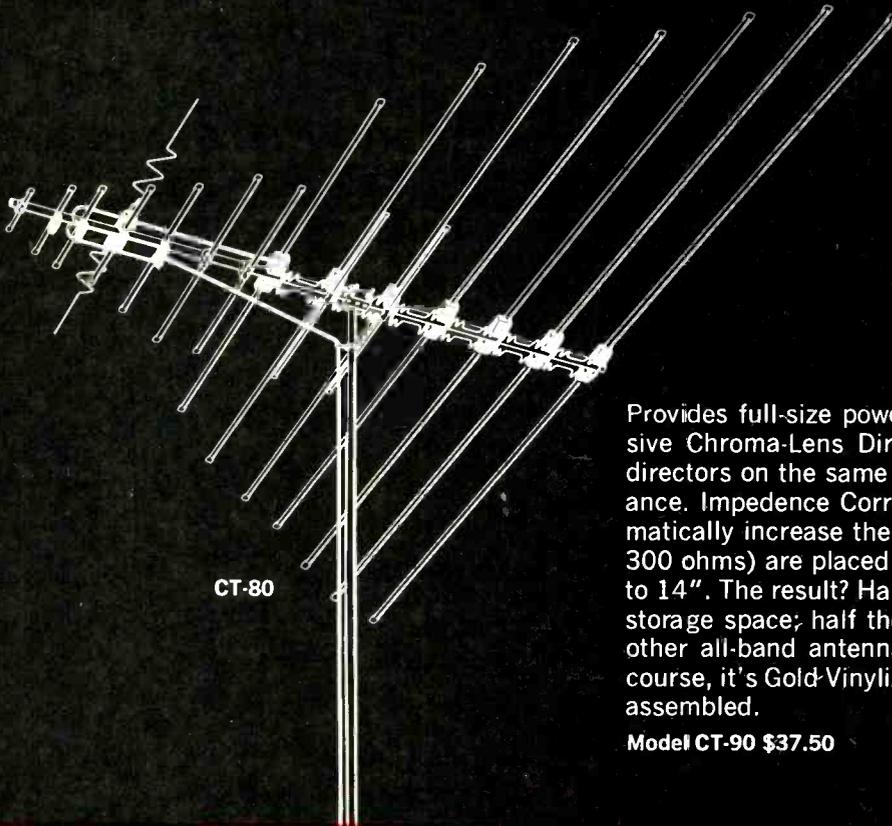
Vertical deflection plate signals for V2 come from the emitter of Q4, Q5, Q6 or Q7 without intermediate amplification.

The HV power supply is a voltage doubler circuit consisting of diodes D1 and D2. The output of this supply is -600v with respect to ground. This voltage is applied to V2's cathode. A tap on the transformer feeds diode D3, a half wave rectifier which provides 125vdc to power the tube circuitry. This 125v is dropped through a series resistor and D4, an 18v diode. This regulated voltage operates all semi-conductor circuitry in the color bar generator. ■

Schematic Model V-7.



MADE-FOR-COLOR ANTENNAS



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Provides full-size power in a half-size all-band antenna. Exclusive Chroma-Lens Director System intermixes VHF and UHF directors on the same linear plane without sacrificing performance. Impedance Correlators (special phasing wires that automatically increase the impedance of Chroma-Tel's elements to 300 ohms) are placed only 5 3/4" apart instead of the usual 10" to 14". The result? Half the bulk; half the wind loading; half the storage space; half the truck space; and half the weight of all other all-band antennas—and at a much lower price. And, of course, it's Gold-Vinylized to triple antenna life, and factory pre-assembled.

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WINEGARD'S FALL COLOR SPECTACULAR

Know how many color TV sets will be sold before the end of the year? Close to 2 million! There's no telling how many more will be sold during 1966. But the figure will be way up in the millions—and we'd like every single one of those sets to be hooked-up to a new Winegard made-for-color antenna. Impossible? Maybe. But we're sure going to try. And here's how we plan to do it. We're going to tell more people than ever before (and more often than ever before) that they do need a special antenna for color TV reception. Then we're going to tell them how very special Winegard made-for-color antennas are . . .

* They effectively reduce snow, ghosts and distortion in all reception areas—metropolitan, suburban and deep fringe!

* They make color TV brighter, sharper and more brilliantly alive!

* They make all-channel black & white reception better than ever!

* And they make expensive new color sets (black & white sets, too) worth every penny!

We're going to tell them on television, in magazines and via in-store merchandising aids. And the nice thing about advertising is, if you have an outstanding product, a truthful story and sensible prices—and if you tell people often enough, they'll buy. We call it our Fall Color Spectacular. Winegard dealers will call it the best thing that ever happened to antenna and accessory sales. Better call your Winegard distributor or write for complete information about Winegard's Fall Color Spectacular. It's here now!

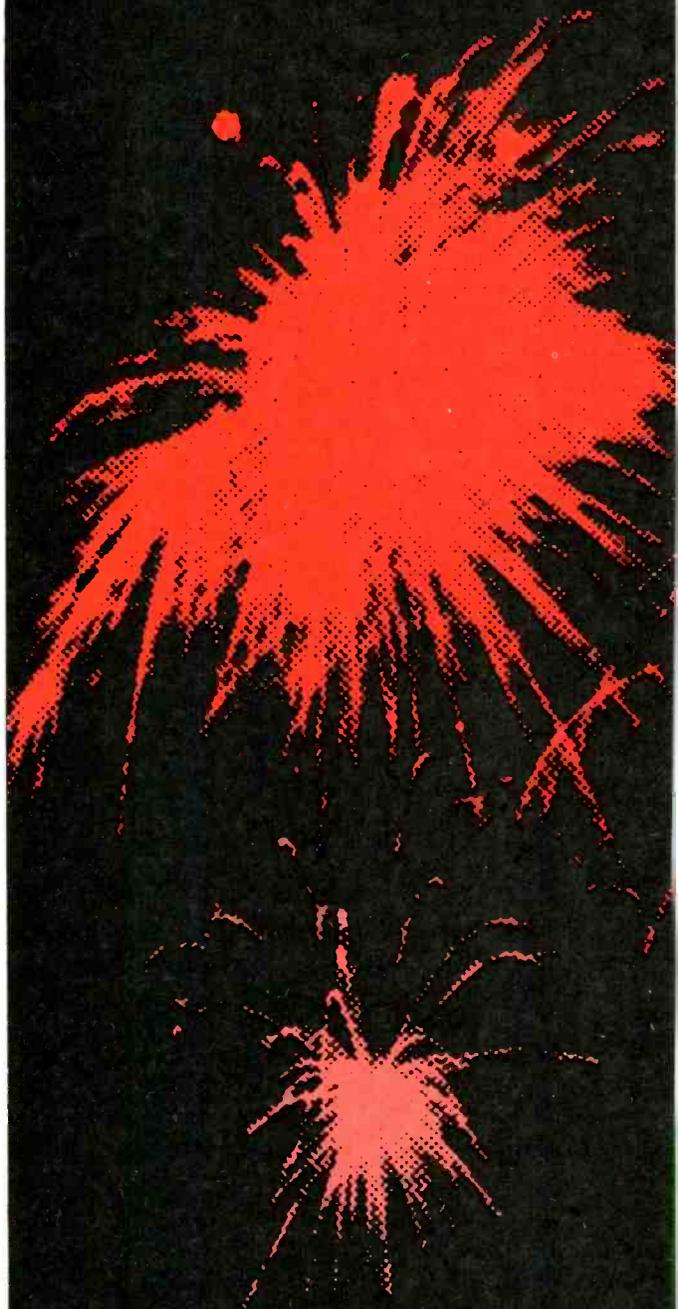
Spectacular WINEGARD Made-For-Color TV Commercials . . . thousands of them!

Winegard has actually scheduled more than 2,000 minute and 30-second commercials to run before the end of the year. They'll be seen from coast to coast and in color as well as black & white. And here's the best part. They're more than commercials. They're station testimonials! That's right. Station engineers throughout the country have tested Winegard made-for-color antennas and found them to be everything we say they are and more. Wait 'til color TV prospects (and owners) hear these commercials. And they'll start hearing them in October!

Spectacular WINEGARD Made-For-Color Ads in * LIFE * PARADE * SUNSET

They're the powerful, hard-selling publications that are read, believed and used as a buyers' guide by families (more than 6 million of them) now in the market for color television sets. They're your prospects and they'll soon read about Winegard made-for-color antennas . . . believe in them . . . and buy!

SPECTACULAR



WINEGARD CO.



COLORFAX

NBC TV News in Color

Color will be used on "all major, regularly scheduled, NBC news, network programs seven days a week," according to a recent announcement of William R. McAndrew, executive vice president, NBC News Div.

The changeover began Sept. 19 when NBC's Sunday program returned to the network with a new format that will be "largely in color."

On Nov. 15, The *Huntley-Brinkley Report* will switch to color, network TV's first weekday, nighttime news program to do so. Although late-breaking stories will still be presented in B/W, McAndrew said it's "entirely possible" for reports from South Vietnam to be carried in color. Also in color will be studio originations of Huntley in New York and Brinkley in Washington, important domestic and international topics and all feature stories.

The third phase of the news-in-color cycle will occur Nov. 20 when *The Scherer-MacNeil Report*, which bows Oct. 23 as network TV's first

regular half-hour program on Saturdays, makes the conversion.

McAndrew reiterated that *Today* will also carry major segments in color.

He indicated that, although news in color is costly (because so much of the footage remains in the cutting room), the addition of color delivers extra impact, as verified by the difference between documentary shows in color or in B/W.

CBS reportedly is also considering news programs in color, but has yet to announce specific plans, while ABC's news coverage will, for the time being, at least, continue in B/W.

Sylvania Color CRT Expansion

Sylvania Electric Products Inc. announces an increase in its 1966 production of color television CRT five-fold over the 1964 level by building a multimillion-dollar manufacturing facility in Ottawa, Ohio.

Merle W. Kremer, a senior vice president in charge of the electronic components group, said the facility will be a 158,000 sq ft addition to the present 322,000-sq ft plant in Ottawa, where the company is producing black-and-white CRTs.

Mr. Kremer said the expansion will enable his company to increase its 196 production of color tubes 100 percent over 1965 and will help meet the rapidly increasing demand for color tubes.

The first phase of the program began earlier this year at the company's color tube plant in Seneca Falls, N. Y. There, through alteration of the existing facility, 150,000 sq ft of additional manufacturing space was devoted to color tube production. Additional screen facilities were installed at Seneca Falls along with a custom-designed exhaust system and related manufacturing equipment.

Zenith Color Sales

Zenith Sales Corporation reports that the company's distributors sold more color TV receivers to retailers in the eight months through August 28 than for the entire year of 1964.

"The increase in Zenith color sales for the year-to-date exceeds that for the entire industry," L. C. Truesdell, president said, "and we are obtaining a larger share of industry color sales than for the same period last year.

"Our current color sales are moving at an even more accelerated rate of increase than earlier," he said, "with Zenith distributor color TV sales to dealers in recent weeks showing a sharp rise over sales for the comparable period a year ago."

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You can test for all shorts, grid emission, leakage and gas; and check cathode emission the accurate way—under simulated load conditions! Each section of a multiple section tube is checked. With the Model 606, you won't reject the good tubes, and you'll quickly find the bad ones, reducing call backs, selling more tubes, and increasing service profit.

You'll find "tough dogs" and weak tubes with the exclusive adjustable grid emission test, which has a sensitivity of over 100 megohms. Tube sockets have phosphor bronze contacts for long, trouble-free life. Complete tube listings are provided in a handy reference index.

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From now through December 15, 1965—with every purchase of an RCA WR-64B Color Bar Generator—you get a FREE color-TV TEST picture tube for use in your color-TV test jig. This is a 21-inch 70° round color-TV TEST picture tube, electrically guaranteed six months from first installation date. These tubes will have minor mechanical (not electrical) defects... they're not quite good enough to go into a new TV set but perfectly adequate for testing purposes.

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Simply buy an RCA WR-64B Color Bar Generator—THE essential color-TV test instrument—between now and December 15, 1965. Fill out your warranty registration card and attach the red identification label on the WR-64B carton. Send them to RCA, Test Equip-

ment Headquarters, Bldg. 17-2, Harrison, N.J. We send you the tube (either from Lancaster, Pa. or Marion, Ind.) freight charges collect. To allow for postal delay, we will honor cards received up until December 31st.

Don't miss out on this never-before offer. You've got to have a color-bar generator anyway—so be sure you buy it now—at the regular price—while you can get a FREE color test tube.

\$189.50*

Optional distributor resale price; subject to change without notice. Price may be higher in Alaska, Hawaii and the West.



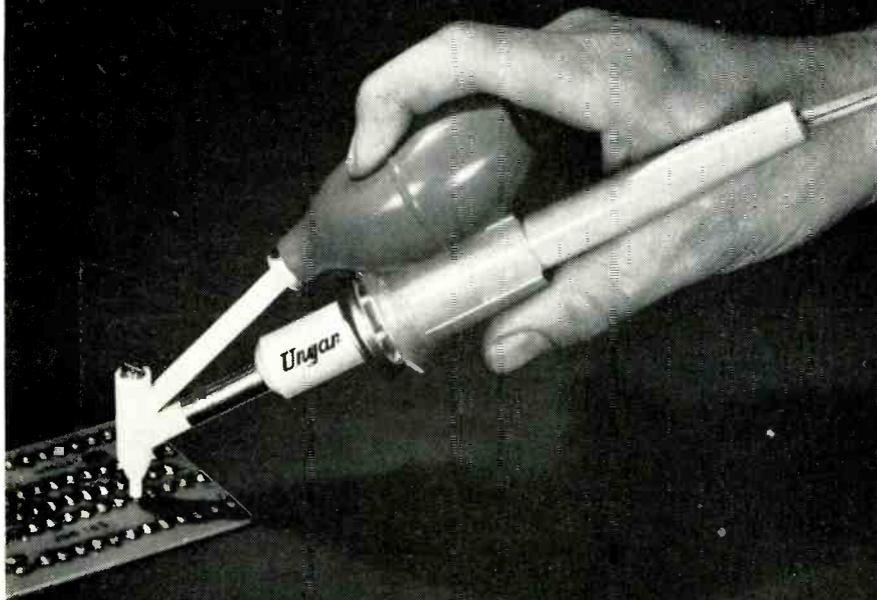
RCA WR-64B Color Bar/Dot/Crosshatch Generator

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COLORFAX

RCA 15-in. Rectangular Color CRT

The Radio Corp. of America's 15-in. rectangular color television picture tube will be available in limited commercial quantities in the first quarter of 1966 at a price of not more than \$90 per unit, the manufacturer announces. A laboratory model of a simulated 15-in. tube was demonstrated in Chicago recently for color set manufacturers in an effort to provide them "with maximum lead time for consideration of design details and to help promote color picture tube interchangeability within the industry," according to Harry R. Seelen, Division vice president and general manager, television picture tube division. Similar demonstrations will be held this week in Newark, N. J., for eastern manufacturers. Mr. Seelen said developmental samples of the new tube, which will be produced at the Lancaster, Pa., plant, are expected to be available to color receiver manufacturers in December at a price of \$150 per tube.

Olympic "Model of the Month"

A 21-in. color TV/radio/phono combination with a six-speaker sound system has been named an Olympic "Model of the Month" for September, Morton M. Schwartz, president of Olympic Radio & TV Sales Corp. announces.

Introduction of Model CK353, "The Austin," brings to 20 the number of models available in this company's 1966 color line. The user can play TV, radio and phonograph simultaneously in different rooms. With this model the set has an automatic color purifier, "Safe-T-Bond" picture tube with etched face, power transformer chassis and a COLOR-ON indicator light which automatically tells the viewer that the program he may be watching in black and white is actually being broadcast in color and should be retuned for color telecast.

CBS Buys 20 Movies

Screen Gems, Inc. confirmed sale of 20 post 1961 Columbia feature films to CBS-TV for approximately \$8 million. The features, half of which are in color, are slated for network airing in the 1966-67 season. Earlier, Screen Gems had sold CBS a package of 19 Columbia features, scheduled for Thursday night movies this season.

... for more details circle 28 on postcard →

NEW ATOMIC

TIMING DEVICE

An atomic timing device, so accurate that if used in space navigation it would provide a fix on a moon shot's position in flight to within $\frac{3}{4}$ in., has entered full-scale production. Scientists describe the stability of the clock in parts per hundred billion.

Only slightly larger than a shoe box and weighing less than 20 pounds, the rubidium frequency standard was said to be the world's smallest atomic frequency standard and the lowest priced. Its size and price open the way for the incredible stability and accuracy inherent in atomic clocks as an electronic reference for space-age navigation and for systems to prevent mid-air collisions in supersonic planes. Previously, these ultra-stable frequency sources were of such size, complexity and cost to limit their use to national observatories and comparatively few top-level research institutions.

The rubidium frequency standard produces reference signals at precisely one hundred thousand, one million and five million cps. Within a small aluminum container an atomized vapor of the element rubidium (a soft, silvery metal) is excited electronically. The rubidium responds by emitting energy at a never-changing, ultra-high frequency which is used to govern the output of a relatively unstable crystal oscillator to accuracies undreamed of a few years ago.

Space-age Uses

The need for self-contained miniaturized atomic frequency standards grows with every advance in aerospace and communications. In collision avoidance systems, for supersonic airliners due to fly in a few years, for example, the instrument will provide very precisely timed signals by which supersonic airliners flying at two or three times the speed of sound will all know their relative and changing position down to inches. The eternal constance of the atom can now also be applied in manned space laboratories planned for orbit within this decade.

In already overburdened military and aviation communications, the rubidium frequency standard provides a precise check on radio frequencies, permitting narrow band transmissions. Hence, more message capability is squeezed into each channel.

In addition to the rubidium vapor standard, developed and produced by Varian Associates, there are two other types of larger atomic clocks. The Metallic element cesium provides an atomic constant, while the giant 800 lb hydrogen maser is the most stable atomic clock known. All three are produced by Varian.

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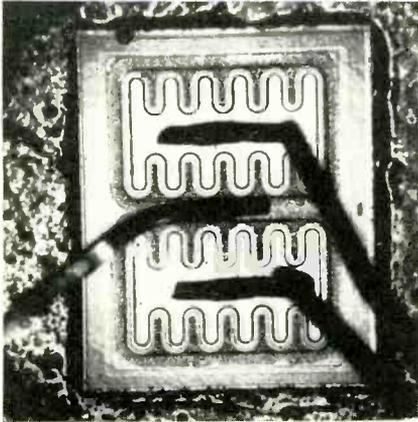
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NEW PRODUCTS

FOR MORE INFORMATION CIRCLE NEW PRODUCT NUMBERS ON POSTCARD INSIDE LAST COVER.

NPN Transistor 200

Introduced is a transistor employing a combination of thin film and planar epitaxial techniques. It is



capable of handling 30 w of power at 40 v at 100°C, according to the manufacturer. The FT7207 employs nichrome thin film emitter resistance elements to equalize current flow through the multiple geometry of the monolithic unit. Fairchild Semiconductor.

FM/Stereo Tuner Kit 201

A solid state FM/stereo tuner kit is announced. All critical circuitry is pre-wired, pre-tested, and pre-aligned at the factory. A front panel meter



function switch allows the tuner meter circuit to be used as either a signal strength indicator, a zero-center indicator or a precision alignment meter. The LT112 has three stereo outputs available, one located on the front panel to allow portable tape recorder use without disturbing the tuner installation. H. H. Scott.

CB Radiotelephone 202

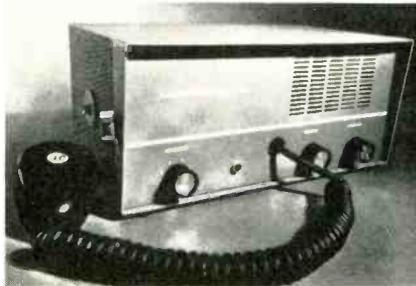
A 23-channel citizens band radiotelephone for direct operation from a 12-v battery or 117-vac power is announced. The Model 779 transceiver employs a frequency synthesizer for crystal controlled transmission and



reception on all available citizens band channels. The desired CB channels are selected with a single front panel control and the number of the selected channel may be seen through an illuminated window. EICO Electronic Instrument.

CB Transceiver 203

A CB transceiver which covers six CB channels in both transmit and receive functions is announced. The unit interchanges from 12 vdc to 117



vac. It consumes 6 amp on dc and 70 w on ac and has a self-adjusting noise limiter in the receiving circuit. Transmitter output is 3w over the complete range of any six of 23 CB channels. Size of the 14 lb instrument is approximately 5¼ x 12 x 7 in. Hammarlund.

Portable Tape Recorder 204

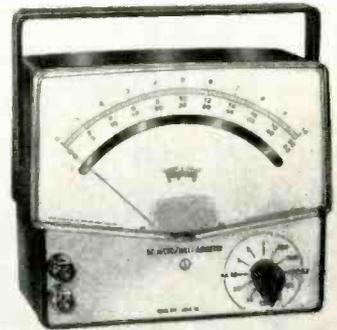
A portable tape recorder that operates on both ac and flashlight batteries is introduced. The solid-state 320 has a remote-control microphone, which permits start/stop operation



from a distance. The six lb instrument offers both 3-¾ and 1-7/8 ips speeds. Optional equipment available is a voice-operated microphone, which automatically turns the tape recorder on when sound is picked up, turns it off when the sound stops. Concord Electronics.

Meter 205

A portable dc micro/milliammeter model 825, is announced. It has a 6.84 in. mirror scale, knife edge pointer, and open meter front. It



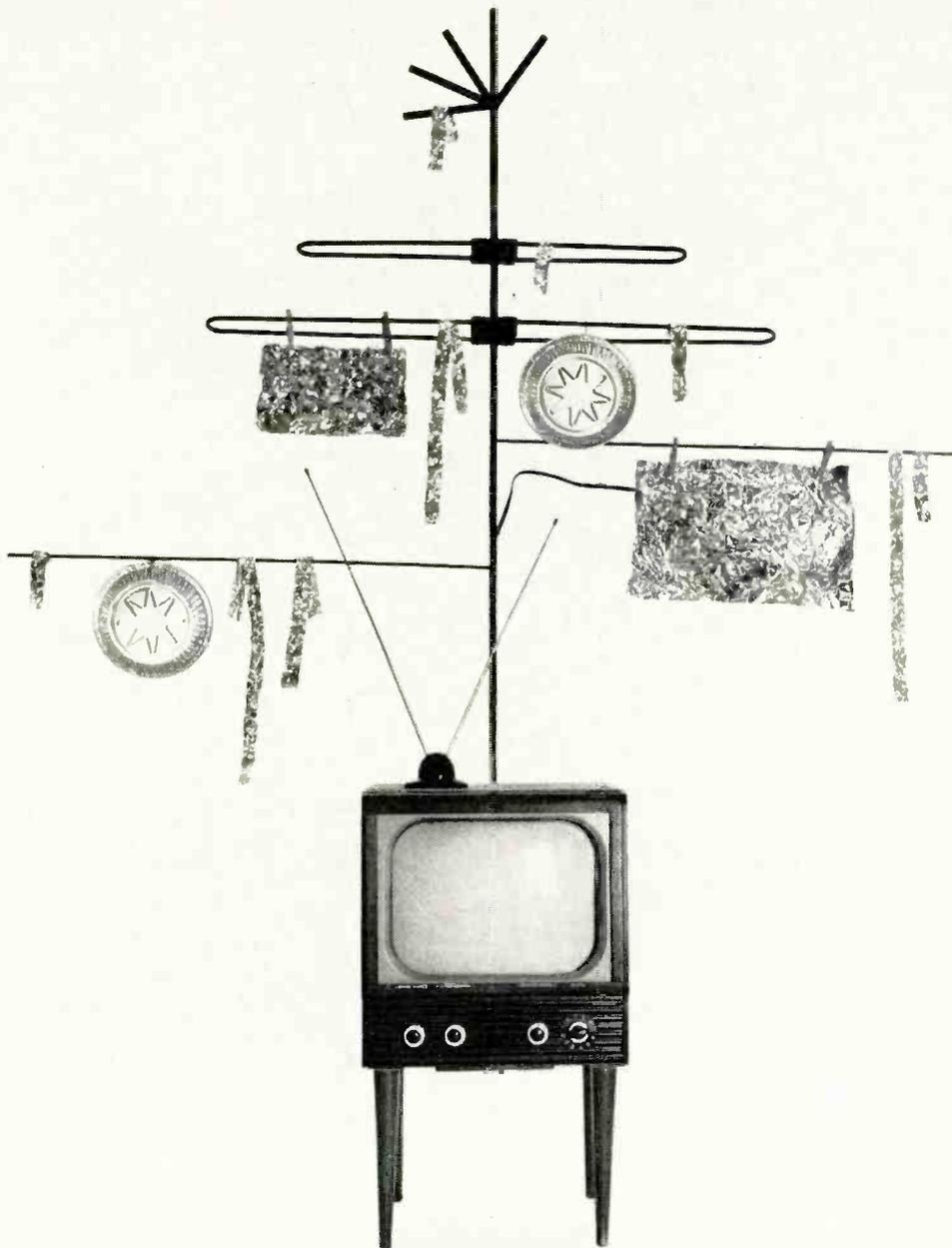
features suspension movement and has no pivots, no bearings, and no hair-springs, the announcement said. The unit measures 7½ x 6¼ x 3⅞ in. Triplett Electrical Instrument.

Antenna Amplifiers 206

An antenna amplifier, featuring transistor and nuvistor design, is announced. The high frequency match-



ing transformers at both input and output provide impedance match for signal transfer. The transformer-operated power supply isolates the amplifier from the power supply. JFD.



aerial view: do-it-yourself style

He's going to need a real antenna. So he'll be looking in the Yellow Pages. The chances are 9 in 10 he'll then take action. Will he see your ad?

When his wife sees his creation, this man will be joining the 21 million people who turn to the radio, television, and high fidelity headings of the Yellow Pages every year. (That's 33% of the entire market!)

When he does look in the Yellow Pages, chances are 9 in 10 he'll either call, write, or visit. (Every 100 references to the radio, television, and

high fidelity headings of the Yellow Pages bring 93 calls, letters, or visits!)

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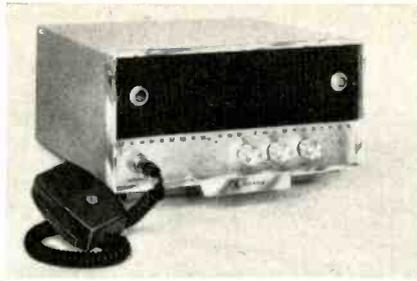
Yellow Pages



NEW PRODUCTS

Two-Way Transceiver 207

An 85 w AM radio transceiver for two-way communications is announced. Interchangeable for base station or mobile use, the Messenger "600" measures 5 3/16 x 11 x 10 in. and weighs 19 lb. Typical applications for the "600" include business uses in service and delivery vehicles operating over wide territories; industrial uses



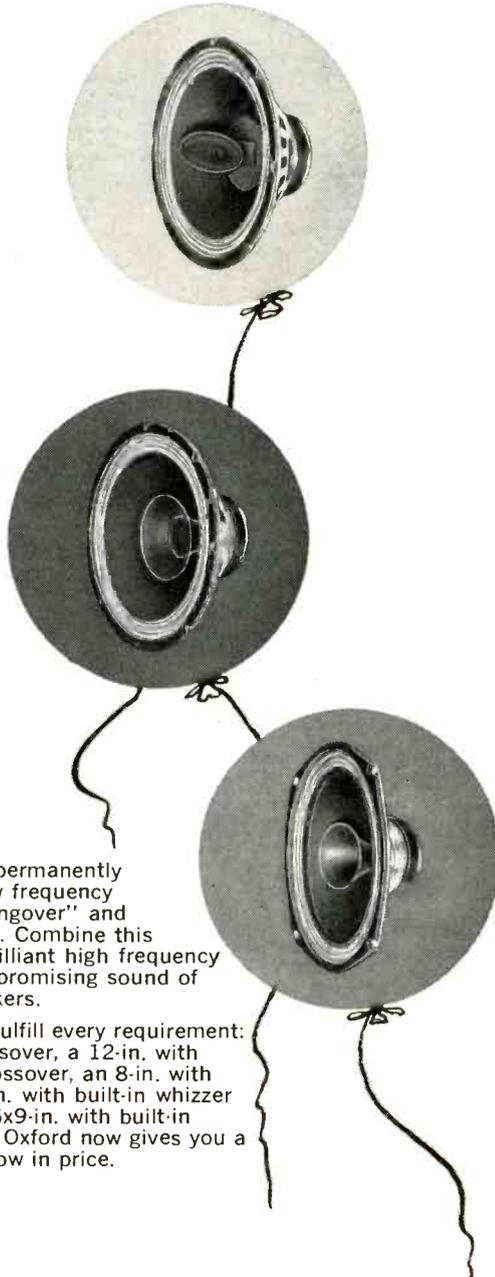
by utilities, refineries, ready mix contractors, mining operations and quarries; and municipal functions—fire, police and municipal government. E. F. Johnson Co.

HOW "HIGH" SHOULD A HI-FI SPEAKER BE?

The answer is found in Oxford's new Tempo High Fidelity Speakers. High enough to perform with the best . . . BUT without an astronomical price tag. From the design standpoint, the new Tempo speakers have everything you could desire. Extremely heavy ceramic magnets to give you the power handling capacity necessary for today's wide range reproduction. Each unit also features Oxford's "Floating Suspension Surround" a resilient, permanently flexible edge which extends the low frequency spectrum without undesirable "hangover" and assuring clean transient responses. Combine this with the smooth mid-range and brilliant high frequency response and you have the uncompromising sound of the new Tempo High Fidelity Speakers.

There are five models available to fulfill every requirement: a 12-in. with built-in electrical crossover, a 12-in. with built-in whizzer and mechanical crossover, an 8-in. with built-in electrical crossover, an 8-in. with built-in whizzer and mechanical crossover, and a 6x9-in. with built-in whizzer and mechanical crossover. Oxford now gives you a new high in high fidelity at a new low in price.

Write for complete information.



**OXFORD
TRANSDUCER
CORPORATION**



A Subsidiary of Oxford Electric Corporation

2331 North Washtenaw Avenue • Chicago 47, Illinois

Circular Slide Rule 208

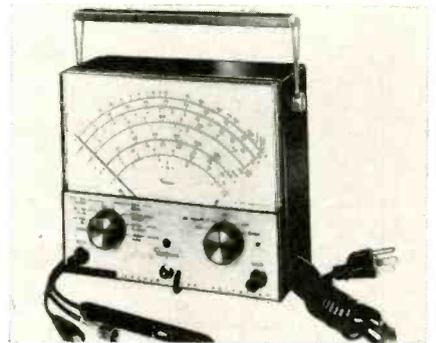
A circular slide rule for engineers and other plant and office executives is announced. Simple calculations:



multiplication, division and finding proportions can be performed. General Industrial.

VTVM 209

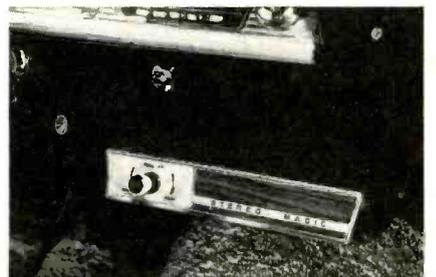
A VTVM with an input resistance of 16 M is introduced. Offers 1/2 v range. RF Probe and HV probes are



available. The Model 312 with ac Ω /dc probe and operator's manual is priced at \$79.95. Simpson Electric.

Reverberation Unit 210

An under-dash reverberation unit is announced. This unit may be installed under the dash instead of the trunk. It is 1 5/8 x 9 x 4 in. Tenna.



... for more details circle 45 on postcard

Congress DIDN'T GO FAR ENOUGH!

PUBLIC LAW 87-529; 76 STAT. 150

[H. R. 8031]

An Act to amend the Communications Act of 1934 in order to give the Federal Communications Commission certain regulatory authority over television receiving apparatus.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That:

Section 303 of the Communications Act of 1934 (47 U.S.C. 303)³⁴ is amended by inserting at the end thereof the following:

“(s) Having authority to require that apparatus designed to receive television pictures broadcast simultaneously with sound be capable of adequately receiving all frequencies allocated by the Commission to television broadcasting when such apparatus is shipped in interstate commerce, or is imported from any foreign country into the United States, for sale or resale to the public.”

Sec. 2. Part I of title III of the Communications Act of 1934 is amended by inserting at the end thereof a new section as follows:

THEY SHOULD HAVE ALSO REQUIRED...

“—that all 82-channel television receivers* must use an 82-channel television antenna.”

Of course, you can't take the law into your own hands—but you *can* take advantage of today's ready-made opportunities to sell an 82-channel antenna with each 82-channel TV set.

Our Antenna Research Laboratories in Champaign, Illinois knew what they were doing when they teamed the acclaimed Log Periodic concept of the University of Illinois Antenna Research Laboratories with our new antenna design advance—the capacitor-coupled electronic dipole. Proof is the fact that the JFD LPV-VU is America's No. 1 82-channel TV/FM antenna!

Who says you can't have everything

you want in a TV antenna—VHF?... UHF?... FM Stereo?—with a *single* down-lead to boot!

MOST EFFICIENT PERFORMANCE EVER ON VHF, UHF, FM/STEREO FROM ONE ANTENNA USING ONE DOWN-LEAD!

- *Cap-electronic* dipole design makes more elements resonate on channels 7 to 13 with a corresponding increase in gain.
- *Higher mode* operation in UHF band achieves higher gain on channels 14 to 83—and FM stereo.
- *Narrower beamwidths* . . . higher front-to-back ratios step up ghost rejection . . . intensify color.
- *Patented frequency independent* design maintains peak perform-

ance characteristics regardless of channel or band tuned.

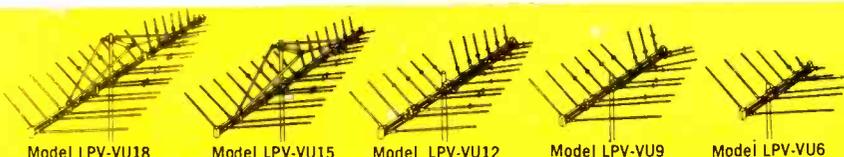
- Includes 3-way splitter so single down-lead can be tied into individual VHF, UHF and FM system inputs.

REMEMBER — AN 82-CHANNEL TV SET IS NOT AN 82-CHANNEL TV RECEIVER UNLESS IT HAS AN 82-CHANNEL TV ANTENNA!

*Lest we forget—every *color* set is also an *82-channel* set requiring a color-perfect antenna. In fact, many color TV shows are broadcast on UHF channels.

JFD

SEE YOUR DISTRIBUTOR OR WRITE FOR BROCHURE 806



JFD LPV-VU LOG PERIODICS for channels 2 to 83 and FM/Stereo.

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JFD ELECTRONICS CORPORATION

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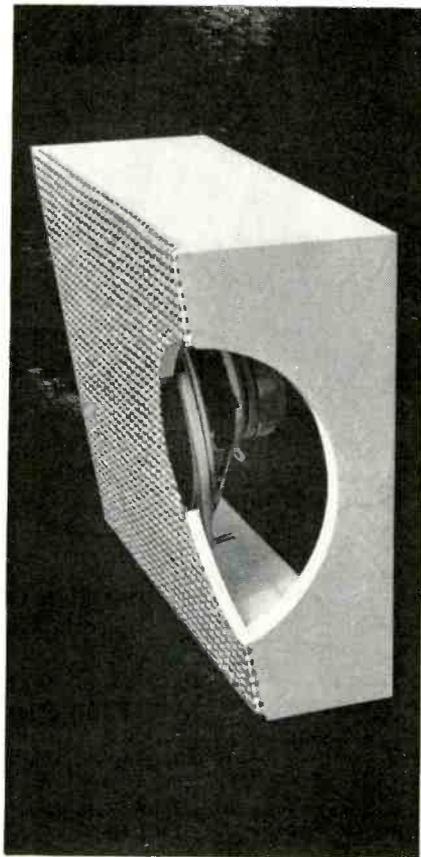
Oxford, North Carolina

JFD International

64-14 Woodside Ave., Woodside 77, N.Y.

JFD Canada, Ltd.,

51 McCormack Street, Toronto, Ontario, Canada



GET PLUS PERFORMANCE FROM OAKTRON SPEAKERS

All Oaktron speakers feature the exclusive Aluminum Voice Coil. This tempered, all aluminum form eliminates warpage from humidity changes and from severe overload. The unique aluminum Voice Coil also provides increased sensitivity and longer speaker life.

A complete range of sizes and styles are available in Oaktron Baffles. Styled in smart furniture finish, Oaktron Baffles feature 1/2" hardwood, double strength interlocking corners, and solid glued and stapled grills.

For complete information, write today for your FREE Catalog.



OAKTRON INDUSTRIES, INC., MONROE, WIS.

... for more details circle 43 on postcard

NEW PRODUCTS

Parts Bags 211

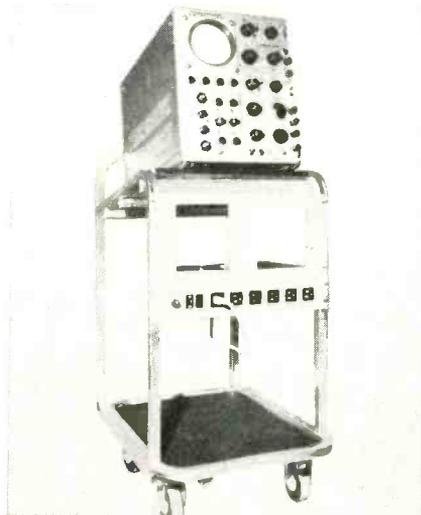
A line of bags for handling and packing small parts is introduced. The bags are available in four dif-



ferent styles. Tags are available optional on all bags. Hutchinson Bag.

Scope Dolly 212

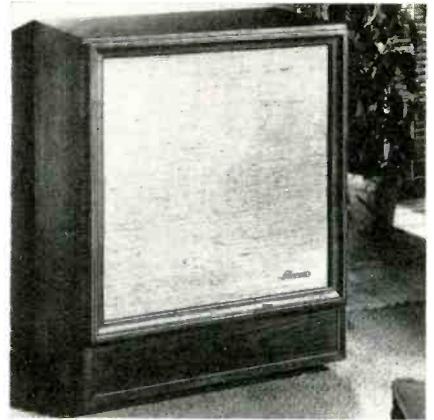
A dolly designed to handle standard and oversize oscilloscopes and other test equipment is introduced. The dolly has a deck inclined at 22



deg to accommodate laboratory and workshop instruments. The unit is valuable in locations with insufficient bench or table space. Dimensions are 19 1/4 x 29 1/2 x 36 1/2 in. Waber.

Speaker System 213

A four-way, six-speaker system with a response of 29 to 17,500 cps., $\pm 2\frac{1}{2}$ db, is announced. A 12 db./octave crossover isolates the four speaker response ranges at 200, 600,



and 3500 cps. There are two 10-in. woofers, an 8-in. midwoofer, an 8-in. midrange, and two 3 1/2-in. ring-radiator tweeters. All speakers are individually chambered and mounted to 1-in. thick, cross-braced and resin-filled, flakeboard baffles. Sherwood Electronic Laboratories.

Tape Recorder 214

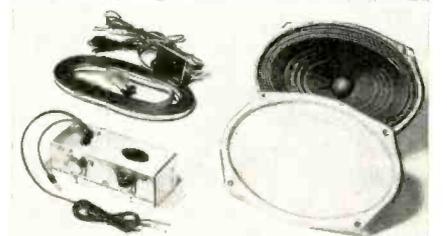
A stereo tape recorder, the model 6000S, is introduced. It is battery operated and includes mike, recharge-



able battery, battery charger, ac adapter, and double amplifiers for stereo playback. Roberts Electronics.

Reverberation Kit 215

An all-transistor reverberation kit for 12 v negative ground car radios is announced. Power supply is 12.6



vdc (negative ground) with a 4 w power output and an idle current of 0.25 amp. It has a fader control between speakers. The unit measures 6 x 2 x 2 1/2 in. Cleveland Electronics.



Why does Arco wind all its tv-replacement capacitors with computer-grade 99.99% pure aluminum foil?

To help cure that pain in your neck.

Impurities in aluminum foil can lead to deterioration, premature failures, lost customer confidence—and call-back time you can't charge for. Big pains in the neck.

So we wind every Arcolytic® electrolytic capacitor with the purest aluminum foil available: 99.99% pure. It meets computer manufacturer standards. And exceeds those of radio-tv manufacturers.

Result: Arcolytic capacitors last longer in your customer's set. In fact, they won't deteriorate even at high operating temperatures of 85° C.

And while we wind them with computer-grade foil, we price them for home-entertainment service. You pay no premium.

You'll find whatever discrete capacitance value you need at your Arco Distributor's. And in your choice of single- and multiple-section tubular, or twist-mount designs. (You'll also find a complete line of equivalent-quality miniature ceramic disc capacitors up to 6000 VDCW.)

Start using Arcolytic capacitors. And the next call from your customer will be because he likes your kind of reliability, and wants more of your service.

Arco Electronics

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COMMUNITY DRIVE, GREAT NECK, N.Y. DALLAS, TEX. PASADENA, CALIF. WRITE FOR FREE CATALOG.

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MAKE THIS A COLOR-FILLED HOLIDAY SEASON

with valuable premiums and G-E tubes



**COLOR TV
COMPONENTS**

Look at these valuable premiums . . . there's something for everyone on your Christmas gift list . . . and they're all available with

purchases from General Electric's line of receiving tubes, the line with more tubes for color TV applications. Make this a real color-filled holiday—stock up on G-E color components and earn brand name merchandise for your family, friends, or yourself. Ask your G-E Distributor*. Premiums available from October 21 through December 15. **Distributor Sales, Owensboro, Kentucky** 285-08

*Premiums available at option of your G-E Tube Distributor.



WHITE DRESS SHIRT

Pima cotton oxford man's dress shirt with precision needle tailoring. Popular button-down collar with box-pleat back. Sanforized. White only, in neck sizes 14 to 17, sleeves 32 to 35.

Order ETR-4329

BATES TABLECLOTH & NAPKINS

Perfect for the lady of the house. Set includes one 52" x 52" tablecloth in 100% cotton with four matching napkins of pure Irish linen. Completely washable. Specify choice of orange/brown with orange napkins, brown/green with gold napkins, or blue/green with turquoise napkins.

Order ETR-4323



STRUCTO AUTO TRANSPORT

All metal toy auto transport, multi-colored with two metal cars. Ramp extends for loading. Length 21 $\frac{7}{8}$ "

Order ETR-4327



RONSON BUTANE TORCH

Lightweight, easy-to-handle torch has many household and hobby uses. Adjusts from pin-point to blowtorch flame. Complete with large-size Ronson multi-fill fuel container.

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D'ORSAY PERFUME SET

What lady wouldn't appreciate this. Set includes 3 oz. Nuage Parfume spray mist plus 1 dram flaconette of Parfum de Bain bath scent. Matched fragrance set comes gift boxed.

Order ETR-4326



TIMEX WATCH

Regular size man's watch with chrome plated bezel, sweep second hand, radio-lite dial. Features Timex unbreakable mainspring; is shock resistant, gift boxed.

Order ETR-4333



G-E CHRISTMAS LIGHT SET

Your choice of either 10-lamp multiple indoor set or 15-lamp outdoor set. Both sets feature all-green, extra-durable sockets and cords. Use season after season.

Order ETR-4334 (Indoor),
ETR-4335 (Outdoor)



KODAK CAMERA OUTFIT

Famous Hawkeye Instamatic F® outfit comes complete with camera with wrist strap, 1 Kodapak cartridge, 4 AG-1 flashbulbs, 2 AAA-size batteries, flashguard, and instruction book.

Order ETR-4332



PILE LINED JACKET

Stylish year-round Cougar jacket in 100% cotton poplin with 100% Orlon pile lining. Completely wash 'n wear, full zipper front, two slash pockets. Beige only in sizes 36, 38, 40, 42, 44, 46.

Order ETR-4330



MEN'S STRETCH HOSE

Three pairs 100% nylon stretch hose, one each of black, cordovan, and navy. Fits sizes 10-13. Available either Regular or Calf-length.

Order ETR-4325
(Regular)
ETR-4324 (Calf-length)



G-E CLOCK RADIO

Popular G-E AM clock radio features famous Snooz-Alarm® and Muted Slumber Switch. Handsome white cabinet; 4" Dyna-power speaker; built-in ferrite rod antenna; drift compensation and automatic volume control.

Order ETR-4331

GENERAL ELECTRIC

ATR PRODUCTS FOR MODERN LIVING

NEW ATR Golden Line



A.C. HOUSEHOLD ELECTRICITY Anywhere . . . in your own car, boat or plane! Operates Standard A.C.

- Portable TV Sets
- Record Players
- Small Tape Recorders
- Dictating Machines
- Small Radios
- Electric Shavers
- Heating Pads, etc.
- Additional Models Available

This ATR 12T-RME-1 INVERTER with automatically controlled "Frequency - Stability" will deliver 110-volt A.C. 60 cycle power for all popular make 11" to 13" portable TV Sets.

12 T-RME-1 (12V D. C.)
Rated: 140 watts max.
Shipping Wght., 14 lbs.

Dealer Net Price, **\$2916**



ATR UNIVERSAL INVERTERS

A.C. Household Electricity Anywhere in your car, boat, plane!

- Tape Recorders • TV Sets
- Dictating Machines • Radios
- Public Address Systems
- Electric Shavers • Record Players • Food Mixers • and Emergency Lighting.

12U-RHG (12V) 150 to 175 W Shp. Wt. 27 lbs \$73.00
28U-RHG (28V) 150 to 175 W Shp. Wt. 27 lbs \$87.50



ATR BATTERY CHARGERS

NO INSTALLATION . . . PLUG INTO CIGARETTE LIGHTER RECEPTACLE! Keeps car battery fully charged in your own garage! Needed more now than ever before—makes motor starting easy! Operates directly from standard 110 volts A.C. current.

612CA4 (4 amp.) 6/12 V, Shp. Wt. 6 lbs. NET \$19.46
612CA6 (6 amp.) 6/12 V, Shp. Wt. 8 lbs. NET \$22.46
612CA10 (10 amp.) 6/12 V, Shp. Wt. 10 lbs. NET \$27.71

HAND WIRED—NO PRINTED CIRCUITRY

ATR ALL-TRANSISTOR ULTRA COMPACT UNIVERSAL MODEL 707



Karadio IN DASH... UNDER DASH...

Complete with variable tone control . . . R. F. stage . . . Built-in speaker . . . and External speaker jack.
ATR MODEL 707 . . . \$2597 NET



ATR "A" Battery ELIMINATOR

For Demonstrating and Testing Auto Radios—TRANSISTOR or VIBRATOR OPERATED!

Designed for testing D.C. Electrical Apparatus on Regular A.C. Lines.

MAY ALSO BE USED AS A BATTERY CHARGER
MODEL 610C-ELIF . . . 6 volts at 10 amps, or 12 volts at 6 amps. Shipping weight 22 lbs.

USER NET PRICE . . . \$5500

ATR AUTO RADIO and COMMUNICATION

LONGER-LIFE VIBRATORS

"The Best by Test!"



SEE YOUR ELECTRONIC PARTS DISTRIBUTOR OR WRITE FACTORY FOR LITERATURE & DEALER PRICES

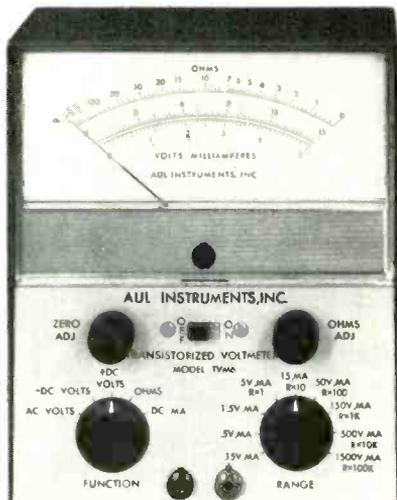
ATR ELECTRONICS, INC.

Quality Products Since 1931
St. Paul, Minnesota 55101—U.S.A.

NEW PRODUCTS

VOM 216

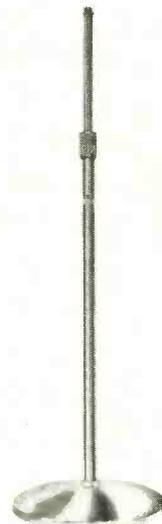
A transistorized VOM, model TVM6, is introduced. The instrument offers nine dc voltages, seven ac volt-



age, nine dc current and six resistance ranges. It has a 6 in. meter and measures 7 1/8 x 6 1/8 x 3 1/2. Aul Instruments.

Microphone Stand 217

A line of microphone stands, featuring low profile bases, is announced. The announcement said that more weight has been used at the outer edge of the base for maximum stabil-



ity. The MS11C and MS12C are adjustable from 34 to 62 in. All units have an extra-long clutch for secure, full hand grip. The MS11C sells for \$14.50 and the MS12C, with wrinkle finish base, is \$11.50 list. Atlas.

J. W. Miller 4th Video IF replacement for more than 20 Color TV manufacturers

Model 6037 Fourth Video IF Transformer is a high quality replacement for most Color TV sets.

Cross Reference Guide No. 6037 listing manufacturers, models and part numbers has been prepared for quick, easy comparison. Included are a schematic diagram and installation instructions.

Write today or mail reader service card for your copy.



J. W. MILLER COMPANY

5917 South Main Street • Los Angeles, California 90003

See your local distributor for the full line of RF and IF coils, chokes, filters and transformers.

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ELECTRONIC TECHNICIAN



**When you spend hours
trying to trace down the trouble
with one of these . . .**

**you know why we
take the trouble to handwire
every Zenith Handcrafted TV**

ZENITH
®
HANDCRAFTED TV



IS BUILT WITH THE SERVICEMAN IN MIND!

NEW PRODUCTS

Stereo Receiver 218

Announced is a stereo receiver, model SR-400, which includes an AM/FM stereo tuner, stereo preamplifier and amplifier. The solid-state unit is said to be flat (± 1 db at 1w)



from 6 to 25,000 cps. IHFM music power output is rated at 36 w — 18 w per channel. Dimensions: 14½ x 4½ x 11½ in. Shipping weight 16 lb. Harman-Kardon.

CB Transceiver 219

A 23 channel CB transceiver is announced. Called the "Cobra", the unit is equipped with all necessary crystals for immediate transmit and receive on 23 channels. It has 5 w



input; double conversion superhet receiver; transistorized 117 vac/12 vdc power supply; maximum modulation and modulation indicator; delta-tune fine tuning; squelch control and standby switch; illuminated S and RF output meter; plug-in microphone suitable for public address amplifier use. B & K.

Intercom System 220

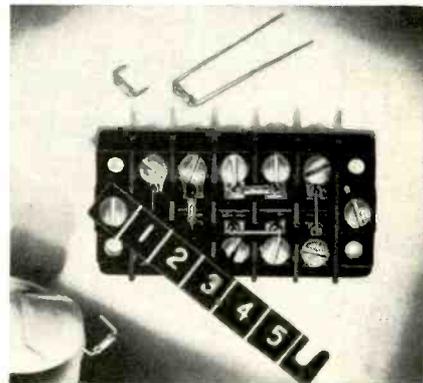
A 2-station battery operated intercom system is announced. Employ-



ing one 9 v transistor battery, the transistorized master and remote station are connected with a 50 ft two-conductor cable equipped with plugs which jack into the two units. The cases are constructed of plastic in ivory and gray colors with gold-tone appointments. Fanon Electronic Industries.

Fuse Terminal Strip 221

Introduced is a small size fused terminal strip recommended for electronic or electrical control wiring, office machines, computers, instru-



ments, machine tools and custom built equipment. The fused terminal strip permits use of electrical circuitry rated up to 130 v — 10 amp. Picofuses, rated from ½ amp through 5 amp at 125 v can be used. Littelfuse.

Transistor Battery 222

A 9 v transistor battery is introduced. The battery comes in a blister pack and is available with a display



that holds 12 batteries. This Display can be placed on a counter or shelf. Union Carbide Corp.



The boss didn't believe us, so we borrowed his new Cadillac and came to a dead stop on top of one of the new all steel Sencore cases . . . and without an ounce of damage. We wanted to prove once and for all that only Sencore was rugged enough for constant field use. We doubted that you would run over your new Mighty Mite tube tester, CRT checker, solid state color generator, or any of the other fine Sencore time saving testers but we do know that you toss them around plenty . . . all day long. This requires all steel construction. Only Sencore has a complete line of all steel ruggedized testers. Wood and fabric just aren't good enough for today's technician on the go. That's why Sencore is the World's leaders in portable testers.

SENCORE ■ 426 WESTGATE ■ ADDISON, ILLINOIS

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"I haven't the space for a large inventory.."



that's why I always specify Greyhound Package Express!"

Your inventory can be as big as the catalog from which you order, when you specify Greyhound Package Express. Using this fast, efficient, low cost shipping service, you can order only what your customers need. And have it when they need it... usually the next morning. Very often, the same day. No premium rates to pay, either! You'll save space, time and money, without sacrificing the needs of a single customer. Your

shipments travel aboard regular Greyhound buses on fast, frequent schedules. What's more, Greyhound Package Express works 365 days a year, 24 hours a day, weekends and holidays. Convenient C.O.D., Collect, Prepaid or special charge account service, too.

For information on service, rates and routes, call Greyhound, or write: Greyhound Package Express, Dept. 53-K, 40 S. Dearborn St., Chicago, Ill. 60603.

It's there in hours... and costs you less

For Example	Buses Daily	Running Time	20 lbs.	30 lbs.	40 lbs.*
BOSTON— NEW YORK	20	5 hrs. min.	\$2.00	\$2.35	\$2.60
LOS ANGELES— SAN FRANCISCO	28	9 hrs. 20 min.	2.10	2.45	2.80
PITTSBURGH— CLEVELAND	13	2 hrs. 55 min.	1.80	2.05	2.40
INDIANAPOLIS— CHICAGO	10	4 hrs. 15 min.	1.90	2.20	2.55

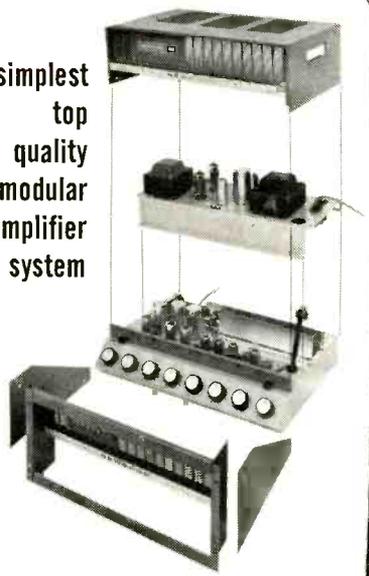
*Other low rates up to 100 lbs.



One of a series of messages depicting another growing service of The Greyhound Corporation.

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simplest
top
quality
modular
amplifier
system



NEWCOMB
TOP QUALITY CUSTOM



Newcomb's finest, the Custom K Series is the climax of 27 years devoted to developing and producing the very best public address amplifiers. You quickly and simply get the combination of channels and power you need. A power output module is dropped into either a front-end or booster chassis. Two electrical plug-in connections; no soldering. Put a cover over the top or insert the chassis in a rack mount. You can plug in a transistorized VU meter accessory which has a sensitivity control and monitor jack for crystal headphones. The 4-channel models have provisions for a remote control accessory. There are 3 power amplifier modules: 40, 60, and 125 watts, and a power supply when you want to use a front end as a mixer-preamplifier only. There are three preamplifier modules: 3, 4, and 5 channels, and a chassis for making a booster amplifier out of any of the output modules. All in all, only 14 components permit 70 combinations. Performance is superb. Frequency response is ± 1 db 20-20,000 cps; distortion is extremely low. Custom K amplifiers run remarkably cool. Easy-to-trace, easy-to-service vacuum tube construction is used throughout. Colors are soft shades of gray-green. Write for Catalog K-15.

NEWCOMB AUDIO PRODUCTS CO., Dept. ET-10
6824 Lexington Avenue
Hollywood, California 90038

... for more details circle 42 on postcard

NEW PRODUCTS

FM Radiophone 223

A two-way FM portable radiophone is introduced. The battery-operated Minipak II will operate on all authorized commercial and government frequencies with a choice of single or



dual channel, wide or narrow band modulation and either microphone-speaker or handset audio systems. Radio Specialty Mfg. Co.

Variable Transformer 224

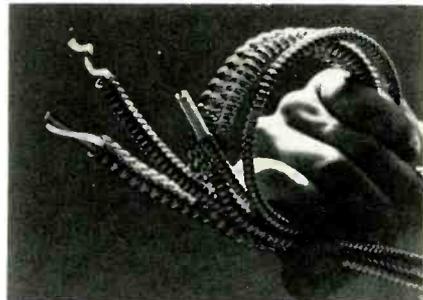
Introduced is a portable variable transformer rated at 3.75 amp. Model 3PNPA375 is enclosed in a ventilated case, complete with pilot light,



switch, fuse, NEMA standard 3-wire grounding receptacle and 6-ft line cord with NEMA standard 3-wire grounding plug. The unit is finished in green hammertone. Outside dimensions are: 6½ x 6⅞ x 6½ in. Specifications are: Input 120 v, output 0-140V, Max. KVA 0.53, 60 cps. Staco.

Flexible Coax 225

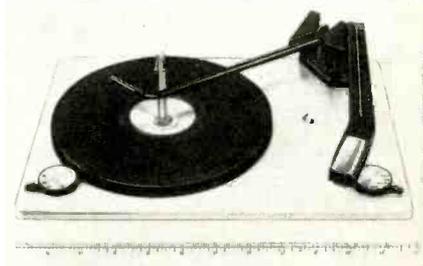
A foam and air dielectric flexible coaxial cable in ¼, ⅜ and ½ in.



sizes is announced. The cables have a copper inner and corrugated outer conductor. Andrew.

Changer 226

Announced is a compact record changer, called the "Minichanger," which weighs 4½ lb and measures 8⅞ x 11⅞ x 5 in. It plays 4 speeds,



stereo or monophonic on either ac or cordless battery power. It stacks six 7, 10 or 12-in. records, and will intermix the 10 and 12 in. sizes, with automatic shut-off after the last record is played. DuFine.

NEW...POSITIVELY NEW

Positively—

- CONTAINS NO CARBON TETRACHLORIDE
- HARMLESS TO ANY PLASTICS KNOWN TO KRYLON
- CLEANS AS IT LUBRICATES
- NON-FLAMMABLE
- NON-CORROSIVE . . . NON-TOXIC

Contact your local jobber for Tuner Cleaner and other everyday Krylon aerosol products—Crystal Clear, Let-Go (oil penetrant), Red Insulating Varnish, Silicone Lubricant, Cleaner and Degreaser

If you prize it... KRYLON-ize it!®



... for more details circle 35 on postcard
ELECTRONIC TECHNICIAN

Steve Lovitch is too busy to wait a week for any part to arrive.

Steve Lovitch keeps on the go. He gets a lot of business because he is running a Philco Qualified Service Center. And the attention he gets from his Philco Parts Distributor helps to keep things moving.

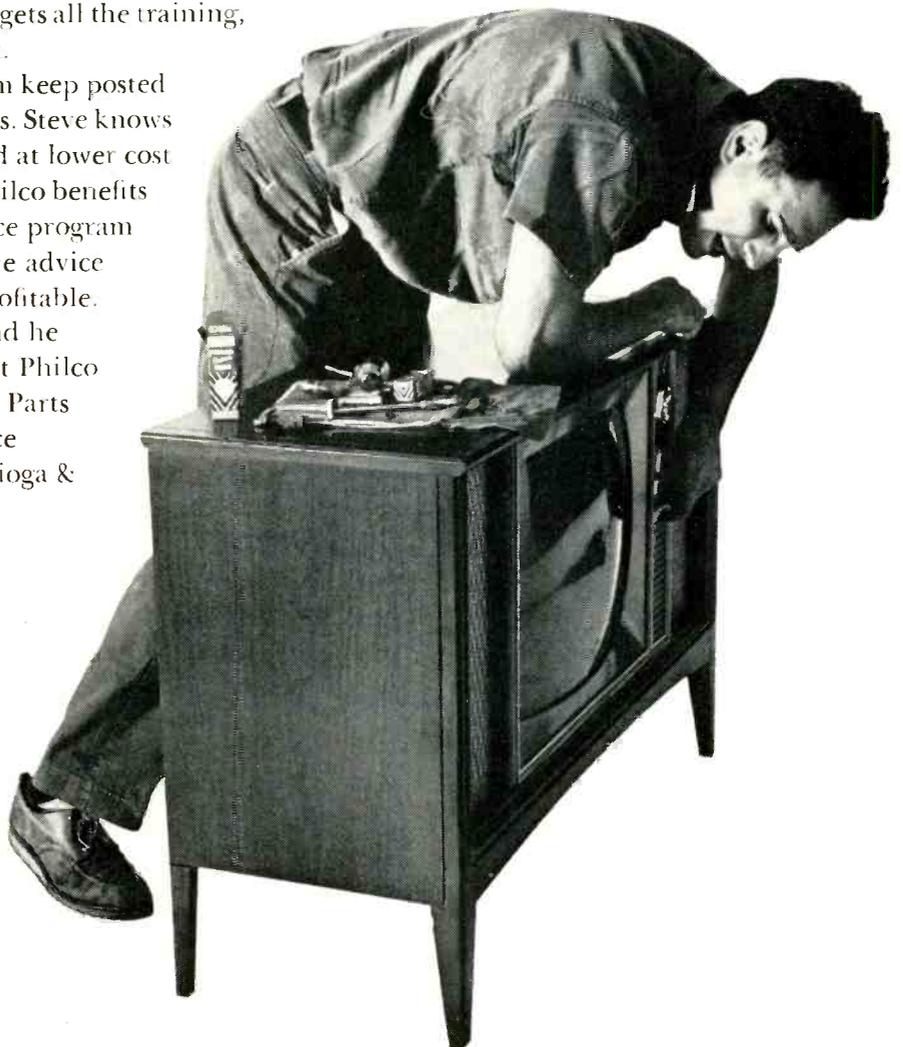
99 out of 100 times that Steve needs a part, he finds that his Philco Distributor has it right on hand. That hundredth time, Philco's Lifeline Emergency Service swings into action, and Steve's part is on its way to him — by air — in 24 hours or less.

That's not all Steve likes about being teamed up with Philco. He's his own boss, but he still gets all the training, attention and benefits he could want.

Philco Tech Data Service helps him keep posted on how to service new Philco products. Steve knows that he gets the facts faster, fuller and at lower cost through Philco. And Steve's other Philco benefits include a complete accident insurance program for himself and his men and valuable advice on how to make his business more profitable.

Steve Lovitch has a good deal. And he knows it. Shouldn't you find out what Philco can do for you? Talk to your Philco Parts Distributor, or contact Parts & Service Department, Philco Corporation, Tioga & "C" Streets, Philadelphia, Pa. 19134.

PARTS & SERVICE DEPARTMENT
PHILCO
A SUBSIDIARY OF *Ford Motor Company*



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NEW PRODUCTS

Stereo Amplifier 227

A stereo amplifier especially designed for private headphone listening to records, tape recorder, or FM tuner is announced. The Solo-Phone (Model SA1), will accept the lower output of magnetic cartridges. The unit is a small fully-transistorized amplifier, housed in a wood and metal cabinet measuring 10¼ x 3½ x 3 in.



Two separate input jacks for phono and tuner or tape recorder and an ac power outlet are located on the back panel. A two-position switch to select these inputs as well as a separate ON-OFF switch and pilot light are located on the unit's front panel. Shure Brothers.

Wire Stripper 228

Announced is a wire-stripping device for removal of varnish insulation from solid magnet wire is introduced. A motor drives an arrangement of three counterbalanced knives which close in around the wire by centrifu-



gal force. At a given motor speed the rotating blades seek an equilibrium position corresponding to a given wire diameter. At this position, the announcement said, the knives are "weightless" and there is no further tendency to cut deeper. Jensen Tools and Alloys.

Underwater Speaker 229

An underwater speaker having a frequency response of 100 to 10,000 cps and a power capacity of 30 w is announced. Underwater speakers are



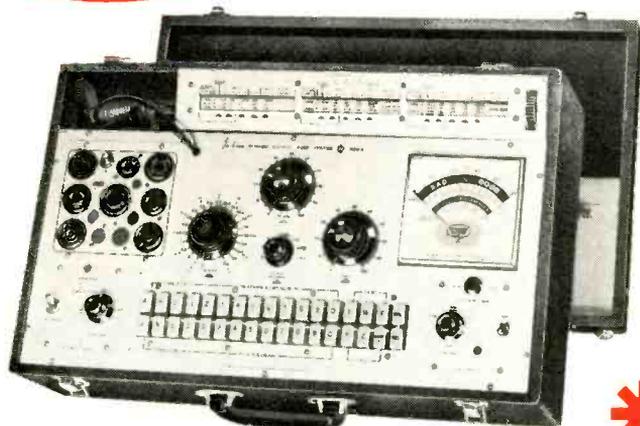
used for many activities in commercial and luxury resort pools. Speakers can be used for synchronized swimming events and instruction in Olympic pools and where underwater ballets and similar water shows are presented. LTV University.

Decade Box 230

A decade box with a total resistance range of 0 to 1.1 M in 1Ω steps is announced. The ARD41 has six dials and measures 6¾ x 4¼ x 2 7/16 in. Aerovox.



...IT'S THE FINEST



is \$234.95
too much to pay for a
TUBE TESTER?

It can be too much if you have little use for a tube tester. But if you are a *technician on the go*, who believes an investment in top equipment is a sound investment in your own *skill, ability and livelihood*, then the Model 658-1 DYNAMIC OUTPUT TUBE TESTER is your *greatest bargain*. No other tube tester available makes *so many accurate tests on more tubes, so quickly*. Makes a true rectifier test, handling high current types with ease • tests grid leakage up to 80 megohms • heater current on series string tubes • heater continuity without warm-up • indicates striking point and operating range for regulator and reference tubes • provides the right sensitivity for triple shorts sensitivity test on each tube • dynamic test for eye tubes • accurate test on all 12-volt hybrid tubes • famous Jackson life-line test. Among the many extraordinary features of the Model 658-1 is the brilliant *dynamic output principle*, providing the most valid kind of test for amplifiers, by considering the entire output curve of the tube—not just a small portion. Fast push-button sequence switching makes set-up time less than tube warm-up time. Convenient angled view zig-zag color coded roll chart is read right on the panel. Don't settle for less than the ultra reliability of the Model 658-1.

*Model 658-1 DYNAMIC OUTPUT TUBE TESTER...Net...\$234.95

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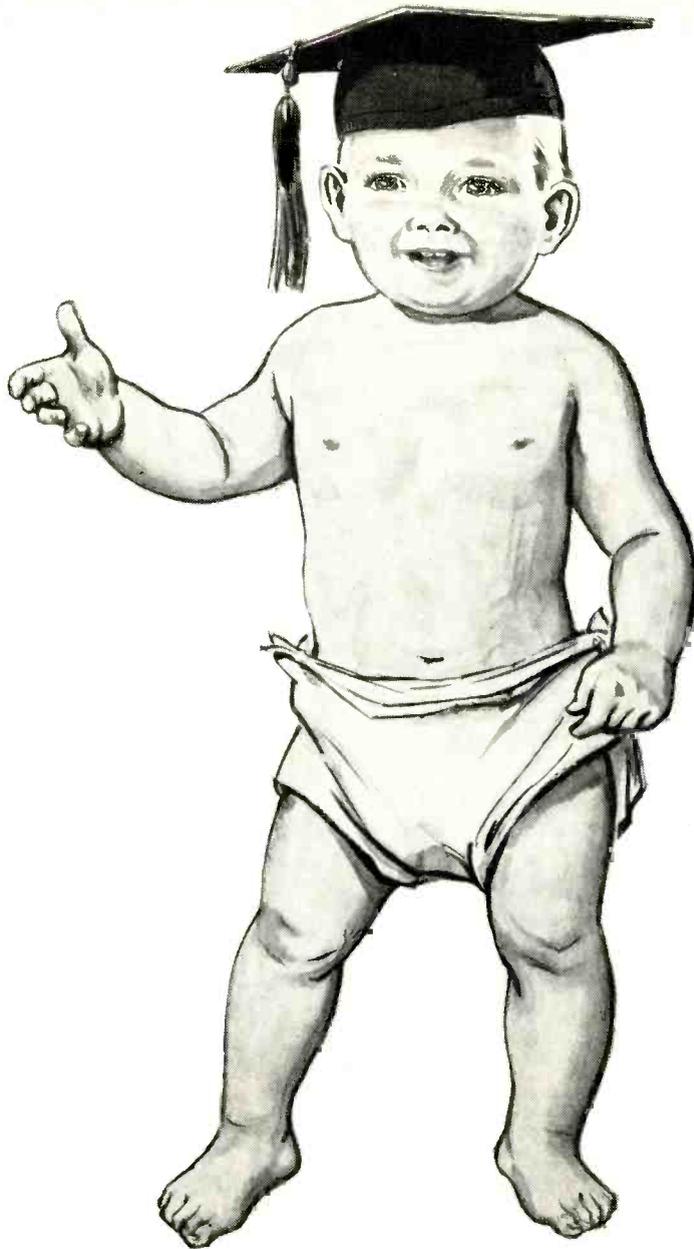
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ecutive survey made of 100 manufacturing businesses revealed that of the 200 top executives, 86% were college-educated.

But our colleges are facing problems. They need facilities, yes. But even more urgent is the demand for competent teachers. This is the human equation that will help America develop and maintain a higher *margin of excellence*.

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 New RCA Strato Star II-15 Reflector UHF antenna for suburban to fringe area reception. Stock #7B141
 New RCA Strato Star I-11 Reflector UHF antenna for urban reception. Stock #7B140



What's
 the latest
 angle in

UHF-ANTENNAS

...and how can it make money for you?

There's a lot of money to be made in UHF antenna installation in localities where UHF is established... or is coming, because top UHF reception requires a separate antenna designed for UHF... and UHF is coming to more and more communities every week.

These two RCA UHF antennas let you cover every UHF sales possibility from urban to fringe areas.

The "Latest Angle" Increases Gain. RCA has increased corner reflector angle to 100°. This feature increases gain up to 18% on the most popular UHF channels.

A "Snap" to Install. Antenna arms snap into place and lock automatically. No rivets—no bolting—no bag of hardware. This feature alone can save valuable man hours on each installation.

Better Impedance Match... through new, improved dipole design.

Increased Directivity, plus rejection of unwanted ghosts and other types of interference, as a result of precision variable-spacing of reflector elements.

Better Front-to-Back Ratio, achieved by means of a special element at the apex of the corner reflector.

Don't miss out on UHF profits! Call your nearest Authorized RCA Antenna Distributor today.

RCA PARTS AND ACCESSORIES, DEPTFORD, N. J.



The Most Trusted Name in Electronics

NEW LITERATURE

Soldering Gun 300

This four-page bulletin describes a soldering gun which automatically feeds solder to the work. Gerber Communications.

Ceramic Cartridge 301

A data sheet gives performance information on a line of micro-ceramic cartridges. Sonotone Corp.

Industrial Equipment 302

Office furniture, filing cabinets, all types of industrial equipment and other items for the shop are listed in a 32-page catalog. General Industrial Co.

Semiconductors 303

This catalog lists a line of semiconductors by type number and gives information on their electrical characteristics. Bendix Semiconductor Div.

Voltage Stabilizers 304

The causes of voltage variation in apparently normal power service is explained in this catalog. The catalog also gives operating characteristics and applications of a line of voltage stabilizers. Acme Electric Corp.

Electronic Products 305

This 88-page catalog illustrates and describes a line of electronic products and equipment. Transceivers, tape recorders, transistor radios, test equipment, microphones, speakers, CB equipment and tools are some of the items covered. Midland International.

Meters 306

This catalog illustrates and describes a line of custom-built meters. A cross-section of this manufacturer's line is contained in the book. Hickok.

Test Accessories 307

Catalog No. 10-65 contains specifications and applications on a line of test accessories. Patch cords, cable assemblies, socket savers, test socket adapters and molded test plugs are covered. Pomona Electronics Co.

Power Rectifiers 308

This 70-page booklet contains application data and technical articles on a line of controlled and power rectifiers. International Rectifier Corp.

FINCO

COLOR-VE-LOG ANTENNAS

FOR UHF, VHF, FM RECEPTION

ALL-BAND UHF-VHF-FM ANTENNA

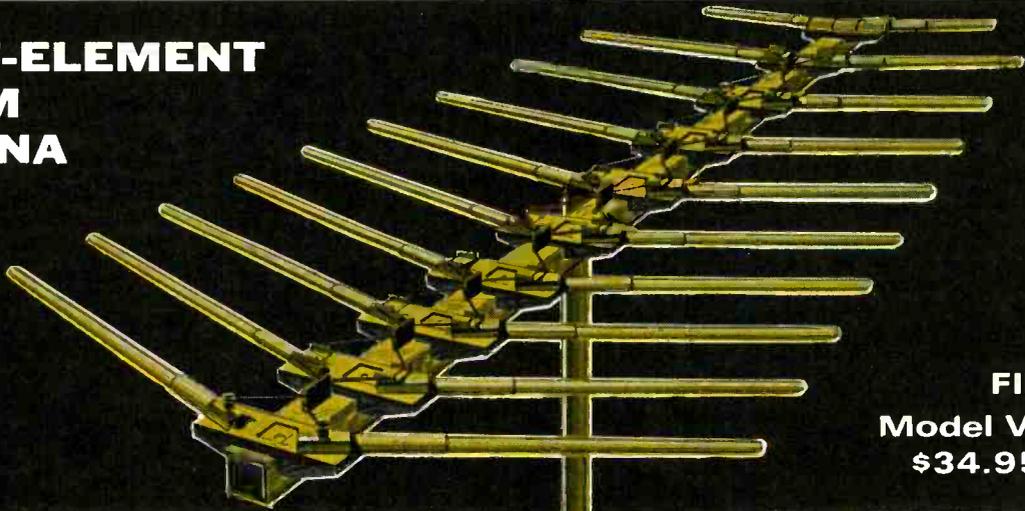


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Model UVF-24
\$59.95 list

The one antenna that does the work of 3! Gives startlingly clear black and white pictures and beautiful color on both UHF and VHF television channels — plus the finest in stereophonic and monophonic sound reproduction.

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FINCO Model UVF-16—\$30.50 list
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SWEPT-ELEMENT VHF-FM ANTENNA



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Model VL-10
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FINCO's Color-Ve-Log challenges all competition! Its swept-element design assures the finest in brilliant color and sharply defined black and white television reception — as well as superb FM monaural and stereo quality.

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FINCO Model VL-7—\$23.95 list
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SHORT HORN &
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It's happened to you. Half-way through a new installation, you're in trouble. Client wants plenty of power, but space is tight. Here's the solution—the ultra-compact, super-efficient, Model SH Short Horn. Use it with the new ID-75 driver—or with any University driver. It will provide *maximum* power conversion and clean, intelligible, High 'A' (*high audibility*) sound, comparable only to costlier and larger systems! And, with the ID-75 driver you'll overcome the toughest ambient noise problem! So efficient, it makes any amplifier more powerful.

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A DIVISION OF LTV LINE ALTEC, INC.

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NEW LITERATURE

Speaker System Kit 309
Specifications and description of a speaker system kit are given in this leaflet. Sonotone Corp.

UHF Antenna 310
A line of all UHF-band antennas are described in this four-page brochure. Specifications and prices for a line of UHF antenna preamplifiers and matching transformers are also listed. Winegard.

Desoldering Resoldering Iron 311
This bulletin describes a pencil-type combination desoldering and resoldering iron. Enterprise.

Rear Seat Speakers 312
This four page catalog gives technical and general information on three lines of automotive rear seat speaker kits. Reference tables covering such technical data as speaker size, magnet weight, impedance control data and grill description are included. Oxford.

CB Antennas 313
A line of antennas and accessories for the citizens band market are covered in this catalog. Included are a number of mobile antennas as well as base station models. Newtronics.

Motors and Timers 314
This 20-page catalog contains specifications and applications of a line of synchronous motors for a variety of electro-mechanical timing devices. A number of different types are described with applications and schematic diagrams given. Controls Co. of America.

UHF Antenna 315
The adjustable band-span UHF antenna is described in this four-page brochure. Gain charts are illustrated and specifications given. Channel Master Corp.

Vidicon Tubes 316
Specifications and performance data for a line of vidicon camera tubes are discussed in this data sheet. Cohu Electronics, Inc.

Motors 317
This 12-page bulletin, GEA-8095, includes design features, application and specifications of two series of induction motors. General Electric Co.

Test Equipment 318
This eight-page catalog covers test equipment including oscilloscopes, power supplies, VTVMs, decade boxes, signal generators, a tube and transistor tester and probes. Precise Electronics and Development.

Audio Systems 319
Catalog No. B278 describes a line of audio systems. Specifications are given for five different systems. Price and application information is included. Perma-Power Co.

Coaxial Cable 320
This eight-page brochure lists a line of coaxial cable by both type number and characteristic impedance. Bulletin C-265 also contains a table of special radio frequency cables for commercial applications. ITT Wire and Cable Div.

Audio Amplifiers 321
An eight-page brochure describes a line of modular audio amplifiers. Specifications of the equipment and accessories needed to build a custom designed system are included. Newcomb Audio Products Co.

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DUAL TV BIAS SUPPLY**

... a *MUST* for AGC trouble shooting; Quickly isolates the problem by direct substitution of TV AGC voltage with a variable bias supply. A *MUST* in B&W TV alignment, and *NOW*: a *MUST* for Chroma Bandpass amplifier alignment in color TV sets. The BE113 ALIGN-O-PAK provides all the voltages recommended by TV manufacturers with two non-interacting bias supplies of 0 to 20 volts DC at less than 1/10th of 1% ripple with calibration accuracy better than standard battery tolerances. Eliminate those messy time consuming batteries and get your BE113 from your distributor today.



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Speakers and Headphones 322

Stereo and monophonic, high fidelity loudspeakers, headphones, speaker systems and speaker kits are described in a 24 page catalog. Acoustical and dimensional specifications and prices are given. Jensen Mfg.

Electronic Parts 323

This catalog lists industrial electronic parts. Listings are illustrated

and specs clearly described. Newark.

Controls and Switches 324

A line of potentiometers are described in this 32-page catalog. Specifications and applications of both wire-wound and composition elements are included. Also covered are power rheostats, wire-wound resistors and a line of switches. Clarostat Mfg. Co.

Electric Motors 325

Buying information for a line of induction motors is provided in this 16 page catalog. Motors varying from 1/20 to 3 hp are covered. Features, applications, ratings and operating

characteristics of the various types of motors are included. G-E.

Cable Jacketing 326

Additions to this company's line of cable jacketing and shielding products are listed on this catalog sheet. Zippertubing.

AC Motor Capacitors 327

This 20 page catalog contains data, a replacement and cross reference guide for a line of motor run and motor start capacitors. Also included is a listing of mounting hardware. Aerovox.

Audio Equipment 328

A line of audio products including equalizers, filters, and power supplies are described in this eight page catalog. Complete electrical and mechanical specifications are included. Hi-Q.

Phono Cartridges 329

This 24 page catalog contains a listing of a line of replacement phono cartridges and cartridge brackets. A cross-reference guide for a number of brands of cartridges is included. Jensen Industries.

Transceiver 330

A business/industrial transceiver for base station or mobile use is described in a four page brochure. Features and applications of the unit are contained in the brochure. E. F. Johnson.

Soldering Irons 331

This catalog describes a line of soldering irons designed for miniature soldering operations. American Beauty.

Electrical Tape 332

Specifications and application data for a line of electrical tape are contained in this 16 page catalog. Electrical and physical characteristics, dimensions and packaging data of the tapes are included. Plymouth.

Voltage Regulators 333

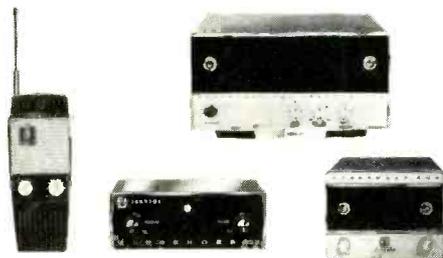
Catalog VR-200 contains operating data, schematic diagrams, specifications and physical dimensions of a line of voltage regulators. Sola Electric Co.

Wattmeters 334

A line of termination wattmeters is described in this data sheet. Prices and connector options are listed. Philco.

Business/Industrial 2-Way Radio is hot!

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You can sell Citizens Band equipment for many Business/Industrial applications—and we recommend it! However, our 25 to 50 Mc. AM BUSINESS INDUSTRIAL 2-WAY LINE opens *new* profit potential for you!

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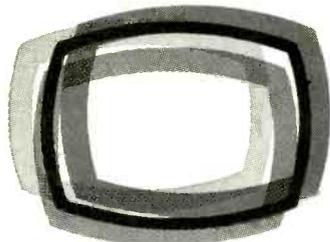


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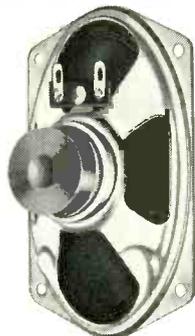
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**QUAM COLOR TV
REPLACEMENT
SPEAKERS PREVENT
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DISTORTION**

OFTEN CAUSED BY STRAY
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ORDINARY LOUDSPEAKERS



When you use an ordinary loudspeaker in a color TV set, you're looking for trouble... picture trouble. The external magnetic fields from standard loudspeakers will deflect the primary color beams, causing poor registration and distorted pictures.



**QUAM RESEARCH SOLVES
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An entirely new construction technique, developed in the Quam laboratories, encases the magnet in steel, eliminating the possibility of stray magnetic fields and the problems they cause! These new Quam speakers have been eagerly adopted by leading color TV set manufacturers. Quam now takes pride in making them available for your replacement use. Five sizes (3" x 5", 4", 4" x 6", 5 1/4", 8")... in stock at your distributor.

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OCTOBER 1965

NEW LITERATURE

Transistorized 2-way Radio 335

A 4-page brochure describes and illustrates features and applications of a business/industrial transceiver for base station, mobile or portable field use. Johnson.

Photoelectric Cells 336

This brochure describes a complete line of Cadmium Sulfide photoelectric cells, ranging in size from 1/4 in. (TO5) to 1 in. Extensive technical details are given. Pioneer.

CB Antennas 337

A 30-page catalog, SD242, lists 1965-66 CB mobile-base station antennas. Radiation patterns are shown. Antenna Specialists.

Shielded Cable Stripper 338

A 4-page brochure describes a plier-type cutter for stripping shielded cable. Handles wire sizes from 0.055 to 0.50 in. od. Gagne Associates.

BOOK REVIEWS

BASIC ELECTRONICS. By Bernard Grob. Published by McGraw-Hill Book Company. 509 pages, hard cover. \$7.50.

The second edition of this volume is designed for students without previous knowledge of electronics. It begins with introductory technical training in basic principles, electron tubes and transistors. The book is organized into twenty-five chapters. Each chapter contains information to prepare the student for more advanced material which appears in a later chapter. This method is somewhat similar to the approach used in "programmed learning" arrangements — a method of teaching which has become increasingly popular. Each chapter has a section at the end to explain common troubles in components or practical applications of theory. Many photographs and drawings enhance the text material. In addition to being updated, this edition makes greater use of graphs and sample problems. The graphs and additional problems enable the student to grasp the difficult material with greater ease. Although this book is written for the beginner, its practical approach adapts it to professional use also. The author has done an excellent over-all job in presenting viewpoints and considerations existing in both practical and theoretical areas.

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Zenith Sales and Earnings

Zenith Radio Corporation established new record highs in sales and earnings for both the second quarter and first half, Joseph S. Wright, president, announces. Consolidated sales for the six months were the highest for any half-year period in the company's history. Earnings for the six months ended June 30, 1965 rose to an all-time first half high of \$10,728,000 (after provision for Federal income taxes of \$10,301,000). This is equivalent to \$1.15 per share and represents a 21 percent increase over the previous record first half earnings of \$8,895,000, or 96¢ per share, reported for 1964.

FM Master Antenna on Empire State Building

Thirty-two dipoles have been installed above and below the observation windows on the 102nd floor of the Empire State Building to serve as the nation's first frequency modulation master antenna. When fully installed and wired, the antenna will be able to transmit the signals of 17 different FM stations simultaneously. WQXR/FM, WHOM/FM, WLIB/FM and WNCN/FM have received approval from the Federal Communications Commission to use the antenna. The master antenna, constructed at an estimated cost to the Empire State Building

of \$300,000, will probably be ready to operate by mid-October, according to Elliott M. Sanger, executive vice president and general manager of WQXR. Transmitting equipment is being installed on the 81st floor and will feed the antenna through coaxial cable. The cost of installation and equipment for each participating station is approximately \$100,000, not including annual rental of the antenna. The antenna is composed of two circular rows of dipolar antennas, 16 below the observation windows and 16 above. The antenna will permit multiplex, simultaneous broadcasting. The 1,250 ft height of the antenna will eliminate interference from surrounding skyscrapers and it is expected that participating stations will be able to reach a greater number of people.

Monochrome TV CRT Sales Drop

Factory sales of monochrome TV CRT's in April 1965 totaled 724,556 units, down 5.6 percent from 767,753 units in April 1964 and down 8.7 percent from the 793,723 units sold in the previous month of March 1965, Electronic Industries Association's marketing services department reports. Factory sales of mono picture tubes in dollars totaled \$11,920,633 in April, representing a decline of 11 percent from \$13,402,847 for April 1964 and a decline of 12.5 percent from \$13,626,220 for the previous month of March 1965. Cumulative unit sales of mono picture tubes for the first four months of 1964 totaled 2,943,538, down 11 percent from the 3,308,802 units sold during the same period of 1964, and dollar value for the first four months of 1965 totaled \$49,541,382, a drop of 16 percent from \$58,985,497 in the January-April period of 1964.



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- ★ Motorola will train you for this rewarding, elite profession
- ★ Send for our FREE EVALUATION EXAM. Prove to yourself that you are ready to learn FM 2-way radio servicing.

Opportunities in 2-way radio servicing are virtually unlimited. ■ Just one of the hundreds of successful Motorola Service Stations writes, "we would be pleased to interview any graduate of your school that has received some training in 2-way radio maintenance. We are an established firm, 10 years old, with a promise of expansion governed by our ability to obtain competent technicians." ■ Get all the facts today. There is no obligation and no salesman will call.



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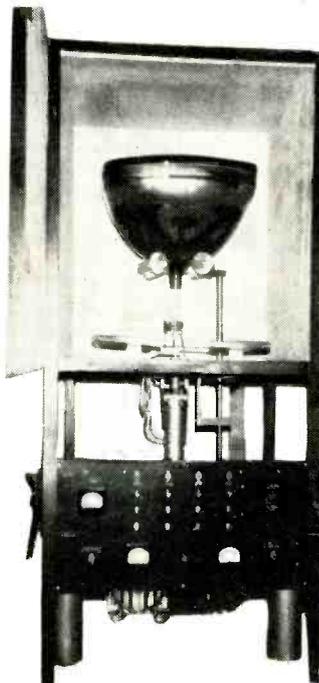
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Windsor Equipment
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ed-Face As Well As
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pays for itself in a few
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Equipment Division
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ELECTRONIC TECHNICIAN

Don't install half a tv system!

The all-channel and color TV era is here. Most sections of the country will have both UHF and VHF channels. Only all-channel TV sets are now being sold. All three TV networks are increasing their color TV programming — so, if you're installing a TV system, it makes sense to put in a color approved all-channel system. Here are the Blonder-Tongue all-channel, color approved products that will do the job most effectively, at a down-to-earth price. **All-Channel UHF/VHF Amplifiers** The world's first channel 2 to 83 amplifiers provide superior color or black and white TV reception on all channels when used with any all-channel TV receiver, or with sets equipped with UHF converters.

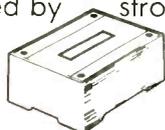
UHF/VHF Amplifier. Mounts near antenna to achieve optimum signal-to-noise ratio. Unique 2-transistor circuit provides power to turn fuzzy pictures into sharp clear ones and handle strong local TV signals without overloading. Overload caused by local FM stations. Remote AC power supply can be installed anywhere indoors. Rugged, weatherproof, cast aluminum amplifier housing. Separate antenna inputs (300-ohm) for UHF and VHF. Built-in, low-loss UHF/VHF splitter, no additional unit is required to separate the signals at the TV set or UHF converter antenna terminals. \$49.95 list.



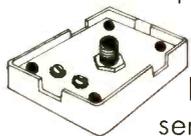
U/Vamp-2 mast-mounted UHF/VHF Amplifier. Installs easily anywhere in the home. unique two-transistor circuit provides excellent gain and low noise figure for one or two TV sets. For two-set operation, it provides an excellent impedance match, necessary isolation between sets plus an increase in antenna signal power. Single 300-ohm input accepts signals from both UHF and VHF antennas. A two-transistor circuit and a built-in filter minimize overloading caused by strong local stations. Patented 300-ohm stainless steel striplless terminals. \$42.50 list.



All-Channel Couplers—Color-approved, channel 2 to 83 delivering full-power signals to all-channel sets, only VHF Excellent inter-set isolation, low-loss, patented 300-ohm stainless steel striplless terminals. Model A-102 U/V two-set coupler. \$3.75 list. Model A-104 U/V four-set all-channel coupler. \$5.85 list. Model A-107, UHF-VHF antenna coupler combines UHF and VHF antennas or provides separate VHF and UHF outputs from a common line or a single antenna.



Model MT-283 UHF/VHF indoor/outdoor matching transformer. High quality color-approved unit matches 300-ohm antennas to 75-ohm coax down-lead (or 75-ohm terminals at set). Superior rejection of interference. Minimum insertion loss. "Jiffy Mount" provided for quick mast mounting. Connectors: Patented stainless steel striplless terminals (300-ohm); BTF connector (75-ohm). Solderless male connector supplied. \$6.75 list.



Cablematch U/V—All-channel, indoor matching transformer covers channels 2 to 83. Matches 75-ohm to 300 ohm impedance or reverse. Ideal for matching TV set inputs to a 75-ohm distribution system. Low insertion loss. Connectors: two spade lugs (300-ohm) and patented, solderless Autoplug supplied for RG-59/U cable (75-ohm). \$4.50 list.



TF-331 U/V All-Channel, 300-ohm Outlet Plate. Fits standard AC receptacle boxes. Designed to allow 300-ohm distribution systems to terminate at wall outlets for easy connect, disconnect. Patented 300-ohm stainless steel striplless terminals. \$3.35 list.

In addition to all-channel TV products, Blonder-Tongue provides a complete line of VHF (300-300Ω twinlead, & 75-Ω coax) and UHF system products. Blonder-Tongue, and only Blonder-Tongue, makes them all. Don't install half a system. Insist upon a system to meet all your customer's requirements, now and in the future. Insist on the top-rated line from the leader in all-channel products. Write for free booklet "How To Plan A Color Approved Home TV System".



BLONDER-TONGUE

9 Alling Street, Newark, New Jersey 07102
home TV accessories • closed circuit TV • community TV • UHF converters • master TV

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EICO Expands World's Fair Exhibit

EICO Electronic Instrument Co., Inc., whose main office is located adjacent to the World's Fair site at 131-01 39th Avenue, Flushing, N. Y. has expanded their exhibit at the World's Fair this year, it is announced by Harry Ashley, president. Mr. Ashley explained that the response to last year's efforts at the Fair were so favorable, that it was decided to obtain additional space for the 1965 opening. About 1/2 million visitors from all parts of the United States and the world saw the EICO line of Hi-Fi/Stereo components at the Pavilion of American Interiors during the 1964 season. In conjunction with the World's Fair season, EICO's N. Y. plant will be open for public tours from 3:00 to 4:00 every Thursday.

Delco Radio 30th Anniversary

Delco Radio Div. of General Motors started its 30th year of operation May 1st, it is announced by H. G. Riggs, general manager. Organized at Kokomo the division began operations May 1, 1936, with about 400 employees. It now employs more than 6000. From the one-time body shop of the old Haynes automobile, the division has grown from one plant to five plants, from 117,000 sq ft of floor space to more than 1,300,000 sq ft. By the end of the first 12 months of operation, the company had an average

of 709 employees. Its payroll for the first 12 months of operation totaled \$620,000. In contrast, the company payroll for 1964 totaled more than \$40,800,000.

RCA Brings Action Against SCM Corporation

The Radio Corporation of America filed an action against the SCM Corporation in the United States District Court for the Southern District of New York, charging SCM with infringement and threatened infringement of RCA patents relating to the RCA Electrofax high-speed electrostatic direct printing process used in office copiers. At the same time, RCA denied allegations made by SCM to have three RCA patents declared "void and unenforceable." The RCA court action also asks for an injunction restraining SCM from infringing the RCA patents and an accounting of damages. SCM recently terminated its license under an RCA patent with respect to office copiers using Electrofax.

Columbia Wire Appoints Reps

Columbia Wire and Supply Co., Chicago, Ill., manufacturer of wire and wire products announces the appointment of the new manufacturers' representatives to serve their distributor sales division. The representative for Maine, Vermont, Massachusetts, Rhode Island and Connecticut is the Robert Smith Co., 59 Verndale St., Brookline 56, Mass. The representative for Indiana and Kentucky is Courier Sales, 2070 East 54th St. — No. 6, Indianapolis, Ind., 46220. The representative for Michigan is Butchart-Rathsburg & Assoc., 16637 East Warren Ave., Detroit, Mich., 48224.

new!

All-Transistor Color Bar Generator

Rugged, solid-state Seco 900 puts you on top of the booming Color-TV Service Market... with the finest unit in the field!

Setting new standards in both engineering and design, Seco's new Model 900 will outperform every other color bar generator on the market! A true precision instrument that offers brightest dots and purest color quality, the 900 takes the "guess" out of color TV-servicing, makes possible big new profits in the booming color service field!

Only the Seco 900 offers all of these features:

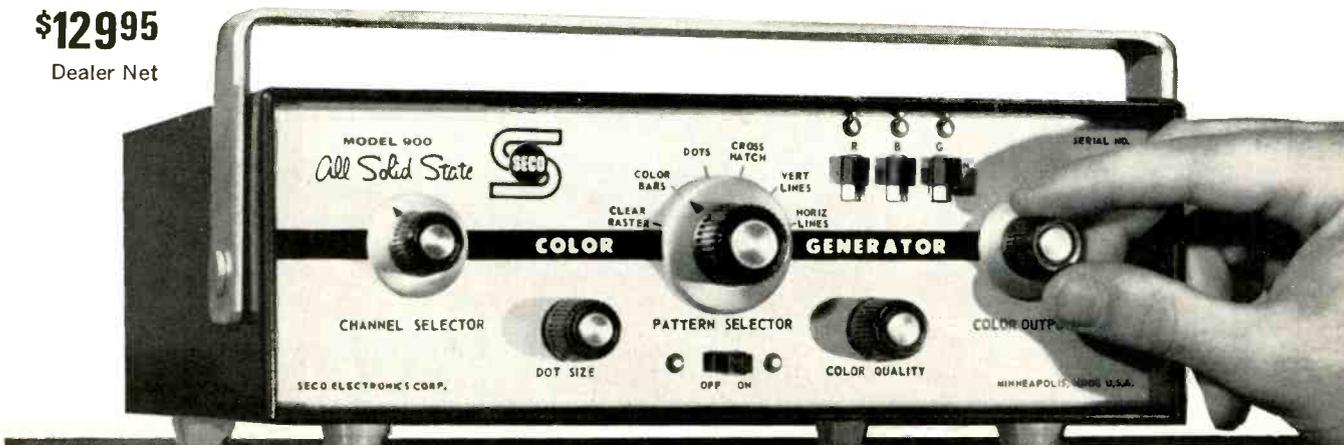
- Single Burst Dots are bright—"rock" solid... will not move
- Purest Color Quality—10 completely different color bars... positive graduation from color to color
- Single Trace Horizontal Lines—are bright, sharp... begin and end during horizontal retrace
- No Blinking On Cross Hatch—at any intensity level
- All Transistor Circuit—for highest reliability and instant operation with no warm-up
- Outstanding Stability—Zener regulated power supply... crystal controlled oscillators!



SECO ELECTRONICS CORP., 1205-B So. Clover Dr., Minneapolis, Minn. 55420

\$12995

Dealer Net



Blonder-Tongue CCTV Sales Rise

Sales of Blonder-Tongue Laboratories' closed-circuit television cameras during the first quarter of 1965 climbed sharply over sales in the same period of 1964, according to figures announced by Issac S. Blonder, chairman of the board. Mr. Blonder reported that during the comparative quarters, his company's sales of viewfinder cameras jumped 400 percent, and sales of non-viewfinder cameras rose 181 percent.

ITT to Establish Hong Kong Company

A manufacturing company with a production capacity of one million radio chassis per year is being established in Hong Kong, according to plans announced today by Gerhard R. Andlinger, group executive of the Far East and Pacific division. The company will have the controlling interest in the new enterprise, which will be known as Transelectronics, Limited. It was said the Hong Kong company will employ 600 people, of whom certain key personnel will be given advanced training in the United States. Production is scheduled to begin before the end of the year.

Pay TV Expands

RKO General, Inc., operator of the country's only pay TV station (Channel 18 — Hartford, Conn.) has obtained options to the Zenith Radio Corp.'s Phonevision system in five additional markets: New York City, New Haven, Philadelphia, Washington, D.C., and San Francisco. The exercise of these franchise rights will depend

on further results of the Hartford operation and Federal Communications Commission approval. RKO General Phonevision Company has operated Channel 18 as an experimental subscription TV station for three years in Hartford.

Jerrold Has \$5 Million Sales During CATV Convention

More than \$5 million in CATV equipment was sold by Jerrold Corp. during the five-day National Community Television Association convention in Denver, it was disclosed by Robert H. Beisswenger, executive vice president of Jerrold.

B & K Market Manager

Walter P. Herbold has joined Dynascan Corp., Chicago, as market planning manager. According to Carl Korn, president, Mr. Herbold will be responsible for the development of new product programs, primarily for the B&K division. Mr. Herbold comes to the company from IIT Research Institute, Chicago, Illinois.

Admiral Appoints

Jack M. Daly has been appointed regional sales manager for Admiral Corp. covering distributors in Jackson, Miss., Little Rock, Ark., Memphis, Tenn., and Shreveport, La. He succeeds Whitney B. Garrett who recently became manager of Canyon State Distributors, Inc., in Phoenix. Mr. Daly had been associated for 11 years with Kelvinator, most recently as a branch manager.

tests all tubes!

MODEL 88—Tests receiving tubes including novars, nuvistors, newest 10-pin types, compactrons and magnovals. PLUS: Picture tube adaptor with 12-pin socket fits more than 400 cathode ray picture tubes including 110° deflection types. Grid Circuit Test, Tube Merit Test and Filament Test . . . quickly find cathode emission leaks, shorts, grid emission, gas error, filament continuity and cathode-to-heater emission. Stationary receiving tube chassis. Complete with speed-indexed setup data, pin straighteners and 12-pin picture tube socket on 2-foot cable.

Complete picture tube test—accommodates new 10-pin sockets!

Model 98—Spots same tube faults as Model 88 above—PLUS unit features a replaceable plug-in chassis to customize or update instrument for newest tube types; built-in 12-pin picture tube socket; dial controls that isolate or transpose tube circuits and select test current. Grid Circuit; Cathode Emission; Tube Merit; and Heater Current tests for over 2500 types of receiving and picture tubes.

\$99⁵⁰

Dealer Net

Features "no-set-up" testing . . . always up to date!

Model 107B—40 prewired sockets accommodate 63 basic pin arrangements for testing all modern TV, radio, industrial and foreign tubes. Has plug-in chassis wired to test tubes, circuit by circuit. Performs Grid Circuit Test, Dynamic Mutual Conductance Test and Cathode Emission Test. Data book pages covering new tubes mailed periodically to all registered owners.

\$189⁵⁰

Dealer Net

Popular low cost tester—complete with adapter for more than 400 Cathode Ray Picture Tubes!

\$74⁵⁰

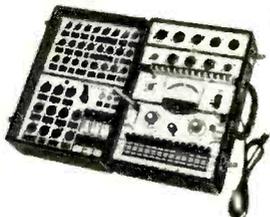
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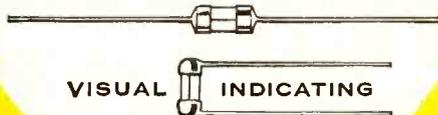
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TRON SUB-MINIATURE PIGTAIL FUSES



BODY SIZE ONLY
.145 x .300
INCHES

For use on miniaturized devices, or on gigantic space tight multi-circuit electronic devices.

Glass tube construction permits visual inspection of element.

Smallest fuses available with wide ampere range. Twenty-three ampere sizes from 1/100 thru 15 amps.

Hermetically sealed for potting without danger of sealing material affecting operation. Extremely high resistance to shock or vibration. Operate without exterior venting.

Insist On
BUSS
QUALITY
Fuses

Write for
BUSS
Bulletin SFB

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World Accord Necessary for Direct Satellite TV

A world agreement governing communications satellites that broadcast television directly into the home is proposed by Chairman David Sarnoff of the Radio Corporation of America.

Such satellites will be in operation within the next five to ten years, General Sarnoff predicted, and warned that unless nations agree in advance to a new pattern of global regulation for their transmissions the result will be chaos in the world's air waves.

He told more than 2,000 lawyers and jurists at the Washington World Conference on World Peace Through Law that communications satellites of the future will create formidable social and economic problems for all mankind.

"When, for example, a Russian satellite can broadcast directly to a Kansas farm, or an American satellite can broadcast directly to a Hungarian collective," General Sarnoff asked, "what will be the reaction in both countries? When we can reach the homes of the world with instantaneous sight and sound, what rules of conduct are to apply, and who is to establish them? This question evades the jurisdiction of any established body, yet it will affect the welfare of all nations and all people."

General Sarnoff said that he is convinced that if direct satellite broadcasting is to fulfill its destiny, "some type of *modus vivendi* must be established among the many rival national and ideological interests.

"It would be a travesty on the hopes of humanity if this immense force for enlightenment, understanding and social advancement were to be subverted to narrow national ends, or become discredited by the failure of nations to agree upon its beneficial uses," he said.

BUSS: The Complete Line of Fuses and . . .



LTV To Ling Altec

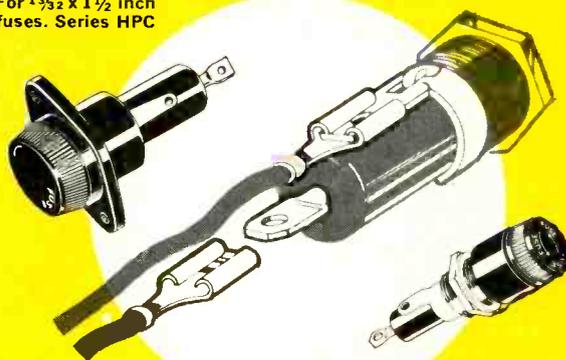
LTV Ling Altec, Inc., has acquired the former LTV University Div. of Ling-Temco-Vought, Inc., from the parent corporation for cash and short term notes, the companies announced today. The acquisition is subject to completing the final legal and financial arrangements. The LTV University Div. is a commercial audio system organization and this move will concentrate most of LTV's commercial electronic enterprises in one subsidiary. Alvis A. Ward, president of LTV Ling Altec, said no changes in personnel or operations are contemplated.

Improved Colorbar-Dot-Crosshatch

Two improvements which have been incorporated in RCA WR64B color generator are: a crystal-controlled RF oscillator circuit which assures the user that the frequency of the WR64B signal is the same as the frequency of the signal broadcast by the TV station — providing stability and continuity of the picture carrier signal.

Separate red, blue and green gun-killer switches greatly simplify convergence adjustments and color purity testing, the manufacturer announced. Using special lead-piercing clips, technicians can "kill" one or any combination of three guns.

For 1 3/8 x 1 1/2 inch fuses. Series HPC



For 1/4 x 1 1/4 inch fuses Series HJ, HK and HLD

SAVE ASSEMBLY TIME with
QUICK CONNECT
TERMINALS ON
BUSS FUSEHOLDERS

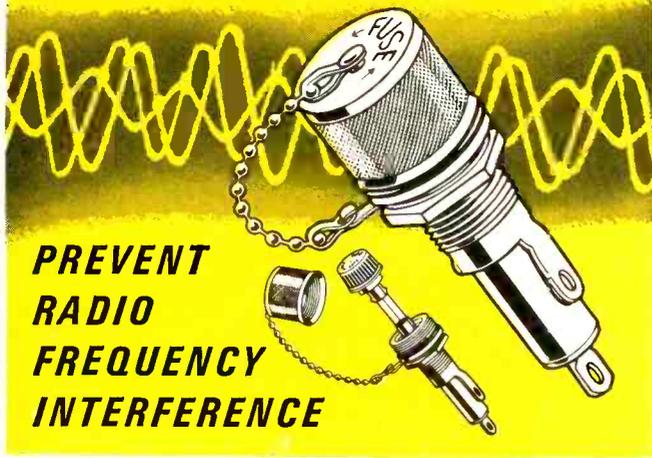
Eliminates soldering. Permits use of pre-assembled harness. Reduces assembly time.

Insist On
BUSS
QUALITY
Fuseholders

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BUSSMANN MFG. DIVISION, McGraw-Edison Co., St. Louis, Mo. 63107

BUSS SHIELDED FUSEHOLDERS



**PREVENT
RADIO
FREQUENCY
INTERFERENCE**

For use where fuse and fuseholder could pick up radio frequency radiation which interferes with circuit containing fuseholder—or other nearby circuits.

Fuseholder accomplishes both shielding and grounding.

Available to take two sizes of fuses— $\frac{1}{4} \times 1\frac{1}{4}$ " and $\frac{1}{4} \times 1$ " fuses.

Meet all requirements of both MIL-I-6181D and MIL-F-19207A.

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BUSS**

**QUALITY
Fuseholders**

*For complete information
write for
BUSS Bulletin SFH-12*

BUSSMANN MFG. DIVISION, McGraw-Edison Co., St. Louis, Mo. 63107

Fuseholders of Unquestioned High Quality

Philco Tinyvision

A 9-in. Philco portable TV set, adapted for use in automobiles, is introduced. Ford Motor Company has announced that marketing of the car-and-home TV will start in the Great Lakes area and be expanded to the rest of the country as inventories permit. The all-transistorized set has a 12-vdc cord which can be plugged into either the car cigarette lighter or a portable battery pack. It also has a 110-vac cord for home use. The unit permits all-channel VHF and UHF reception, with built-in antenna and speaker, and an earphone for private listening. A separate car antenna to improve fringe-area reception and a bracket for attaching the set to the back of the front seat are available at additional cost.

RCA Telegraph Service Via Early Bird Satellite

RCA Communications, Inc. has initiated international commercial telegraph service via the Early Bird satellite. The service was inaugurated with the transmission of the first regular paid telegrams between the United States and Germany, according to Thompson H. Mitchell, president of RCA Communications, Inc. The company will use channels in the Early Bird for its data, facsimile, and telex services as well as for the message telegraph service. Plans to provide bandwidths capable of high speed overseas computer-to-computer communications via the satellite are under way. Mr. Mitchell said his company was proud to be the first U.S. carrier to exchange commercial messages with Europe via satellite. He added that this step was consistent with his company's role of providing better communications service.

OCTOBER 1965

Admiral First Half Sales

Consolidated net sales of Admiral Corp. in the second quarter and first six months established new records, while earnings also were substantially higher. Vincent Barreca, president, said that sales in the first half were \$143,007,312, 32 percent higher than sales of \$108,530,077 in the comparable 1964 period.

Computer and Man Communicate

A data-processing system developed by the National Bureau of Standards Institute for Applied Technology, represents an advance in communication between man and computers. The system will receive and process data from local and remote sources and can present its output in a form immediately intelligible to the human operator.

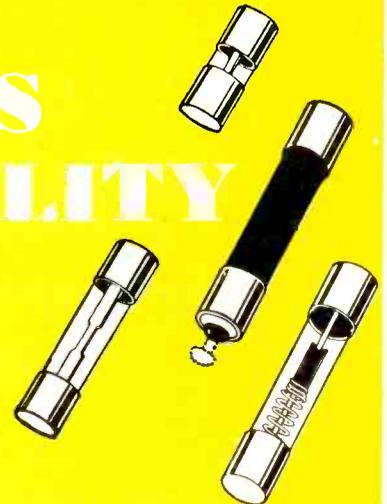
Called ACCESS (Automatic Computer Controlled Electronic Scanning System), the system was developed by the Office of Emergency Planning to help provide rapid access to digital and pictorial data when evaluating situations during a national emergency.

ACCESS accepts input information directly from microfilm records of hand-marked documents and digital information either from other machines or directly from its keyboard. It will store information, perform a variety of operations on it, and present outputs either in digital form for use by other machines or in a form requiring no further translation for man. The system includes an X-Y plotter which prepares such output displays as maps, charts and diagrams.

Four different types of memory are used in ACCESS: Transistorized registers, magnetic drum, core and tape memory systems.

**BUSS
QUALITY**

**small
dimension
fuses**



For protection of all types of electronic and electric devices

The complete line of BUSS and "TRON Family" fuses includes quick-acting, slow-blowing, signal or visual indicating fuses in sizes from 1/500 amperes up.

All standard items are easily obtained through your BUSS distributor, but if you don't find what you want get in touch with us.

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BUSS**

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Recommend the TURNER 500 Cardioid

**DON'T GO WRONG
... GO TURNER**

In your business, your reputation depends on your recommendation. Don't risk either — always recommend the high-performing, trouble-free Turner 500 Cardioid. Most problems in PA or sound applications — extraneous noises, poor acoustics, etc. — can be successfully solved by incorporating Turner 500's into the system. So before you make your next installation, check the Reader Service card for the complete Turner catalog. Get details on the Model 500 — list price \$84.00 — and the rest of the Turner line, including:



MODEL 251

Low cost, high performance paging microphone with Turner's unique lift-to-talk feature. List price \$49.50



MODEL SR585D

Fixed mounted microphone conveniently mounted on a flexible 16" gooseneck. List price \$40.



MODEL 58

A natural for any application requiring freedom and mobility ... does double-duty on desk stand. List price \$57.

THE TURNER MICROPHONE COMPANY
918 17th Street N.E.
Cedar Rapids, Iowa

In Canada: Tri-Tel Associates, Ltd., 81 Sheppard Avenue West,
Willowdale, Ontario
Export: Ad Auriema Inc., 85 Broad Street, New York 4, N.Y.

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How To Cut Your Advertising Risks

How many of your advertising dollars are going down the drain? Are you sure your messages are getting through to the people you want to reach, when you want to reach them?

Are your ads "right" for the medium in which they run? Do you advertise "by guess and by gosh," or do you carefully take into account what you want your ad to do and the best place for it to do it?

If you're dead certain that none of these questions hit you where it hurts — in your ledger profit columns — then there's no need to review your advertising. But of you felt a twinge here and there, you should take a long, hard look at where your ad dollars are going.

First, consider the role of advertising. It's a business investment. As with any investment, the element of risk enters. Your aim should be to minimize that risk by making sure you're choosing the right tools, and by using them only for what they're designed to do.

Determine first what you want to accomplish and the ability of your advertising media to do the job. Some media will meet your needs; others will not and should be rejected — regardless of the claims of ad salesmen. Remember, you're out to cut your risks, not expand them.

Newspapers. This is the most timely medium at your command. If you have a newsworthy message, it may belong in your local paper. For one thing, newspapers are often read for — not in spite of — the ads and shopping news they contain. Anything timely — an announcement of new service or product, new location, special sale, a seasonal offer, a special event — anything new or different in terms of price or offering is ideally placed here. Newspapers offer an opportunity to illustrate and to give major and minor details.

Newspapers generally have a very short life, however. Once read, they are discarded, and with them goes your message. You must advertise consistently for long-term results.

Radio. This medium also is timely. It has the advantage of reaching people wherever they are, whatever they are doing. If sound is important to your message, it is especially useful. Moreover, the announcer's voice can create excitement that's hard to achieve in any other medium.

But whatever that message is, keep it simple and basic. Sell one item or one service, or tell a general service story with one selling point. Remember that listeners cannot see what you are selling, so don't make the mistake of trying to give complicated details.

Make sure you take enough spots to build a sufficiently large cumulative audience. One announcement can reach people for pennies per head, but this is not a "selective" medium. Rather, it is one that must reach the many to sell the few.

Television. The great advantage of TV is its wedding of sight and sound and motion. Here you can demonstrate what you are talking about. You can't go

into great detail, for brevity is important — to hold your audience and to avoid excessive costs. But TV is forceful and dramatic — if you can afford a sizable investment.

There's the rub. Creating and broadcasting good TV commercials can be very expensive. It should be used only if you are reasonably sure it brings in enough business to pay its way. If TV fits your needs, be sure your commercial will run at a time when a reasonably large audience is assured. Unlike radio, which has a relatively constant group of listeners, TV reaches widely varying numbers of people through the day.

Yellow pages. Most advertising media enable you to seek out your prospects and try to sell them. The telephone directory yellow pages appeals to the prospect seeking your services. And it serves the further function of making available to everyone your name, address, telephone number and selling message when they are ready to buy.

The yellow pages, however, is no place for timely or newsworthy offers. These belong in other printed media or on radio or TV. Yellow pages ads should give information, direction and reasons why the customer should buy from you or call you for service. Yellow pages can reach buyers of virtually everything you offer, and can be a year-round constant in what otherwise would be an opportunistic, "here today, gone tomorrow" advertising effort.

Direct mail. If you want to deliver your message to a select group—chosen because of income, prior purchase of a product or service, neighborhood, membership, or what have you—direct mail is an excellent tool. It is a highly efficient, selective medium, with few wasted dollars: *If you have a good list.* Direct mail is no better than the accuracy of the list of people to whom it goes. Given that list, however, you can use direct mail to put your message directly into the hands of your most likely customers.

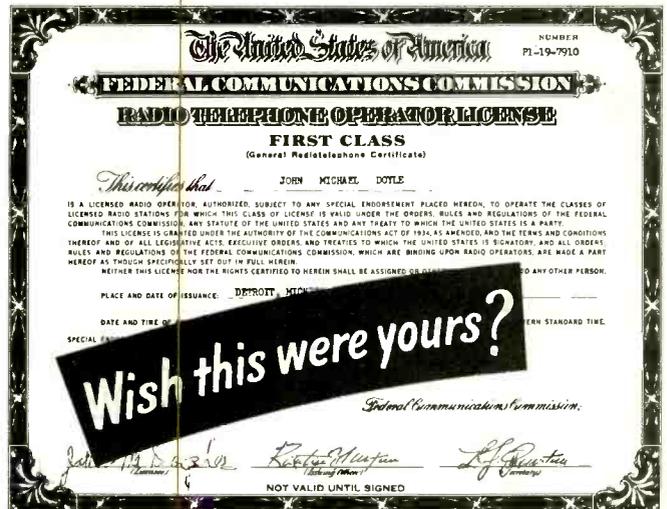
Outdoor and car cards. If you have a simple story to tell and want continuity over a period of time at low cost, try outdoor or car card display. But it should be remembered that they are supportive rather than primary media.

Location is all-important. Depending on your purpose, posters or car cards should ideally be located in your neighborhood or along the most heavily traveled routes leading to you. And outdoor posters must be very brief, with just a few words telling your story. Car cards give you more latitude for details and are good for promoting seasonal offers and similar specials that have a life over a period of weeks or months.

Whatever your objectives, it usually is best to use a combination of media, with messages designed to fit the purposes of each. Get comparative facts from all the competing media in each field and use those that deliver the largest number of prospective customers. Advertise timely opportunities in the short-term media and back up these messages with a year-round reference, like the yellow pages.

If you follow these tips you'll cut both the risk and the cost of getting new business through advertising.

You earn your FCC First Class License



or your money back!

THERE'S A WORLD OF OPPORTUNITY FOR THE MAN WITH AN FCC LICENSE

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What does it take? Men with absolutely no training or experience in Electronics complete the course in 10 months. A Technician or man with some background can easily cut that time in half. And because NRI has a greater enrollment than any other school of its type, training costs you less than comparable courses offered by other schools. Further, **YOU MUST PASS your FCC exams or NRI refunds your tuition in full.**

Get full details today about NRI FCC License Course plus 9 other home-study instruction plans offered by NRI, oldest and largest school of its kind. Mail coupon for free catalog. There's no obligation. No salesman will call. NATIONAL RADIO INSTITUTE, Washington, D.C.

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Name _____ Age _____
PLEASE PRINT

Address _____

City _____ State _____ Zip _____

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BUSIEST COUPLER IN TOWN

\$195



U. S. PATENT 2,915,679

**THE
WIZARD 300
Electro Magnetic**
ALL CHANNEL UHF/VHF/
FM/STEREO COUPLER

Have you become disen-
chanted with ordinary coupl-
ers? The kind that limit you to
2 or 4 outlets? Next time get
Wizard 300s — PARALLEL
COUPLING UNLIMITED!

CHARLES ENGINEERING, INC.
3421 N. Knoll Dr., Los Angeles, California 90028

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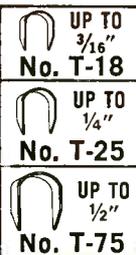
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AUTOMATIC STAPLE GUNS

For Fastening Any
Inside or Outside
Wire Up to 1/2" in Diameter



- Telephone wire
 - Intercom wire
 - Bell wire
 - Thermostat wire
 - Radiant heating wire
 - Hi-Fi, Radio & TV wires
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gets into close corners!

Available in:
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Amps, Tuners, CB, Hi-Fi's, and thousands
of other Electronic Values. Credit plan
available.

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If you have a friend interested in electronics
send his name and address for a FREE sub-
scription also.

OLSON ELECTRONICS, INC.

412 S. Forge Street Akron, Ohio 44308

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SNAP
CRACKLE
POP

is a pleasant sound in
a bowl of Breakfast Food
BUT
it's a malfunction in TV and
radio that can be eliminated
quickly and profitably with
QUIETROLE



NOW! QUIETROLE

Offers 3 New Aerosols

To save time . . .
make added income



- 1 **QUIETROLE MARK-II**
For Tuners
- 2 **QUIETROLE SPRAY-PACK**
For Controls & Switches
- 3 **QUIETROLE SILITRON**
For General Use

All with extenders
HARMLESS TO PLASTICS

. . . non-conductive, non-inflam-
mable and non-corrosive. Zero
effect on capacity and resistance.

Harmless to metal

YES! Quietrole is still available
in bottles with an eye dropper!



manufactured by
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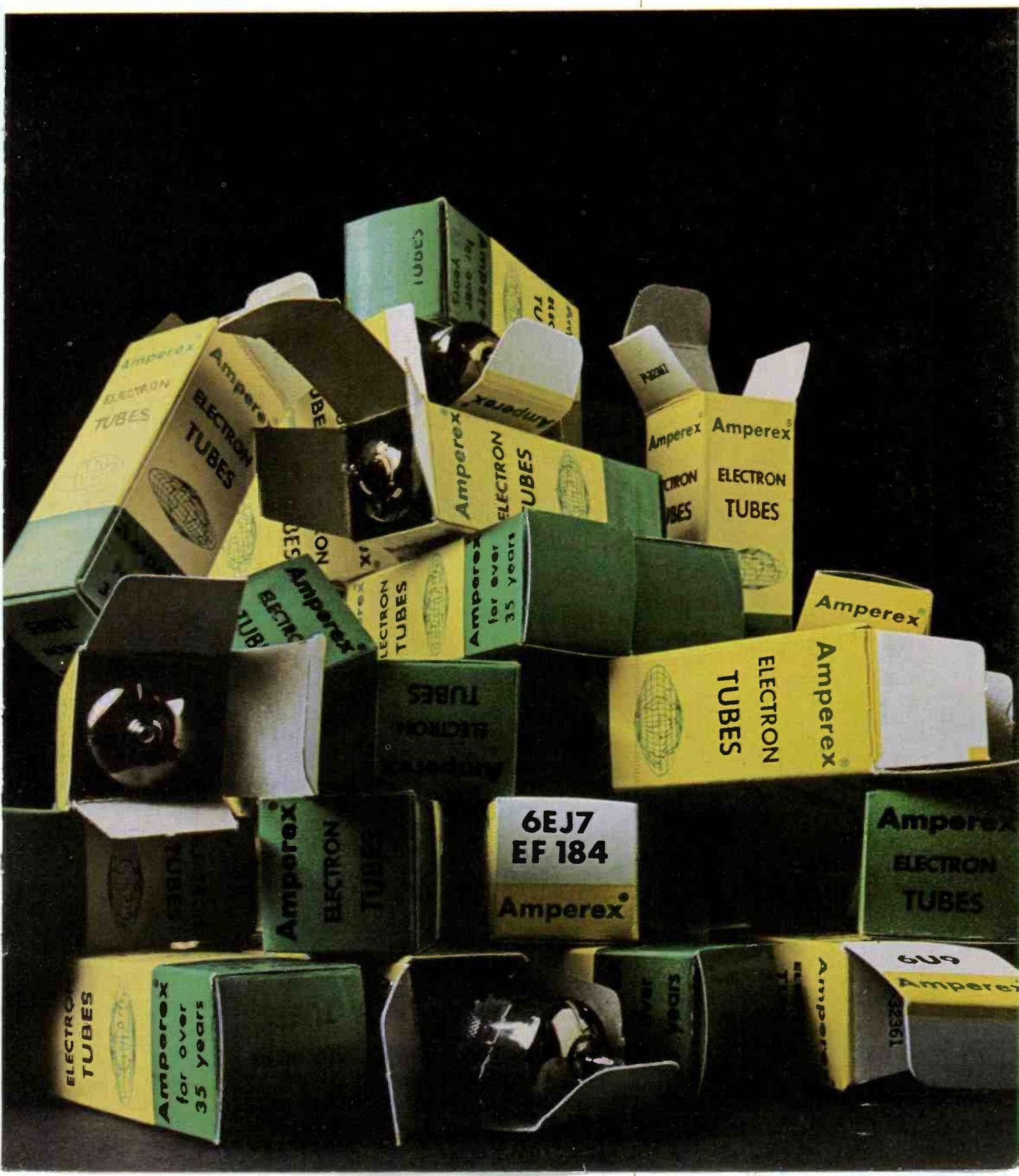
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PICK ANY NUMBER FROM 1G3GT TO 19AU4 AND YOU'RE A WINNER!

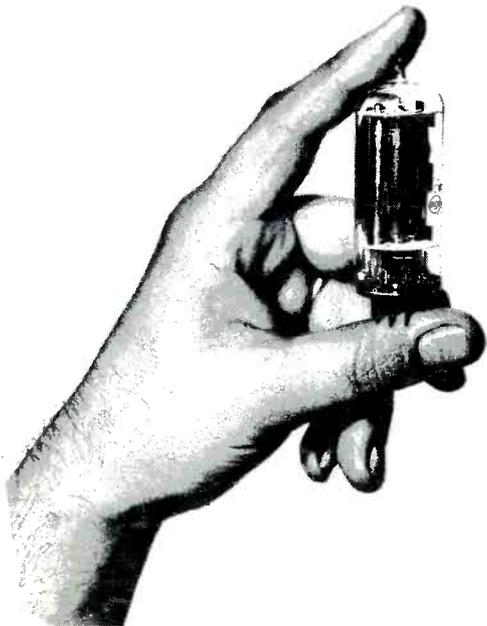
1G3GT/1B3GT	4HA5	6BZ6	6GW8	8CW5
1X2B	5HG8	6CB6A	6HA5	9A8
3BZ6	5U8	6CG7	6HG8	10CW5
3CB6	6AL5	6DT6	6S4A	12AT7
3GK5	6AU4BTA	6EH7	6SN7GTB	12AU7A
3HA5	6AU6A	6EJ7	6U8A	12AX4GTB
4BL8	6AV6	6GB5	6U9	12AX7A
4EH7	6AX4GTB	6GJ7	6X9	15CW5
4EJ7	6BA6	6GK5	6Y9	16A8
4GK5	6BL8	6GK6	8BQ5	19AU4

...AND ON AND ON. FOR THE COMPLETE LIST, WRITE
AMPEREX ELECTRONIC CORPORATION, HICKSVILLE, L.I., NEW YORK 11802.



Meet some of the people responsible for RCA's personal quality performance program

Norman Haythorn
Liz Johnson
Rose Manigault
Theresa Pagano
Jule Harris
George Merritt
Alexander M. Collins
Ronnie Ferguson
Hans Weber
Nadia Spas
Hazel Anderson
Elizabeth Posthigel
Medred Sherman
Shigeko Strelecki
Charles Deber
Bernice Munnally
Al Munschauer
Jean Lurski
Catherine Claver
Claire Wade
[Signature]



People are the prime ingredient in RCA's attempt to achieve zero defects in the production of receiving tubes. Thousands of RCA people engaged in the manufacturing of receiving tubes have deeply committed themselves to the attainment of missile-type reliability in commercial receiving tube production. They say, "I pledge to strive for error-free performance in every task I undertake through my personal quality performance."

That's why replacing with RCA receiving tubes—across the board—is your best short-cut to a satisfied customer instead of a callback.

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.



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