A HOWARD W. SAMS PUBLICATION

FEBRUARY 1967 75¢

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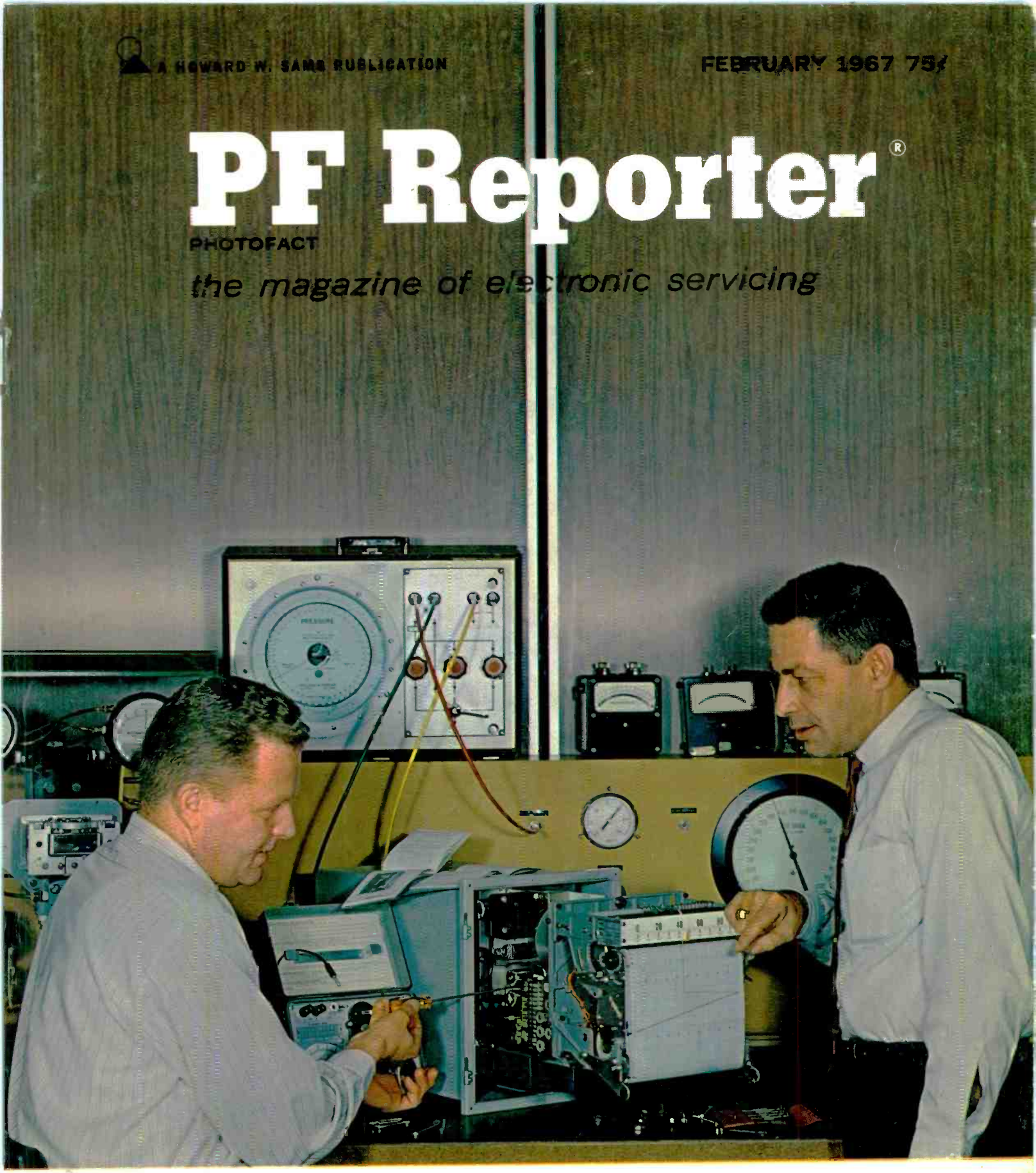
PHOTOFACT

the magazine of electronic servicing



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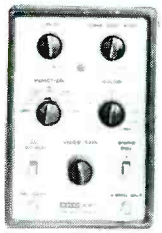
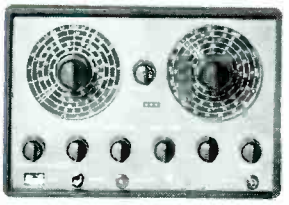
COLOR TV LAB

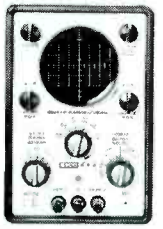
Three compact portable instruments for shop or home Color TV servicing. Add one more and you're set for FM-MPX stereo.



New Model 380 Solid State NTSC Color Generator generates exact NTSC color signals individually and all required dot-bar patterns. Super-compact, 4 pounds light, instant operation. **$169.00 wired only.**



Model 369 Sweep/Marker Generator for easiest, fastest visual alignment of color or B&W TV and FM RF and IF circuits. Five sweep ranges from 3-220mc. Four marker ranges from 2-225mc. Crystal marker oscillator. Post injection of markers. **$99.95 kit, $149.95 wired.**

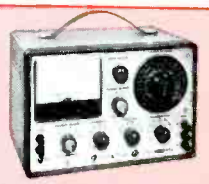


New Model 435 Direct-Coupled Wideband Scope. Top-quality DC-4.5mc scope with 3" flat-face CRT. Zener calibrator: Outperforms 5" scopes three times its size, facilitates on-location color TV and other servicing. **$109.95 kit, $159.95 wired.**

New Model 342 FM Multiplex Signal Generator. Design lab quality. Both composite audio and FM RF outputs. Inputs for stereo audio source for store demonstrations, critical A/B listening tests. **$149.95 wired.**

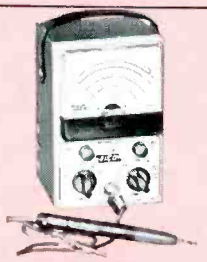
New Model 1030 Regulated Power Supply. Speeds troubleshooting, design work, production line testing, electronics teaching. Variable bias and plate sources regulated to ⅓ of 1%: 0-150V @ 2ma; 0-400V @ up to 150ma. Ripple less than 3mv rms. Unregulated fil. volts of 6.3V & 12.6V, @3A. Switchable, monitoring milliammeter and voltmeter. **$59.95 kit, $99.95 wired.**

New Model 378 Audio Generator. Near-distortionless sine wave generator (<0.1% 20-20,000c) providing fast, convenient switch-selection of frequencies from 1c to 110kc (1c steps 1c-100c, 10c steps 100c-1kc, 100c steps 1kc-10kc, 1kc steps 10kc-110kc), 8-pos. 10db/step output attenuator & fine attenuator. Output meter (4½" 200ua) with 8 voltage ranges & db scale. **$49.95 kit, $69.95 wired.**



New Model 965 FaradOhm Bridge/Analyzer. "Unusually versatile" — Electronics World. 9-range, low-voltage capacitance-resistance bridge safely measures even 1-volt electrolytics. Metered bridge balance, leakage test voltage (6 DC VTVM ranges 1.5-500V), leakage current (11 DC VTAM ranges 0.15ua-15ma). DC VTVM & VTAM externally usable. **$129.95 wired.**

Model 460 Wideband Direct-Coupled 5" Oscilloscope. DC-4.5mc for color and B&W TV service and lab use. Push-pull DC vertical amp., bal. or unbal. input. Automatic sync limiter and amp. **$89.95 kit, $129.50 wired.**



Model 232 Peak-to-Peak VTVM. A must for color or B&W TV and industrial use. 7-non-skip ranges on all 4 functions. With Uni-Probe.® **$29.95 kit, $49.95 wired.**

New 888 Solid State Universal Engine Analyzer Tune up/troubleshoot any car or boat — electronically as professionals do. Self-powered, self-contained 888 checks total ignition/electrical system on all 6/12V; 4, 6, 8-cyl. engines, + or − ground. Latest all-professional solid-state precision circuitry. Complete with comprehensive manual, test leads, batteries. **$44.95 kit, $59.95 wired**

New "Cortina" 3070-A compact, powerful all Silicon Solid-State 70-watt Stereo Amplifier at a sensational low price! Features advanced design and smart styling typical of far more expensive components. Complete control facilities including tape monitor, loudness contour, low and high cut filters, balance control and speaker systems switch. **$89.95 kit, $129.95 wired.**

New Model 753 The one and only SSB/AM/CW Tri-Band Transceiver Kit. "The best ham transceiver buy for 1966"—Radio TV Experimenter Magazine. 200 watts PEP on 80, 40 and 20 meters. Receiver offset tuning, built-in VOX, high level dynamic ALC, solid state VFO. Unequaled performance, features and appearance. Sensationally priced at **$189.95 kit, $299.95 wired.**

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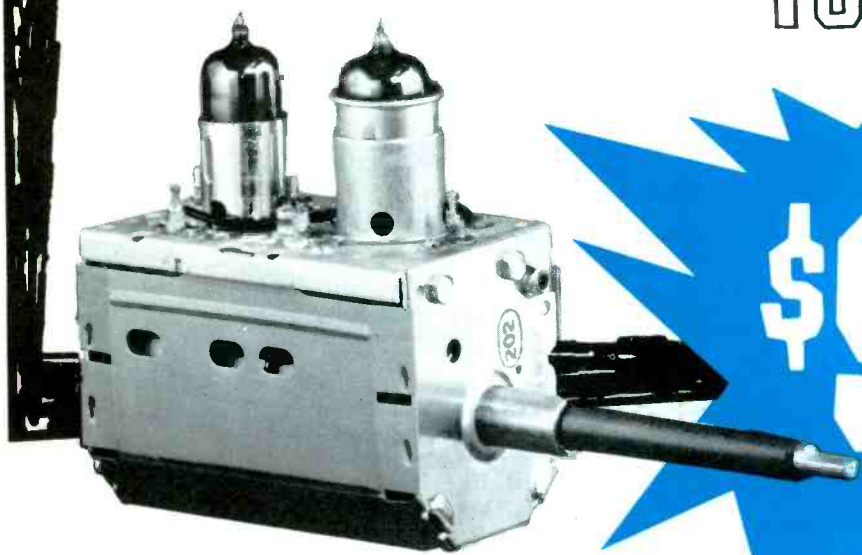
Complete TUNER REPAIR for only



$9.50

Sarkes Tarzian, Inc., largest manufacturer of TV and FM tuners, offers unexcelled tuner overhaul and factory-supervised repair service. Completely-equipped and conveniently-located Service Centers offer fast, dependable and factory-supervised repair service on all makes and models. Centers are staffed by well-trained technicians, assisted by engineering personnel.

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Always send TV make, chassis and Model number with faulty tuner. Check with your local distributor for Sarkes Tarzian replacement tuners, parts or repair service. Or, use the address nearest you for fast, factory-supervised repair service.

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PF Reporter™

PHOTOFACT

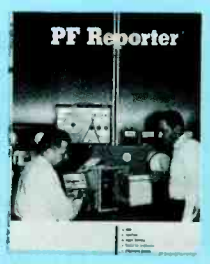
the magazine of electronic servicing

VOLUME 17, No. 2 FEBRUARY, 1967

CONTENTS

About the Cover

Our cover this month was taken in Howard W. Sam's Instrument Laboratory, where PHOTOFACT Instrument Maintenance Outlines (IM⊙'s) are produced. The strip chart recorder being analyzed is an example of today's industrial process control instruments. The large instrument on the top shelf is a pneumatic calibrator, typical of the high-precision instruments used in this field. It and the electronic calibrator behind the technician's hands are rated at .1 of 1% accuracy.



2,365 reasons why Sprague Twist-Lok® Capacitors help you to protect your reputation

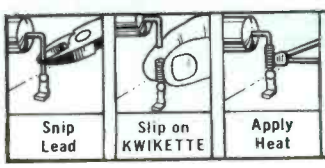
When you fool around with makeshift or "fits-all" capacitor replacements by substituting sizes and ratings, you leave yourself wide open for criticism of your work, you risk your reputation, and you stand to lose customers. With so much at stake, it just doesn't pay to use makeshifts when it's so easy to get exact replacement capacitors from your Sprague distributor.

With 2,365 different Sprague Twist-Lok Capacitors as standard catalog items, and more being added regularly, Sprague gives you the world's most complete selection of exact replacements.

We don't have to tell you that it's easier to service with exact replacements. And we don't have to tell you that it's better, too. When sets are designed, specific capacitance values are used for peak operation, so it takes exact replacements to restore original set performance.

And who better than Sprague knows which values and sizes are needed in the replacement market? Sprague, the world's largest component manufacturer, has the most complete specification file on original set requirements. That's why you're always right when you work with Sprague Twist-Lok exact replacements!

GET YOUR COPY of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-108 from your Sprague Distributor.



HAVE YOU TRIED KWIKETTE* CONNECTORS?
Not just another wire spring connector! Copperweld wire inner core, a layer of flux, and an outer coating of solder . . . all you supply is heat! They're now being packed with Sprague Capacitors at no extra cost to you! See your distributor!
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Circle 3 on literature card

Let's talk sense about color TV lead-in!

The common sense of the situation calls for *two* 82-channel lead-ins for color and UHF TV... one to give a stronger signal in uncongested fringe areas where interference usually is not a serious problem. The other to give a much cleaner signal in congested or close-in areas where serious interference problems are likely to exist. This is why Belden gives you a choice—the *Color Guard Twins.*

8285

*Color Guard Twin—Belden Permohm**

Use to get stronger signals in uncongested fringe areas, like this . . .

You get an excellent color image . . . because in a 100-foot run, Permohm delivers 38% to 200% more signal voltage than RG-59/U with matching transformers and 23% to 80% more signal voltage than "Low Loss Coax" with transformers.

Permohm obtains the highest efficiency of any available unshielded 300 ohm line when exposed to weathering and industrial atmospheres. Low loss cellular polyethylene insulation around the conductors provides the necessary protection.

You don't need expensive transformers and connectors.

8290

*Color Guard Twin—Belden Shielded Permohm**

Use to get cleaner signals in congested or close-in areas, like this . . .

Belden Shielded Permohm (8290) combines strong signal strength with the clean signal protection of shielded cable.

Shielded Permohm eliminates transmission line pickup of noise and ghost signals. You can install it easily anywhere . . . no need for standoffs, twisting, or inconvenient routing of lead-in. Tape it to a mast, route it through metal pipe, or bury it underground.

Beldfoil† shielding is used to shield against outside signal interference. The jacket is weatherproof polyethylene. The critical signal area is protected from rain, snow, salt, smog, fog and industrial contamination. No expensive transformers or connectors are needed.

Belden Trademarks Reg. U.S. Patent Office
**Patent No. 2,782,251 and Pat. Pending*
†*Patent No. 3,032,604*

Choose the Color Guard Twin that gives your customer the best 82-channel color TV reception. Get complete information on the Belden Color Guard Twins.

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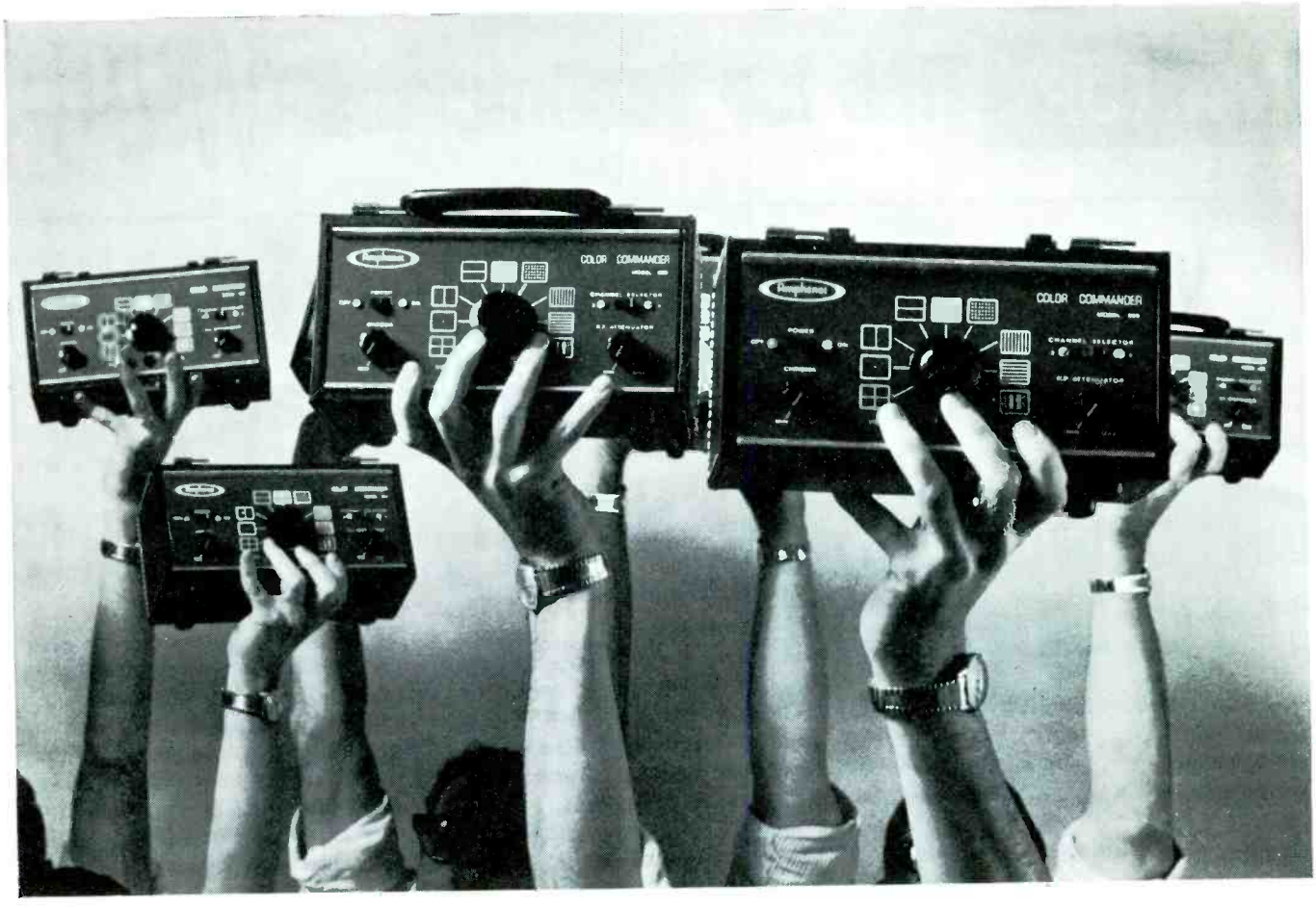
Circle 4 on literature card



Suddenly, everyone's a Watch Watcher!

And for a good reason. Service dealers found out we were right when we said Amphenol's Color Commander color bar generator would save them enough time for two or three extra service calls a day.

What's it all about? We're so sure we can save you as much as 18 minutes a call, we're including a $10.95 Timex watch with every Color Commander purchased —just so you can prove it yourself.

And if the Color Commander doesn't save as much time as we say, return it within 10 days and keep the Timex watch with our compliments.

What makes us so sure? Amphenol's exclusive technique of color alignment which features a:

1. Single crossbar to immediately center the raster.
2. Single dot for fast, consistently accurate static convergence.
3. Three-bar color array to isolate your working bars —the 3rd, 6th and 9th.

Join the Watch Watchers

If you take advantage of this limited-time offer today, your Color Commander can be paying for itself in extra income tomorrow. For the name of your nearest Amphenol distributor, contact your nearest Amphenol Sales Division office or write Dan O'Connell, Head Watch Watcher, Amphenol, Box 134, Broadview, Illinois 60153.

Watch Watcher Offer

With every lightweight, compact, completely solid-state Amphenol Model 860 Color Commander we'll include a $10.95 Timex for you to time your savings. If the Color Commander doesn't save you time, return it within 10 days and keep the watch with our compliments. **Act now. This offer is limited to available stock of your Amphenol Distributor.**

$169.95*

*Suggested resale prices

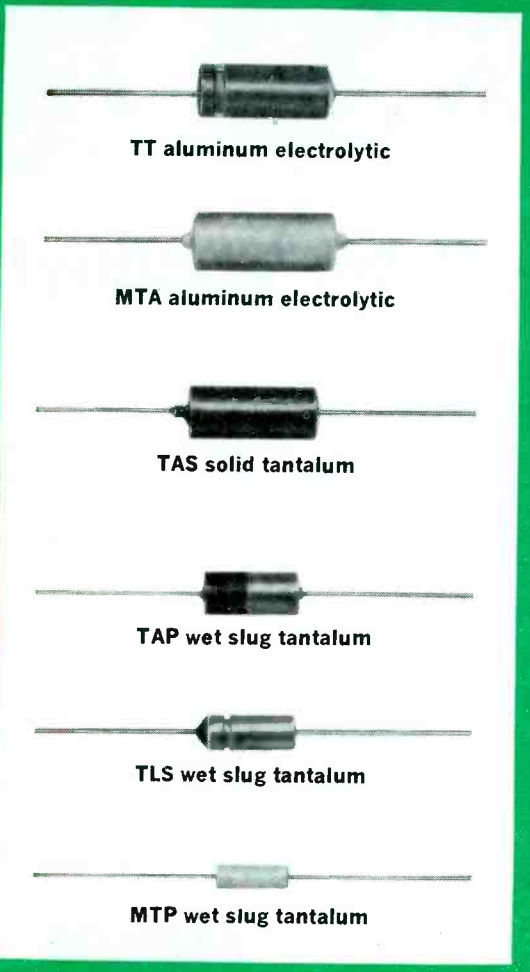
Model 860AC $20.00 higher*

AMPHENOL™

Circle 5 on literature card

Which miniature electrolytics for transistorized AM-FM radios?

COMPARATIVE SIZES OF CAPACITORS ALL RATED 10 MFD., @ 25 WVDC
(shown actual size)



TT aluminum electrolytic

MTA aluminum electrolytic

TAS solid tantalum

TAP wet slug tantalum

TLS wet slug tantalum

MTP wet slug tantalum

The new portable AM-FM radios are so compact you wonder how they get all those components into that little box. You wonder even more when you have to replace some of the parts.

Electrolytic capacitors, for example. The original electrolytic usually turns out to be a tiny thing jammed in among a dozen other midget gidgets. Getting it out is a trick in itself. Getting a suitable replacement is even tougher! And unfortunately, you're apt to need replacements, because many of these tiny capacitors just aren't much good. They don't meet the quality specs of good domestic capacitor makers. But high quality domestic capacitors are often just a bit too big to fit in the space available.

What's the answer? Search the town for another "little-bitty" original capacitor? Tell your customer you can't finish the job?

Don't give up. We have a few suggestions.

First, try a Mallory TT aluminum electrolytic. This is a real quality capacitor, rated 85°C, and it's pretty doggone small. Or a Mallory MTA, a revolutionary molded case aluminum electrolytic with excellent quality at low-low price.

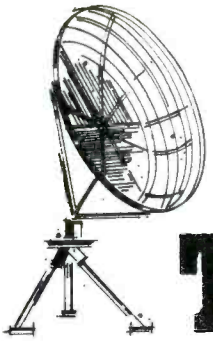
If neither of these will fit, try a Mallory tantalum capacitor. The TAS solid tantalum is about the same size as the TT, but it's rated 125°C. Need still smaller size? Take a look at the Mallory "wet slug" tantalum types TAP and TLS—and the super-miniature MTP, which gives you the most microfarads in the smallest size of anything on the market. The pictures at the left show you comparative sizes, all for a 10 mfd, 25 WVDC rating.

Sure, you'll pay a little more for the tantalum capacitor. But not as much as you might think. The TAP only costs 42c more than the TT, in the rating shown. And you get the utmost in reliability.

We certainly don't expect you to use a tantalum capacitor to replace every aluminum electrolytic. But they come in mighty handy sometimes. And you can get them when you need them from your Mallory Distributor. Ask him for our latest catalog, or write to Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Indianapolis, Indiana 46206.

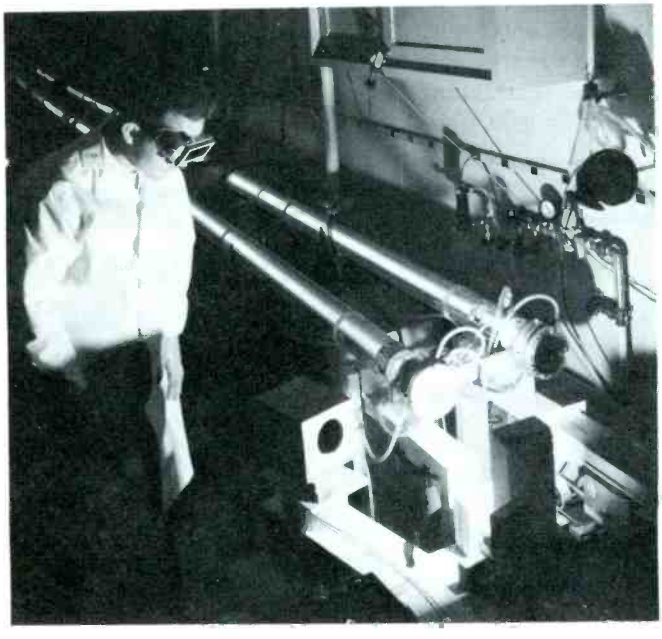
DON'T FORGET TO ASK 'EM—*"What else needs fixing?"*

Circle 6 on literature card



THE ELECTRONIC SCANNER

news of the servicing industry



High-Power Laser

Dual-tube carbon dioxide laser produces more than *one kilowatt* of continuous wave output power at **Raytheon's** Research Division. Experimental laser is a flowing gas system and is water cooled.

A tubeless television camera smaller than a man's hand was announced by the **Radio Corporation of America.**

The camera, which can be operated on battery power, takes pictures by means of networks of 132,000 thin-film devices deposited on four glass slides one-inch square. Among the thin-film elements are some that respond to the presence of light and others that perform various circuit functions, so that the networks take the

headed an entertainment explosion that has brought TV into the homes of millions of Mexican families."

A loudspeaker complemented the traditional shovels and scissors to signal the start of construction of a new 175,000 sq. ft. plant for **Jensen** Manufacturing Division/The Muter Company. At a brief ceremony, Herbert J. Rowe, Muter president, pushed a button to actuate a Jensen high fidelity loudspeaker with a scissors attachment to sever a ribbon and signal the beginning of construction. The new plant will be constructed on an 11-acre site in Bedford Park, a suburb of Chicago.

Completion of a 65,000 sq. ft. addition to the **Tenna Corporation** main plant in Warrensville Heights, Ohio, was announced by Harvey A. Ludwig, Executive Vice Pres. of the company. The plant expansion is designed to increase manufacturing and assembly capacity of the four and eight track automobile cartridge stereo tape players, automobile radios, and reverberation units.

In addition to production space, the new facilities will house the radio engineering department, including a sound room, laboratory, and model shop.

Money Matters

Record 1966 sales and substantially increased earnings are anticipated by **Dynascan.** President Carl Korn told a meeting of security analysts that he expects sales for the year ending Dec. 31, 1966, to top $4,900,000, an 18% gain over 1965 sales of $4,174,000.

place of the conventional pickup tube and other picture processing elements of standard TV cameras.

The image sensing area of the experimental camera consists primarily of dots of photoconductive material deposited at the intersections of thin metal conductors that have been evaporated onto a glass slide in a grid pattern. Along two of the four edges of the image sensing slide are attached two other slides on which are deposited circuits containing 540 thin-film transistors.

These are arranged in such a way that the output transistors of one slide connect with all of the horizontal lines in the image sensing grid, and the output transistors of the other connect with the vertical lines of the grid. A fourth slide carries arrangements of thin-film elements that perform a variety of control functions.

Expansions

The new manufacturing facility of Admiral de Mexico, a subsidiary of **Admiral Corporation,** was officially inaugurated before 300 guests by Octaviano Campos Salos, Mexican Minister of Commerce and Industry, and Ross D. Siragusa, Admiral board chairman.

The new plant employs more than 650, of whom only one is a North American. Principal products are black-and-white television receivers, stereo phonographs, and radios.

Mr. Siragusa said that the introduction of black-and-white television in Mexico over 10 years ago, "spear-

utor inventories of RCA Victor color sets are "extremely low and factory inventory is virtually non-existent."

The **Telex Corporation** had after-tax operating income for the fiscal six months ended September 30, 1966, of $395,513, as compared with $368,484 for the like period last year when no Federal taxes were paid. For comparative purposes, net income for that period, fully taxed, would have been $198,000. Revenues for the period increased 14% to $14,541,037 from $12,720,388, for the six-month period last year.

Zenith Radio Corporation had record sales and earnings in both the third quarter and the first nine months of 1966, according to President Joseph S. Wright. This was the fifteenth consecutive quarter in which both sales and earnings increased over the corresponding quarter of the previous year.

Earnings for the nine months ended September 30, 1966, were a record $25,832,000 up 50% from the previous record first nine months earnings of $17,242,000 reported a year earlier. Sales were $458,259,000, 44% ahead of the previous first nine months record of $317,986,000 set a year earlier.

Color television was the most important factor in the sales increase with dollar volume up over 100% from the first nine months of 1965. Despite substantially increased production, factory and distributor inventories of color receivers continue at low levels. Zenith's current production consists almost entirely of rectangular color television sets, principally 25-inch units. ▲

. . Fuseholders of Unquestioned High Quality

November, 1966 was the largest volume month in the history of the **Jerrold Corporation,** it was reported by Robert H. Beisswenger, President and Chief Executive Officer of the electronics firm. This was the second straight month that the company reported record sales.

"Consolidated sales for the month of November exceeded $5 million," he said. This topped the previous record sales month of October, 1966, which posted sales of $4.6 million. Comparable sales figures for November, 1965 barely exceeded $3 million.

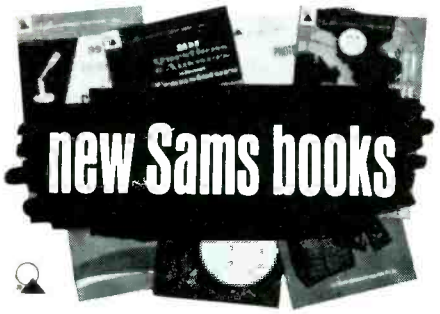
Sales and earnings of **Packard Bell Electronics Corp.** showed substantial gains in the fiscal year ending Sept. 30. Net earnings were $1,044,600, up from $303,000 in 1965, and sales for fiscal 1966 were $45.4 million, up 33% from $34.2 million in 1965.

The **Radio Corporation of America** announced that October was the best color television set sales month in RCA history in terms of both dollars and units, with factory dollar sales up 94% over a year ago.

"The October record is especially significant since traditionally September is a stronger month than October for factory sales," according to Raymond W. Saxon, Vice President and General Manager, Home Instruments Division.

"The fact that the reverse was true this year indicates that the retail market is growing stronger and stronger, reflecting in large measure the vastly expanded network and local colorcasting schedules," Mr. Saxon said.

He said RCA currently turning out more color sets than black-and-white units, and that dealer and distrib-



ABC's of Varactors

by Rufus P. Turner. A basic introduction to varactors—a special group of semiconductors whose capacitance varies with the voltage applied. Explains operating principles and describes typical circuits in which varactors are used. Describes use in microwave applications, for which they are particularly suitable, as well as uses in receivers, transmitters, and amplifiers. An easily understandable book for anyone who desires to be informed on this comparative newcomer in the semiconductor field. 96 pages; 5½ x 8½". Order **AVT-1**, *only* **$2.25**

101 Ways to Use Your VOM and VTVM

by Robert G. Middleton. New edition, fully revised and updated. Describes and explains all the common and many uncommon uses of the VOM and VTVM. Explains how to make proper connections, how to test and evaluate results. Chapters cover equipment checks, DC voltage tests, ohmmeter tests, signal-tracing tests, DC current tests, alignment applications. 144 pages; 5½ x 8½". Order **TEM-3A**, *only* **$2.95**

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Book Review

Electron Tubes: Royce Gerald Kloeffler; John Wiley & Sons, Inc., New York, 1966; 262 pages, 6" x 9", hard cover; $5.95.

This book, written as an introductory text for the junior-college and technical-institute level, describes the operation and application of electron tubes. The text has been written on the assumption that the reader is already familiar with DC circuits and is concurrently studying AC circuits.

Chapters cover electron emission, graphical circuit analysis, vacuum diodes, vacuum triodes, multielement tubes, single-stage amplifiers, multistage amplifiers, power amplifiers, gaseous tubes, power supplies, and special electron tubes. A group of questions follows each chapter, and answers to some of these are included at the back of the book. A four-page index completes the volume.

A knowledge of simple algebra is essential to the understanding of this book. Where appropriate, explanations employing calculus have been included, but the same points are explained by other means for readers not familiar with calculus. Schematics, graphs, line drawings, and photographs are used throughout to supplement the text.

The author of this volume is Professor Emeritus of Kansas State University. He has been author or coauthor of a number of books on electrical engineering and related subjects.

Though an introductory text, *Electron Tubes* is by no means superficial; yet, a high degree of understandability has been preserved throughout. The reader who has need to learn the basic principles of electron tubes should find this book quite helpful. ▲

electronic cables

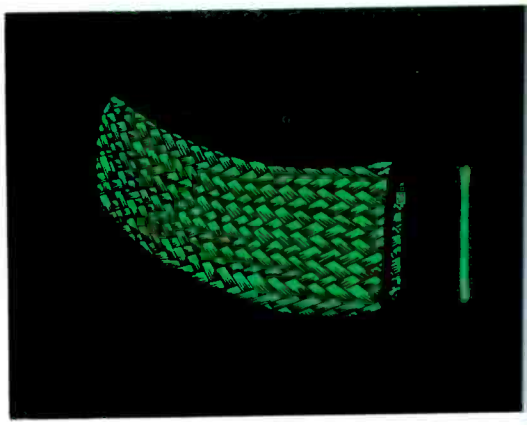

Fig. 1. Braided wire cable.

The evolution of electronic cables has produced a multitude of designs and characteristics to match an equally varied assortment of applications. The following article, adapted from Howard W. Sams' Electronic Cable Handbook by the Engineering Staff of Belden Manufacturing Company, provides a concise review of the more common types of cable the serviceman will encounter.

As the field of electronics has expanded in size and technology, the science of electronic cable design, manufacture, and use has kept pace. Exotic new concepts in electronic devices and techniques demand the development of equally complex cables to fit the ever-increasing varieties of applications. Gone are the days when a piece of wire or cable was only expected to carry a given signal from a source to a load. Today, cables are designed to be an integral part of an electronic circuit and actually perform one or more functions in the circuit in addition to carrying a signal.

Characteristics

What is an "electronic cable"? This unanswered question has been asked, or perhaps should have been asked, countless times by those who work in the electronics field. Simplified, an electronic cable may be defined as a length of any conductive or semiconductive material, with or without insulation and other "refinements," which is used in an electronic application. It could be a length of lamp cord, when used as a speaker extension cable, or a piece of braided wire cable used as a chassis ground strap.

Conductors

The most commonly used conductor in wire and cable is copper, because of its optimum combination of properties of high electrical and thermal conductivity, great malleability, reasonable strength and cost, and its ability to be alloyed or coated with many other metals, resulting in special-use conductors. To minimize oxidation and facilitate soldering, the copper conductor is often coated with another metal which oxidizes more slowly.

Copper alloys or copper-covered steel are used where additional strength and long flex life are necessary, but the use of these materials always results in a sacrifice of electrical conductivity. For example, cadmium copper, a copper alloy containing 0.5 percent to 1.0 percent cadmium, has up to 150 percent of the tensile strength of copper, but has only about 80 percent of the conductivity of copper. Also, copper-covered steel wire has 150 percent to 200 percent of the tensile strength, but usually has only 30 percent to 40 percent of the conductivity of copper.

Aluminum conductors are lighter in weight than equivalent copper conductors, but aluminum has only about 60 percent of the conductivity of copper. Aluminum also forms a surface oxide when it is exposed to air; these oxides can result in undesirable high-resistance.

A different type of metallic conductor is occasionally used in wire and cable. This is the *tinsel conductor,* which is comprised of very fine ribbons of copper or bronze spiralled about a high-strength woven thread core. The tinsel conductor has extremely long flex life and excellent limpness, and is an excellent choice for use in such applications as retractile telephone and microphone cords, language-lab cords, and other applications where a great amount of flexing and a small size of conductor is required.

Where little vibration and no flexing are required of a wire or cable, solid (single-strand) conductors are used. The advantage of a solid con-

ductor is its lower cost compared with that of the equivalent stranded conductor. Wire and cable with solid conductors are normally used in hookup wire for small instruments, chassis wiring, or any similar fixed installation.

Stranded conductors are utilized in most electronic wires and cables to give them better limpness and longer flex life. From a practical standpoint, stranded conductors offer longer service life than solid conductors. For example, if a solid conductor is nicked or similarly damaged when being cut and stripped in preparation for use, it will break after only a few bends of the conductor. On the other hand, the chances are good that only a few members of a stranded conductor would be nicked or damaged in the same operations. The remaining undamaged strands would still give a good service life to the cable.

For a given size of conductor, increasing the number of strands while reducing the size of the individual strands will increase the flexibility of the conductor.

In general, the finer the size of the individual wires in a stranded conductor, the higher the cost. This higher cost is also true of tinned (or other coated) wire as compared with bare wire.

Flat or round (tubular) braided conductors (Fig. 1) are occasionally used in certain applications in which they are better suited than round solid or stranded cables. These are seldom insulated since the insulation would hinder the extra flexibility and ability of the conductor to extend or retract slightly in length by pulling or pushing axially on the cable. Flat braids are machine-rolled flat by the braid manufacturer and are usually used for grounding or bonding. Tubular braids are occasionally used for bonding, but are more commonly desired as shields to slip over a cable or group of cables in an installation.

There are some conductors utilized in electronic cables which are not metallic. These are generally termed *semiconductors* and could be textile thread impregnated with carbon or similar conductive particles. Also, elastomeric compounds, such as polyvinyl chloride and, to some extent, rubber or neoprene, are used, in which a semiconductive ingredient is mixed before the compound is extruded Such semiconductors are sometimes used as shielding. This could be an extruded semiconductive plastic shield tubed over the cable components, with a drain wire running axially under and touching the tube, to carry off accumulated electrostatic charges uniformly throughout the cable length. When used as a shield, semiconductors almost always have an overall protective insulating jacket.

Insulation

Although wire and cable insulations may be classified in two very broad and basic categories — *thermosetting* and *thermoplastic* — the types and compound mixtures within each of these groups are so varied as to make the available number of compounds almost unlimited. Most of the insulation materials used today are composed of compounds made from any of 14 or 15 types of synthetic rubber polymers (thermosetting) and from seven or eight synthetic thermoplastics.

An insulation must do more than cover a conductor to protect it from its surroundings and to contain the electrical signal. The higher the voltage or the frequency, the more difficult becomes the problem of providing the proper insulation. In addition, external factors such as heat, oxygen, ozone, oil, chemicals, sunlight, moisture, etc., can cause deterioration of the electrical and physical properties of an insulation.

Thermosetting materials are characterized by their ability to be stretched, compressed, or otherwise deformed (within reasonable limits) under mechanical strain, and then to "snap back" to their original form and shape when the mechanical stress is removed. Since thermosetting insulations are not subject to heat softening, they will not drip, flow, or deform appreciably during the application of external heat or electrical overloads (which cause internal heat). Some of the more commonly known thermosetting insulations are natural rubber, neoprene, butyl, silicone rubber, and synthetic natural rubber.

Thermoplastic insulating materials are best known for their excellent electrical characteristics and relatively low cost. In general, thermoplastics are popular as insulation since much thinner insulation thicknesses may be used to obtain good electrical properties, especially for higher voltage cables. Also the thinner insulations usually result in a smaller size of cable than that of an electrically equivalent cable made with thermosetting insulations. By nature, these materials are thermoforming in that they heat-soften and flow under mechanical pressure, then retain their deformed shape or form after cooling and/or removal of the mechanical strain. Commonly encountered thermoplastics include PVC, polyethylene, nylon, and Teflon.

Shields

The shield in an electronic cable is used to prevent harmful electrostatic interference, since this type of disturbance is typically present in and around an electronic circuit. Electromagnetic interference is not usually a problem in electronic circuits.

The first, and most common reason for including a shield on a cable is the need to keep external electrical disturbances from affecting the signal in the cable. The second basic reason is to prevent the signal in the cable from being detectable at locations other than at the cable ends. The third reason is a combination of the first two; it is the elimination of unwanted transfer of signals between circuits in the same cable, commonly called *cross talk*.

The best known electrostatic shield used in electronic cables is the braided copper-wire shield (Fig. 2A). This type of shield does not provide 100 percent shield coverage over the cable. The practical limit is about 96 percent coverage. Braided shields are reasonably flexible and quite durable, and they offer a good balance of shielding properties. The drawbacks to a braided shield are difficulty in terminating, higher cost, lower flexibility, and maximum diameter.

Copper-wire strands which are closely wrapped around a cable component as shown in Fig. 2B provide an electrostatic shield which is

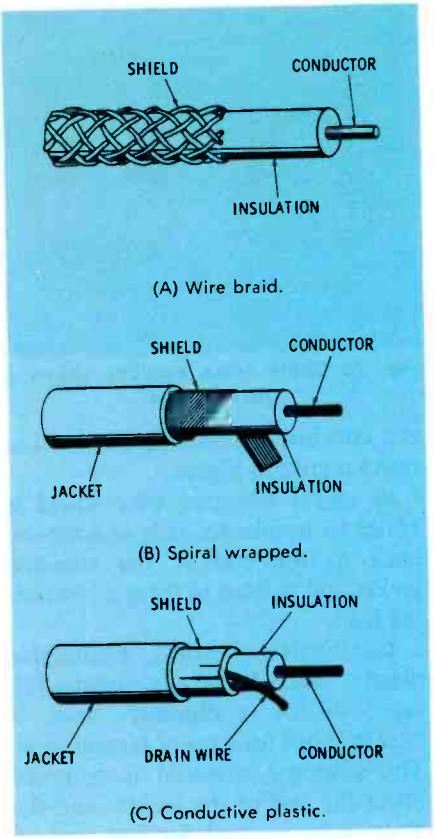

Fig. 2. Cable shields.

suitable for use at audio frequencies. Wrapped-wire shields may cover up to 97 percent of the area, and they are more easily terminated than braid shields. However, these shields are generally not recommended for use at radio frequencies because the inductance of the wire strands produces a "coil effect."

A conductive plastic extrusion may be placed over a cable component as shown in Fig. 2C and used as a shield. Again, a drain wire must be employed to terminate this type of shield. These semiconductive-material shields are not effective above audio frequencies, because they are basically only "particles" of a shield suspended in a nonconductive medium.

With the introduction of Du Pont *Mylar* (polyethylene terphthalate film), a new concept of cable shielding became possible. By laminating Mylar to aluminum foil, a tape which makes an excellent metallic shield on one side and an excellent insulator on the opposite side is produced.

Fig. 3 illustrates the cross section of a basic Mylar-aluminum shielded cable. The tape is applied with the Mylar on the inside and the aluminum on the outside, and with the drain wire in contact with the aluminum. Mylar-aluminum tape provides total (100 percent) electrostatic shielding and will flex repeatedly with no breakage because it is spirally applied instead of longitudinally applied. The Mylar-aluminum tape shield is recommended for use in both AF and RF circuits.

Cable Handling Techniques

The choice of methods for terminating a wire or cable depends to some extent on whether the operation is to be a repetitive manufacturing operation or a low-volume operation as in a repair shop, development lab, or ham shack. Those engaged in manufacturing usually have high volume machines and methods for automatic cutting, stripping, and terminating wires and cable. This article will concentrate on small-shop or single-user operations.

Stripping

The type of insulation to be removed determines the best or easiest stripping method. Since you may encounter a wide variety of wire insulations, you must be familiar with the type used and known the best methods for removing each of them. The commonly used insulations can be classified in the following categories:

Thermoplastic (vinyls, polyethylene, Teflon, etc.)

Thermosetting (rubber, Neoprene, silicone, etc.)

Fabric (cotton, synthetic, asbestos, glass, etc.)

Fabric over thermoplastic or thermosetting insulations.

The devices available for stripping the insulation from a wire are generally designed to do this job rapidly, with as little damage to the wire as possible. There are a variety of types of hand strippers available. Essentially, the basic principle is the same for all of them: a set of mating v-shaped blades adjustable for various sizes of wire. Hand strippers are primarily used when the required stripping is to be done at the work area on thermoplastic, thermosetting, and fabric over thermoplastic or thermosetting insulated wires.

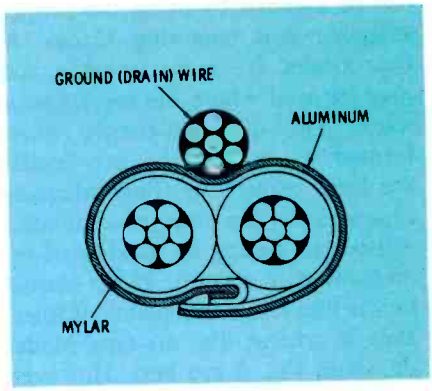

Fig. 3. Cross section of Mylar-aluminum shielded cable.

One type of hand stripping device is the *Strip-It* shown in Fig. 4.

Other types of strippers available include bench, hot-blade, rotary, wirebrush, and automatic power strippers. Since these are usually employed in assembly-line techniques, they will be considered to be outside the scope of this article.

When you are stripping the various types of insulation, remember that not only are there variables in the insulation, but also, one manufacturer's wire may strip more readily than another's. This is due to different methods of processing or applying the insulation. For example, plastic insulation can be "tubed" over a conductor and behave like sleeving, or it can be extruded so it adheres firmly to the conductor. The stripping qualities of fabric-covered insulation depend greatly on the angle at which the fabric was applied to the cable.

On wire sizes No. 18 AWG and smaller, it is generally accepted that individual wire strands must not be cut or kinked. On automatic strippers that employ knife blades, this

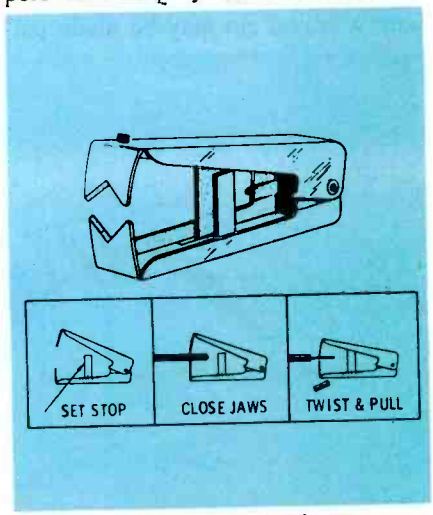

Fig. 4. Hand wire stripper.

can be avoided by using the proper stripping and centering blades. V type blades are more versatile and may be used where the insulation is thick. The diamond-shaped holes formed by mating the two blades are large enough to allow adequate clearance for the stripped conductor to prevent cutting or nicking of individual wire strands. If the insulation is thin and the adjustment tolerance is critical, the die-type blades shown in Fig. 5 are best. However, a die-type blade will not do a satisfactory stripping job unless the cutting edges are sharp. Dull cutting edges will merely crush or pinch the insulation, requiring a great deal of effort to remove it. This effort may tear off the insulation, and it usually stretches the wire.

Multiple Conductor Cables

Removal of cable jackets (Fig. 6) can be accomplished on an automatic stripper by using sharp die-type stripping blades with a mated hole size somewhat larger than the diameter of the cabled conductors beneath the jacket. This prevents cutting the insulation of the conductors.

Jackets may also be removed by hand strippers of the type previously discussed. The jacket is first cut almost all the way through by rotating the hand stripper at the desired point. Then the piece of jacket to be removed is grasped with the hand stripper blades, and the piece is pulled off the cable. If a hand stripper is not available, a knife or razor blade is used to make a careful cut around the jacket, but not quite all the way through the jacket. Should the jacket insulation prove difficult to remove after a circumferential cut, a lateral cut may be made parallel to the axis of the wire to relieve the pressure, after which the jacket piece may be "peeled" off by hand. The jacket will usually tear easily along the circumferential and lateral partial cuts.

Shielded Cables

Cables may have an overall shield (with or without a jacket), a shield over one or more conductors, or both. Braided wire shields have been used frequently in electronic cables although new shielding types are gaining in popularity.

The simplest case of braided wire shield involves a single conductor as in a shielded grid lead or a microphone cable. After removal of the jacket, the shield is pushed back toward the end of the jacket or the desired distance from the end of the conductor (Fig. 7). This will bunch the shield and loosen it over the conductor. Using a pick, spread the strands of the shield at the desired point, bend the conductor, and insert the pick through the shield opening and under the loop of the conductor. Pull the conductor out through the shield hole, then pull the shield pigtail out tight for easy connection to ground.

If the cable is too large to pick out the conductor through a shield hole, or if the shield is over a multi-conductor group or cable, then the shield is "combed" to prepare a ground lead and expose the conductor(s) beneath it. Using a sharply pointed tool, the braid is unwoven by separating the shield strands, starting at the end of the cable and working progressively back and around the cable toward the end of the cable jacket. When all strands have been straightened, they

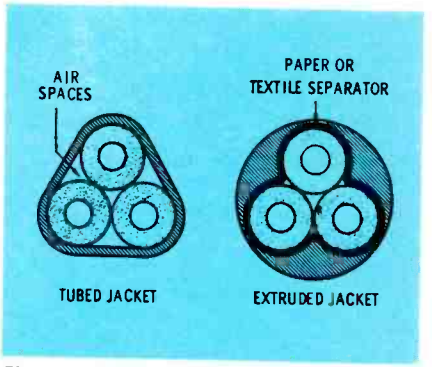

Fig. 6. Cable cross sections showing jacket types.

are bunched together and twisted to make a ground pigtail.

A spiral wrapped wire shield is easier to terminate. It is unwrapped back to the end of the stripped jacket and twisted to form a grounding lead.

Conductive textile, conductive plastic, and Mylar-aluminum foil tape shields commonly have a "drain" wire for ease of termination. The shielding material is trimmed off at the end of the jacket, and the drain wire is used for the ground connection. When terminating a shield which utilizes a drain wire, be sure to allow a "stress loop" in the drain wire so flexing the cable will not cause strain on and early failure (breaking) of the drain wire.

Installation Techniques

This section covers suggestions for installation of cable. Close attention to proper techniques will insure that the cable has a long, trouble-free life.

Conduit Installations

It is frequently necessary to install electronic cables in metal conduit. Building codes do not normally permit installation of communica-

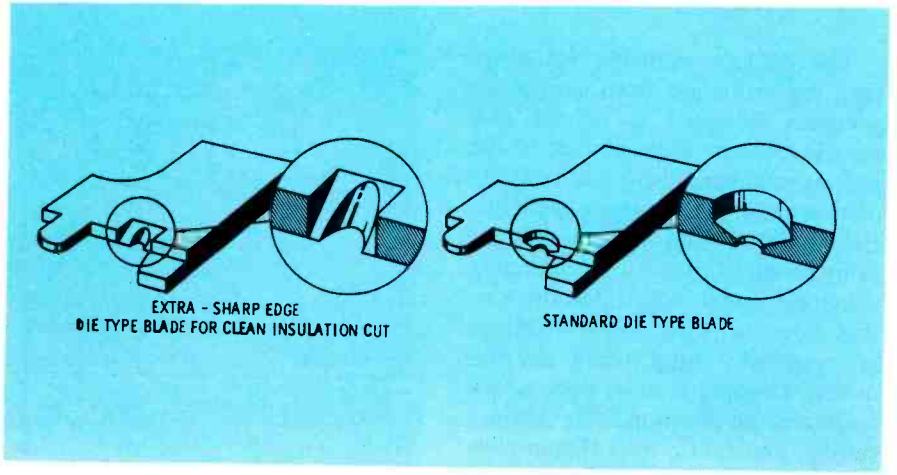

Fig. 5. Die-type stripping blades.

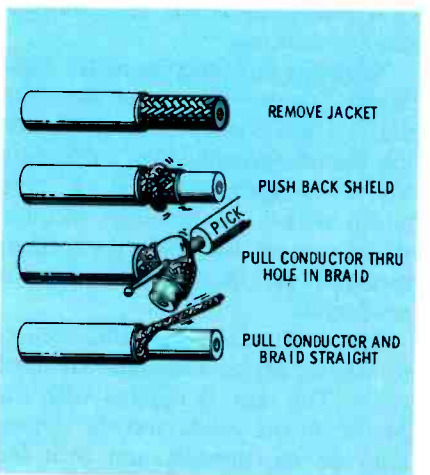

Fig. 7. Pigtailing single-conductor shielded cable.

tions cables in the same conduit with power cables, so a separate conduit must be provided. It is poor practice to route communications cables of any kind near power cables, because the fields surrounding the power cables usually disturb and distort the signals passing through the communications cables.

For ease in pulling a cable into a conduit, particularly in long runs or runs with bends, a lubricant is recommended. Powdered soapstone is excellent as an antifriction agent, although there are other commercial lubricants available which will also do a good job. However, if a lubricant other than powdered soapstone is used, the lubricant label should be checked to be sure the ingredients will not damage the cable jacket.

In pulling the cable, it is important to distribute the pull evenly among all the conductors and other elements in the cable. A cable may easily be damaged if the pull is confined to only a few conductors of, say, a multiconductor cable. A steady pull is important. Sudden jerks can stretch the conductors or even break them.

Direct Burial

Almost any cable with a vinyl or polyethylene jacket is suitable for direct burial in the ground, unless unusual chemical conditions exist in the soil, such as might be found in certain industrial sites.

When burying a cable, lay it without tension so it will not break when earth is packed around it. To prevent subsequent mechanical damage, the cable should be buried below the frost line. A local water company or city water department can advise the frost line for the area. Cinders, rocks, etc., may damage the cable jacket and destroy its moisture-proof qualities; for this reason it is always advisable to surround the cable with sand.

Stapling

Cables up to about ½-inch diameter may be stapled in place, provided proper precautions are taken. Special staples and staple guns are available from several companies. The staples should be round to fit the cable without crushing it; flat topped staples will tend to cut the cable jacket. Staples should never

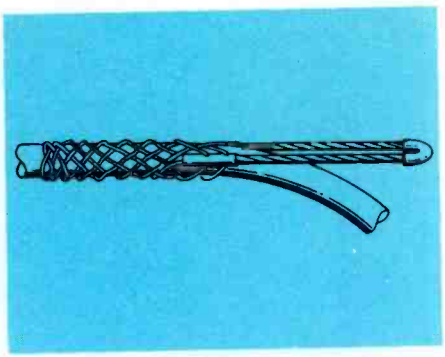

Fig. 8. Closed Kellems grip.

be used to install flat tv lead-in, because the staples will disturb the electrical field around the lead-in.

Overhead Wiring

When cable is to be freely suspended either horizontally or vertically, adequate supporting devices and techniques must be used. One of the best cable supporting devices works on the principle of the old toy, the "Chinese finger puzzle," also known as a basket, stocking, or come-along. As shown in Fig. 8, this grip distributes the load evenly over the cable surface and conforms naturally to the exact shape of the cable. The open wire mesh allows the cable to breathe and drain dry naturally; it can be used indoors, outdoors, on buildings, poles, or in elevator shafts. Fig. 9 illustrates a typical installation between two buildings, using the "finger puzzle" grip over the cable at the point of entry into the building. Note the loop in the cable to prevent water from entering the building.

Another factor to be considered when suspending cables is the sag between spans. Sufficient sag must be allowed to compensate for the weight of the cable, wind, and ice loading. If a cable is not sufficiently strong to be suspended between spans, then it should be supported from a high strength messenger cable. Care must be taken to keep the method of securing the cable to the messenger from damaging the cable. Tape or a spiral lashing of wire are better than loops of wire.

Cable Maintenance and Repair

The same techniques recommended for splicing of new cables may also be employed in repairing breaks, faults, or damaged points in a cable. Naturally, the outer jacket of a cable must be intact if the cable is to perform satisfactorily. The prime function of a jacket is to protect a cable in its environment. Even a simple nick through a jacket should be repaired by wrapping with electrician's tape. Larger areas may require a complete splice job, if the conductors and insulation and/or shields beneath the jacket have also been damaged by whatever caused the jacket rupture.

Fig. 10. shows how to tell the difference between a tensile break and a fatigue break in a cable conductor. The ends of a conductor that has failed due to excessive tension will be smoothly necked down in diameter at the point of break. The ends of a conductor that has failed due to excessive bending or flexing will have sharp, pointed edges and a crystalline appearance. This method of determining how a conductor failed is frequently helpful in determining what precautions to take to avoid recurrence of the break after repair or replacement.

Hi-Fi

Most high-quality home music systems contain three or more separate pieces of audio equipment. The basic system usually consists of phonograph pickup, an amplifier, and at least one speaker. Since these components are frequently located in different areas of the home, cables are required to convey the signal from one to the other.

Phono Pickup Cables

A very small, flexible, limp cable is required between the pickup cartridge and the input of the preamplifier or amplifier to ensure that no appreciable mechanical load is transferred to the tone arm. These miniature cables must not interfere with the delicate tracking action of the stylus. Pickup arm cables are made in several different constructions, to fit the internal wiring requirements of the various types of record players. The construction varies widely, however all high-impedance pickup cartridges require a shielded cable to eliminate problems of electrostatic hum disturbance from nearby 60-cycle components,

such as the turntable motor. The ideal stereo arrangement employs two individually shielded twisted pairs to provide maximum channel isolation and hum reduction, along with cable flexibility and limpness.

Interconnecting Wiring

The cable used to connect record-player outputs to amplifier inputs is normally a single conductor with an overall shield and a protective outer jacket. Characteristics desirable in this cable are flexibility, low capacitance, and small diameter.

The amplifier input cable is very similar to a high-impedance microphone cable—the center conductor carries the signal, and the shield acts as a return path. Any shielded cable type may be used, but if the cable run is long and it is connected to a high-impedance output, a low-capacity cable should be used to prevent loss of high-frequency characteristics due to capacitive loading.

Speaker Cables

The selection of a cable suitable for connecting the amplifier to the speaker is quite uncomplicated. This wiring is not susceptible to interference from outside signal or power circuits and does not ordinarily require shielding. Either a twisted pair or parallel two-conductor cable is suitable for connecting the power amplifier to the speaker.

Number 22 or 24 AWG conductors are sufficient for home entertainment speaker systems. However, for very long cable runs the resistance of the wire can become appreciable. (See Table I)

Table I

Wire Size (AWG)	Length of Cable-Pairs (Ft.) for 10% Power Loss		
	4 Ohm	8 Ohm	16 Ohm
14	88	176	352
16	55	110	220
18	35	70	140
20	22	44	88
22	13	26	52
24	8	16	32

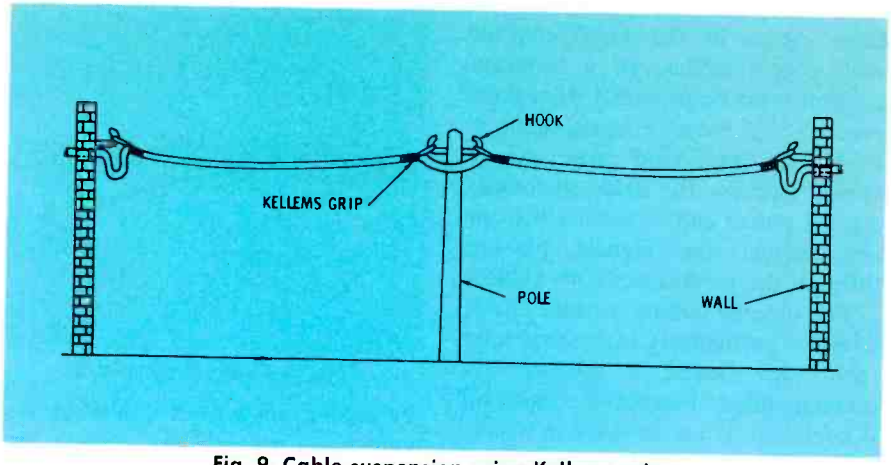

Fig. 9. Cable suspension using Kellems grips.

Television Lead-In

The antenna lead-in cable accounts for only a fraction of the cost of a television receiving system, but its physical and electrical characteristics can make the difference between good and bad reception. Selecting the optimum transmission line is just as important as installing a suitable antenna.

Losses

There are several kinds of signal losses in lead-in; it is significant that these losses increase with signal frequency:

1. *Conductor Loss.* Signal current in the lead-in conductors dissipates energy in the form of heat. As frequency increases, and especially at VHF and UHF frequencies, this loss rises rapidly, because the current is increasingly nearer the surface of the conductor (skin effect), thus reducing the effective cross-sectional area of the conductor.

2. *Dielectric Loss.* Dielectric losses are caused by the insulating material heating when a voltage difference exists between the lead-in conductors. This is one reason why polyethylene, which resists heat losses, is used on lead-in. Cellular polyethylene is even better because it combines polyethylene with dry air dielectric (which has the lowest loss).

3. *Radiation and Induction Losses.* These losses result from electrostatic and electromagnetic fields surrounding the conductors. When the field around the conductors is disturbed by a metallic object less than six inches away, current is induced in the metal, resulting in power loss.

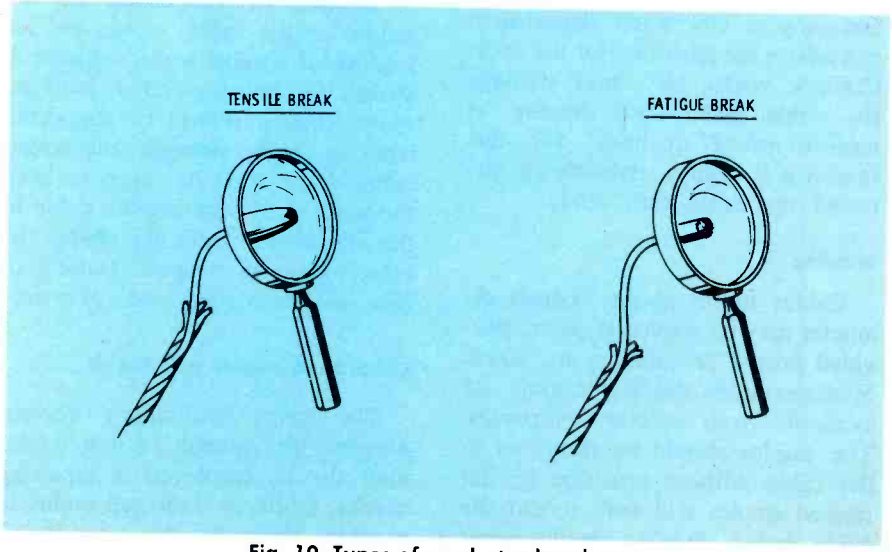

Fig. 10. Types of conductor breakage.

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Additional loss occurs because some of the energy is radiated into space.

Many installation technicians have used the flat ribbon lead-in almost exclusively in the past. Although these installers can cite many examples of satisfactory reception using this type of line, flat line was designed for indoor use only.

Today's lead-in cables must carry both UHF and VHF signals, including critical color signals. Any installations which require outside antennas should use a lead-in which is also specifically designed for outdoor operation. When moisture accumulates on the surface of a flat line, or when the flat line is routed near metallic or conductive objects, part of the electromagnetic field surrounding the lead-in extends (is induced) into these objects, increasing attenuation losses. These conditions also result in losses due to impedance changes and signal reflections. This problem is not eliminated by increasing the thickness of the insulation web; flat twin-lead with 0.080 inch or 0.100 inch web thickness has essentially the same electrical limitations as twin-lead with a thinner web.

The color of the polyethylene insulation used on outside lead-in cable is quite critical, odd as it may seem at first. Polyethylene in its natural state (translucent milky color) or in any light color is very susceptible to stress cracking from the effect of ultraviolet light which is, of course, a strong component of sunlight. Such cracks collect moisture and dirt and cause leakage paths which distort and greatly weaken the signal through losses. A dark-pigmented color, such as the brown commonly used on lead-in, screens out this ultraviolet light and eliminates stress cracking. Black would be even better, but black pigments contain carbon, which is conductive and would therefore impair the dielectric strength of the polyethylene insulation.

The actual installation of unshielded lead-in plays a major part in the performance of the receiving system. General rules such as twisting the lead-in during installation and always using long stand-offs have been followed in the past. Sometimes these things are done from habit, and the installer loses sight of the serious problems which can be created unless the lead-in is protected from proximity effects.

Routing unshielded TV lead-in near metallic or loss-creating surfaces (such as masts, gutters, downspouts, roofing, wet lumber, etc.) results in severe signal losses, as well as reflections. Ghost pictures and smearing of the vertical picture edges are frequently the result of routing the transmission line near harmless-looking objects.

Coaxial Lead-In

Coaxial cable has concentric conductors separated by solid or cellular polyethylene insulation. It is used for special applications. RG-11/U and RG-59/U coaxial cable types, with line amplifiers, have been used for hotel, motel, hospital, apartment house, and similar master antenna system installations, or in other commercial situations where high ambient noise levels exist, caused by such sources as elevators, automotive ignition systems, industry, and medical equipment. In ad-

• *Please turn to page 60*

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*Makes test under actual set-operating conditions

NEW B&K model 707 DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER *with obsolescence protection*

Tests:
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Provides multiple-socket section to quick-check most of the TV and radio tube types the *true dynamic mutual conductance way**—plus simplified switch section to check other tube types in Dyna-Jet emission circuit. Also includes provision for future new sockets.

You can quickly check all the tubes in the set, detect hard-to-locate weak tubes that need replacement . . . sell more tubes, save call-backs, and make more profit. *Makes test under set-operating conditions.* Checks each section of multi-section tubes separately. Checks for *all* shorts, grid emission, leakage, and gas. Makes quick "life" test. Exclusive adjustable grid emission test provides sensitivity to over 100 megohms. *Quickly pays for itself.* Net, $189.95

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Circle 13 on literature card

SOURCE GUIDE TO IMPORTED SETS

The last source guide to imported sets appeared in the June '65 issue of PF REPORTER. Since that time, many companies have gone out of business, changed service policies, moved, or added new brand names to their lines. The revised source guide shown here was compiled by querying over 200 importers and manufacturers of foreign made radios, television, tape recorders, phonographs, and other home entertainment products. Only those who answered are included here.

The numbers following each brand name indicate the source from which schematics and parts may be obtained, or to which a set may be sent for repair service. (Before shipping a set to the company indicated, it is usually best to write for specific shipping instructions.) The notation "(Dist.)" indicates that parts or service literature are usually available through authorized distributors. If the distributor is unable to furnish the needed item, direct a request to the source indicated by the number. The letters "ARS" mean that factory service is performed by authorized repair stations, usually located throughout the country; information concerning the nearest one may be obtained by writing the company. "NA" means not available. The column titled "Sams Coverage" indicates whether the trade name is covered in Howard W. Sams' specialized series on transistor radios, auto radios, and tape recorders (TSM, AR, and TR series).

Brand Name	Schematics	Parts Available	Repair Service	Sams Coverage
Admiral	1A	1A	ARS	Yes
Air Chief	20	20	21	Yes
Airline	39	39	39 ARS	Yes
AMD	2	2	2	Yes
Archer	46	46	46	Yes
Autovox	6	6	ARS	Yes
Becker	8	8	8	Yes
Blaupunkt	48	48	48	Yes
Bryan	45	45	45A	No
Butoba	54	54	54 ARS	No
Channel Master	10	10	10 ARS	Yes
Claricon	2	2	2	Yes
Concord	11	11	11	No
Conferette	45	45	45A	No
Coronado	23 (Dept. 54)	23 A, B, C	23 A, B, C	Yes
Craig	12	12	12	Yes
Crown	27	27	27	Yes
Dejur-Amsco	13	13	13 ARS	Yes
Dejur/Grundig	13	13	13 ARS	No
Delmonico	14, 40	14, 40	14, 40	Yes
Delmonico Nivico	14, 40	14, 40	14, 40	Yes
Doric	15	15	15	No
Dorset	59	59	59	No
Duo Vox	16	16	16	Yes
EH3	13	13	13 ARS	No
Electramatic	13	13	13 ARS	No
Electro-Brand	NA	17	17A	Yes
Elgin	18	18	18	Yes
Embassy	13	13	13 ARS	No
Emerson	19 (Dist.)	19 (Dist.)	19A ARS	Yes
Empire	NA	NA	61	No
Essex	31	31	31 A, B, C	Yes
Europhon	32	32	32	No
EW3	13	13	13 ARS	No
Executmatic	13	13	13 ARS	No
Fleetwood RhytMATE	15	15	15	No
Four Star	22	22	22	No
Geloso	NA	4	4 ARS	Yes
Golden Shield	24	24	24A	Yes
Grundig	25	25	25A ARS	Yes
Hemisphere	60	60	60	Yes
Hitachi	26	26	26	Yes
Jade	47	47	47 ARS	No
JVC	27	27	27	No
Kensington	59	59	59	No
Korting	45	45	45A	Yes
Kowa	29A	29A	NA	Yes
Lafayette	30	30	30	Yes
Lamina	27	27	27	No
Lucor	32	32	32	Yes
Mastercraft	NA	34	NA	Yes
Masterwork	35	35	35	Yes
Mayfair	5	5	5A	Yes
Midland	37	37	37	Yes
Monacor	38	38	38 ARS	Yes
Nordmende	56	56	56	Yes
Olympic	41	41	41 ARS	Yes
Packard Bell	42	42	42A ARS	Yes
Panasonic	36	36	ARS	Yes
Peerless	NA	43	43	Yes
Penney	28	28	28 ARS	Yes
Penncrest	28	28	28 ARS	Yes
Philco	44	44	44 ARS	Yes
Phono Trix	45	45	45A	Yes
Radio Shack	46	46	46	No
Realistic	46	46	46	Yes
Realistifone	46	46	46	No
Realtone	47	47	47 ARS	Yes
Rheem	9	9	9A	No
Rheem Califone	9	9	9A	No
Rheem Roberts	9	9	9A	No
Ross	49	(To ARS only)	49 ARS	Yes
Sears-Silvertone	50	50	ARS	Yes
Sharp	51	51	51 ARS	Yes
SjB	33	33	33 A, B, C	No
Sony	52	52	52A	Yes
Sony (Tape Recorders Only)	57	57	57	Yes
Standard	53	53	53, 53A	Yes
Stanford-Butoba	54	54	54 ARS	No
Star-Lite	55	NA	55A	Yes
Stenorette	13	13	13 ARS	No
Sutton	59	59	59	No
Sylvania	58	58	58A	Yes
Telefunken	3	3	3	Yes
Telmar	33	33	33A, B, C	No
Tempest	7	7	7	No
Three Star	40	40	40	No
Transette	37	37	37	Yes
Uher	33	33	33A, B, C	Yes
Valiant	62	62	62	Yes
Versatile II, III	13	13	13 ARS	No
Vista	12	12	12	Yes
Waltham	60	60	60	Yes
Welby	18	18	18	No
Westinghouse	63	63 (Dist.)	63 ARS	Yes

1. Admiral Corporation
P. O. Box 845
Bloomington, Illinois

1A. Admiral Corporation
National Service Division
903 Morrissey Drive
Bloomington, Illinois 61701

2. AMD Electronics
663 Dowd Avenue
Elizabeth, New Jersey

3. American Elite Inc.
48-50 34th Street
Long Island City, N. Y.

4. American Geloso Electronics
251 Park Avenue South
New York, N. Y. 10010

5. Artic Import
1024 W. Randolph Street
Chicago, Illinois 60607

5A. Cleftronics
155 N. Carpenter
Chicago, Illinois

6. Autovox Corporation of America
250 W. 57th Street
New York, N. Y. 10019

7. Azad International Inc.
1133 Broadway
New York, N. Y. 10010

8. Becker Auto Radio U.S.A., Inc.
613-19 South 24th Street
Philadelphia, Pennsylvania

9. Califone/Roberts Electronics
5922 Bowcroft Street
Los Angeles, California

9A. Rheem Roberts—Califone Service Center
6017 Venice Blvd.
Los Angeles, California

10. Channel Master Corp.
Ellenville, New York 12428

11. Concord Electronics Corp.
1935 Armacost Street
Los Angeles, California

12. Craig Panorama, Inc.
2302 E. 15th Street
Los Angeles, California 90021

13. Dejur-Amsco Corporation
Northern Blvd. at 45th Street
Long Island City, N. Y.

14. Delmonico International Corp.
50-35 56th Road
Maspeth, N.Y. 11378

15. Doric Organs
128 James Street
Morristown, New Jersey 07960

16. Duosonic Corporation of America
255 Park Avenue South
New York, N. Y. 10010

17. Electro-Brand, Inc.
210 W. Chestnut Street
Chicago, Illinois 60610

17A. Electro-Brand, Inc.
210 W. Jefferson Street
Chicago, Illinois 60610

18. Elgin Radio
847 Jackson Blvd.
Chicago, Illinois

19. Emerson Radio & Phono Corp.
524 W. 23rd Street
New York, N. Y.

19A. Emerson T.V. Sales Corp.
14 Cole Street
Jersey City, New Jersey

20. Firestone Tire & Rubber Co.
1200 Firestone Parkway
Akron, Ohio 44317

21. New York Transistor Corp.
150 Fifth Avenue
New York, N. Y. 10011

22. Fortune Star Products
1207 Broadway
New York, N. Y.

23. Gamble-Skogmo, Inc.
15 N. 8th Street
Minneapolis, Minnesota 55403

23A. Gamble-Skogmo, Inc.
Warehouse No. 5
5445 Wayzata Blvd.
Minneapolis, Minnesota 55440

23B. Gamble-Skogmo, Inc.
Warehouse No. 8
1301 N. Main
Monmouth, Illinois 61462

23C. Gamble-Skogmo, Inc.
Warehouse No. 13
1035 E. Dodge
Fremont, Nebraska 68025

24. Golden Shield Corporation
10 Grace Avenue
Great Neck, N. Y. 11021

24A. Golden Shield Corporation
56 Harvester Avenue
Batavia, N. Y. 14021

25. Grundig-Triumph-Adler Sales Corp.
355 Lexington Avenue
New York, N. Y. 10017

25A. Grundig-Triumph-Adler
75 Sedgwick Street
Brooklyn, N.Y.

26. Hitachi Sales Corporation
666 Fifth Avenue
New York, N. Y.

27. Industrial Suppliers Co.
755 Folsom Street
San Francisco, California 94107

28. J. C. Penney Co., Inc.
1301 Avenue of the Americas
New York, N. Y. 10019

29. Kowa American Corporation
230 Fifth Avenue
New York, N. Y. 10001

29A. Prominar International Corporation
1150 Broadway
New York, N. Y.

30. Lafayette Electronics International, Inc.
111 Jericho Turnpike
Syosset, Long Island, N. Y. 11791

31. Lloyd's
30 W. 23rd Street
New York, N. Y. 10010

31A. Lloyd's
Service Distributing Corporation
59 N. 5th Street
Saddle Brook, New Jersey

31B. Lloyd Trade Company
6651 E. 26th Street
City of Commerce, California 90022

32. Lucor Electronics Inc.
22-20 40th Avenue
Long Island City, N.Y.

33. Martel Electronics Sales, Inc.
2339 S. Cotner Avenue
Los Angeles, California

33A. Martel Electronics Sales, Inc.
1199 Broadway
New York, N. Y.

33B. Martel Electronic Sales, Inc.
5445 N. Lincoln Avenue
Chicago, Illinois

34. Mastercraft Electronic Corporation
1115 Broadway
New York, N. Y.

35. Masterwork Audio Products
1080 Goffle Road
Hawthorne, New Jersey

36. Matsushita Electric Corporation of America
200 Park Avenue
New York, N.Y. 10017

37. Midland International Corporation
1909 Vernon Street
North Kansas City, Missouri

38. Monarch Electronics International
North Hollywood, California

39. Montgomery Ward & Company
619 W. Chicago Avenue
Chicago, Illinois 60607

40. Nason Trading Co., Inc.
230 Fifth Avenue
New York, N.Y. 10001

41. Olympic Radio & Television
34-01 38th Avenue
Long Island City, Long Island, N.Y.

42. Packard Bell
12333 West Olympic Blvd.
Los Angeles, California

42A. Packard Bell Service Department
6833 Acco Street
City of Commerce, California 90022

43. Peerless Telerad Inc.
162 Fifth Avenue
New York, N. Y. 10010

44. Philco Corporation
Tioga & C. Streets
Philadelphia, Pennsylvania

45. Phono Trix Service Inc.
3650 Dyre Avenue
Bronx, N. Y. 10466

45A. Phono Tape Service Co., Inc.
7810 13th Avenue
Brooklyn, N. Y.

46. Radio Shack Corporation
730 Commonwealth Avenue
Boston, Massachusetts 02115

47. Realtone Electronics Corporation
34 Exchange Place
Jersey City, New Jersey

48. Robert Bosch Corporation
Blaupunkt Radio Division
40-25 Crescent Street
Long Island City, N. Y. 11101

49. Ross Electronics Corporation
589 E. Illinois Street
Chicago, Illinois 60611

50. Sears, Roebuck and Company
9255 Homan Avenue
Chicago, Illinois

51. Sharp Electronics Corporation
178 Commerce Road
Carlstadt, New Jersey

52. Sony Corporation of America
514 Broadway
New York, N. Y.

52A. Sony Corporation of America
47-36 32nd Place
Long Island City, N. Y.

53. Standard Radio Corporation
410 East 62nd Street
New York, N. Y. 10021

53A. Standard Radio Corporation
1300 W. Olympic Blvd.
Los Angeles, California 90015

54. Stanford: International
569 Laurel Street
San Carlos, California 94070

55. Star-Lite Electronics Corporation
37 West 23rd Street
New York, N. Y.

55A. EL-Jay Sales
32-08 31st
Astoria, Long Island, N. Y.

56. Sterling Hi-Fidelity, Inc.
22-20 40th Avenue
Long Island City, N. Y.

57. Superscope Inc.
8150 Vineland Avenue
Sun Valley, California

58. Sylvania Electric Products
Entertainment Products Division
700 Ellicott Street
Batavia, N. Y.

58A. Sylvania Service & Parts Dept.
2001 N. Cornell Avenue
Chicago, Illinois

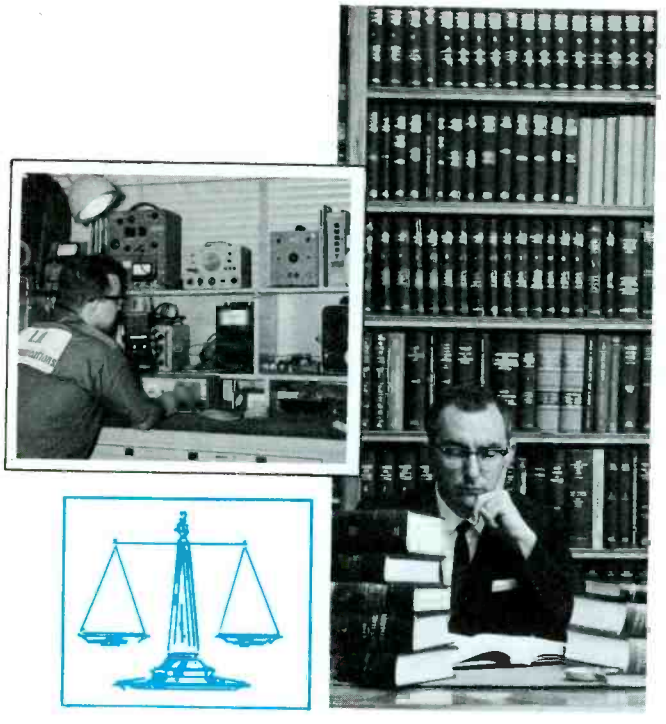
59. Terra International Co., Ltd.
3 E. 28th Street
New York, N. Y. 10016

60. The Sampson Company
2244 South Western Avenue
Chicago, Illinois

61. Trade Distributors
1199 Broadway
New York, N. Y. 10001

62. Valiant Radio Corporation
380 Second Avenue
New York, N. Y.

63. Westinghouse Electric Corporation
Metuchen, New Jersey



legal services

for small retail and service firms

Credit problems, taxes, litigation, business organization are only a few of the many aspects of a retail or service business that demand qualified legal assistance.

by Charles W. Laughlin†

Many small business owners consider legal services only when their firms are in trouble. They fail to realize that legal troubles can be reduced or avoided by a program of consultation which is carried out on a continuing basis. The advice and suggestions of a lawyer on day-to-day operations help prevent costly and time-consuming problems.

As you read this *Aid,* you should keep in mind that a lawyer's job, properly done, is to see that his clients adhere to the law and thus prevent inadvertent violations and near-violations which may turn out to be costly.

Checks, Advises, Guides, and Represents

The legal services which a lawyer provides the owner-manager of a small retail or service firm can be summed up in four words: checking, advising, guiding, and representing.

Your lawyer can *check* past actions to determine if you have unintentionally violated the law. For example a retailer may have failed to get a license for a new line of merchandise because he wasn't aware that one was required.

Such a check may sometimes turn up facts that can be used to improve the firm. For example, the lawyer's examination may show that another form of business organization from the one used in the past may be much better for the owner-manager and his family.

In *advising,* the lawyer can explain the legal principles involved in the various courses of action which are open to the owner-manager under the law. A decision will be easy when but one action is allowed. *Making* a judgement may be difficult, however, when the law allows several courses of action.

At this point, a lawyer's *guidance* can be valuable. While the ultimate decision must rest with the owner-manager in all cases, the lawyer because of his experience, can help evaluate the courses of action and materially assist in making this decision.

In *representing* the owner-manager, the lawyer speaks as one specialist to other specialists. He knows and can talk the language of licensing boards, regulatory bodies, town courts, and other governmental agencies. Equally as important, is the representation which your lawyer provides in negotiating and drawing up contracts. You can be sure your interest is protected, for example, when your lawyer sits down with his counterpart to negotiate a lease. He can protect you from unknowingly placing restrictions on future expansion plans or obligating yourself to pay the renovation costs if your rented store or shop is damaged by a fire.

Organization

The financial future of a retail or service business will be affected by the initial decision of the owner as to the form to be used in its organization. There are certain incidents attached to any form selected which make it imperative that an attorney discuss fully the consequences with the owner.

Three forms generally are available to the owner—sole ownership, partnership, or a corporation. Each form has distinct rules applicable to it regarding taxation, management, liabilities of the owner, and division of profits. Only after being advised as to all of these may an intelligent decision be made as to which form is most suitable.

Legal services are a necessity when the choice of organization requires contracts, partnership agreements, or the filing of certificates. There are many municipal and State

This little part plays a big role in radio.

This box gives you top revues.

The transistor is no bit player when it comes to radio performance. That's why Delco transistors are manufactured under controlled conditions that assure extremely high reliability. And why they're thoroughly tested before being placed in the familiar blue and black box.

Delco Radio engineers are leaders in auto radio design and transistor technology. One reason why Delco radios are original equipment on over half of the cars on the road today.

That United Delco box is your guarantee of genuine OEM quality replacement parts.

Doesn't it make good sense to stock the best for your customers?

Remember these facts when you re-order. And remember, too, that your United Delco supplier handles the most widely advertised, merchandised and recognized name in the parts business.

Next time you think little, think big. Think Delco.

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

GM
MARK OF EXCELLENCE

United Delco

law requirements attached to the beginning of any new business. Full compliance can be best assured with legal advice.

Even after the business is established, periodic checks should be made as the business progresses, particularly from a tax standpoint. For example, a sole proprietorship may have been desirable in the early years when losses were incurred and could be used to offset other income of the owner.

However, when a firm grows and profits are being shown, the owner-manager may desire to incorporate in order to obtain a tax advantage and at the same time reduce personal liability for any losses of the business. As management responsibilities increase, he may wish to form a partnership to help carry the load. Or he may wish to realize on the increasing value of the business by incorporating and selling shares in the business to the public.

Acquiring Property

Acquiring property is another area in which legal services can be helpful and profitable. This is true whether the property is real estate or merchandise.

Real Property

In many cases, the owner-manager's concern with real estate is through a landlord. He rents space in which to operate his retail or service business. In such cases, a lawyer always should check the provisions of the lease.

The lawyer can explain in lay language the consequences which an owner-manager may suffer because of provisions in a lease. Some of the more important considerations when signing a lease are: (1) title to and cost of any improvements to be made to the property; (2) ownership of these improvements when the lease ends; (3) renewal provisions; (4) any restriction on competitive operation by the lessee or others; (5) provisions as to compensation in case of fire or condemnation of the property; (6) provisions for assignment or subletting of the premises; and (7) the means of determining and measuring your sales—an important item when the amount of rent is to depend on a percentage of sales.

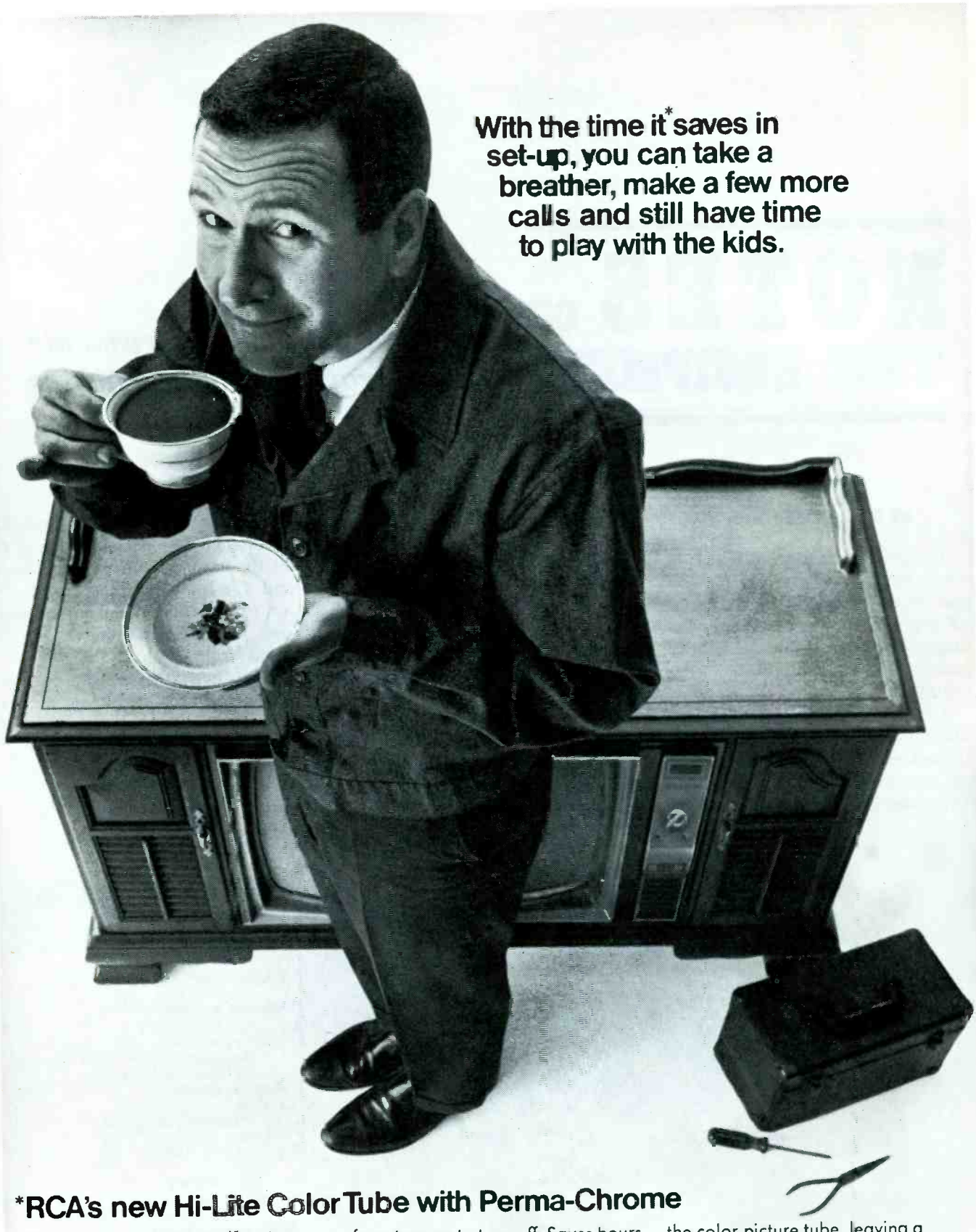
Your lawyer also will call to your attention any reciprocal restrictions as to the use of the premises, such as are commonly found in shopping center leases. Sometimes, the provisions in the leases of other stores may severely restrict your operations as well as future development of the shopping center.

If you buy a store building, the services of a lawyer are essential. In those States where title abstract companies do not operate, a lawyer will examine and certify title to the real estate to insure that you own what you are paying for. Also, he can explain the meaning and impact of any mortgage or other type of instrument necessary to finance such a purchase.

Title to Merchandise

If you buy a stock of merchandise from another retailer, or another business, your lawyer can tell you whether you are complying with the applicable provisions of the Uniform Commercial Code or the Bulk

• *Please turn to page 48*



*RCA's new Hi-Lite Color Tube with Perma-Chrome

If you've been waiting half an hour for the picture tube to warm up every time you repair or install a set, here's good news. RCA's new rectangular Hi-Lite Color Tubes with Perma-Chrome lock colors in place instantly, eliminate distorted color as the set warms up. Colors are true and unchanging from turn-on to turn-off. Saves hours of set-up time. New Hi-Lite Color Tubes with Perma-Chrome now in RCA Victor consoles. **New service switch in all 1967 color chassis.** Three-position for Normal, Service and Raster. When Raster is selected, all video and noise is removed from the color picture tube, leaving a noise-free Raster. Purity is adjustable without removing an IF tube or using other means to remove noise and/or interference from the screen.

RCA The Most Trusted Name in Electronics

NOTES on TEST EQUIPMENT

analysis of test instruments ...operation...applications

By T. T. Jones

RF Signal Generator

The generator shown in Fig. 1. is a sort of in-between type. It's too good to be classified with the usual RF generators found in most service shops, yet it's not quite a laboratory generator. It's the Precision Model E-200-C RF generator.

The E-200-C has many features which most service-type generators are lacking. Obvious among these is the extremely rugged construction. This thing is a real brute; it weighs over 13 pounds. The cabinet is very heavy-gauge steel, and the chassis inside is constructed of copper plated steel about 1/16" thick. The heavy aluminum dial gives a nice musical ring when it's tapped. All this ruggedness was designed in for stability, and the E-200-C has stability to an exceptional degree.

The oscillator circuit (Fig. 2.) is a fairly straightforward electron-coupled oscillator. However, it is suppressor-grid modulated, a technique not often seen in RF generators. R1 on the schematic is not the modulation % control; it's used to set the fixed bias on the suppressor grid. The front-panel modulation % control is in the modulator circuits, and is calibrated directly in % points from 30 to 100.

The attenuator network is separately shielded in a copper box, with all the components compart-

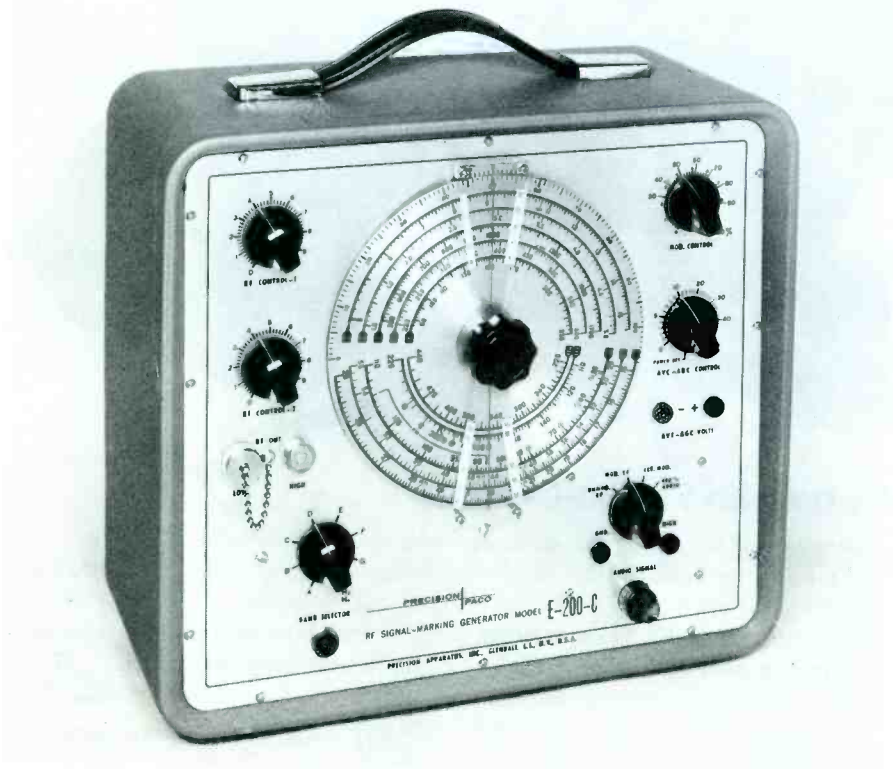


Fig. 1. High-quality RF generator.

Precision E-200-C Specifications

VFO
Frequency:
88 kHz to 110 MHz, strong calibrated harmonics to 440 MHz.
Output:
Nearly ½ volt out to 10 MHz, dropping to about .05 volt at the highest frequencies.
Calibration Accuracy:
± 1%

Internal Modulation:
400 Hz, 0-100%.
External Modulation:
Approximately 9 volts required for 30% modulation.

Audio Oscillator
Type:
Phase-shift oscillator.
Frequency:
400 Hz, fixed.
Level:
0-35 VRMS
Impedance:
Cathode-follower output stage.

AVC Voltage Supply:
0-50 volts. 3K ohms maximum internal impedance.

Power Requirements:
115 VAC, 25 watts.

Size (HWD):
13" × 11½" × 6⅝".

Weight:
13¼ pounds.

Price:
$119.95

Finally somebody is helping... helping you prepare for

The growing crisis in service

Motorola takes the bull by the horns . . . introduces "on-the-job" technical training for your men—with a greatly expanded staff of technical personnel.

Home entertainment products are changing—fast. There's more transistorization . . . and of course more color every year. This means great opportunity for service organizations that keep abreast. Well-informed technicians will be in even greater demand than they are now.

Motorola can help your service department be well prepared.

We have recently increased our staff of field technical personnel. It is their job to help provide you with Technical information for your men and to give some of the training your men will need to cope with this rapidly changing industry.

Each of our technicians has had extensive, practical consumer experience. They know their business—from your side of the fence. The training will be done *right in your place of business*. It will provide a valuable adjunct to the large-scale training meetings held by Motorola Regional Managers & Distributors. Two hours will be spent in formal training. The remainder of the day will be spent working with your men *on your work* to give information—and to help find ways to make more profitable and productive use of service time. Get full information on availability of this training for your shop. Just call your Motorola Distributor.

MOTOROLA®

Circle 17 on literature card

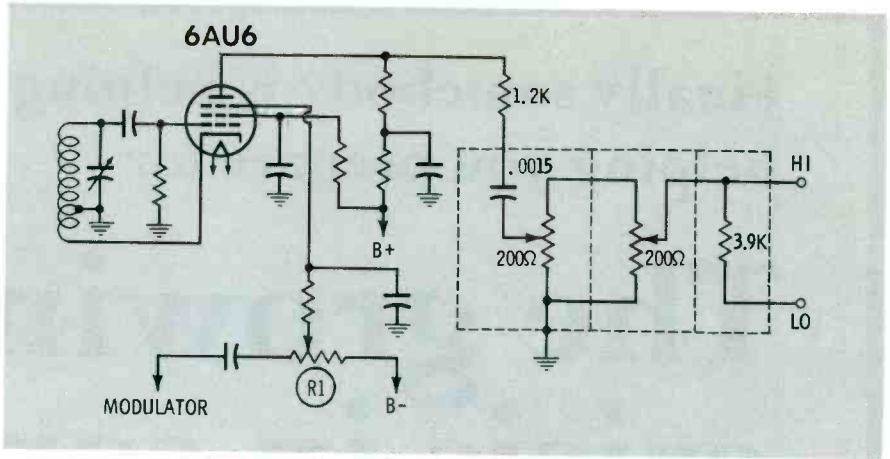


Fig. 2. Partial schematic of RF stages.

mented inside the attenuator box. However, the attenuators are calibrated only with a logging scale, not in microvolts. This is about the only thing which keeps the E-200-C from being classed as a true laboratory instrument.

An added feature is the AGC voltage supply at the front-panel. The positive side of this voltage is at case ground, and the negative side is variable from 0 to 50 volts. Thus the need for a separate bias box is eliminated.

The generator has a quick warm-up, and good long-term stability. The dial calibrations are well within the advertised tolerance of 1%. We found the E-200-C to be quite compatible as a marker generator with several sweep generators in the lab. The dials are laid out so that you don't have to crank through from one end to the other to align an AM radio. Just switch from band B to band C, staying near the high end of each. This is a nice time-saver. ▲

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- **Survey of Transistor Testers**
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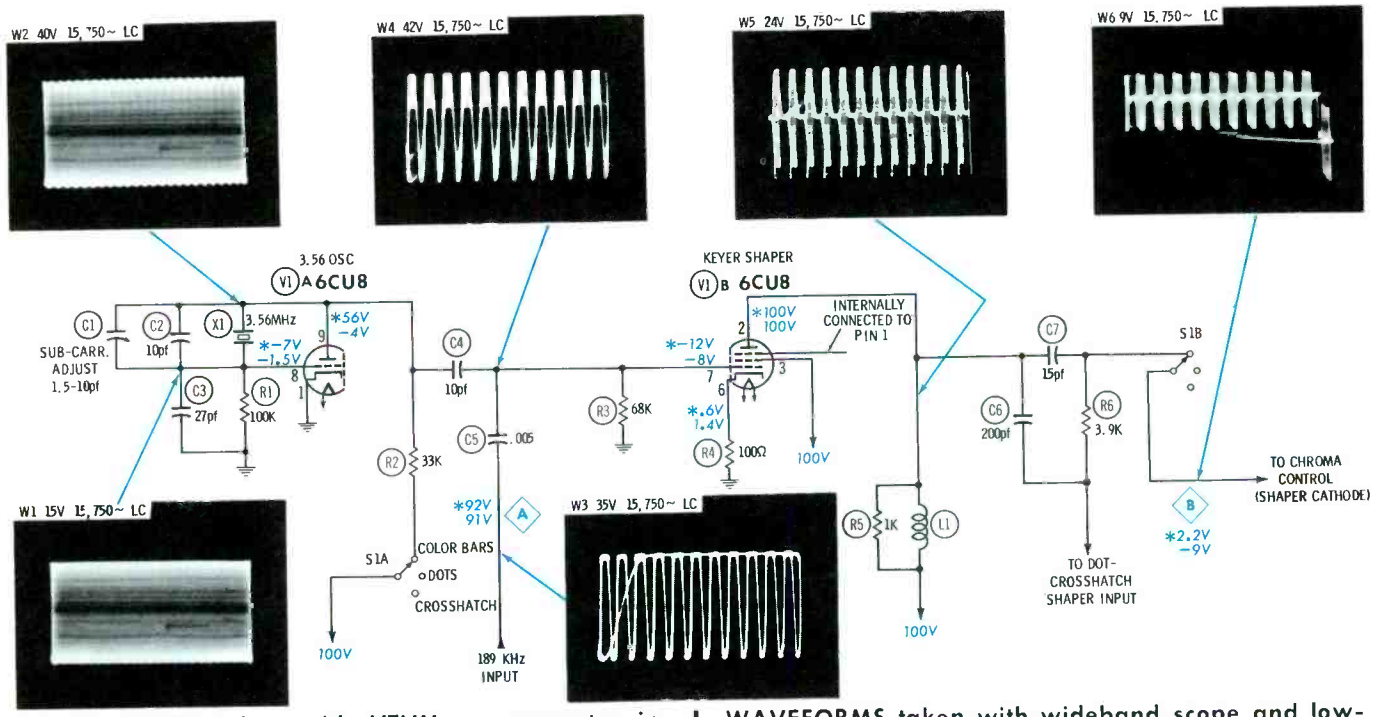
PF REPORTER Symfact®

COLOR GENERATOR

Bar/Dot/Crosshatch



DC VOLTAGES taken with VTVM — generator in "color bars" function. *Indicates voltages taken in "dot" or "crosshatch" — see "Operating Variations."

WAVEFORMS taken with wideband scope and low-capacitance (LC) probe. Generator chroma control at 100%; connected to normally operating color TV.

Normal Operation

Subcarrier oscillator-keyer circuitry shown above is from RCA color bar/dot/crosshatch generator model WR-64B. Color demodulators in TV receiver recover color information by detecting differences in phase of color signal. Generator produces signal that gives the effect of phase modulation. This is accomplished with a constant frequency signal from the generator at 3.563795 MHz (15,750 Hz below burst frequency input to receiver circuitry). Generator signal beats with 3.579545 MHz receiver subcarrier oscillator frequency in demodulators, resulting in demodulator output of 15,750-Hz sine wave. Keyed-rainbow pattern differs from simple rainbow only in that signal is switched on and off to produce 10 bars of colors at 30° intervals. V1A and associated circuitry is crystal controlled 3.563795 MHz oscillator with output thru C4 to keyer grid. Also, gate frequency, from 189-KHz crystal controlled oscillator, is shaped into squarewave and connected to keyer grid thru C5. Keyer tube turns color signal on and off 12 times per horizontal line (189 KHz divided by 15,750 Hz equals 12). Horizontal sync pulse eliminates one portion; following one is used as color sync (burst)—resulting in 10 color bars. Plate circuit time constants are such that 189-KHz signal also blacks out spaces between bars. Output of keyer is fed to mixer stage where sync information is added. For dot/crosshatch operation, plate output is changed so that a positive and negative going spike, produced from each cycle of 189 KHz, is combined with counter signals to produce dot or crosshatch.

Operating Variations

V1A Plate voltage turned on in color bar position by switch S1A—off in dot/crosshatch positions (rainbow signal not used). Negative voltage on plate and grid with S1A open is produced by 189-KHz signal fed thru C4 and rectified by diode action of inactive tube.

V1B Plate voltage remains constant in all functions. Grid and cathode bias changes slightly when function is changed from color bars to dots or crosshatch because of change in W4 content.

A, B Point A is constant DC voltage. DC voltage at B varies from 0 at minimum chroma control setting, thru 2.2 volts at 100%, to 5 volts at 200%—voltage is about −9 volts in dot or crosshatch functions.

WAVEFORMS W1 and W2 constant in amplitude (or 0 volts when 51A is open). W3 also constant in all functions. W4, similar to W3 in dot and crosshatch functions, is combination of W2 and W3 in color bar function—either way, p-p voltage is constant. P-P voltages of W5 are constant on either pulses of color signal, or positive and negative going spikes in dot or crosshatch functions. Chroma portion of W6 (only considered in color bar function) is varied from 0 to about 5 volts p-p by chroma control—at minimum, sync pulse is only waveform present.

Color Not In Sync

Dot and Crosshatch Normal

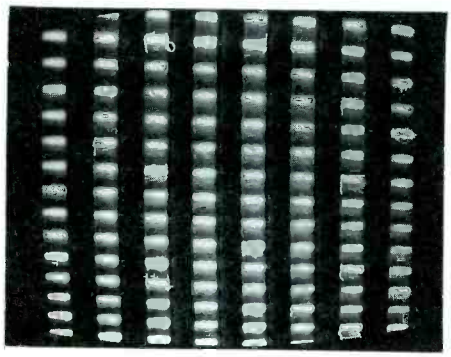
C1 Open

(Variable Capacitor—1.5-10 pf)

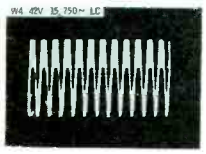
Symptom 1

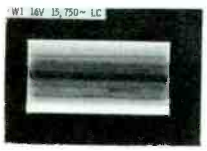
Symptom

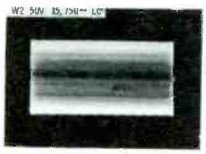
Symptom Analysis



Color bar pattern is 20 vertical bars alternately shaded light and dark grey, with little color information at lower chroma control settings. At maximum setting (200%), pattern has some color, but each bar has "barber pole" effect. Dots and crosshatch are normal.







Waveform Analysis

W4 at grid of keyer tube V1B is normal—contains color and 189-KHz signals. W1 at grid of V1A (3.56-MHz oscillator) appears normal in amplitude and indicates oscillator is running, but impossible to check exact frequency with normal shop scope. W2 is slightly high in amplitude —normally 40 volts p-p—but indicates oscillator is running. More important—capacitance of scope probe nearly synchronizes color pattern.

Voltage and Component Analysis

NO VOLTAGE CLUES

Voltages within tolerance (since 3.56-MHz oscillator is running, but slightly off frequency). Frequency of subcarrier oscillator held to extremely close tolerance of ±10 Hertz. Service shop equipment not this accurate; however, burst signal from TV station can be used. Exact method outlined in generator manufacturer's service literature. Briefly, tune color receiver to color program, disable 3.58-MHz oscillator DC control voltage (per manufacturer's procedure), adjust 3.58-MHz oscillator coil for zero beat. Connect color generator and adjust C1 for zero beat.

Best Bet: Symptom analysis; component substitution.

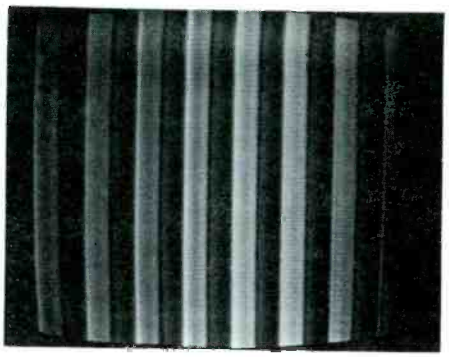
Colors Weak

Sync Not Affected

R2 Increased In Value

(Oscillator Plate Load Resistor—33K)

Symptom 2

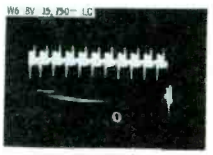


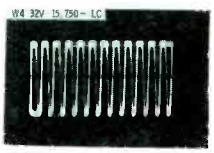
Symptom Analysis

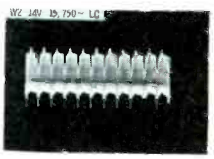
Good dots. Vertical and horizontal lines normal in crosshatch. Bar pattern has good bars, but little color—faint at 100% chroma control setting—much more evident at 200% setting, but not pure—edge of bars good, middle is different hue.

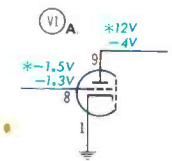
Waveform Analysis

W6 p-p voltage near normal, but content poor—spikes which insure good definition between bars are evident, but little color signal shown. W4 shows good 189-KHz gate, but little color signal. Overall p-p voltage shows loss of color signal. W2 and W1 (not shown) indicate oscillator is running, but output is very weak—W1 shows 5 volts p-p and W2 about 14 volts. Large portion of W1 and W2 is 189-KHz feedback signal.









Voltage and Component Analysis

Best clues are plate and grid voltages of V1A—plate shows only about 20% of normal 56 volts, and grid is near no signal potential of −1.5 volts instead of normal −7 volts. Crystal controlled oscillator remains on frequency even though B+ to plate drops almost to zero; hence, colors displayed on screen are proper hue, but very weak. C4, comparatively small in value to pass 3.56 MHz, blocks 189-KHz feedback to oscillator circuitry. With this particular trouble, 189-KHz signal is shaped in V1B output to produce bars on screen, but color signal not strong enough to produce color.

Best Bet: Scope; then VTVM.

Symptom 3

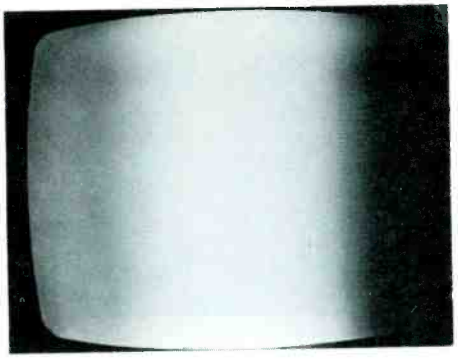
Color Pattern Not Keyed

Dots and Crosshatch Also Affected

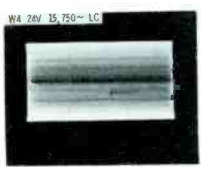
C5 Open

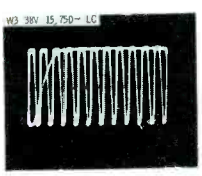
(Coupling Capacitor—.005 mfd)

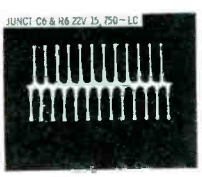
Symptom Analysis



With generator in color bar function, color TV screen shows simple rainbow pattern instead of keyed rainbow. Dot function shows practically nothing—very weak pattern with brightness reduced and contrast advanced. Crosshatch pattern contains only horizontal bars which appear normal—vertical bars missing.



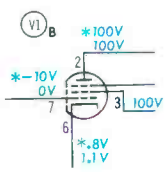




Waveform Analysis

W4 shows only 3.56-MHz oscillator output and no 189-KHz keying signal—explains simple rainbow pattern on color bar function. No W4 with generator in dot or crosshatch function since 3.56-MHz oscillator is disabled. W3 quickly isolates trouble—waveform is near normal square-wave signal (38 volts p-p, normally 35 volts p-p). Third waveform shows normal signal at junction of C6 and R6 with generator in dot or crosshatch position (result of V1B shaping 189-KHz signal). No signal now.

Voltage and Component Analysis



Pin 7 of V1B good indicator of trouble—complete loss of bias in dot/crosshatch positions. Symptom shows generator as simple rainbow type without keying or gating signal. W4 observed at 15,750-Hz scope rate shows 12 cycles of 189-KHz keying signal with 3.56-MHz information riding on it. V1B conducts only on positive going portion—result is 12 portions of color information 30° apart per horizontal line. In dot/crosshatch function 189-KHz is only input to V1B—output is combined with counter circuitry signal to produce dot and crosshatch.

Best Bet: Scope and symptom analysis.

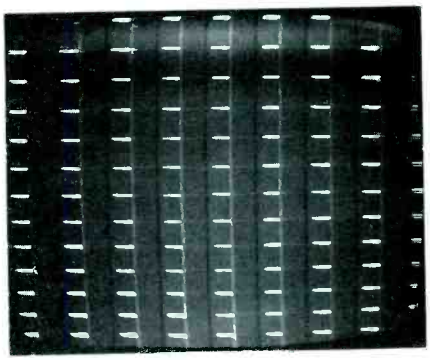
Symptom 4

Dot/Crosshatch Patterns Incorrect

Color Pattern Normal

L1 Open

(Keyer-Shaper Plate Coil)

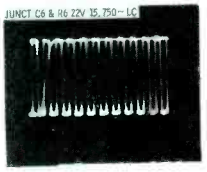


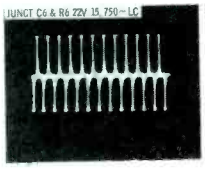
Symptom Analysis

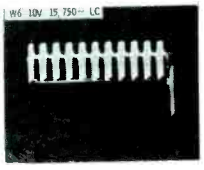
Color bar pattern appears normal both in number of lines and hues. Dots very weak and appear to be smearing to left. Equally spaced shading bars also evident. Crosshatch pattern looks more like shading pattern—horizontal lines seem normal, but vertical information is alternate light and dark bars of equal width.

Waveform Analysis

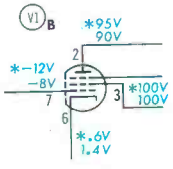
First waveform taken at junction of C6 and R6, input to dot/crosshatch shaper stage. Second waveform is normal one at same point. Comparison of two shows p-p readings same, but content quite different—with trouble symptom W3 is merely coupled thru V1B to output. W6, in color bar function, appears near normal, but closer observation shows 189-KHz portion (which makes distinct edges on color bars) is incorrect. W5 (not shown) is similar to waveform at junction of C6 and R6.







Voltage and Component Analysis



All voltage measurements within tolerances. However, plate voltage, compared to screen grid, shows abnormal drop across R5, L1 (good clue). Square-wave input to V1B grid normally shaped by plate components into positive and negative going spikes (one each per square-wave cycle), which are used to produce short CRT conduction time—necessary to produce small dots and narrow vertical lines. In color bar function, leading edge of each color bar is positive spike (white vertical line)—trailing edge is negative spike (black vertical line).

Best Bet: Scope and circuit analysis.

Symptom 5

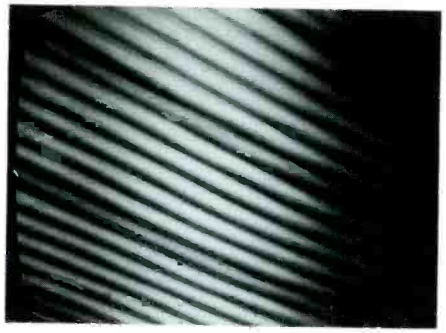
Color Bars Not In Sync

Dot/Crosshatch Patterns Incorrect

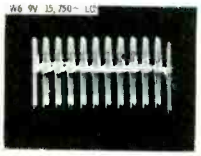
C7 Leaky

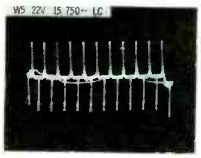
(Coupling Capacitor—15 pf)

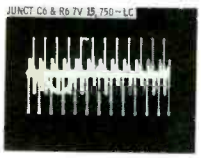
Symptom Analysis



Color bar pattern appears nearly normal at lower chroma control settings, but as control is advanced toward 100%, keying bars lose horizontal sync—color then appears similar to symptom 3 (simple rainbow). No video at higher control settings. Dot pattern almost non-existent—crosshatch incorrect.



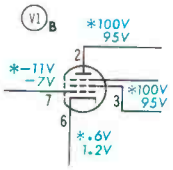




Waveform Analysis

Point A is wiper arm of chroma control—cathode load for sync mixer stage. W6 color signal content is normal, but sync pulse, which offsets every twelfth burst, is missing. W5 in dot/crosshatch (shown) and in color bar function (not shown) is near normal. Waveform at junction of C6 and R6 in dot/crosshatch function is wrong—7 volts p-p, normally about 22 volts—content should be only positive and negative going pulses similar to W5.

Voltage and Component Analysis



Excessive DC voltage at point B during color bar function and 30 volts DC reading at junction of C7 and R6 in dot/crosshatch operation indicate leaky C6 or C7. R5, R6, C6, C7, L1, and chroma control shape 189-KHz portion of V1B plate signal in color bar function to form alternate shading bars for color pattern. With S1B open in dot/crosshatch operation, waveform at junction of C6 and R6 is normally alternate positive and negative going spikes of same amplitude as W5. Leaky C7 upsets bias of tube in next stage during color bar function, and shapes waveform incorrectly in dot and crosshatch functions.

Best Bet: Scope and VTVM will solve.

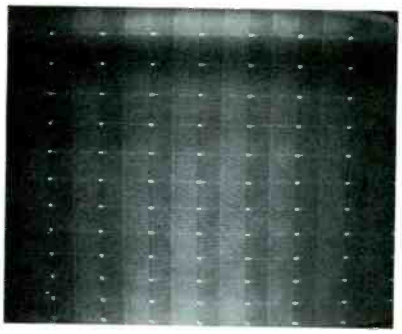
Symptom 6

Dots Dim

Vertical Crosshatch Bars Affected

R4 Increased In Value

(Cathode Resistor—100 ohms)

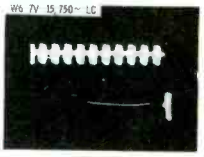


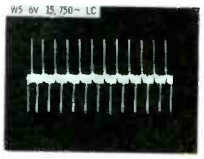
Symptom Analysis

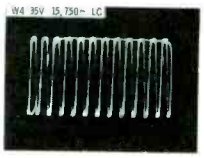
Dot pattern in sync, correct number of lines—normal, except dots are weak. Crosshatch horizontal lines are good, but vertical lines are weak with black lines evident between vertical white lines. Color bars look good, except edges are fuzzy—no distinct separation of color bars and blank bars.

Waveform Analysis

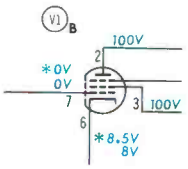
W6, in color bar function, shows low amplitude and poor content —3.56-MHz signal weak and 189-KHz portion poor. W5 weak, and while not shown, waveform at junction of C6 and R6 shows similar trouble (5 volts p-p, normally 22 volts). Content of both explains shading bars in both dot and crosshatch pattern, along with weak dots and vertical lines. Normal W4 (shown with dot pattern displayed) isolates trouble to V1B or associated circuitry.







Voltage and Component Analysis



Excess cathode voltage and no grid bias indicate high cathode resistance. Keyer tube divides 3.56-MHz color signal into bursts of approximately 9 cycles (12 per horizontal line). Signal connected to cathode of mixer stage where sync is added. Sync pulse occurs during one burst, the next is used as color sync burst—result is 10 color bars 30° apart with blanking bars between each. 189-KHz signal is also shaped to provide distinct separation of color bars and blanking bars. In dot/crosshatch operation, V1B acts only as 189-KHz shaper, providing signal used in conjunction with counter output signal.

Best Bet: Scope; then VTVM.

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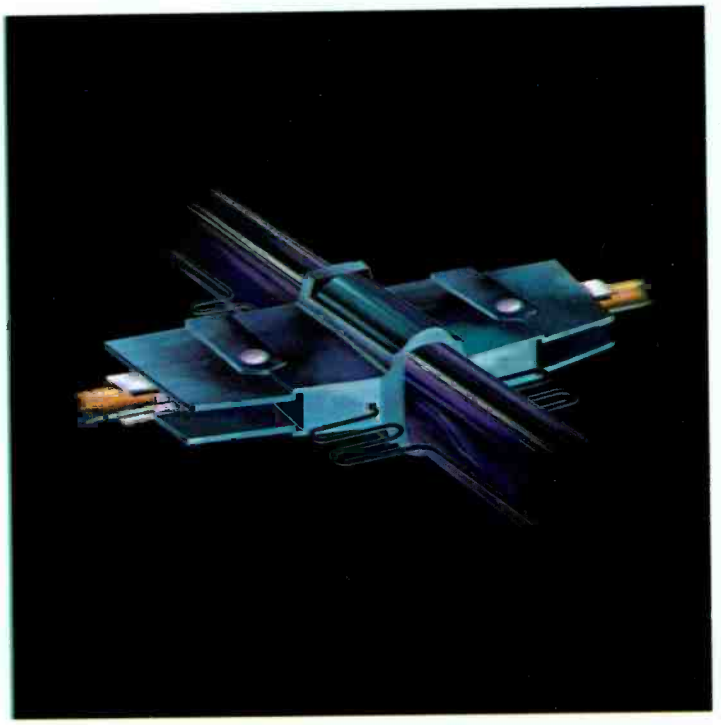

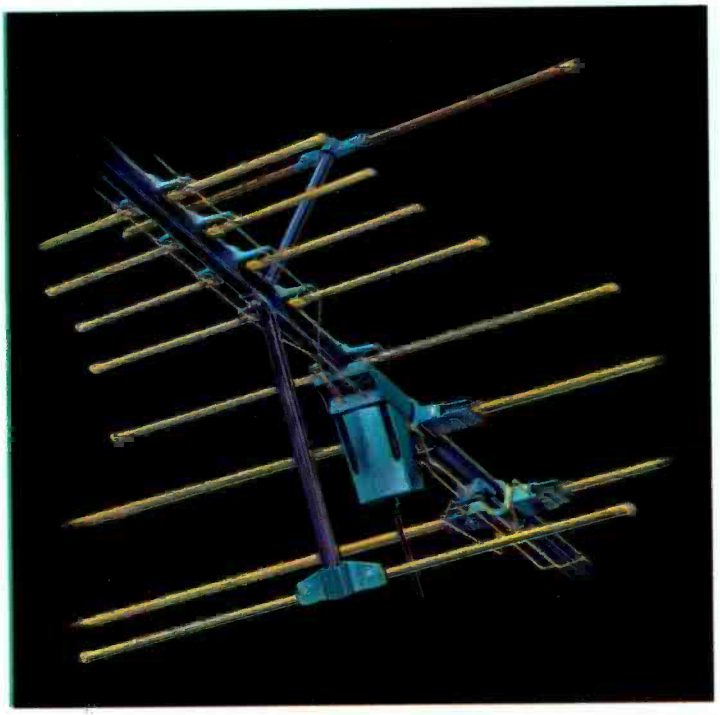

Circle 20 on literature card

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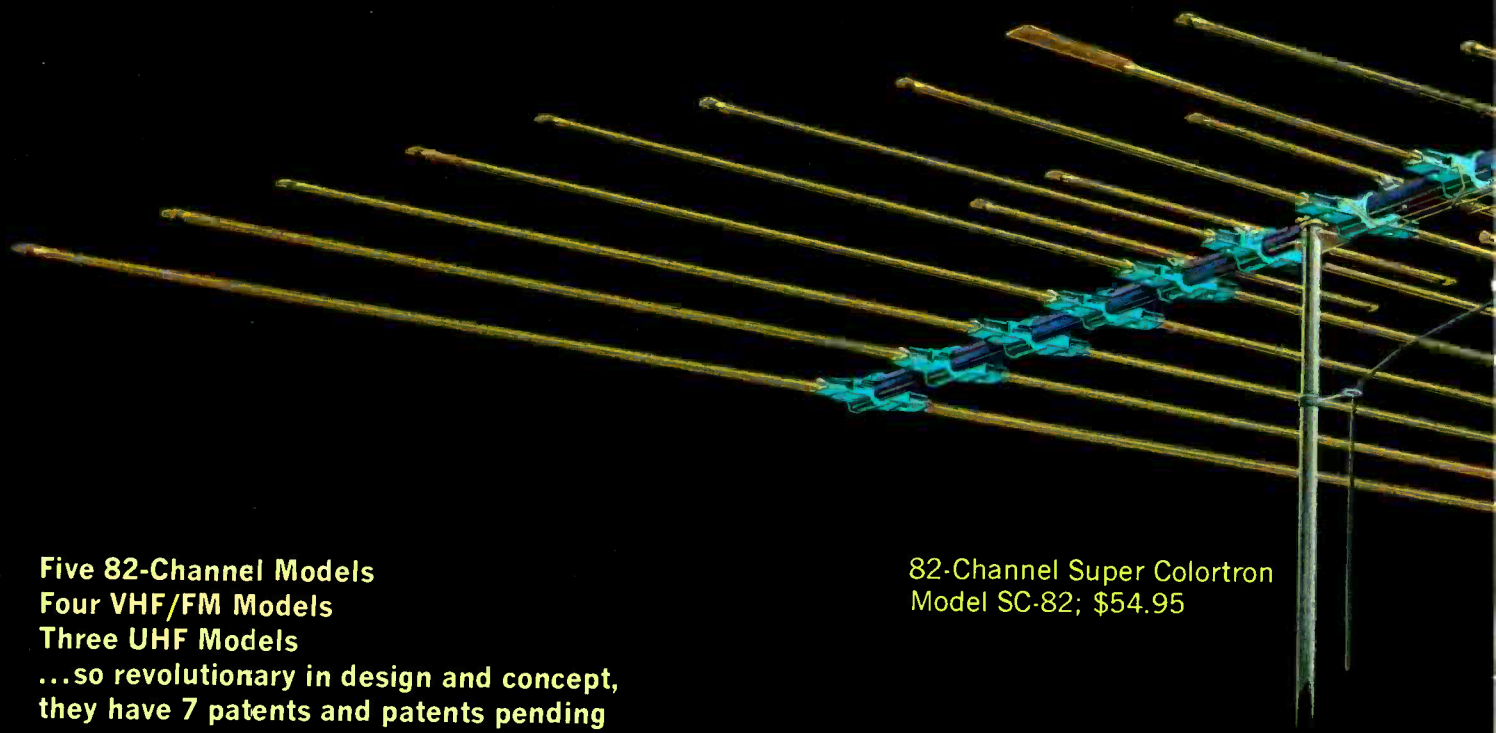

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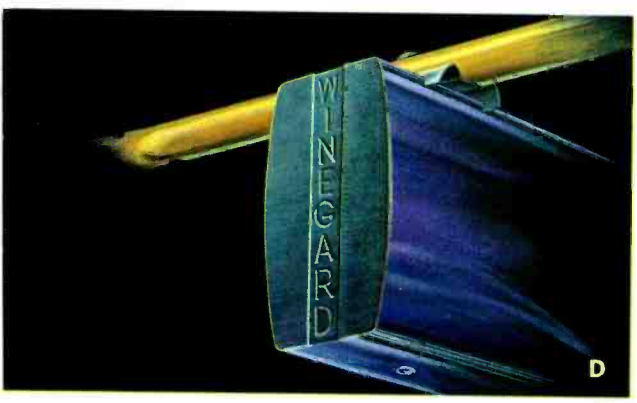

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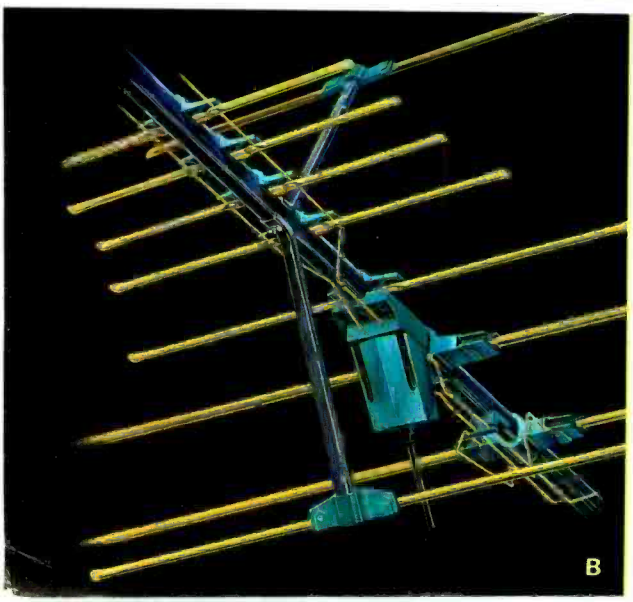
B

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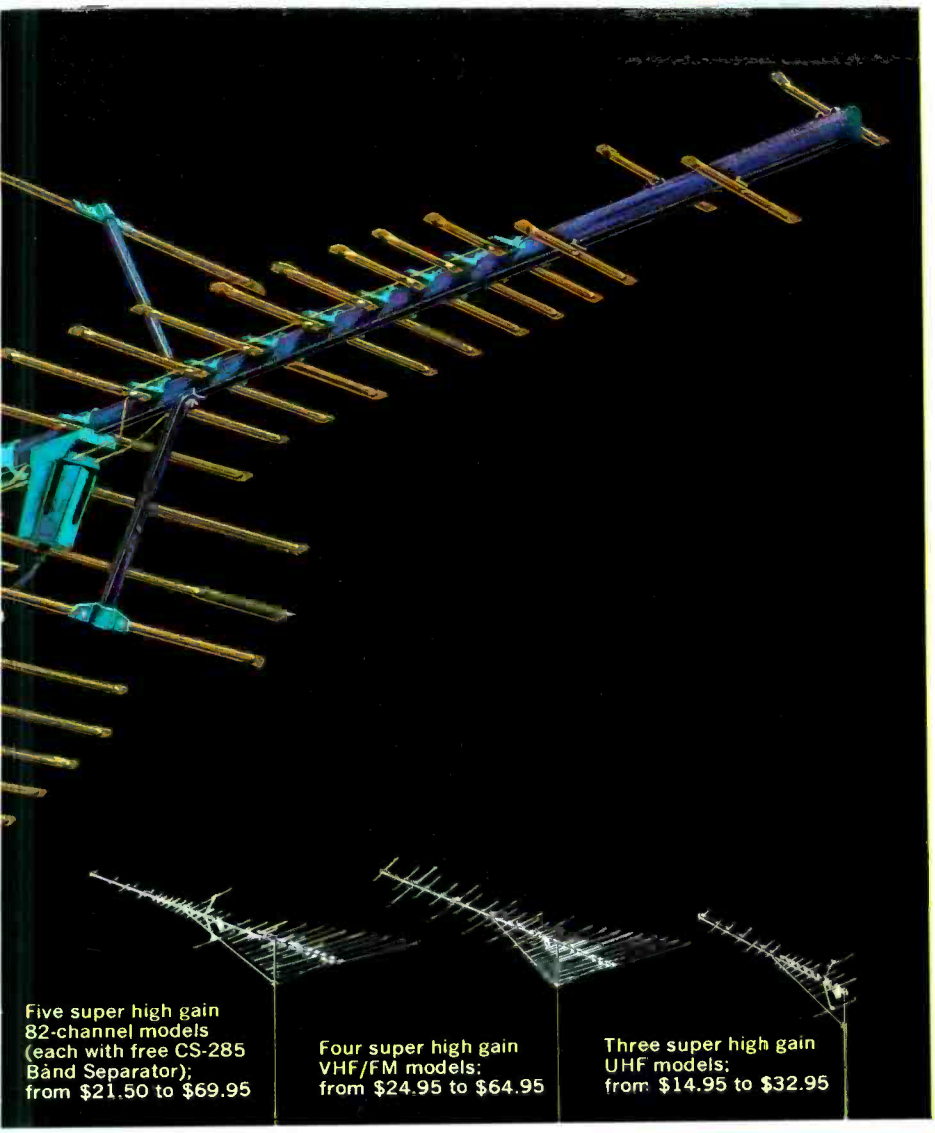
(A) Total Design Cartridge Pre-Amps: Exclusive solid state, instant-loading cartridge pre-amps drop into totally enclosed, weatherproof cartridge housing at point of signal interception. Models for 82-channel (VHF-UHF) antennas, VHF only, UHF only—plus a color spectrum filter. Custom-match the Super Colortron to any reception requirements.

Total Design Impedance Correlators: Exclusive impedance correlators (2 patents pending) automatically increase 75 ohm driven elements to 300 ohms to provide 100% signal transfer from antenna to set. Enables antenna to be 20% more compact!

(B) Total Design Vertical Resonant Reflectors: Exclusive UHF vertical resonant reflectors achieve highest realizable gain on channels 14-83 because of exceptionally large vertical capture area. More UHF gain than any other 82-channel antenna design.

Total Design Electro-Lens Director System: Exclusive patented Electro-Lens system (U.S. Patent 2,700,105; Canada 511,984) absorbs entire signal and focuses it directly onto the driven elements to give Super Colortrons pinpoint directivity.



Five super high gain 82-channel models (each with free CS-285 Band Separator); from $21.50 to $69.95

Four super high gain VHF/FM models: from $24.95 to $64.95

Three super high gain UHF models: from $14.95 to $32.95

Total Design FM Control Element: Exclusive FM element provides high gain on FM bands—and enables you to attenuate FM bands in areas where strong FM signals interfere with TV reception.

(C) Total Design Cartridge Housing: Exclusive housing is an integral part of Super Colortron—built-in and permanent. Completely weatherproofed to protect solid state cartridge pre-amps and connections.

(D) Total Design Ellipsoidal Boom: Exclusive boom is the first aluminum tubing shape engineered especially for antenna use. Proved far stronger than any other existing boom design.

(E) Total Design Wrap-Around Insulators: Exclusive low loss dielectric insulators completely encapsulate and weatherproof elements and correlators at point of electrical contact. Hi-impact polystyrene. Provide perfect alignment of elements and eliminate sagging and loosening.

Total Design High Tensile Aluminum Elements: Exclusive aluminum alloy has PSI rating of 38,000 as compared to 27,000 PSI for alloys used in other antennas. More than 49% stronger—and 29% more resistant to bend and wind distortion.

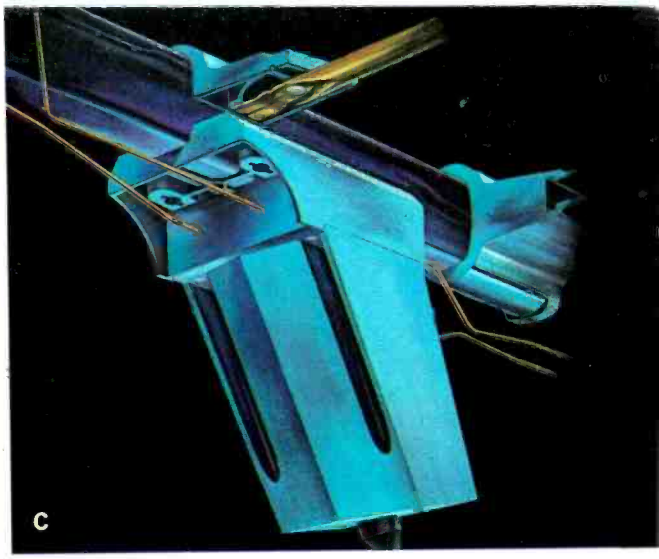
Total Design Wrap-Around Mast Clamp: Exclusive mast clamp has 4 pair of locking jaws (not just 2) to automatically align antenna on mast and for greater strength and durability. Requires only one U bolt.

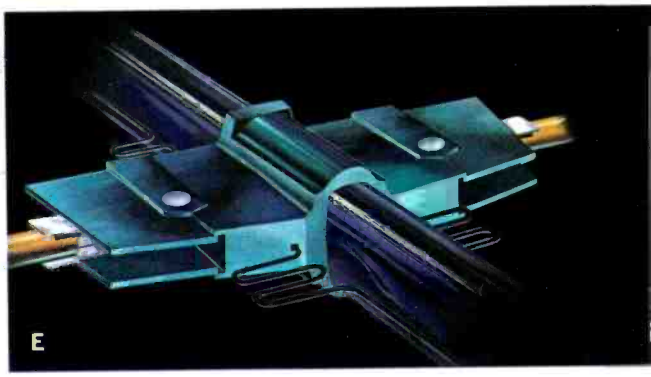
Total Design Gold Anodizing: Exclusive Gold Anodizing is the only permanent gold finish used on any antenna—the only positive protection against corrosion and fading.

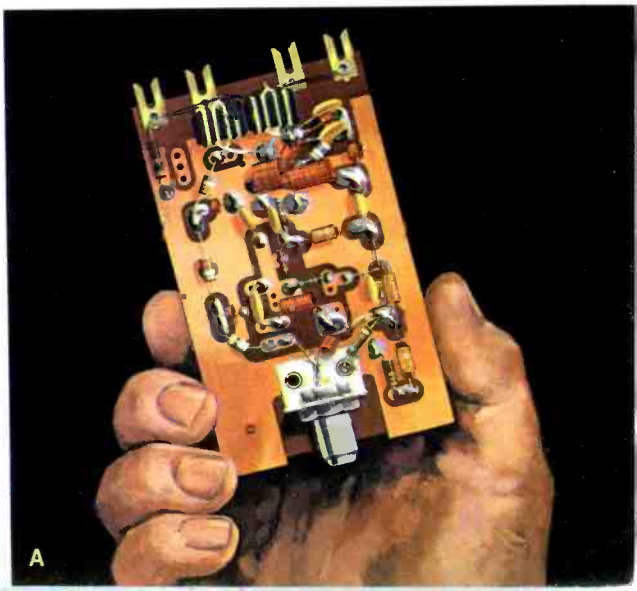
Total Design Assembly: Exclusive construction makes the Super Colortron truly easy-to-install—unfolds in seconds—completely factory pre-assembled.

Winegard
ANTENNA SYSTEMS

WINEGARD COMPANY, 3000 KIRKWOOD STREET, BURLINGTON, IOWA 52601







PFR PUZZLER

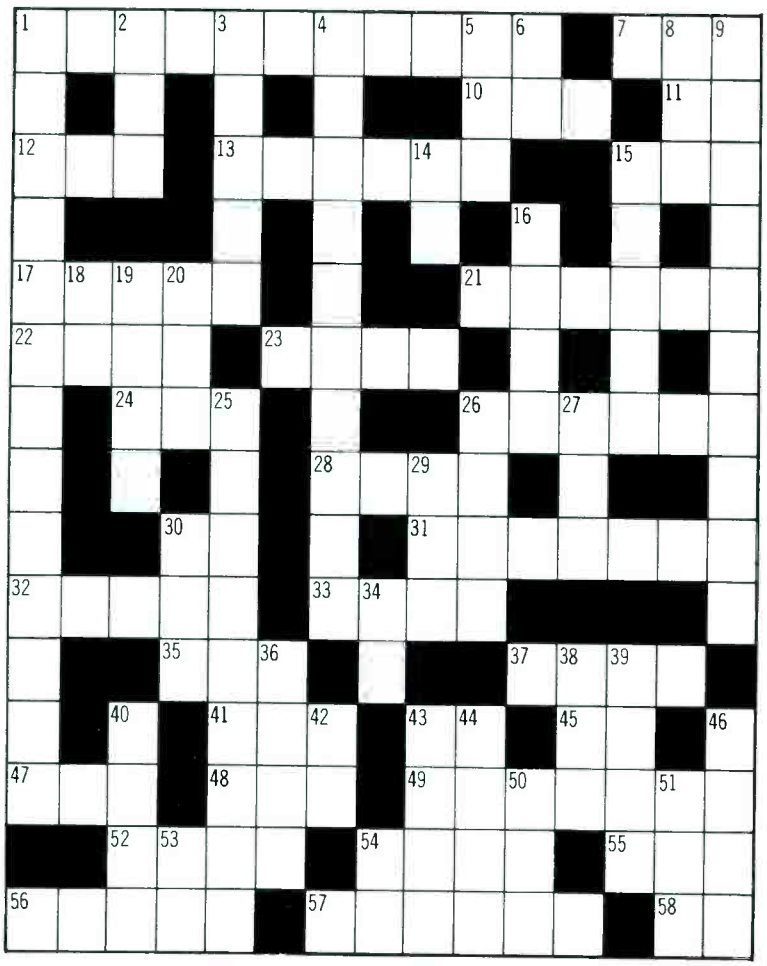
Electronic Crossword

This conventional crossword puzzle contains electronic and non-electronic words taken from the following sources: *Allied Dictionary of Electronic Terms*, *200 Business Terms and What They Mean*, and *Webster's New Collegiate Dictionary*.

DEFINITIONS. DOWN

1 Pertaining to electricity at rest.
2 The absolute cgs unit of energy and work.
3 A triangular group of three primary color phosphor dots.
4 A test instrument for generating an audio-frequency signal, at any desired frequency for test purposes.
5 Billiard stick.
6 City division. (abbr)
8 Make a mistake.
9 The science or knowledge of industrial arts.
14 Greek letter used as a symbol for amplification factor, for micron (a unit of length), and for the prefix micro.
15 Adjust or tune one or more circuits so that they operate to predetermined specifications.
16 Prefix meaning half.
18 Egyptian sun god.
19 _____area, the effective scattering cross-section area of a radar target.
20 Born.
25 Electromagnetic wave whose frequency is higher than 300 MHz.
26 To secure with a closure against access or leakage.
27 Liquid measurement. (abbr)
29 The seventh letter of the Greek alphabet.
30 Private retreat.
34 Publication director. (abbr)
36 Deteriorated from use.
38 Employ.
39 Dispatched.

• *Please turn to page 49*



TRIPLETT

EXTRA QUALITY IS HIDDEN*

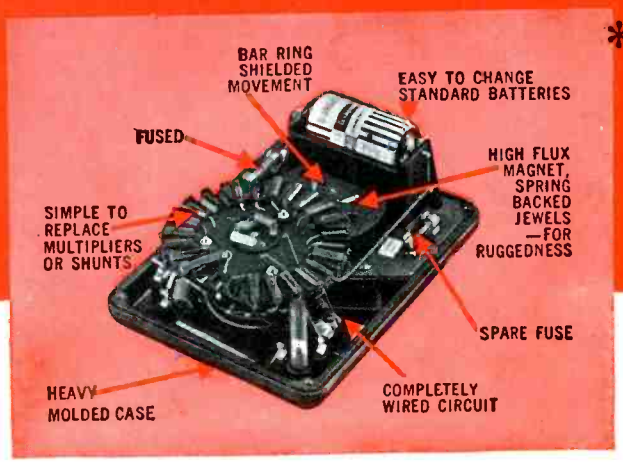
MODEL 630 V-O-M

PRICE† $58.00

Standard Of The Industry

USES UNLIMITED:

- Field Engineers
- Application Engineers
- Electrical, Radio, TV, and Appliance Servicemen
- Electrical Contractors
- Factory Maintenance Men
- Industrial Electronic Maintenance Technicians
- Home Owners, Hobbyists



FACTS MAKE FEATURES:

1. Popular streamlined tester with long meter scales arranged for easy reading. Fuse protected.
2. Single control knob selects any of 32 ranges—less chance of incorrect settings and burnouts.
3. Four resistance ranges—from .1 ohm reads direct; 4½ ohm center scale; high 100 megohms.

Attention to detail makes the Triplett Model 630 V-O-M a lifetime investment. It has an outstanding ohm scale; four ranges—low readings .1 ohm, high 100 megs. Fuse affords extra protection to the resistors in the ohmmeter circuit, especially the XI setting, should too high a voltage be applied. Accuracy 2% DC to 1200V. Heavy molded case.

RANGES	
DC VOLTS	0-3-12-60-300-1,200-6,000 at 20,000 ohms per volt.
AC VOLTS	0-3-12-60-300-1,200-6000 at 5,000 ohms per volt.
OHMS	0-1,000-10,000.
MEGOHMS	0-1-100.
DC MICRO-AMPERES	0-60 at 250 millivolts.
DC MILLI-AMPERES	0-1.2-12-120 at 250 millivolts.
DC AMPERES	0-12.
DB: −20 to +77 (600 ohm line at 1 MW).	
OUTPUT VOLTS: 0-3-12-60-300-1,200; jack with condenser in series with AC ranges.	

†630A same as 630 plus 1½% accuracy and mirror scale only $68.00

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THE WORLD'S MOST COMPLETE LINE OF V-O-M'S. AVAILABLE FROM YOUR TRIPLETT DISTRIBUTOR'S STOCK.

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PARALOG Plus™

Improves Color Reception Three Ways

1. Plus GAIN—to provide sharper directivity to eliminate multipath reception.

2. Plus FLATNESS—to eliminate tilts which cause incorrect colors on the TV screen. Industry experts say that color antennas must be flat within ±2 db. Paralog-Plus antennas are flat within ±1 db per channel.

3. Plus MATCH—to prevent color-distorting phase shifts.

The unique feature of the Paralog-Plus is a BI MODAL DIRECTOR system. Its parasitic elements combine two hi-band directors into a single director covering all lo-band channels, plus the entire FM band. Thus, more of the elements work to bring in any given channel.

Plus—300 and 75 ohm outputs for match to *either* twinlead or coax. And full, flat gain over the entire FM band.

Plus these quality mechanical features: Self-cleaning wedge-snap locks that tighten with vibration, Cycolac insulators to eliminate cumbersome cross feed points, Golden Armor coating, Square boom construction, One-piece antenna array—and more.

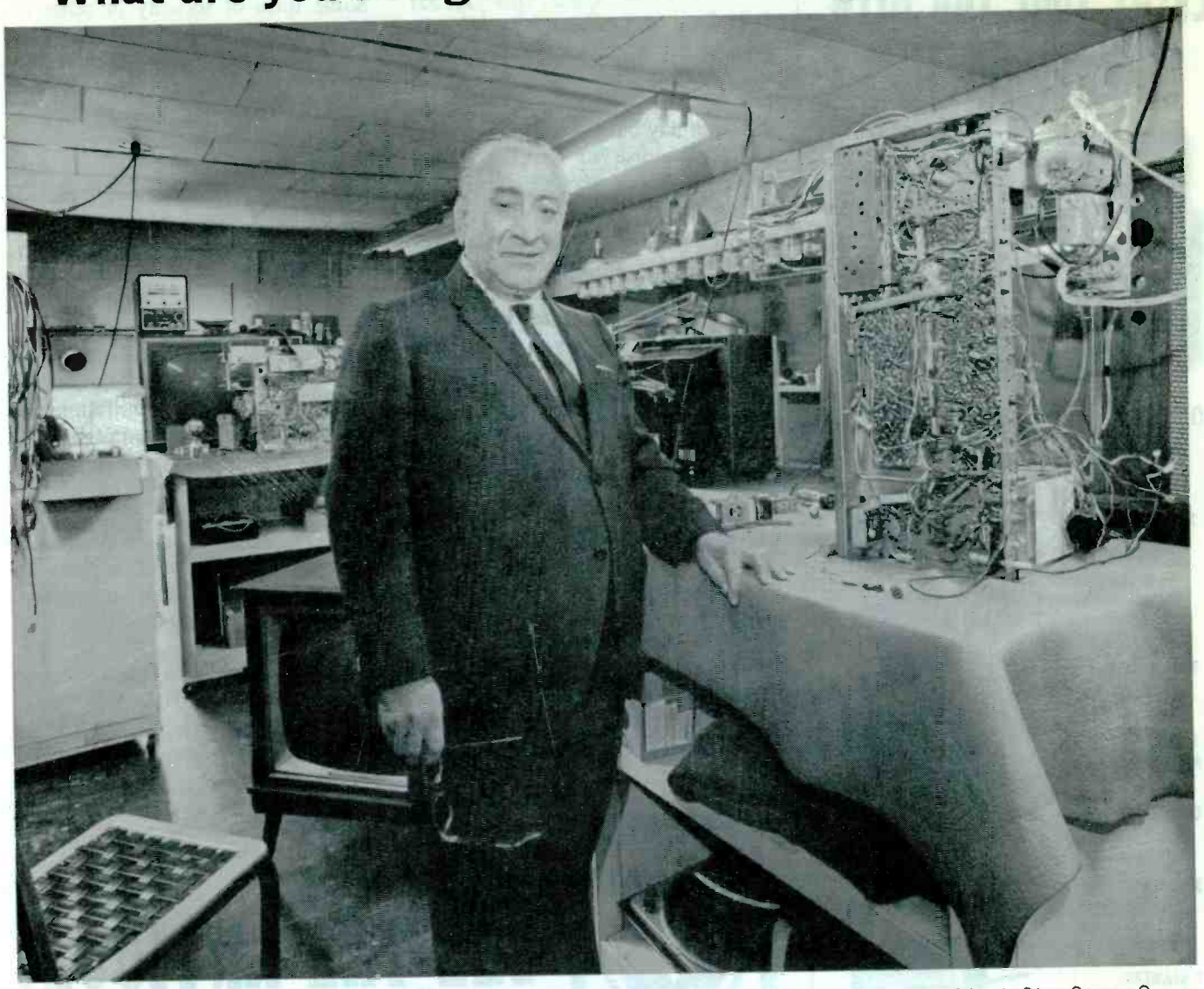
Check on how these plus features can help make plus profits for you. See your Jerrold distributor, or write:

DISTRIBUTOR SALES DIVISION
401 Walnut St., Phila., Pa. 19105

JERROLD

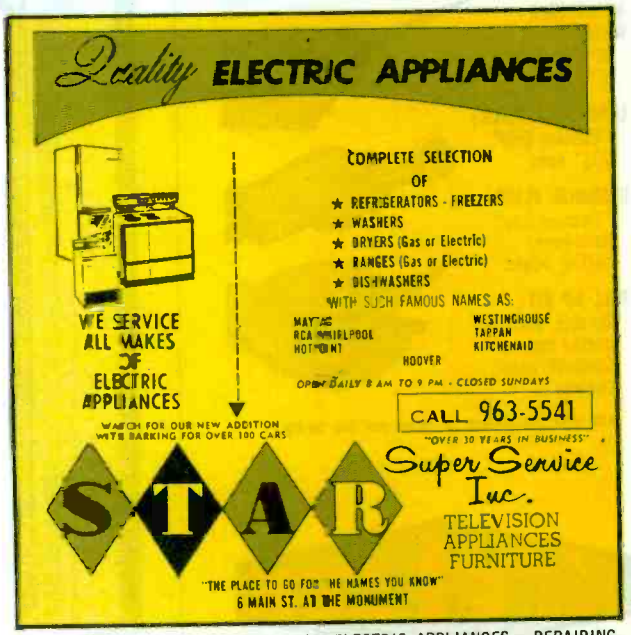
Circle 24 on literature card

What are you doing in the Yellow Pages, Mr. Star?



"We get lots of business through the Yellow Pages," says Mitchell Star, president, Star Super Service Inc., Battle Creek, Michigan. "We've got four ads in the Yellow Pages. We know they're working because we ask people how they happened to come in, and then mark it down on our tickets. Many customers look in the Yellow Pages even when they've seen our other advertising — even when they know us. This year we gave a separate ad to one line we carry, and gained thirty to thirty-five per cent more business on this alone."

Advertise for action... Yellow Pages



Display ad (shown reduced) runs under ELECTRIC APPLIANCES — REPAIRING. Call your Yellow Pages man to plan your program. Find him in the Yellow Pages under: ADVERTISING — DIRECTORY & GUIDE.

Legal Services

(Continued from page 32)

Sales Law of the State in which you and the seller are located.

Basically, these laws require that the creditors of the *seller* be protected in any outright sale of a stock of merchandise to another. Your title to the goods may be jeopardized if you fail to examine and comply with these laws. Your lawyer can also check for any security interests that may be outstanding against the goods, and insure that you have proper title before you close the transaction.

Inventory and Other Financing

No retail business can operate without an inventory. Rarely is this purchased for cash by the owner, and some form of financing is essential. If you borrow against inventory, for example, your lawyer should be consulted to make sure that the contracts and security documents are in order and help make clear what commitments you are making.

The basic idea behind inventory financing is that the seller does not turn the goods loose completely. Some form of security or other interest in the property is held by the seller until the merchandise is sold or paid for. Your lawyer can make sure that the security restrictions incurred by you are fully understood so that the method of financing does not unduly hamper the conduct of the business.

Aside from financing inventory, funds may be obtained by short- or long-term bank loans either secured or unsecured. In any such borrowing, your lawyer's help and advice can be especially helpful because such borrowing puts limitations on your firm. For example, in the term-loan agreement, the bank or lending institution may impose certain restrictions as to the operations of your business. You may obtain funds by assigning your acounts receivable to a lending institution. Here also a lawyer should be consulted.

Legal advice is a must, if and when, you seek funds through equity financing. Here you raise funds by selling a part of your business to

Puzzle Definitions Down

40 A small aura of light surrounding the spot on a fluorescent screen.
42 Weight. (abbr)
43 Discharges, as a debt.
44 Against.
46 A type of 49 across.
50 Roman numeral X.
51 A short sleep.
53 Ego.
54 A large continent. (abbr)

DEFINITIONS: ACROSS

1 A field dealing with the use, characteristics and properties of electrons, especially in vacuum or gas filled tubes. Example: Radio, TV, Radar, Control circuits, etc.
7 Remaining part after all deductions.
10 American Indian.
11 With regard to.
12 "Nest—," what we all try to lay aside.
13 Capital gain.
15 Luminous discharge between electrodes.
17 A current style or preference.
21 The intended arrangement of materials to produce a certain result or effect.
22 Run in competition.
23 The movable iron core or an inductor.
24 A folded, stitched border.

(Continued from page 44)

26 _____strength, a measure of the power output of a radio transmitter at a particular location.
28 A woody plant.
30 Type of current. (abbr)
31 On a television screen, a prolongation of the luminous spots. Also called hangover.
32 Change.
33 _____estate, land and the rights associated with the land.
35 At this time.
37 A protective circuit component.
41 Term used to denote distortion in a sound reproducing system, caused by periodic variation in the speed of the tape, turntable, wire or film.
43 System for carrying sound over large areas. (abbr)
45 Compass point.
47 Government agency. (abbr)
48 Skill.
49 Aerial.
52 Broadcast directly at the time of production instead of from recorded or taped material.
54 Location.
55 Label.
56 A component having two electrodes, one being a cathode and the other the plate or anode.
57 A variation on the signal intensity.
58 Roughly, 3.1416.

SOLUTION NEXT MONTH

another person—bringing him in as a part owner. If you do this by offering stock to the general public, your lawyer will have to make sure that your firm meets the requirements set by the Securities and Exchange Commission and by any State regulatory body.

Taxes

There are innumerable instances in which the advice of an attorney with tax experience is essential in complying with tax laws. Among the factors in tax planning about which you may want to seek legal advice are: (1) the fiscal year you use; (2) the legal aspects of adopting a profit-sharing or pension plan; (3) the means and methods of capitalizing your business to minimize taxation; (4) the availability of stock-option plans to the owners, if you operate as a corporation; (5) the legal implications of insurance programs which your firm can adopt; and (6) the election as to the form of taxation available to you.

Advice and assistance on such matters can be helpful not only when the business is showing profits, but also when it has losses. For example, the effects of a loss when a newly established firm is trying to reach its break-even point sometimes may be softened measurably by using the loss in relation to other income.

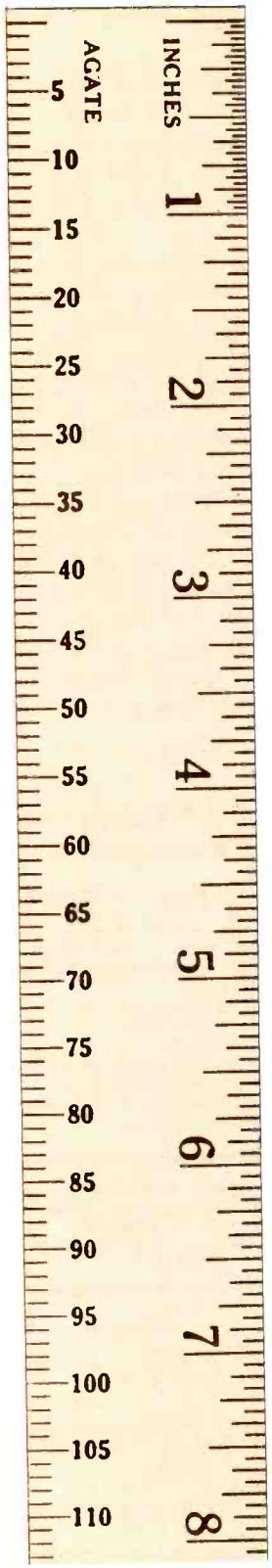
Legal advice also should be sought by the owner-manager in making plans for the continuation of his business in event of his death. Such long-range plans for transferring ownership of the firm to the next generation should made early in the firm's existence, as such planning may be difficult if not impossible at a later date.

Laws Affecting Employees

Advice and assistance on laws covering employees is another helpful legal service. For example, a lawyer can point out and help the owner-manager to observe the requirements which Federal and State laws set on wages, employees' hours, workmen's compensation, and unemployment compensation.

Legal assistance can be useful also when, and if, you employ workers represented by a labor

NOW...a full-sized VOM in a palm sized "package"



160 Volt-Ohm-Milliammeter
Complete with alligator clip leads and operator's manual.
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Carrying Case—
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Simpson 160 Handi-VOM®

Simpson Handi-VOM gives you the ranges, the time-saving conveniences and the sensitivity of a full-sized volt-ohm-milliammeter—yet it's only 3-5/16" wide, weighs a mere 12 ounces. Recessed range-selector switch never gets in the way . . . polarity-reversing switch saves fuss and fumble. Self-shielded taut band movement assures high repeatability and freedom from external magnetic fields. Diode overload protection prevents burn-out—permits safe operation by inexperienced employees and students. The demand is BIG, so get your order in to your electronic distributor, TODAY!

RANGES

ACCURACY: ±3% FS DC, ±4% FS AC

DC VOLTS: 0-0.25, 1.0, 2.5, 10, 50, 250, 500, 1000 @ 20,000 Ω/v

AC VOLTS: 0-2.5, 10, 50, 250, 500, 1000 @ 5000 Ω/v

DC MICROAMPERES: 0-50

DC MILLIAMPERES: 0-1, 10, 100, 500

DB: −20 to +10, −8 to +22, +6 to +36, +20 to +50

"0" REFERENCE: 1 MW into 600Ω

RESISTANCE: Rx1, Rx10, Rx100, Rx1K, Rx10K
(30 Ω center)

AGM DIVISION

Simpson
INSTRUMENTS THAT STAY ACCURATE

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Representatives in Principal Cities ... See Telephone Yellow Pages

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Circle 29 on literature card

union. It is essential in collective bargaining, and contract negotiations.

You will also want your lawyer to check to insure that your employment practices comply with any applicable fair employment legislation.

Antitrust Problems

Perhaps you think of big companies when you hear the word "antitrust." Most small business owners do. Nevertheless, small as well as large businesses are subject to these laws and regulations. Legal services can help you be aware of the impact of the Federal antitrust laws on your operation.

For example, you should check with your lawyer before you enter into any form of franchise or exclusive dealer arrangement with a manufacturer, wholesaler, or other supplier. In pricing your merchandise, you should have a working knowledge of the influence and impact of any fair trade law in your State. You should also be advised as to the meaning and reach of Federal laws relating to resale price maintaining and fixing.

Many States have some form of local unfair competition law, and your lawyer can help you to understand in general the influence which this law exerts on your day-to-day operations. No retailer should enter into any agreement regarding price or the division of territories for competitive purposes without the close advice of an attorney. Any trade association to which you belong and whose meetings you attend

Getting a hernia and not getting paid for it?

Let Arcolytic® capacitors lift the load off your mind. Or anywhere else it happens to be.

These aluminum electrolytics are built to last: wound with computer-grade 99.99% pure aluminum foil so they'll keep operating in your customers' sets even at continuous temperatures of 85°C.

You'll find they take the worry right out of premature failure, lost customer confidence and costly call-backs.

There's no premium cost, either. Arcolytics are priced along with other home entertainment capacitors.

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Arco Electronics

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should be adequately represented by counsel also.

Litigation

Of course, you'll use a lawyer to defend your firm if someone should sue it or if you should have to sue someone. The fire has to be put out.

However, it is easier when you have a regular lawyer. Because he is already familiar with your business, you will spend less time away from your work in such cases. This familiarity, which your lawyer gets from working with your firm on a regular basis, can also enable him to help you prevent situations which might lead to trouble. Such preventive law can keep your business out of the court room. Thus you avoid time-consuming and expensive attempts to rescue a situation after things have gotten out of hand.

Operating without litigation also helps your store's image. Some customers and prospective customers prefer not to deal with a business when its name is frequently in the court news.

Credit Problems

Sometimes a small retailer gets in trouble because he is unable to pay his debts. If things have not progressed too far, a lawyer may be able to work out an arrangement which will allow the store to pay its debts on an installment plan, over an extended period of time and out of current income. In other cases, the lawyer may help to reorganize the store's financial structure so its creditors can receive a reasonable amount while the business continues to operate.

On the other hand, if the creditors insist on closing, the lawyer can work to prevent them from taking unfair advantage of the retailer — prevent his sacrificing his business and insulate him from any undue personal liability for the debts of the business.

Disposing of the Business

Legal services can be helpful if for any reason you want to sell your business as a going operation. You can also use them if you want to dispose of all or substantially all of the assets of your business.

Many tax and credit implications are involved in the disposition of all or substantially all of any business or its assets. The advice and assistance of a lawyer can help you to avoid premature taxation. It can also insure that no personal liability is imposed on you in transfer of the assets.

As a rule, the sale of a business or of a substantial part of a business, requires the seller to provide certain covenants, warranties, and representations as to the title and quality of the merchandise and property he is transferring. When made properly, these representations protect both the seller and the buyer. However, if either makes them without legal advice, intentionally or unintentionally, the covenants and warranties may be oppressive. The results which evolve from this can be most unfair.

For Further Information

Readers interested in exploring

This Outdoor TV Antenna Installer Just Made a Profitable Discovery.

He Replaced a Portable TV Antenna With a New JFD Exact Replacement.

How about you?

Are **you** overlooking the exploding portable TV antenna market? Alert service-dealers throughout the U.S.A. will earn 9 million dollars in quick, easy profits this year selling **and** installing JFD Exact Replacement antennas.

You can capture this profitable portable TV antenna business as **the** JFD Exact Replacement specialist in your market. JFD has the complete line (over 155 different models) and the promotions that make you king of portable TV antenna replacements—(as it has done for thousands of service-dealers since 1952 when JFD started it all).

Makes sense, doesn't it to call your distributor today for JFD Exact Replacement Antennas—even if you're coining a mint installing outdoor antennas (like the JFD LPV)?

Write for 1966 JFD Exact Replacement Portable TV antenna catalog. See your SAMS Photofact folders for detailed information.

ONLY receiving tubes are replaced more often than portable TV antennas!

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ONLY receiving tubes are replaced more often than portable TV antennas!

Circle 34 on literature card

further the subject of legal services may wish to consult the references indicated below. This list is necessarily brief and selective. However, no slight is intended toward authors whose works are not mentioned.

Applied Business Law by McKee Fisk and Dwight A. Pomeroy. 8th Ed. 1960. $4. South-Western Publishing Company, 5105 Madison Rd., Cincinnati, Ohio 45227.

"How Small Business Firms Cope With Their Legal Problems." The University of Washington Business Review, October 1963. $3.50 per year; 75 cents per copy. Issued monthly by College of Business Administration, University of Washington, Seattle, Wash. 98105.

"Legal Aspects of Small Business Use of Cooperative Arrangements." Management Research Summary No. 225. 1964. Free from the nearest SBA office. Small Business Administration, Washington, D.C. 20416.

"Federal Taxes and the Legal Form of Small Firms." Management Research Summary No. 129. 1963. Free from the nearest SBA office. Small Business Administration, Washington, D.C. 20416.

Insurance and Risk Management for Small Business. Small business Administration. Available for 30 cents from the Superintendent of Documents, Washington, D.C. 20402. ▲

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This Remington PREMIER PORTABLE TYPEWRITER

FREE

WHEN YOU BUY THIS RCA WR-64B COLOR BAR/DOT/CROSSHATCH GENERATOR...THE ESSENTIAL COLOR TV TEST INSTRUMENT

Here's a deal you can't afford to miss! A FREE Remington portable typewriter—yours when you purchase the most essential color-TV test instrument—the RCA WR-64B!

Just imagine how handy your new typewriter will be—in the shop or at home. You'll use it almost as much as you use the RCA WR-64B—standard of the color TV servicing industry.

Here's how to get your FREE Remington Typewriter. Mail in the warranty card plus the gold label from the shipping carton of your new RCA color bar generator to RCA Test Equipment Headquarters, Bldg. 17-2, Harrison, N.J. We will ship your new Remington portable typewriter to you direct, freight prepaid. But remember—this offer covers only equipment purchased between February 1, 1967 and May 15th, 1967. To allow for postal delay, we will honor cards postmarked up to May 31st.

Plan NOW to take advantage of this BIG offer—a FREE Remington portable typewriter with your purchase of an RCA WR-64B color bar/dot/crosshatch generator.

The standard of the Color-TV Servicing Industry. Generates all necessary test patterns—color bars, crosshatch, dots plus sound-carrier. *Only* **$189.50***

*Optional Distributor resale price. All prices subject to change without notice. Price may be slightly higher in Alaska, Hawaii, and the West.

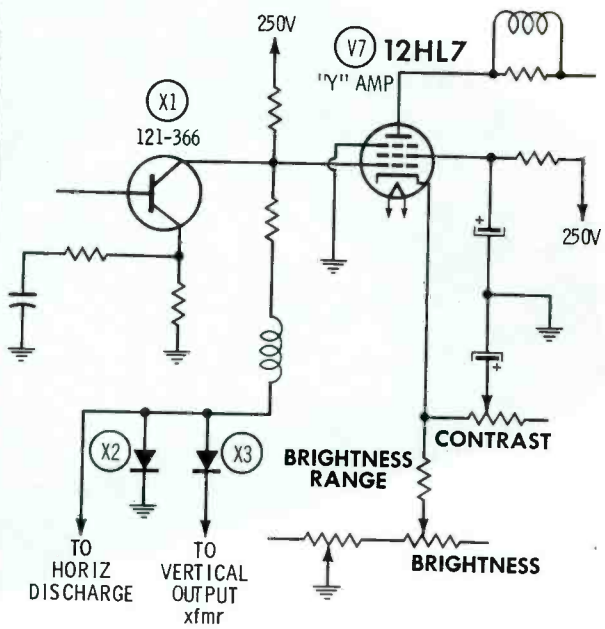
Ask to see it at Your Authorized RCA Test Equipment Distributor

RCA Electronic Components and Devices, Harrison, N. J.

RCA® **The Most Trusted Name in Electronics**

COLOR COUNTERMEASURES

Symptoms and Tips from Actual Shop Experience



Chassis: Zenith 23XC38

Symptom: Excessive vertical retrace lines.
Tip: Replace X-3 with a new diode, Zenith part #103-79. A few stubborn cases may also require replacement of X-2.

Chassis: Philco 16M91

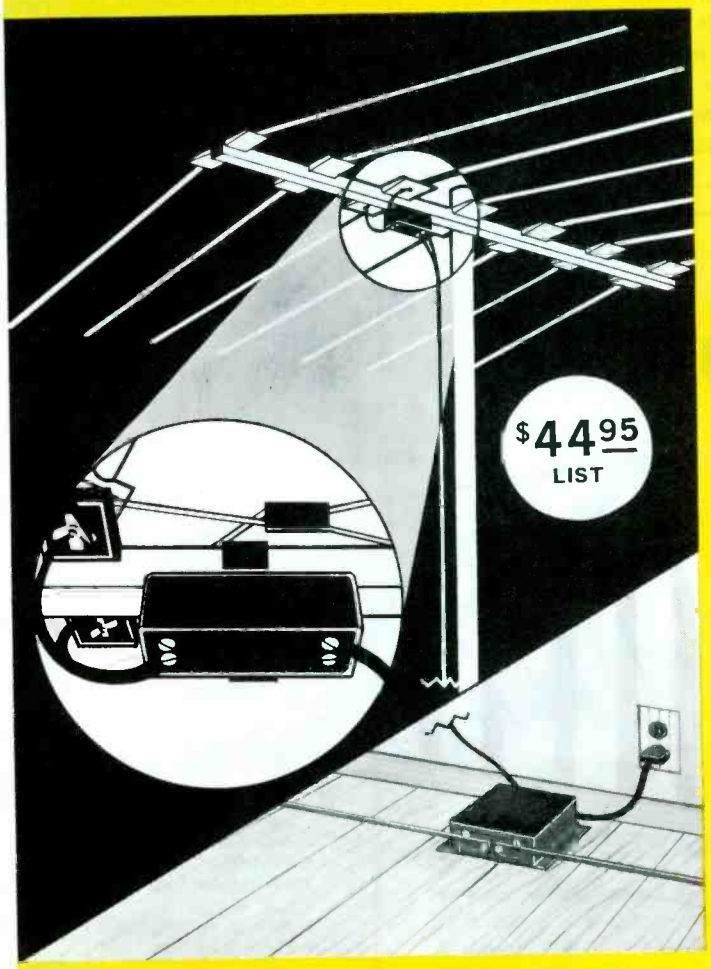
Symptom: Many dim diagonal ringing lines.
Tip: Adjust yoke lead dress.

Chassis: Philco 16QT85

Symptom: Buzz in audio.
Tip: Dress audio output transformer leads as far as possible away from vertical output transformer.

NEW POWER

FROM FINCO



Model 65-3 VHF-TV ANTENNA AMPLIFIER

improves reception of WEAK VHF-TV signals in FRINGE AREAS even where strong local TV or FM signals are present. AMPLIFIES UP TO 7 TIMES for Better Color and B/W

A two-transistor—high and low band—amplifier in one compact weather-resistant housing. Engineered to provide the lowest noise and highest amplification with the most desirable overload characteristics. Designed for easy and convenient installation on antenna boom, mast, or under roof eave.

Amplifier used in conjunction with dual outlet power supply for one, two, or multiple set installations (with Finco 3003 coupler). 117 V 60 cycle input. AC power up to amplifier: 24 volts - 60 cycle. Metal enclosed with easy keyhole mounting. Amplifier and power supply provided complete with mounting hardware. Each unit tested and inspected prior to shipment.

Let Finco solve your Color and B & W reception problems. Write for complete information, schematics and specifications. Form #20-357.

Model 65-3 VHF-TV ANTENNA AMPLIFIER

MAKER OF THE WORLD FAMOUS COLOR FINCO BLACK / WHITE TV AND FM ANTENNAS

THE FINNEY COMPANY

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Circle 38 on literature card

(Continued from page 26)

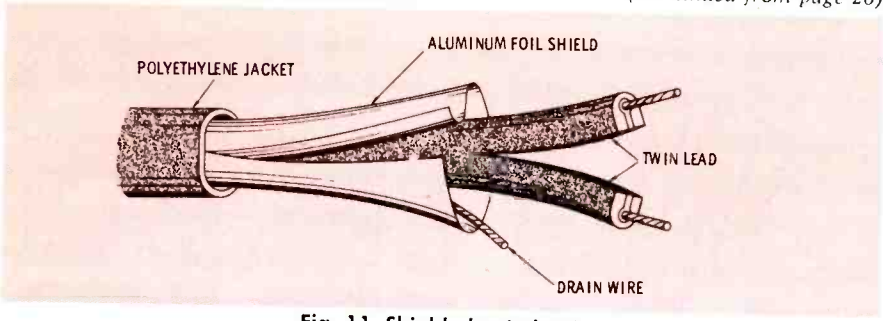

Fig. 11. Shielded twin-lead.

dition, long horizontal runs of unshielded flat type lead-in would act as antennas.

Shielded Twin-Lead

A new development in shielded twin-lead incorporates a total shield (a wrap of thin aluminum foil) and a jacket of weather-proof polyethylene as shown in Fig. 11. This lead-in eliminates the need for stand-off insulators and does not require twisting or careful routing of the lead-in to minimize reflections. The design of this shielded twin-lead allows it to be taped directly to the mast or tower, routed through metal conduit, buried underground or even installed in rain filled gutters, if need be. This feature also makes shielded twin-lead a logical choice for applications which require installing lead-in within building walls.

The primary advantage offered by a shielded twin-lead is the elimination of down-lead pick-up of man-made electrical noise, as well as the elimination of out-of-phase TV signals created by the transmission line acting as an antenna.

Although coaxial cable can also be used to minimize down-lead pick-up of unwanted electrical interference, this benefit is generally offset by attenuation losses which are intolerable in many UHF receiving systems. In addition, coaxial cable introduces new problems by requiring two additional components. These components (two matching transformers) are required in coaxial systems to convert the unbalanced 75-ohm cable to a balanced 300-ohm impedance. Laboratory tests indicate that a pair of these matching transformers typically adds 2-dB attenuation loss over the frequency band for which they are designed to operate. A 100-foot run of coaxial cable delivers 15 to 25 percent of the UHF antenna signal to the receiver when used with matching transformers designed for these frequencies. This does not compare favorably with a 100 foot run of shielded twin-lead, which delivers approximately 50 percent of the UHF antenna signal to the set.

Helpful Tips

Regular flat and cellular core unshielded lead-ins should be routed away from gutters, conduit, water pipes, metal baseboards, and similar obstructions. Insulated stand-offs should be used every four to six feet. Stand-offs which do not en-

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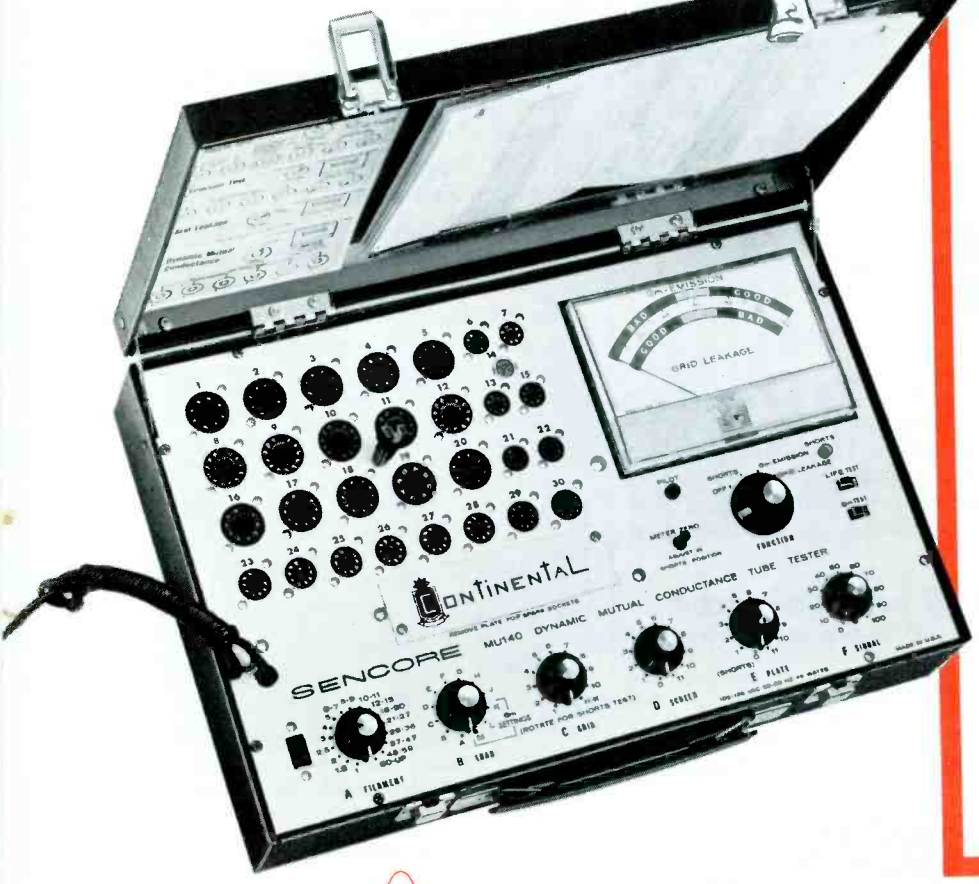

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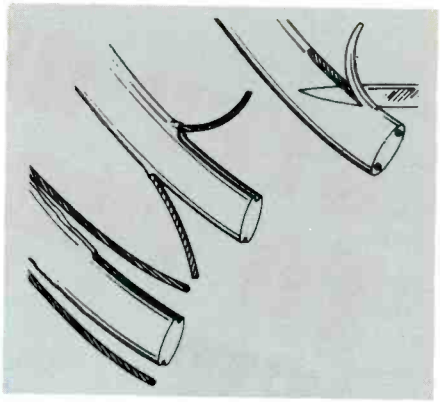


Fig. 12. Preparing lead-in cables for termination.

circle the lead-in with metal are required for UHF. Unshielded lead-in should be twisted (conductors transposed) about once every 18 inches to minimize effects of external objects on electrical fields. When the installation requires more than one lead-in (FM, UHF or VHF), individual lines should be spaced a minimum of six inches.

Use a knife to prepare unshielded twin-lead ends for termination as illustrated in Fig. 12. Cut the insulation along the outside of the conductors and spread the conductors to the side. This leaves the center intact for attaching to the boom or mast as shown in Fig. 13, providing physical support for the lead-in at the antenna terminals.

The newer shielded twin lead-in requires a somewhat different approach in preparation and installation, so this cable will be covered separately. At the antenna end of

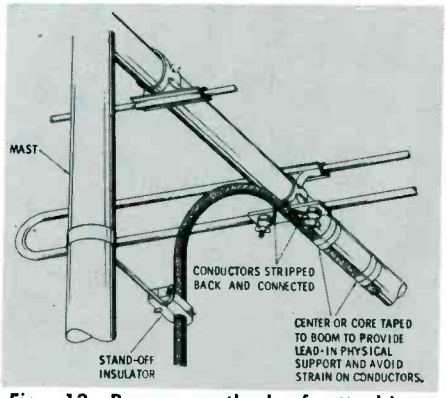


Fig. 13. Proper method of attaching unshielded lead-in cable to antenna and mast.

the cable the jacket is removed, and the exposed shield is covered with electrician's tape or heat shrinkable tubing, to seal out moisture. The encapsulated lead-in is then prepared as illustrated in Fig. 12.

At the receiver end, the shielded lead-in is just as it is at the antenna

end, except the ground (drain) wire is not cut off, and tape or shrinkable tubing is not required over the end of the jacket. After the two lead-in conductors are connected to the set, most interference picked up by unshielded lead-in will be eliminated. If a noise still exists in a particular location, ground the drain wire to the chassis of the TV set through a 0.001-mfd, 1000V, mica or ceramic capacitor, for protection from line voltage which may be present on the chassis. However, in most installations an ungrounded, "floating" shield will serve as an excellent reflector shield: external signals will be bounced off, and any stray signal within the cable will be reflected back into the lead-in conductors and thus retained. In fringe areas, this latter feature can deliver the strongest possible signal to the TV set.

The lead-in may be taped to the boom at a point directly behind the electrician's tape or shink tubing, to provide mechanical support and minimize stresses on the terminal connections. Tape the lead-in directly to the tower or mast at six-foot intervals. Stand-offs are not required. Staples, when used, must not penetrate into the cable.

Fig. 14 shows an actual photograph of many poor lead-in installation practices. These are the conditions which can be avoided by following these recommendations. ▲

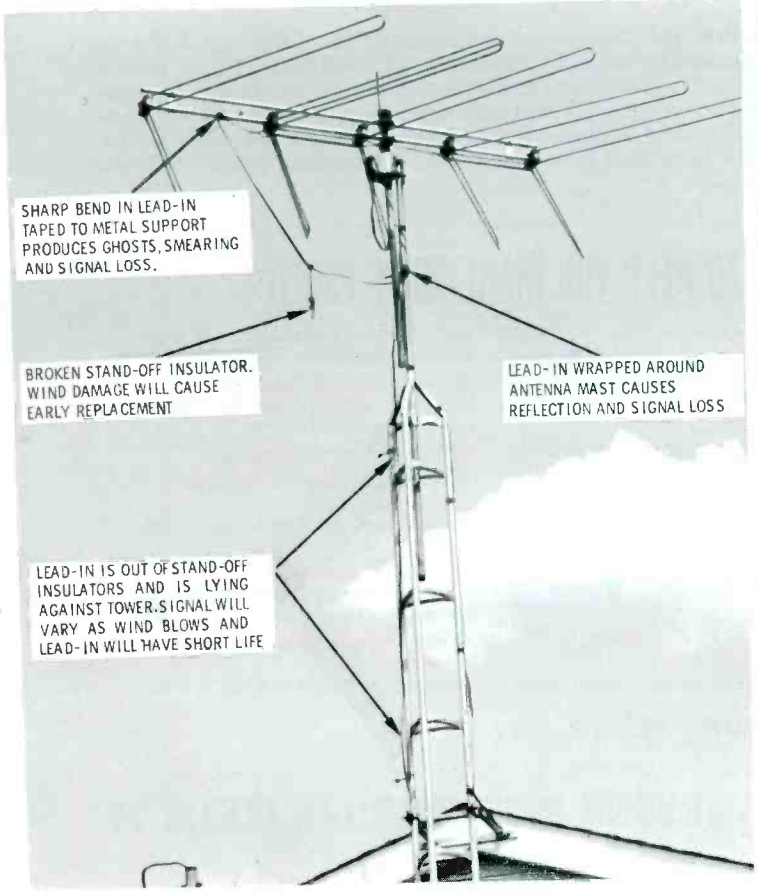
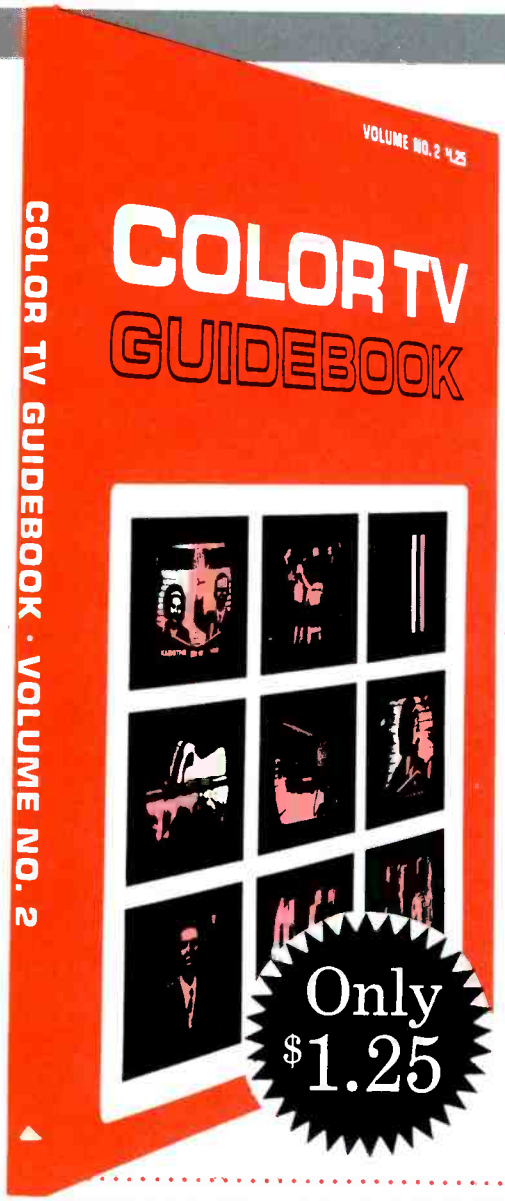


Fig. 14. Example of poor lead-in installation practices.

Howard W. Sams 2nd Volume of

COLOR TV GUIDEBOOK



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THE TROUBLE-SHOOTER

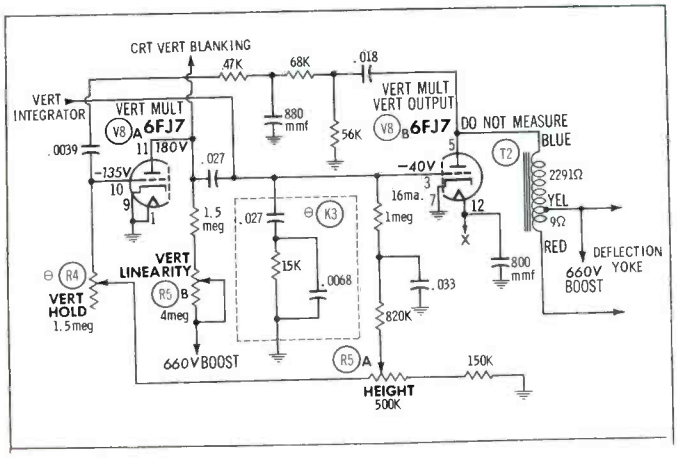
answers your servicing problems

No Raster, Sound Normal

We have recently experienced a problem with a General Electric MW chassis (PHOTOFACT Folder 628-2) that should be of interest to other technicians. The trouble symptoms were no raster, but normal sound. A high-voltage check revealed 2kv at the CRT anode, instead of the normal 18-20kv. Boost voltage initially surged to a normal 660 volts, then dropped to 330 volts. Analyzing the problem as a case of excessive loading, attention was focused on the stages served by the high-voltage and boost circuits. Resistance checks of the yoke and flyback failed to produce a possible source of trouble. Since the vertical output circuit in this chassis used boost voltage, it became a prime suspect. When the vertical output tube was pulled, the boost and high-voltage readings immediately returned to normal. Because the pulsed voltages at the plate of this stage precluded live voltage testing, an ohmmeter was brought into play and quickly provided a valuable clue—a resistance reading of 1.5 megohms (normally 2.3 megohms) at the grid (pin 3) of the vertical output tube. Further resistance tests isolated the trouble to the vertical compensation network in the grid circuit. Defective PC unit, K3, had reduced the grid bias enough to allow the vertical output tube to conduct continuously, placing an excessive load on the boost and high-voltage circuits. A replacement PC unit was not available, so we built up a unit out of individual components. (In some versions of the MW chassis, this compensation network is composed of individual components, rather than a PC unit.) The raster and a normal picture were restored after the defective unit was replaced.

OTTO KINBACHER

Babylon, N.Y.



You make it sound so easy—undoubtedly a result of your effective troubleshooting procedure. Problems associated with stages that use pulsed voltages can be time consuming and frustrating, unless a logical technique and correct test equipment are used. A Symfact covering such stages will be included in PF REPORTER *in the near future.*

Reduced Sound on Lower Frequencies

A General Electric Model C403G AM radio operates normally from 1100 kHz to 1600kHz; however, the volume is reduced to about one third when tuned to the frequencies between 1100kHz and 550kHz. While attempting to find the cause of this trouble symptom, I discovered that turning the bottom slug adjustment on one side of the 2nd IF transformer failed to produce a noticeable deflection on the output meter. I replaced the transformer, but this has not cleared up the trouble, nor am I able to obtain any deflection on the output meter while adjusting the same slug.

MAX C. PATTERSON

Lu Verne, Iowa

Your description of the trouble symptoms indicates tracking problems which are usually associated with IF or oscillator misalignment. If a complete alignment fails to clear up the trouble, look for possible defects in these stages. Unusual defects which can produce poor tracking include bent rotor plates in the tuning capacitor, or shorted turns in the loop antenna. While aligning the receiver, keep the signal generator output as low as possible to avoid excessive AVC action which can produce erroneous indications on the output meter. If the output deflection is too small to provide an accurate indication while tuning the IF slugs, connect the meter to the plate of the output stage, rather than across the voice coil.

Station Test Signal

The vertical blanking bar produced by a Zenith Chassis 16D21Q (PHOTOFACT Folder 467-2) has a white line running through the middle of the vertical sync and equalizing pulse. I have tried changing components in the video, vertical, and sync stages but have been unable to remove the white line.

KASIMIR PIETROWSKI

Philadelphia, Pa.

The white bar that you see in the vertical sync pulse is a test signal inserted by the station. It is a pulse at reference white level for monitoring of equipment performances. It is shaped and positioned in the sync signal so that it cannot interfere with receiver performance. Not all stations use it.

Color Trouble

I am having trouble locking in the color bars on an RCA CTC11D chassis (PHOTOFACT Folder 550-2). There seems to be horizontal tearing, along with vertical roll. Reception of color broadcasts is good with the exception of channel 3, which has a beat signal that cannot be tuned out during a color program. I have not uncovered any abnormal voltage or resistance readings, or any other clues to the trouble that is causing the preceding symptoms.

DONALD D. TEAGLE

Barberton, Ohio

The symptoms you have described indicate improper RF-IF bandpass. The channel 3 beat may be related or a separate problem. First, try testing all tubes in the video string, paying particular attention to gas tests. Next, check the bandpass, and perform a sweep alignment, if necessary. At this point, if the vertical roll and critical color sync persist, treat each as a separate problem. Normal troubleshooting procedures should take care of the vertical problem. An article titled "Removing the Barber Pole", in the January '67 issue of PF REPORTER, *should provide some useful information on the causes and cures of color sync troubles.*

Horizontal Output Overheated

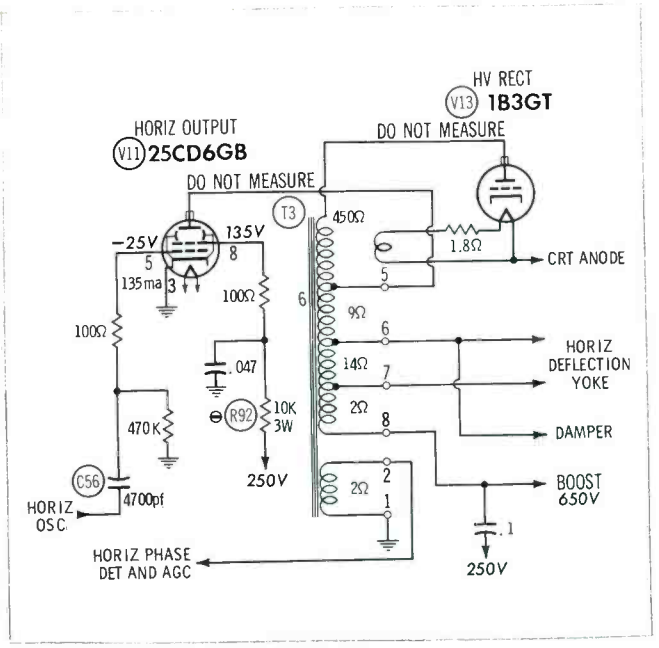
The 25CD6GB horizontal output tube in an Admiral 1601 chassis (PHOTOFACT Folder 394-1) overheats continuously. The set will operate normally for about ten minutes then the 25CD6GB becomes red hot and the picture disappears. If the set is turned off for a few minutes and then turned on again, the same process is repeated. I have replaced all tubes in the vertical and horizontal sweep circuits, as well as the damper and high-voltage tubes. What is the most effective troubleshooting procedure for a trouble such as this.

J. J YOWNS

Murrysville, Pa.

There are many circuit or component defects that can cause or contribute to an overload of the horizontal output stage; however, to simplify troubleshooting, these possible troubles can be catagorized into three factors which have the most effect upon the horizontal output current. These factors are the horizontal oscillator drive voltage, the horizontal-output screen voltage, and the circuits that make up the horizontal-output load.

Since you have already checked or substituted the tubes associated with these circuits, we can assume that they are



not the cause of the trouble. Therefore, begin troubleshooting by making a quick measurement of the horizontal output cathode current. This can be accomplished by one of two methods (there are others, but these are the most practical); connect a 0-200 ma meter in series with the cathode and read the current directly, or connect a 10-ohm resistor in series with the cathode and measure the voltage across the resistor. The current then can be calculated using Ohms law. The normal reading is 135 ma; a reading above 175 ma must be considered excessive for this particular circuit. (Actually, the maximum DC cathode current rating of a 'CD6GB is 200 ma.) Next, check the grid bias; as indicated on the PHOTOFACT *schematic, the normal reading should be about −25 volts. A bias reading of less than −20 volts indicates a faulty horizontal oscillator, or possibly a leaky grid coupling capacitor, such as C56.*

If the grid bias is normal, check the screen voltage—an increase in screen voltage has the same affect as decreasing the grid bias. If screen voltage is above normal (135 volts), check screen dropping resistor R92—it may have decreased in value.

If the preceding checks have failed to produce the reason for the overload, concentrate on the circuits that load the horizontal output stage—the flyback, yoke, damper, high-voltage rectifier, or stages that are supplied with boost voltage. Begin by making a visual inspection, looking for melted insulation or discolored resistors. The most probable source of trouble is the flyback. Disconnect the "hot" yoke lead from the flyback (pin 6) while monitoring the horizontal output cathode current. If the flyback is not shorted, the cathode current should decrease considerably when the yoke is disconnected. If it does not decrease, this is a good indication of shorted turns in the flyback.

I just about had it fixed when the wife called you!

PRODUCT REPORT

for further information on any of the following items, circle the associated number on the Catalog & Literature Card.

Mast-Mounted Matching Transformer
(62)

Shown here is a new mast-mounted matching transformer for master and home TV systems. The **Craftsman** 1002A matching transformer matches 300-ohm antenna lead to 75-ohm coaxial cable. Insertion loss is 0.8 db maximum over 50-220MHz. MF61A and MF59A connectors are included. The transformer measures 1½" x 4" x 2" and weighs ½ lb.

A special kit containing the 1002A mast-mounted matching transformer is available with the Model T-15 receiver matching transformer. This combination, with all hardware, provides ghost-free color and black-and-white reception. Price of the mast-mounted unit is $4.15. The kit is priced at $7.15.

Color Bar Generator
(63)

A solid-state color generator with push-button selector switches has just been introduced by **Jackson Electrical Instrument Co.** The new instrument, designated the Model X-100 Color Bar Convergence Generator, provides an extraordinary range of patterns and includes many features that enable the serviceman to quickly install and troubleshoot color TV.

Two sets of color bar patterns simplify and speed-up color adjustments. With just a push of a button, the serviceman selects either of three NTSC type colors: red, blue and green—or yellow, magenta and cyan. This unique feature eliminates confusion and counting of bars and enables the technician to concentrate on only the necessary bars. Other patterns include crosshatch with 20 vertical lines and 15 horizontal lines for convergence adjustments. Perfect squares are provided for linearity adjustments. The horizontal lines can be adjusted from double to single line thickness as desired. The dot pattern is small and uniform for more simple and accurate convergence.

The solid-state circuit of the unit provides dependable, instant operation. The 3.58-MHz color signal is crystal controlled (3.15-KHz oscillator for positive stability). Additional features include color video control to check color sync circuits and to adjust the signal output on all patterns; blank raster at minimum color-video control setting for purity adjustment; video output to bypass tuner and IF circuits when desired; RF output on channel 3 or 4 is controlled with a convenient slide switch on front panel and can be adjusted for channel 5 through opening on panel (feeds directly into antenna); individual circuit boards are easily removed for accessibility; line isolation to prevent shock hazard; and lead piercing clips are included for positive grid connections.

The generator, designed for easy portability, is housed in a leatherette wood carrying case with a compartment provided for all cables. The unit is priced at $149.95, complete with gun killers.

High-Voltage Resistor For Color TV
(64)

Exact replacement, original equipment, high-voltage resistors for color TV are now available from **IRC, Inc.** The Type MV is an axial lead, film-type resistor rated at 6,000 volts and available in two values: 47 megohms and 66 megohms ±20%. Precise mechanical spacing of the helical resistance path allows uniform voltage gradient throughout the resistor length.

Each replacement unit is packaged in a two-color display card with complete replacement information on the back. Price is $2.00 for the MV47 (47 megohms) and $2.50 for the MV66 (66 megohms).

Marine Radiotelephone
(65)

A new solid-state, 50 watt, FM Marine Radiotelephone has been announced by **Pearce-Simpson, Inc.** The MRT-50, designed for pleasure boats and commercial vessels, operates on 12 FM channels in the VHF frequency range. (The Coast Guard now monitors VHF Call and Safety Channels).

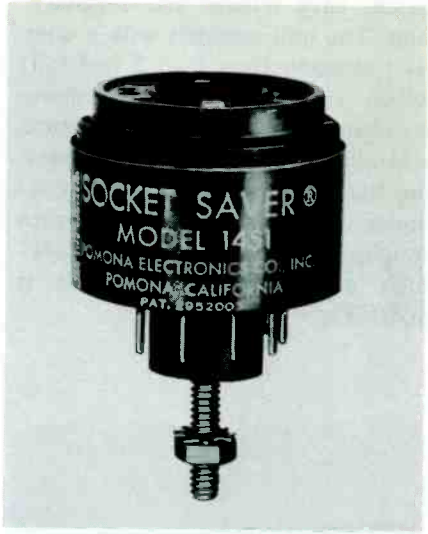
The unit features a solid-state receiver and transistorized transmitter, and is equipped with a transmitter cut-off switch to reduce battery power requirements and yet permit channel monitoring for extended periods. Other features of the radiotelephone include a crystal filter for adjacent channel rejection and greater selectivity, and an instantaneous, automatic-deviation–limiting circuit which keeps the transmitter frequency within the bandwidths required by the FCC.

A universal, all-angle mounting bracket on a slide rail provides quick, easy release and reinstallation. The unit operates with a compact antenna (less than 2 feet tall) which is self-supporting, requires no clamps or special superstructure, and eliminates the need for lowering the antenna as the craft passes under bridges. The unit, which weighs 20 lb., is 11½" wide, 4¾" high and 10½" deep. Price is $650.00.

Home TV System

(66)

A new solid-state 82 channel home TV antenna system has been introduced by **Jerrold Electronics.** It is built around a 4-outlet, all-channel amplifier, the Colorcaster-4. The new unit amplifies all frequencies from 54 MHz to 890 MHz, with a flat response of ±2 db across any 100 MHz. It provides a total of 10-dB gain, or 3-dB gain to each of four outputs. Accessories to the new amplifier required to make a complete home master TV system include the Pathfinder series of 82-channel Coloraxial antennas, 82-channel Coloraxial cable, Model FL-82 wall outlets, and Model T-380 UHF/VHF matching transformer-splitters. Price of the amplifier is $72.50.



Magnoval Socket Saver
(67)

A 9-pin Magnoval socket saver (Model 1451) has been added to the line of socket savers offered by **Pomona Electronics Co.** The units are easily installed on the tube bases supplied with tube checkers and other equipment, saving wear and tear and eliminating the need for replacing and rewiring original sockets. Model 1451 is priced at $2.25.

Cable System
(68)

A new flat cable system for music, sound, and low voltage control systems has been developed by **3M Company.** Called "Scotchflex" brand flat cable system No. 500, it is designed especially for use in dwellings, hospitals, schools, hotels and industrial plants for intercom, music, burglar and fire alarm, remote control signalling, learning, or paging systems.

Available with a new improved pressure sensitive foam adhesive and special accessories for terminating and splicing, the cable can be mounted to nearly any smooth, clean surface, such as ceramic or plastic tile, concrete or cinder block, porcelainized steel, plaster, dry wall, or wood paneling. There is no need for nails or screws. The cable system consists of No. 22 stranded wire embedded in a vinyl plastic strip, to which a layer of foam adhesive is applied.

Accessories are constructed of injection molded plastic, also with foam adhesive backing. They include the No. 515 barrier strip terminal and the 516 "U-grip" terminal, designed so that connections are made simply by laying the cable in the channel of the accessory base and pressing the top in place. Special "U-grip" elements in the unit automatically strip away the insulation and make the connection. Permanent hookup of sound or background music systems or home stereo or hi fi installations are made as quickly and easily as applying a strip of tape. The system is also adaptable to inductive antenna or formal listening station programmed learning systems.

The cable is available in 2- or 3-conductor widths, in rolls of 100'. Price of the 2-conductor roll starts at $6.10.

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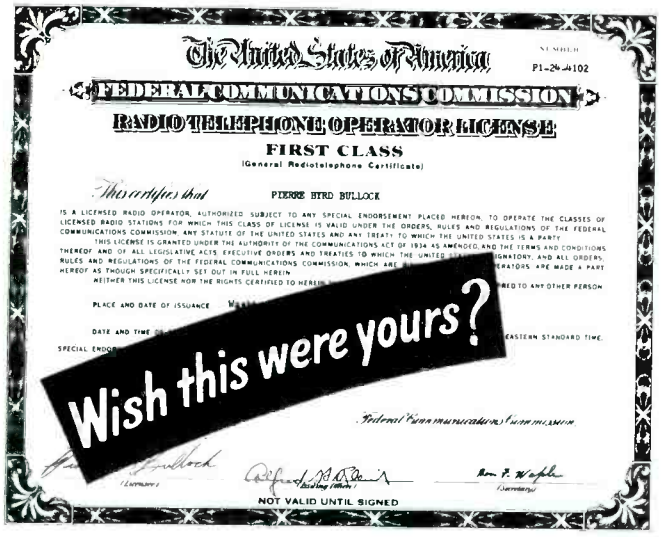

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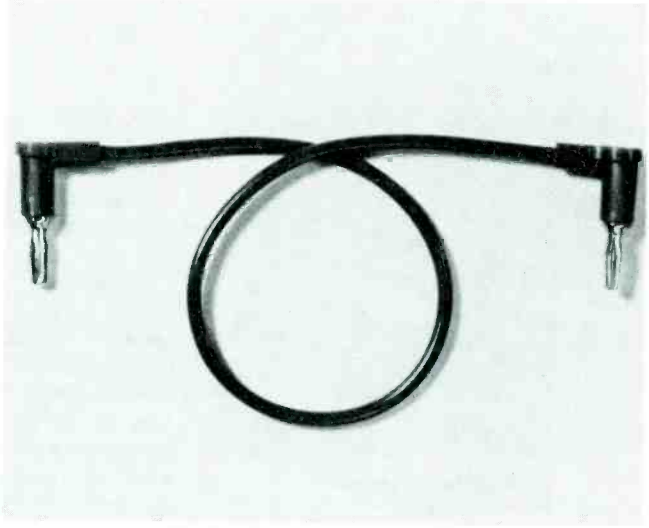

Right Angle Banana Plug
(69)

A new right angle banana plug patch cord, designed for use where space is limited, is announced by **Pomona Electronics Co.** The Model 2700 plug features a concave ribbed top and an oversize shoulder for easy connect and disconnect in tight places. Right angle design keeps cable in close to panel to save space.

The plug springs are made of one piece beryllium copper, heat treated for maximum life, and rounded for greater contact area. Thermoplastic insulation, molded to a nickel-plated, brass plug body and wire, provides a strong moisture-proof integral unit. Available in 10 colors and various wire lengths, the patch cord is priced at $1.00.

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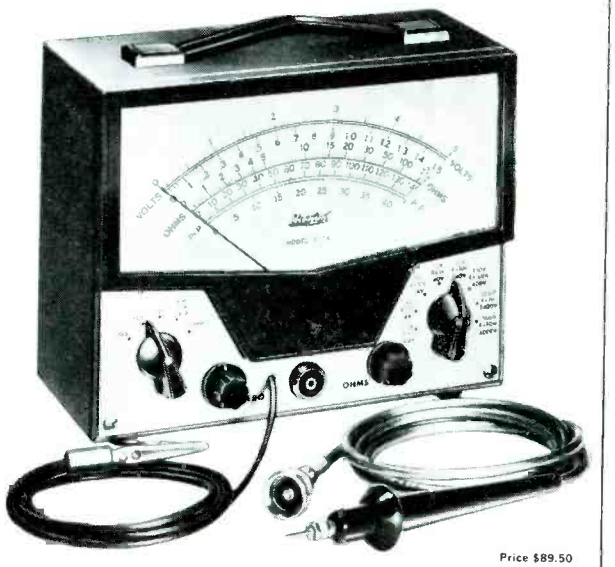

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Circle 53 on literature card

Cleaner-Lubricant

(70)

A new, improved heavy white lubricant in an aerosol spray is announced by **Colman Electronics Products.** Heavier bodied and safe for use on plastics, Lube-A-Trol No. 1605-8S is useful as a control cleaner and lubricant. Other uses include the lubrication of gears, phono mechanisms, auto radio tuning mechanisms, and similar applications requiring a permanent heavy bodied lubricant. Price is $1.89.

CB Transceiver

(71)

A major feature of the 12-channel, solid-state CB transceiver shown here is the use of a precision crystal filter in the receiver. This filter provides a marked reduction in adjacent channel interference, making the new unit especially attractive to operators in areas of high CB activity. Other features of the Messenger 300 include a multistage, noise-limiting circuit, speech compression in the transmitter for more audio power without distortion, a plug for accommodating the Johnson Tone Alert selective calling system, and a built-in PA amplifier.

The **E. F. Johnson Co.** unit comes equipped for 12-volt DC operation and is furnished with a mobile mounting bracket, push-to-talk microphone, and crystals for one channel. Also offered are two accessory power supplies which enable the transceiver to be operated as a base station or a portable unit, as well. Price of the unit is $189.95.

INDEX TO ADVERTISERS

February, 1967

FREE Catalog and Literature Service

**Check "Index to Advertisers" for further information from these companies.*

ANTENNAS

85. *ALLIANCE* — Colorful 4-page brochure describing in detail all the features of Tenna-Rotors.
86. *ANTENNACRAFT*—12-page catalog listing complete Antennacraft line of UHF, VHF & FM antennas for all types of installations.
87. *BLONDER-TONGUE*—Compact brochure detailing a line of all-channel products, expressly designed to improve reception in the home and small MATV systems.
88. *CORNELL-DUBILIER*—16-page booklet: "How to improve TV/FM Reception."
89. *FINNEY*—Forms 20-338, 20-356, and 20-357 describing distribution amplifiers and antenna amplifiers for 300 Ohm and 75 Ohm TV and FM systems.*
90. *JERROLD*—New 4-page full-color catalog describes the new Paralog Plus antennas.*
91. *JFD*—Color Laser and LPV antenna brochures. New 1967 dealer catalog covering complete line of log-periodic outdoor antennas, rotators, and accessories.*
92. *WINEGARD* — Literature on new 82-channel 2-set coupler; new 82-channel variable line tapoffs; new VHF-UHF matching transformers and color brochure on new sales aids.*

AUDIO

93. *ALCO*—Brochure on a new 10-watt solid-state paging system.
94. *ATLAS SOUND*—Catalog 556-67 illustrates and describes many new models of public address loudspeakers, microphone stands, and accessories for commercial sound applications.*
95. *AUDIOTEX*—Stereo and Hi-Fi accessories catalog FR-66-A, also phono-recorder drive chart and cross reference FR250-W.
96. *EICO*—Brochure on the new "Cortina" solid-state stereo system.*
97. *ELECTRO-VOICE* — Specification sheet on E-V's new M253 multicellular horn for indoor and outdoor use. Dispersion essentially uniform at all useful frequencies. Utilizes two rows of five identical cells.
98. *JENSEN*—New brochure No. OJ featuring a full line of rear seat speakers.
99. *KOSS*—Brochures on Rek-O-Kut turntables and personal listening products.
100. *OAKTRON*—"The Blueprint to Better Sound," an 8-page catalog of loudspeakers and baffles giving detailed specifications and list prices.
101. *OXFORD TRANSDUCER* — Catalog sheets featuring speaker systems for automobiles.
102. *SONOTONE*—Set of 3 microphone frequency demonstration charts.
103. *STANFORD INTERNATIONAL*—Brochure about a new battery-operated tape recorder. Also, brochures about headphone and microphones.
104. *STERLING*—Flyer about Model CS 400 solid-state 4 track continuous stereo cartridge player for auto, boat, camper, or trailer.
105. *TRIAD*—Data sheet on 8 new line-matching transformers.
106. *VIKING* — Brochure about Model 230 tape transport, amplifiers and accessories.

COMMUNICATIONS

107. *ACTION* — Brochure on new Page-All system and accessories.
108. *AMPHENOL*—2-color spec-sheets on new Model 650 CB transceiver and Model C-75 hand-held transceiver.*
109. *COMCO*—Flyer about the 697-H remote control unit for base stations.
110. *MOSLEY ELECTRONICS* — New 1967 deluxe citizens band antenna catalog.
111. *MOTOROLA* — New brochure tells how to reach people on-the-move through use of personal two-way radio.*
112. *RAYTHEON*—Brochures about Webster mobile antennas and accessories for CB and Amateur bands. Also, Raytel TWR 8, 9, 11, & 11T CB transceivers.
113. *SONAR*—Flyer sheets on Model J-23 CB radio and Model A10 CCTV camera.
114. *SQUIRES SANDERS*—Brochure on low cost miniature CCTV camera and accessories, solid-state 23-channel CB transceivers, FM monitors, and VHF and HF amateur products.

COMPONENTS

115. *BUSSMAN* — Protection for mobile radio and telephone equipment is made easy with a TRON waterproof fuseholder. This in-the-line fuseholder is readily installed in the circuit and protects the fuse against water, moisture, dirt and corrosive fumes. Ask for BUSS Bulletin SHF-11.*
116. *CENTRALAB*—Catalogs offered on electrolytic capacitors, PEC's and auto radio shafts and bushings.*
117. *GC ELECTRONICS*—Catalogs FR15-G TV knob cross reference, FR-028-C antennas, and IR-7018-G, a transistor reference.*
118. *LITTELFUSE*—Pocket-sized TV circuit breaker cross-reference gives the following information at a glance: Manufacturer's part number, corresponding Littelfuse part number, price, color or b/w designation. A second glance gives trip ratings and acquaints you with a line of caddies. Ask for CBCRP.*
119. *MINNEAPOLIS SPEAKER*—New descriptive brochure of the complete Misco Red Line—loudspeakers for replacement and high fidelity applications.
120. *ONEIDA*—Catalog sheet of new color TV replacement components.
121. *QUAM-NICHOLS*—Catalog #66 listing public address, sound systems, high fidelity, automotive and radio-TV replacement speakers.*
122. *SONOTONE*—Spec sheet on the 100T stereo phono cartridge.
123. *SPRAGUE*—#C-617, a complete catalog of the Sprague line.*
124. *SWITCHCRAFT*—Bulletin 165, describes two new rugged, pendant (cord) switches. This momentary action switch has a 1-A circuit. Integral brass, hard gold contacts rated 500 MA., 50 watts max., A.C., non-inductive load.

SERVICE AIDS

125. *CASTLE*—How to get fast overhaul service on all makes and models of television tuners is described in leaflet. Shipping instructions, labels, and tags are also included.*
126. *CLEVELAND INSTITUTE OF ELECTRONICS* — New pocket-sized, plastic "Electronics Data Guide" of formulas and tables, including frequency and wavelength, dB formulas and table, including frequency and wavelength, dB formulas and table, antenna lengths, and color code.*
127. *ELECTRONIC CHEMICAL* — Catalog sheet on aerosol sprays for servicemen.
128. *MIDSTATE TUNER* — 24-hour tuner service is described in a colorful brochure.
129. *QUALITY TUNER SERVICE*—Introductory letter describing costs and service on all makes of TV tuners. Repair tags and shipping labels included.
130. *RAWN*—Bulletins on repair ideas using Plas-T-Pair knob and plastic repair kits. Also, bulletins on tuner cleaners and circuit coolers. Includes price sheets.

SPECIAL EQUIPMENT

131. *ELECTRONIC ALARMS* — Complete step-by-step installation instructions for burglar alarms.
132. *EUPHONICS*—Catalog sheet on a new wireless remote switch.
133. *PERMA POWER*—New leaflet describes Perma-Power's new Electro-Lift Garage Opener.

TECHNICAL PUBLICATIONS

134. *PHILCO*—Information about Tech Data & Business Management service. Also, free parts catalog.
135. *RCA INSTITUTES* — New 1967 career book describes home study programs and courses in television (monochrome and color), communications, transistors, industrial and automation electronics.*
136. *RIDER*—Latest catalog listing practical technical paperbacks for the ham, hobbyist, and industrial ttchnician.
137. *HOWARD W. SAMS*—Literature describing popular and informative publications on radio and TV servicing, communications, audio, hi-fi, and industrial electronics, including special new 1967 catalog of technical books on every phase of electronics.*

TEST EQUIPMENT

138. *B & K*—New 1967 catalog featuring test equipment for color TV, auto radio, and transistor radio servicing, including tube testers designed for testing latest receiving tube types.*
139. *EICO*—1967 short-form catalog is 48-pages long. Describes a complete line of test instruments, CB and ham equipment, hi-fi components, and miscellaneous electronic equipment.*
140. *HICKOK*—Specification information new Models: CR-35 CRT rejuvenator tester, GC-660 solid-state color bar generator, 860 AM/FM signal tracer.*
141. *JACKSON*—Catalog on "Service Engineered" test equipment featuring the new X-100 color generator.
142. *LECTROTECH*—Two-color catalog sheet on new Model V6-B color bar generator, the latest improved model of the V6 color bar generator. Gives all specs and is fully illustrated.*
143. *MERCURY*—1967 16-page booklet features the full line of test equipment for servicing color and black/white TV, radio, hi-fi and communications equipment. Includes the new Model 1900 color generator and Model 2000 mutual conductance tube tester.
144. *PRECISION APPARATUS*—Illustrated catalog describing signal generators, oscilloscopes and meters.
145. *SECO* — New line folder featuring the new Model 107C Gm, Em and grid circuit tube tester.
146. *SEMITRONICS*—Brochure on the new Model 1000 transistor tester.
147. *SENCORE* — 8-page full color catalog plus a new 4-page supplement catalog.*
148. *SIMPSON*—Flyer giving specifications of Model 604 multicorder for measuring and recording volts, amps, milliamps, and microamps.*
149. *TRIPLETT*—Catalog D-66-I features the complete line of panel instruments.*

TOOLS

150. *ARROW*—Catalog sheet showing 3 staple gun tackers designed for fastening wires and cables up to ½" in diameter.
151. *CHANNELLOCK*—General catalog #66 and price supplement on the complete tool line.
152. *ENTERPRISE DEVELOPMENT*—Time-saving techniques in brochure from Endeco demonstrate improved desoldering and resoldering methods for speeding and simplifying operations on PC boards.*
153. *LUXO*—Flyers on counterbalanced and magnifying bench lamps.
154. *VACO*—Catalog #SD-120 completely describes new Vaco screw launcher which holds, starts, and drives all straight slot csrews.
155. *XCELITE*—New catalog #166 shows the complete tool line.

TUBES AND TRANSISTORS

156. *IR*—Transistor cross reference guide—22 pages of detailed specifications on universal silicon and germanium transistors and a complete listing of more than 5000 devices which they replace.
157. *RADIO CORP. OF AMERICA*—PIX 300, a 12-page product guide on RCA picture tubes covering both color and black-and-white. Includes characteristics chart, terminal diagrams, industry replacement, and interchangeability.*
158. *SEMITRONICS* — Suggested list price schedule of over 2000 semiconductors by EIA type number
159. *WORKMAN*—Two new cross references in vest pocket size. Miracle Five transistors, and circuit breakers.*

RCA's COLOR TV FASTCHECK #6

No color?

Use this procedure to narrow down the trouble area...

If the receiver produces a normal black-and-white picture but no color during a color broadcast, try the following steps, in order:

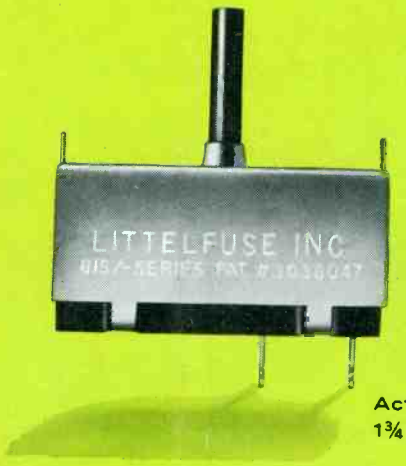
1. Tune to a channel broadcasting color, or feed an rf color-bar signal into the antenna terminals.
2. See that the fine-tuning and color (saturation) controls are correctly set.
3. Rotate the color-killer threshold adjustment in the direction which disables the color-killer stage. *If locked-in* (in sync) *color appears*, reset this control as recommended by the set manufacturer.
4. *If color appears out of sync*, look for trouble in the automatic frequency and phase control (AFPC) circuits. Use a color-bar generator, and follow the AFPC adjustment procedures described in the manufacturer's service notes.
5. *If no color appears*, determine whether the color is lost in the circuits which handle the *composite* signal (antenna to bandpass amplifier) or in circuits that handle the *separated* color signal, as follows:
6. Feed a color-bar signal into the antenna terminals and use a scope to check the composite signal at the video detector.
7. If color-bar waveforms are absent or badly distorted, check for trouble, including poor bandpass, between the antenna terminals and video detector.
8. If color-bar signals are present at the video detector, check the burst keyer or separator, bandpass amplifier, color-killer, and the 3.58 MHz oscillator stages and their associated circuits.
9. Once the inoperative stage is found, use voltage and resistance measurements to pinpoint the circuit defect.

This ad is still another in a series of color TV service hints from RCA. To keep your customers satisfied, always replace with RCA receiving tubes. Your local RCA Distributor is your best source for top quality receiving tubes for color TV.

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

The Most Trusted Name in Electronics

Introducing a Complete Line of Littelfuse Quality Circuit Breakers



Actual Size
1¾" x 13/16" x ½"

Exact replacement from factory to you

Designed for the protection of television receiver circuits, the Littelfuse Manual Reset Circuit Breaker is also ideally suited as a current overload protector for model railroads and power operated toy transformers, hair dryers, small household appliances, home workshop power tools, office machines, small fractional horsepower motors and all types of electronic or electrical control wiring.

LITTELFUSE DES PLAINES, ILLINOIS

Circle 59 on literature card