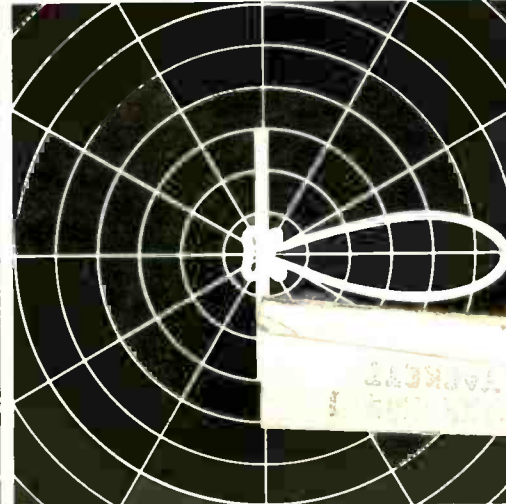
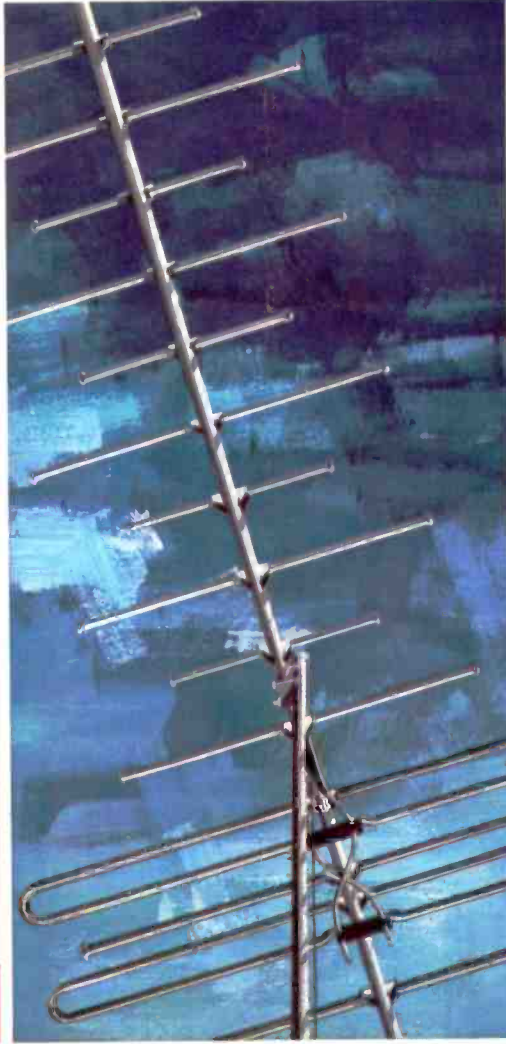


ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION



AUGUST 1965



VHF/UHF/FM ANTENNAS



NEW JERROLD **COLORAXIAL**TM Antenna System

The old familiar twinlead, that worked pretty well for black-and-white TV, is hopelessly inadequate for color reception. When your customers complain about changes in color, ghosting, and smearing of pictures, chances are the fault lies squarely with the twinlead connecting the set to the antenna.

What's the answer? Jerrold announces the exciting Coloraxial TV Reception System—an absolute necessity for color, and also best for black-and-white and FM stereo. With Coloraxial, you can quickly convert any outdoor antenna to shielded coax operation. Installs anywhere in minutes, without need for standoff insulators or the fear of running near metal objects.



A subsidiary of The Jerrold Corporation

Your customers will welcome the predictable, perfect reception that's assured with a Coloraxial system. And you'll welcome

the simplicity and profitability of a Coloraxial installation. Jerrold Coloraxial Kits give you everything you need for a quick, perfect job: 50 or 75 feet of sweep-tested, shielded RG-59/U cable with fittings already on; matching transformers for both ends of the cable—even Coloraxial (75-ohm) antennas and preamplifiers where the job calls for them.

Talk with your Jerrold distributor today about Coloraxial, or send coupon for complete information.

Jerrold Electronics Corporation
Distributor Sales Division
15th & Lehigh Ave., Philadelphia, Pa. 19132

Send me complete information on the new Jerrold Coloraxial TV Reception System.

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

... for more details circle 28 on postcard

The new Amphenol 860 Color Commander cuts alignment time in half!

Ever finish a convergence job to find the raster off center. Lose convergence when you re-centered? Can't happen with the Amphenol Color Commander, battery-powered, solid-state color generator. A special, single-crossbar pattern consists of one horizontal and one vertical line, crossing just where the center of the raster should be. No need to guess when centering the raster with this new pattern.

See dots before your eyes when you want only one to start static convergence? The 860 gives you that single dot, right at center screen. You'll be switching back to this important dot during dynamic adjustment to make sure you haven't gone off the track.

Even the old patterns offer something new. Line spacing in the cross-hatch pattern is rigidly maintained for the 4:3 aspect ratio. You can rely on it for linearity, height, and width adjustments. The pattern gives you finely etched line width at normal brightness levels. What good is perfect convergence at reduced brightness if you lose it when the set's readjusted for normal viewing? This special crosshatch also eliminates receiver fine-tuning error. Among the 860's nine (most generators have only 5 or 6) are: multiple-dot, single vertical line, single horizontal line, vertical lines only, and horizontal lines only.

Finally, the Color Commander's unique color bar pattern (just three bars: R-Y, B-Y and -R-Y) simplify color adjustments. You can get a rapid, overall check of color circuits. Then adjust color demodulator phase or pre-set the hue control and check its operating range. In each step, you know precisely how the color bars should look and how they should change during adjustment.



A new timing circuit eliminates instability and loss-of-sync problems. Silicon transistors maintain built-in precision and stability indefinitely. RF output is on channel 3 or 4, switch selected. An attenuator simulates weak-signal conditions. It has gun killer circuit. Uses 9 penlight cells. Weighs 3½ lbs. in compact leatherette carrying case. \$149.95. Optional AC power supply, \$19.95.

AMPHENOL CRT COMMANDER, MODEL 855. Solid-state. Checks all black-and-white or color CRT's with the same techniques used by tube manufacturers. Rejuvenates where others fail. Versatile 5-socket cable accommodates 7 different sockets. With CRT chart, \$89.95.

See the new Color Commander test instruments at your Amphenol distributor.

Amphenol
DISTRIBUTOR DIVISION
amphenol corporation
2875 S. 25th Ave., Broadview, Ill. 60155

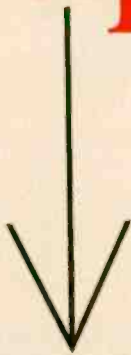


... for more details circle 13 on postcard



Next time you need one, get it fast.

Mail this coupon.



YES, Philco, I want faster, complete parts service! Tell the nearest Philco Parts Distributor to send me information about special Philco Parts offers, prices and facts. And tell him to hurry!

Name _____

Address _____

City _____ Zone _____

State _____

Mail to: Philco Parts & Service Department
P. O. Box No. 3635
Philadelphia, Pennsylvania 19125

T

Cathode ray tubes, receiving tubes and genuine Philco parts — your Philco Parts Distributor has them. In one quick stop you can also get universal replacements for nearly every TV and radio ever made, a tremendous range of national brand components and many profit-making accessories and extras.

The rare time a Philco part isn't in stock, Philco's Lifeline Emergency Service jumps into action. Your order is instantly transmitted to Philco's national parts depot in Bedford, Indiana — and the part you need is on its way to you, *by air*, in 24 hours or less.

Extra services from your Philco Parts Distributor include valuable knowhow and data on just about every TV, radio or phono ever made. When you're stuck on something, he's the man who can help you.

If you're not getting this kind of fast, one-stop parts service, you should. Mail the coupon and start doing business with your Philco Distributor.

PARTS & SERVICE DEPARTMENT

PHILCO
A SUBSIDIARY OF *Ford Motor Company*

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

AUGUST 1965
VOL. 82 NO. 2

ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

RON KIPP Publisher
JACK HOBBS Managing Editor
QUINTO BOCCHI Technical Editor
DOUGLAS HEDIN Industrial Editor
JOHN BAILEY Assistant Editor
THOMAS MURN Assistant Editor
MARY CONNORS Editorial Production
MAGGIE KANE Advertising Production
JIM GHERNA Art Director
RUTH GELINEAU Circulation Fulfillment



AN OJIBWAY
PUBLICATION

OJIBWAY PRESS, Inc.

Ojibway Building, Duluth, Minn. 55802
AREA CODE 218 727-8511

ADMINISTRATION:

MARSHALL REINIG President
ROBERT EDGELL Executive Vice President
DEAN MYHRAN Vice President
GREGORY BLODGETT Treasurer
BEN MARSH Editorial Director
HARRY RAMALEY Production Director
JOE WOLKING Circulation Director
ANGUS STONE Marketing Manager

Sales Offices:

NEW YORK: Ron Kipp, 25 W. 45 St.
New York, N.Y. 10036
AREA CODE 212 581-4200

CHICAGO: Jack Daniels, 221 N. LaSalle
St., Chicago, Ill. 60601
AREA CODE 312 CE 6-1600



Copyright 1965 by Ojibway Press, Inc., Duluth, Minn. 55802. Reproduction and reprinting prohibited except by written authorization of the publication. Subscription price: \$5 for 1 year, \$8 for 2 years, \$10 for 3 years. Foreign, \$9 for 1 year, \$14 for 2 years, and \$18 for 3 years.

If you have a change of address or a question about your subscription, write: ELECTRONIC TECHNICIAN, Circulation Department, Ojibway Building, Duluth, Minnesota 55802. BE SURE TO SEND ALONG THE ADDRESS LABEL FROM YOUR MOST RECENT ISSUE.

Cover

Our cover shows three basic antenna types and their approximate polar patterns—the corner reflector, the broad-banded yagi and the log-periodic—which symbolizes this month's emphasis on antennas, accessories and installation problems.

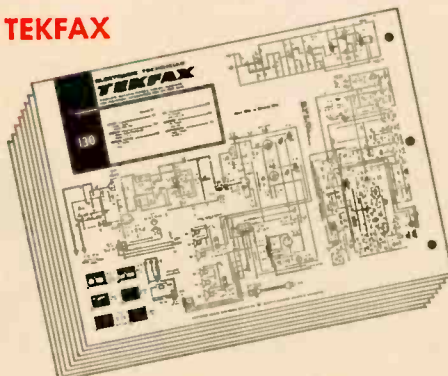
FEATURES

- One Man Can Erect Fringe Area Antennas** 41
Dennis Crisp, a one-man antenna installation specialist, shares his valuable experiences in a two-part article series
- There's Money in Master Antenna Systems** 44
Lon Cantor reviews installation and merchandising techniques in this profitable area
- How Multipath Signals Affect FM Reception** 48
Bob Brickey reminds us of a major problem to be solved if we are to give our FM/Stereo customers satisfactory reception
- Color Bar/Dot Generators** 51
A new feature that covers one instrument each month
- Color, Color Everywhere—But Not a Bit in Sync** 54
Joe Hayes concludes another 'Bob' and 'Scoot' in-shop story that's full of practical color information
- Combination VOM/VTVMs** 57
A review of two different combination test instruments
- FM/Stereo Servicing Principles** 58
Tom Haskett tells what every technician needs to know about servicing this equipment
- Soldering Tips for Today** 61
Technician Conrad Larson gives us the latest on this subject

DEPARTMENTS

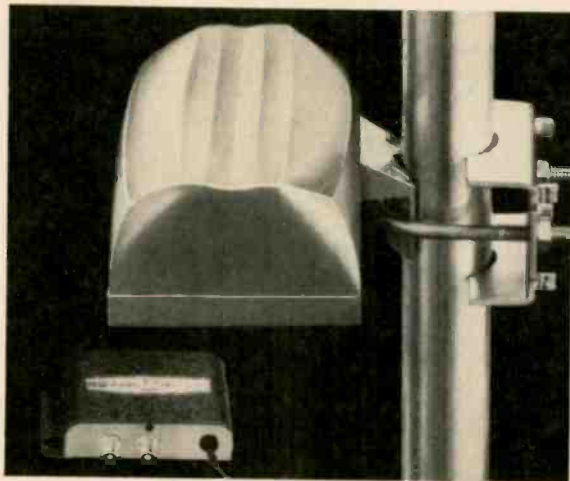
Letters to the Editor	22	Colorfax	64
Editor's Memo	26	Tough Dogs	66
Sync on Business	29	New Products	68
Technical Digest	34	News of the Industry	82
Advertisers Index	88		

TEKFAX



ADMIRAL: TV Chassis G4, 2G4, 8G4, 9G4
AIRLINE: TV Model Gen-1266A
CORONADO: TV Model TV2-9398A
EMERSON: TV Chassis 120779, 780, 781, 782, 783, 784, 785
MUNTZ: TV Chassis Run Number T68H28
RCA VICTOR: TV Chassis KCS 154A, B
TRUETONE: TV Chassis Model 2DC3651
ZENITH: TV Chassis 14M21

“What our business needs is a good UHF VHF amplifier.” “What our business needs is a good UHF-VHF amplifier.” “What our bu..”



“Say no more.”

“You mean there’s an amplifier that covers all TV channels from 2 to 83?”

“You bet. In fact there are two—the outdoor U/Vamp-2 and the indoor V/U-ALL2.”

“Suppose I live in an area where there’s only VHF?”

“Your motto should be ‘Be Prepared’ because there are a lot of new UHF stations soon to come on the air. These all-channel amplifiers are obsolescence-proof.”

“Anything I should know about the U/Vamp-2?”

“Well, the U/Vamp-2 is compact and easy to install on the antenna mast. Has a remote AC power supply.”

“How about performance?”

“Two transistors give you all the power you need for better reception on VHF and UHF. Also protect against overload. Lists for \$49.95.”

“Supposing I don’t want to put an amplifier up on my antenna mast?”

“Then use the V/U-ALL2. Not as effective as the U/Vamp-2, but you don’t have to climb a ladder . . . and it delivers signals to two TV sets. Only \$42.50 list.”

“Guess I’ll rush down and get one of the new Blonder-Tongue UHF/VHF amplifiers.”

(This message was paid for out of the gross profits of
BLONDER-TONGUE, 9 Alling St., Newark 2, N.J.)

. . . for more details circle 16 on postcard

LETTERS TO THE EDITOR

Persian Observations

I am an Iranian (Persian) and one of only a few technically qualified technicians in Tehran.

I wonder if any of your readers would be willing to send some of their schematics to me for no return, unless they might be interested in Persian stamps. In this part of the world radios, TV sets and other electronic equipment are sold without schematics . . .

In your February 1965 issue (page 68) under “Tough Dog Corner,” Walter Anderson’s intermittent trouble requires some explanation:

In the first place, what are such huge capacitors (220 μf and 470 μf) doing bypassing screens and plates in an IF circuit?

Assuming that the intermittent Mr. Anderson discovered was shorting of these capacitors (of course, they were not intermittently open because open bypassers would not kill the entire video), and also assuming he did use a voltmeter prior to suspecting these huge bypassers, did he not find the plates and the screens of both stages at ground potential? If he did, what is so tough about this trouble? If he did not, how did he arrive at his conclusions?

Each time either or both guilty capacitors shorted out, it must have lasted some time or the owner would not have bothered to bring the set in. Again assuming that the longest time that one of these capacitors shorted out was one minute, in this one minute what would have happened to the 220 Ω resistor in series with the plate and screen of the 2nd IF? Could a half-watt stand more than a whole amp of current that long?

I personally have had more trouble with these bypassers than any other circuit component. But Mr. Anderson’s trouble seems a little unusual, especially with the values of the bypass capacitors.

VLADIMIR D. BET-EIVAZI
c/o USIS, American Embassy
Tehran, Iran

• All capacitor values shown in the schematic were not correctly indicated. Value indicators, of course, should have been pf instead of μf .—Ed.

Needs Jackson Schematic

I need a schematic and operating instructions for a Jackson Model 634 dynamic tube tester, serial No. 6415.

Have you tried new **QUIG**[®] connectors?

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

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

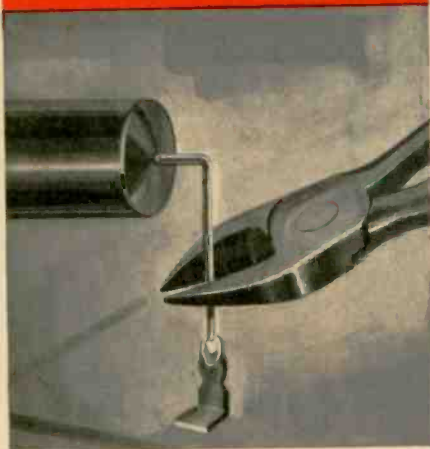
Mechanically sturdy and electrically reliable, the revolutionary QUIG provides fast, expertly-soldered connections as easy as A-B-C!



Ten times
actual size

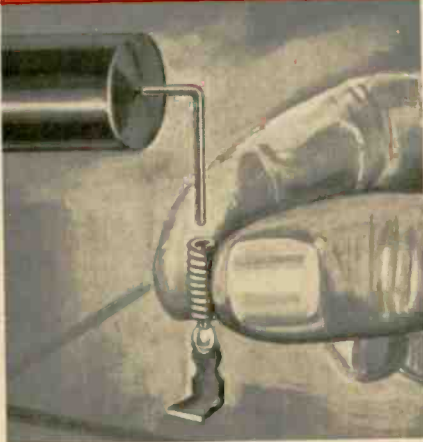
A

**Snip
Lead**



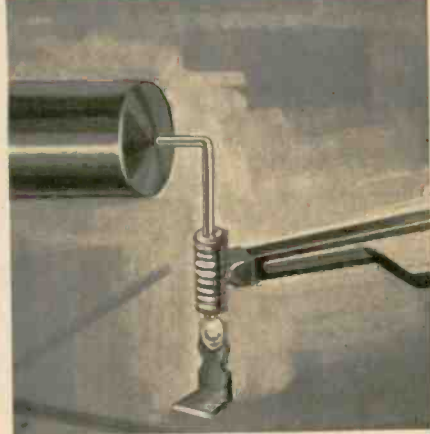
B

**Slip on
QUIG**



C

**Heat QUIG,
Connection Made!**



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

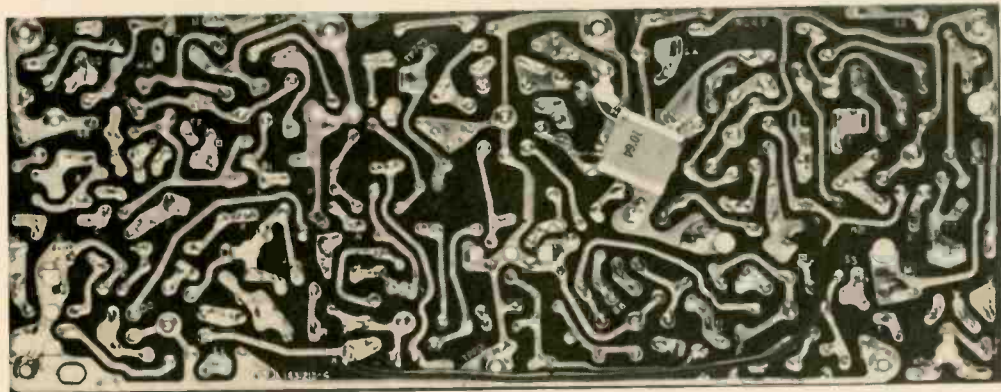
QUIGS are now being packed with Sprague Atom[®] Capacitors at no extra cost to you! Whenever you need tubular electrolytics, insist on pre-packaged Sprague Atoms from your parts distributor and you'll automatically get your QUIG component connectors . . . the biggest boon to the service technician since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

SPRAGUE[®]
THE MARK OF RELIABILITY

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

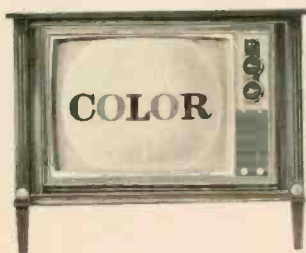
... for more details circle 44 on postcard

RCA Solid Copper Circuits



replace old-fashioned
"hand wiring"... RCA Solid
Copper Circuits are the
circuits of the space age

RCA Solid Copper Circuits are made by methods as modern as tomorrow. They give greater dependability . . . better TV performance. It's typical of the advanced design you'll find throughout every RCA Victor home instrument. It all adds up to sets that are easier to service so that owners are more satisfied with results.



The Most Trusted Name
in Electronics

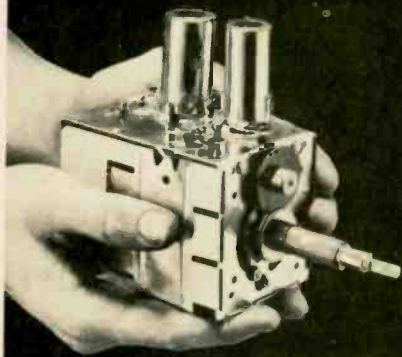
TM&C®

More TV servicemen own RCA Victor Color TV than all other leading makes combined



COMPLETE TUNER OVERHAUL

ALL MAKES—ONE PRICE



ALL LABOR AND PARTS
(EXCEPT TUBES & TRANSISTORS)*

995



VHF



UHF



COLOR



U-V



COLOR TUNERS



TRANSISTOR

Guaranteed Color Alignment—No Addit. Charge

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

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

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

Printers in TV Tuner Overhauling

CASTLE

TV TUNER SERVICE, INC.

MAIN PLANT: 5713 N. Western Ave., Chicago 45, Illinois
EAST: 41-92 Vernon Blvd., Long Island City 1, N.Y.
CANADA: 136 Main Street, Toronto 13, Ontario

*Major Parts are additional in Canada

... for more details circle 19 on postcard

EDITORS' MEMO

Another Facet of DIY

Service-dealers and technicians have complained for years about newspapers and mass-reader magazines "fogging-up" their status in the public eye. But, with few exceptions, little or nothing has been done by service-dealers and technicians as a group to change this situation except through "legislative" nostrums.

We are reminded of a few old "idea-provokers" that haven't been obsolete by space-age progress. They include "Charity begins at home," and "If you want the job done right, do it yourself."

And that brings us to an interesting speech which Vincent T. Wasilewski, president of the National Association of Broadcasters (NAB), made last spring. Said Wasilewski, "We believe that a society in which there is freedom of expression, freedom of belief, and freedom of competition is a supreme achievement. . . . But, "The freedoms we prize so highly themselves generate pressures tending to limit those freedoms. . . . Competition which is truly free and unrestricted permits, on the one hand, the growth of enormous combines which become so powerful as to endanger the freedom of all of us. . . . On the other hand, free competition can result in an excess of competitive zeal which in its lowest form deteriorates into deception and fraud."

Then he went on to say that wherever these "unfortunate side effects" occur, "there is a strong outcry for control. The public is offended; it seeks a remedy and the handiest remedy is legislative restrictions imposed by government."

For this reason, he said, there is only one position that American businessmen can take if they truly wish to remain free of further governmental control.

"We will accept not only the responsibility of our own individual actions, but also for the actions of our associates. . . .

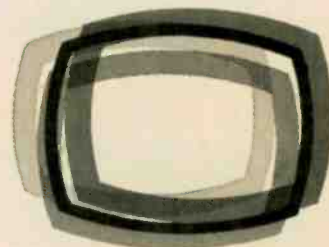
"If we do not, we abdicate the responsibility to the government."

And there you have it—in plain, simple language. If you won't clean up your own back-yard through self-regulative, joint effort; if you can't do it yourself, then you'll get licensing—which is no guarantee that your status will "automatically" improve in the public eye. If you want *guaranteed* results—DIY!

brand new
... and very important...

QUAM COLOR TV REPLACEMENT SPEAKERS PREVENT COLOR PICTURE DISTORTION

OFTEN CAUSED BY STRAY MAGNETIC FIELDS FROM ORDINARY LOUDSPEAKERS



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



QUAM RESEARCH SOLVES THIS PROBLEM

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

QUAM

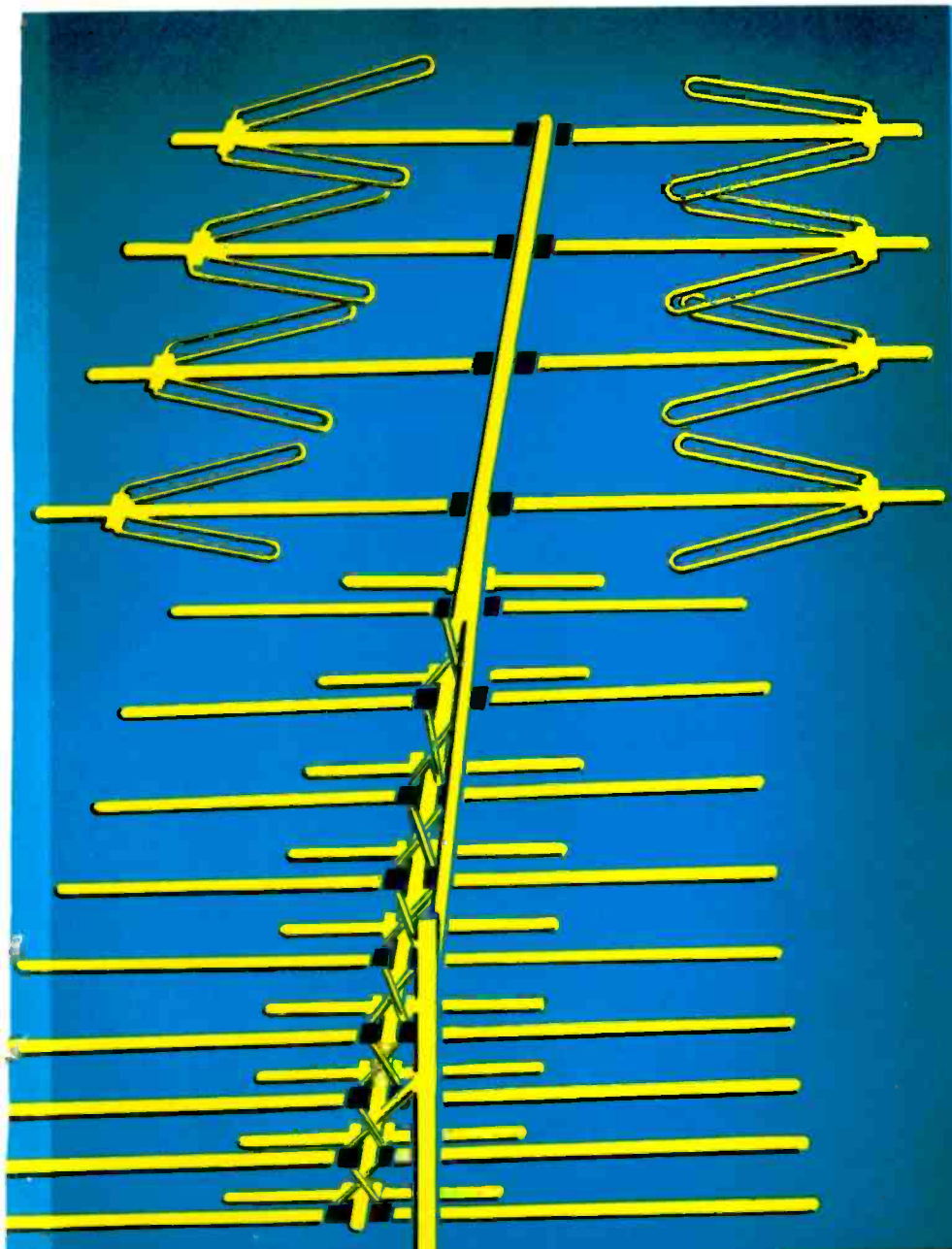
QUAM-NICHOLS COMPANY

234 E. Marquette Rd. • Chicago, Ill. 60637

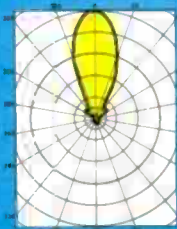
... for more details circle 37 on postcard
ELECTRONIC TECHNICIAN

Introducing Channel Master's new Color Crossfire Series

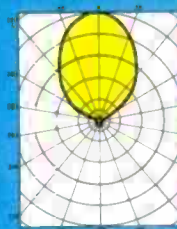
It does for color (and black-and-white) what no other antenna can. FM Stereo, too!



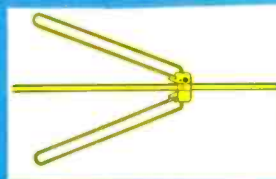
Up to 38% more TV gain...
up to 100% more FM gain...
than the Crossfire...



plus up to 16:1
Front-To-Back ratio
on each band



...plus the "cats whiskers"
the heart of the
Tri-Band Director System...
that further increase
broad-band
efficiency.



Also Available... 75 ohm Balun
Model 0035 which fits directly
on terminals of all Color
Crossfire models.

Now... the year of the big color boom... is the time to have a fresh look at color. Channel Master has done exactly that, and more. From the metropolitan area on out to the deep fringes, we've taken a new look at the whole TV picture—black-and-white included.

As a result, we've come up with the Color Crossfires—far and away the most powerful antennas in the world. (Yes, even more powerful than our Crossfires were).

Name an area. We'll show you a Color Crossfire that does more things better within that area—than they've ever been done before by any antenna. But where the Color Crossfire really shines is in color; it's especially engineered to beat the extra-tough problems typical of color reception.

No color suckouts! No dips. Perfect impedance match. Ghosts and interference—they're "murder" in color—are knocked out. (If you also sell color sets—this antenna keeps 'em sold). And new tapered length elements on the larger models make color reception possible in areas where even black-and-white is a problem with ordinary antennas. Naturally, an antenna so beautifully designed for color takes black-and-white in stride.

The unique (and inimitable) concept behind this total superiority is exclusively

Channel Master's—and it's remarkable. The Color Crossfire takes "Proportional Energy Absorption"—the famous "power principle" which has made the Crossfire the world's best selling antenna. And teams it with our equally unique Tri-Band Director System.

The Tri-Band Director System. Until now, this system could be found only in the Super-Crossfire. In effect, with its Phase Controllers, it simplifies and revolutionizes director design. By actually conserving director space, Channel Master is able to put more directors to work on the Color-Crossfire crossarm. The tapered director train gives the greatest power possible.

Upshot? Higher, cleaner gain than ever before—right across the entire broad band... including FM. The Color Crossfires have more driven elements working with greater efficiency than any other antenna.

More rugged than ever, too! A new "spacer" means easier, more durable installations, and prevents harness short-outs at crossover points, to insure permanent all-channel reception. Exclusive E.P.C. "Golden Overcoat."

Any wonder we've got these Color Crossfires covered by 3 separate patents!

CHANNEL MASTER
ELLENVILLE, N. Y.

To fit every area need... Channel Master makes a complete line of Color Crossfires. Plus a complete line of super-powered Booster-Couplers... and Super-Torque Rotators (automatic and manual).

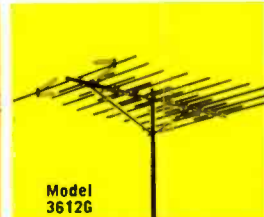
Model 3610G Color Crossfire
outperforms 28 Element
Model 3600G



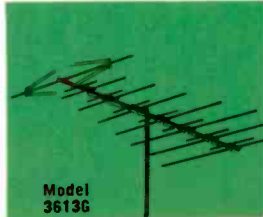
Model 3617G



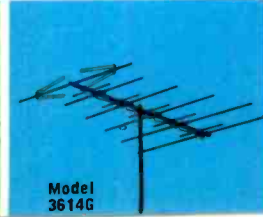
Model 3611G



Model 3612G



Model 3613G



Model 3614G



Model 3615G



Explosion

You may not have thought
it possible...but

The most successful* TV antenna of all time is now better than ever

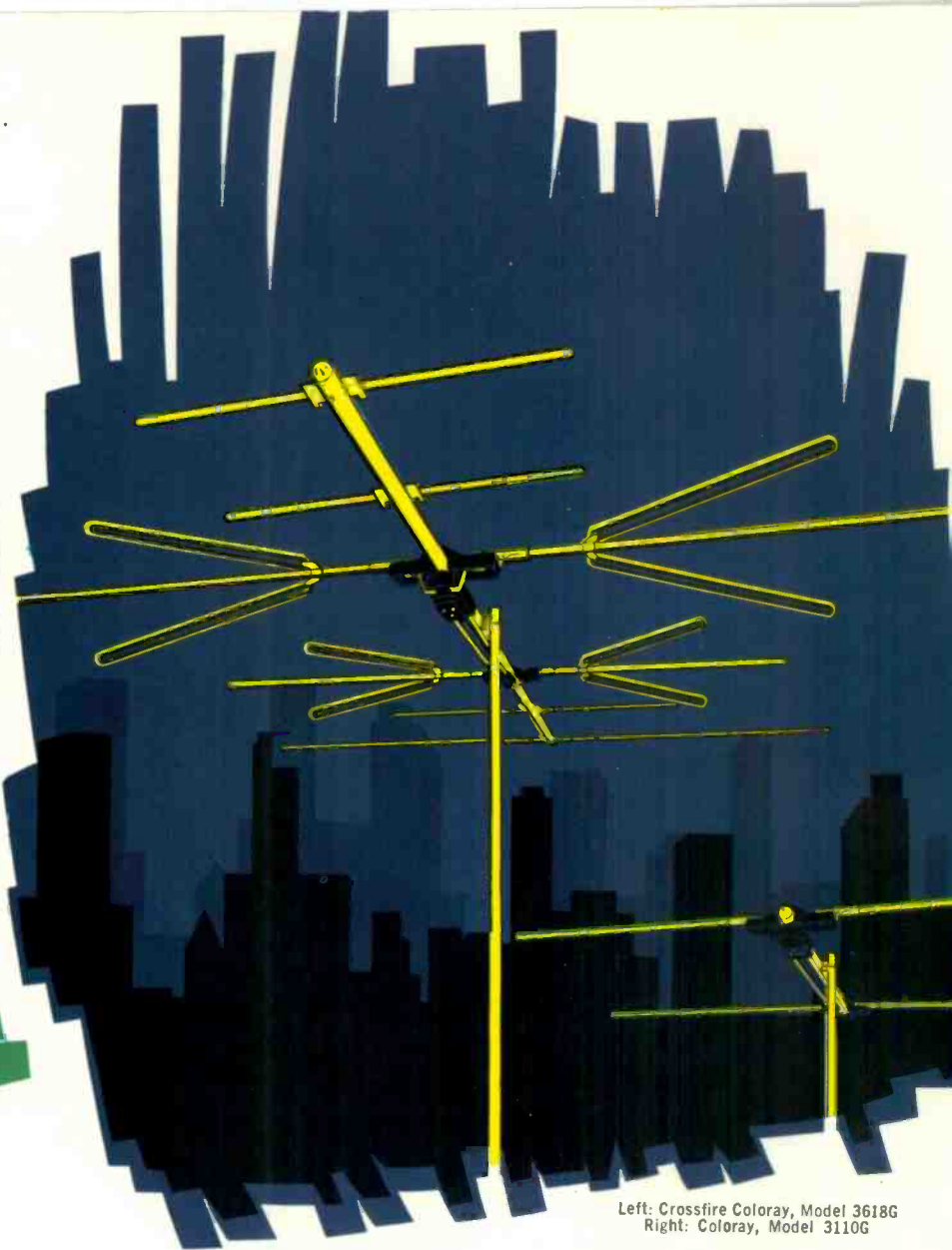
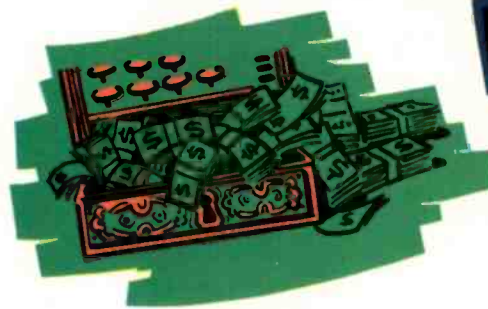
*More Crossfires have been sold than
any other antennas in TV history.

*Element for element no other antenna
has ever matched Crossfire performance.

TO KILL GHOSTS QUICK...
(any shade)



AND COLOR THIS GREEN...



Left: Crossfire Coloray, Model 3618G
Right: Coloray, Model 3110G

Paint the town with the new Channel Master CROSSFIRE **COLORAY**

VHF/FM STEREO BROADBAND ANTENNA SERIES

Famous Ghost-Killing Electronic Antenna Is Now Even Better! Money, money, money. You can make it real big with the Crossfire Coloray—an antenna that now combines the high gain characteristics of the famed Crossfire with the exceptional front-to-back ratio of an improved Coloray. It lets you do the best possible reception job in your specific metropolitan or suburban area . . . in color or black-and-white.

Two New Models Both With Unique Dual Impedance. Sell in a strong signal area? You'll want the Coloray. For weak-pocket signal areas, where extra gain and ghost-

killing power is needed, the Crossfire Coloray . . . will provide **31½ DB better front-to-back ratio than Coloray**, and **5 DB more gain**. Both models have 300 and 75 ohm impedance for perfect impedance match with either 300 ohm twinlead or 75 ohm coax.

Expensive Color Sets . . . don't bounce back when you sell the Coloray. They stay sold. And remember—an antenna made to murder color ghosts makes short work of the black-and-white kind. Get in the money. Cover your town with the Coloray.

Unique Power Equalizer Circuit. Provides front-to-back ratios up to 30 to 1. In color and black-and-white. Higher than 10-element yagis cut to each channel.

Exclusive 75 and 300 ohm impedance. Insures ideal color reception for MATV and co-axial home installations.

Exclusive E.P.C. "Golden Overcoat" protects against corrosion.

And who else makes this remarkable guarantee?

Coloray antennas are guaranteed to eliminate or minimize ghosts better than any other antenna type on the market regardless of size or price or your money back.

CHANNEL MASTER

ELLENVILLE, N. Y.



Now that the Excise Tax Cut Bill, HR8371, has been passed, it should help you sell more FM/stereo component and other consumer entertainment products. As a service-dealer, you have until around the first of the year or shortly thereafter to file your floor stock tax refund claims with manufacturers. The law provides that all such claims must be paid to you, either in the form of cash or credit, no later than February, 1966, according to information received from the Institute of High Fidelity.

Two capacitor assortments, molded tubular and dipped tubular, have been made available to service technicians. A custom, professional rubber stamp for imprinting service dealers' own four-line address and telephone number plus a large roll of 500 colorful pressure-sensitive "service-seller" stickers are included with each assortment. It's a Sprague product and available at your distributor.

The American Society of Certified Engineering Technicians received the following letter from Dr. William G. Torpey, Manpower Specialist, Executive Office of the President, Office of Emergency Planning, Washington, D.C.: "Congratulations to you and your organization on its first anniversary. ASCET progress during its first twelve months—with a membership which has already grown to nearly 1000—augurs well for the future, not only for the Society but also for the cause of engineering technology throughout the nation. Best wishes for the next twelve months—and many, many more months and years to come." ELECTRONIC TECHNICIAN has forwarded approximately 800 reader-inquiries to ASCET during the past nine months.



A fully-illuminated tape recorder floor stand display is designed to turn seven sq ft of space into a complete tape recorder department. The unit has built-in electrical outlets for on-the-spot demonstrations. It is constructed of square chrome-plated tubing and lacquered display board. Available to Norelco dealers at a cost of \$35, fully chargeable to cooperative advertising funds. Contact North American Philips, 100 E. 42nd St., New York, N.Y. 10017.

"Everybody's Tape Recording Handbook" is a 24-page booklet that discusses tape recording in all its aspects. It covers selecting magnetic recording tape, tips on recording, care of tapes, choosing a tape recorder, and

**top money maker in
the service business**



NEW IMPROVED SENCORE CR133 CRT CHECKER & REJUVENATOR

The new, improved CR133 CRT Checker is designed to test all present picture tubes—and it's ready for future tubes too! Two plug-in replaceable cables contain all sockets required. The compact, 10 lb., CR133 checks CRT emission, inter-element shorts, control grid cut-off capabilities, gas and expected life. Checks all tubes: conventional B&W, new low drive B&W, round color tubes and new rectangular color picture tubes. Exclusive variable G2 Volts from 25 to 325 Volts insures non-obsolescence when testing newly announced "semi-low" G2 CRT tubes. New Line Voltage Adjustment insures the most accurate tests possible. Uses well-filtered DC for all checks to avoid tube damage and reading errors. Color guns are individually tested as recommended by manufacturers. Exclusive automatically controlled rejuvenator applies rejuvenation (ACR) voltage as required by individual tube condition; precisely timed to prevent over-rejuvenation or tube damage. The ACR feature is most useful for color tube current equalization to insure proper tracking. Hand-wired and steel-encased for protection of meter and panel in truck or shop, the new improved CR133 is only . . . **\$89.95**

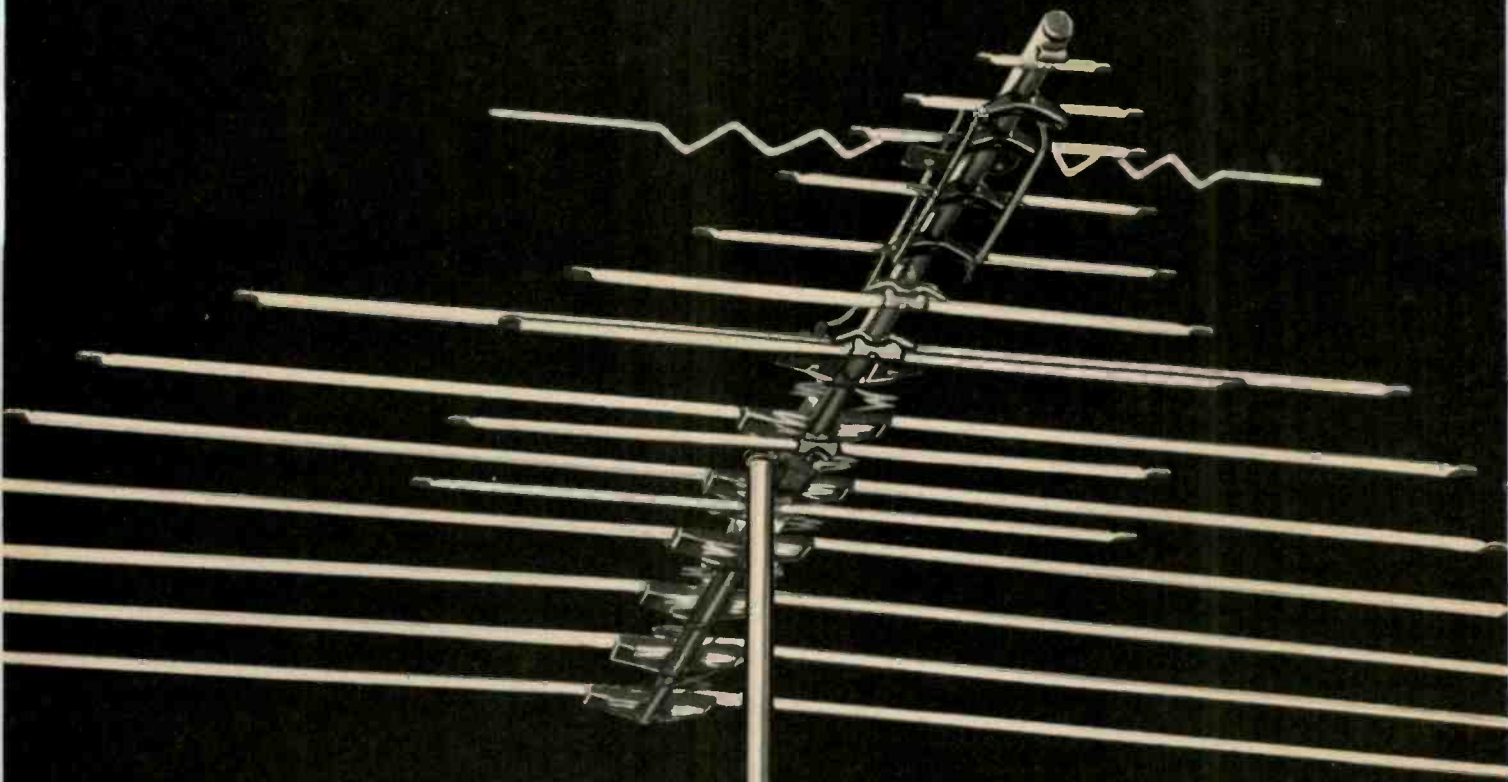
The famous CR128 CRT Checker and Rejuvenator is similar to above, but with a three position G2 slide switch and without Line Voltage Adjustment at \$69.95

professional quality — that's the difference!

SENCORE

426 SOUTH WESTGATE DRIVE • ADDISON, ILLINOIS

. . . for more details circle 42 on postcard



HOW DID
WINEGARD
PUT
FULL SIZE
POWER IN A
1/2 SIZE ALL-BAND
(UHF-VHF-FM)
COLOR
ANTENNA?

WITH
WINEGARD
CHROMA-TEL

the new
super-compact high
gain antenna
designed specifically
for all-band UHF-VHF
Color Reception and FM

A big disadvantage of most all-band (UHF, VHF, FM) antennas is that they are larger and heavier than necessary. This is because they are really VHF antennas with UHF antennas tacked on the front end. *Chroma-Tel isn't*. It's super-compact and the

first integrated antenna designed specifically for all-band UHF-VHF color operation.

How did we reduce the size so drastically without sacrificing performance?

Two ways. First with our new *Chroma-Lens*

Director System. With this unique system, we are, for the first time, able to intermix both VHF and UHF directors on the same linear plane without any sacrifice of performance.

Second, with *Impedance Correlators*. These are the special phasing wires that automatically step up the impedance of Chroma-Tel's 72 ohm driven elements to 300 ohms. The correlators make sure each element has an accurate 300 ohm impedance at its given frequency. No other antennas with multiple driven elements have this! They also allow us to place the elements *only 5 3/4"* apart instead of 10" to 14" apart as on other all-band antennas, reducing antenna length by one-half.

With the new Winegard Chroma-Tel antenna, we have eliminated *half* the bulk, *half* the wind loading, *half* the storage space, *half* the truck space, and *half* the weight ... yet still have the best working, easiest installing UHF-VHF-FM antenna ever developed!

You give your customers a neater installation that performs as well or better than any other all-band antenna on the market ... and at a much lower price.

Compare Performance. You can't find an all-channel UHF-VHF-FM antenna that will give you better results than Chroma-Tel. Look at the polar patterns. There are no side lobes with Chroma-Tel because the elements are straight ... unlike V'd elements that offer an element surface sideways to the signal, Chroma-Tel's straight ele-



Exclusive Winegard Impedance Correlators insure 300 ohm impedance on each element

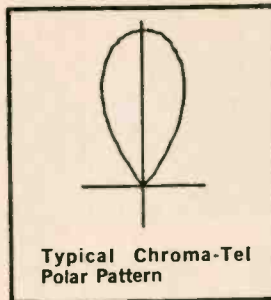
ments will not pick up ghosts from sides or back. Chroma-Tel's front-to-side ratio is practically infinite—Chroma-Tel's exceptional front-to-back ratio is up to 30 db.

Compare Construction. The Chroma-Tel is Winegard quality throughout ... from its sales-making compact 4-color box, to its weather resistant Gold Vinylized Finish, to its first quality snap-lock hardware.

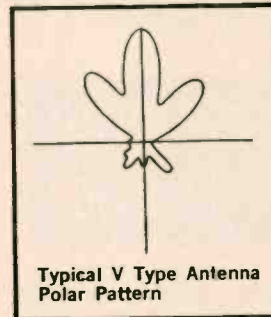
For complete information on the exciting new Winegard Chroma-Tel All-Band Antenna, ask your distributor or write for Fact-Finder #242 today.



So compact it fits in the back seat of a car



Typical Chroma-Tel Polar Pattern

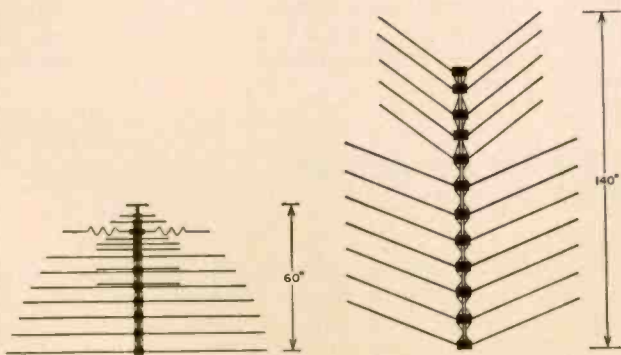


Typical V Type Antenna Polar Pattern

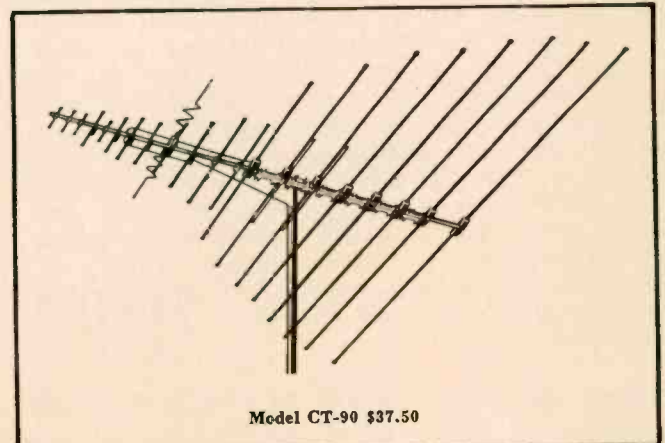


All Chroma-Tels include Winegard's model CS-283 UHF-VHF signal splitter. Splitter hangs conveniently behind TV set. Separates UHF and VHF signals coming from antenna to the two sets of terminals on your set. It's yours FREE when you buy Chroma-Tel.

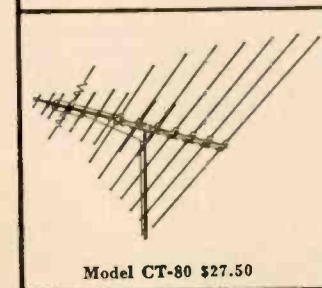
Compare Size and Price. We've illustrated the super-compact Chroma-Tel CT-80 and a comparable V type antenna. Note the difference in size, price and weight for equal or better performance. Because it's even much smaller than ordinary VHF antennas of comparable performance, it is perfect for attic installations, too!



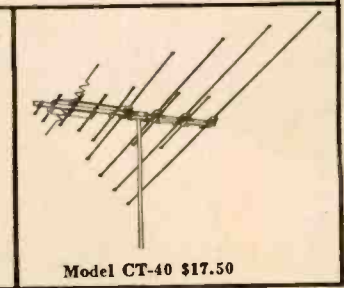
Winegard Chroma-Tel	V type (Approximate Figures)
Boom Length: 60"	140"
Total Weight: 5 lb., 1 oz.	10 lb., 3 oz.
Carton Size: .97 cu. ft. (less than 1)	5.8 cu. ft.
Number of Elements: 17	12
List Price: \$27.50	\$50.00



Model CT-90 \$37.50



Model CT-80 \$27.50



Model CT-40 \$17.50

Winegard Co.
Antenna Systems

3000 Kirkwood • Burlington, Iowa

... for more details circle 50 on postcard

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



THE ALL NEW SENCORE CG135 DELUXE TRANSISTORIZED COLOR GENERATOR

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

\$149⁹⁵

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

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

professional quality — that's the difference!

SENCORE

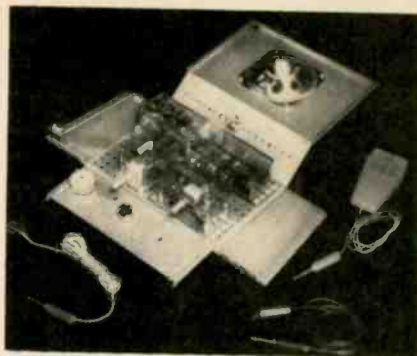
426 SOUTH WESTGATE DRIVE • ADDISON, ILLINOIS

... for more details circle 43 on postcard

SYNC ON BUSINESS



caring for a tape recorder. You can use this booklet to build your business. Write on your letterhead or inclose business card to Magnetic Tape Div., Sarkes Tarzian Inc., East Hillside Drive, Bloomington, Ind.



Business-minded independent service - dealers are being promised "new money in their pockets" with a hot item that could not be more timely. Prefabricated electronic "building blocks" designed for walk-in do-it-

yourselfer quick sales can be assembled in minutes with only a screwdriver. And if a customer doesn't feel so sure of himself, you can do a fast custom-installed job in minutes with these units. They include home intercom systems, nursery monitors, remote control actuators and piped-in music—as some of the 20 projects available. They should go well all year round—particularly in the months before Christmas. See your jobber or contact International Rectifier Corp., 233 Kansas St., El Segundo, Calif.

A special hotel/motel TV set is made by Sylvania Electric Products Inc. The number is 19T51GY and it is equipped for either a 75 or 300 Ω antenna.

Accurate resistors in a range of values can be easily made up by using resistance wire kits available from Quality Electric Co. of Los Angeles, Calif. Each spool of wire is clearly marked in ohms-per-ft and requires only a ruler to achieve good accuracy.

A miniature selenium rectifier for radio and phono service is available from International Rectifier Corp.'s 800 distributors. The T065U's are rated at 65 ma dc output and 130 v maximum RMS input. At I-R distributors.

Industrial timer information is available from G-E, Schenectady 5, N.Y. Ask for GEA-7668.

A special \$1 offer is being made to TV-radio service-dealers who use-test an indoor antenna that retails for \$4.95. The manufacturer offers to return the \$1 to any service-dealer who finds the antenna fails to meet manufacturer's claims. You have to send the dollar with business card or letterhead direct to Snyder Mfg. Co., Westmoreland and Stokley Streets, Philadelphia, Pa. 19140.

Universal color TV replacement rectifier kits, part number 16-500, are made by GC Electronics. Available at your jobber.

Congress DIDN'T GO FAR ENOUGH!

PUBLIC LAW 87-529; 76 STAT. 150

[H. R. 8031]

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

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

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

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

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

THEY SHOULD HAVE ALSO REQUIRED...

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

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

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

Who says you can't have everything

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

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

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

ance characteristics regardless of channel or band tuned.

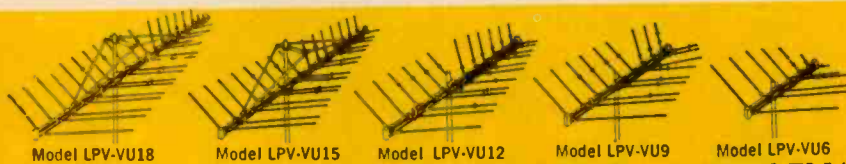
- Includes 3-way splitter so single down-lead can be tied into individual VHF, UHF and FM system inputs.

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

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

JFD

SEE YOUR DISTRIBUTOR OR
WRITE FOR BROCHURE 806



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

Licensed Under One or More of U.S. Patents 2,958,081; 2,985,879; 3,011,168; 3,108,280; 3,150,376 and Additional Patents Pending in U.S.A. and Canada. Produced by JFD Electronics Corporation under exclusive license from the University of Illinois Foundation.

JFD ELECTRONICS CORPORATION

15th Ave. at 62nd Street, Brooklyn, N.Y. 11219
JFD Electronics-Southern Inc.
Oxford, North Carolina
JFD International
64-14 Woodside Ave., Woodside 77, N.Y.
JFD Canada, Ltd.,
51 McCormack Street, Toronto, Ontario, Canada

... for more details circle 30 on postcard

TECHNICAL DIGEST

EMERSON

TV Chassis 12077 — Circuit Descriptions and Operations (See TEKFAQ No. 938 July 1965 ELECTRONIC TECHNICIAN)

Video Amplifiers: The video amplifier Q9 is an NPN silicon transistor operating from a collector supply voltage of +160v. This voltage is obtained by rectifying the pulse tapped off the primary of the high voltage transformer. In the absence of a signal from the video detector, the video amplifier is biased to conduction so that its collector voltage is approximately +20v. This bias is applied to the emitter from the voltage division of resistors R55 and R59. The resulting negative base voltage is partially counter-balanced by the flow of current through R50 so that the voltage across the video detector diode remains practically at zero. This biasing arrangement, in the absence of signal, reduces the video amplifier gain and no snow appears on the CRT. If the voltage is too high, the maximum available video drive is reduced.

As the negative going signal is applied to the base of the video amplifier, the sync tips drive the video amplifier toward cutoff and appear at the collector as a positive going signal, which is then applied to the cathode of the CRT through C44.

The collector of the video amplifier supplies 4.5 Mc to the audio IF amplifier through transformer T7. This transformer also acts as a trap to reduce the amount of 4.5 Mc beat interference visible in the picture. The video amplifier also supplies a sync positive signal to the AGC amplifier and the sync separator.

4.5 Mc Sound IF: The 4.5 Mc audio is amplified and limited by two stages, with the limiting done principally by the second stage.

The FM audio detector is of the conventional discriminator type and except for the impedance of the circuit, it looks very much like the types used in tube receivers.

Audio: This receiver utilizes a class "A" audio system consisting of a driver and an output stage capable of delivering 500 mw of undistorted output. The input stage operates between B- and chassis ground. The collector of this stage is directly coupled to the base of the output transistor which operates between B- and B+ with B- applied to the emitter through R21 and B+ applied to the collector through the primary of the output transformer. B+, in this circuit, is +24v and B- is -32v. This difference of potential of approximately 50v is across the collector-emitter junction, with the collector positively biased with respect to the emitter. This arrangement improves the efficiency of the audio system and keeps the total current drain down to a minimum.

AGC Amplifier: The sync positive signal from the collector of the video amplifier is divided down towards the -18-v bus, by the combined resistance of R56, R57A and R58, resulting in a voltage only slightly higher than chassis potential. The signal is then taken off the variable arm of R57A and applied to the base of the AGC amplifier. The emitter of this NPN transistor is connected to a secondary winding of the high voltage transformer, at which point there exists a 7-v negative pulse. This pulse is attenuated by R54 before application to the emitter of the AGC amplifier. With relatively low levels of sync positive (low antenna signal) applied to the base, this transis-

tor will be cut off. In this off state resistors R53, R40, R32 and R31 divide the +150 v to +5 v for the tuner AGC and +3 v for IF AGC, resulting in maximum gain for these sections. If a stronger signal is received, resulting in higher levels of sync positive at the base of the AGC amplifier, the transistor will turn on, but only if these positive sync tips coincide with the negative horizontal pulse at the emitter. With the transistor conducting, the 150 v will be divided down to a lower level than previously, resulting in lesser voltages for both tuner and IF AGC. These lower AGC voltages will decrease the gain of both the tuner and the first two IF stages. R57A controls the amplitude of the positive sync tips applied to the base of the AGC amplifier and is adjusted for maximum video drive without overload. Buzz is usually the first sign of overload.

GENERAL ELECTRIC

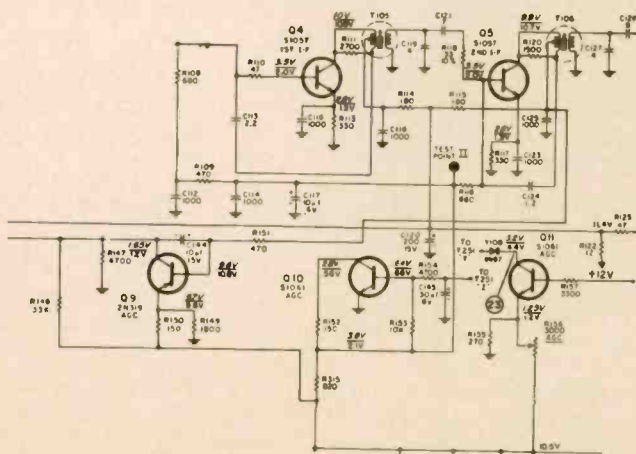
TV Chassis TA, AGC Stages — Circuit Operation

The tuner RF transistor and the 1st and 2nd IF amplifier transistors, Q4 and Q5, are biased to operate such that an increase in emitter current reduces the gain.

Since these three transistors are NPN types, current is increased by making the base voltage more positive and gain is thereby decreased.

Q11 has a pulse from the horizontal output transformer impressed on its collector and a positive-going composite video signal on its base. Q11 will therefore conduct during the sync pulse interval and its conduction will change in relation to the sync pulse level which is proportional to the signal strength.

For an increase in signal, Q11 will conduct heavier causing the voltage across R153 and R154 to increase.



This decreases the voltage on the base of Q10 causing its conduction to decrease. A reduction in the collector current of Q10 raises the positive voltage at the junction of R152 and R315 which is the AGC voltage impressed, through RC filters, on the bases of Q4 and Q5, the 1st and 2nd video IF amplifier transistors. Since this is a rise in the forward bias of those two stages, the gains will decrease.

In addition to reducing the IF gain, the RF gain will

NOW! OVER 2700 REPLACEMENTS

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

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

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

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

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

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



The Most Trusted Name in Electronics

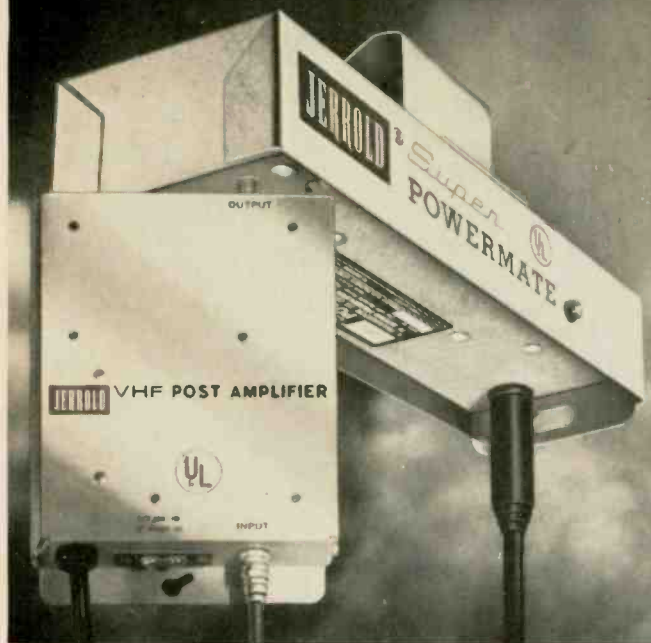
"Top-of-the-Line Replacement Transistors"

SK-3003	npn type, AF Driver and Output Stages (9 V Supply)	SK-3010	npn type, AF Driver and Output Stages of Broadcast Receivers
SK-3004	npn type, AF Driver and Output Stages (15 V Supply)	SK-3011	npn type, RF, IF, and Converter Stages of Broadcast Receivers
SK-3005	npn type, RF, IF, and Converter Stages of Broadcast Receivers	SK-3012	npn type, Audio Output Stages of Auto Radios
SK-3006	npn type, RF, IF, and Converter Stages of FM and AM/FM Receivers	SK-3013	Matched pair of SK-3009
SK-3007	npn type, RF, IF, and Converter Stages of All-Wave Receivers	SK-3014	Drift Field type for Output and Driver Stages of HI-FI equipment
SK-3008	npn type, RF, IF, and Converter Stages of Auto Radios	SK-3015	Matched pair of SK-3014
SK-3009	npn type, Audio Output Stages of Auto Radios	SK-3016	Silicon Rectifier for color, B/W TV, Radios, Phonographs
		SK-3017	Silicon Rectifier for color, B/W TV, Radios, Phonographs



... for more details circle 39 on postcard

**5 Transistors
No Tubes
30 db Gain***



**NEW JERROLD
ALL-SOLID-STATE
"DE-SNOWER" Model SPC-132**
...the most powerful
of all antenna amplifiers

Do you remember the original and famous Jerrold De-Snower? Thousands of De-Snower preamplifiers have served fringe-area antenna systems since 1950, amplifying weak television signals at the antenna before download loss. Now every benefit of the original De-Snower, and more, is offered by the new SPC-132 all-solid-state antenna amplifier.

Jerrold has combined the ultra-sensitive twin-transistor preamp, SPC, with a compact three-transistor postamp, 132, to give you the powerful double-punch performance of this unusual new antenna amplifier—with absolutely no tubes to replace.

30 db high-band gain* • 26 db low-band gain*
• Lowest input noise figure • Highest output capability (100,000 microvolts each of 7 channels)

Use the SPC-132 on your next "tough-dog" antenna system—custom home or multi-set installation. Drive as many as 20 to 30 sets from one antenna system.

Only \$97.95 list. Ask your Jerrold distributor or write Jerrold Electronics, Distributor Sales Division, Philadelphia, Pa. 19132.

*Measured average production unit

The nation's foremost manufacturer and supplier of television antenna systems and equipment



... for more details circle 29 on postcard

TECHNICAL DIGEST

also be reduced through the action of Q9.

Q9, a PNP transistor, will conduct heavier when its base becomes less positive, producing a higher positive voltage across R147. The voltage across R147 is set for low signal levels by its divider action with R148. This sets the level of I_E .

As Q5 conduction is increased to lower its gain, the voltage across C125 decreases. Since this voltage is impressed on the base of Q9 through R151, Q9 will increase its conduction, drawing more current through R147 and thereby raising the RF AGC voltage. Since the RF transistor, like those in the IF, is biased to go down in gain with an increase in conduction, the increased AGC voltage on its base will increase conduction and reduce its gain.

MOTOROLA

Color TV Chassis WTS-907 or TS-908—Service Experience Information

Symptom: Set overloads when tuned to strong signals.

Solution: Replace 0.02 μf capacitor, C124.

Symptom: Color indicator light will not stay lit during entire hue control rotation. **Solution:** COLOR KILLER control incorrectly adjusted and should be readjusted.

Symptom: Insufficient brightness. The customer brightness control does not have sufficient range to cause the HV to go off the regulator even when the master GI control is full clockwise. **Solution:** This could result from a loss of blanker pulse on the color difference amp's or from a contrast control that has increased in value. One case of blanker malfunction has been traced to an open R920.

Symptom: Severe vertical fold-over. **Solution:** Replace 0.0033 μf capacitor, C602.

Symptom: Vertical buzz in sound, frequency varies with vertical hold control. **Solution:** Dress all leads away from the audio leads at the point they enter the 12 pin plug underneath the chassis. The audio cable is the one with two leads inside one shield.

PHILCO

Color TV Chassis 15M91—Field Service Information

Sound IF Padding: In the event of sync buzz in the audio, check (L2) interstage transformer bottom core for maximum output. The bottom core of L2 can be peaked at two different settings. The proper setting should be with the bottom core closest to the circuit panel. The bottom core can be adjusted from the top of the transformer without the need to pull the chassis.

Proper Lead Dress, Sound Det. RFC (L40): RFC L40 located on the video IF panel between lugs M72 and M73 must be dressed up and away from the bottom of the circuit panel. If it is dressed against the panel, some evidence of sync buzz may occur when tuning toward smear.

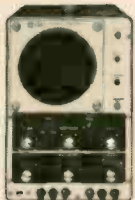
Vertical Bands or Lines During Blank Raster: The purple lead running from lug M36 on the chroma panel to socket J1 pin 8 should be dressed away from the delay line (DL1) and copper on circuit panel where lug M33 connects to RL network N3. Proper dressing of this lead should remove the vertical bands from the raster during the absence of video.



SAVE MOST ON DEPENDABLE
TEST INSTRUMENTS

BUILD YOUR OWN QUALITY

knight-kits®



KG-635 5-Inch DC to 5.2 Mc Wideband Oscilloscope Kit. \$99.95



KG-625 6" VTVM Kit with 1/2-Volt Full-Scale DC Range. Includes probe. \$36.95



KG-375 Solid-State Universal Auto Analyzer Kit. \$49.95



KG-650 RF Signal Generator Kit—wide-range, extremely stable. \$23.95



KG-201 Solid-State Motor Speed/Light Control Kit. \$9.95

See dozens of other great Knight-Kits: Stereo Hi-Fi, CB, Short-Wave, Amateur, Automotive, Test Instrument, Intercom—easiest to build, and the savings are substantial.

YOUR COMPLETE SUPPLY SOURCE: One order to Allied fills the whole bill for all the electronic parts and servicing equipment you need.

EASY TERMS

Use the convenient Allied Credit Fund Plan—over 24 months to pay

ALLIED RADIO

Everything for the Electronics Service Technician

FREE

ALLIED

1966 CATALOG

send for it today!

508 VALUE-PACKED PAGES

Everything for the
ELECTRONICS TECHNICIAN

World's Largest Stocks of
Electronic Parts

TV Tubes, Antennas, Accessories
Replacement Tubes & Transistors

Test Instruments & Meters

Servicing Tools & Hardware

Automotive Electronics

P.A. & Intercom Systems

Everything in Stereo Hi-Fi

Tape Recorders & Tape

2-Way CB Radio

**PROMPT SHIPMENT FROM STOCK
FOR ALL YOUR SERVICING NEEDS**

MAIL COUPON TODAY

send for
**FREE
CATALOG!**

ALLIED RADIO, Dept. 28-H
100 N. Western Ave., Chicago, Illinois 60680

Send FREE 1966 Allied Catalog.

Name _____
PLEASE PRINT

Address _____

City _____ State _____ Zip _____

... for more details circle 11 on postcard

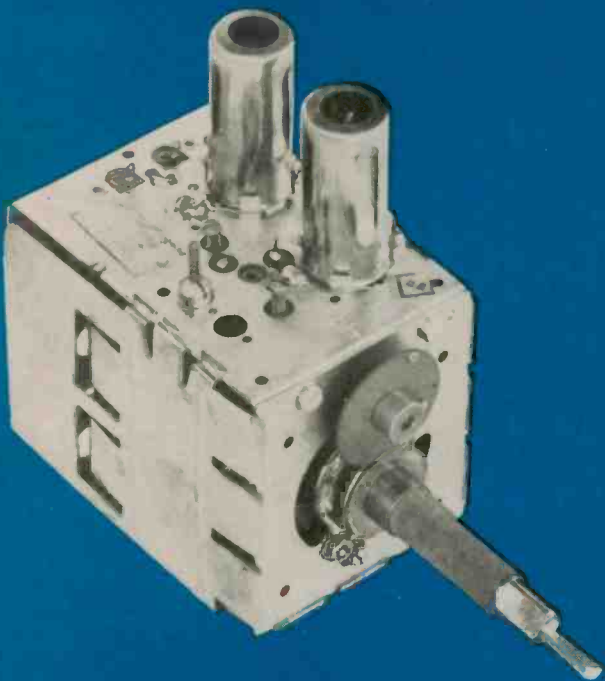
TUNER REPAIRS

\$9.50

FOR COMPLETE OVERHAUL

**Includes ALL parts (except tubes)
ALL labor on ALL makes**

**24-HOUR SERVICE with
FULL YEAR WARRANTY**



Sarkes Tarzian, Inc., largest manufacturer of TV and FM tuners, maintains two completely-equipped Service Centers to serve YOU. Both centers are staffed by well-trained technicians in this specialized field and are assisted by engineering personnel to assure you of FAST, DEPENDABLE service.

Ⓢ Tarzian-made tuners—identified by this stamping—received one day will be repaired and shipped out the next. A little more time may be required on other makes. Every channel is checked and re-aligned per manufacturer's specifications, not just the channels which might exist in any given area.

You get a 12-month guarantee against defective workmanship and parts failure due to normal usage. Cost to you is only \$9.50 and \$15 for UV combinations, including all labor and parts except tubes. No additional costs. No hidden charges. All tuners repaired on approved, open accounts. You pay shipping. Replacements on tuners beyond practical repair are available at low cost.

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



SARKES TARZIAN, INC.

TUNER SERVICE DIVISION

See your distributor, or use the address nearest you

537 South Walnut St.,
Bloomington, Indiana
Tel: 332-6055

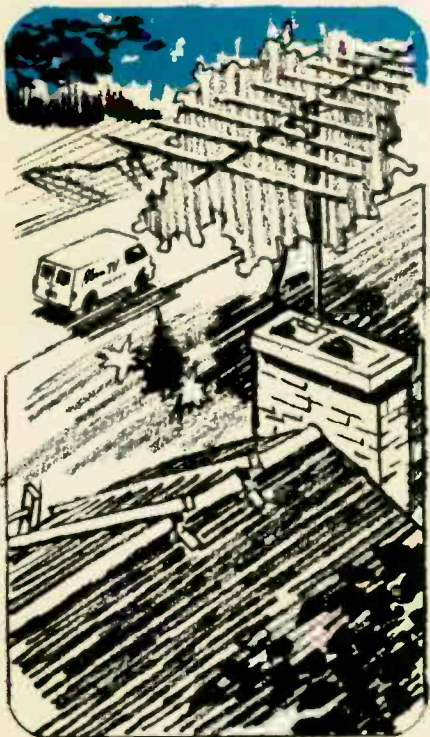
10654 Magnolia Blvd.,
North Hollywood, Calif.
Tel: 769-2720

Manufacturers of Tuners . . . Semiconductors . . . Air Trimmers . . . FM Radios . . . AM-FM Radios . . . Audio Tape . . . Broadcast Equipment

ONE MAN CAN ERECT FRINGE AREA ANTENNAS

Meet competition and make
a good profit on elaborate
antenna installations

by Dennis Crisp



Part I

■ Typical rural or small town communities, a hundred miles or more from a TV or FM transmitting station, will frequently be serviced by one or more small, independent one- or two-man shops. Elaborate antenna installations are required in these fringe- or deep-fringe areas for satisfactory TV reception — particularly for good color reception. And these installations cost the TV viewer considerable money — in some cases *more* than the TV set. But in most situations, *one* experienced, well-equipped technician can handle these jobs efficiently, meet competition and make a good profit on the installation. A planned approach can eliminate the need for two men or the necessity of hiring an untrained part-timer who will cost considerable money.

If you go into this kind of work, however, make sure you do the job well and use the best antenna equipment and accessories you can buy. Don't be tempted to indulge in "shortcuts" or use "bargain-counter" material. Since most situations will differ because of distance to the transmitting station, terrain, proximity of obstructions, and the limited amount of money some customers can afford to spend, always give your customer a simple, direct explanation for everything that you do. If a complaint arises about the

price, show him what he is getting for his money and why. If you follow these guide-lines the TV owner will rely on your judgment when further service is required. Remember, sooner or later you may be called on to repair damages done to the installation by unusual windstorms, winter icing or you may even be asked to move it.

Let's proceed to a typical location and make a preliminary survey. Our hypothetical installation site is between TV stations in two directions about 75 and 100 miles away. The terrain is fairly open, flat countryside — a small-town residential area with one- and two-floor houses having lawns and trees and power lines around them. You know from the beginning that you'll need a rotator. And if no UHF stations are telecasting or planned in this area in the near future, you can make a rough "guesstimate" that a good high-gain VHF broad-banded yagi- or log-periodic type antenna, mounted about 40 ft above ground level, will give optimum results.

But if you are not thoroughly familiar with the area — don't already know what a given antenna will do here and you do have field-strength measuring equipment — then measure the signal first. You should have 100 μV from each channel received on whatever an-

tenna you use or plan to select and at the height you intend to erect it. You can measure the signal either from near ground level on your field-strength meter and adjustable half-wave dipole or temporarily run up the antenna you plan to use and measure the signal direct. If you measure the signal on the field-strength setup near ground level, of course, you'll have to calculate or estimate (if you've had previous experience in the area) what your signal-strength will be on the antenna you intend to use at the height you plan to mount it. But don't forget to make allowances for lead-in



losses during wet weather based on whatever kind of lead-in you intend to use. In this business it is helpful to know the db loss of your lead-in, wet vs dry, and the db gain of your antenna on each channel you plan to receive. This data is available from manufacturers' literature. We assume here that you already have a reasonably good idea about the antenna you plan to use, based on previous experience in your neighborhood, so we will concentrate primarily on mast, accessories and installation problems.

Mast and Accessories

Select a good, heavy-duty, corrosion-resistant tubular telescoping-type mast. A 40 ft mast in four sections is best. A 50-ft, five-section mast is about maximum height for one man to handle safely. For house top mount, 30-ft, three-sections is maximum. For the customer who

needs or can afford to go higher, switch to the triangular, telescoping, crank-up tower. And if a customer insists that you use left-over gas or water pipe he has on hand, then run — don't walk — back to your shop, and don't look back. Pick a mast with "L" locking screws. Nothing can be more frustrating and time consuming than a rusty slotted set screw that won't let go. And you will find that the heavy, corrosion-resistant tubing will slip up and down easily year after year even in a strong breeze.

You have a number of rotors to select from. My setup calls for the offset type with thrust bearing mounted above the rotor. If the rotor should require shop work I can drop it off the mast and leave the antenna supported temporarily by the thrust bearing.

Select a good guy-wire. A 6x18 stranded, corrosion-resistant or hardened aluminum alloy, depending on the antenna price, is best.

Various types of wall brackets are available. I keep a few which have two-in. clearance and some with eight-in. clearance for older type overhanging roofs. Heavy three-in. screweyes are adequate for guy anchoring in most cases on installations up to 50 ft. Used harrow discs with a 1/2 in. pipe stake driven through the center hole make a quick ground mount base for your mast. A want ad in your local paper





will bring farm boys in with bushels of them at 50¢ apiece.

When you find a mast, antenna or other equipment that fits in best with your particular operation, stick with it until something better is made. If you standardize your installations and procedures, you'll save much time.

The large, single flat-top, all channel antenna suits my operation best. The antenna I use folds and unfolds easily, locks positively, and has a folded dipole for easy lead-in continuity checking. And if your favorite antenna doesn't have locked terminal bolts, put lock nuts on it before you put it up. If it has *sheet aluminum* wing nuts on the lead-in terminal bolts, replace them with *machined* types. You'll bless your foresight the first cold, drizzly day you have to replace a lead-in.

You can buy repair parts for any good brand of antenna or rotator. Keep parts on hand that you routinely need after a wind or electrical storm. And by using the same types consistently you will find your "bone pile" a good source for parts.

Tools You'll Need

Your one-man installations will be made easier and quicker and thus more profitable if you have the proper tools on hand. You'll need the usual array of hand tools. A 36-ft extension ladder will put you on

top of most two story houses. Two 16-ft straight aluminum ladders with roof hooks are necessary. But make sure you don't go poking aluminum ladders around poorly insulated power lines. Additionally, a 10-ft aluminum ladder is helpful. You'll need it for those roof-mounted telescoping masts and for getting underneath low overhanging eaves. One 5 or 6 ft stepladder will round out the ladder department. You'll need it for a multitude of jobs, including driving tee-posts for ground-mounted guy anchors.

Other tools include: $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{3}{16}$ in. bits to drill starting holes for screweyes and mounting brackets. A battery-powered hand drill is ideal for this work. If you don't have one, you'll need a good heavy extension cable long enough to run into the house or garage for power.

Your most-used tools will be a pair of heavy, 6-in. side cutting pliers and a pair of slip-joint (water-pump) pliers for opening and closing standoff insulators and to substitute for vise, pipe wrench, the socket wrench you left at the shop, etc. Add to this $\frac{1}{4}$, $\frac{3}{8}$, $\frac{7}{16}$ and $\frac{1}{2}$ in. hex wrenches. A sledge hammer, crowbar and a short chain for pulling tee-posts when moving antennas are others you'll need. A $\frac{1}{2}$ in., 75 ft length of rope with a single pulley equipped with a sliding-lock swivel snap, a prop made of two 1 x 2 in. x 5 ft pieces of lum-

ber to support mast while assembling antenna just about rounds out the tool list.

Comfort and Safety

We can't avoid saying a few words here about your working comfort and safety. A pair of "clodhopper" type, ankle-height shoes will prevent turned ankles. They should be thick-soled for easy standing on ladders and soles should be cork and composition for best traction on roofs. And don't forget to wear cuffless trousers to prevent snagging on ladder brackets and other protrusions. Wear shirts and jackets with loose collars, especially in cold weather when wearing extra clothing. When working with arms above your head, looking up and concentrating on what you're doing, it is easy to retard circulation to your head with snug fitting collars or hoods. This can result in dizziness or fainting with dire results. Always be careful, be methodical. If you hurry, you may at best have to retrace your work — at worst, you may never work again. When guy wires are attached to the mast and cut to length, bend up the ends an inch or so to prevent the end poking you in the eye.

Next month we will go into full installation details how one man can install antennas up to 50 ft in height. ■

There's Money in Master

by Lon Cantor

Jerrold Electronics Corp.

■According to the latest information from the U.S. Census Bureau, the population of this country is getting younger. This population explosion means more young families, more multiple-dwelling houses. And this trend intensifies growth of the already expanding master antenna systems field, in TV and FM, VHF and UHF. And you'll have to service a lot of TV sets to equal the profit from one modest sized MATV installation. Further, each TV set connected to your MATV system means a potential new service customer for you.

Before you can install a master system, however, you must sell it first. This is not always as easy as it sounds. Each type of system requires a different sales approach.

Home Systems

Two basic ways are open for selling home MATV systems. First, you can use suggestive selling on your antenna customers:

"As long as you're putting up an antenna now, Mrs. Jones, it would pay you to have a complete home master TV system installed. That way, you can have an outlet in every room. Let me give you an estimate of what it would cost."

Second, you can promote MATV systems in new homes, even before they're completed:

"Let me put a complete master TV system in your home right now. Since the walls are still open, you can get a very neat job and save a tremendous amount in installation time. Of course you're not going to have a TV set in every room. But a MATV system gives you complete flexibility. And you can move your

portable into any room in the house, or out on the patio."

This appeal is successful not only with new home owners, but with development builders, especially in weak signal areas. Be sure to mention that the system can also include FM stereo.

Hotels and Motels

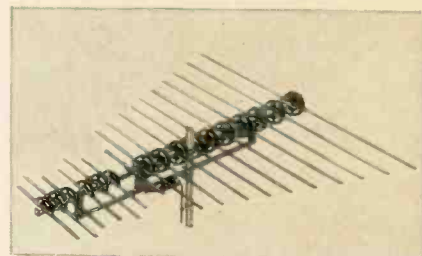
Unfortunately, the hotel-motel field is very hard to crack at this time. Virtually every hotel and motel being built today includes MATV, but they are sold by the TV set manufacturers who generally throw in the MATV system along with the deal for the TV sets.

Unless you're experienced, don't waste your time with this market. Stick to older and smaller motels—those avoided by the TV manufacturers. To sell this market, you should deal directly with the owners or operators of the building.

Apartment Houses

To sell systems in existing apartment houses, you should deal directly with the owners or the real estate management company. Point out how a MATV system can improve the value of the building without costing them a cent (the tenant pays a monthly fee). If you have the financial resources, offer a leasing deal—you install the system and collect monthly from tenants.

New apartment buildings require a different approach. Here, you must work through the consulting engineer and the electrical contractor who will generally subcontract the MATV job. Try to get the equipment you offer written into the specifications. Then, you will



Broadband Paralog antenna is suitable for areas where all channels come from same direction.



Single channel amplifier strips mounted in cabinet.

usually have to submit a competitive bid to get the job.

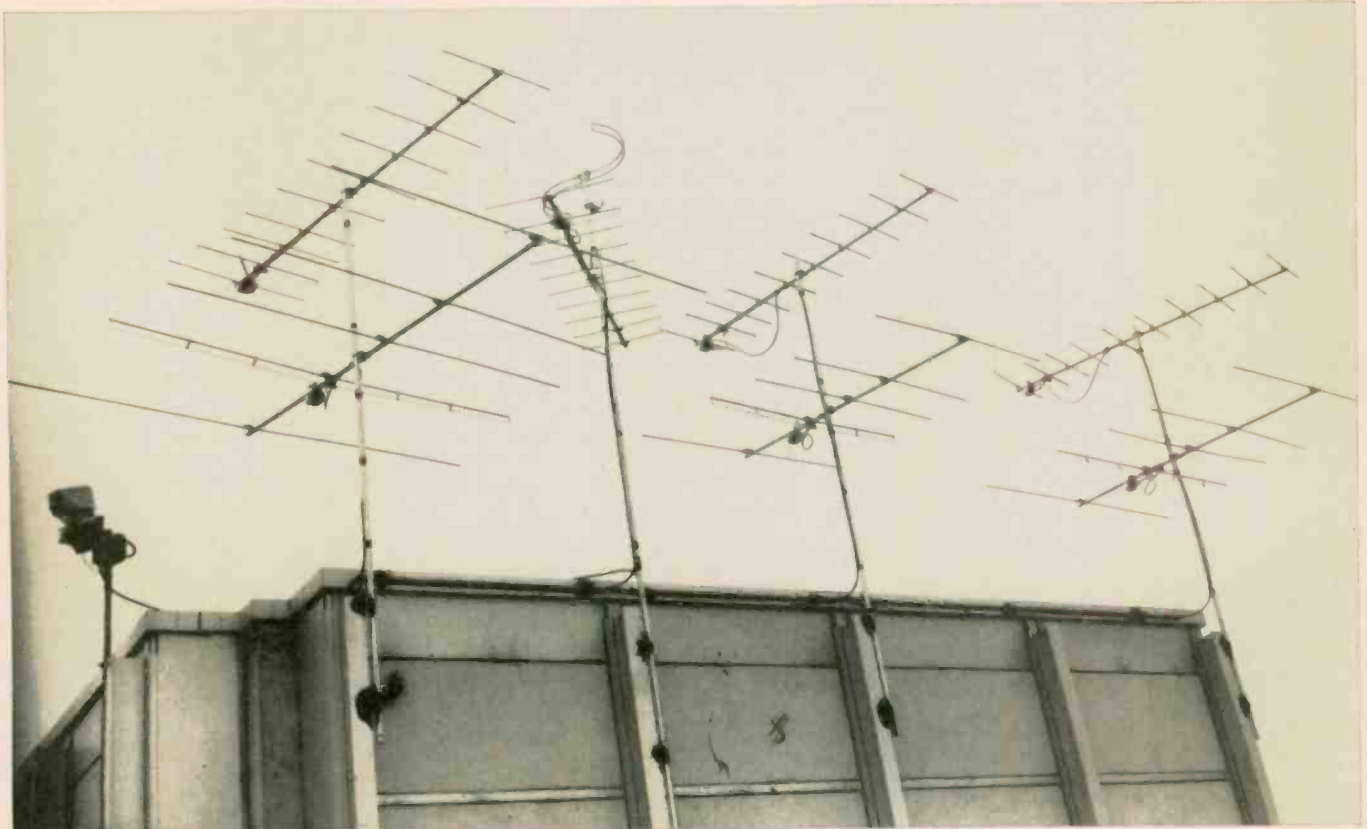
Schools

More schools are being built every year. And schools are an excellent market for MATV systems. With the current emphasis on educational TV, every school in the country will soon need a system. And many school officials prefer to work with a reliable local firm than to deal with some large outfit located many miles away. Canvas the schools in your area and find out what their plans are for ETV.

You must be prepared to work

Antenna Systems

Start negotiating with local building contractors when multiple-dwelling plans are being drawn up



Single channel Yagi-type antennas serving a large apartment house MATV system.

with the school boards and school principals, as well as audio-visual directors and consulting engineers.

One basic requirement to selling MATV systems is that you be able to design a system that works well—at the lowest possible cost. It's easy to design a system that works if money is no object. Most MATV systems are sold by competitive bid, however. Only the technician who really *knows what he is doing* can design a system that works properly but includes minimum equipment.

Antennas

The same knowledge you have of choosing and installing antennas

for homes also applies to MATV systems. In practice, however, there are two important differences. First, you can afford to spend more time and money determining signal conditions. Second, you can use more and better antennas on higher masts.

Two basic antenna types are involved — broadband and single channel. As the names imply, single channel antennas are cut to receive only one specific channel, while a broadband antenna receives a number of channels.

When do you use a single channel antenna and when do you go

Balun is used to match 300 Ω TV antenna to 75 Ω coaxial cable.



broadband? In general, single channel antennas work better, but broadband antennas may allow you to do the job at a more competitive price — depending on reception conditions in a particular location.

The rule of thumb is to use a broadband antenna in every system where all channels are coming from the same direction unless it is a large system (200 or more outlets) or it's plagued with ghosts.

Amplifiers

Like antennas, two types of amplifiers are available — single channel and broadband.

Broadband amplifiers are generally used with broadband antennas and single channel amplifiers with single channel antennas.

Single channel amplifiers cost more, but they have two advantages over broadbands: 1. If one channel goes out, the others continue to operate. 2. Single channel amplifiers can generally produce more undistorted signal output to serve large systems. (Recently, however, very high output broadband amplifiers have been made available.)

The two most important amplifier characteristics are gain and out-

put capability. You must choose an amplifier that can take the available signal and make it strong enough to overcome the losses.

Baluns

Most antennas have a nominal characteristic impedance of 300Ω . But MATV systems use coaxial cable, with a characteristic impedance of 75Ω . And most MATV amplifiers have an input impedance of 75Ω . Therefore, the antennas must be matched to 75Ω with a matching transformer, generally called a balun. The balun is often mast mounted—hence, waterproof.

Mixers

To use a broadband amplifier with single channel antennas, you have to combine the antenna outputs into a single line. The mixer does this. It is recommended that filtered mixers be used. Because these units are tuned to specific frequencies, there's little loss.

Preamplifiers

Essentially, a preamplifier has a low noise figure. To take advantage of the best possible signal-to-noise ratio, it is usually mast mount-

ed. Once the signal-to-noise ratio deteriorates, no amount of amplification will improve it. Preamplifiers are generally used in weak signal areas where channels are received at less than $1000\mu v$. They may be either broadband or single channel. Most preamplifiers are remotely powered on the lead-in.

Filters and Traps

Some kind of RFI is always with us. Some can be eliminated by careful antenna orientation, but others must be filtered or trapped out. MATV filters generally pass a band of about 6 Mc, attenuating all other frequencies. If either channel 2 or 4 is very strong, for instance, adjacent channel interference will result. And filters will not be adequate to eliminate this interference. What you need now is a trap which attenuates sharply one specific frequency.

Traps have one disadvantage. They tend to drift, especially with temperature changes. To avoid callbacks, use filters wherever possible. Filters do a good job if the interfering frequencies are far enough away from the frequencies you want to pass.

'Herringbone' pattern caused by adjacent channel interference.



Typical System Design

Let's suppose we have a five-floor building, with 16 rooms on each floor. We need a TV outlet in every room, or a total of 80 outlets. First, we split the signal in half with a 2-way splitter. Then, we split each of the halves into eight parts, giving us a total of 16 lines. Each line serves one room on each floor. In practice, we plan our cable to be run as easily as possible in the specific building involved.

Now that we've taken the signal into each room, we must find some way of taking it off for the individual TV set. This job is done with a "tap-off." As the name implies, a small portion of the signal is tapped off by this device, without disturbing the signal on the main cable line. Finally, the 75Ω output of the tap-off must be matched to the 300Ω input of the TV set. The end of each line is terminated with a 75Ω resistor, to maintain match.

Once the distribution system is laid out, we must calculate its losses. This is not difficult.

We have to make sure that every TV set in the system gets enough signal. How much is enough signal? This varies by individual TV receive-

er, but we allow $1000\ \mu\text{V}$ across $75\ \Omega$ — giving plenty of tolerance. We establish this $1000\ \mu\text{V}$ as our *standard* and call it 0 dbj.

To calculate the distribution system loss, we simply start at the output of the head-end and work our way to the end of the longest line in the system. If the last TV set at the end of this line gets at least 0 dbj on every channel, we know the system will work.

A 2-way splitter causes 3.5 db loss, and an 8-way splitter loses 10 db. After the splitters, the signal goes through five splitters to get to the end of the line. A splitter actually causes two types of losses: feed-through loss and isolation loss. The signal must pass through each of the feed-through impedances but only one isolation impedance to get to any TV set along the line.

We must consult manufacturers' specifications to find the losses caused by each of these impedances. For example, a typical splitter causes a feed-through loss of 1.0 db and an isolation loss of 11.5 db (at channel 13). To get to the last TV set in the line, we must go through five feed-through losses, but only one isolation loss. Remember, we

multiply the feed-through losses by the number of tap-offs in the line, but we only count the isolation loss once.

Cable, of course, also causes losses. For instance, let's say a system uses 200 ft. of RG-59/U cable between the head-end and the last TV set on the line. At channel 13 (losses are always computed at the highest channel in the system) RG-59/U loses about 5.9 db per 100 ft. For simplicity and added tolerance, we generally say 6 db per 100 ft.

Total distribution system losses, then, can be compared as follows:

A 2-way splitter 3.5 db; an 8-way splitter 10 db; tap-off feed-through losses (5×1.0 db) is 5 db; tap-off isolation loss 11.5 db; cable losses 12 db; which gives a total loss of 42 db.

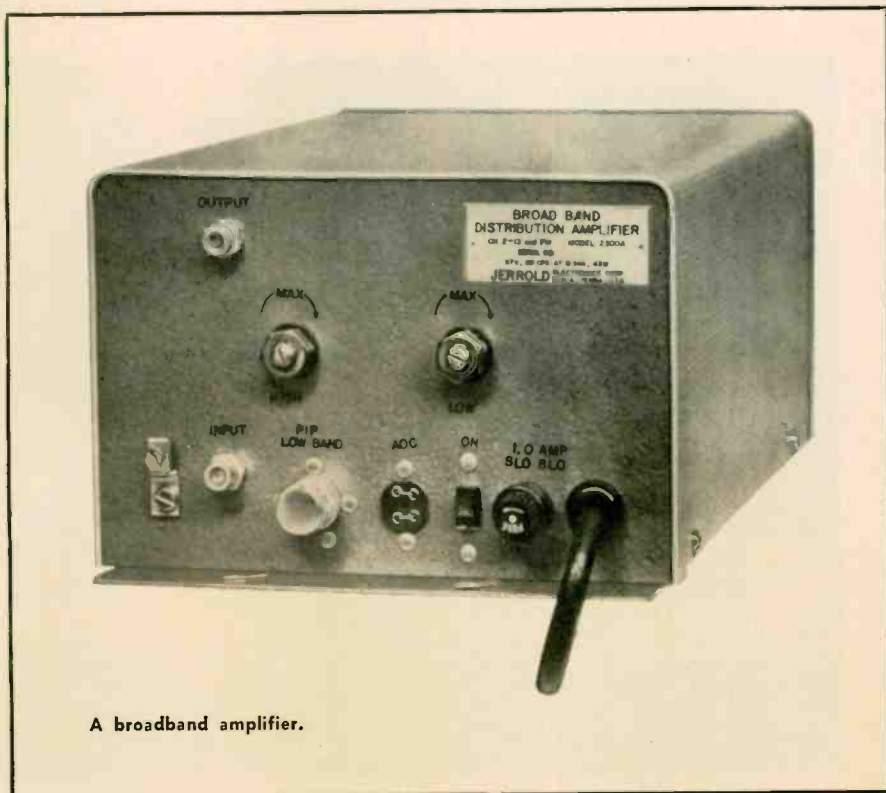
This calculation tells us what we require of our head-end. We must choose an amplifier with an output capability of at least 42 dbj.

For the sake of simplicity, let's assume that all channels come from the same direction and at about equal strength — 6 dbj, or $2000\ \mu\text{V}$. We would then need a head-end amplifier with a gain of at least 36 db.

Typical available amplifiers can handle these requirements easily. As explained previously, weak channels would require preamplification and interference would call for filters or a trap.

You can make money in master distribution systems if you keep in mind the following guide-lines:

1. Design your system carefully and competitively. Never submit a bid on a job without visting and surveying the site carefully. To design a good head-end, you must be thoroughly familiar with local signal conditions. When in doubt, ask the equipment manufacturer for help.
2. Make accurate estimates. Too high an estimate can cost you the job. Worse still, too low an estimate can cause you to lose money on a job.
3. Use good materials and install the system carefully. Callbacks can eat up profits fast. And they don't improve your reputation. ■



A broadband amplifier.

How Multipath Signals

High front-to-back ratio antennas and rotors may be necessary for quality FM/stereo reception

■ Every service-dealer and technician is thoroughly familiar with TV "ghosts" that result from multipath reception of TV signals. Many are unaware, however, of the degrading effect of ghosts on FM/stereo signals. As we know, when two or more signals arrive at the antenna via different-length paths, additional images appear on the TV screen. But multipath reception of FM/stereo signals produce very deceiving effects. Considerable distortion, frequently blamed on poor discriminator alignment or operation, is caused more often by multipath reflections. Improper discriminator tuning is usually aggravates the situation.

Of course, multipath reception occurs on AM signals too. But this takes place primarily as ionospheric "bounce" over long distances and is recognized as an echo. When the signals are received over relatively short distances, however, the difference in path length is usually so small that little echo is noted.

FM Fundamentals

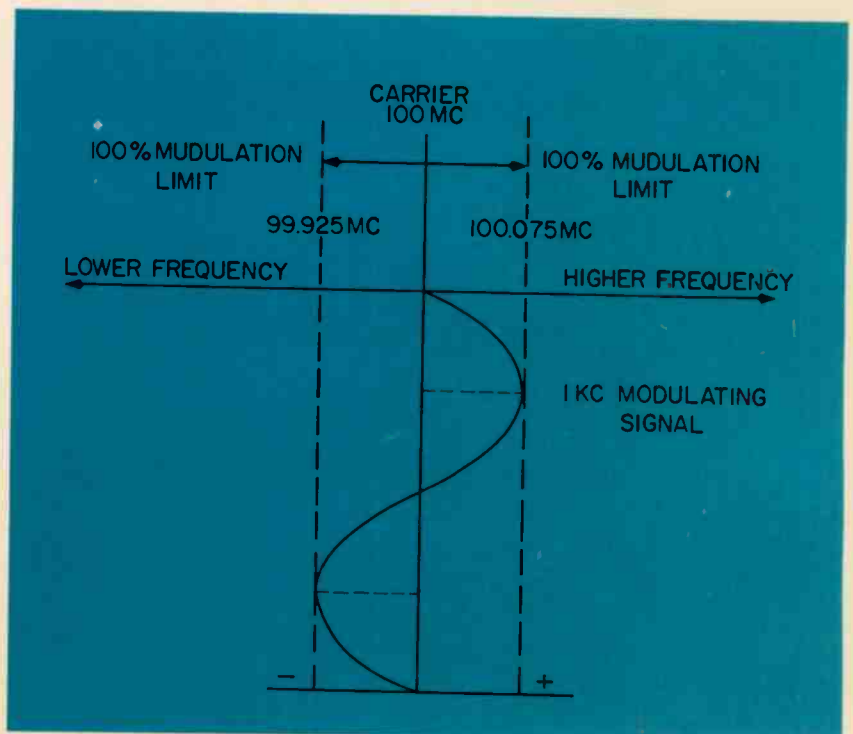
To understand how multipath signals can distort FM/stereo signals, let's look at FM principles.

When a transmitter carrier signal is frequency modulated, the transmitter's output frequency deviates, or varies, above and below the assigned carrier frequency, an amount proportional to the amplitude of the modulating signal and at a rate equal to the modulating frequency. The relationship between the modulating signal and the transmitter output frequency for a standard FM broadcast station is shown in Fig. 1. It is assumed that the transmitter's output frequency increases as the modulating signal goes positive, and goes lower as the modulating signal goes negative.

This modulating polarity is arbitrary and in many transmitters the phase relationship is just the opposite. Regardless of this phase relationship the output frequency changes at a rate which is exactly equal to the frequency of the modulating signal.

Once again, the amount of carrier deviation depends on the modulating signal amplitude. We do not have a modulation limit in FM as we do in AM. For FM broadcast, the amount of deviation considered to be 100 percent frequency modulation is established by the Federal Communications Commission (FCC) and

Fig. 1—Relationship between the modulating signal and the transmitter output frequency for standard FM broadcast station.



Affect FM Reception

by Robert P. Brickey

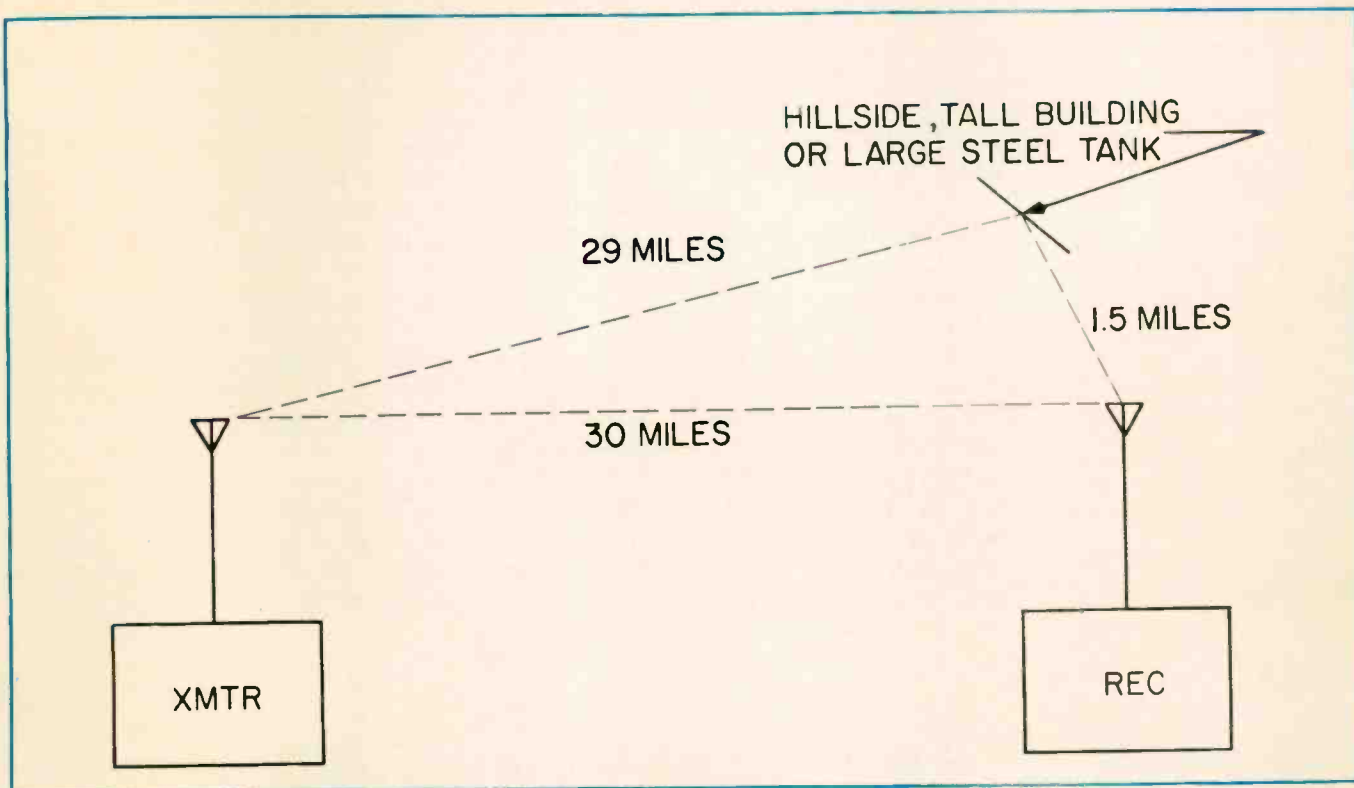


Fig. 2—How multipath signals occur.

is plus or minus 75 kc for FM broadcast, and 25 kc for FM audio on TV stations.

Multipath Distortion

As we have seen, the output frequency of an FM transmitter is constantly changing. If the signal from the transmitter to the receiver follows two paths of different length, for instance, the direct-path signal will arrive at the receiving antenna slightly ahead of the reflected signal. In this example, the signal following the direct route will travel thirty miles. Part of the signal travels twenty-nine miles to a high point and then reflects another mile and a half to the receiver. Hence, it travels one-half mile farther than the direct signal (Fig. 2). Since radio waves travel approximately 186,000 mps, we can calculate the time difference between the two paths as follows:

$$\frac{5 \times 10^{-1}}{1.86 \times 10^5} = 2.688 \times 10^6 = 2.688 \mu\text{sec time difference.}$$

If, for the purpose of illustration, we assume the transmitter is modulated by a 1 kc sinewave, we can determine how much change takes place in the transmitter frequency in 2.688 μsec . This is shown in Fig. 3.

Each cycle of a 1000 cps sinewave would last 1/1000 of a second which is equal to 1000 μsec . As shown in Fig. 3, time intervals in μsec are shown along the top of the reference line and degrees of the cycle along the bottom.

We can now determine how many degrees of the cycle would elapse in 2.688 μsec . This may be calculated by using ratio and proportion as follows:

$$\frac{1000}{360} : \frac{2.688}{X} \quad X = 0.968 \text{ deg.}$$

If we now find the sine of 0.968 deg we can determine what percentage the modulating voltage would change in this interval. $\sin 0.968 \text{ deg} = 0.0168 = 1.68 \text{ percent of the peak value.}$

Thus, if the peak value of the modulating voltage produces a 75 kc deviation in 2.688 μsec , the transmit-

ter frequency will change 1.68 percent of 75 kc or 1.26 kc.

At a time when the signal arriving via the reflected path is passing through the carrier frequency the direct signal, being ahead 2.688 μsec , will be 1.26 kc different in frequency. These two signals will interfere with each other and produce a 1.26 kc beat frequency.

During other portions of the modulation wave-shape the beat frequency produced will be different. For instance, if we look at a time near the peak of the modulating signal the voltage is changing more slowly and in 2.688 μsec less change in frequency would occur.

In fact, there will be two times, one near the positive peak and one near the negative peak, when the direct and reflected signals will arrive at the same frequency. The beat frequency produced will vary between zero and 1.26 kc as the rate of voltage change varies.

If the direct and reflected signals arrive at the receiving antenna at the same signal strength, the resulting antenna signal will vary in amplitude from zero to twice the strength of either signal at the rate of the beat frequency. This will make it impossible for the limiter in the FM receiver to eliminate this amplitude variation from the output. And this has even more ominous overtones for FM/stereo reception.

The values used in this example are arbitrary and are only valid for the conditions we have set up. It can be seen that the interfering frequency may be almost anything depending upon the comparative lengths of the direct and reflected paths, the modulating fre-

quency, the modulating waveshape, and the amount of frequency deviation.

Reducing Multipath Distortion

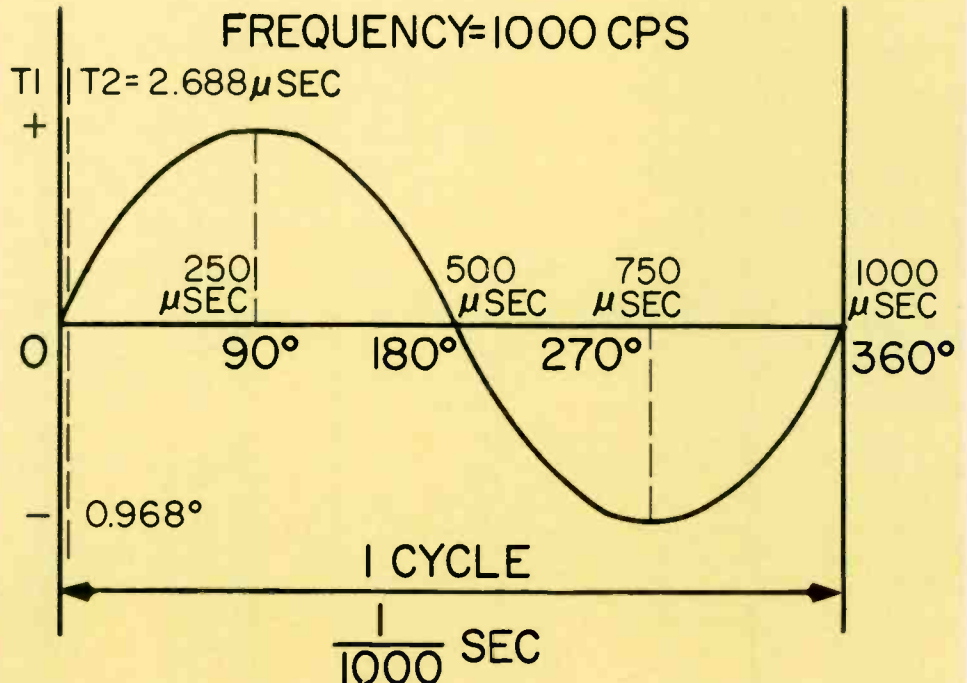
The cure for multipath distortion is the same as that for the elimination of TV ghosts. Anything which can be done to improve the ratio between the amplitudes of the direct and reflected signals will decrease the beat interference.

A more directive receiving antenna, one with a high front-to-back ratio and narrow frontal lobe, will usually bring desired results. In some cases a reorientation of an existing new antenna installation may solve the problem. In many large urban areas, near- and deep-fringe areas, however, a rotator may be required for "micrometer" orientation of the antenna to compensate for changing propagation conditions. Also, simply changing the height or position of the antenna will sometimes change the relative strength of the two signals and may possibly alleviate or even eliminate the trouble.

In some extreme cases it may be desirable to orient the antenna *toward* the reflected signal rather than toward the direct one. The objective is to receive only one signal of adequate strength and it is not uncommon to find a stronger reflected signal than a direct signal in some locations.

No FM/stereo system is completely immune to multipath distortion. But careful selection of the proper antenna and necessary accessories for a particular location will generally provide the best possible reception for your customers. ■

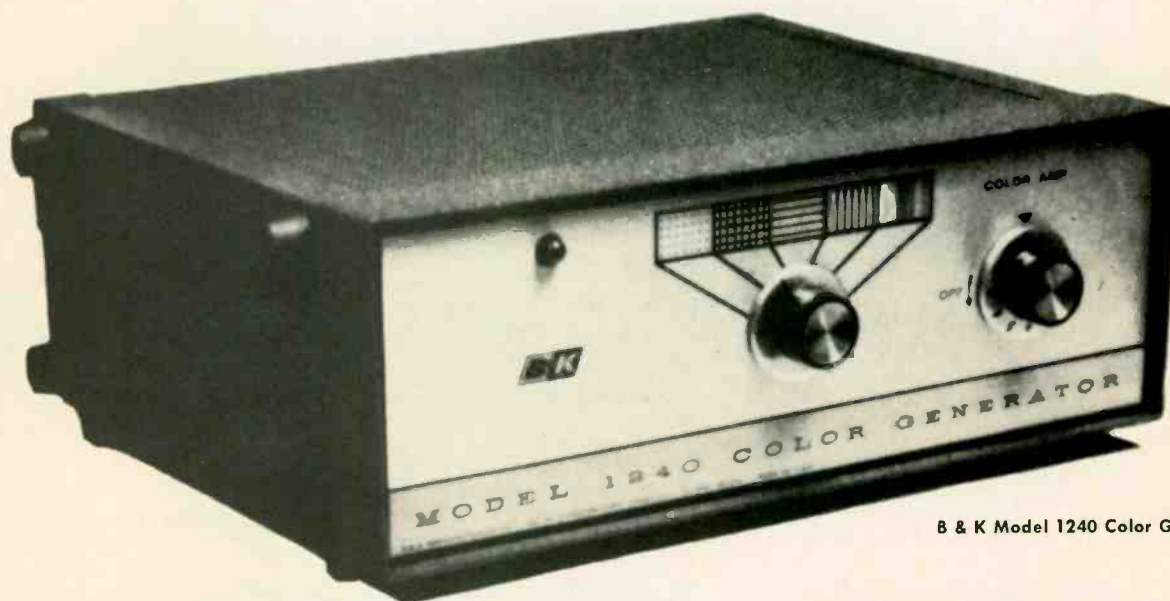
Fig. 3—The period of a 1 kc sine wave is 1/1000 sec or 1000 μsec . An area of 0.968 deg is covered in 2.688 μsec .



COLOR BAR/DOT
GENERATORS

B & K Model 1240 Color Generator

Functions, controls, signals
and circuit description



B & K Model 1240 Color Generator

■ This 11 tube unit generates a *keyed rainbow* pattern. The generator measures $12\frac{1}{4} \times 4\frac{5}{8} \times 10\frac{1}{4}$ in. and weighs 9 lb. The offset subcarrier method is employed and the output contains ten gated color bars. The ten bars are spaced at 30 deg intervals. The signal with horizontal sync pulses added is available for feeding into a color TV set. The RF output for the instrument is factory aligned for channel three but it can be retuned to channel 4 or 5 by adjusting the RF coil. This will enable you to select another channel if channel 3 is being used in your area.

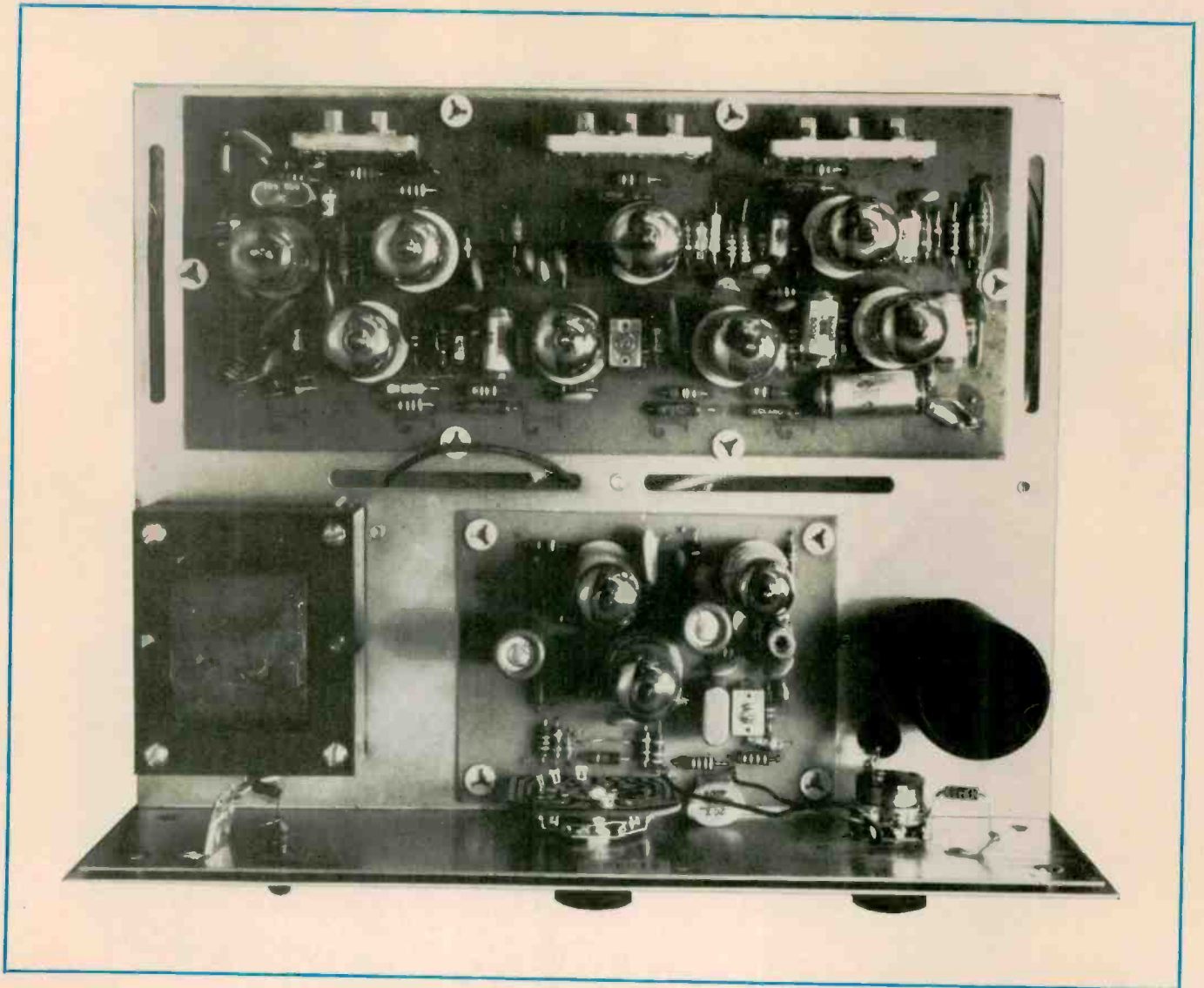
A color amplitude control sets the level of the color subcarrier and can be used in checking the sync capabilities of a color receiver. The modulation level can be varied from zero to 200 percent. The ON/OFF switch is attached to this control.

Besides the ten bar color pattern the instrument provides patterns necessary for converging a color TV set: dot pattern, crosshatch, horizontal and vertical lines. The horizontal lines are one scanning line in height. There are 10 vertical lines and 14 horizontal lines.

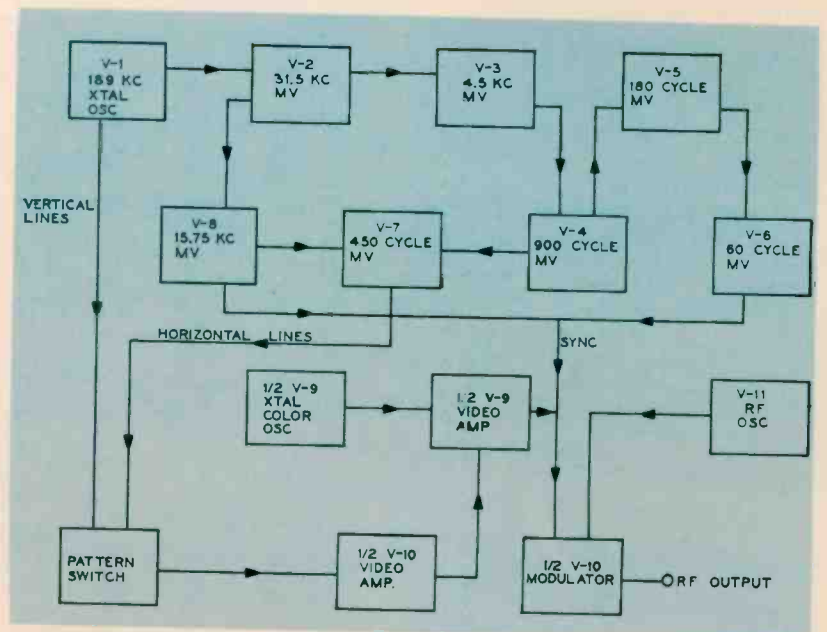
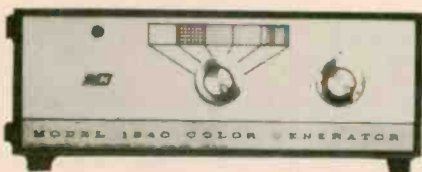
Circuit Functions

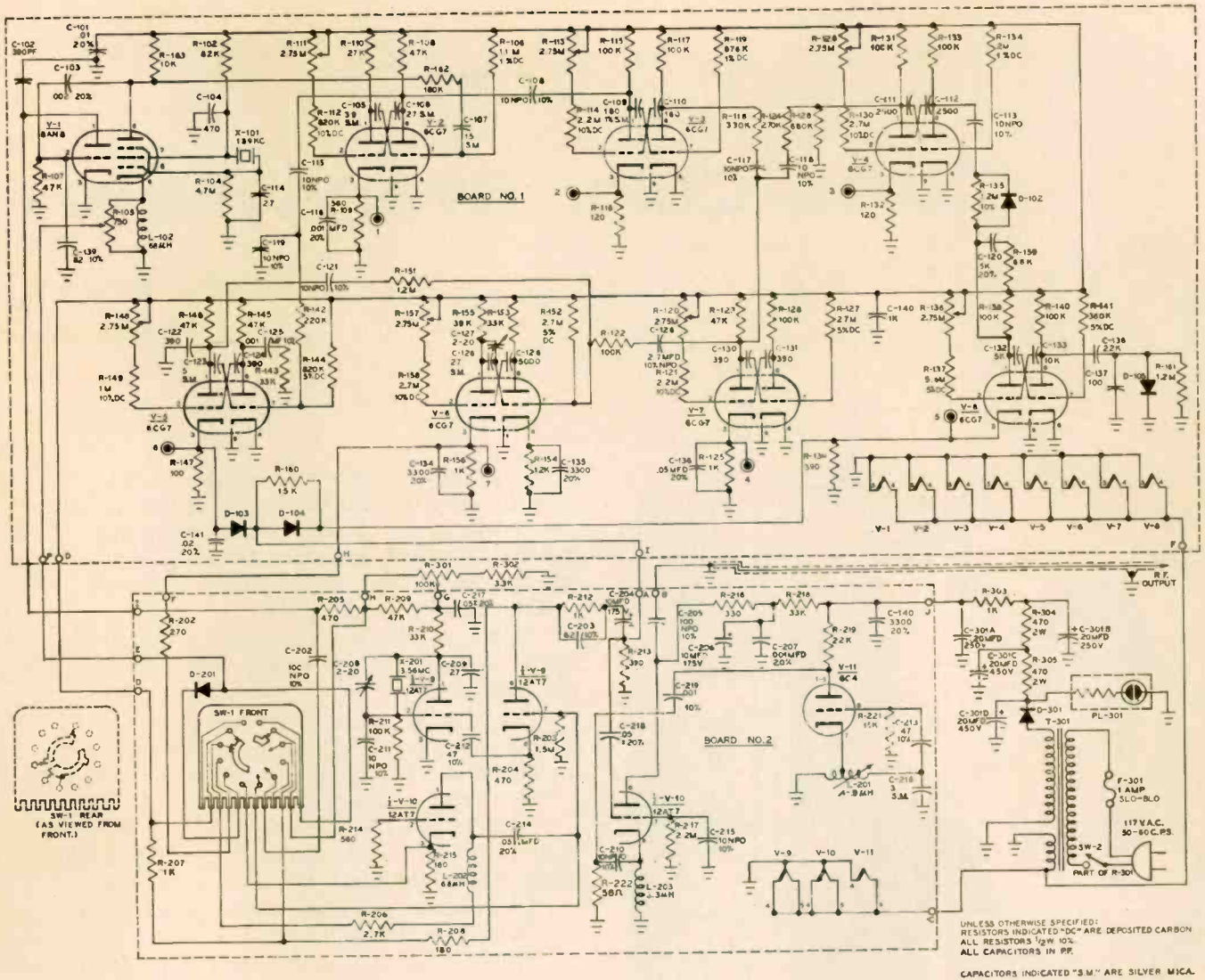
The block diagram shown in Fig. 1 indicates functions of the instruments' various stages. A frequency divider chain begins with a 189 kc crystal controlled oscillator (V1). V2, a 6CG7, is a 31.5 kc multivibrator which is synchronized by pulses from 189 kc oscillator.

The 189 kc oscillator is also used to form the vertical lines when the pattern switch is in the dot



Inside view of printed board sections of 1240 color generator. Photographed in ET's laboratory.





Schematic of B & K Model 1240 Color Generator

crosshatch or vertical lines position. The 189 kc signal is also used to form white bars which, when mixed with color, form color bars. Output from the 31.5 kc multivibrator is used to synchronize both the 15.75 kc multivibrator and a 4.5 kc multivibrator.

The output of the 15.75 kc multivibrator is used to phase-lock the 450 cps multivibrator and it is also used as the horizontal sync pulse. The 4.5 kc stage is used as a buffer between the 31.5 kc multivibrator and the 900 cps multivibrator. Stability is obtained by dividing the frequencies in smaller steps. A pulse from the 900 cps multivibrator locks the 180 cps multivibrator and the output of the 900 cps stage is also used to synchronize the 450 cps multivibrator. Alternate fields are scanned with the 450 cps so single-line thickness of the horizontal sweep is achieved. The 180 cps stage locks the 60 cps multivibrator and the 60 cps stage output is used as the vertical sync portion of the signal.

One-half of V9, 12AT7, (Fig. 2) is used as a crystal oscillator to generate the 3.56 Mc offset subcarrier frequency. It operates only when the switch is in the

color position. Its output is then fed to the 2nd video amplifier, the other half of V9. Keying of the color bars also takes place in this stage.

V11 (6C4), the RF oscillator is on at all times and it feeds a signal to the modulator one-half of V10 (12AT7) and this signal is then modulated by the information selected by the pattern switch. Horizontal and vertical line information, when selected, is passed through two stages of video amplification before being applied to the modulator.

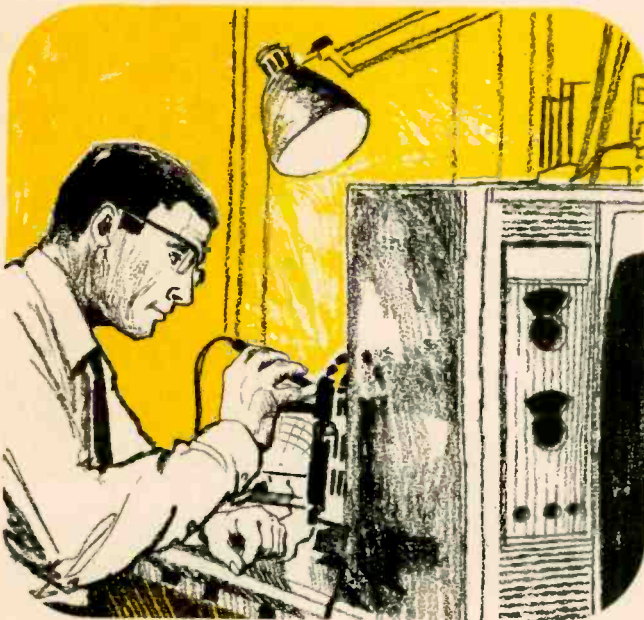
The circuits are divided into two sections, the frequency dividers form one and the RF oscillator, color oscillator, modulator and video amplifiers are included in the second section. These circuits are mounted on separate printed boards. The long printed section contains the counter circuits (Fig. 3) and the smaller section houses the other circuitry.

Voltage test points for adjusting the count circuit are conveniently located along the bottom of the counter board. The counter potentiometers are located at the top rear of the counter board. ■

Color, Color Everywhere—

Part II (conclusion)

by Joe Hayes



■ Scoot rushed in the shop puffing — about half an hour late for work and Bob looked at him inquisitively.

“I overslept,” Scoot finally volunteered as he moved toward the coffee pot, “it must be these spring mornings we’ve been having. It sure is hard to get up — Hey, there’s no coffee yet!”

“Scoot, you know we don’t make coffee this early in the morning. What’s wrong, were you up too late last night?”

“No I wasn’t up too late last night,” Scoot shot back disgustedly, “I rushed down here so I wouldn’t be too late and I didn’t have coffee before I left home.”

“Big deal,” Bob said jokingly, “get to work.”

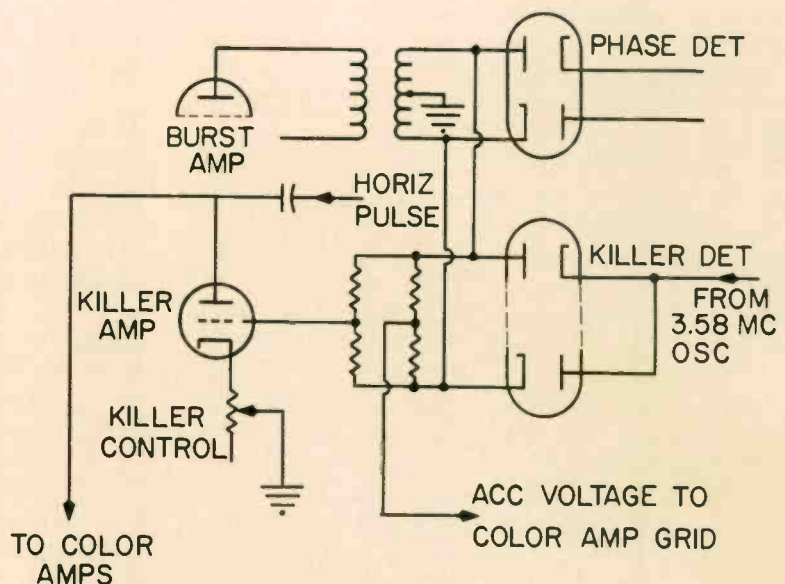
“Have a heart Bob. Let’s go next door and have some coffee. I’ve got a couple of questions to ask you about that burst business you gave me last week.”

They both moved to the door without a word.

“What’s the trouble, Scoot?”

“Well, it’s not a crisis, Bob, but when you were telling me about the origin of the burst and its processing

Fig. 1—Bob pulled out a sketch pad and began to sketch a schematic.



But Not a Bit in Sync

Scoot follows the burst signal through the color section and Bob discusses AGC

it never dawned on me then but you never told me how the burst is ultimately used.”

“I was wondering why you didn’t ask me about that at the time.”

“I guess I was too busy digesting the phase detector, killer and that stuff.”

The boys worked their way into a booth at the far corner of the diner.

“Well? How about it, Bob?”

“All right, you remember where we left off — at the output of the burst and gate amplifier; now let’s trace the path of the burst signal and see what it does.”

Bob pulled out a sketch pad and began to sketch a schematic (Fig. 1).

“Remember the output at the burst gate amplifier is a burst only a few cycles at 3.58 Mc and the phase relationship is quite exacting.

“As you can see here, the burst amplifier output is fed through a transformer. The transformer is center-tapped so a signal can be taken from both the remain-

ing ends. Now, Scoot, a little fundamental knowledge. What can we say about the signal relationship from either end of the transformer?”

“That’s easy enough—they’re out of phase by 180 degrees.”

“Right. Actually, here’s what they would look like if you could see them both on a dual trace scope.”

Bob sketched the 3.58 burst signal one above the other carefully drawing each cycle so that it was half a cycle out of phase with the other. (See Fig. 2.)

“What’s the reason behind that, Bob?”

“Well, the only good reason I can think of is to get two signals so they can be used in a phase detector arrangement and to match the impedance. As you know a phase detector can work from in-phase as well as from out-of-phase signals.

“Now, here’s the way the burst is used.”

Bob continued sketching and drew lines to the phase detector, and the killer detector (Fig. 2). Next, he drew in two blocks and labeled them “3.58 osc.”

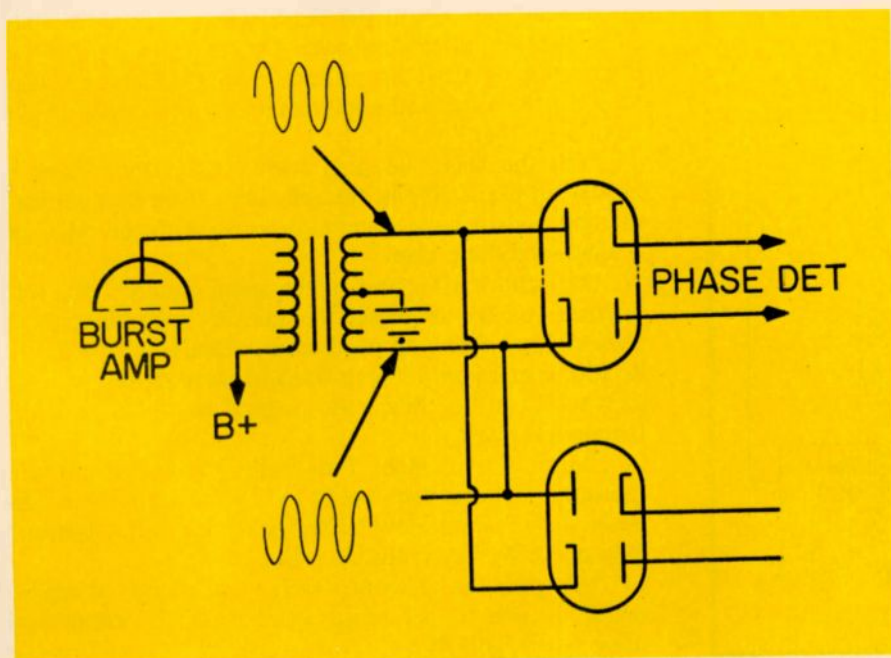


Fig. 2—That’s easy enough—they’re out of phase by 180 degrees.’

Combination VOM/VTVMs

■ Both the VTVM and VOM are indispensable tools for TV-radio, Hi Fi and two-way communications service work. A VTVM is necessary for checking voltages in high impedance circuits and simplifies the reading of P-P voltages. Current measurements cannot be made with a VTVM so in this instance a VOM becomes a necessity. Therefore, an ideal instrument, especially for in-home servicing, would be a unit which combines the functions of both in one compact housing. Combination meters of this type are available from several manufacturers.

The proper application of a combination instrument of this type can widen the scope of service work performed in the home. You get the convenience and ruggedness of a VOM plus the advantages of a VTVM for important circuit measurements which would be unreliable on a VOM.

Triplet Model 631

The Triplet Model 631 is a portable, battery-operated combination VOM and VTVM. It is basically a 20,000 Ω/v VOM with VTVM section used for measuring dc voltage. It does not need an external source of power as it contains its own battery supply. The VTVM section uses a 1R5 tube and has an input impedance of 11 M. Four voltage scales are in the VTVM portion—0-1.2, 0-6, 0-3, and 0-120 vdc. A switch on the front of the meter selects either the VOM or VTVM function. And as the VTVM operates on the self-contained battery supply, the switch should always be left in the VOM position when the unit is not being used as a VTVM. The condition of the batteries can be checked without removing the case.

The VOM section has five dc voltage scales ranging from 0-3 to 0-1200 vdc. The sensitivity of the dc voltage scales is 20,000 Ω/v . There are five ac (rms) voltage scales with a sensitivity of 5000 Ω/v and coverage from 0 to 1200 vac. The unit has dcma scales of 0-.060, 0-1.2, 0-120 and 0-1200 and also a 0-12 amp provision. Zero to 150 M, in four scales, can be measured on the ohms section. Also included is a provision for measuring audio frequency output with the meter reading directly in db.

Sencore Model SM112

The Sencore Model SM112 contains both a complete VOM and a complete VTVM in one portable steel case. The VTVM section contains two tubes and is 117 vac powered. The unit will keep the tubes warm whenever it is plugged in, even if the function switch is in the VOM position. This enables technicians to change from VOM to VTVM operation without delay.

The VTVM section has an input impedance of 10 M and has 6 dcv ranges from 0 to 1000 vdc. It also contains rms acv coverage from 0 to 1000 v in six steps. The unit is calibrated for direct reading of P-P voltages. The P-P scales are 0-8.4, 0-28, 0-84, 0-280, 0-480 and 0-2800 P-P v. The VTVM ohmmeter can measure resistance from 0 to 1000 M in six ranges.

The VOM portion has six dcv ranges: 0-3, 0-10, 0-30, 0-100, 0-300 and 0-1000 with a sensitivity of 5000 Ω/v . The ac voltage scales are divided in the same manner as the dc and have a sensitivity of 500 Ω/v . The ohmmeter section has two ranges available 0-10,000 Ω and 0 to 1M. Provision is made for measuring from 0-1000 ma. ■

Handy integrated portable instruments are adapted to in-house and shop servicing too



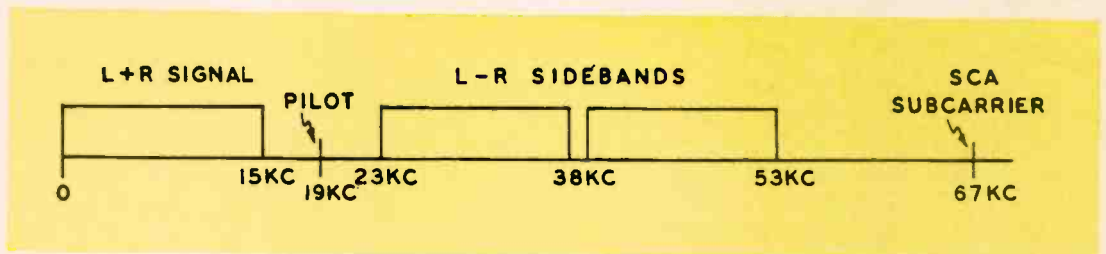
Sencore Model SM112



Triplet Model 631

FM/Stereo Servicing

by Thomas R. Haskett



The frequency spectrum of modulation used for transmitting FM/stereo.

■ Don't let FM/stereo scare you. It's different, sure — but not that different. Like the color TV set, there are a few extra circuits. Unlike color, it's simpler. And, although a stereo generator is indispensable for certain jobs, you can service most sets with a VTVM and scope.

Common Troubles

Most FM/stereo troubles are caused by faulty tubes, weak station signals or poor antennas. Tube troubles aren't difficult, for there are seldom more than three or four tubes in the multiplex section. Weak signals cause distortion and lack of separation, and are usually caused by improper antenna installations. Some salesmen push FM stereo and often neglect to point out that line-cord or back-of-the-set antennas won't give good reception in many locations. A rule of thumb to follow is: If a good outdoor antenna is needed for color, they'll need one for FM/stereo. Some package stereo receivers have a gain control (also called AGC or fringe control) which is preset at the factory for average signal strength. Customers living in fringe areas will require readjustment of this control to obtain maximum possible gain and best separation.

An FM/stereo receiver can be checked in mono to cover RF, IF, detector and power-supply troubles. There must be sufficient gain and bandwidth in the IF, and the detector must be working on the linear portion of its curve for stereo to get through. A large share of the troubles are caused by the multiplex circuitry. Most pure stereo trouble can be detected by ear. Insufficient separation or a fluttering 400-cps tone during a stereo program usually means that the local 38-kc oscillator needs realignment. Whistles indicate interference from the SCA (background-music) channel transmitted by some stations.

Basic Circuitry

The block diagram in Fig. 1 shows the type of circuitry employed in some of the earlier multiplex receivers. The composite signal from the FM detector output consisting of the L+R component, the L-R difference signal and the 19 kc pilot signal, is fed to the input amplifier grid. After amplification, the signal is channeled in two directions: the L+R component (50 to 15,000 cps) goes through a lowpass filter and the L-R component (23 to 53 kc) is fed through a bandpass filter. The 19 kc pilot is separated from the composite signal bandpass and then

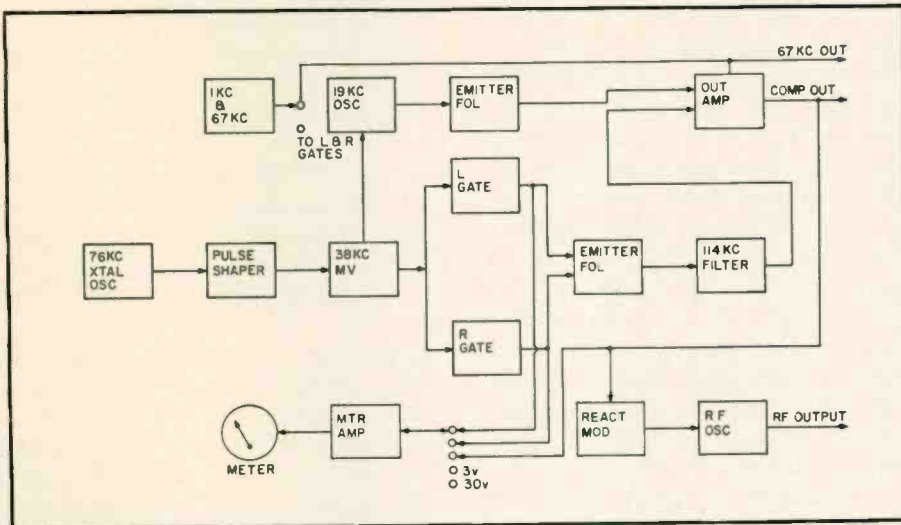
fed to the grid of a locked oscillator where the signal is doubled to 38 kc. It is then coupled to a balanced detector where the 38 kc difference signals are demodulated.

Diode D1 responds only to the L-R portion of the sidebands while D2 responds to the -(L-R) phase of the difference signal. The detector outputs are then applied to a matrix network along with the L+R component. The final result is that only an L signal appears at the L output and only an R signal is found at the R output. The L+R component is passed through a delay line before it is applied to the matrix. In passing through additional circuitry the L-R portion of the signal is delayed somewhat. The L+R component must be delayed the same amount to obtain true reproduction of the transmitted signal. A de-emphasis network flattens the audio response of each output.

More recent FM/Stereo receivers use a circuit similar to the one shown in Fig. 2. The composite signal from the FM detector is fed through a composite amplifier to a 53 kc lowpass filter. This filter allows the L+R, L-R and the 19 kc pilot signal to pass and blocks any SCA signals that may be present. The 19 kc pilot signal is then removed and used to sync the 19 kc

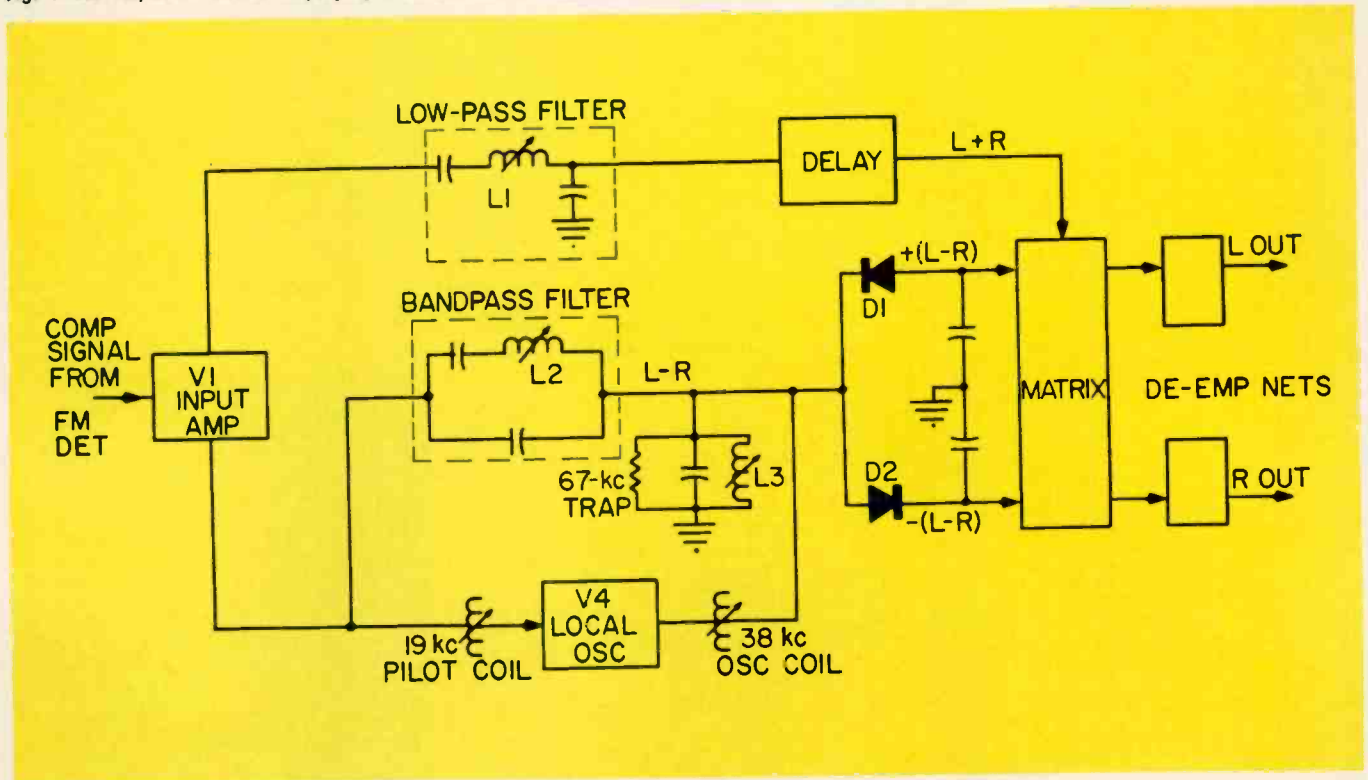
Principles

Align and troubleshoot this equipment with or without a multiplex generator



Block diagram of an FM/stereo multiplex generator.

Fig. 1—An FM/stereo circuit employing a matrix and a balanced demodulator.



... FM/STEREO

local oscillator. The output of the oscillator is doubled and fed to the unbalanced demodulator. The 38 kc signal applied to the anode of D1 is 180 deg out of phase with the doubler voltage at the anode of D2.

The composite signal, less the 19 kc pilot is fed to the center tap of the secondary of T1. Both the L+R component and the L-R sidebands are present at this point. Both D1 and D2 rectify the positive portion of the L+R signal so the L+R voltage appears across each diode load at all times. As the 38 kc signal is applied to the diodes 180 deg out of phase, +(L-R) will appear across the D1 load and -(L-R) will be present at the D2 load. When the L-R signal present at the output of D1 is added to the L+R component the R voltages cancel so only the L portion remains. The -(L-R) signal at the output of D2 will combine with the L+R present and the output will be only the R signal. The L and R signals are then amplified again and fed to a stereo speaker system.

Getting the Job Done

A great many FM/stereo repair jobs can be completed without a generator. Most of the jobs involving parts substitution require only a

touching up of the separation control. Where replacement or repair of tuned circuits are involved, however, or the receiver is obviously out of alignment, a stereo generator will be required.

If a generator is not available a fair job of alignment can be done by using station signals. Stereo receivers which have 19-kc local oscillators are easiest, because this oscillator can be locked to the incoming 19 kc pilot and tuned circuits peaked to it. Some stereos, however, have no local oscillator, and amplify the incoming 19 kc pilot. In these cases, you may have to borrow 19 kc from another known-to-be-good stereo receiver. You can pick it off the 19 kc oscillator output and couple it through a 0.001 μ f capacitor into the 19 kc input of the set to be aligned.

Alignment is simple if you remember only two frequencies are involved — and the second is a harmonic of the first. As a tuning indicator, use either a scope or a VTVM across the diodes. The scope will show the 38 kc waveform, while the voltmeter will read the signal amplitude. In either case, you tune in a station transmitting stereo and peak-tune each coil for maximum amplitude.

Phasing Checks

The next step is to check for 19-kc oscillator phasing (where used). An out-of-phase condition will produce a low-frequency motorboating in the audio, with loss of separation and possibly distortion. Although it's possible to phase-lock the oscillator by listening critically for maximum separation and no motorboating, it's much easier with a scope across the diodes. Referring to Fig. 3, if the waveform is fuzzy, the oscillator is out of phase. It's in phase when the trace is sharp and clean. In matrix-type receivers, the bandpass filter can be peaked for maximum separation by ear. The same is true of the low-pass filters.

The aforementioned methods will get you through most service jobs. Expensive receivers and critical customers, however, will sometimes demand more precise alignment for minimum distortion. So if you do a substantial amount of multiplex work, an investment in a stereo generator would be advisable. Most generators provide composite stereo and 19 kc pilot outputs, which are the most used signals in alignment.

Adjustments at 19, 38, and 67 kc may be made easily by killing all but the desired oscillator in the stereo generator and making the proper alignment. Generators which have a phase adjustable 19 kc crystal oscillator permit precise phasing with station signals. You can cross-beat them, using a receiver as a readout indicator, as described for syncing the local oscillator. ■

Fig. 2—A typical FM/stereo circuit using an unbalanced demodulator.

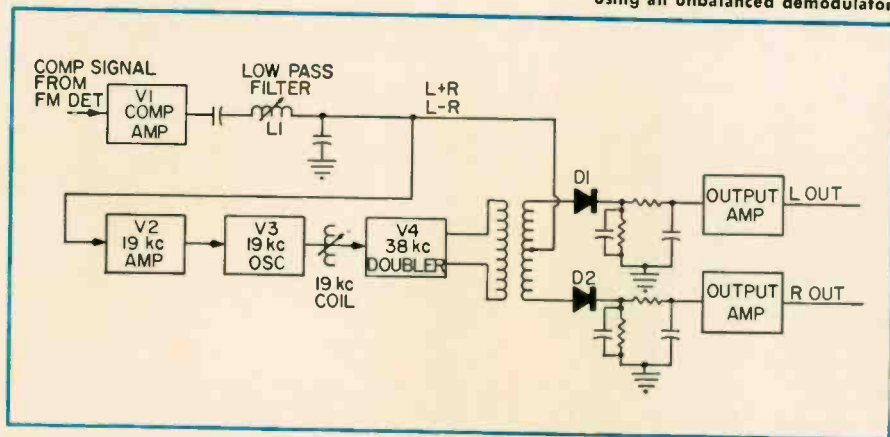
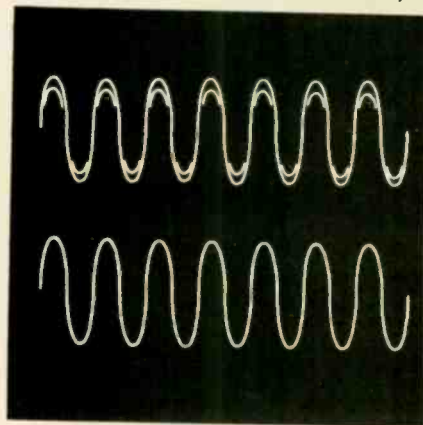


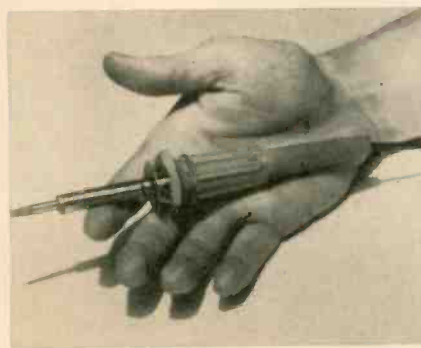
Fig. 3 (A)—Fuzzy 38 kc indicates that local oscillator is not synced. (B)—Sharp 38 kc trace shows that oscillator is in sync.



Soldering Tips for Today

Intelligent, careful selection and application of soldering equipment is essential to efficient shop operation

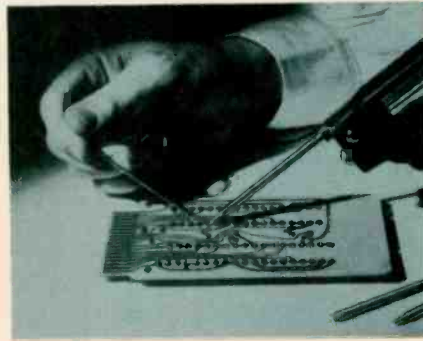
by Conrad Larson



Iron designed for printed board work 'sucks' up solder with bulb. Iron made by Air-Vac Engineering Co.

Wen fine point tip soldering pistol is used on PC board.

Miniature soldering iron by American Beauty.



■ That familiar saying, "A chain is only as strong as its weakest link" is assuming critical importance to electronics technicians today!

Why? Simply because our work deals almost entirely with electronic chains of components in which solder joints are important links, and it takes only one bad solder joint out of perhaps thousands in one piece of electronic equipment to put the entire unit out of commission. Yet, far too many of our colleagues don't realize the importance of good soldering equipment, materials and techniques.

What is Solder?

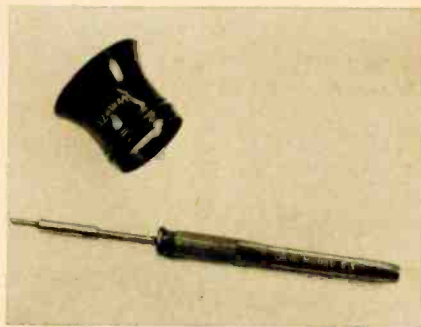
We know that most solder (the kind we ordinarily use, anyway) is made of lead and tin. Most people believe that the higher the tin content the higher the melting point of the solder, but this is not neces-

sarily true—it depends on where you start.

The melting point of pure lead is about 620°F, whereas pure tin's melting point is about 460°F. Starting from no tin at all (100 percent lead), as the amount of tin is increased, the melting point of the solder decreases, reaching a minimum of 361°F when the solder is about 62 percent tin. Above 62 percent tin, the solder's melting point rises again. The relationship between tin content and the solder's melting point is shown in Fig. 1.

Once a joint has been soldered, it makes no practical difference, electrically speaking, what the tin-to-lead ratio of solder is, but this does not mean that the ratio is unimportant—because it is. We know that heat is deadly to electronic components and that it doesn't take too much heat to destroy some of them. (We are all too familiar with the consequences of too much heat when working on printed circuit boards.) Generally speaking, most electronic components undergo the greatest thermal stress they will ever encounter at the time they are soldered into place; therefore, it only makes sense to subject components to as little heat as possible when installing them.

The ideal solder, therefore, is one



Oryx microcircuit soldering instrument with magnifying 'loupe'.

that is 62 percent tin, because this solder has the lowest melting point possible. The melting point of the 60:40 mixture commonly available is only about 4°F higher than that of the "ideal" 62:38 mixture. Of course, tin costs more than lead, which is why the 60:40 mixtures almost always cost more than the 50:50 or even 40:60 mixtures that can be purchased; but the more rapid melting and the reduced chances of PC board damage, cold solder joints and resulting callbacks and unhappy customers are well worth the small difference in cost.

A well-stocked supply house may stock solder in a number of different diameters, but, in general, the solder with the smallest diameter (within reason) is the one to use. We say "within reason" because you can buy a solder so small that it might take 6 in. of it to solder one 1/2-w resistor into place. This would be both ridiculous and unnecessary, but since we must keep component temperatures as low as possible, it should be remembered that the larger the diameter of the solder the more heat it will drain away from the iron and the work. And this means that more time will be required for the joint to reach the solder's melting temperature, giving the heat more time to work its way up the component leads into the component.

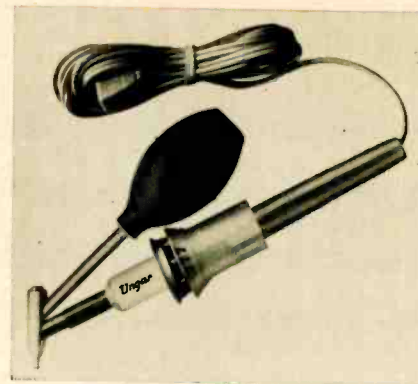
Both acid- and rosin-core solders are available, along with a wide variety of fluxes in the form of pastes and liquids. Only *rosin-core solder* should be used on electronic equipment, however, because acid fluxes tend to form electrically conductive paths across tube sockets, switch contacts, etc., and can gradually eat away wires and components. Even paste and liquid fluxes can in time



Tip that doubles for soldering aid.

Tip that provides for tube socket removal.

Tip that facilitates removal of multiple terminal components



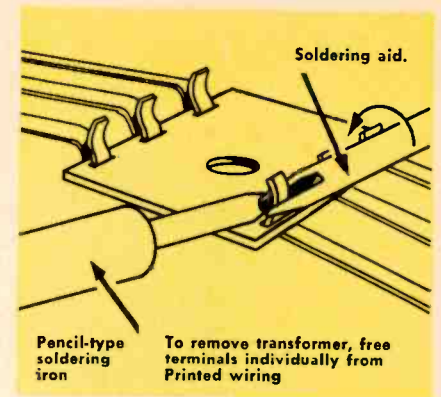
Ungar de-soldering iron.

become somewhat corrosive and conductive. This is why many electronic kit manufacturers will not even attempt to repair kits constructed with acid-core solder or liquid or paste-tube flux.

Irons, Guns and Pencils

Not too long ago, technicians could choose from a wide variety of soldering irons — but *only* irons. Today, however, we are offered an almost infinite combination of irons, guns, pencils, tips and accessories. But bewildering though the diversity of choice may be, most of the new devices were created to satisfy the many present-day needs that did not exist 20 years ago.

PC boards are only one important example of a new set of needs that soldering equipment has had to cope with. It's possible, of course, to work on some PC boards with the heavyweight guns and irons, but even assuming a technician has the skill (and luck) necessary to safely solder PC connections with the high heat monsters, such a mismatch of tool and job is extremely time-wasting. It takes only a few jobs to more than pay for the smaller pencil irons that are made especially for PC board work.



To remove transformer, free terminals individually from Printed wiring

How to remove PC board transformer.

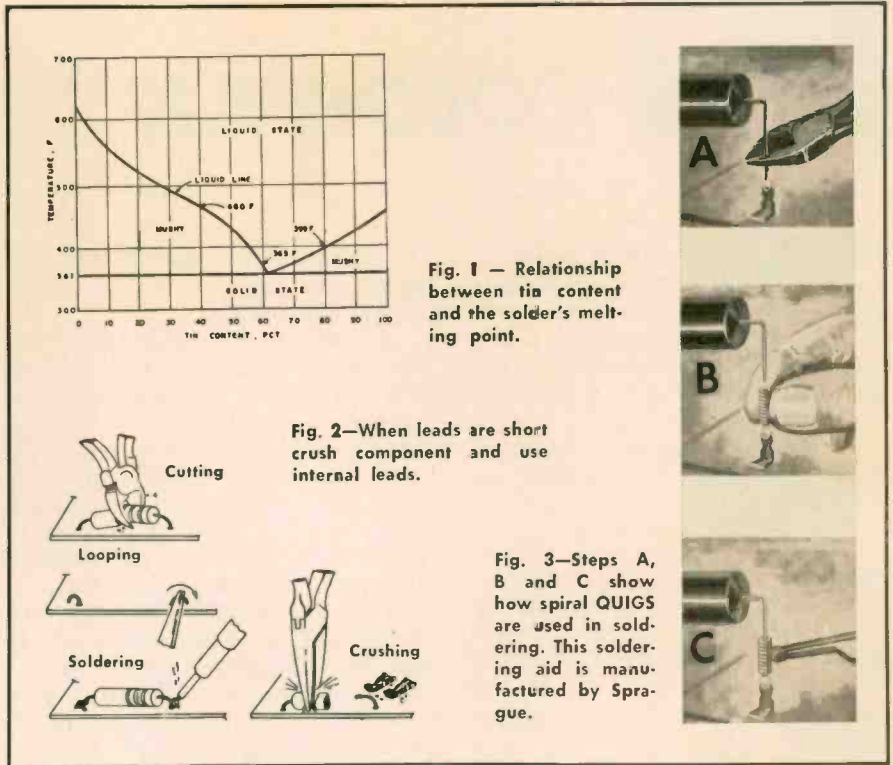
By the same token, it is equally unwise to attempt to use soldering pencils or lightweight irons or guns on heavier work — the lower the heat-producing capacity of the heat source the more time is available for heat to work its way up the wire leads into the components; and irons or guns with marginal heat capacity for the work also tend to promote rosin and cold-solder joints.

The average-size service shop probably could put to good use a half-dozen or more different combinations of guns, tips, irons and pencils; however, in most cases one gun and one pencil should be adequate. The gun should be rated at about 200 w or more and preferably be of the two-heat variety. Almost any soldering pencil in the range of 30 to 60 w is adequate — the lower wattages are generally favored when PC work is frequently encountered.

Techniques

We won't slog through the fundamentals of soldering ordinary tube-type circuitry here, because most everybody knows them (or ought to!) pretty well by now. But PC board soldering is something else again. When soldering and de-

Soldering in a filter capacitor with a heavy Weller gun.



soldering printed circuitry, it's necessary to think not only about the solder joints themselves but about the components, the conductive strips and the board too.

The more modern approach to this problem, however, calls for using a special spiral connector with a copperweld inner core, a layer of flux and outer jacket of solder. These devices can be employed for rapid, one-handed soldering (see Fig. 3).

The most common soldering problem as far as PC boards are concerned is removing and replacing components. Components are mounted to PC boards in two ways: *double ended*, where the components are placed flat against or parallel to the circuit board and the leads come out both ends of the components; and *single-ended*, where the component is "stood up on one end," so to speak, and both leads come out of the component at the end toward the PC board. Each type requires a little different soldering technique.

In replacing double-ended components (Fig. 2), the component leads should be clipped as close to the component as possible — if the leads are exceptionally short, cut the component in half so as to use

the lead length inside the component's body. This way you can solder the replacement component to the old leads and not have to remove the old leads from the PC board and resolder to the board again.

To remove double ended components without cutting their leads (for example, when you don't know whether the component is bad or not), place a small-tip soldering iron on the end of the lead soldered to the printed wiring and melt the solder at the connection. Straighten the lead with a soldering aid, remove the iron and pull the lead out from its mounting hole while the solder is still melted.

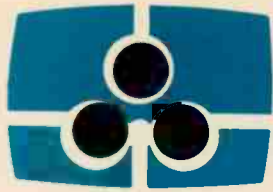
Single-ended components can be desoldered easily if the proper tools are available, but it can really be frustrating without them. One of the most vexing problems encountered in desoldering components from PC boards is getting rid of the solder that is melted from the joint. You can drain the solder away from the joint by gravity if the joint can be positioned higher than the soldering iron, because the molten solder will run back onto the hot tip. But in most cases, of course, this is not possible; however, a rather unique hand-held desoldering aid is available which will suck

up the molten solder when a small rubber bulb is squeezed and the tip of the device is inserted into the solder puddle.

Another problem that is just as bothersome is getting all the component leads to the solder's melting temperature at the same time. Unless only two leads are involved, with an ordinary gun or iron by the time you get the third joint hot enough to melt the solder, the first joint you heated up generally has cooled and resolidified again. If you attempt to overheat the first joints so that they will stay melted long enough to desolder the rest of them, the high heat may severely damage the PC board.

Soldering equipment makers have come to the rescue here, too, however, and now you can buy tips for soldering irons and guns that are shaped so that all the connections of couplates, tube sockets, transformers, etc. can be heated evenly at the same time.

Another problem common to PC boards is the repair or replacement of lengths of the printed conductors. Short breaks can be repaired simply by soldering a short piece of bare wire across the break. On longer breaks, leave the insulation on the wire except where it is soldered. ■



COLORFAX

Zenith Announces 1966 Line

Zenith Sales Corporation announces its 1966 color television line, introducing a \$349.95 table model, and a total of eleven different color sets under \$500. There are a total of seventeen 21-in. models.

Twelve 25-in. rectangular screen receivers starting at a price of \$625, are introduced.

Philco 1966 Sets

Philco Corporation introduced 27 color TV models for 1966. The manufacturer introduced color TV receivers in three screen sizes: 19, 21 and



25 in. The 19 and 25s are 90 deg rectangular types. The 27 color TV models are spotlighted by the 19 in. portable model 5300 WA. In addition to this 19 in. model there are eight 25 in. models which contain solid state circuitry. Both the VHF and UHF tuner and the 3 stage IF system are fully transistorized. A selection of eighteen 21 in. color sets are included in the line.

Admiral Master Screen Control

Three color TV chassis in the G11 series are introduced in the 1966 Admiral Television Line: 1G11, 2G11 and 3G11. These are basically the same as the G11. Chassis have a MASTER SCREEN control on the rear apron which changes the tracking procedure as follows:

The purpose of this adjustment is to obtain good B/W reproduction at the normal useable range of CONTRAST & BRIGHTNESS controls.

To adjust, tune in a channel with a B/W telecast displaying an adequate range of contrast levels, with both light gray and black objects.

1. Set the COLOR FIDELITY and TINT controls to midrange and the COLOR control to minimum.

2. Turn the BRIGHTNESS control to 90 percent of full rotation and the CONTRAST control to produce a normal picture.

3. Turn the MASTER SCREEN control to 75 percent of full rotation.

4. Alternately adjust the BLUE, RED AND GREEN BACKGROUND controls to produce a B/W picture with maximum brightness but without blooming.

5. Check for B/W picture at various settings of BRIGHTNESS control. If picture lacks detail at high brightness levels, increase MASTER SCREEN control slightly; if retrace lines appear, reduce MASTER SCREEN control slightly.

6. Reduce brightness to slightly below normal. If any one color is predominant, reduce that background control slightly. If you cannot get proper tracking, proceed to step 7.

7. It may be necessary to relocate the red, green or blue picture tube cathode wires on the pins provided if a B/W raster cannot be obtained with the BACKGROUND controls. The cathode wires are identified by the red, green or blue tracer on a yellow wire. If one color is predominant, its cathode wire should be connected to pin P (low drive). The other two wires should be connected to either of the N (medium drive) or M (high drive) positions which gives the best B/W picture at all useable settings of the BRIGHTNESS control.

Sylvania Introduces 1966 TVs

Sylvania introduced its 1966 color television line which includes four 19-in. portable models, a 25-in. console series, and a number of 21-in. sets. Robert J. Theis, president of Sylvania Entertainment Products Corp., said the 19-in. sets have rectangular picture



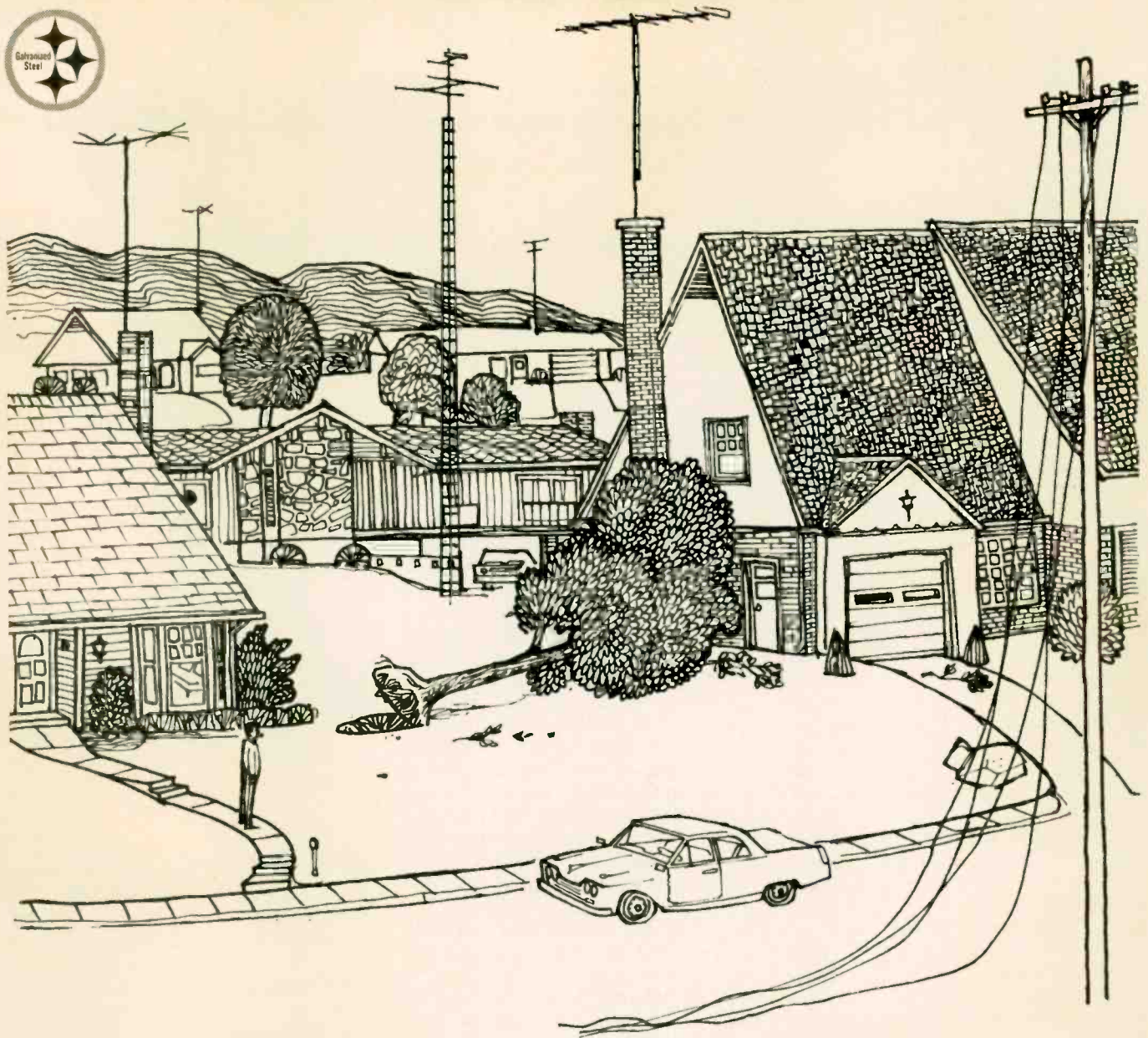
tubes manufactured by the company's electronic tube division. The 19-in. rectangular portable models provide 180 sq in. of viewing area and are available in champagne, mahogany, walnut, and maple finishes and styled in Contemporary and Early American. Designated models 19TC11 and 19TC-12, the sets carry manufacturer's suggested list prices ranging from \$399.50 to \$449.50.

Eleven 25-in. color TV consoles are announced. Twelve 21-in. color TV consoles also are introduced.

RCA Expansion

The Radio Corporation of America announces a \$50 million outlay to increase production facilities for color television receivers and picture tubes. The expansion program is designed to more than double the company's color TV set production capacity within two years and to double color tube output within three years, W. Walter Watts, group executive vice president, said.

A total of \$36.4 million will be spent to expand color TV picture tube facilities, and \$13.3 million will be used to expand color TV receiver facilities, he reported. Watts predicted that annual color receiver sales will grow from more than 2.3 million sets in 1965 to well over 5 million sets by 1970, at which time color will have achieved at least a 40 percent saturation of the nation's television homes. He said color will account for 25 percent of all TV sets sold this year and that the total dollar volume of color set sales at the retail level in 1965 will exceed that of black-and-white for the first time ever — rising to a record \$1.2 billion. Douglas Y. Smith, vice president, RCA Electronics Components and Devices, explained that the \$36.4 million allocated for color tube expansion will be broken down this way: \$24.7 million to provide added manufacturing equipment and support facilities for color tube operations at Marion, Ind., including 264,000 sq ft of additional manufacturing and warehousing space and \$11.7 million to provide added facilities as well as 23,000 sq ft of new manufacturing space at the Lancaster, Pa., plant. He said the company is preparing for greatly increased production of rectangular color picture tubes during 1966.



Sell your customers TV masts, towers that stay up

Steel-strong masts and towers of Armco ZINCGRIP® Steel Tubing help keep antennas aligned despite ice or high winds. When flimsy masts are buckling, your masts of ZINCGRIP Tubing are still up there . . . gaining good will for you. They give you the advantage of pleased customers when it comes to profit-making sales of other items in your line.

In addition to their strength, masts and towers of ZINCGRIP Tubing are protected with a durable zinc coating that fights rust and retains good looks.

Get names of manufacturers who make masts and towers with these features that help you sell. Fill in and mail the coupon below.

Armco Steel Corporation, Steel Division
Department E-3205, P. O. Box 600
Middletown, Ohio 45042

Send me names of manufacturers of TV masts and towers of Armco ZINCGRIP Steel Tubing.

NAME _____

FIRM _____

STREET _____

CITY _____

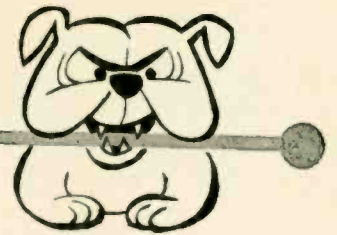
STATE _____

ZIP _____

ARMCO STEEL



... for more details circle 14 on postcard



Difficult Service Jobs Described by Readers

Shorted Diode

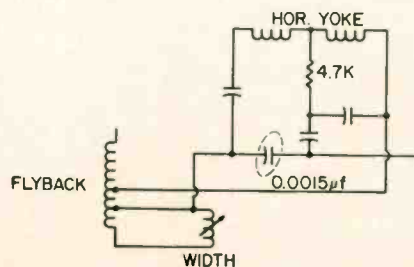
A customer brought in a 1963 Pontiac radio, model no. 5730367. He said it had a bad squeal. This was confirmed when I connected it up on the bench and switched it on. The squeal was caused by an open 30 μf filter. Replacement of this component solved the problem. The radio was "cooked" for two hours or so and it seemed to be functioning normally so the set was returned to the customer. Several days later the customer was back with the car complaining of low volume. We checked the antenna and speaker before pulling the radio. Both checked out OK so the radio was removed from the car. With an audio generator and scope I determined that the gain of the audio output stage was very low. Replacing the 1000 μf capacitor (C36), corrected this problem and the radio seemed to be operating OK again, especially on the local station. But in checking the radio in the car after installation, I noticed that it had a low volume on distant stations. I called my partner out to see if he thought the volume was down. He agreed that the radio was not functioning properly so back the set went into the shop. I replaced the RF transistor with no noticeable improvement in output. With a noise generator, we began signal tracing at the audio output stage. This check confirmed our previous scope check of this stage — that the output stage was operating normally. Moving back to the base of the first audio amplifier, it was determined that this stage was also functioning properly. In fact, with the noise generator fed into the antenna the output seemed normal. All voltages checked OK. All transistors checked out fine on an in-circuit transistor checker. About the only thing in the set that I hadn't checked was the diode detector. A resistance check revealed that the diode had a lower than normal reading in the reverse direction. The diode was replaced and the radio then operated perfectly even on the distant stations. The radio was reinstalled in the car after cooking for three hours. Full volume was obtainable on all stations after installation. The customer has

been in the shop since and said that the radio now picks up the distant stations with ease. The thing that still puzzles me is why the audio quality was so good with a defective diode.—*Danny St. Onge, Lethbridge, Alta. Canada.*

Hot Network Resistor

A "dog" I'll never forget showed up in a 126 RCA chassis. The complaint was "not enough width." Width was "shy" about two inches on each side. A $\frac{1}{2}$ w, 4.7 K resistor connected to the center tap of the horizontal yoke winding was burned to a crisp.

Checks with a VTM did not reveal any shorts or leakage anywhere in the horizontal output circuit. I replaced the resistor, switched the set on and the resistor promptly began to smoke. I removed it altogether and placed a small capacitor across the width coil. To my surprise, the brightness remained exceptionally good and the width expanded fully. I left the resistor out and the set worked fine. I delivered the set—with exhausted patience and loss of pride—and it worked in a very satisfactory manner. But the set was back in the shop within three weeks. Since there was a complete loss of raster this time, I was happy to see it come back since this offered some hope of restoring my pride.



The fault this time proved to be only a bad 1X2. I experimentally removed the capacitor across the width coil and found myself back where I had previously started.

Now I began to reason, since added capacity restored the width, perhaps an open capacitor in this network was causing loss of proper width and over-heat also. I looked for the capacitor that most effectively shunted the

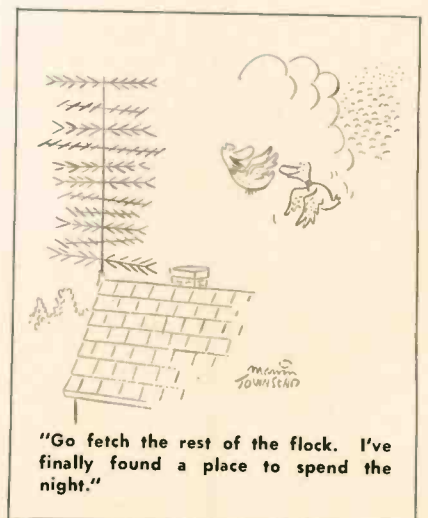
"width circuit." It seemed to me that the 0.0015 μf capacitor (see schematic) did just this. One side is connected directly to the width coil and the other side is connected through two capacitors to the flyback winding.

When this capacitor and the 4.7 K resistor were replaced the resistor ran perfectly cool and the set had plenty of width.

I'll remember this one for a long time. If I had originally considered the relative "high frequency" involved in this network I would have known that a "detuned" condition in the circuit would have caused heavier than normal current to be drawn by the resistor. At any rate, my pride has been restored.—*Oscar Schectar, Pittsburgh, Pa.*

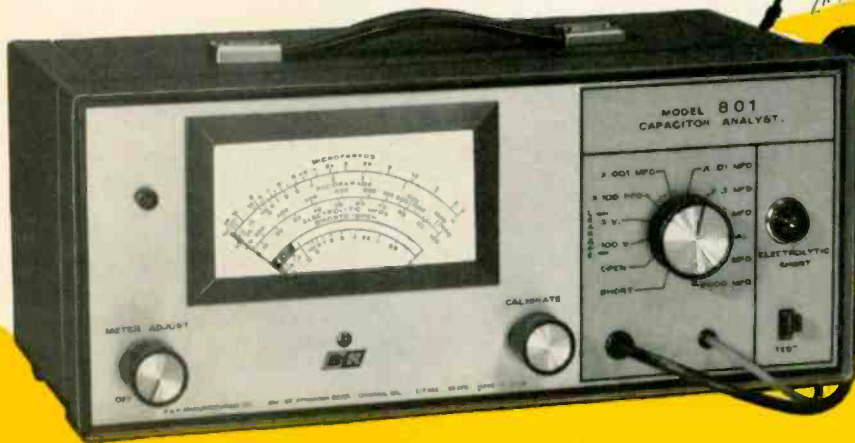
TOUGH DOGS WANTED

\$10.00 paid for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photographs are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, Ojibway Bldg., Duluth, Minnesota 55802.



Now you can quickly locate defective capacitors affecting the performance of electronic circuits —and prevent costly call-backs!

CAPACITOR TESTING IN-CIRCUIT/OUT-OF-CIRCUIT IS QUICK AND EASY



NEW B & K CAPACITOR ANALYST

MODEL 801

for TV, Radio, Transistor Radio, Auto Radio, Hi-Fi, and other electronic equipment

Unique new B & K development puts the measurement of capacitors and electrolytics on a practical basis—picks up all defects that will affect performance—turns lost time into profit dollars.

Servicemen are aware that capacitors and electrolytics are second only to receiving tubes in creating the most servicing problems.

The new B & K Capacitor Analyst enables you more easily to measure capacitance and leakage resistance—detect both opens and shorts—both in-circuit and out-of-circuit. In-circuit leakage resistance test can be made on low-voltage circuits such as transistor radios, or on higher voltage circuits. Checks capacitor value from 25 pfd to 100 mfd.

Tests electrolytic capacitors by unique circuit (Pat. Pend.) which determines how well the electrolytic does the job of storing electrical energy and returning it back to the circuit. Detects marginal electrolytics that should be replaced. Also predicts life expectancy of any electrolytic capacitor rated 3 volts or more.

Model 801 Capacitor Analyst is attractive, rugged, and easy to use.

NET, \$109⁹⁵

Ask Your B & K Distributor for Details,
or Write for Bulletin No. 108-T



B & K MANUFACTURING CO.
DIVISION OF DYNASCAN CORPORATION
1801 W. BELLE PLAINE AVE. • CHICAGO, ILL. 60613
Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.
Export: Empire Exporters, 123 Grand St., New York 13, U.S.A.

NEW PRODUCTS

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

Speaker System 200

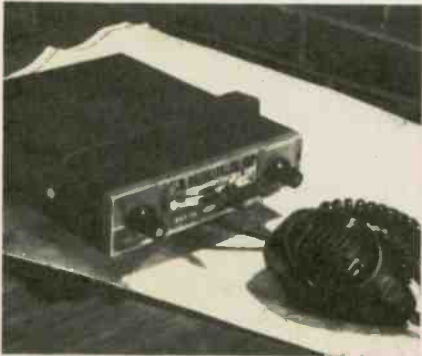
This high fidelity speaker system, 846A, is finished in hand-rubbed walnut and consists of a cast aluminum



sectoral horn powered by a HF driver, a low frequency speaker, and a two-section 800 cps dividing network. The manufacturer says the speaker system has a frequency response of 30 - 22,000 cps and a power rating of 30 w. It is designed to operate from 8 or 16 Ω and stands 29 $\frac{3}{4}$ x 27 $\frac{1}{2}$ x 19 in. Altec Lansing.

CB Radio 201

This two-way unit for automobiles has five channels, a lighted channel



selector switch and a transmitter output light. The transceiver measures 6 $\frac{1}{4}$ in. x 8 in. x 1 $\frac{1}{2}$ in. Raytheon.

Servo Tool Kit 202

A kit of tools for troubleshooting and repair of complex equipment including computers, delicate instruments and business machines is announced. Tools are contained in vinyl roll up case. The tool kit consists of one each of the following: snip wire cutter, swivel screw driver, 25 w



soldering iron, wire stripper, bucket microscope, pin vise, chain nose plier, pocket contact burnisher, inspection mirror, pkg. of 12 replacement blades for burnisher, nickel tweezer and locking plier. Jonard.

Multiplex Generator 203

The FM Multiplex Signal Generator provides a controlled amplitude composite audio signal for direct injection beyond the detector into the multi-



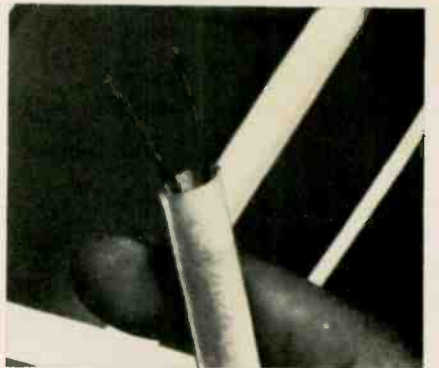
EICO Model 342 FM/MPX Signal Generator

plex section of a tuner or receiver, plus a 100% modulated (± 75 kc) FM radio carrier, modulated by the same composite audio signal, which can be fed to the antenna terminals. The frequency of the RF carrier is adjustable and is ordinarily set at about 100 Mc. Left-only, right-only, sum or difference signals may be provided by the built-in 1 kc oscillator or an external audio signal generator connected to a panel jack. A crystal controlled 19 kc pilot signal is provided which may be switched on and off independently and may be utilized without the audio information. An oscilloscope sync output is provided which delivers via an isolating

cathode follower either the 79 kc pilot signal or the 1 kc internal oscillator signal at the setting of a panel switch. An input is provided for connecting an external audio signal generator to provide an SCA signal. The unit is 8 $\frac{1}{2}$ x 5 $\frac{3}{4}$ x 12 $\frac{1}{2}$ in. and weighs 10 lb. EICO.

Sleeving 204

A thin wall, electrical sleeving, composed of a high dielectric strength film, thermally bonded to a non-



woven polyester mat is announced. Called 1X6029 polyester web-film sleeving, it is designed for low voltage motors, hermetic motors, transformer, alternators and electronic equipment. Nominal wall thickness is 0.0055 in. 3M.

Grease 205

A lubricating grease, designed for electrical contacts and packaged in a pressure can, is introduced. It is a



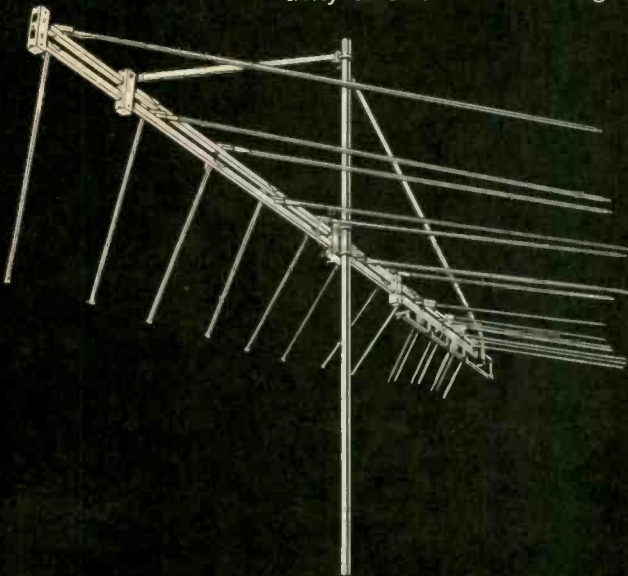
lubricating grease for electrical contacts, packaged in an aerosol can, and contains an anti-oxidant to prevent corrosion and to extend part life. Injectorall.



The quality goes in before the name goes on

FOR THE FINEST COLOR AND UHF RECEPTION INSTALL ZENITH QUALITY ANTENNAS

... to assure finer performance in difficult reception areas!
More color TV sets and new UHF stations mean new antenna installation jobs for you. Proper installation with antennas of Zenith quality is most important because of the sensitivity of color and UHF signals.



ZENITH ALL-CHANNEL VHF/UHF/FM AND FM-STEREO LOG-PERIODIC ANTENNAS

The unusually broad bandwidth of the new Zenith VHF/UHF/FM and FM-Stereo log-periodic resonant V-dipole arrays pulls in all frequencies from 50 to 900 mc—television channels 2 to 83 plus FM radio. The multi-mode operation provides high gain and good rejection of ghosts.

These frequency independent antennas, developed by the research laboratories at the University of Illinois, are designed according to a geometrically derived logarithmic-periodic formula used in satellite telemetry.



ZENITH QUALITY HEAVY-DUTY ANTENNA ROTORS

Zenith quality antenna rotors are heavy-duty throughout—with rugged motor and die-cast aluminum housing. Turns a 150-lb. antenna 360 degrees in 45 seconds. The weather-proof bell casting protects the unit from the elements. Each rotor mounts easily to either a mast or tower without an adapter.



ZENITH QUALITY WIRE AND CABLE

Zenith features a full line of quality packaged wire and cable. Also especially designed UHF transmission wires, sold only by Zenith. Zenith wire and cable is engineered for greater reception and longer life, and is available in various lengths to suit every serviceman's needs.

Check the Yellow Pages for the Zenith Distributor nearest you.
Or write to Zenith Sales Corporation, Parts and Accessories Division,
5801 West Dickens Avenue, Chicago, Illinois 60639,
for Distributor name plus complete catalogue and technical
information on Zenith Quality antenna installations.

Specifications subject to change without notice.

... for more details circle 51 on postcard

**There's a tool right here
for any soldering need.
And you know it's best
because it's from**

Weller®



Dual Heat Soldering Guns.

Weller guns reach full soldering temperature up to 40% faster than other guns. Up to 28% greater soldering efficiency. Two trigger positions let you switch instantly to low heat for soldering near heat-sensitive components—or high heat when you need it. Spotlight illuminates work. Three models cover all needs:

- 100/140 watts—Model 8200 — \$5.95 list
- 145/210 watts—Model D-440 — \$9.95 list
- 240/325 watts—Model D-550—\$10.95 list



“Pencil” Soldering Iron. Small, lightweight, efficient.

A 25-watt, 115 volt iron that weighs only 1¾ ounces. Yet it does the work of irons that weigh twice as much and have much higher wattage. You can hold and maneuver it as easily as a pencil. Recovers heat rapidly. Maximum tip temperature 860°F. With ⅛" screwdriver tip and cord. Model W-PS—\$5.20 list.



Temperature-Controlled Low-Voltage Soldering Pencil.

New! For universal soldering including heavy-duty chassis work. Temperature control is in the tip. Interchangeable tips give a choice of 500°F, 600°F, 700°F and 800°F controlled temperatures. Operates on 24 volts. Small, lightweight, highly efficient. Complete with ⅛" 700°F tip and 60 watt, 120 volt, 50/60 cycle power unit which has stand for soldering pencil attached. Model W-TCP—\$26.00 list.

**AT YOUR ELECTRONIC PARTS DISTRIBUTOR
WELLER ELECTRIC CORP., EASTON, PA.**

In Canada: Weller Electric Corp., 121 Counter Street, Kingston, Ontario

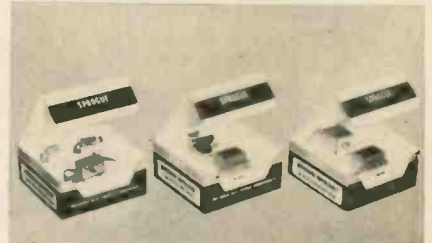
WORLD LEADER IN SOLDERING TECHNOLOGY

... for more details circle 48 on postcard

NEW PRODUCTS

Alternator Suppressors 206

Three noise suppressing kits, each designed for installation in Chrysler, Ford, or General Motors vehicles hav-



ing alternator electrical supply systems are announced. Type SK-10 is intended for Chrysler cars and trucks, while Types SK-20 and SK-30 are engineered for Ford and General Motors vehicles, respectively. For use on cars or trucks with citizens' band amateur, industrial or public service mobile radio equipment, the kits include LC networks and thru-pass capacitors to handle the hash and eliminate the siren-like whine caused by the alternator output, providing effective interference suppression through 400 Mc. Sprague.

Temperature Tester 207

The Model 255 includes the VOM functions of a meter plus the addition of a temperature range package



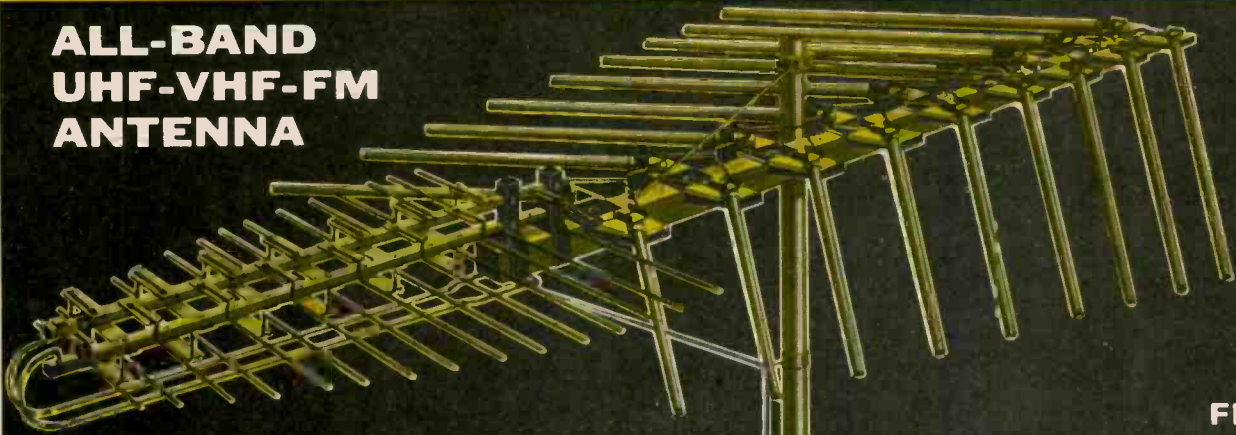
of +100° to +1050°F. It can be used in many fields, including gas appliance servicing and installation, electrical utilities and heating service and installation. A low mv drop is provided on the ranges. By using an ac clamp-on adapter, ac currents through 250 amp can be checked without disconnecting the leads or otherwise opening the circuit. Simpson.

FINCO

COLOR-VE-LOG ANTENNAS

FOR UHF, VHF, FM RECEPTION

ALL-BAND UHF-VHF-FM ANTENNA

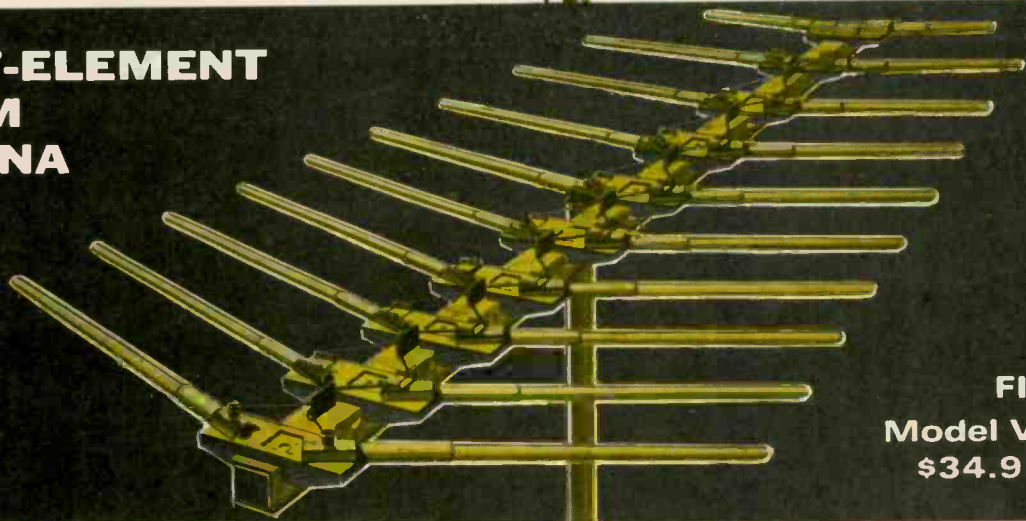


FINCO
Model UVF-24
\$59.95 list

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

FINCO Model UVF-18—\$42.50 list
FINCO Model UVF-16—\$30.50 list
FINCO Model UVF-10—\$18.50 list

SWEPT-ELEMENT VHF-FM ANTENNA



FINCO
Model VL-10
\$34.95 list

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

FINCO Model VL-18—\$54.50 list
FINCO Model VL-15—\$46.95 list
FINCO Model VL-7—\$23.95 list
FINCO Model VL-5—\$16.95 list

Featuring FINCO's exclusive Gold Corodizing

FINCO COLOR-VE-LOG

Prices and specifications subject to change without notice

THE FINNEY COMPANY • 34 W. Interstate Street • Bedford, Ohio

Write for beautiful color brochures Number 20-322, and 20-307, Dept. 110

... for more details circle 24 on postcard

NEW PRODUCTS

TV Antenna

208

This dome-type antenna measures 8 x 18 in. and can be mounted on the roof, under the eaves or in the attic

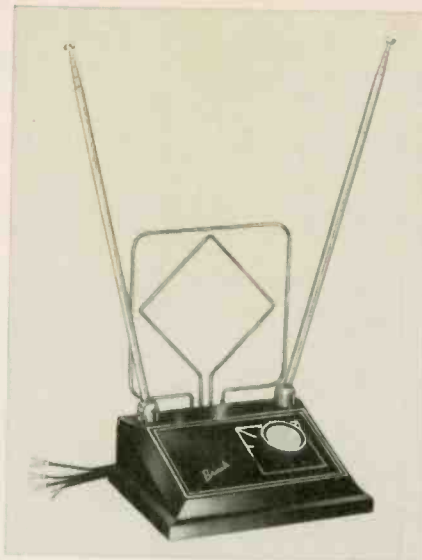


with four screws. The manufacturer claims that the antenna will provide satisfactory reception on both VHF and UHF. Eagle.

Indoor Antenna

209

An indoor antenna, featuring elements with individually spring-loaded ball sockets, is announced. This design allows 360 deg pivoting for extra



fine adjustments in critical signal areas, according to the manufacturer. Over-all construction employs textured material similar to leatherette with either chromate or chrome finish. Brach.

AM/FM Stereo Tuner

210

An all transistor AM/FM stereo tuner is announced. Sensitivity of the ST2000 is rated at 2.9 μV IHFM for FM and 50 μV /meter for AM. IF rejection is 55 db, with image rejection better than 45 db and spurious

response rejection exceeding 60 db, according to the manufacturer. It has a stereo indicator light and a convenience outlet. The unit measures 13 $\frac{1}{4}$ x 4 $\frac{3}{8}$ x 10 $\frac{1}{2}$ in. Shipping weight is 9 lb. Harman Kardon.

Oscilloscope

211

A specialized oscilloscope designed for frequency deviation measurement is announced. The FM deviation meter is essentially a broad-band FM receiver. Audio output voltage from a calibrated discriminator is used as



a measure of modulation deviation. The discriminator output is amplified and directly coupled to the vertical deflected plates of the CRT. A crystal controlled calibration marker is included in the instrument. Radio Specialty.

The only solid state TENNA-ROTOR® ALLIANCE C-225

Distributors and dealers are enjoying amazing sales results with the solid state C-225 Tenna-Rotor®.

Its patented phase-sensing bridge circuit is patterned after scientific test equipment to afford the TV and FM stereo owner life-like 'studio' reception.

Alliance Tenna-Rotors are built to handle today's larger new antennas. They will support, hold and turn any antenna that can be lifted and placed on them. Careful workmanship and precision components provide longer life and dependable, trouble-free operation.

Check the C-225 "plus" features

- accurate repeatability
- constant synchronization
- silent operation
- greater sensitivity

Quality features you expect from the world's leading manufacturer of antenna rotating devices. Sell the line you sell with confidence — Alliance Tenna-Rotor®!

Order the C-225 and other quality Alliance models today.



"TV's better color getter"

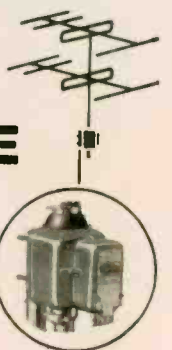
For Complete Details write ...



The **ALLIANCE**

Manufacturing Co., Inc.
Alliance, Ohio

(Subsidiary of Consolidated
Electronics Industries Corp.)



... for more details circle 10 on postcard
ELECTRONIC TECHNICIAN

ALL NEW FROM *HICKOK*

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

OBSOLESCENCE PROTECTION
*Realistic, Practical
No Compromise!*

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

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

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

MODEL 799
Mustang
\$199⁹⁵

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

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

any possible new tube types.

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

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

See it at your Hickok distributor or write for circular TT799. Ask your distributor about the Hickok credit plan.

HICKOK

THE HICKOK ELECTRICAL INSTRUMENT CO.

10523 Dupont Avenue, Cleveland, Ohio 44108

Represented in Canada by Stark Electronics, Ajax, Ontario
Internationally by Hughes International, Culver City, California

... for more details circle 27 on postcard

NEW PRODUCTS

Power Transistor 212

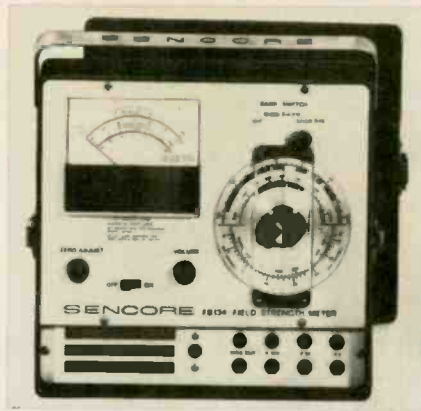
A transistor designed for high power handling capabilities is announced. The transistor can handle



up to 100 rms power in class AB audio power output applications. The ratings of the DTG-110B are: $V_{CEX} = -90v$; $V_{CEO} = -40v$; $I_C = 25$ amp; V_{CE} (sus) at I_C of 5 amp = $-40v$ min. Delco.

Field Strength Meter 213

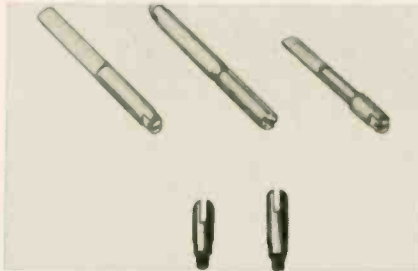
This portable field strength meter has a sensitivity of $5\mu v$ on VHF and FM and $15\mu v$ on UHF, the manufacturer reports. Either $300\ \Omega$ or $75\ \Omega$



input impedance is available. The unit is said to have a 500 kc bandwidth. It has a 4 in. meter calibrated in both microvolts and db. Sencore.

Control Shafts 214

Thirteen exact length control shafts have been added to a line of replace-



ment controls. Three types of nylon single control shaft styles are included. These are $1/4$ in. diameter with knurl and screwdriver slot, and $1/4$ in. and $3/16$ in. diameter with $.156$ in. flat mill. Two metal single control shafts for replacement of G-E "bullet end" controls are also available, since the standard shafts will not accept the specially constructed knobs used with many G-E controls. Centralab.

Knobs 215

A line of round bar knobs in four styles for instrument use is announced. They are offered in plain round, ring-



skirted round, and dial-skirted round styles. A round bar is also available with a concentric base for dual control applications. Raytheon.

MR. TV. SERVICEMAN

STANCOR THE COMPLETE LINE

FLYBACKS • YOKES • VERTICAL OUTPUTS
AUDIO OUTPUTS • RF AND IF COILS
POWER • WIDTH AND LINEARITY COILS

- EXACT TUBE-IN-SOCKET REPLACEMENTS
- NO EXTRA HARDWARE
- NO CIRCUIT MODIFICATIONS
- COLOR--BLACK & WHITE

FOR 11 MAJOR MANUFACTURERS*
LAST 7 MODEL YEARS
AND MOST OTHERS

Ask your Distributor for a copy of the new TV Replacement Guide

Stocked by over 1000 Service Parts Distributors — Back up Stock • Chicago • Dallas • Los Angeles • New York



ELECTRONIC MARKETING DIVISION
ESSEX WIRE CORPORATION
3501 W. Addison Street
Chicago, Illinois 60618

In products, performance, purpose . . . Essex measures up!





RECOMMENDED BY

PHILCO

for **COLOR**

& **BLACK AND WHITE**
TV INSTALLATION

COLORMAGIC

Patent Pending

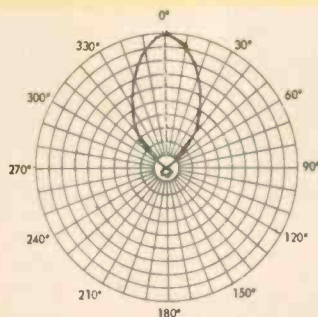
FHR

FUNDAMENTAL HARMONIC RESONANCE...GC'S EXCLUSIVE DESIGN PROCESS!
Colormagic elements resonate on the fundamental harmonics within both the high and low bands. Colormagic FHR outperforms the average second harmonic TV element by producing a tight, laser-linked directivity of signal...higher gain! It's in the elements!

GC "GOLD-GUARD" anodizing process guards against pitting, chipping, rust and corrosion...makes the Colormagic series the best protected, all-weather line available!

GC "SOLID-SEMBLED" construction insures quick, easy installation...rigid-lock elements snap securely into place!

Compare! Colormagic Antenna Systems offer pencil-point polar patterns...laser-linked directivity...flat plateau response curve...no traps or peaks...excellent for color or black & white TV reception.



15 All-New Colormagic Combo-Couplers permit cross-direction reception of UHF-VHF-FM antenna combinations...each unit encased in high-impact polystyrene case...supplied with stainless Steel mounting strap. Complete sales program available.



See your GC Distributor! He'll fill you in on this "prestige" package. **CONSIDER THE ELEMENTS INVOLVED!** ...then GO COLORMAGIC! If not stocked locally, write us for name of Distributor nearest you.

GC ELECTRONICS
DIVISION OF TEXTRON ELECTRONICS, INC.

EASTERN PLANT: HICKSVILLE, L.I., N.Y.
MAIN PLANT: ROCKFORD, ILLINOIS, U.S.A.
WESTERN PLANT: LOS ANGELES, CALIF.

“Which microphone should I use?”

- for tape recording
- for broadcasting
- for CB and ham
- for public address
- for any application...

Free Booklet—
Everything You
Want To Know
About Micro-
phones! Send
Coupon Today!



LTV UNIVERSITY
A DIVISION OF LING TEMP-CO. VOUCHER, INC.

Desk ET, P. O. Box 1056, Oklahoma City, Okla.

Name _____

Address _____

City _____ State _____ Zip Code _____

... for more details circle 31 on postcard

NEW PRODUCTS

Lead Acid Battery 216

A 6 v rechargeable lead-acid battery is introduced. Because it contains no free electrolyte the battery is leak-



proof, splashproof and spillproof, the manufacturer says. The battery is designed for TV sets, radios, camp lighting equipment, hedge trimmers, lawnmowers, typewriters and other cordless electrical devices. The unit measures 1 3/16 x 2 23/32 x 3 25/32 in. It weighs less than 1.5 lb. Yuasa.

Tape Recorder 217

This capstan-drive tape recorder operates at 1 7/8 and 3 3/4 ips on stand-



ard flashlight batteries or 117 vac when used with an external ac adapter. It has a single-lever control for play, record, rewind and stop, inputs for remote microphone or telephone pick-up and for radio recording; plus outputs for earphone or speaker. TR-520 comes equipped with a VU meter, safety-recording lock and fast-forward control. Dimensions are 11 1/2 x 9 1/2 x 4 1/2 in. Weighs 10 lb with tape and batteries. Craig.

Truck Alarm 218

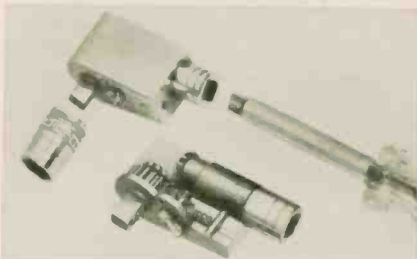
An alarm to guard passenger cars and trucks against looting is introduced. The alarm is set by a tamper-



proof lock in a front fender well. While it is set, the alarm sounds when the hood is raised, a door is opened, or the trunk is opened. Aqualarm.

Spin Ratchet 219

A spinning ratchet tool which integrates ratcheting and spinning is announced. The ratcheting action pro-



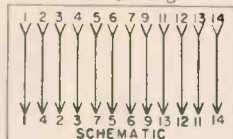
vides leverage for breakaway and final tightening; spinning for high speed. The handle of the ratchet is any conventional square drive spinning handle and may be replaced by other socket equipment to provide the operator with the desired combination. The ratcheting action is performed by the usual side motion; spinning is accomplished by spinning the handle. Amtronix.

NEW FROM POMONA ELECTRONICS: COLOR CRT TEST ADAPTER

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



Miniature Diheptal Socket
14BE Basing



Neo-Diheptal Base
14AL/14AU Basing

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

Features—provision for accepting bases equipped with spark gaps.

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

MODEL 2276

NET \$5.95

POMONA ELECTRONICS CO., INC.

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

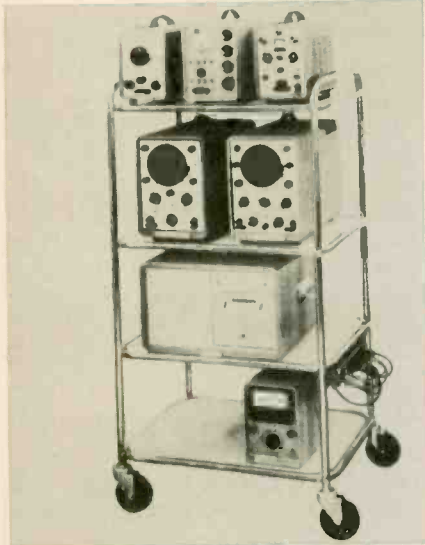
... for more details circle 36 on postcard

NEW PRODUCTS

Lab Cart

220

A stainless steel instrument laboratory cart is introduced. The four-deck instrument cart has removable ply-



wood decks. Over-all width of the CE1500-2 is 24 $\frac{5}{8}$ by 31 $\frac{1}{4}$ in.; cart is 58 $\frac{5}{8}$ in. high with the top deck 55 in. high. Openings between decks are 13, 14 and 17 $\frac{1}{4}$ in. from the bottom up. A 6-outlet receptacle, with 6 female plug outlets, ON/OFF light switch, fuse, 10 ft cord with holding cleat, is included between the bottom two shelves. Cambridge.

Base Stations

221

A line of base stations for mobile radio systems is introduced. Transmitter modulation distortion is rated at 3% or less for 1000 cps. The unit has two audio outputs from the receiver. The first is a 3 w output into the local speaker, with a response between 1 and -8 db from 300 to 3000 cps; the second is to the telephone line which goes back to the remote control console. This output

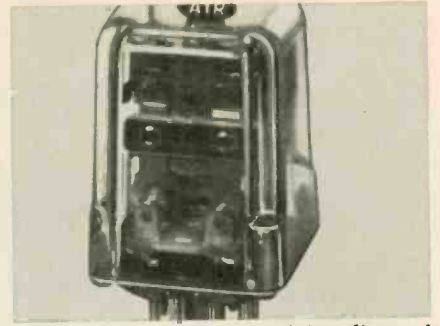


is rated at plus 18 dbm and has a response of plus 1 to -3 dbm from 300 to 3000 cps. Motorola.

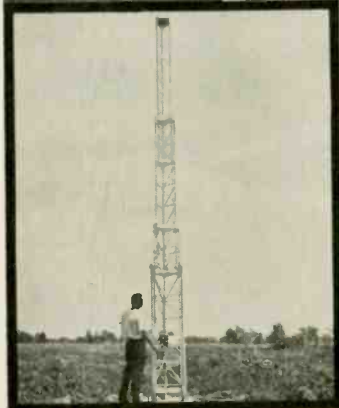
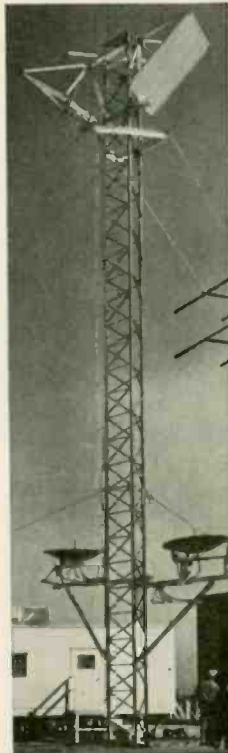
Plug-in-Relay

222

A series of small plug-in relays is announced. These relays are multi-contact units available for operation from 6 vac or dc to 115 vac or dc. They are general purpose relays designed for handling light power loads on small motors, solenoids, and other relays, as well as general automation work. The plug-in relays are enclosed in a plastic dust cover equipped with standard 8-pin octal plugs and 11-pin



plugs. Contacts are 3/16 in. dia and rated at 5 amp or 10 amp. Weight approximately 3 oz. Seated dimensions: 1 13/32 x 1 13/32 x 2 in. ATR.



The most Famous Name in
TOWERS of ALL KINDS!

Here are the advantages you get
when you insist on **ROHN TOWERS**

LARGEST FULL RANGE OF TOWERS—you can get anything from home TV and amateur radio towers to heavy-duty communication and micro-wave towers. Included are 500 foot self-supporting towers, 1,000 foot guyed towers, "fold-over" and crank-up towers. Regardless of your needs, ROHN can supply it.

UNQUESTIONED LEADERSHIP IN DESIGN AND MANUFACTURE—you get the latest in advanced tower engineering. All communication towers are engineered to EIA specifications, and are proved by thousands of installations. No other manufacturer can surpass the quality and fine reputation of ROHN.

QUALITY MATERIALS AND WORKMANSHIP—Only highest quality steel is used which fully meets the specifications for the job. ROHN towers are hot-dipped galvanized after fabrication—a feature ROHN pioneered!

SERVICE WHEREVER YOU WANT IT—ROHN representatives are world-wide. Complete erection service for communication systems, broadcasting, micro-wave, and other needs is available; also competent engineering service to help you.

Settle for the BEST in TOWERS—ROHN—today the world's largest, exclusive manufacturer of towers of all kinds!

For your needs, contact your local ROHN salesman, distributor or dealer; or write direct for information.

SEND THE HANDY COUPON INDICATING YOUR NEEDS

ROHN

Manufacturing
Co.

BOX 2000
PEORIA, ILLINOIS

ROHN Manufacturing Co.
Box 2000
Peoria, Illinois

Send me complete literature on the following ROHN Products:

- | | |
|---|--|
| <input type="checkbox"/> Home TV Towers | <input type="checkbox"/> Amateur Towers |
| <input type="checkbox"/> Communication Towers | <input type="checkbox"/> AM-FM Broadcasting Towers |
| <input type="checkbox"/> Micro-Wave Towers | <input type="checkbox"/> Government |

Name _____

Firm _____

Address _____

City _____ State _____

... for more details circle 40 on postcard

Exact Replacement Coil Service by Miller can help you 4 ways

WIDEST LINE of replacement coils in the industry — over 30,000 listings in catalog cross reference guide.

NATIONWIDE DISTRIBUTORS stock Miller replacement coils on their shelves for immediate delivery to you.

SAME DAY SHIPMENT for virtually all orders received when distributors are temporarily out of stock.

NON-CATALOGED REPLACEMENTS receive same fast service. Just indicate model no., part no., chassis no.



J. W. MILLER COMPANY

5917 South Main Street • Los Angeles, California 90003

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

... for more details circle 33 on postcard

NEW LITERATURE

Amplifiers 300

Two bulletins describe a line of audio amplifiers. Features and specifications of the amplifiers are included. Browning.

Transistors 301

A line of five transistors are cross referenced with numerous others used in various types of circuitry. These five transistors can be used for replacements in radios, phonographs, tape recorders, amplifiers and other entertainment type electronic equipment. Workman.

Coaxial Cable 302

Specifications for a line of semi-flexible aluminum sheathed coaxial cable are contained in this 20 page catalog. It also includes information on a series of coaxial cable connectors. Times.

Power Tubes 303

This five page brochure describes a line of high power tubes designed for applications in radar and microwave modulators. Included are both ceramic and glass hydrogen filled diodes and thyatrons. Tung-sol.

Electrical Components 304

A 68 page catalog covers a wide variety of tube sockets, plugs, connectors and other electrical components. Electrical and mechanical specifications are given for the components listed. Amphenol.

Conversion Chart 305

A pocket conversion chart includes conversion of micro-inches to angles and angles to micro-inches; inches to millimeters, microns and angstroms to millimeters and microns to angstroms to inches. Also shown are wavelengths of monochromatic radiations for gage interferometry; selected physical constants and other data. Engis.

Tools 306

A line of specialty tools is described in this 150 page catalog. The catalog is sectionalized according to product category. Screw drivers, nut drivers, terminals and crimping tools, pliers and wrenches, specialty tools, display and carded items, business gift and premium items are included. Vaco.

READY ... NOW!



NEW *Brach*
UHF/VHF
TV ANTENNAS
FOR
Black/White & Color

6651 Gold Finish
6652 Chrome Finish

- Ultimate in Design!
- Unequaled in Performance!
- Outstanding in Value!

BRACH MANUFACTURING CORP.

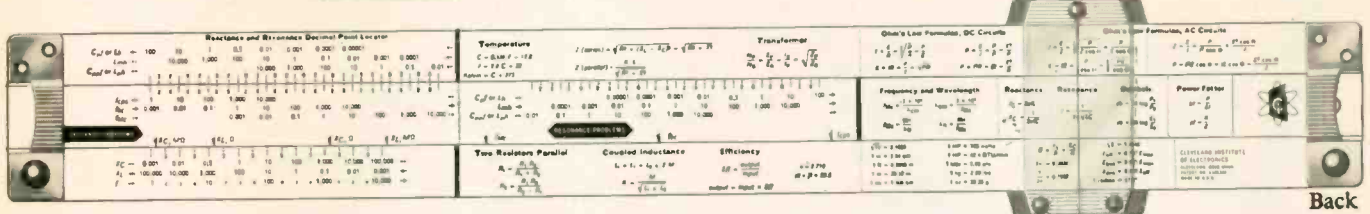
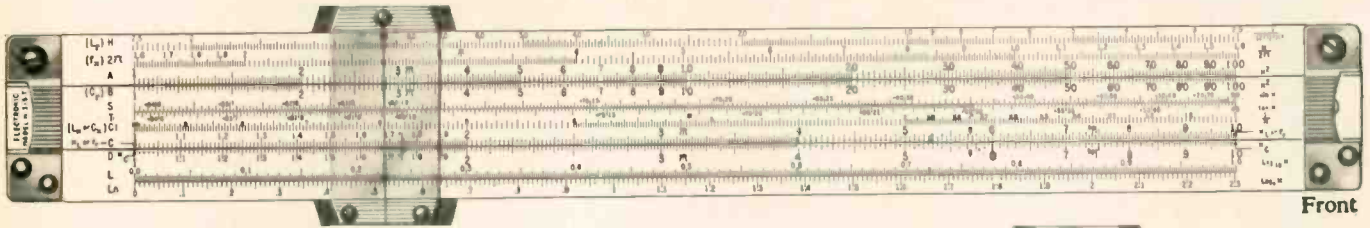
DIVISION OF GENERAL BRONZE CORPORATION

899 MAIN ST., SAYREVILLE, NEW JERSEY

... for more details circle 17 on postcard

LOOK!

A New Electronics Slide Rule with Instruction Course

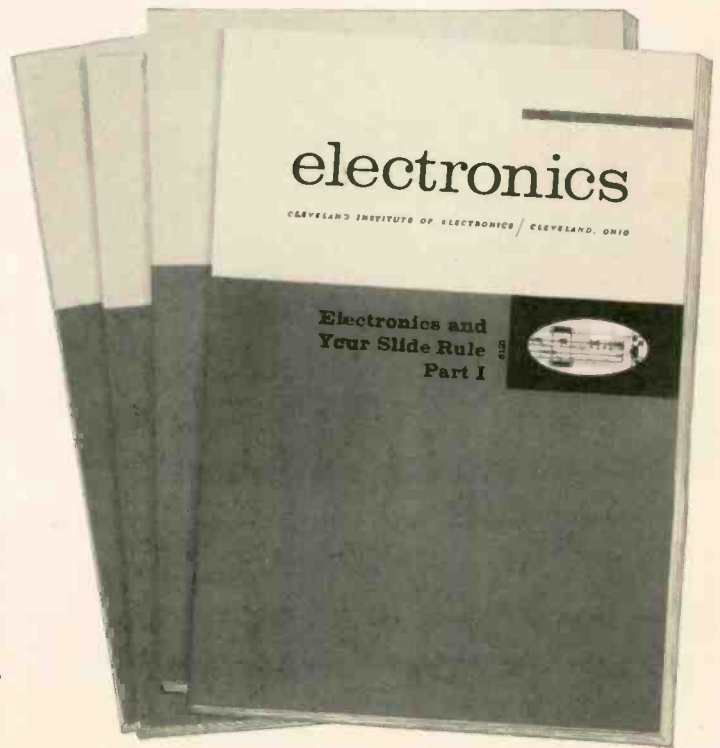


This amazing new "computer in a case" will save you time the very first day. CIE's patented, all-metal 10" electronics slide rule was designed *specifically* for electronic engineers, technicians, students, radio-TV servicemen and hobbyists. It features special scales for solving reactance, resonance, inductance and AC-DC circuitry problems . . . an exclusive "fast-finder" decimal point locator . . . widely-used formulas and conversion factors for instant reference. And there's all the standard scales you need to do multiplication, division, square roots, logs, etc.

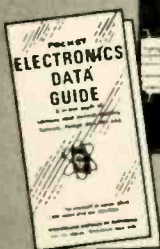
Best of all, the CIE Slide Rule comes complete with an Instruction Course of four **AUTO-PROGRAMMED** lessons. It includes hundreds of illustrations, diagrams and practice problems. You'll learn ingenious short cuts . . . whip through exacting electronics problems quickly and accurately. This course alone is worth far more than the price of the entire package!

Electronics Slide Rule, Instruction Course, *and* handsome, top-grain leather carrying case . . . a \$50 value for less than \$20. Send coupon for **FREE** illustrated booklet and **FREE** heavy vinyl Pocket Electronics Data Guide. Cleveland Institute of Electronics, 1776 E. 17th St., Dept. ET-104, Cleveland, Ohio 44114.

*TRADEMARK



GET BOTH FREE!



ELECTRONICS

SLIDE RULE

Send coupon today →

Cleveland Institute of Electronics

1776 E. 17th St., Dept. ET-104, Cleveland, Ohio 44114

Please send **FREE** Illustrated Booklet describing your Electronics Slide Rule and Instruction Course.

SPECIAL BONUS! Mail coupon promptly . . . get **FREE** Pocket Electronics Data Guide too!

Name _____ (PLEASE PRINT)
 Address _____ County _____
 City _____ State _____ Zip _____

A leader in Electronics Training . . . since 1934.

. . . for more details circle 22 on postcard

**NEW
AND MOST
VERSATILE**

TRIPLETT



**MODEL
850
\$79.50**

**MODEL 850
ELECTRONIC VOLT-OHMMETER
IS BEST FOR YOU**

FACTS MAKE FEATURES:

- 1** Long 7" easy-to-read scale.
- 2** .5 D.C. volt range for transistor circuits.
- 3** HIGH STABILITY. Meter connected in cathode circuit of 12AU7.

High Input Impedance (11 MEGOHMS) and wide Frequency Ranges give this extremely versatile Electronic Volt-Ohmmeter considerable advantage in the measurement of DC voltages, AC RMS and Peak-to-Peak voltages. It measures directly the Peak-to-Peak values of high-frequency complex wave forms and RMS values of sine waves on separate scales.

ADDED PROTECTION. Meter is shorted out in OFF position for greater damping, meter safety during transit, electrically protected against accidental overload. ZERO CENTER mark for FM discriminator alignment, plus other galvanometer measurements.

New pencil thin test probe used for all functions: DC, AC, and ohms. No need to change cables. Beautifully styled case for professional appearance and functional utility, 7^{5/8}" x 6^{1/16}" x 3^{3/4}".

Carrying handle can be used as a tester stand to place the tester at 25° angle for ease in reading.

Frequencies to 250 MC may be measured with auxiliary Diode Probe, \$7.50 extra. DC voltages to 50 KV may be measured with auxiliary High Voltage Probe. \$20.50 extra.

**TRIPLETT ELECTRICAL INSTRUMENT COMPANY, BLUFFTON, OHIO
VISIT US IN BOOTH 4223 AT THE WESCON SHOW**

... for more details circle 45 on postcard

NEWS OF THE INDUSTRY

Semitronics Names Reps

Lawrence Rivman, sales manager of Semitronics Corp., manufacturers of the Semitron line of semiconductors and other electronic parts, announces the appointment of two new representatives: Fred A. Rosenwasser, Cleveland, Ohio, and John Thompson, Ormond Beach, Fla.

Turner Award

The Turner Microphone Co., Cedar Rapids, Iowa, recently presented a plaque for highest sales achievement for 1964-65 to the Kelly-Schmitz-Winkler Co. of St. Louis and Kansas City, Mo.

G-E Appoints Distributor

General Electric Company has appointed Allied Electronics Corp., industrial subsidiary of Chicago-based Allied Radio Corp., as Midwest distributor of its line of thermistors. The G-E line, which includes more than 75 different types of thermistors, will appear in Allied's 1966 industrial catalog. W. G. Hart, manager, marketing and engineering of G-E's magnetic materials section at Edmore, Mich., which manufactures these specialty electronic components, said the addition of Allied as a distributor was prompted by the growing acceptance and usage of thermistors as circuit components by electronic equipment manufacturers and hobbyists.

SINGLE DOWN-LEAD **GET TOTAL COLOR**
and
TOTAL COUPLING

STEREO VHF UHF and VHF

Terminate the down-lead into the color set — couple the remaining inputs with Wizard Electro-Magnetic/ All Channel Couplers — maximum color assurance! This example of signal distributing superiority is another dramatic reason why Wizards are preferred over all other couplers—why Wizards enjoy the "first call for couplers".

\$195

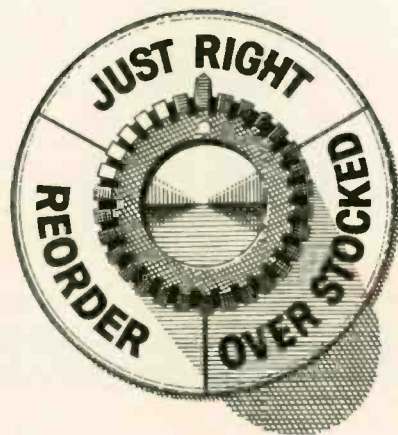
**THE
WIZARD 300
Electro Magnetic
ALL CHANNEL UHF/VHF/
FM/STEREO COUPLER**

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

U. S. PATENT 2,915,679

... for more details circle 21 on postcard
ELECTRONIC TECHNICIAN

Delco Radio offers a new kind of volume control



This year you can get a Delco Radio Parts Kit for *each* 1966 General Motors car. You buy only what you need—no more. That controls the volume of parts you need to carry.

There's a separate kit for Chevrolets, Pontiacs, Oldsmobiles, Buicks,

and Cadillacs. Plus a Universal Kit with parts that are interchangeable on *all* GM cars.

All kits contain the fastest moving parts and information pinpointing the models they're meant for. There are no carryovers from previous years.

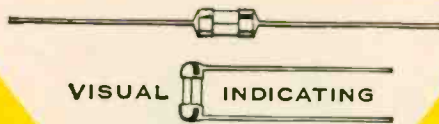
Now's the time to order your Delco Radio Parts Kits for the

makes you service most. Just call your United Delco representative.



Delco Radio, Division of General Motors, Kokomo, Indiana
... for more details circle 23 on postcard

TRON SUB-MINIATURE PIGTAIL FUSES



VISUAL INDICATING

BODY SIZE ONLY
.145 x .300
INCHES

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

Glass tube construction permits visual inspection of element.

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

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

Insist On
BUSS

QUALITY
Fuses

Write for
BUSS
Bulletin SFB

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

BUSS: The Complete Line of Fuses and . . .

NEWS OF THE INDUSTRY

Wen Appoints Reps

Wen Products, Inc., Chicago manufacturer of power tools and soldering guns, has appointed Northeastern Representatives, Inc., Framingham Center, Mass., to handle its radio, television and electronic accounts for the states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island, it was announced by Dean Peel, Wen's national sales manager. Jack Lizars, Don Lemire and Chuck Berube of the representative organization will be primarily responsible for prospect and client contacting, according to Peel. Fred J. Pickel is the regional sales manager for this sales territory for Wen Products.

Reeves Appoints Two

Two new sales representatives for the firm's line of sound recording products have been appointed by the Soundcraft Div. of Reeves Industries, Inc. Stinson Associates, with offices at 227 Haverford Ave., Narberth, Pa., will market Reeves Sound products in EIA territories 7, 8 and 10, consisting of Eastern Pa., Southern N.J., Delaware, Maryland and Virginia. Gene S. Root & Co. has been named to represent Reeves in EIA territory 9, encompassing Western Pa., and West Virginia. The firm's office is at 809 Wainright Dr., Pittsburgh, Pa.

Cabinet Plant Expansion

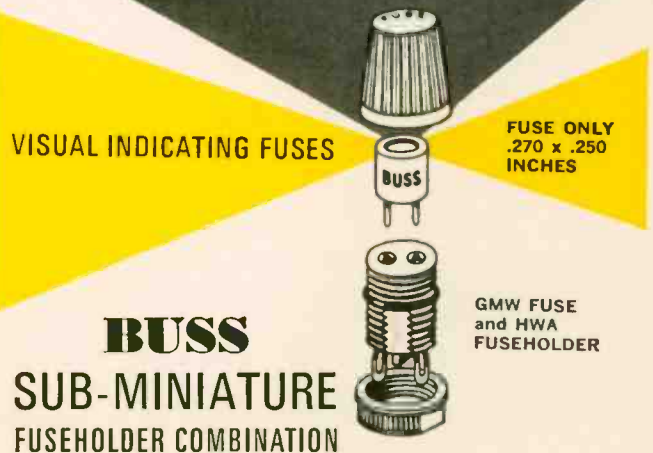
More than 200 employees will be added to the work force at Philco Corp.'s Watsontown cabinet plant, according to R. R. Austin, plant manager. The facility here makes cabinets for television sets, radios and phonographs. "This planned expansion of our work force will allow us to utilize the new plant capacity on a continuing basis and to the fullest possible advantage. The new warehouse will make it possible for us to increase substantially our cabinet production rate at Watsontown. The improvements to our cabinet finishing system included a new forced dry oven which will allow us to operate on a two-shift basis in that area. Both these changes have made it necessary for us to employ new people."

'Go-Getter' Award

In recognition of their sales efforts on behalf of Clarostat Manufacturing Co., Inc., the Bruce Cummings organization of Chicago was presented with the annual "Go-Getter" award for 1964. The "Go-Getter" award is presented annually to those manufacturers' sales representatives who exceed their territorial sales quota.

Assistant Director of Research

Dr. Gerhard E. Weibel has been named assistant director of research for Zenith Radio Corp. Announcement was made by Dr. Robert Adler, the company's vice president and director of research. Dr. Weibel joined the company in June 1964. Prior to this, Dr. Weibel was associated with the General Telephone and Electronics Laboratories, Inc., at Bayside, N.Y. for almost ten years. Dr. Weibel,



VISUAL INDICATING FUSES

FUSE ONLY
.270 x .250
INCHES

BUSS
SUB-MINIATURE
FUSEHOLDER COMBINATION

GMW FUSE
and HWA
FUSEHOLDER

For space-tight applications. Fuse has window for inspection of element. Fuse may be used with or without holder.

Fuse held tight in holder by beryllium copper contacts assuring low resistance.

Holder can be used with or without knob. Knob makes holder water-proof from front of panel.

Military type fuse FM01 meets all requirements of MIL-F-23419. Military type holder FHN42W meets all military requirements of MIL-F-19207A.

Insist On
BUSS

QUALITY
Fuses and Fuseholders

Write for
BUSS
Bulletin SFB

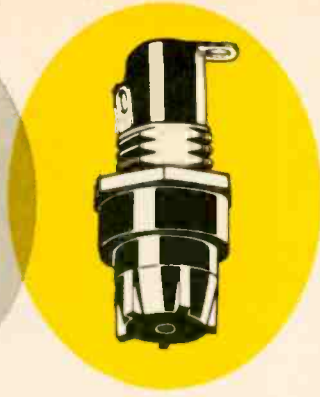
BUSSMANN MFG. DIVISION, McGraw-Edison Co., St. Louis, Mo. 63107

. . . for more details circle 18 on postcard

ELECTRONIC TECHNICIAN



Screw type slotted knob that is recessed in holder body and requires use of screwdriver to remove or insert it.



Screw type knob designed for easy gripping, even with gloves. Has a "break-away" test prod hole in knob.

BUSS Space Saver Panel Mounted Fuseholders

Fuseholder only 1 1/4 inches long, extends just 3/32 inch behind front of panel. Takes 1/4 x 1 1/4 inch fuses. Holder rated at 15 ampere for any voltage up to 250.

Military type available to meet all requirements of MIL-F-19207A.

**Insist On
BUSS
QUALITY
Fuseholders**

Write for
BUSS
Bulletin SFH-10

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

Fuseholders of Unquestioned High Quality

a native of Zurich, Switzerland, studied at the Swiss Federal Institute of Technology, obtaining an M.S. degree in electrical engineering in 1946 and a Ph.D. degree in 1954. He is a Senior Member of the Institute of Electrical and Electronics Engineers, a member of the American Physical Society and the Scientific Research Society of America.

Sylvania Ad Campaign

Entertainment products will be featured in advertisements in ten national magazines beginning this fall, John T. Morgan, vice president — sales and merchandising, Sylvania Entertainment Products Corp. said. The advertising campaign, which will begin in September and continue for three months, is designed to back up the company's 1966 line of color and black and white television, stereophonic high fidelity phonographs and radio lines. Morgan said the ads will appear in the following magazines: Reader's Digest, Life, TV Guide, Time, Newsweek, Sports Illustrated, New Yorker, Saturday Review, Holiday and Sunset. He also said this year's budget is 30 percent greater than in 1964, making the 1965 campaign the largest in recent years.

Mono TV Sales Dip in March

Distributor sales of monochrome television receivers dipped slightly in March as compared to March 1964 but sales of radio sets climbed substantially, Electronic Industries Association's Marketing Services Department reported today. Production figures in March were up considerably

for color and slightly for black-and-white TV as compared to March 1964 and radio production also showed healthy gains.

Sales of monochrome TV receivers totaled 662,755 units in March, down 3.6 percent from the 687,746 sold in March 1964, but up 8.7 percent from the 609,538 total shown for the previous month of February 1965. First-quarter sales of black-and-white TV sets totaled 1,904,302, down 9.8 percent from the 1,920,363 units sold in the first quarter of 1964. Production figures for all television sets (color and black-and-white) in March totaled 995,956, a rise of 13.5 percent from the 877,888 units produced in March 1964 and up 17 percent from the 850,888 units produced the previous month of February. First-quarter production of TV sets totaled 2,591,898, a rise of 9.8 percent from the 2,360,399 units produced in the comparable quarter of 1964.

Of the total TV production, monochrome sets in March accounted for 790,379 units, up 2.5 percent from the figure of 771,488 for March 1964 and up 16 percent from the 681,365 units produced the previous month of February. First-quarter production of monochrome sets totaled 2,089,041, up 0.7 percent from the 2,074,172 sets produced in the same quarter of 1964.

Color-TV production in March totaled 205,577 units, a jump of 93.2 percent from the 106,400 units produced in March 1964 and 21.3 percent above the 169,523 units produced the previous month of February. Color TV production for the first quarter totaled 502,857, a gain of 75.7 percent over the 286,227 units produced in the comparable 1964 quarter. Total production of radio sets (including auto) reached 2,305,993 units in March, up 40.7 percent.

BUSS QUALITY

small
dimension
fuses



For protection of all types of electronic and electric devices

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

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

**Insist On
BUSS
QUALITY
Fuses**

Write for
BUSS
Bulletin SFB

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

... for more details circle 18 on postcard

KIT OR ASSEMBLED!

Either Way, These HEATH Instruments Are Your Best Buy!



A Heathkit IM-21 Laboratory AC VTVM.
• 10 voltage ranges—0.01 to 300 volts RMS full scale • 10 megohm input Z
Kit IM-21, 5 lbs. \$33.95
Assembled IMW-21 \$52.95

B Heathkit IM-11 VTVM . . . Versatile!
• 7 AC, 7 DC, 7 Ohms ranges • Frequency response ± 1 db, 25 cps to 1 mc.
Kit IM-11, 5 lbs. \$24.95
Assembled IMW-11 \$39.95

C Heathkit Wide-Band Oscilloscope
• 5 mc bandwidth • Sweep 10 cps to 500 kc • 5" screen with graticule
Kit IO-12, 24 lbs. \$76.95
Assembled IOW-12 \$126.95

D Heathkit IM-13 "Service Bench" VTVM
• 7 AC, 7 DC, 7 Ohms ranges • Extra-large 6" meter • Glimbal mounting
Kit IM-13, 7 lbs. \$32.95
Assembled IMW-13 \$49.95

E Heathkit Variable-Voltage Regulated Power Supply • Furnishes B +, Bias, & Filament voltages • Fully metered
Kit IP-32, 16 lbs. \$56.95
Assembled IPW-32 \$84.95

F Heathkit Audio Generator • Switch-selected output—10 cps to 100 kc • Near-perfect sine wave
Kit IG-72, 8 lbs. \$41.95
Assembled IGW-72 \$64.95

G Heathkit "Solid-State" Regulated DC Power Supply • 0.5 to 50 v. • Up to 1.5 amp. • Less than 150 uv ripple
Kit IP-20, 13 lbs. \$72.95
Assembled IPW-20 \$114.95

H Heathkit Battery Eliminator • Switch select 6 or 12 v. DC power • AC ripple less than .3%
Kit IP-12, 20 lbs. \$47.50
Assembled IPW-12 \$59.95

FREE CATALOG
Fully describes these at over 200 other different and exciting Heathkits and savings of 50% or more! Fill out the coupon below and send for your FREE copy today!

HEATH COMPANY, Dept. 24-8
Benton Harbor, Mich. 49023

- Please send my free 1965 Heathkit Catalog.
 Enclosed is \$ _____, plus postage.
Please send model(s) _____

Name _____ (Please Print)

Address _____

City _____ State _____ Zip _____

Prices & Specifications subject to change without notice.

TE-134

... for more details circle 26 on postcard

NEWS OF THE INDUSTRY

Mercury Acquires Jackson

Mercury Electronics Corp., Mineola, N.Y., manufacturers of electronic test equipment, has acquired all outstanding stock of Jackson Electrical Instrument Co. of Dayton, Ohio, for an undisclosed amount of cash, it was announced by Harry M. Rich, president of Mercury. Jackson has designed and built electronic test equipment for radio and TV technicians for over 30 years. The combined new activity will give both companies considerable broader base and scope, the announcement said. The combined research talent of the two companies will be utilized in the development of components and peripheral items, Mercury said.

RCA 'Overlay' Transistor

A new RF power transistor, utilizing an improved "overlay" technique to provide higher gain at higher frequencies is announced by RCA Electronic Components and Devices. The new silicon "overlay" transistor, designated RCA 2N3866, will provide 1w power output at frequencies between 30 Mc and 400 Mc with power gains as high as 20 db, according to Ben Jacoby. The electrical characteristics of the new device makes it exceptionally attractive for application in RF power amplifiers, broad-band video amplifiers, antenna boosters, phased-array amplifiers and high-speed switching circuits, Jacoby said. This 28-v transistor is said to offer good gain at drive levels as low as 10 mw for driver and high efficiency output stages. At 1w power output the following minimum power gains are claimed: 20 db at 100 Mc, 16 db at 175 Mc, 14 db at 250 Mc, 10 db at 400 Mc and 4 db at 1000 Mc. The transistor guarantee point is 10 db minimum at 400 Mc.

Zenith Introduces Transistorized Portable

Zenith Sales Corp. announces a 12 in. all transistor portable battery-operated receiver. The Royal 1290 has a battery pack which slips into the bottom and becomes an integral part of the receiver when in use. The set can also operate from a 12 v system as well as from 120 vac. The list price of the unit is \$199.95.

Suit Dismissed

The Federal District Court in New York City dismissed the patent infringement law suit recently brought against Gavin Instruments, Inc. of Somerville, N. J., by Isaac S. Blonder of Blonder-Tongue Laboratories, Inc. of Newark, N. J. The Court held that this law suit was wrongfully brought by Blonder against Gavin in New York City and ordered the complaint against Gavin dismissed.

Factory Assembled Instruments

Heath Co., Benton Harbor, Mich., announces that ten kits in their test instrument line are also available factory assembled. Previously, the company offered five of their most popular instruments in both kit and assembled form on an experimental basis. According to company officials the assembled versions received wide customer acceptance. And as a result, the company received many requests from hobbyists, service technicians, and various industrial users for more factory built versions of Heathkit test instruments.

**Long-Time ET Reader
Obtains Patent
On TV Antenna**

United States Patent Office

1

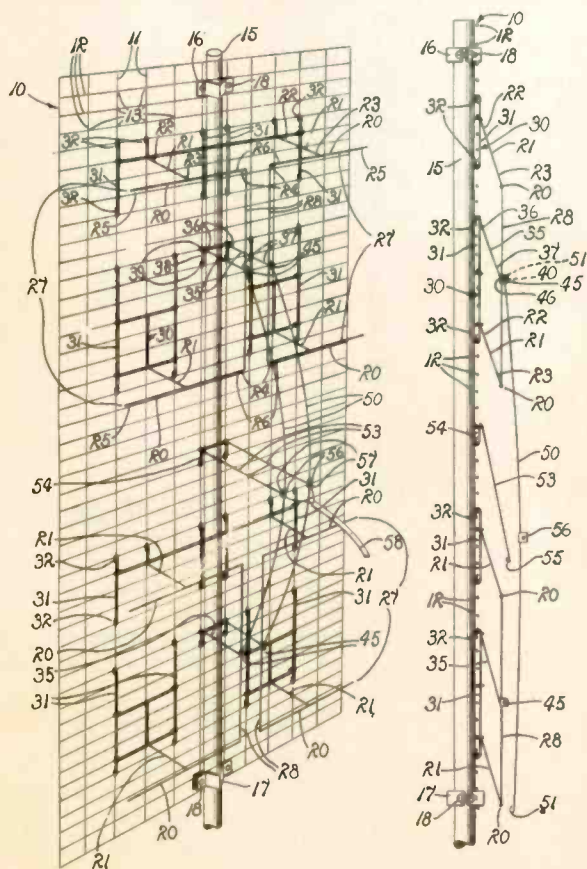
**3,165,817
METHOD OF MAKING A COLLAPSIBLE ANTENNA
OF WIRE MESH**

Grady L. Teague, Rte. 1, Box 726, Porterville, Calif.
Filed Sept. 10, 1962, Ser. No. 222,323
3 Claims. (Cl. 29-155.5)

This invention relates to a high gain directional antenna of the plane-reflector type and more particularly to such an antenna which can be economically fabricated and assembled for shipment and which presents minimum shipping dimensions.

The present invention is described as an antenna adapted to receive electromagnetic energy of the frequency employed in commercial television broadcasting. Antennas for such a purpose have been previously made in a great variety of forms, many of which are of considerable expense.

Normally, the conventional television antenna comprises a multiplicity of parts which are assembled by bolted connections. Accordingly, a great degree of difficulty usually attends their assembly. Also, their structural design results in large assembled dimensions which precludes their being shipped in a pre-assembled condition.



U.S. PAT. NO. 2727089

**Stando-
Insulators**

COMPLETELY INSULATES LEAD-IN WIRE FROM METAL

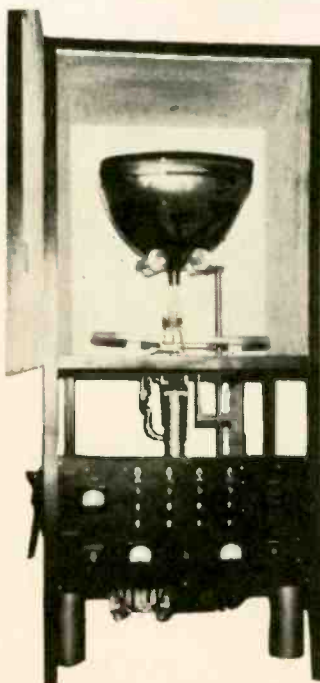
Available with all Standoff Insulators.
Also separately for use on any Standard Insulator.
Holds all types of UHF and VHF wire separately
or in combination with flat wire.



Write for full information.
parker METAL GOODS CO.
85 Prescott St., Worcester, Mass.

... for more details circle 34 on postcard

**TECHNICIANS ... Open the
Door to Greater TV Profits**



Rebuild Color — Black
and White — Bonded Face
Television Picture Tubes in
YOUR OWN SHOP

Send today for 16 page
brochure describing how
you can capture the tele-
vision picture tube re-
building market in your
area. Low investment of
\$3,290.00 and up. Fi-
nancing available. Train-
ing at our plant included
in low price. Get started
today toward greater profit
tomorrow.

VACATION BONUS

When on vacation, plan to
stop by and see a com-
plete demonstration. If
purchase is made while
you are here Windsor will
pay equivalent to your
tourist rate plane fare
from your U. S. home and
back with the exception
of Alaska and Hawaii.

WINDSOR ELECTRONICS, INC.

Equipment Division
999 N. Main St., Glen Ellyn, Illinois

... for more details circle 49 on postcard

LEARN ELECTRONICS FROM A-Z AT HOME

Here's a complete self-training guide covering all the fundamentals you need to know for successful work in electronic circuits, including radio, television, industrial electronics and computers. Following basic coverage of electrons and electricity, the book clearly explains d-c circuits, magnetism, a-c circuits, vacuum tubes, and transistors. For each topic covered, examples are given that show how principles are applied to actual situations.

BASIC ELECTRONICS

NEW SECOND EDITION
BERNARD GROB
RCA INSTITUTES, N.Y.
660 PAGES, \$10.50

Enlarged and revised, this Second Edition gives basic principles and applications of today's electronics. Separate treatments of Ohm's law, series circuits, parallel circuits, and series-parallel circuits show how to apply d-c fundamentals. Electro-magnetic conduction, inductive reactance and capacitive reactance are described, with all their uses in a-c circuits. Included are two new chapters on network theorems and complex numbers.

BUY THIS BOOK AT YOUR BOOKSTORE OR MAIL THIS COUPON

McGraw-Hill Book Co., Dept. 23-ET-85
330 WEST 42 Street, N.Y., N.Y. 10036

Send me Bernard Grob's
BASIC ELECTRONICS, Second Edition
for 10 days on approval. In 10 days I will
remit \$10.50 plus a few cents for delivery
costs, or return book postpaid. SAVE
MONEY: We pay delivery costs if you
remit with coupon; same examination and
return privilege.

NAME (print) _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

For price outside U.S., write McGraw-Hill Int'l, N.Y. 10036

... for more details circle 32 on postcard

ADVERTISERS INDEX

Alliance Manufacturing Co.	74
Allied Radio	37-38, 39
Amperex Electronic Corp	3rd Cover
Amphenol Distributor Div.	19
Armco Steel Corp.	65
B & K Manufacturing Co.	67
Blonder-Tongue Laboratories	22
Brach Manufacturing Corp.	80
Bussmann Mfg. Division	84-85
Castle TV Tuner Service, Inc.	26
Channel Master Corp.	27-28
Charles Engineering, Inc.	82
Cleveland Institute of Electronics	81
Delco Radio Division	83
Electronics Marketing Div., Essex Wire Corp.	76
Finney Company	73
GC Electronics Company	77
Heath Company	86
Hickok Electrical Instrument Co.	75
Jerrold Electronics	2nd Cover
Jerrold Electronics	36
JFD Electronics Corp.	33
LTV University	78
McGraw-Hill Book Co.	88
Miller Company, J. W.	80
Parker Metal Goods Co.	87
Philco Corporation	20
Pomona Electronics Co.	78
Quam-Nichols Company	26
Quietrol Company	88
Radio Corporation of America RCA Electronic Components & Devices	4th Cover
RCA Sales Corporation	25
RCA Semiconductor Distributor Products	35
Rohn Manufacturing Co.	79
Sarkes Tarzian Tuner Service Div.	40
Sencore, Inc.	29
Sencore, Inc.	32
Sprague Products Company	23
Triplett Electrical Instrument Co.	82
TV Tuner Service	88
Ungar Electric Tools	24
Weller Electric Corp.	70
Windsor Electronics	87
Winegard Company	30-31
Zenith Sales Corp.	69

NEW! **QUIETROLE'S**
BIG THREE AEROSOLS
For Electronic Servicing

HARMLESS TO PLASTICS

MARK-II
For Tuners

SPRAY-PACK
For Controls & Switches

SILITRON
For General Use

Zero effects on capacity and resistance. Non-inflammable... non-conductive... non-corrosive. All include free five-inch plastic extender. Yes! Quietrol is still available in bottles with an eye dropper!

manufactured by
QUIETROLE COMPANY
Spartanburg, South Carolina

... for more details circle 38 on postcard

ATTENTION
ALL T. V. TUNERS

Beware of T. V. Tuner Service as they will replace all of your defective parts, align you to exacting original specifications and warranty you for 90 days.

All This For Only **\$8.95** plus major parts

Try our service and prove to yourself how it feels to be revitalized and strong once again.

Pack yourself up and ship yourself out today!

TV TUNER
Service ...

Box 793 ET - Twin Falls, Idaho

... for more details circle 46 on postcard

MOVING?

Be sure to let us know your new address. Please enclose a complete address label from one of your recent issues.

... for more details circle 12 on postcard →

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

1G3GT/1B3GT	4HA5	6BZ6	6G8	8CW5
1X2B	5H8	6CB6A	6HA5	9A8
3BZ6	5U8	6CG7	6HG8	10CW5
3CB6	6AL5	6DT6	6S4A	12AT7
3GK5	6AU4GT	6EH7	6SN7GTB	12AU7A
3HA5	6AU6A	6EJ7	6U8A	12AX4GTB
4BL8	6AV6	6GB5	6U9	12AX7A
4EH7	6AX4GTB	6GJ7	6X9	15CW5
4EJ7	6BA6	6GK5	6Y9	16A8
4GK5	6BL8	6GK6	8BQ5	19AU4

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



RCA announces a zero defects program

through...

Personal
Quality
Performance

RCA's effort to apply some of the concepts of missile-type reliability to the production of commercial receiving tubes

You lose time and money whenever a tube fails.

To minimize such losses, RCA has initiated *still another quality control measure* to guard against tube failure and *keep profits in your pocket*.

It's our ZERO DEFECTS program, an attempt to eliminate as far as possible the factor of human error from commercial receiving tube production.

RCA personnel engaged in the production of RCA receiving tubes have voluntarily signed a pledge of PERSONAL QUALITY PERFORMANCE... a pledge to strive for error-free performance in every task they undertake in the making of RCA receiving tubes.

Their pledge is one more assurance to you of tube reliability and greatest possible reduction in callbacks when you sell and install RCA receiving tubes.

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



The Most Trusted Name In Electronics