A HOWARD W. SAMS PUBLICATION

DECEMBER 1966/50¢

PF Reporter®

PHOTOFACT

the magazine of electronic servicing

- Fusible Resistor Cross Reference
- Color Parts Guide
- Building Good Customer Relations
- Winter Care of Marine Radiotelephones
- Symfact

EICO 380's color signals (3 primaries, 3 complementaries) cover fully 60% of the screen: thus tell you MORE about the set's response — enable EXACT alignment.

Now you can afford a True NTSC* Color Generator

(NEW EICO ALL SOLID STATE 380 IS ONLY $169.)

Every pro knows

that the best generator to use to do the *best, fastest, most accurate* color servicing is the NTSC type. EICO is first to bring it to you at a serviceman price.

The 380 takes the risky guesswork out of color servicing — because it gives you all test signals *exactly* like the Color TV station. So now you can be *certain* of *exact* results — faster, easier, for more profits per day. You'll also quickly become known as the pro who makes sets *"come alive"* with brilliant *correct* color response!

Only EICO provides you with all these advanced engineering features at so low a cost: ■ *100% true NTSC* full-field color signals,* including both chrominance and luminance exactly as specified for a Color TV station transmission. ■ *No "Gun Killers"* — Faster, easier use by feeding to the RF stage. You don't need to go inside the TV set to feed the color signal. ■ *Each true NTSC* color signal covers fully 60% of the entire TV screen* (as compared to 1-inch from a rainbow generator) — this tells you a full, true picture of what's going on inside the set — all the way from the RF to the screen. ■ *100% solid state* (33 transistors). ■ *5 individual switch-selected alignment patterns* for monochrome and color. ■ *Individual, switch-selected full-field color display.* ■ *Generates I, Q, R-Y, and B-Y signals* for demodulator adjustment, *plus 7 standard color signals* (3 primaries, 3 complementaries, plus black and white). ■ *Adjustable bar width and dot size* down to just visible for *exact* convergence. ■ *3 crystal-controlled oscillators* for true 3.58 MC color signal generation, pattern timing, and RF output. ■ *Drift-free RF output* (crystal-controlled Channel 3) and video output. ■ Conveniently compact: 8" high x 5" wide x 6" long. ■ Portable and light weight (only 4 lbs.) for easier field use. ■ Instant-on operation: time-saving, accurate, drift-free. ■ Excellent for field or shop. And *will not* become obsolete!

Why buy an old-fashioned semi-accurate non-NTSC rainbow generator when you can get all the extra benefits of a 100% TRUE NTSC COLOR GENERATOR for the same money.

See your EICO dealer today for a free demonstration.

Unbeatable Value COMPLETE COLOR/BW TV LAB

With the 380 — plus just the 369 & 435 — you're ready for *anything* in Color/BW servicing: EICO 369 Sweep/Marker Generator gives easiest, fastest visual alignment of color or B&W TV and FM RF and IF circuits. Five sweep ranges from 3-220mc. Four marker ranges from 2-225 mc. Crystal marker oscillator. Post injection of markers. **$99.95 kit, $149.95 wired.**

EICO 435 Direct-Coupled Wideband Scope. DC-4.5mc with 3" flat-face CRT. Zener calibrator. Outperforms 5" scopes three times its price. **$109.95 kit, $159.95 wired.**

How about FM-MX Stereo?

Just add *EICO 342 FM-MX Signal Generator:* Gives both composite audio and FM RF outputs. Inputs for stereo audio, critical A/B tests. **$149.95 wired.**

**The NTSC (National Television Systems Committee) color signal is based on the fact that each transmitted color is produced by an NTSC-defined relationship between a 3.58 MC reference and a 3.58 MC chroma modulated subcarrier, with each color having a standard NTSC brightness component. This is the basis upon which all color-TV broadcasters must operate. There are no separate rules for color-TV reception, or color test sets.*

EICO Electronic Instrument Co., Inc.
131-01 39th Ave., Flushing, N.Y. 11352

Send me FREE:

- ☐ "Definitive Comparison of NTSC and rainbow generators FROM THE SERVICEMAN'S VIEWPOINT."
- ☐ 32-page catalog on 200 EICO best buys.
- ☐ Name of nearest dealer.

PF-12

NAME.....

ADDRESS.....

CITY.....STATE.....ZIP.....

ANNUAL INDEX

This code of symbols is used to identify regular department locations in the subject page listings: CCM, Color Countermeasures; Sym, *Symfact®;* TE, Notes on Test Equipment; TS, The Troubleshooter; and VSS, Video Speed Servicing.

PF REPORTER, December, 1966 Vol. 16, No. 12 PF REPORTER is published monthly by Howard W. Sams & Co., Inc., 4300 W. 62nd, Indianapolis, Indiana 46206. Second-class postage paid at Indianapolis, Indiana. 1, 2 & 3 year subscription prices; U.S.A., its possessions and Canada: $5.00, $8.00, $10.00. Other countries: $6.00, $10.00, $13.00. Current single issues 50¢ each; back issues 65¢ each.

COMMUNICATIONS

DIODES

FIELD-STRENGTH METERS

FILAMENT CIRCUITS

FM RADIO

GUIDES

HIGH VOLTAGE

HORIZONTAL OSCILLATOR

HORIZONTAL-OUTPUT TRANSFORMERS

HORIZONTAL SWEEP

HORIZONTAL SYNC

HUM

IF SECTION OF TV

SYMPACT

SYNC

TELEVISION

TEST EQUIPMENT

THEORY

TRANSFORMERS AND COILS

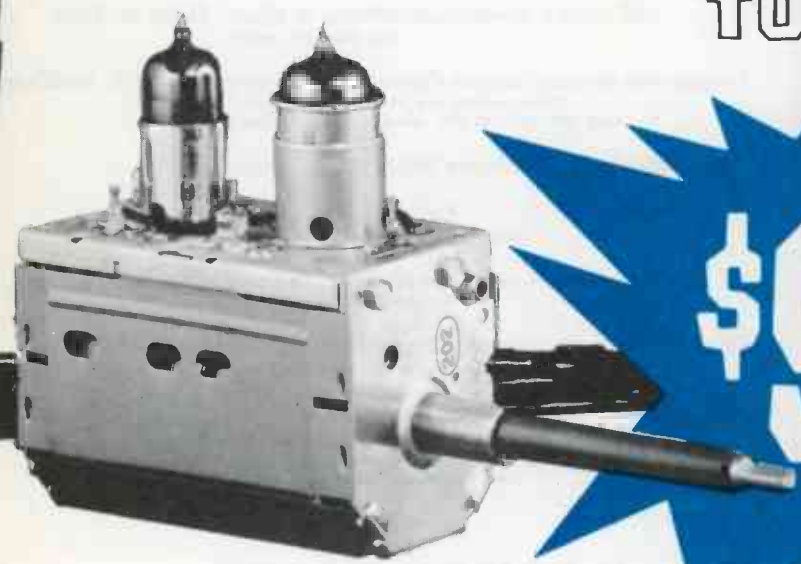
TRANSISTORS

TRANSISTOR RADIO

YOKES

INDEX OF TITLES

Complete TUNER REPAIR for only



$9.50

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

Most Tarzian-made tuners received one day will be repaired and shipped out the next. More time may be required on other makes. Every channel—not just the channels existing in any given area—is checked and re-aligned per original specifications. Exclusive cleaning method makes the tuner look—as well as operate—like new.

Cost, including ALL labor and parts (except tubes) is only $9.50 and $15 for UV combinations. No additional charge. No hidden costs. Too, you get a full, 12-month warranty against defective workmanship and parts failure due to normal usage.

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

TSC

TUNER SERVICE CORPORATION
(Factory-supervised tuner service authorized by Sarkes Tarzian)

MIDWEST — 817 N. Pennsylvania St.
Indianapolis, Ind., Box 1642
Tel: 317-632-3493

EAST — 547-49 Tonnele Ave., Jersey City, N. J.
Tel: 201-792-3730

SOUTH-EAST — 938 Gordon St., S. W.
Atlanta, Georgia
Tel: 404-758-2232

WEST—
SARKES TARZIAN, Inc.
Tuner Service Division
10654 Magnolia Blvd.,
N. Hollywood, Calif.
Tel: 213-769-2720

Circle 2 on literature card

publisher
Howard W. Sams

general manager
Donald W. Bradley

editor
William E. Burke

managing editor
James M. Moore

associate editors
Thomas T. Jones
J. Phipps

consulting editors
Joe A. Groves
C. P. Oliphant

research librarian
Bonny Howland

production manager
Esther M. Rainey

circulation manager
Pat Osborne

art directors
Louis J. Bos, Jr. & Robert W. Reed

photography
Paul Cornelius, Jr.

advertising sales offices
Hugh Wallace, advertising sales manager

central and midwestern
Roy Henry

Howard W. Sams & Co., Inc., 4300 West 62nd St.,
Indianapolis, Ind., 46206
291-3100

eastern
Gregory C. Masefield

Howard W. Sams & Co., Inc., 3 West 57th St.,
New York 19, New York
MU 8-6350

southwestern
C. H. (Jeke) Stockwell

C. H. Stockwell Co., 4916 West 64th St.
Mission, Kansas, RA 2-4417

western
Los Angeles Office
G. R. (Jerry) Holtz

The Maurice A. Kimball Co., Inc.
2008 West Carson St., Suites 203-204
Torrance, Calif., 90501
320-2204

San Francisco Office
The Maurice A. Kimball Co., Inc.
580 Market St., Room 400
San Francisco 4, California
EX 2-3365

Address all correspondence to PF REPORTER,
4300 W. 62nd Street, Indianapolis, Indiana 46206

Subscription Prices: 1 year—$5.00, 2 years—$8.00, 3 years—$10.00, in the U. S. A., its possessions and Canada. All other foreign countries: 1 year—$6.00, 2 years—$10.00, 3 years—$13.00. Single copy 50c; back copies 65¢

Indexed in Lectrodex.
Printed by the Waldemar Press Div. of Howard W. Sams & Co., Inc.

A HOWARD W. SAMS PUBLICATION

PF Reporter™

PHOTOFACT

the magazine of electronic servicing

VOLUME 16, No. 12 DECEMBER, 1966

CONTENTS

About the Cover

A color receiver, flying spot scanner, and appropriate decorations help to convey to you our wishes for a very Merry Christmas and a most prosperous New Year. The preceding year has been, in most respects, generous to the electronics servicing industry. It is our sincere hope that this publication has contributed to the professional prosperity of each reader and that we may continue to do so in the years to come.

WHY risk your reputation with "just-as-good" capacitors?

When you pay little or no attention to quality in tubular replacement capacitors, you leave yourself wide open for criticism of your work . . . you risk your reputation . . . you stand to lose customers. It just doesn't pay to take a chance on capacitors with unknown or debatable performance records when it's so easy to get guaranteed *dependable* tubulars from your Sprague distributor!

There's no "maybe" with these 2 great SPRAGUE DIFILM® TUBULARS!

The ultimate in tubular capacitor construction. Dual dielectric . . . polyester film and special capacitor tissue . . . combines the best features of both. Impregnated with HCX®, an exclusive Sprague synthetic hydrocarbon material which fills every void in the paper, every pinhole in the plastic film *before it solidifies*, resulting in a rock-hard capacitor section . . . there's no oil to leak, no wax to drip. Designed for 105°C (220°F) operation *without voltage derating.*

DIFILM® BLACK BEAUTY®
Molded Tubular Capacitors

The world's most humidity-resistant molded capacitors. Tough, protective outer case of non-flammable molded phenolic . . . cannot be damaged in handling or installation. Black Beauty Capacitors will withstand the hottest temperatures to be found in any TV or radio set, even in the most humid climates.

DIFILM® ORANGE DROP®
Dipped Tubular Capacitors

A "must" for applications where only radial-lead capacitors will fit . . . the perfect replacement for dipped capacitors now used in many leading TV sets. Double-dipped in rugged epoxy resin for positive protection against extreme heat and humidity. No other dipped tubular capacitor can match Sprague Orange Drops!

For complete listings, get your copy of Catalog C-616 from your Sprague distributor, or write to Sprague Products Company, 105 Marshall Street, North Adams, Massachusetts 01247

SPRAGUE®
THE MARK OF RELIABILITY

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

Circle 3 on literature card

Letters to the Editor

Dear Editor:

I wish to thank you for the solutions to the problems in the December, 1965 column. In your comment you said, "They can be shown mathematically to be valid." To help you prove your point, I am sending you a set of trigonometry tables and some more information on the subject of parallel resistors and series capacitors.

Problems involving these components can be solved by the use of the tangents and cotangents from the tables in simple addition. Consider any two resistors, R1 and R2, to be connected in parallel. In the tangent column, find the value nearest to R1. Record the corresponding cotangent value. Find the tangent value nearest to R2. Add its cotangent value to that of R1. Find the cotangent value nearest to this sum and the parallel resistance value will be found in the tangent column. If we pick resistance values of 4 and 8 ohms:

Tan.	Cotan.
.39997	2.5002
.80020	1.2497
	3.7499, corresponding

to a TAN. of .26670, or a resistance of 2.667 ohms.

As proof:

$$RT = \frac{R1 \times R2}{R1 + R2}$$

$$= \frac{4 \times 8}{4 + 8}$$

$$= \frac{32}{12}$$

$$= 2\tfrac{2}{3}.$$

This method will work for any number of resistors in parallel or capacitors in series I call this method "tangent convergence"

MELVIN T. HYATT
Praire Village, Kansas

We tried Mr. Hyatt's method on many different combinations and never failed to arrive at a very close answer. Possibly there are special conditions under which the method could fail, but we haven't found one.—Ed.

The Electronic Scanner

news of the servicing industry

Mergers & Expansions

International Rectifier announced plans for construction of a ¼-million dollar facility at Englewood, N. J., to serve as headquarters for foreign operations and a center for eastern distribution. The overseas headquarters will be moved from its present location at Fort Lee, N. J., and the eastern distribution center from the New Brunswick, N. J. plant of Xaloy, Incorporated, IR's metallurgical subsidiary. Xaloy needs the space for added production. The new Englewood building will be linked with the parent IR manufacturing complex in El Segundo, California through data processing equipment to facilitate movement of products and inventory.

Oak Manufacturing Co. has established a television tuner assembly facility in Kenosha, Wisconsin. The 12,000 square-foot plant will serve as a support operation for the company's principal U.S. tuner assembly facilities in Elkhorn, Wisconsin, and will initially employ approximately 200. In addition to the Kenosha and Elkhorn operations, Oak also has a 72,000-square-foot tuner assembly facility in Hong Kong, employing 1500 people.

The **Sprague Electric Company** announced plans for the construction of a major new manufacturing plant of 75,000 square feet in Wichita Falls, Texas. The plant, to be constructed on a 27-acre tract, will have an employment potential of 750 to 1000. The company has also taken an option on 30 additional acres to provide for future expansion. With the new plant in Wichita Falls, Sprague Electric will now have 25 manufacturing locations throughout the world.

Sylvania Electric Products Inc. announced plans to increase its 1967 production of integrated circuits to four times the present level by buliding a 30,000-square-foot assembly plant at Bangor, Maine, and expanding existing manufacturing at Woburn, Mass.

Construction of the Bangor integrated circuit plant will begin immediately. It is scheduled to be in full production by the second quarter of 1967 and will be devoted to the assembly and packaging of the circuits. The new facility will eventually employ between 1,000 and 1,300 people.

Sylvania also announced plans for a Central Advanced Applications Laboratory at Woburn with overall technical responsibility for the development and application of semiconductors, electronic tubes, and special products. The prime responsibility of the Laboratory will be to work with manufacturers of entertainment products in the development of solid-state devices, hybrid devices, and tubes.

Laboratory presonnel will deal directly with designers, circuit engineers, and advanced applications groups throughout the industry to assure that components required to meet the changing design concepts in entertainment products are developed, tested, evaluated, and made available on schedule from Sylvania.

In further activities, Sylvania dedicated a 221,000-square-foot entertainment products plant in Smithfield, N. C. The plant is designed for production of color and monochrome television, stereo phonographs and radios. Initial production of some components began Sept. 6, just five months after breaking ground for the project. The one-story steel and brick structure consists of 200,000-square feet of manufacturing area, and 17,000 square feet of office space.

In his address at the dedication ceremonies in Smithfield, president Gene K. Beare remarked: "The opening of new manufacturing plants, such as this one, and other facilities has become something of a hallmark for Sylvania. Sometimes it seems to me that at the end of the long list of electronic and lighting products turned out by Sylvania we should add the words 'large buildings'."

Money Matters

New highs in sales and earnings were reported by **Electro-Voice, Inc.** at the end of the first six months of their operating year through August 1966. In the current report to shareholders, sales are listed at $8,603,351, an increase of 30.5% over the same period last year. President Albert Kahn, stated, "The real gains have been in the growth of commercial acoustical products. Manufacturing economies and improved techniques," he added, "have widened margins, offset somewhat by slightly increased operating costs."

The Board of Directors of **P. R. Mallory & Co., Inc.** declared a regular dividend at the rate of 40 cents per share on the common stock of the corporation, plus an extra year-end dividend of 10 cents per share on such common stock, payable December 5, to stockholders of record November 7, 1966. The quarterly dividend rate was increased from 35 cents to 40 cents per share at a meeting held last July. In October, Mallory reported record nine-month sales and earnings of $99.4 million and $6.3 million, respectively.

September sales of the Home Products Division, **Packard Bell Electronics Corp.,** were higher than for any other single month in the company's history. Kenneth R. Johnson, president of Packard Bell Sales, said that September sales were 14% greater than the previous record high established in March of this year. He added that the color TV boom was primarily responsible for the sales records, but that black-and-white TV and stereo also made major contributions. September sales to dealers of black-and-white television sets were up 123% over the same month last year.

Potpourri

Sencore, manufacturer of test equipment, is including a half-hour film and an hour lecture on solid-state servicing of new TV receivers in 120 service clinics this fall from coast to coast. Bob Baum, Sencore Chief Engineer, explained that transistorized TV receivers, both black-and-white and color, were a real mystery to the technician who has not yet equipped himself to service these wired-in components efficiently. Sencore service clinics also feature a half-hour film on "scoping out the chroma circuits" of color TV receivers. Most clinic dates had been confirmed but that a few remained open. The Sencore sales representative should be contacted by distributors still desiring a technical clinic. ▲

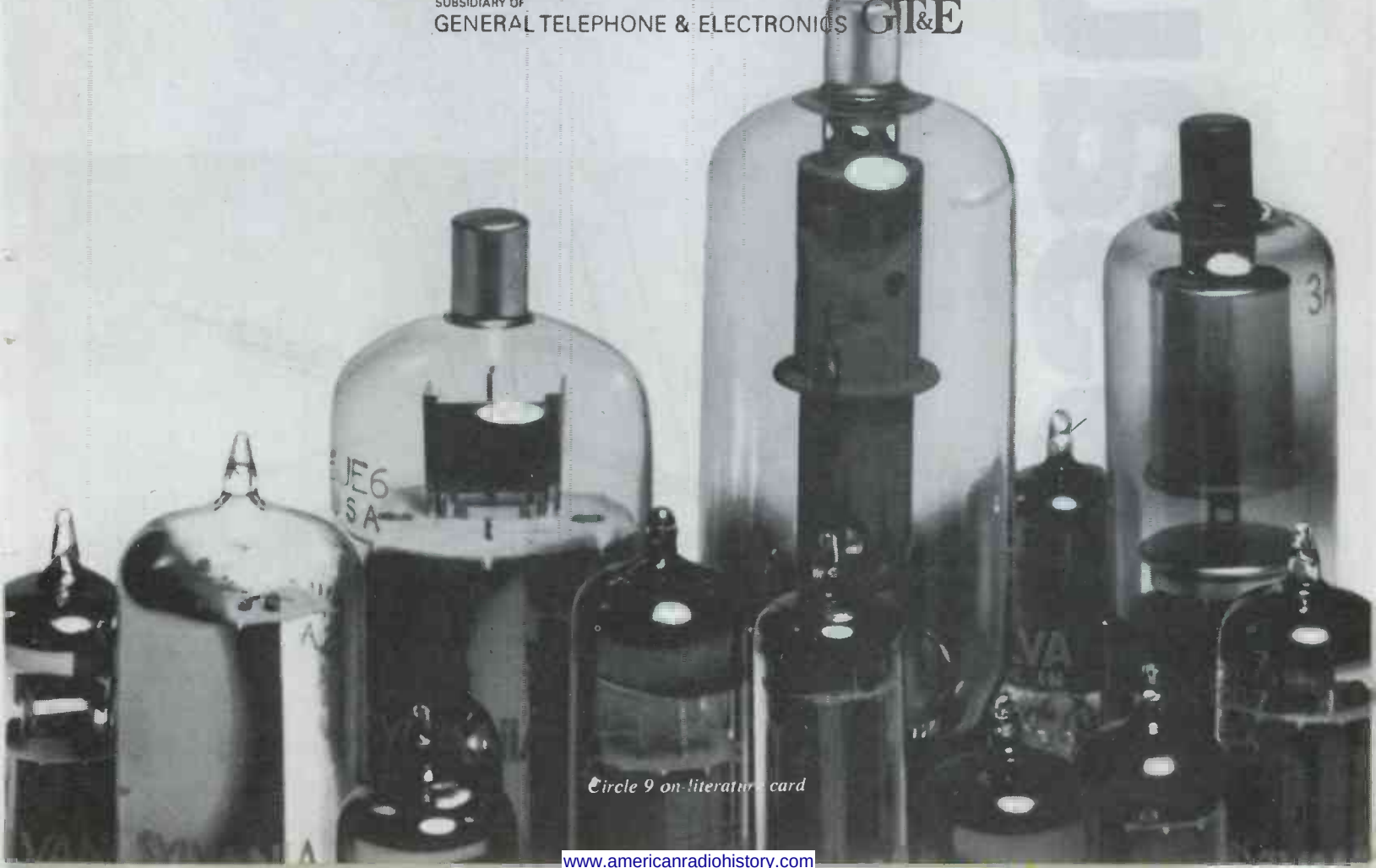
A dozen ways to cut down on color call-backs.

In color TV set repair, these 12 Sylvania tubes do most of the work. They cut down on call-backs because their quality is assured by thorough testing before they leave our plant.

Sylvania makes color replacement receiving tubes for every major color TV set manufactured. Available quickly from your Independent Sylvania Distributor.

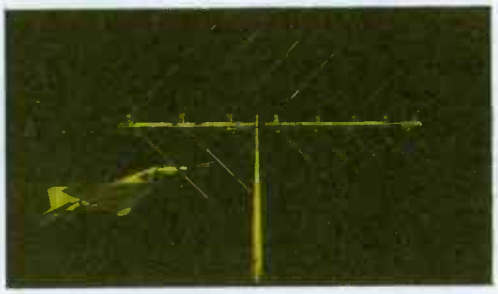
SYLVANIA

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS GT&E

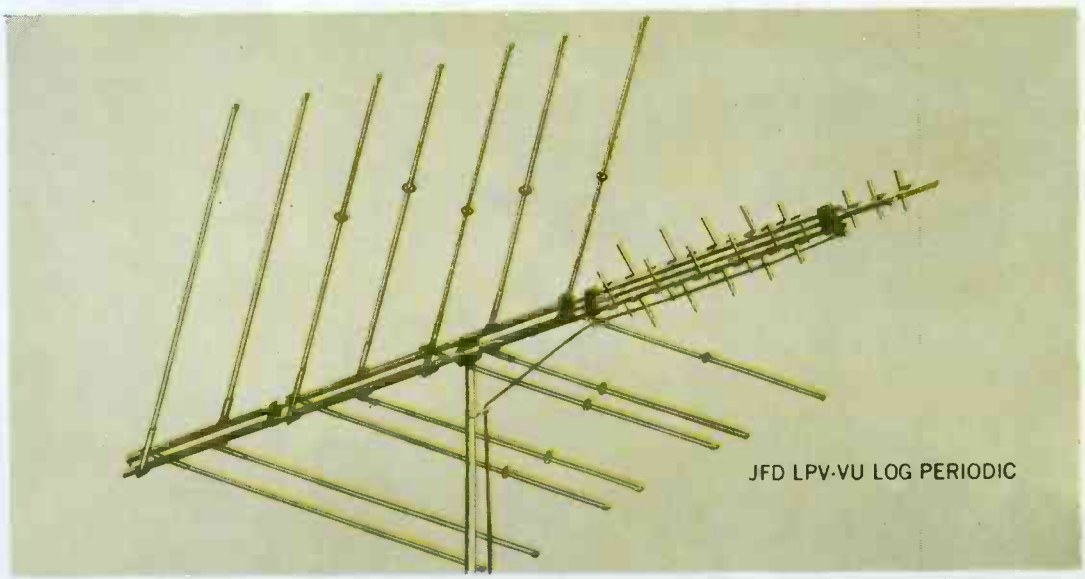


Circle 9 on literature card

assault on perfec



Back in 1962, we invented a new kind of TV antenna.



Licensed under one or more of U.S. patents 2,958,081; 2,985,879; 3,011,168; 3,108,280; 3,150,376; 3,210,767, RE. 25,740 and additional patents pending in U.S.A. and Canada. Produced by JFD Electronics Co. under exclusive license from the University of Illinois Foundation.

tion: PERFECTION CONQUERED

We did not improve on an old antenna. We started from scratch to design a new one. *Really new.*

It wasn't easy. And it wasn't cheap. But it worked like mad.

We called it the LPV Log Periodic. Its performance caught our competitors with their charts down. But it wasn't long before they came up with LPV copies in every way—except in performance.

Meanwhile back at the JFD labs in Champaign, Illinois, our scientists and engineers continued their "assault on perfection." In 1963, they again shattered antenna precedent by coming up with the *first* combination VHF/UHF/FM log periodic antenna, the LPV-VU. Instead of three different antennas, installers now needed only *one* LPV-VU and *one* downlead.

Our competitors scoffed at the idea. They said it couldn't be done. Until the "eye-popping" results started to roll in. Then there was a mad scramble for the LPV-VU bandwagon.

These "me-too" antennas looked like the LPV-VU Log Periodic. Sounded like it, too. But their charms were skin-deep.

Only the JFD LPV-VU delivered deluxe 82-channel log periodic performance. Because only the JFD LPV-VU followed the genuine patented log periodic concept of the University of Illinois Antenna Research Laboratories. Thanks to the protection of eleven different LPV-VU U.S. patents issued and pending—more than those of any other antenna.

You would think by now our Research and Development people in Champaign would leave well enough alone. But no. These "Young Turks" have gone and done it again. This time it's a new all-band log periodic design—the LPV-CL Color Laser. (Must be that "assault on perfection" bug they've still got up their polinear recorder.)

Why did we call it the Color Laser?

Well, engineers tell us that laser light beams with their tremendous bandwidth capacity are the communications carrier of the future. And we believe that our new VHF/UHF/FM Color Laser with its extreme bandwidth, among other unique characteristics, is the antenna of the future—only it's available to you *now*. How does the Color Laser deliver unsurpassed natural color, black and white across 82 channels, and FM, too?

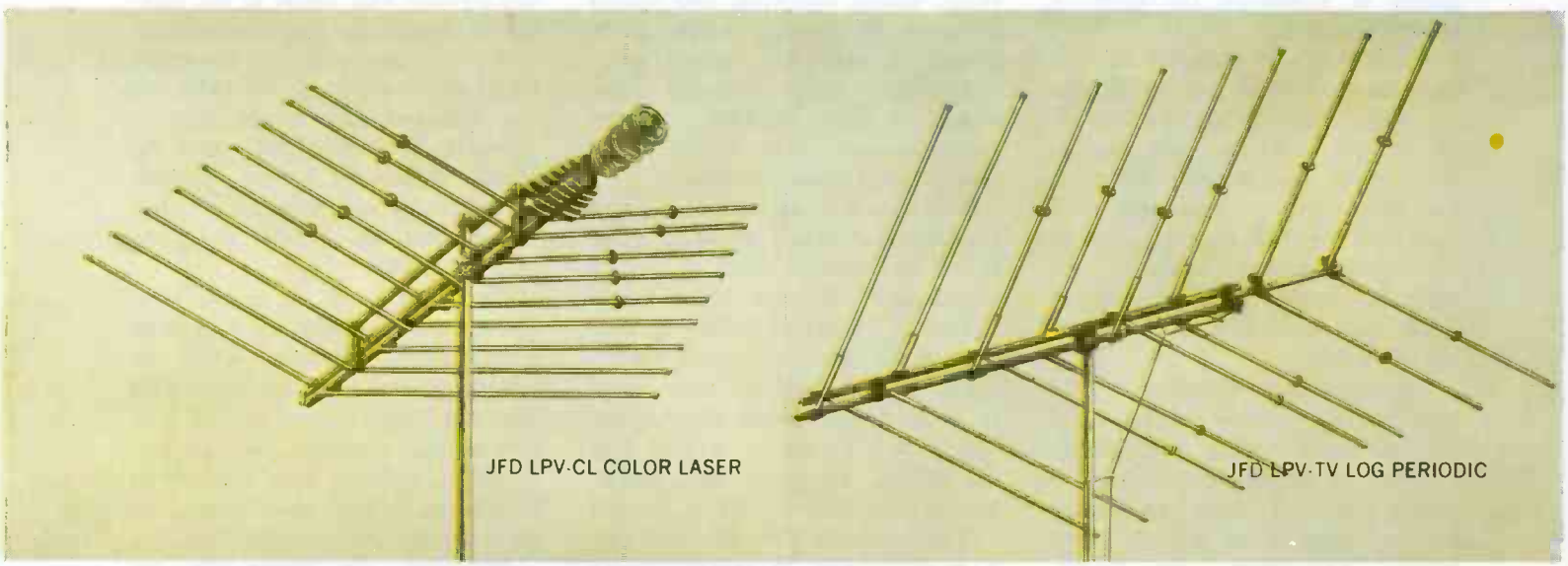
Three reasons: (1) *Patented "VHF "cap-electronic" Log Periodic V Design,* (2) *a new broad band UHF "zoned" trapezoid driver,* (3) *a new disc-on-rod UHF director system.* And there are patents issued and pending on all three.

We've also spun off the LPV "cap-electronic" Log Periodic section of the Color Laser. It forms the heart of a great new VHF antenna series we've named the LPV-TV.

This "assault on perfection" of ours involved a complete new mechanical design, as well. Results: "fast-lok" element brackets, "hot" twin booms (no lossy harnesses or transformers), new super-strength double U-bolt profiles, high reliability cylindrical capacitors, plus our electrically conductive gold alodized aluminum.

If you're the breed of professional contract installer or self-servicing appliance dealer who *never* settles for less than the best, we have a suggestion. Use a JFD LPV-CL Color Laser or LPV-TV Color Log Periodic on your next installation. See what it feels like to install the *best* of all in performance and customer satisfaction.

You will also see why our research and development people have now changed their watchword from "assault on perfection" to "perfection *conquered*".



Licensed under one or more of U.S. Patents 2,955,287 and 3,015,821 and additional patents pending.

JFD®

JFD ELECTRONICS CO.
15th Avenue at 62nd Street, Brooklyn, N.Y. 11219
JFD International, 64-14 Woodside Ave., Woodside, N.Y. 11377
JFD de Venezuela, S.A., Avenida Los Haticos 125-97, Maracaibo, Venezuela

Circle 10 on literature card

Effective Communication

A MUST!

by Ralph M. Scott

What is communication? Very simply, it means the transmission of an idea from one person to another. Orally, or in writing, the only means whereby we communicate is by using words—put together in sentences, the units of logical thought.

Using words to transmit ideas is like driving down an unfamiliar highway, observing signs to follow the correct route to a destination. Too often the traveler becomes lost because the street and road signs are insufficiently clear — or missing altogether. Similarly, the reader or listener may become lost if the communicator lacks proper use of words.

Especially is it necessary to be exact in the writing of technical articles. Such writing is obviously intended to explain a process, describe a needed repair, or discuss the operation of an instrument or device. Frequently, the writer, abounding in technical knowledge, experience, and ability, lacks the communication skills to express himself accurately. The solution to this deficiency is to learn the language, just as the individual learned his trade or profession.

Students in colleges, universities, and specialized vocational schools who seek degrees or other titles all too often ignore courses in composition, public speaking, and others designed to increase one's proficiency in oral and written communication. Such attitudes have about the same validity as saying that a person with 20-100 vision doesn't need glasses to read.

What good is an idea if no one else can understand it? What good is the utterance of truth if no one can accept is? How valid would Einstein's Theory of Relativity have been if no one could have understood his explanation? What good is a article submitted to a magazine if it is so poorly written that the editor, let alone the reader, cannot understand what is meant?

I suppose, in this day and age, it is acceptable in certain circles to declare, "I dig that cat. He's cool with that music to show me how to make bread to keep me in my pad."

Or, another may say, "The recondite, even abstruse, advice of that profound philanthropist enabled me to subsist in more than moderate circumstance."

In either event, the communicator is trying to say that someone advised him wisely in the making of money to live comfortably.

A wise professor at Columbia University once said, "It behooves the educated man to be able to converse at ease when with the erudite within the hallow, ivy-covered walls of universities—or when eating show with hoboes along the railroad tracks."

He spoke truth. It is the obligation of every thinking person to communicate clearly with all among whom he associates. This does not suggest either stilted, Victorian Age elegance, or the vulgarity of a cheap beer hall. What is inferred is the use of clear, understandable language.

Moreover, the personality, the character—and the ability—of a person is reflected by his communication, written or oral. Correctness, accuracy, and precision in speaking or writing indicate that the same

attributes are present in the individual's work and living habits. The service technician who can describe the troubles in a radio or television set accurately in layman's language establishes confidence in his customer. Regardless of his technical skill, the serviceman must be able to communicate well with every customer if he is to achieve the success he desires.

It doesn't require a college education to be proficient in communication. It does require the ability to read and understand good books, newspapers, and magazines —and the dictionary—plus a common-sense realization of the importance of our language, together with the determination to study it.

When any person writes an article for publication, he cannot accurately foretell who his readers will be. True, it is a long established rule that one does not "write down" to his readers—that is, insult their intelligence. It is equally true that he should not write over their heads. Neither is the writer to baffle, confuse, tire, or disgust his readers by strange terms, bad grammar, weird punctuation, outworn phrases, or awkward grammatical structures.

No one, in reading a technical article, is irritated by simple, clear explanations. If the reader is already familiar with the subject under discussion, he may well appreciate a review or different approach couched in terms other than what he might use. If the reader is a novice, eagerly seeking knowledge, he cannot understand an explanation directed toward an experienced college professor.

Simplicity, clarity, and the use of concrete illustrations in presenting any idea are more than desirable—they are essential! Anything, to be acceptable, must have these qualities:

(1) Simplicity—so every one can understand it;

(2) Clarity—so every one can see it;

(3) Honesty—so every one can accept it.

For example, consider this classic statement (used as an illustration in Howard W. Sams & Co. **Technical Writer's and Editor's Stylebook,** written by Rufus P. Turner): "When exposed to air, iron has a propensity for entering into a chemical reaction with the oxygen of the air; a layer of iron oxide soon covers the surface." How much better it is to say, "Iron rusts easily."

What the communicator must persistently ask is, "What am I trying to say, exactly? Precisely, what is my point?" Then he must find words, build sentences, and construct paragraphs that say exactly what he wants to say. He must review his own work, revise, and edit. To compromise this truth is like saying, "The man went down the street." Actually, the man "walked," "ran," "stumbled," "staggered," "reeled," "wandered," "hobbled," "raced," "sped," or "ambled." But for accuracy, he did not just "go" down the street.

The American language is becoming recognized as the only one capable of expressing any idea—especially technological ideas. At last count, British English contained nearly 750,000 words. American English now has nearly 800,000 words and is still growing, largely as a result of the coining of new words in the electronics and other technological fields. "Television," "radar," "s o n a r," "transistor," "electromagnet," "radiometeorograph," and "astronaut," are but a few of the many words added to our vocabulary in recent years. Perhaps within a short time we will hear words like "moonscope," "space-gyrator," "universesometer," or "space-sconics."

Unquestionably, the language is difficult, because of its many grammatical rules and large vocabulary. Rules for its use have been largely derived from complex Greek and Latin grammar, and from the slow-developing Anglo-Saxon language. Moreover, American English contains words from every known language.

But these rules, complex as they superficially seem, provide the means to "say what you mean and mean what you say." Because American English is so large, one can say anything he desires, any way he wishes to say it. Not so for other tongues. In Japan, for example, one can walk into an automobile repair shop, not knowing a word of Japanese, and say "carburetor," "transmission," "differential," (or "baseball"), and be understood. There was simply no way for Japanese to express these terms other than to borrow from English. The same is true with other languages. Consequently, American English is becoming the international means of communication in this technological, electronics age.

But words without rules of communication to govern their use are like wild mustangs without cowboys to break them to saddle or harness. They stampede into confusion.

Consider, for example, just one established rule. "Every pronoun must have a clearly defined antecedent." We have several kinds of pronouns—personal, relative, demonstrative, possessive, indefinite. But one that causes much difficulty among even experienced writers is the relative pronoun "which." By rule, it may stand for inanimate objects only. And it must, also by rule, have a definite antecedent, for the good reason that clear expression is necessary.

But what of this statement: "The man, who was a heavy drinker by habit, had an accident when he was sober, which is ridiculous." What's ridiculous?—The accident, that he was sober, or that he had an accident? For what specific noun (antecedent) does "which" stand? There is lack of clarity in the statement, hence it is poor communication. This is but one of thousands of graphic illustrations that could be given to demonstrate ignorance or neglect of the rules of the language. These violations garble the transmission of ideas.

In recent years, with our emphasis on speed, ease, and short-cutting in everything, abbreviations have become common in nearly all writing. From FDR to LBJ we have permeated our communication with initials and abbreviations. These, however time saving, can be most serious in sidetracking the reader. If a writer makes the following statement, what does he mean? "The AAA has been a valuable organization in our society." AAA

• *Please turn to page 56*

triggered S

Fig. 1. Trigger and magnifier controls on triggered sweep scope.

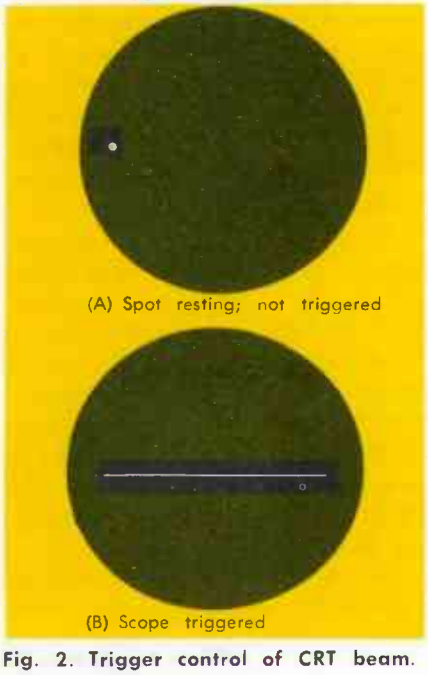


Fig. 2. Trigger control of CRT beam.

To get the most out of your triggered-sweep scope, you must know the functions of the various controls. These controls are provided to permit stable synchronization of all types of waveforms, and to permit the operator to select a desired point along the waveform for triggering the sweep. For example, suppose you wish to pick out the color burst in a complete color signal, and to expand the color burst by itself on the scope screen. Would you know how to adjust the time-base controls? It is the purpose of this article to answer this and other questions that arise in practical service tests, in terms that are easily understood by the technician.

Simple Trigger-Sweep Action

Perhaps the simplest type of triggered-sweep controls are illustrated in Fig. 1. This particular scope has only a trigger sweep and a magnifier positioning control. Let us first investigate the function of the trigger sweep control. When the trigger sweep control in Fig. 1. is turned completely to the left (coun-

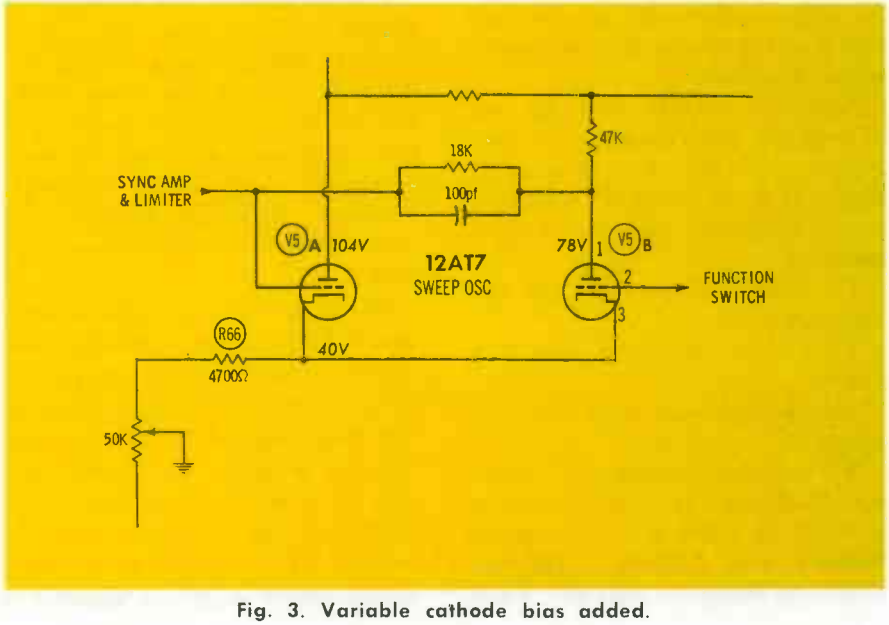


Fig. 3. Variable cathode bias added.

weep Scope

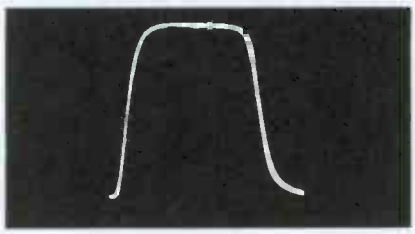
by
Robert G. Middelton

ter-clockwise), the sweep is free-running and we observe a horizontal trace on the screen as shown in Fig. 2B. On the other hand, when the trigger sweep control is advanced beyond a certain critical point, the sweep suddenly stops, and we see only a spot at the left-hand side of the screen, as illustrated in Fig. 2A.

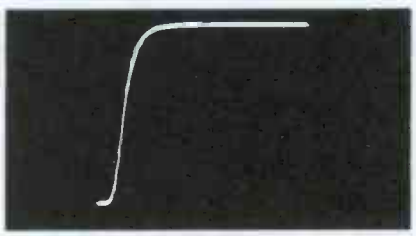
What has happened is this: Fig. 3 shows how the cathode bias is increased to bias off the sweep oscillator. Sawtooth output ceases when the bias prevents free oscillation. However, if we apply an input signal to the scope, the sync signal applied to the sweep oscillator will bring it out of cutoff when the level of the sync signal rises beyond the cutoff level and the sawtooth oscillator will go through one cycle of operation (generate one sweep excursion). Thereafter, the sweep oscillator remains cut off until another sync signal arrives. This is triggered-sweep action.

Trigger Control Operation

Let us consider trigger-sweep action step-by-step. A semi-square



(A) One-half cycle



(B) Higher sweep speed

Fig. 5. Triggered-sweep display of semi-square wave.

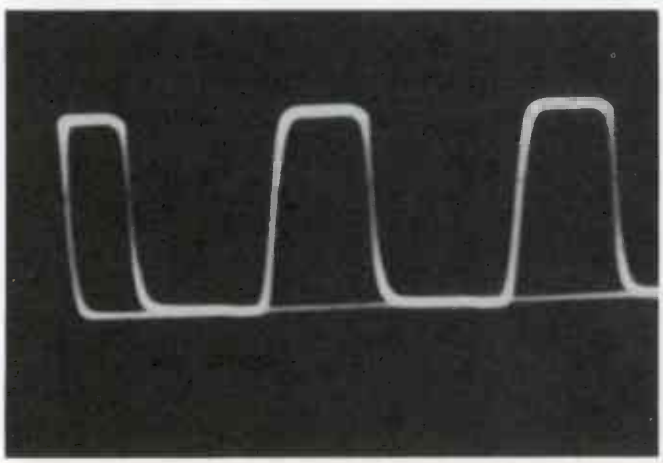


Fig. 4. Semi-square wave on free-running oscilloscope.

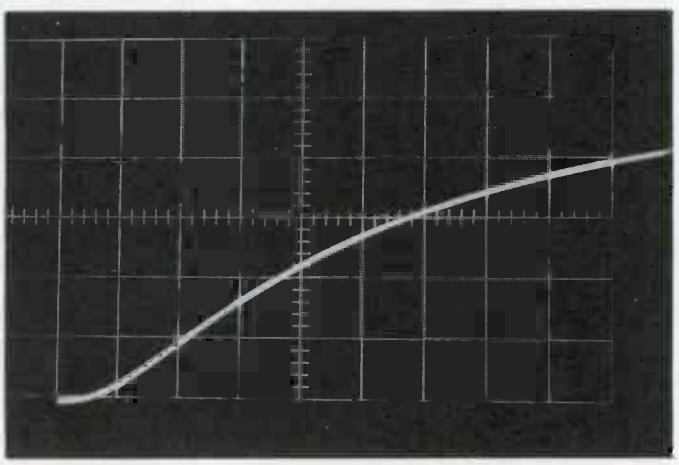


Fig. 6. Leading edge semi-square wave at high sweep speed.

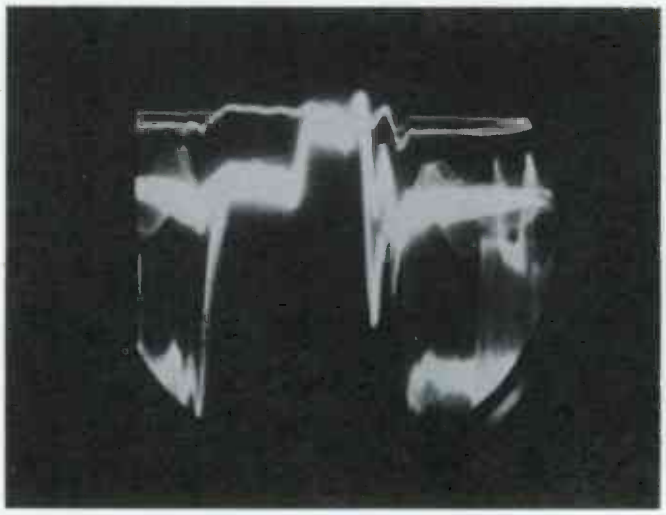


Fig. 7. Horizontal-sync pulse on free-running sweep.

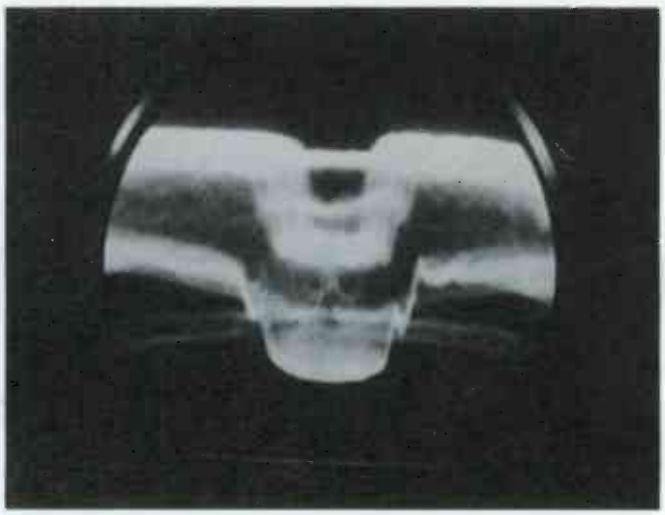


Fig. 8. Magnification of center portion of video signal.

wave, displayed on a free-running sweep, is illustrated in Fig. 4. If we operate the scope in its triggered-sweep function, we obtain the typical patterns shown in Fig. 5. We can speed up the sweep as much as we wish and the waveform remains triggered at the same starting point. The sole effect of speeding up the sweep is to expand the portion of the waveform following the trigger point, as shown in Fig. 5B. This fact is also evident in Fig. 6, which illustrates the leading edge of a semi-square wave displayed at a very high sweep speed. The illuminated graticule can be used with a calibrated time base to measure the elapsed time between any two points along the leading edge of the waveform. After this brief introduction to trigger control operation, we can now discuss the magnifier positioning control in Fig. 1.

Sweep Magnification

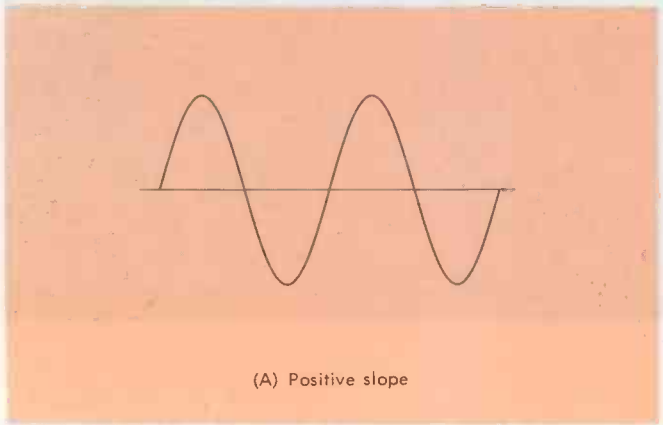
There are two types of sweep magnification provided by different scopes.

1. "Window" magnification displays a selected interval of the waveform; the desired interval is chosen by adjustment of the magnifier positioning control.
2. Total magnification greatly expands the entire waveform; the desired interval is chosen by adjustment of the horizontal position control.

Sweep magnification can be employed on either free-running or triggered sweep. If magnification and triggered-sweep functions are utilized simultaneously, the greatest possible expansion of a small interval in the waveform is realized. The magnification of a horizontal-sync pulse on a free-running sweep is illustrated in Fig. 7. To set up the display, the trigger-sweep and magnifier positioning controls are turned completely counterclockwise. The video waveform is then displayed in the conventional manner. Next, the magnifier positioning control is advanced clockwise, switching the magnifier circuit on and producing a greatly expanded waveform on the screen. Further adjustment of the magnifier positioning control brings the sync pulse into the "window."

The magnifier positioning control can also be adjusted to bring the center portion of the video waveform into the "window" as shown in Fig. 8. With this type of magnifier action, the pattern extends for only a short distance to the left or right off the screen; therefore, there is no possibility of observing any portion of the waveform beyond the "window" by adjustment of the horizontal position control.

However, let us suppose that we are using a triggered-sweep scope in which the entire waveform is expanded, and the "window" display is not present. In such a scope, the magnifier control is merely a switch, and the magnifier function is either on or off. When the magnifier is turned on, the waveform is greatly expanded (typically 5 times) and the desired portion of the magnified waveform is brought into view on the screen by adjustment of the horizontal position control. Although a different control is used to display the magnified portion of



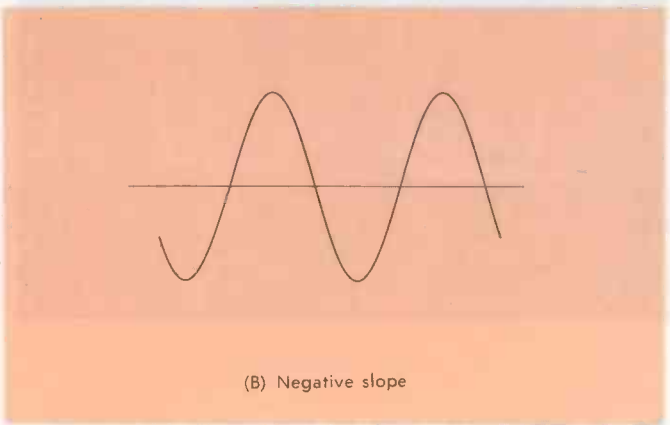


Fig. 9. Waveforms triggered on opposite slopes.

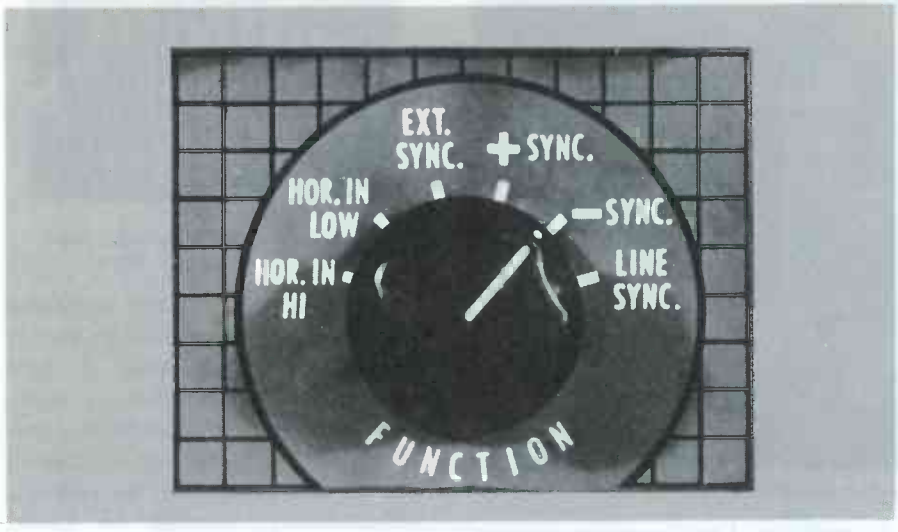


Fig. 10. Negative slope setting.

the waveform, the result is the same.

Positive and Negative Slope

Beginning technicians are often confused by the terms "positive slope" and "negative slope", used in triggered-sweep terminology. These are actually very simple terms, and their meaning is illustrated in Fig. 9. The rising portion of a waveform is said to have positive slope, and the falling portion of a waveform is said to have negative slope. We can synchronize, or trigger, on either slope. With reference to a scope with free-running sweep, the terms "+Sync" and "−Sync" (Fig. 10) have the same significance as "positive slope" and "negative slope". The terms "+Sync" and "−Sync" are also used with reference to simple triggered-sweep scopes.

Consider the effect of varying the position of the trigger sweep control in Fig. 1, with the understanding that the control is being varied within the range of triggered-sweep operation. With the function switch set to "+Sync," the trigger-sweep control causes the waveform to trigger higher up on its leading edge, or positive slope, as shown in Fig. 11. With the function switch set to "−Sync," the trigger-sweep control causes the waveform to trigger lower down on its trailing edge, or negative slope (Fig. 12).

The trigger point can be placed anywhere on the positive or negative slope of a waveform by suitable adjustment of the sweep controls. This is a matter of very practical importance, because when we use triggered sweep, we will ordinarily be interested in observing a small interval in the waveform, which might be located anywhere along the waveform. The color burst in a complete color signal is a familiar example.

Display of the Color Burst

A complete color signal is illustrated in Fig. 13. When we "size up" this waveform, we observe that the color burst appears high up on the waveform, and that the positive peak of the waveform consists of the horizontal sync pulse. Thus, we are primarily concerned with the positive portion of the waveform. A good triggered-sweep scope is equipped with a trigger-level control that has a wide range. This control is set comparatively far up on its positive range—almost to the point where the screen goes blank. The sweep is then triggered

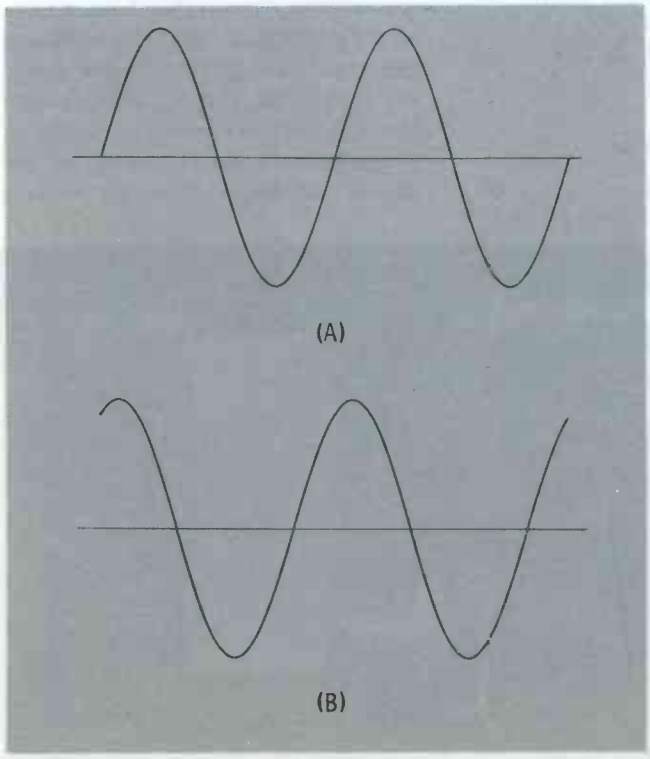


Fig. 11. Triggered higher on the leading edge with + sync.

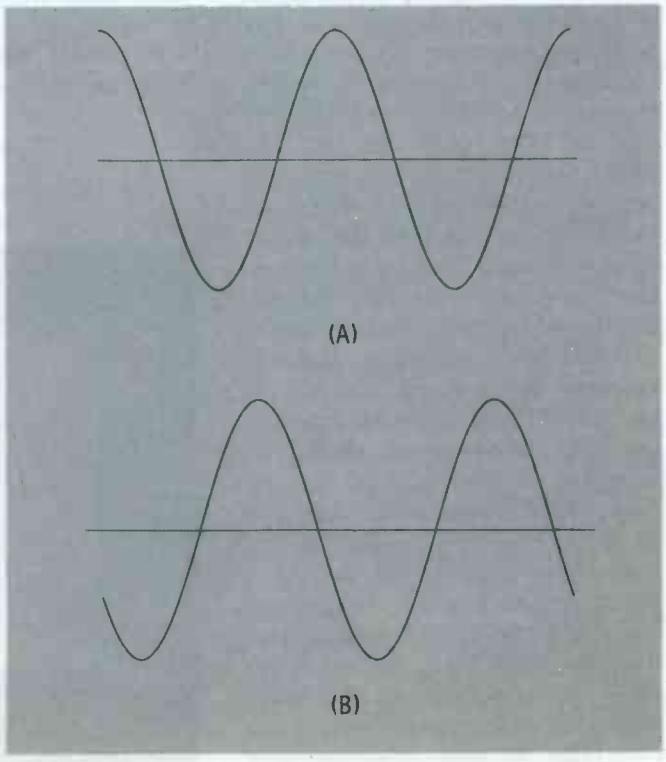


Fig. 12. Triggered lower on trailing edge with − sync.

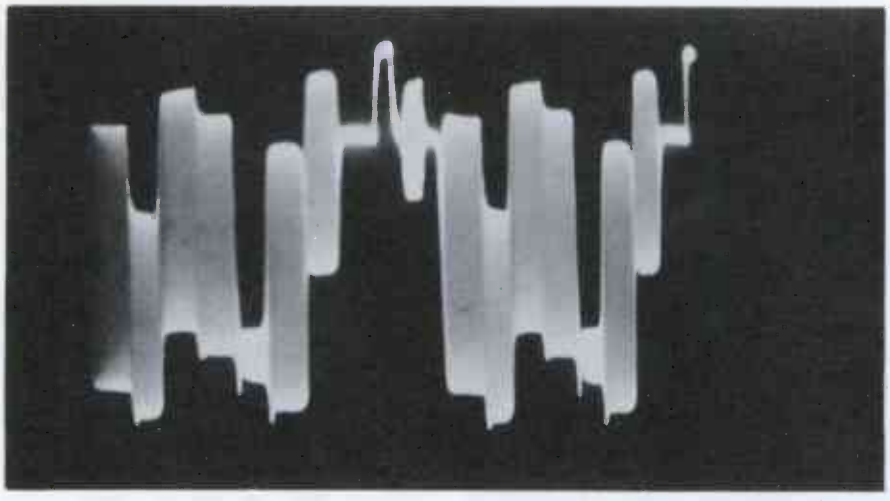


Fig. 13. Composite color waveform.

by the top of the sync pulse.

To eliminate practically all of the sync pulse from the display so that the color burst can be expanded to occupy the full screen, the controls are adjusted to trigger the sweep on the trailing edge of the sync pulse. This is accomplished by setting the trigger-selector control to "−Slope," or "−Sync," causing the sweep to trigger on the trailing edge of the sync pulse.

Good triggered-sweep scopes are also equipped with a stability control to eliminate any jitter or erratic triggering. However, it is possible that jitter or erratic triggering cannot be eliminated by adjustment of the stability control. In such instances, the trigger signal is processed to pass only the sync pulse and reject the high-frequency color signal. This is done by switching the scope to its "DC Trigger" position. This term can be confusing, because "DC" in this case means "low frequency." What actually happens is that the trigger signal is passed through a low-pass filter or integrator that removes any high-frequency components.

With the preceding controls properly adjusted (in addition to the vertical gain and sweep speed), the color burst signal should be displayed as illustrated in Fig. 14. Thus, what might have appeared to be a difficult procedure is actually quite simple when we use a good triggered-sweep scope and know how to set the various controls. In every case, the waveform must be "sized up" to determine where the trigger point should occur. Then, we must relate this data to the scope controls and set them accordingly. Let's consider another example in the same category.

Fig. 15 shows a complete color signal with the color burst located in the negative portion of the waveform. Therefore, to display the color burst, the control settings will be essentially opposite to those described previously. The trigger-level control must be set comparatively far down on its negative range—almost to the point where the screen goes blank. The trigger-selector control must be set to "+Slope," or "+Sync," because the sync pulse is rising along the desired trigger interval. Also, it will probably be necessary to switch to "DC Trigger" position to eliminate false triggering. Finally, adjustment of the stability control will permit display of the color burst, as illustrated in Fig. 14.

Conclusion

The controls of a triggered-sweep scope are less formidable than they appear to the beginning technician. It is essential to clearly understand the function of each control, and to be able to relate these functions to waveform characteristics. In turn, the technician will be able to operate the controls systematically, because he knows the purpose and expected result of each adjustment. If the technician attempts to display the desired portion of a waveform by haphazard control adjustment, it is quite possible that he will give up before he obtains the desired pattern. Even if by sheer luck, the desired pattern might be obtained by trial and error, an enormous amount of time is almost certain to be wasted in the process.

The operations discussed in this article are very basic, and apply to almost any triggered-sweep scope that might be encountered. The beginning technician is advised to familiarize himself first with the use of comparatively simple triggered-sweep scopes that have a minimum number of controls. Although the capabilities of a simple scope are somewhat limited, the technician will progress more smoothly to a competent understanding of sophisticated triggered-sweep scopes. ▲

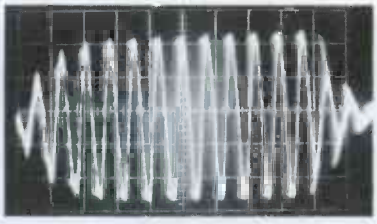


Fig. 14. Triggered-sweep scope display of color burst.

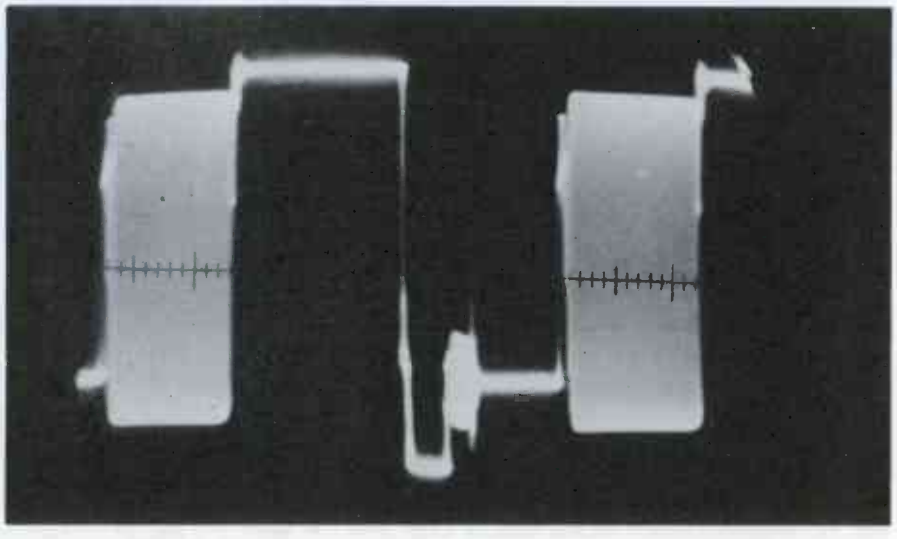


Fig. 15. Color burst located in negative portion of waveform.

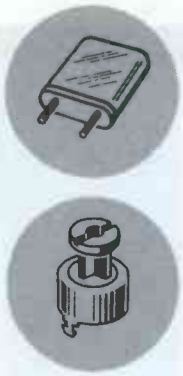
FUSIBLE RESISTOR / CROSS REFERENCE GUIDE

Manufacturer	Part No.	Value Ohms	Watts
Admiral	61A19	7.5	5
	61A19-2	7.5	5
	61A22	10	*
	61A28-3	5	5
	61B43-4	22	1
	61B43-10	100	4
	61B48-1	5.5	*
	61C20-24	5	10
	61C43-5	47	1
	61C43-7	11	2
	61C43-8	1080	2
Airline	B154089-1-6	7.5	5
	E2311	22	5
	F-15	5	5
	F-23	4.7	*
	R-1409	5.5	5
	V 24002	4.7	*
	20E1042	7.5	5
	34X380	7.5	5
	43X394	4.7	*
	43X397	7.5	15
	43X398	4.7	*
	43X431	4.7	*
	43X0431-001	4.7	*
	46M2577	4.7	5
	46M20681	5.6	5
	46M22301	9.1	5
	46M23018	9	5
	259V002H01	7.5	*
	259V004M01	4.7	5
	259V007H02	7.5	*
	053-458110	4.5	10
	099-001500	5	5
Aiwa	V24002	4.7	*
	V29001	4.7	*
Ambassador	672	130	4
Artone	24-1073	5	5
	24B1116	4.7	5
Arvin	325-0134-13	47	5
	47727-3	11 (cold) 22 (hot)	* TC
	47727-5	33	*
	47727-6	16	*
	47727-7	20 (cold) 45 (hot)	* TC
	47727-8	22	5
	68504-130	4.7	10
	2000757-37	4.7	10
Bradford	268021-1	5.6	5
Bendix	V24002	4.7	*
	43X0431-001	4.7	5
Buick	7276499	.33	*
	7281027	.51	*
	728-1890	.47	*
	7286602	.68	*
CBS	31000472	7.5	6
Cadillac	7270608	.47	* TC
	7281027	.51	*
	7281890	.47	*
	7286602	.68	*
Capehart	453924B-1	7.5	5
Catalina	V24002	4.7	*
	43X086-001	22	*
	43X396-001	130	5
	43X0431-001	4.7	5
Chevrolet	7270608	.47	*
	7276499	.33	*
	7281027	.51	*
	7281890	.47	*
	7287480	.68	1
Coronado	TRP-28	4.7	5
	V24002	4.7	*
	024-2-1116	4.7	3
	24B1116	4.7	5
	43X0431-001	4.7	5
	46M-23018	9	5
	46M-25577	4.7	5
	816	22	5
	B154089-1-6	7.5	*
	154087-1	7.5	*
	154089	7.5	5
	156540	7.5	*
Curtis Mathes	FR-3	3	5
Decca	RW10-1	22	3
Delmonico	A04037-4K-3.9	3.9	*
Dumont	397148	22	5
	0231001	7.5	5
Emerson	394158	5	5
	394216	5	7
	397103	1	*
	397118	6	*
	397133	22	5
	397162	11	*
	397180	62	*
	397216	62	*
	963378	220	*
Firestone	24B1116	4.7	5
	43X380	7.5	5
	46M-23018	9	5
	ET14X182	5	5
	ET14X183	3.6	7
GE	ET14X191	5	5
	RRW-048	4.6	*
	RRW-137	3	5
	RRW-149	7.5	10
Hallecrafters	024-201116	4.7	3
	24-1073	5	5
	24-1116	4.7	5
	24B1004	7.5	*
	24B1011	7.2	5
	24B1116	4.7	5
	25B1004	7.5	5

Manufacturer	Part No.	Value Ohms	Watts
	25B1011	7.2	5
	224-20002	10	10
Hoffman	4672	7.5	7.5
	4762	5	*
	4798	7.5	*
	83001	7.5	*
	83002-1	7.5	*
	83003	4.7	*
	825023	7.5	10
J. C. Penney	43X431	4.7	*
Magnavox	24077-1	5	5
	240074-1	5	*
	240080-19	4.7	*
	240084-2	22	*
	240084-3	22	*
	240601-1	7.5	5
Majestic	B-6,326-1	7.5	5
Majorette	not avail.	47	*
Matsushita	FRU-10P4B7	4.5	*
	FRU-2K	22	2
	2000757-37	4.7	10
Meteor	PMA97478	7.5	5
Mopar	7281890	.47	*
	7286602	.68	*
Motorola	1K1027	7.5	5
	1K711027	7.5	5
	1K711574	5	5
	17A700149	5	5
	17A711027	7.5	5
	17A711500	7.5	5
	17A732655	7.5	*
	17A791166	7.5	5
	17A791696	5	5
	17B740668	3	*
	17C67673A01	5	10
	17K711027	7.5	5
	17K738862	7.5	5
	17K742136	5	5
	17K744240	7.5	10
	17K748494	7.5	10
	65A61832A01	120	*
Muntz	RW-005-13	5	5
	RW-022-15	22	5
	RW-055-13	5	*
	Not avail.	4.7	5
Nordmende	409.030	1.5K	5
	00038CTZ100	100	5
	00038CTZ1000	1K	5
	0038CZT	1.5K	5
Oldsmobile	7276499	.33	*
	728-027	.51	*
	7281890	.47	*
	7286602	.68	*
Olympic	R-1409	5.5	5
	RE3823	7.5	5
	RE27113	10	*
	RE27133	3.5	*
	RE28476	5.5	7
	RE32593	4.7	5
	RE32681	7.5	5
Opel	7276499	.33	*
Packard-Bell	not avail.	7.5	5
	73500	5.6	*
	73720	7.5	*
	73724	18	*
Philco	33-1334-17	20	3
	33-1362-4	21	10
	33-1366	4.7	*
	33-1366-2	5.6	5
	33-1366-3	5.6	5
	33-1366-7	5.6	*
	33-1366-9	5.6	*
	76-13605-2	1.45	*
	325-1441-16	47	*
Phonola	14135	47	*
Pontiac	7276499	.33	*
	7281890	.47	*
	7287480	.68	1
Raytheon	46M-20681	5.6	*
	46M-22301	5.6	*
	46M-23018	9	5
	46M-25577	4.7	5
RCA	100117	5.6	5
	100117B	5	*
	103824	4.7	5
	114481	3.5	*
	114966	5	10
	115969	3.4	*
	942924-4	.35	*
Sentinel	B154089-1-6	7.5	5
	20E1042	7.5	5
	240074-1	5	*
	240601-1	7.5	5
Setchell-Carlson	FR-2	2	5
	FR-3	3	5
Silvertone	N41853	5	*
	S43-1007	7.5	5
	T43-1007	7.5	5
	24-1073	5	5
	24-1116	4.7	5
	25B-1011	7.2	5
	43-4-1	22	3.25
	43-1007	7.5	5
	43-1008	7.5	5
	43-1009	5	5
	43-1011	5	*
	61-191-0	4.5	10
	61-193-0	14.5	5
	14135	47	3
	16825	95	3
	47727-3	11 (cold) 22 (hot)	*
	107474	3.1	*
Sonora	F-15	5	5
	R-1409	5.5	5
Spartan	270074-1	5	5
Sparton	PA4227	7.5	5
Studebaker	7276499	.33	*
	7281890	.47	*
	7287480	.68	1
Sylvania	187-0028	7.5	5
	187-0053	4.7	5
	189-0046	4.7	5
Symphonic	A16120	47	2
	A16121	22	3
	not avail.	7.5	10
	not avail.	4.7	*
Travler	E47	47	*
	F6	5	*
	F6-1	5.6	5
	F8	7.5	5
	F-10	4.7	*
	F15	5	5
	F23	4.7	*
	TV-F-6	5	5
Truetone	E27	27	*
	E47	47	*
	F-15	5	5
	024-201116	4.7	3
	24B1116	4.7	5
	43X380	7.5	5
	43X397	7.5	*
	43X398	7.5	*
	43X0398-001	4.5	*
	46M-2557	4.7	5
	46M-20681	5.6	5
	46M-23018	9	5
	244-200002	10	10
	816	22	5
	240076-32	5	10
V.M.	12472	22	*
	17829	27	*
Wells-Gardner	43X380	7.5	5
	43X394	4.7	*
	43X397	7.5	15
	43X398	4.7	*
	43X431	4.7	*
Westinghouse	V-16023-1	7.5	5
	25V020873	100	3
	251V020H23	100	3
	251V020H66	5.6	8
	251V020H73	100	3
	251V035H02	33	*
	251VO36H01	5	7
	259V002H01	7.5	5
	259V002M01	7.5	5
	259V004M01	4.7	5
	259V007H01	7.5	*
Zenith	WC14132	47	*
	63-3269	7.5	5
	63-3287	6	5
	63-3644	6	5
	63-4450	6	10
	63-5193	22	4
	63-5306	33	*
	63-6405	175	7

* Wattage not given by mfr.
TC Temperature-Compensating

COLOR-PARTS GUIDE



A guide to color parts was last published in the February '65 issue of PF REPORTER. Since then, there have been many changes in design and consequently many new chassis. The following parts guide lists the capacitors, resistors, sweep components, and other miscellaneous items needed to repair color TV receivers introduced since early 1965, including the recently-introduced chassis for 1967. As pointed out in the previous parts guide, the majority of these close-tolerance components are seldom used in black-and-white servicing; therefore, it will probably be best if color and black-and-white inventories are separated. You can decide which items listed here are the most practical for you to keep.

The manufacturers part number is listed for all sweep-circuit and miscellaneous components. Exact replacements for most of these components are listed in the appropriate PHOTOFACT Folder and in your distributor's COUNTER-FACTS. "Th" appearing in front of the value of a resistor indicates the resistor is a thermistor.

	Fixed Capacitors				Electrolytics			Resistors			Miscellaneous
Admiral Chassis 2G13, 3G13, 4G13, 5G13, 6G13, H12, 1H12	2.2	pf		1KV	2	mfd	350 V	47	ohm	10W	Circuit Breaker 84D17-11
	47	pf	N2200	2KV				270	ohm	5W	84D17-9 (Ch. H12 & 1H12)
	68	pf		4KV				1	K	3W	Convergence Rectifier 93C1-21
	100	pf		3KV 5%				1	K	20W	93C53-2 (Ch. H12 & 1H12)
	100	pf	N1500	3KV 10%				1.2	K	3W	Crystal 3.58 MHz 93B22-3
	130	pf		6KV				1.4	K	3W	Delay Line 72B217-3
	150	pf		1KV 10%				1.6	K	18W	
	470	pf		1KV				2.7	K	5W	
	470	pf		2KV				4.7	K	4W	
	470	pf		2.5KV				5.1	K	5W	
	1000	pf		1KV				5.6	K	3W	
	1000	pf		1.4KV				8.2	K	3W	
	1500	pf		1KV				15	K	4W	
	1500	pf		2KV				17	K	7W	
	2200	pf		1KV				24	K	3W	
	2700	pf		1.6KV				27	K	3W	
	3300	pf		2KV				33	K	3W	
	4000	pf		3KV				500	K	3W	
	6800	pf		1.6KV				47	meg	6KV	
	.01	mfd		1KV							
	.01	mfd		1.4KV							
	.15	mfd		1KV							

	Fixed Capacitors				Electrolytics			Resistors				Miscellaneous
Dumont & Emerson Chassis 120814A 120822A 120835A					10	mfd	10 V	1	K	5W		Boost Rectifier 817124
	22	pf		1KV	160	mfd	150 V	1	K	10W		Circuit Breaker 808022
	47	pf		2KV				1.1	K	20W		Convergence Rectifier 817149
	68	pf		1KV				4.3	K	5W		Crystal 3.58 MHz 817147
	68	pf		4KV				8.2	K	5W		Delay Line 709008
	130	pf		6KV				10	K	10W		Focus Rectifier 817123
	180	pf		1KV				13	K	7W		
	260	pf		2.5KV				66	meg	4W	6KV	
	390	pf		1.5KV								
	470	pf		2.5KV								
	1000	pf		2KV								
	3000	pf		1.6KV								
	3300	pf		1.6KV								
	8200	pf		1KV								
	.01			1KV								

	Fixed Capacitors					Electrolytics			Resistors			Miscellaneous
General Electric Chassis HC & KC	22	pf	N750	1KV		1	mfd	25 V	.08	ohm	3W	Boost Rectifier ET57X31 (Ch. KC)
	24	pf	N750	4KV		1	mfd	450 V	1.75	ohm	5W	Circuit Breaker ET10X50 (Ch. KC)
	170	pf	N2200	4KV		200	mfd	15 V	3.6	ohm	7W	Convergence Rectifier ET57X38 (Ch. KC)
	130	pf	N2200	6KV		220	mfd	200 V	(Th)3.8	ohm	Cold	Crystal 3.58 MHz ET41X47 (Ch. HC)
	160	pf	N1500	6KV					(Th)120	ohm	Cold	Delay Line ET36X809 (Ch. HC) ET36X556 (Ch. HC)
	260	pf	N3300	2.5KV					250	ohm	10W	Focus Rectifier ET57X32 (Ch. KC)
	470	pf		1.4KV					300	ohm	3W	
	470	pf	N3300	2.5KV					680	ohm	5W	
	1000	pf		1.4KV					800	ohm	20W	
	1000	pf		2KV					1	K	3W	
	4700	pf		1KV					1.46	K	10W	
	5000	pf		1.4KV					3.6	K	3W	
	.0082	mfd		1.6KV					3.9	K	4W	
	.033	mfd		1KV					4.3	K	10W	
	.01	mfd		1.4KV					5.6	K	7W	
	.1	mfd		1KV					8.2	K	3W	
									10	K	10W	
									15	K	4W	
									15	K	10W	
									16	K	3W	
									22	K	4W	
									39	K	4W	
									(Th)1.052	meg	Cold	
									66	meg	6KV	

	Fixed Capacitors					Electrolytics			Resistors			Miscellaneous
Hoffman Models 1P-5001, B W-5002, B SP-5003, B FP-5004, B W-5310 SP-5311 W-5320 MS-5322 W-5330 SP-5331 IP-7001 W-7002 SP-7003 MS-7005	22	pf	N750	1KV		10	mfd	10 V	(Th)1.25	ohm	Hot	Boost Rectifier 004-003100
	47	pf	N2200	1.4KV				N.P.	(Th)5	ohm	Cold	Circuit Breaker 099-002500
	68	pf	N1500	4KV					270	ohm	3W	Convergence Rectifier 004-003700
	130	pf	N2200	6KV					680	ohm	4W	Crystal 3.58 MHz 136-000100
	150	pf	NPO	6KV	5%				820	ohm	7W	Delay Line 111-023800
	180	pf		1KV					1	K	3W	Focus Rectifier 004-003200
	200	pf		2.5KV					1.4	K	20W	
	390	pf	N1500	1.5KV	5%				2.7	K	3W	
	470	pf	N2200	2.5KV					3.3	K	3W	
	1000	pf		1KV					3.3	K	10W	
	.0033	mfd		2KV					5.6	K	4W	
	.0082	mfd		1KV					6.8	K	3W	
	.01	mfd		1.4KV					10	K	10W	
									11	K	7W	
									13	K	7W	
									66	meg	6KV	

	Fixed Capacitors				Electrolytics			Resistors			Miscellaneous
Magnavox Chassis T911 T918 T919 T920	22	pf	N750	1KV	160	mfd	250 V	270	ohm	3W	Boost Rectifier 530097-3
	47	pf		2KV				910	ohm	5W	Convergence Rectifier (Dual) 430087-2
	68	pf	N1500	4KV				910	ohm	7W	Convergence Rectifier (Single) 530098-1
	130	pf	N2200	6KV				1	K	3W	Crystal 3.58 MHz 530089-2
	180	pf		2KV				1.1	K	18W	Delay Line 360949-5
	390	pf	N1500	1.5KV				1.8	K	3W	
	1000	pf		1KV				2.2	K	3W	
	1000	pf		1.5KV				3.3	K	3W	
	1000	pf		2KV				4.3	K	5W	
	.002	mfd		1KV				5.6	K	3W	
	.0082	mfd		1KV				5.6	K	4W	
	.01	mfd		1.4KV				8.2	K	3W	
								15	K	7W	
								18	K	4W	
								66	meg	6KV	

	Fixed Capacitors				Electrolytics			Resistors			Miscellaneous
Motorola Chassis TS918 TS918A	2.2	pf	NPO	1KV	150	mfd	250 V	(Th)3.8	ohm	Cold	Boosted Boost Rectifier 48D67120A08
	33	pf	N150	2KV	160	mfd	250 V	820	ohm	3W	Circuit Breaker 80C66390A13
	47	pf	N1500	6KV				820	ohm	7W	
	100	pf	N1500	3KV				1	K	20W	

	Fixed Capacitors	Electrolytics	Resistors	Miscellaneous
Motorola Chassis TS918 TS918A	120 pf N750 1KV 470 pf 1KV 470 pf 2KV .001 mfd 2KV .0015 mfd 1.4KV .002 mfd 2KV .005 mfd 1KV .005 mfd 2KV .01 mfd 1KV .02 mfd 1KV		1.5 K 3W 2.2 K 5W 2.2 K 10W 2.7 K 7W 3.9 K 4W 5.6 K 7W 7.5 K 7W 8.2 K 4W 8.2 K 7W 10 K 3W 10 K 5W 10 K 10W 15 K 4W 47 K 4W	Convergence Rectifier 48S10062A01 Crystal 3.58 MHz 48C66865A03 Focus Rectifier 6D67800A03

	Fixed Capacitors	Electrolytics	Resistors	Miscellaneous
RCA Chassis CTC17 thru CTC25X	22 pf N750 1KV 47 pf N1500 5KV 68 pf N1500 4KV 130 pf N2200 6KV 180 pf N1500 1KV 330 pf N1500 2.5KV 390 pf N1500 1.5KV 470 pf N2200 2.5KV 680 pf 1KV 1000 pf 1KV 1000 pf 2KV .001 mfd 2KV .0022 mfd 1KV .0022 mfd 2KV .0033 mfd 1.6KV .0047 mfd 1.6KV .0082 mfd 1KV .1 mfd 1KV .22 mfd 2KV 3300 mfd 3KV	10 mfd 350V 50 mfd 150V	(Th)1.25 ohm Hot (Th)5 ohm Cold (Th)120 ohm Cold 270 ohm 3W 560 ohm 7W 600 ohm 18W 680 ohm 3W 680 ohm 10W 680 ohm 15W 750 ohm 10W 820 ohm 3W 820 ohm 7W 1 K 3W 1.2 K 4W 1.2 K 7W 1.8 K 3W 2.7 K 3W 3.3 K 3W 3.9 K 7W 4.3 K 5W 4.7 K 3W 5.6 K 4W 6 K 15W 6.8 K 3W 6.8 K 4W 10 K 10W 13 K 7W 15 K 5W 16 K 3W 22 K 4W 39 K 3W 39 K 4W 66 meg 6KV	Boosted Boost Rectifier 113391 Circuit Breaker 113950 Convergence Rectifier 114013 (Ch. CTC17 & CTC20) 118244 (Ch. CTC19, CTC21, CTC24, CTC25 & CTC25X) Crystal 3.58 MHz 105330 Delay Line 109837 (Ch. CTC17) 116505 (Ch. CTC19, CTC20 & CTC24) Pincushion Rectifier 113998 (Ch. CTC17) only 119593 (Ch. CTC21, CTC25 & CTC25X)

	Fixed Capacitors	Electrolytics	Resistors	Miscellaneous
Sylvania DO1-1, -2, -8 DO2-1 DO2-7 thru 12 DO3-2 DO5-1, -2	22 pf 1KV 47 pf 2KV 68 pf 4KV 130 pf 6KV 180 pf 1KV 1000 pf 1KV 1000 pf 2KV 2200 pf 2KV 3300 pf 1KV 4700 pf 1KV 5600 pf 1.6KV 5600 pf 2KV .01 mfd 1.4KV	3 mfd 150 V 3 mfd 350 V 10 mfd 350 V 160 mfd 250 V 200 mfd 25 V 500 mfd 200 V	3.9 ohm 25W 4.7 ohm 3W (Th)125 ohm Cold 270 ohm 3W 900 ohm 30W 1 K 3W 1.2 K 4W 1.2 K 7W 1.2 K 20W 1.2 K 25W 2.2 K 3W 3.3 K 3W 4.3 K 5W 4.7 K 3W 4.7 K 4W 5.6 K 3W 5.6 K 4W 5.6 K 5W 12 K 4W 13 K 7W 15 K 3W 33 K 5W 39 K 3W 39 K 4W 66 meg 6KV	Boosted Boost Rectifier 13-16105-3 Circuit Breaker 29-17690-1 (DO1-1, -2, -8; DO2-7 thru -12) 29-16012-4 (DO2-1) 29-17312-1 (DO3-2; DO5-1, -2) Convergence Rectifier (Mult) 13-16247-3 (DO1-1, -2, -8; DO2-1, -7 thru -12) 13-17569-1 (DO3-2; DO5-1, -2) Convergence Rectifier (Single) 13-14627-1 (DO2-7 thru -12) 13-10102-1 (DO5-1, -2) Crystal 3.58 MHz 26-16162-1 Delay Line 32-16108-2 (DO1-1, -2, -8; DO2-1, -7 thru -12) 32-16108-3 (DO3-2) 32-23216-1 (DO5-1, -2) Focus Rectifier 13-16106-1

	Fixed Capacitors			Electrolytics			Resistors			Miscellaneous
Zenith Chassis 24NC31 24MC32, 42 25MC35, 36, 45, 46	45	pf	5KV	4	mfd	475 V	300	ohm	10W	Circuit Breaker 85-763
	75	pf	4KV	10	mfd	475 V	450	ohm	15W	Convergence Rectifier (Horiz.)
	90	pf	5KV	40	mfd	400 V	680	ohm	3W	212-25 (Ch. 24NC31; 24MC32, 42)
	100	pf	4KV	160	mfd	250 V	3.3	K	4W	212-63 (Ch. 25MC35, 36, 45, 46)
	150	pf	5KV				3.9	K	4W	Convergence Rectifier (Vert.)
	150	pf	6KV				4.7	K	7W	212-50
	470	pf	1KV				10	K	3W	Crystal 3.58 MHz
	.001	mfd	1KV				10	K	4W	103-89 or 103-71
	.0015	mfd	1KV				10	K	5W	Delay Line
	.0022	mfd	1KV				12	K	5W	S-65296
	.0068	mfd	1KV				18	K	3W	Focus Rectifier
	.01	mfd	1KV				22	K	3W	212-48 (Ch. 25MC35, 36, 45, 46 only)
	.015	mfd	1KV				39	K	3W	
	.033	mfd	1KV							
	.1	mfd	1KV							

Sweep Components

Admiral

Horiz Output Tansformer	79D110-5 (Ch. 2G13, 4G13, 5G13)
	79D110-6 (Ch. 3G13, 6G13)
	79D126-1 (Ch. H12, 1H12)
Vertical Output Transformer	79D106-6
Yoke	94C304-2

Dumont & Emerson

Horiz Output Transformer	738213 (Ch. 120814A)
	73814 (Ch. 120822 & 120835)
Vertical Output Transfomer	738207
Yoke	708476 (Ch. 120814A)
	708479 (Ch. 120822 & 120835)

General Electric

Focus Coil	ET36X710
Horiz Output Transformer	ET77X99 (Ch. HC Early Prod.)
	ET77X102 (Ch. HC Late Prod.)
	ET77X89 (Ch. KC)
Vertical Output Transformer	ET64X116 (Ch. HC)
	ET64X113 (Ch. KC)
Yoke	ET76X47 (Ch. HC)
	ET76X43 (Ch. KC)

Hoffman

Focus Coil	111-032200
Horiz Output Transformer	033-012700 (Models IP-7001, W-7002, SP-7003, MS-7005)
	033-010200
Vertical Output Transformer	033-010300
Yoke	027-032000 (Models IP-5001, W-5002, SP-5003, FP-5004)
	027-032800 (Models IP-7001, W-7002, SP-7003, MS-7005)
	027-031400 (All others)

Magnavox

Focus Coil	361240-2
	360957-5 (Ch. T918)
Horiz Output Transformer	361197-1
	361241-1 (Ch. T918)
Vertical Output Transformer	320317-2
	320111-6 (Ch. T918)
Yoke	361130-402 (Ch. T911)
	360947-1 (Ch. T918)
	361130-302 (Ch. T919)
	361130-202 (Ch. T920)

Sweep Components

Motorola

Horiz Linearity Coil	24D65853A13
Horiz Output Transformer	24D67564B06
Vertical Output Transformer	25D66761A07
Yoke	24D67822A07

RCA

Focus Coil	113999
Horiz Output Transformer	115876 (Ch. CTC17 CTC21, CTC25X)
	116554 (Ch. CTC19)
	117426 (Ch. CTC20)
	119834 (Ch. CTC24)
	119876 (Ch. CTC25)
Vertical Output Transformer	115835 (Ch. CTC17)
	118980 (Ch. CTC19)
	117428 (Ch. CTC20)
	119828 (Ch. CTC24)
	119615 (Ch. CTC21, CTC25 & CTC25X)
	114741 (Ch. CTC17, CTC21, CTC24, CTC 25 & CTC25X)
Yoke	116324 (Ch. CTC19)
	109457 (Ch. CTC20)
	114741 (CTC21, 24, 25)

Sylvania

Focus Coil	50-16023-4 (Not in DC5-1, -2)
Horiz Output Transformer	56-16016-2 (D01-1, -2, -8)
	50-17069-2 (D02)
	50-17314-1 (D03-2)
	50-17314-4 (D05-1, -2)
Vertical Output Transformer	56-16017-4 (D01-1, -2)
	56-16017-6 (D01-8)
	56-16017-5 (D02-1)
	56-17559-1 (D02-7 thru 12)
	56-17559-2 (D03-2; D05-1, -2)
Yoke	51-16083-1 (D01-1, -2, -8)
	51-15949-1 (D02-1)
	51-15949-2 (D02-7 thru 12)
	51-17570-1 (D03-2)
	51-17570-2 (D05-1, -2)

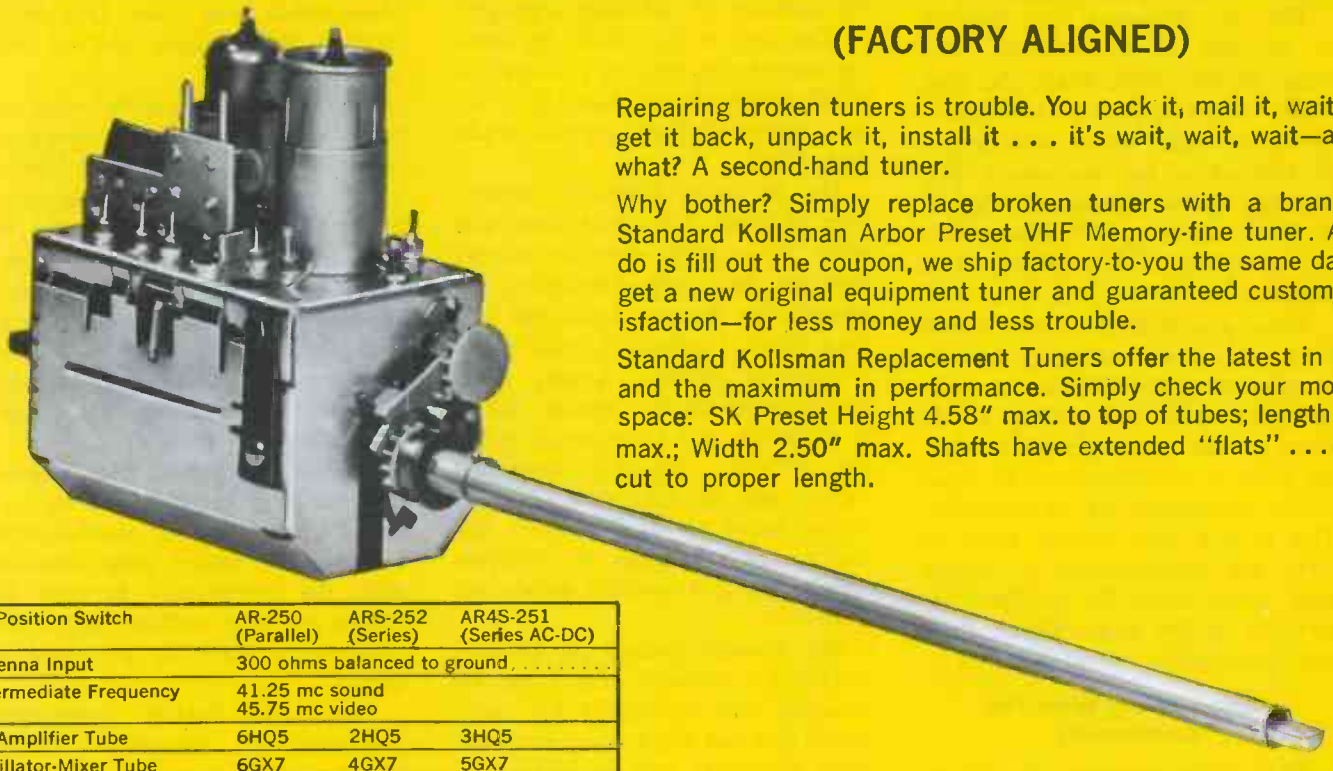
Zenith

Horiz Output Transformer	S-71144 (Ch. 24NC31)
	S-67915 (Ch. 25MC35, 36, 45, 46)
	S-65465 (Ch. 24MC32, 42)
Vertical Output Transformer	95-2281 (Ch. 24NC31; 24MC32, 42)
	95-2222 (Ch. 25MC35, 36, 45, 46)
Yoke	95-2280 (Ch.24NC31; 24MC32, 42)
	95-2286 (Ch. 25MC35, 36, 45, 46)

Scrap it!

WHY BOTHER REPAIRING IT...WHEN YOU CAN REPLACE IT FOR ONLY $10.95?

(FACTORY ALIGNED)



Repairing broken tuners is trouble. You pack it, mail it, wait for it, get it back, unpack it, install it . . . it's wait, wait, wait—and for what? A second-hand tuner.

Why bother? Simply replace broken tuners with a brand new Standard Kollsman Arbor Preset VHF Memory-fine tuner. All you do is fill out the coupon, we ship factory-to-you the same day. You get a new original equipment tuner and guaranteed customer satisfaction—for less money and less trouble.

Standard Kollsman Replacement Tuners offer the latest in design and the maximum in performance. Simply check your mounting space: SK Preset Height 4.58" max. to top of tubes; length 3.61" max.; Width 2.50" max. Shafts have extended "flats" . . . simply cut to proper length.

13 Position Switch	AR-250 (Parallel)	ARS-252 (Series)	AR4S-251 (Series AC-DC)
Antenna Input	300 ohms balanced to ground		
Intermediate Frequency	41.25 mc sound 45.75 mc video		
RF Amplifier Tube	6HQ5	2HQ5	3HQ5
Oscillator-Mixer Tube	6GX7	4GX7	5GX7
Heater	6.3 volts	600 ma	450 ma
B Plus	125-145 volts dc		

REMEMBER THESE STANDARD KOLLSMAN EXCLUSIVES

Memory Fine Tuning • Direct UHF Plug-in for Fast Replacement on 82-Channel Sets • Universal Mounting • 100% American Made • Preset Fine Tuning • Outstanding Oscillator Frequency Stability • 3-Position Detent Turret Switch for Positive Lock-in Tuning • Fits Most T.V. Sets Produced From 1956 to Now

Standard Kollsman
INDUSTRIES INC.
2085 NORTH HAWTHORNE AVE., MELROSE PARK, ILLINOIS

Circle 11 on literature card

Just fill out this coupon and enclose it, along with payment, for same-day shipment of your order.

Please rush_____ Arbor replacement tuner(s) at $10.95 each

Quantity_____ Check ☐ M.O. ☐
(Illinois customers add 4% tax)

Name_____

Company_____

Address_____

City_____ State_____ Zip_____

Building Good Customer Relations

By Charles J. Collazzo†

Building good customer relations is a continuing task because it is made up of the many separate impressions which individuals form in their day-to-day contacts with owner-managers of small retail and service businesses. These impressions are gained not only in their business dealings but also in the community activities in which the owner-manager participates.

This *Aid* discusses both aspects of building good customer relations. In the store, itself, the task is one of setting policies and supervising activities which will appeal to customers. In community life, building good customer relations involves becoming a leader in activities which will promote civic progress.

What people in the town or city think can cause customers to visit or shun a store. The owner-manager can count on getting a fair share of the area's business when his store is considered as an asset to the community by its members. This is true even though some of them are noncustomers — people who don't need the products or services of the store. Often their recommendations result in sales.

Going Along With The Community

The owner-manager should be deeply concerned when even one person doesn't think highly of his store. For example, an ex-customer tells a neighbor who has just moved to town, "I don't trade there any more since he chased my son Billy out when he was distributing Boy Scout Week posters."

To the ex-customer, the retailer's rudeness to the Boy Scout meant a lack of interest in the comunity. To the retailer, it meant a loss of a customer and loss of a powerful selling tool—favorable word-of-mouth advertising.

An example of how interest in the community pays off is provided by the experience of a gasoline service station owner. He shows his concern by advising teenagers on the care of their cars, by lending them tools, and by providing a wholesome meeting place. As a result, many of their parents trade with him.

On the other hand, the experience of Tom Nevaton,* illustrates what can happen when an owner-manager disregards community interests. The Nevaton store was in a town where tradition dictated many community actions. Among them was a campaign for colonial motifs in all public and commercial buildings. At the urging of the historical society and the chamber of commerce, many of Mr. Nevaton's fellow merchants began to renovate their stores and remodel their store fronts.

Mr. Nevaton joined in. Besides installing a colonial store front, he enlarged and remodeled his store which was one block away from the most historical part of the town. However, as a finishing touch, he put up a new sign which became the talk of the town.

Not only was the sign out of keeping with the colonial motif, it was also ornate and brightly colored. It would have been considered garish by people of good taste in any town.

*All names are disguised in *Aids*.

Mr. Nevaton's disregard for the feelings of his fellow townsmen cost him their goodwill. The newspaper criticized him, and many of his customers became ex-customers. His failure to go along with the community meant that the money he spent in renovating his store was lost as a result of the bad customer relations his sign had generated.

Support Local Improvement

Sometimes going along with the community means supporting local improvements even though they inconvenience your store. One small retailer, Bill Guston, learned this the hard way.

He opposed a street widening because it would require a complete alteration of his store front. Yet he had known for years that the street might be widened. Furthermore, he was to be repaid for the alterations.

As his neighbors saw it, many people would gain by the street widening and Mr. Guston had no problem. He was getting paid for losing the front of one of the ugliest buildings in town.

To his neighobrs, Mr. Guston and his firm appeared to be opposed to progress for short-sighted reasons. He created poor relations with the community because he placed his own welfare before the community which he professed to serve.

Instead of fighting community pressures, the successful retailer tries to forsee how they might effect his business. He then tries to plan his actions so as to cope with them. Unless you are fighting for a worthwhile principle, it is usually better to cultivate goodwill by conforming to the consensus of the community.

Do More Than Is Expected

Customers, potential customers, and others expest small retailers and service operators to help in local charity drives, give window

†*This article was reproduced from Small Marketers Aid No. 120, Small Business Administration, Washington, D. C. Copies of this Aid are available free from field offices and Washington headquarters of the Small Business Administration.*

space to educational and civic recreational activities, and support community building activities. They also expect merchants to respect the spirit as well as the letter of rulings of local regulating agencies.

If you want your store to be outstanding in its community, you have to go further than just meeting the standards expected by fellow townspeople. In effect, your stores has to be a leader in community life. Such leadership can bring goodwill which advertising, low prices, high quality, and other merchandising tools cannot buy.

If a town, or city, is to progress, its business leaders must help solve the problems connected with zoning, urban redevelopment, parking street beautification, air pollution, and juvenile delinquency. Being a leader in such projects even when it is not your store's immediate concern puts you on record as being interested in the community. Moreover, when you are on the ground floor in community planning, you are in a better position to prepare for any proposed changes.

But suppose that, for sound reasons, you do not agree with the proposed solution to a community problem. What do you do? If some of your neighbors and competitors agree with you, then they can help tell your side of the story to the rest of the citizens and officials. If none agrees with you, you may want to reexamine your position before risking actions which could damage your customer relations.

You should keep in mind that it is always important to make your firm a part of the community. And when your position is different from the majority, you will have done a good job if your neighbor says, "He may not always agree with you, but you know his heart's in the right place."

Activities Within The Store

Community life is so complex that small retailers—even the ones who are civic leaders—sometimes have little control over the things which affect external customer relations. However, inside your store you *can* plan and control activities which make for good customer relations.

A question to consider is: Why do customers walk out without buying and often never return? When a sale is rung up on the cash register, the impression is that the customer is satisfied. Yet she may have come in as the lesser of several evils and is ready to move to the first competitor who satisfies more fully her needs.

The cash register does not tell what your customers and potential customers are like. Yet you have to know this if you are to plan the store's activities so they will bulid up good customer relations.

The activities suggested in this *Aid* are based on a recent survey of shopping behavior. An important trend is that consumer shopping behavior seems to be maturing. Tremendous numbers of people now have, for the first time, discretionary spending power and the knowledge they need for buying what they want. In effect, shoppers are maturing, and this maturity will increase as income, education, and occupational achievement increase.

This trend means that customers expect more from stores than formerly, and store activities which cause them disappointment or inconvenience make for bad customer relations.

Less Reliance on Advice

One of the things which irritates some customers is the amount and quality of the advice they encounter in stores. Mature customers want to make decisions as to whether they need a clerk's advice on the style, color, or material which is best suited for a particular purpose. They want to ask the clerks for advice and help rather than having it forced upon them.

In order to use advice and help as a goodwill builder, salespeople have to know their customers. They have to know when to hold back and when to step forward. Some people—those who lack buying experience or self-confidence—want clerical assistance.

It is a good idea to size up your trade. Do most of your customers and potential customers need and want help from a sales clerk? Or do most of them want to go it alone because they are mature shoppers?

Pleasant Surroundings

Pleasant surroundings are important to good customer relations because shopping competes with other activities in lives of mature shoppers. For certain of their purchases, they want to visit uncrowded, tastefully decorated stores that have comfortable temperatures. They have these conditions in their homes and are reluctant to shop in ugly and dingy stores.

Customers also want to shop in stores that are located near community functions such as medical, transportation, occupational, and entertainment centers. Thus, they can take care of several types of errands on a single trip.

Most lines of merchandise have their own natural neighbors, and a merchant eager to please will find a location near complementary shopping or service facilities. For example, a small hardware store owner will try to locate near a supermarket or other stores which householders visit each week rather than near an automobile repair shop which they visit infrequently.

Believable Advertising

Believable advertising is another activity which helps to make good customer relations. Such advertising stays away from promotions which offend customers. An unbelievable ad, for example, might proclaim an extraordinary bargain which even the most stupid customer recognizes as a "come on."

Blatant ads may destroy the customer's belief in the store's integrity—especially if he bought recently at full price the item which is now advertised at an extremely low one. Then, too, you should be alert for the nonbelievers — those who doubt most of what they read in an ad.

Some customers are skeptical about extreme advertising claims because they have been taken in before or know people who have been. This outlook also makes many consumers suspicious of promotional devices which some retailers use to attract and hold business. Promotional gimmicks should be handled with care lest they offend the very customers—the mature ones —which the store needs the most.

"Out-of-Stock" and Size

Some stores lose goodwill because of "out-of-stock" situations. Customers expect you to have their

sizes and the styles with which they are accustomed. They want them in season. Families want to make their buying decisions based on their budget needs rather than the merchandising expediencies of the merchant.

Stocking a complete range of sizes is an important consideration in good customer relations. Often size is more important to the customer than "price," "style," "color," "brand," or even "quality."

When size is out-of-stock, it creates inconvenience at best. If the owner-manager is lucky, the customer will make a second trip. But even then, her neighbors will hear about the inconvenience the store caused her.

Assortment

Carrying an assortment which customers want is another part of building good customer relations, but it is hard to do when the money you can invest in stock is limited. To obtain the right assortment requires that you study prospective customers and carry the merchandise that will appeal to the majority of them rather than trying to do the impossible job of being "all things to all people."

Another way to handle assortment is specialization—carry a narrow line but in great depth. For example, some retailers specialize in pillows rather than in dry goods. Others specialize in marble-top tables rather than in furniture or in high-fashion women's shoes rather than a complete line of women's shoes. Keep in mind, however, that successful speciality operation depends on store location. It requires a location near other specialty retailers who can share in providing one-stop shopping.

In using assortment to build good customer relations, the owner-manager should beware of inferior products. Being the exclusive dealer for inferior products can hurt a store's reputation.

Clerk Service

To the customer, the clerk is the store. When the clerk is rude, aggressive, lacking in product knowledge, slow, indifferent, or tricky, the store's reputation suffers. Most customers will not excuse rudeness, sloppy appearance, and so on. Therefore, salespeople should be trained to foster good customer relationships.

Training should include how to handle returns and refunds—often the cause of conflict between clerk and customer. The possibility for arguments can be reduced by putting exchange and refund policies in writing so they are clear to the clerk and the customer. Except for clerical errors in billing, no other area is as likely to arouse intense emotions.

Self-service problems

In building good customer relations, self-service stores have particular problems. Customer relations are damaged by the lack of signs, inadequate price tags, carts which are hard to push, blocked aisles and shelves, poor layout, and crowded checkout stands.

Older people may be bothered more in inadequate self-service than others, but no one likes a crowded checkout counter. If customers are in a hurry, they resent being slowed down after they have raced through the store. Also customers who shop leisurely feel harassed in a crowded checkout. Many self-service stores need better control over checkout operations in order to give good service to customers.

Keeping In Touch

As the income and educational levels of customers increase, their shopping attitudes and patterns change. Such changes often mean that activities within the store must be adjusted in order to keep good customer relations from deteriorating.

Therefore, it is necessary to keep in touch with your customers. You should check periodically your ideas of what customers expect from your store. Jotting them down on a piece of paper can help your thinking and serve as a reference for your observation of how customers react when they are in the store.

You should keep an ear open for complaints. Handle them immediately to the customer's satisfaction. And ask some of your best customers—and some of the worst ones—for their opinions about your store and its merchandise.

The importance of such a check is shown by the experience of one small retailer. A customer quit buying from the store when he was billed for a service call. He silently nursed and magnified what he felt was an unjust charge. "If he had told me," the retailer said, "I could have adjusted it."

Asking for customers' opinions at regular intervals should help you to obtain the information needed for keeping store activities in line with what customers expect. With it, you can plan and supervise activities to build good customer relations.

For Further Information

Readers interested in exploring the subject of building good customer relations may wish to consult the references indicated below. This list is necessarily brief and selective. However, no slight is intended toward authors whose works are not mentioned.

Shopping Behavior of Department Store Customer by Stuart U. Rich. 1963. $5. Division of Research, Graduate School of Business, Harvard University, Soldiers Field, Boston, Mass. 02163.

The Social Context of Economic Behavior by W. T. Tucker. 1964. $3.75. Holt, Rinehart, and Winston, 383 Madison Ave., New York, N.Y. 10017.

Motivation in Advertising by Pierre Martineau. 1957. $6.50. McGraw-Hill Book Co., 330 W. 42nd St., New York, N.Y. 10036.

Marketing and the Behavioral Sciences by Perry Bliss. 1963. $7.15. Allyn and Bacon, Rockleigh, N.J. 07647.

Profitable Community Relations for Small Business. Small Business Management Series No. 27. 1961. Small Business Administration. Available for 25 cents from the Superintendent of Documents, Washington, D.C. 20402.

"Pleasing Your Boss, the Customer." Small Marketers Aids No. 114. June 1965. Free. Small Business Administration, Washington, D.C. 20416. (or nearest SBA office).

"Quality and Taste as Sales Appeals." Small Marketers Aids No. 113. June 1965. Free. Small Business Administration, Washington, D.C. 20416 (or nearest SBA office). ▲

Winter Care for Marine Radiotelephones

by Larry Allen

Along, some of the northern waterways and lakes, it is not good practice to leave a boat exposed to ice, snow, and wind all winter. If your service shop is located in one of these areas, you may be asked to prepare a customer's marine radiotelephone for storage during the off-season for boaters. You can handle this without damage to the set, antenna, or power supply, provided you take a few precautions.

Before you disconnect any units of the system, it is wise to make sure the set operates properly. If any deficiencies are noted, they should be corrected before the set is taken off the vessel. This will prevent the owner having to wait for you to find time to fix the set in the spring when your workload is much heavier.

Testing Before Removal

First, check the power source to be sure the set is supplied with proper voltages on both receive and transmit. The transmitter RF output can be checked with the antenna connected. If you prefer a dummy load, one can be made easily (see Figs. 1 and 2). Power output can be determined by the formula $P = I^2R$ (with R being the resistance of the dummy load and I being the reading on an RF ammeter in series with the dummy load.) You can also use the indirect method of power measurement: Measure plate voltage and current in the final stage, and use the same $P = I^2R$ formula to find the input power. RF power output should be about 50% of input power.

A frequency and modulation check can be made with a combination frequency meter. (When you shop for a marine-servicing frequency meter, be sure it covers 150-160 MHz as well as the HF bands; more and more VHF-FM sets are being introduced into marine use.) Frequency accuracy should be within ±.02% of the designated channel frequency. Modulation should be between 75% and 100% on whatever modulation meter you use.

Winterizing

If possible, the set should be removed from the boat for storage. This may be impractical for some of the larger radiotelephones, but at least the antenna should be removed from its mount and stored out of the weather. Exposed portions of the antenna mount could be covered with waterproof tape, or with some waterproof coating such as grease or vaseline, to protect them from dirt and corrosion.

If the set is to stay on the boat, a 40-watt refrigerator bulb (West-

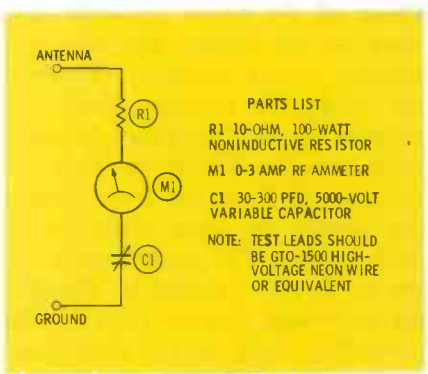


Fig. 1. Circuit diagram of dummy load.

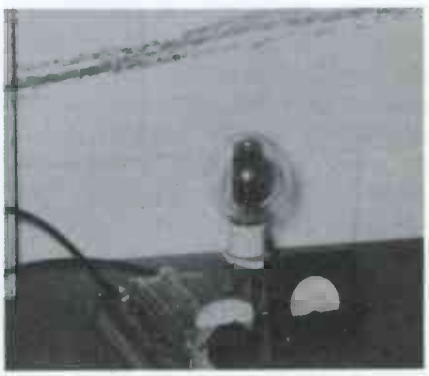
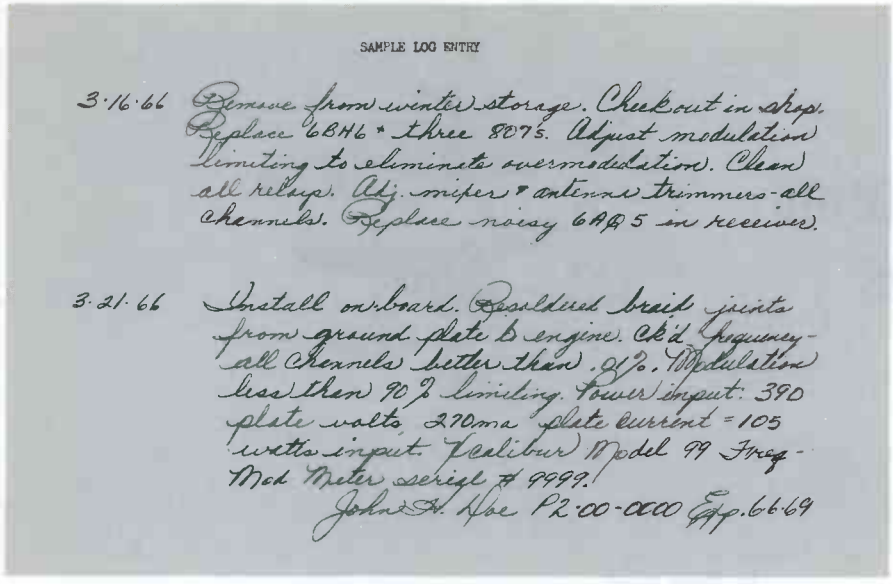


Fig. 2. Dummy load—finished product.



SAMPLE LOG ENTRY

3·16·66 Remove from winter storage. Check out in shop. Replace 6BH6 + three 807s. Adjust modulation limiting to eliminate overmodulation. Clean all relays. Adj. mixer + antenna trimmers-all channels. Replace noisy 6AQ5 in receiver.

3·21·66 Install on board. Resoldered braid joints from ground plate & engine. Ck'd frequency-all channels better than .01%. Modulation less than 90% limiting. Power input: 390 plate volts 270ma plate current = 105 watts input. Yealibur Model 99 Freq-Mod Meter serial # 9999.
John A. Doe P2·00-0000 Exp. 6·6·69

Fig. 3. Information recorded in log.

inghouse #4815 is typical) should be placed inside the set to combat condensation. All units of the system—lead-in, insulators, ground braids, mounts, etc.—should be given a thorough visual inspection for faults. All cables and connectors should be checked closely for shorts, cracks, and deterioration. Be especially watchful where cables pass through the bulkhead or deck and where they are exposed to water or the weather. All connectors should be checked for broken or bent pins.

If the set is to be removed from the boat, all connectors left aboard should be taped over with waterproof tape. The set should be removed from its mount, along with the power supply, any special batteries, and the dynamotor, if one is used. The units should be inspected thoroughly for any signs of damage or corrosion and placed in boxes, with wadded newspaper packing, for storage.

The boxes should be stored in a warm, dry place—at the owner's home or in your shop, if you have the space. One advantage of storage facilities at your shop is the availability of the set for repair at your convenience during the winter, if your preremoval tests revealed faults that need correcting.

Bringing It Out Again

Before the spring boating season. the set should be taken out of storage (or, if the owner is storing the set, brought to the shop) and operated for a week or so before it is to be reinstalled on the craft. It should again be checked visually for corrosion, loose wires, or damage that might have occurred during storage or that was overlooked in your prestorage checks.

Turn the set on and allow it to warm up, watching for smoke and sniffing for odors. Connect the shop antenna and tune in one of the marine channels to check reception. If it is early spring, you may be able to pick up signals only from commercial ships. Check the broadcast band, if the set has one. Use a signal generator to check sensitivity against the manufacturer's specifications. After being used all last season, most sets will need the antenna and mixer trimmers readjusted. In crystal-controlled receivers, the channel 'noise" is useful for peaking these. (CAUTION: Be sure you don't transmit into the signal generator.) Check sensitivity on all channels. If all are weak, it may be necessary to tune the IF transformers or replace weak tubes. In transistor sets, lightning or static discharges sometimes damage the first transistor in the receiver, resulting in loss of sensitivity.

Use a dummy load as you check power output in the shop. If power is not up to snuff, check the tubes and the tuning. Be sure the input power doesn't exceed the rating for the set; if it does, transmitter tubes will be short-lived. Always be sure the PA final plate current is *dipped* before you measure input (or output) power.

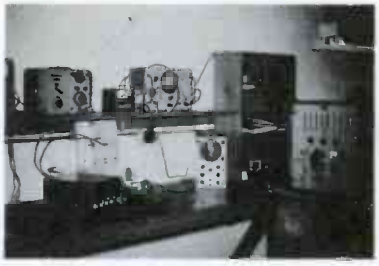


Fig. 4. Marine-radio servicing bench.

Check the frequency of the transmitter on every channel, using a frequency meter or a frequency counter. A tolerance of .02% is allowed in the HF marine band. If the frequency does not fall within this tolerance, the crystal will probably have to be replaced. Always use a crystal designed to be used in the particular set (there are many different oscillator circuits). Never load the final amplifier above levels recommended by the manufacturer.

Check the percentage of modulation with a modulation meter or your shop oscilloscope. If 75% to 100% modulation cannot be obtained, check the microphone. Waterlogged carbon microphones often cause this trouble; a new carbon element is the only sure cure. Check the speech amplifier and modulator tubes and replace weak or noisy ones. Transistor sets are usually trouble-free on this account. Modulation should never exceed 100%. When everything checks out satisfactorily, you are ready to reinstall the set on the boat.

Back Aboard

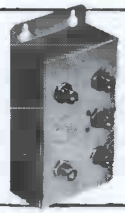
Check the mounts again for corrosion, and then remount the set. Clean off the power terminals and hook up the battery and fuse, observing proper polarity. Remove the protective covering from the antenna mount, and check for possible corrosion before hooking up the antenna. If you have used a coating instead of tape, clean it off with alcohol. The ground plate (if the set is AM) should be checked for corrosion and to be sure the grounding strap makes good connection. The plate may need cleaning, as it is one of the most

• *Please turn to page 54*

RCA ANNOUNCES NEW ANTENNA ACCESSORIES ENGINEERED FOR COLOR TV

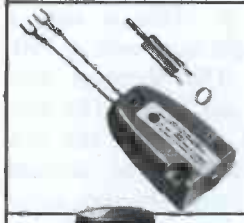
New catalog tells the full-line story.
Get it from your RCA Distributor.

5 **RCA Deluxe Transistorized Antenna Amplifiers** . . . a full line of dual purpose units with the most advanced silicon transistors in high-gain, low-noise circuits. They are masterfully designed to bring in the sharpest picture on color or black and white TV. Or they can drive multiple receivers from a single antenna using RCA multi-set couplers as a small distribution system. Five types include: 300 ohm UHF type 10P223; 300 ohm VHF/FM type 10P213; 75 ohm coaxial VHF/UHF type 10P215 and 10P235; and 300 ohm VHF/UHF type 10P233—all with remote, A.C. operated power supplies.



4 **RCA Deluxe Multi-Set Couplers** . . . UHF/VHF/FM 300 ohms, couple two or four sets to one antenna or amplifier. Channels 2 to 83, types 10P302 and 10P304. Also VHF/FM 75 ohm coaxial types 10P752 2-set coupler; 10P754 4-set coupler.

3 **RCA Deluxe Band Splitters** . . . Separate UHF, VHF and FM signals from a single transmission line or combine separate antennas. 300 ohms. Three types include: 10P311 couples VHF/UHF signals to one line; 10A135 separates UHF and VHF at set; 10P312 separates UHF, VHF and FM.



3 **RCA Deluxe Coaxial-to-twin lead Transformers** . . . streamlined for fast installation. Coax plugs in using solderless connector. Terminals for twin lead connections. Models: 10P723 and 10P753 for indoor use and 10P375 for outdoor use.

2 **RCA Deluxe Lightning Arrestors** . . . Positive contact with all varieties of twin-lead (flat, round, and oval). Eliminate lead stripping, insert line in slot, screw on cap for fast installation. Low insertion loss, does not increase VSWR of a good antenna even at critical UHF frequencies. Screw mount type 10A118; and strap-mount type 10A119.

When you buy antenna accessories bearing the RCA Mark of Quality, you know they're reliable.

RCA PARTS AND ACCESSORIES, DEPTFORD, N.J.

The Most Trusted Name in Electronics

SQUARE WAVES to determine COIL Characteristics

by
Robert G. Middleton

Most technicians know that the AC resistance of a coil is much higher than its DC resistance, particularly at frequencies from 0.5 MHz to 4 MHz or higher. We can measure the DC resistance of a coil with an ohmmeter, but this tells us nothing about its AC resistance. Insofar as the performance of a coil in an RF circuit is concerned, only the AC resistance is of practical importance — we can forget about the DC resistance because it is negligible by comparison. AC resistance is high because of skin effect, eddy currents, and dielectric losses. But how can we measure the AC resistance, or determine the inductance once the AC resistance is known? This is easy with a square-wave generator and scope.

Measuring AC Resistance

Connect the coil to the input terminals of a scope, and feed in a square-wave signal with a gimmick, as shown in Fig. 1. This is the same test setup that is used to measure the Q of a coil. In this case, we will use it to measure the AC resistance of the coil. A waveform appears on the scope which is a damped sine wave, as depicted in Fig. 2. In this example, there are seven peaks, or cycles, from the 100% amplitude point to the 37% amplitude point. To measure the AC resistance of the coil, connect an arbitrary resistance in series with the coil, as shown in Fig. 3. (This is only a guess — we might start with a 150-ohm resistor). The damped sine wave now dies out faster. The correct value of R will cause the sine wave to decay to 37% in one-half the number of peaks (cycles), compared with the first test in Fig. 1. Or, to continue the example of the waveform in Fig. 2, R must have a value which makes the waveform decay to 37% in 3.5 cycles. In other words, the third cycle will have greater than 37% amplitude, but the fourth cycle will have less than 37% amplitude.

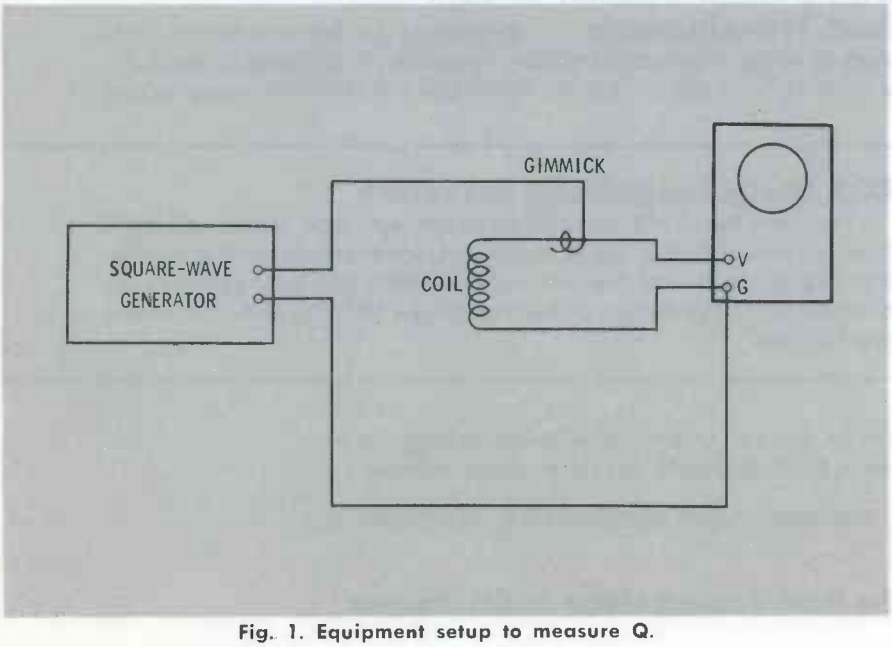


Fig. 1. Equipment setup to measure Q.

The value of R which makes the waveform decay twice as fast, equals the AC resistance of the coil. If you read the squares on the scope graticule as carefully as you would the scale on a meter, the method is surprisingly accurate. Use 1% re-

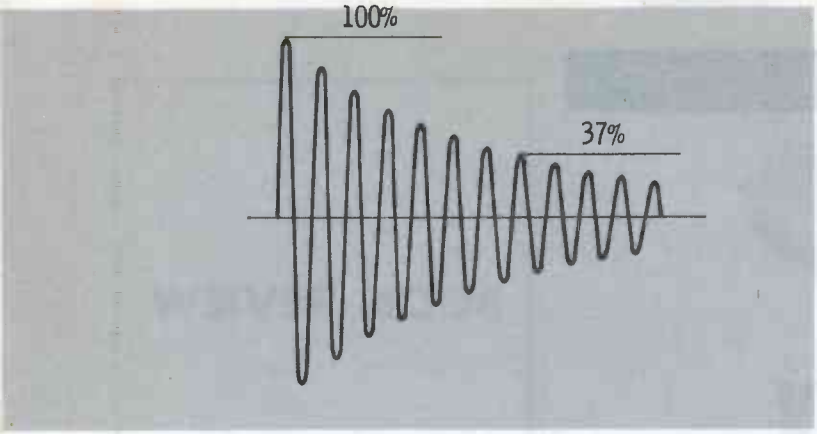


Fig. 2. Damped sine wave with 7 cycles between amplitude level of 100% and 37%.

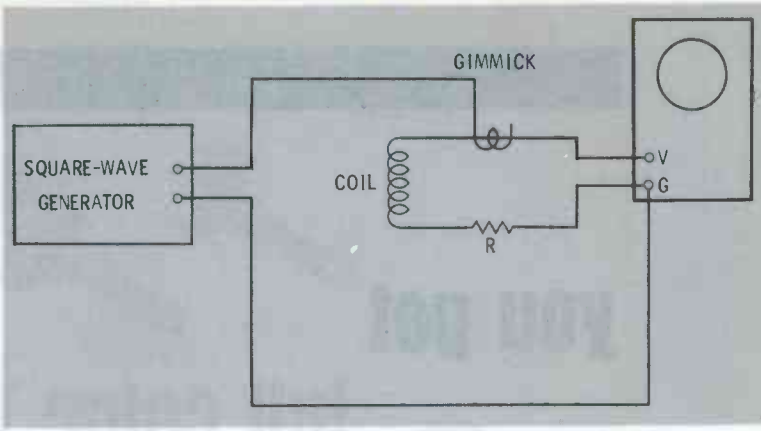


Fig. 3. Test setup with arbitrary resistance connected in series with coil.

sistors in the test, if you want to get really good accuracy. Square-wave tests of AC resistance provide measurements which compare favorably with those obtained on expensive laboratory equipment. Let us see how a square-wave test works on an RF coil from an ordinary broadcast radio receiver.

The resistance of the coil was first measured on an ohmmeter at 4 ohms; a Wheatstone bridge gave a reading of 4.1 ohms. This, of course, is the DC resistance of the coil. On a square-wave test, the waveform decayed to 37% in eight cycles. It required 180 ohms to make the waveform decay twice as fast. Accordingly, the square-wave test indicated an AC resistance of 180 ohms. Note that this is about 44 times greater than the DC resistance. Next, the AC resistance was measured on an expensive lab-type bridge, at the ringing frequency of 3.1 MHz. The bridge reading was 161 ohms, which is within acceptable experimental error.

We must recognize that although a coil has only one value of DC resistance, it has many values of AC resistance. The AC resistance depends upon frequency, in an unpredictable manner. Hence, AC resistance must always be measured at the frequency of interest in the application. For example, if you want to measure the AC resistance of the coil at a lower frequency, a variable capacitor must be connected across the scope terminals in Fig. 1. Tune the capacitor to get a 1-MHz ringing frequency. Then, insert resistance as in Fig. 3. to make the waveform decay twice as fast. The AC resistance at 1 MHz will be less than at 3.1 MHz, but we cannot say how much less until it is measured.

Determining Q and Inductance

The ringing waveform in Fig. 2 gives the Q of the coil. In this case, the Q value indicated is approximately 22; $Q = n\pi$, where n is the number of peaks from 100% to 37% amplitude. When we measure the Q and the AC resistance, we can easily calculate the inductance of the coil, because

$$Q = \frac{X_L}{R}$$

where X_L is the inductive reactance of the coil, and R is the AC resistance. X_L is equal to $2\pi fL$, where f is the ringing frequency.

Here is a practical example: The Q of a coil measured 20.4 in a square-wave test, and its AC resistance measured 175 ohms in the test setup of Fig. 3. The ringing frequency measured 3.1 MHz. It follows from the previous discussion that

$$L = \frac{nR}{2f}$$

Accordingly, the inductance of this coil was calculated to be 183 microhenrys—

$$\frac{6.5 \times 175}{2 \times 3.1 \times 10^6} = 183 \text{ microhenrys},$$

approximately. To check the square-wave test, the coil was placed on a lab-type impedance bridge, which read 189 microhenrys. Accordingly, the accuracy of the square-wave test was better than 4%.

Special Considerations

Since the cost of lab-type impedance bridges is prohibitive for shop work, the good accuracy which can be obtained with square-wave tests makes the method very attractive. One precaution to observe when making square-wave measurements is to use a scope graticule which has closely-ruled divisions, so that waveform voltages can be read accurately. Keep your observation point the same when reading the 100% and 37% values, to avoid parallax error. (This is the same principle as using a meter with a mirrored scale to avoid parallax error). It is also important to rotate the scope graticule so that the horizontal center line runs exactly through the CRT trace when no signal is applied. Finally, be sure that the ringing pattern is exactly centered on the horizontal center line of the graticule. This will be the case if the CRT trace and the graticule center line coincide when the signal is removed. With a triggered-sweep scope, you can measure the ringing frequency directly, of course. Best accuracy is obtained by counting about ten centimeter squares on the graticule, and observing how many cycles occupy the ten intervals. If you try to measure just one cycle, there is likely to be an appreciable observational or experimental error.

Conclusion

Careful application of the foregoing techniques will enable the technician to determine the AC resistance, Q, and inductance of a coil without the added expense of a lab-type bridge. The results obtained with scope and square-wave generator may not be as accurate as those obtained with an expensive bridge; however, they are within the tolerance demanded by most shop measurements of reactive components. ▲

BOOK REVIEW

Transistors: Principles and Applications: R. G. Hibbard; Hart Publishing Company, Inc., New York, 1965; 304 pages, 5½″ × 8″; cloth, $5.95, paperback, $2.45.

This book outlines the history of semiconductor development, explains the fundamental principles of the operation, details the manufacturing process, and outlines the application of semiconductors in practical circuits, with emphasis on design considerations. Such semiconductor devices as germanium and silicon transistors, several types of diodes, and silicon controlled rectifiers are explained, and the words planar, zener, thyristor, and tunnel take on real meaning.

The limitations of each type of semiconductor with respect to frequency, temperature, current, and voltage are carefully delineated. Special consideration is given to these limitations in practical applications in oscillators, amplifiers, switches, and power supplies.

Concluding chapters discuss integrated circuits, solid-state components, and recent developments, including the semiconductor microphone and its unresolved problems.

A good working knowledge of vacuum-tube circuits is required for a full appreciation of this volume. The use of mathematics is limited to advanced algebra. In conjunction with manufacturer's semiconductor specifications, the book could be used as a design handbook. ▲

Color that comes on strong and sure

...with Channel Master Accessories

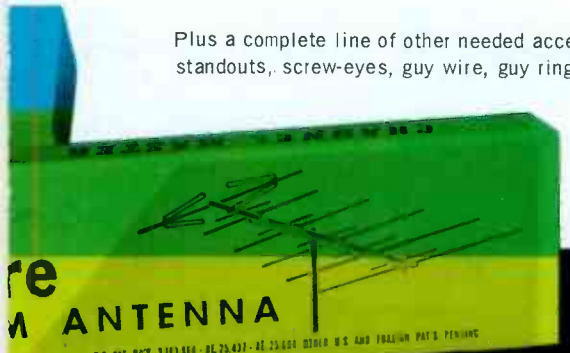
New-Design Colorotor Tenn-A-Liner Rotator... brings in extra color stations. And kills color ghosts (the worst kind). The only rotator that can aim an antenna within one degree of precise transmitter location. Shown, the Crestwood, Deluxe Automatic with solid walnut cabinet, Model 9516.

UHF/VHF Twin-Twenty Figure-8 Foam Transmission Lead... puts you right on color target. Designed for fast, sure, profitable installations in any weather! Lower loss. Fewer callbacks. Longer life. And less interference.

Color Boosters! A complete line... broadest in the industry... for MATV and every home entertainment need: VHF... UHF... areas with high overload... plus black-and-white, FM, and FM Stereo. Shown, VHF/FM Color Amplifier, Model 7035.

The "Golden Look" in masting! Rust-proof, storm-proof, and designed to match Channel Master's golden look in antennas. Choose from Golden ALUMast (shown) one-third the weight of steel... or Dura-Tube Steel Masting. 50% stronger for extra durability.

Plus a complete line of other needed accessories such as standouts, screw-eyes, guy wire, guy rings, etc.



...and here's something new from the HOUSE OF COLOR!

Announcing...

Operation Opti-Chrome

The picture comes alive! And you can certainly live with the clear-cut savings and higher profits Opti-Chrome alone gives you.

Color comes clean in every Opti-Chrome tube because we start with brand-new components only, and nurse them along with tender loving care.

3-Stage Operation. Green, blue, and rare-earth red phosphors are slurryed onto face panel in exact proportions and photographically fixed in three separate operations.

Screen Test! 330,000 dots in each color, must be no more or less than .018 of an inch in diameter. If not, panel is washed clean and a fresh start made.

Channel Master's all-new color tubes.

It's a tough operation but the color lives!

Clean from America's most modern color tube plant...for your growing replacement tube market... come Opti-Chrome rare-earth phosphor color tubes. New-all-through from glass to gun!

Making a color replacement tube is far more critical than making one in black-and-white.

No consumer product in the world calls for a more scientifically exacting combination of chemistry, optics, mechanics, and electronics. Even indoor climate control (and yes, a dust-speck) can make a big difference in a tube's life or performance.

So we start in a brand-new automated plant, devoted exclusively to color tubes (the most modern in the country). And we work in a clean, dust-free atmosphere... under rigidly controlled humidity and temperature conditions...with components that are **new-all-through.**

We use only brand-new glass, brand-new screens, brand-new shadow masks, brand-new guns, and only rare earth phosphor. And we use them all with surgical precision and know-how.

Along the way, we watch every tube like a hawk from start to finish. And boy are we tough! The tube must pass 41 separate inspections by man and machine before it can be sealed in its carton.

But the final result is Opti-Chrome: an optically perfect rare-earth replacement tube that glows with optimum brilliance and will last for a long, long time. A replacement tube designed to be worthy of your customer's big color-set investment. One built to make that set work like new and to show the picture in its true colors.

Opti-Chrome: the rare-earth color replacement tube that means business.

CHANNEL MASTER

Color Tube Division, Ellenville, N.Y.

And remember: for the economy minded, Channel Master offers a complete line of highest quality sulfide color replacement tubes.

Every size and shape of color tube can be produced simultaneously in our spotlessly clean plant...to serve your replacement market needs.

Final check-out. To make certain it matches the performance potential of modern color TV sets, every color tube is individually checked for convergence.

When finally sealed in its carton, the Opti-Chrome tube has passed 41 separate inspections with flying colors. There is no finer replacement tube anywhere.

We're up to our necks in Color!

In fact, we're so deep in color antennas there's no color problem we can't solve for you.

What do you need? Does Joe Smith want the finest in a VHF and FM/Stereo antenna? Give him one of our Color Crossfire Series and you're right on his wave length. They're the best-selling antennas in TV history.

Does Mrs. Jones go for UHF along with her VHF and FM? One of Channel Master's 82-channel Ultradyne Crossfire Series should please her across the board. They're the most powerful all-frequency models ever designed. (We have Ultradyne UHF-only antennas, too.)

Are ghosts driving Doc Peterson crazy? One of our two famous Crossfire Colorays, ghost-chasers extraordinary, will run them right out of Doc's house. (Our unique Power Equalizer actually provides up to 30 to 1 back-to-front ratios.)

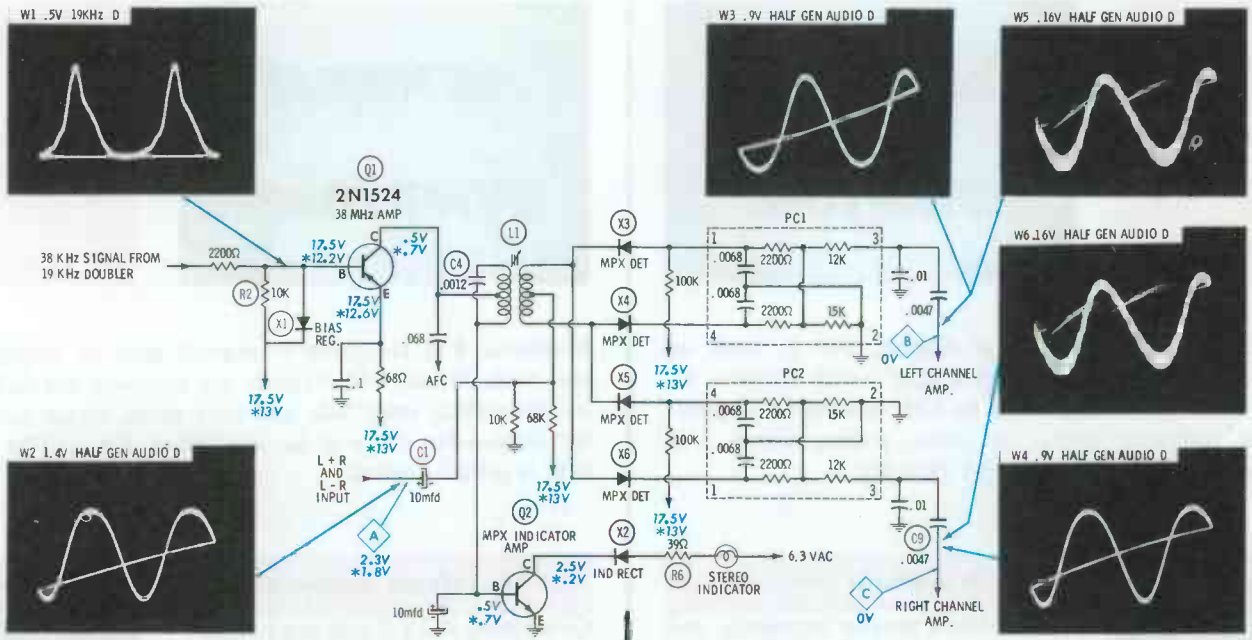
Got a color problem? Bring it to the House of Color. Channel Master.

Remember! Channel Master—and only Channel Master—sells more color antennas than any other antenna manufacturer in the world. Anyone else is second best . . . at best.

PF REPORTER Symfact®

Stereo Multiplex

Envelope Detection



DC VOLTAGES taken with VTVM; receiver off station. *Indicates voltage taken with signal from stereo generator present — see "Operating Variations."

WAVEFORMS taken with wideband scope, receiver controls set to produce normal stereo FM sound. D (direct) probe used for testing where indicated.

Normal Operation

Stereo FM audio is recovered by three basic methods —electronic switching, matrixing, and envelope. This circuit utilizes the envelope method. Stages ahead of detector circuit have divided opposite stereo FM signal into two portions; 19-kHz pilot signal (which is then doubled) and audio information (L + R and both sidebands of L − R). Doubler output consists of pulses at 38-kHz rate (W1). Q1 amplifies pulses, and since output of Q1 is tuned to 38kHz, waveform at collector of Q1 is 38-kHz sine wave. Conduction of Q1 changes bias of Q2, causing it to conduct, which in turn, causes stereo indicator to light. 38-kHz sine wave is induced into L1 secondary with 180° phase difference between ends of coil. Audio information is connected to center tap. Result is 38-kHz carrier signal plus L + R and both positive and negative going L − R signals at junction of X3 and X6. X3 is biased so that it conducts on positive going L − R signal (along with positive half cycle of carrier) and when combined with L + R signal, produces only "L" signal (L − R + L + R = 2L). X6 conducts only on negative going L − R and carrier signal; adding this to L + R results in − (L − R) + L + R = 2R. 38-kHz carrier is still present in output of X3 and X6 and, while not audible itself, may develop unwanted beat frequencies. X4 conducts directly opposite from X3—low-frequency audio signal is dropped across 2200-ohm and 15-K resistors, but higher 38-kHz signals are coupled through capacitors to X3 output and cancel each other. Action is similar in right channel.

Operating Variations

Q1 Emitter, base, and collector all show expected change when W1 (from stereo generator or stereo FM station) is applied to base. Base goes from B+ potential to 12.2 volts, emitter from B+ to 12.6 volts, and collector from .5 to .7 volt.

Q2 Q2 base is at same DC potential as Q1 collector and varies from .5 volt with no signal to .7 volt with signal. Collector of Q2 shows approximately 6.3 volts rectified AC (2.5 volts DC) under no signal conditions and .2 volt DC when transistor is conducting.

A Voltage variation of about .5 volt (2.3 volts with no signal, 1.8 volts with signal) is due to drop in B+ when transistors conduct.

WAVEFORMS Output voltages of diodes X3, X4, X5, and X6 vary with signal and with no signal according to polarity of diode. Example: X3 output is 2.4 volts DC with no signal applied and 1.2 volts DC with signal.

DECTECTORS Waveform amplitude varies only with generator output or station strength. 38-kHz signal from local station (W1) is about same amplitude as generator signal. W3 and W4, with station signal, are approximately 75% of generator signal. Good separation is maintained on weak station when W1, W2, W3, and W4 are only about 50% of p-p voltages shown on schematic.

FM Weak

Symptom 1

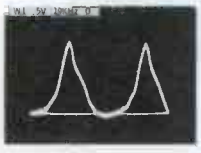
Both Stereo and Monaural

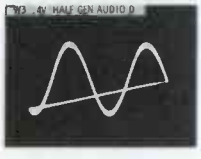
C1 Decreased In Value

(Coupling Capacitor—19mfd)

Symptom Analysis

AM and phono operation is normal. FM is weak on normally strong stations—normally weak stations almost lost. Stereo FM same as FM, separation is poor. Stereo indicator lights on stereo station signal. All symptoms point to stereo FM circuitry.





Waveform Analysis

W1 shows proper amplitude and content. Although not shown, normal waveform at Q1 collector (9 volts p-p sine wave) confirms part of detector circuitry is operating. Q1 conduction is necessary to light stereo indicator. W3 (shown) and W6 (not shown), with only left channel input, indicate low output and little separation. W2 low in amplitude (.5 volt) p-p normally 1.4 volts p-p) and 19-kHz signal dominates overall signal.

Voltage and Component Analysis

All voltages normal. Generator uses same audio frequency (180 degrees phase difference) to modulate both channels. W2 is sine wave at audio rate riding on 19-kHz carrier. (Some generators modulate each channel at different frequency, making waveform at point A more complex). Decrease in C1 to .1 mfd reduces audio information available to stereo FM detector. Monaural FM is also affected since FM audio signal is fed through stereo FM circuitry. Open C1 would cause complete loss of FM signal.

Best Bet: Scope solves problem.

No Stereo Separation

Symptom 2

Mono FM Normal

C4 Decreased In Value

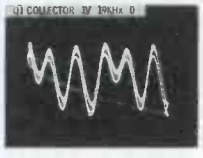
(Tuned Circuit Capacitor—.0012 mfd)

Symptom Analysis

Monaural FM reception is normal both in amplitude and tone. Stereo FM stations are received normally—no distortion, amplitude and tone good, stereo indicator lights—but there is no separation. Stereo FM section is prime suspect.

Waveform Analysis

Comparing W3 (.7 volt p-p) with W6 (.7 volt p-p), indicates there is no separation of channels since both outputs have the same amplitude with only left input signal applied. Although not shown, W4 and W5 also indicate same problem. W1 (not shown) is normal with 38-kHz pulses at an amplitude of .5 volts p-p. However, waveform at collector of Q1 is not true sine wave and amplitude is only about 1 volt p-p compared to normal 9 volts.



Voltage and Component Analysis

All Q1 element voltages measure near normal. With normal element voltages and signal voltage applied to collector of Q1, stereo indicator lights even though output at points B and C is not stereo. C4 and primary of L1 form tuned circuit that is resonant at 38 kHz. Normally amplified 38-kHz pulses from Q1 produce necessary high amplitude (compared to audio signal) sine wave that is induced into L1 secondary for proper demodulation. Decrease of C4 detunes circuit resulting in loss of 38-kHz sine wave and separation.

Best Bet: Careful scope work will locate.

Left channel weak

Symptom 3

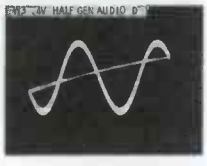
Poor Separation

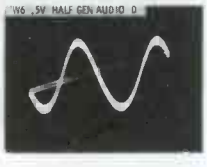
X3 Open

(MPX Detector Diode)

Symptom Analysis

Left channel weak on stereo FM signal compared to right channel and has excessive noise (popping, cracking, etc.) and background "rush" noise. Separation poor. Monaural FM, AM, and stereo phono functions seem normal. Trouble suspected in stereo FM circuitry.

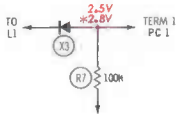




Waveform Analysis

Waveforms at points B and C indicate trouble is in MPX circuitry. With left signal only input, W3 is .4 volt p-p compared to normal .9 volt p-p. W6 measures .5 volt p-p (normally .16 volt p-p). Both waveforms indicate that excessive 38-kHz signal is reaching output points. W4 and W5 (not shown) are of near normal amplitude and content. Normal amplitude and content of W2 shows proper audio signal available to detector.

Voltage and Component Analysis



Best voltage clue is X3 output—2.5 volts without signal, 2.8 volts with signal. Polarity of diode dictates that negative voltage appear at output when signal is applied and, combined with positive bias voltage, should make reading less positive. However, with X3 open, positive going L − R is not recovered—only L + R signal is coupled through X4 to left output. 38-kHz signal is not filtered out, causing noise since cancelling action is lost with open diode. Open X6 would cause similar symptoms in right channel.

Best Bet: VTVM and careful circuit analysis.

No Stereo FM Separation

Stereo Indicator Does Not Light

Symptom 4

X1 Shorted

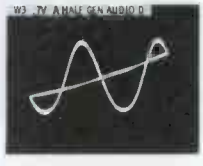
(Bias Regulator Diode)

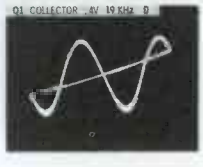
Symptom Analysis

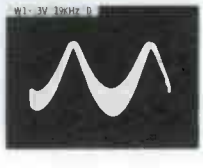
All functions of tuner/amplifier operate normally except stereo FM. There is little or no separation and indicator does not light on stereo FM station. Station trouble might be suspected, but MPX generator shows same problem. Stereo FM circuitry must be at fault.

Waveform Analysis

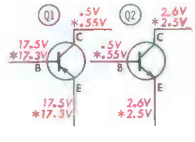
Comparing W3 and W6 (with left only input) confirms symptom analysis. W3 is near normal (.9 volt p-p) but W6 shows nearly same amplitude as W3 (not shown) instead of normal .16 volt p-p. Conclusion: no separation. Waveform at collector of Q1 shows reason—amplitude low (.4 volt p-p, normally 9 volts p-p). Waveform W1 slightly low in amplitude (.3 volt p-p, normally .5 volt p-p) and excessive audio in content.







Voltage and Component Analysis



Element voltages of both Q1 and Q2 show almost no change when signal is applied. Indicates Q1 is not conducting and confirms waveform analysis. X1, by being connected across R2, acts as a limiter to 38-kHz input pulses. X1 also filters out unwanted audio information of composite signal at this point. Shorted X1 maintains base at nearly same potential as emitter, nearly cutting off transistor. Since Q1 does not conduct, Q2 is also cutoff, and stereo indicator will not light when stereo FM station is being received.

Best Bet: Scope to isolate; VTVM to pinpoint.

Stereo Indicator Lights On All Functions

Symptom 5

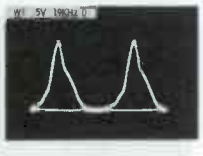
Stereo Reception Normal

Q2 Shorted

(MPX Indicator Amp)

Symptom Analysis

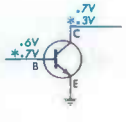
Stereo indicator remains lit with function selector in any position. All functions operate normally—stereo FM has good separation and normal amplitude and tone. Trouble is evidently in switching circuitry which turns indicator on and off with stereo signal.



Waveform Analysis

Left and right stereo FM outputs, W3 and W6, with left only signal input show normal amplitude. W4 and W5 show normal amplitude with right only input. This proves separation and other waveforms must be normal since 38-kHz pilot, L + R, and both sidebands of L − R are necessary for proper separation. W1 shows normal amplitude and content. Only conclusion drawn is that stereo FM is operating properly.

Voltage and Component Analysis



Q2 collector voltage is clue—near normal with signal voltage (.3 volt, normally .2 volt), but without signal, voltage remains low (.7 volt, normally 2.5 volts). Normally, 38-kHz signal causes Q1 to conduct, increasing collector and base voltage of Q2. Q2 conducts from collector to emitter, effectively putting collector at ground potential. Since one end of indicator is connected to 6.3 volts AC and other end through R6 to Q2 collector, indicator lights. Leakage simulates Q2 conduction and light is on all the time.

Best Bet: VTVM will locate.

Right Channel Dead

On FM Only

Symptom 6

C9 Open

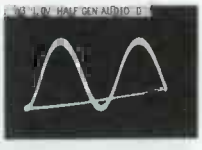
(Coupling Capacitor—.0047 mfd)

Symptom Analysis

Right audio channel is dead—no output whatsoever from speakers in either FM or FM stereo positions. Tuner/amplifier operates normally on AM broadcasts and phono-tape positions. Symptoms indicate trouble in stereo FM or switching circuitry.

Waveform Analysis

Waveforms at point B, are of proper amplitude and content—W3, with left only input reads 1.0 volt p-p and W5, with right only input, reads .2 volt p-p. Only waveform at point C (W4 or W6), right channel output, shows a small amount of radiated 38-kHz signal. Conclusion: Stereo FM detector is probably operating since both left and right information is present at point B; however, that signal is lost after detection.



Voltage and Component Analysis

All voltages are normal with and without signal, offering no clues. Note that careful symptom analysis has isolated trouble to multiplex or switch circuitry. Since monaural FM, as well as stereo FM is fed through multiplex circuitry in this unit, a completely open detector circuit not only stops one channel of stereo FM but also results in loss of monaural signal at input to AF amplifier. An open PC component or broken PC board could cause similar symptom. Circuit tracking with scope will locate problem.

Best Bet: Scope with careful symptom analysis.

OK, Watch Watchers!

We want you to time your next service  call with our watch!

Buy our Color Commander color bar generator. If it doesn't save you time, return the Color Commander within 10 days and keep the $10.95 Timex.

What makes us so sure you'll save time? Amphenol's exclusive technique of color alignment. Only Amphenol gives you a:

1. **Single cross bar that immediately centers the raster.**
2. **Single dot for fast, constantly accurate static convergence.**
3. **Three-bar color array that isolates your working bars—the 3rd, 6th and 9th.**

Your Time is Money

If you're spending 45 minutes on a color alignment job, the Color Commander technique can cut that to as little as 27 minutes. That could mean two or three more calls a day—$24-$36 more income. Result: The Color Commander could pay for itself in two to three weeks.

Become an Amphenol Watch Watcher

Take advantage of this limited time offer. Cut out this coupon and beat the Watch Watcher rush. For the name of your nearest Amphenol distributor, write Dan O'Connell, Head Watch Watcher, Amphenol, Box 134, Broadview, Illinois 60153.

Watch Watcher Special

Count me in on the Watch Watcher Special. I understand I will get a lightweight, compact, completely solid state Amphenol Model 860* Color Commander along with a Timex watch to time my savings all for $169.95

Model 860AC $20.00 higher*

*Suggested resale prices

AMPHENOL™

Circle 13 on literature card

Notes on Test Equipment

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

by T. T. Jones

Portable VOM

Right on the heels of their fine model 1700 VTVM **Mercury Electronics Corp.** has released the Model 1800 VOM. This instrument follows their pattern; a lightweight, accurate, easy-to-use instrument at a low cost.

The lowest current range feeds directly to the movement, and the scale reads in 1 microamp increments on this range.

The DC voltage ranges start at a low 250 millivolts full scale. On this range the lowest increment is 5 millivolts. There is also a 1-volt DC range, and from then on the AC and DC ranges are identical from 2.5 volts to 5KV full scale. Sensitivity is 20 K-ohms/volt on DC, and 5 K-ohms/volt on AC.

The ohms ranges are the usual R×1, ×100, ×10K, with 2K ohms full scale, giving a maximum reading of 20 megohms. Center scale is about 13.

There is a decibel scale thrown in for good measure, and it reads from −20 to +50 dBm.

As always, we measured the performance of the instrument against the published specifications, and the model 1800 did better than specs in all ranges. The AC performance was flat within ±½ dB from 10Hz to 110kHz, with reference of 2 volts at 500 Hz. The dB scales were used to correlate this.

The DC scales performed well within their claimed accuracy of 2%. We did not measure performance on the 5KV ranges, but the multiplier resistors on those ranges are 5% tolerance. All other resistors are 1%.

The instrument is housed in a grey high-impact plastic case with vinyl carrying strap, and weighs only 2¼ pounds. The meter is electrically damped when the function switch is in the off position. This adds up to a meter that should travel well in the truck, and perform well when it gets to the pob.

For further information circle 45 on literature card

Mercury Model 1800 VOM

Specifications

AC Volts:
0—2.5, 10, 50, 250, 1000, 5000 Volts RMS. 5000 ohms/volt, 10 Hz—100 kHz, 4% accuracy.

DC Volts:
0—.25, 1, 2.5, 10, 50, 250, 1000, 5000 volts. 20000 ohms/volt, 2% accuracy.

DC Current:
0—50 μa, 1, 10, 100, 500 ma, 10 amp. 2% accuracy.

Resistance:
4—2K, 200 K, 20 Meg ohms.

Decibels:
−20— +50 dBm.

Size (HWD):
7½" x 6½" x 4¼" overall.

Weight
2¼ pounds.

Price:
$34.95.

Fig. 1. New VOM is a lightweight.

In-Circuit Tranistor Tester

Fig. 2 is a somewhat deceiving picture of SENCORE's new TR139 transistor tester. When we ordered this unit we expected a meter about the usual VTVM size. We were somewhat surprised to unpack a unit half again as large as expected.

When we started to put the unit through its paces, we got some more surprises. This tester virtually ignores circuit loading of the transistor under test. Only with resistances under 50 ohms can we even detect a difference in beta readings, and the readings are still useful with loadings of 15 ohms.

The beta test circuit, shown in Fig. 3, is quite simple. The output voltage of T2 is controlled by the Beta **CAL** control. The zeners, CR1 & CR2, limit the input voltage to T2, to insure that the transistor under test will not have excessive voltage applied, regardless

FINCO

"has 'em both"

MODEL #65-1 $29.95 list

MODEL #65-2 $39.95 list

BOOSTER COUPLERS IN 300 OR 75 OHM

For Deluxe Home & Commercial Use

Finco's famous 2-tube, 4-set VHF-TV OR FM Distribution Amplifier is now available for 75 OHM CO-AX or 300 OHM operation.

Price? You can't beat it! Rugged quality? Finco's got it! Performance? Finco challenges 'em all!

Equip either model with Finco low-loss splitters (#3001 or #3003) and you can drive up to 16 sets in a master antenna system!

FINCO MODEL #65-1 $29.95 list

Outstanding Features:

• 350,000 microvolts maximum input with +8dB to each output • Maximum signal output of .85 volts in each of 4 outputs • Low noise 6HA5 premium tubes • One 300 ohm input — 4 300 ohm outputs • Silicone diode rectifier for dependability • Flat response — ±¼ db per 6 mc channel • Ventilated perforated steel cabinet 6 5/16 x 3 7/16 x 3 9/16" • Metal enclosed to eliminate shock hazard — easy access for servicing • Easy mounting and connecting • All fittings & brackets supplied • UL listed AC cord—117 volts, 60 cycles • 100% test for all electrical characteristics

FINCO MODEL #65-2 $39.95 list

Outstanding Features:

• 400,000 microvolts maximum input with +6dB to each output • 200,000 microvolt input — 1 volt output per band • Low noise 6HA5 premium tubes • One 75 ohm input — 4 75 ohm outputs • Most compatible "F" type input and output fixtures • Ultra-flat frequency response and complete RF isolation • Ventilated perforated steel cabinet 6 5/16 x 3 7/16 x 3 9/16" • Metal enclosed to eliminate shock hazard — easy access for servicing • Easy mounting and connecting • All fittings & brackets supplied • UL listed AC cord —117 volts, 60 cycles • 100% test for all electrical characteristics

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

ALL FINCO PRODUCTS ARE ENGINEERED FOR COLOR!

THE FINNEY COMPANY

34 West Interstate Street, Bedford, Ohio 44014

Dept. 310

Circle 14 on literature card

Fig. 2. Makes fast beta checks.

of line voltage. They also act as a line voltage regulator.

The output of T2 is adjustable to a maximum of about 1.25 VAC. This voltage is then applied to the transistor under test through R7 and R8. M1 reads the voltage across R8, in series with the collector. It is set to full scale by the Beta **CAL** control; this reading equals 2 ma collector current.

When the Beta **TEST** button is pushed, the meter is transferred to the base circuit, and base current is read. The meter is calibrated directly in beta. Since the test is for AC beta (h_{fe}) rather than DC beta (h_{FE}), the test is made under dynamic conditions more nearly simulating actual operating conditions of the transistor under test.

Not shown in Fig. 3 are the switching circuits for NPN-PNP, the beta range switch (2-100, 10-500), or the leakage tests. The leakage test uses a separate power supply which produces about 4 volts DC. With a diode and resistor compression network, the basic 200-ma meter is made to read 5 ma full scale, while retaining a 100-μa center scale. The leakage tester can be used for testing solid-state diodes.

Included with the TR139 is a detailed operator's manual, with many application tips. Also included is a copy of the Howard W. Sams Transistor Specifications Manual HTA-1. ▲

For further information circle 46 on literature card

Sencore TR 139

Specifications

TRANSISTOR TESTS

Beta:
LO 2-100, H1 10-500. Accuracy: ±5% out of circuit, slightly less in-circuit.

Leakage:
I_{CBO} 0-5000 microamps.

DIODE TESTS

In-Circuit:
Shorts and opens tests, providing not less than 20 ohms parallels device under test.

Out-of-Circuit:
Forward current, reverse current.

Power Requirements:
117 VAC, 60 Hz, 2.5 watts.

Size (HWD):
9½" x 7½" x 6".

Weight:
7 pounds.

Price
$89.50.

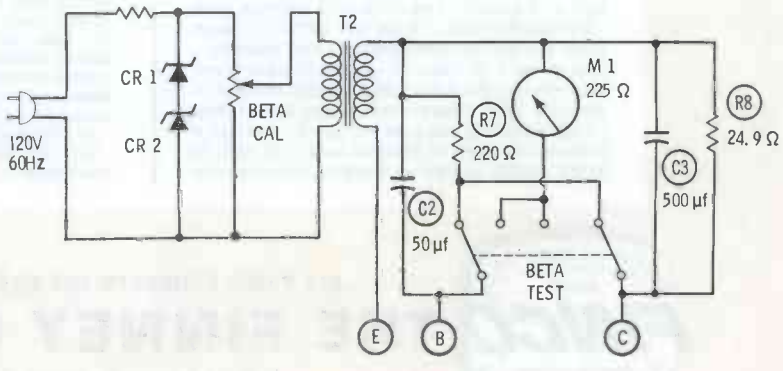


Fig. 3. Simplified schematic of the beta tester.

Ed Leahy doesn't work for us. We work for him.

Ed Leahy believes in being his own boss. Which is what Ed likes about running his own Philco Qualified Service Center. It means that, with no strings attached, he gets better training, better service and more benefits than any other manufacturer offers.

When he needs a part, he gets it fast. His Philco Parts Distributor has what Ed needs right on hand. But even if Ed gets a job like fixing a 1947 model, he knows the oddball part he needs will be shipped in 24 hours or less through Philco's Lifeline Emergency Service.

Ed keeps up on new products with Philco Tech Data Service. He tried other services and found out that he gets the facts sooner, better and at lower cost from Philco.

Ed likes Philco's "fringe benefits," too. A complete accident insurance program for himself and his men. Advice on business management, found in Philco's popular "Service Businessman" magazine. He gets extra business, too, when his name appears under a Philco listing in the Yellow Pages.

Ed Leahy has it good. You can, too. Talk to your Philco Parts Distributor or contact Parts & Service Department, Philco Corporation, Tioga and "C" Streets, Philadelphia, Pa. 19134.

PHILCO Ford

FAMOUS FOR QUALITY THE WORLD OVER

Circle 15 on literature card

Marine Radio Telephone

(Continued from page 36)

commonly neglected parts of the system. Check all connectors for shorts, broken pins, and broken or deteriorated cables. Check the antenna- and plate-tuning clips on the tank coils for tightness. Check the power source for correct voltages *under load*.

Table 1. Steps For Tuning Final Stage

1. Tune all preceding stages for *maximum* drive to the power amplifier, indicated by maximum grid (or base) current.
2. Dip the plate (or collector) tank trimmer for *minimum* current in the cathode (or emitter) circuit, with antenna disconnected.
3. Connect antenna and check input power. If too high, reduce antenna loading (coupling). If too low, increase loading a *little at a time*, dipping plate tank each time loading is changed.

Connect an RF ammeter in series with the antenna to see if the antenna is loaded to the recommended value. It may be necessary to reset the loading clips. Use a milliammeter in the plate circuit to dip the plate current. The chart of Table 1 shows how.

Recheck the frequency and modulation on each channel. Make the appropriate entries in the station log (see Table 2 and Fig. 3). Make sure the ship license is current and is posted. If these steps are followed, the boat owner—now your regular customer — should have a summer of trouble-free and reliable communications. ▲

Table 2. Information To Be Entered in Log

1. Nature of repairs and adjustments made, in shop and on board.
2. Measured frequency of each channel.
3. Power input (in watts) on each channel.
4. Date of final check.
5. Type and serial numbers of measuring equipment used.
6. Technician's name.
7. Technician's license number and date of license expiration.

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

"Two-thirds of my business comes from advertising in the Yellow Pages," says George E. Nelson, proprietor, Bud's Appliance Repair, Springfield, Massachusetts. "I get a number of calls every day from people who say they need this or that fixed. Then, they say they saw my ad in the Yellow Pages. I don't have to ask them how they found my name. *They* tell *me*. It's the one place people look when they need someone."

Advertise for action... Yellow Pages

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

Effective Communication

(Continued from page 19)

according to the dictionary, stands for Agricultural Adjustment Act and for American Automobile Association. As far as the reader may be concerned, it might stand for Advocates of the Abolition of Anonymity.

According to Webster's Dictionary, PA stands for "particular average," "passenger agent," "power amplifier," "power of attorney," "press agent," "private account," "prothonotary apostolic," "public address," and "purchasing agent."

The moral is clear. If the writer uses abbreviations, he must first identify them by using the full name, title, or term. The reader is not interested in guessing names. He reads for information. And the writer is not at liberty to coin unapproved abbreviations.

People these days do not like to read unnecessary words. Every one rushes—from eating instant breakfasts to reading condensed novels.

Therefore, the communicator must find concise, exact expression. Why say "according to the law," if "legally" will do? Why write or speak "each and every" when "each" or "every" sufficies? Perhaps an individual might ease his conscience by saying "financially embarrassed," but he means "penniless"—or "broke." Many times, budding authors write "due to the fact that" when they mean "because."

It is not an overnight job to build one's vocabulary and gain an adequate knowledge of the rules of grammar. But regardless of the difficulty involved in building vocabulary and learning rules in order to write and speak lucid, interesting, informative prose, the transmission of ideas is essential to our very way of life. In any field, vocation, or profession, without the continuous interchange of knowledge and experience there can be only stagnation and decay.

The task of learning to communicate well is far from impossible. Any intelligent worker, technician, engineer, or other professional man can make his ideas profitable by arming himself with a good dictionary, Roget's **Thesaurus,** and a good style manual or stylebook. Words, definitions, rules of grammar, abbreviations, and a wealth of other information are available in a dictionary. A **Thesaurus** contains thousands of synonyms and antonyms to build vocabulary and sharpen expression. A good style manual (like **Writer's and Editor's Stylebook)** provides rules, examples of correct and incorrect usage, and much other information on correct style. The careful reading and study of good books and magazines offers vast opportunity to examine examples of effective communication.

Any normal human mind in any job or profession manufactures ideas. These ideas are valuable, necessary — and often financially profitable—only if they are simply, clearly, and honestly expressed for acceptance by other minds. ▲

We set out to give you the industry's outstanding VOM value. We succeeded.

Leave it to B & K engineering know-how to create a Volt-Ohm-Milliammeter that puts you a jump ahead of your competition—helps make your job more rewarding and profitable. Only B & K Model 120 VOM offers a 2 ohm center scale, burnout-proof meter movement, a polished mirrored scale plus a total of 61 ranges! Model 120 VOM ranges start lower . . . and go higher than other instruments of similar size and type, making transistor servicing far easier. It's true. B&K brings you the industry's outstanding VOM value—Model 120 VOM, and prices it right! Only $51.95, net.

B&K

Division of Dynascan Corporation
1801 W. Belle Plaine
Chicago, Illinois 60613

Export: Empire Exporters, 123 Grand St., New York 13, U.S.A.

And we succeeded with our VTVM, too.

Only the B & K Model 175 VTVM has a built-in battery eliminator —no ohmmeter battery required! B & K Model 175 features Transit-Carry — reducing possibility of a bent meter indicator. In addition, B&K built into this VTVM a totally reliable protection system. The meter movement cannot be damaged from application of a wrong input voltage. Looking for the industry's outstanding value in VTVM application? Look to B&K Model 175, only $59.95, net.

B&K

Where Electronic Innovation Is A Way Of Life

Circle 18 on literature card

The Troubleshooter

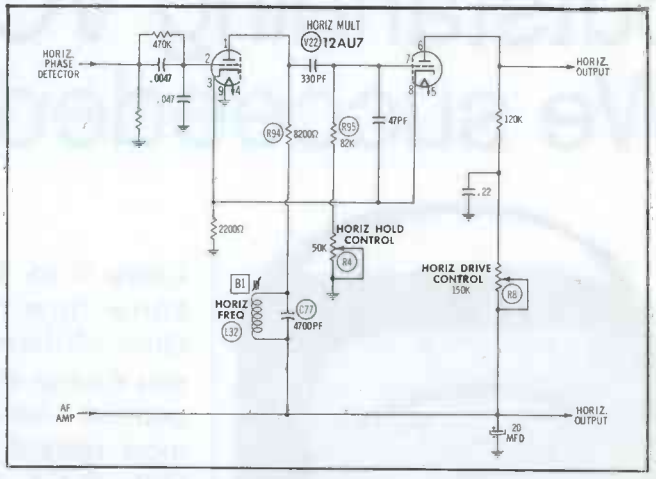
answers your servicing problems

Intermittent Horizontal Sync

I am having horizontal sync trouble with a Radio Craftsman Model RC-101 (PHOTOFACT Folder 142-10). When the set is first turned on, the picture does not lock in horizontally. Adjusting the ringing coil clears up the trouble until the set has operated for about an hour. Then the picture falls out of sync again and the ringing coil must be adjusted once again. Thereafter, the ringing coil must be adjusted at varying intervals to maintain horizontal sync. The horizontal oscillator seems to be operating above and below the normal frequency of 15,750 hertz. What do you think is the cause of the trouble and what is the best troubleshooting procedure for uncovering it.

J. F. DALY

New York, N.Y.



The trouble in this case is undoubtedly caused by thermal drift of one of the frequency determining components in the horizontal oscillator. R4, R95, C77, and R94 are likely candidates. Since there are so many other oscillator components that can also cause this symptom, it is impractical to attempt substitution. Instead, locate the faulty component with one of the freeze-sprays currently on the market. First, while the set is still cold, perform a quick horizontal alignment. Then when the set heats up and drops out of sync, spray the suspected components one-by-one until the set falls back into sync.

new!

Example:
82 Channel
MATV System

NEW WINEGARD 82 CHANNEL MATV SYSTEM...

Includes Revolutionary New VHF-UHF "V.I." Variable Isolation Line Tap-Offs*

Now you can run practically any number of TV sets for 82 channel reception without UHF conversion by using Winegard's flexible MATV system.

A new solid state UHF amplifier, Model A-222 teams up with any Winegard VHF amplifier to a single 82-channel trunk line. Delivers full gain on both the VHF and UHF bands plus FM.

A unique feature of the system is Winegard's new series of 82 channel "V.I." variable isolation line taps.* At last, you can have uniform 82 channel signal distribution to each tap-off in the system without compromise of picture quality.

All Winegard amplifiers, splitters, line taps—everything—from the antenna to the set are perfectly matched and designed to operate at top efficiency on all 82 channels. The ideal MATV system for stores, apartments, motels, schools and institutions.

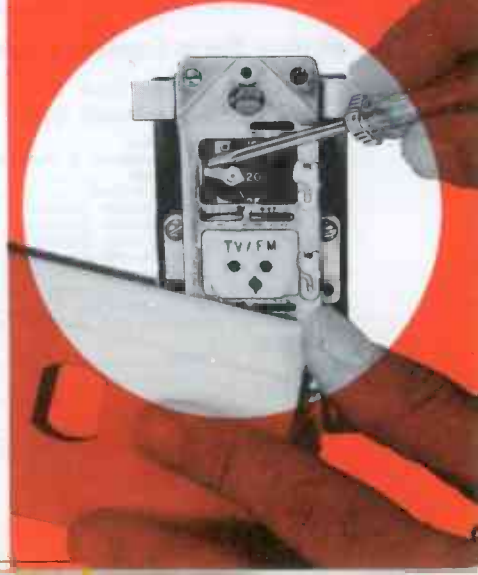
Ask your distributor or write for Fact-Finder #248.

Winegard
ANTENNA SYSTEMS
3000 Kirkwood Street • Burlington, Iowa 52601

Circle 21 on literature card

**Patent Pending*

Just a flick of the wiper arm up front permits you to vary the isolation to any value between 10 and 25 db—makes balancing of the line quick, simple and accurate. V.I. Taps accept new low loss foam cable, provide positive connection for all types of trunk lines. Winegard V.I. Taps include ivory wall plate to match standard AC outlets. Available in flush or surface mount, 300 and 75 ohm.
All models designed for VHF, UHF and FM.



Reduced Raster and Shading

The trouble symptoms in a Dumont Model RA-500 (PHOTOFACT SERVICER in PHOTOFACT Folder 514) have me puzzled. After the low- and high-voltage rectifiers and other weak tubes were replaced, the set operated perfectly for about four hours. Then, the vertical raster decreased at the bottom and retrace lines appeared. Also, the lower left corner of the raster darkened. The sound remained normal. Waveform checks reveal that the video and sync circuits are contaminated with horizontal spikes. As an example, the vertical-output waveform scoped at the bottom of the vertical-output transformer has "grass" at the horizontal frequency riding on top of the waveform The horizontal oscillator and amplifier waveforms are normal, but reduced in amplitude by 30 to 40 percent. The horizontal-output grid voltage measures —30V, B+ measures 280 volts, and boost measures 450 volts.

Removing the horizontal phase detector, sync clipper, video amplifier, and vertical-output tubes does not affect the "grass" on the vertical-output waveform. However, when both vertical yoke leads are disconnected the "grass" disappears. I have replaced the yoke, vertical-output transformer and flyback, but the trouble persists. In addition I have substituted the horizontal-output, high-voltage, and damper tubes, as well as every capacitor and coil in the horizontal and vertical sweep sections, with the exception of the vertical integrator. I have also substituted the picture tube.

The dark area at the low left corner of the raster is getting larger. Do you have any suggestions that might shed some light on the possible cause of the symptoms I have described?

R. L. WOODHOUSE

Indianapolis, Ind.

Resorting to the scope was a wise move in this situation. Now that you have uncovered the probable cause of the trouble—contamination of the vertical sweep circuit by horizontal pulses—all that remains is to trace the interfering signal back to its source and point of entry into the vertical section. Check all the possible coupling points between the horizontal and vertical circuits, paying particular attention to decoupling capacitors. The purpose of a decoupling capacitor in any circuit common to both horizontal and vertical sweep is to shunt or bypass the horizontal pulses to ground, thereby keeping them out of the vertical circuit. One possible source of trouble is the boost line that supplies B+ boost to the vertical output tube. An open decoupling capacitor anywhere along this circuit could allow horizontal pulse contamination of the vertical circuit. Note that the horizontal size and brightness controls are in series and that the screen circuit of the horizontal output tube supplies B+ to the brightness control circuit. Also, note that a DC path exists between the screen of the horizontal-output tube, the brightness control circuit (cathode of CRT), and the cathode of the video amplifier. A defective decoupling capacitor in this circuit would allow horizontal pulse contamination of the video, CRT, and vertical sweep circuits, either directly or indirectly. Another possible source of trouble in a situation such as you describe is poor lead dress, particularly in the yoke circuit.

Width Reduced

The trouble symptom in a General Electric Model M940XMD (PHOTOFACT Folder 678-1) is reduced width

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

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

8285

*Color Guard Twin—Belden Permohm**

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

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

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

You don't need expensive transformers and connectors.

8290

*Color Guard Twin—Belden Shielded Permohm**

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

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

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

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

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

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

CALL YOUR BELDEN ELECTRONIC DISTRIBUTOR.

Belden

8-8-6

BELDEN MANUFACTURING COMPANY • P. O. Box 5070-A • Chicago, Illinois 60680

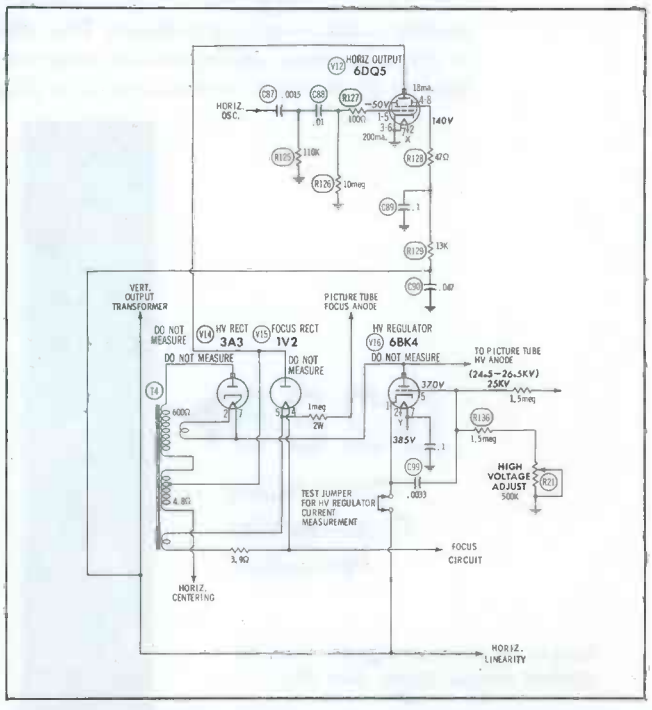
Circle 24 on literature card

—right side drawn in about 1" and leftside about ¼". The right side seems to breathe in and out. The horizontal-output tube screen voltage reads 100 volts (normally 140). I have replaced the high-voltage rectifier, horizontal oscillator, high-voltage regulator, and horizontal-output tubes. I have also replaced C89, C90, R129, and R128 without any noticeable effect on the narrowed raster. What could possibly be the trouble?

C. L. WILDE

Pinon, N. M.

Before attempting further component substitution, be sure the horizontal oscillator is providing sufficient drive to the horizontal-output tube and the high voltage is properly adjusted. Check the voltage and waveform at the grid of the horizontal-output tube. If the voltage or waveform is not close to that prescribed on the PHOTOFACT *schematic, a check of the grid circuit is indicated—a leaky C87 or C88, or a change in value of R126 or R127 are possible defects. A quick check of the high-voltage adjustment can be made by connecting a 1.5 to 2 ma current meter in series with the high-voltage regulator cathode and monitoring the regulator current as the brightness control is varied If the regulator current does not decrease as the brightness control is advance, the high voltage is not adjusted properly or a defect exists within the regulator circuits. Perform a horizontal sweep circuit adjustment as outlined on page 7 of the* PHOTOFACT *folder. If the trouble symptoms persist or if the horizontal sweep circuits cannot be adjusted properly, check C99 for leakage or R136 for a change in value. Other components could be defective; however, these are the most likely candidates. It should also be noted here that a circuit change has been issued for this model to correct a narrow width problem inherent in this particular chassis. This modification calls for the addition of a 33 pf (6000V) capacitor between pin 1 and pin 3 of the yoke socket.*



MALLORY **Tips for Technicians**

Choosing electrolytic capacitors for color TV

When you need to replace an electrolytic capacitor in a color television, it pays to select the best. Your customer has a lot of dough invested in his color set, and he won't settle for less than top performance. And his eye can see sub-standard performance in color that would go unnoticed in black-and-white.

Color TV is tough on electrolytics. Ambient temperatures run hotter, because of the greater number of tubes and resistors inside crowded cabinets. Ripple currents are higher, so the capacitor has to do a better job of getting rid of internally generated heat. Voltage ratings are higher, too; most electrolytics in color TV are 400 volts or higher.

It's no surprise that leading color TV makers are pretty darn particular about the electrolytics that they use as original equipment. They demand a true high-voltage, high-temperature, high ripple capacitor . . . not one that's simply made to sell at bottom price. And meeting these demands is the way Mallory got to be the top supplier of electrolytics for color TV. We're the guys who pioneered the 85°C capacitor, who have consistently increased ripple current capacity, and who have the reputation of leadership in high voltage ratings.

Here's our tip of the month. To save yourself time, get a copy of our new cross reference, "Exact Replacement Metal Can Electrolytic Capacitors for Color TV". It lists the original part number and the catalog number of the corresponding Mallory replacement for 38 leading color TV manufacturers. To save yourself costly call backs, use only the best . . . and that's one of the Mallory FP-WP series, made to original equipment specs. To get everything you need for color TV service, see your Mallory distributor. He stocks Mallory power resistors, circuit breakers, carbon and wire-wound controls and Discap® ceramic capacitors.

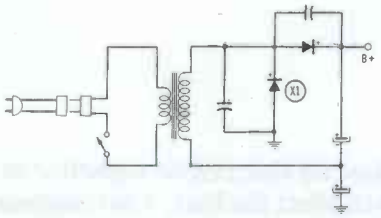
For a copy of the Color TV cross reference, ask your Mallory Distributor, or write to Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Indianapolis, Indiana 46206.

Circle 27 on literature card

Color Countermeasures

Symptoms and Tips from Actual Shop Experience

Chassis: All Zenith chassis using silicon rectifiers.
Symptom: Low high voltage; no raster; sound normal.
Tip: Check for low B+. Check for open X1 silicon rectifier. If open, replace both rectifiers.

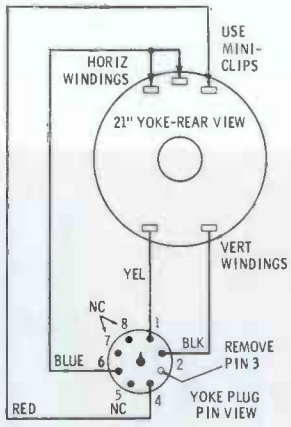


Chassis: All 25", 70° RCA color chassis.
Problem: Adapting 21", 70° color test jig for service of 25", 90° color chassis.
Tip: Present 21" test jigs can be converted to fire-up a 25" color chassis using the following procedures and adapter cables:

1. Construct a yoke extension/adapter cable as shown in Fig. 1. An old 8-pin yoke plug is suitable; be sure pin 3 is removed.
2. Use the regular 8-pin convergence extension cable (male to female) as used with the 21" jig.
3. Obtain a color kine socket adapter/extension from your local parts distributor (RCA Stock Number 13B111).

Vertical and horizontal yoke windings for the 21" and 25" picture tubes are different. For this reason, vertical linearity and size will be affected somewhat; some chassis may have slight vertical foldover at the top of the picture. Horizontal ringing will be exhibited at the left side and width may be reduced a small amount.

However, the distortion isn't large enough to disturb normal servicing procedures where the main concern is in the video, sound, or color circuitry. The majority of sweep circuitry problems can also be serviced once you learn what to expect on your particular jig. It's a good idea to fire-up a normally operating 25" color chassis and note how the raster is affected on the test jig. In this manner, you'll know what to expect in actual troublehooting situations.



fast. accurate. versatile.
what else would you want from a tube tester?

money, of course.

We know that swift and sure tube testing makes servicing more profitable. So we created the Dyna-Jet 606 Tube Tester, the professional portable loaded with the most-wanted features. Multiple 13-socket design means only 4 test settings, yet it tests the latest miniature and color receiving tubes as well as older types.

It tests for all shorts, grid emission, leakage, gas. Checks cathode emission the accurate way—under simulated load conditions. Checks each section of multi-section tubes. And the 606's exclusive front panel adjustable grid emission test spots the "tough dogs" and the weak ones. With the 606, good tubes aren't rejected, bad ones show up fast. That means less callbacks, more tube sales, better profit . . . MORE MONEY!

Few test instruments pack the profit-per-square-inch as does the Dyna-Jet 606. It's another product of B & K electronic innovation . . . of B & K's policy to provide maximum value and maximum quality. And the B & K Professional Servicing Equipment emblem assures you . . . and your customers . . . that you use the finest equipment available. Model 606 Net: $79.95

B&K

A DIVISION OF DYNASCAN CORPORATION

1801 W. Belle Plaine, Chicago, Illinois 60613

WHERE ELECTRONIC INNOVATION IS A WAY OF LIFE *Circle 30 on literature card*

Export: Empire Exporters, Inc., 123 Grand Street, New York, N.Y. 10013

Product Report

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

CB Signal Generator

(45)

A precision CB signal generator, designed for testing and servicing Citizens-band radio equipment, was announced by **Pace Communications Corps.**

The all-solid-state unit, Model 5404, provides 24 crystal-controlled channels. Wide variable output voltage range, accurate calibration, excellent modulation characteristics, and low envelope distortion, combine to make it an ideal instrument for taking accurate measurements on all types of CB radios.

Modulation, from an internal 400-Hz oscillator, is adjustable from zero to 100%. The unit may also be externally modulated from zero to 100% with audio signals from 60 to over 5000 Hz.

Paging Speaker

(46)

Oxford Transducer Company has introduced a new "Cobra" wide-angle paging and talk-back speaker Sectoral defraction gratings, placed at three positions on the bell of the horn, eliminate the usual "fall-off" of energy at the extreme ends of the polar pattern. This new concept in design offers flat, wide-angle dispersion and minimum vertical dispersion.

The Cobra has a frequency response of 250 to 13,000 Hz, a power rating of 30 watts, dispersion angles of 120° x 60°, and a microphone sensitivity of —23 dbm.

Power Control

(47)

A new soldering iron power control

Getting a hernia and not getting paid for it?

Switch to Elmenco dipped Mylar®-paper capacitors and you won't have to worry about call-backs, lost profits, broken reputations or broken anything else.

The only ordinary thing about them is the r price.

You get capacitors that meet the requirements of high-reliability computer and missile systems. You get capacitors that hold their rating at 125°C continuous operation. Yet you get them at TV set prices.

Elmenco dipped Mylar-paper capacitors come in just about any value you need from .001 mfd to 1.0 mfd. And just about any TV rated voltage you need, too, from 100V through 1600V.

Ask your Authorized Arco Distributor to put them on your next order. Without fail.

Tell him you're counting on his support.

(While you're at it, ask about other Elmenco types: padders and trimmers; high voltage dipped micas.)

Arco Electronics
A Division of Loral Corporation
Community Drive, Great Neck, N.Y.
Dallas, Texas, Pasadena, California,
Menlo Park, California.

® DU PONT TRADEMARK.

Circle 32 on literature card

unit, infinitely variable up to 125 watts, has been introduced by the **American Beauty** Division of the American Electrical Heater Company.

The new unit's stepless design facilitates switching soldering-tip heat instantly to match changes in work rates (up for continuous, down for intermittent), and its percentage-of-capacity dial readings give a guide for repeating any job. Fused and pilot-lighted, the 477 has a ventilated steel casing and mar-proof rubber stabilizing feet. The unit can also be used as a variable power source for small motors. List price: $24.00.

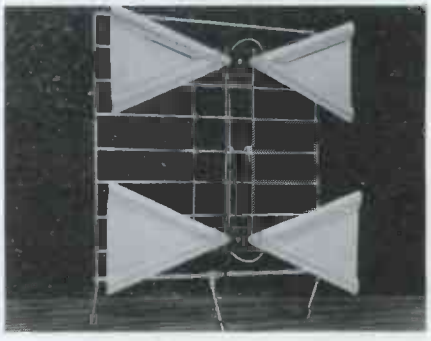
Transistor Tester

(48)

Servicing, quality control, and production line testing of complex solid-state equipment has been simplified with the announcement of a new in-circuit Transistor Tester by **Sencore.** Rather than pulling each transistor to test or substitute for it, the TR139 lets you check any transistor or diode without disconnecting a single lead.

The Sencore TR139 gives you two important readings; true AC beta, the gain factor of a transistor, and leakage current (Icbo) in microamps. In-circuit and out-of-circuit tests are identical.

A specially designed circuit protects the delicate low-current type transistor or diode from damage even if the leads are accidentally hooked up backwards. Parameters of unknown transistors are determined without a setup book or manual. Price of the tester is $89.50.



UHF Antenna

(49)

A new UHF indoor TV antenna, de-

signed to match the "contemporary" furnishings of any living room, bedroom, family room, or den, is now being offered by **Snyder Manufacturing Co.**

Constructed to afford superior reception of all UHF channels, whether on color or black-and-white sets, this new antenna (Model UHF-1) may be attached to a receiver in sectonds.

The space-saving slimline design of the UHF-1 measures 12½" x 15", and has a decor-matching gold tone finish. The three-legged base is equipped with protective, no-slide tips.

The Snyder UHF-1 indoor TV antenna is priced to retail for $3.95.

Illuminated Switches

(50)

Two new illuminated long-frame switches—one a pushbutton type, the other a push-turn button type—and each designed with an extra-rugged "T-Beam" frame have been announced by **Switchcraft, Inc.** They are recommended for use in high quality communication equipment and telephone apparatus.

Both types are called "T-Lite" switches. The Series 3200 "T-Lite" is the momentary pushbutton type. The round, highly-visible pushbutton is ½" in diameter and frosted to diffuse the light evenly over its entire surface.

The Series 32000TL "T-Lite" has a paddle-shaped button. When simply pushed, action is momentary. When pushed and turned, locking results. The plastic button is also frosted and is designed with a black indicator line for quick indication of switch position.

The new switches feature leaf springs of special nickel silver and welded crossbar palladium contacts rated at 3 amps. 300 watts, max., A.C., noninductive load. They may also be ordered with fine silver contacts to accommodate heavier current carrying circuits.

Models with standard contact assemblies range in price from $6.00 to $8.10 in small quantities.

Professional Pliers

(51)

A new line of precision-built professional pliers is now available from **Vaco Products Company.** The full line consists of 23 varieties that meet every trade and service need, and is available in four special assortments, each complete on a Vaco "custom plier" Vari-Board® display.

The pliers have color-coded, plastic-sleeve cushion grip handles for ease, comfort, grip control and eye appeal. Of hot drop forged alloy steel, hand finished, the pliers are individually tested, and their precision-ground jaws individually adjusted for accurate bite, strength and cutting efficiency. Like all Vaco products, the pliers are unconditionally guaranteed.

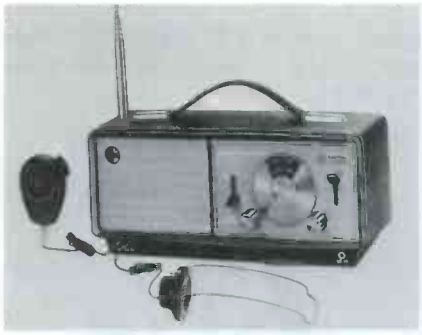
Electronic Library

(52)

IRC, Inc. has introduced a library of "How-To" electronic books. The first books in the library consist of 12 volumes for the hobbyist, experimenter, and do-it-yourselfer.

The original volumes being offered include titles such as "Diodes," "How To Read Circuit Diagrams," "Basic Electronics Math," "Learn Electronics In 5 Minutes, 37 Seconds," "The Oscilloscope," and "Practical Radio." Titled the "103 Series," the library will consist of 103 books when it is completed.

Each book lists for $1.25.



Portable Base Station

(53)

This portable base station, designed for use with citizens band walkie-talkies, also features an AM radio. The New **General Electric** Model Y 7060 solid-state unit can receive all 23 of the citizens band channels that walkie-talkies use, and transmits voice or Morse code on Channel 14. Effective range is up to a mile, depending on conditions.

Uses of the unit include monitoring local CB activity, transmitting to other walkie-talkies either as a base station or as a walkie-talkie, serving as a wireless intercom, and as a portable or home AM radio. Features include a built-in telegraph key, and a key jack for use with an auxiliary key. Signals are audible to the sender as well as receiver, which aids in practice. A microphone for transmitting voice and a headset for listening are also supplied with the unit. The 51" telescoping antenna used with the set provides CB performance as well as AM radio reception.

The unit operates on six "D"-size flashlight batteries and an optional a-c converter is available. Weight is five pounds and dimensions are 12.5" x 5.5" x 6". Price of the unit is $34.95.

Rechargeable Portable Power Source

(54)

A new, portable, 12-volt rechargeable power source, complete with built-in charger, has been introduced by **Centralab.** The CRL-1200 Power Pack is a portable source of regular, standby, or emergency electrical power. The versatile power pack covers a wide range of applications, transferring easily from one 12-volt appliance to another. Included among these are portable TVs, tape recorders, phonographs, camping lights, ski-trail lights, portable radios, electric shavers, public address systems, portable power tools, movie cameras, portable lamps, electric typewriters, and CB and FM radio communication units. Marine and aircraft uses include depth sounders, running lights, navigational aids, fog hailers, and emergency radio needs.

The unit can operate continuously up to 40 hours or more, depending on the current or wattage requirement of the equipment it is powering. The average portable TV set will operate for 5 to 8 hours. Hundreds of holes can be drilled through a 2" board with a heavy duty, ¼" power drill. A portable fluorescent camp light can be run fro 13 to 15 hours, etc., or all of these can be

combined, with appropriate reduction in operating time. Charging time is seven hours for 90% and 12 hours for a complete charge. Best operation is assured by charging before reuse.

The power pack operates efficiently from −30°F to +122°F. It can't be damaged even if the temperature extremes drop to −60°F or rise to +158°F. Charge loss during storage is only 3% per month. After 2½ years of shelf life, the unit can be recharged to its original full capacity.

Most 12-volt devices are already equipped with a "cigarette lighter" plug as standard equipment or as a readily available accessory to fit the socket of the power pack. On equipment with internal power supplies, it is only necessary to connect the power pack to the battery terminal points. The unit includes two type RP-680 6-volt, 8 ampere-hour, lead-silica-gel batteries and one CRL-1000 automatic charger. The charger is a solid-state electronic device with no moving parts which charges the batteries at 1.2-ampere rate. The complete unit is contained in a genuine black leather carrying case. The power pack is 8.5" high, 2.25" wide and 9" long. It weighs 9½ lbs. Price is $49.95.

Wide-Band Probe

(55)

A new scope probe, Type J6045, with DC to 230-MHz bandwidth, has been announced by **Tektronix, Inc.** It is designed for use with all Tekronix oscilloscopes, including various sampling instruments. The new unit introduces less circuit loading, and with 1× attenuation, permits displays of low-amplitude signals which might otherwise be unobtainable. A DC-offset control allows measurements of very small AC signals in the presence of DC potentials up to one volt. Risetime of the probe is approximately 1.5 nanoseconds, input resistance is 10 megohms, and input capacitance is less than 4 pf.

The probe consists of two major parts: a probe head connected by a cable to a compensating amplifier. A separate supply is provided to power the probe. Supplied with the attenuators and an AC coupling probe are plug on 10× and 100× capacitor. Output load impedance is 50 ohms. A switch on the compensating amplifier provides internal 50-ohm termination, or the probe can be terminated externally. The compensating amplifier is capable of driving lengths of terminated 50-ohm coaxial cable for uses such as coaxial switching in systems applications. It is also possible to extend the distance between the probe amplifier and the oscilloscope if desired. The small size and lightness of the probe makes it exceptionally easy to use in dense circuitry. Price of the unit with power supply is $375.

Marine TV Antenna

(56)

An antenna designed especially for all-channel TV reception on both cruising and anchored pleasure boats has been announced by **JFD Electronics Co.** The JFD Marine TV Antenna (Model MTV222) is supplied with a versatile marine mounting bracket which permits side or top mounting on any horizontal or vertical surface of the boat. Special features are built in to make it seaworthy.

The antenna is an offset, omni-directional V-dipole unit that works with practically every portable TV set. It can be installed and detached in minutes and stowed away on any craft, large or small. Maximum signal aboard is produced through a six-position clarifier. Interference from ignition and motor is suppressed by a 25′ shielded coaxial cable. Triple-chrome-plated brass construction eliminates corrosion and withstands severe weather conditions. The unit is priced at $27.95, complete with non-ferrous mounting bracket.

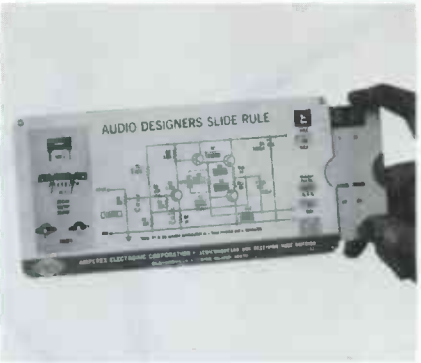
Microphone

(57)

This new dynamic cardioid microphone features a dual

impedance of 50,000 ohms or 200 ohms. The user can select either impedance by changing wires at the end of the microphone cable. Sensitivity with 50,000-ohm impedance is —83db at 1 kHz and —59 db at 1 kHz for 200-ohm impedance. Frequency range of the **Sonotone** Model CDM80 is 80 to 10,000 Hz with uniform rejection to reduce "squealing" in long-line applications. Front-to-back sound rejection is 16 to 20 db.

Other features include an on-off switch, dynamic diaphram of polyester film, and rubber sleeve mounting of the complete cartridge motor to protect against sudden physical shock and noises produced from handling. The unit measures 5¼" high by 1¼" in diameter (at top). Made of die-cast metal and finished in brushed chrome, the microphone comes equipped with 15' of three-conductor cable, plus shield (no plug). Price of the single unit is $43.50. The model is also available in matched pairs for stereo recording (Model CDMT80), priced at $87.50, and a combination package of microphone and stand (Model CDMC80), priced at $48.75.



Audio Circuit Slide Rule
(58)

A slide rule specially designed for those involved in the engineering of audio equipment has been announced by **Amperex Electronic Corporation.** The unit provides a dual function. First, it gives the circuit designer a quick means of determining the component values and transistor types required in a series of seven basic audio amplifier circuits ranging from a 1-watt amplifier to a 5-watt car radio. Merely by the movement of a hand, the engineer has a circuit layout from input through the speaker. The slide rule also serves as a handy audio calculator. Presuming either the known value of the output power or the load resistor, the user is able to calculate the related values required within a circuit of complementary symmetry, which enables the engineer to gain maximum effectiveness from the use of audio transistors. The unit which measures 4⅛" x 8½", is priced at 50c.

Appliance Manual
(59)

A 32-page booklet on electrical appliance servicing has just been published by **Simpson Electric Co.** Titled "Simplified Electrical Appliance Servicing", the new booklet is a source of "how to do it" information on appliance troubleshooting with test instruments.

Subjects covered include measuring appliance current and temperature, testing split-phase motors, checking heating elements, and testing timers, thermostats, magnetic valves and other components. Photos of test situations and test circuit diagrams are included.

The new publication contains technical data that should prove helpful to appliance servicemen, schools, industrial maintenance men and do-it-yourselfers. It is available through electronic distributors or direct from Simpson by enclosing 50c to cover mailing and handling. ▲

INDEX TO ADVERTISERS

December, 1966

FREE Catalog and Literature Service

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

ANTENNAS

70. *ALLIANCE*—Colorful 4 page brochure describing in detail all the features of Tenna-Rotors.
71. *ANTENNACRAFT* — Four-color catalog sheet about the new "Big-Shot-8" VHF-UHF-FM antenna designed for city and suburban use.
72. *BLONDER-TONGUE* — Compact brochure detailing a line of all-channel products, expressly designed to improve reception in the home and small MATV systems.
73. *CORNELL-DUBILIER* — New revised booklet shows how to use rotors to best advantage, depicts complete CDE rotor line.
74. *FINNEY*—Form 20-353 about the Finco-Axial 75-ohm antenna system for UHF-VHF-and FM.*
75. *JERROLD*—New 4-page full-color catalog describes the new Paralog Plus antennas.*
76. *JFD*—Color Laser and LPV antenna brochures. New 1966 dealer catalog covering complete line of log-periodic outdoor antennas, indoor antennas, rotators, and accessories.*
77. *PARKER* — Catalog sheets illustrating new UHF-VHF-FM color antennas.
78. *WINEGARD* — Literature on new 82-channel 2-set coupler; new 82-channel variable line tapoffs; new VHF-UHF matching transformers and color brochure on new sales aids.*

AUDIO

79. *ADMIRAL*—Folders describing line of equipment; includes black-and-white TV, color TV, radio, and stereo hi-fi.
80. *ATLAS SOUND* — Catalog 566-67 illustrates and describes many new models of public address loudspeakers, microphone stands, and accessories for commercial sound applications.
81. *JENSEN*—New brochure No. OJ featuring a full line of rear seat speakers.
82. *MARANTZ*—Flyer sheet on a new solid-state stereo amplifier featuring very low distortion.
83. *NUTONE*—16-page full-color booklet illustrating built-in stereo music, intercom, and radio systems.
84. *OAKTRON* — "The Blueprint to Better Sound," an 8-page catalog of loudspeakers and baffles giving detailed specifications and list prices.
85. *OXFORD TRANSDUCER*—4-page catalog describing speakers, musical instrument & communication loud speakers.
86. *PERMA-POWER*—Catalog sheet about a new 25-watt solid-state megaphone.
87. *SONOTONE*—Set of 3 microphone frequency demonstration charts.

COMMUNICATIONS

88. *AMPHENOL* — 2-color spec-sheets on new Model 650 CB transceiver and Model C-75 hand-held transceiver.*
89. *FANON*—Descriptive brochure on 13 new transceivers including specifications. Includes new "Call-Tone Selector" which allows 5 CB's to selectively signal on each channel.
90. *INTERNATIONAL COMMUNICATION*—Comprehensive report on the market and applications for citizens band two-way radio equipment and accessories, and about the opportunities in marketing and servicing citizens band radio equipment.
91. *MOSLEY ELECTRONICS*—Folder about "Talk Power" and new stacked CB beams.
92. *MOTOROLA*—Brochure TIC 2042B describes high-power business-band base stations.
93. *POLYTRONICS*—New price sheets reflecting latest price reductions of Duo-Com equipment. Flyer sheets on new 3-watt two-channel and 5-watt seven channel units.
94. *RAYTHEON*—Brochures about Webster mobile antennas and accessories for CB and Amateur bands. Also, Raytel TWR 8, 9, 11, & 11T CB transceivers.
95. *TURNER*—Booklet gives wiring instructions to hook up the +2 mike to all popular CB units.

COMPONENTS

96 *BUSSMANN*—Bulletin on BUSS Fustat Box Cover Units offers simple, low-cost way to protect work bench tools; soldering irons, drills and the like against damage and burnout. Units are easy to install—fit standard outlet or switch box, have fuseholder—plus a plug-in receptacle, pilot light, switch, etc. Ask for SBCU.*
97. *CENTRALAB*—Catalogs offered on electrolytic capacitors, PEC's and auto radio shafts and hushings.*
98. *GC ELECTRONICS* — FR-029E Electrocraft wall charts on plug-jacks, binding post etc.
99. *LITTLEFUSE*—Pocket-sized TV circuit breaker cross-reference gives the following information at a glance: Manufacturer's part number, corresponding Littlefuse part number, price, color or b/w designation. A second glance gives trip ratings and acquaints you with a line of caddies. Ask for CBCRP.*
100. *MERIT COIL & TRANSFORMER*—180-page complete-line catalog, stock control forms No. SR-216, and cross-reference pamphlet No. 716.
101. *OAK*—New eight-page two-color catalog describes a full line of rotary, pushbutton, lever and slide switches available from electronic distributors throughout the country. Form SP-228.
102. *QUAM-NICHOLS*—Catalog #66 listing public address, sound systems, high fidelity, automotive and radio-TV replacement speakers.
103. *SPRAGUE*—Catalog K-108 a complete electrolytic capacitor replacement cross-reference.
104. *SWITCHCRAFT*—Catalog A-401b illustrates audio mixers, speakers, controls, couplers, adapters, selector switches, molded cable assemblies and a wide variety of audio connectors. Detailed electrical data is provided.

SERVICE AIDS

105. *CASTLE* — How to get fast overhaul service on all makes and models of television tuners is described in leaflet. Shipping instructions, labels, and tags are also included.*
106. *CLEVELAND INSTITUTE OF ELECTRONICS* — New pocket-sized, plastic "Electronics Data Guide" of formulas and tables, including frequency and wavelength, dB formulas and table, antenna lengths, and color code.*
107. *ELECTRONIC CHEMICAL* — Brochure of aerosol chemicals for controls, tuners, and tape heads. Also brochure on Frigid-Air.
108. *LUXO*—Form 107 about counter-balanced and magnifying bench lamps.
109. *PRECISION TUNER*—Literature supplying information on complete low-cost repair and alignment service for any TV tuner.
110. *QUALITY TUNER SERVICE*—Introductory letter describing costs and service on all makes of TV tuners. Repair tags and shipping labels included.
111. *RAWN*—New catalog and instruction bulletins about knob and plastic repairs, and denture repairs.
112. *WILCO*—Catalog pages on an anti-static plastic cleaner and a scratch remover compound.

SPECIAL EQUIPMENT

113. *PERMA POWER* — New leaflet describes Perma-Power's new Electro-Lift Garage Opener.
114. *SOUND SENTINEL*—Brochure about a commercial-residential security alarm that uses paging and/or music speakers that are already installed as detectors.

TECHNICAL PUBLICATIONS

115. *HAYDEN*—Latest 64-page catalog listing books published by the Hayden Book Company, Inc. and John F. Rider Publisher, Inc. for the electronics service technician, student, and hobbyist.
116. *PHILCO*—Information about Tech Data & Business Management Service. Also, free parts catalog.*
117. *RCA INSTITUTES*—1967 career book describes programs and courses in television, telecommunications, automation and industrial electronics, drafting, and computer programming.*
118. *HOWARD W. SAMS*—Literature describing popular and informative publications on radio and TV servicing, communications, audio, hi-fi, and industrial electronics, including special new 1966 catalog of technical books on every phase of electronics.*

TEST EQUIPMENT

119. *B & K*—New 1966 catalog featuring test equipment for color TV, auto radio, and transistor radio servicing, including tube testers designed for testing latest receiving tube types.*
120. *EICO*—1966 short-form catalog is 48-pages long. Describes a complete line of test instruments, CB and ham equipment, hi-fi components, and miscellaneous electronic equipment.*
121. *HICKOK*—Specification sheets on Model GC 660 color generator and model 860 signal tracer.*
122. *JACKSON*—Catalog on "Service Engineered" test equipment featuring the new X-100 color generator.
123. *LECTROTECH*—Two-color catalog sheet on new model V6-B color bar generator, the latest improved model of the V6 color bar generator. Gives all specs and is fullly illustrated.*
124. *MERCURY*—Complete catalog of new fall line of test equipment.
125. *PRECISION APPARATUS*—Illustrated catalog describing signal generators, oscilloscopes and meters.
126. *SECO*—New line folder describing fifteen items of test equipment.
127. *SEMITRONICS*—Brochure on the new model 1000 transistor tester.
128. *SENCORE*—Spec sheets on the TR-139 transistor tester, FS-14 field strength meter, the SM-112B VOM/VTVM, and the full line catalog.*
129. *SIMPSON*—Flyer giving specifications of Model 604 multicorder for measuring and recording volts, amps, milliamps, and microamps.
130. *TRIPLETT*—Catalog D-66-I features the complete line of panel instruments.

TOOLS

131. *ARROW*—Literature describing 3 staple guns.
132. *ENTERPRISE DEVELOPMENT*—Time-saving techniques in brochure from Endeco demonstrate improved desoldering and resoldering methods for speeding and simplifying operations on PC boards.*
133. *VACO*—Catalog #SD-120 completely describes new Vaco screw launcher which holds, starts, and drives all straight slot screws.
134. *XCELITE*—Form S766 describing 2 new Series 99 "Plastic View" kits, each containing a plastic handle and a selection of interchangeable screwdriver blades.*

TUBES & TRANSISTORS

135. *IEC*—Literature on IEC service range receiving tubes.
136. *IR* — Transistor cross-reference guide JD61-C and semiconductor cross-reference guide JD198.
137. *RADIO CORP. OF AMERICA* — PIX 300, a 12-page product guide on RCA picture tubes covering both color and black-and-white. Includes characteristics chart, terminal diagrams, industry replacement, and interchangeability.*
138. *WORKMAN*—Transistor cross-reference for use with Miracle Five transistor line that replaces 2,977 entertainment-type transistors.

USE THE HANDY CARD BELOW TO OBTAIN FREE CATALOGS & LITERATURE

As a service to its readers, PF REPORTER makes this postpaid card available for your convenience in obtaining current manufacturers' literature.

To use the card simply:

a. Circle the numbers corresponding to the numbers of the items appearing either on page 76 or in the "Product Report" department.

b. Print your name and address and check your occupation in the spaces provided.

c. Tear out lower half of this insert and place in mailbox.

Note the deadline date — Requests received after this cannot be handled.

Subject Index on Reverse Side

DECEMBER, 1966

Please Indicate number of items you have circled →

OFFER EXPIRES FEBRUARY 1, 1967

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131
133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175

Print plainly or type below

Name_____

Firm_____

Firm Address_____

City_____ State_____ Zip_____

Did you receive this issue through

☐ **Distributor** ☐ **Subscription**

Subscription Offer

Enter my subscription to PF REPORTER

☐ 3 Years $10.00 ☐ 2 Years $8.00 ☐ 1 Year $5.00

☐ Bill Me ☐ Remittance Enclosed

☐ Extend Present Subsciption

Please check business classification:

☐ Independent Radio, TV Serviceman

☐ Full time ☐ Part time

☐ Retailer with Service Department

☐ Owner or Manager

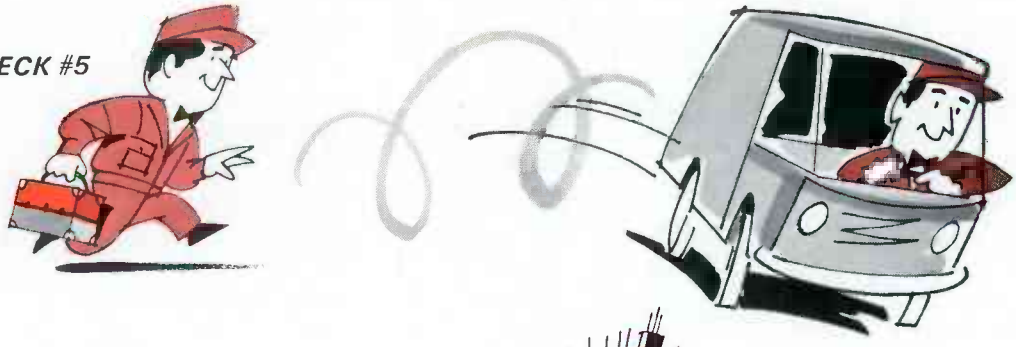
☐ Service Manager

☐ Employee

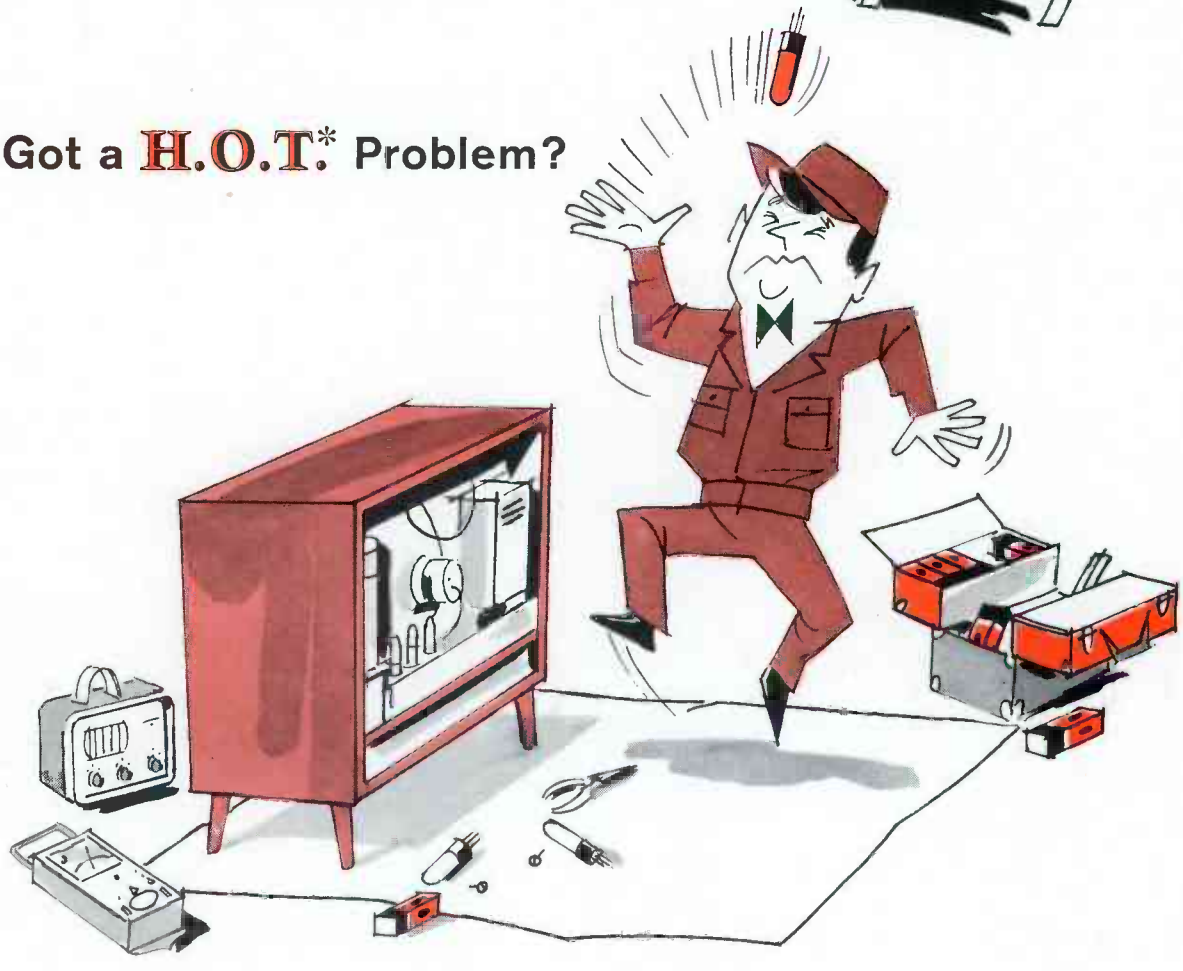
☐ Other (Specify occupation)

PF REPORTER SUBJECT REFERENCE INDEX—DECEMBER, 1966

RCA's COLOR TV FASTCHECK #5



Got a H.O.T.* Problem?



Keep it cool...and avoid burnout!

The *Horizontal Output Tube in a color set has to work hard...and efficiently. Abnormal circuit conditions can send its plate dissipation far beyond the allowable limit and permanently damage the tube.

The most likely source of damage is failure or removal of grid circuit drive for even 10 to 20 seconds. When servicing horizontal oscillator and deflection circuits, therefore, observe these "don'ts."

1. ***Don't*** pull the horizontal-oscillator tube with power applied to the set.
2. ***Don't*** apply power to a "warm" set if the oscillator tube is cold. Wait a few minutes, or heat the oscillator tube in a tube tester.
3. ***Don't*** risk H.O.T. damage by shorting out overload devices.
4. ***Don't*** disconnect the H.O.T. plate cap to kill high voltage. Use the method recommended by the set manufacturer.
5. ***Don't*** replace an H.O.T. without adjusting the horizontal-efficiency coil for correct cathode current.

Observing these precautions will help you to obtain maximum efficiency and longer life from the horizontal output tube. This is the latest in RCA's continuing series of color TV service hints. You will find your RCA tube distributor your best source for quality RCA receiving tubes for color TV, black and white TV, Radio and hi-fi. To help keep your customers happy, and avoid callbacks, always replace with RCA receiving tubes.

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

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

CIRCUIT BREAKER CADDIES

CADDY #094077

10 circuit breakers, trip ratings: 2.25, 2.5, 2.75, 3, 3.25, 4, 4.5, 5, 6, and 7 amps.

CADDY #094076

8 circuit breakers, trip ratings: 2.25, 2.75, 3, 3.25, 4, 4.5, 5, and 7 amps.

30 Popular Fuses; 5 each — N 3/10, N 7/10, N 1, C 3/10, C 1/2, C 3-1/2.

Circuit breakers and fuses at your finger tips for instant servicing in field and shop. For color and black/white TV sets.

LITTELFUSE DES PLAINES, ILLINOIS

Circle 42 on literature card