

6547

September, 1973 □ 75 cents

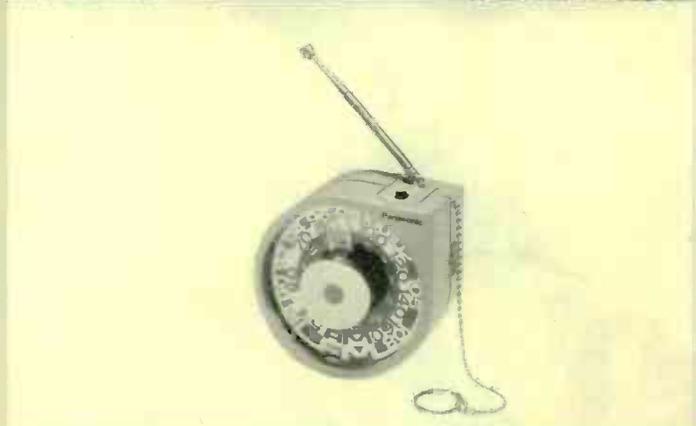
# Electronic Servicing



A HOWARD W. SAMS PUBLICATION



## News from the CES show



53914

Foreign color systems.  
Tips for selling security

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**Warning: Independent Bookkeepers  
have determined that ordering any  
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**S.** stands for our new Symptom Repair Manual. It was created for you by GE to deal with the most common faults. It lists a variety of symptoms. And then tells you what to check and in what order.

**T.** stands for our Troubleshooting Flow Charts. If a particular problem was not found by using the Symptom Repair Manual, these charts will take you through a logical sequence of checks to locate the faults.

**C.** stands for time-consuming Circuit Analysis. If you follow the 'S' and 'T', in most cases you will never have to get to 'C.' With these two service aids you can quickly diagnose 95% of all General Electric TV service problems. Using them will save you time, money and aggravation. And needless to say, they'll help you generate a lot of good will and build your reputation for fast, reliable service.

The Symptom Repair Manual is available for a \$1.00 handling charge. To receive your copy or details of GE service subscription plans, write "Dutch" Meyer, GE Television Receiver Products Department, Portsmouth, Va. 23705; or call collect (804) 484-3521.



**STC. A service technician's  
best friend.**

GENERAL  ELECTRIC

September, 1973/ELECTRONIC SERVICING 1

# Electronic Servicing®

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**"Brightness is best."**



**We think Sylvania ChroMatrix™ gives the best of both.**

**Brightness is great if you don't have to lose contrast.**

**And contrast is great if you don't have to pay for it with a dimmer picture.**

**At GTE Sylvania, we think the best replacement tube is the one that gives you just the right balance of both.**

**That's why we developed the ChroMatrix line using a jet black dark surround and Sylvania bright phosphors.**

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**And you can get them now in all large-screen sizes from 19" to 25" diagonal including the popular 23" diagonal size.**

**Using the replacement line that gives the best of both worlds might make customers think that you're the best serviceman in this**

**one.** Sylvania Electronic Components, 100 First Avenue, Waltham, Mass. 02154.

**GTE SYLVANIA**

**It seems incredible, but the "instant-on" feature of television sets has come under condemnation** by some apparently-misguided energy crisis "experts". An article in **Home Furnishings Daily** quotes Parker Mathusa, of the power section of the Public Service Commission of the State of New York, as saying that instant-on "can contribute up to 1 percent of the residential electrical energy requirements". Because the "off" power consumed by a solid-state TV receiver is less than 5 watts, we suggest Mr. Mathusa recheck his mathematics. And we wonder if these alarmists have considered how much wasted energy would be used for the tubes and components required to replace the many extra ones that would be damaged by operation without instant-on?

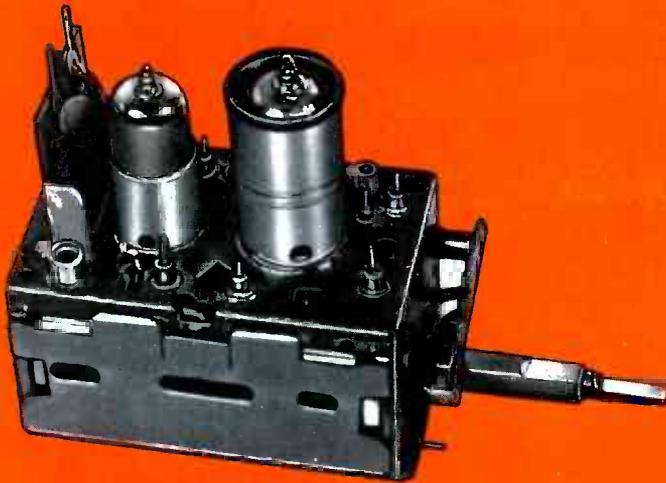
**Sony has introduced a new 114-degree 25.2-inch Trinitron color tube for sale in the United States.** Previously, reports **Home Furnishings Daily**, the largest Trinitron was 19 inch, used in portable receivers. The tube has a narrow 30.6-MM neck, a special lighter deflection yoke, and a new-type lens system to provide sharper resolution. It's said that gate-controlled switch semiconductors (SCR's?) are used in the deflection circuit. Seven integrated circuits (IC's) are used in the receiver.

**Times Square in New York City has become infamous for the huge numbers of crimes** committed there. Closed-circuit TV cameras are going to be used, according to an item in **Radio & Television Weekly**, to watch the "Great White Way" and some of the side streets. Police security prevents telling how many cameras will be used or where they will be stationed. The monitors will be mounted in a van. Similar systems have been tried in two other cities with excellent results.

**Cordless telephones might be a big seller in the future.** As reported in **Home Furnishings Daily**, one pioneering model has a self-contained headset which includes two antennas, one external and one internal. Radio-link operation is on the 27-MHz Citizens Band. A CB transmitter/receiver and an interfacing device are located at the regular telephone. Price of the units (Manufactured by Hugel International) is now about \$350, but increased production might reduce the price to about \$100.

**Another disappointment about video tape comes from California**, where an inconclusive marketing test has been completed. Teledyne Packard Bell, Cartridge Television (Cartrivision), Sears, Wards, and Admiral (according to **Merchandising Week**) participated in common advertising. Comments from the store spokesmen were varied. One said the promotion had gone very well. Others remarked about the high selling price and some equipment malfunctions. Other showcase tests might be arranged at later dates in Chicago, Atlanta, or New York.

*(Continued on page 6)*



# \$9.95

ALL PARTS INCLUDED  
EXCEPT TUBES & TRANSISTORS

ONE YEAR GUARANTEE

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PROVIDES YOU WITH A COMPLETE SERVICE FOR ALL YOUR TELEVISION TUNER REQUIREMENTS.

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Universal Replacement Tuner **\$9.95**

This price buys you a complete new tuner built specifically by **SARKES TARZIAN INC.** for this purpose.

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UHF/VHF Combo **\$15.00.**

In this price all parts are included, tubes, transistors, diodes, and nuvistors are charged extra. This price does not cover mutilated tuners.

Fast efficient service at our conveniently located service centers.

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**Cartridge Television, Inc., manufacturers of Cartrivision video-tape players has filed under the Chapter 11 provision of the Bankruptcy Act, as reported in the Wall Street Journal.** Under Chapter 11, the company continues to operate, while the courts give protection against creditor lawsuits. It is said that problems of introducing their tape-playing system had exhausted company funds. Assets are listed at \$18,629,866, with liabilities of \$29,004,706.

**Sales of electronic organs has exceeded in unit volume the sales of pianos, according to Merchandising Week.** This statement was made by Eddie Osborne, assistant sales manager of the Baldwin Piano and Organ Company, during a speech at the National Association of Music Merchants show held recently. Some models of organs now have built-in tape recorders or players for music instruction purposes; many have multi-channel stereo, mechanically-rotated speakers, or four-channel sound and reverberation.

**Automotive electronics is due for a huge increase in the next few years.** Even now, some of the 1973-model cars have solid-state alternator controls and electronic ignition, plus the more conventional radios and tape players. All 1974 trucks are to have anti-skid braking systems having solid-state controls. The circuit senses skids, and automatically adjusts the braking effect of the individual wheels to stop the skids. Other improvements, according to **Radio & Television Weekly**, are radar speedometers. One advantage is that a single type of radar can be used on all brands and models of cars, because the system does not (like conventional types) depend on the gear ratio of the car. Also, Detroit-manufactured cars for 1974 are to have a seat-belt-interlock system which will prevent starting the engine unless the seat belt is fastened. Integrated circuits are to be used in these control circuits. In the far future, perhaps 1980, cars might be equipped with a central processing unit (a small computer). This could monitor all of the variable engine conditions that affect mileage and emission, and also perhaps perform the functions of obstacle detection and controlled braking. One advantage of such a unit is the possibility a garage could merely plug into the computer and obtain an instantaneous read-out of the condition of the car.

**The government of India hopes within the next seven years to reach their entire countryside** (including the illiterate masses) with messages about birth control, improved agriculture, and health programs by means of television. This ambitious project, reported in **Radio & Television Weekly**, is to be made possible through cooperation of the National Aeronautics and Space Administration, which is to launch a satellite having an equatorial orbit in 1975. Plans call for India to have use of the satellite for six hours per day for one year. After that it is hoped India will have launched her own satellite. Aided by expansion with microwave links and the satellite, it is expected that about 80% of India will have television by 1980.

**Interest in stereo audio for TV is being expressed in the television industry, according to Merchandising Week.** Multi-channel sound also is possible, such as broadcasts in Japan in both English and Japanese. Many problems remain to be solved, and it is believed practical stereo-TV audio is at least three to five years in the future. □



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 From 1/500 to 30  
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## For every electronic protection need **BUSS**® has a quality Fuse and Fuseholder



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HTA Space-Saver Panel-Mounted Fuseholder for ¼ x 1¼ Fuses (solder terminals) also HTA-DD, ⅜" Quick-Connect Terminals and HTA-HH, ¼" Quick-Connect Terminals



HKL Lamp Indicating - Panel - mounted Fuseholder for ¼ x 1¼ Fuses



HMR RF-Shielded Panel-Mounted Fuseholder for ¼ x 1¼ fuses and HMS for ¼ x 1" fuses — Solder or Quick-Connect Terminals



HLD Visual-Indicating Panel-Mounted Fuseholder — for ¼ x 1¼ Fuses — Solder or Quick-Connect Terminals



NEW: BUSS SNAP-LOCK rear panel mounted fuseholder for ¼ x 1¼ fuses — a "snap" to install  
 Ask for BUSS Bulletin SFH-14

The BUSS line of fuseholders is as complete as the BUSS line of fuses, covering all applications.

If you've got a circuit to protect, BUSS has the fuseholder as well as the fuse to protect it.

For more information on the complete line of BUSS fuses, fuseholders, fuseblocks, and fuse clips, write for a free copy of BUSS Bulletin SFB.



BUSSMANN MANUFACTURING  
 a McGraw-Edison Company Division  
 St. Louis, Missouri 63107



## troubleshooting tips

(Continued from page 8)

resistance wire were acting as the turns of a coil. The RF received was lighting the defrost-indicator lamp.

Installation of a .005 ceramic capacitor from the "hot" wire of the defroster to ground cured the incorrect lighting of the lamp.

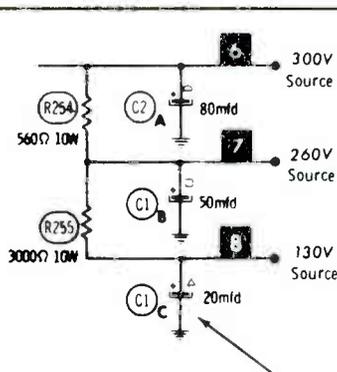
B. G. Dean, CET  
Dyersburg, Tennessee

## Yellow picture on right RCA CTC38 color TV chassis (Photofact 1000-3)

Analysis of the raster made with one color at a time showed there was no blue on the right edge of the raster and no red and green on the left edge.

This is the "color" equivalent of a b-w raster that is dark on one side, and that's usually caused by bad AGC or filter capacitors.

A few quick tests with my scope of the power-supply sources showed horizontal pulses riding on the 130-volt source.



To make a long story short, replacement of C1 cured the problem. C1C apparently was open.

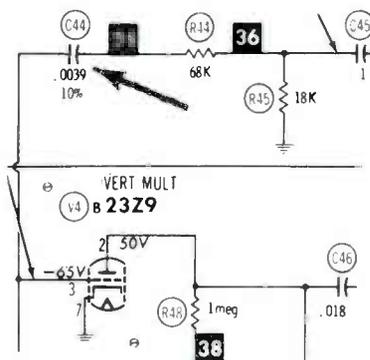
Richard Castanie, CET  
Grand Rapids, Michigan

## Poor linearity Teledyne Packard Bell b-w model 2M321 (Photofact 1315-2)

Severe expansion of the linearity at the top of the picture, and the vertical-hold control adjusted completely to one end to achieve lock-

ing were the two symptoms.

Quite often, such symptoms are caused by defective parts in the positive-feedback path. Therefore, these were checked first. Replacement of C44 cured the two original symptoms, although the use of a paper/mylar capacitor permitted some tendency toward drift of the locking.



Changing C44 to a 3900-pf mica type restored like-new performance.

Thomas O. Ward  
Lutz, Florida

# Fastest gun tester... and rejuvenator... only \$169\*

It's the new RCA WT-333A Television Picture Tube Tester/Rejuvenator that:

- Tests red, blue and green color guns simultaneously with RCA's unique CR III "SIMUL-TEST" 3-meter system.
- Provides new, more effective 3-step rejuvenation function and newly designed "no-delay" G1 shorts removal function.
- Reveals H-K leakage other testers may miss, with special high-voltage surge circuit.
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- Tests over 1800 TV picture tubes — including RCA's new "Precision In-Line" and other in-line types.
- Includes built-in socket plus four socket adapters at no extra charge to cover most of today's picture tubes.

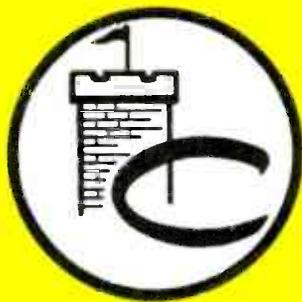
To buy: order the WT-333A from any one of the more than 1,000 Authorized RCA Distributors worldwide. For more information, write RCA Electronic Instruments Headquarters Harrison, N.J. 07029.

\*Optional Distributor Resale Price



# RCA Electronic Instruments

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# The Tuner People

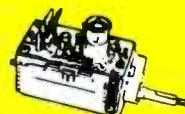
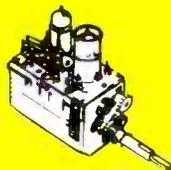
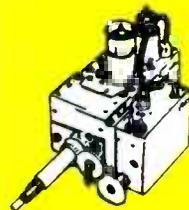
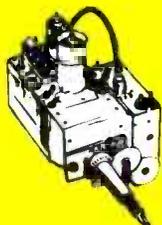
**Pioneers of TV Tuner Overhauling  
Originators of Complete TV Tuner Service**

**Castle offers the following services to solve ALL your television tuner problems.**

## Universal Replacements from \$8.95

These universal replacement tuners are all equipped with memory fine tuning and uhf position with plug input for uhf tuner. They come complete with hardware and component kit to adapt for use in thousands of popular TV receivers.

STOCK No.	HEATERS	SHAFT		I.F. Snd.	PRICE
		Min.*	Max.*		
CR6P	Parallel 6.3v	1 3/4"	3"	41.25	<b>8.95</b>
CR7S	Series 600mA	1 3/4"	3"	41.25	<b>9.50</b>
CR9S	Series 450mA	1 3/4"	3"	41.25	<b>9.50</b>
CR6XL	Parallel 6.3v	2 1/2"	12"	41.25	<b>10.45</b>
CR7XL	Series 600mA	2 1/2"	12"	41.25	<b>11.00</b>
CR9XL	Series 450mA	2 1/2"	12"	41.25	<b>11.00</b>



## Castle Replacements

**\$15.95**

Castle custom replacements made to fit in place of original tuner. Purchase outright . . . no exchange needed. Write for current list of Castle replacements, or request the part number you require (use number on ORIGINAL TUNER ONLY; do not use service literature numbers). Available for many of the popular models of following manufacturers: Admiral, Curtis Mathes, Emerson, GE, Heathkit, Magnavox, Motorola, Muntz, Philco, RCA, Sears, Sylvania, Westinghouse, Zenith and many private labels.

### Tandem uhf-vhf replacements

**NOW \$21.95**

Available in popular models of: Muntz, Olympic, Philco, Sears, Westinghouse and private labels.

## Overhaul Service

**\$9.95**

**This is the service pioneered by Castle! We are now in our third decade of serving the TV Service Industry**

Service on all makes and models, vhf or uhf, including transistor and color tuners . . . one price \$9.95 (does not include tuners older than 10 years). Overhaul includes parts, except tubes and transistors.

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

Dismantle tandem uhf and vhf tuners and send in defective unit only. Remove all accessories . . . or dismantling charge may apply.

## Custom Exchange Service

**\$17.95**

When our inspection reveals that original tuner is unfit for overhaul, and it is not available from our stock of outright replacements, we offer to make a custom replacement on exchange basis. Charge for this service is \$15.95 for uhf tuner and \$17.95 for vhf tuner.

If custom replacement cannot be made we will custom rebuild the original tuner at the exchange replacement price.



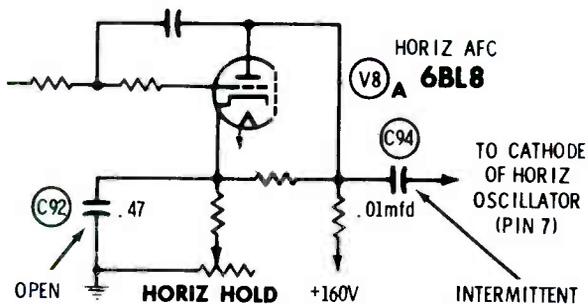
All replacements are new or rebuilt. All prices are f.o.b. our plant. Add shipping and handling of \$1.25 on all prepaid orders. We will ship C.O.D.

## CASTLE TV TUNER SERVICE, INC.

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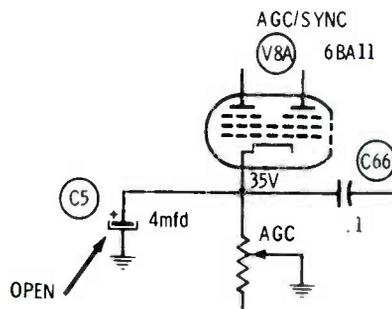
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Chassis—Philco 19QT87  
PHOTOFACT—1026-3



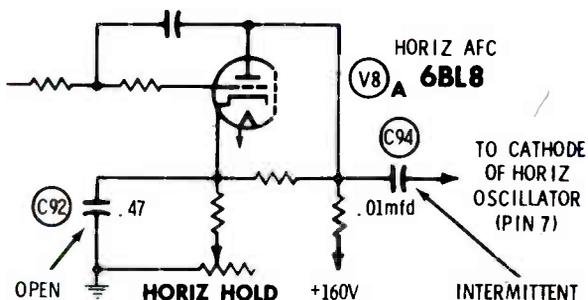
**Symptom**—horizontal pulling, perhaps intermittently  
**Cure**—check C94 for an intermittent open

Chassis—Zenith 20Y1C38  
PHOTOFACT—927-2



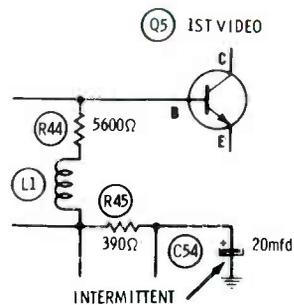
**Symptom**—soft locking, hook at top of picture  
**Cure**—check C5 and replace, if defective

Chassis—Philco 19QT87  
PHOTOFACT—1026-3



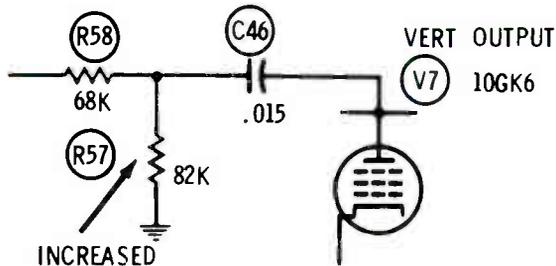
**Symptom**—picture displaced three inches to the right  
**Cure**—check C92 and replace, if open

Chassis—RCA CTC44  
PHOTOFACT—1191-1



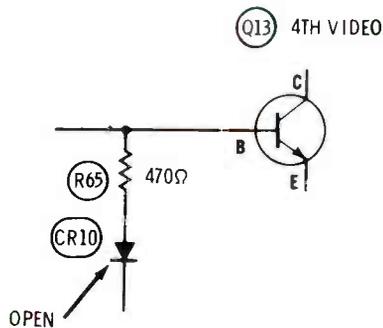
**Symptom**—intermittently-blurred picture  
**Cure**—check C54 and replace, if it is intermittent

Chassis—Zenith b-w 14Z33  
PHOTOFACT—964-3



**Symptom**—vertical won't adjust to 60 Hz  
**Cure**—check R57 for increased value

Chassis—RCA CTC44  
PHOTOFACT—1191-1



**Symptom**—vertical retrace lines, brightness control operates backwards  
**Cure**—check CR10 and replace, if open



## How some tubes are rebuilt.

1. Inspect screen and replace electron gun.
2. Reinstall safety glass.
3. Test tube.

## How our color bright 85<sup>RE</sup> is rebuilt.

1. Completely clean old glass so it gleams like new.
2. Apply new internal and external coating to the bulb.
3. Replace phosphors with Sylvania high-brightness types.
4. As required, install new aperture mask with Sylvania thermal compensation system.
5. Replace electron gun with Sylvania electron gun assembly.
6. Install new implosion protection system.
7. Final test.

Every tube is remanufactured and tested on the same assembly line used for our new color tubes. And that line includes the latest computer-designed improvements in screen exposure optics. In short, when you install a Sylvania *color bright 85RE* picture tube, you are installing a tube that is practically brand new except for the glass. In fact, if we rebuilt it any further, it would be a new tube.

Available at your local Sylvania distributor.  
Sylvania Electronic Components,  
100 First Avenue, Waltham, Mass. 02154

**GTE SYLVANIA**

# KIT OR ASSEMBLED

## Heath color generators are your best buy



Now you can buy Heath's solid-state color bar/pattern generators as kits or factory-assembled & calibrated. Either way you get that famous Heath quality...and the features you want at a price you can afford. These high performance generators provide 12 patterns plus clear raster for purity adjustments: dots, cross hatch, vertical & horizontal bars, color bars and gray scale...in either familiar 9 x 9 or the exclusive Heath 3 x 3 display. Switch-selected RF or Video output on channels two through six. RF output is variable to 50,000 uV for composite signal injection into the receiver antenna input. Video output of more than  $\pm 1$  V p-p is available for composite signal injection behind the video detector. Other features include front panel sync output...4.5 MHz crystal-controlled sound carrier oscillator for sound trap adjustments...red, blue and green grid jacks and shorting switches...two front panel 500 W AC receptacles...crystal-controlled master oscillator and IC logic circuitry for rock-stable operation. Buy your generator in kit form and enjoy maximum savings. Or order it assembled, ready to go to work for you on the bench. Either way you get a versatile, high quality generator...and substantial savings over comparable equipment through Heath's low, direct-to-you prices. Order now...or send for your FREE catalog below.

Kit IG-28, 8 lbs. ....\$79.95\*  
 Factory assembled & calibrated SG-28A,  
 10 lbs. ....\$114.95\*

Heath Company  
 Dept. 180-9  
 Benton Harbor, Michigan 49022

Please send latest Heath catalog.  
 Enclosed is \$ \_\_\_\_\_, plus shipping.  
 Please send model(s) \_\_\_\_\_

Name \_\_\_\_\_  
 Title \_\_\_\_\_  
 Company/Institution \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

\*Mail order prices; F.O.B. factory. TE-288

For More Details Circle (13) on Reply Card

## reader's exchange

Need a not-available schematic? Need an obsolete part? Have an unusual service problem and want help? Send information and full mailing address to ELECTRONIC SERVICING. Other ES readers should send replies with their offer of help direct to the writer. We reserve the right to edit and print all letters sent to this column. Let us help one another.

**Wanted:** school-age pen pals for Korean boys and girls attending high school. Please send name, whether boy or girl, address, age and hobbies to:

Miss Lee, Beom Soon  
 P.O. Box 20, Central  
 Seoul, Korea

**Needed:** Play-mate II model AFP66M AM-FM car radio made in Japan.

Thomas J. Morrison  
 31133 Minton  
 Livonia, Michigan 48150

**Needed:** Power transformer (T801) for a Motorola solid-state TV CH. TS-453, model 19XP32. Motorola #25C65392A01.

Peter J. Golumbas  
 64 Coolidge Street  
 Irvington, New Jersey 07111

**Needed:** Jerrold antenna preamplifier model DSA-132, any shape. State price.

Frank Szwanek TV  
 Box 237  
 Mullen, Nebraska 69152

**Needed:** Service data and transformer for a Longines Symphonette model LCR 511 AM-FM radio.

C. E. Robertson  
 1431 Wicks Road  
 Pasadena, California 91103

**Needed:** Operating manual and data for Mercury 103 tube tester.

Encarnacion Media  
 5938 Bromley Avenue  
 Oakland, California 94621

**Wanted:** Atwater Kent speaker circa 1924.

A. L. Hershberger  
 Box 280  
 Soldatna, Alaska 99669

**Needed:** Operating manuals and schematics for a Hallicrafters S-107 SW receiver, and a Superior Test Instruments Co. model TV-60, 20,000 ohm per volt Allmeter (VOM).

Mike Kocek  
1015 Highland Park Blvd.  
Lorain, Ohio 44052

**Needed:** Schematic and parts list for a Professional model 1070 Geiger counter, made by Precision Radiation Instrument, Inc., Los Angeles, California. A Xerox copy would suffice. Will reimburse for same, plus handling costs.

Glen Mathewson  
217 Ridgeway  
Benton Harbor, Michigan 49022

**Needed:** Service Data for a Teletronics model 18K001, or the address of Teletronics Industries. Letters addressed to Mesquite and Garland, Texas returned by post office.

Nickle Electronics  
158 West Delos Street  
Willcox, Arizona 85643

**Needed:** Replacement power transformer for model S-55 Paco Scope. Either used or new, or information leading to one.

Daykin Radio and TV  
19 Oxford Place  
Geneva, New York 14456

**Needed:** A schematic and manual for a Superior Instruments Company [SICO] model 76 capacitance/resistance bridge and signal tracer.

Jerry L. Yates  
132 Chapel Street  
Greenville, Tennessee 37743

**Needed:** Schematic and parts list for Halldorson "Varivolt Master" No. N-202 bench isolation transformer.

Laurence G. Hotchkiss  
2562 Mountain View Drive  
Escondido, California 92027

**Needed:** Address of the Kaysons International Ltd. who manufactured Raleigh AM-FM stereo machines. This is not the Kaysons International Corp. of New York who do not handle electronics.

Ulster Appliance TV Sales & Service  
95 North Chestnut  
New Paltz, New York 12561

(Continued on page 17)

# KIT OR ASSEMBLED

## Heath audio generators are your best buy

kit only  
**49<sup>95</sup>\***



assembled just  
**74<sup>95</sup>\***

Now you can buy Heath's low distortion audio generators as kits or factory assembled & calibrated. Either way you get famous Heath reliability...and a low cost, high quality bench instrument. Use them as a signal source for bridge and harmonic distortion measurements...as an external modulator for an RF generator...in testing audio amplifiers for gain and response. These high performance generators provide near-perfect sine wave output from 20 Hz to 20 kHz with less than 0.1% distortion. Fast switch-selection of output frequencies from 10 Hz to 100 kHz. Eight output ranges from 0.003 to 10 V full scale into a 10 k ohm load...six ranges from 0.003 to 1 V full scale into a 600 ohm load. Large meter reads out in both voltage and dB, with output meter accuracy of  $\pm 5\%$  with proper termination. Buy this easy to assemble generator in kit form and enjoy maximum savings...or order it factory assembled and calibrated, ready to go to work for you. Either way, you get a versatile, quality piece of equipment...and substantial savings over comparable equipment through Heath's direct-to-you prices. Order now...or send for your FREE catalog below.

Kit IG-72, 8 lbs. .... \$49.95\*  
Factory assembled & calibrated SG-72A,  
9 lbs. .... \$74.95\*

Heath Company  
Dept. 186-9  
Benton Harbor, Michigan 49022

HEATH  
Schlumberger

Please send latest Heath catalog.

Enclosed is \$ \_\_\_\_\_, plus shipping.

Please send model(s) \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Company/Institution \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

\*Mail order prices; F.O.B. factory.

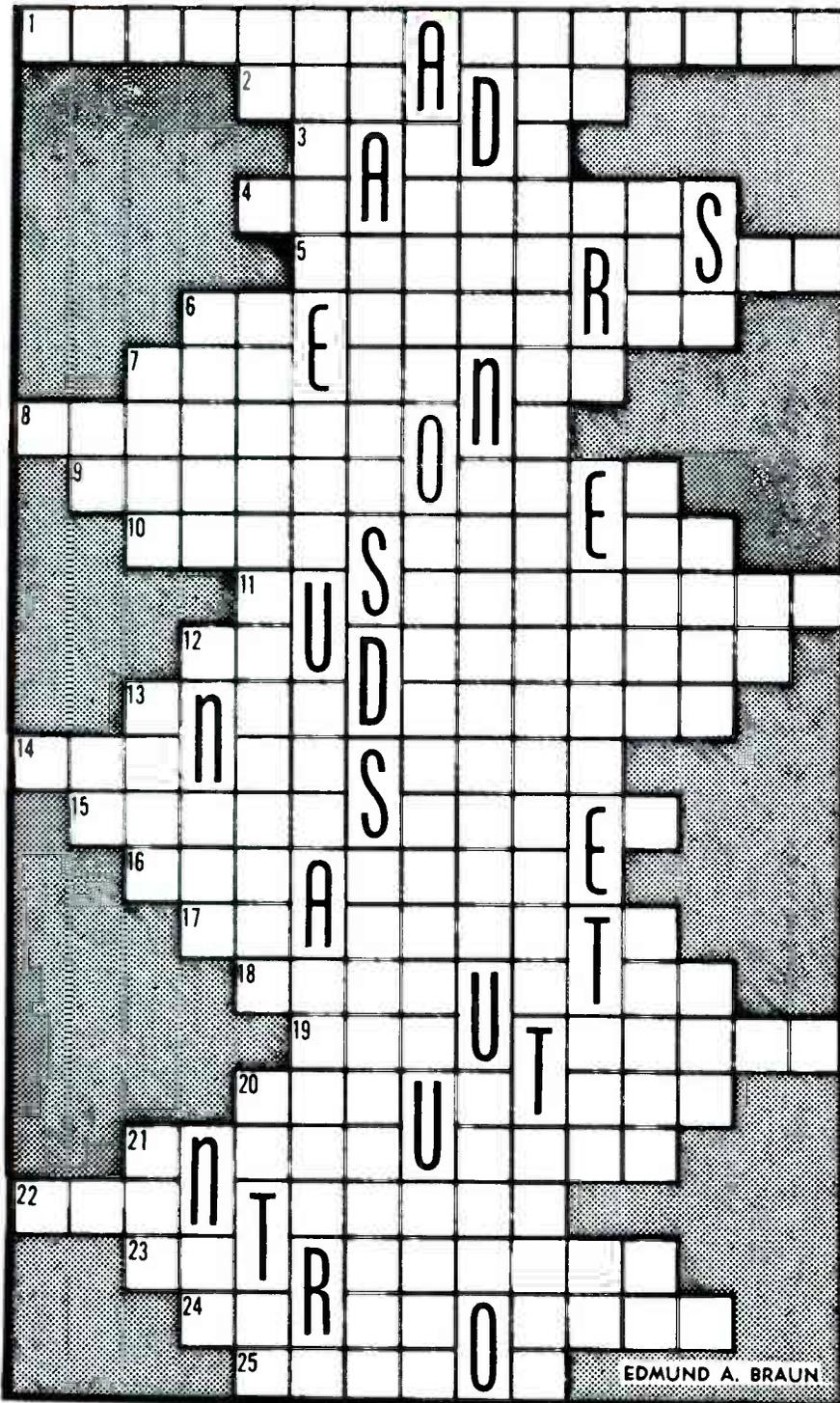
TE-289

For More Details Circle (14) on Reply Card  
September, 1973/ELECTRONIC SERVICING 15

# Watt A Puzzle!

by Edmund A. Braun.

Hi, neighbor! for a change of pace, try solving this Only-across-word Puzzle based on electronic terminology. Each word is connected to the word above and below by a single letter. Each correct answer is worth 4 points; a perfect score is 100. It should prove a fairly easy puzzle except perhaps for someone who thinks that "chrome" is where there's no place like, and that "nutdriver" is screwball motorist! So sharpen your pencil and your wits and GO!



1. Capable of being substituted.
2. Conductive graphite coating used in and on a CRT.
3. Case for carrying stock of vacuum tubes.
4. Type of wire cutters.
5. Magnetic lag when ferromagnetic substance is subjected to varying magnetic field.
6. A non-conducting material.
7. Total opposition a circuit offers to the flow of a.c.
8. An instrument converting sound into electrical waves for transmission.
9. Changes a.c. of one voltage to another.
10. Clear thermoplastic material having excellent insulative qualities.
11. Reciprocal of reactance.
12. Electroacoustic transducer.
13. Pertaining to a carrier transmitted during moments of silence in programs.
14. Non-vacuum electronic devices similar in use to electron tubes.
15. Ceramic-like material containing iron and other elements combined with oxygen.
16. One million changes per second.
17. Special varnished tubing used as insulation.
18. Substance able to transmit electricity.
19. Decorative metal, wood, or other material around knobs, etc.
20. Act by which one conductor sets up a voltage in another body without connection.
21. Device capable of measuring, recording, and/or controlling.
22. Revolving platforms used in recording and playing records.
23. Pertaining to radio waves shorter than 10 meters in wavelength.
24. Perpendicular to the direction of gravity.
25. Color of band on resistor to designate four.

Solution on Page 32.

EDMUND A. BRAUN

## Reader's Exchange

(Continued from page 15)

**Needed:** Operating manual and schematic for a model TW-11 tube tester made by Superior Instrument Company.

Chris C. Lutz  
1294 South Cleveland Avenue  
St. Paul, Minnesota 55116

**Needed:** manual and service literature (or address of manufacturer) for Krohn-Hite function generator model 5600.

Lynn Weigle, CET  
6521 Asbury Lane N.E.  
Cedar Rapids, Iowa 52402

**Needed:** Schematic for a Hickok scope model 670. Also, I have several new 83-type RCA tubes such as used in Hickok tube testers, and some new 6K7 and 6SK7 tubes for old radios.

Jack Smith  
120 Cherry Street  
Montezuma, Georgia 31063

**Needed:** An audio-transformer for a RCA model R-7 or R-9 Superette radio. Also found in GE model S-22.

Lonnie Goodwin  
Martin's TV  
P.O. Box 391  
Wadesboro, North Carolina 28170

**Needed:** Schematic for Precision model E200C signal and marking generator. Will pay or borrow to make copy.

Arthur A. Hall  
603 Glenpark Court  
Nashville, Tennessee 37217

**Needed:** Schematic and operating manual for a Jackson 640 signal generator.

Harry W. Barnes  
9322 North Rancho Verde Drive  
Tucson, Arizona 85704

**Needed:** One Fanon MKC-52 microphone with cable connector.

A. A. Aikin  
Box 771  
Lansing, Michigan 48903

**Needed:** Schematic or manual for Precision E-200-C signal marker generator.

Clyde M. Smith  
Box 46  
Marcy, New York 13403

# KIT OR ASSEMBLED

## Heath bench VTVMs are your best buy



Now you can buy Heath's popular service bench VTVMs as kits or factory-assembled & calibrated. Either way you get famous Heath quality and reliability...and the features you want at a price you can afford. Measures AC & DC voltage from 1.5 to 1500 V full scale in seven ranges...measures AC p-p voltage in seven full scale ranges from 4 V to 4 kV...seven resistance ranges with 10 ohm center scale, x1 to x1 megohm. Other features include single test probe for all measurements...big 6" meter...11 megohm input impedance for minimum loading...25 Hz to 1 MHz response...sturdy gimbal mount for under-bench installation...120/240 VAC operation.

Buy this meter in easy-to-assemble kit form and get maximum savings. Or order it factory assembled and calibrated, ready to go to work for you right out of the box. Either way, you get a high quality, versatile service tool...and enjoy the substantial savings over comparable equipment that Heath's direct-to-you prices provide. Order now...or send for FREE catalog below.

Kit IM-28, 7 lbs. .... \$39.95\*  
Factory assembled & calibrated SM-21A,  
7 lbs. .... \$59.95\*

Heath Company  
Dept. 190-9  
Benton Harbor, Michigan 49022

HEATH

Schlumberger

Please send latest Heath catalog.

Enclosed is \$ \_\_\_\_\_, plus shipping.

Please send model(s) \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

Company/Institution \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

\*Mail order prices; F.O.B. factory. TE-290

For More Details Circle (16) on Reply Card

September, 1973/ELECTRONIC SERVICING 17

# Tips for selling security systems



This could be your sale!

By Treva J. Moon  
and Forest H. Belt

*Selling security systems is quite different from selling appliances. The following suggestions should help you with those security sales.*

A recent survey shows that few electronic service dealers are sharing in the profits from the security boom. And yet your store is the natural outlet for this additional business. Is a hardware, drug store or discount house better equipped than is your store to engineer, install and maintain security-protection systems? Of course not! This extra business is yours for the taking.

Your start in the security field could be made at low cost. If you already have the ladders, drills, and other tools used for antenna installations, and the test equipment to run a radio-TV shop, all you need is some stock to sell, and a few selling tips.

## Selling Peace of Mind

The easiest sales of intrusion and fire alarms are to people who have just experienced a loss. They believed thefts happened only to someone else. Now they know better, and are out shopping.

If they go to professional alarm companies, they are not usually sold **equipment**; they are sold a **service**. Equipment may be merely leased to the customer for a monthly fee that includes upkeep and monitoring. Most cities have at least one company that specializes in alarm monitoring. Sensors on the customer's premises tie, by phone

line, to large monitor boards (Figure 1). The kind of alarm—fire or intrusion—can be identified, and the proper authorities phoned or dispatched. Some security companies have their own special police.

But not everyone can afford the expense of protection by a professional alarm company. So, alarm systems range in size and price all the way down to the purse-sized "wailer" horn (Figure 2).

The in-between area is where you should operate, especially at first, and you can do so without a large investment.

When you plan security systems, remember that alarms producing noise and light are the ones most likely to cause the burglar to leave hastily without the loot. Silent systems that signal the police or a security office help catch more thieves, but many escape with the booty because of the inevitable time delay between tripping the alarm and the arrival of police.

## Types Of Intrusion Detection

There are three basic types of intrusion alarm: electromechanical (sometimes called **perimeter** systems), photoelectric, and ultrasonic or RF.

### Perimeter alarms

Perimeter alarms are the most time-consuming to install, but give versatile protection. Figure 3 shows a sample on display. A central control box, with an external bell or siren, connects to switches at

windows, doors, vents, and all other openings. A fail-safe unit operates the unit from DC in case power fails or lines are cut.

Heat or smoke sensors for fire warning easily can be added, although ideally the alarm (bell, etc.) should be different from that for intrusion. Some systems include "panic" buttons which the customer pushes to alert a monitor company of trouble. A delay switch, another accessory, minimizes false alarms. You can offer the homeowner these add-ons even if you didn't sell the main unit.

### Photoelectric alarms

More costly, but simpler to install, are photoelectric systems. Each unit covers an entryway, so protection of an entire building perimeter requires several units. A light source shines on a photocell sensor. When the beam is interrupted, photocell resistance increases, setting off the alarm. Modern near-invisible infrared light sources make these units hard to spot or fool. Mirrors can enable a unit to cover more than one opening.

### Ultrasonic alarms

Quickest to install, but costliest of the three, are devices that use ultrasonic or RF waves. Solid-state systems fit both transmitter and receiver into a single box. Some are small enough to take along on a trip for portable protection. The ultrasonic or RF energy fills the area surrounding the "box." Move-



Fig. 1 Banks of monitor terminals connect by leased phone lines to fire and intrusion alarm systems located at customers' premises. Only professional alarm companies offer services like this.



Fig. 2 Canned-air wailer fits into purse. Though not electronic, this is part of the security and protection merchandise you can sell.

ment of any intruder, even a pet, causes doppler variations that trigger the alarm. These models are very sensitive. Without proper adjustment, they are easily triggered into false alarms.

#### Telephone systems

A customer may ask for "direct dial." He wants his alarm to "call" the police. A **taped** voice tells the police operator that something or someone has triggered an alarm at such-and-so address. Phone calls like this draw a low-priority response from most police or fire departments. Too many of such alarms prove false. Direct-dialing alarms have been outlawed in some localities. But the system could dial a cooperating neighbor, a telephone answering service, or a security company. A professional security outfit might dispatch its own investigators before calling police or firemen. (Cooperation between alarm companies and police is directly responsible for a reduction of crime in many areas.)

A silent system like this, if it's monitored, results in more thieves caught in action rather than merely chased away. An unoccupied building is best protected by a silent system because there's no one to respond to the bell ringing, siren wailing, or horn blowing. In residential areas, a noisy alarm wakes the neighbors, and they can call the police or fire department. However,

an unmonitored direct-dial system could be deactivated by cutting the phone line.

#### Window Signs

Incidentally, once your customer goes to the expense and effort of an intrusion system, tell him to say so with window signs or stickers (Figure 4). Some claim this merely marks where the goodies can be found. Experience proves otherwise. With dozens of places **not** wired for detection, why chance one that might be?

One dealer relates this experience: Twice he had a stereo and a CB transceiver taken from his car. He then put an alarm sticker on one car window. Nothing more was taken, even though it was six months before an alarm was actually installed. Another employee parked his car near by and it was stripped of everything that would come loose. **Theft is a crime of opportunity. Stack the odds, even psychologically, and you may thwart the crime.**

#### You, Selling Alarms

If you've decided to add intrusion and fire warning systems in your store, do you need any special qualifications? With your electronic background, you can figure out how to assemble and wire any ordinary system. With a little study—not much—you can learn to adjust and set up ultrasonic de-



Fig. 3 Demonstration boards help customers to select sensing systems of their own.



Fig. 4 Labels contribute to protection, although some "experts" claim they don't. No sensible thief tackles a rigged car or home when dozens of others around are clean and so easy to take.



Fig. 5 Some plug-in protection systems come already packaged and are extremely simple for the customer to set up. Sales on equipment like this involve little of the responsibility installations entail.



Fig. 6 Revolving sign does excellent marketing job for this electronics chain store. Same thing or an attractive window display does as much for any electronics dealer.



Fig. 7 Package displays from manufacturers increase impulse buying of alarm system accessories. With a bit of imagination, you can dream up tricky "live" displays that attract customers (be sure you use sounders that don't disrupt the neighborhood).



Fig. 8 Closed-circuit television comes under the heading of intrusion protection. A display in your own store makes an effective sales demonstration. Aim the camera at some remote part of your store, and use it for your own surveillance as well as for a selling tool.

tectors. A little more training can qualify you to troubleshoot and repair them.

There have been, and will be, attempts to license people who install alarm systems (no worse than licensing television technicians). Fire laws require careful compliance in some towns, although the ordinances are not necessarily very restrictive.

Training? So far the only instruc-

tion available comes from people who have experience in the business. Or, some instructions may be packed with the merchandise. Some manufacturers occasionally sponsor seminars, such as one held by Mallory at a recent JESUP (Joint Electronic Service Upgrading Program) meeting.

You don't have to get involved in the installing and servicing. You can sell prepackaged units (Figure

5) that come complete with explicit directions for assembly and installation. The customer does that job himself. All responsibility for performance is his, barring manufacturers' defects of course. Some manufacturers have the customer send defective units directly to them for repairs, so you are not required to service them.

Be selective in the brands of merchandise you buy, because there

are now over a hundred manufacturers of security products. As you might assume, not all of these products are efficient, safe and dependable. Your customer will blame you, if the devices he purchases turn out to be duds. Avoid models that are prone to false alarms, or ones that can be spotted easily by the burglars. They're a poor investment both for you and for your customer. Insist that all merchandise carry the Underwriters Laboratories seal.

### Sales Techniques That Work

Newcasts and newspapers do part of your advertising for you. They tell daily of crimes that profit the thief who goes undetected.

The recently-victimized customer probably looks first in the telephone Yellow Pages, so make sure your security ad is there. When you advertise in the newspaper, include that you also sell home alarm systems. An attention-grabber used effectively by one dealer is a revolving sign (Figure 6) out front. You could mount a working display inside a front window.

Often the customer has already talked to a professional alarm company before he comes into your store. He's decided the cost is too great for what he wants to protect. When he comes to you, he's **ready** to buy. The size of your sale relates directly to how well you display the merchandise. Many manufacturers

supply alarms and accessories on their own display rack (Figure 7).

You can always expand your display more imaginatively. For instance, set up a display that the customer triggers when he walks by. A lighted sign swings up and tells the "intruder" what he has done. Explain the mechanics of the system then. Hook up a fire or smoke sensor and let a sign invite the customer to "try it out." You can come up with a dozen ideas like this to promote alarm sales.

Install security equipment to protect the premises of your own business. Mention this fact, or show the prospect some of the components, as a very effective sales point.

Don't scatter system components all over the store. Everything relating to alarms and their installation should be together, the way you display a stereo system. The employee trying to fill an order in one store we visited spent more time hunting and gathering than it took to "design" the customer's system. He did well to sell the basic system; there was no hope for an expanded sale.

Learn all the basic advantages and limitations of each type of security protection. Then teach each of your employees enough of these fundamentals that he can carry on when you are not present.

Don't wait for walk-in traffic. Perhaps you could offer incentives for your technicians to sell security systems in the course of making service calls on TV or radio receivers.

Question the customer carefully to determine his security needs. Here are some things to be considered:

- is the protection for a motorbike, automobile or travel trailer?
- if the system is for a building, is there just one, or a group?
- what is the construction of the building, brick or frame?
- is the protection for a leased apartment?

• are all rooms and access openings to be protected, or just some?

• would a wireless system be preferable?

• does the neighborhood require a silent or a noise alarm?

• if used in a store, would a television closed-circuit system (Figure 8) give adequate surveillance?

Customers who want to install their own alarms need some simple instructions. For example, most false alarms in amateur-installed equipment are caused by poor connections. One dealer I know shows his customers how to make solid connections without soldering.

If the unit is a plug-in type, use every opportunity to demonstrate it in the customer's home. This plan usually gives excellent sales results.

Some customers might want to rent ultrasonic-type units. This is a good way to expose the customer to your other components. But don't count too much on changing rentals into sales at a later date.

### Sell Fire Sensors

Most people shopping for an alarm system are interested primarily in burglar protection. Tell them how easily and cheaply they can add sensors to sound the alarm in case of fire. Both you and your customers gain from these additions.

### Undecided About Security

Are you still not convinced you should sell security systems? Then think about "impulse buying", which is probably the most potent profit-maker of the discounter. A customer enters a store intending to buy one certain item. Something seen or heard there convinces him to buy other things. So, **you could profit both ways.** From security buyers reminded of a TV that needs repair, or from a customer buying radio batteries, who decides to buy a security system. □



"Installed a closed circuit TV system—right?"

# How to successfully meet



*There's much more to meeting competition than underpricing, or by spending more for advertising.*

By Robert G. Amick

A businessman without competition is rare, indeed. And he's probably not as lucky as you might imagine. Fair competition keeps you sharpened in your skills, alert and aggressive in your search for business, and more careful in your management of the business.

Nevertheless, competition brings its own special set of dangers, which can hurt you if you get careless.

Meeting competition is a constant concern of most small businessmen. Some must struggle merely to survive. Others find their growth plans blocked unless they find a way to neutralize aggressive competition. In any case, the stakes are high, and the outcome is vital.

If competition is squeezing you hard, and there's a question about your survival, you need to streamline, simplify and rush your plan of action. Give your competition time and he'll get stronger while he slowly bleeds you of the resources you need to fight back. Your battle plan must be short-term, with a goal of quick results.

Actually, your competitive planning should have started the minute the competition first developed.

## Setting a Competitive Policy

You must choose the points on which you'll compete, and by what methods. That's tactical initiative. Pick the points most favorable to you, use the best weapons you have, and make the most of every possible advantage. If you let the other fellow set the conditions, he'll choose the ones most favorable to him.

First of all, you need accurate

information about your own strengths and weaknesses, data about your opponent and the general conditions of the common market you share. You need to know where he's hurting you, and why.

Is he squeezing you because he has more to offer, or are you helping him take you by your weaknesses and inaction? You also need to know where he is vulnerable.

I know of one analysis which only turned up one important fact: Jim wasn't losing business to Bill, he was forcing it on him! Jim was overpricing, cutting corners on quality, and not keeping his promises to the customers. Bill was getting Jim's unsatisfied customers.

Bill was the Johnny-come-lately, which normally would have placed him at a disadvantage. But Jim had been "top dog" so long he had become a "fat cat".

## Pricing

Are your prices fair to both you and your customers? Do they leave you a safe margin of profit? Do you keep expenses and losses down to give increased efficiency? Do you actually know your cost of doing business?

## Service

Do you really give good service? Or just patch things? A "fixer" might install a new tube that restored a mediocre picture. A real technician would have checked for tubes about to fail, adjusted the focus and centering, and cleaned the outside of the picture tube screen. Sure, some of these extras might inflate the bill, but the price will be forgotten long before the memory of the poor repair.

## Quality of Repairs

Is your workmanship of a high quality? Are your callbacks rare because you use dependable, first-rate tubes and parts? Do you ever turn down repairs on a set that has

been so butchered you know there is no chance it will continue to work?

Allowing the receiver to "cook" during a timetest before delivery, and better communications between outside men and bench men are two suggestions for improving the quality of repairs.

## Specialization

Confining your repairs to a certain brand, or class of product might be a very smart move, if there are enough of those machines in your area to keep you busy. I know many men who specialize only in b-w and color receivers. Others won't touch anything but color sets of certain brands.

On the other hand, narrow specialization might be all wrong for your market area. If you service only TV's or expensive-type stereo machines, it's very possible for your wily competitor to "get his foot in the door" by offering to repair an antique radio, a child's portable phonograph, or some other product you consider not worth the effort. Naturally, you can't build a second business on one microwave oven, three garage-door openers and two burglar alarms. But you certainly can lose a lot of radio/TV business by refusing to repair them.



# competition

## Expanding Your Business Area

Because of your good reputation and effective small-area advertising, the people living in your area might be giving you substantial amounts of business. But, maybe your competitor is enjoying an equal degree of success. Perhaps you should attempt to get new business beyond the present fringes of your operating area.

## Personnel

Inevitably, you must examine yourself and your employees and compare them against the owner and employees of your competitors. It's the **people** who actually make a business prosper or fail. Rate them on technical skill, customer relations, and morale. If the competition rates better than your crew, you'd better make some changes.

## Comments From Mutual Customers

Although it's not considered good business practice to "put down" a competitor, there's nothing wrong with listening to any comments made by a customer whose machine previously was worked on by the competitor. Even by discounting a large part as being "sour grapes", you're likely to learn a great deal about the competitor and his methods of doing business.

Did he refuse to give any priority to an invalid? Does he argue if asked to make a callback? Does he refuse to give estimates? Be a good listener and you'll learn many valuable things.

## After You've Analyzed

After you've analyzed both your operation and that of the competition, it's time to decide on needed changes. You can compete on any or all of these grounds: price, service, quality, specialization and market coverage.

## Price competition

Sometimes it's necessary to com-

pete on the basis of price alone. But it's dangerous for the small operator. If you're really overpriced, then you can take a reduction. But you **must not** reduce your profit margin down to an unsafe amount. Underpricing can make you vulnerable because you're accruing reserves too slowly.

## Improving service

Performing your service better and quicker is one of the best ways to improve your reputation. This is where your employees become more important. You can radio-dispatch your trucks to speed up the service cycle. Or you can load down your test bench with sophisticated expensive test equipment. Your people use these things in rendering service, but **they** do the serving, not the machinery. Given good tools and the inspiration to use them efficiently, your people will do the job right.

Although some efforts to give better service might be costly, others cost nothing except the consideration to bend the rules for a customer in unusual trouble. I remember the case of a neighbor, the wife of a traveling man, whose garage-door opener jammed an hour or so after her husband left town for the week. She had

children to take to school, an appointment with her hairdresser and a number of other errands. But her car was locked in the garage. She called her regular TV-service shop and was told no one could be there before the next day. She nearly panicked. When I arrived home that noon, she desperately asked me for help. I showed her the emergency-release cable, and even located the loose setscrew on the drive pulley. Of course, the service shop could not have diagnosed the trouble over the phone, but they could have described to her how to get the car out. Needless to say, she didn't ever call that shop again.

## Quality competition

A set that works like new following repairs, and stays fixed for a reasonable amount of time is a part of quality competition. A chassis that is picked up on time, and delivered on time is quality competition. A set that is returned clean, without new nicks or scratches, is a quality job. Quality is a relative term, so be sure the quality of your service is better than that of the competitor.

## A Time For Action

You've examined the market both you and your competitor want.



"He's the only TV repairman in town."

"In compliance with the FCC's latest fairness doctrine, a representative from 'Toby's Fix It Shop' must be allowed equal time to work on your set."



"Your competitor down the street couldn't fix it after my husband fixed it either."

You know both your strengths and weaknesses. You know how to conduct the battle so it favors you, with the weapons you have chosen.

Make these decisions the theme of your ads and promotions. And, hopefully, they will appear to your customers to be your strong points.

We've talked about advertising

earlier in other articles. But don't think a tremendous amount of advertising will automatically do the job. There might be a small amount of value to a dozen ads that miss your chosen target; but it won't equal **one** really **effective** ad.

Continually emphasize good customer relations. You can't buy

with money the reputation you can get by making an extra effort to fix the TV for a shut-in, or even helping a lady motorist change a flat tire.

Remember, it's almost impossible to beat a combination of technical competence, fair prices, fast service and a public-relations image of being a good guy. □



## Zo-o-o-m-m-m

First in the race. Raytheon put together the car. You drove it to top money in the big '72 season. It's a money-making team that started with your switch to Raytheon, the largest independent tube supplier. We know the competition is rough. As an independent serviceman, you can't waste time and money on call backs or pit stops. So, Raytheon builds to beat the competition. You drive hard for first place. And we're going for the trophy again this year. Together.

For More Details Circle (8) on Reply Card

# "PEOPLE STILL HAVE THE YELLOW PAGES OPEN TO MY AD WHEN I ARRIVE TO FIX THEIR SETS."

William Early, Aida T.V. Sales & Service, Washington, D.C.



"We try to service calls within an hour of receiving them," stressed Mr. Early. "To achieve this, we have a serviceman on the street at all times. Quite often when he arrives, the Yellow Pages will still be open, with my ad right there.

The most frequent call we get is for a set with a loss of picture. It could be a fuse, the picture tube, the high voltage transformer, or a faulty condenser. We do all repairs here, where we have the equipment.

A year after I started this business, I went into the Yellow Pages. Why? Where else could I get this much exposure for the money? I usually ask people how they found me. Sixty percent of my customers still say, 'In the Yellow Pages.'"



**3 OUT OF 4 PROSPECTS LET THEIR FINGERS DO THE WALKING.**

# News from the CES show



Fig. 1

*At the Consumer Electronics Show (CES) displays were set up by the electronics manufacturers. Attending the show to look over the new products, and also attempting to spot industry trends, were retailers and buyers from the parts distributors. Because it is also important to the technicians who shortly will be working on the new machines, we are presenting some of the highlights and interesting items found at the show.*

By Carl Babcoke



Fig. 2

Optimism was the prevailing mood of the CES show held recently in Chicago. Profits and sales of most of the manufacturers had been excellent for the first quarter of 1973. The dealers appeared to expect a very good fall and winter selling season. But, at the same time they appeared a little cautious and selective about the types of merchandise they purchased. Also, they asked penetrating questions about the kinds of support offered by the manufacturers, such as sales training, adequate margins of markup and warranties.

To illustrate the interest in the show, more than 22,000 dealers attended the first day. About 400 manufacturers operated exhibits.

## New And Interesting

Our roving correspondent brought back hundreds of pictures and dozens of press kits giving the sales stories of many of the products that were displayed. Because this was a sales convention, many technical details are missing. Perhaps we can cover some of them in articles later on.

Lack of space limits the news we can give you about these products, but we'll try to cover the ones that were the most unique.

## Radio in a mug

An AM radio disguised as a mug was offered by Panasonic as their Model R-63 Music Mug. It has a 2-1/4" speaker, earphone jack and earphone (Figure 1).

## Radio earphones

The Mura Corporation demonstrated their latest model of AM headsets. Available in red, blue, yellow or gray, their model RH-02 (Figure 2) has built-in a six-transistor radio, two 3-inch transducers and a 9-volt battery.

## Funnygraph phonographs

No, it's not a waffle iron, but a portable phonograph! The Panasonic model SG-200A (Figure 3) has no tone arm. Auto-Play starts the record spinning when the lid is flipped down. Record-size indicator automatically selects either 33 or 45 RPM playing speed. There is a ceramic cartridge with sapphire stylus, solid-state amplifier and a built-in carrying handle. It can be operated either on AC or internal batteries.

## Floating dials

In this model RC-6500 AM-FM clock radio by Panasonic, the clock hands and the radio pointer appear to be floating in air without visible support (Figure 4). All of the regular alarm and radio features are included.

## Portable electronic organ

GTR Products presented this model Orgatron 1 (Figure 5). It weighs less than three pounds and operates on six "C"-cell batteries. Playing melody notes only, the battery life is extended because no current is drawn until a key is depressed. Four musical voices, horn, brass, reed, and flute are produced by the 17-note keyboard. Vibrato and a volume control also are provided.



Fig. 3



Fig. 4



Fig. 7



Fig. 5



Fig. 8



Fig. 9



Fig. 6

#### In-dash cassette

This year, the industry trend is towards in-dash mounting of cassette and 8-track machines. Not only are such installations more attractive, but they eliminate most of the danger from loss by theft.

Pictured in Figure 6 is the Tenna Corporation model TC-112-CMX AM/FM, FM-stereo and cassette which comes equipped with trim plate and adjustable shafts to fit most dashes.

#### Auto-reversing cassette

The most unique feature of the Hitachi model CS-200 stereo-cassette player (Figure 7) is that the tape direction and head positioning are reversed at either end of the tape. This eliminates one of the inconveniences of cassettes because manual flipping of the cassette is not necessary.

#### Dolbyized cassette recorder

Cassette players and player/recorders must be very popular with music lovers, according to the number of models on display.

This Sanyo model RD350 (Figure 8) is a top-of-the-line model with Dolby noise-suppression circuitry, super-ferrite heads and dual VU meters.

#### Telephone-answering recorder

The Metrotec Electronics company apparently is aiming for both home and business sales of their Phone Butler 1000 (Figure 9) because the price is under \$100. The Phone Butler is factory adjusted to answer after three rings, and can record up to 30 messages on the cassette. After a message has been taped, a "Message Waiting" light is illuminated. The machine also can act as an electronic bulletin board, as well as being operated as a normal tape recorder, using the built-in condenser microphone.

#### Matrixed 4-channel adapter

A high degree of interest was expressed for four-channel sound. Most of the new machines had provision for either matrixed or discrete sound; some were equipped for both.

For those who want to update older equipment, BSR presented their Metrotec (Figure 10) quasi-quad adapter. The adapter is to be connected to the speaker terminals of any 2-channel stereo, and comes complete with two rear-channel speakers.

#### Scope for 4-channel

As a step towards 4-channel sound perfection, Panasonic introduced their Technics model SH3433 AFD scope (Figure 11). As shown in the picture, an equal-amplitude unmixed signal in each of the four channels produces an "X" pattern on the scope. It can be used with both discrete and matrixed stereo.

#### Record changer with discrete demodulator

Panasonic also demonstrated their model SL-701 (Figure 12) record changer which has a semiconductor cartridge and a built-in demodulator for the CD-4 system of 4-channel stereo on discs. In addition to DC-4 discs, the machine also plays 2-channel stereo and monaural records at 33, 45 or 78



Fig. 10



Fig. 11



Fig. 12

RPM. A Radar-Eye lights when CD-4 discrete discs are being played.

#### TV shows on discs

The young lady is about to change the program (Figure 13) by placing another video disc on her MCA Disco-Vision machine which is connected to the antenna terminals of the TV receiver. The playback unit has an optical unit using a low-powered helium-neon laser beam. There is no physical contact with the disc. The company expects to market the player unit for less than \$400, with the video discs priced between \$1.99 and \$9.95.

#### Hidden antenna

Zenith has eliminated the "whip" antenna for FM reception (Figure 14) by using a flat copper-foil loop printed on a plastic base. The antenna is called a "Wave-Sensor", and it's hidden above a conical sound deflector used to disperse the sound in a full circle. It is said the efficiency is higher than that of a whip, which is vertically polarized.

#### B-W Television

Although b-w television sales are not spectacular compared to that of the more glamorous color receivers, they are a steady source of profit for most dealers. The trend is toward the smaller-screen solid-state models. Some popular ones operated on 12-volts DC as well.

One example of b-w in a multiple-use instrument is found in the RCA model AS059 (Figure 15). The machine has b-w TV, AM—FM radio and a digital alarm clock.

#### Admiral Color

The combination color receiver shown in Figure 16 is the Admiral Tara (SLS5751), which incorporates the SS1000 solid-state chassis having nine color-coded modules. Electronic remote control gives instantaneous channel changes, and the channel numbers appear as digital read-outs on the control panel. This model also includes a radio and a tape player.

*(Continued on page 30)*



Fig. 15



Fig. 16



Fig. 13



Fig. 14



Fig. 17



Fig. 19

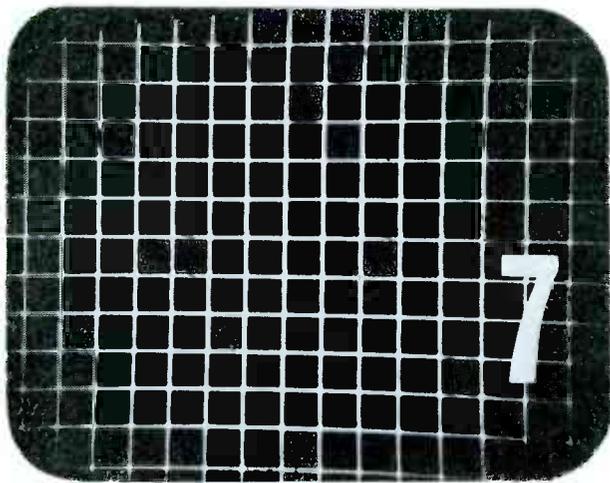


Fig. 18



Fig. 20

### Motorola Color

This 21-inch Quasar Motorola (Figure 17) is color TV model WT6106KK. Extra cost options are book-shelf chests that match the Mediterranean-styled cabinet of the TV. These furniture modules can be stacked vertically or horizontally to accommodate books, record players, or other items.

### Sharp Color

A huge channel number displayed with the picture (Figure 18) is one feature of the model C1933 Sharp color set. When the channel is selected by the remote control, the channel number is displayed on the screen for about 1.2 seconds;

then it fades away. If you want to see the number again, just press the "Electronic Channel Display" button on the remote.

### Magnavox Tune-To-Light

Available in seven of Magnavox's 25" console models is the Digital Remote Tuner, called Tune-To-Light. In addition to the usual remote functions of channel change, volume, and on/off, there is on the remote box a button marked "mute". When depressed, the button circuitry eliminates the sound for a period of one minute. Sound can be restored sooner than the minute by depressing the mute button a second time.

As each channel is tuned, the channel number is displayed (Figure 19) in large, bright digital numbers. After a few seconds the brightness of the digital numbers decreases to an unobtrusive level.

### Zenith Color

Near the top of the Zenith line is this set having a modernistic walnut cabinet with a high-gloss shell-white pedestal mounting (Figure 20). Inside is a Titan-200 solid-state chassis, with an electronic remote control system that permits automatic selection of up to 14 pre-tuned channels in any combination of UHF or VHF. □

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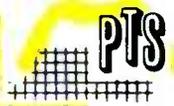
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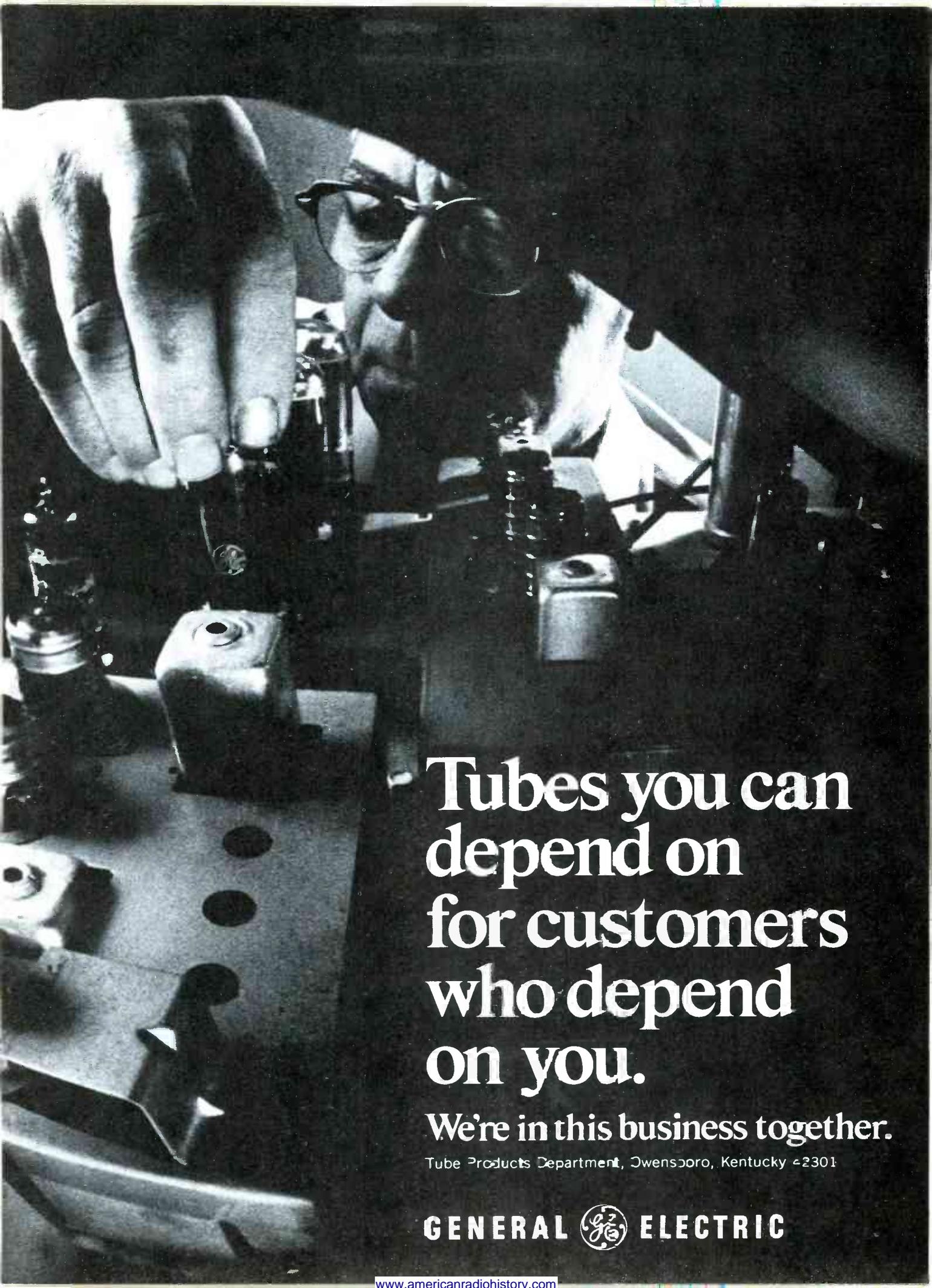
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**GENERAL  ELECTRIC**

# New from Zenith... a voltage-regulating transformer



By Robert L. Goodman

*Low-line-voltage "brownouts" make the picture small. High line voltage causes component failures in TV receivers. Zenith's answer to these problems is a power transformer that regulates the AC voltage.*

Imagine that you're reading the evening newspaper while occasionally glancing at the program on your TV screen. Suddenly a voltage "brown-out" occurs. Your reading lamp dims so much you can hardly

read the paper. You glance at the TV screen expecting the picture to be missing, or at least to be about half size. But, surprisingly, there is no noticeable change of the picture. It's bright, well focussed, and has full height and width!

This imaginary scene could be a reality, if the TV receiver happens to be one of certain Zenith solid-state color receivers.

Zenith has combined both old and new ideas to introduce a power transformer regulating all of the AC voltages that feed the voltage supplies.

Of course, some types of regulation are not new. In color receivers, the high voltage has been regulated for many years. Newer models often regulate certain of the low-voltage supplies.

Even line-voltage regulators are not completely new. For many years, external transformers providing regulated 117 volts of either

square or sine waveforms have been available. However, these regulators were seldom used because they were large, heavy, hot and expensive.

Our story will describe how Zenith has gotten around the previous drawbacks, and also the differences of techniques necessary in troubleshooting this power supply circuit.

At this time, the new voltage-regulating transformer (VRT) has been used in the 1973 Zenith 25DC56 chassis, and is in all Zenith solid-state 1974 models, including the 25EC58 chassis.

## How The Regulation Works

Briefly stated, AC voltage regulation is accomplished by using a power transformer having loosely-coupled windings, and designed to go into core saturation at a very low primary voltage. Input voltages above this minimum do not raise the output voltages. In other words, the output is a square wave made by clipping a sine wave. Sounds easy, but it must be done correctly, otherwise the result would be a transformer giving poor regulation and having excessive heat.

Figure 1 shows the schematic of the entire power supply. More wiring is shown than is needed to explain the voltage regulation feature, but other parts will be used later for troubleshooting tips.

Only **one** extra power-supply component is used. That's C248, the 3.5-mfd, 450-VAC oil-filled capacitor which is connected in parallel with the total secondary of the power transformer, T205. **This capacitor and the special design of the transformer account for the voltage regulation.**

Proof of the regulation is shown by the waveforms of Figure 2. In each dual-trace waveform, the upper trace is the input line voltage; while the bottom trace is the waveform across C248. When the input voltage was reduced from

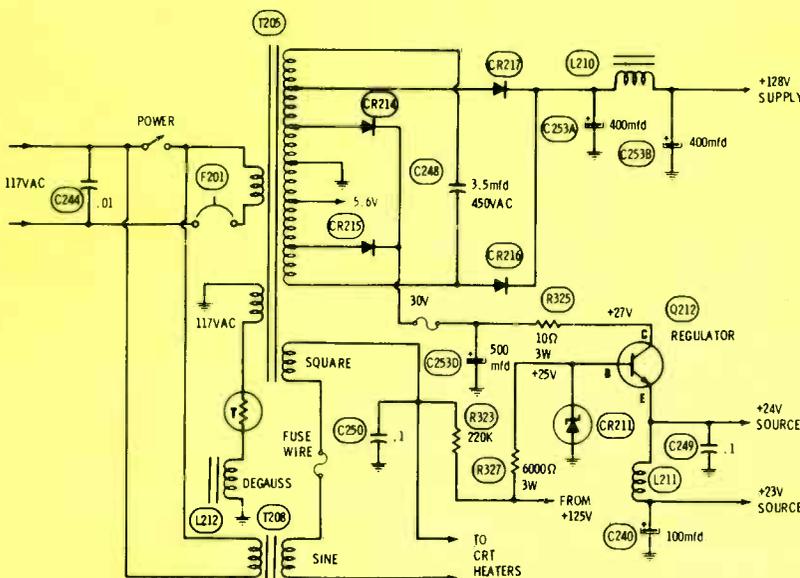


Fig. 1 Complete schematic of the power supply of the Zenith 25DC56 color TV chassis. T205 and C248 regulate the secondary voltages.

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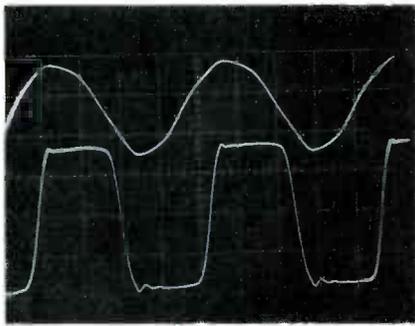
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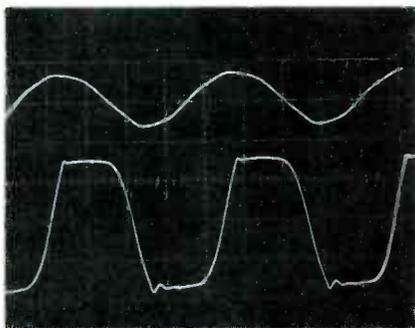
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Fig. 2 The near-square voltage across C248 changes very little with large variations of the primary voltage of T205.



(A) Normal 120-volts primary voltage is the trace at the top. Bottom trace shows the normal voltage and waveform at the secondary of T205.



(B) Top trace is only 60 volts applied to the primary of T205. Bottom trace shows nearly the same voltage and waveform as when the primary voltage was normal.

120 volts RMS to 60 volts RMS, the secondary voltage decreased very little, perhaps 10%. Also, the waveform at the secondary changed very slightly, tending to become more like a sine wave at the lower primary voltage.

Several facts can be inferred from these waveforms. Because the secondary waveform remained essentially square at the low primary voltage, we can assume that core saturation occurs at less than 60 volts. The other assumption is that the tuning (filtering, or resonance) effect of C248 is not very large. Because, if the "Q" of the tuned circuit (C248 and T205 in parallel) were a high value, the secondary voltage would approach a sine wave. It is not; therefore, we must say that most of the regulation is accomplished by the transformer,

not the capacitor. Why, then, is the capacitor included?

#### Functions of the capacitor

Here are some of the things C248 does in the circuit:

- increases the secondary voltage about 20%;
- eliminates nearly all the high-frequency transients entering through the AC line; and
- removes most of the transients of the square-wave switching, thus rounding the corners of the square waves.

Elimination of the AC-line transients greatly reduces the failure of the solid state components. Remember that they are very susceptible to transient over-voltages.

#### The regulating transformer

A VTR does not have the same appearance (it's taller and slimmer) as a more conventional transformer. First of all, it has less iron in the core (to cause the needed saturation). Next, the primary winding is around one of the legs of the "E" core, and the secondary is around the opposite leg. This is in contrast with a conventional transformer which has all windings around the center leg to provide the tightest possible coupling.

Because of the desired core saturation, the VRT's operate perhaps 20-degrees warmer than do conventional transformers. This does not make the transformers likely to burn out, because the wire has a new-type coating which is not affected by the higher temperatures. Hint: don't mistakenly judge a VRT to be defective merely be-



Fig. 3 Operation of one receiver at about 55 volts produced a nearly-normal picture. There was a slight loss of width on the left.

cause of its operating temperature.

#### Normal Set Operation

One of the demonstrations Zenith sales people do is to show that there is no noticeable difference in the picture as the line voltage to the receiver is varied from 130 volts down to 70 volts. Under the same line-voltage conditions, the +128 volt supply only decreases 4 or 5 volts; a very good performance.

Also, individual sets often will operate at even lower line voltages. When the line voltage was only about 55, the picture shown by one receiver was only slightly reduced (Figure 3). In fact, the same receiver still had a picture when the line voltage was less than 50 volts (Figure 4), but the filtering effect of the 24-volt regulator transistor had been lost, causing huge hum bars across the small picture.

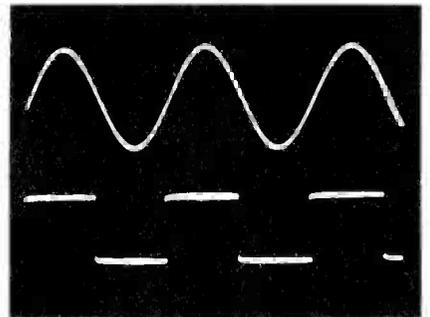
#### Fast CRT Warmup

During normal TV reception, the heaters of the color picture tube are supplied with about 6 volts RMS of square waves from a regulated heater winding of T205 (see Figure 1). Now the voltage from T205 is slightly higher than 6 volts, but there is some voltage drop across the winding of the standby transformer (T208) which is in series.

At this time, T208 is not energized because the primary is connected in parallel with the on/off switch, which is now closed (shorted).

Different basic types of meters give drastically different readings of these square waves. We'll discuss this later under troubleshooting.

When the power switch is



Both of these waveforms read 2.5 volts RMS. However, the sine waves are 5 volts p-p, while the square waves measure 7.5 volts p-p.

changed to the off position, the primaries of T205 and T208 are in series across the 120-volt input. However, the impedance of T205 is far smaller than that of T208. Therefore, virtually all of the line voltage appears across T208, and too little is applied to T205 for any of the TV circuits to operate. In addition, the phasing of the two CRT-heater windings is correct to minimize any transfer of energy from one transformer to the other.

The secondary of T208 supplies 5 volts; however, resistance of the heater winding of T205 reduces this to about 4.8 volts at the picture-tube heaters. This voltage keeps the CRT heaters warm enough for the picture tube to show a raster in just a few seconds after the set is switched on.

### Automatic Degaussing

Each time the receiver is turned on, voltage from a separate winding of T205 flows through a posistor and through the degaussing coil. This high current causes the posistor to increase resistance gradually, until finally the resistance is so high it stops all significant current, and degaussing is completed. We are not sure whether the degaussing voltage is a sine or a square in waveshape. But that's not important, because both waveshapes degauss with the same efficiency.

### Effects Of Waveforms On Readings

Here is one important point to remember when measuring the AC voltages in this regulating circuit: **Many meters will produce com-**

**pletely erroneous readings on these square waves.** The reason for this has to do with how the meter arrives at its reading, and has nothing to do with the brand or quality of the meter.

For example, most VTVM's and FET meters use either peak-reading or peak-to-peak reading AC systems. This same circuit is used for both sine waves (RMS) or irregular waveforms (p-p). The only difference is in the calibration scales on the face of the instrument. RMS scales are accurate **only** for sine waves; p-p scales are accurate for **all** waveforms.

Most VOM's are non-peak-reading. Therefore, they can read (and are calibrated for) only RMS values of AC voltages.

Therefore, if you read the picture-tube heater voltage using a portable VOM (or other RMS-only meter), a normal reading of about 6 volts should be obtained. But, make the same test on the "RMS" scale of the usual VTVM and the reading will be about 4 volts.

Of course, you could make the measurement on a calibrated scope, or use the p-p scale of a VTVM, and the reading then should be about 12-volts p-p.

Measurements of the AC voltages at the four power-supply rectifiers (Figure 1) must be measured with the same rules in mind, else the tests might give answers that are completely wrong.

### Troubleshooting Tips

Because the power transformer and C248 are the only different components in the circuit, most of the troubleshooting will be the

same as that for similar circuits.

If C248 shorts, the primary current of T205 increases (although perhaps not as much as for non-regulating transformers) and the circuit breaker operates to protect the transformer. A shorted rectifier or filter capacitor would cause exactly the same symptoms.

An open C248 drops the voltages at the secondary of T205 by about 20%, and makes the picture small on all four sides (Figure 5).

By the way, we recommend use of an exact replacement capacitor (in the unlikely event one fails), because the capacitor must handle very-high circulating currents which are above the ratings of ordinary capacitors.

### Hum Bars

Hum bars caused by insufficient filtering appear to be wider (thicker) and with much sharper edges (Figure 4) in sets with this system of voltage regulation. In the usual rectifier circuit, current is drawn for only a short period of time at the tip of each sine wave. However, when the waveform applied to the rectifiers is a near-square wave, rectifier current flows for a larger percent of each cycle.

### Buzz When Set Is Off

If a loud buzz can be heard only when the set is turned off, but operation with the set on is normal, something in the T208 circuit is probably drawing too much power. In that event, the reduced inductance of T208's primary acts as a resistance in parallel with the on/off switch permitting partial line voltage to reach T205. The buzz comes from insufficient filtering of the voltage supply for the audio circuit.

### Set Cannot Be Turned Off

A shorted primary of T208, or a shorted on/off switch are possibilities when the set continues to operate in the off position.

### Conclusion

You should have no unusual difficulties troubleshooting this power-supply circuit. At least you won't if you remember (and compensate for in measuring) the square waves applied to the low-voltage rectifiers and the heater of the picture tube. □

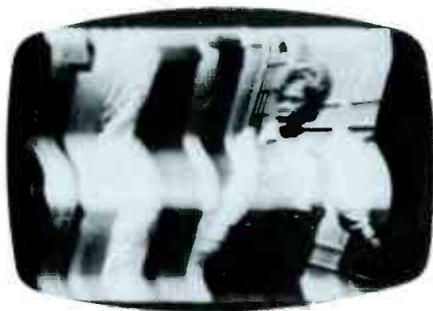


Fig. 4 Reducing the line voltage below 55 volts caused huge hum bars and a smaller picture.



Fig. 5 When C248 was removed for a test, the picture was small on all four sides of the raster.

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## bookreview

### Light Emitting Diodes (20964)

Author: Forest M. Mims, III

Publisher: Howard W. Sams & Co., Inc.

Size: 5-1/2 X 8-1/2 inches, 160 pages

Price: \$4.50 softbound.

This book thoroughly covers the topic of light-emitting diodes, starting with the theory of semiconductor emission and details of physical construction. There are chapters devoted to infrared and visible-light-emitting diodes. Another chapter discusses the use of the LED as a display device, with such applications as digital display, alphanumeric display, polarity and overflow displays, logic displays, etc. Other chapters explain the accessory devices needed to make full use of the light provided by the LED—detectors, receivers, viewing devices, lenses, fiber optics, and filters. LEDs are undergoing important new developments. In recent years the field has multiplied, largely because of the demand for LED displays in electronic calculators and digital equipment. This book keeps the reader abreast of all the important and latest applications of light-emitting diodes.

### Automobile Electronics Servicing Guide, First Edition (20927)

Author: Joseph J. Carr

Publisher: Howard W. Sams & Co., Inc.

Size: 8-1/2 X 11 inches, 128 pages

Price: \$4.95 softbound.

Written for the technician who wants to be proficient in all aspects of automobile electronics servicing, the Automobile Electronics Servicing Guide takes the reader step-by-step through a basic review of superheterodyne theory, through circuits, stages, and sections of complete tape players (both cassette and eight-track) as well as AM, FM, and FM-stereo. The first seven chapters are devoted to the electronic and mechanical aspects of the automobile radio. Chapters 8 through 10 discuss tape players, and the remainder covers such servicing topics as bench test equipment, troubleshooting alignment, noise suppression, and reception problems. This guide is useful for the technician who wants to become expert in servicing today's automobile entertainment equipment. □

# Can't be anything wrong, the **MATV** system is new!

By J. E. Strenk, CET

*It's embarrassing and inconvenient when the picture in your shop is poor, but the MATV system is new.*

About a year ago, I installed a new antenna, MATV distribution amplifier, splitter and 24 tapoffs to furnish signals to my sales and service areas. At first the reception was excellent.

However, a few months ago the quality of the signals became degraded at all tapoffs, and was worse and erratic at other tapoffs. At first I dismissed the poor signals as merely changing conditions from the fringe signals we must work with. After all, we could use a dot-bar generator to make sure the receivers were okay. And most of the customers believed us when we told them their receptions would be better once they got the receivers back home.

But we lost a lot of new-set sales. Those tired excuses just don't work in those cases.

## Locating The Defect

To isolate the problem, I connected a single coax from the distribution amplifier to a color receiver known to be in good condition. The picture was beautiful. Then I tried through each of the three splitter outputs. Again, the pictures were just fine. The trouble had to be located following the 3-way splitter.

Next, I measured with an ohmmeter each of the three branches of 8 tapoffs. Each should measure 75 ohms because of the terminating resistors.

Unfortunately, each branch measured from 1 to 5 ohms. No wonder the receptions had been so poor!

By selectively opening each line at points indicated by the shorts, I finally found one or more short circuits in each of the branches. This so discouraged me that I

opened every tapoff and checked them.

## The Permanent Cure

To make a longer story much shorter, I found the insulating jacket on the cable ends inside the tapoffs had moved just enough to allow the insulation-piercing tips of the shorting bar (left drawing of Figure 1) to contact the "hot" wire of the cable. A short of this kind not only reduces the signal strength, but also produces standing waves with the ghost-like actions.

Whether the piercing points were too long, the cable too small in diameter or I applied too much force in tightening the screws is beside the point at this time.

There are two general ways of solving this problem. One is to monitor with an ohmmeter the continuity between the cable shield and the shorting bar. Tighten the screw holding the bar until the meter shows continuity, then add another turn.

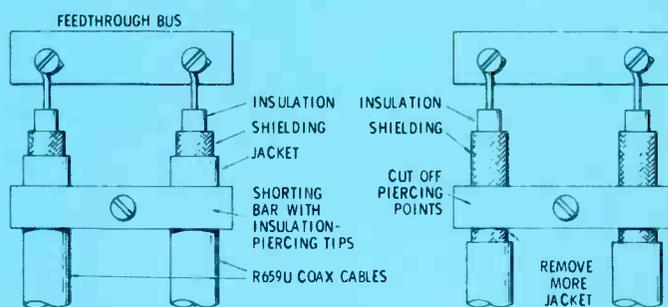
I chose the other method, on the theory that "once bitten, twice shy." First, I removed the bar and

both cables, and cut off the piercing points from the bar. Then I prepared both cables as usual except I cut back the insulating jacket so the shield was bare where it touched the shorting bar (right drawing in Figure 1).

After all the tapoffs were changed over in this same way, I again checked each of the three branches from the splitter and found them to be the correct 75 ohms. When the system was placed back in service, reception of all channels was very good.

Remember, if cable shorts happen to you, that the one with the short might not give any worse performance than the next one. Whether the reception becomes better on one certain channel, has a very weak reception on other channels, or has ghosts, depends on the location of the short relative to the length of cable to each individual tapoff. With a short in the system, it's possible for each tapoff to give different results.

Keep all these things in mind where there is erratic trouble in any MATV system. □



**Figure 1** Use precautions to prevent coax shorts from occurring as the components "settle in" later. The drawing on the left shows the original method of connecting the coax cables, especially the automatic grounding of the shields. However, the insulation-piercing tips eventually contacted the center "hot" conductor. One good remedy is to cut off the piercing tips and expose the cable shields to direct contact with the shorting bar inside each tapoff.

# Understanding foreign color systems

By Bruce Anderson

*Our NTSC-type color system is only one of several in use around the world. Here are some of the interesting major differences between them.*

Sometimes it's difficult for those of us who have serviced color sets for about 19 years to imagine any other TV system. Even the majority of viewers in foreign countries watch receivers such as ours.

The other basic systems are somewhat more complex, but it's said they produce better pictures under some conditions. The arguments both for and against each system are endless.

But even if some system emerged as being vastly superior, it's not likely it would be adopted in America, unless it would be compatible with the millions of receivers already in use here.

It has been suggested (as a means of eliminating the different tints between consecutive programs) that

another system might be used from station-to-station or from network-to-station, with the signal then converted back to the present standards for broadcast. Any action on this suggestion seems to be years in the future.

Meanwhile, it should give us additional insight into our own system for us to learn some of the basic facts about other color systems.

## Three Basic Systems

Anyone who has done the setup adjustments of a color receiver knows that the picture is actually displayed as three separate but overlapping pictures, one in red, one in green, and one in blue. When these three "colors" are displayed with the correct ratio of intensities, there is no sensation of color at all—the raster can vary only within the gray scale. Drive any color more or less than this balanced amount and a color results.

Three different ways of combining the three colors to produce a picture of any desired hue have been used at one time or another.

The first wheel method proposed in the US was pioneered by CBS. In this system, a single camera tube scanned the scene to be televised. A revolving wheel between the camera and the scene interposed three optical filters which passed only red, blue, or green light, and thus the camera "saw" first the red components of the scene, next the blue, and finally the green. The wheel was synchronized so that the filter was changed during vertical retrace time.

A similar filter wheel between what was essentially a monochrome receiver and the viewer had to be synchronized with the one in the studio. In this system, separate red, blue, and green fields were transmitted in sequence; hence the name, "Field Sequential System." The limitations of this system were recognized in the early '50's and it

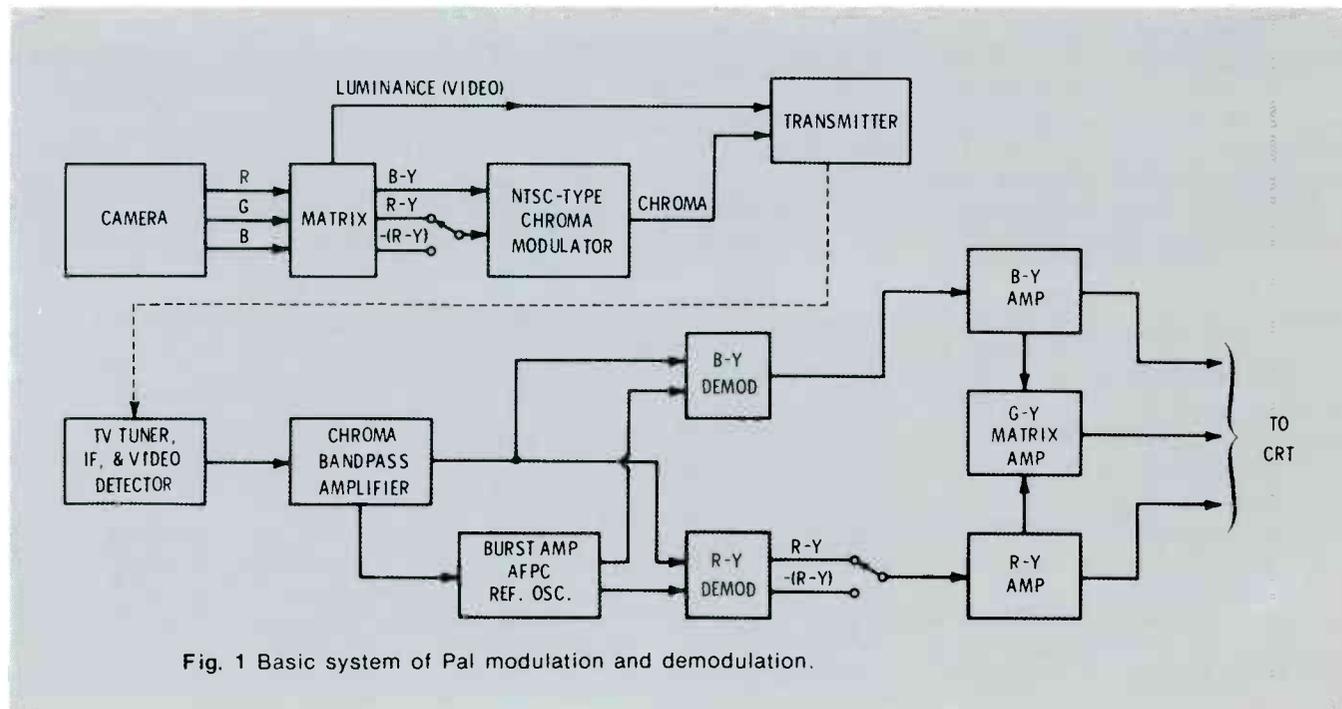
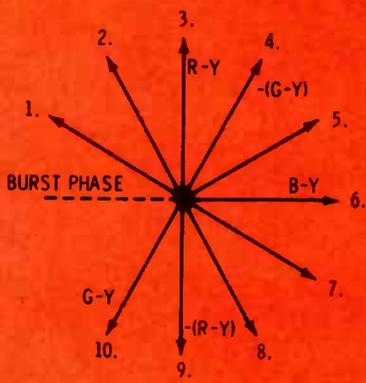
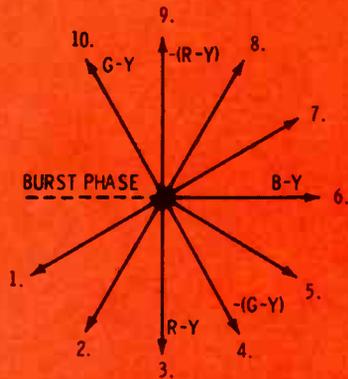


Fig. 1 Basic system of Pal modulation and demodulation.



A. NTSC AND ODD-LINE PAL



B. EVEN-LINE PAL

Fig. 2 Normal keyed-rainbow vectors and inverted PAL pattern.

was discarded in favor of our present system. Interestingly, the field-sequential system is now used in some types of light-weight, portable cameras because it can be made very simple and compact by the use of modern technology. For example, color cameras taken to the moon used that principle. A decoder can be used to translate the field-sequential information into our present system, when desired.

#### Dot-sequential system

Invention of the tri-color picture tube allowed a new approach to color transmission. In essence, this picture tube is three tubes in one envelope, with the pictures displaced from each other by the distance between the different-colored phosphor dots or stripes. When the viewer is any reasonable distance from the CRT, the three pictures blend into a single, multi-colored one. This is called the "Dot-Sequential System."

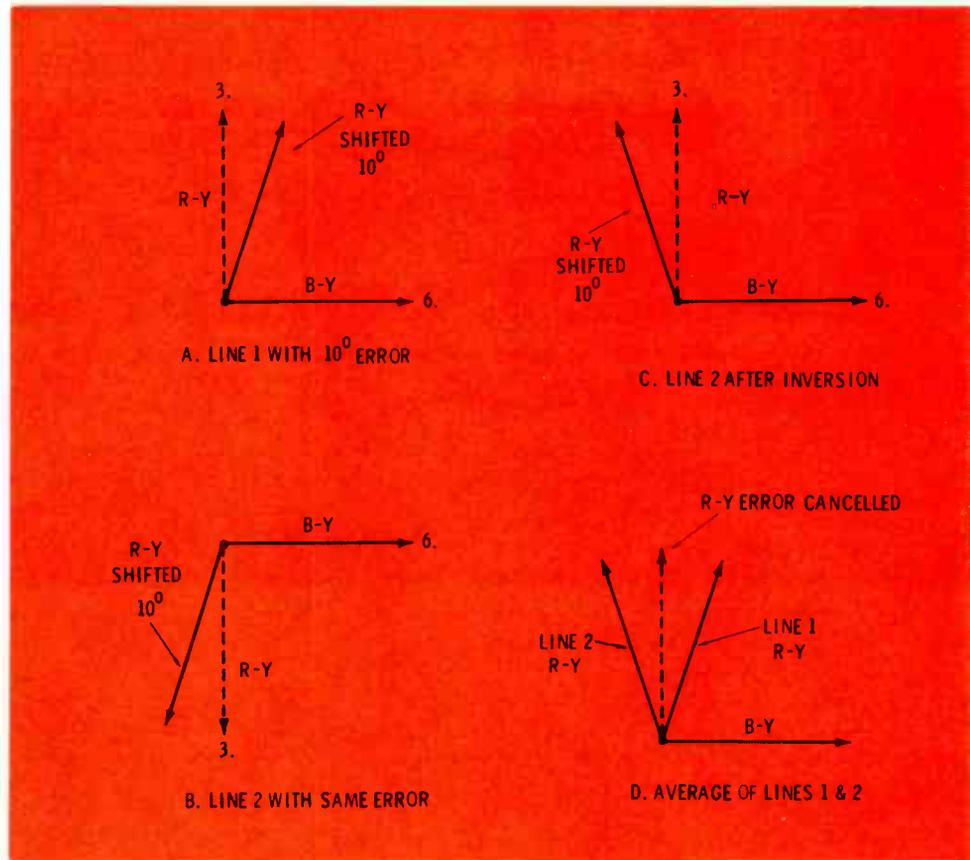


Fig. 3 Basis of PAL phase-error cancellation.

#### Line-sequential system

The third basic system uses what is called the "Line-Sequential System." In this system, a different kind of chroma signal is transmitted on alternate horizontal lines. A delay line in the receiver delays the color information for the interval of one horizontal line so that the two can be matrixed to recover the third primary. A conventional color picture tube is used with this system.

#### NTSC System

Of the systems in use today, the US system is the oldest. Properly it is called the NTSC system in honor of the National Television Standards Commission. This commission developed our transmission standards for color over twenty years ago, and it is a testimonial to their efforts that the system has remained substantially unchanged since that time.

Because NTSC is familiar to all

of us, there is no need to review here how it works. There are, however, some inherent limitations to the system which may not be widely known.

A NTSC receiver uses either two or three chroma demodulators to recover the color-difference signals. When two are used, they recover R-Y and B-Y, from which G-Y can be derived by matrixing. If three are used, each of the color-difference signals is recovered by its own demodulator. The problem arises from the fact that each of the demodulators generates a certain amount of crosstalk between the signal it is supposed to recover and the other color-difference signals.

For example, suppose a saturated blue scene is being televised. The B-Y demodulator drives the blue gun to maximum conduction while the R-Y and G-Y demodulators (assume there are three demodulators) drive their respective guns to cutoff. Now, let us change the scene

to a deep magenta. This causes the R-Y demodulator to develop an output which drives the red gun to maximum. But, in the NTSC system, it is impossible to do this without having the output of the B-Y demodulator change slightly because of the presence of the R-Y component in the chroma sidebands. The result is that the precise shade of magenta which was transmitted will not be reproduced, because the R-Y signal has caused the B-Y demodulator output to shift. Of course few people worry about precise shades of purple—this example was used because it is easy to grasp. Obviously, the same problem occurs in the reproduction of flesh tones, and people worry a lot about these!

Flesh tones are composed of considerable negative B-Y, a little of negative G-Y, and a fairly large amount of positive R-Y. A mathematician can work out the precise amounts, once he has decided who has the standard flesh tone. Obviously, there are several degrees of phase difference between Doris Day and Sammy Davis, Jr. In every instance, each color-difference signal is affected by the others. The tint control can be adjusted to reproduce any one hue correctly, but no other hue will be reproduced exactly as it was transmitted.

The broadcasters also have problems. There are literally hundreds of places where a minor malfunction can upset the precise phase relationship between R-Y and B-Y. If this happens, the hue of the transmitted picture will shift. Two items of equipment which are particularly difficult to control are video tape recorders and the network video system. When we consider the number of cameras, film chains, tape recorders, microwave links, etc. that may be employed in a single 30-minute newscast, it is a marvel that the color is as consistent as it is. It's simply not humanly possible to keep all the equipment in perfect condition all the time.

The third problem doesn't really belong to any one system. This is the problem of transmission-path errors. We have all seen the effect of ghosts on color fidelity.

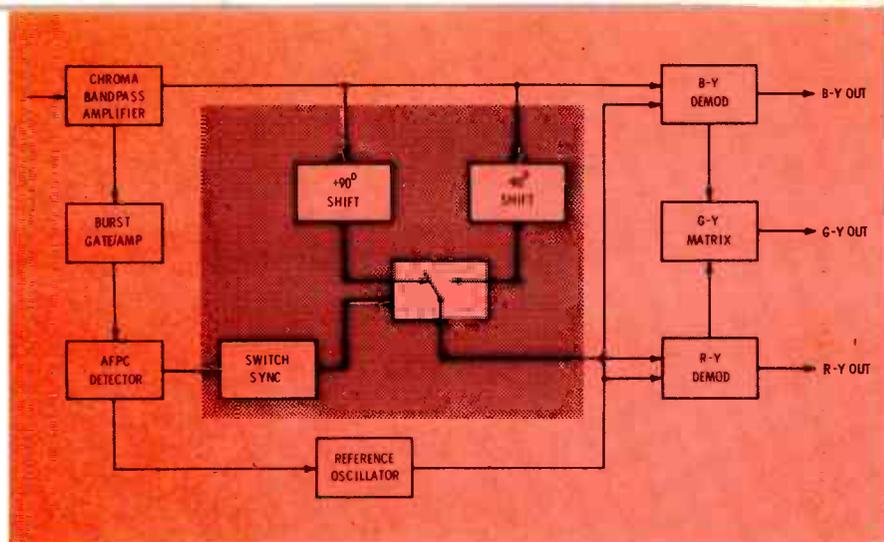


Fig. 4 Color demodulation system of PAL receiver.

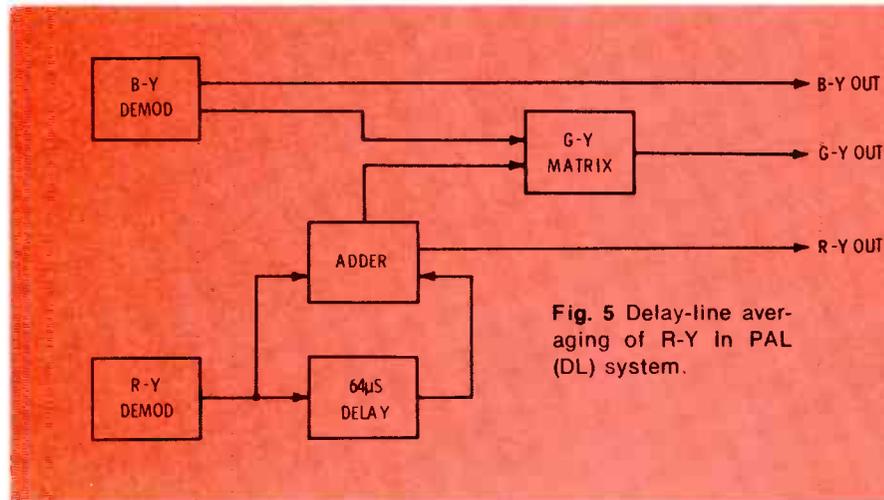


Fig. 5 Delay-line averaging of R-Y in PAL (DL) system.

### PAL System

The Europeans took advantage of the decade or more that elapsed before color TV was introduced there. A number of variations of the NTSC system were proposed and other, radically different, systems also were considered. The tendency of the NTSC system to suffer from tint variations brought about the humorous acronym of NTSC as "Never Twice the Same Color." Finally most of the Europeans adopted a variation of NTSC called PAL, for "Phase-Alternate Lines." Since this was supposed to settle the argument for all time, PAL soon came to stand for "Peace at Last."

Figure 1 shows the basic PAL system of modulation and demodulation. Odd-numbered lines of chroma are transmitted with R-Y and B-Y signals in the same phase relationship as they are in the NTSC system. On even-numbered lines, phase of the reference signal

to the R-Y modulator is reversed so that a "mirror" image of the vector pattern is produced. Thus, if we scanned a standard keyed-rainbow scene with the color camera, transmitted the signal in PAL, and received it with an NTSC receiver, the vector pattern would look like the patterns in Figure 2. On odd-numbered lines the normal pattern would appear; on even-numbered lines its mirror image would appear.

(In the PAL system the two chroma transmission axes are called V and U. These are defined as  $V = .877(R-Y)$  and  $U = .493(B-Y)$ . To avoid confusion, the familiar terms of R-Y and B-Y are used in this article.)

To illustrate how this scheme of modulation and demodulation enhances color fidelity, Figure 3 compares the effect of a R-Y phase shift in both the NTSC and PAL systems. With NTSC, the error that has been chosen has shifted red

towards blue so that the "red" has a magenta cast. This can be corrected with the tint control, but adjusting tint introduces errors in other colors.

On odd-numbered PAL lines the error still makes red shift towards magenta; but, **on even-numbered lines, this same phase error shifts red towards orange.** If these two lines can be "averaged" by the eye, the error will cancel itself and "pure red" will be seen. Actually, the averaging process reduces the red amplitude slightly, but this cannot be noticed under most conditions.

Figure 4 shows the basic circuitry of those parts of the PAL receiver which differ from NTSC. Of the eleven blocks in the diagram, only the four that are shaded are different from a NTSC receiver. Color-difference amplifiers normally are used between the demodulators and the CRT in both systems.

The B-Y demodulator is just like its NTSC counterpart and all the differences are in the R-Y system. The phase of chroma into the R-Y demodulator is alternately shifted  $+90^\circ$  and  $-90^\circ$  from its phase at the output of the bandpass amplifier. In effect, this inverts the demodulator output on alternate lines. But, R-Y was reversed on alternate lines at the transmitter, so this restores R-Y to the same polarity on all lines. The demodulators themselves and the circuitry following them are the same as they are in NTSC.

Synchronizing the inverting switch in the receiver is accomplished by playing a little game with the burst phase. In NTSC, burst is transmitted at a phase angle equal to negative B-Y. For convenience, let's call this NTSC burst phase  $0^\circ$ . In PAL, burst is transmitted at  $+45^\circ$  on one line and at  $-45^\circ$  on the next. Seemingly this would drive the reference oscillator in the receiver "out of its mind" trying to follow a burst signal that shifts  $90^\circ$  between lines. Actually, the oscillator cannot follow these sudden changes because the Q of its tuned circuit is very high, just like the ones in our receivers. Instead, it locks to the "average" phase angle, which is the

same as ours, or  $0^\circ$ . Either an injection-locked oscillator or a phase-locked-loop oscillator can be used; both of them will seek the "average phase" of PAL burst.

The switching pulse for the R-Y demodulator is obtained by comparing the burst signal with the reference oscillator. The AFPC detector used here is the same as those used in many US receivers. When the two input signals are  $90^\circ$  out of phase, the demodulator output is zero; when they are in phase the output is maximum; with  $+45^\circ$

phase difference the output has a voltage of one polarity; with  $-45^\circ$  the output polarity is reversed. Therefore, the output pulses are alternately positive and negative and these synchronize the electronic switch. This restores R-Y to the proper polarity.

#### R-Y averaging

In the original PAL concept, the eye was supposed to average the R-Y errors to cancel them, but this didn't work very well. A final change was made by including an

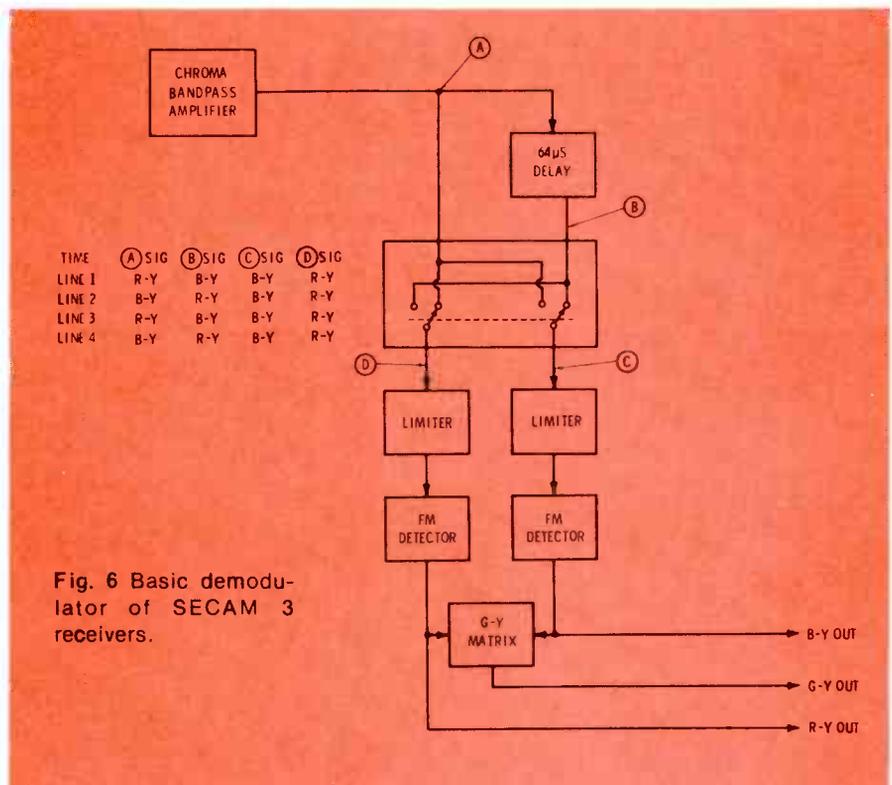


Fig. 6 Basic demodulator of SECAM 3 receivers.

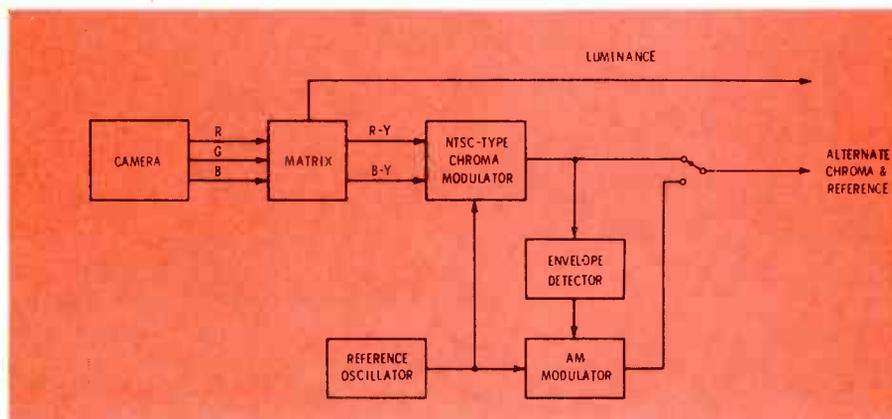


Fig. 7 Fundamentals of NIR chroma modulator.

"averaging" circuit in the R-Y output circuit. This is shown in Figure 5. The delay line delays R-Y for exactly the period of one scanning line. Then this delayed signal is mixed with the undelayed R-Y signal so that errors are cancelled electronically instead of visually. This refinement of the system is called PAL (DL).

### SECAM 3 System

The French were not content to use either the NTSC or the PAL system, and so they developed one of their own. SECAM is the French acronym for "Sequence and Memory". Only by accident does it also seem to mean "System Essentially Contrary to American standards."

The concept of the SECAM receiver is not difficult to understand, although the circuitry itself is complex. The first big difference between this and the other two systems is that the chroma signal is used to **frequency modulate** a chroma subcarrier. Think of it as a second sound carrier modulated by chroma. This allows a simpler modulation system, compared to PAL or NTSC, and FM chroma avoids many of the problems associated with amplitude-phase modulation of a chroma subcarrier. Offsetting this is the fact that trapping a second FM signal out of the luminance video is quite difficult.

The problem of cross-modulation in the chroma demodulation is eliminated very simply—only one chroma signal is present during any single line interval. During odd-

numbered lines the chroma subcarrier is modulated by R-Y and on even-numbered lines it is modulated by B-Y. (Actually the signals are called V and U, respectively, as in PAL.)

Figure 6 shows the basic system of demodulation. The electronic switch is synchronized with one at the transmitter to prevent R-Y and B-Y from becoming mixed. At the moment a line having R-Y chroma is leaving the video detector, the previous line (which had B-Y chroma) is leaving the delay line. Since the electronic switch is in the position shown, undelayed R-Y chroma feeds to the left-hand limiter and detector of the drawing, and B-Y delayed chroma drives the right-hand limiter and detector.

One line later, B-Y chroma is appearing out of the video detector and the R-Y chroma from the previous line is leaving the delay line. But, the electronic switch has reversed its contacts so that B-Y still is directed to the right-hand detector and R-Y is directed to the left-hand detector. Note that each 64-microsecond train of R-Y chroma that is transmitted is displayed on **two lines** of the raster. The same is true of the B-Y chroma, of course.

### NIR System (SECAM 4)

The NIR system might best be described as a "marriage" of PAL and SECAM which was consummated in Russia. In this system, every other line is a standard NTSC line. On the alternate lines, the NTSC color signal is modified as

shown in the block diagram of Figure 7.

In the NIR chroma modulator, the NTSC-type chroma sidebands are detected by an envelope detector so that only the **amplitude** of the chroma signal remains—the phase information is lost. This signal is used to modulate the chroma subcarrier in a suppressed-carrier modulator, and this signal is then transmitted on alternate lines.

In the receiver, a delay line and switching circuit similar to the one used in SECAM 3 "sorts" out the two chroma signals. Following this, the amplitude-modulated-only signal is used instead of our type of reference-oscillator signal as the reference input to the chroma demodulators. This is shown in Figure 8.

This system was devised to overcome still another problem inherent to NTSC color. In NTSC, burst "rides" on the back porch of the sync pulse, but chroma "rides" on the luminance video. Consequently, they suffer from different amounts of distortion, depending on the instantaneous luminance of the scene. In NIR, both the chroma signal and the reference signal "ride" on the luminance, so they are distorted equally. With proper design of the demodulator, these distortions cancel each other.

### Summary

This discussion of foreign systems of color transmission is necessarily very brief. Therefore, many of the niceties of these systems have been completely ignored. It also should be noted that these systems doubtless have many shortcomings which naturally are not emphasized in the literature published by their proponents.

In presenting the basics of the systems, we have not intended to imply that any system is inherently better than any other. The "advantages" which have been enumerated should be considered as claims, rather than scientifically-proven facts. Probably the only real fact is that it would be virtually impossible to determine which system is best unless all systems were in operation in the same location at the same time.

Meanwhile, lets get back to the bench and the job at hand. Maybe these NTSC sets aren't so tough after all! □

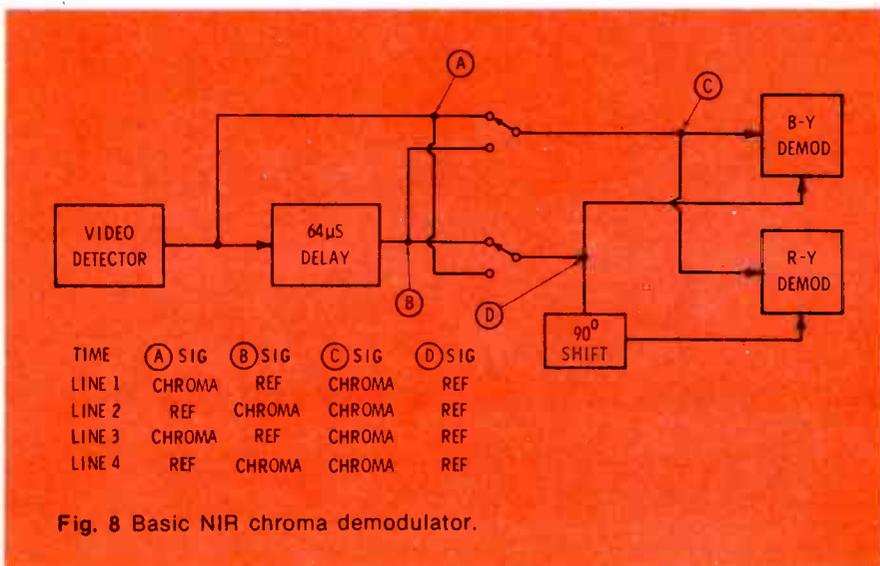


Fig. 8 Basic NIR chroma demodulator.

# test equipment report

Features and/or specifications listed are obtained from manufacturers reports. For more information about any product listed, circle the associated number on the reader service card in this issue.

## Solid-State Triggered-Sweep Scope

**Product:** Model LBO-502 5" oscilloscope by Leader.

**Features:** Graticule markings are in three segments so the corresponding one lights when the VOLTS/CM switch is adjusted, a scale-tilt adjustment is provided, and selection of triggering source, mode and slope is by means of pushbuttons. The scope also can be used as a vectorscope for color measurements.

**Specifications:** Horizontal sweep is from 1 microsecond/CM to .5 second/CM in 17 calibrated steps. Vertical sensitivity is 10mV/CM p-p. Vertical bandwidth is DC to 15 MHz, with a rise time of 35 nanoseconds.

**Size and Weight:** The LBO-502 measures 7-3/8 X 9-1/8 X 15 inches and weighs 15 pounds, complete with a direct/low-cap probe, terminal adapter and one set of vectorscope leads.

**Price:** Leader model LBO-502 scope sells for \$529.95.

For More Details Circle (50) on Reply Card

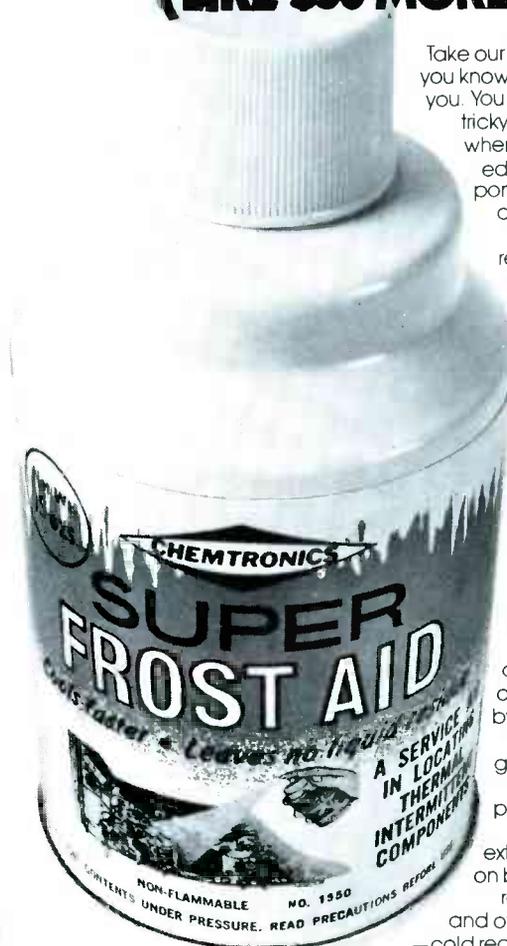
## Do-It-Yourself "Grabber"

**Product:** Model 3925 do-it-yourself "Grabber" by Pomona Electronics.

**Features:** Model 3925 permits the user to assemble quickly his own test leads for specific testing requirements. It will accept any wire up to .090" in diameter and features a plunger-action contact hook designed to connect with and hold component leads or terminals without damage.

For More Details Circle (51) on Reply Card  
(Continued on page 48)

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September, 1973/ELECTRONIC SERVICING 47

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For More Details Circle (27) on Reply Card

## Test Equipment

(Continued from page 47)

### Digital Counter

**Product:** CM41, digital counter offered by Analog Digital Research Limited.

**Features:** The CM41 incorporates an easily-read 6-digit gas-discharge display, will measure frequencies over a 5 Hz to 40 MHz range at a sensitivity of better than 35 mV. A push-button attenuator and 2-pole low-pass filter are included for use with noisy signals. Besides 4-decimal gate times, an "RPM" position is included, allowing direct display of RPM when counting the output of a revolution sensor. The CM41 also includes a Normal/Totalize mode. Options with TTL-compatible BCD output, and BCD display preset are offered.

**Price:** CM41 is priced at \$299.

For More Details Circle (52) on Reply Card

### High-frequency Probe

**Product:** Model 2791 from Simpson Electric Company

**Specifications:** Designed for use with the Simpson Solid-State Electronic Multimeter Model 2795, this high-frequency probe offers: a wide measuring span from 0.1 to 25 V RMS, wide frequency range from 10 kHz to 800 Mhz, 5% accuracy through 300 MHz, 15% accuracy through 800 Mhz, can be used as an indicator through 1 GHz, usable with any voltmeter having a range of 1 Megohm input resistance.

**Price:** Model 2791 is priced to sell at \$75.00.

For More Details Circle (53) on Reply Card

### Electronic Bench Instrument

**Product:** Versatester 1™ by Systron-Donner Corp.

**Features:** This is a single-instrument electronics test lab. It provides signal sources, power sources and has digital multimeter and counter capability. It can be used for self-test and calibration. It features a DC power supply with +5 V, +15 V, -15 V, ±30 V, generates 20 Hz to 20 MHz, and digitally measures and displays to four digits.

For More Details Circle (54) on Reply Card

### Frequency Counter

**Product:** SM-118A 30-MHz frequency counter from Heath Schlumberger Scientific Instruments.



**Features:** SM-118 provides a minimum range of 5 Hz to 30 MHz (2 Hz to 40 MHz typical). Input sensitivity is 10mV over the entire range, with typical sensitivity of 5-8 mV. Other features include 6-digit LED readout with leading-zero blanking, combination carrying handle/tilt stand, small size and light weight, 120/240 VAC operation.

**Price:** SM-118 sells for \$225.

*For More Details Circle (55) on Reply Card*

### CRT Checker

**Product:** Pix-Mate KP710 CRT checker by Telematic of U.X.L. Corporation.



**Features:** The KP710 will check the emission of each gun of the color picture tube, and give an accurate reading on the meter. Each gun is checked by its own switch which is coded the same color as the gun it is checking. Pix-Mate is a useful

portable instrument to have along on service calls when picture tube performance is border line and it is important for the set owner to be so informed before the chassis is taken to the shop.

**Price:** Pix-Mate KP710 sells for \$39.95 net.

*For More Details Circle (56) on Reply Card*

### Volt-Ohm Meter

**Product:** Model VM-100K volt-ohm meter by The Finney Company.

**Features:** Model VM-100K offers features which include 100,000 ohms/volt DC, 10,000 ohms/volt AC,  $\pm 1\%$  temperature stabilized, carbon resistors, mirror scale, overload protected, polarity change over switch.

**Specifications:** Twenty three ranges cover DC volts from 0.6 to 1200; AC volts from 6 to 1200; DC current 12  $\mu$ A to 12A; AC current, 12A; resistance (ohms), 20K to 20M; decibels, -20 +17, 31, 43, 51, 63.

**Size:** The dimensions are 7-1/8 X 5-5/16 X 2-7/16 inches. Weight is 2 pounds, 4 ounces.

**Price:** VM-100K sells for \$65.95.

*For More Details Circle (57) on Reply Card*

### Two-way Radio Test Meter

**Product:** Model P5425 two-way radio test meter from Pace Division of Pathcom, Inc.

**Features:** The tester, with 250-watt maximum rating, features a "0 to 25 watt scale" and a "0 to 250 watt scale" with accurate calibrations for checking either CB or Business Radio Transceivers operating in the 25-to-50 MHz band. Crystal activity can be checked, and other tests can be made of transmitter and receiver functions. On the 25-watt scale, there is a built-in dummy load, but the 250-watt scale has "thru-line" power measurement, so the antenna can be kept in the line if desired, or an accurate dummy load connected for precise measurements without the effect of an antenna. □

*For More Details Circle (58) on Reply Card*

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Harrison, N.J. 07029

**RCA** Electronic Components



# productreport

for further information on any of the following items, circle the associated number on the reader service card.

## Electronics Bench

**Product:** Electronics work bench by Duralab Equipment Corp.

**Features:** A 37-inch-high table with Duralite or Formica top on welded

tubular steel frame, the bench has a 6-inch high Duralite turret with 12 built-in 110V outlets and one 220V outlet. An alternate model provides a metal turret with removable back plate, permitting the installation of variable voltage receptacles, grounds and controls for specific requirements. A wide choice of modular drawer and storage cabinet combinations is also available.



**Size:** The 37-inch high table is available in three lengths: 40, 52 or 72 inches long by 24 or 30 inches wide.

For More Details Circle (59) on Reply Card

## Color-TV Service Handbook

**Product:** A new edition of the RCA Color-TV Service Handbook is offered by RCA Electronic Components.

**Features:** A convenient source of field-service information for 1971-1972 color-TV receivers of fifteen manufacturers, this handbook is the latest edition in RCA's series of service handbooks which covers color-TV receivers from 1967 through 1972. The 1972 edition contains information on receivers manufactured by: Admiral, Airline, Dumont, Emerson, General Electric, Magnavox, Hitachi, Olympic, Packard Bell, Panasonic, Philco, RCA, Sony, Sylvania and Zenith. Service information has been extracted from the original manufacturer's service notes and is presented in clear, concise, step-by-step procedures.

**Size:** The handbook contains 294 pages, 6 x 5 inches.

**Price:** 1A1973 can be obtained from RCA distributors, or by sending \$2.95 to RCA Commercial Engineering, Harrison, New Jersey, 07029.

For More Details Circle (60) on Reply Card

## Tape Solder

**Product:** Archer Tape Solder from Radio Shack.

**Features:** Tape solder is ideal for on-the-spot wiring and repairs, installing light fixtures, automotive accessories. Twist wires together, wrap them with a piece of tape solder, and melt solder with a

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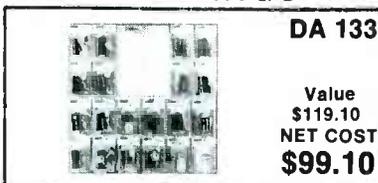
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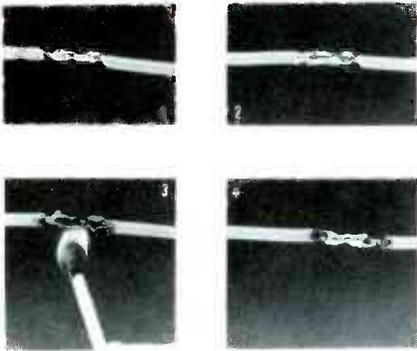
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For More Details Circle (18) on Reply Card



match, candle or cigarette-lighter flame. No soldering iron is required. **Price:** Archer Tape Solder sells for 89¢ for a plastic pouch of 100 pre-cut pieces.

For More Details Circle (61) on Reply Card

### Tuner Parts and Replacement Guide Catalog

**Product:** Available now from PTS Electronics is the 1973 edition of the Tuner Parts and Replacement Guide Catalog number 3. PTS has added UHF tuner parts, tuner chemicals and tools, and added blow-ups for VHF and UHF tuners. A replacement guide for antenna coils and shafts is also provided. 2000 available exact-replacement tuners are listed under their original manufacturer number for easy exchange.

**Price:** PTS Electronics Catalog number 3 is priced at \$1, redeemable on first minimum parts order.

For More Details Circle (62) on Reply Card

### Replacement CRT's



**Product:** "Speed Fit" pre-assembled replacement CRT's from Channel Master.

**Features:** Color picture tubes, fitted with pre-assembled and pre-mounted straps and hardware, are said to reduce replacement time by as much as 75%. The CRT's are designed to replace tubes in Motorola, RCA, and Zenith receivers. All mounting hardware is factory positioned in place, assuring the technician that the tube will be properly aligned within the cabinet. No separate hardware has to be purchased or transferred from the dud. "Speed Fits" are now available for Motorola Chassis 908, 914 and 914A; all RCA 25" (23V) chassis; and 9 Zenith chassis from 20" to 25".

For More Details Circle (63) on Reply Card

### Hand-Impact Driver



**Product:** Vaco Impact Tool stock number 70220 by Vaco Products Co.

**Features:** Internal helical design converts a hammer blow to over 200 foot pounds of shock torque to loosen tight screws. It can drive forward or backward according to adjustment of collar. Choice of four bits (5/16- and 1/2-inch regular, plus #2 and #4 Phillips) snap in or snap out of tool adapter.

**Price:** Vaco Impact Tool number 70220, adapter, and four bits come in a plastic pouch at a list price of \$14.95. □

For More Details Circle (64) on Reply Card

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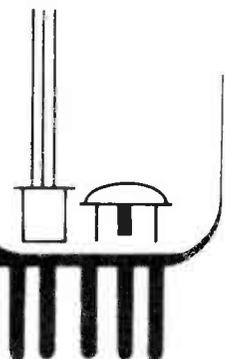
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For More Details Circle (22) on Reply Card

## audio systems report

Features and/or specifications listed are obtained from manufacturers reports. For more information about any product listed, circle the associated number on the reader service card in this issue.

### Booster Amplifier

**Product:** Power Plus 120B booster amplifier by Fanon/Courier.

**Features:** Although they are designed to work with all other Power

Plus amplifiers or audio pre-amplifiers, their gain is sufficient to accept the output of a radio tuner, crystal or phono cartridge or tape deck with pre-amp. The booster unit has no tone controls, and supplies up to 120-watts RMS. A VU meter monitors the power output. There are two high-impedance inputs for driving the amplifier, and output impedances of 4, 8, 16 ohms, 6.25 ohms at 25 volts and 49 ohms at 70 volts balanced and unbalanced.

For More Details Circle (65) on Reply Card

### Pocket-size Stereophone

**Product:** The "Travler" pocket-size stereophone by Koss Corporation.

**Features:** Transformation from a full-size set into a compact, palm-size unit for storage or traveling is achieved by means of a telescoping headband which encircles the ear-cups to reduce the size. The reproducer features a 1-1/2 inch Mylar diaphragm, a lightweight, stiff material that is resistant to moisture and temperature changes. The ear-cups include PVC foam cushions.

**Size:** The stereophone weighs nine



ounces, is rated at a frequency response range of 10-18,000 Hz and has an eight-foot cord.

**Price:** The Koss Travler sells for \$29.95.

For More Details Circle (66) on Reply Card

### Stereo Phonograph Cartridges

**Product:** Model 5600D and model 5601D Magne-Ceramic stereo phonograph cartridges from EV GAME.

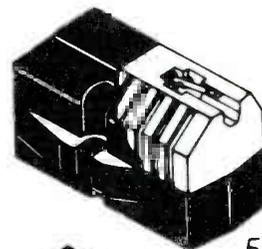
**Features:** Magne-Ceramics can be installed in tone arms using either a 1/2-inch mount or single-screw in-line mount. They employ "positive stylus alignment" which insures that the needle is always in the proper position when it comes in contact with the record groove, preventing stylus and record damage. The cartridges can be used in any low-priced changer equipped with two-pole motors, as well as in high quality turntables. They are not sensitive to hum from the motor, do not require pre-amps, and are compatible with 4-channel matrix systems.

**Specifications:** Model 5600D tracks at 2-4 grams with an output voltage of 600 mv, and 5601D tracks at 3-5

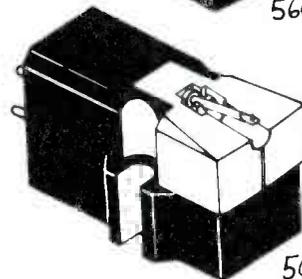
grams having an output voltage of 400 mv. Both use a .7 mil conical diamond stylus.

**Price:** Magne-Ceramics models 5600D and 5601D are priced at \$17.95.

For More Details Circle (67) on Reply Card



5600D



5601D

### Service Cartridge

**Product:** TSC-8 Player-recorder service cartridge by The Duotone Company.

**Features:** Providing easy maintenance and test service in one compact unit, Duotone's head-cleaner kit includes a capstan cleaner, track-switch test, head demagnetizer and stereo tape-player-cleaning solution.

**Price:** TSC-8 sells for \$5.95.

For More Details Circle (68) on Reply Card

### Automobile Speaker Systems

**Product:** Phillips automobile speakers introduced by Amperex Electronic Corporation.

**Features:** The line offers a selection which ranges from a pair of five-inch speakers in recess-mount enclosures to the Model SA1000, a 30-watt RMS, 2-way stereo system using 4 X 6-inch air-suspension woofers, 2-1/4 super-tweeters and crossover networks. The Phillips line features instant-mount, hardware-less installation, air-suspension cones, high-temperature voice coils and aluminum tweeters. Although designed for automobile music systems, these units are suitable for use on patio, poolside, camper and boat.

**Price:** Prices range from \$14.95 to \$39.95.

For More Details Circle (69) on Reply Card

### Stereo Headphone

**Product:** Model 10R200 stereo headphone from RCA Parts and Accessories.

**Features:** Model 10R200 is equipped with dual head bands, foam-cushioned adjustable ear cups, 6-1/2 foot cable, and a standard plug that fits most sound systems. It is lightweight for comfortable listening.

**Specifications:** Unit impedance 8 ohm at 800 Hz; 4- to 32-ohm matching impedance; 300 mW maximum input; 50-16,000 Hz frequency range; 108 dB sensitivity at 1,000 Hz with 1mW applied signal.

**Size:** The headphone weighs 12 ounces.

**Price:** Model 10R200 is priced at \$19.95.

For More Details Circle (70) on Reply Card

### Head Demagnetizer

**Product:** Model QM-202 professional head demagnetizer from Nortronics.

**Features:** The QM-202 is designed to remove safely and effectively all residual magnetism from tape heads, rollers and guides, and thus to protect expensive pre-recorded tapes. □

For More Details Circle (71) on Reply Card

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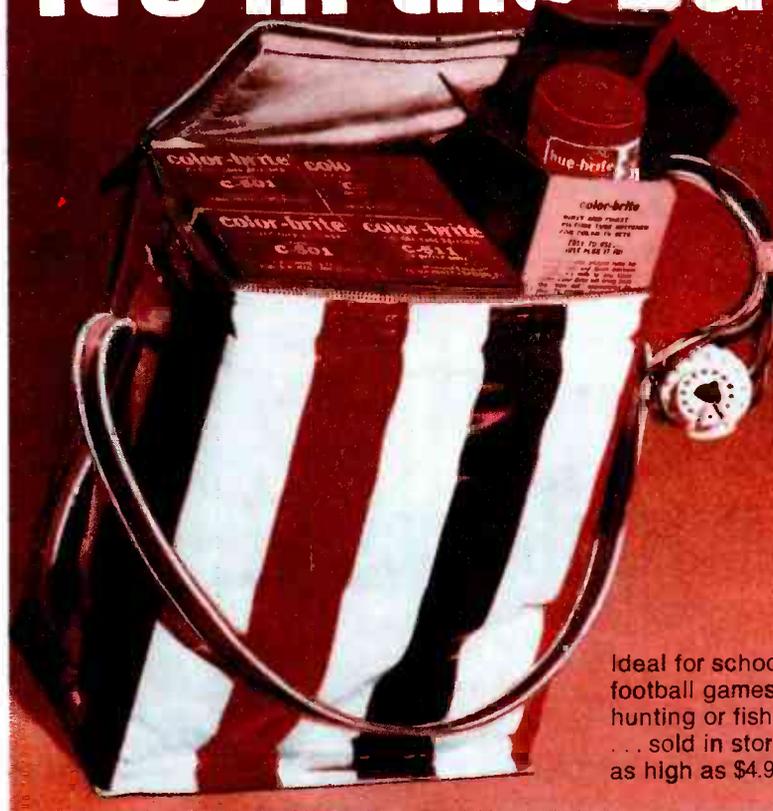
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# photofact<sup>TM</sup>bulletin

PHOTOFACT BULLETIN lists new PHOTOFACT coverage issued during the last month for new TV chassis.

- BRADFORD**  
1007D44 (WTG-90027) ..... 1341-1
- BRADFORD**  
1071A33 (WTG-78584), 1071B33 (WTG-78592) ..... 1339-1
- BRADFORD**  
1104A33 (WTG-51763) ..... 1323-1
- BRADFORD**  
1104B43 (WTG-51771) ..... 1324-1
- BRADFORD**  
1104C43 (WTG-51789) ..... 1330-1
- BRADFORD**  
1105A33/B33C33/D33 (WTG-51938A/46A/53A/61A,  
1205A43/B43 (WTG-51805A/05B/13A/13B) ..... 1338-1

- CATALINA**  
122-3128A/30A/32A/35A/42A/50A ..... 1334-1
- CHANNEL MASTER**  
6150A/51A/52A/53A, 6154B/55B/56B ..... 1340-1
- CORONADO**  
TV2-2012A/22A/32A/42A/62A ..... 1332-1
- CORONADO**  
TV22-1041B ..... 1336-1
- CURTIS MATHES**  
5E10 (Ch. C-52, CMC-52) ..... 1330-1
- DUMONT**  
16DPO2W ..... 1334-2
- EMERSON**  
Chassis 5K1673-34, 5K1675-4, 11K1663-43, 11K1670-2 ..... 1336-2

- EMERSON**  
12EPO2, 12EPO3W, 16EPO3, 16EPO4W ..... 1340-2

- GENERAL ELECTRIC**  
Chassis 25MA ..... 1341-2

- J. C. PENNY**  
4856A/57A/99A, 4921A, 6893B/93C/93D/94A/94B ..... 1326-2

- MGA**  
BS-135 ..... 1322-1

- MGA**  
CS-197 ..... 1342-1  
Remote Control Receiver, transmitter ..... 1342-1-A

- MIDLAND**  
15-213 ..... 1333-2

- MORSE/ELECTROPHONIC**  
1500 ..... 1323-4

- RCA**  
Chassis CTC53E/F/XM ..... 1342-2

- RCA**  
Chassis KCS187B ..... 1340-3

- SANYO**  
91C57R ..... 1331-2

- SONY**  
KV-1500, KV-1510 (Ch. SCC-20B-A, SCC-25A-A) ..... 1322-2

- SONY**  
KV-1710, KV-1720 (Ch. SCC16A-A thru SCC16A-E) ..... 1325-1

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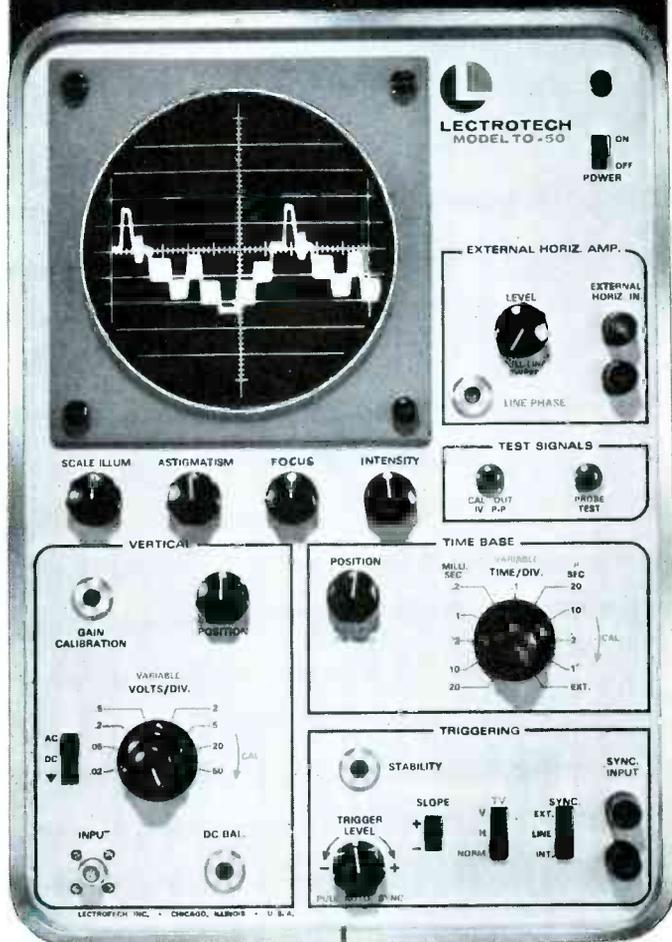


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## catalogs literature

Circle appropriate number on  
Service Card.

**100. Belden Corporation**—offers a catalog that presents a line of wire and cable products expressly for use in alarm/security systems. Included are products for closed-circuit television (CCTV), digital dialing, alarm controls, central stations, photo-electrics, power supplies, telephone dialers, intrusion sensors, access controls, sirens, bells, horns, paging, audio detection, emergency lighting, and scanners.

**101. Dukane Corporation**—has released a brochure entitled "Sound Systems" which offers the reader basic data for the design of sound-reinforcement systems. Path of the signal is traced from the source through components in the systems that range from the elementary to the complex. System organization is depicted by flow diagrams with line drawings of actual components. Two tables assist the reader in selecting appropriate volume controls and determining correct power requirements.

**102. Eder Instrument Co.**—announces release of a four-page catalog illustrating and describing the new Eder-Lite, a full line of miniature inspection lamps and accessories. The Eder-Lite has long been used for the inspection of electronic equipments, appliances, and precision instrumentation, because it permits viewing of inner surfaces and hard-to-get-at places.

**103. GTE Sylvania Inc.**—has published an ECG semiconductor guide which gives replacement information for nearly 80,000 solid-state devices. The first 32 pages of the 148-page illustrated catalog give electrical characteristics and mechanical specifications for all industrial and commercial components in the ECT line. The remaining pages cross-reference almost

80,000 foreign and domestic types, in alphanumeric order, to the equivalent ECG devices.

**105. Koss Corporation**—describes listening sensations in a catalog designed to serve as a dealer hand-out. The 36-page full-color brochure uses descriptions about each of the firm's 16 dynamic (including high-velocity and four-channel) and electrostatic stereophones and accessories.

**106. Littelfuse, Inc.**—has an eight-page cross reference catalog that lists the comparable Littelfuse and Bussman parts for hundreds of standard fuses, fuseholders, fuse clips, and fuse blocks. A comprehensive array of voltages, amperages, and fuse types, including indicating fuses, delayed or "slow blow" fuses, miniature types, high voltage, limited current fuses, rectifier blocks, fuse blocks, fuse clips, and fuse holders, is identified and cross-referenced.

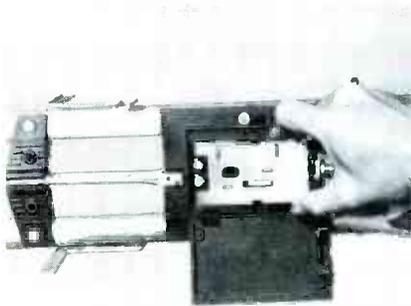
**107. Motorola's HEP**—offers a catalog in which 43,000 semiconductor devices are cross-referenced to 472 HEP replacements. Included in the catalog (HMA-07) are 1N, 2N, 3N, JEDEC, manufacturers' regular and special "house" numbers and many international devices. All Motorola HEP devices are listed by type numbers and case style with a packaging index, device dimension drawings and selection guide information.

**108. Multicore Solders**—introduces a 6-page brochure describing and illustrating in full-color photographs typical soldering problems, and the company's full line of solders, fluxes and chemicals. Among the problems illustrated are icycling, bridging, dewetting, blow-holes, contamination, insufficient and excess solder. Each is an actual photograph showing the problem related to the circuitry and solder of joints of DC boards and terminals. □

# antenna systems report

Features and/or specifications listed are obtained from manufacturers reports. For more information about any product listed, circle the associated number on the reader service card in this issue.

## Solid-State Amplifier

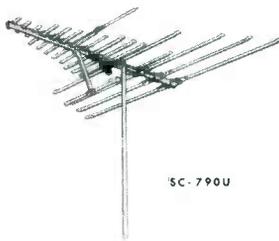


**Product:** Solid-state amplifier from Channel Master.

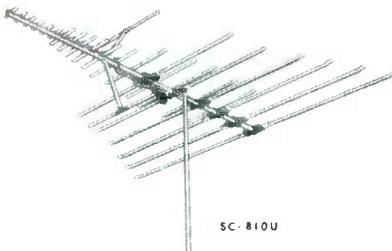
**Features:** This amplifier module was custom designed for installation within the weatherproof terminal housing on the crossarms of the "Quantum" antenna series. Four models are available: VHF/UHF/FM, 300 ohm output; VHF/UHF/FM, 75 ohm output; VHF/FM, 300 ohm output (2 terminals); and VHF/FM, 75 ohm and/or 300 ohm output. The amplifiers have high-gain low-noise characteristics. A built-in FM trap may be switched on to prevent FM signal overloading in areas where this is a problem, while allowing reception of local FM stations. The Quantum Amplifier Modules will perform in temperatures ranging from -40°F. to 140°F. Dual-diode circuitry provides protection against lightning.

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## Antenna



SC-790U



SC-810U

**Product:** Models SC-790U and SC-810U from The Winegard Company.

**Features:** These antennas feature high gain and sharp directivity. A high front-to back ratio rejects unwanted signals and interferences, reducing ghosts and noises. FM control elements allow user to fit the antenna to particular area for improved FM and FM-stereo reception. Each model includes a 3-way (VHF-UHF-FM) band separator for dividing signals at the TV set and a built-in enclosed downlead cartridge which accepts either 300 ohm twinlead or 75 ohm coaxial cable.

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## Mobile Antennas

**Product:** Model HTM and Model HSM Citizens Band antenna systems by New-Tronics Corporation.

**Features:** Models HTM and HSM were designed specifically for use on trucks, recreational vehicles, and other over-the-road vehicles. Slotted

mounts at the bases of the antennas permit attachment to side view mirror brackets without special tools. The resonators are power tested to withstand severe overloads. Each antenna system comes complete with plug-in cable assembly for easy installation.

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## Checklist of Books to Broaden Your Service Capabilities

- Introduction to Medical Electronics—for Electronics and Medical Personnel—27cp. No. 630 \$6.95
- How to Repair Home & Auto Air Conditioners—Fully explains operation, maintenance and repair of all types of air conditioners. 208p. No. 520 \$4.95
- Everyman's Guide to Auto Maintenance—Provides complete basis for auto maintenance. 192p. No. 648 \$4.95
- Computer Technician's Handbook—Comparable to a complete 1000 hour maintenance course. 480 pps. 400 ill. No. 554 \$7.95
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- Refrigeration—An indispensable volume for those who must service all types of air cond. & refrig. units. 160p. No. 295 \$2.95
- Servicing the New Modular Color TV Receivers—Vols. 1 & 2. Vol. 1—RCA, Motorola, Philco, Vol. 2—GE, Magnavox, Packard-Bell, Zenith. No's. 662-663 \$4.95 each
- MATV Systems Handbook, 176p. No. 657 \$4.95
- The Complete Mini-Bike Handbook, 304p. No. 651 \$5.95
- Mobile Radio Handbook, 192pps. 175 ill. No. 665 \$4.95
- Electric Motor Test & Repair—160p. 102 ill. No. 97 \$6.95
- Installing & Servicing Electronic Protective Systems—Covers entire field. Maintenance/installation stressed. No. 605 \$4.95
- 4-Channel Stereo—From Source to Sound No. 656 \$3.95
- Troubleshooting Solid-State Electronic Power Supplies No. 619 \$4.95
- CATV System Engineering: 3rd Ed.—This is the complete, up-to-date handbook on CATV Systems. 256 pages, hb. No. 298 \$12.95
- How to Repair Small Gas Engines, 288p. No. 617 \$4.95
- Pulse & Switching Circuits, 256pps. No. 528 \$4.95
- Japanese Radio, Record, & Tape Player Schematic Service Manual. All popular makes. 228p. No. 642 \$4.95
- Pinpoint Transistor Troubles in 12 Minutes, 495pps. \$5.95
- Designing & Maintaining the CATV and small TV Studio 256pps. 102 ill. hb. No. 615 \$12.95
- Using Electronic Testers for Auto Tuneup No. 604 \$4.95
- CATV System Maintenance—192pps. No. 82 \$12.95
- Marine Electronics Handbook, 192pps. No. 638 \$4.95
- How to Repair Musical Instrument Amplifiers—Covers amplifiers & instruments. 288p. No. 610 \$5.95
- Modern Electronic Troubleshooting, 256p. No. 474 \$4.95
- All-In-One TV Alignment Hbk. 304p. No. 598 \$5.95
- Modern Radar: Theory, Operation & Maintenance, 480pps. No. 575 \$7.95
- Major Appliance Repair Guide—288p. No. 555 \$5.95
- Pictorial Guide to Tape Rec. Repairs—256p. No. 632 \$4.95
- How to Solve Solid-State Circuit Troubles—304p. No. 624 \$5.95
- CB Radio Service Manual—228p. No. 581 \$4.95
- Pinpoint TV Troubles in 10 Minutes—372p. No. 428 \$5.95
- Modern Radio Repair Tech.—260p. No. 580 \$4.95
- Small Appliance Repair Guide—Fix any type of iron, toaster, frypan, etc. 224p. 100 ill. No. 515 \$4.95
- How to Test Almost Anything Electronic—160pps. No. 132 \$2.95
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- Industrial Electronics—Prin. & Prac.—288p. No. 583 \$5.95
- How to Fix Transistor Radios & Printed Circuits—256p. No. 504 \$4.95
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- Electric Motor Repair Shop Problems & Sol.—194p. Hardbd. No. T4 \$8.95
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- Inst. & Servicing Home Audio Systems—256p. No. 505 \$4.95
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- 25 cents per word (minimum \$3.00)
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Each ad insertion must be accompanied by a check for the full cost of the ad.

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This classified section is not open to the regular paid product advertising of manufacturers.

### FOR SALE

TV & RADIO TUBES 36c EA!! Free color catalog. Cornell, 4221 University, San Diego, California 92105 4-73-1f

USE YOUR SCOPE (any model, no rewiring) to test transistors in/out circuit. Simple instructions \$1.00. Schek Technical Services, 8101 Schrider St., Silver Spring, Maryland 20910. 2-73-8t

UNUSUAL SURPLUS electronics and parts catalog, thousands of items. \$1. ETCO, Dept. ES, Box 741, Montreal, Canada. 2-73-10t

### FOR SALE (Cont.)

DIAGRAM SERVICE MANUALS, 18 Radio-TV volumes, cost \$44.50, only \$14.95. Beitman, 409-E Chalmers, Champaign, Ill. 61820 9-73-1t

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ventional ohmmeter with a 1.5 volt supply could cause a shunt semi-conductor to conduct, giving a false resistance reading.

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