

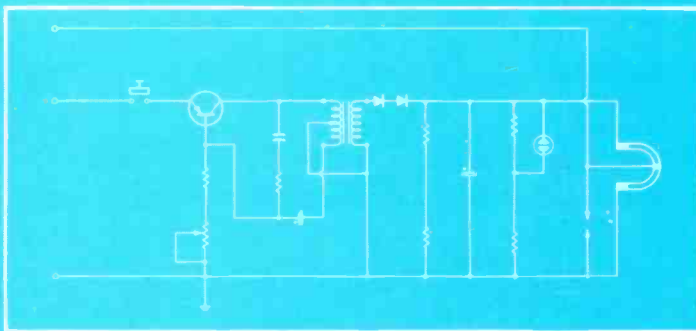
CHIPPWA FALLS, WI 54729  
103 SOUTH GROVE ST  
OLESKY'S RADIO-TV CLINIC  
JOSEPH J OLESKY  
4510-272 N-1A 875 4

November, 1972 □ 75 cents



A HOWARD W. SAMS PUBLICATION

# Electronic Servicing®



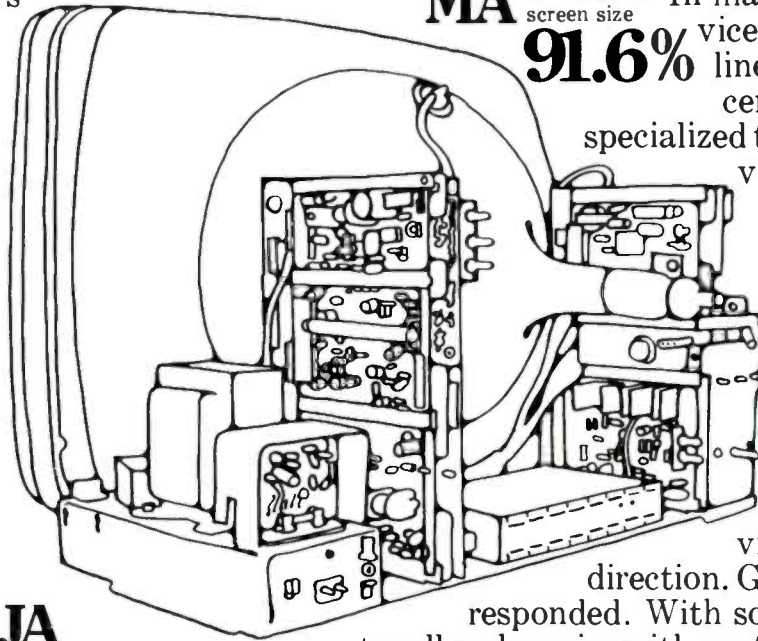
**Servicing automotive test equipment, page 18**

Taming color rainbows, page 40

More about contracts, page 28

# These solid state color systems are the most serviceable we've ever built. Because independent servicers helped us design them.

Independent servicers awarded us these serviceability ratings. Proof that foresight pays. The foresight of the television service industry in developing specific serviceability guidelines and urging TV manufacturers to use them. The foresight of General Electric in working side by side with independent servicers to create 100% solid state sets that are easy to service.

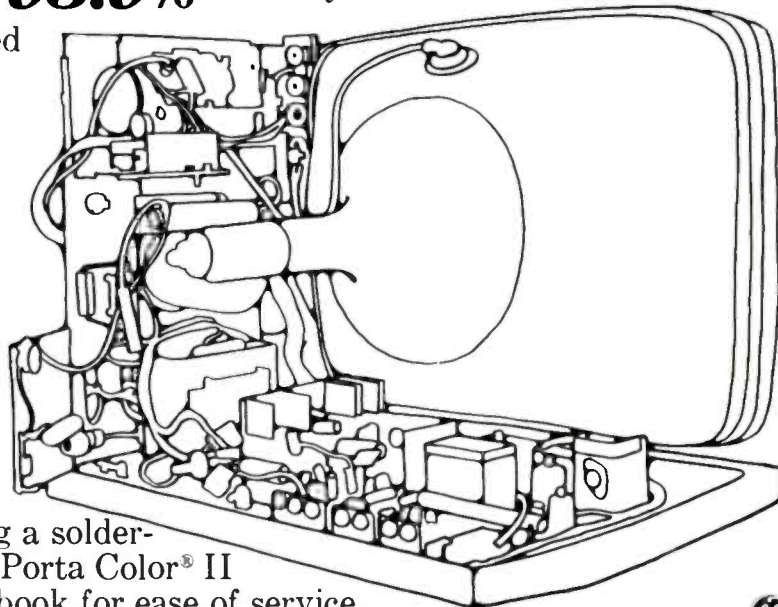


**MA** 25" diagonal screen size  
**91.6%** In many states, TV servicers use direct phone lines to regional parts centers. We provide specialized training. Our Television Service News provides advance information servicers need to more easily service GE monochrome and color models.

The service industry has provided foresight and direction. General Electric has responded. With solid state products to sell and service with confidence. To achieve our mutual goal of customer satisfaction.

**JA** 19" diagonal screen size  
**93.9%**

GE's new solid state sets are designed for maximum accessibility. With extensive use of visual aids. And plug-in modules and components. Example: 95% of the total components in GE's new solid state modular color console models can be removed for servicing without using a soldering iron. Solid state Porta Color® II models open like a book for ease of service.



If you want to know more about GE service, call collect or write "Dutch" Meyer, Television Receiver Products Department, Portsmouth, Virginia 23705. Phone (703) 484-3521.

Impressed? That's only half the story. To improve local parts availability we are expanding parts distribution through independent parts distributors.



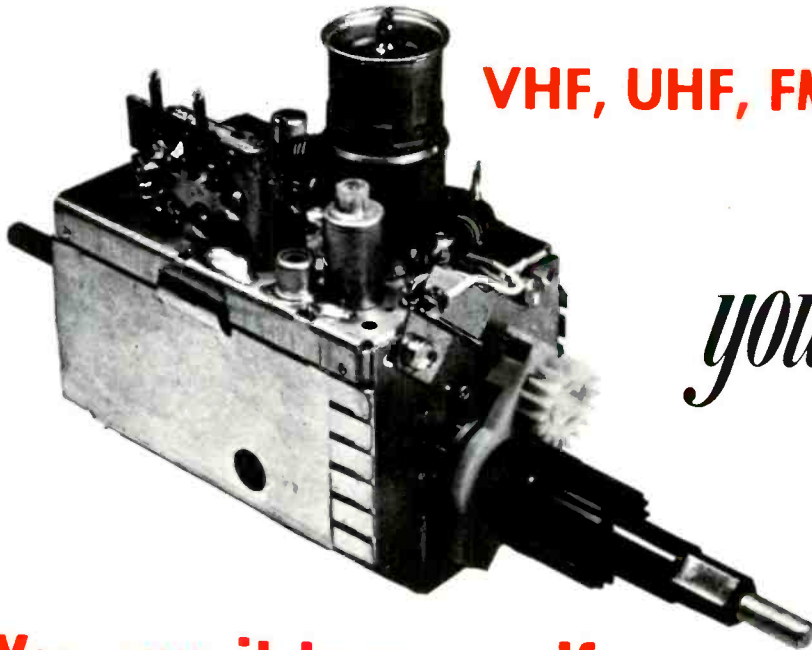
OUR NO. 1 GOAL:  
TO MAKE  
GENERAL ELECTRIC  
YOUR BEST BUY



*We build every television as if we were going to use it ourselves.*

**GENERAL  ELECTRIC**

# TV TUNER SERVICE



**VHF, UHF, FM or IF-Subchassis. . .**  
**. . . All Makes**

*you get...*

**Fast 8 hr. Service!**

**You owe it to yourself**

to try P.T.S. We are the fastest growing, oldest and now the largest tuner service company in the world. Here is what you get:

1. Fastest Service — 8 hr. — in and out the same day. Overnight transit to one of our six plants, for parts, tuners or IF-modules.
2. All tuners cleaned inside and out, repaired, realigned and air tested.
3. On IF-modules all stages checked, all traps set with high calibre test equipment.
4. Fine Quality! Your customers are satisfied and you are not bothered with returning your units for rework!
5. Lower Cost! Up to \$5.50 less than other tuner companies!
6. Friendly, helpful personalized service!

**1 YEAR GUARANTEE**



FIRST TO OFFER 365-DAY GUARANTEE!  
 COLOR—BLACK & WHITE—TRANSISTOR TUNERS—ALL MAKES  
 GUARANTEED COLOR ALIGNMENT—NO ADDITIONAL CHARGE

**We offer you finer, faster...**

VHF-UHF-FM	<b>\$ 9.95</b>
UV-COMBO	<b>\$16.95</b>
IF-MODULE	<b>\$12.50</b>

Major Parts charged at Net Price

**CUSTOMIZED REPLACEMENTS AVAILABLE  
 FOR \$12.95 UP (NEW OR REBUILT)**

**Precision**  
**Tuner Service**



**LIKE TO DO IT YOURSELF?**

PTS makes all tuner parts available to you.  
 Send one dollar (redeemable) for our  
**TUNER REPLACEMENT GUIDE AND PARTS CATALOG**

- 60 pages of top information
- Blow-up of all tuners
- Largest exact tuner replacement guide
- Antenna Coil Replacement Guide
- Multi-fit Replacement Tuner Shaft Guide

For fastest service, send faulty unit with tubes, shields and all broken parts to:

**PTS ELECTRONICS, INC.**

HOME OFFICE— P. O. Box 272—Bloomington, Ind. 47401 Tel. 812/824-9331  
 EAST— P. O. Box 3189—Springfield, Mass. 01103 Tel. 413/734-2737  
 WEST COAST— P. O. Box 41354—Sacramento, Calif. 95841 Tel. 916/482-6220  
 MOUNTAIN— P. O. Box 4145—Denver, Colo. 80204 Tel. 303/244-2819  
 SOUTHWEST— P. O. Box 7332—Longview, Tex. 75601 Tel. 214/753-4334  
 SOUTHEAST— P. O. Box 6771—Jacksonville, Fla. 32205 Tel. 904/389-9952

# Electronic Servicing®

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**EDITORIAL**  
 RONALD N. MERRELL, Director  
 CARL H. BABCOKE, Managing Editor  
 BARBARA L. BORDERS, Editorial Assistant  
 WEBB G. STREIT, Graphic Designer

**CONTRIBUTING AUTHORS**  
 Bruce Anderson  
 Joseph J. Carr  
 Wayne Lemons  
 Robert G. Amick

**TECHNICAL CONSULTANT**  
 JOE A. GROVES

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 Herengracht 365  
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Tokyo, Japan  
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 Tele: 502-0656



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Robert E. Hertel, Publisher

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# Introducing the expensive digital multimeter that doesn't cost a lot.

The B&K Precision Model 281. A solid-state, lab-quality portable instrument that measures AC/DC voltage, current and resistance.

The state-of-the-art Model 281 shows readings on a large, clear, 2½-digit numeric display. It also has positive over-range and reverse-polarity indication. There's no need to switch leads. You can reverse polarity at the flick of a switch.

Model 281 readings are faster and more accurate than analog-type meters. Unlike hard-to-see needle indicators, you can read the large, illuminated numerals—including the decimal point—from a distance.

Featured are 32 ranges: five DC voltage (+ and -), 100mV to 1000V, with 1% accuracy and 10 megohms input impedance; five AC voltage, 100mV to 1000V RMS; five DC current, 100μA to 1A; five AC current, 100μA to 1A; and seven resistance, 10 ohms to 10 megohms.

With built-in protection, the 281 can't be harmed by overload. And for safety's sake, it has a three-line AC grounded cord.

Everything about the 281 says expensive—except the price.

Call your B&K distributor.  
Or write Dynascan Corporation.

# \$169<sup>95</sup>

Very good equipment  
at a very good price. **B&K**



Product of Dynascan Corporation, 1801 West Belle Plaine Avenue, Chicago, Illinois 60613

Circle 5 on literature card

# electronic scanner

news of the industry

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**Rates for federally-funded crime insurance once again have been slashed**—this time by as much as 70 percent—to make the coverage better suited to the budgets of the owners of sales and service electrical-appliance stores. If your business is in one of the eligible areas you can buy crime insurance under the program, regardless of any previous losses, and be guaranteed the policy cannot be cancelled because of the size or frequency of any losses. The insurer for New York, Connecticut, Massachusetts, Missouri, Ohio and the District of Columbia is Aetna Life and Casualty of Hartford, Connecticut (06115) and further information can be obtained from them, or from any casualty and property insurance agent in your area.

**An oven giving temperatures up to 400°F without the use of gas jets or electrical heating elements** has been developed by the Blue M Electric company, a Chicago manufacturer, according to a recent article in *Business Week*. Heat is developed by the friction of air molecules rubbing against each other and the internal oven surfaces when a 3-horsepower blower circulates air through the oven at velocities up to 1,000 feet-per-minute. This oven was engineered to provide a safe heat source for use with such highly-combustible substances as paints, solvents or plastics. Although conventional gas or electric ovens maintain a safe overall temperature, the flame or incandescent wire always is of much higher temperature and might exceed the combustion point of some combustible substances.

**A video disc called Video Long Play which resembles an audio LP record is in the news.** *Home Furnishings Daily* reports that a low-powered laser provides the light for recovery of the video information, thus eliminating record wear during playback. Each disc should play about 45 minutes on each side. The VLP system has provisions for image speedup, stills, reverse play random access or picture-by-picture display. Initial costs of VLP playback machines are expected to be about equal to that of color TV receivers. This new product is to be marketed by the North American Philips Corporation.

**Neon lamps which glow green or blue** now are manufactured by the General Electric Company. Previously, only neon lamps glowing red, yellow or orange were available. The basic glow color of the new lamps is green. Internal filters change the color to blue.

**Three-million power transistors** have been ordered from the Solid State Division of RCA by the Chrysler Corporation. This is RCA's largest silicon transistor order to date from the automotive industry and reflects Chrysler's decision to install electronic ignition systems in all of its 1973 automobiles. The Chrysler type of electronic ignition uses two transistors and is triggered magnetically without use of the traditional "points".

*(Continued on page 6)*

---

# TO A PRO, TIME IS MONEY

So take time to read about the BUSS® Kolor Kit of replacement fuses

The mark of a professional Certified Electronic Technician is efficiency. He's got the ability to locate a problem quickly, repair it quickly, and get on to the next job.

One of his secrets is that he always has the part he needs when he needs it. That's where the BUSS Kolor Kit of replacement fuses for domestic and foreign TVs comes in.

The Kolor Kit comes in two sizes, the No. 140 Kolor Kit containing 120 fuses, and the No. 240 Deluxe Kolor Kit containing 240 fuses plus four sets of twin clips. With a BUSS Kolor Kit in your tube caddy, you'll always have the fuse you need when you need it. Ideal for servicing both color and black and white TV's.

BUSS Kolor Kits are available from your local BUSS Distributor.



Bussmann Mfg. Division, McGraw-Edison Co., St. Louis, Mo. 63107

SUPPLIED THE ECONOMICAL WAY  
... THRU DISTRIBUTORS  
**BUSS QUALITY**  
FUSES

An article in **Radio & Television Weekly** reminds us that this year is the 25th anniversary of the beginning of commercial television broadcasting. In 1947, 179,000 table-model TV's were manufactured. Most of these were 10-inch models selling for about \$375. A few models featured a "big screen" 12-inch picture. In contrast, this year a total of 15 million b-w and color receivers should be produced. Also, 699 commercial stations are broadcasting to an estimated 100 million TV receivers. Few industries can boast of such a rapid growth.

"**Brightness Race Continues In TV**" was one of the headlines recently in **Home Furnishings Daily**. Zenith executives, questioned by the HFD reporter, stated their research was towards a brighter color picture tube as one factor of picture quality. They also said Zenith will not emphasize factory-owned distributing branches, nor will there be any direct selling to customers.

**Pay TV** has been introduced in a new form, according to the **Wall Street Journal**. Slightly-dated Hollywood movies can be viewed for a fee in hotel rooms in New York, Little Rock, and Atlanta. The hotels are enthusiastic about the plan because the viewers are very likely to order food and drink for consumption while watching. Technically, the various systems operate much like past proposals for CATV use. In one hotel, the guest must call room service and request deactivation of the scrambling signal. In others, a control box attached to the standard room TV descrambles the signal and records the use so a billing can be made. At this time, all the systems operate with video tape.

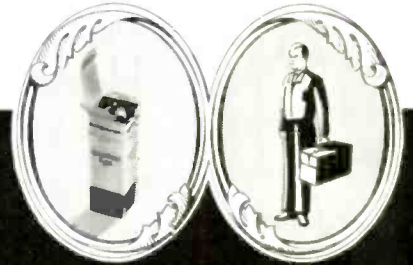
Seven New York City TV repair shops were charged with performing unnecessary repairs after a month-long survey, as reported in the **Radio & Television Weekly**. The seven independent shops have been given summonses charging deceptive trade practices under the consumer protection law, which specifies fines of \$500 for each conviction. A defective tube was placed in a television receiver and the interior of the set sprayed with ultraviolet paint. Then investigators of the Commissioner of Consumer Affairs in New York City asked eight TV shops to make repairs. One factory-affiliated firm performed the one repair in the home. The other seven, selected because of many past customer complaints, all removed the set to their shops and claimed to have made other repairs in addition to the tube replacement. It is alleged that most of these additional repairs were never made, but the total repair prices ranged from \$29.50 to \$52.45. □



# There's an Amperex replacement tube for any socket in any set you're likely to service...

TV, HiFi, FM or AM, House Radio, Car Radio, P.A. System or Tape Recorder. Imported or Domestic!

AMPEREX ELECTRONIC CORPORATION, DISTRIBUTOR SALES, HICKSVILLE, NEW YORK 11802



AMPEREX SUPPORTS THE INDEPENDENT SERVICE DEALER

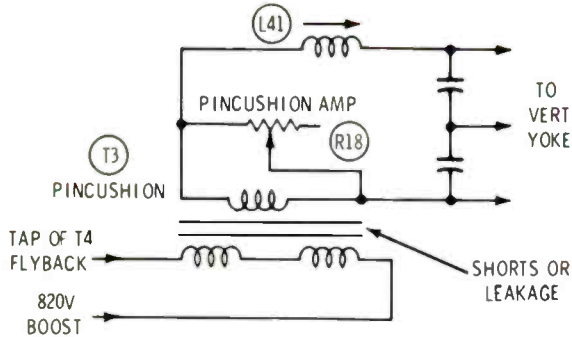
## Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS  
A NORTH AMERICAN PHILIPS COMPANY



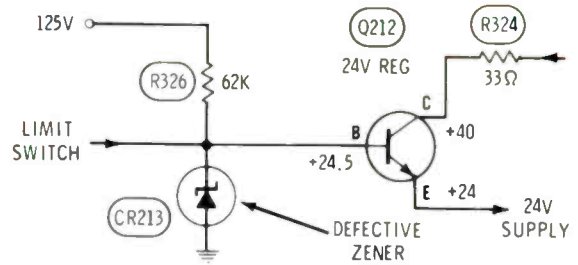
Circle 7 on literature card

**Chassis—Zenith 4B25C19**  
**PHOTOFACT—1166-3**



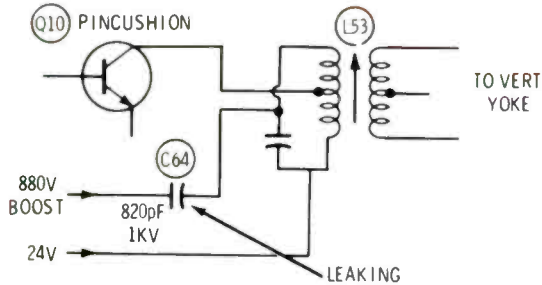
**Symptom**—No high voltage; plate of horiz output tube red  
**Cure**—Check for shorted turns or leakage between windings of T3

**Chassis—Zenith 25CC55**  
**PHOTOFACT—Not yet available**



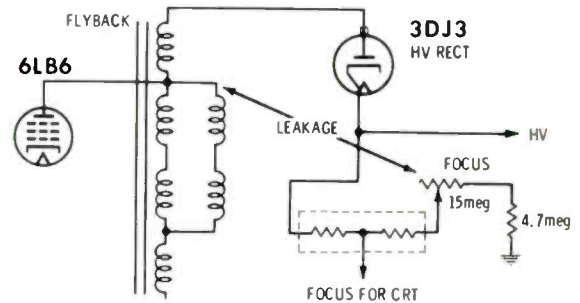
**Symptom**—Hum in video, picture pulling, incorrect 24-volt supply  
**Cure**—Check for a defective CR213 zener diode

**Chassis—Zenith 14A9C29**  
**PHOTOFACT—1116-3**



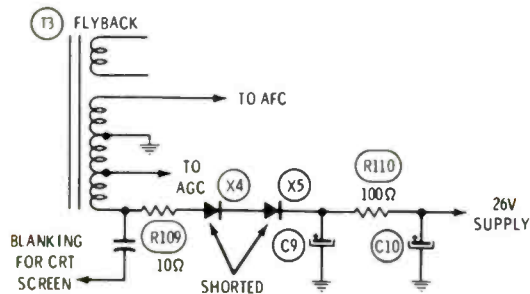
**Symptom**—Boost voltage low, 24-volt supply high  
**Cure**—Check for leakage in C64

**Chassis—Zenith 12B14C52 (and others)**  
**PHOTOFACT—1157-2**



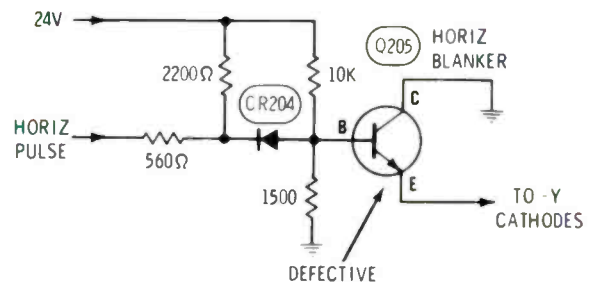
**Symptom**—No or low focus voltage; poor focus  
**Cure**—Check for burned path between flyback lead and focus control

**Chassis—Zenith 12CB12X (b-w)**  
**PHOTOFACT—1252-3**



**Symptom**—Raster narrow, and low 26-volt supply  
**Cure**—Check X4 and X5 for shorts

**Chassis—Zenith 20CC50Z**  
**PHOTOFACT—Not yet available**



**Symptom**—Poor skin color, partial loss of green  
**Cure**—Check Q205 blanker transistor, and replace if defective



## Our ECG 102A transistor replaces...

To Be Replaced	ECG Replacement	To Be Replaced	ECG Replacement
11B33	102A	MA3931	102A
11B54	102A	MA3931D	102A
11B55	102A	MA3931RD	102A
11B56	102A	MA815	102A
11B75	102A	MA881	102A
11B75C	102A	MA882	102A
11B77	102A	MA883	102A
11B77B	102A	MA884	102A
11B77C	102A	MA885	102A
11B156	102A	MA886	102A
11B156C	102A	MA887	102A
11B171	102A	MA888	102A
11B172	102A	MA889	102A
11B175	102A	MA890	102A
11B176	102A	MA891	102A
11B178	102A	MA892	102A
11B186	102A	MA893	102A
11B187	102A	MA894	102A
11B263	102A	MA895	102A
11B270	102A	MA896	102A

## and hundreds more.

The 102A is only one big part of our very small line.

Just 124 Sylvania ECG semiconductor parts will replace over 41,000 manufacturer's part numbers and JEDEC types.

Our new ECG semiconductor replacement guide makes it easy for you to find out exactly which one of ours is the one you need.

With our guide and our 124 replacements, you can service practically any solid-state entertainment product on the market.

No more lugging sets back to the shop because you couldn't carry all the parts you needed.

With Sylvania's 124 semiconductors you can handle almost all of your repair jobs right in your customer's home.

Stock up on Sylvania ECG semiconductors now.

It's just another small thing from GTE Sylvania that can take a big load off your back.

*Sylvania Electronic Components,  
Waltham, Mass. 02154*

**GTE SYLVANIA**

# readers' exchange

**Wanted:** I am looking for a company that sells empty receiving tube cartons. I would like to collect tubes as a hobby. Can you help me find cartons for 5U4, 65N7, 5AQ5, etc?

Eds Radio & TV  
5712 Lathers  
Garden City, Michigan 48315

**For Sale:** Five Tungsol 12FR8 tubes for \$5.00 each.

George Gibbons  
78-14 90th Ave.  
Woodhaven, N.Y. 11421

**Needed:** The schematic for a Bogen public address amplifier, Model MX 60A. It is a 60-watt PA amplifier manufactured by Bogen. Also, I am having difficulty locating the schematics for a new transistorized Fender Bassman amplifier and design for the Fender Bassman speaker cabinet.

Tom Rea  
64 N. Salamaua Ct.  
Lexington Park, Maryland 20653

**Needed:** Schematic and instructions for Weston Multimeter, Model 976.

Carl Peterson  
2720 "Q" St.  
Vancouver, Washington 98663

**Needed:** Schematics and service information on a Philco Universal color bar and dot bar generator, Model 7100. This is a very old model.

Joe Alward  
1719 Pluto Way  
Sacramento, California 95825

**Needed:** We need a source of parts for Playtape two-track cartridge player assembled in Hong Kong from Japanese parts. We have ordered several times from Craigstan Corp. with no response.

Roy Randall  
P.O. Box 1167, AIA Highway  
Hobe Sound, Florida 33455

**Needed:** I have a VTVM in need of repair. Could you tell me if Radio City Products Co., Inc. is still in business and supply me with the address? If this company is out of business, could you suggest a place that repairs meters?

Kessler Radio Service  
Ridgely, Maryland 21660

**Needed:** A schematic and operating instructions for a Dumont Cathode-Ray Oscillograph, Type 241 made by Allen B. Dumont Laboratories.

John H. Grumbling  
9 Woodcrest Dr.  
Oroville, California 95965

**Needed:** Schematic and service data for Century b-w transistor TV, Model MT510, made by Toyko Transistor Ind. Co., Ltd.

W. L. Porter  
1818 Baldwin Dr.  
McLean, Va. 22101

**Needed:** Schematic for a Sylvania AM & FM radio, Model BT320.

Maurice Ahearn  
RD #3  
Auburn, N.Y. 13021

**Needed:** Information on locations where I can purchase Panasonic parts and special tools to make my servicing easier.

John Stahl  
727 Westwood Ave.  
Rivervale, N.J. 07675

**Needed:** Schematic for a Philips radio, Type 436AN, No. X36188. I also need a transformer, No. 45713.

C. L. Cagle  
6636 Mona Lisa Ave.  
Fort Worth, Texas 76148

**Needed:** Schematic for a Stewart, Model ST8010 eight-track tape player.

David Boughter  
943 Sherwood Dr.  
New Castle, Pennsylvania 16101

**Needed:** Schematic for a Trav-ler b-w television, Model 19P6243.

Watson's TV Service  
414 East 5th St.  
Muscatine, Iowa 52761

**Needed:** Schematic, operating instructions and service notes for a Webcor 210-1C tape recorder.

Anthony J. Wegrzyn  
39 Maryknoll Dr.  
Lackawanna, New York 14218

**Needed:** Schematic and operating instructions for Webcor 5000R auto reverse tape recorder.

F. E. Hall  
623 Lonsdale Ave.  
Fremont, California 94538

**Needed:** Schematic and setup manual for an Eico 368 sweep and marker generator.

Lloyd Martinson  
204 Central South  
Swift Current  
Saskatchewan, Canada

*Needed: Schematic and operating instructions for an Autothern deep heat therapy unit. This unit is manufactured by Mettler Electronics and is used for medical purposes.*

*B. J. Sturtevant  
821 N. Bishopthorpe St.  
Bethlehem, Pennsylvania 18015*

*Needed: Could you please tell me the address of the company that distributes the Nobility line of radios, cassette tape recorders, etc.?*

*William Blankinship  
Blankinship Electronics  
General Delivery  
Gallatin, Texas 75764*

*Needed: A PIX No. 17DXP4, the distributor told me the PIX is obsolete and they don't make them anymore. If anyone has one I would like to hear from them.*

*J.J. Yowns  
4578 Ashbaugh Rd.  
Murrysville, Pennsylvania 15668*

*Needed: Source for parts such as sockets, electrolytics, vertical blocking and output transformers flybacks and knobs for old TV's.*

*Francis Burlingame  
3334 W. Highland Blvd. #809  
Milwaukee, Wisconsin 53208*

*Needed: Horizontal output transformer for a SUN MARK TV, Model SM-12.*

*J. Heyden  
7910 Brevard Ave.  
New Orleans, Louisiana 70127*

*Needed: Instruction book and schematic diagram, parts list for a Recordio, Model R-806, Serial number 1689. This is a fairly old recorder.*

*Michael Meharra  
2512 A St.  
Liberty Boro  
McKeesport, Pennsylvania 15133*

*Needed: Schematic diagram and service literature for a WEBCOR TV, Model TV 208, Serial number 09303176.*

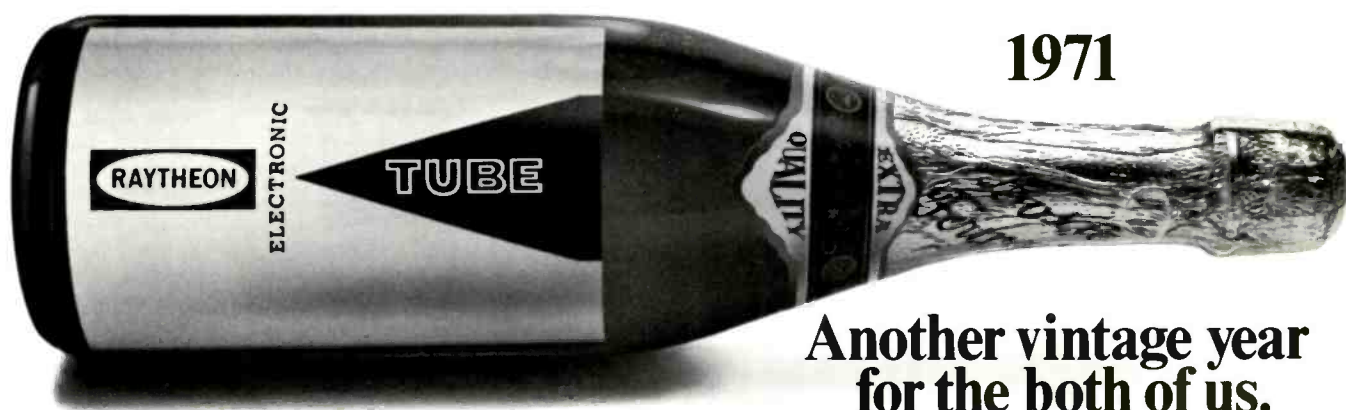
*S. Comeaux  
1616 Thomas Ave.  
San Francisco, California 94124*

*Needed: Schematic and service manual for a Triplet Model 3434 TV & FM signal generator.*

*Gustav Hoffman  
524 Station Ave.  
Haddon Heights, N.J. 08035*

*Needed: Schematic and parts list for a Dokorder, Model 800A AM/FM stereo.*

*Sunset Electronics Service  
4201 NE Sunset Blvd.  
Renton, Washington 98055*



## Another vintage year for the both of us.

1971 was a very good year. And 1972 already tastes even better. The truth is every year's a vintage year for you, the independent serviceman, and Raytheon, the largest independent tube supplier in the business. Last year, while a lot of other suppliers were running behind, even dropping out of the race, the two of us had another great year. We've come a long way together.

And like a good wine, we keep getting better.

That's because Raytheon works so well with you.

And never works without you. That's the kind of thing that makes for a very good year for both of us. Year after year.

Circle 9 on literature card

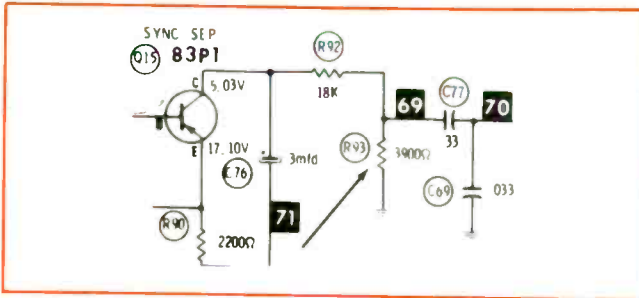
# servicebulletin

a digest of info from manufacturers

## Weak vertical locking

Magnavox T936, T956 or T957 color TV chassis

Vertical-sync pulses can be doubled in these chassis by increasing the value of resistor R93 from 3900 ohms to 6800 ohms and connecting it to the other end of R92 and ground.



## Audio squeal at turn-off

Magnavox T958 and T962 color TV chassis

An audio squeal that sounds for a short time after the set is turned off has been found by Magnavox to be caused by some 6DT6 sound-detector tubes. Audio

oscillation occurs when the plate voltage drops to a certain value.

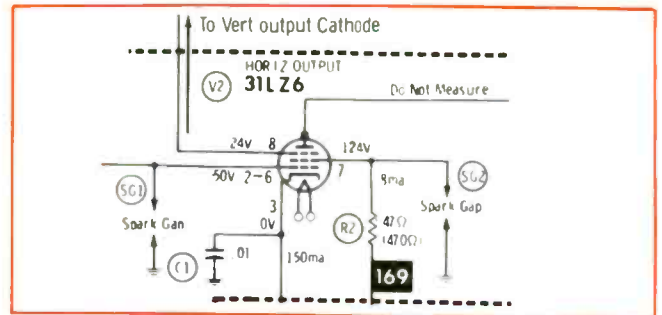
Replacement of the tube, or a slight readjustment of the quad coil (Magnavox L703), usually solves the problem. Magnavox 6DT6 tubes in their stock have been tested to insure that the replacements will not exhibit this problem.

## Insufficient vertical sweep

RCA CTC51, CTC52, CTC53 or CTC55 color TV chassis

Reduced vertical sweep in these chassis can be caused by a defect in the horizontal-output tube, a 31LZ6. Suppressor voltage for the horizontal tube is obtained from the cathode of the vertical-output tube; therefore, any voltage wrongly supplied by the horizontal tube applies excessive cutoff bias to the vertical tube.

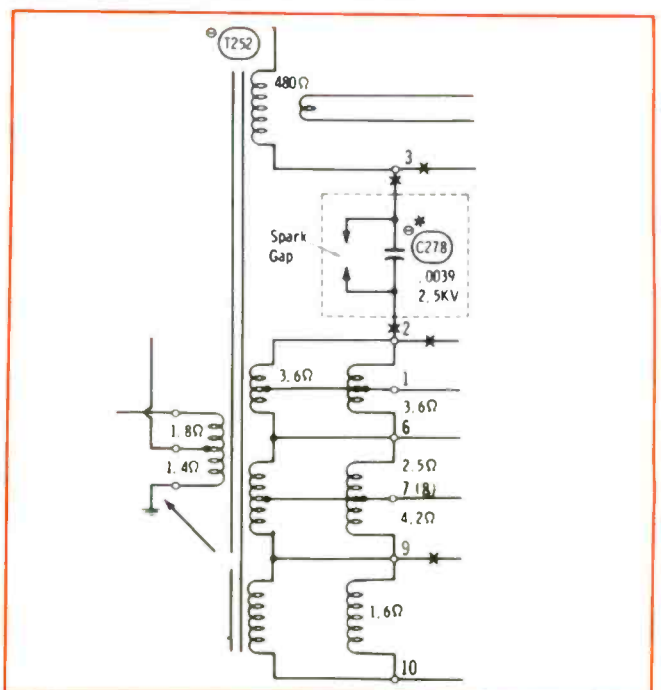
If the horizontal-output tube requires replacement, it is advisable to replace the 31LZ6 type with a 36MC6 tube. This is a direct replacement, and no circuit modifications are required.



## Poor color sync and excessive high voltage

General Electric C2/L2 color TV chassis

If color locking is erratic, check for a cold-solder joint at the ground end of the pulse winding of the HV transformer. This winding is located at the rear of the transformer core, and the ground wire is connected to a lug on the inside of the HV shield.



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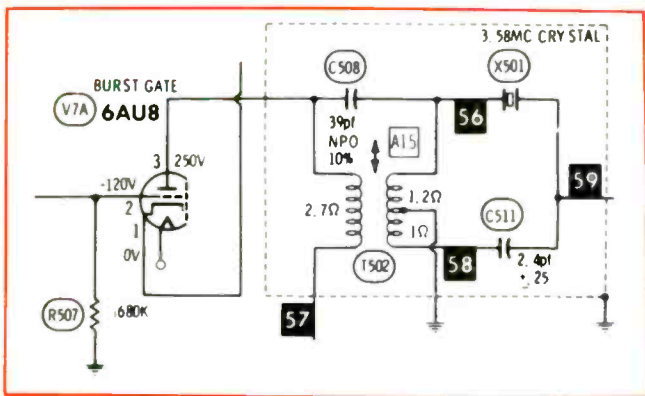
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**Tint control has little effect**

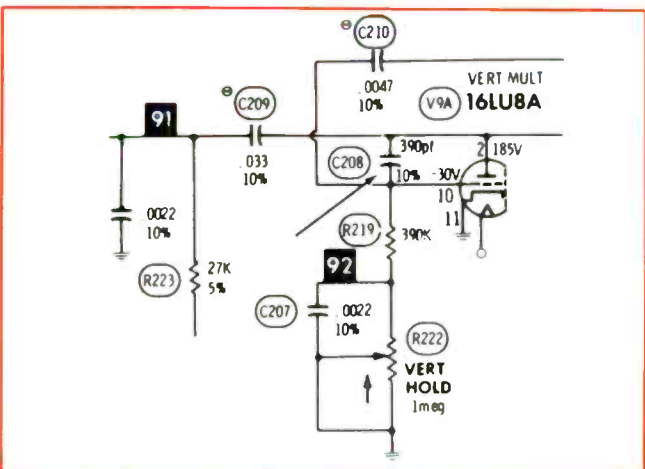
General Electric C2/L2 color TV chassis

When the tint control has little or no effect, test the X501 3.58-MHz crystal by replacement. Use the GE EU41X3 2-lead or EP41X1 3-lead crystals for replacement.

**Vertical rolls down**

General Electric C2/L2 color TV chassis

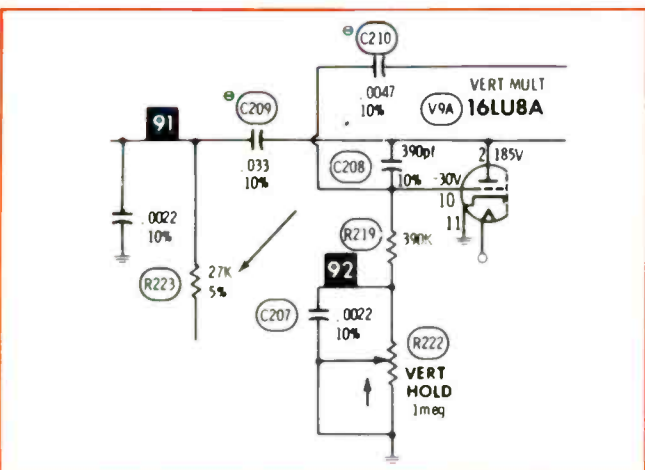
A slow vertical roll downward, especially as heat in the cabinet builds up, might be caused by leakage in C208 (Photofact 1231-2), a 390-Pf capacitor.



**Vertical linearity stretched at top and compressed at bottom**

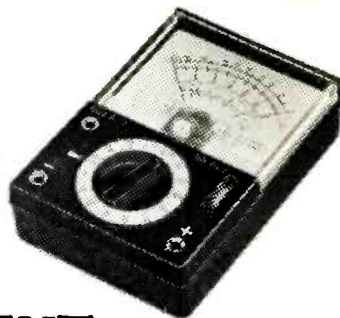
General Electric C2/L2 color TV chassis

When the vertical linearity is compressed at the bottom and stretched at the top of the picture, measure R223 (Photofact 1231-2), a 27K-ohm 5% resistor. Replace the resistor, if it is out of tolerance.



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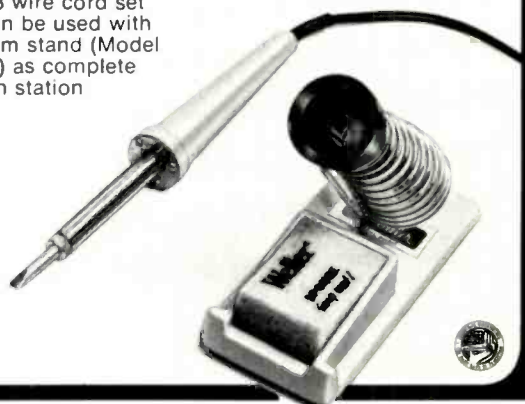
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# Be a "good guy" and brighten your image

*Make your name and good deeds known in your community by using these public-relations suggestions and the A-I-D-A method which makes them effective.*

by Raymond E. Herzog

Two of the key factors that can bring a better image and increased profits to any business are: effective advertising, and pleasant public relations.

You undoubtedly believe your paid advertising using newspaper ads, telephone yellow pages, direct mail, and radio or TV commercials is very important. And, of course, you should feel this way, for advertising is so valuable its worth can hardly be overestimated. Part of the value goes beyond the immediate coverage of the ad, and contributes to your image by giving publicity.

However, things other than paid advertising also can give you favorable publicity. Some cost nothing. Others require small expenditures, but might produce better results than the usual benefits from paid ads.

Generally speaking, these are your personal actions that are beneficial to all those in the community. In other words, you should engage in the social services and good deeds which really should be done on general principles by everyone. But who among us doesn't need the prodding of extra reasons for doing the things we should?

In addition to the inner satisfactions of knowing you have been a good citizen, these public relations

(PR) activities can bring you:

- indirect proof that you are a dynamic person who probably operates your business in the same manner;
- another method of keeping your name before the public;
- the increased confidence of customers and potential customers in your personal, professional, and technical abilities;
- the respect and good will of those in your area.

The following PR ideas have been used elsewhere with beneficial results. Adopt the ones that might work best for you.

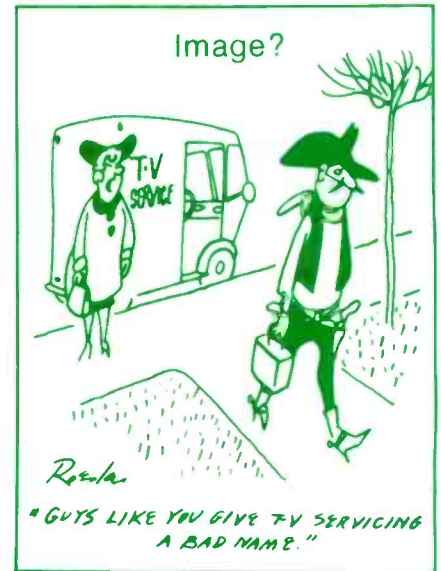
## Write For Your Local Newspaper

If you have a hobby, such as photography, stamp-collecting, or any other of general interest, arrange with your local newspaper to write articles or news items about it.

Of course, newspapers print other items about which you might have special knowledge. For example, there is much in the fields of electronics that would be of interest to many people, if it were translated into laymen's language. Is CATV under consideration for your city? Pertinent facts about the practical operation, or the advantages and drawbacks of such systems, might prevent your city council from making a mistake in franchising which would be expensive for the taxpayers.

Perhaps you could comment about such late developments as home-video tape players or 4-channel sound.

Safety pointers for installing antennas or in using some specific kind of electronic product would be appropriate. Warnings about the hazards of do-it-yourself servicing might be helpful.



And, if handled in a way to minimize the commercial aspects, you could write a news-type story about an award for product serviceability won by a manufacturer.

Use the "Letters To The Editor" section of your newspaper to comment on civic affairs. (Avoid subjects which might cause people to resent or oppose your views.) Or, give electronic information which could be important to the average citizen, but not available through the normal news channels.

## Write Articles For Magazines

Most of the national electronics magazines (including ELECTRONIC SERVICING) buy articles from first-time writers. If you have a better method or a new technique for doing some kind of a servicing job, write it up and send it in to a publication.

Here's a tip. If you should have any of your material published, be sure you report all the details to the editor of your local paper. He will welcome the information, and you will reap the favorable publicity when he prints the news.

## Teach Night School Courses

Contact the school board and ask if there is a need for an instructor for basic electronics (or other electronics subject), perhaps in a night school for adults. TV men who have done this report they learned an amazing amount about electronics by teaching such a class.



# Now every product in this catalog is available on a special money saving offer from your RCA distributor.



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RCA's all new line of Antenna System Accessories has been planned and designed to fulfill specific requirements of any antenna system in every detail. Covering every requirement from a simple passive two-set coupler up to a complete amplified, 82-channel coaxial multi-outlet distribution system for houses, offices, stores and small apartment buildings, this new line is complete in every respect and represents a new standard of performance, convenience and styling.

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All housings have RCA's "new-look styling" in molded high IMPAC® plastic cabinets. Similar styling design for all models presents a uniform appearance for a complete line.

Installation convenience . . . mounting is simplified with the use of the new RCA "slip-on" clamps. No solder connections are required to connect any model into a system. Serrated washers simplify connecting 300-ohm line to the devices. All hardware, complete installation instructions and system wiring connectors are included with every model.

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## This is how to get it.

The RCA Antenna Systems Accessories Catalog is the TV service dealer's complete guide to better reception for his customers and more sales. So tune in and get your free copy today with absolutely no obligation. Ask your local RCA Parts and Accessories distributor how to get your free copy, and find out about

the special money saving offer available from participating RCA distributors. For the name and address of your nearest RCA distributor, write: RCA Parts and Accessories, Distribution Services, 2000 Clements Bridge Road, Deptford, New Jersey 08096. **RCA**

Circle 12 on literature card

### Help Form A "Ham" Club

Most neighborhoods have youngsters who are interested in ham radio, but who need an experienced person to help them with the theory and code. And, if you help these fledglings, you might find a future source of beginning technicians.

### Donate Old Equipment And Parts

Old or obsolete test equipment and any ancient components you never will sell should be donated to the high-school radio club, vocational school, or amateur-radio group in your city.

Again, if you help in any of these ways, inform the newspapers.

### Become A Public Speaker

Start to become a public speaker by advising the high-school graduating class next career day of the opportunities in the many fields of electronics. Invite any interested students to your shop for a guided tour. Perhaps you'll feel compelled to do that cleanup you have put off so long!

Participate in local radio or TV interview programs, and speak at meetings of civic, business and religious organizations.

Such speaking activities should help to overcome your natural stagefright. And, contact with all the people in those groups extends your reputation and brightens your image.

### Join Clubs And Organizations

Become a Scoutmaster, join the



Rotary Club or the Junior Chamber of Commerce, work with the Community Chest, Junior Achievement, or any other worthy organization. Most civic projects welcome additional helpers.

### Involve The Community In Your Promotions

Hold a contest having small prizes, perhaps to find the oldest-operating TV receiver in the county. Be sure your picture with the prize winner is printed in the paper. Make the arrangements yourself to have the picture taken, if that will assure coverage.

Hold an open house in your store or shop in connection with some national event, such as Amateur Radio Week or National Radio Month. Start the publicity well in advance.

Again, it is important that any of your good ideas reach the attention of your local newspaper editor. Both of you will profit.

### A-I-D-A, A Method For Selling Ideas

I'm sure you've noticed that many of these PR ideas involve formal writing or speaking. And yet, most technically-trained people would rather have a test probe in their hand than a pen and pencil. If you feel this way, be assured you're not alone.

However, writing an article, outlining a speech or organizing a lesson plan is not all that hard to do. At least, not if you follow a proven-effective plan called the A-I-D-A method.

A-I-D-A is a term familiar to successful salesmen and advertising men, and it is an acronym formed from the first letters of these words:

- Attention,
- Interest,
- Desire, and
- Action.

The ideas behind these four simple words are absolutely basic and essential to selling anything, whether ideas or merchandise.

A written selling job is more difficult than one attempted by speaking in person. There is only one chance to get the idea across, because the writer cannot be ques-

tioned and add more information when it is needed. So, many of our suggestions involve written material.

### Making A-I-D-A Work For You

#### Attention

Regardless of what advertising and PR activities you do, they'll be competing with others. So, your first step is to focus the attention of your audience on your ideas or merchandise.

In written material, a good title or headline is the attention-getter. An effective one does any or all of the following:

- aims for a certain audience,
- promises the reader a benefit,
- appeals to the reader's self-interest,
- gives news or new information, or
- arouses curiosity.

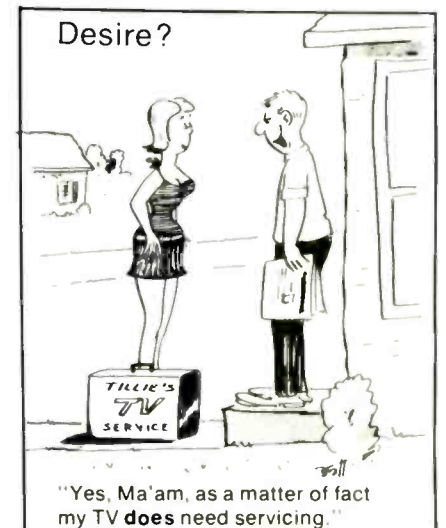
Exactly what is best to say depends on the subject and the audience. But, just make sure what you say next lives up to the implications of the headline, and doesn't make the reader feel let down.

#### Interest

For the second step, arouse the reader's interest in the proposed idea. Usually, this is done by describing both features and benefits promised by the title or headline. One of the best concepts used in sales work is to "Sell the sizzle, not the steak."

#### Desire

Next, you should present strong



## Action?



"IT'S NOT A FALSE ALARM THIS TIME — THE SET WAS PLUGGED IN WHEN THE PICTURE TUBE GAVE OUT."

and compelling reasons why the reader should follow your suggestion. This should cause him to **Desire** to accept the idea or obtain the merchandise. Both positive and negative reasons can be given; however, positive reasons are preferred.

Attention and Interest might be attained by purely emotional appeals, but **Desire** must be built up by proof, the nitty-gritty of hard facts.

### Action

Attention, Interest, and Desire are all of no value unless they inspire the reader to act on the proposed idea. Make it easy for him to act, invite him to a demonstration, and give him reasons for immediate action. **Action delayed is often action never made.** Help him to act immediately.

### A-I-D-A Is Universal

Don't delete any of the four basic steps of the A-I-D-A method. Although, in some specific cases you might want to add another step (such as adding "Decision" between Desire and Action). You will find these basic steps can be used for nearly any kind of "selling".

Advertising, articles, news items, speeches, outlines for seminars, or a recommendation of a hobby or profession should be based on the A-I-D-A principle, if they are to be effective.

Think back to the last time you bought a new automobile. The start of that purchase probably was the Attention you gave the headline or picture of the car in a newspaper or TV ad. A listing of the new fea-

tures, and the benefits you would obtain from them changed Attention into Interest, Interest into Desire, and finally, Desire into a Decision to buy.

But you actually didn't receive the new car and all its potential benefits until you started Action. You reached an agreement with the salesman and signed on the traditional dotted line before the car was yours.

### You Can Use A-I-D-A To Sell Service

You can (and should) use the A-I-D-A principle in selling service to your customers.

The Attention step already should have impressed itself on your customer before the equipment actually failed. At least, if you have used effective advertising, received favorable word-of-mouth reports from neighbors of your customer, and have engaged in some of the public-relations activities as we have suggested earlier, this customer should remember you.

Being deprived of his favorite

TV programs or stereo music certainly would arouse an Interest in having someone make repairs. So he calls you.

The Desire to have his machine repaired, and repaired by you, can be stimulated in reassuring him that you have fair prices, fast repairs, etc. Don't use overkill, however; stop when he decides to have you do the work, and tells you to proceed (Action).

### Magazine Articles Need A-I-D-A

Even this article follows the A-I-D-A method. It's true that the best information in the world will be useless if no one reads it. Therefore, the title and the general layout must attract your attention. Then your interest should be aroused by the paragraph which summarizes the subjects to be covered.

Next, the main body of the article should give you (in this case) suggestions for things you should do to improve your image. This should give you the Desire to acquire a better image.

But now, the last part—the Action—is up to you. □

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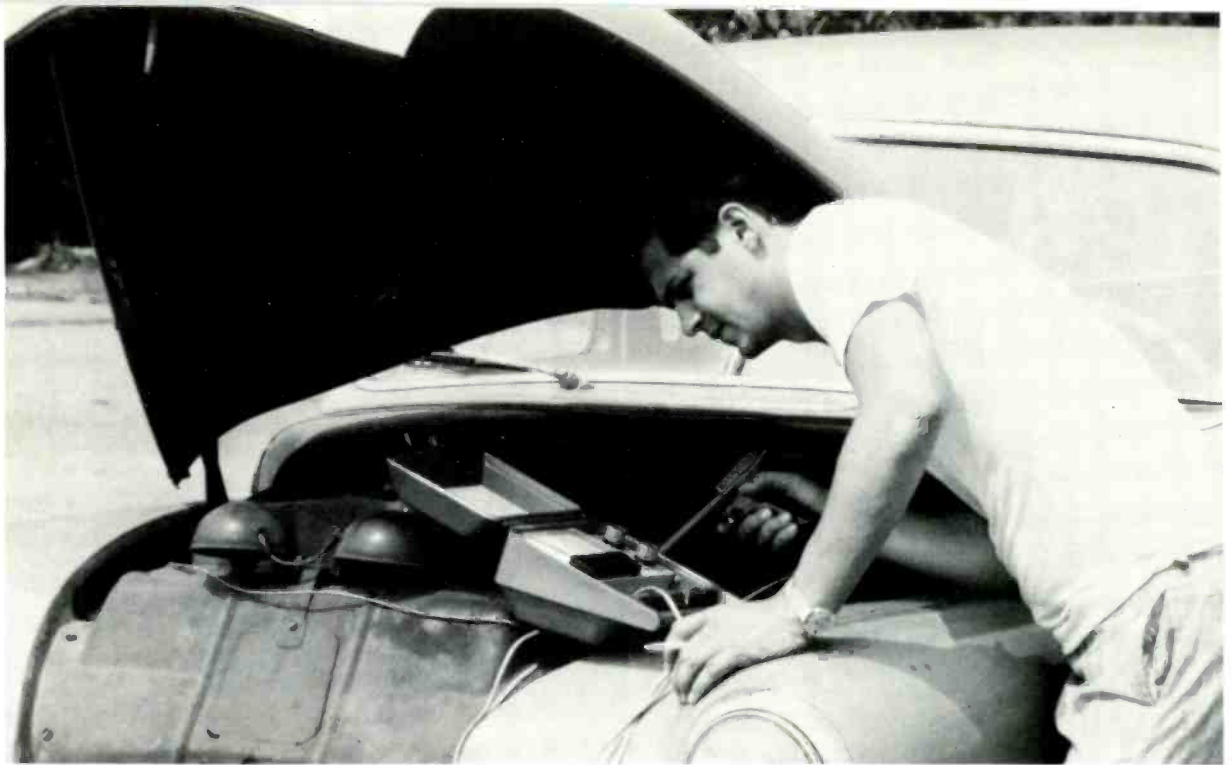
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## Servicing automotive test equipment

By Joseph J. Carr

*Most of the test equipment used in the automotive business uses familiar electronic principles. You can increase your income by repairing these items.*

If you service car radios, it's a sure bet you eventually will be asked to repair some item of automotive test equipment. The request might come from one of the garages that have you do their car-radio repairs. Or a broken tune-up meter might be brought in by a "do-it-himselfer".

In any event, you can make extra money and stay one jump ahead of your competition, if you can accommodate such repairs.

Most automotive test equipment is designed to check the electrical systems of cars, and especially the adjustments and performance of the ignition system. Therefore, you should feel right at home with this type of equipment.

### The Basic Ignition System

For many decades, the Kettering-type ignition system has

been standard in most cars. At the heart of this circuit (Fig. 1) is a switch, called "breaker points", or just plain "points". The switch is opened and closed by the rotary motion of a multi-cornered cam inside the "distributor" unit.

When the switch is closed, direct current from the battery flows through the primary winding of the high-voltage "coil" (Fig. 2). (Although the word "coil" is used universally by mechanics, it is actually a step-up transformer, or autoformer.) The current causes a magnetic field to build up around the core of the coil. When the breaker points are opened, the magnetic field collapses inducing a very high-voltage ringing pulse in the secondary winding.

This high-voltage pulse of more than 12 KV is fed to the distributor where it is routed by the rotor to the correct spark plug. Both rotor and points are controlled by the same shaft so they must operate in synchronism. The points open each time the rotor is adjacent to a connection going to a spark plug.

A capacitor (universally called a "condenser" by everyone in the automotive business) is paralleled across the breaker points to reduce the arcing which pit and ruin the points when it is excessive. (Editor's note: my observations of the magnetic forces in the sweep circuits of TV receivers lead me to believe the "condenser" has another and more important function. The capacitance series-tunes the coil to a lower frequency which is necessary to stop the ringing before the start of the next cycle. In any event, auto mechanics know that an open "condenser" changes a normal "hot" spark into a very weak one.)

### Timing The Ignition

"Timing" of the ignition system is necessary so the arc between the electrodes of a spark plug begins when the piston is in a certain position. In other words, timing adjustments determine the electrical phasing of the high-voltage pulses relative to the mechanical cycle.

While the engine is idling, a

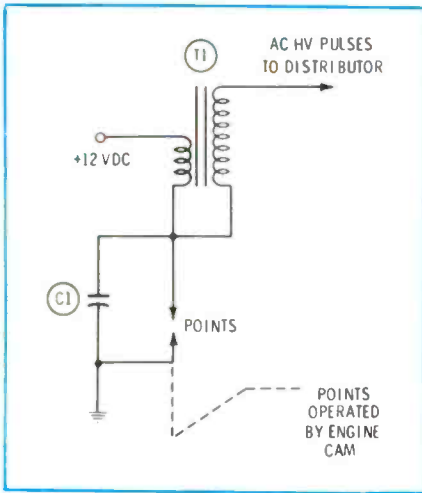


Fig. 1 Schematic of the traditional Kettering-type ignition system which has been used in most auto engines.

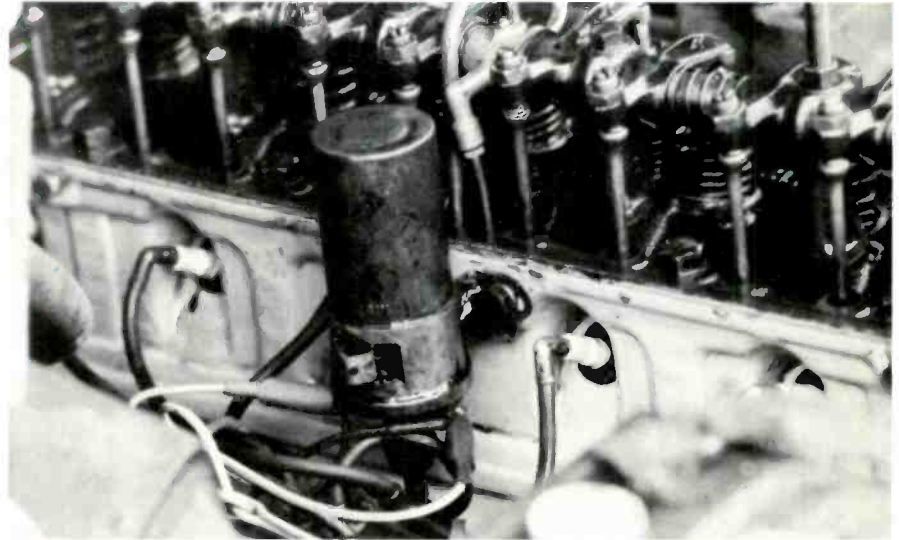


Fig. 2 This "coil" is mounted on the side of the engine block. Location is not important, but the transformer must be of waterproof construction.

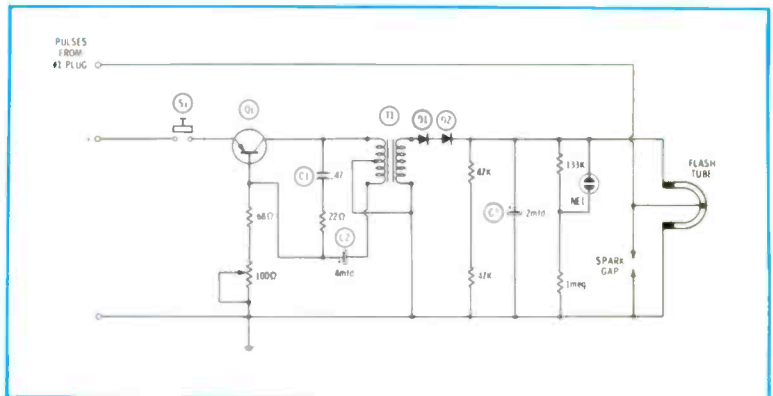


Fig. 3 Details of the Heathkit Timing Light. (left) In appearance, the timing light resembles an automatic pistol. Inside are a transistorized power supply, flash tube and a lens system. (right) Q1 is an audio oscillator supplying AC for rectification. DC is stored in C3 ready for use by the flash tube when it is triggered by a pulse from the spark plug.

mechanic adjusts the timing by rotating the entire distributor assembly. He watches for the degree markings on the pulley as the stroboscopic light "freezes" the motion. When the desired degree mark appears to be lined up with the pointer which is fastened to the block, the timing is correct. Each engine is rated at so many degrees before or after "dead center" for the recommended timing.

When timing, it's possible to connect a neon bulb to the correct spark-plug wire and use it as a stroboscopic source of light. However, the light would be so dim the markings on the scale would be very difficult to read, even in total dark-

ness. So, commercial timing lights use the pulse from a spark plug as the trigger for an electronic flash unit. These strobe units are very similar to the ones used in photography, except they recycle much faster.

The appearance and schematic of the Heathkit Timing Light are shown in Fig. 3. Inside the pistol-type housing are the transistorized power supply, a flash tube, and a lens system to focus the light.

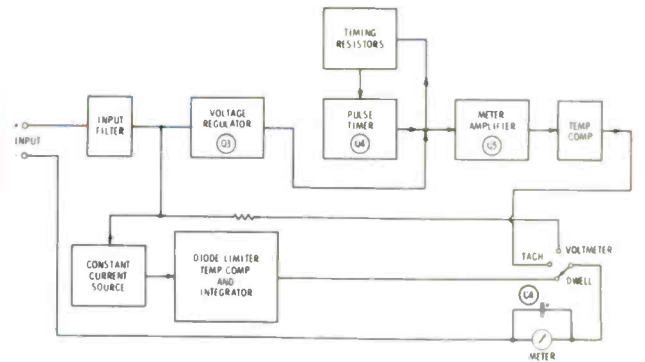
When the switch S1 is closed, Q1 oscillates at an audio frequency, producing from the secondary of the transformer an AC signal of several hundred volts of amplitude. This AC voltage is applied to the

two series-connected diode rectifiers, and the DC voltage obtained charges C3, a 2-mfd capacitor. C3 is the power reservoir for the flash tube.

However, the Xenon-filled flash tube cannot conduct even after C3 is charged until it is supplied with a triggering pulse from the spark-plug wire. Then the flash tube ionizes into a low resistance which rapidly drains C3 while releasing a powerful flash of light lasting a few hundredths of a second. It cannot flash again until C3 is recharged and another triggering pulse arrives. Therefore, these amplified flashes of light are synchronized with the pulses from the correct

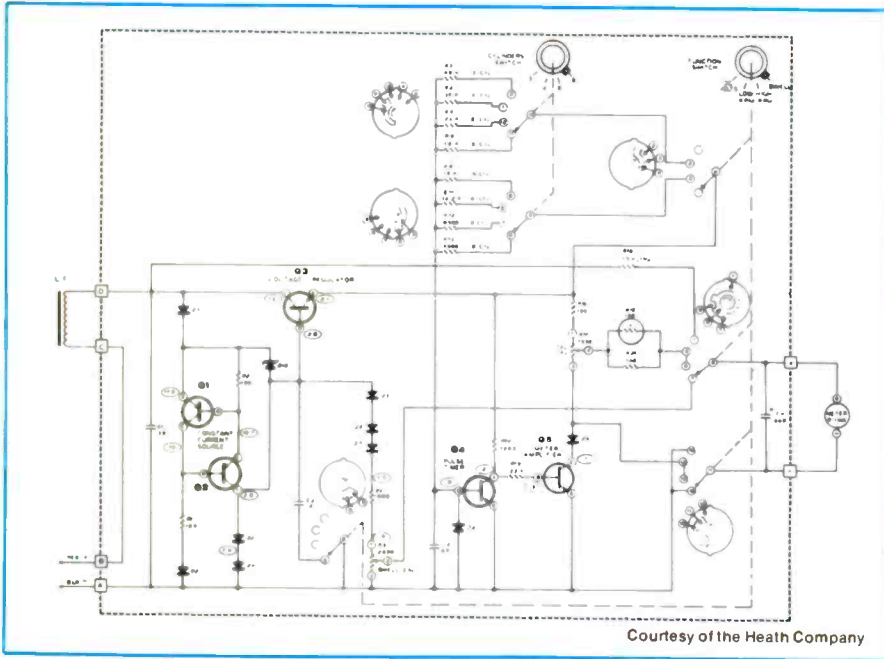


(A) The Heathkit Automobile Tune-Up Meter tests battery voltage, dwell time and engine speed.



(B) A block diagram of the Heath meter helps show how the various test functions are obtained.

Fig. 4 A typical tune-up meter.



Courtesy of the Heath Company

Fig. 5 This is the complete schematic of the Heathkit Model ID-29 Tune-Up Meter. The functions are explained in the text.

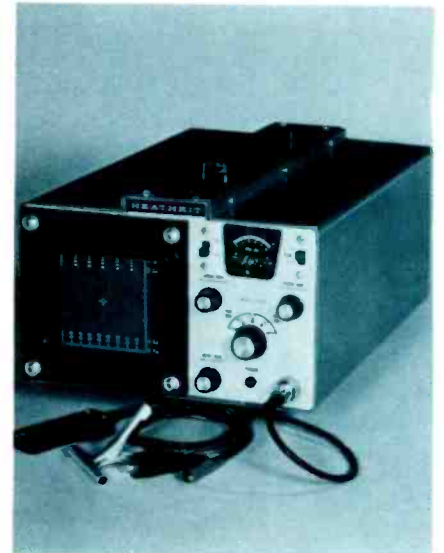


Fig. 6 The panel of the Heathkit Model CO-1015 automotive scope shows the operation is more simple than that of a service scope. A two-range tachometer also is built-in.

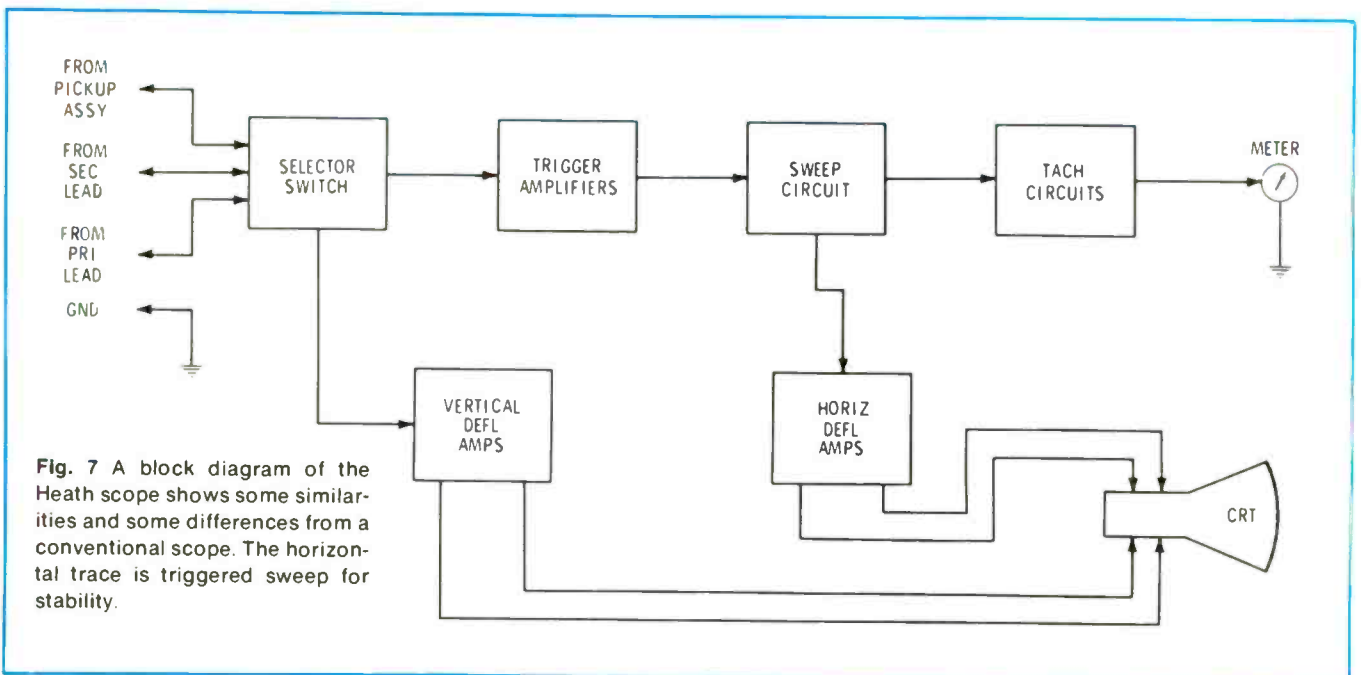


Fig. 7 A block diagram of the Heath scope shows some similarities and some differences from a conventional scope. The horizontal trace is triggered sweep for stability.

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spark plug. Incidentally, the pulses from the plug are fed to a piece of foil, or metal, looped around the glass of the flash tube. There is no direct connection.

The correct source of the strobe-triggering pulses is the front spark plug in most four- or six-cylinder engines, or the front plug on the drivers side in V-8 engines.

### Setting The Dwell Time

Most ignition adjustments also include setting the "dwell" time, which is the length of time (expressed in degrees of crankshaft rotation) that the breaker points remain closed. This dwell time is critical because there is a slow buildup of current in the primary winding of the coil when the points close. Therefore, a too-short dwell time reduces the maximum coil current, and with it the maximum amount of high voltage. Excessive heating and current drain would result from an abnormally-long dwell time.

### The Heath ID-29 Tune-Up Meter

One example of a tune-up meter is the Heath Model ID-29, which tests battery voltage up to 15 volts, measures the dwell time, and has two tachometer ranges for indicating engine speed. Figure 4 shows a block diagram of the circuitry. Because this is a multi-purpose instrument, the block diagram helps to make clear the functions of the various components in the complete schematic of Fig. 5.

#### Dwell meter function

An input filter (L1 and C1) removes most of the ringing transients found at the primary of the ignition coil, so an approximate square wave remains. After current limiting by a solid-state circuit, the square waves are integrated by C2. This integration, plus the low-pass filter action of R3/R4 and the 500-mfd capacitor which is across the meter, slows down the rise time of the square waves. The slow rise time produces a DC voltage that

increases at a nearly linear rate so long as the points are open. Therefore, the longer the dwell time, the lower the voltage reading. The meter scale is calibrated in degrees instead of voltage.

#### Tachometer function

Many tachometers, including that function in the Heath meter, operate by using a pulse from the ignition to activate a monostable multivibrator.

As the name implies, a monostable multivibrator is stable in only one of the two possible states (either conducting or not). When switched to its unstable condition, the circuit remains that way for a period of time determined by a resistor-capacitor circuit, then it reverts to the original state.

In the Heath ID-29, the square wave caused by the opening of the points is applied to the base and saturates Q5. The same square wave also is applied through the timing resistors to the base of Q4, which is bypassed by C3. At the start of the square wave, the base of Q4 has zero voltage. After a period of time determined by the RC time constant of the timing resistance and the capacitance of C3, the base voltage of Q4 begins to increase. When the voltage reaches +.6 volts, Q4 is saturated, and remains saturated for the duration of the square wave.

When Q4 saturates, its collector current removes the forward bias from the base of Q5. Then Q5 stops conducting and remains that way until the start of the next square wave.

Therefore, the output of Q5 consists of pulses whose amplitudes and widths are always the same regardless of the repetition rate (motor speed).

Integration of these pulses (by the 500-mfd capacitor paralleling the meter) produces a voltage across the meter that varies with the repetition rate. This permits calibration of the DC meter direct-

ly in revolutions-per-minute (RPM's).

### Ignition-Analyzing Scope

By using an oscilloscope, a mechanic who is skilled in its operation can successfully diagnose a wide assortment of engine defects. Shorted spark plugs, open plug wires, shorted turns in the coil and open "condensers" all make distinctive changes in the normal waveforms of an ignition system.

One example of such specialized scopes, the Heath Model CO-1015, is shown in Fig. 6. Scopes used for engine analysis (block diagram in Fig. 7) are similar in many ways to typical TV-service scopes.

However, they are not required to have such a wide bandwidth. And there are no locking controls because the sweep is triggered by one of the high-voltage pulses.

(Editor's note: While inspired by this article, I tried to photograph the spark-plug waveforms of my own cars, using two recurrent-sweep scopes. Unfortunately, the display was not stable enough for photographic purposes. But I could steady the display sufficiently to see clearly the main characteristics of the waveforms. For example, the waveform from the car with electronic ignition had far less ringing than was observed in the waveform obtained from the conventional ignition system. My conclusion is that a service scope could be used in an emergency, but an automotive type would give a more steady trace.)

### Summary

Far from being some weird offshoot of electronics design, most automotive test equipment is fairly conventional, and will seem very familiar to most technicians experienced in car-radio or TV repair. Many defects in such equipment can be found and repaired, even without a schematic, just by using common sense and the normal tests for resistors, capacitors, coils and solid-state components. □





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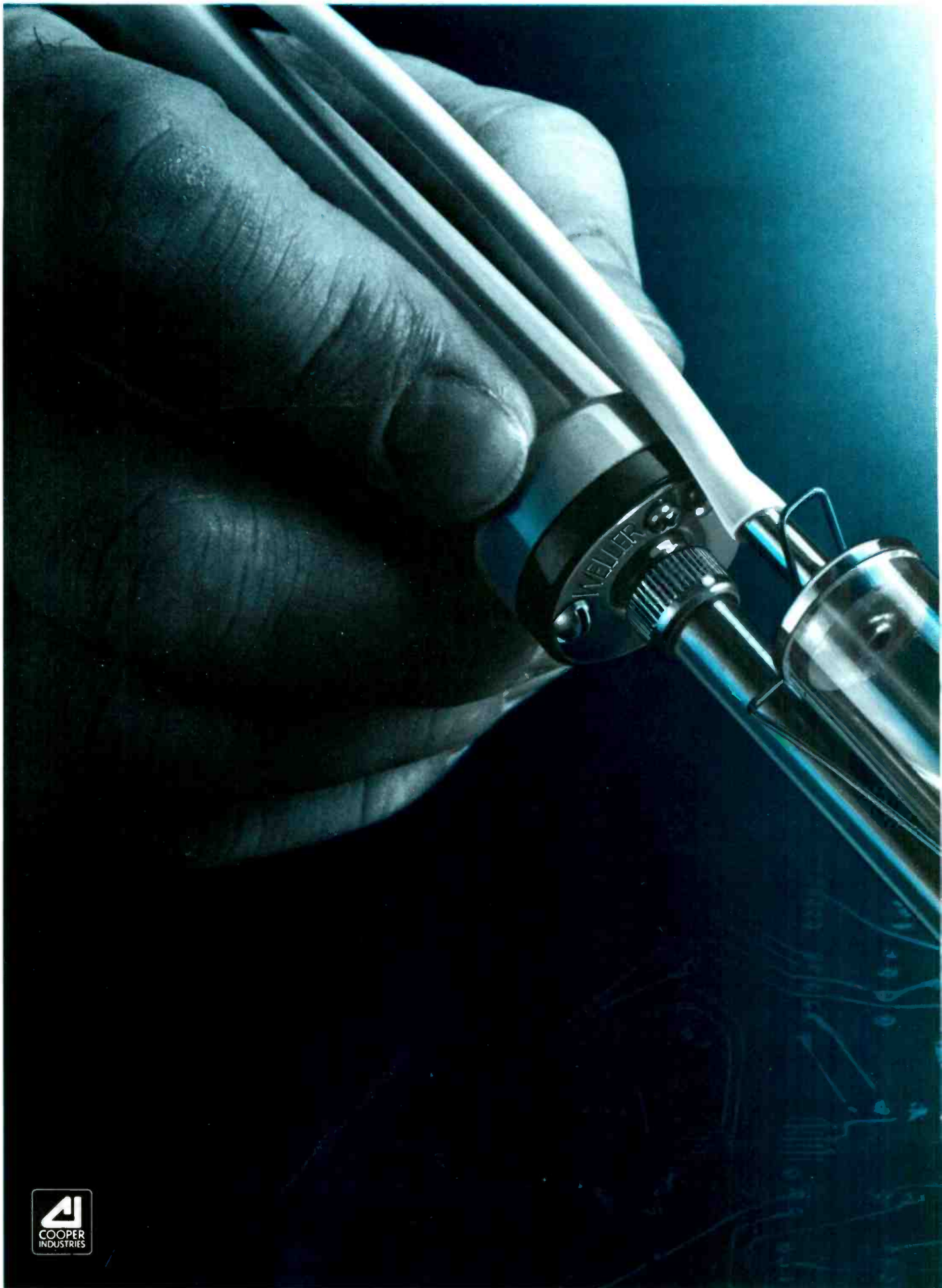
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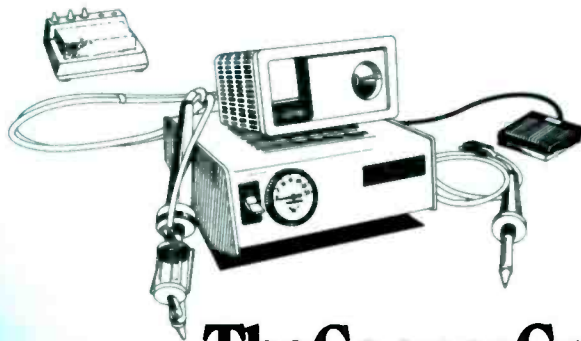
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# Understanding more about CONTRACTS

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*Here's additional and important information about contracts. Contracts—even those you don't recognize—legally make you responsible for their fulfillment. But, they also protect you.*

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In the September issue, I wrote about general types of contracts. There are many more specific contracts, and you should know about them for your own protection.

You're in business to render a service to the property of others. Such services result in a special type of contract called a bailment. You employ helpers, who may become your agents in another form of contract. In handling the financial affairs of your business, you deal with checks, drafts and notes; all special legal papers with contractual implications. You manage a business at a public location, operate vehicles, and enter your customer's homes; all acts which can have legal consequences and involve legal relationships.

These legal, but often unrecognized, contracts are the subjects of our business advice this month.

## Bailment

A bailment is a contract under which possession of property—but not ownership—is transferred by the owner to another person for a specific purpose. You lend your neighbor your lawnmower, take your suit to the cleaners, rent a car, or take in a television set to repair for a customer. Each of these acts sets up a **bailment**.

In your service business, you encounter most frequently the **bailment for mutual benefit**. You fix the customer's set, and he pays you for the service you've performed. Your customer is the **bailor**; you are the **bailee**. You must use "ordinary care" toward the property while it's in your custody. Legally, "ordinary care" means care which a reasonable and prudent man would use in caring for his **own** property. If damage occurs despite your care and diligence, you are not liable.

If your agreement calls for return of the property to a certain place or person, at a designated time, you might be held liable for damages resulting from your failure to do so.

There are also bailments for the sole benefit of one party. If you agree to store a set for one of your customers and receive no consideration, it's for **his** benefit. You need only exercise slight care. If you borrow a tool from another technician, that's for **your** benefit and you must use great care. Slight care means just that, while great care means that anything less than extreme caution and concern will be treated as negligence.

Understand that you, personally, need not be negligent to become liable. Negligence by those who work for you is the same as yours. No matter what your receipt says, your liability is defined by the courts. Signs

and tickets disclaiming liability more often than not are just plain bluff.

## Transportation damage

Transportation of goods is also a service covered by the bailment concept. Normally this is done by a "common carrier"; that is, one who transports private property for all who choose to employ him.

A common carrier is also an **insurer** of goods he accepts for transport. His liability begins with his acceptance of the shipment and covers loss from almost any cause, not simply loss from the negligence of himself and his employees. But, there are some exceptions. He is not responsible for "Acts of God" (snowstorms, floods and the like), or loss by acts of public enemies (robbers, strikes, mobs or riots). He is excused from liability for loss due to the nature of the goods (deterioration of perishables or fermentation), and for loss due to the action of public authorities (seized by police or health authorities). And, of course, he is not responsible for loss caused by the shipper's negligence where it is not known, or apparent, to him.

From that list of the carriers obligations and liabilities, you can see why **prompt** handling of goods you receive is important. You should open, inspect, and count the contents of the shipment. If there is damage, save the packings and wrappings, and notify the carrier. The packing helps establish whether or not it's his liability or the shipper's. You not only owe him this cooperation, you owe it to yourself, because it simplifies settlement of your claim.

You also might do business with "private carriers". A private carrier isn't primarily in the business of transporting goods, although he might do it occasionally. For example, your friend with a pickup truck who agrees for a fee to bring back supplies from a nearby





By Robert G. Amick

city. He is liable only for loss due to his own negligence.

### Agency Relationships

In many situations almost every day, you create agency relationships, without knowing it. Whenever you have another person act for you—as when you have your neighbor get something from the store for you—you create an agency. You are the principal; your neighbor is your agent.

Agency may be created by an express contract, or it may be implied from the conduct of the parties. The agent acts for his principal with the same legal effect as though the principal himself had performed the deed. When assigned, an agent can perform any act which the principle can lawfully perform, except where the law requires a personal performance by the principal. Your agent can't vote for you, take a driver's license test for you, or take a civil service examination for you.

Obviously, your big concern in agency is with what your employees do that binds you legally. The main purpose of agency law is to determine who is liable; the acts of an agent must be charged to his principal.

Your counterman and outside man are your agents in dealing with your customers. You assigned them those duties, and they accept and perform them.

An agent can be authorized to perform for his principal in a general line of business, or he might be limited to specific duties, or even one specific act. Your counterman isn't authorized to buy parts and supplies, or sell your shop, but just to accept equipment for repair. Your neighbor was asked to buy you a pound of coffee, and was not authorized to buy anything else for you. Which brings up an important limitation on your liability as principal: **You are not bound by any act of your agent which exceeds his authority.** Be wary of this, however. His authority must be clear and unmistakable, otherwise his "implied" authority can exceed your intentions. His implied authority is that power enabling him to carry out his instructions. If your instructions to him are clear and complete, no implied authority is needed. And he is liable only when he acts beyond this authority.

Your agent owes you his complete loyalty. He cannot serve other interests involved in a transaction with you without your knowledge and consent. He also owes you obedience to your instructions, care and diligence in his performance as your agent, good faith in his actions for you, and an accounting for all money received on your behalf. He must follow your instructions—unless they are illegal, immoral or against public policy—and is liable to you for any loss if he fails to do so.

Your agent warrants to third parties that he has authority to transact business. If he hasn't such authority, you are not bound, and he is liable for the breach of his warranty of authority.



You, however, must be cautious and prompt to disaffirm his unauthorized act. If you delay, or accept benefit from it, you probably will be held to have ratified it, even though it was outside your agent's authority. This ratification should be one of your biggest concerns. You must disavow unauthorized acts as soon as you discover them, and before you've benefited from them, to avoid the appearance of accepting the deal.

### Negotiable Instruments

Every day, you deal with a form of negotiable instruments: checks. Also, you might issue promissory notes or receive a draft. These are all negotiable instruments, written documents conforming to certain legal requirements which can be negotiated from one person to another as an exchange of credits instead of money.

Because it has special legal safeguards, a negotiable instrument is secure in its collectibility. If you acquire one in a proper manner, for valuable consideration, and without knowledge of any legal defects in it, you can collect the face amount.

All negotiable instruments contain the words "order" or "bearer," and this distinguishes them from all other instruments.

The law of negotiable instruments is complex. But, you should know enough to recognize them, and understand the main obligations and rights of the parties. This is especially important with checks.

### Checks

There is no legally-prescribed form for a check, but it should contain: the date, the directions to "Pay to the Order of . . .", the sum to be paid, and the signature of the drawer. While the payee is generally named, checks sometimes are drawn to "Cash" or to "Bearer." These two designations are very vulnerable, and should not be used where there is a possibility

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In handling your check, the bank acts as your agent. It is only required to pay when the check is properly drawn, and you have funds enough to cover it. If these conditions are met, the bank must pay it. But, when a check is postdated—that is, dated for some time after the date on which it's issued—the bank cannot pay on it until the date on the check.

## Negotiation

Negotiation merely means transfer of the instrument and the credit it represents. If it's made payable to a named payee, he transfers it to a third party (his bank or someone else) by endorsement and delivery to that third party. "Bearer" instruments are negotiated simply by delivery, no endorsement is needed. This explains their vulnerability: possession of a "Bearer" instrument gives any holder possession of the credit it represents. He might have no right to it, but if he cashes it, you have to track him down, and sue him to recover.

There are several types of endorsement. A "Blank" endorsement is simply the endorser's name with no other comment. The first blank endorsement turns the check into "Bearer" paper, no more endorsements are needed and the paper is transferred by mere delivery.

A "special" or "full" endorsement specifies the person to whom the endorser intends payment. He writes "Pay to," and signs his name underneath it, on the back of the check.

A "restrictive" endorsement makes the endorsee a holder for a limited, specific purpose. This is common in the form "For Deposit" which means the bank is not to pay out cash for them, but must credit the amount of the check to the payee's account. You are advised to do this when you send another person to deposit your checks.

## Torts

One final point at law for you to know about is the "tort." This is a civil wrong, a violation of certain personal rights which each of us enjoys under the law.

When you operate a place of business, you have a right to use it and enjoy it. But, this must be consistent with the rights of others. You must use reasonable care to see that those who come to do business are not injured or exposed to health hazards while on your premises. You must not create nuisances or hazards to your neighbors. When you meet competition, you must do so without depriving your competitors of whatever good name and reputation they have earned. Violation of these rights is a tort.

From this and the preceding article about contracts, you can see that your daily activities in business bring you into many situations which could have legal consequences. In such cases, always seek the advice of an attorney. Acting without counsel can be dangerous. □

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by Wayne Lemons



## Testing the TV tuner subber

*Performance reports of a unique, portable, solid-state tuner which tests defective tuners by easy substitution.*

A TV tuner which is suspected of being defective can be tested by the installation of a new tuner, or by sending the tuner to a repair station for an overhaul. This idea is as old as television itself. However, such a crude method of diagnosis wastes time and money when the old tuner proves to be normal. A better test is to temporarily connect a similar tuner for just long enough to determine any difference of performance.

Technicians often have arranged two TV sets back-to-back and made haywire connections so the tuner of the normally-operating set fed the IF circuit of the chassis which is suspected of having a tuner defect.

Unfortunately, this basically-sound idea has several drawbacks. A suitable chassis with a compatible tuner seldom is available when needed. Mechanical problems often interfere. For example, the IF cable wires might require solder-

ing, or the two sets of connectors might not mate. And there is always a possibility that a mismatched combination of tuner and chassis might cause damage to one or the other.

Most dangerous of all is the possibility of "fireworks" if two "hot" chassis are incorrectly connected together during the test.

So, I was interested when Castle TV Tuner Service first announced the introduction of their TV Tuner Subber. I ordered one, and waited impatiently for the first TV receiver having a tuner of questionable performance to arrive at the shop.

### Features Of The Subber

Basically, the TV Tuner Subber is a portable box containing a transistorized tuner operated from self-contained batteries. Here are some of the features:

- has an RF GAIN ADJUST control located on the front panel,
- tunes all 12 VHF channels (each with preset fine tuning) plus providing a UHF input socket,
- has electrically-isolated antenna-input terminals,

- the IF-output and UHF-input sockets are located on the back panel,
- two output cables are supplied. One is an 18-inch extension with male and female phono plugs. The other is an adapter having two alligator clips for attachment to any IF strips not having cable plugs, and
- a light-emitting diode (LED) operating as a power-on indicator.

Two popular-type 9-volt batteries are supplied for power, and they must be installed. The battery life is from 4 to 6 hours, according to the instruction book. This doesn't sound like very much time, but it is enough to test dozens of tuners if you always remember to turn off the Subber after each use.

The LED used instead of a dial lamp is wired in series between the batteries and the tuner, so its red glow requires no extra battery current.

All danger of shorts between "hot" chassis is eliminated by the self-contained battery supply. Also, you do not have to discon-



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nect any power wires from the suspected tuner.

### Anticipating Subber Performance

From my past experiences with tuner-swapping as a test method, I expected some limitations of picture sharpness when using this (or any other) test-type universal tuner. The main reason is that the IF transformer located on the tuner plays an important part in the overall-IF alignment. Therefore, it follows that the fixed-tuned IF adjustment of a test tuner seldom perfectly matches a chassis. Also, the shielded IF cable between tuner and chassis affects the alignment.

When using the Subber, I found the amount of misalignment to be of little importance to the main use of the instrument (which is to provide a strong IF signal on each active channel).

A tuner suspected of having slightly below-normal performance

probably could not be judged accurately by comparison with the results when using the Subber. But analysis using the Subber is virtually foolproof when the complaint is snow or no reception on any or all channels.

### Case Histories

The following case histories are typical of those you can expect in checking tuners with a Subber.

#### Subber tested on a new color TV

Before using the Subber on sets of unknown quality, I wanted to find out how it operated with a new color TV receiver.

A phono-type connector was used in this receiver, so I disconnected the IF cable and plugged it into the socket on the back of the Subber.

With the receiver and the Subber turned on, I turned to the channel of our strongest station signal and rotated the RF GAIN to maxi-

mum. Reception was fine (Fig. 1); about the equal of that with the original tuner.

Then I added the 18-inch extension cable between the IF cable and the Subber. After a slight readjustment of the fine tuning, picture, sound and color were nearly normal.

#### Results with another new TV

The Subber did not match quite as well with another brand and model of color set. Color saturation was weak, and some ringing (Fig. 2) could be seen in the b-w part of the picture. All channels showed pictures of normal contrast.

#### Injection into solid-state IF's

Strong station signals should be received when the Subber is connected to the second-IF stage, according to the instruction book.

I experimentally tried this on a receiver having solid-state IF's by



Fig. 1 Good color and sound were obtained when the Subber was tested on this new receiver.

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tuning in the channel of our "local" station (22 miles away), turning up the RF GAIN of the Subber to maximum and then connecting the IF cable with the clips to the base of the second-IF transistor. The sound and b-w picture were good, but the color was weak.

Better results were obtained when I connected the Subber to the collector of the first-IF transformer.

In either case, the results were good enough to positively check the gain of the tuner and the first-IF stage.

#### **Snowy picture**

By this time a TV set with what appeared to be a definite tuner problem had come into the shop. The picture had excessive snow on all channels: a classic symptom of a dead RF stage.

Because it was a tube-type tuner, I shorted out the RF AGC to make sure an excessive amount of negative AGC wasn't the cause of the snow. No difference, so the AGC was okay.

Next, I carefully checked the windings of the antenna coil, because these coils sometimes are blasted by lightning into molten copper. The coils tested okay.

When I connected the Subber to the receiver and an antenna, the pictures on all channels were snow-free. Diagnosis: definitely a case of tuner trouble. The defect was only a dead RF tube.

#### **No picture; slight snow**

No picture could be obtained on any channel; there was hiss in the sound and a trace of agitation in the raster.

With the Subber, reception was normal on all channels. Further testing of the old tuner showed the mixer tube had shorted and burned open a B+ resistor. After both parts were replaced, the receiver operated okay.

#### **No picture; moderate snow**

More snow appeared on the raster than that of the last case, but no stations were received. Good oper-

ation of all channels was obtained using the Subber. A burned resistor feeding B+ to the oscillator tube had nearly eliminated all plate voltage from the oscillator stage.

#### **Faint picture; noisy sound**

The symptoms were a low-contrast picture and a buzz in the sound. After I connected the Subber, the symptoms were the same. Therefore, the tuner in the receiver was **not** the cause of the trouble.

When I clipped the output of the Subber to ground and the grid of the second IF, the contrast was no better.

At the urging of my electronic ESP, I connected the output of the Subber to the grid of the third-IF



**Fig. 2** Some video ringing and weak color resulted from an apparent mismatch between the Subber and another color receiver. Even here the picture quality was satisfactory for diagnosis.

tube and obtained a faint picture. This indicated the third-IF stage was okay. Perhaps the second stage was dead.

When I measured the DC voltages of the second-IF tube, the plate voltage was normal, but the cathode voltage was zero. I checked the grid voltage and found it to be nearly -10 volts. After more testing, I found a leaky capacitor in the AGC keyer stage which had upset the bias of the tube. This caused an excessively negative AGC voltage, even without a signal. Both the first and second-IF tubes had been biased nearly to cutoff.

#### **No high-band stations**

A nearly-normal picture showed

on Channel 3, but Channel 10 and UHF were missing. The Subber produced good reception on all three stations.

After opening the tuner, I found a burned, increased-value resistor which reduced the oscillator plate voltage in the B+ circuit of the oscillator tube. Low voltage permitted operation only on the low band.

#### **Weak snowy picture**

The picture on a hybrid-type color TV showed excessive snow and slightly low contrast. When the Subber was used, the reception of all channels was good.

Generally speaking, these symptoms indicate a dead RF stage, or a wrong AGC voltage applied to the RF amplifier transistor. Unfortunately, the grounding-the-AGC test won't work with transistors. The AGC is the forward bias of the transistor, and **either** an increase or a decrease of AGC voltage reduces the gain of the transistor.

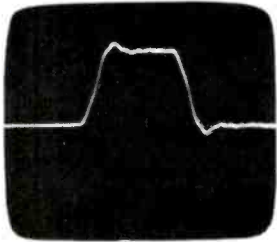
For this receiver, the Photofact schematic listed the RF AGC with no signal as +5 volts. Therefore, +5 volts is the voltage giving maximum gain of the RF transistor, and this voltage could be applied from a bias box to see if the snow decreased.

When the original tuner was turned to a channel without a signal, the RF AGC measured -3.5, obviously a wrong voltage. I connected a bias box and applied several positive volts to the AGC and the snow disappeared. Further testing revealed that a shorted diode in the AGC circuit was the defective part.

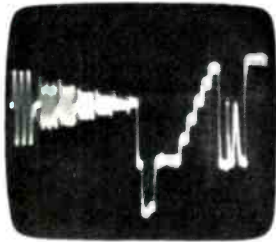
#### **Conclusion**

I have been very pleased with the performance and convenience in operation of the TV Tuner Subber. Although it does not always produce as sharp a picture as that from a tuner individually aligned for each IF circuit, the picture quality usually is good. Certainly, the performance is more than adequate for determining whether or not the tuner in a receiver is defective. □

### TRIGGERED SWEEP

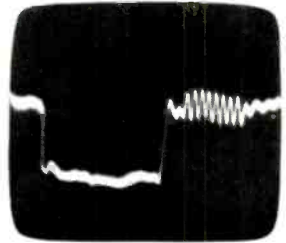


250-nanosecond ( $\frac{1}{4}$ -microsecond) pulse demonstrates trace expansion and rise time capability of the new RCA WO-535A in Triggered Sweep Mode.

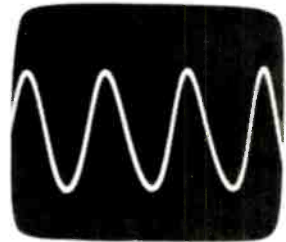


Typical TV VITS pattern on the new RCA WO-535A in Triggered Sweep Mode.

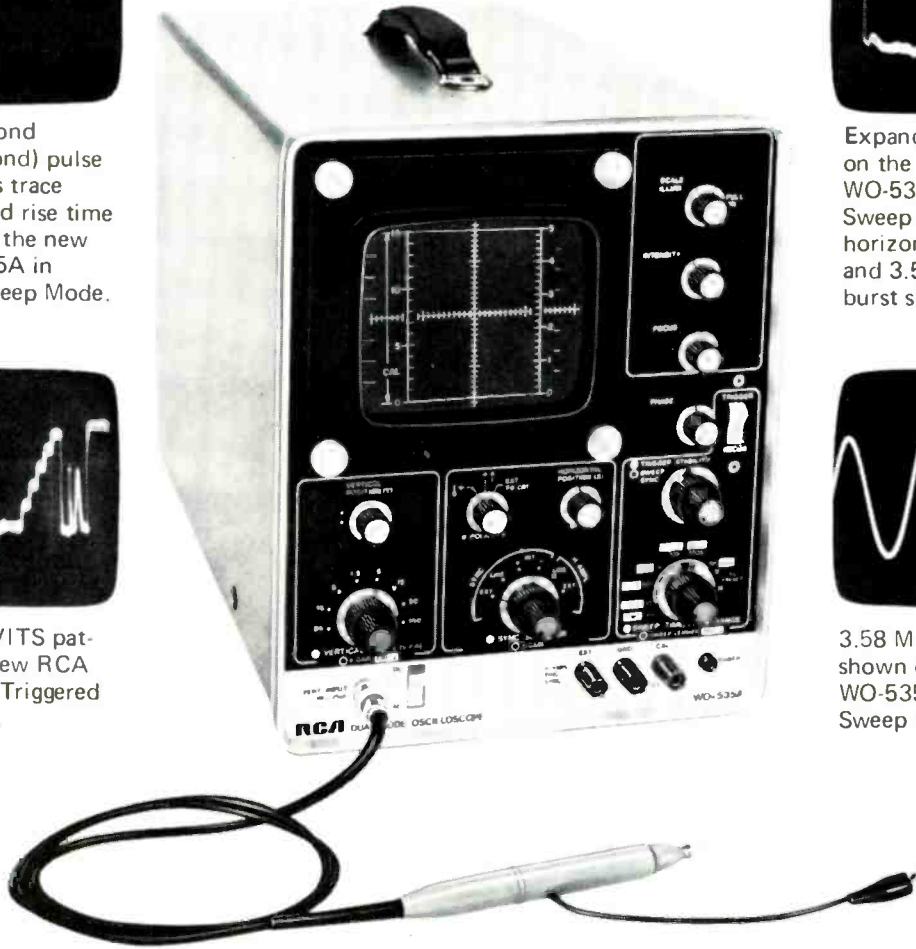
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# RCA

# An unusual hum bar in the color

by Vilis Karitons

*Be careful in diagnosing complaints of hum in solid-state color receivers. The hum might originate in a circuit you would never suspect.*

One horizontal bar having brighter colors moved slowly up the screen of the RCA CTC44A-chassis color receiver which included remote control.

Because the one bar drifted slowly upward, I suspected 60-Hz hum in the chroma circuit. However, such hum usually allows color only on the top or bottom half of the picture, or it might appear as normal b-w hum when the color is turned down.

In this case, when the color was turned down there was no hum bar, but just a faint bar much like power line interference.

When the color control was adjusted for normal-saturation color, the bar of brighter color was about 3/4 inch high. This increased to

about 2 inches when the color was maximum.

One other symptom: A loud hum could be heard in the speaker when the volume control was turned down, but the hum disappeared when the control was rotated higher for normal sound volume.

All of these symptoms pointed to some type of hum. However, any hum that is more visible when the color is high and yet is more audible when the volume is low must be a very unusual kind of hum.

## Tests For Hum

Using a scope, I checked the ripple of all the B+ voltage supplies in the main TV chassis and found nothing wrong.

Next, because the height of the bar changed with adjustment of the color control, I connected the scope to the top terminal of the color control. A 7-volt p-p near-square wave was found there, al-

though with this system of remote control about +10 volts without ripple should have been measured.

These test indicated the problem might originate in the power supply of the remote-control chassis.

When I measured each supply voltage there, I found normal ripple on the -38-volt supply, but a huge amount on the +35-volt supply which also had low DC voltage. Further testing proved that a 200-mfd filter capacitor (C9 in Fig. 1) was open.

## Explanation Of Symptoms

The open capacitor also lowered the voltage of the 16-volt (B) source so the zener could not clip the ripple. Therefore, the ripple of the 16-volt supply was amplified by Q6 of the remote chassis.

And, because the color-control DC voltage from the collector of Q6 is used to change the resistance of CR9 and the bias of Q4 to control the color gain, the 60-Hz ripple produced the bar of brighter colors.

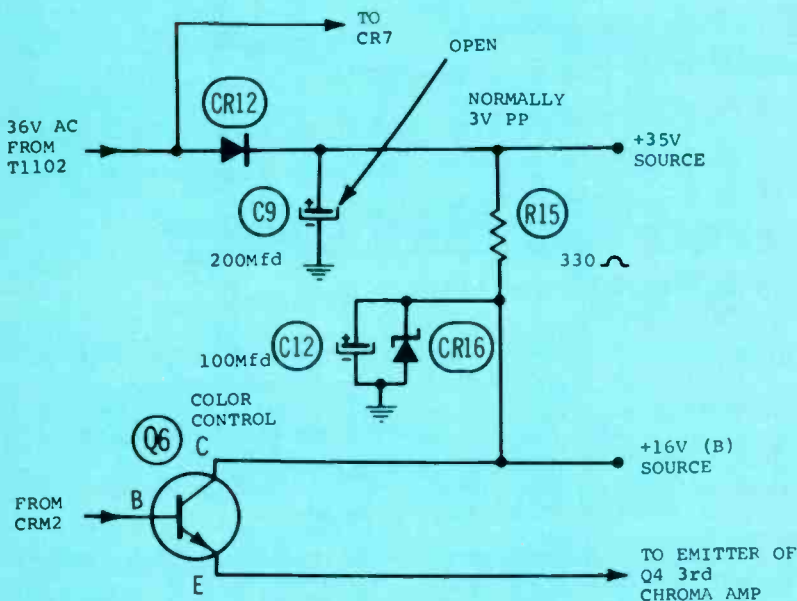
After the trouble had been pinpointed, I wondered why the color showed more hum with the color control advanced, yet the hum in the sound was worse with the volume control turned down.

The reason for this unusual symptom is found in the remote control action which increases the positive DC control voltage to increase the volume but decrease the color saturation.

## Conclusion

Two items of good advice can be learned from this example of color hum:

- Adjust all of the customer-operated controls and analyze the results, both normal or incorrect.
- Remember that many of the new all-solid-state receivers operate the remote functions by using a variable DC voltage. Hum, or other supply defects, can cause some unique symptoms not possible with more conventional circuits. □



**Fig. 1** Open capacitor C9 produced a high ripple in both the +35 and +16 volt (B) supplies. In turn, the volume (Q7) and color (Q6) control transistors amplified the hum and injected it into the sound and chroma channels. A horizontal bar of brighter color was the most noticeable symptom.

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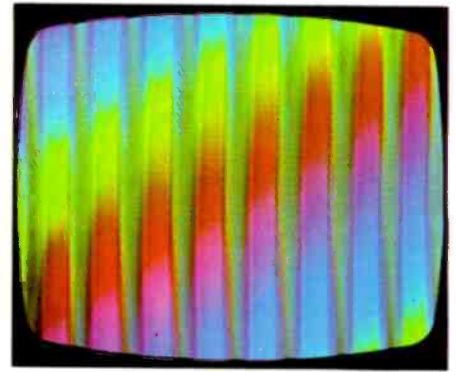
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# Taming those color RAINBOWS

part 1

by Carl Babcoke



Out-of-lock color is much easier to see on the bar pattern than on a color-cast.

Presenting some of the lesser-known defects that cause a loss of color locking.

Rainbows in the color are a sure sign the color oscillator is out of lock. But, don't automatically reach for the frequency adjustment of the oscillator. The gremlin is just as likely to be in the burst amplifier or the phase detector. On the average, you will save time and do a better job if you follow a logical sequence of tests and adjustments.

The more clearly you can see the trouble symptoms, the better you can adjust for them. So, the first step is to obtain the brightest, sharpest rainbow stripes.

Although it is true an experienced color technician can work fairly well using the colorcasts from TV stations, the out-of-lock stripes are much easier to see when the picture is a color-bar pattern. Therefore, we recommend you

connect a color-bar generator to the antenna terminals and tune in the color bars.

## Defeat The Color Killer

Many color killer circuits either weaken or eliminate the color when it is out of lock. So, defeat the color killer. In most receivers, it is enough just to turn the killer control completely CCW.

Adjust the fine tuning into the sound bars and color beat patterns, then reverse the rotation until the beats barely disappear.

These steps should insure sharp color with high saturation. Don't reset the killer control until after all repairs and adjustments have been made.

## The Phase-Locked Loop

Two general methods are used to lock color oscillators. Most of the older models used phase detectors

and reactance control, as shown in Fig. 1. The four basic circuits are:

- burst amplifier;
- phase detector;
- reactance circuit;
- 3.58-MHz oscillator.

Notice the loop linking the phase detector, reactance and oscillator circuits. Conditions inside this loop determine the correct phase of the oscillator signal relative to the burst.

All loops are more difficult to diagnose, because any change anywhere inside the loop affects the signal in all parts of the loop. For example, let's assume a non-defective circuit in which normal aging has changed the oscillator frequency until locking is lost and a rainbow of color is seen on the screen.

Now, you could adjust the frequency until the color locked. However, this would be a very broad-tuning and inaccurate adjust-

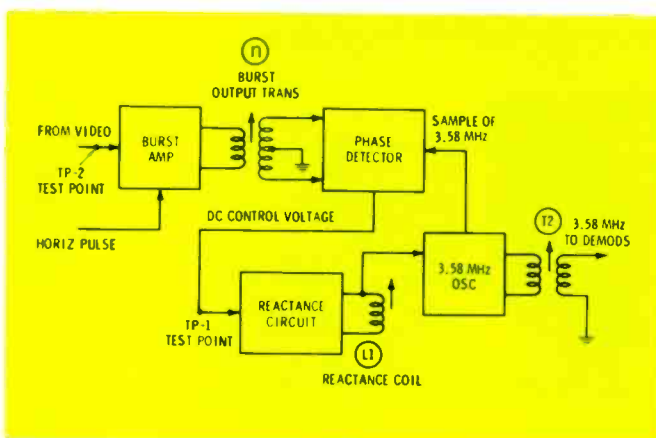


Fig. 1 The three adjustment points are shown in this block diagram of a typical reactance-controlled color oscillator.

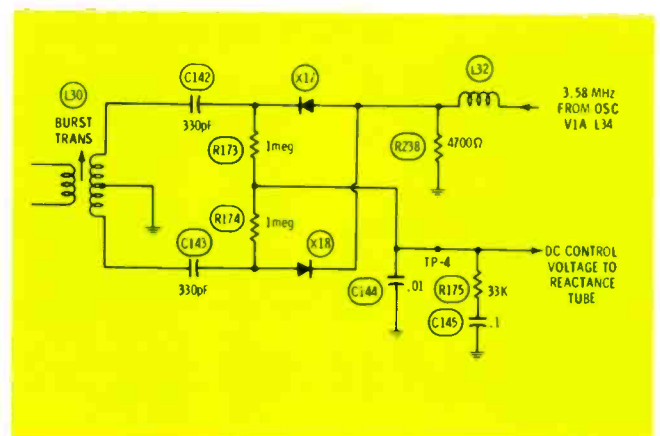
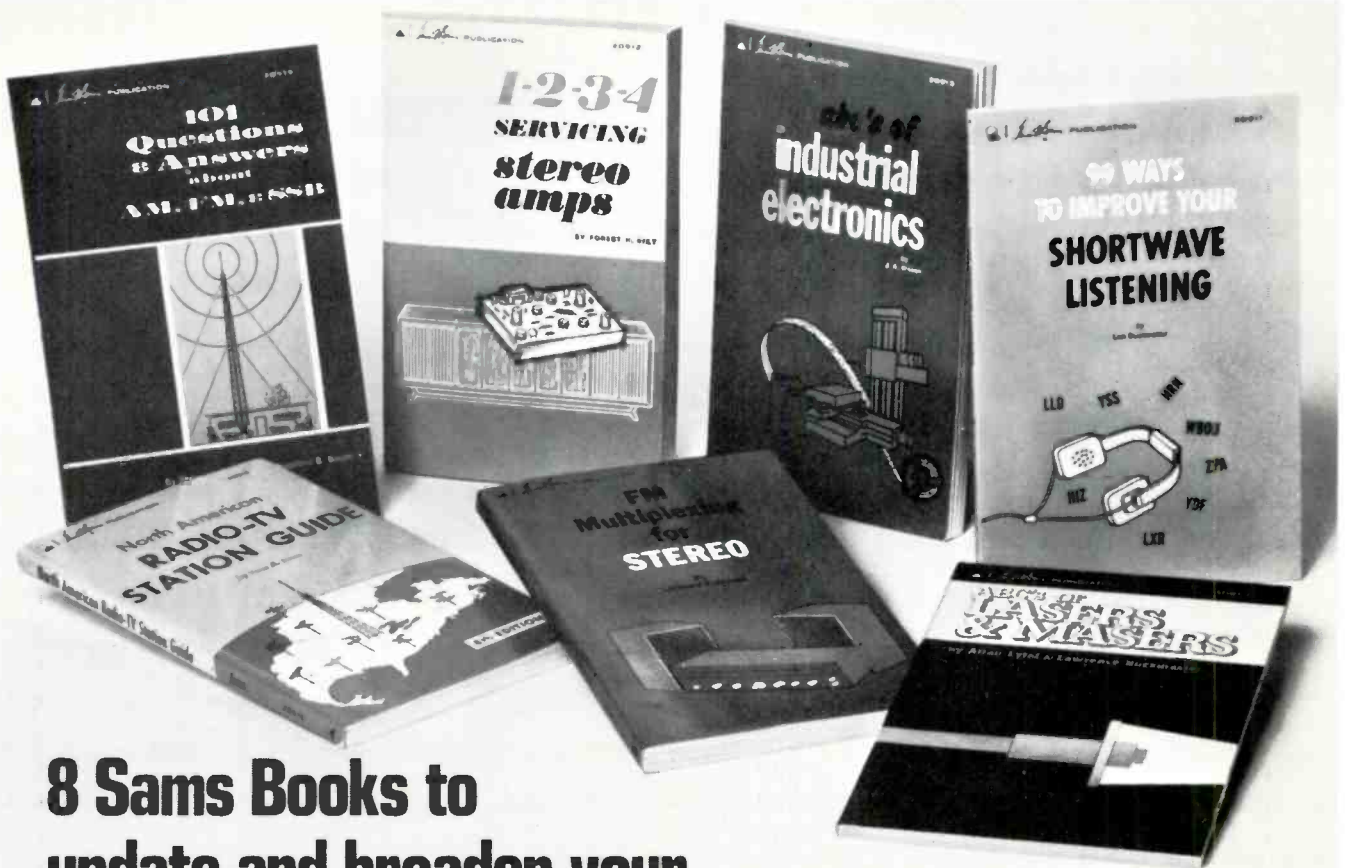


Fig. 2 Two diodes are used in the Magnavox T933 chassis (Photo-fact 1005-1) to rectify the instantaneous voltage between the burst and 3.58-MHz signals.





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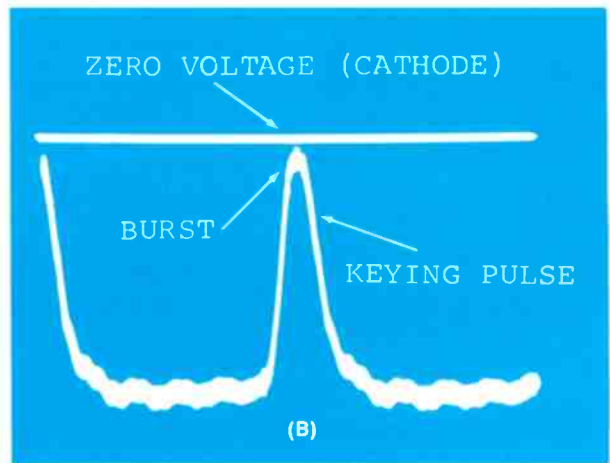
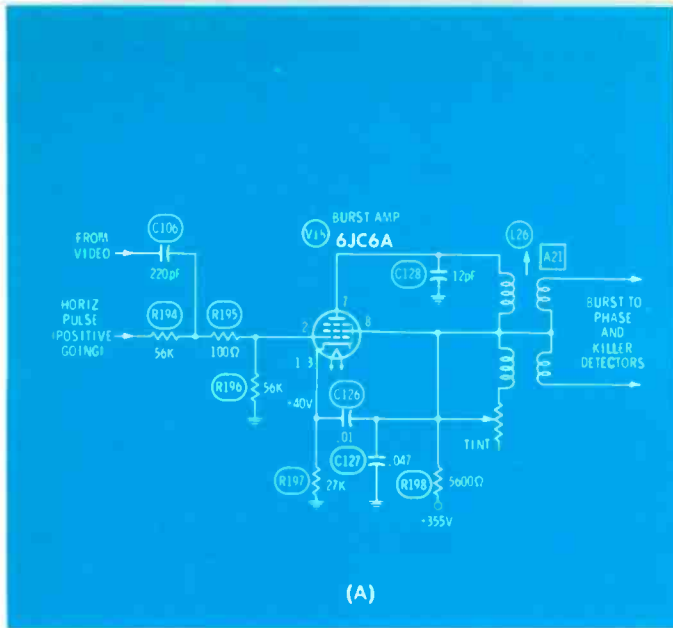
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**Fig. 3** In most burst-amplifier stages, the tube is biased to cutoff by a large cathode resistor except when the horizontal pulse at the grid cancels most of this excessive bias.

**(A)** Schematic of the burst-amplifier stage in the Zenith 20Y1C37 chassis.

**(B)** Accurate grid bias during burst time is shown by use of a DC scope connected from cathode to grid of the burst-amplifier tube. Relative to the cathode zero line at top, the grid is about -2 volts at the tip of the pulse.

ment. This is true because the circuit is opposing your adjustments. After the circuit is locked, further rotation of the core merely changes the control voltage (testpoint TP-1 in Fig. 1) as the circuit automatically compensates for your wrong adjustment. A better method is needed. The answer is to break the loop at the DC control voltage between the phase detector and the reactance circuit.

### Adjusting The Oscillator Frequency

During normal circuit operation, it's desirable for the DC control voltage at testpoint TP-1 to be nearly zero. So, we can get a very accurate oscillator frequency by grounding this testpoint (giving an artificially-obtained zero voltage which defeats the AFC action) and then adjusting the oscillator frequency for "zero beat" relative to the color bar pattern.

**When you adjust, remember that the fewer complete rainbows seen on the screen, the nearer the oscillator frequency is to zero beat. Therefore, the core of the reactance coil should be turned in the direction giving fewer stripes of rainbows. Continue in that same rotation until the bars slide sideways slowly across the screen, but with all the bars upright.**

It is not necessary to completely stop the motion of the bars, for at this point we have reached the

practical limit of the accuracy of the color-bar generator. Also, we don't need any better accuracy. Most circuits will pull-in reliably from **three** stripes.

**TIP:** If the screen showed many more than three complete rainbows when the testpoint was grounded and before any adjustments were made, a defect in the oscillator circuit is likely; more than an adjustment is needed. Make repairs before finishing the adjustments.

Alternately, if the screen had six or eight rainbows which decreased to one when the testpoint was grounded, a severe unbalance of the voltages from the diodes should be suspected. Or perhaps the reactance tube was gassy, or the small capacitor from plate to grid might be leaky.

On the other hand, two or less rainbows suggest weak locking, because a normal circuit should still lock tightly with such a small error. If the locking is loose, check the burst and reactance stages.

### Partial AFPC Adjustments

If there are three or four rainbows, when the testpoint is grounded, it is usually not necessary to make the complete series of Automatic Frequency and Phase Control (AFPC) adjustments. The ordinary aging of components in the oscillator and reactance stages often cause that much frequency error.

In such cases, just ground the testpoint (TP-1 in Fig. 1) and adjust the reactance coil for zero beat. Remove the ground; that's all.

However, the tightness of the locking should be verified. One good method is to turn down the chroma control on the generator. A normal chroma circuit will remain locked even at very low levels of chroma signal.

Or, if you're using a station colorcast as a standard, rotate the fine tuning away from the sound bars to weaken the chroma. The color should remain locked as long as you can see it.

If the oscillator can't be brought into zero beat by these previous steps, check for a defect in the reactance or oscillator stages.

### Diagnosis By Adjustment

Have you noticed that we diagnosed the general nature of several color-locking problems just by performing part of the ordinary adjustments? Plus, of course, making a logical comparison of the symptoms actually obtained with those expected from a normal circuit.

And, in similar fashion, we can use the remaining AFPC adjustments for additional steps of diagnosis.

### The Effects Of Transformer Adjustments

Both burst output transformer T1, and 3.58-MHz output trans-

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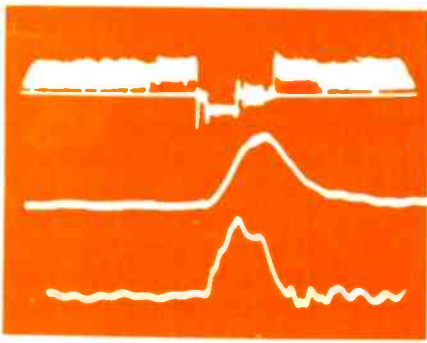
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**Fig. 4** These waveforms show the phasing between a video signal having burst and the keying pulse. At the top, the video waveform is expanded to show the burst on the "back porch" of the blanking pulse. The horizontal pulse from the fly-back transformer is the bottom waveform. At the grid of the burst keyer (center waveform), the pulse has been delayed in phase (moved to the right) so it arrives simultaneously with the burst.

former T2 (Fig. 1) are designed to resonate at 3.58 MHz. There are two reasons why they are tuned. First, correct tuning increases the amplitude of each signal. If either signal is weak, the color locking will be loose. Equally important, tuning of the transformers determines the relative phase between the signals. If either signal has the wrong phase, it will be impossible to obtain correct range of the tint control.

Although a minor detuning occasionally is necessary during the final touchup to give the correct phase, it's reassuring to find how many times the desired phase is obtained automatically by merely adjusting for the maximum amplitude of each signal. Now that the tuning question is settled, how can we measure the amplitudes in the best way?

Of course, we could measure both amplitudes by using a scope with a low-capacitance probe. Unfortunately, even this small amount of added capacitance detunes too much. A better plan is to use the rectifiers that are already built into the circuit (Fig. 2).

In this typical phase-detector circuit, both the burst signal and a sample of 3.58-MHz carrier from the oscillator are applied to the two diodes. These diodes operate in a shunt-type peak-reading rectifier circuit for the burst signal, and in a series-type peak-reading rectifier

circuit for the carrier. In both cases, the cathode of X17 measures a positive DC voltage to ground, and the anode of X18 always measures negative. We can measure the DC voltages produced by these diodes to find the point of tuning which gives maximum amplitude of either signal without adding any appreciable capacity to the circuit.

For example, to adjust L30 for the maximum amount of burst, use this method:

- Preset the tint control to the center of its rotation,
- connect a very short test lead across R238 (to eliminate the carrier),
- attach a VTVM or FET meter set for the -50 volt DC range to the anode of X18,
- and adjust L30 for the maximum negative reading of the meter. (Expect -35 to -50 volts.) Disconnect the meter and test lead.

Even less capacitive loading can be obtained, if you add a 470K carbon resistor having short leads between the anode of X18 and the tip of the meter probe.

Use this similar method for adjusting L34 for maximum amplitude of the 3.58-MHz carrier:

- Preset the tint control to the center of its rotation,
- disable the burst amplifier stage (more about this later),
- attach a VTVM or FET meter set for the -10 volt range to the anode of X18,
- and adjust L34 for the maximum negative voltage reading of the meter. Expect -7 to -10 volts. Disconnect the meter and activate the burst amplifier stage. (This adjustment also provides a maximum amplitude of carrier to the demodulators.)

Check the range of the tint control and the tightness of the color locking.

If either the burst or carrier adjustments fail to give the expected DC voltages, check for a weak or missing signal in their sources.

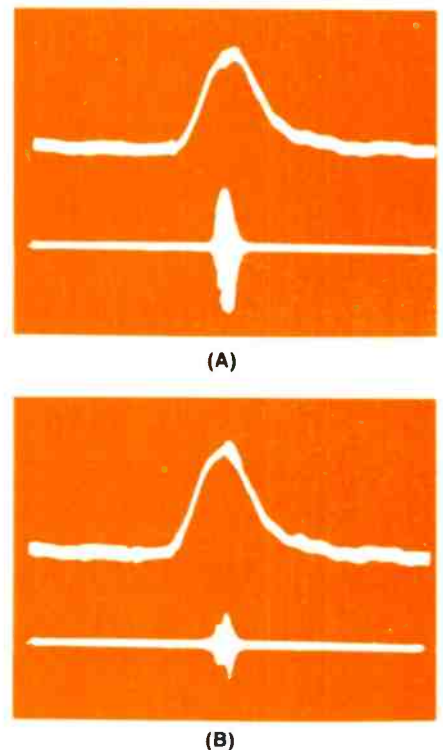
### Troubleshooting The Phase-Detector Circuit

When there is no burst signal, the positive voltage at the cathode of X17 should be exactly equal to the negative voltage at the anode of

X18, and the DC control voltage at the junction of R173 and R174 (Fig. 2) should be nearly zero.

In fact, this balance of the opposite voltages is an excellent test for all of the components in the phase-detector circuit. An open or leakage of C142, C143, X17 or X18, an unbalance in the resistances of R173 or R174, or an open in one of the secondary windings of L30 would either cause the positive and negative voltages to be unequal, or the control voltage to be either positive or negative.

When both signals are present at the phase detector and they are of opposite phase, the carrier signal adds equally to the burst signal at



**Fig. 5** When the tips of the keying pulses do not arrive at the precise time of burst, the burst envelope at the plate of the keyer tube will be weak or missing.

(A) Normal grid waveform (top) with the burst riding on the tip of the keying pulse produces normal width and amplitude of the envelope of burst at the plate (bottom waveform).

(B) When the burst is to the right of the tip of the keying pulse (top waveform), a weak and narrowed envelope of burst (bottom waveform) is produced at the plate. This is the result of insufficient delay of the phase of the pulse.

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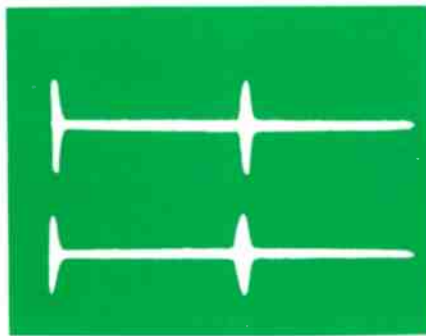
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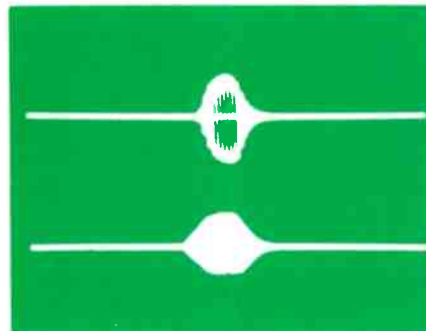
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(A)



(B)

Fig. 6 Don't be fooled by "false" burst.

(A) As usually viewed on a scope, the normal burst (top waveform) at the plate of the burst amplifier appears to be nearly identical with "false" burst (bottom waveform) caused by operation on a channel without a signal.

(B) But when the waveforms are widened, the differences are plain. Burst (top waveform) is made up of sine waves, while the "false" burst (bottom waveform) is composed of a random blur.

the two diodes. Both the positive and negative voltages are increased the same and the control voltage at the output remains zero.

When the two signals are not perfectly out-of-phase, one of the DC voltages increases, the other decreases. The control voltage is no longer zero, and this error-correction voltage is fed to the reactance stage which speeds up or slows down the oscillator to cause the phase to be restored. The average range of the control voltage is from about +3 to -3 volts. Voltages exceeding this range must be considered abnormal.

#### Limitations Of Tests

Voltage tests and scope-waveform analysis are helpful in finding defects in phase detectors. Unfortunately, both of these basic methods are subject to misinterpretation.

First of all, the amplitudes of burst in different receivers at dif-

ferent times can be normal, and yet the readings might deviate as much as 50 percent. The amplitude of burst depends on the individual TV station, the antenna used, the alignment of the receiver, and especially on the adjustment of the fine tuning. Therefore, we can't specify any exact DC voltages for any phase detector.

In addition, the DC-voltage tests and the scope-waveform analysis both can be fooled by "false" burst coming from snow, noise, video harmonics or by wrong phasing of the burst-enabling pulse.

A review of burst keying is needed to make these things clear.

#### Normal Burst Keying

Most burst-amplifier stages (see Fig. 3) are biased to cutoff, except when a horizontal pulse cancels the excessive bias and permits normal gain, during the time burst is present in the video signal. In other words, burst separation is by means of time, and not according to amplitude, as is the case with horizontal sync.

But, there's a catch in the phrase "a pulse...permits normal gain during the time burst is present". Because an unaltered horizontal pulse from any section of the horizontal-sweep circuit would arrive at the grid of the burst-keyer tube before the burst. In that event, the chroma signal would consist of harmonics of the horizontal-sync pulses.

The triple-exposure scope waveform in Fig. 4 illustrates these phase relationships. In the top waveform, the burst can be seen on the back porch (right side) of the horizontal blanking pulse. The phase-delayed keying pulse at the grid is shown in the center waveform. In the original photograph, the burst can be seen at the tip of this pulse, and it is exactly in line with the burst part of the video. The keying pulse from the output transformer is shown in the bottom waveform. Notice that the start of this pulse is in line with the leading edge of the horizontal sync pulse in the video waveform.

When you examine the schematic of Fig. 3 you might wonder what components delay the phase of the

keying pulse at the control grid. Actually, the phase delay is caused by the low-pass filter action of C106 (which brings in the video signal containing the burst) and R194 and R196. A larger capacitance value of C106 or larger resistances of either R194 or R196 delay the phase more than normal. Conversely, a smaller capacitance or smaller-value resistors provide an insufficient amount of phase delay.

A secondary function of R194 and R196 is to act as a voltage divider providing the required amplitude of pulse to bias-on the grid. A larger value of R194 reduces the amplitude of the keying pulse. This might reduce the gain of the tube and cause weak color locking. But in addition, the increased value would also increase the phase delay of the keying pulse, which also would weaken the burst at the plate.

In the same way, an increased value of R196 would delay the phase of the pulse. However, there would be less loss of gain than when the value of R194 was increased, because the amplitude of the pulse would be increased.

Other circuits omit the equivalent of R196, but all have the series resistor and the coupling capacitor to provide a phase delay.

#### Weak Burst

The burst-amplifier stage can suffer from all the conditions which reduce the gain of an audio amplifier (such as, open screen bypass, open cathode bypass, excessive bias, insufficient impedance at the plate, and insufficient input signal) in addition to some unique ones. Insufficient keying-pulse amplitude relative to the cathode resistance, and a wrong phase of the keying pulse are two of the more common general defects.

Incidentally, an important fact to remember during troubleshooting is that the DC cathode voltage goes up and down nearly in step with amplitude of the grid pulse. For example, the cathode voltage is only about +6 volts when there is no pulse.

The waveforms in Fig. 5 show the effect on the burst at the plate of the keyer tube when the phase of the keying pulse is changed. The top waveforms show the input to

the burst tube grid during a color-cast, and the single envelope of burst at the plate when the phase of the pulse is correct. For comparison, the bottom pair of waveforms show the input and outputs when the pulse arrived ahead of the burst. The burst at the plate was so weakened that the receiver dropped out of color lock.

#### False Burst From Noise Or Video

Watch out for noise or harmonics of the sync pulses and video waveforms which can appear to be normal burst at the plate of the burst amplifier tube. Remember that the tube will attempt to amplify any signal which is at the grid when the pulse tip is there. But because the plate circuit is tuned to 3.58 MHz, only the higher harmonics of video, sync pulse or noise signals will appear at the plate.

This is illustrated by the waveforms in Fig. 6. The scope controls were not adjusted for Fig. 6A; the top waveform is the normal burst when the scope sweep is set for 7867 Hz, and the bottom waveform shows a burst-like envelope composed of noise. It is slightly fuzzier than that of burst, but an unwary technician might be deceived.

When the burst and noise envelopes are spread out laterally, as shown in Fig. 6B, the differences between them are very noticeable. You can even count the individual sine waves in the burst!

#### Next Month

The tricky aspects of the direct-injection of burst to lock the color oscillator by "brute force" will be our subject next month. □

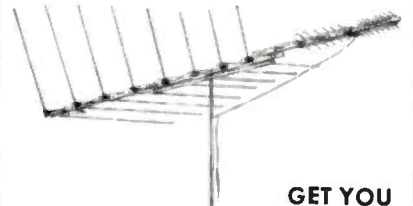


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# A glimpse of TV receivers in the far future

Most attempts at prophesying result in a red-faced prophet when the future doesn't unfold as proclaimed. So, to prevent our embarrassment because of wrong predictions, we are presenting a short report received by Inter-Time mail from Forest H. Lemons, Technical Editor of *ELECTRONIC SERVICING* in 1992. Here is his dispatch telling of the newest trends in the 1992 color receivers:

"About 1978, the old-fashioned metal chassis was replaced by a plastic framework on which the modules were mounted. Present frameworks are somewhat similar, but have all the variable controls and mounting posts for the picture tube molded as part of the framework. Metallic shields, where needed, now are molded inside the framework of the individual modules.

"All solid-state elements, resistances, capacitances and inductances (except for a few large ones externally mounted) are located inside small modules. These modules are of odd sizes to fit the contours of the cabinet and are small, seldom exceeding 2 inches by 4 inches. They are fastened to the framework either by gluing or heat-sealing techniques, and can be removed by use of the proper solvent, if replacement becomes necessary. All connecting conductors between modules are molded into the framework.

"Inside the modules (which are not repairable) are the equivalents of several IC units, plus some solid-state equivalents of resistances, inductances and capacitances connected by solid-state conductors. All components are covered by an air-tight coating of epoxy or plastic. Where the few

external discrete components are required, terminals made like loops of wire protrude through the epoxy.

"Although the color picture tube is recognizable as an evolutionary descendant of the old tri-color slotted-aperture type, the brightness is intense, and the tubes are only about 8 inches in depth.

"However, the most radical change of all is that the old NTSC television standards were superseded about five years ago by the new Color Diffraction Principle (CDP). The color subcarrier is eliminated (allowing development of the proposed stereo-video system) and the raster scanning lines were changed to 1050. Of course, this automatically doubled the bandwidth requirements and increased picture sharpness.

"One of the compromises making the CDP system compatible and practical was that the older NTSC models show a less sharp picture by alternate scanning at the old rate of 525 lines.

"After giving up any hope of using lasers in television, several large manufacturers are known to be working on a solid-state picture tube in which millions of super-bright LED's in four colors (red, blue, green & white) are imprinted on the screen. Scanning is performed by the speed of electrons and holes inside the LED's. Rough scanning speed is determined by the kind of dopant, while locking is permanently set by trimming voltages obtained from factory-adjusted controls. These picture tubes are expected to be about 1/4 inch in thickness, finally making possible the 'picture on the wall' TV receiver, so long desired.

"Servicing of electronic home-entertainment products in 1992 is a very large industry, although the methods used are often the 'replace the black box' type."

We hope you enjoyed this glimpse of the future. Inter-Time mail is extremely expensive and not to be employed very often. Write to the editor if you want to learn more. □



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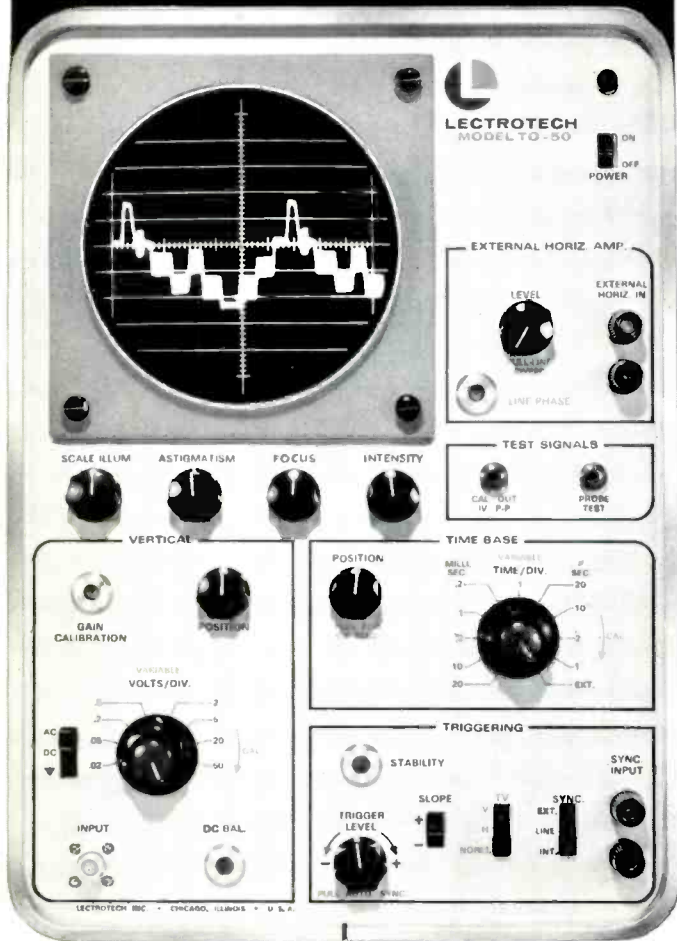
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News from the

## SERVICE ASSOCIATIONS

Ed Gorman, publisher of TV Tech Aid, has issued an open letter to the press and radio media of the United States. In the letter, he writes about consumer fraud, and about the efforts of the Suffolk County TESA group (affiliated with NATESA) to eliminate fraudulent practices from their area. He points out that the commission of fraud probably is made easier by the unwise acceptance by the public of "bait advertising" and other something-for-nothing schemes. Television technicians, he emphasizes, have been subjected to exposes, entrapment, and a bad press attitude which makes sensational reading, but is definitely unfair to the many thousands of ethical, professional technicians.

Frank Moch, Executive Director of NATESA, strongly suggests the use of video tapes to eliminate the shortcomings of the conventional service meetings. He proposes that each of the major manufacturers cooperate in financing and supplying his best trainer with a set of test equipment during the recording of video tapes which could be played in all locations of the United States. This plan would eliminate much of the duplication of similar material by the manufacturers and provide the equivalent of many thousands of trained teachers and sets of test equipment. So far, no reaction has been obtained from the representatives of the manufacturers who attended the AIC Training Meeting, September 11 in Indianapolis, Indiana when this suggestion was made.

Notice: The editors of ELECTRONIC SERVICING invite the national and state service organizations to submit news items or plans for seminars or conventions. Allow two months lead time for any dated material. We reserve the right to edit to shorten or clarify.

### IRS Small-Business Publications

"Plain-language" publications have been issued by the Internal Revenue Service (IRS) to clarify the rules controlling the freeze of prices, wages and rents under the Economic Stabilization Program.

These publications are available at no-charge from your local IRS office.

We suggest the following S-3000-series publications as those most likely to be of help and interest to the managers of electronic-repair shops:

Retailer's Price-Posting Requirements	S-3
Record Keeping For Economic Stabilization	S-6
Items Not Controlled	S-3007
Legal Price Increases Under Economic Stabilization	S-3011
Service Organizations and Price Controls	S-3017
Exemption of Small Business	S-3037
Price and Wage Classification	S-5

## bookreview

### Electronics Data Handbook

Author: Martin Clifford

Publisher: TAB Books, Blue Ridge Summit, Pennsylvania

Size: 5 5/8 x 8 3/4 inches, 256 pages

Price: Softcover \$4.95; hardcover \$7.95.

This working guidebook was written to help cut down the research needed to find specific information and formulas in electronic problems. This is not a book of electronic theory. A formula is usually the end product of theory, the intent here is to provide formulas in an easily accessible manner. Where explanatory material is given in this text, its function is to clarify the use of a formula, or its derivation. A knowledge of elementary algebra and trigonometry and some skill in handling algebraic functions will be of considerable help.

**Contents:** DC Circuits—AC Circuits—Vacuum Tubes And Vacuum Tube Circuits—Semiconductors—Television—Antennas And Transmission Lines—Measurements—Tables And Data.

### 1-2-3-4 Servicing Stereo Amps

Author: Forest H. Belt

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

Size: 8 1/2 inches x 5 1/2 inches, 240 pages

Price: Softcover, \$4.95.

This new volume begins with a basic discussion of the fundamentals of the 1-2-3-4 servicing method, showing an easy way to service electronic equipment by dividing it into four distinct divisions—sections, stages, circuits, and parts. Then, an analysis is made of the four important servicing steps—diagnose, locate, isolate, and pinpoint. Several chapters cover stereo music systems, kinds of stereo systems, specifications and measurements, two- and four-channel stereo, transistor circuit operation, and various stages in transistor amplifiers. The text is supported with numerous illustrations and schematics.

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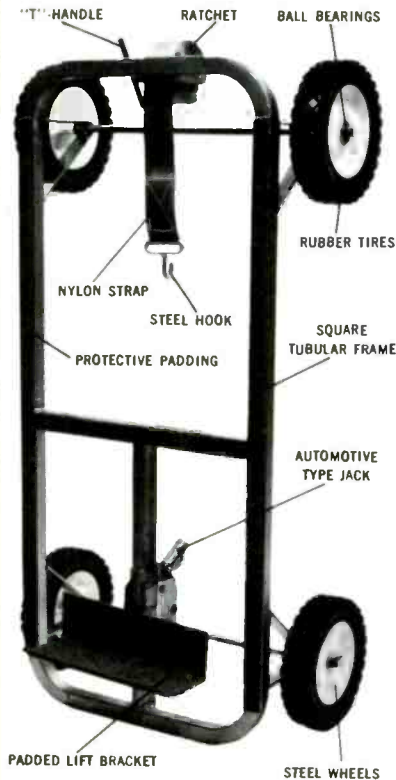
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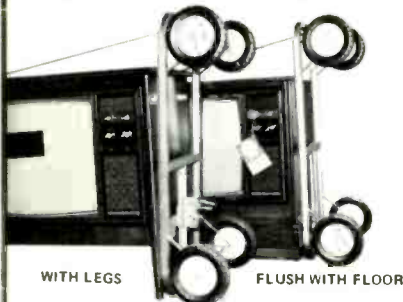
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## catalogs literature

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### ANTENNAS

**100. Antenna Specialists Co.**—announces a new amateur radio catalog with an expanded line of two meter, six meter, and three-quarter meter amateur base and mobile antennas.

**101. Blonder-Tongue, Inc.**—announces a booklet presenting the basic facts necessary to understand MATV systems. A Glossary of Terms is included for further understanding.

**102. Jerrold Electronics Corp.**—has introduced a new 10-page guide to installing TV and FM antennas covering antenna selection, masts, mounts, lead-in wire, lightning protection and multi-set systems. Tips on how and where to take lead-in wire into the house, how to run coaxial cable and twinlead indoors and out, and how to drill through exterior walls are included.

### AUDIO

**103. Atlas Sound**—introduces an 8-page color brochure of loudspeakers, paging and intercom speakers, projector horns and drivers, mobile and industrial communications units, hi-fi and sound columns. Included are 100 individual models of loudspeakers and accessories.

**104. Mellotone, Inc.**—introduces a new catalog featuring CHANGE-A-GRILLE self-stick acoustic fabric for speaker grilles. Swatches of six basic patterns are attached to the catalog showing fabric styles and colors.

**105. Radio Shack**—announces the new 1973 Electronics Catalog No. 227. The 180-page catalog lists thousands of hard-to-find or specialized electronic items.

**106. Switchcraft, Inc.**—introduces a 28-page catalog listing its line of

phone jacks and plugs, switches, connectors, adapters, and molded cable assemblies. Each part is listed by number and the page on which it is found.

### CCTV

**107. GBC Closed Circuit TV Corp.**—announces a new 20-page catalog, which illustrates and describes all of the components necessary to a complete video communications system. The catalog illustrates monitors ranging from 5-inch units to a 20-inch solid-state unit.

### FUSES

**108. Littelfuse, Inc.**—announces a new four-page catalog featuring its product line of exact replacement fuse and circuit breaker caddy assortments designed for domestic and foreign electronic equipment service requirements in the field.

### KITS

**109. Heath Co.**—announces their new 1973 Heathkit catalog with over 350 kitbuilding ideas. New kits include: FET tester; 60-watt stereo receiver; inductive timing light; SWL receiver; audible-alarm depth sounder; metal locator; QRP CW transceiver; and a 50-watt stereo receiver and "separates".

### MARINE ELECTRONICS

**110. Raytheon Co.**—introduces the Webster antennas and seven new antennas designed for use with standard and single sideband marine radio-telephone and citizens band radios. The Webster antennas for VHF/FM radio are offered in 3 dB, 6 dB, and 9 dB models.

### SEMICONDUCTORS

**111. GTE Sylvania**—has published a 12-page supplement, designated ECG 212D-2, cross referenced with more than 7,100 industrial part numbers with the Sylvania types which replace them.

**112. North American Electronics**—

announces a new catalog supplement (N-72) describing 70 new products. Included are miscellaneous accessories as a universal AC adapter and a low-cost auto burglar alarm, audio cables and adapters, DIN cables, speakers and accessories, and a selection of 13 semiconductors.

**113. Sprague Products Co.**—has released a new color TV electrolytic replacement guide, the M-945. Included are TVL and PCL aluminum electrolytics intended for color TV servicing and lists 54 leading color TV manufacturers along with the catalog numbers of the TVL/PCL units which fit their respective chassis.

### SERVICE AIDS

**114. Castle Television Tuner Service, Inc.**—introduces literature describing the Castle TV Tuner Subber, solid-state, portable unit for field service of color or black and white TV receivers.

**115. Mega Industries Corp.**—introduces VIZI-KASE, a two-sided, portable, tool and parts organizer. Available in 7 models from 46 to 79 individual internal compartments.

**116. Injectorall Electronics Corp.**—has released a 12-page 1973 catalog, which features new sensitized printed circuit boards in their line of breadboard and printed circuit supplies. The catalog also provides information on chemicals used in electronic servicing and maintenance.

### SHOP EQUIPMENT

**117. Kole Enterprises, Inc.**—announces a 36-page color catalog which includes 31 sizes of corrugated stock/parts bins, flat and vertical storage bins, transfer and magazine files and shipping cartons.

### TECHNICAL PUBLICATIONS

**118. Howard W. Sams & Co., Inc.**—announces publication of a new 96-page 1972 Technical and Scientific Book Catalog. Described are over 800 hardbound and softbound books which cover

“do-it-yourself” titles from the Audel Division, amateur radio publications, audio visual materials, instructor’s guides and student workbooks. Titles range from “ABC’s of Air Conditioning” to Writer’s and Editor’s Technical Stylebook.”

**119. Sencore, Inc.**—Speed Aligner Workshop Manual, Form No. 576P, provides 20 pages of detailed, step-by-step procedures for operation and application for Sencore Model SM 158 Speed Aligner sweep marker generator.

**120. Sylvania Electronic Components Div.**—has published the 14th edition of their technical manual, which includes mechanical and electrical ratings for receiving tubes, television picture tubes and solid-state devices.

### TEST EQUIPMENT

**121. Leader Instruments, Corp.**—announces the 1972 Catalog of Leader Test Equipment. Test equipment included is the LBO-301 portable triggered-sweep oscilloscope, LSW-300 new solid-state post injection sweep/marker generator, and the LCG-384 miniportable, solid-state battery operated color-bar generator.

**122. Lectrotech, Inc.**—announces the 1972 catalog. “Precision Test Instruments for the Professional Technician”. It contains specifications and prices on sweep marker generator, oscilloscopes, vectorscopes, color bar generators and other test equipment.

**123. Speco Components Specialists, Inc.**—announces their 43-page, 1972 catalog VOM multimeters and meters for TV technicians. Individual features and specifications for each instrument are included.

### TOOLS

**124. Jensen Tools and Alloys**—has announced a new catalog No. 470. “Tools for Electronic Assembly and Precision Mechanics.” The 72-page handbook-size catalog contains over 1,700 individually available items.

**125. Plato Products, Inc.**—intro-

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Circle 31 on literature card

duces a 28-page, 2-color soldering tip catalog, No. 0372. Illustrated with dimensioned drawings to facilitate accurate selection, the new catalog features tips to fit leading brands and models of soldering irons.

### TRANSFORMERS/COILS

**126. Essex Controls Division**—new Stancor Transformer Catalog No. 207 lists over 1,900 standard transformers for design engineers. Full technical data, mounting dimensions, photographs and other specifications on the line of audio transformers, power transformers, chokes and inductors are included. A complete listing of all Stancor sales offices and stocking warehouses is included.

**127. J. W. Miller Co.**—announces a new 92-page radio and TV replacement coil cross reference guide for known domestic and foreign color and black and white TV sets, home and car radios. Over 22,000 replacement coils for 327 manufacturers names reportedly are listed.

### TUNER REPAIR

**128. Castle Television Tuner Service, Inc.**—announces a list of Castle replacement TV tuners made to fit in place of original tuner. A comprehensive range of Universal Replacement TV Tuners is also included.

**129. PTS Electronics, Inc.**—62-page catalog with over 600 exact-replacement tuners listed under their original manufacturer number for ease of exchange. A replacement guide for antenna coils and shafts is also provided.

### TV ACCESSORIES

**130. Telematic**—introduces a 14-page catalog featuring CRT brighteners and reference charts, a complete line of test jig accessories and a cross reference of color set manufacturers to Telematic Adapters and convergence loads. □

**For more information about above products use reader service card**

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Circle 45 on literature card

# 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.

## Color Test Jig Kits

**Product:** Five new portable color test jig kits have been announced by Pix-O-Scope, Inc.

**Features:** The kits include cabinet



and necessary components, but not picture tube. A patented yoke adapter is available for use in servicing various makes. With color picture tube added and proper yoke adapter connected, each kit may be used to check any U.S. television set in the home. The new kit line includes four 15-inch models and one 19-inch model. The 15-inch model, weighs only 28 pounds. The Pix-O-Scope line consists of U.S. patented portable color test jigs, complete with color picture tube, special circuit to allow setting of the efficiency coil, DC meter, kv meter, mv meter, volt-ohm meter, built-in color bar generator and eye-bolts for safe hanging in the shop.

**Price:** Prices start at \$149.95.

Circle 50 on literature card

## Digital Multimeter

**Product:** Model 281 multimeter by B&K, Dynascan Corp.

**Features:** Included are large, ultra-stable 2 1/2 digit numerical display with automatically positioned decimal point, 100 percent overrange capability, full overload protection, positive overrange and wrong polarity indication, high sensitivity, 1 percent accuracy and 10 megohms input impedance.

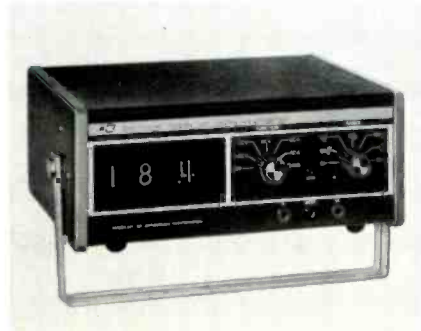
**Specifications:** Ranges include DC and AC volts (0-1KV), DC and AC current (0-10.0 amp) and resistance (0-10.0 megohms). All ohms ranges are constant-current, a fea-

ture not found on conventional, analog meters. DC accuracy is  $\pm 1$  percent of reading,  $\pm 1$  digit. On the lowest ACV and DCV ranges the 281 reads 100 mV full-scale. The five-position handle doubles as a stand, for eye-level viewing. Model 281 operates from 105-125 VAC, 50-60 Hz and is supplied with test leads and B&K's PR-21 probe with switchable 100K ohm isolation resistor that prevents capacitive loading when measuring DC in RF circuits.

**Size:** 3 1/2 inches x 7 inches x 9 inches.

**Price:** Model 281 sells for \$169.95.

Circle 51 on literature card



## Minimum/Maximum Indicator

**Product:** Minimum/maximum indicator by Digilin, Inc.

**Features:** The indicator displays the limit conditions reached by a process during an extended time period. Other measurement instruments can be controlled by this unit to take additional data when a minimum or maximum point has oc-

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Circle 33 on literature card

curred. Depending on whether Minimum or Maximum has been selected, the display is updated only when the new reading is lower or higher than the old reading. Three and four digit units are available.

**Specifications:** Input—TTL, BCD; Output—TTL, BCD and HI, LO, EQUAL; Power—115/220V, 50/400 Hz, 5 watts.

**Price:** The three-digit model sells



for \$204.00 and the four-digit model sells for \$240.00.

Circle 52 on literature card

## Solid-State Curve Tracer

**Product:** Model LTC-905 curve tracer by Leader Instruments Corp.

**Features:** Included are: variable, horizontal length adjustment to 100 volts of sweep; this helps place the entire horizontal trace on the scope face and enables use of the instrument with all oscilloscopes. The unit checks for opens, shorts and leakages with a sweep frequency of 120 Hz and a sweep voltage, 8 steps selectable from 10 to 100V. Test capabilities include such devices as transistors, unijunction transistors, triacs, SCR's, zener diodes, signal diodes, rectifier diodes, FET's and MOSFET's—both depletion and enhancement mode types. Accessories include special in-circuit "Leader-Flex"

probe, 2 sets of leads for external checking as well as horizontal and vertical scope leads.

**Size and Weight:** 3 1/2 inches x 6 1/4 inches x 9 3/8 inches and weighs 7 pounds.

**Price:** The LTC-905 sells for \$119.95.



Circle 53 on literature card

## Portable Oscilloscope

**Product:** Model PM3200 by Test & Measuring Instruments, Inc.

**Features:** This new portable oscilloscope has been converted from a cathode follower to FET circuitry. The change has produced a significant reduction in power consumption, extending operating time on the optional battery pack from 4 1/2 to 5 1/2 hours.

**Specifications:** Triggering is fully automatic; once the trigger mode has been selected. The vertical amplifier is internally compensated for drift so that no DC balance control is needed. Response is flat to 3 dB from DC to 10 MHz; sensitivity is 2 mV per division. Calibration of the amplitude control is accurate to ±3 percent.

**Weight:** 11.7 pounds without battery pack; the optional battery pack weighs 10 pounds, including batteries.



**Price:** The PM3200 sells for \$395.00.

Circle 54 on literature card

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Photo-Tip  
To The Editor  
Yes—We Pay



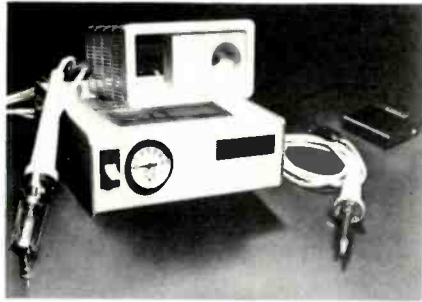
# productreport

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

## Soldering/Desoldering Station

**Product:** Model DS100 by Weller Division, The Cooper Group.

**Features:** Design features include, completely automatic temperature and output control to suit every soldering requirement, and vacuum



adjustment for safe desoldering. The station operates at 24 VAC from standard 110V line current and is equipped for hookup to in-plant compressed air lines. The

unit's low voltage power unit is silent, free from vibration, and requires no maintenance. The barrel assembly is manufactured of stainless steel for long life, and the high impact resistant, nonconductive molded plastic handle stays cool. A twin safety tool holder with no heat sink increases operator convenience, and a separate sponge and tip holder makes tip cleaning fast. Model DS100 is available with offset or angled tips for better operator visibility and a see-through solder collector which is easy to remove, clean and replace. A wide variety of long life tips lined with stainless steel and in orifice sizes to suit the application are also available. A storage area for extra tips is provided.

Circle 60 on literature card

## Parts and Tool Organizer

**Product:** VIZI-KASE by Mega Industries Corp.

**Features:** VIZI-KASE is a transparent, portable parts and tool organizer for the technician using assorted small parts. Available in 7 models ranging from 46 to 79 compartments, each compartment has its own hinged cover and snap type lock, plus the convenience of parts being kept in an orderly fashion and indexed for reference. Outer case and covers are molded from high impact plastic, making the outer case virtually indestructible. Outer case cover transparency enables user to see contents without opening case. Built around an



unique frame, called the "Z" frame, the case has two independent covers fastened to the frame with plated hinges. These covers lock into position when not in use by a plated-type key lock. By simply flipping VIZI-KASE from front to back, each cover becomes accessible to the user.

**Size:** 18 1/4 inches x 12 3/4 inches x 3 3/4 inches.

Circle 61 on literature card

## Repair Servicing Bench

**Product:** ALDEN Work Center System by ALDEN Systems Co., Inc.

**Features:** All test cables, work tools and meters are stored on an eye-rest green pegboard for easy reach and reference. Important information is stored in an optional locked drawer. Other optional items include lower shelf for ample storage area, swivel posture chair, solder iron holster and a locking 360-degree turntable for minimum reach. Additional features include almost shadowless low wattage lighting, master indicating 15 amp fused/switch package for operator

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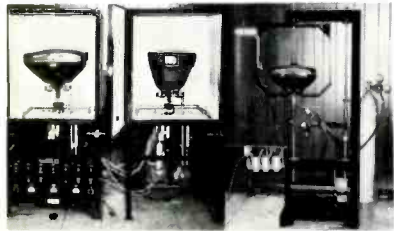
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Profit? Imagine building four color tubes per day and if you sold these tubes for \$60.00 each. Total income \$240.00. Total cost \$26.40. Net profit \$213.60. Multiply this figure by five days per week. Your profit \$1,068.00 per week. Cut this figure in half! Build and sell only two color tubes per day. Your profit \$534.00 per week. Facts are facts, figures do not lie.

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## Messenger 122.

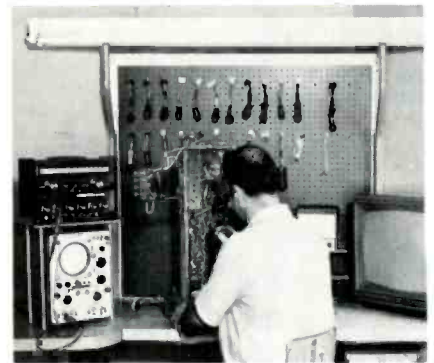


**JOHNSON**  
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safety and comfort. Additional safety features include eight grounded 110V convenient outlets, pre-punched holes for the addition of standard DC or other receptacles with all wiring enclosed in the back frame. The Alden Work Center is supplied knocked down—assemble and set-up in 35 sq. ft.

**Size and Weight:** 82 inches x 84 inches x 82 inches and weighs 185 pounds.



Circle 62 on literature card

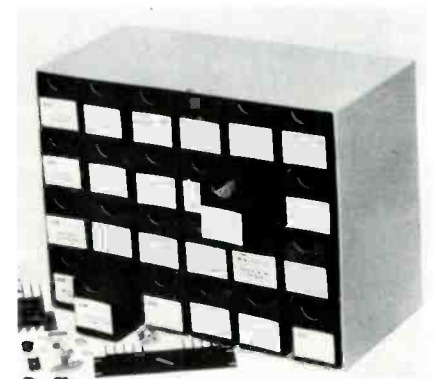
### Hardware Kit

**Product:** Model LK-44 by International Rectifier Corp.

**Features:** The kit was assembled especially for experimental or laboratory use with semiconductors, and contains 20 different items including an assortment of transistors and IC sockets, heat exchangers and mounting hardware. Transistor sockets include a universal type for low power units, plus TO-3 and TO-66 sockets. The IC sockets available are TO-5 lead, 10 lead and 12 lead types, plus 14 and 16 PIN DIPs. The compartments of the 24-drawer cabinet are clearly labeled with pertinent data and part numbers for easy identification and reordering convenience. Also in-

cluded in the kit is a do-it-yourself IC component carrier and a wide selection of heat exchangers.

**Price:** Model LK-44 sells for \$63.11.



Circle 63 on literature card

### Capacitor Kits

**Product:** Seventeen new capacitor kits by International Components.

**Features:** The new kits offer low voltage miniature aluminum electrolytics, high voltage aluminum electrolytics, non-polarized electrolytics, subminiature polyester film and metalized polyester film capacitors. The aluminum electrolytic and film capacitors are available in separate high or low voltage kits, with non-polarized offered in high voltage.

**Price:** The kits come in compartmentalized plastic containers or metal cabinets and contain as few as 25 capacitors for \$4.00 and as many as 250 capacitors for \$49.50.

Circle 64 on literature card

### Magnetic Screwdriver Set

**Product:** Five-piece screwdriver set, No. 70191, by Vaco Products Co.

**Features:** The 5-piece all-magnetic

screwdriver has four interchangeable tips. The magnetism is transmitted from the shank to the tip of the screw providing a screw-holding driver. The other part of the combination consists of a 7-piece hex drive socket set for turning all hex head nuts and bolts. A 1/4 inch hex key wrench is included for driving screws in recessed or hard-to-reach areas. Extra components are stored in the handle of the tool.

**Price:** No. 70191 screwdriver set sells for \$5.95. □

Circle 65 on literature card

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1014 Wyandotte St.  
Kansas City, Missouri 64105

# 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.

## Four-Channel Synthesizer

**Product:** Audio Quatrovox Four-Channel Synthesizer by Radio Shack.

**Features:** A four-channel effect is created with the Quatrovox by placing the rear speakers out of



phase with the front. This eliminates sound common to both stereo channels, leaving only ambient sound from the rear. It provides independent volume control of front and rear speakers for both stereo and four-channel so you can listen to front speakers only, rear only or balance all four speakers.

**Price:** The four-channel synthesizer sells for \$9.95 and includes mounting hardware, 18-foot speaker cables and instructions.

Circle 70 on literature card

## VHF/TV and FM Sound Receiver

**Product:** Model RV-04 by Concept Plus.

**Features:** The RV-04 is a solid-state dual-band VHF television sound and FM broadcast portable receiver that is operated on batteries giving the listener the opportunity to hear his favorite program when he cannot watch the TV screen. A combined VHF and FM monopole antenna pulls in the signals and an earphone jack and private earphone is provided; otherwise, a three-inch dynamic loud-

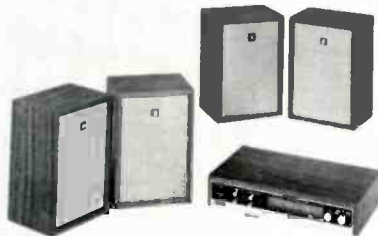
speaker delivers the full audio range.

**Price:** The RV-04 receiver sells for \$29.95.

Circle 71 on literature card

## Four-Channel Stereo System

**Product:** The DXR-5111 by Sanyo Electric, Inc.

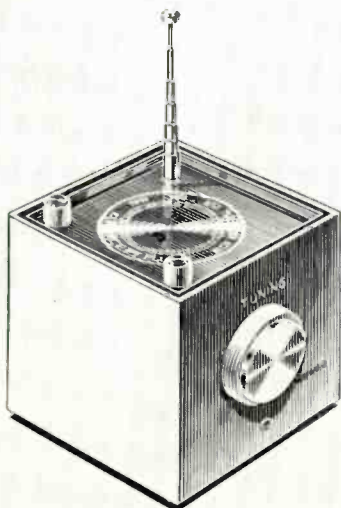


**Features:** The DXR-5111 is a four-channel system with decoder matrix circuitry built-in and four amplifiers. The system also includes four speakers and an AM/FM stereo receiver. Tape recordings made in two-channel stereo can be reproduced through the four-channel matrix circuit.

**Price:** The DXR-5111 sells for \$175.00.

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For more information about above products use reader service card



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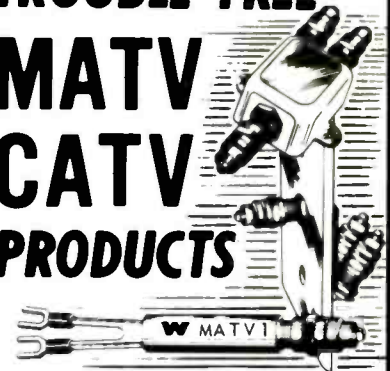
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**FURNITURE PADS**  
**ROLLS UP & DOWN STAIRS**

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YEATS Model No. 5 566.50

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## The MARKETPLACE

This classified section is available to electronic technicians and owners or managers of service shops who have for sale surplus supplies and equipment or who are seeking employment or recruiting employees.

**Advertising Rates**  
 in the Classified Section are:

- 25 cents per word (minimum \$3.00)
- "Blind" ads \$2.00 additional
- All letters capitalized—35 cents per word

Each ad insertion must be accompanied by a check for the full cost of the ad.

Deadline for acceptance is 30 days prior to the date of the issue in which the ad is to be published.

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

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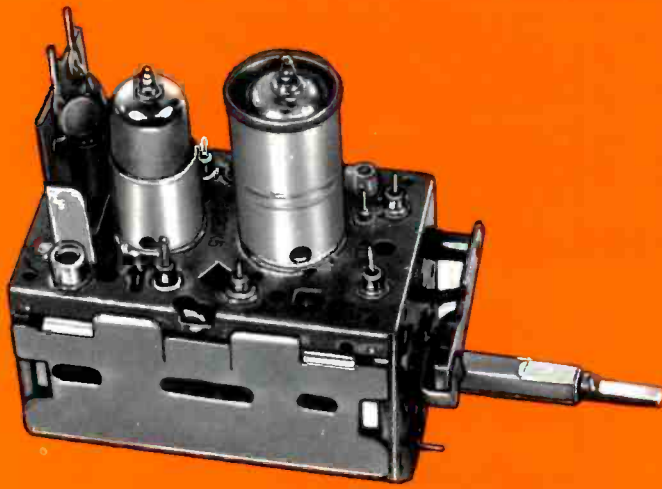
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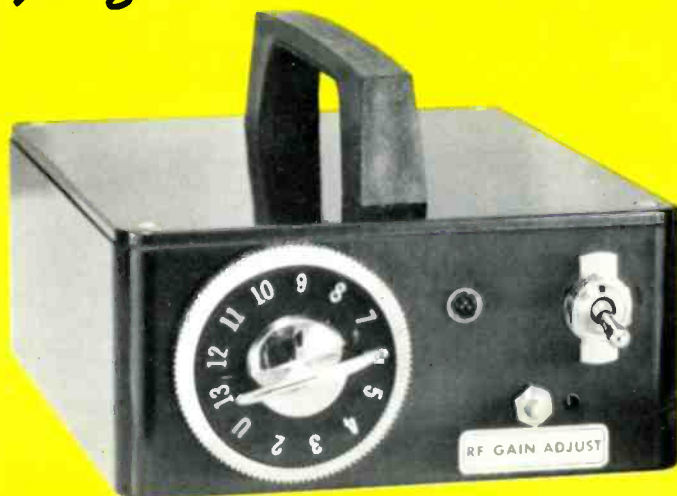
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