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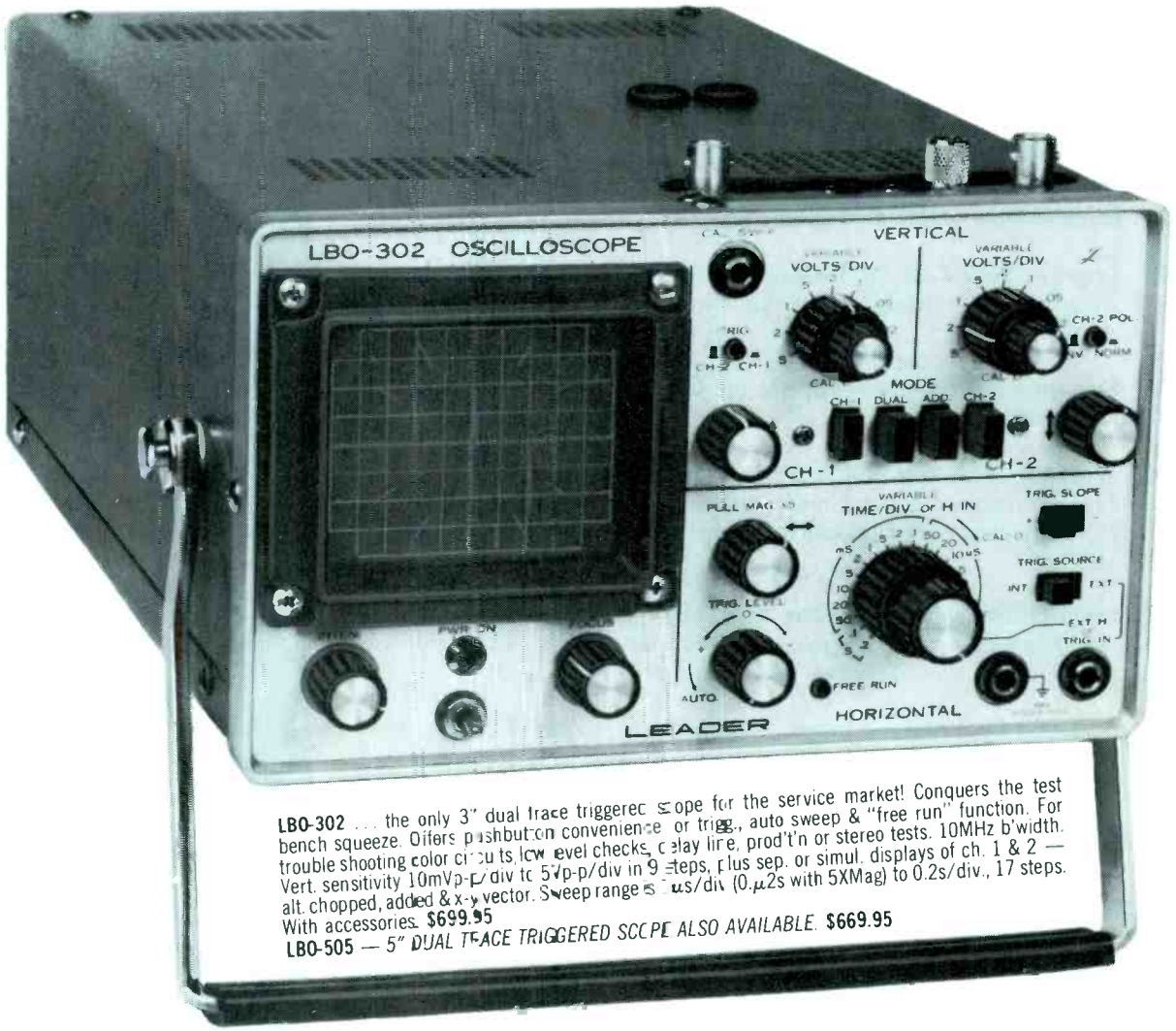

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October 1973 □ Volume 23, No. 10

Electronic Servicing

in this issue...

DEPARTMENTS

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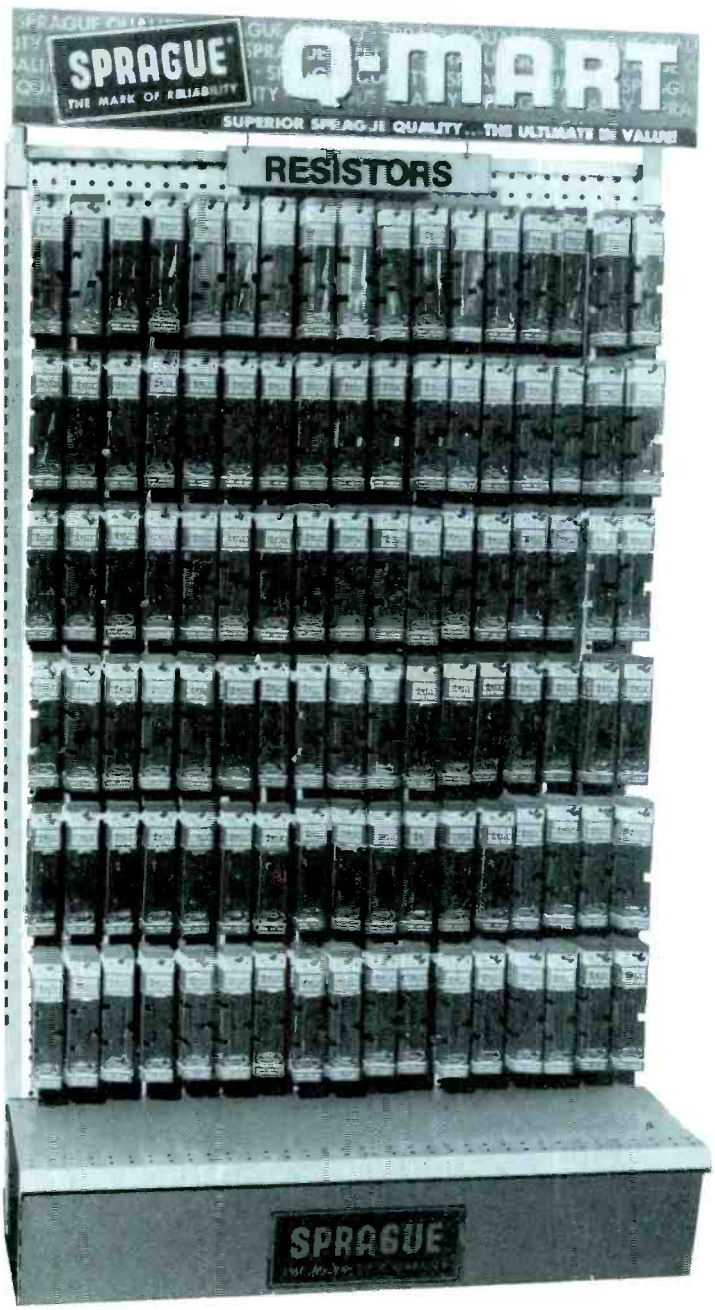

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For More Details Circle (5) on Reply Card

electronicscanner

news of the industry

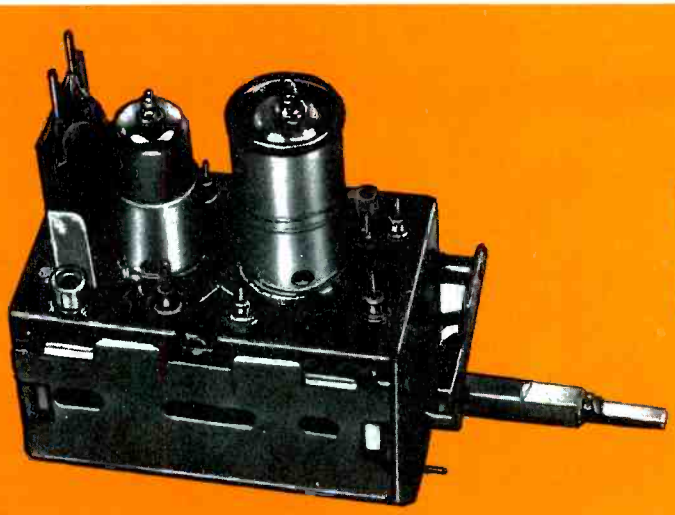
Electronic controls are to be used with the anti-skid brake equipment necessary for all trucks and buses manufactured after September 1, 1974, according to the **Wall Street Journal.** Each axle must have its own unit, consisting of sensor, magnet and computer whose wholesale cost is between $100 and $250 per unit for perhaps five axles per truck. The sensor (slotted or toothed disk) is fastened to each wheel near a permanent magnet. Signals from the sensor go to the computer which has a bank of data permanently stored on a tiny wafer of silicon. The computer determines when each brake should be applied in order to eliminate wheel locks, the cause of skids and jackknives. Ten manufacturers are competing for their share of this potentially-large business. Service of the units is the headache of the industry. Bendix already has instructed sales and service personnel of its 750 distributors about the anti-skid system during one-week schools.

The results of one small survey were very complimentary to TV service dealers. The August NEA Newsletter gives the details of a survey conducted by the BBB of Indianapolis. Only 25 shops participated in the survey which had 1285 responses. Only 41 (3%) stated they would not use that firm again. Too bad the test was not larger, the results then would have been real valuable **news.**

Now there are four feminine-type CET's. They are: Mary Makin of Portland, Oregon, Norma Blair of Beatrice, Nebraska, Valerie Miller of Portland, Oregon, and Alma Roberts of Coker, Alabama. Congratulations!

A new-type lie detector analyzing the voice alone has been introduced to a mixed reaction. The Psychological Stress Evaluator model PSE-1, states an article in the **Wall Street Journal,** analyzes voice characteristics live or over telephone, radio or other audio channels. It is the invention of three ex-Army Intelligence men and was introduced over a year ago by the Dektor Counterintelligence & Security, Inc. of Springfield, Virginia. More than 350 have been sold for $3,200. Housed in a case resembling a briefcase, the machine has a tape recorder and a moving-strip chart which displays traces made on heat-sensitive paper by a heated stylus. There are about 15 adjustments that can be made. The inventors say the machine detects the presence of inaudible frequency modulations normally there when a person is not under stress. A loss of frequency modulation would indicate stress, which might be the result of lying. All forms of lie-detection equipment have been the subject of controversy, and the PSE system is even more controversial than the polygraph.

Productivity of technicians was increased in 1972, according to a National Appliance & Radio-TV Dealers Association (NARDA) survey of 200 service shops reported in **Merchandising Week.** Because of higher operating expenses, the net operating profit was 5.8%, the same as reported for 1971.



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VIRGINIA	NORFOLK, VIRGINIA 23502	4538 East Princess Anne Rd.	Tel. 703-855-2518

FOR INFORMATION ON FRANCHISE, CONTACT HEADQUARTERS

For More Details Circle (4) on Reply Card

Zenith has introduced a 12-inch b-w portable TV that is denim covered, with orange stitching and copper-colored rivets, states an article in **Home Furnishings Daily.** The set is called "Sidekick", and it's said Zenith is having difficulty in obtaining sufficient denim cloth to cover all those sets.

A prediction that by 1980 the watch industry would be producing 100-million electronic wristwatches, selling for as little as $25, was recently made by Harry Weisberg of RCA's Solid-State Division. He used as an example the Pulsar Time Computer which uses LED's and an RCA IC containing the equivalent of more than 1,300 transistors on a sliver of silicon measuring two ten-thousands of a cubic inch. Also, he predicted watches with automatic changes for daylight savings and standard times, watches that automatically adjust for the number of days in a month, and watches which read the temperature or function as simple calculators.

According to EIA, sales to dealers for the first seven months of 1973 compared to 1972 were: color TV up 17.2%, b-w down 14.7%, home radio down 15.6%, and auto sound up a resounding 29%. Next month look for our article about starting and making a profit with the auto-sound business. Other products enjoying a boom are security and antenna sales. Electronic Servicing will continue to cover these three important new fields in depth.

Sales of 25-inch solid-state Motorola Quasar color-TV receivers will be made in Japan starting this fall. Although about 70% of the homes in Japan have color receivers now, compared to only about 58% in the States, most previously have been those with smaller screens. Motorola hopes to satisfy the increasing demand for large-screen import color sets.

A first-of-its-kind educational telecommunications system linking schools and homes is scheduled for operation in Adrian, Michigan this fall. The system will link eight public and private educational complexes with two-way audio, video and digital signals. In addition, 21 other school buildings and 5,000 homes in two communities will receive selected educational television programs transmitted one-way from the eight facilities that have production capacity. □

The new 1974 Magnavox line includes more than 90 percent all-solid-state models, according to **Home Furnishings Daily.** Other features include in-line matrix tubes for the 17- and 19-inch models and a Videomatic button for automatic color. Videomatic now includes control over tint and fine tuning in addition to the actions of last year's models which varied the brightness, contrast and color according to changes of room lighting. The 25-inch solid-state chassis has six large plug-in modules, eight smaller modules, and plug-in transistors. **General Electric has introduced an expanded line of solid-state 25-inch console color receivers** featuring One-Touch Color, Tint-Range Lock, Automatic Chroma Control and Customatic Tint Lock, plus indented stops for all 70 UHF channels. **The 1974 Motorola's include 14 new 25-inch color consoles,** 11 of which are all-solid-state Quasars. All have modular chassis and one-button InstaMatic tuning. □

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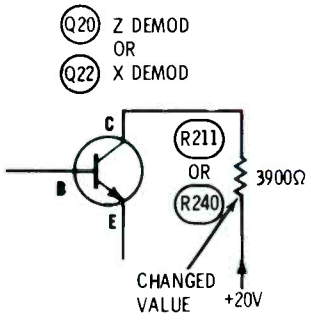
*Of course we cannot ship on weekends and holidays.

For More Details Circle (7) on Reply Card

symcure

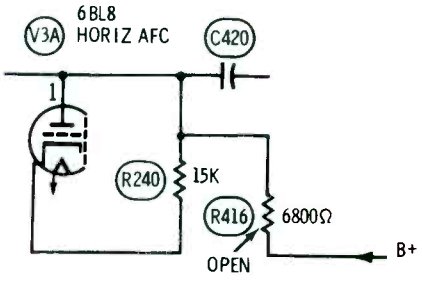
Symptoms and cures
compiled from field reports
of recurring troubles

Chassis—Sylvania D12
PHOTOFACT—1045-2



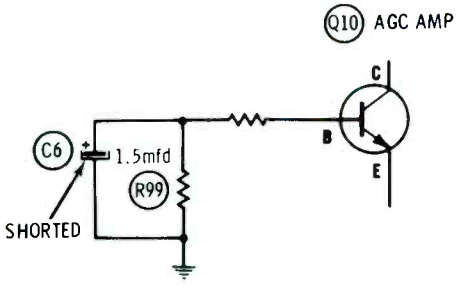
Symptom—poor color, might appear as bad alignment
Cure—Check R211 and R240, and replace if out of tolerance

Chassis—Sylvania D16
PHOTOFACT—1178-3



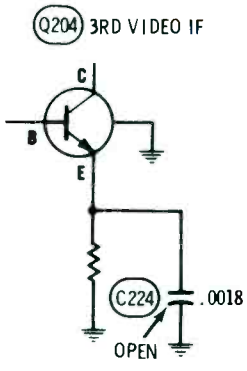
Symptom—Critical horizontal locking
Cure—Check R416, and replace if open or out of tolerance

Chassis—Sylvania D12
PHOTOFACT—1045-2



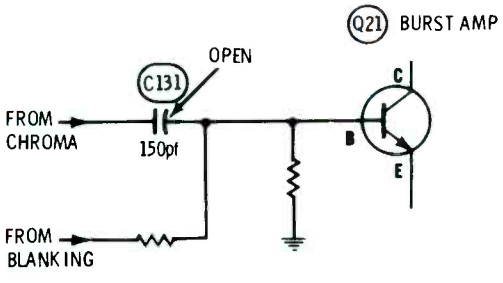
Symptom—Insufficient AGC
Cure—Check C6, and replace if shorted

Chassis—Sylvania D16-07
PHOTOFACT—1264-3



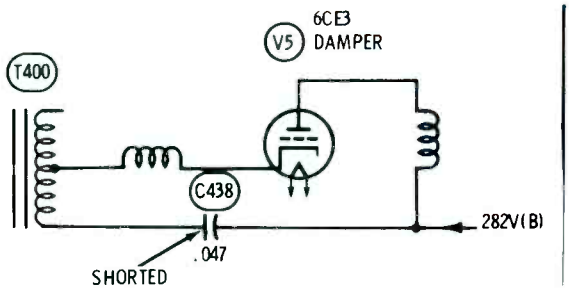
Symptom—Ringing in picture, no snow off-channel
Cure—Check C224, and replace if open

Chassis—Sylvania D12
PHOTOFACT—1045-2

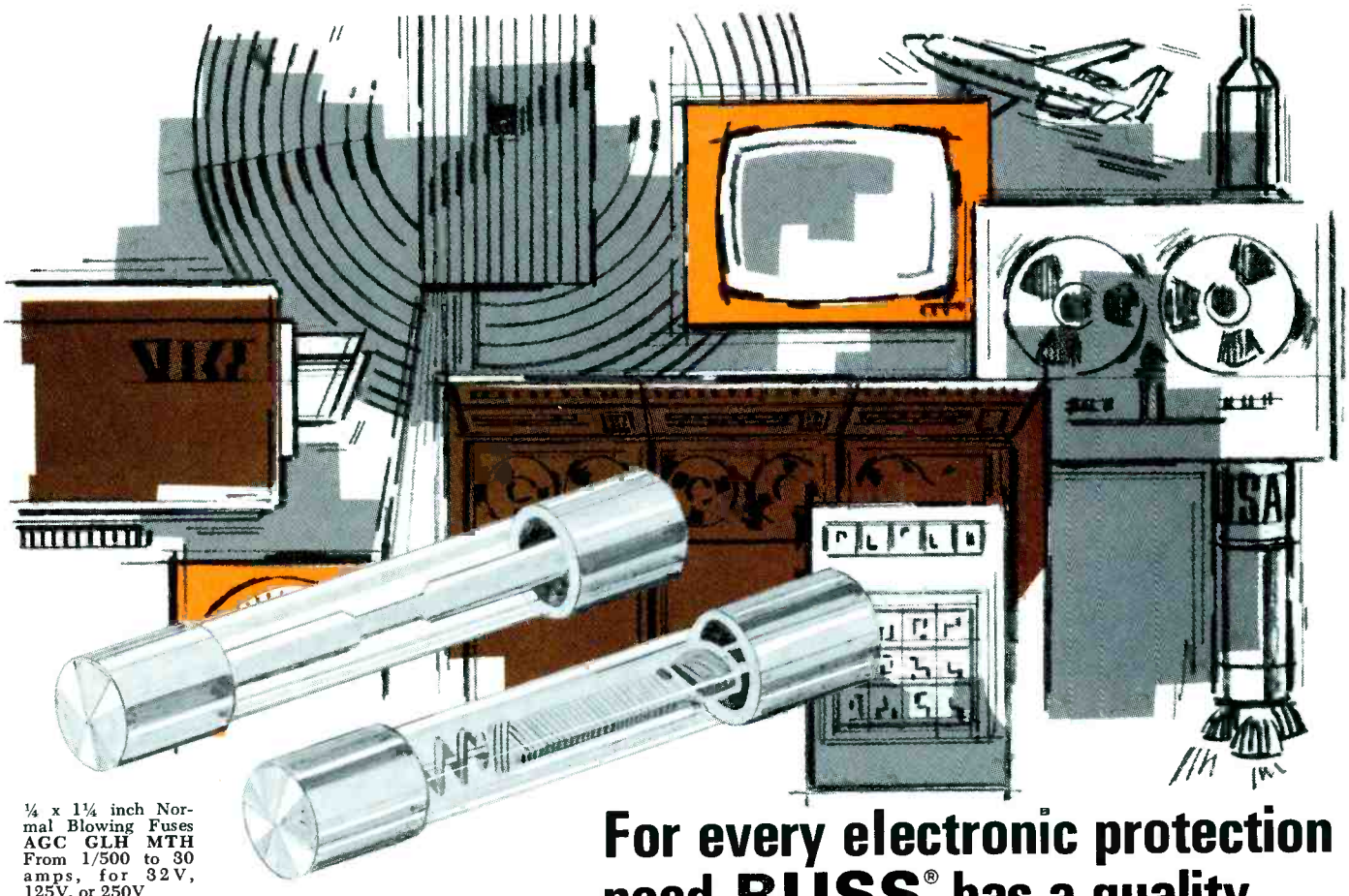


Symptom—Weak color, intermittent color locking
Cure—Check C131, and replace if open

Chassis—Sylvania D16
PHOTOFACT—1178-3



Symptom—No high voltage, output tube hot
Cure—Check C438, and replace if shorted



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troubleshooting tips

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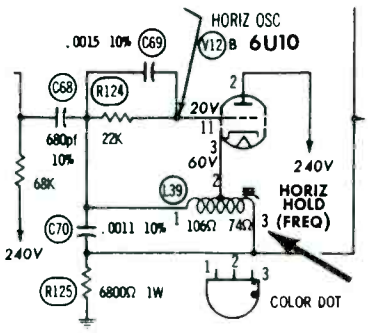
Intermittent horizontal oscillator
Packard Bell 1C620 (Photofact 1320-3)

When you know by scope waveforms that the horizontal-oscillator stage is intermittent, remove the oscillator coil (L251).



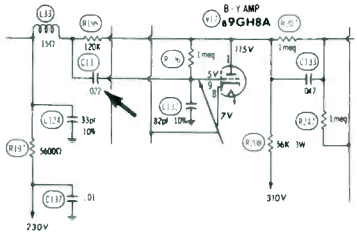
Check it for physical damage, and if the coil checks okay out of the circuit, reinstall it using extreme care in soldering the pins to the board. Some of these symptoms have been caused by poor solder joints at the pins.

Thomas O. Ward
Lutz, Florida

Weak blue
Panasonic CT92 chassis (Photofact 1007-1)

The color picture had no true blues, and the raster also had no blue. Two faint hum bars could be seen in the background.

DC voltage at the plate of V17B (B-Y amp) was about half the normal reading, and it did not change when the picture tube was unplugged. This proved there was no CRT short.



Testing or replacing the components of the B-Y stage changed nothing until C131 (.022 mfd) was paralleled. That brought the DC readings to normal and restored the blue to the raster.

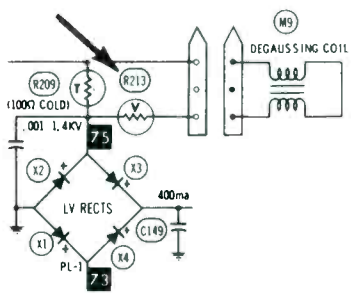
At first it was difficult to imagine why a grid coupling capacitor should have that much effect on the plate voltage. It doesn't in an audio stage, for example.

But the theory of operation is that the grid circuit must be completed back to B+ and ground for the blanking pulse at the cathode to give the proper action. This stage is not class "A" to the horizontal blanking pulses; grid current flows and thus affects the plate voltage.

J. E. Strenk, CET
Rhinebeck, New York

Drifting bar of color
Admiral 6H10 (Photofact 949-1)

Two 3-inch high horizontal bands of changing tint moved slowly up the screen. That was the only symptom.



Power supply filters and bridge diodes checked okay, although the picture appeared to have insufficient supply filtering.

Then I operated the chassis without the degaussing coil, and the bars were gone.

I replaced R209 and R213, the thermister and varistor of the degaussing circuit, and the bars of changing purity were gone.

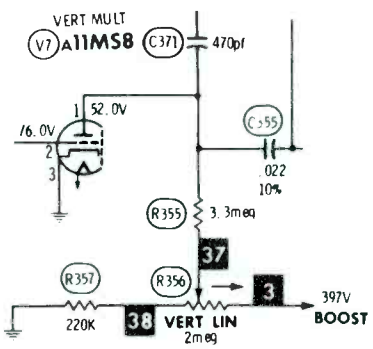
Ervin F. Bauer
St. Louis, Missouri

Vertical foldover Panasonic N93A b-w TV chassis (Photofact 1240-2)

The symptoms of this vertical problem were easy to see on the screen of the CRT: the picture had insufficient height and compression of linearity near the bottom.

Ohmmeter tests of the vertical circuit showed too low a resistance reading from plate of the vertical oscillator tube to ground. After disconnecting the three components from pin #1, I found a 30K leakage in C371, a 470-pf capacitor which feeds vertical blanking to the screen grid of the picture tube. Replacement of the capacitor restored normal vertical performance.

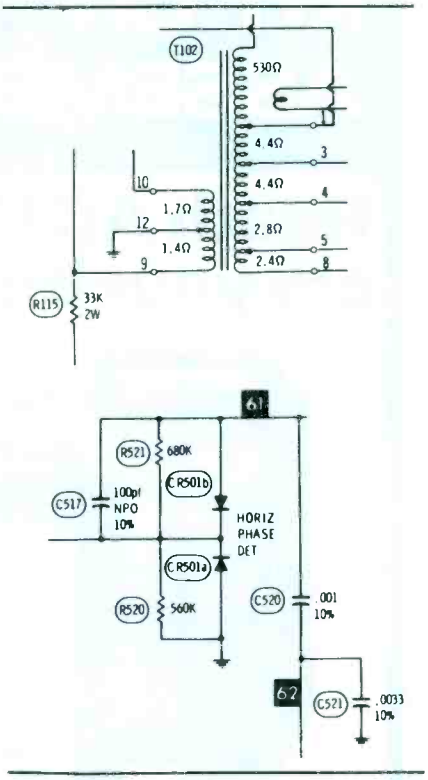
Edward F. Hasse
Monrovia, Maryland



Weak horizontal locking Curtis Mathes C40 color TV chassis (Photofact 1283-1)

If substitution of the horizontal oscillator and sync tubes don't help the locking, check R115, a 33K 2-watt resistor used to attenuate the horizontal pulses and, with C521, change them to sawteeth. I have found several of these resistors to be shorted.

The resulting excessive sweep signal applied to the horizontal phase detector diodes often ruins them (they check open), so both the diodes and R115 must be replaced at the same time. A higher wattage resistor used for replacement will be good insurance against a similar future failure.



Gerhard Hauber
Raleigh, North Carolina

reader's exchange

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

Needed: *Present address of Electra Radio Corporation, listed as 30 West 23rd Street, New York, New York.*

W. Harvey Hiatt
Route 3, Box 258
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For sale or trade: *One or more 26, 27, 45, 56, 71A, 77, 80, 2A5 and 6C6 old radio tubes. What do you have?*

R. S. Gordon
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Homewood, Illinois 60430

Needed: *Schematic for a model 600 Seeburg automatic record player stereo console.*

Horst H. Pollesche
2912 Mesa Drive
Las Vegas, Nevada 89120

Needed: *Schematic with voltages and any other information for Viscount stereo model No. T-1500, serial No. 15830.*

Emil Slovacek
3988 Charles Street
La Mesa, California 92041

Needed: *An operator's manual for Precision series 612 tube and battery tester.*

Robert Pedro
274 Summer Street
Lyon, Massachusetts 01902

For Sale: *2000 old tubes; name what you need and price you are willing to pay.*

Roy Randall
Randall's Radio & TV
P.O. Box 1167, A1A
Hobe Sound, Florida 33455

Needed: *Schematic for Atwater Kent radio, model 60.*

William Deitenbeck
305 Cleveland Street
Lafayette, Louisiana 70501

Needed: *Schematic and supporting data for Musicall home inter-com AM-FM radio [model unknown].*

Robert J. Duba
15901 Devonshire Street
Granada Hills, California 91344

Needed: *R-F collector coil part No. 36021, reference symbol T2 for a U.S. Navy 26K1A transistor radio kit. The following numbers also appear on the coil, but I am not sure of their meaning: 119-62-07 NF-33799Z.*

George P. Timmons
2039 Ezekiel Avenue
Zion, Illinois 60099

Needed: *Schematic for Sears-Silvertone AM/FM/FM-stereo tuner "Medalist" model No. 7404, chassis No. 132-77802.*

R. A. Buss
625 North California Street
Burbank, California 91505

Needed: *C-40 tube adapter for B&K CRT tester model 440.*

Harold D. Babb
239 Holmgreen Road
San Antonio, Texas 78220

Needed: *Schematic and service information for Crown [Japan] Radio Corp., San Francisco, eight-transistor Telephone Valet answering and message unit, model CTA-4000. Will copy and return data or pay.*

Charles E. Haugh
6117 Norwaldo Avenue
Indianapolis, Indiana 46220

Needed: *Schematic and manual for Heathkit condenser checker model-C1.*

H. Jenkins
218 East Seventh Street
Erie, Pennsylvania 16503

Needed: *Cartridge replacement for Weathers turntable.*

William H. Lyndell
247 East Atlantic Avenue
Audubon, New Jersey 18106

Needed: *Schematic and service information on a Hammarlund model HQ-110 (ham) receiver. I will pay one U.S. dollar to the first reader who sends me the above information.*

Dale W. McMindes
Trans World Radio
Bonaire
Netherlands Antilles

(Continued on page 14)

Reader's Exchange

(*Continued from page 13*)

Needed: *A high-voltage transformer part #G12234 for a Truetone television model #2DC3609.*

B. L. Roberts
829 East Mustang
Crowley, Texas 76036

Needed: *Sony TV Model 8-301W circuit boards, plugs and sockets for facilitating voltage tests outside chassis.*

T. R. LePage
Box 17571 Central Station
Fort Worth, Texas 76102

Needed: *Loctal tubes [particularly 7A4, 7A7, 7B5 and 7B6] at reasonable prices.*

Scampi Electronic Service
12 Elmwood Drive [Tioga Terrace]
Apalachin, New York 13732

Needed: *Tube chart for a B&K Dyna-Quik, model 550 tube tester.*

Douglas L. Cecrle
21114 Greenleaf Drive
Cupertino, California 95014

For Sale: *Bound volumes for RCA radios 1929 to 1939, all in good condition.*

J. L. Finney
3425 South Griffith Avenue
Owensboro, Kentucky 42301

Needed: *Schematic and servicing information for a Boman car radio, model No. UM6A, serial No. 0061663.*

George Le Valley
30 Livingston Avenue
Dobbs Ferry, New York 10522

Needed: *A Microtrans M2127 power transformer and a manual or schematic for a Precise Development Corporation scope model 305R.*

Jim Taylor
11 John Street
Phillipsburg, New Jersey 08865

Needed: *New or unused 6JE6 [not 6LQ6/6JE6C types] in either RCA or GE brands.*

Bernard H. Serota
2502 South Phillip Street
Philadelphia, Pennsylvania 19148 ☐

letters to the editor

Dear Editor:

What chance does the average 1-or-2-man shop have of staying alive in this business where all of the new color TV's are going to the use of panels and modules?

Yesterday, I went to my attic and pulled out an old tube caddie, then filled it with boxes of 1974 Magnavox panels. Including the other one with Motorola panels, I now have 6 caddies in my van-type truck.

Must I contemplate driving a Greyhound Bus full of panel caddies by 1978? I estimate it soon will cost me $15 just to set brakes in front of a home, because of bringing such a medicine show.

Your magazine is terrific—but, please stop fiddling while Rome burns, and give us an in-depth report on this growing cancer.

Thomas H. Davenport
Bellevue Radio & TV
Bellevue, Ohio

Editor's Note:

Our staff has been keeping a watchful eye on this new problem, and we will shortly have some suggestions. In addition, we are planning a whole series covering the servicing of specific models that use modules. In the meantime, write to the editor giving your methods or suggestions for dealing with the problems peculiar to modules.

Dear Editor:

Three years ago, I established my own shop and have since expanded it. I believe the quality of my work to be very good, and have had no complaints against me through the Better Business Bureau or the Consumer Action Center. But I am aware of the growing trend toward licensing as a part of the consumer movement.

What are the requirements to be licensed? Who gives the examination and where? What textbooks do you think are best for study? Thank you for any help you can give.

Derek Pierson
Ann Arbor, Michigan

Editor's Note:

Neither Ann Arbor nor the state of Michigan has a licensing law, according to the information I have. I have heard that Detroit has some sort of city law.

However, I strongly recommend the CET program. CET is the acronym for Certified Electronics Technician, and there are over 5,000 CET's. For more information about the CET movement, write to:

National Electronic Associations (NEA)
1715 Expo Lane
Indianapolis, Indiana 46224

(Continued on page 58)

NO MERGER!

Plans to merge NATESA and NEA were blocked during the simultaneous conventions held in Kansas City August 23-26. Following a strong and emotional plea by Morris L. Finneburgh, Sr., as only he could deliver it, NEA overwhelmingly voted for merger. In turn, NATESA voted against merger, reportedly by a 3-to-1 ratio.

When informed of the NATESA decision, NEA then voted to adopt the bylaws, constitution and name proposed for the new organization, called National Electronic Service Dealers Association (NESDA). One of the major differences is the incorporation of shop owners and managers into NESDA, and the inclusion of technicians in the ISCET branch. Most of the previous NEA programs (such as the convention next year in Hawaii, ISCET and CET's, JESUP training, Techni-Tips, and Serviceability Committee) will be continued by NESDA. It is reported that some dissident NATESA groups have now joined NESDA.

Newly-elected officers of NATESA are:

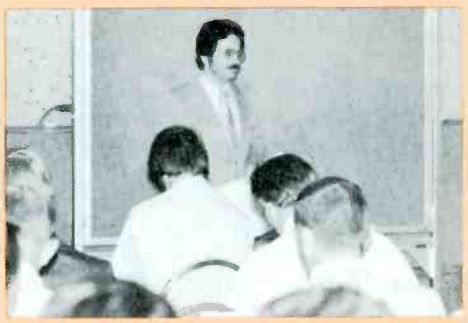
- Leon Skalish, president,
- Philip E. Holt, Jr., vice-president,
- H. O. Eales, secretary-general,
- Howard Larsen, treasurer, and
- Frank Moch, executive director.

NESDA elected the following officers:

- Charles Couch, Jr., president,
- Virgil V. Gaither, secretary,
- Jesse Leach, treasurer,
- Norris Browne, immediate-past-president,
- Tom Plant, Warren Baker, Tom Ruth, Al Moskal, Wilfred Carden,

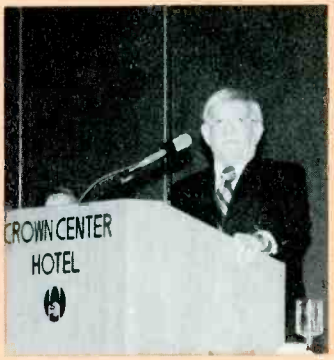
PICTURES FROM THE NEA/NATESA/ISCET CONVENTIONS

Wes Correll (left) and Bob Harrison (right) received special awards from Chairman Finneburgh for their work in writing the proposed bylaws for NESDA.



Miles Sterling of Electro-TV in California related how he increased service labor prices without any serious repercussions. The key is knowing the true cost of labor.

Charles R. Couch, Jr. is shown as he made an announcement. Later, he was elected the first president of NESDA.



Morris L. Finneburgh, chairman of the joint Merger Committee, waited patiently for the photographers to finish before he proceeded with his impassioned plea for merger.

Emmett Mefford made the first nomination of Nicoli Tesla for the Electronics Hall Of Fame award.

Forest H. Belt, technical writer and photographer, answered questions about his "1-2-3-4 Servicing" method.

Somers H. White, former Senator from Arizona, presented a forceful and inspirational message entitled "Dare To Be Different, And Reap The Staggering Rewards."

Bob Bond, Jim Rolison and Everett Pershing, regional vice-presidents, and
• Dick Glass, executive vice-president.

North Carolina ETA

New officers elected at the North Carolina Electronic Technicians Association convention held in Wrightsville Beach June 15-17 are: Paul Cartrette, president; Greg Hager, vice-president; Earl Todd, secretary; and Jesse Thacker, Sr., treasurer. Interesting and informative speeches were made by Dick Glass, Charles Couch, and Joe Lewis of NEA.

TV Sets Switched

Reported in the NATESA Scope are several cases where an irate customer brought back a "recently-repaired TV" claiming ineffective workmanship and demanding satisfaction. One observant technician noticed that the serial numbers did not match and refused to be bilked. Another was not so lucky for he had not recorded the serial number during the first repair. Moral: always record the model number, chassis number and serial number and avoid being victimized.

Serviceability Review

Recently, four members of the Virginia Electronics Association reviewed the serviceability features of a new General Electric television receiver at the GE plant in Portsmouth, Virginia. Pictured are W. H. Myer, Manager of Product Service for GE, Walter Cook (CET), Cobb Laine (CET), Frank Blount (CET) and John McPherson (CET). □

Details of the new RCA cable receivers

By Bruce Anderson

Modern CATV systems require a special converter at the receiver, or a special receiver, because 24 channels are used.

In May, 1973, RCA announced their line of color receivers designed to receive both normal channels and CATV special channels. Basically, the receivers are the same as others using the CTC68 chassis, but with the addition of a third tuner mounted internally.

The electronics of this extra tuner are not difficult, although some new circuitry is involved.

However, before we examine the circuitry, we should take a quick look at the channels used in CATV and the usual interface equipment, between the cable and a standard receiver.

John Meelan is holding in his right hand the 24-channel solid-state RCA cable tuner. It does the same job as the larger unit held in his other hand, a converter that is placed on top of the conventional TV receiver.
(Courtesy of RCA)

Older Cable Systems

The pioneering cable systems of the 1950's were rather crude affairs designed to bring a few broadcast channels into areas where reception by ordinary home antennas was unsatisfactory or impossible. At that time, the state-of-the-art made it desirable to carry only the low-band channels; so channels 7 through 13 normally were converted to low-band frequencies at the master antenna.

As better cable and better amplifiers were developed, it became feasible to carry the hi-band channels. If UHF channels were to be "put on the cable" these were converted down to unused VHF channels. Locally-originated "cable channels" also began to be used, generally for "TWT" (time, weather, and temperature), or stock market quotations. Gradually, all 12 of the VHF channels became occupied and a demand for additional channels began to emerge. Also gradually, CATV was "coming down from the mountains" and beginning to compete with broadcast TV in some urban areas where reception from a simple antenna was possible.

Modern CATV

At present many CATV systems are providing more than 12 channels by using one of two methods. One is the "A-B" cable plan, which is actually two separate systems. Cable A carries up to 12 channels of programming; Cable B carries up to 12 additional channels. Two separate cables enter the user's home and terminate in a set-top switch. The viewer can select a channel from either cable by operating the "A-B" switch and tuning to the desired channel.

An obvious drawback of the A-B system is that two complete sets of amplifiers, splitters, tap-offs, etc.—plus two cables—are required. Offsetting this to a degree is the simplicity and low cost of the A-B switch.

Also, the second cable could be installed without interrupting service on the earlier one, and an outage in either system might not affect the other.

The alternative method of making more channels available to the users is to increase the spectrum of a single-cable system. To this end, nine channels below the frequency of hi-band VHF and five channels above it are used. The frequencies of these mid-band and super-band channels are shown in Figure 1.

The use of these frequencies for CATV is possible because a well-designed cable system has very little radiation leakage which might interfere with the types of radio communications for which these frequencies are allocated by the FCC. Likewise, there is little probability that radio transmissions on these frequencies will enter the CATV system and interfere with the TV signals.

Note in Figure 1 that the spectrum from 88 MHz to 120 MHz is "off limits" to CATV. "Omni stations" (aeronautical radio-navigation omnidirectional radio ranges) transmit on frequencies between 108 and 118 MHz, and the possibility that a CATV system might generate leakage radiation is too hazardous to chance. The high-powered transmitters used in the FM broadcast band easily could interfere with CATV programming if CATV channels were allowed in the 88- to 108-MHz band. Thus, there is room for only nine channels in the mid-band.

The super-band is less desirable

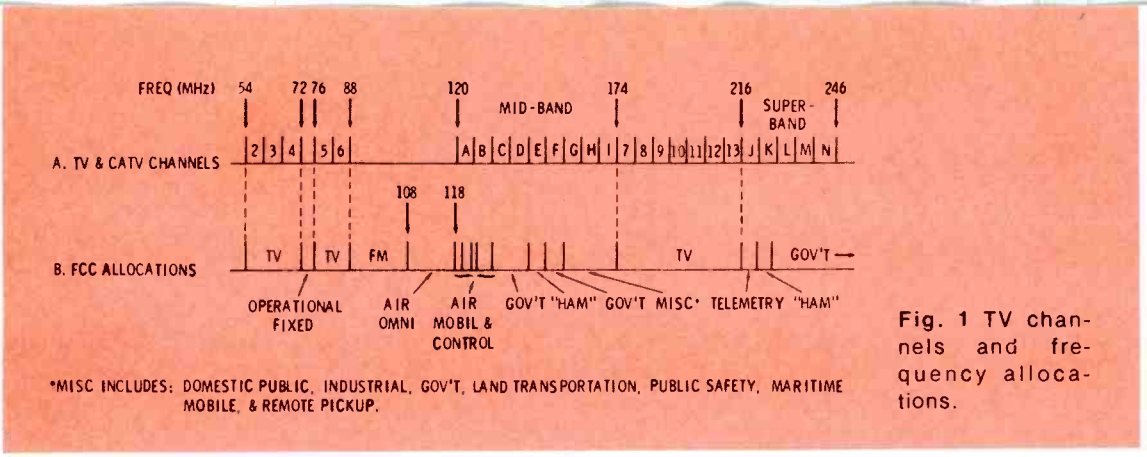


Fig. 1 TV channels and frequency allocations.

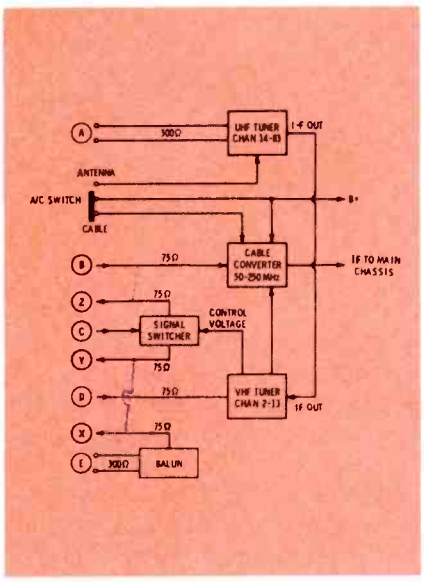


Fig. 2 Signal-input connections.

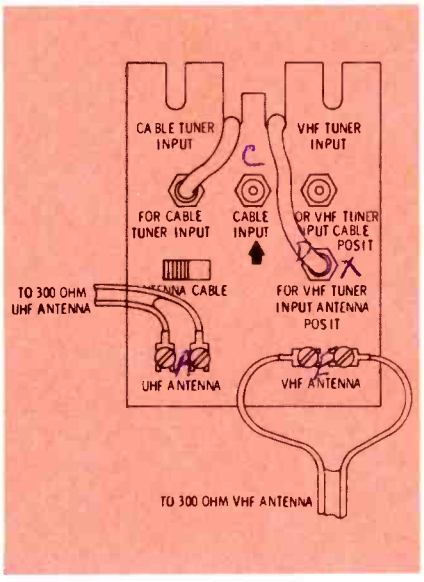


Fig. 3 Connections for 300-ohm UHF and VHF antennas.

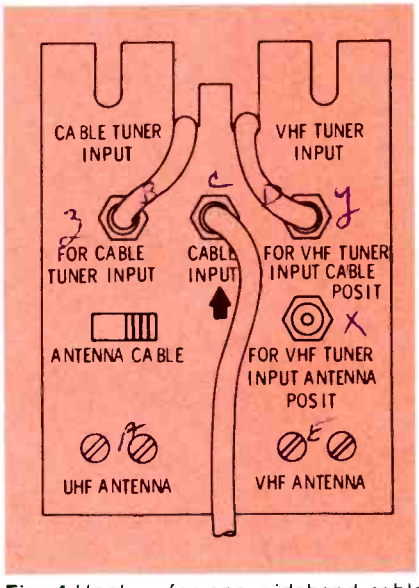


Fig. 4 Hookup for one wideband cable (up to 24 channels).

because cable attenuation increases with frequency. Undoubtedly, technology will make more super-band channels feasible in the years ahead. For now, five channels is about the practical limit.

Converters

A converter is required to interface a wide-band cable system with a broadcast-only receiver. This converter is similar in some respects to a TV tuner, but there are some important differences. Naturally, it must tune to all the channels available on the cable. Usually its "IF" frequency is the same as a standard broadcast-channel RF frequency so that it can be connected directly to the antenna terminals of the receiver, and it must not invert the sidebands.

Note: The upper and lower sidebands of a signal are reversed in most superheterodyne receivers because the local oscillator frequency is higher than the carrier frequency and the difference between these two is used as the IF. Thus, the upper sideband of the RF signal becomes the lower sideband of the IF signal. In most applications, this is not particularly important, but there is **only** an upper sideband in television signals (except for low-frequency video components). This becomes the lower sideband in the IF strip, which is tuned to the lower sideband. If the cable converter reversed the sideband location and the TV tuner did it again, the chroma subcarrier and the aural carrier would be above the IF video carrier, rather than below it.

The RCA System

In the receivers announced by RCA, a third "tuner (which we will call the cable converter) is added, along with a switching system allowing the receiver to be used with a wide-band cable system, an A-B cable system, or with antennas. Most of the switching is done automatically by a switch which is driven by the VHF tuner shaft. However, there is a manual switch on the antenna terminal block which is set to select either the UHF tuner or the cable converter. It is unlikely that both CATV and UHF reception will be required in any one location, so this is not a disadvantage.

Operating Modes

There are four basic operating modes for the cable receiver. Each of them utilizes the various tuners in some combination. As indicated in Figure 2, there are five connectors on the antenna terminal block to which a signal source can be connected. These are labeled A through E. Also on the terminal block are the output of the VHF balun and the two outputs from the signal switcher, labeled X, Y, and Z.

Terminals A and E are ordinary 300-ohm terminals for lead-in.

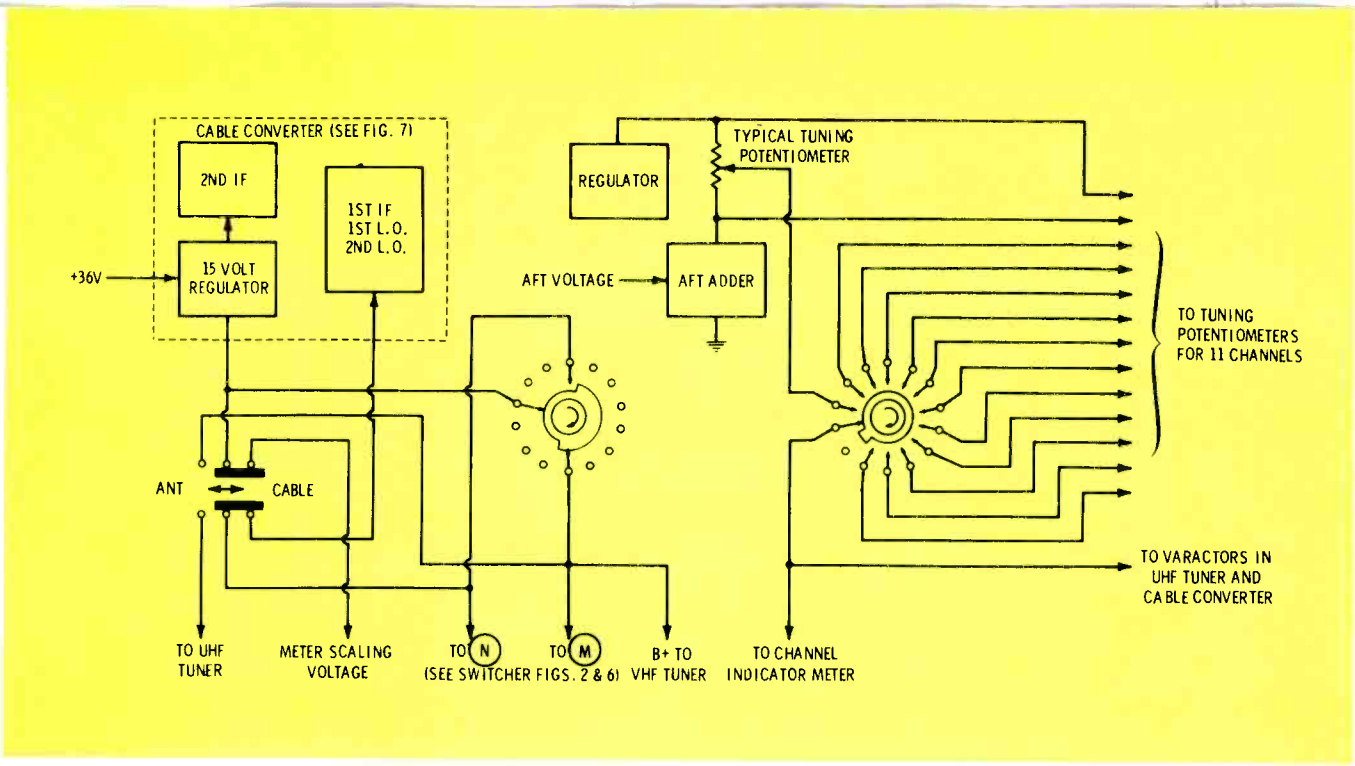


Fig. 5 Tuner power switching.

Terminals B and D are simply the ends of the coaxial cables leading to the tuners, fitted with **female** connectors. Terminal C is a female coaxial connector mounted on the terminal block. Terminals X, Y, and Z are **male** coaxial connectors also mounted on the terminal block. B and D can be attached to X, Y or Z, or to coaxial cables from a CATV system, or from a 75-ohm antenna.

If the instrument is to receive signals from 300-ohm antennas, connections are made as shown in Figure 3. The lead-ins are attached to A and E, and D is plugged into X. The antenna/cable switch is set to "antenna" to energize the UHF tuner. If a 75-ohm VHF antenna is used, its coaxial lead-in is connected to terminal D and the balun is not used. This allows complete shielding of the VHF lead-in, from the antenna to the tuner itself.

For reception from a wide-band cable, the CATV cable is attached to terminal C (refer to Figures 2 and 4). The switcher consists of two steering diodes which conduct the mid-band and super-band signals to terminal Z and the standard VHF channels to terminal Y. B is plugged into Z and D is plugged into Y to complete the signal paths. The antenna/cable switch is set to "cable", which energizes the cable tuner and disables the UHF tuner. Details of the signal switcher are discussed later.

For a two-cable CATV system, simply connect one cable to terminal D and the other one to terminal B. The antenna/cable switch must be in the "cable" position, of course.

Channel Selection

All channels, UHF, VHF, and CATV, are selected by a single, detented, 24-position knob and shaft. Remote control is provided in most models by gearing a drive motor to the rear end of this same shaft. Beginning with channel 2, as the tuning knob is rotated, a gear train on the main shaft advances the VHF tuner through the channels from 2 to 13. The next position of the knob advances the VHF tuner to its UHF position. As the tuning knob is rotated through its remaining 11 positions, the VHF tuner does not advance. This is accomplished very simply: some of the teeth are missing from the gears.

Also driven by the main tuning shaft is a 24-position switch, shown in Figure 5. In the first 12 positions of the tuning knob (VHF channels 2 through 13) a segment of the switch energizes the VHF tuner. In the next 12 positions, it supplies B+ to the antenna/cable switch. When the antenna/cable switch is in the "antenna" position, it passes B+ to the UHF tuner and also to the VHF tuner, which is used as an IF amplifier as in conventional TV sets. With the antenna/cable switch in the "cable" position, B+ supplies the cable converter, and both the UHF and VHF tuner are turned off.

Both the UHF tuner and the cable converter are tuned by varactors. The control voltage for the tuning varactors may be taken from any one of twelve potentiometers, as determined by the second segment of the 24-position switch. This allows "presetting" either 12 UHF channels by way of the UHF tuner or 12 CATV channels by way of the cable converter. The cable converter is continuously tunable from about 50 MHz to 250 MHz, so it will accomodate standard channels in an A-B cable system or mid- and super-band channels in a wide-band CATV system.

The channel-indicator drum has provisions for inserting the proper channel numbers for either UHF or CATV channels. Insertable numbers (2 through 83) and letters for unnumbered CATV channels are supplied.

Signal Switcher

The signal switcher is shown schematically in Figure 6. The control voltage for it comes from the 24-position switch shown in Figure 5. Since it is used only in the wide-band-cable mode of operation, the control voltage to it is immaterial if another mode of operation is used. When the receiver is receiving its

signal via the VHF tuner, diode CR1 is forward biased by the control voltage. This connects input terminal C (Figure 2) to terminal Y. Likewise, when the signal must reach the IF strip via the cable converter, the control voltage forward biases CR2, which connects C to Z.

Cable Converter

Figure 7 is a block diagram of the cable converter. Since CATV signals normally have a 1000 microvolt level, no RF amplifier is necessary, and the input is directed through a high-pass filter to the first mixer. The other input to the mixer comes from the first local oscillator. This oscillator is varactor tunable from approximately 640 MHz to 830 MHz.

The mixer-output frequency is the difference between the local-oscillator and signal frequencies, just as it is in a conventional tuner. However, the IF is higher than the RF carrier, an unusual situation. This is properly termed "inverted superheterodyne" operation. The RF and IF frequencies are indicated for some channels in Table 1.

The first IF amplifier is controlled by AGC and its output feeds the second mixer. The second local oscillator is fixed tuned to 542 MHz, so that the second IF frequency is 45.75 MHz for the IF video carrier (the standard for most color TV receivers in the U.S.).

An unusual feature of the second-local-oscillator/mixer system is that the local oscillator is tuned **below** the frequency of the input signal. This is done so that the IF aural carrier frequency will remain below the video carrier frequency. Therefore, at the output of the second mixer, the video IF is 45.75 MHz, the aural IF is 41.25 MHz, and the chroma subcarrier frequency is 42.17.

The tuned circuits of the stages just discussed resemble those used in a varactor-tuned UHF tuner, since both operate in the same frequency range. Only one stage, the first LO, has variable tuning; the remainder of the tuned lines are fixed tuned. Automatic-fine-tuning voltage is included in the tuning voltage for the varactor, just as it is in other varactor tuners.

Notice that frequency drift in the second LO will be compensated by the AFT voltage fed to the first LO. This will change the frequency of the first IF, of course, but its bandpass has been made wide enough to accommodate the slightly-changed frequencies which result.

The last IF amplifier of the cable converter is always supplied with B+, since all signals ultimately

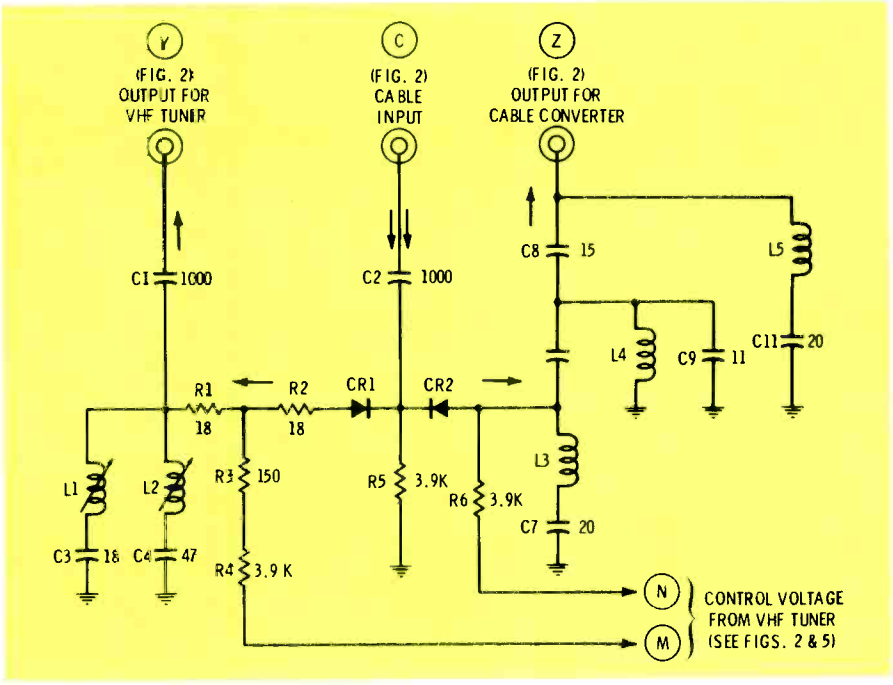


Fig. 6 Wideband-cable input splitter.

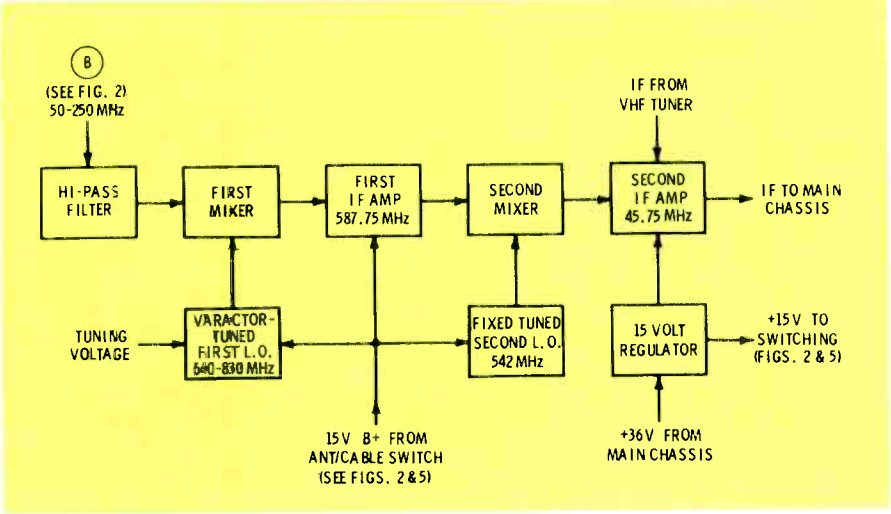


Fig. 7 Cable converter block diagram.

Table 1

Channel	Vid. Carrier	Aural Carrier	L.O.	IF Vid.	IF Aural
2	55.25 MHz	59.75 MHz	643.0	587.75	583.25
A (mid-band)	121.25	125.75	709.0	587.75	583.25
13	211.25	215.75	799.0	587.75	583.25
N (super-band)	241.25	245.75	829.0	587.75	583.25

must pass through it. Possibly the prime purpose of this amplifier is to provide a means of connecting the outputs of both the cable converter and the VHF tuner to the IF-amplifier module of the TV main chassis. Both the last IF amplifier and the high-frequency first IF amplifier have AGC.

Servicing

With the exception of the cable converter itself, there doesn't appear to be any need for new service techniques. The UHF and VHF tuners are "garden varieties" similar to those used in many other receivers. There is, of course, a lot more interconnecting harness and switching in this system, so there are more possibilities for loose or broken connections. Obviously, the smart technician should make sure that all is intact before attacking the cable converter.

Replacing components in the high-frequency parts of a UHF tuner is very tricky, as we know. Lead dress and orientation of components are always critical. The same is true in this cable converter. If replacement of a part is attempted, be sure to use an exact replacement and be very careful to put the new part in exactly the same position, with the leads cut to the same lengths and routed exactly as they were originally.

The last IF amplifier and the AGC amplifiers are no more critical than their counterparts in other systems. Reasonable care is required, of course. As with most low-power solid-state circuits, the transistors probably are the most vulnerable components.

Summary

During the past few years, many features and fads have been added to standard color-TV receivers. Many of these, such as ATC, ACC and AFT, probably will survive the test of time.

Another important addition to the state-of-the-art is that of 24-channel CATV. Although RCA is the first to market a line of receivers especially for CATV use, it's very likely other manufacturers have their own plans for this field.

24-channel CATV appears to be an important development, one that we will continue to cover as the new products are released. □

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The accuracy of your tests depends on your signal generator. But you needn't pay high prices for accuracy—B & K is proud to introduce our Model 2050 Solid-State RF Signal Generator, with features other companies charge more for. Just look at our specs: 100% Solid-State Silicon Circuitry featuring FET's in RF and audio oscillator stages for greater stability and linearity. Six bands, with ranges from 100 kHz to 30 MHz with 1.5% accuracy. 3 outputs: RF, modulated RF (400 Hz) and externally modulated RF. A big multi-colored, 4½" vernier dial, with positive anti-backlash dial drive. Zener-regulated and internal fuse-protected power supply.

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For More Details Circle (16) on Reply Card

Is it the Cable... or the TV?

By John E. Cunningham

Is the defect in the receiver or in the cable system? That is the first question when performance is poor on some channels.

Cable TV Brings New Problems

The spread of cable TV is presenting more TV technicians with new types of problems. Originally, cable systems were used only in areas far from the nearest station. All the signals were so weak that usually satisfactory reception was impossible without the cable. Modern installations often are made in metropolitan areas where some signals are strong, and others are very weak.

Strangely enough, it's those strong signals that cause most of the problems! Also, some of the newer cable installations are designed for up to 20 separate channels. Such close spacing of stations can cause interference.

Ghosts On Cable— Okay On Antenna

In this case, the customer's TV had just been connected to the new cable system in a large city. Unfortunately, reception was not very good. Three local channels had ghosts, and some of the weaker out-of-town channels showed horizontal lines.

Of course, the customer immediately called the cable company to complain. The cable troubleshooter tested the various signal strengths at the cable drop, and then looked at the quality of the signal on each channel, using a 9-inch b-w receiver. After making these impressive tests, he said the customer's receiver was defective, and recommended the set-owner call in a TV technician.

At first examination, it seems the troubleshooter had handled the case just right. Many cable-TV franchises prohibit the cable men from doing TV repairs. Even when there is no law involved, many cable employees are reluctant to touch any set for fear the customer will say "It never did this before you worked on it!" Lastly, even highly-trained cable technicians are not necessarily competent to make TV repairs.

Reception normal on antenna

The local TV technician, selected by the customer, arrived and started making tests. Replacement of all the tuner and picture-IF tubes changed nothing. Range of the AGC control was normal, and no adjustment helped the problems.

Previously, the receiver had been operated on an attic antenna, and the down-lead wire was still near the set. When he disconnected the cable lead and changed to the attic antenna, the technician found all three local channels could be tuned in snow-free and ghost-free. Of course, none of the distant channels could be received. Must be cable trouble.

Where is the defect?

Now there are accusing fingers pointed in both directions. The cable man and the TV technician both have strong reasons for placing the blame on the other. Each is sure his own tests are valid, and the other at fault.

The correct answer is that both are partially right and partially wrong. To explain how this is possible, we must first explain how cable reception differs from normal reception with an antenna.

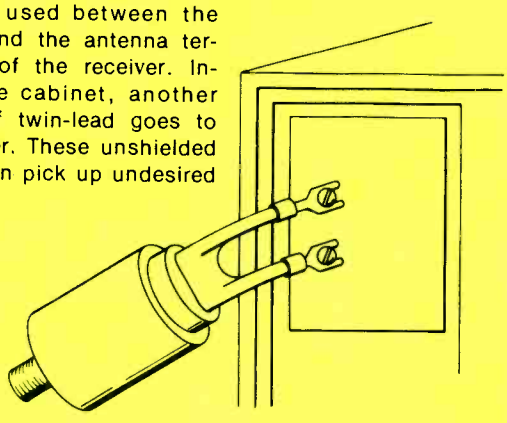

Fig. 1 Usually a balun coil is mounted on the end of the coax cable, and a short piece of unshielded twin-lead is used between the balun and the antenna terminals of the receiver. Inside the cabinet, another piece of twin-lead goes to the tuner. These unshielded wires can pick up undesired signals.

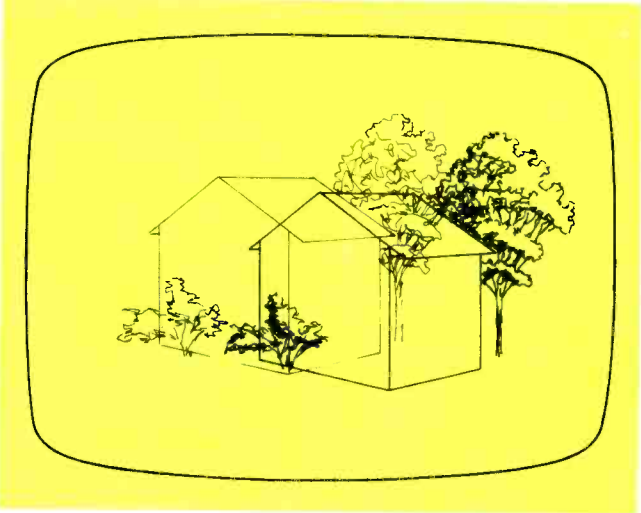

Fig. 2 Appearance of a "leading" ghost caused by direct (non-cable) pickup of the same station.

Cable Distribution And Termination

Coaxial cable of about 75-ohms impedance is almost universally used to distribute cable signals. All coaxial cables are unbalanced. That is, one side of the circuit is the shield which also is used as a ground.

TV receivers usually have 300-ohm balanced inputs. To bridge the gap between 75-ohm unbalanced and 300-ohm balanced, a balun coil or transformer is used. The name is an acronym for BALanced to UNbalanced. Not only does the balun match impedances, but it also adds isolation from the set back to the cable. This minimizes the effect on the cable signal of any open or short circuits at the receiver.

Figure 1 shows a typical connection of the cable balun to the antenna terminals of the receiver. Notice that although the entire cable system is shielded, there are a few inches of twin-lead attached to the balun, and perhaps 18 inches of unshielded twin-lead from the antenna terminals to the tuner.

These seemingly-innocent pieces of wire are often the cause of many cases of poor reception of cable channels.

Co-Channel Interference

Co-channel interference is produced by two or more signals being received on the same channel. This situation seldom happens when sets are connected to an antenna, because of the wide geographical spacing of the stations. But it often occurs with cable signals.

In order to find space for the 20 channels now specified by the FCC, many cable systems rebroadcast on different channels. For example, a channel 3 station might be found on channel 5 in one cable system and on channel 7 in another.

Assume that channel 3 is rebroadcast on channel 5, but there is a local station also transmitting on channel 5. If any of the local channel 5 signal finds it way accidentally into the tuner, two pictures will be seen on the screen. Probably the cable signal will be dominant, but the local signal will contribute a ghosty, low-contrast picture that drifts slowly sideways.

Time-delay problems

Another situation that is even more difficult to analyze in practice can happen when the cable system carries a local station on its original channel.

Because of the miles of coax and the many amplifiers in a cable system, there is a large time delay of the signals. Normally this is of no consequence, the receiver processes and locks to the signal no matter when it is received.

It's only when delayed and non-delayed signals are received together that a problem develops.

A leading ghost (one of the left of the picture, as shown in Figure 2) is produced by any station signal arriving from any source other than the cable.

Usually it's those short lengths of twin-lead in and around the TV receiver that act as small antennas to add their tiny share of unwanted and un-delayed signal to degrade the picture.

Occasionally a lagging ghost (to the right) can be seen. In such cases the local, unwanted signal is actually stronger than the cable signal, and the set locks to the undelayed signal. This usually indicates a fault in the cable system, unless the receiver is located practically in the shadow of the transmitter.

Co-channel bars

Another kind of co-channel interference occurs when the cable system uses the same channel as that of a local TV station to distribute a low-priority cable service such as time, weather or FM music. The strong signal of the cable insures that only the cable picture is seen, but the frequency might drift slightly and cause slanting dark bars (Figure 3), or black horizontal bars.

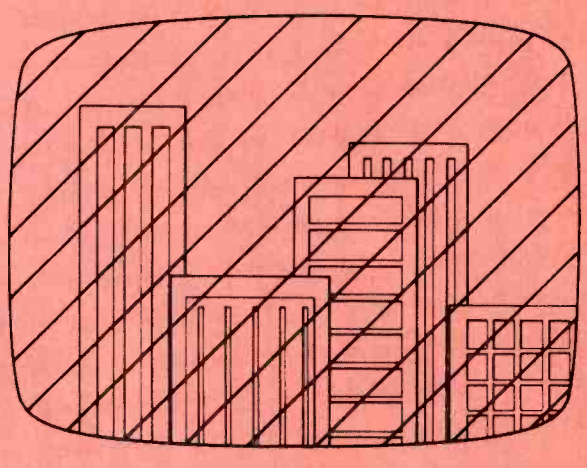

Fig. 3 Precise-frequency co-channel interference produces straight horizontal bars. Cable-company channels might cause diagonal bars, if the carrier frequency was not accurate.

Eliminating Co-Channel Interference

The theory behind the elimination of co-channel interference is simple enough. It's the practice that's difficult.

Just prevent all signals, except the one from the cable, from reaching the tuner of the receiver. That's all.

Move the balun

Often the easiest way of stopping unwanted pickup is just to move the balun to the tuner inside the cabinet, as shown in Figure 4. Sometimes, connecting the shield of the coax to the frame of the tuner minimizes the pickup. **Caution:** Don't do this with "hot-chassis" sets.

Use shielded wire

Another approach is to replace the twin-lead between the tuner and the terminals on the back with shielded 300-ohm cable and ground the shield to the frame of the tuner (Figure 5).

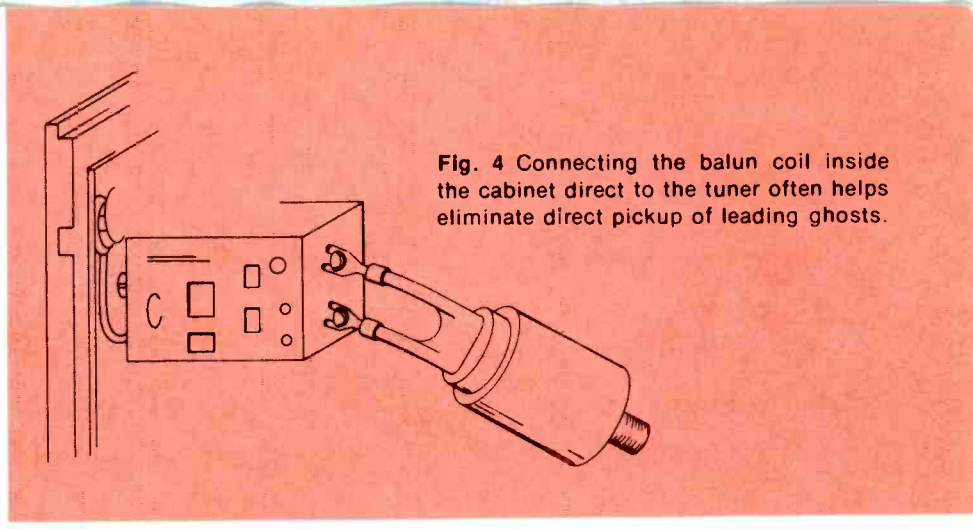

Fig. 4 Connecting the balun coil inside the cabinet direct to the tuner often helps eliminate direct pickup of leading ghosts.

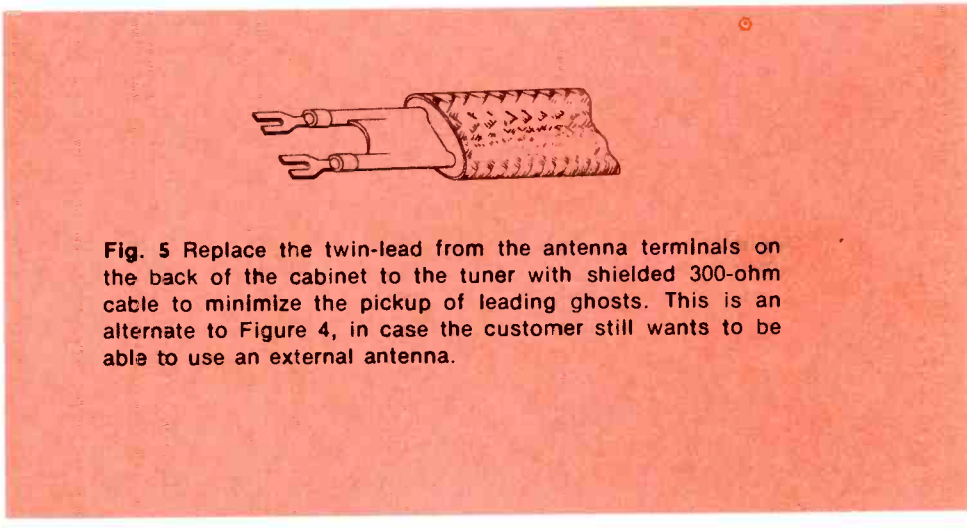

Fig. 5 Replace the twin-lead from the antenna terminals on the back of the cabinet to the tuner with shielded 300-ohm cable to minimize the pickup of leading ghosts. This is an alternate to Figure 4, in case the customer still wants to be able to use an external antenna.

Shield the tuner

In extreme cases, it might be necessary to shield the entire tuner using copper screening soldered to form a cage. This usually requires some experimentation to determine the best method.

Cable interference

Co-channel interference might be coming through the cable system. Because the antennas are located so high, it's possible for them to also pickup a more distant signal on the same channel.

This type of interference is easily recognized because one picture is not delayed relative to the other. The fault is not seen as a ghost, but as "windshield wiper" where the dark vertical bar drifts slowly sideways. In some cases, there will just be dark horizontal bars.

Also, it's likely the amount of interference will change with weather conditions, or the time of day.

Adjacent-Channel Interference

It is nearly an impossibility to design and build color-TV receivers which are immune to interference from strong stations on adjacent-frequency channels.

Interference between adjacent channels is very rare when the signal is obtained from an antenna. Only when the signals involved are extremely strong does this result in cross-modulation.

But, it's a whole different situation with cable. In order to squeeze in enough signals, sometimes every VHF channel will be in use simultaneously. In this borderline situation, the slightest defect of either the cable signal or the set's condition can be disastrous.

If the set is b-w, a realignment narrowing the bandwidth of the IF's or resetting the traps can be helpful.

Unfortunately, this remedy is not available for color receivers. Only in rare cases can the alignment be compromised enough to eliminate the interference without degrading the color too much to be tolerated. Correct alignment, according to the manufacturer's instructions, usually is as far as you can go.

Symptoms of adjacent-channel interference

The symptoms vary greatly depending on the severity of the problem. A small amount of adjacent-channel interference makes the picture look grainy or have a little herringbone. In b-w this can be eliminated by careful use of the fine tuning.

More-serious interference results in "windshield wiper" in which the horizontal-blanking bar of the interfering channel moves sideways across the screen. Sometimes the picture can be seen, too.

Reduce the signal

Test the source of the interference by reducing the signal strength applied to the receiver. An adjustable "L" or "T" pad is best for this test. If the interference is noticeably reduced along with the signal strength, it's likely the signal from the cable is too strong and should be reduced. In that case, add a permanent loss pad sufficient to reduce the problem without adding excessive snow to the picture.

Who Is To Blame?

Let's return to the original example in which the TV technician thought the cable signal was bad, and the cable troubleshooter was just as certain the receiver was defective.

The essence of any good test is to change one condition, but leave all the others the same. And, as effective as those tests seemed at first, both men changed more than one condition at a time. Thus, their conclusions were based on partial information.

Testing the cable signal

Only a few hard facts can be obtained by using a b-w set to check the quality of a signal. As a general rule, the smaller the screen size, the narrower the bandwidth. The IF alignment curve often has a single peak, similar to that of a radio. There's no way this will show how the signal should look on a well-designed color set.

Secondly, because there is no color to indicate the correct fine tuning, any viewer automatically

will set the fine tuning of a b-w set for the "best" picture . . . . a luxury denied color viewers.

And finally, some portable sets are less prone to direct pickup of signals because the wire between the antenna terminals and the tuner might be very short or missing altogether.

Testing with a signal-strength meter can spot channels that are too weak or too strong but cannot give **any** indication of the quality of picture.

Receiver deficiencies

Testing the receiver on an outside or attic antenna (or even rabbit ears) is fairly effective in finding receivers that are prone to overload, and therefore to cross-modulation distortion.

But it is of no value in finding direct-channel pickup on unshielded leads or tuner parts. Nor is it any real help in determining possible alignment problems.

Several manufacturers are bringing out lines of color sets which are designed for use with cable. It's likely that comparison of a suspected receiver against one of these would be as good a test as can be obtained.

Public Relations And Cable

One of the most effective tools in servicing sets connected to cable systems is in having a good relationship with the cable people. They are blamed often for conditions beyond their control, sometimes on the work of an incompetent "tube jockey", and are understandably gun shy.

However, after the cable operators learn you are competent and are careful not to blame their equipment unneccessarily, they are likely to welcome your help and cooperate with you. □

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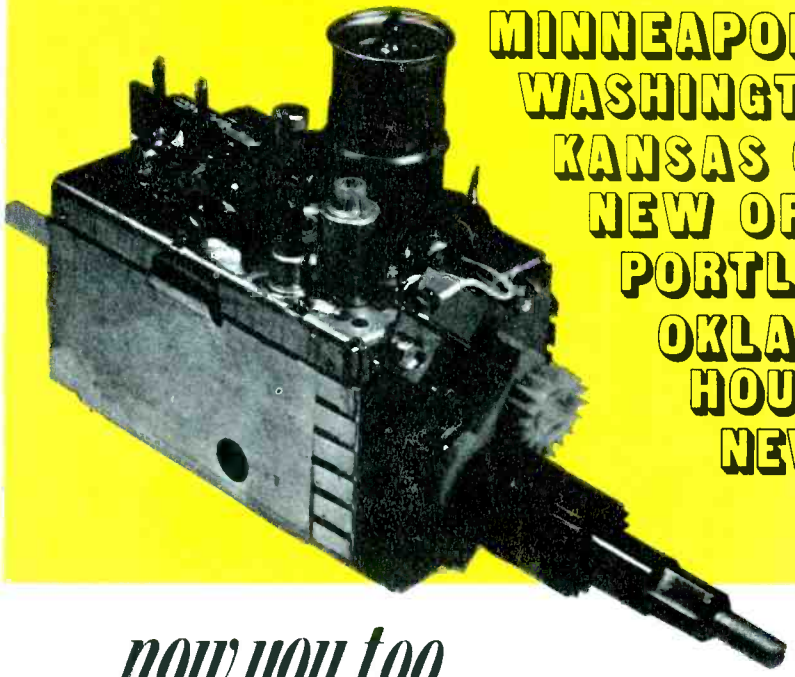

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Improve your cash management

Manage your cash intelligently, or the lack of cash will manage you in ways you won't like.

By Robert G. Amick

Mike Farad's business is going great. The volumes of both sales and service are growing. And his profits grow with them.

Do you think Mike has it made, that it's all smooth sailing? Not quite. You'd know it wasn't all that good if you could see him late at night in his little backroom office trying to figure out where to get enough cash to pay bills, meet the payroll, and pay himself.

Like so many other small businessmen, Mike hasn't learned enough about cash management. Although his financial statement looks good, showing a growing net worth and a healthy profit margin, he often does not have the cash when he needs it.

How can such a thing happen? You'd think the cash would come in automatically, and be spent in the same way. Unfortunately, it just isn't that easy.

Purchase of a building

In this specific case, what really got Mike in trouble was that the building in which he had his shop went up for sale at a very favorable price last year. He bought the building, and then remodelled the shop area to make it more efficient.

That's where most of his cash went: down payment, mortgage installments, and remodelling expenses.

His first mistake was failing to distinguish between Capital Cash and Working Cash. He used essential Working Cash for an unessential Capital outlay (no matter how desirable it was, the outlay wasn't necessary).

Capital Cash Versus Working Cash

Capital Cash is money expended on buildings, fixtures, tools, trucks, test equipment, and the like. Working Cash is spent for materials, labor and overhead. The important difference between the two is that Working Cash "flows" through a cycle. It's converted into the necessities of production, which are converted into cash (or credits) when they're sold. So, Working Cash goes through a short cycle of conversion into materials (or labor) for sale, and then back to cash (Figure 1).

Capital Cash doesn't flow through a cycle like this. And the flow is much slower. In a way, it contributes to production of business income. You need the place, the tools and test equipment to work with, but they return their cost only over a considerable period of time. Theirs is just a small part of the sales dollar (Figure 2).

The cycle period of Working Cash might be short or long depending on the type of business. Some manufacturers work months or years ahead. Service shops usually have fairly short cycles of Working Cash.

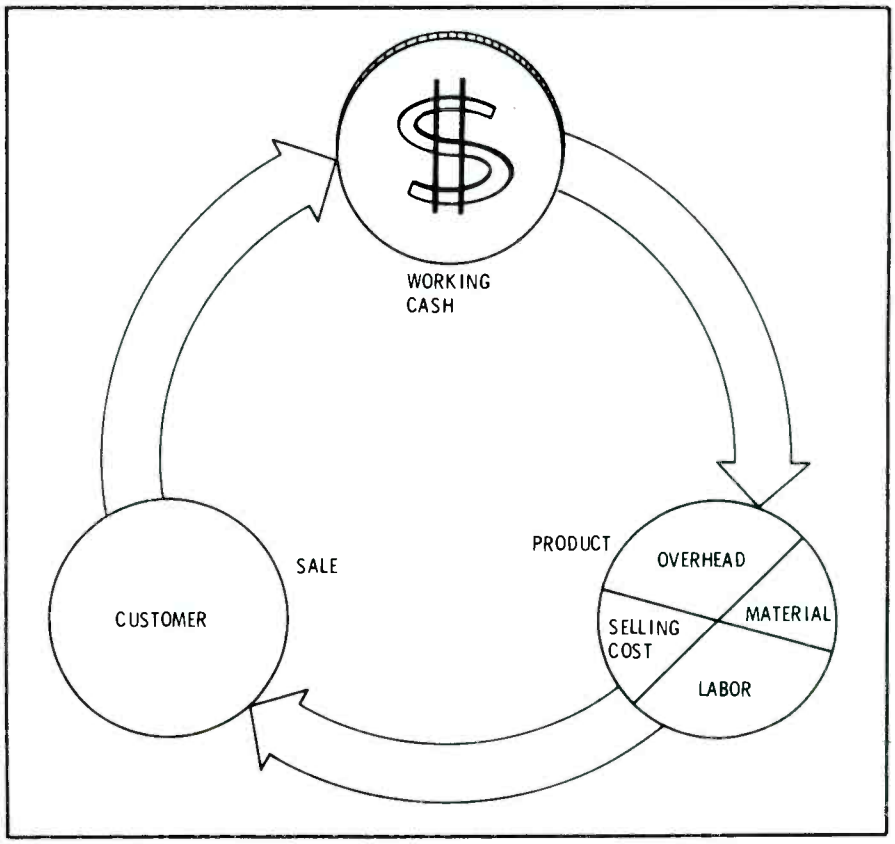

Fig. 1 Working Cash goes through a very short cycle into materials for sale, and then back to cash.

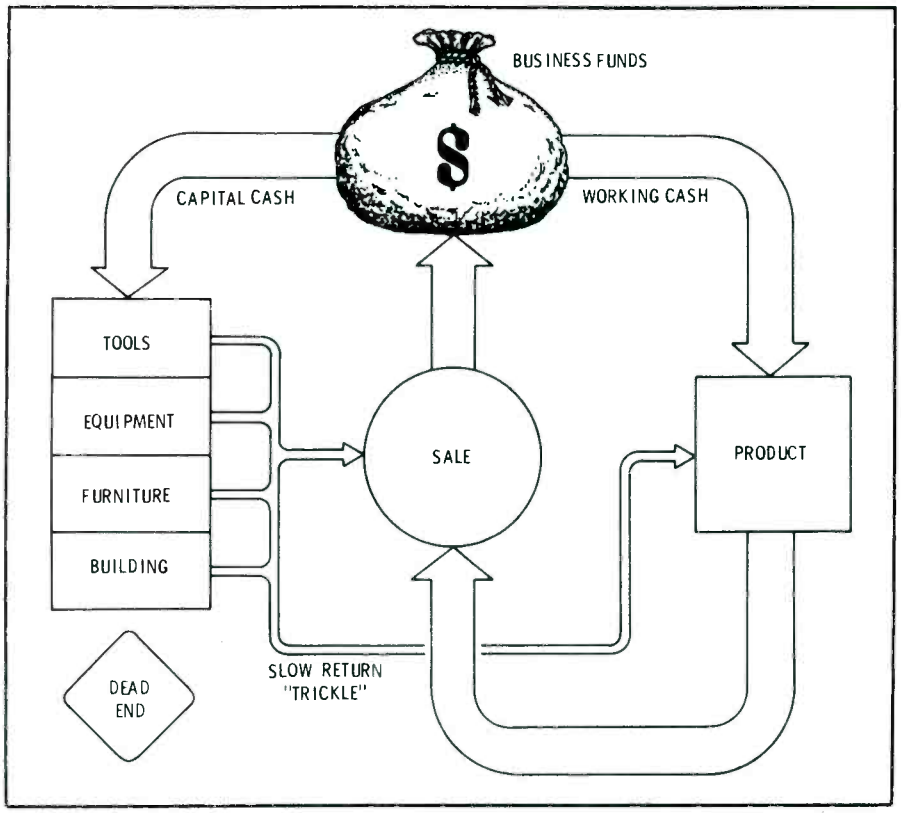

Fig. 2 The cycle of Capital Cash flows slowly. Sometimes it is wiser to pay Capital Cash with borrowed money or on time payments so Working Cash is not tied up.

"**Up to date** on your house calls, eh....What's this item on Martha Washington of Mount Vernon?"

What should he have done?

It isn't always wrong to purchase and remodel a building, as Mike did. But it was bad cash management for him to do it at **that** time. If he'd made a good forecast of his cash needs, he probably would have made a different decision. He might have deferred the purchase until a better time, or he might have worked out different down payment and monthly payments that would have left him more cash.

As it is, he's learning the hard way that a prosperous business doesn't necessarily mean lots of cash.

Of course, there are many other possible reasons why cash could be in short supply. We'll discuss them next.

Factors Affecting Cash Management

Credit problems

Accounts Receivable are not cash, any more than buildings and test equipment are. Reduce those "on the cuff" informal credit cases. Even though you have a "cash only" policy, sometimes you might make exceptions. Watch it, if it gets out of hand the cash pinch can injure the business.

Profit margin

Of course, a generally-poor profit margin will show up in the annual profit-and-loss statement. But it can hurt the amount of cash long before it shows on the statement.

Overbuying

Parts inventories aren't cash either, but they consist of things for which you must pay cash. Stocking too heavily gives the same effect as withdrawing that much extra cash.

Price competition

Sometimes there might be a temptation to go after a greater volume of business by cutting down on prices. A careful analysis of cash management will tell you whether to settle for less volume and a safe profit margin, or to reduce the profit margin and hope for a larger volume. Sometimes it's good business to let the competition have the low-profit business.

Expense control

Effective cash management can do more than any other approach to help you hold down operating expenses. After you're conscious of cash requirements and the planning it takes to meet them, you become sensitive as never before to the necessities and priorities. You avoid non-essential added expenses, rather than accepting them and then having to cut back on everything else to make up for them.

Cash leakage

Living beyond the means of the business is poor **planning.** Keeping coin in a sieve is inadequate **control.** A poor profit structure eventually will show on an analysis; cash leakage might not. This makes it very dangerous.

First possibility is a failure to separate personal and business finances. An owner/manager should pay himself a salary and live on it. Otherwise, he should **not** make withdrawals from the capital account of his business (except in real emergencies, or on the annual "settlement" day). Small cash expenditures for the business should be paid from petty cash, not from his own pocket. These mistakes can foul up the amount of cash available, and cause deductible expenses to remain unrecorded.

Next leakage is through employees, and this includes carelessness as well as dishonesty. Check all employees (trusted or not) often to be sure they are following **your** sound business instructions. Compare parts invoices against parts received, check all bank withdrawals and deposits, watch those bad-debt writeoffs, and other points where cash can leak away.

Laxity is more common than dishonesty. Either way, it's the "trusted" employee who's most likely to pose a problem. They're the ones working without supervision, and if they devise a system of their own, it's a cinch it will be in their favor. Business done at the convenience of employees can cost you much.

Tax money

Finally, don't let any money you collect as taxes (to be paid to city, state or federal government) get mixed with your working-cash money. Account for these as liabilities, posted to the proper accounts, and enter them on the cash-management plan as upcoming expenses. Spending the government's tax money is a dangerous practice.

Summary

The time to solve a shortage of cash for business-operating expenses is before it happens. Plan ahead, determine priorities, and don't let personal "feelings" play too large a part in planning.

A practical technique for working up a forecast for cash management was described starting on page 22 of the February, 1972 issue of ELECTRONIC SERVICING. Refer there for additional data.

Lately, small-business advisers are recommending that a basic cash-requirement forecast be worked up for six-months or a year ahead, then revised monthly. This provides current data that is necessary for an effective cash-management plan. □

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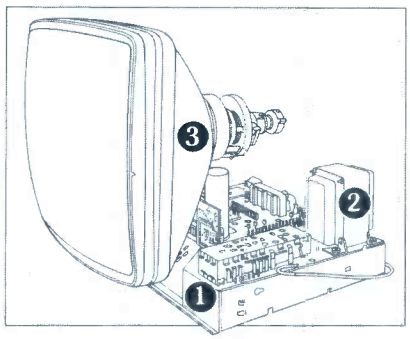

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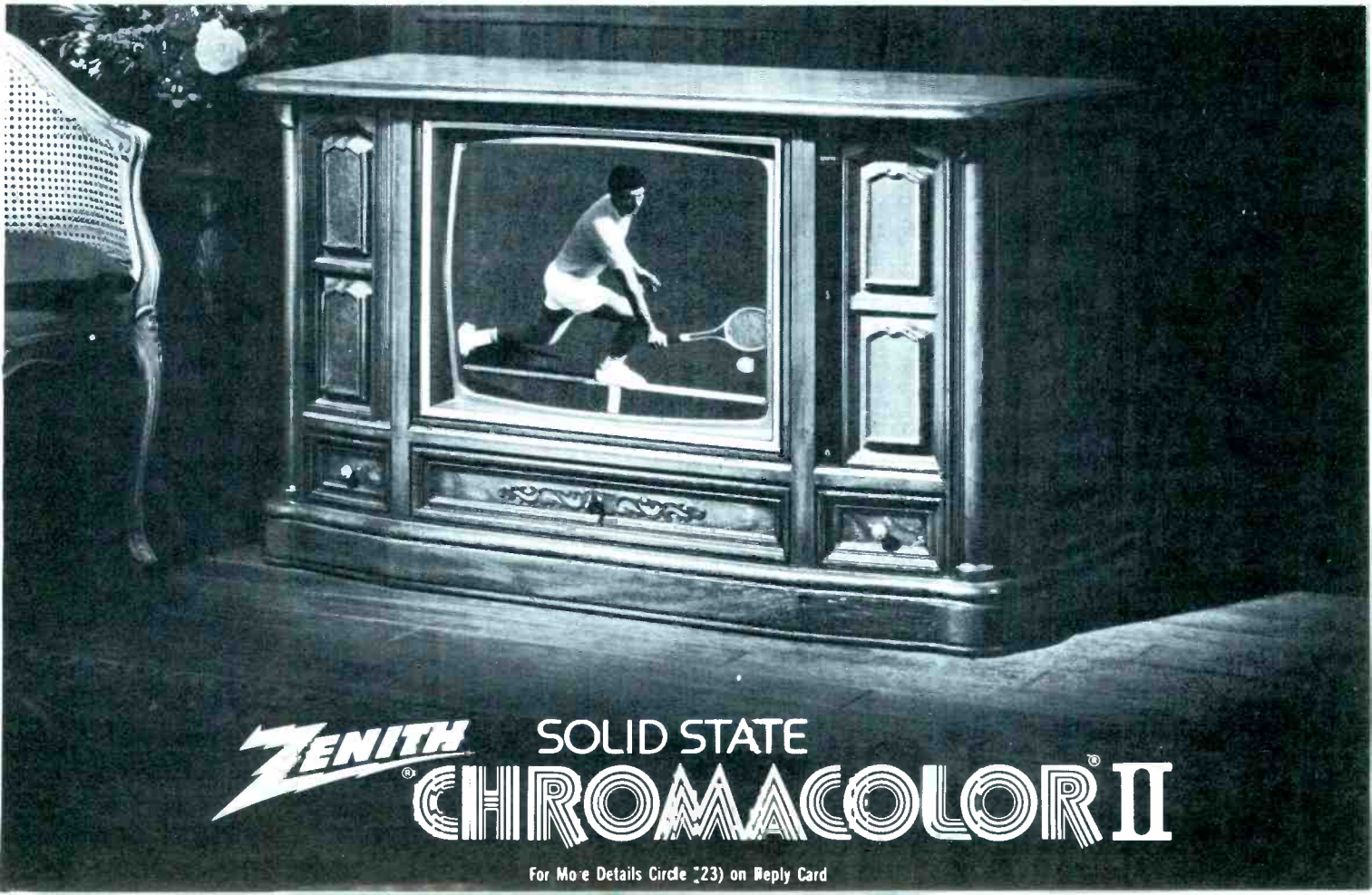

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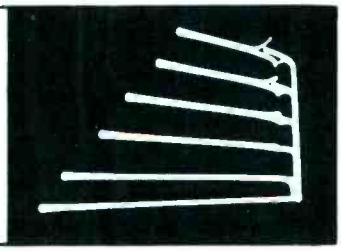
MAL-001B
POLARITY PNP
SWEEP VOLTAGE 30 V
BASE CURRENT 10 uA



Q3 1ST VIDEO
MAL-001B
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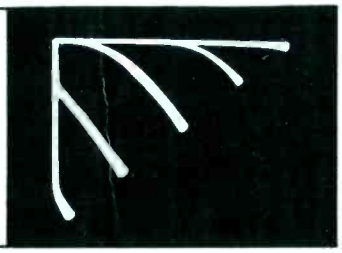

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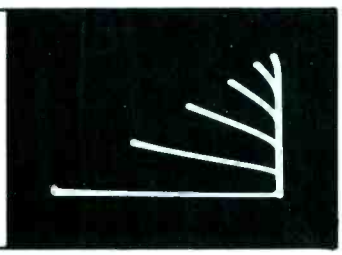
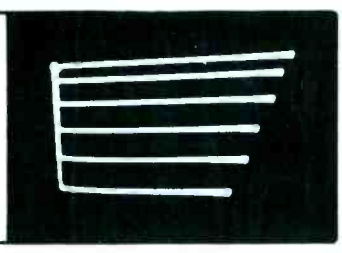
BASE CURRENT 10 uA



Q1 REG
MAE-001B
POLARITY NPN
SWEEP VOLTAGE 30 V
BASE CURRENT 10 uA



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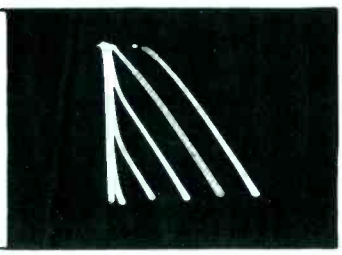
BASE CURRENT 50 uA



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MAK-001B
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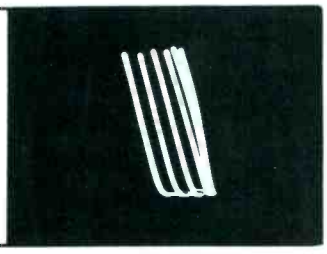
SWEEP VOLTAGE 30 V
BASE CURRENT 50 uA



Q1 SPLITTER
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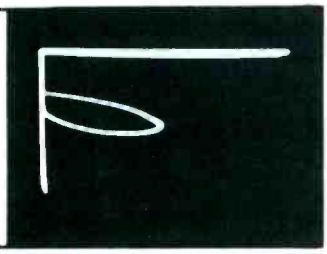
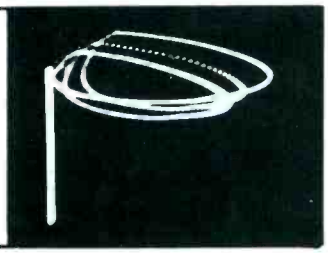
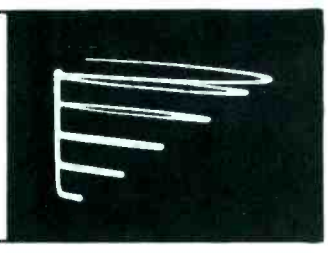
BASE CURRENT 50 uA



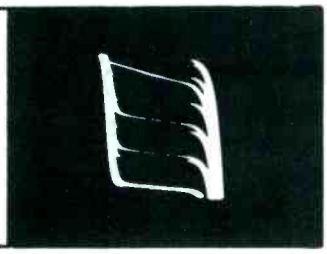
Q2 HORIZ OSC
MAH-001A
POLARITY NPN
SWEEP VOLTAGE 30 V
BASE CURRENT 50 uA

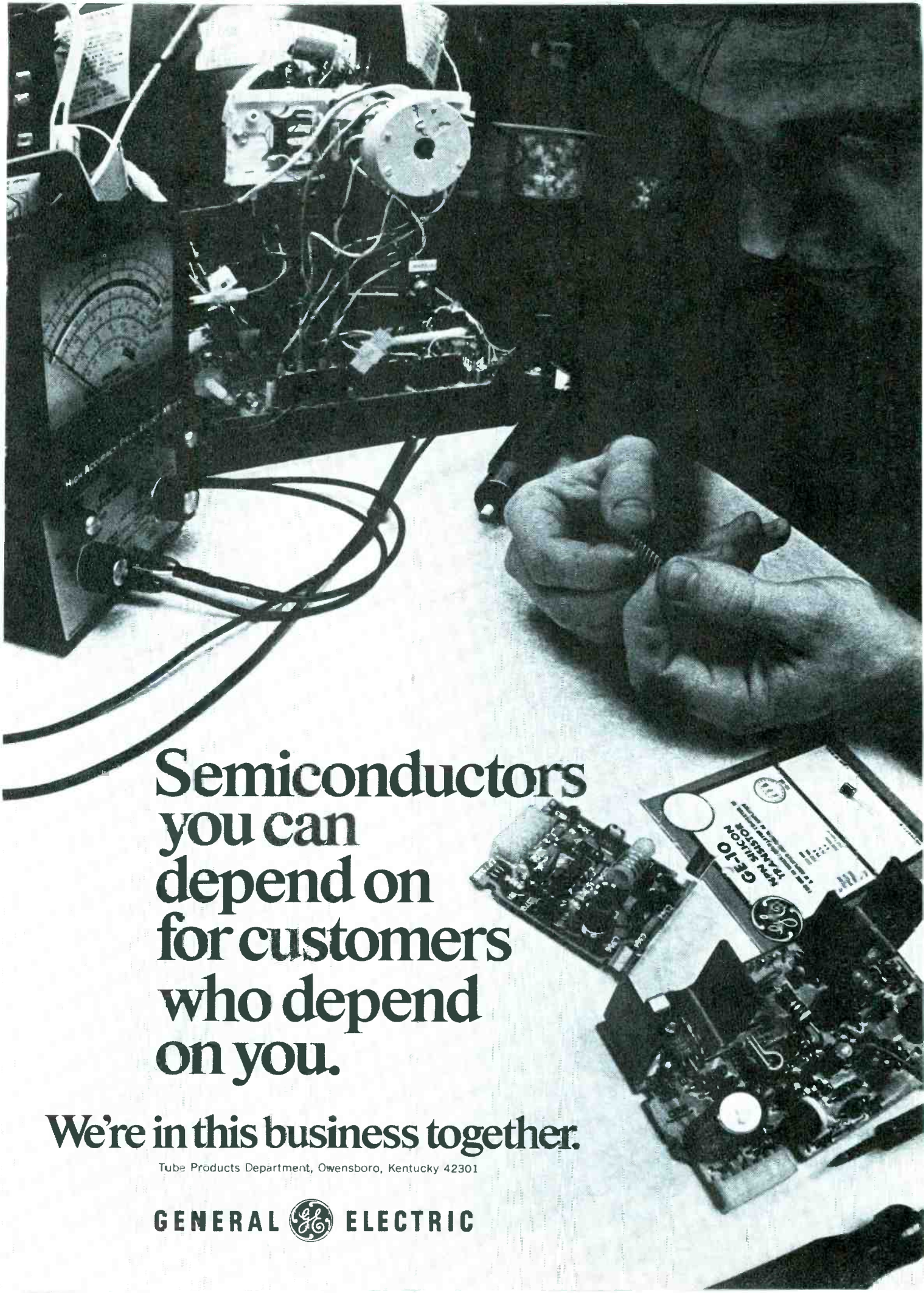


Q3 SAWTOOTH
MAH-001A
POLARITY NPN
SWEEP VOLTAGE 30 V
BASE CURRENT 10 uA



Q1 SWITCH
MAG-001B
POLARITY NPN
SWEEP VOLTAGE 30 V
BASE CURRENT 10 uA





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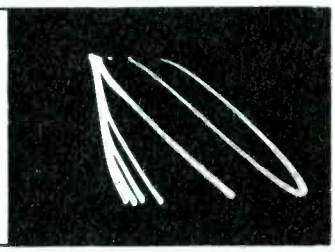
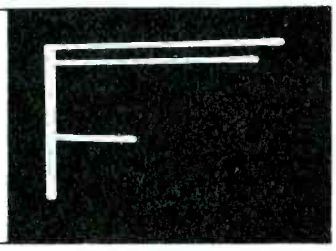
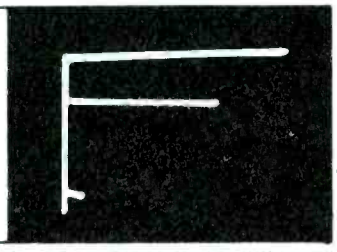
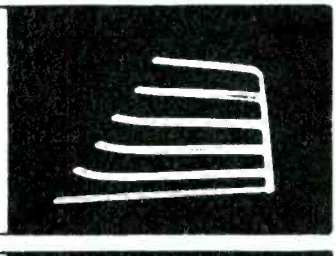
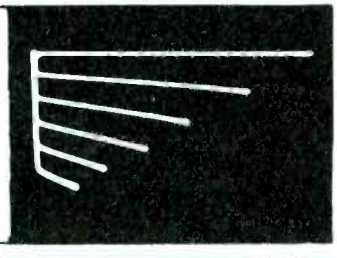
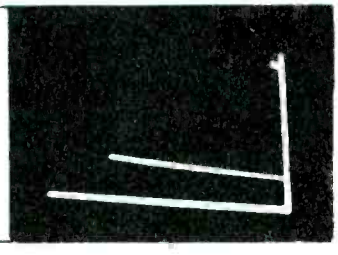
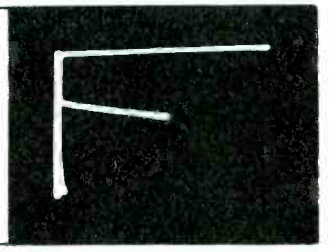
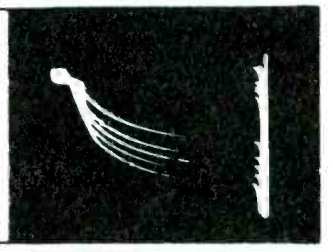
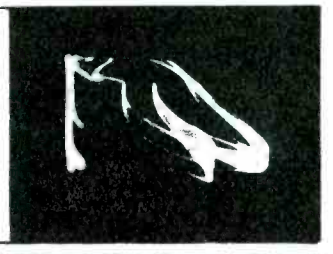
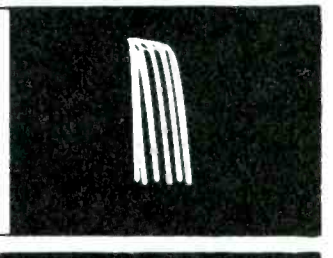
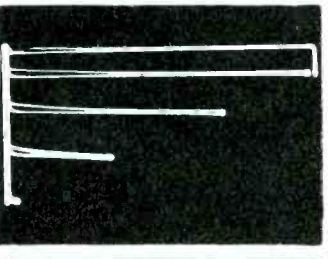
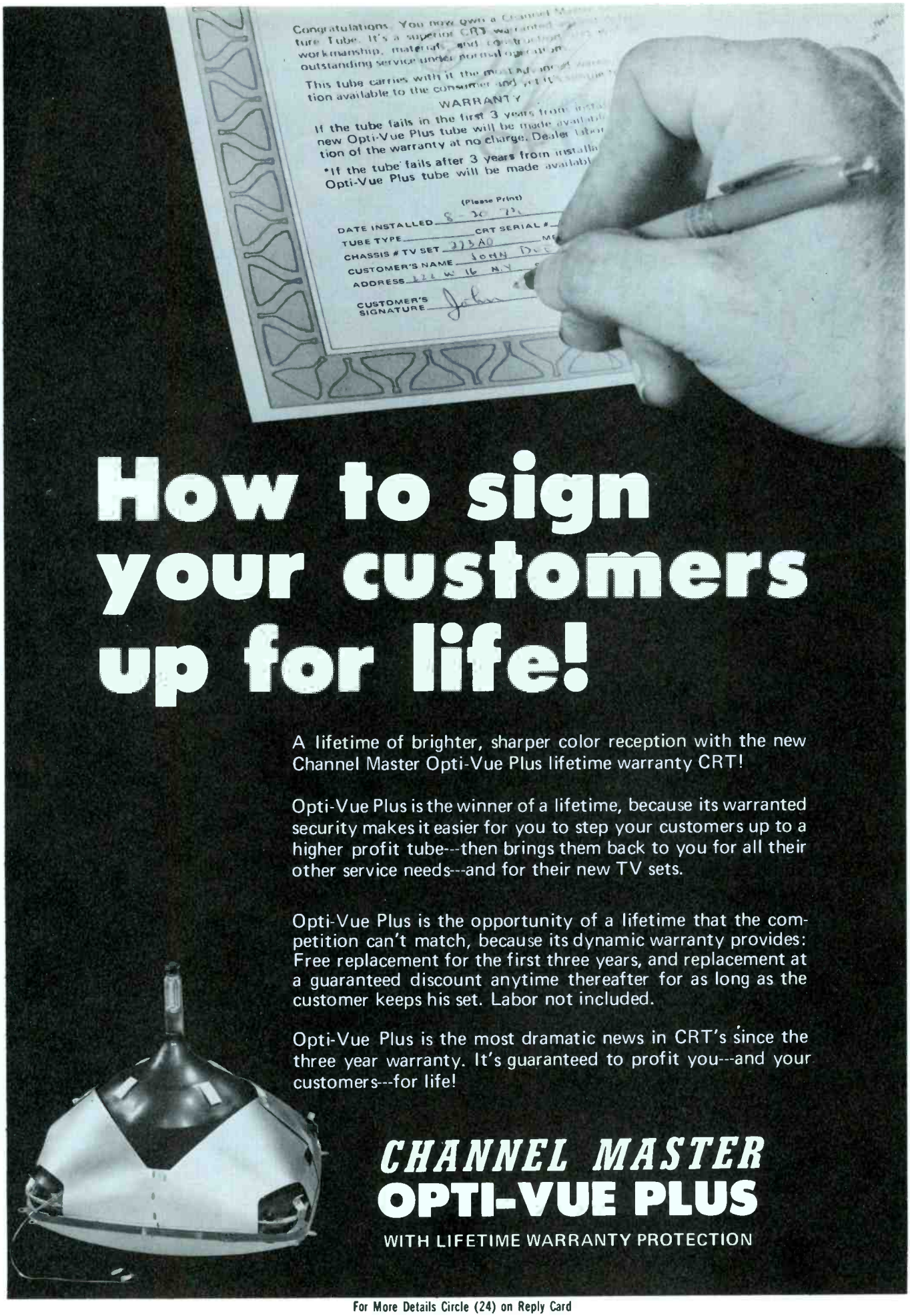
MANUFACTURER RCA	MODEL OR CHASSIS CTC48
TRANSISTOR IDENTIFICATION & CURVE TRACER SETTINGS	SIGNATURE PATTERNS
Q2 PREDRIVER MAG-001B **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 10 uA	
Q3 DRIVER MAG-001B **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 50 uA	
Q4 SYNC BLANKER MAG-001B **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 50 uA	
Q1 OUTPUT MAN-002A **POLARITY** PNP **SWEEP VOLTAGE** 30 V **BASE CURRENT** 10 uA	
Q2 OUTPUT MAN-002A **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 10 uA	
Q3 DRIVER MAN-002A **POLARITY** PNP **SWEEP VOLTAGE** 30 V **BASE CURRENT** 50 uA	

MANUFACTURER RCA	MODEL OR CHASSIS CTC48
TRANSISTOR IDENTIFICATION & CURVE TRACER SETTINGS	SIGNATURE PATTERNS
Q4 PREAMP MAN-002A **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 10 uA	
Q401 HV REG **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 100 uA	
Q402 HOLDDOWN **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 20 uA	
Q302 BRIGHT LIM **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 50 uA	
Q101 VERT **POLARITY** NPN **SWEEP VOLTAGE** 30 V **BASE CURRENT** 50 uA	
Q102 VERT **POLARITY** **SWEEP VOLTAGE** **BASE CURRENT**	TEST DIODE JUNCTIONS; NO SIGNATURE PATTERN



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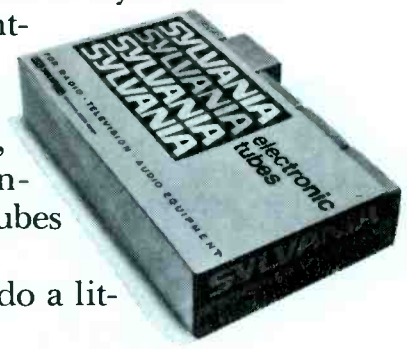

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Working with car-radio tuners

By Joseph J. Carr, CET

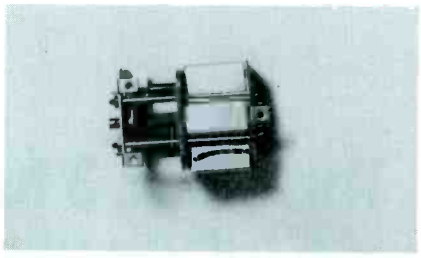

Fig. 1 A typical 3-section manual tuner from a car radio.

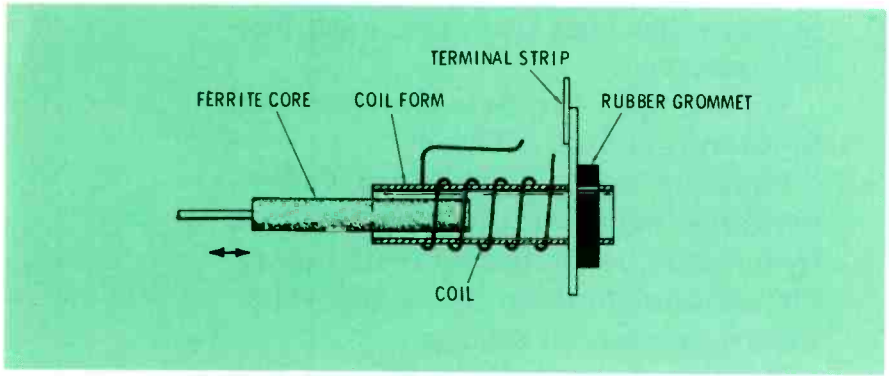

Fig. 2 Drawing of a pitch-wound coil with slug tuning.

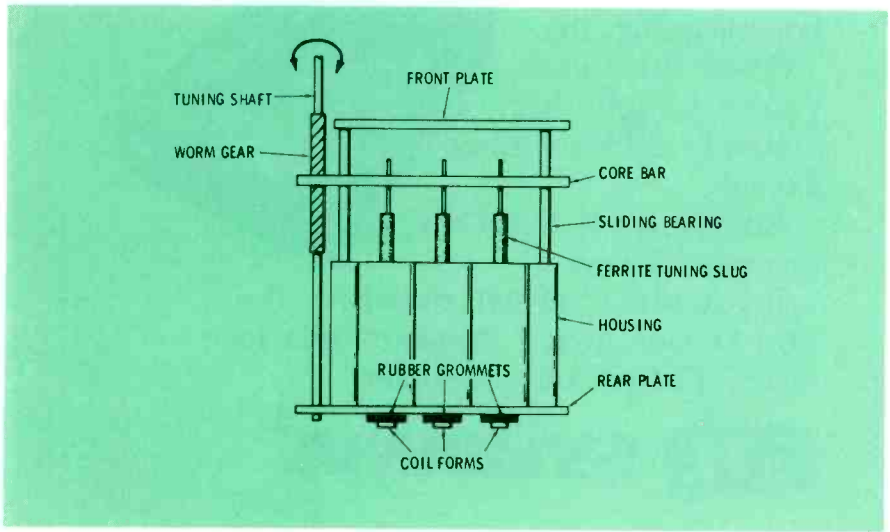

Fig. 3 Details of the manual tuner shown in Figure 1.

Because of pushbutton and signal-seeking functions, many car-radio tuners are mechanically quite complex. Often the mechanical defects seem more difficult than the electronic ones. The following helpful suggestions coming from my own experiences should help minimize those problems for you.

Permeability Tuning

All tuned circuits use inductances and capacitances. To tune in a station, the value of either can be adjusted. Although home radios tune by means of variable capacitors, nearly all car radios vary the permeability of each coil by changing the amount of powdered-iron core that extends inside the winding.

Pictured in Figure 1 is a typical 3-section tuner, and Figure 2 shows a detailed drawing of one coil. The whole assembly is called a Permeability Tuning Mechanism (PTM).

The coils are "pitch" wound (turns spread apart at one end) to make the frequency of tuning more linear with mechanical movement of the cores. Thus, the high end of the band is spread out for easier tuning.

Mechanisms for tuning

All PTM's must be adjustable by the operator, and they should have a readout (dial) indicating the frequency in use. Figure 3 shows the most simple kind of PTM, a manual tuner.

The coils are mounted to a phenolic or plastic rear-end plate by means of rubber grommets. They are enclosed in sheet metal or a cast metal housing which protects and shields them. The ferrite cores are ganged to the core bar that moves them in and out of the coil windings. Rotary movement of a worm gear slides the core bar, and a standard dial-cable arrangement

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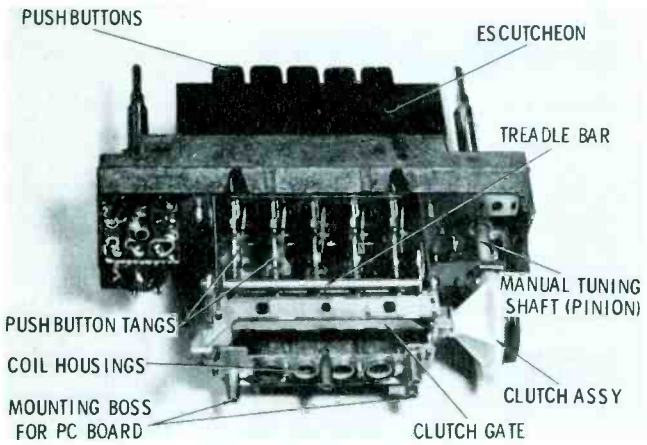


Fig. 4 Philco/Ford pushbutton tuner.

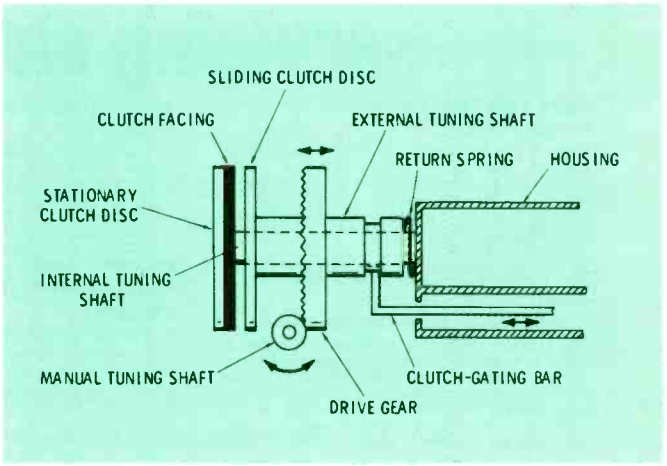


Fig. 6 Details of the clutch which makes pushbutton operation easier.

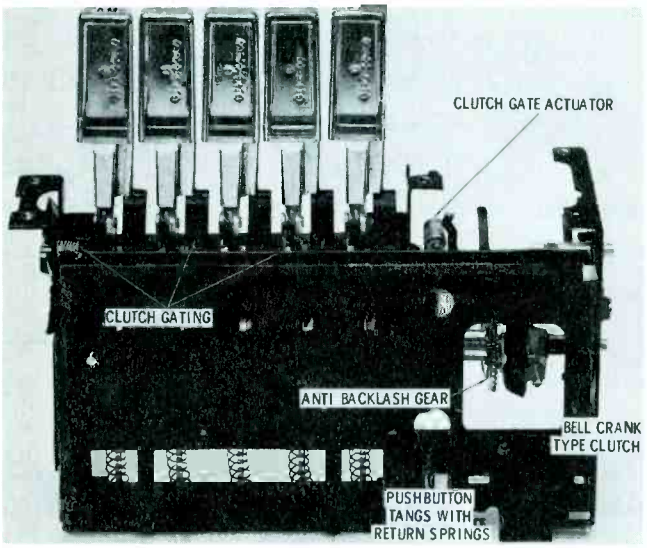


Fig. 5 Delco pushbutton tuner.
(Courtesy of Delco)

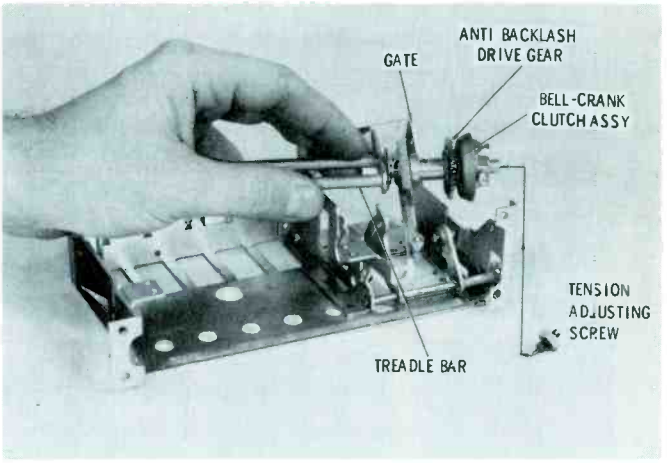


Fig. 7 Disassembled tuner showing treadle bar and clutch.
(Courtesy of Delco)

with a pointer completes the assembly.

The Philco tuner of Figure 4 is typical of the pushbutton tuners used for several years in radios made for Ford. Many other brands and models will have a similar appearance.

When a pushbutton is depressed, the treadle bar is moved to a position determined by the presetting of the pushbutton. Here's the way to set the pushbuttons:

- pull out the pushbutton you wish to adjust;
- tune in the desired station using the manual-tuning knob;
- push the button all the way in until it stops; and
- check the adjustment by turning manually off station, then depressing the pushbutton and checking for the accuracy of tuning. A well-made tuner that is in proper adjustment will show only a small amount of backlash (detuning).

One common trouble is obtaining correct tuning while a finger remains on the button, but having the pointer move to one side and detune the station when the finger is removed from the button.

How well the setting holds depends partially on the accuracy of the original adjustment of the button, and also on the action of the "anti-backlash" gears and springs which are attached to the clutch assembly (Figure 5). When you reassemble such a tuner, remember that these two gears must be under tension by the power spring before the worm gear is engaged.

A typical clutch

Pushbutton tuning would be a lot more difficult to push if the mechanism also had to drive the manual-tuning shaft. The problem is eliminated by the gating bar which disconnects the clutch when the pushbuttons are depressed, as shown in Figure 6. When the clutch-gating bar is not under pressure, the clutch disc slides away from the stationary clutch facing because of pressure from the return spring, disconnecting the manual tuning and pushbutton functions.

Several common troubles occur with pushbutton tuners. One of these is "no manual tuning", although the pushbuttons work okay. Usually the cause is a clutch stuck in the open position.

The problem is to find **where** the

mechanism is stuck. Is it the external-tuning shaft binding, or something wrong with the gating bar?

If the radio has had much usage, the clutch-facing material might have worn away. In that case, the clutch will return to its normal position when the button is released, but there is no manual tuning.

Ordering parts

Ordering car-radio tuner parts can be a very tricky deal. In most cases, it will be necessary that you list all of the numbers and letter groups found on the tuner itself (not just the defective piece or the radio model number). There are at least three manufacturers of car-radio tuners, plus Delco which makes all of its own. It's possible for any of the three to be in different specimens of the same year and model radio.

That's a good reason for using universal clutch-facing material obtainable through your local parts distributor wherever possible.

Adjusting clutch tension

In some tuners (such as Delco shown in Figure 7), the tension or pressure of the clutch can be adjusted. Often resetting the tension will correct a slippage problem without major surgery.

One nice feature of the Delco models is the clutch adjustment which is located on the **outside** of the radio chassis where it can be turned easily.

Quite often only a slight amount of adjustment will be needed. The correct amount permits the manual tuning to go all the way through the range of travel in both directions, yet still allow the pushbuttons to operate without binding. Watch out for the cases where manual works okay in one direction, but slips in the other.

Some Typical Problems

Here are some of the typical failures according to models:

- Bendix VW (1968)—look for the nylon manual-tuning shaft to be broken;
- 1971-73 Motorola (especially VW/Porsche/Audi models)—check for a broken pinion shaft;
- older Philco/Ford AM radios—look for both a broken clutch assembly, and a worn out plastic pinion shaft; and
- late-model Delco AM radios—might be found with the dial-pointer linkage missing.

Ten-Slide Tuners

Until a few years ago, owners of AM/FM radios had to be satisfied with only five pushbuttons which had to be allocated between the two bands. Newer versions, however, have a ten-slide tuner allowing use of all five buttons on **BOTH** AM and FM. Figure 8 shows how this is done in Bendix and Delco radios.

In the normal five-slide/five-button tuner, each pushbutton tang is ganged with only one pushbutton slide assembly. But in the AM/FM designs, however, there are separate slides for AM and FM, thus giving the effect of ten pushbuttons. The AM/FM bandswitch and the shuttles couple each tang to the matching slide. Changing the bandswitch changes the shuttles over to the other set of slides.

Ten-slide problems

Typical problems are:

- jammed tuners because of poor alignment of the shuttles;
- broken shuttle races; and
- broken or biased shuttle bars.

Signal-Seeking Tuners

Signal-seeking tuners are the most difficult of all to repair, but they appear to be much worse than they really are. Just a little understanding added to some practical experience reduces the handling of their problems to what I like to call "TNT" (Time and Tedium). Because several articles in the past have adequately covered the electrical functions of the tuners, we will only examine the mechanical aspects.

Motor-driven

In this kind of PTM, once popular in non-Delco American radios and presently popular in Japanese imports, a motor is geared to the manual-tuning gear through a clutch arrangement. Mechanisms of this type can be identified by the "whirring" noise made by the high-speed DC motor, and in some models by the manual-tuning knob which rotates during seeking.

Power-spring driven

The other system, used by Delco under the name of "Wonder Bar", and by Becker AutoRadio of Germany, receives power from a "power" spring to move the tuning mechanism during the seeking part of the cycle.

The power spring propels the treadle bar and associated components (see Figure 9) towards the high-frequency end of the tuning range. To limit the speed of travel during this seeking mode, Delco uses a gear-train governor (Figure 11). When the mechanism is supposed to stop for a station, amplified AGC deactivates the seeker relay, which has a tang that moves a paddle wheel inside the governor housing. The paddle wheel jams the gears of the governor and causes an abrupt halt to the movement of the tuning mechanism.

When the "start" switch is activated (Figure 10), the seeker amplifier operates, energizing the relay, which in turn removes the paddle from the governor's gears and allows the unit to seek the next station.

By the time the tuning has reached the high-frequency end of the dial, most of the power stored in the spring has been expended. It is necessary that the power be restored, and the dial mechanism moved rapidly to the low-frequency end of the dial so seeking can continue.

These two actions are accomplished by the recock solenoid (a high-current device drawing around 14 amperes). Always use a high-current power supply when you test these units on the bench. An inadequate supply often causes the mechanism to stick part way through the recock cycle, burning out the solenoid.

Common Seeker Problems

Here are some of the typical service problems encountered with Wonder Bar mechanisms.

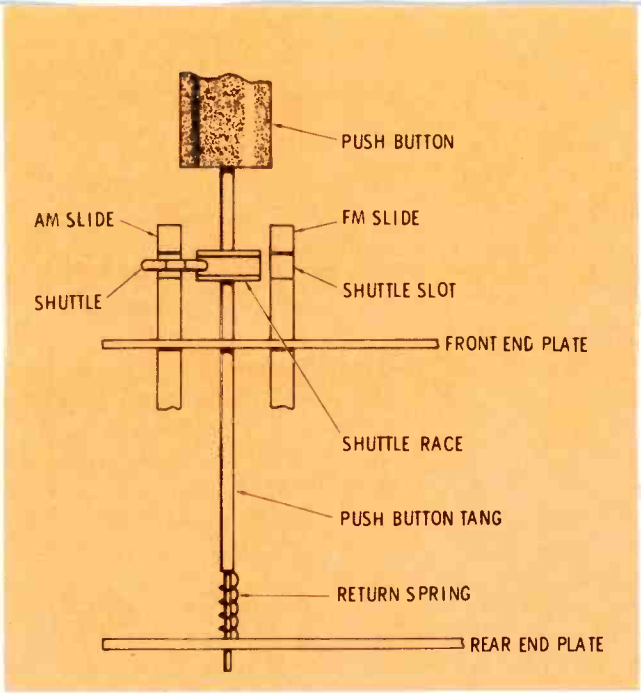


Fig. 8 Details of a ten-slide tuner which allows the use of all five pushbuttons for both AM and FM.

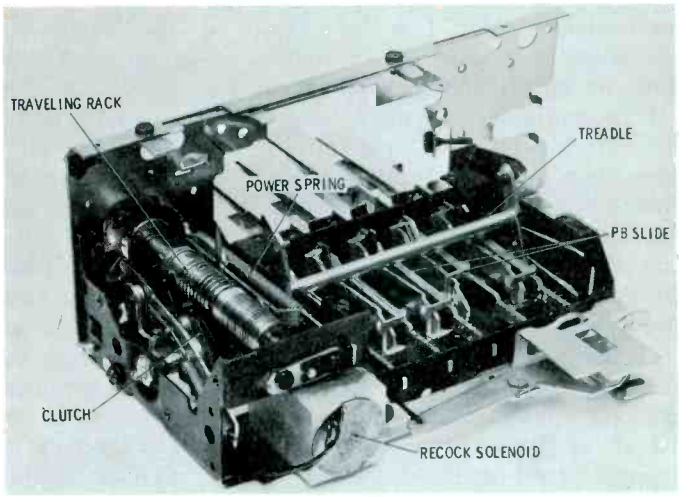


Fig. 9 Photograph of a Wonder-Bar tuner.
(Courtesy of Delco)

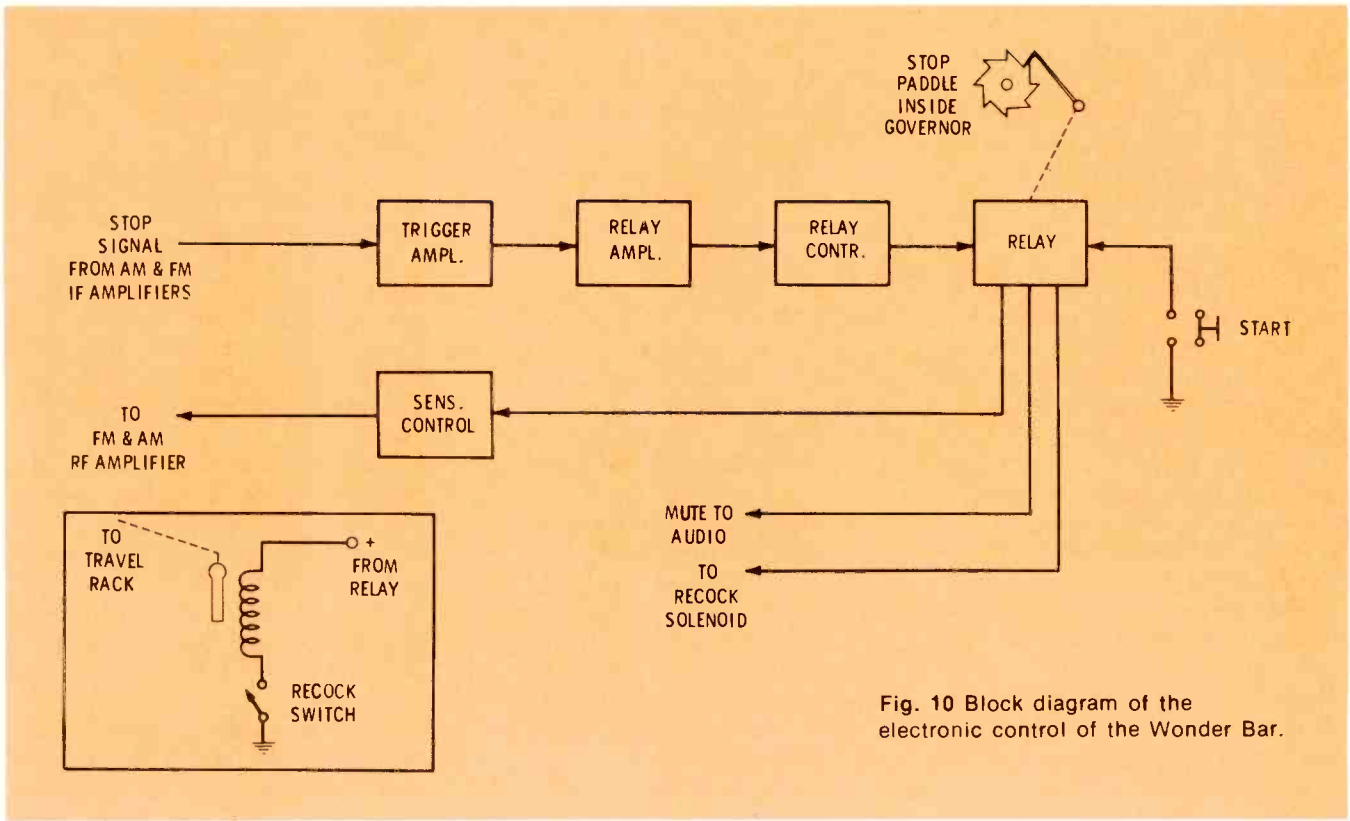


Fig. 10 Block diagram of the electronic control of the Wonder Bar.

Refusal to seek

When the seek bar is depressed, the thing refuses to run. If the receiver audio is properly muted, look for a jammed governor, jammed PTM section of the tuner, or a misadjusted seeker relay. Test the tuner by depressing a pushbutton while attempting to move the dial pointer by hand. It should move with relative ease.

If the PTM is free, try manually operating the relay, forcing the tang clear of the paddle wheel. The relay is at fault, if the rack starts to seek normally.

Next, check the governor, if the relay checked okay. Turn off the power to avoid "machine-gunning" fast operation of the unit, and loosen the mounting screws of the governor. If it has been the cause of the jam, the PTM will now move to the high-frequency stop.

In case the radio neither mutes nor runs, try checking for an open Wonder Bar switch. Generally

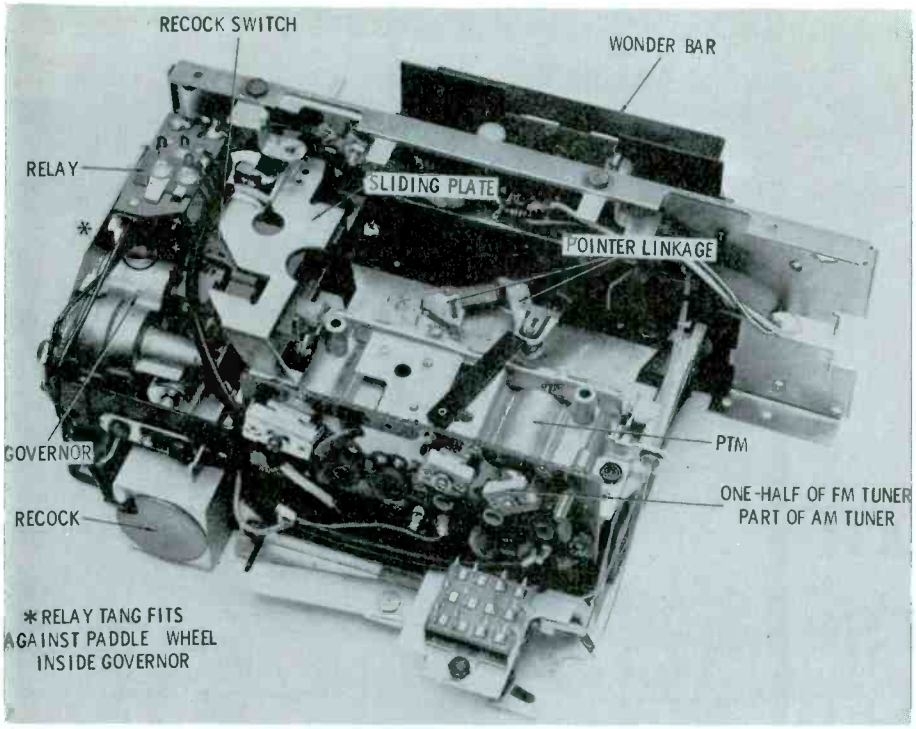


Fig. 11 Another view of a Wonder Bar tuner.
(Courtesy of Delco)

speaking, troubles in the electronic part of the system either produce a failure-to-stop symptom, or a condition of starting to seek, but stopping when the Wonder Bar is released.

Failure to recock

When the tuner travels to the high-end stop and fails to recock, the cause is an open or misadjusted recock switch. In a few cases, further testing will disclose that the solenoid is burned up. Replace both the solenoid and the recock switch, if this happens.

Machine-gunning

This is probably the most spectacular of all Wonder Bar troubles. The entire PTM mechanism continuously slams back and forth from low end to the high end at high speed, making a loud racket like that of a machine gun. Cause: the governor is not slowing down the seeking part of the cycle. It might be defective or misadjusted.

Don't permit any receiver to machine-gun for long, else considerable damage can be done to the mechanism.

There are two general causes for this symptom. One is failure to recock, while the opposite trouble is caused by the recock solenoid switch turning off too soon. In the latter case, adjust the switch.

Erratic running

When the dial pointer and PTM seem to jerk or operate erratically, suspect dirt that is causing binding, or a defective governor. If it is the governor, replace it; don't attempt repairs.

Stopping at the low end

Car radios should tune down only to 540 KHz. If one tuned lower, it might receive a station (such as marine radio) and stop below the broadcast band. Readjustment of the local oscillator should stop this trouble.

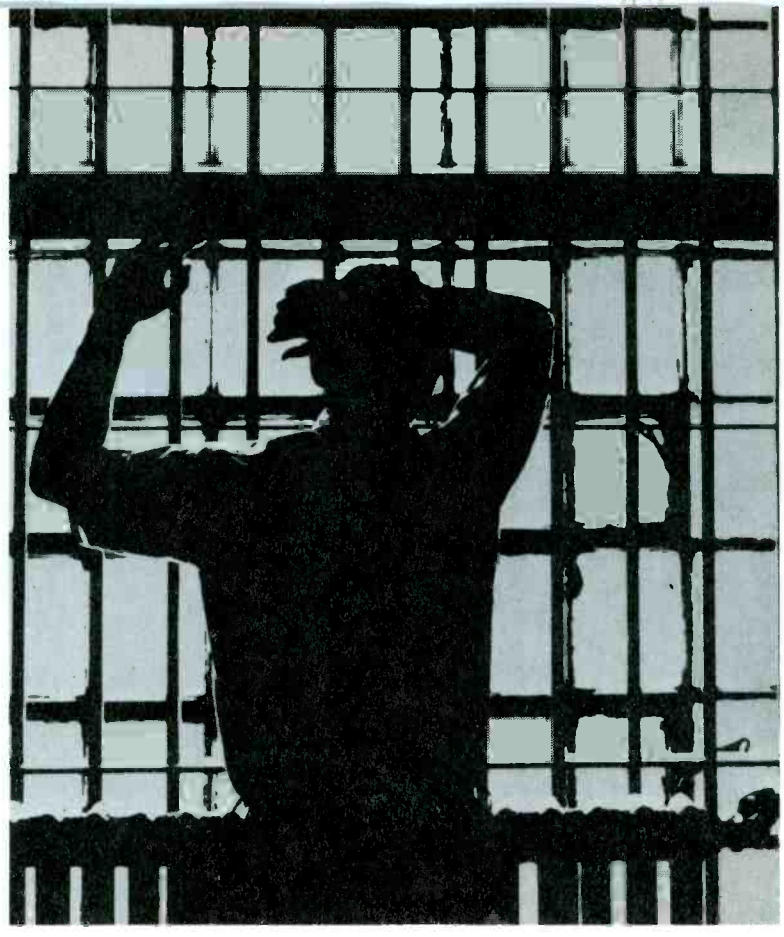
Tips For cleaning

A very important part of servicing car-radio tuners is CLA (clean, lube and adjust).

I recommend a white grease (such as Lubriplate) and a light oil (3-in-1). **But do NOT overlubricate!** Especially keep excessive oil or grease away from the clutch. A light smear of white grease lubricates correctly, whereas a thicker application might cause the same mechanism to bind later. □

Security systems from the burglar's viewpoint

By John R. Mac Isaac



Inside the State Prison of Southern Michigan, lives the largest group of burglars ever assembled under one roof. The author interviewed 80 of them to give us this authentic report about what burglars feel and know about security systems.

Rapid advances in the field of scientific crime prevention have made burglary a trade that is demanding more skill than the average thief can ever hope to possess. In fact, it's virtually impossible for a second-rate burglar to safely make a prosperous living. Because burglary now is such a hazardous profession, many crooks are turning to crimes more in keeping with their limited talents.

Invisible Stool Pigeons

Modern burglar alarm systems—known among thieves as "invisible stool pigeons"—are responsible for much unemployment in this larcenous line. They are also credited with protecting more cash, merchandise and property than any other security measures against theft.

It was the unanimous opinion of the eighty burglars interviewed that nothing complicates their work more than trying to compete with an up-to-date alarm system using hidden or inaccessible components. Sixty-three of these professional burglars attributed their apprehension to such tricky electronic devices as motion detectors, closed-circuit television, and photo-electric alarms. And, to a man, they agreed there was something unfair about it all.

Some Stores Help The Crooks

Apparently many TV-electronic service shops agree with this unfairness, for they operate on the outmoded theory that easy-to-reach clanging bells or loud buzzers offer adequate protection! Not so.

Any burglar capable of using a penlight knows that these exposed alarms can be put out of business with nothing more than a sponge or a handful of rags. How's that for low overhead?

Ineffective Methods

One old-time burglar, presently working his way through a ten-to-fifteen year sentence, specialized in externally-mounted alarm signals. He would put them out of operation by gumming up the works with ordinary caulking, from a caulking-gun such as ones used to seal storm windows.

As he so aptly phrased it, "Show me a TV-repair shop with an externally-mounted bell, and twenty minutes later I'll show you a business that's just been burgled."

Perhaps the most widely used, but least effective, barrier against illegal entry is the metal foil applied around windows. Any crack in the glass also breaks the foil, sounds an alarm and brings the police. But, if the foil is installed too tightly, temperature changes can cause breakage of the foil and false alarms.

There isn't a thief in the business who, at one time or another, hasn't cancelled the effectiveness of these foils. First of all, it's easy to see where the foil is placed. Then the thief simply makes an opening where there is no foil (such as in the surrounding sash, or in the center of the glass) and bridges the circuit. After that, the window or door can be opened without danger of an alarm.

Another alarm which burglars rate as very ineffective is the mechanical switch. Such switches are supposed to open circuit and set off the alarm when a door or window is opened. Others have spring contact strips held apart by insulator strips.

When the insulating strip is removed, the alarm is tripped. Innovations such as these were considered pretty clever years ago when the thieves were less competent in electronics. Modern, capable burglars are not apt to allow one of these gadgets to go off.

Ineffective as they are against a clever professional burglar, even antique alarms offer some protection. They have been known to scare away vandals and other less-experienced burglars.

Aside from needing a burglar having a certain incompetence in his trade, the major weakness of the older systems is that many different kinds of protection must be used. For example, a magnetic switch might furnish adequate protection against anyone forcing open a door. But a different device must be used to sound the alarm when a window is kicked in. Then, if all these vulnerable spots are protected, something must be done about the walls and roof.

Fact and fiction about burglars

Now, burglars aren't any smarter than the average citizen, nor are they the cat-like prowlers so often described in fiction or films. But many of them **are** professionals engaged in a very hazardous occupation. The ones who **stay** in business, are the ones who minimize the hazards. They learn something each time they pull a job, or every time they get caught. They talk "shop" with other burglars, and generally show a keen interest in knowing how alarms operate.

Their object is not only to learn how to disable a certain alarm (perhaps that's impractical or impossible), but how to recognize the **type** of alarm and how to go around it.

Successful burglars know enough about electricity to tell an open-circuit alarm from a closed one. They usually know when to cut a wire and when to bridge a contact. But the average professional knows very little about electronics. When faced with such modern alarms as motion detectors, capacity alarms, and infra-red beams, usually he will proceed on his way in search of places not so well protected.

The point is this: you should visibly protect the premises by the use of a system having high-quality components installed by excellent workmanship. Although he probably could defeat all the devices he sees, the logically-minded burglar gets the message that such a good system probably has other invisible detection equipment which would spot him before he could locate it. The odds against him are too great, so he decides to find an easier "pigeon".

Summary

Modern alarm systems **could** change burglary into a profitless profession. But there are far too many businesses and homes equipped with outmoded alarm systems; some systems offering protection so inadequate even amateurs dare take a crack at them.

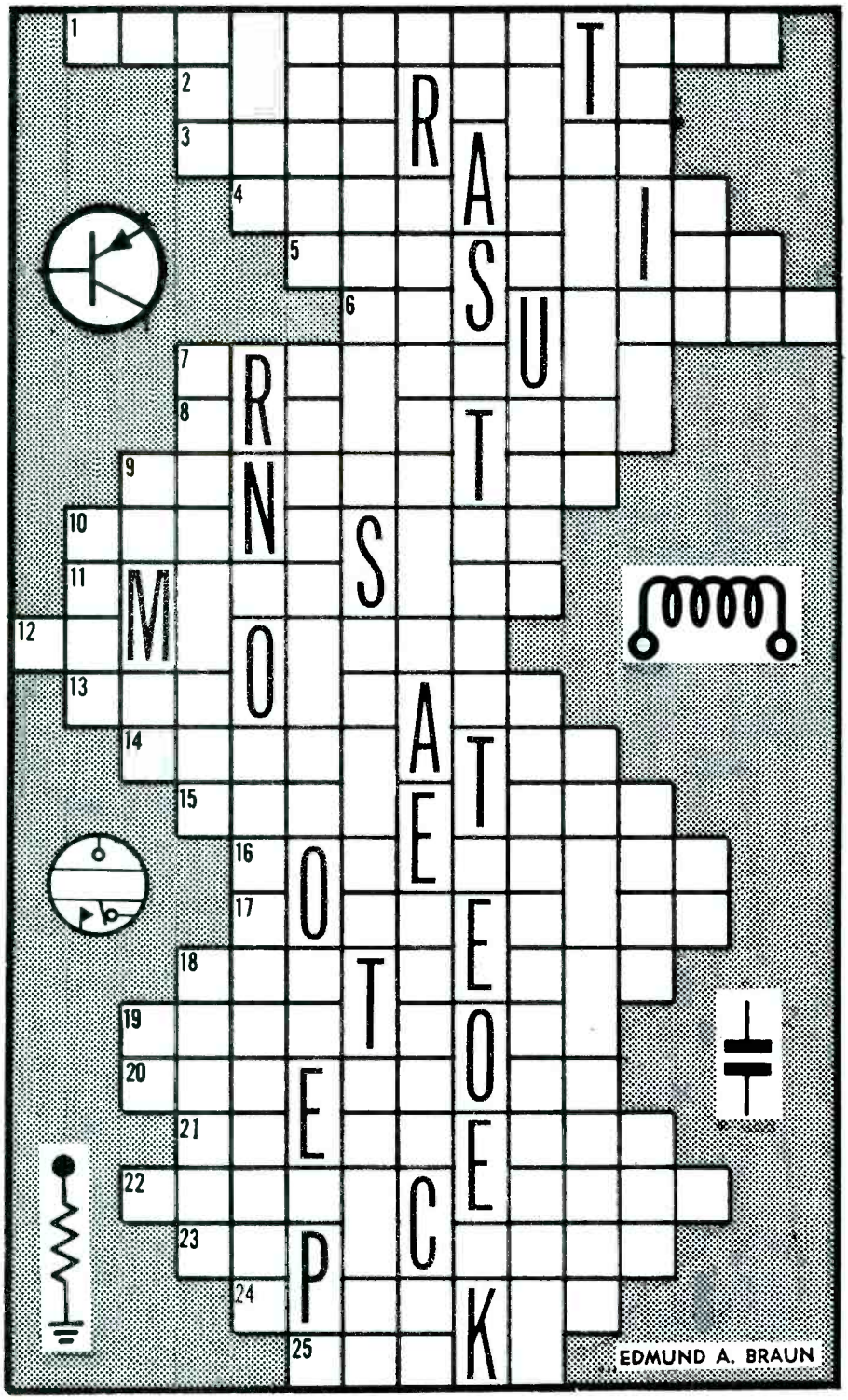
If your burglar alarm is one that easily can be made inoperative, then be assured some observant burglar eventually will try it.

Burglars appreciate all the help they can get—and the absence of alarms or the presence of obsolete alarms provides them with all the help they need. □

Arcs and Sparks!

By Edmund A. Braun

For a change of pace, try solving this Just-across-word based on electronic terminology. Each word is connected to the word above and below by one or more letters although only one letter is ever shown as a clue. Each correct answer is worth 4 points; a perfect score is 100. It should prove quite easy to get a high rating except perhaps for someone who thinks "heptode" is similar to a frog, or that "autodyne" means eating in a drive-in restaurant! Pencil sharp? Thinking cap on? Then, GO!



1. Protective cured plastic coating placed around delicate electronic components.
2. Specially designed speaker baffle.
3. Permissable deviation from a specified value.
4. Electron tube having five grids plus an anode and a cathode.
5. Type of broadside antenna array with a flat reflector.
6. High-resistance separator or support for a conductor.
7. A calibrated screen placed in front of a CRT for measuring purposes.
8. Original model from which copies are made.
9. Rotary device to change electrical energy from one form to another.
10. Compounds of this metal are sometimes used for cathodes.
11. Possible result of dropping a CRT.
12. An essential part of a subsystem or equipment.
13. A transformer's output winding.
14. Type of construction used for iron cores of transformers, etc.
15. Invisible force which attracts ferrous metals.
16. Voltage difference between two points of a circuit.
17. Type of iron using copper.
18. Instrument for measuring EMF.
19. Either terminal of an electric source.
20. Electrical safety device.
21. Number of complete cycles per second of an alternating current.
22. A component to be substituted for one that is inoperative.
23. A condenser.
24. Device for converting audio frequency current into sound waves.
25. A coil of low resistance and high inductance.

You'll find the solution on Page 58.

bookreview

Color-TV Field Service Guide, Volume 4 (20953)
Author: Howard W. Sams Editorial Staff
Publisher: Howard W. Sams & Co., Inc.
Size: 8-1/2 X 11 inches, 320 pages
Price: $5.95 softbound.

The Color-TV Field Service Guide has been compiled to enable the TV technician to service color TV more efficiently in the customer's home. The chassis layouts show the type, function, and location of all tubes used in a particular chassis, as well as the ratings and location of fuses and circuit breakers. The Guide features the location of service controls and adjustments on the chassis layout. These include the quadrature or ratio-detector transformer and the color AFC adjustments. Now the technician can make field adjustments without worrying about the consequences of adjusting a bandpass or IF transformer by mistake. Specific field-adjustment procedures for a particular chassis are given on the page facing the chassis layout. These procedures include critical information such as: horizontal sweep, AGC, color ATC, purity, and gray-scale adjustments. Numbers located to the left of the adjustment procedures refer to partial schematics which show the location of test points.

Building and Installing Electronic Intrusion Alarms (20929)
Author: John E. Cunningham
Publisher: Howard W. Sams & Co., Inc.
Size: 5-1/2 X 8-1/2 inches, 136 pages
Price: $4.50 softbound.

This book explains how to select, construct, install, operate and maintain electronic intrusion alarms. It is divided into sixteen chapters, each dealing with a particular phase of electronic intrusion alarms such as electromechanical intrusion alarms, sensors and switches, audio and vibration alarms, photoelectric intrusion alarms and proximity alarms. Also covered are closed-circuit television, access control switches, telephone attachments, an automobile protection system and other commonly-used types of intrusion alarms. An appendix contains a general listing of companies that supply alarms and accessories. This easy-to-read book is for everyone interested in electronic security systems, whether he is a novice who wishes to build his own security system, or a skilled technician who wants to enter the lucrative field of security electronics. □

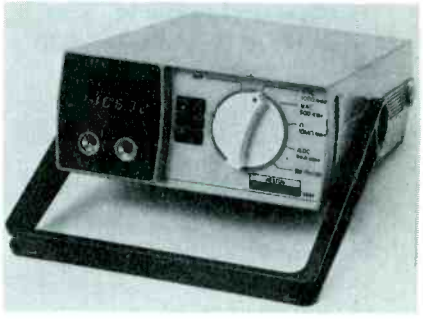
test equipment report

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.

Portable Digital Multimeter

Product: Model 4444 DMM portable digital multimeter from Weston Instruments.

Features: The Model 4444 DMM has instant auto-ranging, made possible by a triple-slope integration technique. It offers the following automatic features: setting of the decimal point; polarity sign; proper units annunciator; over-ranging; blanking of redundant zeros, and overload protection. The instrument features a high noise-rejection capability. Its common-mode rejection is over 130dB for DC voltage measurements and greater than 70 dB for AC voltage measurements at 50/60Hz ± 1%. The multitester is housed in a lightweight carrying case.



Size: Dimensions are 2.25 X 5.45 X 7 inches.

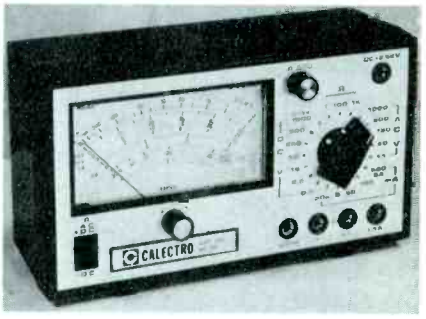
Price: The Weston Model 4444 DMM is priced at $575.

For More Details Circle (50) on Reply Card

Multitesters

Product: Catalog No. H3-365 22-range "bench-style" multitester with decibel scale by GC Electronics.

Features: No. H3-365 features a taut-band suspension meter that enables the indicating needle to be set at any position up to center scale. Fuses prevent accidental overloads or burnout and it has a switch for polarity inversion.



For More Details Circle (51) on Reply Card

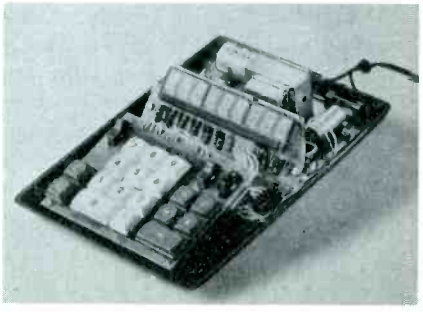
Calculator Kit

Product: Heathkit IC-2108 desk-top calculator from Heath Company.

Features: A low-profile case and bright ½-inch readout tubes in an 8-digit display make this calculator one that is easy to read. It is a four-function calculator with both floating and fixed decimal. A Constant key permits chain calculations and a Clear-Entry key allows removal of an entry from the display window without disturbing prior calculations. Negative answer, entry, and result-overflow indicators are automatically displayed. The color-coded keyboard eliminates confusion when making entries or lengthy arithmetical calculations. Simple to build, it can be assembled in two evenings.

Price: Heathkit IC-2108 is priced at $79.95.

For More Details Circle (52) on Reply Card



Transistor/FET Tester

Product: Model RCA-WT-524A dynamic transistor/field-effect transistor tester by RCA Electronic Components.

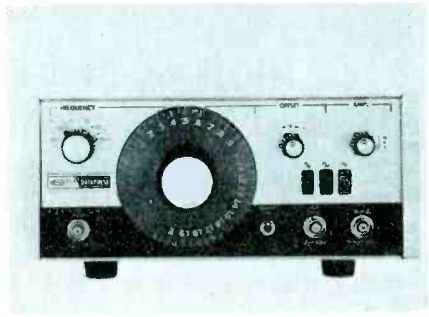
Features: Designed for testing all types of bipolar and FET transistors, the RCA-WT-524A features a 6-1/2 inch meter and two plug-in transistor socket adapters. The instrument will measure the AC beta of bipolar transistors, including Darlington and dual types, with an accuracy of ± 3 percent. Transconductance of FET's can also be measured up to Gm values of 100,000 with accuracy of ± 3 percent. Zero bias drain current, DC drain current, and out-of-circuit gate leakage measurements can also be made. Operating current levels are adjustable up to 20 milliamperes. The tester is supplied with instructions, two plug-in test adapters, and a set of clip leads for in-circuit work. The test leads, three-wire power cord, and adapters can be stored in the rear of the instrument.

Price: Model RCA-WT-524A is priced at $159.

For More Details Circle (53) on Reply Card

Function Generator

Product: Model 400 function generator from Datapulse Division of Systron-Donner.



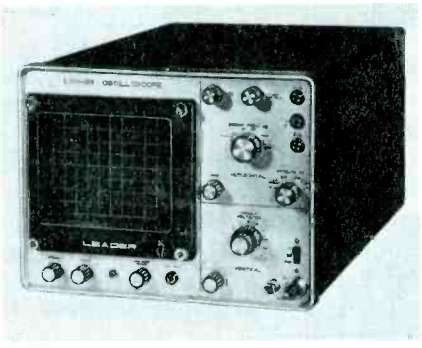
Features: Model 400 features 1Hz to 2MHz frequency range, 1000 to 1 frequency modulation, sine, square, and triangle waveforms with sine distortion less than 1 percent. The dial index is backlit by the pilot light for ease of setting. Waveform selection is accomplished by pushbuttons.

Price: Model 400 sells for $250.

For More Details Circle (54) on Reply Card

Wideband Solid-state Scope

Product: Model LBO-511 wideband solid-state oscilloscope/vectorscope from Leader Instruments Corp.



Features: Recurrent sweep with automatic synchronization, and a phasing control are included in the LBO-511. Sweep frequency is in four ranges (10Hz to 100 KHz) while the phasing control is continuous from 0 to 140°. The calibrated vertical input has 20uV p-p/CM to 10V p-p/CM sensitivity. Special inputs are included allowing use as a vectorscope. Bandwidth is DC to 10MHz. Power requirements are 115/230V; 50-60Hz/; 25VA.

Size: Dimension are 7-3/8 X 9-7/8 X 16-1/2 inches. Weight is 15 pounds.

Price: Model LBO-511 is priced to sell for $349.95 □

For More Details Circle (55) on Reply Card

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productreport

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.

Collapsible Hand Truck

Product: Tota/ton, collapsible, aluminum two-wheeled hand truck by S & H Industries, Inc.

Features: Made of aluminum alloy, the hand truck is an aid in transporting loads weighing up to 300 pounds. The collapsible 15-pound unit can be used at a 36-inch height for moving short loads, or extended to 54 inches for taller loads. Tota/ton unfolds for use, then collapses to a flat 6 X 36 inches for car trunk or other storage. Two models are available, tota-

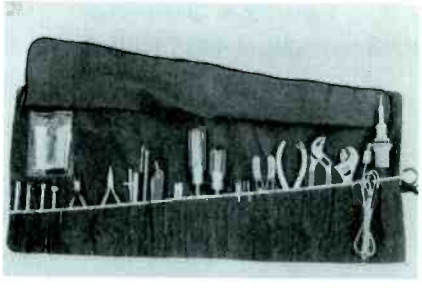
ton Model TT-65 with 6-inch lifters and Model TT-105 with 10-inch lifters. They have a 13-1/2-inch wheel base and 5-inch non-marring rubber wheels which are equipped with lubricated wheel bearings.

For More Details Circle (56) on Reply Card

Tool Kit

Product: JTK-80 roll pouch tool kit from Jensen Tools and Alloys.

Features: Designed primarily for service technicians, field engineers and advanced students of electronics, the kit contains 25 professional tools. The assortment includes a soldering iron, double-ended solder aid, combination wire stripper/cutter, reverse-action heat-sink tweezers, 8" adjustable wrench, six-key hex-wrench set, six-key spline-wrench set, two Phillips driver blades, two regular-slot driver blades and four nutdriver blades, two handles for the driver blades, two pocket screwdrivers, a general-purpose alignment tool, burnisher, electrician's pocket



knife, long-nose pliers, miniature chain-nose pliers, miniature diagonal cutters, a pair of slip-lock pliers, and a 6" stainless steel scale.

Size: The kit measures 27-1/2 X 13 inches.

Price: JTK-80 sells for less than $45.

For More Details Circle (57) on Reply Card

MATV Design Guide

Product: Mastering TV Distribution Systems, a master-antenna design book by Jerrold Electronics.

Features: The 64-page book provides 38 head-end and distribution system layouts which are representative of most MATV system requirements. It first presents three easy steps to system design, then goes into basic MATV theory, system calculations and signal balancing. All types of MATV systems for apartment houses, hotels, schools, hospitals, mobile-home parks and housing developments are covered. The design guide includes a thorough discussion of decibels and how to use them in MATV calculations. It also covers methods of eliminating interference, signal surveys, antenna stacking, closed circuit TV channels and background music.

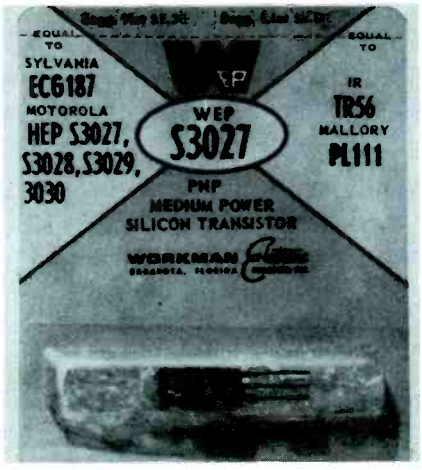
Price: Mastering TV Distribution Systems is priced at $3.

For More Details Circle (58) on Reply Card

Semiconductors

Products: WEP solid-state semiconductor components from Workman Electronic Products, Inc.

Features : The WEP line of solid-state semiconductors features informative packaging. All packs are cross-referenced to all major lines on the face of the package. The uniform, pre-priced and color-coded packs also contain full specifications, basing diagram with symbol and ratings on the reverse side. Up-to-date cross-reference material is available on call from



the manufacturer. The WEP series consists of some 200 numbers providing one-for-one replacement against competitive numbers and the complete cross referencing enables them to replace up to 1000 numbers in other lines.

For More Details Circle (59) on Reply Card

Replacement Transistor

Product: IRTR94 MP replacement transistor for the Sanyo 2SB474(G) by International Rectifier Corporation.

Features: The IRTR94 MP is an exact replacement for the widely used Sanyo transistor because the pin spacing is slightly wider than the standard TO-66 configuration. The device from International Rectifier is used in stereo amplifiers and other audio frequency equipment which requires wide frequency range and low distortion, specifically, all Sanyo and Panasonic tape decks as well as a high percentage of other tape decks manufactured in the Far East.

Price: IRTR94 MP is priced at $10 per pair.

For More Details Circle (60) on Reply Card

Electronic Siren

Product: S8 Electronic Siren by Mountain West Alarm Supply Company.

Features: The S8 electronic alarm siren features a loud, penetrating, yelping signal, especially useful for burglar and fire-alarm systems. The high sound level of 109dB measured 10 feet from siren can not only summon help, but also can drive away an intruder. Completely transistorized, the S8 Siren has no moving parts to wear out. It is packaged in one waterproof unit. Power input is ¾ AMP at 12 VDC but siren will operate at 6 VDC or less.

Size: The S8 Electronic Siren measures 6 inches long with a 5-1/4-inch diameter trumpet. It weighs 1.5 pounds.

Price: S8 sells for $39.50.

For More Details Circle (61) on Reply Card

Camera Housing

Product: Cyclonic Camera Housing by Triple-S Development Co., Inc.

Features: The camera housing, of all-weather or adverse-environment design, provides viewing clarity through its high-speed rotating window. While in operation, the window hurls off window contamination agents such as rain, snow, dirt, mud, or oil. In addition, the window will not fog as a result of excessive temperature changes, or high humidity conditions. It is self-cleaning.

Size: 12½ inches wide, 12½ inches high and 26½ inches long. □

For More Details Circle (62) on Reply Card

catalogs literature

Circle appropriate number on Reader Service Card.

100. AVA Electronics Corp.—has published a 1973 CATV, MATV connector price schedule featuring a comprehensive listing of "F" connectors. Each connector is illustrated with a picture. The schedule also illustrates a complete listing of UHF and BNC connectors.

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

102. Cornell-Dubilier Electronics—has issued a 1973 replacement guide for electrolytic twist-prong capacitors. The guide lists 276 CDE capacitors which can replace 97% of all the twist-prong units now in service (estimated to be over 25,000). The 56-page brochure tabulates the capacitors in three ways: by catalog number, OEM number (manufacturer's name) and by ratings.

103. GC Electronics—offers Audiotex Catalog FR-73-A which lists everything necessary for proper care and maintenance of sound equipment, a complete assortment of security alarms and accessories, and antennas and installation hardware.

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

105. Kay-Townes, Inc.—introduces a 16-page short-form MATV/CATV catalog and price list. The new catalog contains complete specifications on the "New Reliables" line of equipment listing over forty additional products.

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

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

108. Metropolitan Supply Company — has a directory of electronic tubes which lists some 5000 industrial, entertainment and military tube types in alphanumerical order with quantity discount prices. Copies are available free when requested on company letterhead.

109. Pomona Electronics—announces publication of its 1973 catalog of electronic test accessories. Featured new products include a do-it-yourself "Grabber" (a version of the mini-test clip) and two molded breakout test cables. The catalog provides illustrations and

complete engineering information on all products, including dimension drawings, schematics, specifications, features, and operating ranges.

110. TDK Electronics Corporation—has a 48-page booklet, "The TDK Guide to Cassettes", which contains useful information on home tape-recording methods and equipment. The booklet offers facts and tips for those who want to learn more about tape-recording techniques and how to get more rewarding results. It contains a short course in tape-recording terminology and technology for the layman, including an explanation of the various types of tape formats, their merits and applications.

112. Hitachi Sales Corporation of America—presents a compilation of audio basics written to be used by retail salesmen. It's a primer and introduction to the most commonly used audio terms. Complete with definitions, illustrations, and diagrams, it runs the gamut from "acoustic suspension speaker" to "woofer and wow". A special feature is a clear explanation of the various systems for 4-channel sound.

113. The Semiconductor Division of International Rectifier Corporation—offers the 1973 Semiconductor Cross-Reference and Transistor Data Book. The 72-page cross-reference uses straight alphanumeric listing and includes rectifiers, capacitors, zeners, transistors, SCRs and ICs (chips). The book shows IR transistor specifications and case diagrams, and also contains an "exact replacement" IC data sheet.

114. Motorola, Inc.—has released a full-line catalog on "Motorola Test Equipment" covering products ranging from service monitors to tone generators and wattmeters. The 36-page, color catalog includes photographs and complete listings of features, specifications and model nomenclatures for available test equipment. □

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.

Auto Stereo Accessories

Product: Program No. 49-1440 merchandising program of auto stereo accessories from GC Electronics.

Features: The merchandising program features a series of replacement speakers and speaker kits, padded speaker grilles, headphone adaptors and control boxes, auto voltage inverters, speakers and fader controls, AM and AM/FM Multiplex tuners, stereo mounts and locks, and various tape maintenance accessories.

For More Details Circle (63) on Reply Card

Radio Headset

Product: Model #RH-02 "The Sportster" AM radio headset by Mura Corporation.

Features: Model RH-02, a lightweight radio headset, was designed for active people such as football and baseball fans, fishermen and cyclists. Six transistors and two three-inch transducers supply hi-fi sound. Including all standard features plus an adjustable headband, the "Sportster" comes with a plastic carrying case/padded pillow. The headsets include a nine-volt battery.

For More Details Circle (64) on Reply Card

Microphone

Product: Model 857L-S microphone from Astatic Corporation.

Features: Designed for public address, paging, hotels, and recording, model 857L-S has low impedance with "on-off" switch connector. The nickel-finish microphone features slim-line design with ball-head filtering to minimize wind and close-talking "pop" effects. The cable connector is a professional, threepin type. □

For More Details Circle (65) on Reply Card

Letters To The Editor

(Continued from page 15)

Before a technician takes the examination, they recommend he study a book called "Study Guide For CET Examinations" written by J. A. Wilson and Dick Glass. This book is Howard Sams number 20834 which can be purchased for $5.95 from many parts distributors or from:

Howard W. Sams & Co., Inc.
4300 West 62nd Street
Indianapolis, Indiana 46268 □

Solution to:

ARCS AND SPARKS!

(Continued from page 50)

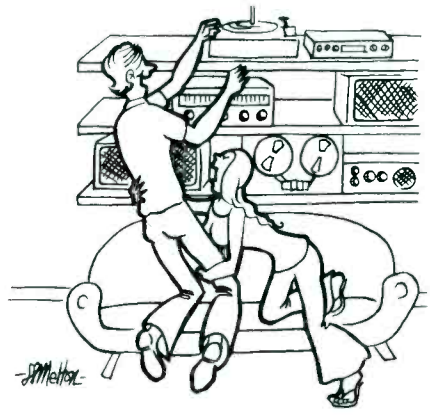
1. encapsulation
2. labyrinth
3. tolerance
4. pentagrid
5. bedspring
6. insulator
7. graticule
8. prototype
9. converter
10. magnesium
11. implosion
12. component
13. secondary
14. laminated
15. magnetism
16. potential
17. soldering
18. voltmeter
19. electrode
20. interlock
21. frequency
22. replacement
23. capacitor
24. speaker
25. choke

Start with 100 points and deduct 4 points for any part you may not have answered correctly

BONUS: Just trying this puzzle qualifies you to subscribe (or renew your subscription) for a mere $6.00 to cover the cost of publishing and mailing for a full year!

Your rating:

60 - 64 Not bad.
68 - 72 Not good.
76 - 84 Not excellent.
88 - 96 Not perfect.
100 **PERFECT!**



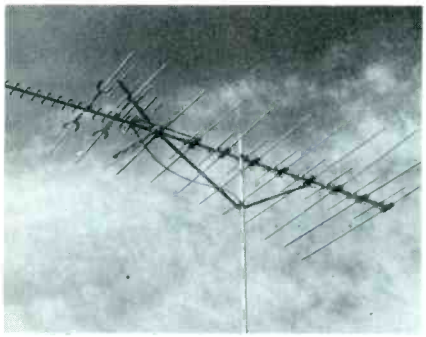
"Roger! You're going to have to make a choice—**me** or my father's hi-fi equipment!"

antenna systems report

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

Antennas

Product: Ultra-Hi Crossfire VHF-UHF antennas by Channel Master.



Features: Channel Master has developed a series of VHF-UHF antennas incorporating colinear elements and a corner reflector to provide increased gain on the UHF band, particularly the lower channels which carry most of the UHF programming. The UHF section has been engineered to avoid interference with the rest of the antenna. The antenna has a single set of terminals, but a band splitter is supplied at no extra cost. The splitter employs separate VHF and UHF circuits, affording electrical isolation between outputs.

Price: Ultra-Hi Crossfire prices range from $30.25 to $98.50.

For More Details Circle (66) on Reply Card

Broadband Indoor Amplifiers

Product: Models DA1V-75P indoor solid-state 75-ohm broadband amplifier, and Model DA4V-75P amplifier by Blonder-Tongue Laboratories.

Features: Models DA1V-75P and DA4V-75P, redesigned for wider bandwidth CATV specifications, now cover the range from 54MHz to 270 MHz, including VHF, mid-band and super-band channels. Both amplifiers produce only -57 dB cross modulation when operating with 21 channels having 27 dBMV input. Minimum gain of the single-output DA1V-75P amplifier is 9.5 dB, while the gain of the four-output Model DA4V-75P is 8 dB with only one output used, or about 5 dB when all four outputs are in use. Because of the low amount of cross-modulation, Blonder-Tongue recommends these amplifiers for use where signals of greatly-different strength are encountered. Model DA1V-75P also supplies 15 volts AC, which may be duplexed up the 75-ohm signal cable for powering a mast-mounted preamplifier.

Price: Price to CATV operators is $19.50 for the DA1V-75P.

For More Details Circle (67) on Reply Card

Indoor Antenna

Product: Model TELE-VUE No. 6040 from I E Manufacturing.

Features: TELE-VUE indoor antenna is engineered for UHF-VHF-FM, and has a lead-in wire for UHF and one for VHF. It has a 12-position selector switch. □

For More Details Circle (68) on Reply Card

advertisers' index

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.

FOR SALE

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

FOR SALE (Cont.)

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

REPLACEMENT TRANSISTORS up to 75% below **Dealer Net!** Send for details. Kenneth E. Hull C.E.T., 835 Halesworth Dr., Cincinnati, Ohio 45240. 10-73-2t

TV-RADIO TEST EQUIP.: RCA WR69A sweep gen.; WR70A marker adder; WG295C video marker; WG304B R.F. Mod.; Hickock 288AX Gen.; Precision E-200C Gen. Instruction books, cables. Make offer. Gerald Wilson Hamburg, Ill. 62045. 618-232-4406 10-73-1t

NEW CONDITION TEST EQUIPMENT: HEATHKIT 1G57 TV SWEEP GEN $125. HEATHKIT IM25 LAB TYPE VOM $95. HEATHKIT IP25 L.V. SUPPLTY $85. DATA INSTRUMENTS 555 SOLID STATE TRIGGERED 7MHZ OSCILOSCOPE $255. SEND CERTIFIED CHECK F.O.B.: APPLIED VIDEO ELECTRONICS, INC., BOX 25, Brunswick, Ohio 44212 10-73-2t

USE YOUR SCOPE (ANY MODEL, NO REWIRING) TO TEST TRANSISTOR IN/OUT CIRCUIT. SIMPLE ISTRUCTIONS $1.00. SCHEK TECHNICAL SERVICES, 8101 SCHRIDER ST., SILVER SPRING, MARYLAND 20910. 10-73-12

BUSINESS OPPORTUNITIES

PARTNERS WANTED: We currently own and operate stereo repair stores in the states of Delaware, Pennsylvania and New Jersey. We are authorized warranty stations for more than fifty national corporations who manufacture televisions, radios, tape recorders, turntables, speakers, and various other hi-fi components. We seek strong individuals to build a national service organization. You must be a capable technician trained in solid state repair. We'll guarantee you sets to repair and the tools and facilities with which to repair them. You will, of course, have a store of your own to manage near your present home. A $25,000 investment is required but a good portion of it can be paid out of the future profits of your own store. Call or write: Donald A. Bailey, Sound Repair Centers, Inc., 1700 Market St., Philadelphia, Pa. 19103, 215-563-4400 10-73-1t

SERVICE

"NOW YOU DON'T HAVE TO throw-away that good old piece of equipment because of a transformer. Send us the old transformer and we will re-wind it. May cost less than buying a new one. Power transformers, modulation, vertical, audio, etc. etc. Any kind. Any size. Televideo Communication Lab., 380 E. 14 St., Hialeah, Fla. 33010". 10-73-1t

WANTED

YOUNG MAN 22 seeking job in T.V. and Radio Servicing, in N.Y.C. area. Call after 7 p.m. 212-UN-4-2400 Apt.#609 9-73-2t

EDUCATION INSTRUCTION

REPAIR TV TUNERS—High Earnings; Complete Course Details, 12 Repair Tricks, Many Plans, Two Lessons, all for $1. Refundable. Frank Boeck, Box 3236 Enterprise, Redding, Calif. 96001. 9-73-7t

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Our tests show that JERROLD Super Vu-Finders And Paralogs Outperform All Others

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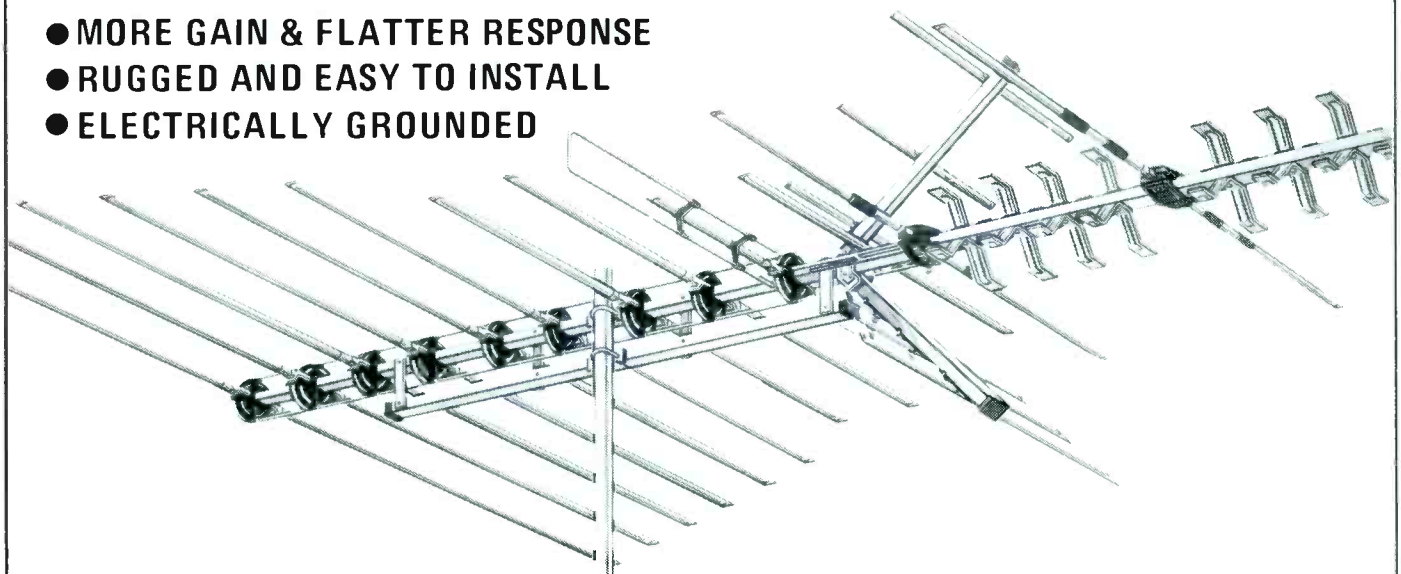
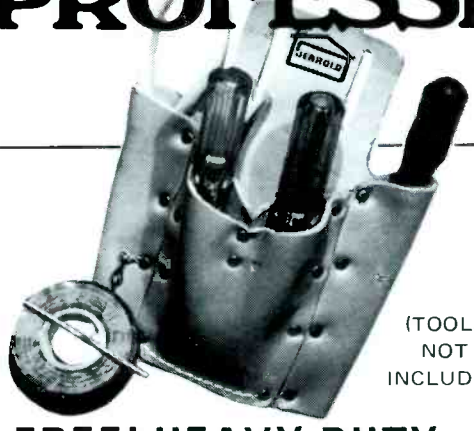
- ELECTRICALLY GROUNDED



WE WANT YOUR PROFESSIONAL OPINION.



(TOOLS NOT INCLUDED)

FREE! HEAVY DUTY LEATHER TOOL POUCH

Last year we offered NFL Coffee Mugs for trying Jerrold antennas. This year it's Tool Pouches. Why do we make these offers? Because we know that once you stack Jerrold antennas up against the antennas you are using now, you'll switch to Jerrold. Hundreds of dealers switched last year.

If you're a professional antenna installer, you owe it to yourself to make this evaluation.

FOR EVALUATING ANY SUPER VU-FINDER OR PARALOG 300 PLUS.

JERROLD ELECTRONICS CORPORATION

P. O. Box 350, Dept. DSD, 200 Witmer Road, Horsham, Pa. 19044

ES

Please send me a free Tool Pouch. Enclosed is an instruction sheet from the following Super VU-Finder antenna.

(model) _____

1 Before trying the Super VU-Finder, I was using the following antenna:
(make) _____ (model) _____

2 In my opinion the Super VU-Finder is: ☐ BETTER ☐ WORSE
because: _____

3 Comments: _____

NAME _____

COMPANY NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

COUPON MUST BE POSTMARKED BEFORE DEC. 31, 1973

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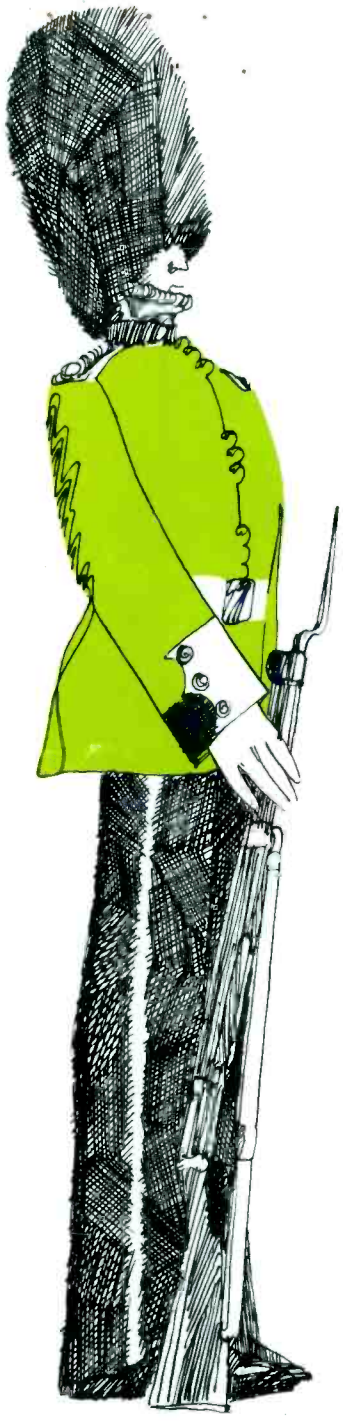

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