

ET/D

MARCH 1978 • \$1.00

ELECTRONIC TECHNICIAN/DEALER
LEADING THE CONSUMER AND
INDUSTRIAL SERVICE MARKETS

Car radio tuners

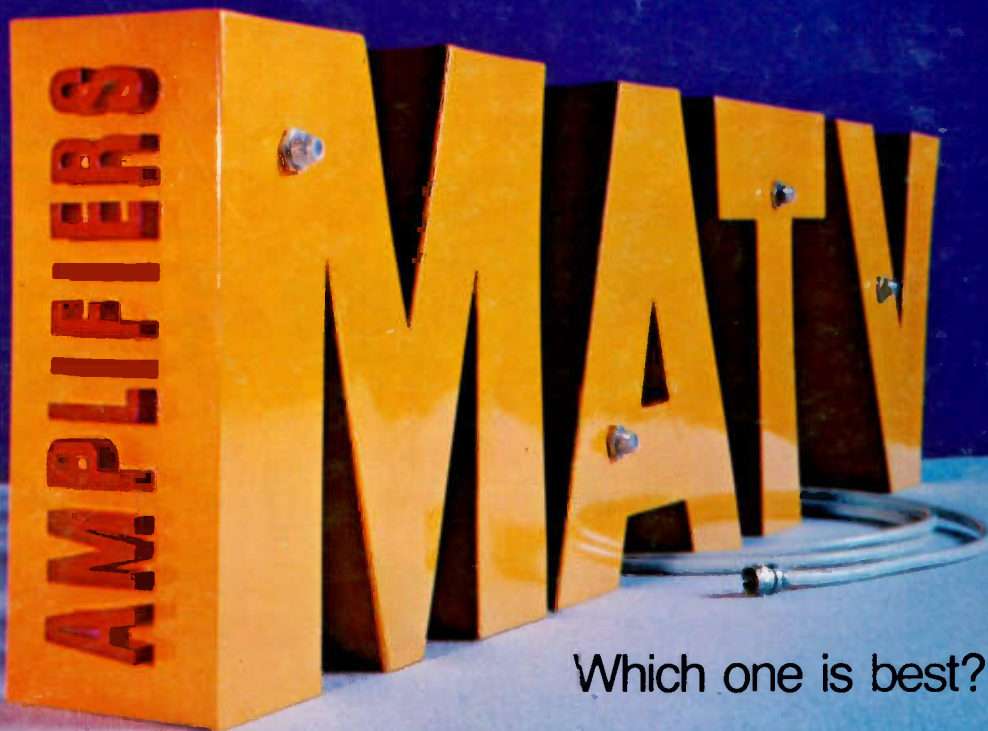
Some service hints

TV antenna design

Thirty years of progress

Winter CES

The year ahead



Which one is best?

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47938BA4M
RAY KOWECK
27734 DENMAR
WARREN
-676-

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APR 79
-AS

MI 48093



A HARDCOURT BRACE JOVANOVIICH PUBLICATION

An up front discussion on tuner repair and module rebuilding.

TV service technician dealers are in business to earn a profit, providing customers with timely, professional work. To maximize profits and still provide quality work, it makes sense to take advantage of outside independent help. Our tuner repair and module rebuilding services can add new dimension to your shop's profits. Consider the advantages PTS offers.

1. One stop shopping. Our tuner repair service includes

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2. Repair . . . our first business and our major business. Our service business isn't an after thought to manufacturing. We stay on top of the latest design developments in all brands—not just one or two.

3. Same day service. Your reputation is as much time as it is quality. Same day service isn't a gimmick with us, it's a promise we strive to keep.

4. Module Exchange. Not only do we rebuild modules. We also exchange and buy duds.* You can turn dud modules into needed cash.

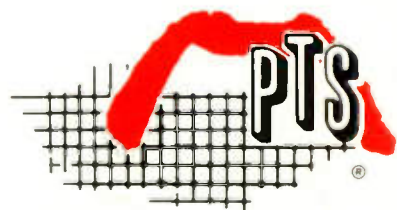
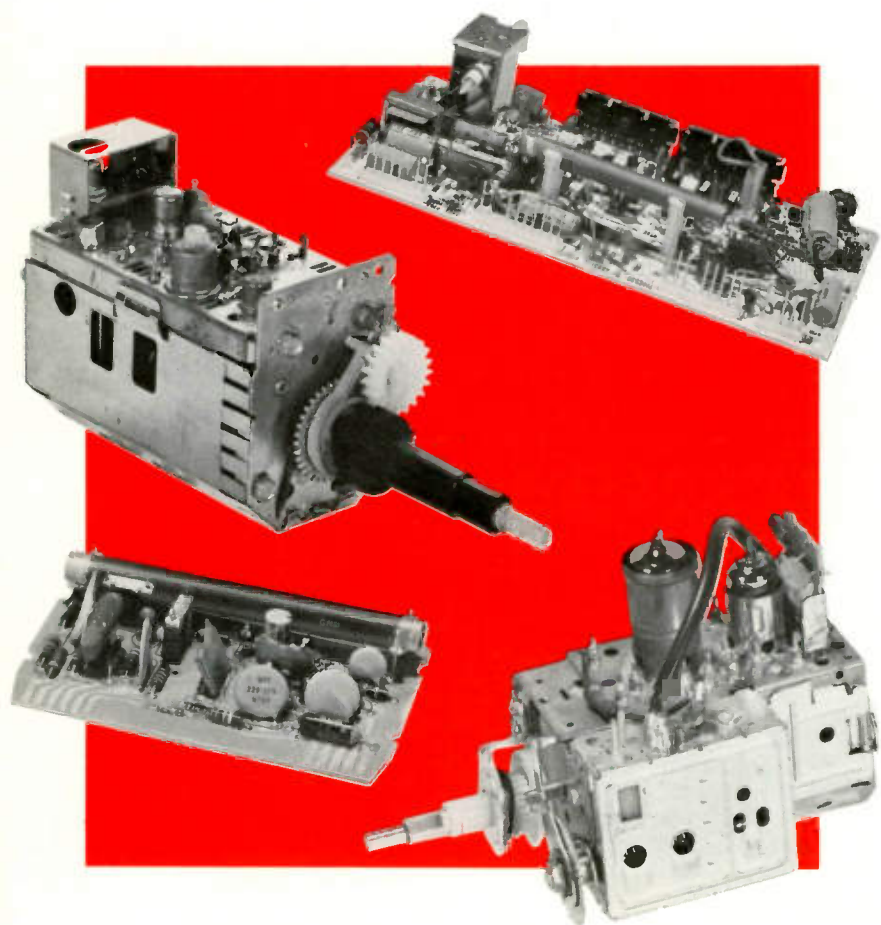
5. One year warranty. We're so confident of the professional quality of our work, we provide a one year limited warranty to back it up.

6. Protective packages. Tuners and modules are shipped to you in protective packaging, eliminating risk of damage.

7. Replacement parts. All tuner and module services utilize original or superior parts. Parts are constantly updated to improve module and tuner performance and reliability.

8. Servicenters. There are PTS company owned servicenters in every metropolitan area of the U.S. Each is fully equipped and professionally staffed to serve you.

* Acceptable brands are Admiral, GE, Magnavox, Montgomery Ward, Philco, Quasar, RCA, Sylvania, Sears/Warwick, Wells-Gardner and Zenith. PTS reserves the right to reject any or all modules presented for dud value including ceramic encapsulated, broken or cannibalized modules.



PTS ELECTRONICS, INC.

A COMPLETE LIST OF PTS SERVICENTERS
APPEARS AT THE RIGHT.

PTS SERVICENTER GUIDE

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602-278-1218

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3007 N. May, P.O. 60566
405-947-2013

HOUSTON, TX 77207
4326 Telephone Rd., P.O. 26616
713-644-6793

INDUSTRY REPORT



JAFFE



O'BRION

NEWCOM To Host Video and Safety Seminars

The 1978 New Communications (NEWCOM) show, scheduled May 2-4 at the Las Vegas Convention Center will feature a series of special marketing seminars, including two on developing areas of consumer electronics.

Keynoting a session Tuesday May 2 on "Life Safety Sound Systems" will be Herbert M. Jaffe, (on the left) director of marketing of Atlas Sound. He will discuss the general standards and requirements for life safety systems, the types of products the distributor and sound contractor will need, and will end with a special presentation on opportunities for sound distributors and installers in this developing new area of electronics.

Another speaker, on Wednesday, will be Richard O'Brion (on the right) of JVC. This seminar will deal with current products, applications and opportunities in the commercial video field.

Other informational programs scheduled during NEWCOM will be sessions on the impact of electronic technology, automotive electronics and motivating and training personnel.

Detailed Marketing Study Released by High Fidelity Institute

A detailed marketing study, the first of its kind, has been released by the New York based Institute of High Fidelity indicating optimistic business conditions for the remainder of 1978.

In its first of what is to be an annual sales volume and product forecast survey the IHF has predicted growth patterns by channels of distribution as well as different product categories.

Robert L. Gur-Arie, IHF executive director, reported the study was based on a nationwide sample of high fidelity dealers of all types, including radio-TV appliance retailers, and is designed "to provide retailers and manufacturers with a useful management tool in preparing marketing plans."

According to Gur-Arie, this type of de-

tailed marketing data has never before been available to the industry.

The forecast, available from IHF (489 Fifth Ave., N.Y.C., N.Y. 10017) at \$15 for members and \$25 for non-members, is broken down into three main topics. They are: annual sales volume by product; the national and regional distribution growth forecast; and the national and regional business forecast, which indicates the anticipated growth by percentage on the national and regional levels.

The various types of high fidelity outlets listed in the survey are HIFI Audio Specialists, Audio Equipment & Accessories Retailer, Radio - TV appliance dealer, automotive parts retailer, Department store, catalog showroom, discount store, mail order house, general electronic retailer, music and record shop, photo retailer and a catch all "other" category.

According to John Hall of U.S. Pioneer Electronics, who served as chairman of the IHF Research Committee responsible for the survey, the results are designed to permit hifi dealers "to examine their own method of operation in terms of product mix, future plans and retail competition on local, regional and national levels.

"For the high fidelity manufacturer, the survey provides information relating to their future product efforts, as well as the types of distribution for those products."

The four regions categorized in the survey are East Coast, including the New England and Middle Atlantic states; the Midwest, made up of east north central and west north central states, the South, consisting of South Atlantic, east south central and west south central states, and the west coast region which includes the mountain and pacific states.

Coast Guard Selects Channel Nine

The Coast Guard has decided it will monitor CB channel nine as an emergency backup to the currently used maritime emergency channels.

According to an EIA statement, the Coast Guard reports it will have CB equipment installed at all of its Search and Rescue stations throughout the United States in time for the 1978 recreational boating season.

EIA Spokesman Mark Rosenker said the Coast Guard's decision to monitor CB channel nine is an effort to provide an alternate means of alerting the Coast Guard to boaters not equipped with VHF-FM or 2Mhz systems. "With the Coast Guard's decision to monitor CB for maritime emergencies, CB users can be secure in knowing that emergencies can now be reported on both land and sea," he said.

The Coast Guard said, however, that the national maritime communications



Circle No. 102 on Reader Inquiry Card

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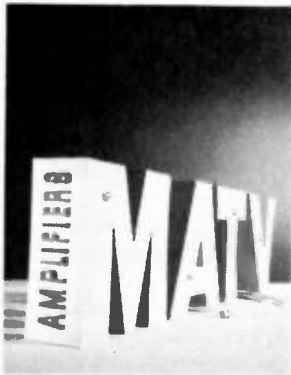
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On the cover:

The choice of which amplifier to use for that MATV system is important, as symbolized by our cover this month. You'll learn more about making that choice on page 16.

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Proper price-performance tradeoff is the key to profit 16

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WITH CABLES

**ONE YEAR
GUARANTEE**



\$10.95
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MAJOR PARTS
AND SHIPPING
CHARGED
AT COST

FEATURES

- A UHF Tuner with 70 channels which are detented and indicated just like VHF channels.
- A VHF Hi Gain Solid-State Tuner
- AC Powered
- 90-Day Warranty

Demonstrate the **SUBSTITUNER** to your customers and show improved reception with their TV sets.

You may place your order through any of the Centers listed below.

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

TUNER REPAIRS

VHF OR UHF ANY TYPE (U.S.A. ONLY) \$10.95
UHF/VHF COMBINATION (U.S.A. ONLY) \$17.95

MAJOR PARTS AND SHIPPING
CHARGED AT COST

- Fast, efficient service at any of the conveniently located service centers listed below.
- ONLY ORIGINAL FACTORY PARTS USED
- All tuners ultrasonically cleaned, repaired and realigned.

EXACT REPLACEMENT

Exact Replacement Tuners are available at a cost of \$14.95 and up. (U.S.A. Only)

- Send in your original tuner for comparison purposes to any of the Centers listed below.

UNIVERSAL REPLACEMENT

UNIVERSAL REPLACEMENT TUNER (U.S.A. ONLY) \$13.95

- This price buys you a complete new tuner built specifically for this purpose.
- All shafts have a maximum length of 10½" which can be cut to 1½".
- Specify heater type parallel and series 450mA or 600mA.

**F
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NOW AVAILABLE — TUNER SERVICE PARTS CATALOG OF ALL SARKES TARZIAN VHF AND UHF TUNERS, INCLUDING EXPLODED VIEW DRAWINGS. OVER 200 PAGES. ORDER YOUR COPY TODAY. SEND \$2.50 WITH ORDER TO BLOOMINGTON HEAD OFFICE.



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	MODESTO, CALIF. 95351	123 Phoenix Avenue	Tel. 209-521-8051
	SAN MATEO, CALIF. 94402	600 S. Amphlett Blvd.	Tel. 415-348-3292
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TEXAS	DALLAS, TEXAS 75218	11540 Garland Road	Tel. 214-327-8413
CANADA	ST. LAURENT, QUEBEC H4N-2L7	305 Decarie Boulevard	Tel. 514-748-8803
	CALGARY, ALBERTA T2H-1Y3	P.O. Box 5823, Stn. "A"	Tel. 403-243-0971

IF YOU WANT TO BRANCH OUT INTO THE TV TUNER REPAIR BUSINESS, WRITE TO THE BLOOMINGTON HEADQUARTERS ABOUT A FRANCHISE.

Circle No. 133 on Reader Inquiry Card

and distress systems associated with VHF-FM and 2182 Khz will continue to be the primary system and the one that is "strongly recommended for safety."

Panasonic to Expand Role for its VIR Integrated Circuit

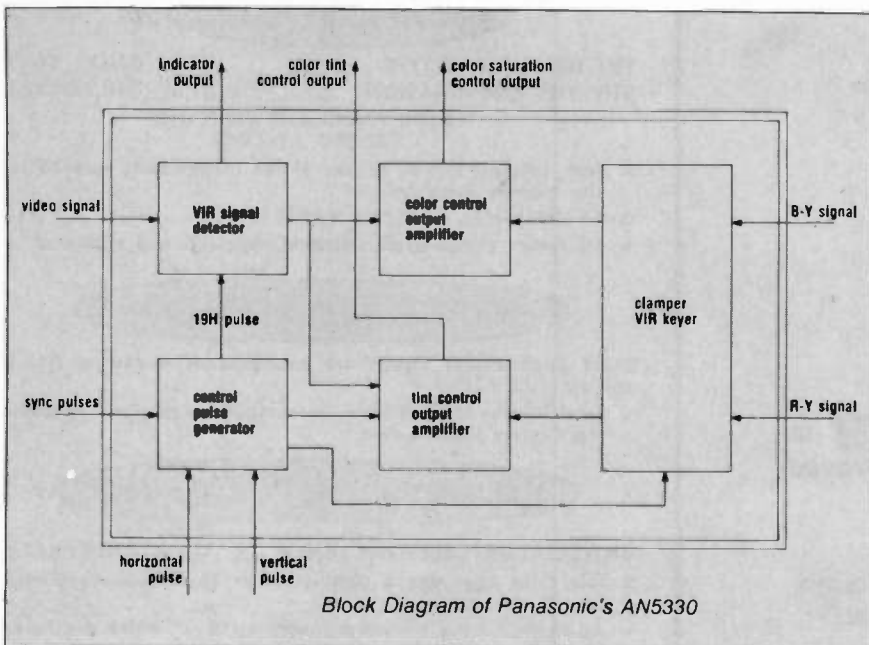
Panasonic Company, which currently is using the Matsushita developed VIR signal processor IC in its 19-inch portable model CT-947, has announced it will incorporate it into even more models.

The VIR (Vertical Interval Reference) IC (AN 5330), is a fully automatic television control system for color saturation and tint which monitors the broadcast VIR signal and automatically compensates for variations in color intensity and tint. The VIR broadcast signal originated when an effective means of eliminating

unwanted color broadcast signal variation was sought.

According to Panasonic spokesmen, the new IC incorporates some 481 elements onto a 9.3 square millimeter chip—the largest concentration ever achieved in a bipolar IC for use in television. The new chip works in conjunction with standard color circuitry already incorporated in color sets. The AN 5330 requires only horizontal, vertical, video, and R-Y and B-Y signals as inputs.

According to the Panasonic statement, the model 5330 "utilizes an adjustment free circuit design which provides highly accurate control and excellent transient characteristics." The digital and linear circuits of the IC are fabricated onto a single, 24-pin, dual in-line package.



Atlanta to Host High Fidelity Show May 19-21

Atlanta, Ga., will be the site of the first annual International High Fidelity Show, billed as the only national trade show exclusively for high fidelity, May 19-21 at the new Georgia World Congress Center.

According to the sponsoring Institute of High Fidelity, this first high fidelity show will include eleven full sessions providing lectures by experienced dealers and retail professionals.

According to a spokesman, one highlight of the show will be Saturday morning's concurrent breakfast sessions during which convention goers will be able to select according to their tastes. One session, emphasizing sales training, will deal with "The Audio Store's Profitability Challenge." A second session, "Showcasing Hi-Fi Components to Increase Sales, will detail sales promotion hints, and a technical conference will preview innovations in high fidelity technology.

This latter session will provide insight into 1979 high fidelity technology.

NESDA Names New Exec and '78 Convention Plans.

Charles Porter, CET, president of the Virginia Electronics Association, has been named the new Executive Vice President of the National Electronics Service Dealers Association (NESDA).

Porter, a member of ISCET with over 20 years experience in the electronics service industry, replaces Ralph Tirrell, the executive director of the Arizona State Electronics Association, who took over on an interim basis with the resignation last August of Dick Glass.

In announcing Porter's appointment, NESDA President LeRoy Ragsdale said Porter, being familiar with the original programs of NESDA and ISCET will provide the association with continuity and expertise."

In addition to Porter's appointment, Ragsdale also announced NESDA's 1978 annual convention will be held August 7 through the 13th in Portland, Ore. The convention headquarters, he said, would be the Red Lion Motor Inn on Jantzen Beach. **ETD**

ET/D

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"There's no reason why a TV service shop can't be run in a professional way—and that's exactly how we operate here at SUS."



"One of our chief sources of new business has been referrals. Our customers tell their friends about our clean shops, good service, and courteous technicians."



"Every technician must take his full tool kit to a customer's home. How much confidence will a customer have in a technician who walks in with just a screwdriver?"

"Our name, **SERV-U-SERVICE**, spells out what we believe in... **SERVICE!**"

Jack Hahn, President, SERV-U-SERVICE Corp., Pittsburgh, Pennsylvania.

Three generations devoted to service.

SERV-U-SERVICE is a family-operated consumer electronics service primarily devoted to TV repair. SUS covers a tri-state area including southwestern Pennsylvania, eastern Ohio, and West Virginia.

Jack Hahn, founder and president, began with a four-year course in electronics, worked for several small television shops and then for a large service agency where he became service manager. Self-confidence led Jack into his own business, which was incorporated as SERV-U-SERVICE in 1970.

To his own technical competence Jack added the business expertise of his older brother, Frank D. Hahn, who is now general manager.

Patriarch Frank J. Hahn, Sr., now 73, helped convince Frank J.



Patriarch Frank J. Hahn with Sons, Jack (center) and Frank (right).

Hahn, Jr. (son of Frank D. Hahn) to join SUS in 1976. Frank, Jr. had just earned his Master's Degree. He handles SUS service operations in Ohio and West Virginia.

In all there are *eight* family members contributing daily to servicing the SUS customers.

But close family is not all. A key figure at SUS is Service Manager Ron Landis. Ron joined in 1970 after earning an Associate Degree in Electronics Engineering and working two years servicing electronic equipment for the Air Lines.

Neatness and orderliness are basic.

A visitor's first impression of SUS is the obviously well-maintained two-story building. All shop and work areas are spotlessly clean and carpeted.

There are four shop technicians and eleven field technicians. All wear uniforms that bear the SUS logotype: "Let SUS Repair It."

Each SUS truck is kept clean and orderly by the technician who drives it. Carpeting in the trucks and heavy cardboard boxes protect television sets in transit.

Color-coded stickers are attached to sets indicating: Open, Parts Needed, and Complete.

"Mobile shop" is busy and efficient.

Jack Hahn works almost entirely out of a "mobile shop" featuring a \$20,000 parts inventory and testing equipment investment. He makes weekly visits to fifteen Kelly and Cohen department stores.

(SUS also services twenty-eight non-servicing dealers.)

SUS uses an unusual "tip sheet."

Ron Landis lists repair tips to aid the technician. If Ron feels special parts are needed, he adds them to the technician's pouch.

Paying attention to details is part of good service.

Field technicians maintain parts inventories in their trucks and benchmen keep a list of parts needed in the shops.

If the estimate signed by the customer is likely to be exceeded, the customer is called before the work is done.

All replaced parts are returned to the customer in a plastic bag that doubles as a litter bag.

Plus, a "Serviced by SUS" convenience sticker is affixed to each set to make it easier if SUS is needed.

The future looks good for SUS and the Hahn clan, with plans to double the business in five years through diversification and servicing of new products. The elder Hahn, 73 years wise, explains the success of SERV-U-SERVICE: "You see, our hearts are in the business."

RCA

Consumer Electronics Division
600 N. Sherman Drive
Indianapolis, IN 46201

Better Service Through Better Communications

Circle No. 127 on Reader Inquiry Card

FROM THE EDITOR'S DESK



Despite the fact that 98 per cent of American homes already had a television set, 1977 — by any standard — has to be considered a boom year for video. By video, I refer not only to television which racked up its strongest year in sales since 1973, but also in regard to the developing markets in home video tape recorders, video tape, and video games—all of which are closely related to your customer's color television screen.

For those who are inclined toward figures, here are some recent statistics released by the Electronic Industries Association. While total television set sales last year were 14.77 million, the year in color TV was phenomenal. It was the best "color" year ever in terms of dollars (\$3.3 billion) and the second best in terms of units sold to dealers, 9,106,826—just short of the record 9.3 million units sold in 1973 and a hefty 18.3 per cent over the 7.7 million sold in '76.

The enthusiasm for video, carried over into other home entertainment electronics segments, too. For instance, the number of AM/FM or FM only radios sold to dealers exploded in 1977 to 31 million units, up an astounding 61 per cent from the 19 million sold in 1976.

We also know from talking with manufacturers and other industry sources that the demand for home video tape recorders at the end of last year far exceeded supply. Predictions for continued growth in this market are encouraging.

The market in video games, programmable and otherwise, seems firmly entrenched as another profit area for manufacturers and, in a sense, is helping pave the way for more expensive and complicated devices such as the portable home computer—many of which have already been designed for use with the consumer's color television screen as the readout device. Then too, just over the horizon, is the possibility of the perfection of "large" screen video projection systems.

For those who are in the home entertainment, small business, consumer and small industrial service markets, these statistics seem to bear a very important message. That is: The units are out there in the customers home and will increase in number; they are going to need periodic adjustment, cleaning and eventual repair of some part; and, that a sound service-business base continues to exist for the alert and aggressive home entertainment-oriented service business.

The problem posed for the service industry, however, is how to keep on top of the new technologies which are coming down the pike at us year after year at faster and faster rates.

One thing is for sure, the area of home entertainment electronics, like many other areas of electronics, is taking on a digital look—and that look is packaged in an IC. Consider the video games, the electronic tuners in all of the new, high end television receivers, and in audio and stereo electronics where Sony is about to break with its Pulse Code Modulation system of recording.

Quite frankly, I believe the only way the competitive service dealers of the future will be able to maintain a viable share of the growing consumer electronics markets will be to stay aware of the new products being introduced, to learn what is "inside" of these units, and to actively seek the skills and knowledge for servicing the technology incorporated therein.

As a starter, I can recommend a look at our article this month on what is new and important in consumer electronics from this Winter's Consumer Electronics Show.

Sincerely

Richard M. Lay

Two new "no installation" security products to help you catch more profits.

The Sound Sentry. Simple intrusion protection for any room in the house or apartment. Sound Sentry is set off by such sounds as a window breaking or a door being forced. It plugs into a regular outlet and will transmit a signal through the house wiring to activate a lamp or alarm anywhere else in the house — or an outside wired alarm. Sell several Sound

Sentrys and auxiliary alarms throughout the house.

The Door Sentry.* Here's one for travelers (and homes, too). This compact unit detects intruders before intrusion occurs. Small enough to carry in pocket, purse or attache case. Hangs on inner door knob — anyone touching outer door knob triggers 85-decibel alarm. Two models available — battery operated #DRSDC, or 110V. plug in #DRSAC.

With the security market booming, these two new products from Mallory can help bring more sales your way. They're the intrusion equivalent of the best-selling smoke alarms. They can be used anywhere. No wiring necessary.

For all the facts, contact your Mallory representative or Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Box 1284, Indianapolis, IN 46206. (317) 856-3731.

*Patent Pending



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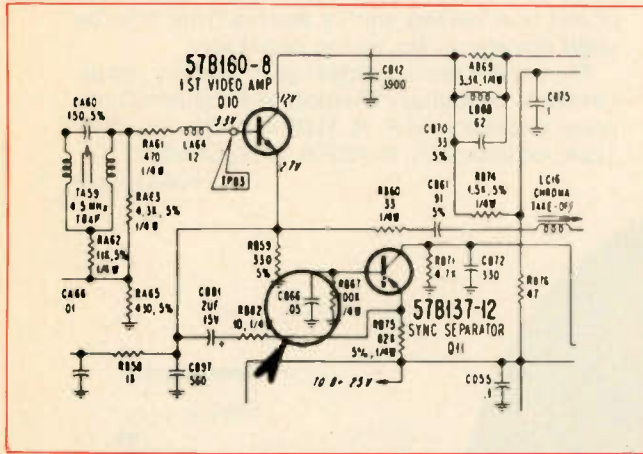
SERVICE SEMINAR

ADMIRAL

Color TV Chassis T15K10/16K10— Loss of Vertical or Horizontal Sync

The symptom of no vertical or horizontal sync, or horizontal weave in the picture can be caused by a defective CB66 capacitor (.05 mfd, 50 v). In some cases, the sync problem may only appear when the set is first turned on. Then, as the set warms up, the sync improves.

To correct the problem, replace capacitor CB66, .05 mfd ceramic disc, with a .047 polyester film capacitor, part number 64A43-11 as used in later production models.

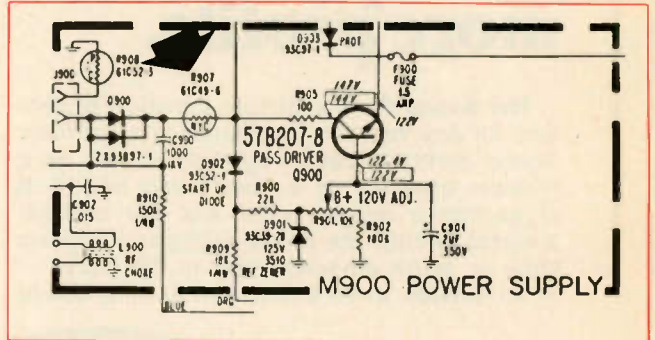


Color TV Chassis 4M10C — Snivets at right side of picture, ozone smell present

A possible cure for this problem is to redress the focus lead away from terminal #1 on the flyback transformer.

Color TV Chassis M10—NTC Resistor Failure

According to field reports, the R907 NTC resistor on the power supply board may fail prematurely. This pertains only to the aqua (blue) color resistors. Replace only with the black colored 61C49-6 resistor. It is located on the M900 Power Supply board. (see diagram)

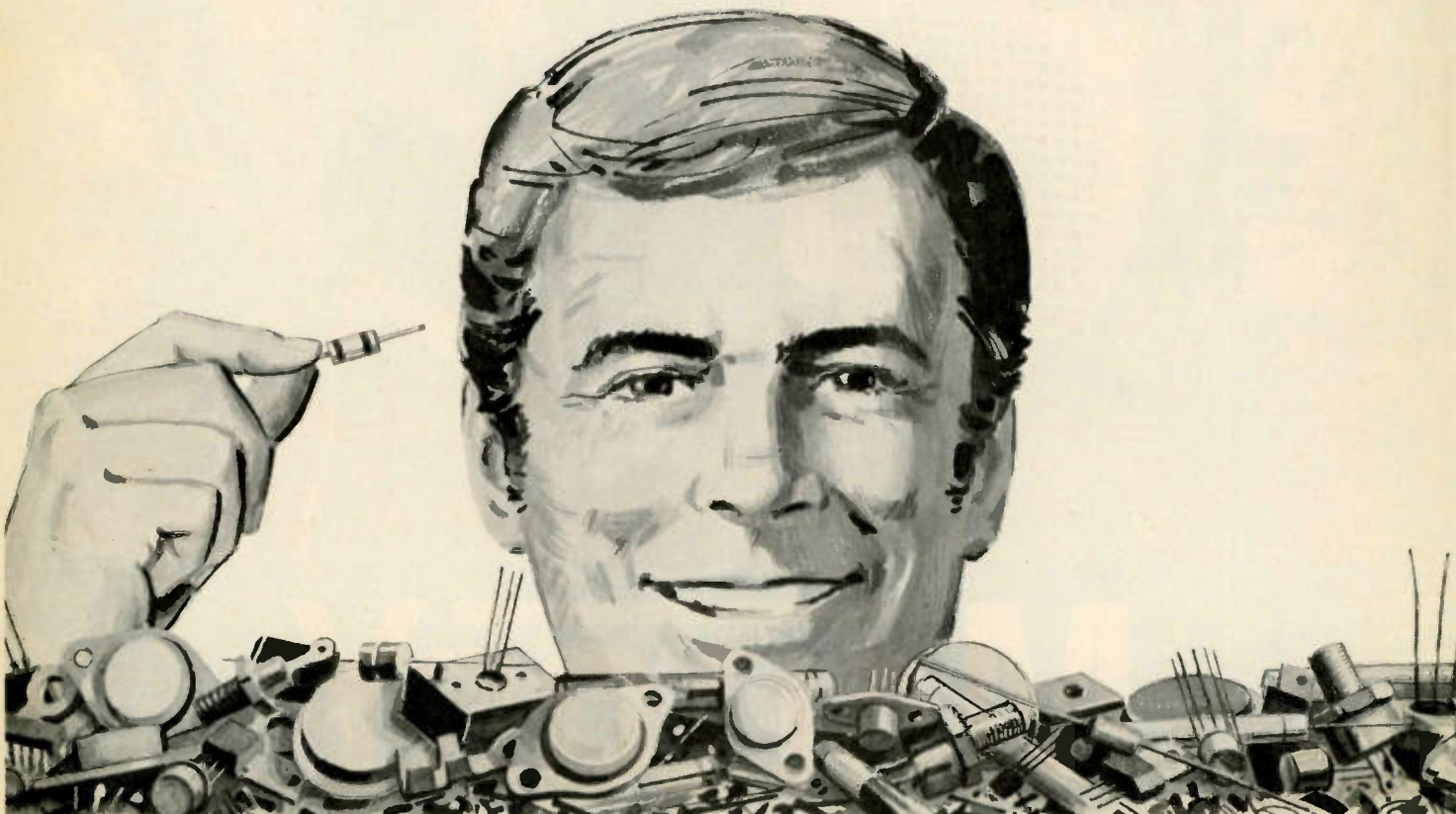


GENERAL ELECTRIC

Color TV Chassis MA/MB—No raster, but a substitute buffer module restores the raster.

If Q1101 on the original module is mounted to the board with a screw, tighten the screw, then reinsert the module in the receiver. The screw connects the collector of Q1101 to the rest

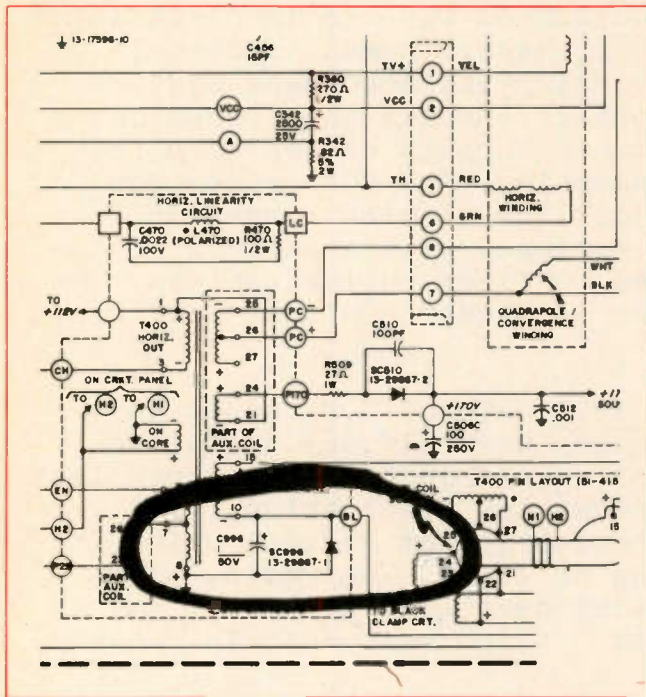
Finding the right semiconductor replacement is easy with.....



of the circuit. GE says a large number of returned modules have been repaired by tightening the screw.

GTE SYLVANIA

Color TV Chassis E21 — Problem is low brightness
Check SC996 and/or C996 for an open. Replace if necessary.



MAGNAVOX

Color TV Chassis T985 — Intermittent contact on secondary controls

This set uses Nomex insulation, which is a stiff paper, between the CRT anode cap and the top of the cabinet. If installed incorrectly, this insulation could apply pressure against the small secondary control PC board at the upper right portion of the chassis. Over a period of time this pressure could cause intermittent contact of the secondary controls. If this occurs, the controls will require resoldering on the PC board.

When the insulation is correctly installed, it will not touch the secondary control board and blue-green lettering will be visible on top of the insulation. If the insulation is found to be upside down (lettering not visible and insulation applying pressure to secondary board), remove the secondary control board and the two screws securing the insulation. Turn the insulation over and reinstall the two screws plus the secondary control board.

RCA

Color TV Chassis CTC 59XA — Malfunction in the low voltage power supply

Check capacitors C13 or C14 in horizontal output circuit. They could be shorted. If so, use RCA part no. 167871 for replacement.

Color TV Chassis CTC 31—Vertical Foldover problem, with voltage too high and fluctuating on 12JQ6-G

First replace the service switch. Then to check, remove white

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RCA SK Replacement Solid State



RCA UNVEILS ITS FIRST FIBER OPTICS LINK. RCA has moved into the relatively new field of fiber optics systems with the introduction of its first fiber optics data link designed for use in digital-data computer links, digital telephony, secure communications, process control and high-voltage optically isolated data systems. Optical communications using fiber optics enables the transmission of light waves from one point to another through cables of ultra-thin strands or fibers of glass or plastic. The RCA system consists of a transmitter containing a gallium-aluminum-arsenide, light-emitting diode and a receiver equipped with a silicon photodiode. These two units are connected to fiber optics cables. The new system was demonstrated at a Laser & Electro-Optical conference in San Diego, California.

COLOR TV SALES UP -- SO FAR -- OVER 1977. Total U.S. sales to dealers of color TV receivers in January were 618,963 units, an increase of 2.8% over the 605,244 units sold in the same month last year, according to the Electronic Industries Association (EIA). Black-and-white TV sales declined, however, from 358,601 units in 1977 to 313,970 units in 1978, a drop of 12.4%. In radio, AM/FM or FM-only receivers increased in sales over 1977 by 33% -- and AM radios dropped by 2%. Automobile radio sales were down in January, 1978 4.4% from 1977.

TEST INSTRUMENT MARKET TO DOUBLE IN NEXT DECADE. The worldwide market for electronic test and measurement equipment, at \$1.8 billion in 1977, will climb to \$2.4 billion by 1980 and \$3.6 billion by 1985, according to a new study by Frost & Sullivan, Inc. in New York. Categories studied include: automatic test equipment (ATE) for in-circuit; board memory; logic analyzers; linear devices; circuit board; and logic device; program-mable pulse generators and low cost (under \$400) counters. Largest growth (50%) is expected over the period for the in-circuit automatic test instruments, and the smallest growth (15%) will be in low cost counters. Other than the automatic test equipment that can be interfaced with computer systems, the study suggests test equipment will be: simple in operation, with high reliability, small and compact, with built-in self-diagnostic and test features.

NEW COLOR TV IS INTRODUCED. RCA has introduced its new 13-inch color line of four models with "Xtended Life" chassis. The new models, which consume 75 watts of power, are expected to sell at leader retail price of under \$300. The chassis are produced in the RCA plant in Taiwan. Also expected to introduce new color television this spring are Sony and Bohsei. Sony will introduce a new high-performance chassis to its color line -- and Bohsei will unveil a Korean-made 19-inch color model, which may be priced at retail as low as \$299.

IF YOU'RE GOING TO THE NEWCOM SHOW -- you should check the low-cost travel and hotel 'packages' and information available from the EIA. There are packages that include air travel and hotel space, and information about both from: Gerald Newman, EIA/DPD Central, 222 South Riverside Plaza, Chicago, IL 60606 -- and Stanley Lehrer, EIA/DPD Eastern Region, 551 Fifth Ave., New York, NY 10017.

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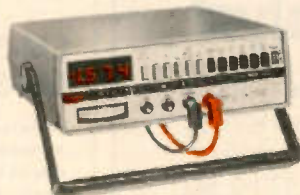
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- For AC line operation. Optional AC/rechargeable version available \$265.



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Deluxe 460-3A

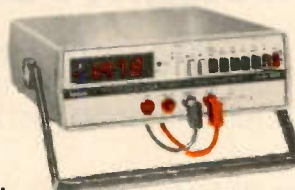
- 0.1% DC V accuracy, custom MOS/LSI circuitry
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- For AC line operation. Optional AC/rechargeable version available \$338.



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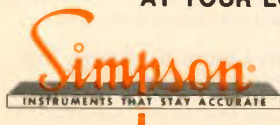


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wire to 1800 ohm regulator and check for voltage with switch in normal position.

Color TV Chassis CTC68—Horizontal hold intermittently goes off frequency. Also slight curvature at top of the raster

The problem is probably a loose solder connection at pin 3 of the T405 pincushion transformer. Resolder.

PHILCO

All A and B line chassis—Hum bar in video.

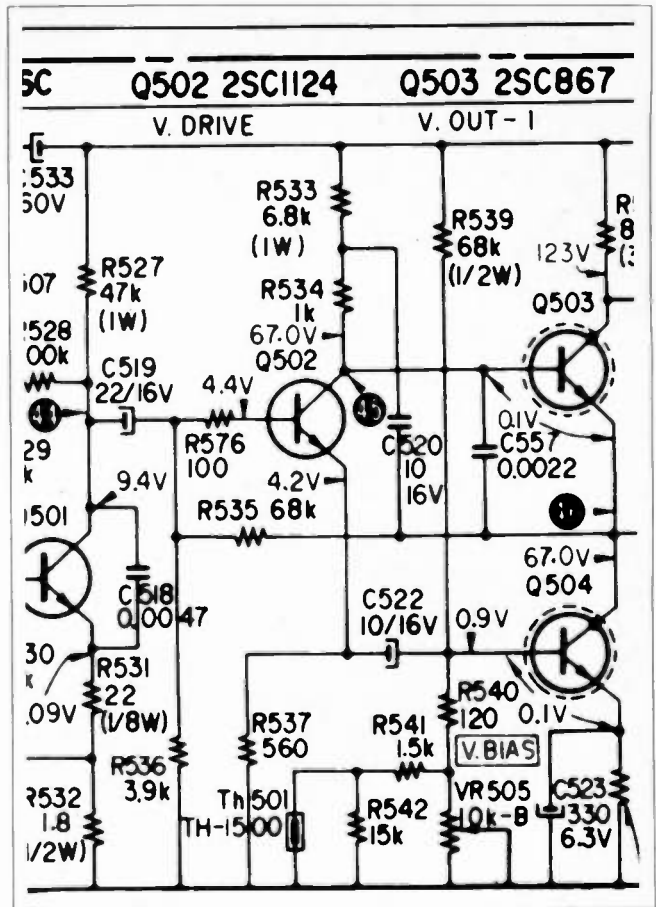
Check the +20V line and adjust for output voltage vs. AC line voltage as indicated in chart below. This assumes no other component has been found defective. With adjustment of the +20V line, hum bar should disappear.

AC Line voltage		+20V Output Setting	
105VAC	120VAC	+17.2V	+20V
110VAC	125VAC	+18V	+21V
115VAC	130VAC	+19V	+22V

SONY

Color TV Chassis KV 1722 — Vertical foldover. Horizontal Drive Line

If top half of the picture is streaked, replace resistor R535 (68K). It's probably shorted. (See diagram to right)



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LETTERS

WHOOPS! YOU CAUGHT US!

In the January issue of ET/D, the article on page 35, "Introducing the Digital Gate" is in need of a correction. Figure 4 shows an OR gate when the caption below the diagram states it is a NOR gate. Consequently, Figure 2 shows a NOR gate when the caption states it is an OR gate, thus the two captions should be reversed.

Michael Gambuzza
Pine TV Co.

I just received my January edition of ET/D and have found a grave error on page 25. "Fig. 4 - (A) The schematic symbol for the (NOR) gate, etc." This is the symbol for the OR gate. Figure 2 is also incorrect. It appears as though the two figures were transposed.

Verdeen T. Wolfe
Pittsburgh, PA

EDITOR: We wish we could say we put those mistakes in the article on purpose just to see if our readers were alert — but, alas, we just plain goofed. Just reverse the captions from Fig. 2 to 4, and

vice versa. But you missed two other mistakes we made in the same article, on page 24. The line over the "A" in the truth table at the top of the page should not be there — and in the truth table at the bottom of the page, it should be INPUT A, INPUT B, and OUTPUT C, instead of three INPUTS. Thanks for your help.

HELP WANTED

We have been unable to locate a schematic or any address for a black and white TV/radio console. The TV is listed as: Muntz Model No. 20951, Run No. T87A014. Could you provide any information as to where we can start in our search for a schematic?

Thelbert R. Silverman
Route 2, Box 246F
Crewe, Virginia 23930

EDITOR: We've looked through our TEKFAK files, but that Muntz was missing. Try writing to a Mr. M.N. Beitman, P.O. Box 46, Highland Park, IL 60035. He says he will "supply data for almost any radio or TV for \$2.95, postpaid." Or maybe one of ET/D's readers can help you.

MORE HELP WANTED

I would like to find some technical information on the "Bucket-Brigade" In-

tegrated circuit, and where I can obtain it. I know the chip costs about \$30 and is used in programmable time delay and phase shift. The chip itself is used as an echo chamber.

Ricky G. Sartin
3312 Furman Blvd.
Louisville, Ky 40220

EDITOR: Again, maybe one of our readers or advertisers can come to your rescue.

IMPROVE OR LEAVE

I am a C.E.T. radio and TV tech. I have been servicing TV's now for over 15 years, and now I have a complaint. It's about the TV's, radios and tape recorders from Japan. What I am saying is their market is a big mess with no parts for replacement. We the Americans let them get away with it. No one will spend \$600 for a color TV when they can't get a \$2 replacement on/off knob. When the word gets around that you can't get parts, the Japanese market must go — or improve. When you write to them for parts you don't even get an answer. People may stand for this in Japan but it won't work here. It's time for something to be done.

Charlie Mellum
Terre Haute, Indiana **ETD**



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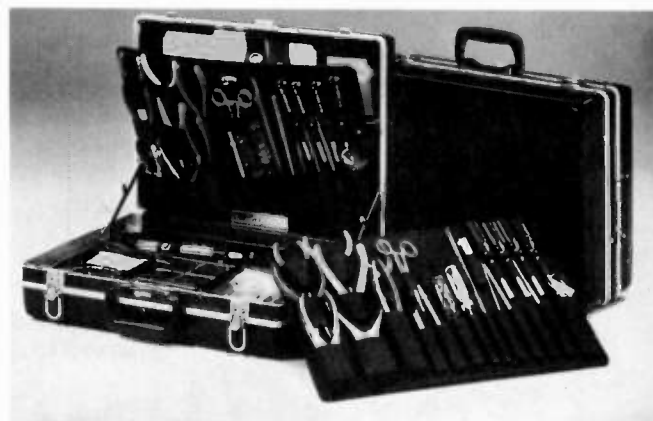
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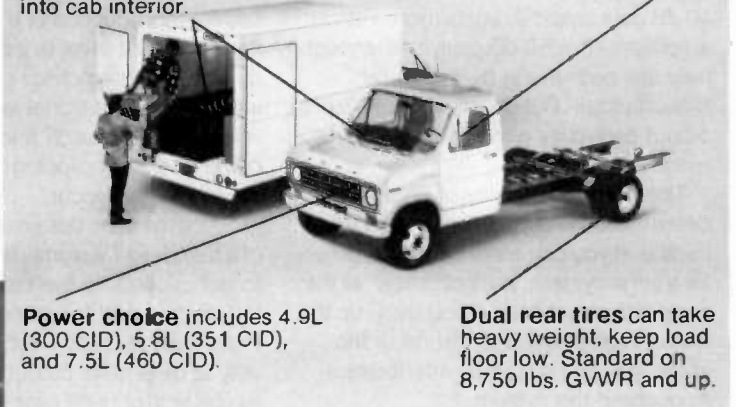
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MATV amplifiers

How to choose the right one

There's more to it than just gain. So, let's take a look at some other important considerations.

By Allen Pawlowski

Choosing the right amplifiers for a Master Antenna (MATV) system can be tricky. Pick one that's too small and people are likely to complain about snow or interference in their picture. Choose one that's too expensive and you will probably not be competitive on the job. The two most important MATV amplifier specifications are gain and output capability. Gain is relatively well understood. You need enough gain to give you enough signal output to overcome the distribution losses.

Output capability is a different animal. Often MATV installers really don't have a thorough understanding of the factors involved in output capability. Yet, the price of a MATV amplifier is determined largely by its output capability. Often, a 40 dB gain amplifier costs more than an amplifier with a 50 dB gain, even though they are both made by the same manufacturer. But an amplifier with extra output capability almost always costs extra.

The output capability of an amplifier determines the size of the system it can handle. If you use a low output amplifier for a large system, you get "snow" at the ends of the trunklines. If you crank up the output high enough to get rid of the snow, you get distortion interference throughout the system.

Types of distortion

In single channel amplifiers, such as headend strip amps, there are two basic limits to output capability. The easiest of all to understand and most popularly used is sync clip. Any single channel

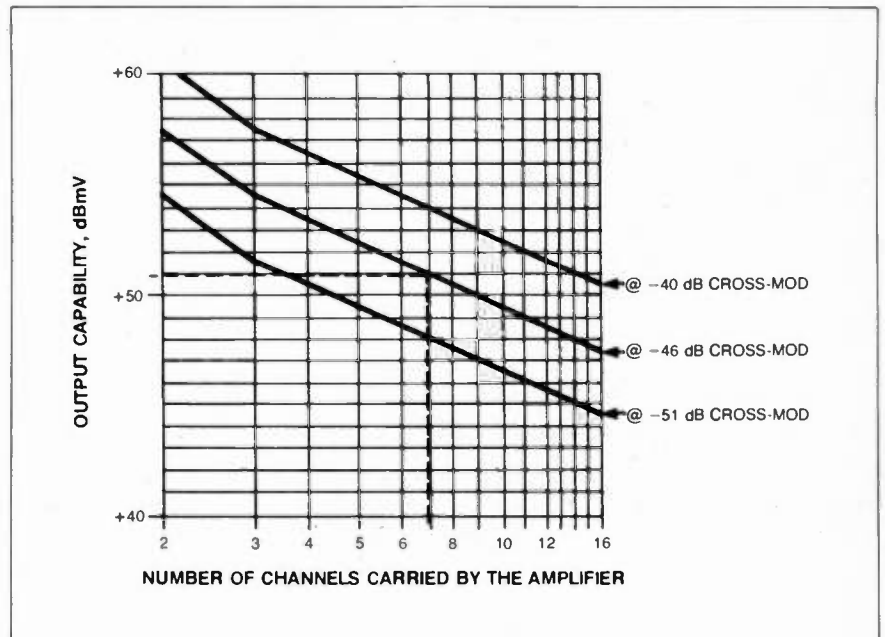


Fig. 1 - Graph compares output capability of amplifier rated at 51 dBmV with 7 channels at -46 dB cross-mod with permitted variations for other than 7 channels and other specifications for cross-mod.

amplifier operating below its specified maximum can be expected to deliver a faithful reproduction of the input signal. As the output level is increased, either by increasing amplifier gain or increasing input signal level, the output will eventually reach a level where compression or clipping of the peaks of the signal will occur.

Since the sync tips are the peak points of a standard TV signal, they are the first to get clipped. In the early days of television—and for monochrome transmission today—sync clip is a good way to determine output capability. The typical limit of $\frac{1}{2}$ dB sync clip is tolerable for all monochrome TV receivers. Color TV, however, involves a third carrier, namely the color sub-carrier, located 3.58 MHz above the video carrier. Another way to look at the color sub-carrier is that it is located 920 KHz below the sound carrier.

As maximum output capability is approached, sums and differences of each carrier are produced within the amplifier. The visible beat which occurs is described by the formula $Snd-Col+Pix = Beat$, with beat always showing up as 920 KHz herringbone pattern in the picture. Unfortunately, 920 KHz color beat interference occurs at operating levels of 2 to 6 dB below popular methods of specifying output capability based on sync clipping.

Sound Carrier levels

A complicating factor is that the amount of 920 KHz beat present is dependent on the sound carrier level. Sound carriers can be as little as 3 dB below pix carrier level to as far down as 18 dB below pix level. If the sound carrier is 18 dB below the picture carrier, the amplifier can be operated at 2 dB more output (without 920 KHz beat interference) than the

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Automatic frequency nulling and auto set level features of the 339A speed your total harmonic distortion measurements (THD). And true-rms detection means accurate measurements as low as 0.0018% (-95 dB) from 10 Hz to 110 kHz. Just select the frequency of the built-in oscillator and the 339A's "turn signal" indicators show you how to make the proper range settings. Whether you're testing transceivers, sophisticated audio equipment or broadcast performance, here's how the 339A, priced at \$1900*, can help you make quick and accurate measurements.

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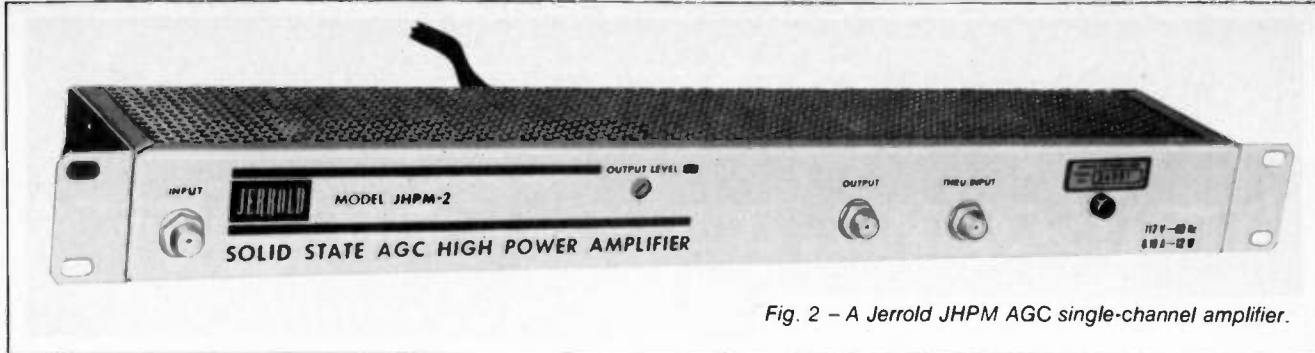


Fig. 2 - A Jerrold JHPM AGC single-channel amplifier.

same amplifier working with a sound carrier that is only 3 dB below the pic carrier level.

Most strip amp manufacturers today use sync clip as the way to specify output capability. Sync clip is easily measured and is essentially independent of sound carrier level. It is also a relatively easy measurement in the field, with minimum test equipment. By contrast, 920 KHz beat is difficult to measure and requires very expensive test equipment.

Perhaps manufacturers should rate their single channel output capabilities at the point where 920 KHz beats may appear, but they don't. Therefore, it is up to the system designer to compensate for this problem.

All strip type amplifiers should be operated approx. 4 dB below their output rating for 1/2 dB sync clip. Should the output rating be stated at the 1 dB sync clip point, beat free operation requires approx. 7 dB reduction. Their figures can be safely reduced to -15 dB below picture carriers.

The distortions produced by amplifiers carrying two or more channels are known as cross modulation and triple beat. Let's look at them.

Cross modulation can be roughly related to sync clip in single channel amps. Even at levels well below measurable sync clip, small amounts of sync signals get distorted by inherent amplifier non-linearities. These distorted signals tend to modulate themselves onto all other channels being carried by the amplifier. When strong enough to be visible, this interference appears as black or white vertical bars moving across the screen. When the bars move rapidly, you get the windshield wiper effect.

Triple beat is often confused with crossmodulation because the visual effects on a TV screen are almost the same. On close inspection, the vertical bars are made up of a beat or herringbone pattern instead of the

Mr. Pawlowski is Senior System Engineer for the Jerrold Electronics Corporation of Horsham, Pa.

solidly shaded bars of crossmod.

Comparing amplifiers

As we have seen, distortion occurs where high level signals are distorted by encountering amplifier non-linearities. The highest level of signal occurs in the output stage of any amplifier.

The practice of comparing the price/output capability of various manufacturers products can sometimes be misleading. Given a specific amplifier, the rated output capability will vary depending upon the number of channels specified and the amount of distortion permitted. Therefore, the buyer must translate varying manufacturers claims. For example, manufacturer A claims +52 dBmV output per channel with 7 channels at -46 dB crossmod, while manufacturer B claims +54 dBmV output per channel with 5 channels at -40 dB crossmod. Assuming that both amplifiers are priced the same, which amplifier is the better buy?

Figure 1 shows the relationship between amplifier distortion limits and output capability vs. number of channels carried. Applying Fig. 1 to our example, manufacturer A claims +52 dBmV output for -46 xmod with 7 channels. Enter the graph at 7 channels on the bottom, move up to the -46 xmod line and read 0 dB correction factor on the lefthand scale. This means that the output level has been increased 4 dB over the 7 ch. at -46 xmod point. To compare these two amplifiers on an equal basis, 4 dB must be subtracted from B's claims thus showing that A's amplifier actually has 2 dB more output capability.

The graph has more uses than comparing competitive product. It will give you the proper correction factor to be used in field situations where other than 7 channels are present. For example, if you have only 4 channels to distribute, any 7 channel rated amplifier can be run 2 dB per channel higher output without fear of running into cross modulation. Conversely, if you want to distribute, 10 channels, you must reduce

the per channel level by 1.5 dB to assure interference free operation.

The—57 crossmod line is useful for MATV distribution of CATV signals. Should you interconnect with a CATV system carrying 9 channels, you must derate amplifiers output by 6.5 dB per channel. This will assure interference free operation where the MATV amplifier is actually in cascade with the CATV system feeding in signals.

Automatic overload amps

Up to this point, we have been discussing MATV amplifiers as though input signals were constant. They are not. Signals received on an MATV antenna swing widely with changing atmospheric conditions. This problem is easily compensated for in single channel amplifiers through the use of automatic gain controls (AGC). AGC single channel amplifiers such as the Jerrold JHPM series (Fig. 2) have been available for more than 20 years.

Until recently, however, it was not possible to compensate for fluctuating signals in broadband MATV systems. Prudent MATV system designers routinely ran broadband amplifiers at about 3 dB below their rated output so that input signals that suddenly become strong would not drive them into overload. The Jerrold 3662 Gibraltar amplifier was the first to incorporate Automatic Overload Control. It can handle input swings up to 20 dB. When input signals are strong, AOC reduces gain to prevent overload interference. When input signals are weak, AOC increases amplifier gain, to prevent snow at the ends of the trunklines. The effect is constant amplifier output even with side antenna signal fluctuations. Thus, the 3662 can safely be run at full rated output capability under all reception conditions.

Understanding the limits of operation for various MATV amplifiers will permit you to design and install better systems. This understanding will also be useful when you are called upon to add channels to existing systems or to service deficient systems. **ETD**

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TV antenna development

Thirty years in review

A look at the early technology impacting TV antenna design, including the development of the first preamplifier

By James E. Kluge

Television is not just an entertainment medium, it's a way of life for the vast majority of Americans. Commercial television as we know it, got its start way back in the late thirties when even if there had been mass-produced TV sets, few people, because of the depression, could have afforded one.

It wasn't until post World-War II that commercial television got underway on a large scale. It was dominated primarily by the two major networks, NBC and CBS plus the DuMont network and the fledgling ABC.

At the end of World War II, when the United States returned to a peacetime economy, the television broadcast standards which were established in 1939 and 1940 provided for 19 VHF-only channels. Channels 1 through 6 occupied what we presently know as low-band. (Note: Channel 1 on 44-50 MHz was allocated in 1939 to FM broadcasting and later when FM was moved to 88-108 MHz, it was allocated to 2-way radio.) Channels 7-19 occupied the TV high band and CATV super band as it is known today.

In 1948 there were less than 1 million receivers in the U.S. And, by late 1953, that number had increased to 25 million. These receivers were characterized as VHF-only, black and white and for the most part offered 12- to 21-inch picture tubes.

Early antennas

Receiving antennas for many of these early sets were built into the cabinet-interior or attached to the back cover. They consisted mainly of foil or hookup wire combined with a 300-ohm

folded dipole. Later, manufacturers provided built-in rabbit ears.

Outdoor receiving antennas, for those who bought them in the early days and had them installed, were for the most part low-band and either conical, folded dipoles utilizing a simple reflector or the memorable "bedspring" colinear arrays.

During the early post-WW II years, John Winegard, then a radio-repair technician, designed and built, and with the help of others, installed a huge TV-receiving antenna on the home of a local appliance dealer in Burlington, Iowa—some 190 plus miles from Chicago. Using one of the first Philco 10-inch TV sets, they received a watchable picture from WBKB, a Chicago television station (now WBBM).

John Winegard, in 1948, was suddenly launched into the TV-antenna business. Other people heard about his accomplishment and they also wanted to receive the network programs from Chicago.

As word spread, Winegard and an associate began constructing antennas for other people around Burlington. Production soon moved from the basement to the Winegard family garage and orders started coming in from several midwestern cities. By 1954 the Winegard Company was incorporated and settled at its present location in Burlington, Iowa, where they began full-scale operations designing and manufacturing TV antennas.

Basic problems

During the years of the FCC's freeze on TV channel allocation (1948-52), two basic antennas served the needs of the television industry quite adequately. Since most of the TV stations were assigned channels 4, 5 and 6 or 7, 8 and 9, a pair of Yagi antennas, one cut for the low-band channels and another cut for the high-band channels, took care of most major markets.

In 1952 when the freeze was lifted and the low-band filled up, new stations

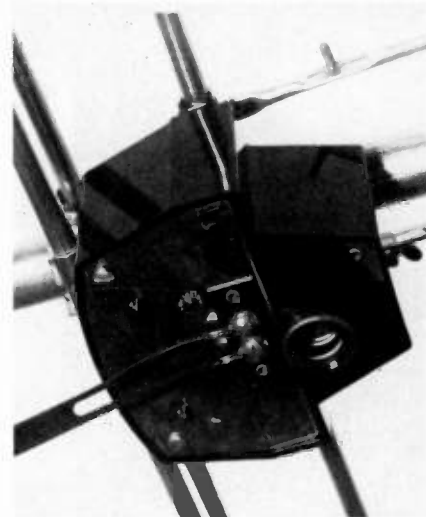


Fig. 1 - The "Powertron." This first preamplifier, introduced in 1960, contained a 6DJ8 dual triode in a low-noise cascode amplifier circuit.

moved into the high-band (Ch 7-13) and new antennas sprouted additional elements to accommodate these higher frequencies. Gain was low on these early antennas, snow was common and the fringe areas were only 40-50 miles out. Many of the early TV-antenna designs were 300-ohm folded-dipole types with a reflector element.

The original Yagi-Uda array design, as developed by H. Yagi and S. Uda of Japan, used additional director elements and provided excellent performance. It was relatively simple to construct, was low in cost, and offered low wind resistance. The Yagi-Uda array is basically a narrow-bandwidth antenna. The length of the elements determines the frequencies to which it responds. Its bandwidth, determined by its geometry, extends over a full TV channel (6 MHz) and into adjacent channels but falls off sharply beyond that. It can be made responsive to channels 4-5-6 or 7-8-9, for example, to serve TV market areas where those channels are available. Some compromise is necessary where the antenna is tuned for channel 8 and is



Fig. 2 - John Winegard, founder of his own antenna company, with his then newly designed high gain all channel VHF antenna in the early 1950s.

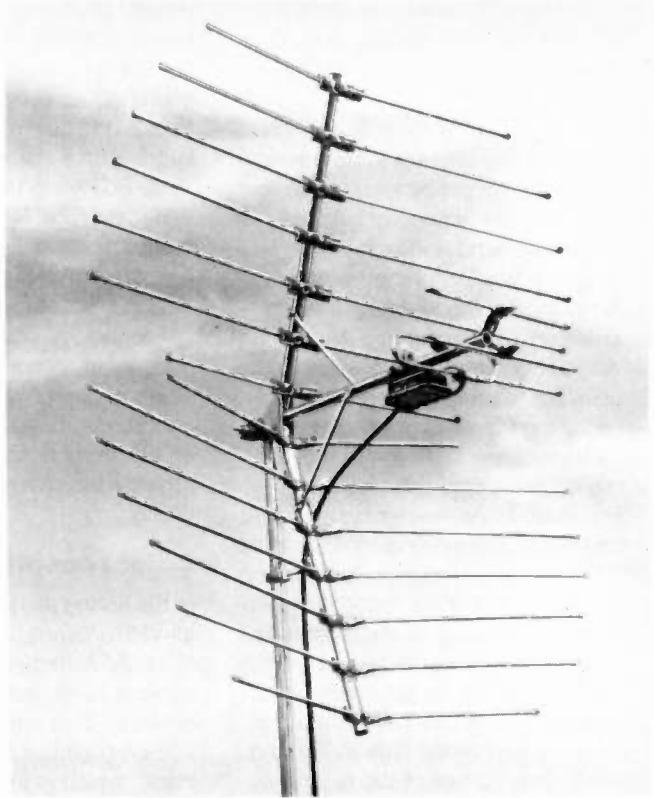


Fig. 3—This collapsible parabolic antenna, introduced by Winegard in 1964, was one of the first really effective all channel UHF antennas.

used on channels 7 and 9, but in strong signal areas, such as large metropolitan cities, this poses little problem.

Wideband design needed

In fringe areas where optimum gain is needed, "cut-to-channel" Yagis were the best way to receive those available channels or for catching sports events which were blacked out locally for a 100-mile radius. These narrow band Yagi's comprised the bulk of the Winegard antenna business during the years of the freeze. They were sold primarily in Iowa, Illinois, Indiana, Minnesota, Wisconsin and Missouri. However, markets within range of Chicago—which had channel 9 broadcasting—did have need of a highband antenna. This situation was complicated on April 13, 1952, when the FCC lifted its freeze on channel allocations and released its plan which included UHF. The immediate effect was to fill up the available VHF slots and to expand into UHF.

Suddenly, the older VHF antennas were inadequate to cover the new VHF and UHF stations. What was needed now was a single antenna that would handle both high and low band signals—plus new antennas for UHF.

New antenna designs proliferated, among them high and low band Yagi's coupled with a phasing harness or

passive couplers. Large stacked arrays and Vee or conical configurations were common. So were snowy pictures, especially in rural areas and towns without television stations.

The first answer to this problem, the first hi-gain VHF all-channel television antenna, came as a result of an idea by Winegard. This new antenna, named the *Interceptor*, retained the same physical size and durable design of the single channel Yagi-Uda array—yet it performed equally well on all VHF channels whether it was at 54 MHz for channel 2 or 216 MHz for channel 13.

The key to this important move forward in antenna development was a patented idea by Winegard called the *Electrolens*. The Electrolens is considered to be the first major improvement to the Yagi design.

Yagi design basics

Basically, there are two types of dipole elements in most Yagi antenna arrays. One type is the driven or collector elements from which the signal voltage is derived. The others are the parasitic elements which are connected to nothing. Parasitics influence the signal voltage by reradiating their energy into adjacent or nearby elements. They can be used to reinforce or cancel signals at the collector elements and thereby influence the gain and directivity of the

antenna array.

There are two categories of parasitic elements—directors and reflectors. If one is placed between the signal source and the driven element, it is called a director. If it is behind the driven element, it is called a reflector. In a coplanar array there is only one reflector. Additional reflectors are virtually ineffective. In this discussion of parasitic elements then, we are concerned only with director elements.

The Yagi-Uda antenna array employs any number of directors to achieve certain gain and directivity characteristics, but it basically is a narrowband antenna suitable for two or three adjacent TV channels at the most.

TV-antenna engineers in trying to use directors in a wideband array (low- or high-band) have been confronted with the inherently high Q (narrow passband) of the unloaded or parasitic element which restricts their usefulness to a very narrow range of frequencies.

Many TV-antenna manufacturers have tried to get around this basic limitation by mounting a high-band antenna in front of a low-band system, each with its own directors. The two sections are connected together with phasing rods, a harness or couplers. This system has the advantage that only a single boom is required, but it does not make efficient use of the physical size of

the antenna since only one section, either high band or low band is used at any one time.

Electrolens focusing

The Electrolens director system has solved this problem by allowing a director element to perform efficiently at *both* the low-band and high-band frequencies in spite of their wide separation. For the first time it made possible an all-channel VHF-V antenna having performance comparable to the famous cut-to-channel Yagi-Uda array, yet retaining the small physical size and rugged mechanical design of the single-channel Yagi antenna.

The Electrolens director system used in the Interceptor antenna consists of the first five elements including two loading coils. Inductance of the coils acting with the end capacitance of the dipoles to which they are connected and the stray capacity of the hardware, form parallel-tuned circuits that resonate in the central part of the high VHF band. The high impedance of the resonant circuit effectively isolates the dipole halves from each other on the high-band channels causing them to act independently as half-wave directors.

Because the loading-coil reactance is 180 degrees opposite to that of the elements to which the coils are connected, a desirable cancellation of reactance takes place over the high band leaving only the radiation resistance of the elements to be reflected into the collector elements. This canceling action stimulates resonance over a very wide band of frequencies. The loaded elements are interlaced with three unitary directors that, by working together, act as seven independent full-wave directors across the entire high band—channels 7 through 13.

At the low-band frequencies, channels 2 through 6, these elements, connected by the loading coils, operate as normal halfwave director elements. The loading coils at these frequencies are operating so far off resonance that they offer very little impedance to antenna currents flowing between the dipole halves.

All channel VHF

The Electrolens director system combined with the Winegard patented multiresonant-dipole cross-fed driven elements (U.S. Patent No. 2,832,956),

The author, who holds an electrical engineering degree from Marquette University, is a Technical Writer for the Winegard Company.

yielded an all-channel VHF antenna, the Interceptor, with true Yagi performance not only in gain, but front-to-back ratio and sharp directivity on every channel from 2 to 13, and all this in an antenna no larger than a conventional 5-element Yagi. Following this invention, John Winegard received a letter from H. Yagi in Japan commending him on achieving a significant improvement in his basic design.

Technology continued to advance, not only in antenna design, but also in antenna durability. In 1955 the gold anodizing process was introduced. It is an electro-chemical process which protects aluminum from corrosion and pitting.

Color reception

In the spring of 1956 the first high-gain all-VHF antenna, expressly designed for color TV reception, was introduced through the patented *Color Ceptor* antenna. This antenna contained an add-on 5-element unit called "Power Pack" which is the first 18-element all VHF Yagi with more power for fringe area reception. This particular antenna, incidentally, averaged 47 percent more gain on high band and 30 percent more on low band frequencies than its nearest competition.

Significant to the development of signal reception technology, of course, is the preamplifier. In 1960, Winegard Company introduced this breakthrough in antenna development with its "Powertron." Considered to be the first electronic antenna, the Powertron incorporated a built-in preamplifier. This unit incorporated a 6DJ8 dual triode electron tube in a cascode, low-noise amplifier circuit. The tube was later replaced with a 13CW4 Nuvistor made expressly for this application by RCA.

It was powered by 24 volts sent up the lead-in wire from a separate power supply. In addition to the clear, sharp pictures, it produced on previously unusable channels, the Powertron permitted up to six sets to be operated from a single antenna or the remote location of the antenna itself.

In addition to producing clear, sharp pictures on previously "poor" channels, the Powertron permitted up to six sets to be operated from this same antenna or, in some cases, to locate the antenna at a remote site.

UHF/VHF couplers

As UHF became more established in the television market, more and more UHF-only antennas were added to the existing VHF units. The need existed for

a simple, inexpensive means of coupling the two antennas.

The patented Tetrapole UHF-driven element incorporating a quarter-wave stub filled this need perfectly. Basically, the Tetrapole is a UHF folded dipole made from stamped aluminum parts.

Instead of the top half of the folded dipole being a continuous conductor in the Tetrapole, the conductor, like its lower counterpart, is open and supported by an insulator bridging a 2-inch gap. On each side of the gap, another stamped metal piece is attached at right angles to each dipole element thus forming a pair of quarter-wave stubs on each side of the folded-dipole elements. The stubs are different lengths so as to resonate at overlapping UHF passbands.

Quarter wave stubs

At UHF frequencies, the quarter wave stubs act like a short circuit to allow UHF antenna currents to bridge the gap causing the elements to behave like a normal folded-dipole element. At VHF frequencies, the stubs are simply open circuits and what was a folded dipole at UHF, are now simply conductors of VHF signals to the UHF transmission-line terminals in the center of the lower half of the folded dipole.

If the 300-ohm transmission line from the existing VHF antenna is connected across the quarter-wave stubs, then the VHF signals at that point will be conducted to the UHF folded-dipole terminals and thence down the lead-in.

The Tetrapole then not only receives UHF signals, but serves as a no-loss VHF-to-UHF antenna coupler at littler cost to the customer and much simplification for the installer.

Bringing in UHF

Despite continuing refinement, UHF reception remained a problem area for antenna manufacturers. Some early sets carried wholly inadequate built-in UHF antennas consisting of triangular shaped metallic foil fastened to the inside of the removable cabinet back. Other outdoor UHF antennas were mostly low sensitivity "bow tie" arrangements in front of a plane reflector.

In 1964, however, Winegard introduced a patented innovation, a collapsible parabolic for use on channels 14 through 83. The reflector elements approximated performance of a true dish-type parabolic reflector and sensitivity was for the first time greatly improved. Less than a year later, another patent—the "Planar Grid" came

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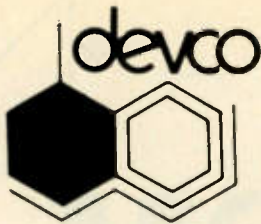
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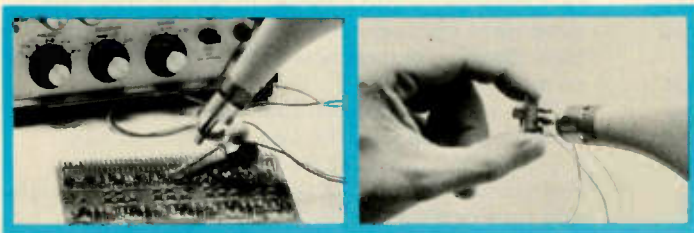
into being. It is another variation of the Yagi—a rear fed multielement driven array. Each element is one electrical wave length at some frequency between 470 and 890 MHz (channels 14-83). Its low Q permits greater bandwidth and it is so designed so that all elements are connected in phase using parallel phasing lines along the boom.

Later refinements to this system included addition of a special "Tri Linear" director system to improve overall gain and the addition of low noise preamplifiers for greatly improved UHF reception in deep fringe areas.

This preamplifier, the AC-4990 introduced in 1976, gave an unprecedented ultra-low noise figure of 2.2 dB over the UHF band. Not just a new low-noise input transistor or rebiasing the active devices which have previously resulted in extremely low noise figures, but a totally new approach in amplifier-circuit design.

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What's ahead in consumer electronics

A review of the winter CES

Visitors predict television-video and auto sound will be the big winners in 1978

The consumer electronics industry turned out in record numbers in January for the first Winter CES ever held in hustling, bustling and definitely gaudy Las Vegas.

Vegas, which provided the welcome winter respite from the icy 1977 show held in Chicago, attracted 40,000 to 45,000 grateful visitors to make it the best attended Winter CES ever, according to show officials — a figure that exceeded expectations by about 10,000.

What they came to see encompassed every aspect of the consumer electronics market from auto sound to CB, to watches and calculators, and television video. It was a show of the future and of the present — a vast bin of electronic goodies and toys all aimed at satisfying the leisure time and entertainment needs of the American consumer.

The star of the show? New technology — new at least insofar as home and consumer electronics is concerned. Yet technologies that eventually will saturate American homes, autos, pleasure boats alike — all in the foreseeable future.

And with cautious optimism, they came to predict an expanding market in 1978 for all segments of consumer electronics — even CB.

But, if there was one segment of the industry that appeared headed for superior performance — according to the prophets — it is television-video... the real golden boy. Coming off a near record sales year for color television in



Fig. 1 — Panasonic and Quasar both displayed the Matsushita developed video programming system, a prototype capable of controlling a full week of television viewing for the user.

1977, Quasar's Alex Stone predicted the video segment of the consumer market will grow "with explosive force" over the next five years. "For the first 25 years all the consumer could do was turn on or off his TV. But, now we're at the stage where he is interacting with it."

RCA's Bill Boss, Chairman of EIA's Video Division, went so far as to say a growth rate of 25 per cent is possible given the most favorable conditions for all segments of video (games, TV, VCR, large screen TV, etc).

"Video, discounting traditional television, is looking at the emergence of a business that will reach \$1 billion within the next three years," he said. This included large screen TV, VCRs and video games.

Among the coming trends seen for television — video is the development of an expanding market in portable DC receivers for use at the beach, on picnics, or campers and boats.

Insofar as video cassette recorders are concerned, 1978 estimate of sales ranged from 500,000 (Zenith) to 750,000 (RCA). Among the comments heard were "We sold out in August," — Alex Stone, Quasar; "Availability was the major problem," — Dick O'Brion, JVC America; and "we've shipped out

every unit we've received, particularly after the price adjustment in November," — John McCallister, Zenith.

Despite the enthusiasm shown over the VCR, there were surprisingly some very optimistic comments concerning the status of the video disk. In fact, the VCR and the video disk units are expected to draw two very different types of people. The VCR appears to be attracting the type of person who is more interested in making his own tapes and its success appears to be hinging less and less on the availability of pre-recorded tapes.

According to one CES participant, "The video disk is the real contender for pre-recorded material because of the pricing differential between pre-recorded tape and pre-recorded disks. The person who buys a VCR is going to use it for many other reasons than playing back pre-recorded commercially made tape. How many times will one family or individual sit through the replaying of the same movie."

According to Sony's Joe Lagore, "The thing that continues to amaze us is the demand for our tape which is constantly growing." He said Sony would deliver 1.7 million blank tapes in 1978 to



consumer, industrial, and business concerns.

Among the newest innovations in consumer video displayed on the floor of the show was Sharp's "dualvision." It was the first time it has been shown in the United States. This set, which still has not received FCC approval for marketing in this country, displays a six-inch diagonal black and white picture on the main (21-inch) color screen. Audio for the superimposed black and white picture can be heard through an accompanying headset. A remote controlled unit, the control operations are main/sub screen channel selection, inversion of pictures between the main and sub screens, the bidirectional control of volume and the on/off for the sub screen to permit viewing of the main color picture only.

Panasonic and Quasar also displayed Matsushita's experimental microprocessor controlled video programming system, which may be used in conjunction with the VCR for automatically programming a full week of video taping. The unit turns a TV or VTR on or off and repeats a weeklong schedule continuously until modified. Up to 11 channels can be programmed by pushing just two buttons.

Panasonic also showed an exceptionally bright and as yet unnamed projection television system, one of several displayed at the Winter CES. The experimental unit, which uses the Matsushita developed projection tube and high efficiency screen, electronic tuning, a video sensor which automatically adjusts picture brightness, and VIR circuitry.

The shell-shocked CB industry, trying to regroup from the inventory glut of 23 channel units, also heard words of encouragement during CES. While the boom years are definitely over, there are certain things taking place within the market now to indicate respectable growth in the years ahead.

For one thing, according to EIA's John Sodolski, the CB market is far from saturated at this point in time. Then, too, there are subtle changes occurring in the CB marketplace. For one thing, the old image of a CBer being a beer drinking, blue collar youth between 18 and 21 with an annual income of \$10,000 is rapidly changing. Today's CB purchaser is likely to be older, better educated and has higher income.

The era which looked upon the CB as a mere toy is also rapidly coming to an end with marketers beginning to stress

the safety and emergency nature of the radios. More and more state police are thinking in terms of CB to aid in emergencies and disasters and the U.S. Coast Guard is installing CB radios in its search and rescue stations throughout the United States in an effort to improve communications with small boaters.

As if to underscore this general consensus, both G.E. and Motorola announced significant new "high end" candidates into the CB arena during WCES.

Stating that G.E. has assumed "a very strong position" in regard to its commitment to CB, Audio Products General Manager, Walter Williams announced the introduction of three new CB transceivers at the show.

The new units are two mobile units, one with mic control and the other designed for dashboard mounting, and a single side band CB base station which retails at \$470. The mobile units retail at \$180 and \$280 respectively.

Motorola, announcing it is in "the CB and auto sound business to stay," introduced its new 500 line, which includes a single sideband base station to go on the market later this year, an in-dash CB "entertainment center" with AM/FM stereo, and the under-dash



Fig. 2 - Panasonic's experimental large screen projection television system proved to be one of the main conversation pieces at the Winter CES.



Fig. 3 - A special panel consisting of television and video manufacturing executives predict an exceptionally bright year for television and video during the Las Vegas meeting.

mobile AM/SSB CB transceiver.

According to a Motorola spokesman, a major effort is being made to downplay CB as a toy and to emphasize it as a safety device. Other factors which will impact CB is the fact that OEM manufacturers, such as Motorola, in the future will tend to offer Detroit more combo units, that is, AM/FM stereo/CB combinations.

Estimates of the 1978 market size for CB in terms of units ranged conservatively from 5 million (Motorola) to 7 million (GE). In CB antennas and accessories, the market should total \$175 million in 1978, the same as last year.

Throughout CES, auto sound (whether CB or AM/Stereo radio or cassette decks) is tabbed as one of the potentially significant growth areas.

As Fred Tushinsky, senior vice president of marketing and sales for Marantz, put it: "We see the car becoming the second living room as evidenced by the sophistication of the automotive components now being marketed and the vastly enriched quality of sound which they produce."

Motorola spokesman noted the contribution AM stereo — of which Motorola is one of three contenders before the FCC with a system — will have on auto sound when and if it is approved.

Additionally, such technological innovations as the programmed playing of tapes and records and pulse code modulation (a digital method of stereo reproduction which greatly reduces noise and hiss) will tend to add to the general overall audio and auto sound



Fig. 4 - The Shape of Things to Come? Sharp's as yet experimental "dualvision" system was displayed for the first time in this country at the Winter CES. Capable of displaying a 6-inch diagonal black and white picture over the main color frame, the system allows viewer to keep check on two channels at once.

market, dollarwise.

Overall, it was predicted there will be a 20 per cent growth rate chalked up in auto sound in 1978, excluding CB. This will break down into car stereo sales (wholesale) of \$550 million, radio \$87 million, amplifiers \$55 million and speakers \$240 million, all of which will add up to a total market of about \$1.5 billion in retail sales.

Perhaps the biggest surprise of the show was that Philips — the test instrument people — have for the first time entered the broad-based consumer electronics field in this country with three AM/FM stereo receivers.

The receivers, with 30, 45 and 60 watt per channel, are to be priced in the under \$279, under \$400 and under \$500 categories.

However, the technology was the

attention getter in the audio components arena of the CES. In addition to one of the manufacturers having several of the Penthouse "PETS" centerfold girls on hand to autograph issues, Sherwood introduced its MICRO/CPU 100 FM Tuner, a microprocessor controlled unit with a four-station memory, autoscanning, PLL tuning, digital station call letter and frequency displays, and IF systems and a digital detector which has no coils and never needs alignment, according to the manufacturer.

Another microprocessor entry was Optonica's MPU-controlled cassette deck. This unit, retailing at \$360, featured a five program memory which turns on or off, record or playback, and tape counter memory. The fifth memory — Automatic Program Locate Device — automatically searches via fast wind or rewind for the programmed selection.

Sony was another entrant into the technology arena when it displayed its prototype PCM (Pulse Code Modulation) system to be used in conjunction with standard VCRs. Using digital pulses, rather than analog signals as the recording signal, PCM, according to Sony, never reproduces tape hiss and quiet passages "are virtually noise free."

And finally, Hitachi — the people who invited the PETS — announced the development of a new \$1,400 power amplifier — the HMA9500 — which it says is based on a new, state-of-the-art highpower MOS/FET design.

The unit, which contains four of the new MOS/FETS in each channel, is capable of improved frequency response (5-to-20,000Hz) and improved rise times at higher power ratings. **ETD**



Graham Holmes

Sound Engineer, Aerosmith Winter Tour '77,
Tasco Sound, Newburgh, NY;
London, England; Los Angeles, CA.

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GENERAL  ELECTRIC

Car radio tuners

A look at the mechanics

Car radio servicing requires more than an expert knowledge of electronics. In this article, Mr. Carr discusses some common mechanical problems that could eat away profits if you don't know how to handle them quickly.

By Joseph J. Carr, CET

The tuner mechanism in an auto radio is almost purely mechanical, and sometimes, a little difficult for electronic technicians to service profitably. In fact, ordinary auto radio tuner service work is rarely profitable, yet must be done—especially if the radio came from an auto dealer or other high volume customer. Even fixed fee tuner jobs can be profitable, however, if you are forearmed with a little knowledge of how they work, and some of the more common problems.

There are three classes of non-signal seeker types of auto radio tuner mechanisms: manual tuning, pushbutton models, and multi-band (AM/FM or AM/FM/SW). An example of a simple manual tuner is shown in Fig. 1.

Manual tuners

Fig. 1 shows the basic manual tuner mechanism. Car radios are permeability tuned, meaning that the inductances of the respective coils in the front-end are varied to tune in stations. In Fig. 1 the powdered iron cores of the tuning coils are attached to a *core drive bar* that rides on a worm-gear tuning shaft. Car radio tuners are usually called *permeability tuning mechanisms* (PTM) to distinguish them from variable capacitor models.

The user turns the manual tuning shaft to select a station, and this causes

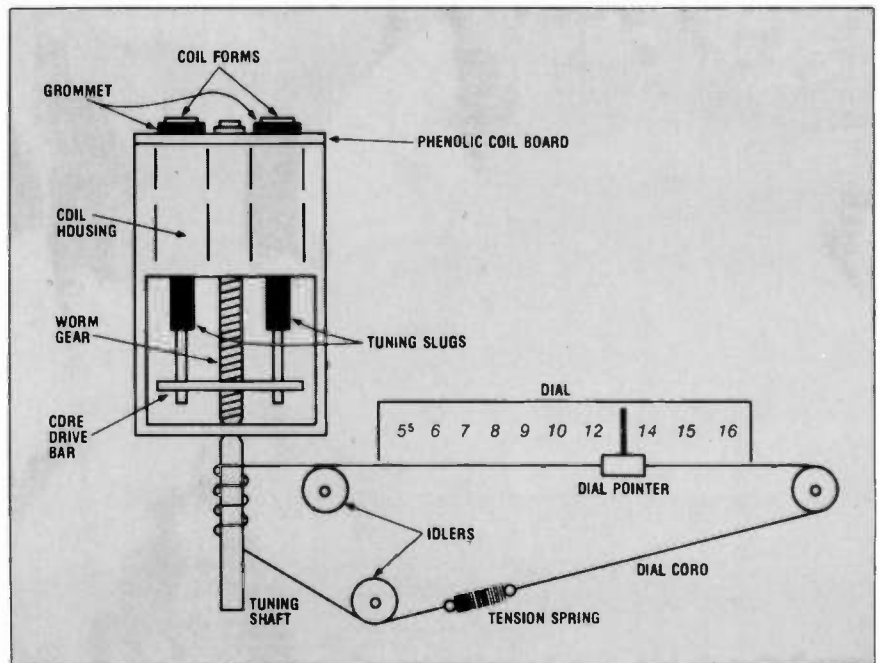


Fig. 1—Manual tuning mechanism.

detail. Also, be aware that Motorola made it their habit to pack a copy of the service manual with all of their after-market radio models, and the customer may have this booklet in the glove box of the car.

Fortunately, there are only a few different types of problem associated with the manual car radio tuner. One, already discussed, is the broken dial cord. A related problem is the *slipping dial cord*. This is caused by either a stretched cord or a bad tension spring. In both cases it is usually best to replace the dial cord or spring, as required. Sometimes, in the case of the stretched cord, there is sufficient slack to tie a new knot and pull the cord up tight, but this is not usually the case. Also, it has been my experience that the use of wax anti-slip compounds simply will not suffice in the rugged auto radio environment.

Another manual PTM problem that is

the core drive bar to move. Since the tuning slugs (i.e. coil cores) are attached to this bar they will move in or out of the coil forms, depending upon which direction the shaft was turned.

The frequency being tuned is indicated on a dial scale by a pointer that is driven by a dial cord from the main tuning shaft. Rewinding dial cords on any kind of radio is a bit of a problem, and one is cautioned to use only real, genuine dial cord from an electronic parts and supplies distributor rather than some substitute such as waxed fishing line.

You will probably be able to figure out how the dial cord is supposed to be wound, but will likely make a few false starts before the correct combination is found. Because of this problem, it is usually advisable to look up the correct instructions for the model of radio involved. Most service manuals or Sams AR-series books will give that type of

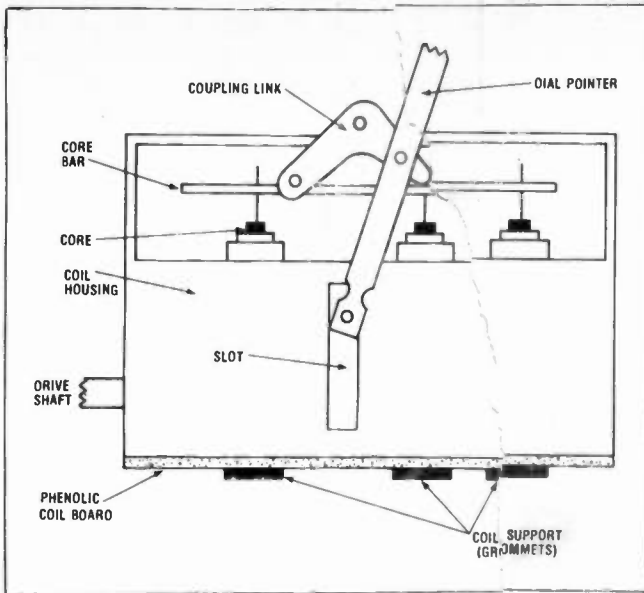


Fig. 2—Coil housing for a pushbutton PTM.

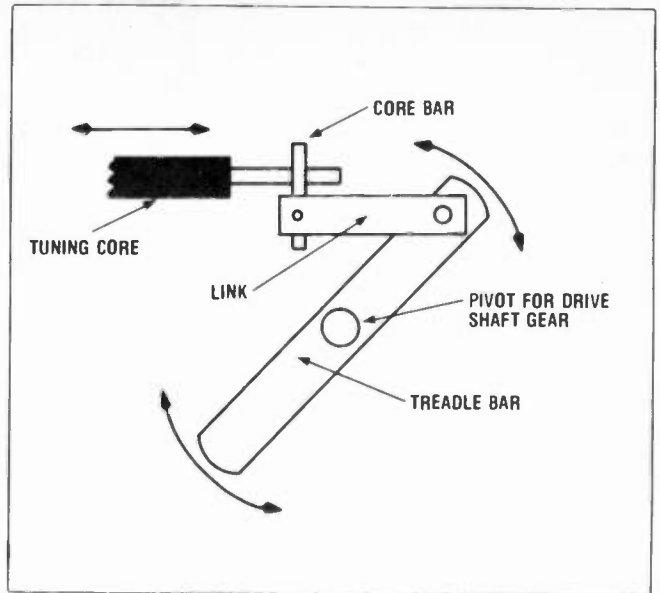


Fig. 3—Treadle bar linkage.

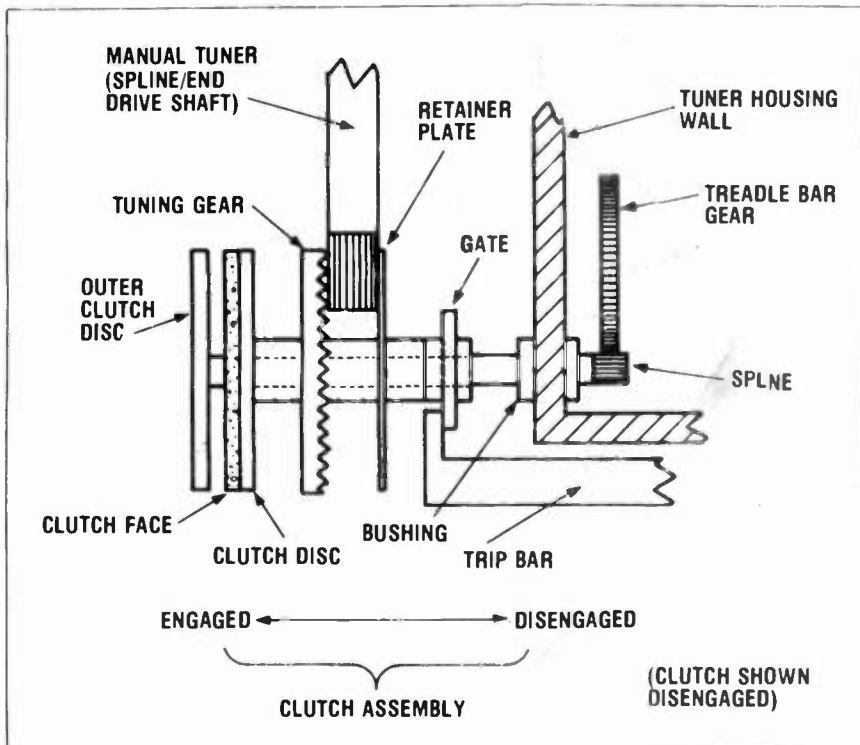


Fig. 4—Clutch assembly with manual drive system.

often seen is a loose coil board assembly. This piece is a phenolic board that holds the coils in place. Rubber grommets actually hold the coil forms, and the entire assembly is connected to the tuner coil housing either by screws or through the use of "dog ears." In the latter case we often find that the dog ears become loose, and the coil board will not stay in place as the tuner is adjusted. In the past there was little we could do unless the dog ears were essentially intact. Today, though, we use modern cyanoacrylic-based "super glues" to secure the coil board. Be careful, though, because this glue sets

up in seconds, so you will not get a second shot at seating the board. It is also quite possible to glue yourself to something, or glue your fingers together, if you get that glue on your skin. Most super glues, however, can be dissolved by acetone, which is a major constituent of finger nail polish remover.

Pushbutton tuners

The basic pushbutton PTM is shown in Figs. 2, 3, 4, and 5. Delco uses a coil housing assembly similar to the type shown under manual tuners in Fig. 1, but most non-Delco radios use a PTM that has a coil housing shown as such in Fig.

2. Since the tuner is a PTM, the tuning slugs are moved in and out of the coil forms by the core bar, not at all unlike the manual PTM assembly discussed earlier. The pointer in this case is driven by a coupling link to the core bar. The core bar, on the other hand, is driven by link to a part called the *treadle bar* or *treadle* (shown in Fig. 3). The treadle is on a pivot that is gear driven from the manual tuning shaft. The basic function on the treadle is to convert the rotary motion of the manual tuning shaft to the rectilinear (straight line) motion of the core bar.

The pushbuttons press against the treadle, pushing it to the correct position for the station selected by the user. Little tabs on the pushbutton tang protrude up to engage the treadle at the appropriate point.

Pushbuttons are set by first clearing the previous setting and then creating a new setting. Clearing is done by pulling the button out. This action releases the tab, and causes it to assume a neutral position. The user then manually selects the station desired, and then sets the pushbutton to this new station by pushing the button all the way in. This last action will set the tab on the pushbutton to a new position that corresponds to the newly selected station. The tab and its associated linkage are, then, a kind of mechanical position memory.

The pushbutton assembly will have a difficult time pushing against both the treadle bar and the manual tuning drive system. This problem is overcome by using a clutch mechanism (see Fig. 4) to disconnect the manual tuning shaft during pushbutton operation.

In the manual tuning mode the clutch

face will be engaged with the outer clutch disc. The outer disc's shaft passes through the center of the clutch assembly, through a brass bushing in the tuner housing, where its spline end engages and operates the treadle bar gear. The manual tuning shaft, operated by the user, drives a gear on the clutch assembly. When the clutch is engaged, the movement of the gear is transmitted to the outer clutch disc, and hence through its shaft to the treadle bar gear.

When the user operates a pushbutton, the clutch is disengaged. The pushbutton assembly will engage the *trip bar* as it is pressed. This trip bar moves slightly to the right, pulling in the clutch assembly as it goes.

Most pushbutton tuner troubles, although by no means all, seem to revolve around the operation of the clutch assembly, or related structures such as the trip bar.

One such problem is dial slippage. Two different causes seem to exist: jamming of the PTM or dial pointer, and actual slippage in the clutch assembly itself. The way to determine which is the case is to *slightly* depress one of the pushbuttons, and then use the fingers of your free hand to move the treadle bar through its entire travel. Note whether or not the treadle and dial pointer moves freely, and if not try to discover where the bind is located. Most binding problems occur because of a bent pointer, dried or no lubrication in the treadle bar and associated linkage, or due to maladjustment of the treadle bar pivot bearings. When you make this test, make sure the pushbutton is depressed only enough to operate the trip bar, and not enough to make the pushbutton set-tab engage the treadle bar.

If the problem is clutch slippage, then look to a deteriorated clutch fading or misadjustment of the clutch assembly as the most probable cause. On non-Delco tuners we often find that the only clutch adjustment that is possible is bending the trip bar actuating arm. Delco, though, provides an adjustment on the side of the radio. A few Delco models have a 1/4-inch screw as the adjuster. Most, however, use a slot screw for the adjustment and a 3/8-inch retainer nut to keep it in place.

Another problem that could cause apparent slippage is a worn spline on the manual tuning shaft. This problem was seen quite a bit a few years ago when Philco-Ford used a drive shaft made of plastic.

We also occasionally see problems where the manual tuner works, but the pushbuttons quickly jam. Very often

such problems are caused by a failure of the clutch to disengage. This is caused either by binding of the trip bar, or by misadjustment of the trip bar actuating arm.

The actuating arm can be adjusted using a pair of heavy long nose pliers. Bend carefully, and slowly or you may break the arm off, and ruin the tuner. Binding of the trip bar is usually caused by either warpage or by dried lubricant.

Multiband tuners

AM/FM or AM/FM/SW auto radios have

a peculiar problem: how do you allocate the five or six pushbuttons on the tuner? Some radios, notably German and Japanese models, use either two tuners in one coil housing or two parallel tuners, one for each band. The radio still has only five or six pushbuttons, so the user must decide how they are allocated between the bands. If a button set for another band is pressed, then the radio will land on whatever station chances to be on the same position of the dial, or there'll just be dead air.

Another approach is to make the

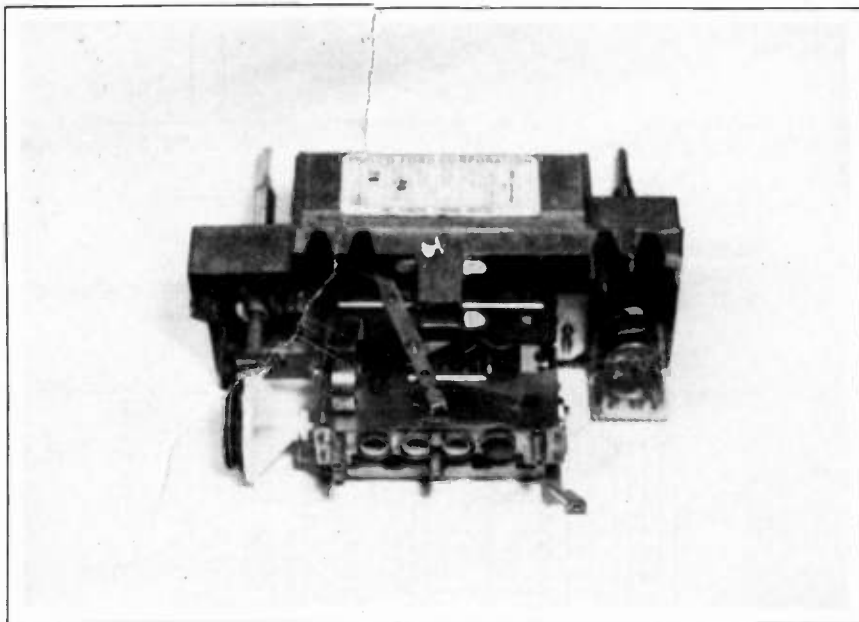


Fig 5A—Philco-Ford pushbutton PTM with coil board removed.

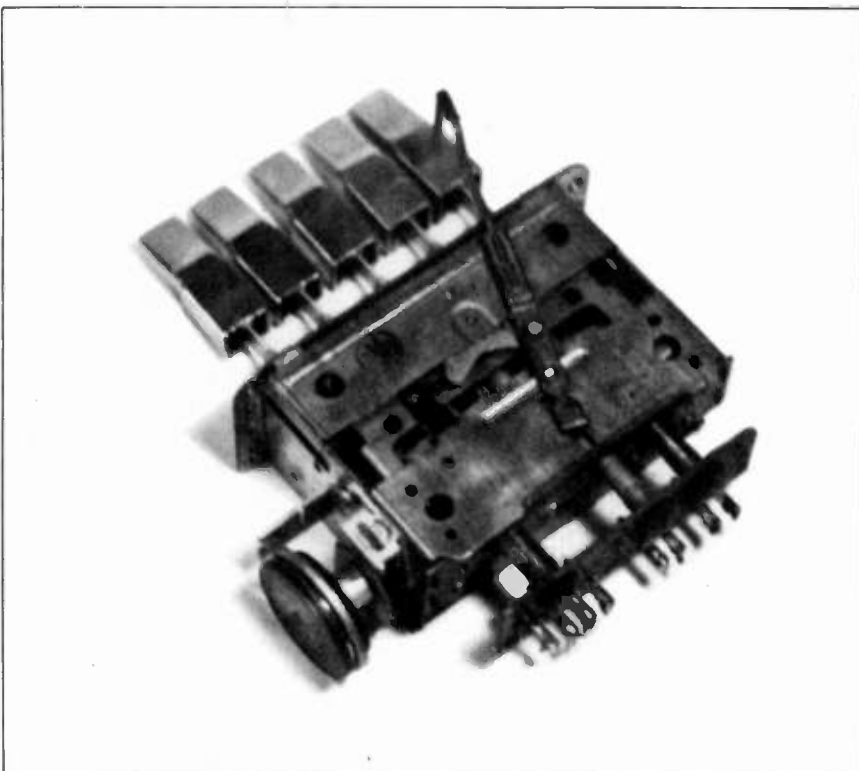


Fig 5B—Pushbutton PTM with the coil board partially removed.

AM/FM bandswitch an integral part of the pushbutton assembly. The radio manufacturer sets the pushbutton allocation as part of the design and the user has little say in the matter. This is the practice on Becker Autoradio and Blaupunkt models, and certain other European brands on which the pushbuttons will be labeled as to band. They will bear designations such as "AM," "FM," or "SW." Or alternatively, the letter designations "M" (medium wave) for the AM band, "K" (kurzwaben) for shortwave, and "U" (ultrakurzwaben)

for FM are sometimes used.

Shuttle tuners

A mechanical solution to this problem that allows all five pushbuttons to function independently on each band is the shuttle tuner of Fig. 6. This technique has been used by both Delco and Bendix. Shuttle selector tuners have a single tang that operates either of two sets of slides. The slides, of course, press against the treadle bar in the manner of all pushbutton tuners. When the shuttle is to the right (see Fig. 6A),

the AM slide is operated. Similarly, when the shuttle is to the left, the FM slide is operated. The shuttles are shifted back and forth by a shuttle bar (see Fig. 6B).

Most of the jams seen in this type of tuner seem to involve the shuttle bar of the shuttles themselves. The shuttle bar is operated as part of the bandswitch, and if the bar is warped, it will jam the mechanism rather quickly. Replacement seems the best solution in these cases.

Servicing PTM assemblies

It is often the case that tuner problems are compounded through the use of inappropriate lubrication, or by dried lubrication. The lubricant to use is white grease such as *Lubriplate*, and to a lesser degree ordinary 3-in-1 oil.

But do not be too generous with the grease. Most tuner applications require only a very thin *film* of white grease, and will become too sluggish if excessive amounts are used.

One can frequently work wonders by spraying out the old white grease in the treadle bar pivot bearings and their races, and then relubricating with new grease. Ordinary non-foaming tuner cleaners, or solvents such as Freon TF will do the trick.

Original replacement parts for auto radio tuners can be a little tricky to locate. Bendix, Delco, and Motorola seem to keep the parts in stock for several years after the model is terminated, but some of the imported brands have no such convenience. This is one reason why full-time auto radio people tend to keep old tuners in a box under the bench

someplace—cannibalization being the only solution to the parts problem.

Also, it's a good idea to keep a "servicer's assortment" of small ball bearings and springs available. These may be used to make impromptu tuner parts replacements.

When ordering certain non-Delco tuner replacements be aware that there are several different, non-compatible, tuner assemblies for every model of radio. Many companies require that you copy every letter and number stamped into the frame of the car radio tuner itself when making your order. It is not sufficient to simply give the part number of the tuner, because the same part number occasionally describes two or more PTM assemblies that fit the same model of radio. At least one source sends the entire front bezel and escutcheon for that model, so that the problem of exact OEM manufacturer is eliminated. **ETD**

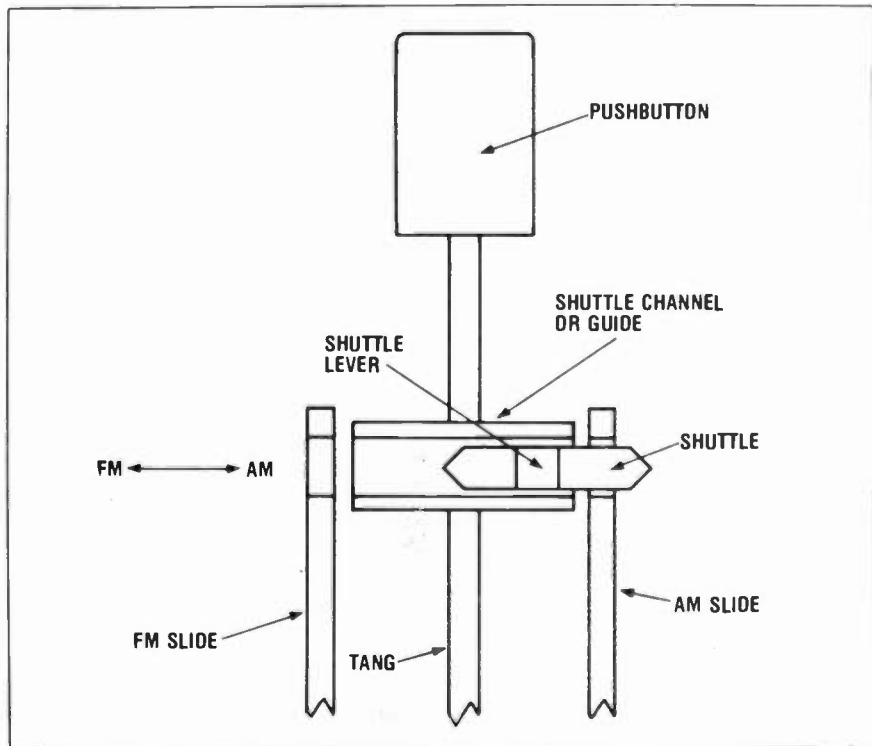


Fig. 6A—Shuttle mechanism of a ten-slide, five pushbutton tuner.

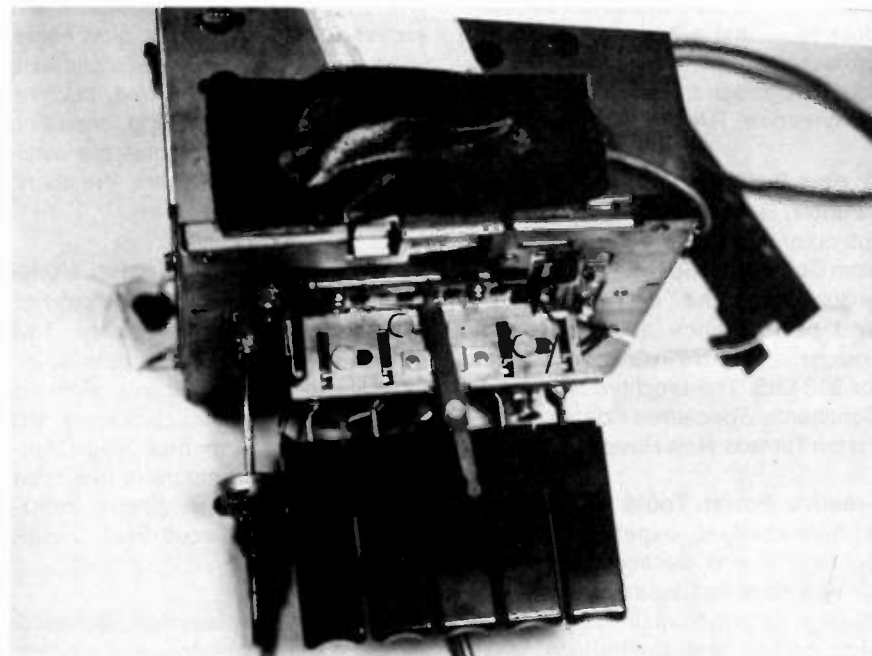


Fig. 6B—Bendix shuttle bar system. The shuttle bar is part of the AM/FM bandswitch.

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BULLETIN BOARD

Original Replacement Parts for Japanese consumer electronic products are listed in the new 1978 catalog available now from Ora Electronics. Over 400 original Japanese I.C.'s, transistors, tape heads, ceramic filters and special devices, as well as repair kits are listed and illustrated in the new literature. Explanations of the parts and pricing up to 70% below market price is included. Also a toll free telephone number for parts ordering. Free from *Ora Electronics*, 7235 Canby Avenue, Reseda, CA 91335.

Antennas and Accessories are just some of the many electronic products included in the new expanded catalog available now from RMS Electronics. Also included are MATV systems equipment, replacement antenna rods, CB and other two-way communications accessories, PA and audio speaker horns and tape storage units. New products include: a 75-300 ohm balun for indoor and outdoor use, new MATV cables featuring a 75 ohm CB interference filter, and MATV cable adaptors. Catalog is free from *RMS Electronics, Inc.*, 50 Antin Place, Bronx, N.Y. 10462.

Electronics Home-study Courses are outlined in a new brochure issued by MTI. The new brochure describes two new courses being offered by the Institute — a 4-lesson course on semiconductors — and a 34-lesson course on professional FM two-way radio servicing. The brochure is free from *MTI*, Summerdale, PA 17093.

A new 8-digit 100 MHz frequency counter is described and pictured in full-color 4-page brochure available from *Continental Specialties*. The folder, entitled "Freq. Out," details the features and performance of the Max-100 counter, a portable instrument that sells for \$134.95. The brochure is free from *Continental Specialties Corporation*, 70 Fulton Terrace, New Haven Connecticut.

Creative Power Tools for hobbyists, do-it-yourselfers, experimenters, lab technicians, and electronic technicians are described and illustrated in the latest 20-page catalog from *Dremel*. Over 250 photographs and illustrations vividly display each of six power tools, their

many uses, and a complete line of accessories to make cutting, shaping and finishing jobs easier and more creative. The catalog is free from *Dremel Manufacturing, Div. of Emerson Electric Co.*, 4915 21st St., Racine, Wisconsin 53406.

An Expanded Line of Semiconductors is presented in the new Spring catalog from *Mouser Electronics*. This 88-page catalog, No. 518, includes 7 pages on transistors, rectifiers, diodes, LEDs, SCRs, and triacs. Leading lines include Zener, germanium, and silicon diodes, rectifiers, and TO-18 and TO-92 transistors. Also included is a line of IEE light emitting diodes, including sockets. Free from *Mouser Electronics*, 11511 Woodside Avenue, Lakeside, CA 92040.

Audio Parts and Accessories are covered in a 16-page short form catalog from *BP Electronics*. Included in the catalog are: speakers, antennas, capacitor and CB kits, plugs and jacks, audio cables, connectors, adaptors, CB accessories, tools and other accessories. All necessary ordering information such as packaging, minimum quantities, and pricing is included. Free by writing on company letterhead to *BP Electronics*, 855 Conklin Street, Farmingdale, N.Y. 11735.

"Common Production Soldering Problems; Causes & Cures" is the title of 4-page guide available from *Multicore Solders*. The booklet details the most common problems encountered in hand, dip or wave soldering. Among problems covered are: insufficient and excess solder on the joint; blow holes; wicking; dull grainy joints; discoloration of solder joint areas; icicles; bridges; non-wetting and dewetting; measing and cold joints. Free copies are available from *Multicore Solders*, Westbury, N.Y. 11590.

A New Portable Multi-Tester, Model SP-170, is described in a new product data sheet from a.w. Sperry. The SPB-89 data sheet contains detailed information on the description, features, ranges, specifications, packaging and accessories of the new Volt-Ohm-Milliameter. The literature is free from *David Weissman. a.w. Sperry Instruments Inc.*, 245 Marcus Blvd., Hauppauge, N.Y. 11787.

A Solid State Replacement Guide for 1978 is now available for service technicians from *RCA*. The 240-page book,

SPG-202W, can also be used by engineers, experimenters and other who work with solid-state devices. The RCA SK line of replacement transistors, rectifiers, thyristors, integrated circuits and high voltage triplers, now numbering 750 devices that replace over 141,000 domestic and foreign industry devices, is covered completely by the new guide. Priced at \$1.50 from *RCA Distributor and Special Products Division*, P.O. Box 85, Runnemede, N.J. 08078.

New Test Instruments are detailed in the latest Instrument Catalog from Exact Electronics. The 66-page 1978 catalog contains detailed specifications for each function generator, waveform generator and frequency synthesizer in the product line. A quick select short-form and comparison chart plus a representative roster is included. Free from *Exact Electronics, Inc.*, P.O. Box 160, Hillsboro, OR 97123.

Wire, Cable and Cord Sets are covered in a new industry cross reference guide from Columbia Electronic Cables. The guide lists part numbers for Columbia's product line and corresponding part numbers of ten other manufacturers. Some products included are: microphone cable, TV transmission line, shielded and unshielded audio cable, power supply cable, stereo cable, coaxial cable and assemblies, and air conditioner, range, dryer and extension cords. Free from *Columbia Electronic Cables*, 11 Cove Street, New Bedford, MA 02744.

Frequency Counters are detailed in a new 6-page brochure from B&K-Precision. The literature provides information on applications and features on the company's full line of counters. All specifications are grouped on a common page. Included is information frequency counter accessories. Free from *B&K-Precision*, Sales Dept., 6460 W. Cortland Ave., Chicago, Illinois 60635.

The new 1978 **ECG Semiconductor Master Replacement Guide** is available now from GTE Sylvania. The guide and catalog cross references, in alphanumeric order, more than 137,000 industry part numbers to the Sylvania ECG line. The 300-page publication contains nearly 18,000 more part numbers than previous editions. Includes outline drawings, circuit diagrams, and technical descriptions. Available for \$2.95 from *GTE Sylvania Marketing Services Center*, 70 Empire Dr., West Seneca, N.Y. 14224. **ETD**

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ET/D - March 1978 | 35

TEST INSTRUMENT REPORT

High productivity is most certainly the key to success — and maybe even survival — in today's electronic servicing business. And so it's not surprising that a number of test instrument manufacturers are designing their newest offerings with servicing speed in mind.

The goal is to combine as many test instrument functions into one unit as is

For purity checking and adjustment, the three raster positions — red, blue and green — allow you to do the job without a need for shorting the grids or disturbing the screen controls.

Actually, the GTS-10 provides these 10 multi-purpose patterns: *3.58 Monitor* — a ten-bar gated rainbow with no color burst or luminance pedestal. Therefore it is a combination color and monochrome pattern. Mainly, it allows a check on the 3.58 MHz oscillator without having to ground the oscillator input. It also doubles as clear raster pattern with the CHROMA control turned down.

Vector — a gated ten-bar pattern without luminance pedestal. Used to check overall receiver response at 3.56 MHz; to produce vector patterns in conjunction with an oscilloscope or vectorscope; to produce R-Y, B-Y, and G-Y waveforms; to provide scope patterns for AFPC troubleshooting; and for checking the chroma demodulator bandwidth.

Color Bars — a gated rainbow with luminance pedestal. Used for fine tuning of TV to generator; for checking, adjusting of hue control; to check color sync locking range; to check ACC; for a cross-check of color killer adjustment; to check for color "fit"; and for an analysis of receiver bandwidth and damping characteristics.

Red, blue and green rasters — Used for purity checks without shorting the grids or disturbing screen controls.

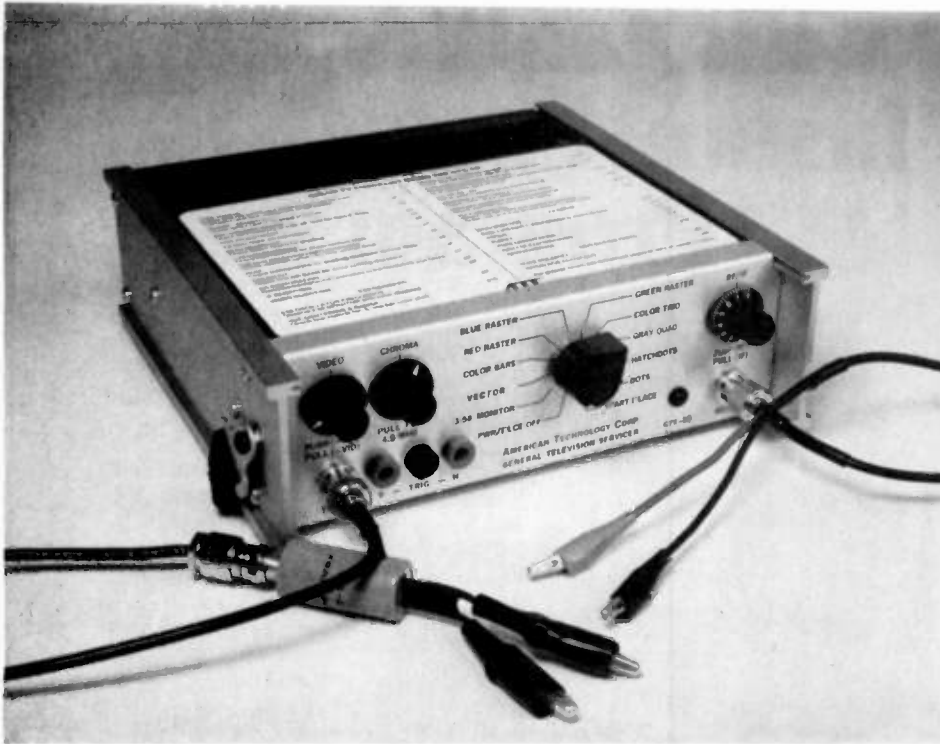
Color Trio — A pattern consisting of the three primary colors in large areas of the screen. Used to test the picture tube and matrix, and for bandpass amplifier alignment.

Gray Quad — Consists of four densities of gray with each filling one quadrant of the screen. Used for checking and adjusting gray scale tracking; checking tuner sensitivity; checking effects of video level on horizontal sync; checking for reversed yoke connections; and checking low frequency video response.

Hatchdots — a combined dot and cross-hatch pattern with a dot in the center square of crosshatch, and with dots in other squares. Used for convergence — static and dynamic — and for checking vertical and horizontal linearity, size, centering and pincushion. Also to check receiver/video bandpass at 1.78 MHz.

Dots — a standard dots matrix, except that two dots (one above & below center dot) are omitted for center-marking the pattern. Used for static and dynamic convergence.

continued on page 53



For more information about this instrument, circle 145 on the Reader Service Card in this issue.

ATC's GTS-10 general television servicer

A service simplifier

By Don W. Mason

possible — simplify the service bench hookup — and reduce the necessary steps in any one servicing procedure.

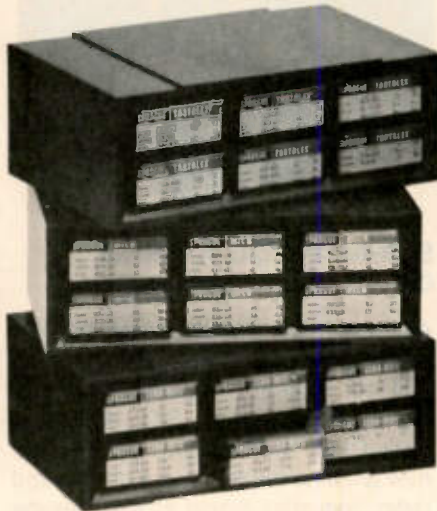
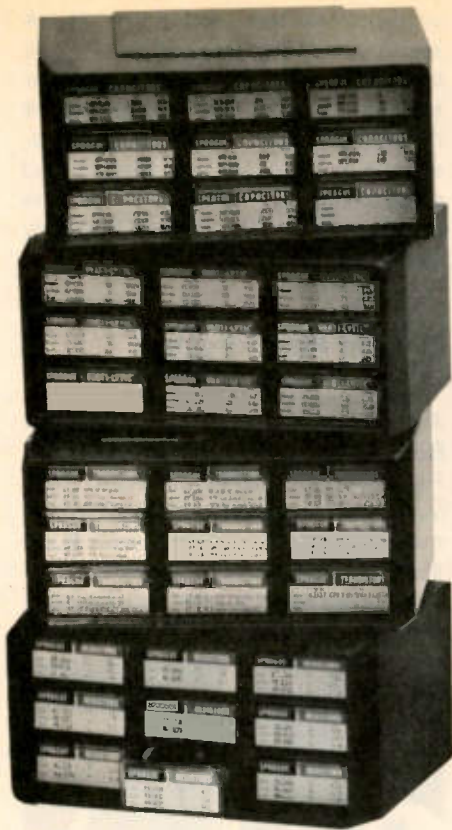
The subject of our Test Instrument Report this month — ATC's GTS-10 General Television Servicer — seems to reach that goal.

The GTS-10 started life several years ago as the ATC-10 Color Bar Pattern Generator, but now with additions and refinements, it can justifiably be called a general television servicer. We worked with it on our service bench, and found it to be "as advertised."

Just four of the positions on the function switch — the 3.58 monitor, and the red, blue and green rasters — convinced us of the ability of the GTS-10 to save time and bother.

To check for frequency error in the color sync oscillator with the GTS-10 you simply flip the switch to 3.58 MONITOR and the colors float like they're supposed to without the bother of shorting out the AFPC test point.

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Assortment CBK-3. 46 miniature single-ended aluminum electrolytic capacitors in 27 popular ratings. 9-drawer cabinet.

Assortment CBK-4. 34 tiny dipped solid-tantalum capacitors in 17 popular ratings. 6-drawer cabinet.

Assortment CBK-5. 46 miniature axial-lead aluminum electrolytic capacitors in 23 popular ratings. 9-drawer cabinet.

Assortment CBK-6. 26 disc ceramic capacitors plus 12 trimmers in 19 popular ratings. 9-drawer cabinet.

Assortment CBK-7. 70 tiny temperature-stable ceramic capacitors in 14 popular ratings. 6-drawer cabinet.

Assortment CBK-8. 34 miniature dipped mica capacitors in 17 popular ratings. 6-drawer cabinet.

Assortment CBK-9. 130 ¼-watt carbon-film resistors in 23 popular resistance values. 9-drawer cabinet.

Assortment CBK-10. 127 ½-watt carbon-film resistors in 24 popular values. 9-drawer cabinet.

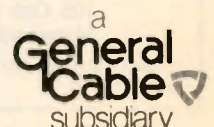
Assortment CBK-11. 115 single-ended ultra-thin polyester-film capacitors in 23 popular ratings. 9-drawer cabinet.

For complete information on the CBK-110 Servicer, write for Brochure M-994A to Sprague Products Co., 65 Marshall St., North Adams, Mass. 01247.



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ET/ID - March 1978 / 37

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Circle No. 110 on Reader Inquiry Card

DEALER'S SHOWCASE



Self-tuning CB Antenna

Circle No. 146 on Reader Inquiry Card

A new self-tuning antenna system that is said to improve performance of both 23 and 40-channel CB transceivers has been introduced by *GTE Sylvania*. Called the "Auto-Match" system, the new antenna measures the transmitted radio frequency signal at the antenna feed point and correctively tunes the antenna for maximum performance and minimum VSWR. The antenna automatically stays tuned as channels are changed, the whip sways, becomes wet, weathered, or as any condition is encountered that would ordinarily effect the performance of a conventional fixed-tuned antenna. The non-corroding stainless steel antenna operates from the same power source as the CB transceiver, and is designed for trunk-mounting on most vehicles.

Stereo Headphones

Circle No. 147 on Reader Inquiry Card

Two new stereo headphones, a deluxe model and an economy model, have been introduced by *Robins Industries*. The deluxe model, No. 47-921, features a full audio spectrum frequency response from 20 to 20K Hz for both stereo and mono use. Each earcup features imprinted left/right positioning with indi-

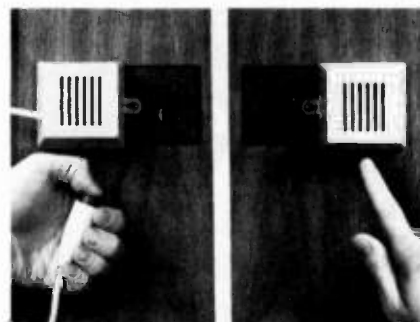


vidual continuous volume controls. A stereo/mono switch is also provided. Has large 3 inch dynamic speakers. The economy model, No. 47-901, has 8 ohms impedance with frequency response of 30 to 18K Hz. Has padded earcups and 2 1/2 inch speakers. The deluxe sells for \$20, and the economy model is priced at \$11.

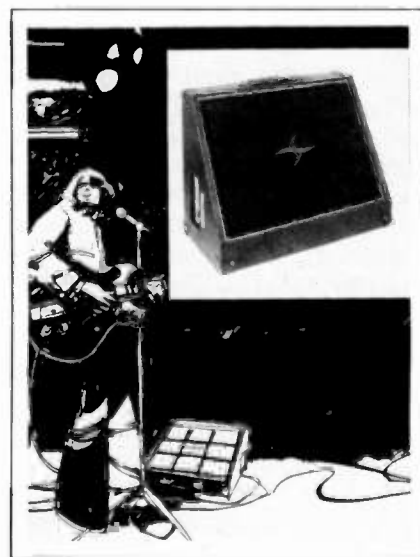
Plug-in Alarm System

Circle No. 148 on Reader Inquiry Card

A new plug-in security alarm called the Bedroom/Neighbor Signal Horn and Panic Alarm is new from *Waldom Electronics*. Designed for homes, apartments, mobile homes and business offices, the new alarm emits a moderate pulsing signal tone when an intrusion activates the system's Control Center.



System utilizes signal transmission via existing electrical outlet wiring. Thus, the alarms may be installed anywhere wiring is common, even in a neighbor's home if serviced by the same utility transformer. Plugs into wall outlet. Priced from \$35.95 to \$44.95.



Stage Monitor Speaker

Circle No. 149 on Reader Inquiry Card

A new stage monitor speaker for musical groups wanting to hear themselves

while performing on stage has been announced by *Shure Brothers*. Called the Model 702, the new monitor features wide-angle high frequency dispersion provided by a new tweeter configuration that disperses sound in a broad pattern, allowing entertainers to move about stage without sound loss or distortion. The new speaker has a shaped frequency response, with boosted mid-range and controlled bass roll off. It can be used with any amplifier delivering up to 50 watts to 16-ohm load. Priced at \$238.

Battery Charger System

Circle No. 150 on Reader Inquiry Card

A new line of rechargeable nickel-cadmium batteries for household use coupled with a new battery charger has been introduced by *Dynamic Instrument*. The batteries—AA penlight, C-size, D-size, and 9-volt transistor—carry a warrantee for 5 years of use, or 1,000 recharges. The charger, called



the Dynacharger, can charge all types of batteries, up to four at a time or two different pairs at one time. Batteries and charger are available to dealers in a point-of-sale display to be hung on pegboard or placed on a counter. Either self-serve or pilfer-proof display is available.

Remote Smoke Alarm

Circle No. 151 on Reader Inquiry Card

A new remote alarm device to help amplify and spread the alarm of home smoke detectors has been introduced by *Floyd Bell Associates*. The new unit, called "Remote-A-Larm," has been created to augment smoke detectors that have limited signal ranges. The device carries the warning signal to distant bedrooms, basement, attic, garage, even to and from other buildings. It connects to the main smoke detector by a self-adhesive attachment at the end of

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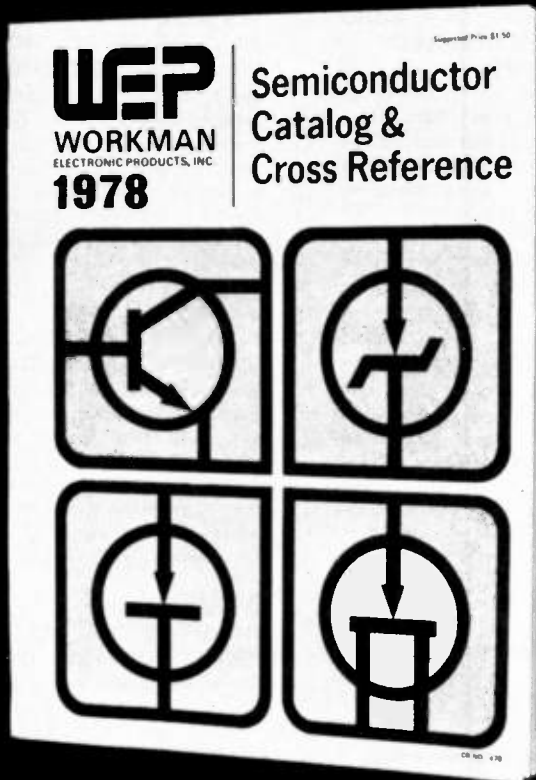
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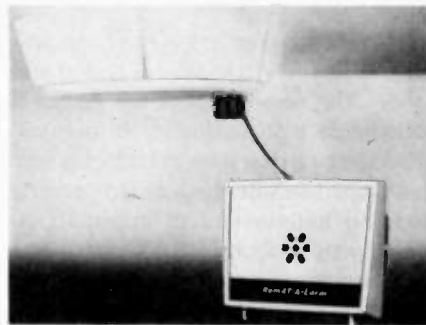
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the wire. When smoke detector is set off, the Remot-A-Larm activates a remote unit in a distant room, spreading the warning. Operates on one 9-volt battery.

Video Projector

Circle No. 152 on Reader Inquiry Card

A new video projector designed for both commercial users and apartment dwellers has been added to the video projector line from Amtron Video. The projector is available either for ceiling mounting or on roll-away casters. Called the



Epic 110, the new unit is 33 inches by 17 inches by 13 inches, has a 4 foot 3 inch screen measured diagonally, comes with mounting hardware and easy-to-follow instructions. Optional 5 foot 6 inch screen is available.

CB Mike Display

Circle No. 153 on Reader Inquiry Card

A new 'Sell-A-Mike' counter display that exhibits four CB hand mikes and gives the customer the chance to handle and compare the different models is being



Circle No. 138 on Reader Inquiry Card

offered dealers now by *Telex Communications*. The mikes can be removed from their brackets for examination. The mike cords feed through holes into a tray in the back of the display and are fastened together to prevent pilferage. The display and are fastened together to prevent pilferage. The display, made of heavy-gauge rigid plastic and printed in two colors, is compact, measuring 12 in. by 9 in. by 4½ in. Available to dealers for a special promotional price.

Audio Cables & Connectors

Circle No. 154 on Reader Inquiry Card

A new line of audio cables and connectors with 23K gold plated connections has been announced by *Audiotex Laboratories*. The low resistance factor and non-corrosive quality of gold is said to insure a clean, unobstructed connection for maximum transfer of power. All ca-



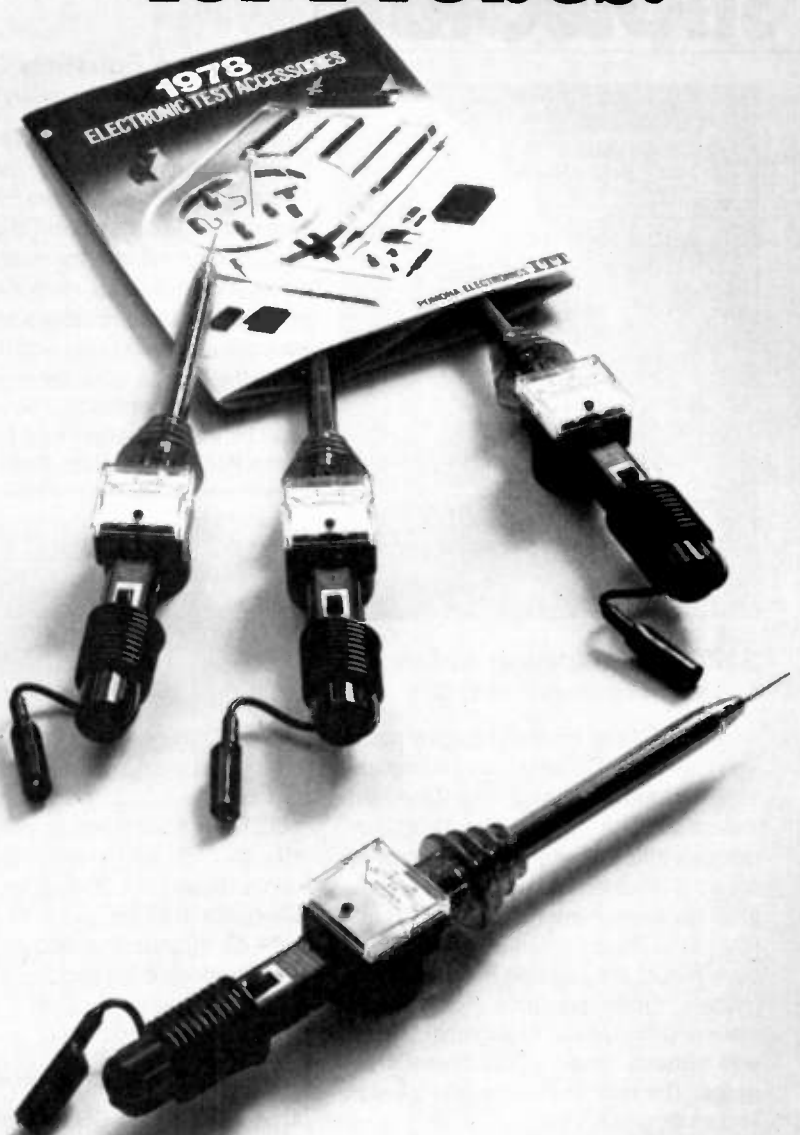
bles have spring strain reliefs for long life. Cables and connectors, which carry a "Lifetime Guarantee," are available in a revolving display along with record care accessories for audio enthusiasts.

Car Coaxial Speaker Kit

Circle No. 155 on Reader Inquiry Card

A new speaker kit for stereo FM car radios and tape players is new from *BP Electronics*. The kit includes two 6 inch by 9 inch speakers, custom padded grilles, hardware, cables and installation instructions. Each speaker features a ceramic magnet for optimum activation of the voice coils. The cloth air-suspended woofer and separate 3 inch tweeter evenly distribute all the audio frequencies. Response is 70-15000 Hz, impedance is 8 ohms and peak power is 25W continuous. Speaker assembly is constructed to withstand vibration. **ETD**

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Circle No. 124 on Reader Inquiry Card

DEALER'S SHOWCASE



Self-Merchandising Antennas

Circle No. 156 on Reader Inquiry Card

A new self-merchandising display package for mobile CB antennas and accessories is available now from *Winegard Industries*. The rack, model ID-500, includes a total of 34 items, two each of 17 different products and is sold as a complete package. Featured are four CB antennas: trunk lip mount models, roof/deck mount models and magnet mount models. Other products included are mounting hardware replacement parts and various types of stainless steel whips. The rack features a header sign and stuffer rack.

Tape & Phono Belts

Circle No. 157 on Reader Inquiry Card



Exact replacement tape recorder/phono belts and drives have been revamped by *GC Electronics* into a new, space-saving 'bin' merchandising program. The space saver is a colorful, plastic corrugated bin which allows approximately 30 belt and drive cards to be stored per bin. The program, 49-176,

includes 15 bins, index card and label set, the Walsco cross reference, and a 'belt-o-meter' for sizing and 164 belts and drives.

Car Stereo Equalizer/Booster

Circle No. 158 on Reader Inquiry Card

Car Stereo dealers may find interest in a new response equalizer and power booster device from *Prime Electronics*. Called the "Tone Stroker," the device is said to compensate for deficient or inadequate frequency response in tape player/radios and speakers and for poor acoustical areas in cars and vans and to allow the user to tailor the frequency response to his own taste. The unit is powered by the car battery and has 30 total Watts RMS for 15 Watts RMS per chan-



nel. Tone adjustment is possible at 65 Hz, 300 Hz, 1KHz and 10KHz with a control range of +20 db boost to -20 db attenuate at 65 Hz and +14 db boost to -14 db attenuate at 300 Hz to 10,000 Hz. Suggested list price is \$149.95.

Power CB Mike

Circle No. 159 on Reader Inquiry Card

A new hand held CB microphone with self-contained tone and volume controls has been introduced by *Astatic*. Designated Series 575, the new mike has a pre-amplifier that uses a replaceable 9-volt battery for talk power. Volume and



tone adjustments are made with a slide-switch. Other features include a press-to-talk lever, a spring return switch that disconnects the battery in the 'off' position and operates the control circuit and amplifier in the 'on' position. Mike housing is of high impact molded plastic. Impedance is 5000 ohms maximum.

Four-inch Portable B TV

Circle No. 160 on Reader Inquiry Card

A new 4-inch diagonal portable AC/DC black and white television set called the "Sidekick" has been introduced by *Sharp Electronics*. The new set has an electronic varactor tuner, an anti-glare hood, and weighs 6 pounds without batteries. It will play on a 12-volt car or boat battery, or with 9 "D" cells. An optional adapter is available for "D" cell play. It also has a 2-9/16inch round permanent magnet speaker, earphone, and a telescopic monopole common antenna for VHF / UHF. It retails for \$139.95. **ET/D**



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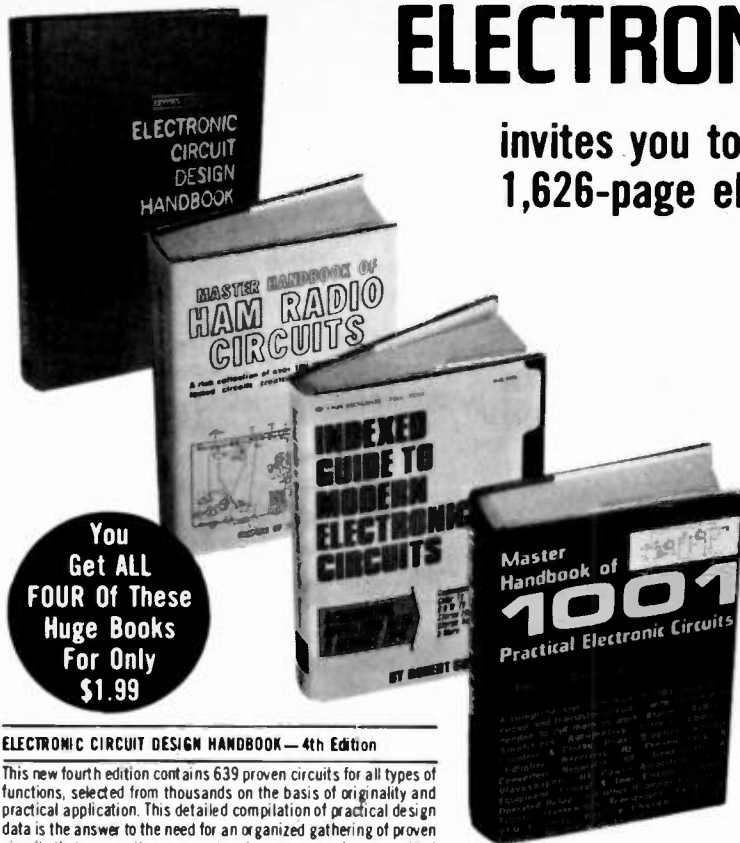
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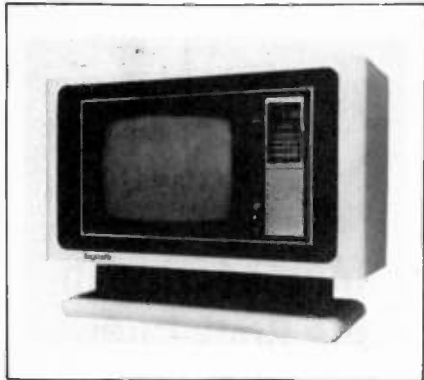
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(Valid for new Members only. Foreign and Canada add 10%) T-38

Circle No. 112 on Reader Inquiry Card

NEW PRODUCTS



Programmable Television

Circle No. 161 on Reader Inquiry Card

A new 21-inch color television set that allows a viewer to preset up to eight favorite programs for automatic play has been introduced by *Sharp Electronics*. Each pre-set program schedule on the set can be repeated every 24 hours. When programming the model, an audible beep tells the viewer that the programming instructions have registered in the set's microprocessor controlled memory. A digitron clock renders the time throughout the day with the channel numbers replacing the time display during the first five seconds of each program change. Direct remote control provides one-touch channel selection and minute control of volume levels.

Miniature Balun

Circle No. 162 on Reader Inquiry Card

A new miniaturized 75 to 300 ohm VHF or UHF matching transformer or balun is being introduced by *RMS Electronics*. Designated Model MA-100UV, the new



product features a completely shielded network and housing, with a heavy-duty twisted and tinned twin-lead with oval cut. Frequency range is 54-890 MHz. Insertion loss at 54-216 MHz is 0.8 max, and at 470-890 MHz, 1.8 db max. Isolation is 500 volt. List priced at \$2.15.

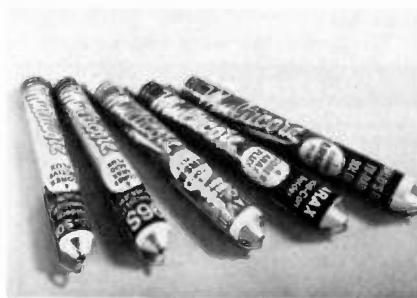
Ring Tongue Terminals

Circle No. 163 on Reader Inquiry Card

A new line of ring tongue terminals for wire sizes #8 through #2 AWG, vinyl insulated and non - insulated, has been announced by *Panduit Corp.* The new



terminals are individually sized for a specific wire size to assure positive connection, and have color coded polyvinylchloride sleeves to provide insulation support for the crimped wire. The large wire ring tongue terminals are made of pure copper, electro-tin plated. The terminals incorporate a brazed seam and a serrated inner barrel to provide maximum tensile strength and optimum wire contact after crimping.



Solder Sampler Kit

Circle No. 164 on Reader Inquiry Card

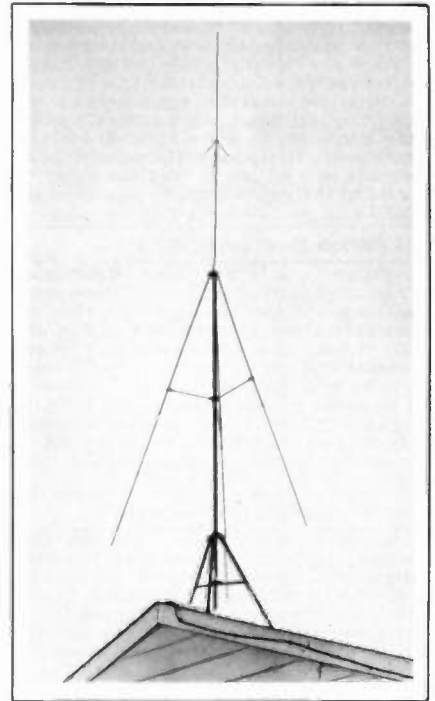
A sampler kit of five different solders, each for a particular application, is new from *Multicore Solders*. Packaged in handy, feed-out metal dispenser packs, the kit includes solders for the following applications: stainless steel and jewelry; plumbing, sheet metal and general metal joining; electrical wiring; electronic assemblies and pc boards; and aluminum soldering. The purpose of the kit is

to introduce current and potential solder users to the various alloy and/or flux combinations that are available. The flux for each solder is included in each as multiple cores. Included with each kit is a 'Soldier User's Guide.' Priced at \$8.95.

Base Station Antenna

Circle No. 165 on Reader Inquiry Card

A new preassembled CB base station antenna that is said to be ready for mounting on the mast 60 seconds after removal from the carton is available now from *Channel Master*. The new antenna, called the Golden Hawk, has a maximum SWR of 1.3:1 across 40 channels and average gain of 5dB. It is made of aircraft aluminum and has a heavy duty, machined aluminum support block. The antenna has a gold EPC weather-resistant coating. Everything is included for quick mounting. Suggested retail price is \$79.95.



Doppler Detector Diodes

Circle No. 166 on Reader Inquiry Card

New low noise Doppler detector diodes for use in police radars and other motion detection devices are now available from *Parametric Industries*. The new diodes, designated PD422, are glass encapsulated, hermetically sealed and encased in a ceramic housing to provide high burnout resistance and maximum sensitivity. Incident RF power is 2W (10ns,max.) and incident RF/CW Power is 200 mW (0.1 us or longer) at 25' C. Sensitivity (Tss) is -60 dBm at 10.525 GHz. The diodes are designed for zero

For the first time, a power microphone with tone and volume controls



Model 575M (4 wire)
Suggested List Price \$70.00

Model 575M6 (6 wire)
Suggested List Price \$75.00

Introducing the new Astatic 575 series CB microphone. The **first** ever with self-contained tone and volume controls. Designed to put talk power and sound quality in your hand. Made tough to last.

Fingertip slide controls on the mike allow quick volume and tone adjustment. You get the right modulation level and tone quality for each operator's voice with amazing ease!

Take complete control with the convenient press-to-talk lever. A spring return switch disconnects the battery in **off** position and operates the control circuit and amplifier

in **on** position. Easy to use with either hand.

Talk power? You bet! The contemporary tear-drop styled mike has an easily replaceable nine-volt battery power source. The 575 series is available in four or six wire coil for relay, electronic or special hook-up. The audio circuit is open during receive.

The first time you use the Astatic 575 series you'll know it's the right CB microphone for contouring your voice! See your electronics distributor or dealer about this Astatic **first**. Or write for more information.

...and powered by a 9-volt battery.



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Ask your local distributor or write...



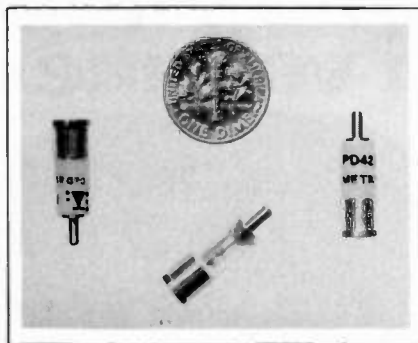
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Electronics Division**

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Circle No. 136 on Reader Inquiry Card

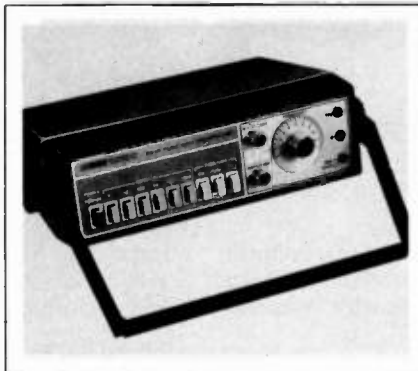
IF systems such as CW Doppler radars, police radars, braking systems, intrusion alarms and other motion detecting systems. They sell for \$8.50 each, or \$2.50 each in 10,000 lots.



Function Generator

Circle No. 167 on Reader Inquiry Card

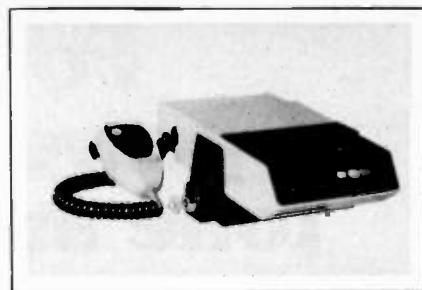
A relatively low priced, low-distortion function generator is new from *B & K-Precision*. Designated Model 3010, the new generator provides unusually wide frequency coverage — from 0.1 Hz to 1 MHz in six ranges, with each range providing linear 100:1 frequency control. It generates sine, square, TTL square and triangle waveforms, and is pushbutton controlled for fast, error-free operation. Frequency generation originates from a stable voltage-controlled oscillator (VCO) which can be varied on each range by the front-panel FREQUENCY control, or the VCO external output. Priced at \$175.



800 MHz FM Radio

Circle No. 168 on Reader Inquiry Card

FM Two-Way mobile/control station radios are now being offered by *Motorola* in the 800 MHz band, which is said to offer clear interference-free communications, even in most urban areas. Also, business radio users who qualify under FCC guidelines on channel loading can request their own private channel in the 800 MHz band. The new Motorola radios, called "Maxar," feature integrated and hybrid circuitry,



monolithic crystal and harmonic filters, and a solid-state antenna switch. The entire radio, including speaker, is housed in a small package weighing only 6 pounds.

Antenna Rod Cutter

Circle No. 169 on Reader Inquiry Card

A new tool that should simplify the cutting of stainless steel antenna rods has been introduced by *Larsen Electronics*. The new device features long 9 inch

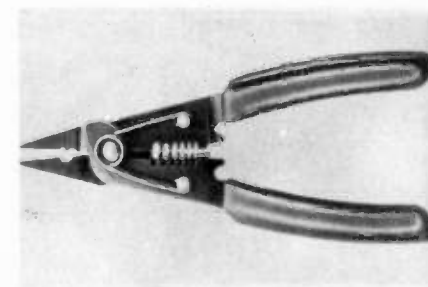


handles and a compound leverage of 18 to 1. The cutter allows for tightly spaced cuts of as little as 1/8-inch to assure rod lengths for the very lowest V.S.W.R. The replaceable blades are made of precision hardened Swedish tool steel.

Four-way Tool

Circle No. 170 on Reader Inquiry Card

A new electrical tool that performs 4 functions is new from *Hunter Tools*. Called the "Plike®", the new tool operates as a needle-nose plier, a crimper, a stripper, and a cutter. It features serrated needle nose tips that can be used for bending, gripping and pulling; a crimper for most types of solderless terminals; a hand ground stripper with 6



wire stripping holes; and a sharp hand-ground cutter. It is made of high carbon steel tempered and hardened for long life. The handles are rolled and dipped in heavy plastic.

Base-loaded CB Antenna

Circle No. 171 on Reader Inquiry Card

Two new low-silhouette CB antennas using a new base-loading technique have been introduced by *Antenna Incorporated*. The new antennas feature hand-wound, hand-tuned loading coils in the mounting cup. The new coil-in-cup design is said to eliminate the need for a vertical loading coil and shock spring.



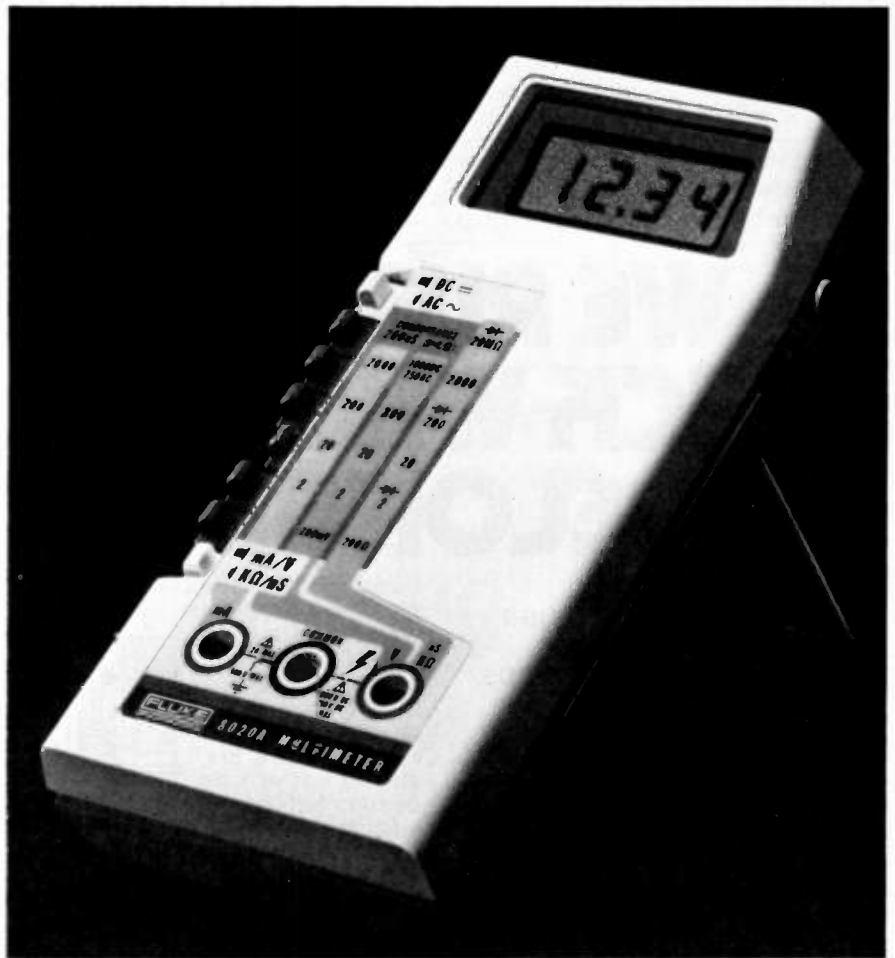
The new antennas, both completely pre-assembled, are the Firelock, Model 13503, and the Snub Nose, Model 17603. The Firelock has a mobile base loaded magnet mounting which holds at speeds up to 100 mph on metal roofs and up to 70 mph on vinyl roofs. The Snub Nose is a trunk lip mount designed for installation on the auto's rear deck lip or on the front hood of rear-engine vehicles.

Wattmeter

Circle No. 172 on Reader Inquiry Card

A new wattmeter for amateur and CB operators has been announced by the *Transel Corp.* Designated the Mark IIA, the new meter features headphone output for modulation monitoring on AM. All three power ranges (20, 200 and 2000) appear on a single meter scale. Frequency range is 3.5 to 30 MHz and accuracy is +5% of full scale. A direct reading SWR scale is in red, a complementing percentage-of-reflected-power scale is included. The SWR function can be used as an aid in adjusting carrier sup-

The reasons for giving up analog.



The best reason is accuracy of 0.25% dc. The 8020A digital multimeter has it, and that's *ten times* better than most analog meters!

And we guarantee that accuracy for a full year, plus we've calibrated your 8020A with equipment that's NBS traceable. A tradition with Fluke.

But you're also buying performance. Like high/low power ohms and *conductance*—the missing function on other multimeters. Ten megohm input resistance on both ac and dc. Plus more, for only \$169.*

The tougher your job gets, the more you need resolution, and the 8020A offers a full 2000 counts. The large 3½-digit liquid crystal display is readable

anywhere. Inexpensive 9V battery power means continuous operation for up to 200 hours.

The new 8020A is especially suited for TV service. Measure transistor voltages with 10 millivolt resolution, all the way up to 20V. With the 200Ω range, you also can measure circuit breaker resistances within 0.1Ω. Try *that* with analog.

Get your hands on an 8020A today: Call (800) 426-0361, toll free. Give us your chargecard number for immediate shipment. Or, we'll tell you the location of your local Fluke office or distributor. (Buy a ten-pack of 8020As for only \$1521* and *save* \$169!)

*U.S. price only.

Fluke 8020A DMM for TV Service: \$169.

1807-7108



Circle No. 114 on Reader Inquiry Card



pression for SSB operation. Peak power or average power is measured at the flip of a switch. The back of the meter is

open to allow the removal of the RF connector box for remote reading of the meter. Priced retail at \$79.95.

Rotary Switch Kit

Circle No. 173 on Reader Inquiry Card

Three rotary switch kits each with an instruction manual for assembling between 20 and 25 switches — designed to give engineers and technicians a complete selection for use in designing circuits and systems— are available now from *Oak Industries, Inc.* Each kit includes all necessary components for assembling A, F or JKN type switches.

The stators, clips, eyelets, rotor blades, shafts, indexing blades, and all mounting hardware are in individual jars to keep the silver from tarnishing. Outside of the shaft and star-wheel assembly, all items in the kits are ready for direct assembly. Necessary tools are also included. Kits are priced at \$625 each.



WE PUT THE WICK WHERE IT BELONGS

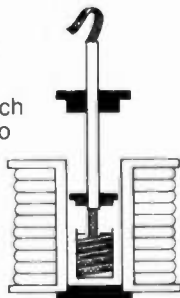
IN A UNIQUE, BUILT-IN DESOLDERING TOOL — YOURS FREE, AS A LIMITED-TIME INTRODUCTORY OFFER TO SD5.

Imagine having desoldering wick, right where you can get at it fastest, when you need it most... while you're soldering. It's our new patent-pending, refillable SD5 solder/desolder system with 2½ inch heat-resistant, telescoping Teflon* probe.

Snapped right into the center of a pound spool of our high quality 16, 18 or 21 gauge MIL-spec solder is D5 — our easy-to-use desoldering tool. D5 contains 5 feet of pure copper wick that lets you see the absorption of solder... so you never overheat boards or components by working with a used portion of wick. Its non-activated, pure water-white rosin flux coating quickly removes all solder, without corrosive residue.

Nothing beats the D5 dispenser tool for easy desoldering without

burnt fingers. Its 2½ inch probe reaches right into tight areas. And by applying tension to the probe, you can shape or "web" the wick to provide a greater absorption surface. You also use less wick, dispensing the right amount as you need it.



Modular construction — D5 tool is removable, 2½" probe snaps into wick refill

SD5 is the total system for maximum soldering/desoldering efficiency. Alone, the D5 tool is perfect for times when you want to pocket the wick and leave the solder behind. And D5 is also refillable... just snap out the Teflon* probe and plug in a D5 refill, available in two gauges — .10 inch and .06 inch.



Snap out, pocket D5

The Chemtronics modular solder/desolder system can be purchased separately as half or one-pound spools of solder, D5 desoldering tool and D5 wick refill. Or as a complete SD5 unit with free D5 desoldering tool. Take advantage of this limited-time offer at your Chemtronics distributor now.

precision application even in high density circuits

nothing beats the D5 dispenser tool for easy desoldering without

*Reg DuPont Trademark



FREE!
\$2.45 VALUE!



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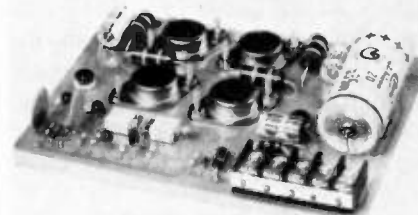
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Circle No. 108 on Reader Inquiry Card

Siren Driver

Circle No. 174 on Reader Inquiry Card

A new electronic siren driver with variable sweep rate and sweep range is new from *Mountain West Alarm*. The driver can be connected to produce either a steady or a sweeping tone. Rate can be

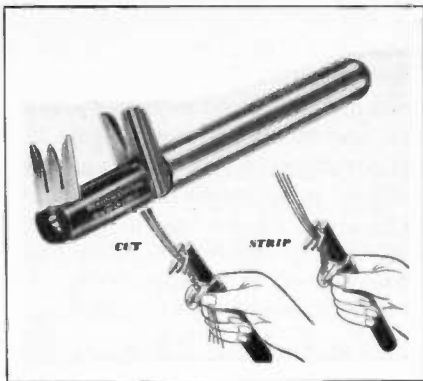


varied from .1 second sweep to 6 second sweep, range from 2500 Hz to 400 Hz. The circuit board fits easily in the control box and comes with complete connecting instructions. Priced at \$49.

Cutting and Stripping Tool

Circle No. 175 on Reader Inquiry Card

A new tool for clean stripping and cutting of wires for wire-wrapping and other electronic and appliance applications has been introduced by *O.K. Machine & Tool*. Called Model ST-100, the new tool strips wire without nicking and generates the proper strip length for wire-wrapping. To use, simply place wires (up to 4) in stripping slot with ends extended beyond cutter blades, press tool and



pull. Wire is automatically cut and stripped to proper length. It easily stores in pocket, belt holster or tool kit. Available for wire sizes from 20 to 30 AWG.

Amplifier Cable Plug

Circle No. 176 on Reader Inquiry Card

A new cable plug that eliminates those annoying loudspeaker noises which occur when amplifier cables are connected and disconnected from amplified guitars and other musical instruments, has been introduced by *Switchcraft, Inc.* Called 'Silent-Plug No. 172P1,' the device is connected at the instrument end of the amplifier cable and features a



patented built-in switch which is operated by a plunger device. When the plug is connected to the instrument, the plunger immediately opens the switch and the instrument is ready to play. Priced at \$4.65.

Replacement Semiconductors

Circle No. 177 on Reader Inquiry Card

A new line of exact replacement semiconductors has been introduced by *Thordarson-Meissner, Inc.* Called the Tech-MateTM line, the new products are

A new standard in quality Frequency Counters . . . yet priced under \$400!

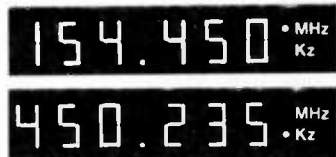


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Read
frequency
to nearest KHz
in the "MHz"
position, or to the
nearest cycle (Hz)
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Factory Direct!!!



Maintaining a high degree of accuracy in frequency tolerances is essential . . . you can't afford to use anything but the best, whether it is in audio, or FCC type accepted equipment, microwave sets, base station transmitters and so on. Wilson, the name known for a decade in 2-way amateur and commercial equipment, brings you two highly accurate quality frequency counters at less than wholesale prices. The Model WFC-500-E has 0.000002% measurement accuracy, and Model WFC-500-S has 0.0001%. Both models enable counting of a wide range 10 Hz to 500 MHz, have MHz or KHz indication with six digit readout and feature lightweight advanced integrated circuitry design. Comes with probe chord and both 110V AC and 12VDC power chords.

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 Please send me further literature on your Frequency Counters.

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Ship C.O.D. Cashiers Check or M.O. enclosed

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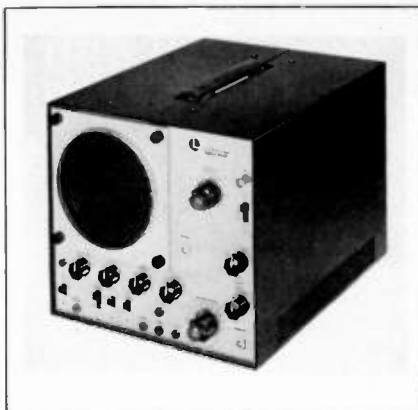
Circle No. 137 on Reader Inquiry Card

exact replacements for consumer electronic equipment made in the Far East. The lines are: voltage multipliers, ICs and IC modules, and diodes and transistors. A company spokesman says that it is the firm's intention to "provide independent servicemen with exact replacements which previously had been difficult or impossible to obtain."

Dual-trace Oscilloscope

Circle No. 178 on Reader Inquiry Card

A new dual-trace oscilloscope that offers automatic triggering, astigmatism, horizontal sweep and horizontal/vertical



triggering is new from Lectrotech, Inc. Designated Model TO-60, the new

scope gives instantaneous comparisons of multiple stages triggered by the same pulse. Shape and time duration of wave forms can be viewed in the same display, and inputs and outputs, the in-and-out bursts of gate amplifiers and the horizontal pulse stages of TV sets can be checked by the new instrument. Push-button switching of dual-trace modes and trigger selections along with 16 MHz bandwidth are featured.

Pocket Television Set

Circle No. 179 on Reader Inquiry Card

Billed as the "world's first pocket TV," a new television set about the size of a paperback book with a 2-inch diagonal screen has been introduced by Sinclair Radionics. The new unit weighs just 26 ounces, and is said to fit easily into a coat pocket, handbag or attache case.

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South River's HEAVY DUTY, TUBULAR TRI-POD ROOF TOWERS

ONLY *South River* GIVES YOU ALL THESE PLUS FEATURES TO MAKE INSTALLATIONS EASIER... BETTER!

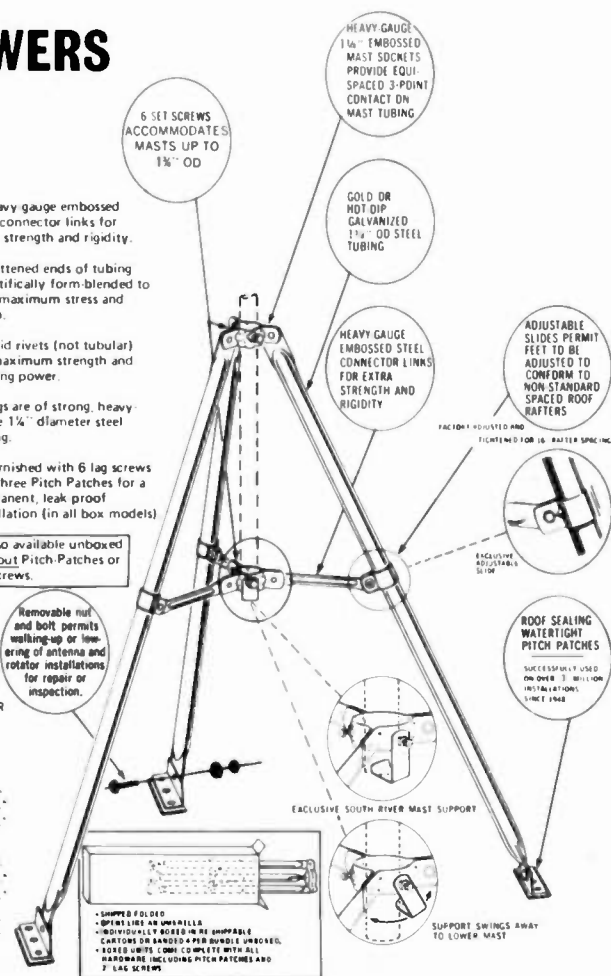
- Exclusive South River mast support holds mast in place while antenna is oriented. Mast support swings aside to permit lowering mast tubing, to work on antenna, rotor, or amplifier.
- Six heavy 5/16" set screws with 12 jam nuts keep mast from turning.
- Heavy gauge steel, 1 1/4" wide embossed mast sockets provide equi-spaced three point contact on mast tubing.
- Removeable nut and bolt permits walking-up or lowering of antenna and rotator installations for repair or inspection.
- Heavy gauge embossed steel connector links for extra strength and rigidity.
- Flattened ends of tubing scientifically form-blended to take maximum stress and strain.
- Solid rivets (not tubular) for maximum strength and holding power.
- Legs are of strong, heavy gauge 1 1/4" diameter steel tubing.
- Furnished with 6 lag screws and three Pitch Patches for a permanent, leak proof installation (in all box models)
- Also available unboxed without Pitch Patches or lag screws.

GOLD BAKED ENAMEL OR HOT-DIP GALVANIZED

CAN BE MOUNTED ON PEAKED OR FLAT ROOFS • ELIMINATES NEED FOR GUY WIRES • ACCOMMODATES MASTS UP TO 1 1/2" OD • RECOMMENDED FOR COLOR TV INSTALLATIONS WHERE HEAVY MULTI-ELEMENT ANTENNAS ARE USED

GOLD BAKED ENAMEL TOWERS			
HDT-2G	2 ft.	HDT-5G	5 ft.
HDT-25G	2 1/2 ft.	HDT-75G	7 1/2 ft.
HDT-3G	3 ft.	HDT-100G	10 ft.
HOT-DIP GALVANIZED TOWERS			
HDT-2	2 ft.	HDT-5	5 ft.
HDT-25	2 1/2 ft.	HDT-75	7 1/2 ft.
HDT-3	3 ft.	HDT-100	10 ft.

*Exclusive SWING-LOCK feature included permits mast to be placed in sockets from side of tower.



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DESIGNERS AND MANUFACTURERS OF THE MOST COMPLETE LINE OF
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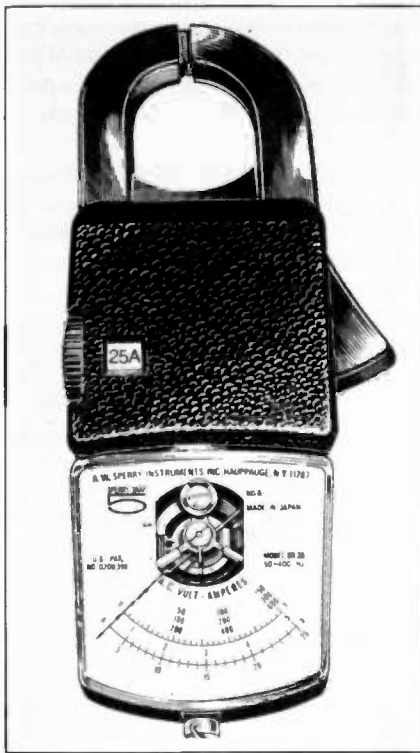


Called Microvision, the new TV operates on all VHF/UHF wavebands and is powered by re-chargeable 1.5 volt AA batteries. The set will operate about 6 hours before requiring a recharge and it can be plugged into an automobile cigarette lighter. The solid-state circuitry is self-contained in a heavy duty steel casing with 2 built-in antennas (UHF, telescopic, VHF, loop). A black-and-white TV, it sells for \$395.

Snap-around Volt-Ammeter

Circle No. 180 on Reader Inquiry Card

A new volt-ammeter with snap-around jaws that allow instant and accurate current readings is available now from A. W. Sperry Instruments. Designated Model SR-25, the new instrument measures in two current and three voltage ranges. Readings are on a graduated scale, and a rotary selector switch snaps the scale



selection into position. The scale always faces the user, regardless of conductor position, thus permitting readings in crowded switch boxes. Weighing only nine ounces, the SR-25 is + 3% of full scale accuracy at 50-400 Hz. A swivel

wrist strap is included to prevent accidental dropping of the instrument. Ranges are 5-25A and 150/300/600V AC.

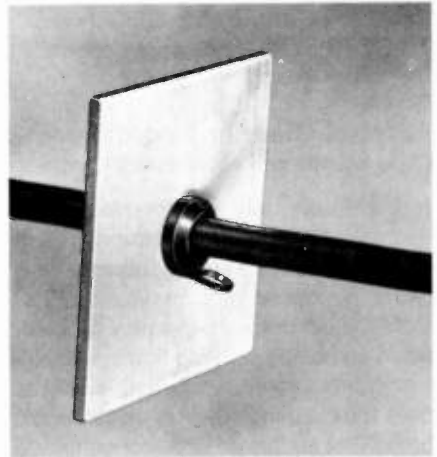
Desoldering Wick

Circle No. 181 on Reader Inquiry Card

A new vacuum process for manufacturing desoldering wick has been announced by *Multicore Solders*. The new vacuumization technique de-oxidizes the copper braid of the wick while applying a very smooth, adhering coating of non-corrosive flux. It is said to improve



the capillary and shelf-life properties of the product. The new wick will desolder component leads from a pc board or remove solder from virtually any joint, cleanly and in seconds. Available in 1/16 inch, 3/32 inch and 1/8 inch braid widths, each 66 inches long on plastic dispenser spools.



Cable Bushing

Circle No. 182 on Reader Inquiry Card

A new nylon cable/wire bushing that provides resistance against push, pull and twist forces without damaging insu-

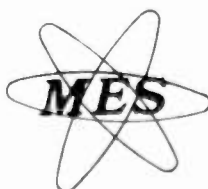
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Circle No. 121 on Reader Inquiry Card

lation has been introduced by the Wec-kesser Co. Called "Straincheck", the new bushing can be installed without tools. The cable is laid firmly in the bushing section, the bushing and cable are inserted into the chassis, and then the locking member is pushed in over the cable into the open portion of the hole until it locks. The method is said not to crimp or torture the cable or its insulation. Available in sizes to fit SC-J cable, in 18/2, 16/2, 18/3 and 16/3 gauges.

Aerosol Cleaner/Degreaser

Circle No. 183 on Reader Inquiry Card

A new, heavy-duty aerosol cleaner and degreaser designed for electronic, electrical and mechanical applications is being introduced by Chemtronics, Inc. Called Electro-Wash, the new product, when combined with the firm's new pulsating attachment, Vibra-Jet, is said to have the cleaning power of an ultrasonic bath. Electro-Wash is a concentrated blend of Freon solvents and said to be effective in penetrating, dissolving, and washing away accumulated gunk, grease, dirt and oxidations from delicate assemblies. It evaporates quickly without leaving a residue, is safe for plastics, and is non-flammable. A 24 ounce can of



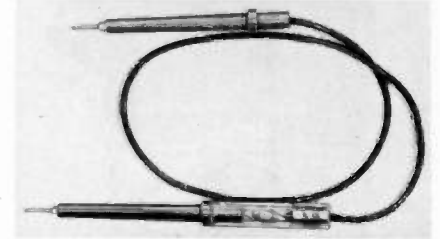
Electro-Wash retails for \$3.80—and the Vibra-Jet attachment retails at \$1.98 and is re-usable.

Low-voltage circuit tester

Circle No. 184 on Reader Inquiry Card

A new circuit tester for AC/DC low-voltage circuits has been announced by

Etcon. Called the RL 400 Right-light, the new tester is rated for 5 to 50 volts AC or DC, 20 to 60 Hertz. The new device provides safe, rapid testing of programmable controllers, fire alarm controls, low-voltage telecommunications circuitry, relays, switches, batteries, contacts and for setting thermostat controls. It features a high-visibility incandescent lamp, and 24 inch leads.



Magnetic Screwdriver

Circle No. 185 on Reader Inquiry Card

A new screwdriver with a magnet that holds both interchangeable bits and the screw has been introduced by Vaco. Designated No. 70035, the new tool features four interchangeable bits that are stored in a removeable dome cap. The bits include 3/16inch and 9/32inch slotted and a No. 1 and 2 Phillips. A specially designed handle is said to allow for fatigue-free driving. **ETD**

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- High sensitivity for circuit testing ■ Easy-to-use pushbuttons.
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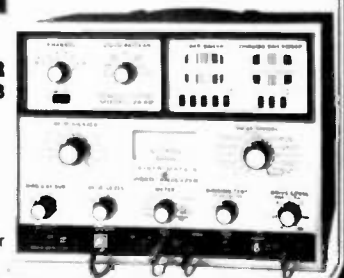
AUTOMATIC CB ANALYZER Model CB 42

- The total CB service bench ... simplified.
 - Combines 5 units in one for complete testing:
- 1) Frequency Counter; 2) RF-IF Generator; 3) Audio Generator; 4) Digital RF Wattmeter; and 5) Special CB Tester



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- New patented Bar Sweep patterns for simplified speed alignment ■ All RF & IF signals for injection before the detector from one cable ■ All drive signals for every stage after the detector — tube and solid state ■ Uses standard color bars and patterns ■ 100% accurate Ringer yoke and flyback test ■ Accurate drive signal monitoring ■ Video sweep generator
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Seeking Original Japanese Replacement Parts for CB and Stereo Repair Use?

TEST INSTR.

continued from page 36

In addition to the patterns produced, the GTS-10 can be used for signal injection and signal tracing, to tune coils and traps on a cold chassis and modules, and provide an external trigger for an oscilloscope.

The construction of the GTS-10 is impressive with a lot of function packed into a small package. According to the manufacturer, 5 crystal oscillators, 33 digital ICs, 10 transistors and 12 silicon diodes are packed into a box roughly 8 inches wide by 8 inches deep by less than 3 inches high. All frequencies are crystal controlled without need for adjustment.

Included with the instrument are: 75 ohm RF cables, a 75 to 300 ohm balun, an IF/video cable, a very thorough two-volume instruction manual, and a handy checkout reminder card that attaches to the top surface of the servicer for easy viewing by the technician. The GTS-10, which carries a two-year parts warranty, is priced at \$349. **ETD**

SPECIFICATIONS

RF OUTPUT:

Frequency as specified by user—55.25 MHz (Ch.2), 61.25 MHz (Ch.3), or 67.25 MHz (Ch. 4). Impedance is approximately 75 ohms or 300 ohms. Adjustable from 5 microvolts to 200,000 microvolts, depending on impedance.

IF OUTPUT:

Frequency, 45.75 MHz; Impedance, approximately 75 ohms; Level adjustable from 5 microvolts to 100,000 microvolts.

VIDEO OUTPUT:

Polarity (Sync), choice of + or -; frequency, 30 Hz to 10 MHz; Impedance, approximately 75 ohms; Level adjustable 0 to 1.7V P-P across 75 ohms.

4.5 MHz:

Unmodulated sound carrier available at RF, IF & Video outputs.

OSCILLOSCOPE TRIGGER:

Two separate 3.7V P-P rectangular pulses for H and V trigger.

HORIZONTAL FREQUENCIES:

Vector, 15.769075 KHz; All other patterns, 15.734265 KHz.

VERTICAL FREQUENCIES:

Vector, interlace 60.06 Hz. Progressive scanning 60.19 Hz; All other patterns, interlace 59.94 Hz. Progressive scanning 60.05 Hz.

CHROMA FREQUENCIES:

Red, green & blue rasters & color trio, 3.579545 Mhz. 3.58 monitor, vector & color bars, 3.563811 MHz.

POWER REQUIREMENTS:

105-130V, 60 Hz, 10W.

OPERATING TEMPERATURE:

32 to 140° F.

WEIGHT: 4 lb. 6 oz.

PRICE: \$349.00



CB REPAIR PACKAGE

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Contains 2 each. Repair almost all CB Sets

2SB 405 2SC 1014 2SC 1307
2SC 710 2SC 1173 2SC 1678
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2SA 70	1.10	2SA 847	.59	2SC 460	.59	2SC 929	.59	2SC 1584	8.50	2SD 427	2.80
2SA 101	.59	2SA 850	.70	2SC 461	.59	2SC 930	.59	2SC 1586	6.60	2SD 525	1.60
2SA 102	.59	2SA 872A	.59	2SC 481	1.60	2SC 943	1.20	2SC 1624	1.30	2SD 526	1.10
2SA 234	.59	2SA 908	11.00	2SC 482	1.50	2SC 945	.59	2SC 1626	1.10	2SD 555A	6.60
2SA 342	.90	2SB 54	.59	2SC 485	1.60	2SC 959	1.50	2SC 1628	1.30	2SD 610	1.90
2SA 353	.70	2SB 55	1.10	2SC 486	1.60	2SC 971	1.00	2SC 1647	.59		
2SA 377	2.00	2SB 77	.59	2SC 493	3.90	2SC 983	1.00	2SC 1669	1.60		
2SA 440	.90	2SB 77	.59	2SC 495	1.00	2SC 984	.90	2SC 1674	.59	2SK 19	1.60
2SA 483	3.00	2SB 186	.59	2SC 497	1.60	2SC 1000BL	.59	2SC 1675	.59	2SK 30	.90
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2SA 489	1.60	2SB 220	.70	2SC 535	.70	2SC 1018	1.20	2SC 1684	.59	2SK 40	.70
2SA 495	.70	2SB 303	.59	2SC 536	.59	2SC 1030C	2.80	2SC 1708	.59	2SK 49	1.30
2SA 496	1.10	2SB 324	.70	2SC 537	.59	2SC 1047	.70	2SC 1728	2.00	2SK 55	1.30
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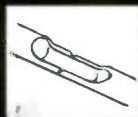
Transmission Line Termination bleeds off static charges thru antenna system ground. Terminal stub improves front to back ratio on lower channels.



Aluminum Construction of all key metal parts works to eliminate rusting—provides long life. **Golden-Color Alodine Finish** is conductive—helps improve electrical performance!



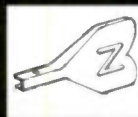
High-Impact Plastic Insulators double-lock each element to the boom for extra bracing and durability.



FM Block reduces FM gain up to 12dB. Remove to receive full FM gain.



Corner Reflector Bracket improved with larger tabs. (Combination models only.)



Zenith Dipole on UHF. (Combination models only.)



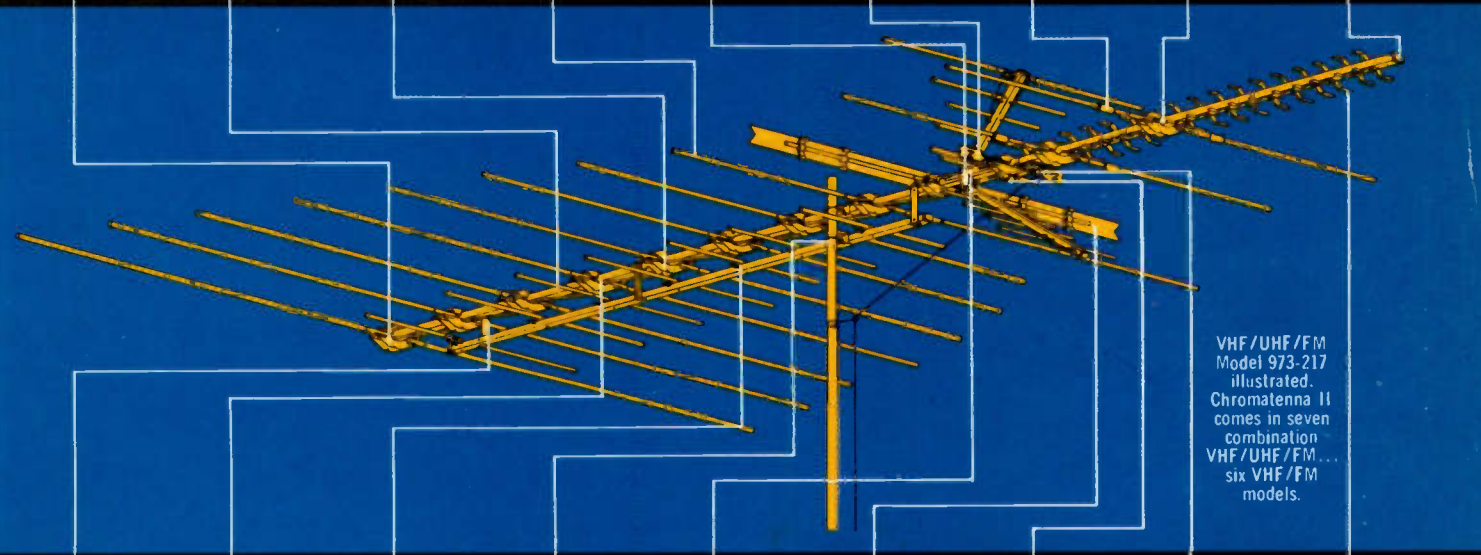
VHF Colinear Directors provide extra signal boost on both low and high band VHF.



Loading Straps—metal plates close to first VHF element insulators provide compensation for Lo and High band by tuning the first driven element with extra capacity.



Rugged 1" Square Boom provides extra strength compared to many round-type booms.



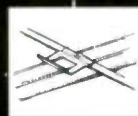
VHF/UHF/FM Model 973-217 illustrated. Chromatenna II comes in seven combination VHF/UHF/FM... six VHF/FM models.



Wide-Spaced, Heavy-Duty Feed Lines help prevent shorting from heavy build-ups of snow or ice.



Sleeved Elements of heavy-duty construction afford extra bracing and protection.



Hi-Bracket with angled ends for added strength.



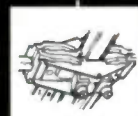
U-Bolt Mounting provides a larger clamping area; larger locking nut with teeth an integral part assures a more rugged U-BOLT arrangement.



Dual Isolator Bars insure no loss of UHF to VHF signal transfer. (Combination models only.)



Proximity Spaced Signal Balancer (2 elements) provides automatic control of periodic driver, improves impedance matching and signal leveling on both Lo and High band channels. Improves Channel 7 pattern.



Electrically Matched Terminals With Stainless Steel Screws eliminate mismatch... protect against rusting, and provide positive electrical contact with improved no-strip stainless steel serrated washers for the take off terminals.



Strain Relief Insulator accommodates either 300-ohm twin-lead, foam lead or Coax downlead.



Optional Break-away UHF Wing Directors provide maximum gain of standard UHF channels with optional coverage of Hi UHF channels and translator frequencies when broken off. (Combination models only.)

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