MEDICAL ELECTRONICS:
Is there a place for you?

Modern chroma circuits, part II

ET/D's 1977 Index

Admiral's newest chassis
GET MORE FOR YOUR DUDS!

PTS OFFERS GREATER VALUES FOR DUD TV MODULES

PTS is into module rebuilding in a big way, and we'll buy all the dud modules you can lay your hands on. Check your shop whether you have one or 101, PTS will give you more for your dud TV modules.

A FEW EXAMPLES OF DUD MODULES PTS PAYS TOP DOLLAR FOR:

<table>
<thead>
<tr>
<th>MODULE</th>
<th>OEM DUD VALUE</th>
<th>PTS DUD VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasar 65534A828.11</td>
<td>$13.05</td>
<td>$14.20</td>
</tr>
<tr>
<td>RCA MCK001A/141224</td>
<td>$10.00</td>
<td>$11.40</td>
</tr>
<tr>
<td>Zenith 150-162</td>
<td>$10.48</td>
<td>$12.20</td>
</tr>
</tbody>
</table>

If you have a large quantity of dud TV modules send us a list of brand* and module numbers and we'll advise you of the value. Contact the PTS Servicenter nearest you for more information.

*Acceptable brands are Admiral, GE, Magnavox, Montgomery Ward, Philco, Quasar, RCA, Sears/Warwick, Sylvania and Zenith. Do not include ceramic encapsulated, broken or cannibalized modules. PTS reserves the right to reject any or all modules.

Check this listing for the PTS Servicenter Nearest You.

PTS ELECTRONICS, INC.

...for more details circle 182 on Reader Service Card
NEWS OF THE INDUSTRY

Sylvania-Panasonic Join Home Video Tape Parade

Panasonic and GTE Sylvania are the latest to join the growing list of U.S. television manufacturers who will market home video cassette recorder/players in time for Christmas this year. Both have opted for Matsushita's two and four hour recording format, the same unit being marketed by RCA which caused industry waves by pricing their unit at a suggested retail of $1,000 earlier this year.

Matsushita, of course, is Panasonic's parent company.

Panasonic's entry into the field began about two weeks ago with their unit, called Omnission IV, going for a suggested retail of $1,095. Sylvania, on the other hand, delayed putting their units on the market until an initial round of distributor service seminars could be conducted around the country. At press time, no decision had been reached by Sylvania on price or what they will call their version of Matsushita's machine.

Following the industry trend, both will offer optional black and white television cameras for a price in the neighborhood of $300.

Still taking a wait and see attitude regarding VCR units are Zenith and Amstrad among the major U.S. manufacturers.

Sony, the first to market VCR in this country with its Betamax two-hour maximum recording time, is also offering its $1,300 unit through other manufacturers. Zenith Radio Corp., is thus far the only U.S. manufacturer opting for this format, although it is also being offered through Toshiba and Haetchi.

Among the manufacturers selecting Matsushita's VHS (Video Home System) format are JVC, RCA, Magnavox, Panasonic, and Sylvania. JVC is actually manufacturing the Matsushita designed unit.

Quasar Electronics is the only manufacturer offering a third variation of the VCR, a single head recording "Alpha Wrap" format with one or two hour record/play options. This unit, as of press time, was priced at $995.

Radio-TV Dealer Sales Boom

Booming color television sales, judging by third quarter statistics, continue to point to 1977 as a banner year, according to EIA figures.

Color TV sales to dealers for September were 1,104,941, up 28.3 per cent from a year earlier and for the nine-months totaled 6,208,922, up 20.5 percent over a year earlier. Total television also showed strong gains with the nine-months figure totaling 9,960,807 which amounts to an increase of 15.1 per cent over the nine months figures a year earlier.

Both RCA and Zenith report color TV sales to dealers at record or near record levels while other manufacturers report performances substantially ahead of last year.

EIA also reported soaring dealer sales in radio. For September 7,765, 263 units were sold, up 60.5 per cent over September of 1976. For the nine months, EIA said, total radio sales were 39,446, 360 and this amounted to a hefty 35.6 per cent increase over figures for the comparable period a year earlier.

Tube Warranty Practices Criticized

The Chicago chapter of NATESA (National Association of Television and Electronic Servicers of America) says members are becoming increasingly concerned over the "growing practice" of circuit tube sales without warranty and it is considering notifying the Consumer Advocates office in Washington, D.C.

According to NATESA president George Weiss, "Ultimately it will be the consumer who will get burned if this trend continues."

Although manufacturers about two years ago discontinued warranties on circuit tubes, distributors were giving a 5 per cent discount to cover faulty tubes. Now, Weiss said, some distributors in the Chicago area have discontinued the practice of passing on the 5 per cent discount to service dealers and others are contemplating following suit.

"Right now I find in my own shop a 10 per cent tube failure rate, and it is not the $3 tubes that are giving out. It's the bigger $12 tubes."

"If one of these breaks down in the home there's the additional consideration of a $25 service call we have to sacrifice, so it's a problem of labor costs as well," he said.

A statement released by NATESA said that an August 12 letter to tube manufacturers and marketers calling attention to the situation has gone unanswered. The non-warranty policy "is conducive to a serious drop in quality," NATESA charged, and added "it appears that such is already the case" since field reports indicate the 5 per cent allowance "definitely is not compensating for the cost of needed replacement and certainly not for the cost of calls."

In addition to the proposal that the Consumer Advocate be notified, NATESA said it was also suggested that servicers "find new sources re-
18 A look at biomedical electronics servicing

What you need to know to break into this expanding field and what you can expect when you get there. By Joseph J. Carr, CET

24 Admiral color television for 1978

A new chassis—the 25M55M—is introduced and designed to handle Admiral’s new 90 degree delta CRT. We take a look at the new circuits.

27 Servicing modular chroma—Part two

The conclusion of our two part series on servicing modern color circuits emphasizes proper signal tracing methods.

By Bernard B. Dain

30 The ET/D Annual subject reference index


DEPARTMENTS

1 NEWS OF THE INDUSTRY
8 NEWSLINE
12 TECHNICAL LITERATURE
11 FROM THE EDITOR’S DESK
14 SERVICE SEMINAR
34 TEST INSTRUMENT REPORT

36 DEALER’S SHOWCASE
39 NEW PRODUCTS
46 CLASSIFIED ADS
48 ADVERTISING INDEX
49 READERS SERVICE
51 TEKFAX

HARCOURT BRACE JOVANOVICH PUBLICATIONS, Robert L. Edgell, Chairman, Richard Moeller, President/Treasurer, Lars Fladmark, Senior Vice President, Thomas Greny, Vice President, Ezra Pleus, Vice President, James Gehrz, Vice President, Lois Sanders, Vice President, Harry Ramholt, Vice President, Joe Bolderbach, Vice President, George Gleen, Editorial Director.

ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate offices: 757 Third Avenue, New York, New York 10017. Advertising and editorial offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial: Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rate: one year, $1; two years, $2. Single copies. 72¢ in the U.S. and Canada, all other countries, $2. Second Class postage paid at Duluth, Minnesota 55806 and at additional mailing offices. Copyright © 1977 by Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, P.O. Box 6016, Duluth, Minnesota 55806.
Why fiddle with cross-references...
when replacing standard Japanese original equipment semiconductors?

Buy the original Japanese number from HEP, such as 2SA495, 2SB468, etc.

Our broad line includes the Discretes, ICs and Modules most in demand by the professional service technician.

Time is money—HEP can save you both. And that’s the name of that tune!

Write:
Motorola HEP
705 W. 22nd Street
Tempe, AZ 85282

Your complete semiconductor supplier.

...for more details circle 120 on Reader Service Card
Shape up can chalk

1. ZENITH'S INSTANT PARTS PROGRAM

It's the easiest, least expensive Zenith inventory control system ever devised for TV service technicians.

Organizes the most needed, most used TV replacement parts so they're where you want them, when you want them.

And ZIP keeps these parts organized thru periodic checks by your Zenith distributor salesman who personally replaces slow-moving stock numbers with new, popular parts.

As a result, your original investment is protected and your supply of Zenith parts is always current.

Call your Zenith distributor now for all the details on the ZIP program that fits your needs.
your shop so you
service more sets...
up more profits!

2. FINGERTIP CONTROL OF
YOUR CURRENT TECHNICAL AND
CROSS-REFERENCE MATERIAL

Now's the time and here's the way to
to end forever the costly nuisance of
searching for current technical data,
trying to find cross-reference material,
and looking for the oldest and
newest schematics.

With Zenith’s new CRSP*
Manual Organizer, you keep
everything neat, clean,
orderly...right at your
fingertips.

Housed in a beautiful,
durable “organizer” is a
3-ring binder with 4½ inches of
catalog capacity...a “want” book...
space for your most often used phone
numbers...separate wells for note
paper and pencils...and even a chain-
attached towel to reduce catalog-
page soilage.

It's just what the doctor ordered for your service
shop. Comes completely assembled, ready to use.

Call your Zenith distributor now and find out how
you can put the Zenith CRSP Manual Organizer to
work for you!

*Cross-Reference Sales Program

For your own reputation and in your
customers' best interest, always specify Zenith
eaxt replacement parts and accessories.

Zenith Radio Corporation / Service, Parts & Accessories Division / 11000 Seymour Avenue / Franklin Park, Illinois 60131

...for more details circle 131 on Reader Service Card
regardless of point of origin" or simply
tell the customer there is no warranty
even though "this obviously will...null-
ify guarantee on the set as well."

In a letter sent to tube manufactur-
ers, NATESA said the present situa-
tion "is not conducive to good industry
or consumer relations (and) servicers
being on the 'firing line' are catching
most of the flak."

Zenith Seeks Supreme Court Decision;
Announces Third Quarter Loss
Zenith Radio Corp., which announced
in October a 25 per cent reduction in
its U.S. workforce over the next year
and transfer of its module and chassis
assembly operations to foreign shores,
has officially asked the U.S. Supreme
Court to review a lower court's ban on
counter duties on Japanese consumer
electronics products.

Zenith has long been seeking U.S.
government intervention in what it
has termed unfair competition. Specif-
ically, Zenith cites the Japanese gov-
ernment's practice of rebating to
Japanese manufacturers excise taxes
on consumer electronics products for
import to the United States.

Although Zenith won an initial U.S.
Customs Court ruling defining the re-
bate as a Japanese government sub-
sidy to manufacturers, a federal ap-
peals court reversed that ruling.

Opposing the Zenith position is the
U.S. Treasury Department which
fears a world trade debacle since many
Japanese and European manufactur-
ers are the beneficiaries of similar tax
considerations by their governments
on items for export in world trade. Ap-
parently the U.S. is in a bind over the
situation since the sanctioned General
Agreement on Tariffs and Trade has
said such counter duties would violate
world trade agreements.

Joining Zenith in its bid to have the
Supreme Court settle the issue are
several U.S. television manufacturers
and labor groups as well as the U.S.
Steel Corp.

Zenith contends the effect of the
Japanese government's rebate policy
allows consumer electronics products
sold in Japan to be sold in the United
States for up to 40 per cent less in
price.

If the Supreme Court decides to hear
the issue, it will most likely hand
own a decision sometime around the
first of the year.

In another announcement Zenith
said it had suffered a $12.9 million
third quarter loss, primarily through
the write-off of an inactive color pic-
ture tube plant in Lansdale, Pa. The
loss amounted to 69 cents per share
with the plant write off accounting for
65 cents.

For the first nine months Zenith
sales totaled $724 million, compared
to $699 million in 1976 and net income
totaled $600,000, compared to $24.8
million for the comparable period a
year earlier.

CB Or Not CB
CB radios are often the whipping boy
for all kinds of reported television in-
terference, reports the Citizens Radio
Section of the Electronics Industries
Association, when in fact the problem
may be common household appliances.

That statement came from the Cit-
zens Radio Section as it proposed new
technical standards to eliminate what
it called the "occasional interference"
which unwanted signals from CBs
cause in TV sets. The section said in a
proposal to the FCC that CB harmonic
emissions be limited to 75 decibels
below the station's 4 watt power limit.

"Harmonics have no communica-
tion value to the CB user, but may
have the potential for interfering with
certain TV channels," especially in
high density residential areas. How-
ever, the CB section said, a study of
American households reveals that the
typical private home might contain 60
to 100 devices capable of TV and radio
interference, devices such as auto igni-
itions, household appliances, fluo-
rescent lights, electrical toys "and
many other sources."

In addition, "no significant decrease in reported cases of CB interference to TV reception can be expected until firm action is taken to end the use of illegal power amplifiers."

GTE Reports Earnings Increase

General Telephone and Electronics Corporation reports third quarter earnings of $143.4 million, an increase of 26 per cent over third quarter results a year earlier.

According to a company spokesman the improvement was attributable to "substantial increases" in manufacturing earnings from the communications products and consumer electronics products groups.

Theodore F. Brophy, chairman, said the consumer electronics products group sustained a $4.3 million third quarter loss in 1976 but this year showed a $444,000 gain.

Briefs

EIA's 10-year forecast for the government electronics market indicates a modest real growth rate of 1.4 per cent, or 7.4 per cent when the expected 6 per cent rate of inflation is counted in—EIA's Board of Directors has voted to support Sony's position in the latter's legal battle with Universal Studios and the Walt Disney Studios. Universal and Disney allege copyright infringement through the marketing of Sony's videotape recorder equipment—and, Donald R. Kronewetter has been named vice president of GTE Sylvania's newly reorganized Distributor and Special Markets Division. It was formerly known as the Replacement Markets Operation.

Help

Our Cities.
Our Oceans.
Our Trees.
Our Rivers.
Our Air.
Our Mountains.
Our Fishes.
Our Deserts.
Our Tomorrows.

Give a hoot! Don't pollute.
EXTENSION OF 23-CHANNEL CB SALES IS DENIED. The FCC has turned down requests from 23 CB manufacturers, importers, distributors and retailers for an extension to Aug. 1, 1978 of the deadline for sales of 23-channel transceivers. Thus, the deadline stands at Jan. 1 at which time all 23-channel radios must be off the retailers shelves. The FCC felt that an extension would be unfair to those who have already lost money unloading their 23-channel inventories.

MEANWHILE -- CB MANUFACTURERS ARE HAVING MONEY PROBLEMS. The E. F. Johnson Co., Electronic News reports, is negotiating with its banks for a restructuring of its credit agreement in accordance with the company's changed financial situation. Because of an announced third quarter loss of $4.4 million, the firm expects to grant the banks security interest in the balance of its assets. Johnson spokesmen say year-to-date sales were hurt by cost of liquidation of 23-channel radios and oversupply of foreign imports.

DYNASCAN REPORTS LOSS FROM CB SQUEEZE. Dynascan, producer of Cobra CB products, has reported a loss of $682,000 or 24 cents a share on sales of $12,432,000 in three months ended Sept. 30. Dynascan's president, Carl Korn, "Excess supplies of 23-channel and 40-channel models have led to a continuation of price-cutting, and to reduced sales of 40-channel models." Korn said, however, the firm's Industrial Products group continued to show strength with sales exceeding last year's record in test equipment and radio remote controls.

SHARP SURVEY REVEALS LIKELY SALES POINTS FOR HOME VTR. A survey by Sharp Electronics reveals that the TV departments of mass merchandisers and department stores, along with appliance stores and hi fi specialty shops are the most likely places through which home VTR will be sold. Most department stores and mass merchandisers (92%) said the addition of home VTR offered a new opportunity to form "a more advanced consumer entertainment department."

COMPETITION UP -- PRICES DOWN IN VTR. Following the lead of others, Sony has dropped the list price for their Betamax from $1,300 to $1,095. This is still $100 above the new price announced by Zenith for the same unit. Zenith's new price is $995, which makes it competitive with the RCA offering.

FOUNDER OF THE TRIPLETT CORPORATION DIES. One of the few remaining pioneers of the electronic industry, Ray L. Triplett, 93, founder of the Triplett Corporation, died in Florida on October 25. His one room factory, founded in Bluffton, Ohio in 1904, has grown into one of the major test instrument manufacturers.

EICO MOVES TO NEW LONG ISLAND LOCATION. The EICO Electronic Instruments Company, producer of electronic kits and wired equipment, has moved from Brooklyn to new quarters at 108 New South Road, Hicksville, NY. The new location will permit intergration of the company's engineering, production and shipping departments into one modern building.

WINTER CES SHOW IS A SELL-OUT. The 1978 Winter Consumer Electronics Show, to be staged for the first time in Las Vegas, Jan. 5-8, is a complete sell-out with over 75 applicants on the waiting list.
Charles Varble, Jr.,
Chart Television, St. Ann, MO 63074

“I don't compromise the quality of my service... or the quality of the parts I use.”

Your reputation is our reputation
Tube Products Department - Owensboro, Kentucky 42301
From blisters to boxes to bags.

Mallory's got the winning team for your solderless terminal needs.

Mallory solderless terminals are available now — packaged to suit your needs. These crimp-type terminals and connectors fit virtually all popular applications and come in a complete range of sizes from 26 through 4/0 AWG.

Buy the winning team for convenience and reliability. See your Mallory Distributor. Or contact Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Box 1284, Indianapolis, Indiana 46206. (317) 856-3731.
FROM THE EDITOR'S DESK

VTR repair: yes or no?

A recent phone check with many of the television manufacturers who are bringing out one of the two basic VTR units in time for Christmas (see Industry News Page) reveals that training sessions are in full swing. If your service shop is contemplating getting into this service area as it develops, now would appear to be the time to make that decision.

However, there are several things you should keep in mind. Primarily, the considerable investment in equipment you will have to make to service these very complicated machines will have to be weighed against the limited amount of service that will be available initially. VTR service at present is not self-supporting. Whether it becomes self-supporting in the future is a judgmental decision that can be argued either way.

However, for the present, it seems likely that to make your investment as economical as possible you'll have to know both the Sony Betamax and the Matsushita VHS formats.

In addition to freeing up a technician for the four or five days of schooling on VTR units, you'll need the following in the way of basic test equipment (in addition to the special jigs which each manufacturer is selling for servicing the servo-mechanical parts of these units).

—An NTSC color generator
—A dual trace, delayed sweep scope with channel 2 polarity inversion and TV sync separator capabilities.
—A quality frequency counter with at least 7 digit readout and 4 place period display.
—And, a quality digital VOM.

Most of the manufacturers have just finished first level training sessions for their distributors. Now it is up to the distributors to continue with the training cycles, sometimes with support from the manufacturer, in other cases without. To be blunt about it, the distributor level training will be geared toward locating authorized retail dealers with service centers and "serious" independent shops willing to purchase the specialized test equipment that goes with the specific VTR unit. To assess your chances of getting into this area, it would be best to contact your local distributor. Meanwhile, here's a rundown on who's doing what in the service training area on VTRs.

SONY: Began Sept. 25th in its four U.S. regions 5-day training seminars aimed at Sony Service Centers, servicing dealers, and selected independents.

GTE SYLVANIA: Began Oct. 17th special 4-day distributor training seminars at various U.S. locations. Second round of training to continue at distributor level with manufacturer support.

ZENITH: Began 5-day session in mid-August for distributors, service centers and independent dealers. Currently accepting class loads of about 30 technicians in Chicago.

RCA: Started 5-day sessions for 70 distributors in late August. Some distributors began a special 1-day introductory course open to all service dealers and centers, plus a second level 5-day program for authorized service centers.

MAGNAVOX: Began Nov. 14th, 5-day sessions for selected franchised independent service dealers.

Suffice it to say VTRs are complicated and precise electronic and mechanical products. For instance, Matsushita's VHS unit contains 9 circuit boards which serve as 13 when operated in the 2 and 4 hour modes. Video information recorded on tape is an FM square wave, the chroma signal recorded on tape is beat down to 629 KHz, drive motors are clocked by video signals. In short, it's a whole new world.

With this issue ET/D is beginning the first of a series of articles on VTRs, or VCRs, if your prefer. I hope they will give you a better insight on what to expect when you come face-to-face with them in the field.

Richard W. Say
OPTIMA ELECTRONICS

Box 372 Ryder Street Station
Brooklyn, New York 11234
Phone (212) 439-7434

...for more details circle 124 on Reader Service Card

TECHNICAL LITERATURE

Indicator Lights and Lampholders are catalogued colorfully and completely in new literature available from Chicago Miniature Lamp Works. The new catalog, No. 7800, describes the company's full line of standard lenses, incandescent and neon indicators, cartridge hardware and lamp holders. Each page cover a separate series, showing features, dimensional drawings, electrical and mechanical specifications. Also included are lamp types suggested for use in the various indicators. Available free from George Neeno, Chicago Miniature Lamp Works, 4433 N. Ravenswood Ave., Chicago, Illinois 60640.

Chemicals For Electronic Servicing are described and illustrated in the latest catalog from the Rawn Company. The new 12-page catalog covers such chemical servicing aids as tuner cleaners, tuner lubricants, circuit and component coolers, cements for all types of repair work, protective and insulating coatings, solvents and polishes. Prices are included. This new catalog is available free from Rawn Company, Inc., Box 9, Spooner, Wisconsin 54801.

Getting To Know OSCAR—From the Ground Up is the title of a new book guide to amateur communications satellites from the American Radio Relay League. In 14 sections, the new book provides an introduction to space communications, the equipment needed, a description of the brand-new OSCAR satellite and future ones now under construction. Each copy of the book contains a four-color tracking device that makes finding the satellites an easy task. Available for $3 from The American Radio Relay League, 225 Main Street, Newton, CT 06111.

CB Microphone Adapters for 1080 models and 153C CB transceiver brands are cross referenced and described in a new 4-page guide available from GTE Sylvania. The new guide identifies the right Sylvania Match-All adapter to use with the different CB brands and models. The guide, which is in alphabetical order, also contains a listing of those CB radios which require the use of other Sylvania microphones. Available free from CB marketing Dept., GTE Sylvania Inc., 100 First Ave., Waltham, Mass. 02154.

Pre-packaged Electronic Components are shown in the latest catalog from Sprague Products. Catalog C-651 contains 28 pages of information on carded components ranging from all types of capacitors, including trimmers, to carbon-film and vitreous-enamel resistors, silicon and germanium transistors, rectifiers, diodes, integrated circuits, quartz crystals, optoelectronic devices, switches, wiring components, pulse transformers, and CB noise filters. Available free from distributors or from Technical Information Service, Sprague Products Co., Marshall Street, North Adams, Mass 01247.

Mobile Communications Antennas for all frequencies used for mobile-to-mobile and mobile-to-base operations are described in the latest catalog from Larsen Electronics. Both quarter wave and gain types are featured with a variety of permanent and temporary mounts included. Over 200 antenna types, frequency ranges, and mounting styles are detailed. The catalog is indexed by both number designations and description for easy finding of specific styles or models. Available free from Larsen Electronics, P.O. Box 1686, Vancouver, WA, 98663.

Sub and Microminiature Switches for many applications are covered in the most recent catalog from C & K Components. The 48-page catalog describes and illustrates brand-new offerings of the company in the first five pages ranging from actuators, bushings, terminations and interchangeable nylon lever handle caps for toggle switches. Also in the catalog are specifications for: toggle, rocker and lever handle, printed circuit mounting, snap-acting pushbutton, alternate and action and momentary pushbutton, subminiature and microminiature pushbutton, illuminated rocker, push, slide, and thumbwheel switches. Available free from C & K Components, Inc., 103 Morse St., Watertown, MA 02172.

The Proper Use & Care of Hand Tools is the subject of handy 88-page booklet available now from Klein Tools, Inc. Tools covered are pliers, screwdrivers, wrenches, striking and struck tools, vises, clamps, snips, tool boxes, chests and cabinets. The booklet contains hundreds of illustrations which show how to select the proper tool for various jobs, the care and maintenance of tools and many of the hazards which can result from misuse of tools. Cartoon characters are used to emphasize the test. This new literature is available free from Klein Tools, Inc., 7200 McCormick Road, Chicago, Illinois 60645.

Quartz Crystals Technology is covered in a new 150-page manual avail-
You can be sure
more times in more circuits in more places
than with any other multimeters on the market today

Each Sencore DVM is backed
with 15 Megohm input
impedance for one third less cir-
cuit loading on every measure-
ment. That means 50% higher
accuracy than other DVMs.

DVM38 $348
3% DIGIT .1% DCV ACCURACY
AUTO-RANGING DVM
A “prime” standard at your fingertips for
measurements you can trust. Auto-ranging
for extended low-level range and ease of
operation. 15 Megohm input impedance
assures .1% reading accuracy is maintained
in solid state circuits. Highly sensitive, yet
fully protected to 2000 VDC overloads. Hi
Lo Power Ohms circuit simplifies in-circuit
resistance measurements.

DVM32 $198
3% DIGIT .5% DCV ACCURACY
PORTABLE DIGITAL MULTIMETER
Bench and field master for digital accuracy
measurements anywhere. 0.5% DCV accur-
cy, backed with 15 Megohm input imped-
ance. Exclusive battery-saving Auto-Display
turns the display on automatically when you
make a measurement. 2000 V input protec-
tion on all functions and ranges—including
Ohms.

DVM37 New $248
3% DIGIT .1% DCV ACCURACY
PORTABLE DVM
Prime standard .1% accuracy on the bench
or in the field for less than $250. The
DVM37 is the most accurate portable DVM
you can buy, with 15 Megohm input imped-
ance for 50% more accuracy. Includes auto-
matic features—Auto Zero, Polarity, Deci-
mal, Overrange. Fully protected inside to
over 2000V on all functions, including
Ohms, and protected outside with super-
rugged case. Full ranges for every test.
Fingertip “Push-On” switch in probe saves
batteries as power is applied only when
needed.

DVM36 $158
3% DIGIT .5% DCV ACCURACY
POCKET PORTABLE DVM
Pocket portable lab accurate performance
that fits every budget with highest perform-
ance-to-price benefits of any meter. .5% DCV
accuracy, backed with 15 Megohm input im-
pedance for lowest circuit loading. Full pro-
tection to 1000 V on all functions and
ranges—including ohms. Drop-proof case.
Battery-saving “Push-On” button in probe.

DVM35 $134
3 DIGIT 1% DCV ACCURACY
POCKET PORTABLE DVM
Fast, direct reading digital accuracy for the
man on the go. Same features as DVM36,
except 3-digit, 1% DCV accuracy, backed by
15 Megohm input impedance that is ten
times more accurate than analog meters.

In stock at your favorite local
Sencore Full Line Distributor.

DECEMBER 1977. ELECTRONIC TECHNICIAN/DEALER / 13
SERVICE SEMINAR

The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

ADMIRAL

Color TV Chassis K10 & K19—One or two thin, dark, vertical interference bars from left to center of picture

These bars, which are more prevalent on the low VHF channels, may only be noticeable on weak signals or when using a built-in antenna. The position of the bars changes when the horizontal dynamic controls on the convergence board are adjusted. This is not the same as 'snivets' which are caused by the horizontal output tube during UHF operation. The problem can be corrected by adding a 680pf 500V capacitor across each of the clamp diodes on the convergence assembly, as shown in drawings below. The top diagram is for the K10 chassis, and the bottom diagram for the K19 chassis. Keep the leads short.

GTE SYLVANIA

Color TV Chassis E06/08/20/21—Snowy UHF picture

The cause is probably the RF AGC Delay (R276) set too high. Do not replace the UHF tuner. Instead, check the delay control.

Color TV Chassis M10—Service Hint for Replacing Transistor Q101

When replacing the forward pass transistor Q101 the transistor socket may slip out of its retainer while inserting the new transistor. Improper installation could be the result with failure, then, of Q101, blown fuses, etc. To avoid this problem, insert a blunt rod or tool through the lower of the two holes in the bottom left rear of the chassis shown below, and the left of the power supply panel. Pressure can then be applied to hold the socket in its retainer while removing and inserting the new transistor.

B/W Chassis B-10-7—Horizontal oscillator will not start except when set has been in 'instant on' mode. Then it is off frequency. The fault is capacitor C400 which is shorted. Replace.

B/W Television (console)—Correction of VHF dial slippage

Properly calibrate VHF dial, and then remove complete dial and hub assembly from tuner shaft. Install soft wire staple through the plastic dial and hub as shown in dia-
ANTENNA CENTER
THE ANTENNA ORGANIZER . . . THAT DOES MORE THAN DISPLAY ANTENNAS!

COMPREHENSIVE ASSORTMENT
OF ANTENNA--TOP, CENTER &
BASE LOADED MODELS--ALL
INDIVIDUALLY SKIN PACKED
FOR PROMINENT DISPLAY.
▷ SINGLE ANTENNAS
▷ SINGLE ANTENNA KITS
▷ CO-PHASED ANTENNA SYSTEMS
▷ MOUNTS & CABLES
UNIQUE "SWING-ASIDE" FLOOR
MERCHANDISER LETS YOU GET
MAXIMUM RETURN FROM MINI-
MUM FLOOR SPACE. REQUIRES
ONLY 5' x 2' AREA.
LOOK WHAT YOU GET:

PROGRAM
NO. 49-855

- 20 different antennas, antenna kits and
  co-phase systems--40 total products.
- Revolutionary "Swing-Aside" self-service
  floor merchandiser places entire selection
  at customer's finger tips.
- Colorful, descriptive header, complete
  with illustrations and catalog numbers,
  informs customer of the exact antenna
  or kit he desires.
- Versatility of selection allows 65 differ-
  ent antenna and mount combinations.

CONTACT YOUR GC
DISTRIBUTOR TODAY!
Oneida knows how important it is to have the right parts (sockets) at the right time. That’s why your Oneida distributor can probably supply you with the right socket for just about any job. 7-pin, 9-pin, 12-pin, circular, exact replacement, etc. Oneida has ‘em by the hundreds.

IMMEDIATE DELIVERY FROM YOUR ONEIDA DISTRIBUTOR

Use this versatile frequency counter when accuracy counts.

Exceptional accuracy and sensible features make our new wide-range frequency counter the ideal choice for checking out audio, video, CB, ham radio and other communications equipment.
- Wide range—10Hz to 60MHz
- Precise 10.000MHz crystal-controlled time base for ±0.1ppm stability
- 1KHz audible tone for SSB carrier frequency measurement
- Selectable input sensitivity (for noise rejection)—10 or 100mV
- 6-digit bright LED readout
- Indicators for signal, overflow, and range
- Small and compact; ac operated

WD-752A
$200.00

See it at your VIZ distributor

Exceptional accuracy and sensible features make our new wide-range frequency counter the ideal choice for checking out audio, video, CB, ham radio and other communications equipment.

GENERAL ELECTRIC

Color TV Chassis CD—Poor horizontal sync or no horizontal sync
This refers to sets serial coded 5T3T and later sets with stick HV rectifier. The cause is a decrease in value or an open with the 39K, ½ watt resistor, R251. The solution is to replace R251 with a 39K, 1 watt 10% carbon resistor.

Color TV Chassis MC & MB-75—When the grass is not green.
To solve this ‘blue grass’ problem, first, set up the fleshtone properly in both the auto and manual positions with the tint control. Then turn the core of L642 on the chroma
module clockwise one full turn. This reduces the demodulation angle by about 25 degrees. Next, check the tint control in the manual position to make sure that the fleshstone range is still wide enough. Then widen fleshstone range, if necessary, by turning L642 counterclockwise until the desired results are attained. This adjustment is only possible on EP93X41 modules. It is fixed on EP93X89 modules.

MAGNAVOX

Radio Chassis R344—C202 capacitor failure
A few R344 stereo console chassis were produced with a jumper at C202 installed. This jumper is intended for use only on the R342 and R343 chassis. When it has been installed wrongly in the R344, it can create distortion at high volume levels, and can eventually damage C202. If the jumper is found in an R344 chassis being serviced, remove the jumper.

Color TV Chassis T995—Replacing the feed-thru capacitance assembly
In late production of the T995 chassis, three feed-thru capacitors and two ferrite beads have been added to the horizontal output stage. The capacitors are soldered to a mounting bracket which is attached to the heat sink alongside the horizontal output transistor, Q1, as shown in the diagram. The connecting leads to the base and collector pass through the opening in the ferrite beads. If replacement of one of the feed-thru capacitors is necessary, you can save time by replacing the entire feed-thru assembly, which consists of the bracket and capacitors soldered in place. The ferrite beads are not provided because the original can be re-used. Part number is 171441-1.
Tapping the medical electronics market

By Joseph J. Carr, C.E.T.*

(EDITOR'S NOTE: The sale of medical industrial electronic equipment to medical institutions within the United States now constitutes a market that surpasses $660 million annually. It is expected that medical instrumentation sales will increase at a rate of 15 to 20 per cent through 1980. All of this equipment needs regular service and calibration. As part of ETID's goal of keeping the consumer electronics service industry aware of expanding opportunities, we present this general overview of the medical electronics service business and how to break into it).

Biomedical equipment servicing is one of the service industry's growth areas and potentially quite profitable for both service companies and individual technicians. Considering that some 1,300 manufacturers offer about 10,000 different models, the medical equipment industry obviously is healthy enough to structure a career around, or a business from.

I know from experience that the person who is really qualified to service a solid-state color television receiver is knowledgeable enough in basic electronics to learn medical equipment servicing. There's little that is exotic, but some specialized knowledge is required.

So how do you get this knowledge? The best is from a formal program at a college, university, or technical institute. A good background in electronics courses, plus a few courses in biomedical instrumentation or something similar would be in order. A number of community colleges now offer such programs and their popularity is growing everyday.

And don't forget to check your local library or scientific bookstore for such books as the one I have written, "Servicing Medical and Bioelectronic Equipment" (TAB Books No. 930). Medical equipment manufacturers themselves provide well written and complete service and training manuals on their own products.

WORKING IN THE HOSPITAL ENVIRONMENT

The hospital is a sensitive area,
It contains electrical as well as mechanical components and no small amount of plumbing. Other electro-mechanical devices you'll run up against are the intra-aortic balloon pump, heart lung machines, autotransfusion pumps, respirators, suction pumps and a host of other devices.

**KNOW YOUR MARKET**

If you are a shop owner contemplating a medical service business, an investigation of your potential market will give you a good idea of your chances. In the larger cities there will probably be others doing the same type of work. However, smaller towns often offer the best opportunities.

A reader in a small western town wrote to me about a proposal he received from the local hospital administrator. The hospital wanted local service for their coronary care unit patient monitoring system. The nearest factory service was out of San Francisco, some 600 miles away. Each service call, one every three weeks, cost not less than 8 to 10 hours in time (at $35 an hour). Add air fare for the technician and air freight for his equipment and parts, and the hospital ended up typically paying $500 per call—or about $9,000 a year.

To check out your service shop's potential in this area, first determine who does the buying. Hospital departments are economic activities not unlike businesses, and you may be able to sell your services to specific departments if not the whole institution.

Service purchase decisions may be made by any of the following people, either singly or in concert with each other: administrator, assistant administrator, purchasing director, director of materials management, medical doctors, department heads, director of nursing, head nurses in intensive care units, operating rooms, emergency rooms or dialysis units, and lastly the director of plant operations. More recently, you may have to "sell" the clinical engineer, senior biomedical equipment technician (BMET), or a technical administrator.

**WHAT SERVICES SHOULD YOU OFFER?**

The two areas where many hospitals seem to be potential customers are in repair and a regular preventive maintenance program. The repair function must be clearly defined so you will have to decide on what you can do. You should remember, too, it is virtually mandatory you offer 24-hour service seven days a week. In fact this may help you get an account if the competition in your area does not provide such service, or fails to deliver as promised. In some cases, hospitals use outside vendors only after hours so that they do not have to pay a salary differential to the in-house technician. This then could be your foot in the door.

If there are only a few hospitals in your locale, and you want their general electronic repair business, it will be wise to assemble a list, by manufacturer and model number, of their intensive care, coronary care, operating room and emergency room monitoring equipment, all of the electrosurgery equipment in the OR, and all of their ECG (electrocardiogram) machines. Contact each manufacturer to inquire about doing their service formally. If new installations are contemplated inquire about becoming a warranty station. In any event, try obtaining all service manuals and other pertinent literature, plus a list of recommended spare parts. Generally, the service technician at the plant is the best source of information.

Preventive maintenance has become a major consideration in hospitals because of the requirements of the JCAH (Joint Commission on Accreditation of Hospitals) and insurance carriers. Also, it's necessary as a legal safeguard in medical malpractice suits.

This job may be performed in-house or by an outside contractor on a fee-for-service basis. The job may range from checking a piece of equipment to a complete mechanical rebuilding. But, beware of contracts that leave you open to liability for the cost of some repair parts, as they can be quite costly.

**BASIC TEST EQUIPMENT**

Although some specialized equipment is necessary in medical electronic service, most of the test instruments required will be of the same sort as needed in any electronic servicer operation.

Oscilloscope: It should have a
bandwidth of not less than 5-MHz (15-MHz is necessary if a lot of digital circuits are serviced). It should be dual trace and have a triggered sweep circuit.

DMM: Capable of setting a potential to 0-volts + 10-millivolts. This means at least 3½-digits of resolution, which is no longer either uncommon or expensive.

Electrosurgery apparatus are high powered R.F. generators capable of delivering upwards of one ampere of R.F. current to a 500-Ohm (non-inductive) dummy load. Therefore you will need a tester that provides a means for observing the waveform (safely!) on an oscilloscope. This capability is necessary for servicing some solid-state electrosurgery equipment.

Another required instrument is the electrical safety analyzer. Safety considerations in medical environments are far more critical than in other places, so a constant surveillance program must be followed. An addition to this is an electronic a.c. leakage current tester for more portable operation.

The ECG waveform simulator, affectionately dubbed a "chicken heart", is used to provide a reasonable waveform to ECG preamplifiers when troubleshooting or testing.

Also required will be a defibrillator analyzer, and be sure to specify a model that has an oscilloscope output jack. These devices are little more than a 50-Ohm dummy load, driving an integrating voltmeter calibrated in watts-seconds.

A leading supplier of specialized test equipment for the BMET is Med-Search Systems, Inc.; 5480 Wisconsin Avenue; Chevy Chase, MD 20015. They are in a position to make up a starting package of instruments from several manufacturers.

CERTIFYING ORGANIZATIONS

There are two non-governmental organizations offering certification for medical electronics technicians—in addition to the Veteran's Administration which has its own certification procedure.

Certified Electronic Technician (CET) program of ISCE (1715 Expo Lane; Indianapolis, IN. 46224). This organization offers a medical electronics option.

Association for the Advancement of Medical Instrumentation (AAMI—1901 Fort Myer Drive; Suite 602; Arlington, VA 22209). The AAMI also certifies clinical engineers, who are often responsible for directing the efforts of BMET's in addition to performing the functions of consultant on medical equipment purchases, design of new devices and facilities planning.

JOB ROLES IN MEDICAL ELECTRONICS

The Biomedical Equipment Technician (BMET) fills the most common job roles in medical electronics regardless of whether he works for a vendor, manufacturer, or is employed in-house by a hospital. His duties will be to troubleshoot, repair, calibrate, inspect and manage the maintenance of medical equipment as well as to instruct other hospital personnel on the proper operation of the equipment.

Below are listed the most common functions of the BMET.

The Factory BMET: Usually works out of a local field office with company car and modest expense account. Will service his company's line of equipment and make new installations. Generally they report incomes of $10,000 to $22,000.

In-House BMET: Salary generally ranges from $10,000 to $16,000 a year. Works regular hours at the same location every day. He may be employed by the maintenance or "plant operations" section, one of the hospital's clinical departments, or a separate department of biomedical or clinical engineering.

Independent Vendors: They come in two varieties, national corporations and local service companies. The locals tend to be operated in much the same manner as consumer electronics and two-way radio shops. Pay is usually competitive but advancement may be limited due to smallness.

National Corporations, such as Honeywell, Inc., and The Stanwick Corporation, provide maintenance services. Pay and incentives are about the same as for manufacturer's technicians, but these technicians will service a much broader range of equipment than the factory servicer.
At General Electric we're treating every TV parts order like a rush order. Here's how it's paying off: Over 99% of the General Electric TV replacement parts ordered this year were in stock in our national computer-linked parts distribution system. And on the average better than 90% were ready for immediate shipment from the Regional Replacement Parts Centers.

This is why most parts are now shipped the same day an order's received or by the close of business the following day.

But ordering parts from us is more than fast. It's easier than ever before. In almost all areas, our toll-free ordering numbers connect you directly with GE Parts Centers. And you can charge your order to Master Charge, VISA (BankAmericard) or your approved GE Open Credit Account.

What's more, when you order several parts and one isn't immediately available, we don't leave you hanging. Instead, we ship what's in stock and include the expected shipping date for what isn't.

How did General Electric's parts distribution come so far so fast? One factor was the enlargement of stocks at many GE Parts Centers. But the deciding factor was our determination to build a streamlined, efficient system that simplified the parts ordering process for both of us.

Now comes the easiest part of all. Clipping out and sending in the coupon below. When you do, we'll send you a list of our toll-free numbers and all the information you need to take the easy way out next time you order TV replacement parts from us. It's our business to make your business easier.

"I've got your number."

"DUTCH" MEYER/GENERAL ELECTRIC COMPANY
TELEVISION BUSINESS DEPARTMENT
COLLEGE BOULEVARD/PORTSMOUTH, VA. 23705

Dear "Dutch":
Please send me the items checked below:
☐ Brochure covering GE toll-free ordering numbers.
☐ Listing of Parts Distributors.
☐ Master Charge and VISA (BankAmericard) information.
☐ GE Open Credit Account information.

Name
Service Company
Address
City State Zip

THIS IS GE PERFORMANCE TELEVISION

GENERAL ELECTRIC
Admiral color television for 1978

Eight models in Admiral's 1978 color TV line feature the new 25M55M chassis which is basically an M45 chassis with modifications. We take a look at the changes.

A total of thirteen new models make up the 1978 color TV line for Admiral. Five of the thirteen use last year's 9M50 chassis with electronic tuning, and the remaining eight models feature the new 25M55M chassis. All models use the negative matrix 90 degree delta CRT. The new 25M55M chassis is basically an M45 chassis which has been modified for full N-S and E-W pincushioning as well as to drive the larger 23-inch and 25-inch delta CRTs. Now let's take a look at circuitry which is new with the 25M55M chassis.

POWER SUPPLIES

The 25M55M is a line-connected chassis (Fig. 1) that gets its B+ from two basic rectifier supplies. One is a +145 volt source primarily used for horizontal and vertical sweep output. This supply is then decoupled to produce +130 volts for the audio output. The other rectifier supply is a +250 volt source for the RGB output amplifiers. The +250 volt source is required in the case of delta CRTs because a 140-150 volt bias is needed between cathodes and grids for gun cut-off. Actually, 170 to 180 volts of instantaneous signal/DC is used for gun cut-off because the control grids are already operating at about 30 volts above ground.

An isolation transformer must be used during servicing as one side of the AC line is 'hot'. It's this hot side that provides the AC source for the half wave diode, D900, used in the +145 supply, and diodes D130 and D131, as a half wave doubler to produce the +250 volt supply. The hot side of the AC line is also applied across PTC R900 and the degaussing coil, L102.

The low voltage supply (+24 and +12 volts) that operates the front end, the tuners, the low level signal and low level sweep circuits comes through Module M600 but is derived from the positive flyback pulse (Fig. 2) that appears across the horizontal output transformer, T101, secondary winding between pins 7 and 10. This is a pulse-derived supply even though it is often called 'scan-derived'. It is actually produced by the 40KHz flyback pulse oscillation.

The +250 volt supply which, as has been noted, is required by the delta CRT for gun cut-off, is produced by the doubler circuit (Fig. 1) that includes diodes D130 and D131. This doubler circuit works in the following manner: Diode D130 starts to conduct to ground through capacitor C130 and resistors R130 and R133 during that half of the AC cycle when the 'hot'
"Our son fixes digital computers for the Navy and pop-up toasters for me."

Mrs. Kenneth Johnson, Ellisville, Missouri.

“Our son is a Data Systems Technician. The Navy taught him how to remove computer circuits and repair them. But I can't wait till he comes home on leave," says Mrs. Johnson. "All that training comes in very handy."

If your son is good at fixing up his stereo or if he knows his way around the wiring in your appliances, he may be eligible for about $17,000 worth of advanced technical training in electronics. And it won't cost you a cent.

For more information, tell him to talk to his local Navy Recruiter. Or mail the coupon below. For the fastest reply, call toll-free, 800-841-8000 anytime, day or night.

The Navy.

TO: Capt. Robert W. Watkins
NAVY OPPORTUNITY INFORMATION CENTER
P.O. Box 2000, Pelham Manor, N.Y. 10803

Yes, I think my son is good enough to qualify for $17000 worth of technical training in Advanced Electronics. Please send more information.

NAME (Please Print): ____________________________

ADDRESS: ____________________________________

CITY: ______________________ PHONE: __________

STATE: ___________________ ZIP: __________
charges capacitor C130 to near other half cycle of AC, diode D131 with respect to ground during the hot side of AC becomes positive with respect to ground during the other half cycle of AC, diode D131 starts to conduct with a path from ground through filter capacitors C133 and C134, and then through D131, R130 and C130 to the positive AC source. The two voltages produced combine to produce almost twice as high a charge across filter capacitors C133 and C134 as could be obtained from a simple half wave rectifier.

THE SIGNAL SYSTEM

The signal circuits—front end AGC loop, Y video and chroma—are almost the same as in the previous M45 chassis except for some minor modifications. The changes, mainly, have been made to accommodate the new delta CRT. For example, separate drive controls are used in the emitters of the green, blue and red amplifiers, as shown in Fig. 3. And separate G2 screen controls are included for each gun. The G2 supply voltage is produced by a separate diode in
the H.V tripler, M100, (Fig. 2) and is obtained from the flyback pulse input return winding at pin 12 of the horizontal output transformer.

The +250 voltage supply described earlier is used as the R,G, and B collector source for cut-off of the CRT guns. A +145 volt supply was used for this purpose in the earlier M45 chassis.

**PRE-SET CONTROLS**

When the Admiral color control (ColorMaster) system is in operation, pre-set adjustments for tint, color and brightness are substituted for manual customer controls. The connections from the control assembly to the chassis are made through jack J110 and plug P110.

**Brightness**

Whether pre-set or manual, the brightness control varies the positive DC voltage at pin 1 of P110 (Fig. 4). This voltage is applied to the anode of the Video-Emitter Follower, Q700. Because of DC coupling through the remainder of the “Y” channel, the DC bias voltage is altered at the CRT cathodes which in turn changes the average CRT gun conduction and, therefore, brightness.

**Color**

The color gain control (Fig. 4) varies the DC voltage on pin 4 of P110. The voltage is then applied to pin 6 of the Chroma Amp and Demodulator IC400 which, in turn, varies the gain of the 2nd chroma amplifier in the IC. The color gain increases as the voltage is decreased toward zero volts.

**Tint**

Depending on the ColorMaster setting by the customer, either the manual or pre-set tint control arm (Fig. 4) is connected to pin 6 of P110. This connection shifts the 3.58MHz oscillator output phase, which in turn, changes the de-
modulation angle of the demodulators in IC400. The source DV voltage for the tint control potentiometers appears on pin 5 of P110. The altered tint voltage from the arm of either manual or pre-set tint control is applied to pin 1 of Subcarrier Regenerator IC401.

**CONTRAST CONTROL**

In Admiral's 25M55M chassis, the contrast control is not pre-set. It is a manual control in series with a video level pre-set, which is a service adjustment. The video level control selects the proper peak-to-peak composite video for the "Y" channel input. Admiral's service literature for the 25M55M chassis points out that this video level control is necessary because there is no signal loop gain level adjustment for the front-end AGC gain loop, and thus the composite video can vary widely from set to set.

The contrast control center arm (Fig. 4) is connected to pin 3 of P110 and then through a 10 mfd coupling capacitor (C701) to the base of the video emitter follower, Q700. DC coupling is used in all "Y" circuits from C701 to the CRT cathodes.

**AUTOMATIC PICTURE CONTROL**

A device, Q170, in the 25M55M chassis known as "picture control" automatically changes the color level of the set in accordance with the amplitude of the "Y" video content. By observing the circuit of Q170 (Fig. 5), you'll notice that the base has a 10 mfd capacitor to ground to bypass any signals that might be present. This means that Q170 is only a DC device. Its collector voltage is the source voltage for the color gain control potentiometers.

Three resistors, R171, R170 and R157, and the contrast control, R156, make up a voltage divider from the +24 volt supply to ground. However, as Admiral's technical literature points out, "a calculation of the maximum change in voltage from this divider that would result at the arm of the contrast control over the full range of the control would show it to be less than .1 volt. Thus, a larger voltage source must be involved for the picture control device."

This larger voltage comes from the emitter of the 1st video stage, Q201, which varies slightly with black content, but is inversely proportional to the energy level of the IF signal. This source voltage, with a DC value of about +3.5V with normal signals, appears across the divider made up of the video level pre-set, R700, the contrast control, R156, and resistor R157 to ground.

When the contrast control is turned down, a less positive (or more negative) DC voltage appears at the arm of R156 as well as at the base of Q170. As a result, less collector current flows through Q170, and a higher (or more positive) voltage appears at the collector, and along any point on the divider in the collector circuit. This divider connects from the +24 volt supply and through the color gain control and finally through R174 to ground. The more positive voltage from the arm of the color control is applied through pin 4 of J110-P110 to pin 6.
Modular chroma circuits, part two: Adding luminance

After last month's discussion of the different methods of sub-carrier regeneration, we go a step further to show circuit variations after demodulation.

By Bernard B. Daien

In the TV receiver, the red and blue demodulators drive the red and blue amplifiers which in turn drive the grids of the CRT, as shown in figure 4A. To derive the green signal voltage (only red and blue voltages are transmitted) we combine voltages from the red and blue amplifiers in the proper proportion at the green amplifier. (This proportion is minus 51% of the red signal voltage plus minus 19% of the blue amplifier output.

Notice that the input to the red amp is labeled – R– Y, and the blue amp – B– Y. Thus a phase reversal occurs as the signal passes through the amplifier stages. This, of course, is easily obtained due to the addition of the extra stage of gain employing a common cathode (or common emitter) configuration.

The previous examples should enable the reader to follow the signal paths and phases, and understand them. So let's proceed to apply what we have read to some actual color sets. First, however, we must make a few general comments about some other things you will find on modules, which might cause problems, if you fail to keep them in mind.

Many modules have jumpers on spare terminals, which are wired to form interlocks on the power sources in the set. Removing a module often turns off all, or part of the set, to prevent damage, or for safety reasons. A dead, or partly dead set is often due to a dirty module contact... so a good point to start on a modular set is by cleaning contacts. Lift the module partly off the contact, spray the contacts with tuner spray, and reseat the module. Do it a few times if necessary. It's surprising how often the set is "repaired". Remember, the average set uses about 8 modules, with a dozen or more contacts active, so we have one hundred or more metal contacts which can sit there for years, tarnishing. A 99% "good" rate is not enough with 100 contacts!

In addition, many modules have built in "on board" voltage reg-
ulators. Older TV sets used main regulators, or voltage dividers to supply all circuits. Today, many integrated circuits have regulators on the chip, for three reasons. It spreads the heat, eliminating the need for heavy, heat-sunk power regulators and high power resistors. Second, each module can run at a different voltage as required. Third, it reduces the need for big decoupling filters in the supply leads, since the regulators wipe out ripple, signals, and noise on the power leads. But we now have many little regulators, and sooner or later we have failures due to sheer numbers involved. Since the regulators control the internal voltages on an IC, you may have to probe the pins to see if the dc voltages are ok, even if the supply line to the module is good.

**TEST EQUIPMENT**

I have evolved a little technique that helps in this regard. It consists of wiring up one of those little retractable probe type miniclips to a two foot insulated test lead terminating in an alligator clip. The module can be removed, the miniclip clipped on the desired pin, the module replaced, and you have a lead brought out for test purposes with power on the module. These insulated miniclips can actually clip onto one IC lead without touching the adjacent one! Probing such closely spaced terminals with your meter test leads often results in shorting two pins together and blowing out the circuit.

To get back to the chroma modules, remember the chroma is 3.58 mHz, so if you wish to see the signals on a scope you must have a scope flat to 4 mHz. You will also have to take your sync from either the sync separator, or the horizontal keying or blanking pulses (say, the keyed agc pulses), using the external sync on your scope, and adjusting the frequency to the horizontal rate of 15,750 to see one line. You should hook up your color bar generator, set for color bars, so that you have a steady signal with a consistent information pattern.

The RCA CTC 76 is a recent chassis, which illustrates many of the things we have discussed (See April 1977 TEKFAK #1689). Since the chroma in this set is spread over five modules, I suggest you obtain the schematic, in order to obtain the most from this section. Chroma I module is an MAC002 and contains the chroma bandpass amplifier, ACC, color killer, burst amp, 3.58 mHz oscillator, and the zener diode used as a reference for the voltage regulator used on another chroma module (the MAE001). In addition there is a tint centering control, and a 3.58 mHz oscillator frequency trimmer, on the module.

**WHICH BOARD IS BAD?**

The output of the Chroma I amplifier module drives the Chroma II module, (the MAE001), which contains the 90 degree phase shifter, the red and blue demodulators, and the R-Y, G-Y, and B-Y low level color amplifiers. This board has a voltage regulator on it, which uses the reference from the Chroma I module. Thus a defect in the Chroma I module, or its removal, will drastically affect the dc voltages on the Chroma II module.

Each of the three color amplifiers drive an output color amp, on a separate module. Thus there are three identical MAD001 modules. The relatively high voltage of 150 volts dc is applied to these amplifiers, as well as horizontal blanking pulses, for horizontal retrace blanking. Each MAD001 module drives one of the cathodes of the color CRT. The video (luminance, "Y") signal is also applied to the cathodes of the CRT. The three CRT grids are tied together, and bias applied.

Thus we have a total of five modules involved in the chroma, plus the CRT tube's elements, which also affect the color. It should be noted that when a color defect occurs, the CRT should be tested as a matter of routine, and if good, the CRT socket should be removed and the operating voltages at the socket measured. Quite often chroma modules are replaced when the actual problem is a bad connection to the CRT, a bad potentiometer in the screen circuits, a shorted spark gap capacitor, or defects in the PC board.

At this point it is advisable to stress the common sense fact the modules should not be removed or replaced with the power on the set. Further, modules with large capacitors should have the capacitors discharged with a 5000 ohm 5 watt resistor before reinserting in the set, as the heavy discharge current from a large capacitor can destroy other components.

**LOSS OF COLOR**

Since we know that the ACC and color killer circuits are in the Chroma I module, along with tint centering, defects in these functions would indicate this module likely to be at fault. Loss of color could be due to loss of input, failure of the 3.58 oscillator, loss of voltage applied, or failure of the Chroma II module. It is unlikely that all three MAD001 modules would fail, but loss of one color may indicate a defect in one of them.
The most important lesson to be learned from this popular set, which has a chroma system similar to many other RCA modules receivers, is that servicing modular chroma is not very different from servicing a set with one large PC board. You still have to use a schematic, and you still have to understand chroma theory. The big advantage of the module is that you can trade it in a piece of the set. This is a lot better than pulling a chassis into the shop, or hauling a console down the stairs! It still requires a skilled tech, a schematic, and some reasonable amount of test equipment.

In this regard, you should be aware that some set manufacturers have over-simplified the problems of modular set repair, as a selling point for the customer, as well as the service-dealer. This leaves the service tech, who must face the customer, stuck with the customer relation problem of telling the customer that his modular, instantly repairable set, will cost close to $50 to repair. Consider an intermittent, for instance. It could be on either of two modules. Replace two modules at $16 each, plus tax, plus service call. Time in house 20 minutes! (No module tester available). Alternative;... replace each module in turn, wait for intermittent to act up, charge for time in house. The bill will be the same. It is a fact that a large percentage of modules turned in as defective are actually good!

"EDUCATED GUESS" PAYS OFF

Since neither the set manufacturers nor the semiconductor manufacturers have felt any obligation to market testers for modules, or linear IC's, to replace the tube testers, the service tech will have to make some "educated guesses", and consequently some mistakes, without these needed diagnostic instruments. More about this after looking at another set.

The General Electric MC chassis (see TEKFAK #1614 in Nov. 1975), uses modules which have a high percentage of discrete parts, and some ICs. Like the Zenith, RCA, and Magnavox sets of the same year, the CRT cathodes are driven elements, with both color and video applied, (R+Y, G+Y, and B+Y).

The large number of accessible discrete parts in this set makes it attractive to attempt module repairs. The Chroma module has a voltage regulator on it, a color killer threshold control, ACC control, and a chroma gain equalization control. There are two ICs on the board, one a chroma processor with the burst regeneration function in it, the other is a color demodulator and matrix which delivers R-Y, B-Y, and G-Y outputs to the "R G B Amplifier" module. There is also an input from the video section, which is combined with the color inputs. As a result, the output of the RGB Amp is R+Y, G+Y, and B+Y, driving the CRT cathodes. Three drive controls are on the board. This set has both positive and negative supply voltages, with minus 21 volts, and positive 23 volts applied to this module. Following a recent trend, some of the sources are derived from the horizontal output transformer.

MAKE VISUAL CHECKS

Before trading in a module, especially one with mostly discrete components, it is advisable to closely examine the board under a good light, with a magnifier. Modern resistors must meet certain safety standards, and unlike the older composition resistors, they crack before showing much discoloration. You must look for these cracked components, as well as defective semiconductors. All voltage regulator transistors seem to have a high failure rate, so it is advisable to test them first if the voltages are incorrect on the board.

Now for diagnostics. With a color bar generator hooked up to the antenna terminals of the set, tune for the best presentation of the bars, and then look for the waveforms from each of the color amplifiers, using horizontal sync from the sync separator, or some other convenient point in the set. If one or more is missing, go to the inputs of the color amps, which are almost always accessible. This will determine if the problem is in the color amps, or further front in the receiver. If the color demodulators have chroma in, and if the burst regenerator is running, there should be output from the color demods, otherwise, the problem is in the demods. Lack of burst regenerator output, "I" is readily noted on the scope, as is loss of "C", (chroma).

ADDITIONAL CHECKS

Be sure to check for color killer action. Often "C" is lost because the killer threshold is set wrong, or has drifted over a period of time. The waveforms involved are very easy to recognize after you have seen them. Unfortunately troubles in the picture L.F., or automatic fine tuning can lead to loss of chroma by putting the color carrier too far down the slope of the IF response curve. If the fine tuning on the tuner does not have enough range, the same thing happens. I have restored color on many sets, continued on page 45
Q. What will WOW your customers, add to your test bench capabilities and FLUTTER your heart with more profits?

A. **FIDELIPAC** WOW & FLUTTER METER

For only $350.00 you can have a portable, solid-state device that quickly and accurately measures the wow, flutter and drift characteristics of any sound reproducing device... reel-to-reel, 8-track or cassette tape deck, turntable, film projector, etc. It's easily connected to your equipment and comes complete with standard phone output jack for oscilloscope or other suitable recording device. It has an internal precision 3.150 MHz reference oscillator, too. In fact, Fidelipac's Model 65-390 Wow and Flutter Meter is indispensable for your test bench as well as your profit picture.

To order, just send us a purchase order or other authorization along with your BankAmericard, VISA or Master Charge number and expiration date. Or, for more information, call us today or circle the reader's service number below.

**ELECTRONICS by FIDELIPAC**

109 Gaither Drive • Mt. Laurel, NJ 08057
(609) 235-3511

DISTRIBUTOR INQUIRIES INVITED

...for more details circle 112 on Reader Service Card

32 / ELECTRONIC TECHNICIAN/DEALER, DECEMBER 1977
An Extraordinary Offer to introduce you to the benefits of Membership in

ELECTRONICS BOOK CLUB

...for details circle 110 on Reader Service Card

DECEMBER 1977, ELECTRONIC TECHNICIAN/DEALER / 33
In addition to its 30 Hz to 230 MHz standard range, the PR47 prescaler (optional at $125) can extend the range of the counter to 600 MHz for UHF coverage. Loaded with 15 ICs, the state-of-the-art counter is designed to provide average 25 millivolt sensitivity across the VHF band and when used with the prescaler, 225 millivolts in the 450-to-600 MHz range. Sencore reports that all measurements exceed FCC specifications for communications work with 1 part per million accuracy.

Some of the features of the FC45 which you should find especially useful are:

- A built-in high power (12-watt fuse protected) 50-ohm dummy load for direct connection of the FC45 to the transmitter (for use in reading frequencies above 100 KHz only).
- A front panel universal crystal socket for checking any crystal with a fundamental frequency of 1-to-20 MHz. Tests on 500 KHz, 3.58 MHz, and 4 MHz crystals came out right on the button.
- Mini clip counter probe with a switch right on the probe for either direct or isolated connection to the test point. With the probe in the "isolated" mode, a 33pF isolation capacitor is placed in series with the test lead to prevent detuning that may occur in many sensitive circuits when a direct connection is made. (The 12 VDC power lead and the direct/isolation probe are supplied with the FC45).

One accessory I found most useful with the FC45 was the PL207 RF pick-up loop for $9.95. It’s especially handy for probing in low-level circuits where direct connections will upset the oscillator frequency even with the direct/isolation probe. Just lay the pick-up loop next to a coil preferably, but sometimes a transistor or capacitor will do the trick, and you can verify, for instance, the presence of your 3.58 MHz CW in chroma troubleshooting. The same goes for frequency checks in the horizontal or vertical oscillator sections of the TV, although direct connections also worked in the latter two circuits.

But the PL207 isn’t for low level circuits exclusively. It’ll also see
you through frequency checks in higher power transmitters where voltages exceed the FC45's 1 meg input rating or the 12 watt rating of the 50 ohm dummy load.

The FC45 is operating from seven front panel push buttons. Frequency range buttons of 30 Hz to 30 MHz and from 30-to-230 MHz; input buttons of 50 ohm, 1 meg. and the "crystal" check button. Two other "read rate" push buttons will give you updated reading either once every second or 10 times a second.

The special crystal check connector is located in the front as well as the on-off and a special 9-volt output to power the optional prescaler. A back panel connection is for the 12-volt DC supply input.

**SPECIFICATIONS**

**INPUT FREQUENCY**
1 Meg Input: 30 Hz-230 MHz
50 Ohm Input: 100 kHz-230 MHz

**Crystal Check:** 1-20 MHz Fundamental Frequency—overtone crystals read at approximate fundamental frequency.

**ACCURACY**
+timebase accuracy; ± 1 count

**RESOLUTION**
30 Hz-30 MHz: 1 Hz (1 S timebase) 10 Hz
(1 S timebase), 30 MHz-230 MHz: 10 Hz
(1 S timebase) 100 Hz (1 S timebase)

**SENSITIVITY**
50 Ohm Load: 10 milliWatts average (see graph 1)

1 Meg Input: 30 Hz-30 MHz: 20 m V. 30 MHz
to 100 MHz: 25 mV. 100 MHz-230 MHz: 25 to
400 mV (see graph 2).

**INPUT PROTECTION**
50 Ohm: Diode protected to 12 Watts. Fuse
protected over 12 Watts.

1 Meg Input: 250 VP-P to 10 kHZ. 50 VP-P to
30 MHz. 8 VP-P to 230 MHz.

**TIMEBASE**
Crystal Frequency: 10 MHz—oven controlled.

Setability: ± 0.1 ppm (.00001%).

Temperature stability: 1 ppm (.0001%),
0-40° C ambient after 10-minute warmup.

Time Stability: 2 ppm/year after 30 days

**GENERAL**

DISPLAY: 8 digit, 0.5" LED, Auto decimal. 

"Hz" and "MHz" indicators.

SIZE: 5.5" x 7.83" x 9" HWD (14 cm x 19.9 cm x 22.9 cm).

WEIGHT: 6.5 lbs. (3 Kg).

POWER: 105-130 VAC, 50-60 Hz, 30 W max.

(220 VAC conversion available) 12 VDC, 2.2
Amps maximum.

**FUSE REQUIREMENTS:** .5 A, 3 AG Fastlow
for 50 Ohm input, 2 A 3 AG Fastlow for 12
VDC leads. Two spare fuses supplied. AC
line: transformer internally fused.

**ACCESSORY OUTPUT VOLTAGE:** 9-12 VDC
through front panel jack to power PR47 Pre-
scaler.

**ACCESSORIES**

Supplied: 39G112 Direct/Isolated Counter probe
39G111 Fused DC Supply Lead

Optional: PR47 UHF Prescaler
NE206 Noise Eliminator
PL207 RF Pick-Up Loop
39G80 10:1 Lo Cap Probe

Specifications subject to change without notice.

---

The Intervox LS Series includes nine popular 8 ohm models for original and replacement use in alarm devices, intercoms, portable radios, tape recorders, TV, TV games and CB Radios.

Other impedances including 3.2, 4, 16, 40 &
100 ohms are also available.

Choose from 1¹/₄", 2¹/₄", 2¹/₂", 3" & 3¾"
round frames plus 3" & 3¾" square frames. All
with a fully enclosed 0.34 oz. Alnico V magnet.

Cone material is weatherproof paper with the frame of cadmium plated steel.

The manufacturer's specified maximum input in the 30 Hz to 10 KHz range is 250 volts pp; from 10 KHz to 30 MHz, 50 volts pp; and 8 volt pp (3 volts rms) in the 30-to-
230 MHz range. However, these input limitations may be exceeded by a factor of 10 when the FC45 is used in conjunction with a 10-to-1 low capacity scope probe, which incidentally increases the 1 meg input impedance to 10 Megs.

---

**Intervox miniatures speak quality at unheard of prices.**

The Intervox LS Series includes nine popular 8 ohm models for original and replacement use in alarm devices, intercoms, portable radios, tape recorders, TV, TV games and CB Radios.

Other impedances including 3.2, 4, 16, 40 &
100 ohms are also available.

Choose from 1¹/₄", 2¹/₄", 2¹/₂", 3" & 3¾"
round frames plus 3" & 3¾" square frames. All
with a fully enclosed 0.34 oz. Alnico V magnet.

Cone material is weatherproof paper with the frame of cadmium plated steel.

Rated power is between 0.1 and 0.8
watts. Frequency response is from 520
Hz-4 KHz in the 1¹/₄" model to 230 Hz
to 5 KHz in the 3¾" model. Sensitivity is
approximately 90 dB watt in all models.

Each speaker is attractively housed in a
secure, shrink-wrapped package. And their
versatile shipping container, which holds
twenty speakers, can be used as a colorful
counter display or stack bin carton.

We don't know of any other miniature
speaker series of this quality that is priced
better. We'd be happy to give you all the
facts. Write or call us today.
**DEALER SHOWCASE**

Descriptions and specifications of the products included in this department are provided by the manufacturers. For additional information, circle the corresponding numbers on the Reader Service Card in this issue.

**PORTABLE CHANGEABLE SIGN**

A new double-faced, portable and changeable sign unit is now available from Berloc Sign Co. Each side of the sign offers five complete lines of copy and comes with a font of 200 heavy-gauge aluminum letters. Lightweight and unbreakable, the complete set of 6½ inch letters, file box and index can be held in one hand. Letters slip quickly and securely in place, permitting messages to be changed in minutes. The panels are 8 feet wide by 3½ feet high. The steel frame is 7 feet high. Front wheels are included for portability. Priced at $595.

**PHONO CARTRIDGE MAINTENANCE KIT**

A new kit that allows the consumer to inspect, maintain, install and replace delicate phono needles and cartridges is available now from Robins Industries. Called the 'Stylee' kit, components included are: precision stylus handheld microscope, screwdriver, tweezers, and stylus cleaning fluid and brush, all packaged in a permanent plastic storage case. The nucleus of the kit is the hand-held microscope with precision optically designed lens of sufficiently high powered magnification to reveal imperfections and wear points. The kit has a suggested list price of $10.

**MICROPROCESSOR CRYSTALS**

A new line of "time-base" microprocessor crystals for use in TV games, toys, home computers and advanced commercial and industrial computer applications is announced by United States Crystal Corp. Marketed under the name of "Synclod", the new crystals are precision made, high quality crystals engineered to close tolerance specifications for stability and lower resistance levels. They are aged, individually tested and factory sealed in protective packages for in-store merchandising. A display unit is also available, on a 'no-risk' deal for dealers. A full credit return plan allows dealers to trade-in any frequencies which prove to be slow-movers.

**CB ANTENNA FOR CYCLES**

A new CB antenna, called the "Super-Broad", that delivers broad band coverage over the entire 40 channel CB range with low SWR readings is available now from Antler Antennas. The antenna, Model 1C40, has an adjustable clamping bracket that...
locks onto tubing or bars up to one inch in diameter. It is made of heavy-duty, chrome-plated steel and is finished to eliminate sharp edges or corners. The antenna is a 'center-load' style that is precision tuned at the factory. The whip is made of 17-7 stainless spring steel and is adjustable for fine tuning.

**RECORD CLEANER ROLLER 138**

A new roller-type record cleaner which lifts dirt, fingerprints, dust and smudges from within the ridges of phonograph records and renues itself by simple washing in warm water and detergent is being introduced by Rotel. The new roller/cleaner uses a rubber-elastomer material which is said to prevent cavity resonance in the speaker enclosure. It will also help to eliminate undesirable echoes, feedback and reverberations. It is available in 55 inch by 24 inch by 1 inch sheets.

**AM RADIO AMPLIFIER 140**

A new AM radio amplifier, Model AMA-51, which will boost radio sales by providing clear, static-free reception in showrooms is now available from Extronix, Inc. The new unit amplifies signals received by a rooftop antenna and retransmits them to overcome the poor reception in steel-frame buildings, and the electrical interference generated by fluorescent lights, elevators and appliances. The amplifier boosts the whole AM radio band (540-1600 KHz) to a satisfactory reception level without tuning. Composite output is rated at 30 volts in 75 ohms with all distortion at least 40 dB down. Installation is made with ordinary TV cable.

---

**ACOUSTIC PADDING FOR SPEAKERS 139**

An easy-to-handle, non-irritating material for the acoustic padding of speaker cabinets is being introduced by Audiotex. Designed for sale to do-it-yourselfers, the new product, called Tufflex, is made of natural wood fibers, and is said not to irritate skin like fiberglass. Tufflex provides total damping of standing sound waves and

---

**RCA helps you do it all—faster and more profitably.**

RCA knows what you need for fast efficient service. Your RCA Distributor can quickly solve your stocking and ordering problems because he represents RCA’s Distributor and Special Products Division — one of the industry’s largest single sources for your electronic servicing needs.

You name it — we’ll supply it. Receiving tubes; color and black-and-white picture tubes; SK replacement semiconductors; exact replacement parts; antenna hardware; outdoor and indoor antennas; antenna rotators; industrial tubes; test jigs; reception and servicing aids ... and the list goes on.

And that’s not all. The size and scope of RCA’s activities in electronics means you can get the latest, most advanced products. Backed with extensive promotional support; advertising programs; handy directories; catalogs and cross-reference library.

Get the full story from your RCA Distributor. Or write RCA Distributor and Special Products Division, 2000 Clements Bridge Road, Deptford, N.J. 08096. Attn: Sales Promotion Services

**...for more details circle 126 on Reader Service Card**

DECEMBER 1977, ELECTRONIC TECHNICIAN/DEALER / 37
If you are an executive and have not heard of Drake-Beam & Associates... You should have.

Drake-Beam & Associates, Inc. is a consulting organization specializing in the application of behavioral sciences to the solution of “people-problems” in business. Drake-Beam is particularly skilled in the design and implementation of innovative approaches aimed at increasing the utilization of its clients’ most valuable resource — people.

D-B’s clients, comprised largely of Fortune 500 (17 of the top 25) speak well about Drake-Beam’s ability to produce results that have tangible impact on profit.

Those services include:

**Out-Placement Counseling (OPC)** . . .
Assisting the terminated individual and the organization in making a smooth transition.

**Training & Development** . . .
Custom designed learning experiences in management and sales skills.

**Executive Search** . . .
Through a unique, dynamic and demonstrably successful approach, finding the right person for a key position in your organization.

**Mid-Career Guidance** . . .
Revitalizing a valued employee whose performance is failing within your organization: improving the performance of a key management member who has high potential.

**Personnel Research & Assessment** . . .
Providing sound recommendations about organization and individual problems by means of attitude surveys and individual psychological assessments. Drake-Beam also validates hiring and test selection procedures.

**Organization Development**
Making individuals and groups more productive through team building and job design.

For information, call or write:

**NEW YORK:**
William J. Morin, Group Vice President
277 Park Avenue, New York, N.Y. 10017
(212) 826-8890

**CHICAGO:**
Phil Simshauser, Vice President
1001 East Touhy Avenue, Box 26
Des Plaines, Illinois 60018
(312) 299-2286

**LOS ANGELES:**
Steve Savage, Vice President
5900 Wilshire Blvd.
Los Angeles, California 90036
(213) 938-9111
NEW PRODUCTS

Descriptions and specifications of the products included in this department are provided by the manufacturers. For additional information, circle the corresponding numbers on the Reader Service Card in this issue.

VOM WITH FIVE-OHM MID-SCALE RANGE 141

A new 30,000 ohm/volt compact VOM has been introduced by B&K-Precision. The new instrument, Model 115, features a five-ohm mid-scale range for checking the low-resistance of coil, transformer and motor windings. All four resistance scales (0-500Ω, 5k, 50k, 5MΩ) are fuse protected. For checks of the thermocouples and oil burner controls, four DC current ranges are included (0.03, 0.06, 60, 60mA). DC and AC voltage measurement extends to 1200 volts, or 12kVDC with the optional HV-12 high-voltage probe adapter. The color-coded meter scales are uncluttered and simplified. A full-arc mirrored scale eliminates parallax errors. The 115 is small enough to fit into most tool kits. Test leads and instruction are included. Priced at $37.50.

MAGNETIC MOUNT CB ANTENNA 142

Two new magnetic mount CB antennas—Models 5029A and 5030—are announced by Channel Master. Called the 'Mag-Ne-Tenna', the new models were tested on a plane going 140 mph and a vinyl top car at 100 mph. They are said to be the only magnetic mount CB antennas that use an in-line ferrite choke, mounted in the base housing, to stabilize SWR, boost efficiency, and enable the antennas to perform on vinyl top cars. Both antennas have epoxy-dipped, base-loaded coils protected by weatherproof housing, plus a stainless steel shock spring and high-capacitance stainless steel whip. Model 5030, which is adjustable, comes with a triple chrome-plated universal ball-joint. Model 5029A sells for $29.95 and Model 5030, $33.95.

RECEPTACLE TESTER 143

A new, pocket-sized tester for correct wiring of 15 or 20 amp, 115V single-phase 3-wire receptacles is now available from Elecon Corp. To test, simply plug the unit into the receptacle. A combination of colored lights indicates whether the receptacle is properly wired. It is a lightweight and compact enough to be carried in a shirt pocket. Called the CT 102 Circuit Tester, it incorporates the same blades as a standard 15 amp U-ground plug, and fits either 15 or 20 amp U-grounded receptacles.

IC TEST CLIPS 144

A new 40-pin, dual-in-line test clip for attachment of test probes to IC packages has been announced by ITT Pomona Electronics. Designated Model 4140, the new clip is designed to permit hand-free testing while maintaining a good electrical connection. Special features include solid, non-
NEW EICO 480
TRIGGERED SWEEP
10 MHz SCOPE

100% Solid State • Includes 10:1 Probe

More Professional scope performance for your money! DC to 10 MHz bandwidth, AC and DC coupling, 11 position calibrated attenuator, 10 mV/cm sensitivity, push-button operation. Outstanding features: Built-in TV Sync Separator; Digitally controlled trigger circuits; reference baseline display; calibrated 21 step sweep speed; Fully regulated power supply, Custom Bezel for standard camera mounting. Assembled $425.00

FREE 78 EICO CATALOG

Check reader service card or send 75¢ for first class mail. See your local EICO Dealer or call (516) 681-9300, 9:00 a.m.-5:00 p.m. EST. Major credit cards accepted.

EICO—108 New South Rd. Hicksville, N.Y. 11802

...for more details circle 108 on Reader Service Card

NEW EKCO 480
10 MHZ SCOPES

100% Solid State • Includes 10:1 Probe

More Professional scope performance for your money! DC to 10 MHz bandwidth, AC and DC coupling, 11 position calibrated attenuator, 10 mV/cm sensitivity, push-button operation. Outstanding features: Built-in TV Sync Separator; Digitally controlled trigger circuits; reference baseline display; calibrated 21 step sweep speed; Fully regulated power supply, Custom Bezel for standard camera mounting. Assembled $425.00

FREE 78 EICO CATALOG

Check reader service card or send 75¢ for first class mail. See your local EICO Dealer or call (516) 681-9300, 9:00 a.m.-5:00 p.m. EST. Major credit cards accepted.

EICO—108 New South Rd. Hicksville, N.Y. 11802

...for more details circle 108 on Reader Service Card

QUICK CHANGE IRON-QUICK CHANGE TIPS

ISOFTIP Quick Charge Cordless Soldering Iron recharges in 3-4½ hours. Uses any of Wahl’s 16 snap-in tips.

Low voltage, battery powered, ground free isolated tip design.

= 7571 - BEVELED TIP = 7572 - BLUNT TIP = 7573 - TINNING TIP = 7574 - MICRO SOLDERING TIP = 7575 - REGULAR TIP = 7576 - KNIFE TIP = 7577 - CONCAVE CENTERING TIP

WAHL CLIPPER CORPORATION
ORIGINATORS OF PRACTICAL CORDLESS SOLDERING
Sterling, Illinois 61081 (815) 625-6525

...for more details circle 129 on Reader Service Card

A new line of high performance, ground plane base station antennas for CB has been announced by Winegard Industries. Bearing the "Wavemaster" tradename, the new antennas are small in size, yet are said to provide the performance expected of larger models. Gain of the six models in the line ranges from 3.5dB to 5.0dB. They are engineered for 40 channel operation. Installation is easy with the four basic parts of each antenna assembled without tools. They feature twist-lock sockets which hold the radiator and radial elements firmly in place, assuring solid electrical contact between the elements and the transmission cable.

TUNGSTEN HALOGEN LIGHT BULB 146

A tiny tungsten halogen light bulb designed for use as a light source for microfilm readers, optical comparators, medical and dental lighting fixtures, scientific instruments, and other low voltage lighting equipment has been introduced by Westinghouse.

The 24 volt quartz bulb, containing a pressurized halogen atmosphere, provides a high brightness level (4500 lumens) and excellent color rendering ability (3400° Kelvin). It offers 100% lumen maintenance throughout its
people. It is capable of testing all Zenith Space Command remote transmitters, both mechanical and electronic units. It will also check output on other brand transmitters emitting a continuous sinewave to 50,000 Hz. Operation is simple. When remote transmitter is held about six inches from the tester, a red LED indicates whether or not there is sufficient output to operate the TV receiver.

COIL-SPRING FUSE HOLDER 148

A new type of coil-spring fuse holder that eliminates the need to pull a chassis or tuner for fuse replacement is being introduced by Oneida Electronic. The new holder, which is permanent, is constructed of tempered spring steel with dip soldered leads. It is said to eliminate the need for O.E.M.'S for using more costly pig-tail fuses, and does away with cutting and resoldering pig tail leads. Available at distributors.

MINIATURE ROTARY ATTENUATOR 149

A new line of miniature rotary attenuators for low cost applications has been announced by Kay Elemetrics.

DESIGNATED THE 200 SERIES, THE NEWS ATTENUATORS ARE DESIGNED SPECIFICALLY FOR OPERATION FROM DC-750 MHZ (75Ω IMPEDANCE) AND DC-1GHz (50Ω IMPEDANCE). THEY HAVE GOLD PLATED DOUBLE CONTACTS, GLASS EPOXY ROTOR WAFERS WITH GOLD CIRCUITRY, SILVER PLATED ROTOR, WOVEN RF GASKETS AND PRECISION METAL FILM RESISTORS. THERE ARE FOUR MODELS IN THE SERIES WITH AN OVERALL ATTENUATION RANGE OF 0 TO 70 DB. PRICED AT $85.

HIGH VOLTAGE PROBE 150

A full-size dual range high voltage probe that breaks down to fit into a convenient caddy case is now from Polaris New York. Designated the '851' Caddy-Probe, the new tool is a dual range instrument with a voltage capability of 400 Ma DC with ±2% accuracy. The meter movement has a sensitivity of 50 µa. It is manufac-

NEW EICO 270 3½ DIGIT DMM KIT

ONLY $79.95

FREE '78 EICO CATALOG

Check reader service card or send 75¢ for first class mail. See your local EICO Dealer or call (516) 881-9300, 9:00 a.m.-5:00 p.m. EST. Major credit cards accepted.

EICO - 108 New South Rd. Hicksville, N.Y. 11802

†for more details circle 109 on Reader Service Card

SUBBER®

MARK IV-CUVB

A TIMESAVING INSTRUMENT BY CASTLE

UHF-VHF TV Tuner and i-signal analyst
Incorporates these important features:
- Tunes all UHF & VHF Channels
- Electronic Fine Tuning
- Dual 40 MHz IF Output Jacks
- Battery Condition Indicator

MARK IV-CUVB (BATTERY POWERED ONLY) Net $64.95

CASTLE ELECTRONICS

5233 Old South Highway 37 Bloomington, Indiana 47401

For More Details and Specifications Contact Your Nearest Distributor In Canada: Len Finkler Ltd. Ontario

††for more details circle 101 on Reader Service Card

DECEMBER 1977, ELECTRONIC TECHNICIAN/DEALER / 41
MEET OUR FAMILY OF GRABBERS

- MODEL 4233 MICRO GRABBER
  Tests high density packaging

- MODEL 3925 MINI GRABBER
  Tests conventional packaging

- MODEL 4011 THREADED GRABBER
  Accepts 6-32 threaded leads

- MODELS 3780 - 3789 GRABBER LEADS
  10 choices of connectors other end

Our Grabber family is five years old now, and we're adding new members to keep pace with the complexities of state-of-the-art electronic packaging. Grabber is our name for a series of test clips designed to simplify testing of electronic packages from conventional components to maximum density DIP's. They're rugged, dependable, versatile, and very easy to use. Write for our catalog and get the complete story on the whole family of Grabbers. Find out why they are your best solution to your electronic testing problems.

AVAILABLE THROUGH YOUR
FAVORITE ELECTRONIC
PARTS DISTRIBUTOR

MODEL 4225 MAXI GRABBER
Tests high rise packaging

All Grabbers shown actual size

Our Grabber family is five years old now, and we're adding new members to keep pace with the complexities of state-of-the-art electronic packaging. Grabber is our name for a series of test clips designed to simplify testing of electronic packages from conventional components to maximum density DIP's. They're rugged, dependable, versatile, and very easy to use. Write for our catalog and get the complete story on the whole family of Grabbers. Find out why they are your best solution to your electronic testing problems.

UHF/VHF FIELD STRENGTH METER 151

A new UHF/VHF field strength meter with a digital display window is new from Blond-Tongue Labs. The window contains a half-inch 3-digit LED readout that is photo transistorized to adjust brightness for optimum visibility under changing ambient lighting. There is also an analog meter and scale to facilitate tuning for maximum levels and a status display comprised of four LEDs to indicate over or under range, picture carrier tuning and battery charge warning. The new meter provides 90 db total range with 0.1 db resolution. An auto-ranging attenuator automatically programs the display to the proper range. Selectable detector mode of operation includes accurate pulse peak detection, quasi-peak detection or noise detection for S/N ratio measurement.

SOLDERING IRON STAND/TIP CLEANER 152

A new safety stand and tip cleaner for pencil-type soldering irons is being introduced by American Beauty. Des-
NEW & DAZZLING!!!
MS-15 Miniscope—$289.00 from NLS

Features include:
- Bandwidth: 15 MHz.
- External & internal trigger.
- Automatic & line harmonic test.
- Input sensitivity: vertical - 10 mV; horizontal - 1 V.
- Vertical gain: .01 to 50V/div - 12 settings.
- Time base: 1 usec to 50 Sec/div - 21 settings.
- 3% accuracy on all functions.
- Power consumption: <15 W.
- Battery or line operation with batteries and charger unit included.
- Weights only 3 lbs. & dimensions are 2.7" H x 6.4" W x 7.5" D.
- Options include a 10 to 1, 10 megohm probe and leather carrying case.

for more details circle 122 on Reader Service Card

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle's metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "Ins-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

ignated Model 483, the new device protects irons from overheating damage while at rest by surrounding the iron’s tip with a pool of molten solder. The solder acts as a heat sink and keeps tip tinned ready for use. An integral part of Model 483 is the tip cleaner which has its own water reservoir and wick-fed sponge. A hole in the sponge and the stainless steel supporting shell provides an ample wiping edge. Excess solder, dross and burnt flux drop thru the hole, leaving wiping edge free of contaminants.

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-

Inside CB Antenna

A new CB antenna that, installed inside the vehicle, utilizes a vehicle’s metal frame as a slot-fed metal ground plane antenna has been introduced by Microwave Filter Co. Called the "In-
A new wire wrapping tool uses 28-gauge silver-plated new tool, 'daisy-chain' terminations require about 5 seconds per post. A special bit uses 28-gauge silver-plated copper wire with Tefzel insulation fed from a spool on the tool's shaft. A cutting edge, adjacent to the wrapping bit, slits the insulation longitudinally along the wire at the point a wrap is to be made. Life of the cutter edge is said to exceed 10,000 wraps. Three models are priced at $29.50, $80.00 and $89.00.

**TUNER CLEANER & LUBRICANT**

A new tuner cleaner and heavy lubricant for use in coastal areas and other locations with high humidity has been introduced by the Raw'n Company. Named Blue Magic, the new product has undergone extensive field tests and is intended for use by professional technicians for tuner servicing. It is said to be not harmful for plastics or other tuner components and is non-inflammable. It has been formulated to provide resistance to oxidation and gumming.

**WRAPPED-WIRE TOOL**

A newly developed wrapped-wire tool that makes gas-tight interconnections with standard Tefzel insulated wire without time-consuming measuring, cutting and stripping is available from Vector Electronic Co. Polyurethane-Nylon wire only could previously be slit and wrapped. With the new tool, 'daisy-chain' terminations require about 5 seconds per post. A special bit uses 28-gauge silver-plated copper wire with Tefzel insulation fed to the new device is said to allow for steady, pin-point positioning of the pure copper wick on the connection to be desoldered. The wick, constructed of fine strands of pure copper treated with non-conductive, non-corrosive rosin flux, is designed to eliminate the hazard of burned fingers or electrical shock. Tech-Wick is available in two styles—Model S-16, with 10 feet of No. 16, gauge wick—and Model R-20, with 20 feet of No. 20 gauge wick. S-16 is priced at $2.75 each, and R-20 is $3.75 each.

**LOG SWEEP FUNCTION GENERATOR**

A new 5MHz, 100,000:1 log sweep function generator, designated Model 508, is available now from Exact Electronics. The new instrument is actually two generators in one package—a VCF generator covering 0.0001Hz to 5.5MHz and producing sine, square, triangle, pulse, haversine, and haver-triangle waveforms, and a Ramp generator, producing ramps with periods from 10μsec to 100 sec. The Ramp generator is used for direct out-
MODULAR CHROMA
continued from page 29
by spacing the oscillator coil in the tuner to put the fine tuning range where it belonged! This problem usually shows up on one or two channels only, and is due to tuner drift.

Finally, weak chroma, and poor contrast can result by poor "set up" of the picture tube. Excessive negative bias on the CRT results in washed out pictures. Turning up the IF gain by tweaking the AGC only results in overload symptoms such as poor sync.

I think it is important to remember that troubleshooting chroma is less difficult than handling IF problems, (chroma can be viewed directly on a scope). The signal levels are fairly high and using a color bar generator gives an easily recognizable display. As for modular sets, they are nothing but a PC board broken up into smaller pieces. Take out the connector problems, and there's no difference.

SWEEP CIRCUITS
The vertical sweep circuit in the 25M55M chassis is almost identical to that used in the previous 7M45 chassis. The horizontal sweep circuit is also basically the same as the M45 chassis. There is some difference, however, in the use of pincushion correction and a convergence panel. The convergence voltage for horizontal is derived across a pin condenser on the horizontal output transformer between pins 9 and 5.

For pincushion correction, the winding between pins 3 and 5 of the pin reactor, T600, is placed in series with the horizontal yoke in order to produce maximum horizontal sweep width when the vertical scan is in the CRT center and minimum width on the top and bottom of the picture.

Pincushion correction is maximum but opposite on the top and bottom of the CRT and gradually decreases toward the center. It is zero in the CRT center.

The convergence panel is similar to that used in the M50 chassis but is not directly interchangeable. It should be noted that a 4 pin socket for connections in the 25M55M is used, as compared to a 3 pin socket in the M50.

FORDHAM
BEST BUYS

FORDHAM
1977 ELECTRONICS MARKET
FREE 148 page catalog of over 3500 items test equipment, C.B. tools, tubes, components and a full line of electronic supplies.

FOR PRICING AND TO PLACE YOUR ORDER
CALL TOLL FREE (800) 645-9518 (Outside N. Y. State)
For N. Y. State call (516) 750-5500
Master Charge, BankAmerican & C.O.D.'s accepted.

FORDHAM
RADIO SUPPLY CO., INC.
2155 Colkon St.
Farmingdale, N. Y. 11735

FREE 148 page catalog of over 3500 items test equipment, C.B. tools, tubes, components and a full line of electronic supplies.

FOR PRICING AND TO PLACE YOUR ORDER
CALL TOLL FREE (800) 645-9518 (Outside N. Y. State)
For N. Y. State call (516) 750-5500
Master Charge, BankAmerican & C.O.D.'s accepted.

FORDHAM
RADIO SUPPLY CO., INC.
2155 Colkon St.
Farmingdale, N. Y. 11735

FREE 148 page catalog of over 3500 items test equipment, C.B. tools, tubes, components and a full line of electronic supplies.

FOR PRICING AND TO PLACE YOUR ORDER
CALL TOLL FREE (800) 645-9518 (Outside N. Y. State)
For N. Y. State call (516) 750-5500
Master Charge, BankAmerican & C.O.D.'s accepted.

FORDHAM
RADIO SUPPLY CO., INC.
2155 Colkon St.
Farmingdale, N. Y. 11735

FREE 148 page catalog of over 3500 items test equipment, C.B. tools, tubes, components and a full line of electronic supplies.

FOR PRICING AND TO PLACE YOUR ORDER
CALL TOLL FREE (800) 645-9518 (Outside N. Y. State)
For N. Y. State call (516) 750-5500
Master Charge, BankAmerican & C.O.D.'s accepted.

FORDHAM
RADIO SUPPLY CO., INC.
2155 Colkon St.
Farmingdale, N. Y. 11735

FREE 148 page catalog of over 3500 items test equipment, C.B. tools, tubes, components and a full line of electronic supplies.

FOR PRICING AND TO PLACE YOUR ORDER
CALL TOLL FREE (800) 645-9518 (Outside N. Y. State)
For N. Y. State call (516) 750-5500
Master Charge, BankAmerican & C.O.D.'s accepted.

FORDHAM
RADIO SUPPLY CO., INC.
2155 Colkon St.
Farmingdale, N. Y. 11735

FREE 148 page catalog of over 3500 items test equipment, C.B. tools, tubes, components and a full line of electronic supplies.
MECHANICALLY INCLINED INDIVIDUALS—BUILD ELECTRONIC DEVICES IN YOUR HOME. GET STARTED IN YOUR SPARE TIME. $300 TO $600 WK POSSIBLE. EXPERIENCE NOT NECESSARY. WRITE FOR FREE LITERATURE. ELECTRONIC DEVELOPMENT LAB., BOX 1535 (B), PINELLAS PARK, FLA., 33765.

INCREASE YOUR INCOME! Rent Lease TVs. Anyone can! Easy to start and operate, part or full time; even from your home. Basic preliminaries $4.00. Perry's TV Leasing, 308 N. McClelland, Santa Maria, Calif. 93454.

TRANSFERRED airline pilot has lucrative TV repair shop in beautiful colonial on ½ acre. $49,900 for home, TV business FREE. Bruce Electronics, 10 White Birch Drive, Centereach, NY 11720, 516-585-6260.

SELLING, FLORIDA—ZE-NITH T.V. SALES & SERVICE: 10 YEARS SAME LOCATION—PARTS, FIXTURES, EQUIPMENT & CUSTOMERS—$7000.00. BILL ELLIS, 5688 OAK-HURST DR., ST. PETERSBURG, FL 33752.

2 way radio service shop, CB and FM Sales and Service. Six years in business, all up to date test equipment. Inventory is 40K and price 30K. Details write: P.O. Box 611, Delta, Colo. 81416.

WORK AND PLAY IN THE FABULOUS FLORIDA RAYS—Radio—TV—Communications Sales and Service. $125,000. For further information write ET/D, Box 113.


"TV Repair Shop in Bakersfield, California. Well established, low overhead, plenty of customer goodwill, excellent stock of tubes, parts, etc. Well equipped van. Lots of test equipment. Same coverage from 1946 to current. $29,000. Technician willing to help train. 805-871-3580."

In The Best Of Greater Miami. TV & COMMUNICATIONS SALES & SERVICE. $15,000 Buys Everything. Televideo, 380 E. 14 Street, Hialeah, FL 33010.
ATTENTION SERVICE DEALERS

Buy directly—Top Line Solid State Replacements

40% Off Dealer Cost  2 Year Warranty Devices

These are professional devices which replace over 130,000 industry types, and you buy them at substantial savings.

To Order: Send us the ECG, SK, or GE numbers and we will promptly ship you the premium FR direct Replacements,—plus a free FR Replacement Guide. Remember, these are top quality, no calls, no seconds. Orders over $25.00 shipped free. Orders up to $25.00 add $1.00 UPS. All orders over $100.00 receive 5% discount. To approximate amount of your order, deduct 40% from dealers cost of ECG, SK, or GE types. All orders shipped within 24 hours.

P.O. Box 270, Garwood, NJ 07027 (201) 688-0222

Vermont Radio-TV Sales & Service.
Best product line. Long established. New building with rental potential. Price $280,000 w/terms. Marble City Realty, P.O. Box 265, Rutland VT 05701. $280,000

For Sale:

PICTURE TUBE MACHINE

We buy and sell NEW AND USED CRT rebuilding machinery. Buy with CONFIDENCE from the ORIGINAL MFGR. For complete details, send name, address and zip code to:

LAKESIDE INDUSTRIES
3520 W. Fullerton Ave., Chicago, Ill. 60647
Phone: 312-342-3099

WANTED

TRANSISTOR REPLACEMENT.


For Sale: Sencore MU150 $250.00, SG165 $425.00, CR168 $175.00. All Like New. Hugh M. Adams, 286 Beachview Dr., Ft. Walton Beach, Fl. 32548.

FREE MONTHLY LISTING of IC's, transistors, regulators, opamps at super savings e.g. SN7400-08, 2N2222-03, LM309K-50, LM709C-13. Many, many more great buys. Write us to be put on our monthly list and we'll send you free one of each of the above parts. Industrial Semiconductors Inc., 97 Rantoul St., Beverly, MA 01915.

Alarm Systems

DON'T PURCHASE any burglar-fire alarm equipment before getting our free value packed catalog. Super savings on dealers, master controls, infrared detectors, wireless panic buttons and much more. No shipping charges. Sasco, 5619 E St. John, Kansas City, Mo. 64123 (816) 483-4612.

ELECTRONIC TECHNICIAN/DEALER
is not responsible for any of the items, plans, courses or quality of products offered through our classified section.
READER SERVICE INDEX
ADVERTISER'S INDEX

American Technology Corp. 43
101 Castle Electronics 41
105 Chemtronics Inc. 39
106 Cornell Electronics Co. 43
107 Dana Laboratories Inc. 36
132 Drake Beam 38
108 Eico Electronic Instruments Co. 40
109 Eico Electronic Instruments Co. 41
110 Electronics Book Club 33
111 Elin Uniform Mfg. Co. 26
112 Fidelipac 32
113 Fordham Radio Supply Co. 45
114 Fuji-Svea Enterprise 7
115 General Electric/Tube Div. 9
116 General Electric/TV Dealer 21
117 International Components Corp. 35
118 Mallory Distributor Products 10
119 Modular Electronics Services 17
120 Motorola/Semiconductors 3
121 Mountine West Alarm Supply Co. 45
122 Non-Linear Systems Inc. 43
123 Oneida Electronics Mfg. Inc. 16
124 Optima Electronics 12
125 Pomona Electronics 42
126 Pomona Electronics Inc. Cov. 2, 1
127 RCA Distributor & Special Products 37
128 RCX Corporation 13
129 RCA Corporation (for info.) 4
128 Triplet Corp. (for demo.) Cov. 4
130 Triplet Corp. Cov. 4
128 VIC Mfg. Co. 16
130 Workman Electronic Products Inc. 48
131 Zenith Radio Corp. 4, 5

This Index is furnished for the reader's convenience. However, the publisher cannot guarantee its accuracy due to circumstances beyond our control.

Don't cut yourself out of a career as a two-way radio technician...

MTI offers the only training for professional FM two-way radio available. Qualified technicians are employed in government, industry, and public service. But training is your key. You could cut out a career as a two-way radio technician by cutting out this coupon. We'll send you information on how you can learn more about this specialized field, at home.

Name
Address
City
State/Zip

MTI
MOTOROLA TRAINING INSTITUTE
Summerdale, Pennsylvania 17093

you're whistling in the dark.

... if you haven't had your blood pressure checked lately. You could have high blood pressure and not know it. It can lead to stroke, heart and kidney failure. See your doctor—only he can tell.

Give Heart Fund
American Heart Association
In replacement parts nothing is foreign to us.

We know the problems in finding the right semiconductor replacements for imported TV, CB and other electronic equipment.

That’s why we have a line of thick-film modules and ICs that will replace over 3,000 devices in 139 brands of foreign-made equipment.

And we’ve made them easy to find in two ways. One is through our new Module and IC Replacement Guide that cross references the original part number with our ECG® semiconductor part number.

The other way we’ve made it easy is by making sure your local Sylvania distributor has access to a full stock of semiconductor replacements.

Pick up a copy of the replacement guide at your distributor today, so you’ll be able to pick up all the parts you need in just one stop tomorrow.
The new 60 Series has been designed for the value conscious users in industrial production and maintenance, communications, vocational training and hobbyists, air conditioning, appliance and automotive service, R & D and application engineering... anyone who wants to be more productive with the latest in V-O-M technology. The large, "simplified" 4 1/2" scale is an "easy reader". This combined with a single range selector switch minimizes the possibilities of error. Detented handle position, only 2 recessed input jacks and 48" safety engineered test leads are just a few of the many other user benefits of the 60 Series. Compare them with other V-O-Ms and you'll know why the new Triplette family of V-O-Ms eliminate over 90% of the costly repairs from V-O-M misuses. Cultivate a profitable habit for selecting Triplette designed products.

For more technical data and a demonstration of the Model 60 Series, see your local Triplette distributor or a Triplette sales representative. Triplette Corp., Bluffton, Ohio 45817, (419) 358-5015.