October, 1977 ☐ 75 cents

Electronic Servicing

A HOWARD W. SAMS PUBLICATION

NESDA and NATESA Conventions

Magnavox Chroma

Handling Checks

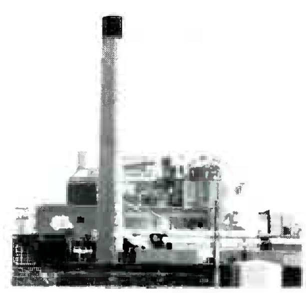
Capacitive Transducers

October, 1977 ☐ Volume 27, No. 10

Electronic Servicing®

CONTENTS

page 18



page 38

About The Cover—Cinderella Castle of Disney World illustrates the fun-time activities of the NESDA convention in Orlando, Florida. From top to bottom are: Hank Aaron, the home-run king of baseball; Will Rogers Junior, who talked about his famous father; Dick Glass was without his NESDA badge, so "Texas Sheriff" William Brandon stopped him at the door; George Weiss is the President of NATESA; Mr. NATESA is Frank Moch, the Executive Director of NATESA.

DEPARTMENTS

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Electronic Servicing

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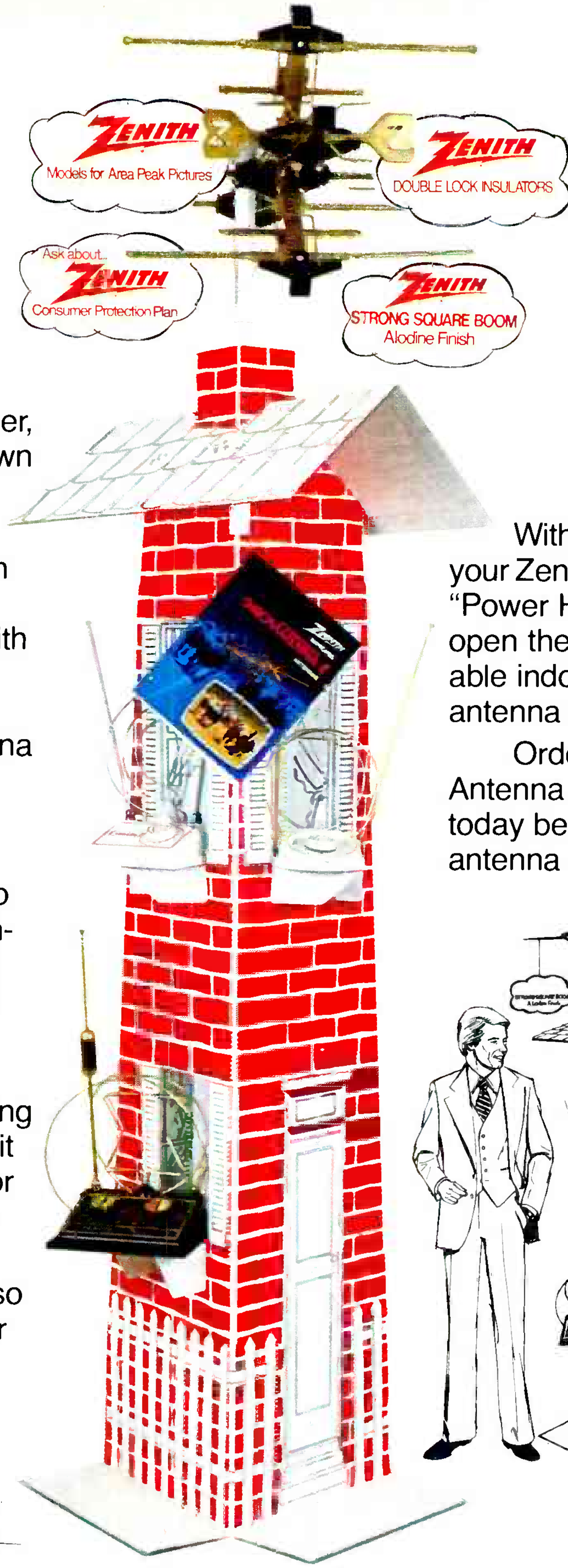

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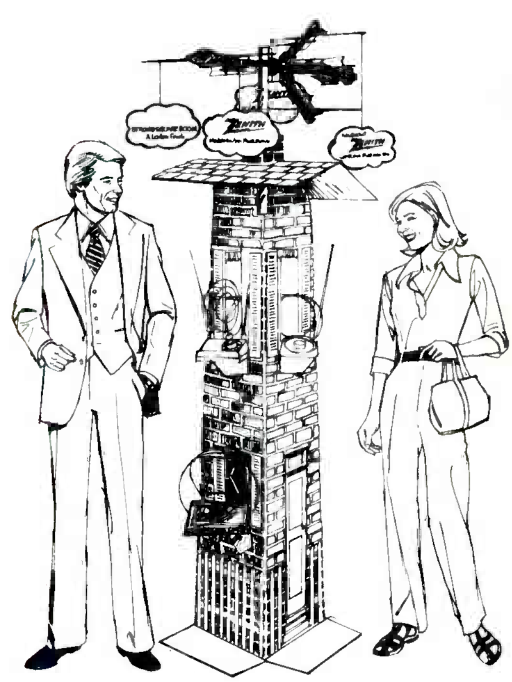

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electronic**scanner**

news of the industry

The National AM Stereophonic Radio Committee has completed tests on three proposed AM-stereophonic broadcast systems developed by Belar Electronics, Magnavox and Motorola. The committee now is preparing a report to be submitted to the Federal Communications Commission, which is reviewing information about AM stereo in order to determine a standard by June, 1978. *Retailing Home Furnishings* reports that AM-stereo products could be on the market within two years.

The California Energy Resources Conservation and Development Commission has voted to drop television from its energy efficiency and labeling program. Representatives of the television industry had warned the commission that proposed restrictive energy-saving standards for TVs could severely disrupt the industry and hurt the consumer. The energy proposals would have set wattage limits on color TV and monochrome TV sets based on screen size, and would have banned the use of any feature requiring power when the set is off, such as remote control and instant-on.

Peter F. McCloskey has been selected to be president of the Electronic Industries Association. McCloskey replaces V. J. Adduci, who left the presidency of EIA in June. McCloskey has been president of the Computer and Business Equipment Manufacturers Association since 1973.

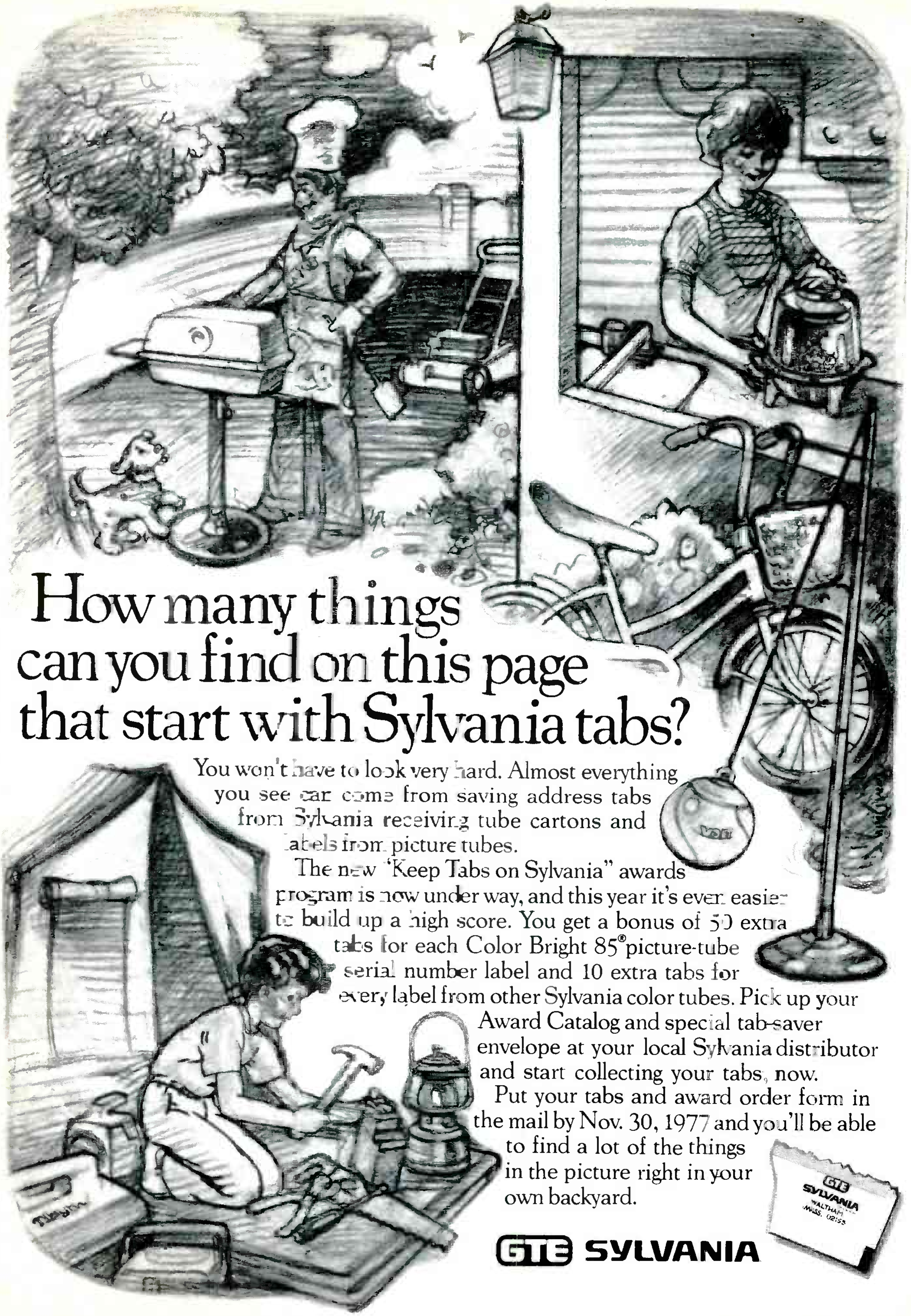
Citizens Band Radio Service licensees reached a total of 11,127,695 in the first seven months of 1977, according to the FCC. The new total marks an increase of 3,288,692 since the beginning of the year, when CB service expanded to 40 channels. At the end of December 1976, the total was 7,839,003.

Warranties and guarantees requiring consumers to mail in registration cards should be abolished, according to the Federal Trade Commission (FTC). The commission believes a consumer only should have to prove the product was under warranty when the malfunction occurred. The FTC also objects to the requirements that a consumer assume the cost of mailing or shipping defective products, mail or ship items weighing more than 36 pounds, remove built-in products, and return a defective product in its original container.

Bussman Manufacturing division of the McGraw-Edison Co. plans to house many of its operations in a new $8.2 million manufacturing and office complex in Ellisville, Missouri, a suburb of St. Louis. Approximately 1,200 people will be employed at the new facility, located on a 42-acre tract, beginning in mid-February, 1978.

Hand-held 23-channel CB radios can be sold through August of 1978, the FCC has ruled. The previous deadline for the sale of the units was January 1, 1978. The ruling is in response to a petition by Radio Shack and Fanon Courier to extend the cut-off date for the hand-held units because of the difficulty in selling sets already in inventory. Hand-held radios are defined by the FCC as those with a built-in microphone, antenna, and power supply.

continued on page 8


How many things can you find on this page that start with Sylvania tabs?
You won't have to look very hard. Almost everything you see can come from saving address tabs from Sylvania receiving tube cartons and labels from picture tubes.
The new "Keep Tabs on Sylvania" awards program is now under way, and this year it's even easier to build up a high score. You get a bonus of 50 extra tabs for each Color Bright 85® picture-tube serial number label and 10 extra tabs for every label from other Sylvania color tubes. Pick up your Award Catalog and special tab-saver envelope at your local Sylvania distributor and start collecting your tabs, now.
Put your tabs and award order form in the mail by Nov. 30, 1977 and you'll be able to find a lot of the things in the picture right in your own backyard.
GTE SYLVANIA

continued from page 6

A low production level has delayed Cybernet Electronics' proposed price reduction on its new 40-channel CB radio containing just five ICs. *Electronic News* reports that poor CB market conditions in the U.S. have forced Cybernet to alter its production and pricing schedule on the compact unit. According to a company spokesman, Cybernet Electronics has postponed plans to have all its models using the IC chassis by November.

California State Senator David Roberti recently received an award from the California State Electronics Association for his outstanding service to the small business community. Roberti is chairman of the Senate Select Committee on Small Business Enterprises and actively supports legislation to solve the problems of small business. He is also senate majority leader.

Zenith Radio Corporation has introduced its first two videocassette recorders. Model SJR9500P is a full-feature color-TV/videocassette-recorder console combination with a suggested retail price of $2600. Model JR9000W is a deck unit, ready for attachment to the antenna terminals of any television receiver. The suggested retail price is $1300. Zenith also will market a one-hour videotape cassette with a suggested retail price of $12.45 and a two-hour videotape cassette with a suggested retail price of $16.95. An optional video black and white camera kit has a suggested retail price of $395. The company's distributors will introduce the units to dealers in special showings and open houses. Zenith's national service organization has established service training programs for independent service technicians.

A hand-held electronic device that alerts tactical combat troops before they can be detected by anti-personnel radar is being marketed by GTE Sylvania. The device (RWR-1000) also is designed to monitor and locate frontline anti-aircraft gun radars, fire-control and mortar-location radars, as well as isolate and identify high-priority radar signals in a clutter of signals and noise.

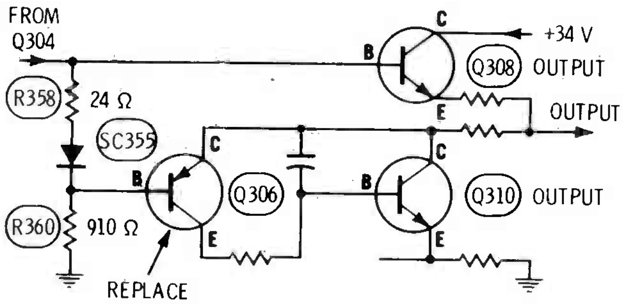
Quasar Electronics Company is reducing the price of videocassettes for their videotape recorder, "The Great Time Machine." The suggested retail price of the VC120, a two-hour cassette, is now $24.95 (previously $33.95). Similar reductions were announced for the 100-minute and 60-minute tapes.

The Personal Communications Show [PC-78] will be held in conjunction with the 1978 Winter Electronics Show, following an agreement between the EIA Consumer Electronics Group and EIA Citizens Radio Section-Communications Division, sponsors of the two trade shows. The electronics show will be held in the Las Vegas Convention Center and Pavilion Exhibition Hall of the Las Vegas Hilton Hotel, January 5-8, 1978. (The PC-78 show had been scheduled for February 14-16, also in Las Vegas.)

symcure

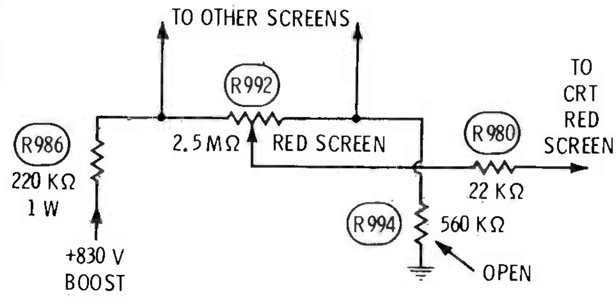
Symptoms and cures compiled from field reports of recurring troubles

Chassis—Sylvania E04
PHOTOFACT—1425-3



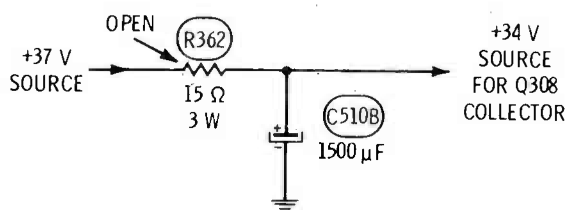
Symptom—Compression of lower third of the raster
Cure—As a test, replace Q306, the vertical driver transistor

Chassis—Sylvania E08
PHOTOFACT—1481-2



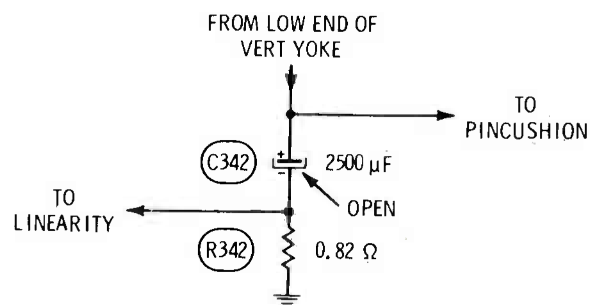
Symptom—Excessive brightness
Cure—Check R994, and replace it if open

Chassis—Sylvania E03/E04/E05
PHOTOFACT—1425-3



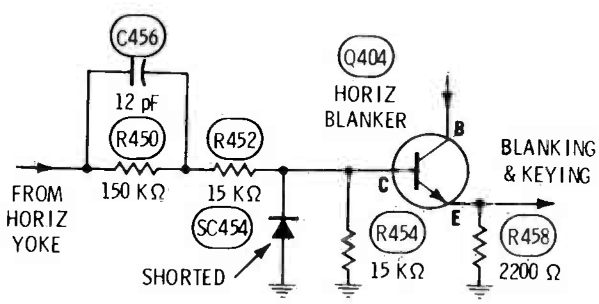
Symptom—No vertical deflection
Cure—If there's no voltage at Q308, check R362, and replace it if open

Chassis—Sylvania E08
PHOTOFACT—1481-2



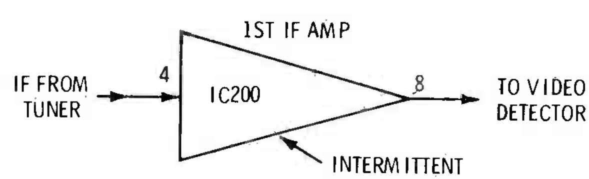
Symptom—No vertical deflection, but square waves are present at the input to the yoke
Cure—Check capacitor C342, and replace it if open

Chassis—Sylvania E08
PHOTOFACT—1481-2



Symptom—Video is smeared, horizontal locking might be affected
Cure—Check diode SC454, and replace it if shorted

Chassis—Sylvania E08
PHOTOFACT—1481-2



Symptom—Intermittently, has snow in the picture
Cure—Replace IC200, the IF amplifier IC

Blown fuses and burned parts Admiral 4M10C

(Photofact 1504-1)

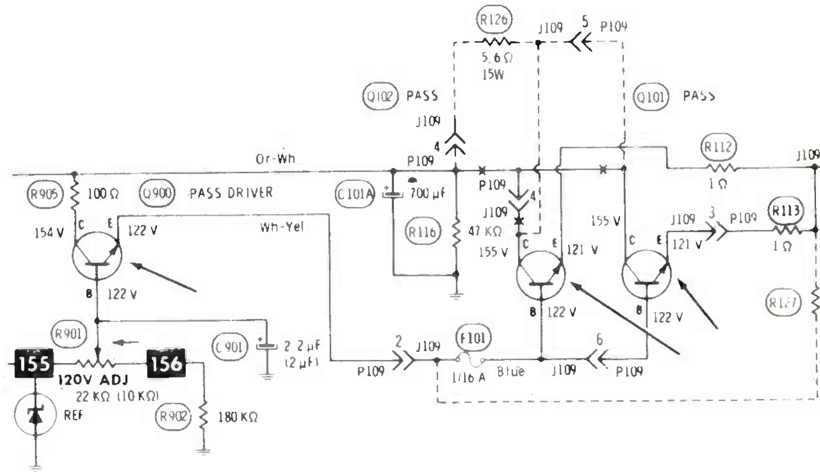
When the set first was brought to the shop, three fuses had been blown and paralleled with wire by a do-it-yourselfer. A visual inspection showed a cracked R907 thermistor, and burned R905 and R112.

Ohmmeter tests proved R12 was open, R905 was burned, also Q101, Q102, and Q900 were shorted.

obtained from +120-volt supply to ground. Such a low reading usually indicates a short. The audio output and horizontal output transistors were checked and found to be okay.

When I located the D101 damper diode (behind the horizontal output transistor and heat sink), it was split, so no test was necessary.

Installation of a new D101 brought back to normal picture with good sound.



All bad components were replaced, including the fuses. When the set was plugged in, F101 blew instantly. I checked Q101, Q102, and Q900, even though they were new, and found Q900 had 3 milliamperes of leakage. Another Q900 was installed.

Next, 1.5-ampere F900 blew (it protects the 120-volt source). An approximate 1,000 ohm reading was

Probably the damper diode was the original defect, but after so many parts had been ruined by the jumpered fuses, it was difficult to be certain. Anyway, this repair reminded me to check all solid-state devices *before* I install them, even when they are new.

Richard J. Serrano
Madera, California

Low contrast Zenith 14B38Z B&W

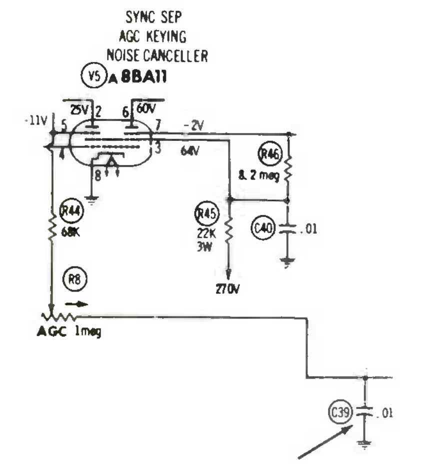
(Photofact 1156-3)

This model is susceptible to two common troubles which reduce the contrast. One is the tuner; we have sent in several to be rebuilt. Secondly, the grid of the AGC-keyer tube requires a negative voltage, which is obtained by filtering a sample of the DC grid voltage of the horizontal-output tube. When the output tube develops a slight gas or grid leakage, this voltage is reduced, causing excessive AGC action, and resulting in insufficient (and drifting) contrast. (Keep this in mind for future use, for it is a difficult defect to find.)

Unfortunately, this set was not to be repaired that easily.

I connected a tuner substitutor to the IF cable, and the contrast was strong. Before removing the tuner for shipping to a tuner station, I made some simple tests. Removing most of the channel strips (to give room for the test probe), I tuned in a local station. Checking DC voltages, I found none at the mixer screen grid. This grid is fed from the mixer-plate supply through a 47K resistor, and is bypassed by a feedthrough capacitor. Neither the tube nor the feedthrough were shorted.

Suspecting some kind of regeneration, I bypassed the feedthrough with a .001 disc capacitor. The voltage rose to a normal value. I left the new capacitor soldered to the feedthrough.



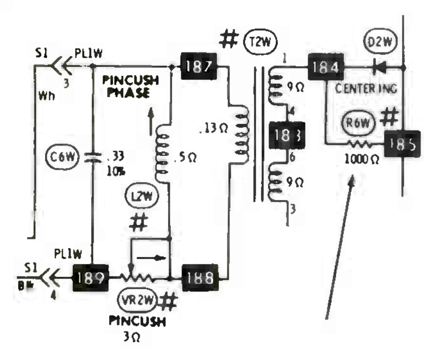
I believe strongly in final time-tests, and it paid off this time. After about two hours, the contrast slowly went down again. Yes, the negative AGC voltage was excessive! A new 21HB5 horizontal-output tube didn't help. Finally, after tests of many resistors and capacitors, I found C39 had about 50K leakage **when hot.** With a new capacitor installed, the next time-test was normal.

Raymond Russell
Bear Lake, Michigan

Consecutive multiple troubles Philco 5CY82

(Photofact 1487-3)

The first complaint of "no picture" was solved by replacing the 2-ampere fuse and the power board. Three days later, the customer called in to report a lack of blue. A new demodulator board cured the problem.



Next day, the customer called again, complaining of no picture and no sound. The fuse was okay, so I reset the breaker. After about five seconds, the breaker tripped again. The horizontal-output transistor checked good. I replaced the horizontal oscillator board, and the set worked fine for about 30 minutes before the breaker tripped. Now the output transistor was shorted. After it was replaced, the high voltage measured only 3 KV.

I checked the tripler by disconnecting the lead to the flyback, and could see a strong arc when the lead was held near the terminal. I installed a new tripler, obtaining a picture. However, there was "pie crusting" at the top and bottom of the raster. The Sylvania factory man suggested the problem might be in the pincushion circuit. While testing the pincushion components, I found an open in R6W (1000 ohms). A new resistor and replacing the chassis in the cabinet produced a good picture.

Multiple problems, such as these, demand more skill and patience than do most other repairs.

Adrian's Electronic Enterprises
Woodhaven, New York

Send in your helpful tips —we pay!

reader's exchange

For Sale: Five line-isolation transformers for servicing AC-DC chassis. Primary rating 120 V or 240 V (double wound) at 400 watts of continuous power. Perfect for high school electronics lab use. $25 each prepaid (shipping included). *Gerald Koske, 10204 Thayer Road, RR 1, Ringwood, Illinois 60072.*

Needed: Hickok model 189 Tracemeter; also one 1B85 geiger-counter tube. *ARO Electronic Service, 735 Mills Street, Kalamazoo, Michigan 49001.*

Needed: Schematic and parts list for Western Auto model DC-4850 auto radio. Material no longer available from manufacturer or Sams. *Charles Prater, Edna, Kentucky 41419.*

Needed: Schematic and service manual for AKAI M-10 or M-9 stereo tape recorder (especially interested in alignment specs). Will buy, or copy and return. *Michael Craig, 421 Fairmount NE, Warren, Ohio 44483.*

For Sale: Heath scope model IO-102, factory wired and calibrated, good condition, with low-capacity probe, $95. Also, Telematic VHF/UHF sub tuner, AC/battery operation, never used, $55. *Willis Ormes, 1420 Melrose Avenue, Fort Wayne, Indiana 46808.*

Needed: Scope with wide bandwidth (10 MHz or better), something similar to B&K 1465. Must be in good condition with instruction manual. Send description and asking price. *Harold Kinley, 212 Marble Road, Kingstree, South Carolina 29556.*

Needed: B&K model 1077B TV Analyst; color-bar generator; and assembly manual for VOM kit supplied with RCA Institute's course. *Roger E. Davis, RFD 1, Box 472, Mossup, Connecticut 06354.*

Needed: Schematic for a Minerva Tropic Master AM and short-wave radio. *Samson Newsome, 9312 Arlington Avenue, Manassas, Virginia 22110.*

Needed: Schematic and information on antique Apco radio using 3-199s. *John Uscinownski, RR1, Box 379, Greenwich, New York 12834.*

Needed: Solid-state triggered scope, comparable to RCA WO-535A, B&K 1461, etc. Also, a late model CRT checker and rejuvenator. State price and condition. *Keath L. Kincaid, 1530 E. Washington, Charleston, West Virginia 25311.*

Needed: Operation manual and schematic for a Precision model 120 VTVM. Will buy, or copy and return. *Joseph E. Kosydar, RD 1, Box 182C, Jermyn, Pennsylvania 18433.*

For Sale: Rider's radio and TV manuals. Also, the following radio and TV tubes: 00A; 01A; G2S; 99; 199; 299; 120; all 6-volt and 7-volt tubes; 12-volts, 12A, 12FR8; 24; 26; 27; 30; and 35. Fifty or more surplus tubes for 75 cents each. All tubes are guaranteed to be satisfactory. *G. C. Goodwin, Goodwin Radio Shop, Rankin, Illinois 60960.*

continued on page 16

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GENERAL ELECTRIC

reader's exchange

continued from page 14

Needed: Service information and schematic for a silver Marshall superheterodyne radio. Cannot find model number. Has a serial number of 50260. Radio has type 80 rectifier tube, three type 45 power amplifier tubes, three type 56 tubes and three 58 tubes in IFs. Will buy a copy of original. *Ronald E. Blevins, 608 Rupert Lane, Grayson, Kentucky 41143.*

For Sale: Eico model 460 scope, $50. *Al Potter, Potter's TV Shop, 2 Buttonwood Drive, Parlin, New Jersey 08859.*

For Sale: Rider's radio manuals plus index. Will sell singly or as a set. Also, other antique-radio service data for sale. *Lawrence Beitman, 1760 Balsam Road, Highland Park, Illinois 60035.*

Needed: AM/FM Delco stereo custom-fit auto radio for 1969 Chevelle 307 auto. Good used or new. *Paul Capito, 637 W. 21st Street, Erie, Pennsylvania 16502.*

Needed: Schematic for Mitsubishi TV model 6P-126. Will buy, or copy and return. *Gerwig's TV & Electronics, Route 1, Box 194, Round Hill, Virginia 22141.*

For Sale: RCA WO91B scope; RCA WR69A sweep generator; and WR99A crystal-controlled marker generator. All used very little and in mint condition. Cables and manuals included. Make a reasonable offer. *B. G. Brandt, 241 Retama Place, San Antonio, Texas 78209.*

For Sale: Complete Bell & Howell radio and television training course, includes: 16 textbooks, all experiments, design console (AC/DC power supply and sine-square wave generator), digital multimeter, 5-inch triggered-sweep solid-state scope, and GR2000 Heathkit 25-inch color TV. All kits unassembled. Best offer over $1100 plus freight. *"A" TV Service, 1822 N. Pleasantburg Drive, Greenville, South Carolina 29609.*

Needed: Rider's radio manuals 1 to 7. Will buy or trade 7-series tubes. Also, need WD11 and UX199 tubes. *Troch's Television-Radio-Appliances, 290 Main Street, Spotswood, New Jersey 08884.*

Needed: Service manual for Mercury model 1800 VOM. Will buy, or copy and return. *David F. Koterba, RD 5, Box 255, Johnstown, Pennsylvania 15905.*

Needed: Operators manual for a Wayne WT2A transistor tester. Will buy, or copy and return. Will pay for service. *Thomas F. Burns, 9 Allegheny Terrace, Pittsburgh, Pennsylvania 15207.*

For Sale or Trade: Triplett 801 VOM, $175. Might trade for Hickok 6000B tube tester or Super Cricket. (The 801 is still in warranty and in mint condition because never used.) *Kenneth Miller, 10027 Calvin Street, Pittsburgh, Pennsylvania 15235.*

Needed: B&K 1077B TV analyzer, and B&K 467 CRT tester. State condition and price. *Stephen Solomon, 1800 N. Cunningham, Lake Hamilton, Florida 33851.*

Needed: Lafayette HE-20 series (A-B-C) tube-type CB transceiver. Want repairable unit and schematic. *C. Pryson, 4909 Gettysburg Road, Knoxville, Tennessee 37921.*

Needed: Service manual for a Sylvania model 131 scope. Will buy, or copy and return. *Murray Goldstein, 8842 Grange Hill Road, Sauquoit, New York 13456.*

For Sale: RCA test equipment and tubes, sweep generator, marker, adder, scope and VTVMs. *Harold Bentley, 8012 W. Sunbury Ct., Milwaukee, Wisconsin 53219.*

For Sale: Antique TV sets, 15-inch RCA CT100 in cabinet, $150; RCA console projection set, $150. Both in excellent condition. Other sets available. *Howard Katz, 101 Hilltop Road, Silver Spring, Maryland 20910.*

Needed: Power transformer (part #U-204-U) for Telefunkin reel-to-reel tape deck, Magnetophon 204. *Woodron Smith, P.O. Box 3173, Columbia, South Carolina 29203.*

Needed: Ultra-sonic cleaner large enough for tuner work, and used UHF marker generator covering the 450 to 1000 MHz range. Also, TV tuners, used or factory rejects and factory over-runs. Cash paid. *Earl Triplett, Box 165, Avant, Oklahoma 74001.*

For Sale or Trade: Sencore model FT 155 FET tester, like new, $65 postpaid. Also, Heathkit TV post-marker sweep generator, like new, with attenuator and probes, $140 postpaid. Or trade for a recent model mutual-conductance tube tester. *Mike Shepherd, 775 Park Glen Drive, Windsor, California 95492.*

Needed: Schematic and operating maintenance manual for scope model OS-8A/U, manufactured by Hycon Manufacturing Co., Pasadena, California. Scope is enclosed in a case, type CY-912/U. Will buy, or copy and return, paying postage both ways. *Dennis Baron, 129 Townsend Avenue, Staten Island, New York 10304.*

For Sale: Precision sweep generator model E400; and Precision scope model ES 500 with leads and instruction books; both for $125. *Al Crispo, 159-30-90 Street, Howard Beach, New York 11414.*

Needed: Heath SP5ZZO variable isolated AC supply. Also, Heath SG-28 color-bar pattern generator or equivalent. State condition and price. *Caswell Davis, Jr., 601 Delmar, Apt. 2, San Antonio, Texas 78210.*

For Sale: Rider's TV manuals volumes 1 through 23 plus a public address manual. No reasonable offer refused. *J. Hart, 26 William, St. Glens Falls, New York 12801.*

There is no charge for listing in Reader's Exchange, *but we reserve the right to edit all copy. If you can help with a request, write direct to the reader, not to* Electronic Servicing.

News from the Service Associations Conventions

By Carl Babcoke, Editor

All of the home-entertainment service associations are concerned with improving the conditions of our industry. They are having successes; therefore, we believe they are worthy of your support and ours. It is impossible to report these conventions completely, so we urge you to join one or more of them and attend next year's convention. Names and addresses of three organizations will be given at the end.

August was national-convention time for NATESA, NESDA, and ISCET. These conventions had better attendances, exhibited more harmony, and were operated more smoothly than any in the past.

Entertainment Giants

Traditionally, the electronic manufacturers send their presidents, sales managers, or national service managers to the conventions as PR men and after-dinner speakers. This year something new was presented by nationally-known entertainment and sports figures.

RCA brought Will Rogers Junior to speak at both the NESDA and NATESA conventions about his famous father, Will Rogers. Of course, Will Rogers was the favorite humorist of a previous generation, who still is remembered and loved. He started as a rope-trick cowboy, became a star of the Ziegfield Follies, where he first began to tell topical jokes along with the rope tricks. From that he made several movies, and started his famous front-page short daily newspaper column. Will Rogers' humor was based on human foibles, and was not bitter or vindictive. He died in an Alaskan plane crash, along with famed pilot Wiley Post.

Hank Aaron, the baseball home-run king, recounted at both conventions his $200-a-month start with the Indianapolis Clowns. The rest of his long career is history, peaking when he broke Babe Ruth's home-run record. After each prepared message, Hank answered baseball questions from the audience. In these personal appearances, Hank gave the impression of being a likable, interesting speaker. He is an asset to Magnavox, which has appointed him as the Magnavox good-will ambassador.

NESDA National Electronic-Service Convention

August 17 through 22, and the Sheraton Twin Towers in Orlando, Florida were selected for the National Electronics Service Dealers Association (NESDA) for the simultaneous NESDA and ISCET conventions. Details of the ISCET meetings will be given later in this article.

NESDA greeters, under the di-

Will Rogers, Jr. spoke at both NESDA and NATESA conventions about remembrances of his father, the famous humorist.

Hank Aaron, the home-run king of baseball, talked about the highlights of his career, and answered questions from the audiences of both conventions.

Newly-elected officers of NESDA (from left to right) are: Hershel Lawhorn, treasurer; Kenneth Parese, secretary; Bob Villont, national vice president; and LeRoy Ragsdale, president.

Officers of ISCET elected at the Orlando convention (left to right) are: Charles Couch, Jr., chairman; Frank Grabiec, vice chairman; Jesse Leach, treasurer; and Carl Babcoke, secretary.

rection of David Garwacki, met many of the conventioneers at the airport, giving lapel decals, small gifts, and transportation information. This service was the first such help at a convention, and it was appreciated.

Many of the meals were sponsored by the manufacturers (such as RCA, Admiral, Sony, Zenith, Panasonic, Sylvania, General Electric, Magnavox, and Sharp), who furnished after-meal speakers.

Activities on Wednesday were limited to a golf tourney and a poolside party. Thursday brought full activities, including many technical seminars (many by manufacturers of digital tuners and videotape recorders) which were attended by more than 120 technicians, and a 100-person all-day business-management school. At noon, RCA presented Will Rogers Junior, who reminisced about his famous father. RCA also provided transportation and admission to nearby Disney World.

"Man of the Year" award was made to M. L. Finneburgh, Sr., who often is called "The Champion of Independent Service." Past president Everett Pershing presented the huge trophy.

One large surprise occurred during the NESDA nomination meeting on Friday. In the three-way contest for president, Everett Pershing (previous president) withdrew, and recommended support of John McPherson. However, LeRoy Ragsdale triumphed in the election. Other newly-elected officers are: Bob Villont, national vice president; Kenneth Parese, secretary; and Hershel Lawhorn, treasurer. Ten regional vice presidents also were installed.

The National Electronic Trade Show (this year called the "Magic Kingdom of Electronics" after the Disney World theme) was the largest ever, with 60 booths operated by various TV and test-equipment manufacturers. Also included were 18 booths for association projects and other similar exhibits.

Hank Aaron, who holds 18 baseball records, including the most home runs (755) in the major leagues, spoke at the Magnavox dinner.

On Saturday, the National Service Conference (under the chairmanship of Tom Thomas) studied the future of the home-entertainment electronic servicing businesses, and concluded that solid-state equipment is causing fewer per-set repairs, but that the cost of each repair is higher. Also, there will be fewer repairs in the field and more in the shops.

The license seminar and an Association workshop gave the conventioneers much information on those two subjects.

J. A. "Sam" Wilson was unable to attend this convention or to record the training videotape, as was planned. Forest Belt substituted with a demonstration of his new "Easi-Way" servicing technique.

Another innovation this year was the "NESC Daily Newsletter," edited by Forest Belt, Marti McPherson, Steve Bernard, and Arlene Tuttle. Teen reporters were Carla Glass and Judy Posey, while Jeff Tuttle delivered the papers under the inn doors early each morning. Forest was not paid for this valuable service, but placed a one-page ad in each issue. He now offers several kinds of workshops, seminars, training monographs, and self-trainer kits. (For information, write to Forest at: Forest H. Belt, Box 68120, Indianapolis, Indiana 46268.)

To show NESDA's appreciation of the "NESC Daily Newsletter," a special award plaque was presented to Forest Belt.

Special "Thanks" go to Nolan Boone, chairman of the trade show, Anita Parks for the local direction, and to Larry Steckler, Tom Thomas, Paul Dontje, and many others who helped tremendously with the arrangements.

Many "hospitality" suites operated after the convention meetings, including the annual Howard W. Sams cocktail party, hosted by Joe Groves, manager of the Photofact Division.

Total registration was nearly 900: a new NESDA record.

Dick Glass resigned

Probably the biggest news of the convention was the Sunday resignation of Dick Glass as executive vice president of NESDA. At first, the conventioneers thought the resignation was precipitated by the election of LeRoy Ragsdale as president.

continued on page 20

Typical of the activity at the National Electronics Trade Show in Orlando is this scene of the Howard W. Sams booth, with Joe Groves (manager of the Photofact Division) in attendance.

For the first time, *Electronic Servicing* had its own space at the NESDA Trade Show. Carl Babcoke, editor, and his wife Virginia (shown passing out free copies of ES) operated the booth.

Conventions

continued from page 19

However, Ragsdale made it clear that he was very willing to work and cooperate with Glass. (Ragsdale also was president for the 1975/1976 term, without any unusual conflicts with Glass who was EVP then.)

Afterwards, Glass stated that NEA (and later NESDA) has been plagued by political in-fighting between some state organizations and the national. Since these leaders had not responded to his suggestions for organizational changes to minimize these frictions, Glass decided to leave, for the good of NESDA.

Glass was executive vice president of NEA for four years and NESDA for about four years, and he leaves NESDA when it is at the strongest, having 40 affiliate state groups, 2400 business members, good benefits for members, effective management-training programs, and certification of both service managers and technicians. Dick intends to form a service-management and consultant firm.

NESDA changes

Ralph Tirrell III has agreed to assume the duties of executive vice president of NESDA for a 90-day interim period. Tirrell was director of the Arizona State Electronics Association for four years. (The NESDA office will remain in Indianapolis for this period.) Steve Bernard has agreed to become editor again of *Service Shop*, the NESDA monthly magazine. A full additional

executive council meeting is scheduled for October 14-16.

President Ragsdale has appointed chairmen for 24 committees, including several new ones. He is convinced that "working" committees are the vital lifeblood of a successful association.

Next year

In 1978, the NESDA convention will be held in the Inn at the Quay, Thunderbird Hotel, Portland, Oregon. Tucson, Arizona is to be the location for 1979.

ISCET Convention

The International Society of Certified Electronic Technicians (ISCET) also held its convention with NESDA at Orlando, Florida. NESDA began the CET program to increase the knowledge of technicians, and to give them reason to be proud of their profession. There are now more than 10,000 CETs. John Suwak, the ten-thousandth CET, attended the convention. ISCET members now number nearly 1500.

Last year, the nomination and

continued on page 22

(Left to Right)

Dick Glass, former executive vice president of NESDA, is shown admiring the plaque he received.

Jules Steinberg, the executive vice president of NARDA, received a plaque and induction into the "Electronic Hall of Fame." Everett Pershing is congratulating him, while Mrs. Steinberg and Kurt Wertheim, the master of ceremonies, look on.

Forest Belt (left) received an award and loud applause for supplying the "NESC Daily Newsletter" for four days of the NESDA convention.

Past-president Pershing and President LeRoy Ragsdale shared a quiet moment at the NESDA awards banquet.

At the NATESA convention, Executive Director Frank Moch presented a plaque to Carl Babcoke (editor of *Electronic Servicing*) for his help during the past year, including a convention one-hour seminar about measurements.

Conventions

continued from page 21

voting by mail for ISCET officers was authorized for the first time. The intent was to allow every member, and not just those attending the convention, a chance to select the leaders. For those not mailing a ballot, voting was permitted at the nomination meeting. Some questions arose about the procedure, perhaps requiring small changes to correct the minor flaws.

Proposals were made for advanced grades of CETs, and the matter was referred to a committee. Promises were made of financial help for shelving and equipment for the ISCET Technical Library and Librarian Henry Golden. The trial membership program has been successful, and it is to be continued, in more limited form.

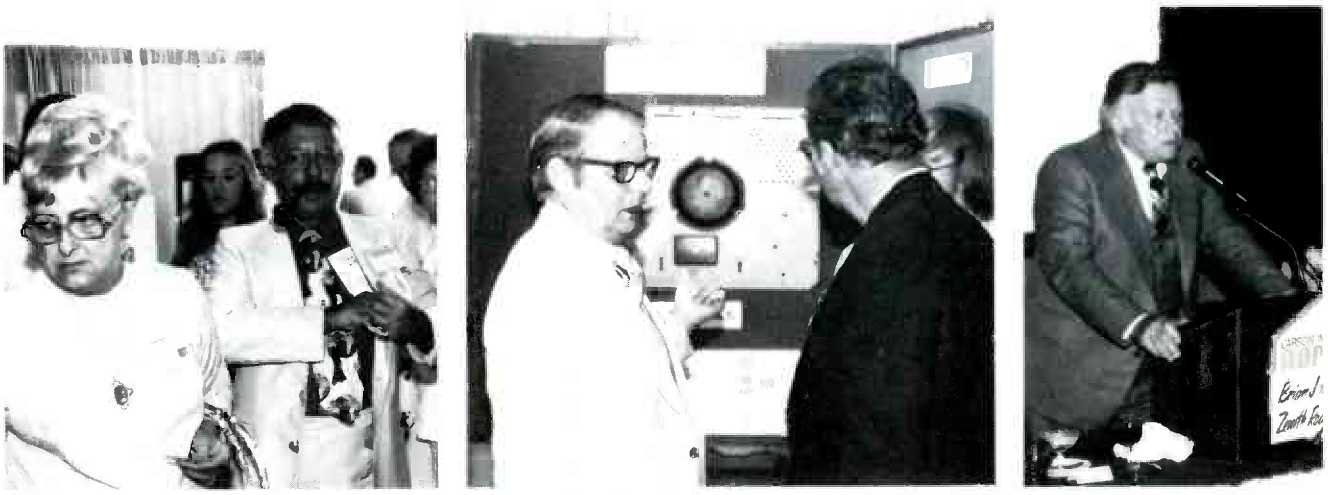
Because of the resignation of Dick Glass, and the uncertainties about headquarters, the ISCET operation has been moved to Ames, Iowa under the jurisdiction of Ron Crow, the ISCET executive director.

During the past year, ISCET Serviceability Inspections were made to Admiral, Sony, Magnavox, and two RCA plants. Over the years, the scores have been rising steadily, probably because the manufacturers realize the benefits to them (as well as to the technicians) of designs that make servicing easier.

NATESA National Convention

The Carson Inn in Nordic Hills near Chicago was chosen for the August 25-28, 1977 convention by the National Alliance Of Electronic Service Associations (NATESA).

Wednesday was registration day, with an optional tour of the Quasar plant in Chicago, and the golf tourney. Thursday breakfast was sponsored by GTE Sylvania, and the host, J. W. Ritter, spoke about the new trends in color TVs. An official NATESA business session followed. At noon, Hank Aaron, the baseball superstar, spoke and answered



These are three of the national service managers attending the conventions. (Left) shows Ray Guichard of Magnavox (Mrs. Guichard is at the left); "Dutch" Myers of General Electric (middle) was busy explaining a point to a conventioneer; and (right) "Bronc" Marohnic of Zenith is said to be preparing for retirement later this year.

Doris Hotzoll won the first prize in the NATESA attendance drawing, a Quasar "Great Time Machine" which was presented by Ed Gaiden. Virginia Babcoke, wife of Carl Babcoke, won the Magnavox color receiver with an Odyssey game built-in.

All of the NATESA officers were reelected. They are (left to right): Richard Ebare, treasurer; Leo Cloutier, secretary general; Earl Gove, Jr., who swore them in; Frank Moch (behind podium), executive director; George Weiss, president; and Paul Kelley, vice president.

questions, under the sponsorship of Magnavox. The afternoon sessions consisted of: warranty information by Paul Kelley and Robert Haskings; scope practices by James Farrell of B&K-Precision; Carl Babcoke (editor of *Electronic Servicing*) spoke on "Measuring the New Technology"; and Leo E. Cloutier gave a presentation of digital math.

Saturday started with another business meeting, followed by a CB seminar by a representative of Sencore. Joe Groves, manager of the Photofact Division of Howard Sams, spoke about the new directions of electronics. The RCA luncheon featured Will Rogers Junior, who told many fascinating stories of the life and career of his famous actor-and-humorist father. Later Jim Newbrough demonstrated the new RCA 2-hour or 4-hour videocassette tape recorder. Another NATESA business session completed the day, except for the banquet, featuring entertainment by Randy Brown (MC and comedian), the Farrell Sisters (twin accordions and vocals), and the orchestra of Rennie Collins.

Many awards were presented during the banquet. Zenith was awarded the coveted "Friend Of Service" plaque. *Electronic Servicing* and its editor, Carl Babcoke, both were placed in nomination, among others.

Two major attendance prizes were given during a drawing of the ticket stubs. The Quasar "Great Time Machine" was won by Doris Rotzoll, while Virginia Babcoke, the bride of Carl Babcoke, received a Magnavox 19" color receiver that had a built-in color Odyssey game.

NATESA traditionally has worked with various government bureaus for the good of the servicing industry, and has responded with vigor to the accusations of consumerists, in addition to providing many valuable services for its members. However, for years there has been a problem with the previous total autonomy (without control by the national) of the local and state affiliates. Even so, NATESA has grown somewhat in past years. For example, the attendance at this year's convention was 22% higher than the 1976 convention.

For the past year, NATESA has pondered a change to become an association, rather than an alliance. This step was approved at the convention, involving changes of bylaws and name (although the initials NATESA remain the same) **NATESA now can accept individual members, or local groups.** The local groups would not be held responsible for the association dues. Another change is to add a new "associate" classification for members who are entitled to partial benefits.

NATESA now is "The National Association Of Television & Electronic Servicers of America." All of the previous officers were reelected. These are: George J. Weiss, president; Paul Kelly, vice president; Leo Cloutier, secretary-general; and Richard Ebare, treasurer. Frank Moch again was chosen to be the executive director of NATESA. □

Addresses of the Service Associations

NESDA
1715 Expo Lane
Indianapolis, Indiana 46224
Phone (317) 241-8160

ISCET
310½ Main Street
Ames, Iowa 50010
Phone (515) 294-5060

NATESA
5908 South Troy Street
Chicago, Illinois 60629
Phone (312) 476-6363

Servicing Magnavox

By Gill Grieshaber, CET

The Magnavox T995 chassis matrixes the video and -Y signals before they reach the picture tube. This is called pre-CRT matrixing. The chroma stages, plus the remainder of the video circuits, are described, including the matrixing in the red, blue, and green power amplifiers.

Troubleshooting the video and chroma sections of the Magnavox T995 (Photofact 1469-1) can be done in either of two general ways. If you have a full set of known-good modules, use the block diagram of Figure 1 to help you decide which module to substitute, based on the symptoms.

When you are using test equipment (either during calls or at the bench), locate the appropriate test point of the many on the "bottom" of the main chassis (which faces the rear while the chassis is in the normal upright position, as shown in Figure 2).

For shop service, lower the chassis back in the service position and make measurements at the ICs and other important points on the modules.

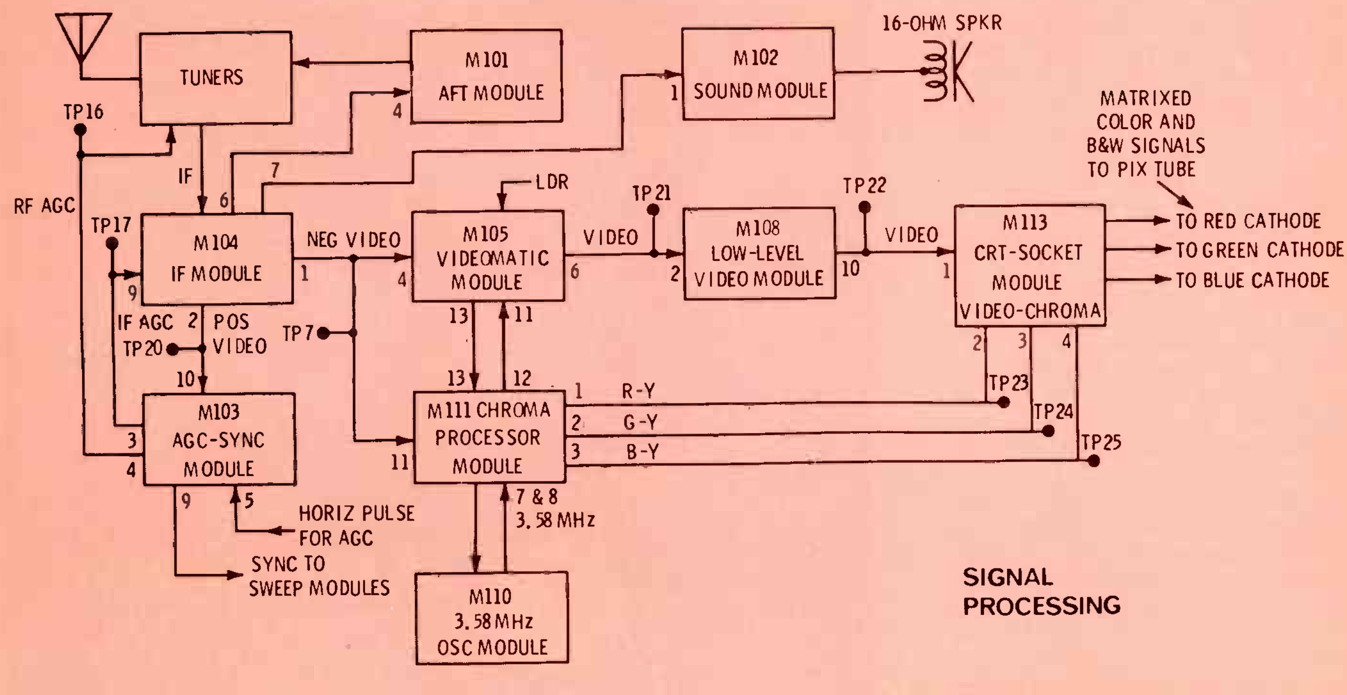


Figure 1 The block diagram shows the various signal paths of the Magnavox T995 chassis.

Modular Color TV, Part 5

The circuit descriptions and waveforms that follow should help you during times when you are using scope and meters for detailed and logical troubleshooting tests.

Chroma Modules

Because of the many interconnections between them, the schematics of chroma-processor module M111 and color-oscillator/APC module M110 are shown together in Figure 3.

In addition, the major components of M111 are located in the photograph of Figure 4, and those of M110 are identified in Figure 5.

Chroma IF stages

Chroma enters module M111 at pin #11 (see Figure 3), and goes through a bandpass filter (C1, C2, L1, and L2) before it is applied to pin 2 of IC1.

Early-production modules specified R2 as a 22K-ohm variable control, which could change the tilt of the filter during alignment. Later modules substituted a fixed 4300-ohm resistor that replaced both R1 and R2. Evidently, this was not a critical adjustment, and safely could be eliminated without affecting the performance.

Gain of the first chroma IF amplifier inside IC1 is varied by the "burst" ACC circuit. (It is called that because the ACC is controlled by the amplitude of the burst. There is another ACC circuit on the Videomatic module that levels the gain according to the total chroma amplitude.)

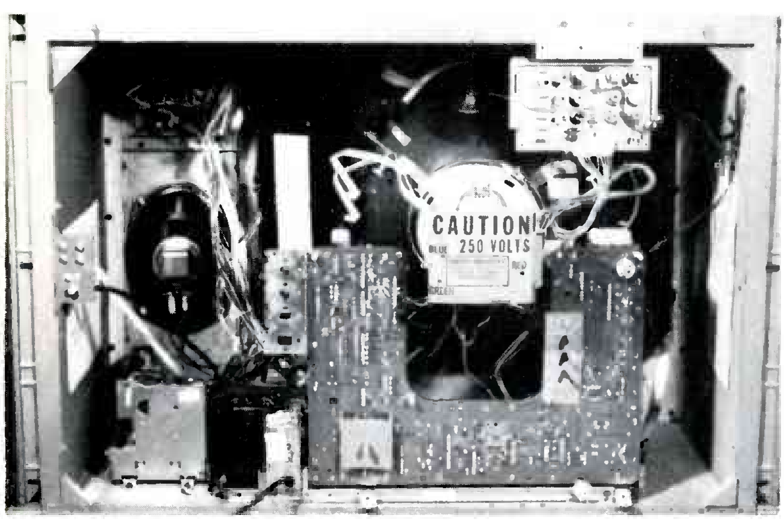
Control of the "burst" ACC is accomplished by the **difference** between the DC voltages at pins 1 and 14 of IC1, and it will be explained with the ACC circuitry of module M110.

Back to module M105

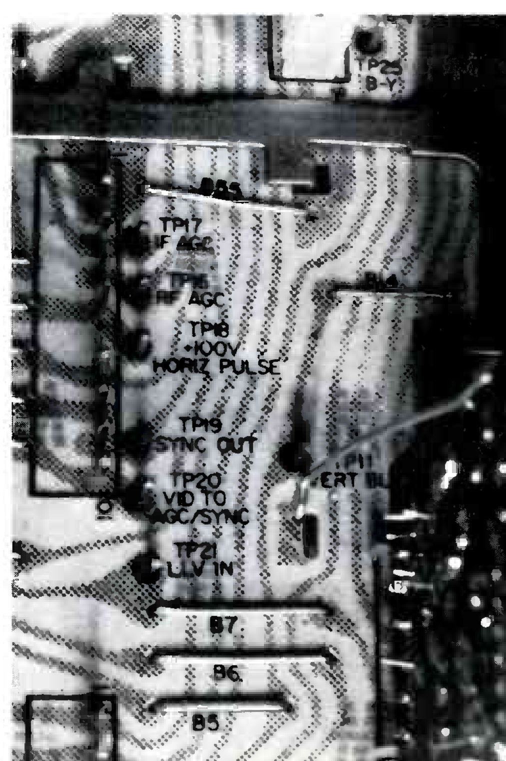
Chroma from the output of the first IF amplifier at pin 6 of IC1 is sent both to the burst circuit on M110 (via pin #6 on M111), and through voltage divider R3/R4 and M111 pin #12 to pin #11 of the Videomatic module M105 (refer to Figure 1).

On M105, the chroma amplitude is leveled by another ACC action, and also the amplitude is varied in step with the contrast changes, as explained last month. Following

continued on page 26



A

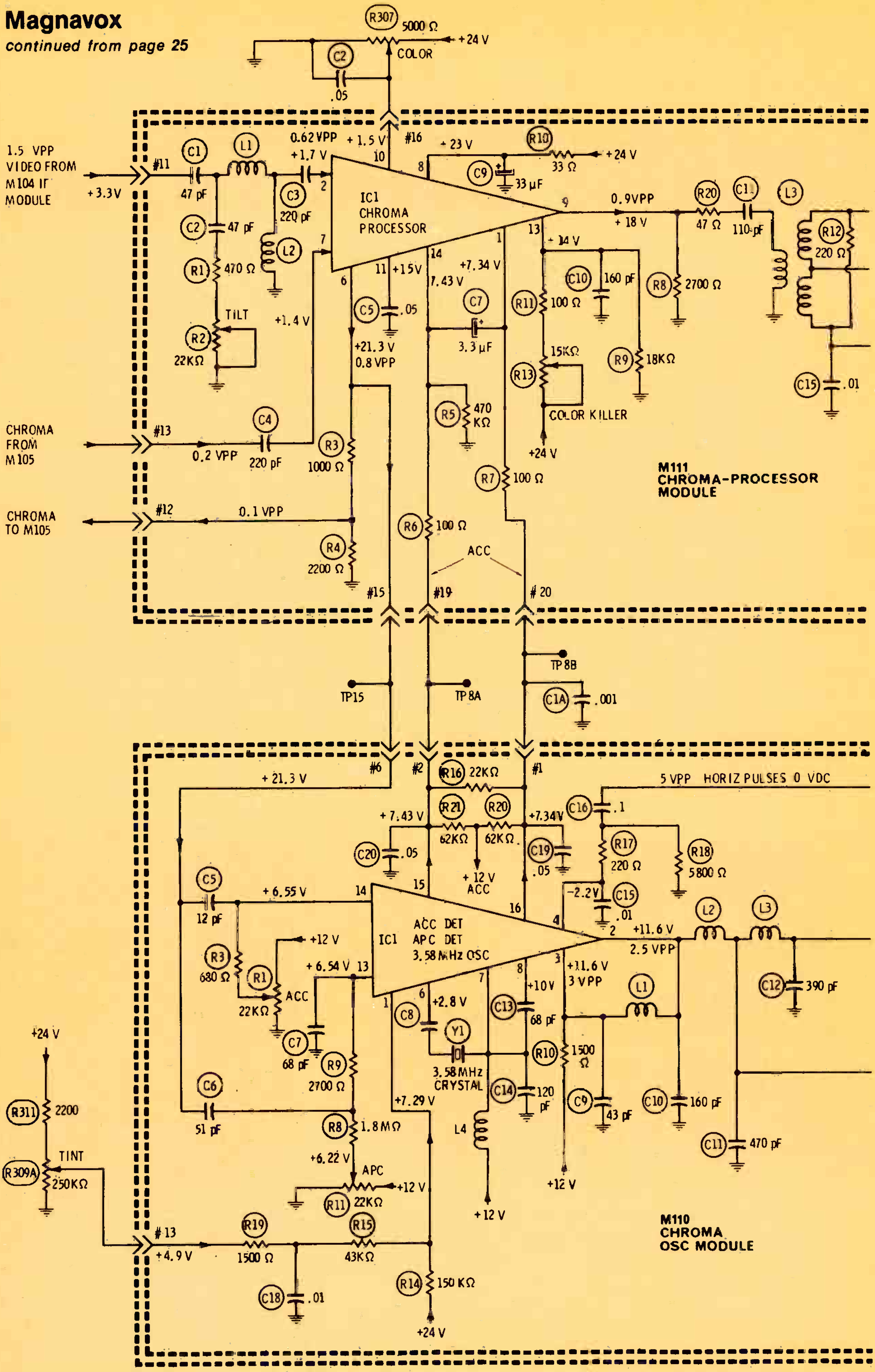


B

Figure 2 When the chassis is in the normal upright position, the bottom of the "mother" chassis is accessible (picture A). The back of the chassis board (B) has road-map wiring paths shown, plus the markings of many helpful testpoints.

Magnavox

continued from page 25



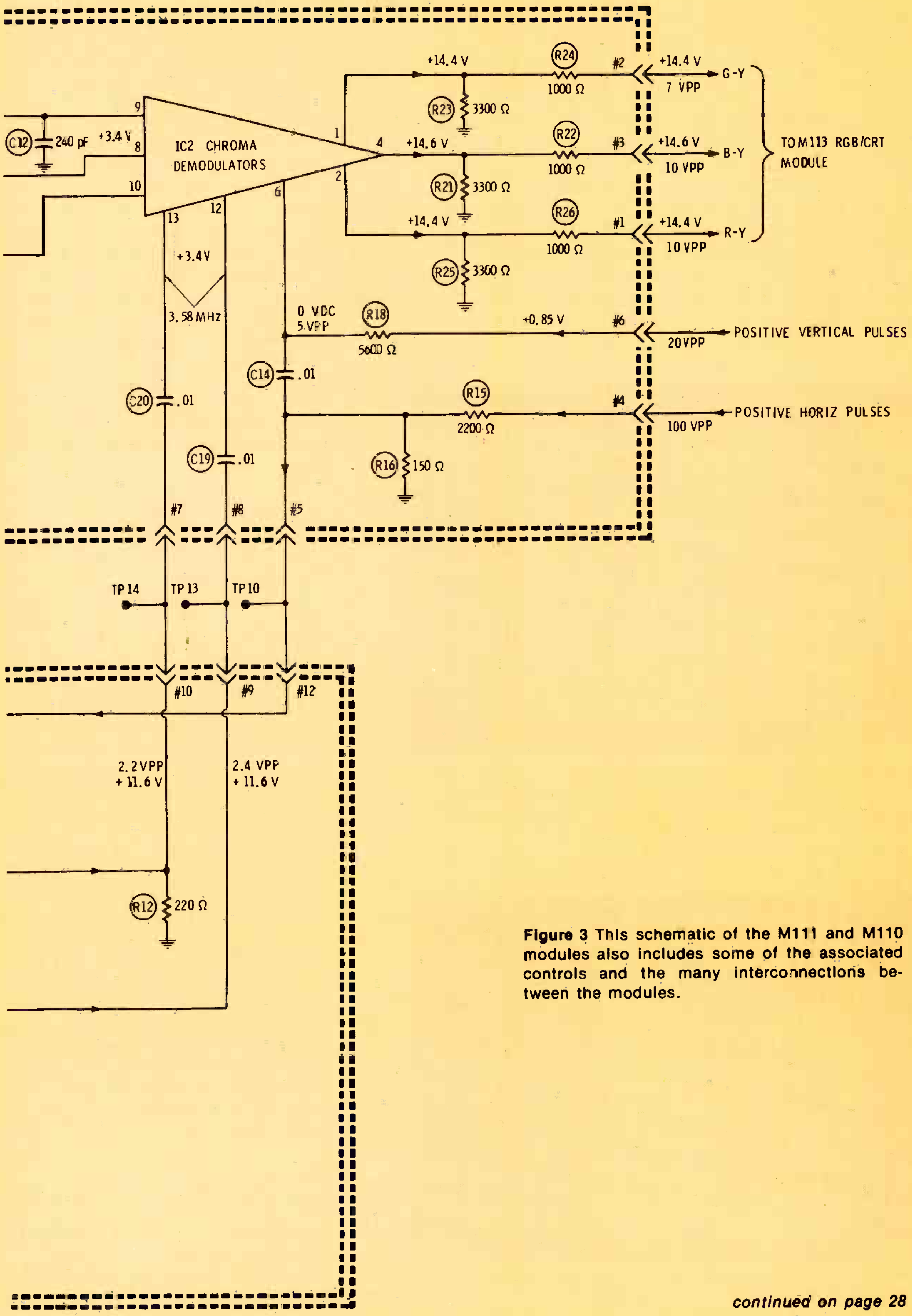


Figure 3 This schematic of the M111 and M110 modules also includes some of the associated controls and the many interconnections between the modules.

continued on page 28

continued from page 27

this processing, the chroma-IF signal leaves M105 at pin #13 and returns to M111 at pin #13.

Return to M111

The chroma signal from M105 again enters M111 and is applied to pin 7 of IC1, which is the input of the fourth chroma amplifier. This stage of the IC is a differential amplifier, having two outputs. One output goes to the demodulators, leaving the IC at pin 9. The other output is at IC1 pin 11, but it is used only in the gain variation, for that pin is bypassed by C5.

Gain of the fourth chroma amplifier is determined by the amount of DC voltage that comes from the front-panel color control. The DC voltage is applied to pin 10 of IC1.

Color Killer

The color-killer circuitry stops the conduction of the fourth chroma amplifier when there is no color burst. Most of the action goes on inside IC1, so we can give only a general explanation.

Conduction and gain of the first chroma amplifier is controlled by the ACC circuit according to the amplitude of the burst. This varies the DC voltage at pin 13 of IC1, which changes also with adjustments of the killer control, R13. A sample of the pin 13 DC voltage controls the color-killer amplifier, which in turn controls the conduction of the fourth chroma amplifier. Therefore, a lack of burst eliminates all gain of the fourth chroma amplifier, preventing colored snow during B&W programs.

Early-production M111 modules included a variable color-killer control, but later versions replaced both R11 and R13 with a single, fixed 5600-ohm resistor, designated R13.

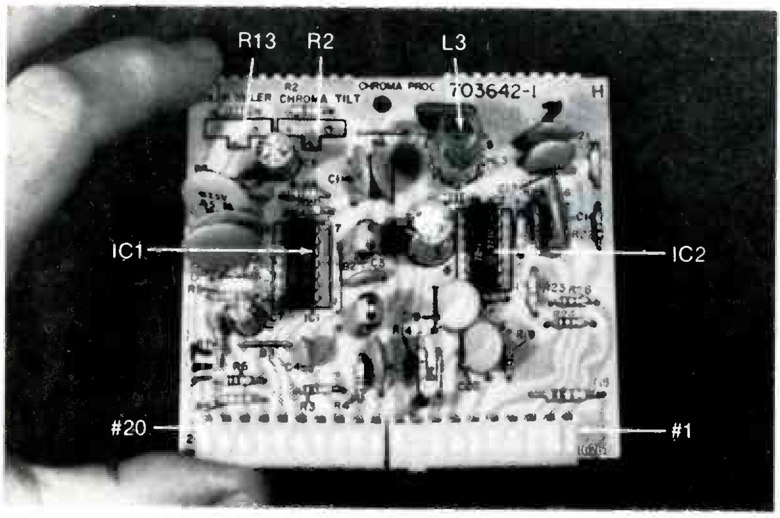


Figure 4 Arrows show the locations of most major components of the M111 chroma-processor module. Late-production versions—such as this one—have substituted fixed resistors for the color-killer and chroma-tilt variable controls.

Four chroma amplifiers

Chroma amplifiers numbers one and four are on M111 module, and amplifiers two and three are on M105. You need this vital information when you trace the chroma signal through the various stages and modules.

From pin 9 of IC1, the chroma-IF signal proceeds through a bandpass transformer circuit (C11, L3, C12, and R12). Full signal is applied to pin 9 of IC2, and a smaller signal from a tap of L3 is fed to pin 8.

Demodulators

Three demodulators also are contained inside IC2. Two continuous 3.58-MHz carriers (having a phase difference of 120 degrees) enter IC2 at pins 12 and 13 (refer to Figure 3). The synchronous demodulators operate from the chroma IF signals and two carriers from the color oscillator. Outputs from the demodulators are G-Y, B-Y, and R-Y, which are sent on to the RGB/CRT module for matrixing with the -Y video signal.

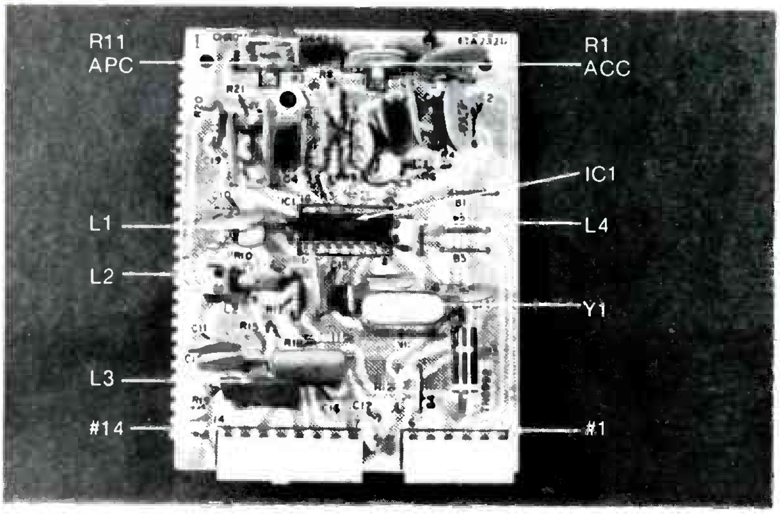


Figure 5 Major components of the M111 color-oscillator module are identified on the photograph.

Blanking

Vertical and horizontal blanking of the chroma IF signal is accomplished in IC2 of the M111 module. Samples of vertical and horizontal sweep are filtered and combined before they are applied to pin 6 of IC2.

In addition, this combined signal enters the M110 module at #12, passes through C16, and finally reaches pin 4 of IC2. Horizontal blanking of the burst and the 3.58-MHz carriers is the purpose of the pulses.

Phase detectors

M110 module (picture in Figure 5, and schematic in Figure 3) has only one IC (IC1), and it functions as ACC detector, APC (color-locking) detector, tint control, and 3.58-MHz reference color oscillator.

One bit of clever engineering is shown by the RC circuits that feed burst into IC1. The chroma signal from M111 enters M110 at pin #16, and is split into two signals having different phase (remember the chroma signal has the burst, which is retained here while the remainder of the chroma is eliminated).

One branch is through a leading-phase high-pass filter (C5 and R3) to pin 14 of IC1; while C6, R9, and C7 comprise a low-pass lagging-phase network that brings the burst (and chroma) to pin 13. Between pin 14 and pin 13 there's a phase difference of 90 degrees, that's necessary for the ACC and APC phase detectors. In addition, each detector is supplied with some 3.58-MHz from the color oscillator. Pin 14 signal is for the in-phase ACC detector, and the signal at pin 13 is used for the quadrature-type Automatic-Phase Control (APC) detector. Horizontal pulses at pin 4 of IC1 allow only the burst to reach the detectors.

At IC1 pins 15 and 16 appear the two DC output voltages produced by the ACC detector. When there is no burst at pin 14, the ACC control (R1) should be adjusted to provide the same DC voltage at pins 15 and 16. As previously stated, the voltage difference between pins 1 and 14 of IC1 on the M111 module determines the gain of the first chroma stage in that IC. Both ACC systems together keep the chroma level very constant.

The APC detector supplies an error-control voltage to maintain

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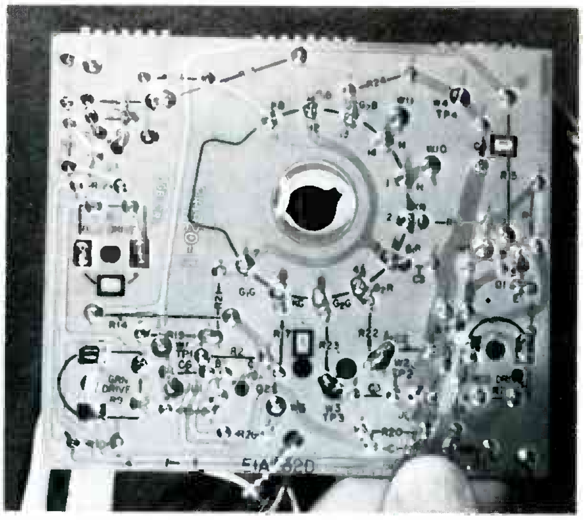
A 

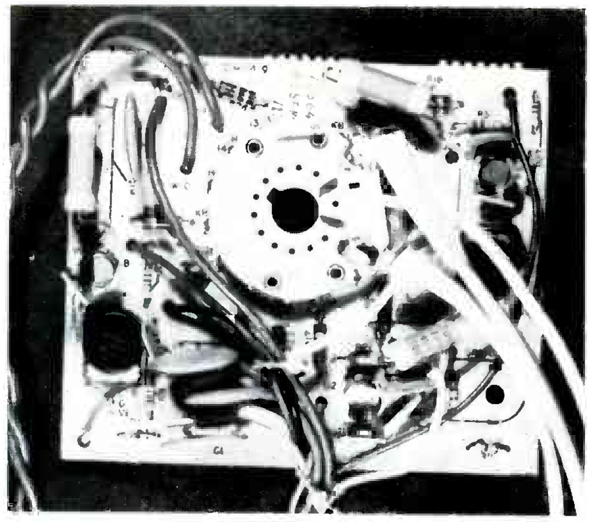
B 

Figure 6 The base socket of the picture tube is fastened to the M113 module, and this "rear" view shows the road-mapping of wiring and components that are mounted on the "front" side (picture A). With the socket removed and the module turned over, picture B reveals the three power transistors and other discrete components of the matrixing circuits.

Magnavox

continued from page 29

correct locking of the color oscillator, which also is inside the same IC1. Adjustment of the APC control (R11) is made to produce the correct 3.58-MHz frequency when there is no burst to provide locking. The error-correction voltage can be measured at pins 11 and 12.

Color oscillator

Quartz crystal Y1, along with C8, C14, C15, and L4, determines the approximate frequency of the 3.58-MHz color oscillator.

Two 3.58-MHz output signals come from the oscillator. They have different phase, and tint control is accomplished by a variation of the two signal amplitudes.

From pin 2 of IC1 comes the direct 3.58-MHz signal. A similar signal is obtained from pin 3; however, it travels through a phase-lagging network (C9, L1, and C10)

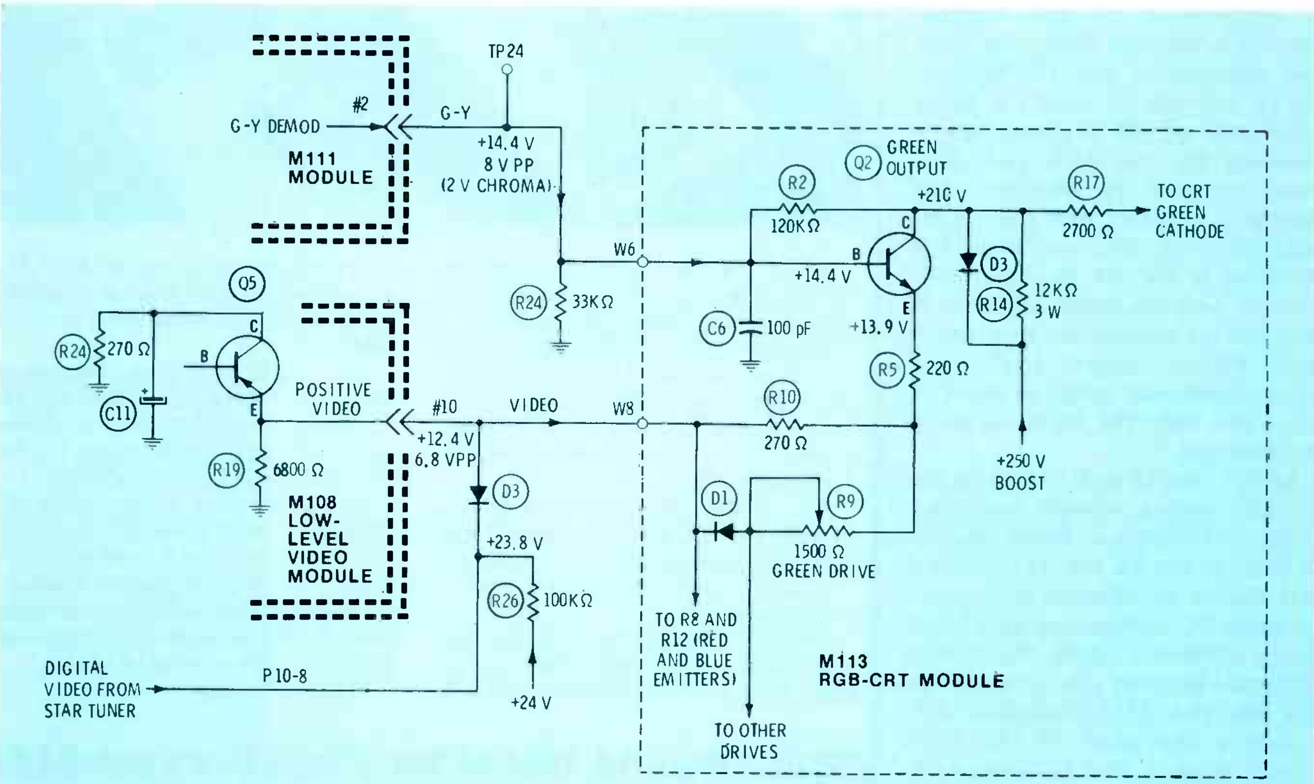


Figure 7 Matrixing of the G-Y and video signals to produce a green signal for the picture tube is diagrammed here. The blue and red stages are similar. Diode D3 is not used for blanking, as stated last month. Instead, it isolates the video of the digital signal that comes from the STAR tuning system. This model uses the Videomatic tuner, not the STAR; therefore, the P10-8 connection is not wired to anything.

which delays the phase. The two signals join at the input of L2. Vectoral addition occurs, so that the output phase is between zero and 90 degrees, with the exact figure depending on the amplitudes of the two signals. And that brings us to the tint control.

An adjustable DC voltage is obtained from the front-panel tint control (R309A), and it is routed to pin 1 of IC1 through R19 and R15 (with C18, they form an AC filter). Also, a fixed amount of DC voltage is added by R14, from the +24-volt supply.

Now, the DC voltage at pin 1 determines how much signal amplitude will be obtained from pin 2 versus the amplitude from pin 3 (which has a phase change). If all the output signal is from pin 2, the phase is zero; if all is from pin 3 and the phase-shift network, the phase is 90 degrees. Variation of the tint DC voltage, therefore, can swing the phase almost that amount, giving more than enough tint change.

This resultant-phase signal is shifted an additional fixed amount by L2 and C11, and then it is fed to one of the demodulators in IC2 on the M111 module.

For the other demodulator, the signal travels through the L3, C12, and R12 phase-lagging network, which provides a phase change of about 120 degrees.

Matrixing the -Y and Y signals

As explained last month, the output of the low-level video module (M108) is the Y or video signal that is sent to the RGB/CRT module (located at the base of the picture tube) for matrixing with the three -Y chroma signals from the demodulators. (Both sides of the M113 RGB/CRT module are shown in Figure 6.)

The partial schematic of Figure 7 illustrates the matrixing method. An appropriate -Y signal is fed to the base of a color-output power transistor, while the video or Y signal is applied (through an amplitude control) to the emitter of the same transistor. Matrixing is accomplished inside the power transistor, and the amplified complete color signal at the collector is direct coupled to the corresponding cathode of the picture tube.

continued on page 32

Magnavox

continued from page 31

Three identical color stages are furnished; one for red, one for green, and the other for blue.

Typical Waveforms

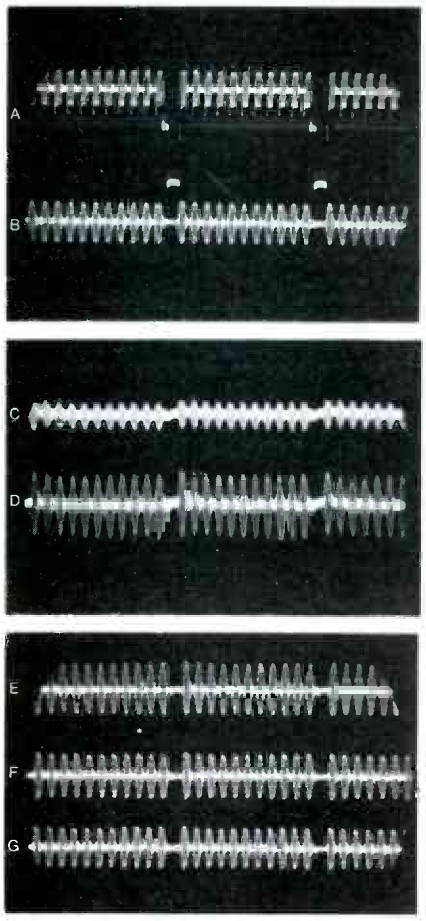
Typical chroma waveforms produced by a color-bar generator are featured in Figure 8, and appropriate video waveforms from a TV station are shown in Figure 9.

Correction

Last month, the correct waveform was shown at the output of module M108, but the wrong interpretation was given. That waveform is found at pin #10 of M108, and the photograph is repeated in Figure 10. Refer to the M108 area of the schematic in Figure 7, and specifically to the wiring around diode D3. Now, D3 is NOT used for blanking (as stated previously) for no pulses come to the cathode from P10-8. This pin is used *only* with models that have the STAR digital tuner, and it brings in the digital video from the generators that show the channel number and correct time on the screen of the picture tube. A negative-going signal at the cathode of D3 increases the brightness. Therefore, the channel number appears in white letters.

A positive voltage through R26 normally reverse biases D3, so it has no effect on the signal at the anode.

Of course, the original question remains: what causes the *negative going blanking pulses* that accompany the *positive-going video* at the output of M108 at #10? Answer: the peculiar pulses come from the horizontal blanking that's



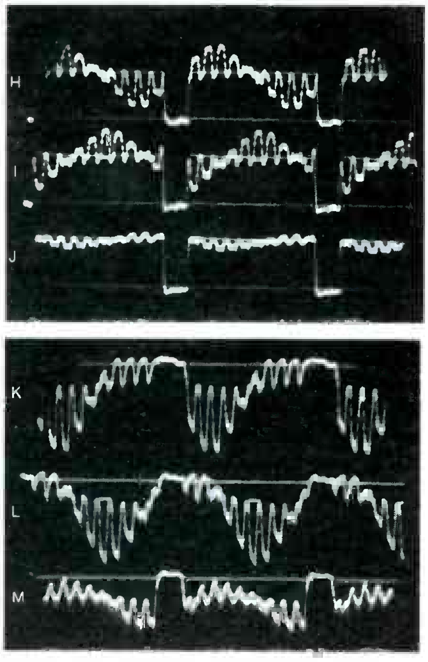


Figure 8A These are some of the waveforms on modules M111 and M113, when color bars are displayed on the TV screen. Trace A is the 1.5 VPP video waveform at the pin #11 input of M111 module, while trace B is the 0.62 VPP input chroma signal at pin 2 of IC1. Bandpass filtering has removed the horizontal sync/blanking pulses. Trace C shows the 0.09 VPP output signal of M111 pin #12 which goes to M105. After being processed and amplified, the 0.2 VPP signal (trace D) coming back from M105 is fed to pin 13 of M111. Trace E is the 0.9 VPP output of IC1 at pin 9, which goes to bandpass transformer L3. At the pin 9 input of IC2 is found this 1.4 VPP chroma signal (trace F), while trace G is the 1.2 VPP signal that goes to pin 8 of IC2 from the tap of L3. Following demodulation inside IC2, these three -Y signals are produced: trace H, 10 VPP R-Y waveform at #1 of M111 module; trace I, 10 VPP B-Y signal at #3; and trace J, 7 VPP G-Y waveform at #2 of M111. The three -Y signals are sent to the M113 module for matrixing. Following matrixing, these three color signals go to the picture-tube cathodes: trace K, 120 VPP of red output at the red cathode; trace L, 120 VPP of blue output at the blue cathode; and trace M, 80 VPP of green output at the CRT green cathode.

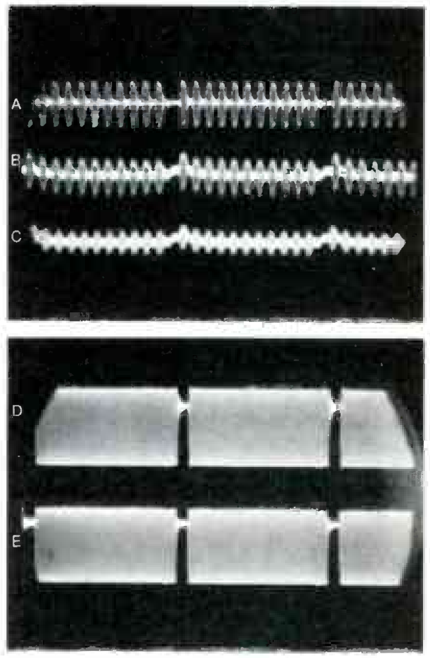


Figure 8B Here are the waveforms of module M110, which has two phase detectors and the 3.58-MHz oscillator. Trace A is the 0.8 VPP chroma signal coming to M110 pin #6 from the M111 module; trace B is the 0.11 VPP phase-shifted signal input to IC1 at pin 14; and trace C is the 0.07 VPP phase-delayed signal input to IC1 at pin 13. Trace D is the 3.58-MHz 2.4 VPP output carrier at TP13. It supplies one of the demodulators on M111, and has undergone horizontal blanking. Similarly, trace E is the 2.2 VPP 3.58-MHz output signal at TP14.

present in the -Y signals at the bases of the color amplifiers on M113. Blanking at the collector of a color-output transistor must be positive-going, and that requires a negative-going blanking at the base. The waveforms of Figures 8 and 9 prove the statement is correct.

Now, a negative-going base signal also will appear at an unbypassed emitter resistor. Follow the emitter circuit of Q2 in Figure 7. It goes through R5, R10 and R9/D1, and finally arrives at pin #10 of M108. The emitter returns to ground through R19 and the E/C resistance of Q5 on M108. Therefore, the negative blanking pulses overpower the weaker positive-going ones in the video, showing a waveform that appears to have only negative-going blanking. Clear?

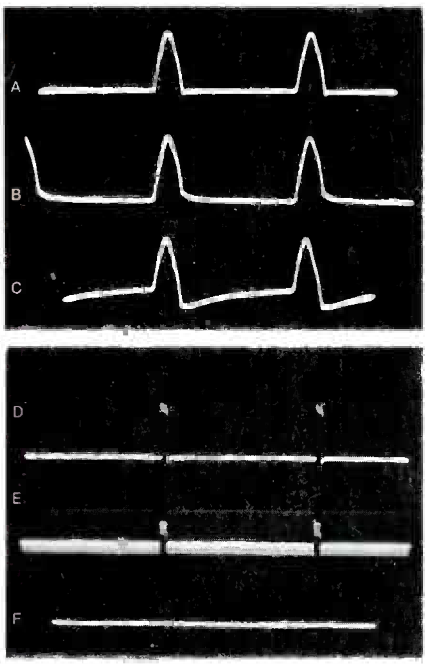


Figure 8C Combined vertical and horizontal blanking is applied to the chroma signal in M111. Also, horizontal pulses go to M110 from the same circuit. Trace A reveals the 100 VPP horizontal pulses that enter M111 at pin #4; trace B shows the 5.1 VPP pulses at M111 pin #5. These are sent to M110; and trace C is the 5 VPP horizontal signal at pin 6 of IC2. These pulses produce chroma blanking. Trace D shows the 20 VPP vertical pulses at M111 pin #6; trace E is the mixture of horizontal and vertical signals at IC2 pin 6 (scope at vertical rate); and the line of trace F shows the zero amount of 60 Hz pulses at the output of M111 at pin #5. The signal there keys the burst separator (among other functions), and therefore 60 Hz is not desired.

Troubleshooting T995 Chroma

Chroma signals are processed on four modules (M111, M110, M108, and M113). If you knew which module probably had the chroma defect, it would save much time, and eliminate much of the risk inherent in the shotgunning of modules (a module might have been damaged by an external defect—and the defect might ruin your *replacement* module).

Follow these preliminary tests for localizing chroma problems:

- Check operation of the customer-operated controls, the antenna connections and performance, and the service adjustments (for example, color killer, horizontal locking, and the 3.58-MHz oscillator);
- Study the symptoms, especially the appearance of color bars;
- If only one color is missing (but all three are present in the raster), the defect probably is in the M111 demodulator module or the M113 RGB module;
- Loss of all colors might originate in the M105, M111, or M110 module, but not the M113 module; and
- Out-of-lock color probably can be cured by replacement of the M110 module.

If you attempt to repair a module, check the ICs indirectly by measuring input and output signals, and analyzing the DC voltages at the IC pins. For example, when the input signal is normal, but there is no output, and the supply voltages are okay, but some of the IC pin voltages are wrong (and the wrong voltages are not caused by bad external components), then the IC probably is defective.

Next Month

The Magnavox T995 that we are analyzing has a Videomatic electronic tuner that is controlled by much digital circuitry. Next month, we'll begin the description of this interesting feature. □

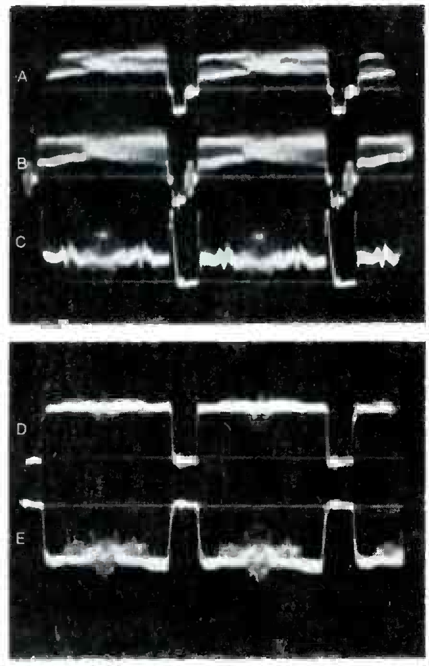


Figure 9 These are typical waveforms when the T995 Magnavox is operated from a TV-station signal source. Trace A is normal negative-going 1.7 VPP video at TP7; trace B shows the 3.5 VPP video (that has high-frequency boosting) at TP21; trace C has positive-going video and negative-going blanking, which is found at input W8 of module M113; trace D shows horizontal blanking plus the random color signal at the base of the red output, Q1 on M113; and trace E is a typical 140 VPP waveform at the collector of Q1, the red output (also, at the CRT red cathode).

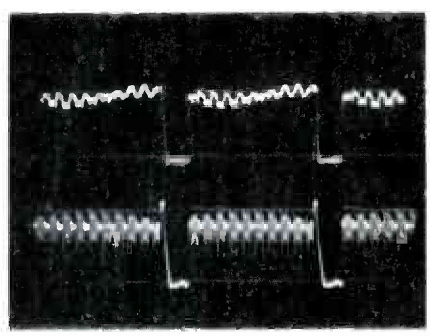


Figure 10 This dual-trace waveform reveals the G-Y signal at W6 on M113. The negative-going horizontal-blanking pulses appear also at the emitters of the color amplifiers (Q1, Q2, and Q3), where they overpower the normal positive-going video blanking. The result at the W8 video input of M113 is positive-going video with large negative-going blanking. In practice, the waveform at the bases of Q1, Q2, and Q3 appears with little change at each individual emitter.

Tips For Cashing Checks

By Lipman G. Feld,
B.S., J.D.

Here are reasons for and against accepting or cashing checks for your customers. If you do accept checks, these suggestions can save you many dollars.

Checks are so simple in appearance that it's hard to believe the amount and degree of trouble they *can* cause. Of course, we're referring to "bad" checks, which can cost you a loss of money, in addition to wasting much of your valuable time.

A Necessary Nuisance

Checks have become essential to our modern way of life. At busy check-out counters, I have noticed that nearly half of the customers offer checks in payment. Each store has a method of handling checks, including identification, lists of known offenders, or calling the office for confirmation. However, such procedures slow down the flow of customers, often triggering resentment (toward the store) in other buyers who are forced to wait. Even after all of these precautions, it's likely those merchants lose a large amount of money by accepting the checks.

Why do they take checks? Well, many customers do not carry cash (indeed, some authorities advise against it, because of the risks of robbery), and they insist on paying with checks. If one store refuses their checks, they just go to a competitor who is not so selective. Yes, the fear of losing sales is the reason shops and store continue to accept checks in payment, despite the losses and extra expenses.

No Obligation

Remember this: *you never are obligated to settle for a check instead of cash.* Checks from strangers have no value until their bank has paid you the money. Until that time, a check is merely a promise to pay.

Except for money orders or cashier's checks, which are paid for in advance, a check actually is a form of credit based on trust. Even when the check is genuine and is backed by money in the bank, you have to wait for several days for the check to clear before the cash legally is yours.

Sometimes a check is refused by

Figure 1

1. The name and address on a check are not to be considered as proof of identification. Always ask for additional IDs.
2. This number is for the customer's record. Watch for low numbers, however, because this indicates a new account.
3. Make sure the check has the correct day, month, and year. Don't accept checks post-dated or more than 30 days old.
4. This is the payee (you or your company). Make sure the name is correct.
5. This is the numerical amount of the check. Be sure there is no space preceding the first figure which could permit adding another digit.
6. The written amount should correspond to the numerical amount (5).
7. Look for the bank's name, branch, city, state, and zip code. Beware of out-of-town banks.
8. This is the authorized signature. It should correspond with the name in the upper left-hand corner of the check.

a bank because of insufficient funds. Even honest people often play the little game called "race the check to the bank." Although such checks eventually are made good, there are delays and sometimes extra charges.

Anyway you look at it, checks are bad news. Losses are inevitable. However, if you believe it's good for your business to accept checks in payment, then observe the following suggestions for handling checks.

The Form Of Checks

Typical checks have several important entries, such as the name and address of the bank, the date, the legal signature of the owner of the bank account, and the precise amount (given both in figures and spelled out). Figure 1 shows a sample.

Before accepting a check, look for:

Non-local bank. Use extra care in examining a check drawn on an out-of-town or non-local bank, including the best types of indentification. On the back of the check, list the customer's local and out-of-town address and phone number, including area code. Verify local phone numbers in your area code plus 555-1212, then giving the name of the city. After the operator answers, request the phone number for that certain name and address.

Date. Make sure the check has the correct day, month, and year. Don't accept any check that's not dated, if it's post-dated, or one that's more than 30 days old.

Bank. Look for the bank's name branch, city, state, and zip code.

Amount. The numerical amount *must* agree with the written amount.

Legibility. Don't accept a check that is not written legibly in *ink*.

Two-party checks. Don't accept two-party checks.

Payee. That's you or your company, so be certain it's made out to the exact name you want, and for the exact amount, without any change in cash.

Amount. Repeating: personal checks should be only for the exact amount of the purchase, and the customer should not receive any change.

Company checks. Paychecks, or other company checks, are not above suspicion. Many blank checks are taken during burglaries and robberies, and the rest of the check is easy to falsify.

Erasures. Don't accept a check with erasures or written-over amounts.

Identification

Require double identification, before you cash checks. Of course, IDs can be lost or stolen, so ask for one that has a picture or description.

Here are good, recommended indentifications:

- automobile-operators license, especially ones with a photo. If those of your state do not have a picture, ask for additional identification. Also, look at the date of birth, while you ask the person to tell you his birth date;

continued on page 36

Checks

continued from page 35

"On second thought, sir, I see no reason why I can't work on your set immediately."

- the car license number. Look at the car, and write the number on the back of the check (write it also on the invoice; the bank stamping on the back of checks often obscures extra writings);
- credit cards usually are safe, if they bear the signature of the person or a photo laminated to the card;
- government passes should have the department name and a serial number. Often they have a picture, too; and
- ID cards carried by members of the armed forces, police departments, and fire departments. Police cards should show the badge number, which you can copy, while the other cards should have a description, a signature, and a photo.

A few examples of improper identification include: business cards; social-security cards; organization cards; bank books; insurance cards; draft cards; hunting licenses; birth certificates; marriage licenses; library cards; unsigned credit cards; payroll stubs; work permits; temporary driver's license receipts; voter's registration cards; and passports.

Teach Your Employees

Instruct all of your employees about these precautions and proper identifications. Also, show them any bad checks which are returned to your store, explaining why each check is worthless.

For example, one business within just a few days got back checks because: two were not endorsed; one was endorsed improperly; two were made out to the wrong business name; three had different written and numerical amounts; one had not been signed; two were dated incorrectly; two had no address; and one was post-dated.

More Precautions

Watch out for identification that's less than 30-days old. Also, be suspicious of a person who has *too much* identification. Compare the signature on the check with pre-written signatures (driver's license and credit cards), and verify the address. Examine IDs for tampering or erasures. *Remember, a person who will forge a check also can forge identification.*

Be cautious of checks presented outside of banking hours or on holidays. This applies particularly to persons who do not live in the immediate vicinity.

After examining the identifications, if you still have doubts, write down the height, weight, and a general description of the passer. If the case goes to court, a personal ID is necessary to get a conviction.

Don't be swayed by the commercial-appearing payroll check, for such checks are easy to steal or to counterfeit; don't accept any from people you don't know.

Before accepting a check, ask yourself, "Can I find the person if the check bounces?" If the answer is "No," ask for more information and identification, or refuse the check.

After The Bounce

After a check bounces, you should take immediate action. However, the type of action depends on the reason for the bounce.

If the check is stamped "no account," it's likely you have lost your money, for this usually is evidence of a deliberate fraud or swindle. Of course, in rare instances, a customer might issue a check by mistake on a wrong bank, or on a discontinued account. You quickly should determine which possibility is true. If the person is known in the community, you should proceed with collection efforts.

Another warning is a check marked "closed account," which usually is a sign of deliberate fraud. Again, investigate a bit, for a person might have opened a new account, forgetting about the check that still was outstanding.

Whether the bounce was accidental or fraudulent determines your next step.

Criminal Offense

It is a criminal offense under bad-check laws to issue or pass a bad check. If you can locate the person who deliberately cheated you, it's best to obtain the advice of your lawyer, or turn all of the information over to the local prosecuting or district attorney for action. Otherwise, the person might file a counter-suit against you.

Incidentally, criminal charges against someone who gives you a check for a down payment usually can be prosecuted successfully, because you lost a property right. However, very few charges can be successful against someone for a bounced check paid for a later payment.

Diversion Of Attention

One reason for the success of stage magicians is that they direct your attention to an unimportant action or area, while they accomplish unobserved whatever they must do to make the trick work. This is a diversion of attention, and bad-check passers often use the same tactics.

Become suspicious of anyone who tries to distract you from a proper examination of their identification. Perhaps he might question you about something at a crucial moment, or tell some story of why he is in a big hurry. A con man needs to prevent you from checking him too closely, and he must get out in a hurry before you remember to verify some vital facts.

All of those warning signs were there, and were ignored in a case I'll tell you about next.

The Rock Concert

The owner of an electronic shop

was contacted to set up a public-address system for a rock festival. He knew that show-business functions often were unstable and not well-financed, so he talked to the bank where the rock promoter had an account.

"Is a check on the 'Horrible Chanters' good?" he asked at the bank. "It's all right to five figures," answered the banker, where the money for advance tickets had been deposited.

As the technician went about installing the elaborate sound system, Joe Chanter was very interested in the details. In fact, he seemed fascinated, and he talked and talked constantly until the job was finished and tested.

Then he handed the technical expert his personal check for the agreed amount, plus a couple of hundred dollars "for pocket money." The electronics man confidently accepted the check and gave the change.

The concert was not a success. Many listeners became angry and violent, and took out their frustrations on the band stand and the equipment.

Not only was much of the sound equipment ruined, but the check bounced a few days later. The shop-owner victim stormed into the bank, demanding to know why the check had bounced. He received a fast and costly education.

First, Joe Chanter had no authority to sign checks for the promoter; only Moe Chanter was authorized. In the meantime, many of the listeners wanted their money back, and the "Horrible Chanters" bank account was tied up by creditors. Also, by now Joe Chanter could not be found.

One of the morals of this story is that the bank account of a company that's in a risky business can be substantial on one day, and be depleted only a couple of days later. Another lesson is to be sure a check is signed by a person who is authorized to do so.

The worst mistake of the shop owner was in not insisting on a *certified* check for the exact amount of the invoice.

Comments

The old advice to "Stop, look, and listen!" certainly applies to cashing checks for customers.

Stop for a moment and ask yourself why this person is asking you, rather than a bank, to cash his check. *Look* at the identification and determine whether or not it is sufficient, under the circumstances. Then *listen* to the customer to determine if the request seems valid, or whether the person is trying too hard to distract or hurry you.

Don't accept the check until all of these factors ring true. □

The Basics of Industrial Electronics, Part 4

By J. A. "Sam" Wilson, CET

A capacitance transducer undergoes a change of capacitance when the condition of the material or process being monitored becomes different. These capacitance changes can be accomplished in one of three general ways.

The factors that determine the capacitance of a capacitor are: the **area of the plates; the distance between the plates; and the type of dielectric between the plates.**

Temperature often affects the capacitance. But, in most applications, the temperature coefficient is listed as a disadvantage that must be overcome.

Any of these three factors can be made variable in transducers that change capacitance to indicate a different condition of the material being tested.

Varying The Distance

Condenser microphone

One example of a capacitive transducer that operates by varying the distance between the two plates is the "condenser" microphone. Of course, the word condenser in electronics has been replaced by capacitor. However, this type of microphone was developed in the 1920s, and the old name persists.

Operation of a condenser mike does not vary the applied voltage or the dielectric, but it changes the capacitance by changing the distance between the plates (see Figure 1).

The formula for the charge on a capacitor (called Q) is: $Q = C \times V$. Therefore, when the voltage is held constant, any change of capacitance results in a corresponding change of the charge. For example, an increase of capacitance increases the charge; or a decrease of capacitance decreases the charge.

One plate of the capacitor in a condenser microphone is rigid, while the other is a very-thin and flexible diaphragm that's clamped at the edges but free to vibrate at the center (Figure 1). Sound waves striking the diaphragm move it alternately closer or farther away from the back plate, changing the capacitance. The charge varies in step with the capacitance. Increased capacitance requires more current, while reduced capacitance has less current flow. When a load resistor (R1) is added is series with the charging current, the sound waves cause a varying voltage drop, which is the electronic equivalent of the sound waves.

In practice, the change of capacitance is very small, and the output voltage is extremely low. To raise the level so it's equal to that of other types of mikes, a preamplifier usually is mounted near the capacitance unit. The diaphragm must be mounted very close to the back plate, to give the highest possible output signal, and when it is stretched tightly to raise the resonant point above the range of hearing, the frequency response can be much flatter than the response of dynamic or ceramic mikes. This is the value of a condenser mike, and the improved response is worth all of the extra components.

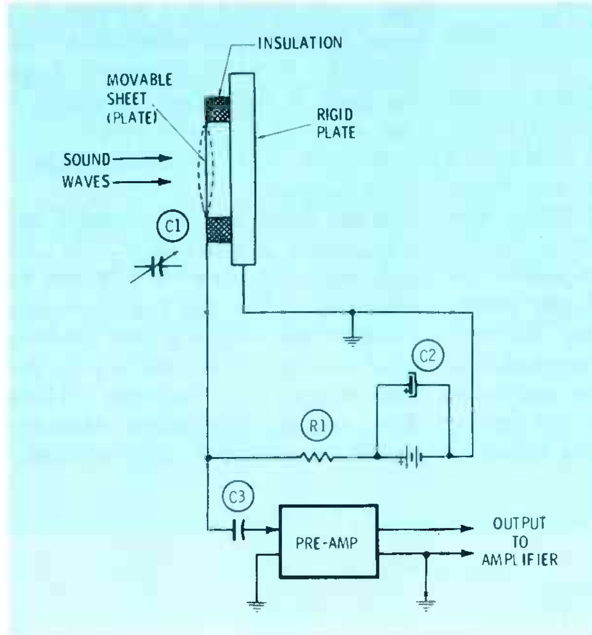


Figure 1 In a condenser microphone, sound waves move the flexible plate, varying the spacing of the plates, and producing a variable capacitance. The changing capacitance requires a varying charging current, which in turn causes a varying voltage drop across the load resistor, R1.

Vibration transducer

The same principle of movable plates is used with capacitive transducers that are designed to sense vibrations. One example is illustrated in Figure 2. It is built to endure strong pressures and is ruggedly constructed, in comparison to a condenser mike, which is very delicate.

Thickness transducer

Figure 3 shows another type of transducer that varies the distance between the capacitive plates to detect deviations of thickness. The dielectric is the material being tested for thickness, and therefore it must be a nonconductor such as rubber, linoleum, or other similar substance.

The capacitance is part of an oscillator circuit, whose frequency shifts with capacitance changes.

continued on page 40

Industrial

continued from page 39

Frequency of the oscillator is adjusted with sample material of the desired thickness so it produces a minimum reading after the signal passes through a notch filter. Any change of thickness and its resulting change of frequency moves the signal up the sides of the notch, increasing the amplitude. The sensitivity is adjusted for the amplitude of signal produced by the maximum allowable deviation from the desired thickness, and the control action or the alarm is activated for variations that exceed the tolerance. For example, the relay contacts might be used to stop the movement of the material until the problem was corrected. Or it could light a warning sign.

If the notch filter is replaced by a zero-center discriminator, the circuit then can indicate whether the material is too thick or too thin. Further, the output signal could be used to control the mechanism that determines the thickness. Therefore, any out-of-tolerance thickness would be corrected *automatically.*

Varying The Dielectric

The level of fluid in a tank can be sensed by a capacitive transducer, as shown in Figure 4. Of course, the liquid must be a non-conducting type, and it's desirable for it to have a high dielectric constant.

When the liquid level is low, the dielectric is air and the capacitance is low also. At higher levels, the liquid becomes the dielectric, increasing both the dielectric constant and the capacitance.

Two different indicators are illus-

continued on page 42

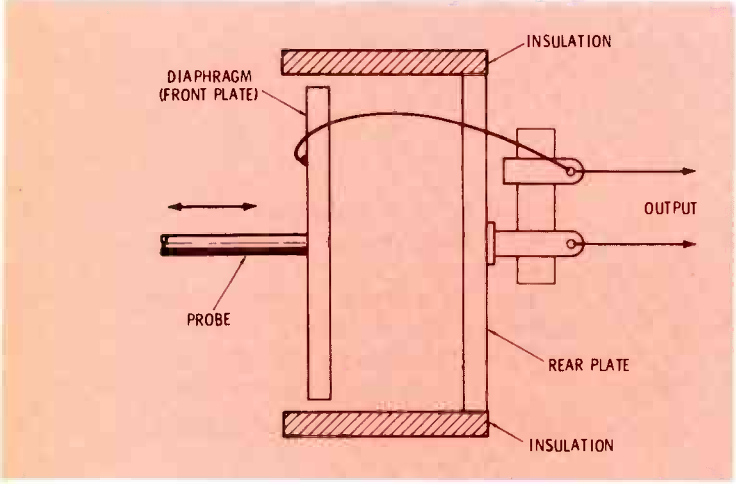


Figure 2 A capacitive vibration transducer is similar in principle to a condenser mike, but it is built much stronger to withstand the heavy blows.

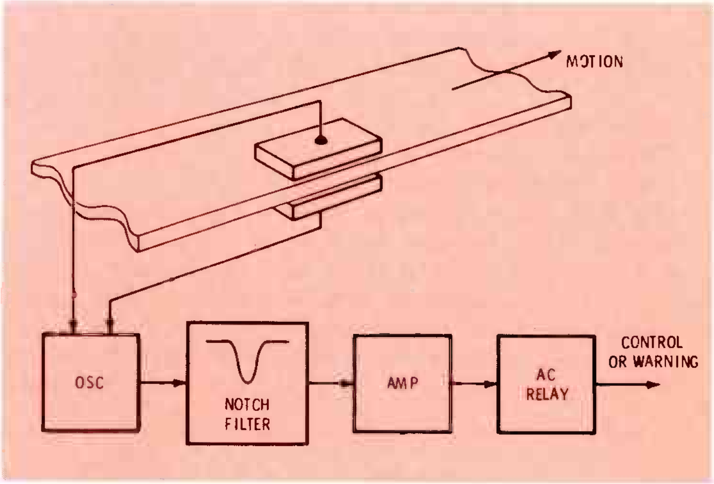


Figure 3 Two metal plates held against top and bottom of a moving piece of insulating material in a manufacturing plant change capacitance according to the thickness of the material. Thus, thickness variations change the oscillator frequency, and an unacceptable thickness moves the frequency out of the notch. This increased amplitude can trigger a relay or a warning device.

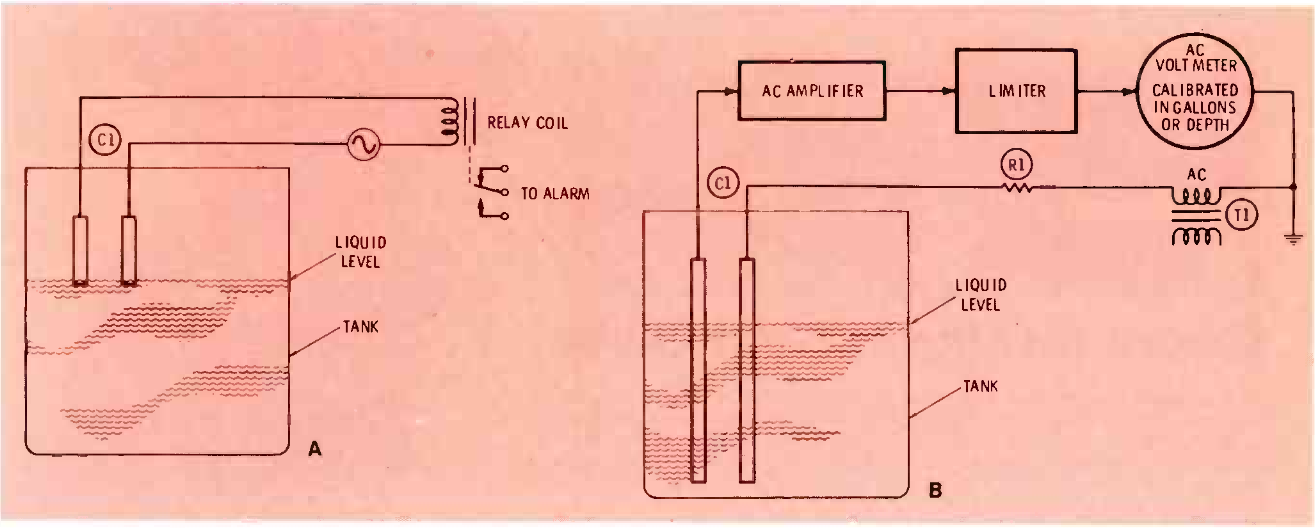


Figure 4 Here are two versions of a capacitive depth indicator. (A) When the liquid is between the plates that act as a capacitor, the capacitance is increased, and the stronger current trips the relay to sound an overfill warning. Lower liquid levels provide only air between the plates, and the weak current is not enough to trip or hold-in the relay. (B) A more-sophisticated version uses longer capacitor plates, an amplifier for sensitivity, and a meter than can be calibrated in gallons or depth. More plate area with the non-conducting liquid between gives increased capacitance; thus passing more voltage to the meter, and giving a continuous reading of depth.

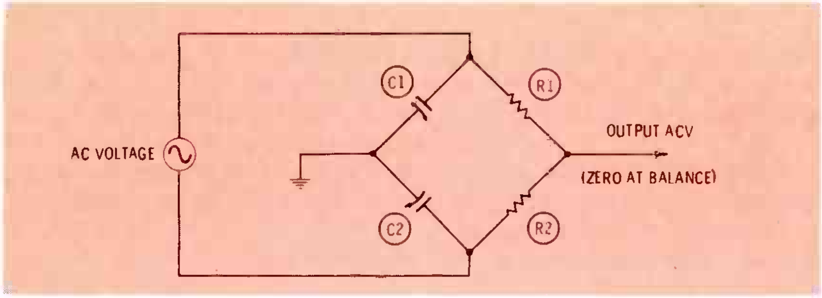


Figure 5 Capacitive bridges have a sharp null at the balance point. Output AC signals from the bridge can be amplified to provide good sensitivity. Bridges are very useful when the capacitance change is not large.

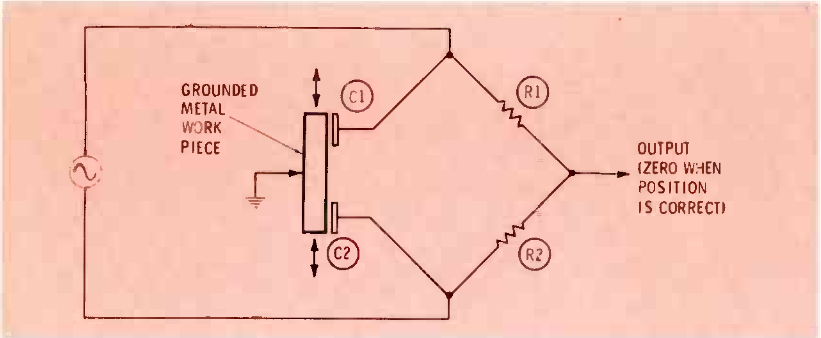


Figure 6 Here is one example of an AC-bridge circuit that's used in industrial electronics. When the production-line metal item is positioned exactly between the C1 and D2 plates, two equal capacitors are formed. This balances the bridge, and the AC output has almost zero amplitude. If the metal object is positioned wrongly, one capacitance will be larger, and the other smaller. Thus, the bridge is unbalanced, and the output rises sharply. If the output increases above a preset point, an auxiliary circuit can flash a warning sign or prevent the next automated step of the production machinery.

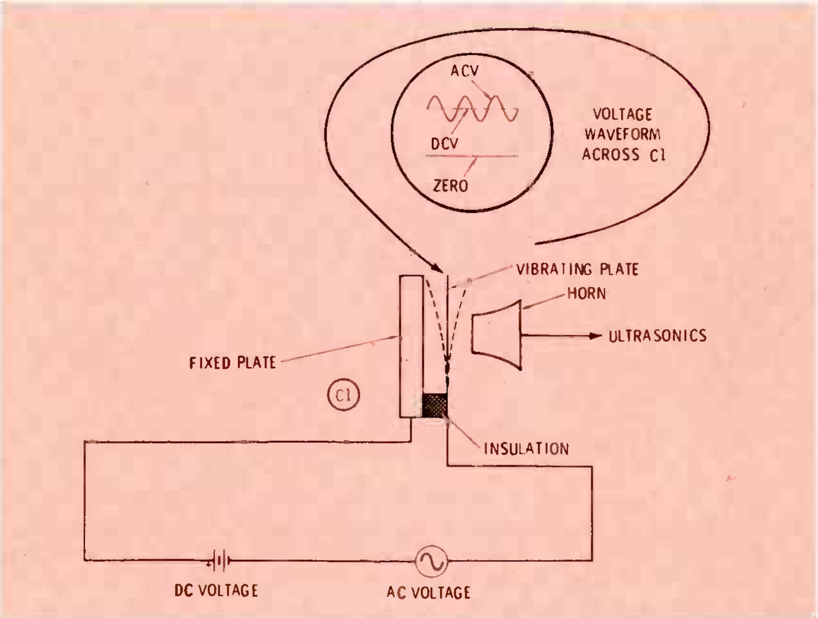


Figure 7 Electrostatic transducers closely resemble some capacitance types. In some ways, operation of this ultra-sonic generator is opposite to that of the condenser mike in Figure 1. Both have a DC polarizing voltage, but the mike accepts acoustic sound waves and produces an electrical audio signal, while the generator uses an AC electronic signal that's similar to audio (but higher in frequency) to produce super-sonic acoustic sound waves. Some models have a tuned horn to strengthen the signal level.

Industrial

continued from page 40

trated. The first sensor is not very sensitive. Air is the dielectric at normal depths, and the current is not sufficient to close the relay. At the overfill point, the increased capacitance from the change of dielectric increases the current, closing the relay points. The second circuit indicates *any* depth by the amount of AC voltage that passes through the capacitance. In fact, the meter can be calibrated in gallons or the depth in feet.

Capacitive Bridges

Capacitive transducers often produce a very small change of capacitance, and need amplification to make the change sufficient for a reliable reading. Or, an undesirable temperature coefficient might cause excessive drift. Both of these corrections can be made in an AC bridge circuit (Figure 5).

This bridge is balanced when C1/C2 equals R1/R2. In other words, when the ratio of the capacitances equals the ratio of the resistances. At the balance point, the output AC voltage is minimum.

Position sensor

One use for a capacitive bridge is shown in Figure 6. Two separate capacitances are formed by the plates and the grounded metal object. When the object is centered correctly, the two capacitances are

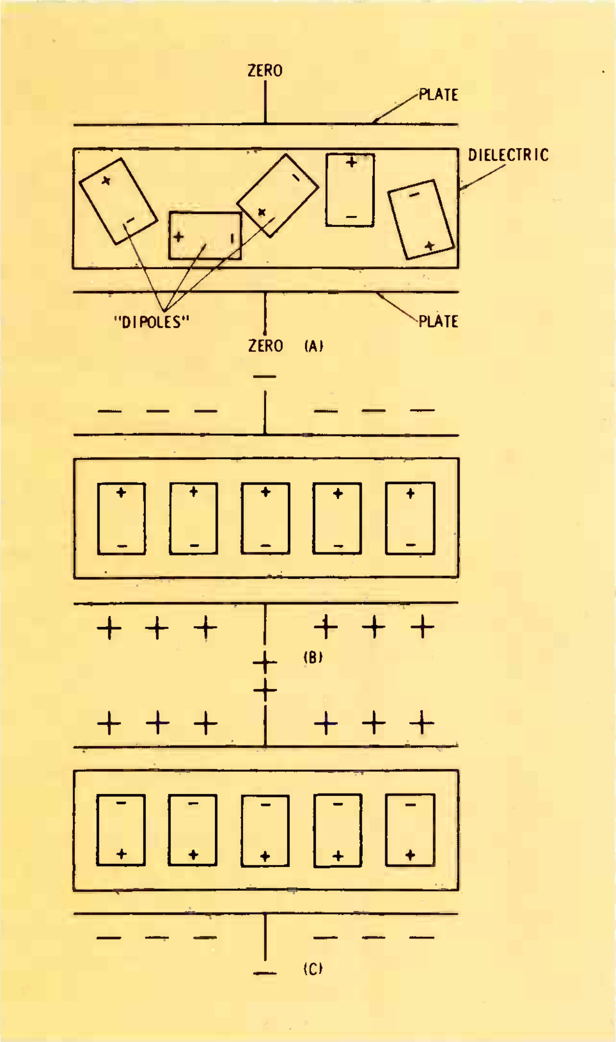


Figure 8 The action of capacitors when taking or discharging power is quite complex. This simplified explanation should help you understand the basic principle. Imagine that dielectric material is composed of many tiny "dipoles" (as shown in A) of random orientation. When a capacitor accepts a charge, the dipoles arrange themselves as drawn in B. Reversing the polarity of the charge (C) also reverses the dipoles. Heat from friction is produced during the movement of the dipoles, when an AC charge is applied to the capacitor. This is the reason for the dielectric-heating phenomena.

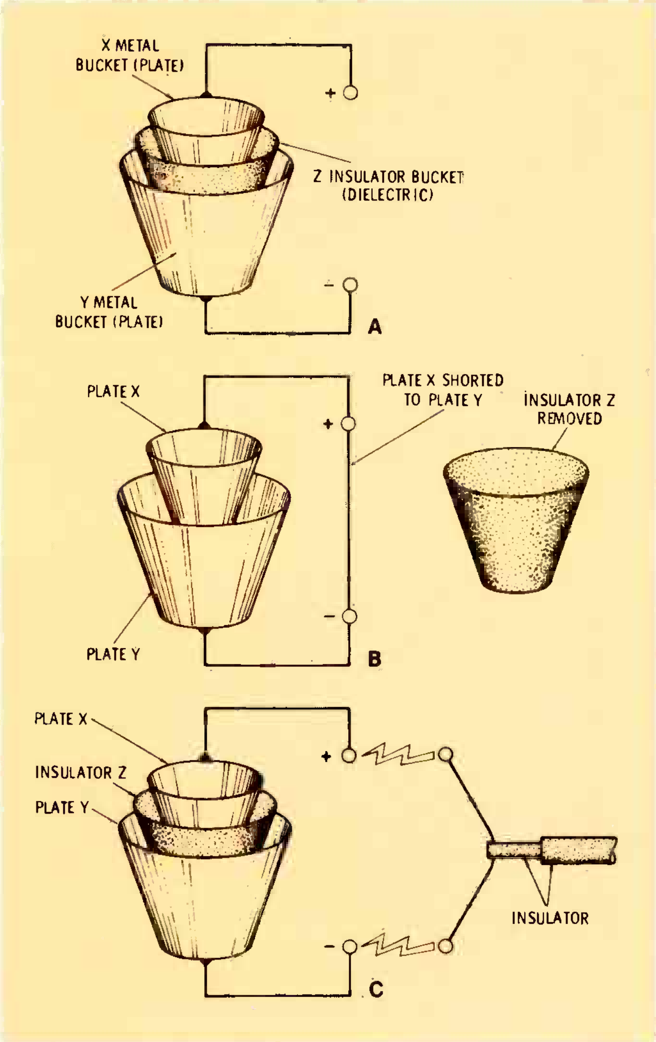


Figure 9 Here is an experiment you can perform to prove that the charge of a capacitor is held in the dielectric. Make a capacitor from two metal buckets and one of dielectric material, assembled one inside the other (A). Charge the capacitor to a high voltage. Then, using insulating sticks, remove the dielectric pail, and short together the two metal buckets (B). Such a short would remove or dissipate any charge held between these "plates." Assemble the components again, as shown in C, and carefully connect a shorting bar to the two metal buckets. Before or during the contact, you should see an arc, proving that the original charge was there, even after the disassembling and efforts to discharge.

equal, and the bridge is balanced (giving a minimum-amplitude output AC signal). If the object is not centered, the capacitances are not equal, the bridge is not balanced, and the output signal has a comparatively strong amplitude.

This output signal might be read on a meter marked with in-tolerance and out-of-tolerance areas. Or, the amplified output signal could activate a safety circuit that would not allow a subsequent step to occur unless the bridge was balanced.

The balanced-bridge transducer operates by varying the active area of the plates, according to the position of the object. Remember that only those areas facing each other contribute to the capacitance.

Electrostatic Transducers

Closely related to the capacitive types are the electrostatic transducers. One example is given in Figure 7. The ultrasonic generator (frequency above 20 KHz) has a fixed plate and a movable plate.

A DC voltage is connected between the plates, placing a negative voltage on one and a positive voltage at the other. Unlike charges attract, and like charges repel, so the voltage produces a small attraction between the plates.

An AC voltage source is wired in series with the DC voltage. When the positive peak of the signal is at the positive plate, the attraction between the plates is increased. Similarly, when the negative peak of the signal is at the positive plate, the attraction between the plates is decreased. Therefore, the movable plate vibrates in front of the rigid plate, producing a sound wave.

One use for an ultra-sonic generator is to agitate a liquid which shakes loose the dirt and grease from the inside of clocks or TV tuners. In addition, ultra-sonic devices also are used for measurements, and in intrusion burglar alarms.

Dielectric Heating

The principle of dielectric heating can be understood by reviewing some little-know facts about the behavior of the dielectrics in capacitors.

Actually, **the energy of a capacitor is stored in the dielectric.** A physical change occurs in the dielectric when the capacitor is charged. Figure 8 shows a simplified version of what happens inside the dielectric material.

The dielectric can be imagined as being made of many tiny dipoles, each having a positive charge at one end and a negative charge at the other. In the uncharged state (Figure 8A), the dipoles are pointing in random directions.

When the capacitor is charged, the dipoles align with the electrostatic lines of flux, as shown in Figure 8B. If the polarity of the applied voltage is reversed, the dipoles also reverse direction (Figure 8C).

A high-frequency AC voltage across the capacitor causes the dipoles to reverse direction rapidly in step with the positive and negative peaks of the waveform. The reversal of the dipoles is opposed by friction, so heat is generated within the dielectric material.

Some frequencies of RF produce more heating effect than others do. Dielectric heating is used extensively in industry to heat plastics and other non-conducting materials.

Electrostatic Pail Mystery

The theory of dielectric behavior just described explains the results of the experiment in Figure 9.

Three buckets or pails are inserted one inside the other (Figure 9A). The outside pails are metal, and the middle one is made of dielectric material. Of course, you recognize this as a capacitor.

The capacitor is charged with a very high DC voltage (say 1 million volts). Then the capacitor is disassembled, using insulated sticks (Figure 9B), and the two metal plates are stacked together (which shorts them together). If the charge actually is stored in the **plates,** it now will be gone.

But when the pails are reassembled (Figure 9C) and a shorting bar touched to the two metal pails, a large arc can be seen.

The dipoles were held in their previous alignment by friction; therefore, the charge remained in the dielectric, and when the capacitor was reassembled, the charge still was there.

This experiment proves that the charge of a capacitor is stored in the dielectric. □

Figure 1 The FC45 Sencore digital frequency counter has several unusual features, including high- and low-resistance inputs, and coverage from 20 Hz to 230 MHz in two ranges. No external adjustments are needed to obtain an accurate count.

Reports from the test lab

Each report about an item of electronic test equipment is based on examination and operation of the device in the ELECTRONIC SERVICING laboratory. Personal observations about the performance, and details of new and useful features are spotlighted, along with tips about using the equipment for best results.

By Carl Babcoke

Sencore FC45 Frequency Counter

Model FC45 digital frequency counter from Sencore (Figure 1) has no external adjustments, but it does have seven pushbuttons and two input jacks, plus the on/off switch. These extra pushbuttons and jacks greatly increase the versatility of the instrument, permitting additional types of measurements.

FC45 Features

Here are some important features of the Sencore FC45 counter:

• The display has eight 0.5-inch red LED digits;
• Hz and MHz lights show the range that's in use;
• The decimal is placed automatically according to the pushbutton selected (although not mentioned in the instruction book, the internal circuit apparently selects the range giving best resolution);
• Both 1-megohm and 50-ohm inputs are provided;
• Either 0.1-second or 1-second update can be selected;
• Two ranges of frequency coverage are supplied;
• An external socket is provided for testing the fundamental frequency of crystals;
• The 50-ohm input has a 12-watt 50-ohm load, which can be used as the load for a CB transmitter;
• The counter can operate from either 120 VAC or 12 VDC;
• An oven maintains a constant temperature for the internal timing oscillator, to minimize calibration drift;
• Many accessories are available, including special probes; and
• The input circuits protect against moderate overloads, and a fuse protects the 50-ohm input from massive overloads

Frequency Ranges

Two ranges cover from 30 Hz to 30 MHz, and from 30 MHz to 230 MHz (see Figure 2 for the panel layout). Actually, the two ranges overlap, with the lower range useful to about 35 MHz, and the higher one operating down to about 10 MHz. Readings of the higher band are provided by a built-in 10-to-1 scaler.

The minimum amplitude of input voltage required for reliable counting varies with the frequency and type of input. Any input above 20 millivolts should give a reading, except at the extreme ends of the ranges where a stronger input is required. Refer to the charts in the instruction manual for the exact levels needed.

Input Resistances

Pushbuttons select either a 50-ohm or a 1-megohm input resistance. The 50-ohm input has an internal 12-watt dummy load rated at 12 watts, and it can be used as the test load of a CB transmitter. The frequency can be checked at the same time, or the 50-ohm input can function only as a load, while you check the frequency of another circuit by using the 1-megohm input.

For most other measurements, the 1-megohm input probably is better. There is less undesirable loading of the circuit that's being tested.

However, a few square wave or pulse waveforms suffer ringing when they enter the 1-megohm input (because of the mismatch between cable and load). In such cases, the ringing will be counted as extra cycles, giving a wrong count. This can be prevented by using the 50-ohm input. Refer to the instruction manual for details.

Time Base

Frequency readings can be updated either every 1/10 second or once every second, depending on the resolution needed. Of course, all audio measurements should be made with the 1-second timebase.

The timebase also determines the accuracy of this (or any other) digital counter. The FC45 has a temperature-regulated oven for the crystal oscillator, to minimize the drift from changes of room temperature.

Specs call for a temperature stability from 0° to 40° Centigrade of only 1 part-per-million, following a 10-minute warmup. After 30 days of operation, the stability versus time should be about 2 PPM per year. Therefore, the total accuracy is ± the time base accuracy, ±1 count.

Figure 2 Three pushbuttons are for input selection, two more select the reading rate, and another two buttons select the range desired. At the lower left is the power jack for the prescaler, and the crystal jack is at the lower right. Two BNC connectors are provided for the inputs.

Accessories

A 39G112 direct/isolated (through 33 pF capacitor) probe is supplied with each FC45 counter. It is pictured in Figure 3. The "hot" lead is very handy for connecting to small wires (such as transistor leads), for it is spring loaded and completely insulated (except for the tiny hook).

Also, a fused, DC-supply cable with plug for a cigarette lighter is furnished.

Optional

Useful, but not supplied with the FC45, are the 39G80 low-capacitance 10-to-1 probe, the NE206 noise-minimizer probe (not sent for testing, but it apparently gives different amounts of low-pass filtering to remove some types of noise from the input signal), a PL207 pickup loop for RF signals (Figure 4), and a PR47 prescaler. The prescaler can be operated from an FC45, or other types of counters.

Figure 3 A sliding switch in the 39G112 probe selects direct input, or routes the input signal through a 33 pF capacitor.

Figure 4 The PL207 RF pickup is small so it can be slipped over coils. The offset handle permits easy location of the loop, even in crowded chassis. This is an excellent method of obtaining a sample signal for the counter, without loading the circuit that's under test, or exposing the counter to excessive voltages.

Figure 5 The small PR47 Sencore prescaler permits a counter having an upper limit of 60 MHz to count up to 600 MHz. It has a divide-by-10 circuit. The input is 50 ohms, and the signal should have a level between 300 millivolts and 3.5 volts.

PR47 10-to-1 Prescaler

The PR47 prescaler (Figure 5) is designed to be connected ahead of a digital frequency counter. It has a 10-to-1 divider circuit; therefore, the output frequency is 0.1 times the input frequency. The PR47 is rated for inputs up to 600 MHz, when used with a counter having a top frequency of 60 MHz.

Because there is no action except the divide-by-10 function, the accuracy depends on the counter. PR47 does not change the accuracy of the count.

External power of 7 to 10 volts DC is required for the prescaler. The FC45 has a 9-volt jack at the lower-left corner of the front panel for powering the PR47. However, the PR47 can be used with other counters by the addition of a PA202 AC adapter (not supplied).

Input resistance is 50 ohms, to minimize cable ringing. The input is protected up to 3.5 volts RMS at 600 MHz input, or 7 volts RMS at low frequencies. Output amplitude is 1 volt PP. The sensitivity varies with frequency, but should not require more than 325 millivolts of input for dependable operation.

A PL207 RF loop and a 39G116 power cable are supplied with each PR47.

Comments

The Sencore FC45 is one of the few counters I've tested that correctly counted an audio signal, with the generator connected to the high-impedance input of the counter. Also, the direct/isolated probe should allow operation with more circuits, and with far less chance of accidental shorts.

Another good idea is the RF loop. I obtained a reading of 3.579552 MHz by placing the loop over the reactance coil of an old color TV. In the same television, a reading of 15,734 Hz was shown when the loop was hung over the horizontal-efficiency coil.

All counters give wild and inaccurate readings under certain conditions. The Sencore instruction manual illustrates them and gives the solutions. I advise that you study the manual thoroughly.

The Sencore model FC45 counter performed all tests perfectly, and should prove to be a reliable and versatile instrument. □

productreport

Soldering Pistol

The **Kager** KL 3000 is a lightweight instrument suited to precision applications in the electrical and electronics fields.

The solder, incorporated in the pistol, is fed to the heated soldering tip by squeezing the trigger. The precise amount of solder required

for a particular joint may be selected by simply turning a knob. Cold soldering spots are minimized because the object being soldered or the copper lamination surrounding it is heated prior to the application of the solder.

The KL 3000 is available with power inputs of 20 to 60 watts. A large choice of solder tip designs also is available.

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Technical Manual

GTE Sylvania has published a technical manual describing more than 275 linear ICs and modules in its ECG replacement semiconductor line.

The fully-illustrated manual presents comprehensive technical data for devices used in consumer, commercial and industrial electronic equipment. It contains sections on electrical ratings and characteristics, mechanical specifications, application notes, performance information, and a selector guide.

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Anti-Static Desoldering Tool

Edsyn now offers a manual desoldering tool which protects sensitive FET and MOSFET semiconductor devices from failure by static electricity, while isolating the operator from a direct short.

The "Silverstat Soldapullt" is a hand-held, spring-loaded vacuum device which incorporates an enclosed loading shaft, high-low vacuum adjustment, and fast bayonet-type disassembly for ease of maintenance. No conductive straps are necessary when working with FET devices because of its conductive plastic tip and barrel housing which allow any static charge to drain off harmlessly through the hand to the ground. The usual precautions such as conductive work mats and grounded wrist or body straps might be required.

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Smoke Detector

The Fl photoelectric smoke detector from **Mountain West** is said to detect early fire indications before flames and elevated temperatures can be detected by other devices.

The light-source lamp has a 2½-year life span, and an alarm sounds when replacement is needed. The Fl has an 85-decibel alarm.

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CB Radio

The new **RCA** remote CB 40-channel transceiver, model 14T275, is a three-piece, two-way radio. The detachable, hand-held microphone has all operating controls built-in: on/off, volume, squelch, channel selector, digital channel readout, microphone, and separate speaker.

The main chassis, with 100% solid-state and phase-locked circuitty, can be mounted in concealed locations by using the optional 13-foot extension cable (14T819).

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CB Meter

Mura has a full-function CB meter (model CBM) on the market. The meter measures SWR and relative field strength for checking and tuning the antenna; RF power output from the transceiver; and modulation level.

The CBM-40 has the following specifications: SWR scale—1:1 to 20:1; power scales—0 watts to 10 watts, 0 watts to 100 watts at ±10%; modulation scale—0 to 100%; frequency range—3.5 MHz to 150 MHz; impedance—52 ohms.

The unit is provided with its own 9½-inch antenna for FS measurements, an instruction booklet, and a 3-month warranty.

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Portable FET VOM

Model WV-543A VoltOhmyst from **VIZ** is an all-purpose VOM using FETs. Some of the features include: automatic polarity of DC readings, with a separate meter to indicate the polarity; 10 megohms input impedance for all voltage ranges; a switch selects the polarity of test leads during ohms measurements, and a meter indicates the polarity; both high-power and low-power ohms functions are provided; the FETs and the tautband meter are protected; decibels from -50 to +56 can be measured using the AC ranges; and the VOM can be operated either from line power or from eight "AA" cells (not supplied).

AC and DC voltage ranges are 0.15, 0.5, 1.5, 5, 15, 50, 150 and 500 with a separate jack for 1.5KV. Seven resistance ranges are provided, with a choice of high or low power. The AC and DC current ranges are the same as those for voltage, except the readings are in milliamperes.

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Dual-Trace Scope

Simpson Electric has introduced a new dual-trace scope for design, development and service of digital circuitry as well as general communications, audio and TV servicing.

The Model 452 has triggered sweep and 15-MHz bandwidth plus all solid-state and IC components (except CRT). Differential vertical amplifier stages give wide bandwidth (DC coupled, DC to 15 MHz; AC coupled, 2 Hz to 15 MHz) with rolloff through 27 MHz.

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Analog Power Meter

Elwin Electronics offers a new analog power meter designed for use in laboratories, service installations, factories, and for operator applications.

The Hooker APM-15 through-line watt and VSWR meter has negligible insertion loss which allows it to remain "on line" for continuous monitoring of either forward or reflected power.

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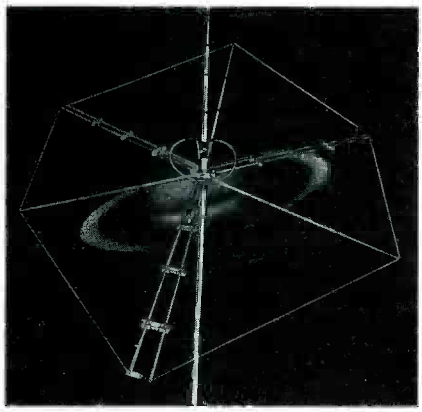
antenna systems report

Dual-Polarity Antenna

Avanti has introduced a combination vertical and horizontal omnidirectional antenna. The "Saturn" antenna needs no rotor, yet picks up vertical mobiles, or horizontal and vertical beams.



The Saturn not only works on both polarities with high gain, but is said to be efficient for both transmit and receive. When sun spots cause a signal-level shift, the polarity often can be changed to pick up the desired channel more strongly.

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Ground Plane Antenna

An **Antenna Incorporated** quarter-wavelength ground-plane antenna for the 25-54 MHz frequency range is designed to provide lightning protection and static discharge.

The antenna is nine feet high and has three nine-foot radials to establish the ground-plane system. A cutting chart is included for tuning it to exact frequencies. All tubing and brackets are made of aircraft-type aluminum. The antenna accepts a PL-259-type connector for use with 50-ohm RG-8/U or RG-58/U coaxial cable. A pre-wired betamatch assembly for 50-ohm termination provides lightning protection and static discharge.

Included with the unit is a heavy-duty mounting bracket with weather-protected hardware to fit on a standard 1-5/8-inch mast or 1¼-inch plumbing pipe.

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