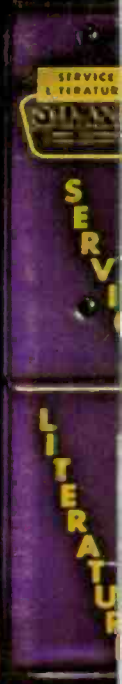


NOVEMBER 1972  A HARCOURT BRACE JOVANOVIICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



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ATLAS
MI 48411
AS
8756723AL1

Basic Digital Circuitry

There must be an easier way...



There is: Sylvania's Chek-A-Color test jig.

TV servicemen were never meant to be movingmen.

But, that was before antique, modern and French Provincial units that included hi-fi, tape decks and record players were built around a large-screen color TV set.

Getting those units to the shop can be a big job.

That's why we developed our two Chek-A-Color test jig units. One, our full-house model, gives everything you need to test a chassis. The other is a basic unit that practically lets you design your own test jig.

All you have to take back to the shop is the electronic guts of the TV monsters.

Regardless of the size of the original picture, Chek-A-Color lets you see it on a benchtop 14-inch



(diagonal) screen. It adapts to both high and low focus voltage sets and a full line of adapters lets you test over 5,000 different models.

A front-panel switch controls a yoke programming system that gives you a range of impedances and/or deflection voltages to closely match both tube and solid-state systems.

For actual testing, a convenient meter lets you measure anode voltage and a speaker lets you check sound performance.

Since Chek-A-Color handles tube, hybrid and solid-state chassis, there won't be many complete cabinets to lug.

With a Chek-A-Color test jig all you have to take is the chassis. Get the picture? Sylvania Electronic Components,

lets you see it on a benchtop 14-inch

GTE SYLVANIA

100 First Avenue, Waltham, Mass. 02154

GROUP
243

SCHEMATIC NO.

SCHEMATIC NO.

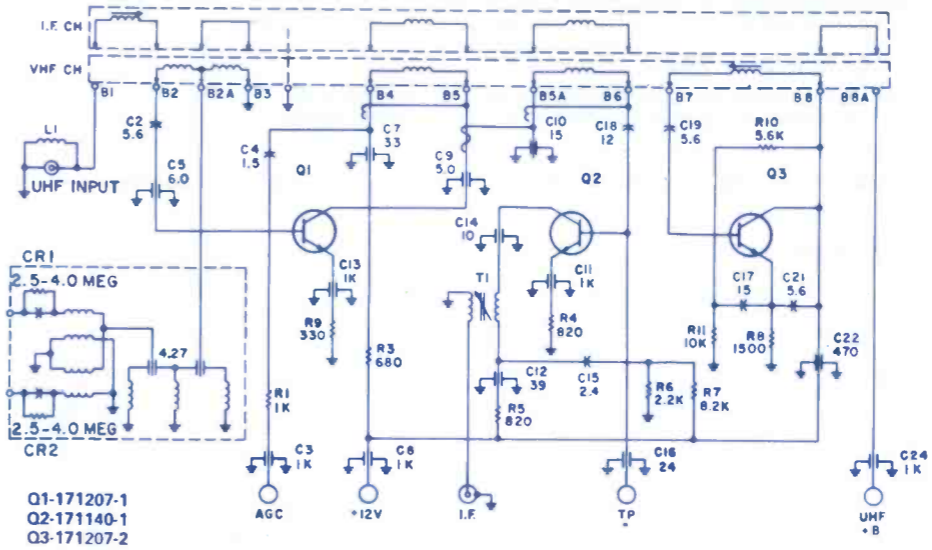
EMERSON 1446
TV Chassis T25H4-1A

MAGNAVOX 1445
Color-TV Chassis T974

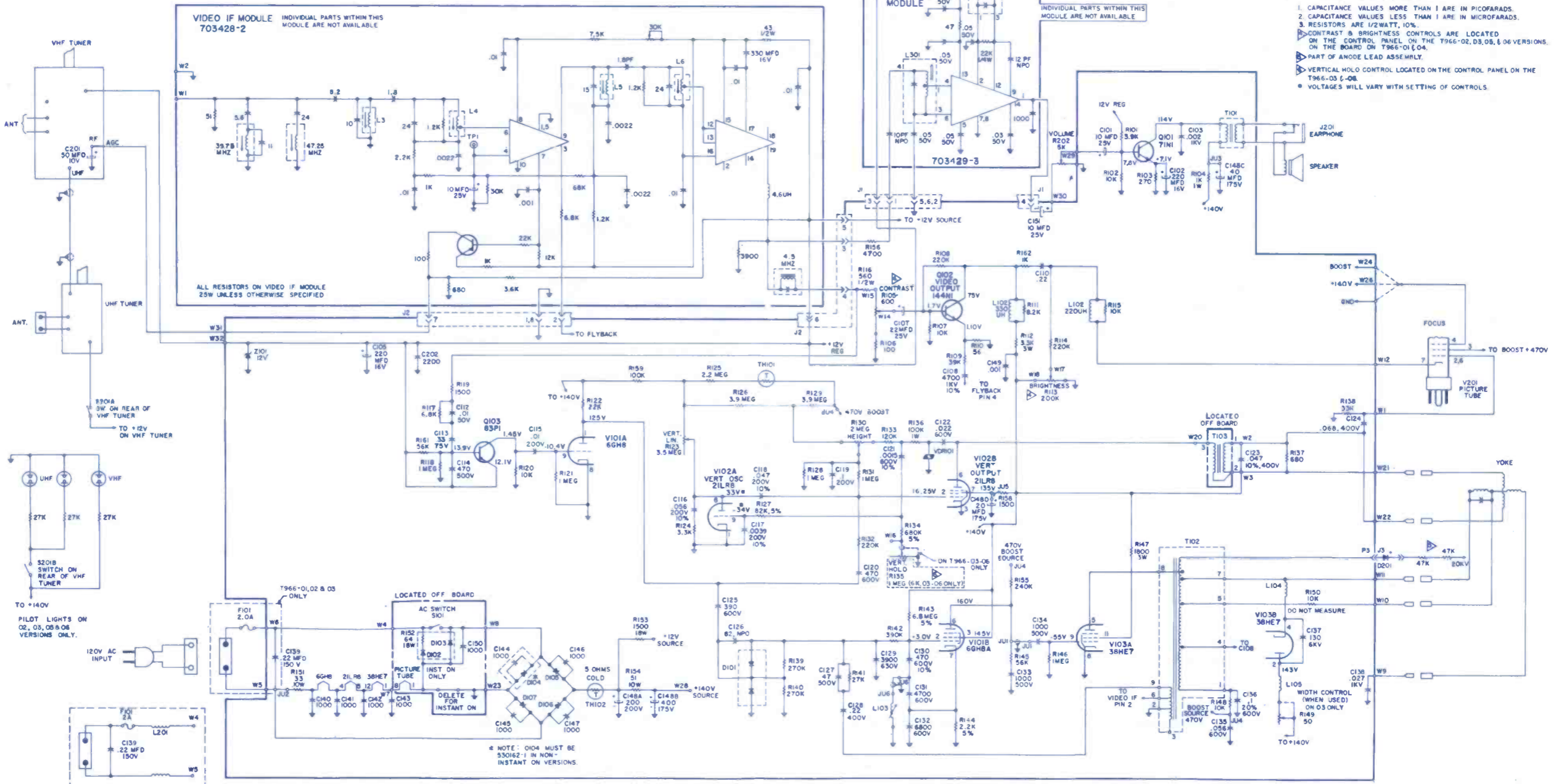
MAGNAVOX 1443
TV Chassis T966 Series

RCA SALES CORP. 1444
Color-TV Chassis CTC48 Series

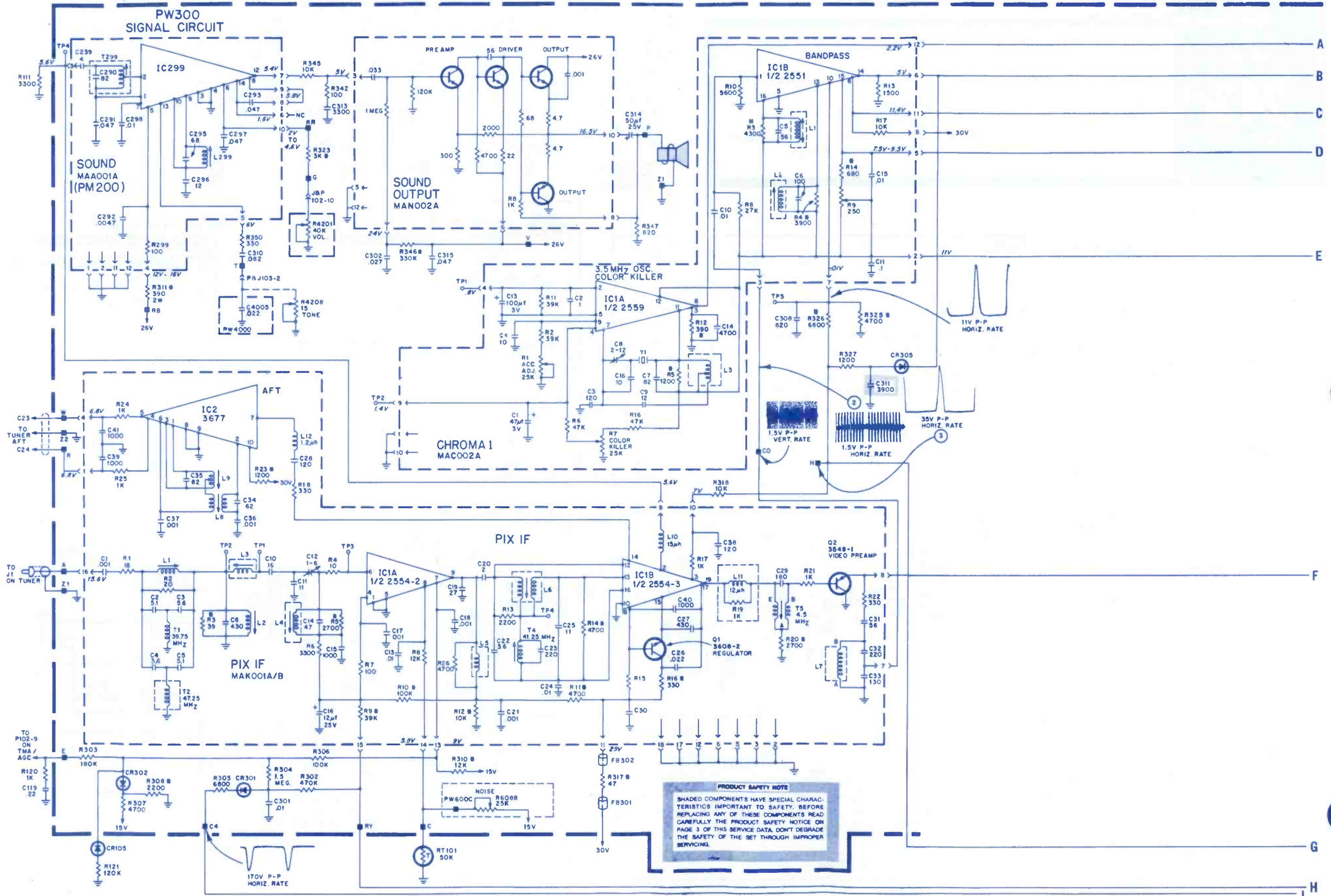
VHF TUNER SCHEMATIC



Q1-171207-1
Q2-171140-1
Q3-171207-2

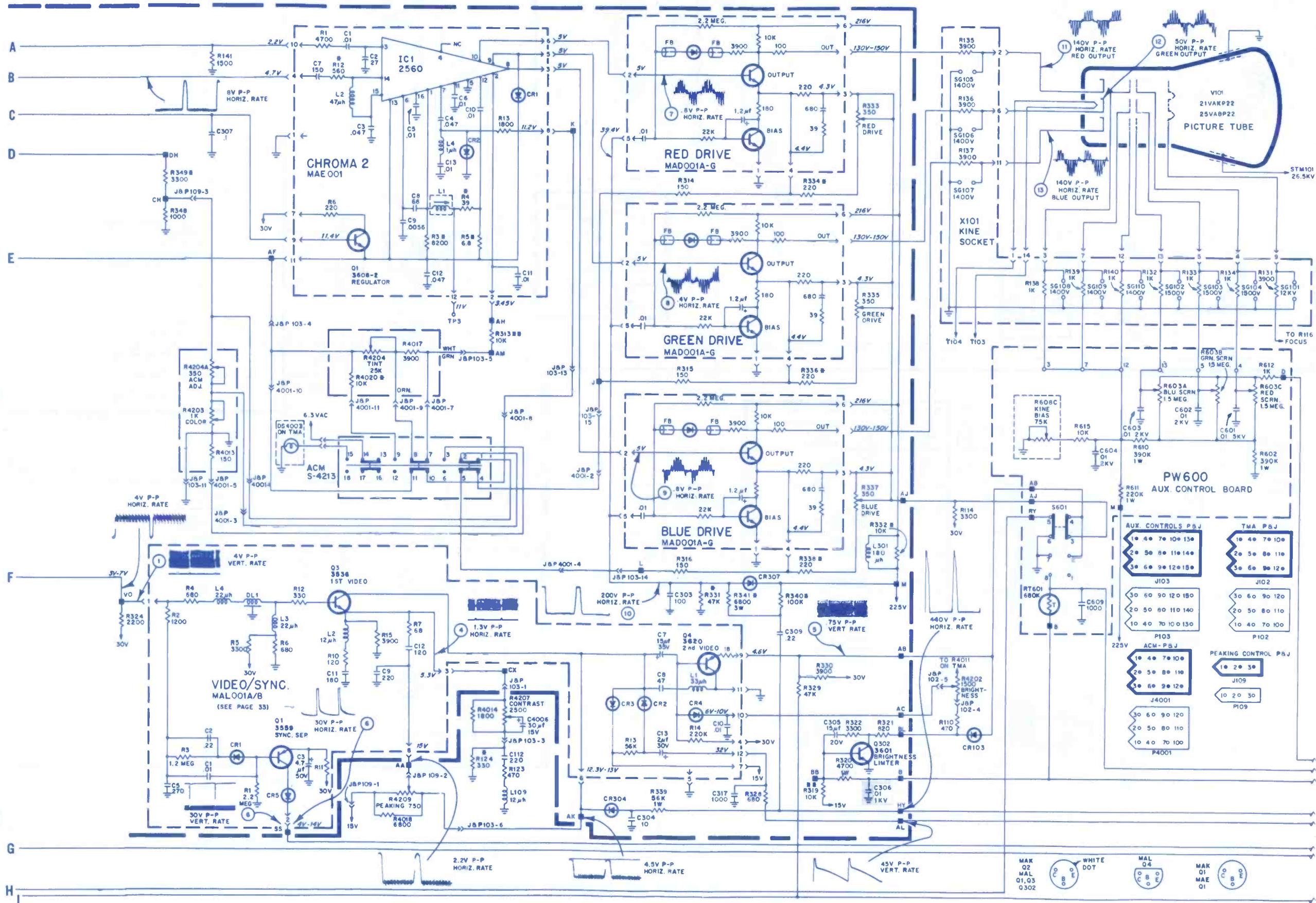


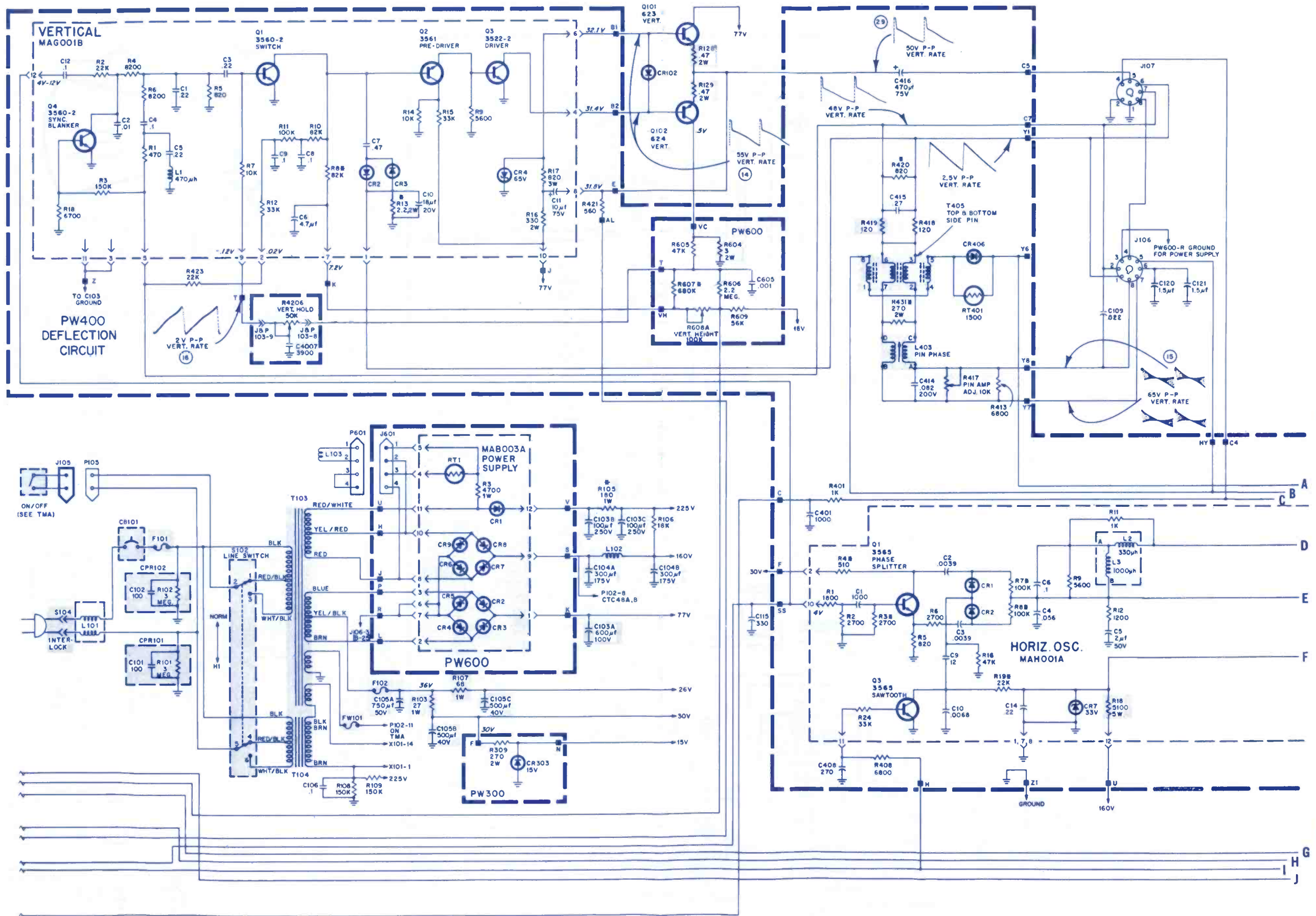
NOTES: UNLESS OTHERWISE SPECIFIED
1. CAPACITANCE VALUES MORE THAN 1 ARE IN PICOFARADS.
2. CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS.
3. RESISTORS ARE 1/2WATT, 10%.
CONTRAST & BRIGHTNESS CONTROLS ARE LOCATED ON THE CONTROL PANEL ON THE T966-02, 03, 05, & 06 VERSIONS ON THE BOARD ON T966-01 & 04.
PART OF ANODE LEAD ASSEMBLY.
VERTICAL HOLD CONTROL LOCATED ON THE CONTROL PANEL ON THE T966-03 & 06.
VOLTAGES WILL VARY WITH SETTING OF CONTROLS.

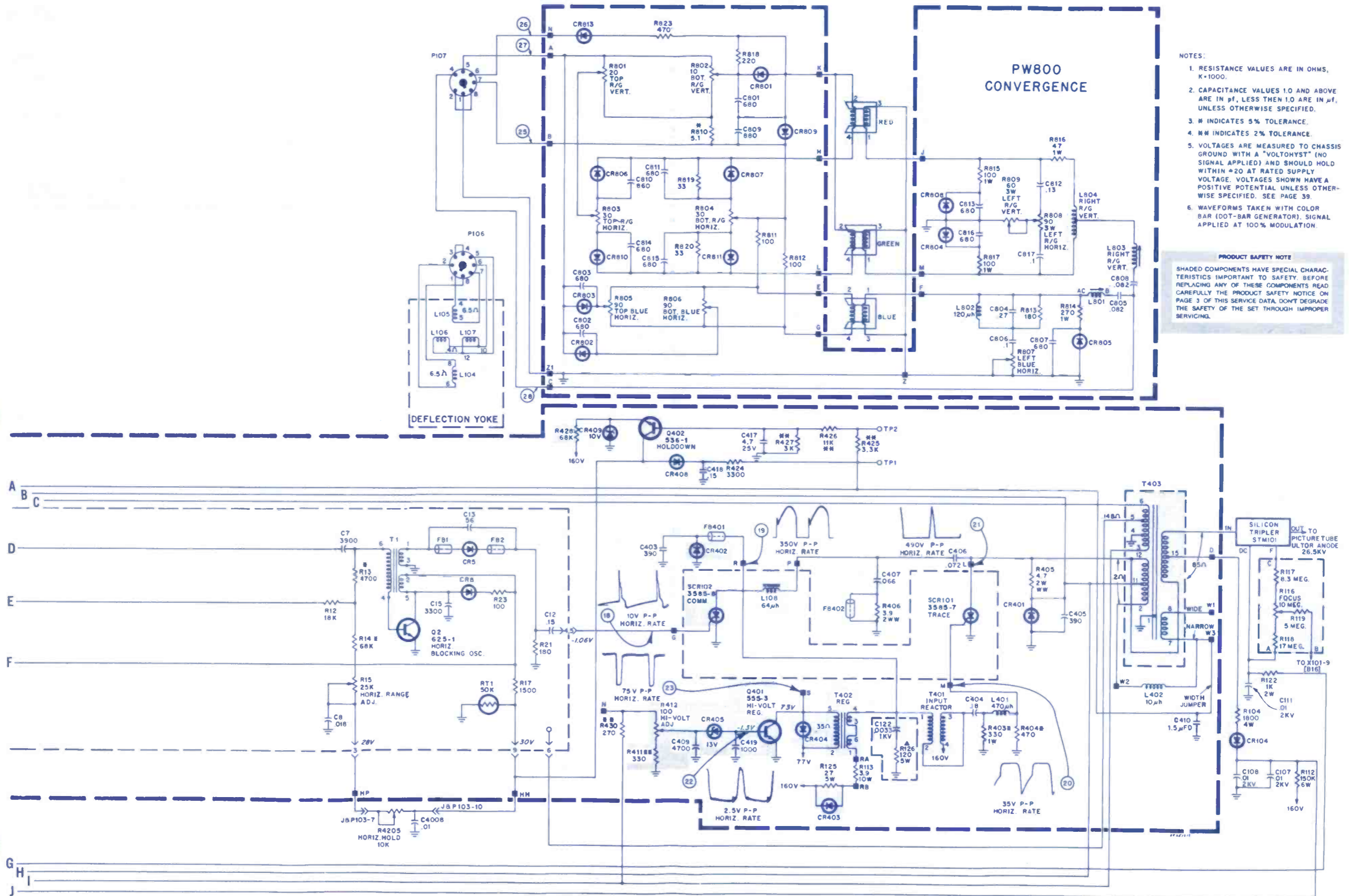


RCA CONTINUED NEXT PAGE

RCA SALES CORP.
Color-TV Chassis
CTC48 Series







- NOTES:
1. RESISTANCE VALUES ARE IN OHMS, K=1000.
 2. CAPACITANCE VALUES 1.0 AND ABOVE ARE IN μ F, LESS THAN 1.0 ARE IN μ F, UNLESS OTHERWISE SPECIFIED.
 3. W INDICATES 5% TOLERANCE.
 4. WW INDICATES 2% TOLERANCE.
 5. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHYST" (NO SIGNAL APPLIED) AND SHOULD HOLD WITHIN ± 20 AT RATED SUPPLY VOLTAGE. VOLTAGES SHOWN HAVE A POSITIVE POTENTIAL UNLESS OTHERWISE SPECIFIED. SEE PAGE 39.
 6. WAVEFORMS TAKEN WITH COLOR BAR (DOT-BAR GENERATOR). SIGNAL APPLIED AT 100% MODULATION.

PRODUCT SAFETY NOTE

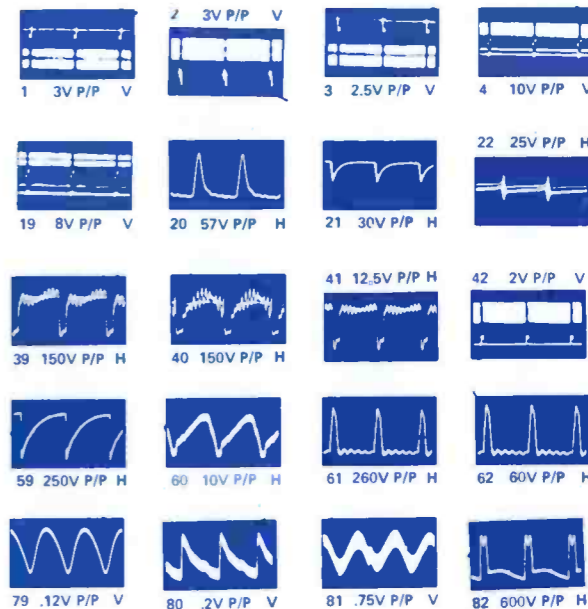
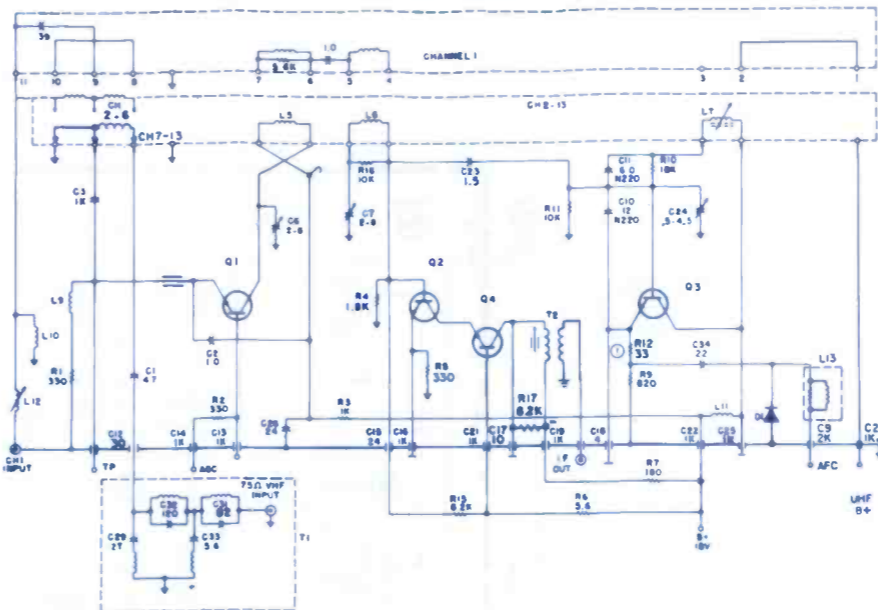
SHADED COMPONENTS HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS READ CAREFULLY THE PRODUCT SAFETY NOTICE ON PAGE 3 OF THIS SERVICE DATA. DON'T DEGRADE THE SAFETY OF THE SET THROUGH IMPROPER SERVICING.

SYMBOL DESCRIPTION MAGNAVOX PART NO.

Table with 3 columns: SYMBOL, DESCRIPTION, MAGNAVOX PART NO. Includes components like L12-sound detector coil, C133A,B,C-electrolytic, R154-metal oxide, etc.

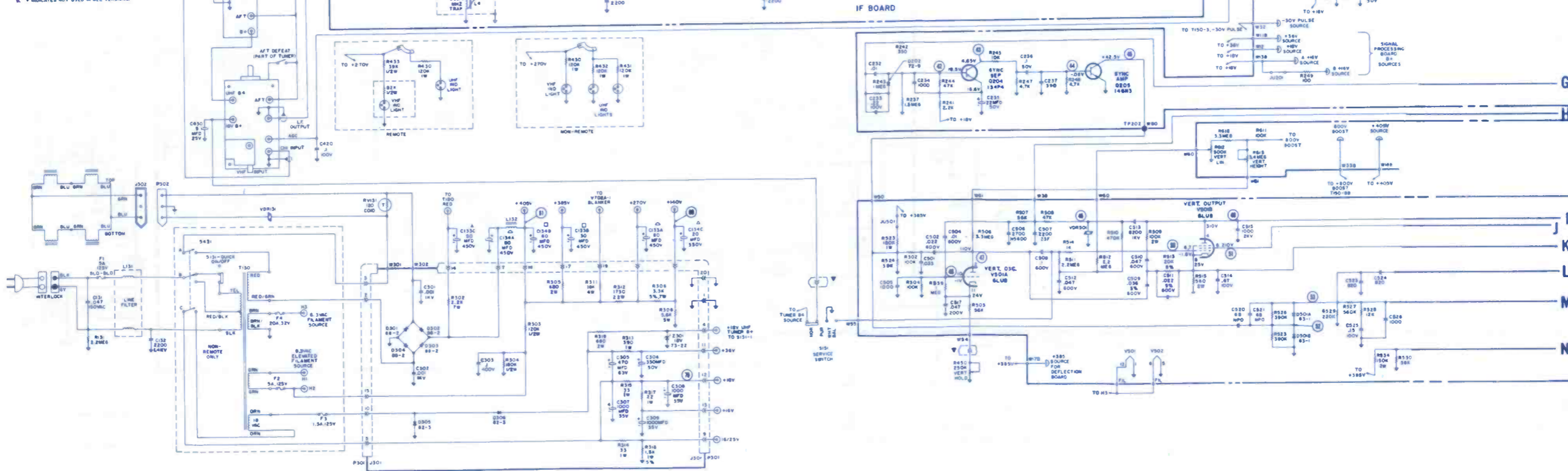
Table with 3 columns: SYMBOL, DESCRIPTION, MAGNAVOX PART NO. Includes components like R11-41.25 null control, R77-AFT DC balance control, R120-AGC control, etc.

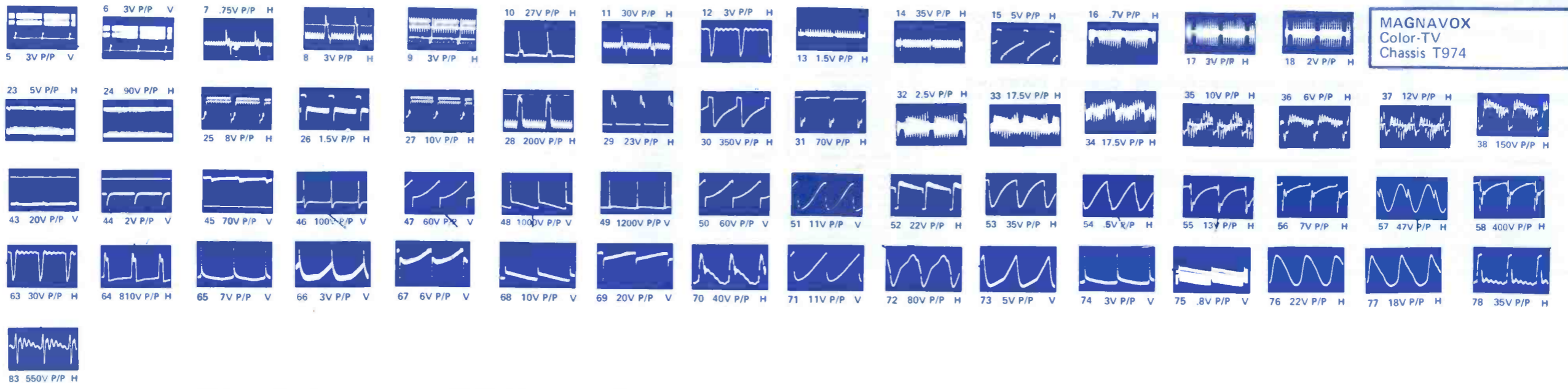
VHF TUNER SCHEMATIC DIAGRAM



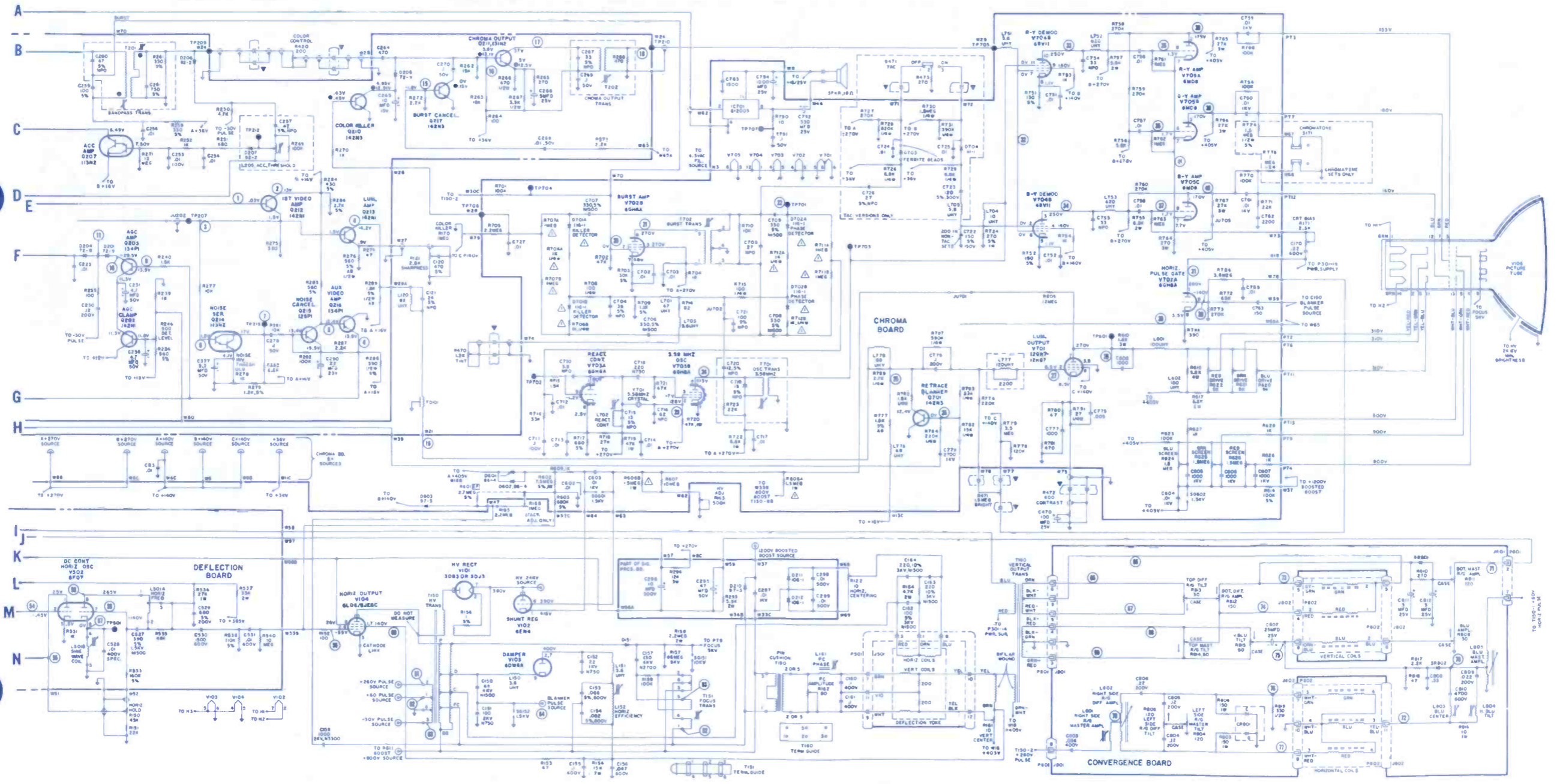
NOTES UNLESS OTHERWISE SPECIFIED.

- 1. INDICATES RESISTOR VALUES MATCHED WITHIN 5%.
2. COMPONENT LOCATED OFF BOARD.
3. COMPONENT LOCATED ON BOTTOM OF BOARD.
4. CAPACITANCE VALUES GREATER THAN 1 ARE IN MICROFARADS, LESS THAN 1 ARE IN PICOFARADS.
5. CAPACITORS RATED 50VDC, 10%.
6. RESISTORS ARE 1/4 WATT ON IF AND SMC PROC. BOARDS AND 1/2 WATT ELSEWHERE WITH 10% TOLERANCE.
7. DC VOLTAGES MEASURED WITH NO SIGNAL WITH CONTROLS SET FOR NORMAL OPERATION EXCEPT VOLTAGES MARKED WITH @ TAKEN WITH SIGNAL.
8. @ EARLY PRODUCTION.
9. V INDICATES NOT USED IN ALL VERSIONS.





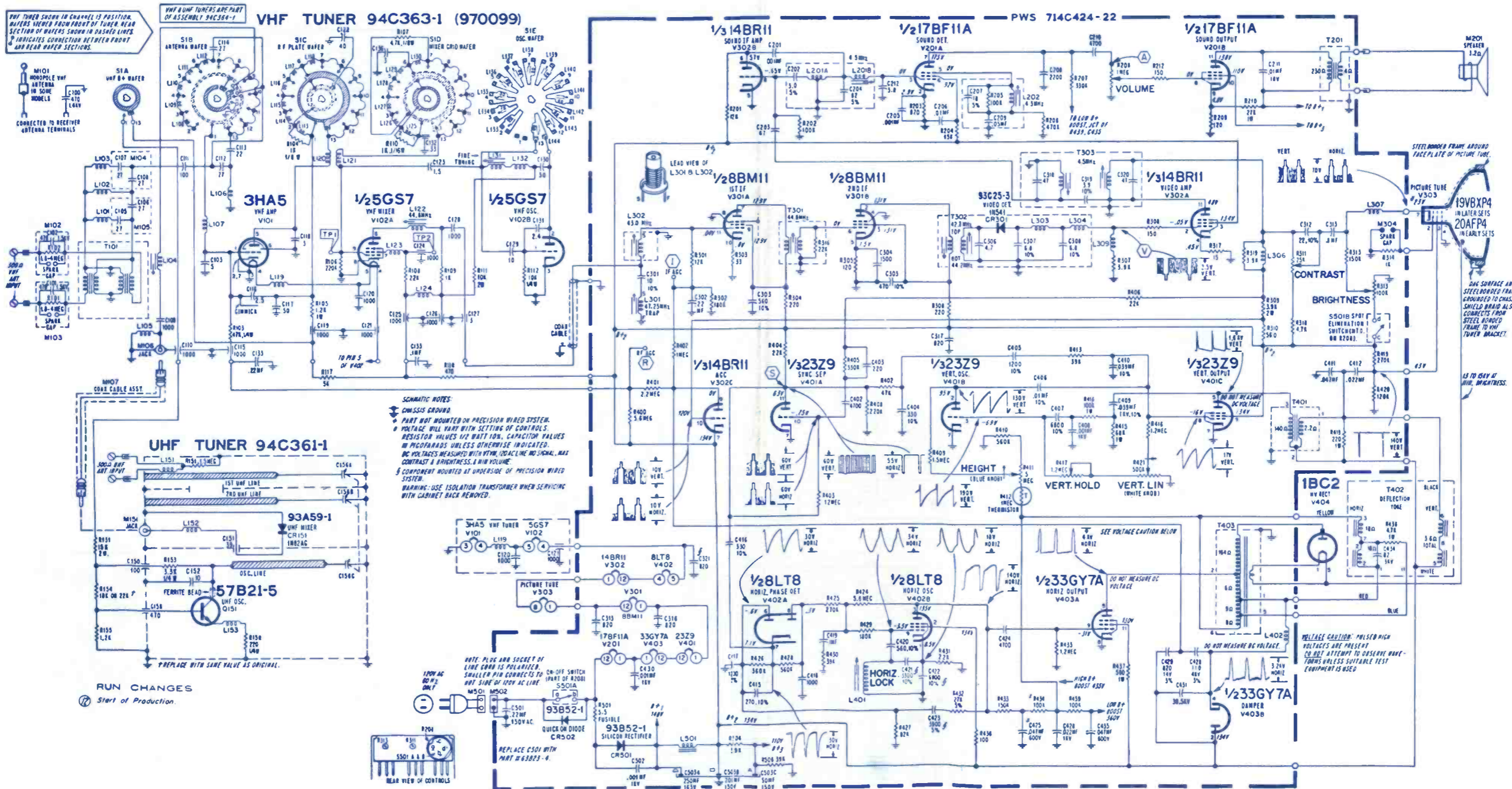
MAGNAVOX
Color-TV
Chassis T974



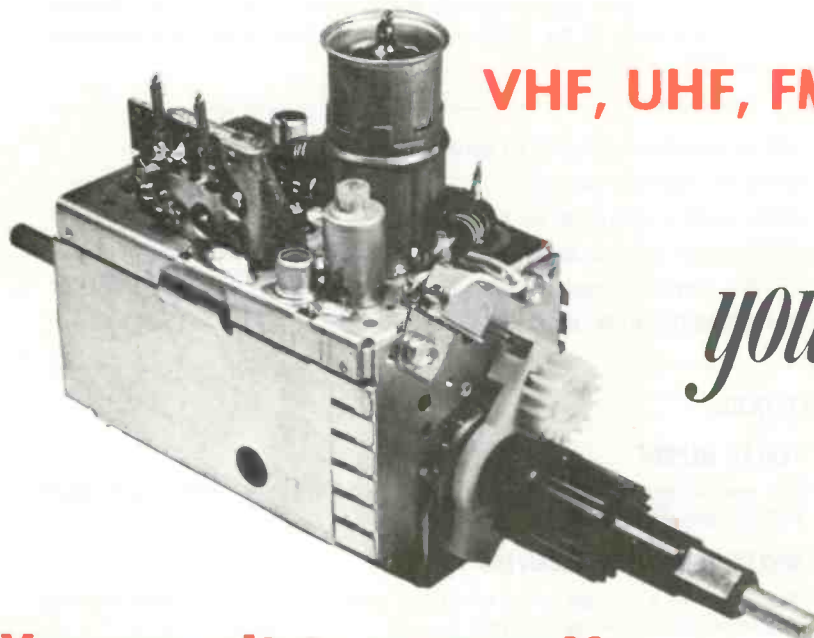
NOVEMBER • 1972

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SYMBOL	DESCRIPTION	EMERSON PART NO.
R208	1M vol control and on-off switch	75A126-2
R309	3900Ω 2w	970000
R311	25K contrast control	Part of R208
R313	100K brightness control	Part of R208
R411	5M height control	970001
R412	1M thermistor	61A41-2
R417	1.2M vert hold control	75A100-8
R421	500K vert linearity control	970002
R501	5.5A fuse	61A48-1
C503A	250μf, 165v elect	67A30-12
C503B	200μf, 150v elect	67A30-12
C503C	50μf, 150v elect	67A30-12
L202	quad coil (includes C207 & R205)	970013
L301	47.25MHz	72A308-8
L401	horiz lock coil	94A17-21
T201	audio output xformer	79A124-1
T301	1st IF xformer	970015
T302	2nd IF xformer (includes C306)	72A310-1
T303	sound takeoff & 4.5MHz trap	72A185-7
T401	vert output xformer	79A123-1
T402	deflection yoke assembly	970016
T403	horiz output xformer	79A138-2
	vhf tuner	970099
	uhf tuner	93A361-3



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WEST COAST—P. O. Box 41354—Sacramento, Calif. 95841	Tel. 916/482-6220
MOUNTAIN—P. O. Box 4145—Denver, Colo. 80204	Tel. 303/244-2819
SOUTHWEST—P. O. Box 7332—Longview, Tex. 75601	Tel. 214/753-4334
SOUTHEAST—P. O. Box 6771—Jacksonville, Fla. 32205	Tel. 904/389-9952

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- Antenna Coil Replacement Guide
- Multi-fit Replacement Tuner Shaft Guide

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NOVEMBER 1972 • VOLUME 94 NUMBER 11

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This month's cover photo is supplied through the courtesy of the John Fluke Manufacturing Co., manufacturers of the digital multimeter described in the Test Instrument Report on page 60.

- 3 TEKFAQ: Up-to-date schematics for easier servicing.
- 22 EDITORIAL: Space-Age Neighbor.
- 24 NEWS: Events of interest to our industry.
- 28 READER'S AID: What you need or have for sale.
- 30 LETTERS: Pertinent comments concerning past issues.
- 34 NEW AND NOTEWORTHY: Merchandise of special interest.

FEATURES

39 TEKLAB REPORT

The modular circuitry that we encountered when examining RCA's Model ER475 Portable Color-TV Set.

43 WHAT'S NEW IN TV RECEIVERS FOR 1973

The second in a two-part series of articles concerned with the TV sets that you may be selling or servicing next year.

49 KENWOOD'S KC-6060A SOLID STATE AUDIO LAB-SCOPE

The features that we observed when examining a scope designed for use by your audiophile customers.

56 BASIC DIGITAL CIRCUITRY

The first in a series of articles concerned with the type of digital circuitry that you may soon be servicing.

60 TEST INSTRUMENT REPORT

Reviewing specifications for Fluke's Model 8000A 3½-digit Multimeter.

- 62 COLORFAQ: Tips for easier color-TV set repair.
- 64 TECHNICAL DIGEST: Hints and shortcuts for more effective servicing.
- 67 NEW PRODUCTS: Instruments and components to make your job easier.
- 71 DEALER SHOWCASE: These items may increase your sales revenue.
- 75 TECHNICAL LITERATURE: Informative material that you may need.
- 77 BOOK REVIEWS: Our appraisal of recent publications.
- 78 ADVERTISER'S INDEX: Manufacturers concerned about you.
- 79 READER'S SERVICE: A source of additional information.



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



A complete new look from RCA in Antenna System Accessories

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

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INDEX

Multi-Set Couplers	3
Band Separators (Back of Set)	5
(Wall Mount)	7
Matching Transformers	8
Antenna Couplers	9
Interference Filters and Traps	11
Wall Outlets and Plugs	13
Preamplifiers	16
Distribution Amplifiers	24
Typical Distribution Systems	31

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Space-Age Neighbor



In the April issue of **ELECTRONIC TECHNICIAN/DEALER**, Isaac Blonder predicted that by early 1973 Canada would have a domestic TV satellite in space, providing up to 12 TV channels at

frequencies somewhere around 4GHz. Our September news section contained a photograph of that satellite, which is now scheduled to be in orbit this month—and may even be functioning in space by the time you read this editorial.

From the limited information that we have been able to obtain, it seems that the satellite was developed by the Hughes Aircraft Co. in El Segundo, Calif.; that it will be put into space by our government space center at Cape Kennedy, Fla.; and that it will be tracked with Hughes equipment in Guam as it is brought into synchronous orbit—all of these services having been provided under contract with Telesat Canada.

Since the satellite will be transmitting a beam width of $3\frac{1}{2}^\circ$ by $7\frac{1}{2}^\circ$, reception will not only be possible in Canada, but also in much of the United States. This satellite is expected to be located above the equator somewhere between 85° and 110° west longitude, 22,300 miles above the Pacific Ocean. Upon checking our maps and doing a little math, we observe that this could locate the satellite almost due south of Minneapolis, approximately $6\frac{1}{2}^\circ$ below the noon-day sun. Like the moon, we expect that the orbit of this satellite will appear to shift north and south, depending upon the seasons. Being in synchronous orbit, it should otherwise appear stationary.

I feel that this satellite is a real credit to Canada—a country that has had enough sense to use its

money to put our country's space-age technology to some practical use that directly affects the public.

Although I applaud their wise decision, I am annoyed by the fact that things are so snarled in Washington red tape that there have not yet been public announcements of even definite plans for such a system to serve our own country. We will instead be forced to borrow from a Canadian Satellite (made here in the U.S.) program material (quite possibly originated by one of the four major U.S. TV networks) not intended for our use.

I hope that the above paragraph has not offended any of my many Canadian friends. I greatly admire their nation and the significant work that it has done with a smaller population, and therefore a smaller economy. They too have great scientists, and I have observed when in Canada some of the excellent TV program material that they do originate for use in their nation. This situation is instead a slap in the face of our own country—where too many involved in communications are so wrapped up in their own interests that they fail to show adequate concern for the people in our own country's TV fringe and non-reception areas. CATV is not the only answer!

I feel that there are many parts of our nation where the population is much too thin for a system of wired TV to be economically feasible. There are also some population centers where people are lucky if they are even able to scrape together enough money to purchase a used TV set, let alone subscribe to a wired TV service.

CATV promoters are now most interested in high-density population areas that already have quite a number of over-the-air TV channels—selling the public on “better” reception (which sometimes actually

turns out to be worse) and additional program material. However, satellite systems, functioning on an international scale, can provide many, many times the program material available on even the most sophisticated CATV system, with the satellite antenna representing a one-time cost that can be less than that of a second TV set. Local TV stations can continue to provide the news and programs of special interest to the immediate geographical area. And as for two-way communications, AT&T is well on the road to developing public two-way video communications systems that are not limited to a mere 20 or so channels—each person having their own private or party line.

Several decades ago Budapest, Hungary went modern and installed wired music throughout the city—yet radio prevailed. Now we talk of a nation wired for pictures.

The CATV promoters are not the only people that would like to take away our right to over-the-air TV for their personal gain. Some manufacturers of two-way radios have openly spoken of eliminating this form of TV—choosing to disregard greater public needs. No one said much when we lost TV Channel 1—44 to 50MHz—to two-way radio, then later in many areas the top 14 UHF channels; but more recently we also lost the bottom seven UHF channels to such applications in the top 10 urban areas in the U.S. (Some day all automobiles will probably be equipped with two-way radios, but with computerized switching techniques, this should be possible through the proper budgeting of other portions of the radio spectrum.)

Since the Canadians did purchase this satellite for their own domestic use, most of us in the U.S. are rather ignorant concerning the exact microwave

continued on page 78

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NEWS OF THE INDUSTRY

Board Approves Changes In IS CET Program

At the NEA and IS CET board meetings in Omaha, Neb. during the first week of October, some basic changes and clarifications were made concerning the IS CET program.

It was decided that the serviceability rating of consumer electronic products—formerly an NEA function that has been given much publicity by some TV set manufacturers—will in the future be an IS CET function with the administrative support of NEA.

In response to pressures by some correspondence schools, IS CET will set up a committee concerned with the rating of more schools. In the opinion of the IS CET Board, many correspondence schools currently fail to include an adequate hands-on approach, relying too heavily on theory in their curriculum. Therefore, only two correspondence schools have thus far received the association's endorsement.

At the request of some members, a standardization of the use of the initials CET after the signature of those having passed the CET Exam was recommended. It has been suggested that the association promote the use of these initials by everyone passing the exam, and that they appear in capital letters without periods—as in the signature following this month's editorial.

The questions supplied this month are similar to those included in Part VI of the CET Exam.

Section VI Instruments

1. A basic meter movement uses shunts to change the (current/voltage) ranges.

2. The curve tracer can be used to check voltage versus current characteristics of any active solid-state devices. (True/False)
3. Calibration of the vertical amplifiers in a scope is normally a "factory-type" setting. (True/False)
4. A sawtooth voltage is normally used for a time base at the horizontal plates in the scope's CRT. (True/False)
5. A post marker generator used in alignment places markers on a response curve by injecting energy into the unit being aligned. (True/False)

Explanation

1. Shunts are used to bypass some of the current around the meter movement to increase the current ranges. Series resistances are used to limit meter current in volt-meters.
2. True. The curve tracer "looks" at current from one element of the solid-state component while that element's voltage is varied; such as, collector current versus collector voltage.
3. False. Calibration is normally a "front-panel" adjustment on most vertical amplifiers in scopes.
4. True. A sawtooth is used to deflect the electron beam in the horizontal direction at a linear rate from left to right (as viewed from the screen) and to return the beam quickly to the left side. The left-to-right movement can then be calibrated in units of time since the movement is linear with respect to time.
5. False. A post marker generator injects energy onto the response curve after it comes from the unit being aligned.

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**Solid-State
Triggered
Sweep 10MHz
Oscilloscope**

\$379.⁹⁵

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Those attending the meeting held for the St. Louis "Open Sesame Street" project include: (L to R) Mrs. Lillie Milkie, Chairman of the project (AOA Aux.); Vincent Lutz, CET, NEA Director of Special Activities; Carol Wells, Mayor's Council on Youth; and Marilyn Rothbard, Consultant to KETC School Services. The "Open Sesame Street" Project for providing TV sets to non-profit day-care centers, thus enabling pre-school disadvantaged children to watch Sesame Street, was "Kicked Off" in October in St. Louis. The project is sponsored by The American Optometric Assn. Auxiliary and National Electronic Assns. The AOA Auxiliary will collect the donated TV sets and NEA members will safety check them before delivery to the day-care centers. The program is national in scope.

Service Dealer Contributes \$124.50 to S.I.S. Fund

At the Joint Convention in New Orleans last August, Bob Harrison handed Morris L. Finneburgh, Sr., E.H.F., Trustee for the S.I.S. Fund, a check for \$124.50 that he

A Message to All Independent TV Service!

*The Finney Antenna Company offers congratulations to
NATESA and NEA
on their Historical Merger Project!*

The Finney Antenna Company is highly honored by the unanimous selection of its Senior Officer—M. L. Finneburgh, Sr., E.H.F. — as Moderator-Chairman of the all important NATESA/NEA Joint Merger Committees.

The Finney Antenna Company Board of Directors — recognizing that the future security of Independent TV Service is seriously involved — has taken the following action:

“Morris L. Finneburgh, Sr., E.H.F. has been temporarily relieved of certain important Company administrative responsibilities in order to invest his maximum time, efforts and guidance in behalf of the TV SERVICE INDUSTRY MERGER PROJECT”.

The Finney Antenna Company knows no ethically better way of continuing to earn the respect, confidence and patronage of our Industry.



Morris L. Finney, Jr.,
President

had received from Richard S. Megyese of Hi Fi Clinic, Inc., Virginia Beach, Va.

We were advised that this generous gift represented 50 percent of the insurance rebate that Mr. Megyese received as a result of his activities with the Virginia Electronics Assn.

We hope to hear of many other similar contributions by other service dealers concerned with maintaining the public image of Superior Independent Service.

Merger Committee Conducts Successful Memphis Meeting

The first of a series of NATESA/NEA Merger Committee Meetings was held at the Admiral Ben Bow Hotel in Memphis, Tenn. on September 29 and 30, 1972. The Friday meeting lasted until approximately 3:00 in the morning, while the Saturday session was from 9:00 a.m. until 4:00 p.m. The meeting was attended by the following members of the NATESA Committee: Leroy Ragsdale, Ft. Smith, Ark., Chairman; Gerald Hall, Milwaukee, Wis.; Clifford Shaw, Va.; George Weiss, Chicago, Ill.; and Edward Gorman, N.Y. The attending NEA Committee members were: Norris Browne, Houston, Tex., Chairman; Charles Couch, Fla.; Virgil Gaither, Calif.; Emmett Hughes, Kan.; and Paul Dontje, Denver, Colo.

Les Nesvik, the ex-official member representing ISCET, could not attend due to an important previous engagement. The Joint Committee Chairman, Morris Finneburgh, Sr., appointed Mr. Ragsdale as Recording Secretary for the present and subsequent Joint Committee Meetings and Mr. Browne as Parliamentarian.

A surprisingly substantial amount of progress was ac-

complished at the first meeting. Plans were set up for a subcommittee to develop a complete package, including by-laws, constitution and procedure for the election of a Board of Directors and officers. Tentatively a name for the new association is—NESDA (National Electronic Service Dealer Association). The name is subject to possible change.

It was unanimously agreed that Frank Moch (NATESA) and Richard Glass (NEA) would be elected to the position



of Executive Vice Presidents for the new association. A subcommittee will, at subsequent committee meetings, present an outline of their separate duties. It was suggested that in the broad sense Mr. Moch have the responsibility of public
continued on next page

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NEWS ...

continued from page 25

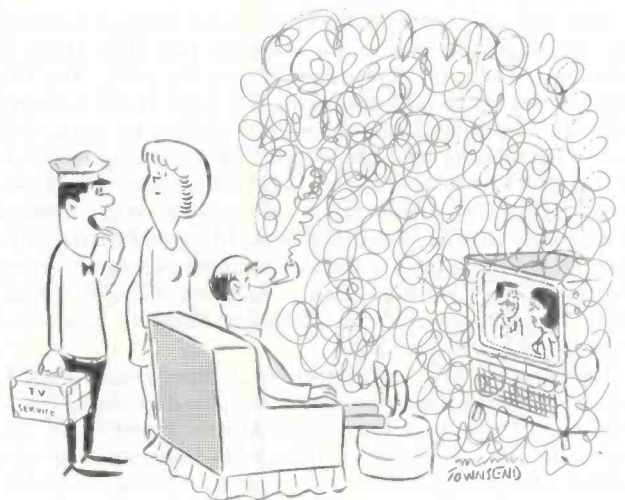
relations, governmental contacts, publicity and other such procedures and responsibilities; while Mr. Glass would be in charge of internal and administrative affairs.

The Joint Committee agreed that no paid official of the new association would be allowed to own or independently operate a publication in the field of Independent Service. The Joint Committee unanimously agreed that there should be a continuation and maximum support of the CET Examination, IS CET and the development of a "shop certification" similar to the program initiated by NATESA. The Joint Committee unanimously decided that Messrs. Moch and Glass would not be invited to the next Joint Committee Meeting, but that an invitation would be considered for subsequent committee meetings. The next Joint Committee Meeting will be held in the first week of December 1972 in Denver, Colo with Mr. Paul Dontje as host.

Many other subjects pertaining to the procedure of merger were discussed at length and in most cases there was unanimous agreement with only the matter of detailed refinements to be accomplished. At the Denver meeting it will be decided as to whether or not the Joint Merger Committees will request early ratification by the governing bodies of NATESA and NEA and their membership, or to await the 1973 Joint NATESA/NEA Convention in Kansas City for the finalizing of the merger.

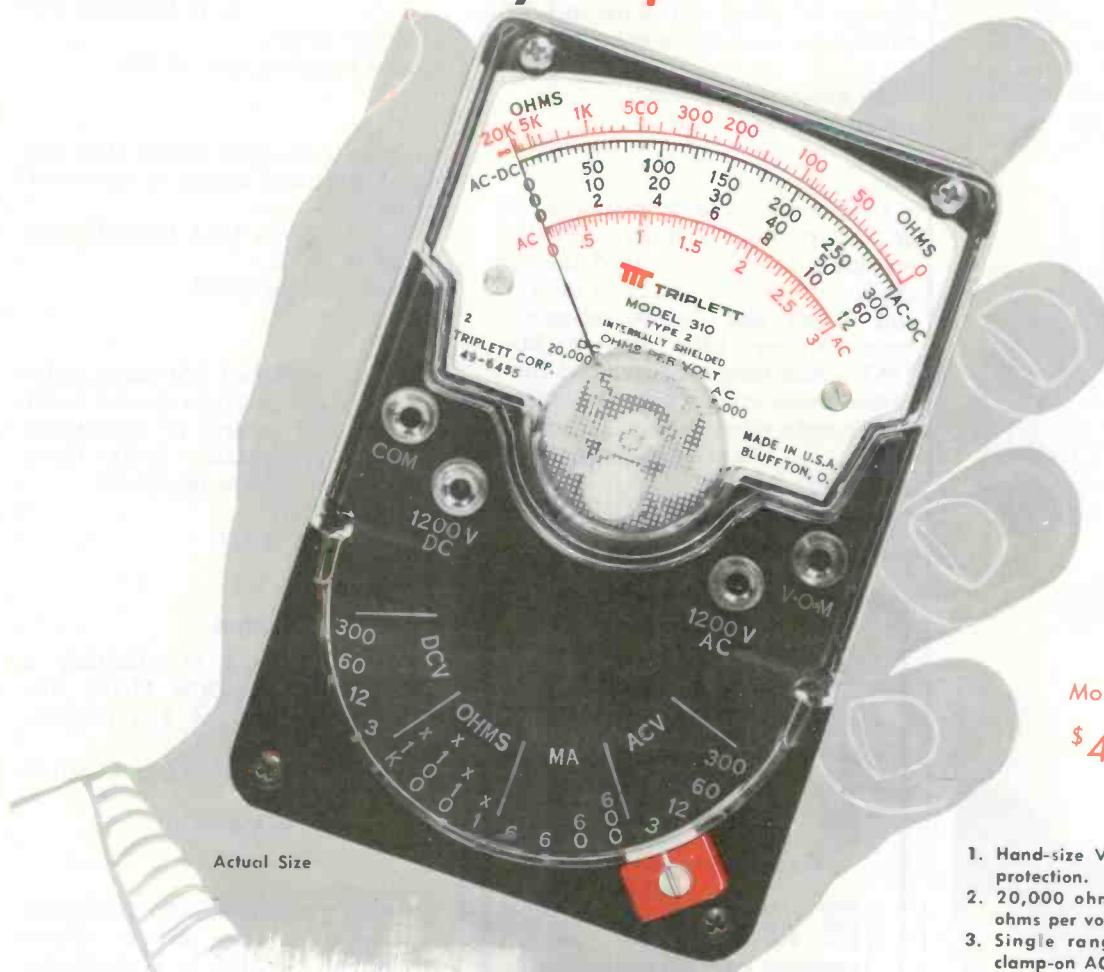
Much concern and good discussion was accomplished on the subject of retaining and protecting the reputation, image and dignity of both NATESA and NEA and their professional executive leaders: Messrs. Moch and Glass. No specific motion nor discussion was presented in reference to the location of the 1974 convention. However, if the merger is accomplished and ratified by the time of the Kansas City Convention in August, 1973, it was generally agreed that a 1974 Hawaiian Convention to celebrate the merger would be acceptable.

At the close of the long and extremely constructive Joint Merger Committee Meeting, a motion was unanimously passed thanking Mr. Finneburgh, Sr., E.H.F. for his untiring effort as Chairman, and asking that he continue to act as Chairman and Co-ordinator of subsequent meetings until the merger project is completed. It was generally agreed by all in attendance that a "giant step forward" had been taken in behalf of the image and future security of all Independent Service. When the new national association is accomplished, plans are in the works for an all-out effort to reach a membership of 10,000.



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Buy **Triplett's 310**



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gedness of a suspension movement and the convenience of a polarity-reversing switch, insist on Triplett's **Model 310-FET** at **\$78**

See them all at your local Triplett distributor or, for a free demonstration, see him or your Triplett sales representative. Triplett Corporation, Bluffton, Ohio 45817.

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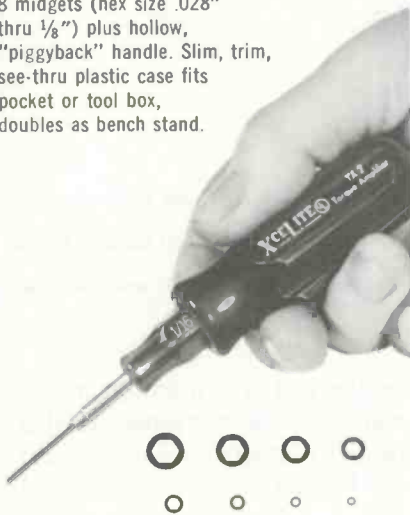
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For Sale

I have previous issues of ELECTRONIC TECHNICIAN/DEALER from January 1958 to present, less schematics. Will sell them in one batch very reasonable. My age is forcing retirement, so I will have no further need for them.

W. B. GARNER

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Amarillo, Texas 79107

I have for sale a complete set of ELECTRONIC TECHNICIAN/DEALER magazines from August 1965 through the current issue. I also have the Circuit Digest and Tekfax schematics from October 1960 through May 1965, which have been removed from earlier copies due to space limitations. Please make offer.

WILLIAM H. RAUCKMANN

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Colorado Springs, Colo. 80915

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Having reached retirement age, I wish to find a qualified buyer for my TV sales and service business, which has been built over a nine year period. The 800 sq ft block building and technician cottage are located on the 1/3 acre lot. This business has been a pa and ma operation with a gross average over five years of \$40,000. Sale includes complete up-to-date equipment and inventory. Please write for complete details.

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I have a two-man service shop for sale. I will send details to interested parties.

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I am interested in obtaining a schematic for a VOCA Model 101, built by Demolab of Los Angeles, Calif.

GARY L. MILLS

1511 E. 7th St.
Parkersburg, W.Va. 26101

I need a schematic for a Stromberg Carlson short wave receiver, Model 230-H. If available, a photographic view of the chassis would be helpful.

LARRY COLLINS

88 Cornell Dr.
Enfield, Conn. 06082

I need an operating manual and schematic for a Jackson Universal Oscillator, Model 420.

IDEAL STORE OF CATSKILL

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I need a schematic and power transformer, No. P-18-165, for a Paco Model 5-50 oscilloscope.

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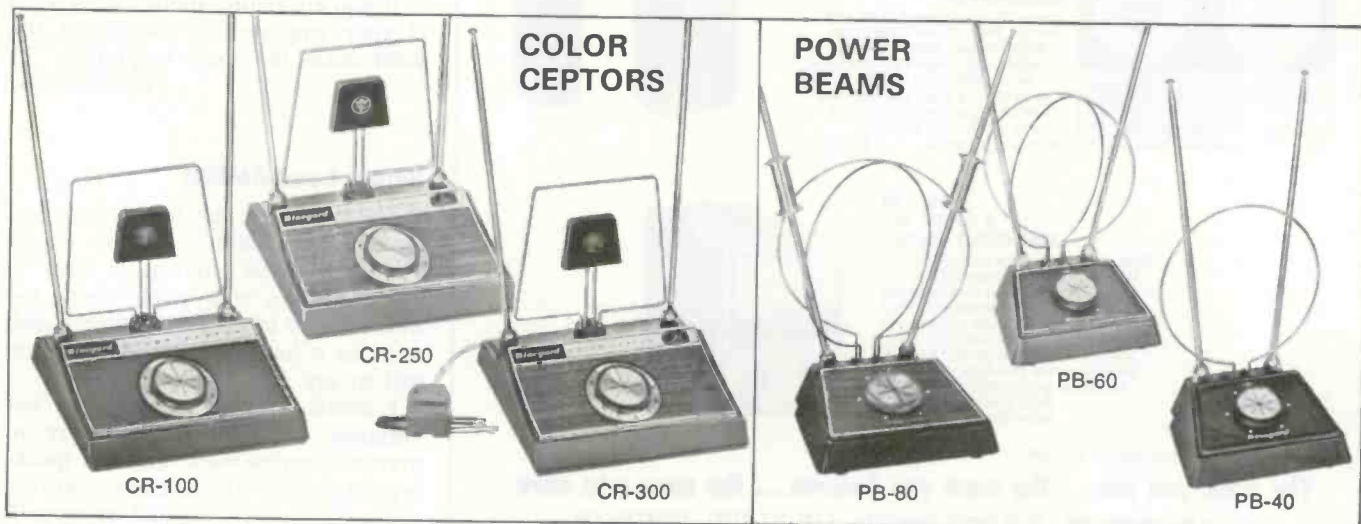
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LETTERS

Reader comments concerning past feature articles, Editor's Memos, previous reader responses or other subjects of interest to the industry.

Working in a Toy Shop

About a year ago, I was at a service training meeting and met an interesting fellow. He had been working for a dealer that knew nothing about electronics other than to tell this techni-

cian to "fix it."

The technician, who seemed to be qualified, had been unable to get much test equipment over the years that he was employed for this dealer. He had hobby-type equipment, as that was all the dealer would pay for. This technician, alone in his "toy" shop, was doing the best that he could with the equipment the store owner would provide. As time went on, some of his "cheap" equipment broke down and the dealer would not replace it or provide funds for repair—saying the equipment was not needed.

Toward the end, the only piece of equipment left working in the shop was a cheap VOM, which after many years of hard use finally broke down. When the technician tried to replace it, the shop owner hit the roof, saying it was not needed. So here was a man working under stone-age conditions with no equipment, yet required to operate this dealer's repair department.

What did he do? He quit! The real topper was that the dealer was paying this man, I believe after seven years with the store, \$75.00 per week. We were all stunned at the meeting when he related the story during a break. I no longer remember where he worked, his name or other details.

However, I do recall him saying that the very next day he went down the street and got hired for a "living wage" at a fully equipped shop.

I have often thought of this man and how he must have been "brainwashed" into believing that his job was the only one left on the face of this earth. And with such fear, for all those years had been unable to bring himself to quitting.

I believe that through our associations and trade publications we are made aware of the fact that we must conduct ourselves in a top professional manner—demanding, within reason, proper professional equipment, demanding and getting a "living wage," and in turn *earning* our money.

Even this man saw that he was a fool all those years. Many have slipped into this condition without seeing it happen.

Step back, fellow technician, what is the condition where you work? What is the money you are making? Are you giving your employer a fair day's work? Do you buy books and trade publications to know how to do your job properly? Are you keeping up with the new things? Do you go to the service sessions?

If you are falling short, "shape up." If your employer is giving you the short end of the stick, "bug out."

TIM SKONING

Leader

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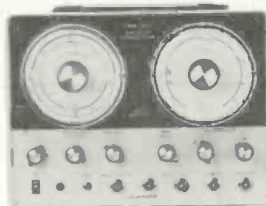
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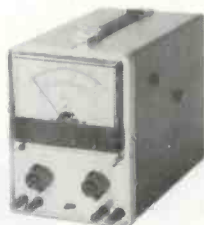
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Voices Loud AMEN!

Just a line to say that I have just read your Editor's Memo about "Three Brothers" and your reply to the gentleman who wrote about too much theory in the CET exam; I wish to voice a loud AMEN! to what you had to say.

I couldn't agree more on the importance of fundamental theory in practical service work, and I'm speaking not only as an electronics instructor

continued on page 32

7

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- merizes, resulting in a solid, rock-hard capacitor section.
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.022	29/64 x 15/16	2PS-S22	.0056	15/32 x 3/4	6PS-D56	.033	19/32 x 1 3/8	10PS-S33
.047	33/64 x 15/16	2PS-S47	.006	15/32 x 3/4	6PS-D60	*.039	43/64 x 1 3/8	10PS-S39
.05	33/64 x 15/16	2PS-S50	.0068	15/32 x 3/4	6PS-D68	.047	43/64 x 1 3/8	10PS-S47
.1	35/64 x 1 1/4	2PS-P10	.0075	15/32 x 3/4	6PS-D75	*.056	47/64 x 1 11/16	10PS-S56
.15	5/8 x 1 1/4	2PS-P15	.008	29/64 x 15/16	6PS-D80	.068	47/64 x 1 11/16	10PS-S68
.2	43/64 x 1 3/8	2PS-P20	.0082	29/64 x 15/16	6PS-D82	*.082	47/64 x 1 11/16	10PS-S82
.22	43/64 x 1 3/8	2PS-P22	.01	29/64 x 15/16	6PS-S10	.1	49/64 x 1 11/16	10PS-P10
.25	43/64 x 1 3/8	2PS-P25	.012	31/64 x 15/16	6PS-S12			
.33	11/16 x 1 11/16	2PS-P33	.015	31/64 x 15/16	6PS-S15	1600 VOLTS D-C		
.47	49/64 x 1 11/16	2PS-P47	.02	35/64 x 15/16	6PS-S20	.0005	1/2 x 7/8	16PS-T50
.5	49/64 x 1 11/16	2PS-P50	.022	35/64 x 15/16	6PS-S22	.001	13/32 x 7/8	16PS-D10
			.025	35/64 x 15/16	6PS-S25	.0015	7/16 x 7/8	16PS-D15
400 VOLTS D-C			.027	17/32 x 1 1/4	6PS-S27	.002	1/2 x 7/8	16PS-D20
.01	15/32 x 3/4	4PS-S10	.03	17/32 x 1 1/4	6PS-S30	.0022	1/2 x 7/8	16PS-D22
.015	33/64 x 3/4	4PS-S15	.033	17/32 x 1 1/4	6PS-S33	.003	7/16 x 1 1/8	16PS-D30
.02	31/64 x 15/16	4PS-S20	.035	17/32 x 1 1/4	6PS-S35	.0033	7/16 x 1 1/8	16PS-D33
.022	31/64 x 15/16	4PS-S22	.039	19/32 x 1 1/4	6PS-S39	*.0039	31/64 x 1 1/8	16PS-D39
.025	31/64 x 15/16	4PS-S25	.04	19/32 x 1 1/4	6PS-S40	.004	31/64 x 1 1/8	16PS-D40
.03	17/32 x 15/16	4PS-S30	.047	19/32 x 1 1/4	6PS-S47	.0047	31/64 x 1 1/8	16PS-D47
.033	17/32 x 15/16	4PS-S33	.05	19/32 x 1 1/4	6PS-S50	.005	31/64 x 1 1/8	16PS-D50
.04	33/64 x 1 1/4	4PS-S40	.056	41/64 x 1 1/4	6PS-S56	.006	17/32 x 1 1/8	16PS-D60
.047	33/64 x 1 1/4	4PS-S47	.06	41/64 x 1 1/4	6PS-S60	.0068	17/32 x 1 1/8	16PS-D68
.05	33/64 x 1 1/4	4PS-S50	.068	41/64 x 1 1/4	6PS-S68	.007	17/32 x 1 1/8	16PS-D70
.056	37/64 x 1 1/4	4PS-S56	.075	41/64 x 1 1/4	6PS-S75	.0075	17/32 x 1 1/8	16PS-D75
.068	37/64 x 1 1/4	4PS-S68	.082	11/16 x 1 3/8	6PS-S82	.008	3/8 x 1 3/32	16PS-D80
.075	37/64 x 1 1/4	4PS-S75	.1	11/16 x 1 3/8	6PS-P10	.01	3/8 x 1 3/32	16PS-S10
.1	41/64 x 1 1/4	4PS-P10	.15	47/64 x 1 11/16	6PS-P15	.015	21/32 x 1 19/64	16PS-S15
.15	43/64 x 1 3/8	4PS-P15	.2	27/32 x 1 11/16	6PS-P20	*.018	3/4 x 1 19/64	16PS-S18
.2	43/64 x 1 3/8	4PS-P20	.22	27/32 x 1 11/16	6PS-P22	.02	3/4 x 1 19/64	16PS-S20
.22	43/64 x 1 3/8	4PS-P22	.25	27/32 x 1 11/16	6PS-P25	.022	3/4 x 1 19/64	16PS-S22
.25	43/64 x 1 3/8	4PS-P25	.33	59/64 x 1 11/16	6PS-P33	.03	3/4 x 1 39/64	16PS-S30
			.47	1 1/64 x 1 11/16	6PS-P47	.033	3/4 x 1 39/64	16PS-S33
						.04	27/32 x 1 39/64	16PS-S40
						.047	27/32 x 1 39/64	16PS-S47
						.05	27/32 x 1 39/64	16PS-S50
						2000 VOLTS D-C		
						.001	3/8 x 1 1/4	20PS-D10
						.0015	27/64 x 1 1/8	20PS-D15
						.0022	15/32 x 1 1/8	20PS-D22
						.0033	33/64 x 1 1/8	20PS-D33
						.0047	1/2 x 1 3/8	20PS-D47
						.0056	37/64 x 1 3/8	20PS-D56
						.0068	37/64 x 1 3/8	20PS-D68
						*.0082	39/64 x 1 3/8	20PS-D82
						*.027	51/64 x 1 11/16	20PS-S27

*New rating



MEMBER

For information on Sprague's broad line of components for the service trade, get Catalog C-620 from your Sprague Distributor or write to Sprague Products Co. 65 Marshall St., North Adams, Mass. 01247

THE BROAD-LINE PRODUCER OF ELECTRONIC PARTS



65-2105

... for more details circle 133 on Reader Service Card

LETTERS...

continued from page 30

tor, but also as a graduate from the school of hard knocks! Countless are the ways I used basic theory in the dozen or so years I spent in the radio-TV service business before embracing the teaching profession.

The only complaint I had when I wrote my CET exam was that a few questions were somewhat ambiguous; but then so were some of the test questions I composed for our students in my first year of teaching! I've

learned a lot about wording exam questions properly, in the last ten years! Presumably, NEA will periodically revise their CET exams, and I would hope that these ambiguities will be removed.

Keep up the good work, Phil.

LAMBERT HUNEALT

Any Reference Material Permitted?

I have been following, with great interest, your recent series concerning the CET Exam.

I would like to add that in my opinion if a fella has to drag out a few books and brush up on theory a little to pass the exam, it's still a small price to pay if it will help us police our profession (and it needs it!) and make it more difficult for people who are lazy, incompetent or dishonest to make a bad name for those of us who are not.

Also, in regard to the exam (as I intend to take it), is one entitled to have any reference material on hand or is it strictly from the top of your head?

Thank you for letting me say my piece.

JOHN BOSHEAR

BOSHEAR ENTERPRISES

Sorry, no reference material or notes allowed. Ed.

If we don't have the needle, there's no point in looking for it.

We're a prime manufacturer of phonograph needles and cartridges. So we're always ahead in needle knowledge. That's why your E-V/Game distributor always has just the right replacement needle you want. Factory sealed. Attractively packaged. And priced right.

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Division of Electro-Voice, Inc. • A GULTON Company
In Canada: E-V of Canada, Ltd., Gananoque, Ontario

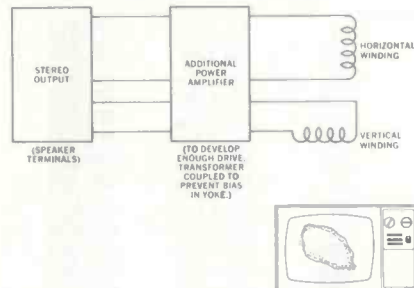


... for more details circle 111 on Reader Service Card

Interesting Window Display

Another technician and I have converted an old color-TV set into a unique (we think) advertising display. Since your magazine is aimed at the radio and television servicemen and dealers, we thought they may be interested in making a similar display for their business.

In essence we took off the yoke in a 21-in. (90°) TV set and replaced it with an identical yoke to which the



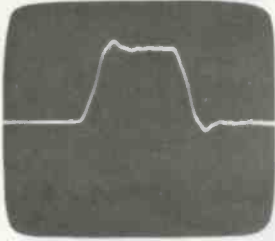
output of a stereo system was connected (the original yoke remained functional for the high-voltage supply). The result is a myriad of patterns 180° displaced from each other.

A color-TV set not worth repairing may be ideal for this eye-catching display . . . only the high voltage and dc voltages to the guns must be working properly. A weak picture tube is okay as long as the three guns are alright (we used a booster on ours).

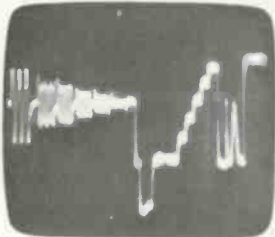
There are many possibilities for visual display . . . music and voice, of course, produce many effects, but other sources such as a short-wave receiver output of code Teletype, etc. are interesting. For an added effect, we recorded some advertising for the store and piped it into the yoke to make the patterns coincide with our sales pitch.

VERN ELDRIDGE

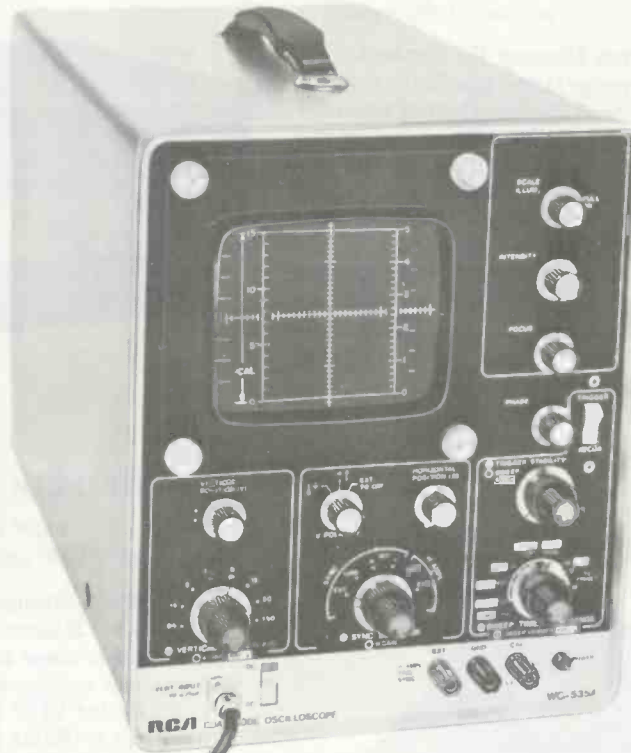
TRIGGERED SWEEP



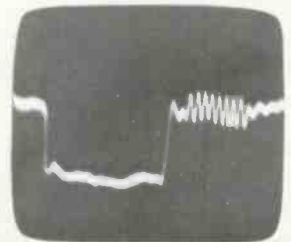
250-nanosecond (¼-microsecond) pulse demonstrates trace expansion and rise time capability of the new RCA WO-535A in Triggered Sweep Mode.



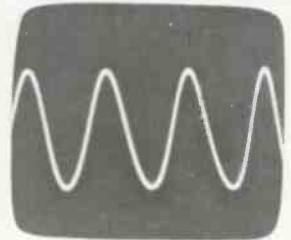
Typical TV VITS pattern on the new RCA WO-535A in Triggered Sweep Mode.



RECURRENT SWEEP



Expanded video signal on the new RCA WO-535A in Recurrent Sweep Mode shows the horizontal sync pulse and 3.58 MHz color-burst signal.



3.58 MHz sine-wave as shown on new RCA WO-535A in Recurrent Sweep Mode.

Now...a 5-inch triggered/recurrent sweep oscilloscope for only \$329*

It's the all solid-state RCA WO-535A featuring one-step calibration for simplified voltage measurements and usable frequency response to 10 MHz.

In the Triggered Sweep Mode, you can lock in waveforms and patterns that cannot be viewed easily using recurrent sweep. Triggered sweep with wide, variable trace expansion permits you to view small segments of complex waveforms, such as vertical-interval test signals (VITS). In the Recurrent Sweep Mode, you get all the ad-

vantages of a conventional continuous-sweep oscilloscope.

There are many other features of the WO-535A you'll like — and your RCA Distributor will be glad to supply complete information about this general-purpose oscilloscope that provides high performance in such applications as radio and TV servicing, industrial maintenance, troubleshooting, and general waveform analysis.

Also ask your RCA Distributor for the full story on the RCA WO-505A,

priced at \$299*, and the RCA WO-33A, priced at \$180*. Or write RCA Test Equipment Headquarters, Harrison, N.J. 07029.

*Optional Distributor Resale Price, complete with direct/low capacitance shielded probe and cable.

RCA|Electronic Components|Harrison, N.J. 07029.

RCA

NEW AND NOTEWORTHY

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

SOLID-STATE FREQUENCY COUNTER KIT 700

*Frequencies to 120MHz
with eight-digit readout*

The Model IB-1102 Frequency Counter Kit employs eight cold-cathode display tubes, an overrange lamp, gate lamp and two indicator lamps to provide an easy-to-read display. Overall accuracy is assured by the use of a pre-built temperature compensated crystal oscillator. The unit reportedly has a sensitivity of 50mv to 100MHz and 125mv above, and accepts inputs up to 120v rms from 1Hz to 150Hz, 50v at 40MHz, and 3v at 120MHz without damage to the instrument. The latest emitter coupled logic is said to be used and the full 8-digit readout lets you read frequencies with the best possible resolution (down to 1Hz) without switching the time base. Plug-in ICs and circuit boards are provided to speed and simplify assembly and service. The unit can be wired for either 120v ac or 240v ac operation. Price: \$349.95. Heath Company.



FOR MORE
NEW PRODUCTS
SEE PAGE 67

FIELD STRENGTH METER 701

*Compact lightweight design
with separate VHF and UHF tuners*

A new Field Strength Meter, Model FS-719, reportedly reads directly in dBmv (and microvolts) to show exact signal levels, and provides continuous coverage from 54MHz to 216MHz for VHF TV and FM, and 470MHz to 890MHz for UHF-TV. It has a 75 Ω input. Meter ranges: 25 μ v to 1,000 μ v—basic scale: 250 μ v to 10,000 μ v with one attenuator "in"; 25,000 μ v to 100,000 μ v with two attenuators "in." Sensitivity with minimum detectable signal 10 μ v. This solid-state unit is lightweight, battery operated, and housed in a rugged case with a large accessory compartment. Safety switch turns OFF power when cover is closed. Audio output jack and crystal earphone are included. Dealer net price: \$228. Sadelco, Inc.



TWO-CHANNEL AC MILLIVOLT METER 702

*Checks audio signal quality of
two-channel and four-channel circuitry*

The Model LMV-89 Two-Channel AC Millivolt Meter is designed to check audio signal quality of two- and four-channel stereo circuitry. The measuring range is from 100 μ v to 300v in 12 steps and full scale accuracy is reportedly $\pm 3\%$; while decibel scale readings are at 0dB = 0.775v and 1v each over the entire range. The unit reportedly has a single, easy-to-read meter face and two independent scales with separate pointers. Each of the two channels has individual switches and amplifier systems to assure operation without crosstalk effect. Both channels operate separately or in common at channel two. Scale calibration is based on the effective value of a sine wave output. The unit measures 8 in. high by 6 in. wide by 10 in. deep and weighs 8 lb. Leader Instruments Corp.





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More money, better jobs, greater opportunities...a Government FCC License gives you a big edge, and CIE has the course you need to get it...backed by a Money-Back Warranty.*

Compare what you're doing now—auto mechanics, assembly line, shop work—with the exciting new opportunities you can have as a *licensed* service technician!

In just 10 years the number of licensed communications *stations* has grown from 100,000 to over 2,000,000—including those for police and fire departments, airlines, merchant marine, pipeline companies, telephone companies, taxicabs, railroads, trucking firms, delivery services! And according to Federal law, no one is permitted to operate or service such communications equipment without a Commercial FCC License or without being under the direct supervision of a licensed operator.

Industry needs licensed technicians

In addition to communications stations, TV and radio, think of the opportunities in big industry. At leading companies like Burroughs Corporation, for example, "The licensed man is the one called upon to handle the challenging assignments."

Start your own business

If you don't want to work for somebody else, you can open your own shop or service business. The basic principles of Electronics you learn in preparing for your Government FCC License exam will give you the know-how—and your License will *prove* it to everybody!

CIE training really works

Why not start preparing for your FCC License right

Joseph E. Perry of Cambridge, Massachusetts passed his license exam and got a new job with 40% more pay. "I'm now an Engineering Specialist with National Radio Company, Inc., testing prototype equipment. CIE training gave me the electronics technology I needed to pass the exam for First Class FCC License. I'm already earning 40% more than I could without my CIE training."

Ralph E. Butler, Columbus, Ohio, signed up for CIE's First Class FCC License course and completed it while in the Navy. "Now I'm responsible for transmitter operations at both WSPO-AM and WVKO-FM. CIE meant so much to me, I talked two of my Navy buddies into taking courses."

now... in your spare time... at home... with a licensing course from Cleveland Institute of Electronics? CIE's training has proven so effective that in a recent survey of 787 CIE graduates, better than *9 out of 10* CIE grads passed the Government FCC License exam! That's why CIE can offer their famous Money-Back Warranty:

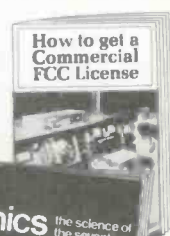
* When you complete any FCC Licensing course, you will be able to pass your FCC exam or be entitled to a full refund of all tuition paid. This warranty is valid during the entire completion time allowed for your course—you get your FCC License OR YOUR MONEY BACK!

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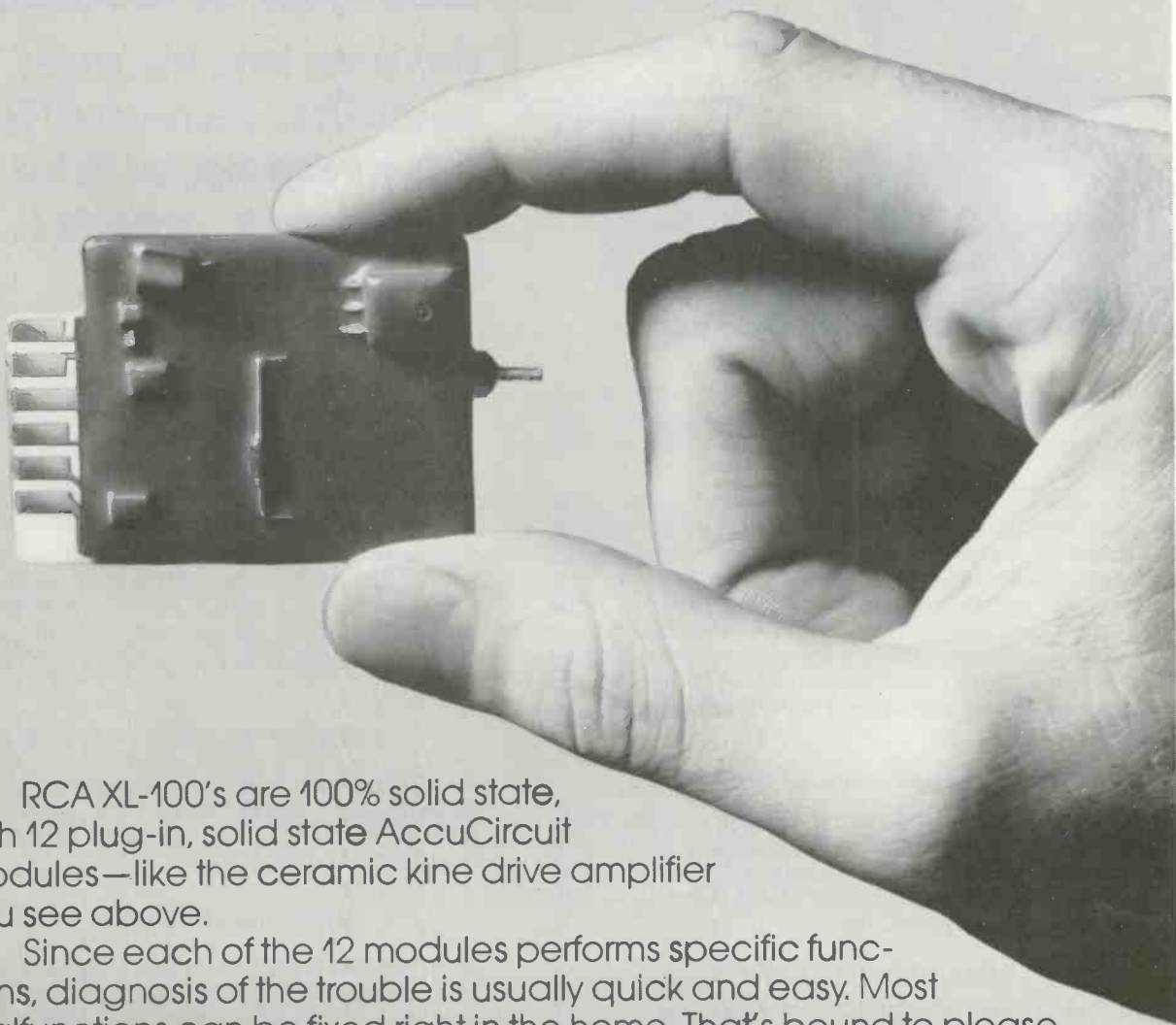
City _____ State _____ Zip _____

Veterans and Servicemen: Check here for G.I. Bill Information.

ET-64

... for more details circle 107 on Reader Service Card

Why RCA XL-100's can be a quick fix:



RCA XL-100's are 100% solid state, with 12 plug-in, solid state AccuCircuit modules—like the ceramic kine drive amplifier you see above.

Since each of the 12 modules performs specific functions, diagnosis of the trouble is usually quick and easy. Most malfunctions can be fixed right in the home. That's bound to please your customer.

So when it comes to servicing RCA solid state color, XL-100's let you make more house calls—in a lot less time!

And you won't waste so much time hauling sets back and forth to the shop.

Something else: Whether you're servicing an XL-100 console, table model or portable, most modules are interchangeable, function for function. That will make your life easier, and you won't have to worry about stocking a large parts inventory.

RCA XL-100. It's already got a great reputation. It could even add to yours.

RCA **XL-100** 
100% Solid State AccuColor

TEKLAB REPORT

RCA's Argosy Model ER475 Portable Color-TV Set

by Joseph Zauhar

The solid-state modular construction of this chassis practically revolutionizes manufacturer's servicing

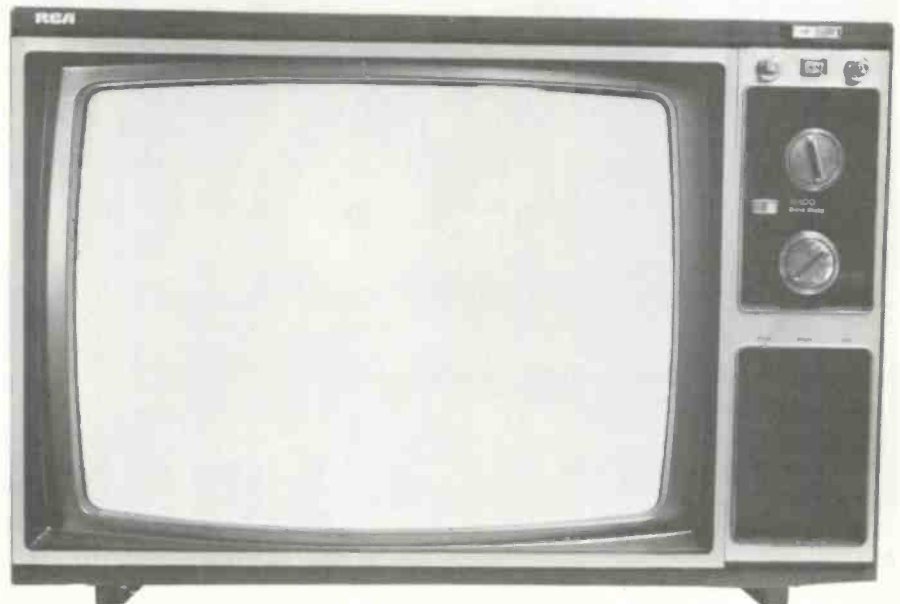
■ In 1968 RCA introduced the CTC40 color-TV chassis which was their first solid-state TV set, using only a high-voltage rectifier tube in addition to the CRT. Next came the CTC47 chassis which was released in 1969. This TV-chassis retained most of the circuits used in the CTC40 with several significant changes such as electronically tuned VHF tuner and solid-state high-voltage rectification, using a voltage quadrupler.

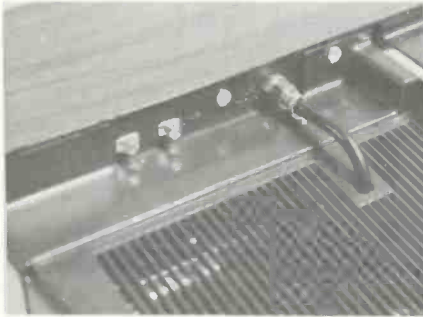
The CTC44 chassis represented the third generation of their solid-state color-TV receivers, including some of the basic circuit designs carried over from the CTC40 chassis

with many updated features, which included the high-voltage quadrupler and motorless remote VOLUME, TINT and COLOR controls carried over from the CTC47 chassis. The CTC49 chassis is a natural outgrowth of these predecessors.

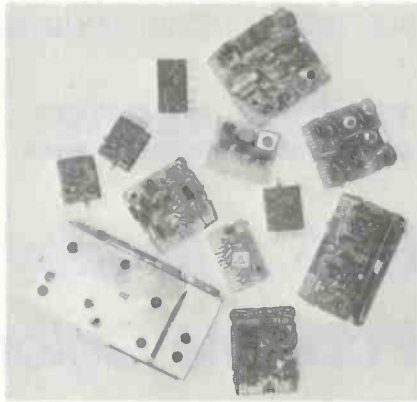
The Argosy Model ER475W, employing the CTC59 chassis, sent to us for review is very similar in concept and physical appearance to the very familiar CTC49 chassis. This 100-percent solid-state chassis employs 12 plug-in boards that are compatible with those used in either the CTC49 or the CTC46 chassis. An ultra-rectangular, 110° deflection picture tube (19BLP22) is

The Argosy, Model ER475, employing the CTC59 chassis, is continued as RCA's top-of-the-line, all-solid-state portable color-TV set.

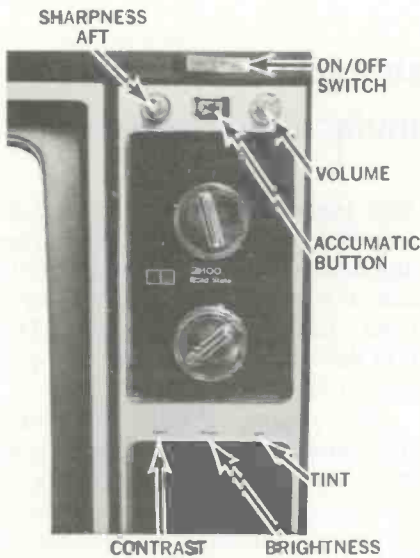




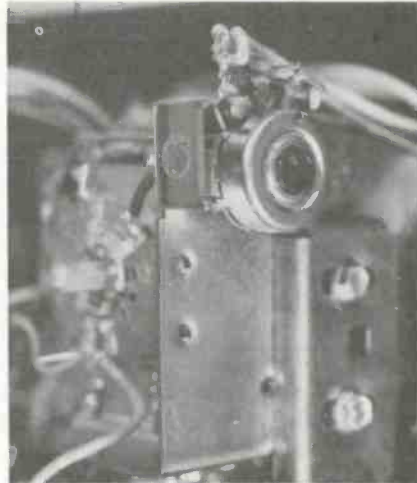
A 75Ω antenna connector is located on the back cover to allow direct connection to an MATV system without additional adapters.



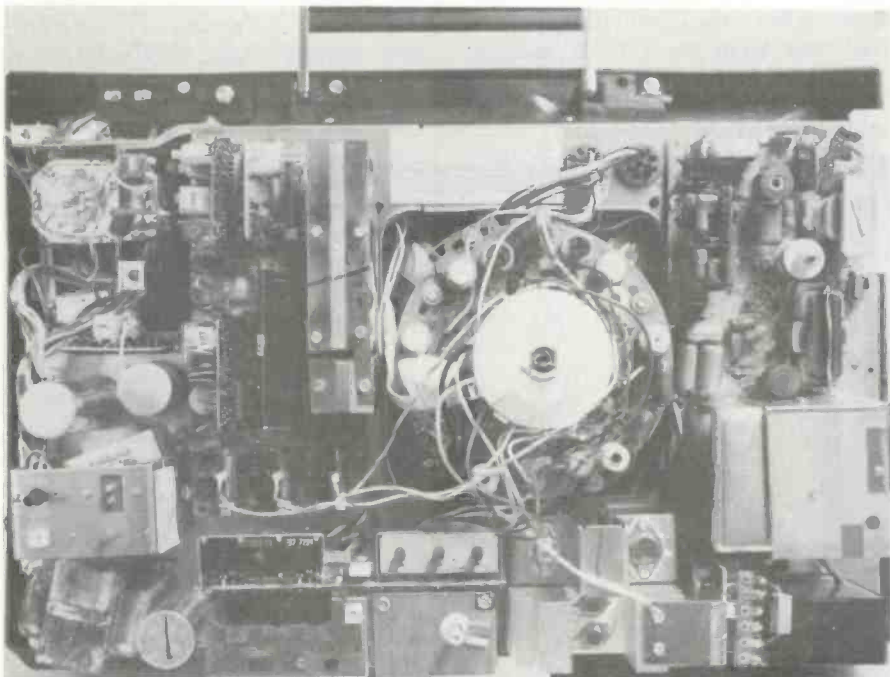
The 12 plug-in modules contain a majority of the circuits employed in the CTC59 chassis and are compatible with those used in either the CTC46 or CTC49 chassis.



The front control panel, showing the location of the various controls.



The ACM COLOR-LEVEL control located at the top-rear of the tuner mount brackets is a screwdriver adjustment.



Rear view of RCA's CTC59 color-TV chassis which is quite similar to the CTC49 chassis.

used to provide a 19-in (measured diagonally) screen size.

When unpacking the TV set, we were quite impressed with its cabinet. Not only is it made of nicely styled high-impact plastic with wood-grain acrylic finish, it is much slimmer than earlier cabinets—having been reduced 19 percent in depth by using the new 110° deflection picture tube rather than a 90° one. Serviceability is also incorporated in the cabinet design, there being fewer screws on the back cover and no screws on the bottom of the cover under the cabinet. In most cases, this has eliminated the need for tipping the set forward or removing the set from the stand for servicing.

The TV set has a 75Ω coaxial cable input for direct-line MATV systems. This cable can be connected without a special adapter or additional service. Additional shielding is employed on the VHF tuner to help prevent unwanted signal interference.

Many of the controls on the front panel are only partially exposed, giving the TV set a smooth uncluttered look. These include the ON/OFF switch, SHARP/AFT, VOLUME, COLOR, BRIGHTNESS and TINT controls, along with the ACM button. The rocker type ON/OFF switch is conveniently located at the top edge of the cabinet within easy reach.

The AccuMatic switch (ACM), when in the ON position, effectively places the COLOR LEVEL and TINT controls at predetermined settings. It also produces a slight shift in the color demodulator circuitry output and color drive outputs.

The main chassis contains the power transformer, power-supply filters, audio-output transistor, two vertical-output transistors, high-voltage quadrupler and focus bleeder, plus the SCR's and diodes of the horizontal deflection system. Although transformer powered, one side of ac line is connected to the chassis.

The PW200 board mounted on the main chassis contains the three SCREEN controls, plus the CONTRAST, NOISE, KINE BIAS, VERTICAL HOLD and HEIGHT controls, and the three-position SERVICE switch.

The PW300 board serves as the parent board for all but the MAB,

MAH and MAG modules. In addition to containing edge connector sockets for these modules, this board also contains the audio-driver and brightness limiter transistors (Q301 and Q302) and the three KINE DRIVE controls.

The PW400 board contains the MAH and MAG modules, plus most of the components for the horizontal-deflection and high-voltage systems, including the high-voltage regulator and the side-pincushion amplifier and control potentiometer.

Most wire connections to the main chassis are made with sockets, making chassis removal easier if required for servicing.

Much of the circuitry employed in the CTC59 chassis is quite similar to that in the CTC46 and CTC49 chassis, and our review will cover some of these circuit modifications. The circuits for this chassis can be followed in Tekfax Schematic No. 1408, March 1972.

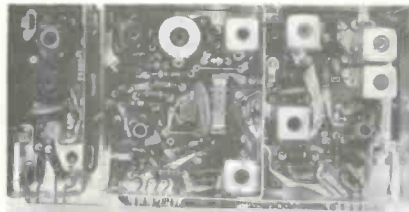
Signal Processing Circuit

The signal processing circuitry remains the same as in the CTC46 chassis with some minor component value differences on the main circuit board (PW300), and the same circuit configuration and adjustment procedure is used. However, the ACM COLOR-LEVEL control is adjusted with a screwdriver and is mounted at the top-rear of the tuner mount bracket.

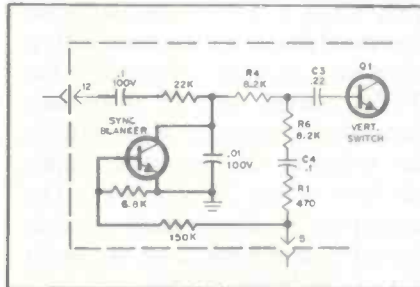
Vertical Circuit

A change was made in the vertical module, MAG001, which appears in all currently produced modular chassis; however, the new MAG001B module is compatible as a replacement for all MAG001A boards before the change was effected. Shown in the partial schematic is the new "Sync Blanking Circuitry" which has been added to the MAG001 module. The added components are shown in bold lines.

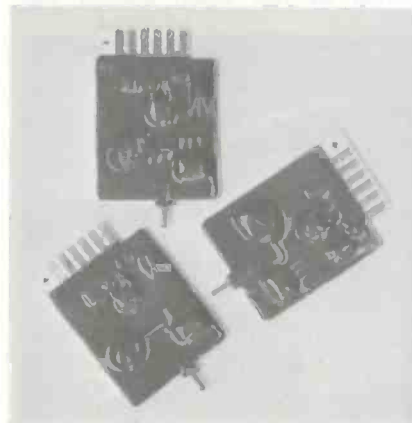
The operation of this circuit can be more clearly understood if we follow the basic operation of the vertical switching transistor, Q1. The yoke circuitry feedback pulses are coupled to the transistor base to sustain the free-running operation of the vertical oscillator. Sync pulses at the vertical rate are applied



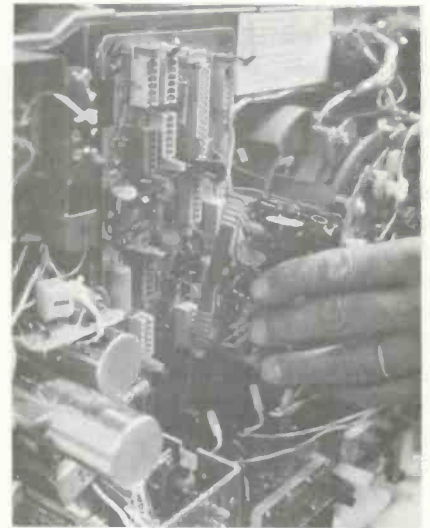
Module MFK contains two transistors and two IC's, and includes all the IF amplifiers and the keyed-AGC circuit.



Partial schematic showing the new "Sync Blanking Circuitry" (in bold lines) added to the MAG001 module. Courtesy of RCA.



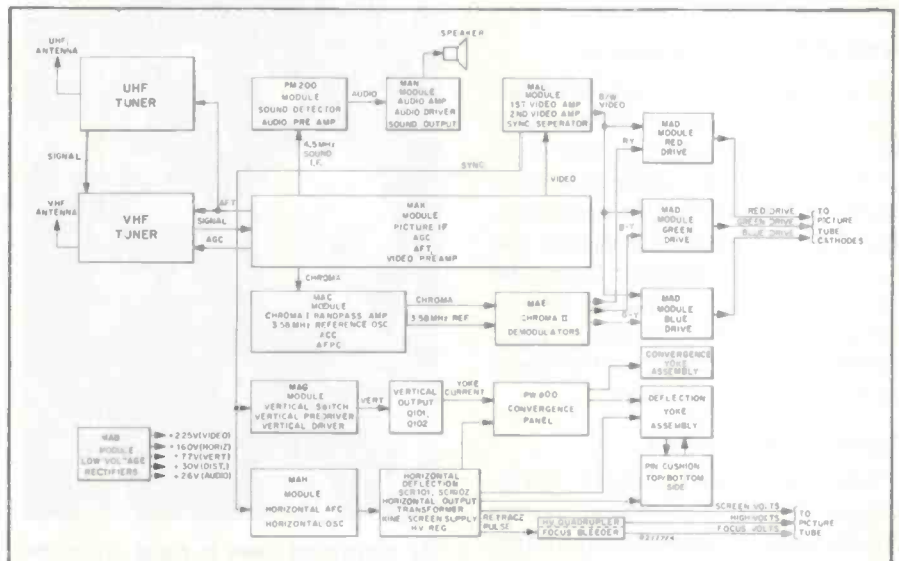
The ceramic MAD modules are interchangeable, requiring only readjustments of the KINE-DRIVE control for tracking.



The plug-in modules with edge connectors are held securely in place by two spring clips, simplifying removal.



A hermetically sealed solid-state quadrupler reduces the required pulse from about 23kv to 6kv.



A functional block diagram of the CTC59 color-TV chassis. Courtesy of RCA.

through board contact No. 12 to the base of transistor Q1, synchronizing the oscillator operation to the proper frequency.

The sensitivity of this vertical system to low-level sync pulses makes its output acceptable despite noise pulses, such as those found in improperly maintained CCTV systems where the vertical sync pulses actually become clipped off or badly suppressed. In problems like this, the only signal present in the sync system of the receiver is an abnormal blanking pulse.

Noise produced by cross-modulation, thermal noise, ripple, or other sources, can appear on this blanking pulse and trigger the vertical switch a second time, shortly after the beginning of the vertical scan, producing the appearance of vertical jitter. The new MAG001B vertical module helps prevent the noise from prematurely triggering the vertical switch.

The sync blanker circuit is used to permit only the leading edge of the vertical-sync pulse to be effective in triggering the vertical switch ON. A yoke circuit pulse is coupled to the base of the sync blanker transistor, this feedback pulse driving the sync blanker into saturation and thus effectively shorting the remaining portion of the sync pulse to ground. Only a short duration spike, representing the leading edge of the sync pulse, is employed in synchronizing the vertical oscillator to the correct scanning frequency.

Vertical-Output Transistors

This chassis also employs metal-cased transistors in its vertical-output stage to provide greater reliability. The circuit configuration remains unchanged, but to accommodate the new output transistors the heat-sinks are changed from the type used in other modular chassis designs. The two vertical output transistors are located on the lower right of the main chassis.

High-Voltage System

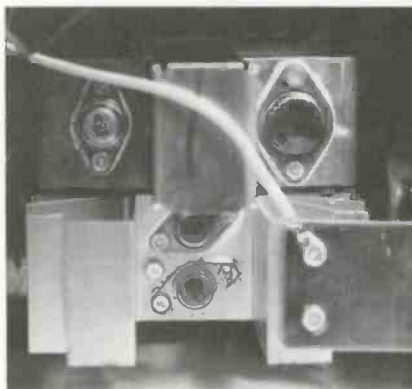
The fixed-tuned flyback transformer in the high-voltage system does not need a separate adjustment for third harmonic tuning. Other differences in the deflection circuit-

ry involve minor component value changes on the main circuit board (PW400), but these changes do not change the circuit operation or configuration.

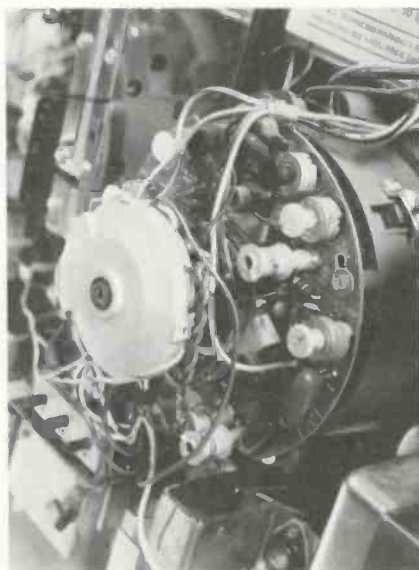
The CTC59 and the CTC49 chassis employ the same deflection yoke; while the high-voltage power supply differs from the conventional types, which rectify a positive pulse from the flyback transformer with a half-wave rectifier. Instead, the CTC59 chassis uses a solid-state quadrupler to produce high voltage, thus reducing the required amplitude from about 23kv to 6kv. The quadrupler is hermetically sealed, repairable, and located on the lower right of the main chassis.

Video System

Most of the video system has



The CTC59 chassis now employs metal-cased, vertical-output transistors.



The convergence panel is placed around the neck of the picture tube to conserve cabinet space and reduce wire lengths to the panel.

some resemblance to the ones found in earlier chassis. The matrixing of luminance and chrominance video outside the picture tube has not been done in an RCA color-TV chassis since the CTC2 color-TV chassis was discontinued. The most important advantage of this system is that the load offered by the three picture tube cathodes may now be divided equally among three moderately rated drivers instead of one relatively high-power device, thus eliminating the three kine-control-grid drivers.

The three identical MAD modules are used to drive the three picture tube cathodes. The luminance signals are driven in parallel, but each is driven by its respective color-difference signal and the output signals are true color-video signals: red, blue and green. Each module also contains a bias regulator stage which stabilizes the dc operating point of the output amplifier by returning the output voltage to the same point during each horizontal blanking interval. This system is the same as the one used in the CTC49 chassis.

Summary

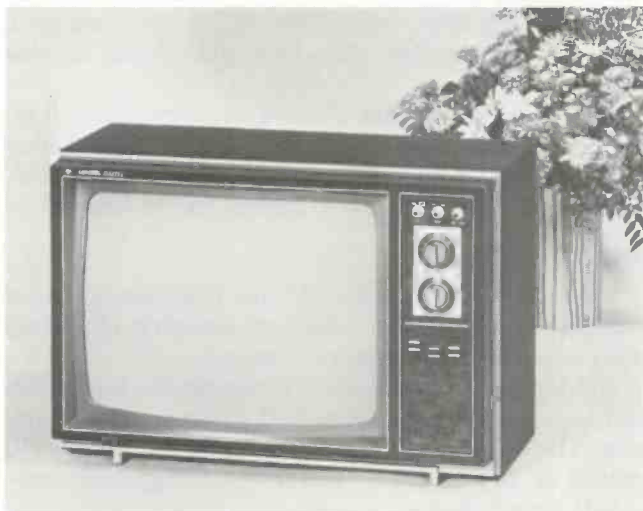
We feel that the picture and color quality produced by the set is very good and that the AccuMatic color monitor (ACM) button is excellent for customers having trouble adjusting a color-TV set, while others may still adjust the set manually for personal preference of the color desired.

From the serviceability standpoint, this chassis is designed to permit easy access to all modules, making the substitution method of troubleshooting very feasible. The use of circuit modules should enable the service technician to correct the majority of problems in the home. Most of the circuitry used in this TV chassis is contained in but 11 modules, three of which are identical so that only nine items need be stocked in addition to the replacements for five plug-in transistors, two plug-in SCR's and two diodes of the horizontal-deflection circuit. These should be carried on service calls to reduce service time in the home. ■

What's New in TV Receivers for 1973

by Joseph Zauhar

Part II—Many of these TV-sets employ new chassis and circuit designs to simplify servicing



Channel Master's 19-in. (diagonally measured) Model 6143 color-TV set. Courtesy of Channel Master.



Electrohome's 19-in. (diagonally measured) "Contour" color-TV set features a new Electracolor control for constant color. Courtesy of Electrohome.

■ Last month we reviewed the new 1973 TV sets manufactured by Admiral, Emerson, General Electric, Magnavox and Motorola. The manufacturers of the TV sets reviewed this month—like those covered last month—have made substantial progress in the development of all-solid-state modular chassis, some now producing their third generation models having brighter picture tubes and more pushbutton tuning. Many of these TV set manufacturers have given much consideration to chassis designs that simplify any required servicing.

CHANNEL MASTER

Channel Master is introducing 13 new TV sets, constituting the largest TV line in the company's history. This introduction includes nine color-TV sets, ranging from a 15-in. portable to three 25-in. custom sets in hardwood-crafted cabinets. Most of the sets feature Instachrome circuitry, with automatic COLOR, TINT and HUE controls, and an Integrid chassis consisting of a series of plug-in modules to permit quick in-home servicing. Other engineering features include a full-power transformer, twin oversized dual-cone speakers and a high-voltage tripler. The black-matrix picture tube employed carries a three year warranty that is not prorated.

Two new portables will be featured in Channel Master's color-TV line. Shown in this article is the 19-in. (diagonally measured) Model 6143 which is said to

offer consistent color fidelity through its Automatic Fine Tuning and Automatic Tint Modifier circuit. The TV set also includes slide COLOR and TINT controls. Channel Master's 15-in. entry, Model 6131, is reportedly smaller and lighter than any portable TV in its class.

Added to Channel Master's B/W TV line for 1973 is a console and table/portable model featuring a 22-in. (diagonally measured) picture tube with a 2 year warranty.

The Model 6145 console, the Basque, features an authentic styled Spanish Grille design in oak finish hardwoods, while the Model 6144, table/portable, with its own cart, offers the compactness of a portable with console features and styling. Two new B/W-TV portables are also added to the line. These include a 12-in. (diagonally measured) Model 6139 and a 19-in. (diagonally measured) Model 6142.

ELECTROHOME

Innovations in Electrohome's new color-TV line include an all-transistorized chassis, a 75 Ω cable provision, an all-electronic remote control unit and a new Electrocolor circuit which automatically provides constant color density.

Screen sizes (measured diagonally) include 18-, 19-, 21-, and 25-in. models. Most control panels have only a few exposed controls—ON/OFF, VOLUME, and VHF/UHF channel selector—while other controls are hidden

from view. For the electronic technicians a built-in sensing device indicates what circuits are not functioning in the chassis.

The 19-in. (diagonally measured) Capri incorporates a transistorized chassis design, automatic COLOR DENSITY, automatic TINT and COLOR controls, plus a built-in circuit function sensing device and a 75Ω cable hookup provision.

One 25-in. (diagonally measured) unit is a Spanish styled model, the Armada. This transistorized design features comparable 12 VHF/12 UHF varactor slide tuning, automatic color density, automatic color and tint, plus built-in sensing of functioning circuits.

PANASONIC

Panasonic has introduced five new B/W and six new color-TV sets to their consumer electronics line, including the company's first 25-in. (diagonally measured) color-TV set.

The Marlow, Model CT-250, is a console color-TV set with a 25-in picture, providing 315 sq in. of viewing. The TV set features the new "Pana-Matrix" picture tube. Other features in the Marlow include four integrated circuits, 50 solid-state devices, and an automatic, illuminated "self-set" COLOR control. By touching a button, pre-set color is provided instantly. Also included is a matching stand, illuminated AFT button, automatic degaussing, noise cancellor circuit, 10 position detent UHF tuner and antenna connectors for CATV/master antenna systems.

The Glenwood, Model CT-398, is a 19-in. (diagonally measured) portable color-TV set featuring the company's "Quatrecolor" chassis and a Q-Lock control that is designed to electronically compensate for any change in the incoming color signal. The chassis incorporates all solid-state construction, including integrated circuits and five modular circuit boards for more service-

ability. It also features the Pana-Matrix picture tube and automatic controls for color adjustment.

The Woodbridge, Model CT-701, is a 17-in. (diagonally measured) portable color-TV set also featuring "Quatrecolor" and the Q-Lock control. Other features include automatic degaussing, set-and-forget tuning on VHF, UHF click-stop tuner and a VACATION switch.

The Cheswick, Model CT-301, is a 13-in. (diagonally measured) portable color-TV set with Panalock AFT and Q-Lock II. To fine tune the picture, simply touch the Panalock Key. Color tuning is simplified with Q-Lock II, which offers pre-set COLOR and electronic TINT levels. A 70 position click-stop UHF tuner is also featured.

The Evanston, Model CT-994, is a solid-state 9-in. (diagonally measured) portable color-TV set weighing 29 lb. It features three integrated circuits, 90 solid-state devices, plus Panalock AFT control and Q-Lock II.

PHILCO-FORD

Philco-Ford's new color-TV line combines its latest engineering advances in solid-state circuitry, black matrix picture tube and automatic tuning.

Among the 18 new color-TV console entries, all but two come with three-dimensional full-to-the-floor cabinets. The portable color-TV line features a total of 10 entries in 14-, 16-, 18-, and 19-in. (diagonally measured) screen sizes.

Highlighting the new line is the introduction of the Philcomatic III color-TV set featuring a new 100 percent solid-state modular chassis. The chassis, called the "Boss," brings a fully modularized approach, which they call "functional modularization" to solid state. This chassis includes 14 modules which reportedly operate independently of each other, but in concert. Actually each module has its own specific functions to perform and if one module malfunctions, the other will reportedly continue to operate, simplifying servicing problems.

The modules are said to be flame retardant and notched to fit into the chassis only one way. A code



A new Pana-Matrix picture tube is employed on Panasonic's Marlow, Model CT-250, console color-TV set. Courtesy of Panasonic.



Philco-Ford's 25-in. (diagonally measured) Model C7430BWA employs a new all-solid-state modular chassis. Courtesy of Philco-Ford.

number designates the modules function. According to the manufacturer, the cost of each module has been kept low enough that an inoperable unit can simply be discarded or be replaced with newer, more sophisticated ones as technologies are developed.

A new picture tube, the Philcomatic Super Black Matrix, reportedly uses an improved light transmission glass to allow 85 percent of the available light from the electron beam gun to filter through—producing a brighter and sharper picture. The picture tube also features a new gun design using a metal cathode which reportedly lasts from two to three times as long as earlier models.

Tuning is simplified on the new color-TV line, with the Philcomatic advanced color tuning system featuring one step tuning. The viewer selects the channel and removes his hand when the Philcomatic light appears. If the light doesn't appear immediately, the viewer need only turn the fine-tuning knob until it does, then remove his hand and the picture is adjusted. The Philcomatic III tuning is automatic, but leaves room for individual preferences. Even when the tuning system is in the automatic position, it allows the viewer to adjust the COLOR, TINT, CONTRAST and BRIGHTNESS controls to his own individual preferences.

On selected 19-in. and 25-in. models the Philcomatic pushbutton tuning selector is available—featuring VVC (Voltage Variable Capacitance) instead of the usual rotary channel selector. These sets feature 12 buttons which can be set by the owner of the TV set to different combinations of VHF or UHF channels. Once set, the advanced tuning system will automatically lock in the proper picture.

Several other models in the 1973 line will feature Philco's new Channel-Set selector providing 70-position detent tuning. In this system, the channel selector will stop or "click" as each channel is reached.

Other features include "instant play" and easy-out chassis construction, enabling the chassis to be removed from the top without the need to get under the cabinet. Two "mother-board" panels, which are permanently

attached to the chassis, contain 15 percent of the circuitry, the balance being on modules.

According to the manufacturer, a comparison of wiring between the Philcomatic III chassis and Philco's 1972 25-in. color-TV sets showed that the new model has less than half as much actual wiring footage, about two-thirds as many actual pieces of wire, and less than half as many hand-made wiring connections.

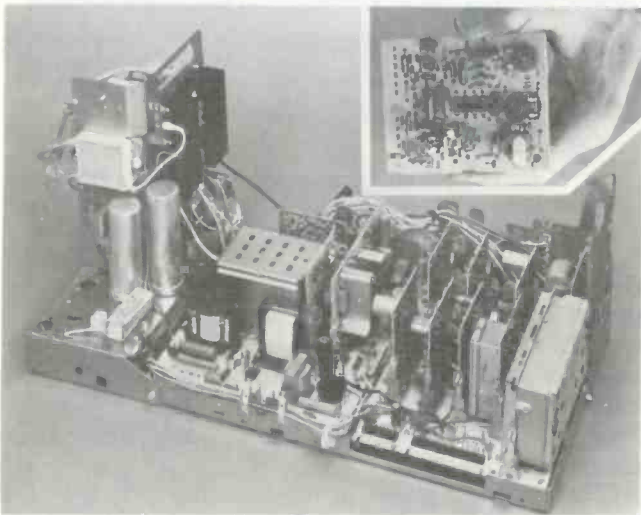
In the B/W portable and console TV lines, Philco-Ford will reportedly satisfy all the consumers' basic needs in screen sizes, features and styling. The console entries include a Mediterranean, Early American and two Contemporary models, all with 22-in. (diagonally measured) screens. The portable TV sets come in 8-, 12-, 13-, 16-, 19-, and 22-in. screen sizes.

RCA SALES CORP.

RCA is introducing its new color-TV line with more than 75 percent of the models, including portables, employing 100 percent solid-state circuitry.

In consoles and combination models, over 90 percent of all TV sets are 100 percent solid state. According to the manufacturer, the new line will feature more remote-controlled models, new furniture styling, broader use of the black matrix picture tube and provisions for better cable-TV reception.

Nine color-TV chassis will provide a wide selection in color-TV models. At the top of the line is the all-solid-state CTC54 chassis, with varactor tuning, ACM, plug-in modules and engineering features which make up the most sophisticated chassis in the line. A new CTC48 chassis, complementing and sharing many of the CTC54 all-solid-state circuits, is employed in the bulk of the XL-100 console models. This chassis is designed to replace the CTC46 chassis in the R-Line TV receivers. These two chassis are very similar in design; the major variations occurring in the horizontal deflection, tuner and remote control, and auxiliary-control panels. Some of the features available include: slide controls,



Philco-Ford's solid-state Philcomatic III chassis employs 14 modules, each about the size of an average file card. Courtesy of Philco-Ford.



RCA's Royalton, Model GR-802, color-TV set employs a tempered black architectural glass top. Courtesy of RCA Sales Corp.

70-detent UHF, varactor-tuned UHF, and four-function remote with triac power control.

The deflection system of the CTC47 chassis is one of the SCR systems first introduced in the CTC40 chassis in 1968. In this chassis, as in the CTC40, there is no impedance-matching required between the yoke and the trace diode. This chassis also employs a high-voltage tripler instead of a quadrupler and it requires a greater pulse output from the flyback transformer, about 9kv instead of 7.5kv. The width on the CTC48 chassis is controlled by selecting the appropriate "tap" on the flyback primary windings. This chassis employs basically the same overvoltage protection circuit as employed in the CTC46 chassis.

The familiar CTC39 chassis is retained in the R Line with essentially no circuit changes. One significant new feature, however, is a flame-retardant horizontal-output transformer. This transformer is electrically the same as the one used in earlier production of the TV set.

The CTC51, 52, 53, and CTC55 chassis—familiar from the Q Line—will remain in the new line with a few changes which have been carried back from the CTC63 chassis. These changes, all of which were developed for the CTC63 chassis, have been made in the following circuits: The vertical-destable circuit is where the cathode lead of the vertical output tube is now opened with the SERVICE switch, rather than grounding the grid of the tube for set-up procedures. A vertical retrace-blanking transistor has been added to improve blanking, but the high-voltage protection circuit of the CTC63 connected with the blanker is not used with this chassis. A thermal fuse is placed in the horizontal-output tube cathode, protecting the chassis and cabinet from overheating effects.

The CTC59 chassis, which is featured in this month's Teklab Report, remains virtually unchanged from the Q-line TV sets. Early production of the remote-controlled chassis did not include the triac power-controlled circuit, which was incorporated in later production.

A new set added to the color-TV line is a hybrid portable employing the CTC63 chassis, which is similar to the CTC55 from which it evolved. This chassis is developed to drive a 19-in. (diagonally measured) bi-potential high-focus voltage picture tube. The principal differences between this chassis and the CTC55 is the deflection and high-voltage system. The picture tube used with the CTC63 requires 4 to 6kv of focus voltage, higher deflection currents and about 3.5kv more anode voltage. The horizontal-output tube employed is a 36MC6 with higher ratings to meet the additional power requirements. A fusible link is used as a thermal fuse in the cathode of this tube for protection against overheating.

The CTC63 employs a two-section vertical integrator, instead of a single section as used in the CTC55, allowing a faster rise time of vertical sync while retaining good horizontal-sync rejection.

A total of eight different chassis are employed in the new B/W-TV line. Two chassis, the KCS188 and the new KCS187, provide a choice of tube or all-solid-state performance in the 12-in. (diagonally measured) size.

The KCS187 employs the solid-state modular concept and approximately 80 percent of the circuit functions are accomplished by six modules. The KCS188 tube-type chassis continues in the new line for this year. Also, available is a 15-in. (diagonally measured) set employing the KCS168 chassis and available with remote control.

Three large-screen portable receivers, with a wide choice of features, are made available in continued chassis. A 19-in. (diagonally measured) portable employs the KCS186 solid-state chassis using five plug-in modules. The tube-type vertical KCS171 chassis is also used with the 18-in. and 19-in. (diagonally measured) portables. The KCS172 tube-type chassis is used to drive a 19-in. or 20-in. (diagonally measured) tube and employs familiar circuitry.

The KCS179 and KCS183 hybrid chassis are continued chassis used with the 22-in. (diagonally measured) screens. A KRK149 VHF tuner is mated with the KRK204, a 70-position, detented UHF tuner. The selection of all 82 TV channels with parity of UHF and VHF tuning is provided by this combination.

SYLVANIA

Sylvania's 1973 color-TV line includes sets with black matrix picture tubes, all solid-state chassis and a Perma-Lock tuning system. Six of the Chro-Matrix consoles are also equipped with the new GT-100—a 100 percent solid-state chassis with automatic pushbut-



The Gibraltar 90 chassis is 90 percent solid-state and includes a Perma Lock system that tunes pre-set COLOR, TINT, and BRIGHTNESS settings in Sylvania's Model GL2237P color-TV set. Courtesy of Sylvania

ton tuning. In this chassis, electronic circuits replace mechanical tuner parts and any combination of 11 VHF or UHF channels can be pre-selected for pushbutton tuning. A solid-state voltage multiplier and plug-in transistors are used to simplify servicing. Also included is the Perma-Tint circuit which reduces flesh-tone variations.

Circuit advancements in the Gibraltar 100 are said to provide better sound and circuit reliability, along with good color performance under large signal and

continued on page 76

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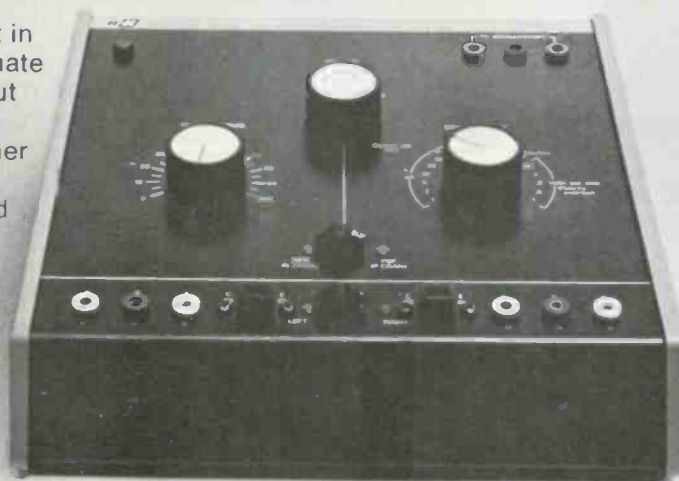
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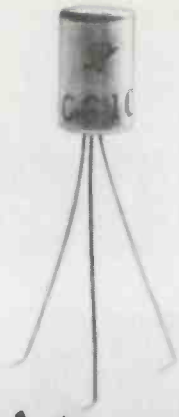
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HB377	102A	MA883	102A
HB377CB	102A	MA884	102A
HB156	102A	MA885	102A
HB156C	102A	MA887	102A
HB171	102A	MA888	102A
HB172	102A	MA889	102A
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GTE SYLVANIA

■ Audio component systems are becoming so sophisticated that some of the more critical audiophiles are turning to the use of electronic instruments for making precise adjustments. With this in mind, Kenwood has introduced its Model KC-6060A Solid State Audio Lab-Scope, which is styled to match other audio components in the product line (Fig. 1).

For evaluation purposes, Kenwood shipped us its Model KT-7001 AM-FM Stereo Tuner (Fig. 2) and Model KA-7002 Solid State Stereo Amplifier (Fig. 3), to be used in conjunction with the scope (Fig. 4) that it also sent us. Together, these three components form a very attractive system.

The scope is definitely designed for the consumer rather than the electronic technician. This is quite apparent in the arrangement of inputs and controls.

For most applications, the audiophile will use merely the inputs provided at the rear of the scope, thus concealing all connecting electrical cables during normal use (although banana-plug-type connectors are also provided on the front panel for optional use). At the rear, four inputs are provided (Fig. 5) in addition to three outputs—all of these terminals consisting of phono-type sockets.

The scope's FM Multipath Horizontal and Vertical inputs are connected by phono-type cables directly to the corresponding outputs at the rear of the tuner (Fig. 6), while the scope's left and right audio inputs may be connected to either the tuner's

tape recorder outputs or one of the two sets of tape recorder outputs on the stereo amplifier (we chose to use the tape recorder A, left and right channel record outputs—Fig 7.)

The left- and right-channel direct-output jacks are wired directly to the rear left- and right-channel audio-input jacks, thus providing an output for the tape recorder or any other component displaced by the scope's audio input connections (a complete schematic of the scope is provided in Fig. 8). The only other scope output is a 1kHz test signal that can be fed through other audio components.

The FM Multipath HORIZONTAL- and VERTICAL-GAIN controls are located on the scope's rear panel. This we consider an appropriate location since the scope trace can also be adjusted by the front panel HORIZONTAL- and VERTICAL-GAIN controls—in fact we never even found need to adjust the rear panel settings. All other controls are conveniently located on the front panel.

The POWER switch, plus the FOCUS, INTENSITY, HORIZONTAL-GAIN, VERTICAL-GAIN and SWEEP controls are all basically like those found on conventional scopes—and thus they needn't be described to experienced electronic technicians. The 1kHz OSCILLATOR control merely varies the amplitude of the oscillator output, and the REAR/FRONT switch selects the set of stereo inputs used (either front or back panel).

So much for the more conventional controls. We were pleased to note that sliding potentiometers are used for HORIZONTAL and

Kenwood's KC-6060A Solid State Audio Lab-Scope

by Phillip Dahlen

More sophisticated audio system adjustments can now be made by the audiophile who expands his system to include a matching scope



Fig. 1—Kenwood's Model KC-6060A Solid State Audio Lab-Scope (right) is styled to match other audio components in the product line.



Fig. 2—FM Multipath signals for the scope were obtained from Kenwood's Model KT-7001 AM-FM Stereo Tuner.



Fig. 3—Audio signals for the scope were obtained from Kenwood's Model KA-7002 Solid State Stereo Amplifier.

VERTICAL POSITIONING of the scope trace—simplifying such adjustments by the less technically inclined customers. The SELECTOR switch is also definitely designed for consumer use, for with each position of this switch, a corresponding lamp is illuminated the right of the scope trace

—indicating the current mode of operation.

When the SELECTOR switch is fully counterclockwise, a lamp indicates that the vertical trace displayed consists of an internally applied 0.1v p-p test signal (1kHz) that can be used for calibration purposes (Fig. 9).



Fig. 4—Kenwood's Model KC-606A Solid State Audio Lab-Scope.



Fig. 5—Input and output terminals at the back of the scope.

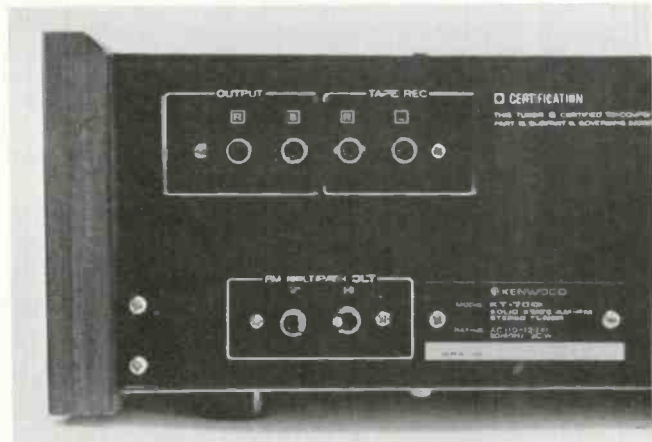


Fig. 6—Output terminals at the back of the AM-FM stereo tuner.

The dimensions of this waveform can be adjusted with the VERTICAL-GAIN and HORIZONTAL-SWEEP controls.

Upon rotating the SELECTOR switch one position clockwise (from its formerly full counterclockwise position), a lamp indicates that the waveform observed represents the left stereo channel (Fig. 10); while in the next position another lamp indicates that the new waveform observed represents the right stereo channel (Fig. 11). Either waveform display may be adjusted by the VERTICAL-GAIN and HORIZONTAL-SWEEP controls. Their shape is also affected by the type of sound observed, the sound level of the stereo amplifier, and tone-control or audio-filtering settings.

The Stereo Display represents one of the most useful functions of the scope. With the tuner SELECTOR switch set for FM MONAURAL reception, the same audio signal is fed to both the left and right channels of the stereo amplifier. Thus the amplifier can be critically adjusted for the same gain on both channels, resulting in a single diagonal trace on the scope (Fig. 12).

In addition to being used for adjusting the stereo amplifier, the stereo display can prove useful for monitoring the types of stereo FM or other stereo programming received—which can be anything from announcers whose voices are transmitted equally through both channels (producing a waveform similar to that shown in Fig. 12); to an-

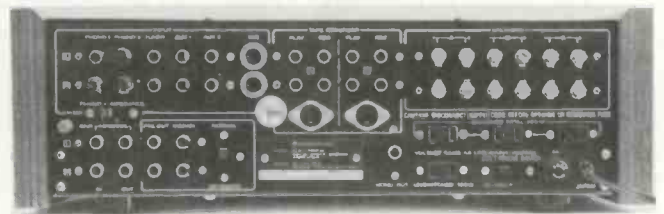


Fig. 7—Input and output terminals at the back of the stereo amplifier.

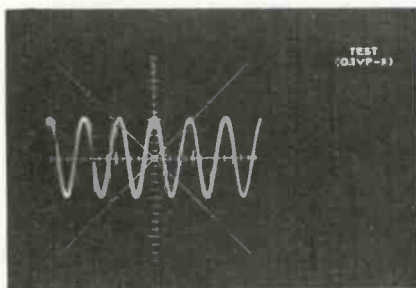


Fig. 9—Waveform produced by an internally applied 0.1v p-p, 1kHz test signal.

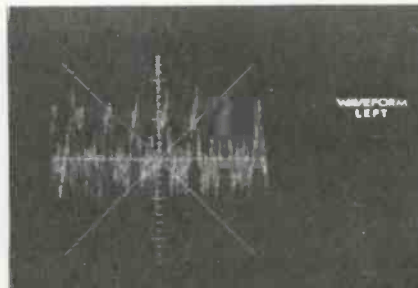


Fig. 10—Waveform obtained from the left stereo channel.

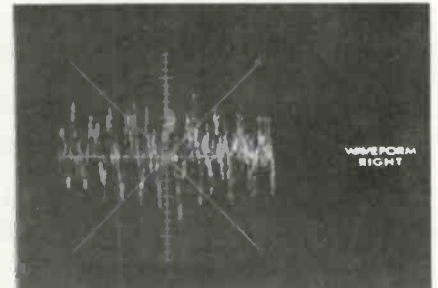


Fig. 11—Waveform obtained from the right stereo channel.

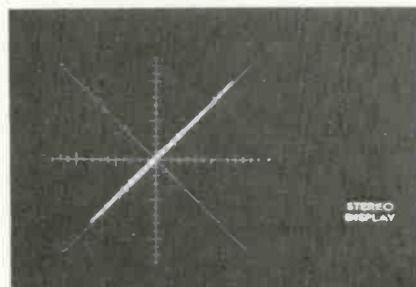


Fig. 12—Stereo display resulting when the same audio signal is present in both the left and right stereo channels.

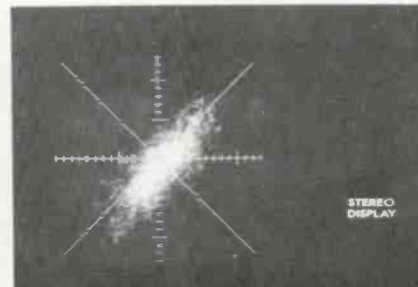


Fig. 13—Stereo display resulting when there is only minor channel separation in the stereo signal observed.

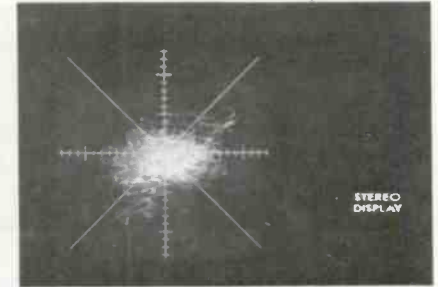


Fig. 14—Stereo display resulting when there is a significant amount of channel separation in the stereo signal observed.

nouncers that are a little trickier and use a slight amount of phase shifting to add a stereo dimension to their voice, producing a rather flat elliptical scope trace; to music containing only a minor stereo element (Fig. 13); to music with a great degree of channel separation (Fig. 14). With such scope displays, one quickly real-

izes that their ears aren't playing tricks with them—that frequently the "stereo" information received is really something else.

It was while in the stereo mode that the automatic spot killer circuitry proved quite useful, for when no audio signal was present, the scope beam was automatically switched

OFF—thus eliminating the bright spot that would otherwise appear at the center of the screen during the absence of horizontal and vertical deflections.

In the last remaining mode (FM MULTIPATH), the scope can also be used for observing FM receiver signal conditions. Fig. 15 shows a photo-

graph resulting from a time exposure that was made as the receiver was tuned from a frequency below that of a local FM station (left portion of scope trace) to a frequency above that of the station. (The resulting scope trace appears distorted due to the extremely strong signal conditions normally present in the ET/D electronics lab. This characteristic waveform has been described in a number of previous articles.) An expanded trace of the on-station FM Multipath signal can be seen in Fig. 16, while an expanded trace of the above-frequency signal can be seen in Fig. 17. (For best reception, the antenna system should be adjusted to eliminate reflected RF signals and thus produce a much flatter topped characteristic curve than that shown in Fig. 15.)

Although the waveforms observed thus far on the scope appear quite satisfactory, we decided to also see what sort of waveforms the scope would

continued on page 66

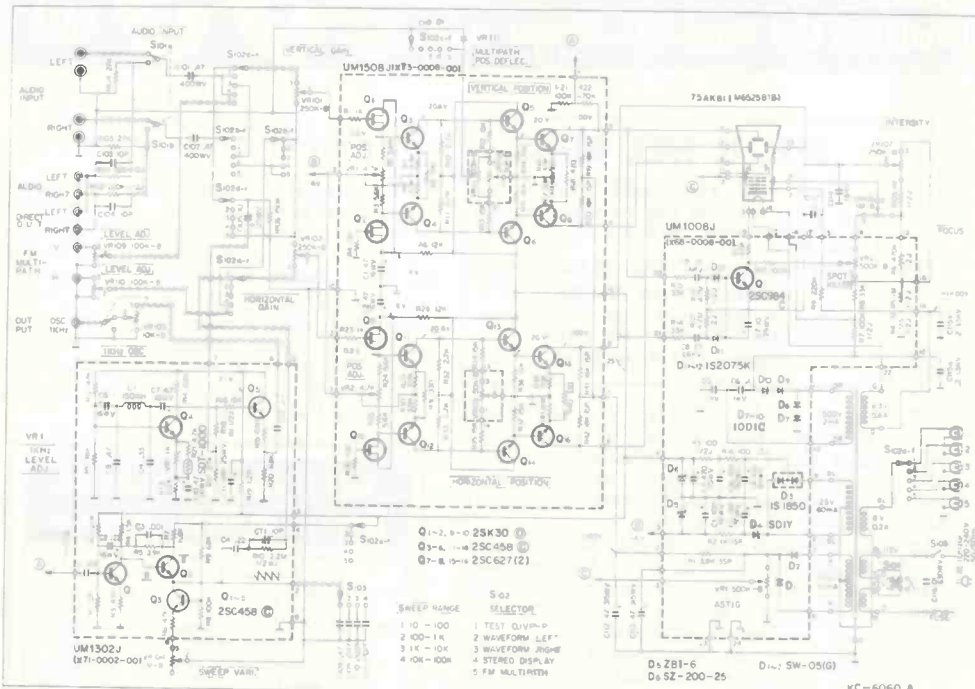


Fig. 8—Schematic of the audio lab-scope.

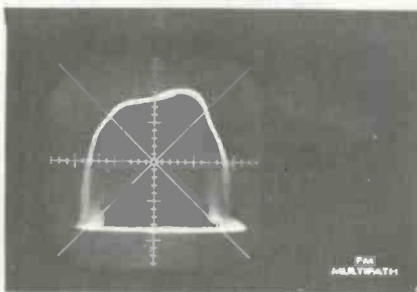


Fig. 15—Time exposure of the pattern traced out as the FM receiver was tuned.

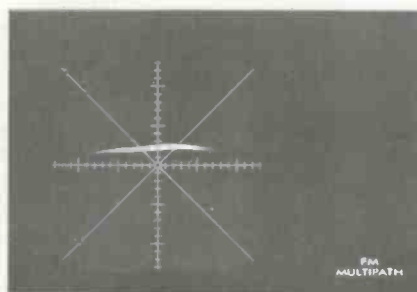


Fig. 16—Expanded trace of the on-station FM Multipath signal.

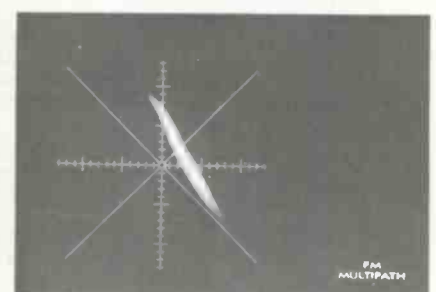


Fig. 17—Expanded trace of the above-frequency FM Multipath signal.

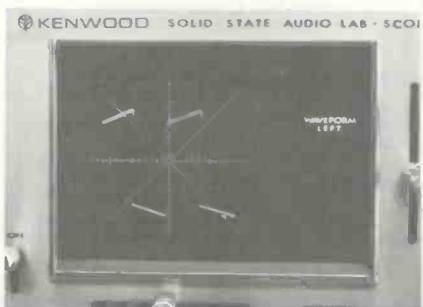


Fig. 18—Waveform observed when applying a 20Hz square wave to the scope.

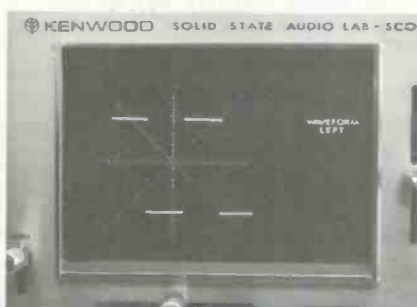


Fig. 19—Waveform observed when applying a 2kHz square wave to the scope.

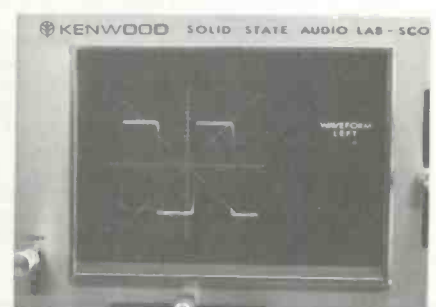


Fig. 20—Waveform observed when applying a 200kHz square wave to the scope.

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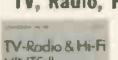
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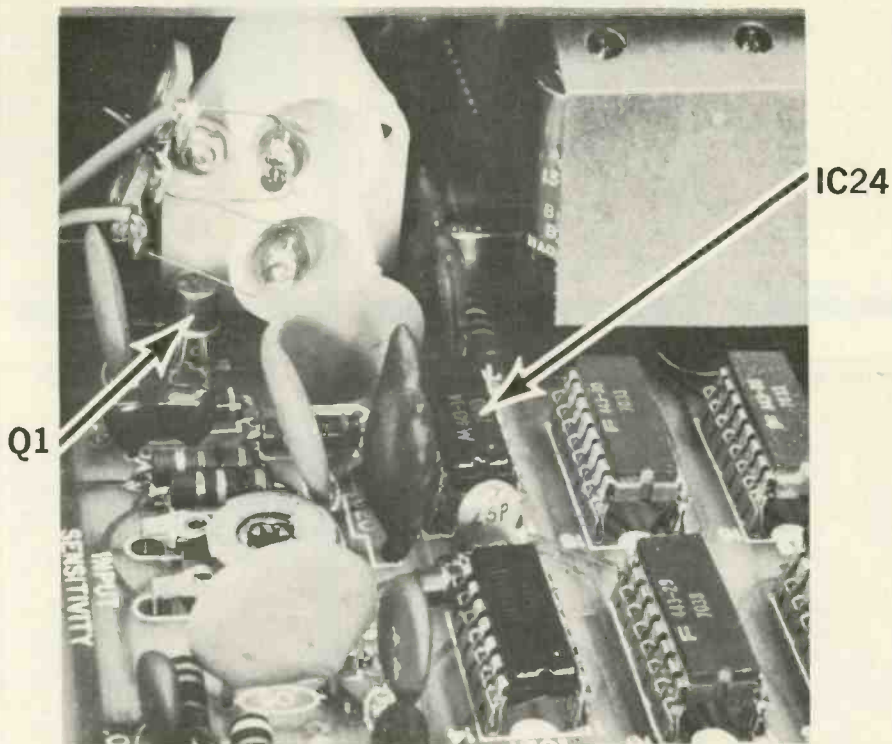


Fig. 1—The dual-gate MOSFET (Q1) and integrated circuit (IC24) used in the input circuitry. Only two of the six inverters in this integrated circuit function together as the Schmitt trigger. The other inverters will be described in a future article.

Basic Digital Circuitry

by Phillip Dahlen

Some fundamental characteristics of new circuitry that is becoming increasingly common in consumer electronic products

■ With the development of low-cost digital integrated circuits, computer-type functions have suddenly become practical for applications that would never have been seriously considered even a few years ago. As an example, previous issues of *ELECTRONIC TECHNICIAN/DEALER* have covered the use of digital circuitry when tuning Magnavox's 1500 DTI Receiver (Page 40 of our July 1972 issue), as well as for adjusting the volume of a Motorola TV set (Page 41 of our February 1972 issue). The Heath Co. is currently marketing an FM tuner that can be tuned with digital touch-tone-type circuitry, and we have recently learned of a Japanese TV-set manufacturer that plans to omit all mechanical TV channel indicators from a coming model. Instead, IC digital circuitry will be used to generate a complex video signal for superimposing numerals upon the TV picture viewed to automatically indicate the channel received.

With such developments in digital circuitry already a reality or soon to be on the market, it is becoming increasingly important that electronic technicians be able to understand some basic digital circuitry. And in describing such circuitry, we will use for most of our examples the circuitry found in Heath's Model IB-101 Frequency Counter—the first of a number of frequency counters that Heath has recently placed on the market.

Unlike previous articles dealing with circuit fundamentals, this series of articles will not cover the theory of sub-component functions. In fact, in our coverage of the integrated circuitry we will not even be concerned with the equivalent transistor circuitry contained within. Instead, all components will be considered on a "go/no-go" basis—they either produce the expected results or they are probably defective. Thus, these articles may seem a little unusual to many readers of *ELECTRONIC TECHNICIAN/DEALER*, since they are concerned with little more than how signal waveforms observed on a scope inter-relate during the proper function of this frequency counter. (The complete schematic of the frequency

counter circuitry—Fig. 7—will be referred to frequently in this and future articles of the series.)

Since this series is not intended as a course in basic computer technology, we are intentionally omitting the general use of such terms as negative logic, S, T, C, Q and \bar{Q} —although in future independent study the understanding of such terms may come more easily as a result of this series.

The second article in this series (following this introductory one) is a rather lengthy article telling how basic flip-flop circuitry—which typically counts from zero to one and then back to zero again—can be used to count to 10 and thus form the basic building block of the decade counter. Numerous composite scope pictures are included in that article to show just how this is done. First, however, it is necessary to see how a signal of some known or unknown frequency is changed to the type of signal that can be handled by these flip-flops.

The flip-flops used in this instrument can automatically handle an extremely broad range of counting rates, but those in the first decade circuitry can be activated only by negative pulses from an applied square-wave-type signal—remaining unaffected by longer duration negative pulses, positive pulses of any duration, or any voltage levels of the applied signal. This, the first article in the series, is thus concerned with automatically converting an applied signal of varying amplitude (a signal voltage range of 100mv rms to 200v rms) and frequency (1Hz to 15MHz) into an appropriate square-wave-type signal for activating the decade-counter circuitry.

The initial circuitry for processing the applied input signal of unknown frequency consists basically of a dual-gate MOSFET (Q1) and two inverters (IC24 inverters E and F), which function together as a regenerative, bistable Schmitt trigger. These two semiconductors are shown in Fig. 1.

The MOSFET is designed in such a manner that internal zener diodes protect it against overload, while its dual design acts as an automatic level control. Thus the am-

plitude of its output (within limits) is not greatly affected by either the frequency or the voltage of the applied signal. This semiconductor tends to clip the applied signal, initiating the process of forming a square-wave signal.

Higher-frequency signals pass more readily through capacitor C4, while coil L1 limits this attenuation. Resistor R7 adjusts the threshold of the Schmitt-trigger circuitry, being used to bias it so that the voltage at the input of inverter F is just below the turn-on point.

The Schmitt-trigger circuit serves to “sharpen the corners” of the square wave resulting from the input signal, and its output is also of virtually constant amplitude despite the frequency and amplitude of the signal fed to the frequency counter. Although the positive and negative portions of the resulting waveform may not always be of equal time intervals to form a true square wave, it is the negative pulses generated during its switch from a positive to a negative state that really interests us.

So much for circuit description. The scope traces in Fig. 2 through 6 demonstrate the operation of this circuitry.

In Fig. 2 we note (top trace) the application of a 100.0v rms, 60Hz signal to the frequency counter, the signal fed to inverter F (second trace), the signal fed to inverter E (third trace), and the output of the Schmitt-trigger circuit (bottom trace).

(It is, of course, not possible to photograph all of the waveforms shown in Fig. 4 simultaneously on the Telequipment Model D67 dual-trace scope used for this article. The photograph shown is instead a composite picture produced by first taking three dual-trace photographs. The first photograph contained the top two waveforms—that of the 100v rms, 60Hz signal applied to the frequency counter and the resulting signal fed to inverter F—IC 24, Pin 8. The second photograph consisted again of the 100v rms signal, plus the signal applied to inverter E—IC24, Pin 7. And the third photograph consisted of still again the 100v rms signal, plus the

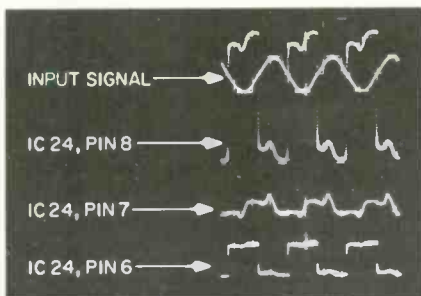


Fig. 2—Waveforms observed in the input circuitry when applying a 100.0v rms, 60Hz signal.

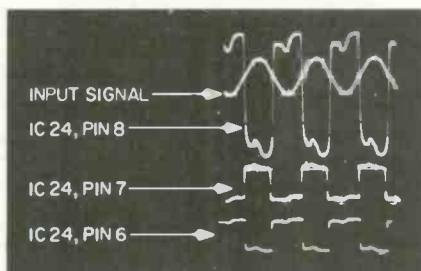


Fig. 3—Waveforms observed in the input circuitry when applying a 10.00v rms, 60Hz signal.

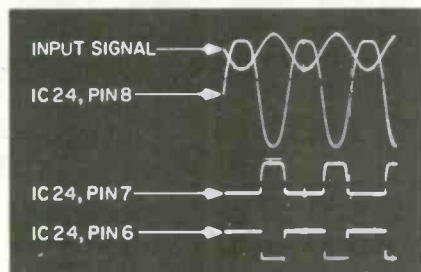


Fig. 4—Waveforms observed in the input circuitry when applying a 1.00v rms, 60Hz signal.

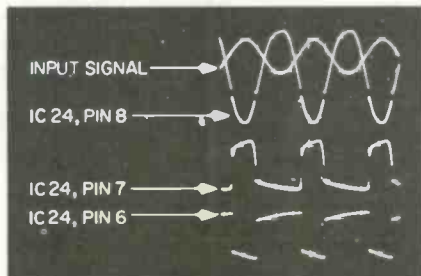


Fig. 5—Waveforms observed in the input circuitry when applying a 6kHz signal.

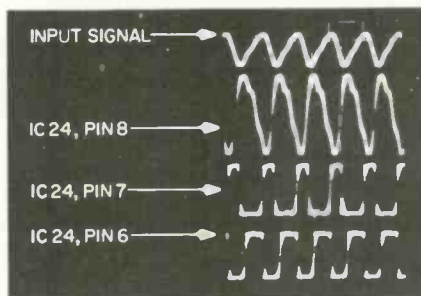
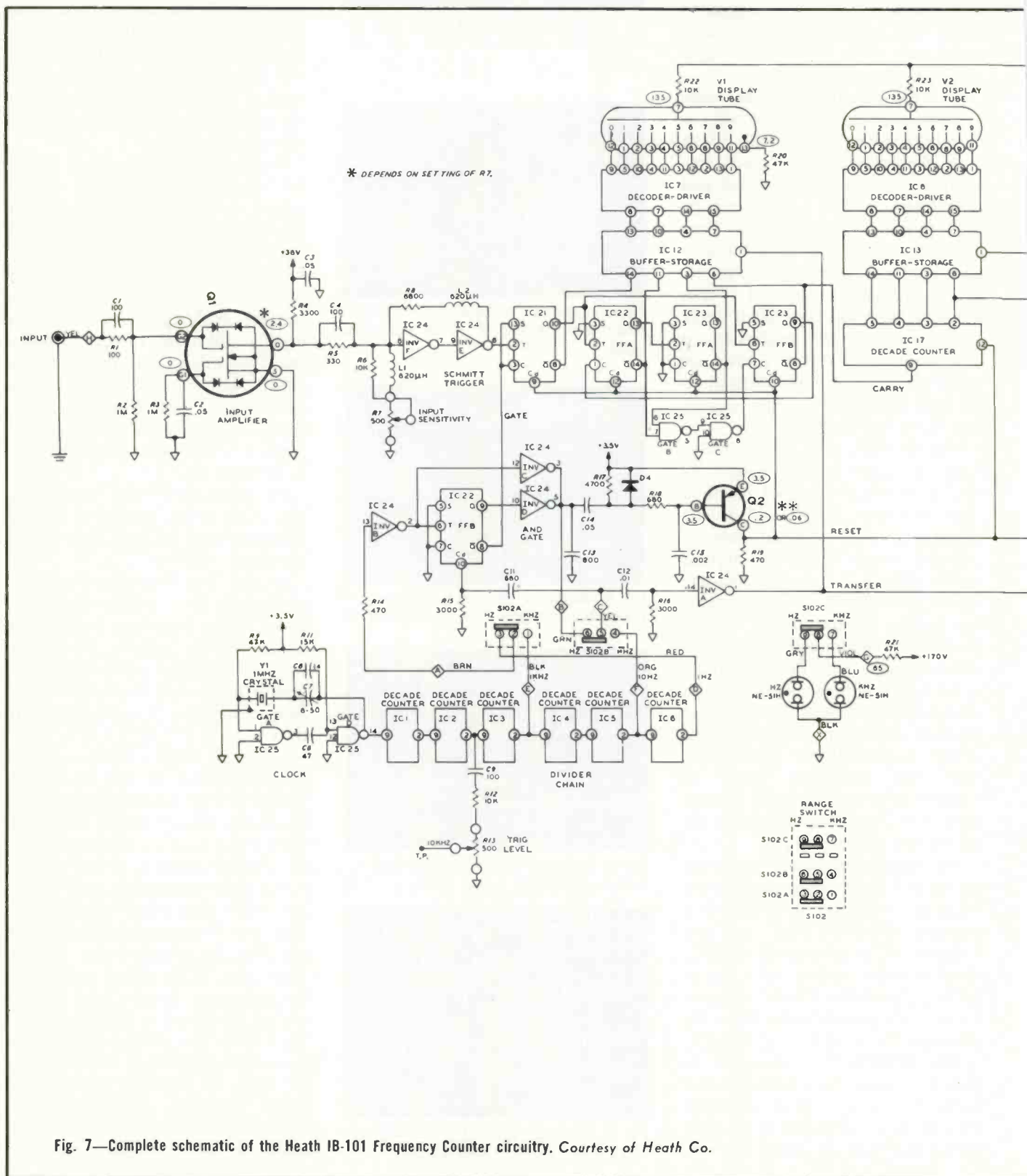


Fig. 6—Waveforms observed in the input circuitry when applying a 6MHz signal.

signal present at the output of the Schmitt-trigger circuit—IC24, Pin 6. Upon aligning the three photographs of the 100v rms scope traces horizontally, so that they appeared in phase with one another, we were able to determine the corresponding

phase relationships of the other signals. The second and third 100v rms waveforms were then cropped from the photographs, the remaining photographed scope traces positioned together in the composite picture to maintain the observed

phase relationships.) Similar composite pictures were produced of the waveforms that are observed when the applied signal voltage is reduced to 10.00v rms (Fig. 3) and 1.00v rms (Fig. 4). (For the second trace in all three il-



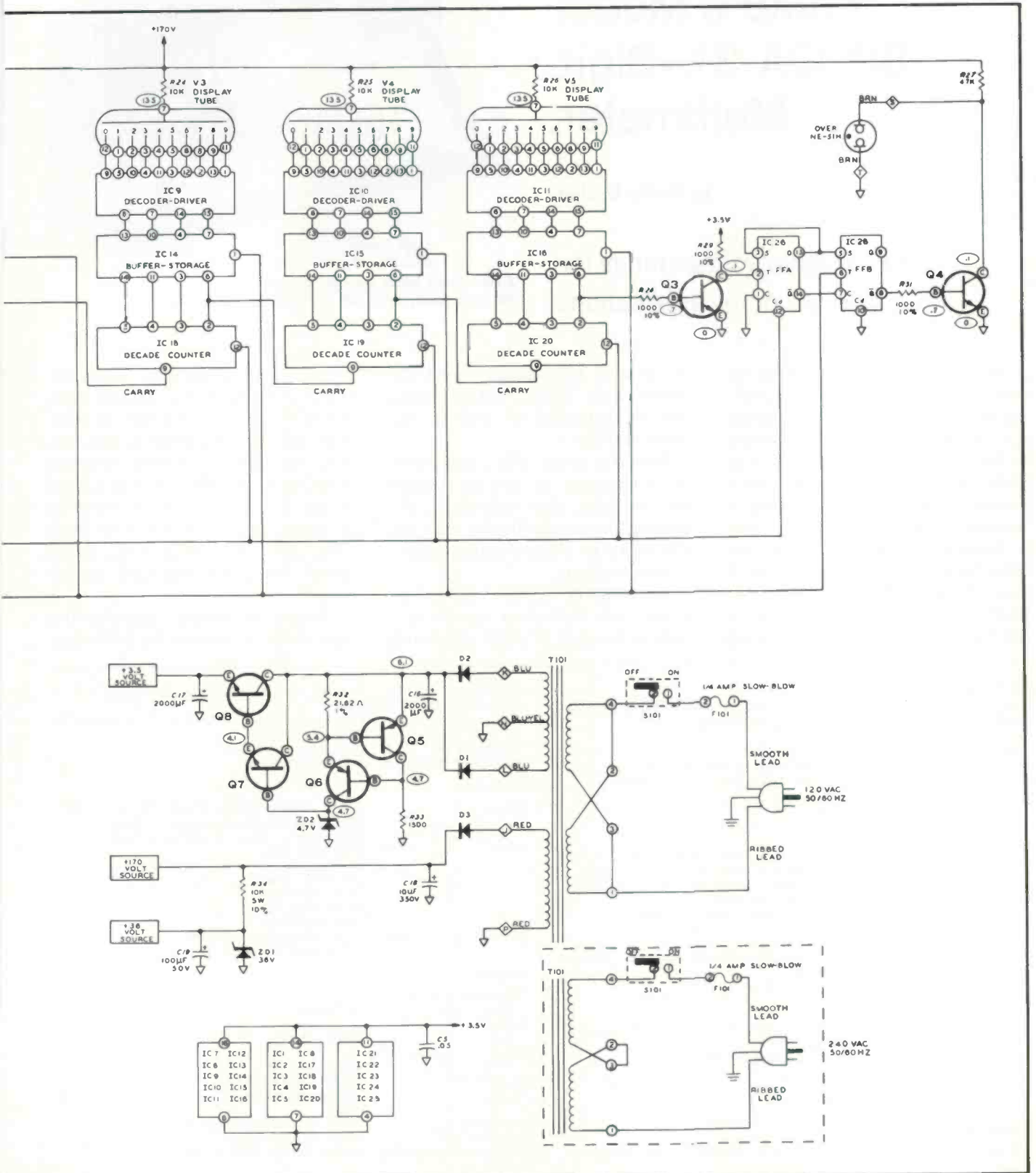
illustrations—the signal fed to inverter F—we used a relatively large scale of 100mv/cm on the scope gradient to observe more closely any variation in resulting amplitude.)

To observe the circuit's apparent

independence to the applied signal frequency, we also applied a low-voltage 6kHz signal to the frequency counter and observed how it was changed into a waveform resembling that of a square wave (Fig. 5). The same observations were made with

the application of a 6MHz signal (Fig. 6).

Next month's article will continue this subject by showing how the square-wave-type signals produced by this circuitry are processed by the decade circuitry. ■

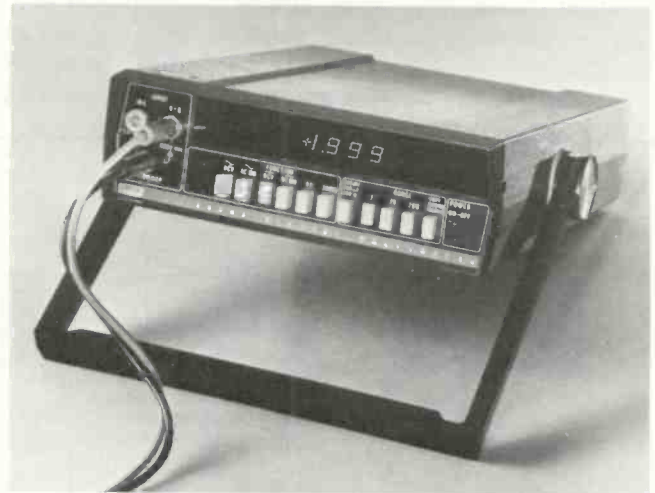


TEST INSTRUMENT REPORT

Fluke's Model 8000A 3½-Digit Multimeter

by Phillip Dahlen

Has a higher voltage range for
more servicing applications



Fluke's Model 8000A 3½-Digit Multimeter.
For more details circle 900 on the Reader Service Card.

Not too long ago, while using another digital multimeter for checking scope voltages, we encountered a 1100v CRT voltage. Not wanting to be bothered with a high-voltage probe, we chose to make these measurements with a VOM having a mechanical meter movement. Such a handicap, however, would not have occurred had we instead been using Fluke's Model 8000A 3½-digit multimeter, for it is able to handle voltages up to 1200v. (With

its optional high-voltage probe, the instrument's upper voltage range can be extended to include 1kv through 30kv.)

Priced at under \$300, this instrument measures ac and dc voltages and currents, plus resistances, displaying the measurements with the use of LED (light-emitting diode) digital readouts.

In addition to the high-voltage probe, this instrument can be used with a number of other interesting

options and accessories. These include a rechargeable battery pack for a minimum of 8 hours of portable use, digital printer output, deluxe test lead kit, a probe covering 100kHz to 100MHz with a voltage range of 0.25v to 30v, a clamp-on ac probe having ranges from 2a to 20a, plus a carrying case, front-panel dust cover and rack mounting kit.

Other interesting manufacturer specifications include the following:

DC Voltage

Ranges: $\pm 199.9\text{mv}$, $\pm 1.999\text{v}$, $\pm 19.99\text{v}$, $\pm 199.9\text{v}$, $\pm 1199\text{v}$
Accuracy: $\pm(0.1\%$ of reading + 1 digit)
(1 year, 59°F to 95°F)
Input Impedance: 10M, all ranges
Normal Mode Rejection: Greater than 60dB at 50Hz and 60Hz
Common Mode Rejection: Greater than 120dB at dc, 50Hz and 60Hz (1K unbalance)
Maximum Input Voltage: 1200v rms, all ranges

AC Voltage

Ranges: 199.9mv, 1.999v, 19.99v, 199.9v, 1199v
Accuracy: 45Hz to 10kHz: $\pm(0.5\%$ of reading + 2 digits)
(1 year, 59°F to 95°F)
10kHz to 20kHz: $\pm(0.7\%$ of reading + 2 digits)
Input Impedance: 10M in parallel with 100pf
Common Mode Rejection: Greater than 60dB at 50Hz and 60Hz (1K unbalance)
Maximum Input Voltage: 1200v rms
Not to exceed $10^7\text{v} \times \text{Hz}$ product on 20v, 200v and 1200v ranges
500v rms on 200mv and 2v ranges

DC Current

Ranges: $\pm 199.9\mu\text{a}$, $\pm 1.999\text{ma}$, $\pm 19.99\text{ma}$, $\pm 199.9\text{ma}$, $\pm 1999\text{ma}$
Accuracy: $\pm(0.3\%$ of reading + 1 digit)
(1 year, 59°F to 95°F)
Voltage Burden: 0.22v maximum up to 2a
Maximum Input Current: 2a rms, fuse protected

AC Current

Ranges: 199.9 μa , 1.999ma, 19.99ma, 199.9ma, 1999ma

Accuracy: 2a range: 45Hz to 3kHz: $\pm(1\%$ of reading + 2 digits)
(1 year, 59°F to 95°F)
Other ranges: 45Hz to 10kHz: $\pm(1\%$ of reading + 2 digits)
Voltage Burden: 0.22v maximum up to 2a
Maximum Input Current: 2a rms, fuse protected

Resistance

Ranges: 199.9 Ω , 1.999K, 19.99K, 199.9K, 1999K, 19.99M
Accuracy: 20M range: $\pm(0.5\%$ of reading + 1 digit)
(1 year, 59°F to 95°F)
Other ranges: $\pm(0.2\%$ of reading + 1 digit)
Current through unknown: 200 Ω range, 1ma
2K range, 1ma
20K range, 100 μa
200K range, 1 μa
2000K range, 1 μa
20M range, 0.1 μa
Maximum Input Voltage: 200 Ω and 2K ranges, 130v rms
20K through 20M ranges, 250v rms

General

Maximum Common Mode Voltage: 1200v peak
Operating Temperature Range: 14°F to 131°F
Storage Temperature Range without batteries: -40°F to 167°F
Humidity Range: 0 to 80% relative humidity
Display: 7-segment light-emitting diodes, 0.25 in. character height
Dimensions: 8½ in. wide by 2½ in. high by 10 in. deep
Weight: 2¾ lb without batteries
AC Power Requirements: 100-115-230v ac, 50Hz to 400Hz, 2w

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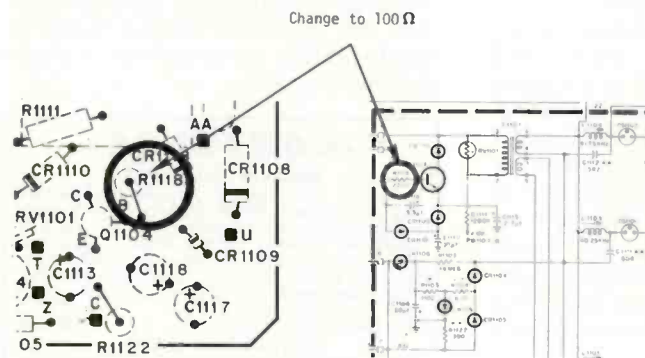
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

RCA SALES CORP.

Slow Remote Control Operation

There is the possibility of slow reaction of the remote system in early-production instruments. This symptom has been described as "slow turn-ON/OFF," "delayed channel change," "sluggish remote action," etc.

A resistor value change in the noise immunity circuit,

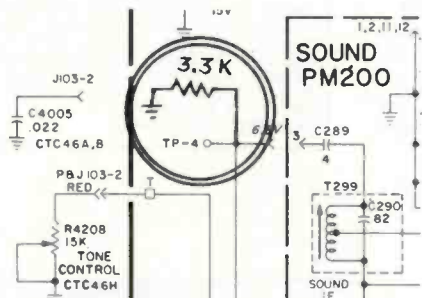


(base of transistor Q1104) as shown in the above illustration, may be helpful in resolving this symptom.

Color-TV Chassis CTC46 Series—Hum Modulation

There have been isolated instances of hum modulation in instruments utilizing this chassis. The intensity of the hum is variable with the fine tuning.

Usually the hum can be reduced to an acceptable level by



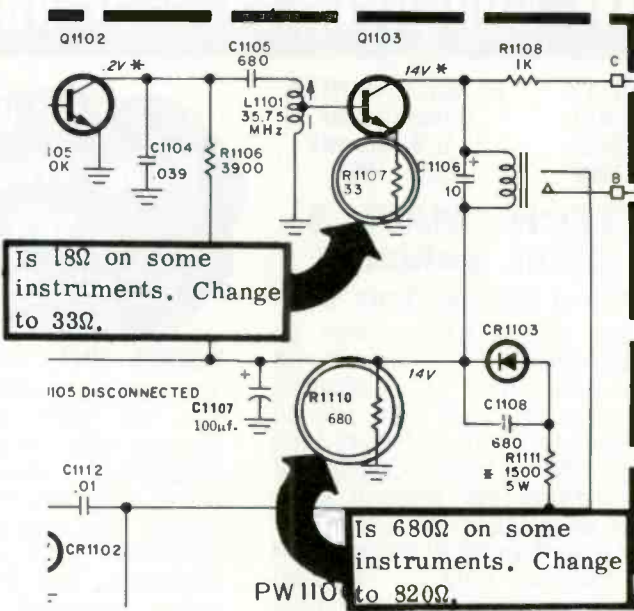
connecting a 3300Ω resistor from TP4 to ground on the PW400 board. If the hum is still present on strong signals a smaller value resistor may be used. However, do not use a value lower than 2200Ω.

Color-TV Chassis CTC52 Series—Remote Noise Immunity

In the event early-production versions of the CTC52XR chassis exhibit poor remote noise immunity, i.e. the remote function is triggered by spurious noise (such as telephone ringing, etc.), the following changes may improve selectivity.

First check the value of emitter resistor R1107; and if it is 18Ω, change it to 33Ω. Then check the value of power supply resistor R1110; and if it is 680Ω, change it to a 820Ω, 5%, 1w film type. Resistor R1110 is connected from the cathode of diode CR1103 to ground. This resistor and

C1107 (a 100μf electrolytic capacitor) were inadvertently left off the Service Data schematic.

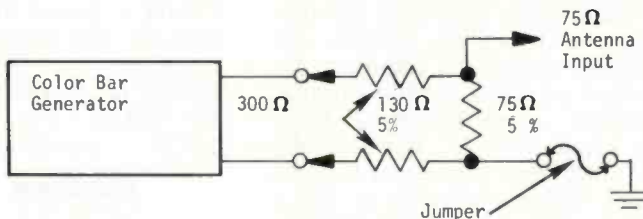


Color-TV Chassis CTC59 Series—Use of Color Bar Generator

The CTC59 is a "Hot" chassis. Therefore, normal hot-chassis servicing procedures should be observed when servicing this chassis.

The 300-to-75Ω balun transformer is mounted on the back cover of Model EQ475W/WR TV sets and is connected to the antenna block through a short coaxial cable with a standard antenna-type coaxial connector. There are several ways of connecting the 300Ω output of a color bar generator to the TV set with the back cover removed:

Connect the generator directly to the 75Ω coaxial connector wiring using a 1/2w resistor lead to make contact with



the center conductor and ground the other lead. This method is satisfactory for most service requirements even though the impedance mismatch causes some "ghosting."

Construct a resistive matching pad as shown in illustration. This will minimize "ghosting" but will also attenuate the signal somewhat.

Use a commercial 75-to-300Ω matching transformer (or another TV balun transformer, Stock No. 134986) with appropriate connectors.

Make an extension cable for the back cover-to-instrument connection. Use coaxial cable with a male connector on one end, female on the other.

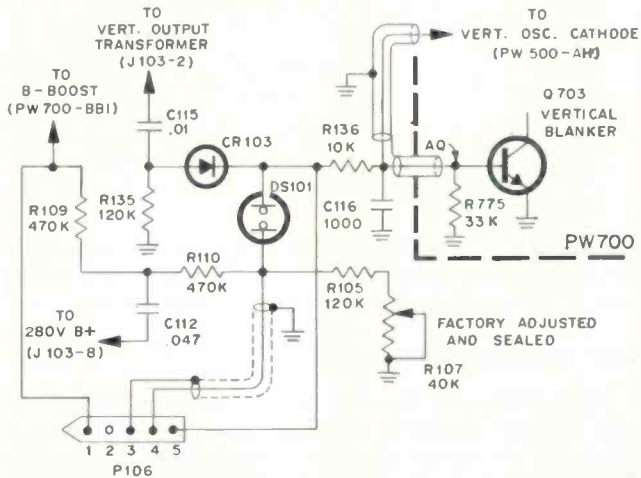
Color-TV Chassis CTC63 Series—High-Voltage Protection Circuit/ Isolating "No Video" Symptoms

In the event the high voltage increases above a predetermined level, the high-voltage protection circuit blanks the video signal by activating the vertical blanking stage. The symptom of "No Video" in the CTC63 chassis may be attributed to one of three areas: the video stages, the high-

voltage circuit, or the high-voltage protection circuit.

Outlined are procedures which can be used to isolate the symptom to a specific circuit area:

Apply power to the receiver. Then visually inspect the neon bulb, DS101, shown in illustration. If the neon bulb is lighted, proceed to the next step. If the bulb is not lighted, the problem is in the video section and troubleshooting of the video circuitry will be required.



CTC 63 - HIGH VOLTAGE PROTECTION CIRCUIT SCHEMATIC

Measure the voltage from Pin 1 to Pin 3 (ground) of the test fixture plug, P106. If this voltage exceeds 880v, the problem is in the high-voltage section; while if it does not exceed the 880v, the problem is in the high-voltage protection section. It is then necessary to troubleshoot the high-voltage protection section.

Should the solution of a problem in the high-voltage protection circuit involve replacement of variable resistor R107, it is necessary to reset the control for proper circuit operation. The following procedures are prescribed for correct adjustment:

Set the line voltage to 120v and the BRIGHTNESS control to minimum. Connect a 10M, 1% precision resistor to Pins 1 and 4 of test fixture P106 (leads should be as short as possible). Then from a fully clockwise position, rotate control R107 until the neon bulb fires. Then, very slowly turn control R107 in a clockwise direction until the neon bulb is just extinguished. Adjust the customer controls for a normal picture. Check the operation of the high-voltage protection circuit by connecting a 5M, 1% precision resistor to Pins 1 and 4 of test fixture P106. The video should now be blanked. Cement the control (R107) after the proper setup is achieved.

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TECHNICAL DIGEST

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ADMIRAL

Repairing Power Tune Radios

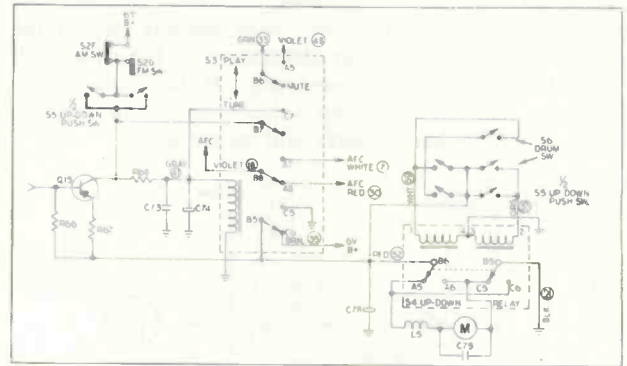
Studying the simplified schematics before repairing the power tune section of Models YK367, YK361A, YK367A or PRF157 can save you time and make the repair easier. The remaining circuits in these sets are standard FM-AM radio circuits.

Model YK 367-15B4 Chassis

The variable tuning gang capacitor can be manually tuned with the knob or power tuned with the 6v dc motor. Motor rotation direction is controlled by a DPDT relay, S4, which reverses the motor leads. The motor direction relay is controlled by the UP/DOWN pushbuttons or by the dial drum reversing switch, S6, located at one end of the dial drum. At either end of the dial, one set of drum switch contacts closes to reverse the motor direction through relay S4.

The dc power for the drum switch and the remainder of the power tune section is switched ON or OFF by a set of contacts on the power tune relay, S3. This relay can only be closed by supplying power to it from the UP or DOWN pushbutton through the AM or FM pushbutton, it can only

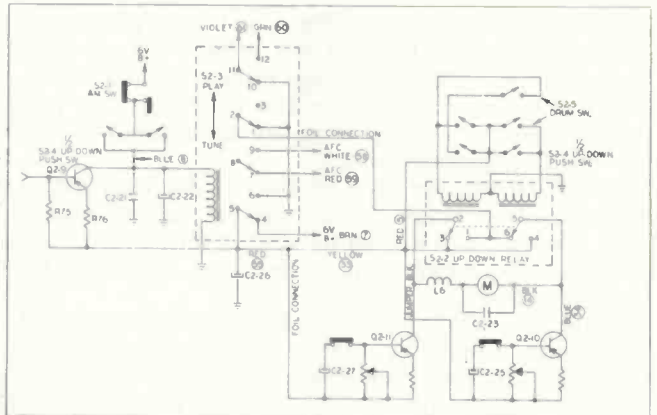
be opened by turning the set OFF, or by amplifying an AM or FM station signal enough in the power tune section to



bias the Q15 transistor to cutoff. Since this transistor is in the relay control circuit, it will open the relay and disconnect dc power from the entire power tune section.

Models YK361A, YK367A-15B4 Chassis

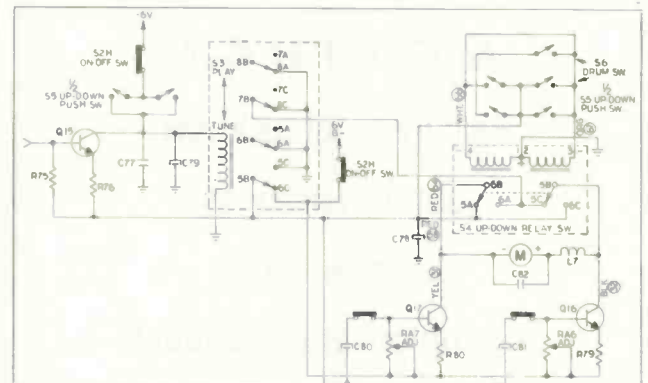
These radios use the same basic circuit as YK367 but with different schematic symbols. The main difference is that when the motor drives the dial downward, transistor Q2-11 conducts to charge the C2-27 electrolytic capacitor.



When a station is detected, S2-2 relay opens but the motor continues to operate long enough to discharge C2-27. When tuning upward, Q2-10 and C2-25 perform in a similar manner.

Model PRF157-17B4 Chassis

This third version of power tuning uses NPN transistors instead of the PNP types used in the previous sets, so the



batteries are reversed to provide -6v instead of +6v. The symbols and the layout of the board are different but the circuits are similar.



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Troubleshooting

A good approach to troubleshooting the power tune section is as follows:

Repair any defect in the AM or FM section before looking at the power tune section. If the motor will not operate with the UP or DOWN button depressed, trace the dc power from the motor back through the motor reversing relay and to the dc power source of the power tune relay. Transistors Q16, Q17, Q2-10, Q2-11 can be disconnected if suspected. If the motor does not stop at a station, check for the trouble on the power tune circuit board. With the motor running, you may want to disconnect a motor lead while servicing the power tune board. Power is only applied to the power tune section when the power tune relay is closed.

A few radio motors have been found that rock back and forth at the end of the dial. This is usually caused by a defective dial drum switch. Make sure that the replacement has not been damaged in handling.

Replacement Relays

Four different relay boards have been used in the production of models YK367 (manual S1091), YK361A and YK367A (manual S1091A) and PRF157 (manual S1240). It can be difficult to determine the correct replacement relay from the information given in the service manual.

A table has been prepared to help you. The board num-

BOARD NUMBER	SYMBOL	DESCRIPTION	PART NO.
569096	S3	On-Off Power Tuning 40 (MQ-13G6) 1 1/2 x 1-1/8 x 11/16	2083A1-3
569096	S4	Magnet or Motor Relay P25 S25 (MQ-11H) 1 1/2 x 1-1/8 x 11/16	2083A1-4
YD1569009-0 or YD1569009-2	S2-2	Magnet or Motor Relay DC6V P-26 S-60 1-3/16 x 1-1/8 x 11/16	2083A1-8 or -12
YD1569009-0 or YD1569009-2	S2-3	On-Off Power Tuning 511 46-1.650 0.41Cul 1-1/4 x 1-1/8 x 11/16	2083A1-7
YD1569008-0	S2-2	On-Off Power Tuning 40 1-1/8 x 1-1/8 x 3/4	2083A1-11
YD1569008-0	S2-3	Magnet or Motor Relay 68 1-1/8 x 1-1/8 x 3/4	2083A1-10
YD2418002-0	S3	On-Off Power Tuning 511 46-1.650 0.14Cul 1-1/4 x 1-1/8 x 11/16	2083A1-7
YD2418002-0	S4	Magnet or Motor Relay DC6V P-26 S-60 1 1/2 x 7/8 x 11/16	2083A1-12

ber is printed on the underside of the relay board. The information printed on the relay coil is shown in the description column of the table along with the size of the relay's plastic case.

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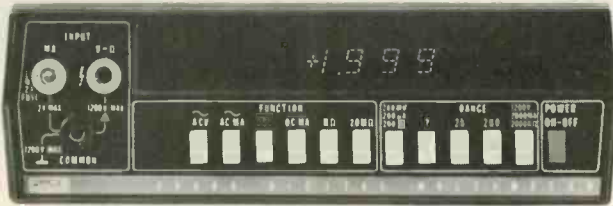
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KENWOOD SCOPE...

continued from page 51

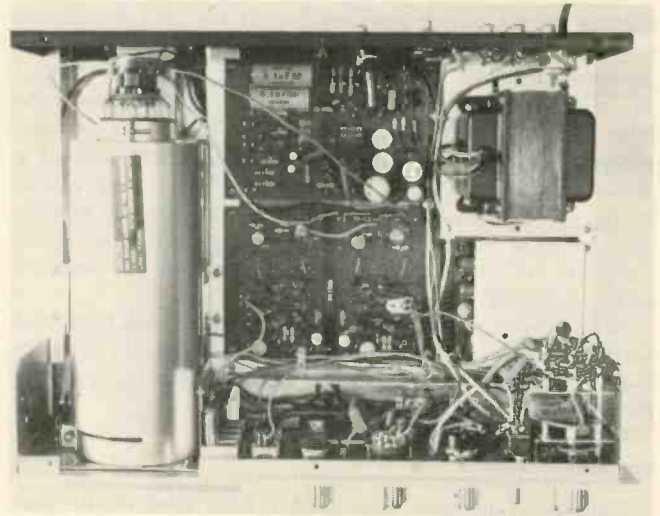


Fig. 21—Top view of scope with cover and sides removed.

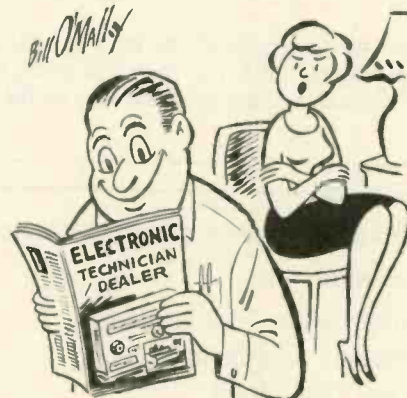
produce when applying square-wave signals to the scope's left-channel front-panel audio input. Fig. 18 shows the waveform observed under these conditions when applying a 20Hz signal, Fig. 19 shows the waveform observed when applying a 2kHz signal, and Fig. 20 shows the waveform observed when applying a 200kHz signal.

Manufacturer specifications indicate that the scope's horizontal and vertical amplifiers have a sensitivity of 25mv p-p/cm at the front panel input and a sensitivity of 250mv p-p/cm at the rear panel input, there being a

frequency response of 3Hz to 200kHz -3dB or less, with a 250K input impedance and an input capacity of less than 40pf at the front panel input and less than 60pf at the rear panel.

The scope's horizontal-sweep generator is said to have internal negative synchronization and cover a range of 10Hz to 100kHz in four steps.

We were quite impressed with the clean layout of components within the scope (Fig. 21), and with the frequent use of labels instructing the customer to refer the instrument to qualified service personnel for maintenance. ■



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either boxed No. 70159 or carded No. 70160. Vaco Products.

COLOR TEST JIGS 704

Offered in kit form

Five new portable color test jigs in kit form, including four 15-in. models, are offered for the first time in the Pix-O-Scope line. The kits include cabinet and necessary components, less picture tube.

A patented yoke adapter is available for use in servicing various makes. With a color picture tube added and the proper yoke adapter connected, each kit may be used to check any domestic television set in the home. Determination can be made quickly, whether trouble is caused by the picture tube, convergence board or chassis. This enables the service man to show the customer when a new picture tube is



needed. The new kit line includes four 15-in. models and one 19-in. model. The 15-in. model is said to be the smallest on the market and weighs only 28 lb. The line also consists of patented portable color test jigs complete with color picture tube, special circuit to allow setting of the efficiency coil, dc meter, kv meter, mv meter, volt-ohm meter, built-in color bar generator, and eye-bolts for safe hanging in the shop. Pix-O-Scope Inc.

WD-40 705

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causes of short circuits and power failure. The product reportedly will not harm rubber, plastics or fine finishes and is available in aerosol spray cans or bulk sizes. WD-40 Co.

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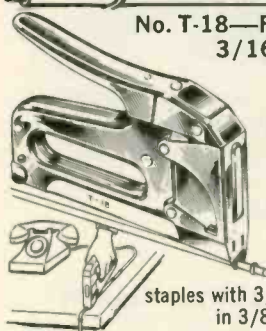
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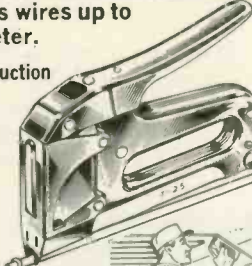
No. T-18—Fits wires up to 3/16" in diameter.



BELL, TELEPHONE, THERMOSTAT, INTERCOM, BURGLAR ALARM and other low voltage wiring.

Uses T-18 staples with 3/16" round crown in 3/8" leg length only.

No. T-25—Fits wires up to 1/4" in diameter.



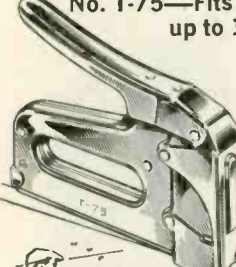
Same basic construction and fastens same wires as No. T-18.

Also used for **RADIANT HEAT WIRE**

Uses T-25 staples with 1/4" round crown in 9/32", 3/8", 7/16" and 9/16" leg lengths.

T-18 and T-25 staples also available in Monel and with beige, brown and ivory finish at extra cost.

No. T-75—Fits wires and cables up to 1/2" in diameter.



RADIANT HEAT CABLE, UF CABLE, WIRE CONDUIT COPPER TUBING or any non-metallic sheathed cable.

Also used as **DRIVE RINGS** in stringing wires.

Uses T-75 staples with 1/2" flat crown in 9/16", 5/8" and 7/8" leg lengths.

Arrow Automatic Staple Guns save 70% in time and effort on every type of wire or cable fastening job. Arrow staples are specially designed with divergent-pointed legs for easier driving and rosin-coated for greater holding power! All-steel construction and high-carbon hardened steel working parts are your assurance of maximum long-life service and trouble-free performance.

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NEW PRODUCTS...

continued from page 67

ity. The instrument graphically analyzes the characteristics of transistors, diodes, rectifiers, tunnel diodes and zeners by displaying their characteristics on the oscilloscope screen. The resulting family of characteristic



curves reveals the gain, saturation voltage, linearity, dynamic collector impedance, leakage, breakdown voltage, polarity and alloy of bipolar transistors. Tests performed on field-effect transistors include mutual conductance in either the depletion or enhancement mode, pinch-off voltage and polarity. The unit can also be used to differentiate between junction and insulated gate FET's. The unit reportedly cannot damage the semiconductor under test even if it is improperly inserted and checks transistors in-circuit regardless of the circuit impedance by using the "signature pattern" technique—a family of curves resulting from subjecting in-circuit transistors to the curve tracers signals. The instrument measures 8 3/8" in. W by 3 1/2" in. H by 6 1/2" in. D and comes complete with probe. Jud Williams Co.

ANTENNA AMPLIFIER 707

Provides two outputs from single antenna

A new two-set antenna signal amplifier—Model TA-82, Colorcaster II—reportedly amplifies all UHF and VHF TV channels, plus all FM stations. The amplifier makes it easy for a single antenna to serve two or more TV or FM receivers, providing two outputs from a single input.



Gain at each output is said to be 8dB at VHF and FM, 5dB at UHF. Completely solid state, the unit is encased in an attractive cyclac housing that mounts easily behind a TV set or in any other convenient location. Input

and output impedances of the amplifier are 300Ω matched to twinlead. The response is reportedly flat within 1/2dB per channel and isolation between outputs is rated at least 15dB. The unit comes on a colorful peg-board display card which graphically illustrates its applications and features with simple installation instructions. Jerrold Electronics Corp.

FET VOM

708

Fifty-three ranges on four scales

A portable, lab-grade FET VOM, Model IM-104 reportedly combines accuracy, versatility, convenience and ruggedness in an easily assembled kit. Low-drift 1% precision metal film and wire wound resistors are used for greater stability, and dual FET meter amplifier circuitry is provided for a 10M input impedance and instant operation. There are 53 ranges on four scales, which include nine dc-v-acv ranges from 0.1v to 1000v; six current ranges from 0.01ma to 1000ma, dc and ac; 7 resistance ranges from 1Ω to 100M, conventional or low-voltage modes; decibel ranges from -40dB to +62dB; and dc null scale with reportedly better than 1mv resolution. The 4 1/2-in. taut-band meter is diode protected and built-in circuitry indicates the condition of the battery at the flip of the range selector. Heath Company.



DEGREASER 709

709

Completely safe for delicate instruments

A cleaning agent has been developed that is said to be completely safe for degreasing delicate instruments, electronic equipment and circuit boards, as well as motors, recording tapes, switches, relays and similar parts and equipment.

The Freon TF Degreaser can reportedly be sprayed onto the instrument or component and will flush away contaminants, then evaporate instantly without leaving a residual film. According to the manufacturer, it is safe to use on plastics, elastomers, metals, and photographic films. It is said to be non-flammable and non-toxic. To fa-



Facilitate use in small, hard to reach areas, the degreaser is provided with an extension attachment for pinpoint applications. Crown.

710

COLOR-TV COMPONENTS KIT

Contains most-common components for RCA XL-100 chassis

The new XL-100 Components Kit is designed to give technicians greater servicing capabilities for the RCA XL-100 solid-state color-TV chassis. This kit contains a variety of transistors, diodes and resistors, plus one circuit breaker—27 components in all. All of the components have been selected for fast, efficient service of the chassis. The kit contains 11 more components



than the Power Device Kit offered previously. A special parts location diagram and a separate cross reference chart is included with the kit, which fits conveniently into the lid of the RCA module caddy—another time-saving in-the-home servicing aid. For technicians already using the old Power Device Kit, RCA is offering a special "Add-on" kit. The kit, 12H181, includes the 11 new components in the new plastic box with a cross reference and parts location diagram. RCA Parts and Accessories.

DIGITAL MULTIMETER

711

Measures voltage, current and resistance in 25 ranges

The Model LDM-850 is a digital readout ac/dc multimeter that measures voltage, current and resistance in 25 ranges. The instrument reportedly has a scale accuracy of 1.0% or greater and will provide a 3-1/2 digit non-blinking display up to 1,999. Specifications indicate that it offers a dual-slope operating mode and has a maximum input voltage of 1,000v dc and 350v ac with a 10M input impedance. Rated sensitivity ranges from 100µv to 1v with current from 0.2ma to 1,000ma on dc. Resistance readings reportedly range from 0.2K to 2,000K. Other features include automatic polarity reversal and overrange lamp indication. The display has a hold and

lock position and there is a segmented display lamp test position. The sam-



pling frequency is 200m/sec and there is an INSTANT-RESPONSE, MANUAL-RANGE switch with appropriate decimal indications. The unit also has a dual power supply for field or in-shop testing and measures 10 in. W by 7 3/4 in. D by 3 1/4 in. H. Leader Instruments.

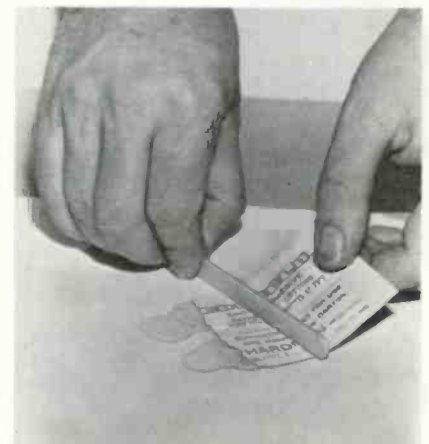
ADHESIVE

712

Packaged in twin-pack to assure proper mixing ratio

Double/Bubble is reportedly an extra-fast-setting, self-curing, Epoweld adhesive—a two-part epoxy that bonds to almost anything. For maximum convenience, parts A and B are packaged in a foil twin-pack that

assures that the mix will be in proper ratio. This adhesive is said to set in just 3 to 4 min, has excellent resistance to weather, hot and cold water,



gasoline, oil, etc., and produces a bond that will resist stresses up to 1 1/2 tons per sq in. Hardman Inc.

OSCILLOSCOPE

713

25MHz bandwidth with X-Y capability

The Model D66 is a dual-trace, lightweight and compact 25MHz
continued on next page

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NEW PRODUCTS...

continued from page 69

scope. Bright displays are obtained by using 10kv on the rectangular 5-in. CRT, which has a big 8 by 10cm display area. A wide range of sweep rates are reportedly included from 100ns/div to 2 sec/div (20ns/div with X5 magnifier), X-Y measurement capability, 5% accuracy and 14ns risetime,



make the scope ideal for general use. Sensitivity extends to 10mv/cm at 15MHz. The ability to trigger at TV field or line rates will allow those in the TV industry to use these facilities to view a selected line or field. Tektronix, Inc.

ANTENNAS

714

Most-needed exact antenna replacements



A floor display, Model WE19, contains six each of the 23 fastest moving model numbers of universal and exact antenna replacements for AM/FM radio, portable TV sets, walkie talkie and two-way radios. The new slim design saves

pegboard and wall space and contains 138 packages. Workman Electronic Products.

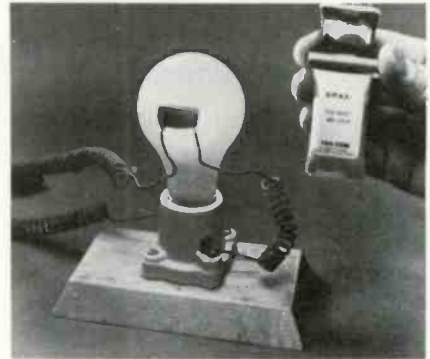
ADHESIVE

715

Electrically conductive and resists high temperatures

A electrically conductive silver-epoxy adhesive for critical high temperature (up to 190°) bonding and sealing applications is developed. Tra-Duct 2924 is a two-part conductive composition of specially blended epoxy materials and highly refined silver which is free of copper, carbon and other impurities. This paste formulation reportedly combines the adhesive

properties of epoxies with the electrical and thermal conductivity of pure silver. The adhesive is especially recommended for the repair of electronic



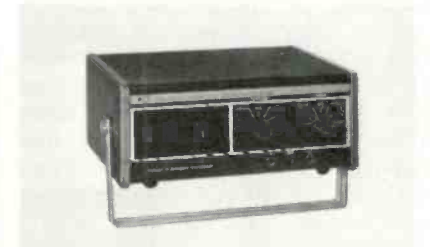
modules, waveguides, RF shields and similar applications in circumstances where conventional soldering or jointing techniques would be difficult or impossible. Tra-Con Inc.

DIGITAL MULTIMETER

716

Positive overrange and wrong polarity indication

A new, solid-state digital multimeter, Model 281, reportedly features a large, stable 2-1/2 digit numerical display with automatically positioned



decimal point, 100% overrange capability, full overload protection, positive overrange and wrong polarity indication, high sensitivity, 1% accuracy and 10M input impedance. It is said to be lightweight and portable with a convenient five-position handle that doubles as a stand for eye-level viewing. The instrument measures 3-1/2 in. H by 7 in. W by 9 in. D. Dynascan Corp.

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DEALER SHOWCASE

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

AM/FM/STEREO PHONO 717

Budget-priced matrixed four-channel package

For the four-channel enthusiast, a new budget-priced package, Model E-1008, is equipped to bring reproduc-



tions from matrixed four-channel recordings or four-channel FM broadcasts. It will reportedly also enhance the sound of conventional stereo. Included are tuner-amplifier for AM as well as FM with AFC; 20w IHF music power; Micromatic record player with synchronous four-pole motor; four air suspension speaker systems, each with 6-in. speaker; four-channel decoder; and three long-play records. Magnavox.

CB RADIO 718

Features Selector Drum For Displaying Channel Numbers

A new 23-channel CB radio, the Messenger 122, is said to come with a unique rotary selector drum. This design permits larger illuminated channel numbers for readings at a glance, thus making it especially easy to change channels while operating mobile. Also featured is push-button



"instant on" that is entirely separate from the VOLUME and SQUELCH controls. This allows these settings to remain undisturbed and eliminates the need for readjustment every time the unit is turned ON. On transmit, the unit has electronic speech compression for higher average modulation to increase range capability. E. F. Johnson Co.

LECTERN SOUND SYSTEM 719

Completely self contained and sets up in seconds

Introduced is the Speech Director II, a portable lectern sound system that features a solid-state amplifier, sound



c o l u m n speaker system and modernized styling. The system is said to be completely self contained and sets up in s e c o n d s , making it ideal for professional lecturers and speakers. Op-

erating on 110v ac or the single self-contained 12v battery, it can reportedly be used in every location, even outdoors. The built-in four-speaker sound column speaker system aims the sound to the audience in a focused beam. The unit is designed with input and output jacks to easily accommodate accessory items such as a second microphone and satellite speaker system. Outputs for recording and inputs for music sources on tape or record are included. The complete unit is enclosed in a rugged case finished in scuff-resistant pebble-textured grey vinyl. Argos Products Co.

SPEAKER PROTECTOR 720

Prevents stereo speaker blow-outs

An electronic "fuse" has been designed to keep overloaded stereo speakers from blowing out. The speaker



protector, No. R47001, has solid-state circuitry and is self contained, requiring no other power source. Actuated by sound itself, the protector is said to automatically limit output of the stereo hi-fi amplifier without impairing tone quality. Speaker cones that might otherwise burn out or burst under the strain of overload are reportedly saved. Limiting is achieved by a compressing action, which can be preset to defy excessive levels. Robins Industries Corp.

continued on next page

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6BA11	\$.95 ea.
6BQ7	\$.90 ea.
6SN7	\$.75 ea.
12EK6-12DZ6	\$.60 ea.
12GE5	\$.95 ea.
35EH5	\$.90 ea.
300 Asst'd Resist. 1 & 2 Watt	\$4.95
100 Mica Cond. Asst'd	\$1.49
20 Asst'd Mallory Controls	\$2.49
25 Asst'd Cond. (Cans)	\$4.95
25 Asst'd Cond. (Axial)	\$4.95

DIODES—SEMI CONDUCTORS

HEP 170-2.5 Amp. 1000 PIV	.....	25 for \$4.95
6500 PIV Focus Rect.	.....	4 for \$2.00
13.5KV Focus Rect.	.....	5 for \$3.00
18.5 KV Focus Rect.	.....	3 for \$2.49
Sel. Boost Rect.	.....	5 for \$2.00
Crystal Diodes 1N34A	.....	25 for \$2.00

CONDENSERS—AXIAL LEADS

25 mfd. 25 volts	.....	5 for \$1.00
50 mfd. 50 volts	.....	4 for \$1.00
50 mfd. 150 volts	.....	6 for \$1.49
100 mfd. 150 volts	.....	12 for \$1.98
1000 mfd. 50 volts	.....	6 for \$2.49
30 mfd. 450 volts	.....	6 for \$1.98

CONDENSERS (CANS)

300 mfd. 150 volts	.....	3 for \$1.98
500 mfd. 200 volts	.....	2 for \$1.98
300 mfd. 200 volts	.....	4 for \$1.98

PHONO EQUIPMENT

Mono Tone Arms TO Cart.	2 for \$2.19
Stereo Tone Arms TO Cart	2 for \$2.98
Equiv. Astatic 133 Boxed	\$3.19 ea.
Equiv. Astatic 142	\$2.79 ea.
Equiv. Astatic 13TX Boxed	\$2.98 ea.
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DEALER SHOWCASE...

continued from page 71

MICROPHONE 721

Designed for base station operation

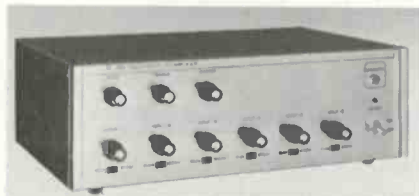
Introduced is the SBE-100X, a base station microphone with preamplifier for SBE use in all communications applications. The microphone is die cast designed for heavy usage in base station applications and includes a unique split bar for "press-to-talk" or "lock-to-talk" operation, which represents an advance in operational ease for base-station microphones. The microphone is finished in black with dull chrome highlights. Linear Systems Inc.



PA AMPLIFIERS/BOOSTERS 722

Provides 39 modular combinations allowing up to 6 modular inputs

A flexible series of TA-900PA amplifiers, boosters and mixer preamplifiers consists of 10w, 30w, 60w and 100w amplifiers, plus 50w and 100w boosters. A unique design is said to



provide 39 modular combinations, allowing up to six modular inputs with a variety of connectors. The specifications indicate less than 2% THD over the frequency range of 50Hz to 15kHz and a frequency response of 20Hz to 20kHz ± 1dB. The noise level is reportedly not less than 60dB below the rated output with the microphone preamplifier. Toa Electric Co.

ELECTRONIC TURNTABLE 723

Servo-controlled for precise speed calibration

A servo-controlled electronic turntable, Model GA212, is designed with an integrated tone arm and a sturdy hinged dust cover. The dc powered manual turntable provides two speeds—33⅓ and 45 rpm. Two independent potentiometers allow for precise speed calibration so as to obtain exact musical pitch regardless of voltage, power-

line frequency variation or tracking force. Capacity switches select the speed and stop, while automatic shut-off at the end of the record is provided

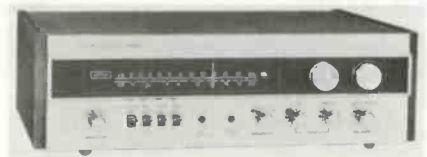


by a photoelectric switch. Tone arm cueing, through a touch rocker bar, is reportedly positive, hydraulically damped and accurate. The generator motor and flexible belt drive system are designed to filter out vibration and rumble. Correction of drift, wow and flutter is constantly compensated for. North American Philips Corp.

AM/FM STEREO RECEIVER 724

FM sensitivity is rated at 1.9µv

The Model S7100A receiver is rated at 70w (IHF), 44w rms across an 8Ω load, both channels driven. It features a direct-coupled amplifier, ceramic FM IF filtering, FM MUTING switch and a front panel control for tape dubbing. FM sensitivity is



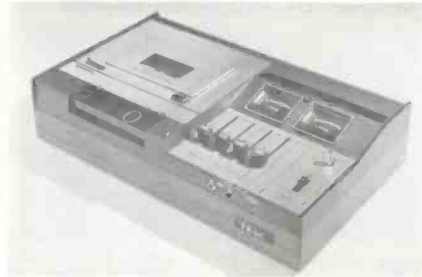
rated at 1.9µv (IHF), selectivity at 50dB. Retail price is \$199.95 with walnut case included. Sherwood Electronic Lab., Inc.

CASSETTE DECK 725

Designed to maximum control of record and playback functions

Specifications indicate that the Model 220 cassette deck has the following features: An extremely hard ferrite tape contact surface which is virtually wear free; core material that is machined from permalloy; bias selector for chromium dioxide tape and high density ferric oxide tape; plus four separate preamps, two for record and two for playback. Also incorporated in the unit are linear

potentiometers for the LEVEL control, a four-pole hysteresis synchronous motor, tape selector switch, automatic shut-off mechanism, all silicon transistorized solid-state preamps, expanded-scale high-visibility VU meters, tape travel direction indicator, finger-



tip piano key operation (with pause control) and built-in headphone and microphone jacks. TEAC Corp. of America.

PARTS AND TOOL ORGANIZER

Keeps parts organized and indexed for immediate reference **726**

The Vize-Kase is said to be a completely transparent portable parts and tool organizer for the technician using assorted small parts, mechanically or electronically oriented. The case offers



a practical solution to keeping parts in an orderly fashion and indexed for immediate reference. It is available in seven models ranging from 46 to 79 compartments, each having its own hinged cover and snap type lock. The outer case and covers are molded from high-impact plastic, making the outer case virtually indestructible; and its transparency enables the user to see contents without opening the case. Mega Industries Corp.

FOUR-CHANNEL DECODER **727**

Synthesizes four-channel sound from two-channel source

The Model SDW-Q, Universal four-channel decoder, decodes CBS SQ and EV encoded records as well as synthesizes four-channel sound from any two-channel source. The unit is said to retain full bass response in the

rear channels, utilizing a special 300Hz turnover in the matrix/phase shift circuitry. Other features include



a FRONT-TO-BACK BALANCE control, MASTER VOLUME control, TAPE MONITOR switch, SOURCE switch and MATRIX MODE switches. Metrotec Electronics, Inc.

AM/FM RECEIVER **728**

Has 195w of IHF music power output

The Model SX-727 AM/FM stereo receiver, with up to 195w of IHF music power output (across 4Ω), is reportedly capable of handling two tape decks, two turntables, three pairs of speaker systems and a mike. The front-end uses a junction type FET in the first stage of a two-stage RF amplifier. The result is a sensitivity of 1.8μv, IHF; a high signal-to-noise ratio *continued on next page*

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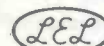
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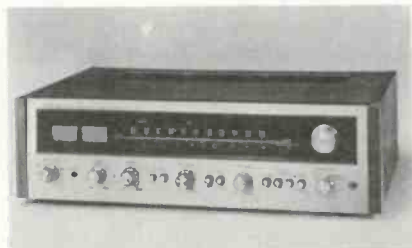
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DEALER SHOWCASE...

continued from page 73

tio of 70dB and optimum reception. Ceramic filters are used in both the AM and FM IF sections. IC's in the IF help produce a capture ratio of 2.0dB. The unit also uses an FET equipped switchable FM muting circuit to eliminate unpleasant interstation noise. Harmonic distortion is reportedly less

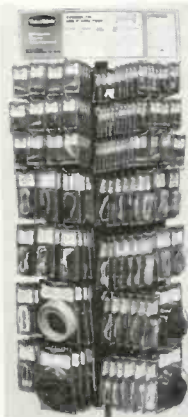


than 0.1% and frequency response is 10Hz to 20kHz, with a maximum variation of 1dB. The direct-coupled complementary symmetry power amplifier, with both channels driven at 1kHz, can supply 40w plus 40w for 8Ω speakers. With both channels driven in the range of 20Hz to 20kHz, the output is 37w plus 37w across 8Ω, with continuous power output and less than 0.5% harmonic distortion. When power output is decreased to 24w per channel, harmonic distortion and IM drop to less than 0.03%. The frequency response is 7Hz to 80kHz with a variation of 1dB, while the IHF power bandwidth is 10Hz to 60kHz, measured across an 8Ω load, with harmonic distortion of less than 0.5%. Price: \$349.95. U.S. Pioneer Electronics Corp.

AUDIO ACCESSORIES 729

Occupies only a few feet of floor space

A rotating peg rack merchandiser, Display No. A9914, holds a complete line of accessories for stereo or monaural enthusiasts. The products—including audio connector patch cords, adapters, speaker extensions, plugs, jacks, wire and accessories—are individually blister packed and coded for quick and easy identification. A permanent header sign explains how the coding system works, making it a simple matter to quickly select the correct item. It is said to hold 242 packages (23 assorted items). Saxton.



SSB/AM CB RADIO 730

Features 15w peak envelope power

The Cheetah SSB is reportedly the smallest mobile side-band unit on the market, yet features the maximum 15w peak envelope power allowed on



single side band. It also has an SWR bridge for checking antennas. Some of the features include: variable RF gain that controls both AM and SSB, plug in mike and power cord, S/RF meter that changes color from transmit to receive and RF noise blanker. Retail for \$339.95. Pearce-Simpson Div., Gladding Corp.

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(Signature) Richard Moeller
Treasurer

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TECHNICAL LITERATURE

TV/Appliance Dolly

The new 1973 catalog describes a complete line of dollies, appliance covers, utility straps and other time and labor saving devices. All models are now reportedly improved to move loads up or down stairs twice as fast as they did previously. Yeats Appliance Dolly Sales Co., 1300 West Fond du Lac Ave., Milwaukee, Wisc. 53205.

Relays

A new 4-page brochure and cross-reference guide describing miniature antenna change-over, heavy duty power relays and do-it-yourself kits is now available. General purpose midjet relays are available as SPDT, DPDT or 3PDT configurations with 5a or 10a contacts. Heavy duty power relays are available in a DPDT configuration for 20a operation. J. W. Miller Co., 19070 Reyes Ave., Compton, Calif., 90221.

TV/FM Antenna Guide

A 10-page guide to installing TV and FM antennas is available covering antenna selection, masts, mounts, lead-in wire, lightning protection and multi-set systems. Illustrated with a series of clear, complete pictures and diagrams, the guide gives the reader step-by-step instructions on various types of home antenna installations. Practical tips on how and where to take lead-in wire into the house, how to run coaxial cable and twinlead indoors and out, and how to drill through exterior walls are included. Jerrold Electronics Corp., 401 Walnut St., Philadelphia, Pa. 19105.

Electronic Components

A 32-page, 1972-73 commercial products catalog is now available which contains details on a wide range of products ranging from replacement components for home entertainment and industrial electronic equipment, to components for hobbyists. Replacement components for home entertainment equipment include transistors, integrated circuits, rectifiers, diodes, solid-state tube replacements and electrolytic capacitors. The catalog contains photographs of the products, case diagrams of the devices and price information. International Rectifier Corp., Semiconductor Div., 233 Kansas St., El Segundo, Calif. 90245.

Technical Publications

A flyer, Form No. SMF-109, describes the broad range of technical publications on solid-state devices available from the manufacturer's solid-state division. These publications include the new Databook series, the popular technical manual series, a reference handbook on solid-state power circuits, and a variety of catalogs and brochures. They provide accurate, detailed, up-to-date information on the theory of operation, mounting and handling techniques, circuit applications, and definitive ratings and characteristics for all the manufacturer's solid-state devices, including integrated circuits, transistors, power hybrid circuits, thyristors, rectifiers, and other solid-state diodes. RCA Solid State Division, Box 3200, Somerville, N.J. 08876.

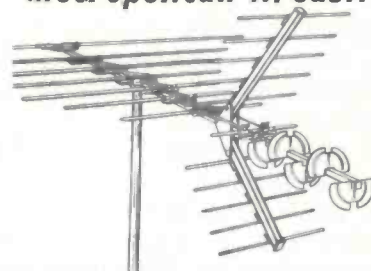
Circuit Protection Products

A new 56-page, multi-color, product catalog featuring complete mechanical and electrical specifications for all types of glass and ceramic tube fuses, fuseholders, fuse clips and blocks, automatic and manual reset circuit breakers, heavy and medium duty relays, alarm buzzers and momentary action switches, is being offered at no charge. The catalog provides product photos, schematic diagrams and operating characteristics of many types of circuit protection devices and components. A special nine-page "Fuseology" section is devoted to an informative presentation of basic fuse and circuit protection technology and includes time/current characteristic charts for the main fuse range. Littelfuse, Inc., Dept. 19 PR, 800 E. Northwest Highway, Des Plaines, Ill. 60016.

Electrolytic Capacitors

A new color-TV electrolytic replacement guide, the M-945, is released. It contains a specially selected listing of Types TVL and PCL aluminum electrolytics intended for color-TV servicing. The guide also lists 54 leading color TV manufacturers along with the catalog numbers of the TVL/PCL units which fit their respective chassis. A cataloging innovation is the listing of the number of color-TV sets a given TVL or PCL is used in. The service technicians thus know the most popular capacitor types and can stock accordingly. All capacitors are identified by catalog number, capacitances, dc working voltages, dimensions and the number of color-TV set makes in which it is used. Sprague Products Co., Marshall St., North Adams, Mass. 01247.

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TV RECEIVERS ...

continued from page 46

brightness variations.

In the audio output stage is a complimentary pair of transistors similar to a push-pull circuit, dc coupled to the driver transistor.

In the power supply, an additional winding has been added to the power transformer for half-wave rectification. This winding also provides a 200v source for the collector voltages of the color amplifiers.

A new electronic VHF tuner, which is similar to the Hopt and GI Varactor unit, will be found on some versions of the E01 chassis. The UHF tuner has a three-section Autodyne circuit, differing from the Hopt and GI units used previously, which employ an RF, mixer and oscillator transistor. The Autodyne tuner employs two transistors: one as a mixer and oscillator and the second as the RF amplifier.

A 70-detent UHF tuner is used in the 19-in. (diagonally measured) color-TV sets, Models MY2086, MY2087 and MY2088, with a channel read-out on film, identifying all 70 UHF channel numbers. Tuning is accomplished by fine tuning on the detented position. Each detent position will tune in the adjacent channels.

Two entertainment centers with 19- and 25-in. tubes (diagonally measured) feature Perma-Lock—a tuning system that, at the touch of a button, “locks-in” pre-set COLOR, TINT and BRIGHTNESS levels and corrects flesh tone variations.

The Chro-Matrix picture tube and the Gibraltar 90 chassis will be included in 15 of these models, which are 90 percent solid-state.

Other screen sizes (diagonally measured) include three 19-in. portables, three 21-in. table models, three 23-in. models, one 18-in. portable, and one 14-in. portable.

ZENITH

Zenith introduced two lines of color-TV sets, featuring an advanced superbright color picture tube, a new modular all solid-state chassis, electronic tuning and an automatic one-button COLOR control.

The super Chromacolor picture tube is featured in 41 sets in the 43 model line. The solid-state chassis, the Titan 200, powers all of the 25-in. (diagonally measured) models. The active phosphor area seen by the viewer has been increased, with a new iris mask development in which the size of the phosphor dots which make up the picture was enlarged in the super Chromacolor picture tube.

The Titan 200 chassis is used in 10 sets with the new solid-state electronic tuning system, reportedly making it easier to pre-set the TV set from the front for up to any combination of 14 VHF and UHF channels.

Also introduced is a new Chromatic tuning system with a control button on the front of the set. Pressing the button gives the set owner the convenience of color TV pictures pre-set at the factory, eliminating the adjustment of the BRIGHTNESS, CONTRAST, COLOR LEVEL and TINT controls. This feature is included in 38 color-TV sets.

The Titan 200 chassis is featured in all 25-in. color-TV models. This chassis employs five plug-in dura-

modules, three other individual modules and four integrated circuits. A typical use of the IC's is the color processing system of the TV set. Each module accom-



Zenith's Avante I is a 25-in. (diagonally measured) solid-state color-TV set that features Chromatic one-button tuning. *Courtesy of Zenith.*

modates solid-state components and permits their arrangement on a modular carrier in any of various circuit configurations. They are flat mounted rather than edge mounted on the chassis.

With remote control becoming increasingly popular in color-TV sets, a completely separate line (17 sets) features three different systems of Space Command ultrasonic remote TV tuning: the 600X, 500 and 100.

The B/W line of TV sets comprises 17 models in five different screen sizes, including a 19-in. remote-control portable called the “Celestial,” which employs the Space Command 100 systems of remote VHF tuning that turns the set ON, OFF and changes VHF channels. ■



BOOK REVIEWS

NORTH AMERICAN RADIO-TV STATION GUIDE by Vane A. Jones, published by Howard W. Sams, 160 pages, paperbound, \$3.95.

We have received a number of requests in the past concerning the location of TV stations and their assigned frequency so that plans can be initiated for the construction of fringe-area TV antenna systems. Thus far, this is the only condensed source of such information that we have been able to locate.

The eighth edition of this publication is said to list over 5500 AM stations, over 3000 FM stations and over 1200 TV stations in the United States, Canada, Mexico and the West Indies (we didn't take time to count). These listings are broken down into the following categories: TV stations by geographical location, TV stations by channels, FM stations by geographical location, FM stations by frequency, AM stations by geographical location, AM stations by frequency, and AM, FM and TV stations by call letters.

The TV station listings include call letters, location, channel number and network; while the FM station listing also includes antenna height above average terrain and transmitter power; the AM station listing adding both daytime and nighttime transmitter power information. We are sorry that this additional transmitter information is not included in the TV station listing, although fringe-area TV reception is more a case of trial and error.

The material provided in this book appears very well presented and should be of value to those concerned with receiving and identifying distant AM, FM or TV signals.

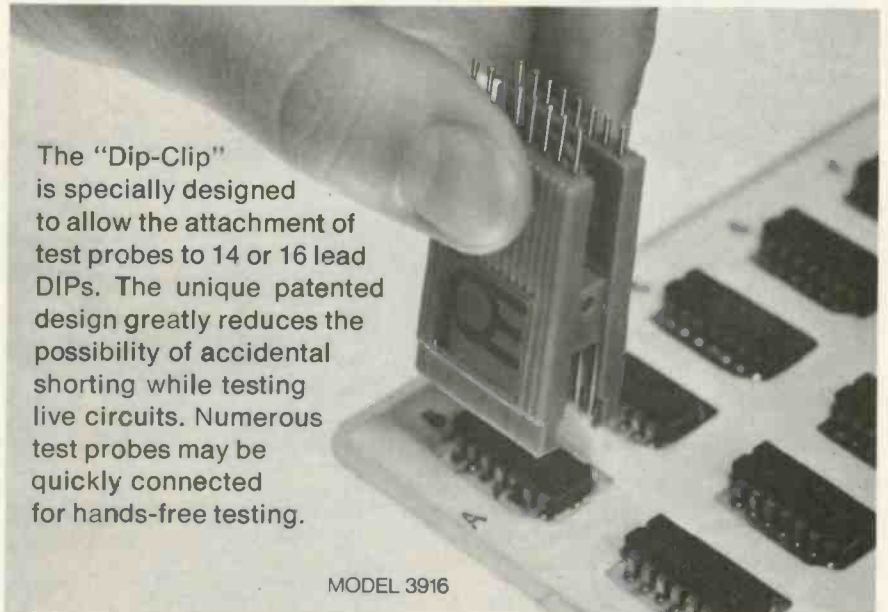
199 COLOR TV TROUBLES & SOLUTIONS by Robert L. Goodman, published by Tab Books, 224 pages, paperbound, \$4.95.

This book's 11-page table of contents contains a lengthy alphabetical listing of circuit defects according to the brand and chassis of the TV set being serviced. Using this as a reference, one can then quickly find the page of the book describing the symptoms of the problem in the TV set that is being serviced—along with a partial schematic of related circuitry and suggestions as to the probable cause.

The book is well written, clearly describing circuit symptoms. It should prove a useful guide for the less experienced TV electronic technician.

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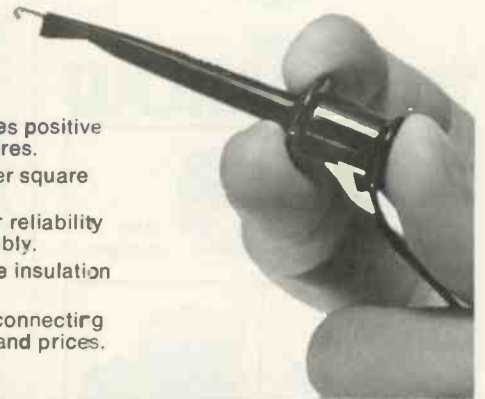
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READERS SERVICE INDEX

ADVERTISER'S INDEX

101	Arrow Fastener Co., Inc.	68
102	Aztek	74
103	B&K Div., Dynascan Corp.	47
104	Book Club—Schematics	61
105	Book Club—Tab Books	52-55
106	Chemtronics, Inc.	67
107	Cleveland Institute of Electronics	35-37
108	Cusack Electronics	73
109	Delta Products, Inc.	70
110	Dictaphone	75
111	E-V/Game, Inc.	32
112	EICO Electronic Instruments Co., Inc.	24
113	Electronic Devices, Inc.	63
114	Enterprise Development Corp.	78
	Finney Company, The	25
116	John Fluke Mfg. Co.	66
117	Fordham Radio Supply Co., Inc.	78
118	GC Electronics Co.	26
	GTE Sylvania, Electronic Components	48, 2nd Cover
119	Heath Company, The	65
120	International Components Corp.	64
121	Jensen Tools & Alloys	78
122	Leader Instruments Corp.	3rd Cover
123	Leader Instruments Corp.	30
124	Lee Electronic Labs Co., Inc.	73
125	Oneida Electronic Mfg.	72
126	Panasonic-Service Div.	23
127	Pomona Electronics	77
128	Pomona Electronics	77
129	Precision Tuner Service	19
	RCA Consumer Electronics	38
130	RCA Parts & Accessories	21
	RCA Semiconductors	4th Cover
131	RCA Test Equipment	33
132	RMS Electronics, Inc.	75
133	Sprague Products Co.	31
115	T & T Sales Co.	28
134	TV Tech Aid	71
135	Telematic Div., UXL Corp.	69
136	Triplet Corporation	27
137	Wahl Clipper Corp.	66
138	Weltron Co., Inc.	78
139	Winegard Company	29
140	Workman Electronic Products	74
141	Xcelite, Inc.	28
142	Yeats Appliance Dolly Sales Co.	70

NEW PRODUCTS

700	Solid-State Frequency Counter Kit	34
701	Field Strength Meter	34
702	Two-Channel AC Millivolt Meter	34
703	Wire Stripper	67
704	Color Test Jigs	67
705	WD-40	67
706	Transistor Curve Tracer	67
707	Antenna Amplifier	68
708	FET VOM	68
709	Degreaser	68
710	Color-TV Components Kit	69
711	Digital Multimeter	69
712	Adhesive	69
713	Oscilloscope	69
714	Antennas	70
715	Adhesive	70
716	Digital Multimeter	70
717	AM/FM Stereo Phono	71
718	CB Radio	71
719	Lectern Sound System	71
720	Speaker Protector	71
721	Microphone	72
722	PA Amplifiers/Boosters	72
723	Electronic Turntable	72
724	AM/FM Stereo Receiver	72
725	Cassette Deck	72
726	Parts and Tool Organizer	73
727	Four-Channel Decoder	73
728	AM/FM Receiver	73
729	Audio Accessories	74
730	SSB/AM CB Radio	74

TEST INSTRUMENT

900	Fluke's Model 8000A 3½-Digit Multimeter	60
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EDITORIAL...

continued from page 22

frequencies assigned to each of the 12 new Canadian TV channels, the number of channels initially used, their English and French program schedules, and copyright limitations that might concern those of us in the U.S. that would like to tune in.

I am very interested in the possibility of personally installing a satellite antenna so that I may know first-hand what our readers can expect to encounter. Any specific information from those dealing with the Canadian satellite—either through program transmissions or the development of new satellite antennas for public use—would certainly be appreciated. A free nation such as ours cannot consider restricting its public video communications to but a hunk of cable.

Philip Dahlen, CET

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106	115	124	133	142	151
107	116	125	134	143	152
108	117	126	135	144	153
109	118	127	136	145	154

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706	715	724	733	742	751
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107	116	125	134	143	152
108	117	126	135	144	153
109	118	127	136	145	154

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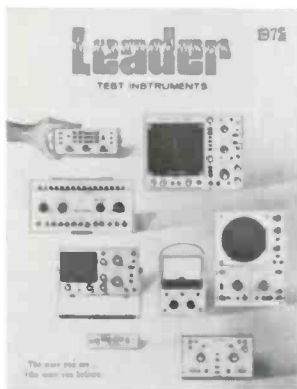
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