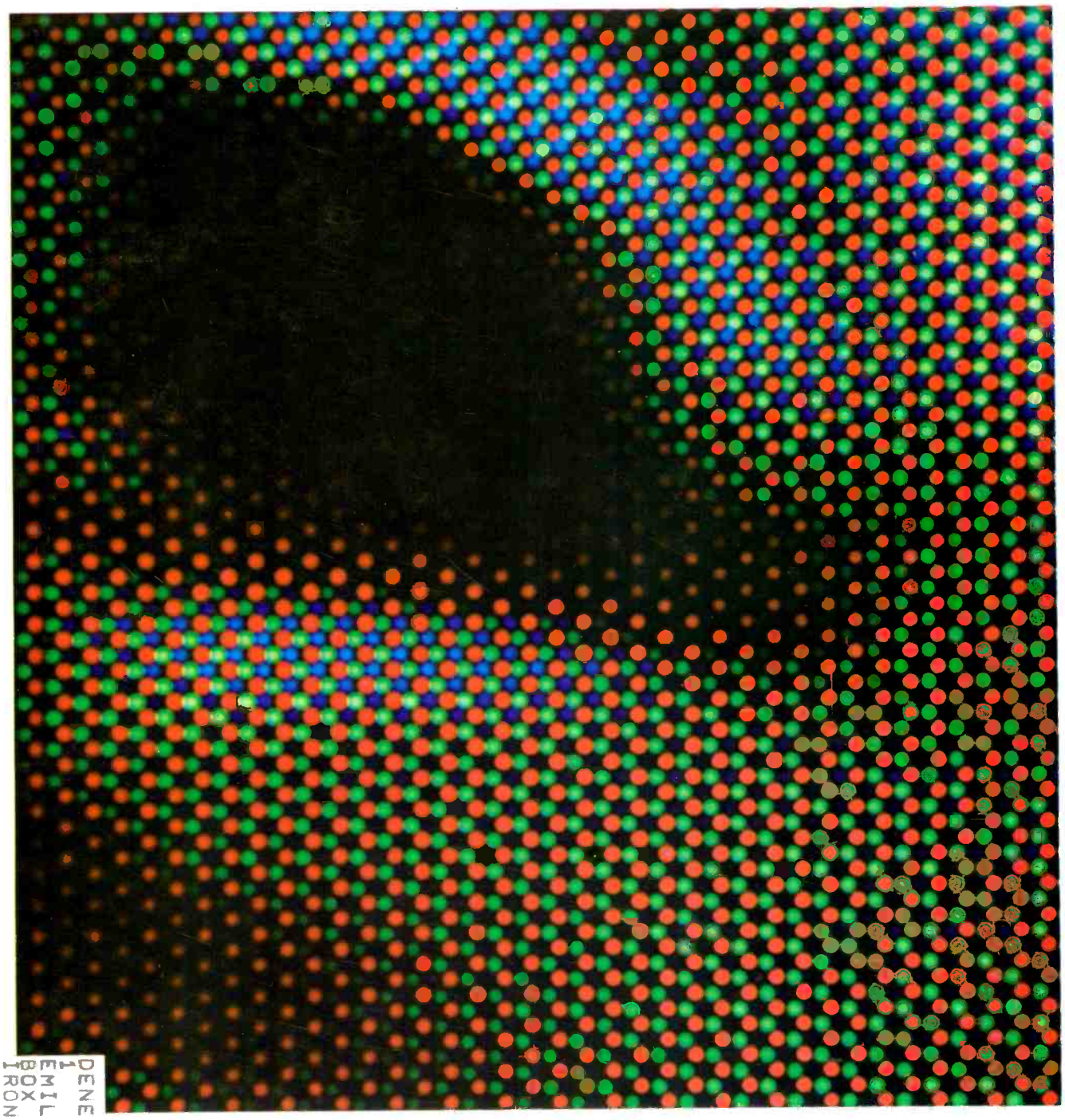

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WI 54847

Editorial: Status of Association Merger

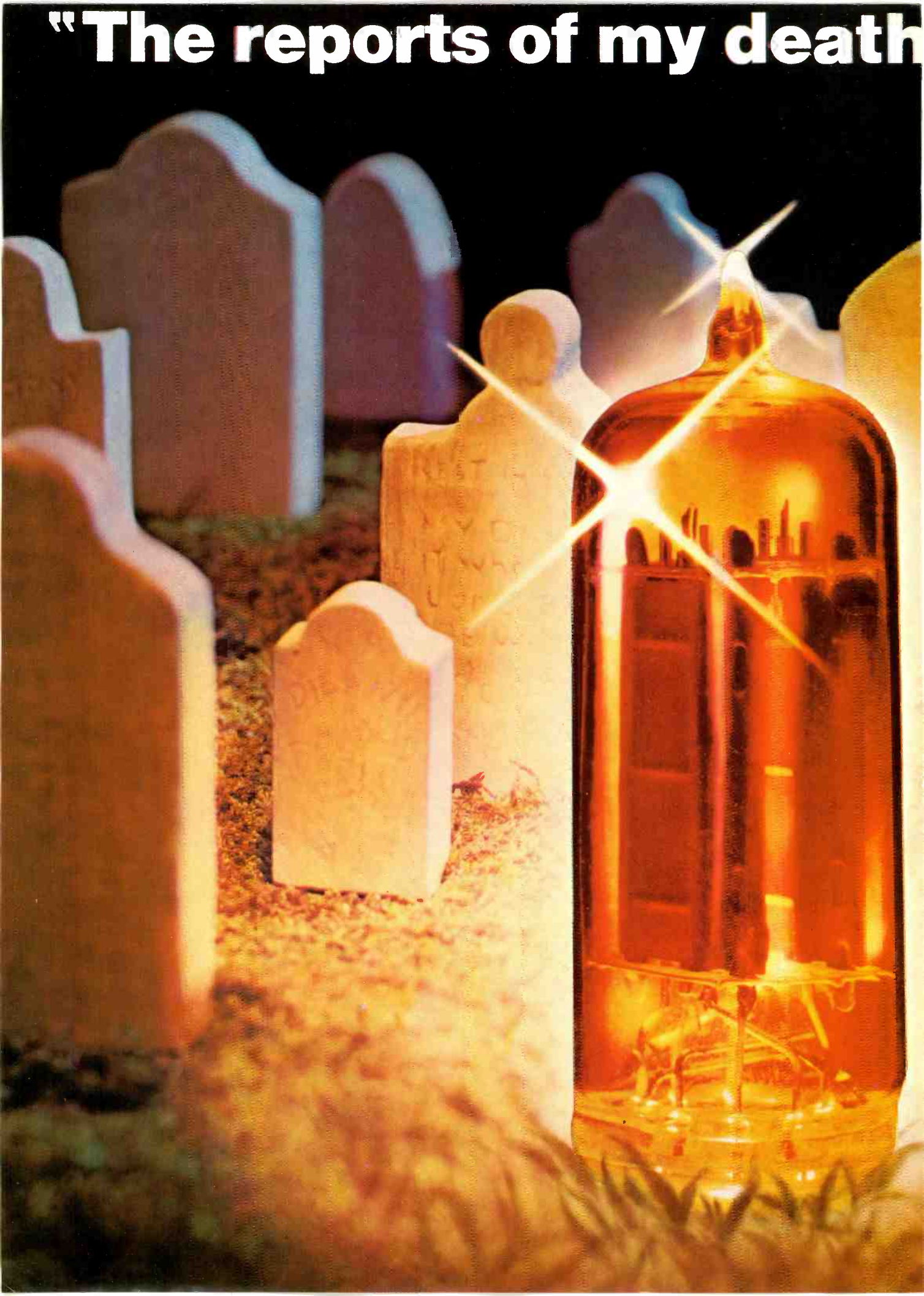
Just as each color dot determines the total TV picture, what each of us does determines the future fate of our profession.

FEBRUARY 1973 A HARCOURT BRACE JOVANOVICH PUBLICATION

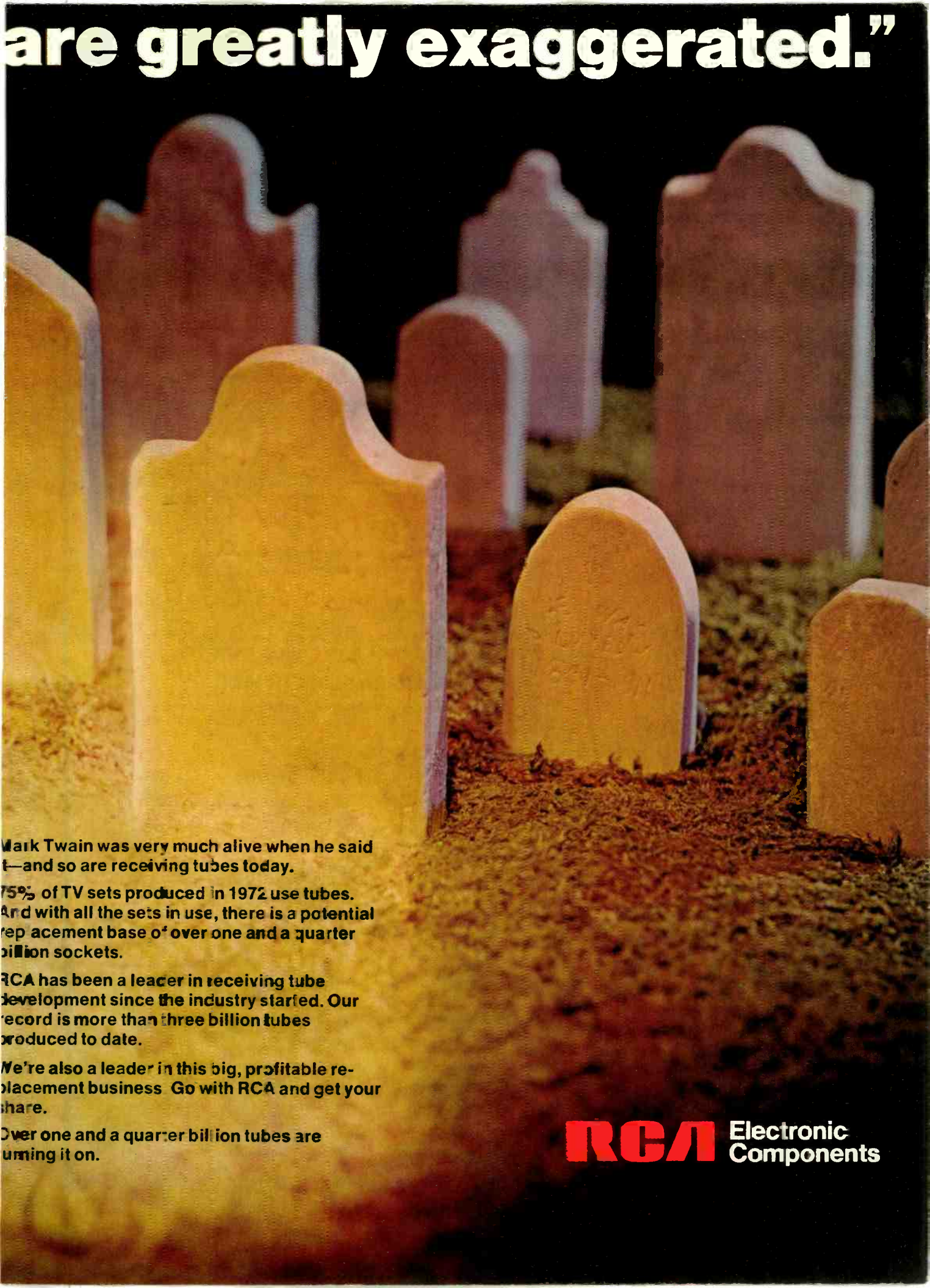
ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

"The reports of my death



are greatly exaggerated."



Mark Twain was very much alive when he said it—and so are receiving tubes today.

75% of TV sets produced in 1972 use tubes. And with all the sets in use, there is a potential replacement base of over one and a quarter billion sockets.

RCA has been a leader in receiving tube development since the industry started. Our record is more than three billion tubes produced to date.

We're also a leader in this big, profitable replacement business. Go with RCA and get your share.

Over one and a quarter billion tubes are turning it on.

RCA Electronic Components

ELECTRONIC TECHNICIAN/DEALER

FEBRUARY 1973 • VOLUME 95 NUMBER 2

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Our cover photo is a closeup of the screen of the Electrohome color-TV set described in the Teklab Report beginning on page 21. Taken by your editor, this photo symbolizes how each one of us is important in determining the total picture of our industry (note the Editorial on this subject—page 7).

FEATURES

A HARCOURT BRACE JOVANOVICH PUBLICATION

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Our Professional Associations

As has been indicated frequently in past editorials, news items and letters, your editor is an extremely strong supporter of our professional associations. As editor, it is my belief that only by working together can we hope to master the political strength, the economic resources, and the technical and business skills necessary for insuring our position in the future world of electronic sales and servicing. We must all work together for our own common good or **perish** separately!

As you know, the two major national associations in existence today are the National Alliance of Television and Electronic Service Associations (NATESA) and the National Electronic Associations (NEA)—Frank Moch being Executive Secretary of NATESA and Dick Glass being Executive Vice President of NEA.

Our publication has in the past made every effort to offer **equal** support to **both** associations. When receiving an offer to become an associate member of NEA, we immediately contacted the NATESA headquarters to see if we might also purchase such a membership from that association. NATESA, wanting to remain independent of such "outside" influence, was unable to provide such membership—current membership being restricted entirely to active service dealers and honorary members.

The first two national association conventions that I attended were NEA's 1971 convention in Portland, Oregon and NATESA's 1971 convention in Hot Springs, Ark. I brought my wife and daughter to the Portland convention and we had a delightful time meeting people there and working with them. Although the Arkansas association that sponsored the NATESA convention was **very** cordial and did an **excellent** job in preparing for the convention, I just about bit my fingers off as I observed a group within the NATESA membership openly ridicule Mr. Moch as he sat at the platform, attempting to unseat him as Executive Secretary—plus taking a number of business sessions merely to approve the minutes of the previous convention's business meeting.

Prior to the 1972 Joint Convention, I passed the CET Exam and was accepted as a member of the International Society of Certified Electronic Technicians (ISCET)—a technical arm of NEA and the only association prepared to offer me full voting membership. And at the Joint Convention I was drafted and elected Chairman of ISCET. Thus as a result of association acts—rather than any bias on my part—I have become more deeply involved in one phase of our professional associations.

As a result of my ISCET activity, there have been complaints that I have promoted that association's programs more strongly than the "NATESA Plan to Create Confidence," described in our December issue. On the other hand, one NATESA member has complained that their plan has received **too much** coverage. His letter then went on to say: "I noticed the big spread in your December issue about NATESA's 'Electronician' certification. Unfortunately, you were given only an outline of how the plan **should** work—theoretically. It is possible that it might actually work that way in Chicago and maybe elsewhere, but I have never seen that good an application made of the potentially good program. In practice, **every** member of NATESA gets a certificate with an 'Electrician License #' (I and every local member has one and **we** were never required to prove any degree of competency), and, except in areas where local associations are active, **anyone** who pays $35.00 can become a member of NATESA."

Previous issues of our publication have given considerable coverage to the subject of association merger, some background concerning the subject having been included in the December Editorial. As strongly as our publication—plus many manufacturers—are in favor of merger, the process of merger presently appears at a virtual standstill. In fact, to such a degree that the presidents of both associations recently issued a statement indicating that additional studies were required before future action could be taken concerning merger. It is unfortunate (and in my opinion improper) that such a statement was not first given to the respective merger committees and then allowed to be regretfully released to the public by the gentleman elected by **both** associations as Chairman of the Joint Merger Committee—Mr. Morris L. Finneburgh, Sr., E.H.F.

Mr. Finneburgh, as Chairman of the Joint Merger Committee, has attempted to influence both associations as they have worked toward this effort. In carrying out his **elected** function, he has been subjected to unnecessary abuse. (After having commitments for a 1973 NEA convention in Hawaii postponed—over their strong objections—in order to conduct another Joint Convention this year and improve the chances of merger, some individuals became obsessed with a nightmare that much of what had been accomplished for the good of the association might be scuttled as an expediency for the sake of merger.) From my frequent personal telephone conversations with Mr. Finneburgh, it has become apparent that their resulting overreactions have been most distressing to him.

What is the basic problem? Both associations were formed for the same basic purpose. We are supposedly dealing with highly intelligent grown men and women, all of the same profession, who should be capable of getting along with one another. What has gone wrong?

Our November issue contained a glowing report of the first Joint Merger Committee meeting in Memphis, Tenn. It seemed in November that merger was just as close at hand as the end of the Vietnam War.

On page 26 of the November issue there are two sentences from the merger report that seemed to blow things "sky high." It said: "The Joint Committee unanimously agreed that there should be a continuation and maximum support of the CET Examination, ISCET 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 latter of these two decisions was made over the strong objections of Mr. Finneburgh, who felt that these two gentlemen should at least be allowed to express their personal views at the next Joint Merger Committee meeting.

Mr. Moch founded NATESA and has been a leader in this association for about 25 years. It has become his life. During one phone conversation with Mr. Moch, he told me of his concern that without the proper safeguards the NEA segment of the new association (once merger was completed) might attempt to dump him, leaving him with nothing in return for his many years of dedicated service to our industry. And if the new national association headquarters were to be somewhere else, what of his secretary who has served

continued on next page

EDITORIAL...

him these many years, and what of his own personal investment in NATESA headquarters' equipment?

Mr. Glass was part of the faction in NATESA that around 10 years ago decided they had enough of NATESA and Mr. Moch, leaving that association to form NEA. These people now feel that the majority of the NATESA delegates would remain loyal to Mr. Moch and would reject any merger proposal that did not assure Mr. Moch a position at least equal to that of Mr. Glass—yet they (this earlier faction) seem to stay awake nights with the fear that by gaining such a position, Mr. Moch might somehow obtain control of the new association, nothing having been gained them as a result of the original association split. Some NEA members have even openly stated that they would not belong to any association that employed Mr. Moch. Old feuds have thus been revived—at least in the memories of some association members.

Of equal concern to many association leaders is the apparent incompatibility of the CET Exam, which involves testing under controlled conditions and which is even used in some states as the official state licensing exam, and the NATESA program, which calls for shop testing of employees under an honor system.

Some association members feel that if we are to be successful in our efforts to achieve merger, then both associations should demonstrate a greater respect for the other association and its activities. For quite some time now, considerable effort has been given to the task of developing a program for coordinating manufacturer technical training programs for the electronic technician. The resulting program—the JESUP Program which we support and have described in detail on page 30 of our January issue—was developed by NEA through the cooperation of the Electronic Industries Association (EIA). Although the pilot run of this program is being greeted with enthusiasm by electronic technicians across the nation (judging from the responses received even at this early date) for a while the enthusiasm of some manufacturers was cooled by adverse comments printed by Mr. Moch in the November 1972 issue of NATESA SCOPE. In concluding his comments concerning the JESUP Program, Mr. Moch said: "Let us be really practical about the problem and its many ramifications. Let us not commit the serious blunder of hoping to create a thousand genii in one location that will cost far more in dollars and time servicers cannot afford, and let us not be so foolish as to expect that effective upgrading is a one week-end cram session."

At the October NEA Board meeting that I attended in Omaha, Nebr., a resolution was passed granting the Merger Committee the authority to act on merger, authorizing the balloting of all members by certified mail to hopefully complete the merger prior to the next Joint Convention this August in Kansas City, Mo. It was the Board's hope that the NATESA Executive Council would give a similar endorsement to its Merger Committee. But in contrast, on December 20th Leo Shumavon, President of NATESA, wrote: "NATESA has not given nor does it intend to give the Merger Committee any undue power. Their job is to progress to as far as possible, then report to the Executive Council. After the council acts on its progress and they feel it is warranted, they will ask the NATESA membership for a vote."

Some members of NEA see no need to hurry into a merger. They feel that should attempts at merger fail, then several disgruntled NATESA state associations would simply leave NATESA and join NEA, thus in effect resulting in but one major association. (There is even talk of the association then adopting a new constitution, taking on a new name and pretending that a merger had taken place.) However, such a shift of state associations may not occur. As you will note in this month's Letters to the Editor Column, one state association—Virginia—has decided that too many feet have dragged long enough. If the two national associations cannot get together and complete a merger by August 1973, then the Virginia association will no longer have anything to do with either national association. We have received reports that one major NEA state association is also considering the withdraw of its support after August 1973 until a merger has been accomplished—or a **new** association has been formed.

Prior to the publication of this editorial, and hopefully even after, I have had a good working relationship with both Messrs. Glass and Moch. However, quite a number of rank-and-file association members (of both associations) that I have spoken with are of the opinion that attempts at merger have deteriorated to a battle between the advocates of these two men. These members are quick to acknowledge the great work done in the past by Messrs. Moch and Glass, but feel that a new united association is **far** more important than these two personalities. Merger may thus be completed through the regrouping of state associations, ignoring current national association leadership. And, because of (or despite) everything done thus far, we may very well have a new major association developing from the next Joint Convention. Just as our nation's Congress may well end the Vietnam War despite the peace efforts of President Nixon, our state associations may bring about merger without the aid of their national executives.

However, these dissident state associations had better have their strategy clearly mapped out and well coordinated with other states before they even seriously consider undertaking such a drastic plan of action. Otherwise they will merely produce a third association no stronger than the former two, or generate anarchy —each state association functioning independently without any national coordination of efforts. We need **one** strong association— **not two, three . . . or fifty!**

This evaluation of the merger situation by your editor is bound to generate additional controversy. Many will fear that it is an unfortunate case of airing our dirty linen in public. However, with all the harmful rumors that are currently being spread around, your editor feels that it is necessary to attempt to clear the air by reporting on the situation as he sees it.

Despite many unresolved conflicts concerning the merger situation, plans are definitely underway for a second Joint Convention to be held at the Crown Center in Kansas City, Mo. on August 23-26. These plans call for another ELECTRONIC SERVICE INDUSTRY YEARBOOK, which will again be very capably edited by Vincent Lutz, CET. Those manufacturers wishing to show continued support of independent electronic sales and servicing would still invest their money **wisely** by contacting Mr. Lutz **directly** concerning all advertising in the **only** yearbook that serves our entire industry. His address is 1546 Sells Ave., St. Louis, Mo. 63147. (He already has ELECTRONIC TECHNICIAN/DEALER's contract for an advertisement in this next edition of the yearbook.) Revenue from that publication will be divided amongst the participating associations— NEA and NATESA.

Last year Nolan Boone did a **very** capable job as Chairman of the Joint Convention Trade Show. All manufacturers having a product worth selling for more effective consumer electronics sales and servicing should **most definitely** contact him **directly** to reserve their booths while space is still available. His address is 5522 W. 12th St., Little Rock, Ark. **Manufacturers need not get involved in association controversy in their active support of our industry!**

This is definitely the year of decision. Association matters must now be resolved to insure our place in the future of electronic sales and servicing. Now is **not** the time to sit back and let others fight the battle for you. It offers the best opportunity ever to have a part in molding our association future—and thus our own business future. We need men and women with enough "guts" to get out there, join their respective associations, put on their hard hats, and take up their battle stations to insure a better future! We are facing an exciting challenge! The next Joint Convention should prove to be the most interesting **ever!**

Phillip Dahlen, CET

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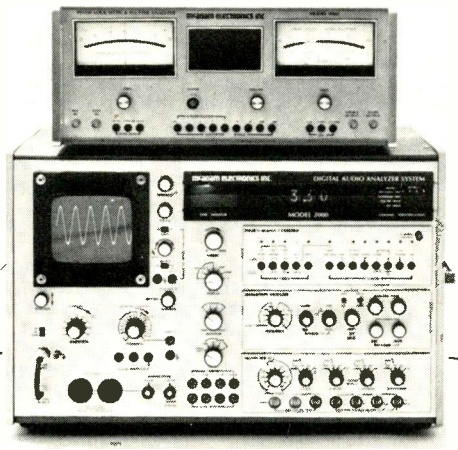

(Almost)

Bet you thought it took a whole stack of instruments to analyze audio equipment. It does. And that's a whole stack of instruments above — disguised as two boxes. Most of the stack is in the bottom box . . . the McAdam Tester. The McAdam Tester contains oscillators, meters, transformers, circuitry and controls for measuring nearly every critical parameter of audio equipment performance. It checks harmonic distortion, IM distortion, true RMS power and true RMS voltage, plus others. And it displays the results on a digital readout.

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mcadam electronics inc.

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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.

General Membership Demands Merger Be Accomplished

You are to be commended for your timely and provocative editorials and, especially, for your outspoken stand in support of unification. We very badly need that kind of support if this single-association concept is going to get past the next convention (or even *to* it).

I feel that the key to unification lies in heavily promoting the fact that a new association *will be formed,* not with the intent of having a third association and trade representative but with the expressed purpose of *replacing both* of the existing associations. As it is, too many people are against merger (not the general members, but the "leaders" and the persuaded Delegates) for there to be any hope of success at the NATESA [and NEA] convention[s].

If, however, stress is placed upon the *new* association and the fact that both existing organizations have but to vote to become part of it in order to implement the merger resolutions —and if it is publicized loudly enough —it will be extremely difficult for the group which reject "unification" to survive. One can be against merger because of various technical problems, or because he doesn't like the leaders of the other group, etc., but it would be a little more difficult to vote against becoming a part of an already established "single association."

While certain anti-merger groups within NATESA control too many votes to permit a "dishonorable merger," even Frank Moch and Dick Glass will have to be impressed by the handwriting on the wall when probably *all of NEA* plus many of the major Affiliates from NATESA actually *become* a "single association." If either leader passes up the opportunity to get in on the ground floor of the new group, he will have to know that he will never be allowed in afterwards— and I don't believe that any remaining group can long survive financially on the members that remain. This will be especially true if the new group can rightfully gain recognition from interrelated industries as THE association.

Anyhow, those are some thoughts, and I'd sure be interested in hearing other possible alternatives. The enclosed resolution printed below is submitted with the hope that you will be able to utilize it, or the idea behind it, in a forthcoming issue of ET/D.

W. S. (BOB) HARRISON

VIRGINIA ELECTRONICS ASSOCIATION
INCORPORATED

RESOLUTION

WHEREAS; The Virginia Electronics Association is an organization composed of over 150 independent consumer-electronics service businesses in the state of Virginia; and

WHEREAS, the purpose of the Virginia Electronics Association is to promote the general well-being of those persons and firms identified with the electronics service industry; and

WHEREAS, the Virginia Electronics Association is committed to cooperate and/or affiliate with other such organizations which enhance, promote and safeguard the electronics service industry; and

WHEREAS, the Virginia Electronics Association has traditionally cooperated with and significantly contributed to the recognition and growth of both NATESA and NEA; and

WHEREAS, the Virginia Electronics Association is keenly aware of the existing situation whereby the electronics service industry is inadequately represented at the national level by two factionally divided and duplicative associations, NEA and NATESA; and

WHEREAS, the Virginia Electronics Association believes that the existence of such duplicative groups promote frictional rivalries which are wasteful of already insufficient time, effort, talents and funds and which are conducive to neither harmony within the industry nor productive achievement of the goals of either association; and

WHEREAS, the pressures being exerted upon the industry from outside sources demand nothing less than a totally unified committment by industry representatives toward collectively seeking effective solutions to survival; and

WHEREAS, the membership of the Virginia Electronics Association has the utmost confidence in the abilities of the eleven-man NATESA-NEA Merger Committee to democratically effect fair and practical solutions and rules for the creation and implementation of a single, effective and widely-recognized national trade association to represent the electronics service profession; now therefore

BE IT RESOLVED THAT, EFFECTIVE DURING THE MONTH OF AUGUST, 1973, THE VIRGINIA ELECTRONICS ASSOCIATIONS SHALL HENCEFORTH CEASE TO RECOGNIZE BOTH THE NATIONAL ELECTRONIC ASSOCIATIONS (NEA) AND THE NATIONAL ALLIANCE OF TELEVISION AND ELECTRONIC SERVICE ASSOCIATIONS (NATESA); AND

BE IT FURTHER RESOLVED THAT THE VIRGINIA ELECTRONICS ASSOCIATION AND ITS LOCAL AFFILIATES SHALL WHOLEHEARTEDLY SUPPORT, AFFILIATE WITH AND/OR COOPERATE WITH THAT NATIONAL ASSOCIATION WHICH IS CREATED BY OR FORMED UPON THE STUDIED RECOMMENDATIONS OF THE COMBINED MERGER COMMITTEES OF NATESA AND NEA AND CHAIRMAN/MODERATOR MR. M. L. FINNEBURGH, SR.

The above resolution was adopted by a unanimous vote of the Board of Directors in regular quarterly session on December 9, 1972.

John McPherson, President

W. S. Harrison, Secretary General

Likes November Editorial

This letter is a little tardy, but I must write to you and comment about your editorial in the November 1972 issue.

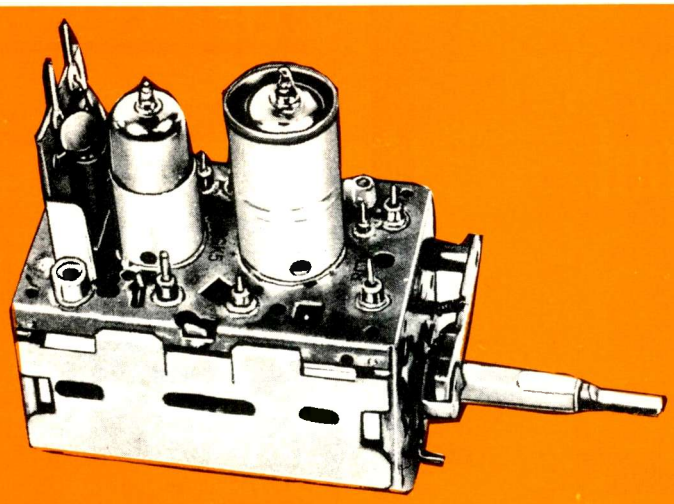
Having been in the electronics field 20 years—a graduate of DeVry Technical Institute of Chicago 1957, after military service and a BBA from Central Missouri State College, Warrensburg, Mo. 1963—I certainly think you laid the cards where they belong.

I have worked as an electronic technician in the Cable-TV Industry and assure you that your last sentence ["A free nation such as ours cannot consider restricting its public video communications to a hunk of cable."] is 100 percent correct; and so is the other information published.

I am just as anxious to hear more about the Canadian transmitter as you are—especially the equipment necessary for the reception of this signal. I surely hope I'll be able to receive this signal in the state of Kansas. I am looking forward to seeing additional articles on this subject.

The Cable-TV Industry is against anything and everything that might interfere with its capitalistic pursuits! Again—a wonderful article.

ARTHUR CRABB



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	1215 SNAPPS FERRY RD., Greeneville, Tenn. 37743	**TEL: 615-639-8451**
TEXAS	**11540 GARLAND ROAD, Dallas, Texas 75228**	**TEL: 214-327-8413**
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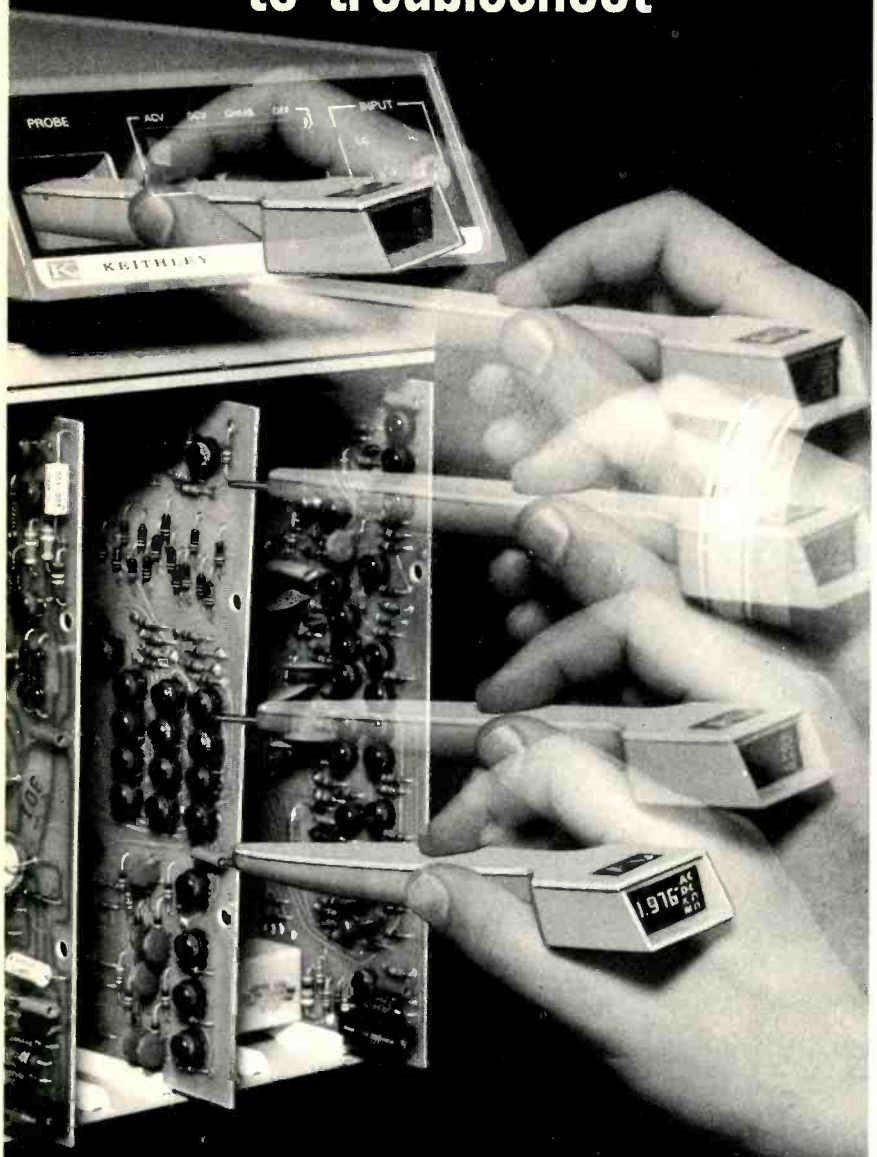

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READERS' AID

Space contributed to help serve the personal needs of you, our readers.

Schematic Needed

We have a George Gott amplifier and preamplifier in for repairs. It was manufactured by Bigg of California, 2506 W. Washington Blvd. L.A. 18, Calif. We need a schematic for the following: Model G50D amplifier and Model GDP-50 preamplifier.

NIMPKISH ELECTRONICS
P.O. Box 324
Albert Bay, B.C.

I would like to obtain a schematic for a Mercury Model 1800 VOM.

BILL BRETT
P.O. Box 562
Leesburg, Fla. 32748

I need a schematic for a Candle TV Model MT-510A, manufactured by Tokyo Transistor Ind. Co.

D. VAN DE WATER
18 St. Josephs Dr.
Stirling, N.J. 07980

I need a schematic for a Stromberg Carlson short wave receiver, Model BC-348M.

WILLIAM WEST
238 Alta Loma Ave.
Daly City, Calif. 94015

Alignment Data Wanted

I would like to obtain alignment data and instructions for a Korting AM/FM/SW/Phono, Model 1007W, manufactured in Germany in August of 1959. Will gladly pay cost of duplication, mailing, etc.

REY EILERS
7419 Somerset Ave.
Clayton, Mo. 63105

Antique Tubes

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NEWS OF THE INDUSTRY

Winegard Three-Day Workshop Entitled "MATV Like It Is"

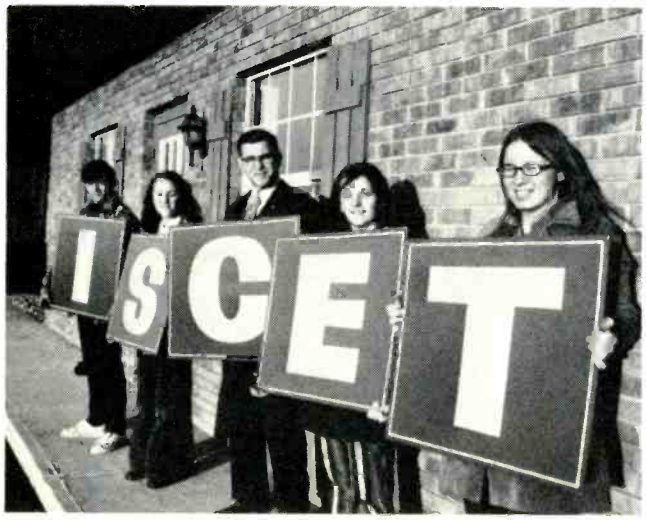
"MATV like it is," was the main topic of discussion at the three-day workshop held by the Winegard Co. in the new Pzazz! complex in Burlington, Iowa. The workshop, one of 12 in a series held throughout the country in 1972,

was conducted by J. C. Banard, Sales Mgr., Commercial Products Div.; Hans Rabong, Jr., Chief Engineer; and Dick Paulus, Systems Engineer. The session drew 43 distributors, contractors and dealers—plus your editor.

Instruction centered around basic MATV theory, system layout and design, trouble shooting, operation, maintenance and selling systems. The importance of installing systems "that work" was a recurrent theme throughout the workshop. Active discussion on this subject, the problems and solutions, persisted during the session.

ISCET Moves Headquarters To New Indianapolis Facilities

With the rapid growth of ISCET (and NEA, its parent association) it recently became necessary to move to larger quarters. This was accomplished by the ISCET/NEA Staff with the assistance of Charles R. Couch, CET, President of NEA. The new address is 1715 Expo Lane, Indianapolis, Ind. 46224; and the phone number is now (317) 241-8172.



Shown holding the ISCET letters upon completion of the move are (l to r): Mike Tapp, Sherrill Glass, Charles Couch, Barbara Tapp and Suzy Rives.

As indicated frequently in previous issues of our publication, electronic technicians can become members of ISCET only after having successfully completed the CET Exam. Sample questions of the type found in part nine of this

continued on next page

MAGIC COLOR ANTENNAS
Sales Orbit
THROUGH:
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NEWS . . .

continued from page 11

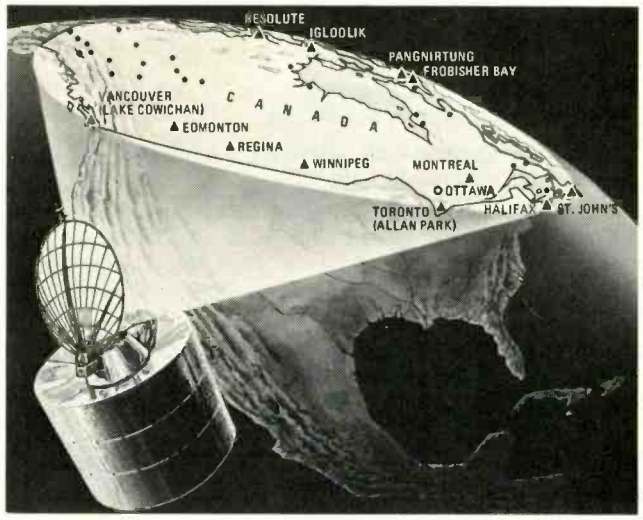
exam are given below.

Section IX
Antennas and Transmission Lines

1. If a flat-ribbon 300Ω line is connected to the 75Ω antenna input of a TV set, what problems might occur in reception?
2. A simple dipole antenna is bi-directional. (True/False)
3. If an antenna distribution amplifier has a 0dB gain, what will the output be if the input signal is 400μv?
4. Why is a preamplifier sometimes located at the antenna?
5. What will an ohmmeter measure on a 75Ω coaxial cable from center conductor to the outside shield?

Explanations

1. Because of the impedance mismatch, at certain frequencies standing waves will result in "ghosts." Some channels may be very weak or may be "trapped" out completely.
2. True. A simple dipole has a "two-petal" clover-leaf pick-up pattern. With a reflector added it becomes uni-directional.
3. 400μv since a 0dB gain is the same as no gain.
4. To reduce noise. If the preamplifier is located at the end of the transmission line away from the antenna, it will amplify the noise picked up by the transmission line.
5. The ohmmeter will measure a *very* high resistance—unless the line is shorted, in which case it would measure 0Ω. The 75Ω is the ac impedance at high frequencies.



Drawing shows the football-shaped antenna coverage provided from synchronous orbit by the Anik communications satellite successfully put in space last November for Telesat Canada. Triangles mark initial network TV ground stations to be activated when commercial service started some time in January. Small black dots mark remote TV stations, which will provide live TV programming to isolated regions not served by terrestrial facilities. The largest and only manned stations in the network are located at Allan Park, near Toronto, and Lake Cowichan, near Vancouver. Ottawa is the main satellite control center for Telesat.

Telesat Canada to Provide U.S. Communications Service

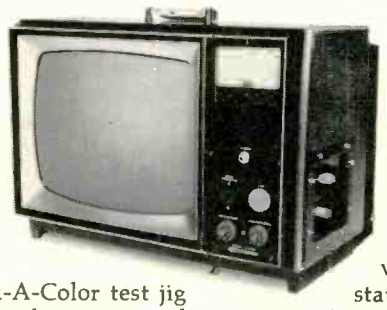
An agreement with Telesat Canada for the first use of Canada's satellite system to provide domestic communications satellite service in the United States was recently announced by RCA Chairman Robert W. Sarnoff.

Mr. Sarnoff said the service is subject to Canadian Parliamentary approval of Telesat's objects and powers permitting Telesat, the Canadian domestic satellite system, to

continued on page 14

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, 100 First Avenue, Waltham, Mass. 02154

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SUPER STICK

This is the superstuff you've been hearing about. Eastman 910® adhesive.

Use it on wafer switches, tuners, drive belts, cabinets, ferrite cores and antennas, knobs, panels, trim.

Cost? About 1-1/2 cents a drop for one square inch coverage.

Available through Tech Spray, P.O. Box 949, Amarillo, Texas 79105. Originated and produced by Eastman Chemical Products, Inc., Industrial Chemicals Division.

Kodak

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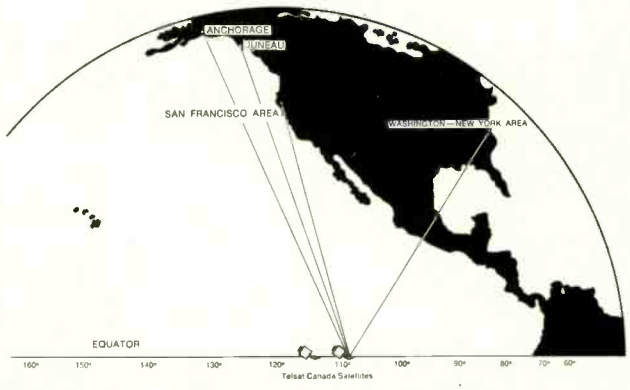
NEWS . . .

continued from page 12

provide service outside Canada. The agreement with Telesat was approved by the Telesat Board on December 5.

The U.S. service is scheduled to begin no later than June 1, 1973. The RCA companies will install earth stations in



the Washington-New York corridor, California and Alaska, to relay communications signals through the Canadian satellite.

With inexpensive 15-ft diameter antenna earth stations, the system will be used in a test program of demand multiple access techniques for Alaska. That state's remote, sparsely populated "bush" communities, in particular, now have minimal communications.

It is planned that the RCA companies initially will provide approximately 260 voice-grade circuits between the four initial earth stations—one on the East Coast, one in California and two in Alaska. In addition, a full channel of color TV can be carried through the occasional use channel.

Association Merger Meeting Postponed by Chairman

As a result of previous difficulties in resolving vital issues in the NATESA/NEA Merger Project, Morris Finneburgh, Sr., E.H.F., Chairman of the Joint Merger Committee, requested that the leaders of both associations hold a special "sub-committee" meeting. Those invited to attend included: Frank Moch, Executive Secretary of NATESA; Dick Glass, Executive Vice President of NEA; Leo Shumavon, President of NATESA; Charles Couch, Jr., President of NEA; Leroy Ragsdale, Chairman of the NATESA Merger Committee; and Norris Browne, Chairman of the NEA Merger Committee. This meeting was scheduled to be held at the Muehlbach Hotel in Kansas City, Mo., on January 29th, following a NATESA Executive Council meeting scheduled for January 27th and 28th at the same hotel.

In response to his request for this meeting, Mr. Finneburgh was advised that Mr. Moch would be unable to attend due to an excessive work load, and that Mr. Shumavon would be unable to attend due to other commitments in Massachusetts—the NATESA Executive Council meeting having been postponed to February 3rd and 4th. (All others indicated that they were prepared to attend.)

Mr. Finneburgh has wired both associations, rescheduling the same meeting for the same location, to follow the rescheduled NATESA Executive Council meeting.

RCA antennas- your answer for the 2 toughest questions you get.

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2. "What does it cost?"

With RCA in your inventory, you'll never have to turn down a sale because you don't have the right image-improver. RCA has everything for every reception problem—a complete line of outdoor antennas, rotators, reception aids and hardware. Each RCA product is a precision engineered, top quality performer in its class. All carry the RCA name that your customers know they can depend on. And the complete array of models gives you a full range of prices to bargain from, too.

Next time you get a tough question from a customer, make sure you have RCA on hand to answer it for you.

See your RCA Parts and Accessories distributor today, or contact RCA Parts and Accessories, Deptford, N.J.

RCA

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NEW PRODUCTS

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

CORDLESS SOLDERING IRON ACCESSORY 703

Auto lighter plug allows in-transit charges

A new accessory is designed for the "Iso-Tip" cordless soldering iron for the convenience of field service personnel. The cigarette lighter adapter

plug allows charging of the soldering iron while traveling between jobs or where ac power is not available. The adapter, No. 7585 Charger Plug Assembly, can be used with any 12v system and with all current "Iso-Tip" models, as well as previous models coded D72 and up. The plug will reportedly allow complete recharges from dead to full overnight with negligible battery drain. Wahl Clipper Corp.

FREQUENCY MULTIPLIER/COUNTER 704

Measures frequency to 0.001Hz in 1 sec

A counter has been developed to make highly accurate direct-reading measurements of audio and low-frequency inputs. The Model 6220 2MHz Frequency/Multiplier Counter reportedly features a unique phase-lock/multiplier technique which makes

possible high resolution measurements without an increase in measuring time, and which offers high rejection of electrical noise. Additional features include AGC which sets all input adjustments automatically for total hands-off operation, zero suppression to blank out all leading zeroes for easier reading of measurements, and a highly legible, parallax-free digital readout with an autoranging decimal point and units annunciator. The 2MHz frequency measuring range of the unit is covered by four manually selectable multiplier ranges. All measurements are also available in digital serial 4-bit BCD parallel output. Systron Donner Corp.

MATV COAXIAL CABLE 705

Designed for greater flexibility and easier handling

A top-of-the-line low-loss MATV cable, Part No. 4851, features a 12-gauge copper-clad aluminum center conductor, 100% shielding and aluminum tape shielding with 50% aluminum braid. It is reportedly

continued on page 45

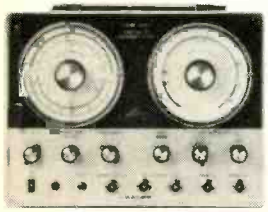
Leader

AUDIO TEST INSTRUMENTS

Now You Can Say Service... and Smile!

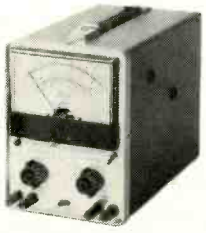
LV—77
FET MULTIMETER
Solid state dependability and stability plus high impedance—make this a fine general purpose meter. Has dual power supply—batteries and AC line. It's truly portable! ±3% full scale accuracy with easy to read, clearly marked face panel. $109.95

LFM—30
TAPE SPEED/CHECKER
Checks any tape recorder for speed and drift accuracy at 3KHz as well as 1, 2, 4, 5, 6, 7, 8 & 9KHz frequencies. 100MV to 10Vrms input level. ±5% end scale accuracy with -3% to +3% test range. Complete with carrying case. $129.95



LSW—250
FM-TV SWEEP/MARKER GENERATOR
Use with any scope to test and service FM, TV and more. Has 2-260MHz freq. range, cont. adjustable, with calibrated markings for most often used bands. Marking method is post injection with external signal input provision. Highly stable and accurate. With accessories. $309.95

LMV—89
2 CHAN. AC MILLIVOLT METER
Test stereo circuitry and 4-channel too—especially where differences exist in voltage at two separate points. ±3% full scale accuracy (1KHz); dB scale readings at 0dB=0.775V and 1V each. 2 chans, 100MV to 300V range in 12 steps. With separate pointers, individual switches, and amplifier systems. Both channels operate separately or together. $229.95



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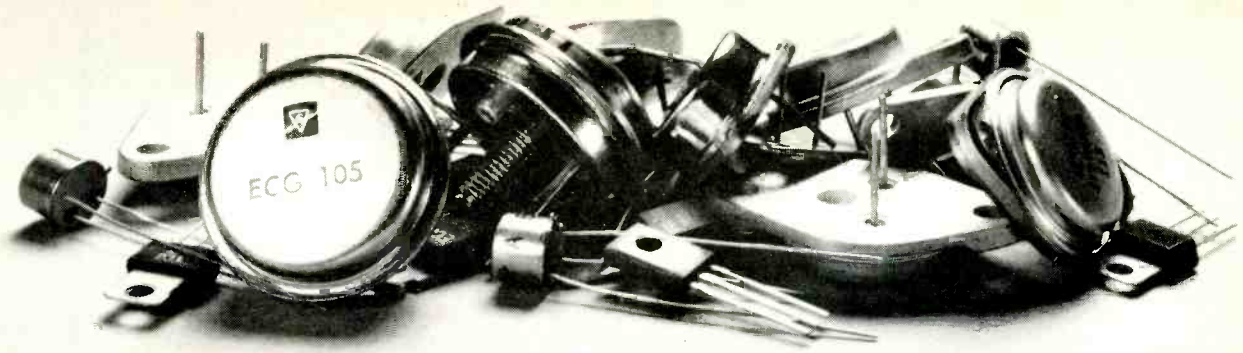


Our 39 audio power transistors replace...

To Be Replaced	ECG Replacement	To Be Replaced	ECG Replacement
AD138	121	QP-1A	179
AD138/50	121	QP-2	179
AD139	104	QP-3	179
AD140	121	QP-4	179
AD142	179	QP-5	179
AD143	179	QP-6	179
AD143B	179	QP-7	179
AD148	131	QP-8	130
AD149	104	QP-8-1	130
AD149-01	121	QP-8-P	130
AD149-02	121	QP-10	179
AD149B	121	QP-11	130
AD150	121	QP-12	130
AD152	131	QP-13	185
AD155	131	QP-14	184
AD156	131	QP8-6623N	105
AD157	131	QP-13	153
AD159	121	QP-14	152
AD160	175	QQC61209	158
AD161	155	QQC61210	102A

and thousands more.

There are a lot of identical transistors around hiding under different manufacturers' part numbers.

But we've boiled power transistors down to just 39 types that will handle almost all of your replacement problems.

And we've also put together a cross-reference guide that tells you which one replaces which.

Our cross-reference guide also tells you about the rest of our ECG replacement semiconductor line. Altogether they can substitute for 53,000 others.

Practically everything from diodes to integrated circuits.

And we don't stop there.

The ECG semiconductor line includes a variety of heat sinks, heat-sink compounds, transistor mounting kits, and sockets.

In short, carrying Sylvania's ECG replacement semiconductor line can take a big load off your back.

And you can still give power to the people.

Sylvania Electronic Components, Waltham, Mass. 02154.

GTE SYLVANIA

NEW AND NOTEWORTHY

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

AUTOMATIC TELEPHONE DIALER 700

Offers replacement for direct-wire telephones

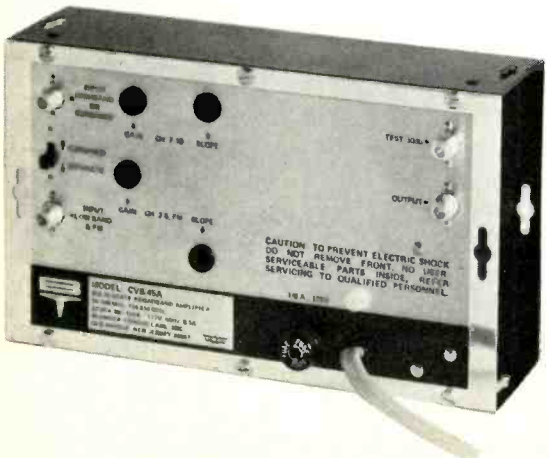
A single-number automatic dialer called "Hot-Line" is introduced as an economical replacement for dedicated or leased telephone lines. The unit is available as a desk set with dialer built in or as a wall box that converts any phone to a "Hot-Line." It can reportedly be programmed to dial automatically when the handset is lifted or when a push button is manually actuated, and it is being marketed as a replacement for direct-wire telephone lines now being used by businesses as an aid for customers who can use a direct line to suppliers and for any reservation, security, alarm system, or other applications using a frequently dialed telephone number. Com-U-Trol Corp.

FOR MORE NEW PRODUCTS SEE PAGE 16

NEEDLE MERCHANDISER 701

Holds over 400 needles on three slide-out trays

A needle merchandiser, Model CND, has been introduced for dealers. Its front panel displays 25 of the most popular needles for instant identification. Holding over 400 needles on three slide-out trays, the merchandiser is equipped with lock and key. The side panels are walnut-grain and available in a counter type or with a floor stand. Duotone Co.



VHF BROADBAND AMPLIFIER 702

Separate high- and low-band amplifiers with individual GAIN controls

An all solid-state VHF/FM broadband amplifier, Model CVB-45A, is designed for large VHF MATV systems. The low- and high-band GAIN can reportedly be separately varied over a range of at least 18dB, a feature which permits the user to individually balance both bands to compensate for higher cable losses in high-band service. The input circuit may be fed from either a single wideband VHF antenna or from two separate VHF antennas designed for channels 2-6 and 7-13 with input choice switch-selectable. With low- and high-band GAIN controls fully open, full gain is said to be typically 45dB for all TV channels and FM. Rated seven channel output capability is 59dBmv for each low-band channel and 54dBmv for each high-band channel. Blonder-Tongue Laboratories.

Now appearing at your local distributor's.

Here it is! A sure fire guide to a profit loaded market. The foreign-made TV, stereo, AM/FM radio, tape deck and cassette player service market. And this time saving guide is yours FREE.

The program is Raytheon's Sizzling 66. A collection of top quality semiconductors designed to replace over 5000 foreign devices.

And our guide to this program will be your guide. It cross-references the thousands of foreign semiconductors to the exact Raytheon replaceable. Complete with all electrical, mechanical and terminal arrangement data. So you can find the information you need—fast. Without frustration and confusion.

A beautiful program, a beautiful program guide (and it fits right in your service caddy). For all the details see your local Raytheon distributor. Or contact Raytheon Company, Distributor Products Operation, Fourth Avenue, Burlington, Mass. 01803. Telephone 617-272-6400.

RAYTHEON

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Introducing the expensive curve tracer that doesn't cost a lot.

The B&K Model 501A.

It's a lab-quality instrument that provides fast analysis of all semiconductors including J-FET's, MOS-FET's, signal and power bipolar transistors, SCR's, UJT's and diodes.

You can test transistors in circuit for GO/NO GO condition. Badly distorted curves will indicate the stage where a defective transistor or other faulty component exists.

The 501A is complete—with scope graticule and FP-3 probe for fast, one-handed in-circuit testing. It generates true current and voltage steps, with 3% accuracy, for measuring beta at all current levels. And it has a sweep up to 100 volts and 100 milliamperes.

$129.95

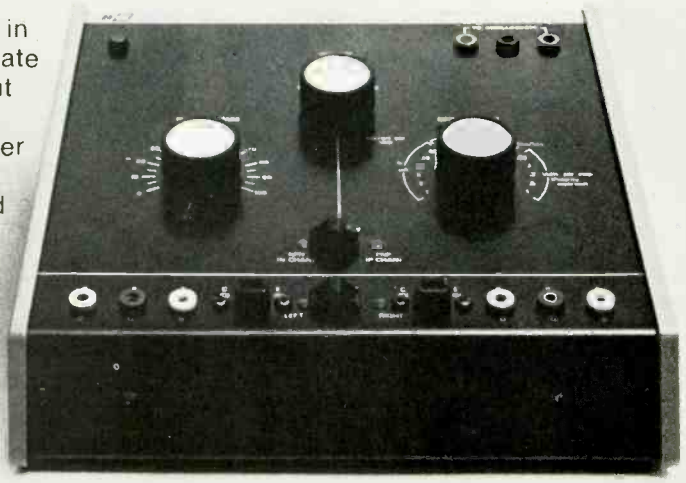
With the 501A, curves are displayed on an auxiliary scope screen. And you can hook it up to any scope—old or new.

All three controls can be set in quick-test positions to test and evaluate 90% of all solid-state devices without manufacturer's data sheets.

The 501A won't burn out either the semiconductors or itself.

With all these features, you'd think the 501A was an expensive curve tracer. But look at the price.

For complete technical data, call your B&K distributor. Or write Dynascan Corporation.



Very good equipment at a very good price. B&K

Product of Dynascan Corporation
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

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TEKLAB REPORT

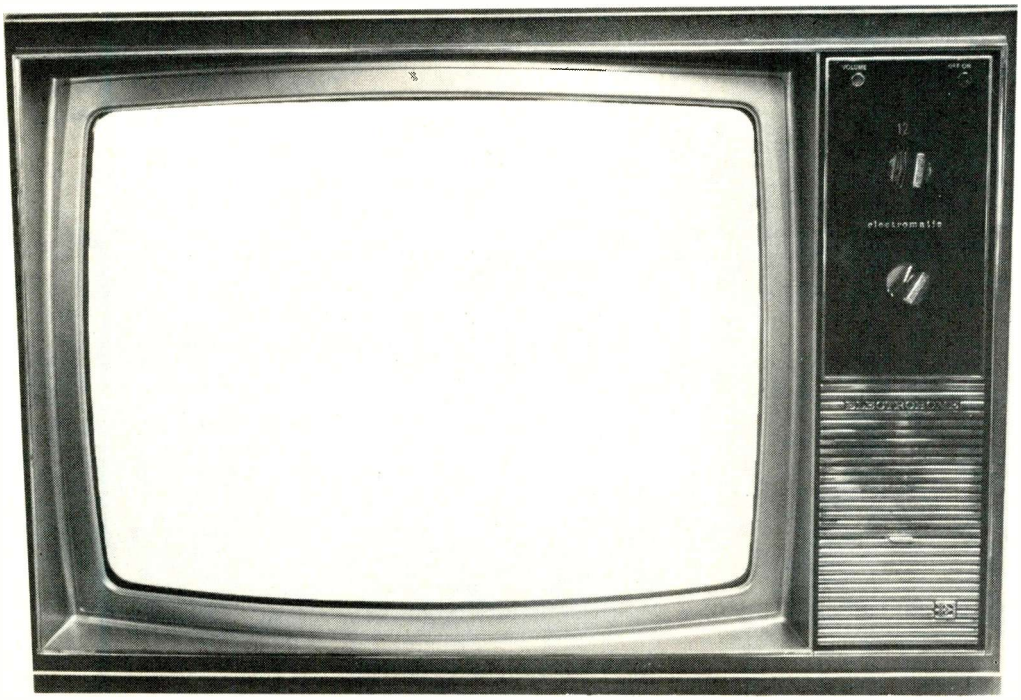
Electrohome's Servicease C12 Color-TV Chassis

by Joseph Zauhar

This set contains a fault indicator board for informing the technician of the defective area in the chassis

■ Each year as new color-TV sets are introduced, we try to review the major ones that you are likely to encounter while servicing, pointing out the service features and what to expect in new circuits. The one reviewed this month is manufactured by Electrohome Limited, a major manufacturer of color-TV sets in Kitchener, Ontario. This, the first Electrohome color-TV set that we have received, it was of particular interest to us for two reasons: Electrohome products are now sold in the U.S. and therefore this is a set that our readers in this country may be called upon to service; plus some unusual circuitry which you have probably never encountered before.

We received in our lab an Electrohome Capri, Model C12-301, Color-TV set employing a C12 chassis. This is a table model set with a 20-in. (measured diagonally) screen.



Electrohome's Capri Color-TV set employs a C12 Servicease chassis.

The C12 color-TV chassis itself is all solid-state, although two tubes are used in the tuner. Transistors and integrated circuits are provided with sockets for quick replacement, if required, and modularization is employed in the tuners, AFT unit and prealigned IF stages. These factory-serviceable modules are plug-in with metal cases that greatly reduce transit and handling damage.

This chassis is accessible, while it is operational, from the top or the bottom by removing the back cover and a panel on the bottom of the TV-set cabinet. The chassis can also be pulled back for service after removing two screws from the rear chassis skirt. It is roadmapped on both the bottom and top to assist in locating components and test points.

Whenever the tuner, IF or AFT module is suspect as a particular problem, the modular approach al-

lows diagnosis by substitution to isolate the trouble. The circuits in these modules allow interchanging without realignment, and the task of immediate realignment may be deferred until the trouble has been isolated and confirmed.

As we review some of the important new circuits, they may be followed in this month's Tekfax schematic, No. 1456.

VHF Tuner

After removing the back cover of the TV set we noted a number of important features in the tuner and associated components.

Being equipped with a 75Ω antenna input on the tuner, provisions for a 300Ω connection is accomplished at the antenna terminal board by means of a 300Ω-to-75Ω balum and link switch. The tuner employs a simplified tuner mount and can be easily removed by loosening two screws and removing a third. All electrical connections to the tuner including antenna input and IF output, employ quick disconnect, plug-in connectors.

The VHF tuner employs two tubes, a 6AH5 RF amplifier and a 6LJ8 RF oscillator tube. Its fine tuning is quite different from the TV sets that we have reviewed in the past since it does not employ the familiar mechanical linkage arrangement, but utilizes the control of varactor diode D1 over the tuner's local oscillator. The electronic FINE TUNING control R2, called "Electrolock," is located in the lower right control panel on the front of the TV set. It is connected between 11v B+ and ground through resistor R3 to provide the AFT input voltage to the tuner. The reverse bias voltage range of this control is sufficient to affect tuning into either sound or smear. Resistor R3 restricts the range into sound and the control can be centered mechanically for the correct channel tuning point.

Power Supply

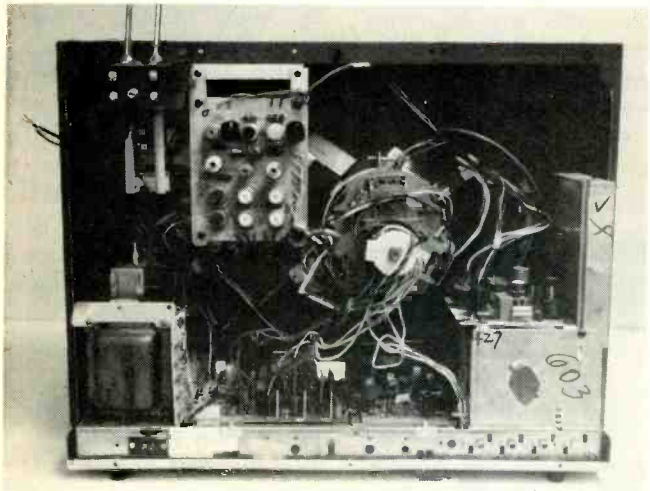
The power supply used in the C12 chassis must provide a number of independent voltages, resulting in a more complex design than in previous chassis. Included are two regulated dc supplies of 132v and 24v; four unregulated dc supplies of 270v, 170v, 60v and 32v; and two ac supplies of 6v for the picture-tube filament and 6.3v for the pilot light and tuner filament.

The dc power supply provides four separate sources generated from three separate rectifier circuits. The 32v and 60v sources are supplied by the same rectifier group—diodes D406 through D409.

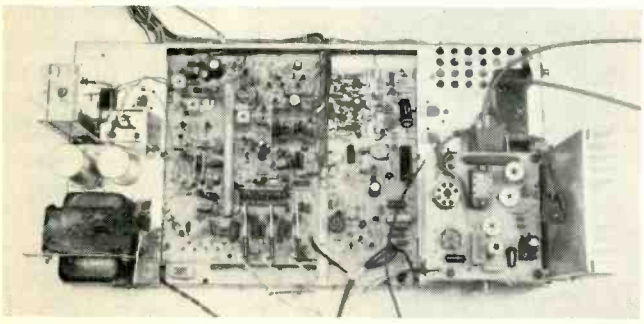
The 60v source is supplied by full-wave bridge configuration while the transformer secondary supplying this rectifier group is tapped at the half-voltage point to supply two rectifiers of the group (diodes D406 and D407) in a full-wave, center-tapped configuration to provide the 32v source.

The full-wave bridge configuration of diodes D402 through D405 supplies the 170v from the tapped T401 secondary winding (red to green/red). A 4.7Ω resistor, R404, limits the surge current through switch SW401 and its A and B contacts as capacitor E401 charges with initial switch-on.

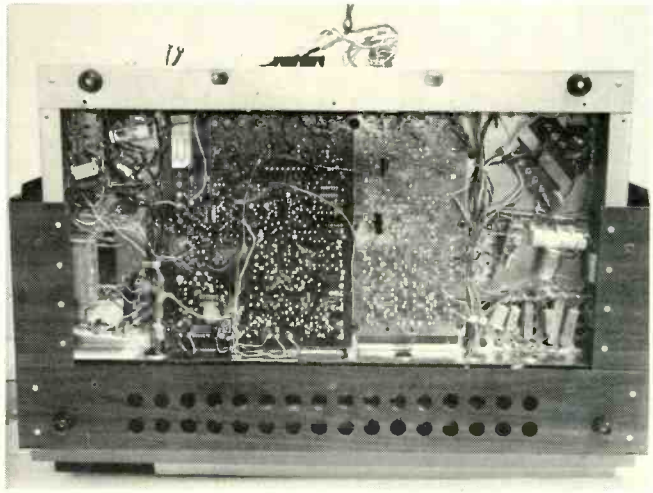
The 270v source is provided by a half-wave rectifier circuit employing diodes D401 and D403 and the full transformer winding. When switch SW401 is open, the 270v source does not drop to 0v, but rather to 110v as diode D402 functions in addition to diode D403 with a reduced portion of the transformer winding. Thus to eliminate the expense of an extra switch, a portion of the TV set remains active even when



Rear view of Electrohome's Capri color-TV set with an open display of components and a slide-out chassis.



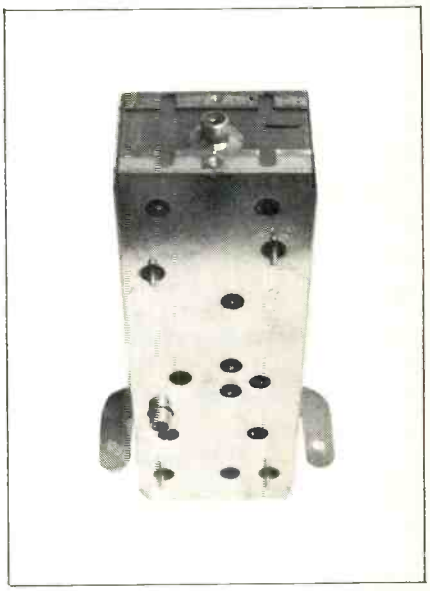
Top view of the solid-state color-TV chassis with road-mapped circuit boards to simplify identification of components.



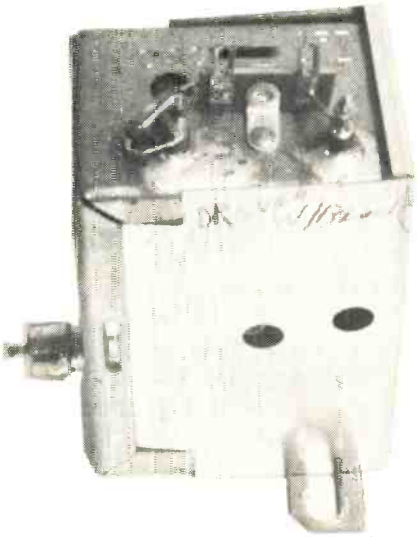
After removing a panel the complete underside of the chassis is exposed, making solder connections very accessible.

A panel door hides most of the controls on the front panel of the TV set.

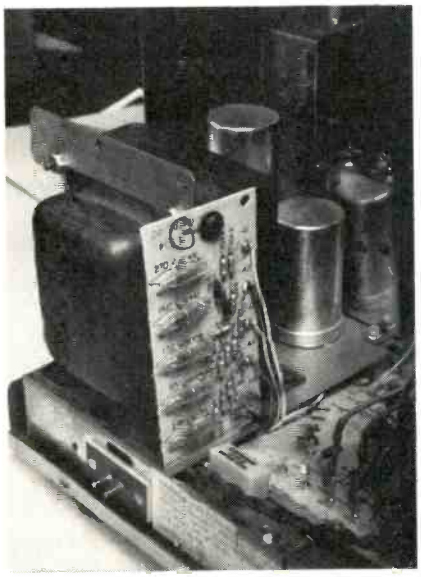
A 75Ω cable connector on the antenna block allows direct connection to cable systems or coax antenna system without additional adapters.



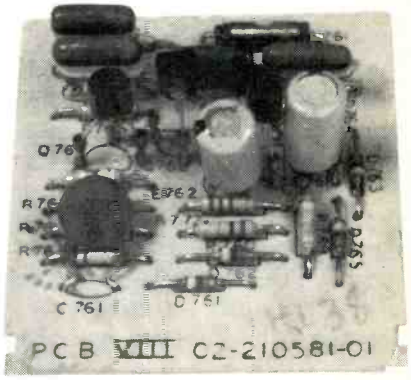
This rugged metal-cased factory serviceable IF module can be substituted in the field without requiring alignment.



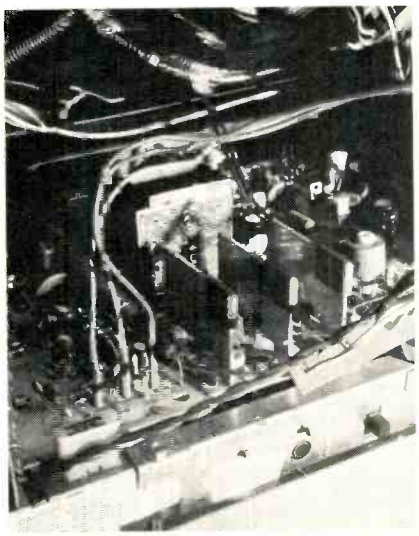
The AFT module is coupled to the IF module with a phono-type jack connector and is mounted on the top of the main chassis.



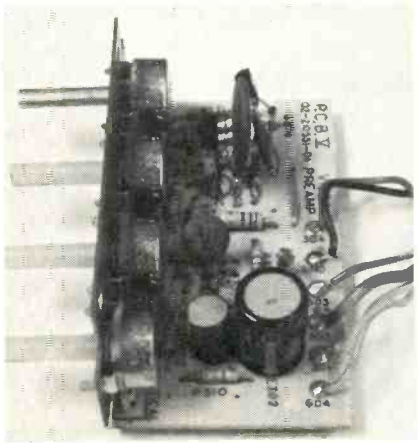
The fault indicator board is mounted vertically on the main chassis and monitors the five important voltages in the power supply. Should excess circuit current cause one of these voltages to drop, the corresponding bulb will light.



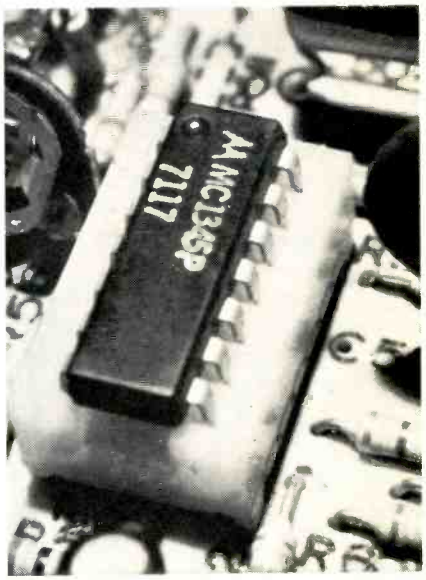
The auto-saturation printed-circuit board employs edge connectors and plugs into a socket on the main small signal printed-circuit board.



The blue, red and green video output transistors are plugged into the chassis and employ large heat sinks. Also shown are the ground pins to disable the color guns for purity adjustments.



The DETAIL, BRIGHTNESS, CONTRAST and VERTICAL controls are mounted on a separate video preamp board.



The integrated circuits are plugged into sockets for ease of removal when using the substitution method of servicing.

the TV set is turned OFF. This TV set is always hot unless unplugged!

A very interesting current foldback circuit is incorporated in the 132v regulated supply of this chassis. Scan stability is obtained by regulating the B+ supply to the horizontal deflection circuitry for a ±10 percent line voltage variation and for a 0-to-2ma picture-tube beam current variation. For this reason the 132v supply may be considered a part of the horizontal deflection circuitry, and supply adjustment R422 serves as the HIGH-VOLTAGE ADJUST control.

Transistor Q401 is the series regulator power transistor, transistors Q402 and Q404 are the two high-voltage error amplifiers and diode D414 is the reference zener. Transistor Q403 and resistor R416 form the current limiter and components D416, D415, R424 and R418 work in conjunction with the current limiter to provide a current foldback feature that allows a short circuit at the supply output to be maintained indefinitely. This is possible because even with the large voltage drop that results across transistor Q401, when the supply output is short circuited, the current through Q401 has reduced to a point where the power dissipation in Q401 is actually less than during normal operation. This we observed with interest, making an intentional direct short to ground.

Fault Indicator Board

The fault indicator board used in this chassis is quite unique and different from any other serviceability feature that we have encountered in the past. This feature was designed to diagnose service problems quickly and efficiently, allowing most of the service work to be done in the home. Since most service problems result in abnormal load on the power supply, this feature should shorten service time.

This board is located next to the power transformer on the top left rear of the chassis. Five neon bulbs are located on the board to monitor the five important voltages in the power supply. Should abnormal loading occur to one of the supplies, the appropriate bulb will illuminate, indicating the problem area. Since both of the regulated supplies derive biases from the higher B+ sources, failures in the higher sources will cause a combination of lamps to light.

Since loss in the 270v supply results in loss of voltage in the 132v supply, due to biasing through resistor R411, both the 270v and 132v lamps will light. Similarly, losses in the 60v source will cause both the 60v and 24v lamps to light.

Color Circuitry

The color circuitry in this chassis may be divided into four basic segments as follows: A two-stage chroma bandpass amplifier and associated killer switch, a five-stage 3.58MHz reference channel, a three-stage automatic saturation control function and the chroma demodulator.

The transistors are mounted in sockets to shorten service time, if removal is necessary.

The chroma amplifier contains two closed-loop, automatic-gain control systems: An ACC system dependent on signal burst amplitude gain controls (transistor Q701) and an automatic saturation control (electrocolor) dependent on average chroma picture information gain controls (transistor Q-703). The killer switch (transistor Q702) interconnects with both of these to detect the transmission of color or B/W signals.

The ACC closed loop encompasses the first chroma amplifier (transistor Q701), the burst gate amplifier (transistor Q-720), two reference buffer stages (transistors Q-721 and Q722) and the ACC detector diode configuration (diodes D721 and D722). The bias controlling the gain to Q701 varies from 0.95v for maximum gain on B/W transmissions to 0.55v for maximum gain on strong chroma transmissions. The ACC control range is approximately 14dB.

The second closed-loop gain control system is the auto saturation loop encompassing the second chroma bandpass amplifier (transistor Q703) and the electrocolor circuitry (transistors Q761, Q762 and Q763).

The purpose of the auto saturation control circuitry is to provide additional control over the range of color input signals so that reduced variation in saturation results as stations are switched or as program material is changed. The circuit is designed to hold output changes to within 6dB over an input change of 30dB—at a saturation control setting that would likely be used for pleasing saturation for a reasonable input level.

This auto saturation control circuitry is located on its own small print circuit board that plugs into an edge-connector socket on the main chassis.

The chroma demodulator, IC701, is based on the principle that all color information is contained in any two of the three color difference signals. This integrated circuit demodulates the R-Y and B-Y signals through synchronous detection and then matrixes the proper proportion of inverted R-Y and B-Y to get G-Y. The actual process of demodulation requires two phase locked 3.58MHz reference signals in quadrature and phase locked to the burst by constant amounts.

Auto Tint (Electrotint) Circuit

Another feature employed in this chassis is the auto-tint circuit which takes advantage of the wider range of flesh tones (oranges) associated with wider than normal demodulation angles. Because this does produce somewhat incorrect colors (especially in yellows) the AUTOTINT switch, SW-701A and B, provides for switching between normal hues and the auto feature.

High-Voltage System

The shunt efficiency deflection system used in this chassis is in parallel to the yoke windings and the primary of the flyback transformer T902—the 1100v pulse developed

continued on page 43

The CAT Game —Part III

by Lambert C. Huneault, CET

The first two Circuit Analysis & Troubleshooting (CAT) Games—October 1969 and September 1971 issues of ELECTRONIC TECHNICIAN/DEALER—involve vacuum tube and solid-state B/W-TV receivers. This third quiz deals with a color-TV chassis, Zenith 20X1C38. The format is the same, i.e., 20 multiple-choice questions which test the reader's troubleshooting skill by asking him to predict the symptoms that defective components will produce. Following the questions, detailed answers are given, which, it is hoped, will help the reader to better understand circuit operation and thus relate more clearly component failures to observed symptoms.

■ Throughout the quiz, the assumption is made that the TV set has been properly set up, is tuned to a local (snow-free) color channel, properly fine-tuned, and that all controls (including the COLOR KILLER control) are adjusted properly.

In several of the questions, the following expressions will be used:

Monochrome picture This will mean that the reproduced picture will show no color, i.e., the same as if a B/W-TV broadcast were tuned in or the COLOR LEVEL control turned down fully counterclockwise.

Color out of sync This means that the luminance information is locked in, i.e., the B/W component of the picture is holding steady on the screen, while the color is drifting by. On a keyed rainbow generator signal, this leads to the well known "barber pole" effect, while on an actual televised picture, the colors of objects are constantly changing (drifting or flickering).

Raster okay This means a normal *white* raster.

Enjoy the game, and score five points for each correct answer.

Questions

1. Capacitor C147 (located in the grid circuit of reactance control tube V17A) becomes shorted. The resulting symptom will be:
   (a) picture breaks into diagonal bars (no horizontal sync)
   (b) monochrome picture
   (c) no picture, raster okay
   (d) color out of sync
2. Capacitor C35 (located to the right of the three CRT grid-two controls) becomes shorted.
   (a) no raster
   (b) picture quite dark (low brightness)
   (c) raster (and picture) yellowish
   (d) raster (and picture) purple
3. Open connection (e.g., poor solder joint) between pin 6 of the R−Y demodulator (V13) and the wire leading to it.
   (a) picture all blue; off-channel, the raster is blue
   (b) picture contains only blues and greens (no reds), flesh tones being only blue or green, depending on the setting of the HUE control
   (c) monochrome picture
   (d) all hues are present, but HUE control must be turned maximum clockwise to produce normal fleshtones
4. TR1, the video driver transistor, is inoperative or pulled out of its socket.
   (a) no picture, raster and sound okay
   (b) no raster (screen blacked out)
   (c) blurry colored objects in the picture, but no B/W components visible, i.e., no luminance information
   (d) no picture, no sound, raster okay
5. Tube V12 (B−Y demodulator) develops an open heater.
   (a) picture contains no blues, but does contain reds and greens
   (b) dim picture has a bluish cast and low contrast
   (c) same as (a), but picture is also out of focus and shows retrace lines
   (d) same as (b), but picture is also out of focus and shows retrace lines
6. Capacitor C89 shorts (located below demodulator injection transformer T12).
   (a) no raster
   (b) monochrome picture
   (c) color out of sync
   (d) monochrome picture, but also out of focus
7. Tube V15 (6JU8A, ACC killer detector and AFC

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phase detector) develops an open heater.
(a) monochrome picture
(b) color out of sync
(c) picture contains no reds
(d) picture contains no blues

8. Capacitor C72 opens (second color amplifier plate circuit).
(a) weak color (pastel shades only)
(b) no color (monochrome picture)
(c) color out of sync
(d) raster okay, no picture

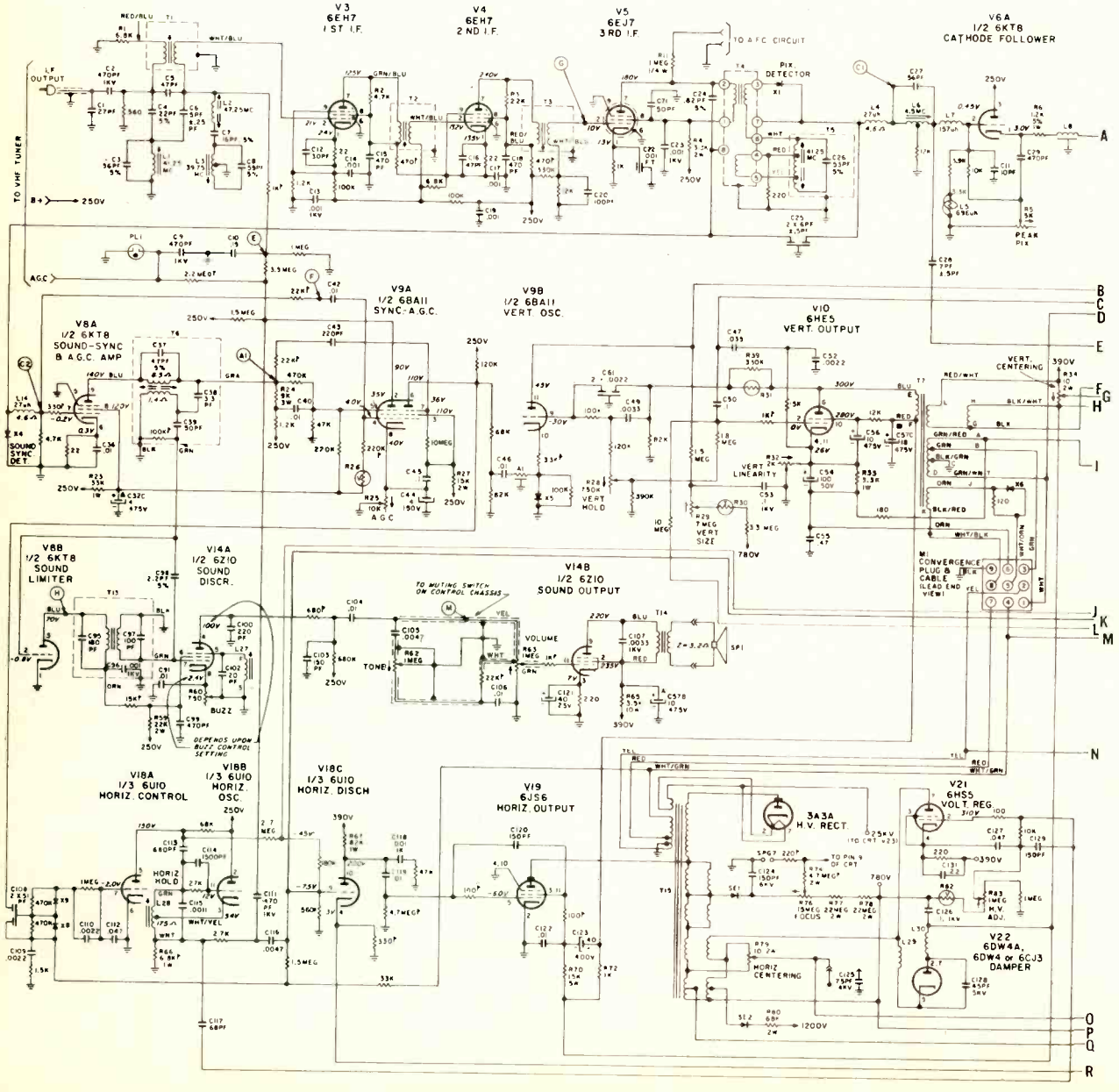
9. Capacitor C146 opens (grid circuit of the reactance control tube, V17A).
(a) monochrome picture
(b) color out of sync
(c) B/W picture details holding steady while color information unsteady (wiggly or bending)
(d) little noticeable effect

10. Slug misadjusted by a couple of turns in burst transformer, L38.
(a) wrong hues in the picture
(b) color out of sync
(c) monochrome picture
(d) little noticeable effect

11. Capacitor C152 shorts (control grid circuit of the 3.58MHz oscillator).
(a) monochrome picture
(b) color out of sync
(c) picture red throughout
(d) slight purple and green cast in the picture, otherwise no colors

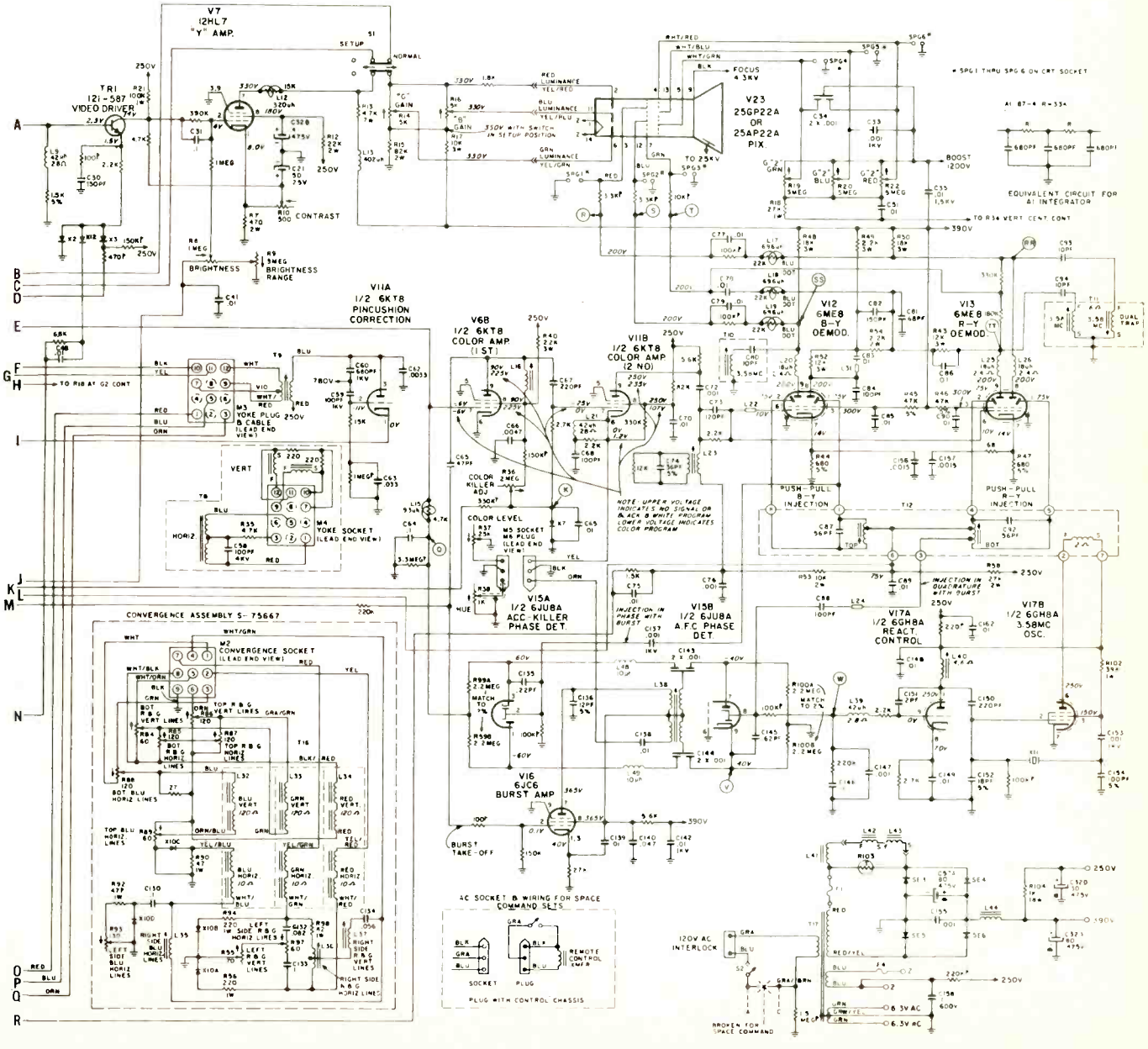
12. Poor solder connection (open circuit) between pin 5 (heater pin) of tube 6KT8 (V6) and ground.
(a) monochrome picture
(b) color out of sync
(c) no picture, raster okay

Schematic diagram of Zenith's 20X1C38 (late production) color-TV set.



(d) blurry color only, with no B/W (luminance) details in picture

13. Shunt peaking coil L13 opens in plate circuit of Y amplifier, V7.
    (a) very bright picture
    (b) raster very bright but no picture
    (c) no raster
    (d) blurry colored picture with no B/W detail visible
14. If the delay line, L8 (located to the right of the cathode follower, V6A) opens or becomes disconnected, the *brightness* of the raster will:
    (a) increase
    (b) decrease
    (c) remain unchanged
    (d) decrease completely (no raster)
15. The 27K resistor opens in the cathode circuit of the burst amplifier, V16.
    (a) color out of sync
    (b) monochrome picture
    (c) no blues in the picture
    (d) no reds in the picture
16. Capacitor C88 opens (above and to the right of the AFC phase detector, V15B).
    (a) wrong hues in the picture
    (b) monochrome picture
    (c) little noticeable effect
    (d) color out of sync
17. Electrolytic capacitor C32B shorts (screen circuit of Y amplifier, V7).
    (a) monochrome picture
    (b) no raster
    (c) blurry color only, with no B/W (luminance) detail in picture
    (d) color out of sync
18. Thermistor R103 opens in the low-voltage power supply.
    (a) no raster, no sound



(b) brightly colored horizontal bands superimposed on the picture
(c) very dim, narrow, out-of-focus picture
(d) no raster, sound only

19. Capacitor C77 opens (red-grid circuit of CRT).
(a) raster normal (white), but no reds in the picture (blues and greens only)
(b) red colors lack intensity
(c) red gun cut OFF, causing a cyan raster
(d) little noticeable effect

20. Delay line L8 becomes shorted by improper lead dress that connects both ends together.
(a) no noticeable effect
(b) no B/W (luminance) detail in the picture
(c) color ghost
(d) monochrome picture

Answers

1. (d)—The color is out of sync because with capacitor C147 shorted the dc correction voltage produced by the color phase detector (V15B) is shorted to ground instead of being applied to the reactance control triode. The 3.58MHz oscillator is therefore free-running, and colors do not lock in.
2. (b)—With capacitor C35 shorted, the 1200v boosted-boost voltage drops to 390v (B+). This drastic reduction in CRT screen-supply voltage reduces the beam currents of all three guns so much that only the brighter picture highlights remain visible. Incidentally, this short in the boosted-boost circuit does not appreciably upset the operation of the HOT, because of the 68K resistor (R80) which isolates the boosted-boost terminal from the HOT.
3. (b)—With its grid lead open, the R−Y demodulator receives no chroma signal and produces no red video for the CRT. The B−Y demodulator, however, continues to produce video signals in its two plate circuits, feeding the blue and green grids of the CRT.
4. (c)—The cathode follower (V6A), video-driver transistor (TR1) and Y amplifier (V7) make up the luminance channel, which amplifies and applies to the CRT cathodes the high-resolution B/W (Y) picture information. With TR1 inoperative, this monochrome information is missing. The chroma information is taken off before these luminance circuits, however, and is applied through capacitor C28 to the chroma channel, which includes the first and second color amplifiers, V6B and V11B. After demodulation, this color information reaches the CRT grids. This is why colored pictures are still visible on the screen even though TR1 is out of the circuit. The chroma channel is a low-resolution circuit, however, its response limiting the chroma sidebands to a "fidelity" of only 0.5MHz (compared to approximately 4MHz in the luminance channel). This is why color information, by itself, looks quite blurry on the screen, lacking all the fine detail of the Y signal.
5. (d)—With tube V12 inoperative, its pin-9 plate voltage will almost double, rising toward the B+ supply voltage of 390v. Being dc coupled, this excessive positive voltage will cause excessive beam current in the blue gun, giving an overall blue hue to the picture. At the same time, the excessive beam current will exceed the regulation capability of the 6HS5 regulator and load down the high-voltage supply excessively, causing a dim and out-of-focus picture. Retrace lines would also be visible—as the CRT would continue conducting even during retrace blanking pulses, which are fed to its cathode via the transistor TR1 and tube V7 luminance channel.
6. (a)—No raster because the high voltage for the CRT anode is loaded down so much by the excessive beam current that it drops down to about 12kv. The short in capacitor C89 grounds the +75v dc voltage normally available at the demodulator tubes' beam switching plates (pins 1 and 2). This reduces the tubes' plate current sufficiently to raise the plate voltage to between 250v and 300v. This increase is dc coupled to the CRT grids, causing a large increase in beam current, which makes the raster bloom right out of sight!
7. (a)—No color will be visible because the second color amplifier (V11B) will be cutoff by a high negative control-grid voltage (e.g., −25v) from the killer circuit.

There is no color killer tube in this receiver. Color killing normally works as follows: When the color burst is missing (e.g., during a B/W show) the killer detector, V15A, produces essentially no output ACC voltage at the junction of its 2.2M load resistors—R99A and R99B (Test Point Q). With approximately 0v bias, the first color amplifier conducts heavily and its plate and screen voltage drops to 90v. This low voltage is applied to the COLOR KILLER control, R36, through a 150K resistor.

On the other hand, the negative dc voltage is applied from a −75v source (the grid of the horizontal discharge tube, V18C) through a 330K resistor to the wiper of the killer control. With a normal adjustment of R36, the negative voltage has "the upper hand" and biases the second color amplifier to cutoff.

During a color show, the burst signal is normally rectified by the killer detector and a negative ACC bias developed at point Q (e.g., −6v). This drastically reduces conduction of the first color amplifier and its plate and screen voltage rises to about 225v. This much higher voltage, applied to the KILLER control, bucks the negative dc from the −75v source, and the wiper of the control now tends to become positive. This positive dc voltage is shorted to ground by the clamp diode, X7, and, as a result, it does not actually reach the control grid of the second color amplifier, but allows the latter to operate normally, with only its own cathode bias.

Now, in the present case, i.e., with tube V15A dead, the effect is the same as if the burst were absent: no ACC bias is produced, and the second

color amplifier is killed. Note, however, that if the COLOR KILLER control were adjusted slightly clockwise from its normal setting, more positive voltage would be available to oppose the negative dc at the wiper, and tube V11B could easily be turned back ON, allowing color to reach the CRT. But, since tube V15B, the color phase detector, is also dead, the color oscillator is free-running and color in the picture will be out of sync—answer (b).

8. (b)—C72 is the coupling capacitor between the plate of the second color amplifier and the input to the demodulators. When open, no chroma signals reach the demodulators.
9. (d)—Capacitor C146, along with its series 220K resistor, forms an anti-hunt network. While the color oscillator might be expected to hunt when the capacitor is open, the writer has, in practice, observed no such instability in the color picture.
10. (a)—Misadjusting burst transformer L38 by a couple of turns causes an appreciable shift in the phase of the color burst signal reaching the AFC phase detector. This, in turn, results in a similar shift in the phase of the 3.58MHz oscillator signal, forcing the detector tubes, V12 and V13, to demodulate along the wrong axes. Flesh tones will become different shades of purple or green, depending on whether the slug was misadjusted clockwise or counterclockwise.
11. (d)—If you chose answer (a), i.e., no color, don't feel bad . . . you probably have a lot of company! In many color-TV receivers, a B/W picture is precisely what you would get if the color oscillator failed. And the oscillator certainly has failed here, with its control grid shorted to ground! However, a strange phenomenon occurs in many models, including this Zenith receiver: the demodulators *do* produce some output signal, even in the absence of a reinserted 3.58MHz subcarrier.

    This is strange because one would expect that the incoming chroma signals (sidebands), not finding a subcarrier to heterodyne with, could not produce any color video signals (low-frequency) in the output circuits of the demodulators. The chroma signals themselves certainly could not pass through the demodulators, because of the 3.58MHz traps (T10 and T11) in their plate circuits. And yet, some intelligence *is* provided in the outputs of tubes V12 and V13. This can be seen plainly on a scope.

    This color video information, although not similar to the color signals that should normally be produced there, does reach the CRT grids and invariably produces a *green and purple* cast on the otherwise B/W picture. This is not a colored raster, i.e., if the set is switched off-channel, the raster is plain white, not tinted—the actual pictures take on a color tinge unrelated to the genuine colors that should normally appear. For example, a person's face may be purple, with the eyebrows green; or a close-up object purple against a green background. Although of low saturation, the intensity of this purple and green cast is controllable with the COLOR LEVEL control. Of course, the HUE control has no effect on the color cast, the color oscillator being inoperative.

    Why then do the color demodulators produce color video signals in the absence of a reference (C.W.) subcarrier signal? The writer feels that the phenomenon can perhaps be attributed to some sort of intermodulation distortion generated within the demodulators, different chroma sidebands at their inputs beating against each other, the heterodyne effect giving birth to some lower-frequency plate voltage variations which are then direct coupled to the CRT grids. Because these intermodulation products do not possess a direct, simple relationship to the actual chroma signals, the resulting intelligence is "all-wrong," i.e., objects in the picture take on a pastel green and/or purple hue, regardless of the actual colors of the real objects.

    For readers familiar with single-sideband, suppressed-carrier communications, this could be compared to reception of SSB signals with the BFO switched OFF. In the absence of a regenerated carrier, some signals still manage to appear in the detector's output, but the resulting audio is unintelligible, as anyone who has ever heard it will readily agree.

    Incidentally, while some types of chassis will not produce this purple/green cast, this rather odd phenomenon is not peculiar to this chassis only. The writer has seen a similar effect on other color-TV sets as well—such as RCA chassis featuring low-level X and Z triode demodulators.
12. (c)—Because tube V6 contains both a luminance amplifier (triode V6A) and a chrominance amplifier (pentode V6B), no picture information is allowed to reach the CRT.
13. (c)—No raster, unless the COLOR LEVEL control is turned to maximum—then, there will be a dark, blurry color picture with no luminance information visible. The reason for the blacked-out raster is a substantial increase in CRT cathode bias when the Y amplifier is removed from the R14-R15-R16-R17 voltage divider network in the CRT cathode circuit.
14. (a)—Normally the cathode current of the tube, V6A, flows through the 1.5K cathode resistor and peaking coil, L9, setting up a 2.3v base voltage which forward biases the video driver transistor. With delay line L8 open, tube V6A can no longer conduct. Transistor TR1's base voltage then drops to 0v, and the transistor turns OFF. The resulting increase in collector voltage is dc coupled to the grid of tube V7, causing the latter's plate voltage to drop, reducing the CRT cathode bias, forcing the brightness to increase. Vertical retrace lines will also be visible.
15. (b)—With an open cathode resistor, tube V16 is inoperative. With no color burst signal fed to the killer detector, the ACC bias is 0v. And as described in answer No. 7, the second color amplifier

continued on page 50

Basic Digital Circuitry

by Phillip Dahlen

Part IV—Regulating the decade counters

■ For the past few months we have been concerned with the function of digital circuitry used in Heath's IB-101 Frequency Counter, it being our belief that circuitry of this general type will be found in more and more of the consumer electronic products that you will be called upon to service in the future. The previous articles in this series have been concerned with shaping the applied signal (of unknown frequency) so that it can be handled by the first decade counter (page 56 of November issue), how flip-flop circuits can be combined for counting to ten (page 45 of December issue), and how "clock" signals can be obtained for timing the decade circuits (page 48 of January issue).

We are now concerned with how these clock signals can be processed to produce a series of signals that regulate the decade counter and associated circuitry. This circuitry (Fig. 1 and 2) must *gate* the initial decade counter to determine the counting interval, *transfer* the resulting count to a buffer-storage stage, and then *reset* the chain of decade counters to zero prior to the next counting interval.

From the schematic in Fig. 1 we note that this circuit can function in either an *Hz* or *kHz* mode. In the *Hz* mode a 1Hz signal is applied to the input of Inverter B (IC24-13) and the resulting outputs of Inverters C and D (IC24-3 & 5) are applied to capacitors C11 and C12; while in the *kHz* mode a 1kHz signal is applied to the input of Inverter B and a 10Hz signal is applied to capacitors C11 and C12. Although in both instances we are dealing with the same basic circuitry, there is enough difference in signals present to warrant their coverage in separate articles. Thus, this article is solely concerned with the function of the circuit in the *kHz* mode.

In the composite photo of scope traces in Fig. 3 we note the shape of the 1kHz signal that is applied to the input of Inverter B (IC24-13). This inverter merely amplifies the more negative portion of the applied signal, the signal resulting at its output (IC24-2) thus differing from the applied signal in both polarity and waveform.

The flip-flop circuit contained in the portion of IC22 shown in Fig. 1 of this month's article functions in the same manner as the flip-flop circuit used in the other half of IC22—shown in Fig. 1 on page 46 of the December article. Thus we note that the two outputs of this flip-flop (IC24-8&9) are of opposite polarity and change state with every negative excursion of the output of Inverter B (IC24-2). During the

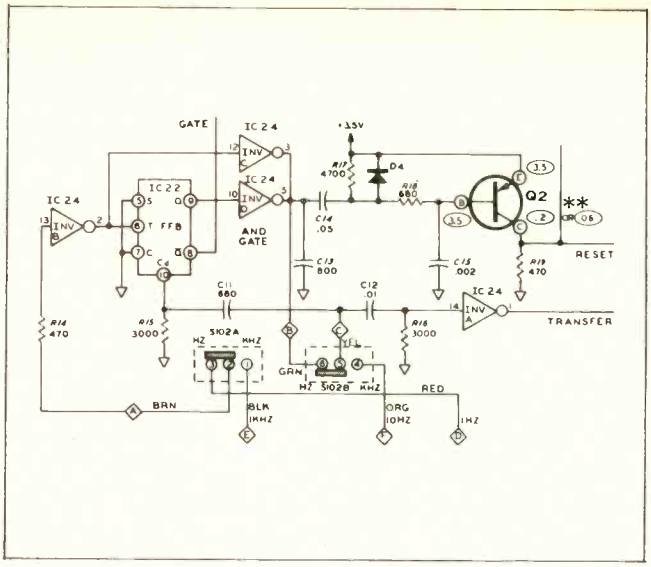


Fig. 1—Schematic of the control circuitry. *Courtesy of Heath Co.*

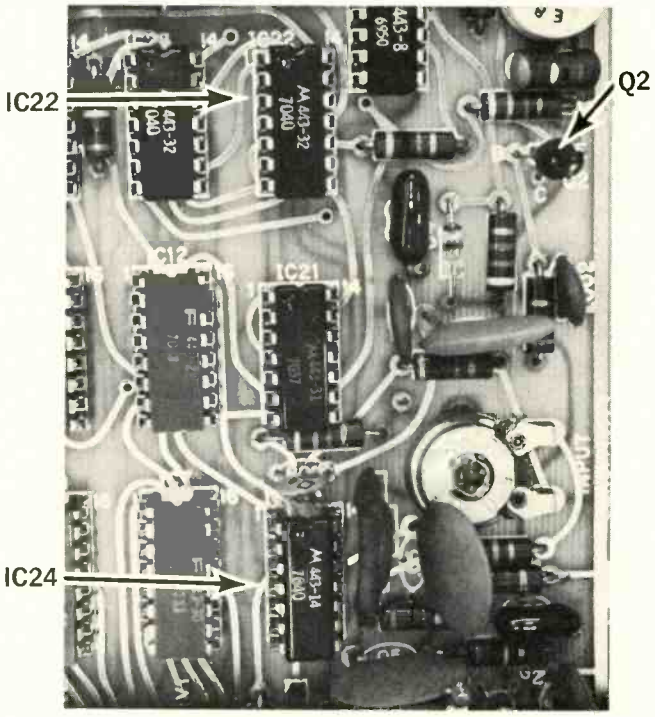


Fig. 2—Close-up of the components used in the control circuitry.

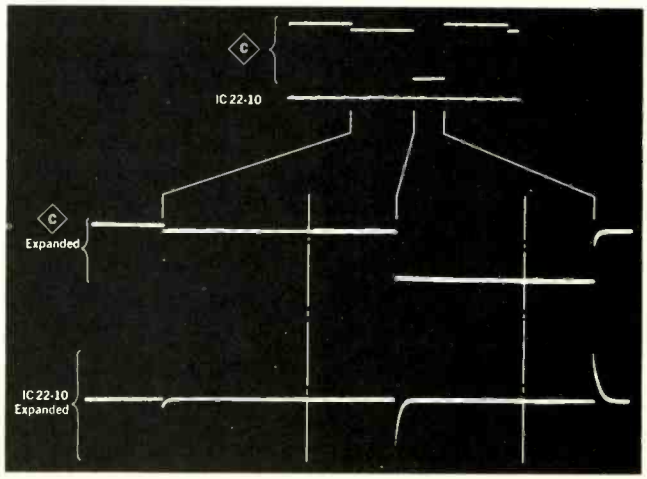


Fig. 4—Differentiated pulses from the 10Hz signal are used for resetting the flip-flop circuit.

0.001 sec. that IC22-8 is negative, it allows the first circuit in the decade counter to function. (This is the Gate—B signal shown in the December article.) During the 0.001 sec. that IC22-8 is positive, it keeps the decade circuitry from counting.

The second output of this flip-flop circuit (IC22-9) is fed to the input of Inverter D (IC24-10), while the output of Inverter B is fed to the input of Inverter C (IC23-12). Their resulting outputs are combined and observed as they occur at Terminal B. From the corresponding scope traces in Fig. 3, we note that this signal (at Terminal B) is positive only when both IC24-2 and IC22-9 signals are negative, and that it (signal at Terminal B) becomes negative when either the IC24-2 or IC22-9 signal becomes positive.

The combined signal present at Terminal B is differentiated prior to being applied to the base of transistor Q2. This transistor, in turn, amplifies only the negative portion of the applied signal. The resulting positive pulse (at Q2-C) is used to *reset* the decade counters to zero prior to beginning a new count. (This is the Reset—M signal shown in the December article.) Note that the *reset* pulse occurs just shortly before the *gate* signal changes state to allow the next count.

The circuitry, as described thus far, functions in a relatively simple manner and can be studied with any professional-quality scope available. If this constituted the only circuit function, the article would end right here. However, things are not nearly that simple. In fact, the remaining illustrations required approximately 160 Polaroid prints before we were able to obtain the results shown. The basic problems should be clearly seen further along in the article.

The upper pair of scope traces in Fig. 4 are typical of the waveforms observed on nearly any professional scope that one might have available. From these waveforms it appears as though the 10Hz signal fed to capacitor C11 is filtered to ground before reaching IC22-10. The applied signal can be clearly seen, but even when the second channel of the scope is at maximum gain, only a slight ac ripple can be observed on the lower trace. Can we thus assume that there is no differentiated signal present? No! This circuit *is* performing a function!

Capacitor-resistor (R-C) time constants can be determined by using the equation $T = R \times C$. This time constant is defined as the length of time required for a capacitor to gain or lose 63 percent of its charge in a circuit. Substituting values into this equation we have: $3000\Omega \times 680\text{pf} = 3 \times 10^{3}\Omega \times 680 \times 10^{-12}\text{f} = 3 \times 10^{3}\Omega \times 6.8 \times 10^{-10}\text{f} = 20.4 \times 10^{-7}$ sec. $= 2.04 \times 10^{-6}$ sec. $= 2.04\mu s$ or roughly $2\mu s$. Thus we know that if

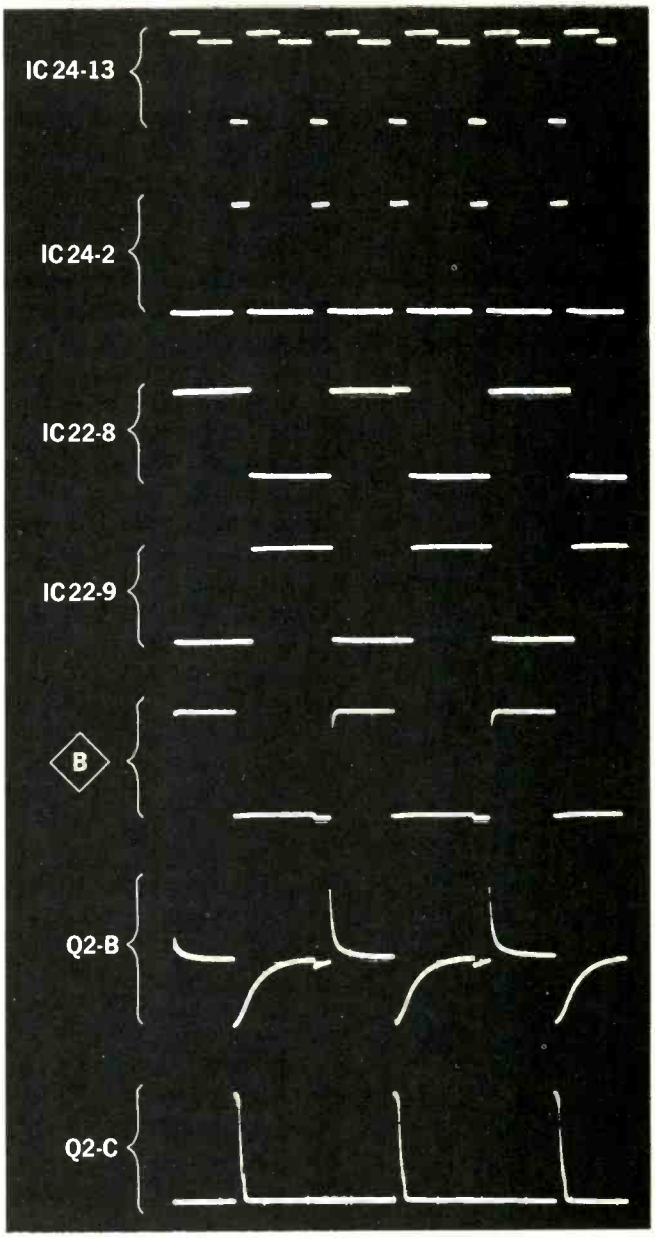


Fig. 3—Composite photo of 1kHz signals processed in the control circuitry.

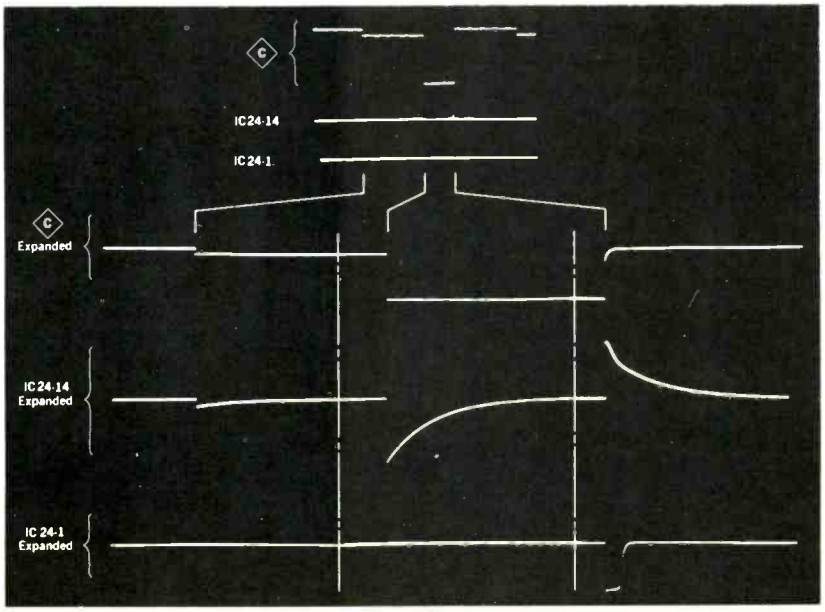


Fig. 5—Differentiated pulses from the 10Hz signal are used for producing the transfer signal.

the capacitor is charged and discharged by a "sharp" enough square-wave-type signal—even if the basic frequency is only 10Hz—it is capable of differentiating a 2μs signal. And as we will note, this signal has "sharp enough edges" for the capacitor to do just that. This is in effect producing a half cycle of a 250kHz signal with each edge of the 10Hz signal.

In order to observe these differentiated signals, we found it necessary to use the delayed sweep of the Telequipment D67 scope described on page 47 of our July 1972 issue. Even with this scope, we found the time factors of the two signals so greatly different (observing a 2μs signal generated by a 0.1 sec. signal) that we had considerable difficulty synchronizing the delayed sweep. This problem was finally solved by applying the *transfer* signal—which has a slightly longer time constant—to the external sync input of the delayed sweep circuitry. We then set the delayed sweep rate at 20μs/cm and switched the horizontal trace to $\times 5$. The resulting sweep rate was 4μs/cm and the differentiated pulses observed on the lower scope trace appeared ½ cm long —corresponding to the 2μs signal calculated.

Thus in Fig. 4 the upper pair of scope traces show the 10Hz signal and the resulting differentiated signal applied to IC22-10 when observed at a normal horizontal sweep rate of the scope. The lower pair of traces show the same pair of signals, the gain of the scope remaining the same, but the sweep rate being changed to show the three segments of the 10Hz signal and the resulting differentiated signals applied to IC22-10. With the differentiated pulses appearing 0.1 in. long in Fig. 4, a single cycle of the 10Hz signal would have had to appear 50,000 in. or .78914 miles (roughly ¾ mile) long to be shown in its entirety.

The same techniques were used for obtaining the scope traces shown in Fig. 5. There the upper set of three traces show what is present on most professional-type scopes when observing the 10Hz signal present at Terminal C, the lower traces failing to indicate the resulting differentiated signal applied to Inverter A (IC24-14), or the signal present at its output (IC24-1).

The lower set of three scope traces were expanded as before. There we note that the resulting differentiated signal appears longer than that shown in the previous illustration. This is because of the longer time constant resulting from the use of a .01μf capacitor ($3 \times 10^3\Omega \times 1 \times 10^{-8}$f $= 3 \times 10^{-7}$ sec. $= 30\mu$s). Inverter A, in turn, amplifies only the positive portion of the signal applied to it. The resulting negative pulse (at IC24-1) is used to *transfer* the count of the decade counters in the buffer-storage circuits.

With the circuit in its present mode of operation, we have (as previously indicated) a 1kHz signal applied to Inverter B (IC24-13)—the upper trace in Fig. 6—and a 10Hz signal at Terminal C applied to capacitors C11 and C12—the lower trace in Fig. 6. (Fig. 7 shows the same pair of scope traces with the scope sweep rate switched to $\times 5$.) The formation of these "clock" signals were described in detail in the previous article—page 48 of the January issue. The timing relationship of these

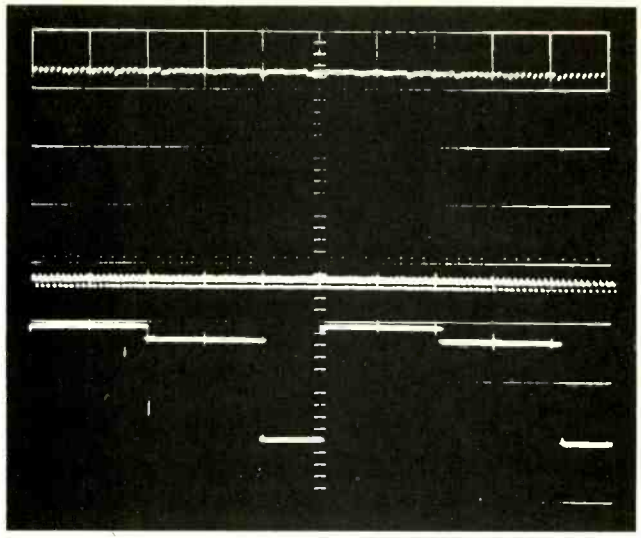


Fig. 6—Comparing the 1kHz signal applied to Inverter B (upper trace) with the 10Hz applied to capacitors C11 and C12 (lower trace).

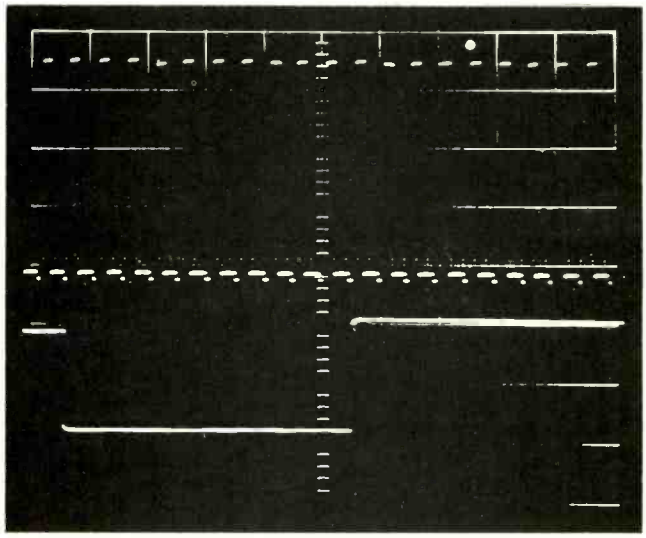


Fig. 7—By increasing the sweep rate by $\times 5$, more detail of the 1kHz and 10Hz signals can be observed.

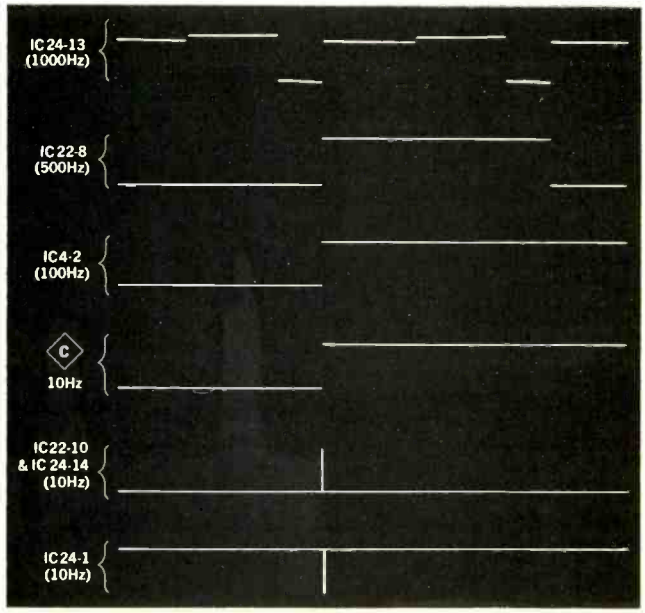


Fig. 8—Even though the signal frequencies range from 1kHz to 10Hz, there is still a definite timing relationship.

signals, plus related signals described previously in this month's article, are shown in Fig. 8.

The top trace drawn in Fig. 8 represents the signal applied to Inverter B (IC24-13). The trace drawn below it represents the resulting *gate* signal developed at the output of the flip-flop circuit (IC22-8). The third trace drawn represents a small segment of the output signal of decade counter IC4 (IC4-2 shown in last month's article). This decade counter is switched to a positive state with every tenth change of the previous decade counter (IC3) to a positive state—the output of the previous decade counter being the 1kHz signal applied to IC24-13. The fourth trace drawn represents an even smaller segment of the output signal of decade counter IC5, which is switched to a positive state with every tenth change of the previous decade counter (IC4) to a positive state. Therefore, with every hundredth change of the signal at IC24-13 to a positive state, the signal applied to Terminal C is switched to a positive state. This positive excursion results in a positive differential signal (the fifth trace drawn) applied to IC22-10 and IC24-14; a negative *transfer* pulse (the sixth trace drawn) appearing at IC24-1.

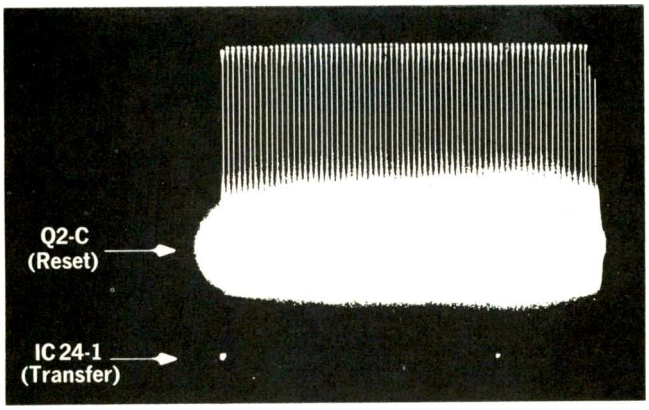


Fig. 9—There are a hundred reset pulses for every transfer pulse.

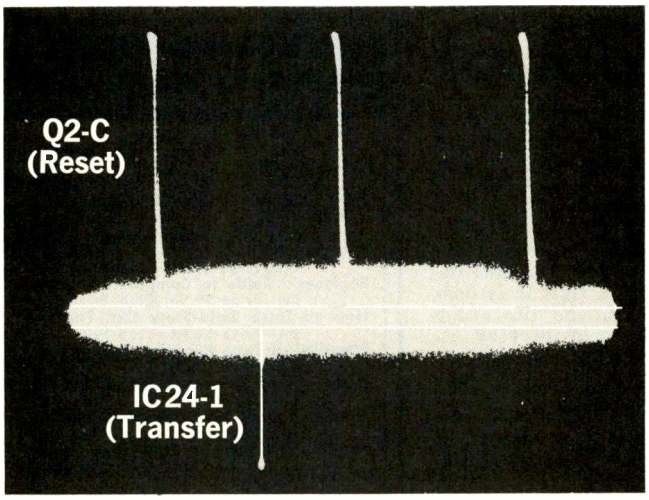


Fig. 10—By increasing the scope sweep rate we can more clearly see the timing relationship between the reset and transfer pulses.

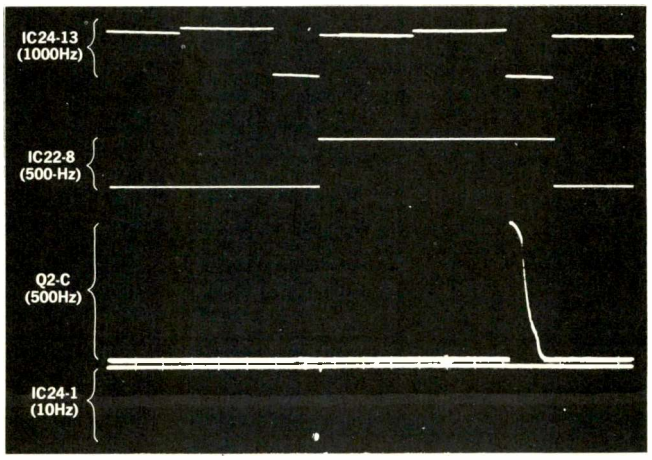


Fig. 11—Timing relationships exist between the applied 1kHz signal and the resulting *gate*, *transfer* and *reset* signals.

From Fig. 8 we thus see that the negative *transfer* pulse is produced with every hundredth positive excursion of the signal at IC24-13. With every second positive excursion of the signal at IC24-13, the *gate* signal at IC22-8 becomes positive to inhibit the function of the frequency counting circuitry. It is while the frequency counting circuitry is inhibited that this total count is transferred to the buffer-storage circuitry.

Should the *gate* signal not be synchronized with the *transfer* signal—it instead switching positive on the preceding and following positive excursions of the signal at IC24-13—the *transfer* signal (IC24-1) would cause the buffer-storage circuitry to accept an incomplete count. To prevent such a possibility from occurring, a reset signal (IC22-10) is applied to the flip-flop circuit in IC22. Thus with every hundredth excursion of IC24-13, both IC22-8 and Terminal C are coincidentally positive—the *transfer* signal occurring during the interval that the *gate* signal inhibits the frequency counter.

From the scope traces clarified for reproduction in Fig. 9 we note that the *transfer* signal occurs each time the *reset* signal has occurred a hundred times. Thus only one count in a hundred is actually transferred to the buffer-storage circuitry. This permits later stages to operate at .1 sec. intervals while the preceding stages operate at .001 sec. intervals—the buffer-storage circuitry holding sample counts for longer observation.

The expanded scope traces in Fig. 10 (as clarified for reproduction) show in more detail the timing relationship between the 1kHz *reset* pulses and the 10Hz *transfer* pulse. Still more detail is shown in the composite illustration in Fig. 11.

To produce the illustration in Fig. 11 required using the delayed sweep of the scope—externally synchronizing the conventional sweep of the scope with the signal at Terminal C and externally synchronizing the delayed sweep with the signal at IC24-1. Thus for this illustration we photographed at the same sweep rates each scope trace used. This included one cycle of the signal at IC24-13 reproduced twice. Below it, using the waveforms in Fig. 3 as a guide, we drew in the waveform corresponding to the *gate* signal at IC22-8 (being unable to photograph the entire waveform at the sweep rate used). The *reset* signal (at Q2-C) and *transfer* signal (at IC24-1) are shown together as photographed on the scope—the base line having been extended to their left and right with the use of art work.

From Fig. 11 we note that just after the count

continued on page 50

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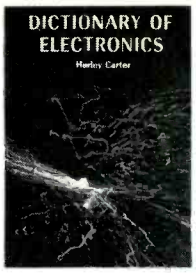

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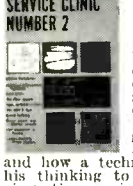

Here's more of the Jack Darr wisdom (and wit!) in book form—a valuable collection of timely service hints and trouble solutions covering color and monochrome TV, radio, stereo, phonos, recorders, CB gear, etc. Discusses the "engineering" servicing approach, efficiency, and how a technician may condition his thinking to produce more in a given time period. Like the first volume, the content was selected on the basis of usefulness to the average technician, covering a wide range of electronics devices. Each of the 10 chapters covers a general category of interest, and in each the subject matter is arranged in logical order to enable you to find what you need quickly. Provides a wealth of information. 176 pps., numerous illus. Hardbound.

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Modern Radio Repair Techniques

Up-to-date service data on all types of modern radio receivers, including AM, FM, stereo, auto and multiband plus complete 36-page foldout schematics for 12 popular brand-name sets. Reveals many simple shortcuts to making radio repair a profitable side or main line of business. Material is presented so that seasoned technicians can gain from the numerous troubleshooting tips, and beginners, with a few hours study, can begin to turn out profitable work in a short time. Includes shortcut methods of troubleshooting, plus general test techniques. Covers receiver circuits and fundamentals of circuit operation. 260 pps., 170 illus. Hardbound.

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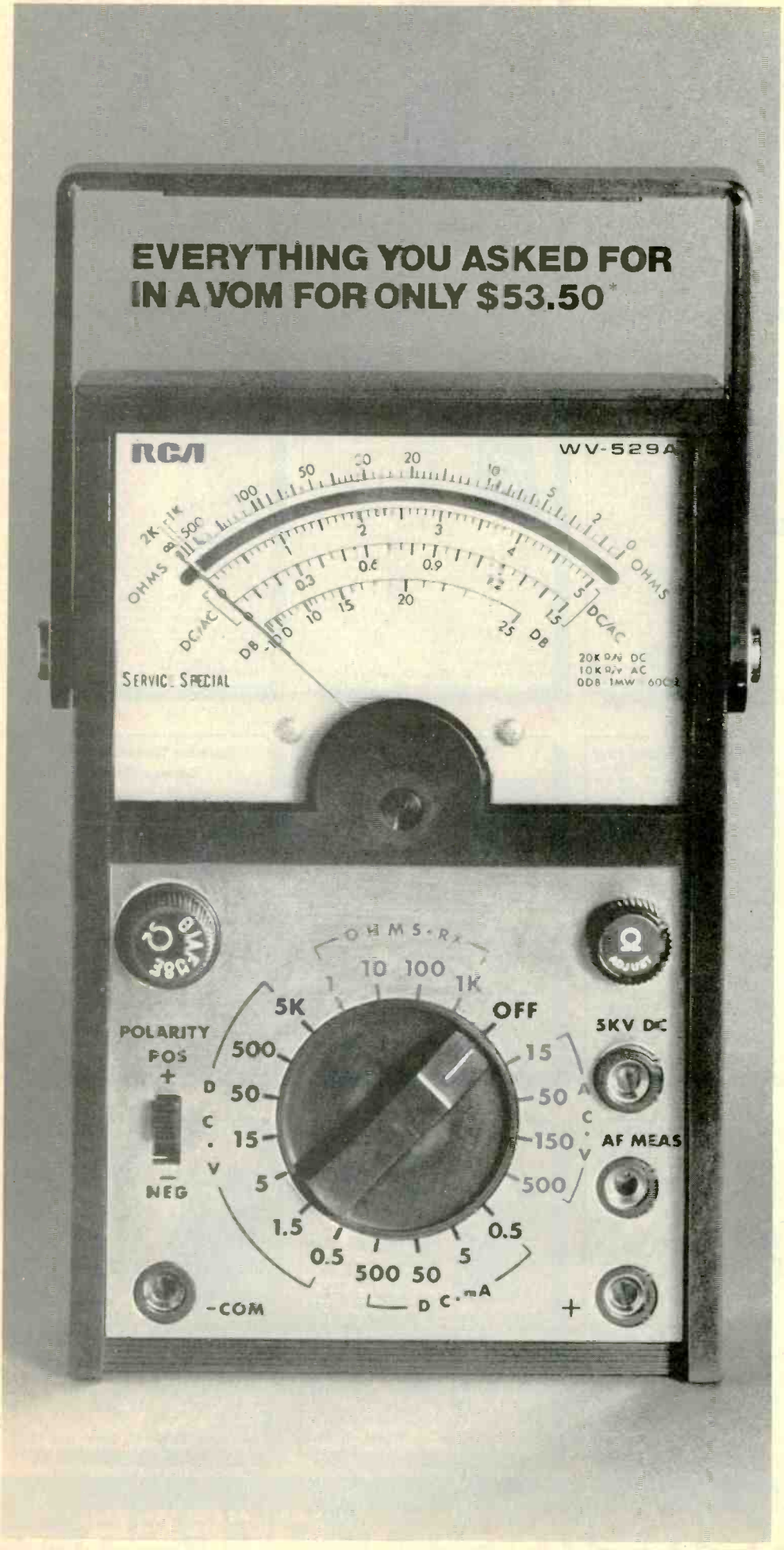
199 Electronic Test & Alignment Techniques

Here's a brand-new quick-reference guide of 199 tests that will help you troubleshoot virtually any electronic device found in the average home—AM and FM radios, TV receivers, antenna systems, intercoms, electronic organs, garage door openers, auto ignition systems, and many others. You'll also learn how to check out home intercom systems and electronically-controlled garage door openers. With this book, it'll be a breeze for you to tackle almost any electronic repair job. You'll learn how to analyze the results of each step you take and how to come to the right conclusion. A concise, easy-to-use source of troubleshooting information. 224 pps., 130 illus. Hardbound.

List Price $7.95 • Order No. 593

AN EXTRAORDINARY OFFER...

. . . for more details circle 102 on Reader Service Card



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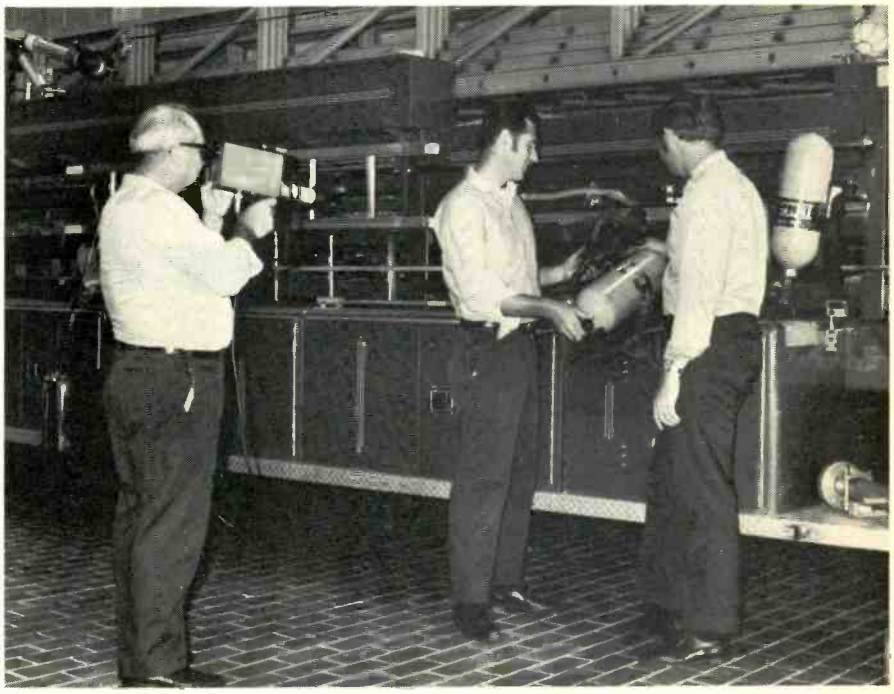
. . . for more details circle 127 on Reader Service Card

Deputy Chief James P. Blackburn takes along a Panasonic portable video camera and VTR on a fire call.



Wilmington Fire Dept. personnel tape instruction in fire-fighting equipment with a Panasonic portable camera and VTR.

Videotape Improves Fire-Fighting Techniques

Central Fire House in Wilmington, Del., uses television for evaluating and training its men

■ The alarm bell rings three times at the Central Fire House in Wilmington, Del., and the serenity of the morning coffee break is shattered as the fire fighters rush to do their thing—hands automatically reach for the uncomfortable garb—boots, gloves, helmets and heavy canvas coats. The big red apparatus roars out, sirens shrieking, and leading the way is the district chief . . . lights flashing on his fire-red station wagon. The chief's car conveys the department's newest and most unusual piece of fire "equipment"— a portable Panasonic video tape recorder and camera.

Wilmington, Del.'s progressive fire department is believed to be the first in the country to use videotape as a means of capturing the action at actual fires and then replaying the tapes for its men at critique sessions held in the fire houses. These sessions are providing invaluable training for the department's personnel, and also provide the chiefs and captains with an evaluation of their fire equipment's performance. The tapes let the brass see how their equipment works in bonafide fire situations.

Initially, most of the VTR action

The Wilmington Fire Dept.'s top brass preparing training tapes for their fire fighters.

Wilmington firemen at Center City station house handle the video console with professional skill.

was done with portable Panasonic cameras and video tape recorders, tapes were edited on a video console at the Center City Fire Station, and then sent to the various fire houses, which are equipped with playback VTRs and monitors.

In order to improve the training programs and performances of its firefighting force, Deputy Chief James P. Blackburn of the Planning and Research Unit contacted Rick Whildin of Megonigal Electronics, a local Panasonic dealer, to draw up the specifications and the plans to equip a highly sophisticated CCTV/VTR studio directly in the Center City Fire Station.

Deputy Chief Blackburn submitted the plans to Commissioner William J. O'Rourke and Chief John J. Malloy for approval and received their okay to launch the VTR/CCTV program. The Planning and Research Unit is also planning to telecast programs over Wilmington's local cable channels, with the idea of communicating to the public on a regular basis suggestions that will reduce and prevent fires.

The department recently purchased a number of Panasonic CCTV cameras which, along with the console, are being used to produce in-studio tapes of high quality to be received during in-service training in all the firehouses.

Delaware Technical and Community College, along with Megonigal Electronics, is assisting the fire department in training its personnel in the latest techniques of programing and proper utilization of the studio equipment.

Chief Blackburn intends to use the Panasonic portable VTR and cameras at actual fires for training purposes and also the taping of arson investigations for apprehension of arsonists. According to Chief Blackburn, "We can stage burn downs and hot drills as often as possible and still never quite achieve the atmosphere of an emergency situation in a non-drill situation. Not only does the video tape recording of the actual actions of men and equipment in the face of an emergency serve as a valuable critique for the chief and company officers, it captures both the sights and sounds of the fire scene, it conveys the urgency of the moment to personnel who were not there. This

continued on page 52

Keithley's Model 167 Digital Multimeter

by Phillip Dahlen

Features digital readout right in the probe

■ This is one of those test instruments that might initially appear awkward to someone that has never used it before. However, from actual experience in our electronics lab, we found this battery-powered instrument one of the most convenient that we have ever used. No longer need a person look in one direction to see that a probe is properly touching the desired connection while having to look in another direction to see the resulting reading. All this can be done at a glance by merely looking at the probe. And the 15-lead shielded cable between the instrument and probe is reasonably flexible, allowing us relatively easy access to the portion of the circuit under test.

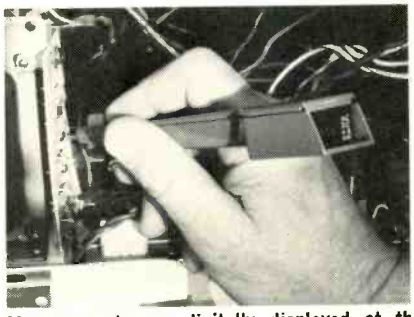
When using the instrument, it is only necessary to select the desired function—acv, dcv or ohms—scaling and polarity are automatic; and the present mode of operation and polarity are indicated—along with the digital reading—at the end of the test probe.

Should it be necessary to make high-voltage measurements or shunt the instrument for current measurements, or should one find an instance when it is not convenient to hold the entire probe assembly when making measurements, then the probe can be inserted through an opening in the front of the instrument, and while in that position an auxiliary test lead may be used.

In addition to the impressive instrument specifications included in this article, much attention should be given to the exceptional instruction manual included with the instrument. Most such manuals merely tell how to turn an instrument ON, what the controls do, and list some specifications. But not this manual, which is 32 pages long and includes fold-out schematics. In addition to the usual sections on specifications, general information and operating instructions, it provides extensive coverage of the theory related to the instrument's operation, plus maintenance tips, troubleshooting procedures, parts lists, component layout photographs, and block diagrams of the integrated-circuit functions.

Manufacturer's specifications for this instrument include those shown at the lower left. ■

Keithley's Model 167 Digital Multimeter. For more details circle 900 on the Reader Service Card.



Measurements are digitally displayed at the end of the probe.

Closeup view of digital readout.

DC Volts

Range: ±1mv per digit to ±1000v
Accuracy: ±0.2% of reading ±1 digit
Impedance: 55M shunted by approximately 220pf

AC Volts

Range: 1mv per digit to 500v rms
Accuracy: Up to 200v; ±1% of reading ±2 digits, 20Hz to 10kHz, ±2% of reading ±4 digits to 20kHz
200v to 500v; ±2% of reading ±2 digits, 20Hz to 1kHz, ±5% of reading ±4 digits to 20kHz
Impedance: 50M shunted by approximately 220pf

Resistance

Range: 1Ω per digit to 20M
Accuracy: ±0.3% of reading ±1 digit ±1Ω
Test Conditions: Current; 1ma to 0.1μa depending on range Voltage; 1v at 1000 digits, 9v maximum into open circuit

TECHNICAL DIGEST

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

MAGNAVOX

Stereo Console Four Channel Speakers

Some cases have been reported of low VOLUME level from the rear speakers when playing four channel mode. This can occur when the front (console speakers) are higher in efficiency than the rear speakers.

A new series of open back extension speakers, with higher efficiency, are now available for use with console stereo models as either extension speakers or rear four channel speakers.

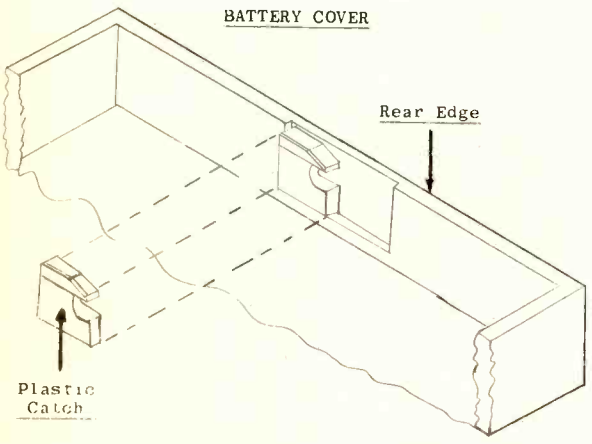
Model 1S8440 speakers should be used with the 1P3440, 3470, 3680, 3780 and 3790 series console stereos; and Model 1S8450 speakers should be used with the 1P3840 and 3960 series console stereos.

PHILCO-FORD

Tape Recorder Model TRC20BK—Battery-Cover Replacement

The following is a procedure to use when it is necessary to replace the battery cover on the TRC20BK tape recorder:

The plastic catch is not included when the battery cover is ordered. It will be necessary to remove the catch from



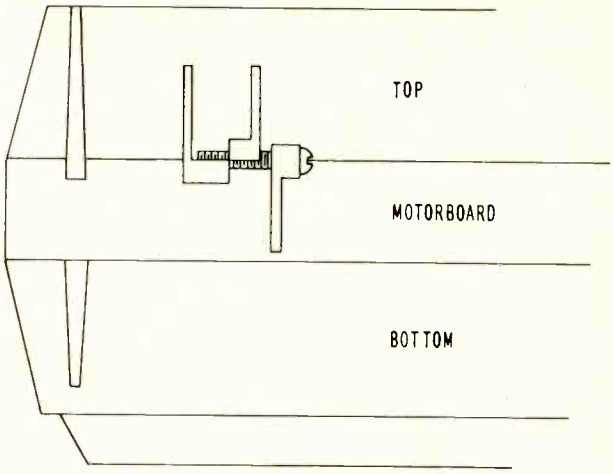
the old cover by sliding the blade of a small pen knife between the catch and the cover, very carefully prying it loose.

When placing the catch into the new cover, use speaker-cone cement. With the back of the cover facing up and away from you, place the catch in the lower left hand corner of the smooth cut-out area.

Portable Phono Models P710BU/S1479BU/P715BE/S1480BE—Broken Hinge Studs

Should any of the above models require service because of broken hinge studs on the motor board, the following method can be used to replace hinge studs—thus avoiding the necessity of otherwise replacing the entire motor board. Replacement of the motor board would entail exchanging all items and assemblies attached to the old motor board.

First cut away any remains of the plastic stud flush with the plastic stud support, then drill a hole through the center of the circle where the plastic stud extended from, using a .136 in. diameter drill (wire size No. 29). Next, use a



size No. 8-32 tap to thread a hole for a No. 8-32 screw, ⅞ in. long to replace the broken hinge pin.

Stereo Component Models M4780BWA/M5780BWA—Hum Conditions Low Residual Hum on Minimum Volume—All Functions

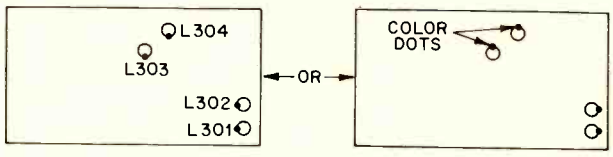
These models contain a chassis assembly of modular design composed of individual modular assemblies. Each modular assembly (tuner, preamps, amplifier, etc.) are linked together with inter-connecting wires and cables having plug connectors to form the complete tuner-amp chassis assembly, 2ACMT100354Q. To avoid danger of "ground loops" causing a residual hum at minimum volume, the chassis of all individual modular sub-assemblies are externally grounded together by ground cables and clips.

Should a condition of residual hum occur at minimum volume on all functions, look for a poor or open connection in the ground wires and clips electrically connecting the chassis of each module together. A "ground-loop" is caused when inter-modular grounding is made through the inter-connecting signal cables rather than externally through common-ground jumper wires and clips.

Background Hum on FM Reception

When replacing any of the choke coils (L301, L302, L303 and L304) on the tuner panel in the 2T204E tuner modular assembly, a condition of 60Hz hum can be created as background interference during FM/stereo operation if the coils are not polarized by their phasing dots as shown in the sketches.

The four color dots should be facing in, towards the center of the panel or facing out, towards the outer edge



of the panel. In either of these two combinations, the coils are oriented so that stray 60Hz hum pickup is cancelled out.

With any other combination having some coil color dots facing out and others facing in, the hum pickup by these coils will pass through along with the FM monaural or stereo audio signals as the volume is increased, either on or off station—the hum level also increasing. Moving the

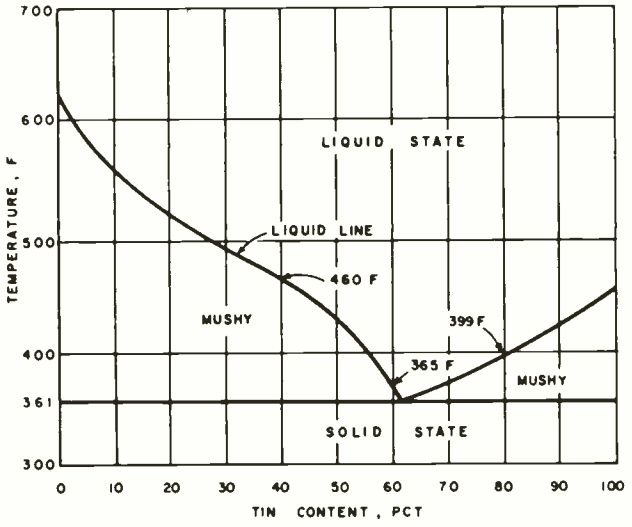
BASS control to maximum will emphasize the background hum.

This hum results from the close proximity of the power transformer and its ac leads to the multiplex circuitry on the tuner panel. The power transformer leads should be dressed tight against the amplifier sub base to minimize coupling to the tuner.

RCA SALES CORP.

Characteristics of Solder

Solder is an alloy (mixture) of two metals that have low-temperature melting points. The two metals used are tin and lead. Tin melts at about 625°F. An alloy of the two metals has a lower melting point than either metal in its pure state. The lowest melting point (known as the "eutectic" point) is reached when the tin-lead mixture is about 62 percent tin and 38 percent lead. The melting point of this mixture, usually written 60/40, is about 306°F. The



Melting Temperatures of Various Solder Alloys

chart shows the various solid and liquid states of tin and lead alloys over a given temperature range. Since tin is more expensive than lead, a cheaper solder with a tin/lead ratio of 40/60 or 50/50 is sometimes used for non-critical applications where the higher melting temperatures are of no concern. The solder used for radio and TV servicing should be the 60/40 alloy because a lower temperature is required to melt the solder and thus components of the circuit are not exposed to excessive temperatures.

Kelvin Color Temperature

The color temperature of the raster on a color picture tube refers to the tint of white or gray produced by the raster, and not to its brightness level. To reproduce color and black-and-white pictures properly on a color-TV receiver, it is necessary that the raster be set up to a specific color temperature. This provides the background upon which the picture can be reproduced.

The Kelvin temperature scale is used in reference to light, as a means of establishing the hue (coloration—yellowish, bluish, etc.) of a light source. Most light is produced by thermal-radiation (matter being raised in temperature until it emits light). The hue of this light is directly related to the absolute temperature of the heated, light-emitting object. Thus, this temperature is a quality of light that can be readily measured.

The Kelvin scale (°K) is somewhat like the centigrade scale; but begins at absolute zero rather than the freezing temperature of water. Hence, 0°C is +273°K. By using

Light Source	Kelvin Temperature
Ordinary Candle	1900-1950
Common Household Lamp	2750-2850
Moonlight	4100
Sunlight	5300-5800
Daylight (Sun & Clear Sky)	5800-6500
Daylight (Overcast Sky)	6300-7200
Clear Blue Sky	14000-50000

Kelvin temperatures as a means of measuring the color of light, black is the color that an absolute black body would emit at 0°K (absolute zero). As the temperature of the black body is increased, the color of the light emitted changes. When the temperature of the black body reaches the range of 9,000°K to 10,000°K, the color of light emitted approaches the white that is seen in the raster of a TV picture tube. The Kelvin color temperature of several of the more common light sources is shown in the color temperature chart. This table is included to provide some relationship between this visual appearance of a light source and its Kelvin temperature. RCA color-TV receivers normally call for a color temperature of 9300°K, which is a bluish-white screen color.

The technician, knowing the meaning of the Kelvin temperature scale, will realize the importance of adjusting the color receiver to produce the proper white raster. When the screen temperature of a color-TV receiver is adjusted too high, loss of red in the picture detail will result and the overall picture will take on a metallic appearance. Conversely, too low a color temperature results in the picture having a reddish-brown cast. Thus, this short discussion should illustrate the importance of optimizing the performance of a color-TV receiver.

TEKLAB . . .

continued from page 24

across this circuit during the retrace period being applied to T902. By auto transformation, this pulse is stepped up to 8.3kv in the tertiary winding, which is tuned to a combination of the third and fifth harmonic to provide for improved regulation. The 8.3kv pulse is applied to a capacitor-input six-diode six-capacitor tripler system, which multiplies the voltage to a 26kv dc level.

Bleeder resistor R945 and FOCUS control R946 provide dynamic focus and a means of preloading the tripler assembly to avoid excessive picture "breathing" at low-brightness settings.

Unlike previous designs, the yoke windings in this chassis are in parallel and balancing coil L943 provides for equalization of currents. Coil L903 is treated as a convergence adjustment, since it can control red-green crossing in the yoke. The parallel connection of the yoke windings means that the hot ac potential on the common lead is only 1400v.

A unique circuit in the collector of the horizontal output transistor, Q906, damps any short-term collector transients which could exceed the collector-

continued on page 50

NEW EICO TR-410 Solid-State Triggered Sweep 10MHz Oscilloscope

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COLORFAX

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

PHILCO-FORD

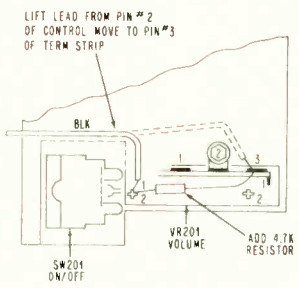
Color-Killer Location and Adjustment

The COLOR KILLER control (VR2V) on the modular chassis is located on the signal board and is accessible from the rear of the chassis. There is no provision made in the cabinet back to adjust this control, the back must be removed to make the color killer adjustment.

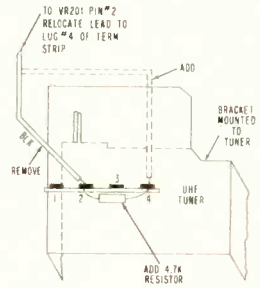
This adjustment should be made as outlined: Set the channel selector to an unused channel to obtain color snow. Then set the COLOR control to mid-range position with the Philcomatic switch in its OFF position, adjusting the COLOR KILLER control (VR2V) until color snow disappears.

Low-Level VOLUME (slide-type control)

The slide-type VOLUME control may exhibit a sharp increase in volume as the control is moved from minimum toward maximum. To correct this condition, a 4.7K, ½w



WIRING DIAGRAM FOR DETENT TUNER

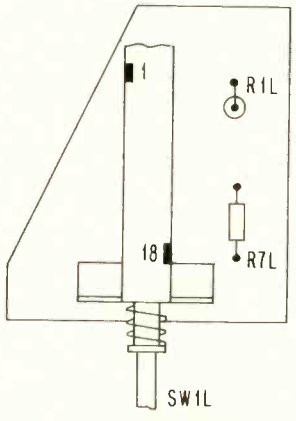


FOR V.V.C. TYPE TUNERS

resistor is wired in series with the ground (black) lead of the VOLUME control. Mount the resistor as shown.

High-Contrast Level with Minimum Contrast-Control Setting

Chassis that may exhibit a high contrast level with the CONTRAST control at minimum (full counterclockwise) can be corrected by replacing resistor R1L with a 1.2k ½w



PHILCOMATIC SWITCH/PANEL

resistor and resistor R7L with a 560Ω resistor. These resistors are located on the Philcomatic switch panel as shown.

NEW PRODUCTS...

continued from page 16

comparable to aluminum sheath. It is rated for only 3.1dB of attenuation per 100 feet at Channel 13 frequencies and only 3.1dB attenuation at Channel 57 frequencies. Nominal dc resistance of the center conductor is only 1.59Ω per 1000 ft. Nominal capacitance of the cable is 17pf/ft. while nominal velocity of propagation is 81%. Blonder Tongue Laboratories.

BATTERY 706

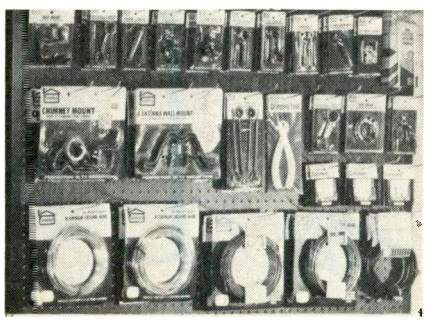
More energy capacity than ordinary batteries

Introduced is a 9v alkaline battery called Duracell, with reportedly three times the energy capacity of ordinary batteries and especially adapted for use in mini-calculators and transistor radios. Its development has been reportedly made possible by an entirely different internal construction, with fewer parts allowing for greater volumetric energy density. As a result, longer service life and better performance under continuous high drain are obtained by more efficient use of the energy producing materials contained in the battery. Mallory Battery.

ANTENNA HARDWARE 707

Colorful display mounted on pegboard cards

A new line of colorful display packed hardware for TV and FM antennas is introduced. The line includes masts, chimney mounts, roof mounts,

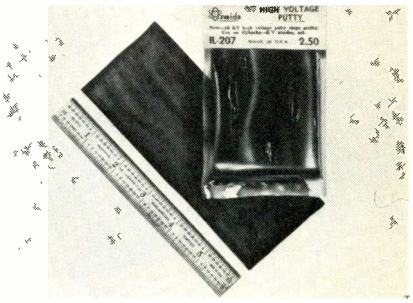


wall mounts, stand-off insulators, guy wires, anchor hooks, eye bolts, turnbuckles, lead-in clips, lightning arrestors, ground rods, ground wire and twinlead. Except for masts, the entire line is mounted on pegboard cards which graphically illustrate their use and provide complete installation instructions. Jerrold Electronics Corp.

HIGH-VOLTAGE PUTTY 708

Eliminates high-voltage arcing to 40kv

A high-voltage putty is introduced that can be molded around uneven objects, eliminating arcing in high-voltage TV transformers, anodes, tube sockets, filament wire and any application where high-voltage arcing is a problem. The putty is designed to replace corona dope and, according to the manufacturer, it will last for years.



The putty is packaged in 6-in. lengths for convenient use. Oneida Electronic Mfg. Inc.

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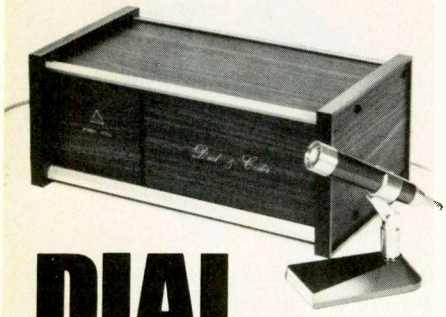

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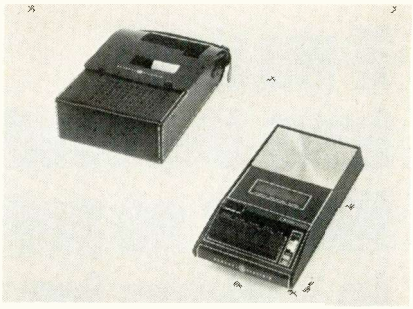
DEALER SHOWCASE

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

CASSETTE TAPE RECORDER 709

Built-in condenser microphone allows "no-hands" operation

A compact ac/dc portable cassette tape recorder, Model M8455, operates in its protective case and reportedly offers a three-way power capability to



enable users to record anywhere. The built-in sensitive condenser microphone is said to ease the recording difficulties encountered in situations such as classrooms and meetings, and allow "no-hands" recording. Also featured is an automatic end-of-tape shut-off capability in PLAY and RECORD functions. This feature promotes motor life and saves on battery life. Tone calibrated VOLUME and built-in AUTOMATIC LEVEL controls (ALC), erase guard to prevent accidental erasure of pre-recorded cassettes, external microphone jacks, cassette eject and easy-to-load cassette carrying door also are reportedly offered. General Electric.

AC POWER CORD 710

Designed for use with Japanese electronic products

The Model 44-459 ac power cord is designed for use with most Japanese

ac-dc tape players, radios or record players. Weltron Co.

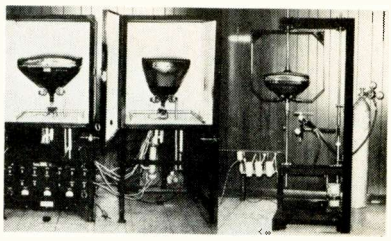
FM TRANSCEIVER 711

A compact and lightweight solid-state unit

Introduced is the Model GTX-2, a 10-channel, 2 meter, FM transceiver with a frequency range of 144 to 148MHz. The lightweight, all solid-state unit is said to employ 11 silicon

transistors, 4 diodes, 5 FETs and 3 integrated circuits. The unit reportedly comes complete with quick disconnect

REBUILD YOUR OWN PICTURE TUBES?



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Profit? Imagine building four color tubes per day and if you sold these tubes for $60.00 each. Total income $240.00. Total cost $26.40. Net profit $213.60. Multiply this figure by five days per week. Your profit $1,068.00 per week. Cut this figure in half! Build and sell only two color tubes per day. Your profit $534.00 per week. Facts are facts, figures do not lie.

For further information, please send your name and address to Lakeside Industries, Inc., 3520 West Fullerton, Chicago, Ill. 60647. Phone: (312) 342-3399.

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power cable, plug-in microphone, antenna connector and mobile mounting bracket. The manufacturer indicates that pushbutton frequency selection is a major feature of the unit, which comes equipped with a 146.94MHz communications channel—the remaining nine channels being available for a nominal charge. Specifications indicate that the transceiver has 30w of output power and is readily adaptable for fixed or mobile operation. General Aviation Electronics, Inc.

COLOR-TV SET 712

Incorporates nine "snap-in" modules

Introduced is the Seville, Model 5L5658, a 25-in. (measured diagonally) color-TV set employing the SS900 chassis. This Super-Solarcolor chassis incorporates nine "snap-in" modules for faster and more convenient servicing. The picture tube is a black matrix design that reportedly imparts greater brilliance to color phosphors. The "Color Master" con-

trol provides one-button tuning of AFC, color and tint. This all-wood pecan finish Mediterranean cabinet, with "wrap-around" design, rolls easily on concealed casters. Admiral.

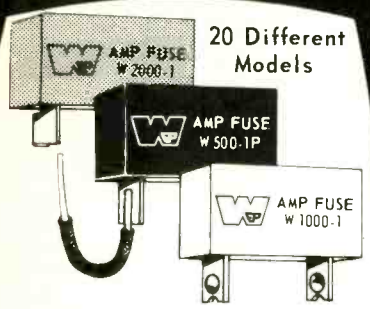
STEREO CASSETTE RECORDER

Employs heavy-duty bi-peripheral drive system 713

A cassette stereo recorder deck is said to contain a heavy-duty bi-peripheral drive system, Dolby tape and FM broadcast noise reduction circuits. When the Model 4765 recorder is used in conjunction with a tuner, "Dolbyized" FM broadcasts can reportedly be received without additional equipment. When the FM Dolby switch is ON, the broadcast signal is fed back into the pre-amp and speakers. The motor is shut off automatically, except when it is in the RECORD PLAY mode. A tape selector

continued on next page

MOLDED PLASTIC COLOR CODED AMP FUSES



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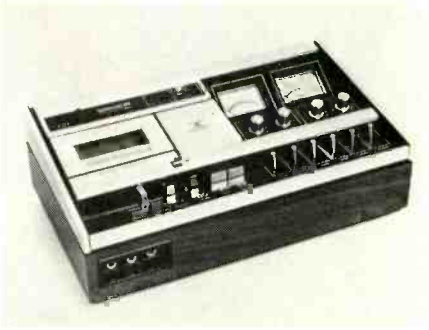
DEALER SHOWCASE . . .

continued from page 47

switch changes the record-playback equalization and record current for regular and high-performance tapes as against chromium-dioxide tapes. Other



features are said to include large professional-style dual VU meters, separate RECORD and PLAYBACK LEVEL controls, ferrite head, head cover (which can be removed easily for head cleaning and azimuth adjustments), end-of-tape sensing and shut-off, plus an adjustable high-level, low-impedance headphone output for monitoring and playback. 3M Co.

AM/FM/FM STEREO RADIO 714

All solid-state stereo modular unit

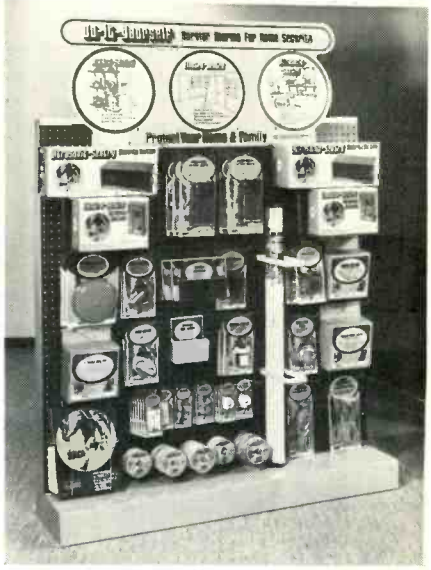
Introduced is the Model 2002 AM/FM/FM Stereo Radio, a compact, all

solid-state modular unit. The unit employs 3 IC's, 1 FET, 10 transistors and 12 diodes. The stereo multiplex frequency range is from 88 to 108 MHz, while AM covers frequencies from 540 to 1600kHz. A swivel base allows turning in any direction without lifting the unit. It will reportedly operate on ac power, batteries or from your car or boat cigarette lighter. Weltron Co.

SECURITY SYSTEM 715

Burglar and fire protection for the "do-it-yourself" market

Total burglar-fire protection for any home or business is possible with the introduction of a complete line of "do-it-yourself" burglar and fire alarms. Security Systems Merchandising Program, 49-1430, features three economically priced, solid-state burglar



and fire alarms (Ultra-Sonic Sentry—Electro-Sentry—Magna-Sentry) with a wide variety of selected accessories, offered on a space saving, self-service display merchandiser. Also included with the program is a complete selection of related accessories such as connecting wire, mat switch, magnetic reed switch, satellite extensions, fire sensors and battery charger that allows expanded protection. GC Electronics.

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AUTO BURGLAR ALARM SYSTEM 716

Easy to install and all solid-state

An electronic siren vehicle burglar alarm system reportedly features the

latest sound used by police and emergency vehicles. This alarm, Model SE-812, is said to feature full vehicle protection by sounding an alarm when the trunk, door, hood, ignition, lights, brake, etc., are activated. The system is said to include hood and trunk switches for cars without hood and trunk lights, plus an electrical switch lock (factory wired) with built-in dust cover and two keys. Also included is the wire, mounting hardware, instructions, and decals. On-Guard Corp.

VIDEO TAPE RECORDER 717

Designed for professional time-lapse recording

The Model TVR-321 is reportedly the only time-lapse video tape recorder using the standard EIAJ-1 format and solenoid operated. It is reportedly the only recorder capable for surveillance use of over 300 lines of horizontal resolution with playback at time-lapse speed, normal speed or still frame. The machine uses a 7-in. reel of ½-in. video tape, and offers such features as

stop motion, solenoid operated controls, auto-cycling and automatic gain control. Tapes made on the unit can be played back on any standard recorder. GBC.

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CAT GAME...

continued from page 29

will cutoff, allowing no chroma sidebands to reach the demodulators.

It should be pointed out here again, however, that a slight clockwise readjustment of the COLOR KILLER control could restore color amplifier operation. Color would then appear on the screen, but it would be out of sync, the color oscillator being free-running in the absence of the burst signal—answer (a).

16. (d)—Capacitor C88 couples the 3.58MHz reference (subcarrier) signal from a tap on the R−Y injection coil (T12, terminal 3) to the color phase detector tube (V15B, pin 8). With the capacitor open, the incoming burst signal finds no reference subcarrier to be compared to in the phase detector. As a result, no dc correcton voltage is applied to the reactance control tube, and the C.W. oscillator is left unsynchronized.
17. (b)—With its screen shorted to ground, tube V7 is inoperative (no plate current) and its plate voltage rises towards the 390v B+ potential, causing excessive bias on the CRT cathodes. The raster blacks out, even with the BRIGHTNESS control turned fully up, because the latter is in the video amplifier's *grid* circuit and thus has no effect.

    Now is a good chance to see how well you remember some of the "basics" you picked up in electronics school: Will the screen resistor, R12, burn out when capacitor C32B shorts? Well, let's see: $P = \frac{E^2}{R} = \frac{250v^2}{22000\Omega} = 2.85w$. Being a 2w resistor, it *would* overheat.
18. (b)—Resistor R103 is across automatic degaussing coils L42 and L43. When the set is first switched ON, ac input current flows through the degaussing coils on the way to the B+ bridge rectifiers. Since the resistance of R103 is then normally high, the CRT gets demagnetized. By the time the raster is about to appear on the CRT screen, R103 has normally heated up to the point where its resistance is negligible, thus essentially shorting out the degaussing coils—the ac input current thereafter flowing through the thermistor rather than the degaussing coils.

    However, when resistor R103 opens, the input current to the B+ rectifiers is forced to continue flowing through the degaussing coils, even after the set has warmed up. This produces ac magnetic fields which result in the colored bands. Depending on the exact frequency and phase of the (60Hz) ac voltage from the local electric utility, as compared to the 60Hz vertical scanning frequency generated by the broadcast source, these bands may appear stationary on the screen or roll slowly up or down across the picture.
19. (d)—Capacitor C77 and the 100K resistor shunted with it form a frequency compensation network. With C77 open, a very slight phase shift in red video can be noticed if one examines the picture carefully and compares it with the picture under normal conditions. But the effect is so slight that, from a normal viewing distance, it can easily go unnoticed.
20. (c)—The color ghost (displaced approximately ¼ in.) is caused by misregistration of the color and B/W information on the CRT screen. With the delay line shorted, the Y signal arrives at the CRT cathodes sooner than the color signals at the grids, resulting in a highly noticeable horizontal displacement. Color signals are normally slowed down due to the narrow passband of the chroma amplifiers.

The Moment of Truth!

Well, how did you make out? With five points per correct answer, if you scored 90 to 100, congratulations! 75 to 85 is good, while 60 to 70 is considered fair. Less than 60 calls for dusting off the old color-TV textbooks, paying closer attention to circuit descriptions in manufacturers' service literature, or perhaps attending a few service clinics put on by manufacturers or by your local technicians' association.

Stay "tuned" to ELECTRONIC TECHNICIAN/DEALER . . . we'll be sending more CAT Games your way in future issues. ■

TEKLAB...

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to-emitter breakdown rating of 1500v for the transistor.

In the high-voltage hold down circuit a protection mechanism is incorporated in the horizontal scan system. Basically, the protection mechanism consists of a low-frequency multivibrator biased into operation by an overdrive sensing voltage. Once functioning, the multivibrator interrupts the horizontal oscillator drive to transistor Q905 to lower the average energy delivered to the deflection system, thus decreasing the high voltage.

Summary

We feel that this chassis is well designed for rapid diagnosis and serviceability, reducing service time and allowing for more in-home type servicing.

The regulated power supply, with its current fold-back circuitry, which is considered a part of the horizontal deflection circuit, not only helps scan stability but permits trouble-shooting with a shorted circuit. We actually shorted the 132v power supply source directly to ground for a period of time without injury to the TV set.

We also feel the TV set produces a very good, stable color picture. ■

DIGITAL CIRCUITRY...

continued from page 33

has been completed (just after the *gate* signal becomes positive) a negative *transfer* pulse allows the buffer-storage circuitry to accept the new count. And upon accepting the count, the *reset* signal (Q2-C) returns the decade counters to zero.

The next article in this series will cover the same circuit as it is driven by a 1Hz signal—a frequency much too low to be observed without either time-exposure photography or a scope having a memory tube. We intend to use the latter. ■

TECHNICAL LITERATURE

Cables and Adapters

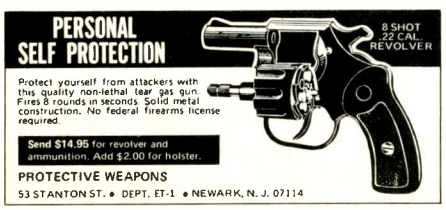
A 12-page brochure illustrates the various cables and adapters used with RCA's Industry Compatible Test Jig (ICTJ) Program. Color-TV sets of 41 manufacturers reportedly can be serviced with an RCA Color-TV Test Jig. Pictured in the brochure are extension cables and universal adapters, all identified by their appropriate stock numbers. Deflection yoke adapters, convergence adapters and automatic degaussing adapters are also listed by illustration numbers. Supplied with the brochure is an RCA ICTJ cross-reference chart listing all the cables included in the program by description and numerical order. RCA Parts and Accessories, 2000 Clements Bridge Rd., Deptford, N.J. 08096.

Semiconductors

A 52-page Semiconductor Replacement Manual lists over 30,000 OEM part numbers alpha-numerically, which can reportedly be replaced by a line of 82 popular semiconductor devices. Manual K-500 also includes performance characteristics, outline drawings and pertinent parameters for the entire line. Included in the semiconductor replacement line are 42 small-signal and power transistors, 5 field-effect transistors, 6 silicon rectifiers, 14 linear integrated circuits and 15 LED devices. These semiconductor devices provide exact replacements for components found in home/mobile entertainment and communications equipment. Sprague Products Co., 65 Marshall St., North Adams, Mass. 01247.

CB Antennas

A 16-page Citizens-Band Communications Catalog featuring the firm's complete line of base station, mobile and marine antennas, trunk lid and deck mounts, co-phasing harness kit and other mobile accessories is available free on request. Avanti Research & Development, Inc., 33-37 W., Fullerton Ave., Addison, Ill. 60101.



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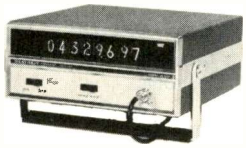

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The new Heathkit IB-1100 adds up to one of the best bargains you can buy in a 5-digit, -30 MHz counter. This easy-to-assemble kit gives you: Solid-state digital circuitry for non-blinking readout. Dependable cold-cathode display tubes. Custom designed time base for ±3 ppm accuracy from +22° to +37° C. Diode-protected J-Fet for improved triggering over inputs from 100 mV to 150 V rms. 1 megohm input, shunted by 20 pF, for minimal loading. kHz/MHz switch and overrange lamp. You can have yours together in approximately seven hours, and at this low price that's time well spent. **Kit IB-1100,** 6 lbs.

The IB-1102 is the finest Heathkit Counter you can buy and build. Design features include a temperature compensated crystal oscillator clock for ±1 ppm stability from +10° to +40° C.; high impedance FET input circuit for minimum loading; automatic triggering level for hands-off operation. Sensitivity is 50 mV to 100 MHz and 125 mV above 100 MHz. The full 8-digit cold-cathode display, overrange lamp, gate lamp and two range indicator lamps make the IB-1102 one of the easiest reading counters around. **Kit IB-1102,** 12 lbs.

Heathkit IB-1101 gives you maximum capability in the medium-price range. The all solid-state circuitry accepts inputs from less than 50 mV to 140 V rms, depending on frequency. The full five-digit cold-cathode readout can be expanded to eight digit capability using the overrange circuitry. Other features include 1 megohm input impedance and low input capacitance; custom designed time base crystal for accuracy better than ±3 ppm from 17° to 32° C. Compare performance and price with the competition. Then order your Heathkit IB-1101. **Kit IB-1101,** 8 lbs.

The Heathkit IB-102 Scaler is a two-evening kit that extends the range of virtually any counter to 175 MHz. In most cases you'll get improved sensitivity too. The solid-state circuitry divides input frequencies from 2 MHz to 175 MHz with the scaled output fed to any compatible frequency counter with a 1 megohm input. There is front panel switching of 10:1 or 100:1 scale ratios, plus 1:1 straight-thru counting. Resolution is down to 10 Hz with a counter having a 1 second time base. The Heathkit IB-102 is the economical way to add 175 MHz capability to your service bench. **Kit IB-102,** 8 lbs.

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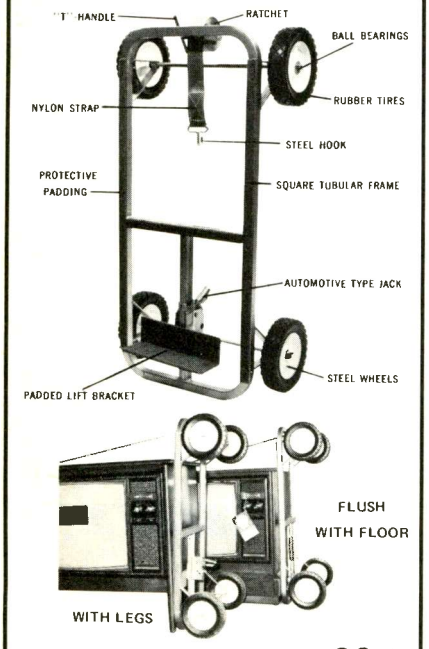

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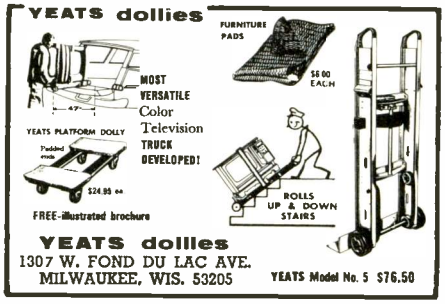

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VIDEOTAPE . . .

continued from page 40

immediately is one of the key factors in getting a point across to the men," he stated.

Commissioner O'Rourke and Chief Malloy enthusiastically approve the use of science and technology in personnel training and fire-prevention public education. Says Chief Malloy, "VTR has improved our performance and operations tremendously. We are very proud of our new studio and are making increasingly effective use of our TV communications equipment." ■

ELECTRONIC TECHNICIAN/DEALER

TEKFAX

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GROUP **246**

SCHEMATIC NO.		SCHEMATIC NO.	
ELECTROHOME	.1456	**SYLVANIA**	.1455
Color TV Chassis C12		TV Chassis B15-1-2	
GENERAL ELECTRIC	.1459	**ZENITH**	.1457
TV Chassis U1/UA		Color-TV Chassis 23DC14	
MAGNAVOX	.1458		
Color TV Chassis T947			

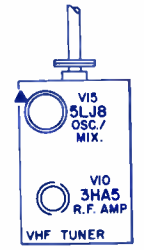
1455

SYLVANIA

TV Chassis
B15-1-2

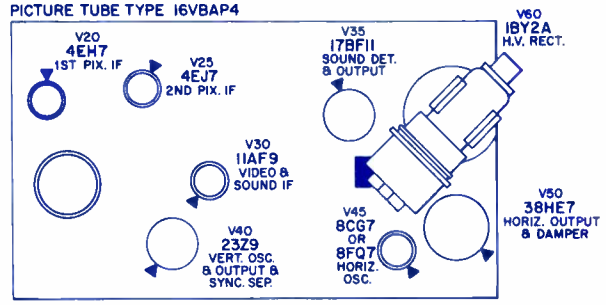
FEBRUARY • 1973

SYMBOL	DESCRIPTION	SYLVANIA PART NO.
C105	4 section elect A—400/185v B—600/185v C—4/150v D—20/150v	41-31041-3
L100	choke-line radiation	50-31050-32
L200	45.25MHz trap	50-31050-7
L350	quadrature	50-31050-12
L450	horiz stabilizer (horiz hold)	50-31050-14
L550	deflection yoke	51-31051-1
T200	IF input	50-31050-8
T201	1st IF	50-31050-9
T250	video output	50-31050-10
T300	sound take-off/4.5 MHz trap	50-31050-30
T350	sound IF	50-31050-13
T351	audio output	56-31056-5
T400	vert output	56-31056-7
T500	horiz output	50-31050-31
R300	450 Ω a contrast	37-31037-11
R350	1M, volume	37-31037-13
R400	3M, vert height	37-31037-1
R450	50K, horiz frequency	37-31037-2
R550	200K, brightness	37-31037-12
R600	50K - AGC	37-31037-2
CB100	circuit breaker	29-31029-3
F101	fuse link-No. 31, copper nickel, 1-¼ in. long capristor	38-31038-2
	VHF (-1 CH.)	54-31054-6
	VHF (-2 CH.)	54-31054-4

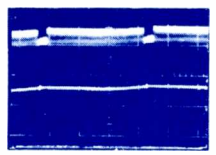


TUBE LAYOUT

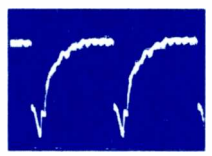
PICTURE TUBE TYPE I6VBAP4



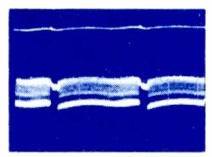
▲ TUBE INDEX POSITION



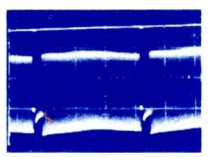
1 — 3 VPP Vert.



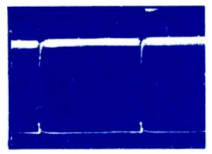
2 — 1.8 VPP Horiz.



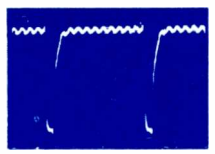
3 — 60 VPP Horiz.



4 — 38 VPP Vert.

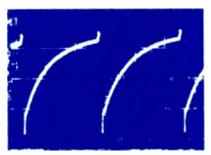


5 — 60 VPP Vert.

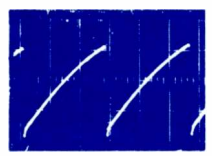


6 — 60 VPP Horiz.

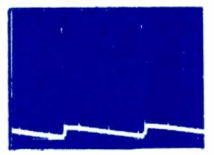
7 — 140 VPP Vert.



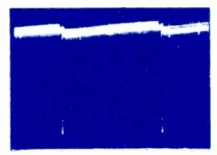
8 — 320 VPP Vert.



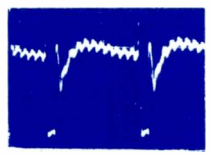
9 — 30 VPP Vert.



10 — 1600 VPP Vert.



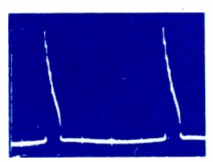
11 — 160 VPP Vert.



12 — 7 VPP Horiz.

13 — 7 VPP Horiz.

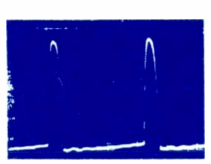
14 — 20 VPP Horiz.



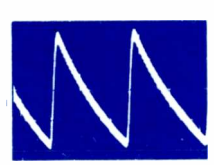
15 — 10 VPP Horiz.

16 — 110 VPP Horiz.

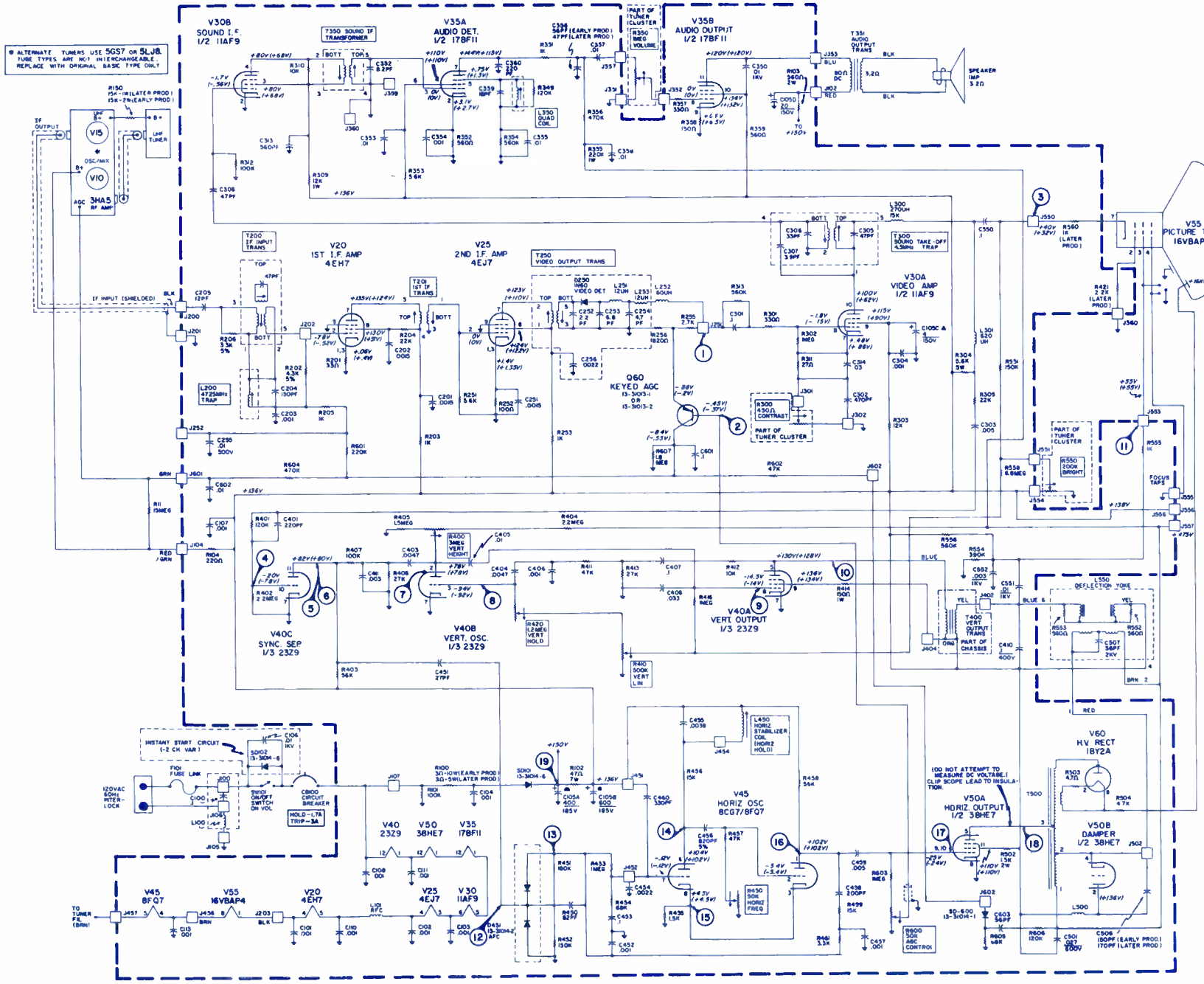
17 — 100 VPP Horiz.



18 — VPP Depends on amount of coupling Horiz.



19 — 10 VPP Vert.



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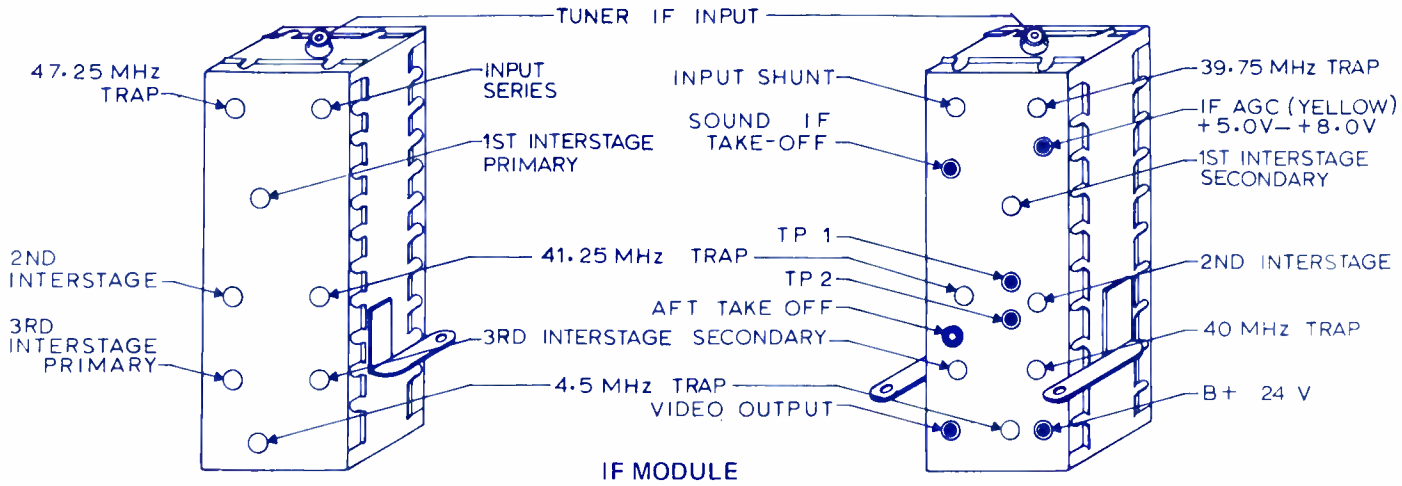
1456
ELECTRO-HOME
Color-TV Chassis-C12

FEBRUARY • 1973

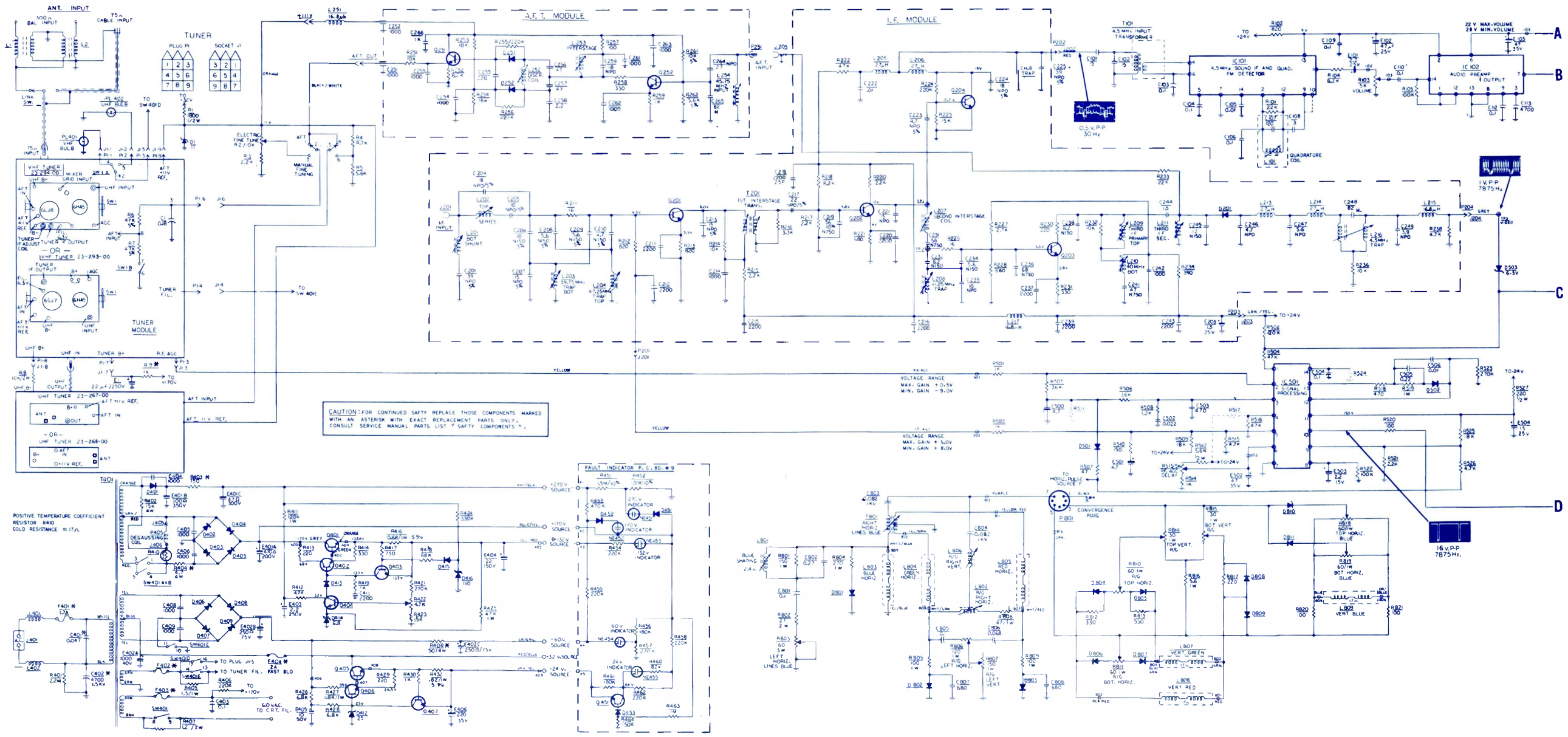
ELECTRONIC TECHNICIAN/DEALER TEKFAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL	DESCRIPTION	ELECTROHOME PART NO.
T101	xformer, sound input	21-1121-01
L722	coil, chroma osc	21-1122-01
T721	xformer, chroma ref output	21-1123-01
R359	bright limiter cont 100K	41-265-15
L901	coil, horiz osc	21-1070-02
T901	xformer, horiz buffer	24-170002-01
R422	cont, HV adj	41-192-24
R316	cont, 470 contrast	41-263-03
R328	cont, 750 bright	41-263-04
R325	cont, 2K detail	41-263-02
R609	cont, 20K vert	41-263-05
R942	cont, horiz centering 470 Ω 3W	41-281-01
VT901	voltage tripler	28-32-01,02,03
T902	horiz output xformer	21-229-01
T401	power xformer	24-10157-01
R513	RF AGC delay 5K	41-227-65
R658	vert center 1K	41-228-33
R964	focus 10M	41-251-02
E401A	470µf 200v electr	44-203-19
E401B	100µf 250v 3 section	
E401C	47µf 300v	
E402A	1000µf 40v electr	44-203-20
E402B	250µf 75v 3 section	
E402C	250µf 75v	
F401	1.7 a chemically activated fuse	27-25-01



IF MODULE



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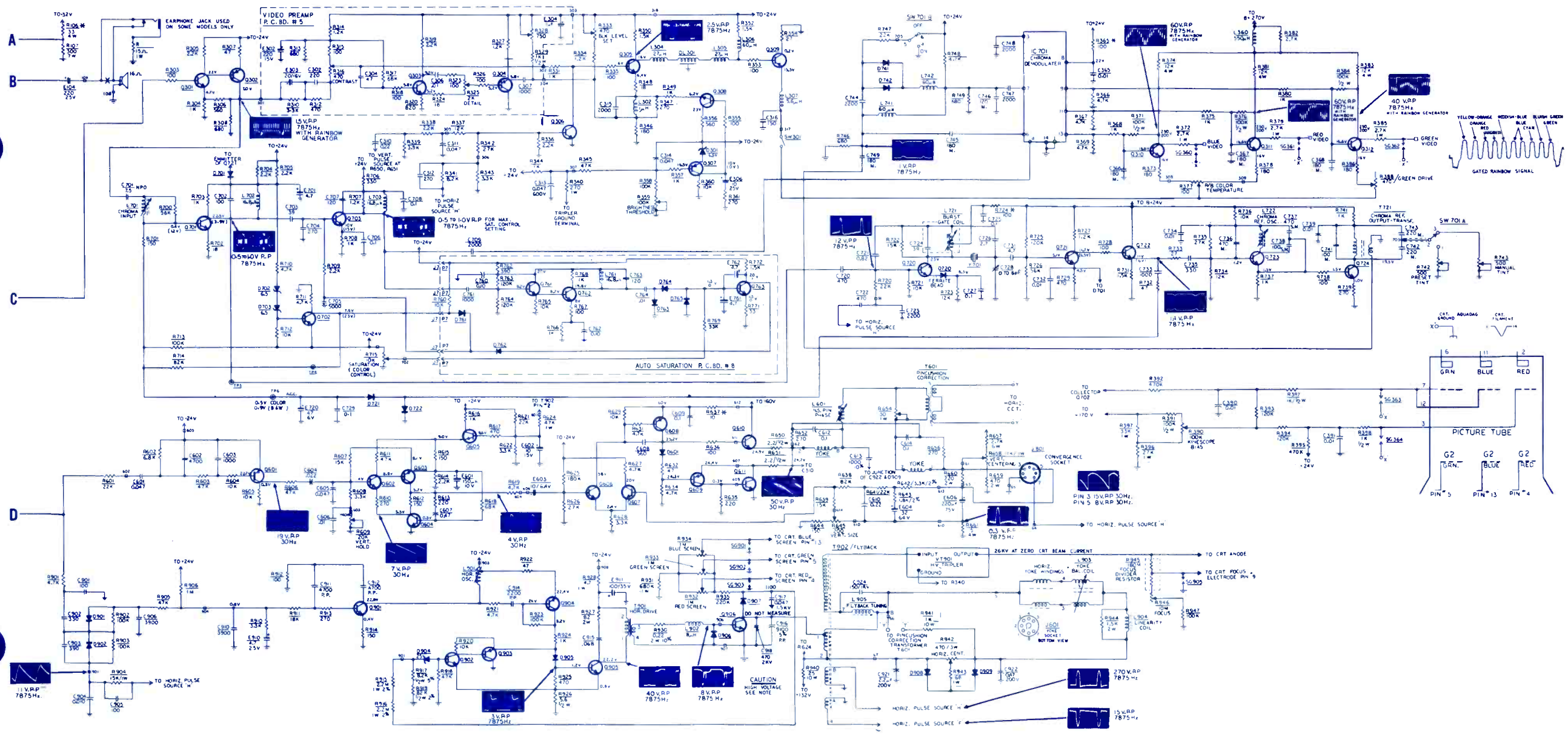
ELECTROHOME
Color-TV Chassis
C12

TRANSISTOR CROSS REFERENCE CHART

SYMBOL	ELECTROHOME LTD. PART NO.	BASING	FUNCTION
IC 101	14-2008-01	INDEX DOT, 14	SOUND IF AND FM DETECTOR
IC 102	14-2009-01	INDEX DOT, 14	POWER AUDIO OUTPUT
IC 501	14-2011-01	INDEX DOT, M	SIGNAL PROCESSING
IC 701	14-2010-01	INDEX, 14	CHROMA DEMODULATOR
Q 201	14-653-21	F, B, C, CASE	IST IF AMPLIFIER
Q 202	14-654-21	E, B, C	2ND IF AMPLIFIER
Q 203			3RD IF AMPLIFIER
Q 252			AFT RF AMPLIFIER
Q703	14-660-12	B, E, C	CHROMA BANDPASS OUTPUT
Q204	14-661-21	F, B, C	SOUND DETECTOR
Q 251			AFT DC AMPLIFIER
Q 303			IST PEAKING AMP.
Q 304	14-862-32	C B E	2ND PEAKING AMP.
Q 307			BRIGHTNESS LIMIT THRESHOLD
Q 301	14-809-23	B C E	IST VIDEO AMP.
Q 302	14-856-23	B C E	2ND VIDEO AMP.
Q 702			COLOR KILLER
Q 309	14-857-12 OR 14-867-32	B, E, C; C B E	VIDEO DRIVER
Q 310	14-901-12 OR 14-904-12	PART NO., C B E	BLUE VIDEO OUTPUT
Q 311			RED VIDEO OUTPUT
Q 312			GRN. VIDEO OUTPUT
Q 402		C B E	+132V REG. DRIVER
Q 404			+132V ERROR AMP.
Q 601	14-803-12	B, E, C	VERT. SYNC INVERTER
Q 903			'HOLD DOWN DRIVER
Q 602	14-805-12 OR 14-858-12	B, E, C	VERT. OSC.
Q 403			+132V CURRENT LIMIT
Q 604			VERT. OSC.
Q 605			VERT. B+ REG.
Q 305	14-802-12	B, E, C	DELAY LINE DRIVER
Q 306			H & V BLANKER
Q 308			BRIGHTNESS LIMIT DR.
Q 406			+ 24V REG. DRIVER
Q 407			+24V CURRENT LIMITER
Q 451			+24V FAULT SWITCH
Q 607			LINEARITY COMPARITOR
Q 701			IST CHROMA AMP.
Q 720			REF. BURST GATE
Q 721			IST REF. BUFFER
Q 722			ACC. BUFFER
Q 723			REF. OSCILLATOR
Q 724			REF. OUTPUT
Q 761			AUTO. SAT. RF BUFFER
Q 762			AUTO. SAT. RF AMP.
Q 763			AUTO. SAT. DC AMP.
Q 901			REACTANCE CONTROL
Q 606	14-805-12	B, E, C	LINEARITY COMPARITOR
Q 608 Q 609	14-807-12	B, E, C	VERT. OUTPUT DRIVERS
Q 603 Q 904	14-807-12 OR 14-861-12	B, E, C	VERT. OSC. HOR. OSC.
Q 902	14-801-23	B C E	'HOLD DOWN MULTIVIBRATOR
Q 401	14-601-26	E, B	+ 132 V REGULATOR
Q 906	14-601-27	E, B	HORIZONTAL OUTPUT
Q 905	14-910-13	PART NO., B E	HORIZONTAL DRIVER
Q 610 Q 611	14-905-23	PART NO., E B	VERTICAL OUTPUTS
Q 405	14-909-23	PART NO., E B	+24V REGULATOR

THE DASH NO'S. OF NEW ELECTROHOME TRANSISTOR PART NO'S. RELATE TO LEAD IDENTIFICATION. EMITTER = 1, BASE = 2, COLLECTOR = 3. FIRST 2 LEADS READ FROM LEFT, WHILE LEADS ARE FACING YOU AND FLAT OR OPEN TRIANGLE POINT DOWNWARD, CONSTITUTE THE DASH NUMBERS.



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1457

ZENITH

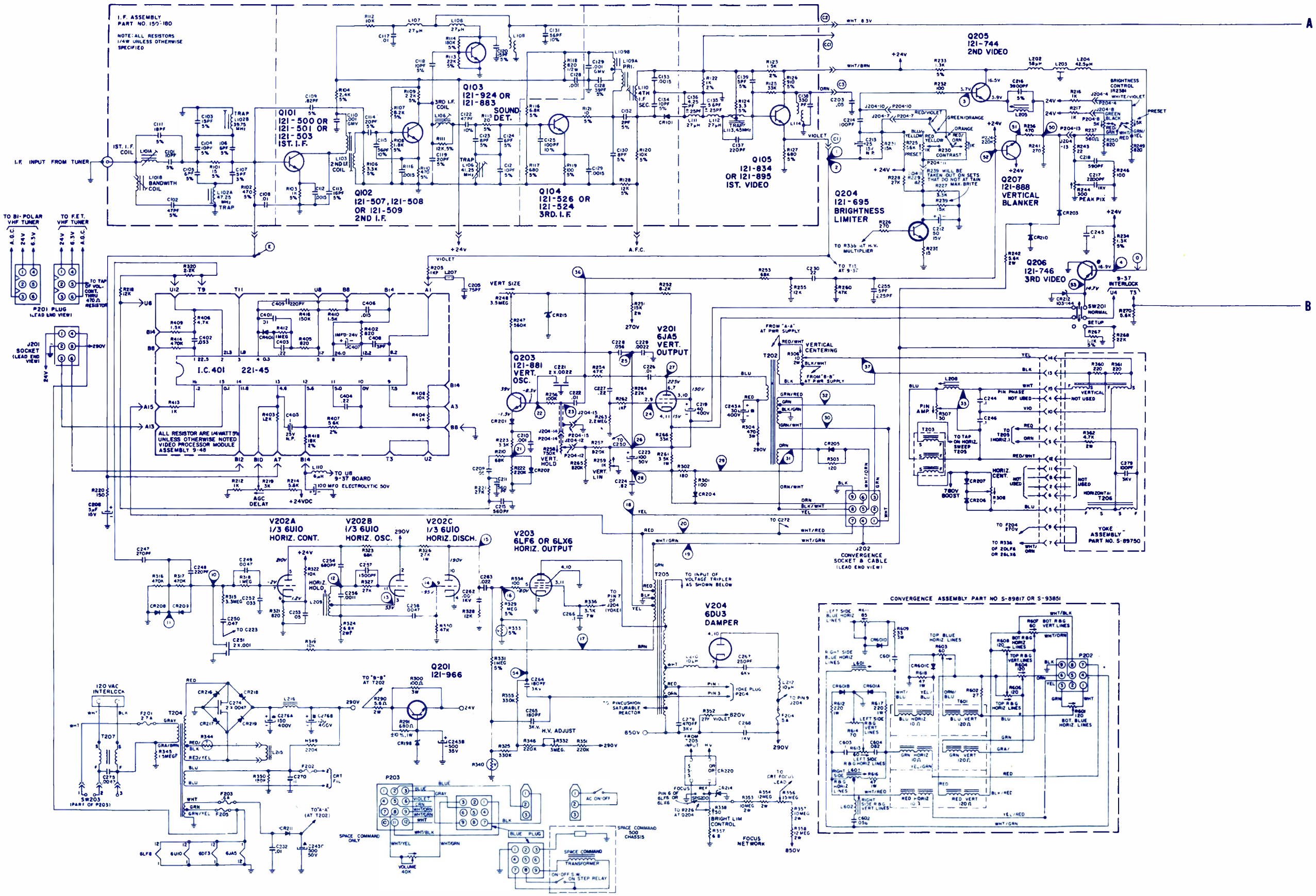
Color-TV Chassis
23DC14

FEBRUARY • 1973

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL DESCRIPTION	ZENITH PART NO.
C243A—30 μf elect. cap 400v	
C243B—500 μf elect. cap 35v	22-7066
C243C—500 μf elect. cap 50v	
C276A—150 μf elect. cap 400v	
C276B—100 μf elect. cap 400v	22-6903
C276C—15 μf elect cap 400v	
R204—voltage dependent resistor	63-5440
R219—3K, AGC delay control	63-9116
R248—3.5M vert size control	63-9115
R259—1K vert lin control	63-9066
R308—7Ω horiz centering control	63-8474
R309—100K, killer threshold control	63-8499
R310—5K, color level control	
R332—3M high voltage adjust	63-9882
R338—50Ω, bright limiter control	63-8989
R340—voltage dependent resistor	63-8688
R344—thermistor	63-8687
R356—15MΩ, focus control	63-8709
R359—250K, tint control	
R1013—20K, ACC control	63-8576



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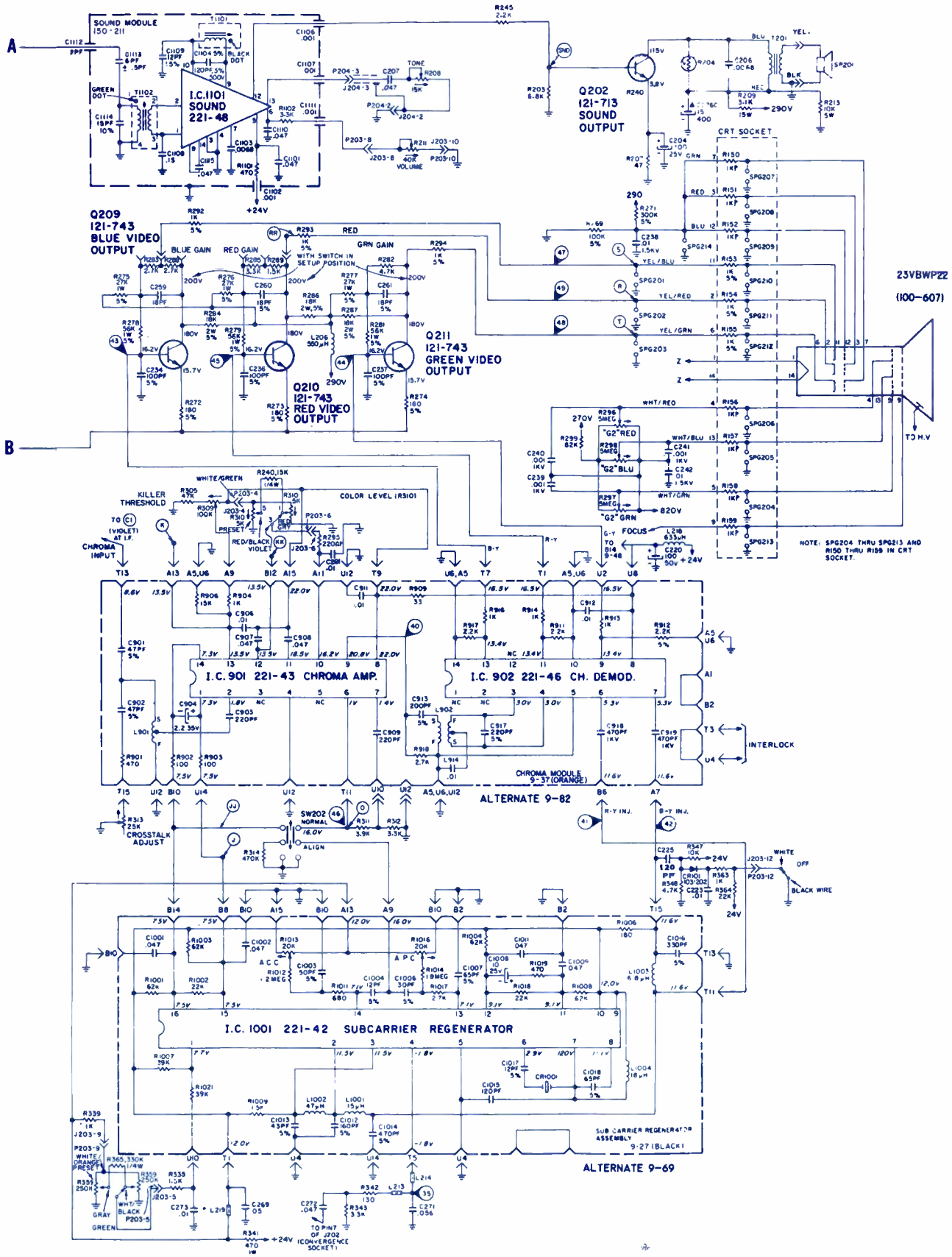
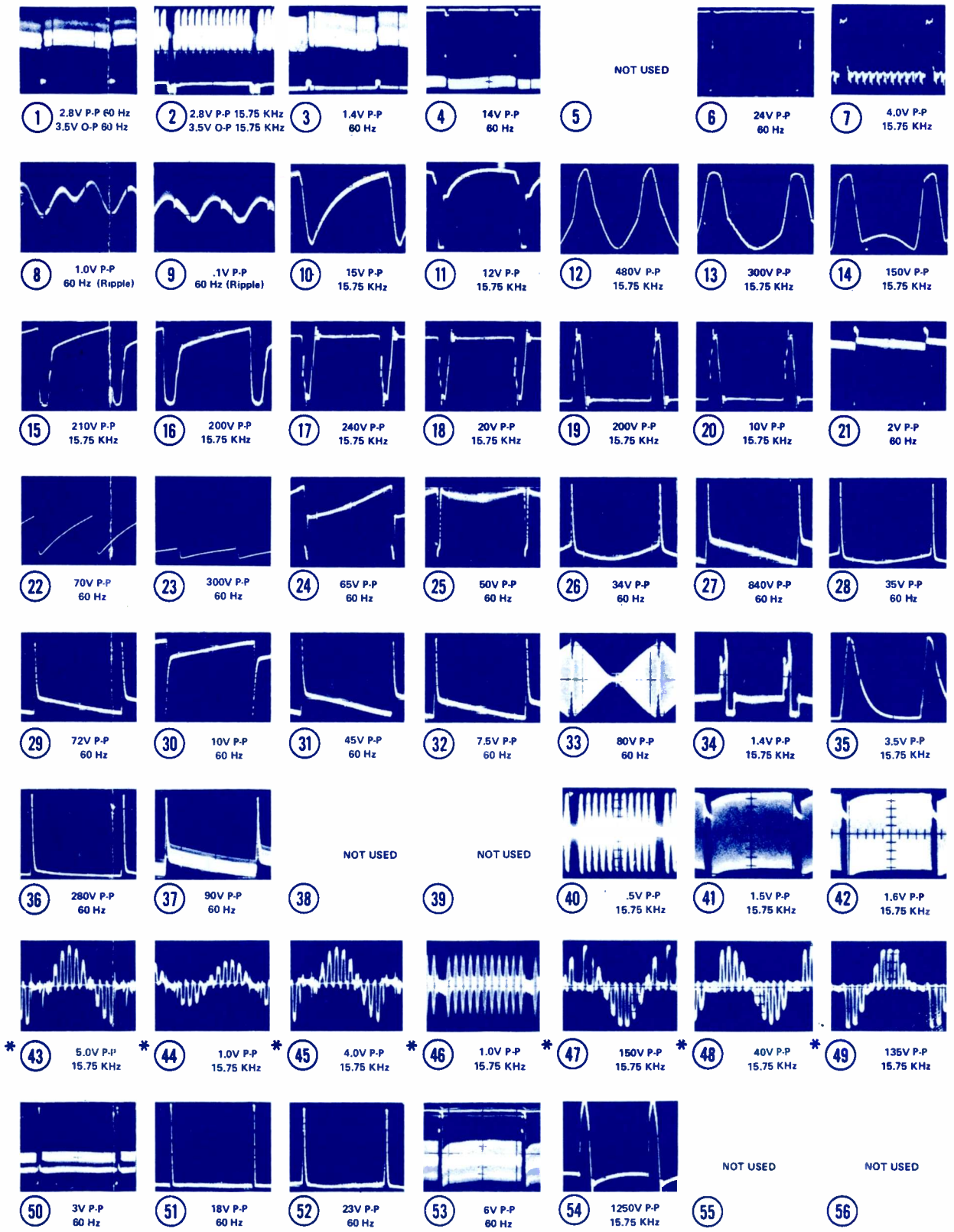
R1016–20K, APC control	63-8576
L113–4.5MHz trap coil	20-3289
L209–horiz ocs coil	S56877
T204–power xformer	93-3039
T205–horiz tweet xformer	S-92510
T206–deflection yoke	S89750
T1101–detector xformer	95-2789
F203–.6 a bel-fuse	136-100
F204–.5 a bel-fuse (pigtail)	136-89

ZENITH
Color-TV Chassis
23DC14





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1458

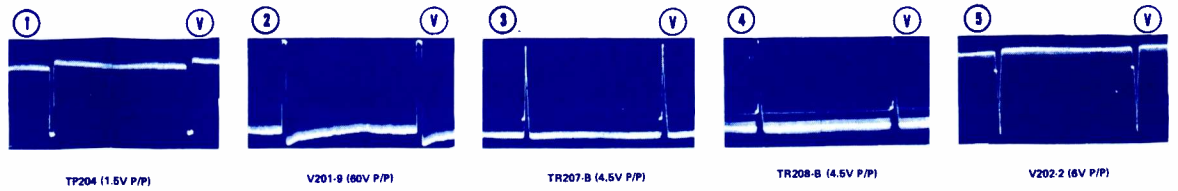
MAGNAVOX

Color-TV Chassis
T947

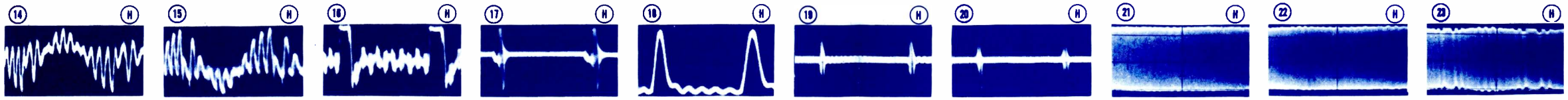
ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

FEBRUARY • 1973

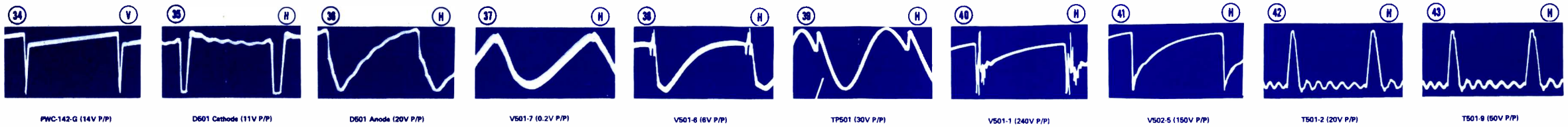
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS



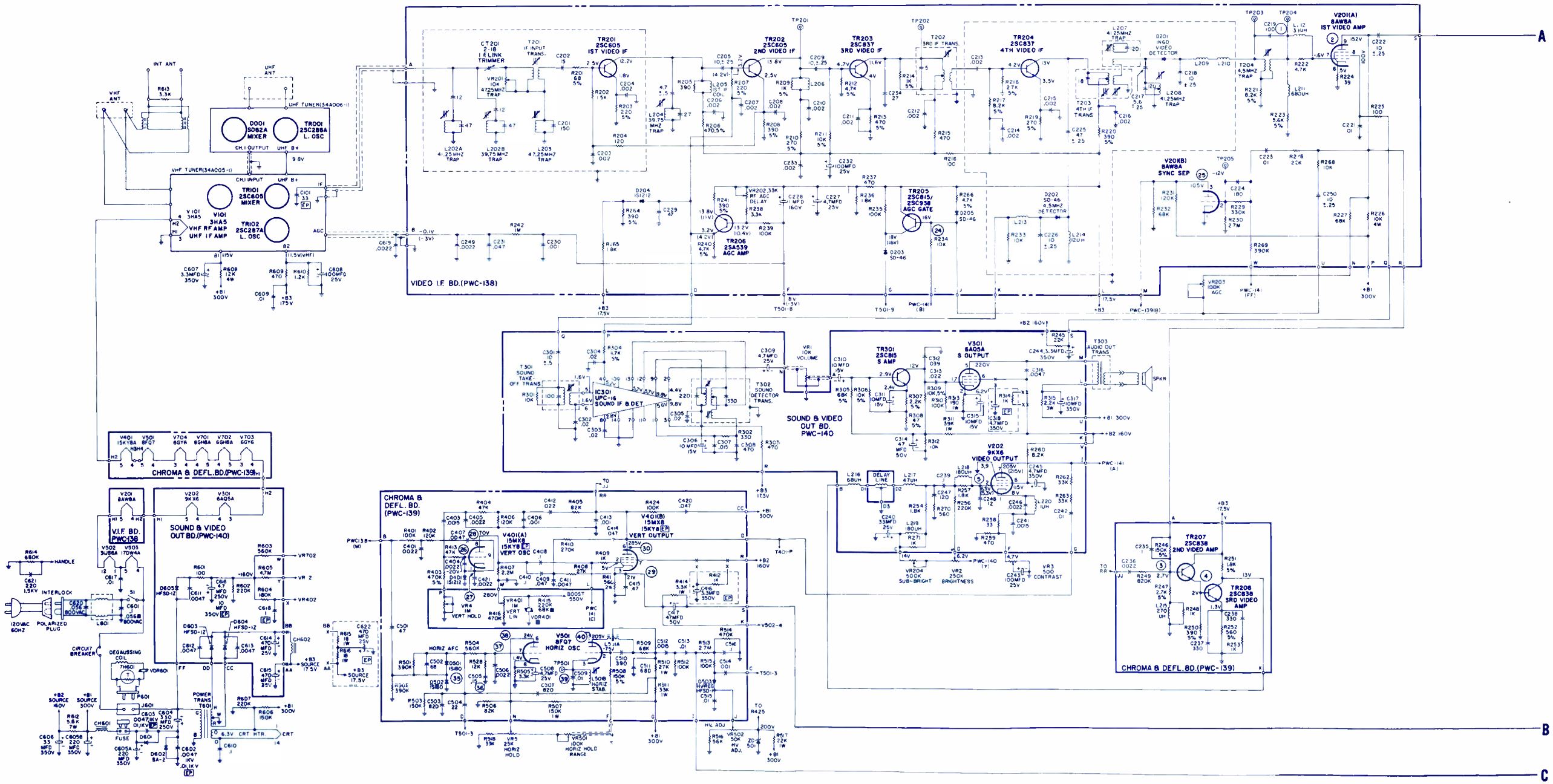
TP204 (1.5V P/P) — V201-9 (60V P/P) — TR207-B (4.5V P/P) — TR208-B (4.5V P/P) — V202-2 (6V P/P)



V702-9 (1V P/P) — V702-1 (25V P/P) — TR703-B (8V P/P) — TR703-C (35V P/P) — TP704 (56V P/P) — V701-8 (240V P/P) — PWC-139-Q1 (70V P/P) — V702-6 (80V P/P) — TP705 (18V P/P) — V704-7 (21V P/P)



PWC-142-G (14V P/P) — D601 Cathode (11V P/P) — D601 Anode (20V P/P) — V501-7 (0.2V P/P) — V501-6 (6V P/P) — TP501 (30V P/P) — V501-1 (240V P/P) — V502-5 (150V P/P) — T501-2 (20V P/P) — T501-9 (50V P/P)



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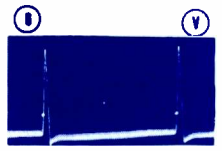
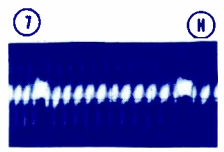
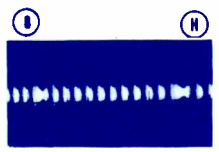
MAGNAVOX
Color-TV Chassis
T947



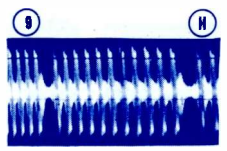
CRT 2 (100V P/P)



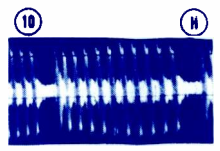
TP701 (1V P/P)



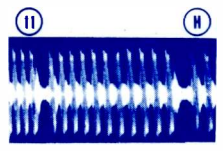
PWC-139-BB (1.5V P/P)



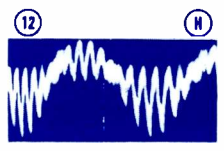
TR701-B (0.25V P/P)



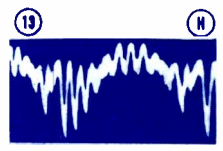
TR701-C (9V P/P)



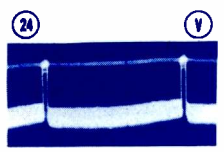
TP703 (5V P/P)



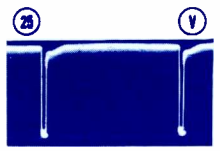
V703-5 (100V P/P)



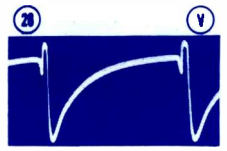
V704-5 (110V P/P)



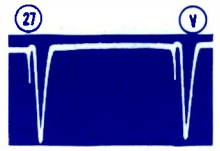
TR205-B (2.8V P/P)



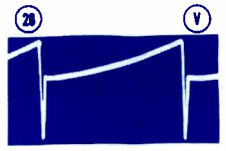
V201-3 (70V P/P)



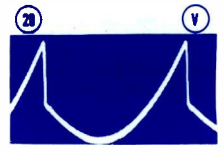
V401-9 (60V P/P)



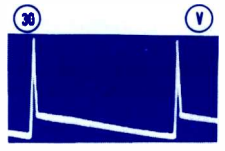
V401-1 (18V P/P)



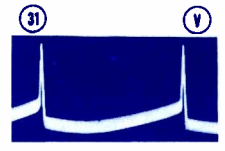
V401-8 (50V P/P)



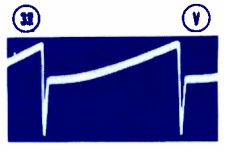
V401-3 (5V P/P)



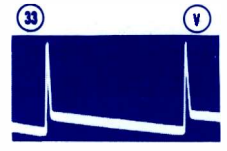
V401-6 (1000V P/P)



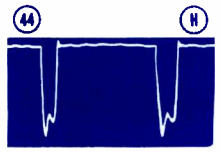
PWC-142-D (5V P/P)



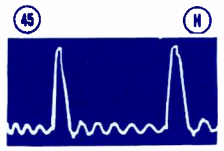
PWC-142-C (7V P/P)



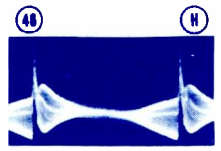
PWC-142-F (15V P/P)



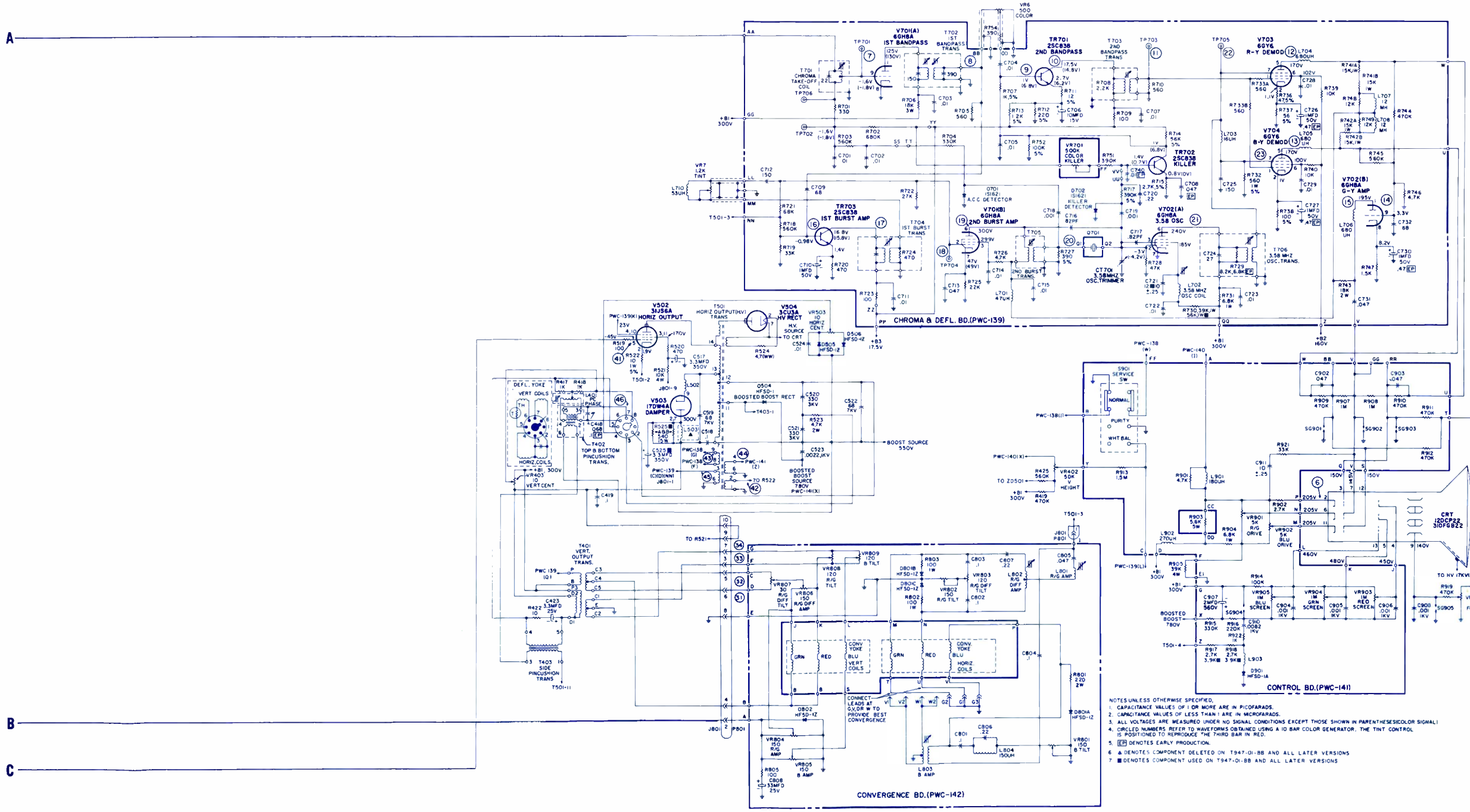
T501-4 (500V P/P)



T501-3 (280V P/P)



T402-5 (100V P/P)



NOTES UNLESS OTHERWISE SPECIFIED.
1. CAPACITANCE VALUES OF 1 OR MORE ARE IN PICOFARADS.
2. CAPACITANCE VALUES OF LESS THAN 1 ARE IN MICROFARADS.
3. ALL VOLTAGES ARE MEASURED UNDER NO SIGNAL CONDITIONS EXCEPT THOSE SHOWN IN PARENTHESES(COLOR SIGNAL)
4. CIRCLED NUMBERS REFER TO WAVEFORMS OBTAINED USING A 10 BAR COLOR GENERATOR. THE TINT CONTROL IS POSITIONED TO REPRODUCE THE THIRD BAR IN RED.
5. [EP] DENOTES EARLY PRODUCTION.
6. ▲ DENOTES COMPONENT DELETED ON T947-01-BB AND ALL LATER VERSIONS
7. ■ DENOTES COMPONENT USED ON T947-01-BB AND ALL LATER VERSIONS

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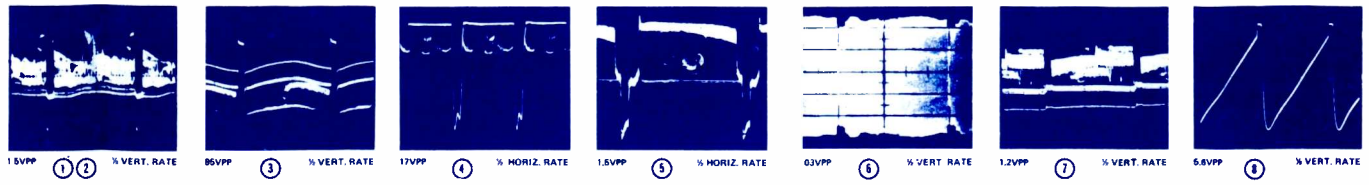
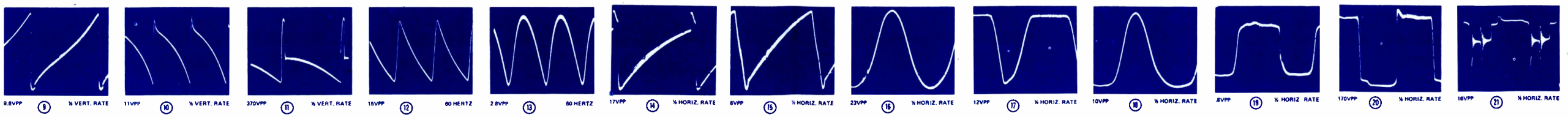
FEBRUARY • 1973

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

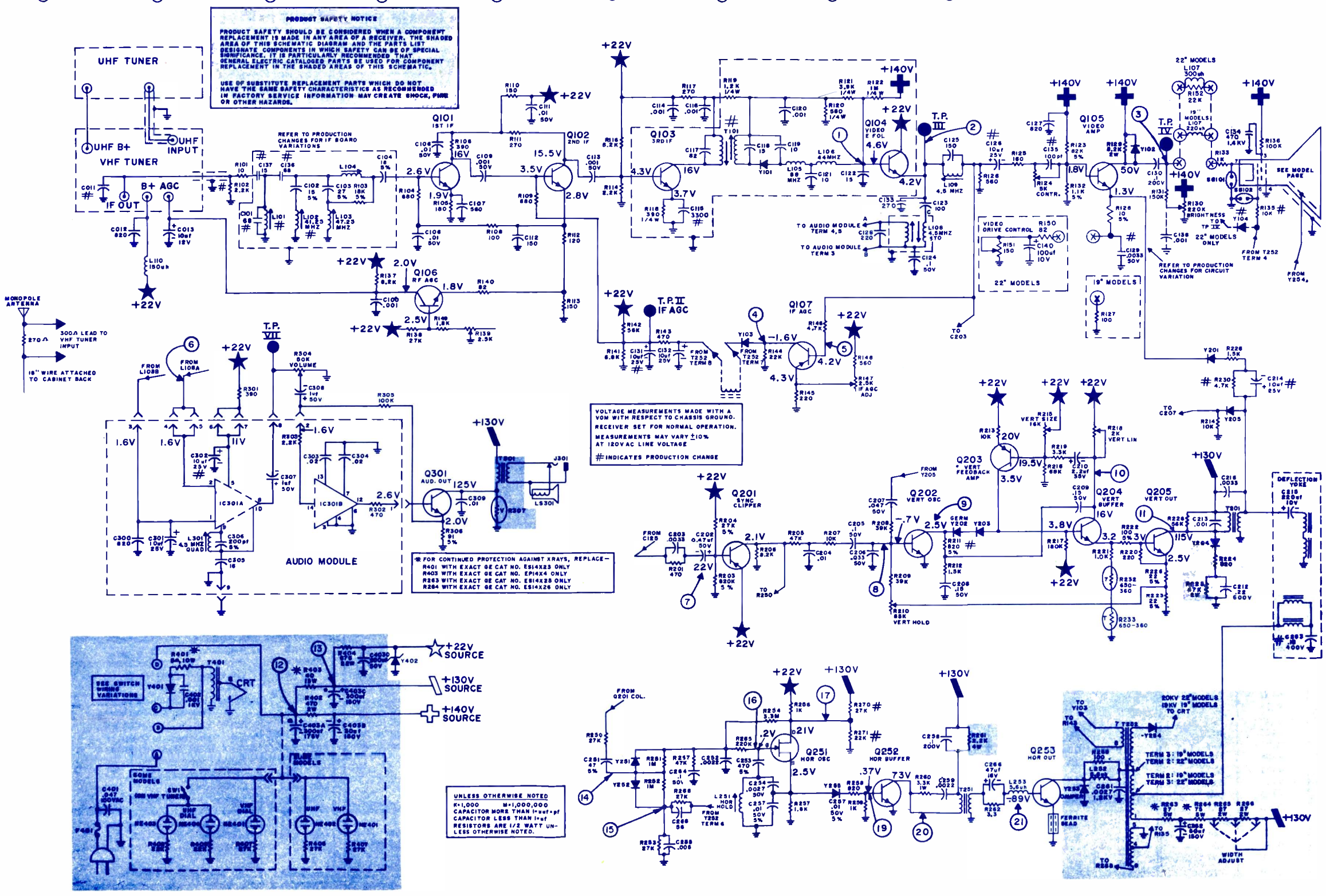




PRODUCT SAFETY NOTICE

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN A COMPONENT REPLACEMENT IS MADE IN ANY AREA OF A RECEIVER. THE SHADED AREA OF THIS SCHEMATIC DIAGRAM AND THE PARTS LIST DESIGNATE COMPONENTS IN WHICH SAFETY CAN BE OF SPECIAL SIGNIFICANCE. IT IS PARTICULARLY RECOMMENDED THAT GENERAL ELECTRIC CATALOGED PARTS BE USED FOR COMPONENT REPLACEMENT IN THE SHADED AREAS OF THIS SCHEMATIC.

USE OF SUBSTITUTE REPLACEMENT PARTS WHICH DO NOT HAVE THE SAME SAFETY CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SHOCK, FIRE OR OTHER HAZARDS.



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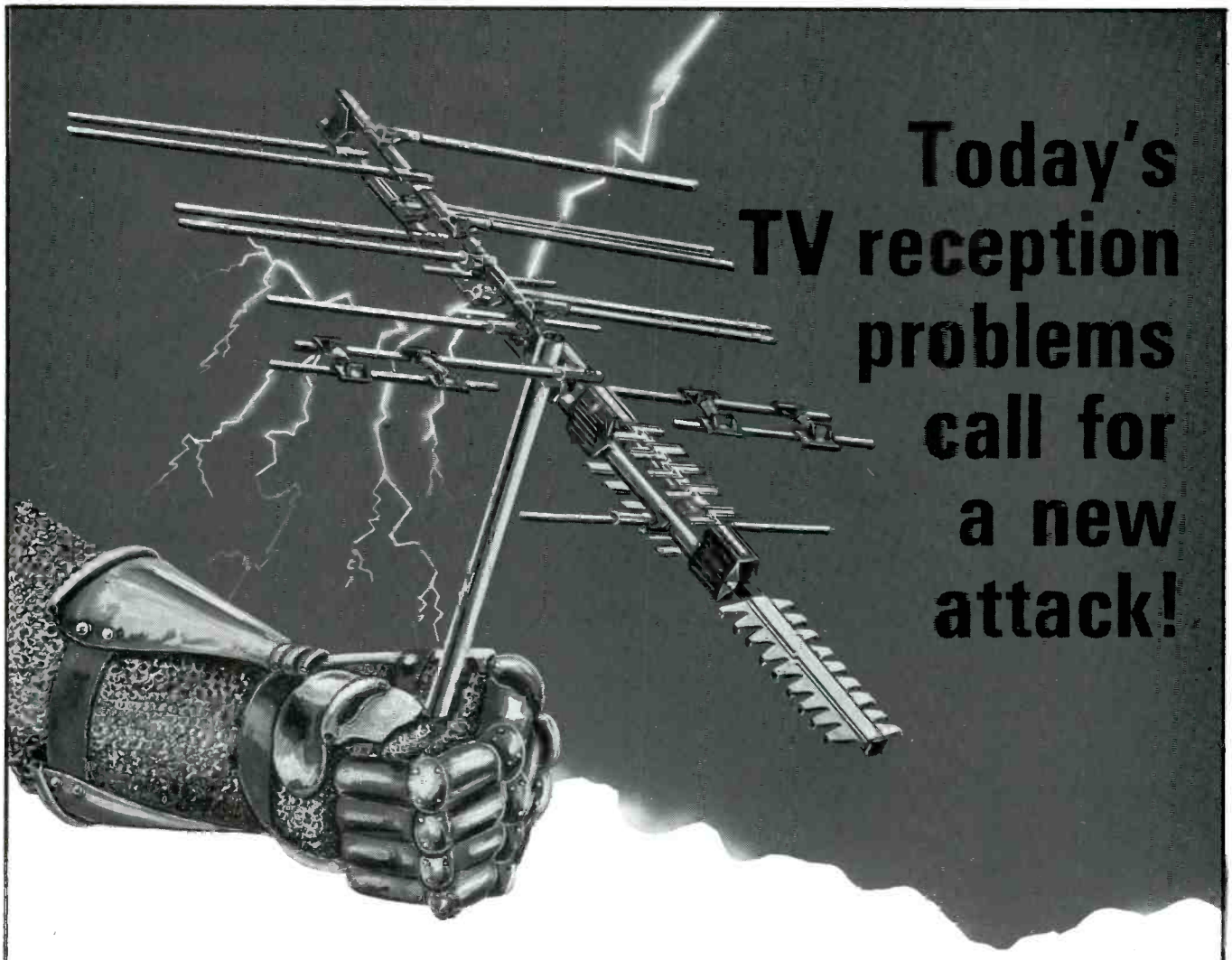

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And the Quantum wipes out strong local FM interference problems with an optional trap that provides 25dB effective attenuation.

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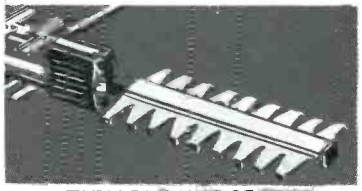
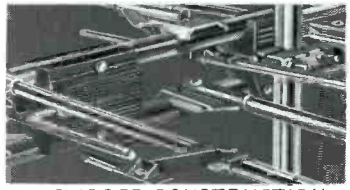
All in all, the Quantum is a massive attack on problems that have been making your job more and more difficult--it's an entire new breed of antenna engineered for the reception needs of today---and tomorrow!

OPTIONAL FM TRAP



TUNABLE UHF SECTOR



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