



A Shop For Thieves
 The Picture Tube of the Future
 Tuner Cover Booby Traps

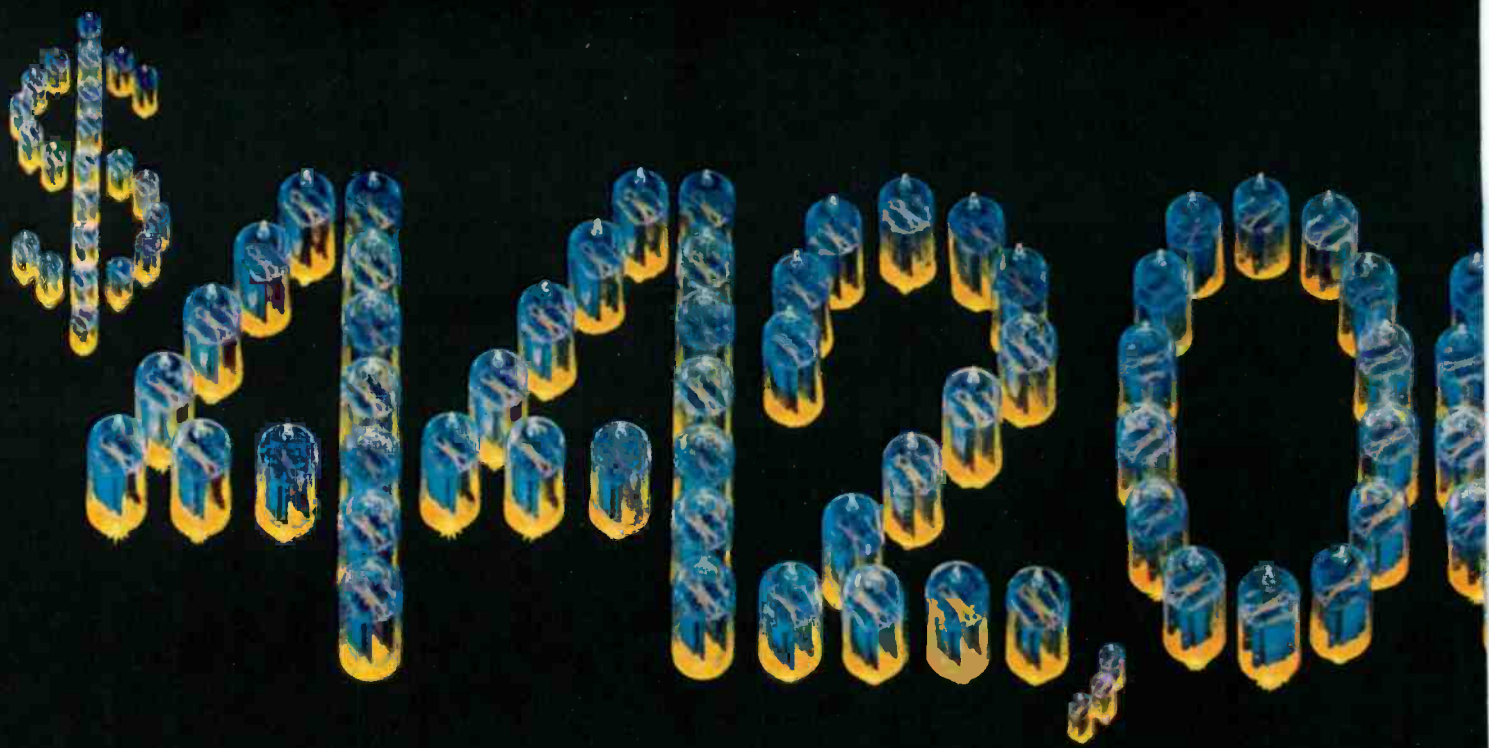
MAY 1973 • 75 CENTS  A HARCOURT BRACE JOVANOVIH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

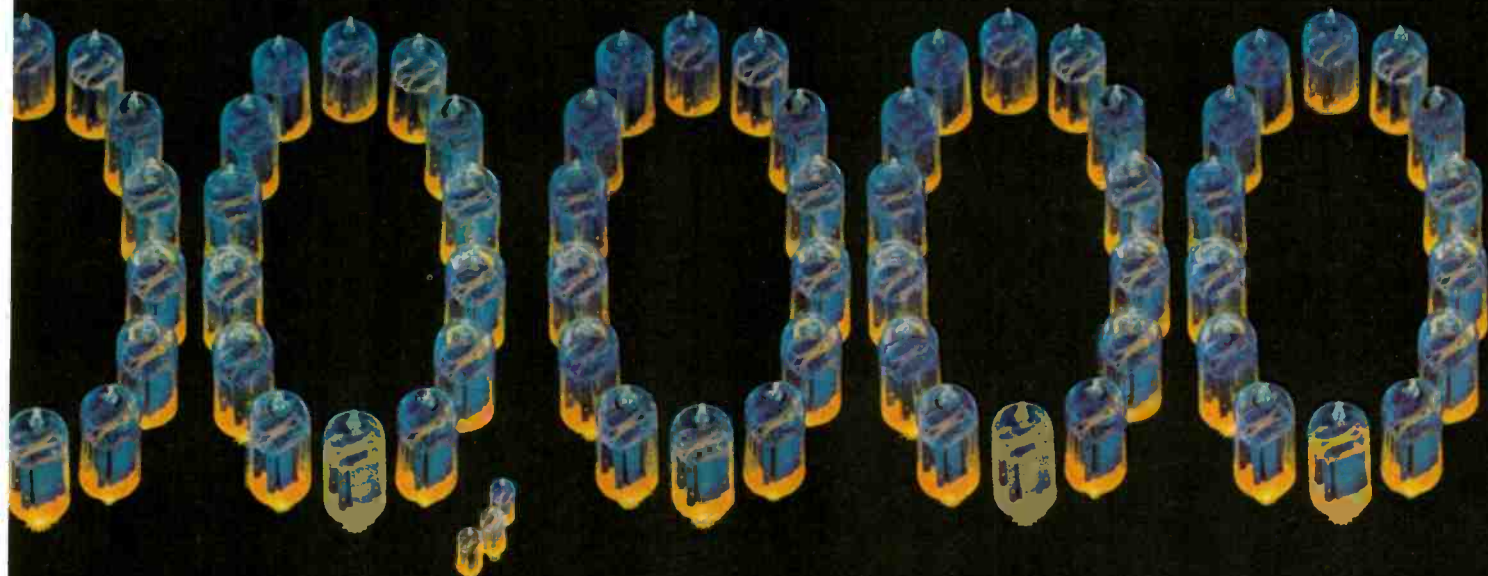
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Tubes: a business with



a helluva big future!

Receiving tubes spell opportunity. The replacement market was approximately \$442 million* in 1972, and 75% of new TV sets produced last year use tubes.

With all the TV sets in use and the new ones being added, there's a potential replacement base of over one and a quarter billion sockets.

Based on actual and projected E.I.A. figures for 1972 and calculated at RCA's optional list prices.

RCA is a leader in tube development. Our record is over three billion receiving tubes produced to date.

You can count on RCA to lead the way in getting 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

... for more details circle 132 on Reader Service Card

ELECTRONIC TECHNICIAN/DEALER

MAY 1973 • VOLUME 95 NUMBER 5

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This month's cover design is supplied through the courtesy of G. C. Electronics. A related article concerning security begins on page 30.

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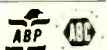
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A HARCOURT BRACE JOVANOVIH PUBLICATION



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POSTMASTER: Send form 3579 to ELECTRONIC TECHNICIAN/DEALER, P.O. Box 6016, Duluth, Minnesota 55806.

The PHILIPS PM 3200 doesn't look like a \$395 portable scope...

It doesn't perform like one, either.

Developed and manufactured by N. V. Philips of Holland, the PM3200 looks... and performs...like an expensive, laboratory-quality instrument.

Yet it costs only \$395, weighs less than 12 pounds, operates 5½ hours on its optional battery pack, is rugged enough for any kind of field work you can name and offers a wide range of professional performance capabilities, including:

- Freq response flat (-3 db) to 10 MHz
- Sensitivity of 2 mV/div
- 21 calibrated sweeps from 100 nsec/div to 0.5 sec/div
- Vertical amplifier dynamic range allows any signal to be expanded to 24 divisions, with any 8 displayed to 1 MHz
- Negligible DC drift: ¼ div/day

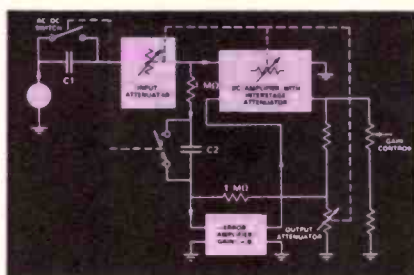
And the PM3200 is simple to operate; even semi-skilled factory workers find it easy to use it for precision test procedures. Most tests require only Y AMPL and TIME/div settings; other functions are automatic.

For instance, the PM3200 has no need for trigger-stability or continuous-level controls. Choose a trigger mode, choose a time base...and you see a stable display. Even for pulses with low duty cycles. And for TV work, a modified version of the PM3200, the PM3200X, adds automatic selection of TV frame or line sync for triggering.

PM3200 needs no DC balance control; a unique feedback circuit reduces trace drift to only ¼ div/day @ 2mV/div and automatically compensates for DC offsets caused by attenuator tracking and by differences in AC and DC coupling.

Try the PM3200 (or the PM3200X) with no obligation. We are convinced that at \$395, considering its portability, ruggedness, precision, flexibility, simplicity of operation and its Philips-of-Holland professional performance—you'll agree that it's the optimum general purpose scope for all kinds of field service organizations, production and QC departments, schools and engineering laboratories.

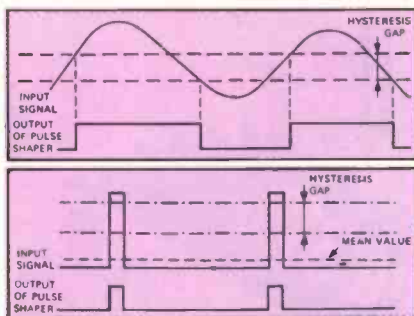
For details of our no-obligation, 15-day free trial offer and for complete descriptive literature on the PM3200 and the PM3200X, write: Test & Measuring Instruments Inc., 224 Duffy Avenue, Hicksville, N.Y. 11802. Tel: 516-433-8800.



**PM3200 IS DRIFT-FREE AND
INHERENTLY DC BALANCED**

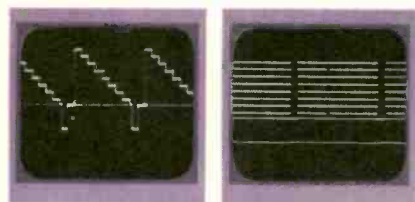
Sensitivity and DC drift are both on the order of the noise voltage. The active drift compensation loop compares vertical amplifier input to output and provides feedback to attenuate any drift voltage by a factor of $1 + \frac{1}{2}B$, where B is the feedback amplifier gain (approx. 30).

DC offsets are automatically compensated when interstage attenuators are switched, when the Y AMPL gain setting is changed, and when there is leakage around the AC coupling capacitor. Need for a DC balance control, even at 2 mV/div sensitivity is totally eliminated.



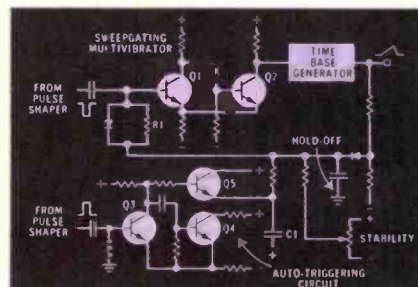
**THREE AUTOMATIC TRIGGER MODES IN
PHILIPS PM3200**

Trigger mode selection allows triggering on the mean value of the AC signal, on the peak value of the signal, or on the AM component of an HF signal. Mode switches select DC level of "hysteresis gap" of pulse shaper relative to mean signal value to determine shape of switching pulses applied to time base and auto-trigger controls.



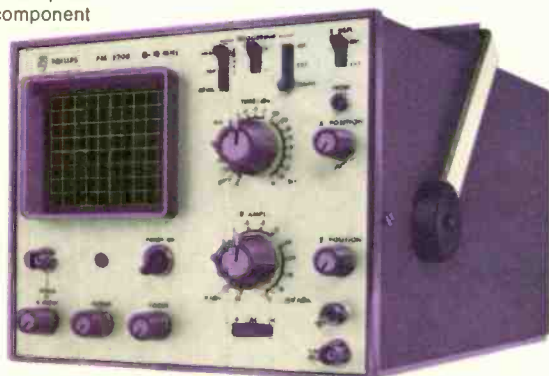
PM3200X FOR TV SERVICE

PM3200X offers automatic TV frame/line sync selection for convenience in TV service work. With TRIGGERING switch in TV position, setting the TIME/div control to any sweep speed up to 50 μsec/div produces frame-synchronized displays. Setting the TIME/div control to any sweep speed of 20 μsec/div or faster results in a perfectly stable TV line-synchronized display.



**PHILIPS PM3200 OFFERS AUTOMATIC TRIGGERING
TO 10 MHz WITHOUT STABILITY OR
CONTINUOUS-LEVEL CONTROLS.**

Time base generator is free running at TIME/div setting. Any signal produces simultaneous pulse-shaped inputs to time base control Q1, Q2 and to auto-trigger control Q3, Q4. The time base control switches the time base generator off and the auto-trigger control switches Q5 to charge C1 to the mode-set trigger level and starts the time base generator via Q3, Q4 in sync with the signal.



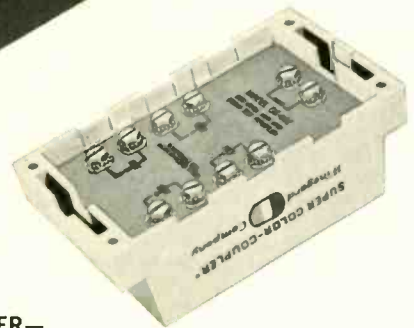
TEST + MEASURING INSTRUMENTS INC.
A NORTH AMERICAN PHILIPS COMPANY

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Why buy "second line" TV components when you can buy the best . . . Winegard engineered-and-built for less and get the same high quality and performance?

Reduced 31%



**CC-482 82 CH.
4-SET COUPLER—**
Deluxe low loss coupler connects four TV-FM sets to a single 300 ohm download. Efficient coupler circuit provides a maximum amount of signal to each receiver. Specially designed for color, black and white and stereo.

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**CS-285 300 OHM V-U
BAND SEPARATOR—**
High quality, low loss Band Separator for adapting single 300 ohm download to separate 300 ohm VHF and UHF antenna connections of TV set. Perfect match insures perfect color and black and white reception.

Reduced 28%



**CC-33 82 CH.
2-SET COUPLER—**
Inexpensive coupler for connecting two TV or FM sets to a single 300 ohm download. Features handy no-strip terminals for easy connection.

Reduced 31%



**CS-387 75 OHM V-U-FM
BAND SEPARATOR—**
Band Separator for making connection between 75 ohm coaxial download and separate 300 ohm antenna terminals of TV set and FM receiver. Features latest printed circuit design for low loss, high isolation and perfect match. Excellent for quality color and FM stereo reception. Connector included.

Check with your distributor for new low pricing on these items.

QUALITY ACCESSORIES!

separators—matching transformers ^{reduced up to} **31%**

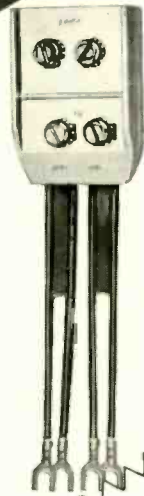
Reduced 22%

**CS-175
75 OHM V-U
BAND SEPARATOR—**
Quality 75 ohm Band Separator for attaching coaxial cable to separate 300 ohm antenna terminals of TV set. Features printed circuit and latest circuitry for low insertion loss and perfect color transmission. Connector included.



Reduced 18%

**CS-380 300 OHM
V-U-FM BAND
SEPARATOR—**Latest Band Separator design adapts 300 ohm download to separate VHF and UHF antenna terminals of TV set and provides FM stereo thru handy no-strip screw terminals. Unique printed circuit design has extremely low loss, excellent match and high isolation for perfect color and FM stereo.



Reduced 26%

**CC-282 82 CH.
2-SET COUPLER—**
Efficient 300 ohm coupler connects two TV-FM sets to a single 300 ohm download. Input and output connections are handy no-strip type for easy installation. Quality circuitry insures perfect color and black and white reception.



Low Price!

NEW

**T-12BLK 82 CH. MATCHING
TRANSFORMER—**Compact indoor Matching Transformer for attaching coaxial cable to 300 ohm antenna terminals of TV or FM receiver. Packed 6 per poly bag, 8 bags per master carton. Connectors included.



Low Price!

NEW

**LS-27 82 CH. LINE
SPLITTER—**High quality line splitter for dividing a single 75 ohm coaxial cable into two trunk lines. Indoor type with transformer network features excellent match. Connectors included.



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ANTENNA SYSTEMS

3000 KIRKWOOD ST. BURLINGTON, IOWA 52601

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There must be an easier way...



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

TV servicemen were never meant to be movingmen.

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

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

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

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

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



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

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

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

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

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

lets you see it on a benchtop 14-inch

GTE SYLVANIA

100 First Avenue, Waltham, Mass. 02154

He's Human, Too



This month's editorial does not deal directly with the current association merger situation. Although your editor is increasingly optimistic that there will definitely be a merger approved by the members of at least significant segments of both NATESA and NEA, unfortunately copy deadlines do not always correspond with association activity and an editorial concerning the details of association merger must await another issue. (We fully expect complete coverage by our July issue so that there will be ample time for members to "digest" all available merger information well in advance of voting at the August conventions.)

There is unfortunately one fact too frequently overlooked, not only by the members of NATESA and NEA, but also by members of ISCET and even EIA (A manufacturers' association which has assumed many responsibilities overlapping those also assumed by NATESA, NEA and ISCET), **plus those that do not choose to be affiliated with any association**—still the majority of our readers. Far too many people in all these classifications fail to realize that the other fellow is human too and has a need for personal dignity. And as a result, some have allowed personal fears to run rampant.

Some in NATESA and NEA fear the members of ISCET, developing the notion that a group of upstart electronic technicians may somehow turn it into a treacherous union. In turn, some members of ISCET fear both NATESA and NEA, and feel that once merger is accomplished the shop owners will be in a really good position to effectively "cut the throats" of the electronic technicians.

Some members of NATESA fear NEA because its membership has not been as restrictive as NATESA's and there might be elements in NEA that would seek to destroy NATESA's past accomplishments. On the other hand, some members of NEA fear that with a merger it might be forced to accept elements of NATESA that have an

"entirely different" outlook concerning association activity, central leadership and involvement with "outside elements."

Then too, there is a feeling of distrust held by some members of NATESA, NEA and ISCET concerning the activities of some manufacturers that belong to EIA—this same distrust being reciprocated. Some EIA members cooperate well with one or more other associations in the evaluation of product serviceability, warranty programs and in-service training. Other manufacturers prefer to operate alone in such efforts, forming their own "independent" serviceability committees or only begrudgingly cooperating in any joint training programs. Thus they have "earned" the mistrust held by some members of NATESA, NEA and ISCET. Those manufacturers that prefer not to cooperate, fear being accused of favoring one "outside" association over another, or delegating any undue authority or prestige to an "outside" association of mere shop owners or service men.

And then there are the manufacturers, electronic technicians and service dealers that simply do not want to have anything to do with any association. They feel that such alignment requires too much valuable time, costs too much money, or simply delegates too much power to others. Whatever their reason, the majority of our readers still do not belong to any professional association, and many of these readers do not trust the manufacturers, electronic technicians or service dealers that do belong. In return, there are members of all these associations that consider non-members freeloaders—people quick to reap the benefits of association activity, but slow to develop their own professional business standards.

What far too many people fail to realize is that such people as Frank Moch, Dick Glass, Ron Crow, . . . , etc. have quite a number of things in common. Those listed, and most of the many not, are married men who have families that they love dearly. Once while I was on an evening hike with Frank, he spoke to me of the fact that he had to return home early from our Wisconsin meeting to attend his grandchild's baptism. Dick and Dot Glass have very cute kids that they

enjoy bringing along to many association functions. Ron Crow loves camping with his family, and if he could also take an entire association out in the woods camping, he would. Similar personal comments can be made concerning the others.

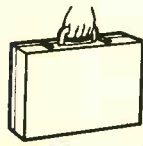
I realize that there are many conflicting attitudes and strong feelings, but some of these have developed to such an irrational extreme that I have received complaints in the past from the supporters of some of the above mentioned officials for even printing these names together in the same paragraph—such an act lowering the stature of others. Whether or not such hate and anger is justified, these outbursts are but an insult to the intelligence of the parties issuing them. Some of us realize that we are human enough to overreact to stress, ignoring the fact that the other fellow has a similar human frailty. Then we, in turn, overreact to the other fellow's overreaction—despite generally supporting the same basic principles.

If we all look out for our own interests without any personal concern for the other fellow, and if our own egos are too big to permit us to realize that everyone else is also human and facing similar problems within our industry; then we may be forced to delegate our responsibilities to still another party, one quite ready and willing "to set things straight." Dear old Uncle Sam has his own way of "doing it right." His ways could well include federal licensing laws slightly out-of-step with the realities faced by manufacturers, electronic technicians and service dealers; regulated warranty programs that could destroy any manufacturer, electronic technician or service dealer unable to conform; training programs that will flood the industry with "experts;" and price controls that fail to acknowledge the need for an adequate return on investment, or the worth of one's skills.

Are we going to grow up and learn how to get along, or must we face an even greater, more effective consumer cry for Uncle?

Phillip Dahlen, C&S

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ASSIGNMENT...



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with different tool selections



Model TC-100/ST



Model TC-200/ST

Technicians, servicemen, field engineers: Here's the ideal combination — Xcelite professional hand tools made to highest standards for any job ... all housed in a rugged, attractive attaché style case personalized with your initials. Tools neatly mounted in see-thru pockets on removable pallets and trays ... plus generous space for individualized selection of test instruments, parts boxes, soldering gun and other tools.

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READERS' AID

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

Part Needed

I would like to obtain a schematic and a power transformer for a Type CB-1-60 Solar Capacitor Analyzer.

W. R. DASHO

445 Sunny Hill Rd.
Bremerton, Wash. 98310

We are in need of a schematic and power transformer for a Rickenbacker Supersonic, Model B-16A, two channel guitar amplifier.

W. J. COOK

Box 3086
Sioux City, Ia. 51102

I am in need of a channel selector switch for a Pearce Simpson Model Companion.

A. G. HAMMOCHER

2450 Granada
South Daytona, Fla. 32019

I would like to purchase the test leads and probes for a DuMont Model 208-B Cathode-Ray Oscillograph.

JOHN C. COX

1329 Devonport Drive
Lexington, Ky. 40504

Schematics Wanted

I would like to purchase Tekfax Groups 154 through 226, Schematics No. 926 through 1364.

B. A. MURPHY

9750 Frankford Ave.
Philadelphia, Pa. 19114

I would like to obtain a schematic and part list for a Continental Model 327 CBK Stereo MPX Receiver or a Belair Model CRH-401 Portable Cartridge Tape Player and radio combination.

BOB & LEE'S TV'S

P.O. Box 168
Wrightwood, Calif. 92397

I would like to obtain a schematic and operating instructions for a Solar Model CE, Serial No. E-6842, Capacitor Analyzer.

HAROLD HOFFMAN

11682 Magnolia St.
Garden Grove, Calif. 92641

I have a Ham Transmitter Model No. AF-100 manufactured by Supreme Transmitter Corp., New York, N.Y. and would like to obtain a schematic diagram and other technical data on this set. I would like to know if this company still exists and if so where it is located.

LESLIE PITTMAN

P.O. Box 484
Curling, Newfoundland

Service Business for Sale

I have a TV sales and service business for sale in a growing city with a population of 15,000. The business has been located in the same area for 16 years and there is only one other major shop in the city. Retirement is the reason for selling. Please write for more details and price. Address "Personal."

BELCHER ELECTRONICS

J. H. W. BELCHER

33 W Downtown Mail
Ozark, Ala. 36360

Test Equipment for Sale

I have for sale a Sencore Model SS137 TV Sweep Circuit Analyzer purchased recently. Make an offer.

BARNET TOYEN

39 Saddle Hill Rd.
Newington, Conn. 06111

I have a number of used test instruments for sale. Please write for complete listing and price.

GARY GIPSON

Box 19B
Newark, Ark. 72562

I have several used test instruments and a number of Sams Photofacts for sale. Please write for details and price.

DUANE WILSON

Rt. 2
Guymon, Okla. 73942

I want to sell a Beckman Model 5571 Frequency Meter in good condition with manual.

JASPER J. SIPES, CET

P.O. Box 85
Bethel Island, Calif. 94511

I have for sale a Heath, Model IG-57A, Post Marker/Sweep Generator, complete with cables and service manual. Used one time.

STEPHEN GRIMES

Rt. 1, Box 284A
Independence, Kans. 67301

Announcing the RCA MINI-STATE Antenna System



The profitable new achievement in antenna technology.

The Mini-State is brand new from RCA. It's the first true miniaturized rotating antenna system on the market. *It works . . . and works well!*

This system is specifically made for your metropolitan and suburban customers who want the quality reception of an outdoor-type antenna, in a beautifully compact unit suitable for homes and apartments.

Measuring just 21" across and 7" high, the Mini-State is completely enclosed in an attractive sturdy plastic case that's weatherproof and resistant to dust and dirt. It weighs just 6 pounds and can be mounted almost anywhere: rooftop, chimney, window, attic and closet.

The RCA Mini-State's uni-directional pattern, VHF slotted ring and multi-element UHF design, combined with its completely integrated solid state circuitry, provides excellent reception on all channels, and helps avoid interference and ghosts.

Mini-State model 5MS440, with built-in rotator, allows your customers to zero-in for best reception on any chan-

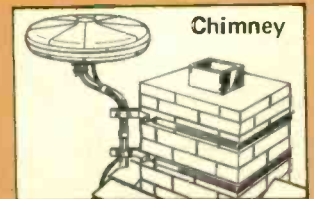
nel. Exclusive direction indicator light on the hand held control unit tells them where the antenna is aimed.

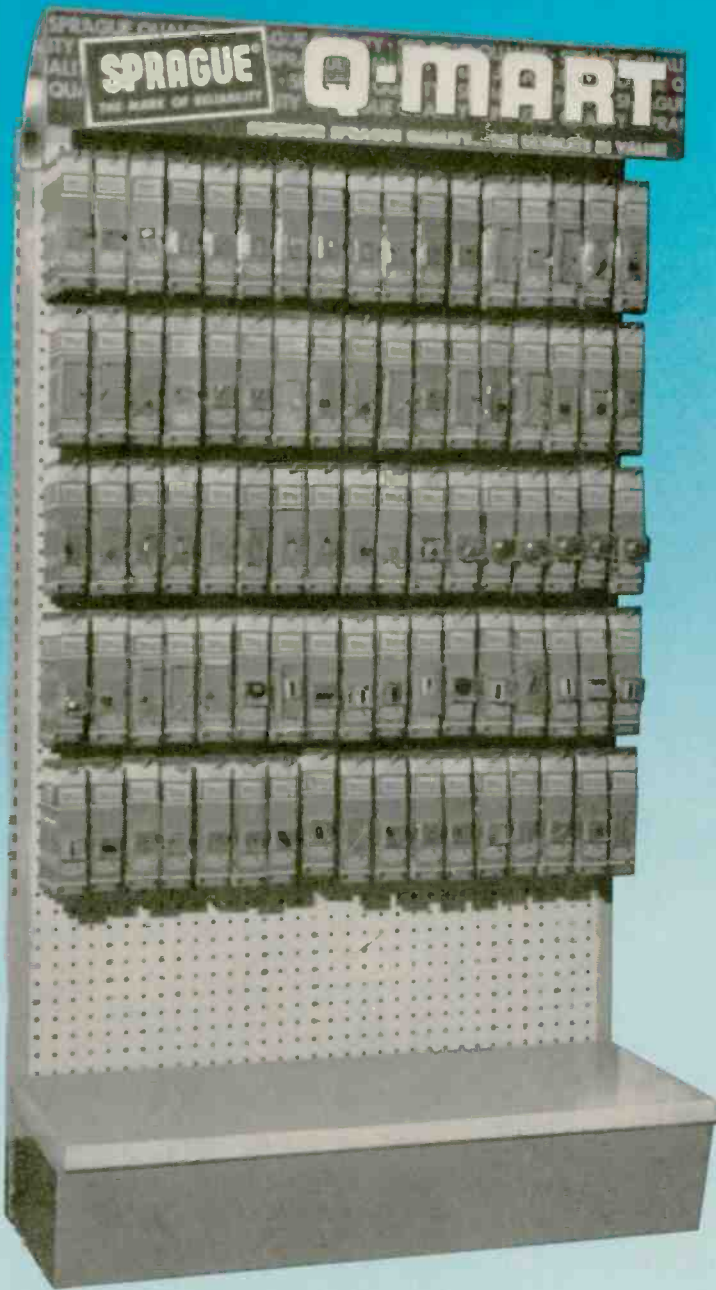
The RCA Mini-State rotating antenna system includes: The antenna with built-in amplifier. Built-in rotator and hand held remote control unit. A 120 volt AC power supply. A VHF-UHF antenna matching transformer. An outdoor mast clamp. Legs which can be snapped into place for indoor use.

Although regular coaxial and rotator cable may be used, a unique combined coaxial and rotator cable is available in prefabricated lengths for quick, easy installation. (A fixed non-rotating model 5MS330 is also available.)

Yes, this new RCA Mini-State antenna system can mean maxi-profits for you. See your RCA Parts and Accessories distributor today, or contact RCA Parts and Accessories, P.O. Box 100, Deptford, N.J. 08096. Make sure you're in on the ground floor of this profitable new era in TV antenna systems.

RCA





New
**SPRAGUE
 SEMICONDUCTOR
 Q-MART READY
 TO SERVE YOU!**

**Replacement Semiconductors for
 Service Technicians, Laboratories,
 Hobbyists, Experimenters**

Sprague's "Total-Capability" Replacement Semiconductor Q-MART, being installed in more distributors' stores with each passing day, simplifies the selection and purchase of small-signal transistors, power transistors, field effect transistors, silicon rectifiers, linear integrated circuits, and LED devices, with a product variety that cannot be obtained from any other single source.

Designed with the service technician/hobbyist/experimenter in mind, it gives you ready replacements for over 30,000 original manufacturers' part numbers which are frequently found in home/mobile entertainment and communications equipment.

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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.

We Must Bury Hatchet

Congratulations on your very fine editorial in your February issue. It is an extremely well put article that should help put many of us thinking deeply about our profession. You will undoubtedly have some bricks tossed at you, but this is to be expected.

What made this great country was the ability of its leaders to discuss with open minds the problems of the day. To use logical and analytical reasoning to seek a solution to the problem at hand. Even though at times intelligent people disagree, they can still rise above their own selfish desires and agree to solutions that are good for the majority.

Today—now as never before we in the consumer electronics industry need unity to survive the battle of giantism, consumerism and government harassment. We in the electronics industry must today each get a "Positive Mental Attitude" (Dr. N. V. Peale) about unity and working together, and practice the "Good Book's" teaching, "I am my brother's keeper."

We each must BURY the HATCHET of hate, spite, disrespect, selfishness and greed. We must, to survive, learn to give a little, admit our mistakes, quit "nit picking" and get at the more important and very serious tasks that confront our industry.

Again, let me say you and your publication need to be thanked and were brave to come out with such an admirable stand.

CHARLES R. COUCH, JR., CET
PRESIDENT, NEA

Some Write to Gain Prestige

Quite often we feel editors, such as yourself, create an editorial to gain prestige in/or within a circle, but after reading your editorial in the February issue of ELECTRONIC TECHNICIAN/DEALER, we are convinced you would never fit in the above-mentioned category.

Realizing you knew in advance that you, as an editor, from writing such an article had much more to lose than you could possibly gain, still you dug up the bold, truthful facts and printed them like you saw them.

Having been a NATESA member the past 18 years, I realize the many accomplishments it has made for our

industry. On the other hand, I have closely and enviously observed the accomplishments that NEA has attained in the short 10 years it has been in existence.

This makes us wonder just how much could be accomplished for our industry if the efforts of both groups with their many great leaders were directed in one direction for one common cause.

In my opinion, one of the main reasons, in the fear of a combined effort of one strong National Association, is the fear of the loss of stature of some of the leaders of each association.

It is my opinion that if greater emphasis were given to the State Associations and greater recognition be given to the leaders of each state association, many of these leaders would feel more secure.

Considering the memberships of both groups in each state, all 50 should be fairly well represented in the new association.

While in Kansas City attending the recent NATESA Executive Council, we again visited the Crown Center Hotel facilities. Construction is progressing at a rapid pace. With 850 people working on the project, I guess it should.

I talked with Crown Center Sales Manager Bill Nuhn this week and they are to move into their new executive offices in the hotel the first weekend in March.

The Hotel will officially open May 8th, 1973.

The facilities will be the greatest ever for our convention. All meetings, meal functions and exhibits will be on the same floor. Sound good?

NOLAN BOONE

Appreciates February Editorial

Please accept my personal gratitude for your editorial of February. You could very well clear up more problems in our profession beating your typewriter than dozens could do pounding their gavels.

I abstained from voting at the ISCET meeting in August when you were elected because of insufficient knowledge of the candidates. Thankfully the others knew what they were doing. My belated congratulations.

Mr. Finneburgh deserves another feather in his cap for his sponsoring of the "teen room" at the last convention. While it cost as much as a booth, it didn't sell merchandise. He volunteered in advance to back it because it was needed. A function such as this is really only appreciated by the 30 or 40 children who were entertained during the day sessions, and their par-

ents who could get their work done uninterrupted, knowing the kids were safe. I saw a beautiful quality in this giant of industry, for every few hours he and "Babe" would stroll by to see if anything was needed, ready to wipe a drippy nose if necessary. In itself, unselfishly filling this kind of need makes him an uncommon man. We of the Electronics Technicians Association of Greater New Orleans are honored to have worked with him on this project.

MALCOLM G. McCANN, JR., CET
PRESIDENT, ETA of GNO

Comments on February Editorial

Regarding your February editorial, which discussed current merger problems between NEA and NATESA, let me make a comment or two.

First, to me the most important part of it is the fact that you and your publication had the courage to enter into the discussion of this important trade action, and to express your honest evaluation of the situation. A large problem in the electronics business has been the lack of debate and comment on the issues and problems. Without open discussion, the readers and the members of this industry cannot understand exactly what the problems are, and therefore cannot participate in the solution to them. On the other hand, to comment on them, as a publication, is to assure yourself that at least some will disagree with you. Some readers as well as some advertisers—both of which every publication must have.

I and others who have read the editorial do not agree with everything you stated. I doubt that you expected that. In particular, I felt the editorial left the reader with the feeling that the continued rift between NEA and NATESA is still merely a "Squabble."

Definition: *Debate*: An argument between two parties.

Squabble: When you aren't one of them.

NEA was formed in 1963 because there was a definite problem within NATESA, which could not be solved from within. The same problem is evident in the present situation. Adding to the merger difficulties is a giant lack of understanding of practically all the details of the two associations. Many of the people who voted for merger at the New Orleans convention did not really understand the definition of that word and have expressed the feeling that they would not "merge" under any conditions. A majority of the members of both organizations really have no idea of the differences in ac-

continued on page 14

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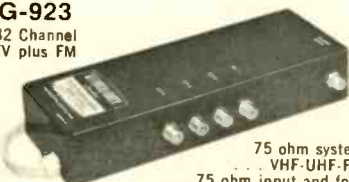
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LETTERS...

continued from page 13

tivities; services to members; net worth; or operation of each group.

Without such an understanding, it is human nature to take the most convenient issue at hand and to choose up sides and enter a name-calling contest. That is where we are now, and it really is up to the members to take the time and to make the effort to see that their leaders are making the correct decisions as regards to merger or consolidation or the termination of the talks.

Your editorial is a big step in the right direction.

DICK GLASS, CET
EXECUTIVE VICE-PRESIDENT, NEA

Backs Words with Money

It's been a long time since we've visited, but I want you to know that I think your magazine is great. It is certainly relevant to our industry and association, and there has been such a change for the best that, well, I'm getting a little tired of reading the school's copy and I would like to subscribe myself.

Personally, I think you have done a fine job with ET/D and am glad that you are the chairman of ISCET. We are fortunate to have capable individuals in important and influential positions.

Please process my personal subscription to ET/D, and thanks for all your efforts. [Money enclosed for three-year subscription.]

KENNETH G. BROWN, CET
PRESIDENT, TSA OF IOWA

NATESA Merger 19 Years Ago

Your latest editorial relative to the NATESA/NEA merger has aroused my memory of a similar affair which occurred nearly 19 years ago in Philadelphia. Then, as now, Frank Moch was head of NATESA. Another national association, called NESDA, encompassed many local chapters throughout the Northeastern Atlantic coastal states, plus some from Missouri and Texas. Max Lobowity, head of NESDA, along with Lewis Winner, owner and publisher of SERVICE Magazine, had staged a "Color TV Symposium" at the Bellevue Stratford Hotel of Philadelphia in April 1954. It was a three-day affair.

Color TV was in its infancy and servicemen were anxious to learn more about the subject. Thus a symposium that attracted the major TV manufacturers to display their wares

and engineers to lecture the servicing technique. It was a huge success. The NESDA people had anticipated the outcome, so they billed the occasion as a "Color TV Symposium and Eastern Conference." Despite such publicity, the real purpose of this meeting was to initiate a program to merge the two national associations so that there would be a unified voice to speak for the Radio/TV Servicemen.

This humble writer had attended some organizational sessions of NESDA, trying to find a solution for a possible merger. In retrospect, NATESA was not receptive at the time. As I recall, Mr. Moch, who was billed as a feature speaker in one of the sessions, did not commit himself to a definite date of arrival, showing up at a breakfast meeting attended by but a small group of delegates. I cannot recollect the text of his speech, but it was in generalities. In fact, some said it was ambiguous, containing nothing even remotely pertaining to merger.

No criticism of Mr. Moch was intended here. Moreover, I think the gentleman is dedicated to the profession. The Radio/TV Service people owe him a great deal because he's always in the front line battling the adverse publicity aimed at the Radio/TV Serviceman, from time to time fighting the discount houses that cause financial ruin to independent operators.

Back to the Eastern Conference: For some reason or another, after a successful symposium, the locals seemed to cool toward NESDA and it went out of existence some time later.

As it looks now, the success of the scheduled August NATESA/NEA merger meeting appears anything but promising. There are two barriers that must be removed before a meaningful negotiation can begin. (1) The NEA people must abandon any idea that Mr. Moch has no place in the new association. (2) Mr. Moch must realize that no mortal man is indispensable. If past performances mean anything, neither side is ready to lower the barriers, as mentioned, so long as the same personnel run the respective organizations.

It is unfortunate that Mr. Moch has been tying up his personal fortune (finances) with NATESA. This writer has no way of knowing the amount, but it must be considerable. His adversaries often accuse him of using some of his own funds to operate the association so that he can control same. Such accusation is unfair, for he has little to gain and everything to lose should the association fold.

Regardless of the method or man-
continued on page 66

Announcing the first annual Zenith components and accessories warehouse sale.



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JESUP Project Gets Applause From Attending Technicians

JESUP, the "Joint Electronic Service Upgrading Program," got its first test at the Indianapolis Stouffers Inn, March 19-20, 1973.

While the 10 participating manufacturers (Admiral, Sony, Sylvania, Philco-Ford, General Electric, Zenith, Panasonic, Magnavox, RCA Corp. and Motorola) haven't as yet concluded their evaluation; the attending independent service technicians expressed mostly praise for the idea.



Les Nesvik, CET, leads a special session that discussed "the service call," providing hints on using a professional approach on calls.

According to Ron Crow, CET, who was in charge of technical evaluation and curriculum: "The individual classes at each manufacturer's training booth varied between 6 students and 20. In the future we would not be afraid to take classes as large as 30 technicians at a set-up, even though smaller numbers allow the trainer to give more personal help to the technicians, which has its benefits too."



At the Sylvania set up, Jack Berquist, Sylvania's training specialist, shows some of the technicians how to service color-TV receivers.

Instructors for the four general sessions, which all the technicians attended simultaneously, were all Certified Electronic Technicians. They were:

- J. A. Wilson—Kent State University, Warren, Ohio
- Les Nesvik—Service Manager, Wholesale TV, Indianapolis, Ind.
- Buzz Padgett—Bench Technician, Wholesale TV, Indianapolis, Ind.
- O. C. Brown—O. C. Brown TV, Jeffersonville, Ind.
- Charles Cave—Ahrens Trade School, Louisville, Ky.
- Frank J. Teskey—R.E.T.S. Electronics School, Indianapolis, Ind.

The purpose of JESUP is to give technicians an opportunity to learn new product information about all the major brands. At the same time, they are exposed to lectures from association trade technicians and college personnel on general troubleshooting theory and procedures.

Of the 175 people participating in the Indianapolis school, 130 were practicing technicians, electronics instructors or students. This number was less than the 200 quota originally set by the all-industry committee.

Forest H. Belt—Forest H. Belt and Associates, Noblesville, Ind.

Dick Glass, CET, Executive Vice President of NEA, and Coordinator of the Pilot JESUP School, made the following observations:

1. Student/technician reaction to the pilot training school was outstanding.
2. While many changes will be made in future JESUP Schools, as a result of the evaluation of this first school, the concept (which was based on two years of combined study by various trade groups) appears to be the correct approach to supplementing manufacturers' individual training programs, and increasing the capabilities of the country's independent electronic service technicians who do over 90 percent of the electronic repair work.
3. The attending technicians were subjected to as much as 11 hours of study on the first day of the school, yet the most often heard suggestion was that both students and trainers needed *more time!*
4. Only a few of the technician attendees, when questioned, indicated they had attended more than one or two manufacturer/distributor one-brand training sessions during the past year. The 10 brand aspect of the JESUP Program seemed to be the most appealing part of the school to attendees.



Andy Murnick of Philco-Ford uses a chassis that he can switch-in simulated troubles with.



During the JESUP School lunches, technicians, instructors, factory reps and students found time to exchange ideas and information.

The second JESUP Project is scheduled to be conducted in St. Louis, Mo., on May 22-23, 1973. Those interested in this project should contact Vince Lutz, CET, 1546 Sells Ave., St. Louis, Mo. 63147, phone (314) 381-9944.

RCA Canadian Subsidiary Designing Inexpensive TV Satellite Receivers

RCA Corp. has announced that its Canadian subsidiary, RCA Ltd., has received a \$2 million contract to design a key earth station for the first satellite relay of TV directly to small village receivers.

The experiment in India calls for educational TV programs transmitted by the RCA-designed station to be relayed through a satellite to inexpensive receivers located in several hundred settlements throughout the country. It could be in operation by mid-1974.

The earth station will originate programs carrying every-

thing from birth control information to instructions on how to plant and cultivate crops. The programs will be received by the village stations and shown on TV sets located in community centers.

Besides designing the earth station, RCA will supply most of the high-technology subsystems for the facility, and will provide technical assistance and personnel training for operation and maintenance crews. The contract was signed with the government of India, with financial assistance from the Canadian International Development Agency.

The spacecraft to be used for the experiment is the United States' ATS-F communications satellite, which is due to be launched by NASA in mid-1974. ATS-F is an applications technology satellite capable of beaming a more powerful and more highly focused TV signal than present communications satellites.

Several hundred villages will be equipped with special TV receiving stations, designed to pick up signals relayed directly from the ATS-F satellite. Each receiving station will cost \$500. It will consist of a "dish" antenna, approximately 8 to 10 ft in diameter, along with the electronics necessary to convert and amplify the signal for regular TV sets located in community centers.

Mr. I. A. Mayson, Vice President of the Government and Commercial Systems Div., RCT Ltd., says that the project "has been widely discussed in national forums, including the United Nations, and it is regarded as an important pilot test of procedures and programs which could vastly accelerate the advance of national communications systems in the world."

Colorado Professional Electronics Assn. Passes Resolution Concerning Merger

WHEREAS,

both NEA and NATESA's general membership voted at their conventions in 1972 in New Orleans that there shall be a merger, and

WHEREAS,

the NEA Board of Directors in October in Omaha and again in January at Phoenix reaffirmed NEA's efforts toward merger, and

WHEREAS,

the NATESA Executive Council chose to ignore at their fall meeting the progress of the Merger Committee, even though they were given a copy of the NEA resolution made by the NEA Board in October and

WHEREAS,

the Executive Director of NATESA failed to attend the Merger Subcommittee meeting in December, and

WHEREAS,

the officers of NATESA chose to have the January Subcommittee meeting in Kansas City postponed, and

WHEREAS,

the NATESA Executive Director and the NATESA President refused to attend the Atlanta Merger Subcommittee meeting in March,

BE IT RESOLVED,

that the Colorado Professional Electronics Association does support the merger movement and is in favor of one unified National Electronics Service Association. If this is not possible, however, the Colorado Professional Electronics Association does wholeheartedly support the National Electronic Associations and it's positive and aggressive programs and does hereby reaffirm its affiliation with the National Electronics Associations.

The above resolution passed unanimously at the CPEA Board of Directors meeting, March 17, 1973.

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NEWS...

continued from page 17

TESA Wisconsin Announces Plans for June Convention

TESA Milwaukee, host chapter for the 14th annual convention of TESA Wisconsin, has announced plans for a gala affair on the week end of June 9th and 10th.

Jerry Hall, past NATESA president and chairman of the convention, expressed optimistic confidence for a record breaking attendance. The theme of the meeting is "New Dimensions in Service," and one of the new dimensions is that all servicers, NEA members, CETs, as well as the regular members of TESA Wisconsin, are invited.

Arrangements have been made to conduct a CET exam on Saturday, June 9th, any time after 8:30 AM. Seminars will be presented on "Interior design and remodeling," and "Service productivity and profits." The latter will be presented by well known NARDA member, Dean Ridgely, of Green Bay, Wisc. Dean has also been a member of TESA Wisconsin for many years.

Room reservations should be made directly to the Ramada at North 12, West 26500 Golf Rd., Pewaukee, Wisc. 53072, (414) 547-0201. Reservations cannot be guaranteed after May 19th, and a deposit is requested.

Convention registrations should be made to Mrs. Hazel Horst, 2521 E. Park Place, Milwaukee, Wisc. 53211, (414) 962-4260. The fee is \$15.00 per person and covers all meals and activities. Registrations received prior to May 19th will qualify for a drawing to win a free "Whirlaway Weekend Special" at the Ramada.

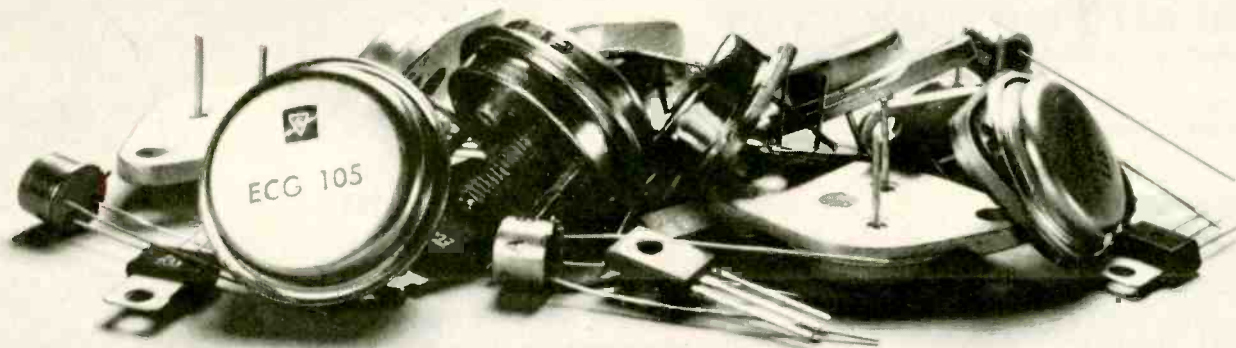


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AD149-02	121	QP-10	179
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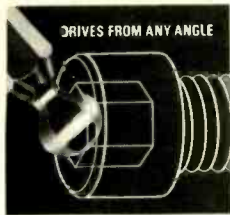
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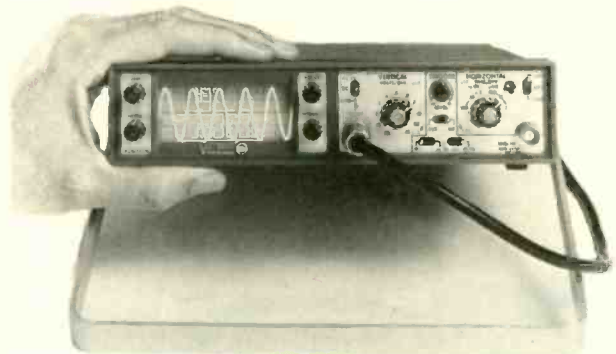
A line of Allen hex type screwdrivers and interchangeable blades is introduced with an unusual "ballpoint" tip design that reportedly achieves a speed and ease in engaging and turning that is unattainable with conventional drivers. The tools are said to work at any angle, thus being able to handle hex socket screws that, because of obstructions, cannot be reached straight-on. Nine sizes—from .050 in. through 3/16 in.—are available. Xcelite Incorporated.



OSCILLOSCOPE 701

Mini-portable unit providing dc-20MHz wide-band operation

The Model PS910A scope is designed to extend the feasibility of on-site service and maintenance by providing dc-20MHz wide-band operation in a miniature, line or battery operated instrument. Up to 5 hr of operation can reportedly be obtained from the nickel-cadmium batteries. Other manufacturer specifications include: Risetime, 18ns; Vertical Sensitivity, 10mv/div; Time Base, 100ns/div to 100ns/div; Trigger, internal or external with automatic or manual level and slope selection; CRT Gradient, 4 × 10 div with 1/4-in. divisions. The instrument measures 1 3/4 in. H by 8 1/2 in. W by 12 in. D and weighs 7 lb. Vu-Data Corp.



PICTURE-TUBE TESTER 702

Checks three color guns simultaneously

A "three-meter" picture-tube tester, Model WT-333A, is designed to simultaneously test the three guns of a color tube on three separate meters for emission quality, emission tracking under varying voltage conditions, and internal shorts and leakage. Under continuous monitoring, even a short term intermittent condition in a gun can reportedly be detected instantly, eliminating the need to remember or record separate gun readings to determine the emission ratios (tracking) between the red, green and blue guns of a picture tube. Housed in a high-impact blue plastic case, the tester is supplied with most popular sockets, plus four tube-socket adapters designed to cover more than 90 percent of the picture tubes currently used. RCA Electronic Components.



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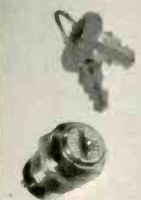
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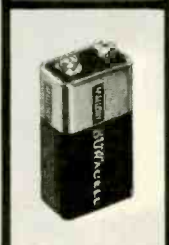
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TEKLAB REPORT

Introducing General Electric's Modular MA Color-TV Chassis

by Joseph Zauhar

This chassis offers plugability features for maximum service accessibility

■ Many color-TV manufacturers are making great efforts to simplify the troubleshooting and servicing of their color-TV sets. In fact, the color-TV set featured in this article, manufactured by General Electric, was designed with the help of field-service technicians. The TV set was then given a high rating for accessibility and serviceability by an independent service review panel using the NEA (Na-

tional Electronic Association, Inc.) rating form for the all solid-state color-TV modular chassis.

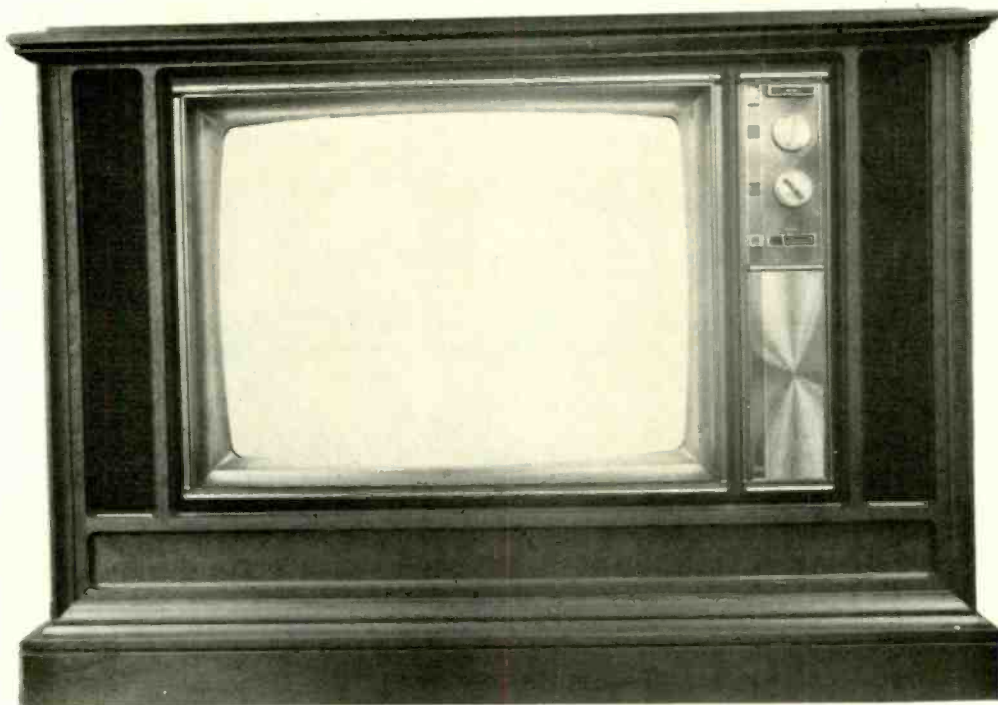
We received for lab purposes a General Electric color-TV set, Model MA9002WD, employing the MA chassis. This chassis is presently used in their new line of 25-in. (measured diagonally) receivers and is completely solid-state, except for the picture tube. It has been designed to provide maxi-

imum serviceability by employing 10 plug-in modules, plus numerous interconnecting cable plugs and instruction labels provided with the set.

Approximately 66 percent of the TV set's electrical components are located on the 10 plug-in modules. These modules, plus 17 major components and five plug-in assemblies, can be removed without using a soldering iron, leaving only 41 minor components that require solder. According to the manufacturer, approximately 95 percent of the 899 electrical components in this TV set are in effect modularized.

The modules permit practically all of the servicing required to be done in the home. *However, if module replacement might involve a delay to the customer in a remote area, all of the modules are designed with full circuit-board markings and component identifications to permit conventional servicing where this approach is preferable! Too many other manufacturers attempt to prevent this dual approach to servicing.*

When viewing the TV



General Electric's Model MA900WD color-TV set employing the 25MA chassis.

set from its front, the controls appear essentially the same as on the KE-II chassis assembly. They include the One Touch Auto button, push-push ON/OFF switch and sliding VOLUME control. However, the plastic frame has been designed to accept a 70-position detent UHF tuner assembly. The UHF channels can now be selected as easily as a VHF channel.

The secondary controls which include the VERTICAL, BRIGHTNESS, CONTRAST, COLOR, TINT LOCK, and TINT are mounted on a hide-away tilt-out panel. This complete bin assembly can be removed from the front of the cabinet by simply removing four screws and disconnecting six plugs.

Upon removing the back cover by removing two screws and turning four clips, the "U" shaped modular chassis really caught our eye. It is laid out in a clean uncluttered, compact fashion, with the test points on the modules being very accessible.

Nine of the modules plug in, and eight of these modules consist of plug-in circuit boards. Each of these eight boards has a

receptacle on one edge which matches a plug on the master board, and slide into place on a plastic guide. Each track has a retaining nib at its outer end to hold the module in place. To remove a modular board, one need only grasp the edge of the board with the fingers of both hands and pull straight away from the chassis.

The ninth board plugs in, but in a different manner. This 23v regulator module is mounted on top of the power supply chassis and consists of a circuit board inside a "U" shaped heat sink.

There are a number of other important features on this chassis to simplify component removal and servicing: Major sub-assemblies, such as the high voltage system and the main power supply, are quickly detachable from the main chassis and may be completely disconnected by unplugging. Also, the high-voltage transformer and high-voltage tripler are of plug-in design and no soldering is required for their replacement.

There will no longer be the need for the old

grounded screwdriver spark-gap method of checking for the presence of high voltage (a technique which can prove disastrous to some solid-state circuitry). This chassis contains a built-in neon high-voltage indicator that

is visible from the rear of the high-voltage compartment. The indicator glows when high voltage is present, thus providing an instant check.

Other high-serviceability features include: A picture-tube socket that can be replaced by disconnecting seven plugs and removing the socket from the end of the picture tube; the VHF and UHF pilot lights which can be changed by removing a screw and grasping a small metal handle to remove both bulb and bracket; and plugs on the interconnecting cable that are designed so that they can be plugged in only one way.

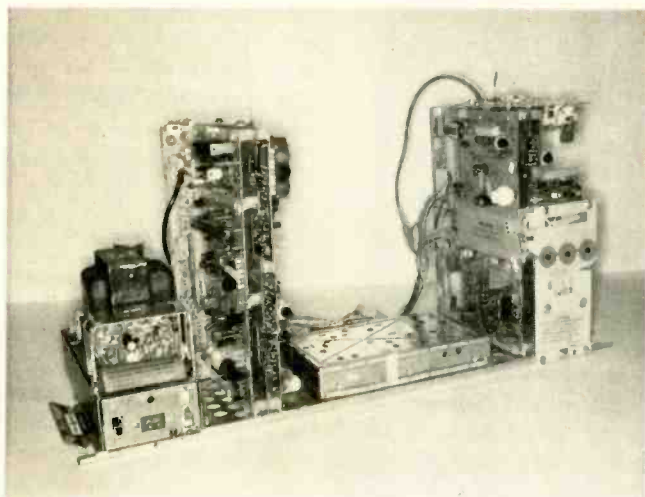
As we review some of the important new circuits employed in the "MA" chassis, they can be followed in this month's Tek-fax schematic No. 1469.

One Touch Color System

The improved "One Touch" control circuit has two switch positions, MANUAL and AUTOMATIC, as in previous TV receivers. In this chassis the AUTOMATIC position limits the ranges of the TINT and COLOR controls so that the customer always gets a reasonably good color pic-



The control panel is essentially the same as on the KE-II chassis assembly. However, the plastic frame is now designed to accept a seventy position detent UHF tuner assembly. The secondary controls are mounted on the tilt-out panel.



The modular solid-state 25MA chassis is laid out in a clean uncluttered "U" shaped design.



Approximately 66 percent of the set's total electrical components are found on these 10 plug-in modules.

ture when he pushes the AUTO button. In this position, the button is illuminated with a neon indicator.

Power Supply

The power supply assembly is located on a sub-chassis which is easily removed by disconnecting four plugs and two screws from the chassis lip. This assembly contains the power transformer, main filter capacitors, and the Insta-Color stand-by filament transformer. It also accepts the plug-in Low-Voltage Regulator Module, which includes the main power-supply diodes.

The power-supply provides five dc voltages and two ac voltages. The secondary winding on transformer T1201 normally provides the 6.3v ac for the picture-tube filament; while in the "Insta-Color" position the 4.0v ac for the picture-tube filament is provided by the secondary of the standby filament transformer, T1202.

A full-wave bridge rectifier, filtered by capacitor C1702A, produces the 160v dc for the high-voltage regulator B+. The voltage between Pin 9 and ground is half wave rectified by diode Y908 and

filtered by capacitors C1202 and C1203 in conjunction with resistor R1202, which produces the -34v for the vertical module. The center tapped voltage at Pins 4 and 6 are full wave rectified by diodes Y905 and Y906, and filtered by capacitor C1206A and resistor R2106 to supply 22v to the audio module. The voltage from Pin 8 to ground is half wave rectified by diode Y907 and filtered by capacitors C1204 and C1205, and resistor R1204 to provide the 13v for the vertical circuit. The 22v rectified voltage from diodes Y905 and Y906 is regulated in a conventional manner and supplies several points in the chassis.

A dc voltage is fed to the filament winding of transformer T1202 to elevate the picture-tube filament voltage to minimize filament-to-cathode breakdown.

A 2.5a Slo-Blo fuse, F1201, in the primary of the power transformer protects the entire receiver while a 1/2a fuse, F1202, protects the primary of the standby filament transformer T1202. The high-voltage section is protected

by circuit breaker CB1200.

VHF Tuner

The wafer-switch type VHF tuner used in this chassis employs three transistors and is similar to the one used in the "J" General Electric chassis, although the external connections are different.

A MOSFET is used for the RF amplifier and NPN bipolar transistors are used in the oscillator and mixer stages. The impedance of the VHF input terminal is 75Ω. By using shielded cable between the antenna terminals and the tuner input, co-channel or harmonic interference on cable systems is minimized.

Video IF Module

The Video IF module contains the Video IF Amplifier, AGC Keyer and Delay, Video Detector, Video Emitter Follower, 41.25 MHz IF Amplifier, 4.5 MHz Detector and AFC Discriminator. The input circuit used in this module differs from the conventional type in that it is designed to enable the replacement of the tuner or IF module without the need for alignment.

In this chassis the out-

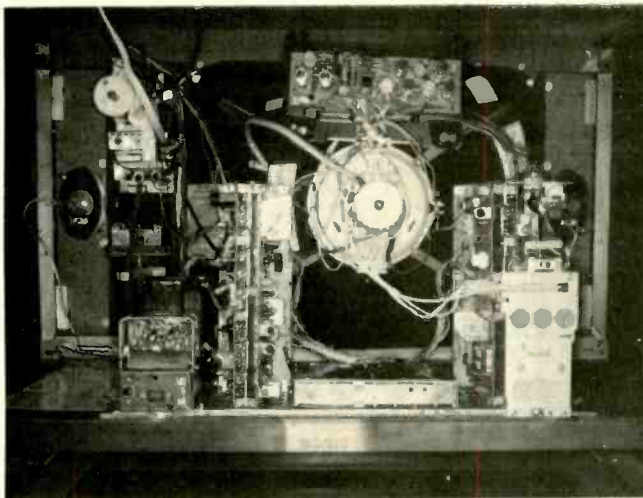
put of the tuner is a single broadly tuned circuit which has negligible effect on the IF response. The IF signal from the tuner is delivered through the link cable to the first IF amplifier input of IC201. The input impedance of this stage is essentially constant at 75Ω. The selectivity usually provided by the conventional link circuit is now furnished by the tuned circuit consisting of coils L201, L223, L224 and two traps.

The IF module is completely shielded in a rugged metal enclosure and can be removed without the aid of a soldering iron.

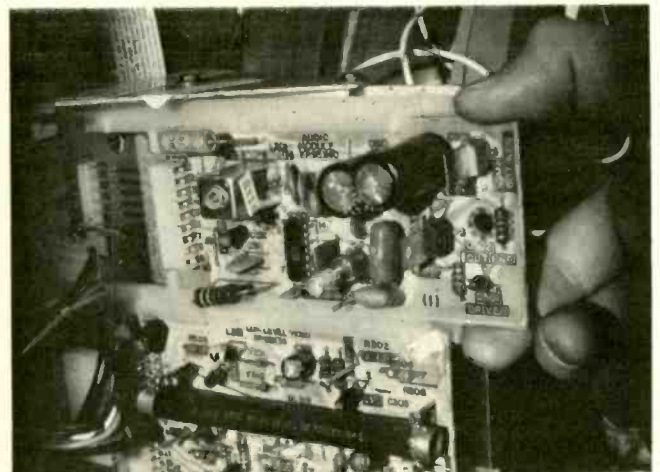
Video Low-Level Module

The circuits employed in this module perform the following functions: Low-level video amplification impedance matching to the delay line, video reference shift and picture-tube beam limiting.

Class A amplifier transistor Q301 provides isolation from the video IF module, along with impedance matching to the input of delay line DL301. The CONTRAST control adjusts the video output from transistor Q302 before it is fed to Class A amplifier



Rear view of the color-TV set with the back cover removed showing the service controls.



Eight of the modules are plug-in circuit boards. Each of these boards has a receptacle on one edge which matches a plug on the master board, and slides into place on plastic tracks.

transistor Q303. The video signal is then coupled to video reference shift amplifier transistor Q304. In this stage the vertical and horizontal blanking pulses are coupled through diodes Y303 and Y304 to the base of that transistor. These blanking pulses are superimposed on the video signal appearing at the collector of transistor Q304. Since the video on the base of Q304 is clamped, the same is true of the collector signal. Therefore, during the horizontal and vertical blanking pulse intervals, a blanking pulse is present in the signal at the collector. These pulses exceed the reference level established by the clamped video on the base of Q304 by approximately 3v. This added pulse voltage there-

fore forward biases diode Y305, whose conduction establishes a new reference level for the video signal. This circuit simplifies customer adjustment of the BRIGHTNESS control, which in a 100 percent dc restored receiver may be difficult for the customer to understand and adjust properly.

The purpose of the CRT beam limiter is to establish a limit of CRT beam current under extreme customer misadjustment so that it does not exceed the rating of the CRT.

Horizontal pulses, having a magnitude directly proportional to CRT beam-current, appear across the parallel combination of capacitor C1703 and resistor R1703 in the ground return of the high-

voltage multiplier, HVM 1600. These pulses are delivered to the video Low-Level module and processed by a voltage doubler—capacitor C341 and diodes Y340 and Y341. The resulting dc potential appearing across capacitor C342 and the CRT beam limiter control network, R340 and R341, is a function of CRT beam current.

Zener diode Y346 is employed as a threshold element. BEAM LIMITER control R340 is adjusted so that zener diode conduction is reached when the CRT beam current reaches 1.7ma. Transistor Q306, acting as an emitter follower, provides a very high input load impedance, which prevents the voltage developed across capacitor C342 from being appreciably influenced

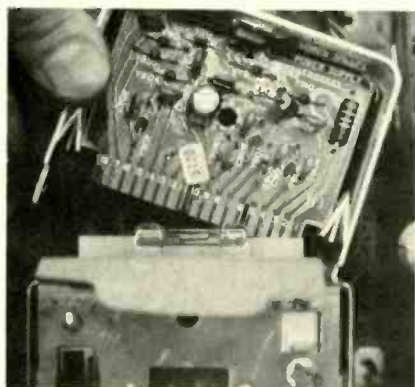
by loading after zener conduction is reached.

Chroma Module

The Chroma module is a complete chroma system in one module, which receives its input signal from the emitter-follower output of the video IF module. The chroma module contains two integrated circuits. One, IC601, contains a chroma-bandpass amplifier, a reference oscillator, an ACC circuit and a color killer. The other, IC602, contains a chroma demodulator, a color summing matrix and three output amplifier stages.

RGB Module

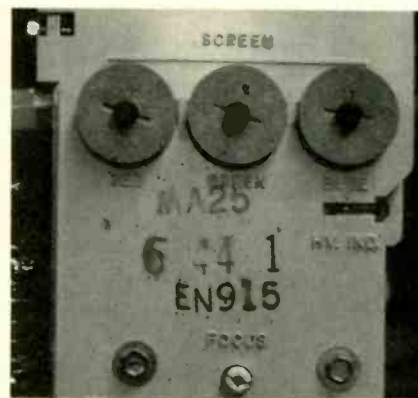
In addition to providing a linear composite video signal to drive the picture tube to full output, the



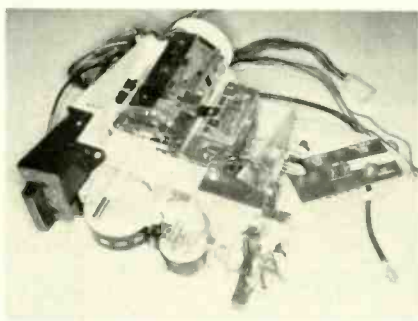
The 23v regulator module plugs in, but in a different manner, on the top of the power-supply chassis. The circuit board is inside a "U" shaped heat sink and includes all of the power supply diodes.



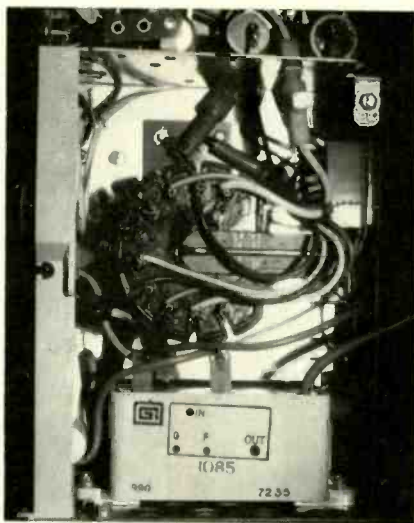
Provisions are made to accept a 75Ω coaxial cable antenna system. A 300Ω VHF input is provided via a 75Ω-to-300Ω balun, which is connected by means of a shorting link.



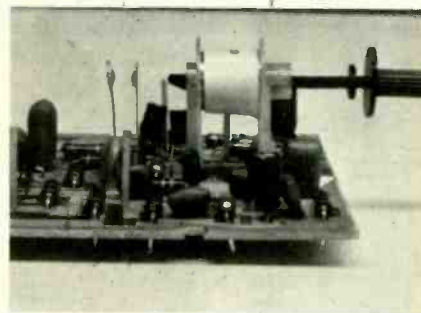
This chassis features a high-voltage indicator light which glows when high voltage is present. The neon bulb is located below the BLUE SCREEN control and eliminates using a meter to check for the presence of high voltage.



After removing the knobs, the entire tuner package is removed from the cabinet by removing six screws and disconnecting four plugs.



The plug-in high-voltage transformer and high-voltage tripler eliminates the need for soldering, enabling more service work to be done in the home.



When the HORIZONTAL-HOLD shaft is pushed in, a shorting switch is activated, killing the sync signal and causing the picture to float for a more accurate HORIZONTAL HOLD adjustment.

RGB module also matrixes the luminance signal with the color difference signals, while maintaining the dc reference level.

The positive output of the Video Low-Level module is ac coupled through capacitor C314 to the RGB module. Consequently, dc voltage variations, component tolerances and thermal changes are not coupled through the RGB module to the picture tube.

Basically, the RGB amplifiers consist of individual transistor amplifiers—Q403, Q405, Q407—connected in a common-base configuration, one for each color signal. Inputs to each of the three amplifiers are direct coupled from the emitter-follower stages, transistors Q402, Q404, Q406. These stages are essentially in parallel to the luminance signal, which is ac coupled to the base element of each emitter. The BRIGHTNESS control on the Video Low-

Level module is coupled through diodes and isolation resistors to the base elements of the same emitter followers.

This module provides a linear composite video signal, clamped or referenced to a dc potential during the horizontal retrace to the picture-tube cathodes. When the TV-set viewer changes the dc reference potential, it produces a net change in the picture tube bias, causing a change in the displayed brightness. This dc BRIGHTNESS control voltage must pass through the RED, GREEN and BLUE DRIVE controls to obtain grey scale tracking.

R-Y, B-Y and G-Y signal voltages from the color demodulators are ac coupled to the bases of their respective emitter-follower stages, which places the color signal input to each stage in parallel with the luminance signal input. Matrixing of the R-Y and Y signals is ac-

complished in the linear passive network—consisting of capacitors C401 and C403, and resistors R409 and R410 on the RGB module, plus resistor R647 on the Chroma module.

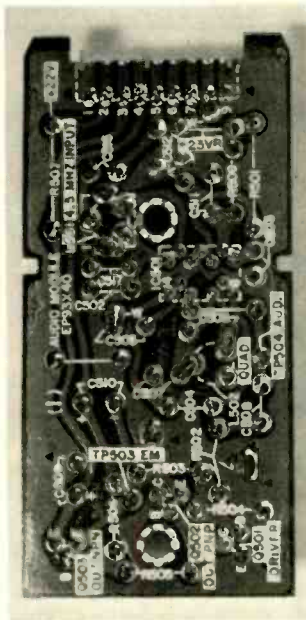
High-Voltage Regulation Circuit

High-voltage regulation is accomplished by the dc voltage supplied to the horizontal-output stage, and a conventional transistorized voltage regulator is supplied with 160v from the power supply. The regulated 130v supply is delivered to the horizontal output stage, and the regulated voltage is adjusted to produce 26.5kv at the picture tube anode with the BRIGHTNESS and CONTRAST controls set at minimum. Depending upon picture-tube requirements, the regulated B+ voltage can be between 120v and 140v to produce the 26.5kv for the picture tube requirements.

A unique protection device is used in this chassis to prevent X-ray radiation and protect the circuitry from excessive voltage on the B+ regulated line or failure of the regulator circuit. If the regulated line voltage exceeds 150v, an SCR is triggered to short circuit the power supply and open the circuit breaker, causing it to remain open until the faulty condition is repaired.

Horizontal-Output Circuit

The horizontal-output transistor, Q1701, and damper diode, Y1602, employed in this chassis provide switching to the horizontal yoke windings, which are in a conventional configuration. The collector voltage of transistor Q1701 is the regulated 130v from the low-voltage power supply and is in effect the high-voltage regulator adjusted by the HIGH VOLTAGE ADJUST control, *continued on page 56*

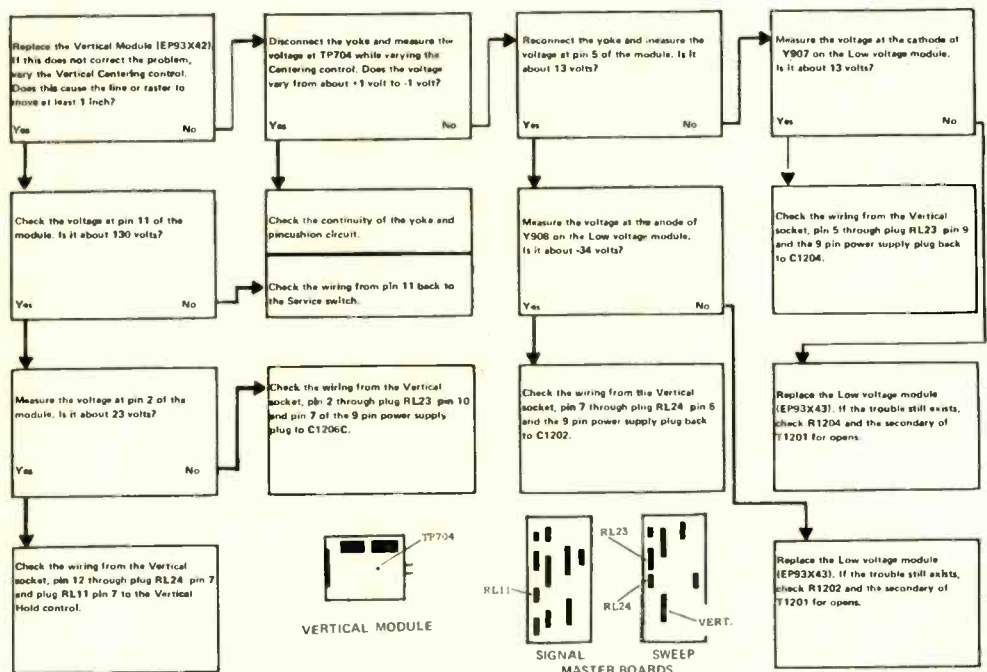


The copper pattern side of all modules—as illustrated by this sound module—employs silk-screen printing to identify all components, test points, functions and key voltages.

INSUFFICIENT OR NO VERTICAL SWEEP

CAUTION: DO NOT REMOVE OR INSERT MODULES OR PLUGS WITH POWER APPLIED

CHART 11



For fast diagnosis of chassis problems, an in-home service troubleshooting chart is provided with the service literature.



J. Nick Adams, CET (left)—author of this article—is the Parts and Service Manager at Couch's Inc. Charles R. Couch, Jr., CET (right)—owner of Couch's Inc.—is President of the National Electronic Associations, Inc.

A Shop Built for Thieves by J. Nick Adams, CET

When Couch's Inc. began planning new quarters, the crime history of the past 36 months was a major factor in the considerations

■ The planning of a new building for a business organization is an awesome task. There are literally thousands of details and decisions—from carpet to roof. Cost and efficiency must constantly be considered as limiting factors, based on the requirements of the business. But equally important was the crime history of the past 36 months! Almost a dozen break-ins [as described in the article "Smash and Snatch" beginning on page 43 of the September 1972 issue of *ELECTRONIC TECHNICIAN/DEALER*] gave owner Charles R. Couch, Jr., plenty of food for thought—along with some additional gray hair and rapidly rising insurance rates.

Mr. Couch realized that he needed an attractive building for the display of brown goods. He also needed an efficient layout to make use of every

foot of enclosed space, with the whole arrangement as burglar proof as possible. The building was designed around these factors.

There is probably no system which offers perfect protection—and very few service dealers can afford to post armed guards every 10 ft. However, the integrated system described in this article strikes an excellent balance between cost and protection.

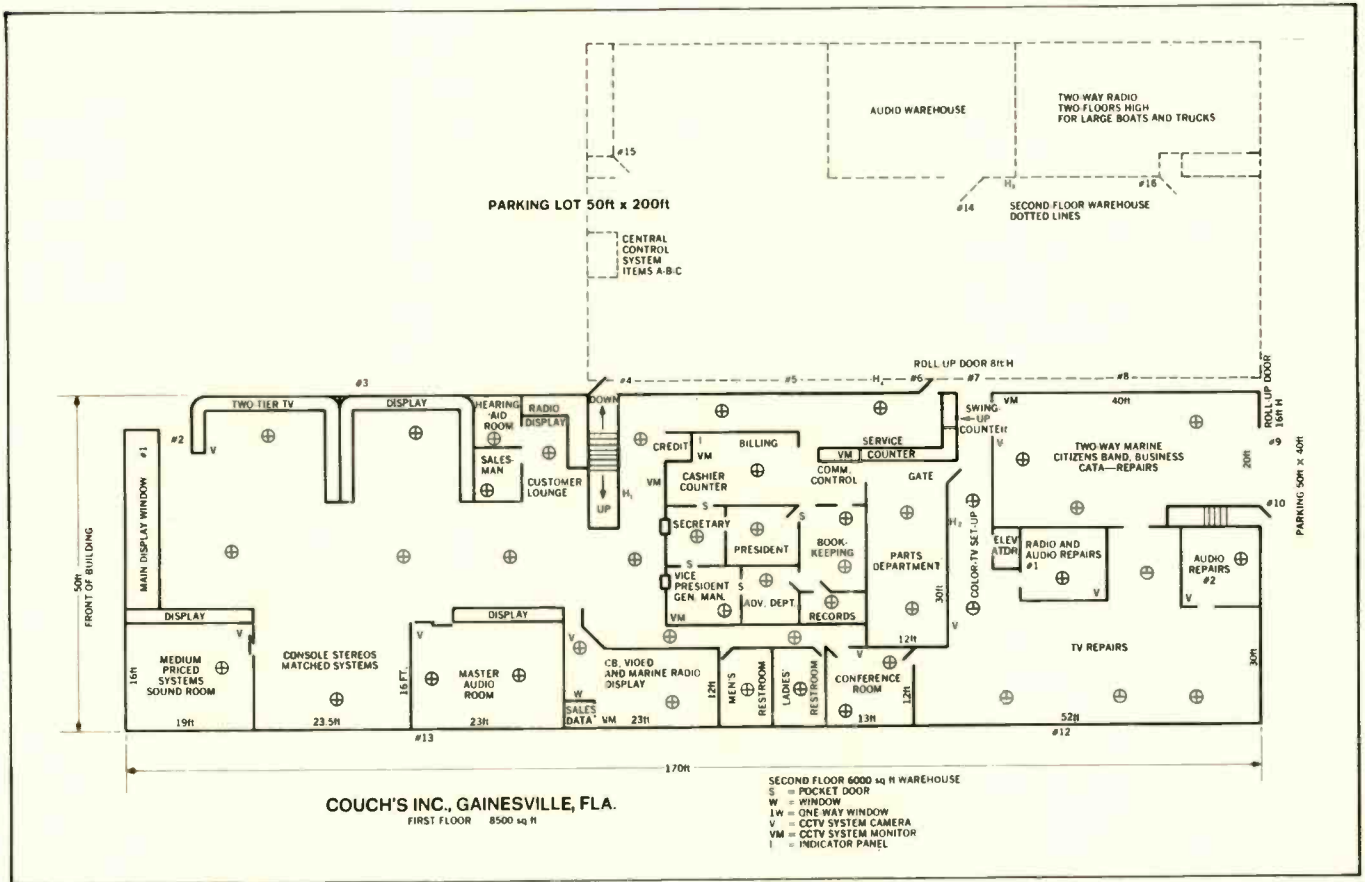
The front glass area is minimal, as shown in the photograph of the building. These are the only windows in the building. The front and service-entrance doors, along with the windows, are of Laxan plastic, rather than glass. This product of the space age is nearly unbreakable; and according to specifications, it will withstand pounding, cutting and the occasional hurled brick. While

its initial cost is higher than glass, it will reduce insurance costs considerably.

The burglar protection and alarm warning system was designed for simple operation, with all functions monitored at a central status panel. Experience with the prototype of this system indicated that if something went wrong, a major problem was locating the trouble area. An indicator panel solves this problem handily. Lights give a quick status on continuity, door opened or closed, etc.

Switch-over to an internal power source gives additional protection in case of ac interruption. This function is automatic.

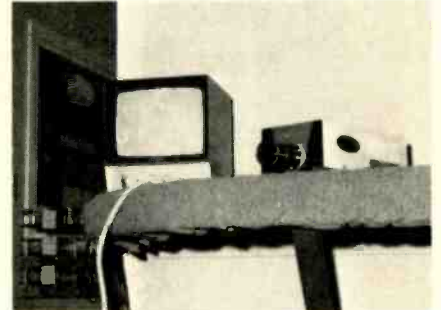
Pressure switches trigger the audible alarm and alert the police station if someone attempts to break or otherwise tamper with the windows.



Front view of the nearly completed building shows the minimal window area.



This vast expanse of roof is completely protected by pressure switches underneath.



Typical closed-circuit camera and monitor.

This audible alarm has saved Couch's on a previous occasion [as reported in the November 1972 issue of *ELECTRONIC TECHNICIAN/DEALER*].

The noise is provided by a pre-recorded tape feeding through a PA amplifier. A wide-angle dispersion horn speaker is mounted high above the building, with monitor speakers at several inside locations (refer to diagram).

The effectiveness of the alarm system dictated that it be installed during the construction of the building, not just added when everything else was finished. While under construction, Couch's employees

worked closely with the architect and contractor to install various portions of the system as the building went up.

The walls of the building contain approximately 6000 ft of wire (Belden 8484 was used). This continuity wire is interlaced throughout the construction, and there is scarcely a chance that a hole could be opened without breaking the wire and triggering the alarm. Naturally, latching relays are used. Once the alarm sounds, they must be reset. A simple reconnection of the broken wire is not enough.

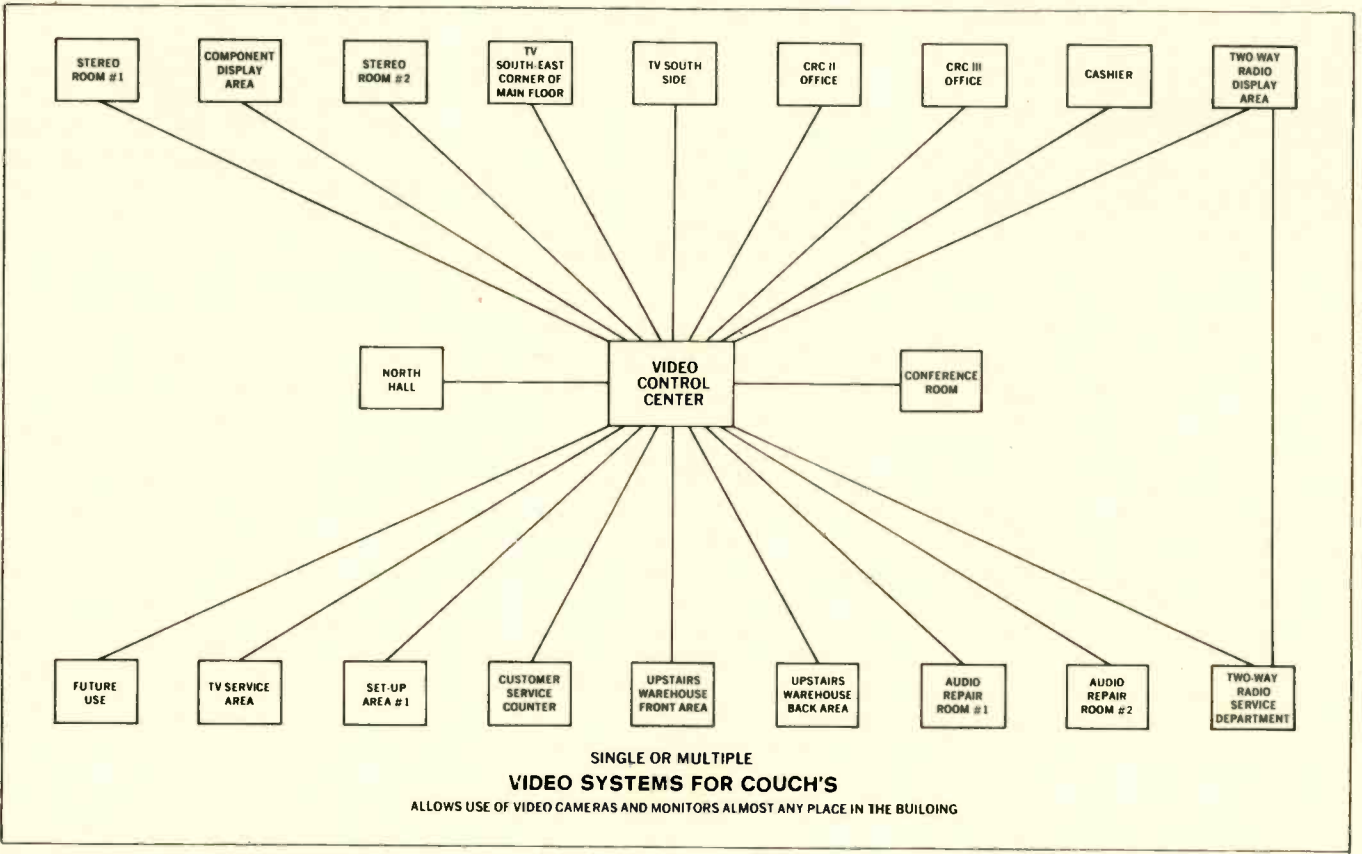
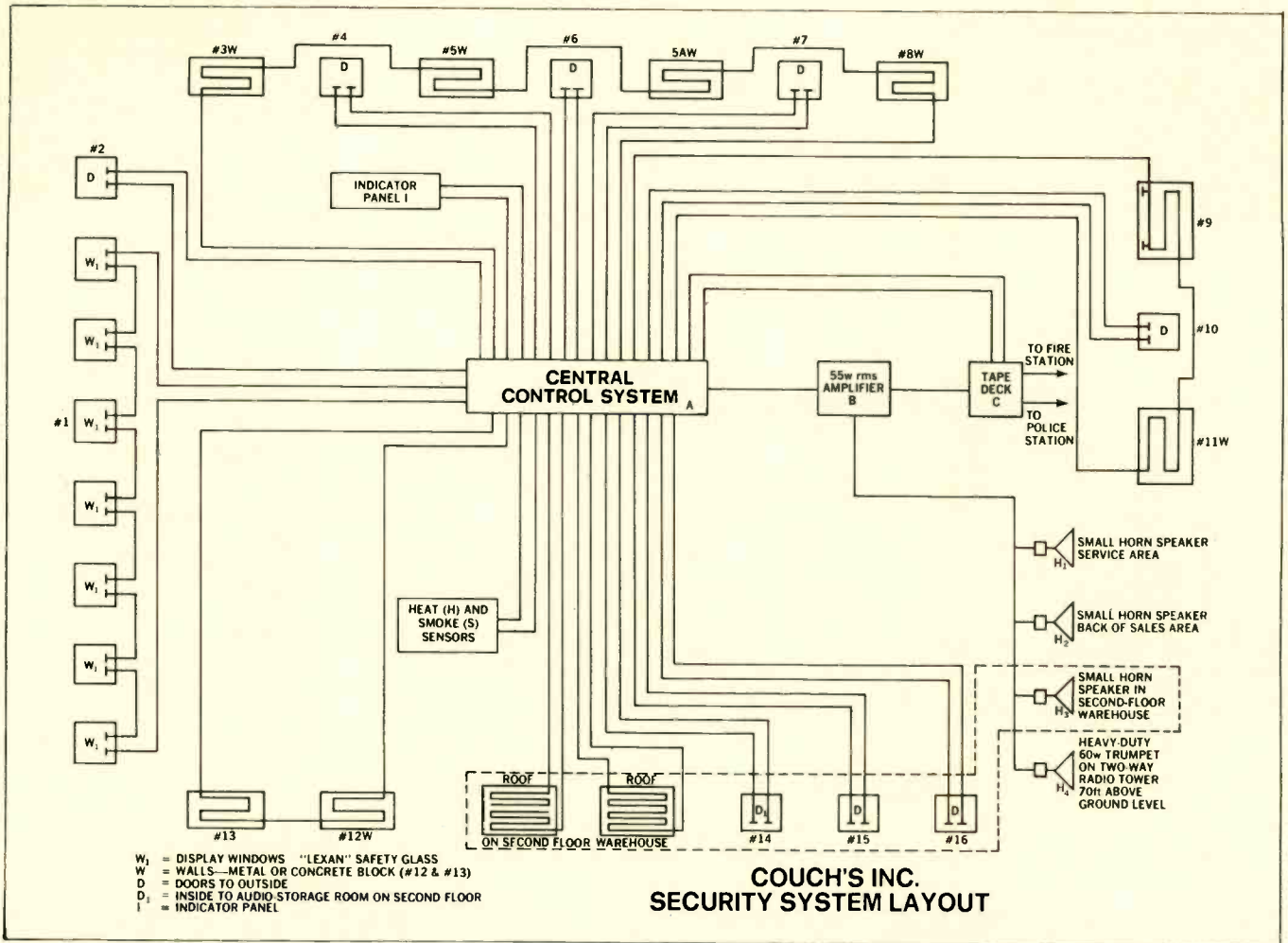
Just below the metal roof, a network of 2-in. mesh screen wire

blocks any possible entry from above. Even slight pressure on the wire trips the alarm.

All doors have two sets of magnetic switches. One indicates if the door is ajar on the indicator panel. Another indicates entry with an audible gong, for use during working hours. At night, this switch provides continuity for the alarm system.

Smoke and heat sensors are also a part of the general alarm system. These sensors are strategically located and tied into the main status panel. There, a hook-up with the local fire department via a telephone line is contemplated.

Finally, provision has been made



Tuner Cover Booby Traps

by Bob Cook, CET

BEWARE! or one of these TV tuner-cover booby traps will get you if you don't watch out!

■ From the rash of missing tuner covers these days, one can imagine that more and more electronic technicians have fallen into one or more of the many typical tuner booby traps. But, leaving the tuner cover off the tuner is a poor solution to the problem. This will not only introduce stray radiation, but will fill the tuner with dirt, causing a worse intermittent problem than was present before the tuner was cleaned. Be forewarned of the problems that can happen and watch for them after every tuner cleaning job. (The Standard Kollsman tuners mentioned in this article can be identified by two criteria: they have green bar channel strips with adjustable contacts and the detent spring and roller are at the front of the tuner, on one side. The Sarkes Tarzian tuners have square channel strips that snap into a plastic wafer—which has a habit of breaking—and the contacts are not adjustable. The detent for these is on the back.)

Trap No. 1

Especially prevalent on Magnavox, Admiral and others using Sarkes Tarzian tuners.

You have carefully removed some of the channel strips, cleaned and adjusted the stator springs, lubed the contacts and replaced the cover. Now you mount the whole assembly back in the cabinet and fire the TV set up to see how beautifully it tunes, now with that good cleaning job you did on it.

The TV set warms up and you not only don't get a picture; but worse, you get a strange smell and smoke begins emerging from the back of the TV set. After pulling the whole assembly back out of the TV set, you find that in removing the cover with all of its slots, slides

and snap locks, you inadvertently bent one of the center tongues, and it shorted against a plate-resistor tie point.

If you caught it quickly enough (nearly impossible at this point), you may not have to replace the $\frac{1}{2}w$ resistor that found itself between 240v and ground. If you didn't catch it in time, you will have to remove most of the channel strips and replace the burned resistor.

My solution on these tuners is to carefully inspect the cover before replacing it on the tuner, and bending the tongues so that they are tight against the inside of the tuner mating surfaces. A few minutes spent on this stage may save a lot of time later. Result, no more two hour jobs after a 20 minute tuner cleaning.

Trap No. 2

Especially prevalent on RCA, Admiral, Magnavox, Philco-Ford and



Bob Cook, CET, is Treasurer of the International Society of Certified Electronic Technicians, as well as being the owner of Cook's Electronic Repair in Garden Grove, Calif.

others using Standard Kollsman tuners—also possible with Sarkes Tarzian tuners.

Be sure to check the UHF response after every tuner cleaning job. Here the problem is the rear corner of the cover on the side of the UHF input jack.

This corner is easily bent when removing the cover, and it doesn't have to be distorted much to hit the hot point of the UHF jack and short it out. The result will be a weak, snowy picture on the strongest UHF stations—much like a bad UHF tuner. In fact, one of the distributors told me they sell a lot of UHF tuners for this very reason, only to find later that the tuner was okay.

If you don't make a UHF check after you clean one of these tuners, you can be sure that you are going to get a call from your customer (if you have UHF in the area) accusing you of ruining their UHF tuner, because it was okay before you worked on the TV set. This call back hurts you in more ways than one. BEWARE!

Trap No. 3

This is one of the more insidious traps that occurs in Admiral, Magnavox and others using Standard Kollsman tuners.

You get a call on an intermittent sound and picture, and when you check the TV set, the tuner is so bad that you can't get a steady picture on any channel.

You give the customer an estimate for a tuner cleaning job and proceed with your usual method of cleaning the tuner. Upon completing the job you turn the TV set on to demonstrate how good a job you did for the customer, only to find that most channels have tunable

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The Picture Tube of the Future

by Vincent J. Lutz, CET



Vincent J. Lutz, CET, is editor of the **ELECTRONIC SERVICE INDUSTRY YEARBOOK**, Director of NEA Special Activities, and owner of Lutz TV Electronics in St. Louis, Mo.

How many of you remember way back about 22 years ago when everyone was "buzzing" about color television? CBS and RCA each had a "system" that they were trying to get the FCC to approve as "compatible," so that the approved system could be put into production and sold to the public. Any of you who had the opportunity to view both "systems," I am sure, could see the advantages of the RCA system that the FCC finally did approve. All of us who have been in the service business for some time have been working with color picture tubes since 1954 that use the internal pole piece gun. This type of picture tube has been the standard of the industry; and as we well know, uses dot trios and requires static and dynamic convergence. The deficiencies of this tube have been something that we all have learned to live with.

■ Lo and behold, we are told that 1973 will see a "break through" in picture tube design. The new tube will be lighter in weight, with a shorter neck and above all, will make the cost of a new color-TV set much cheaper. Added to these advantages is the fact that replacing a defective color-picture tube of the new style will involve little more work and set-up adjustments than black-and-white tube replacement.

There are four major manufacturers claiming that their picture tube is best, and another up-to-now unheard of tube maker also issuing claims of superiority. The four companies who will market this new version of a color-picture tube are: RCA; General Electric, Sony and Toshiba. The fifth entry into the "race" is David Sunstein, a Philadelphia engineer who developed the UNIRAY tube. As each of these tubes have major differences, requiring different circuitry (thus are not interchangeable), and as none of us has had a chance to make side by side comparisons; how may we establish a "standard?"

With the information available on each of the five tubes, an attempt shall be made to describe each of the color-picture tubes. Bear in mind that each of the companies claim that their product will afford radical

improvements in color reception, and will reduce the problems of the present-day CRTs.

RCA

The first one to be discussed will be the RCA precision in-line type. The screen consists of continuous vertical phosphors instead of the conventional dot trios. RCA claims that the line screen reduces the beam-to-phosphor mis-register and improves purity and "white" uniformity performance. The split-shaped shadow mask does not require as much reduction in the outer edges, as does the dot trio mask.

To further insure beam position accuracy, the grids are planar electrodes and the beams inside the gun mounts are made to travel parallel paths. The cathodes are electrically separated to allow cathode video drive using solid state red-, blue- and green-drive circuits.

The RCA deflection yoke is a PST (precision static toroid) type, which is a self-inherent convergence yoke. Thus convergence (RCA says) will be equivalent or superior to that of present day commercial TV sets, and will eliminate the need for dynamic convergence circuitry in the TV chassis. The PST yoke consists of plastic rings cemented to the ends of the core, the plastic

rings having precisely placed grooves, each holding but one turn of wire. These yokes are said to be more uniform in performance, with convergence variations being less than half that of those in saddle yokes. The new type yoke is smaller and less costly, using about 20 percent of the copper used in saddle yokes and weighing only about 1¼ lb. The PST yoke has an impedance suited for use with solid-state deflection circuits.

In this new RCA circuit, where purity and convergence are independent of the driving circuit, it becomes possible to "set-up and attach" the yoke permanently to the neck of the CRT at the tube manufacturing plant. The critical adjustments are made at the factory at the time the yoke is cemented in place and are good for the life of the CRT. It can be seen that with such a CRT, replacement will be no more difficult than that of a black-and-white CRT.

You may say: "Well, what if the CRT or the yoke goes bad? Is it necessary to replace both?" RCA's picture-tube warranty applies to both the tube and the yoke. So both will be replaced within the two-year warranty period in the event that either the tube or yoke fail. This will simplify servicing since much less

time is required to install this new RCA tube. The PST yoke has been designed to have excellent reliability by eliminating the normal failure modes associated with conventional saddle coils in the multiple solder connections. A simplified field replacement method is being developed for introduction after the two-year warranty period to replace a defective yoke on a good tube.

What are the advantages of the RCA in-line system? It is claimed that: Lines "nest" better than dots; the effects of geometric trio distortion can be eliminated; better beam-to-phosphor can be obtained; there is less effect by the earth's magnetic field; and chassis generated fields can be oriented and isolated for minimum effect. Additional advantages claimed by RCA are the fact that being about 2-in. shorter, it will make "styling" better for TV-set manufacturers. It will be a more uniform product, more reliable and cost less, thus providing lower original TV pricing and lower in-field servicing cost by eliminating the convergence adjustments. It will be lighter in weight, so easier to handle, and will have compatibility to solid-state circuits. Only 15-, 17-, and 19-in. versions will be made for the United States portable market. The 17- and 19-in. tubes will feature a black matrix screen to improve brightness and contrast. Black matrix guard bands separate the red, green and blue phosphor line triplets.

General Electric

General Electric has announced the second generation of its in-line color-picture tube. G.E. will not cement the yoke to the neck of the CRT. Purity and convergence (both dynamic and static) will be necessary when installing the G.E. tube, but the dynamic convergence adjustments have been reduced from 12 to only 4.

General Electric will use the vertical striped phosphor pattern, slotted mask, in-line gun structure and reflection-reducing black matrix background. The yoke is a multiple layer toroid type. The three beams are produced by three electron guns arranged side by side in a line.

Vertical oriented corrections will

not be necessary, but if raster size is incorrect, an adjustment can overcome this. Unlike RCA, which places the red beam between the green and the blue beams, G.E. places the green beam between the red and blue beams. G.E. engineers claim that this maximizes picture details and is responsible for eliminating the need for vertical adjustments. The manufacturer claims that its new in-line picture tube gives greater brightness, improved apparent picture detail, increased contrast, a reduction in vertical registration errors, improved color uniformity, lighter weight, and permits slimmer cabinet styling. At present, G.E. contemplates production of a 19-in. tube, but says that it is working to extend into larger screen sizes—up to 25-in. with a deflection angle of 110°.

Sony Trinitron

We have all had some experience with the Sony Trinitron. It too uses a vertical-striped phosphor screen, but does not use a slotted shadow mask. Instead of the vertical slots used by RCA and G.E., Sony uses an "aperture grill" or "open grill" that has continuous vertical spaces running the entire height of the grill. Because of these continuous lines and other complexities of the Trinitron, Sony spokesmen say their CRT gives a much brighter and sharper picture than other CRTs.

Toshiba

Toshiba, another Japanese manufacturer, has also announced the production of a vertical phosphor screen using a slotted mask and guns similar to the G.E. design described in this article. At the time of this writing, the details of the Toshiba yoke or method of convergence of their new CRT are not known by this author. It is mentioned only to show that the trend is to the in-line system of color picture tubes, and that there may be many different types on the market shortly.

UNIRAY

The UNIRAY tube developed by David Sunstein is not now being produced. Mr. Sunstein has stated

that if no major manufacturer will undertake the production of the tube, then he will go into the manufacturing business of the tube and a TV set that will use it.

The UNIRAY tube is said to use 300 (each) red, blue and green vertical phosphors on the face plate, and does not require the use of a shadow mask. Mr. Sunstein says that the shadow mask absorbs at least 80 percent of the beam current; so by eliminating the shadow mask, a brighter picture is obtained with considerably lower "high voltage" than any present color-TV set. A black matrix will occupy the space between each phosphor stripe, and a thin layer of aluminum is deposited over the entire phosphor area. Thus electrons can pass through the aluminum, but not light—all of which will be reflected through the front of the tube—giving a much brighter picture. (A feature also held in common with the other tubes described in this article.)

The UNIRAY tube is said to not require convergence or synchronizing circuits—part of the beam striking the phosphors being reflected back through a "window" in the back of the bell glass to accomplish the convergence and synchronization "job." No detailed circuitry or method of operation was given, so we will have to accept Mr. Sunstein's explanation. He does say that his CRT and circuitry will cut prices on color-TV sets from \$100.00 to \$150.00 per set.

Conclusion

To sum up the mechanical adjustments of the five CRTs, we can refer to the chart shown below.

Manufacturer	Dynamic Adjustments	Static Adjustments
RCA	none	none
General Electric	four	four
Toshiba	three	four
Sony	two	one
UNIRAY	unknown	unknown

The desire on the part of manufacturers to shorten the over-all length has not stopped. General Electric says they will go from 90° deflection to 110° and on to 114° CRTs. Sony already has a 114° 17-in. color tube on the market in

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signal—the signal resulting at its output (IC24-2) thus differing from the applied signal in both polarity and waveform.

As noted in the previous article, the flip-flop circuit contained in the portion of IC22 shown in the partial schematic has

two outputs (IC24-8&9) that are of opposite polarity and change state with every negative excursion of the output of Inverter B (IC24-2). During the 1 sec. that IC22-8 is negative, it allows the first circuit in the decade counter chain to function.

(This is the Gate—B signal shown in the December 1972 article.) During the 1 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 (IC24-12). Their resulting outputs are combined and observed as they occur at Terminal B. (The previous article went into detail concerning how these two signals were combined.)

Fig. 3 also shows the differentiated signal, resulting from that present at Terminal B, which is applied to the base of transistor Q2. As before, this transistor amplifies only the negative portion of the applied signal, the resulting positive pulse (at Q2-C) being used to reset the decade counters to zero prior to beginning a new count.

Unlike this circuit's *kHz* mode of operation, when in its *Hz* mode the signal present at Terminal B is fed directly to Terminal C. Thus the *reset* and *transfer* signals operate at the same frequency (both at $\frac{1}{2}$ Hz), rather than at different frequencies (one at 500Hz and the other at 10Hz) as described in the previous article. This considerably simplifies the viewing of both signals simultaneously on a scope.

In Fig. 4 and 5 of the February 1973 article we are able to view the differentiated pulses resulting from a 10Hz signal present at Terminal C when in the *kHz* mode—it having been made apparent with the use of the delayed-sweep circuitry incorporated in Telequipment's Model D67 scope. For this month's article, however, we are using a $\frac{1}{2}$ Hz signal to generate the $2\mu\text{s}$ and $30\mu\text{s}$ pulses. And to make a comparable 0.1-in. trace of the

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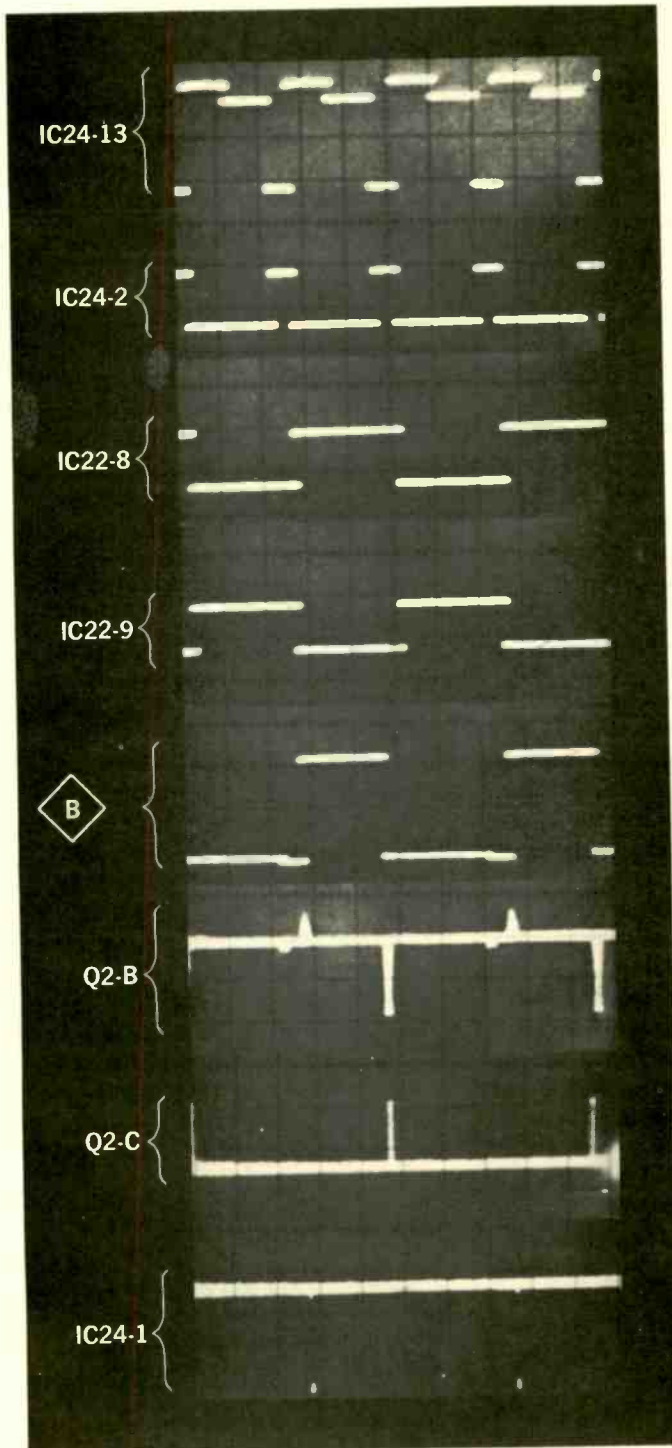


Fig. 3—Composite photo of 1Hz signals processed in the control circuitry.

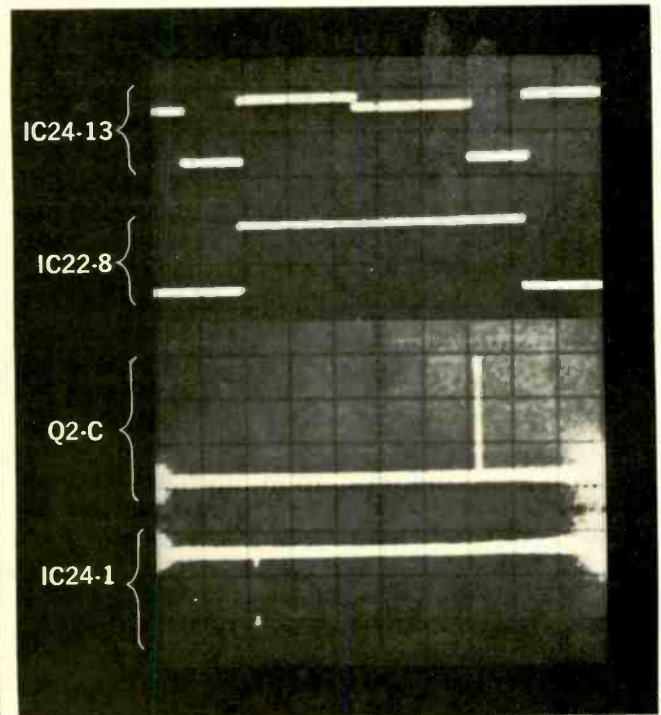


Fig. 4—Timing relationships exist between the applied 1Hz signal and the resulting *gate*, *transfer* and *reset* signals.

ER important as PR

A successful service dealer must be as much concerned with employee relations as with public relations

■ When we attended the NEA Business Management School in St. Louis some years ago, some of the courses were taught by Dr. Sokolik—head of the Business Administration Department of an Illinois college—a very bright and flexible young man. By flexible we mean that he was modern, able and willing to adapt to the changing times.

One of his sessions, in particular, remains firmly imbedded in our memory. As he stated, we are all acutely aware of the need for good Public Relations, but good Employee Relations are very frequently overlooked. We believe he has struck a vital point of good business management.

ER has taken a back seat to PR, and it is costing business dearly, was his theme. We have neither the space nor the expertise to make the case like he did; but we will try to project some of his points.

Employees, to be efficient, must be happy at work and at HOME. They must get along well with co-workers. They must like their employer and/or supervisors. They must be free from health and financial worries. They should have some ambition. If employees register on the positive side in these points, then they will be efficient, productive, and good-will ambassadors for the employer—both on and off the job.

A new employee should be introduced all around, made familiar with his surroundings, and instructed on policy. He should be made to feel he is an important entity in the organization, not a cog in a machine. An unobtrusive effort should be made to find out something of his family—his wife's and children's names, something of his hobbies. This will afford a background for establishing a camaraderie with and concern for him.

This does not mean you should

get buddy-buddy with him on social terms, though he should never be snubbed. Often times too close a relationship with anyone will breed contempt.

Never, never, refer to him as "my man." At all costs refrain from saying "My man will take care of it," "I will send my man out," or "My man is reliable." The phrase "my man" implies subservience. This can lead to rancor in a man and build to a point where he despises his employer.

Rather say "Mr. Doe will take care of it," or "Mr. Doe, one of our best technicians, will be out this afternoon." You not only build up the ego of your technicians (remember he does not want to be, nor should you, call him a serviceman), but you also improve the image of your company.

If an employee begins slipping, his production lags, or he starts making errors; something is bothering him. Don't just fire him; he is a valuable, trained employee, and to replace him is costly. In addition, firing can instill resentment among your crew, and even cause a loss of customers.

Get at the root of his troubles, but this must be done diplomatically. Individuals differ. Some can be called into the office for a man-to-man talk. Sometimes a supervisor may have a clue to the problem. Taking a man fishing for a day is a great common denominator. It is almost uncanny how some men, under the spell of the quiet outdoors, will voluntarily loosen up and tell their troubles.

With most men, don't pry, don't become too persistent. Some employers have the knack of becoming sort of a father confessor. But whatever the method employed, the first step is to determine what is bothering the employee.

He may be sick, need an operation, or just need to get away from it all for a couple of days—just as you do occasionally. His daughter may need her teeth, or his son an eye, straightened; and he cannot see his way financially clear. Someone may be pressing him for repayment of a debt. A child may be doing poorly in school, or running with the wrong crowd. He may have wife, or in-law trouble.

True, you are not a trained counselor, but you can evaluate the matter in an unbiased manner. Here being on a first-name basis with the family helps. Sometimes just to share knowledge of the problem with a confidant relieves the bearer of half the load. This is the secret of many ministers' success.

He may have the idea that he is doing all the work and you are getting a lion's share of the compensation. A few minutes of time, shooting square with facts and figures, should suffice.

Sometimes the focal point may be a feud, a prank, or an injustice, real or imagined. He may believe he is getting all the undesirable jobs. He may despise the type of work he is given, but covet another at which he is particularly good. All these are in your sphere of action. You CAN do something about them.

These are some of the tenets propounded by Dr. Sokolik. Strict adherence to them could materially increase production in many businesses and increase profits substantially. Aren't they worth reading over? ■

We do not normally reprint articles from other publications, but this material seemed so exceptional that it warranted your attention. Reprinted with permission from the TSA SERVICE NEWS, Seattle, Wash., Enos R. Rice, CES/CET, Editor.

Customers Expect Good Business Manners

How manners are practiced determines how often each and every customer will return when he or she needs our services

by Ernest Fair

■ As youngsters, we were all taught a liberal quantity of those rules of human behavior called Good Manners—the code of conduct which all of us expect of others and grant to them in return.

Just as there are good manners in social life, so are there good manners in a service shop operation. Good manners therein are as important as those at any social function. How well they are practiced determines how often each and every customer will return when he or she needs our services. Good manners truly make a good service business.

Most of the rules of good manners expected of us by our customers are simple and easy to follow. Here are the more important of these:

Always practice courtesy for there is never a time when we should act otherwise. No matter how unpleasant the customer, nor how badly we feel at that particular moment, exercising courtesy and consideration is an absolute necessity during every moment of our business life.

Use a gentle tone of voice, even when vigorously pressing a point. Few indeed are the customers who appreciate the loud shout in a conversation. No one likes to be bullied—a loud shout and harsh voice leaves that impression.

Be attentive and understanding. When a customer is telling us something, he or she expects us to listen and absorb what is being said. Dividing our attention with someone or something else while handling a customer is discourtesy of the first order.

Avoid slang when talking with customers. Some people resent slang words of any type—they make little

impression on the others. Learn to use small words (avoid the big ones) for small words more effectively get the ideas across to the customer.

Be quick to meet customers. One of the surest ways of creating an unpleasant reaction is to let them stand around waiting while busying oneself with something else. Even when we are busy, it pays to say “Hello” and assure the customer that he or she will be taken care of in just a moment.

Keep yourself neat and clean. The individual with dirty fingernails or unkempt appearance can never leave a good impression with any customer. He or she goes out of the way to be rude to every customer.

Don't overdress for in doing so one creates the impression of bad manners in trying to look better than the customers.

Respect the customer's wishes for even though one may be certain a statement or request is utterly wrong, remember that he or she believes otherwise. The customer's beliefs are the important ones in all business matters—if they are met, the customer is satisfied and that is our big purpose.

Speak clearly and distinctly for not only is it bad manners to mumble our words or release them from a corner of our mouth, such talking is extremely difficult to follow. Slow and distinct pronunciation of every word is not only good manners but a much more effective way of conveying a point.

Make the first impression pleasant for initial impressions are usually lasting. Show every customer that you have a sincere desire to please him or her as an individual. It is

very important to look the customer directly in the eye and provide perfect attention.

Avoid chewing gum and smoking in the presence of customers, particularly while attending to their specific needs. These habits may or may not be all right, but we cannot afford to offend many of our customers who view them with distaste.

Eliminate familiarity from all dealings with customers. It never pays to “kid” customers no matter how well we know them. Every customer should be treated with maximum courtesy and respect during each and every moment of business contact.

Be responsive in waiting on every type of customer. Chiefly, that involves learning to be a good listener. It is good manners and it helps to make our business liked by the people who will want to come back again and again.

Practice being tactful for that is another foundation stone of good business manners. We can be certain that when an individual comes into the shop that he or she expects service, and they are a great deal touchier than they are in their other daily contacts.

Let every customer feel important by each word and action taken in handling his or her needs. The successful individual is always the one whose sense of good manners is so acute that it leaves every person with the impression that he or she is the most important individual to conduct business with that day.

Never laugh at a customer. If he or she mispronounces a name or title, do not laugh at their mistake, as they are certain to be offended and it is always bad manners to show off our knowledge before others who have less acquaintance in our particular field.

Avoid exaggeration. Exaggeration, like flattery, is apparent to the simplest person. It is always bad manners. It always leaves the impression with the customer that one considers him or her a simple soul who can be swayed with such talk. ■

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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.

SYLVANIA

Color-TV Chassis EO2-1,-2,—Vertical Jitter

At some signal levels, the VERTICAL-HOLD control can be adjusted to cause vertical jitter in the picture. To correct this condition for all signal levels, make the following changes: Remove resistor R57 (on EO2-1 tuner panel

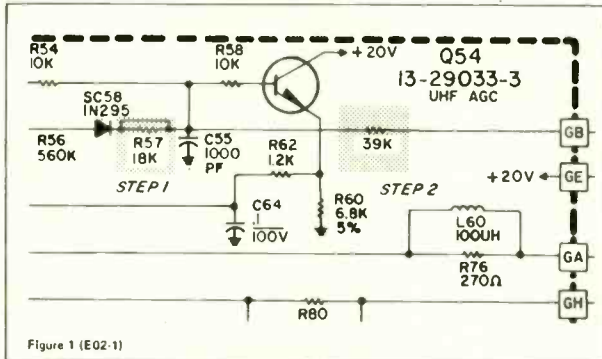


Figure 1 (EO2-1)

only) and replace it with a jumper as shown in Fig. 1. Insert a 39K, ½w, 10% resistor from tie point GB to the junction of capacitor C55, resistor R54, R58 and diode

SC58 (on EO2-1-2 tuner panel) as shown in Fig. 1 and 2.

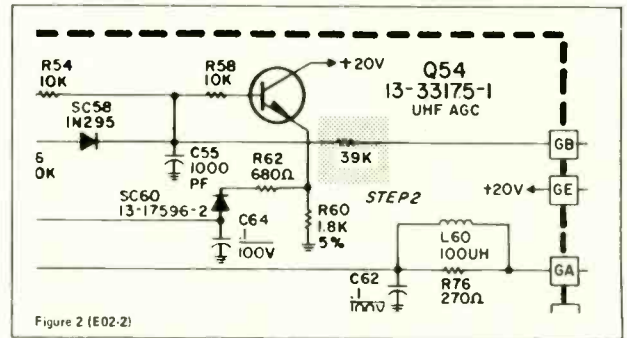


Figure 2 (EO2-2)

Remove capacitor C208 (on EO2-1-2 IF panel) and replace it with a 5μf, 50v electrolytic capacitor, as shown in Fig. 3. Remove capacitor C302 (on EO2-1-2 IF panel)

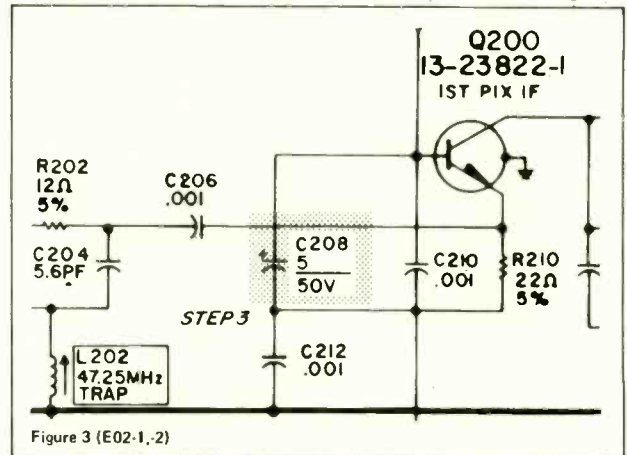


Figure 3 (EO2-1,-2)

and replace it with a .33μf, 100v capacitor as shown in Fig. 4.

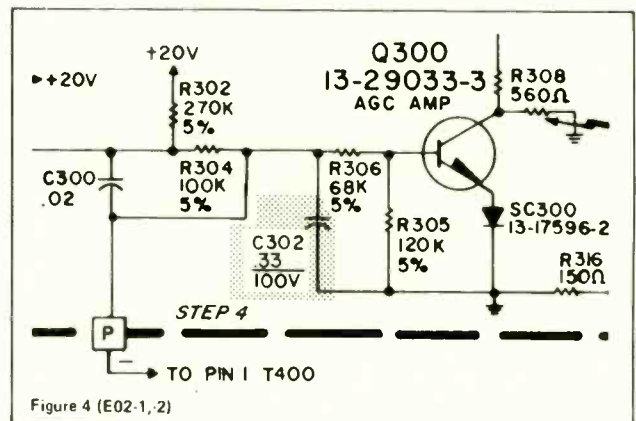


Figure 4 (EO2-1,-2)

Color-TV Model CL2498 Entertainment Center—Wrong Speakers Installed

A small quantity of the above model TV sets were shipped with the wrong speakers installed. The correct speaker for the TV function only (two per set) is Part No. 12-15696-5. If the speakers in the set are -3, they should be replaced with the -5. Performance of the TV set is not affected at normal listening volume, however, premature failure of the audio output transistors in the TV chassis can be experienced if the TV set is operated at high volume with the incorrect speakers used.

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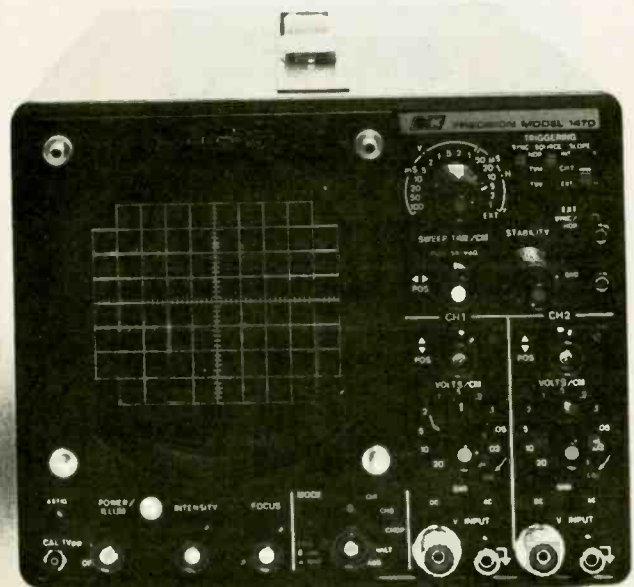
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CIRCUITRY...

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2 μ s pulse (as in Fig. 4 of the previous article) would require that we "stretch" the 1/2 Hz waveform roughly 39 1/2 miles—50 times as far as it was necessary to "stretch" the 10 Hz waveform shown in Fig. 4 of the previous article. Such drastic trace expansion is well beyond the capability of the Tel-equipment Model D64 scope, and we are unable to satisfactorily photograph the pulses differentiated from the 1/2 Hz signal that are applied to IC22-10 (the flip-flop circuit) and IC24-14 (Inverter A). However, the output of Inverter A (IC24-1) can be photographed. And since it does occur in the same frequency range as the other signals in Fig. 3, it has been added as the bottom scope trace.

We are primarily interested in the 1 Hz signal applied to the time-regulating circuit and the resulting *gate*, *transfer* and *reset* signals. The relationship of these signals is shown in the composite photograph in Fig. 4, which in many ways looks very similar to the corresponding composite illustration in Fig. 11 of the February issue, produced while the circuit was in its kHz mode. (The major apparent difference in these waveforms is actually the result of an error made by your editor in preparing the composite illustrations for Fig. 8 and 11 of the February article. There the scope traces for IC24-13 were inadvertently flipped from left to right. The basic timing relationship with the other waveforms is correct, but the sequence of voltages within the top waveforms should have been the

same as in the actual scope photograph used for IC24-13 in Fig. 3 of the February article.) However, instead of covering a frequency range of 1 kHz to 10 Hz, the waveforms shown in Fig. 4 of this month's article merely cover a frequency range of 1 Hz to 1/2 Hz.

From Fig. 4 we note (just as we did from Fig. 11 in the previous article) that immediately after the count has been completed (right after the *gate* signal becomes positive) a negative *transfer* pulse allows the buffer-storage circuitry to accept a new count. And upon accepting that count, the *reset* signal (Q2-C) returns the decade counters to zero.

Unlike the previous article in this series, we were unable to show the pulse applied to IC22-10, which resets the flip-flop circuit. However, with the time-regulating circuit in its Hz mode of operation, this pulse merely performs a redundant function, since for all practical purposes the resetting pulse would be coincidental with the next negative excursion of the output of Inverter B (IC24-2), which also serves to return the flip-flop circuit to its previous state.

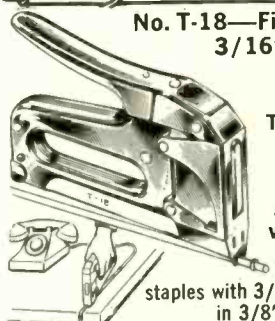
Although future articles in this series will be concerned with the Buffer-Storage and Decoder-Driver circuits in Heath's IB-101 Frequency Counter, this is the last article in this series for which we plan to use scope traces to illustrate circuit function. This is due to the fact that the remaining circuits perform switching functions more readily observed and studied with the use of LED displays than with a scope. ■

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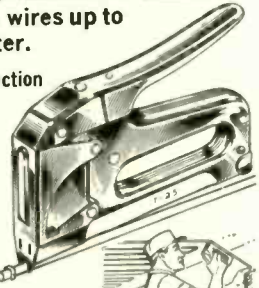
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BOOBY TRAPS ...

continued from page 33

ringing ghosts on the right side of the objects in the picture. Since you don't know who was in the TV set last, or how the picture was before the tuner became so dirty that it wouldn't work, you assume that along with a tuner cleaning the customer's TV set is in dire need of an IF alignment job. Right?

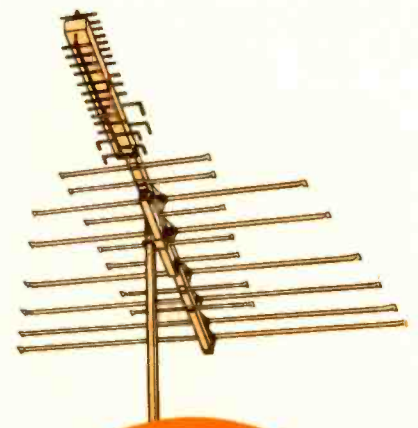
Maybe, but more probably wrong. Take off the cover and try again. If the ghosts disappear, look for the small tongue at the front end of the tuner nearest the IF cable jack. This is very easy to bend while trying to put the cover back on the tuner, and if you bend it just right, it will short out the IF output cable jack. Surprisingly enough, you will get a fairly good picture with good color, but with those tunable ringing ghosts. This has resulted in many chassis being pulled for alignment only to find the real culprit while attempting to align the TV set.

Conclusion

Considering the BOOBY TRAPS that tuner covers can get you to fall into, it might seem expedient to just leave them off and avoid all the pitfalls, but that is the mark of a sloppy electronic technician; and worse yet, if you carry it away with you, that makes you a thief in the eyes of the electronic technician that follows you. And if he tells that customer that their last technician stole their cover, you can be sure that you'll be on their list. Be forewarned of the traps and be careful when you reassemble those covers.

One of these days, someone is going to get Sarkes Tarzian and Standard Kollsman to design their covers with no internal tangs on the cover to give us problems. Zenith, with its Video Guard, proved that it could be done.

There are many other pet peeves with tuners and tuner assemblies, such as: mounting the UHF tuner directly under the VHF tuner so that you have a major disassembly job to even get the VHF cover off; tuner assemblies requiring six to eight screws to be removed with a 2-ft nut driver to remove them from the cabinet, when Sylvania proved that one screw will do the job if you engineer a couple of hooks on the top. ■



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THIEVES...

continued from page 32

for a two-way closed-circuit video system throughout the store. A video system provides much versatility, and there are several ways such a setup can be used to good advantage.

Lonely warehouse aisles can be monitored. Employees will no longer have a spot to take that "extra" break. Big Brother will always be watching.

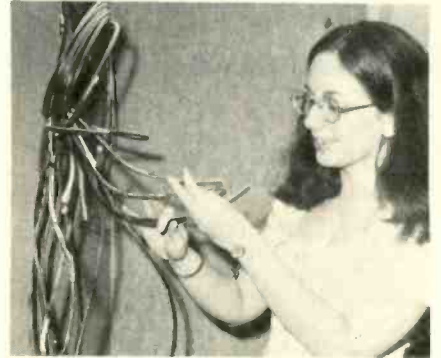
The sales floor can constantly be watched. When traffic is heavy, attempts at shoplifting are quickly

detected. The high camera angle gives a good view.

Either monitor or camera can be placed at several locations. Trained on a clean corner of the service shop, customers can view an efficient CET at work, without interference to the electronic technician or danger to the interested party. A person working in one area can monitor another to ascertain if he is needed there.

Even though the building is protected from the top, the sides, and the inside out, Couch's is still considering additions and refinements to the alarm system. As mentioned

earlier, no system is completely foolproof—"Mission Impossible" fans will attest to this.



Miss Mary Delgato, an employee at Couch's, wonders if the six CET's can figure out how to wire the alarm system.

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One addition to the system might be ultrasonic detection. Such systems [described in the article "Electronic Security" beginning on page 42 of both the October and December 1972 issues of ELECTRONIC TECHNICIAN/DEALER] would provide additional safety and offer the advantage of being very hard to locate and defeat. However, such installations are rather critical.

Details concerning other systems currently in use by other readers would certainly be welcome. ■



"Actually, that's the couple next door. My picture tube is in the shop for repairs."

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PICTURE TUBE . . .

continued from page 35

Japan that is 3 lb lighter and 5 in. shorter than the present Trinitron. Sony has said that it will definitely produce such a tube for the American market this year, but has not announced what sizes they will be. Sony also said that the 114° tube will cost more than the present color tube, but just how much more, they cannot say at this time. Presently Sony has the highest-priced color tube on the world market.

One thing appears certain: Every manufacturer claims that his tube is superior and will do a better job. We, the servicing dealer and electronic technician, will have to find out and prove which is best for ourselves. Surely every one cannot be "the best." It can be seen that an intensive and hard fought battle is shaping up for manufacturers to capture for themselves the larger share of the color-picture tube market, which last year totaled almost \$475,000,000.00.

The following information was not received in time to be included in the author's article, but is being added since GTE Sylvania is a principal supplier of picture tubes in the original equipment market and has been very active in the new in-line tube technology. GTE Sylvania developed and demonstrated large neck three-gun in-line tubes in 1970 and has contributed considerably on its present refinement. Large neck in-line appears to be applicable to all screen sizes 13-in. to 25-in. Subsequently, they have in the past year developed a small-neck, single-gun in-line product to serve a broader segment of the future small-screen set market.

A major contribution to the in-line system concept has been the development of unique and proprietary equipment by Sylvania for the manufacture of precision Toroidal yokes. The Toroidal yoke, because of its precision and unit-to-unit uniformity, becomes, as it were, a necessity for in-line tube performance. ■

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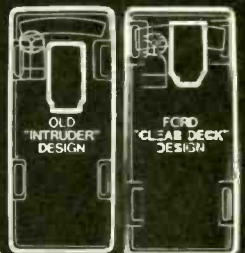


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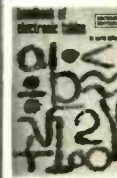
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A practical guide of value to anyone involved in any phase of circuit design work—from design to actual breadboard performance. Written for the circuit designer who encounters difficulties either in conceiving a suitable circuit configuration to meet a required specification or in obtaining optimum performance from a newly designed circuit. Part I is devoted to basic design problems, and includes a wealth of actual examples. Part 2 deals with ways of meeting specific requirements not readily achieved by standard circuit. In certain cases a simple modification to a standard circuit configuration is shown to be sufficient; in others a novel approach is given. 224 pps., 114 illus. Hardbound. **List Price \$9.95 • Order No. 288**

199 TV Tough-Dog Problems Solved



Here is a master collection of actual case-history solutions—answers to many of the most challenging tough-dog TV problems on both color and B & W sets—covering all popular makes from Admiral to Zenith. This book is organized so that you can quickly find the solution to particular problems. To enable you to find information relative to a particular problem in a specific set, a cross-reference of troubles by brand name and chassis is included. The content is organized into trouble symptom sections. Several different circuits are included; thus, the information provided will apply to similar circuits in other models. 256 pps., 199 illus. Hardbound. **List Price \$7.95 • Order No. 559**

Electronic Circuit Design Handbook



New Fourth Edition—A brand-new, enlarged edition of the ever-popular circuit designer's "cook-book," now containing over 600 proven circuits, for all types of functions, selected from thousands on the basis of originality and practical application. Now you can have a your fingertips, this carefully planned reference source of tried and tested circuits. Selected on the basis of their usefulness, this detailed compilation of practical design data is the answer to the need for an organized gathering of proved circuits that can easily serve as stepping stones to almost any kind of circuit you might want to build. 496 pps., 17 big sections, over 600 illus. 8 1/2" x 11". **List Price \$17.95 • Order No. T-101**

Installing & Servicing Electronic Protective Systems



Here's everything you need to know to break into this challenging field! Covers the installation and servicing of virtually every electronic fire and theft security system. Tells how to estimate costs, and contains data on how to build your business. Over 160 photos and illustrations, including complete schematic diagrams of many protective devices. Discusses sensing and detecting methods, then covers specific types—electromechanical, photoelectric, ultrasonic, microwave, proximity, audio and visual, seismic, vibration and stress intrusion systems, night viewing devices, vehicular, etc. Federal Crime Insurance regulations, glossary, and list of manufacturers and suppliers. 256 pps. Hardbound. **List Price \$7.95 • Order No. 605**

Electronics Self-Taught With Experiments & Projects



Tired of project books that simply tell you how to build some gadget, then leave you wondering why you bothered? Looking for a greater challenge and worthwhile knowledge as a result of your effort? You'll find it in this unique new book, written especially for serious experimenters, hobbyists and students—a book that shows why you do certain things, tells how devices and circuits work, and suggests innovations that should spur you forward to more important work in electronics. There are circuits and projects using integrated circuits, plus communications devices, logic circuits, "industrial" devices, and lab-type equipment. 288 pps. Hardbound. **List Price \$7.95 • Order No. 553**

104 Easy Projects For The Electronics Gadgeteer



A varied assortment of TUBELESS and TRANSISTORLESS devices that are useful in the home and car—and fun to build! These specially-designed one-evening projects require no tubes, transistors, or IC's, yet frequently outperform more sophisticated designs. There's an anemometer, a hygrometer, a light meter, a fishing tester, a darkroom timer, automatic slide projector, an electric combination lock, dry-cell rejuvenator, tape recorder tone compensator, tone generator, telephone intercom adapter, an electronic coin toss, a "worm" timer, and many, many more. Any project in the book can be built for under \$5.00. 160 pps. Hardbound. **List Price \$6.95 • Order No. 524**

Model Car Racing By Radio Control



A complete handbook on one of today's most fascinating hobbies—encompassing everything you need to know to get started and advance to competition status. Written by one of model racing's pioneers, it explains the basic concepts of model cars and the means used to control them remotely. Also included are detailed chapters on the engine, power train, suspension system, and chassis. You'll learn how to put a car together, either from "scratch" or from one of the many kit types available. Next, you'll learn how to prepare for a race, how to "drive" a model racer, and the etiquette of the sport. 224 pps., over 250 illus. Hardbound. **List Price \$6.95 • Order No. 592**

Philco Monochrome TV Service Manual



This all-in-one schematic servicing manual contains all the data you need to repair all Philco black and white TV sets, from 15G20 to 20V-35 ("N" through "M" line). Covers 42 different chassis designations! In this one compact volume, you have all the basic information needed. Included are full-size schematic diagrams, PC board layout drawings and photos, adjustment and alignment instructions, and parts lists. The foldout section has 24 full-size schematic diagrams. 196 pps., including 36-page fold-out section. 8 1/2" x 11". **List Price \$7.95 • Order No. 564**

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TECHNICAL DIGEST

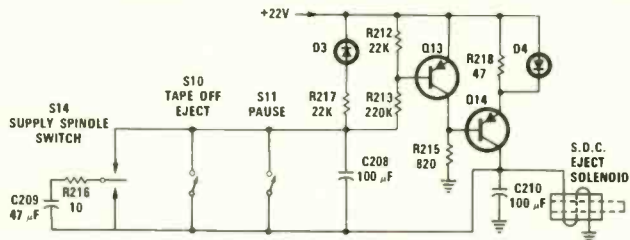
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

RCA CORP.

Cassette Recorder Model YZD572—Automatic Cassette Eject

The YZD572 cassette recorder has a special circuit that senses the end of the tape or that the power is OFF and ejects the tape cassette. When the cassette is ejected at the end of a tape, the instrument is turned OFF.

The schematic shows the simple circuit used for the



automatic cassette eject function. A solenoid (S.D.C.) ejects the cassette when energized by the conduction of transistor Q14.

Tape-motion-sensing switch S14 is part of the tape-supply spindle. When the tape is moving, the movable wiper of S14 alternately closes the contacts of the switch—much like the brushes and commutator of a dc motor. When the tape motion stops, switch S14 can be open or touching either contact. When the tape is moving, transistor Q13 conducts because increased base current is available. The base current for Q13 serves as charging current for capacitor C208.

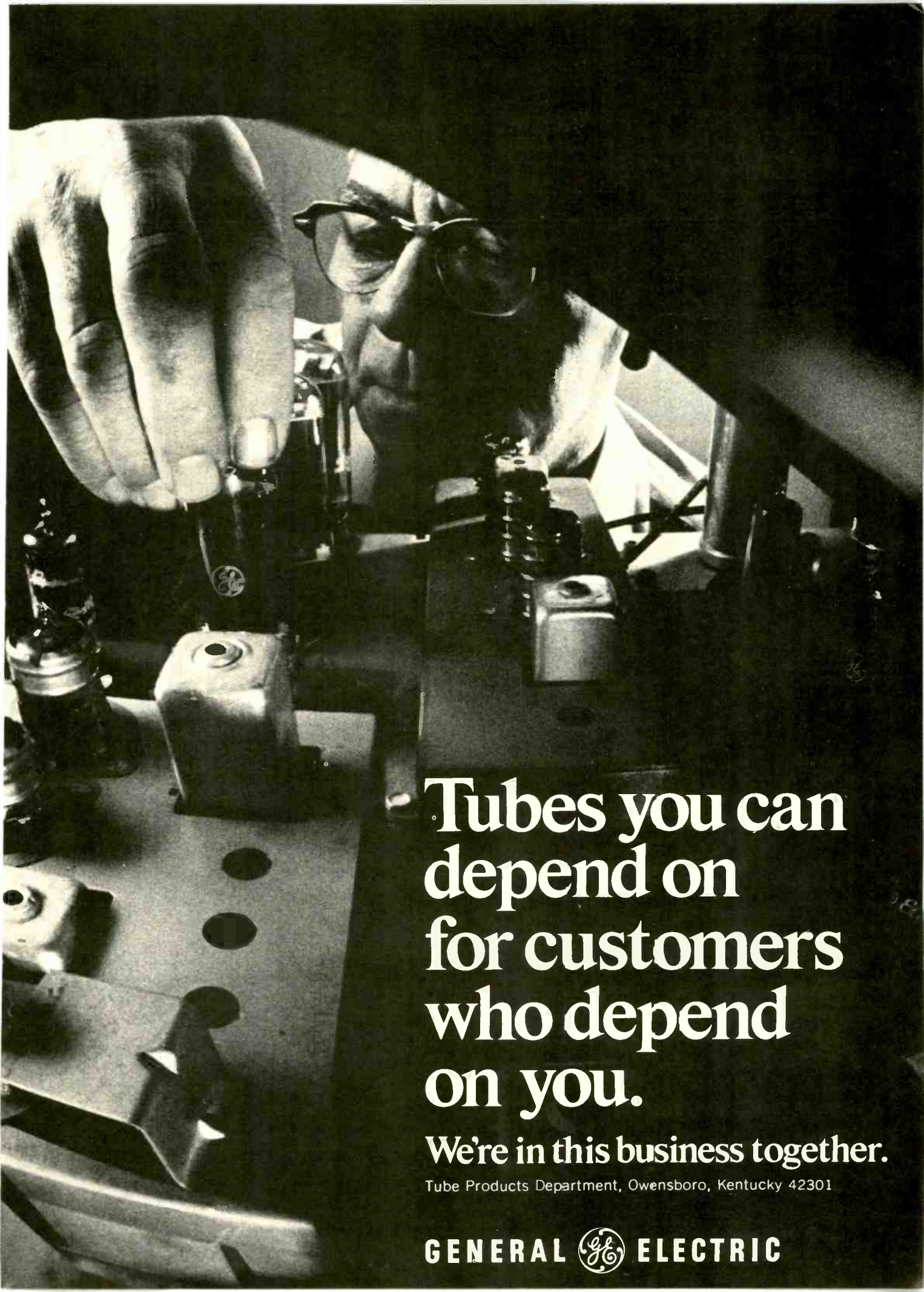
Capacitor C208 never reaches a full charge because the tape-motion sensing switch (S14) alternately connects C209 across C208 and then discharges it. This action assures continuous base bias for Q13 while the tape is in motion. When the tape stops, S14 no longer cycles and capacitor C208 assumes full charge. With C208 fully charged, Q13 has no base current and is cut off. When Q13 is not conducting, transistor Q14 conducts and energizes a solenoid. As the cassette is ejected, S10 (discharge switch) closes and discharges C208. This prevents the cartridge from being ejected if it, or another, is immediately reinserted. Diode D3 forms an alternate discharge path for C208.

The cassette is also ejected when the power is switched OFF because the emitter voltage of transistor Q13 decays much faster than the base voltage, due to the charge on capacitor C208. Thus Q13 switches OFF within one second after the power is removed and the solenoid is energized to eject the cassette before the 22v power supply decays below a useful level.

A pause button (switch S11) is provided to allow the user to stop the tape motion without triggering the eject circuit. Obviously, the cassette will not automatically eject when the power is turned OFF as long as the pause button is ON.

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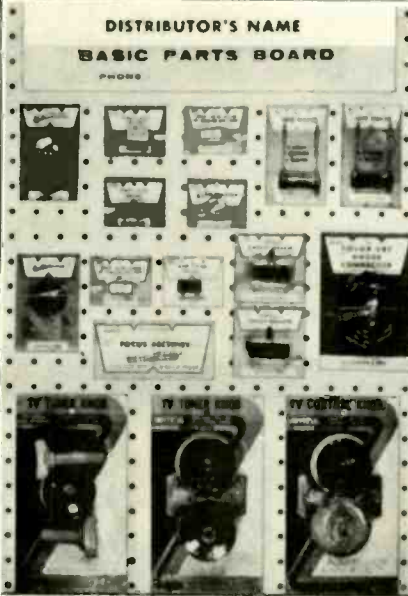
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TEKLAB ...

continued from page 29

R1315, on the high-voltage regulator module.

The high-voltage transformer used in this chassis supplies a fifth-harmonic tuned pulse from the high-voltage winding to the five-diode high-voltage tripler. The negative portion of the pulse, which occurs during retrace, is heavily clamped by the clamp circuit diode Y1661, capacitor C1661 and resistor R1661 to improve the high-voltage regulation at low beam currents.

A high-voltage indicator neon bulb, NE-1600, is inductively coupled to the input lead of the high-voltage tripler and glows when the horizontal circuits are operating.

A resistive focus divider, R1662, provides the focus voltage for the picture tube. Horizontal pulses, at the ground end of R1662, appear across capacitor C1703 and resistor R1703 with a magnitude directly proportional to the picture-tube beam current.

Diode Y1141 scan rectifies the pulse output of transformer T1700 Terminal 5 to attain the -21v power supply for the IF, Video Low-Level and RGB amplifier modules.

Summary

We feel that the manufacturer did an excellent job in designing this chassis not only for maximum accessibility but also for maximum serviceability. The features employed are what most independent electronic technicians would suggest to make home servicing of the color-TV set easier.

General Electric's "module caddy" service kit is also a major step towards "one-call" home service. It includes the modules and most of the major components required for servicing this TV set. If you should want to repair the module, the tie points, component identification and full circuit board markings permit conventional servicing. ■

Comments from our readers are always welcome.

Address your letters to:

Phillip Dahlen, CET, Editor
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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.

AUTOMATIC TELEPHONE DIALER 703

Features self-contained message programmer

This automatic telephone dialer, Model R2, features a self-contained message programmer. It reportedly permits fast, silent communication of pre-recorded alarm voice messages over existing phone lines and responds to inputs from either fire or burglar alarm detectors, or both. Two channels permit the sending of separate

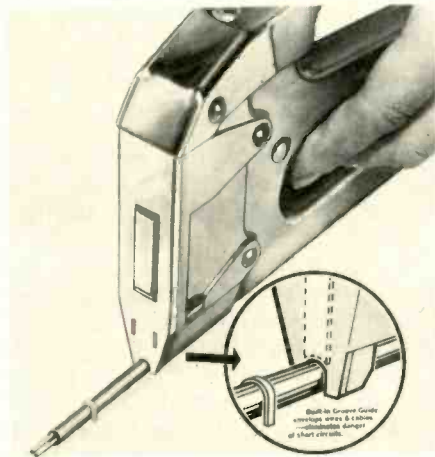


messages for two types of emergencies, and up to six separate parties may be contacted on each channel. The dialer is packaged in a locked, tamper-resistant cabinet measuring 12 in. wide by 10½ in. deep by 4½ in. high. Mountain West Alarm Supply Co.

STAPLE GUN 704

Designed to fasten low-voltage wire up to ¼ in.

The Model T-18 staple gun is specially designed for safe, secure and



neat fastening of any inside or outside low-voltage wire, up to ¼ in. in diameter. The tapered striking edge reportedly gets into close corners, and

the grooved guide positions wire for proper staple envelopment. The automatic safety stop reportedly halts the staple at a proper height to prevent damage to the wire. Arrow.

SOLDERING TIP 705

Tip can be selected for job application

A new line of soldering tips are designed and rated for the following



qualities: heat transfer, durability and thermal load in watts. These tips are exclusively used on the company's solid-state, constant-temperature probe, the Loner soldering instrument. Edsyn.

HEAD DEMAGNETIZER 706

Removes residual magnetism from heads, capstans and guides

The Model QM-202 head demagnetizer is designed to remove all residual magnetism from recording heads,

capstans and guides. The unit generates a controlled 60Hz magnetic field which is reportedly strong enough to



effectively demagnetize without producing additional residual magnetism. It reportedly features a flexible probe which will flex to reach usually inaccessible recorder/player parts. The magnetic field radiates from the tip of this probe, which is designed to contact sensitive areas without danger of physical damage. A sensitive micro-switch is activated by finger tip pressure when the unit is picked up and deactivated when it is released. Nortronics Co.

ANTENNA 707

Designed for signals that come from different directions

A new series of single-channel yagi TV and FM antennas are designed to improve home TV and MATV reception. Designated as the EY series, continued on next page

All New and Improved Ferrograph RTS-2

Simple to operate

- Learn to use in minutes
- Minimum set-up time
- Only two leads necessary
- Pushbutton activation

Versatile all-in-one precision test unit

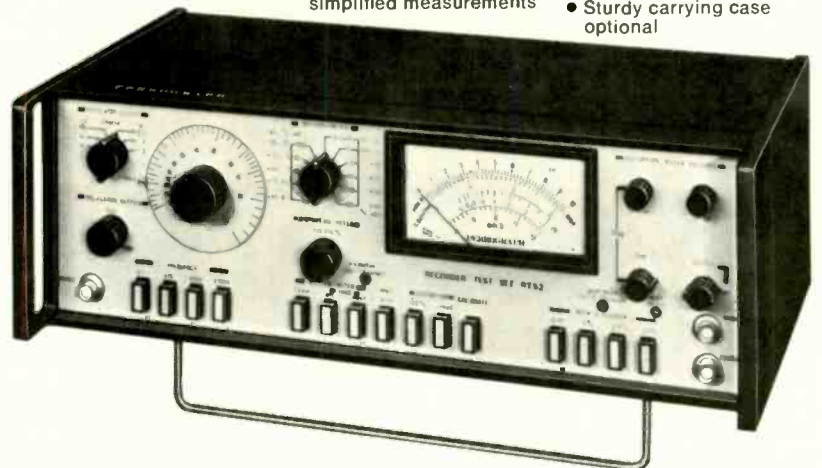
- Sine Wave generator
- Millivoltmeter
- Wow & Flutter bridge with expanded range
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Use it anywhere

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- Compact, lightweight, portable

All this for only \$1450

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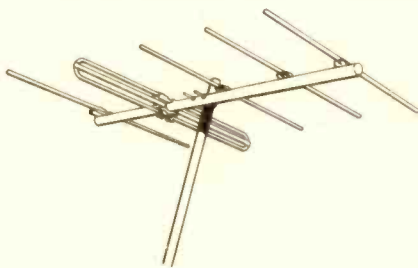
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NEW PRODUCTS...

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these yagi antennas are especially designed for areas where the viewer is located between several TV stations with signals coming from different directions. The antennas reportedly feature a 6MHz wideband response to ensure good color reception even at channel band-edges. Gain is typically 7dB over that of a tuned dipole, and the double-fold 300Ω driven element provides an exact match to the downlead and to mixing networks or pre-

amplifiers. These yagi designs are said to provide typical front-to-back ratios as high as 16dB and beam widths that



range from 56° to 65°, depending upon the channel required. Rugged

construction and deluxe gold finish are combined in the antennas to maintain reliable performance and good appearance over the years. Blonder-Tongue Laboratories, Inc.

SCOPE

708

A compact, lightweight, solid-state instrument

The Model LBO-310, 3 in. solid-state scope is designed to offer 20mv p-p/div vertical sensitivity with a maximum input at 600v (dc/ac p-p).



The sweep frequency is in four ranges: 10Hz to 100kHz, continuously adjustable between steps. The input impedance is reportedly 1M shunted by 40pf with the ability to monitor waveforms to 100MHz with direct connection. It has ac and dc coupled vertical inputs with provisions for dc voltage level checks and the bandwidth is reportedly dc to 1MHz, at -3dB. The instrument measures 6 in. high by 4 in. wide by 13¼ in. deep and weighs approximately 10 lb. Leader Instruments Corp.

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

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

And, it's easy to specify Electro-Voice needles. They're listed in the most up-to-date, comprehensive catalog in the industry. Simplified cross-referencing and precise illustrations enable you to pinpoint what you want in seconds.

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TOOL CASE

709

Moderately large assortment of hand tools and specialized equipment

A attache-style tool case, Model TC-200/ST, is designed for the electronic technician who has frequent need of a moderately large assortment of hand tools and specialized equipment for his work. The case contains a generous assortment of screwdrivers, nutdrivers, pliers, cutters, stripper/cutter, etc., all mounted in see-thru plastic pockets on a removable pallet of heavy gauge vinyl located in the lid of the case. Construction features of the case reportedly include a solid-wood frame with dovetailed corners, locking brass-finished hardware and a

continued on page 60

FREE



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Now you can get RCA's brand new Color-TV Service Handbook, Volume 4, free of charge when you buy RCA entertainment receiving tubes *from your local participating RCA Distributor.*

Get 284 pages of practical service information on 1971 and 1972 color sets made by 15 manufacturers:

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You'll find everything from chassis layouts to step by step instructions for adjustments that can be performed in the home. You'll solve your late model color servicing problems faster and easier. For practical field-service information you can use every day, see your local participating RCA Distributor and

ask for details on Volume 4 of RCA's Color-TV Service Handbook (1A1973).

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NEW PRODUCTS...

continued from page 58

rugged, black Durahyde vinyl covering. The bottom of the case is unoccupied to allow ample space for an individualized selection of additional



tools, test instruments, parts boxes, soldering gun, etc. to be carried along with the pre-selected tools. The case measures 18½ in. by 13½ in. by 4¾ in. Xcelite Inc.

SOLDER/DESOLDERING WICK HOLDER 710

Designed for fast, clean, professional repair methods

An economical handy supply holder, called TWIP, is designed for the



technician who is looking for fast, clean, professional repair methods. It holds a roll of desoldering wick and a roll of solder, making it ready for immediate use. The holder has a storage clip for both the wick and solder. It also includes a belt clip and storage port with window gauges for supply level viewing. Edsyn.

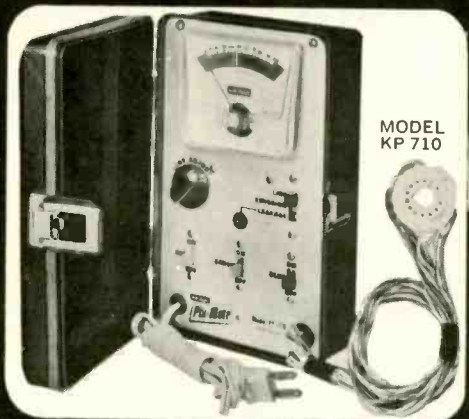
TRANSISTOR-CAPACITOR REMOVAL AIDS 711

Leaves hands free to desolder leads

A reportedly quick and easy method of removing transistors or capacitors is introduced. It consists of a set of seven versatile tools, Quick Picks, Catalogue No. 9216, in a convenient plastic carrying case that reportedly fit more than 25 different outlines of

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the crt tester
you can afford to take along
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MODEL KP 710

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transistors or can capacitors. These non-magnetic tools leave hands free to desolder leads and are color coded

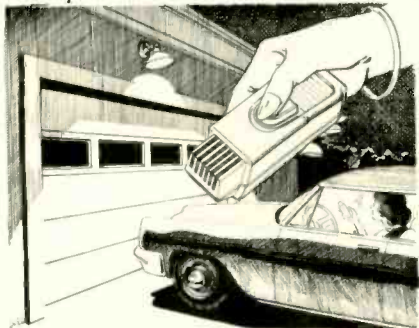


for fast, easy size selection. They also make excellent heat sinks. GC Electronics.

REMOTE CONTROL UNIT 712

A security and safety product

The Sonic-Raylight is an outdoor remote control light that is used outdoors as a garage or door light and is said to be ideal for the porch or walkway. The unit reportedly consists of an all-aluminum, weather-proof receiver box and socket, plus a convenient pocket-size remote control hand



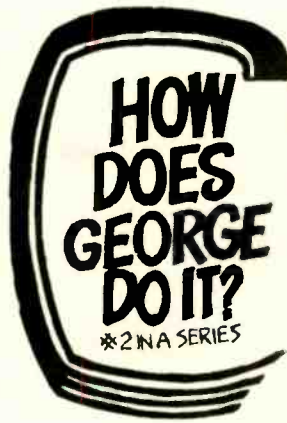
unit. Each socket reportedly powers a lamp rated at up to 150w. Acting as both a security and safety product for the home, the unit may reportedly be controlled from the owner's car, within a 75-ft. distance. Signal Science, Inc.

VHF/UHF LINE AMPLIFIERS 713

Offers more flexibility when designing MATV systems

A solid-state, line-powered, line amplifier is designed to overcome problems resulting from high loss systems caused by long trunk lines and remote antenna installations. The line amplifier is designed to add signal gain where it is needed most, in the

continued on page 62



"IN EVERY GROUP OF TECHNICIANS, THERE'S A 'GEORGE' WHO ALWAYS SEEMS TO EARN A LITTLE MORE THAN THE REST OF US--SOMETIMES EVEN WITH SHORTER HOURS. TO HELP EVERY TECHNICIAN MAKE THE MOST OF HIS TIME, HERE'S 'HOW GEORGE DOES IT!'"

AFTER TWO DAYS AND NIGHTS OF COOKING AND TESTING, I STILL CAN'T FIND THIS DARN INTERMITTENT. GUESS I'LL HAVE TO CANCEL THE BOWLING.



I KNOW IT'S THE KINE BIAS, BUT I JUST CAN'T LOCATE THE COMPONENT. LOST MY SHIRT ON THE JOB ALREADY, BUT PETERSON'S MY BEST CUSTOMER. BET YOU A STEAK DINNER YOU CAN'T FIX IT.



THIS CAN OF SUPER FROST AID SAYS YOU LOSE. USE THE EXTENDER TUBE AND SPRAY COMPONENTS ONE-BY-ONE UNTIL THE SET'S BACK TO NORMAL. THERE IT IS--BET THAT CATHODE RESISTOR'S DOUBLED IN VALUE!



DO YOU USE THAT SPRAY A LOT?

SURE. CARRY IT WITH ME AS AN EMERGENCY FIRE EXTINGUISHER. USE IT FOR LOCATING PC-BOARD CRACKS, AS A HEAT-SINK, AND LOTS OF OTHER WAYS. GOT THE IDEA FROM A FREE BOOK CHEMTRONICS WILL SEND YOU... BUT RIGHT NOW, LET'S GET THAT STEAK!



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NEW PRODUCTS...

continued from page 61

trunk line. The Model LE-215 reportedly amplifies VHF signals +15dB and passes UHF signals with negligible loss. It is also said to feature a



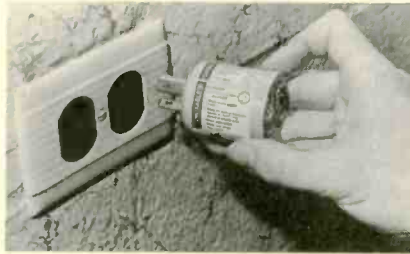
built-in 3dB tilt compensator to correct for the unlinear attenuation characteristics of coaxial cable. The high input level, excellent VSWR and low noise figure are said to allow a large number of these to be cascaded, if necessary, to overcome extra high losses. Winegard Co.

GROUNDING OUTLET TESTER

Simplified tester checks for faulty wiring circuits **714**

A simplified tester, Model GT-20, is designed to check for faulty wiring circuits in a matter of seconds. Simply

plug the tester into your outlet and observe the indicator lights on the device. The amber lights will show the presence or absence of power. Reverse



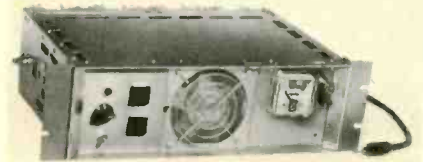
polarity, faulty connections or missing grounds are immediately evident when the red light glows—either alone or in conjunction with the amber lights. The red light indicates a need for immediate qualified service. Alco Electronic Products, Inc.

STANDBY-POWER SYSTEMS 715

Instantaneously provides up to 1000w of ac power

A solid-state standby power system, Model 660-112, is designed as a standby emergency ac power source for radio communications, CATV, microwave, amateur radio and citizens band

radio equipment. If normal ac line power is interrupted or fails, the unit reportedly transfers to system power in 20 ms. When the normal ac power returns, it is said to transfer the load to incoming ac and disconnects the emergency power. The charger then reportedly turns ON to its high-charge position until the batteries are recharged, then automatically switches to its maintenance "sensing" position to keep the batteries in full-charge condition. The pilot light and ammeter are located in the front operating panel. The light indicates that ac incoming power is available to the system. The ammeter shows the operat-



ing charge rate of the charging system. The system is said to have forced-air cooling and the cabinet is designed to be both attractive and functional, measuring 5¼ in. high by 16¼ in. wide by 12¼ in. deep. The unit is supplied with brackets for mounting in a standard 19 in. rack or panel. Terado Corp.

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DEALER SHOWCASE

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

FM/AM/FM STEREO RADIO 716

Radio has four amplifiers for discrete four-channel sound

The Hastings Model RE-7740 is said to be a new "Series-44" home entertainment system combining an FM/AM/FM Stereo radio with four amplifiers for discrete four-channel sound, supplied complete with four



air-suspension speaker enclosures. The unit reportedly features Quadruplex circuitry for matrix records and also provides four-channel sound

presence from two-channel sources. There are said to be two jacks for four-channel headphones, one for the front channels or stereo, and the other for rear channels. Panasonic.

TELEPHONE ANSWERING DEVICE 717

Designed for use in the home

The Metrotec electronic phone answerer is designed for home use and incorporates operating and design features particularly suited to the general



consumer. It is shipped with pre-recorded answering messages for an authoritative, attention commanding sound and to aid microphone shy users. But there is also provision for home recording of personal messages

with a built-in condenser microphone. All functions are activated by push-buttons for simple and fool-proof operation. The device can reportedly record up to 30 messages on a special cassette and a "Message Waiting" indicator light is illuminated whenever a call has been taped. The answerer is factory set to answer after three rings, but may be adjusted by the user to answer after as many as five rings. Another feature is the phone answerer's reported ability to act as an "electronic bulletin board," for in-home messages. The ac-powered device reportedly meets all applicable telephone company regulations. Computer-type logic circuitry is used instead of moving parts for switching functions. The unit measures 9 in. by 10 in. by 2 3/4 in. BSR-Metrotec.

VIDEOCASSETTE TEST TAPE 718

Provides proper adjustment of videocassette players

An inexpensive, accurate 3/4 U videocassette test tape is supplied for the proper adjustment of videocassette players and TV receivers. The tape is specifically designed for use with Wollensak, Sony, Panasonic, Concord, *continued on next page*

Spots trouble fast-tells where it is

WR-515A Master Chro-Bar/Signalyst is the most advanced color-bar generator ever developed by RCA



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For more information on the WR-515A, see your RCA Distributor or write RCA Electronic Instruments Headquarters, Harrison, N.J. 07029.

*Optional Distributor Resale Price

RCA Electronic Instruments

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DEALER SHOWCASE...

continued from page 63

and J.V.C. videocassette recorders with 3/4 U format systems. It is described by the manufacturer as "a must for anyone involved in set-up and performance of a videocassette system." Each test tape is said to be a high quality, carefully prepared, master recording with every element planned to allow a step-by-step adjustment procedure. The videocassette test tape reportedly consists of: Registration Pattern-RETMA, Color Bars (Split field), Dots, Cross Hatch and Dots, Cross Hatch only, and Color Bars (full field). The videocassette player can also be adjusted for tracking and skew. A 1kHz audio tone, at zero level VU, is recorded throughout the entire tape to make adjustment of the TV receiver for inner carrier separation. Magnetic Video Corp.

RECORD CHANGER 719

Offers many features of the higher priced units

A Model 1214 record changer is designed which offers many features of the higher priced units. The unit reportedly features a high-torque constant-speed motor, 6% pitch-control,



silicone-damped cue-control and elevator-action changer spindle. The low-mass counterbalanced tonearm has low-friction pivot bearings and can reportedly track at as low as 1/4 grams. United Audio.

INTRUSION/FIRE ALARM SYSTEM 720

Solid-state control center operating on 12v dc

A Model Y-2000-A burglar and fire alarm system is designed to be installed almost anywhere without difficulty or special tools, and operates on 12v dc. When an intrusion is attempted, the magnetic closure contacts are latched, sounding the alarm siren. Within the system is a special circuit for fire detection, sounding the siren if the temperature exceeds sensor limits (135°F). The protection system is available with additional switches or sensors (two of each included per

package). The system is completely self-contained and reportedly has a heavy speaker horn, solid-state control center, two heavy-duty 6v batteries,



security shunt lock (ON/OFF) with two keys, package of mounting hardware, door or window decal, 150 ft of black and yellow conductor wire, instruction sheet and guarantee. Idea Systems.

FM/AM DIGITAL CLOCK RADIO 721

Receives government weather broadcasts in many cities

The Model C4332 FM/AM Digital Clock radio is designed to provide all desired clock radio functions: wake-up-to-music, or wake-up-music and alarm. It is said to also have the capability to receive continuous government weather broadcasts in many cities. All of these controls, plus AM/



FM selector, are top-mounted for convenience. Also reportedly featured is the Snooz-Alarm clock, a 24-hour wake up system and an electronic tone alarm with adjustable loudness. The cabinet is made of easy-to-clean polystyrene and a walnut-grain finish. General Electric.

VIDEO TIMER 722

Superimposes numerical indications on monitor

A new video timer reportedly superimposes clear, high-definition numerical indications directly on the monitor in a TV system. The Model G-77 video timer accepts input from any video source, such as a camera or VTR. A precise time reference is provided by a crystal-controlled oscillator and the time information is then superimposed on the video signal, which may be displayed on a monitor

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or recorded on tape. The unit is said to be compatible with all popular CCTV and VTR systems, including color, B/W, 2:1 and random interlace, without equipment modifications.



The user can control horizontal and vertical position of the numerals, size of the numerals, mat intensity and several other useful functions. Portions of the display are independently ON/OFF switchable, with hold, start and reset functions also provided. Important operating modes are all selectable through front panel controls. Gyr Products.

AUTO BURGLAR ALARM 723

Bolts to license-plate holder

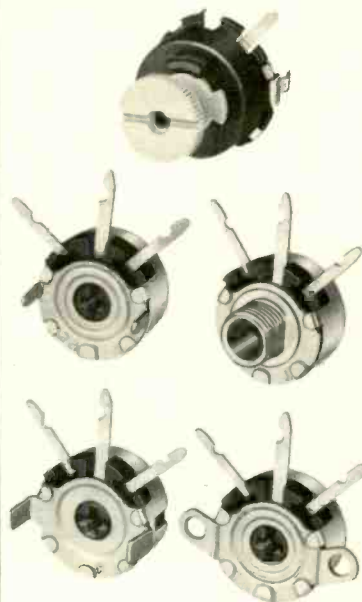
A new self-contained automobile burglar alarm has been designed that can reportedly be installed by anyone in less than 5 min. Called Carguard, the alarm simply bolts to the license

plate holder on the front or back of any car. The unit includes a motion sensing circuit triggered by two silicon activated mercury switches. When activated, any movement of the car reportedly sets off a piercing 115dB alarm. The self-contained unit is said to operate from two Mallory Duracells with two separate circuits, each of which includes an alarm horn, a



mercury switch and a power supply. To avoid false alarms, the sensitivity is usually set to a moderate level so that only someone attempting to enter the car or to remove something will set it off. A built-in logic circuit shuts the alarm off after about 30 seconds, but if the car is touched again, the alarm blasts continuously. The auto alarm can only be turned OFF with a key and when the owner leaves the car, he arms the unit by turning the key to the ON position. Omnicco.

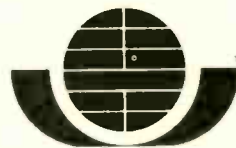
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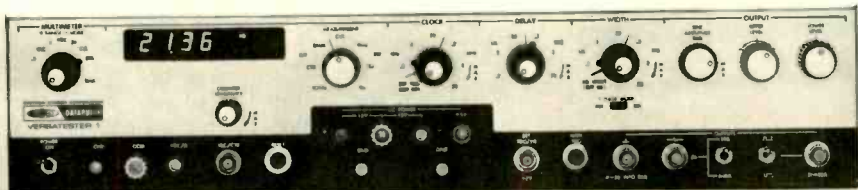
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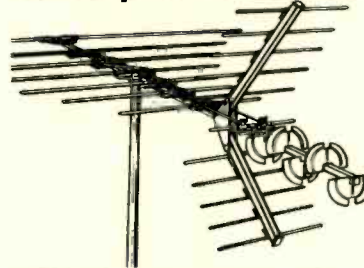
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LETTERS...

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ner in which Mr. Moch administers the affairs of NATESA, no one can deny that it is a successful organization. Any corporation or organization that operates successfully must have a good director or president. He (they) must have wide latitude of authority in order to attain its objectives. Perhaps Mr. Moch is using his own money on behalf of NATESA business because, on occasions, there is no time to call a board meeting and decisions must be made immediately. Of course, he is taking a chance that he may not get reimbursement. Because of such accounting practices, he may find himself on the horns of a dilemma today. However, his counterpart (NEA or whatever) should not take undue advantage of a man's awkward predicament to deny him the hard-earned money incurred on association properties. So equitable compensation should be made where necessary.

TOM GING

Clarify Digital Articles

I've just found the time to read your excellent articles "Basic Digital Circuitry" in the November and December issues. I've learned a lot, but I am puzzled by one point. I would appreciate it if you would clear this up for me.

What puzzles me is this: If J, the output of Gate C is in the "1" condition at Time T₁₀ (as shown in Fig. 2 on page 47 of the December issue) how can the negative excursion of C cause the fourth flip-flop to change from the "1" condition to "0"? Would not the "1" applied to pin #7 of the fourth flip-flop inhibit change just as the remaining positive potential on output K is slated to inhibit the second flip-flop from changing (at Time T₁₀) from "0" to the "1" condition?

W. M. S. RILEY

Only when the second and third flip-flop circuits are both in a "1" condition can the output of Gate C also be in a "1" condition—from shortly after T₆ to shortly after T₈, and not during T₁₀ as indicated in your letter. Only during that time interval may a negative excursion from the first flip-flop circuit switch the fourth flip-flop circuit to a "1" condition.

However, once switched to a "1" condition, the fourth flip-flop cannot be inhibited from switching back to its original "0" condition with the next negative excursion from the first flip-flop circuit, as occurs at time T₁₀.

When in a "1" condition, the fourth flip-flop circuit prevents the second

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flip-flop circuit from being switched from a "0" condition to a "1" condition. And at time T_{10} , the fourth flip-flop circuit does not switch into a "0" condition fast enough to allow the second flip-flop to switch to a "1" condition with the negative excursion from the first flip-flop circuit. Ed.

What We need is a New Union

Some of the brightest men I've ever met have been Electronic Technicians. After 19 years in this business it seems bewildering why we are the vassals of the public whim, whipping boy of the press and still we "collectively" cannot see the wisdom of solidarity in our action.

I dropped out of NATESA this year because I've got a "CHRONIC" desire to be a CET. Still I can easily feel resentment that just CET after one's name does not insure that he could ramrod a TV shop for 19 years as I've done.

I believe Mr. Finneburgh has our best interests at heart. We are by our nature self-made men and "mavericks." At this time it would be appropriate, I think, to appoint Mr. Finneburgh as the temporary head of a new National "UNION," not association. What we need is the type of clout the Teamsters have—only power matters in America!

The public is cruel. How many of us know of old time technicians who retire without a pot by the window!

TOM DAVENPORT

Fool-Hardy Daredevil Method

Your January 1973 feature article, "New Color Picture Tube Replacement Technique," is a fool-hardy, daredevil method—without gloves and safety mask—and the most dangerous unsafe method published. It does not denote skill and understanding of the force and damage done by an imploding kinescope.

You must show pictures of force and damage done by imbedded glass from a kinescope implosion. Safety begins here in ET/D.

LEO J. DARAUS

So many electronic technicians ignore these basic safety procedures that we failed to even note that these precautions were not shown in the photographs supplied us by the manufacturer. This was not the first letter bringing the fact to our attention. We would like to hear from our other readers concerning this matter. Have any encountered implosion of the newer tubes and taken pictures of the damage done? How many do take these safety precautions? Ed.

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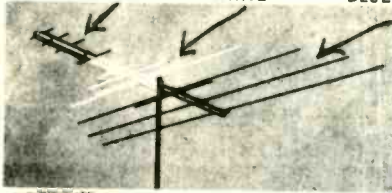
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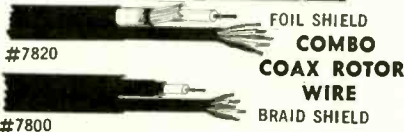


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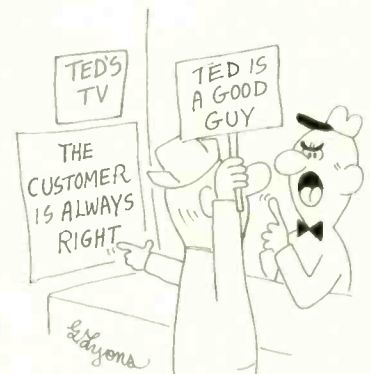
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... for more details circle 127 on Reader Service Card



"You still can't have any credit!"

ELECTRONIC TECHNICIAN/DEALER

TEK FAX

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

1468

MAGNAVOX

TV Chassis
T968

MAY • 1973

GROUP
249

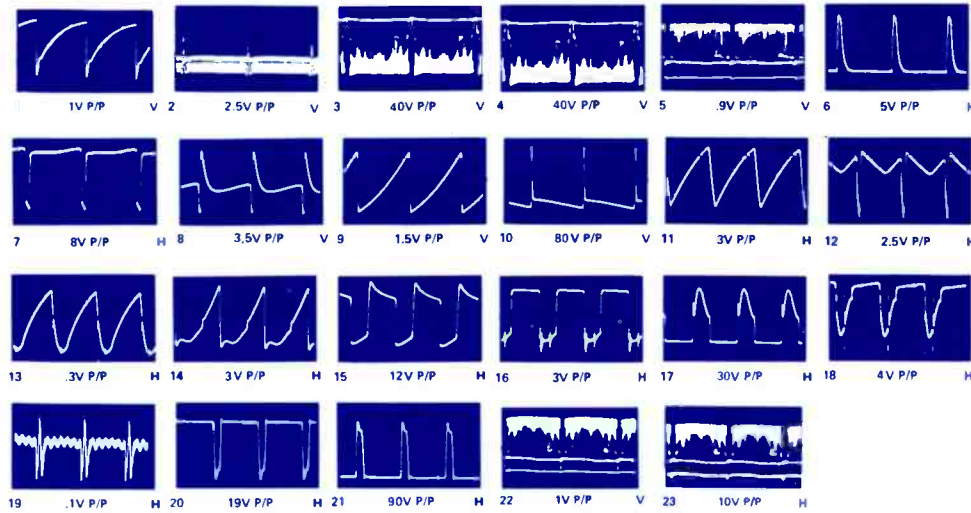
GENERAL ELECTRIC 1469
Color-TV Chassis MA

GENERAL ELECTRIC 1470
Color-TV Chassis HD/H4

MAGNAVOX 1468
TV Chassis T968

RCA SALES CORP. 1472
TV Chassis KCS191

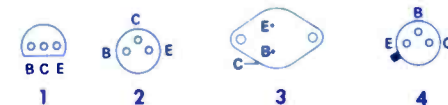
ZENITH 1471
Color-TV Chassis 19DC21



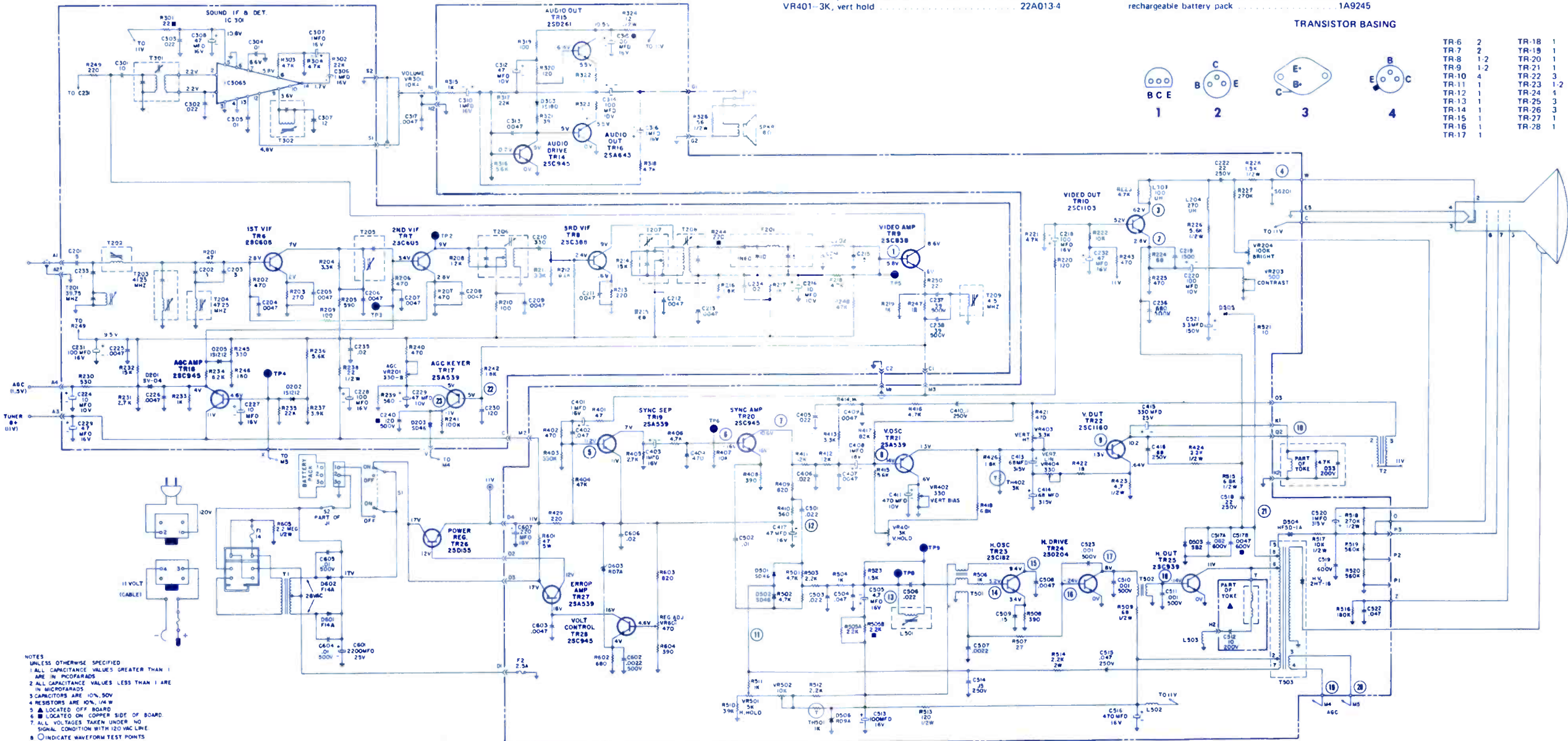
SYMBOL	DESCRIPTION	MAGNAVOX PART NO.
T1	x-former, power	36A001-23
T2	x-former, vert. output	32A001-2
T209	coil, 4.5MHz trap	36A001-20
T301	x-former, audio input	36A001-21
T302	coil, quadrature	36A001-22
T501	x-former, horiz osc	36A041-24
T502	x-former, horiz driver	36A041-25
T503	x-former, horiz output	36A002-17
VR201	330 Ω , AGC	22A012-15
VR203	500 Ω , contrast	22A013-1
VR204	100K, bright	22A013-2
VR301	10K, vol w/switch	22A001-23
VR401	3K, vert hold	22A013-4

VR402	330 Ω , vert bias	22A012-15
VR403	3.3K, vert height	22A013-6
VR404	330 Ω , vert lin	22A012-15
VR501	5K, horiz hold	22A013-7
VR502	10K, horiz range	22A010-10
VR601	470 Ω , reg adj	22A001-7
SW1	on-off switch (Part of VR301)	
F1	fuse, 1 a, 125v	18A001-12
F2	fuse, 2.5 a, 125 v	18A001-17
TH402	3K, thermistor	22A012-14
TH501	1K, thermistor	22A001-6
	deflection yoke	36A002-16
	tuner, VHF	34A001-4
	rechargeable battery pack	1A9245

TRANSISTOR BASING



TR-6	2	TR-18	1
TR-7	2	TR-19	1
TR-8	1,2	TR-20	1
TR-9	1,2	TR-21	1
TR-10	4	TR-22	3
TR-11	1	TR-23	1,2
TR-12	1	TR-24	1
TR-13	1	TR-25	3
TR-14	1	TR-26	3
TR-15	1	TR-27	1
TR-16	1	TR-28	1
TR-17	1		



NOTES
UNLESS OTHERWISE SPECIFIED
1. ALL CAPACITANCE VALUES GREATER THAN 1 ARE IN MICROFARADS
2. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN PICOFARADS
3. CAPACITORS ARE 10% 50V
4. RESISTORS ARE 10% 1/4W
5. Δ LOCATED OFF BOARD
6. \square LOCATED ON COPPER SIDE OF BOARD
7. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITION WITH 120VAC LINE
8. \circ INDICATE WAVEFORM TEST POINTS

1469

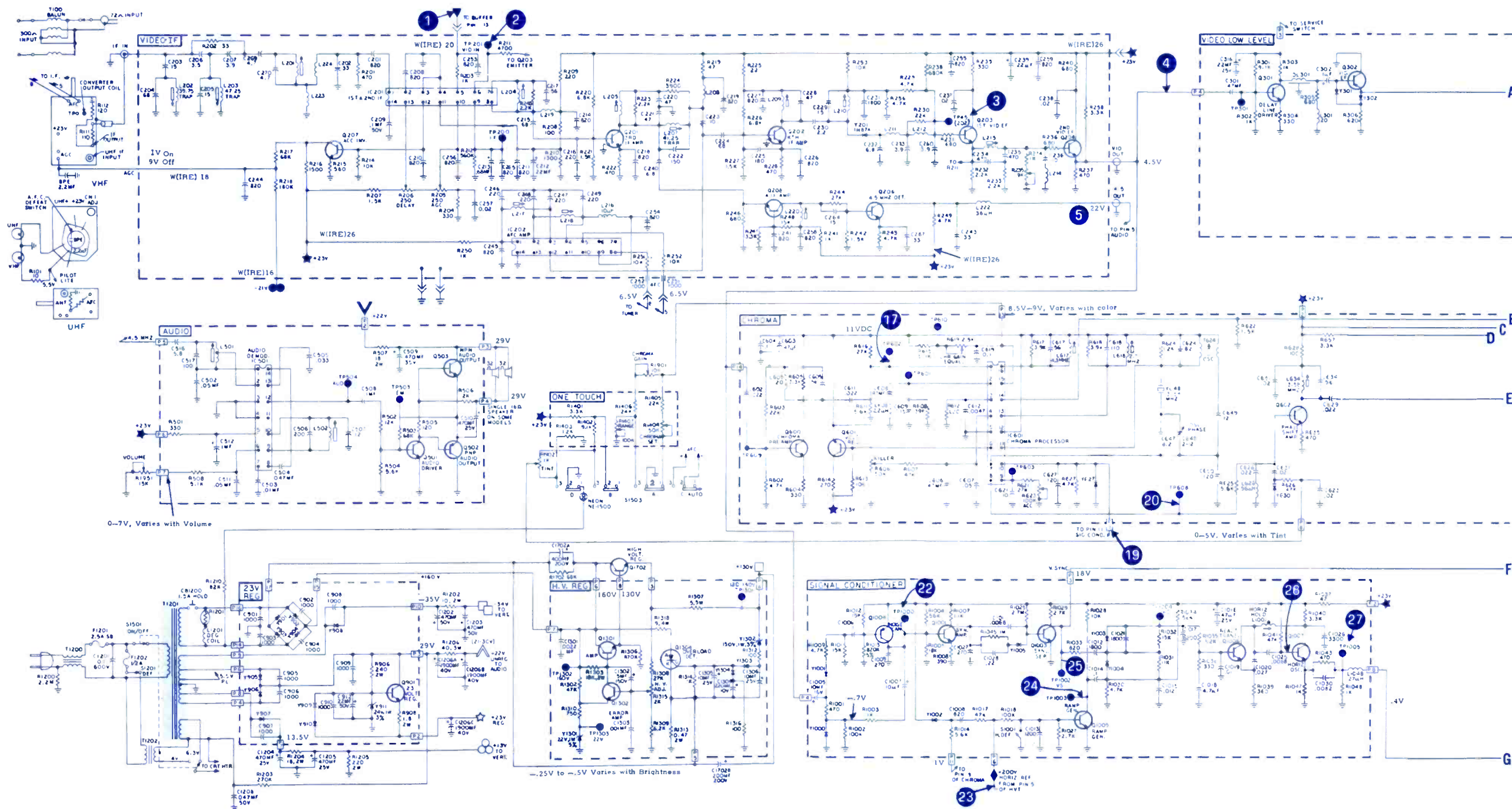
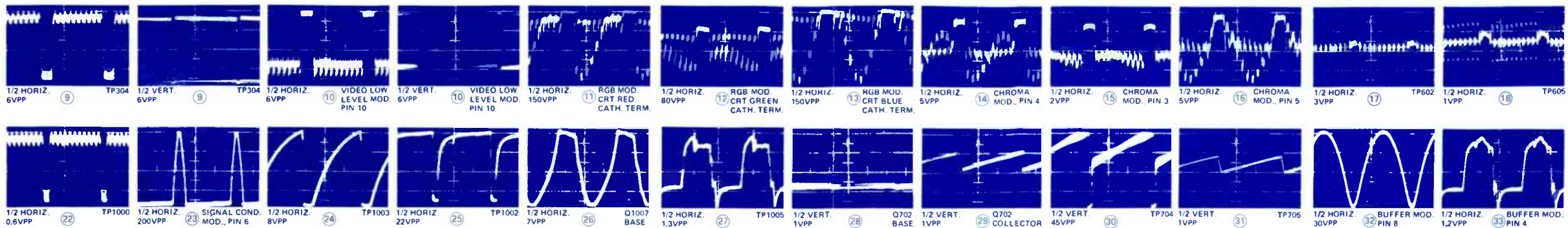
GENERAL ELECTRIC

Color-TV Chassis MA

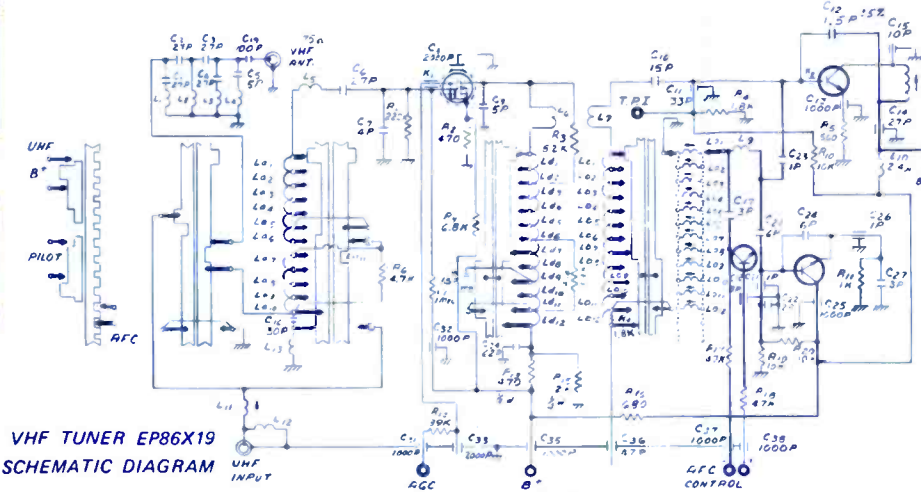
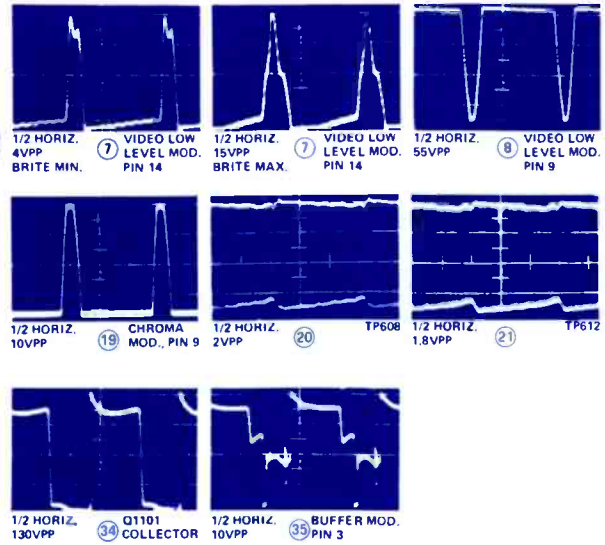
ELECTRONIC TECHNICIAN/DEALER **TEKFAK**

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

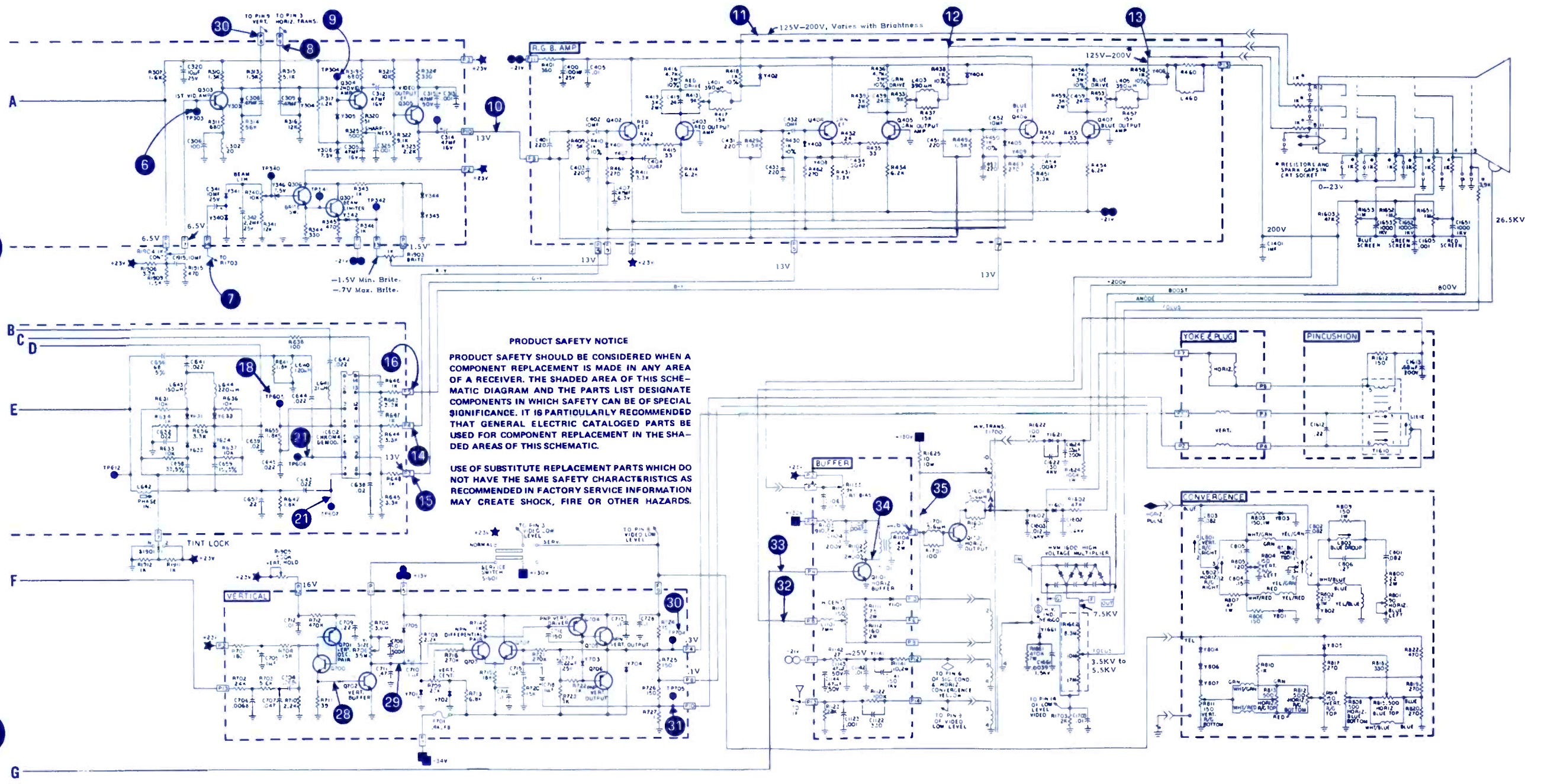


GENERAL ELECTRIC
Color-TV Chassis
MA



SYMBOL	DESCRIPTION	GENERAL ELECTRIC PART NO.
R1201	degaussing switch	EP39X4
R205	IF AGC, 250 Ω	EP49X142
R206	RF AGC, 250 Ω	EP49X142
R325	peaking, 500 Ω	EP49X140
R340	brite limit, 10K	
R413	red drive	
R433	green drive	EP49X141
R453	blue drive	
R606	killer adj, 50K	EU49X35
R619	chroma gain equal, 2.5K	ES49X628
R623	ACC adj, 100K	EP49X143
R706	vert size, 3.5M	EP49X144
R1113	horiz centering, 150 Ω	EP49X147
R1133	CRT bias	EP49X148
R1315	H V adj, 2K	EP49X90
R1651	red screen, 1M	
R1652	green screen, 1M	EP49X131
R1653	blue screen, 1M	
C1206A	1900 μf, +100-10%, 40v	EP31X42
C1206B	1900 μf, +100-10%, 40v	
C1206C	1900 μf, +100-10%, 40v	

L207	41.25MHz trap	EP36X92
L215	4.5MHz trap	EP36X111
L222	choke	ES36X751
L501	audio take-off	EP36X107
L502	quad	EP36X106
L617	chroma, 4.3MHz	EP36X112
L634	phase, 3.58MHz	EP36X112
L642	chroma phase	EP36X112
L1001	horiz. osc. (Hold)	EP35X2
T1200	power line choke	EU36X856
T1201	power xformer	EP62X34
T1202	CRT filament	EP64X22
T1700	high voltage	EP77X13
IC201	IF	EP84X1
IC202	AFC	EP84X5
IC501	audio	EP84X6
IC601	chroma processor	EP84X7
IC602	chroma demod.	EP84X7
	tripler, H. V. (H. V. M. 1600)	EP62X41
	yoke, deflection	EP766X10



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.

1470

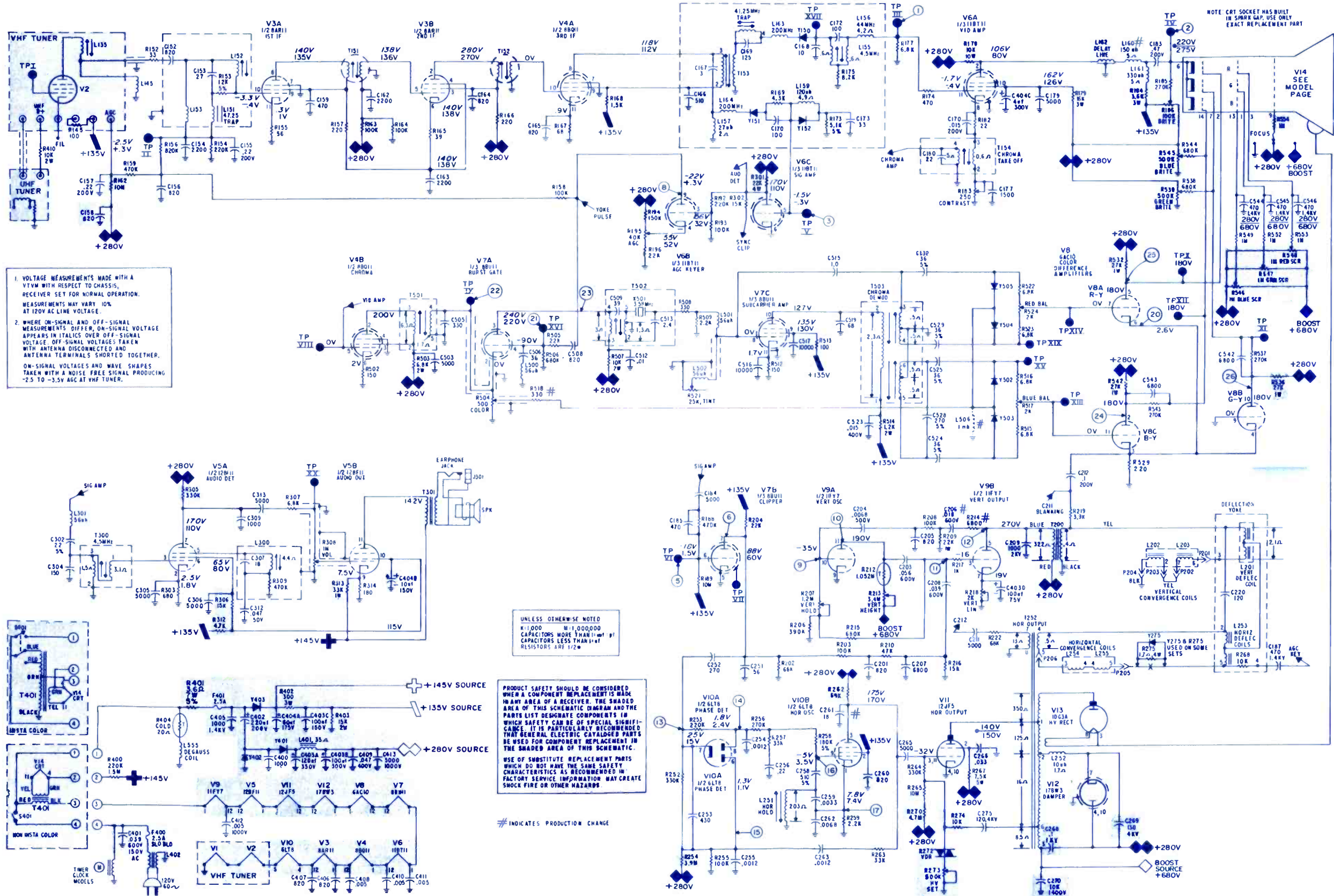
GENERAL ELECTRIC

Color-TV Chassis HD/H4

MAY • 1973

ELECTRONIC TECHNICIAN/DEALER **TEKFAK**

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



1. VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS. RECEIVER SET FOR NORMAL OPERATION. MEASUREMENTS MAY VARY 10% AT 120V AC LINE VOLTAGE.

2. WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS DIFFER, ON-SIGNAL VOLTAGE APPEARS IN ITALICS OVER OFF-SIGNAL VOLTAGE. OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED AND ANTENNA TERMINALS SHORTED TOGETHER. ON-SIGNAL VOLTAGES AND WAVE SHAPES TAKEN WITH A NOISE FREE SIGNAL PRODUCING +2.5 TO -3.5V AGC AT VHF TUNER.

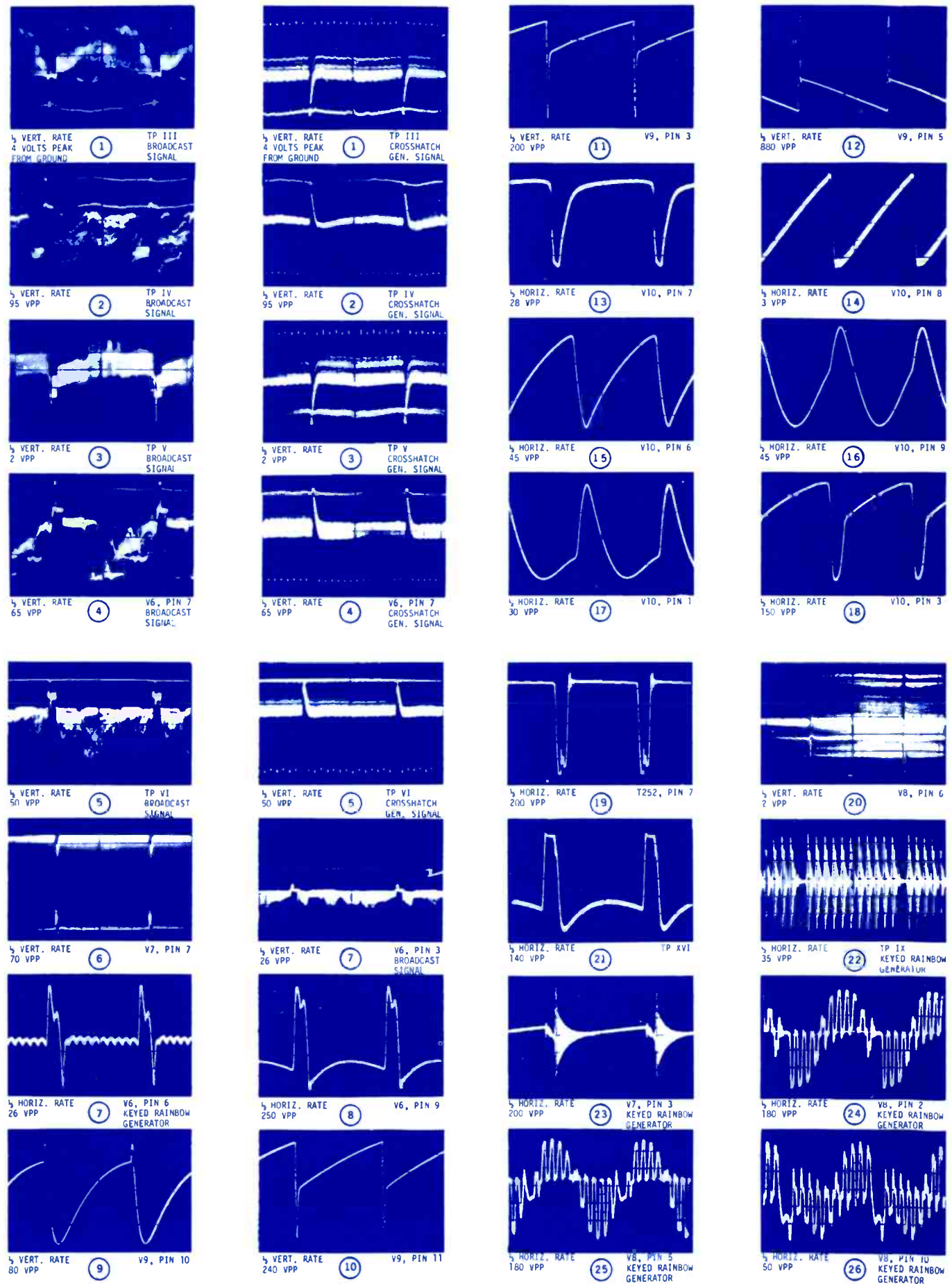
UNLESS OTHERWISE NOTED
 K=1,000 M=1,000,000
 CAPACITORS MORE THAN 1µF
 CAPACITORS LESS THAN 1µF
 RESISTORS ARE 1/2W

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 CATALYZED PARTS BE USED FOR COMPONENT REPLACEMENT IN THE SHADED AREA OF THIS SCHEMATIC.

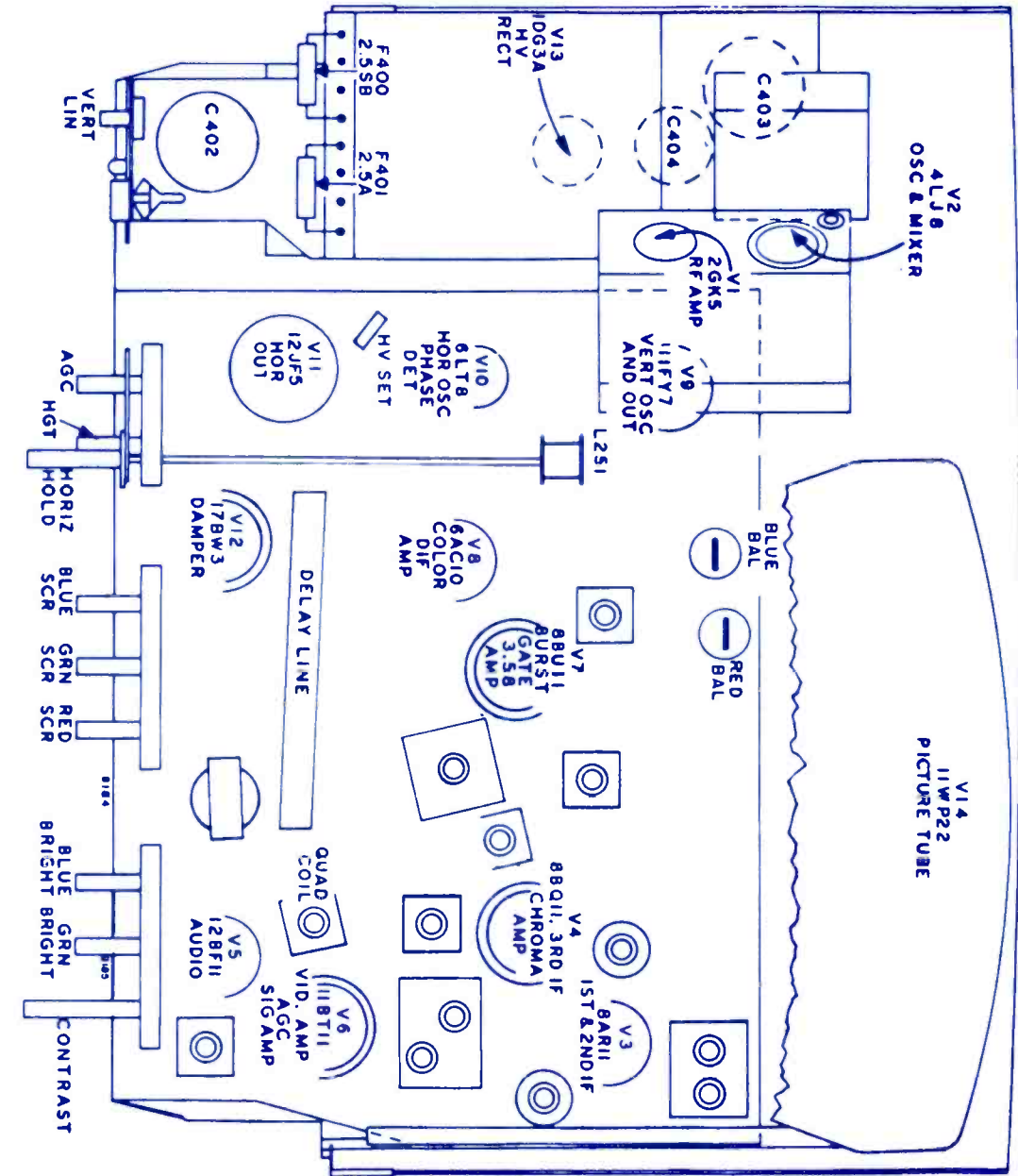
USE OF SUBSTITUTE REPLACEMENT PARTS WHICH DO NOT HAVE THE SAME SAFETY CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SMOKE FIRE OR OTHER HAZARDS.

≠ INDICATES PRODUCTION CHANGE

WAVEFORMS FOR POINTS INDICATED



TUBE AND ADJUSTMENT LOCATOR



SYMBOL	DESCRIPTION	GENERAL ELECTRIC PART NO.		GENERAL ELECTRIC PART NO.	
R212	thermistor, 1.052M	EP14X206	C404A	-80 μ f, +100-10%, 175v	EP31X266
R272	VDR, 1ma @ 850 ± 15%	EP13X2	C404B	-10 μ f, +100-10%, 150v	
	triple control	EP49X592	C404C	-4 μ f, +100-10%, 300v	
R183	-250 Ω, contrast		L155	-coil, 4.5MHz trap, w/core	EU61X121
R539	-500K, green brightness		L201	-deflection yoke-Horiz & vert.	EP76X4
R545	-500K, blue brightness		L251	-coil, horiz osc, w/core	ET35X52
	dual control	EP49X593	L300	-coil, audio detector, w/core	EP36X52
R195	-40K, AGC		L501	-coil, 3.58MHz, peaking, w/core	EP36X20
R213	-3.4M, vertical height		T154	-x-former, chroma take-off, w/core	EP61X177
R218	-2K, vertical linearity	EP49X590	T200	-x-former, vert output	EP64X14
R273	-HV set, 500K	EP49X42	T252	-x-former, horiz output, w/cap & lead assembly	EP77X4
	triple control	EP49X591	T300	-x-former, 4.5 MHz, interstage, w/core	EP36X813
C403A	-120 μ f, +100-10%, 350v	EP31X265	T301	-x-former, audio output	ET64X105
C403B	-100 μ f, +100-10%, 300v		T501	-x-former, chroma amp output, w/cores	EP61X173
C403C	-100 μ f, +100-10%, 150v		T502	-x-former, crystal filter, w/cores	EP61X174
C403D	-100 μ f, +100-10%, 75v		T503	-x-former, chroma demodulator, w/cores	EP61X175
				fuse, 2 1/2 a, slow-blow, F400	EP10X11
				fuse, 2 1/2 a, fast-blow, F401	EP10X47

1471

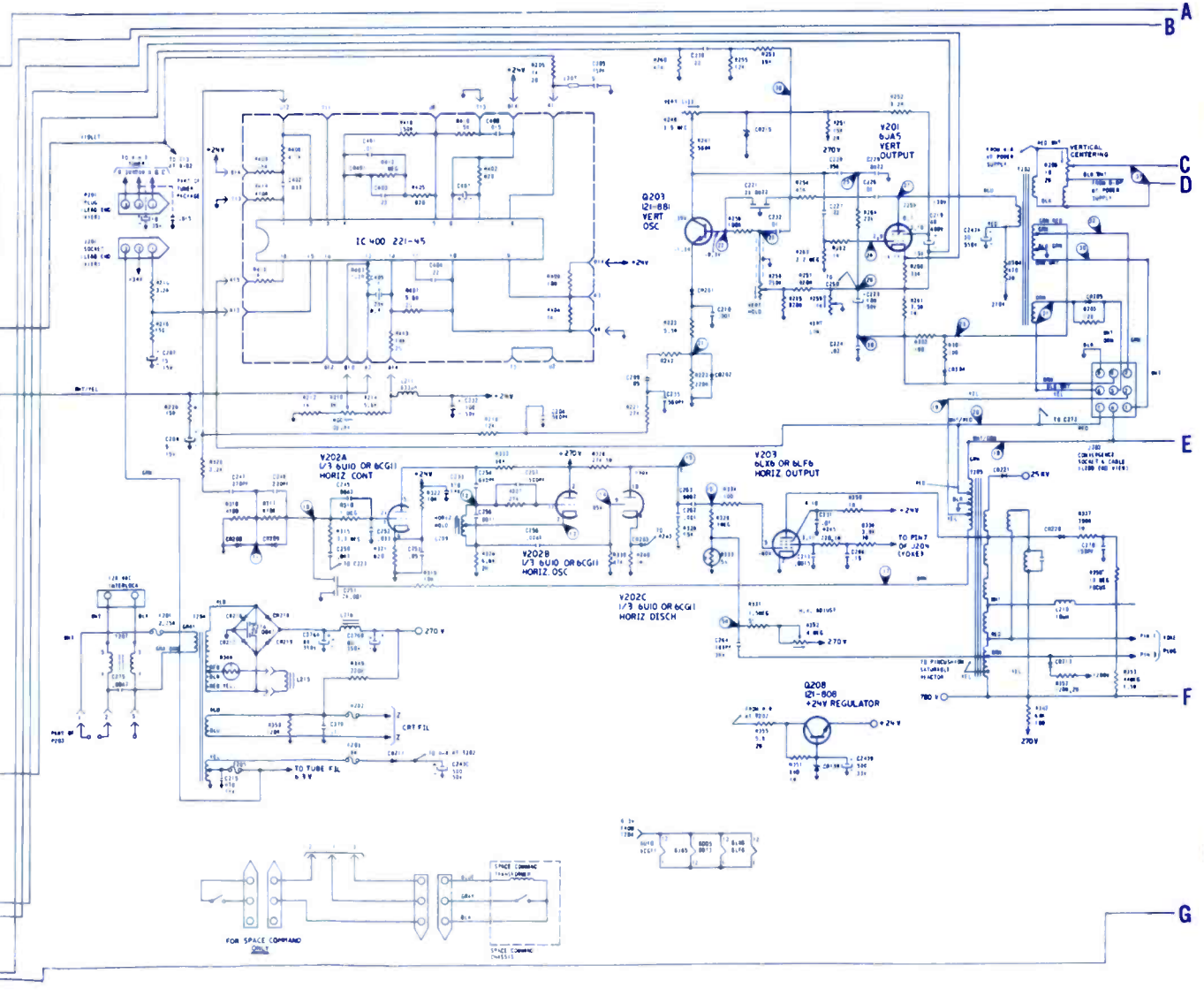
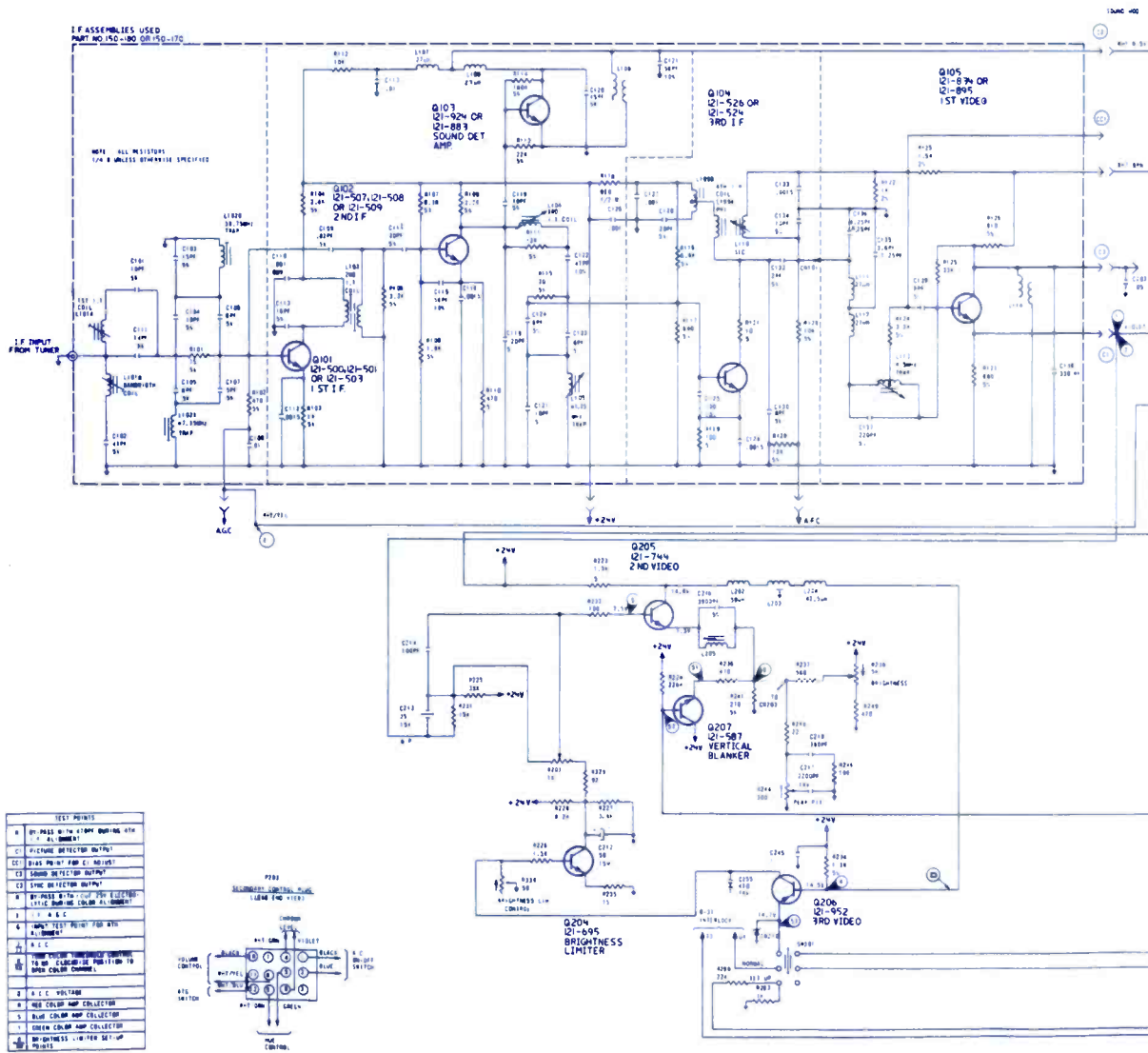
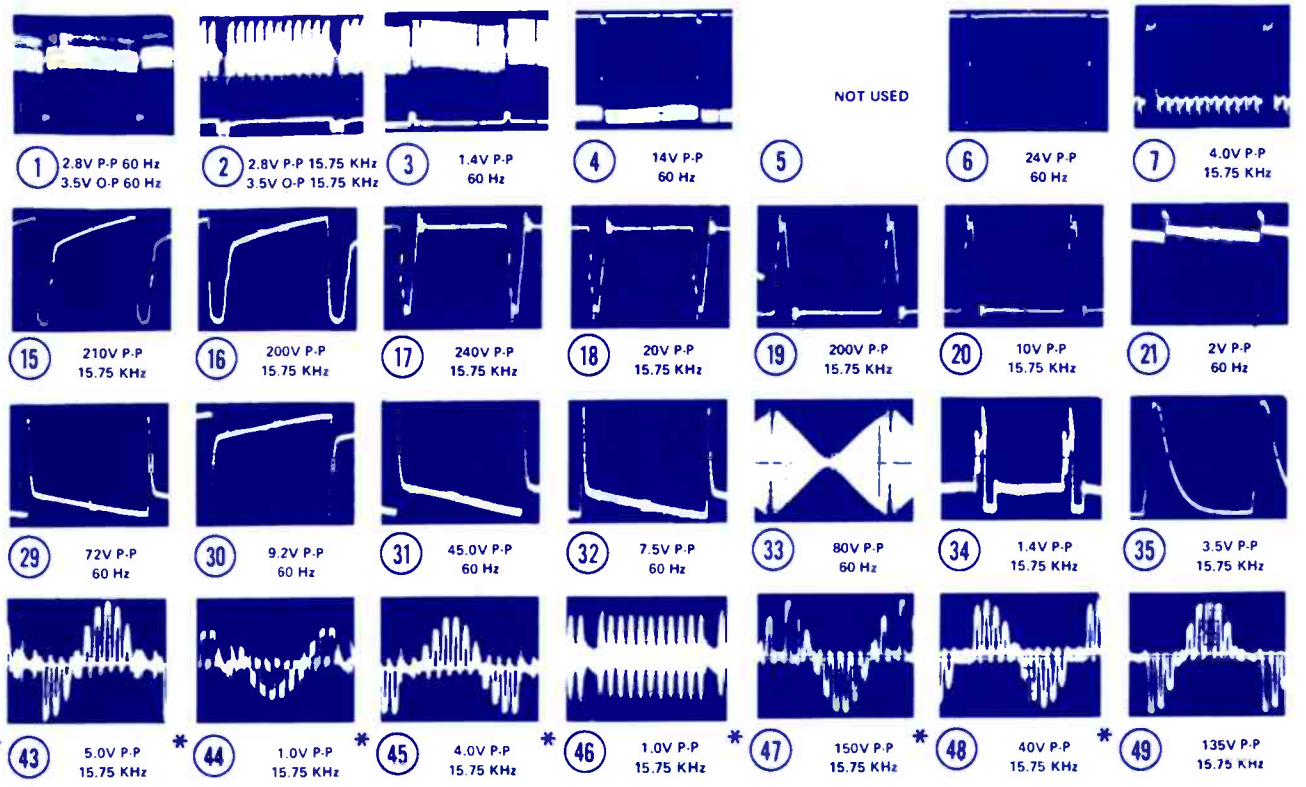
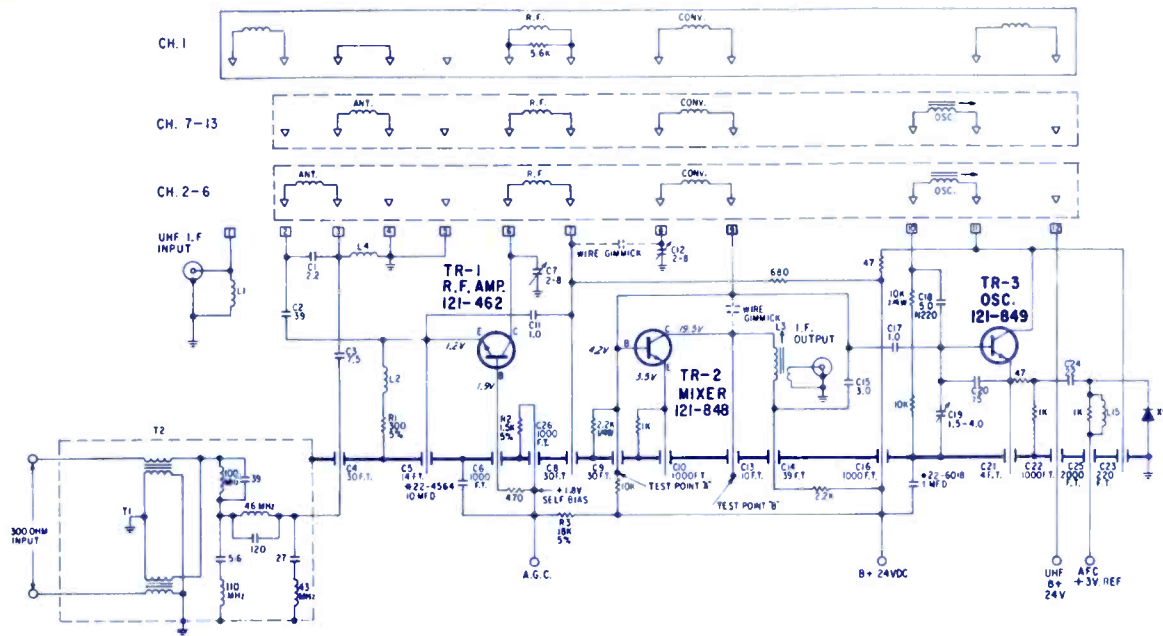
ZENITH

Color-TV Chassis
19DC21

ELECTRONIC TECHNICIAN/DEALER **TEKFAK**

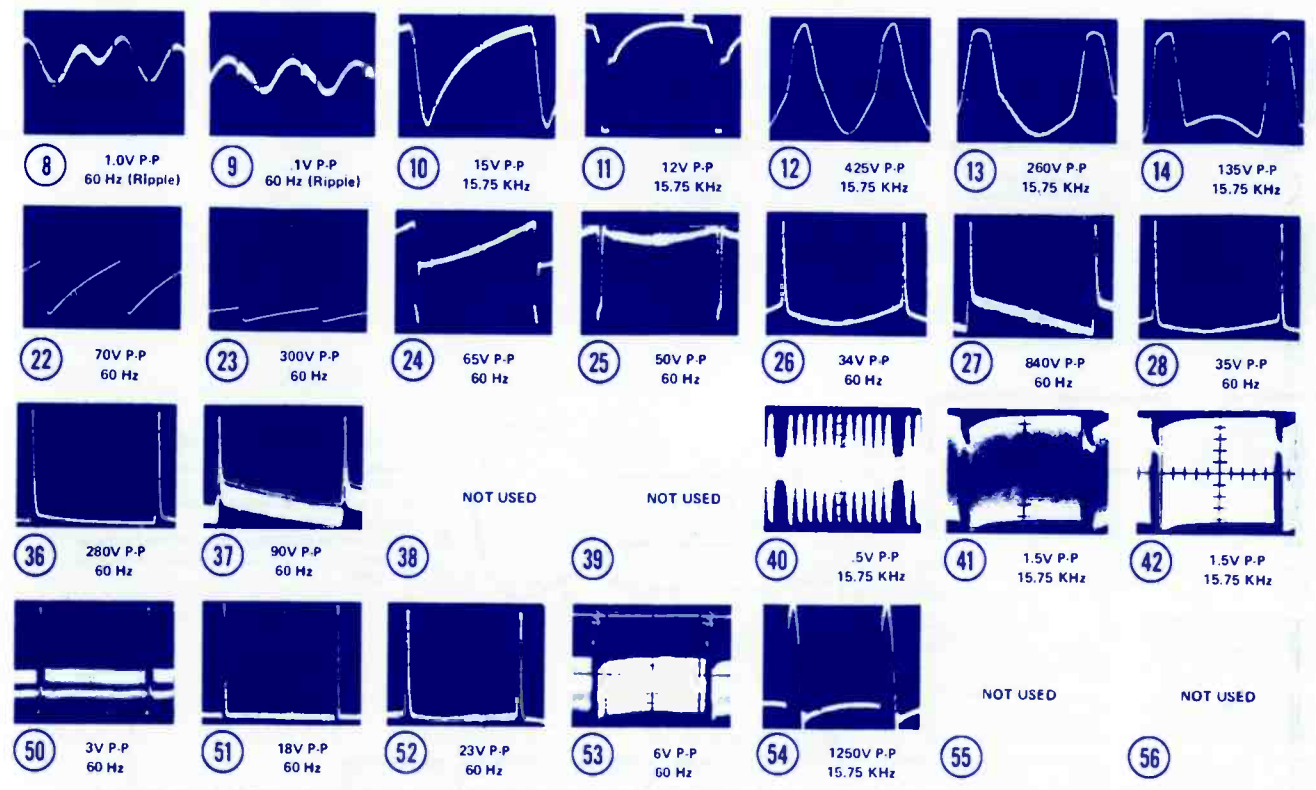
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COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATIONS FOR 5 NEW SETS

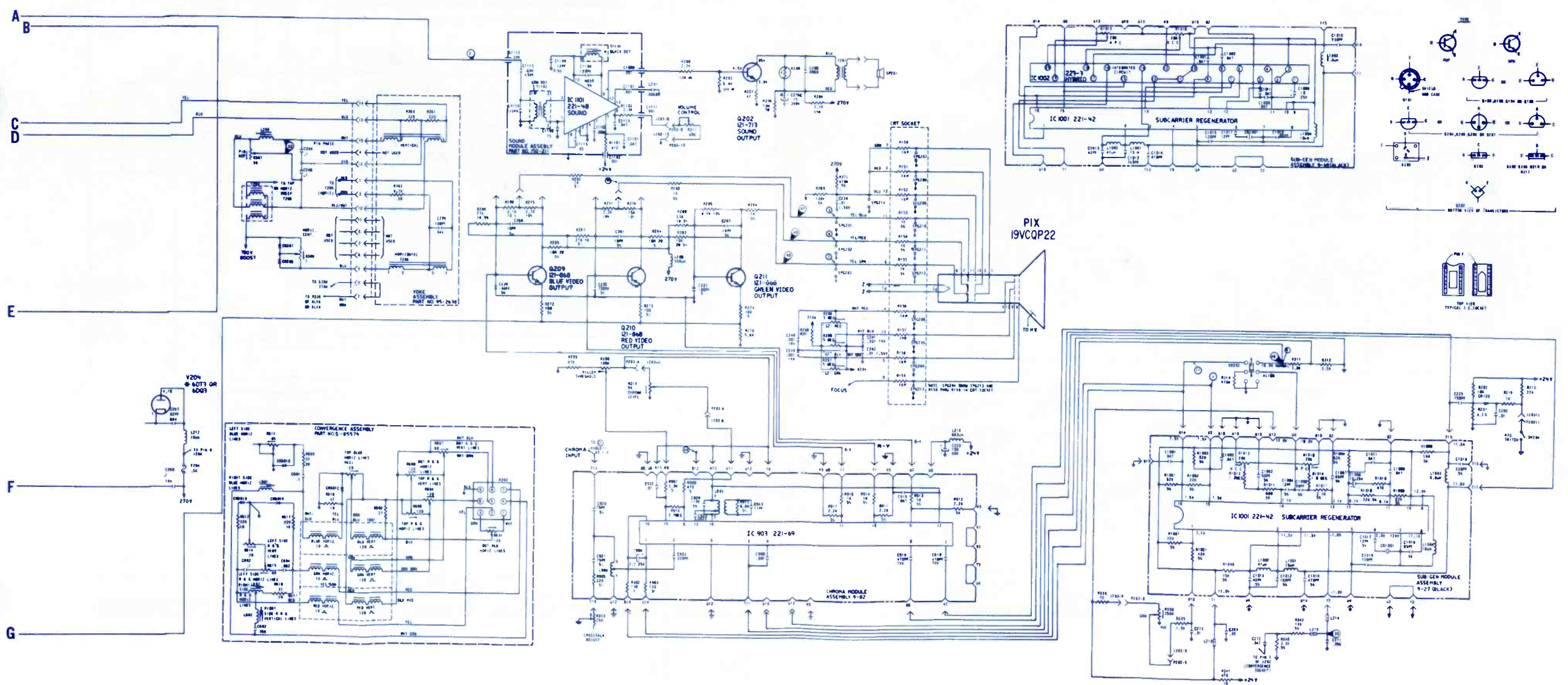
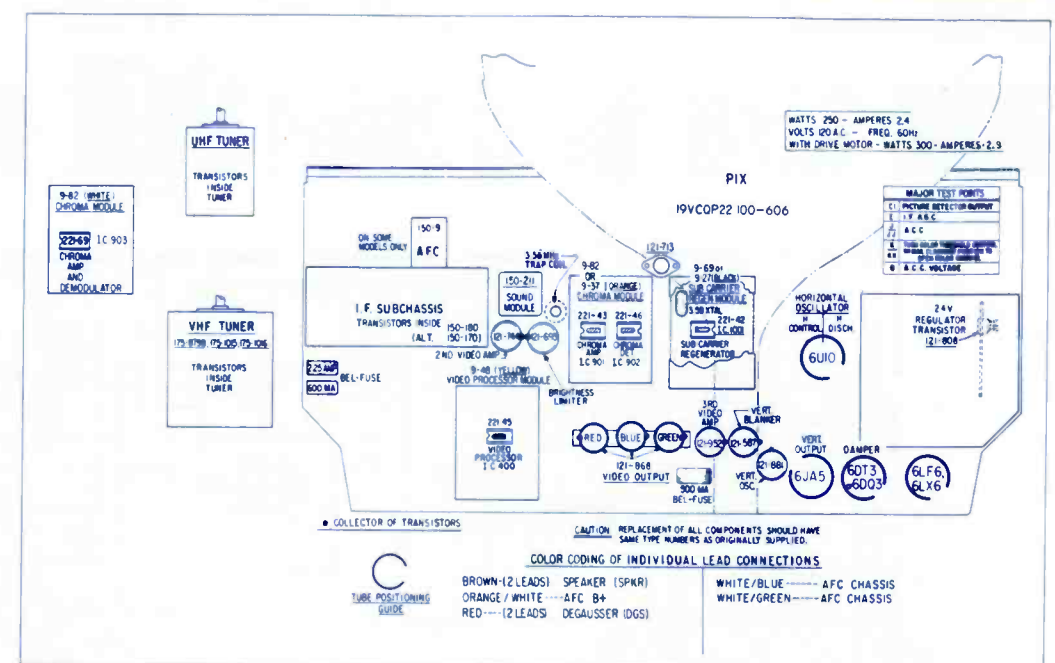


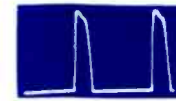
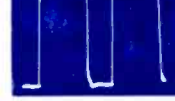
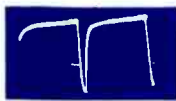
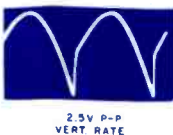
- TEST POINTS
- 1. ANTENNA INPUT
- 2. SOUND DETECTOR OUTPUT
- 3. SOUND DETECTOR INPUT
- 4. SYNC DETECTOR OUTPUT
- 5. BRIGHTNESS LIMITER OUTPUT
- 6. BRIGHTNESS LIMITER INPUT
- 7. BRIGHTNESS LIMITER INPUT
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**ZENITH
Color-TV Chassis
19DC21**

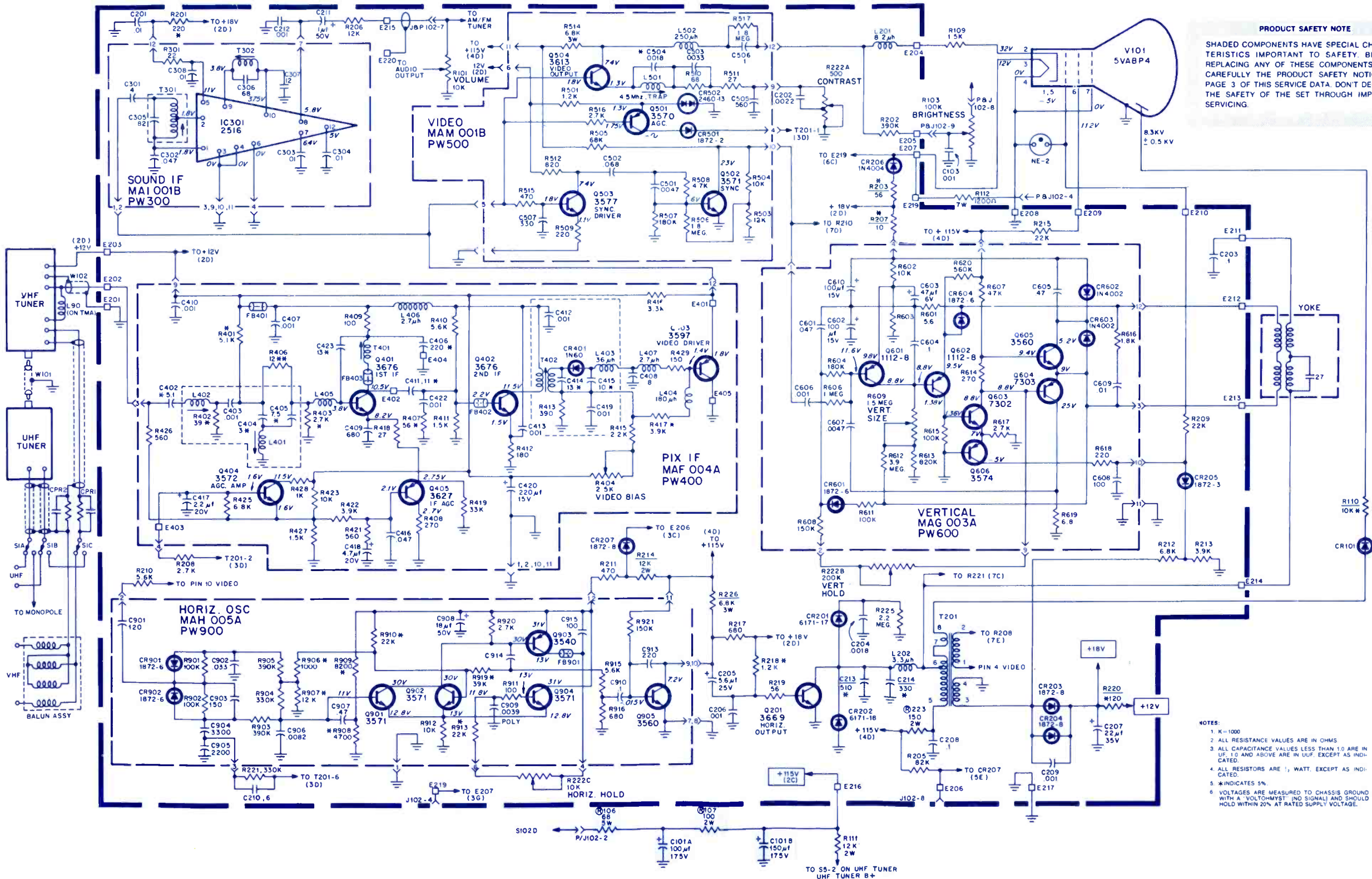


* FOR WAVEFORMS 43 THROUGH 49, BYPASS TEST POINT "D" WITH 1.0 MF CAPACITOR.





SYMBOL	DESCRIPTION	RCA PART NO.
C101	2 section elect	137324
CPR1	circuit encapsulated	132650
CPR2	circuit encapsulated	132650
F101	fuse	137325
	yoke, deflection assembly	137347
T301	xformer	130120
T302	xformer	130121
PW400	module, complete MAF004A	137326
PW500	module, complete MAM001B	131951
PW600	module, complete MAG003A	137327
PW900	module, complete MAH005A	137328



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

- NOTES:**
1. K=1000
 2. ALL RESISTANCE VALUES ARE IN OHMS
 3. ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN UF, 1.0 AND ABOVE ARE IN UUF, EXCEPT AS INDICATED.
 4. ALL RESISTORS ARE 1/2 WATT, EXCEPT AS INDICATED.
 5. * INDICATES 5%.
 6. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHMIST" (NO SIGNAL) AND SHOULD HOLD WITHIN 20% AT RATED SUPPLY VOLTAGE.

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LBO-511 5" GENERAL PURPOSE WIDEBAND SCOPE A solid state winner offering recurrent sweep with automatic synch; phasing control, calibrated v't'l input and high linearity sweep. Features FET input stages for firm stability plus distortion free displays. V't'l sensitivity is 20mVp-p/cm to 10Vp-p/cm; bandwidth is DC to 10MHz and you can use it as a vectorscope, too. For color, black and white service or on-line production use. Access. incl. \$349.95

LBO-310 3" SOLID STATE GENERAL PURPOSE SCOPE Unusually high sensitivity with bright display, sharp focus & excellent stability. Delivers 20mVp-p/div v't'l sensitivity with 600V max. input. Sweep frequency is in 4 ranges — 10Hz to 100KHz, cont. adjust. Also monitors waveforms to 100MHz and has provision for DC voltage/level checks. Compact, lightweight, it's an ideal time and money saver everywhere — for hobbyist, educators, production and service. \$199.95

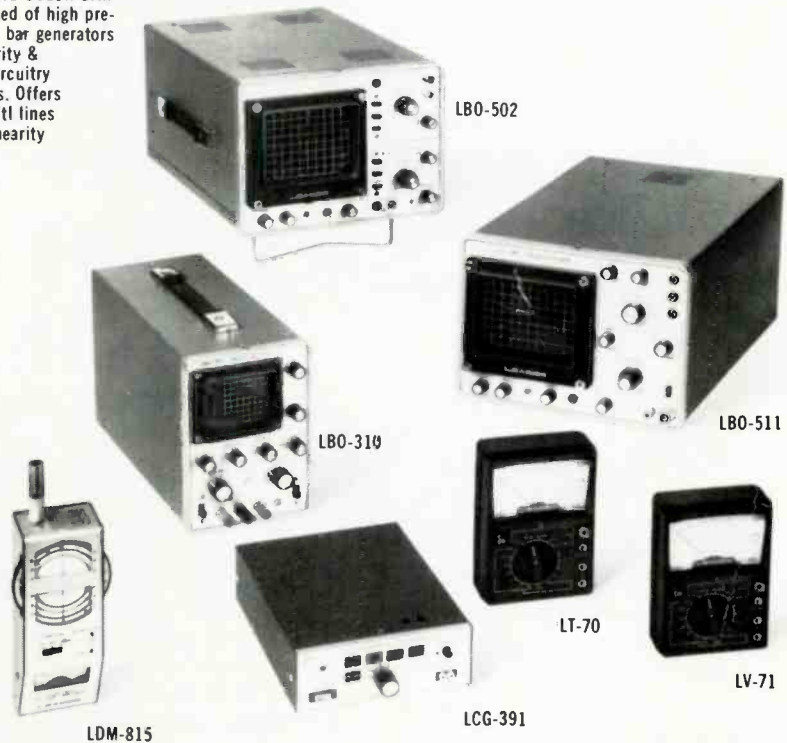
LCG-391 SOLID STATE COLOR BAR GENERATOR A new breed of high precision, compact, color bar generators with a white "no noise raster" for purity & balance checks. Has digital integrated circuitry to assure 6 sharp, clear, precise patterns. Offers return trace blanking and flickerless h'z't'l lines plus square cross-hatch pattern for linearity checks; two switch selectable frequencies; RF output connectors and integrated circuit PC board construction. Clearly a best buy. Carry case and RF cable incl. \$129.95

LT-70 BATTERY OPERATED VOLT/OHM METER An all-around, extra-tough instrument with full protection against polarity reversal and overload. Has special LI scales for SCR and transistor checks. Reads as low as 0.25V full scale and 250 μ A for smaller solid state needs. There are 9 current ranges, 10DCV ranges, 3ACV ranges and 5 resistance ranges. Sensitivity is 20,000 ohms/VDC. Portable, lightweight, with shielded metal case. Battery operated, complete with accessories. \$34.95

LV-71 SOLID STATE FET VOLT/OHM METER VTVM accuracy plus battery operated convenience! Has instant on-operation, polarity reversal switch, dual FET circuitry & diode overload protection. Incorporates 12 voltage, 4 current & 4 resistance ranges plus a zero center scale on a large 4 1/2" meter. Perfect for use in a broad range of service, hobby and industrial areas, it's compact, lightweight and complete with accessories. \$64.95

LDM-815 PORTABLE, TRANSISTORIZED DIP METER A sturdy RF tester that enthusiasts and technicians have always wanted. Use it for quick, easy checking of receivers, transmitters and antennae in 1.5 to 250MHz range. Determine LC network resonant freq; align receivers; adjust wavetraps; find parasitic oscillations. Has 310° calibrated dial, 3 position function monitoring, indicating meter and 6 plug-in coils. With earphones. \$89.95

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Model 630

\$69

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 Buy *Triplet's 630*

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Now featuring a rugged suspension movement, Triplet's Model 630 is being welcomed by lots of new buyers.

They're buying it for its long, easy-to-read scales, 27 ranges, 20,000 Ohms per Volt sensitivity and 2% accuracy on DC, 5,000 Ohms per Volt and 3% on AC, diode overload protection, resistance measurements to 100 megohms, 6,000 Volt AC

and DC capability and lots more. The feature-packed Model 630 is \$69.

If you want the same features in a V-O-M with laboratory accuracy, Triplet's Model 630-A at \$79 offers 1½% DC accuracy and a mirrored scale.

See for yourself, at your local Triplet distributor, the "lots more" that makes Triplet's

Models 630 and 630-A such great values. For more information or for a free demonstration call him or your Triplet sales representative. Triplet Corporation, Bluffton, Ohio 45817.

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