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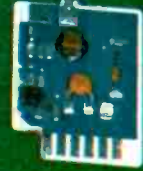
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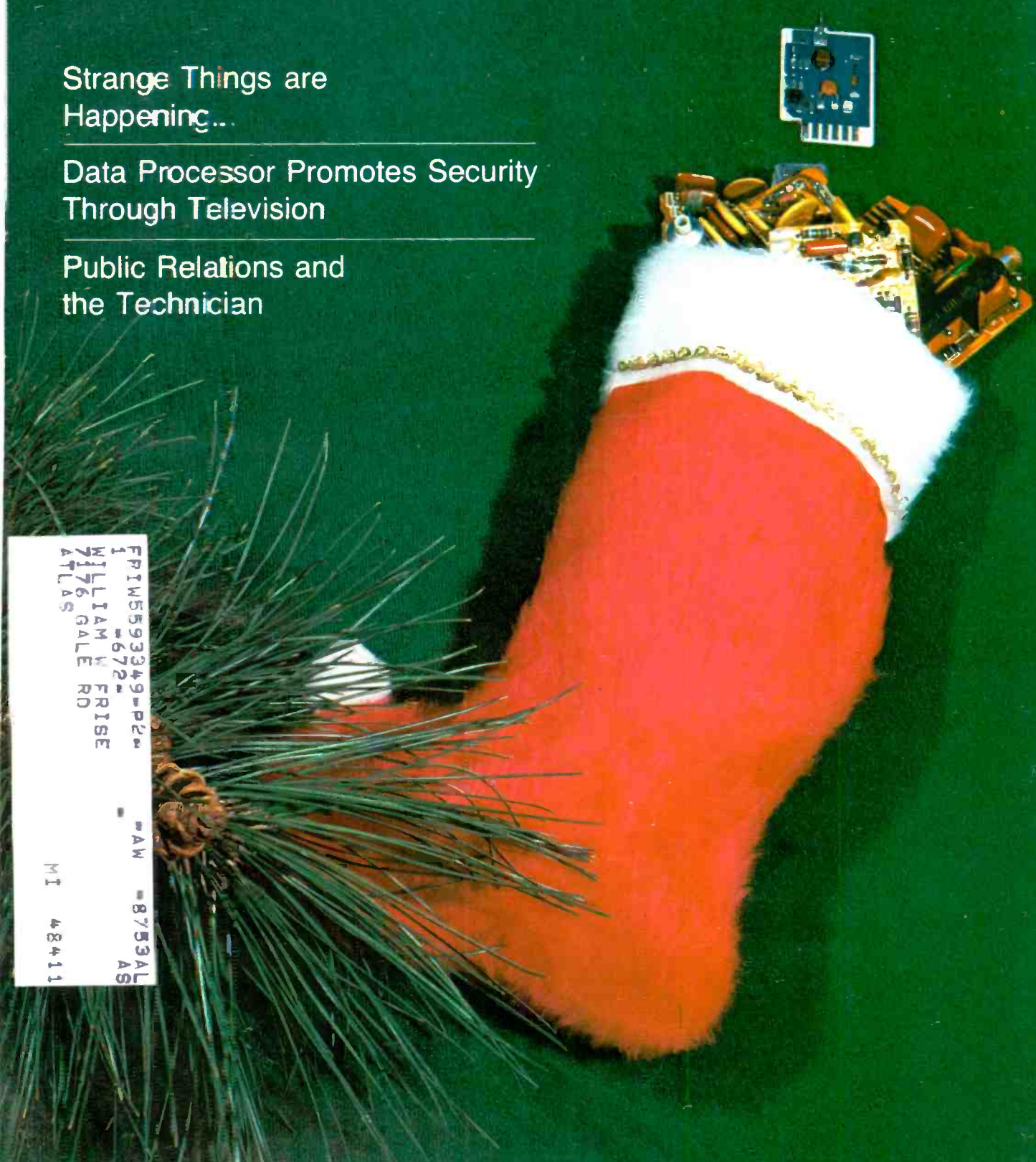
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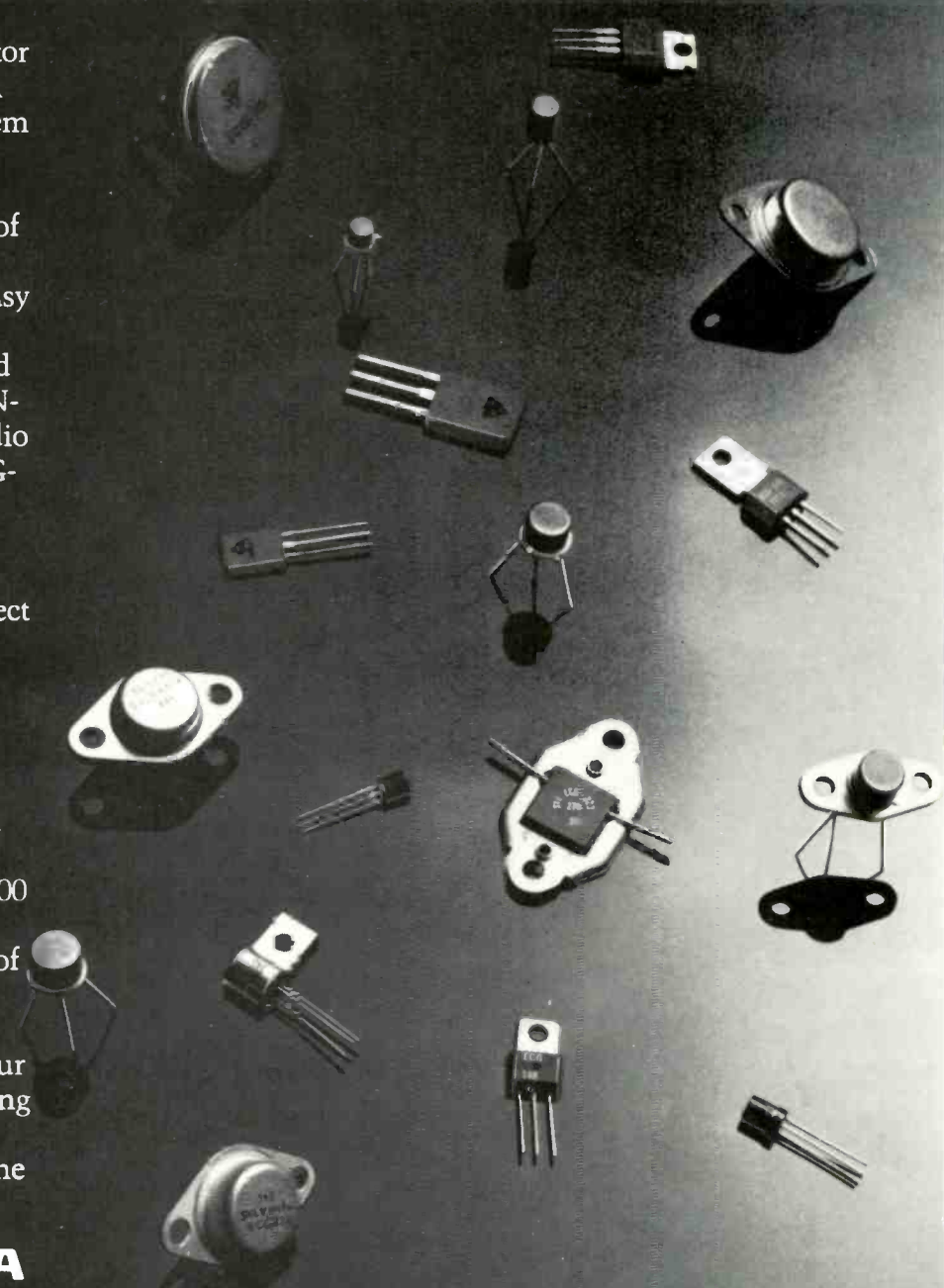
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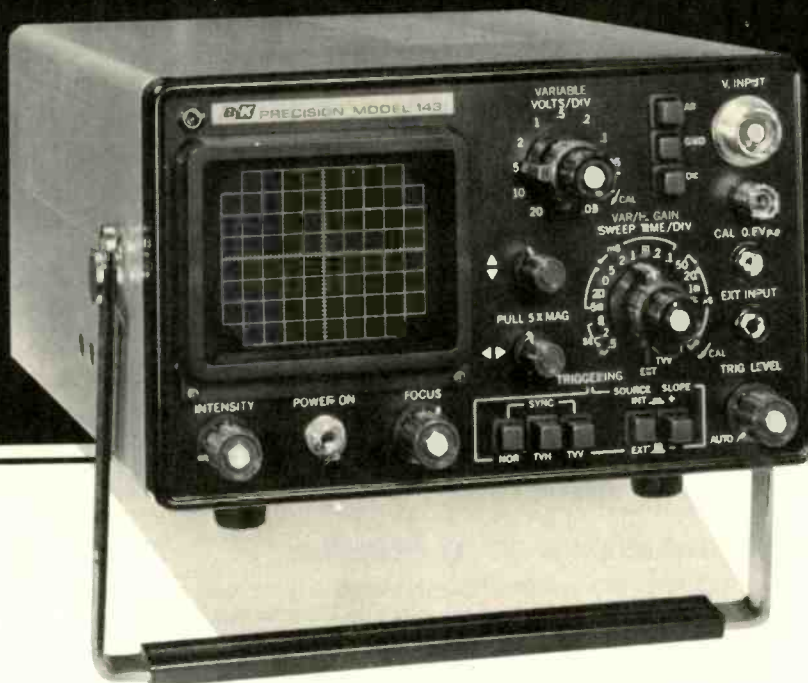
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Cover Photo: If only there was a Santa that could supply us with all the modules that we now seem to require for effective servicing.

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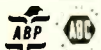
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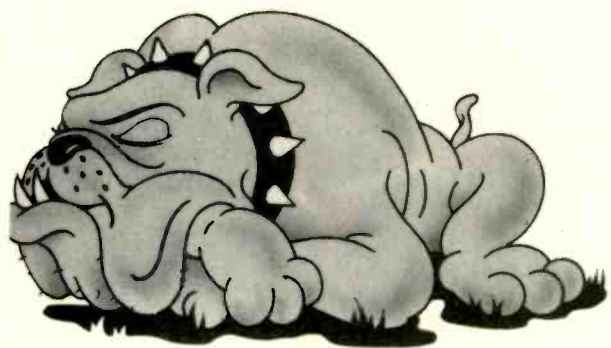
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We Can't Do It All!



This year marks the end of the 20th year that this magazine has been published—it having been founded in 1953. And interestingly enough, we are still occasionally contacted by readers that have

maintained their subscriptions continually since that very first year!

Although color television and transistors were introduced to the public prior to the founding of our publication, a great deal has happened to our industry during the past 20 years. And we hope that ELECTRONIC TECHNICIAN/DEALER has helped many readers become successful in our industry.

Beginning on page 40, this month's annual index lists the many technical- and business-type articles that have been printed during the past year, plus listing the tips for more effective color-TV set servicing that have been printed in our Colorfax section and the other servicing tips printed monthly in our Technical Digest section. A second annual index, printed in the Tekfax section, provides a handy reference to all such schematics that have been printed in ELECTRONIC TECHNICIAN/DEALER during the past 10 years.

We make no claims of being perfect, but have tried hard to serve you, so that you can be truly successful in your profession. However, our efforts alone are not enough! No monthly publication—whether it contains less than a hundred pages or many times that number—can possibly provide all the assistance required to succeed with the problems facing today's electronic technicians and service dealers. It is necessary

to rely on other resources as well.

Every electronic technician and service dealer should have access to a technical library—either in his home, or preferably in his place of employment. (Employers must begin to realize that a little time spent by employees reading during working hours will save more money in increased efficiency than it will cost in "idle" time.) There is much that the library should contain in addition to notebooks for each 12 months of indexed ELECTRONIC TECHNICIAN/DEALER and separate bound volumes of our Tekfax schematics. It should also contain the following: Service information received either free or by paid subscription from the manufacturers of products serviced; service information provided by fellow technicians, plus local, state and national trade associations; and such information as is found in TV TECH AID and other such publications. There should also be books, including those published by various manufacturers, Tab Books, Howard W. Sams, McGraw-Hill, Prentice-Hall, and others. (Some of these books may be selected as a result of recommendations in our Book Review column, others on the basis of books found in the public or university library, and still others upon the recommendation of your local book store. Too frequently we fail to remember that most local book stores purchase for their own use master listings by both title and subject area virtually all books on the market that deal directly or indirectly with electronic sales and servicing.)

Whether it be a rump session in your shop, a formal or informal activity scheduled by your local distributor, or some program sponsored by a local, state or national trade association; there is nothing like getting together with others of similar background and exchanging service tips, discussing

those "tough dogs," or dealing with some other phase of your business activity. You can also collectively view instructional slides or movies, such as the film that RCA just gave NESDA (please note the news item on page 14).

There was once a time when a formal education was unnecessary for effective sales and servicing—life then was relatively simple. But things have changed. Government involvement now requires some understanding of law (by everyone for their own protection), keener competition requires a better knowledge of consumer psychology, and new solid-state circuitry requires a better understanding of fundamental electronics. Thus independent reading and attending group functions is not always enough. It is becoming increasingly urgent that everyone in our profession receive some form of formal training—whether it be at a local business college, a local vocational school or university, at schools sponsored locally by national associations, or through correspondence courses. Any combination of these formal training programs can do much in determining whether one makes it or not as conditions in our profession continue to get more difficult.

Although we cannot possibly do the job alone, all of these other activities can prove more effective if they are supplemented, balanced and brought up to date with the material presented in ELECTRONIC TECHNICIAN/DEALER. We appreciate your loyalty and promise to continue to work hard at this task of serving you.

LETTERS

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

He Would Do Far Better If He Became a Plumber

A letter in the October issue raises the question of the wages paid in this industry. The RETA of Ontario [*Radio Electronic Technicians Association of Ontario*] has recently sent out a questionnaire to all its members in order to find out the charges made for TV repairs and also to get some idea of the wage rates in Ontario. While all the answers are not yet in, a quick scan through them shows that they vary from \$3.25 per hour to \$5, with the great majority earning \$4.50 to \$5.00 per hour.

If your correspondent wishes to plan a well-paid future, he would be far better off as a plumber, an electrician, or in a factory, and about as well off as a garbage collector. I cannot call to mind at the moment any trade which calls for the use of so much equipment or for so much knowledge that must be up-dated continually. The red queen must have been talking about TV repair when she said that it takes all the running you can do to stay in the same place, because things sure change fast. No sooner does one get use to transistors than they are on the way out and "IC" is the magic word.

What can be done? The essential thing is to clear up the chaos in the industry, which can only be done by supporting your electronic associations. Next get the repair rates in line, so that both the employer and the employee can earn a fair return for their work. Looking through the replies from the RETA members, I note that one shop, with a location, charges \$5.50 to do minor repairs on a carry-in color-TV set and \$3.50 for B/W-TV sets; while another charges a flat \$5.00 per hour. At those prices, they could have all my work but I don't suppose that they will be in business long. But the main reason for joining an association is to fight the constant attacks on the service industry by get-popular-quick politicians and others and to get the public to realize that we are not all gougers but solid, honest technicians, who take a pride in their work, and give the public far better value for the money than they realize.

P. M. LEYDEN
PROVINCIAL SECRETARY, RETA

Electronic Technicians Can Make Good Money

In response to the article, "What Future Salary Might One Expect?"—Go west young man, go west.

I have been a subscriber to your magazine for many years and think it is number one. I am definitely not new to the radio and television business. I started with crystal sets 50 years ago. At the present time I operate a retail store with a service department on a main street in a large city. At my age it would certainly be nice if I could work fewer hours and take more vacations. My big problem is getting good technicians.

We work from 9:00 to 5:30 six days a week and are closed nights and Sundays. Our technicians earn over \$6.00 per hour and work a 40-hour week. They make over \$1,000 per month. We still can't find enough competent help. Our employees also receive the following benefits: Health and welfare, paid vacations, and paid holidays. Enclosed is a copy of a pay record for one week of one of our technicians.

Many shops in California are looking for good help. We no longer install car radios or antennas as this has become a more specialized field. We only service major brands. Every day we turn down fixing off-brands, and we still have more work than we can handle. Large shops in San Francisco are Union, while the smaller shops are not. Union scale is now \$6.30 per hour minimum for Journeyman, plus benefits.

STANLEY MICHELSEN

Small Shops Should Combine Efforts for Greater Efficiency

It isn't often that I find time to write in response to what I've read in the many magazines (some 30 a month) which I read to try and keep up with the changing technical advances of our times.

I've had a service shop since 1966, and while I have never attempted to apply for a CET, I have held a First Class Radio Telephone License for as long as I've been in business. In addition, I've worked at commercial radio and TV stations doing everything from Chief Engineer on down.

I feel that the days of the small service shop are numbered. We've never been a large shop and have never employed more than three people at any one time, but we've always enjoyed a substantial income. Lately, with the emphasis on modularized TV's and the incredible prices charged for equipment (extremely low, i.e., a transistor radio for \$2.98) we find it

more and more difficult to maintain a good profit margin in consumer electronics. Most transistor radios and most portable TV sets are priced to be thrown away if they break after a service period of a few years. The junk on the market today compared to the equipment of a few years ago is sickening. We've just recently discontinued all TV service, all radio service, and are maintaining only our commercial, ham, CB, video tape and closed circuit sales and service.

With the disposable electronic components on the market today it is no longer feasible to charge \$25 to repair a TV set that only cost \$69 new. If you don't charge a reasonable amount, your profit level is so low as to barely make overhead.

I would like to propose that several service shops combine to form assembly line repair service for those items worth repairing. This collective service center could have departments specializing in each brand, all drawing from a central supply for parts, and provide streamlined and efficient service. Typically, a day laborer could be employed to dismantle each set, clean out the ton of dirt, check the tubes, and list the symptoms. A trained technician would then diagnose the set for the specific problem, and return it to a semi-qualified person to do the actual repair work. The set would then be reassembled by the laborer and delivered to the customer. To make this a reality and a good profitable venture would take a huge service volume, but one such shop in each locality serving an area of 100,000 people should be practical. What do you think?

HENRY B. RUH

Comments Concerning Home MATV Article

I was extremely interested in your article in the September issue of *ELECTRONIC TECHNICIAN/DEALER* entitled, "Updating One's Home." I did about the same thing about two years ago.

I installed a very high-gain antenna to pick up the three local VHF and one local UHF station. I chose an antenna that used the log-periodic configuration for VHF and reflector log for UHF. Log-periodic antennas have a wide pickup area and are very useful if most signals are contained in a 30° angle. I chose coax also, and I routed it through a vent in the roof to a splitter. From the splitter I routed the coax out under the roof through vents and down the outside and back into selected rooms under windows.

Now I, and I guess you, forgot one thing. That is grounding to protect the

two TV sets and one FM radio connected to the antenna system. Here in Florida there are an average of 90 thunder showers a year. How many lightning storms are there usually in Duluth? I understand that there are quite a few. What lightning-strike protection are you installing? I would suggest a heavy wire connected from the antenna mast to a good ground connection.

There might be in-line lightning arrestors, but I do not think that Jerrold makes any of these devices for use on coax. I found that you can purchase cable similar to CAC-6 from Belden as their No. 8228.

I would appreciate seeing how you would go about protecting our goodies from fire, damage, etc.

RICHARD MCCLEARY

Your concern regarding an adequate ground is certainly justified. We in Duluth do also have many thunder storms.

On page 37 of the article, mention was made to the fact that the antenna was mounted on a mast that came with the house. What I failed to state was that this mast was already well grounded with a ground wire connected between the antenna mast and a large metal stake previously driven into the ground. Please also note the cover illustration which shows the system grounded. Ed.

Business Forms Don't Permit Comments Concerning Service

Concerning the article in the October issue, "A Little Psychology Goes a Long Way": I quite agree that a complete description of the labor is good psychology. However, have you been looking at the recent service forms and the gradual reduction of the space devoted to labor?

For example: The Oelrich Form 125 devotes a space 3/4 by 1/4 in. New England Business Service Form 317 devotes 3 5/8 by 1/4 in. These are typical of others we have seen. Some devote less space for labor, or service as you wish to call it. We use these two examples because they have a third copy which we file.

In the future our service jobs are going to contain more and more of service and less and less of parts. The trend has already set in.

STANLEY J. PEPERA

Business form companies take note! One alternative would be to have a form designed for either just your own shop or the shops in your area and printed by a local job printer—with the two carbons desired. There are many printers that could handle such an order. Ed.

continued on page 10

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LETTERS...

continued from page 9

What You Said Sounds Good But Doesn't Seem to Work

I have just read your latest editorial and have been following your editorials about getting into the field and becoming a TV technician. What you have said sounds good, but I'm afraid it doesn't seem to work.

As your editorial states [page 7, September 1973 issue], "Some never do get a chance to enter our profession." I think you failed to mention that one of the reasons is that there are few jobs for the beginner—but many for the experienced. No one wants to hire the beginner *unless he has to!*

I have been reading ELECTRONIC TECHNICIAN/DEALER since I was in RCA Institute a year ago, and I have been trying with little success to get a job as a TV technician. (After leaving RCA and not getting a job, I took a position with a firm manufacturing electronics equipment as a troubleshooter.)

I have gone to many interviews and filled out still more applications, but have always gotten the same answer. They say I have good technical knowledge and would make a good technician—but, I had no experience or customer contact, or they had a few more applications to check out. When I called back, they picked someone else who had more experience or someone who had applied sooner. (I feel that maybe being a TV technician is like being a member of the Motion Picture Union, you have to be born into it.)

The people who interview me are honest and tell me about how hard it is to train people and about the operating problems with a beginner. But that does not change the situation that the beginner must face.

You cannot blame a young person entering the field of electronics for taking the offers from manufacturers, whether or not it is "attractive with immediate financial returns." It is there that one can get the experience for getting ahead without knocking your head against the wall.

Young people, especially married men with a family, cannot be expected to travel great distances and work long hours for low pay, unless they *really* like the work. But when you add to this the hard time at getting even the low beginners salary, many simply give up, taking the factory job.

I am still trying to become a TV technician, but the longer I cannot get a job, the more training I lose—even though I try to do work on the side in

my apartment.

I feel that the profession as a whole should get together and try to promote the hiring of young new beginners as a natural thing and not as something you do when "you have to" or the profession is going to end up with many retired experienced techs or many unqualified relatives.

I am writing this letter because I have received some more, "things are slow," rejects and cannot continue to take off too many more days or make many more long distant phone calls fruitlessly.

Maybe I'm doing something wrong, but everyone keeps telling me that's the only way and to keep trying. I have talked with other young people trying to get into the field, and they say the same thing.

I hope that something can be done to help the beginner before the beginner—like the TV sets—will have to be imported from Japan.

[We have withheld his name but are prepared to forward any correspondence directed to the writer of this letter.]

An Open Letter to the Hi-Fi Component Industry

Just a few weeks ago a major tape-recorder manufacturer more than doubled its warranty protection period. Recently I received the announcement of a major advertising campaign being launched by this same company. It's really wonderful—better equipment, purchasers protected by longer warranties, more advertising to sell more components. What is good for the high-fidelity industry is good for Eastern Stereo Servicenter . . . or, at least, that used to be our attitude.

But, what about service for these growing quantities of all this wonderful new equipment? Equipment is becoming more complex with every new model introduced. First, a channel was added to make stereo; now the industry is in the process of doubling the number of channels again, more than doubling our job of servicing. And with more complex technology involved—Dolby or other noise reduction systems, matrix or discrete demodulators—the investment in test instruments and people to use it is costly. We independent service organizations are being expected to keep pace with changing technology and extended warranty periods without any increase in compensation. Getting good service on a piece of Hi-Fi gear is a problem that already exists in many areas. If manufacturers continue their present policies and attitudes, it will get much worse.

I wrote to the tape recorder com-

pany's president at the time his firm extended its warranty period, but did not even receive the courtesy of a reply.

Another manufacturer recently demonstrated its interest in its equipment purchasers being able to get qualified in-warranty service by *reducing* its labor rate.

Getting parts orders filled within a reasonable amount of time and being supplied adequate servicing literature continues to be a major problem with a number of companies. (The customer blames us, not the manufacturer, for delays caused by this deficiency.)

The facts appear to be adding up to one thing. Too many manufacturers look at warranty service as being a necessary evil, responding principally to sales needs and governmental and consumerist demands. While it may not matter to the manufacturers, I don't believe that the industry as a whole can afford to lose the few good service facilities that do exist. If service were not important to dealers, why is it so many of them promote their "service department" (when most don't have even one qualified technician or any good test gear) and extra long warranties?

We believe ours is a badly needed commodity, with the need increasing as the industry continues to grow. If service truly is important, I challenge those concerned to place the service function on an equal level with manufacturing and sales, and begin giving it fair and honest treatment. Manufacturers . . . Industry . . . What is your response?

We at Eastern Stereo stand ready to participate with those interested in opening up a dialogue and service discussion on this matter.

MARLAND R. TAYLOR, PRESIDENT



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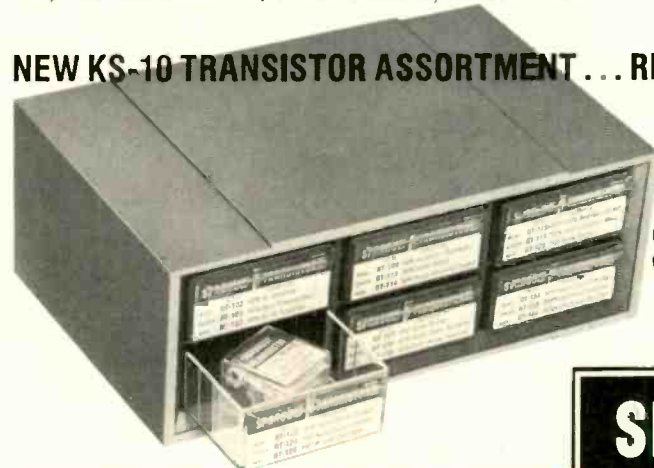
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106 S. Jefferson St.
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Needs Information

I have a Simpson Genescope (for FM/TV alignment) Model 480. I would like to obtain an instruction and servicing manual complete with schematic or a copy—or be allowed to make a copy of same.

THOMAS E. BRIGMAN
P.O. Box 288
Laurinburg, N.C. 28352

I need some information concerning a radio I just acquired. It is an Atwater Kent, Model 60C,

SN#55177407. This particular radio is covered in Volume #3 of the Old Rider Series. If this information can be furnished, I would gladly pay for it.

WALTER D. RETZOLK
1644 B. Hill Dr.
Ft. Gordon, Ga. 30905

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I have Sam's Auto Radio Manuals number 4 through 86 and Sam's CB manuals 1 through 25 for sale. No reasonable offer refused.

DICK BERGERON
Box 311
Essex, Vt. 05451

I have two VTM's with 30kv probes and an in-circuit capacitor tester for sale. All are in fine condition.

JOHN MEDNANSKY
Box 259
Stevensville, Mont. 59870

I have for sale an all solid-state three month old 25-in. Model GR371MX, Heathkit color-TV set in walnut cabinet with two-year warranty on RCA picture tube.

ROBERT H. SANTIMAN, CET
1801 Centinela Ave., #4-D
Santa Monica, Calif. 90404

I have for sale a picture tube rebuilding machine with all accessories.

AL BOURDAGES
192 Richmond St.
Chatham, Ontario

I have a complete color and B/W picture tube rebuilding plant for sale with supplies and many picture tube duds, all for \$1000.

GENE HOLLEY
3130 Manchester
Wichita Falls, Texas 76305

I have a number of old radio tubes for sale; write for list.

BRUCE BOSS
4 Rice Street
Lyons, N.Y. 14489

I would like to sell Schematics Group 134 through 244, Schematics No. 812 through 1450. Make offer.

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HERMAN MARCUS

R R #1 Box 29A
Ringtown, Pa. 17967

I have for sale Sams Photofacts, No. 1 through 351. Also, a very large stock of old tubes that some collectors might be interested in.

JAMES WHITE

92 Main St.
Whitehall, N.Y. 12887

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GREGORY H. SWISKA

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I would like to obtain the schematic for a Model 101-9 Webster Electric Tape Recorder.

JOHN C. COX

C & G T.V. Repair
1329 Devonport Drive
Lexington, Ky. 40504

I would like to obtain a schematic diagram for a Candle Micro TV Set, Model MT-510. I have been informed by Candle America, Inc. of Los Angeles that they do not have them available.

H. E. ROBY

Luther Burbank Vocational
High School
1002 Edwards Street
San Antonio, Texas 78204

We want to buy a good mechanical pump, diffusion pump, vacuum gauge, RF bombarder used, as sold by Lakeside Industries or by C.R.T. Co.

We also need a power transformer for the bombarder.

MANUEL HERNANDEZ

Golden Ray Tube Co.
Av. Zamora #6
Villa Lydia, Puerto Rico 00603

I am in need of a meter for an NRI Model W VTVM which the National Radio Institute advises me that it can no longer supply.

C. V. TODD

1320 N.W. 116th St.
Miami, Fla. 33167

I would like to purchase the bound volumes of Tekfax schematics printed prior to Tekfax 111.

WILLIAM BALLARD

6587 Bock Terr.
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I would like to buy some used picture-tube rebuilding equipment, such as Lakeside Industries' Model 1501, or similar.

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NEWS OF THE INDUSTRY



Sid Baker (left), an RCA Service Company executive, presented a 16mm movie to NESDA's executive vice president, Dick Glass, CET (right). Indiana Radio-TV License Board Investigator James W. Baker, CET (center) was also present. This is a color and sound film made for use by RCA's service branches and entitled "The People Fixers." It is now available for loan to NESDA local associations and is a good customer relations film for all home technicians.

Colorado Electronic Association Reports Tremendous Activity

The Colorado Professional Electronics Association is on the move: Adopting an extensive and binding explanation to its Code of Ethics, biased toward consumer protection, in August; Established a chapter charter agreement to help local chapters with organization, form and continuity; Published a leadership manual for its officers; and formed a new local Chapter in Pueblo, Colo., all in September.

The Pueblo Chapter of CPEA was formed following a quarterly state board meeting in Pueblo, with most officers and many members taking part. The organization meeting was conducted by Paul F. Dontje, CET, executive director of CPEA.

Every Pueblo technician and service dealer attending the meeting joined the association. As an added treat, one individual from Trinidad, Colo.—some 100 miles distance—joined as a member-at-large.



A record 133 technicians, installers, contractors, educators and salesmen attended the two-day MATV Basis Systems school held at the George Washington Motor Lodge in Willow Grove, Pa. Hosted by Lan Elkins, Jerrold Eastern Regional Manager, the school covered antennas, transmission lines, amplifiers, splitters, tapes, system layout, solutions to MATV problems and the latest installation techniques. This is but one of the 23 schools scheduled by Jerrold for 1973.

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Sidney Sampson (right), service manager of George's Stores, Inc., is shown receiving a special "Good Guy" service award from Garth Heisig (left), director of consumer affairs for the consumer products division of Motorola.

Also shown is Harold L. Rendelman, vice president of Washington Appliance Wholesales, Inc. The award, a first of its type from Motorola, was given to Mr. Sampson for exemplifying "a conscientious effort to handle all customer inquiries in a fair and just manner. He listens to the consumer and provides him with prompt service. . . ."

Illinois Association Campaigns to Block License Renewal of Station WBBM-TV

The Associated Radio and Television Servicemen of Illinois reports that WBBM-TV conducted an "expose" by "bugging" TV sets and planting them at random in independent repair shops for servicing and the consequent "smearing" of the repair segment of their business. As a result of such station activity they have petitioned the FCC to deny a license renewal to station WBBM-TV, suggesting that all concerned about "the constant degrading of our business image," write the Chairman of the Commission and tell him so.

The following letter was sent concerning the matter:

Mr. William B. Ray, Chief
Complaints and Compliance Division
Broadcast Bureau
Federal Communications Commission
Washington, D.C. 20554

Subject: License Renewal—Station WBBM-TV

Dear Sir:

On behalf of our members, who are small radio and television shop owners, we submit to you our request for a denial of the renewal of the broadcasting license to station WBBM-TV, 630 North McClurg Court, Chicago, Illinois, when it comes before the Commission for consideration.

Our reason for this requested denial is the following:

At the direction of and instruction by its newsroom management, station technicians took nine television sets, planted a defective component in each of the sets, and sent them out to nine repair shops in the Chicagoland area to be serviced.

After the sets had been serviced by the nine shops, they were examined, and the WBBM-TV management had inserted in the Tribune, Times, and Chicago Daily News, full page ads, a copy of which is enclosed, and which appeared in the papers on February 7th.

On the evenings of February 7th, 8th and 9th, the program conducted by Mr. Bob

McBride, assisted by Mr. John Aster, proceeded to give the results of this "planted" set arrangement, describing what charges and services were made by the shops involved, and suggesting that the results obtained proved that the shops were less than honest in the work done and the charges which were made.

On February 13th, at 6:25 P.M., Mr. Richard Westerkamp presented his Editorial view, describing the "set planting" activity and suggesting that the set-owning public was exposed to uncontrolled cheating and the only answer was a statewide license law to regulate and control television repair shops. (Copy of Editorial enclosed.)

Our members protested this biased and one-sided presentation and requested that a committee secure an appointment with the station management: A committee of three, including the writer, finally secured an appointment with Mr. Robert Wussler, Mr. Van Sauter and a

continued on page 16

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NEWS...

continued from page 15

number of others of the WBBM-TV management staff.

At this meeting we stated that this shameful and distorted program conveyed to the viewing audience an image of television service people wholly at variance to actual fact; that it was prejudicial to the business interests of dedicated competent men; that it was not in the public interest to destroy the faith and confidence of the set-owning public. Further, that it tended to erode the moral integrity and character of competent and ethical small business men, who did not possess the financial means by which they could defend themselves against this kind of visual slander.

We requested time to rebut Mr. Westerkamp's Editorial and were allotted 90 seconds of the evening of February 21st; 90 seconds, a fraction of the programmed

time which the station used in the three-evening programmed arrangements to defame and degrade an important segment of the broadcast industry—the independent radio and television shop owner!

It is our contention that this program was planned and executed for the express purpose of creating publicity for WBBM-TV in order to draw and attract an increased viewing audience, that ordinarily would not tune to the station, and used this offensive means to secure that audience.

In conclusion, we would state again that this entire program was not in the public interest; it defamed and damaged the business character of small business men, and left distrust and doubt in the minds of many people where none had existed before.

We therefore respectfully request that the Commission deny to station WBBM-TV a renewal of its license to broadcast when it is presented to the Commission.

Respectfully submitted,

Howard Wolfson
Secretary
ASSOCIATED RADIO &
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Complete service, alignment, parts and schematic data for all Sylvania black-and-white sets introduced during the last 5 years—from the A01 through B14, and 572 through 578 chassis. Contains everything you need including techniques for setup, preliminary adjustments, tuner alignment, and repair and system alignments. Also, included are the latest factory-recommended modifications to help you eliminate "bugs." 19 complete schematic diagrams are printed on big double foldout sheets with waveform illustrations. 196 pps., 8 1/2 x 11", including 36-page schematic foldout section, and complete parts list for all chassis. Leatherette cover. **List Price \$7.95 • Order No. 599**

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This brand-new updated and expanded second edition contains troubleshooting guidelines and case histories on the latest solid-state receivers, including a 4-color section with 32 trouble-symptom photos and a foldout section with 6 complete TV receiver schematics. Now included are service tips and techniques on RCA, Motorola and Zenith solid-state chassis, plus a host of case histories and current data on G.E. chassis. In fact, each of the 12 chapters is filled with information applicable to virtually any brand of color TV receiver, enabling you to solve tough dog troubles quickly. 404 pps., 250 illus. Hardbound. **List Price \$8.95 • Order No. 436**

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BOOK REVIEWS

STEREO/QUAD HI-FI PRINCIPLES & PROJECTS by Ken W. Sessions, published by Tab Books, 192 pages, hardbound \$7.95, softbound \$4.95.

Although audio was once considered a relatively simple field, times have changed and circuit specifications for Hi-Fi equipment are now far more rigid than they are for color-TV sets, even requiring the use of more expensive test instruments. Thus the great importance of catching up technically in this increasingly sophisticated field.

Some of the many interesting chapters in this book include: "The Character of Sound," "Working with Audio," "Two-Channel Stereo," "Quadraphonic Sound," "Setting Up an Audio System," plus seven chapters on related projects.

We feel that the author has done an excellent job of introducing the reader to the many new concepts that are now incorporated in this field, and many useful schematics and photo-

graphs are included in the book for that purpose. However, we consider the book to be of greatest value to but the beginner in this field. And though the author does an excellent job in developing the readers' understanding of IHF rms power levels, he fails to assist them in the vexing problem of attempting to translate between the various systems of measuring audio power. We also feel that the schematic on page 58 for the four-channel decoder is very misleading since it fails to show the interrelationship of both left and right channels in each rear channel decoder.

PICTORIAL GUIDE TO COLOR TV CIRCUIT TROUBLES by Forest Belt, published by Tab Books, 256 pages, hardbound \$7.95, softbound \$4.95.

Forest Belt is one of the most prolific authors your editor has ever encountered; and if practice makes perfect, then his books must be amongst the best. This book is a sequel to one of his earlier books entitled, "How to Interpret TV Waveforms."

In writing this book the author uses an excellent technique of showing the proper waveforms for certain portions

of a color-TV set, plus the many improper waveforms that can be produced by the same circuitry should it become defective. The book is thus written on the principle that if you can identify the faulty waveform, you can identify the problem.

Using one or more illustrations on practically every page of the book, the author includes the following chapters: "Color Stage Test Signals," "The Nature of Waveforms," "Setting Your Scope for Color Waveforms," "Burst Amplifier Waveforms for Color Sync," "Transistor X & Z Color Demodulators," "Tube-Type X & Z Color Demodulators," "Integrated Circuit Color Demodulators," "Tube-Type Color Difference Amplifiers," and "Transistor Color-Video Output Amplifiers."

Although the concept in preparing this book is an excellent one, it must be remembered that there are far too many combinations of color-TV circuitry faults possible to cover even a relatively good selection of them in a 10 volume encyclopedia. However, upon taking such limitations into consideration, the reader (or at least the beginner) has an opportunity to learn how to use some of the basic test instruments required for effective color-

Zo-o-o-o-m-m-m

First in the race. Raytheon put together the car. You drove it to top money in the big '72 season. It's a money-making team that started with your switch to Raytheon, the largest independent tube supplier. We know the competition is rough. As an independent serviceman, you can't waste time and money on call backs or pit stops. So, Raytheon builds to beat the competition. You drive hard for first place. And we're going for the trophy again this year. Together.



... for more details circle 121 on Reader Service Card

TV servicing, and what to expect of them.

The only aspect of this book that really bothers your editor is the graphics. Although they do their job well, they represent what your editor considers a very sloppy printing job! Some waveforms appear so dark that they are difficult to study and far too many are printed crooked on page—the waves appearing to run up hill or down hill.

SIMPLIFIED TV TROUBLE DIAGNOSIS by Robert L. Goodman, published by Tab Books, 320 pages, hardbound \$8.95, softbound \$5.95.

Although Robert Goodman has written many books, this is one of his best that your editor has seen. Frequent use of partial schematics (even a few complete schematics with fold out pages), scope traces and photographs of video images, together with detailed descriptions of color-TV circuit functions, provide the reader with extremely useful information for understanding the proper function of such receivers—with also a greater understanding of circuit malfunctions. The author also goes to the trouble of

telling the reader the scope settings that were used to produce the waveforms observed and how scope probe impedances can adversely effect signal processing if improperly applied. Thus most readers should be able to duplicate the waveforms shown in the book.

The following listing of chapters merely touches on the many detailed subjects included in this book: "Vertical Sweep Circuits," "Horizontal Sweep and High Voltage Systems," "Vertical and Horizontal Sync," "VHF Tuner Characteristics," "Video Amplifier Circuitry," "Television AGC Systems," "Video IF Amplifier Circuits," "Color CRT Diagnosis, Beam Control and the Trinitron," "Color Sync and Associated Circuits," "Modern Color TV Crystal Ringing Circuits," "Color Killer Circuit Operation," "Chroma Demodulator and Amplifier Circuits," "Servicing the Sound Detector and Audio Circuits," "Troubleshooting Flow Chart Technique," and "Low Voltage Power Supply Functions and Checks."

We consider this book to be one of those few that should be considered *must* reading for just about every electronic technician that does color-TV servicing—whether experienced or not.

In fact trade schools could even find it a useful text!

TRANSISTOR RADIO SERVICING MADE EASY by Wayne Lemons, published by Howard W. Sams, 160 pages, softbound \$4.50.

This is the third revised printing of an exceptional book. Ignoring electron-hole theory, the author begins with basic transistors and basic transistor circuitry and develops these concepts so that they can be successfully applied to front-end circuits on to the audio output stages of AM and FM transistor radios. Other subjects include tracking and alignment, repairing weak or "not quite right" radios, tools and equipment needed, and special tricks and shortcuts. The chapter that interested us most is entitled, "Where to Get Parts," which offers some very practical advice. Just about every page contains one or more related schematic.

We consider this book must reading for even the experienced electronic technician, although still not too technical for the beginner. Integrated Circuits seem to be the only subject omitted by the author.

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NEW AND NOTEWORTHY

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

COLOR GENERATOR 700

Employs digital counting circuit for stability

Introduced is a portable, battery operated digital color generator that uses CMOS Integrated Circuits. The Model CG25, "Little Huey," produces all RCA licensed patterns with push-button operation. Stability is reportedly guaranteed with the digital circuits displaying rock solid patterns. The new circuits allow longer battery life and generator operation, reportedly from -20°F to 120°F .

The unit features an adjustable RF output to cover low channels 2 through 6, a color level control from 0 to 200% and an adjustable dot size—all adjustable from the bottom of the unit. The generator is packaged in an unbreakable acrylic case, the size of the two 5U4 tubes. Sencore, Inc.



VOLTAGE CALIBRATOR 701

Provides four output voltages with a $\pm 0.05\%$ accuracy

A portable precision calibrator, Quick-E Model 450A, is designed for rapid checking and adjusting of digital voltmeters, chart recorders, VOM's, scopes and other voltage-measuring equipment. The battery-powered calibrator reportedly provides four output voltages—10v dc, 1.0v dc and 100mv dc—with a $\pm 0.05\%$ guaranteed accuracy over a 15°C to 35°C (59°F to 95°F) temperature range. All of the unit's outputs are short-circuit proof. Pioneer/Instrumentation.

POWER AMPLIFIER 702

Employs interlocking feature for stacking

A 100w rms continuous duty solid-state audio power amplifier is available for professional sound applications and is designed for 4Ω to 8Ω loading or 25v line application. Output characteristics reportedly include $\frac{1}{4}\%$ typical harmonic distortion over the 20-15kHz frequency range. The Model M-250 amplifier requires .8v across its $10,000\Omega$ input impedance to drive it to full output. The cabinet is covered with thermally bonded leather grained vinyl. PDMC.



FOR MORE NEW PRODUCTS SEE PAGE 46

TEKLAB REPORT**RCA's Color-TV Chassis CTC62 Employing the In-Line System**

by Joseph Zauhar

An inherent self-converging color system is made possible with the combination of a unitized in-line gun and a line-focus type precision static deflection yoke

■ The growing portable color-TV market has encouraged new innovations in TV receiver design. In the past years dynamic convergence of the individual beams of the picture tube has been the standard of the industry. However, we now have a new concept in the color-TV display system employing an advanced design of the electron gun, the deflection yoke and the picture tube to achieve superior performance in a simplified, inherently lower-cost system. The convergence is equivalent or superior to that of present commercial receivers without

the use of any dynamic convergence correction or circuitry.

For the service technician the new system makes the servicing and setup of a replacement in the customer's home much simpler, less time consuming and less costly than previous systems—eliminating the dynamic convergence adjustments. We find these features particularly significant in the highly competitive portable receiver market for which the in-line system was designed.

We received for lab purposes a Model ES-396W receiver employing the CTC62 color-TV chassis, which is designed to accommodate the 17-in. (measured diagonally) AccuLine color-picture tube. The color-TV set also employs the AccuMatic TV feature, enabling one-button control of the four picture qualities—COLOR, TINT, BRIGHTNESS and CONTRAST.

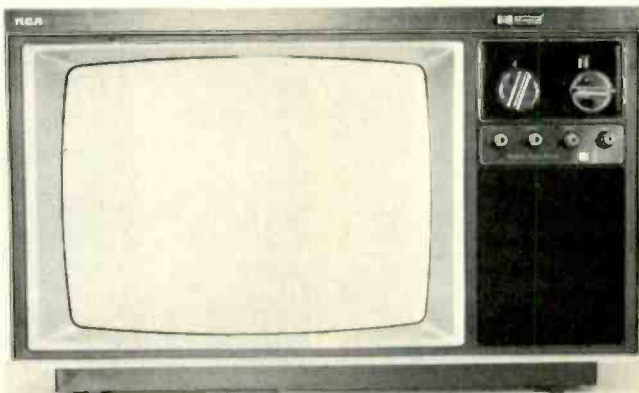
When the AccuMatic switch is engaged, the picture is in the normal factory pre-set range, but if

you want minor changes they can be made for personal preference with the manual controls. The one-button control makes the effective range of the controls much narrower.

The AFT and ACM push-button switches are conveniently located on the top right front of the cabinet. The ON/OFF VOLUME, BRIGHTNESS, COLOR and TINT controls are also located on the front control panel. The seldom used auxiliary controls—which include the CONTRAST, VERTICAL HOLD and HORIZONTAL HOLD—are located on the rear chassis apron.

Upon removing the back cover of the TV set, at first glimpse the chassis resembled the previous XL-100 color-TV chassis. But after taking a closer look, we noted that it lacked the familiar convergence board and convergence yoke assembly. The size of the picture-tube neck is also much smaller and the deflection yoke is completely different.

As we review some of the important new features



RCA's Model ES396W Color-TV set employing the CTC62 chassis to accommodate the AccuLine color-picture tube.

of the in-line system, they can be followed in the simplified diagrams and the August Tekfax Schematic, No. 1483.

The CTC62 chassis is all solid-state and uses 10 of the 12 module types employed in other XL-100 portable chassis. The difference is found in the vertical-deflection module, the elimination of the power-supply module and significant changes in the horizontal-deflection and the high-voltage system.

Vertical-Deflection Module

A different vertical module was necessary because of the much lower impedance of the toroidal yoke (approximately one-tenth the impedance of the yokes employed in other RCA modular chassis). The basic circuit configuration used in the vertical circuit is the familiar closed-loop feedback system which is commonly known as a "Miller Feedback" circuit.

The vertical module is mounted on a heat sink. When replacing the module, the complete assembly, including the larger heat sink to the chassis, must be removed. The heat sink is fastened to the chassis with two screws and after they are removed, the

module can be removed from the edge-connecting socket. The module assembly is now accessible for removal from the chassis heat sink by removing two mounting screws. The reverse procedure is employed to re-install the system.

Horizontal-Deflection System

Electrically the horizontal-deflection circuit configuration employed is the same as the familiar SCR system, but "Intrinsic Rectifiers" (ITR's) are used in place of separate SCR's and diodes. The ITR is electrically the equivalent of an SCR and a diode packaged in the same envelope. Some of the advantages of the ITR include: the elimination of much of the wiring, simplified servicing and reduced stock inventory.

The input reactor has additional windings for the purpose of obtaining power for the low-voltage source, but the horizontal oscillator module is the familiar MAH001A. Also, the regulator transistor and saturable reactor is now eliminated.

Low-Voltage Power Supplies

The method of developing the low-voltage

power sources is quite different from conventional systems. All B+ voltages required for the various circuits (except the horizontal system) are derived from the horizontal output circuits.

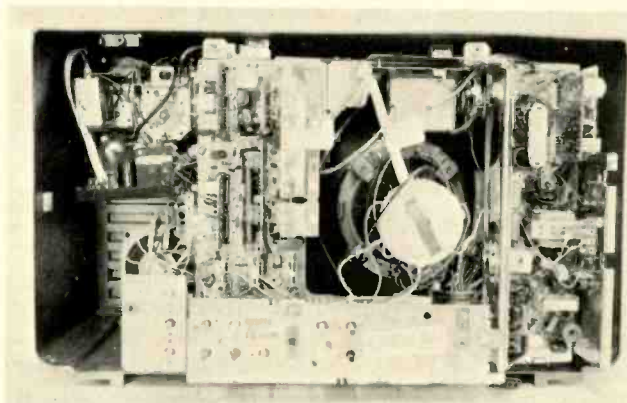
The horizontal oscillator and commutating device receive their 140v from the ac line rectifier, CR101 and the filter network. The horizontal oscillator gates the commutator device, ITR102, into conduction as in normal operation to accomplish retrace. Current flow through the primary windings of the input reactor, T402, induces a voltage into the auxiliary secondary windings. (Thus this system appears to function on the same basic principal as the Motorola low-voltage supply described in detail on pages 41 and 42 of our January 1972 issue.)

Voltages obtained at

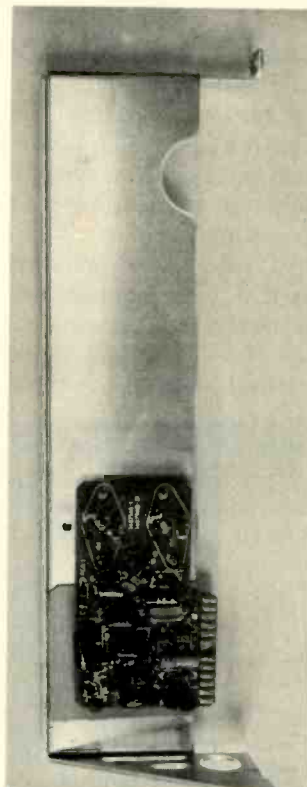
terminals 2 and 3, of reactor T402 are rectified and filtered to provide a dc potential of approximately 40v at terminal 3 of switch S4201 and the induced voltages at terminals 1 and 4 of the same reactor power the picture-tube filaments for the instant-on feature. Diode CR404 and resistor R417 are used to optimize the ratio of standby and operating filament voltages.

The ITR101 is disabled by the ON/OFF switch, S4201, during the standby mode and in the OFF position bypasses or shorts the trace device so that no high voltage or deflection is produced. When switched ON, the low-voltage B+, developed in the auxiliary winding of the input reactor is applied through switch S4201 contacts 3 and 2 to the voltage divider network for distribution to supply the various circuit requirements.

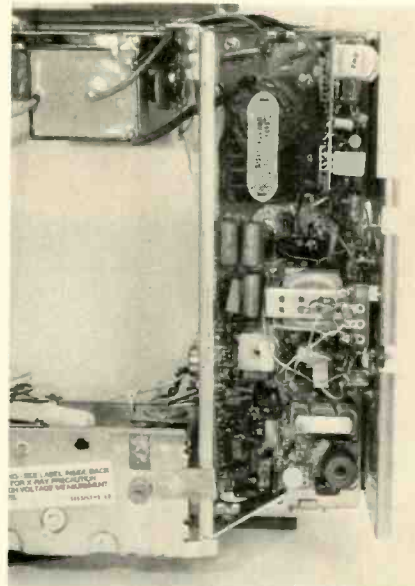
During normal trace operation, the short across trace ITR101 is removed and the high-voltage tripler is activated to produce 25kv at zero beam



Rear view of the CTC62 color-TV chassis showing the service controls and 10 of the 12 module types employed in other XL-100 portable chassis.



A new vertical module is used because of the much lower impedance of the toroidal yoke.



The main deflection board has several changes to accommodate the new AccuLine picture tube.

current. Horizontal-output transformer terminal 13 supplies a signal to diode CR401 to generate a dc potential for the picture-tube screen grids, which are of one-piece construction—only one SCREEN control is required to set the screen potential.

The auxiliary secondary winding, in addition to supplying the AGC keying voltage and burst blanking pulses, provides an ac voltage to diode CR403. This is rectified and filtered to supply 220v to the kine driver modules and pilot lamps. The picture tube control-grid voltage is also supplied from the 220v line through dropping resistor R402.

In-Line Picture Tube Specifications

According to the manufacturers engineering specifications, the new RCA system is the most practical in the portable receiver screen size using the 15v and 17v picture tubes. The picture-tube performance—such as convergence, brightness, purity, resolution, etc.—is said to be equivalent or superior to the present 90° tube. The precision in-line picture tube requires an anode voltage of 25kv with a design maximum of 27.5kv. The panel and screen dimensions are the same for both the

in-line or 90° delta-gun tubes. The new picture tubes funnel has a small neck—29mm in diameter—with the yoke region contour optimized for maximum beam clearance. Other funnel dimensions are the same as the 90° delta-gun tube. The overall length of the new tube is 1.83 in. (46.5mm) shorter and weighs 2½ lb. less than the conventional 90° delta-gun tube.

Beam Alignment

An important factor in the new in-line system is the precise alignment of the three beams and the deflecting field. Misalignment in both the delta-gun and in-line system causes

variations in the convergence pattern. The design of the in-line system allows for almost perfect alignment of the three beams and deflecting fields. The alignment is accomplished with the gun concept and the accurately positioned trio of beams along with the yoke fields being precisely aligned. This is done by mechanically moving the yoke horizontally and vertically until the magnetic center of the deflecting field is aligned with the beam trio. The proper alignment is determined by the convergence pattern observed on the screen of the TV set.

Adjusting the yoke in a horizontal direction increases the height and width of the raster generated by one of the outside beams and decreases the

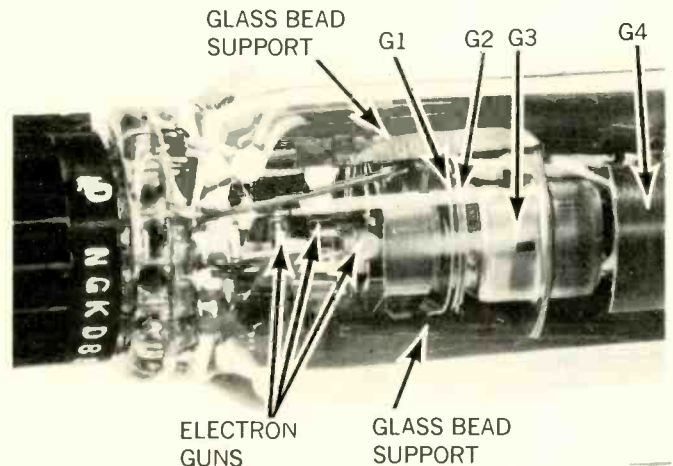
size of the raster of the other outside beam. Moving the yoke vertically rotates the raster of one of the outside beams clockwise, and when the raster substantially coincides the yoke-to-beam alignment, it is properly set. When the yoke is moved to align the deflection field with the beam trio, the convergence and beam-to-phosphor register is more consistent in the new system than with the conventional method.

Electron Gun

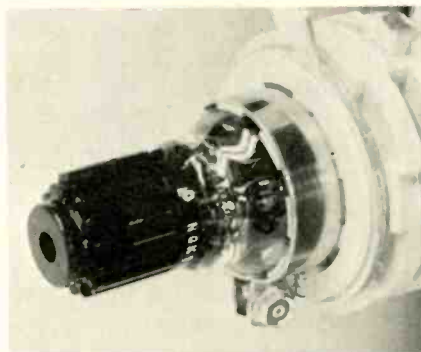
The electron gun used is a bipotential focus type, employing horizontal in-line construction and designed for the 29mm-neck diameter picture tube. This gun is small compared to the 36mm gun used in contemporary small 90° tubes. This new



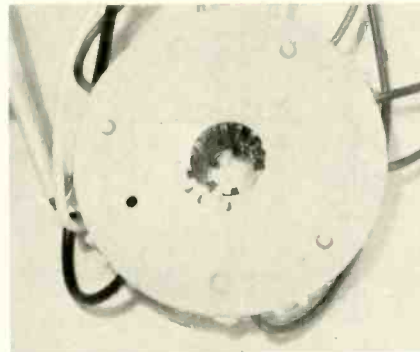
The vertical-output transistors are mounted on a large heat sink, fastened to the main chassis.



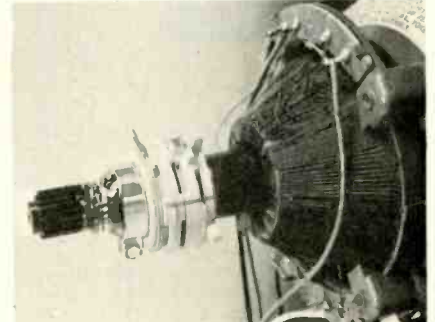
Side view of the precision electron gun employing in-line construction. Shown are two of the in-line guns, the third being hidden by reflections.



A new splined button-type connector is employed on the AccuLine color picture tube.



A new socket employing side pressure spring contacts are used in conjunction with the new small-neck picture tube.



The new toroidal yoke has approximately one-tenth the impedance used in other RCA modular chassis and is cemented to the picture tube.

gun employs a single-piece, triple-aperture grids to provide beam-position accuracy. This one-piece construction reportedly eliminates thermal expansion convergence drift inherent with separate independently expanding elements. All of the gun elements are supported by two glass multi-form beads. The multi-apertured focus grid and high-voltage anode are made in a clam-shell configuration. Although the

grids are one-piece elements for the three beams, the cathodes are electrically separated, allowing cathode video drive operation using solid-state red, blue and green drive circuits, such as the RCA MAD001A modules.

Base connections for the in-line tube are the same as for the 110°, 29mm-neck tubes, except that the blue and green grid-lead connections are omitted, since the grids are common elements and

the leads are not required.

Deflection Yoke

The precision static toroid (PST) yoke employed in the new system has each turn of wire placed into the winding grooves of molded plastic rings cemented to each end of the core. The wire used has four layers of high-temperature insulation. This yoke reportedly is less costly than a saddle yoke and weighs 1¼ lb., using only 20 percent of

the copper used in a conventional yoke. Because of the impedance of the yoke, it is ideal for use with solid-state deflection circuits.

Picture-Tube Screen

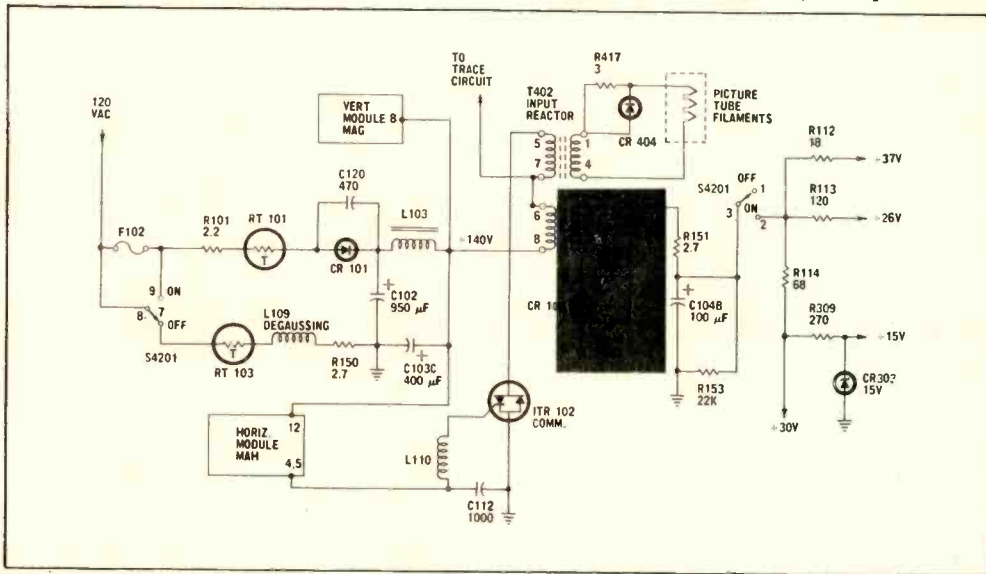
The new screen now employs continuous vertical phosphor lines of alternating green, red, and blue phosphor dots instead of the conventional dot pattern.

There are a number of advantages obtained in a line screen: The screen can now be filled with tangent non-overlapping phosphor lines, whereas with dots the limit is approximately 91% fill. The effects of geometric trio distortion can be eliminated, better beam-to-phosphor register can be obtained, reduced effects of the earth's magnetic field and chassis-generated fields can be oriented for minimum.

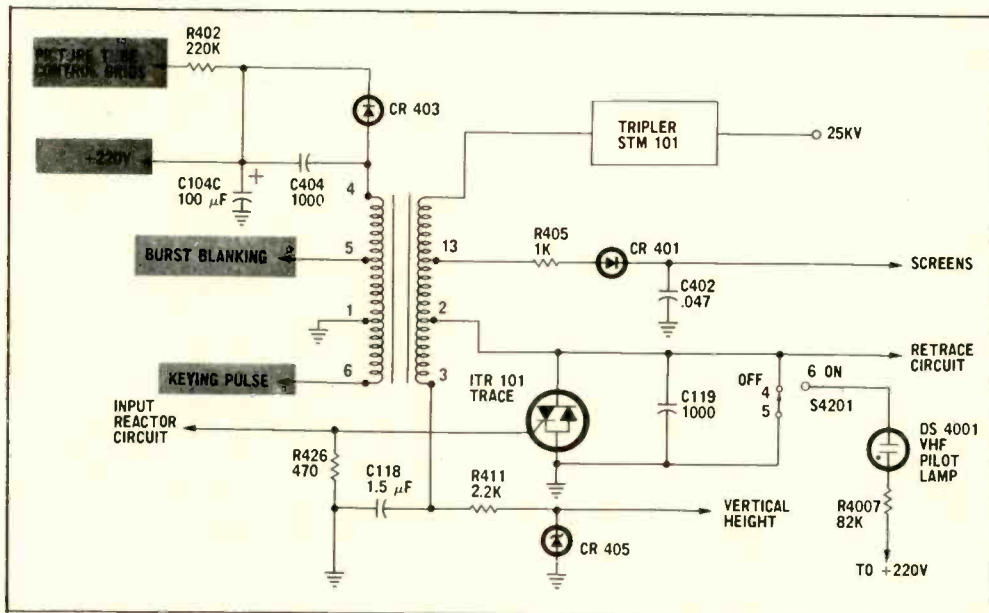
Summary

We feel the advantages found in the in-line system will be particularly significant in the portable receiver market. And set-up time and picture tube replacement will be drastically reduced because of the elimination of the convergence adjustments. The deflection yoke, being cemented to the picture tube, will reduce yoke shift due to handling, especially in the portable TV set size. It will also eliminate yoke shift because of temperature changes. The depth of the cabinet and weight can be reduced because of the new system.

The color-TV set received in our lab for evaluation produces a very good picture without the need for any color adjustments. ■



Simplified schematic of the picture-tube filament and low B+ supplies. All B+ voltages required for the various circuits (except the horizontal system) are derived from the horizontal-output circuits. Courtesy of RCA Sales Corp.



Simplified schematic of the B+ and high-voltage supplies. Courtesy of RCA Sales Corp.

Strange Things are Happening... Inductorless Tuned IF's and Switchless TV Tuners!

by Lambert C. Huneault, CET

■ Today such novelties as tuned circuits without coils or capacitors are featured in an increasing number of applications, in home entertainment equipment as well as in the field of communications. What electronic wizardry makes this unorthodox tuning possible? . . . Two interesting innovations are involved: ceramic filters and varactors. This article is concerned with applications of ceramic filters in transistor radio IF circuits, and of varactors in switchless TV tuners.

Ceramic Filters

Although essentially a newcomer in the home entertainment field, the ceramic filter has actually been available for over a decade. The writer recalls first reading about these new piezoelectric devices shortly after leaving the radio-TV service field in favor of a career in the teaching profession in 1962. Excited at the thought of radios with no IF transformers and requiring no IF alignment, I had visions of a miniature revolution in the field of receiver design and

Until recently, when informed that some radios feature tuned IF circuits without coils or capacitors, or when told that in some TV tuners channel selection is achieved without tuning capacitors or tuning coils, in fact with no moving parts at all, many a technician—if he believed the statements at all—would have responded with a: “Well, what do you know! . . . What will they think of next?”

promptly decided to include the subject of ceramic filters in our Electronic Technician curriculum.

For a few years I communicated to our students my enthusiasm about ceramic filters, predicting all along a great future for these little devices; however, in the mid-sixties, it occurred to me that I had not seen any of these transformerless-IF receivers in actual use yet. A quick check with a few service dealers around town revealed that ceramic filters had not found their way into any radios yet—not even the latest models from any of the manufacturers.

What a letdown! Maybe I had overestimated the potential of these new devices . . . perhaps serious bugs had cropped up in them . . . their cost was possibly prohibitive. . . . At any rate, ceramic filters were dropped from the curriculum and the subject was given little further thought for a while.

While touring the fa-

cilities of a local manufacturer of radio-controlled garage door openers in the late 1960's, however, the author's faith in ceramic filters was restored when the devices showed up on the printed circuit boards of the 27MHz receivers being assembled in the plant. Ah-ha!, I recall saying to myself . . . a new ray of hope!

At about the same time, these piezoelectric devices were also showing up in military transceivers. But as far as the domestic electronic technician is concerned, the clincher was probably the introduction of ceramic filters in some off-shore brands of hi-fi receivers within the last few years. The writer now feels that these devices are here to stay and will undoubtedly show up in increasing numbers in the years to come.

A ceramic filter is a piezoelectric device that can be designed to resonate at a specific frequency and can therefore be used to replace conventional tuned circuits in the

The author is supervisor of the Electronics Dept., Adult Retraining Div., St. Clair College of Applied Arts and Technology, Windsor, Ontario.

kilohertz and megahertz range. Made from certain ceramic substances, ceramic filters can be given different characteristics, depending on their construction; they can be designed to replace series-tuned or parallel-tuned L-C circuits, or coupling transformers, in oscillators, IF amplifiers, FM discriminators, etc. . . . They have several noteworthy advantages: they are very rugged devices and are quite small in size (e.g., some are about the size of ceramic disc capacitors); they are fixed-tuned (i.e., do not require alignment) and have excellent frequency stability; they feature high Q and require no shielding; and their cost is now low enough to be competitive with conventional IF transformers.

Basically, there are two types of ceramic filters: two-terminal devices that can replace series-tuned L-C circuits (symbol shown in Fig. 1), and three-terminal devices that can be used as bandpass coupling networks (commonly used symbols shown in Fig. 2). Fig. 3 and 4 illustrate two different applications of the first type.

In Fig. 3, transistor Q1 is an inductorless IF amplifier in an AM radio. The ceramic filter (CF) has a fundamental resonant frequency of 455kHz. For a 455kHz input signal, the CF's very low impedance (series resonant) shorts out the emitter resistor, giving Q1 maximum gain. For signal frequencies other than 455kHz, the CF no longer resonates and takes on a high impedance, allowing resistor R_E to introduce degeneration, reducing the gain of the IF amplifier.

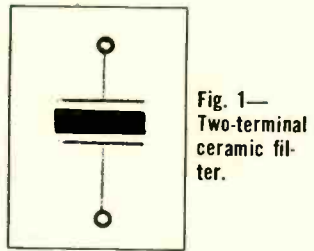


Fig. 1—Two-terminal ceramic filter.

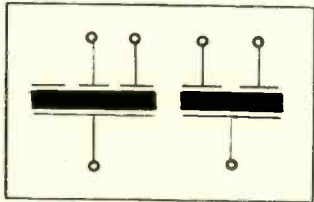


Fig. 2—Symbols for three-terminal ceramic filter.

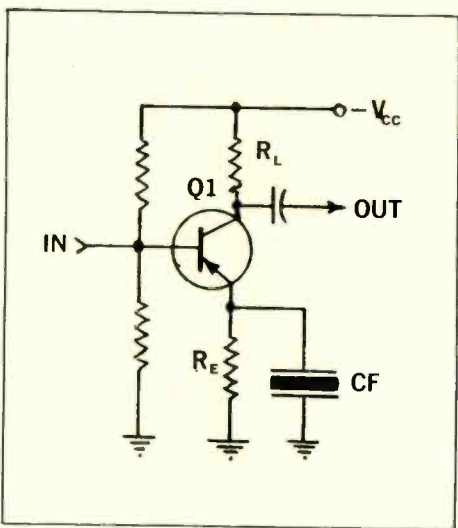


Fig. 3—Ceramic filter in the emitter circuit of a transistor IF amplifier.

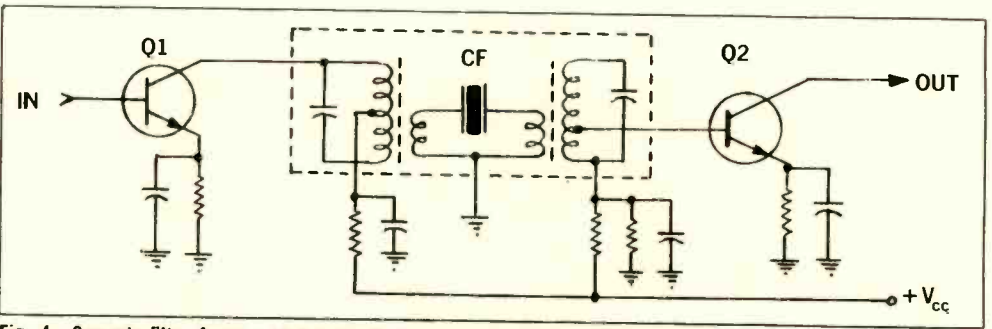


Fig. 4—Ceramic filter forms a high-Q link between two tuned circuits in an IF can.

The loaded Q of the CF is determined by the resistance of R_E . Several decibels of attenuation can be achieved at frequencies only a few kilohertz away from 455kHz, resulting in a passband suitable for an IF amplifier stage.

In Fig. 4, the CF is used in conjunction with an interstage coupling transformer and forms a high-Q link between the two tuned circuits inside the IF can. Good selectivity is achieved, as the 455kHz carrier and its associated AM sidebands can pass through the filter, but other frequencies are rejected.

Three-terminal ceramic filters are sometimes used as bandpass coupling networks in IF amplifiers, where they also replace the IF transformers. For an example of this application, refer to Fig. 5, which illustrates the FM

IF amplifier and ratio-detector circuitry of a currently popular state-of-the-art stereo receiver. In this configuration, the Q of the CF coupling circuits is determined by the resistance of the collector load resistors (e.g., R210), loading or damping resistors (e.g., R211), terminating resistors (e.g., R212) and the input resistance of the following transistor.

It is interesting to note that in this FM IF circuit, the necessary bandwidth is achieved not only by designing the proper Q into the CF coupling networks, but also by staggering the ceramic filters, i.e., by using CF's which have different resonant frequencies, such as CF201 resonating at 10.7MHz, CF202 resonating at 10.66MHz, CF203 resonating at 10.74MHz, etc.

In some receivers, the IF circuits feature a combination of ceramic filters between some of the transistors and conventional IF transformers between the other stages. Manufacturers of ceramic filters occasionally give special trade names to their products; for example, the Cleveite Corporation refers to its devices as "Transfilters."

In conclusion, a special thought for readers who do not care to perform IF alignment: Rejoice! . . . The ceramic filter is slowly but surely coming to your rescue!

Varactor Tuners

Conventional TV receiver head ends, such as turret tuners and wafer switch tuners, achieve channel selection by physically changing coils (in turret types) or by adding or removing inductances

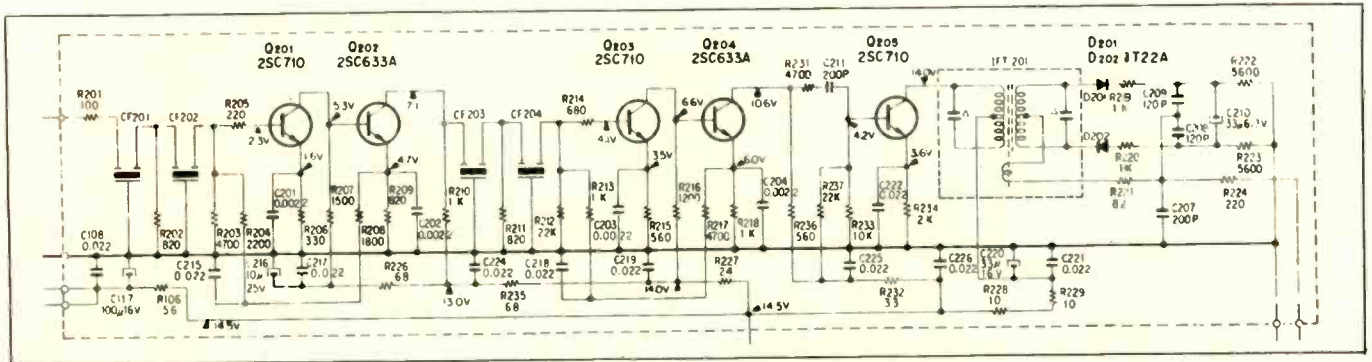


Fig. 5—Ceramic filters in the FMIF section of a Sony HP-510A stereo receiver. Schematic courtesy of Sony.

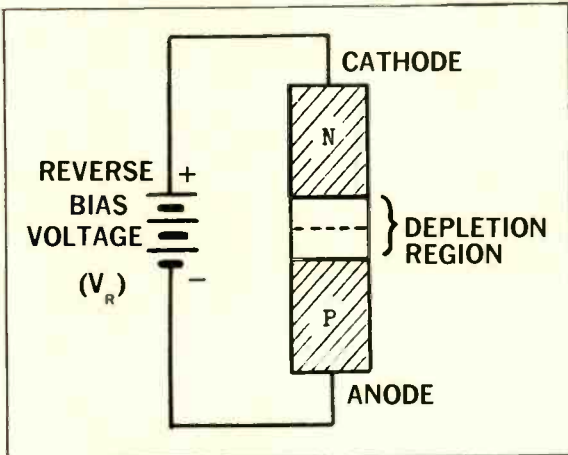


Fig. 6—Depletion region in a reverse-biased diode.

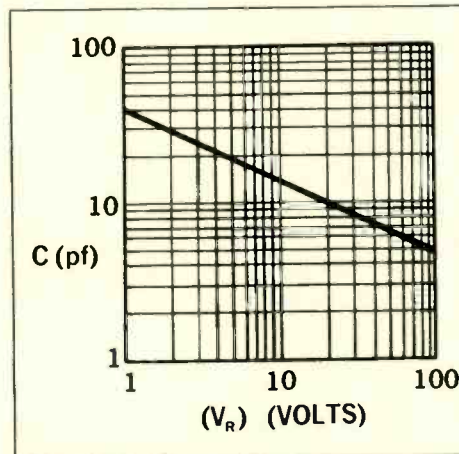


Fig. 7—Graph illustrating how the capacitance decreases as the reverse bias increases.

(in wafer switch types) each time a different channel is selected. From a servicing standpoint, these tuners often suffer from mechanical defects such as poor or dirty contacts, broken wafers, defective detent mechanisms, etc. . . .

The early 1970's have witnessed a major breakthrough in tuner design with the introduction of *electronic tuning* in many TV receivers. Replacing the mechanical coil-switching system of conventional tuners, electronic tuning features voltage-variable capacitance diodes (varactors) and fixed inductances in the various tuned circuits of VHF and UHF tuners.

Varactors—also called variable-capacitance diodes, tuning diodes, voltage-dependent capacitors (VDC), or voltage-variable capacitors (VVC), and often given brand

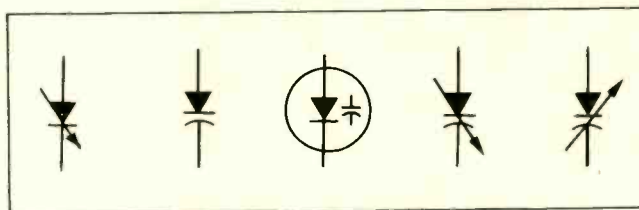


Fig. 8—Commonly used varactor symbols.

names such as Voltcap, Epicap, Varicap, Minicap, etc., by various manufacturers—are P-N junction diodes operating in the reverse-bias mode. As shown in Fig. 6, a reverse-biased diode features a *depletion region* in the vicinity of the junction. This depletion zone is devoid of mobile charge carriers, i.e., it is a good insulator, while the N and P regions of the crystal are rich in free charge carriers, i.e., they are good conductors. This arrangement of insulator sandwiched between two conductors constitutes a capacitor.

The capacitance of the

semiconductor diode can be varied by changing the reverse bias voltage across the junction. Increasing the reverse voltage pulls the electrons in the N-type cathode toward the positive terminal, i.e., away from the junction; likewise, the holes in the P-type anode are attracted toward the negative terminal, i.e., away from the junction also. This results in a wider depletion region, in effect increasing the thickness of the dielectric which, of course, decreases the capacitance of the varactor. Conversely, decreasing the reverse voltage results in more

junction capacitance. The name *voltage dependent capacitor* is therefore very appropriate for a varactor. The graph in Fig. 7 shows capacitance (C) in picofarads plotted as a function of reverse bias (V_R) in volts, for a typical varactor and clearly illustrates the inverse relationship between capacitance and voltage. Commonly used varactor symbols are shown in Fig. 8.

Electronic tuning simply consists of changing the dc voltage applied across each of the varactors contained in the tuner, whenever a different channel is to be selected. A varactor is required in each tuned circuit; since a typical headend features four tuned circuits—RF amplifier input, RF amplifier output, mixer input and local oscillator—it follows that four varactor diodes will be found in such a tuner.

A Switchless Tuner Needs Switching Diodes

Because the capacitance range of most available varactors is insufficient to cover the frequency range of the entire VHF TV band, band switching must be employed in VHF varactor tuners. [At least one TV set now contains a tuner with a varactor that covers the entire VHF TV band without switching. Ed.] To select the low VHF

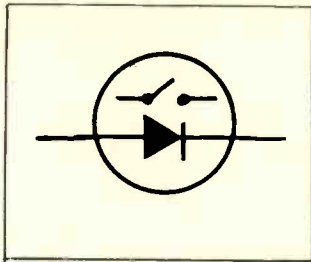


Fig. 9—Switching-diode symbol.

band, i.e., channels 2 through 6 (54MHz to 88MHz), a certain fixed amount of inductance is selected for the tuned circuits. When switching over to the high VHF band, i.e., channels 7 through 13 (174MHz to 216MHz), a certain amount of lumped inductance is removed from each of these circuits. Since mechanical switches are not employed in varactor tuners, *switching diodes* must be used to perform this band-switching operation.

A switching diode is simply an ordinary semiconductor diode used as an ON-OFF switch. When reverse biased, the diode has a very high resistance and behaves, in effect, like an open circuit; with forward bias applied, the diode's resistance is very low, effectively resulting in a closed circuit. The conventional diode symbol is generally used for switching diodes, although the symbol shown in Fig. 9 is sometimes used.

The following description of varactor circuit action is based on the partial schematic of a typical varactor tuner, illustrated in Fig. 10. The diagram shows only the RF amplifier stage, but the reader should keep in mind that additional varactor circuitry would also be found in the mixer input and local oscillator circuits.

Q1 is an NPN RF amplifier transistor operating in the common-base mode

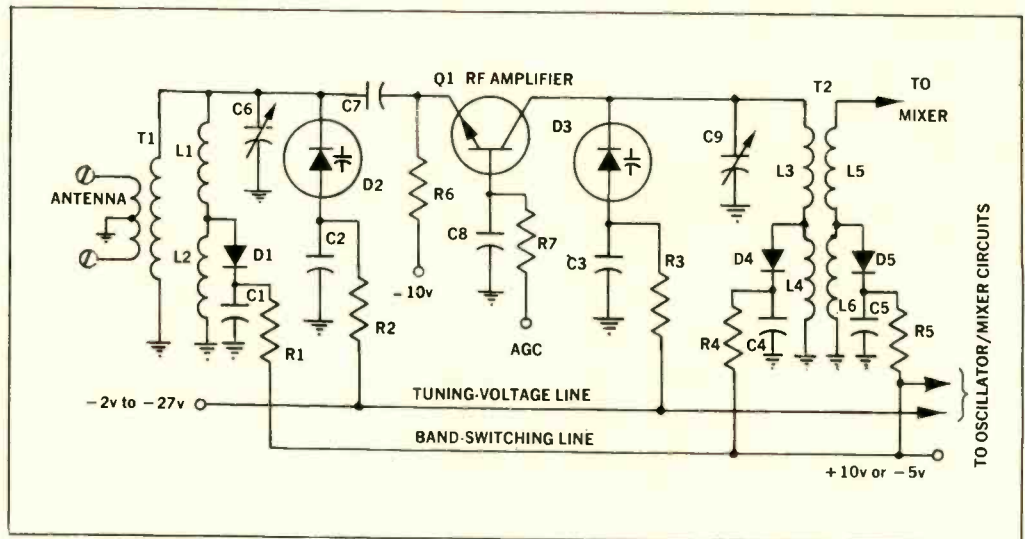


Fig. 10—RF-amplifier stage in a typical VHF varactor tuner.

(the base is grounded by capacitor C8, for RF signals) and connected in the "inverted" dc bias configuration (collector load, coils L3-L4, returned to ground, and emitter returned to the -10v dc supply).

The input RF tuning circuit consists of the following inductances: the secondary of antenna matching transformer T1, and the L1-L2 coil combination; and the following capacitances: trimmer C6 (for alignment purposes), varactor diode D2, plus the usual stray capacitance, distributed capacitance of the coils, and transistor input capacitance. Note that C2 is an RF bypass capacitor and hence has negligible reactance at signal frequencies; its relatively large capacitance returns the anode of the varactor to ground. Therefore, C2 does not constitute part of the tank-circuit capacitance.

Circuit Action

For low VHF band operation (channels 2 through 6), a dc voltage of +10v is applied to the band-switching line, from a suitable source in the

power supply. This positive potential applied to the cathode of switching-diode D1 reverse biases the latter; D1 becomes essentially an open circuit. Coils L1 and L2 in series provide (with the T1 secondary) the necessary inductance to tune the low VHF band.

Which channel will be selected within that band?

... This depends on the actual tuning voltage applied to varactor D2. The tuning control (channel selector) selects a different dc voltage for each channel, in the range between -2v and -27v. Notice that this negative tuning voltage is applied to the anode of the varactor; since its cathode is returned to ground via the inductances, D2 is reverse biased. The higher the dc voltage, the smaller the capacitance of the tuning diode and the higher the resonant frequency of the tuned circuit; hence, approximately -2v tunes-in Channel 2, while close to -27v is necessary to select Channel 6.

For high VHF band operation, -5v instead of +10v is applied to the band-switching line, from a suitable dc source. This

negative potential forward biases switching-diode D1; the latter now behaving like a short circuit and returning the bottom of coil L1 to ground (through RF bypass capacitor C1). Coil L2 is therefore effectively out of the circuit, and the reduced inductance is now suitable for the high VHF band (channels 7 through 13).

Which high-band channel will be selected? ... Here again, this is determined by the dc voltage actually present on the tuning line; i.e., a low voltage will bring in Channel 7, while a voltage closer to -27v is necessary for Channel 13.

The same reasoning can also be applied to the tuned circuit in the output of the RF amplifier (L3-L4 inductance, C9-D3 capacitance). The band-switching voltage applied to switching-diode D4 selects either L3 only (high band) or the series combination of L3 and L4 (low band) for the tuned primary of interstage RF coupling transformer T2, while the actual tuning voltage applied to the anode of varactor D3 selects the desired channel frequency within either

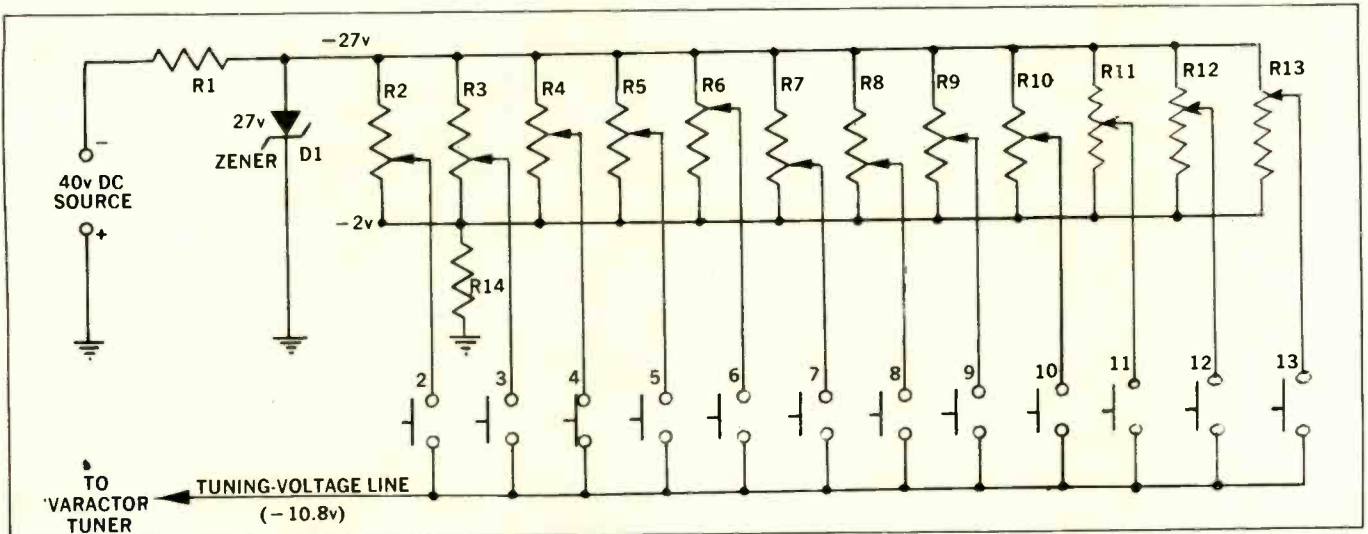


Fig. 11—Part of the varactor support circuitry, supplying tuning voltage to tuner of Fig. 10.

band. Switching diode D5 selects the proper inductance for the secondary of D2.

Note that the same tuning voltage is simultaneously applied to all varactors, and the same band-change voltage is likewise applied to all switching diodes; this simplifies the circuitry. Trimmers C6 and C9 are aligned to produce the proper passband for the RF amplifier stage. Note also networks R1-C1, R2-C2, R3-C3, R4-C4 and R5-C5, decoupling the RF tuned circuits from the common tuning-voltage line and band-switching line.

Individual Pots Select the Tuning Voltage

The viewer's CHANNEL SELECTOR control could simply consist of a single potentiometer across a 27v dc source, its wiper feeding the tuning-voltage line; this would result in continuous tuning, just like tuning a radio. However, government authorities take a dim view of this, insisting that the tuning chore be rendered easier for TV set users by providing some kind of switching or "clicking" action (detent action) rather

than continuous knob twirling. The answer lies in using push-buttons, or a rotary or sliding switch, to select any one of 12 dc voltages preset by means of individual potentiometers, as shown in Fig. 11.

This schematic shows that the Channel 4 button has been pushed and a potential of, say $-10.8v$, is applied to the tuning line of the varactor tuners from pot R4. The potentiometers have to be pre-set during initial receiver set-up, just like pre-set fine tuning in conventional tuners (individual slugs in oscillator coils). For fine tuning purposes, the pots can be made readily accessible to the TV set owner, to compensate for frequency drift as the receiver ages.

Obviously, the $-27v$ source should be very stable; otherwise the viewer would have to fine-tune his receiver each time the dc voltage fluctuates (due to power-line voltage variations, for example). In the schematic shown, a simple voltage-regulator circuit—consisting of zener diode D1 and series-dropping resistor R1—supplies a constant $-27v$ output to the potentiometers,

from an unregulated $-40v$ input.

Varactor Tuning Makes Mini-Tuners Possible

The varactor support circuitry, i.e., the voltage regulator, pre-set pots, push-buttons or slide-switch selector, etc. . . . can be located on the main receiver chassis or on a separate control panel. The tuner itself, now devoid of bulky components like those wafers loaded with dozens of coils or 13 strips clipped around a turret, can be made amazingly small in size, with no moving parts! Mini-tuners are now a reality.

Note that the selection of the switching voltage ($+10v$ for the low band, or $-5v$ for the high band) can be performed by the same channel selector, by suitable design of a ganged switching arrangement. For example, pushing any low-band button would automatically apply $+10v$ to the band-switching line as well as selecting the right pre-set voltage for the tuning line; likewise, depressing any button between 7 and 13 would select $-5v$ for the band-switching line while also selecting the proper volt-

age for the tuning line. Furthermore, the same push-buttons can be made to apply power (e.g., 6.3v ac) to corresponding pilot lights, lighting up channel numbers.

It goes without saying that the same varactor tuning principle can be applied to UHF tuners as well. All in all, channel selection has become a fascinating trick, from a technical point of view.

Of course, in different models or brands of varactor tuners, tuning and switching voltages may vary appreciably from those mentioned here; the switched inductors may be parallel-connected instead of series-connected; the RF amplifier circuit could be quite different from the one shown in Fig. 10, perhaps featuring a common-emitter transistor, a JFET, or a dual-gate MOSFET; or the varactor support circuitry may differ a lot from that in Fig. 11. Nevertheless, it is hoped that the basics of electronic tuning presented in this article will give the reader a good idea of what to expect in the *tuner of tomorrow*, which is already here today. ■



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For they do turn to it. A study of businessmen's use of the Yellow Pages conducted several years ago by the independent research firm, Audits & Surveys Inc., showed that two out of every three prospects in the market for electronic equipment and supplies use the directory. About 80 percent of them did so without a specific dealer or technician in mind.

A similar study of consumers showed that two out of every five American adults in the market for radio, TV and Hi-Fi equipment turn to the Yellow Pages each year. And

when they do, two-thirds of them do not have a dealer in mind.

In short, these business and consumer prospects are engaged in visual comparison shopping—checking ads and lists for stores whose services, locations, and general "look" appeal most to them.

So your advertising has two basic jobs: To attract new customers and to help those who are already satisfied with your services.

Where do your ads belong? The Action Index at the beginning of the Yellow Pages can assist one in determining what category to look under for the information sought. There are at least 11 categories that could prove appropriate for free listings by many readers of this publication. They include the following: Antennas;

Electronic Equipment & Supplies—Retail; Radio Communications Equipment & Systems; Security Control Equipment & Systems; Sound Systems & Equipment; Stereophonic & High Fidelity Equipment—Dealers & Service; Television & Radio Dealers—Retail; Television & Radio Service; Television & Radio Supplies & Parts—Retail; Television Rental; and Television Systems & Equipment—Closed Circuit.

Your local telephone company can give you a list of all headings appropriate to your business. As a general rule, you should be represented under every heading that logically describes the types of products and services you offer.

How Much, What Kinds of Space? The size of your ad or representation un-

der each of the headings you select should be determined by its importance in terms of the number and quality of customers it is likely to deliver, and by your budget. Choose the headings most important to you. Run your largest, most information-filled ad under one or several of the most important headings.

Then determine what kinds of representation you should have under each of the other appropriate headings. In making your choice, remember that your customers are looking for information. Try to take the space you need to provide answers that will bring them to you.

This can be a display ad or one of the smaller Yellow Pages units. "Business Card" listings run alphabetically and, in addi-

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tion to your name and phone number, offer space for information on your products, services, hours and other major selling points. Bold-type listings give you stand-out prominence, particularly when set among the lighter regular listings. Extra lines are available for additional information.

Don't Headline Your Name. Chances are, you'll choose a broad, general heading such as "Television & Radio Dealer—Retail" as the place for a display ad. Under such a heading, your name may mean very little, and other information may be much more important. So don't make the mistake of headlining your ad with your name.

Instead, attract attention with a headline that gives prospects a good reason why they'll benefit

from dealing with you. Tell them about the variety and completeness of your stock, the specific products you sell, the services and conveniences you offer.

Your name does have a place in your ad, of course, but it belongs farther down, along with your phone number and address. Make these facts prominent, using large type. If you have a distinctive logotype or "signature," use it to gain recognition from people who have seen it before.

Tell Them What and Why. Think like a customer. Answer their questions. First, consider the heading under which a given ad is to be run. What will prospects who turn to it be seeking? Make a list of products you sell that are appropriate to that heading. The

key word is "appropriate." If your ad is under "Television & Radio Supplies & Parts—Retail" don't waste valuable space by calling undue attention to public address systems. A prospect in the market for a p.a. system isn't likely to be browsing through a heading devoted to TV and radio.

Do tell him everything of importance with regard to TV and radio equipment and supplies. Make your ad a brief catalog of your products and services. If you are a factory authorized dealer for one or more makes, say so. Tell customers who may be uncertain about the technical aspects of your business that they'll get friendly and courteous technical advice.

Don't overdo it and crowd your ad. Be selective. But be sure to con-

vey facts that will help prospects decide in your favor.

Help Customers Find You. Also, don't assume they'll know where you are and how to find you. If your store is large and on a main thoroughfare, this point may be academic. But if you're off the beaten track, newcomers and old residents who have never been in your area before may have trouble finding you. Pinpoint your location in your ad by mentioning intersecting main streets or highways or cite nearby prominent landmarks.

Bear in mind, too, that many of your prospects may not be able to shop during business hours, or because of an emergency may need your products and services in an off-hour. So, if you're open

continued on page 45

Data Processor Promotes Security Through Television

Industrial espionage and employee sabotage are more than intriguing subplots for Hollywood films and television pilots. For a data processing center they are very realistic and often confounding problems which must be faced and effectively resolved. At Tabulating Consultants, Inc. of Burbank, Calif., a 30,000 sq ft data processing installation often open 24 hours a day, the solution took the form of a Panasonic closed-circuit television system.



The close-up of the four Panasonic television monitors in Mr. Kurzenknabe's office shows the range and flexibility of the Tab security system. All four monitors are viewing separate company areas.

■ Tabulating Consultants has security problems common to most computer organizations. It occupies a large area and is open long hours. Employees are mobile, and the firm is entrusted with millions of dollars worth of client files. Tab's clients include an insurance company, a Southern California trade union, and a mailing house. All demand and expect the company to keep tape records secure.

The computer firm states that the CCTV system works, both as an enforcer and as a deterrent. All entrances to the facility are posted with signs that read, "When you enter these premises it's with the acknowledgement that your presence and your activities therein are being photographed and recorded permanently."

Mr. C. P. Mounce, Tab's Secretary-Treasurer and Security Officer, explained the reason why he chose to let visitors and employees know they were being "watched."

"Our chief asset is our tape file and a slip-up there could be disastrous to all involved. Most of our tapes consist of 'fresh' names and addresses of U.S. residents who have shown their ability to buy and some special interest—either in a magazine, mail order merchandise, or by shopping in a particular store. Because these lists have been collected at great cost over a period of years, they cannot be replaced."

Mr. Mounce emphasized that one client, alone, valued his tape files at \$10 million and acknowledged that guarding and working with client files is an enormous responsibility. He added that Tab has additional duties involving subscription fulfillment, typesetting, art work, advertising, accounting, billing collections and all correspondence for their clients. The operation is complex and the people involved should be monitored closely.

With such a large installation, Tab ruled out the possibility of using security guards.

"If I put on three shifts of guards seven days a week," company President R. E. Kurzenknabe stated, "they would still have to go to the rest room, they'd still see good-looking girls walking by, they'd still get sick, they'd still have to go in

and get a cup of coffee or have a cigarette."

"And there is no way I can afford to meet the payroll necessary to properly control these premises. If anything did happen, it would be a test of two witnesses, one against the other. But when I have it on that Panasonic TV monitor, I can make a hard copy and prove beyond a shadow of a doubt that somebody was there who wasn't authorized. I don't think that there is any current medium that matches this as a security system, and it's very inexpensive for us. It's less than the cost of one guard's 40-hour-week-salary."

Tab began installing CCTV after consulting Seeburg Security, a local Panasonic dealer. Three CCTV and time lapse VTR cameras were employed to monitor the firm's three entrances. With viewing consoles in his office, Mr. Mounce was able to see the people entering the premises but could not always see those leaving. The firm used the system for three months and was so pleased with its success that they had Seeburg enlarge the system and cover every entrance and exit. Four cameras were installed in the computer center to monitor not only the computer room but all the access areas and the tape library.

From his office, Mr. Kurzenknabe can watch his secretary, accounting, the check vault and the overall facility with exceptional clarity. Mr. Mounce also has a set of monitors in his office, acting as a back-up. Tab utilizes 16 cameras, 3 VTRs and 3 sequential switches which enable the viewer to change viewing field, scan an area, or shoot a close-up and display the picture on the monitor of his choice.

The versatility of the Panasonic system has a great many benefits, Mr. Mounce related. For some clients, Tab maintains signature plates for payrolls which total millions of dollars. The plates are locked in a safe, and only four Tab officers have authorized access. From the privacy of their offices Mr. Kurzenknabe and Mr. Mounce are able to watch an officer while the checks are being signed, then "follow" him back to the vault with the plates, thanks to the "pan and zoom" cameras.

Another "plus" of the Panasonic system, the security officer added, is the time-lapse videotape. Mr. Mounce said that tapes are often kept for a long period of time before they are used. In the event of a catastrophe during the waiting time, documented proof of what transpired must be obtained. The time-lapse videotape, which takes one picture every 40 sec., was Tab's answer. For instance, Mr. Mounce was able to prove the exact time an earthquake hit his building by a procedure he devised of automatically filming a clock. Some of the earthquake footage was remarkable, he stated. There were scenes of a briefcase sitting upright on a desk in the computer room, shaking but never falling over; light fixtures falling and acoustical tiles dropping from the ceiling. All the while the audio portion of the tape carried the sounds of a building falling apart.

When asked if his employees mind being "watched" by a modern-day Big Brother, Mr. Kurzenknabe replied negatively. "Our employees are sophisticated people," he explained. "They understand the reasons behind the television system and it doesn't bother them. In fact,

very often they appreciate the close supervision it affords. Perhaps there's a girl sitting and hesitating over a record. I can tell she is having a problem. All I have to do is get on the line to her supervisor and the problem is quickly resolved."

Client response to the security measures has also been tremendous, the president reported. The first thing the client sees when he enters the Tab office is three television monitors. In one monitor is a picture of the client himself. "Our customers are very pleased to know that Tab goes to this extent to assure the safety of our records," Mr. Kurzenknabe said.

Mr. Mounce agrees and adds that the combination of visible cameras and posted warnings has had a major deterrent effect. Tab has yet to have anyone try anything dangerous.

"The idea is to stop a problem situation before it starts," Mr. Mounce concluded; "that's the most important thing. Secondly, if something should happen, we can report it, prove it and nail the guy that did it. The process should certainly give second thoughts to anyone contemplating an action in the future." ■



Tab security officer Mr. C. P. Mounce can sit at his desk and control 16 Panasonic cameras, three video tape recorders and three sequential switches. He says, "Our customers are very pleased to know that Tab goes to this extent to assure the safety of our records."

Public Relations and the Technician

by John Rozsa

I doubt if you'll find a public relations director in a dealer/service organization. The roving ambassador is the field technician.

■ I slowly and observingly drove my dark-blue station wagon on the street of a new customer, unaware of an illness in the family. The day was sunshine and roses, a late morning in June, and I was right on schedule. Promptness and reliability reward double satisfaction—the electronic technician and customer. I spotted the house number and pulled over to the curb. As I knocked on the door, I held my caddy with tube tester tucked under the same arm. As the door opened, a young lady with sandy-brown hair looked at me and then my gear with saddened blue eyes. "Oh! Come in Doctor," she said.

I was momentarily confused, but not disappointed. Smiling about the compliment, I replied, "I'm the TV technician."

"Oh! Well, come in. I forgot that you were coming, with my son sick and all."

She led me to the TV set in the living room and hurriedly made her way into the bedroom to check on the sick child. Within a few minutes, the doctor arrived and the tenseness in the atmosphere seemed to relax. The illness turned out to be minor and was quickly taken care of.

I thought this story would serve as an excellent example of one phase of customer relations in the skilled-labor or technical field of electronics. You can bet I left this job whistling a happy tune. I knew by this incident that I had made a good first impression with a new customer. The importance of neatness and cleanliness cannot be overstressed in the TV service field.

With cigarette smoking branded detrimental to our society, the modern day technician should definitely

refrain from this practice in the customer's home.

When explaining a problem to a customer, come down to earth and use layman's terms. Make it as simple and short as possible without going into a lot of technical vocabulary. A good guideline for the type of language to use is that of the preacher or radio announcer.

In all fairness to yourself and your customers, keep abreast with your studies by reading new books, trade magazines, and supplementary material each day. Today's electronics engineer spends one-third of his work day studying to keep up with late developments. It's a fast moving, dynamic industry; and you must not let yourself lag behind in the dust. Well established firms should periodically get mail invitations to attend color-TV seminars, which are sponsored by manufacturers of receivers or test instruments. Take advantage of these classes which sometimes extend to several meetings. Highlights are such things as demonstrating dynamic and static convergence of color-TV receivers. Discussions on unusual problems are always very interesting and informative. Door prizes, sandwiches and coffee are usually available at no cost. These manufacturers deserve a real pat on the back for providing such an excellent program.

I doubt if you'll find a public relations director in a dealer/service organization. The roving ambassador is the field technician. A good relationship here with the customer will eventually reflect back to the management. If a disagreement does arise with the customer, remember the old elementary principle of salesmanship; the customer is always right. This does not, how-

ever, mean that you leave him misinformed. In explaining, be tactful and constructive.

One question that will always confront the electronic technician is, "Is the set worth repairing or should I buy a new one?" In this case, always present both sides. If the TV set is 10 years old and the picture tube is out, let the customer know the cost and risk involved. You can give him a price for a picture tube and overhaul, but not a guarantee on other major breakdowns. Let him make the decision. You will make a good impression with the customer in this manner. Even if you sincerely believe that a new TV set is the best move to make, do not advise him accordingly because he may think you are trying to make a sale for the company you work for.

Try to avoid a dull and strictly business type service call by being a good listener and talker. Call a customer by name; pay attention to children, pets and family hobbies. Throw a few compliments around and make your customer feel important, after all, he is an important asset, don't lose him.

Always carry a clean drop-cloth in your caddy, and use it when soldering or laying out tools in the home. If you don't have a drop-cloth, a good substitute is an old newspaper which is easily acquired from the customer. You will find that a pleasing attitude and quick response will be at hand. Carpeting is an expensive item and should be given every respect and in turn you will be respected for it. Keep in mind that your work is done in the best room in the house.

Never take old parts such as tubes, fuses, etc., back to the shop, unless the customer requests that you do so. Carrying away old parts may make the customer suspicious that they are good and will be resold.

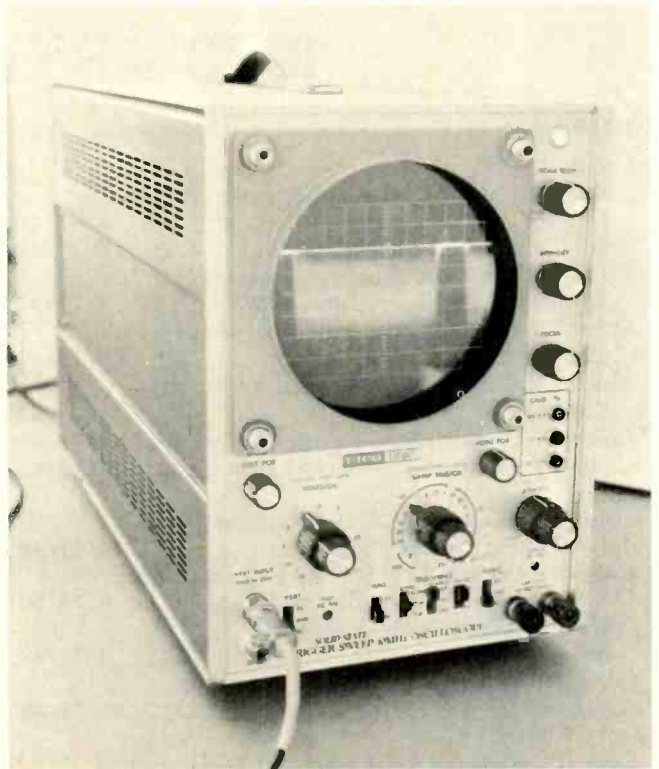
So if you are a one-man operation or member of an enterprise, maintain prestige and reputation by using simple courtesy and your business will prosper. Toss a handful of lollypops into the caddy each morning and pass them out to the children on your route. Isn't that just like the doctor? ■

TEST INSTRUMENT REPORT

EICO's Model TR-410 Triggered- Sweep Scope

by Phillip Dahlen

The New York Mets take on
exciting form



EICO's Model TR-410 Triggered-Sweep Scope. For more details circle 900 on the Reader Service card.

■ Although Joe Zauhar and I are not baseball fans, we were still quite excited with the video observed during the October 10th game. For during that telecast we connected EICO's new triggered-sweep scope to a color-TV set and without making a single adjustment observed a stable TV horizontal-sweep signal upon turning the scope ON. The waveform observed is the one shown in the accompanying photo.

Such an incident might not have proven quite so exciting to some. However, the last time we had used the scope—four days before—it had been left running for several hours while we tried to decide on an appropriate scope picture. After having adjusted the scope for a study TV horizontal-sweep trace and switching the scope horizontal-sweep for times-five expansion,

we were all set to take our photo when we noticed that it was time to quit for the day. Thus on October 10th when we again had time for the project, we merely reconnected the probes to where they had been before in the TV set, turned ON the power to the scope, and there was the waveform—just as stable as ever. Now that's stability for you!

The solid-state scope is said to have a vertical input impedance of 1M, 35pf; a protected FET input stage, 10MHz bandwidth, and variable vertical gain which includes the following switch selections: .01, .02, .05, .1, .2, .5, 1, 2, 5, 10 and 20v/cm. Front-panel switches select between ac-coupled inputs, dc-coupled inputs and grounded inputs—one switch controlling the vertical input and another the external horizontal input. Three terminals on the

front panel permit easy calibration of applied vertical or horizontal input signals by providing 2v p-p, 5v p-p and 10v p-p square-wave signals for comparison.

In addition to providing variable horizontal gain, the scope has switch selectable sweep rates that include: EXTERNAL, TV-V, TV-H, .5 μ s/cm, 1 μ s/cm, 2 μ s/cm, 5 μ s/cm, 10 μ s/cm, 20 μ s/cm, 50 μ s/cm, .1ms/cm, .2ms/cm, .5ms/cm, 1ms/cm, 2ms/cm, 5ms/cm, 10ms/cm, 20ms/cm, 50ms/cm, .1s/cm, .2s/cm and .5s/cm. A switch is also provided for times-one or times-five sweep expansion. Terminals are provided on the front panel for applying horizontal input or external sync signals.

Sweep triggering controls include an AUTOMATIC/TRIGGER-LEVEL control and a STABILITY control, plus the following

trigger-control switches: Sync-NORMAL, TV-H, TV-V; Source—INTERNAL, EXTERNAL or LINE; and Slope—(+) or (-).

Other front-panel controls include SCALE ILLUMINATION/POWER; INTENSITY; FOCUS; VERTICAL POSITION; HORIZONTAL POSITION; plus VERTICAL DC BALANCE and HORIZONTAL DC BALANCE screw-driver controls.

The panel at the rear of the scope includes an ASTIGMATISM control; a scope horizontal-trace output-pulse terminal for gating other instruments; a beam-intensity modulation input terminal; a 1a fuse holder and a special switch for operating the scope on 100v, 120v or 230v of 50Hz or 60Hz power.

The scope has a standard bezel and bushings for camera mounting and includes a quickly converted direct to 10:1 low-capacity probe. ■

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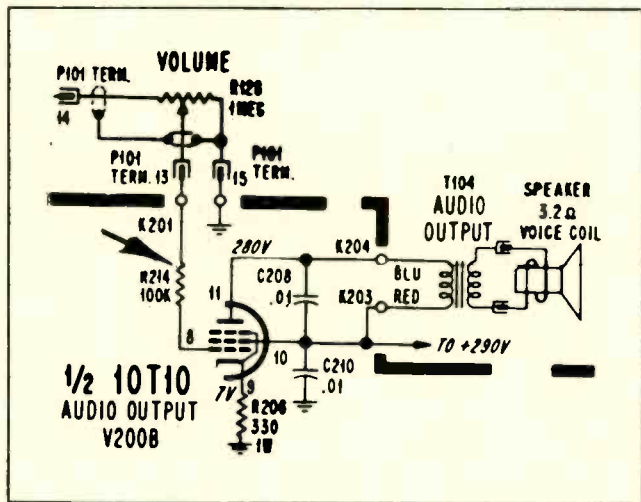
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

ADMIRAL

Color-TV Chassis K-19—Defective VOLUME Control

Occasional failure of the VOLUME control on the K19 color-TV chassis has been traced to an arc in the 10T10 audio detector and output tube as a possible cause.

Damage to the control may be eliminated by adding a 100K, 1/2w resistor between pin 8 of the 10T10 tube socket and the wiper of the control, which connects to pin 13 of P101.



Also when installing this resistor, it must be placed at the circuit board. Because of the capacity of the audio cable, if the resistor were installed at the control, it would level at minimum setting of the VOLUME control. Remove the foil pattern between pin 8 of the 10T10 tube socket and K201 on the circuit board. Keep the resistor leads short and make a good mechanical connection, then solder. Check the cathode resistor R206 because it may have been overheated. The 180Ω, 1/2w resistor may be replaced with a 330Ω, 1w resistor as used in later production.

Color-TV Chassis K20—Failure of Audio IC

Failure of the audio IC, Part No. 57A29-2, can cause a condition of "No Audio"—usually reported following a thunder/lightning storm. This condition can be caused by an arc from the high-voltage or the picture-tube circuits.

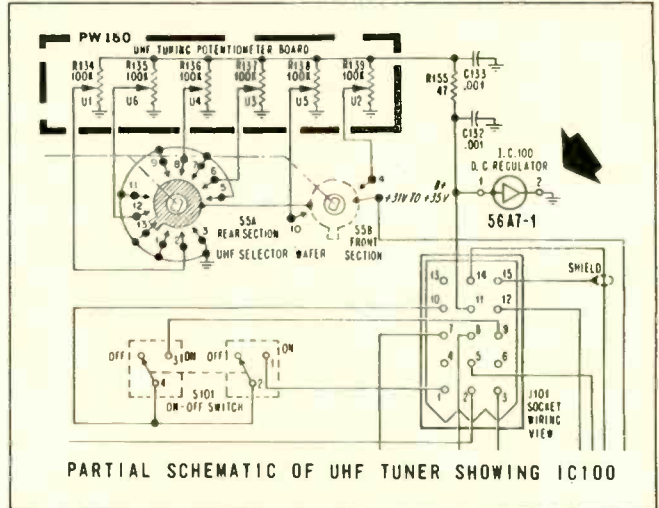
If you encounter a K20 chassis with an IC failure, check the wiring of capacitor C134 (.022μf) TONE control capacitor on the tuner cluster. The ground side of this capacitor should be connected to the shield braid at the VOLUME control and not the tuner cluster bracket. Reconnect if necessary.

Improved reliability of the IC can be achieved by inserting an 8.2K, 1/2w resistor between pin 7 of the IC and the junction of capacitors C212, C213 and resistor R203.

Cut and remove the foil pattern between 7 and the junction of C212, C213 and R203. Keep the resistor leads short and make a good mechanical connection, then solder.

Color-TV Chassis M20—Service Hint

A problem of UHF channels detuning when BRIGHTNESS, COLOR or CONTRAST control settings are changed—found only in models with varactor UHF tuners—can probably be caused by a defective dc regulator diode.

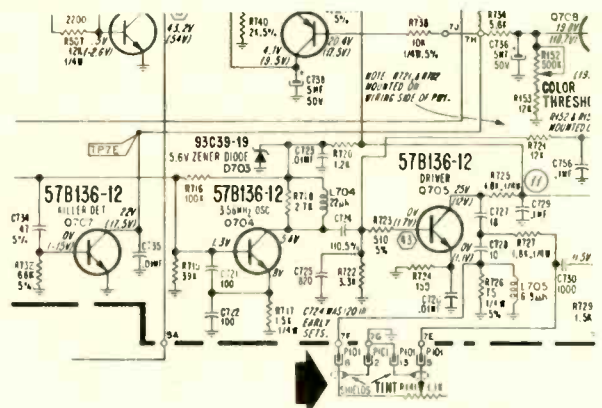


This diode, IC100, Part No. 56A7-1, regulates the 35v supplied to the preset UHF tuning controls. If the regulator is not functioning, a very small change in the B+ supply voltage will change the tuning of the varactor tuner.

To correct this condition, replace the diode, which is mounted on a terminal strip on the rear of the UHF tuner.

Color-TV Chassis K20—Service Hint

When a problem of greenflesh tones is found in the color picture and the TINT control has no effect, a probable cause is a poor connection at the TINT control leads in the Molex connector.



K20 TINT CONTROL CONNECTORS

To correct this condition, locate the leads from the TINT control at the Molex connector. Remove the pins in both the chassis plug and the plug on the control cluster. Solder the crimped connections and reinsert pins, making sure that they seat firmly.

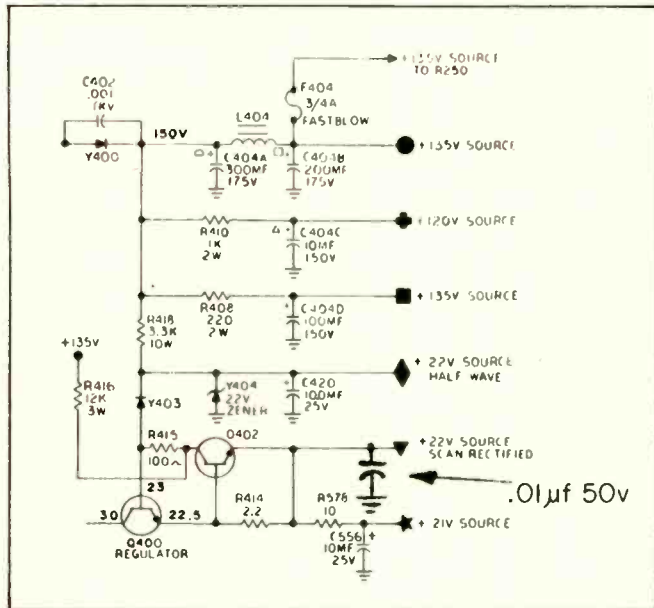
GENERAL ELECTRIC

Color-TV Chassis JA—Herringbone Interference

This interference is a vertically oriented herringbone pattern which varies in severity with the BRIGHTNESS or CONTRAST control settings. It is usually noticed on weak sig-

nals and in some cases is strong enough to blank out the video and cause interference in adjacent receivers.

To correct the problem modify the receiver as follows:



Remove one screw from the power-supply board and tilt it upward. Add a .01µf, 50v, disc ceramic capacitor, ES18X43 or equivalent, to the bottom of the circuit board as shown in the illustration.

Color-TV Chassis MA—Weak or No Color

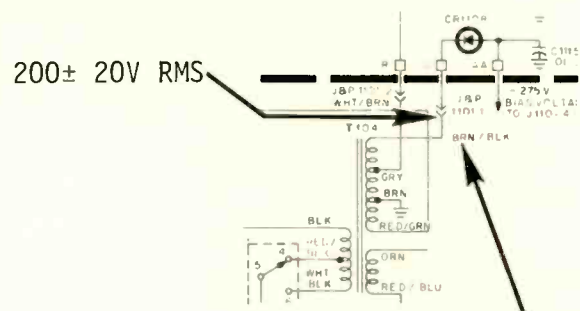
If one color is missing, experience shows that in some cases one of the three picture tube cathode leads that plug into the RGB module are not fastened securely. Resolder the male connector since the solder may have broken and caused an intermittent.

The problem might also be solved by replacing integrated circuit IC602 on the chroma module.

RCA CORP.

Color-TV Chassis CTC46 Series—Standby Transformer Replacement

To insure optimum reliability in those isolated instances where the Standby Transformer (T104) must be replaced, make sure the replacement transformer is connected as



Note color code correction

shown in the Basic Service Data and in the partial schematic.

To confirm the connections are correct, check the following voltage: The voltage at J/P1101-1 (Remote Amplifier) must be 200 ± 20v rms.

Color-TV Chassis XL-100—MAD and MAN Modules

In the past all ceramic-substrate modules used in XL-100 chassis (MAD and MAN modules) have been coated with a green epoxy coating. RCA engineering has determined that the epoxy coating is unnecessary. Hence, late-production of "R" line (1973 model year) XL-100 chassis will utilize uncoated ceramic-substrate MAD and MAN modules. These modules are blue rather than green due to the color of the protective paint used to cover the printed circuitry. These uncoated modules are just as reliable as the coated type and are directly interchangeable.

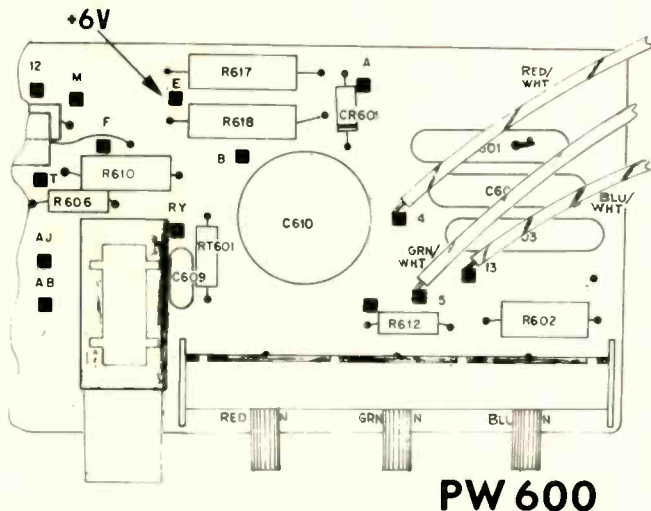
Color-TV Chassis CTC54 Series—Bench Servicing Remote/Color Hum Bar

When bench servicing the remote amplifier circuitry, precautions should be made to protect the memory modules (CRM's) in the remote amplifier from possible damage due to transients. The remote amplifier chassis frame must be grounded to the main chassis when bench servicing. When the remote and main chassis are installed in the instrument, this common ground is made through a foil strap in the cabinet.

A high resistance connection at either end of the foil can result in the symptom of a color bar moving vertically through the picture. Symptom analysis can be misleading since the bar may not be evident when the degaussing coil is unplugged.

Color-TV Chassis CTC54 Series—ETA Motor Symptoms/Servicing

Various symptoms—such as "Motor runs continuously" or "motor does not run," relating to the motor (B4601) associated with the Electronic Tuning Assembly (ETA 423B)—which are not resolved by the replacement of the



MAT module may be the result of loss of the 6v dc input to the MAP module circuitry. This power supply is located on the PW600 board and consists of diode CR601, electrolytic capacitor C610, and two 15Ω, 2w resistors—R617 and R618.

MOVING?

Be sure to let us know your new address. Please enclose a complete address label from one of your recent issues.

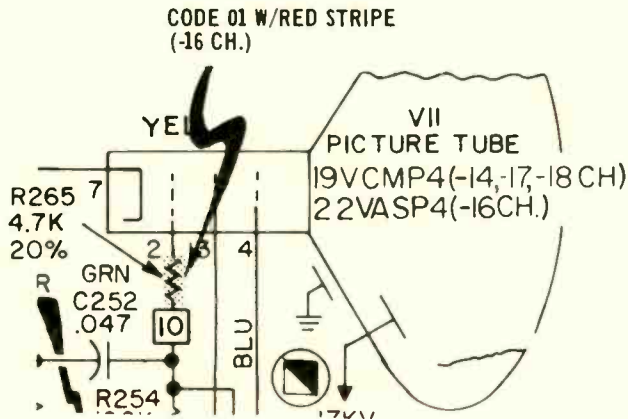
TECHNICAL DIGEST

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

SYLVANIA

TV Chassis B10-16—Diode SC204 Protection

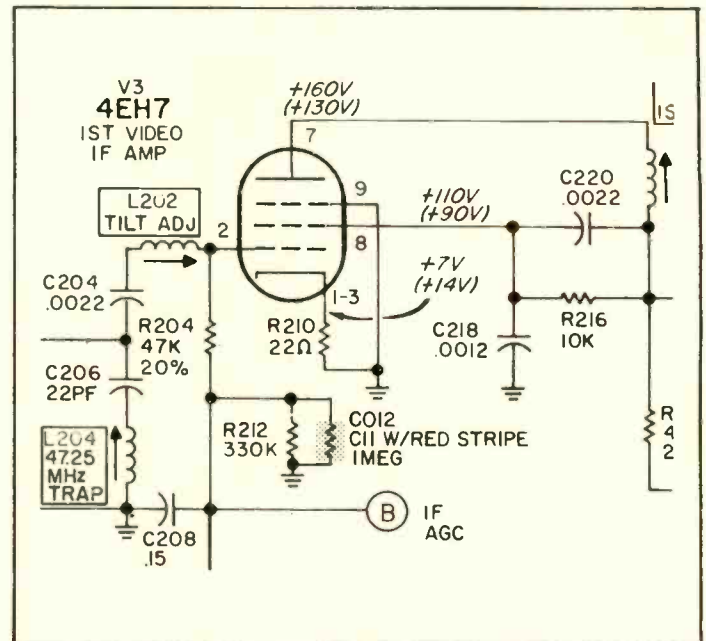
To protect diode SC204 when picture tube arc occurs, the following change was made: A resistor R265 (4.7K,



20% 1/2w) was added in series with the green lead of the picture tube near the socket.

TV Chassis B10-3,4 Code 11—Service Hint

To adjust for some 4EH7 first video IF amplifier tubes with high cut-off characteristic, the following change was

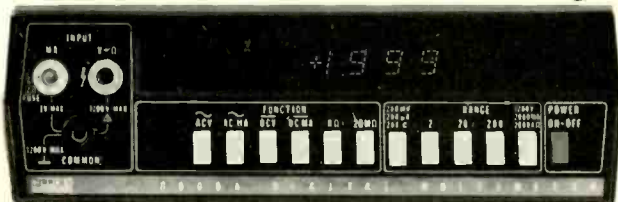


made: A 1M, 1/2w resistor was added across resistor R212, as shown in simplified schematic.

TV Chassis B10-3,4 Code 12—Service Hint

A factory production change was made, using the new 4EH7 tubes with lower cut-off characteristics.

The 1M resistor was removed across resistor R212 as shown in the illustration.



Think of it as the best tester in your bag. Only \$299

Now you can get a high performance Model 8000A Digital V.O.M. from Fluke, America's foremost maker of quality digital multimeters, especially designed for TV, radio, stereo and audio service. No other digital V.O.M. gives you the resistance range to check breakers and switches, the high resolution voltage to look at emitter base and other transistor voltages, excellent ac accuracy and full accuracy with a 30 second warm-up.

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FLUKE P.O. Box 7428,
Seattle, Washington 98133.

Get all the details from your nearest Fluke sales office. Dial toll-free 800-426-0361 for address of office nearest you.

... for more details circle 110 on Reader Service Card



"At least our jobs are permanent. Through good time and bad, depressions and recessions, the TV's must keep playing."

YELLOW PAGES . . .

continued from page 35

late or have special hours on weekends, mention it in your ad. Give specific hours.

Tell Them You're Reliable. Obviously, if prospects have never heard of you and don't know your location they won't know of your carefully built reputation. Assure them of your reliability by using a phrase such as "serving (your city or area) since 1947."

If you're professionally qualified, or belong to a well-known professional association, mention that, too. But be sure your claims are valid.

Promote Brand Names. Some people equate reliability with well known brand names. Other just don't like to take a chance on an item made by a lesser-known manufacturer, no matter how good its quality may be. So it could pay you to make a special effort to reach prospects who are pre-sold on brand merchandise. This can be done by mentioning brand names or by running manufacturers' trade marks in your ads.

It can also be done by tying in with manufacturers' Trade Mark headings. These are 1- or 2-in. spaces, bought by national manufacturers, that show the brand or company name and Trade Mark emblem. Authorized local dealers may buy listings under them. Check with firms whose products you sell to see if they offer such a program.

Consider Neighboring Directories. Also, consider widening your trading area. People in outlying suburbs and adjacent towns may be covered by

telephone directories other than your local one. They may not have local electronic service dealers in their communities that can meet all their needs. If this is the case, it could pay you handsomely to advertise in those neighboring directories. You can check this out with your local telephone company and have them order such ads or listings for you.

Be Neat, Be Different. Whatever representation you decide upon, keep sight of the fact that you're selling your professionalism, as well as products and services. Don't expect to attract prospects with ads that don't appear well organized. They should be neat, clean and attractive, and should convey a friendly but efficient business image.

Keep your layout simple. Construct an orderly progression from attention-getting headline through body copy and signature. Illustrations imply the quality of your operation, so choose them with care.

One final tip. Check the appropriate headings in your local Yellow Pages and examine the ads appearing there. Most of them are probably very like one another. Since one of your main purposes is to show prospects how and why you're different from all the rest, make your ad convey this difference in its appearance and, if possible, its approach.

In short, give your entire Yellow Pages effort a fresh look. It could very well help to freshen up your business. ■

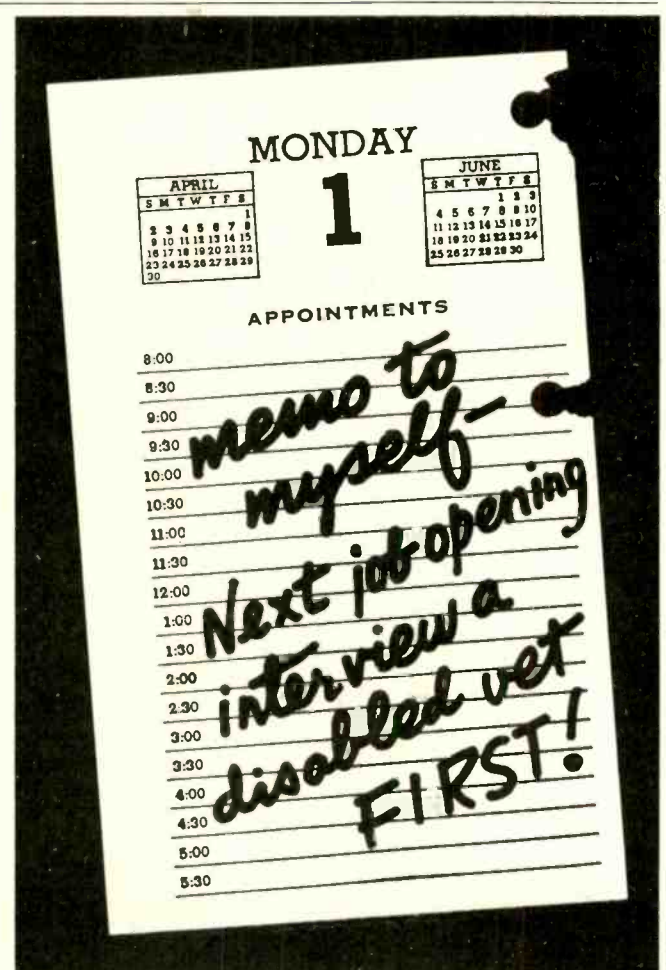
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The President's Committee on Employment of the Handicapped

Washington, D.C. 20210

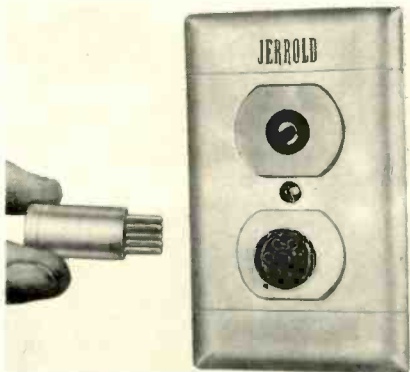
NEW PRODUCTS

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

MATV REMOTE PLUG 703

Easily snapped into new ULTRA-TAP outlets

A remote plug is being offered for MATV tapoffs. Called Model UTS-R, each new saddle and 6-pin jack is shipped complete with a 6-pin mating



plug. This arrangement is said to be especially convenient for hospital systems where remote TV receiver control is required; educational TV systems which include audio; and any sophisticated MATV system where extra functions are desired in MATV outlets. Jerrold.

TELESCOPING ANTENNAS 704

Designed as exact replacements for many name-brand portables

A line of telescoping antenna rods has been designed to replace such antennas — normally found at the rear of domestic and imported portable TV sets — should they become broken. They are said to fit exactly and come complete with necessary brackets and swivel joints for simple installation. RMS Electronics.



SECURITY CONSOLE 705

Maintains visual contact with up to seven CCTV cameras

The SCC 10 Security Video Console Monitor is designed to permit an operator to maintain visual contact with as many as seven CCTV camera

and audio two-way communications with up to five speaker locations. The operator may monitor two camera positions continually, using a five-position selector to determine what camera is used with the third monitor. The



audio portion of the console contains an intercom which allows the operator to speak or listen to each of the five audio locations independently, or with the "all call" feature, all stations simultaneously. Background music may also be provided. Concord Communications Systems.

MULTIPLE-BIT SCREWDRIVER 706

Needed blades selected by slide buttons on handle

Four hardened-steel jeweler's screwdriver bits are said to be instantly ready for use with the Pick-N-Drive, a tool in which blades are advanced and retracted by slide buttons at the sides of the driver handle and secured by a locking ring, which also serves as a pocket clip. Blade diameters are reportedly 0.086, 0.781, 0.055 and 0.069 in. James Electronic Tool Co.



TAPE DEMAGNETIZER 707

Measures and eliminates magnetism in tape recorder components

The Audiophile Hand-D-Kit, Model 20/B5, reportedly provides everything needed to measure and eliminate damaging magnetism—a clip-on extension probe to reach recessed components, dual-purpose demagnetizer, experimental test strips and complete instructions. The demagnetizer has a demagnetizing field strength of over 350 oersteds at ¼-in. distance from end of probe. The complete measurement and demagnetizing of an average recorder reportedly takes only a few minutes.

In operation, the demagnetizer plugs into any 115v ac circuit. Its plastic jacketed probe is shaped to demagnetize hard-to-reach components. The



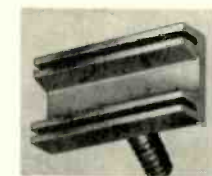
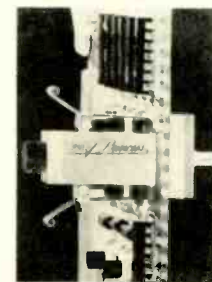
opposite, flush-pole end measures over 800 oersteds and can be used for limited bulk demagnetizing of tapes of up to ¼-in. wide if a regular bulk tape eraser is not available. R. B. Annis Co.

IC EXTRACTOR TOOLS 708

Used together to remove easily damaged IC's

Although it is not customary for us to include two new products in a single listing, these two tools perform

such an interrelated function that an exception seemed appropriate. The No. 6982 Dual In-Line Extractor is said to have a unique spring-loaded action that automatically lifts dual in-line IC's (up to 16 pins) from the circuit board the precise moment of solder melt—thus holding to a minimum the amount of time



that the IC is exposed to heat. Its companion, the No. 6948 Slotted Bar, is designed to be used in conjunction with a number of the manufacturer's low-wattage soldering irons to melt solder on up to 16-pins simultaneously on any dual in-line IC. Ungar.

AUTOMATIC TELEPHONE DIALER 709

Programs up to 38 telephone numbers

An inexpensive automatic telephone dialer called "Name Caller" brings dialing convenience to the multi-line business telephone. The unit reportedly places telephone calls at the push of a button and programs as many as 38 telephone numbers, including area codes for direct long distance dialing.

Simply slide the pointer to the name, press the button and the call is made. The unit eliminates the necessity to look up or to dial numbers. It can be



reportedly used with any multi-line business telephone, both rotary dial and touch tone and comes complete with battery eliminator and power-pak. Video Systems, Inc.

HI-PASS FILTER 710

Eliminates low frequencies from microphone lines

The 513A Hi-Pass Filter is said to have a sharp cut-off at frequencies be-

low 100Hz without changing any program material above 200Hz. This at-



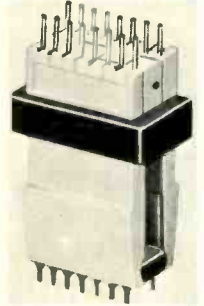
tenuation of low frequencies in microphone outputs is said to be very helpful whenever a microphone pickup is plagued by excessive low-frequency room reverberation, ambient noise, the mechanical noise of air conditioners, 60Hz hum or wind noise. Electro-Voice.

TEST CLIP 711

Suitable for compact PC boards

The original No. A23-2024 Test Clip has been redesigned to make it more suitable for use on closely packed PC boards. The suffix "M" has been added to the part number to in-

dicating the modification and the original design has been withdrawn. In operation, the clip is simply slipped onto the IC being tested and the quick release band slid down the clip, causing the contacts to be firmly engaged with the IC leads. It can also be used as a removal tool. The contacts are said to be plated to give low contact resistance and the contact extensions at the top of the clip are suitable for clip-on test probes or soldering flying leads. Jermyn.



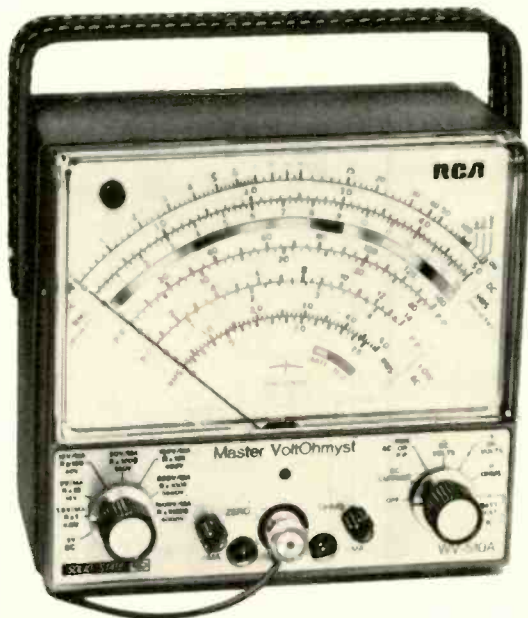
LOGIC PROBE 712

No controls or switches on this test instrument

The Model HS 50A Logic Probe is designed to indicate Logic "1" or Logic "0," show symmetry or non symmetry of pulse patterns, indicate the

continued on page 48

RCA's drift-free Master VoltOhmyst only \$135*



It's the RCA WV-510A Master VoltOhmyst[®], a solid-state VOM with all of these features:

- Excellent stability — drift-free operation
- Battery or AC operation
- Measures from 0.01 ma to 1.5 A in 8 ranges . . . 0.2 ohms to 1000 megohms in 7 ranges . . . 0.01 volt to 1500 volts DC in 8 ranges . . . 0.2 to 1500 rms AC volts in 7 ranges
- Measures peak-to-peak voltages of complex waveforms from 0.25 to 4200 volts in 7 ranges
- 21-megohm input resistance on all DC ranges
- Mirror scale meter-movement electrically protected against burnout

To buy: order from any one of the more than 1,000 Authorized RCA Distributors worldwide, or through RCA Electronic Instruments Headquarters, Harrison, N.J. 07029. (RCA will forward your order to the distributor of your choice.) Also ask for your copy of the new full-line Electronic Instruments 1Q1218F catalog.

RCA Electronic Instruments

*Optional Price including probe and current leads.

... for more details circle 122 on Reader Service Card

NEW PRODUCTS...

continued from page 47

presence of pulse trains to 25MHz, detect and identify the polarity of pulses to 10ns, and thus serve as a valuable tool in servicing some of the new digital circuitry now entering the consumer electronic market. It is said to derive 5v, 75ma operating power from the unit under test via flexible, clip terminated power leads. Digi-Tronix.

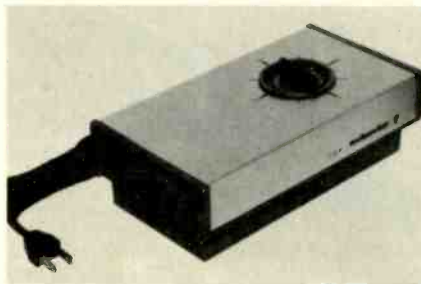
ANTENNA ROTOR

713

Solid-state design and silent operation

A new solid-state antenna rotor, Model AR-40, reportedly features completely silent operation, a decorator design that fits into any room decor, high stall torque, plus an ON/OFF light that indicates when the system is operating. The roof-top portion of the system is housed in a heavy duty

"bell housing." The system can reportedly be rotated a full 360° and has an excellent repeatability with an accu-



racy of 1%. Installation is extremely simple because the unit can be completely assembled on the ground first. The mast-clamp type mounting is said to fit all color antennas and provides distribution of antenna weight. Cornell Dubilier Electric.

SWEEP FUNCTION GENERATOR

Upper sweep-frequency limit can be set to 2% of full scale 714

A 2MHz Sweep Function Generator, Model 411, is designed to enable the operator to set the upper sweep frequency limit to 2% of full scale. The lower limit is controlled by a sweep

width adjustment. The frequency is reportedly specified in six decade ranges from 0.02Hz to 2MHz and the dial accuracy is rated at $\pm 2\%$ of full scale and may be frequency modulated over a 1000-to-1 ratio, either internally or externally up to a rate of 10kHz. Waveform outputs are sine, square, triangle, ramp and a T²L compatible



sync pulse square wave. Amplitude of the main output is 20v p-p open circuit and 10v into either a 50 or 600Ω load. In addition, the amplitude is reportedly variable over a 40dB range with sine distortion of less than 1% to 200kHz. There are reportedly no harmonics greater than -30dB to 2MHz. The unit measures 8 3/8 in. W by 3 1/2 in. H by 12 5/8 in. D. Systron-Donner Corp.

BONDING LIQUID

715

Sets in less than a minute

An alpha cyanoacrylate system has been developed to form a strong bond almost instantly. Called Zipbond, this one-system bonding liquid reportedly joins most man-made materials to themselves and to each other in just 60 sec. Because no heat or pressure treatment is needed, the bonding liquid is ideally suited for jobs requiring a fast curing time with a tensile shear strength of reportedly up to 2770 psi. All types of materials can be bonded in seconds, including rubber, metal, plastic, porcelain, wood, and glass. Tescom Corp.



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For more information
on these
NEW PRODUCTS
See pages 53 and 54
READERS SERVICE

TECHNICAL LITERATURE

Alarm Equipment

An 80-page catalog, designated the M-73, lists over 400 intrusion and fire alarm products. Also included are eight pages of application notes for alarm equipment. A general alarm system discussion is followed by notes on how to apply the many detector options. Some basic installation procedures are also presented. Mountain West Alarm Supply Co., 4215 North 16th St., Phoenix, Ariz. 85016.

Semiconductors

A 144-page semiconductor replacement guide and catalog, ECG212E, is said to cross-reference more than 75,000 foreign and domestic solid-state components with those supplied by the manufacturer. GTE Sylvania Electronic Components Group, 100 First Avenue, Waltham, Mass. 02154.

Selecting Retail Site

A free 12-page bulletin prepared for the federal government and entitled, "Using a Traffic Study to Select A Retail Site," No. 152, offers many helpful hints on how to locate your business where you can best reach your customers for greatest revenue. U.S. Small Business Administration, Washington, D.C. 20416.

Three-Way Connectors

A four-page bulletin describes a line of connectors designed to make electrical tap connection with the simple squeeze of a pair of pliers. Various audio and power applications are illustrated. VACO Products Co., 510 North Dearborn St., Chicago, Ill. 60610.

Test Jig Adaptor Chart

A reference chart has been published that cross-references all brands of TV sets by chassis and numbers to the manufacturer's test jig adaptor models. Telematic, 2245 Pitkin Ave. Brooklyn, N.Y. 11207.

Hard-to-Find Tools

A new 68-page 1974 catalog is said to feature 116 new hard-to-find products, including unusual hand tools

and small power tools. Brookstone Co., 4434R Brookstone Building, Peterborough, N.H. 03458.

Drive Belts

A new cross-referenced catalog lists over 1800 belts available from stock for tape recorders, projectors, record players, dictating machines and video recorders. The cross-reference system is combined with a special belt sizer to simplify ordering and reduce inventory. Projector Recorder Belt Corp., P.O. Box 176, Whitewater, Wisc. 53190.

Choosing a Vocational School

The Federal Trade Commission urges that everyone interested in enrolling in a vocational school first investigate the school, its program and the market for the skills you want. In this free pocket guide, the FTC outlines questions to ask prospective employers, labor and trade groups, guidance counselors, and present and former students of the school you're interested in attending. Write Consumer Information, Pueblo, Colo. 81009.

Test Equipment

A 40-page catalog, No. 4200, describes a manufacturer's complete line of test and measurement devices. It lists over 1500 types, styles, sizes and ranges of panel meters, more than 100 meter relays, and a wide variety of general and special-purpose test equipment. Simpson Electric Co., 853 Dundee Ave., Elgin, Ill. 60120.

Coil Replacement Guide

A comprehensive 100-page radio and TV coil replacement guide, No. 174, is available with a cross-reference directory. Some 30,000 replacement coils for 375 manufacturers' names are listed. Most of these coils are available nationwide from local distributors. J. W. Miller Div., Bell Industries, P.O. Box 5825, Compton, Calif. 90224.

Portable Scopes

A four-page bulletin describes a line of "mini-portable" scopes for field use, providing many photos and specifications. Vu-data Corp., 7170 Conroy Court, San Diego, Calif. 92111.

THINK OF IT AS A CHEMICAL ULTRASONIC BATH

The moment you do, you'll improve the way you service tuners and other greasy chassis troublespots. You'll save time, as a concentrated power spray dissolves and washes away dirt and gunk. You'll save money—less spray is needed because there's a higher percentage of active ingredients. And you'll do a more thorough job—thanks to a premium formula that's more efficient and won't damage components.

Next time you service, service chemically with the world's best-selling degreaser—TUN-O-WASH #2400. One of the fine chemical tools from

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DECEMBER 1973, ELECTRONIC TECHNICIAN/DEALER | 49

DEALER SHOWCASE

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

CB WALKIE TALKIE 716

2w three-channel professional type unit

A SBE Citizens-Band walkie-talkie is designed to be known as the Cascade III. The 2w, three-channel, rugged, professional - type unit is reportedly designed to take the usual tough punishment demanded of this type of equipment. Its all-metal case, while light in weight, is reportedly extremely sturdy. The unit operates on 12v dc and can be used with either dry cells or rechargeable ni-cad batteries. Included with the transceiver are a leather carrying case, earphones and instruction manual. Linear Systems, Inc.



PREAMP/EQUALIZER 717

Features visual monitoring of input-to-output balance

The Model PE2217 Preamp-Equalizer is designed with a total of 39 separate front-panel control functions, enabling maximum convenience and versatility in hookup and usage. The



unit features discrete 10-octave equalizers for each channel and pushbutton-patching for control flexibility with safety-interlocked pushbuttons to prevent inadvertent program destruction. The manufacturer's specifications indicate an extremely low signal-to-noise ratio of -90dB , frequency response of $10 \pm 100\text{kHz}$ -0.25dB , THD and IM of less than 0.02% . Other features include the full use of all other system-functions during tape-dubbing, test-lites optionally ON or OFF, full-spectrum gain controls for each channel, automatic equalizer-defeat when

line or tape equalization is not in use, and two front-panel stereo headphone jacks. Soundcraftsmen.

MARINE RADIOTELEPHONE 718

Provides added bonus of weather information

The Bimini 12+2 marine radio-telephone is said to have 12 transmit/receive channels plus two receive-only



channels for use on the Weather frequencies. The transmitter is rated at 25w and the solid-state receiver has a rated sensitivity of $0.5\mu\text{v}$ or better at 12dB SINAD. Gladding Corp.

FM TWO-WAY RADIO 719

High power 45w output for a longer range

A compact size Fleetcom 528, VHF high-band, FM two-way radio is designed for many medium to large-scale two-way radio systems. The ra-



dio features compact all solid-state construction and is reportedly one of the most sensitive receivers available. It is said to have an exceptional transmitter and receiver sound and an excellent price and performance ratio. The radio features a built-in control head for installation convenience. E. F. Johnson Co.

CAR STEREO 720

Permits quick installation under dash of any vehicle

The Model C905 eight-track car stereo player is said to offer manual and automatic track switching, slide VOLUME, BALANCE and TONE controls, and projected channel indicator lights.

The manufacturer indicates that one of its outstanding features is its compact size—only $4\frac{1}{2}$ in. wide by $2\frac{1}{4}$



in. high by $6\frac{1}{2}$ in. deep—which permits installation in minutes under the dash of any car, truck or other vehicle. Audiovox.

SPEAKERS 721

Only 3-in. deep for wall mounting

A remote speaker system has been developed that is reportedly only 3-in. deep. Called the Thinline Remote



Speaker System, it is functional as well as decorative and may be wall mounted. The units can be used with stereo consoles as remote units or used with a tuner/amplifier and record changer to complete a stereo system. Two tweeters of the system are angled out the front to give greater dispersion of high frequencies and one tweeter faces out the back for bi-directional sound. A three-position LEVEL control enables the listener to adjust for proper listening balance when the speakers are used with other speaker systems. Each speaker measures $25\frac{1}{2}$ in. by 18 in. by 3 in. Magnavox.

TELEPHONE NOISE-CANCELLING ELEMENT 722

Improves clarity and reduces background noise

The Model 645TR is a noise-cancelling element for standard telephones. This element is reportedly



suitable for the replacement of the popular T-1 carbon microphones used in Western Electric telephones. Simply unscrew the receiver mouthpiece cap and exchange transducers. Voice quality is reportedly immediately improved; background noise is blocked out; telephone pri-

vacy is promoted since other conversations and sounds in the vicinity of the phone are attenuated. The unit is reportedly unaffected by polarity changes (a common problem on many phone lines) or large voltage drops (down to 2v) that may be encountered where several telephones have been wired in parallel or on long rural lines. Electro-Voice, Inc.

CASSETTE REMOTE 723

Improves sound from most portable cassette players

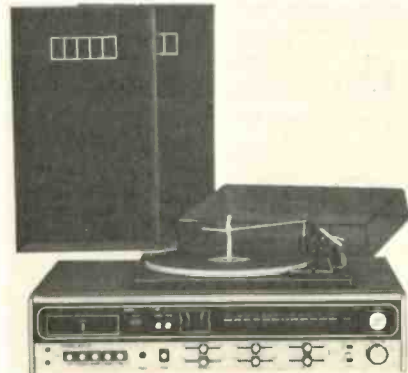
A transmitter, Model CR-FM, has been developed for transmitting audio played through a portable cassette into any FM radio without a connection to the radio. It reportedly uses one 9v battery and is tuneable from 88MHz to 108MHz. The manufacturer indicates that the use

of this transmitter typically improves the quality of the sound heard. Monaco Enterprises, Inc.

STEREO SYSTEM 724

Built-in eight-track cartridge player and recorder

Introduced is the Model 6681, a complete home music system with a built-in eight-track stereo cartridge player and recorder, full size record changer and AM/FM stereo receiver.



The solid-state unit features four-dimensional sound, using a derived audio matrix system which reportedly delivers four different sounds from four separate speakers. It can reportedly record eight-track tape off the air, directly from stereo records or live. The stereo system reportedly has 100w IPP, 20w stereo music power and 5w rms per channel; right and left channel illuminated recording meters;

slide controls for VOLUME, PLAY, BALANCE, TREBLE, BASS and both recording levels. It has pushbutton controls for AUTO, REPEAT, PAUSE, RESTART, FAST FORWARD and ALC. The changer is a three-speed Garrard with full-size metal turntable, viscous cueing and pause plus an adjustable anti-skate mechanism. Channel Master.

POCKET PAGING SYSTEM 725

Capable of paging up to four miles

An in-plant (VIP) radio pocket paging system is designed for two-level paging; tone only receivers or voice and tone receivers may be integrated into a single system. Easy to install and operate, the system consists of a table-top selector console and microphone, 5w transmitter on 27.255, 31.04 or 35.08MHz frequencies, plus either voice and tone or tone only receivers. This system is reportedly capable of paging up to four miles because of the sensitivity of the super heterodyne voice and tone receiver units. Greater distances may be ac-



complished using a linear amplifier. Each receiver is housed in a high impact plastic case and powered by ei-

ther mercury or rechargeable nickel-cadmium batteries. The tone receivers, Model PG101A, weigh only 2 oz and measure 1 3/4 in. W by 3/4 in. D by 3 1/4 in. H. Console Model VEN-20 has a capacity of up to 20 receivers and Model VEN-110 may be expanded to 110 stations. Console units may be combined for even greater capacity. Fanon/Courier Corp.

MICROPHONE 726

Designed with ball-head filtering to minimize "pop" effects

A moderately priced microphone Model 857L is designed for use in applications where good response and unidirectional characteristics are required—such as rock groups, public address, paging, hotels, recording, etc. The nickel finish microphone features slim line design with ball-head filtering to minimize wind and close talking "pop" effects. The cable connector is a professional, three-pin type. Overall dimensions of the basic microphone are 2 1/16 in. diameter (ball), 6 1/8 in. length and the weight is 8 oz, less cable. Astatic Corp.



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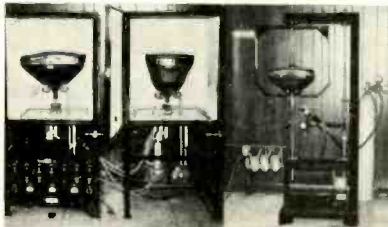


Product of
QUIETROLE
COMPANY

Spartanburg, South Carolina

... for more details circle 120 on Reader Service Card

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With the Lakeside Industries, Inc. picture tube rebuilding unit, you can rebuild any picture tube, be it black and white or color or 20mm or etc. We offer you the most revolutionized equipment of our modern times. This unit is easy to operate and requires only 4 x 8 ft. of space. You can rebuild the finest tube available. The picture will be clear and sharp. Your cost to rebuild a color tube is approx. \$6.60. Your cost to rebuild a black and white tube is approx. \$1.85.

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

P.S. No salesman will call.

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FREE CATALOG

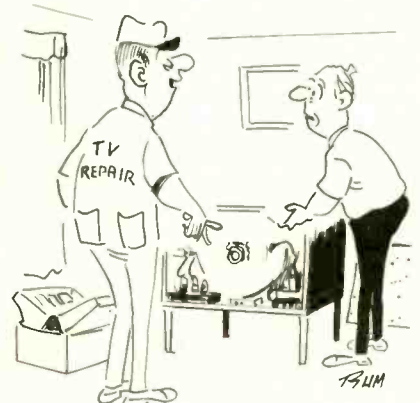
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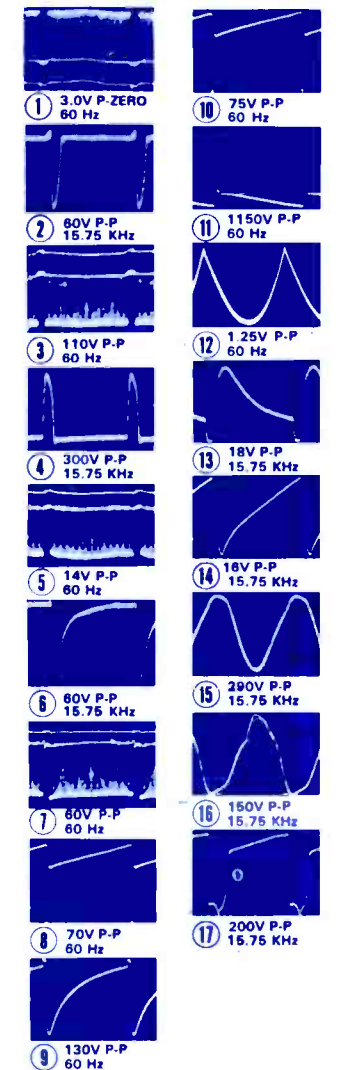
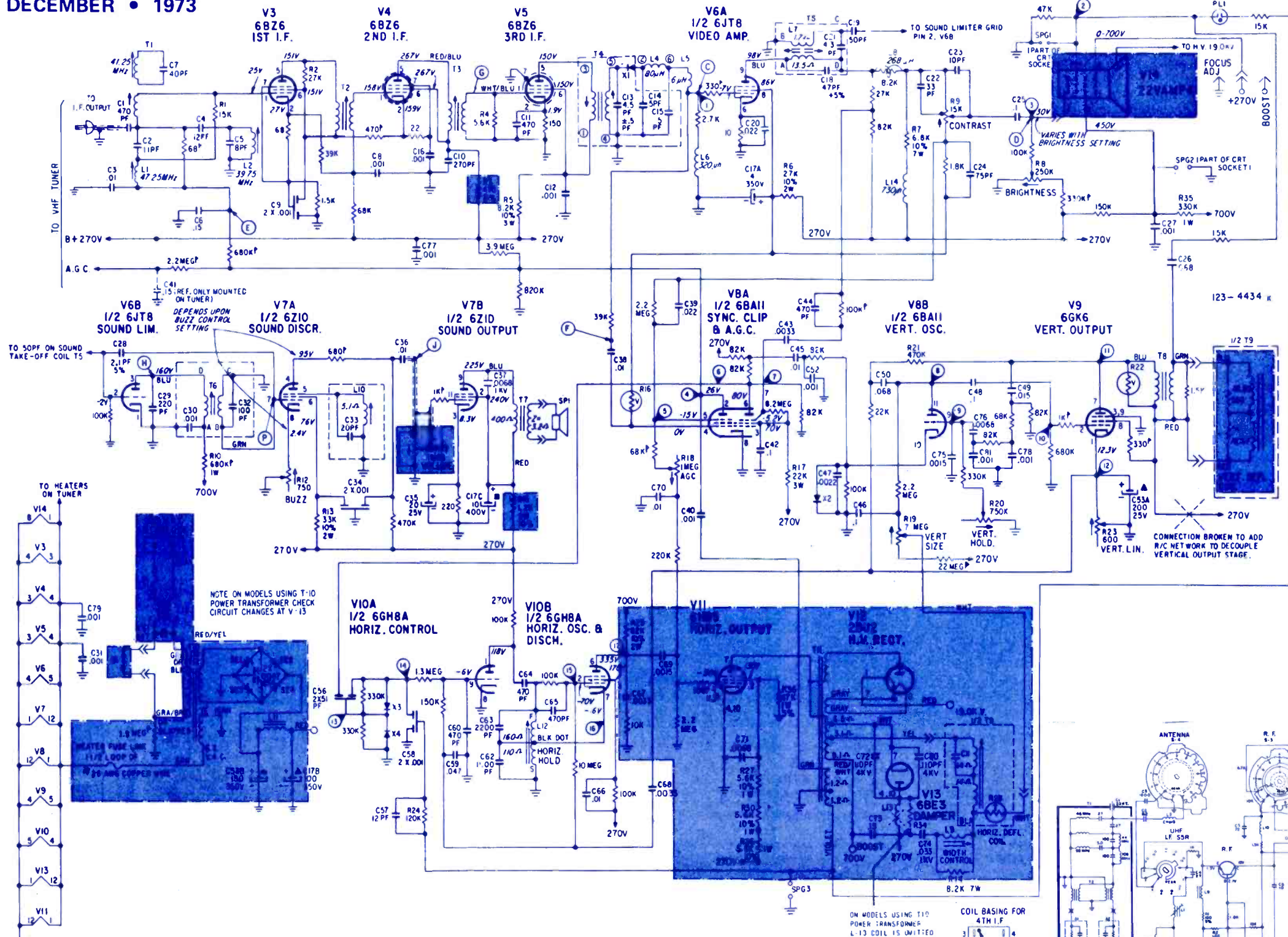
... for more details circle 114 on Reader Service Card



"Of course I don't mind trying it your way first—after all, you're paying the \$7.50 an hour."

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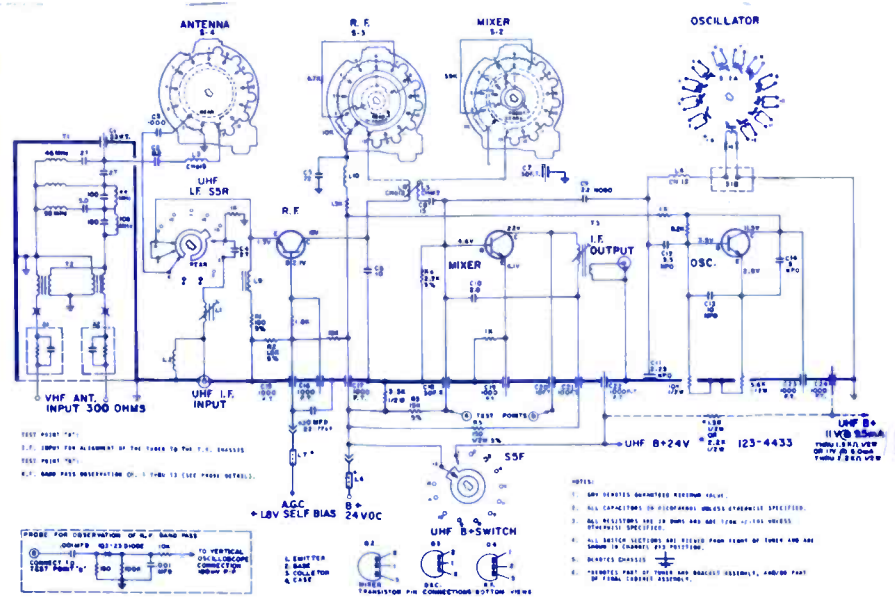
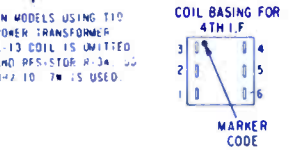
SYMBOL	DESCRIPTION	ZENITH PART NO.
C17A	4 μf elect cap, 350v	22-7138
C17B	100 μf elect cap, 350v	22-7137
C17C	10 μf elect cap, 400v	63-5380
C35A	200 μf elect cap, 25v	63-6491
C35B	150 μf elect cap, 350v	63-8719
R8	250K bright control	63-5058
R9	15K contrast control	63-6491
R12	750K buzz control	63-8719
R16	volt dependent resistor	63-5058
R19	7M vert size control	63-6433
R20	75K vert hold control	63-7185
R23	600K, vert lin control	63-8720
R28	1M volume control	63-9179
L4	detector series peaking coil	20-2002
L10	quad coil winding assembly	S-75409
L11	filter choke	95-3081
T5	sound take-off coil	S-86248
T7	audio output trans	95-2893
T8	vert output trans	95-2333
T9	yoke	95-2874
T10	power trans	95-3033
T11	horiz sweep trans	S-93755



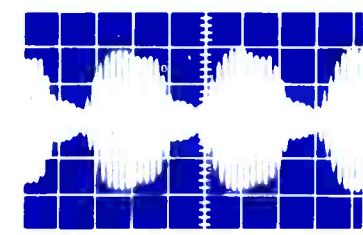
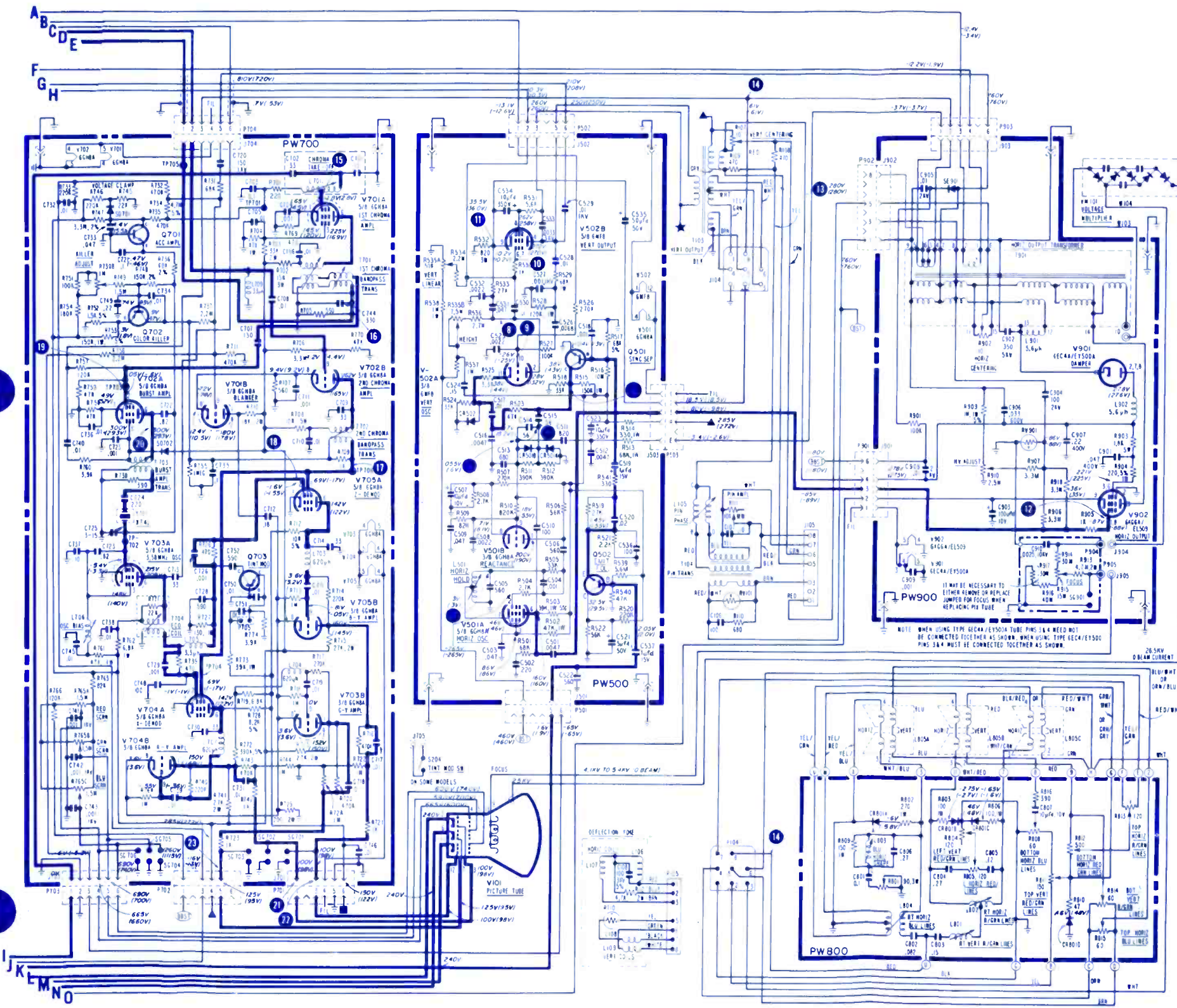
NOTES:
 ALL WAVEFORMS TAKEN ON AIR SIGNAL DEVELOPING 3.5 VOLTS PEAK-TO-ZERO AT TEST POINT "C", AND ALL CONTROLS SET FOR NORMAL VIEWING.
 ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
 ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
 ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
 ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT. NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
 FOR CAPACITOR CAPACITY TOLERANCES SEE LEGEND.

ALL RESISTORS ARE ±10% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
 RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.
 COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
 CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR ZOP MIN. 5MM PER VOLT HIGH VOLTAGE METER.
 ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
 INDICATES CHASSIS GROUND
 INDICATES VOLTAGE SOURCE
 INDICATES WAVEFORM (SEE WAVEFORM CHART)
 PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH

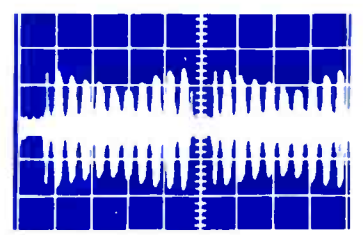
ELECTROSTATIC KILOVOLT METER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.
 C0-CAPACITOR VALUE SELECTED FOR MINIMUM YOKE WINDING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 K.V., ±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.
 CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS WHERE APPLICABLE.
 C - DETECTOR OUTPUT
 D - VIDEO OUTPUT
 E - I.F. AGC
 F - GROUND FOR I.F. ALIGNMENT
 G - 3RD I.F. GRID
 H - SOUND LIMITER PLATE
 J - SOUND OUTPUT
 K - SOUND DISC GRID
 L - INDICATES ±20% TOLERANCE MAY BE USED.
 M - INDICATES INSULATED BRACKET - GROUND PLANE (FOR MONOPOLE ANTENNA)



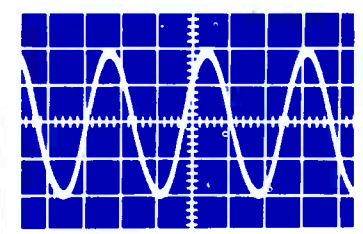
CHANNEL MASTER
Color-TV Chassis
T5002



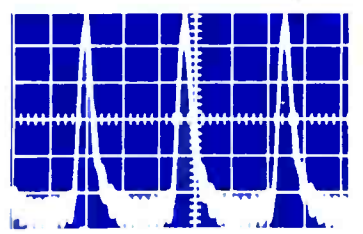
*16. Horiz. Rate 6.8V P-P



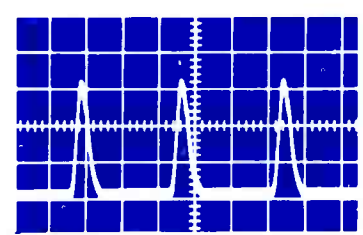
*17. Horiz. Rate 6.8V P-P



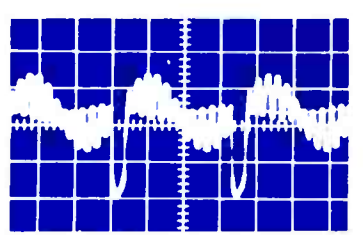
18. Horiz. Rate 8.0V P-P



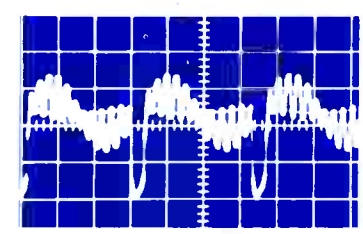
*19. Horiz. Rate 60V P-P



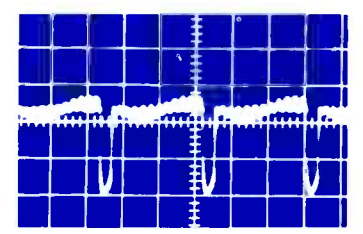
*20. Horiz. Rate 165V P-P



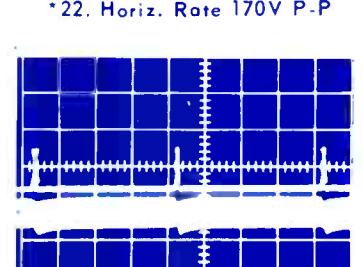
*21. Horiz. Rate 170V P-P



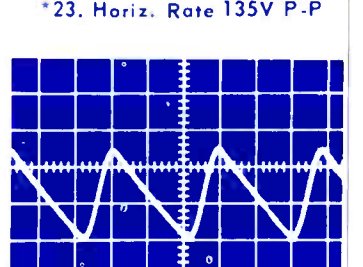
*22. Horiz. Rate 170V P-P



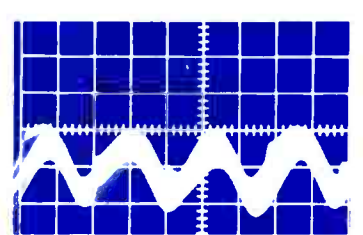
*23. Horiz. Rate 135V P-P



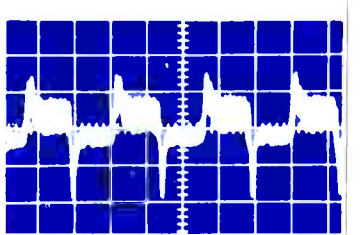
*24. Vert. Rate 125V P-P



*25. Vert. Rate 13.0V P-P

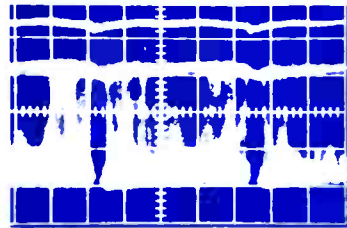


*26. Vert. Rate 0.4V P-P

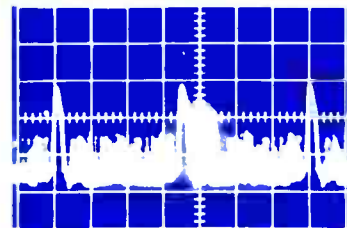


*27. Horiz. Rate 10.6V P-P

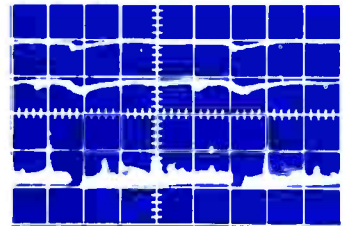
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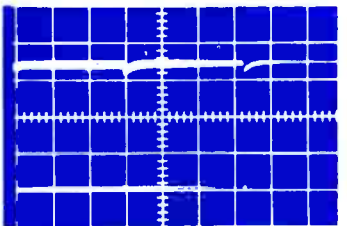
1. Vert. Rate 2.2V P-P



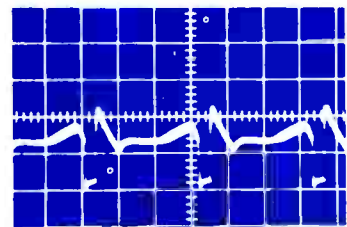
2. Horiz. Rate 14.8V P-P



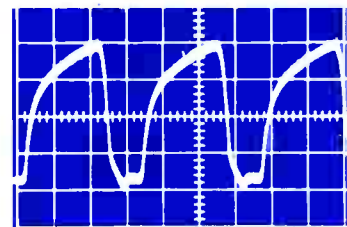
3. Vert. Rate 2.0V P-P



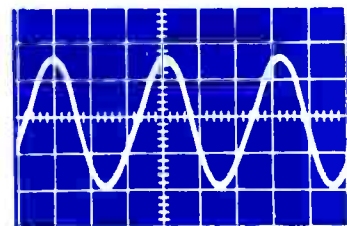
4. Horiz. Rate 34V P-P



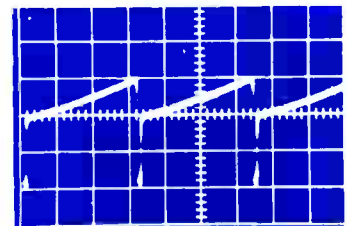
5. Horiz. Rate 11.5V P-P



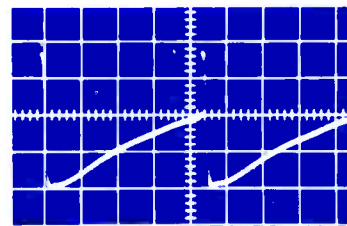
6. Horiz. Rate 20V P-P



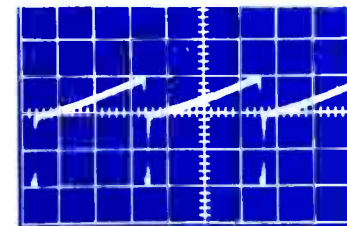
7. Horiz. Rate 180V P-P



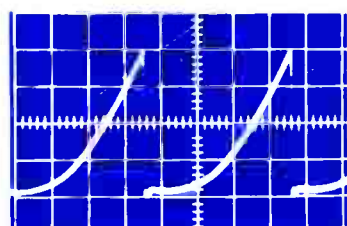
8. Vert. Rate 150V P-P



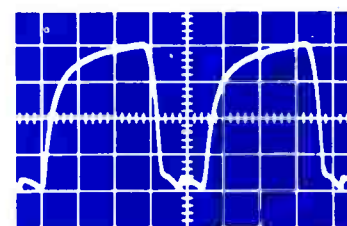
9. Vert. Rate 80V P-P



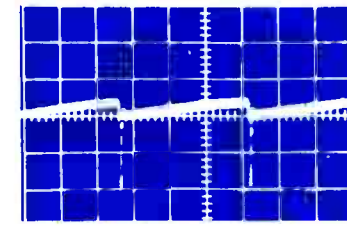
10. Vert. Rate 150V P-P



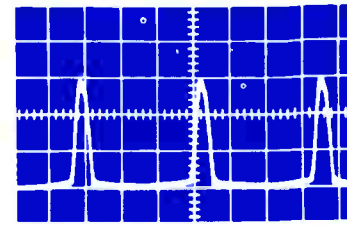
11. Vert. Rate 20V P-P



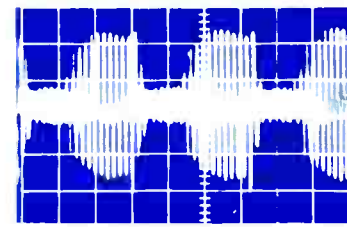
12. Horiz. Rate 205V P-P



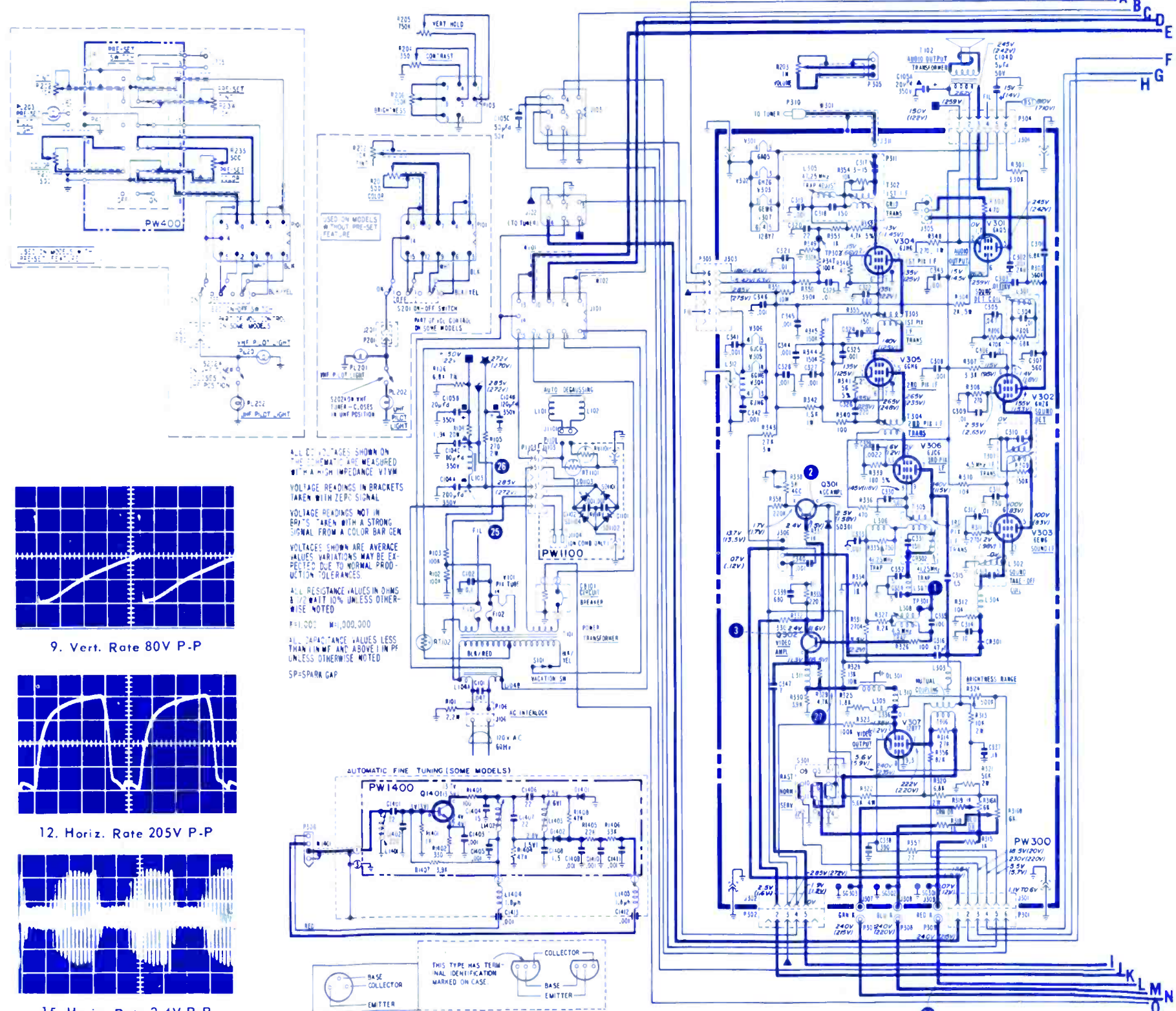
13. Vert. Rate 120V P-P



14. Horiz. Rate 300V P-P



15. Horiz. Rate 2.4V P-P

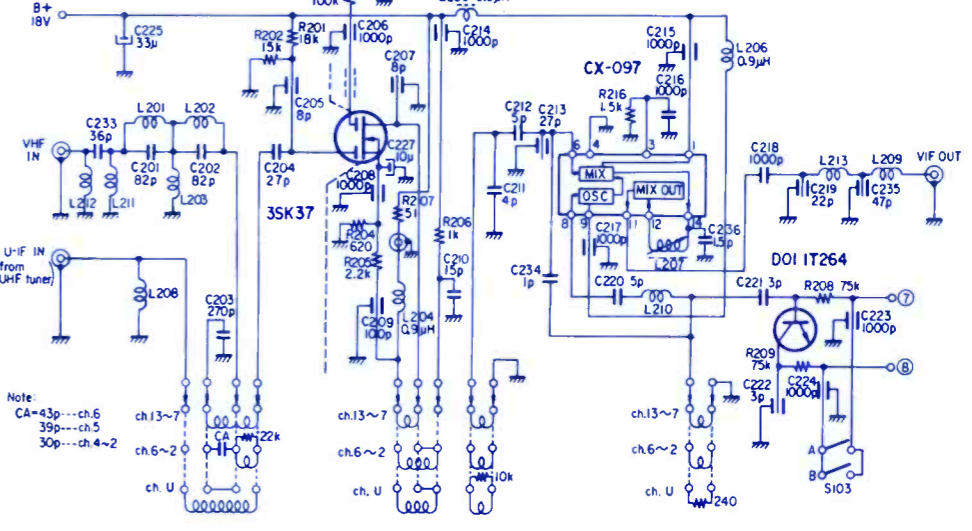
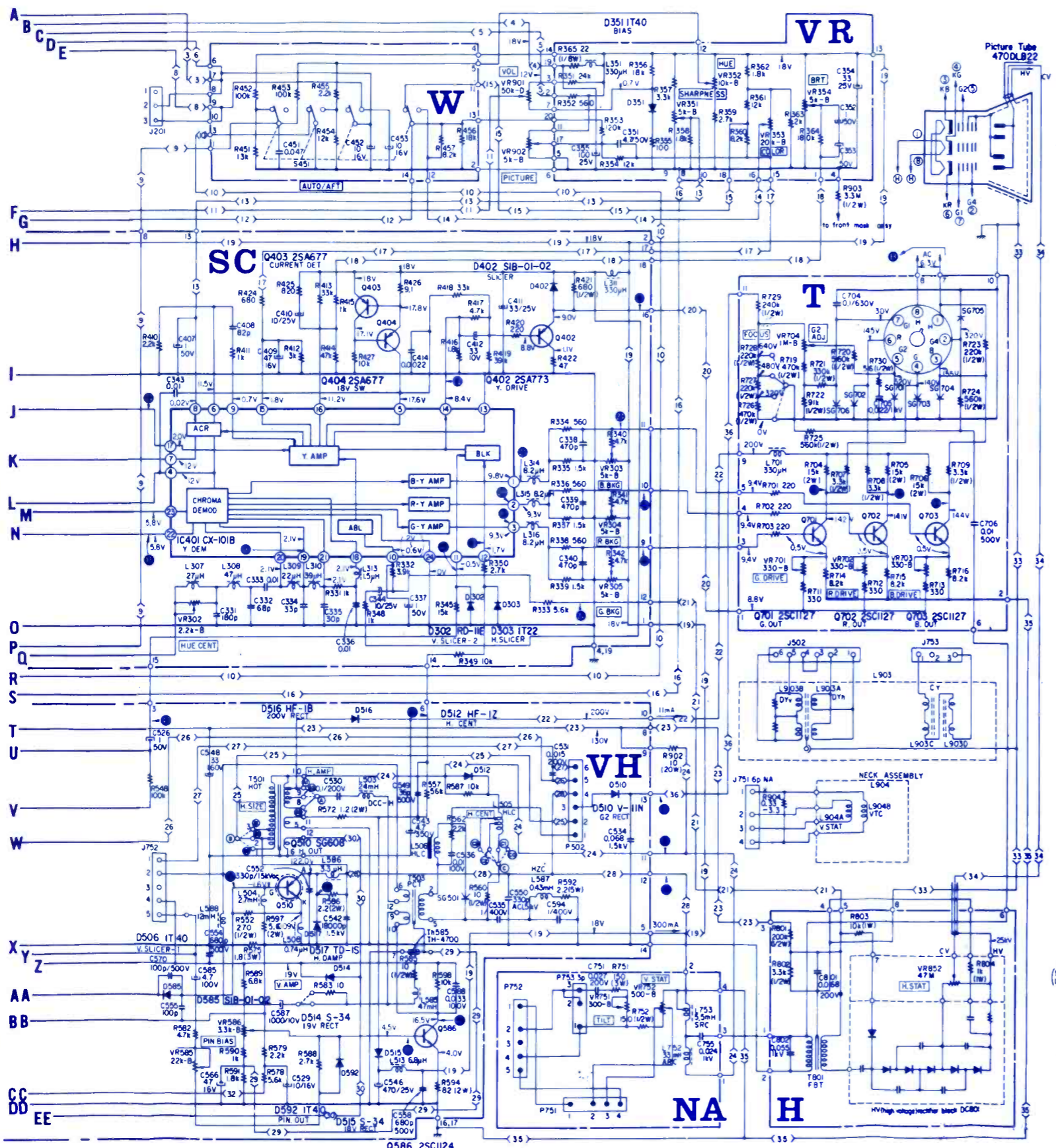
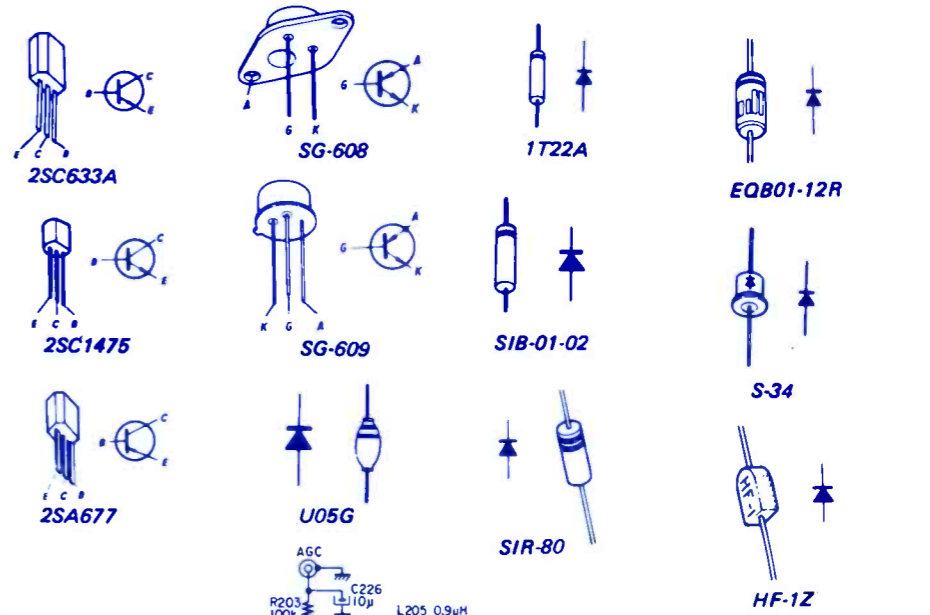


① 50 V p-p (Horiz.) ② 2.5 V p-p (Horiz.) ③ 5 V p-p (Horiz.) ④ 11.5 V p-p (Horiz.) ⑤ 10 V p-p (Horiz.) ⑥ 400 V p-p (Horiz.) ⑦ 400 V p-p (Horiz.) ⑧ 15 V p-p (Vert.) ⑨ 14 V p-p (Horiz.) ⑩ 0.9 V p-p (Horiz.)

SONY
 Color-TV Model
 KV-1722

⑪ 1.3 V p-p (Vert.) ⑫ 2.9 V p-p (Vert.) ⑬ 6 V p-p (Horiz.) ⑭ 13 V p-p (Vert.)
 ⑮ 130 V p-p (Vert.) ⑯ 130 V p-p (Vert.) ⑰ 6.7 V p-p (Horiz.) ⑱ 6 V p-p (Horiz.)
 ⑲ 95 V p-p (Horiz.) ⑳ 20 V p-p (Horiz.) ㉑ 800 V p-p (Horiz.) ㉒ 4.1 V p-p (Horiz.)
 ㉓ 5.8 V p-p (Vert.) ㉔ 28 V p-p (Vert.) ㉕ 3.5 V p-p (Horiz.) ㉖ 18 V p-p (Horiz.)
 ㉗ 800 V p-p (Horiz.)

MOUNTING DIAGRAM - PR Board -



1501

SONY
Color-TV Model
KV-1722

ELECTRONIC TECHNICIAN/DEALER **TEKFAK**

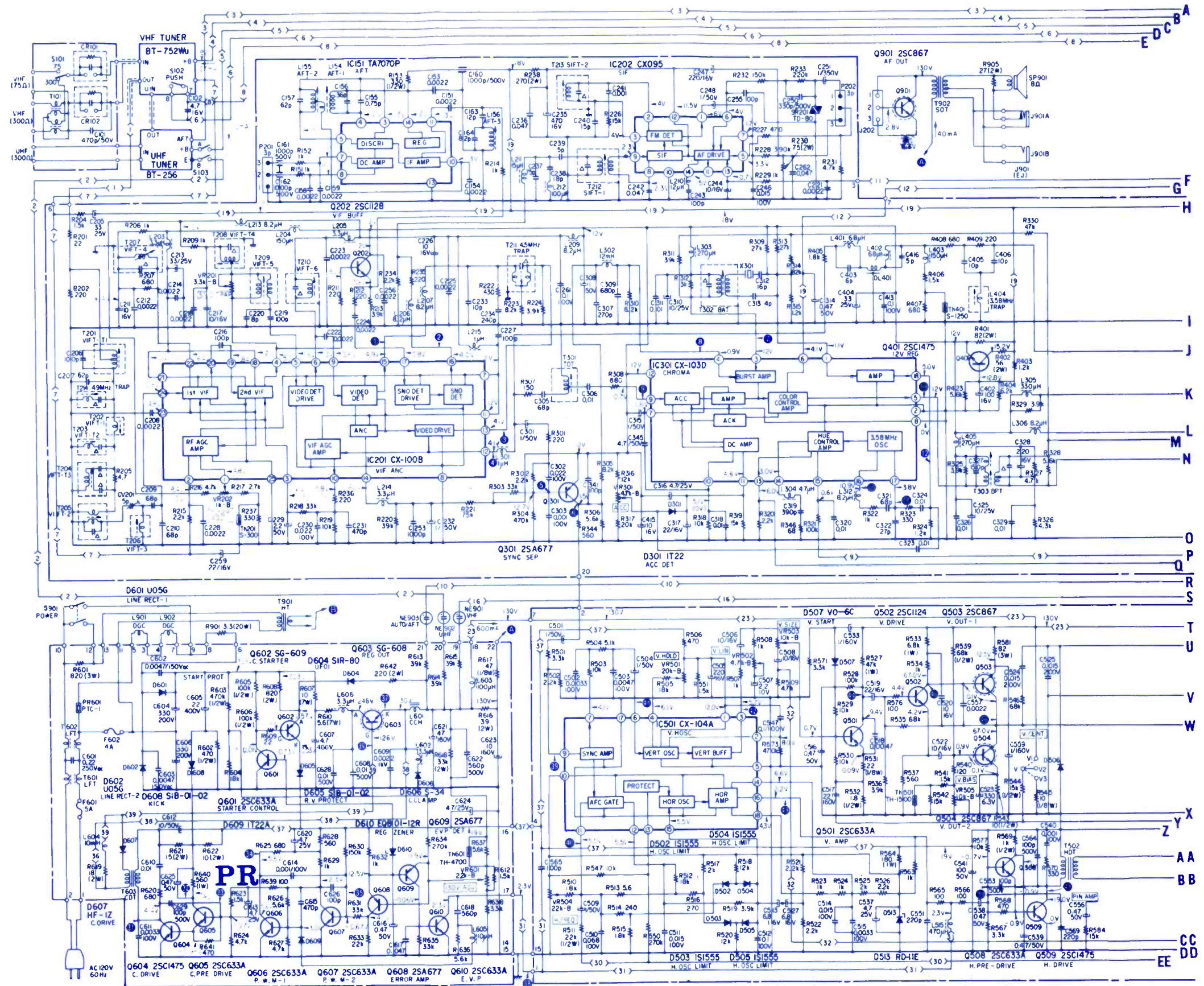
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 4 NEW SETS

25 2.0 V p-p (Horiz.) 26 0.8 V p-p (Horiz.)

28 110 V p-p (Horiz.) 29 130 V p-p (Horiz.) 30 120 V p-p (Horiz.)

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- 1 3.5 V p-p (Horiz.)
- 2 3.5 V p-p (Horiz.)
- 3 3.5 V p-p (Horiz.)
- 4 3.5 V p-p (Horiz.)
- 5 1.5 V p-p (Horiz.)
- 6 14 V p-p (Horiz.)
- 7 9 V p-p (Horiz.)
- 8 6 V p-p (Horiz.)
- 9 0.1 V p-p (Horiz.)
- 10 1.5 V p-p (Horiz.)
- 11 1.3 V p-p (Horiz.)
- 12 1.3 V p-p (Horiz.)
- 13 2.5 V p-p (Horiz.)
- 14 1.0 V p-p (Horiz.)
- 15 5 V p-p (Horiz.)
- 16 0.8 V p-p (Horiz.)
- 17 3 V p-p (Horiz.)
- 18 5 V p-p (Horiz.)
- 19 0.8 V p-p (Horiz.)
- 20 2.0 V p-p (Horiz.)
- 21 2.7 V p-p (Horiz.)
- 22 10 V p-p (Horiz.)
- 23 7 V p-p (Horiz.)
- 24 2.5 V p-p (Horiz.)



**ELECTRONIC
TECHNICIAN/DEALER**

TEKFAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 4 NEW SETS

GROUP
256

	SCHEMATIC NO.		SCHEMATIC NO.
CHANNEL MASTER Color-TV Chassis T5002	1502	SONY Color-TV Model KV-1722	1501
PHILCO-FORD TV Chassis 4B117/4B118	1500	ZENITH TV Chassis 22DB36	1503

**COMPLETE MODEL CHASSIS INDEX
FOR ALL CIRCUIT DIGESTS AND TEKFAX FROM
JANUARY 1963 THROUGH DECEMBER 1973**

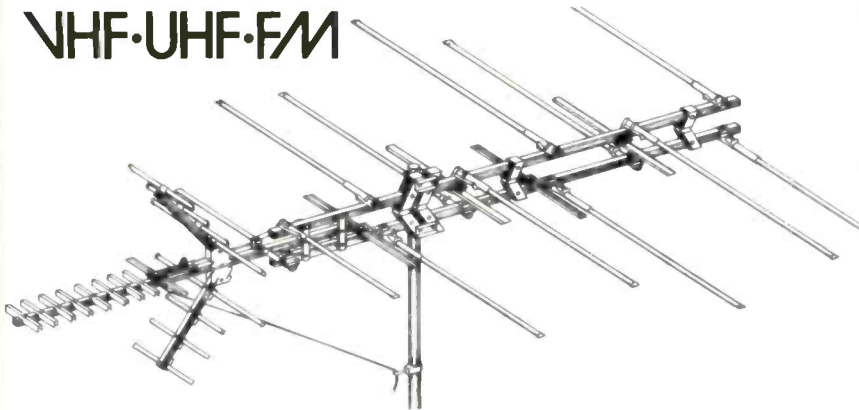
Month In Which Schematic Appears

756-761	Jan. 1963	1029-1035	Sept. 1966	1294-1299	May 1970
762-766	Feb. 1963	1036-1041	Oct. 1966	1300-1305	June 1970
767-772	March 1963	1042-1047	Nov. 1966	1306-1310	July 1970
773-779	April 1963	1048-1054	Dec. 1966	1311-1315	Aug. 1970
780-784	May 1963	1055-1060	Jan. 1967	1316-1320	Sept. 1970
785-790	June 1963	1061-1067	Feb. 1967	1321-1325	Oct. 1970
791-797	July 1963	1068-1073	March 1967	1326-1330	Nov. 1970
798-805	Aug. 1963	1074-1080	April 1967	1331-1334	Dec. 1970
806-811	Sept. 1963	1081-1086	May 1967	1335-1339	Jan. 1971
812-817	Oct. 1963	1087-1092	June 1967	1340-1344	Feb. 1971
818-822	Nov. 1963	1093-1098	July 1967	1345-1349	March 1971
823-828	Dec. 1963	1099-1104	Aug. 1967	1350-1354	April 1971
829-833	Jan. 1964	1105-1110	Sept. 1967	1355-1359	May 1971
834-838	Feb. 1964	1111-1116	Oct. 1967	1360-1364	June 1971
839-843	March 1964	1117-1122	Nov. 1967	1365-1369	July 1971
844-850	April 1964	1123-1127	Dec. 1967	1370-1374	Aug. 1971
851-853	May 1964	1128-1133	Jan. 1968	1375-1379	Sept. 1971
854-858	June 1964	1134-1139	Feb. 1968	1380-1384	Oct. 1971
859-863	July 1964	1140-1145	March 1968	1385-1389	Nov. 1971
864-870	Aug. 1964	1146-1151	April 1968	1390-1393	Dec. 1971
871-875	Sept. 1964	1152-1157	May 1968	1394-1398	Jan. 1972
876-881	Oct. 1964	1158-1163	June 1968	1399-1404	Feb. 1972
882-887	Nov. 1964	1164-1169	July 1968	1405-1409	March 1972
888-893	Dec. 1964	1170-1175	Aug. 1968	1410-1414	April 1972
894-900	Jan. 1965	1176-1181	Sept. 1968	1415-1419	May 1972
901-908	Feb. 1965	1182-1187	Oct. 1968	1420-1424	June 1972
909-916	March 1965	1188-1193	Nov. 1968	1425-1429	July 1972
917-923	April 1965	1194-1198	Dec. 1968	1430-1434	Aug. 1972
924-926	May 1965	1199-1204	Jan. 1969	1435-1438	Sept. 1972
927-934	June 1965	1205-1210	Feb. 1969	1439-1442	Oct. 1972
935-942	July 1965	1211-1216	March 1969	1443-1446	Nov. 1972
943-950	Aug. 1965	1217-1222	April 1969	1447-1450	Dec. 1972
951-953	Sept. 1965	1223-1228	May 1969	1451-1454	Jan. 1973
954-961	Oct. 1965	1229-1234	June 1969	1455-1459	Feb. 1973
962-969	Nov. 1965	1235-1240	July 1969	1460-1463	March 1973
970-975	Dec. 1965	1241-1246	Aug. 1969	1464-1467	April 1973
976-982	Jan. 1966	1247-1252	Sept. 1969	1468-1472	May 1973
983-988	Feb. 1966	1253-1258	Oct. 1969	1473-1477	June 1973
989-995	March 1966	1259-1264	Nov. 1969	1478-1481	July 1973
996-1001	April 1966	1265-1269	Dec. 1969	1482-1485	Aug. 1973
1002-1009	May 1966	1270-1275	Jan. 1970	1486-1489	Sept. 1973
1010-1015	June 1966	1276-1281	Feb. 1970	1490-1494	Oct. 1973
1016-1022	July 1966	1282-1287	March 1970	1495-1499	Nov. 1973
1023-1028	Aug. 1966	1288-1293	April 1970	1500-1503	Dec. 1973

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D1161-2, 6	19R3U	816	GTM-2583A	784
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G4	24C2	808	WG-2343B	778
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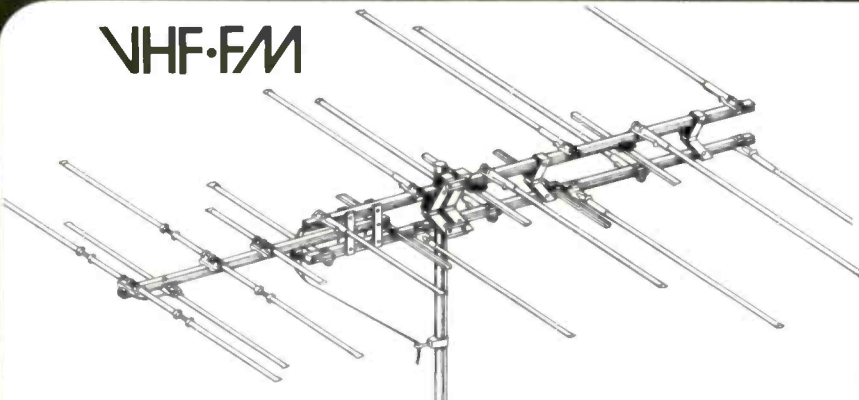
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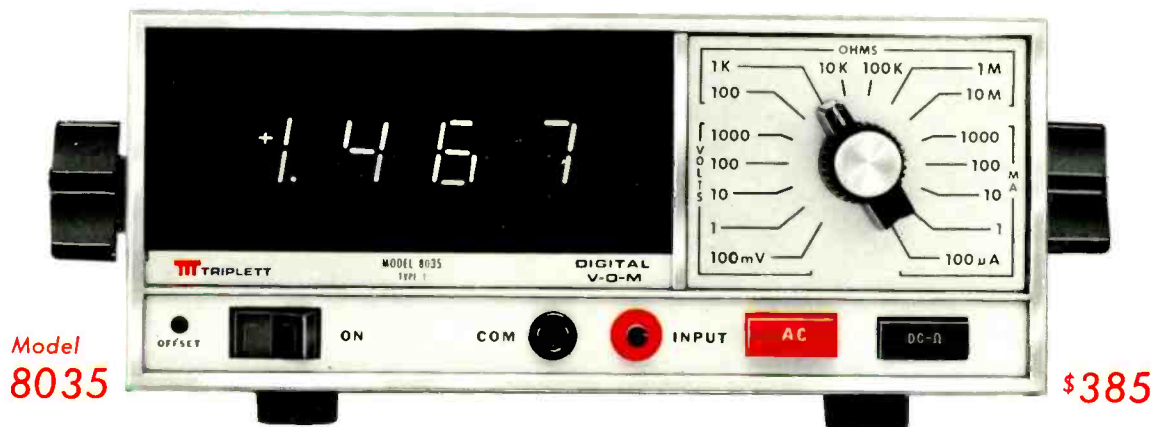
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