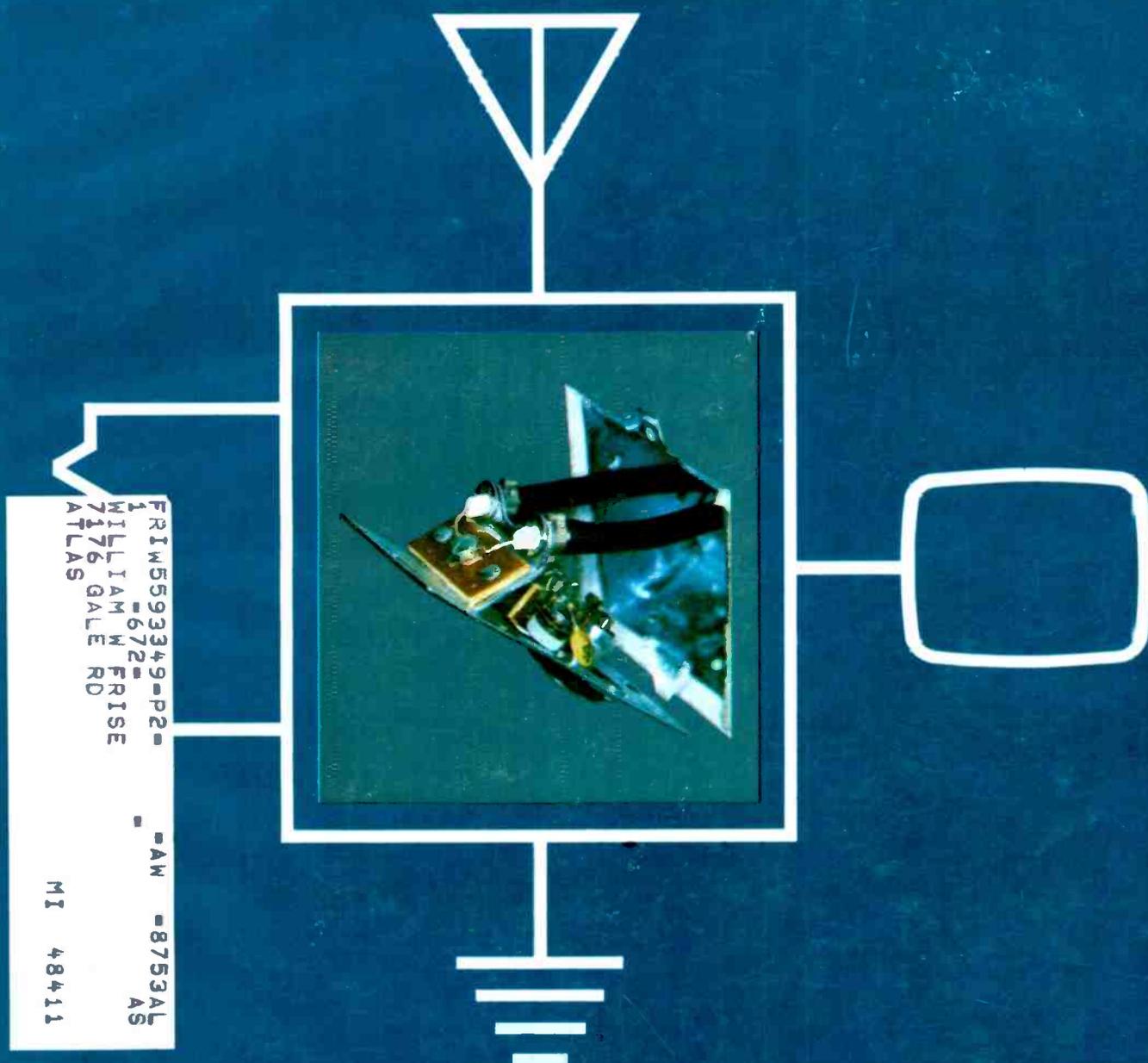


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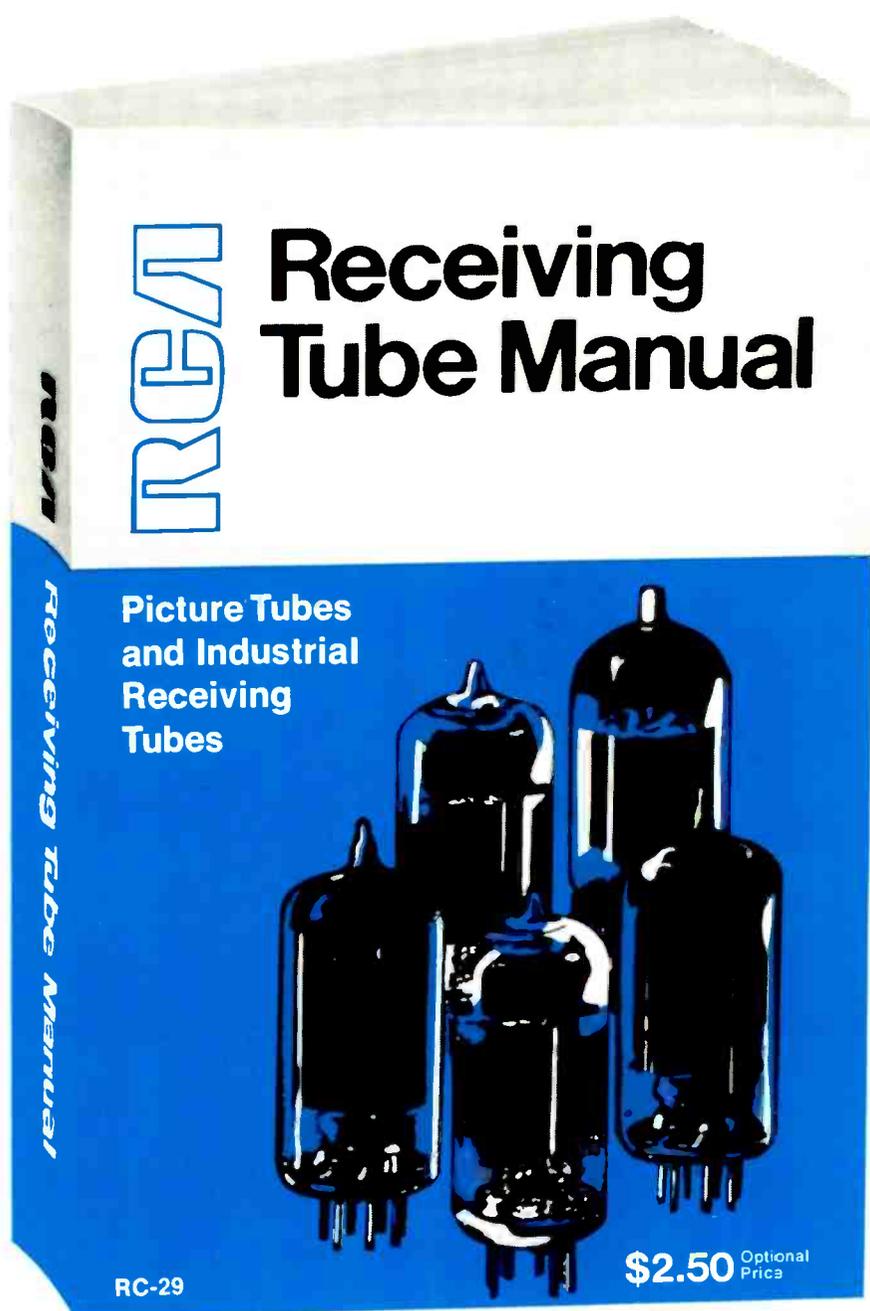


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The TV antenna outlet shown being installed on this month's cover is part of a home MATV installation described in the article beginning on page 35.

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Must You Be Leaving?

Some never do get a chance to enter our profession. Just as soon as they are about to finish school, some manufacturer comes along and offers such attractive immediate financial returns that it seems just too good an offer to pass up. Others become so obviously successful as electronic technicians or service dealers that they too may receive offers from industry that appear too good to ignore. Such people may well be happier outside our profession, and we wish them every possible success.



Others with varying levels of training become electronic technicians or service dealers and with a lot of perseverance make it—either “getting by” or becoming financially “comfortable.”

Unfortunately there are still some that fail to fall into either of the two preceding categories. Some may be employees that seem to wander from shop to shop, never really able to settle down with the right boss and make a go of it. Some may be self-employed electronic technicians who find that although business seems fairly good, there are more creditors than customers. And some service dealers open up a store, move a moderate amount of merchandise; but the books, once nearly balanced, later become pages of red ink. The worst part about it is that these are typically very intelligent, highly frustrated people who simply cannot understand what's going wrong—and not even their best friends seem prepared to tell them.

(This month's editorial is concerned with what is certainly a **very sensitive** subject. Many people in the predicament just described may well think that your editor heard reports from their friends and is using this editorial as a face-saving technique for setting things straight. Your editor does not believe in doing things that way! He would much rather openly call a spade a spade. However, it is hoped that the suggestions offered in this editorial will “hit the nail on the head” for many in our industry and ap-

pear to be written just for them.)

There is little that can hurt a person's chances of getting another job more than a long list of places of past employment. Anyone that has worked for three shops during the past five years is in for trouble. Maybe the boss didn't understand you, didn't live up to his promises, didn't provide an adequate salary or test equipment. But three bad bosses during the past five years????

Just because you are a little hungry, do you snap up the first job that comes along without any concern regarding the type of person that you will work for? You know, a job interview is a two-way conversation. Or, are you such an extreme individualist that no one can get along with you—a person who demands that everything be only his way or he quits? Prospective employers might prefer not to ask you these questions, but they are some of the questions in the back of their minds.

Although there are of course exceptions, a safe “rule of thumb” would be a personal policy of sticking out any full-time job, however unpleasant, for at least three years.

Dissatisfied employees typically make one **disastrous** mistake. They in effect say to themselves: “If the boss is going to be that way, I'll get even with him by not going to those seminars or taking that advanced training.” The person that is going to be hurt in the long run by such an attitude is not the boss, **it's you!** After all, when you become technically obsolete, the boss can always replace you with a bright young technician. Then where will you be? Any shop-employed electronic technician that is really concerned about his future must—if he is to become successful—have the drive to attend whenever possible (even at his own expense if necessary) all the **good** seminars available. (It doesn't take long to learn what seminar sponsors are concerned with teaching valuable subject material and what ones are solely concerned with promoting their own cause. The latter group should be avoided like the plague.) He should also seriously consider night-school classes and correspondence-school courses.

So that he can work like a “dog” for his boss? Certainly not! If he feels that he is being treated fairly and well by his boss, then for advancement in the shop where he is employed. If this unfortunately is not the case, then so that he may have more skills “under his belt” for getting that really good job elsewhere. After all, good employers are always on the lookout for men that can demonstrate at the time of interview that they are technically qualified and serious about the **never-ending** job of self improvement. (**DON'T LEARN TO HELP THE BOSS, LEARN TO HELP YOURSELF!**)

It can be a frightening experience for the self-employed electronic technician or service dealer to go over his books and find that he simply isn't going to make it . . . that no matter what extensions are made on the bills due, anticipated revenue will not cover them. Our profession nationally ranks second in the list of businesses facing bankruptcy!!!!

Why?

Your editor is of the opinion—and it is a belief expressed by others—that those in our profession have **greater** than average intelligence. However, they also typically have one major handicap. They tend to over specialize! In other words, they have such an extremely strong aptitude for circuit repair or possibly customer relations, and they have concentrated so strongly on these particular interests, that they tend to forget the **fact** that a **successful** self-employed individual **must have a variety of skills!!!!**

So much for the theory. Your kids are hungry and it looks like you can't possibly make a go of it. What do you do?

By now it's probably too late. If you had the foresight (they say, “after thought is always better than forethought”) to prepare yourself beforehand, this probably would not have happened. But there isn't time now. Financial pressures are much too great. The best solution may well be to hire a lawyer and file for bankruptcy before things get even worse. Yes, close up shop!

However, in most states, your electronic instruments are considered the

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EDITORIAL . . .

continued from page 7

tools of your trade and, like your home, a necessity. And on that basis they cannot be repossessed to help cover your debts, but may be kept for future employment. Whatever you do, **don't** sell them to pay off your debts. Used test equipment never sells for anything near what it costs to replace. This is an investment that you simply cannot afford to lose! (Keeping them may make some people mad, but that's just too bad.)

Openly admit your mistakes and failures for then you need never fear their later discovery. [I'll even admit in print that I failed third grade . . . hated English with a passion . . . didn't even like it in college . . . concentrated more on science so that I could be like my greatgrandfather who made (and later lost) a small fortune inventing the first hydraulic dentist chair . . . am still trying to become a successful inventor . . . but somehow find myself working as a journalist!]

Whatever you do, don't go around crying on other peoples' shoulders. Nothing will make your friends more uncomfortable . . . and less-frequent visitors. If you fear that you face some public stigma as a failure, you are quite correct! Who wants to hire a failure???? Particularly one that cries a lot. Prospective employers will fear (and maybe correctly) that the faults you possess that closed your shop will also harm their business.

Many an employer will openly admit that he would much rather hire a bright person who knows nothing about electronics—who knows his limitations and is willing to learn—than to hire a bright person who is fairly well skilled in his profession but doesn't know his limitations and isn't about to ask.

Unless in an unsafe geographical area due to recent outbursts of excessive vandalism, no business folds simply because it is in what has become a bad location. A business may suffer a little, but it doesn't just fold. Or it might not even suffer if run in a manner that really attracts the public! The problem must thus be basically one of insufficiently skilled business practices.

If you must close your business and your friends in the industry are genuinely concerned and sympathetic, but don't jump at the chance of hiring you, seek employment in another profession. At least a job that will feed the kids and

relieve you of your most immediate mental and financial strain. Even if the best job available for the moment is pumping gas or factory assembly line work—take it! Possibly you must become a clerk in some department store. It is having a little money immediately at hand and not the glamour of the job that is important. (Too many people these days would rather just give up and go on welfare!)

As soon as the "tail spin" stops and you can start thinking straight again, start thinking in terms of starting over again with a new shop. This will help give you the incentive to bear with it.

But, whatever you do, **don't** open that new shop immediately! Instead, start working to correct those deficiencies that forced you to close-up shop in the first place.

Put a smile on your face, even if you do hurt inside, and visit with your old friends still in the business—always making certain that you refrain from "crying on their shoulders," while remaining open to comments concerning your past mistakes—not asking for these comments, merely accepting them for what they are worth.

As time permits (remember your first business responsibility is now where you are currently employed) begin attending both business and technical seminars. A self-employed electronic technician has just as great a need for sound business practices as a self-employed service dealer.

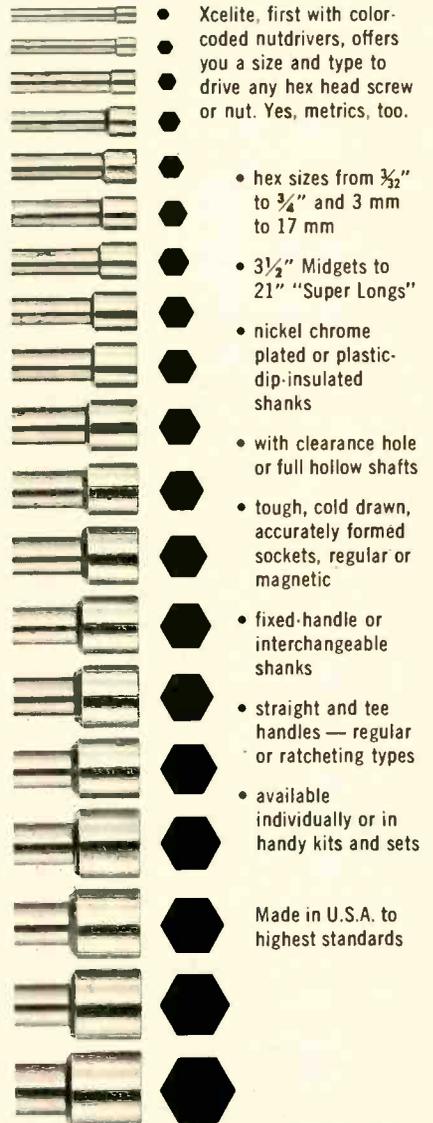
If you have not had courses in business management, accounting or basic psychology, go to your local college and arrange for night-school courses. (Take these courses even if you are not qualified to receive college credits. It's the information, not the credits, that you are after.) You might even consider college courses in English and public speaking. What is learned in these communications courses might be supplemented with the experiences had by joining a local Toastmaster's Club. Although you are anxious to go back into business for yourself, do not take more than one (or at the very most two) night-school courses at a time—at least start out with only one—or you may find yourself overwhelmed and again a quitter.

Check with your local vocational school and see if it offers **advanced**

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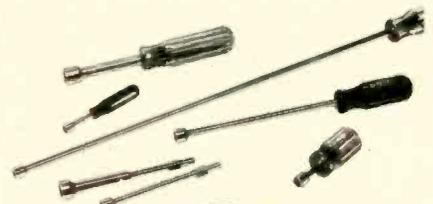
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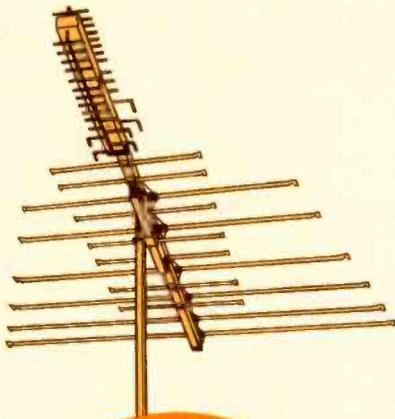
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LETTERS

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

Add Name to Long List of Persons Who Responded

Please add my name to the long list of persons who responded to the "what would you do?" letter in the April issue.

What would I do? I wouldn't! A \$260 repair bill for an older TV set, justified or not, could do nothing but hurt your reputation. I do consider it somewhat dishonest NOT to advise a customer against spending \$260 on an older TV set. The "honest" thing to do would be to sell him a new TV set. (The shop did handle two other brands.)

The TV manufacturers do not distinguish between their economy and luxury TV sets. They are all advertised as "super" color sets; and the buying public believes this. A person buying a VW does not expect the same quality, service and comfort as if he had bought a Cadillac. He is willing to accept this when paying a lower price for the VW. Not so with TV sets. Whether he buys a small Japanese portable or a big American-made console, he is told by the seller that his \$250 TV has a clear, sharp, bright picture with automatic this and automatic that, just like the \$800 console TV set. So, until the advertising departments of the TV manufacturers educate the public to a point where it realizes there ARE differences between TV sets, don't go fixing an older TV set to the tune of \$260. The only thing the customer can think of is that he could have bought a new TV set for that price, and your reputation for being high priced and perhaps dishonest, is all over town. (I would be interested in seeing an itemized bill for the \$260 repair job. It does seem a bit high.)

FLEMMING PEDERSEN

Congratulations on Your Stand

Congratulations on your stand concerning the NEA-NATESA merger, also on your support of the CET program. As a recently approved CET, I can attest to the fact that the test was a fair and comprehensive exam.

In my estimation, anyone worth his salt in our industry should be able to pass the test. So why all the crying by so called technicians? Perhaps they are afraid to put their own ego and

competence on the line! I can't see any other reason why they would scorn the C.E.T. Program.

Presently, we have two C.E.T.'s on our staff and the rest of the men (we have a total of 14) are studying for the test and, by golly, they had better pass or they might be out of a job! Yes, I do feel that strongly about this matter.

I've offered my services in whatever way possible to ISCET and intend to promote the CET Program in my area. We had better do something to clean-up our industry before our "uncle" does, however, I cannot do it alone. Any help or suggestions on your part would be a great assistance.

STANLEY CMIELEWSKI, CET

Reader Locates Error In Digital Article

I am writing concerning your article, "Basic Digital Circuitry," sixth article, in the July 1973 edition of your magazine. This article jumped right out at me due to your use of the HW 10528A Logic Clip. I have become quite familiar with this little jewel as well as the rest of the 5010A Kit.

But back to the article. It's good and I rather imagine that the rest of them were too, though I do not have copies of them right now. The figures #23 to #32 were excellent and I can agree with them. The figures #4 to #13 however have me confused.

I can see your explanation contained in the article concerning the appearance of all 1's at the inputs. However, the clip readouts do not appear to me to refer to your Fig. #3 (Buffer-Storage IC) diagram.

Believe me, I'm not "Nit Pickin'," and while I've had considerable digital experience, myself and anyone else are in a constant learning process, to even try to keep up with the "State-of-the-Art" in solid state, and it's just articles like this that help to do that with a constant banging away at the basics.

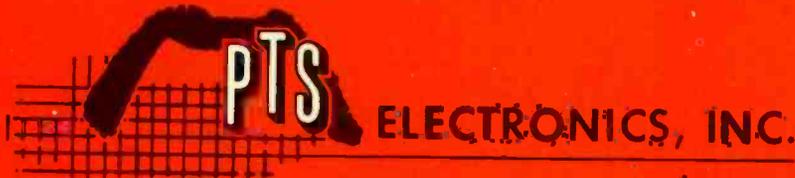
I enjoy your magazine immensely. I'm both a self-employed part-time service technician and I am also working for RCA Service Co. in government contracted electronics. This magazine gives me something for both jobs.

MARVIN H. ROSIE, JR.

We certainly appreciate Mr. Rosie's bringing an error in the July article to our attention. Although the sequence of photographs in Fig. 4 through 13 is correct, we made a transposition in labeling the output terminals for the buffer-storage IC. Thus this one error is repeated in Fig.

continued on page 13

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LETTERS...

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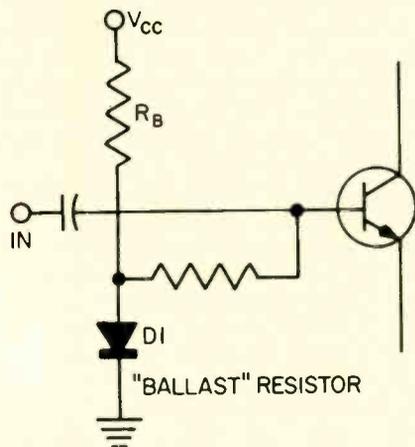
2, Fig. 3 and Table II (pages 40 and 41). These output terminals should be as follows: 7 = A', 4 = B', 10 = C' and 13 = D'. Then everything works as described. Ed.

Reader Comments Concerning Transistor Biasing Article

The author did an excellent job of reducing the problems of proper biasing of transistor elements to simple elementary form. Such work represents an outstanding contribution to the practicing technician and develops the feeling of "being at home" with the circuit behavior pattern of the transistor.

I found the article very interesting—from stem to stern. I did note two details which might warrant a slight change in wording. [This concerns the article, "Transistor Biasing," on page 31 of the July 1973 issue. Ed.]

1. In adding the resistor R_V in Fig. 4 to stabilize the voltage to the base, mention is made of the increased current drain which will result from lowering the values of R_V and R_B , but no mention is made of the fact that there will also result a reduced value of shunt resistance at the input (base to ground). Either a Thevenin equivalent or a "word picture" could make this clear.
2. The use of a diode to fix the driving voltage to the base, as shown in Fig. 11, would "short circuit" the input signal. To erase this fault would require some form of a ballast resistor, perhaps of the form illustrated.



I would invite the author to undertake a similar treatment of the sub-continued on page 14

Comments from our readers are always welcome.

Address your letters to:

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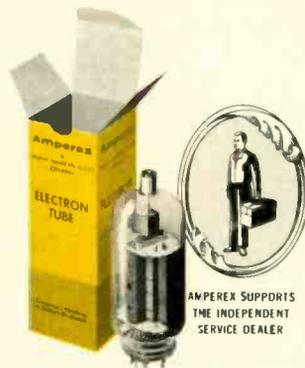
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LETTERS...

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ject "Interstage Signal-Coupling Circuits."

R. H. KAUFMANN

[We contacted Lambert Huneault, CET, the author, concerning points one and two questioned by Mr. Kaufmann and he offered the following reply:]

I am in receipt of your letter of July 9th regarding my article on Transistor Biasing, and I wish to thank you for your generous comments on the article.

As for your two suggestions regarding resistors R_u and R_v and stabilizing diode D1, permit me to make the following comments:

1. The first point is well taken; in Fig. 4, lower values of R_u and R_v would indeed lower the input resistance of the circuit, both resistors being in shunt with the base-to-emitter resistance of the transistor in an ac equivalent circuit. As you can well appreciate, this is an additional factor which must be carefully weighed against the desirable effect of improved bias stabilization when arriving at the compromise value of resistance for both R_u and R_v . This consideration would be particularly important when the output resistance of the preceding stage is relatively high.
2. As for the stabilizing diode of Fig. 11, things are not as bad as they look! My first reaction was the same as yours when I first encountered that circuit, years ago.

... It sure looks like the diode will short circuit the input signal. However, when biased properly, a diode behaves just like a low-value resistance, and this is precisely how the diode is used in Fig. 11; it replaces resistor R_v in Fig. 4 and 9.

In some applications, particularly in high-power stages, the input resistance of some power-output transistors is very low; placing a forward-biased diode in shunt with the base-to-emitter resistance of the transistor does not short the input signal to ground but simply makes the input resistance of the circuit that much lower. A "driver" stage is usually necessary to supply the relatively high amount of signal power to the low-impedance input.

To clarify the point one step further, it should perhaps be pointed out that the diode does not cause signal rectification at the transistor input any more than the transistor's input diode, i.e., the transistor's base-to-emitter junction,

which is indeed a P-N diode. The reason is that in a Class-A amplifier, the amplitude of the signal is lower than the available dc base bias; this allows the diode to remain forward biased through the full cycle of the input signal, so that its low resistance simply varies in accordance with the signal—just as does the transistor's base-to-emitter resistance in shunt with it.

In a somewhat different application, particularly popular in high-power audio output stages featuring complementary transistors, forward-biased diodes are often connected *in series* with the signal, i.e., between the signal source (driver stage) and the base input leads. In effect, the forward-biased diodes conduct *ac current* in this application.

Your suggested circuit does have merit, however, and the "ballast" resistor could be inserted as shown in your letter, to minimize the loading effect of the diode on the preceding stage, particularly when the input resistance of the associated transistor is relatively high.

Another way of using the stabilizing diode would be to connect it instead of resistor R_v in the transformer-coupled circuit of Fig. 15. Being connected between ground and the "low-side" of the driver transformer secondary, the forward-biased diode would not appear across the transistor's input.

For the sake of completeness, it could also be pointed out that a *reverse-biased* diode is sometimes used for bias stabilization in the base circuit of some transistors; in this case, however, it is used to compensate for leakage current in the collector circuit of the transistor rather than for variations with heat in the resistance of the base-to-emitter junction. As a matter of fact, two diodes can be used in some applications—one forward-biased and the other reverse-biased—for an improved solution to the biasing problem.

In closing, I would like to mention that you have apparently *read my mind* in expressing a wish that I undertake a similar treatment of the subject "Interstage Signal-Coupling Circuits." A few months ago I wrote an article on "Transistor IF Coupling Circuits," and it is scheduled for publication in the August issue of ET/D. The article—also written at the technician's level—presents a simplified survey of nine interstage coupling circuits popular in radio and TV circuits. I hope you enjoy it.

LAMBERT C. HUNEULT, CET

READERS' AID

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

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I have retired and have various pieces of used test equipment for sale. Please write for listing and prices.

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PETER GRAULICH

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EDITORIAL...

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courses in electronics. Some seemingly good schools don't. Supplement these courses as necessary with correspondence-school courses. Use the test instruments that you once used in your shop to experiment with the concepts presented in the correspondence courses. Don't be afraid to take time to play around with interesting new circuitry.

Never quit reading your trade journals. You should continue to read not only ELECTRONIC TECHNICIAN/DEALER but also all other publications that you feel will keep you advised of information required for future business success—not only the schematics and service tips but also the basic business principles.

Once you have become a more broadly educated person, start moonlighting. Start out with two or three service calls a week and experiment with your customers. Never be a phony, but see what happens as you experiment with various

techniques for dealing with them. Apply some of the basic customer psychology learned in college or trade school. However, please again refrain from crying on people's shoulders. Be frank concerning the past, if asked, but **don't offer details!** Be certain to be fair to both your customers and other electronic technicians and service dealers when performing this work by charging the going rate for work performed, never offering "cut-rate" service.

Whenever you encounter defective circuitry that you are unable to service, **do not let it sit around!!!!** Instead, offer to pay some friend, that is technically more qualified, to help you. After all, you are responsible for seeing that the job is done right! And if you don't make any money on the job, that's your fault, not the customers—your fault for not knowing how to do the job right, or your fault for not seeing that the customer is charged **what the job is worth.**

It is far too easy to make the mistake of jumping back into business for one's self too fast. First complete those college, trade-school and correspondence-school courses suggested. Work at the subject matter covered until you have mastered it. Not until this is accomplished is there even a chance of future business success. Once this has been done, and once you have again reached the level of electronic technology required for the circuitry to be serviced—and have proven it through effective moonlighting—then that is the time to go back to full-time self employment.

When you start your new business, don't make it too big. Just large enough for you to handle. You are now faced with three responsibilities: Taking care of your family (unless single, then at least your own personal basic needs), providing your customers with the service that they are entitled to, and re-assuming past moral (if not legal) financial obligations to see that all old debts are cleared. Once this has been accomplished, then think in terms of expanding your business.

Even after your new business does become a success, or as an employed electronic technician you get that job you really wanted, never forget your past failures and the fact that they resulted from a lack of professional skills. Learning is a never-ending process.

Phillip Dahlen, CET

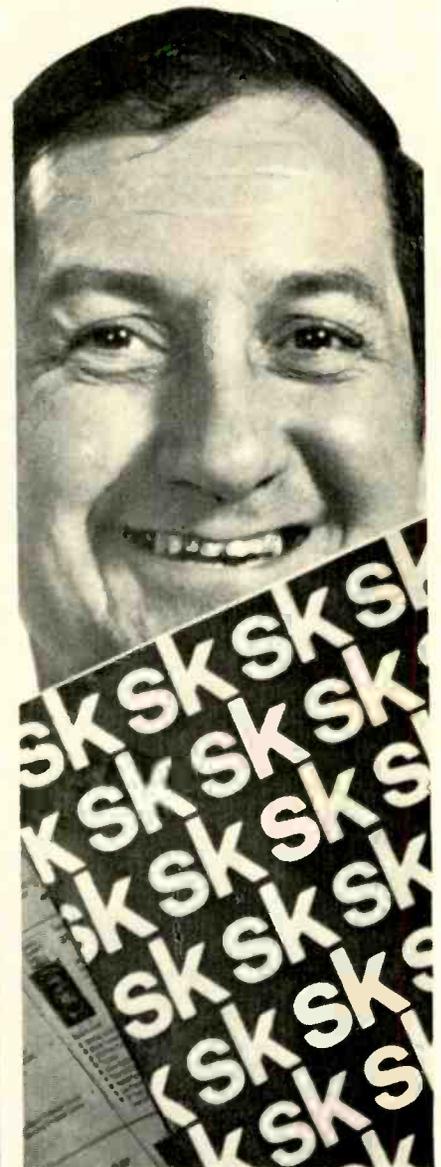
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NEWS OF THE INDUSTRY

Virginia Electronics Association Convention Press Release

The ninth annual Convention of the Virginia Electronics Assn. was held June 22-24, 1973 at Tyson's Corner, Va. and lived up to its theme, "Progress Thru Education."

The association business sessions were highlighted by reaffirmed support of state licensing and national association merger. Testing for Certified Electronic Technicians was held throughout the convention and Dick Glass, Executive Vice President of the National Electronic Associations, addressed a special Saturday luncheon which honored the state's 74 C.E.T.'s

Phillip Dahlen, Editor of ELECTRONIC TECHNICIAN/DEALER magazine and Chairman of the International Society of C.E.T.'s, was the featured banquet speaker and was accorded an Honorary Membership in VEA for having "proven his friendship and concern for the profession he serves."

The VEA Ladies Auxiliary established a well-stocked hospitality room just for the gals and scheduled an enjoyable evening at the Wolftrap Theatre on Friday preceding the convention. Anne Mitchell of Hampton was elected President of the Auxiliary. Lu Cole, Anita Laine and Anne Cooke were elected Vice President, Secretary and Treasurer, respectively.

John McPherson (Yorktown) was re-elected President of the association for the 1973-74 term. Also re-elected were First Vice President, Wayne Appelman (Richmond);

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Second Vice President, Everett Kilby (Manassas); Recording Secretary, Jane Hudson (Lynchburg); and Treasurer, Joe Jackson (Madison Heights). Elected to their first terms as VEA officers were Third Vice President, J. Cobb Laine (Suffolk) and Secretary General, Art Pearsall (Norfolk).



Enjoying the VEA Saturday Night Banquet are (L to R) Dan Witt, G.E. Service Specialist; Jesse Leach, NEA Vice President; Larry Steckler, Editor, RADIO-ELECTRONICS; Dick Glass, NEA Executive Vice President, and his wife Dot Glass.

M. L. Finneburgh, Sr., E.H.F., performed the officer installation ceremony at the Saturday evening banquet and drew a resounding ovation from the general membership with his Sunday dissertation on the need for industry and association unity. Other national notables attending and participating were Stan Prentiss (Associate Editor for TAB BOOKS); Larry Steckler (Editor, RADIO-ELECTRONICS Magazine); Mary Anne Shurtz (Virginia Consumer Affairs Coordinator); Dutch Meyer (General Electric Na-
continued on page 51

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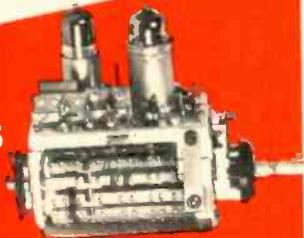
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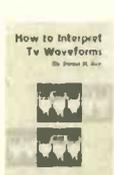
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Japanese Monochrome TV Service Manual



This brand-new, all-in-one schematic-servicing manual contains all the data you need to repair virtually every Hitachi, Panasonic, and Sharp black-and-white model sold in the U.S. and Canada during the past three years (1969-71). In this one compact volume, you have all the background service information needed to service 75 specific models. Included are full-size schematic diagrams, PC board layout drawings and photos, adjustment and alignment instructions, and parts lists. The foldout section has 24 full-size schematic diagrams. The text provides service information on 47 additional chassis similar to those shown in the foldout section. 420 pps., 8 1/2" x 11". List Price \$7.95 • Order No. 602

Installing & Servicing Electronic Protective Systems



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

104 Simple One-Tube Projects



A collection of useful, easy-to-build construction projects for technicians, experimenters, hams, and hobbyists. Now you can put those idle tubes and components to work with this vast, one-of-its-kind assortment of unique electronic circuits. Included in this convenient selection are test instruments, ham gadgets, receivers, power supplies, DX aids, wireless mikes, tube rejuvenators, electronic games, eavedroppers, stereo and hi-fi devices, and literally dozens more. None use more than one tube! Few will cost more than \$5. Astute technicians and hobbyists will find many gadgets adaptable to specific needs. 192 pps. Hardbound. List Price \$6.95 • Order No. 486

Circuit Consultant's Casebook



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

Jack Darr's Service Clinic No. 2



Here's more of the Jack Darr wisdom (and wit!) in book form—a valuable collection of timely service hints and trouble solutions covering color and monochrome TV, radio, stereo, phonos, recorders, OB gear, etc. Discusses the "engineering" servicing approach, efficiency and how a technician may condition his thinking to produce more in a given time period. Like the first volume, the content was selected on the basis of usefulness to the average technician, covering a wide range of electronics devices. Each of the 10 chapters covers a general category of interest, and in each the subject matter is arranged in logical order to enable you to find what you need quickly. Provides a wealth of information. 176 pps., numerous illus. Hardbound. List Price \$7.95 • Order No. 566

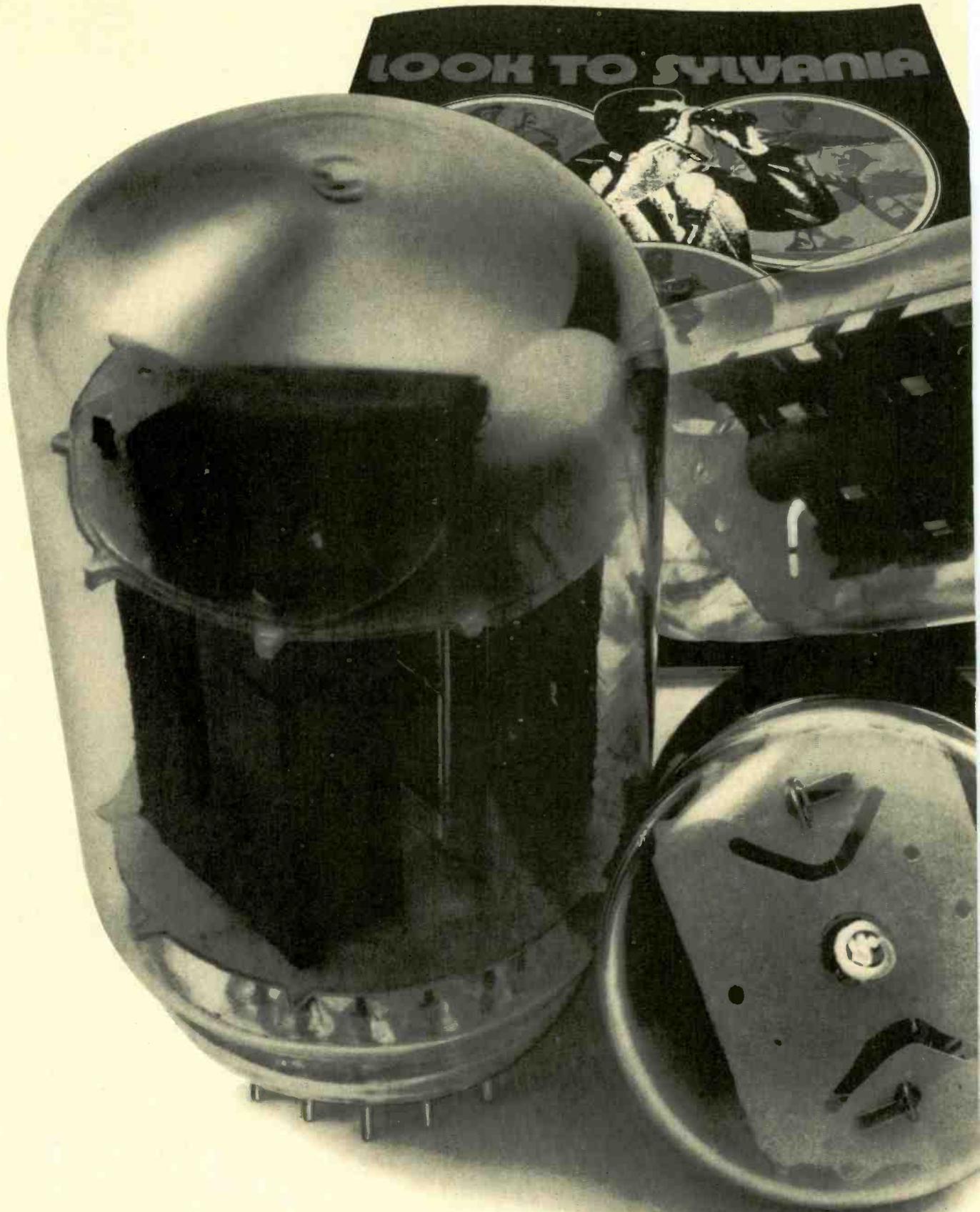
Solid-State Circuit Troubleshooting Guide

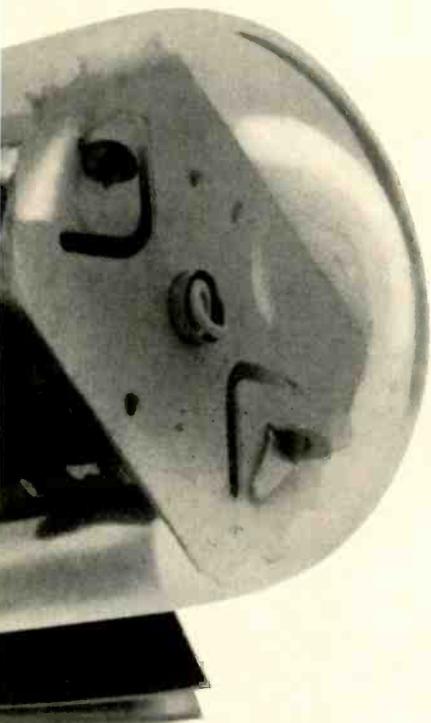


Here's a brand-new approach to understanding and troubleshooting all types of solid-state circuits. This unique book discusses various types of solid-state devices—diodes, transistors, field effect transistors, integrated devices, and silicon controlled rectifiers—with emphasis on how these devices work in circuits you're most likely to encounter, and how to pinpoint a faulty component in minutes. The book is loaded with schematic diagrams of typical circuits and practical suggestions on how to troubleshoot and repair them. Many "service thinking" charts are included. 224 pps., over 150 illus. Hardbound. List Price \$7.95 • Order No. 607

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This year, 3 tubes get you what 5 tubes used to get you.

It's the biggest award program GTE Sylvania has ever had. The most flexible one, too.

It's so simple. Buy Sylvania receiving tubes and get Award Tickets.

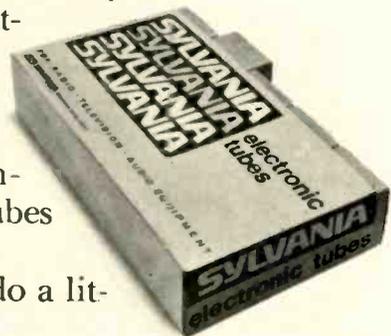
Once you've got your Award Tickets, here's how to redeem them: On-the-spot, from many participating distributors. Or, accumulate them up to any value for any prize in our catalog.

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If you don't have all details on the 1973 Dealer Award Program, talk to your GTE Sylvania representative.



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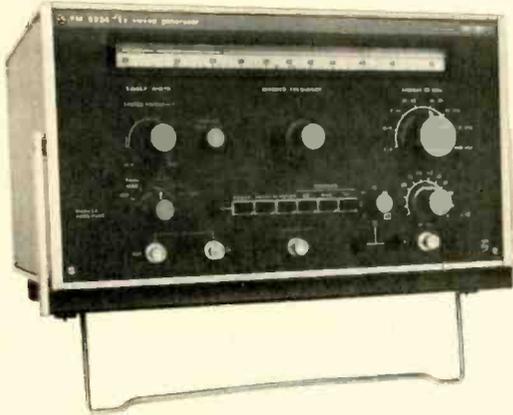
Sylvania Electronic Components, 100 First Avenue, Waltham, Mass. 02154.

NEW AND NOTEWORTHY

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

TV SWEEP GENERATOR 700

*Covers frequencies
from 3MHz to 860MHz*

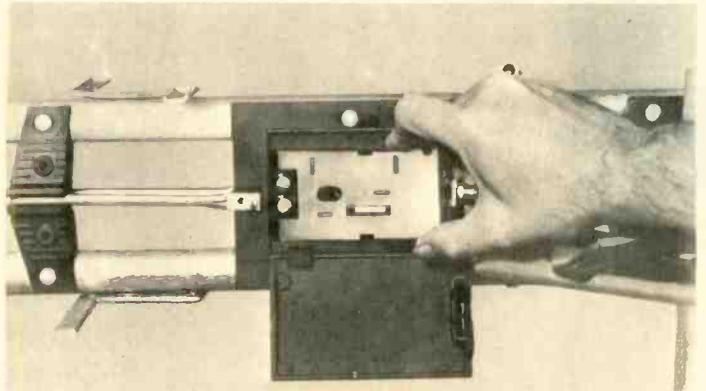


A new sweep generator, Model PM5334, is developed for use in electronic servicing. The generator covers frequencies from 3MHz to 860MHz in eight panel-selected sweep ranges. The setting accuracy in the eight ranges is said to be better than 1%. Sweep width can reportedly be made to cover any of the eight bands or any fraction of any band, being continuously adjustable from 8 to 50Hz on any band. The instrument is said to offer fixed frequency markers at 5.5, 10.7 and 38.9MHz, each with 0.1 percent stability. The output of the generator is reportedly electronically stabilized and is continuously adjustable down to 80dB below the maximum output level of 200mv. A 1kHz internal amplitude modulating signal may also be superimposed on the output. To simplify the many functions, the instrument's front panel controls are color coded by specific function. Test & Measuring Instruments Inc.

ANTENNA AMPLIFIER 701

*Provides high gain with
low-noise characteristics*

A solid-state amplifier module is custom-designed for installation within the weatherproof terminal housing on the crossarms of the company's "Quantum" antenna series. Four models are available: VHF/UHF/FM, 300 Ω output; VHF/UHF/FM, 75 Ω output; VHF/FM, 300 Ω output (2 terminals); and VHF/FM, 75 Ω and/or 300 Ω output. The amplifiers are said to have high-gain, low-noise characteristics, and designed to strengthen fringe area reception. A built-in FM trap may be switched on to prevent FM signal overloading in problem areas, while allowing reception of local FM stations. The Amplifier Module will reportedly perform dependably in all weather, throughout a temperature range from -40°F to 140°F, while the dual diode circuitry provides lightning protection. Indoor power supplies are included with the amplifiers with conveniently located output terminals. Channel Master.



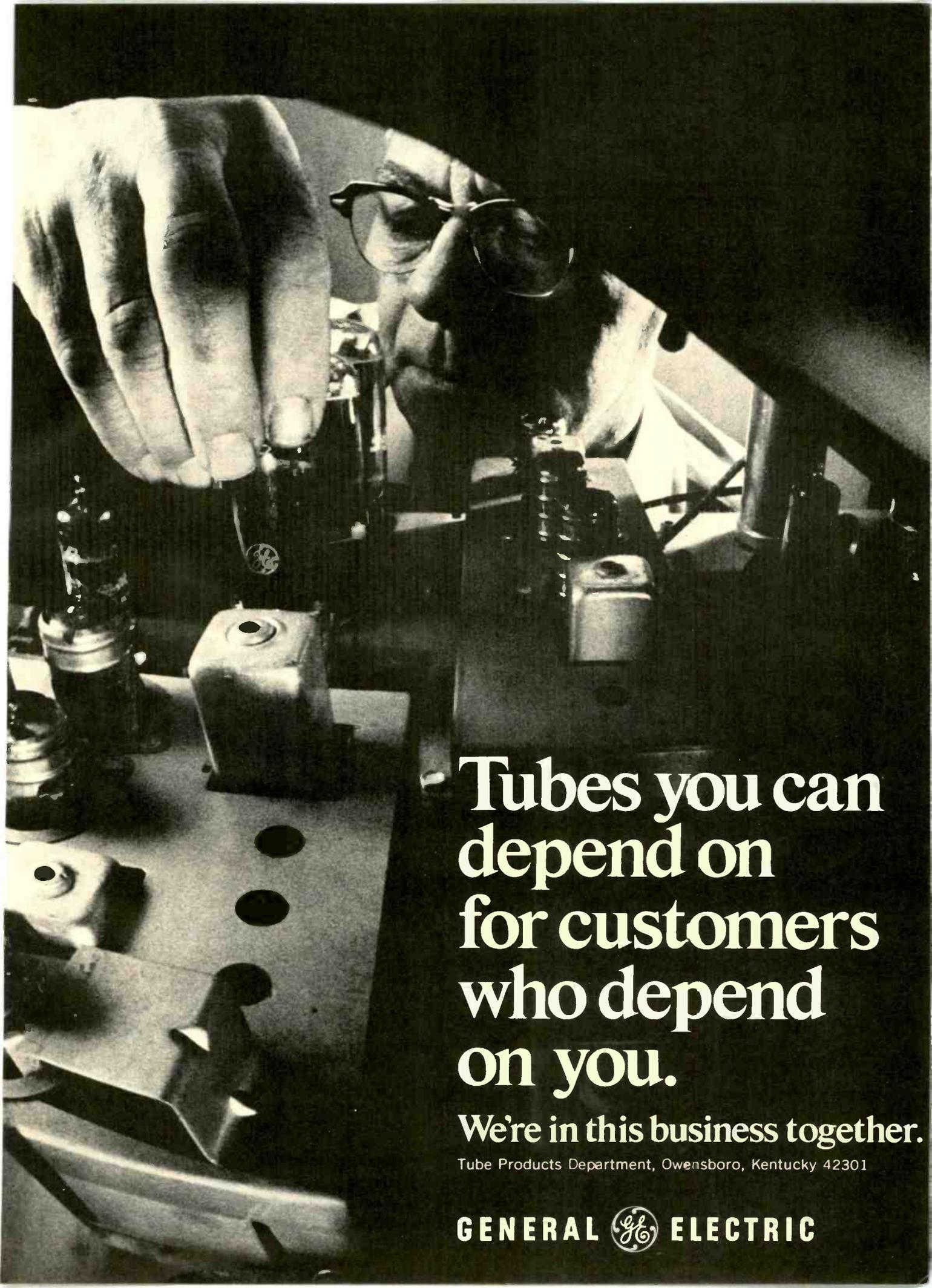
FOR MORE NEW PRODUCTS SEE PAGE 53

TOOL CASE 702

*Rugged one-piece
molded construction*



Introduced is a new tool case which is reportedly as practical as it is strong. The pockets on the pallet are said to be molded without any seams, stitches or rivets to form a one-piece unit; and the case itself is made of one-piece molded construction. An aluminum rim is placed around the case for extra strength; and it is said to have a heavy-duty, steel core handle. There are compartments for extra tools and equipment with multiple lid pockets for papers and order books. Platt Luggage.



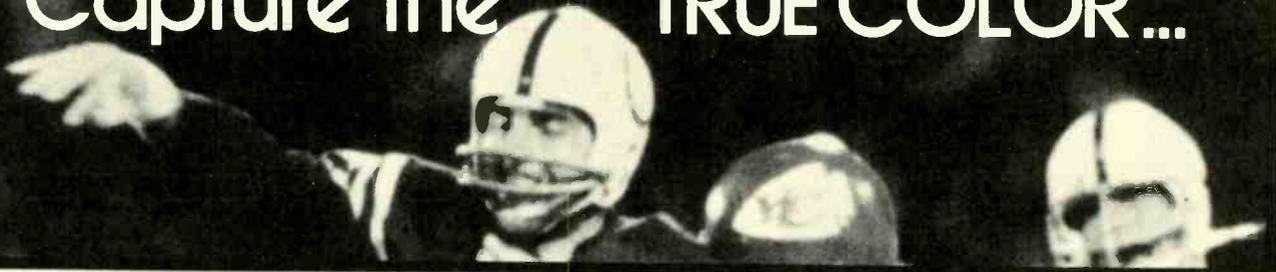
**Tubes you can
depend on
for customers
who depend
on you.**

We're in this business together.

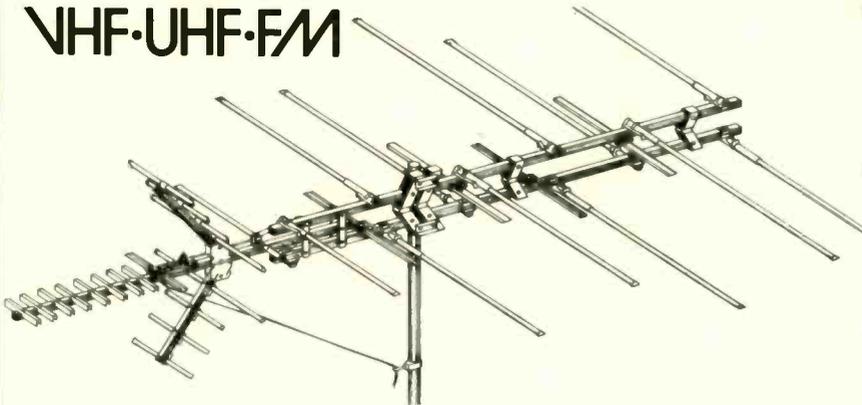
Tube Products Department, Owensboro, Kentucky 42301

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VHF-UHF-FM



■ MODEL F-87-C

Designed for: Weak VHF signal areas.
Very weak UHF signal areas.

33 Elements VHF-UHF-FM List Price: \$59.95
MODEL CX-F-87-C (75 OHM) List Price: \$66.20

■ MODEL F-89-C

FOR: Extremely weak VHF signal areas.
Extremely weak UHF signal areas.

54 Elements VHF-UHF-FM
List Price: \$102.95
CX-F-89-C (75 OHM) List Price: \$109.20

■ MODEL F-88-C

FOR: Very weak VHF signal areas.
Extremely weak UHF signal areas.

47 Elements VHF-UHF-FM
List Price: \$79.95
CX-F-88-C (75 OHM) List Price: \$86.20

■ MODEL F-86-C

FOR: Moderate VHF signal areas.
Weak UHF signal areas.

27 Elements VHF-UHF-FM
List Price: \$46.95
CX-F-86-C (75 OHM) List Price: \$53.20

■ MODEL F-85-C

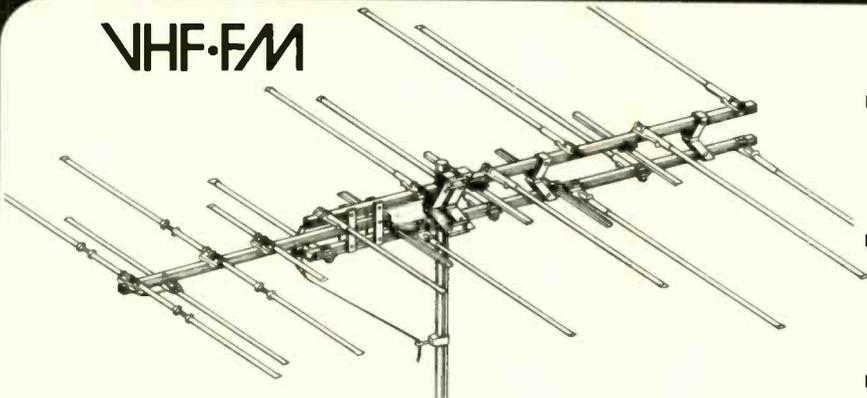
FOR: Moderate VHF signal areas.
Moderate UHF signal areas.

21 Elements VHF-UHF-FM
List Price: \$39.95
CX-F-85-C (75 OHM) List Price: \$46.20

All VHF-UHF-FM models complete with behind-the-set Signal Splitter.

with a new FINCO® '80 Series COLOR SPECTRUM™ TV ANTENNA

VHF-FM



■ MODEL F-82-V

Designed for: Weak signal areas.

20 Elements VHF-FM List Price: \$49.95
MODEL CX-F-82-V (75 OHM) List Price: \$58.30

■ MODEL F-84-V

FOR: Extremely weak signal areas.

34 Elements VHF-FM
List Price: \$89.95
CX-F-84-V (75 OHM) List Price: \$98.30

■ MODEL F-83-V

FOR: Very weak signal areas.

28 Elements VHF-FM
List Price: \$72.95
CX-F-83-V (75 OHM) List Price: \$81.30

■ MODEL F-81-V

FOR: Moderate signal areas.

14 Elements VHF-FM
List Price: \$35.95
CX-F-81-V (75 OHM) List Price: \$44.30

Write for Catalog No. 20-658 Dept. No. ETD 9-73

THE FINNEY COMPANY

34 WEST INTERSTATE STREET,
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Here's Another Month of Extra Profit

by Ernest W. Fair

First Week

Monday What was the last electronic service requested by a customer which you have not advertised or promoted? Do something around it right now, it may be your most neglected source of profits for a long time to come and something you have just been overlooking.

Tuesday Who were the last five customers looking at that big color-TV set or stereo-combo who said they had to think it over and would let you know later? Call on each of them today—just the right amount of time may have elapsed by now.

Wednesday Pick out a particular service that has been rather neglected lately in advertising and promotional effort. Have everyone in the business give it sole and complete attention today. Be sure it is suggested to every customer contacted. The results may be surprising.

Thursday Check the displays carefully for age . . . take down at least the oldest of these today and build a new one around some entirely different item on which there's now too large an inventory.

Friday Set up a "Non-Advertised Special" display for just today only. Point out that it is offered in appreciation for the customer's visiting your business. If it works well, try it at least another week with a different one every day. It may turn out to be the best extra business builder you have ever used.

Saturday Ask every customer who comes in today: "Do you have a small portable radio in your home which needs repair?" You will be surprised how many have just that set aside for taking care of when they get around to it.

Second Week

Monday Use today to change those special displays around the cash register or check-out counter. When left more than a month, their effectiveness becomes small. Best results have been proven out where changes are made weekly.

Tuesday Today's the day for asking every single customer who is contacted about a preventive check-up on his family TV set. Push the idea that big troubles can be caught at small expense when this is done.

Wednesday How much of the manufacturer literature you've been receiving is gathering dust somewhere around the place? Get it all out and start getting it into every customer's hands . . . that's where it can make sales for your business.

Thursday Look around the store for the item standing out as the "orphan" no one wants. Have everybody carry one in hand today, if not too large, and show and suggest it to every last customer.

Friday This is the day to keep old stock from deteriorating and losses resulting. Have each employee use every spare moment checking to make sure oldest items are up front in all displays for first sale, newest stock to the back of the display.

Saturday Set up a display near the exit labeled "Stop! Did you forget something? Maybe it's here." Commonly used items in lower price ranges should be featured as this idea will sell them more readily than higher priced ones.

Third Week

Monday "Be extra nice to disgruntled customers today," is another experiment in merchandising which can often surprise any dealer. Usually "obnoxious" customers are avoided by employees. Many need only a little special treatment to change their approach and make them better customers.

Tuesday Make up a list of customers who, during the past year, have expressed more than normal interest in trading in their old or small TV sets on new big ones, but were not financially able to buy what they wanted. Chances are that conditions have improved for several of them, who can now get what they desire.

Wednesday Give those neglected

corners of the store and shop special attention today—all places have them. Spruce them up, give the merchandise therein better display and make it easier for customers to see things there. It may well add more selling space.

Thursday Use today to check the place carefully for customer comfort, i.e., how well it is laid out to make it easy for customers to do business therein. Aisle displays can become too many and too crowded, for example, unless such a check-up is made regularly.

Friday Put a "Missed" notebook at the checkout counter or by the cash register and have every employee write therein any requested item or service from a customer which has not been offered. It may open up the door to more than one overlooked opportunity for profit.

Saturday Have you spent enough time lately talking with customers about their plans for the future? The more the technician/dealer knows about these, the better he can program his own efforts.

Fourth Week

Monday Make today a "more light for better display" day by closely checking the cleanliness of all sources of light everywhere. Be sure there's enough light so that customers can easily see what you want them to see.

Tuesday "Is today the day you are going to buy that second TV set for your home?" is a good question to ask with a sign the customer can see the first moment upon entering. It's also a good way to dispose of those trade-ins and uncalled for sets left for repair.

Wednesday Set everyone in the place to working on selling "one extra" item or service to every customer who does business with the firm today.

Thursday Know who your customers are, to up-date your mailing list. Start today by taking names and ad-

continued on page 55

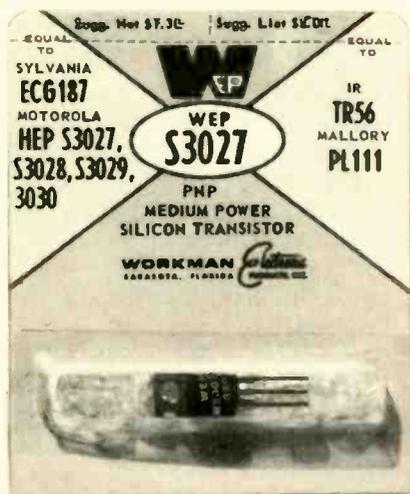
When the big-name companies fail you,

It happens. Boy, does it ever happen.

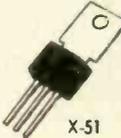
Well, next time call Workman. Off-the-shelf delivery has been our stock in trade for years.

And our new WEP semiconductor line is going to carry on the tradition. It's got a few other things going for it too:

The packaging does a lot of work for you—cross-referenced to all major lines right on the face of the card. The back of the card has basing



WEP 53027
WEP 53027

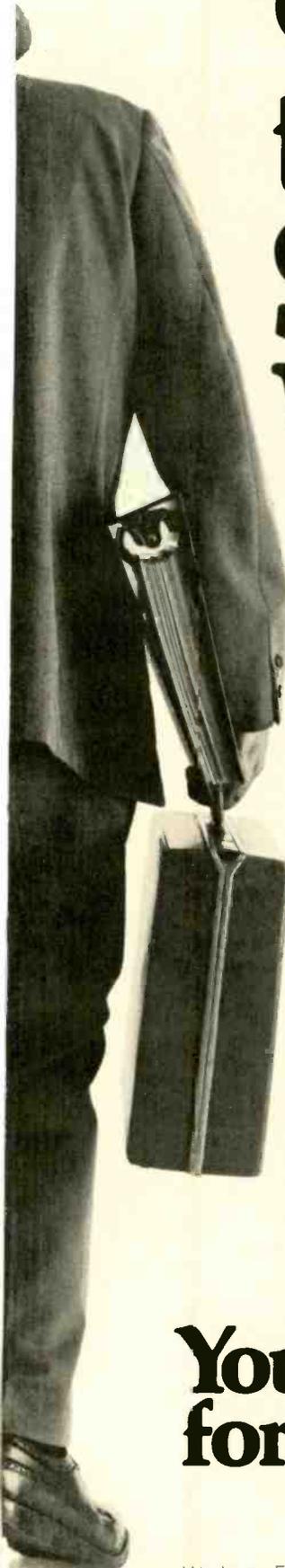



AUDIO POWER AMPLIFIER

Characteristics	Symbols	Rating	Unit
Collector-Base Voltage	BVCBO	35	Vdc
Collector-Emitter Voltage	BVCEO	35	Vdc
Emitter-Base Voltage	BVEBO	4	Vdc
Collector Current	IC	1.5	Amps
Total Dissipation	PD	8	Watts
Small-signal Cut-off Freq.	f _t	50	Mhz
Current Gain (beta)	h _{fe}	110 Typical	

Complete cross reference of all WEP devices with JEDEC and manufacturers numbers, available

Packaging on Workman's WEP Semiconductors tells you all you need to know—cross referencing, specs, basing diagram, symbol and ratings.



come to the Solid State of Workman.

diagram and full specifications with symbol and ratings.

About 200 WEP numbers offer one-for-one replacement against competitive lines and our complete cross referencing enables them to replace up to 1000 numbers in other lines.

The whole line is fully warranted and we've designed it to make life as easy as possible for you.

Which is a pretty good reason for not waiting for someone else to flop before you call us.

After all, things are complicated enough today.

Workman. Your first second resource for replacement components.

Workman Electronic Products, Inc. Box 3828, Sarasota, Florida 33578 A subsidiary of IPM Technology, Inc.

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Here's everything you'd expect from a high-priced signal generator.

Except a high price.

The accuracy of your tests depends on your signal generator. But you needn't pay high prices for accuracy — B & K is proud to introduce our Model 2050 Solid-State RF Signal Generator, with features other companies charge more for. Just look at our specs: 100% Solid-State Silicon Circuitry featuring FET's in RF and audio

oscillator stages for greater stability and linearity. Six bands, with ranges from 100 kHz to 30 MHz with 1.5% accuracy. 3 outputs: RF, modulated RF (400 Hz) and externally modulated RF. A big multi-colored, 4½" vernier dial, with positive anti-backlash dial drive. Zener-regulated and internal fuse-protected power supply.

You needn't pay high prices for versatility, ruggedness and accuracy in a signal generator — now there's the Model 2050. It's just what you'd expect from B & K.

Contact your distributor for full information, or write Dynascan Corporation.

\$9995



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

Product of Dynascan Corporation/1801 W. Belle Plaine Ave. Chicago, Ill. 60613

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TEKLAB REPORT

GTE Sylvania's Modular E05 Color-TV Chassis

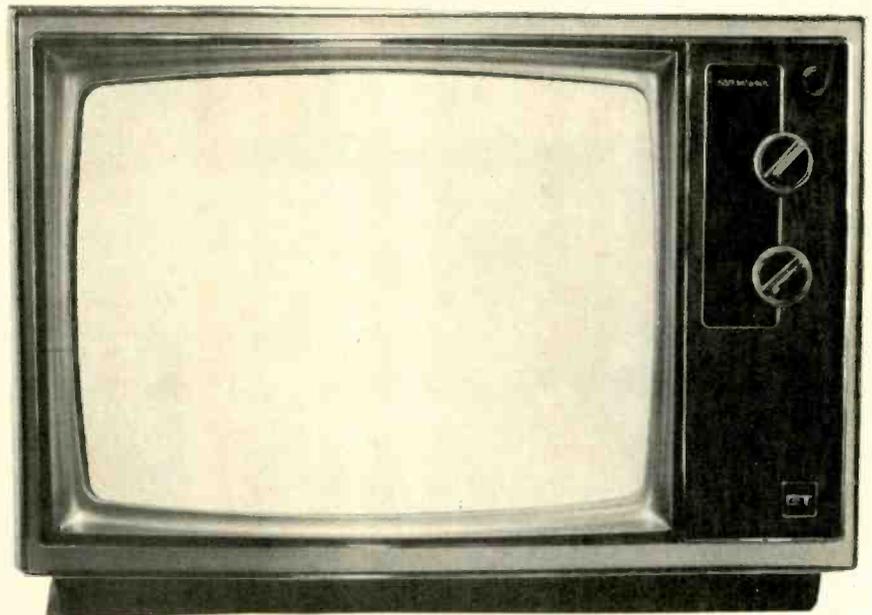
by Joseph Zauhar

Part I—A single plug-in integrated circuit completely eliminates the VERTICAL-HOLD and the HORIZONTAL-HOLD controls as a customer adjustment

■ Most major manufacturers now have a 100 percent solid-state color-TV chassis available. However, many of them are now also employing a modular chassis with plug-in components and using more plug-in IC's with improved complex circuits, thus providing manufacturers with more flexibility in design and set

features not previously possible. ICs and plug-in components enable the TV technician to perform more of the work in the home in less time. With the plugability concept, he can quickly troubleshoot the problem by input, output or substitution methods.

The GTE Sylvania Modular E05



Sylvania's Model CX3178W Portable Color-TV set employing the E05 solid-state modular chassis.

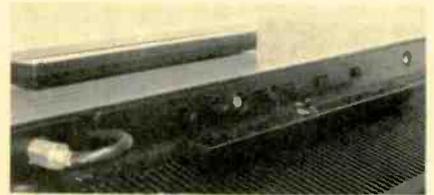
color-TV chassis that we are reviewing this month and next month was given a very high rating for accessibility and serviceability by an independent service review panel using the NEA (National Electronic Associations, Inc.) rating form for an all solid-state modular color-TV chassis.

This TV set is as close to a totally automatic color-TV chassis as we have ever seen. In addition to the large number of automatic circuits employed in the past, the manufacturer has now completely eliminated the VERTICAL-HOLD and the HORIZONTAL-HOLD controls as a customer adjustment.

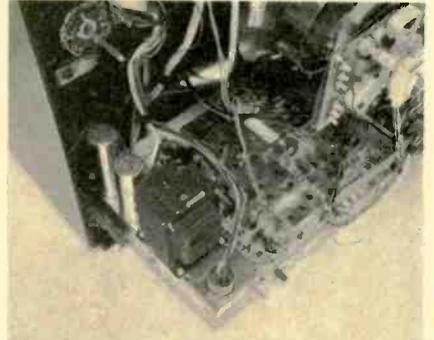
The first thing observed after unpacking the TV set (a GTE Sylvania Color-TV Model CX3178W employing the E05 solid-state modular chassis) was the small number of controls located on the front control panel. This is made possible by a

new color tuning system the company calls "GT-Matic." The system eliminates most of the controls on the front panel leaving only the ON/OFF switch, VOLUME control and channel selector knobs. The VERTICAL hold is eliminated completely by a miniature "digital computer" package in a single plug-in integrated circuit. The COLOR INTENSITY, TINT, CONTRAST and BRIGHTNESS controls are factory preset. If you should want to make minor adjustments for personal preference, just unlock the control center, located on the top rear edge of the TV cabinet, and make the adjustment. The HORIZONTAL control is located on a board in the chassis and is factory set—although it could be adjusted if required.

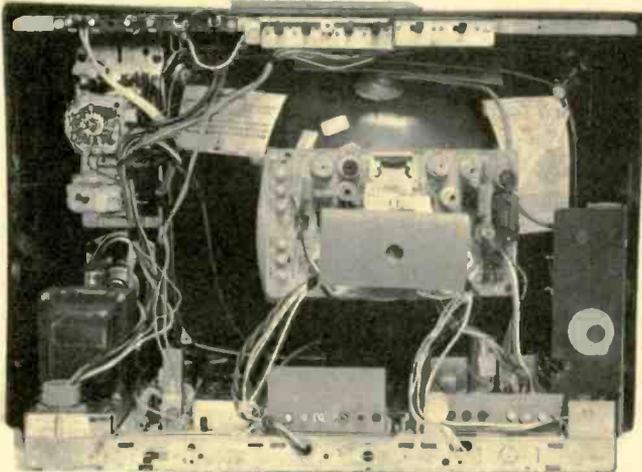
We found the back cover of the TV set easy to remove with a minimum of screws and one tool fit all of the screws on this cover. After the



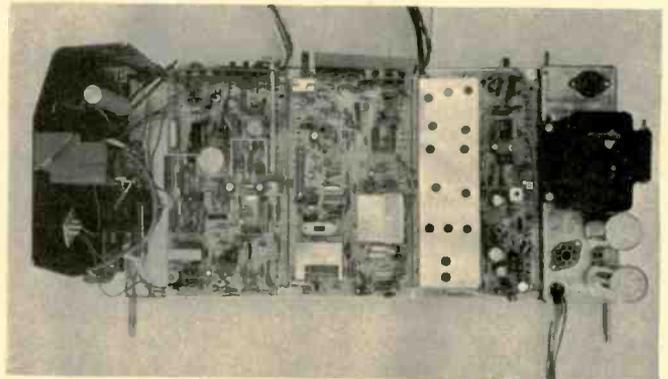
Top rear edge of the cabinet showing the GT-Matic controls through the open door, plus the built-in cable-ready antenna connector.



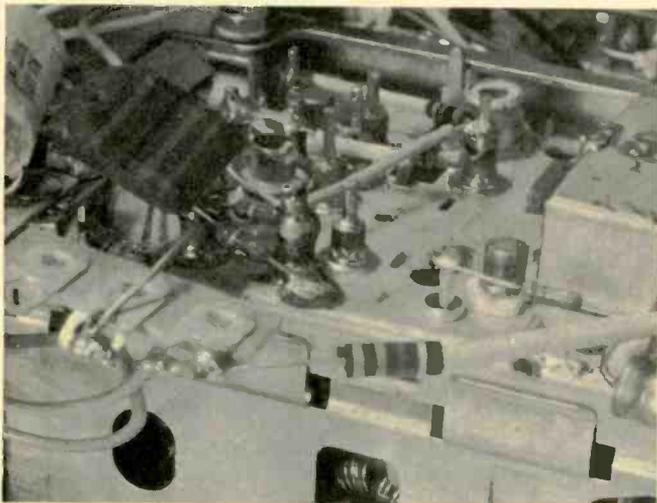
After removing two screws the cabinet slides out an additional 2 in. or can be removed by releasing two retaining springs and unplugging the wire cables connected to the chassis.



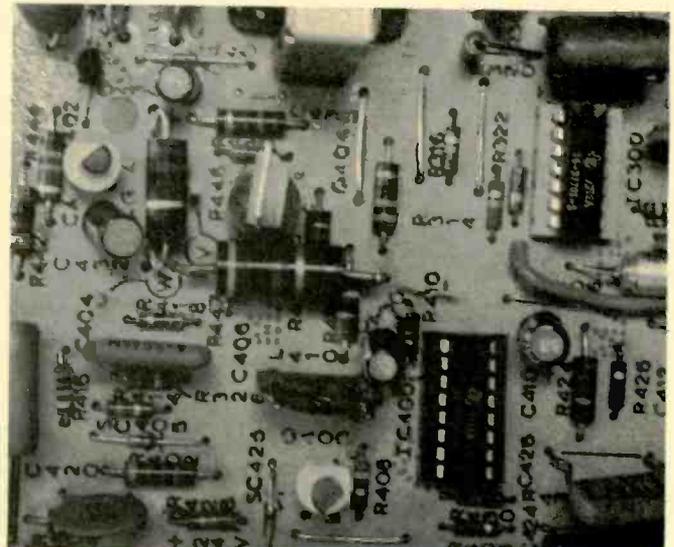
Rear view of the horizontally mounted E05 chassis showing the service controls and adjustments.



Top view of the chassis with most of the circuits grouped on three separate plug-in modules, which include four stages of fully shielded Video IF.



Top view of the VHF tuner showing the transistors plugged into sockets.



Integrated circuit IC400 plugs into the deflection panel, which is road-mapped and includes components clearly identified by number.

brings a high level of technology and circuit sophistication. This miniature "digital computer" packaged in but a single plug-in integrated circuit permits the complete elimination of the VERTICAL HOLD control in the TV set's synchronizing system, simplifying customer adjustments. The noise protection, sync separation and phase comparison produces an excellent phase and frequency lock, whether on a standard or non-standard sync signal.

The 31.5kHz clock is phase locked to the horizontal sync signal by a comparator circuit (Fig. 1, Block D in the IC400 block diagram). The 15,750Hz sawtooth waveform and the horizontal sync are phase compared. Their relationship controls the clock's timing or phase by increasing or slowing the clock's frequency in relation to the sync/sawtooth phase error.

Horizontal output pulses from the horizontal output transformer are clamped to ground by diode SC425 and fed to pin 8, IC400. Transistor Q20 (Fig. 3) amplifies the pulse, inverting its polarity. The zener diode, ZD1, clamps the waveform and feeds the pulse to pin 7. Capacitor C422, tied to pin 7, integrates the pulse into a sawtooth waveform. This sawtooth waveform is applied to the phase comparator transistor bases (Q24 and Q25) for comparison with station sync pulses.

The sync pulses are separated from the positive sync composite signal by diode ZD2, plus transistors

Q21 and Q28. The separated sync is amplified by transistor Q23 and coupled to the phase comparator emitters of transistors Q24 and Q25. When the sawtooth and the sync pulse are phase locked, no correction voltage develops. The 31.5kHz clock timing thus requires no change. However, when the sawtooth frequency is lower, the sync pulse rides down the sawtooth slope, reducing the differential amplifier's forward bias and speeding the clock until the sawtooth and sync pulse are phase locked.

The clock (oscillator) frequency of 31.5kHz is adjusted by coil L420 and capacitor C414, with AFC voltage applied to transistor Q35, which is part of the 31.5kHz clock. Transistor Q37 feeds the oscillator signal to transistor Q34, a dual collector transistor that couples the 31,500 clock pulse to pin 15 of integrated circuit IC400 through transistor Q33.

Count Down Integrated Circuit

Integrated circuit IC300 (Fig. 4), the horizontal and vertical count down chip, contains six sections: A single flip flop that divides the clock input by two for a 15.75kHz horizontal drive signal; a 10 flip-flop array that divides the clock input by 525 for a 60Hz drive signal; a composite sync processor for checking the vertical sync pulse for the presence of equalizing pulses; a vertical sync processor for clocking the vertical drive pulse for non-interlaced

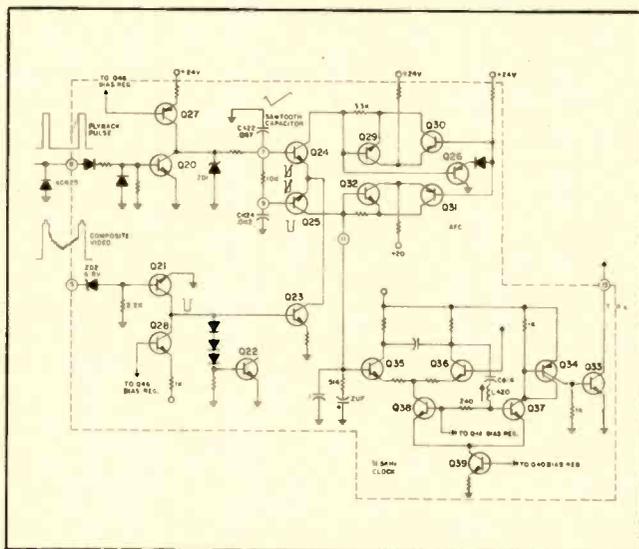


Fig. 3—Partial schematic of the AFC and 31.5kHz clock integrated circuit, IC400. Courtesy of GTE Sylvania Inc.

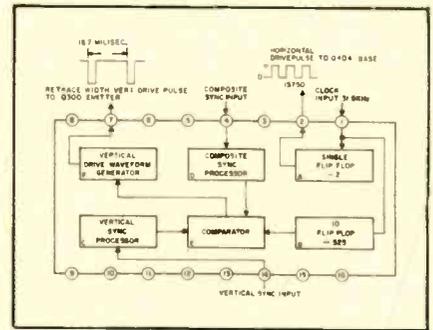


Fig. 4—Block diagram of the vertical count-down integrated circuit, IC300. Courtesy of GTE Sylvania Inc.

signals; a comparator circuit that produces mode switching logic; and a vertical-drive waveform generator that puts out a retrace width vertical drive pulse. These six sections function to provide a synchronized scan system that operates under interlaced or non-interlaced signal conditions. The composite sync signal is sampled by the composite sync processor for the presence of equalizing pulses to determine if the signal is interlaced or not.

Blocks "D" and "E" represent the logic circuits that determine the appropriate vertical sync operating mode. The presence of equalizing pulses indicates an interlaced signal. The logic circuits then switch to a count-down mode, dividing the phase locked 31.5kHz signal down to a 60Hz square wave. The 10 flip-flops (Block B), (Fig. 4), create a perfectly interlaced vertical drive pulse. The resulting clocked 60Hz square wave is fed to the vertical drive waveform generator (Block F), producing a retrace-width, vertical-drive pulse.

The synchronizing signal is sampled by the composite sync processor for equalizing pulses. Their absence over several frames indicate a non-interlaced signal and the logic circuits then switch from the count-down mode to direct synchronization. The vertical pulse from the comparator (Block E) clocks the vertical drive waveform generator (Block F) producing a retrace width drive pulse. A single flip-flop circuit divides the 31.5kHz clock frequency by two, producing a clocked 15.75 MHz output for the horizontal-drive circuit, providing an accurately synchronized scan system.

continued on page 56

Updating One's Home

by Phillip Dahlen

Start right at home getting familiar with MATV

■ Many of us can remember way back when . . . when we either lived in a house that at one time had been converted to electric lighting or had relatives that lived in such a house.

People years back thought nothing of using the socket that hung from the ceiling as both a light socket and an electrical outlet for the toaster, iron, refrigerator, etc. If there were too few outlets in the room, then one simply tacked some extension cords (cotton covered ones at that!) around the baseboard and door molding. It may have looked like heck, but it served the purpose of the time and everyone did it, even if it might have been a bit dangerous. (Some in fact still do it, despite modern building codes.)

The same has been true of the telephone. Maybe your editor is a bit fussy, but neither does he like to see phone wires draped along baseboards around the house. In his house he had the phone company tear out the phones (there had been two wall phones, plus one in the bedroom) and replace them all with but one phone and several baseboard outlets. It not only looks better but has knocked quite a chunk out of the phone bill. (Since then these baseboard outlets have been replaced with a new set of stud-mounted outlets that matches the electrical power outlets. When the

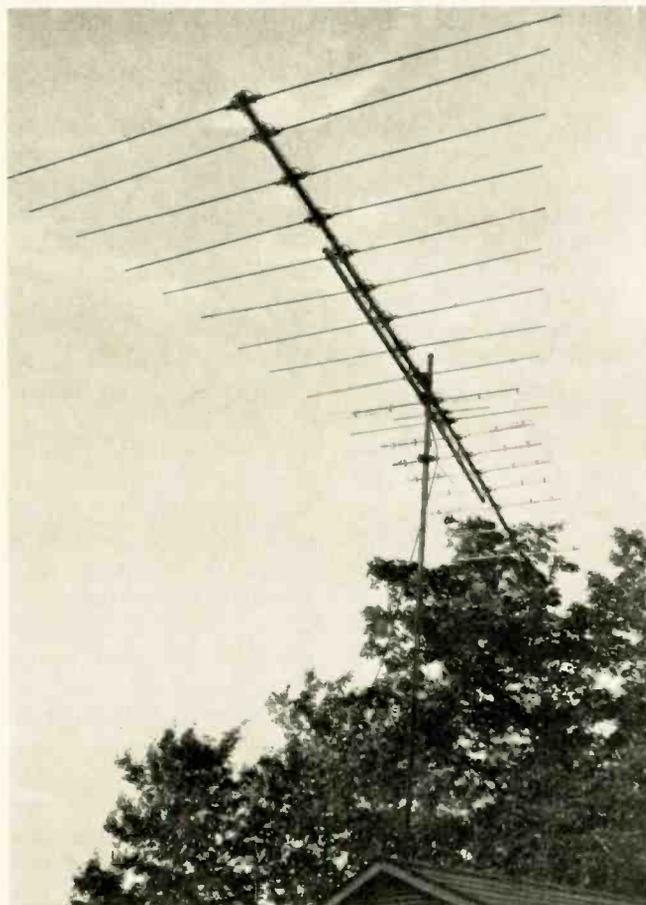
phone isn't in the room, there are no wires to be seen!)

The electrical power, the phones, now what?

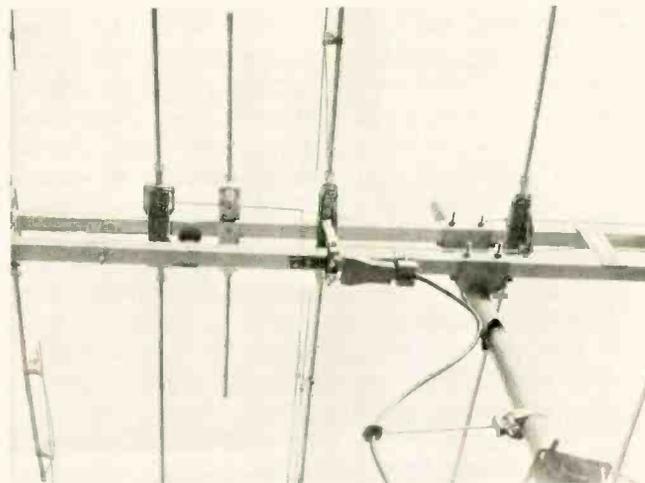
About two years ago your editor began tearing the dark fiber-board paneling out of two first-floor bedrooms, deciding to brighten the rooms up by replacing it with lightly colored plaster board. It was at that time that he decided to prepare for an MATV system with outlets as convenient as the electrical power or telephone outlets.

In the larger of these two bedrooms he installed two extra metal outlet boxes, drilling holes above them into the attic. Lengths of clothesline were extended from these boxes into the attic for pulling through future coaxial cable. One additional box was installed in a similar manner in the smaller bedroom.

During this early planning stage, your editor also decided that the cable to the antenna (which was to be either on the roof or hidden in the attic) would be routed down between the walls to a lower-floor closet, rather than being draped along the outside of the house. This would also help improve the appearance of the installation. In preparing for such routing, he drilled a hole into the attic and another hole through the floor, and ran a piece of clothesline up into the attic as well as



Antenna for MATV installation aimed through trees toward Duluth TV transmitters.



Close-up view of antenna showing antenna matching transformer connected to antenna and coaxial cable.

down into a closet in the lower level.

These clotheslines were covered by the plaster board and the outlet boxes were covered with blank plastic plates that could be removed when the MATV installation was made.

Of the various antenna system manufacturers contacted, Jerrold Electronics was the first one that was really enthusiastic concerning this particular MATV installation.

As the first step, it shipped out a VIP-307 "deeper-fringe" antenna along with a Model A.I.M. 719 field-strength meter. The antenna was manually rotated at the top of a 10-ft. roof mast with the wooden end of a garden hoe, while the resulting signal-strength measurements were logged. It had been hoped that the system would be designed for receiving Minneapolis as well as Duluth stations, but the maximum signal strength received from Minneapolis with that antenna was but a -35dB and so we decided to first concentrate on the Duluth stations. Data was then sent to Jerrold Electronics, which in turn designed the system around its line of components. Although your editor owns but two TV sets—with the only two FM radios being factory installed in the cars—it was decided at that time that the system should be designed to drive 12 TV/FM antenna outlets, installed at convenient locations throughout the house. (Such an extremely large number of outlets does not mean that this is a family "glued" to the TV set. At most, the kids watch "Captain Kangaroo," "Mr. Rogers," "Sesame Street" and the "Electric Company," plus possibly a car-

toon show or two on Saturday morning. Your editor and his wife are lucky if they have time to watch the late evening news.)

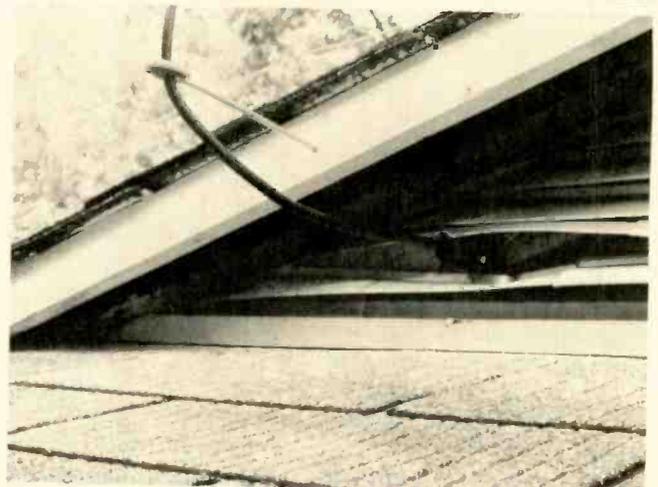
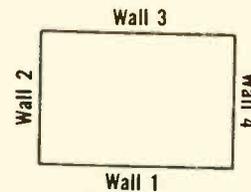
Your editor was quite pleased in noting that the philosophy of the engineer designing the MATV system closely matched his own. He believes that where the size of the antenna or the strength of the signal to be received must be rather limited, then amplifiers or preamplifiers are the *ideal* answer. However, where there are no such restrictions, then it is better to put one's money into a larger antenna rather than to buy both an antenna and an amplifier or preamplifier.

This position results from the fact that no preamplifier, amplifier or filter system can give you a better TV signal than that received by the antenna. These extra components may filter out some forms of noise or RF interference, they may strengthen the signal received . . . but they *cannot* otherwise improve the signal. Thus any snow or ghost signals received by the antenna will also be amplified by the system. It would therefore seem better to spend one's money to purchase a larger antenna which may eliminate the need for any amplifiers (and the distortion that they might produce) and which can at the same time be directional enough to virtually eliminate snow or ghosts.

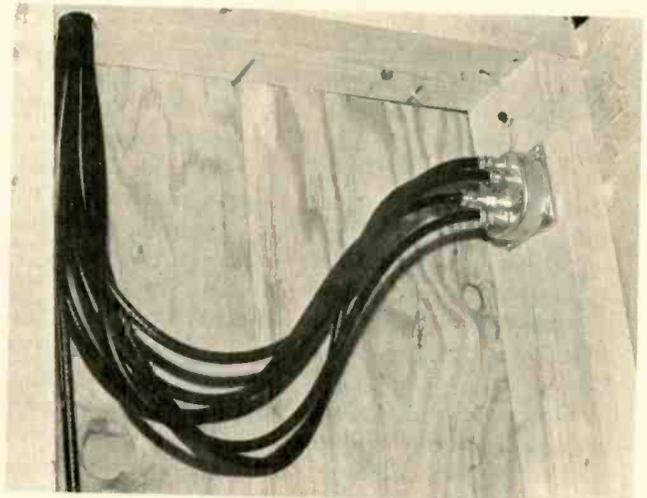
The 12-outlet system designed by Jerrold Electronics contains no amplifiers or preamplifiers (although they do manufacture them). Instead, a VIP-307 "deeper-fringe" antenna is used—even though the TV signals received come from

LOCATION OF TV-ANTENNA OUTLET BOXES

CABLE	OUTLET	LOCATION IN ROOM	ROOM	LOCATION OF ROOM IN HOUSE
A	1	Wall 1	First Bedroom	Left-rear corner of house (first floor)
A	2	Wall 3	First Bedroom	Left-rear corner of house (first floor)
A	3	Wall 3	Second Bedroom	Near center, rear of house (first floor)
B	1	Wall 1 (over counter)	Kitchen	Left-front corner of house (first floor)
B	2	Wall 1	Living Room	Right-front corner of house (first floor)
B	3	Wall 4 (over bench)	Work Room/Furnace Area	Front, near right corner of house (lower floor)
C	1	Wall 3	Living Room	Right-front corner of house (first floor)
C	2	Wall 1	Third Bedroom	Right-rear corner of house (first floor)
C	3	Wall 3	Third Bedroom	Right-rear corner of house (first floor)
D	1	Wall 3	Fourth Bedroom/Den	Left-front corner of house (lower floor)
D	2	Wall 1 (tentative)	Family Room	Left-rear corner of house (lower floor)
D	3	Wall 4 (tentative)	Family Room	Left-rear corner of house (lower floor)



The coax passes through a Wall-Thru at the outer edge of an attic vent on the way into the attic from the antenna.



In an unfinished lower-floor closet, the coaxial cable from the antenna is connected to a four-way splitter, which in turn is connected to four feeder lines. A fourth coaxial cable (shown unused at the left) has been routed through the house for possible future use.

transmitters only about eight miles away. As designed by the manufacturer, this antenna drives a Model STD-82-DP matching transformer which is connected to CAC-6 75Ω foil-shielded cable that extends to the lower-floor closet. There the signal is fed to a Model 1597-DP splitter. Each of the resulting four lengths of CAC-6 cable is fed to a series of three Model VT-75U variable-isolation TV outlets—the last outlet in each series being terminated with a Model TR-72B 75Ω terminating resistor.

Your editor made the entire installation alone during on-again/off-again intervals that corresponded to approximately three days of full-time work. (This enabled him to learn the complete job.) Had two people instead completed the job, it could probably have been done in a day or less—so much of the time being spent climbing through a small hole in the ceiling that lead to the attic, or up and down stairs.

The mast, which came with the house, was hinged at the base and so was easily lowered for attaching the antenna. The screws to the mast clamps were only loosely tightened—loose enough to rotate the antenna, but tight enough to keep it from sliding down the mast. Then with a 20-ft length of coax already connected between the antenna matching transformer and field-strength meter, the meter was tuned to the highest-frequency channel (Duluth Channel 10) for which the antenna would be most directional, and it was rotated with a wooden hoe handle for peak reception. (All local TV transmitters are located on the

ROUTING OF COAXIAL CABLE

Type CAC-6 cable was supplied for the entire system

ANTENNA LEAD-IN CABLE is connected to the VIP-307 antenna—located near the peak of the roof, nearly a third of the way from the right end of the house—via matching transformer STO-82. This cable is then routed into the attic through a Mosley 625 Wall-Thru at the outer edge of an attic vent and passes across the exposed attic beams to near the left end of the house, where it passes between the kitchen and first-bedroom walls to a closet in the lowest level of the house. (This unused closet—facing a stairway between the family room and fourth bedroom/den—is readily accessible for later expansion of the system.) There the cable is connected to four-way coupler 1597.

CABLE A is connected to the coupler and passes from the closet through the walls back up to the attic and then down between the same walls for use in the first bedroom (outlet 1). At the metal electrical box it is cut and connected to outlet VT-75U. Additional cable is connected to the same outlet, passes up through the same opening between the walls and across to the rear outer wall, where it again descends to the first bedroom (outlet 2). From there additional cable returns to the attic, and further along it drops down through the same outer wall to be terminated in the second bedroom (outlet 3). This is accomplished by connecting the cable to a type VT-75U outlet as before, but then connecting a TR-72B loading resistor in place of additional cable.

CABLE B is connected to the coupler and passes from the closet to the ceiling of the fourth bedroom/den (which had to be partly removed) and then up a front outer wall to the kitchen (outlet 1). It returns to the ceiling of the lower room, passing along into the workroom/furnace area and then up the same outer wall to the living room (outlet 2). Upon again returning to the ceiling of the lower room, it passes further along the ceiling beams to a wall dividing the workroom/furnace area from the pantry/well room. Passing down that wall, it is terminated at outlet 3.

CABLE C is connected to the coupler and passes from the closet virtually in parallel with Cable B until it reaches the pantry/well room. There it makes a left turn and after traveling across a portion of that room, it runs upward into a space between the walls of the living room and third bedroom. There it passes from outlet 1 to outlet 2 and then back down to the ceiling of the lower room. It is then snaked over the walk-out laundryroom ceiling (using a heavy sewer-type snake) and (after making a small access hole in the laundryroom ceiling) pulled up the outer wall at the rear of the house to be terminated in the third bedroom (outlet 3).

CABLE D is also connected to the coupler and also passes from the closet virtually in parallel with Cable B for nearly the entire length of the fourth bedroom/den. It then makes a left turn and is snaked across the width of the room into a second unfinished closet located beneath the stairway. From there it is run down along the inside wall of the closet and terminated at outlet 1. (Should the family room be remodeled—it was purchased with such special features as picture windows, plus a landscape painted within an odd artificial fireplace—there will be two additional outlets installed in that adjacent room.)

CABLE X is not yet electrically connected to anything, but runs virtually parallel with Cable B from the first closet into the pantry/well room, where its excess length is coiled up. At a later date it may be extended underground to the adjacent woods by the side of the house where the construction of a giant rhombic antenna system may be attempted for effective reception of extremely distant TV stations.

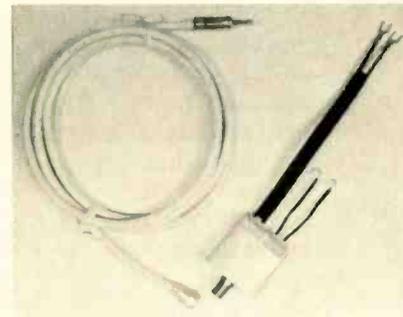
top of the same hill about eight miles away.) The position of the antenna was then marked with the use of a standoff and the mast again lowered for tightening the antenna and connecting the MATV lead-in wire. It was then again lifted in place and the guy wires were tightened.

After running the coax through a "wall through" located at the edge of an attic vent, the cable was run across the open attic rafters and cut. Both ends of the cut cable were then pulled down to a lower-level closet with the use of the clothesline. There a four-way splitter was installed and the remaining length of cable in the attic

was again cut with both new ends being pulled down through the wall for the first antenna outlet. This process was continued until the first three outlets were wired in the boxes that had been installed prior to putting up new plaster board.

The roof was extremely low where the clothesline entered the attic and in this particular house routing cable through the attic to the outer walls would not have been possible without using this clothesline technique. Houses with higher peaked roofs should not represent such a problem.

The three remaining sets of cables were run through the lower-level



Jerrold also supplied Model FSX-1314 television matching transformer/splitters for connection at the UHF and VHF antenna terminals of the TV sets, plus CAC-6-MF cable ready for use between the outlets and transformers.

ceiling (from the front of the house this level would appear to be the basement, while from the back it would appear as the first floor—where the first owner lived when building the balance of the house), removing ceiling tile or small pieces of ceiling plaster as necessary.

With the wiring completed, the field-strength meter was used for checking all 10 installed TV/FM antenna outlets (two await later installation). At each outlet it was noted that the video levels are well above the audio levels on all channels; and with the adjustable isolation at each tap set at minimum (12dB), the TV signal level is relatively near 0dB on all channels. Over a VHF channel range of Channels 3 through 10 (there are no UHF channels in the Duluth area) some of the TV video levels are as high as +2dB and some of the TV audio levels are as low as -5dB.

The best test is a working test with a color-TV set. At each TV-antenna outlet tested we note virtually ghost-free, snow-free reception despite the fact that there are many very large trees nearby that could cause ghost images—including one directly in

front of the antenna. Also, with both color-TV sets operating we are unable to observe any trace of interference resulting from possible interaction between TV sets.

Your editor feels that this installation has been an excellent work experience, one that he recommends for anyone even slightly interested in installing MATV systems professionally. By making the first installation in one's own home, as your editor has done, one has time to study the layout of wall studs and how they are arranged in a house. There is also time to correct mistakes without having a nervous customer looking over your shoulder. As an example, your editor, when missing one inner wall, in one location almost drilled up through the living-room carpet. Imagine if the drill went through and the customer was standing directly above. He has also heard of professionals missing and ruining good wood paneling by coming out at the wrong place—the entire room having to be re-paneled at the service dealer's expense.

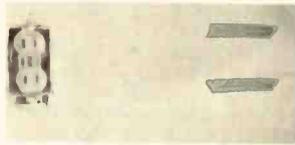
Yes, this is hard work. There is a chance of making expensive mistakes if one is careless or inexperienced. But when you charge what a job is worth, there is a lot of money to be made with such installations. And every modern house should be as well wired with TV-antenna outlets as it is with telephone and electrical power outlets—whether connected to a small antenna, a large series of antennas or a CATV system. ■

INSTALLING THE OUTLET

Although there are many other possible techniques, your editor wanted these antenna outlets to be of the same substantial quality as are electrical power outlets (rather than some makeshift installation merely screwed into plaster) and so chose to mount them in conventional metal electrical boxes.

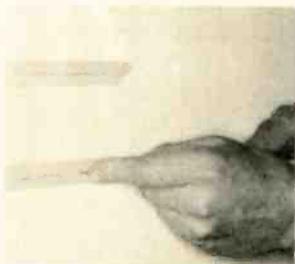
The first task for installing these boxes was to locate a stud (one of the wooden two-by-four's supporting the house) in the approximate area of the desired outlet. For some outlets, it was possible to locate these studs by observing barely visible rolls of nails supporting the plaster board. (Electricians have become proficient in locating these nails with a special magnet.) For this outlet, your editor instead inserted a stiff wire through a gap between the plaster board and the bottom of an adjacent metal power outlet box, extending the wire until it reached a stud—the length of wire representing the approximate distance between the present box and the next stud.

Once the stud is located, masking tape is placed on the wall and a level is used to rule horizontal lines extending from both the top and bot-



tom of the nearby metal power outlet box. Having located the stud, the right ends of these lines correspond to the approximate location of the stud.

A small keyhole saw is used to cut through the plaster board along these ruled lines. These cuts are made relatively near the right ends



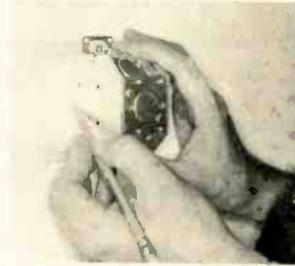
of the lines and extended until they reach the stud beneath the plaster board.

Once the stud has been located exactly by cutting through the plas-



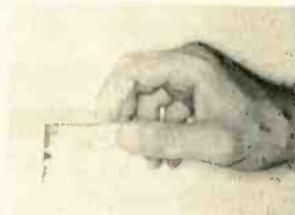
ter board, the level is used to rule a vertical line corresponding to the left edge of the stud.

The metal electrical box to be installed is then placed against the plaster board near the vertically ruled line. Allowing additional space for passing screws—located external to the left and right sides of the box (note the screw on the upper left corner of the box in the photo)—through the plaster board, a second



vertical line is drawn for cutting the left side of the opening.

Upon cutting along the horizontally and vertically ruled lines, the



resulting rectangular piece of plaster board is easily removed.

The wide flanges at the top and bottom: ends of the metal box are adjusted according to the thickness of the plaster board and tightened so



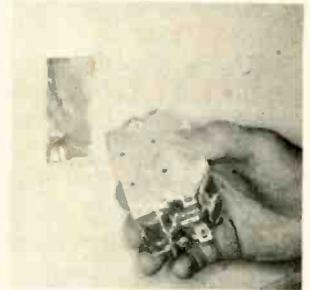
that they will hold the box slightly behind the plaster board.

A hammer and chisel are used to make a notch in the wooden stud corresponding to the future position of the right external screw on the



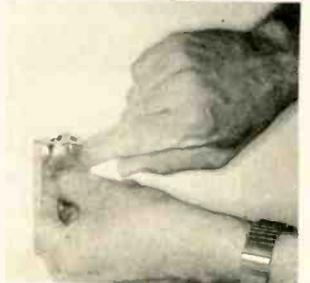
metal box, which would otherwise prevent us from positioning the box vertically against the stud.

The metal box is turned endwise and inserted through the opening in the plaster board, moving aside any wall thermal insulation in the way.



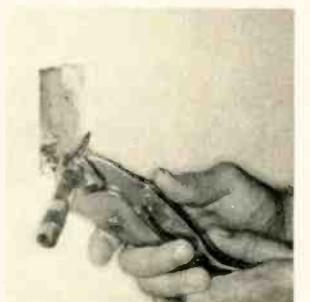
Once in place, notches are cut at the top and bottom of the plaster-board opening to correspond to the small flanges into which the antenna outlet is to be screwed.

With the metal box moved as far forward as permitted by the large metal flanges pressing against the rear side of the plaster board—these preventing the box from extending into the room beyond the plaster board—a pencil lead is used



to mark on the stud the location of the two rear holes in the side of the metal box.

A pair of Vice-Grip pliers is clamped around an automatic center



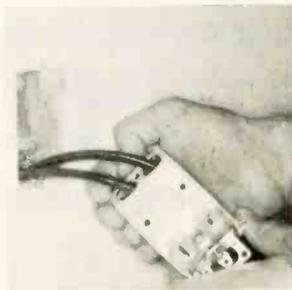
punch, which has an internal spring-snapping action that permits it to be hand driven as though hit by a hammer.

The automatic center punch is used for pounding screw-starting holes into the stud at the two points located with pencil marks.

After drilling a hole up behind the wall somewhere between the two studs, through the ceiling of the workroom/furnace area below, an



accommodate the cable.
The cable is inserted into the two openings at the bottom of the metal



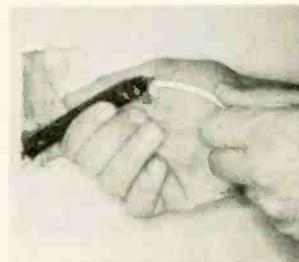
box before the box is again inserted for the last time behind the plaster board.

A ratchet- or wrench-type screwdriver is used to tighten the two screws (we found that round-headed sheet-metal screws worked best)



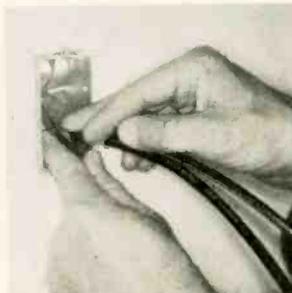
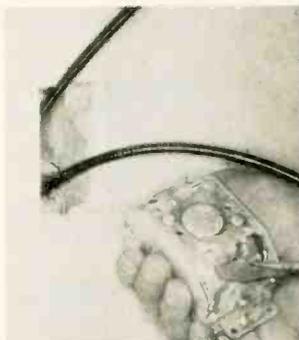
old copper water pipe is pushed up between the walls, pulled near the opening in the plaster board and secured to a length of plastic clothesline.

Upon pulling the clothesline into the room below, two lengths of ca-



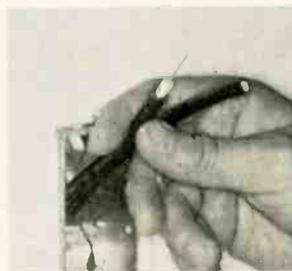
ble are taped to it and then pulled up with the line.

Two openings are made in the bottom of the metal electrical box to



and thus secure the metal electrical box against the stud, making its strength independent of the limited strength of the plaster board.

With the box in place, the cable is cut and stripped.

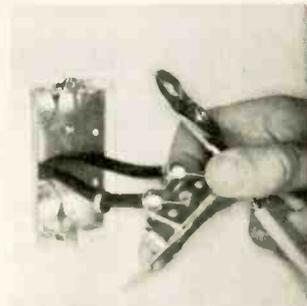


A plastic tool (supplied with the antenna outlet) is used to expand



the grounding sleeve (mandrel) of the outlet to correspond to the larger-than-average diameter of the foil-shielded coax.

Each cable is passed through a



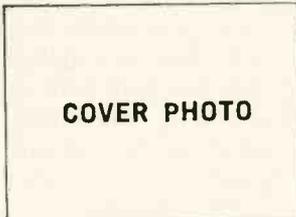
ring (ferrule), and then the connector mandrel is pushed between the cable center-wire insulation (dielectric) and the shield until the mandrel is completely covered. The ferrule is then slid over the mandrel and a crimping tool (PL-659A) is used to crimp the ferrule in place, thus securing and grounding the cable.

Once the cables are secured, the center conductors of both cables are connected to the "hot" side of the outlet.

Now that the cables are connected, the antenna outlet is screwed into position within the metal electrical box.



A plastic cover plate finishes up the job to provide an MATV outlet just as durable and attractively styled as the electrical power outlets in the room.



Two close-up photos for critical observation of any ghosts or interference present on a color-TV set connected to the MATV system. We note that the camera used in taking these photographs tends to be more critical than our eyes and the picture quality on both color-TV sets appears virtually perfect.

How to Convert Lookers Into Buyers

by Arthur G. Maxwell

When I was working my way through college, I had a part time job as a salesman in a now defunct department store. Although the depression of the 30's was in full swing, the store still had a lot of traffic—Lookers

■ Most of the salespeople had just given up trying to sell these *lookers* or just stood around watching them, or tended stock. Being young, ignorant, and perhaps most important, bored with the inactivity, I began to talk to the *lookers*. I discovered that 90 percent followed a pattern. Just for fun I began experimenting with methods of up-setting and penetrating the pattern to see how the *lookers* would react. At that time, it was generally accepted that (1) there was a depression on (2) these lookers were just killing time and (3) they weren't going to buy anything. Depression or not, killing time or not, I found that with my new methods and approaches I began making sales to the *lookers*.

Things are not much different today. We still have periodic "recessions," the stores are still full of *lookers*, and the salespeople still stand around watching them!

There is a popular conception that "every salesperson dreams of converting *lookers* into *buyers*," which is simply not true. Yet, it is not hard to convert a high percentage of the *lookers* into *buyers* if you know how to apply the extra sales push required.

In this article you will find a set of sales tools which, if mastered, will become the method by which you will be able to convert many of your business' *lookers* into *buyers*, even though the *lookers* show little, if any interest, in buying. And these methods and techniques will work in filling stations, hardware stores, boutiques, or anywhere where goods or services are sold. It doesn't make

any difference whether the *lookers* are men, women, teenagers or senior citizens, my sales tools, when mastered, will help convert them into *buyers*. All you have to do is master the sales tools, practice applying them, and you will soon be making sales you have been losing.

Converting *lookers* into *buyers* hinges on your being aware of the *lookers*' reactions to your extra sales push. Reading the *lookers* reactions is similar to reading a player's face in a poker game. People are not born with this ability, they learn it. This article will help you develop the necessary awareness. In addition, it will show you how to create the *desire to possess* whatever you are trying to sell in the mind of the *looker*.

Let's face it, if you don't light the fire of the *desire to possess* within the *looker*, no matter what you do, or what you say to your prospect, you will be ineffective and the *looker* will never buy the item from you.

Now, let's get going and learn how to convert those *lookers* of yours into *buyers*.

First off, you must find out if the *looker* has a current, future, or special interest in whatever you are showing him. To discover this, you must ask the *looker* discovery questions.

Here are some examples:

Suppose that a *looker* walks up to your display of automatic stereo record players. To find out if your prospect has a current, future or special interest in an automatic stereo record player, you must ask him discovery questions. Your dis-

covery question might be: "Madam, do you have a stereo record player?" If the *looker* says no, you have a prospect. If she says yes, divert her attention to another item, because she is generally not a real prospect.

At this point, let me caution you against using "canned" approaches and false sincerity.

How many times have you had a salesperson go into his spiel, sounding automatic, insincere and phoney? Or telling lies like, "I have one in my home and think it's wonderful." Or feed you a line of false flattery?

The expert salesperson analyzes the typical sales situations he is exposed to and composes a *personal set* of discovery questions appropriate to his typical situations. He carefully rehearses each one, just as an actor does, until he has perfected their presentation and can use them smoothly, convincingly and project them with a real feeling of sincerity.

Now, let's go back to our example situation.

Let's say that your "looker" doesn't have an automatic stereo record player and so can be considered a prospect.

There are several approaches that you can take. One is to try and evoke in your *looker* a sense of personal pride that arises from the ownership of whatever you are trying to sell. Here are a few ways to do this:

Using your discovery questions, find out if any of your *lookers*' friends have a comparable automatic stereo record player. If they don't,

you can exploit the fact that your *looker* will be the first one in her set to have one. This is the technique of making her friends and neighbors green with envy.

Another approach is to convince your *looker* that the mere possession of the item you are trying to sell her will give her great personal satisfaction. For instance: The cabinet of the stereo record player is such a beautiful piece of furniture that she will get endless pleasure just looking at it. Or that the music it reproduces for her will give her great personal satisfaction because of its perfection and quality.

Another approach along this line is to convince your *looker* that the item you are trying to sell her will allow her to do something that she can't do now. In the case of the record player, owning it will allow her to listen to hours of music without having to get up and change records, because it is completely automatic. (If you were trying to sell her an automatic dishwasher, she could watch television while the dishwasher did her work.)

Convince your *looker* that ownership of the item you are trying to sell will allow her to do something that she now does far better, and do it more efficiently. An example of this might be that your record player will change records with absolutely no damage to the records, as well as increase the life of her records.

"Keeping up with the Joneses" is still a very real part of everyday life. Therefore, based on what you learn with discovery questions such as: "Do any of your friends or neighbors have an automatic, stereo record player?" you can quickly determine if this approach is applicable to this prospect. If she says that they do, you have a chance to successfully use the "keeping up with the Joneses" approach to convert your *looker* into a *buyer*.

You can, and should, create a personal reason why the *looker* should buy the item. Ideally this should be a personal reason that has not occurred previously to your prospect. Once again, this means that you must get "inside" your prospect by using your discovery questions.

Here are two examples of "personal reasons":

"The record player will look magnificent in her home."

"Ownership will put her in the elite class."

Personal reasons are some of the most vital factors determining whether or not a sale will be made. When a customer has no strong personal reason for buying, he or she becomes very difficult, if not impossible to sell.

Another area to explore is to find out if the item you are trying to sell will open up a new area of pleasure for the "looker." Show her that it will, and by so doing, create another powerful reason for your *looker* to want to own the item.

Don't overlook the fact that pleasure for an individual can exist in many different areas, such as: Evoking admiring glances; pleasure because of the results the item gives; pride of ownership; charming children to sleep; pleasure for use; and sensation from using the item. You must develop your ability to ferret out these hidden items through your discovery questions, and once they are known to you, apply your carefully prepared and rehearsed techniques to make the *looker* desire the item enough to buy it.

Many times the *lookers'* lack of desire to own the suggested item stems from insufficient knowledge of the specific merchandise you are trying to sell him. You can easily discover this by means of your discovery questions. If you discover this to be the case, you can, by proper handling, unlock the *looker's* sales resistance. It is extremely important that you present information about the item as quickly as possible. You may have to educate your *looker*. This has a plus value even when it is not the main approach that you are using with a particular *looker*.

Try to show the *looker* that the item you are trying to sell her will make it easier for her to do something she dislikes, but which she has to do regularly in her life. In the case of the stereo record player, it would relieve her of the necessity of changing records so often. Or perhaps the fact that your machine turns itself OFF automatically, thus relieving

her of the worry, "Will it be ON all night?" You must have a whole repertoire of possible benefits, carefully prepared, rehearsed and ready for instant use.

I made a survey of 40 stores, from small proprietorships to the largest of chain stores. I did not find a *single* salesperson who was sufficiently conversant with Consumer Union's rating of the products they were trying to sell to be able to turn that rating to their advantage if it was complimentary, or to refute it if it was uncomplimentary! Yet, here is one of the greatest selling tools you can have—a Consumers' Union report on the product you are trying to sell. Why not use it to turn *lookers* into *buyers*?

You must give the *looker* hands-on experience . . . I mean you've got to get the product into her hands . . . make her hold it, examine it, open it, start it, stop it, or do something with it.

Have you ever watched a floor salesman in a department store try to sell record players or television sets? Have you ever seen one of them **make** the *looker* open the unit, put on a record, play it, turn the controls and become immersed in the product? If you have seen one in a hundred do this, you've seen a lot. Don't believe me, go into Sears, Ward's, Macy's, Gimbles, or the local appliance store and find out if the salesperson **makes** you operate the device and become immersed in the product. Some 99 times out of 100, the salesperson will be a "gentleman" and operate it for you, while you stand by self-consciously watching him. You certainly are not being given "hands-on" experience with the product.

By failing to give you "hands-on" experience with the product, the salesperson loses some of this chance to make the "looker" desire the product.

When you are pushing a new item, merchandise that has been presented before, you can, and should, exploit the "first possession" factor. You will find that in a great many *lookers* the urge to be the first in her set, or in her neighborhood to have the item is a very powerful

continued on page 54

Looking Ahead to 1980

by Sky West

After reading some of a study made by the Rand Corp., known as the Delphi Study and the Kiplinger Forecast of Washington, D.C., they make a very remarkable over-lay. That is: The service dealer industry may undergo substantial changes in the next few years!

■ For the most part these reports are not specific predictions about what happens to the service dealer, but rather what will happen to industry on a general forecast. These conclusions may be broken down into five broad areas as follows:

Technical

By 1980, computer assisted design, computer assisted quality control, plug in circuits, etc., will reduce the malfunctions of home entertainment systems greatly. However, more and more gadgets will appear on electronic equipment to go wrong. Equipment will undoubtedly be more sophisticated, but in one sense easier to service for an outside man. Again, there will be larger quantities of electronic devices to service in the home and the outside man will undoubtedly have to be knowledgeable and versatile on all home electronic products.

The bench man as we know him today and the percentage of total volume of work he will accomplish will be less. Again he will have to be much more knowledgeable and versatile. The benchman and the outside service tech both will have difficulties if they do not subscribe to a regular program of training of some type. Perhaps a program like the JESUP training program could meet these needs, providing the manufacturers will cooperate.

From the looks of it, over 10 percent of the present business and present technicians of the industry

will be squeezed out by 1980. There will actually be lesser numbers of technicians and businesses even though a larger volume of business will be conducted. The squeeze will be brought about by the like of technicians and service dealers staying with the "state of the art" in technology and in management.

Management

By 1980 a major problem for the independent service dealer will be marketing his service. Two-step procurement will gradually dig into the traditional wholesale house. We will be buying more and more from manufacturers. A closer relationship between the good TV manufacturers and the TV service dealer will be obvious. The manufacturer will have a tighter control on his franchises. Realizing this situation also puts a great possibility of some rascal manufacturers increasing their own service facilities to meet the public demands.

There will be a larger spread between the sales dealer and the service dealer, as well as an even greater trend to specialize. One of the major factors is certainly a sharp demand for increased productivity and more sophisticated management. This perhaps will increase a squeeze on the number of service dealers also.

Foreign competition is still another, a fear that it will swamp us, that the United States will slip far behind other major trading nations.

Wrong again. Some crippling set-

backs, surely . . . lines that will suffer or even fold. But other lines will expand sales, enlarge the market for our goods to service for years to come. But these should not take your eye away from forces of growth . . . even pollution control, an *expense* for many, will mean profits for others.

To capitalize on the new boom, you will need better management, sound planning, better tools and aids that help you to distinguish right from wrong. You will need to spot new markets early, before they're crowded. You will need to tune in on a changing "lifestyle" in America . . . one that affects work, family forming, leisure time use, retirement, etc. Young adults will be the fastest growth market, now through 1980. People 25-34, and those 35-44, there will be large gains for both groups, the former expanding by 25 million by 1980.

These years are spending years, a time for acquiring things. These young adults are bright, individualists, leisure minded. Though families will be smaller, there will still be millions of births. They will be in the market for all sorts of electronic devices, TV's, Hi-Fi Stereo, cassette tapes, video tapes, musical items of all types in their first and second homes, in their autos, their campers, their boats, etc.

The "hippie" years have made this an unusually artsy-craftsy generation. Moreover, it is a generation that has a lot of time to kill. Fewer kids mean they are less "tied down" and better able to roam here and there.

Other markets will be growing also, now through the 70's. Many older Americans, people 65 and over. So, interest in retirement living and in retirement *preparation*. Also: In diet foods, health care, reading aids, peace and quiet with plenty of electronics.

People will live in big cities and suburbs—the majority of them—strip clusters of people on the Coasts, in Florida, in the Southwest and, more and more in Dixie.

The new boom could last for years . . . through this decade . . . or further. The 60's saw a similarly long-lived period of growth in the

continued on page 57

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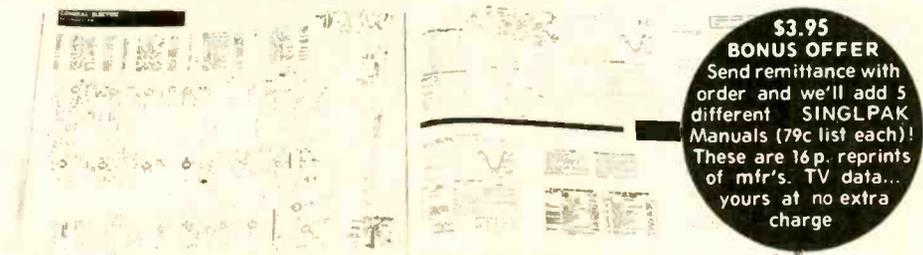
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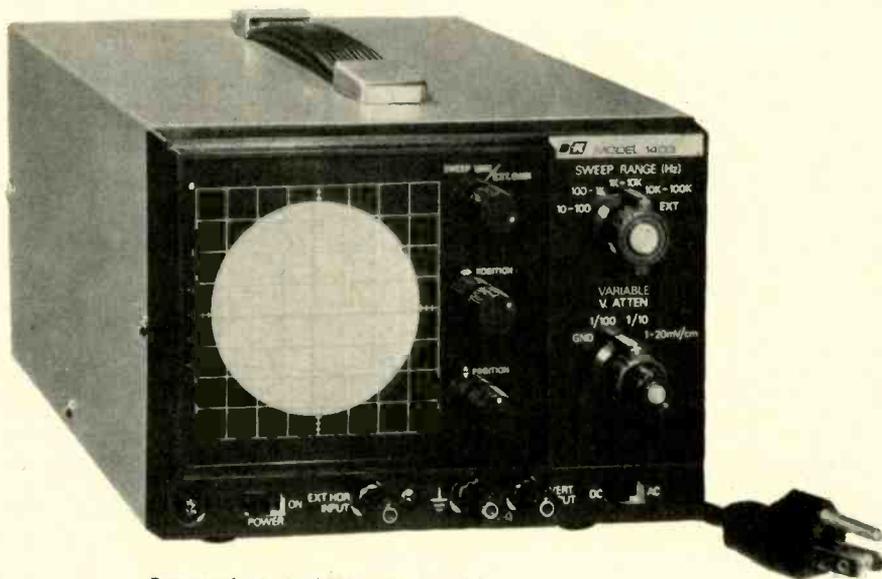
... for more details circle 106 on Reader Service Card

TEST INSTRUMENT REPORT

Dynascan's Model 1403 Scope

by Phillip Dahlen

A lightweight, portable instrument for those jobs other scopes are too expensive to perform



Dynascan's Model 1403 solid-state 3-in. scope. For more details circle 900 on the Reader Service Card.

■ Much past editorial effort has been given to promote the use of triggered-sweep bench scopes having a bandwidth of at least 10MHz. These expensive instruments permit the formation of useful traces corresponding to signal conditions that cannot be observed by other scopes. However, how many electronic technicians are strong enough to toss a 40(+)-lb instrument into their repair kit to lug around from cus-

tomers to customers? And how many of these technicians are ever going to bother to check a defective consumer product in the field for the proper alignment of video and chroma circuits? Probably none that are making any money—this being a job for the bench!

However, there are times when an electronic technician in the field wishes he had access to a scope . . . maybe to locate a defective IF cir-

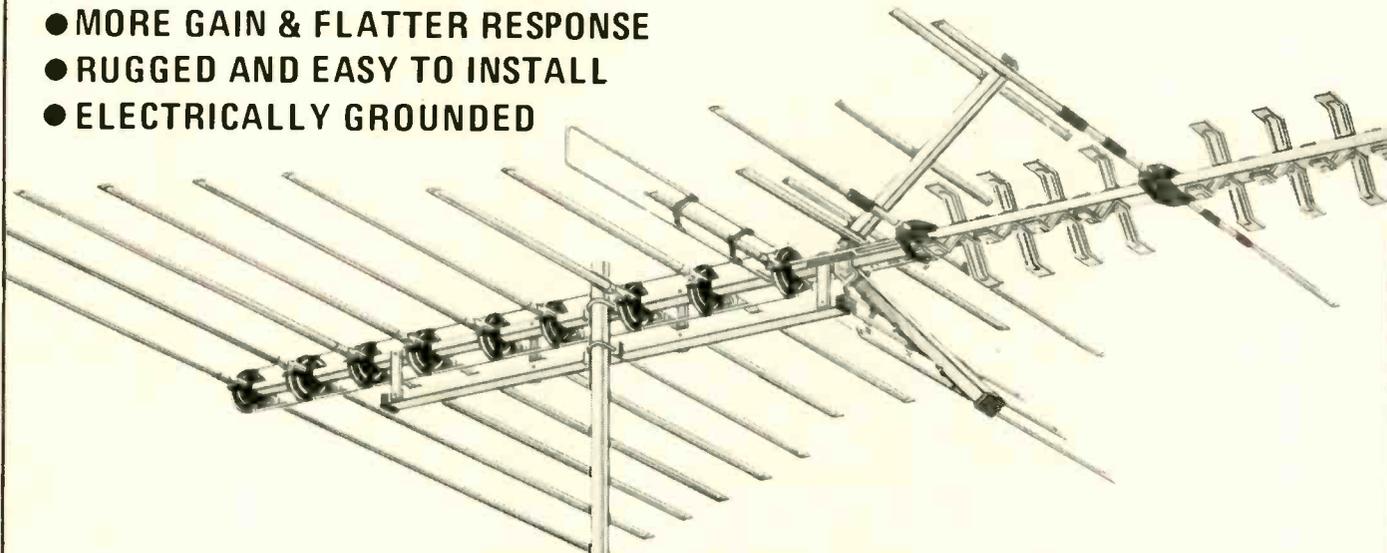
cuit or to locate a source of audio hum or noise . . . or just to make some preliminary checks so that he can give the customer an estimate before taking the set into the shop for repair. This calls for a scope, but not necessarily one that can do all those things required of one in the shop.

To fill such a need, and to eliminate the worry associated with carrying a real expensive scope in the field, Dynascan has introduced its B&K Model 1403 solid-state 3-in. scope, which is said to be extremely rugged yet weigh only 8.5 lb. Its overall dimensions are reportedly 5¼ by 7¾ by 11¼ in.

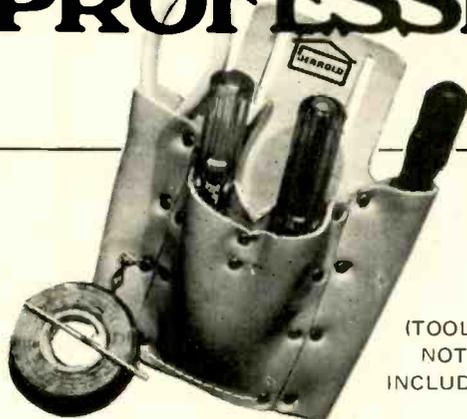
Other manufacturer specifications include the following: The scope has a bandwidth of dc to 2.0MHz, plus direct-deflection terminals for viewing waveforms to 150MHz. It is 100 percent solid-state and has dc amplifiers on both horizontal and vertical axes. A wide-angle CRT is used to reduce case depth. Vertical sensitivity is 20mv/cm or better. Maximum input is 600v p-p; input impedance, 1M shunted by 30pf. Continuously variable GAIN control range is greater than 22dB. There are four continuously variable time-base ranges from 10Hz to 100kHz. Power requirements are 117/234v ac, 50-60Hz, and a three-wire grounded line cord is provided. ■

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BOOK REVIEWS

COLOR TELEVISION THEORY AND SERVICING by *Clyde N. Herick*, published by *Reston Publishing Company*, 374 pages, hardbound.

Far too many authors when preparing a new book these days merely collect manufacturer literature and schematics and prepare a hodgepodge of information that is at least better than nothing. This is definitely not the case with the material prepared by

this author, who is also a member of the faculty at San Jose City College.

This is certainly an up-to-date book concerned with the servicing of hybrid or all solid-state color-TV chassis. It is not intended for the beginner, but instead requires that the reader have at least a little knowledge of B/W-TV sets and some arithmetic, algebra, geometry and trigonometry.

In writing this book, the author concentrates strongly on theory: What colors make up a colored picture and how, the electronic processing of these color modulated signals, why the old disk color system didn't work, what

happens to produce dynamic and static convergence, etc., etc. No attempt is made to catalog every possible servicing problem that you may or may not eventually encounter. Instead the author clearly describes how things should work in a color-TV set so that this basic knowledge can be used to effectively service all makes and models.

If you are going to prepare a technical library, this book should *definitely* be in it.

TELEVISION SIMPLIFIED, SEVENTH EDITION by *Milton S. Kiver and Milton Kaufman*, published by *Van Nostrand Reinhold*, 612 pages, hardbound \$15.95.

When you update and revise a book six times, as has been done for this one, there is little excuse for any error. And thus this is a highly developed text concerned with all aspects of video signal formation, the reception of TV signals, the TV-set circuitry for signal processing, and the formation of the final color-TV picture. Although some rather sophisticated mathematics (for the average reader) is included in the book, this can be ignored, still offering the reader valuable information.

The authors still rely more heavily on tube than solid-state circuitry when describing circuit functions, but the principles covered are so fundamental that this is of little importance.

Although the authors do not provide enough circuit description for effective general servicing, this book together with detailed manufacturer circuit descriptions (obtained from other sources) will certainly make one a much more effective electronic technician.

BASIC ELECTRICITY AND BEGINNING ELECTRONICS by *Martin Clifford*, published by *Tab Books*, 256 pages, hardbound \$7.95, paperback \$4.95.

Except for 11 pages of material near the end of the book, this recently copyrighted book could have just as easily been written 45 years ago. This does not mean that the information included is obsolete, but rather that it is so basic that it is just as important now as it was then. The remaining 11 pages are just as basic but concern semiconductors.

This book appears to be one that would be of interest to either the person with no background in electronics that wishes to consider entering our profession, or the more experienced electronic technician who might flip

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through the pages and scan material in review. Again, this is intended as no criticism of the author, who does have an interesting style of writing, but as an indication of how basic the material is.

Some of the subjects in this book include: How it all started, steps toward current control, basic definitions, static electricity, ac and dc current generation, resistors, current carrying capacity of wires, capacitors and coils.

MARINE ELECTRONICS HANDBOOK by *Leo G. Sands*, published by *Tab Books*, 192 pages, hardbound \$7.95, paperbound \$4.95.

There have been many changes recently in FCC regulations concerning Marine Radio. Although the best source concerning these regulations is, of course, the rules themselves as published by the FCC, this book does provide the prospective owner of marine equipment or the electronic technician thinking of entering this field with a general idea of what it is all about.

Some of the subjects covered in the book include the following: The his-

tory of Ship-to-Shore Radio, frequency bands available, types of stations, communicating range, selection of equipment, general receiver and transmitter design, basic tank and antenna circuits, power supplies, direction finders, and a summary of FCC regulations.

The author, who is also editor of *CB MAGAZINE* and *C/NE MAGAZINE*, provides a well rounded outline of information that one must know before they can really get into this field. However, it provides no substitute for the training required for an electronic technician to obtain the necessary FCC license to work in this field of communications. Neither does it include the necessary specifications for selecting and servicing Marine Radio equipment. Within these limitations, this is an excellent book.

BASIC ELECTRONIC TEST PROCEDURES by *Irving M. Gottlieb*, published by *Tab Books*, 416 pages, hardbound \$9.95, paperbound \$6.95.

The title of this book may confuse some of our readers and cause them to believe, falsely, that this book is

for but the beginner. Instead, it could more accurately be described as an excellent aid for electronic technicians at any level of skill.

As strange as it may seem, many successful electronic technicians still fail to realize that there can be significant errors in the measurements made with even the best VOM's if they are made at the extreme high or low ends of the scales. The book explains why. It also includes such fundamental circuits as the wheatstone bridge and alternate methods for determining resistance. At the other end of the spectrum it goes into detail concerning the use of Lissajous Figures for frequency measurement and observing the firing characteristics of triacs. A six-page index makes this book a handy reference for locating information needed concerning any particular problem encountered in making measurements required for servicing special circuitry.

This book should be considered a must for all electronic technicians concerned with upgrading their technical skills so that they can be considered more efficient at their work. It covers virtually all types of measurement required in our area of electronics.

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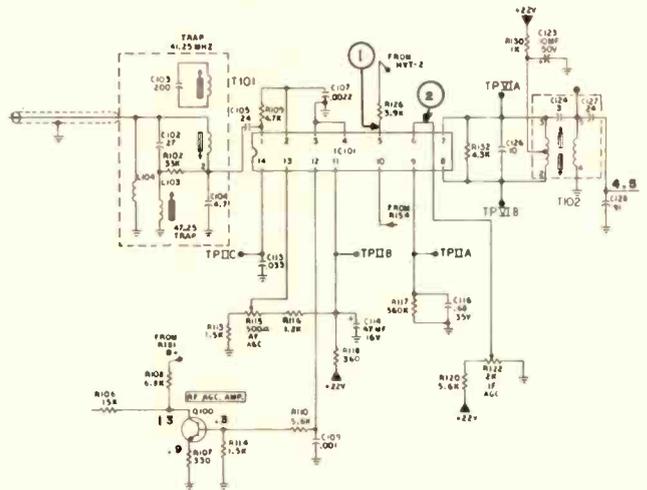
COLORFAX

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

GENERAL ELECTRIC

Color-TV Chassis JA—Repair Information

Symptom: Weak video—no snow between channels.
Repair: Check the voltage at Pins 7 and 8 of IC101 (IF/AGC). If the voltage on either pin is less than 15.5v, then check for an open or short in Transformer T102.



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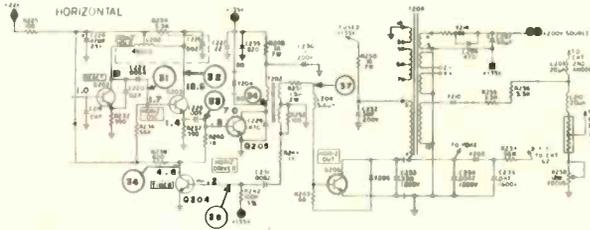
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Symptom: Gear tooth effect, or ragged edges on outlines because of random horizontal scan line displacement. Varies with BRIGHTNESS/CONTRAST control. **Repair:** Damp-er diode Y206 may be open or there may be a poor solder joint at either end of Y206. In some cases the TV set may operate normally but transistor Q206 may draw more current than normal, causing unexplained failure. Diode Y206 can be checked in the circuit by measuring the resistance between the case (collector) of Q206 and the chassis ground. It should read about 7Ω in one direction and more than $1K$ in the other direction.



Symptom: Repeated failure of transistor Q206 (horizontal output). This symptom may be caused by an incorrect drive pulse to the base of Q206 which results in over dissipation of Q206. **Repair:** Check the voltage at the collector of the horizontal-drive transistor Q205. It should be $70v \pm 10v$. If it is incorrect (usually goes to about $120v$), check transistor Q204 for opens or shorts. Check resistors R238, R240 and R244, and capacitor C231 and associated wiring for opens. Check especially for a poor solder connection on the wire jumper from the B+ end of resistor R238 to +22v. This jumper is under the horizontal oscillator coil shield can.

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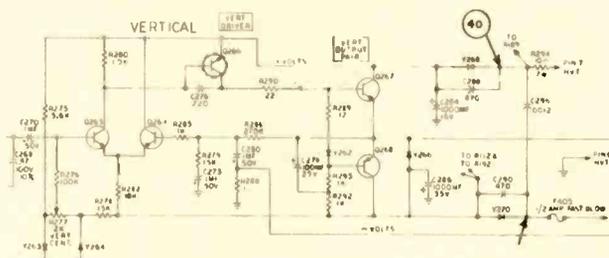
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Symptom: Two vertical "drive" lines—one on each side of the screen. **BRIGHTNESS** control may vary width of the lines. **Repair:** Damper capacitor C234 may be open, or there may be a poor solder joint on either end of C234.

Symptom: Fuse F404 fails (19-in. JA only)—current reads normal about (400-550ma), and resistor R199 may be burned. **Repair:** Look for a discolored or melted spot on the back of the picture tube socket at pins 6, 2, or 11. This indicates that the picture tube has arced and caused shorting of one of the 1K resistors inside the socket in series with each cathode wire. This allows normal picture tube arcing during early life to bypass the spark gaps, causing damage to the above components. If the discoloration or melted spot is not noticed, check the resistance from the circuit board plugs to pins 6, 2 and 11 in the socket, which should be 1K. Change the socket if defective.

Symptom: Dim raster—no video or scan lines. Looks like poor focus or a picture tube. **Repair:** A shorted vertical output transistor (Q267 or Q268) may cause the raster to be deflected completely off the screen. Secondary emission in the picture tube causes the above stated symptom. Transistor Q267 can be checked for a short in circuit. Transistor Q268 must be unsoldered to be checked.

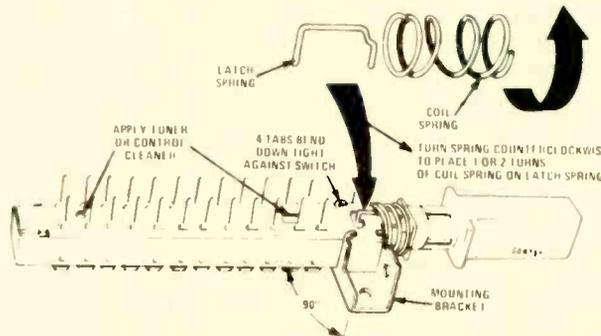


MOTOROLA

Color-TV Chassis TS-929/931/934/938—INSTA-MATIC Switch will not Function Properly

If the INSTA-MATIC switch locks down but will not release or switch will not lock down and there is erratic, mechanical action, make the following corrections:

The switch body may not be properly positioned relative to the mounting bracket. Align the switch body perpendicular to the bracket and tighten the four mounting tabs as



shown in the illustration. Turn the coil spring to place one or two turns over latch spring, whichever obtains the best action. The latch spring may be distorted. If so, replace it with latch spring Part No. 42P63085.

If the switch has intermittent electrical action, make the following corrections: The replacement of switch contacts may be avoided by spraying inside of the switch with good grade of tuner or control cleaner (Part No. 11P65176A04).

tional Service Manager); Bud Petzold (Motorola Service Manager); Paul King (Sylvania Service Representative); Ed Polcen (Zenith Service Representative); Jesse Leach (NEA Region One Vice President); Walter Cooke (NEA Region Two Vice President), the VEA Immediate Past President and recipient of the President's Plaque for outstanding services to VEA.

Denver Chapter of CPEA Adopts Code of Ethics

The Denver Chapter of the Colorado Professional Electronics Association—an association of Television, Radio and Electronics Service Technicians—adopted a Code of Ethics which is one of the most explicit and binding in the industry. The Denver Local, whose president is Mr. William K. Parker, has set standards defining advertising terms, technician qualifications, the firm's responsibility to customers seeking service, among other things. The terms: Service Call, Trip Charge, Inspection Fee, Estimate, etc., are spelled out to eliminate all confusion and misleading types of advertising. Also the Code requires that all warranties be specifically stated on all receipts and protection of customer property be provided for by compulsory insurance or proof of financial responsibility.

It is anticipated that this Code of Ethics will be adopted by the entire State Association of CPEA and will be a model for the entire industry.

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NEW PRODUCTS

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

DIGITAL MULTIMETER 703

*Combines a multimeter
with a 20MHz counter*

A Model 3420 Multimeter Counter combines a four-digit multimeter, which measures ac and dc voltage and resistance, with a five-digit 20MHz counter in one compact instrument. For frequency measurements, the unit offers 100mv sensitivity to 20MHz. With a full five-digit display, 99999 maximum reading, frequency measurements can reportedly be made to crystal accuracy of 1×10^{-6} for one year without recalibration. Maximum resolution to 0.01Hz on any measurement can be realized by selecting one of five time



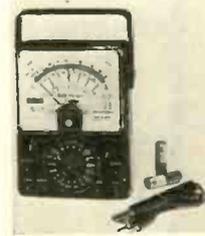
bases. The instrument has five dc voltage ranges from 10 μ v resolution to 1200v; five ac voltage ranges from 10mv resolution to 1000v; and six resistance ranges from 10m Ω resolution to 10M. The reported accuracy of the basic dc function is +0.01% of reading ± 1 digit. Hickok Electrical Instrument Co.

MULTITESTER 704

*Designed primarily for
service technicians*

A new family of Volt-Ohm-Meters (VOM) and accessories is introduced. The multitester includes test leads, batteries and an instruction sheet. As accessories, the company has provided four models of high-voltage probes, meter cases and a Universal Test Lead Kit.

This equipment has been designed for use primarily by service dealers and technicians. The Model VM-100K is the top of the line, with a sensitivity of 100,000 Ω /v. The Finney Co.



C-R REGULATED POWER SUPPLY 705

*No deterioration of performance
when subjected to an RF field*

A Model C-R Regulated Power Supply for bench testing of two-way radio equipment is designed to feature



remote control operation, dual output 1-20v dc, 0-4 and 0-40a, adjustable current limiting on both ranges and voltage limiting. The most significant feature of the unit is that there is reportedly no deterioration of performance when it is subjected to an RF field. Voltage input is selected internally by a terminal strip connection change. The cabinet size is 13 in. high, by 8 in. wide, by 13 in. deep. Lapp Co.

CRYSTAL CHECKER 706

*Gives go or no-go
crystal reading*

The Crys-Mate Model KC720, designed for caddy portability and on the job use, is simple to operate. An immediate indication of the working condition of any plug-in crystal, no matter what frequency, can reportedly be obtained. The unit gives an immediate go or no-go crystal reading, avoiding trouble shooting in other parts of the circuit if the crystal is faulty. The instrument can also reportedly be used as a frequency standard by plugging in the crystal of the frequency to be checked. TeleMatic.



TAPE HEAD AND GUIDE ALIGNER 707

*Aligns axis, height,
zenith and azimuth*

A new concept in accurate cartridge machine head alignment is introduced. It is reportedly the first instrument on the market to allow precision alignment in all three axis: height, zenith and azimuth. It is thus said to offer consistent tracking, reproduction and fidelity. Collimeter II may be used with all stereo and mono machines by manufacturers, broadcast engineers, home and auto stereo service techni-

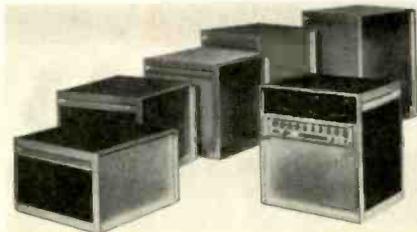


cians. An internal light source in one mode illuminates the head alignment of the pole pieces to the height and azimuth crosshairs. In the second mode, the indicator lamp triggers on only when sensors detect the proper zenith. Ramko Research.

INSTRUMENT ENCLOSURE CABINET 708

Anodized aluminum extrusions with colorful-finish aluminum-panel construction

A line of attractive cabinets are designed to enclose existing instruments or to serve as a decorative alternate to conventional rack mounting. These enclosures are reportedly formed of strong anodized aluminum extrusions with colorful suede-finish aluminum panel construction to ensure high standards of durability. Sizes ranging in standard incremental heights from 12.25 in. to 28 in. with a universal front panel size of 19 in.



are an extension of the company's series of front-loading cases. All cabinets are said to have integral handles and easy access back panels. The heavy-duty aluminum extrusion frame is designed with thread tracks to permit mounting braces and brackets. Buckeye Stamping Co.

ALIGNMENT TOOL 709

Hexagonal shaft for easy gripping

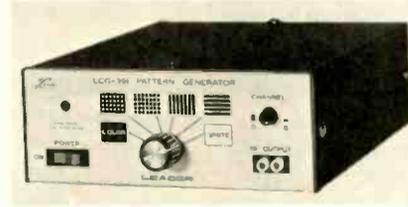
A new glass-filled nylon alignment tool is available with a 1/8-in. hex for use in Motorola business and communication equipment. One end is undercut to enable tuning bottom and top slugs. The 5-in. tool has a non-rolling hexagonal shaft to enable easy gripping. Injectorall Electronics Corp.

COLOR BAR GENERATOR 710

Incorporates a white position purity and balance adjustment

A solid-state, portable color bar generator, Model LCG-391, incorporates a white position PURITY-AND-BALANCE adjustment among six pattern

selections. Compact and light-weight, the unit reportedly provides binary-clock digital integrated circuitry to assure accuracy. The generator is said to also offer return-trace blanking for vertical and horizontal signals; flickerless horizontal lines; a square cross-hatch pattern for linearity checking;



two switch-selectable frequencies; front panel RF output connectors; ON/OFF rocker switch; and silver plated, integrated-circuit PC board construction. Leader.

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NEW PRODUCTS...

continued from page 53

ANTENNA SYSTEM 711

Designed to properly phase CB signals handled

The Model HTM "Twin Huskies" is introduced which includes two antennas — one for each side view mirror bracket on the vehicle. A uniquely designed phasing harness connects the antennas in the exclusive Hustler "Double-Talk" system which reportedly has superior performance over a single antenna installation. Stainless steel adjustable tip rods permit tuning the antennas for the lowest standing wave ratio (SWR), best impedance match and maximum signal radiation.

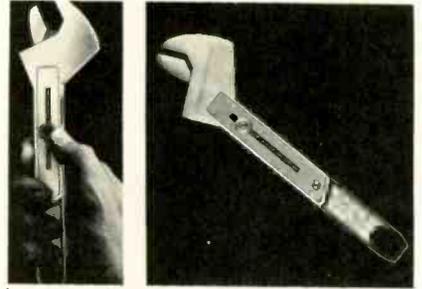


WRENCH 712

Adjustable with thin tool head

An adjustable open-end wrench features a slide adjustment located on the side of the wrench body, resulting in a thinner tool head. The body and jaw assemblies are said to be machined from stainless steel. The thumb operated slide adjustment drives the jaw through a high ratio worm-to-bevel

to bevel-to-worm gear train for easy adjustment in small increments. Nominal body size is 8 in. and the jaw ad-



justs continuously to 15/16 in. National Trail Trading Co.

HOW TO CONVERT...

continued from page 41

impulse towards buying the item. Train yourself to recognize the "first possession" factor in your "lookers." Prepare yourself to exploit this powerful impulse and you will make many sales that otherwise will slip by you.

Many manufacturers provide special displays for their merchandise. Most of these displays provide the *looker* with some good incentives to buy. However, most *lookers* will not become *buyers*, even with top notch displays, because they require "something extra" to create the desire to buy. That "something extra" is the personal selling ideas you have—ideas that are not contained in the display of the item.

When you tell the *looker*, "Here is something you will really want," you are almost sure to make her ask, or think, "Why?" The very act of thinking or asking "Why?" kindles the spark of desiring the item. All you have to do is fan it until the flames of ownership arise.

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When your *looker* shows little or no interest in the item you are showing her, it doesn't hurt your sales a bit to help her become a *buyer* by applying some extra sales push. You'll find it fun and profitable. ■

EXTRA PROFIT...

continued from page 27

dresses off checks given by customers. Set up a prize drawing as another method to find out who those cash customers are. Even if you don't use mailing lists, knowing the name and address of every customer can have considerable business value.

Friday Take the day off and make a tour of other shops and stores in the area. See what they are doing to get ahead of your own. Take measures to keep your leadership.

Saturday What one idea used in this schedule proved most productive? Try it again today and see if there isn't still more business to be had therefrom. Better still—give it real close study to see if it will not suggest something additional in the same general area which can be equally productive. ■

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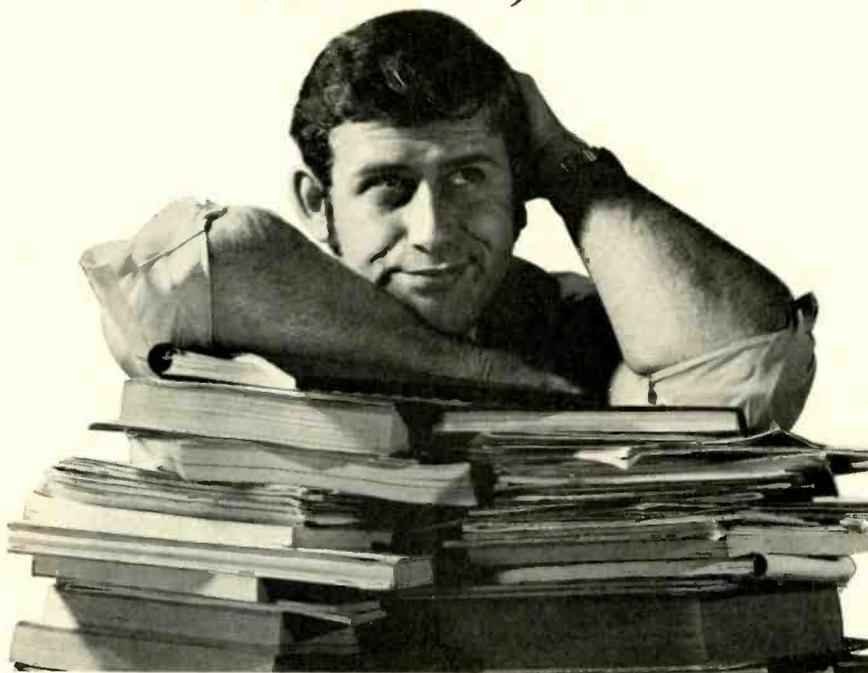
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TEKLAB REPORT...

continued from page 34

Brightness Limiting

The dc level of the fourth video amplifier transistor (Q908) is controlled by the brightness limiting transistor (Q906). The emitter circuit of this limiting transistor is biased by the voltage drop across resistor R930, developed by the picture-tube beam current from the high-voltage multiplier.

As long as the picture-tube beam current stays below 2.0ma, the brightness limiting transistor stays OFF. However, when the beam current rises to 2.0ma, the tripler's current through resistor R930 to ground lowers the brightness limiter's emitter voltage to $-.65v$. This biases ON transistor Q906 and in effect reduces its impedance, bringing the base bias of transistor Q908 toward ground, reducing its conduction. The resulting collector voltage rise in Q908 is dc coupled to Q910, a PNP transistor, causing its emitter voltage to also rise. The increased emitter voltage is connected through the drive controls (R958, R960 and R961) to the R, G and B amplifiers. A rise in their emitter voltage produces a rise in collector voltage, causing a voltage increase at the picture tube cathodes.

The picture tube grid voltage is held steady by a voltage divider network consisting of resistors R984, R987 and R988. The voltage drop across these resistors is coupled to the picture tube grids by resistor R985. When the voltage at the cathode becomes more positive with respect to the grids, beam current reduces. When it falls below 2.0ma, the brightness limiter shuts down.

Next month we will continue this article by describing some more of the interesting new circuits found in this chassis. They will include the color amplifier, automatic color level, chroma demodulator, Perma-Tint, 3.58MHz CW oscillator and the high-voltage sweep circuits. ■

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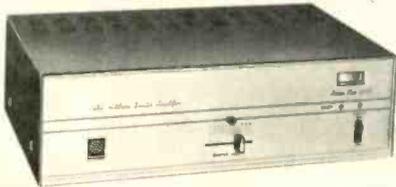
DEALER SHOWCASE

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

BOOSTER AMPLIFIER 713

Supplies up to 120w rms

Introduced is the Model 120B Booster Amplifier reportedly designed to work with all other Power Plus amplifiers or audio pre-amplifiers with sufficient sensitivity to accept the output of a radio tuner, crystal or phono cartridge or tape deck with pre-amp. The booster unit reportedly utilizes the TONE controls of the interfacing equipment and supplies up to 120w



rms. A convenient VU meter monitors the power output and there are two high-impedance inputs for driving the amplifier and output impedances of 4Ω, 8Ω, 16Ω or 6.25Ω at 25v and 49Ω at 70v balanced and unbalanced. The unit reportedly employs IC's and other long-life components for ultra-reliability—including modular driver and pre-amp circuits. Safety circuits are designed to protect it from shorts, opens and overdrive. Fanon/Courier Corp.

UHF/VHF SCANNERS 714

The smallest scanner to be introduced

The Sentinel package is reportedly the smallest eight-channel scanner yet to be introduced and includes eight-channels for scanning, lock-out



switches, manual or automatic scan operation and ac/dc capability. An important feature of the unit is the priority channel, which reportedly assures the reception of the most important or "priority" designated chan-

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LOOKING AHEAD...

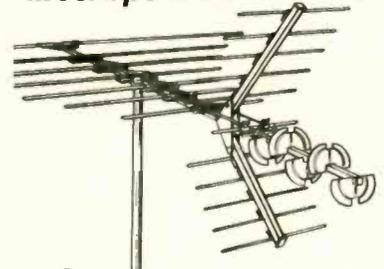
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economy. Oh, there will be interruptions, periods when the boom pauses, or the economy flattens, falls a bit. But long-term depression is over. It is important to keep this in mind and gear your planning long range.

Ecology... clean-up... back-to-nature, more than words through the 70's. In time, billions to be spent renewing rivers, bays, the air, etc. This means more cost for firms to prevent environmental harm, but no halt to industry. Almost two million new jobs a year.

In all this, you will need directions to follow, trade associations will have to keep you informed, alert you to the changes, detours, dead ends in business, etc. With more leisure time, more and more trade association activities will be apparent as well as the real needs to stay with it by the service dealer. He will need guidance on a national scale as well as a state and local level on government policy, which will be political, taxes, controls, etc. Strong associations for the future is a must if a man wants to survive. ■

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DEALER SHOWCASE...

continued from page 57

nel. It comes equipped with cord/plug sets for either 12v dc or 115v ac operation. Also included is a screw-in telescoping antenna for VHF, and where applicable a separate VHF plug-in antenna. The receiver reportedly has a sensitivity of $3\mu\text{v}$ with selectivity rated at -6dB @ 9kHz . Linear Systems, Inc.

STEREO CARTRIDGES 715

Compatible replacement for either magnetic or ceramic cartridges

A new concept in stereo phonograph cartridges, termed Magneto-Ceramic, is designed to incorporate many desirable features of both magnetic and ceramic cartridges, at a low cost. Initially, two units are available. They are models 5600D, which is designed to track at 2 to 4 grams with an output voltage of 600 mv.; and 5601D, which is designed to track at 3 to 5 grams with an output voltage of 400 mv. Both cartridges use a .7 mil conical diamond stylus. Some unique features of the cartridges are that they

can reportedly be installed in tone arms using either a 1/2-in. mount or single screw inline mount—both of which are industry standards for turntables and record changers. The cartridges are reportedly compatible with any system and can be used to update older units or enhance newer equipment. EV.Game, Inc.

INDOOR ANTENNA 716

Includes push-button fine tuning system

The Model 10X808H indoor antenna is said to include an exclusive director/reflector ring to reduce ghosts and interference. The two five-section 46-in. chromed VHF dipoles rotate 180° and the Axial inductors on each dipole are said to augment reception.



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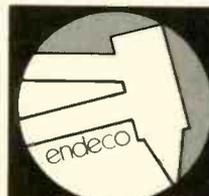
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Tape Recorders

A 48-page booklet packed with useful information on home tape recording methods and equipment offers a wealth of facts and tips for those who want to learn more about tape recording techniques. It includes a short course in tape recording terminology and technology for the layman, including an explanation of the various types of tape formats, their relative merits and applications. Emphasis is on cassettes, with sections on how to obtain the best results when recording, cassette care, maintenance, internal mechanical design features, construction details and even how to make minor repairs. TDK Electronics Corp., 23-73 48th St., Long Island City, N.Y. 11103.

Test Instruments

A new Product Selection Guide describes and illustrates the principal specifications for all of the company's products. Prices are also included. New to this year's catalog are a line of 4 3/4-digit multimeters, an economical 10MHz scope, and modified static card readers with interface electronics. The Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio 44108.

MATV/CATV Equipment

A 16-page short form MATV/CATV catalog and price list contains complete specifications on the "New Reliables" line of equipment—listing over 40 new additional products. Kay-Townes, Inc., P.O. Box 593, Rome, Ga. 30161.

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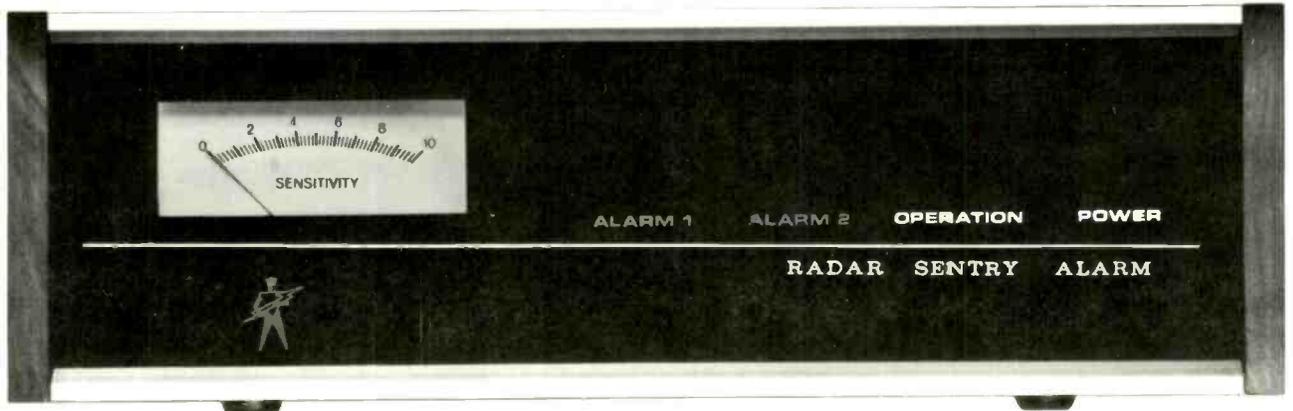
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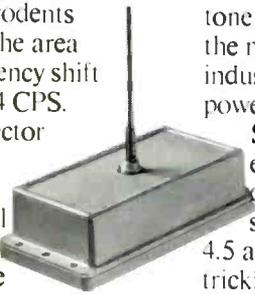


Technical information

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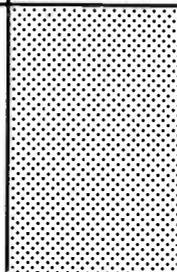
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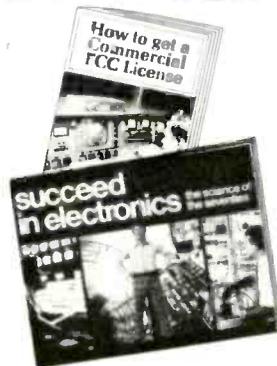
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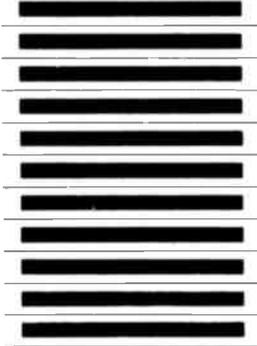
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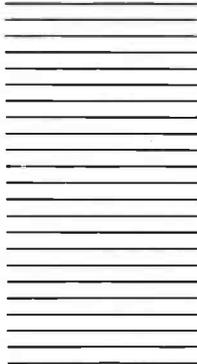
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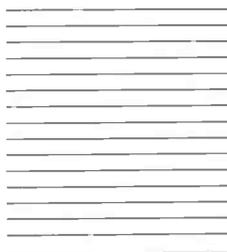


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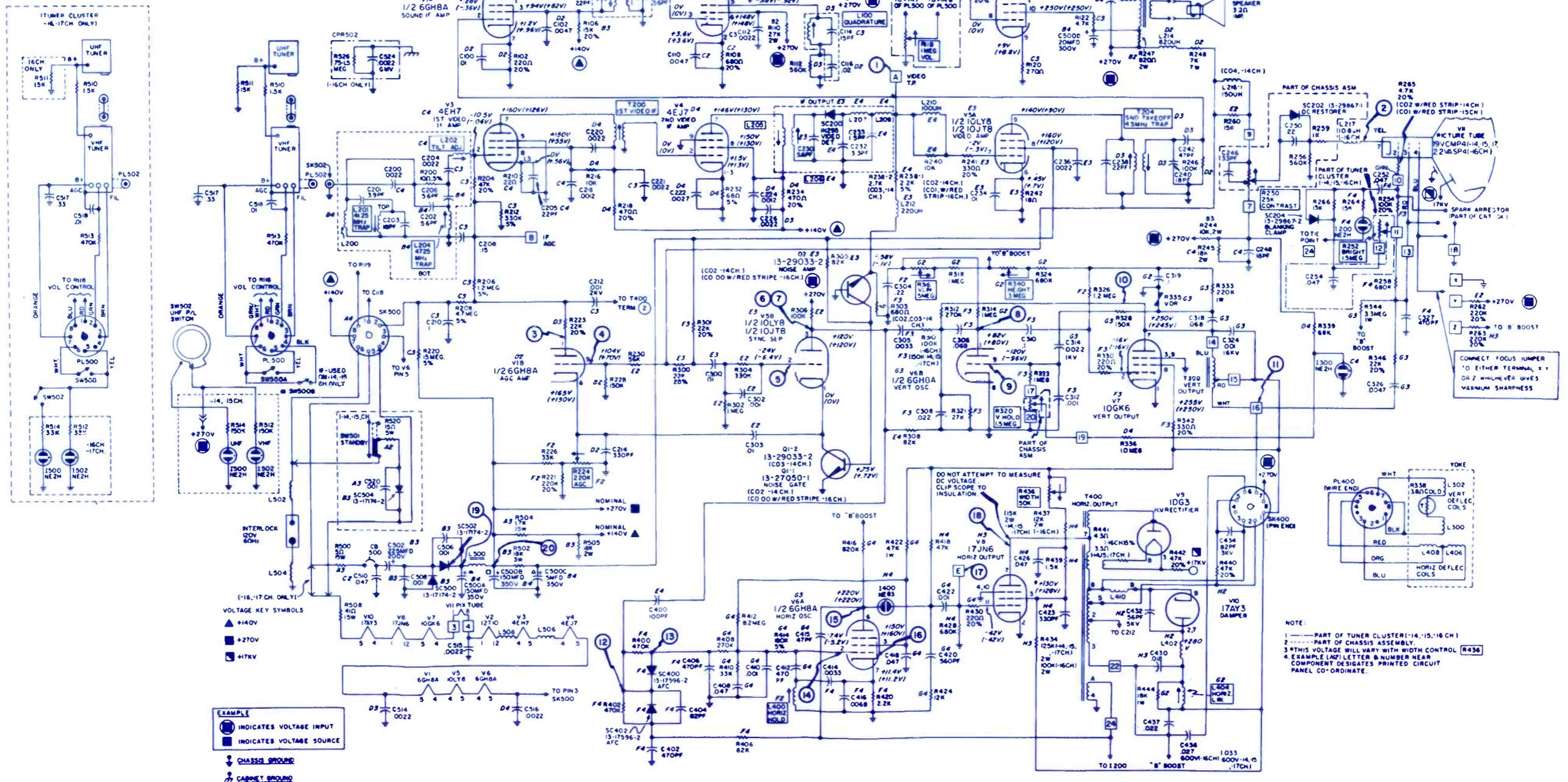
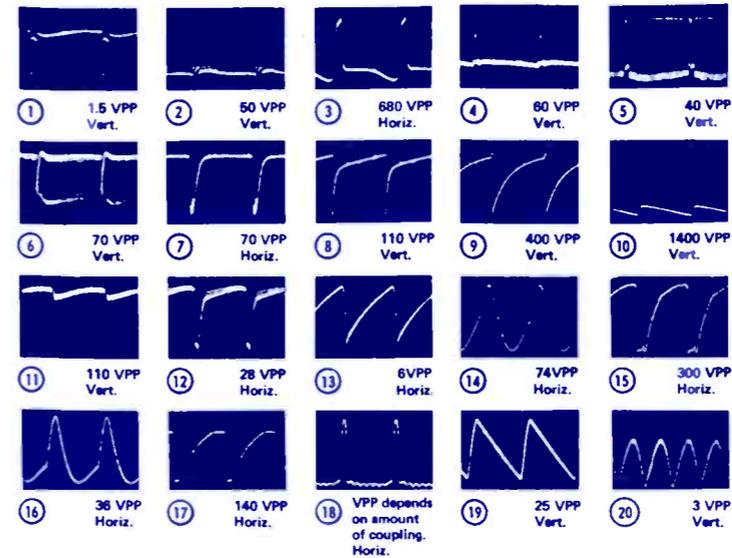
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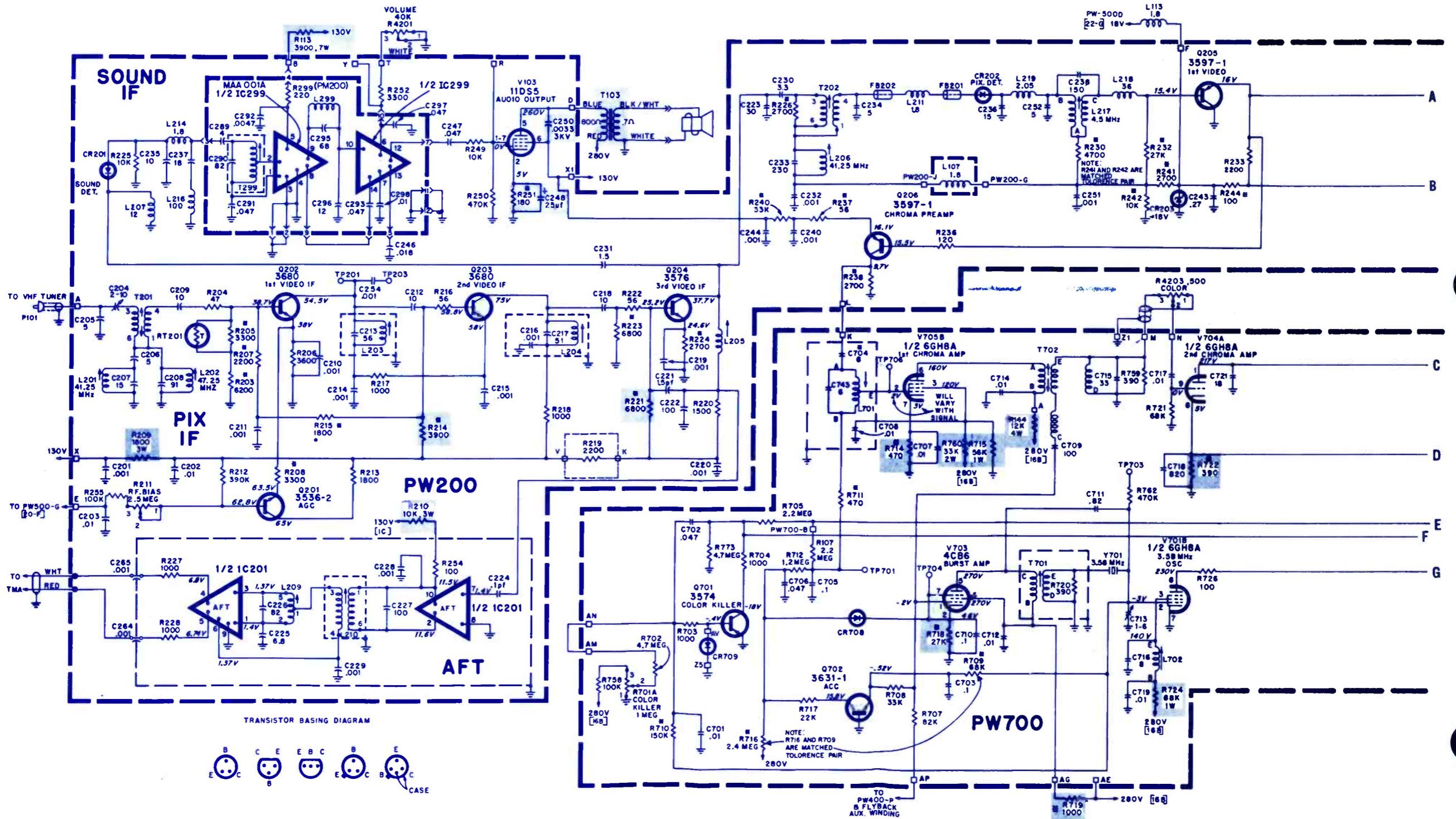
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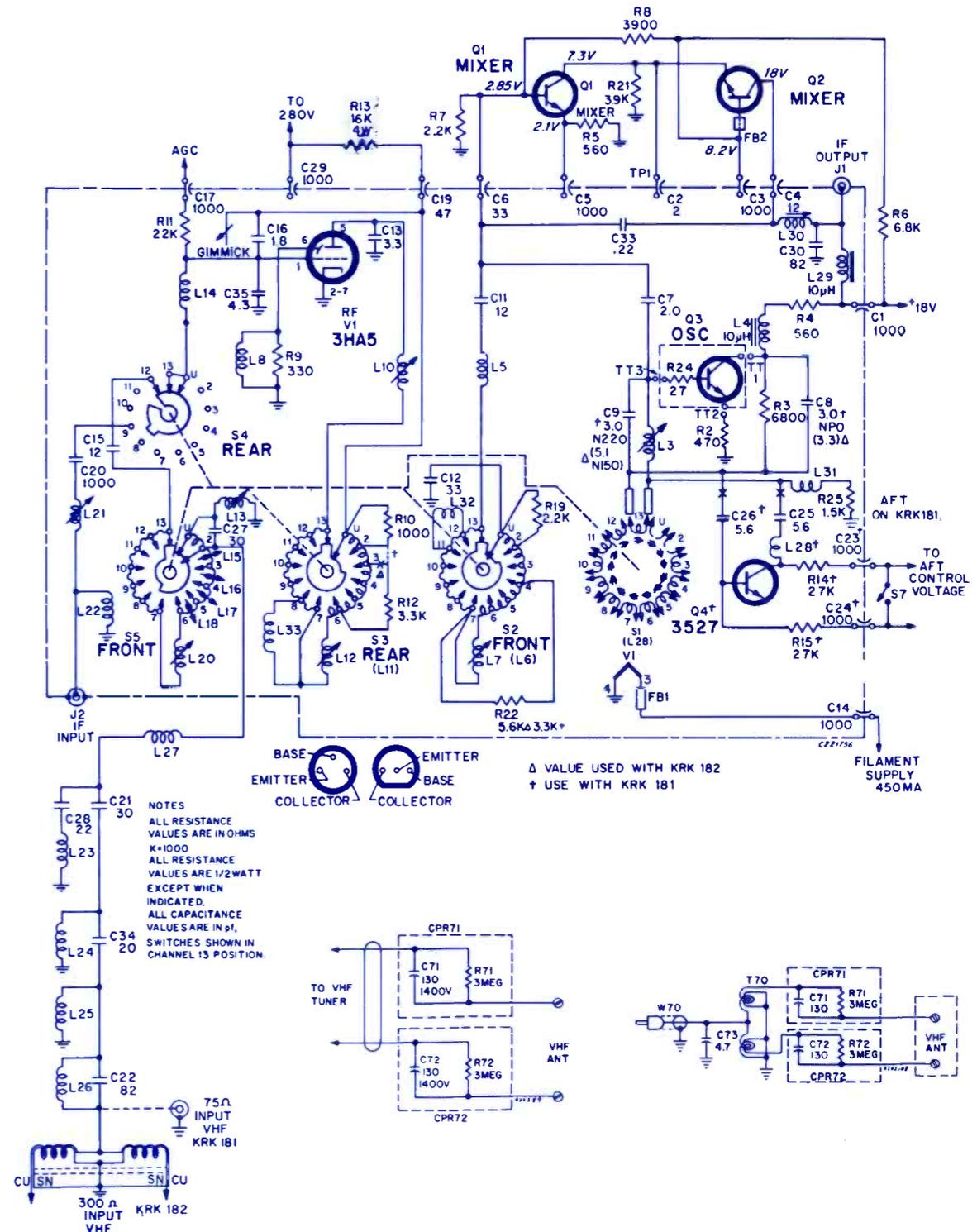
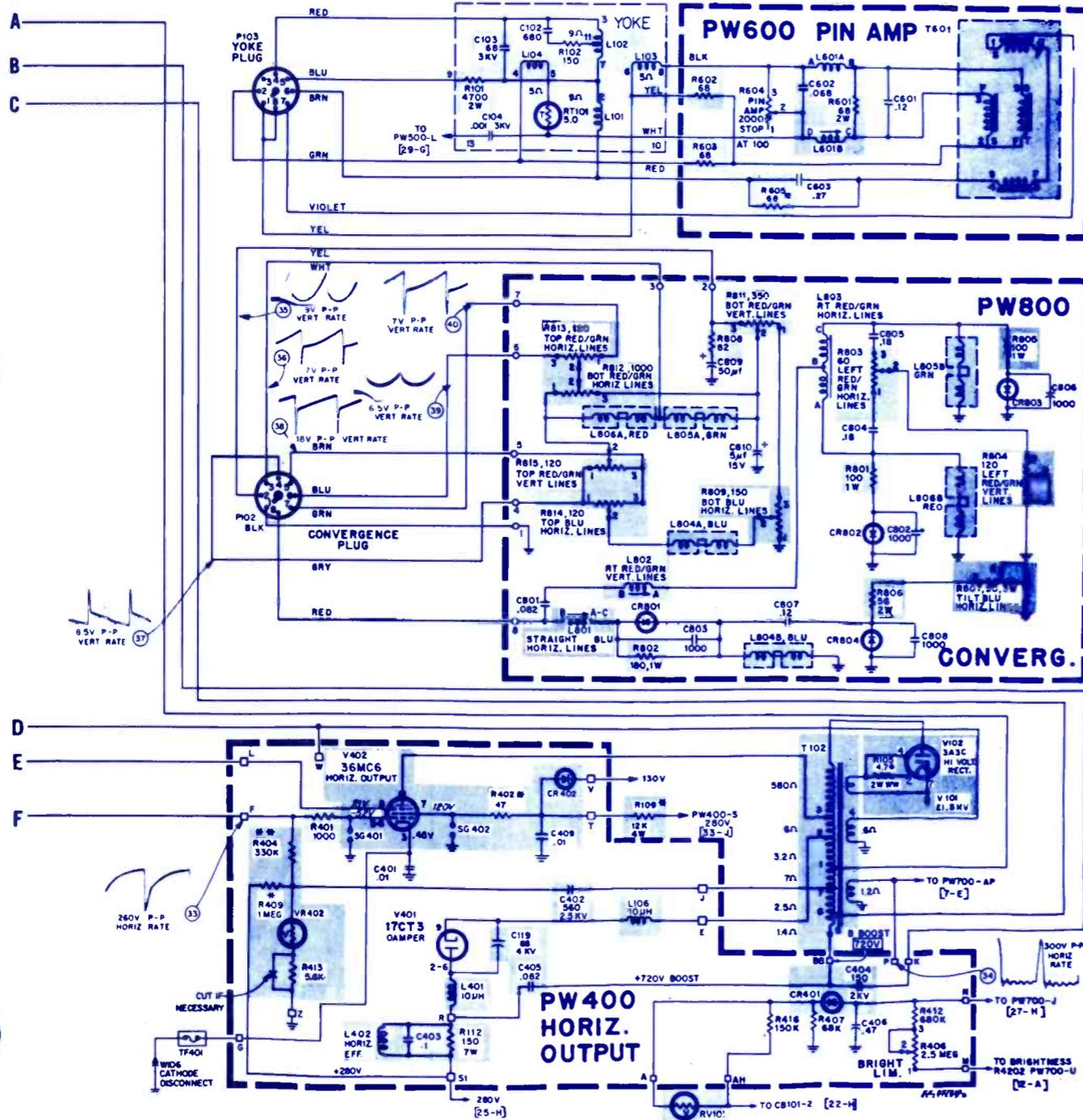
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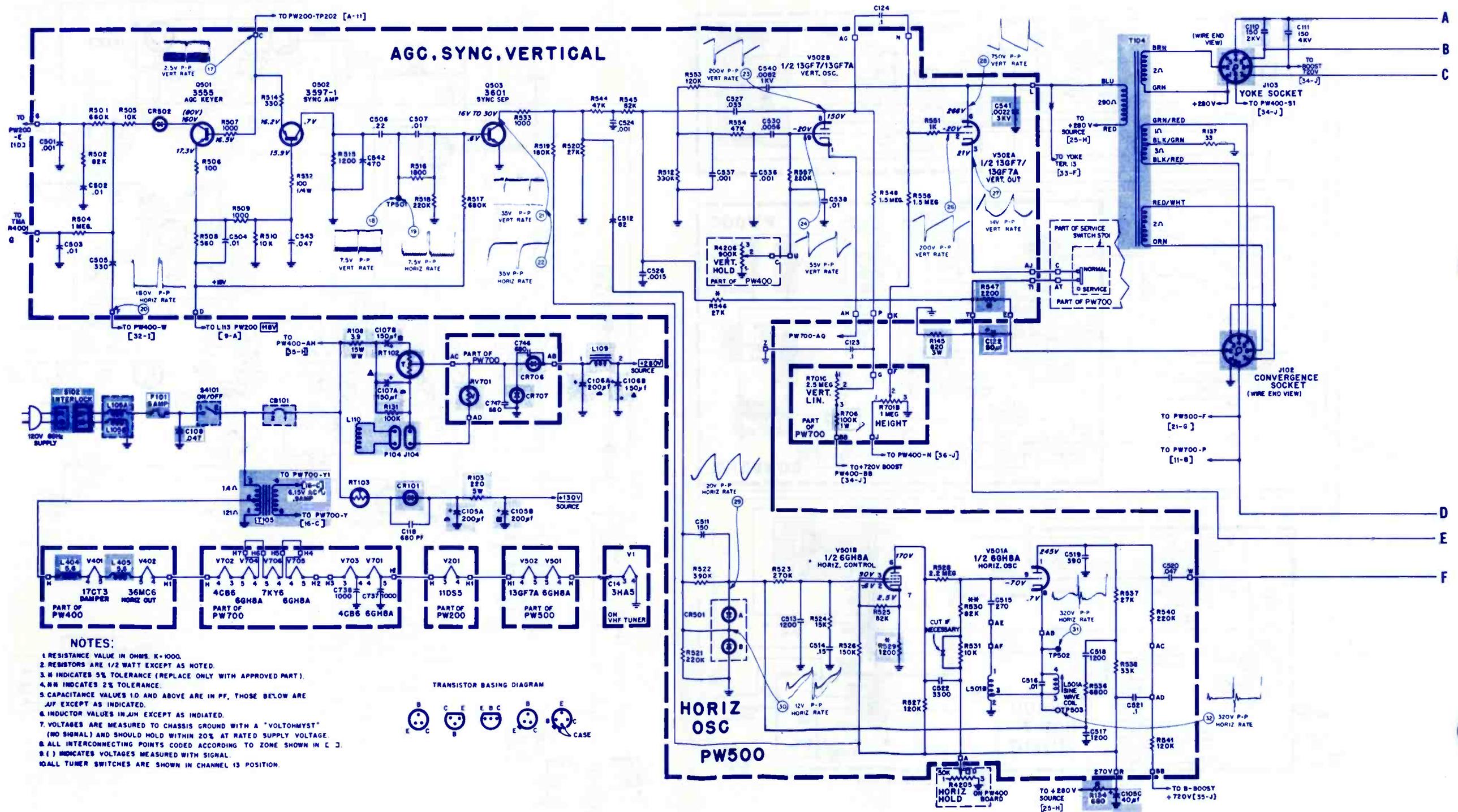
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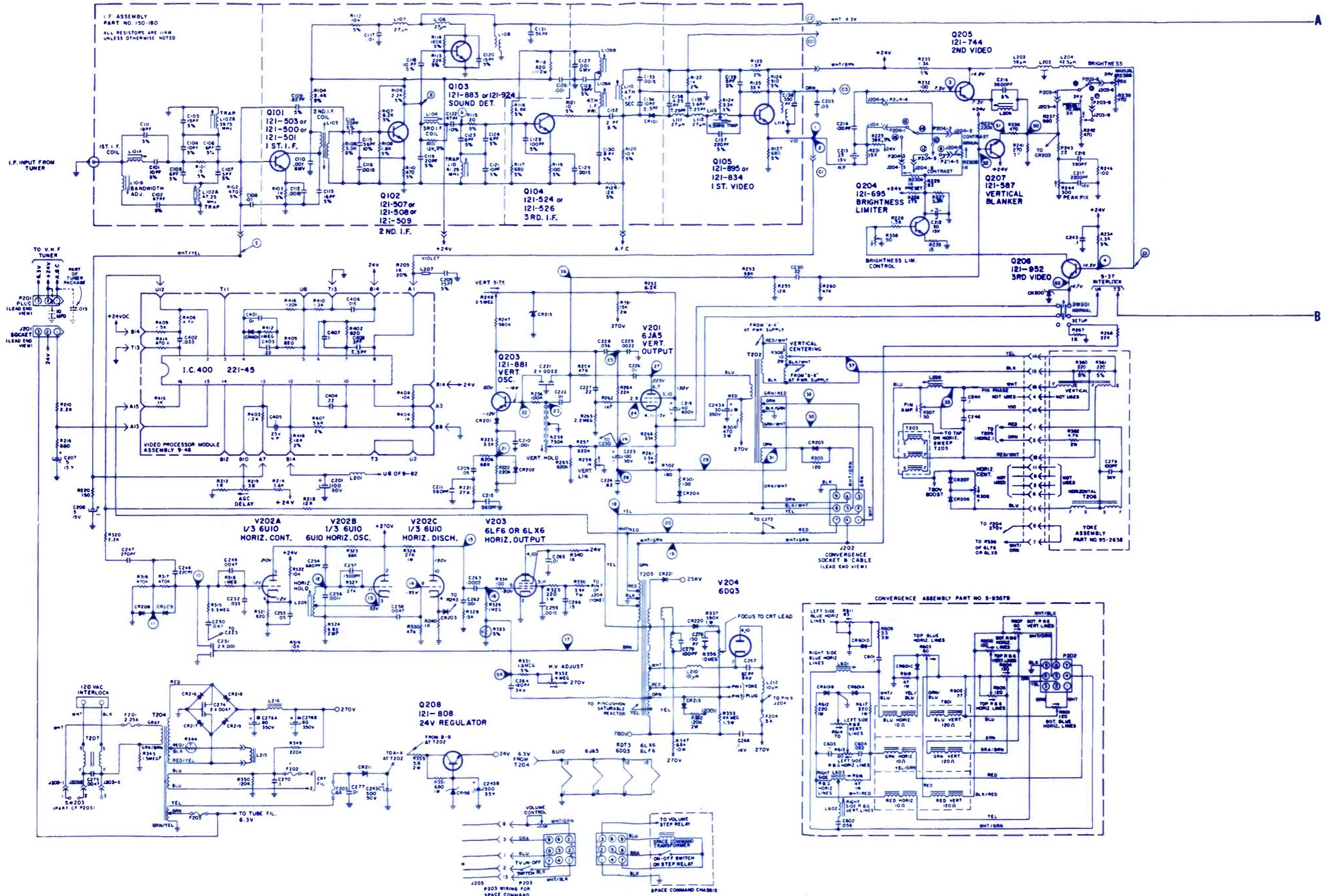




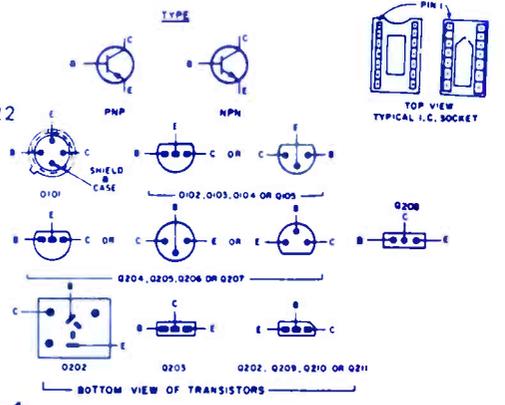
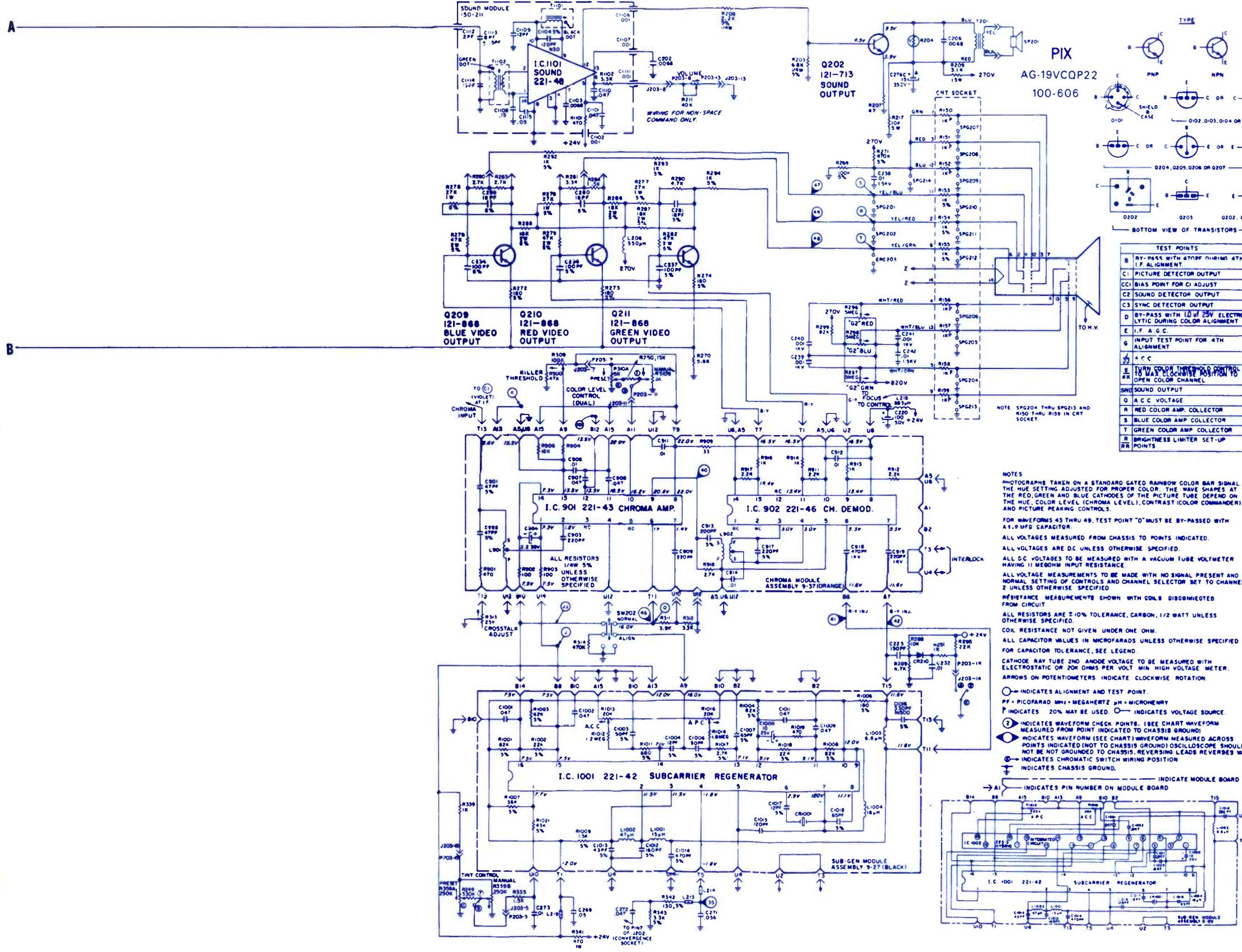
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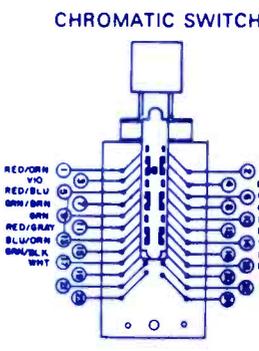
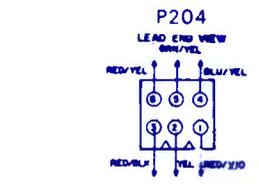
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TEST POINTS	
B	BY-PASS WITH 0.01UF CAPACITOR WITH I.F. ALIGNMENT
C	PICTURE DETECTOR OUTPUT
CC1	BIAS POINT FOR C1 ADJUST
C2	SOUND DETECTOR OUTPUT
C3	SYNC DETECTOR OUTPUT
D	BY-PASS WITH 10UF 25V ELECTROLYTIC DURING COLOR ALIGNMENT
E	I.F. A.C.C.
G	INPUT TEST POINT FOR 4TH ALIGNMENT
H	A.C.C.
I	TURN COLOR THRESHOLD CONTROL TO MAX CLOCKWISE POSITION TO OPEN COLOR CHANNEL
J	SYNC SOUND OUTPUT
Q	A.C.C. VOLTAGE
R	RED COLOR AMP. COLLECTOR
S	BLUE COLOR AMP. COLLECTOR
T	GREEN COLOR AMP. COLLECTOR
R	BRIGHTNESS LIMITER SET-UP POINTS

IMPORTANT SAFETY NOTICE
WHEN SERVICING THIS CHASSIS UNDER NO CIRCUMSTANCES SHOULD THE ORIGINAL DESIGN BE MODIFIED OR ALTERED WITHOUT PERMISSION FROM THE ZENITH RADIO CORPORATION. ALL COMPONENTS SHOULD BE REPLACED ONLY WITH TYPES IDENTICAL TO THOSE IN THE ORIGINAL CIRCUIT. IN SOME INSTANCES REDUNDANT CIRCUITRY IS INCORPORATED FOR ADDITIONAL SAFETY AND MUST BE RETAINED ACCORDINGLY.

NOTES
PHOTOGRAPHS TAKEN ON A STANDARD GATED RAINBOW COLOR BAR SIGNAL THE HUE SETTING ADJUSTED FOR PROPER COLOR. THE WAVE SHAPES AT THE RED, GREEN AND BLUE CATHODES OF THE PICTURE TUBE DEPEND ON THE HUE, COLOR LEVEL (CHROMA LEVEL), CONTRAST (COLOR COMMANDER) AND PICTURE PEAKING CONTROLS.
FOR WAVEFORMS 43 THRU 49, TEST POINT "D" MUST BE BY-PASSED WITH A 1.0UF CAPACITOR.
ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
ALL DC VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT AND NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.
ALL RESISTORS ARE 2.0% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
COL. RESISTANCE NOT GIVEN UNDER ONE OHM.
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED FOR CAPACITOR TOLERANCE, SEE LEGEND.
CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K OHMS PER VOLT MIN. HIGH VOLTAGE METER. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
○ INDICATES ALIGNMENT AND TEST POINT.
PF = PICOFARAD MMH = MEGAHERTZ μH = MICROHENRY
P INDICATES 20% MAY BE USED. ○ INDICATES VOLTAGE SOURCE
② INDICATES WAVEFORM CHECK POINTS. (SEE CHART WAVEFORM MEASURED FROM POINT INDICATED TO CHASSIS GROUND)
③ INDICATES WAVEFORM (SEE CHART) WAVEFORM MEASURED ACROSS POINTS INDICATED (NOT TO CHASSIS GROUND) OSCILLOSCOPE SHOULD NOT BE GROUND TO CHASSIS. REVERSING LEADS REVERSES WAVEFORM
④ INDICATES CHROMATIC SWITCH WIRING POSITION
⊥ INDICATES CHASSIS GROUND.
○ INDICATE MODULE BOARD
→ INDICATES PIN NUMBER ON MODULE BOARD



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