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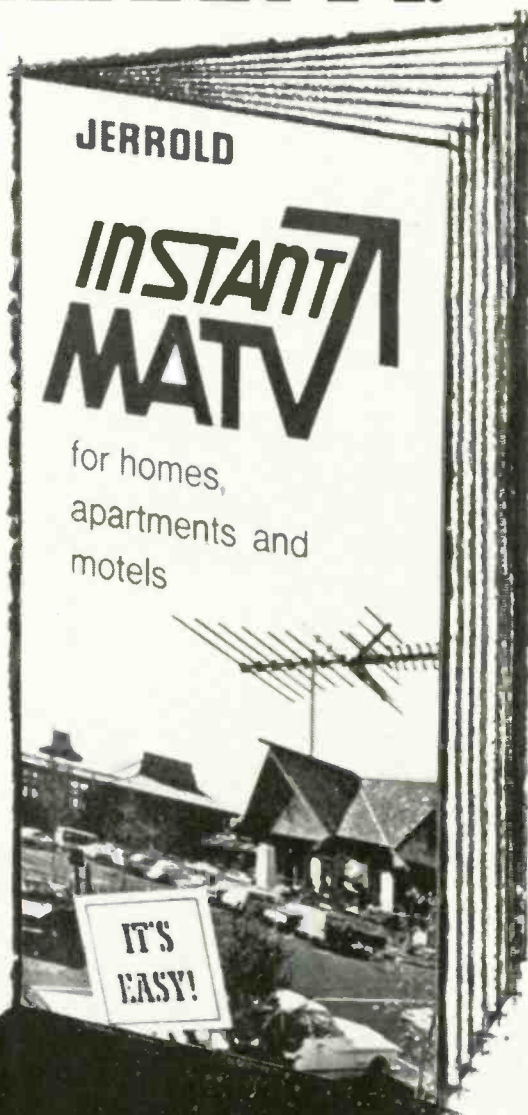
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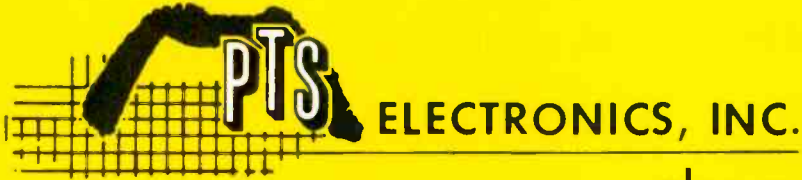
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Joseph Zauhar, our Managing Editor, is shown on this month's cover working in our newly remodeled electronics lab. More details concerning this lab are included in the article beginning on page 29.

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GTE SYLVANIA

Now or Never!



If you are like me, then by now you have heard so very much concerning the proposed NEA/NATESA Merger that with each new development there is a desire to simply lean back and groan,

"No, now what!"

Just about all publications have given this subject coverage; and my good friend Larry Steckler, CET, Editor of RADIO-ELECTRONICS, advises me that this month he too is writing an editorial in support of merger.

At least everyone seems agreed on one thing . . . if merger is not achieved by this August, it will never be achieved. Although there could be a later regrouping of scattered parts, there will never again be an effort by both national associations for merger. And thus, there is the relief in knowing that this is the very last issue of ELECTRONIC TECHNICIAN/DEALER to be so concerned with this subject.

No, not everyone does want merger! I spoke with one NEA elected representative recently at a meeting in Chicago who will vote for merger only because that is what the vast majority of the members in his local group want. But, if it were up to him alone, there wouldn't be merger. Instead, there would be both a strong NEA and a strong NATESA. (And he lives in "NATESA territory!") He is typical of those that are of the belief that two competing associations can do more for the average electronic technician or service dealer than one large complacent association.

Some of the members of NEA fail to see why they should even bother to make any changes for the sake of merger, when, if there is no merger, NATESA will "simply crumble and join NEA."

And then, some members of NATESA feel that Frank Moch (who has given many years of dedicated service) is professionally endangered should there be merger. And thus out of loyalty to him, they oppose merger.

Should the merger of NEA and NATESA mean the formation of but one giant association that could rule the industry with an iron, uncompromising hand, or simply become indifferent to the needs of the industry, then your editor would also oppose merger. However, even with merger, the new association would not remain alone to serve the industry. Too many have forgotten NARDA (National Appliance & Radio-TV Dealers Assn.) which is becoming increasingly concerned with electronic servicing. And with merger, future issues of our publication will give that association increased coverage. (It has even been rumored that should merger not be complete, NARDA will be at this month's Joint Convention in Kansas City to see what it can do about picking up the pieces.)

Your editor is also of the opinion that those in NEA who might hope that without merger NATESA will crumble—with NEA picking up the pieces—could be sadly mistaken. He is personally acquainted with some of the more rebellious members of NATESA, and many of them have far too much pride in the basic concepts of their current association to consider such a move. In fact, this attitude by a few in NEA has actually alienated many such members of NATESA.

Neither does your editor look toward merger as a means of getting rid of Dick Glass (Executive Vice President of NEA) or Frank Moch (Executive Director of NATESA), but rather as a tool to permit both capable individuals to work with equal stature in their differing specialties—both men being given far greater support than would be possible with separate associations.

Some might say, "Yes, but can we afford to employ two full-time executives and their staffs—with separate offices in Indianapolis and Chicago?" What kind of money are we talking about?

According to that which was presented at the last Joint Merger Meeting (see pages 14 and 16), Frank Moch expects a salary equal to that paid Dick Glass (the merger committee having agreed to a figure of \$18,000 yearly), plus another \$18,000 to cover expenses and office staff (we assume the same figure as would be required

for running the Indianapolis office), plus \$10,000 for the purchase of SCOPE. This means that the total first year's expense for the new association (excluding those incurred by elected officers for travel) would be \$72,000. This figure would drop to \$62,000 the second year, assuming salaries and related expenses remained unchanged.

This figure may be too high. With merger it should be possible to cut expenses rather than having to increase them. At least members should not have to expect to pay greater dues as a result of a consolidation of efforts. This matter will certainly be investigated at the Joint Convention.

Morris L. Finneburgh, Sr., E.H.F. has been stressing the importance of having time set aside by both associations for the most important activity at the convention—to decide whether or not there is to be merger now! He is requesting that time be set aside for the Joint Merger Committee to present its case to the entire industry, with both associations sitting together at a meeting starting at 1:30 p.m. in the Crown Center, Kansas City, Mo. on Friday, August 24, 1973. Following this joint meeting, the two national associations are requested to conduct, as soon as possible, separate convention meetings at different times so that the Joint Merger Committee can be called in to clarify points in question. (He stresses the importance in eliminating any possible program conflicts, so that even the wives may be in attendance.)

Thus voting should be accomplished in time for an announcement at the Saturday night banquet that merger has failed with honor, or succeeded with honor and great celebration.

Whether or not we as electronic technicians or service dealers wish merger, we should certainly attend this convention to see that we do know the issues, and that our conclusions are effectively represented in votes! If it is simply impossible to attend, then we should see that those entitled to cast our proxy vote are committed to vote whatever way we specify!

Philip Dahlen, CET

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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.

No More Dues from Me

In regards to merger: I don't think either Dick Glass or Frank Moch realize the consequences of not having a peaceable merger. Both organizations will lose thousands of members.

I know many independents will drop out and I am only paying dues in both organizations up to August this year. Look at all the state organizations like Virginia who have declared they will only join a new organization next year. A new single national is wanted by probably 90 percent of the technicians as evidenced by the standing vote at last year's convention.

The merger has to be finalized in the next few months with no damage to the income of Frank and his office, as he has given many, many years to our cause.

There is no reason why both men can't continue in the new organization in the areas in which they excel. Dues can be raised somewhat to compensate both executives equally. It could be a great new association and only the next few months will prove this true or false.

ROY W. RANDALL, CET

It Finally Happened

The following is a letter that we received typed upon a full-page Kennedy and Cohen newspaper ad for a new "top American brand 9-in. diagonal black and white portable TV" at \$39.00. Ed.

I told an old timer technician retiring back in 1965 that foreign dumping would bring TV's down to \$29.95 for B&W sets and \$39.95 for small color sets. With inflation, I thought it impossible.

With full manufacturing automation and foreign dumping, I don't see much future for consumer electronic technicians who may know 100 percent or 50 percent of a technical system.

The American dream of getting rich off a small shop is a joke. With the electricians and plumbers making \$20,000 annually, the consumer electronic technicians should have unionized long ago. Especially, in the large cities.

The outfit below makes approxi-

mately 1500 appliance service calls weekly. Appliance technicians make as much as TV technicians and they should unionize.

The licensed airline techs are unionized. Audio or convention sound techs do as well or better than electricians. City garbage men have a pension plan. Unless corporate employed, what do the TV techs have to go along with Social Security?

J. PERKINSON

Disagrees Concerning News and Article

I have waited a long time to write this letter concerning articles published in ELECTRONIC TECHNICIAN/DEALER. I may be one of thousands of technicians who believe that being a C.E.T. is not the apathy of the television, radio servicing trade.

But getting back to articles published in said magazine, I would like to see a lot more articles about servicing rather than industry news about NEA, NATESA, or ISCET of which your magazine has spent considerable time publishing.

One article in particular in May 1973's issue titled: "Tuner Cover Booby Traps," the author Bob Cook, CET, explains how to identify standard Koolsman tuners by these criteria: "green bar channel strips with adjustable contacts."

Not all channel strips are green, they are also beige.

While the factory adjusted contacts can be adjusted, the author fails to point out that they should never be adjusted by technicians for fear of detuning and oscillation, and breakage.

While the author is only illustrating these points, some technicians could be led to believe that they can be adjusted to cure a poorly cleaned tuner.

Why not try having one issue concerning servicing problems only, and see what results you get from your readers.

FREDERICK P. HALL, JR.

We make it a policy to print all responsible letters received, whether or not they agree with what we are doing.

We will soon be conducting a survey of a random sampling of our readership concerning this matter. However, based on the correspondence received, the vast majority of our readers agree with what we are doing.

The article by Bob Cook, CET, was concerned only with fitting tuner covers and made no reference to bending or adjusting unrelated parts within the tuner. Some technicians make other adjustments, others do not, based on how well they are equipped (both with equipment and skill) for aligning tuners. Ed.

READERS' AID

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

For Sale

I have for sale an RCA scope Model WO-505A; Jud Williams Transistor Curve Tracer Model A and other used test equipment in good condition.

WILLIAM D. SHEVTCHUK
One Lois Ave.
Clifton, N.J. 07014

I have almost a complete color-TV picture tube rebuilding plant for sale. Equipment is industrial grade and reasonably priced.

JOHN STANIS
P.O. Box 284
Sierra Vista, Ariz. 85635

I have Sams Photofacts, numbers 587 through 875 for sale.

RICHARD L. MOSS
506 S. Oak
Pana, Ill. 62557

I have for sale Sams Photofacts from approximately No. 100 through 1000.

ROBERT A. DEVRIES
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So. Elgin, Ill. 60177

I have some Sams Photofacts from one through 971, plus TSM, CB, and TR manuals for sale.

ROSS J. HANSEN
112 South 1 West
Preston, Idaho 83263

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KENNER RADIO & TV
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Schematic Wanted

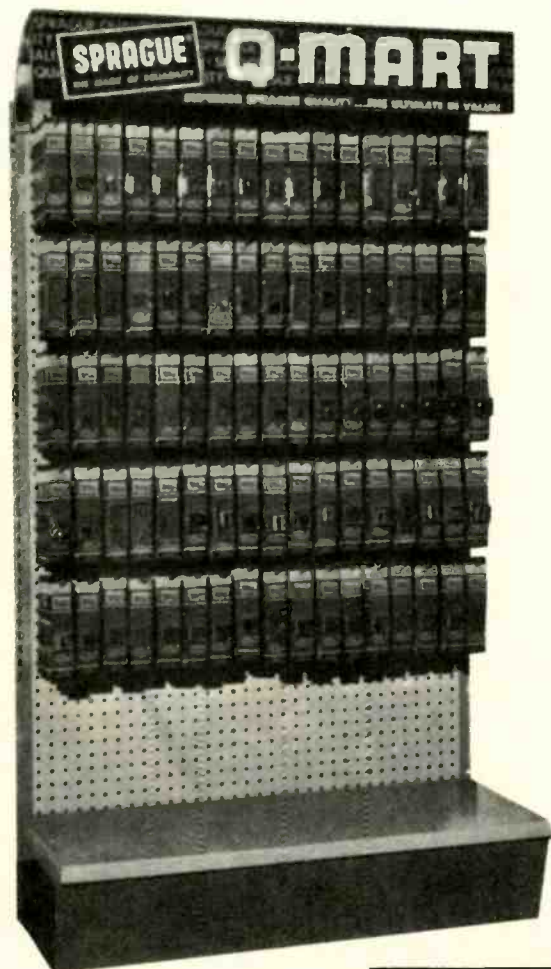
I am interested in obtaining Tekfax schematics from December 1970 to January 1971. Schematics No. 607 through 1334.

FRANTZ DESIR
120 Berkeley Place
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NEW AND NOTEWORTHY

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

FOR MORE NEW PRODUCTS SEE PAGE 52



WIRELESS MICROPHONE 700

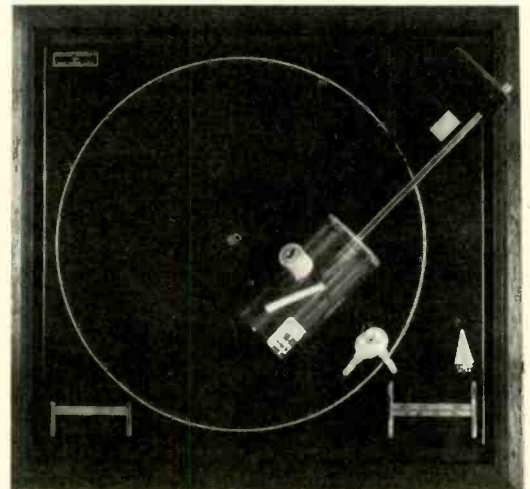
Transmits voice and music through any FM tuner

A new FCC approved FM wireless electret microphone, Model WM-10, is designed to transmit voice and music through any FM radio or tuner. It is designed to be tuned to any frequency between 88MHz and 108MHz, requires a standard 9v battery, reportedly can transmit over a maximum range of 100 ft, and weighs 2½ lb without the batteries. A short insulated wire that hangs from behind the unit acts as the antenna. EV•Game.

DIAMOND-NEEDLE LOCK 701

Offers greater showroom protection

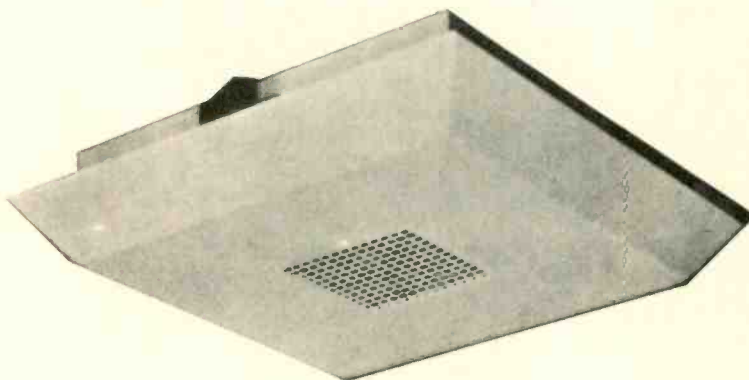
A new protection device for diamond needles while on display in stereo phonographs is called the diamond-needle lock. It is said to be constructed of heavy durable plastic with a multi-combination key lock. Of universal design for fitting most tone arms without special tools, it is said to stop the costly loss of diamond needles while making the turntable ready for immediate demonstrations. Se-Kure Controls.



FIRE DETECTOR 702

Activates alarm before smoke and flame start

The B6-001 Ionization Detector is self-contained and can reportedly detect invisible combustion gases before smoke and flame start. The sensing element is said to be an ion chamber in a circuit that monitors the chamber current. Combustion product particles entering the chamber are said to unbalance the circuit and sound the alarm. It reportedly comes with complete instructions, can be installed on the ceiling with two screws, measures 7 in. square, has its own self-contained power source and a 110dB sounder.

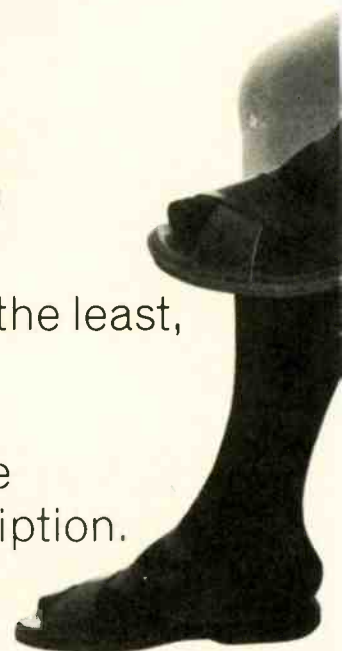


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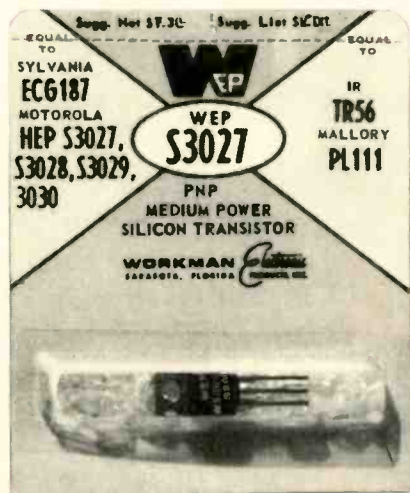
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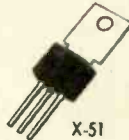
The back of the card makes life easier too — basing diagram, full specs with symbol and ratings.



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



WEP S3027
WEP S3027

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 _r	50	Mhz
Current Gain (beta)	h _{fe}	110	Typical

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Additional Articles of Agreement For Presentation to NATESA/NEA

The Joint Merger Committee has noted that the following articles of agreement were inadvertently omitted from those originally presented and printed on page 22. Ed.

Articles A-I

It is further agreed that the two associations in Joint Convention will under common assembly elect officers for the new consolidated association from the existing membership or officers of the old associations (NATESA and NEA) and the past presidents of NATESA and NEA shall serve in an advisory capacity until the first board (council) meeting.

Article A-II

It is agreed that dues will be on an annual basis, payable in advance after the Membership Meeting Convention, except that those affiliated associations which collect dues on a monthly or quarterly basis may elect to pay their dues to the national association on the same basis. A 45-day grace period shall be allowed.

Article A-III

We further agree to the concept of holding the first annual convention of NESDA in Hawaii to celebrate.

Article A-IV

We agree that the proposals for consolidation package be presented at the Kansas City Membership Meeting and any rule that might prevent a membership vote on ratification of the articles of agreement be suspended. We also agree that the Chairman of the Joint Merger Committee make the presentation.

Article A-V

We agree that the contracts of the executive vice presidents be for one year with a 90-day notice of termination for cause.

Article A-VI

We agree that the fifty vote rule concept of NEA's voting procedure be adopted by the new association.

New Association Formed To Serve Greater Minneapolis

A new electronic association called MESDA (the Metro Electronic Service Dealers Association of Greater Minneapolis) was recently formed with five shops represented. Elected as officers were Harold Haskovitz of H & H TV, president; Bill Maryland of Orbit TV, vice president; John Hemack of North East TV, secretary; and Sherm Kvasnik of Sherm's TV, treasurer.

At their last reported meeting, held on May 22nd at a local restaurant, approximately 35 shops were represented.

Already they have begun fighting a state registration bill which they consider very harmful to legitimate TV shops.

Canadian TV Network Offers Another First in Service

The first phase of Canada's new Global Television Network is being designed to serve more than seven million people in Southern Ontario. To start this system, three VHF transmitters and six antenna systems valued at \$780,000 are included in an order received by RCA Limited, Canada.

Global Television is establishing a grid of TV transmitter facilities strategically located for overlapping coverage of most major Southern Ontario urban centers, as well as broadcast service to less dense areas. The transmitters and Global's new studio complex in Toronto will be interconnected by a two-way microwave system, and stations in the network all will carry the same programming.

Al A. Bruner, Global's president and chief executive officer, said special provisions are being made to overcome interference from other stations in fringe areas. Atomic clock standards will be installed in the VHF transmitters to implement a technique known as "very precise frequency offset." This technique reduces interference by as much as five times by weaving the unwanted signal into the desired one, he said.

Transmitters in the system will be automated and remotely controlled, obviating the need for an operating staff at each site. Roving crews will maintain the grid.

The transmission system is scheduled for testing by the end of November with January 1, 1974 as the on-air date.

Mr. Bruner stated that Global Television plans for additional expansion of its facilities in the future. "The natural extension of this new program service in different time zones can be accomplished using satellite and microwave facilities, inter-connecting regional transmitters in other provinces," he said.

TV Set Deliveries Halted Due to Possible Shock Hazard

RCA Consumer Electronics has announced that it has directed its distributors to stop delivery of Models ES-385W and ES-385WR 17-in. (diagonal) portable color-TV sets because of a possible shock hazard.

RCA has directed distributors to instruct their dealers to freeze deliveries of their stocks and advise all purchasers of these models to keep their sets unplugged until further notice.

RCA said that during a required routine laboratory check, electrical energy sufficient to cause shock had been measured on the ACM/AFT buttons of a sample of the previous day's production.

Analysis indicated that one of the two types of ACM/AFT switches used in these models can transmit electrical energy sufficient to cause a 110v shock in the event the set is connected to the electrical receptacle in such a manner as to defeat the purpose of the polarized plug with which these models are equipped.

A correction for the potential problem has been developed, RCA said, and will be implemented as soon as possible at RCA's expense.

Preliminary Official Minutes of Joint NATESA-NEA Merger Committee

The Joint Merger Committee Meeting was called to order by temporary chairman, Jerry Hall, at 9:15 a.m. on Saturday morning May 19, 1973. The NEA committee had requested that Mr. Hall chair the meeting until the arrival of Mr. Finneburgh, who was unable to arrive in St. Louis until mid-morning.

After a brief opening statement by the Chair, he recognized Mr. Browne, who motioned, seconded by Galtier, that Messrs. Harrison and Correll be appointed to meet and work up By-Laws to be presented to the full Committee later on in this meeting. Motion carried unanimously.

Mr. Correll was introduced to the committee and suggested that he be allowed to present a prepared "Articles of Agreement" for By-Laws, that would form the basis of the new By-Laws. The articles of agreement were then presented point by point with the following action being taken by the Committee:

Due to legal requirements, it was suggested that the word "Consolidation" be used instead of "Merger."

Article I, Sec. 1 and Sec. 2 were approved as proposed.

Article I, Sec. 3 was approved with the addition that the final vote will be taken at the Convention.

Article II. It was agreed that the name of the organization shall be the National Electronic Service Dealers Association (NESDA).

Article III was approved as proposed.

Article IV, Sec. 1 was approved with the striking of the words, "generally found in a home."

Article IV, Sec. 2 and Sec. 3 were approved as proposed.

Article IV, Sec. 4 was approved with the addition of a motion by Galtier, seconded by Donte, that "All present members who are instructors shall be accepted as active members (grandfather clause) and that any future members in this category must be approved by the board."

Article V was approved with the changing of the wording "State Association" to "State Boundary."

Article VI was approved with the changing of the wording "State Association" to "State Boundary" and "Board of Governors" to "House of Representatives."

The meeting recessed for lunch at 12:25, hosted by the Finney Co.

The meeting reconvened at 1:40 p.m. and was called to order by the Chairman, M. L. Finneburgh, who made the following comments: He made an apology for having to arrive late for the morning session (having arrived at 9:30 a.m.). The Chairman remarked that we should try to solve all problems of merger; that we should succeed with dignity and faith; that many people are looking at the merger committee with a supernatural attitude, due to many reasons, but that we should proceed with the job for which we were appointed to do.

Article VII, Sec. 1 and Sec. 2 were approved as proposed, with the changing of the "Board of Governors" to the "House of Representatives" and "Executive Committee" to "Executive Council."

Article VII, Sec. 3 was changed to read, "We further agree that the Executive Council shall be limited to a hand count vote, and with 75% of the members present and voting allowed to veto such action of the Executive Council while in session into the agenda of the next meeting of the Executive Council, and if vetoed the second time, it is then referred to the 'House of Representatives'."

Article VIII, Sec. 1 and Sec. 2 approved by a unanimous vote upon changing "Executive Committee" to "Executive Council."

Article VIII, Sec. 3, approved by unanimous vote by adding the letter "a" to chief, making it "Chiefs," and changing "Executive Committee" to "Executive Council."

Article IX, Sec. 1, Sec. 2 and Sec. 3 were approved by unanimous vote, upon changing "Executive Committee" to "Executive Council."

Article IX, Sec. 4 was changed to read, "We further agree that each association affiliated with the new national association under charter shall be responsible for the collection of all dues for the national association. It was approved unanimously."

Article X was approved with the changing of the words "Board of Governors" to "House of Representatives" and "Executive Committee" to "Executive Council." It was approved by a unanimous vote.

Article XI, Sec. 1 was approved by a unanimous vote.

Article XI, Sec. 2 was approved with one abstention (Weiss).

Article XII was approved unanimously with the addition of another item, (12) "To Represent."

Article XIII was approved as written by a unanimous vote.

Article XIV, Sec. 1 was approved, with the striking of the two words "Joint Convention" in Line 1, by a unanimous vote.

Article XIV, Sec. 2 was changed to read, "We further agree that the (2) two associations in joint convention will under common assembly elect officers for the common and new consolidated association from the existing membership or officers of both associations. The past president of NATESA and NEA shall serve in an advisory capacity until the first board meeting." The article was approved with one dissenting vote (Galtier).

Article XV was called to order. The rules contained in the current edition of Roberts Rules of Order, newly revised, shall govern this new association in all cases to which they are applicable and when they are not inconsistent with the By-Laws and any special rules of order that the association may adopt. Approved by a unanimous vote.

This completed the action of the proposed "Articles of Agreement." Correll and Harrison were commended for their effort in working up the proposals.

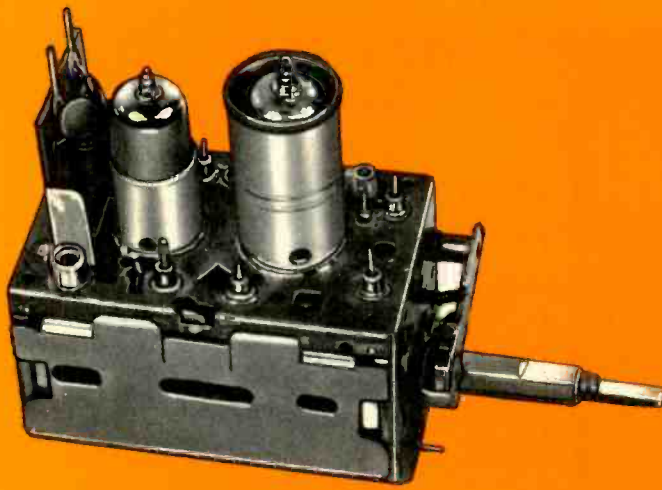
Prior to recess for the Saturday night dinner, it was agreed that both groups would caucus on the following subjects and report on them at the next business session: (1) Dues; (2) Emblem; (3) Offices, where and who; (4) Incorporation, where, etc.; (5) The Two Job Classifications; (6) Legal Requirements; (7) One Vote for Each 500 Members.

The meeting was called to order at 10:15 p.m. by Chairman Finneburgh. The seven caucus items were reported on by the committee chairman Browne and Ragulade. Ragulade reported that the NATESA Committee agreed on the seven points as follows: (1) Dues: The committee recommends that dues be paid annually, in advance, after convention (2) Emblem: The committee recommends that an emblem committee be appointed and that the committee try to include portions of both existing emblems.

(3) Offices: The committee recommends that the two offices be kept as it, each with his staff. In connection with this, Mr. Moch's statement as to what he would expect from the new association was read as follows: (1) If Moch and Glass (or anyone else in his place) will be employed, I would expect equal status. (2) I would expect a home file three year contract. (3) I would expect headquarters in Chicago of equal status to those of the other Executive Officer. (4) I would expect equal personal compensation. (5) I would expect an allocation to cover all operating expenses in the past from NATESA, the total of about \$18,000. This will cover wages of others, supplies, postage, rent, heat, light, phone, travel, entertainment, etc. (6) If SCOPE is to be phased out, I would expect \$10,000 in cash, before termination. (4) Incorporation: The NATESA committee recommends that the association be incorporated in Washington, D.C. (5) Job Classifications: The committee recommends that we use the two classifications as shown up and approved at the Memphis merger meeting. Caucus points (6) and (7) were not discussed, due to lack of time.

Mr. Browne reported for the NEA Committee and stated that NEA did not agree with the idea of paying a year's dues in advance. After much discussion, the following motions were made by Shaw, seconded by Donte, that "Dues be on an annual basis payable in advance after the convention, except that those affiliated associations which collect dues on a monthly or quarterly basis may elect to pay their dues to the national on the same basis. There shall be allowed a maximum 45 day grace period." The motion carried with one dissenting vote (Weiss).

continued on page 16



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TENNESSEE	Greeneville, Tennessee 37743	1215 Snapps Ferry Rd.	Tel: 615-639-8451
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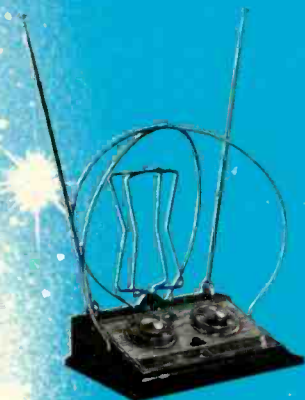
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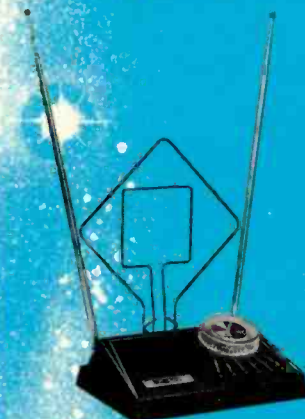
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NEWS...

continued from page 14

Mr. Browne stated that the NEA Committee recommends that the "one vote for each 50 members" (as now being used in NEA) be included in the new association. This is a voting procedure that allows each regional vice president to cast one vote for up to and for each 50 members on controversial issues at the quarterly board meetings.

A motion was made by Gaither, seconded by Shaw, that the committee acknowledge receipt of Moch's six point proposal pertaining to employment requirements, and that it be taken under submission and entered into the minutes. The motion carried by a unanimous vote.

Motion by Hall, seconded by Gaither, that the proposal submitted by Glass also be acknowledged by the committee and that it be taken under submission and entered into the minutes. After much discussion, including the reading of Glass's proposal by Browne, the motion was withdrawn, and motion was then made by Hall, seconded by Browne, that the job description, dated Nov. 8, 1972, as requested by the merger committee from Glass, has been received and entered into the minutes. Motion carried by a unanimous vote. (Note: The secretary was not given a copy of Glass proposal.)

Motion by Hall, seconded by Browne, that this committee re-affirm the job descriptions as approved at the Memphis meeting. Motion carried with one dissenting vote (Weiss).

Motion by Browne, seconded by Gaither, that the merger committee shall serve as the interim implementing advisory committee, until the first quarterly board meeting. Motion carried unanimously.

Motion by Browne, seconded by Hall, that Moch and Glass continue in their present capacity and safety, until such time as the Executive Council of the new association can prepare contracts. Motion carried with three dissenting votes (Weiss, Gorman, Gaither).

Motion by Shaw, seconded by Dontje, that this committee recommends that each Executive Vice President be paid a salary of \$18,000 annually. Carried unanimously.

Motion by Browne, seconded by Dontje, that the 50 vote rule concept be adopted by the new association. Motion carried. Motion by Browne, seconded by Gaither, that this committee endorse the concept of holding the first year convention as a celebration in Hawaii. Motion carried with one abstention (Gorman).

Mr. Gaither volunteered to prepare a projected budget for the new association.

Motion by Dontje, seconded by Gorman, that this committee commission Correll to author the By-Laws and try to fit the articles of agreement with the proposed By-Laws submitted by Harrison. Motion carried (one nay).

Motion by Browne, seconded by Shaw, that this committee recommend to both associations that the merger committee package proposal be presented at the membership convention in Kansas City and that any rule that might impede such ratification be suspended. Motion carried (one nay, Weiss).

Due to departure of Jerry Hall (had to catch a plane) President Leo Shumavon appointed Mr. Otto Horak to temporarily fill Hall's position.

Motion by Browne, seconded by Weiss, that the Chairman of the Joint Committee (Finnburgh) make the presentation of the consolidation package to the membership bodies. Carried with a unanimous vote.

Motion by Browne, seconded by Weiss, that this committee recommend that some accommodation be attempted for Moch's personal interest in SCOPE Magazine, and that a committee composed of Weiss and Gaither be appointed to negotiate the proposal. Carried unanimously.

Motion by Horak, seconded by Ragudale, that this committee recommends that the Executive Vice Presidents be hired by a one year contract with a 90 day notice of termination for cause. Motion carried with one dissenting vote (Couch).

The meeting of the joint merger committee adjourned at 3:30 p.m. Sunday afternoon, May 20, 1973.

Submitted by
LeRoy Ragudale, Secretary

Articles of Agreement

(Prior to previously noted changes by Joint Merger Committee)

ARTICLE I. Acceptance Procedure

Sec. 1. We, of the merging committee, realizing that there is more than one trade association representing the Electronic Dealer Industry, realizing there is an effect costly duplication of efforts and affairs, and realizing that the Electronic Service Dealer Industry has an unmet need from which arises the thrust and position of the Electronic Dealer Industry, therefore we wish to form Articles of Agreement for the possible consolidation of the (2) two industry associations into one, the National Electronic Association, Inc. and the National Alliance of Television Electronic Service Associations.

Sec. 2. We further agree that after the final acceptance of these Articles by this committee that they will be ratified by both existing associations' membership, requiring by each association voting membership in good standing.

Sec. 3. We further agree that the above process shall be accomplished by U.S. Mail returned to an independent address chosen by this Committee, giving each membership 30 days to ratify or reject these proposed Articles of consolidation and if a membership fails to respond within 30 days, such vote will be considered as an affirmative answer.

ARTICLE II. The Name Proposed

Sec. 1. We agree that the name of the proposed consolidated association is to be the United Electronic Service Association.

ARTICLE III. Organization Type

Sec. 1. We further agree that the new corporation shall be founded as a business league under Article 501-06 of the U.S. Internal Revenue Code as a non-profit association.

ARTICLE IV. Membership

Sec. 1. We agree that such membership classified as "active" shall be deemed as a member representing a firm or entity which is engaged in the sales, service and installation of consumer electronic equipment, generally found in a home.

Sec. 2. We further agree that the active members shall be fully licensed or registered which (ever) applies to his field of endeavor.

Sec. 3. We further agree that an active member shall have full voting privileges as well as the privilege of holding National Office.

Sec. 4. We further agree to form other classifications of membership with limited voting rights of technicians, partners, students, instructors, not representing a firm, limited to holding office within their own entity.

ARTICLE V. State Association Entity

Sec. 1. We agree that the new association shall indeed recognize existing state associations as a whole.

Sec. 2. We further agree that such state associations will have a right to solicit, classify their internal membership, their rights to hold internal office and to conduct their internal business and affairs.

Sec. 3. We further agree that such state associations will have the exclusive rights to a membership within their state boundary.

Sec. 4. We further agree that such state associations shall have the right to incorporate or to be incorporated as a non-profit association.

Sec. 5. We further agree that such state associations through articles of sponsorship or articles of agreement may effectuate a charter which can in part or whole affiliate themselves with the national association as an autonomous entity or subsidiary of the parent corporation.

Sec. 6. We further agree that the new national association shall not interfere with the internal policies, business affairs of a state association entity, unless invited.

ARTICLE VI. Government

Sec. 1. We agree that the governing body of this new consolidated association shall be its active members, in good standing voting through a representative so selected by the affiliated state associations.

Sec. 2. We further agree that the body of representatives shall be called the Board of Governors, with each representative being called a governor.

Sec. 3. We further agree that such a governing body shall consist of all governors of affiliated state associations, the Regional Vice Presidents, entity or division representatives who may cast a vote equal to the active membership within his jurisdiction when a poll vote is called.

Sec. 4. We further agree that this body, Board of Governors, shall have full corporate powers, while in assembly, subject to the By-Laws and/or Constitution, Articles of Incorporation and such other laws that may affect his tax exempt status as a non-profit association.

ARTICLE VII. Business and Affairs

Sec. 1. We further agree to form a committee from the Board of Governors called the Executive Committee or Council, who will consist of Vice Presidents representing regions or special entity divisions, and special entity membership, President, Past President, Secretary, Treasurer.

Sec. 2. We further agree that the Executive Committee shall have full powers of turning the routine business and affairs of the association, subject to the rights and ratification or rejection by the Board of Governors, while in session.

Sec. 3. We further agree that the Executive Committee should be limited to a hand count vote, and with 1/3 or more of the members present allowed to veto such action of the Executive Committee while in session into the agenda of the next meeting of the Board of Governors.

ARTICLE VIII. Executive Staff

Sec. 1. We agree that a paid Executive staff of employees as commensurate with the Association's affairs shall be afforded.

Sec. 2. We further agree that the Executive Staff shall be under strict supervision and control of the Executive Committee.

Sec. 3. We further agree that the Executive Committee shall be responsible for the hiring and firing of the Executive Staff.

ARTICLE IX. Dues and Activities

Sec. 1. We agree that the activities and dues of the new association shall be conducted and utilized for the benefit of all members and the industry as a whole and not for the benefit of any particular member or entity.

Sec. 2. We further agree that the association activity shall be financed by dues, and/or grants payable by the membership as fixed by their classification within the By-Laws.

Sec. 3. We further agree that the new association's income may be supplemented by such other income as the association may occur from any other source which does not affect its tax exempt status and may be approved by the Executive Committee.

Sec. 4. We further agree that each state association affiliated with the new national association under charter shall be responsible for the collection of all dues for the national association.

ARTICLE X. The National President

Sec. 1. We agree that the National President shall preside as Chairman of the Board of Governors, Chairman of the Executive Committee, speak and represent the Electronic Dealer Industry as a whole and exercise such leadership and control as necessary to promote the policies and programs of the new national association.

ARTICLE XI. Committees

Sec. 1. We agree that there shall be such standing committees as may be commensurate with the Association's needs.

Sec. 2. We further agree that the following standing committees shall be included in the new association: (1) Consumer and Public Relations Committee, (2) Advertising and Marketing Committee, (3) Research and Development Committee, (4) Ethics and Standards Committee, (5) Apprenticeship and Manpower Development Committee, (6) Education and Training and (7) Field Services Benefit Committee.

ARTICLE XII. Corporate Objectives and Purpose

Sec. 1. We agree that the objectives and purpose of the new corporation shall be:

- | | |
|----------------|-------------------|
| (1) to provide | (7) to cooperate |
| (2) to promote | (8) to adopt |
| (3) to develop | (9) to research |
| (4) to inform | (10) to speak for |
| (5) to assist | (11) to interpret |
| (6) to furnish | |

ARTICLE XIII. Voting

Sec. 1. We do agree that the State Representatives or such other representatives of its active membership shall cast such poll votes of which they represent, while in the activity of voting for the National Officers.

ARTICLE XIV.

Sec. 1. We agree to fulfill the existing joint convention plans between the (2) two National Associations NEA and NATESA, whereby if and only if the membership ratification are in order and if they reflect the will of consolidation.

Sec. 2. We further agree that the (2) two associations in joint convention will under common assembly elect officers for the consolidation and new consolidated association from the existing membership or officers of both associations.

ARTICLE XV. Parliamentary Authority

Sec. 1. The rules contained in the current edition of Robert's Rules of Order, newly revised, shall govern this new association in all cases to which they are applicable and when they are not inconsistent with these Constitution and By-Laws and any special rules of order the association may adopt.

continued on page 22

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Citizens Band Radio Service Manual	List Price \$7.95; Club Price \$4.95
4-Channel Stereo—From Source to Sound	List Price \$6.95; Club Price \$3.95
Complete Minibike Handbook	List Price \$8.95; Club Price \$5.95
125 Typical Electronic Circuits Analyzed & Repaired	List Price \$7.95; Club Price \$4.95
Understanding & Using the Oscilloscope	List Price \$7.95; Club Price \$4.95
Introduction to Medical Electronics	List Price \$9.95; Club Price \$6.95
Handbook of IC Circuit Projects	List Price \$7.95; Club Price \$4.95
Passive Equalizer Design Data	List Price \$19.95; Club Price \$12.95
Basic Audio Systems	List Price \$7.95; Club Price \$4.95
Elements of Tape Recorder Circuits	List Price \$7.95; Club Price \$4.95
How to Repair Music Instrument Amplifiers	List Price \$8.95; Club Price \$5.95
How to Repair Small Gas Engines	List Price \$8.95; Club Price \$4.95
Hi-Fi Stereo/Quad Principles & Projects	List Price \$7.95; Club Price \$4.95
Refrigeration	List Price \$7.95; Club Price \$3.95
Using Electronic Testers for Automotive Tune-Up	List Price \$7.95; Club Price \$4.95
Kwik-Fix TV Service Manual	List Price \$8.95; Club Price \$5.95
Basic Electronics Course	List Price \$8.95; Club Price \$5.95
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How to Use Color TV Test Instruments



Here's an opportunity to close whatever gaps there are in your ability to use modern, up-to-date equipment designed specifically to save you time and money. You'll quickly grasp the author's common-sense approach to using the right instruments, thereby getting the most out of your investment in test gear. You'll improve your ability to use an oscilloscope, color bar generator, alignment generators, vectorscope, TV Analyst and sine, square-wave generators. The author also has included a description of his "curve tracer." With this simple scope attachment, you can rapidly assess the condition of transistors—even ICs—in or out of the circuit. 256 pps., over 230 illus. Hardbound. **List Price \$7.95 • Order No. 577**

Servicing Transistor Equipment



Here is a systematic guide to the servicing of transistor radio, television, tape, and high-fidelity equipment, with emphasis on speedy trouble diagnosis. Chapters describe semiconductors and transistors, their operating principles, characteristics, and circuitry. The author has fully covered how transistors are connected in a circuit, how transistors are tested, and fault diagnosis. A separate chapter is devoted to the portable transistor receiver, with a step-by-step description of operation and repair. Alignment and fault-finding details are amply discussed. A final chapter gives practical advice on making repairs. 160 pps., 6 x 9", 78 illus., 6 troubleshooting charts. Hardbound. **List Price \$7.95 • Order No. 294**

Electronic Circuit Design Handbook



New Fourth Edition A brand new enlarged edition of the ever popular circuit designer's "cook-book," now containing over 600 proven circuits for all types of functions, selected from thousands on the basis of originality and practical application. Now you can have, at your fingertips, this carefully planned reference source of tried and tested circuits. Selected on the basis of their usefulness, this detailed compilation of practical design data is the answer to the need for an organized gathering of proved circuits... both basic and advanced designs that can easily serve as stepping stones to almost any kind of circuit you might want to build. 416 pps., 8 1/2" x 11", lists, over 600 illus. **List Price \$17.95 Order No. T-101**

Basic Color Television Course



This complete, easy-to-follow course on color TV receiver basics (including B & W) serves as a vital text for the beginner, and a useful reference for the experienced. Author Stan Prentiss covers everything you need to know about TV receivers in one GIANT 420-page volume. Includes brand-new circuits using transistors and IC's. Thoroughly explains TV signals, broadcasting, color, how circuits operate (including monochrome circuits), antenna systems, alignment techniques, troubleshooting tips, CATV systems, and foreign TV, with details on I.F. and SELAM systems. Includes study questions and answers. 420 pps., over 300 illus., 24 TV trouble pictures in full color. Hardbound. **List Price \$9.95 • Order No. 601**

Basic Electronics Problems Solved



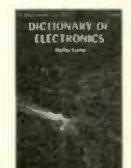
Here are easy step-by-step solutions to many basic electronics problems in a convenient one-stop source dealing with both solid-state and tube-type circuits. The content not only presents a detailed explanation of each point, but also provides many actual examples on how to work out problems. Then, to firmly fix the information in your mind, there are numerous example problems for you to solve; answers to these are included in one Appendix, and worked out solutions in another. Covers DC circuits, AC circuits, powers of ten, semiconductors, power supplies, and receiver circuits. A final chapter shows how to use a slide rule to speed calculation. 192 pps., over 100 illus. Hardbound. **List Price \$7.95 • Order No. 530**

Handbook of Semiconductor Circuits



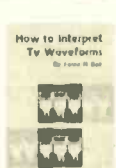
Contains 124 examples of standard transistor circuits, complete with operational data for amplifiers, oscillators, logic and switching circuits, power supplies, and various nonlinear circuits. The broad range of circuits included were selected on the basis of application and practicality. A design philosophy section is included with each group of circuits, thereby providing a basis for understanding circuits other than those selected as examples. This is a collection of practical circuits which have wide application. Each circuit description includes data concerning any unique design or operational data. Hundreds of illustrations and diagrams. 448 pps., 6" x 9", Hardbound. **List Price \$8.95 • Order No. G-30**

Dictionary of Electronics



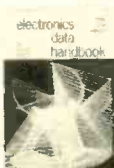
You'll find this huge volume extremely useful in whatever connection you have with electronics. This dictionary of electronics defines most all of the electronic terms you will run across in your everyday reading... from alpha particles through zoom lens terms you need and use most often, including those found in radio, TV, communications, radar, electronic instrumentation, broadcasting, industrial electronics, etc. It provides full, complete and easily-understandable explanations of thousands of specific electronics terms (such as transistors, acoustic feedback, alpha particles, beat oscillator, final anode, electrostatic lens, nonlinear resistance, etc.). 420 pps., 487 illustrations. Hardbound. **List Price \$8.95 • Order No. 300**

How to Interpret TV Waveforms



This truly unique photo-text guidebook by Forest H. Belt was created to help you find and cure TV troubles of all kinds — through proper interpretation of scope waveforms. The over 250 large waveform photos have been collected through intensive study of TV circuit breakdowns. Scope settings in the text tell you how to make each waveform viewable. Shows what normal waveforms should look like and also what happens under various component fault conditions. In each case the author explains the abnormality in the waveform and points out the component causing the trouble. 256 pps., 250 waveform photos and 20 schematic diagrams. Hardbound. **List Price \$7.95 • Order No. 616**

Electronics Data Handbook: New 2nd Edition



This brand-new, completely updated and greatly enlarged edition of an industry classic now saves you even more time in quickly finding the electronics data you need! Now 50% larger than the earlier edition, it includes just about any formula you want — plus numerous worked out tables and charts which give you direct answers so you don't even have to use a formula. Here is an all-in-one reference to the data for DC and AC circuits, vacuum tubes, transistors, antennas and transmission lines, measurements, and all the conversion factors, abbreviations, equivalents and mathematical data for electronics. 256 pps. Hundreds of tables, charts, illustrations and formulas. Hardbound. **List Price \$7.95 • Order No. 118**

Modern Radio Repair Techniques



Up-to-date service data on all types of modern radio receivers, including AM, FM, stereo, auto and multiband — plus complete 36-page fold-out schematics for 12 popular brand-name sets. Reveals many simple shortcuts to making radio repair a profitable side or main line of business. Material is presented so that seasoned technicians can gain from the numerous troubleshooting tips, and beginners, with a few hours study, can begin to turn out profitable work in a short time. Includes shortcut methods of troubleshooting, plus general test techniques. Covers receiver circuits and fundamentals of circuit operation. 260 pps., 70 illus. Hardbound. **List Price \$7.95 • Order No. 580**

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 basic 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. 212 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, regular, 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



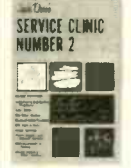
A collection of useful, easy-to-build construction projects for technicians, experimenters, hams, and hobbyists. Now you can put those idle tubes and components to work with this vast, one-of-its-kind assortment of unique electronic circuits. Included in this convenient selection are test instruments, ham gadgets, receivers, power supplies, DX aids, wireless mikes, tube rejuvenators, electronic games, ear-droppers, 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 1 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, CB gear, etc. Discusses the "engineering" servicing approach, efficiency, and how a technician may condition his thinking to produce more in a given time period. Like the first volume, the content was selected on the basis of usefulness to the average technician, covering a wide range of electronics devices. Each of the 10 chapters covers a general category of interest, and in each the subject matter is arranged in logical order to enable you to find what you need quickly. Provides a wealth of information. 176 pps., numerous illus. Hardbound. **List Price \$7.95 • Order No. 566**

Solid-State Circuit Troubleshooting Guide

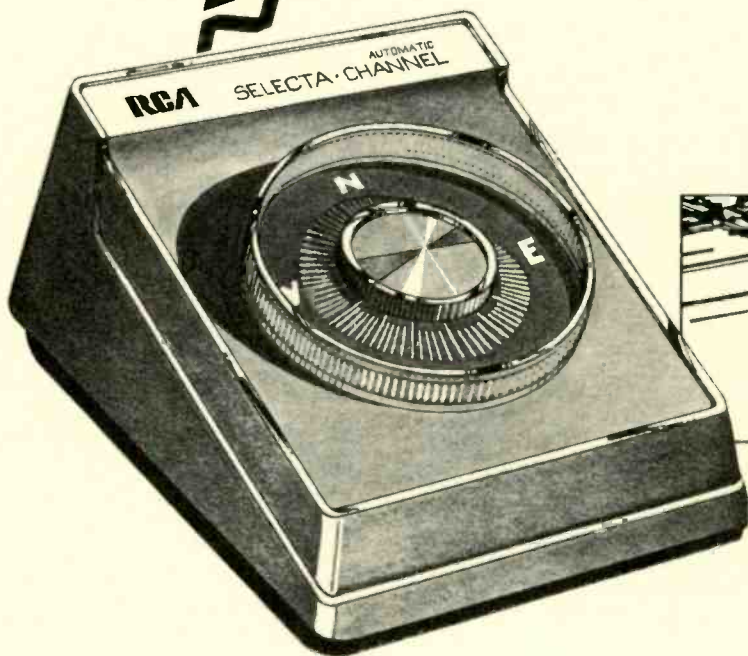


Here's a brand-new approach to understanding and troubleshooting all types of solid-state circuits. This unique book discusses various types of solid-state devices — diodes, transistors, field effect transistors, integrated devices, and silicon controlled rectifiers—with emphasis on how these devices 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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ZERO IN ON PERFORMANCE



RCA'S NEW SELECTA-CHANNEL ANTENNA ROTATOR IS ENGINEERED TO SELL!

Here's an antenna rotator that you can be sure will deliver top performance for your customers—and it sells at a popular price! Just check these buyer-directed features our engineers have designed into this precise, efficient unit:

- Transparent "direct select" control knob for "tuning" ease and accurate selection of antenna location.
- Moving direction indicator light is synchronized every 3 degrees to show exact position of antenna at all times.
- Variable "end-of-rotation" stop permits customized installation to suit local conditions.
- Attractive beige control cabinet blends with any decor.
- Improved heavy-duty precision worm gear drives antenna mast for strong turning force, and locks it in position to prevent "windmilling."
- No annoying "click-clack" sound. Operates quietly.
- Heavy-duty high-torque motor provides fast turning action . . . complete 360° rotation in less than a minute.
- Sturdy IMPAC® plastic control case.
- Electrical current used only during rotation.
- Quick-connect pressure terminals and pre-assembled mounting clamps (no protruding studs that can snag lead wire) mean fast, easy, money-saving installation.
- Plus all the usual top quality features you expect in an RCA rotator—lightweight aluminum drive unit housing, cushioned feet on control console, locking mast clamps with teeth, extended three year warranty (see warranty card for complete details).

RCA's Selecta-Channel antenna rotator passed continuous operation lab tests without burn out or over heating—tougher usage than the consumer will give it. It's your customers' best buy in rotators and that means it's your best buy too. See your RCA Rotator distributor today, or contact RCA Parts and Accessories, P.O. Box 100, Deptford, New Jersey 08096.

. . . for more details circle 123 on Reader Service Card

Section 1—Affiliated Association Eligibility

Any eligible association or group of potential membership, all of whom may or may not be members of this Association, or who simultaneously apply for membership in this Association, is eligible to affiliate with this Association as an Affiliated Association...

Section 2—Affiliated Association Agreements

A. Agreements may be negotiated between applicant affiliates and the National as to: 1. The collection and remittance of the national dues...

Section 3—Exception to the Case

If any exception to any case arises pertaining to this Article, a ruling and permanent resolution shall be obtained from the House of Representatives.

Section 4—Eligibility for a Chartered Affiliation Association

For an affiliation with the National Association as a Chartered Association, the following conditions must exist: 1. It must have organizational structure to be an autonomous affiliation with the National Association...

Section 5—Eligibility for a Sponsored Affiliated Association

A. For an affiliation with the National Association as a Sponsored Association, shall be those associations that cannot comply with the prerequisites of a chartered association...

Section 6—Suspension of Charter of Sponsorship Agreement

The charter or sponsorship of any affiliated association may be suspended by the Executive Council pending Right of Appeal, Art. III, Sec. 12) for breach of any of the following provisions: 1. For disregard and violation of any provision of the legal instruments of this association...

Section 7—Revocation or Reinstatement of the Charter or Sponsorship

A. Upon revocation or reinstatement of the charter or sponsorship of any affiliated association, all its rights, privileges and benefits as an affiliated association of this National Association shall cease and terminate and all property of the National Association shall be returned immediately.

Section 8—Investigation and Report

The Regional Vice President or Executive Vice President shall investigate and present to the attention of the Executive Council for appropriate action, under Art. III, alleged Association operations which in the opinion of the Executive Council of the National Association are of doubtful legality.

Section 9—State Statutory Reports

Each affiliated association shall secure from its members and furnish to the National Association, periodically upon request, such statistical reports as may be requested with the approval of the Executive Council.

Section 10—National Association Participation

Any State Association may invite participation or official action of the National Association in any issue of local origin whose determination may affect the interests of the membership of the National Association as a whole...

Section 11—Requirements of State Associations

Any affiliated association shall keep on file with this association a current copy of its By-Laws or equivalent organizational instruments.

Section 12—Rights and Appeal

A. Any suspended association may file an appeal to the House of Representatives within 130) thirty days, for investigation and hearing of the causes of such suspension or revocation of its charter or sponsorship...

ARTICLE IV. FINANCING—DUES OF MEMBERS

Section 1—Dues - Activities

The activities of this Association shall be financed by the Dues and/or Grants payable by members as fixed by the By-Laws and supplemented by such other income as may accrue to the Association from any source which does not affect its tax exempt status and is approved by the Executive Council.

Section 2—Collection of Dues by Affiliation

Each Chartered Association when affiliated shall be responsible to the National Association for the collection of the National membership dues and/or service charges as fixed by these By-Laws.

Section 3—Remitting Dues

Each Chartered Association shall remit the National dues and/or service charges for its National Members to the National Association, in such a manner, and at such times, as may be determined by the Executive Council. A 45 day grace period from the date to date which payment must be received by the National Association.

Section 4—National Membership Dues by Class

A. Active Membership dues shall be \$16.00 annually, payable in advance at the beginning of each fiscal year, or as may be agreed between an affiliate association and the National Association. B. Inactive Membership dues shall be \$15.00 annually, payable in advance at the beginning of each fiscal year.

ARTICLE V. FUTURE PRESIDENTIAL REGIONS

Section 1—Regions

For the purpose of administration and representation, the membership shall be divided into 10) ten Vice Presidential Regions as designated by states, as follows: Region #1—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

live with his region.

C. The Regional Vice President shall exercise the leadership necessary to assure the proper promotion of the policies and programs of this National Association within his Region.

D. The Regional Vice President shall lend counsel to the State Representative from his Region, and they should coordinate their efforts for the benefit of their membership.

E. The Regional Vice President shall investigate all charges that may be filed against any member of affiliate association of the National Association in his Region and report on same to the Executive Council and/or House of Representatives.

ARTICLE VI. HOUSE OF REPRESENTATIVES

Section 1—Powers

A. The power of this Association shall be vested in its House of Representatives while in session, in ultimate control of all of its assets, affairs, policies and programs.

Section 2—Members

The House of Representatives shall consist of: One Representative selected from each State by the affiliated associations within that State, all Regional Vice Presidents, Division Chairmen, Subsidiary Chairmen, National President, Immediate Past National President, National Secretary and National Treasurer.

Section 3—Officer Duplication

No one individual may hold more than one national office simultaneously.

Section 4—State Representatives

A. The affiliated associations within each State shall collectively select one active member from their State to serve and represent the active National Membership of that State within the House of Representatives.

Section 5—Representatives Expenses

The National Association may reimburse all expenses for the State Representatives pertaining to official functions of the National Association such as: travel, lodging and reasonable food that may be commensurate within the National travel fund budget pertaining to that state as a standing procedure as established by the Executive Council.

Section 6—Meetings

A. Regular meetings of the House of Representatives shall be held at the National Convention and between the dates of January 15th and March 21st of each year. B. Special meetings may be held at the request of the Executive Council or 20) twenty or more members of the House of Representatives.

Section 7—Voting

A. Voting for the national officers of this National Association shall be as follows: the Representatives shall cast their total number of proxy votes in which they represent the Active Membership in good standing within their jurisdictions.

Section 8—Quorum for Business

A quorum for the transaction of business of any meeting of the House of Representatives shall be the representation of the majority of the National Association membership.

Section 9—Chairman of the House of Representatives

The National President of the Association shall serve as Chairman of the House and the National Secretary of the Association shall serve as Secretary of the House and keep or cause to be kept a record of its proceedings.

ARTICLE VII. EXECUTIVE COUNCIL

Section 1—Member Composition

There shall be formed from the House of Representatives a committee called the Executive Council or "Council". It shall consist of the National President, the Immediate Past National President, National Secretary, National Treasurer, Regional Vice Presidents, and Subsidiary and Division Chairmen.

Section 2—Council Powers

A. The Executive Council shall have the powers to conduct, or cause to be conducted, the routine business and affairs of this Association. In addition it will act as finance and control committee for the Association and such other responsibilities as may be described in these By-Laws and that may be delegated to them by the House of Representatives.

Section 3—Meetings

A. The Executive Council shall meet at least (4) four times each year which, may be in proximity with the House, and such intervals as the President shall deem practical. The Council shall meet at the request of the president, or upon request of 15) five or more of the Council members.

Section 4—Quorum

A quorum for the transaction of business shall be (2) two thirds of the members of the Executive Council.

Section 5—Voting

A. Each member of the Executive Council shall have (1) one vote while acting within the affairs of the Executive Council.

Section 6—Association Budget

The Executive Council shall require the Executive Vice Presidents and any committee, coordinator, or subsidiaries to submit a detailed proposed budget for the following fiscal year of their operations within this Association for consideration of the Executive Council and at the discretion of the Executive Council, however, no later than the second meeting of the calendar year of the Executive Council.

Section 7—Annual Convention Subj Proposed

The Executive Council shall propose a time and place for the next annual convention of its members at the House of Representatives at the annual convention each year for their consideration.

Section 8—Executive Council Members Expenses

The National Association shall reimburse all expenses incurred for its official functions such as: travel, lodging and reasonable food that may be commensurate within the National budget and as a procedure as established by the Council.

ARTICLE VIII. PAID EXECUTIVE OFFICERS AND STAFF

Section 1—Chief Executive

The Executive Council may employ such chief executives, called Executive Vice Presidents, as commensurate with the budget of this association for the execution of such business and affairs as they deem appropriate.

Section 2—Chief Executive Employment

A. Each Chief Executive will answer directly to the Executive Council with such terms and conditions of their contract as may be appropriate and within the best interest of the Association welfare.

Section 3—Executive Vice Presidential Duties

A. The Executive Vice Presidents shall be the Chief Administrators of the Association, generally dealing with the Association's external and internal affairs.

changes in policy and programs to the Executive Council or House of Representatives, but shall not be part of the approval or adoption.

Section 4—Other Executive Staff Personnel

There may be such other paid executive staff personnel as the Executive Council may determine appropriate for the execution of business and affairs of the association, commensurate with the Association budget, and that shall answer to one of the other Chief Executive.

Section 5—Executive Staff Honoring

The Association Chief Executives and such other Executive Staff personnel as determined, shall furnish bond in an amount established by the Executive Council for the faithful performance of their duties. The cost of such bond is to be paid by the National Association.

ARTICLE IX. NATIONAL OFFICERS

Section 1—Annual Election of National Officers

A. The National President, the National Secretary, the National Treasurer and the Regional Vice Presidents shall be elected by ballot of the proxy votes, as in Art. VI, Sec. 7A) of these By-Laws.

Section 2—Nominations

A. Nominations for office shall be made by a nomination committee consisting of members of the House of Representatives as appointed by the National President. Additional nominations may be made by the membership from the floor.

Section 3—Election Declared

A candidate for office shall be declared elected when he shall have received a majority of all the votes cast by the membership through their representatives' proxy. If no candidate has received a majority of votes at the first ballot, a second ballot shall be taken, limited to the two candidates who received the highest number of votes on the first ballot.

Section 4—The National Presidential Duties

A. The President shall preside as Chairman of the House of Representatives, Chairman of the Executive Council and Chairman of the Convention of its members.

ARTICLE X. COMMITTEES

Section 1—Standing Committees

There shall be the following Standing Committees of the membership of this Association. The function of such committees shall be as described in Chapter III of this Association Book of Policy.

- 1. Committee on Consumer and Public Relations
2. Committee on Advertising and Marketing
3. Committee on Research, Development and Safety
4. Committee on Ethics and Standards
5. Committee on Apprenticeship and Manpower Development
6. Committee on Education and Training
7. Committee on Membership Service Benefit Expansion
8. Committee on By-Laws and Internal Development

Section 2—Reports

A. All Committees provided for herein shall report to the House of Representatives and Executive Council upon their activities of all action taken pursuant to previous instructions. Between meetings, all Standing Committees shall report to the President.

Section 3—Committee Expenses

The expense and cost incurred by any committee shall be authorized under direct authority of the Executive Council.

Section 4—Committee Assignments

The President may assign any member or type of member to a committee that may seem appropriate for the advancement of the Association; however, standing committee Chairman shall be selected from the Executive Council.

Section 5—Dissolution

The President may discharge any special committee not expressly provided for in the By-Laws when their need no longer exists.

Section 6—Ex-Officio Member

The President shall be a member of all committees, ex-officio, and the Executive staff may be an advisory of any committee.

ARTICLE XI. SUBSIDIARY AND DIVISIONS

Section 1—Subsidiaries

A. Subsidiaries of this National Association shall be those organized groups serving to assist or to supplement, or serving as an auxiliary of this National Association.

Section 2—Divisions

A. Divisions of this National Association shall be those organized groups serving an alpine entity, distinct within the electronic industry, self-contained, separated by an industry function.

ARTICLE XII. ASSOCIATION BOOK OF POLICY

Section 1—Authority

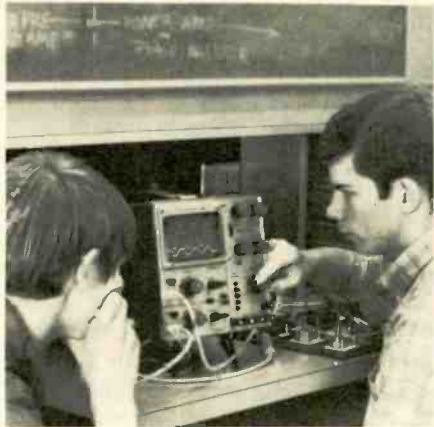
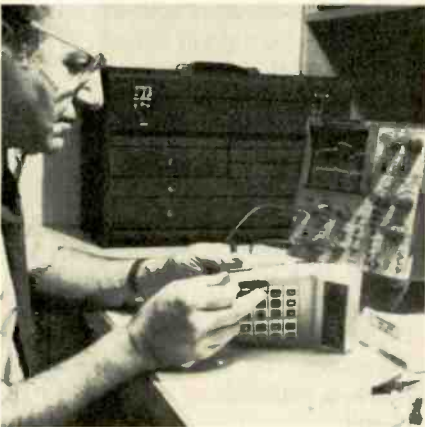
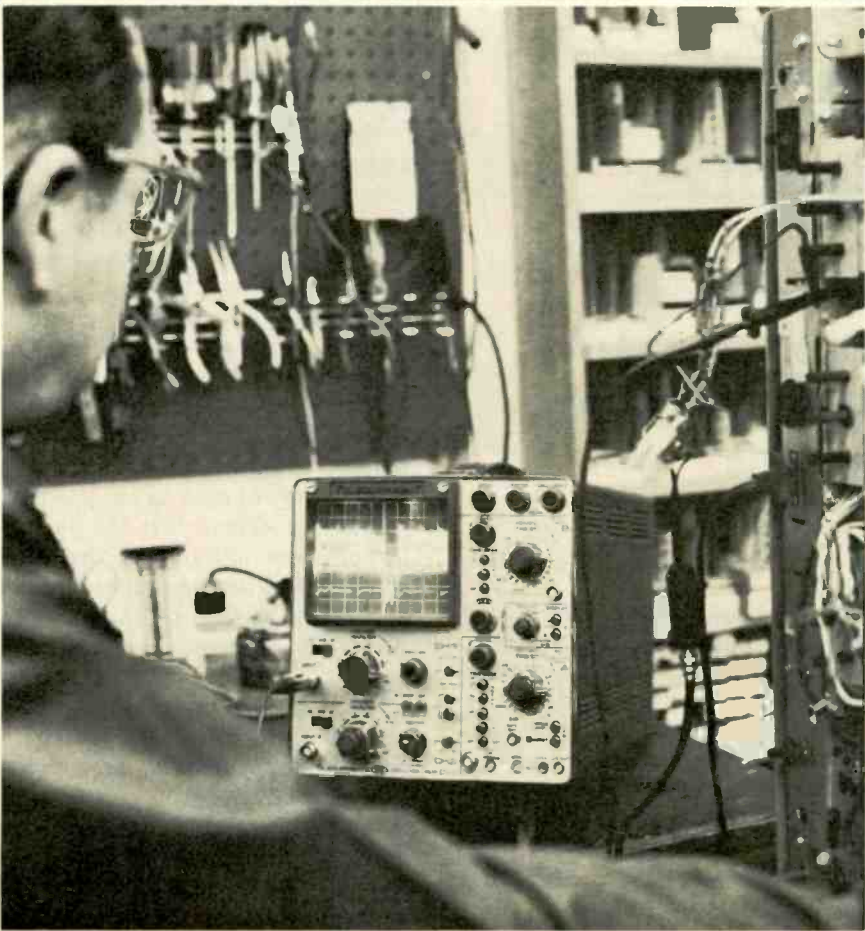
A. The Book shall set forth a greater plan on this association policy and procedures for the benefit of the association well-being and welfare called the Association Book of Policy or "Book of Policy".

Section 2—Amendments to the By-Laws

The By-Laws of this Association may be revised or amended at any meeting of the House of Representatives at which a quorum is present, by (2) two thirds affirmative proxy vote cast in Art. VI, Sec. 7B) of the House, providing:

Section 3—Exception to the Rule

An emergency amendment to the By-Laws and any "exception to any rule" may be made by this Association by the House of Representatives at any meeting and enacted into effect immediately if the following circumstances are commensurate:



If you don't require delayed sweep but need dual trace at 25 MHz, here's another economical, quality scope—the D66. Troubleshooting consumer digital products such as mini-calculators is made easier by using dual trace. Also a "SUM" mode with normal-invert capability makes it possible to look at small signals in the presence of common mode noise—such as power supply hum.

This simple to use, dual trace, 10 MHz D54 gives you low-cost, dependable performance in a wide variety of applications. Like all Telequipment scopes, it is light weight, easy to carry and is backed by Tektronix' warranty and reputation for quality. Students shown are testing amplifier circuit by measuring the gain between input and output signals.

Quick Permanent Repairs with Confidence.

The D67 ends troubleshooting guesswork in complex TV and audio circuits—at a low price.

TV and audio equipment servicing is outdistancing the capabilities of older test instruments. Also, greater use of electronics in consumer products (pocket calculators, microwave ovens, digital clocks, home intruder alarms, etc.) is opening up new service opportunities. Telequipment offers you the high performance you need in a low-cost scope for this new service business.

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Caution Pays Off in Customer Disputes

The easiest of all times to lose a shop's good customer is when some difference has arisen in his relationship with one's business. Such an incident can happen despite all the safeguards that may have been erected.

by Ernest W. Fair

■ How well customer disputes are handled often determines whether or not that individual's future business remains with one's firm. The procedures offered below, outlining precautionary steps to follow at such a time, will lessen the possibility of loss of that customer's business.

Studiously avoid any direct challenge to the customer's position with respect to the matter or point under dispute. Such a procedure only makes it more difficult for that individual to enter into a compromise on the problem or to ever see where he may be wrong.

The direct challenge is always the first step which comes to mind even where the shop could possibly be on the wrong side of the element of dispute. Any such confrontation always makes the customer more determined than ever not to give-and-take in reaching a solution to the dispute, and makes retention of his goodwill more and more difficult.

Keep everything at low key no matter how excited that customer may be at the time. Your own calmness will soon diminish his built-up tensions and permit more reasonable handling of the problem.

"Low key" always offers an approach to more reasonableness in handling disputes. It also keeps the element of emotion out of the effort to reach understanding. That is most necessary for arrival at a position which will be completely acceptable to both the shop and to the customer.

Choose every single word that you are using with the utmost care. Words are always tricky things. The English language is loaded with

many dual meanings. Also many words are harsh and tend to aggravate rather than soothe the person toward whom they are directed.

Even an innocent statement, under the circumstances which will be present during such occasions of dispute with customers, may be misinterpreted and thereby create additional resentment on the part of that individual.

Get the customer into an area of privacy as quickly as the problem becomes apparent. He is always much more reasonable there than where he must defend his position in front of other customers or even employees of the shop.

Man-to-man discussions can be more personal and to the point than those in which others are present as a listening audience. Reasonable concessions come much easier under the former conditions than the latter.

Avoid forming a conclusion as to the customer's intent or motives. Give him every break for sincerity and honesty in his position.

Such conclusions also erect barriers which make the solution to the dispute much more difficult to discover. It is all too easy for one to quickly classify situations into categories which one has found most prevalent in the past.

Speak slowly and softly with what you say to that customer regardless of youth or age, sex, community position or value as a continuing customer of the shop.

Less misunderstanding is possible if this is done rather than using rapidly spoken words uttered at high emotional levels. That type of conversation always lends itself to mis-

understandings and further difficulties.

Handle every customer dispute as a separate problem. Permitting what one has learned in handling a previous customer dispute to prejudice the current one's motives or intent can be most misleading.

Definite guide lines and procedures develop, of course, for handling these customer disputes. It is safest to follow these but never so rigidly that there is no room for specific application in reaching a satisfactory solution to the problem.

Never conclude that the particular problem is so great that it is better to risk losing that customer's business than to make any concessions. No shop can ever afford to lose customers one at a time.

There is always the easy solution to a customer dispute. Besides the obvious disadvantages, as a policy it also tends to grow upon itself. Soon one will find handling customer disputes easier and easier by just letting the shop lose their patronage.

Let the customer speak freely and at length. Be a good listener regardless of what the customer is saying or how much your own resentment is rising at the mistakes he may be making insofar as truth in the matter is concerned.

The more the customer says in the first moments of the contact, the lower and lower his personal tensions will drop. The more "steam" he blows off without interruption or argument, the easier it will be to reach a satisfactory solution to the dispute.

Ask the customer what he feels should be the solution to the problem before coming up with one of your own. Usually what the average customer will propose will be far less costly to the shop than what would have been offered.

Customers always tend to make demands high when they are speaking in generalities. When it comes down to specifics, however, the attitude generally changes a great deal.

This approach also gives the customer a sense of participation in the mutual arrival at a good decision. That sense of participation generally produces a much more reasonable attitude on his part.

continued on page 57

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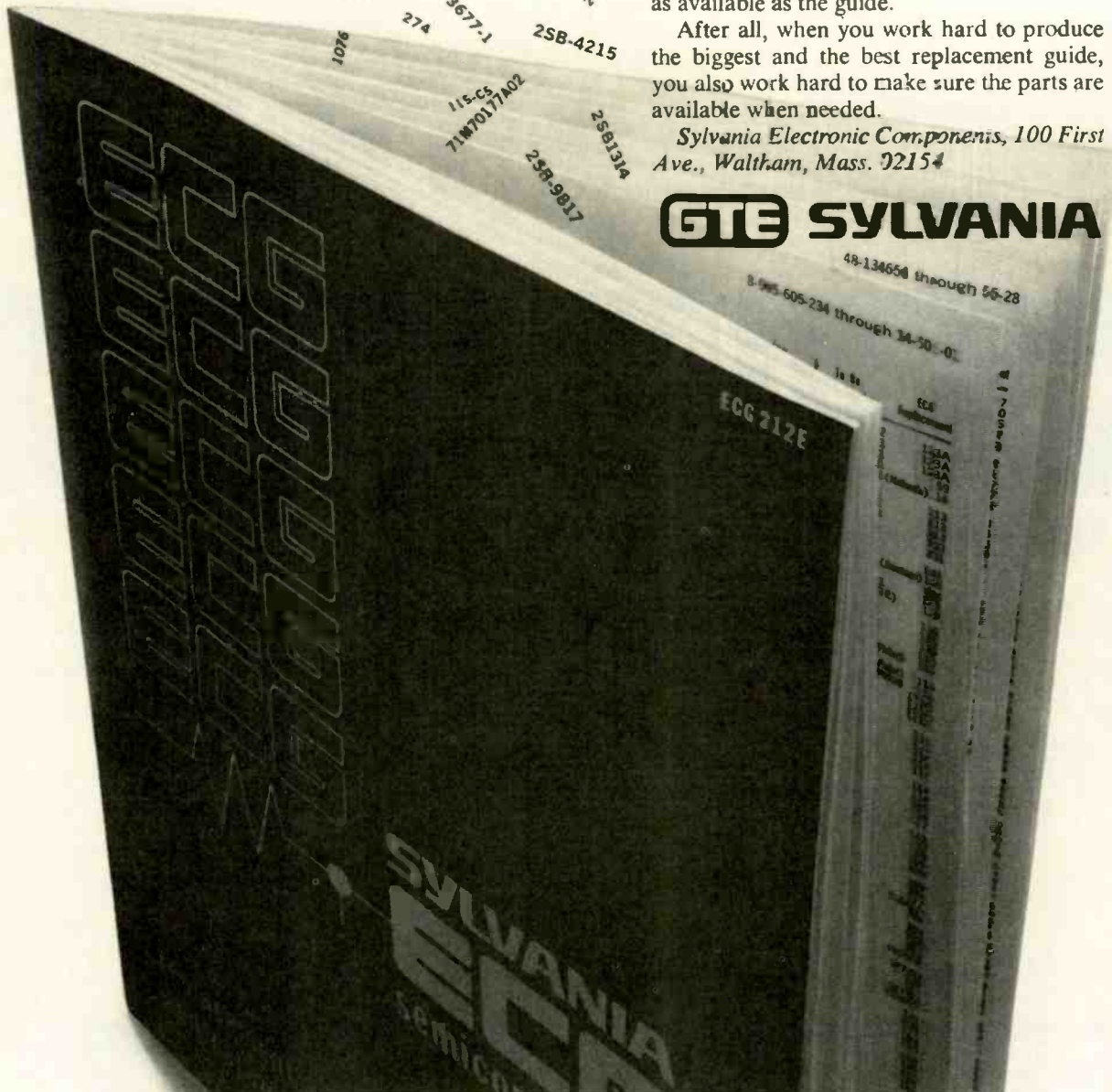
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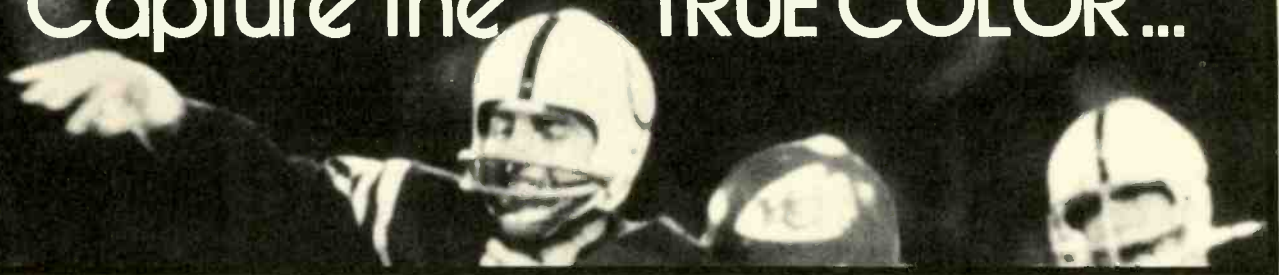
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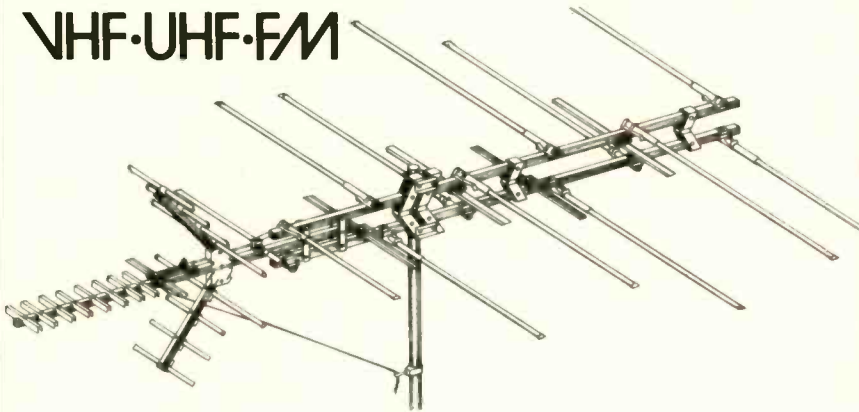
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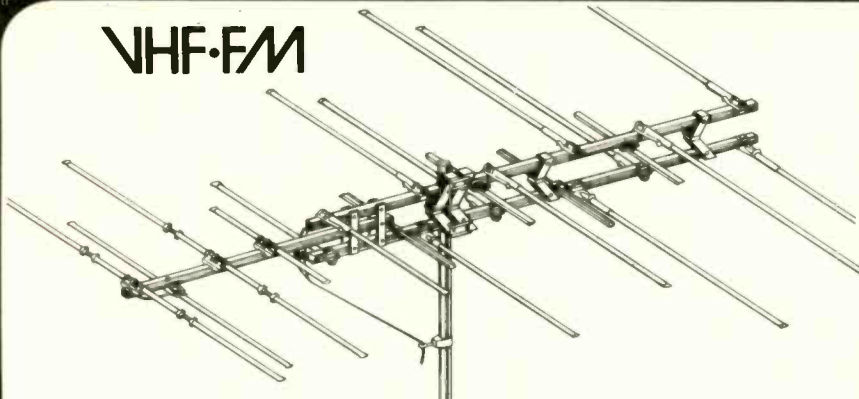
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Our Electronic's Lab

by Phillip Dahlen

A glimpse at the facilities in which many of our articles are prepared

■ A few of our newer readers have had the mistaken notion that the editors of this publication sit off in little offices high up in some ivory tower and either just review articles written by experts in the field or dream up some theory unrelated to any actual contact with the industry that we serve—an assumption considered absurd by those better acquainted with our publication.

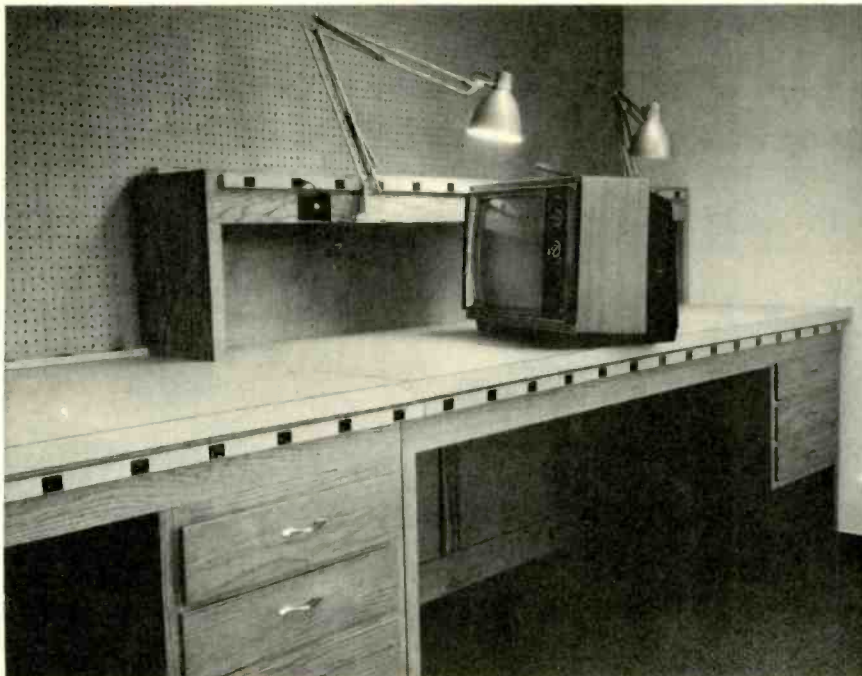
Joe Zauhar, our Managing Editor, has his own shop and spends much of his free time repairing consumer electronic products. Your editor, who *does* have an electronics background, spends a great deal of time visiting with electronic technicians and service dealers across the country, occasionally even speaking at

state association banquet functions. Such travel offers an excellent opportunity for a first-hand exchange of ideas.

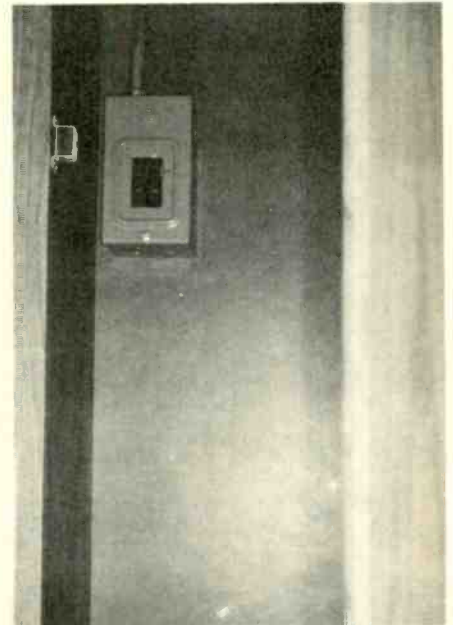
But what about when we are in the office on the job?

Our electronic's lab, shown in color on this month's cover, has just recently been remodeled for even more effective use. It is in this lab that we examine the circuitry described in our bylined original articles. So welcome, take a look around. It's nice having you visit. *(Those interested in what the rest of the Duluth facilities look like might refer back to the audio-application article beginning on page 46 of the January 1973 issue.)* ■

continued on next page



Portion of the nearly 19-ft long bench shared by your two editors. Another work area with table is also provided in the lab should it be required.

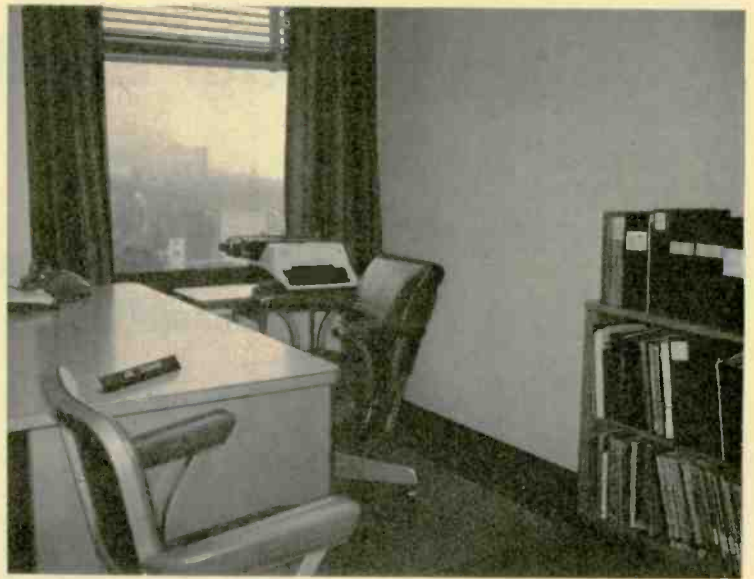


In the closet at the left end of the bench are two circuit breakers that are used for turning OFF all power to the bench at night. This closet will also serve for hanging test leads.

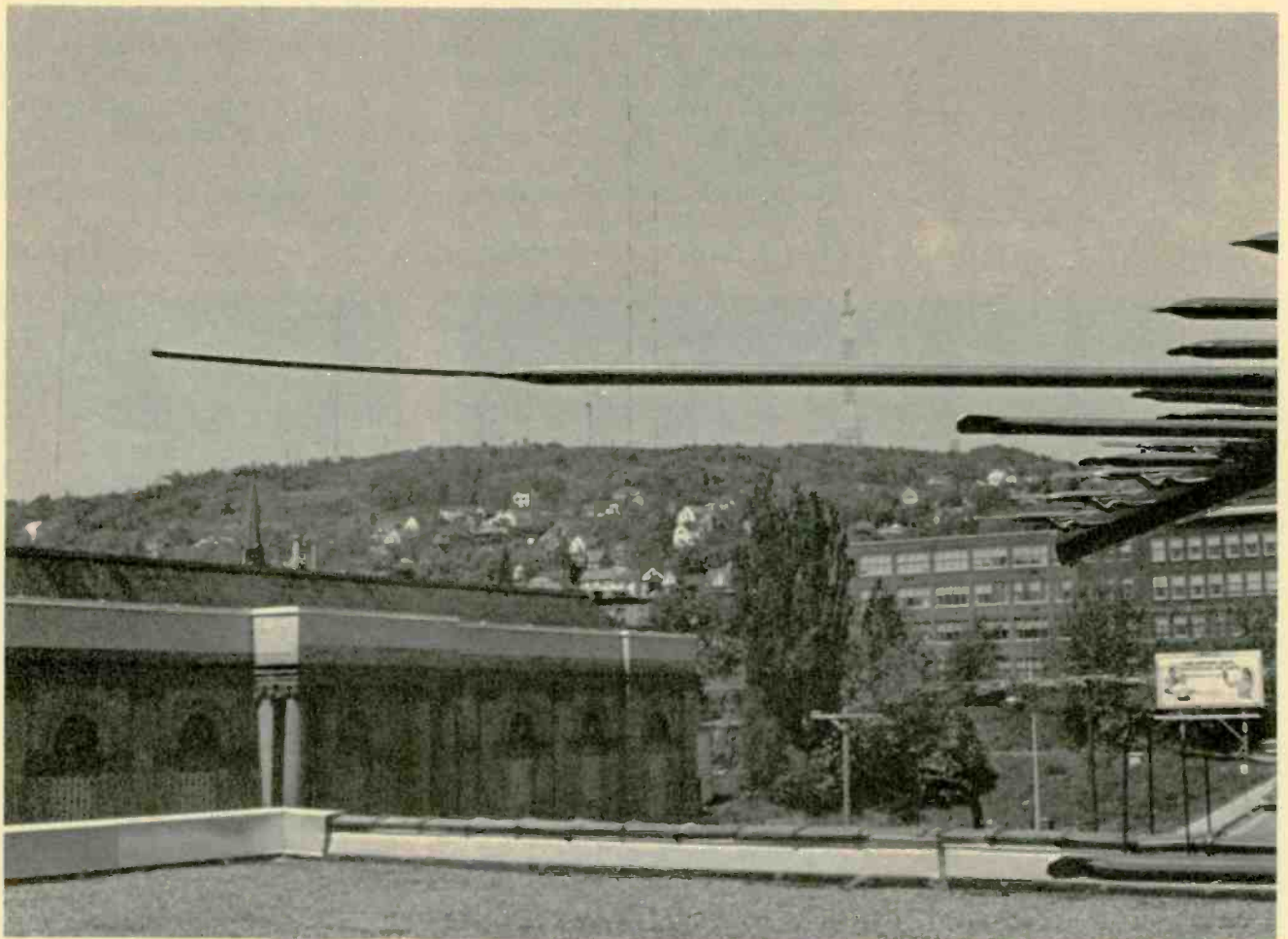
LAB . . . *continued from page 29*



Still further to the left of the bench there is extra space for our files and a much-used dictionary. (The door at the right connects to the hallway, while the door at the left connects to the Editor's office.)



The Managing Editor's office has a good view of Lake Superior to his right, while also allowing him to observe equipment functioning on the bench at his left.



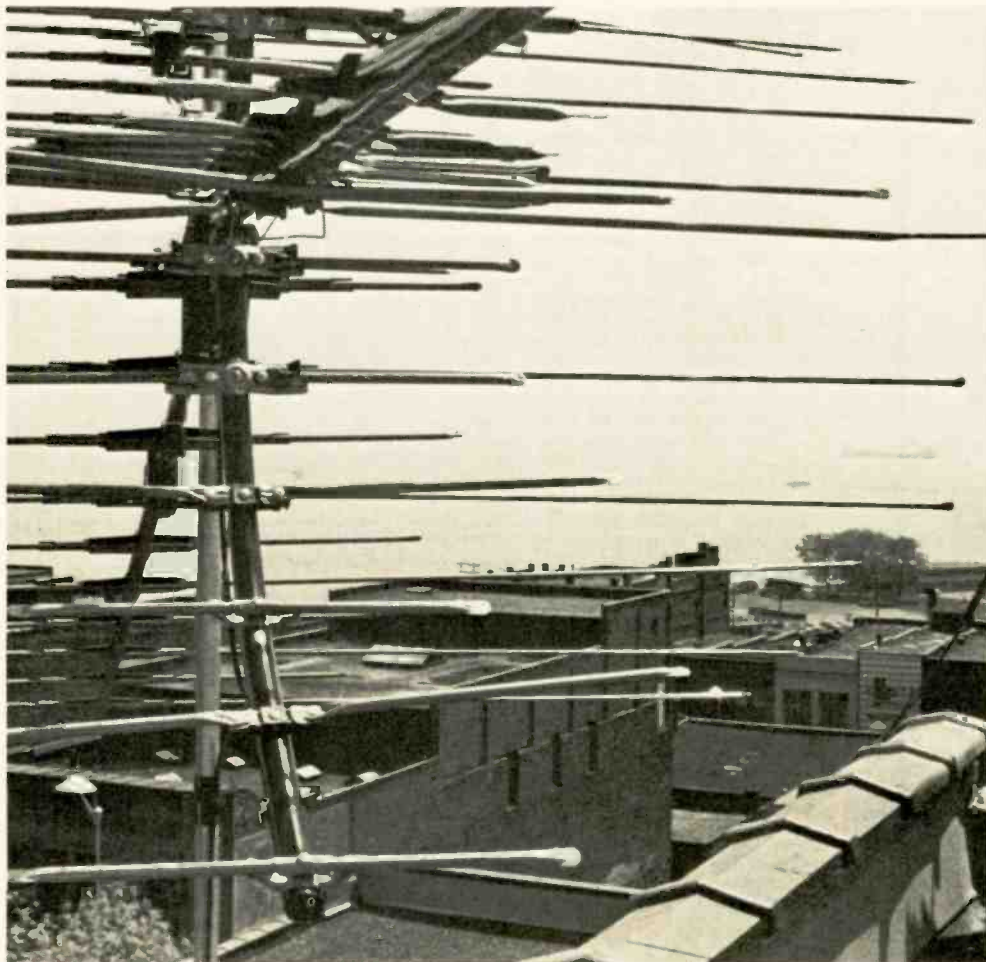
The TV antenna on the roof of our building is within line-of-sight with the transmitters at the top of the hill, thus permitting excellent reception. (The antenna almost needs to be tipped upward so that it faces the towers.) Tests indicate that a clean +55dB (0.56v) unamplified video RF signal is delivered on all available channels to the distribution rack.



An additional work area is provided for the overflow that won't fit on the main bench. Above the filing cabinet is an enclosed rack. It is designed for receiving TV signals from either the roof or a CATV system, and distributing any combination of signals to each of the four MATV-type outlets located on the main bench. Cables from the rack to the roof permit comparing antennas or rotating one antenna remotely for evaluation. (Future articles will cover this feature in more detail.)



In addition to another filing cabinet and bookcases, the Editor's office contains shelves (in front of his desk) holding some of the test instruments supplied by manufacturers.



With our building located high above Lake Superior, there is virtually nothing to cause reflections to the rear of the antenna. (Note the huge arc carrier and the excursion ship in the right of the picture.)



Innocent Service Dealer Arrested

by Phillip Dahlen

DA charges shop owner
with petty larceny for
allegedly not replacing
30¢ resistor!

Report submitted by New York Testing Laboratories, Inc.

Lab. No. K-39,046

CLIENT: Suffolk County District Attorney's Office
1 East Main Street
Bayshore, New York 11706
Att: Detective A. Goldschmidt

MATERIAL: Two (2) G.E. Television Sets

YOUR ORDER NO.: Pending

SUBMITTED FOR: Evaluation Tests

An engineering evaluation of television sets for the Suffolk County District Attorney's Office was performed.

Two (new) Black & White Portable Television Sets, manufactured by the General Electric Co., were purchased by the Suffolk County District Attorney's Office and supplied to New York Testing Laboratories, Inc. for the Evaluation Test Program.

Identification of Television Sets:

1. G.E. Portable TV, Model WM507SEB-2, S/N 5T3L11044 (Marked 1B)
2. G.E. Portable TV, Model WM506SVY-2, S/N 5V1G05165 (Marked 1W)

The submitted TV sets were thoroughly inspected and tested. The sets were checked for proper operation of all accessible controls as follows: the volume control and tuner were inspected for noisy operation; the picture was inspected for linearity and a strong video signal which could readily be adjusted with the Brightness and Contrast controls.

The TV sets were then electrically inspected and a set of initial data was recorded (Appendix 1). The tubes were checked (Hickok 539C Tube Tester) and specific voltage levels measured. The tubes and major components were marked with a dye, detectable only under Black Light.

A fault was then introduced into the audio section of Set 1W (S/N 5V1G05165). The original 17BF11 tube was replaced with one that was artificially aged. The transconductance of the tube was measured and recorded (Appendix 1). The beam power section of the tube was faulty but the tube exhibited no shorts.

This fault exhibited the following characteristics:

The TV Set had no sound.

The video, brightness, etc., were all functioning properly.

On June 17, 1971 (at 11:30 AM), the TV Set was picked up by the Suffolk County District Attorney's Office and delivered to a TV repair shop.

On June 21, 1971 (at 12:30 PM), the TV Set (1W) was returned to NYTL with the repair ticket (Appendix 2) for evaluation. The TV set was thoroughly inspected and the data was compared to the initial data recorded. The results of the evaluation are as follows:

The set was found to be in good working order. The faulty 17BF11 had been replaced and returned. In addition, a 1 Meg. resistor which was said to have been replaced was tested and found to be good. The areas around the following 1 Meg. resistors in the set were inspected: R208, R211, R214, R259, R251, R252. However, it does not appear obvious that a resistor was replaced.

It is noted on the bill for the repair that the following service was performed:

"Cleaned & lubed tuner
Checked all tubes
Replaced tube & resistor
Set up vertical parameters"

Considering the original condition of the set, there was no purpose for any of the above services, except for testing and replacement of the 17BF11 tube.

We certify that this report is a true report of evaluation of this material.
Respectfully submitted,
NEW YORK TESTING LABORATORIES, INC.
G. J. Harvey
Managing Director

■ On November 17, 1971 Alex Sabosto, who operates A & M Electronics in Westhampton Beach, N.Y., was arrested, fingerprinted, mugged and charged with petty larceny, a misdemeanor carrying a maximum penalty of three months in jail or a \$500 fine.

There was a large writeup concerning the incident in Long Island's largest newspaper, *NEWSDAY*, which ran the headlines "TV Repair Bills Out of Line: DA". In a blanket assault of our profession, the article began by telling about the Greek philosopher Diogenes who spent his life looking for an honest man but never found one; and then compared this to the efforts of two detectives working for the Suffolk District Attorney, who wandered through the country with portable TV sets looking for an honest TV repair shop.

The article went on to say that of the 11 shops visited, only one shop charged a "fair" price and seven of the shops, according to District Attorney Aspland, "charged for work which was not done or charged for parts that were not replaced." All seven of the accused were listed in the article by name and address, including Mr. Sabosto.

Henry Wawryck, owner of Henry's Radio and TV shop and President of the Television & Electronics Service Association of Nassau County, reports what then occurred:

"In November of 1972 I was the guest of Phil Holt, President of TESA of Suffolk County. At this meeting, Alex Sabosto of A & M Electronics got up and asked for help. His was one of the 11 shops caught in the DA's entrapment. His voice was sincere and a little broken when he told of being arrested, fin-

ger printed and charged with petty larceny. While awaiting trial the adverse publicity was harming his business. He said that he couldn't believe the D.A., since he ran an honest business.

"This was the first time I met Mr. Sabosto. For three days it bothered me. He said he was honest . . . he was sincere . . . how could I help him?"

"The following week I attended an EASAC Meeting in Albany, N.Y. Mr. Sabosto's case was brought up. The EASAC lawyer, Bill McCarthy, summed up the details, said it made interesting reading and that Mr. Sabosto should be helped.

"That was on a Sunday. On Monday my association, TESA of Nassau County, had its meeting. As President, I asked the membership if they would allow me to help Mr. Sabosto. They agreed. The Association is incorporated, I am not.

"On December 3, 1972 I called Mr. Sabosto, told him who I was and asked him if he had any help. He said that he had some promises, but his lawyer, Robert Diedolf, felt they were not qualified. I asked him if he had replaced the 1 meg. resistor in question. He told me that his repairman had replaced it and returned the old one to the customer. I also asked if I could see the TV set in question. I advised Alex that if the set showed evidence of the resistor being in place, I would be in a position to help him. If he hadn't replaced it, he would get hurt.

"A few minutes later Mr. Diedolf phoned me. We spoke of the case. He said that he felt my help would be significant to the outcome of the case. He said that he would push the case and for me to be ready in 24 hours after his call to testify.

"Late Friday afternoon, January 12, 1973, Mr. Diedolf's secretary phoned my shop. I was out, but returned the call on Saturday and spoke with Mr. Diedolf. He told me to be at the Riverhead Court at 8:30 a.m. on Monday, January 15, 1973. He told me that the TV set in question would be in court for me to examine before the trial.

"This was the start of the Long Island Railroad strike and the expressway was full of cars. The Riverhead Court was about an hour's drive from my home in Hicksville. I then met Alex, his lawyer, and his repair man. I asked where the other defense witnesses were. No one else was present. We were then called into court.

"The New York Testing Laboratories, Inc. had two engineers that carried in the TV set as evidence. Mr. Diedolf advised me to examine the TV set, and I asked the engineers to remove the back of the S2 General Electric TV set.

"They brought out tools suitable for the removal of spark plugs in automobiles. I asked them if they wanted proper tools to remove the back and antenna leads (these were the engineers who evaluated this set to indict Mr. Sabosto), and they said yes.

"I had to help them remove the back.

"Upon exposing the chassis I immediately saw that a resistor was changed. Upon seeing this I signaled to Mr. Diedolf to go out into the hall, where I advised him that a resistor had been changed and that I would testify on Mr. Sabosto's behalf."

The following are direct quotes from the official court transcript of Henry Wawryck's testimony:

ARRESTED...

continued from page 33



DIRECT EXAMINATION BY MR. DIEDLUF:

Q Mr. Wawryck, what is your line of work, sir?
A I'm in radio and television repair.
Q How long have you been in Radio and television repair?
A Thirty-six years.
Q When you say you are in television and radio repair, will you tell the Court exactly what you mean by that?
A I have a small shop in Hicksville, been there all my life, and I repair and maintain home radios, home televisions and auto radios.
Q Did you have any formal training in this line of work prior to your entrance into business?
A I started when you had battery radios, and then I had some training with the Navy in the second war, and then I attended periodic seminars that manufacturers give, different leading manufacturers, seminars on new products.
Q Are you associated with any organization or organizations?
A Yes.
Q Of people who are involved in this line of work?
A Yes, I'm a former president of the Radio Television Guild. I am presently the president of TESA, Television Servicemen's Association of Nassau County.
Q Are you here today at my request?
A Yes.
Q Mr. Wawryck, based on your thirty-six years of experience and president of that organization, have you become familiar with the operation of a radio and TV repair shops wherein a flat labor charge is charged to the public?
A Yes. Some shops do it. As a matter of fact, the majority of the shops do it because sometimes you're limited as to what the customer wants to repair, and we may not know the extent of time involved. Now, if the customer wants a minimum job on it, we can't afford to spend a lot of time on it. So we have to come to some arbitrary figure on labor. Material we never get, because you never get two sets alike with the same material bad.
Q Is \$18.00 a reasonable flat labor charge?
A Very reasonable, when you consider RCA gets fifteen and change just for one service call.
Q Now, in your line of work, in the past thirty-six years, have you become familiar with the mass manufacture of printed circuit boards?
A Very much so. I visited plants. I have watched them make sets. I used to do warranty work, and they would have production mistakes and errors, and they would invite me down to see how they made the sets and how they corrected the problems.
Q And I take it during this thirty-six years you yourself have examined and repaired countless circuits, printed circuits and television sets?
A Yes.
Q Are you familiar with resistors as they are used in television sets?
A Very much so.
Q May I ask you this question: Based upon all your experience, in your opinion, can a resistor be replaced in a television set without leaving any telltale indications that it has indeed been replaced?
A In other words, can a skilled technician replace a resistor without someone observing or being able to observe it has been replaced?
A No, there will be telltale evidence.
Q And I ask you what you look for to determine whether a resistor has been replaced if that is something you were called upon to do?
A Number one, the solder which we use, which is usually sixty percent lead and forty percent tin, oxidizes very fast. When you take a fresh solder joint now and solder, it's going to be much shinier in appearance than something that was soldered six months ago or a year ago, because the oxidation process takes pretty fast, especially in this climate with the salts and everything, the surrounding area, we get a high percentage of oxidation.
Q So, you're saying, sir, that a more newly soldered connection is discernible because it is less oxidized?
A It would be much shinier in appearance.
Q Is there anything else that you, as a skilled technician, might look for to determine whether or not a resistor has been replaced, let's say, in a television set?
A Yes. Factories buy resistors from resistor manufacturers, and in fact all of these sets are automated... by that I mean the parts are not put in by hand. The resistors are put in by machines. They are put in an assembly line that looks like a train. And they come preformed, pre-cut at the source of manufacture. We buy resistors for general replacement. We don't know how long they have to be. So the leads are standardized and they usually are, I would say, two and a quarter inches long. So, we can cut these to any size we see fit. Some places you need a longer one. Some cases a shorter one. Some you have to have bent in that fashion so as to fit it in the holes in the board. When this piece comes down from a conveyor slant above, it fits right into the holes of the board. In most cases, there are two little hammers on the bottom that will bend this under the board so that this piece doesn't fall out of place before it goes down to the assembly line to be soldered.
Now, we have a problem sometimes in taking these out. When we solder, and the old resistor is buried in the solder, we can't find the ends of it. Usually use a knife when the solder is soft. You can't do it when the solder is hard. And you have to bend that end up to be perpendicular to the hole in order to pull it out. You can't leave your heat on too long because it will ruin the printed circuit. It will start to curl because the printed circuit is a thin foil that is edged onto the insulated board or the printed board. They call it printed. It's actually a plated process.
Now, an unskilled man, if he uses a too heavy an Iron, will automatically peel that. We get sets in the shop and we call them buichers.
Q Let me interrupt you and get you back to this process of automated manufacturing.
When these resistors are dropped down into the hole, these ends, as

you call them, protrude through the hole, do they not?
A Right.
Q And then I take it they are soldered by some process?
A They're usually bent.
Q And then what happens?
A Then all your components are put into this board and this conveyor is timed, eight seconds or how many seconds it takes to put, and these are all moved down, and it goes down to the end. And there is a solvent pot and this thing dips just sufficiently that these ends touch into the solvent, and then it goes into lower steps sufficiently and everything is soldered at once. When the board is made, the only parts they want soldered on would be exposed. The parts they don't want soldered on they have a solution, some sort of a solution that solder won't stick to it.
Q Do you have with you, sir, a chassis, an S2 chassis?
A A duplicate of this.
Q Which is a duplicate of the set we have here?
A Yes.
Q That has not been altered in any way?
A It is a virgin set; never been repaired.
Q I ask you to look at it, sir.
A Yes.
(A sealed cardboard box is handed to witness and is opened up by witness.)
Q Don't worry about the pieces. This is a duplicate of the set in question. It is an S2 chassis. Incidentally, this chassis has been made way back in 1955, 1956. Except they changed one tube in sound, otherwise it is the same set. Otherwise durability is the only thing they modified.
Q Demonstrate for us with that device what you just told us about, the soldering of the protruding wires as to these resistors.
A Now, this resistor in question is R259. And it is...
THE COURT: Perhaps we'd better go down to the table and do this so that everyone can see it.
(Witness stands by counsel table.)
A The resistor in question is this point and this point. Now, the intensity of these two is the shiniest, the same as the rest of them.
COURT REPORTER: Your Honor, I can't hear the witness.
Q If you will, can you show to the Court the configurations of the solder that form when it is done in the manner which you described in mass manufacturing? And if you can, use the glass if that would be helpful.
A Where the green stuff is, solder doesn't stick. These parts are protruded down the conveyor line and dropped down individually. This is the resistor in question, and other resistors similar to it. All the parts are on there and they're moving and then they're dipped into the solder and they're soldered simultaneously.
Q Is there a configuration that one obtains because of the dipping and gravity pulling on the solder?
A The solder has the tendency to go to the lowest point. So if this is soldered in this position, solder has a tendency to bulge out to the ends. If they are soldered this direction, solder has a tendency to go down. Except when the man pulls the solder out, he has a tendency to pull it to a cone.
Where there is a lot of solder... for example, if this was reheated now, this pile of solder would flatten out and spread to the full area of the shininess where it is tin. The shininess is called tin. Where there is a lot of solder, it tends to stick and fall downwards because solder is heavy.
Q Also, Mr. Wawryck, can you demonstrate by this device the nature of the ends of the wires that protrude through these holes on this set which we have before us?
A You see the spacing of this particular resistor in here is bent into a "U". Now, these corners are bent symmetrically on the machine. We would take them and bend them with a pair of pliers that look like tweezers. To replace it... and it is hard for a human being to make two ends dead center. When they set up a jig in a factory to bend these things, they set it up to bend the... to bend it dead center. Sometimes we get it to one side or to another. The chances of getting it dead center is very slim. As long as it is neat, that's all.
Q What about the very ends?
A They're sheared in the factory so the ends would be just as if it were cut off straight with a knife. We use diagonal pliers, which I have a pair up there, which have a tendency to make a point...
THE COURT: Sir, on this chassis here, you claim that no work was ever done on that resistor?
THE WITNESS: In this area, yes.
THE COURT: That is the original resistor?
THE WITNESS: Right.
THE COURT: Would you look at People's Exhibit 1, please.
THE WITNESS: Yes. I would like to compare it.
(Handing People's Exhibit 1 to the witness.)
THE WITNESS: It is R259, and here it is R259.
Look at the color of this and look at the color of this one or this one, the shininess of these two.
THE COURT: Which is the one in question?
THE WITNESS: Right here. This one and this one.
Now, look at the brilliancy and the reflection of light on this as compared to these others. This has a higher gloss to it because this hadn't had a chance to oxidize in the air as the others have.
Q What about the configuration of the solder on that particular resistor, does that indicate anything to you in making up your determination whether it was replaced or whether it was the original?
A Well, this one on the bottom here has some resin. The solder we use is a piece of wire and it has a core inside with resin and alcohol. The alcohol evaporates and resin remains. It forms a coating to prevent oxidation.
When we're soldering the alcohol burns off and evaporates, and the resin in most cases remains. This has a little speck of black on top, which is the resin, and this has quite a bit of resin on the bottom.
Q Are those specks of resin found in the new installation?
A Well, there is no evidence in this area at all of resin.
Q What does this mean to you as to your judgment as to whether this was replaced or whether this was the original?
A This has been replaced.
Q I think you can resume the witness stand.
THE COURT: When you say this is replaced, what do you mean?
THE WITNESS: This resistor has been resoldered.
THE COURT: You mean People's Exhibit 1?
THE WITNESS: Right.
And if you look at this resistor, it is duller, and the age of these resistors is different from this.
(Witness resumes witness stand.)
Q Now, Mr. Wawryck, I would like to ask you this question: Based on your thirty-six years of experience in this business, and after your examination of that People's Exhibit number 1 in evidence, can you form an opinion, sir, as to whether that resistor that you just pointed out to the Court, is replaced or whether it is the original?
A In my opinion...
Q Can you form an opinion as to that?
A Yes. It has been replaced.
Q If I may, just once again: Upon what do you base your opinion, sir?
A The circuit it is used in; the job it has to do; and the proximity of it. And it has been a common resistor that has been replaced in a number of our repairs.

Q What criteria do you have, in your own mind; what do you use to determine or form the opinion that this has been replaced?
A The form of opinion that it has been replaced is the physical appearance, the solder of it, the way the things are bent, the shininess of the solder and it is much cleaner than the rest.
Q Is there any question in your mind, sir, as an expert, as to whether that was replaced?
A No question at all.
Q Now, I would like to show you People's Exhibit number 4, and ask you to look at that. Can you identify that object, sir?
(Handing Exhibit 4 to witness.)
A Yes, it is a one meg. resistor, half watt, ten percent of accuracy.
Q How do you know that?
A Well, the brown band is one in our trade. The black band signifies one zero, and the green band signifies five zeroes. The silver is the tolerance. We buy these in different tolerances.
Q In other words, someone skilled in your profession can look at that resistor and tell us what it is from the colors on that resistor?
A Right.
Q Is that the same kind of resistor you picked out on People's Exhibit number 1 as having been replaced... the same kind?
A Yes, it looks in better condition than this one.
Q That's my next question.
Could you tell the Court what your opinion is, sir, as to the nature of that resistor, as to whether it is normal, abnormal, whether in good working order or whether it is not?
A Well, there are a number of factors. One of them, this is the controlling factor of a tube adjacent to it. The energy goes into the grid of the next tube. That is a 17BF11 tube. This is a thirty cent resistor.
Q I don't think you got my question.
What about that resistor that rings a bell in your mind, based on all your experience, insofar as it is not being normal is concerned?
A The physical appearance.
Q What about it?
A It is bulging. It's not the same at one end. I know it has carbon in it. And if carbon is put into a higher voltage or a surge of voltage, it has a tendency to puff up.
Q Can you see that with the naked eye?
A Yes, I can.
Q Is it better able to be visualized with the use of a glass that you have?
A No. If you compare it to another one you can see it.
Q Do you have another one with you?
A Do you have one meg? I don't have it. I have a half watt one.
Q I show you this and ask you to examine that.
A One end of this...
Q Just identify that object I just handed to you.
A One end of this is very smooth and it looks original.
Q You're ahead of me now. The one I just showed to you, is that a similar resistor as to the one that is People's Exhibit number 4?
A Yes. This looks good. This has no sign of rupture.
Q By putting those next to each other, and by use of the glass, can one see what you're talking about?
A You don't need the glass. One end is flatter than the other end. I'm sorry, I don't understand you.
MR. DIEDLUF: I'm asking the Court to put them together and to use the glass to make sure we see what this gentleman is looking at.
THE COURT: You want me to do that, Mr. Diedluf?
MR. DIEDLUF: If you will.
THE WITNESS: The end towards you is normal, and the other end is flatter.
THE COURT: All right.
Q Is the coloration of any significance to you, of People's Exhibit number 4?
A The first band, the brown, has changed color. It doesn't have the intensity of the brownness of the sample.
Q Now, as an expert, Mr. Wawryck, does this mean to you... what does this mean to you in the repairing of a television set? In other words, if you were to come upon a resistor such as People's Exhibit 4 in a TV set, which was delivered to your shop for repair, what would it mean to you and what would you do as a consequence thereof?
A I would believe that it was ruptured from previous experience, from physical appearance, and I would change it.
Q Could you tell the Court what the value in dollars and cents is of the resistor that we're talking about?
A Thirty cents plus taxes.
Q Now, if in fact you did remove that resistor because of that, because of the things that you testified about, and if in fact that resistor would test [on an] ohmmeter to register a thousand ohms, what would that mean, if anything?
A It wouldn't mean anything, because a tester does not test resistors under actual load. It checks them statistically. In other words, not in actual use.
Q What do you mean by that?
A This particular circuit happens to be in a circuit where there is a fluctuation of electricity of 15,750 pulses. We call them spikes. It pulsates 15,750 times a second, to get the width of the picture on the screen. Now, with undue spikes, it has been known in our industry, wherever these spikes exist components are susceptible to breakdowns.
Q Is it compatible, sir, to have a resistor such as the one in People's Exhibit 4, and a resistor that would register to be good on an ohmmeter, or some other testing device?
A Yes, because—it is hard to duplicate the same or exact conditions in a TV set. Heat, physical layout. Sometimes this is soldered, and this board has been known... I have bulletins from General Electric that this board flexes, and we have had occasions where the undue pressure of a board if a resistor is put in and it is sturdy and that board flexes a little, in some cases there have been incidents where it would be intermittent in the end.
Q Would it mean anything to you, Mr. Wawryck, in finding such a resistor, as People's Exhibit 4 in a TV set, if a TV set was a brand new set? Would that change your opinion in any way whether you would remove that resistor or not?
A No. I had brand new sets doing warranty work that had resistors such as this, where sets I had sold, and I would unpack it out of a box and see it right before I delivered it to a customer. Ten to twenty percent of the average TV repairs are repaired on the production line.
MR. DIEDLUF: No further questions, your Honor.
THE COURT: Mr. Danowski.
CROSS EXAMINATION BY MR. DANOWSKI:
Q Mr. Wawryck, had you known the defendant prior to coming to today to testify?
A I met him once.
Q When was that?
A I went to a meeting, a seminar it was, and it was brought up that he was one of the men. And that is all.
Q He was one of the men?
A No, no. He went to the meeting and that's about the same time when this business with the... I don't recall... fellows that were involved in this at the time.
Q Have you offered your services to other people who had similar problems?
A No. Well, not directly. I have been a consultant to Consumer Af-

Transistor IF Coupling Circuits

by Lambert C. Huneault, CET

Did you ever look over a transistor radio or solid-state TV-set schematic and wonder why the coupling circuits between IF amplifiers are usually not straightforward and simple like those between vacuum-tube IF's? Why all those tapped coils, capacitive voltage dividers and step-down transformers? Impedance matching, bandwidth and neutralization . . . that's why!

■ Remember the principle of "maximum power transfer" you learned in electronics school or perhaps in a correspondence course? That was a long time ago, you say! Well, let's see if we can retrieve this little gem from the cobwebs of memory: The principle in question states that maximum power can be transferred (coupled) from a source to a load only when the impedance of the source and that of the load are the same, i.e., matched.

Vacuum-tube IF amplifiers operate Class A¹ and thus have a very high in-

put impedance. Virtually no signal current flows in the tube's control-grid circuit (input); only signal voltage is required to control plate current and achieve amplification. Because power is the product of voltage and current, it is obvious that with no signal current, a vacuum-tube's input consumes no power. So we needn't worry about transferring maximum power from the output of one stage to the input of the next amplifier. In other words, a vacuum tube is a voltage-operated device. In terms of coupling circuit-

ry, this means real simplicity, as seen in Fig. 1 (A and B). Notice the absence of taps on transformer T1 or coil L1.

A bipolar transistor, however, is a horse of a different color. Before it can amplify, it must be "turned-on" by base-to-emitter forward bias. This means that base current flows, giving the transistor's input a relatively low impedance, typically around 500Ω to 2K for small-signal amplifiers in the common-emitter con-

figuration. Let's assume 1K in this article.

With such a low impedance, it is obvious that the transistor's input will "demand" some current from the signal source that drives it. In other words, a bipolar transistor is a *current-operated device* and, as such, its base-to-emitter input consumes a definite amount of *power*. In order to achieve maximum power gain in cascaded amplifiers, the coupling circuits must transfer as much *signal power* as possible from the output of the first stage to the input of the next (Fig. 2).

The transfer of signal power calls for impedance matching between transistors Q1 and Q2. It is this impedance-matching requirement that complicates coupling circuits a bit. IF amplifiers are normally connected in the common-emitter configuration, with the transistor's output impedance being typically in the 10K to 50K range; let's say 25K for the purpose of this article.

We have already seen

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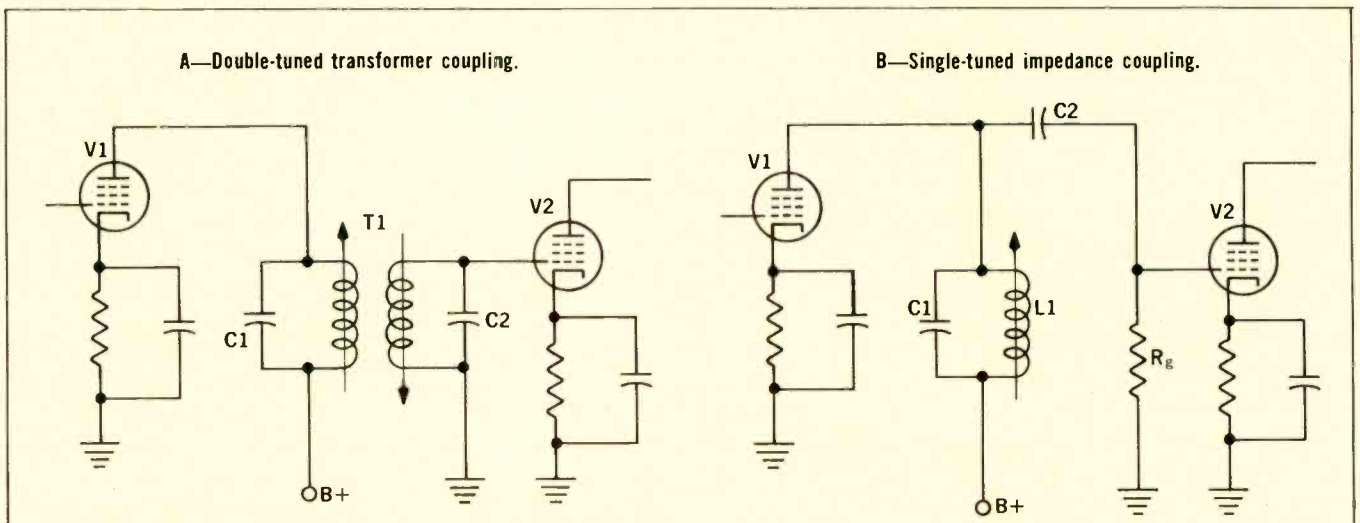


Fig. 1—Vacuum tubes feature simple coupling circuits.

that the input impedance is much lower, at about 1K. How then, in the face of this 25:1 mismatch, can impedance matching be achieved in order to satisfy the principle of maximum power transfer? A variety of circuits can come to our rescue, and this article will examine the nine coupling methods most prevalent in radio and TV IF's.

Single-Tuned Transformer Coupling

A step-down transformer (T1) is used in the single-tuned transformer coupling circuit shown in Fig. 3. Its primary is tuned, but the secondary isn't. Capacitor C1 and the T1 primary form a parallel-resonant circuit and, therefore, constitute a very high impedance. The actual amount of impedance depends on the Q of the coil. To keep our discussion simple, let's assume a perfect coil, i.e., one having zero resistance. The Q of the unloaded tank circuit will therefore be infinitely high, and so will its impedance.

If the low input im-

pedance of transistor Q2 were connected directly across the tank circuit, or inductively coupled by means of a 1:1 turn ratio, it would be like slapping a 1K resistor across the tuned circuit. This severe load on the resonant circuit would lower its Q drastically, producing a serious loss in gain and excessive bandwidth. However, with inductive coupling through a step-down transformer, the low input impedance of Q2 can be made to reflect a much higher impedance across the T1 primary.

Assuming unity coupling, the reflected impedance equals the load impedance across the secondary multiplied by the square of the turns ratio. With a 5:1 step-down turns ratio, transistor Q2's input reflects back $1K \times 5^2 = 25K$ across the primary (tank circuit). Instead of the transistor Q1 collector circuit being loaded down by the 1K input resistance of Q2, Q1 now "sees" as a load the 25K reflected impedance across its output terminals. Thus, source (Q1

collector whose $Z_{out} = 25K$) and load (25K reflected Z) are matched, and maximum power is transferred from the output of Q1 to the input of Q2.

At this point, you'll probably ask: "How about bandwidth?" . . . Well, since bandwidth depends on the Q of the tank circuit, let's take a look at the resistances that damp the L-C circuit. Fig. 4 shows that the 25K output impedance of Q1, and the 25K impedance reflected back across the primary by transformer action, are actually in parallel with the tuned circuit. If the unloaded tank has a theoretically infinite Q (as previously assumed), then the total parallel resistance (12.5K) will be the determining factor as far as Q and bandwidth are concerned. Recalling that $Q = \frac{\text{parallel resistance}}{\text{inductive reactance}}$, if we choose a coil with an inductive reactance of, say 500Ω at the resonant frequency, then $Q = \frac{12.5K}{500\Omega} = 25$. Recalling another well-known formula:

$$\text{Bandwidth} = \frac{\text{resonant frequency}}{Q}$$

if we assume an IF frequency of 455kHz, then bandwidth = $\frac{455kHz}{25} = 18kHz$ (approximately).

So we see that with the proper choice of inductance for the primary winding and the proper turns ratio for the IF transformer, proper bandwidth and maximum power transfer can be achieved nicely. The circuit is a popular one, as you have undoubtedly noticed in many transistor radios.

But (some of you are probably saying), isn't 18kHz a bit much bandwidth in an AM radio? You think so? Well, then . . . enter, another coupling method.

Single-Tuned, Tapped-Primary, Transformer Coupling

In this single-tuned, tapped-primary, transformer-coupled circuit (Fig. 5), the collector of transistor Q1 is tapped down instead of being connected to the top of the primary. Let's assume that this tap is located half-way down on the coil; this need not necessarily be the case, but it will simplify our calculations here.

This gives us a 2:1 turns ratio if you consider the coil as an autotransformer whose primary is the whole winding and whose secondary is the lower portion loaded down by the 25K output resistance of transistor Q1. It becomes obvious, then, that the primary of T1 "sees" a reflected imped-

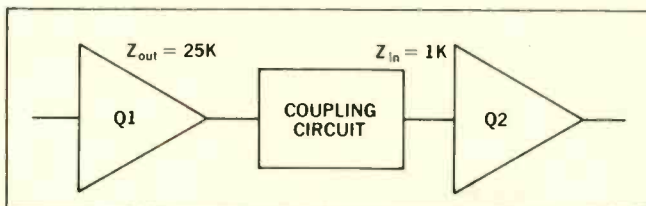


Fig. 2—Transistor-amplifier coupling (note unequal output and input impedances).

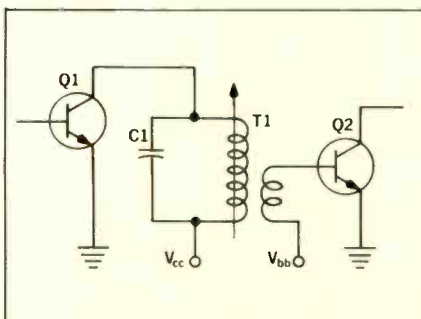


Fig. 3—Single-tuned transformer coupling.

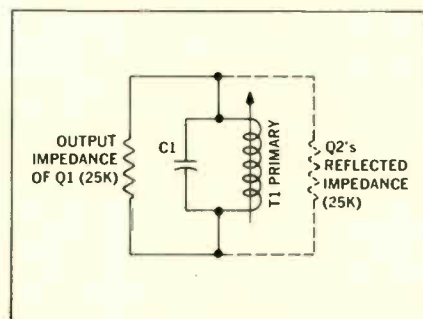


Fig. 4—Tank circuit damped by 12.5K parallel resistance.

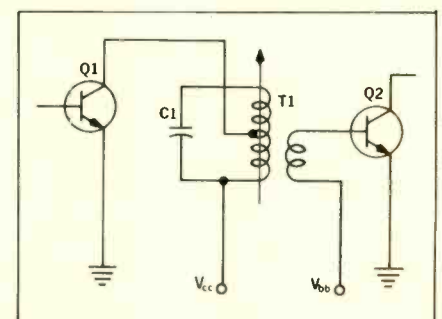


Fig. 5—Tapped primary reduces damping effect of transistor Q1's output resistance.

ance of $25K \times 2^2 = 100K$ across itself due to this 2:1 turns-ratio auto-transformer action; in addition to the 25K reflected back from the input resistance of transistor Q2 by virtue of the 5:1 turns-ratio transformer action discussed earlier.

Combining these two parallel resistances, we get: $\frac{100K \times 25K}{100K + 25K} = 20K$.

The 20K damping resistance now gives us a Q of $\frac{20K}{500\Omega} = 40$. The band-

width is now $\frac{455kHz}{40} = 11.4kHz$ (approximately). Better, isn't it!

Actually, the tap on the primary throws our impedance match off a bit, so that in practice the position of the tap, the inductance of the coil, the turns ratio, the coefficient of coupling (leakage flux normally reduces it lower than 1) and the actual resistance of the primary winding (which in reality lowers the unloaded Q to less than infinity) are all factors which the designer must take into account

in order to achieve optimum results.

Single-Tuned, Single-Tapped, Impedance Coupling

In the single-tuned, single-tapped, impedance-coupled circuit (Fig. 6), the base of transistor Q2 is connected (through coupling capacitor C2, which blocks dc) to a correspondingly low-impedance tap on the tuned inductance, L1. The 1K input impedance of Q2 reflects back (by auto-transformer action) a much higher impedance (e.g., 25K) across the tuned circuit, thus providing a good impedance match for the collector of transistor Q1. It also loads down the tank circuit much less than if C2 were connected to the high end of L1, such as in the vacuum tube circuit of Fig. 1 (B), thus preserving an adequate Q and achieving the proper bandwidth.

Single-Tuned, Double-Tapped, Impedance Coupling

The single-tuned, double-tapped impedance-

coupled circuit in Fig. 7 simply combines the features of the circuits in Fig. 5 (upper tap) and Fig. 6 (lower tap), achieving a good impedance match and unloading the tank circuit sufficiently to produce the required Q and bandwidth.

Single-Tuned Impedance Coupling with Tapped Capacitance

The basic idea for the single-tuned impedance coupling circuit using tapped capacitance (Fig. 8) is the same as for the circuit shown in Fig. 6—except that the low-impedance tap connected to the base of transistor Q2 is provided by a capacitive voltage divider instead of an inductive one.

With the capacitance of C2 appreciably larger than that of C1, the C1-C2 junction represents a low impedance relative to ground, hence a good match for the base of transistor Q2. Note that here a coupling capacitor is not needed, the dc voltage of transistor Q1 being blocked from the base of

Q2. Of course, in this coupling method the collector of transistor Q1 can also be connected to a lower impedance tap on L1 (as in Fig. 7) if the output resistance of Q1 loads the tank circuit too much to achieve the proper selectivity.

Double-Tuned Transformer Coupling

In another coupling method (Fig. 9), a double-tuned transformer (T1) provides more ideal bandpass characteristics, the response curve having a flatter top and steeper skirts. While the collector of transistor Q1 may or may not, in practice, be connected to a tap on the T1 primary, a low-impedance tap on the secondary is essential for connection to the low-impedance base input of transistor Q2. Otherwise, the tuned secondary would be damped excessively (too much bandwidth) and impedance matching would not be achieved.

Although all circuit diagrams discussed so far showed power supply connections (V_{cc} and V_{bb}) at

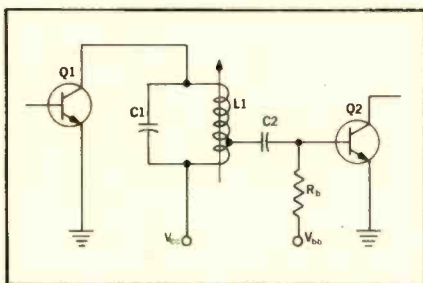


Fig. 6—Tapped impedance coupling.

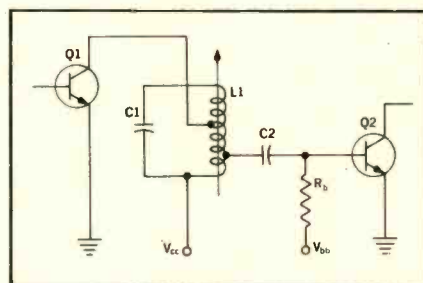


Fig. 7—Double-tapped impedance coupling.

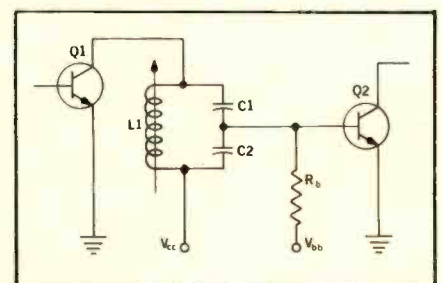


Fig. 8—Impedance coupling with tapped capacitance.

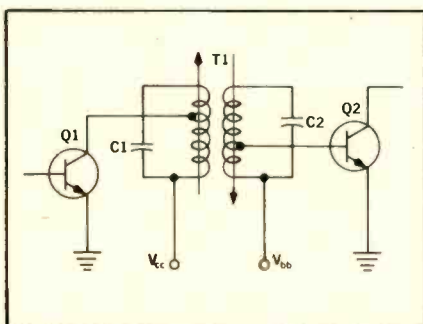


Fig. 9—Double-tuned transformer coupling.

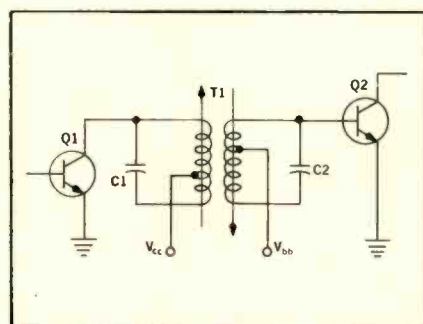


Fig. 10—Circuit equivalent to that in Fig. 9.

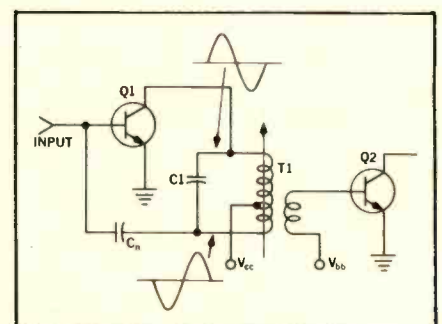


Fig. 11—Transformer coupling with neutralization tap.

the bottom of the tank circuits, while collector and/or base taps were located higher up on the coils, it should be pointed out that in many cases these connections are reversed, as illustrated in Fig. 10. Because the power-supply terminals represent signal ground, it follows that the circuit in Fig. 10 provides the same impedances and loading effect as that of Fig. 9.

Neutralization

Vacuum-tube IF's normally feature pentodes, with their well-known low grid-to-plate capacitance. Because of this low C_{gp} , the IF amplifiers are stable and don't normally tend to oscillate. Thus, they do not normally require neutralization. Unfortunately, the same can-

not be said about bipolar transistors.

By now, most electronic technicians are familiar with the fact that reverse-biased PN junctions exhibit capacitance; because the depletion region in the vicinity of the junction is a "no man's land" devoid of free charge carriers, it behaves as a dielectric between the carrier-rich P and N crystals, the latter acting as the plates of a capacitor. The higher the reverse voltage applied across a junction, the wider the depletion zone and, therefore, the lower the capacitance.

This junction capacitance can be either desirable or troublesome. It is put to good use in applications such as *varactors* (also called voltage dependent capacitors or

tuning diodes), now finding widespread use in FM tuner AFC, switchless tuners for TV sets, as well as AFT and some TINT CONTROL circuits in color-TV sets.

But in transistors, junction capacitance can be detrimental. Because of the reverse-bias voltage applied between base and collector, the B-C junction has a definite capacitance, typically a few picofarads. In some IF transistors this C_{bc} is large enough to allow sufficient collector output signal to feed back to the base input and cause regeneration, leading to amplifier instability and oscillation. Neutralization is then necessary. At the very high frequencies of TV IF amplifiers, neutralization is quite common, although some transistors manage to get along without it. The need for neutralization is sometimes avoided by purposely mismatching impedances between stages, but this is a compromise, at best. Even in AM radio receivers, with their relatively low IF frequency, neutralization is often necessary. To complete our survey of coupling methods, let's then have a look at three popular coupling circuits that do feature neutralization.

Q1 (as was the case in Fig. 10). Because the V_{cc} tap is at signal-ground potential, it follows that whenever the signal voltage at the *top* of the primary swings in a positive direction relative to ground, the voltage at the *bottom* of the primary swings in a negative direction. These 180° out-of-phase signals are both fed back to the base of Q1—one through the C_{bc} of the transistor and the other through neutralizing capacitor C_n . They cancel out at the base, leaving only the actual input signal.

Single-Tuned Transformer Coupling with Capacitive Neutralization Tap

A circuit consisting of a single-tuned transformer coupling with a capacitive neutralization tap (Fig. 12) is basically similar to that in Fig. 11, except that here signal ground in the tank circuit is at the junction of capacitors C1 and C2, rather than at a power supply tap on the primary. Signals are still out of phase at opposite ends of the tank circuit, however, and capacitor C_n serves the same purpose as in Fig. 11. Resistor R_b keeps the RF out of the power supply.

Just for the sake of variety, Fig. 12 shows the base bias of transistor Q2 being shunt fed instead of series fed as in the other transformer-coupled circuits. This requires the use of a coupling capacitor (C3) to prevent shorting the base bias to ground through the secondary of transformer T1.

Base-to-Base Neutralization

In the base-to-base neutralization circuit (Fig. 13), the neutralizing ca-

Single-Tuned Transformer Coupling with Inductive Neutralization Tap

When using single-tuned transformer coupling with an inductive neutralization tap (Fig. 11), the step-down IF transformer (T1) takes care of matching transistor impedances. In addition, however, because the power supply is connected to a tap on the T1 primary, only the upper portion of the tank circuit impedance serves as a load for the collector of transistor

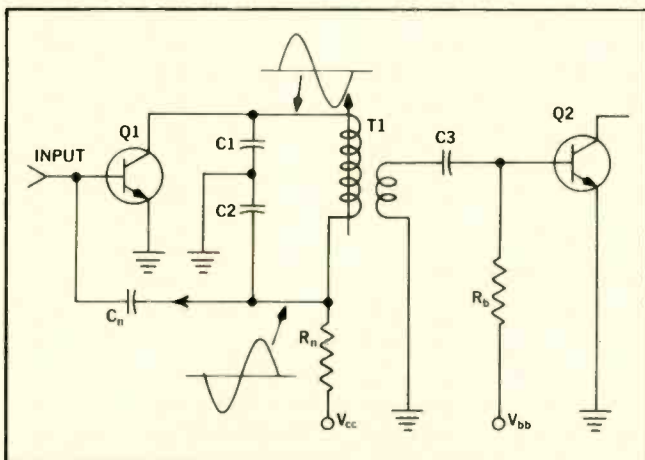


Fig. 12—Transformer coupling with capacitive voltage divider in tuned circuit for neutralization.

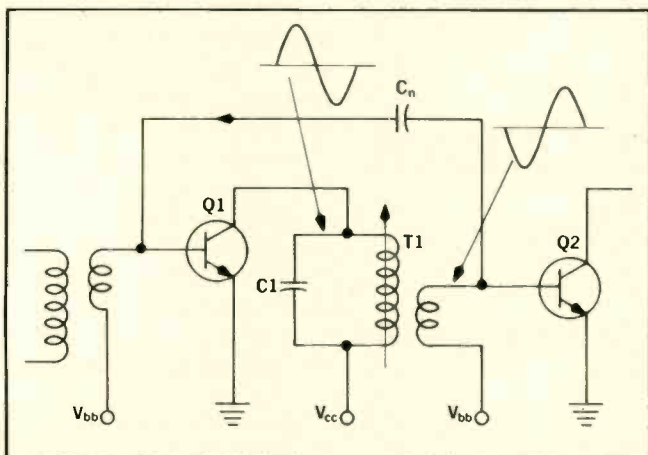


Fig. 13—Base-to-base neutralization.

continued on page 51

■ Very little has been written about troubleshooting intermittents and other faults of an elusive or unconventional nature. It seems that most technical writers choose to disregard this subject for whatever reasons they may have. This is unfortunate because more time has been wasted by more technicians trying to resolve such problems than perhaps in any other area of their technical endeavors. Few, if any, technicians would venture the thought that they have found servicing intermittents profitable. One of the reasons for this, and there are others, is that the general approach to troubleshooting intermittents has for the most part been "intermittent" also; sometimes consisting of nothing more than trying to "out stare" the fault and hoping desperately that it will go away, or present itself permanently so that it will become more manageable. The wish becomes the father of the thought.

Be that as it may, intermittents are never "easy" to resolve. However, they can be made a lot easier to resolve if a

methodical approach is used in tracking them down. The purpose of this article is to explore some of the ways and means of such an approach—particularly the "bi-polar" approach to troubleshooting intermittents. The term "bi-polar" means exactly what the name implies in the practical application of the techniques to follow. We simply subject the set to various pre-determined "extreme" or "opposite" modes of operation and observe what changes, if any, take place. Pronounced changes from the norm indicate a potential problem or problem area.

Temperature (Hot-Cold)

Many components that are on the verge of being defective become quite temperature sensitive, much the same as a bad tooth. That being the case, one of the quickest ways to spot them is to subject them to the "hot-cold" treatment. Heat can be applied with a low-wattage soldering iron. The soldering iron should not make physical contact with the component under test. To cool the component, any of the commercial spray

coolants, such as Zero Mist, can be used. For best results, treat only one component at a time. This technique is particularly effective in weeding out marginal transistors, capacitors and resistors.

Line Voltage (High-Low)

Quite often intermittent faults will not show up when a set is being operated at normal line voltage, but will when the set is subjected to either high or low line. In the application of this technique, the line voltage is set above and below normal line (120v) by approximately 10 percent (108v and 132v). The set should be operated at both voltage extremes for about 15 minutes. Usually the fault will show up by then, if its going to show up at all. A variac, of course, is necessary for providing these voltages.

Signal (Weak-Strong)

Changing the strength of the input signal will sometimes present faults that would otherwise go undetected. The set should be operated on the weakest and then on the strongest signal available in the

area. Although in this application we are primarily concerned with the input signal, much the same type of thinking can also be applied to the output signal, e.g., by changing VOLUME, CONTRAST, or any other control that affects the output signal level. Needless to say, such control change effects should be observed under both weak and strong input signal conditions to make them meaningful. A somewhat different application of this technique is to observe the dc operation of various stages ON and OFF signal, particularly the plate/collector circuits. Nearly all plate/collector circuits (except the "common" variety) usually respond quite dramatically to changes in signal level/strength.

Frequency (Up-Down)

To use a couple of examples in point: What happens at the bottom end of the FM dial may not be the equivalent of what happens at the top end of the dial. How an audio amplifier responds at low frequencies may not be the same as at high frequencies. Checking the operation of suspected sections/stages throughout their entire frequency spectrum is another useful technique that can be used to uncover elusive faults. One point not to overlook in your checks is to take into consideration all the frequencies that the said sections/stages process. Do not settle for the first one that comes to mind. In

How to Troubleshoot Intermittents by A. A. Kleeger

Some general tips for servicing all intermittent circuits

The author is technical services co-ordinator of the Consumer Service Division of Electrohome Limited.

some cases, signal substitution (variable or sweep) may be necessary to carry out such frequency checks conclusively.

Mechanics (Stable-Unstable)

Most sets in their normal environments are not subjected to mechanical stresses, strains or disturbances of any significance. However, mechanical faults can be the cause of many intermittents, e.g., cold solder joints, unsoldered connections, poor grounds, etc. A good visual inspection plus tapping various components, terminals, sockets, connections, etc., will quickly uncover them. The tap test is about the most effective way there is of locating intermittent tubes. Needless to say, this applies to picture tubes as well.

Environment (Dry-Damp)

A set in a dry environment may perform very well, but not equally as well in a damp environment or vice-versa. Always keep this in mind, particularly when dealing with a set that is being operated in a high-humidity area, such as a basement recreation room. Two handy service aids to add to your list of "intermittent exterminators" is a good spray mist dispenser (water) and a small fan heater. With these aids you can simulate either condition in the shop or home at will. This is a very effective way to localize frequency drift, high-voltage arc over, corona problems, etc.

Lighting (Light-Dark)

This only applies to those components that are

light sensitive, e.g., light dependent resistors, various neon bulbs, some transistors, etc. Although these devices are not that frequently encountered in most sets, nevertheless they present a potential problem area that should not be overlooked. Observing how much devices respond to light and darkness will pin point any problems that may exist.

Controls (Minimum-Maximum)

One often overlooked point is simply how stages/circuits respond when various service/customer controls are rotated throughout their range. This seems so obvious that it's hardly worth mentioning, and that probably explains why it is the most overlooked factor of all. Always make it a point to check the circuit response of all pertinent controls and/or adjustments before bringing out the "heavy artillery." In many cases you will find yourself sitting on top of the problem at hand without any further major involvement. Bear in mind that most circuits are designed to operate with the controls/adjustments set at or near mechanical center.

Metering (AC-DC)

A good way to localize intermittents is to meter the input and output circuits of various stages to determine where the breakdown is occurring. A VOM or a VTVM is a poor second choice for this purpose. A better choice is a scope with a dc input so that both the ac and dc components of any signal or voltage can be displayed simultaneously

on the CRT screen. Many intermittents do not disrupt any dc voltages, therefore the need for a piece of equipment that lets you see what is happening on "both sides of the coin." This technique is also very effective in pin-pointing faults that relate to "cold start" and "hot start" modes of operation. A dc scope is perhaps the best piece of equipment there is for troubleshooting intermittents, particularly if it is a dual-trace instrument.

RC Values (Increase-Decrease)

Last, but not least, there is absolutely nothing wrong with increasing or decreasing the values of certain key resistors and/or capacitors on a trial and error basis. For example, when dealing with a general tolerance shift in one direction or the other, little is gained by replacing half a dozen components when changing the value of one key component will usually do the trick. If you stop and think about it for a moment, that is what your so-called field modifications are all about. It is true of course, that the initial values were chosen with what appeared to be best under the circumstances, but that does not mean that the choice was infallible or irrevocable. One word of caution: When using this method, make sure that you do not introduce a second fault in the course of correcting the first one. If in doubt, give the set the "bi-polar" treatment in its entirety after the modification has been carried out. A resistor/capacitor decade

box is another handy item to add to your list.

Conclusion

It should be mentioned that one of the worst ways to approach an intermittent problem is to leave a set supposedly "on test" or "observation" while operating under normal shop conditions. About the only thing that can be said about such an approach is that it seems to be an acceptable and usually an unchallenged way of procrastination. But sooner or later, you must come to grips with the problem, whether you like it or not, as the fault may take hours/days/weeks to show up if left on its own wiles. Better tackle the problem at once and "brute force" the fault; as something most surely has to give, and usually it will. Very seldom will you be disappointed in this respect.

We now have 10 "tools" (and there are undoubtedly more) to cope with intermittents and other elusive and/or unconventional faults. They can be used in any order you wish, singly or in unison. The unison approach is preferable in the more difficult cases as it increases your "fire power." For example: combining the temperature and line-voltage checks can be a lot more effective than carrying them out individually; and so with any of the others. Any number of checks can be used in unison; the nature of the fault and your expertise will largely determine the choice. The main thing to remember when dealing with such faults is: think "bi-polar." ■

Simple Technique Makes Inventory Forecasting Easier

by Raymond E. Herzog

Dealers and servicers—Here's a simple technique for better inventory control and more efficient business operation

■ If forecasting the demand for one of your sales or service items has got you confused. . . . If you're tired of having too many of an item, or too few, too often. . . . You'll be interested in knowing about a simple way to estimate demand—easily and methodically.

Such a way for logical forecasts is the *exponential smoothing technique*. It replaces mere guesswork so prevalent in forecasting. Although not 100 percent accurate, this technique, nonetheless, should provide meaningful information in:

- predicting the *sales* for a given product
- estimating the number of *service parts* that will be needed

Exponential Smoothing Technique Formula

The basic concept of the exponential smoothing technique considers both what is forecasted to happen and what actually does happen. The difference between the forecasted demand and the actual demand is then used in a simple formula along with a "weighting factor" known as alpha (α). This factor yields a number which then becomes the forecast for the next time period:

$$\text{new forecast} = \text{old forecast} + \alpha (\text{actual demand} - \text{old forecast})$$

That the formula should take into account the forecasted and the actual demands is understandable. After all, when one estimates some-

thing, he mentally juggles these two demand factors in deciding on a new estimate. So this exponential smoothing technique is really nothing new.

Or is it?

Take this alpha factor, for instance; it is not used in one's mental juggling. And so it is this alpha factor that becomes an important part of our methodical forecasting technique.

Alpha Factor

Alpha, as we've said, is a "weighting factor." It determines how much effort the difference between the actual demand and its corresponding forecasted demand will have on defining the new forecast.

An important aspect of alpha is in its origin. For indeed, it is from the alpha factor that the name "exponential" comes.

A mathematical function is exponential if, when plotted, its curve changes quite rapidly at its start and more gradually near the end of its plot. When the alpha factor is plotted over a number of time periods, its affective weighting on demand decreases in an exponential manner

as the number of time periods gets greater and greater.

And with that mouthful of definition we've said enough, since it is a complicated subject when pursued further. The important things to know about values of alpha are summarized in Table I.

Values of alpha range from near zero to near one. (Values of exactly zero or one are not valid in the formula.) Typically, alpha ranges from 0.1 to 0.5.

When demand patterns change rapidly, it would be better to use a higher value of alpha. However, since a high alpha takes into account only a few previous time periods, there's a greater chance for less accuracy in such a forecast.

Example

Here's an example with two values of alpha to show how the exponential smoothing technique works. The solid line in the chart plots a hypothetical actual demand for an item over 12 time periods. The dashed line plots the forecasted demand for an alpha value of 0.5; the dotted line, a forecasted demand for a 0.2 alpha.

Table I—Effects of Alpha in Exponential Smoothing Formula

Item	High value of Alpha	Low value of Alpha
amount of weight that alpha has	great	moderate
rate of change	fast	slow
number of previous time periods considered	few	many

We'll assume that there'll be a gradual increase in business. Our job, then, is to accurately forecast just how many units of our item we'll need for each upcoming time period.

We'll plot some points, step-by-step, using the technique with an alpha of 0.5.

Step 1: Start at time T_0 with a known demand for the item of, say, 12 units. (This would be the amount just sold or used.)

Step 2: Having the actual demand of 12 units, we now forecast the anticipated demand for the next time period at T_1 . Note that this first

forecast does not use the formula since there's no past data. We simply put down an estimate; recalling our general assumption of a gradual increase in business. A good estimate for T_1 's demand would be, say, 12 units.

Step 3: Now, using the formula, we can forecast the demand expected at time T_2 . For our situation at time T_1 —forecasting for time T_2 —we have:

$$\begin{aligned} \text{new forecast} &= \text{old forecast} + \alpha (\text{actual demand} - \text{old forecast}) \\ \text{new forecast} &= 12 + 0.5(13 - 12) = 12.5 \end{aligned}$$

Since we can't sell part of a unit, that 12.5 units would become 13 units in practice. But for illustrating the technique, we'll plot the fractional values.

Step 4: Continuing with the formula, we forecast successive time periods. At time T_2 , the formula would work out as:

$$\text{new forecast} = 12.5 + 0.5(13 - 12.5) = 12.8$$

Step 5: We'll go through one more plot, which brings up a point to remember. At time T_3 :

$$\text{new forecast} = 12.8 + 0.5(11 - 12.8) = 11.9$$

Notice that the actual demand was less than the forecasted demand. This requires that the alpha quantity be subtracted from the 12.8.

You may wish to study the calculations shown in Table II to see how these steps can be carried further—both with an alpha value of 0.5 and an alpha value of 0.2. This data is graphed to form the curves shown in Fig. 1.

As indicated in the table, a smaller value of alpha produces a slower change in the forecasted values. This is evident in comparing the dashed line ($\alpha = 0.5$) and the dotted line ($\alpha = 0.2$).

And in comparing either of the forecasted plots with the actual demand (solid line), we see that the net effect of the exponential smoothing technique is a "smoothing" (what else!) of the fluctuations.

Now that you've seen how to work the formula in this example, why not give it a try in your own situation. Go back over your past records and see how the technique might have helped. Then, starting today, use this technique for more accurate forecasts tomorrow. ■

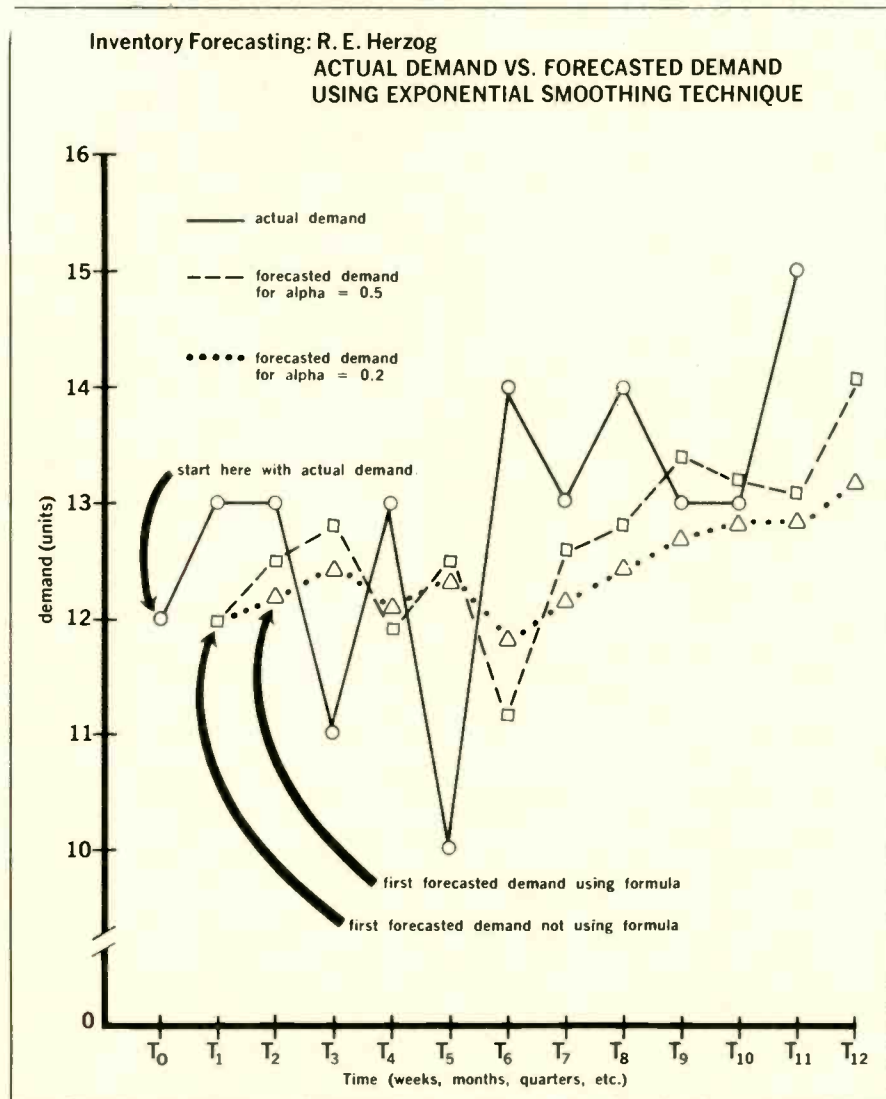


Fig. 1—Actual demand vs. forecasted demand using exponential smoothing technique.

Table II—Data Points for Plotting the Chart

T_1	$12 + 0.5(13 - 12) = 12.5$	$12 + 0.2(13 - 12) = 12.2$
T_2	$12.5 + 0.5(13 - 12.5) = 12.8$	$12.2 + 0.2(13 - 12.2) = 12.4$
T_3	$12.8 + 0.5(11 - 12.8) = 11.9$	$12.4 + 0.2(11 - 12.4) = 12.1$
T_4	$11.9 + 0.5(13 - 11.9) = 12.5$	$12.1 + 0.2(13 - 12.1) = 12.3$
T_5	$12.5 + 0.5(10 - 12.5) = 11.2$	$12.3 + 0.2(10 - 12.3) = 11.8$
T_6	$11.2 + 0.5(14 - 11.2) = 12.6$	$11.8 + 0.2(14 - 11.8) = 12.2$
T_7	$12.6 + 0.5(13 - 12.6) = 12.8$	$12.2 + 0.2(13 - 12.2) = 12.4$
T_8	$12.8 + 0.5(14 - 12.8) = 13.4$	$12.4 + 0.2(14 - 12.4) = 12.7$
T_9	$13.4 + 0.5(13 - 13.4) = 13.2$	$12.7 + 0.2(13 - 12.7) = 12.8$
T_{10}	$13.2 + 0.5(13 - 13.2) = 13.1$	$12.8 + 0.2(13 - 12.8) = 12.8$
T_{11}	$13.1 + 0.5(15 - 13.1) = 14.1$	$12.8 + 0.2(15 - 12.8) = 13.2$

Conway's Model 639 Multitestset

by Phillip Dahlen



Conway's Model 639 Multitestset. For more details, circle 900 on the Reader Service Card.

Has an input resistance of up to 100M

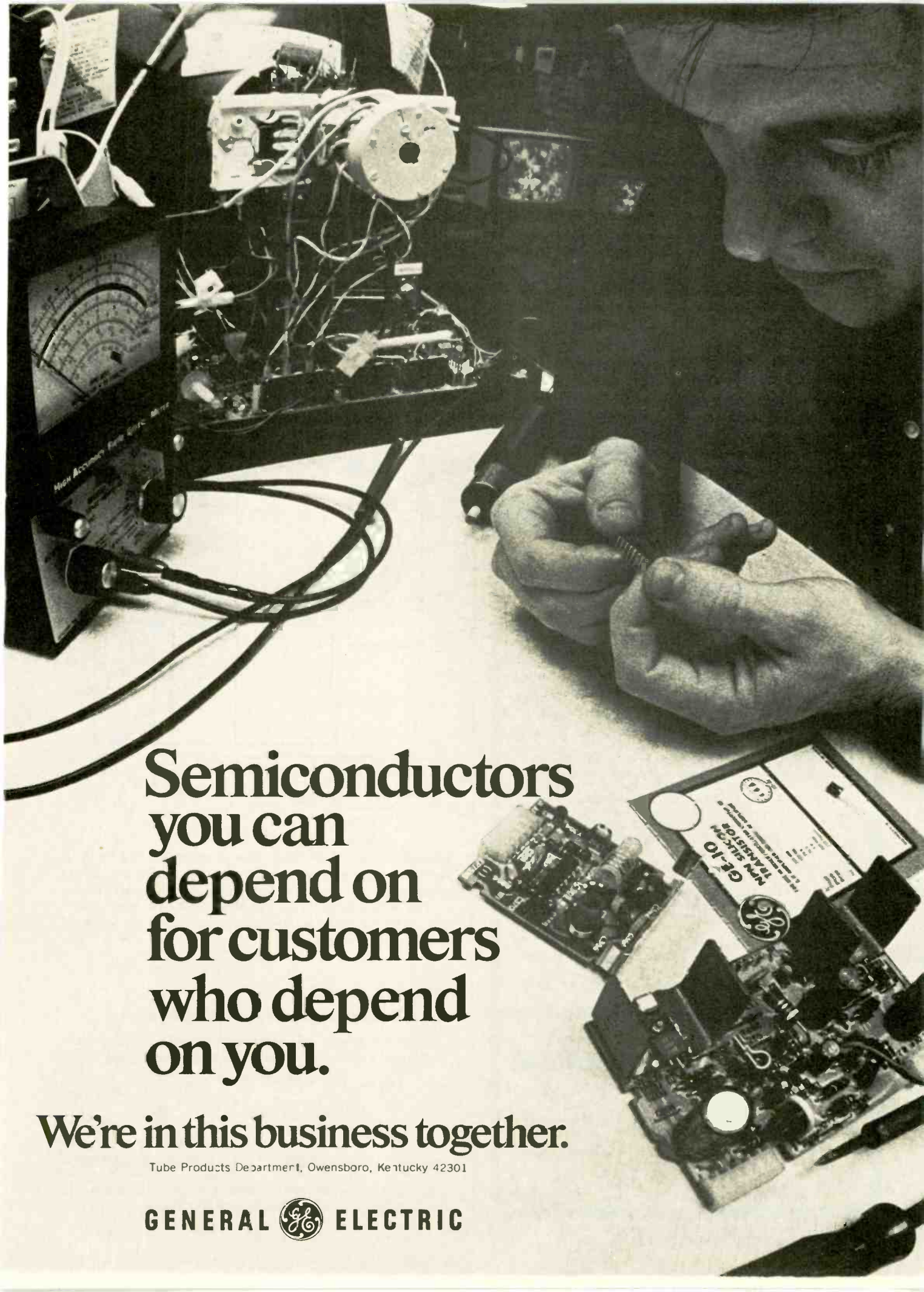
■ This is the first FET meter that we have encountered that has such an extremely low loading effect on the circuitry under test. In fact, for those few that are not familiar with such a high-impedance instrument, the initial reaction may be that there is something wrong when first making measurements. As an example, I have held the ground lead between one pair of fingers and the other test lead between another pair of fingers, on the same hand, and obtained voltage readings as high as 5v. Why? Because my hand did not have a low enough resistance to dissipate the static charges generated by my feet on the rug. (As you will note in this month's cover photo, the company decided to carpet our electronics lab.) With the two test leads shorted together, no voltages were measured, whatever the static charges generated.

Having such an exceptional high impedance, the instrument is also capable of making extremely low current measurements—providing full scale dc current readings as low as 0.15 μ a.

Unlike some instruments that have so many meter scales that it sometimes becomes difficult to locate the right one for the desired measurement, this instrument has but scales for battery check, decibel measurement, and resistance measurement, plus two scales for all remaining functions.

Manufacturer specifications include some additional interesting information concerning this instrument:

AC and DC Voltage (full scale)	1.5mv, 5mv, 15mv, 50mv, 150mv, 500mv, 1.5v, 5v, 15v, 50v, 150v, 500v, 1500v (plus 5kv, 15kv, 50kv with accessory probe—although maximum input should be limited to 30kv)			
RF Voltage with optional RF Probe (full scale)	To 1000MHz 1.5v, 5v, 15v			
AC and DC Current (full scale)	0.15 μ a, 1.5 μ a, 15 μ a, 150 μ a, 1.5ma, 15ma, 150ma, 1.5a (plus 5a, 15a, 50a, 150a with accessory shunt box)			
Resistance Ranges	0 to 10K, 0 to 1M, 0 to 100M, 0 to 10,000M.			
DC Voltage and Current Accuracy	$\pm 1.5\%$			
AC Voltage and Current Accuracy	10Hz to 30Hz	$\pm 3\%$		
	30Hz to 10kHz	$\pm 1.5\%$		
	10kHz to 20kHz	$\pm 3\%$		
AC Voltage with RF Probe	1kHz to 300MHz	$\pm 5\%$		
	300MHz to 700MHz	± 1 dB		
	700MHz to 1GHz	± 3 dB		
Input Impedance	DC Voltage	100M		
	DC Voltage (with high-voltage probe)	1000M		
	AC Millivolts	10M, 60pf		
	AC Volts	100M, 20pf		
Voltage Drop for AC and DC Current Measurements	150mv			
Ohmmeter Open-Circuit Conditions	Resistance Range	Voltage Maximum	Current Maximum	Power Maximum
	$\times 10$	1.2v	12ma	3.6mw
	$\times 1K$	1.2v	120 μ a	36.0 μ w
	$\times 100K$	1.2v	1.2 μ a	0.36 μ w
	$\times 10M$	1.2v	0.012 μ a	0.0036 μ w



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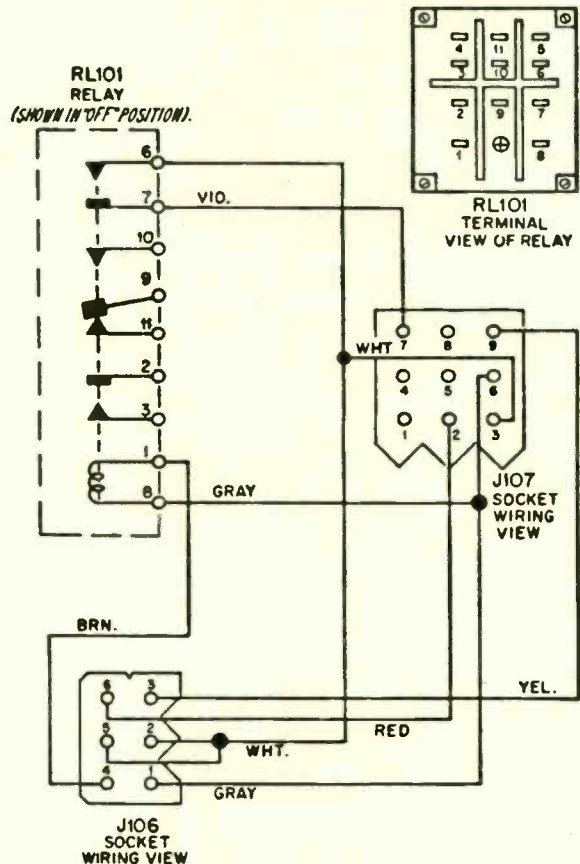
COLORFAX

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

ADMIRAL

Color-TV Chassis K18—Two-Function Remote Control

The two-function remote control models, 18TS121C and 19TS341C, covered in Admiral's manual S1275C have an outboard relay in addition to the relays on the remote



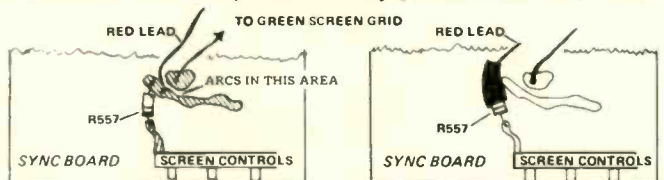
control chassis. This relay, Power ON/OFF (83A56-1) is mounted on a separate bracket and has Molex connectors which plug into the remote amplifier and the tuner cluster.

The wiring diagram for the Power ON/OFF relay assembly, which is shown in illustration above, was not included in the service manual.

GENERAL ELECTRIC

Color-TV Chassis C2/CD, L2/LB—Power-Supply Diode Failure

Repeated failure of power supply diodes Y402, Y403, Y404 and Y405 may be caused by picture tube arcs, which



are coupled into the B+ circuits through a secondary arc from the picture-tube green-screen-grid copper pad to the

copper pad for the B+ end of resistor R557 (on sync board) as shown in the illustration below.

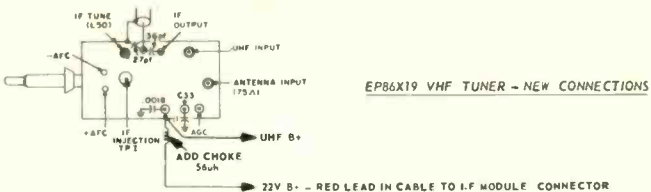
Remove the B+ end of resistor R557 and the red B+ lead from the board and reconnect by means of a "flying joint" covered with heat-shrinkable tubing (Cat. No. EP90X1).

Color-TV Chassis MA—MOSFET Failure in Tuner No. EP86X19

The symptom of a shorted MOSFET RF Amplifier transistor in the tuner may be difficult to evaluate and lead to unnecessary adjustments and improper repair unless the following procedure is followed:

With the "Auto" button OFF (light out) and the receiver properly fine tuned, an interference or slightly high noise level may be observed on one or more channels. A weak to moderate signal level may show little or no interference. Retuning won't clear the problem. The stronger the signal, the worse the condition. The interference may look similar to mistuning into sound, as might occur with AFC mis-adjusted. Severe cases appear as streaks, like cross modulation.

Test the tuner to determine if the MOSFET is shorted. This can be done by unsoldering the AGC lead from the tuner, discharging the AGC tuner terminal to ground and then measuring the voltage at the open AGC terminal. If the voltage at this terminal is positive by more than a perceptible movement of the meter (the voltage should be zero), the MOSFET is shorted or partially shorted and the



tuner should be replaced.

Another test is to adjust RF AGC. If the adjustment has little effect and AGC voltage at the tuner with a strong signal fails to drop below 9v positive, the MOSFET is defective and the tuner should be replaced.

To minimize a possible repeat of the problem, a small encased type choke coil (56μh EP36X33) should be soldered to the 22v B+ terminal on the tuner and in series with the red 22v B+ bus wire. This wire is the one in the cable group going to the IF module connector as shown in the illustration above.

New replacement tuners will have the choke coil and instructions included. Receivers manufactured with chassis code 5D4P and later have the choke.

Color-TV Chassis MA—VOLUME Critical to Adjust

If the VOLUME control is critical to adjust with maximum audio attained within the first 30% of travel of the VOLUME control arm, make the following changes:

On audio modules exhibiting this condition, with Date Code before 5G2P, change resistor R508 from 5100Ω to 6200Ω. Beginning with Date Code 5G2P, the VOLUME control range has been optimized at the factory.

The position of the VOLUME control knob (slider) is determined by the audio output tolerance rating of IC501. With nominal audio output from IC501, the VOLUME control will function through its normal range.

If the audio output from IC501 is near or at its maximum output tolerance rating, then the VOLUME control must be retarded more than usual to attenuate the greater

continued on page 48

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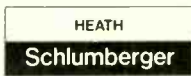
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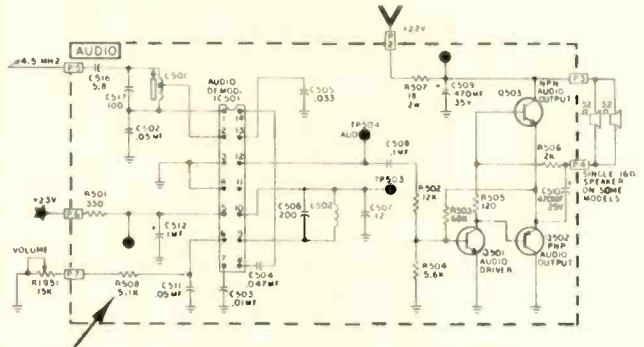
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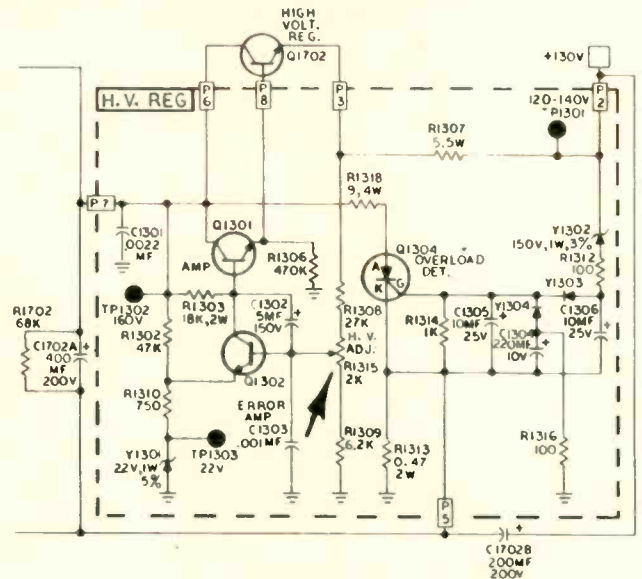
output. This places the slider in a position on the control nearer to the left end, where a larger resistance change occurs over a shorter mechanical path and the control becomes critical to adjust.



Increasing the resistance of resistor R508 allows the slider to be repositioned so that the VOLUME control will operate over its normal range.

Color-TV Chassis MA—Circuit Breaker Tripping

Wait at least 45 sec. before resetting the circuit breaker. By design, resistor R1318 always heats prior to circuit



breaker tripping. Quick resetting or holding the circuit breaker will damage this resistor on the high-voltage regulator module. Tripping can be caused by control misadjustment, allowing the receiver to operate from a few minutes to many hours before tripping.

High-voltage Setting: Adjust BRIGHTNESS and CONTRAST controls fully counterclockwise (CCW). Adjust HIGH-VOLTAGE control R1315 on the high-voltage module for 26.5kv at the picture tube anode. This is at minimum beam current (black screen).

MOVING?

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TECHNICAL DIGEST

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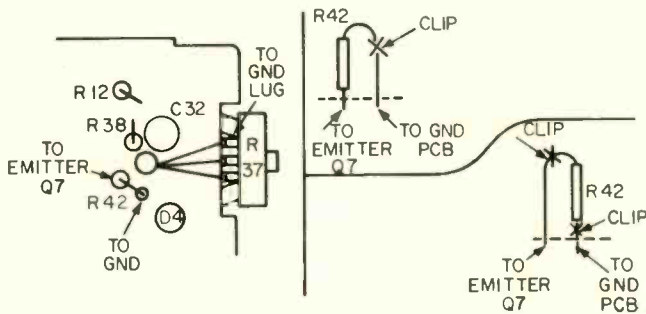
EMERSON

Radio Model 31P86—Excessive Hum When Operating from AC Power

If you encounter excessive audio hum at minimum VOLUME control settings when operated from ac power, the probable cause could be a ground loop condition.

To correct this problem, change the grounding of resistor R42 from its printed circuit board connection to the ground lug of the VOLUME control, R37. This wiring change can be made without removing the print circuit board, as shown in illustration.

If resistor R42 is wired in the print-circuit board, clip the ground lead of the resistor and, using an additional lead, connect it to the ground lug of resistor R37. Or you can clip out the resistor and wire in a new 100Ω resistor between original resistor lead at transistor Q7 and the resistor R37 ground lug.



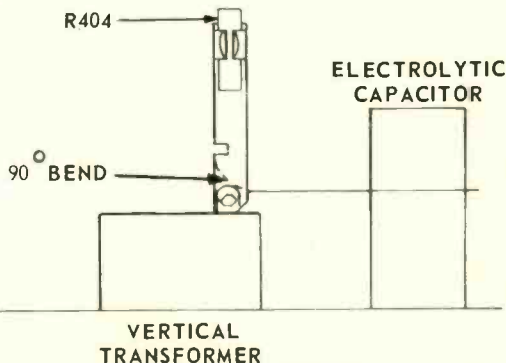
GENERAL ELECTRIC

TV Chassis SF—Vertical Buzz

Vertical buzz can be caused by the heat from resistor R404, causing the temperature of the vertical output transformer to rise sufficiently to soften the transformer wax. This allows the transformer laminations to vibrate, causing buzz.

To correct the problem remove resistor R404 from its bracket. Remove one screw and disassemble the bracket from the transformer and electrolytic capacitor. Then bend bracket 90° as shown in illustration and reassemble bracket and resistor. Allow transformer about one hour to cool off before applying power. This allows the wax to harden.

Maintain the following dimensions for the indicated receiver: In the SF1600 Series receivers, slide resistor R404 down in the clip to create at least a 1/2-in. space between it and the bottom of the VHF tuner cover. In the SF2200 Series receivers, maintain at least a 1-in. space between the resistor and the antenna terminal assembly.



continued on page 50

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TE-287

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AUGUST 1973, ELECTRONIC TECHNICIAN/DEALER | 49

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a Platt tool case
won't fall apart
at the seams
is because there
are no seams.



No. 600T

In a 5-year period, with most other tool cases, you'll go through about 3 pallets.

The reason? Since the pockets on conventional pallets are stitched and riveted, they eventually tear loose at the seams. The pockets on a Platt pallet are molded without any seams, stitches or rivets to form a one-piece unit. They are practically indestructible.

The case itself is that same rugged one-piece molded construction. It's made of tough, lightweight, ABS Thermoplastic.

And besides being stronger than other cases, a Platt tool case is much lighter.

Also on a Platt tool case there's an aluminum rim for extra strength.

A heavy-duty, steel core handle.

And positive closure drawbolt locks.

A Platt tool case is as practical as it is strong. There are compartments for extra tools and equipment and multiple lid pockets for papers and order books.

To sum up a Platt tool case: Strong, lightweight, practical, good looking, plus a 5-year guarantee on the case and pallets.

It all equals an unequalled tool case.

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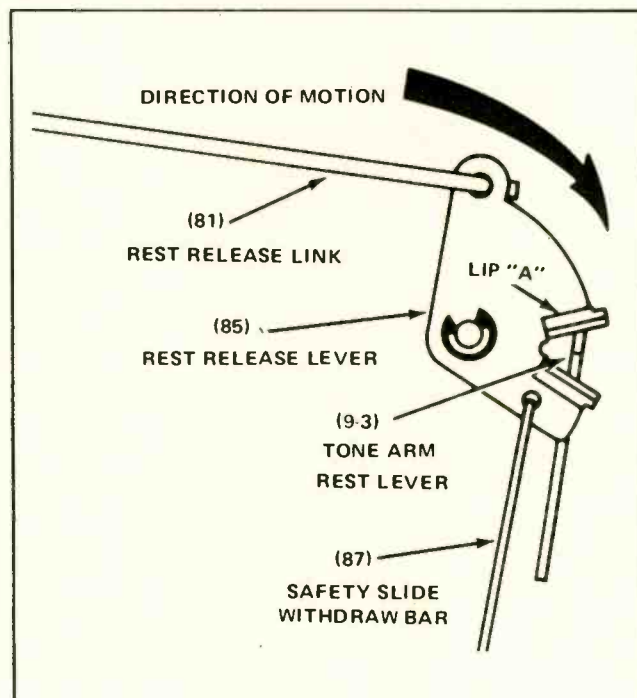
TECHNICAL DIGEST...

continued from page 49

MAGNAVOX

Record Changer Model W832—Binding When Turned ON

Reports have been encountered on several Model W832 Record changers that bound when an attempt was made to turn them ON. The binding was caused by the Rest Release Lever, item 85 in the accompanying sketch, binding against the Tone Arm Rest Lever, Item 9-3. When the



FUNCTION selector is turned to the ON position, the Rest Release Link (81) moves in the direction shown, pivoting the Rest Release Lever. Additional lubricant was first applied to the under side of Lip "A" in an effort to reduce the friction between the two parts. When this failed, the lip angle was increased slightly, i.e., bent away from the baseplate. A very slight bending was all that was required to reduce the friction and correct the problem.

Desoldering Aid

The ever-increasing use of printed-circuit boards and modules requires that a solder-sucker or desoldering device of some type be made a part of the technician's tool kit. The occasion still arises from time to time when a tube or IC socket or some other multi-contact device must be replaced on a printed circuit and the desoldering aid isn't readily available.

The next time this happens to you, try this trick. Take a piece of braided copper from a coaxial or shielded cable 4- to 6-in. long and flatten it between your fingers. Impregnate the braid with flux by either dipping it into a liquid-type or rubbing it with a paste-type flux.

Lay the end of the prepared braid on one of the terminals to be desoldered and apply heat from a low-wattage soldering iron or gun. With a slight pressure, you will feel the solder connection liquefy, and the braid will move toward the board as the molten solder is "wicked" into the braid. Lift the iron and braid at this time. Usually all of the excess solder will have been removed from the connection. Repeat the process using a new section of the

treated braid if some solder remains at the connection.

Handle each remaining connection in the manner just described, remembering that excessive heat lifts the foil and damages the board. After all connections have been desoldered, the device being removed will usually drop free of the board or perhaps dangle by a thin thread or two of solder. Just a touch of the iron will complete the job.

A couple of points of caution. Don't allow the contaminated end of the braid to get too long. Clip it off with a pair of diagonals to prevent its sticking to nearby points. Hold the braid a couple of inches back from the point of iron contact or wear some kind of protection on the hand. The braid does get excessively warm. Use rosin base flux.

Combination Radio/TV Models 1C8017, 1C8019, 1C8021—Continuous VHF Search, Radio Search or Record Reject

A Model 1C8017, 1C8019 or 1C8021 vertical three-way TV console may, depending upon the position of the function selector switch, search continuously on VHF TV or radio or reject records repeatedly. The fault lies in a .1 μ f capacitor soldered across the record reject solenoid beneath the record changer baseplate.

The problem can be eliminated by removing the capacitor, without replacement. After the capacitor has been removed, a reed relay K1 on the remote receiver may have to be gently tapped to free its contacts.

TRANSISTOR IF ...

continued from page 39

capacitor is connected between the bases of transistors Q2 and Q1, the usual phase reversal provided by transformer T1 being used to feed back to the base of Q1 (via C_n) a signal of opposite phase to that feeding back to the same point from the collector of Q1 (through C_{bc}). Neutralization is therefore achieved.

Conclusion

To wrap things up, it might be a good idea, while these nine popular coupling methods are still fresh on your mind, to examine schematic diagrams of actual receivers, and take a good look at those transistorized IF circuits. And TEKFA schematics might not be a bad place to start!

The majority of the coupling circuits will probably now look familiar. Occasionally, however, you will find some coupling meth-

ods not covered in this article, such as R-C coupling instead of tuned circuits between stages—such as featured in General Electric's U-1 chassis (TEK-FAX 1398); or series-tuned coupling, such as between the second and third IF's in Zenith's 19CC19 chassis (TEK-FAX 1397); to mention a couple of marked departures from our circuit survey. Also, many modifications and/or combinations of the nine basic circuits presented here are likely to be encountered.

By and large, however, the writer hopes that this review of coupling methods has helped to remove some of the mystery sometimes associated with these transistor IF circuits. Understanding circuitry usually leads to more efficient troubleshooting, and, in the final analysis, that is what all technicians should hope to achieve. ■

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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.

VOM

Features dual FET amplifier circuit

Battery operated portability and VTVM accuracy are the principal features of the new solid-state Model LV-71 FET Volt/Ohm meter. The unit is said to offer a wide range of operational convenience and features a dual FET (differential) amplifier circuitry in addition to a POLARITY REVERSAL switch, BATTERY CONDITION switch, and diode overload meter protection. Rated dc impedance is 10M, with ac impedance to 1M. There is a zero center scale on a large 4½-in. meter with taut band construction. Other features reportedly include 12



703

FUNCTION GENERATOR 704

Designed to internally sweep extremely large frequency range

The Model 750 Function Generator with internal sweep is designed to offer all standard Function Generator outputs, plus an easily adjustable, wide range RAMP generator, plus Tone Burst, external FM and Phase Lock Synchronization capabilities. In addition to providing high quality sine, square or triangular outputs over the



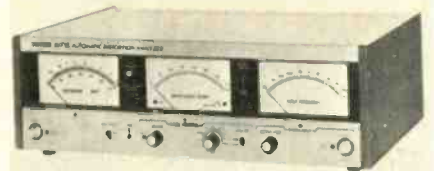
tion to providing high quality sine, square or triangular outputs over the

dial controllable range from 1Hz to 2MHz, the unit can reportedly supply swept frequencies from below 1/10 of the lowest dial setting up to twice the upper dial setting. Overall operation is thus possible from 0.01Hz to 4MHz. The internal RAMP generator is variable in frequency from 1kHz down to 1MHz (periods from 1ms to 1000sec) in four ranges. The internal sweep may free run, single shot, or be triggered from an external source. CLARKE-HESS Communications Research Corp.

HI-FI ANALYZER 705

Complete audio test set designed to sweep four decades

Introduced is the Model BKF10 Automatic Distortion Analyzer. The instrument is reportedly a complete audio performance test set that incorporates a distortion meter, a sweepable AF oscillator, an amplitude response meter, and a frequency indicator—all of which operate automatically. This equipment simultaneously determines both the distortion factor and frequency response, while the input signal is swept through four frequency decades from 20Hz to



20kHz. The results are continuously displayed on the front panel meters. In addition, recorder output signals allow both the distortion factor and the overall amplitude response to be plotted as a function of frequency. Use of dual channel or X, Y, Y' type recorders permits the plots to be developed simultaneously. The result is a complete, hard copy, dual performance signature with one sweep of the frequency spectrum. Total harmonic distortion is reportedly maintained at less than 0.01% throughout its frequency range. Dynamic range of the oscillator signal level reportedly exceeds 60dB, from less than 1 mv to more than 1v rms. The London Co.

PARTS PAK 706

Compact R/C substitutor compact for the tube caddy

An updated R-C substitution unit, Model RC24, is designed to be easily carried in the electronic technician's tube caddy. The unit is called the "Parts Pak" because it employs a full range of resistors, capacitors and

PS910A
"FLAT-PACK"

20MHz ... and small enough to fit in your brief case!

- Mini-portable Oscilloscope • Battery or AC powered
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The PS900's are the first mini-portable scopes to bring lab-quality to "on-site" DC to 20 MHz test and measurement applications. These are "true" portables, since they are of rugged construction, small size (will fit into your tool kit or brief case) and light weight (only 7 pounds with batteries), and since they will operate from internal batteries for up to 5 hours. Recharging circuitry is included, and standard "C" size cells can be used... nickel-cadmium, alkaline or in a pinch, even common flashlight batteries!

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"STACK-PACK"—
3½" H x 4¼" W x 12" D

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electrolytics to substitute on the spot. New features, over the company's previous models, include electrolytics up to 1000 μ f for capacitor substitution

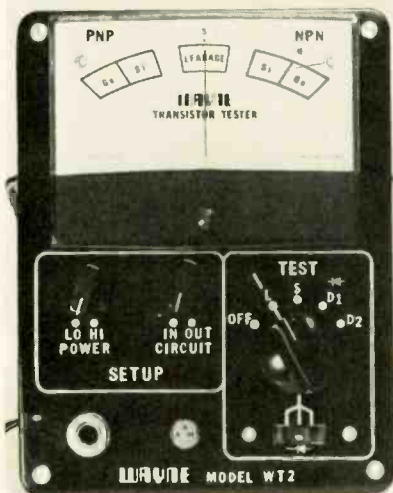


in solid-state receivers. Surge protection reportedly prevents the electrolytic from being heated or shocking the operator. A second protective device is the surge protector light that glows if excessive voltage is about to be applied to the lower voltage (75v) electrolytic. It also prevents applying voltage when the surge protector switch is pushed. Sencore, Inc.

TRANSISTOR TESTER 707

Capable of both in-circuit and out-of-circuit testing

A transistor-diode tester, Model WT2, is said to be capable of both in-circuit and out-of-circuit testing. It is designed to speed up servicing of transistorized units without the need for a set-up book. Only four simple-to-operate switches are reportedly required to allow the rapid analysis of a transistor or diode. The tester does not measure gain or leakage characteristics, instead, it reportedly tests for leakage, emitter-to-base and base-to-collector diode characteristics; emitter-to-collector shorts; determines PNP or NPN types; and identifies the type of material, silicon or germanium, used in the



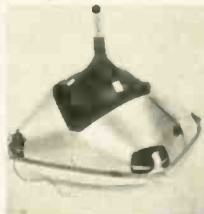
transistor. Three in-circuit finger probes may be used for one-hand

probing or three clip leads. The unit is ac operated and weighs 3 lb. Wayne Electronics.

COLOR TUBE REPLACEMENTS

Fitted with pre-assembled and pre-mounted straps and hardware 708

Introduced is a new series of color-picture tubes, fitted with pre-assembled and pre-mounted straps and hardware to reduce replacement time. Designated "Speed Fit," the picture tubes are designed to replace tubes in Motorola, RCA, and Zenith chassis.

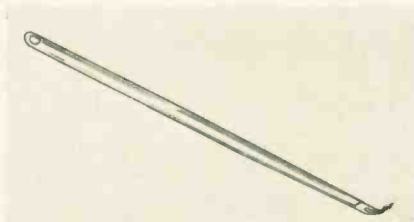


All mounting hardware is reportedly factory-positioned in place, assuring the technician that the tube will be perfectly aligned within the cabinet. No separate hardware has to be purchased or transferred from the dud. "Speed Fits" are now available for Motorola Chassis 908, 914, and 914A; all RCA 25 in. (23V) chassis; and 9 Zenith chassis from 20 to 25 in. The company's "Speed Fit" CRT's for Zenith chassis have a pre-mounted one-piece shield, built-in degaussing coil, pre-mounted pads for repositioning the yoke, and pre-assembled strap and corner brackets. Channel Master.

WIRE REMOVAL TOOL 709

Quickly disconnects quick-connect terminals

Introduced is a "quick disconnect" tool No. N-724A (Aeco. #10731-



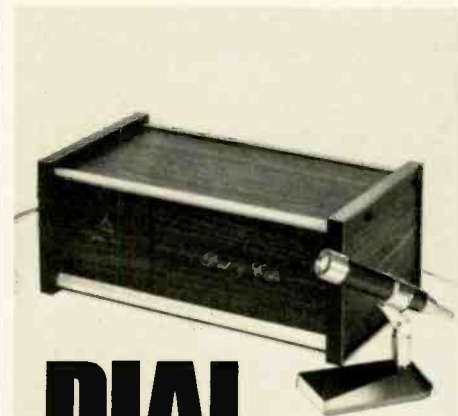
A) for quick-connect terminal blocks. The tool slot width is .050/.053 and has a red plastic coated, insulated handle. P.K. Neuses, Inc.

AC/DC MULTI-TESTER 710

The compact instrument is designed for field service

A portable electrical AC/DC Multi-Tester, Model SP-160, reportedly features a full-view window, easy reading two-color scale, safety-designed front panel, diode-protected meter, overload fuse, polarity switch,

continued on page 54



DIAL & CODER

Delta's Instant Emergency Telephone Warning System.

Dial & Coder guards you around-the-clock, signaling alarm for any emergency condition where a simple contact closure activates the system. Completely solid state, Dial & Coder utilizes the latest in discrete and integrated circuit technology to provide immediate remote signaling between any two telephones.

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NEW PRODUCTS...

continued from page 53

and heavy-duty leads. The sensitivity is reportedly 100K/v dc and 10K/v



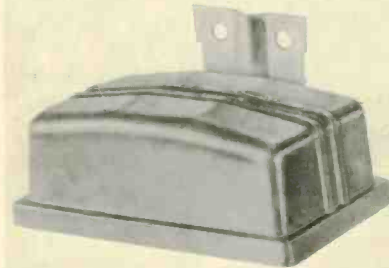
ac. The ranges are said to include ac v, 12/30/120/300/600/1200; dc v, 12/60/300/600; dc mv, 60/300; ac a,

12; dc a, 12; dc ma, 60/120; dc μ a, 12/30; resistance, 2K/20K/200K/2M Ω . The unit is powered by two "C" cells. A. W. Sperry Instruments Inc.

ANTENNA COUPLER 711

Combines TV and FM antennas

A new Yagi coupler has been designed to combine the output of an FM antenna with the output of a broadband TV antenna. Matched to the 75 Ω Model YC-75-FM, it is said to be ideal for Master Antenna TV systems using broadband head-end amplifiers. The couplers can be used to couple both a TV set and an FM



tuner to a common coaxial feed with minimal loss to either receiver while

providing two separate signal paths. One reportedly passes the entire FM band and attenuates all other frequencies by about 20dB while the other path passes all UHF and VHF channels, and attenuates the FM band by about 10dB. They are said to be encased in weather proof housings and supplied complete with straps and thumbscrews for easy mast mounting. Jerrold Electronics Corp.

SCOPE 712

Vertical bandwidth dc to 15MHz for contemporary electronics

Introduced is a service bench scope Model IO-104 designed to meet the needs of contemporary electronics... at a kit-form mail order price. The scope, with a rated vertical bandwidth of dc to 15MHz, reportedly has vertical sensitivity of 10 mv/cm, and 12 calibrated vertical attenuator positions up to 50 v/cm to accommodate a broad range of input signals. Any one



continued on page 56

Trophy Year

Thanks. Every year that goes by proves we have the best competitive team going. You, the independent serviceman, and Raytheon, the largest independent tube supplier. In 1972, we put together the best tube year in a lot



of years. It didn't just happen. Raytheon worked hard to give you more dependability. You worked hard to stay ahead of the competition. Teamwork like that makes trophy years, every year. For both of us.

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“PEOPLE STILL HAVE THE YELLOW PAGES OPEN TO MY AD WHEN I ARRIVE TO FIX THEIR SETS.”

William Early, Aida T.V. Sales & Service, Washington, D.C.



“We try to service calls within an hour of receiving them,” stressed Mr. Early. “To achieve this, we have a serviceman on the street at all times. Quite often when he arrives, the Yellow Pages will still be open, with my ad right there.

The most frequent call we get is for a set with a loss of picture. It could be a fuse, the picture tube, the high voltage transformer, or a faulty condenser. We do all repairs here, where we have the equipment.

A year after I started this business, I went into the Yellow Pages. Why? Where else could I get this much exposure for the money? I usually ask people how they found me. Sixty percent of my customers still say, ‘In the Yellow Pages.’”



3 OUT OF 4 PROSPECTS LET THEIR FINGERS DO THE WALKING.

NEW PRODUCTS...

continued from page 54

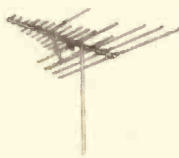
of 22 calibrated time bases from 2 s/cm to 0.2 μ s/cm (x 5 magnifier for maximum sweep of 40 ns/cm) can reportedly be selected to provide accurate frequency measurements. The horizontal amplifier accepts external inputs from dc to 1MHz. A triggering circuit is designed to provide solid waveform displays. Heath Co.

ANTENNA

713

Features extra UHF elements

Introduced is a new 82-channel antenna, Model SC-79OU, that reportedly features extra UHF elements (desirable in many reception areas), high uniform gain, and pin-point directivity for sharp, clear color and high resolution black and white. A high front-to-back ratio rejects unwanted signals and inter-



ferences—reducing ghosts and noise in picture and sound. Each antenna has a built-in ferrite impedance stabilizer which reportedly gives an increase in gain of 10% with an automatic match at 300 Ω . It also includes a three-way (VHF-UHF-FM) band separator for dividing signals at the TV set, and a built-in enclosed downlead cartridge which accepts either 300 Ω twinlead or 75 Ω coaxial cable. Winegard Co.

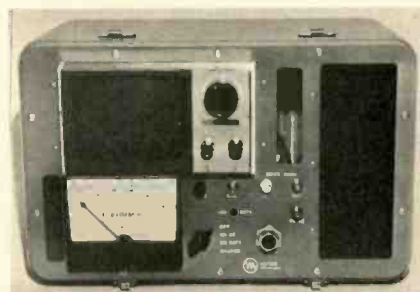
MICROWAVE TV SURVEY INSTRUMENT

714

Monitors 2150MHz and 2500MHz TV transmission Signals

A portable microwave TV field survey instrument, Model MDS-1, contains a 5-in. TV set for observation of picture quality and a large meter for reading signal strength. Nickel cadmium batteries and a built-in charger provide convenient portability for roof-top measurements or antenna alignment, plus ac operation in a TV studio for continuous power and picture monitoring. A dc-to-dc converter is also included for powering a microwave down-converter operating at

2150MHz or in the 2500MHz Instructional TV band. The unit may also be



used on TV channels 2-13 for CATV and MATV system checks. Varian Micro-Link.

FREQUENCY COUNTER

715

A low cost instrument with six digit display

Introduced is the Model CM50 Frequency Counter, which will not only measure frequency, frequency ratio, single and multiple periods, but can also be used as an event totalizer. Sensitivity of the 1M input is said to be 50mv over the entire frequency range of 5Hz to 50MHz. The input is reportedly fully overload protected

Fastest gun tester... and rejuvenator... only \$169*

It's the new RCA WT-333A Television Picture Tube Tester/Rejuvenator that:

- Tests red, blue and green color guns simultaneously with RCA's unique CR III "SIMUL-TEST" 3-meter system.
- Provides new, more effective 3-step rejuvenation function and newly designed "no-delay" G1 shorts removal function.
- Reveals H-K leakage other testers may miss, with special high-voltage surge circuit.
- Performs "brightness," "life" and other evaluation-type tests.
- Tests over 1800 TV picture tubes — including RCA's new "Precision In-Line" and other in-line types.
- Includes built-in socket plus four socket adapters at no extra charge to cover most of today's picture tubes.

To buy: order the WT-333A from any one of the more than 1,000 Authorized RCA Distributors worldwide. For more information, write RCA Electronic Instruments Headquarters Harrison, N.J. 07029.

*Optional Distributor Resale Price



RCA Electronic Instruments

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and equipped with a slide-switch attenuator. Specifications indicate that the six digit LED display uses seven segment display chips which incorporate an on-board counter, quad



latch and decoder driver. Because of the 100% solid-state design the unit will operate from either 115v ac or an external 12v dc source. Analog Digital Research, Inc.

CAUTION ...

continued from page 26

Keep putting questions to the customer. If he is kept busy answering your questions, he usually becomes less and less aggressive. He is also much more prone to understand the firm's side of the dispute where such an approach is used.

Try for a "cooling off" period by postponing your decision or action on the matter with the excuse that it must be checked into thoroughly. A customer's attitude can change greatly in 24 hours.

His individual demands will also be reduced considerably upon the second meeting than they were at first, since emotional feelings have been expended and his satisfaction in doing so completed.

Be sure that both you and the customer are as comfortable and relaxed as possible while the matter is being handled. This is always a sure avenue to smoother approaches in handling these disputes.

No matter how many threats the customer presents in the discussion, avoid accepting any of them or giving them importance in your own mind. Disregard such threats completely and the end result in handling every customer dispute will always be a better one.

Above all, try to understand the dispute from the customer's viewpoint in each specific case. Your own handling of it will become much easier without exception. Good solutions to customer problems are seldom achieved to everyone's satisfaction unless the position of one is understood by the other. ■

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AUGUST 1973, ELECTRONIC TECHNICIAN/DEALER | 57

DEALER SHOWCASE

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

STEREO HEADPHONE 716

Ultra-thin high polymer film diaphragm speakers

The Model HP-11X, lightweight stereo headphone reportedly offers exceptional sound dispersion and vividness. Its features reportedly include:



2¼-in. ultra-thin high polymer film diaphragm speakers, 10-ft coiled cord, and black/chrome frame ear cups. The frequency response is reportedly 20Hz to 24kHz. RMS Electronics, Inc.

B/W PORTABLE TV SET 717

Has metal cabinet with matching stand

The Model AN269A 19-in. B/W portable, the Putnam, is said to come with matching stand in a vinyl-clad

metal cabinet. It features a remote speaker for convenient pillow listening, Speed-O-Vision, VHF Dipole and UHF antennas, and three IF stages. The TV set is available in a rosewood color cabinet. Panasonic.

VHF/UHF MONITOR SCANNER RECEIVER 718

Monitors any eight VHF channels simultaneously

The Cheyenne 8 Marine Monitor Scanner is designed for adding flexibility to any marine communications system. The VHF/FM receiver will monitor any eight VHF channels, simultaneously. Its circuit scans across the band, sampling any eight crystal controlled frequencies you select, stopping to listen only when a signal is present. It is necessary only to plug in crystals for any channels you want to listen to. A typical setup would be to put Channel 16 in Position One, the priority position on the receiver.



At your command, the unit will revert to this channel any time a signal is present even if it's receiving something else at the time. Each position has a bypass switch so that if you want to temporarily cut out any channel, just flick a switch. Pearce-Simpson.

STEREO CABLE COVER 719

Consolidates and covers the tangle of wires

A new product called "Zippertube" is designed to consolidate and cover-up the tangle of wires leading to your stereo components by placing them into a single 5/8 in. cable without disconnecting any wires. Made of flexible, walnut-tone plastic, it forms

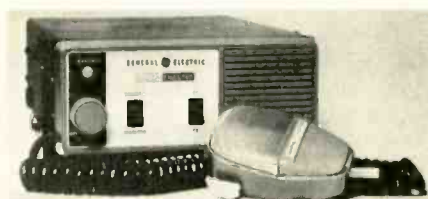


around the wires and reportedly "zips" together in minutes using only finger pressure. The cover comes in 6 ft. lengths and can be cut-to-size with scissors. It holds up to six cables and can be easily reopened to remove wires. Pfanstiehl.

MOBILE RADIO 720

Compact unit designed for needs of cost-conscious users

A compact solid-state radio has been customized to fit the basic communication needs of cost-conscious users who require utility, serviceability and maximum reliability in an uncomplicated radio system.



Custom brackets are designed to facilitate installation over the transmission "hump" in most passenger cars, and the equipment is reportedly easily mounted under the dash of trucks. A compact, tight fitting enclosure helps protect against dust, dirt, and moisture. It is designed to dissipate heat quickly to protect components. The radio is reportedly on frequency and ready to operate the moment it is

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turned ON. Low battery drain is said to allow the radio to be left ON so that no important calls will be missed. General Electric Communications Systems Div.

INDOOR ANTENNA 721

Features dynamic appeal box

The Tele-Vue indoor antenna, No. 6040, is a combination of sophisticated engineering and decorator inspired styling. The antenna is packaged in a self-displayed, colored carton with a full size picture of the antenna, with its features printed on the box. The antenna is engineered for UHF/VHF/FM with one lead-in wire for UHF and one for VHF. The unit also features a 12 position switch. iE Manufacturing.



FOUR-CHANNEL COMPONENTS 722

System comes complete with plexiglass dust cover

Introduced is a set of modern components that includes a Model SQR4201 amplifier that reportedly has 300w of music power, built-in-



four-channel C.B.S. SQ matrix circuitry, illuminated pointers and dial scales, FILTER, CONTOUR and SPEAKER BALANCING controls, plus a Dual turntable with plexiglass dust cover. The system comes with two speakers. Electrohome.

TV CAMERA SYSTEM 723

Provides a complete security package

The Model RGS-50 Television Camera System is specifically designed for any application or environment in your security or surveillance installation. Each of the components in the system has been designed to add a specific capability. The modular system design enables the system to meet many different requirements. Standard models can be revised by simply

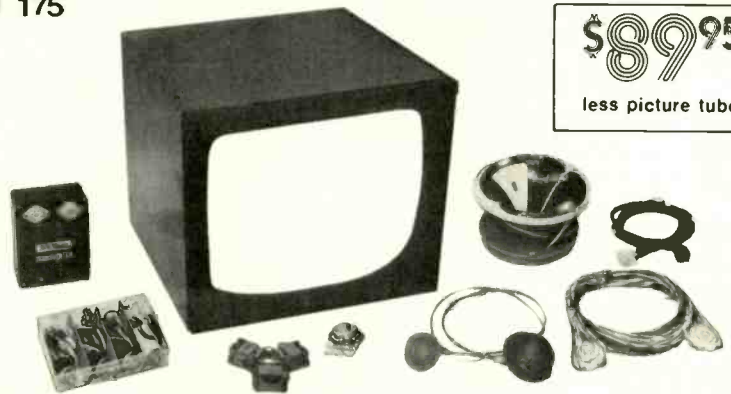
specifying the addition or deletion of components as required to meet special conditions. Components reportedly include weatherproof housings, selection of vidicon or silicon pickup tubes, automatic light-level compensation module, camera drive options (random interlace, crystal-controlled horizontal drive, 2:1 interlace and external drive), housing heater, sun douser, automatic-iris module, selection of lenses, variety of camera control units (controls remote cameras, lenses and pan and tilt), sunshade and monitors. Dage Television.



"You say you tested the tubes at the corner delicatessen? That explains the garlic smell when the tubes heat up."

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\$89⁹⁵

less picture tube

Modernize your shop to speed color TV service—with a Telematic CJ 175

Consists of:

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Universal Yoke
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Included at NO Charge:

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UPGRADE ALL MAKES TEST RIGS



MAP 3500

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SERVICE SOLID STATE WITH ANY TEST RIG

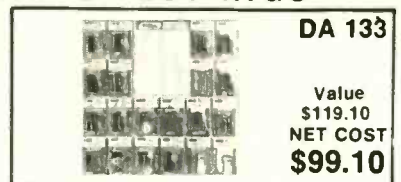
Telematic Transverter will match Solid State TV to any Test Rig

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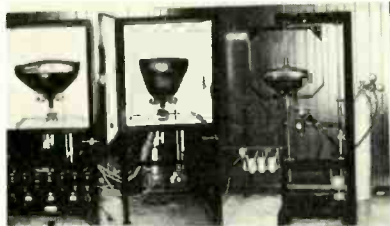


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Spartanburg, South Carolina

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DISCOUNT PRICES TEST EQUIPMENT



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105	113	121	129	137	145	153
106	114	122	130	138	146	154
107	115	123	131	139	147	155
108	116	124	132	140	148	156

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901	909	917
902	910	918
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907	915	923

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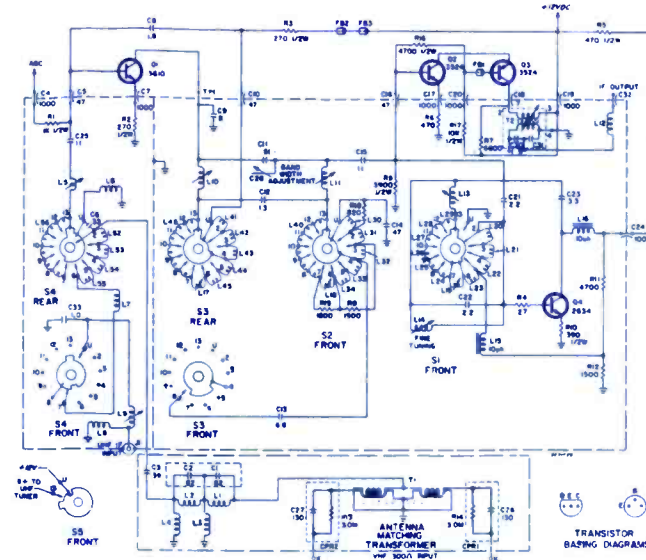
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GROUP
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SCHEMATIC NO.		SCHEMATIC NO.	
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TV Chassis R-1		TV Chassis KCS187	
RCA CORP.	1483	SYLVANIA	1484
Color-TV Chassis CTC62		Color-TV Chassis EO5	



KRK 1768/150A
TUNER SCHEMATICS

SYMBOL	DESCRIPTION	RCA PART NO.
R101	control, brite	128154
R105	control, volume w/s101	128153
T101	power xformer	135812
R207	control, contrast	132554
R211	control, vert hold, slze/bias	131794
T202	xformer, high voltage yoke deflect	135746 135733
1C301	circuit, integ	130751
T902	xformer sound output	132848



PW600 PIN-9
1.5VPP VERT RATE

PW900 PIN-6
28VPP HORZ RATE



PW400 PIN-12
1.5VPP VERT RATE

BASE Q202
1.5VPP VERT RATE



E16
1VPP VERT RATE

COLL Q202
60VPP VERT RATE



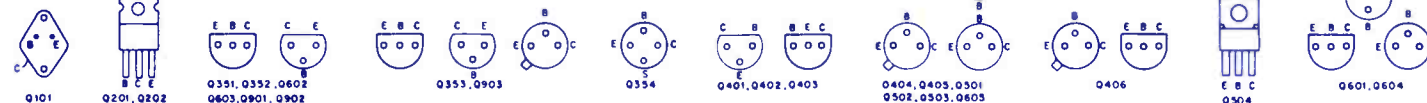
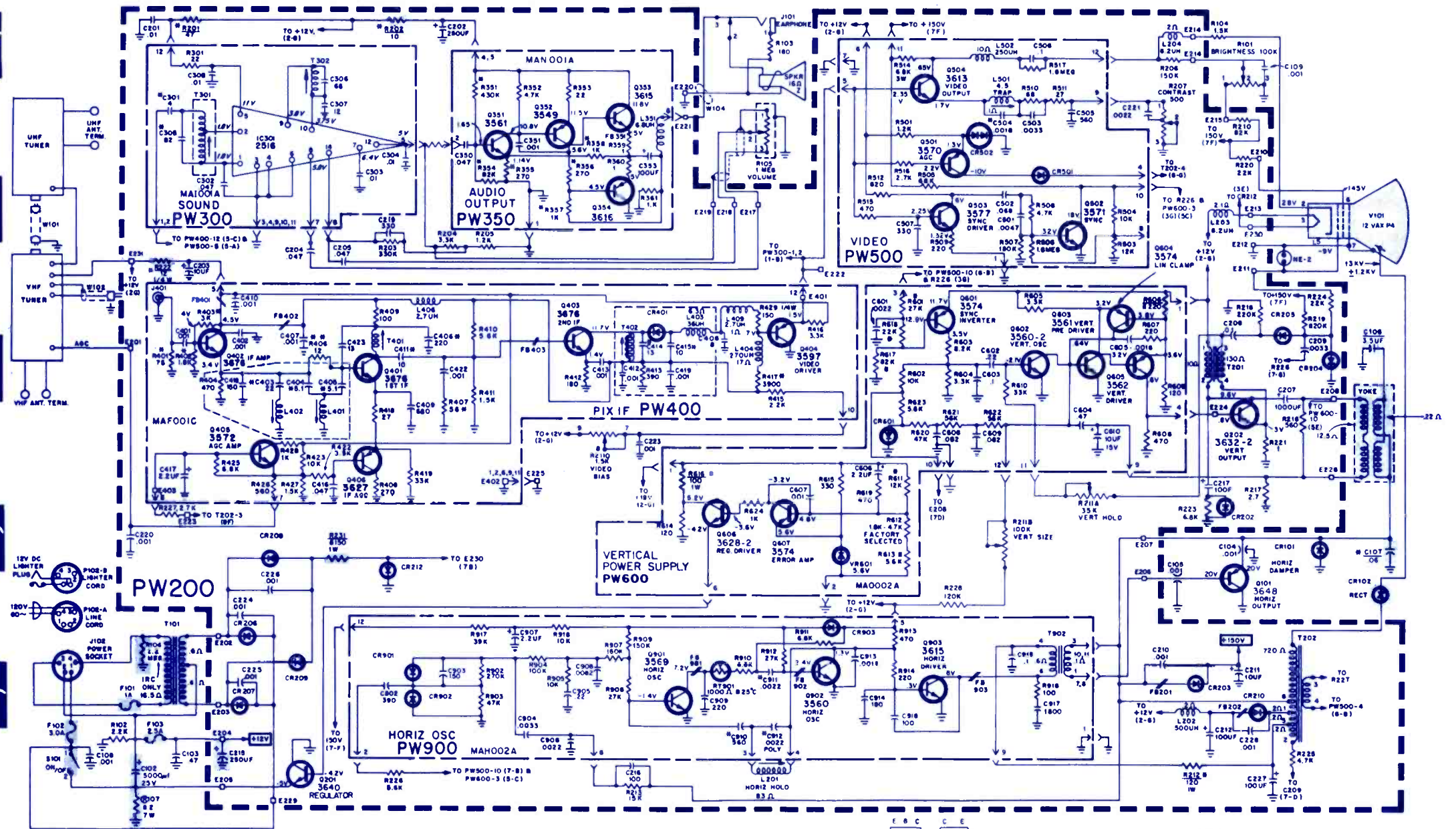
PW600 PIN-12
.7VPP VERT RATE

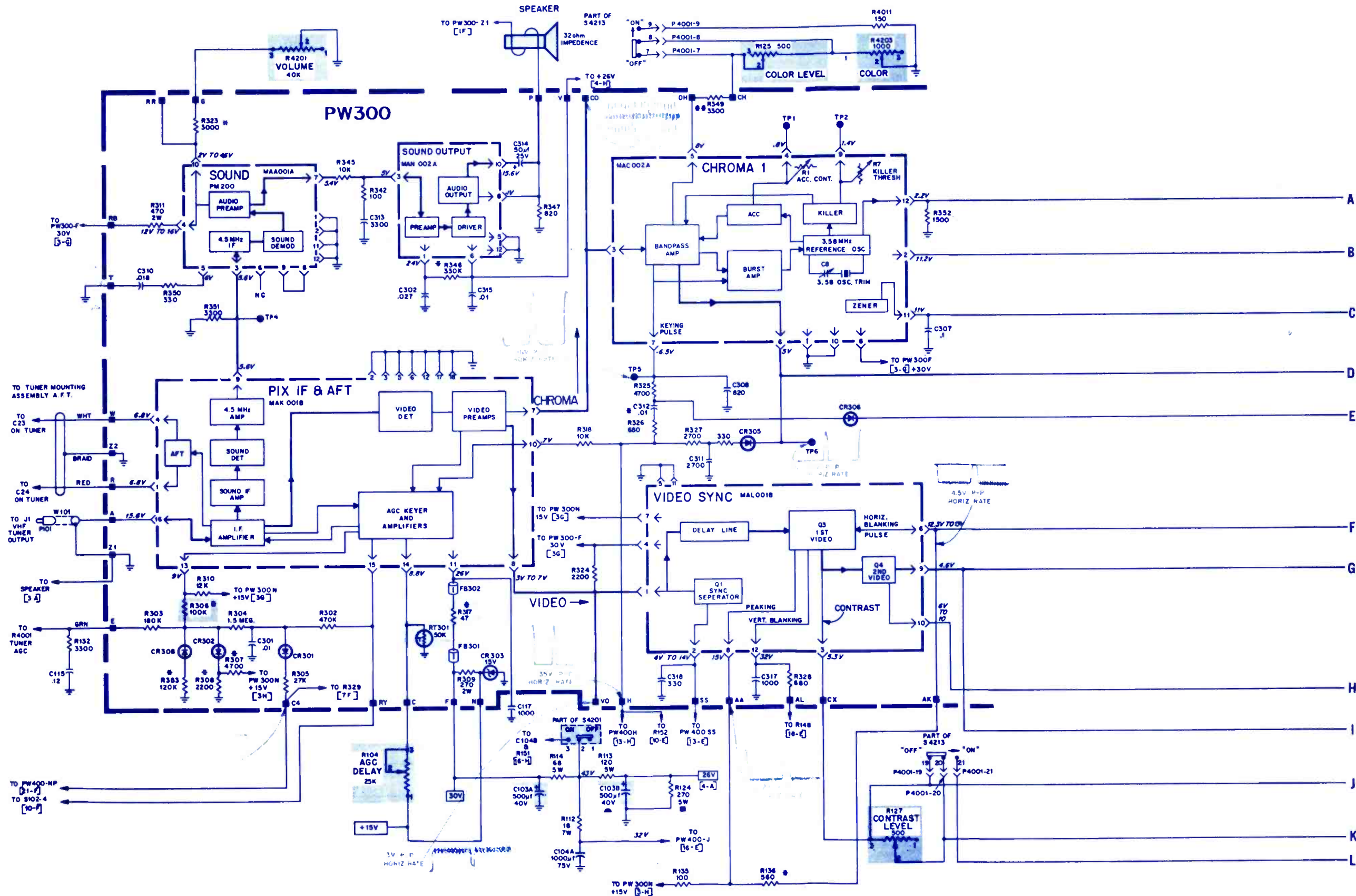
PW900 PIN-2
25VPP HORZ RATE

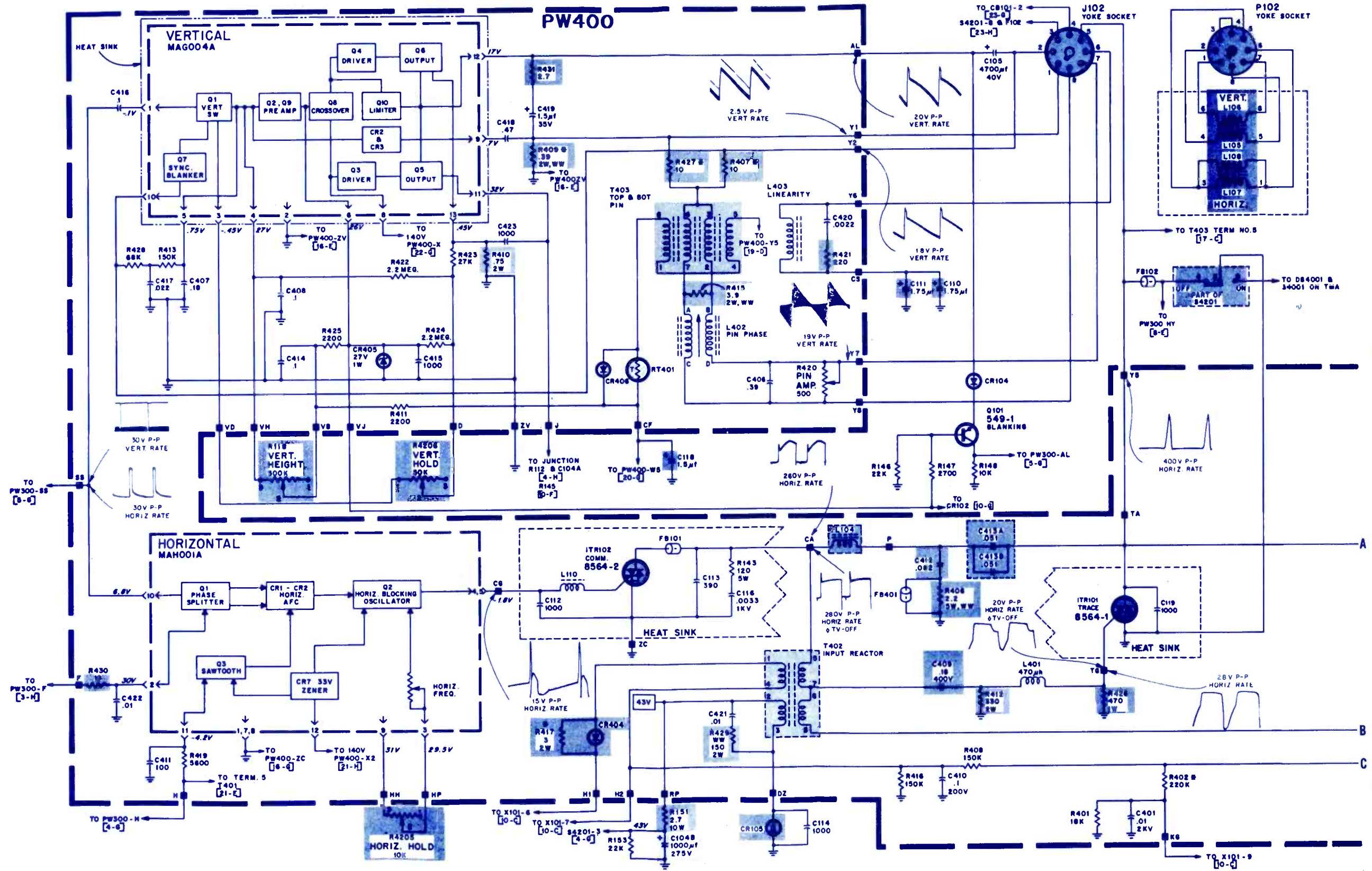


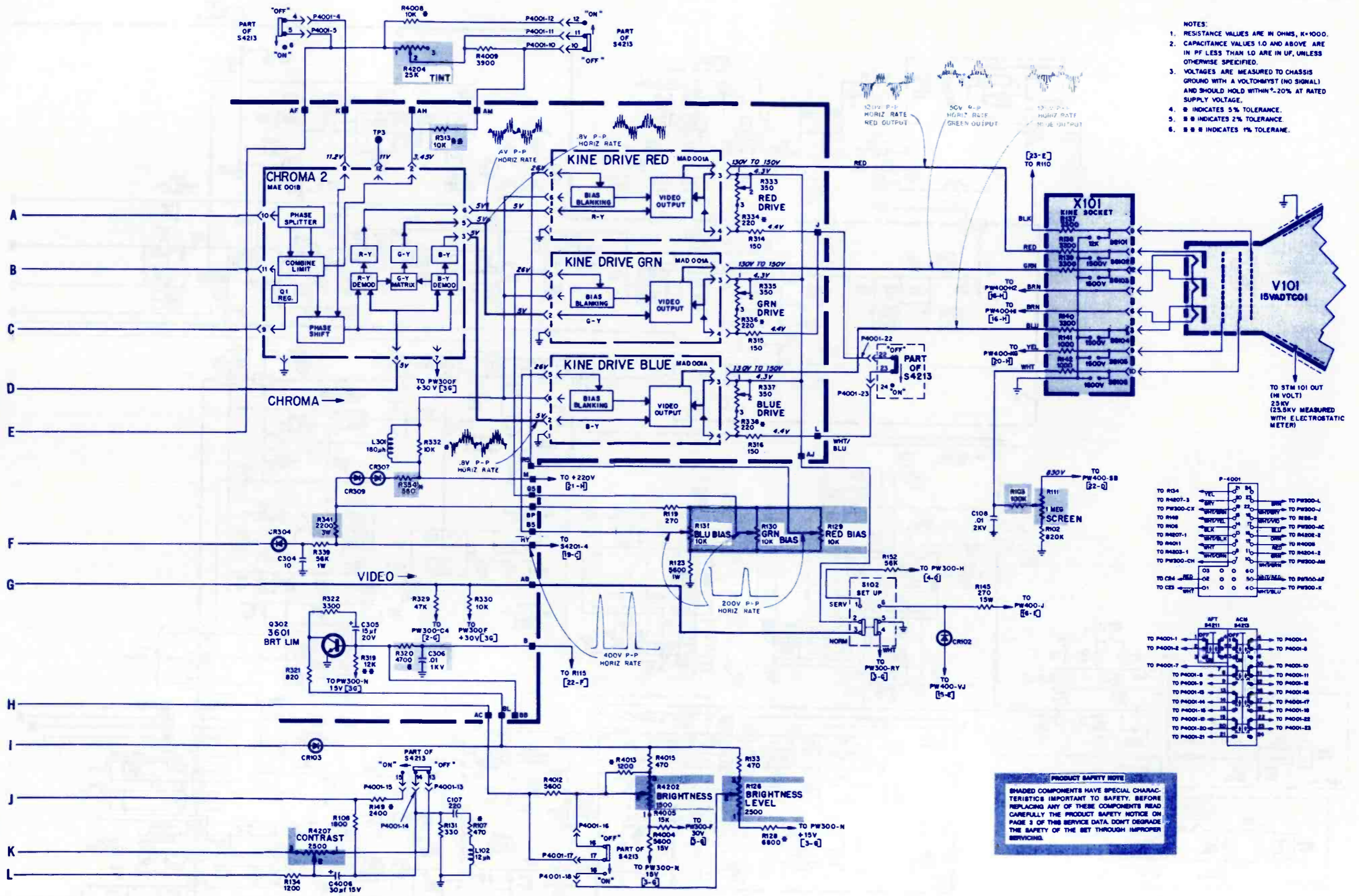
PW900 PIN-11
150VPP HORZ RATE

PW900 PIN-3
9VPP HORZ RATE





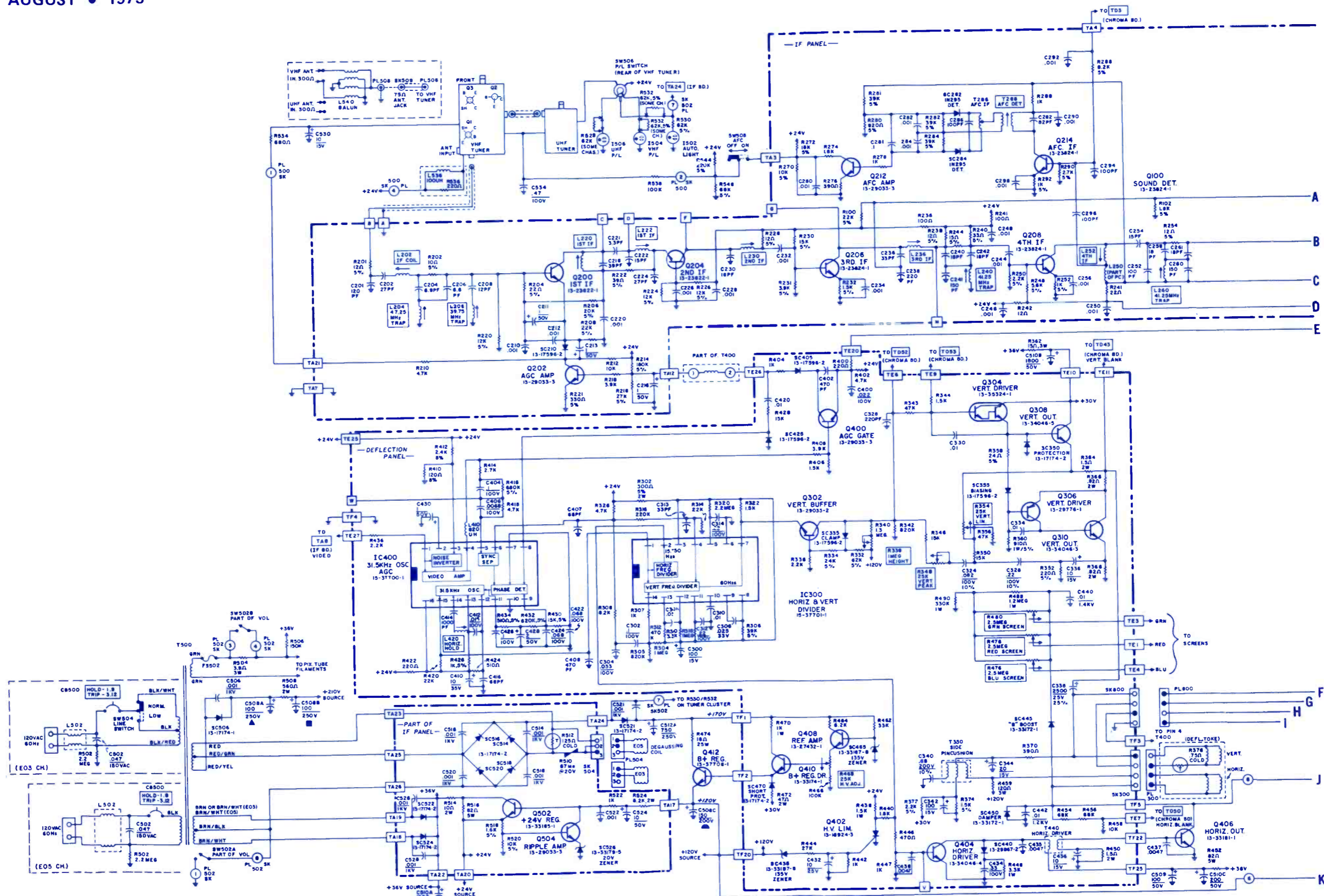


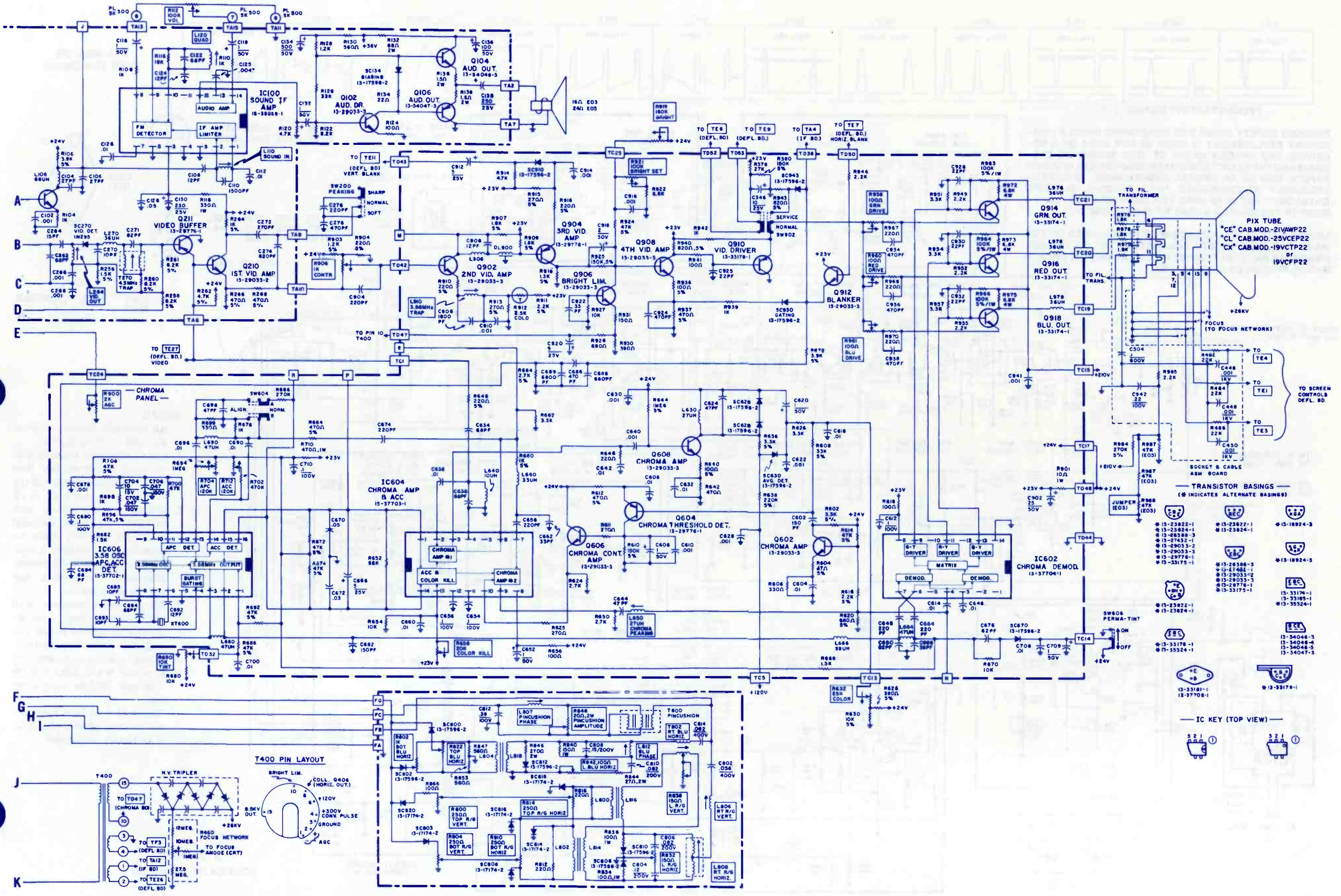


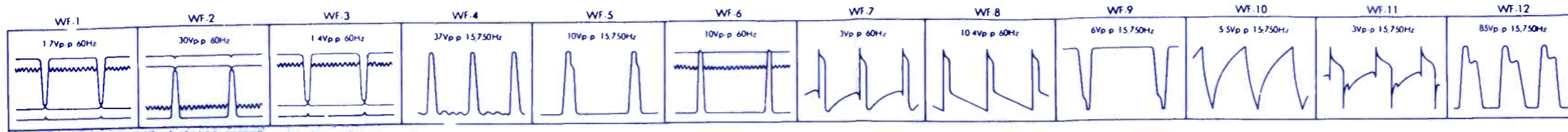
- NOTES:
1. RESISTANCE VALUES ARE IN OHMS, K=1000.
 2. CAPACITANCE VALUES 1.0 AND ABOVE ARE IN PF LESS THAN 1.0 ARE IN UF, UNLESS OTHERWISE SPECIFIED.
 3. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A VOLTOHMIST (NO SIGNAL) AND SHOULD HOLD WITHIN $\pm 20\%$ AT RATED SUPPLY VOLTAGE.
 4. $\text{\textcircled{R}}$ INDICATES 5% TOLERANCE.
 5. $\text{\textcircled{R R}}$ INDICATES 2% TOLERANCE.
 6. $\text{\textcircled{R R R}}$ INDICATES 1% TOLERANCE.

PRODUCT SAFETY NOTE

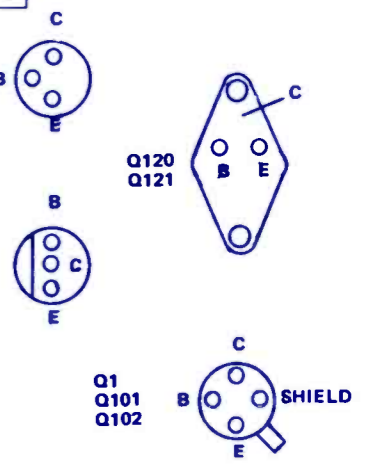
SHADED COMPONENTS HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS READ CAREFULLY THE PRODUCT SAFETY NOTICE ON PAGE 3 OF THIS SERVICE DATA. DON'T DEGRADE THE SAFETY OF THE SET THROUGH IMPROPER SERVICING.







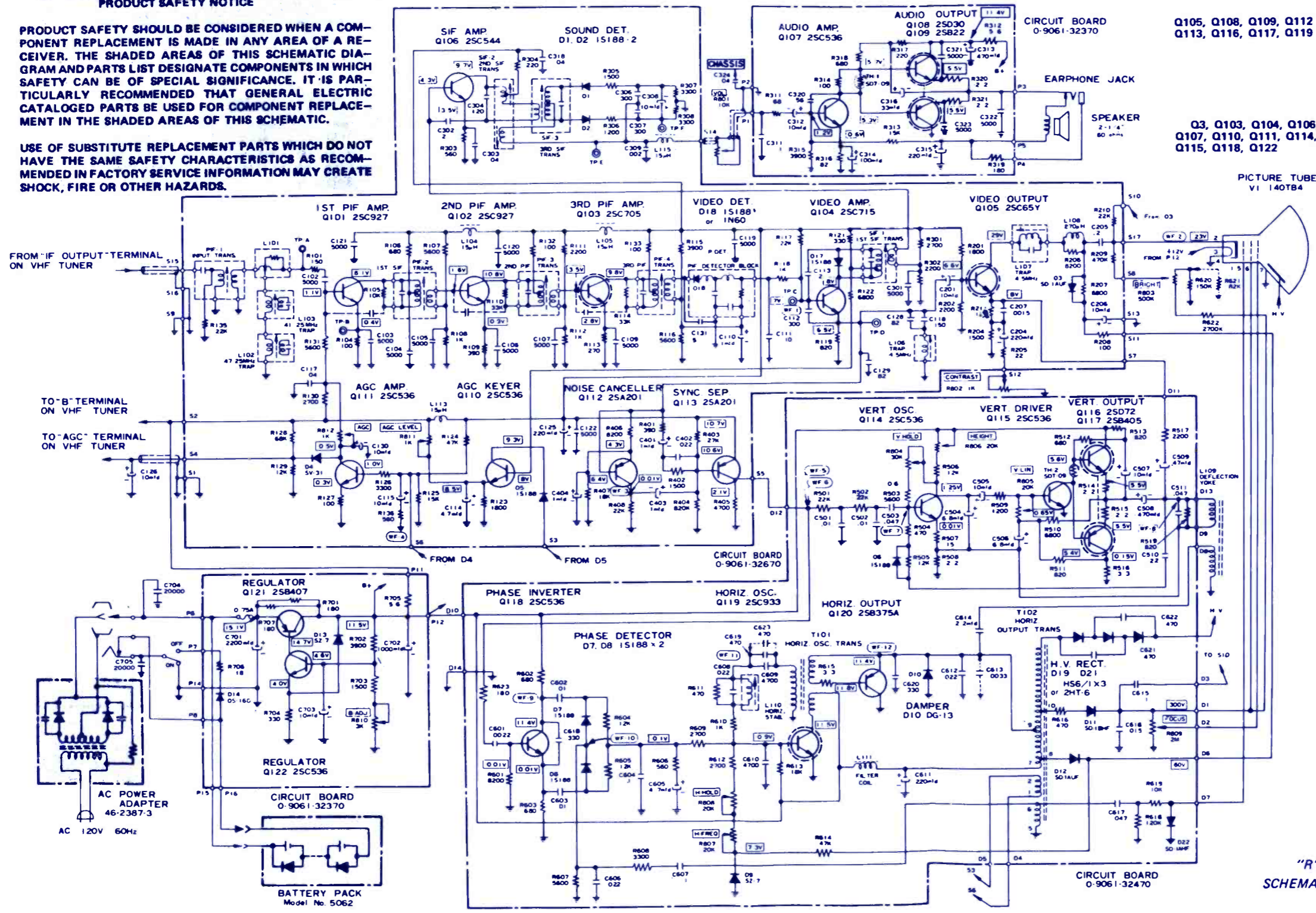
TRANSISTOR BASE DIAGRAMS



PRODUCT SAFETY NOTICE

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

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



- NOTES:
1. All resistance values in ohms K=1,000 M=1,000,000.
 2. Unless otherwise noted in schematic, all capacitors less than 1 are expressed in mfd and the values larger than 1 are in pF.
 3. Voltage reading taken with "VTVM" from point indicated to chassis ground. Tuner on unused channel, contrast at maximum, AGC at fully clockwise, other controls at normal, line voltage 120 volts.
 4. All waveforms measured with strong signal input, contrast set to give normal picture and AGC line operating normally.
 5. Voltage reading may vary $\pm 20\%$.
 6. If picture is too wide, clip the wire near C613 by using a nipper. This wire may have been opened in some chassis as a result of factory adjustment.

"R" CHASSIS SCHEMATIC DIAGRAM

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In 48 hours we can ship you anything we've got.

The New Panasonic Parts Hot Line is a performance promise: 24-hour-a-day, 7-day-a-week service. Now, if you have a problem getting the part you need, just call one central number.

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48 hours, your order is on its way.*

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\$113

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