

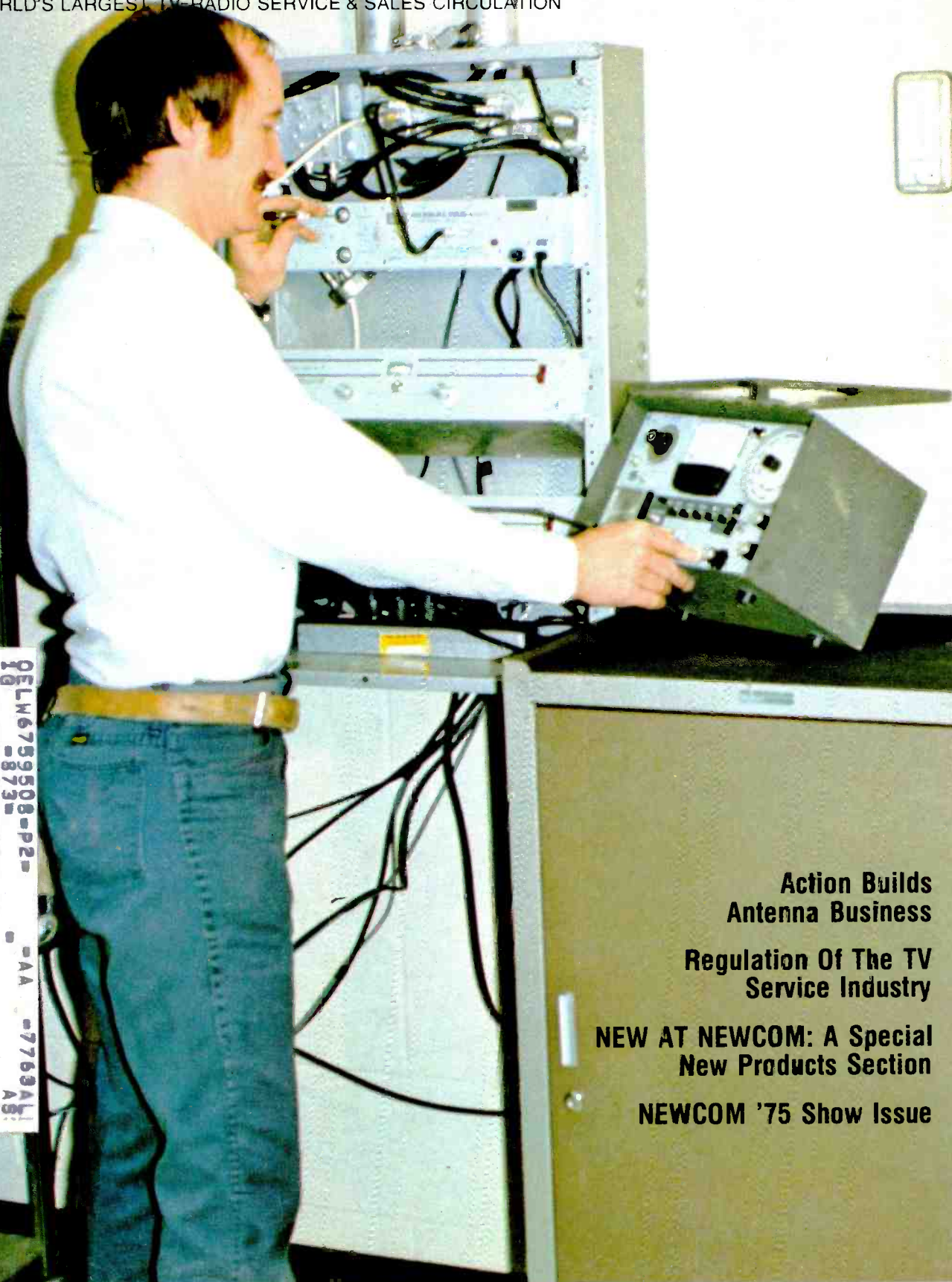
APRIL 1975 • 75 CENTS



A HARCOURT BRACE JOVANOVIICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



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Antenna Business

Regulation Of The TV
Service Industry

NEW AT NEWCOM: A Special
New Products Section

NEWCOM '75 Show Issue

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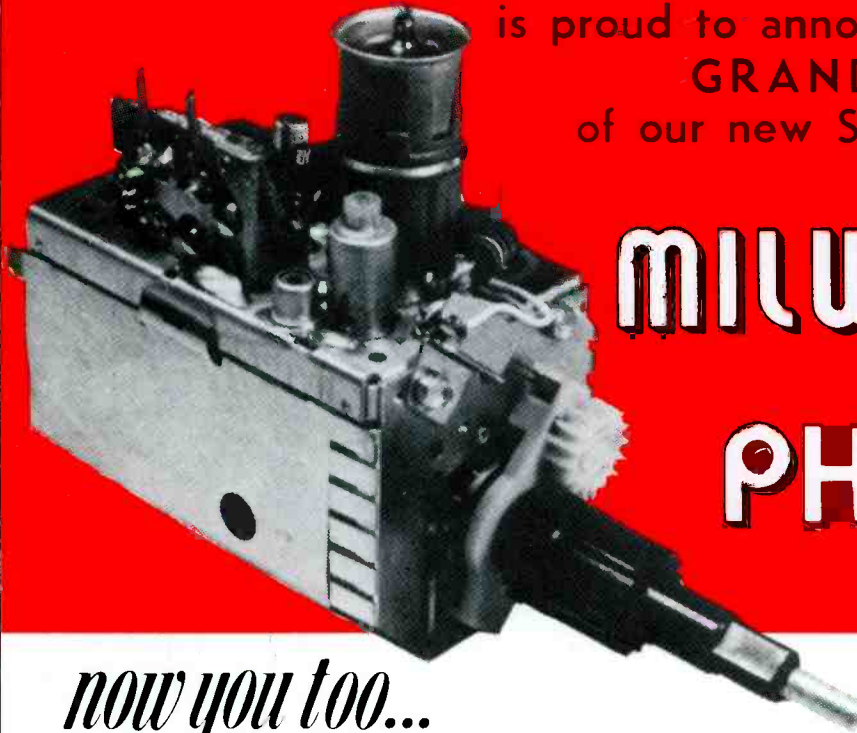
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GTE SYLVANIA

ELECTRONIC TECHNICIAN/DEALER

APRIL 1975 • VOLUME 98 NUMBER 4

THE COVER: Three years ago, James Wellener, shown here adjusting the head end equipment of an MATV system, started Action Sales & Service in Feasterville, Pa. This year he expects to do \$160,000 worth of antenna installation business.

FEATURES

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14 REGULATION OF THE TV REPAIR INDUSTRY IN LOUISIANA AND CALIFORNIA

A synopsis of a recent Bureau of Economics report which examines the effects that two types of state regulation have had on the cost of TV repairs and the incidence of "parts" fraud. By J. W. Phipps.

20 ACTION BUILDS ANTENNA BUSINESS

Action Sales & Service, a Feasterville, Pa., antenna installation and maintenance company, has in the past three years tripled sales. The principal reasons for Action's success are analyzed in this business - profile article. By Lon Cantor.

24 NEW IN COLOR FOR 1975

New and significantly changed features and circuits in quasar Electronic's 1975 color TV line. By Joseph Zauhar, ET/D Managing Editor.

28 AUTO ENTERTAINMENT ELECTRONICS— STATE-OF-THE-ART REPORT

Completion of a two-part analysis of the new circuits in 1975/76 car radios and tape players. By Joseph J. Carr, ET/D Contributing Editor.

36 NEW AT NEWCOM

A special 6 - page preview of some of the many new products your local parts distributor will be seeing at NEWCOM '75, the annual electronic distributors trade show, held this year during May 6-8 in Las Vegas.

TEKFAX— Admiral color TV Ch. 3M10/4M10/4M10R; Admiral b-w TV Ch. T9K6; Airline color TV Model GEN 12985B; Sylvania color TV Ch. E08-1; and TRAV-LER b-w TV Ch. TL6-T1L6.

DEPARTMENTS

- | | |
|---------------------------|-----------------------|
| 4 PUBLISHER'S MEMO | 49 NEW PRODUCTS |
| 6 LETTERS | 52 DEALER SHOWCASE |
| 8 NEWS OF THE INDUSTRY | 56 CLASSIFIED ADS |
| 10 TECHNICAL LITERATURE | 58 ADVERTISERS' INDEX |
| 44 TEST INSTRUMENT REPORT | 61 READER SERVICE |
| 47 TECH DIGEST | |



A HARCOURT BRACE JOVANOVIICH PUBLICATION



ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate offices: 757 Third Avenue, New York, New York 10017. Advertising offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial, Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rate: one year, \$7; two years, \$12; three years, \$16 in the United States and Canada. Other countries: one year, \$15; two years, \$24; three years, \$30. Single copies: 75¢ in the U.S. and Canada; all other countries: \$2. Second Class postage paid at Duluth, Minnesota 55806 and at additional mailing offices. Copyright © 1975 by Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

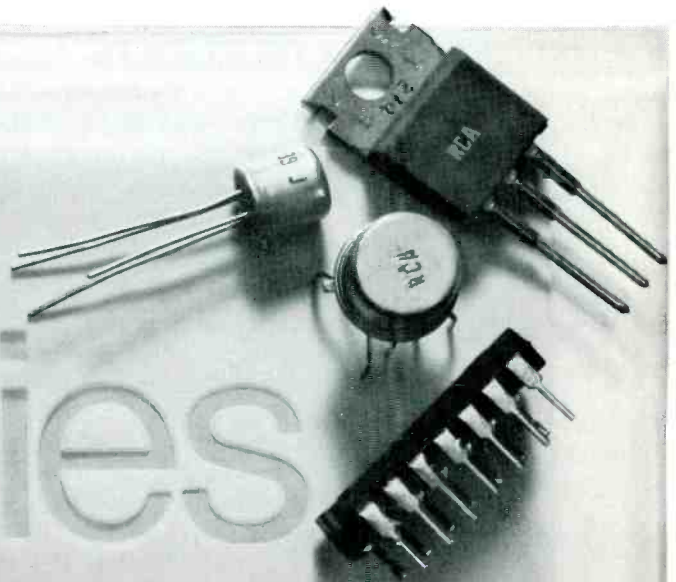
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RCA SK Series



It's OK if it's **sk**

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

APRIL 1975, ELECTRONIC TECHNICIAN/DEALER / 3

PUBLISHER'S MEMO



NEWCOM '75 SHOW HAS GREAT EXPECTATIONS

A record - breaking attendance of over 8000 is anticipated for the 1975 NEWCOM Show in Las Vegas May 6, 7 and 8, at the Las Vegas Convention Center. A comprehensive seminar program supports a growing exhibitor roster: 213 exhibiting companies; 357 display units; 20 conference units; 7200 square feet of arena space.

Most of our readers are aware of the fact that every spring — usually in early May — our industry holds its annual manufacturers, distributors and representatives convention, known as National Electronics Week (NEW). This vital industry show gives manufacturers the opportunity to introduce their latest equipment and components (parts) to distributors in attendance — who, upon return, will be passing this important information on to you—the end user of the products unveiled at this show.

NEWCOM '75 is devoted to professionalism in electronics parts and equipment distribution. Supported largely by participating manufacturers, NEWCOM offers them an opportunity to exhibit their new products along with their regular line. This show is arranged by the Electronic Industry Show Corporation, a non - profit organization. This is the fourth consecutive year that it has been held in Las Vegas. Next year it will be in New Orleans. NEWCOM '75 promises to be the greatest show of its kind. If you should plan on attending, be sure to look us up.

The electronic servicing industry can expect a good sales outlook for the balance of 1975, despite the economic climate at present. The economic outlook had called for a sluggish first quarter, a slow pickup in the second quarter and a promising improvement in the second half of 1975.

As I have stated in the past, it is unfortunate that the bulk of our 70,000 readers, who are professional electronic technicians and service dealers, cannot attend functions such as the NEWCOM Show, since you are the key people responsible for the tremendous growth of our industry through the years.

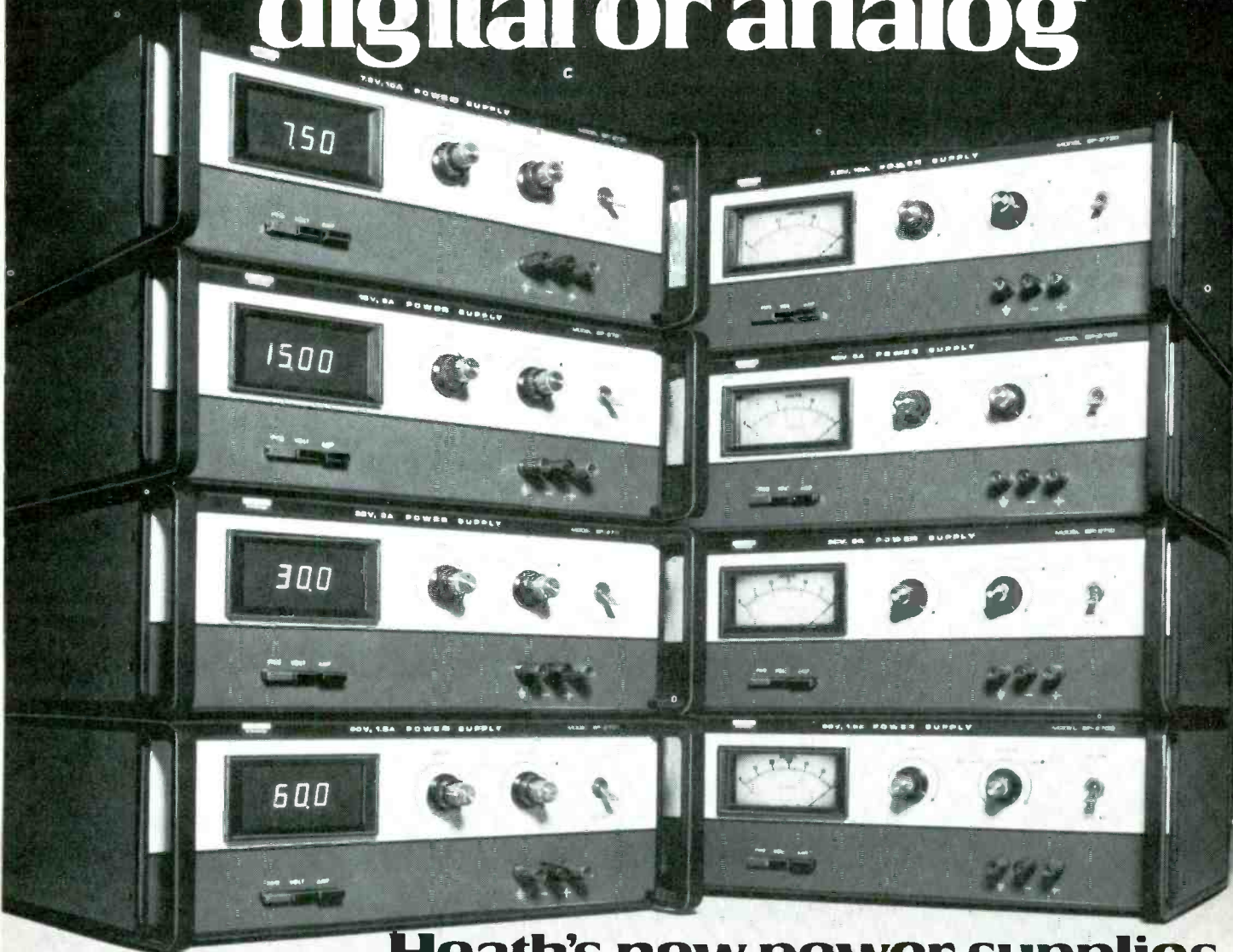
To provide you a preview of some of the many new products which will be introduced at NEWCOM '75, we have included in this issue a special new products section titled "NEW AT NEWCOM." (The new products of those manufacturers who were unable to release information to us in time for inclusion in NEW AT NEWCOM will be covered in the New Products department in upcoming issues of ET/D.)

Each product in the NEW AT NEWCOM section is "keyed" to the Reader Service Card in this special NEWCOM show issue. And you can be sure that your requests for further information will receive priority action from each manufacturer.

As reported in my memo in the February issue, the manufacturers whose products you use in your servicing or which you sell or install are fully aware of the problems that face us all today. They are gearing up strongly so that we can look forward to an impressive and successful turnaround in our industry, which, at present, is still the most viable in the electronics industry.

Al Nevins

digital or analog



Heath's new power supplies set new performance standards

- Choice of four DC outputs: 0-7.5 V, 0-15 V, 0-30 V or 0-60 V
- 3½-digit or 3½" meter readout
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- Remote voltage and current programming
- Precise load and line regulation — ±0.05% voltage, ±0.1% current
- Complete output protection
- Remote sensing automatically compensates for lead voltage drops
- Available factory assembled or in easy-to-build kit form

Constant current and constant voltage operation. And it's true constant current, not simple current limiting. Adjust two controls to get the voltage and current you need. And if one supply doesn't deliver exactly the output you require, just connect them in series or parallel — with no loss of regulation!

Remote programming and sensing. For systems use and remote applications, both voltage and current can be programmed. And all supplies provide remote sensing at the load to automatically compensate for voltage drops due to long leads and connectors.

Output protection. You don't have to worry about these power supplies. Short circuit operation or accidentally applied high voltages can't harm them.

All 2700-Series power supplies are available in easy-to-build kit form or completely factory assembled and calibrated. Either way you get a power supply that offers more performance per dollar than anything the competition can offer. Send for the latest Heath catalogs and get complete details.

Heath's versatile new 2700-Series DC power supplies do much more than just provide the right voltage and current — they set new standards for precision and ease of operation.

Digital or analog readout. These power supplies are the first in their price range to offer a choice of readouts. The digital models have two-decade autoranging to provide high resolution for low voltage and current settings.

Model	Readout	Maximum Rated Output		Price*
		Volts	Cur.	
IP/SP-2700	Analog	60 V	1.5 A	\$169.95 kit \$255.00 assem.
IP/SP-2701	Digital	60 V	1.5 A	\$219.95 kit \$340.00 assem.
IP/SP-2710	Analog	30 V	3.0 A	\$169.95 kit \$255.00 assem.
IP/SP-2711	Digital	30 V	3.0 A	\$219.95 kit \$340.00 assem.
IP/SP-2720	Analog	15 V	5.0 A	\$169.95 kit \$255.00 assem.
IP/SP-2721	Digital	15 V	5.0 A	\$219.95 kit \$340.00 assem.
IP/SP-2730	Analog	7.5 V	10.0 A	\$169.95 kit \$255.00 assem.
IP/SP-2731	Digital	7.5 V	10.0 A	\$219.95 kit \$340.00 assem.

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LETTERS

A TECHNICIAN SHORTAGE?

On page 4 of the November 1974 edition of ET/D, Frank Steckel, an EIA/CEG advisor and university professor, is quoted as stating that "more than 30,000 technicians are needed now to service the growing number of consumer electronics products."

I'd like to know where these jobs are. They surely are not in Illinois and Indiana. Very little advertising for consumer electronics technicians has appeared in Chicago and Indianapolis papers during the past two years...

Some service technician jobs that are advertised require the ability to complete 16 repairs a day or require a license which only a television engineer could pass. (Most of the individuals who do have an Indiana TV/radio repair license received it under the grandfather clause of the license law and, consequently, did not take any kind of written test.)

I don't think your magazine is in touch with the man in the field, who is under constant pressure to fix 16 sets a day or complete 8 service calls a day. The pressure is intense, and there is little help from newspapers and magazines that are out to prove that most repairmen (particularly those who service TV) are crooks.

I don't understand why anyone would want to enter the consumer electronics service field...even if openings in it do exist.

Larry K. Shanklin
Crawfordsville, Indiana

The comment by Frank Steckel to which you refer was made by Mr. Steckel in a speech at the opening ceremonies of the Electronic Opportunity Training School in Chicago and was subsequently included in a report of the opening in the News Of The Industry department of the November 1974 issue of ET/D.

Publication in ET/D of yours, Mr. Steckel's or anyone else's comments does not mean that the editorial staff of ET/D agrees with the substance of the comments. The decision to include or not include an individual's comments in the News Of The Industry, Electronic Association Digest and Letters departments is made by the editor on the basis of relevancy and availability of space, not on the basis of whether the editor agrees or disagrees with the substance of the comments.

I share your skepticism of Mr. Steckel's statement that 30,000 additional technicians are needed now to service consumer electronic products. I have not seen any data or other

evidence that indicates a consumer electronic technician shortage of this magnitude. However, I have seen data which tend to indicate that the demand for competent consumer electronic technicians is increasing and probably will continue to increase until manufacturers achieve electronic and manufacturing technologies which permit them to profitably produce consumer electronic products whose reliability and/or serviceability characteristics are improved sufficiently to offset the continuing increase in the need for service which is attributable to the increase in the number of units in use.

The demand for consumer electronic technicians is directly related to the incidence of need for service, which, in turn, is dependent on 1) the numbers of consumer electronic units in use, 2) the reliability and serviceability of the units in use, and 3) the cost of unit replacement compared to unit repair. As the numbers of units in use increase, the incidence of need for service also will increase unless 1) improvements in reliability reduce the incidence of need for service sufficiently to offset the increase in service need resulting from more units in use, and/or 2) advancements in electronic and manufacturing technologies make possible economies which, when passed along to the consumer, reduce unit costs to levels that make unit replacement more attractive than repair.

All of the "evidence" I have seen indicates that the numbers of consumer electronic units in use will continue to increase in the foreseeable future. Conversely, I have not seen any "evidence" which indicates that there will be sufficient improvement in product reliability to offset the increase in need for service resulting from increases in units in use. Nor have I seen any conclusive evidence that significant numbers of "nonrepairable" consumer electronic products will be introduced within the next five years or so. — The Editor ■

**Perform a
death-defying act.**



Eat less saturated fat.

Give Heart Fund
American Heart Association

Another advance in tube technology from RCA

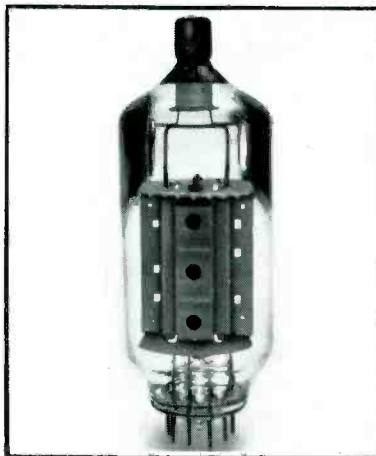
RCA, the leading manufacturer of receiving tubes, offers you advanced types to satisfy the needs of the replacement market. We can do this because RCA has unique design capability that comes only with years of tube design and manufacturing experience. This means that when you install RCA-made tubes, you're selling quality tubes with the newest and best innovations in design and performance.

A dynamic approach to receiving tube technology, geared to the rigorous demands of the replacement market, RCA's exclusive, new 6MJ6/6LQ6/6JE6C brings added reliability to horizontal deflection cir-

cuits, the most critical in your customer's set. Manufactured exclusively by RCA, this new rugged horizontal output tube with the integral envelope-top-cap assembly, which totally eliminates loose top-cap problems, represents another significant advance in tube technology from RCA.

You can be certain that RCA will continue to lead the way in the receiving tube business. After all, *your* tube business is *our* tube business and we expect to share this high volume business with you for a long time to come.

See your RCA distributor for all of your tube needs.



Rugged Features of the 6MJ6/6LQ6/6JE6C

- Integral-Envelope-Top-Cap Assembly
- Rigid Cage
- Stable grid alignment
- Excellent Heat Dissipation

RCA

RCA/Electronic Components/Harrison, N.J. 07029

NEWS OF THE INDUSTRY

GE To Phase Out Portable Phono By Year End

General Electric's Audio Electronics Products Department has announced that it will discontinue the production and marketing of portable phonographs, including Show 'N Tell, by the end of this year.

The reason for the phase out, according to a GE spokesman, is that the portable phonograph business has been declining substantially for a number of years and finally has reached a volume level that makes continuation "uneconomical."

Senate Studying Repeal of Fair Trade Laws

Senator Edward Brooke (R-Mass.) has introduced a bill (S.408) which, if enacted, would repeal the authority of states to enact and enforce fair trade laws. Substantial bi-partisan and administration support reportedly should lead to quick Senate approval.

Federal Warranty Law Effective July 4

A compromise version of the Magnuson-Moss Warranty/Federal Trade Commission Improvement Act was signed into law by the President on January 4 and will become effective on July 4.

Included in this law are minimum standards for disclosure and designation of consumer product warranties. It also provides for new consumer recourses for breach of warranties and service contracts.

Under the new law, the Federal Trade Commission has until January 1976 to issue its rules on warranties.

TV Sales Slump Continued In January, Phono Sales Up

Total television sales to dealers during the first 4 weeks of 1975 were 26.2 percent below levels achieved during the same period in 1974, according to statistics compiled by the Marketing Services Department of the Electronic Industries Association.

The only consumer electronic product categories which showed increased sales to dealers in January 1975, compared to January 1974, were portable, table, compact and component phonograph systems (up 42.7 percent) and FM home radio (up 10.6 percent).

These and other consumer electronics unit sales to dealers are revealed by the following EIA statistics for January 1975/1974:

	JANUARY		%
	1975	1974	CHANGE
TELEVISION			
Monochrome	284,950	379,240	- 24.9
Color	401,029	550,309	- 27.1
TOTAL TELEVISION	685,979	929,549	- 26.2
RADIO			
AM	329,304	436,365	- 24.5
FM	681,423	616,258	+ 10.6
TOTAL	1,010,727	1,052,623	- 4.0
AUTOMOBILE	573,025	816,057	- 29.8
TOTAL RADIO	1,583,752	1,868,680	- 15.3
PHONOGRAPH			
Portable & Table*	155,126	108,678	+ 42.7
Console	33,892	44,498	- 23.8
TOTAL PHONOGRAPH	189,018	153,176	+ 23.4

*Includes compact and component systems.

PTS-Philadelphia At New Address

The Philadelphia branch of PTS Electronics, Inc., Indiana-based TV tuner repair company, has been moved to a new, larger facility at 1742-44 State Rd., Upper Darby, Pa. 19082.

GE Number Three In Overall TV Market Says GE Exec.

Fred R. Wellner, general manager of General Electric's TV Receiver Products Department, in a report published in *MART* magazine, stated that GE achieved an estimated 1.5 percent increase in its share of the color TV market in 1974, moving GE into a "solid No. 3 position" behind Zenith and RCA in combined color and monochrome TV sales.

NESDA Salutes RCA TV Advertising

The House of Representatives of the National Electronic Service Dealers Association (NESDA), in a semi-annual meeting in Yonkers, N.Y., on January 25, passed unanimously a resolution which commends RCA for its recent TV product advertising in which TV technicians appear.

Richard Glass, executive vice president of NESDA, commenting about the resolution, said that the association is pleased that the ads refer to technicians "as 'technicians' rather than 'servicemen' and that in each case they are attired professionally and each is wearing a necktie."

New York City Home Entertainment Service Regulations Now In Effect

A set of rules and regulations which govern the business practices of home entertainment electronic servicers went in effect in New York City on February 24.

The rules and regulations, issued by the New York City Department of Consumer Affairs, include the following stipulations:

- A servicer who is an authorized warranty repair agent for a manufacturer can not refuse to provide a consumer service on that manufacturer's product.
- Before beginning a repair, a servicer must provide the customer with a written, signed estimate which includes the following:
 - a) a list of all parts to be replaced and their costs, plus a general description of the labor to be performed and the total labor cost
 - b) a statement of *all* additional charges, if any, including the cost of the estimate, pick up and delivery charges, service - call charge, and storage and installation charges
 - c) the estimated delivery date (or range of dates)
 - d) a statement that the "final" cost of repairs (including tax) will not exceed the estimated cost by more than 20 percent
 - e) the servicer's warranties and guarantees on parts and labor, including any related manufacturer's warranties and guarantees honored by the servicer.
- A servicer must inform the customer of his service-call charge, if any, before making the service call
- All removed parts must be returned to the customer unless 1) the removed part is rebuilt and reinstalled by the servicer, or 2) the customer signs a written statement waiving the right of return.
- When the servicer replaces a picture tube, the servicer must indicate on the customer's "final bill" the grade of the replacement picture tube, either by a verbatim written description or by use of the appropriate grade code stipulated by the rules and regulations.
- A servicer must warrant or guarantee all individual parts replaced for a minimum period of 90 days and labor for such repairs for a minimum period of 30 days after the repaired item is delivered to the customer.
- A servicer must carry sufficient insurance to protect against liability for damage to a customer's property and against loss by fire and theft of the "average number" of articles entrusted to the servicer or left by the customer at any one time for service. (The servicer must present a certificate of insurance at the time he applies for a license.)

In addition to the preceding stipulations, the rules and regulations also govern the advertising practices of servicers; stipulate grades, codes and descriptive terminology for picture tubes; and make it a violation of law to fail to keep an appointment to deliver or repair an item on the day agreed upon unless the customer is furnished written or verbal notice of the delay before the end of the preceding business day. (Verbal notices must be followed by a written notice within one day.) The rules and regulations also stipulate that servicers must keep some required documents for at least three years and others for one year. ■

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TECHNICAL LITERATURE

COMMUNICATIONS TOOLS

A new 1975 catalog covering everything needed in small tools for the communications, telephone and electronic industries is now available. The catalog makes available to the user photographs of all tools along with sizes and descriptive information in classification order along with stock numbers for easy ordering. Such items covered are cable and wire tools, spring tension gauges, thickness gauges, contact burnishers, wrenches, test connecting tools and brushes, and various kits for numbering and lettering right through to the unique cable tool kits. *P.K. Neuses, Inc.*, P.O. Box 100, Arlington Heights, IL. 60006.

ACCESSORIES CATALOG

A 4 - page, 2 - color accessories catalog is now available. It contains descriptions, list prices and illustrations of 32 phono accessories, 10 tape and cassette accessories, and 5 musical instrument accessories. *Pageant/Miller Industries*, 605 Northern Blvd., Chinchilla, PA. 18410.

TRANSISTOR COURSE

A video tape sampler is now available from *Hewlett - Packard Co.* to introduce its comprehensive, 15 - tape "Practical Transistor Series." The 12 - minute monochrome preview tape (90100) features representative excerpts from a nine - hour videocourse on the practical aspects of transistors. Throughout the series emphasis has been placed on actual transistor problems in job related situations instead of mathematics and theory. A textbook, workbook and set of homework problems are included to reinforce the visual concepts introduced on the tapes. Twelve major topics are covered by transistor authority George Stanley Jr.: transistors vs. tubes; temperature effects; current/voltage drive; answers by inspection; multi - stage amplifiers; trouble - shooting; feedback amplifiers; why a transistor amplifies; FETs and Unijunctions; breakdown diodes, SCRs and tunnel diodes; and PIN, SRD and HC diodes. The complete 15 - tape series is available for \$1,575. in 1/2 - inch reel - to - reel format or \$1,687.50 in 3/4 - inch video cassette format. Individual programs are available for \$140 or \$150., depending on format. *Inquiries Manager*, 1501 Page Mill Road, Palo Alto, CA. 94304.

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

continued on page 12

Service back-up

Quasar's back-up programs are designed to help our thousands of authorized servicers keep their customers happy.

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12 / ELECTRONIC TECHNICIAN/DEALER, APRIL 1975

TECHNICAL LITERATURE...

continued from page 10

MATCHING TRANSFORMER JUMPER

A new 10 foot coaxial cable jumper with a molded on 75 to 300 ohm matching transformer has been introduced by *Jerrold Electronics*. Designated Model CAD-10-TSF, the new product is ideal for connecting a TV or FM receiver to a MATV outlet. The cable is the low loss RG - 59 size coax with a copper clad steel center conductor, foam polyethylene dielectric, a copper clad aluminum braid, and a white polyethylene jacket. One end of the cable is equipped with a snap type SF - 56 fitting which pushes on to any F or G connector. The other end of the cable has a molded on balanced all channel matching transformer for direct connection to the antenna input terminals on any TV set. The product is display packaged. Price is \$6.50.

DEMONSTRATION CENTER

Magnavox is offering its dealers a compact, easy - to - assemble demonstration center for their "STAR" television system consoles. Actual, live demonstrations of the system have proven to be the most effective way to generate sales. Designed to attract prospective buyers and serve as a selling aid for sales personnel, the demonstration center includes free standing back panels, printed four - color on foil. The center panel copy is embossed for additional dimension. The copy states "MAGNAVOX STAR SYSTEM... The most significant TV breakthrough since color". Overall dimensions are 60 inches high and 40 inches wide, allowing use of the display with all "STAR" models. The two color carpet highlights the demonstration area, featuring an eight pointed star and lettering which repeats the "STAR" theme.

FIRE ALARM SYSTEM

Master Lock Co., has introduced a new easy - to - install fire alarm that senses smoke and sounds multiple warnings — at the detector, and also at a "Satellite" unit plugged into any wall outlet throughout the home. The wireless unit makes certain that persons in rooms out of hearing distance of the primary alarm are fully alerted, awakening them even before there's a noticeable rise in temperature. Its solid - state photoelectric circuits will react and alarm at smoke densities as low as 1 to 2 percent. Another advantage of the Master Smoke Detective is its vacation protection versatility. The Satellite can be transferred to a wall outlet in any neighboring home connected to the same utility power trans-

former. An indicator light shows "operational normal" at a glance. When the detector lamp eventually needs replacing, a warning different from the smoke alarm audibly signals the owner. Optional Satellites are offered for outdoor as well as indoor application at three graduated loudness levels.

RADIO-CASSETTE RECORDER

General Electric's MONOGRAM series portable radio - cassette recorder guarantees outstanding performance. It will play and record from FM, AM, Public Service (Hi), aircraft bands and weather bands. The Model 3- 5250 includes superior pull - in power, a four - inch heavy magnet speaker, sleep switch for automatic radio or tape shut - off, and two antennas. The unit also has a high performance (deck type) tape recorder. There is review/preview for fast editing of material and pause control for precise live or radio recording. A digital counter enables recorded material to be located rapidly and a versatile triple indicator meter shows battery strength, recording level and is additionally used for fine - tuning. It has a three - way power capability for AC line cord, four "D" size batteries and optional car/boat adapter plus a two - way microphone system with remote on/off control and built - in Electret condenser microphone. It measures 12¼ inches wide by 8½ inches high by 3½ inches deep and weighs 8 lbs. Price is \$149.95.

ELECTRICAL COMPONENTS, TOOLS, TEST EQUIPMENT

A 1975 Industrial Buying/Engineering Manual No. 803 listing low cost components, production aids, and test accessories is now available. Listed are many new items. The manual has 36 pages of specifications, illustrations, and complete pricing information. Export orders readily accommodated. *Mouser Electronics*, 11511 Woodside Ave., Lakeside, CA. 92040.

Audio Y-Adapters

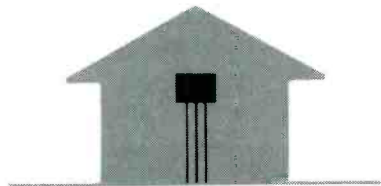
A product bulletin is now available which describes audio Y - Adapters for interconnecting mixers, amplifiers, PA's, lecterns, microphones, phonos, tape decks, cassette recorder/players, tuners and test equipment. The outputs of two microphones are easily and conveniently connected in parallel and connected to a single input using the 391Q23 Y - Adapter; a series 391QY - Adapter can be used where a single audio - output is required to drive two extension speakers, etc. *Switchcraft, Inc.*, 5555 N. Elston Ave., Chicago, IL. 60630. ■

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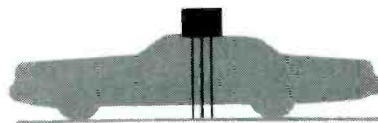
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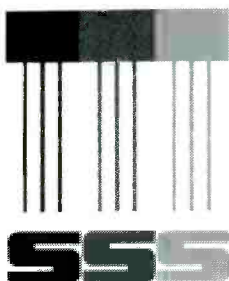
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Regulation of the TV Repair Industry in Louisiana and California

By J. W. Phipps

A synopsis of a recent Bureau of Economics report

■ The Federal Trade Commission's Bureau of Economics in 1974 completed a study of how the state laws and agencies which directly regulate TV servicing in Louisiana and California have affected the cost of TV repairs and the incidence of fraud in these two states compared to repair costs and fraud in Washington, D.C., which has no licensing or registration laws aimed specifically at regulating TV servicing.

On January 7 of this year, the Federal Trade Commission released a 56 - page report of the Bureau's study, titled *Regulation of the TV Repair Industry in Louisiana and California: A Case Study*.^{*} Included in the report are:

- A discussion of some of the general causes of fraud against consumers
- Descriptions of the laws and the composition and operation of the state agencies which directly regulate the TV repair industries in Louisiana and California
- Hypotheses of how the Louisiana and California laws *might* affect the cost of repairs, the incidence of fraud, and the quality of TV technicians and the work performed by them
- The results of "bugged - TV" studies

conducted by the Bureau in San Francisco, New Orleans and Washington, D.C.

- The Bureau's conclusions about how effective the Louisiana and California laws have been in reducing fraud, and the impact regulation has had on the cost of TV repairs

- The Bureau's general recommendations about the composition of laws and agencies intended to directly regulate service - oriented businesses, and the procedures which the Bureau feels should be used to enforce such laws.

A PRINCIPAL CAUSE OF REPAIR FRAUD

The Bureau's report states that, although the number of repair firms and the absence of legal barriers to the entry of new firms in most areas of the U.S. make the TV service industry "typically competitive", the consumer still may have to pay higher prices because of fraud.

One significant contributing factor to fraud, according to the report, is the fact that, in most instances, the repair firm has an advantage because of its "superior knowledge" about repairs that are necessary and the cost of such repairs. This superior

knowledge, says the report, can be used by a repair firm, if it so wishes, to charge the consumer for repairs not actually made or for unnecessary repairs. The legal and economic environment within which the firm operates, according to the Bureau, can have an important influence on its behavior in this regard.

The incidence of fraud would subside, says the report, if consumers were able to obtain free information about the repairs needed, or if local governments had effective enforcement against fraud. However, comments the report, because it is costly to produce diagnostic information for repairs, governments have typically looked to other methods of reducing the incidence of repair fraud.

COMPARISON OF REGULATION IN CALIFORNIA AND LOUISIANA

A large portion of the Bureau's report was devoted to a description and analysis of the laws and agencies which regulate the TV service industries in California and Louisiana. The following is a paraphrased condensation of the report's description and analysis of these two different approaches to regulation:

Who Is Directly Regulated

Louisiana - The Louisiana State Radio and Television Technicians

Board Act was enacted in 1958 and, as its name implies, it *directly* regulates *television technicians*. It accomplishes this by requiring that, before a Technician License can be granted, each applicant for a License must 1) have two years of formal training or two or more years of apprenticeship training (which is also regulated by the law) and 2) must pass a written examination. However, the report points out, technicians who were in business for at least one year prior to July 30, 1960, were given licenses under the "grandfather" clause of the law. That is, they were not required to take the written tests. The report estimates that about 51 percent of the technicians licensed in Louisiana as of June 30, 1972, (or about 1,359 technicians) received their licenses under the "grandfather" clause.

California - The California Electronic Repair Dealer Registration Law was enacted in 1964 and, as its name implies, it *directly* regulates the *operators* of TV service businesses by requiring that they *register* their businesses with the State Bureau of Repair Services and pay a registration fee of not less than \$25 nor more than \$50. The California law neither licenses nor tests technician employees.

Composition Of The Regulatory Body

Louisiana - The State Radio and Television Technicians Board consists of 11 members who are appointed by the Governor. The law stipulates that eight of the members "shall have actually been engaged in the business of maintenance and repair of television and radio receiv-

^{*}A complete copy of the Bureau of Economics report (Stock Number 1800-00166) can be purchased for \$1.20 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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- 8. RANGES**
DC and AC volts, 0-1, 10, 100, 1000V;
DC and AC current, 0-1, 10, 100, 1000mA;
Ohms, 0-100, 1K, 10K, 1 meg, 10 megs.
10 meg industry standard input impedance
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ers as used in the home for at least five years prior to their appointment..." These eight must be selected by the Governor from among 16 nominees (two from each of the eight congressional districts) submitted by radio and TV technician organizations chartered by the state. The remaining three Board members must be selected by the Governor from among at least six nominees recommended by the International Brotherhood of Electrical Workers who are employed in "the television and broadcasting industry."

California - The regulatory agency charged with administering and enforcing the California law is the Bureau of Repair Services, the Director of which is appointed by the Governor. Although the law does not prohibit the Governor from appointing the Director from the television repair industry, the present director has no financial connection with it. Assisting the director in an advisory capacity is a five - member Advisory Board which is appointed by the Governor, subject to confirmation of the State Senate. Three of the Board members represent

the public and two represent the radio, phonograph and television repair industry. The Governor is *not* required to select Board members from a list of nominees submitted by industry representatives.

Statutory Power Of The Regulatory Agency

Louisiana - The Louisiana Board is empowered by law to appoint its administrative director and, within the limits of the law, can make whatever administrative rules it believes are needed to carry out its statutory responsibility of licensing television technicians and technician apprentices. It has the power to revoke the license of any service dealer or technician whom it deems has engaged in "fraudulent repairs". In addition, it is empowered to appoint a five - member committee to develop both the technician and apprentice written examinations. This committee, in turn, has the authority to revise the exams whenever it is deemed necessary. (The law stipulates that three of the committee members be instructors in "accredited" schools which teach electronics and radio and TV maintenance and repairs, and that two members be expert TV technicians employed in the servicing of TV and radio by "leading TV and radio service companies.")

California - The California Advisory Board *cannot* make administrative rules *nor* can it appoint or remove the Director of the Bureau of Repair Services. In theory and in practice, the Advisory Board's power is limited to *advising* the Director of the Bureau of Repair Services. The Bureau of

Repair Services itself is empowered to investigate consumer complaints of fraud on the part of a service dealer and if it concludes from its investigative findings that the consumers complaint is justified, it presents the evidence to the Office of the Attorney General if fraud or negligence is discovered, and also to the local District Attorney if petty theft and/or gross negligence is involved.

Methods of and Provisions For Investigating Complaints

Louisiana - When a consumer complains about a service dealer, the Louisiana Board mails a triplicate form to the consumer. When the completed form is returned, one copy is sent to the service dealer about whom the complaint has been registered. If the Director of the Board agrees that the consumer has a valid complaint, the consumer and the servicer are encouraged to reach an agreement on restitution. If an agreement cannot be reached, a date is set for a formal hearing before the Board. The servicer must be informed of the charges against him at least 30 days before the hearing date. According to the BOE report, the major investigative efforts of the Board are aimed at service dealers who practice without a licence.

California - The Bureau of Repair Services has two laboratories, one in Sacramento and one in Los Angeles, and a staff of five experienced television technicians. The labs are equipped with test instruments and state - owned TV receivers. When a consumer complains that a servicer has committed fraud,

TABLE 1
TV REPAIR PRICES IN THREE CITIES (1973)

	New Orleans (Licensing)	San Francisco (Registration)	San Francisco (Adjusted)	Washington (Free Market)
1	\$40.28	\$24.76	\$22.05	\$30.22
2	33.08	22.61	19.35	28.58
3	28.89	21.36	18.20	28.35
4	25.20	20.93	17.84	24.89
5	25.17	20.43	17.66	24.89
6	24.66	20.33	17.43	22.84
7	24.59	19.38	16.56	19.20
8	23.95	15.93	13.72	17.51
9	22.21	15.93	13.72	16.80
10	19.16	15.93	13.72	16.54
11	19.11	15.93	13.72	14.94
12	17.54	15.93	13.72	14.53
13	17.44	15.93	13.72	13.38
14	17.01	15.92	13.72	12.88
15	16.07	14.47	12.51	11.88
16	15.49	13.95	12.17	11.38
17	13.45	13.43	11.65	10.88
18	11.92	12.93	11.24	10.88
19	11.76	10.93	9.59	10.25
20	8.21	7.43	6.70	8.88
21	—	—	—	0
Average Price:	\$20.76	\$16.72	\$14.45	\$16.65
Standard				
Deviation:	\$ 7.73	\$ 4.24	\$ 3.59	\$ 7.66

SOURCE: Federal Trade Commission, Bureau of Economics

TABLE 2
STANDARD DEVIATIONS OF TV REPAIR PRICES IN THREE CITIES (1973)

	MEAN PRICE	STANDARD DEVIATION
SAN FRANCISCO 3/ vs. WASHINGTON, D.C.	\$16.72	\$4.24
SAN FRANCISCO vs. NEW ORLEANS	16.72	4.24
WASHINGTON, D.C. vs. NEW ORLEANS	16.65	7.66
NEW ORLEANS	20.76	7.73

SOURCE: Federal Trade Commission, Bureau of Economics

a Bureau investigator creates a malfunction in one of the Bureau's TV receivers and takes it to the servicer's shop for repair. When the set is returned, it is tested in one of the Bureau's labs to determine whether or not *fraud* was involved in the repair. The Bureau normally performs this function twice for each complaint. In addition to investigations prompted by consumer complaints, the Bureau regularly performs "unannounced bugged - set" spot investigations throughout the state.

Investigations, License or Registration Revocations, and Criminal Proceedings

Louisiana - According to annual reports of the Board covering the period June 30, 1965 to June 30, 1972, one technician license was revoked for fraud, 40 convictions were obtained for "operating without a license" and 1092 licenses were revoked for "non - renewal." During fiscal year 1971 - 1972, 105 complaints were filed against servicers by consumers. As of June 30, 1972, 85 of these cases had been "closed" and 20 were pending.

California - The Bureau of Repair Services began making investigations in mid - 1965. As of January 1, 1973, a total of 21,820 complaints had been received from consumers and various law enforcement agencies. These complaints led to 10,572 inspections of service dealers, the issuance of 21,120 notices of violations and the revocation of 82 service establishment's registrations (an average of 11 per year). Also as of January 1, 1973, 16 registration hearings were pending with the Attorney General's Office and

12 criminal complaints were pending with the District Attorney's Office.

Summary

Based upon the information contained in the preceding description of the laws, agencies and procedures which regulate TV servicers in Louisiana and California, the BOE report states the following "summary" opinions:

1) "In Louisiana, the television service dealers control the administration of that state's Radio and TV Technician Licensing Law. This control is guaranteed because it is written into the licensing statute."

2) "Service dealers appear to have minor influence upon the California Advisory Board."

"BUGGED-TV" STUDIES IN THREE TEST CITIES

As part of its study of how the laws which regulate TV servicers in Louisiana and California have affected the cost of TV repairs and the incidence of fraud, the Bureau of Economics in 1973 conducted "bugged-TV" studies in San Francisco and New Orleans, and then compared the results with those from the same tests in Washington, D.C., a city which has no law or agency aimed specifically at directly regulating the TV repair industry.

The BOE placed "burned - out" 8FQ7 horizontal oscillator tubes in identical, new, portable, black - and - white TV receivers. The BOE then delivered the "bugged" TV receivers to 20 TV service establishments in San Francisco and New Orleans and to 21 in Washington. The servicers were selected at random from the Yellow

Pages. However, to maintain a "constant time factor," the BOE selected only those service shops which said they would be able to complete the repair and return the set within two days.

The total repair prices (parts and labor) charged by each of the servicers who "participated" in the "bugged - TV" studies in the three cities are listed in Table 1. Also included at the bottom of each column in Table 1 is the *average* repair price charged in each of the three cities and, immediately beneath each of these, the "standard" amount of deviation of the prices in each city.

The amounts listed under the column labeled "San Francisco (Adjusted)" were computed by reducing the actual service charges by 17.5 percent, which, according to the BOE report, represents the percentage of difference between the wages paid journeymen TV technicians in San Francisco (about \$6 per hour) and that paid journeymen TV technicians in New Or-

leans and Washington (about \$4.85 per hour). According to the report, this downward adjustment is necessary because the cost of doing business is higher in San Francisco than in New Orleans and Washington. And, says the report, a strictly accurate comparison of prices requires that such an adjustment should be made to compensate for any such documented variable in the cost of doing business.

The percentage of difference between the highest and the lowest service charge in each city is: New Orleans, 400 percent; Washington, 240 percent; and San Francisco, 233 percent.

The reason for the one extra test repair in Washington is that one Washington servicer did not charge for the repair because, as he explained, the warranty date code on the defective 8FQ7 revealed that it was still in warranty and, consequently, he would be reimbursed for the tube by the manufacturer. However, at the time of the study, the BOE was

TABLE 3
NUMBER OF "FRAUDULENT" TV REPAIRS
AND AVERAGE PRICE OF REPAIRS
WITH AND WITHOUT "PARTS" FRAUD IN
THREE CITIES (1973)

	New Orleans	San Francisco **	Washington
Number of Repairs with "Parts" Fraud	10	4	10
Average repair price without "parts" fraud	\$14.86	\$13.28	\$11.61
Average repair price with "parts" fraud	\$26.16	\$19.13	\$21.23
Standard Deviation of Repairs without "parts" fraud	\$ 3.44	\$ 2.86	\$ 3.87

**San Francisco prices are adjusted for the higher cost of doing business in that area.

SOURCE: Federal Trade Commission, Bureau of Economics

uncertain about the validity of the servicer's observation and therefore added one more servicer to the Washington test sample.

Shown in Table 2 are comparisons of the mean (average) prices and the standard deviations of prices charged by servicers in the three test cities.

Table 3 is a comparison of the number of "fraudulent" repairs encountered among the participating servicers in each of the three test cities, and comparisons of the average prices of repairs in which parts fraud was and was not involved. The data in Table 3 indicates that parts frauds were perpetrated by 20 percent of the "participating" servicers in San Francisco and by about 50 percent in both New Orleans and Washington, D.C.

In its summary of the results of the "bugged-TV" tests, the BOE report states:

1) "The average price of the test repairs in the New Orleans metropolitan area, where the industry dominates the licensing board, is higher than the average price of repairs in the San Francisco or Washington metropolitan areas.

2) "It was necessary to adjust the San Francisco repair prices so that they could be compared to the Washington sample. After making a downward adjustment to reflect the higher wage rates of technicians, the difference in the average repair price for these two samples (San Francisco and Washington) was still not significant.

3) "In the San Francisco test area, where unannounced investigations of television service dealers are performed by

the independent State Bureau of Repair Services, the incidence of 'parts' fraud was lower than in the New Orleans and Washington areas. The incidence of 'parts' fraud was approximately 50 percent in the New Orleans and Washington tests, compared to 20 percent in the San Francisco test. However, as stated above, the average price of repairs in the Washington sample was not significantly different from the average price of repairs in the San Francisco sample.

4) "The average variation in repair prices in the San Francisco sample was lower than the variation in prices in the New Orleans and Washington samples. This may be due to the lower incidence of 'parts' fraud in the San Francisco tests."

BOE'S OVERALL SUMMARY

Summing up the BOE's findings, the report states:

"This analysis began with an explanation of what is considered to be some of the causes of fraud or conditions conducive to fraud. Surely, if consumers had sufficient information about what they are purchasing and how much they should expect to pay for their purchases, it would be difficult for sellers of goods and services to perpetrate fraud. Consumers have little information, and, therefore, are more susceptible to fraud, when the item or service being purchased is technically complicated and/or is purchased infrequently. The repair of durable goods such as an automobile or television could be classified in this category.

"Every effort has been made to provide an objective analysis of two types

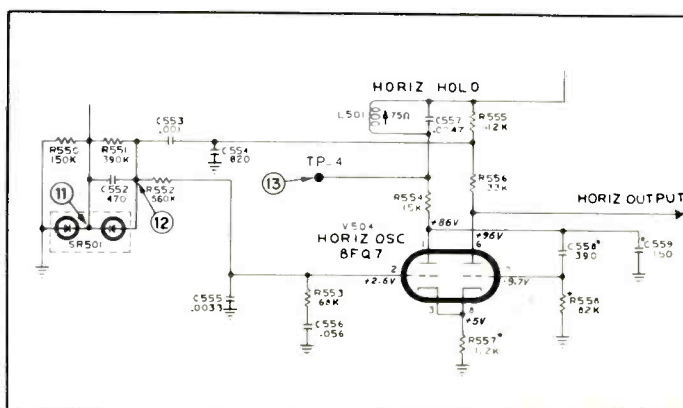
of governmental regulatory devices with the reduction of fraud as one of their objectives. However, neither the California Registration Law nor the Louisiana Licensing Law provides the consumer with the information necessary to avoid fraud. In the case of Louisiana law, the consumer may actually suffer a loss. A summary of the results of staff tests are presented below:

"1) The Louisiana Technician Licensing Law is enforced by a board of practicing television repairmen. The procedures established by the licensing board, and those written into the law, have the effect of increasing the cost to prospective repairmen of entering the television repair business in Louisiana. The higher costs of entry had the effect of reducing the number of television repairmen in Louisiana and, accordingly, produced higher prices for repairs. There were 33 percent more televisions per technician in Louisiana in 1971 than in California, a State with no restrictions on entry. *The cost of repairs, based on our tests, is approximately 20 percent higher in New Orleans than in San Francisco.* The 20 percent figure is probably *understated* because the cost of doing business in the San

Francisco metropolitan area is higher than in the New Orleans metropolitan area.

"2) Although the Louisiana law requires applicants for a Technician License to serve an apprenticeship and to pass a technical examination, it is not clear that the average quality of a technician in Louisiana is above the average quality of a technician in California or Washington. We base this statement on the fact that a majority of the technicians currently active in the television repair business in Louisiana obtained licenses under the "grandfather" clause and, therefore, were not required to take the examination.

"3) It is clear that the Louisiana Licensing Law does not protect the consumer from what has been defined as 'parts' fraud. The Louisiana law does not provide for an independent enforcement mechanism similar to that of the California Bureau of Repair Services to reduce this particular kind of fraud. 'Parts' fraud (replacing parts unnecessarily or charging for parts not actually replaced) was found in half of the cases in New Orleans and Washington, D.C. In San Francisco, where the Bureau of Repair Services performs unannounced investigations



of television service dealers for fraud, 'parts' fraud was found in 20 percent of the cases. We might note here that the Louisiana Radio and Television Technicians Board reports having revoked only one Technician License for fraud since the Board started issuing an Annual Report in 1966. The California Bureau of Repair Services reports having revoked 82 Registration Certificates between January 1, 1964, and January 1, 1973.

"4) The California Registration Law does not substantially increase the cost of entry into the television repair industry in that State. The Advisory Board is not dominated by representatives of the television repair industry and is not empowered to make administrative rules without the approval of the Director of the Bureau of Repair Services.

"The Governor appoints the director and he is not required to appoint a person recommended by the industry association. The California Television Registration Law does not *prohibit* the Governor's appointing a Director of the Bureau of Repair Services from the television repair industry. However, since passage of the law in 1963, the Director, as far as can be determined, has been

independent of the industry.

"5) Although the incidence of 'parts' fraud was 50 percent in Washington, D.C., compared with 20 percent in San Francisco, the cost of repairs to the consumer, including the repairs with 'parts' fraud, were not statistically different. Therefore, we cannot say that the California Registration Law reduces the cost of repairs for the consumer compared to a city where there is not regulation."

RECOMMENDATIONS

The BOE report concludes with the following recommendations about the composition of regulatory agencies or boards, enforcement procedures, and the content of laws which regulate service-oriented industries:

"For state and local governments that may want to regulate industries such as television or automobile repair, certain 'do's' and 'don'ts' should be considered relative to composition of agencies or boards and enforcement procedures. These recommendations are based not only on the findings reported in this study but are also based on an analysis of several types of laws governing other occupations.

"Such recommendations are made based on the following assumptions:

tions:

1) That the primary intent of regulating the industry is to reduce the incidence of fraud and the danger of incompetency to the benefit of the consumer.

2) That it is *not* the intent of the State legislatures significantly to increase or decrease the economic welfare of the industry being regulated.

"With these assumptions in mind, it is recommended that:

1) Any board or commission responsible for carrying out the administrative functions of enforcement *not* be dominated by representatives, past or present, of the industry to be regulated.

2) There be no provision *requiring* or recommending that the Governor choose members of the board or commission or the director of the bureau or agency responsible for enforcing the law from a list of names submitted by representatives of the industry being regulated.

3) No restrictions be placed upon normal and responsible business practices, such as advertising of prices charged or services offered, so long as they are within the bounds of generally acceptable advertising behavior.

4) No provisions be included to restrict or tend

to restrict the number of new entrants into the industry. For example, a provision that requires new entrants be graduates of an "approved" technical school might be a mechanism whereby the supply of new entrants would be restricted. If the accreditation process is controlled by the industry being regulated, the number of new schools could be reduced. The long-run effect of such power over the accreditation process may be to reduce the number of new entrants into the industry.

5) Apprenticeship periods should be avoided and the applicant for a license should be allowed to take the examination, if one exists, whenever he feels he is capable of passing.

"In designing laws to protect the consumer from fraud, consideration should be given the following:

1) A testing laboratory and staff such as that provided for by the California Electronic Repair Dealer Registration Law as a basic provision of any law designed to reduce repair fraud. If properly designed, the basic principle of unannounced tests of repair firms can be used to reduce the chances of fraud in areas where consumers have little knowledge of what they are buying or how much they should expect to pay.

2) An explicit statement that the owner of the repair firm is responsible for the technicians employed by him. If complaints charging incompetency are filed against a firm and if the consumer agency confirms such complaints, the firm should be considered in violation of the law. Consequently, owners of re-

continued on page 46

Nine RCA Model AR 151 black-and-white, portable TV receivers were used by the Bureau of Economics in its "bugged-TV" tests. These receivers are equipped with RCA's KCS168XD hybrid chassis. According to John J. Phelan, the author of the Bureau's report of the tests, the 8FQ7 horizontal oscillator tube in each receiver (shown here) was replaced with an 8FQ7 in which the filament had been purposely burned open by applying excessive filament voltage. Because the KCS168XD chassis has a series filament string, inser-

tion of the 8FQ7s with open filaments, in turn, opened the filament circuits of the chassis, completely disabling all tube-equipped stages - audio output, vertical oscillator/output, horizontal output/damper, and the horizontal oscillator - plus the picture tube. Phelan then personally delivered the "bugged" TV receivers to each of the 61 service shops selected at random for the test. In each case, according to Phelan, he told the shop only that the receiver produced no sound and no pictures.

Action Builds Antenna Business

By Lon Cantor

Profile of a successful antenna sales and installation business

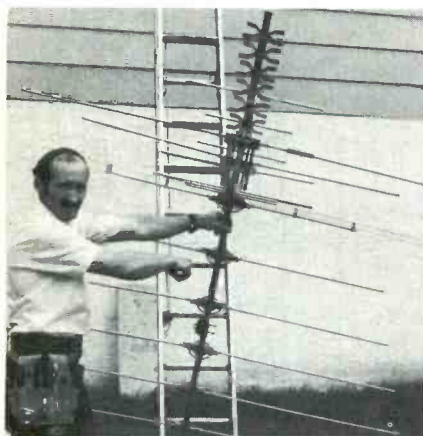
■ James Wellener of Feasterville, Pennsylvania, had worked for years as an antenna installer. Then, about three years ago, he started his own antenna business, Action Sales & Service. Because of his familiarity with them, he started with single - outlet, residential TV antenna installations. Later, he expanded into residential and commercial master an-

tenna television (MATV) systems.

Wellener's first year was a struggle. Operating from a rented garage, he did only \$18,000 worth of antenna installations. The next year, his sales almost doubled, to \$32,000. The third year, Wellener's business really took off, tripling to \$96,000. This year, his fourth, he expects to do about \$160,000 worth of business.



Wellener, shown here with Mel Lucas, a member of Action Sales & Service, keeps his overhead expenses down by operating from an office in his garage. Customers are more interested in the performance and costs of Wellener's products and services than in the plushness of his office.



Three years ago Jim Wellener was an antenna installer. Today, he is owner of Action Sales & Service and expects to do \$160,000 worth of business this year.



When he started Action Sales & Service three years ago, Wellener had only basic, practical experience in installing small MATV systems. Today, after attending four Jerrold MATV schools, Wellener designs and installs MATV systems in both residential and commercial buildings.

After deciding to start his own business, Wellener's first step was to try to get contract antenna installations from TV and appliance dealers. He called on a few dealers whom he knew and, almost immediately, received work from four of them. This was the base on which he started.

Next, Wellener started to call on other brown goods dealers in the area. He went through telephone directories, made a list of dealers, and made mailings to the list, explaining his services and prices. The mailings were followed up by phone calls and personal visits.

Simultaneously, however, Wellener also has built a large direct-to-consumer business. He gets his own customers through intensive advertising, plus recommendations. In fact, recommendations from satisfied customers are one of the principal factors in Action Sales' relatively quick growth.

REASONABLE BUT PROFITABLE PRICING

Of course, it's not enough to make sales. You must also make a reasonable *profit* on the sales. Too many technicians seem to be in business principally because they "love" the electronics field. Jim Wellener, on the other hand, prices his services just low enough to be competitive, but high enough to make a reasonable percentage of profit.

The accompanying table shows how Wellener and his dealers price and profit from a typical residential, single - outlet, TV antenna installation. A two - man crew completes an average of four antenna installations per day. Wellener's labor cost per installation is \$25.00, which, added to his material cost of \$40.00, produces a total installation cost of \$65.00. Wellener sells the installation "package" to a dealer for \$86.00, giving Wellener a gross profit of \$20.95 per installation.

Although this 25 percent markup doesn't exactly thrill Wellener's accountant (particularly since vehicle operating expenses must be deducted from it), Wellener, nevertheless, feels it is a realistic profit margin considering the volume of business the dealers give him. (In the early days of the business, Wellener himself was one of the members of a two - man

crew and, consequently, about one - half of the labor "cost" actually was direct income to him.)

Wellener realizes a significantly larger margin of profit on installations sold *direct* to the consumer. The consumer pays about the same for the package whether it is purchased through a dealer or direct from Action because Wellener adds the typical dealer markup to his dealer price. This gives Wellener a 44 - percent profit margin, or \$50, on each installation.

EFFECTIVE ADVERTISING AND PROMOTION

Because direct - to - consumer sales are so much more profitable than dealer - contract sales, Wellener has worked very diligently to build his direct - to - consumer business. He has found that the best way to do this is through consistent, hard - hitting advertising. Wellener started advertising as soon as he went into business, using the Bucks County Courier and the Public Spirit, two small, local, weekly papers.

Each ad cost him \$25.00 for a 2 - column by 6 - inch space. Wellener figured, therefore, that if he sold one antenna installation he would break even, since he did the work himself. He was pleased to find that he averaged six sales per ad. And the advertising gave him increased recognition in the area and led to referral sales.

Later, Wellener began to run ads in the large Philadelphia daily magazines, the Inquirer and The Daily News. These ads cost more, but they also brought in more sales. The large dailies did not match the local weeklies in terms of sales per dollar of advertising cost. However, Wellener felt that they enhanced his reputation and made Action more widely known. Besides, at about this time he was able to get 50 - 50 coop advertising funds, based on his volume of antenna purchases, to help pay for the cost of the ads.

In addition to newspaper advertising, Wellener also uses flyers. He pays high school students to pass out flyers in housing developments, and has his crews stick flyers into the mailboxes of neighbors whenever they make an installation. Wellener figures he gets about a 3 - percent response to

flyers distributed in this way.

SERVICE LEADS TO SALES

Action Sales also offers antenna service. Wellener charges \$17.50 plus parts for a service call. The \$17.50 enables Action to check out a system and replace twinlead, tighten loose connections, replace guy wires or do whatever else is necessary to restore operation. He gets leads for antenna service from his ads, Yellow Page listings and from dealers. (Dealers get no

markup on service calls. They refer service customers to Action simply as a goodwill gesture.)

Wellener's crews generally handle one or two service calls per day, in addition to their four installations, so this adds to his profits. Also, because some people who call for service actually need a whole new antenna installation, servicing leads to sales.

EXPANSION INTO MATV

Once his basic antenna business was established, Wellener decided to go into Master Antenna TV (MATV) systems. He had some previous basic MATV experience, but not enough to give him the confidence necessary to become actively involved in this area. Early in 1973, he attended his first MATV school, held by Jerrold

An example of the advertising Wellener has been placing in local and metropolitan newspapers since starting Action Sales & Service. Wellener also uses other forms of sales promotion, including direct mail and flyers delivered by high school students.



A typical Action Sales & Service home antenna installation.



Part of the 200 - unit Dreshertown condominium, Wellener's first MATV job. Although his profit on this job was only 10 percent, Wellener gained valuable design and pricing experience, and the system works so well that Wellener uses it to show prospective customers the quality and performance he is capable of delivering.

Electronics. Since then, he has attended three other Jerrold schools.

Wellener found it difficult to get started in MATV. Everyone he talked to wanted to know what jobs he had successfully completed before. After he sold and installed his first two jobs, however, business started to pour in. MATV now accounts for more than half of Action's business, and it is growing by leaps and bounds.

Typically, Wellener's approach to the MATV market was direct. He watched the papers for news of people who got building permits. He then composed a letter and sent it to as many builders and developers as possible. Later, he began stopping by new construction sites. If the owner isn't there, Wellener leaves his card and follows up by phone.

Some MATV installers work through architects, consulting engineers and electrical contractors, but Wellener prefers to work directly with owners.

Using Dodge reports, direct mail, telephone calls and personal visits, he has already sold a number of large MATV systems. Almo Electronics, the Jerrold distributor who supplies equipment to Action, also has been very help-

ful, referring several jobs to Action.

Let's take a look at some typical Action Sales & Service MATV jobs, to see how they were designed and priced.

Dreshertown Town Houses

This is a typical condominium community, with about 200 homes in 14 buildings. (Wellener got this job through one of his mailings.) Two TV outlets were required in each home. Action installed a separate, all-channel system in each building. The systems were laid out as shown in Fig. 1.

Since this was his first MATV job, Wellener didn't do too well on it. He had trouble with UHF channel 29 because his antenna was right in line with the transmitter.

He had to separate the UHF and VHF sections of the antenna (this is easy with the PXB - 50), pad the UHF signal down and then recombine the UHF and VHF signals with an FCO - 320 before feeding them into the 4330 amplifier.

The output of the amplifier was fed through four outlet tapoffs in the attic and then sent to feed-thru wallplates. Each wallplate was connected to a TV set through

an FSX - 1314 transformer/U - V splitter. It took about 300 feet of cable per building.

Wellener charged \$23 per outlet. Because he had problems with the system, he only made a 10 - percent margin of profit on the Dreshertown job. But the system works beautifully now, the owner is very happy, and Wellener uses it as a showcase to convince prospects.

The Dreshertown job is a good example of Wellener's business philosophy. "I feel that my company's reputation is more important than anything else," he says. "Therefore, I spend as much

Action's and Dealers' Pricing And Profits — A Typical Single Outlet Installation

Dealers' Price To Customers	\$114.95
Action's Costs:	
Jerrold PXB - 50	
Antenna	\$25.00
Coax (75 ft)	4.00
Jerrold FSX - 1314 Matching Xformer	2.73
Mast, Mount & Hardware	8.27
Installation Labor	25.00
	\$65.00
Action's Profit	\$20.95
Action's Price To Dealer	\$85.95
Dealers' Profit	\$29.00

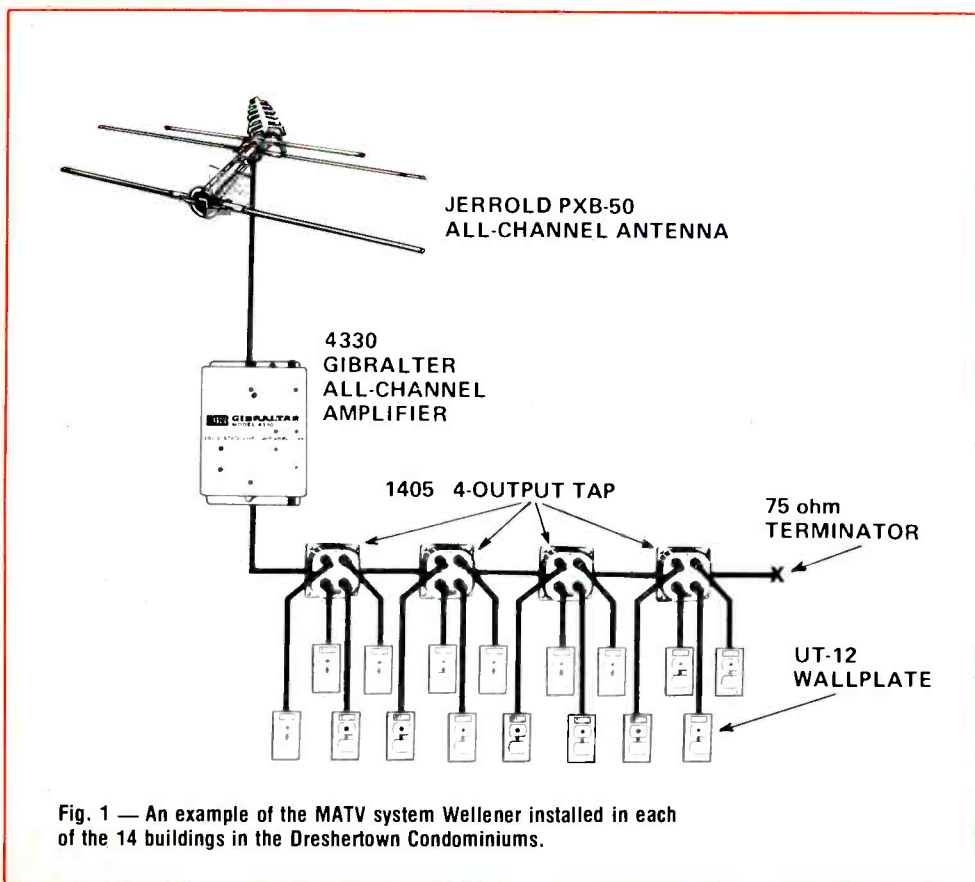
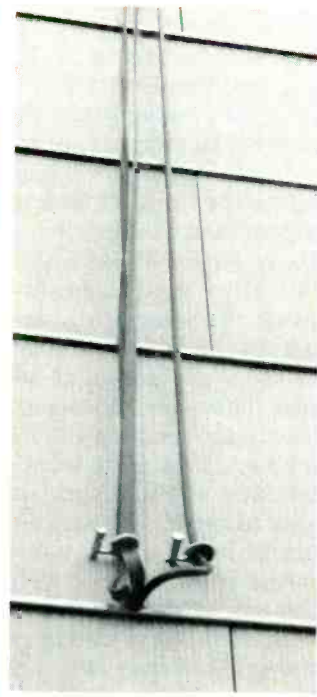


Fig. 1 — An example of the MATV system Wellener installed in each of the 14 buildings in the Dreshertown Condominiums.



Action Sales & Service has earned a reputation for neat, properly installed systems that perform as well or better than Wellener says they will. Shown here is an example of how Wellener routes and secures coax and rotator wires in a typical home installation.

time and money solving problems as is necessary to insure good reception and to please the builder." The result is that he gets a lot of referral business.

Ben Salem Elementary School

More profitable for Action was the Ben Salem Elementary School. Wellener was able to bring in Channels 3, 6, 10, 12, 17, 23, 29, 48 and 52. In addition, he provides a channel for in-school program origination. Program material can be originated anywhere in the 32-outlet system, and then sent back to the head end for distribution via a Jerrold S-CON converter and a Jerrold UNI-MOD modulator. Programs are originated on a Channel T8 UNI-MOD, sent back to the head end, and converted to Channel 4. A second UNI-MOD provides local origination from the studio over Channel 5.

Wellener used a J55LO antenna for the VHF low band and a J105Hi for the VHF high band. Both are fed into a 3880 VHF broad-band amplifier. Three separate J-275 UHF antennas are used to feed two UA-420 UHF amplifiers.

For origination, Wellener supplied a Panasonic Color VTR and a

monochrome Panasonic camera.

He charged \$7800 for the job and made \$1300 — about a 17-percent profit margin. The installation has operated so well that Wellener has since been awarded contracts for four more schools.

The Budget Inn

As Wellener gained experience, his profit margin increased. For example, the Budget Inn in King of Prussia, Pennsylvania, has 153 rooms. Action used J-55Lo and J105Hi antennas to feed Jerrold JHPM single-channel amplifiers. Because of the size of the system, UHF channels were converted to unused VHF frequencies using Jerrold 505-ST converter - amplifiers.

Model 1406 multi-taps were used with STO-75 self-terminating wall outlets in each room.

As part of his service, Wellener installed the TV sets on pedestals in each room. No transformers were required because 75-ohm TV sets were used. He didn't have to worry about pulling cable because this was done by a union electrical contractor. In this case, the contractor charged Action only \$800 for pulling the cable. However, Wellener tries to avoid jobs

where union contractors are involved because another contractor once charged him \$2000 for a 116-room job.

Action did very well on the Budget Inn job. Wellener charged \$26 per outlet, plus \$6.60 per set installed. His profit margin was almost 30 percent.

Aside from town houses, apartments houses, schools and motels, Wellener also is going after condominiums, trailer parks and TV showrooms.

He currently is working on the Towamencin Condominiums, which will eventually be a 20-channel system using Jerrold Starline equipment. This huge system will gross Wellener about \$300,000 over the next six to eight years.

Other MATV contracts recently landed by Wellener include a 660-pad trailer park in South Jersey and a number of Woolco and Woolworth showroom systems.

Upgrading of Existing MATV Systems

One unique service that Action offers is servicing and upgrading of MATV systems. In all too many cases, systems sold by others on a low-bid basis don't perform well.

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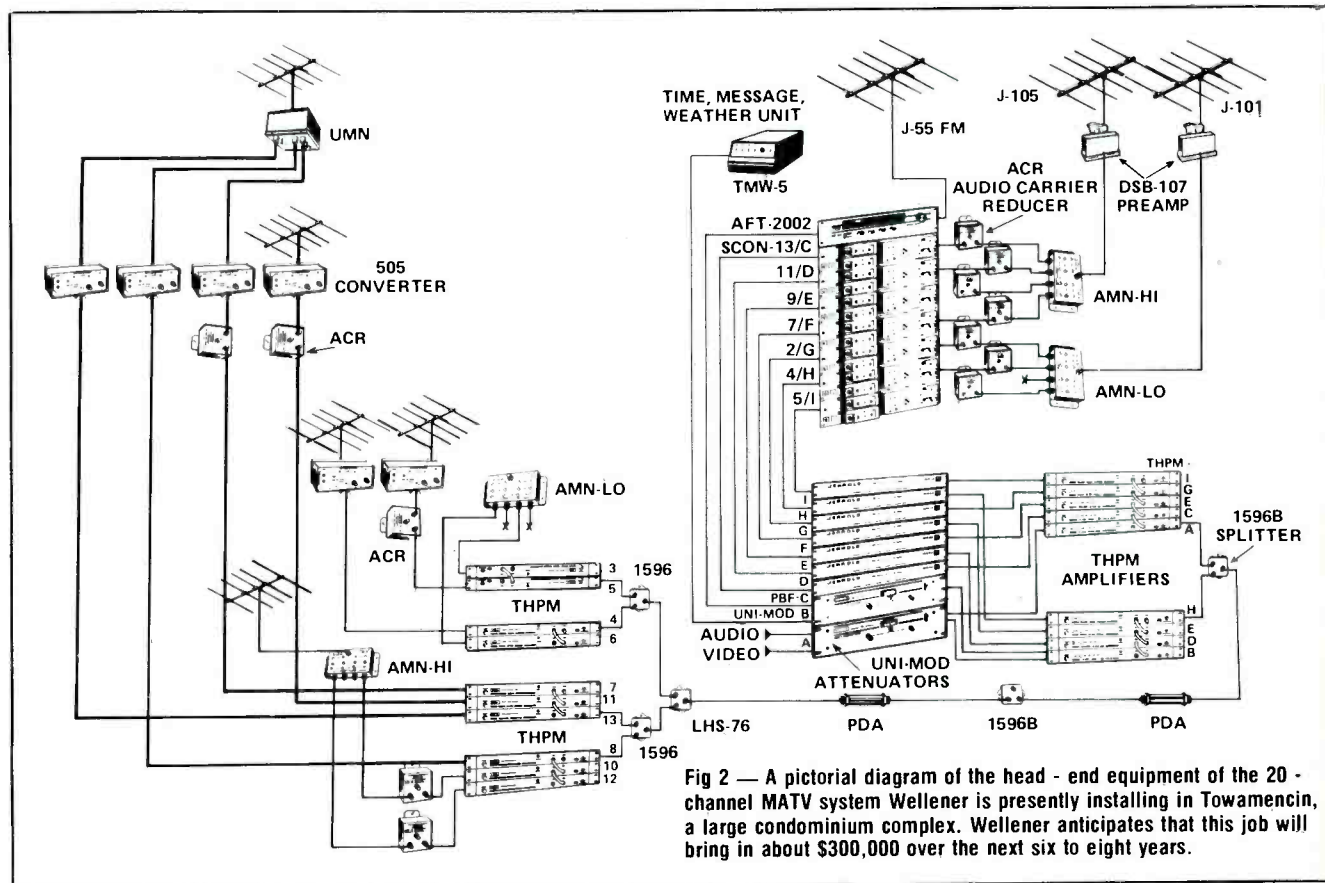


Fig 2 — A pictorial diagram of the head-end equipment of the 20-channel MATV system Wellener is presently installing in Towamencin, a large condominium complex. Wellener anticipates that this job will bring in about \$300,000 over the next six to eight years.

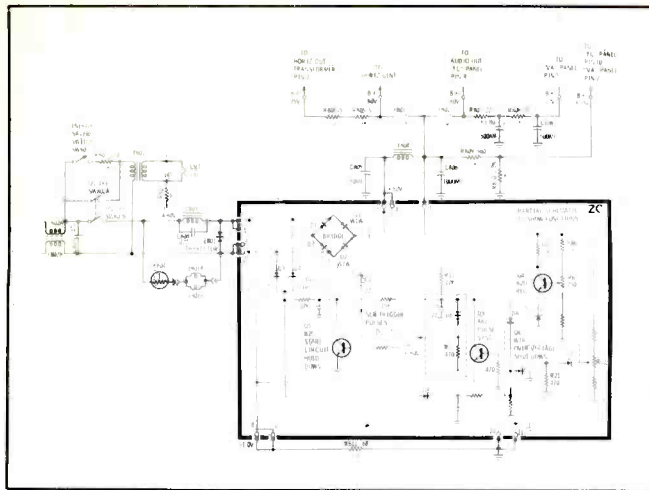


Fig. 1 — Functional block diagram and basic circuits of Quasar's TS - 941/942 color TV chassis. Courtesy Of Quasar Electronics.

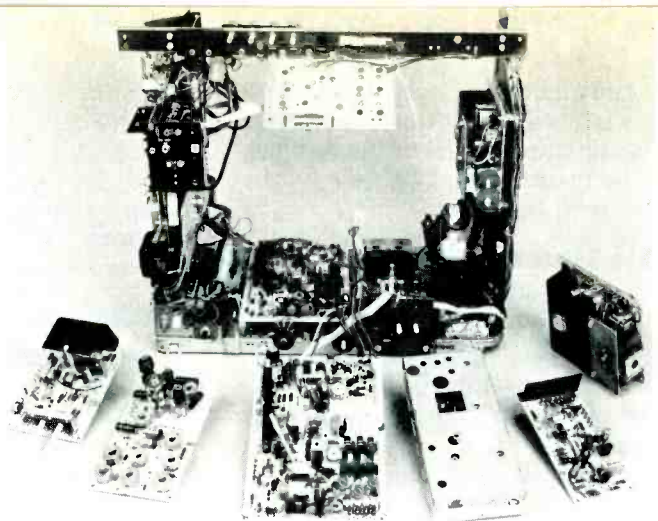


Fig. 2 — Quasar's portable color TV chassis TS - 941 is all solid - state and of modular design. The module count is reduced to six, compared with initially eight and later seven in previous comparable chassis. Courtesy Of Quasar Electronics.

New In Color TV for 1975 — Part 8

Continuation of a series which analyzes the new and significantly changed circuits in 1975 color TV receivers. This month we will review some of the circuits employed in Quasar's solid - state chassis Series QS3000 with the Super Insta - Matic tuning feature. By Joseph Zauhar

■ Quasar Electronics Corp., a subsidiary of the Matsushita Electric Corp. of America, has expanded its 1975 line, the third generation of solid - state color TV chassis with the major thrust in the direction of strengthening the portable line.

Within 12 to 18 months consumers and retailers will see the impact of the vast technological facilities of its parent company on products manufactured by Quasar Electronics Corp., Tex K. Takeoka, chairman of the board of Quasar, recently told *MART* magazine.

According to the report, the basic designing is being performed in Osaka, Japan, by Matsushita engineers, with the final stages being handled by Quasar engineers in Franklin Park, Ill.

Five chassis are used in Quasar's color TV line: The TS - 941 and TS - 942 chassis are new, modular, all - solid - state types. The TS - 929, TS - 934 and TS - 938 are carry - over chassis with minor circuit changes.

The TS - 941 and the TS - 942 chassis which we will review employs the same basic panels (Fig. 1) in both portable and console color TV receivers. The main difference is in the mechanical layout and the power supplies.

COLOR TV CHASSIS TS-941/TS-942

All of the color TV receivers employing the TS - 941/TS - 942 chassis feature a single picture control for manual operation. Most of the receivers will feature Super Insta - matic and the others, a new Insta - Matic picture control. The Super Insta - Matic circuit

will feature a light dependent resistor (LDR) and other circuitry, which automatically changes the b - w picture levels and color intensity under varying room light conditions. This light dependent resistor circuit is activated only when the set is operated with the Super Insta - Matic control in the *on* position. The Super Insta - Matic and the single picture control for manual operation is made possible by using a new integrated circuit which also has provision for DC restoration.

COLOR TV CHASSIS TS-941

Portable color TV receivers employing the TS - 941 chassis (Fig. 2) include a number of serviceability features:

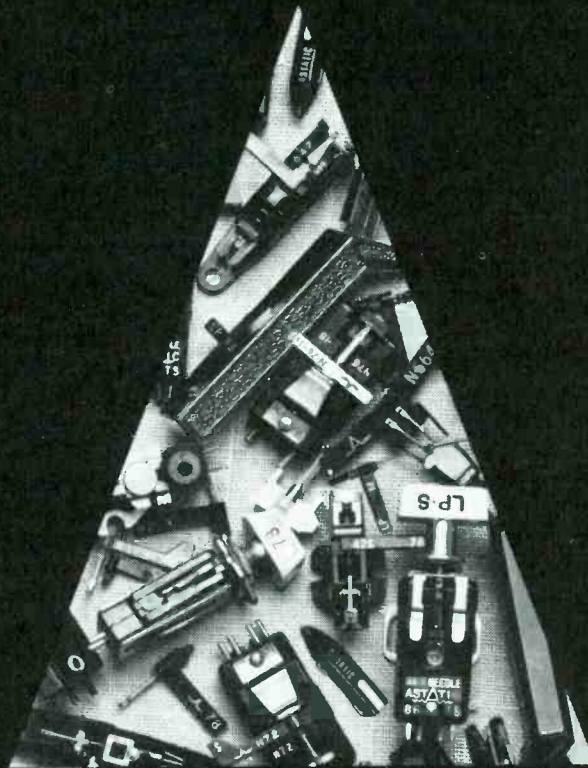
The top and underside of the chassis is exposed for easy accessibility after the back cover is removed.

The weight is reduced by employing a lightweight, compact, plug - in panel power supply which is line and load regulated.

Servicing time is reduced by using six easy to - replace panels which includes the 80 - volt regulated power supply panel, ZC and convergence panel, HC.

Power Supply Circuit

The TS - 941 chassis (Fig. 3) obtains its power supply voltages from two plug - in panels, the ZC and the FC panel. The ZC panel converts the 120 - volt AC input voltage to a regulated 80 - volt output supply voltage. This voltage is fed to the FC panel and supplies the power for the horizontal driver stage. In



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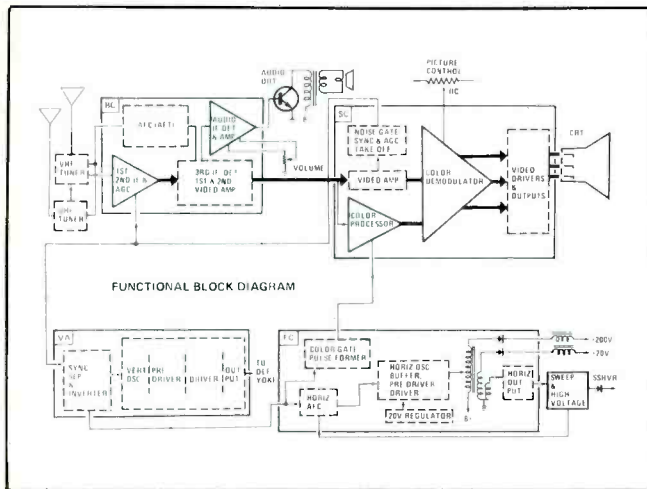


Fig 3 — Schematic of the 80 - volt regulated power supply (ZC panel) used in the TS - 941 color TV chassis. Courtesy Of Quasar Electronics.

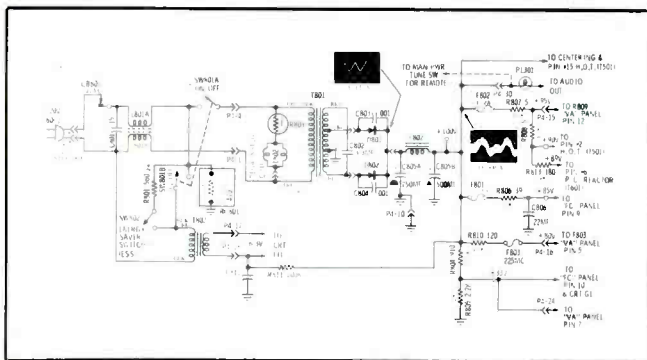


Fig 4 — The regulated power supply employed in the TS - 942 color TV chassis uses a ferro - resonant power transformer. This supply, in conjunction with the voltages generated on the FC panel provides all DC operating voltages for the receiver. Courtesy Of Quasar Electronics.

In addition to supplying driving signals for the horizontal - output stage, the driver also generates the 200 - volt supply voltage for the color panel and the 20 - volt source voltage used in various circuits of the TV receiver. This portion of the FC (horizontal sweep) panel is referred to as the Mini - Mode supply. The 20 - volt output voltage from the Mini - Mode supply is sensed by a regulator on the panel which controls the pulse width from the horizontal oscillator and provides sweep and DC supply regulation for the TV receiver. The ZC power supply panel also provides a number of other DC voltages, by voltage dividing the 80 - volt output voltage.

COLOR TV CHASSIS TS-942

The console and table model color TV receivers employing the TS - 942 chassis retains the "Works in a drawer" serviceability concept. Most of the chassis circuitry is found on the drawer except for the horizontal and high - voltage circuitry which is mounted on the rear horizontal portion of the main chassis. Also included on this chassis is the FC panel which provides the horizontal sweep and secondary source of regulated voltage.

The G2 controls are mounted on the CRT socket, eliminating the long leads for improved performance and reliability.

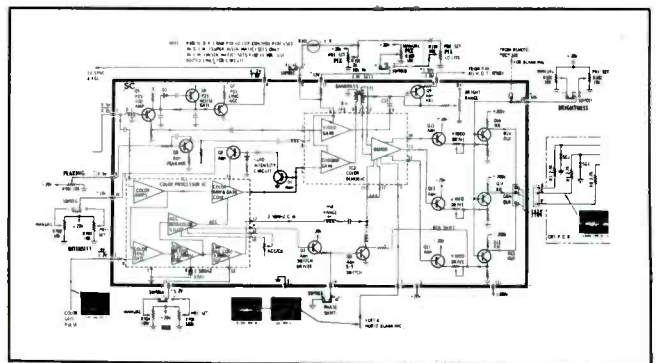


Fig. 5 — The Video/Color and Super Insta - Matic circuits contained on the SC panel. Courtesy Of Quasar Electronics.

The TS - 942 chassis employs a ferro - resonant transformer power supply (Fig. 4) which provides a regulated 100 volts for powering the receiver. This supply is in conjunction with the Mini - Mode portion of the FC panel and performs the same function as the ZC and FC panels found in the TS - 941 chassis.

The TS - 942 chassis employs a total of five plug - in panels which includes the convergence panel HC.

Video/Color And Super Insta - Matic Circuits (SC) Panel

The composite video signal enters the SC panel at terminal 2, as shown in Fig. 5. The chroma signal is coupled to the color processor IC. The video passes through the delay line and is amplified by transistor Q5, then capacitively coupled to the demodulator IC which has provisions to control stage gain. The video signal from the IC is then capacitor coupled by C57 to the band pass transformer T1. A DC level, which is determined by the brightness range control setting, is added to the charge placed on C57 during retrace time. This voltage establishes a DC (black) level at the demodulator amplifier in the IC which is DC coupled through the driver and output stages to the picture tube.

The chroma signal is amplified and ACC controlled by the color processor IC. The signal then follows two paths, one to the demodulator IC, the other to an amplifier and peak detector for chroma AGC control. It re - enters the IC as a DC voltage to automatically control the chroma processor gain. A DC operated control to this stage also provides for manually changing color intensity. (customer control).

The color sync (from the chroma signal) is separated by another section of the processor IC to drive a crystal amplifier and oscillator. The resulting 3.58 CW signal is fed through a hue control stage and leaves the IC to a phasing network from which two reference CW signals are derived. These signals are applied to the demodulator IC (terminals 15 & 12), which in conjunction with the applied chroma signal develops R - B - G signals, that are DC coupled to the driver and output stages before being applied to the picture tube cathodes.

DC control of the video peaking is provided by the conduction of transistor Q8. This arrangement keeps the video signal out of the off - panel peaking control, thereby eliminating problems of lead dress, noise pickup, frequency loss etc.

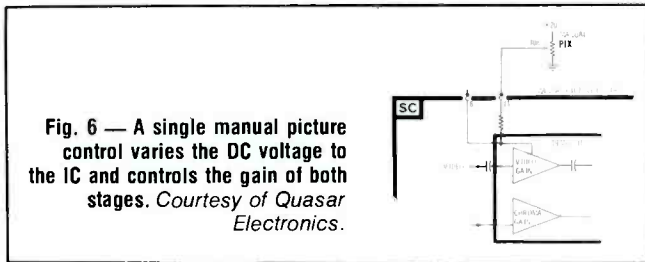


Fig. 6 — A single manual picture control varies the DC voltage to the IC and controls the gain of both stages. Courtesy of Quasar Electronics.

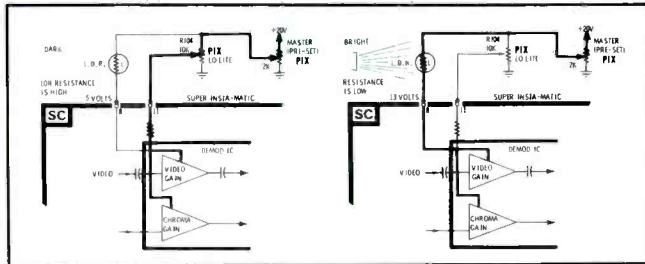


Fig. 7 — In color TV receivers equipped with the Super Insta - Matic features and with the circuit "on" the variable voltages is provided by a light sensor (LDR) to control the operation of the IC. Courtesy Of Quasar Electronics.

The demodulator IC contains video and chroma gain stages that are variable by a single DC control (Fig. 6). This feature provides a practical method of varying both picture and color levels simultaneously with a single control. In Super Insta - Matic receivers the IC works in conjunction with a light sensor providing automatic picture control with variations in room lighting (Fig. 7). A light dependent resistor (LDR) senses ambient light, converts it to a varying DC voltage which controls the gain of the amplifiers in the demodulator IC. External controls and switching circuits provide for manual adjustment. Other control establish the LDR dynamic range for Super Insta - Matic operation.

A noise inverter circuit amplifies noise pulses and re - introduces them into the signal path thereby cancelling the original noise pulse. Low frequency video signals are amplified and leave the panel through terminal 4 to the sync and AGC stages.

Horizontal Sweep, Pulse Former and Mini - Mode Supply (FC Panel)

The horizontal sync enters the FC panel at pin 14 (Fig. 8) and then is applied to both the color gate pulse former and the horizontal phase detector.

Transistor Q1 is the color gate pulse former which has a negative going horizontal sync pulse applied to its base and a horizontal output pulse applied to its collector during retrace time. This transistor is normally saturated and is cut off momentarily by the sync pulse on its base. The resulting output at this time is a positive pulse of the proper timing and duration to gate the color sync stage which is a part of the IC located on the SC panel.

The phase detector circuit then compares the horizontal output and horizontal sync pulses. Any difference in time between the pulses results in the development of a correction voltage that keeps the horizontal oscillator in proper synchronization. The out-

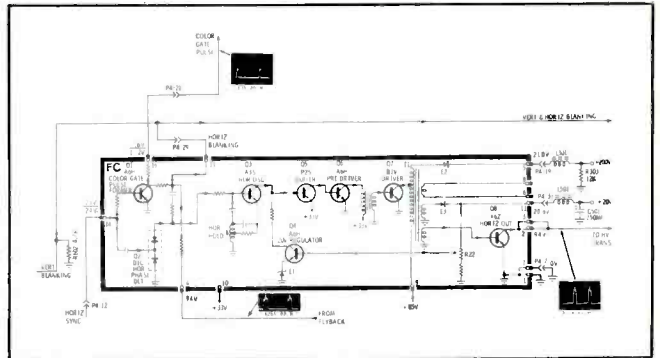


Fig. 8 — The horizontal sweep, pulse former and Mini - Mode supply circuits are contained on the FC panel. Courtesy Of Quasar Electronics.

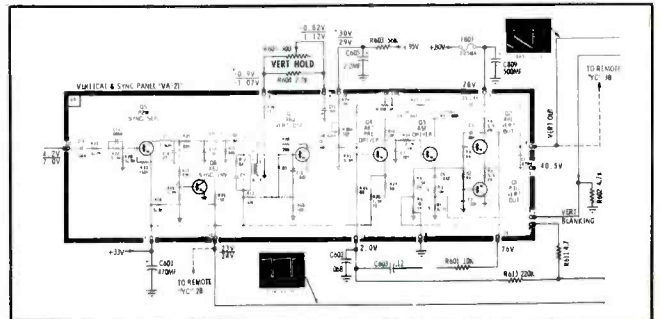


Fig. 9 — The vertical sweep, vertical and horizontal sync circuits are located on the VA panel. Courtesy Of Quasar Electronics.

put from the horizontal oscillator is applied to a buffer stage for isolation.

The predriver and driver stages amplify this waveform, which is then transformer coupled to the output stage. The driver transformer also provides two other voltages which after rectification and filtering provides 20 and 200 volts for other circuits of the TV receiver. The 20 - volt supply is closely regulated by varying the pulse width out of the oscillator depending on the loading of the 20 - volt supply.

Vertical Sweep, Vertical and Horizontal Sync Circuits (VA Panel)

The low frequency video signals enter the VA panel at pin 11 (Fig. 9) and then they are coupled to the sync separator transistor, Q5. The output signal is applied to both the vertical oscillator and the inverter stage. The vertical oscillator is synchronized with the station signals by vertical sync pulses. The sync inverter transistor, Q6, inverts the horizontal sync pulses, and then is fed through pin 10 to the FC panel.

The vertical blocking oscillator, conducts and discharges the saw forming capacitor C5 during retrace time. During vertical scan time a sawtooth wave is formed across this capacitor and is amplified by the pre - driver, driver and symmetrical complimentary output stages. This output which is applied to the yoke, pin cushion and convergence circuits is received from pin 2 of the panel. The voltage for the top and bottom raster correction is obtained through feed back circuits to the predriver.

The vertical hold control which is not a part of the panel, is placed across pins 6 and 9 and is part of the oscillator timing circuitry. ■

Auto Entertainment Electronics — A State - Of - The - Art Report — Part 2

By Joseph J. Carr, ET/D Contributing Editor

Recent developments in car radio and tape products

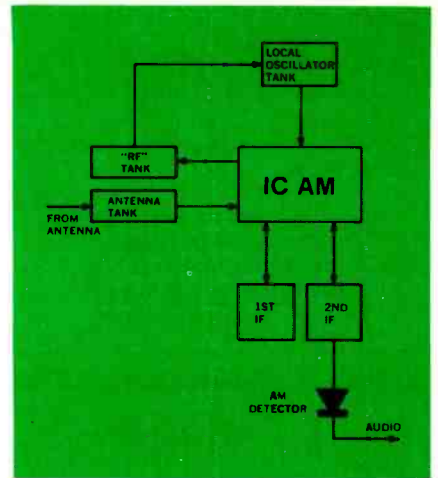


Fig. 1— Simplified block diagram of Delco's DM35 AM radio, in which most of the circuitry ahead of the detector is contained in a single IC.

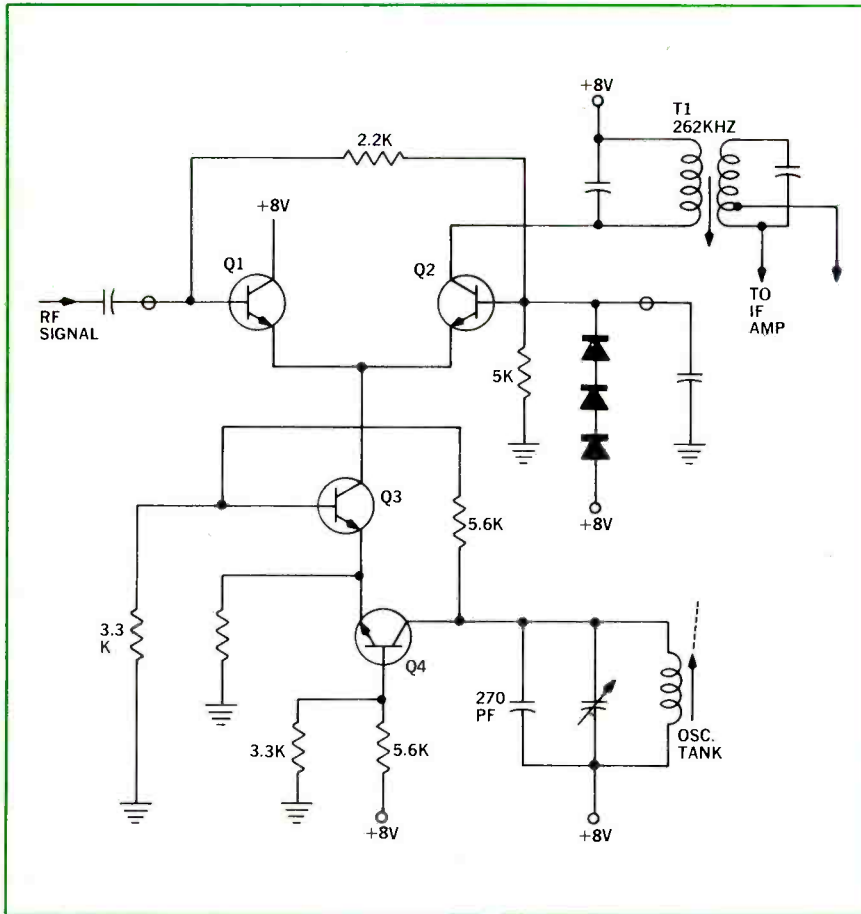


Fig. 2 — Schematic diagram of the converter section contained in the IC used in Delco's DM35 IC AM radio.

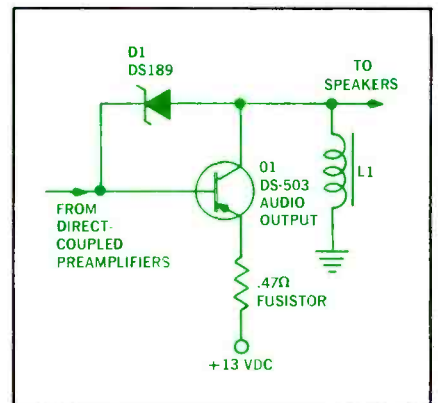


Fig. 3 — One electrical change to existing Delco conventional AM radio is the addition of zener diode D1 between the collector and base of output transistor Q1.

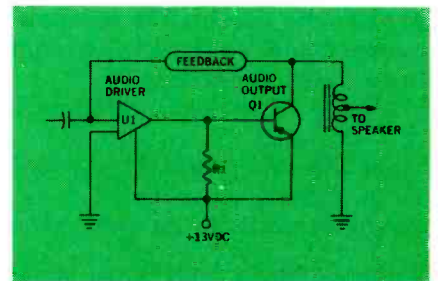


Fig. 4 — Motorola now uses an IC - equipped audio driver.

■ Last month, we examined the newest and most unique circuits in 1974/75 FM radios. This month we will examine AM radio sections, audio circuits and tape players. We will again limit the discussion to OEM models (those installed at the factory or at authorized auto dealers).

DELCO'S SINGLE-IC AM TUNER

Delco offers an integrated - circuit (IC) AM receiver design which uses a single IC for the entire AM tuner section ahead of the diode detector. This design is used in

some AM - only models and a few AM/FM models.

Fig. 1 is a block diagram of the IC AM radio circuit. Note that nothing is left out. I at first suspected that the design was a "cut - down" radio, but this single - semiconductor tuner is "complete." It contains RF, antenna, and local oscillator tank circuits and both of the 262.5 - KHz IF transformers normally found in AM radios of conventional design.

The use of the IC AM section offers two advantages: One, of course, is the possibility of a small-

ler and more compact AM radio or AM section of an AM/FM receiver. Not so evident as the first advantage, but equally as important, is the fact that the all - IC design permits construction of a more sophisticated receiver at a cost that is low compared to that of other approaches. Of course, a manufacturer could simply put three or four transistors and a couple of diodes inside an IC package and still make a relatively small receiver, but this is not the approach used in the Delco AM chips. The complexity of the IC

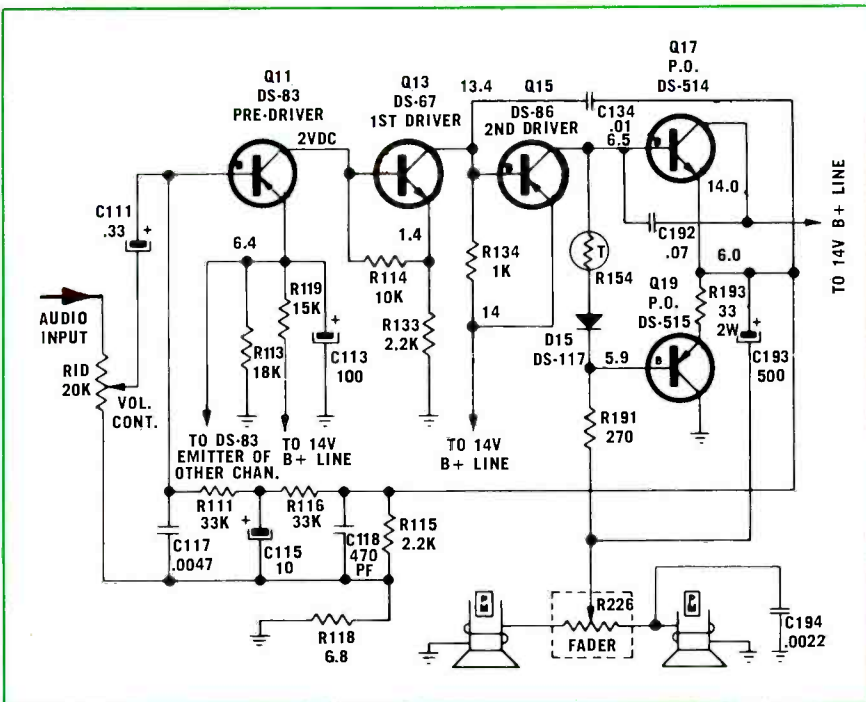


Fig. 5 — Schematic diagram of Delco's new audio amplifier section which uses a complementary symmetry output stage.



Fig. 6 — An example of Delco's compactly designed radio/8-track tape player unit.

AM is revealed in Fig. 2, which shows the converter section of the radio. Q1 and Q2 form a differential - amplifier type of mixer circuit. The sum of the currents flowing in these two transistors is constant. The base voltage of Q2 is held constant by a regular network connected to the 8v DC line, while the base of Q1 is fed by the RF signal. The composite current which feeds the emitters of the differential amplifier varies with the oscillations produced by Q3 and Q4. When the RF signal applied to Q1 causes the emitter current of

Q1 to increase, the current through Q2 decreases. Alternatively, when the signal applied to Q1 causes its emitter current to drop, more current is available for Q2. This action is the source of the non - linearity needed for proper mixer action (no mixing occurs in a linear circuit).

The use of comparably sophisticated amplifiers in the RF and IF sections allows improvement in the performance of those areas also. Such techniques allow better control and higher gain than is possible with single - transistor

RF and IF stages.

MODIFIED "CONVENTIONAL" DESIGNS

Delco and the other auto radio manufacturers still offer conventionally designed AM radios.

As an example, the AM radio introduced by Delco in the fall of 1962 (1963 model year) is still with us in 1974/75 models — a twelve year design life. Of course, there have been changes, some of them significant, but the model is basically the same as the early design, including the use of PNP germanium RF, IF and converter stages; NPN silicon audio drivers; and a hefty TO - 3 or TO - 36 PNP germanium output transistor.

Although the audio section still uses the Delco "teeter - tooter" circuit configuration, the *mechanical* design has been changed in recent models. Rather than being mounted directly on the PC board, the driver stage components are sealed in a white, plastic epoxy *module* that is, itself, mounted on the board. This module, which includes the two NPN transistors and all associated resistors, has been given designations such as DM8, DM28, etc.

Another electrical change in some conventional Delco models is the addition of a zener diode (Fig. 3) to protect the output transistor. This diode is a DS189 type.

In contrast to Delco's use of discrete parts in a "potted" module, Motorola prefers to use an IC in the driver circuit (Fig. 4). The IC controls the voltage between the base and emitter of the PNP germanium output transistor. Until a few models ago, this transistor was Motorola's type 2N176, which has been used since the introduction of vacuum tube/transistor hybrid designs in the late '50s.

DELCO GOES COMPLEMENTARY SYMMETRY

Delco has joined the ranks of those manufacturers who have converted at least some models from the "powerhouse" class A, single - ended, audio power amplifier to a complementary symmetry push - pull design. Fig. 5 shows the new Delco audio section. Transistors Q17 and Q19 form a push - pull, emitter - follower, power - output stage fed in parallel by a three - transistor driver amp-

lifier. Diode D15, a DS117, between the bases of Q17 and Q19, is used to provide a slight forward bias to Q17 and Q19 so that cross-over distortion is avoided. Push-pull action is achieved because the two push-pull transistors are opposite types. When an input signal causes the collector of Q15 to become more positive, Q17 will tend to turn on (it is NPN) while Q19 will try to turn off. This different bias action is the source of the phase reversal required for push-pull action.

RADIO/TAPE PLAYER COMBO'S

Delco's New Compact

For the past few model years, Delco and other manufacturers have offered combination radio/tape units.

Fig. 6 shows an example of a Delco AM/FM radio/8-track tape player unit. Such sets are good examples of efficient electronic "packaging," which has been made necessary by the extremely limited dashboard space. Not only is the total dashboard area available for the radio/tape unit limited, but so is the area for the radio and tape controls. Because of this, many of the controls and related mechanical components must perform double duty. For example, the opening for the 8-track cartridge is located behind the radio dial glass, which swings up

out of the way when pressed. To avoid complicated and troublesome dial cord arrangements, which would invariably lead to reliability problems, Delco has placed a mirror behind the combination radio dial glass/cartridge door so that it reflects on the glass the image of the dial pointer, which is located on and is an integral part of the permeability tuning mechanism (PTM). The volume and tone controls are concentric and are located to the left of the dial glass. A front-rear fader control (not balance) is concentric to the manual tuning shaft on the left side of the dial.

In most models, the balance control (left-right) is a screwdriver adjustment which can be reached through a small hole in the es-cutechon.

One pushbutton serves double duty as a radio tuning pushbutton

and as a tape player program (track) changer. Another tuning pushbutton also is used to energize a solenoid which ejects the cartridge. A radio/tape switch is tripped when the cartridge is inserted, and is released when the cartridge is ejected by the solenoid.

The ten-slide tuner used in these models allows the user to set all five pushbuttons to stations on both AM and FM instead of splitting them between the two bands.

Combo Radio Circuits

The AM and FM radio circuits in combo units are similar to those in non-tape equipment. There are, however, some circuits unique to the combo unit.

Fig. 7 shows the emitter-follower circuit which is used as an AM buffer in certain Delco combo models. Such circuits serve two purposes: 1) they match impedances, and 2) they permit use of simple resistor networks to split the single channel into two channels suitable for driving the stereo audio amplifier sections. (In previous designs, the AM audio also was used to drive the DM-14 IC stereo decoder in the monaural mode.)

Signals from stereo tape heads are significantly weaker than signals from AM or FM demodulators. To compensate for this difference, a tape preamplifier is used between the audio section and the tape heads. An example is shown in Fig. 8. Both right- and left-channel preamplifiers are contained in a single IC. These circuits are similar to the dual operational amplifiers used in home equipment.

Delco uses a special tape-drive motor and an electrical/mechanical negative-feedback control system (Fig. 9) to regulate motor speed. The motor unit consists of a DC motor and an AC alternator/tachometer on the same drive shaft. The AC voltage from the tach is rectified and used to drive a DC control amplifier which, in turn, drives the motor. The mechanical coupling between the motor and the tach causes changes in motor speed to vary the tach output which, in turn, regulates the motor speed via the con-

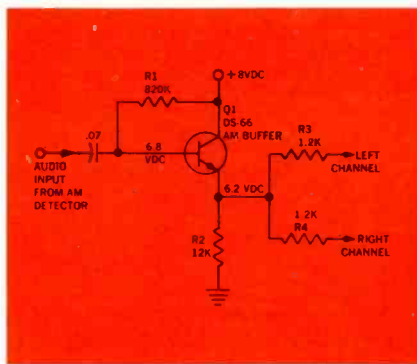


Fig. 7 — AM buffer stage used in some Delco combination radio/tape players.

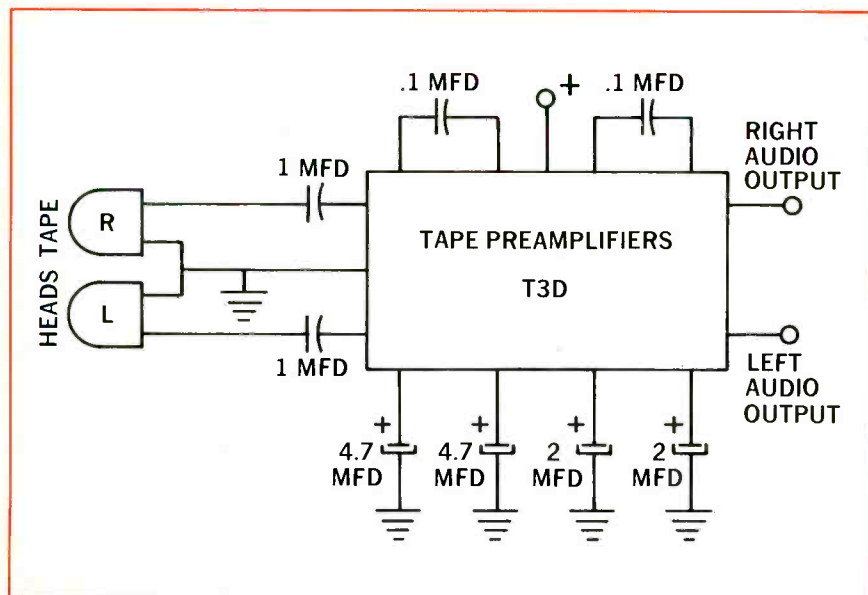


Fig. 8 — New Delco radio/tape players are equipped with IC preamplifiers which are electrically located between the tape heads and the audio amplifier section.

trol amplifier.

Delco Tape Player Adjustments

The adjustments of two different Delco tape decks are pointed out in Fig. 10.

The deck in Fig. 10B is the lift-out type used in radio/tape combo's such as the model in Fig. 6. Delco has impressed into the flywheel metal of most of these decks a 60-hertz strobe pattern which facilitates motor (tape) speed adjustment.

Motor speed and other adjustments also can be made by using a suitable test - tape cartridge. I prefer the RCA "red label" test tape available from RCA distributors and the Delco test tape (Part No. J22683 - 01) which is available from Kent - Moore, 1501 South Jackson, Jackson, Mich. 49203.

TEST EQUIPMENT REQUIREMENTS

Recent developments in auto entertainment electronic products have not had any significant impact on the type and quality of test instruments required for proficient servicing of such products.

Most Delco field service engineers who I know carry only a VTVM; a "modest" stereo generator; a 3 - inch, recurring - sweep scope; a good test - tape cartridge; a simple crystal - controlled marker generator with 9- and 10.7 MHz crystals; and a 6-18v DC power supply, such as Delco's P1200 or the older P-612. (Delco field service engineers usually get to service only the "dogs" that

other technicians have given up on.)

SERVICE AND PARTS DATA REQUIREMENTS

Because of the compactness of auto entertainment electronic products and the variety of physical design and chassis layouts,

well - illustrated service data is essential. Such data can be obtained from most manufacturers' distributors. (In my opinion, Delco furnishes some of the best service manuals available.) Another good source is the Sams AR - series of manuals.

Cross referencing and sourcing out substitute discrete semiconductors and the ICs used in auto entertainment products is easier than for home entertainment electronic products, principally because there are fewer manufacturers and less proliferation of designs. Another reason is that, although common usage of certain discrete semiconductors and ICs by the major auto electronics manufacturers does not approach what could be accurately called universal usage, there is more of a trend to standardization than in home entertainment products.

Also, because most of the ICs used in auto entertainment electronic products are supplied by a relatively few major semiconductor manufacturers, even IC cross referencing and substitution is relatively easy. And some of the ICs are available in quantity from industrial electronics distributors at significantly lower prices than most TV parts houses charge for them. You can cross reference OEM and "industrial" numbers in the various cross - reference guides (HEP, SK, EGG, etc.) and make substitutions based on "types equal to the same type are equal to each other" logic. ■

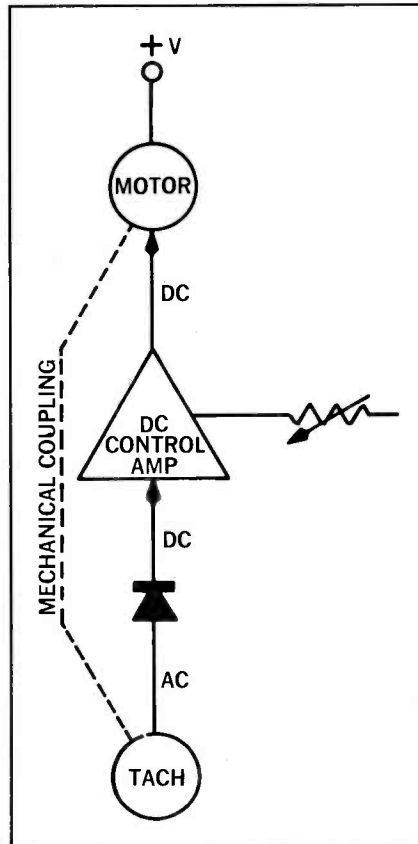


Fig. 9 — Closed loop consisting of an AC alternator/tachometer, a rectifier, a DC control amplifier and a DC motor is used to regulate tape - drive motor speed in Delco combination radio/tape player units.

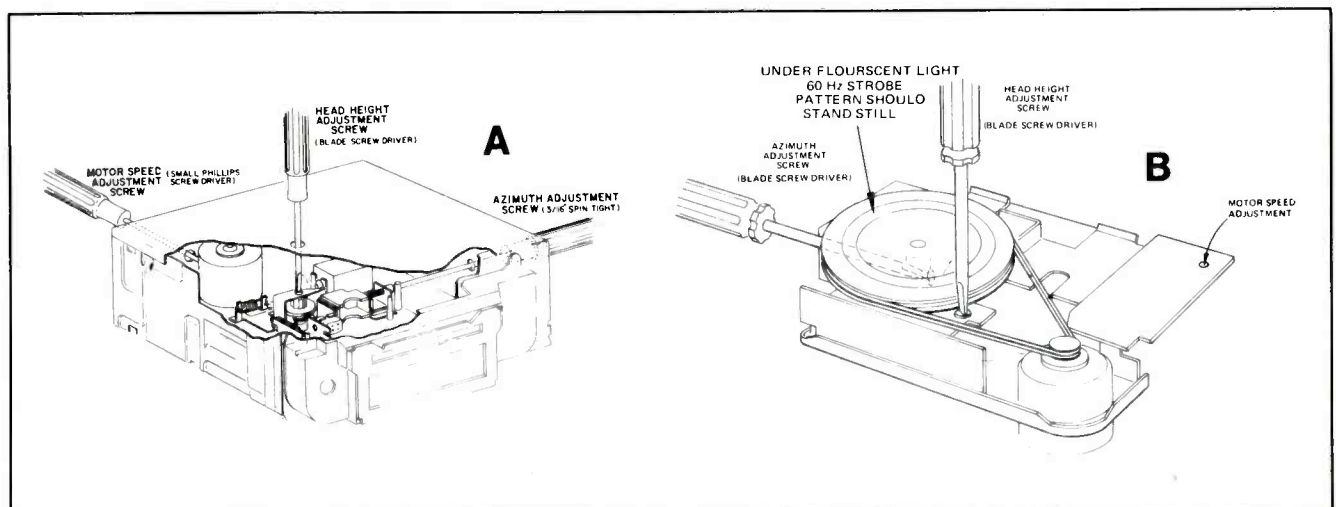


Fig. 10 — Locations of adjustments on two representative Delco tape players. Tape deck in (B) is used in Delco's new compact radio/tape players like that shown in Fig. 6.

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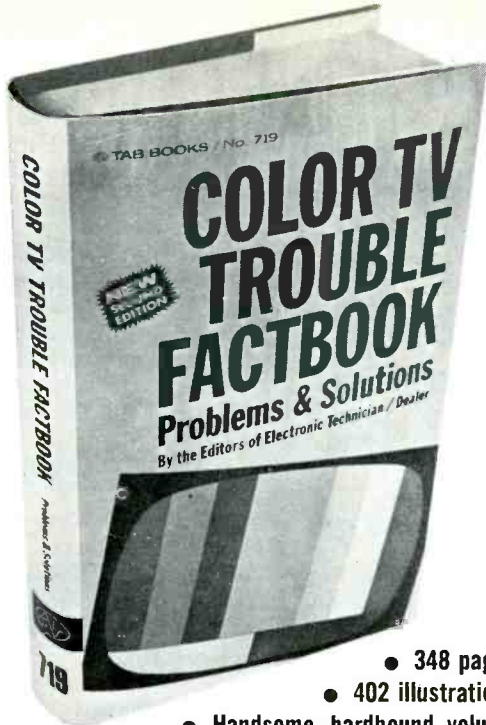
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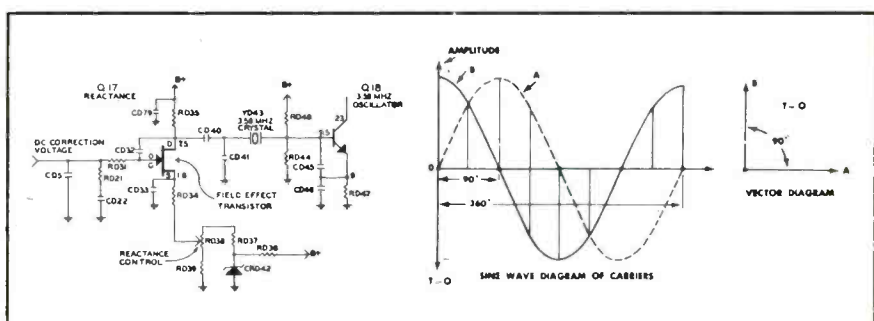
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- Olympic**—Chassis CT400; CT910; CT911; CTC19; CTC20; CTC21; CTC30; CTC31.
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- RCA**—Chassis CTC17; CTC17X; CTC20; CTC21; CTC22; CTC30; CTC36; CTC38; CTC39; CTC40; CTC41; CTC42; CTC43; CTC44; CTC46; CTC47; CTC48; CTC49; CTC50; CTC51; CTC52; CTC54; CTC55; CTC59; CTC63; XL-100.
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- Truetone**—Chassis 2DC4815.
- Westinghouse**—Chassis V2655; V2656; V-8001
- Zenith**—Chassis 12A13C52; 14A9C51; 19-DC12; 19DC22; 19DC28; 25DC57; 20X138.

Twice the size of the bestselling original, this newly updated edition is a fully indexed all-in-one reference guide to color-set troubles and recommended solutions, manufacturers' service notes, and production change data—all alpha-numerically arranged by manufacturer and model. This low-cost handbook contains service tips, troubleshooting data, and special problem-solving aids for all the more popular U.S. and Canadian color TV makes and models, from A (Admiral) to Z (Zenith).

But that's not all! Included also are details concerning repetitive troubles, field-factory changes, new and unusual circuits and descriptions of how they work, special adjustment procedures and other such pertinent service information. Of particular importance are the manufacturer's production changes—this book includes a detailed accounting of such changes where they might logically affect set performance and where the technician might replace a "factory" component with an unsuitable substitute.

This book should be considered a "must" for every practicing professional TV service specialist . . . the information it contains may easily save you hours of time repairing a "tough-dog" color TV. Partial schematics, location diagrams, chassis layouts, and sketches are included as necessary to make every entry easy to understand and simple to implement in the field. To our knowledge, no other single volume contains so much easy-to-find information about so many individual models and brands of color receivers. A complete cross-reference index is provided to enable you to quickly find the specific material you need. In all, over 600 specific items are included.

The material provides instant solutions to many color TV circuit troubles, enabling you to diagnose and repair hundreds of otherwise difficult-to-solve problems. If you service color TVs, this organized file of data will pay for itself time and again. 348 pps., hundreds of schematics and diagrams. Hardbound. Publisher's list price \$8.95.



Literally hundreds of complete and partial schematics and illustrations make each of the over 600 entries in "Color TV Trouble Factbook" easy to understand.

AN EXTRAORDINARY OFFER...

NEW AT NEWCOM

Previewed in this ET/D section are some of the many new products to which your local distributors will be introduced at NEWCOM, the annual convention and trade show for electronic distributors, manufacturers' representatives and manufacturers, held this year during May 6 - 8 at the Las Vegas Convention Center.

TV ANTENNA ROTOR SYSTEM 134

Cornell - Dubilier has announced a new TV antenna rotor system, the SA22, which features a 500 - torque - lb motor in a "bell" housing and a two - button - operated control unit.

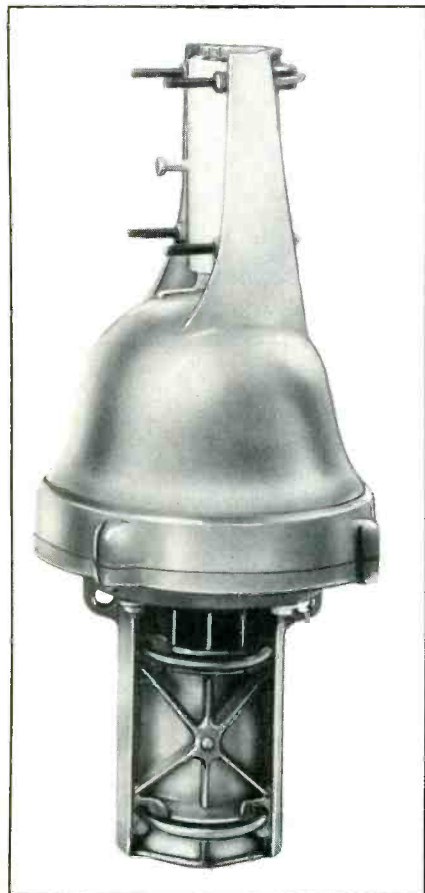
The relative direction in which the antenna is pointing is indicated by a blinking light on the control box. The light blinks once for each 3 degrees of rotation. Once the user has predetermined the best antenna position for each active TV channel, rotating the antenna from one channel position to the next is merely a matter of counting the pre - calculated number of blinks. For example, if the antenna position for Channel 2 is 12 degrees counterclockwise from the channel 6 position,



the "counterclockwise" button is depressed and held in this position until the light has blinked 4 times, at which point the "counterclockwise" button is released.

Connection between the rotor and control box is via a 4 - wire control cable

Retail price of the SA22 system, complete with all rotor - to - antenna mounting hardware and a 1 year guarantee, is \$59.95.



IN-LINE COLOR TV TEST JIG 135

GTE Sylvania's Model CK3000 Chek - A Color™ portable color TV test jig is equipped with a 90 - degree, in - line, slotted - mask, 13 - inch (viewable) picture tube, and, because it comes fully assembled and completely aligned, it is ready for immediate use.

The CK3000 can be used with 48 different brands of color TV receivers, encompassing 7000 all - solid - state, hybrid and tube chassis, with picture tube anode voltages up to 30Kv.

Built into the CK3000 are an alter-



nate focus supply, for substituting focus voltages as low as 4.5Kv, and a high - voltage meter capable of measuring up to 35Kv. All controls and connections are on the front panel.

Provided with each CK3000 are set - up and instruction manuals, two 70 - degree adapters, two 90 - degree extensions, one audio extension, six yoke programmer plugs and four convergence ballast plugs. Adapter kits for the seven most popular brands of color TV and discrete adapters for 42 other TV brands are available on an optional basis.

The CK3000 weighs less than 25 lbs.

TV TEST JIG

136

RCA announces the latest addition to its line of Industry Compatible TV Test Jigs. The new unit designated the 10J106 is equipped with a 1906P22 kinescope. This is a 19V size with a 33 kv rating. Specially designed built - in transformers and switching system permit the testing of almost all American TV receivers. Yoke impedances for virtually every TV set on the market are matched by simply turning two switches. The jig is supplied with a cable to fit all RCA color chassis manufactured within the past ten years. It will work with tube type, hybrid and solid state chassis. Most socket adaptors already allow connection to almost every chassis of all leading TV manufacturers. The unit has an accu-



rate built - in voltage meter calibrated to 35 kv and comes complete with high voltage lead, ground lead, audio cable and speaker. The jig is fully enclosed in lightweight cabinet with carrying handle.

DIGITAL MULTIMETER

137

Dynascan B & K Precision Div., announces a new 3 - digit, portable DMM, Model 280. The instrument features a four times - per - second update of the LED readout. Its accuracy is 1 percent on DCV and 2 percent on DC current, ACV and AC current, and ohms, (2.5 percent on the highest range.) Other features include: au-

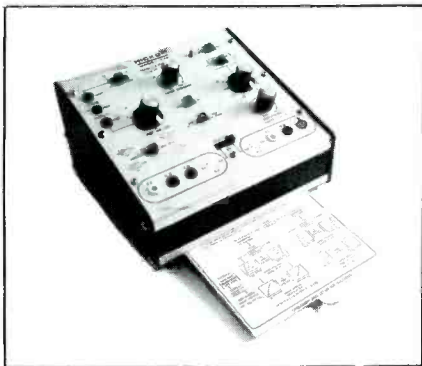


tomatic polarity and decimal point; overrange indicator system (flashing display); full overload protection; Hi - Lo ohms feature; input impedance of 10 megohms; and a resistance measuring range of 100 ohms full scale to 10 megohms full scale. The unit can be operated from alkaline, Ni - Cad or carbon zinc batteries and has provisions for an optional charger/converter. Typical battery life with alkaline batteries is 50 hours of continuous use. Price is \$99.95.

CURVE TRACER

138

Hickok Electrical Instrument Co., is introducing Curve Tracer Model 440. In addition to all conventional displays, the full - range tracer is equipped with an *Insta - Beta* display which provides a single IC/IB curve that lets you find AC or DC beta of transistors without interpolation, as well as a single I_D/V_{GS} curve that shows V_P , I_{DSS} , and G_M of an FET. The instrument generates scope displays which reveal the exact performance of any diode, transistor or FET over its entire operating range. Other features include: Variable control, for up to 10 step per dis-



play; Horizontal Volts/DIV control, for easy setting of the horizontal sensitivity; and a handy, pull - out card which gives reference information about calibration, setup, and operation. Price is \$165.

FUNCTION GENERATOR

139

A new, service and laboratory function



generator, Model 270, is introduced by Hickok Electrical Instrument Co. The compact generator provides calibrated, sine, square and triangle waveforms from 1 Hz to 500 KHz. With external connections you can produce logic pulse sweeps and ramps, amplitude and frequency modulated outputs, phase and frequency shift keying signals, tone bursts and other mixed signal outputs. A DC Level control allows the instrument to generate logic level signals and gating or modulating pulses, and for dynamically testing DC level - responsive circuits. The maximum output level is 24 V_{PP} with a 600 - ohm output impedance. The maximum sine wave distortion is 1 percent T.H.D. over the entire audio range. Square wave rise and fall time is 0.5 micro sec. The generator measures 8½ inches wide by 4 inches high by 6 inches deep and weighs 4 lb. Price is \$166.

PORTABLE 3½ DIGIT DVM

140

Sencore's new Model DVM32 is reportedly the first truly portable, digital multimeter with L.E.D. displays and 3½ digit readout that operates off line, rechargeable or standard "C" cells. To be portable, it also had to be tough, to withstand the typical field use a portable meter encounters. A specially de-



signed, high impact case will withstand those drops off the bench without a trip back to the factory. Protection internally features 2000 V on DC volts, 1000V on all other functions and ranges. Basic .5% volts accuracy is backed by a high 15 megohm input impedance, with a 200K isolation position on probe for accuracy. Exclusive DVM LO - Power ohms brings digital accuracy to ohms measurements. High power ohms gives you the versatility. Fast measurements with Auto - Polarity, Auto - Overrange and Auto - Decimal placement. Exclusive

Auto - Off switch turns the L.E.D. display off between any measurements, and draws only 15 ma during idle for longer battery life. Accessory High Voltage probe allows reading up to 40 kv with 1.5% accuracy. Price is \$198.

THERMAL SPOT TESTER

141

Wahl is introducing its Thermal Spot Tester as a new type of electronic circuit fault detection method. The tester is a small blower heater with an extension tube. Providing 260° F directed at a single spot, it heats up individual capacitors and transistors to



find malfunctions that only appear when circuits are warmed. The tester is claimed to be faster, safer, more convenient and more economical than the opposite method of warming up the entire set and chilling individual components. The tester can also be used with or without the concentrator nozzle tube, it can be used to dry epoxies or tuners and other components after cleaning. It can be generally useful anywhere a heated air stream is needed.

VOM

142

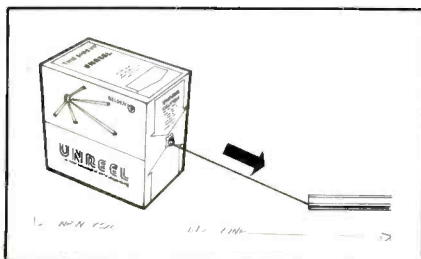
The 260-6XL and 260-6XLP Volt - Ohm - Milliammeters have been introduced by Simpson Electric Co., as additional members of the company's 260 family of VOM multimeters. The new XL Series is supplementary to Simpson's standard line of 260 VOMs. Featured are additional range cover-



age including low power ohms and extra shock and drop resistant construction including a high impact, custom molded panel and case. A total of 33 ranges are provided, with extra voltage and current ranges not usually found in VOMs. The two low power ohms ranges are in addition to the conventional resistance ranges. Price of the 260 - 6XL is \$90, and the 260 - 6XLP is \$125.

PACKAGED SECURITY CABLES 143

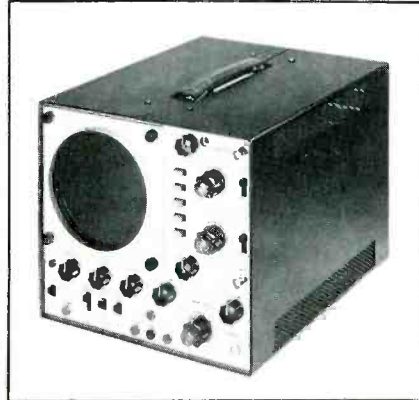
Electronic wire and cable for use in security systems are now available packaged in **Belden's** new UNREEL dispenser cartons. It eliminates reels, spools, and de - reeling equipment at the job site, enabling alarm/security systems contractors and installers to reduce cable handling time and manpower. The cable packaging uses a reel - less coil contained within a disposable paperboard carton. The special process by which the coil is formed permits cable to be withdrawn from the package at high speeds without drag and with instantaneous control of start and stop. Cable is dispensed smoothly and inertia - free from the carton, which remains in place without hold - downs. When pulling stops, there is no danger of backlash and cable snarling. The cables are available in 500 - or 1000 - ft. lengths and include: unshielded two - conductor cable (Belden trade numbers 8442, 8205, and 8461); multiple - pair unshielded sound and control cables



(8740, 8741, 8742, 8757, 8743, and 8690); three - conductor shielded cable (8772); RG-59/U shielded coaxial camera cable (8241); and telephone cable (8794 and 9794).

OSCILLOSCOPE 144

Lectrotech, Inc., has introduced the Model TO-60, all solid - state, automatic dual - trace, triggered - sweep oscilloscope. Service and industrial technicians can now check inputs and outputs, the bursts in or out of gate amp-



lifiers or the stages keyed off the horizontal pulse of TV sets with speed and accuracy. Other important specifications include: DC-15 MHz bandwidth, 10 millivolt/cm sensitivity. Maximum speed: .1 microseconds/m with 5X magnifier. P-31 phosphor, BNC input jacks, pushbutton mode selection. Automatic triggering, automatic astigmatism, automatic horizontal sweep, automatic horiz/vert triggering and 5 - inch scope. Price is \$489.50.

VOM 145

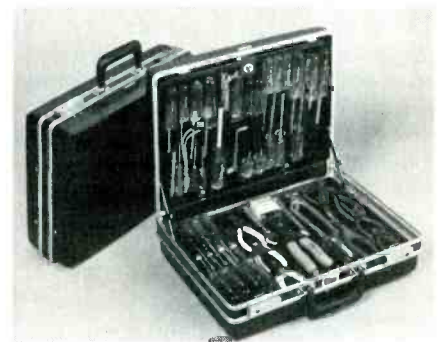
Introduced by **Triplet Corp.**, is the Model 60 VOM, a multi - range instrument for general electrical and electronic troubleshooting and measurement. It has been designed to



withstand the normal accidents of dropping and rough handling which occur in hard day to day use. A self check feature is built into the instrument for periodic check of its accuracy. User safety features include: complete insulation of the unit itself, a new test lead and an internal electrical system which greatly reduced fires and explosion hazards which occur under misuse conditions. A separately sealed battery compartment permits access to batteries and fuses without removal of the remainder of the unit. In addition, battery acids are sealed off to prevent component damage. The measurement ranges have been designed to cover nearly all applications with added convenience of signal level measurements in decibel decade steps. Three fuses are employed for protection to the unit and safety for the user. Maintenance is simplified by designing an independent meter module for quick replacement or service and easy to follow parts layout.

TOOL CASE 146

A new "Super Case" containing 48 professional tools is now being offered by **Vaco Products Co.** Included are 7 pliers, 2 wrenches, 2 reversible screw drivers, 13 specialty drivers, 7 hollow shaft nut drivers, 4 screw holding drivers, 4 testers, 2 crimping and stripping tools, plus 7 unusual type tools for specific problem solving areas. A total of 48. Heavy duty attache' case has simu-



lated black leather exterior and measures 19 inches by 14 inches by 6 inches. Pallets have pockets of heavy duty, see - thru vinyl. Top section has pocket for technical manuals and bottom section has compartments for test meters and other gear.

DISTRIBUTION AMPLIFIER 147

ACA has added a very high input and exceptionally high output distribution amplifier to its MATV line. The Model MSV 70 has a 3.0 volt output with an input capability of 126,000 microvolts. The bandwidth covers 54 to 300 MHz which includes the CATV mid - bands and super - bands, a "low noise" figure of 4.1 dB and includes a variable gain

Jerrold's new Universal TV Remote Control



The Hottest New Product Since The Calculator...

■ **Makes every set on your floor a remote control model**

- Universal— Attaches to any set in minutes
- Changes channel instantly and fine tunes
- Turns set on/off

- Silent push-button varactor— diode tuning— 12 channels
- Amplifies signal and eliminates direct pick up ghosts
- For homes, apartments, bars, hotels/motels, schools, hospitals and nursing homes.

Packaged in a sturdy, colorful, self-selling carton



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 WESTERN OFFICE 1255 Veterans Blvd., Redwood City, Calif. 94063, (415) 365-5050
 MIDWESTERN OFFICE 1334 Atlantic Street, North Kansas City, Mo. 64116, (816) 842-1555

...for more details circle 112 on Reader Service Card

APRIL 1975, ELECTRONIC TECHNICIAN/DEALER / 39



control which allow considerably more input than the rated input capability. Price less than \$125.

SIGNAL LEVEL METER 148

Blonder - Tongue has introduced a solid - state, lightweight portable signal level meter. Designed for CATV and MATV installers and TV service technicians, the FSM - 3 is battery - operated and housed in a leather case with a large convenient accessory compartment. A major feature is a continuity testing facility to check risers for opens and shorts and proper terminations. The scale is 0 to 1000 ohms. A

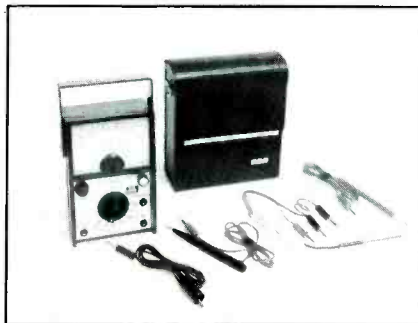


built - in speaker eliminates the need for earphones. The taut - band suspension meter reads directly in dBmV (and microvolts) to show exact signal levels and provides continuous coverage for VHF TV (54 to 216 MHz) and the UHF (470 to 806 MHz). Its sensitivity permits measuring signals down to 10 microvolts while built - in attenuators provide signal - strength readings up to 10,000 mV (+42 dB). VHF accuracy is ± 2 dB; UHF is ± 4 dB. It weighs six pounds and is powered by four standard 9 - volt batteries. Price is \$290.

MAINTENANCE/APPLIANCE TESTER 149

A new Industrial Maintenance and Appliance Tester is introduced by **RCA**. It is designed with special ranges and functions required to service motors, tools, wiring, security systems, heating and air conditioning systems, appliances, etc. In addition to voltage,

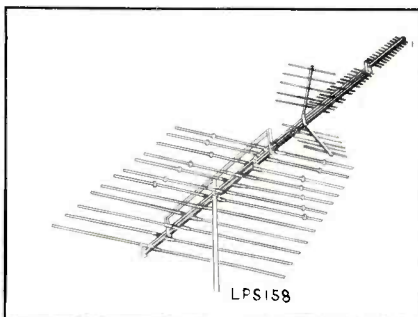
current, and resistance measurements, unique functions for AC leakage current, temperature and continuity measurements are provided. A special LED Probe is provided for easy point - to - point continuity checks of switches, wiring, fuses, terminal blocks, etc. There is no need for repeated reference to the meter reading



if the probe lights there is continuity. The special, high - quality immersible thermistor probe supplied for temperature measurement features accuracy, ruggedness, and fast response. A special AC current leakage test has been included for checking leakage on the exposed metal parts of tools, etc., to be sure they are safe. Precision resistors are used in all measurement ranges to insure accuracy. A convenient, panel - mounted fuse is provided to protect the ohms and DC current ranges, and an internal fuse protects the AC current range. The tester has a large easy - to - read three color meter, and a functionally designed, color - coded aluminum panel. It is supplied complete with test leads, temperature probe, LED probe, and carrying case. Price is \$89.

TV ANTENNA 150

JFD Electronics Corp., has announced the introduction of a new VHF/UHF/FM color TV antenna named Color Metric. The new configuration combines a newly developed straight dipole log periodic design into which is integrated a UHF corner reflector trap and multi - element UHF front end driver. Features include: Coplanar straight - dipole log periodic design for directive VHF patterns for cleaner and higher gain picture reception. Capacitor - coupled dipoles resonate



on more VHF channels than conventional dipoles used in other ordinary antennas. High gain UHF corner reflector that works in conjunction with the UHF driver to trap more signal and help eliminate ghosts and interference. Super sensitive UHF cascaded front end driver for channels 14 to 83. Triple, square crossarms maintain high signal transfer and provides antenna rigidity. An all - band VHF/UHF/FM splitter is included, so only one downlead to the set is required. The five Color Metric antennas designed for every location are: LPS-158 (fringe), LPS-127 (near fringe), LPS-94 (suburban), LPS-86 (local - suburban), LPS-60 (local). List prices range from \$24.40 to \$99.10.

PHONO PARTS PROGRAM 151

EV-GAME Inc., announces the availability of two new blister packed phono parts programs. These programs consist of a balanced assortment of the most popular Automatic Centerposts, Manual Centerposts and Cartridge mounts for record changers. Each blister card has complete cross reference information, including changer brand name, model numbers and manufacturers part number. The programs are

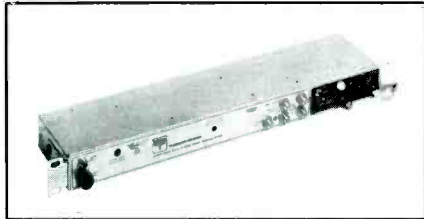


designed to take advantage of the fast growing Hi - Fi after market. The DPP-18 consists of an assortment of 6 types of the fastest selling Automatic and Manual Centerpost and Cartridge Mounts for a total of 26 pieces. The DPP-58 has 6 types of Automatic and Manual Centerposts plus 9 types of Cartridge Mounts totaling 58 pieces.

MODULATORS 152

Four new modulators designed to add closed circuit TV programs into master TV antenna systems or CATV systems have been announced by **Blonder - Tongue Laboratories, Inc.** These mod-

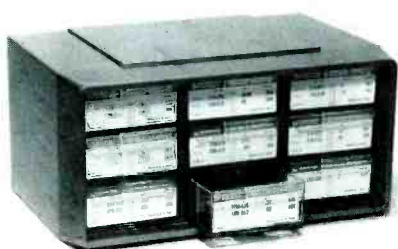
ulators are designed to provide optimum performance, free of adjacent channel problems, beat and other problems associated with mixing into a system. Video signals may be obtained on a TV camera, video tape recorder, film chain or TV demodulator in either color or monochrome. The modulators produce output signals for CATV, MATV or any closed-circuit TV application. They may also be used



as carrier-substitution generators. The Model AVMT 4923 (shown in photo) provides both a modulated visual and modulated aural RF carrier output on any single VHF TV channel. It can be used to put both video and audio on an unused channel of an MATV system or onto a single TV receiver. The VMT 4922 provides only a modulated visual RF carrier output on any single VHF channel. The VM 4925 is similar to Model VMT 4922 with an additional capability of modulating a video bandwidth of up to 8 MHz wide for high resolution CCTV, or modulating a combined 4.5 MHz aural and video signal from a microwave down converter output. The AMT 4921 provides only a modulated aural RF carrier output on any single VHF TV channel. All the new modulators employ a unique circuit that permits stable operation with carrier crystal removed. Fiberglass circuit boards, AC convenience receptacle and 1 3/4 inch slim rack mounting are features that all the units have in common.

CAPACITOR ASSORTMENT 153

A new capacitor Assortment, No. TK-28 is introduced by **Sprague** which contains 41 capacitors — two each of 19 popular ratings and 3 of the most frequently used values. Special dielectric films are used for critical commutating and S-shaping applications. The capacitors are stocked in a handy cabinet that puts the capacitors at the



service technician's fingertips, neatly organized and easy to find. The attractive yet rugged, blue, 9-drawer cabinet measures 9 3/4 inches by 5 inches by 6 1/2 inches deep. Clear plastic drawers are used with adjustable dividers and pre-labeled drawer fronts which identify the capacitors inside. The raised area on the top of the cabinet and the depression on the bottom facilitate stacking of two or more cabinets.

DISTORTION METER 154

The Model LDM-170 Distortion Meter is now available from **Leader Instruments Corp.** Measurement of distortion, signal-to-noise ratio (S/N) and signal levels in audio frequency circuits are easily and simply accomplished with the use of the meter. A balancing circuit suppresses the fundamental frequency in the 20 Hz to 20 KHz range and the distortion products, up to the tenth harmonic of 20 KHz, are fed to a high gain amplifier for indication on the meter. Measurement of noise and signal levels are performed by switching out the balancing circuit and using the high gain amplifier as a voltmeter. Harmonic distortion as low as .1% and noise to 70 dB below the reference level as well as signal levels between 100 microvolts and 300 volts in the



range of 20 Hz to 200 KHz may be measured on the unit. The instrument measures 6 1/2 inches high, 12 1/2 inches wide, 12 inches deep and weighs 13 lbs. Price is \$549.95.

AUDIO TESTER 155

A rapid means of providing performance checking in servicing and maintaining audio equipment is available from **Leader Instruments.** This compact, lightweight Audio Tester Model LAV-190 consists of a wideband audio generator, audio attenuator, and an AC millivoltmeter. A switchable dual impedance matching network of either 6 or 600 ohms is available for ease in measurement. The audio generator frequency range is a 10 Hz to 1 MHz sine wave and output response of ± 0.5 dB at an output of more than 2.5 v rms into 600 ohms at low harmonic distortion. The AC millivoltmeter measures full scale 150 microvolts to 500 volts and has an



input impedance of 10 Megohms. The unit measures 8.5 inches by 12 inches by 7.5 inches and weighs 8 1/2 lbs. Price is \$499.95.

CABLE CRIMPING TOOL 156

Channel Master has developed a new crimping tool whose jaw configuration eliminates the danger of crushing 75-ohm fittings, a common cause of signal loss in MATV installations and other antenna installations using 75 ohm cable. The "Crimp-O-Matic", Model 7188C, is made so that its jaws "bottom out" (close down) on each other instead of on the fitting. When a fit-



ting has too large an outside diameter, the tool will deflect at the handle end, again preventing undue pressure on the fitting. A large percentage of maintenance problems in MATV systems are traced to faulty connections caused by poor crimping. The tool, the first one ever designed by an MATV company, makes crimping almost automatic. The price is \$16.30.

FM DEVIATION MONITOR 157

A new solid state Model 205D Modulation Monitor which measures peak carrier modulation is introduced by **Lampkin Laboratories Inc.** The carrier frequency range is from 25 MHz to 1,000 MHz. The frequency deviation measurement accuracy is five percent of full scale, and is measured in three ranges: 2 KHz, 6 KHz, and 20 KHz.



The discriminator is linear to two percent over a band width 100 KHz wide, RF sensitivity is 15 mv or better to 450 MHz. FM limiting holds within two percent or less over a 100 to 1 range of input voltage. The unit operates from 50 to 400 Hz, 120 VAC or 12 VDC at 150 ma. The price is \$525.

ANTENNA PREAMP/AMP 158

A new combination UHF/VHF/FM preamplifier and amplifier has been announced by **Jerrold Electronics**. Called the **POWERCASTER Model 4287-PC**, the unit combines a Jerrold mast mounted Powermate type preamplifier with a Jerrold Colorcas-



ter type indoor amplifier, providing high gain and high output capability. The amplifier is expected to be especially popular in fringe areas, for use with multiple set installations in homes, apartment houses, hotels and motels. The VHF gain is 30 dB, UHF gain is 25 dB and FM gain is 18 dB. Output capability is +40 dBmV for each of four VHF channels and 37.5 dBmV for each of three UHF channels. Input of the mast or boom mounted preamp is matched to 300 ohm antennas. The downlead and output impedance are 75 ohms. A built-in 12 dB FM tunable trap can be used to eliminate interference from a local FM station. For reception in deep fringe areas, the noise figure is 6 dB at VHF and 8 dB at UHF. Price is \$60.86.

TV TUNER LUBRICANT/POLISHER 159

An aerosol spray which polishes and lubricates TV tuner contacts is introduced by **Chemtronics**. **TUN - O - POWER** is based on DuPont TCF (Tri Chloro Fluoroethane). This is the first time this product has been used in the electronics industry. TCF is notable as a clean, dry chemically inert lubricant which is remarkably effective under conditions of low speeds and light loads. In addition, it includes a silver polishing agent and Freon 11, a cleaner. The total effect of **TUN - O -**



Power is to clean and polish tuner contacts until they shine. The product also provides long lasting lubrication and corrosion protection. The polishing agent removes oxides, yet it does not wear away thin silver or gold platings. The product will not cause tuner drift or mix with dirt and dust to form a heavy abrasive layer which eventually can ruin tuner contacts. **TUN - O - POWER** comes in two sizes: an 8 - oz. size which costs technicians \$2.69, and a 16 - oz size which sells for \$3.85.

HIGH VOLT/CURRENT PROBE 160

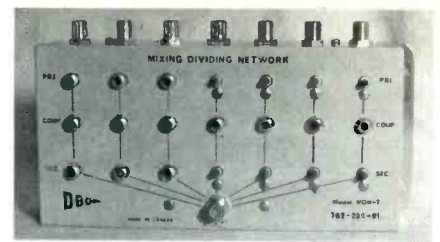
EICO Electronic Instrument Co. Inc., introduces the Model **HVP-5**, a self-contained, direct reading, high voltage and current measuring probe providing for the safe measurement of voltage up to 40 kv DC, and for separate current measurements up to 200 ma, DC. It enables you to accurately



measure the high anode voltage of a color picture tube and with a flick of the switch monitor the cathode current drawn by the horizontal output tube or the output stage. The two circuits are completely separate. Only the meter is switched. The probe can not be damaged by placing the function switch in a ma position while measuring high voltage. The price is \$29.95.

MATV MIXING/DIVIDING 161

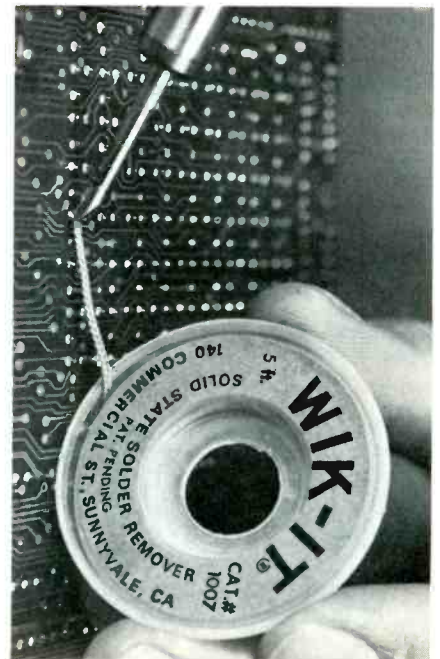
The Mixing Dividing Networks introduced by **Delta - Benco - Cascade Inc.**, combine several single antenna out-



puts into one common down lead. There are three 75 - ohm units, the **MDN-7** to combine or divide three low and four high channels, the **MDN-LO** for three low channels and the **MDN-HI** for four high channels. Incorporating two stage, band pass filters for each of the selected channels, they are coupled capacitively to the line, and are pre-aligned when leaving the factory in the following manner: **MDN-LO: 2 - 4 - 5 MDN-HI: 7 - 9 - 11 - 13. MDN - 7: 2 - 4 - 5 - 7 - 9 - 11 - 13.** The units can be adjusted in the field to channels other than the above with a good quality field strength meter, or they can be ordered, aligned to specific channels.

DE - SOLDERING AID 162

WICK-IT Electronics Corp., announces a de-soldering aid called "**WIK - IT**". It simplifies desoldering by placing your iron on a special metallic braid, laid on the soldered joint. The solder then disappears into the special braid, leaving the soldered joint clean and free of solder. This method helps prevent component overheating, splattering, lifting pads and other desoldering problems. After each desoldering, just snip off about 1/2 - inch of the braid and you are ready for the next job. **WIK - IT** comes in handy rolls from five feet or up to 100 feet. For free sample, circle number on Reader Service Card. ■



JENSEN'S PROFESSIONAL SOUND PRODUCTS SUPER SALE!

Now, for a limited time only, you can take advantage of Super Price Reductions on a line of fast selling Jensen Professional Sound Products. Simply enter a \$500.00 minimum

order for an assortment of loudspeakers and transformers . . . the sound products with the right features and prices to make sound installation-selling easier.

Consider these outstanding features of Jensen Loudspeakers:

- High efficiency and sensitivity with SYNTOX-6® Ceramic Magnets
- Ideal for Indoor and Outdoor locations
- Weather and corrosion resistant



Stock No. C9688 Model No. C8RFX with FLEXAIR SUSPENSION

Size: 8-inch
Impedance: 8 ohms
Power Rating: 12 watts
Frequency Range: 25-18,000 Hz
Free Air Resonant Frequency: 50 Hz
Magnet Weight: 10 oz.
Packed: 10 per carton
Net Weight: 2 lbs. 8 oz. Each

Reg. Price: \$6.99

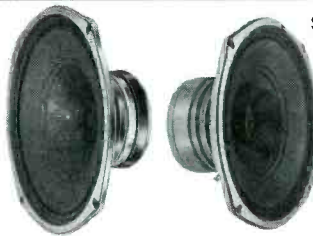
PROMO PRICE \$4.50

ORDER QUANTITY _____ EA. \$ _____

Reg. Price: \$4.19
PROMO PRICE \$3.50

Stock No. C7370 Model No. C850B

Size: 8-inch
Impedance: 8 ohms
Power Rating: 25 watts
Frequency Range: 30-15,000 Hz
Free Air Resonant Frequency: 70 Hz
Magnet Weight: 10 oz.
Packed: 10 per carton
Net Weight: 2 lbs. 5 oz. each



Stock No. C7381 Model No. C855B

Size: 8-inch
Impedance: 8 ohms
Power Rating: 25 watts
Frequency Range: 30-18,000 Hz
Free Air Resonant Frequency: 70 Hz
Magnet Weight: 10 oz.
Packed: 10 per carton
Net Weight: 2 lbs. 7 oz. each

Reg. Price: \$4.41

PROMO PRICE \$3.75

ORDER QUANTITY _____ EA. \$ _____

Reg. Price: \$5.32
PROMO PRICE \$4.50

Stock No. C9316 Model No. C6x9RD8B with FLEXAIR SUSPENSION

Size: 6x9 inch
Impedance: 8 ohms
Power Rating: 12 watts
Frequency Range: 25-18,000 Hz
Free Air Resonant Frequency: 50 Hz
Magnet Weight: 10 oz.
Packed: 10 per carton
Net Weight: 2 lbs. 8 oz. Each



Stock No. C9493 Model No. C835B

Size: 8-inch
Impedance: 8 ohms
Power Rating: 20 watts
Frequency Range: 30-18,000 Hz
Free Air Resonant Frequency: 70 Hz
Magnet Weight: 4.8 oz.
Packed: 10 per carton
Net Weight: 1 lb. 10 oz. each

Reg. Price: \$4.03

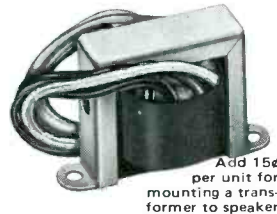
PROMO PRICE \$3.25

ORDER QUANTITY _____ EA. \$ _____

Reg. Price: \$2.26
PROMO PRICE \$1.75

Stock No. C9735 Model No. 70T4

Input: 70-volt line
Output: 8-ohm loudspeaker load
Power to Speaker: 4, 2, 1, 1/2, 1/4 watts
Nominal Core Size: 5/8" x 5/8"
Overall Dimensions: 2-7/8" W; 1-5/8" H
Mounting Holes: 2, 3/16" dia. on 2-3/8" centers
Packed: 10 per carton
Net Weight: 9-1/2 oz. each



Add 15¢ per unit for mounting a transformer to speaker

Stock No. C9736 Model No. 25T4

Input: 25-volt line
Output: 8-ohm loudspeaker load
Power to Speaker: 4, 2, 1, 1/2, 1/4 watts
Nominal Core Size: 5/8" x 5/8"
Overall Dimensions: 2-7/8" W; 1-5/8" H
Mounting Holes: 2, 3/16 dia. on 2-3/8" centers
Packed: 10 per carton
Net Weight: 9-1/2 oz. each

Reg. Price: \$2.26

PROMO PRICE \$1.75

ORDER QUANTITY _____ EA. \$ _____

SPEAKER/LINE TRANSFORMERS

- Designed for constant voltage distribution systems
- Lowest Insertion loss at all power settings
- Tapped for highest compatibility with solid state amplifiers

Terms: Minimum Order \$500.00
Net 30 Days
F.O.B. Schiller Park, Illinois
Standard Bulk Pack, 10 per carton

Offer good until May 31, 1975
Hurry, fill in your order and mail it to:

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Division of Pemcor, Inc.
4310 Trans World Road, Schiller Park, Illinois 60176

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TEST INSTRUMENT REPORT

DATA PRECISION/ MODEL 245 DIGITAL/MULTIMETER

■ The Data Precision Model 245 is a 4½ digit miniature, battery-powered, portable multimeter. The unit measures DC or AC voltage, DC or AC current, or resistance with 0.0005% resolution in 21 ranges.

Ranging and AC/Ohms/Current conversion errors have been minimized to support the rated resolution and accuracy. An interesting feature is that only one precision - attenuator resistor set is used for DC ranging, for AC feedback/gain control, and as resistance - measuring standards, depending upon the function - switch position.

Most of the logic components of the multimeter are contained in a single LSI P-MOS chip, designed to provide better performance, while reducing the cost of both components and assembly labor. The logic control functions are provided by C-MOS ICs. The total power drain in battery operation is 0.75 watts. A fully charged battery pack module is capable of supplying six - hours of operation, and may be recharged fully overnight (12 hours). The batteries are recharging when the battery charger is connected to a line source, whether or not the meter is in use.

The unit is equipped with its own internal NiCad battery module. It operates as a conventional bench - type meter, using the line-cord/charger accessory supplied with the instrument. It also can be used as an independent, highly portable test meter, powered by the battery module.

Operating and Display Features

The instrument is easy to use and is quite immune to most common hazards. The measurement mode is selected by a clearly marked selector switch and a second switch selects the measurement range. Each range provides 100 percent overrange and blanks all but the decimal point and po-



For more information about this test instrument, circle 180 on the Reader Service Card.

larity symbol when an out - of - range signal is applied. DC ranges accept either polarity, and provide automatic polarity indication.

Seven - Segment Readout

The large, bright, readout display is comprised of two segments, providing the capabilities for 4 - full decade digits, a most significant digit which is "1" or blank, automatically selective positive or negative polarity indication, and five selective decimal point indicators. The unit makes use of a novel flex - print mount for the display modules. The display and driver mount on a plug - in PC assembly, which positions the display, while still allowing it to be removed for maintenance.

The multimeter comes complete with carrying case, wrist strap, test probes, battery pack module containing rechargeable batteries, battery charger, line cord and instruction manual. A field manual also is furnished, containing operating and field maintenance procedures for assistance in field use. An optional bench stand is available on which to mount the meter at a convenient bench height and at an adjustable viewing angle.

Size, Weight and Price

The multimeter weighs 1.3 pounds including the battery module. The instrument's high - impact plastic case measures 1 inch by 5½ inches wide and has a depth of 3½ inches. Price is \$295.

SENCORE MODEL TF30 TRANSISTOR ANALYZER

The Model TF30 Super Cricket Transistor Analyzer makes transistor testing fast and does not require technical knowledge about

the transistor for test set - up.

It combines the good - bad in - circuit test used in the company's Model TF26 Cricket, and out - of - circuit parameter tests for those cases where precise information concerning gain and leakage is needed.

In most cases the technician only wants to know if a transistor is good or bad because usually the transistor will fail completely or develop leakage which will prevent them from performing properly. There are times when transistors must be selected for beta or FETs for Gm or zero bias drain current (IDSS), and the unit will provide this information by using the Super Cricket portion of the analyzer.

The unit will test diodes, transistors, single and dual FETs.

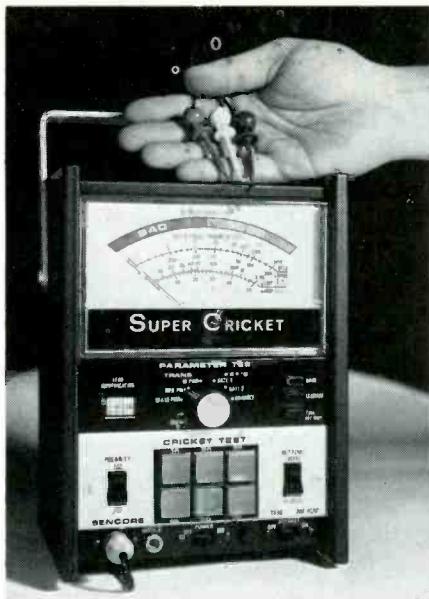
Test Leads

The connections to the device under test are made with E - Z - Mini - Hook connectors supplied with the analyzer. To use the connector, squeeze the collar towards the ball of the connector, and hook the spring - loaded hook to the lead of the device being tested.

For in - circuit testing of transistors mounted closely to the printed circuit board where connections to the lead are difficult, a swivel tip is furnished with the unit. To use this probe, connect the E - Z - Mini - Hook connectors to the rear of the probe. There are three terminals recessed into slots at the rear of the probe.

In-Circuit Testing

To make an in - circuit test of a transistor hook the leads of the analyzer to the terminals of the transistor in any order. Rotate the *parameter test* switch to the



For more information about this test instrument, circle 181 on the Reader Service Card.

Cricket test position. Then press all *permutator* buttons. If no "chirp" and no meter indication is noted, place the *Polarity* switch in the opposite position and push the buttons. It will indicate a good transistor with a chirp and meter indication generally on two buttons. If an indication is not obtained the device is not inverting a signal and it may be open or shorted.

Out-Of-Circuit Test

For out - of - circuit parameter testing and if the basing is not known, make the in - circuit *Cricket test* first to determine which two buttons indicate a good transistor. Then select the power classification of the transistor being tested. Depress one of the six *Cricket test* buttons then engage the *Button Lock* to lock the button down. Press the *gain* button and read gain on the meter. Release the *gain* button and depress the other test button, it too will lock down. Press the *gain* button and read the gain on the meter and of the two readings taken the highest reading will be the proper gain reading. The *permutator* button which gave the highest reading will provide the proper connections, or basing of the transistor. The basing can then be made by rotating the front panel identification drum to read the basing shown by that button number on the drum.

The unit will distinguish a transistor from an FET, then de-

termine all the critical transistor parameters of Beta, Icho, Gm, and Idss. The parameter test implements a new time - saving automatic circuit that eliminates the need to zero or unity calibrate the tester before each gain measurement.

A variable *volume* control located on the back of the unit enables the user to set the pitch of the chirp to his preferred level, or the speaker can be shut - off by a switch on the front panel of the unit.

Parameter Testing

Parameter testing of FET's employ the same method as for regular transistors except that the power classification is not distinguished as all FET's are checked at zero bias. For a single gate FET merely select the GATE 1 position and when checking a dual gate FET, you connect the second gate lead and test both GATE 1 and GATE 2.

A third position may be selected for testing enhancement type FET's.

The transistor analyzer eliminates the need for printed set - up and reference data, but a Transistor and FET Reference book is included as a back - up guide. The book has been simplified to allow quick access to the most important information about any of over 19,000 transistors.

Protection

Complete protection is provided so that the permutator buttons can be operated at any time without heavy current damage to the transistor when it is improperly connected. Power for out - of - circuit gain testing is only provided when the transistor first shows a good *Cricket test* indication. Power for the gain test will be switched off if a second permutator button is depressed while holding the gain button depressed. This protection system makes the test safe.

General Specifications

The analyzer has a large 6 - inch, 100 μ a meter with a full scale accuracy of 2%. It measures 9 $\frac{3}{4}$ inches high by 7 $\frac{1}{2}$ inches wide by 7 $\frac{1}{4}$ inches deep and weighs 6 lbs. Price is \$240 (\$190 with trade - in).■

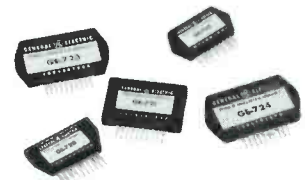
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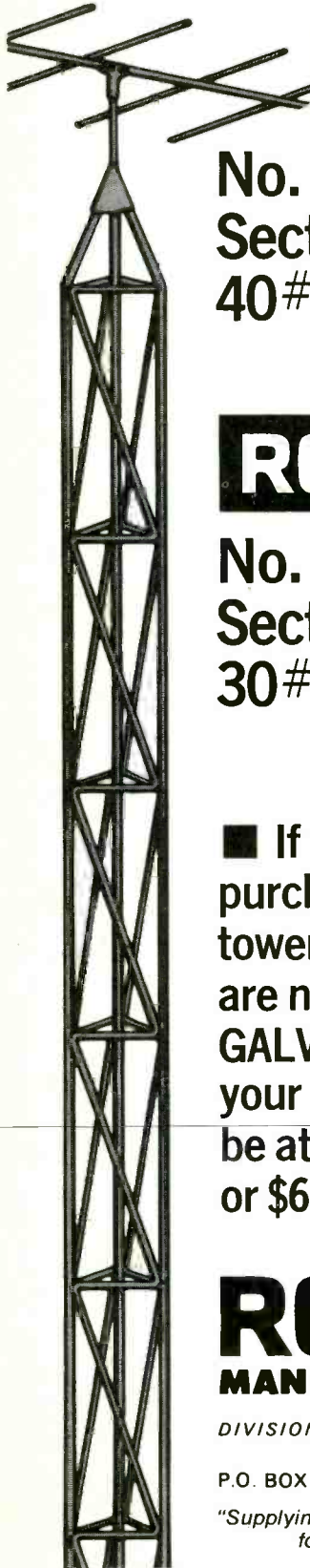


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Regulation of TV...

continued from page 19

pair firms would have added incentive to hire and train competent technicians in order to reduce the probability of prosecution for violation of the law. Rigid apprenticeship rules or requirements that technicians be graduates of "approved" schools should be avoided.

3) Information be available to other local consumer agencies for dissemination to the public if and when repair firms are found guilty by the consumer agency of making fraudulent or incompetent repairs.

4) An explicit statement that the administrator of the agency charged with enforcement should not have

had any past or have any present financial interest in the particular industry being regulated.

5) An advisory board be established, if desired, to give the administrator assistance when needed. Members of the industry and the public should be represented on this board. A board composed of two industry representatives and three public representatives seems workable. The Governor, with approval of the legislative branch, should appoint the board members as well as the administrator of the agency. It should be made explicit that the board acts only in an advisory capacity." ■

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TECHNICAL DIGEST

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

GTE SYLVANIA

Color TV Chassis E04—Solving Tuning Problems

Step 1—Substitute the switching panel. If the trouble is corrected, check the transistors on the original panel. If the problem is not corrected, the trouble is in the tuner or pushbutton assembly. Go to Step 2.

Step 2—Check voltages to the tuner at the switching panel terminals, as follows:

TM4—B+ +24 volts.

TM3—VHF Switch +24 volts.

TN3—AGC will vary with signal.

TM6—Hi-Lo Band Switching, approximately -24 volts, Low - Band.

TM6—Hi-Lo Band Switching, approximately +24 volts, High-Bands

TL6—Timing voltage, approximately +.5 volts to +28 volts VHF, +1.5 volts to +28 volts UHF.

Suggestion—Using a working set, make a chart of tuning voltages for all channels received in your area, for future trouble shooting reference. If problem is intermittent, take voltage readings when operating normally and then with trouble occurring, and compare. The AGC voltage will not be too helpful as a loss of signal or drift will change it. If the voltages are OK and do not change, the tuner is defective.

Step 3—If the tuning or switching voltages are not correct or change when the problem occurs, one or more of the push - button modules are defective. The tuning voltage should vary through the ranges listed above as a button is tuned over its entire travel.

A defective P.B. bank can often be located by opening the buss wires at the rear edge, one bank at a time. Unsolder and slip a strip of cardboard between wires and foil contacts. When a defective bank is opened, the remaining banks will tune OK.

Make resistance check of the P.B. bank. If the bank is opened, the diodes and transistors should be checked. The in - circuit check will show a defective diode and switch contacts.

A "sub" bank can be made up by using an extra bank and a package of miniature chip leads available at parts houses. Cut the clip off of one of the leads and solder leads to the foil contacts at the rear of the bank. The U-V jumper wire should be cut and a short clip connection installed across, so the split U-V bank can be subbed. To use, clip the leads to the appropriate buss wires in cluster, in place of a bank that has been isolated as above, and tune in the channels.

A set of extension cables including an IF extension will allow the cluster to be placed on the top of the set while servicing the unit.

GENERAL ELECTRIC

Color TV Chassis C2/CD—920 KHz Beat in Picture

Effective Jan. 21, 1974 (5A4T) a production change was made to eliminate 920 KHz beat from the few sets exhibiting this condition. A 270 ohm, 1/2w, 5% resistor (3R502) was added to the 8CB11 chroma amplifier grid circuit as follows:

The jumper wire from the "low" end of 3L501 copper "pad" connected to 3C501 and 3R501 was replaced with resistor 3R502, 270 ohm, 1/2 w, 5% (board location M6).

If you encounter a problem with 920 KHz beat in the picture, proceed as follows:

1) Align the 41.25 MHz and 4.5 MHz traps per service manual instructions.

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2) If trap alignment does not cure the problem, replace the 8CB11 tube. It may be necessary to try two or three new 8 CB11 tubes before deciding that this is not the problem.

3) If the trap alignment plus a new 8CB11 tube fails to correct the problem, add the new resistor 3R502 as explained above.

4) Following the addition of the resistor, realign the chroma overall as shown in the service manual instructions.

MAGNAVOX

Color Tv Chassis T960/T984 — Snow, No Picture

TV Models ME5050, 5056, and 5064 use the 340248-1 UHF tuner with the T960 B/W chassis. The oscillator transistor in the UHF tuner may be subject to failure depending on the source of the UHF tuner B+ voltage. Service Manual 7337 correctly shows the B+ source obtained from the 135 v supply through a 13 K dropping resistor, R504, on the main PC board. Some of these models omitted resistor R504 and obtained the UHF tuner B+ voltage directly from the chassis' 13 v source. The UHF tuners using the 12 v source for their B+ are the ones subject to failure. To correct this condition, rewire the UHF tuner B+ per the Service Manual. Resistor R504 is a 2 watt metal film resistor and must be Magnavox part number 230192-1335 or equivalent. Rewiring instructions will accompany replacement tuners.

B/W models ME5110 and 5111 use the 340238-1 UHF tuner and the T984 chassis. Some of these UHF tuners also were connected to the 12 v source. The same possibility of failure exists here as with the T960 chassis. Service Manual 7345 correctly shows the UHF tuner B+ source obtained from the 135 v supply through a 15K dropping resistor, R202. R202 is located on the VHF tuner wafer switch. To correct the wiring, rewire the UHF tuner B+ voltage per the Service Manual. R202 is a 2 watt metal film resistor

and must be Magnavox part number 230192-1539 or equivalent. Rewiring instructions will accompany replacement tuners.

ZENITH

Color TV Chassis 17/19EC45—Video Circuits—Minimize Brightness Drift

Normal temperature increases during warmup could result in a slight brightness drift in some 17 V and 19 V receivers. A modification to the 9 - 88 module was made which created the new interchangeable 9 - 88 - 01 module, associated with the 121 - 744 second video amplifier transistor stage. Most of the drift was caused by a normal change in the internal bias of this transistor and could result in a slight increase in brightness as the receiver warmed up. The changes on this module are shown in the illustration. Negative DC feedback is provided by the 12 K and the 3.9 K resistors in the collector to emitter path. In addition, a diode was added in series to compensate for the internal bias drift of the second video stage. Since these changes reduced the DC coupling of the video system, an additional change was made in the input circuit to restore the system to its original value. The transistor was also changed to a higher Beta device to further minimize any dependence of drift due to power supply voltage change with temperature.

Color TV Chassis 17/19EC45—Hiss in Sound

New audio circuitry in current receivers was designed to achieve greater "presence" in the sound system for portables. However, it was found that in some signal conditions an excessive amount of hiss was present. The audio circuitry was modified by the addition of a single .0068 mfd capacitor in parallel with the .0033 mfd capacitor shown in the illustration. This will reduce the hiss under poor signal conditions.

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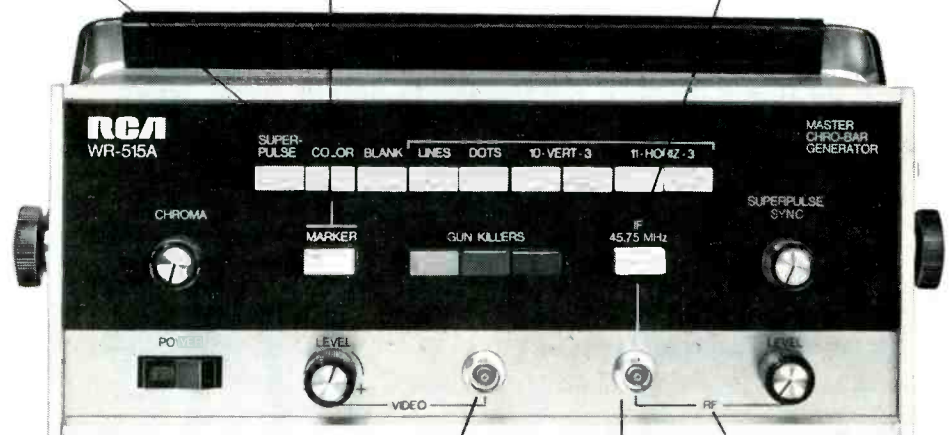
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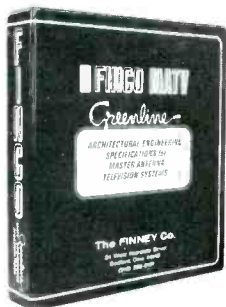
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NEW PRODUCTS

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166

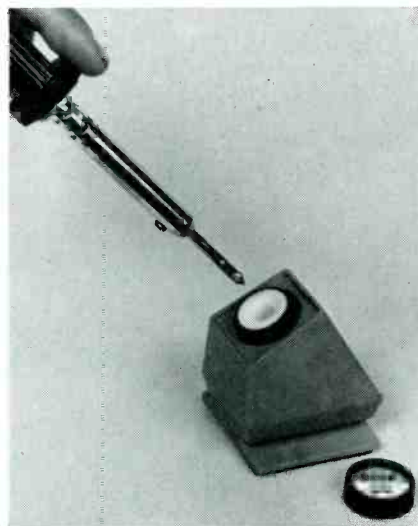
A storage wall with "high - strength" drawers to withstand heavy loads or rough treatment is introduced by *Hallowell Division, Standard Pressed Steel Co.* The 1100 Series Storage Wall also features a slot - and - rib arrangement in the drawer that locks dimpled drawer dividers into place, preventing them from being dislodged. The drawers are strengthened by double - wall drawer side construction, giving them additional rigidity.



The storage wall comes in models containing 12, 14, 16, 18, 24, 28 and 32 drawers, 11 or 17 inches deep. The drawers are available in sizes 2 5/8 - inches or 1 3/4 - inches high and can be 5 1/4 inches or 8 inches wide.

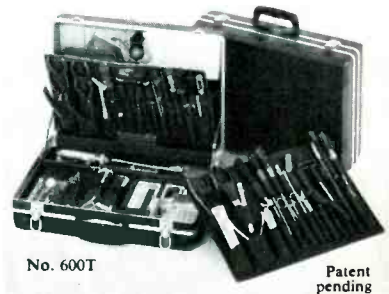
SOLDERING IRON TIP CLEANER 167

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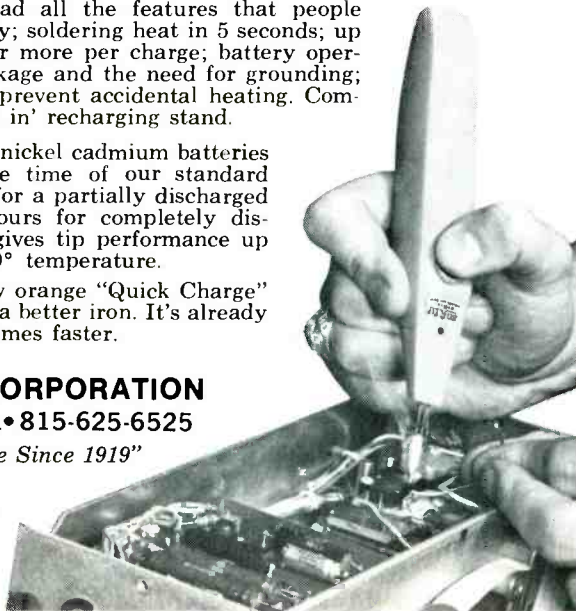
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TV SERVICE TABLE

168

A completely newly designed TV service table that makes it easy to move TV chassis around the shop is now available from *RCA Parts and Accessories*. This handy roll-around utility table is 35 inches tall, to match the heights of most service benches. Its top shelf — constructed of 20 gauge sheet metal, and insulated with 1/2 inch tempered masonite panel — offers nearly four square feet of work sur-



face. The convertible bottom shelf can be installed with a flat surface, or inverted for use with its 1 3/4 inch lip to prevent small parts and tools from falling off. Constructed of 20 gauge rustproof steel, the table is coated with blue enamel paint, baked on for years of hard usage. Two of its four three inch rugged plastic casters are equipped with push-down brakes to prevent rolling. Although shipped dismantled, the service table can be easily and quickly assembled.

CRT ANALYZER/REJUVENATOR 169

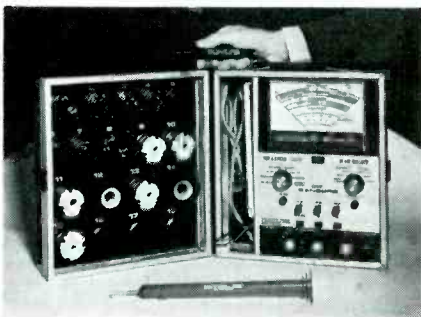
Hickok's Model 265 CRT Analyzer/Rejuvenator is a lightweight, portable service instrument capable of completely testing and rejuvenating all B/W or color TV picture tubes including the new in-line types. The instrument is designed with simplified meter scales and controls for use in the home or on the bench and comes complete with 3 individual socket assemblies. Simplified set-up of the G1 control and automatic set-up of the G2 control reduces service time. The sensitive tracking test assures proper gray scale tracking. A single 10-position function switch controls the shorts, opens, emissions, and tracking



tests, as well as the three rejuvenating levels. The instrument also incorporates a unique filament protection circuit to prevent - accidental CRT filament burnouts. All solid - state circuitry with glass - epoxy PC boards assures long service life.

CRT TESTER AND RESTORER 170

Sencore, Inc., has announced a combination CRT tester and restorer that is designed to test the operating circuit potentials as well. The Model CR31 Super Mack is four testers in one. It is a complete CRT tester with automatic tracking tests. It comes complete with 15 plug - in sockets contained in the cover of the instrument and allows testing of the latest GE and Magnavox in - lines. The instrument is an automatic CRT rejuvenator for those color tubes that need a small amount of current drawn from the cathode to obtain tracking. It is also an automatic CRT restorer with timed circuits. A

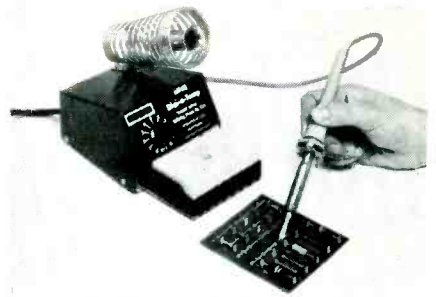


button is simply pushed and the timer restores three times automatically. The time is adjustable, but is preset at the factory according to CRT requirements. A manual position is provided if a technician decides he wishes to take the restoration into his own hands on harder to rejuvenate CRTs. The CRT tester and rejuvenator is a circuit parameter tester with built - in focus voltage probe and second anode 50 kv adapter to measure the high voltage used in the latest TV receiver. The line voltage and filament voltages are measured internally to be sure that these external voltages aren't the cause of the prob-

lem rather than the CRT. The Super Mack is priced at \$395.00, but carries a \$75.00 trade - in, thus lowering the effective selling price.

SOLDERING STATION 171

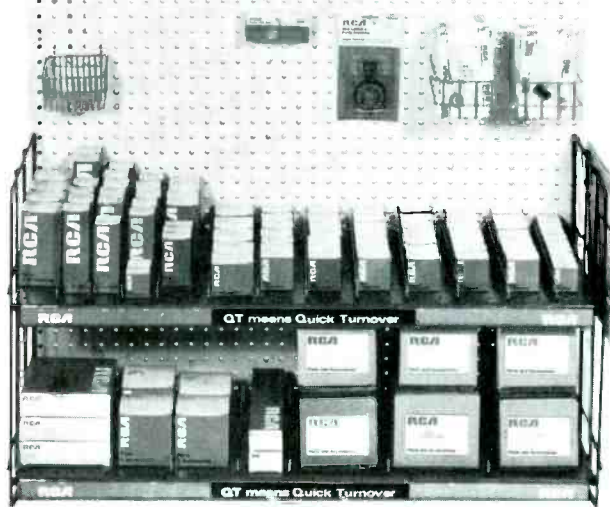
The *Hexacon Electric Co.* announces a new concept in a variable temperature soldering station called "Dial - a - Temp." The soldering station permits infinitely variable temperature selection from 350° F to 950° F by simple dialing. It has an isolated, low voltage power input and a new grounding feature which eliminates voltage leakages which might damage sensitive components. The unit has an On/Off switch with indicator light. The heat



guard holder and the tip cleaning sponge and tray are combined in one compact unit. Standard long - life plated plug tips are used with the unit. Two standard models are available. Catalog No. 1520 using 3/16 inch tips and Catalog No. 1524 using 1/4 inch tips. ■

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Chances are you'd order our QT package anyway. It puts the most frequently used parts right at your fingertips. And combined with the QT rack that's also available, you can streamline your inventory control. Cut re-ordering time. Give faster customer service. And eliminate inventory risk.

Get in touch with your nearest participating RCA Parts Distributor and he'll show you which free luggage goes with which QT package. Or contact RCA Parts and Accessories, P.O. Box 100, Deptford, N.J. 08096.

*Offer expires June 30, 1975

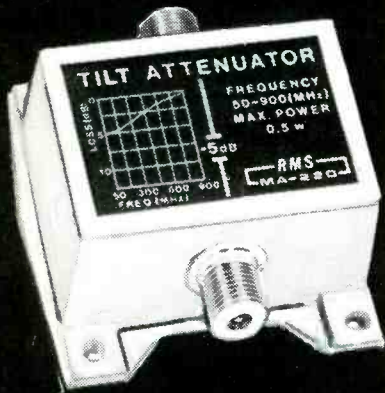


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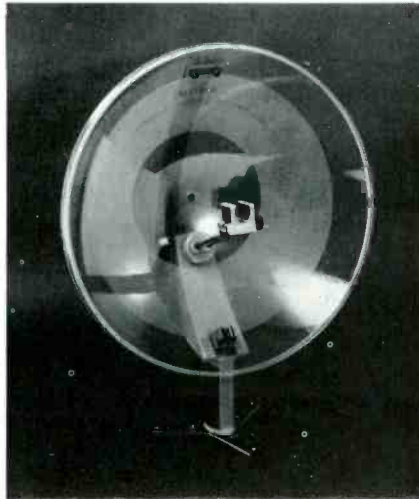
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DEALER SHOWCASE

PARABOLIC REFLECTOR 172

Sony Superscope, Inc., announces the addition of a portable parabolic reflector to the roster of Sony recording equipment. The Model PBR-400 has been designed to pick up high quality sound from a distance. Depending on climatic conditions and surroundings



the reflector has an effective recording range of up to several hundred yards. It will improve the sound sensitivity of most omni - directional microphones 10 to 20 dB over rated sensitivity. Weighing less than three pounds the unit is hand operable, through it comes with a stand adaptor for tripod use. Angle of acceptance for this recording aid is approximately 26 degrees. Included with the reflector are a microphone stand adaptor, stand adaptor for tripod, and hard vinyl coated carrying case with shoulder strap and internal accessory pouch. Price is \$79.95.

CB BASE STATION 173

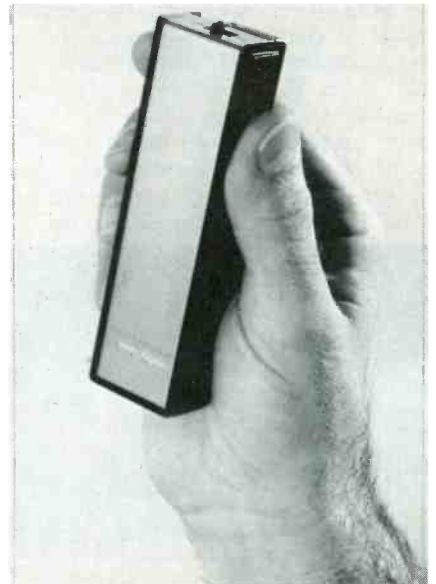
The E. F. Johnson Co. has unveiled its latest development in citizens band communications, the "Messenger 132," which extends the radio-telephone operating concept to base station use. The base station model offers all the advantages of handset design, including the option of private listening. If the user selects, the speaker is automatically silenced



when he lifts the handset to permit listening without disturbing others. The handset also provides increased clarity under noisy conditions. When group listening is desired, a switch on the front panel provides simultaneous handset and loudspeaker operation. Also featured on the unit is an illuminated meter that indicates received signal strength as well as relative RF power output. A PA function allows paging when the radio is used with a remote speaker. With the PA switch in the "on" position, the radio can be used for remote listening of incoming radio calls. The unit is equipped with all 23 CB channels and has a back - lighted channel selector that changes from white to red when the radio is in the transmit mode.

RADIO PAGER 174

Motorola Communications and Electronics, Inc., has introduced a new lowband METRO - PAGEBOY binary digital radio pager. Using hybrid technology consisting of monolithic integrated circuits, the new radio pager is said to be the smallest and lightest highspeed, high - capacity, city - wide pager available. Its binary digital characteristics make possible the placing of 100,000 pagers on a

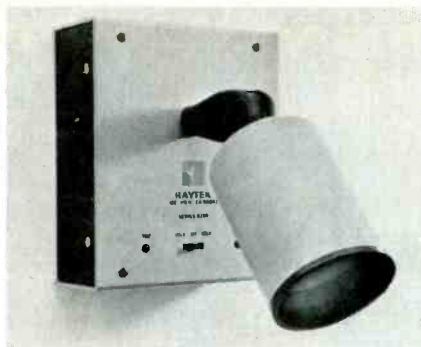


single system terminal versus the approximate 30,000 units possible before this new technology was developed. A major user benefit of the pager is its dual address or function capability. This allows the user to receive two different alert tones: one, a pulsating beep might indicate "call the office"; the other, a steady tone could indicate "call your home." This feature allows the user the advantage of maintaining two bases of operation at the same time and never be confused as to who wants him at a particular time. Another feature called "Mem - O - Lert" provides the ability of deferring

a page when desired. If the pager user does not wish to be paged, he can move his "three - position" switch on the top of the pager to the middle or "Mem - O - Lert" position and all incoming pages will be automatically stored until he moves the switch back to the "on" position. The radio pager provides a call rate of one call every one - fifth of a second.

PASSIVE INFRARED DETECTOR 175

Mountain West Alarm Supply Co., announced a new burglar alarm detection system that uses the latest passive infrared detection principle, virtually eliminating false alarms while providing positive detection of moving human intruders. Designated the R7 BiSpy, this passive device emits no radiation but simply monitors the infrared energy in the protected area and responds to moving human targets. On alarm an output relay operates to sound the alarm. Two detector - amplifier networks operate into a summing gate. The gate produces an alarm only when both detectors locate a moving intruder. Since all building materials form a barrier to infrared, the area covered is precisely defined. It will cover an area 25 feet by 25 feet or a narrow - field area 80 feet long by 3



feet wide. Each unit is powered by 12 volts AC or DC at 100 ma. Rechargeable DC standby power pack is included. Price is \$328.

MOTION DETECTOR 176

The ULTRASON Motion Detector from Master Lock Co., senses the instant anyone enters a protected area and sets off a shrill, pulsating shriek at remote plug - in "Satellite" alarms. Requiring no wire runs or other technical installation, the detector simply plugs into any 120 volt outlet. Ultrasonic waves flood the room guarding vulnerable areas against burglars and other unwanted intruders. No alarm sounds at the unit itself to give away its location. Instead, it sends a signal through existing power lines to a companion, matchbox - size alarm

unit that plugs into any wall outlet. An automatic 30 - second delay allows entering or leaving the area without actuating the alarm. Intruders moving into the area are immediately confronted by an unexpected flood of light from any room lamp plugged into the detector. Half a minute later a screeching alarm resounds from all Satellites in the house for five minutes, then automatically silences and resets itself.

SPEAKERS 177

Two new speakers have been added to the Quam - Nichols Co., high fidelity line. They are air suspension speakers, with a voice coil impedance of four ohms, compatible with newer model radios and tape decks. The units are Model 52C10FEXZ4, a 5 1/4 inch speaker with a whizzer cone and an orange foam edge, and the Model

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69C10FEXZ4, a 6 inch by 9 inch oval speaker with the same features. The price of the 5 1/4 inch speaker is \$12.50 and the 6 inch by 9 inch is \$16.50.

TAPE PLAYER

178

The Model TD8QW, quadrasonic 8 - track tape player is introduced by *BSR McDonald*. It is engineered with a unique tape head design feature. The tape heads are mounted on a straight line stepping cam so there is intimate contact with the tape on all tracks. Conventional 8 - track players are



made with a mechanism that allows the tape head to move in an arc at the end of a swinging boom. The tape player is designed to play the new discrete 4 - channel, 8 - track cartridges, as well as standard stereo tapes. When used with stereo tapes, the two channels of sound play through four speakers for a room - filling effect. It is housed in a walnut - grained cabinet.

OUTDOOR SIGN

179

General Electric's Tube Products Department is offering electronic services and illuminated outdoor sign to provide their TV/radio service shops with day and night identification. Dealers may order the three - by - five foot aluminum - framed Lexan sign in double - or single - faced formats. Faced with internal fluorescent lighting, the sign announces "COLOR TV RADIO SERVICE — (GE Logo) TUBES and TRANSISTORS" and presents the dealer's name in large letters. The double - faced sign is priced at \$165.00 and the single - faced sign \$155.00.

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ACTION BUILDS...

(continued from page 23)

Some MATV contractors who have sold on the basis of only *price* are now out of business. As a result, there are a lot of owners of poorly functioning MATV systems who don't know where to turn for help.

Wellener recently made a mailing to existing MATV systems, offering to upgrade or service them. Incredibly, he got a 5 - percent return on his mailing and as a result sold quite a number of upgrade and servicing contracts.

Of course, Action still does a lot of residential TV antenna work. Wellener continues to advertise heavily in newspapers and Yellow Pages for both antenna and MATV business.

SUMMARY

The reasons for Jim Wellener's success are not difficult to understand. Like most other successful businessmen, Wellener has studied the needs of his market and has come up with products and services that meet the standards of performance, quality and price to which his market is responsive. Equally important, Wellener has a well planned, on - going sales promotion program which keeps his market aware of his ability to meet its needs and expectations. ■

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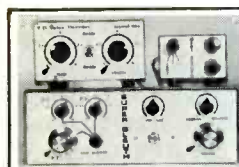
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ADVERTISER'S INDEX

100 AMP Products, Inc.	55
101 Antenna Corp. of America	50
133 Appleway Electronics	46
102 Astatic Corporation	25
103 B & K Div. Dynascan Corp.	15
104 Book Club Tab Books	32-35
105 Book Club Techmatic	53
Cleveland Institute	59-60
106 Eico	6
Finney Co., The	49
107 Fordham Radio Supply Co., Inc.	58
GTE Sylvania	1
General Electric Company, Tube Division	45
108 Heath Co., The	5
110 Hewlett - Packard	54
109 Hickock Electrical Inst. Co.	12
111 Jensen Sound Laboratories	43
112 Jerrold Electronics Corp.	39
113 Leader Instruments Corp.	Cover 3
114 Mountain West Alarm Supply Co.	55
115 Nationwide	55
117 Oelrich Publications	58
116 Oneida Electronic Mfg., Inc.	47
119 PTS Electronics, Inc.	Cover 2
118 Projector - Recorder Belt Corp.	58
120 Qualitone Industries, Inc.	52
121 Quasar Electronics Corp.	11
126 RCA Electronic Instruments	48
125 RCA Parts & Accessories	51
RCA Picture Tube	7
123 RCA Solid State	3
122 RMS Electronics, Inc.	52
124 Rohn Manufacturing	46
127 Rye Industries, Inc.	47
128 Solid State Systems	13
129 Triplett Corporation	Cover 4
130 Wahl Clipper Corporation	50
131 Weller - Xcelite Electronics Div. The Cooper Group	58
132 Workman Electronic Products, Inc.	10

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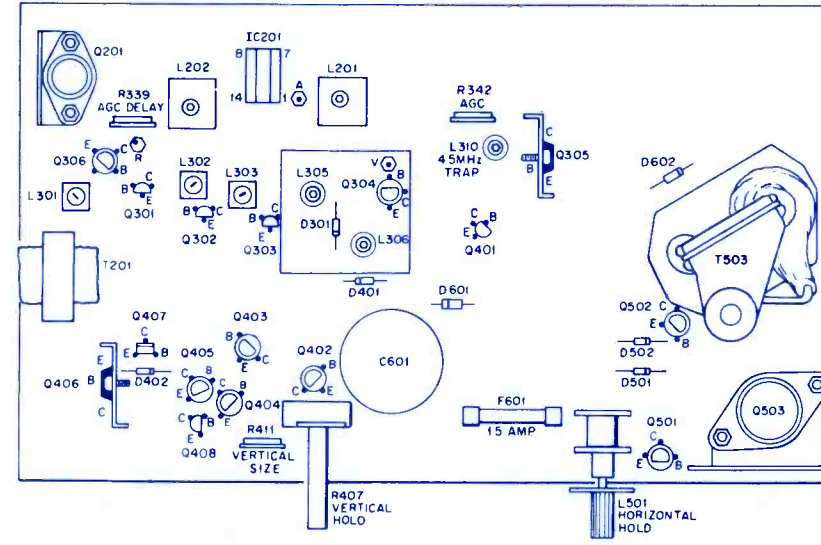
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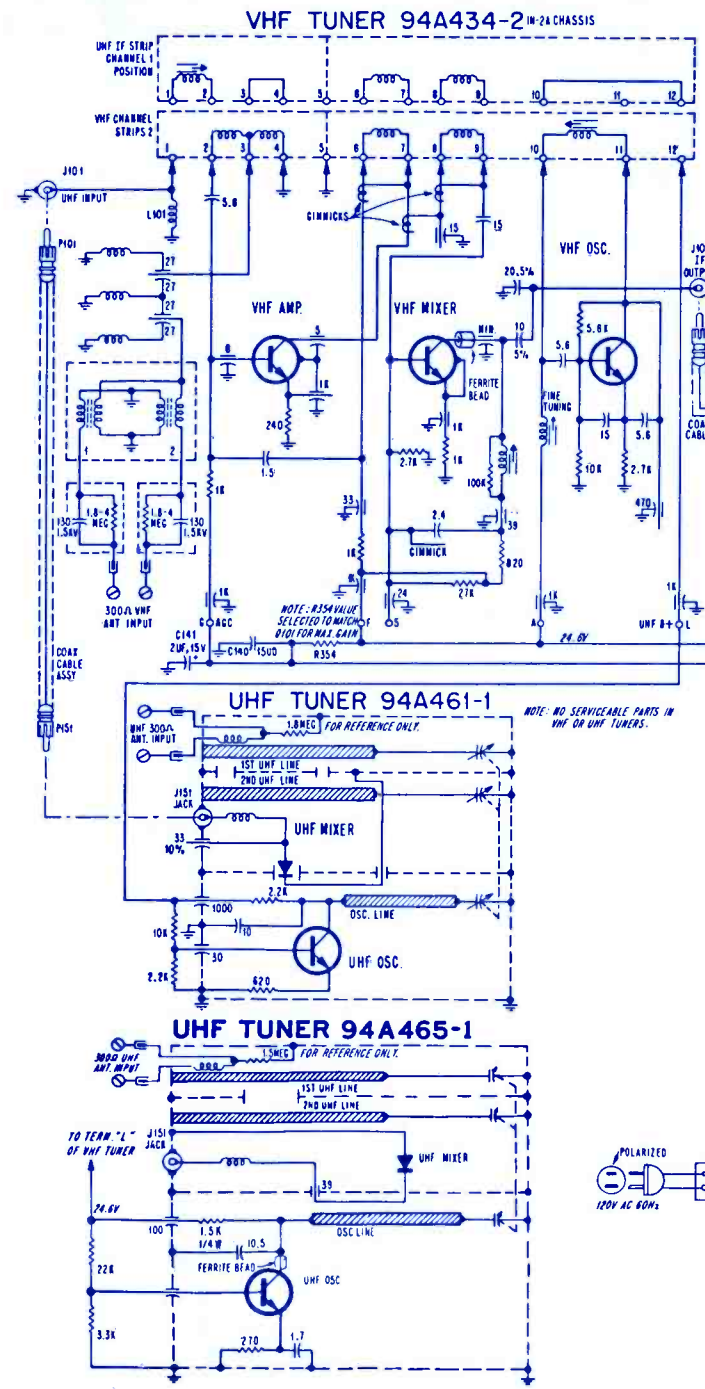
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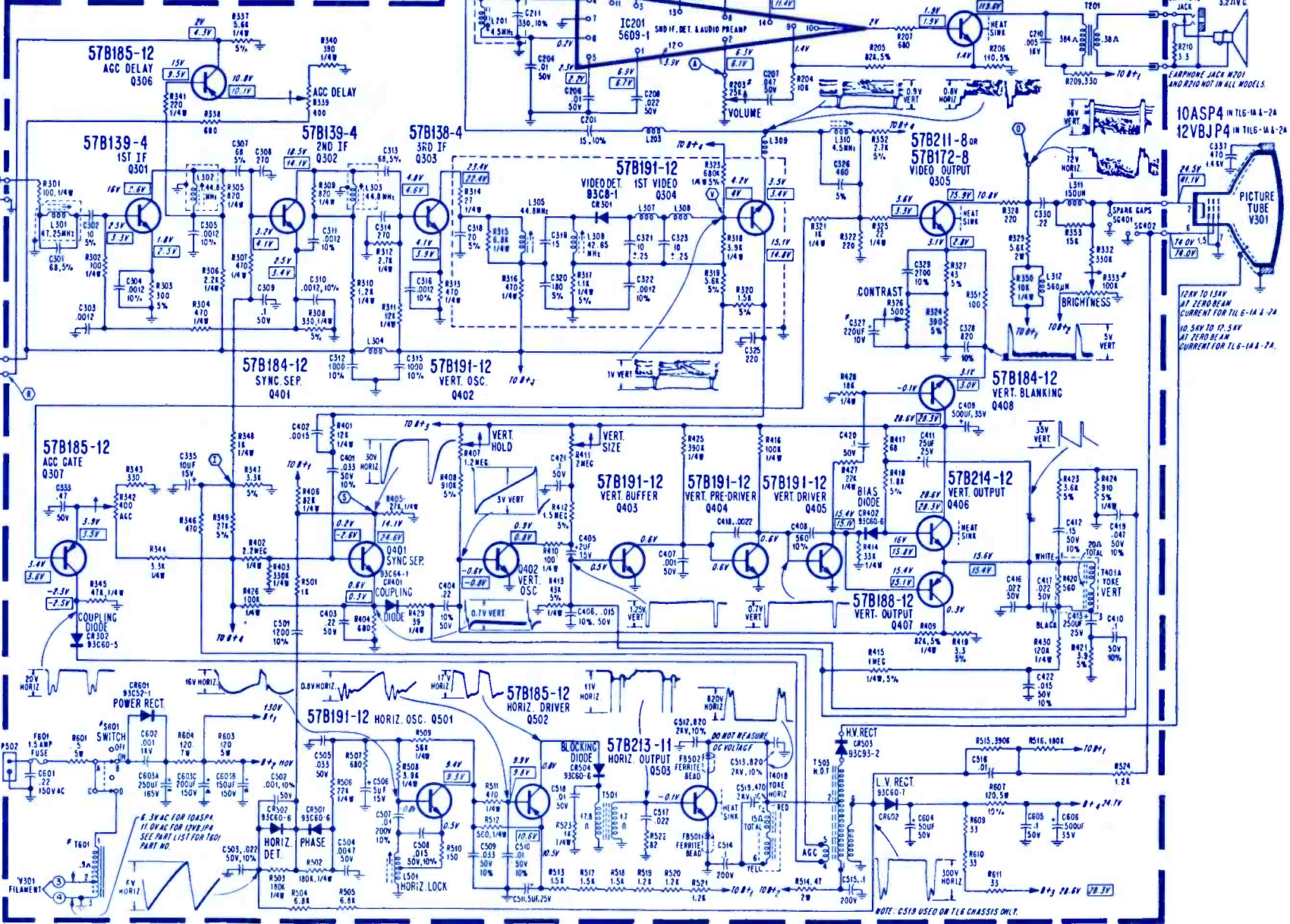
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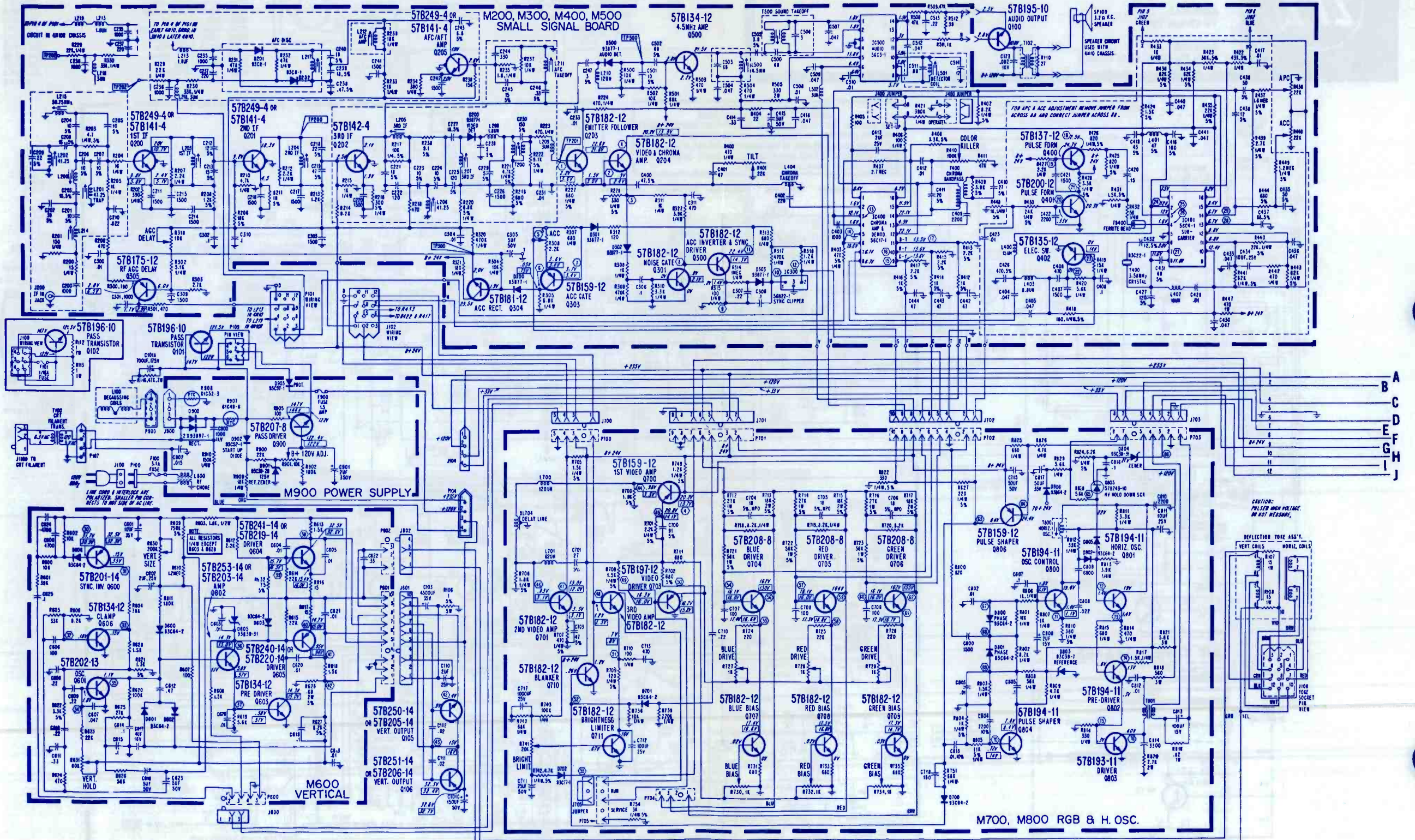


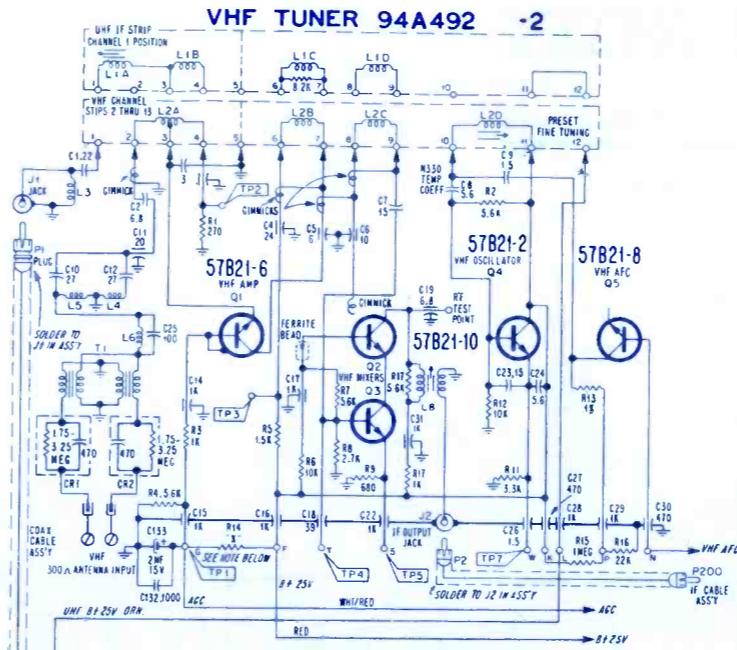
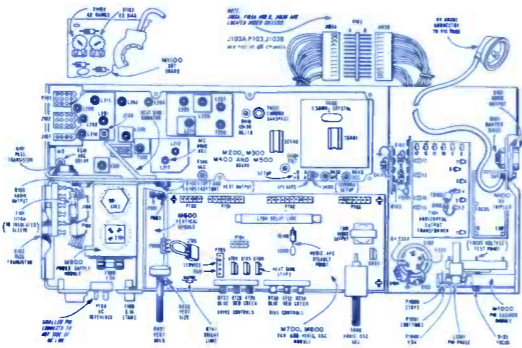
SYMBOL	DESCRIPTION	TRAV-LER PART NO.
C603	250/200/150µf, 165v electro	67A30-11
L201	coil 4.5MHz	72A317-1
L310	coil, 4.5MHz trap	72A317-9
L501	coil, horiz lock	94A480-1
T201	x-former audio output	79A172-1
T401	yoke deflect, TL6-1A-2A	94A372-3
T401	yoke deflect TL6-1A-2A	94A372-4
T501	x-former horiz drive	72A417-1
T503	x-former horiz output	79A166-3
R203	25K brite control	75A1-210
R326	500Ω, contrast control	75A1-211
R333	100K brite control	75A1-212
R339	400Ω, AGC delay	75A101-35
R342	400Ω, AGC control	75A101-36
R411	2M vert size	75A101-61
R407	1.2M vert hold	75A191-3
	fuse 1.5a	84A7-5



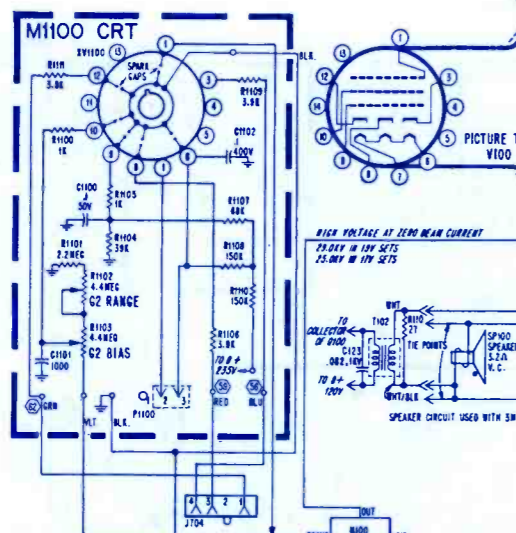
SAFETY NOTICE
THE DESIGN OF THIS RECEIVER CONTAINS MANY CIRCUITS AND COMPONENTS INCLUDED SPECIFICALLY FOR SAFETY PURPOSES. FOR CONTINUED PROTECTION, NO CHANGES SHOULD BE MADE TO THE ORIGINAL DESIGN. REPLACEMENT PARTS MUST BE IDENTICAL TO THOSE USED IN THE ORIGINAL CIRCUIT. SERVICE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.





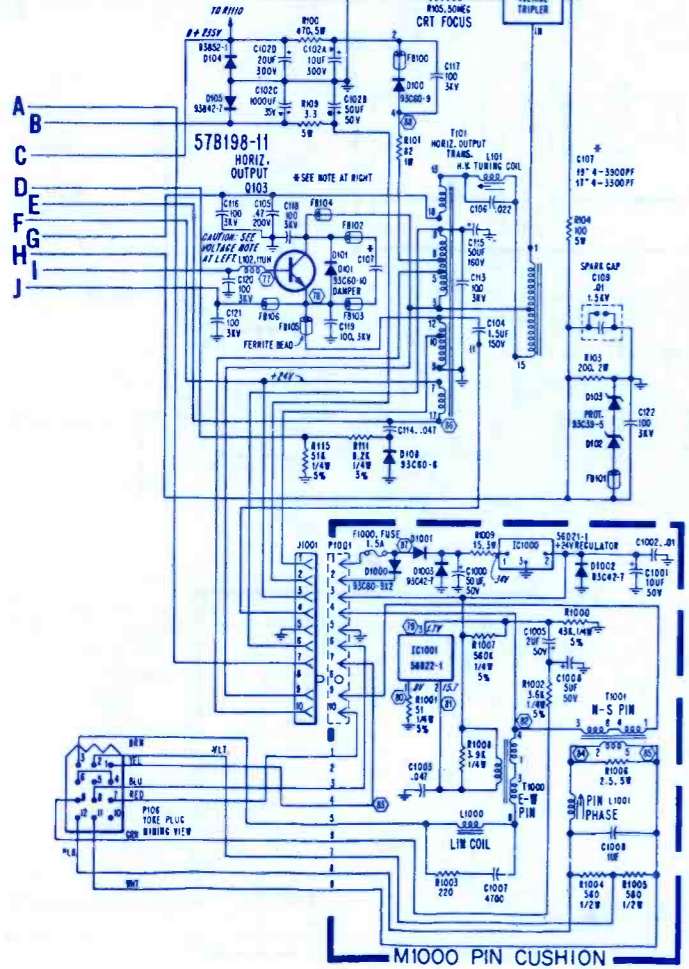
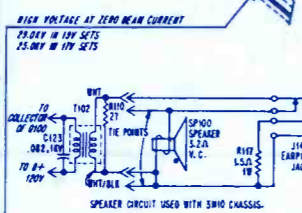


ADMIRAL
Color TV Chassis
3M10/4M10/4M10R



PIC. TUBE SIZE	PICTURE TUBE TYPE	USED IN CHASSIS
17V	17VAYTC02	3M10
19V	19VEJTC02	4M10
19V	19VEJTC02	4M10R

- RUN CHANGES**
- 10 Start of 4M10 production.
 - 11 Small signal Board changed from A8950-2 to -3. Start of 3M10 production.
 - 12 M700, M800 RGB & H OSC Board changed from A8951-3 to -5. M900 Power Supply Board changed from A8953-2 to -3.
 - 13 M1000 Pin Cushion Board changed from A8954-2 to -3. Connectors J1000 & P1000 were omitted. Start of 4M10R production.



CAUTION: TO AVOID DAMAGE TO TUBES, DISCONNECT SOCKET J1001 WHEN APPLYING EXTERNAL TEST SIGNALS TO ANY POINTS WITH SET TURNED ON.

NOTES: UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS, KΩ, OR MΩ. CAPACITANCE VALUES 1 OR HIGHER ARE IN P.F.; CAPACITANCE VALUES LESS THAN 1 ARE IN P.F.; IMPEDANCE VALUES ARE IN Ω. ⊕ INDICATES CHASSIS GROUND. ⊖ INDICATES CATHODE OR SECOND DC VOLTAGE ARE MEASURED WITH VTM PLACED BETWEEN POINTS INDICATED IN CHASSIS GROUND. LINE VOLTAGE SET AT 120V AC. ALL CONTROLS SET FOR NORMAL PICTURE UNLESS OTHERWISE INDICATED. VOLTAGE READINGS ARE TAKEN WITHOUT SIGNAL, WITH TUNER SET TO UNUSED CHANNEL. VOLTAGES SHOWN IN BOX ARE MEASURED WITH RECEIVER TUNED TO A COLOR SIGNAL.

TRANSISTOR CAUTION: TO AVOID DAMAGE TO TRANSISTORS, DO NOT OPERATE CHASSIS WITH PICTURE TUBE BAG DISCONNECTED FROM CHASSIS GROUND. DO NOT TURN SET ON WITH TRANSISTORS, TUBES OR LEADS REMOVED OR UNDISCONNECTED. DO NOT AC TAP AND LEAD TO CHASSIS GROUND. DISCONNECT TWO WIRE ONLY TO PICTURE TUBE BAG OR BAG GROUND. USE CAUTION TO PREVENT ACCIDENTAL SHORT BETWEEN COMPONENT TERMINALS OR TO CHASSIS GROUND. DO NOT APPLY EXCESSIVE HEAT TO TRANSISTOR LEADS. DO NOT USE AN ORDINARY WAX FOR RESISTANCE MEASUREMENT, USE VTM OR B-X100 RANGE OR HIGHER.

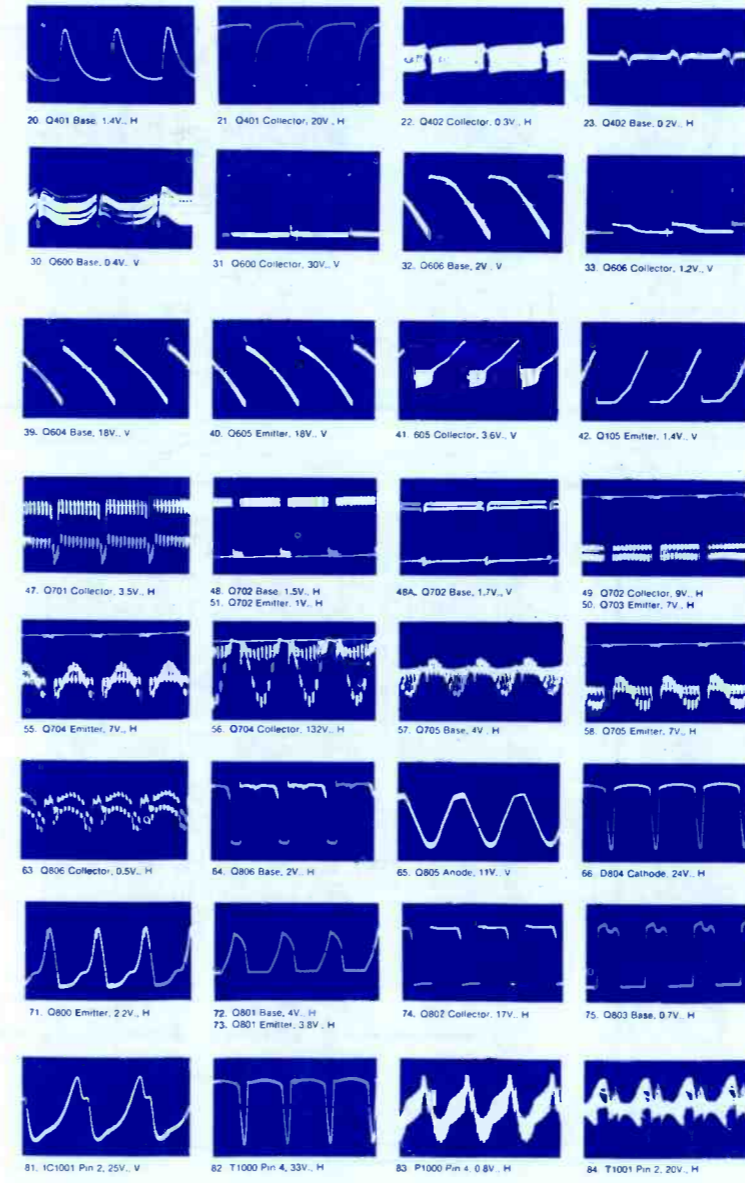
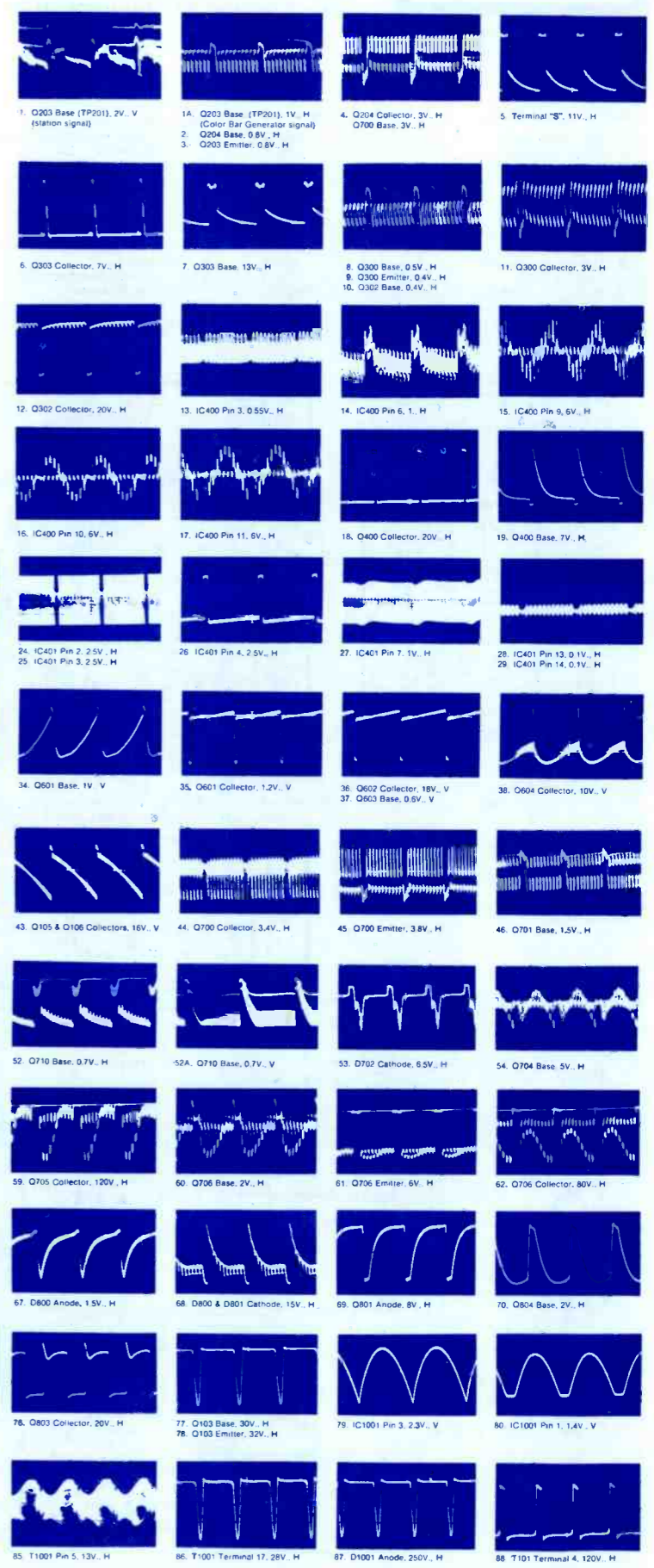
Ⓜ RUN NUMBER INDICATES CHANGES INCORPORATED AS GIVEN UNDER THAT RUN NUMBER, AS WELL AS ALL LOWER RUN CHANGES.

Ⓝ SYMBOLS IN RECTANGLES INDICATE TEST POINT CONNECTIONS.

Ⓞ RESISTORS INDICATE WATERTIGHT OBSERVATION LOCATIONS. CONDUCTORS FOR TAPING WATERTIGHT MEASUREMENTS ARE GIVEN WITH WATERTIGHT PHOTOS.

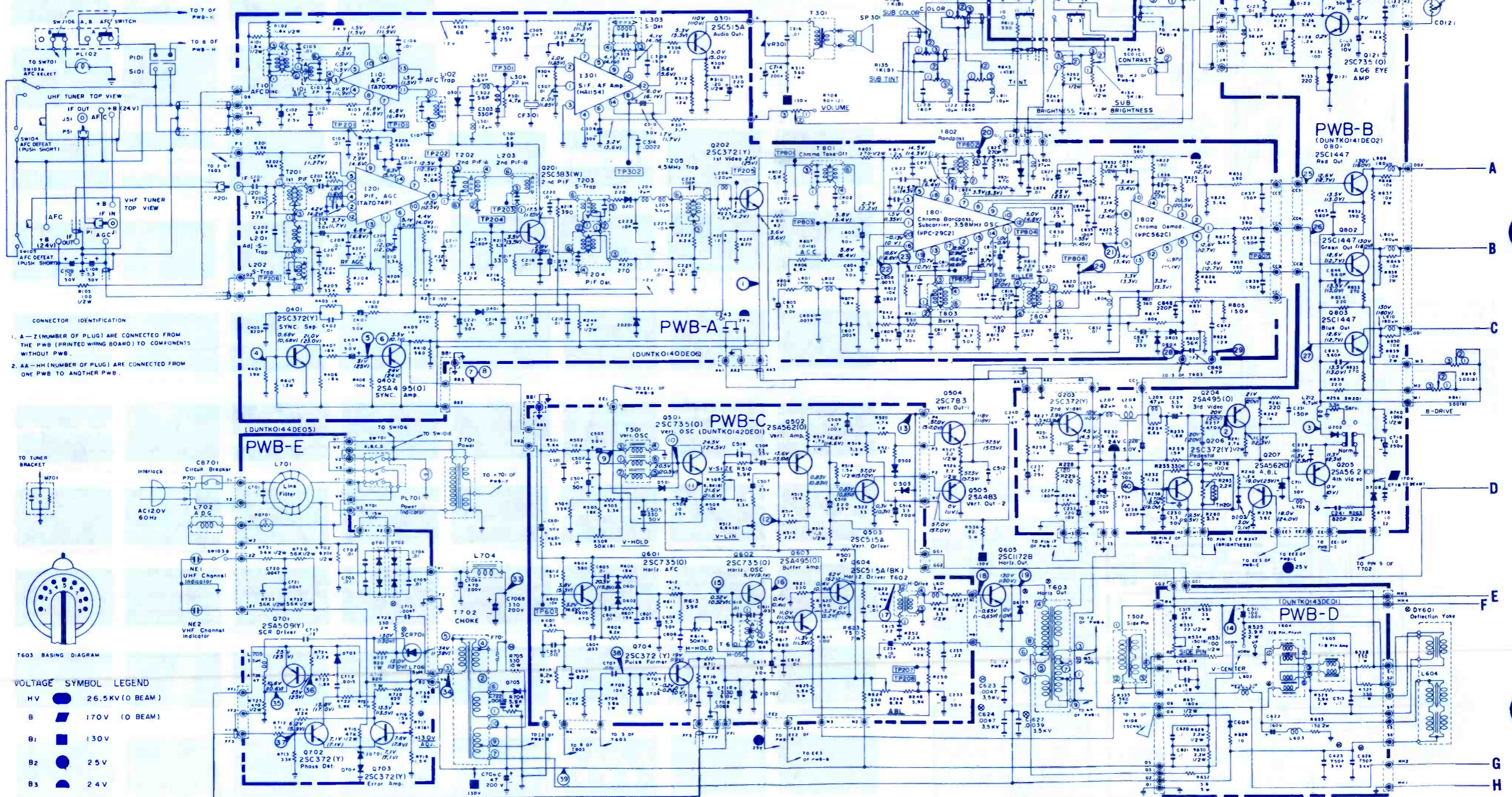
SAFETY NOTICE

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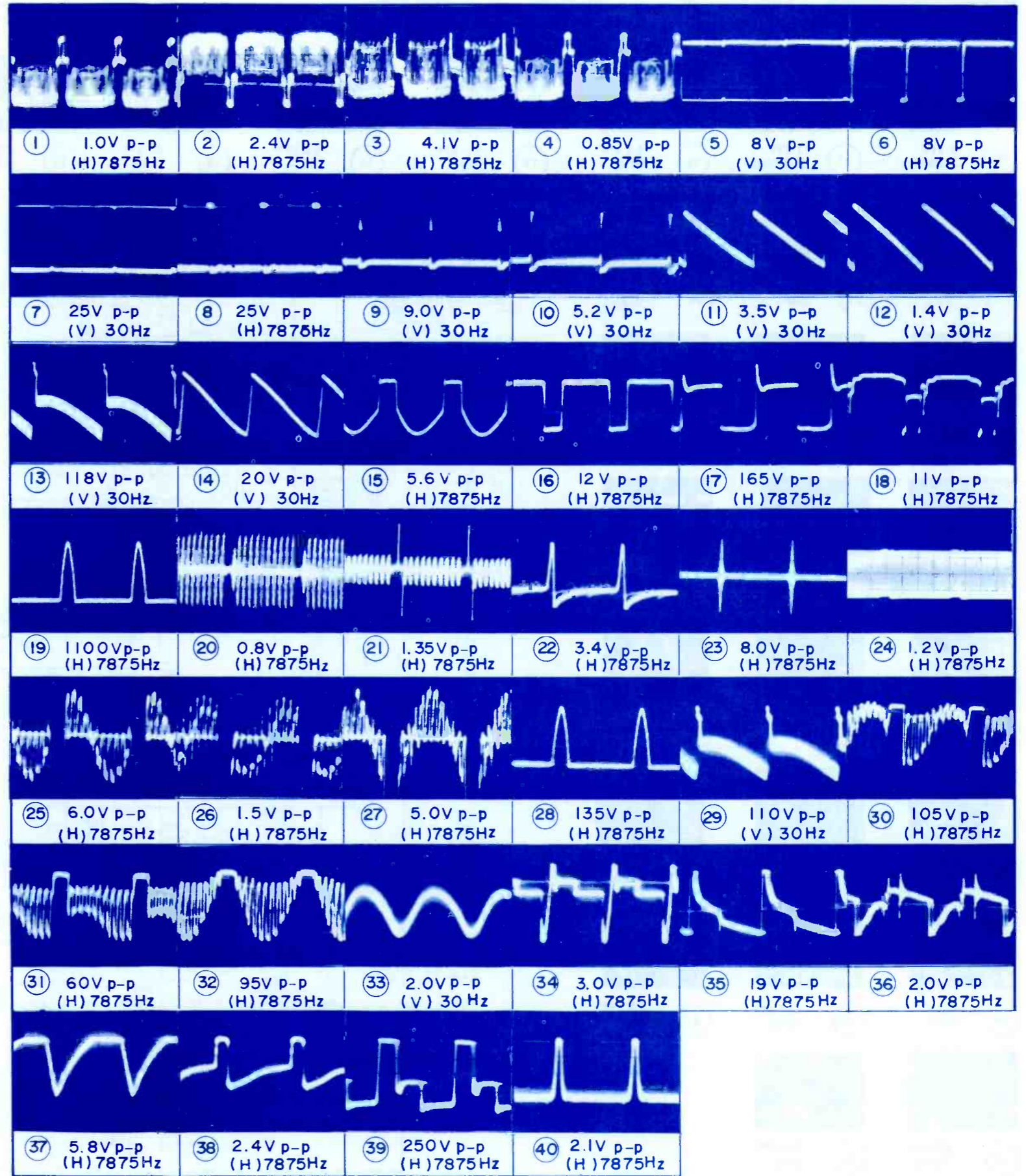
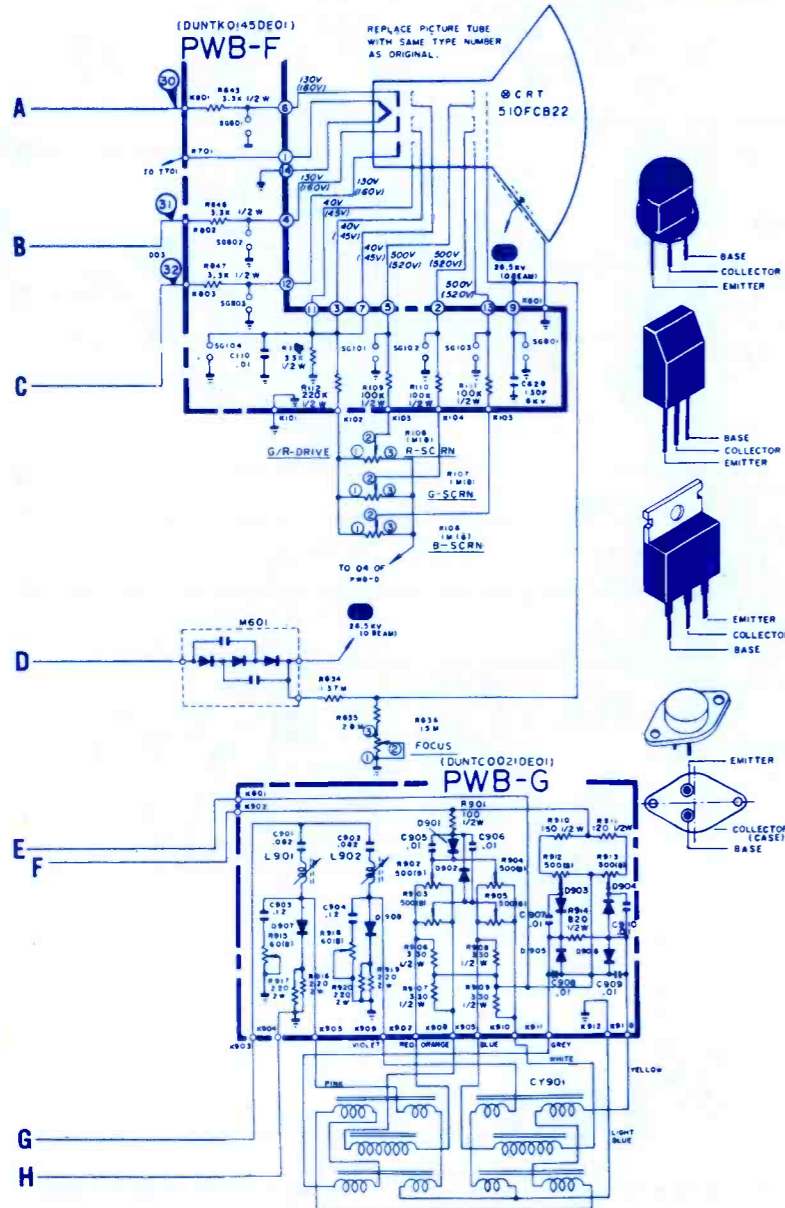
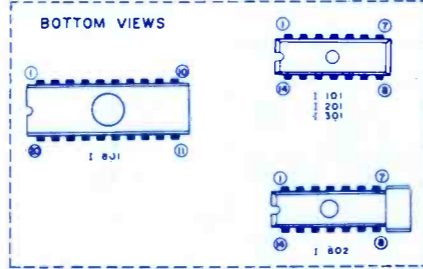
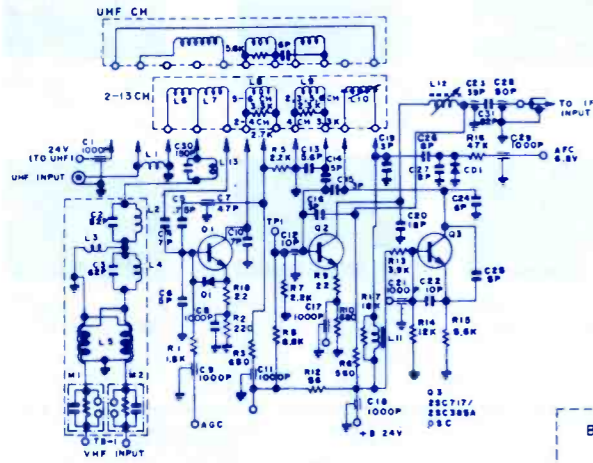
SYMBOL	DESCRIPTION	AIRLINE PART NO.
R106	1M pot red screen	J25616
R107	1M pot green screen	J25616
R108	1M pot blue screen	J25616
R132	500 Ω, pot sub contrast	TV25523
R134	5K pot sub brite	J25615
R135	1K pot sub tint	J25614
R136	1K pot sub color	J25614
R245	500 Ω, pot contrast	J25625
R247	5K pot brite	J25613
R308	50K pot volume slide	J25631
R636	15M pot focus	J25612
R840	500 Ω, pot R/G drive	TV25523
R843	1K pot tint	J25617
R844	1K pot color	J25626
R614	50K, horiz hold	J25624

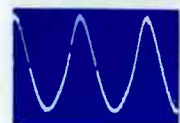
R512	6.8K vert lin	J25622
DY601	coil deflect yoke assm. incl. L604 & JD-S	J611126
T301	x-former audio output	J11421
T502	x-former side pinch cushion	J11420
T603	x-former horiz output	J11417
T701	x-former power	J11418
T702	x-former power choke	J11429
T602	x-former, horiz osc	J11422
M601	HV recifer module incl. CRT	J34150
M701	capristor	J34151
VR301	voltage dependent resist	J241238
CB701	circuit breaker	J18509
F701	fuse, 4a pigtail s/o blo tuner, UHF w/indicator mechanism	J35431
	tuner, VHF	J35428



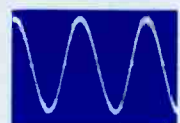
VHF TUNER ASSEMBLY

AIRLINE
Color TV Model
GEN 12985B

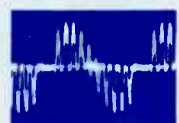




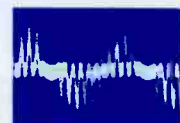
10 .8 VPP 3.58MHz



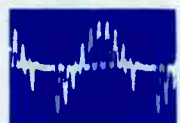
11 1 VPP 3.58MHz



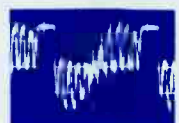
12 4.4 VPP Horiz.



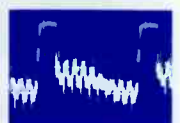
13 1.6 VPP Horiz.



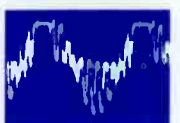
14 5.2 VPP Horiz.



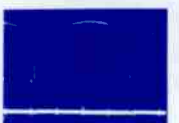
15 60 VPP Horiz.



16 36 VPP Horiz.



17 60 VPP Horiz.



18 22 VPP Vert.



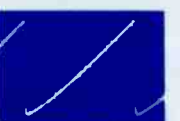
19 7 VPP Vert.



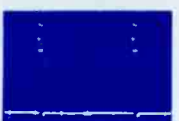
20 20 VPP Vert.



24 6.8 VPP Vert.



25 4.4 VPP Vert.



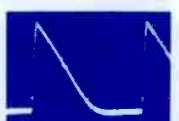
26 25 VPP Vert.



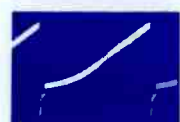
27 4 VPP Vert.



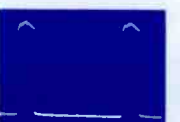
28 3 VPP Vert.



29 2 VPP Vert.



30 28 VPP Vert.



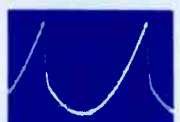
31 5 VPP Horiz.



32 40 VPP Horiz.



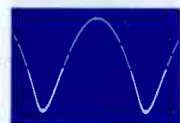
33 13 VPP Vert.



34 4 VPP Vert.



35 8 VPP Vert.



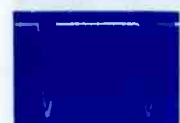
36 10 VPP Vert.



37 3.2 VPP Horiz.



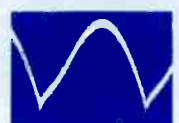
38 150 VPP Horiz.



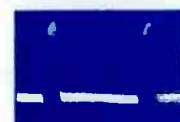
39 480 VPP Horiz.



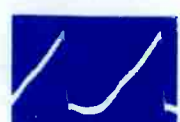
40 440 VPP Horiz.



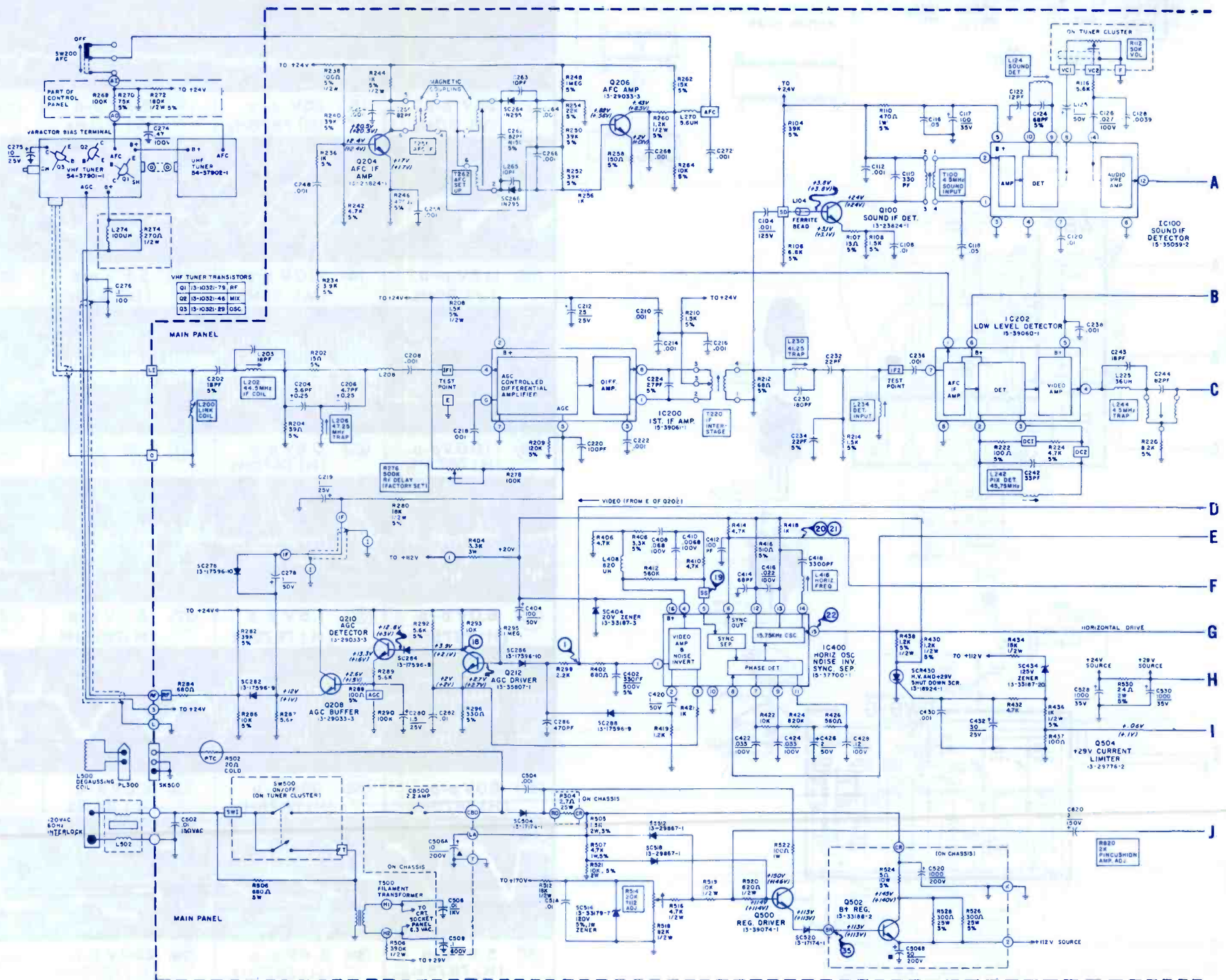
41 2.5 VPP Vert.

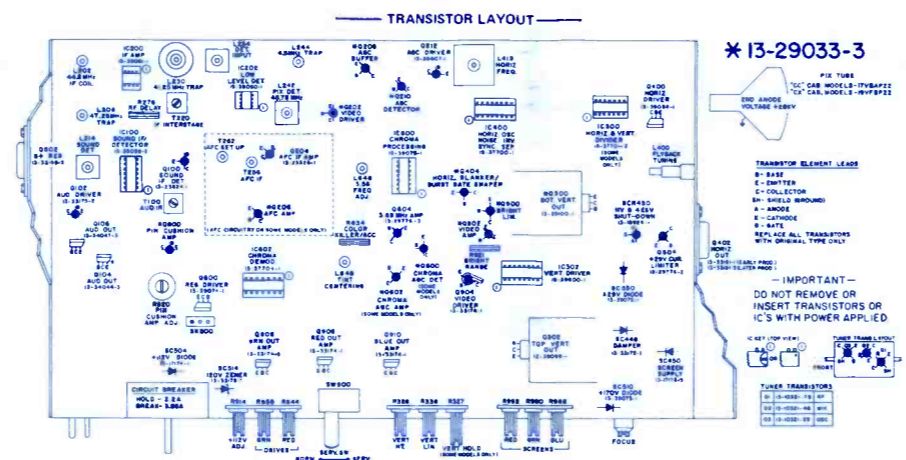
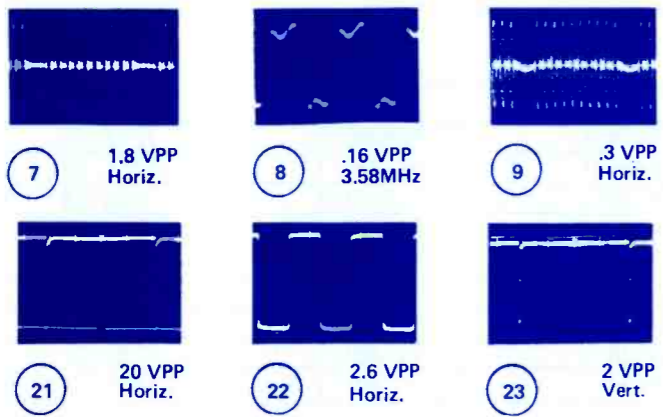


42 90 VPP Horiz.



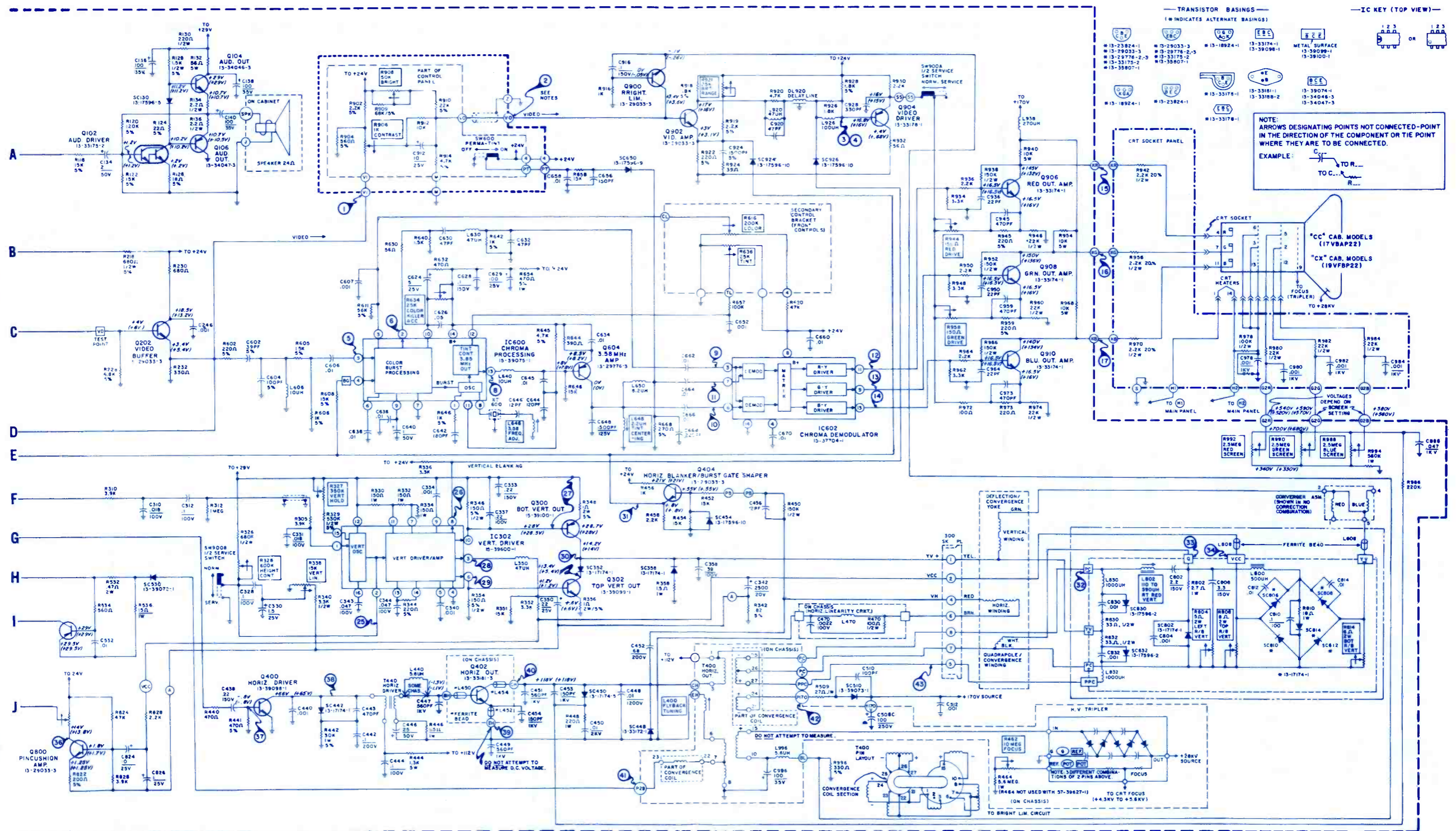
43 6.6 VPP Vert.





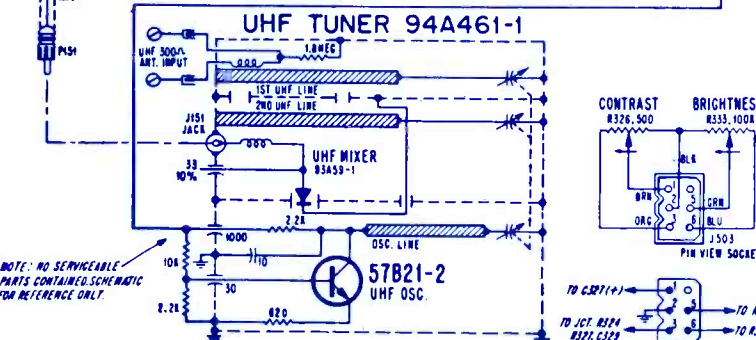
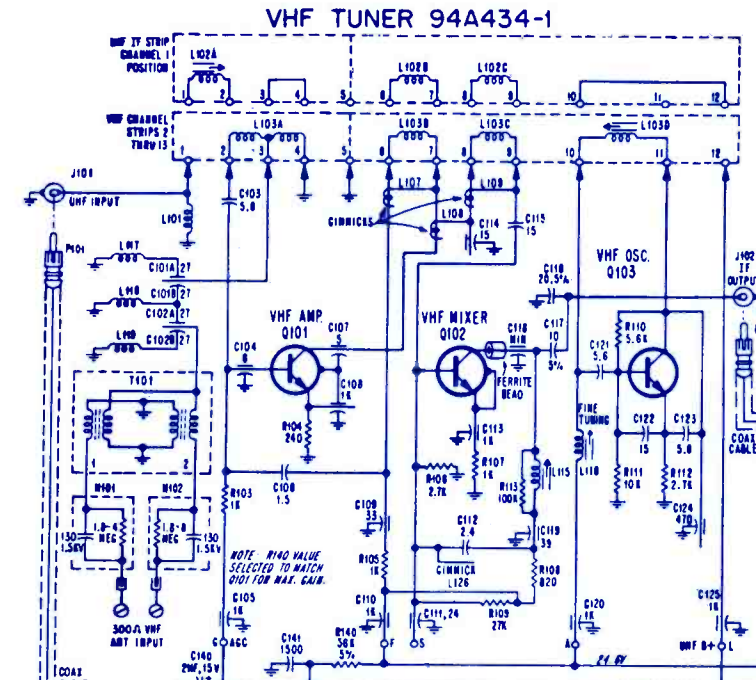
SYMBOL	DESCRIPTION	SYLVANIA PART NO.
C506	three section electro	41-39071-1
A	10/200v	50-35309-1
B	50/200v	50-39121-1
C	100/250v	50-39121-2
L244	4.5MHz trap	50-39053-1
L418	horiz freq early prod	50-39084-1
L418	horiz freq later prod	50-39234-1
L648	tint center	56-39101-1
T100	4.5MHz sound input	55-39078-2
T400	HV	29-39696-4
T440	horiz drive	37-14576-12
T500	filament	37-33036-18
CB500	circuit breaker	part of R328
R276	500K RF delay	37-29783-24
R328	600K vert height -2 CH	37-15902-4
R338	15K vert lin	37-14576-19
R514	20K, +112v adj	part of R616
R616	200K color -1, 3 CH	37-15902-5
R616	5K color -2 CH	37-14576-19
R634	25K color kill	part of R616
R636	25K tint -2 CH	37-15902-5
R906	1K contrast	37-14576-19
R921	25K brite range	

SYLVANIA
Color TV Chassis
E08-1



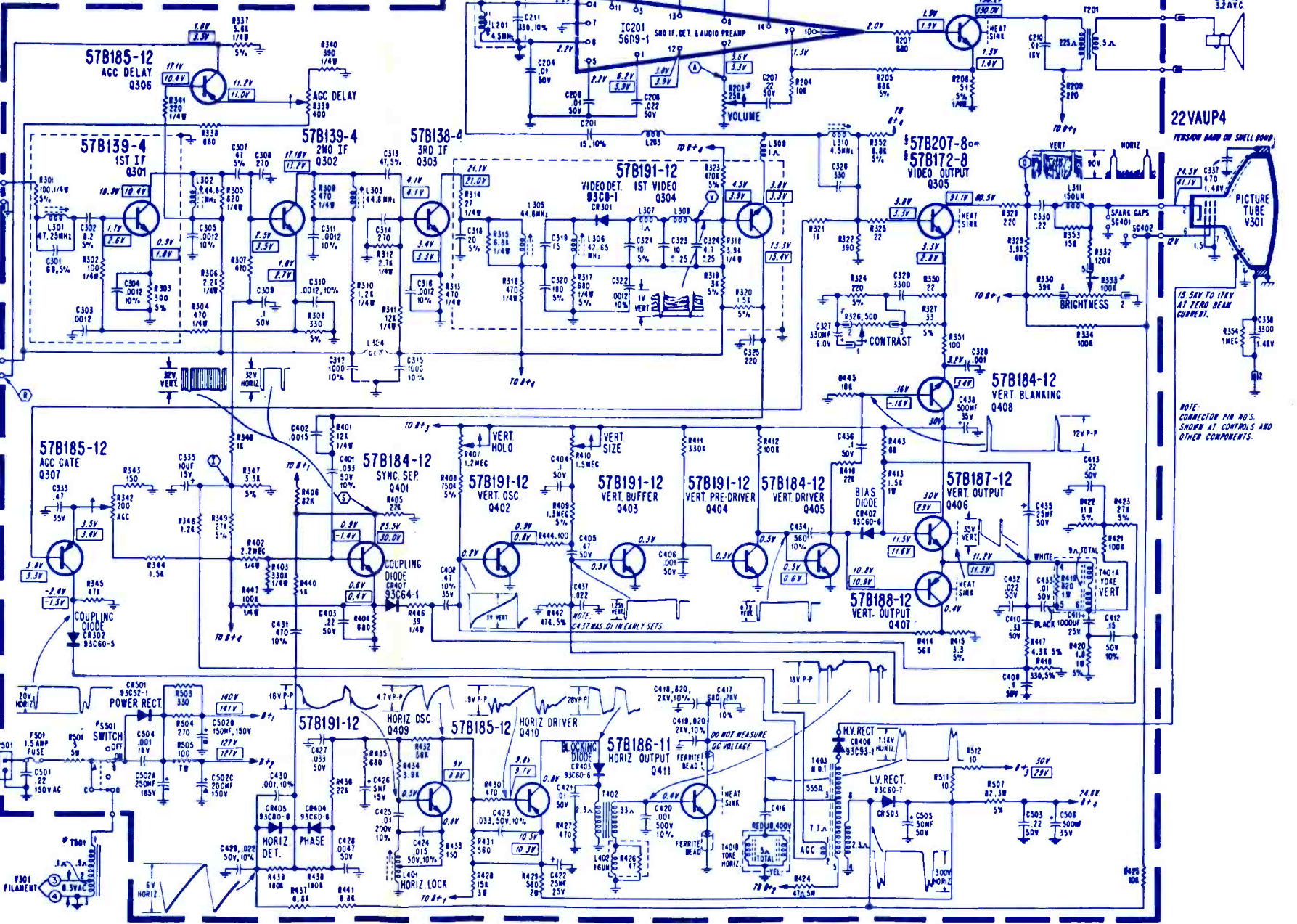
MODEL CHART					
MODEL	FINISH	CRT	VHF	UHF	CHASSIS
16P640M	Black	16VARP4	94A434-1	94A461-1	T7K6-2B
16P657CM	Walnut	16VARP4	94A434-1	94A461-1	T7K6-2B
19P871M	Brown	19VBXP4	94A434-1	94A461-1	T8K6-2B
19P897CM	Walnut	19VBXP4	94A434-1	94A461-1	T8K6-2B
19P889CM	White	19VBXP4	94A434-1	94A461-1	T8K6-2B
22T331CM	Walnut	22VAUP4	94A434-1	94A461-1	T9K6-2A
22C341M	Walnut	22VAUP4	94A434-1	94A461-1	T9K6-2A
22C345M	Maple	22VAUP4	94A434-1	94A461-1	T9K6-2A
22C343M	Oak	22VAUP4	94A434-1	94A461-1	T9K6-2A

SYMBOL	DESCRIPTION	ADMIRAL PART NO.	RESISTOR VALUE	CAPACITOR VALUE	ADMIRAL PART NO.
C502A	250 μf, 165v electro	67A30-11	R203	25K vol, on/off T9K6	75A1-206
C502B	150 μf, 150v electro	67A30-11	R326	500 n, contrast T7K6, T8K6	75A1-220
C502C	200 μf, 150v electro	67A30-11	R326	500 n, contrast T9K6	75A1-222
L401	horiz lock coil	94A480-1	R333	100K brite T7K6, T8K6	75A1-221
T201	audio output xformer	79A124-7	R333	100K brite T9K6	75A1-223
T402	horiz drive xformer	79A167-1	R339	400 n, AGC delay	75A101-50
T403	horiz output xformer	79A166-1	R342	200 n, AGC	75A101-49
R203	25K vol on/off T7K6, T8K6	75A1-219	R407	1.2M vert hold	75A191-1
			R410	1.5M vert size	75A101-57
			F501	1.5a fuse	84A7-15



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SCHEMATIC NOTES:

RESISTOR VALUES 1% TOL. CAPACITANCE VALUES 1% OR HIGHER ARE IN μF. CAPACITANCE VALUES LESS THAN 1 μF ARE IN P.F. RESISTANCE VALUES OF 50Ω OR LESS ARE SHOWN AS Ω. Ω INDICATES OHMS PER SECOND.

VOLTAGE AND WAVEFORM NOTES:

DC VOLTAGES TAKEN WITH VTR, WITH RESPECT TO COMMON GROUND. TAKE FROM 120V AC LINE. WAVEFORMS AND P VOLTAGES MAY VARY DEPENDING ON CALIBRATION OF TEST EQUIPMENT AND PARTS TOLERANCES. WHEN TWO DC VOLTAGES ARE INDICATED, TAKE FROM THE SIGNAL IS COMMON IN BLACK. MEASURING TAKE WITH RESPECT TO SIGNAL. DC SIGNAL VOLTAGES TAKEN ON UNUSED VTR CHANNEL WITH ANTENNA TERMINALS SHORTED. VOLUME CONTROL AT MINIMUM. BRIGHTNESS AND CONTRAST CONTROLS AT MAXIMUM. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION. ON SIGNAL VOLTAGES AND WAVEFORMS TAKE WITH TERMINATED ROSE WIRE SIGNAL PRODUCING 4 TO 5 VOLTS ACC AT TEST POINT W. CONTRAST AND BRIGHTNESS CONTROLS SET FOR NORMAL PICTURE. TRANSDUCER CAUTION:

TO AVOID DAMAGE TO TRANSDUCERS DO NOT ARC AND ANODE LEAD TO COMMON GROUND. DO NOT TURN SET ON WITH TRANSDUCERS. TURN ON LEADS WHENEVER OR DISCONNECT. SET POSITION TO PREVENT ADDITIONAL DAMAGE TO TRANSDUCERS. TURN ON TO COMMON GROUND. DO NOT USE AN ORDINARY DIMMER FOR RESISTANCE MEASUREMENT. USE VTR ON H 1 TO RANGE ON HIGHER. ACC CAUTION:

DO NOT DISRUPT FACTORY SETTING OF ACC CONTROL. IF ACC ADJUSTMENT IS REQUIRED REFER TO SERVICE NOTES. IF NECESSARY TO DISRUPT ACC ADJUSTMENT, MARK ROTOR POSITION SO THAT CONTROL CAN BE RETURNED TO ITS EXACT ORIGINAL SETTING. ALL WAVEFORMS TAKEN WITH A WIDE-BAND OSCILLOSCOPE. SOME DEVIATION WILL BE NOTICED IN HORIZ. WAVEFORMS WHEN USING NARROW BANDWIDTH EQUIPMENT.

* COMPONENT NOT MOUNTED ON PRECISION WIRE SYSTEM.

WARNING: USE ISOLATION TRANSFORMER WHEN SERVICING WITH CABLES BACK REMOVED.

COMMON GROUND IS -

RUN CHANGES

① Start of production

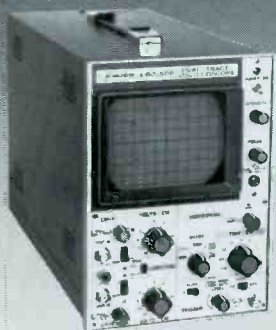
TERMINAL VIEWS OF TRANSISTORS

LEADER

5" Quality Scopes

Cost Less!

*While the Others Keep Raising Prices,
Leader Fights Inflation to Save You Money*



LBO-506
5" Dual Trace/Dual Channel
Automatic Triggered Scope

An outstanding value that does your work automatically . . . with auto hzt'l sweep, auto vert'l input gain and auto trigger (TV-V and TV-H) to reduce errors. Has sep./simul. sweep mode display; X5 mag; X-Y display; direct RF input; vectorscopic display for color phase adj.; with 10 MHz b'width; 10mV to 20Vp-p/cm vert'l sensitivity in 11 calib. steps. PC board construction assures high reliability. It's beautiful! Complete with 2 probes, 2 adapters, lead, plug & clips.

A Trend Setter! \$569.95



LBO-501
5" Triggered Scope
w/Calibrated Input
& Time Base

A professional grade solid state instrument recommended by the experts. Vertical input is calibrated (v/cm) for high accuracy. Hzt'l deflection is time calibrated, with triggered sweep range from 0.2 μ sec/cm to 0.2sec/cm sweep operable in free running or automatic. Offers 20mV to 10Vp-p/cm vert'l sensitivity; 10MHz b'width; lighted graticule and tilt stand. A quality performer you can depend on. Complete with probe, leads and adapter.

SAVE \$60.00 NOW \$399.95



LBO-502
5" Triggered Scope
w/Graded Scale

Solid state dependability lets you put this versatile scope to use for most every electronic purpose. Has automatic and triggered sweep, 17 steps calibrated, from 1 μ sec/cm to 0.2sec/cm, plus X5 mag at 0.2 μ sec/cm; 15MHz b'width; 10mV to 20mVp-p/cm vert'l sensitivity w/1-2-5 graded scale readings. Lab grade accuracy and push button ease of use make it a real winner. Complete with probe, leads and adapter.

SAVE \$80.00 NOW \$449.95



LBO-511
5" Solid State
General Service Scope

State-of-the-art design for lasting quality and performance. Features recurrent sweep with automatic sync and calibrated vert'l input; 0-140° phase control; TV-V and TV-H inclusive w/4 sweep ranges to 100KHz; 10MHz b'width. FET input stages, DC coupling and push-pull amplifiers account for distortion-free displays and rock-like stability for every use. Complete with probe, leads and adapter.

SAVE \$50.00 NOW \$299.95

LEADER "Put Us To The Test"

Instruments Corp. 151 Dupont St., Plainview, L.I., N.Y. 11803 (516) 822-9300

A new 310-Type 3. Made to take a fall.

The rugged new "drop-resistant," hand size Triplet Model 310, Type 3 is priced at just \$49.

The latest addition to the rugged Triplet 310, general purpose, multi-range V-O-M family—the Model 310, Type 3—has impressive new features. Its case and clear front are made of high impact-resistant plastic.

The low Ohms range Rx1 has been fused to protect against damaging overloads. These two improvements should eliminate over half of all repair requirements resulting from field use damage.

But that's not all. The case of the new Triplet 310, Type 3 sports an elegant new non-slip "finger-tread" surface finish. The meter movement brackets and pointer feature a new rugged design as well as newly designed lead jacks and Model 10 jack. Added to this, the front range and tester dial markings are changed to read easier when used with Triplet's Model 10 Clamp-on-Ammeter.

Outstanding features:

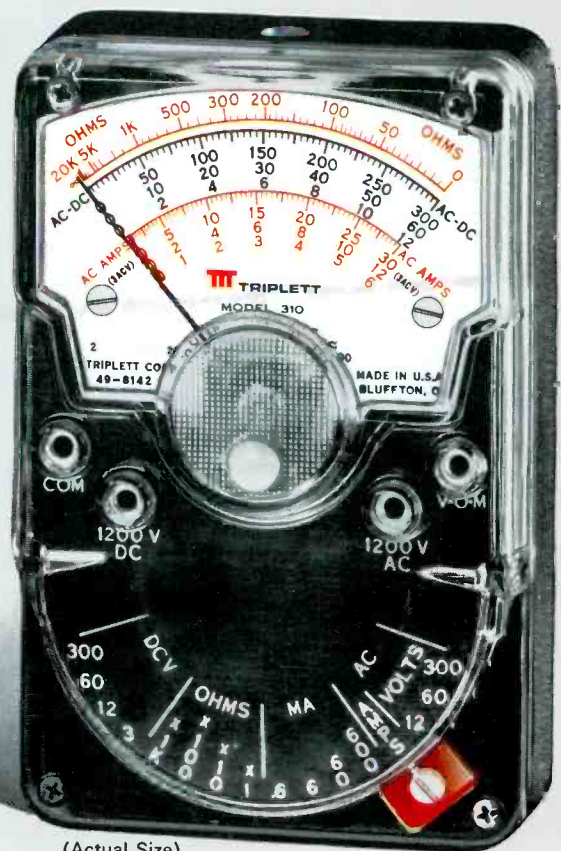
1. Drop-resistant, hand size V-O-M with high impact thermoplastic case.
2. 20,000 Ohms per Volt DC and 5,000 Ohms per Volt AC; diode overload protection with fused Rx1 Ohms range.

3. Single range switch: direct reading AC Amp range to facilitate clamp-on AC Ammeter usage.

The durable new 310, Type 3, self-shielded for checking in strong magnetic fields, is an extra-rugged, high-torque, bar-ring instrument with spring back jewels. An interchangeable test prod fits into the top of the tester, making it a common probe and freeing one hand. All this for only \$49.

For more information or a free demonstration, call your Triplet distributor or sales representative. For the name of the representative nearest you, dial toll free (800) 645-9200. New York State, call collect (516) 294-0990. Triplet Corporation, Bluffton, Ohio 45817.

TRIPLETT
ALL YOU'LL EVER NEED IN V-O-M'S.



(Actual Size)

See this VOM and the amazing new Series 60 at NEWCOM Booth C14/D15.

Triplet. The easy readers.

...for more details circle 129 on Reader Service Card