

OCTOBER 1972  A HARCOURT BRACE JOVANOVIICH PUBLICATION

# ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



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Electronic Security

What's New in TV Receivers for 1973

Reducing Check Voucher Costs



## How to stay in shape without getting your wallet out of shape.

We've shaped up a plan that lets you mix business with pleasure.

The program is simple: You buy Sylvania receiving tubes, you get merchandise award points. When you have enough points, you just pick out what you want from the catalog that Sylvania's distributors will be glad to give you. (Ask him for the "Take Stock with GTE Sylvania" book.)

To keep you in shape, there are things like golf or fishing equipment and shop tools. And if whittling is your sport, there's even a knife for that.

If you'd rather keep your wife in good shape there are pages of kitchen and household equipment that will make her workload a lot lighter.

Or if you are interested in really living the good life, there is everything from clothing to cameras.

And then there are the Sylvania color television sets. They take a lot of points, but they deliver a lot of picture.

Buying Sylvania receiving tubes can keep your business in good shape.

And if you buy enough Sylvania tubes, you can keep the whole family in shape.

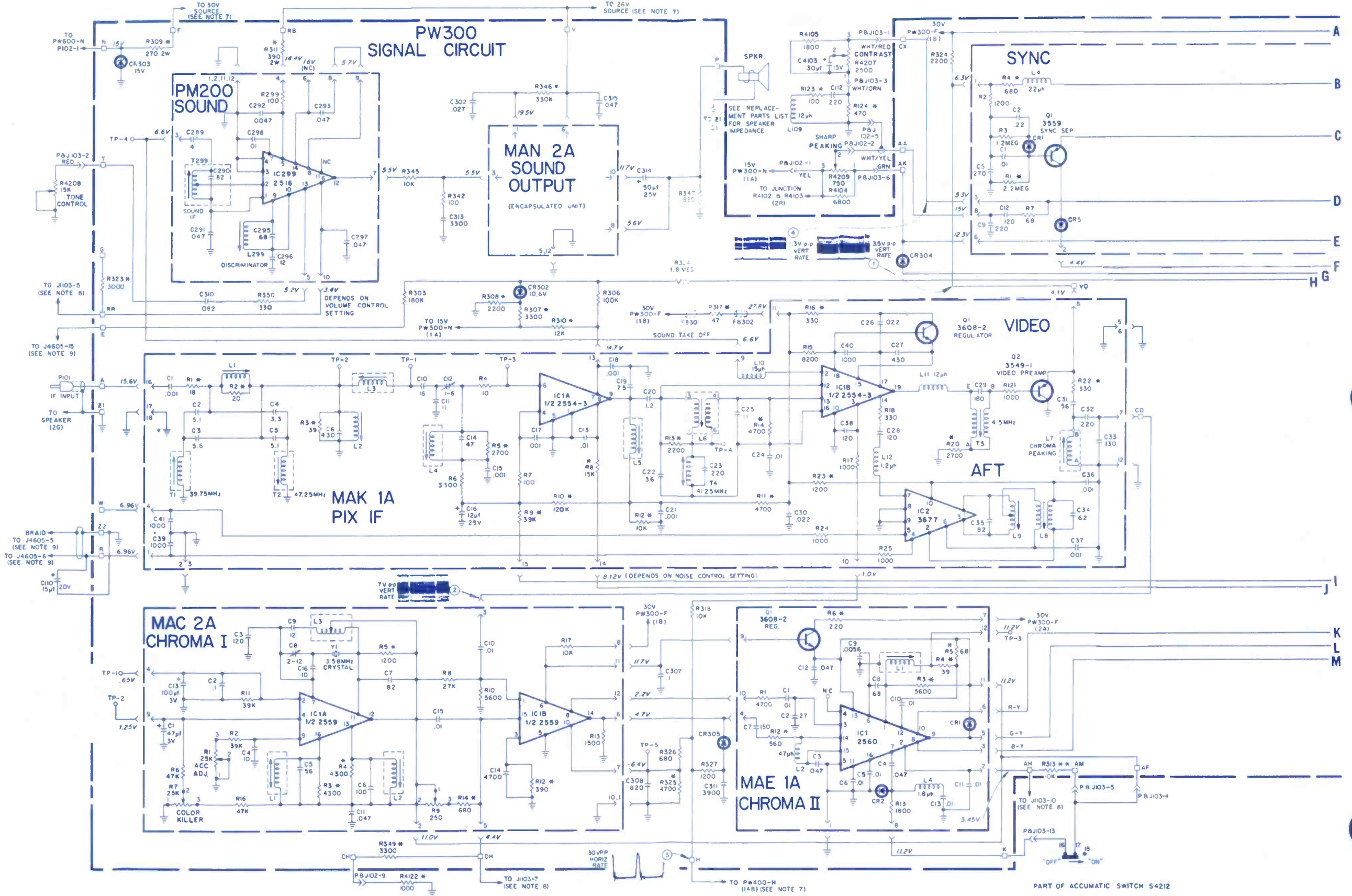
But, we have to warn you, your wallet will get a lot fatter.

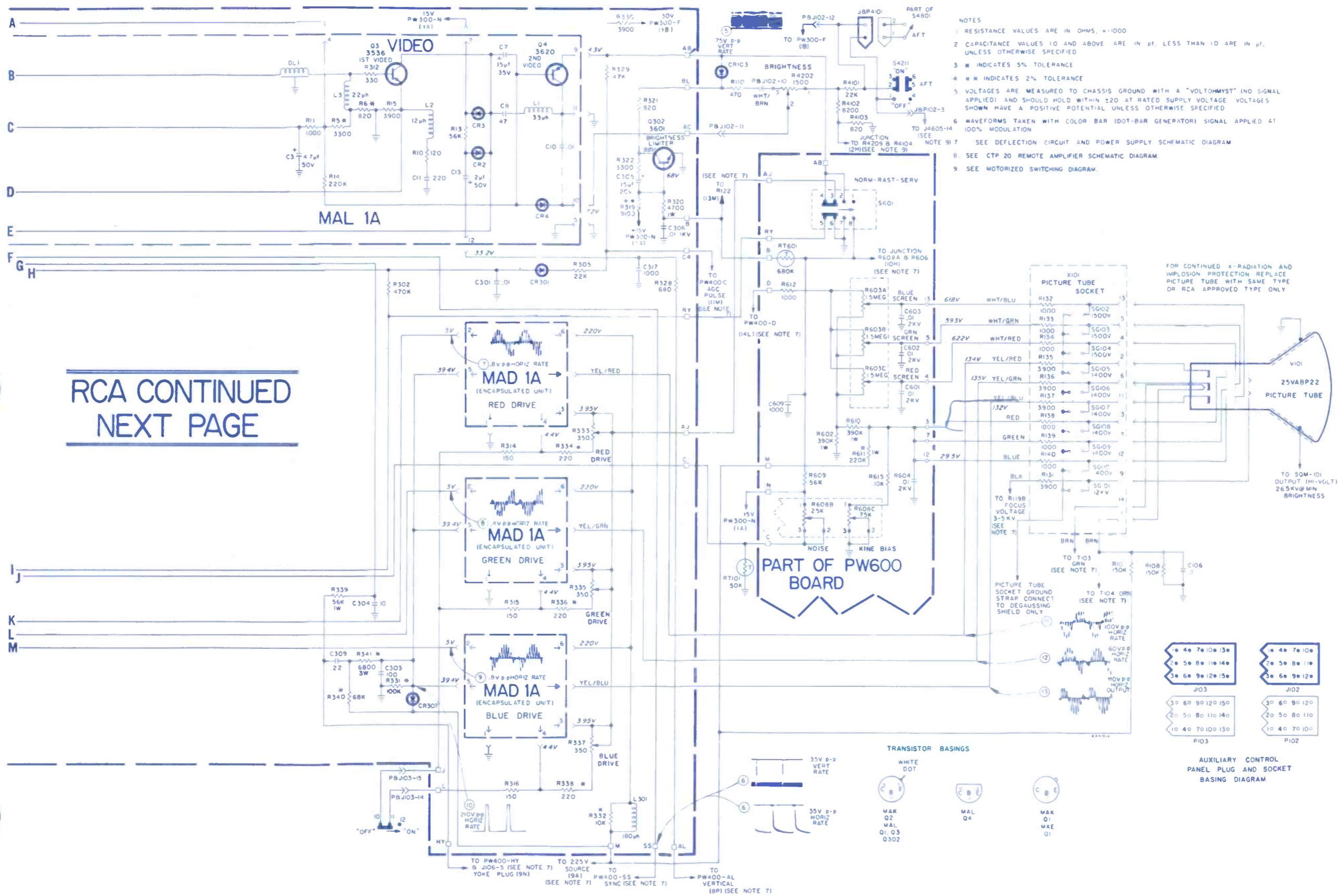
Sylvania Electronic Components, 100 First Avenue, Waltham, Mass. 02154.

**GTE SYLVANIA**



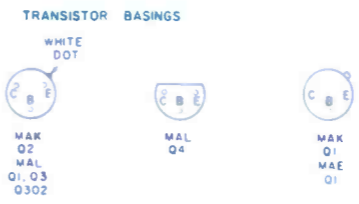
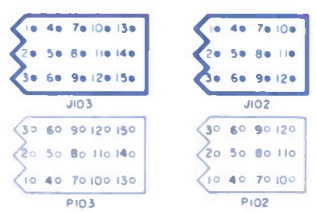






- NOTES
- 1 RESISTANCE VALUES ARE IN OHMS, X1000
  - 2 CAPACITANCE VALUES 10 AND ABOVE ARE IN  $\mu$ F, LESS THAN 10 ARE IN pF, UNLESS OTHERWISE SPECIFIED
  - 3 \* INDICATES 5% TOLERANCE
  - 4 \*\* INDICATES 2% TOLERANCE
  - 5 VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHMYST" (NO SIGNAL APPLIED) AND SHOULD HOLD WITHIN  $\pm 20$  AT RATED SUPPLY VOLTAGE. VOLTAGES SHOWN HAVE A POSITIVE POTENTIAL UNLESS OTHERWISE SPECIFIED
  - 6 WAVEFORMS TAKEN WITH COLOR BAR (DOT-BAR GENERATOR) SIGNAL APPLIED AT 100% MODULATION
  - 7 SEE DEFLECTION CIRCUIT AND POWER SUPPLY SCHEMATIC DIAGRAM
  - 8 SEE CTP 20 REMOTE AMPLIFIER SCHEMATIC DIAGRAM.
  - 9 SEE MOTORIZED SWITCHING DIAGRAM.

RCA CONTINUED  
NEXT PAGE



AUXILIARY CONTROL  
PANEL PLUG AND SOCKET  
BASING DIAGRAM

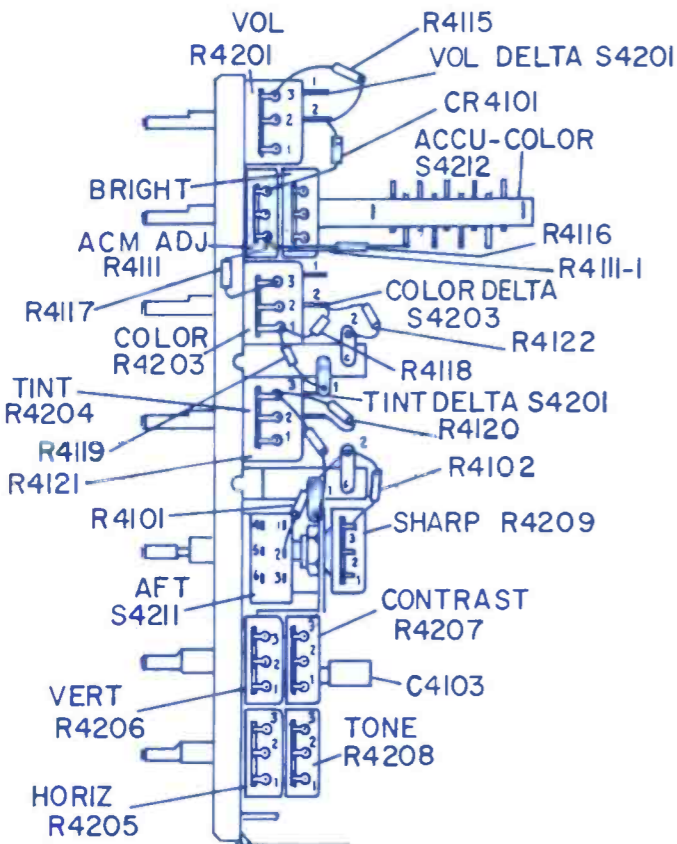
RCA SALES CORP.  
Color-TV Chassis  
CTC54 Series

SYMBOL	DESCRIPTION	RCA PART NO.
C103	3 section electrolytic	133446
C103A	600 $\mu$ f, 100v	133446
C103B	100 $\mu$ f, 250v	133446
C103C	100 $\mu$ f, 250v	133446
C105	3 section electrolytic	133449
C105A	750 $\mu$ f, 50v	133449
C105B	500 $\mu$ f, 40v	133449
C105C	500 $\mu$ f, 40v	133449
F101	fuse	120785
R116	control focus includes R119, R118, R117	129925
SQM101	quadrupler-hi-voltage	130026
T103	x-former-power	133443

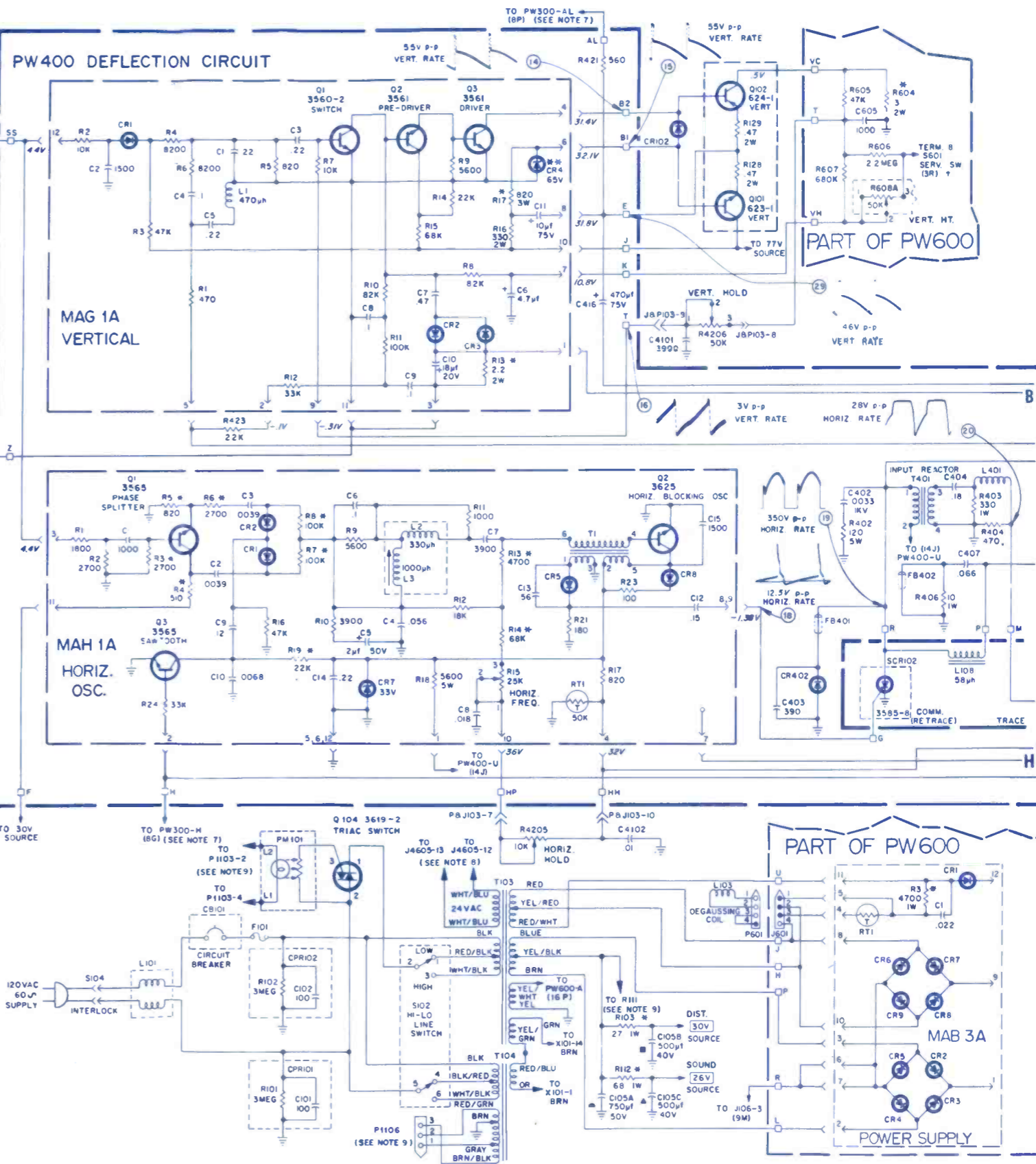
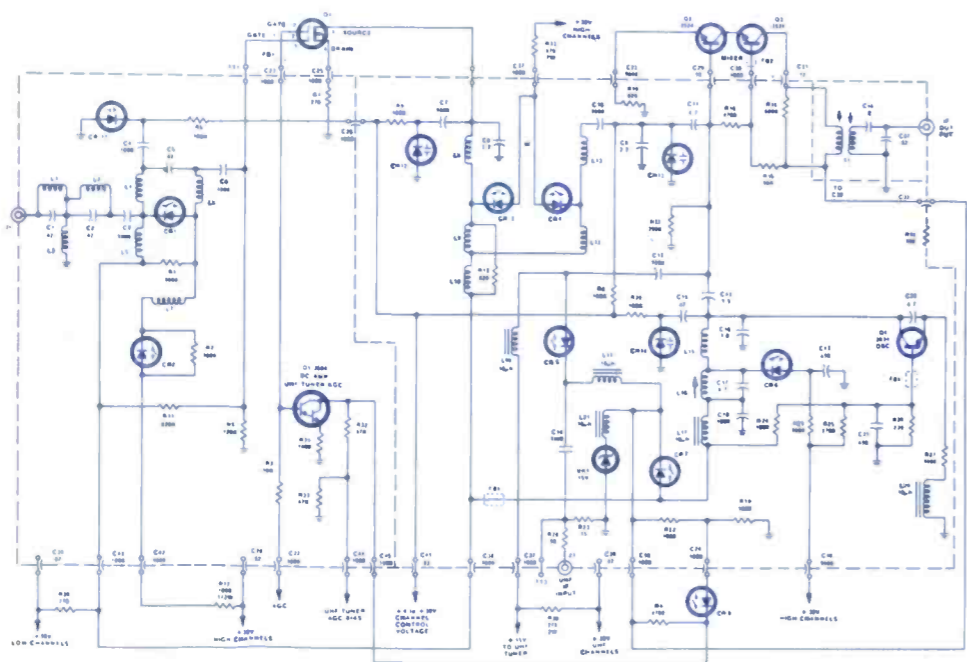
RT1	thermistor-temp comp	132503
IC1	circuit-integrated	132314
R1	control, ACC adj	132170
R7	color killer	132170
IC1	circuit-integrated	132315
R15	variable, horiz freq	132170
RT1	thermistor-50K cold	116109
T1	x-former-horiz osc	126729
IC1	circuit-integrated pix IF	132313
IC2	circuit-integrated AFT	130130
T5	4.5MHz trap	132135
IC299	circuit-integrated	130751
L299	coil-discriminator	130121

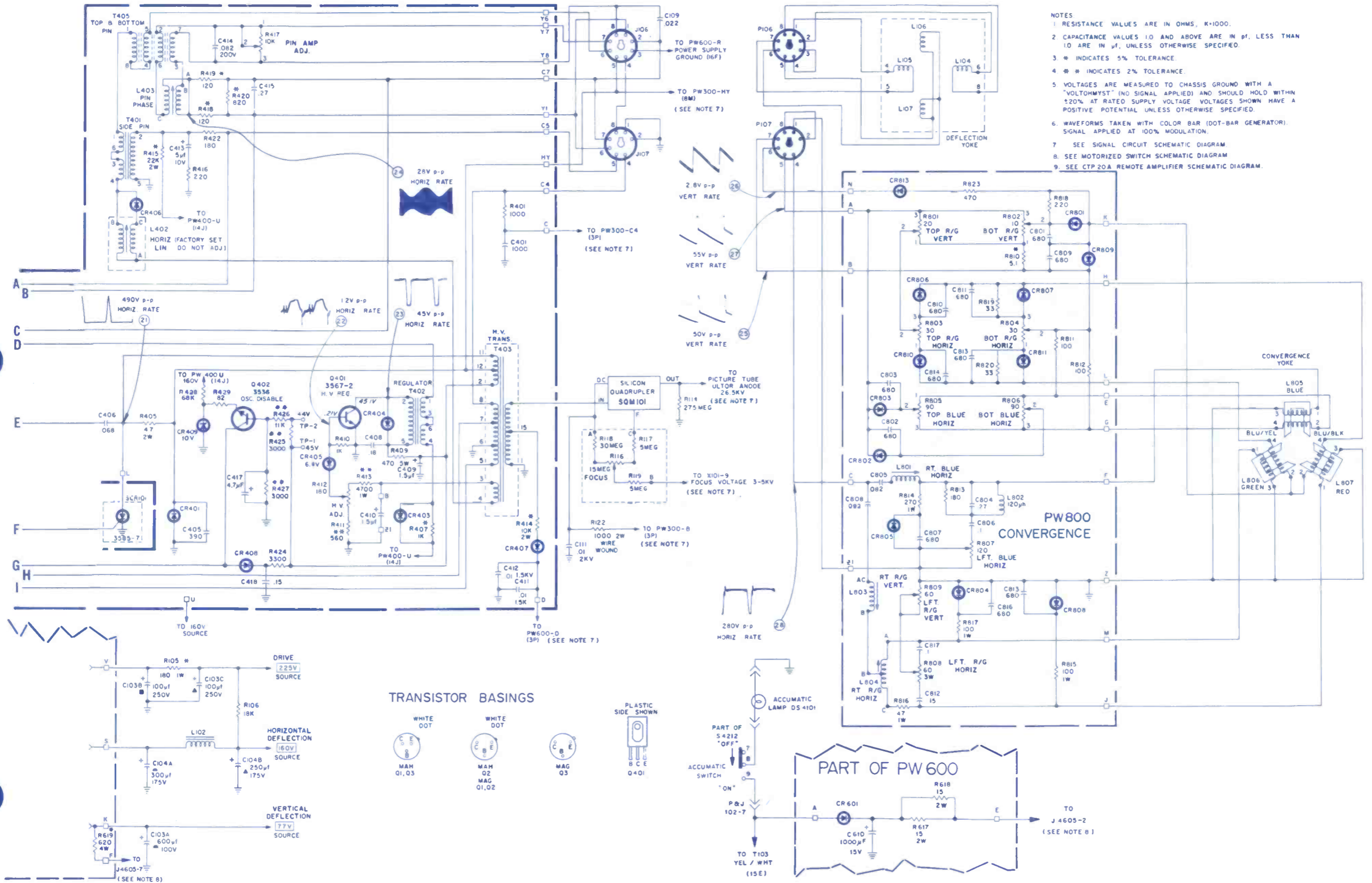
T299	x-former-input	130120
R412	control, hi voltage adj	133355
T402	x-former-regulator	132622
T403	x-former-flyback	135363
R4201	volume	134344
R4202	bright	135067
R4203	color	134344
R4204	line	134344
R4205	horiz	133261
R4206	vert	133252
R4207	contrast	133252
R4208	tone	133261
R4209	sharp	134937

Auxiliary Control Panel



TUNER SCHEMATIC DIAGRAM



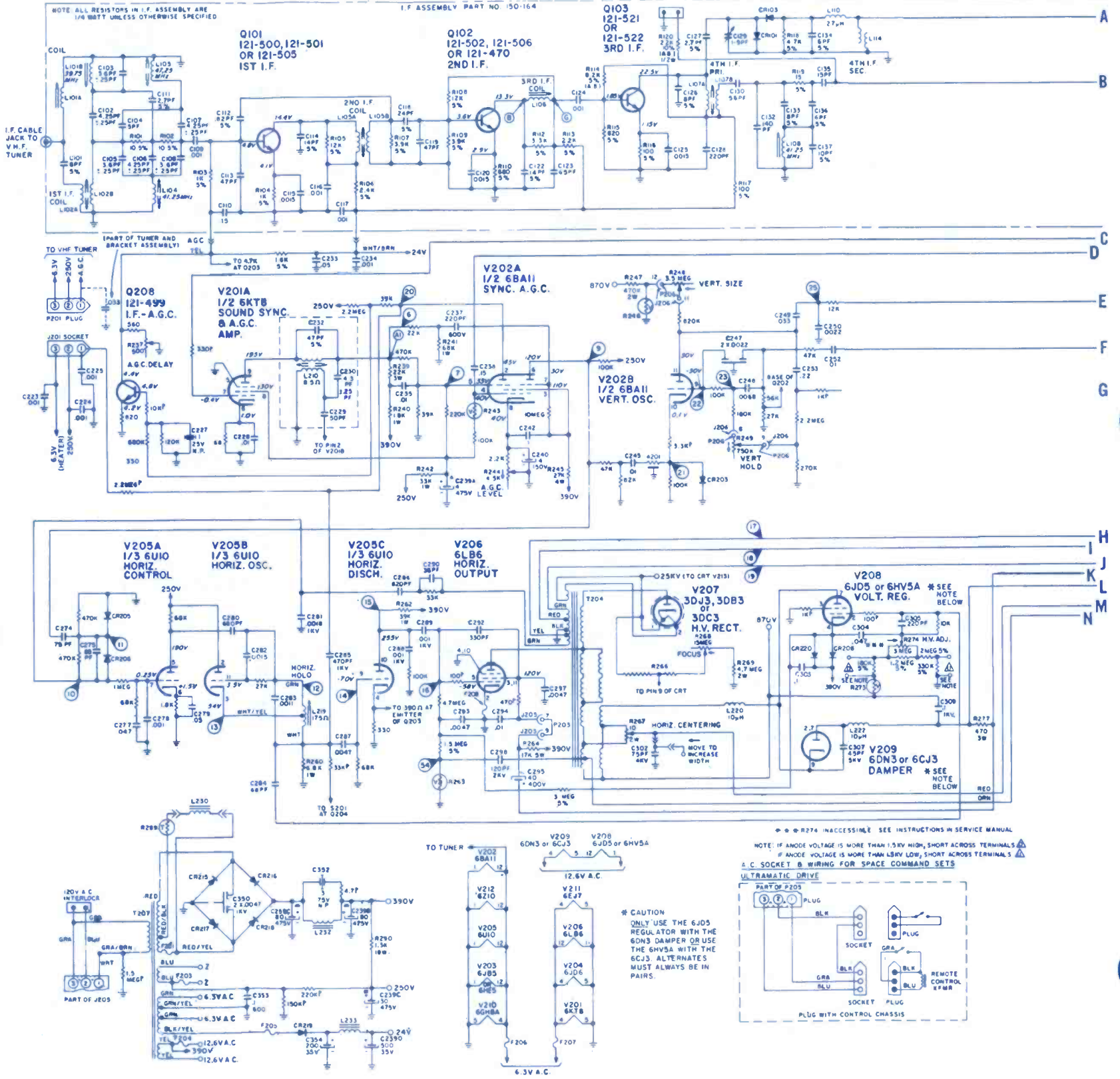
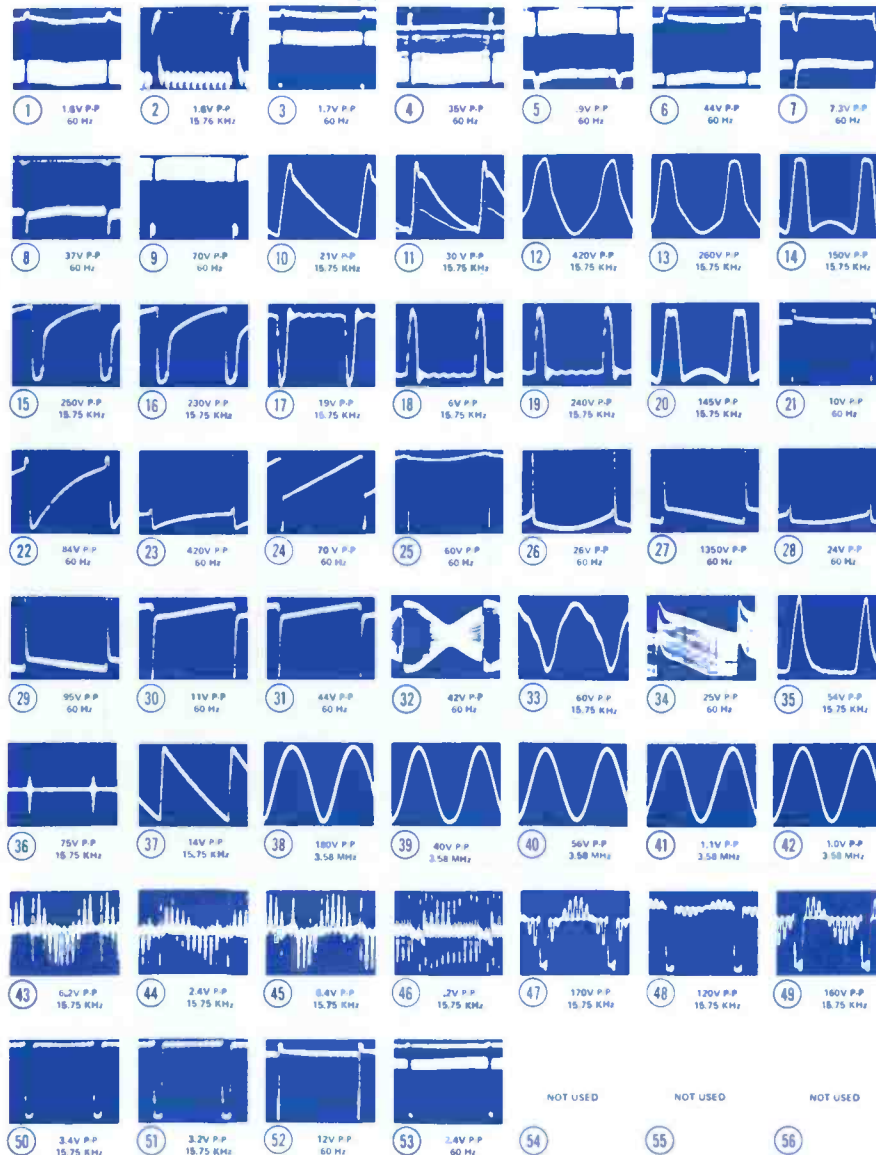
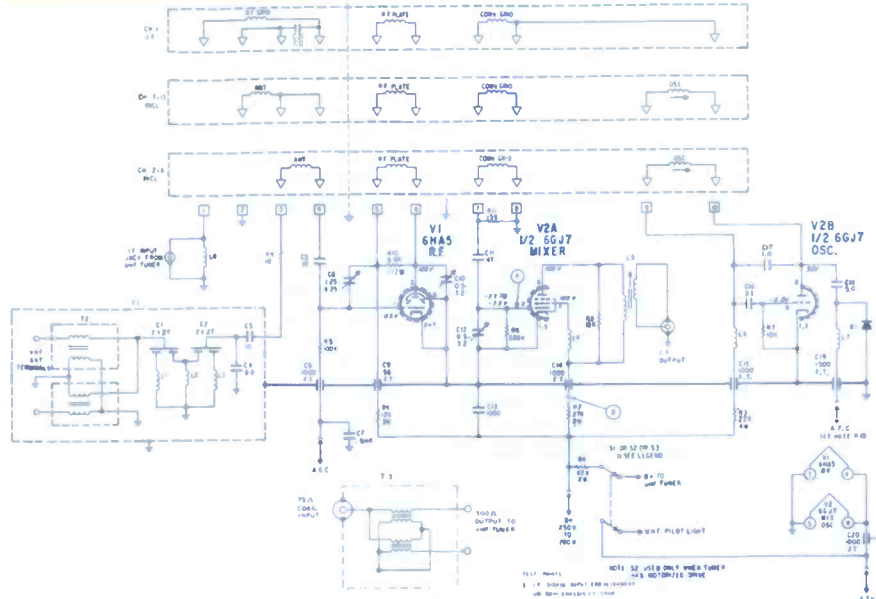


- NOTES
1. RESISTANCE VALUES ARE IN OHMS, K=1000.
  2. CAPACITANCE VALUES 1.0 AND ABOVE ARE IN  $\mu$ F, LESS THAN 1.0 ARE IN  $\mu$ F, UNLESS OTHERWISE SPECIFIED.
  3. \* INDICATES 5% TOLERANCE.
  4. \*\* INDICATES 2% TOLERANCE.
  5. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTHMYST" (NO SIGNAL APPLIED) AND SHOULD HOLD WITHIN  $\pm 20\%$  AT RATED SUPPLY VOLTAGES SHOWN HAVE A POSITIVE POTENTIAL UNLESS OTHERWISE SPECIFIED.
  6. WAVEFORMS TAKEN WITH COLOR BAR (DOT-BAR GENERATOR). SIGNAL APPLIED AT 100% MODULATION.
  7. SEE SIGNAL CIRCUIT SCHEMATIC DIAGRAM.
  8. SEE MOTORIZED SWITCH SCHEMATIC DIAGRAM.
  9. SEE CTP 20A REMOTE AMPLIFIER SCHEMATIC DIAGRAM.

SYMBOL	DESCRIPTION	ZENITH PART NO.
C239A	4-μf electrolytic cap 475v	
C239B	80-μf electrolytic cap 475v	22-5360
C239C	30-μf electrolytic cap 475v	
C259A	30-μf electrolytic cap 475v	
C259B	10-μf electrolytic cap 475v	22-5513
C259C	80-μf electrolytic cap 475v	
R203	10K brightness range control	63-8335
R205	thermistor	63-6848
R209	5K brightness control	63-8201
R216	80-Ω brightness limiter control	63-8707
R243	voltage dependent resistor	65-5327
R244	4.5K AGC level control	63-8682
R246	voltage dependent resistor	63-5314

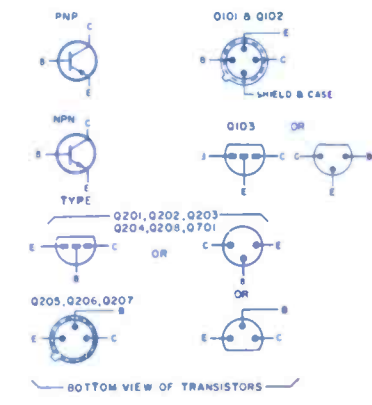
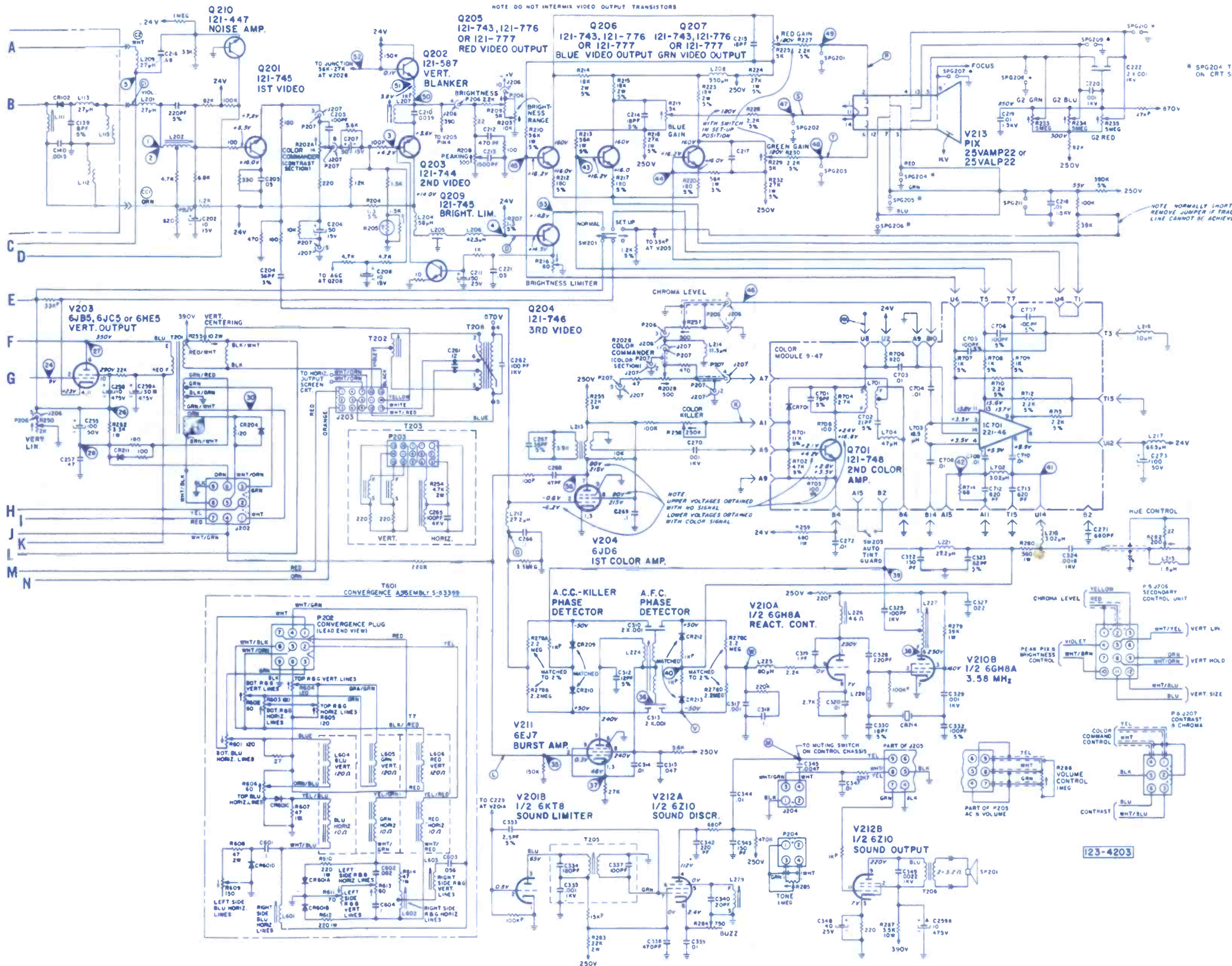
R249	750K vertical hold control	63-8202
R250	2K vertical linearity control	63-8208
R253	10-Ω vertical centering control 2W	63-7009
R257	500-Ω color level control	63-8205
R258	250K color killer control	63-8449
R263	voltage dependent resistor	63-7658
R265	47K divider resistor	63-8676
R267	10M horiz centering control 2W	63-7211
R268	15M focus control	63-7210
R273	voltage dependent resistor	63-8214
R274	3M high voltage adjust control	63-8460
R284	750K buzz control	63-6950
R285	1M tone control	63-8203
R289	thermistor	63-8687
L202	4.5MHz trap coil	S-83086

L207	3.58MHz trap coil	20-1838
L210	sound take-off coil	S-77414
L219	horiz osc coil	S56877
L226	color frequency adjust coil	S-83168
L229	quad coil	S-80480
T201	vertical output xfomer	95-2730
T203	deflection yoke	95-2887
T204	horiz sweep xfomer	S-86950
T206	audio output xfomer	95-2797
T207	power xfomer	95-2847
A201	integrator unit	87-4
F201	1.2a bel-fuse	136-63
F205	35a bel-fuse	136-75
F208	5a fuse (pigtail)	136-83
I201	integrated circuit unit	221-46





ZENITH  
Color-TV Chassis  
12B14C50



TEST POINTS	
A1	SYNC - AGC OUTPUT
B	SECOND I.F. COLLECTOR
C1	PICTURE DETECTOR OUTPUT
CC1	BIAS POINT FOR CI ADJUSTMENT
DE	0VDC SOUND DETECTOR OUTPUT
D	0VDC WITH 25 WFO 25V ELECTROLYTIC CAPACITOR COLOR BALANCE
E	I.F. AGC
G	3RD I.F. ALIGNMENT POINT
H	SOUND LIMITER PLATE
K	KILLER VOLTAGE - SHORT TEST POINT
L	BURST GRID
M	SOUND OUTPUT
Q	A.C.C. VOLTAGE
R	R-Y COLOR AMP. COLLECTOR
S	B-Y COLOR AMP. COLLECTOR
T	Y-MINOR AMP. COLLECTOR
V	COLOR (AFC) DETECTOR
W	COLOR AFC VOLTAGE

NOTES  
PHOTOGRAPHS TAKEN ON A STANDARD GATED RAINBOW COLOR BAR SIGNAL. THE HUE SETTING ADJUSTED FOR PROPER COLOR. THE WAVE SHAPES AT THE RED, GREEN AND BLUE CATHODES OF THE PICTURE TUBE DEPEND ON THE HUE, COLOR LEVEL (CHROMA LEVEL), CONTRAST (COLOR COMMANDER) AND PICTURE PEAKING CONTROLS.

FOR WAVEFORMS 43 THRU 49, TEST POINT "D" MUST BE BY-PASSED WITH A 0.1 MFD CAPACITOR.

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.  
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.  
ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.

ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT AND NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

ALL RESISTORS ARE ±10% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.

COL. RESISTANCE NOT GIVEN UNDER ONE OHM.

ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

FOR CAPACITOR TOLERANCE, SEE LEGEND.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K OHMS PER VOLT MIN. HIGH VOLTAGE METER.

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

○ INDICATES ALIGNMENT AND TEST POINT.  
PF = PICOFARAD MM = MEGAHERTZ μH = MICROHENRY  
□ INDICATES ±20% MAY BE USED. ○ INDICATES VOLTAGE SOURCE.  
② INDICATES WAVEFORM CHECK POINTS. (SEE WAVEFORM CHART)

⊥ INDICATES CHASSIS GROUND.

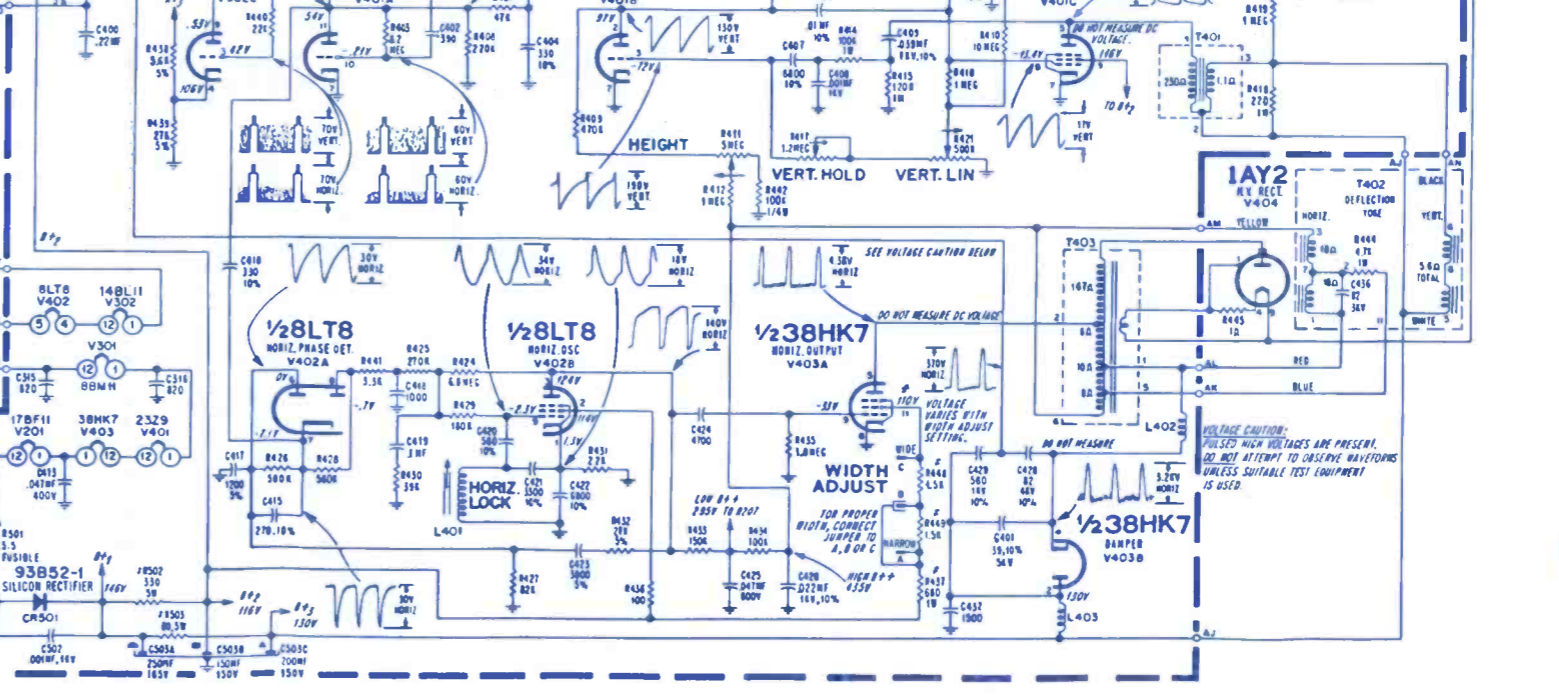
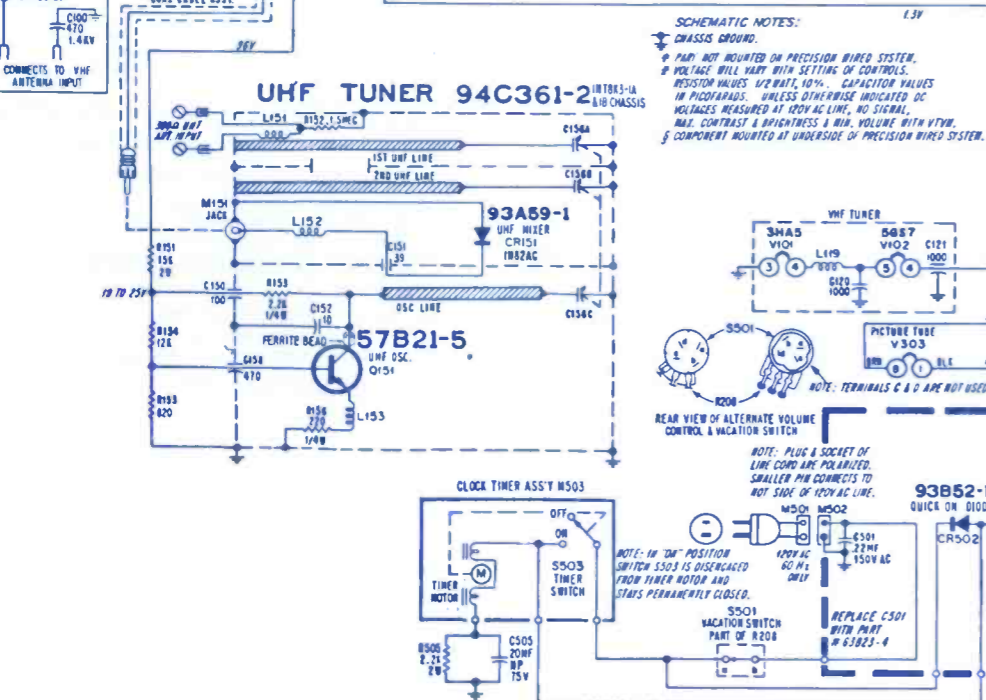
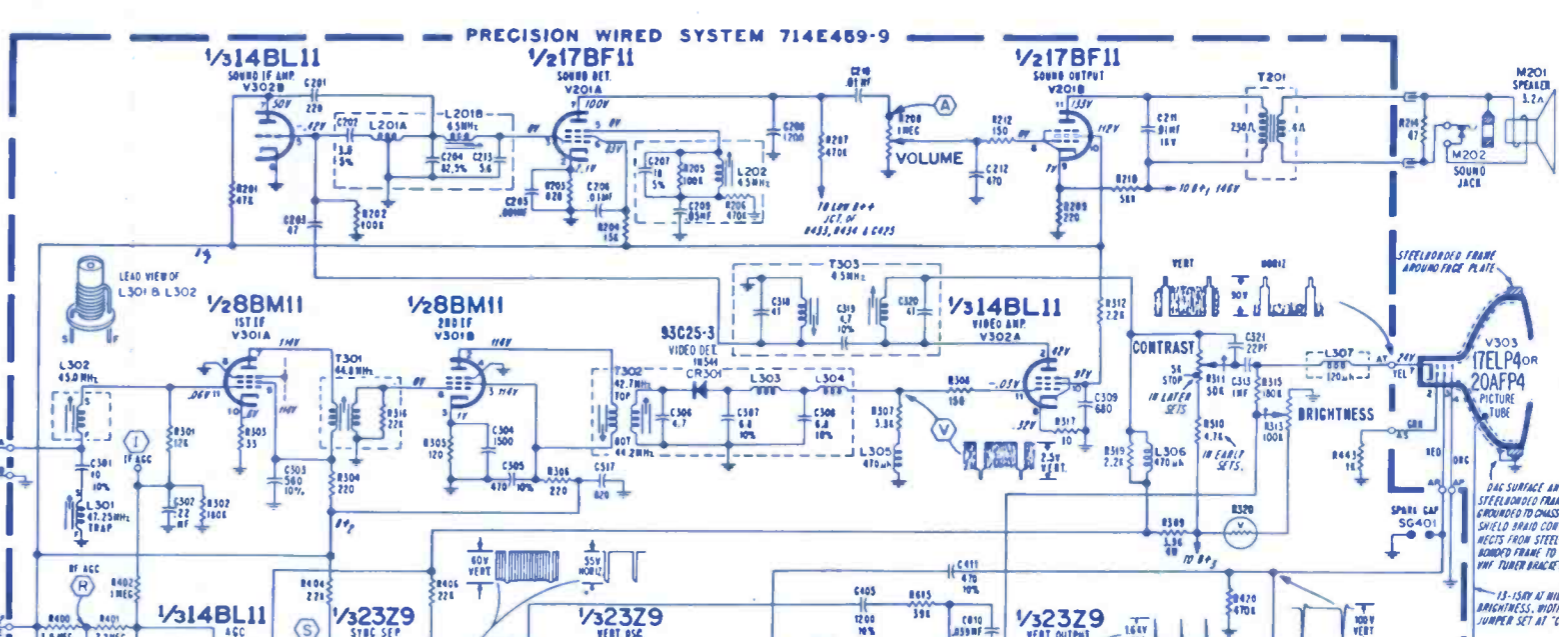
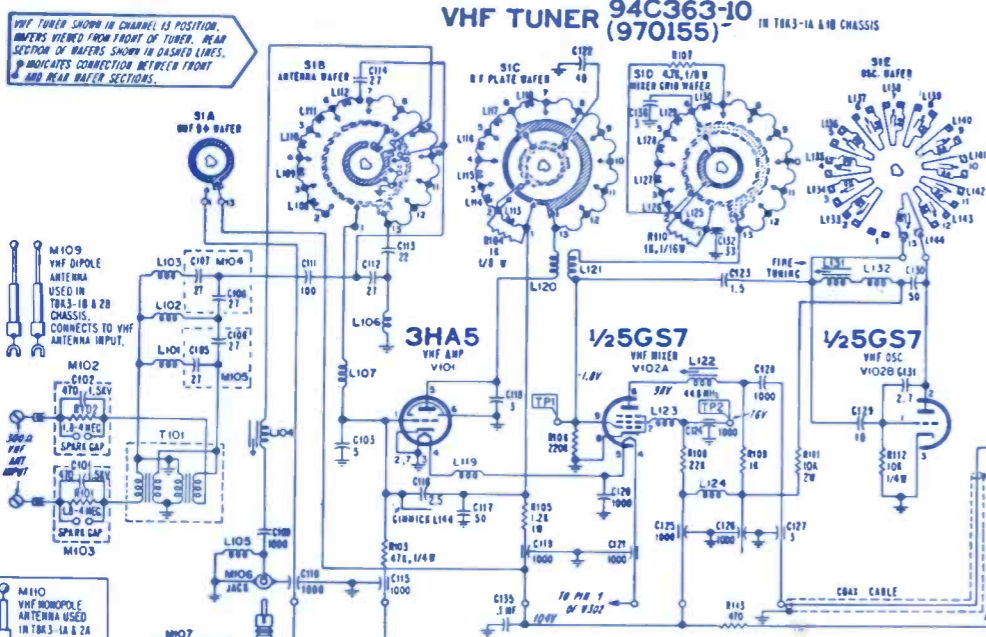
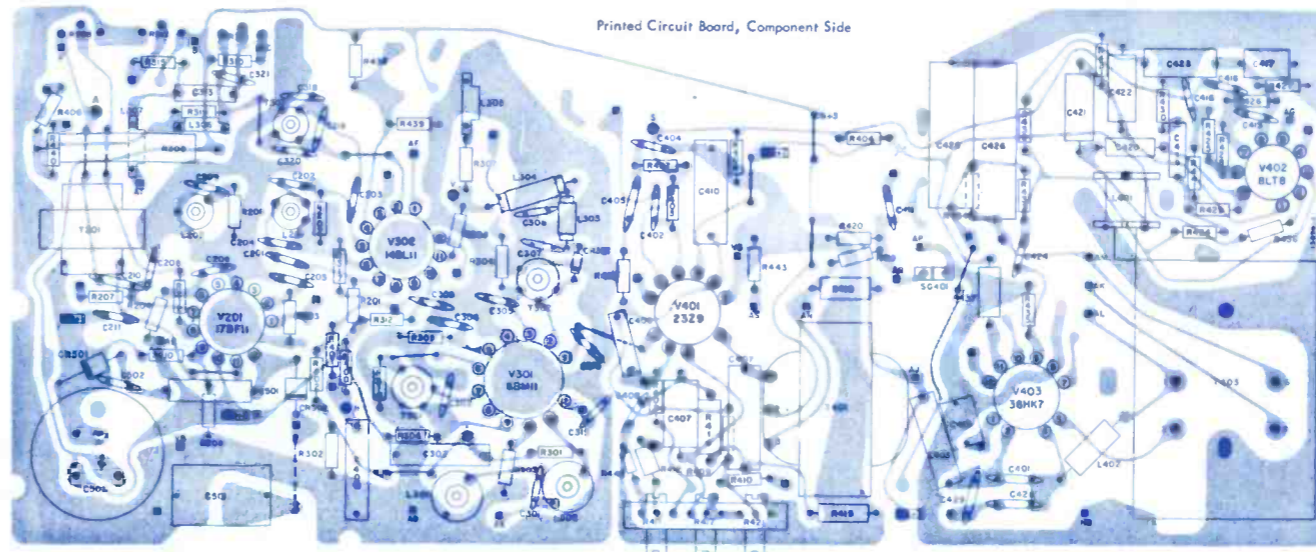
— INDICATES MODULE BOARD

→ A1 INDICATES PIN NUMBER ON MODULE BOARD

⊂ INDICATES CONE CONNECTOR

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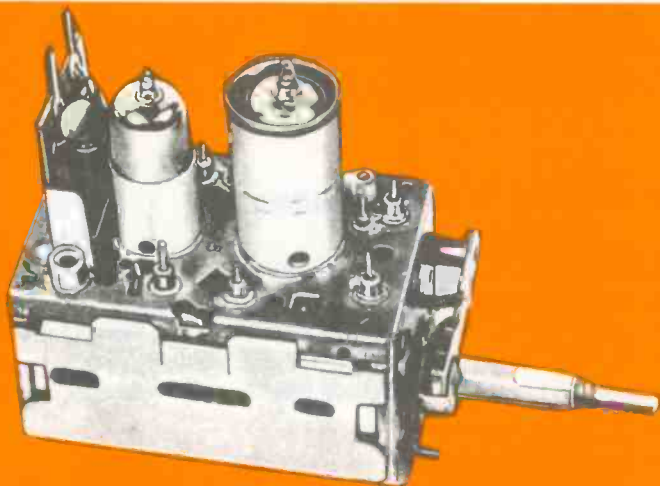
SYMBOL	DESCRIPTION	EMERSON PART NO.
R208	1M volume control and on-off switch S501	75A1-176
R311	30K contrast control	970103
R313	100K brightness control	970104
R320	varistor	61A46-6
R411	3M height control	Part of 75A129-3
R417	1.2M vertical hold control	Part of 75A129-3
R421	500K vertical linearity control	Part of 75A129-3
R501	5.5 n fusible	61A48-1
L201	sound IF & phase shift coil (includes C213)	72A301-4
L202	quadrature coil (includes C207 & R205)	970013
L301	47.25MHz trap	72A308-8
L401	horiz lock coil	94A17-21
T201	audio output xfomer	79A124-3
T303	sound take-off & 4.5MHz trap	72A185-7
T401	vertical output xfomer	79A139-2
T402	deflection yoke assembly	970116
T403	horiz output	79A138-4
CR301	diode, video detector (1N541)	93A25-3



**SCHEMATIC NOTES:**  
 \* CHASSIS GROUND.  
 \* PART NOT MOUNTED ON PRECISION WIRED SYSTEM.  
 \* VOLTAGE WILL VARY WITH SETTINGS OF CONTROLS.  
 \* RESISTOR VALUES 1/2W, 1/4W, 10%, CAPACITOR VALUES IN PICOGRAMS, UNLESS OTHERWISE INDICATED DC VOLTAGES MEASURED AT 100V AC LINE, NO SIGNAL, MAX. CONTRAST & BRIGHTNESS & MIN. VOLUME WITH VTRW.  
 \* COMPONENT MOUNTED ON UNDERSIDE OF PRECISION WIRED SYSTEM.

**REAR VIEW OF ALTERNATE VOLUME CONTROL & VACATION SWITCH**  
 NOTE: PLUS & SOCKET OF LINE COIL ARE POLARIZED. SMALLER PIN CONNECTS TO HOT SIDE OF 120V AC LINE.  
 NOTE: IN "ON" POSITION SWITCH S501 IS DISCHARGED FROM TIMER MOTOR AND STAYS PERMANENTLY CLOSED.  
 S501 VACATION SWITCH PART OF R208  
 REPLACE C501 WITH PART # 93B23-4

**CLOCK TIMER ASSY M503**  
 NOTE: IN "ON" POSITION SWITCH S501 IS DISCHARGED FROM TIMER MOTOR AND STAYS PERMANENTLY CLOSED.  
 S501 VACATION SWITCH PART OF R208  
 REPLACE C501 WITH PART # 93B23-4



# \$9.75

ALL PARTS  
INCLUDED

ONE YEAR GUARANTEE

## TUNER SERVICE CORPORATION

**PROVIDES YOU WITH A  
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### REPAIR

VHF Or UHF Any Type \$9.75.  
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In this price all parts are included. Tubes, transistors, diodes, and nuvistors are charged at cost.

Fast efficient service at our 5 conveniently located service centers.

All tuners are cleaned inside and out, repaired, realigned and air tested.

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Replacement Tuner \$9.75.

This price buys you a complete new tuner built specifically by SARKES TARZIAN INC. for this purpose.

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Dave Garwacki believes that it pays to promote one's technical ability as a C.E.T. That is why these initials are incorporated in his company name in the sign on the front of his shop and on his truck—shown in this month's cover photo. Note that he has even reproduced the C.E.T. emblem on the side doors of his truck. And Dave is one shop owner that has been hurting from too much business—as indicated in the second letter on page 24.

- 
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Increase your profits by reducing the cost of processing paperwork.

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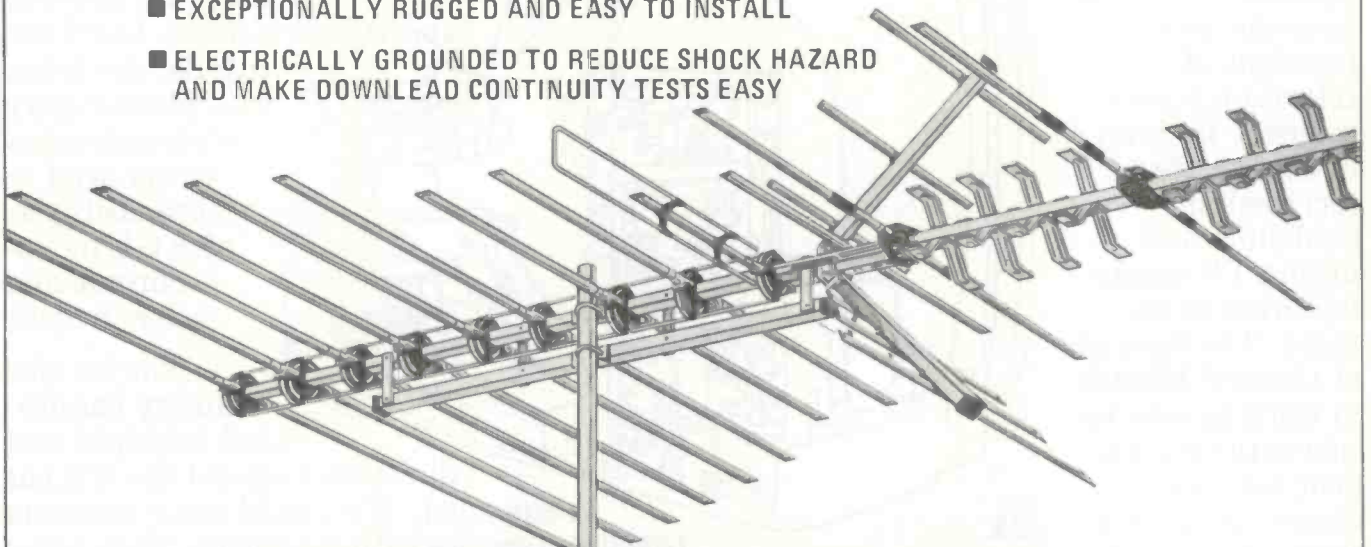
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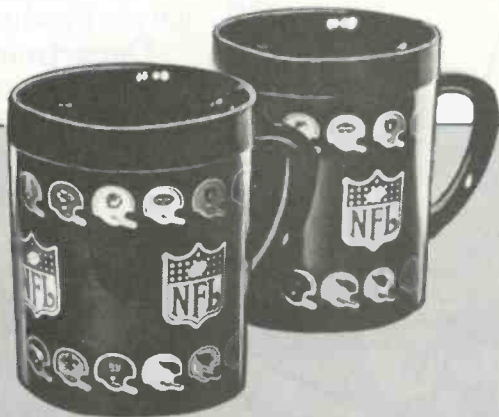
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- EXCEPTIONALLY RUGGED AND EASY TO INSTALL
- ELECTRICALLY GROUNDED TO REDUCE SHOCK HAZARD AND MAKE DOWNLEAD CONTINUITY TESTS EASY



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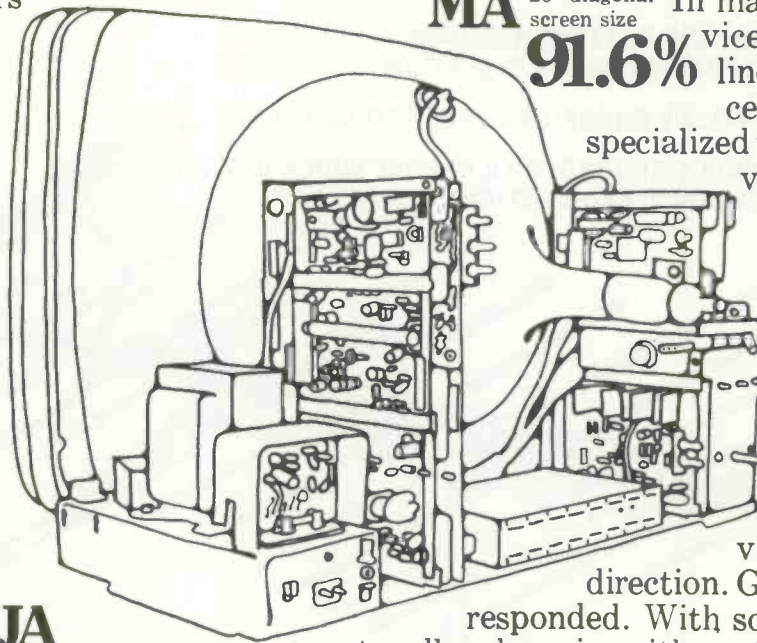
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**91.6%**

In many states, TV servicers use direct phone lines to regional parts centers. We provide specialized training. Our Television Service News provides advance information servicers need to more easily service GE monochrome and color models.

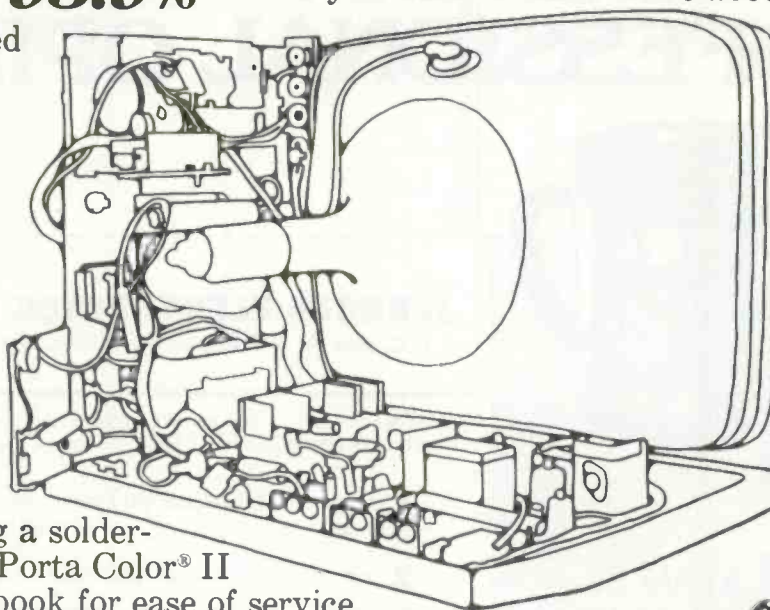
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**JA**

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## Why a CET Program?

It has become increasingly apparent that everyone that feels they understand the CET program is either strongly in favor of it or strongly opposed to it. This was noticed at the Joint Convention held last August in New Orleans.



There I noted that some of the state associations aligned with NEA were either going all out in support of the program or trying to smother it in red tape. And the situation was the same for the NATESA membership with its "Plan to Create Confidence" (a plan which we also intend to promote in future issues of our publication). Some of its members are also CET's and promoters of that program, while others oppose it as a duplication of effort or for other reasons that we will discuss.

Those opposing the CET Program indicate that the CET Exam is far from perfect, and that some people capable of passing the CET Exam might not be good technicians. The person may be a CET, but is he or she even able to properly solder an electrical connection? A person may be unable to pass the CET Exam even though he or she has been successful in servicing consumer electronic products for the past 15 years. Advertising by those that have passed the CET Exam in effect degrades the public image of other professionals that have not taken the exam.

Then there are those that say that too many people that pass the CET Exam expect an immediate raise, yet they are no better a technician today than they were two days ago. Wages are too burdensome now without the CET Program making the problem even worse. These people also feel that the CET Program sets up ideal conditions for unionization. Why it even uses such terms as "Journeyman" Technician—pure union phraseology. (This by the way is also a term used in apprenticeship programs developed long before any of our unions.)

I would be a fool if I claimed that these are not all just causes for concern.

I must also admit that the evening that I was publicly challenged into taking the exam—tired and with no preparation specifically for that purpose (the incident is described in more detail on page 26 of our June 1972 issue)—I was at that moment personally afraid of the CET Exam. I would have been subject to a lot of teasing and ridicule had I failed to pass the exam, and there were those there that would have made a point of asking me immediately upon completing the exam. (I have learned indirectly that there are currently other editors and freelance writers facing this same dilemma. Their future reputation requires that they take the exam, but they also have a reputation to lose should they fail to pass it. I know firsthand just how they feel, and hope that unlike me they will have an opportunity to secretly take the exam.)

Whenever you start something new which requires testing, there is always the problem of those well entrenched in our industry who—for a while at least—are left outside the group that has passed the test. Although we should not take lightly the prospect of others suffering from such a handicap, neither should such circumstances prevent us from actively promoting a testing program and those that have successfully completed it. This month's cover photo shows the truck of one shop owner in Toledo, Ohio who has actively promoted his ability to pass such an examination. And Couch's (featured in last month's issue) not only promotes the fact that Charles Couch, Jr., has passed the exam, it refuses to hire anyone that does not care enough about his profession to actively work to pass the exam within a reasonable period of time.

The CET Exam is certainly not perfect, neither is the CET Program or ISCET. But ISCET, now just slightly over two-years old, already has an impressive membership. A society this young must be subject to a few imperfections and some growing pains. At least it has gone one step forward in upgrading our profession by separating the unskilled amateurs from the professionals. No other organization in our field has so attempted to grade the skills of the electronic technician. Those writing the CET Exam are open to suggestions and

will consider your comments as they continue to revise the examination.

It is interesting to note the results of some studies that have been made concerning the CET Exam. Statistics have been gathered which show that the electronic technician with several years of practical experience is more apt to pass the exam than an electrical engineer fresh out of college. This speaks well for the many practical applications included in this exam.

It is also interesting to note that representatives of some state associations reviewing two CET Exams found one version much too theoretical while considering the other version fairly practical—despite the fact that the same questions were used in both versions. Only the sequence of questions had been changed to reduce any chance of cheating from neighboring test papers.

My feelings concerning unions are fairly well expressed on page 25 of the June 1972 issue in my editorial, "A Bunch of Snobs." If electronic technicians do unionize, it will be because of service dealers that fail to respect their employees, and not because of ISCET or any other association. Although—generally speaking—I am opposed to any unionization of electronic technicians, in some parts of the country the service dealer has asked for it. Should these employees unionize, it will not be with the help of ISCET. These employees know who their fellow electronic technicians are, they aren't dumb, they don't need ISCET to prepare a mailing list for them.

ISCET is a professional society dedicated to upgrading the electronic service industry through the development of greater professionalism, more effective work skills. Any change in ISCET's charter is subject to the approval of NEA—an association in which most members are service dealers. The Executive Vice President of NEA plays an active role in the activities of ISCET, attending its board meetings. Any state group associated with ISCET is subject to the approval of the state group associated with NEA—and such authority includes the screening of new members.

Well, then, why should an electronic

*continued on page 65*

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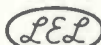
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## LETTERS

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

### Electronic Technicians Make Good

This letter is in response to a letter that you printed in the August 1972 issue.

My partner and I, as of 15 months ago, were each poor under-paid technicians. We spent our time working for the "Big Bad Boss." Then we took your advice and went in business for ourselves. You're right, it hasn't all been a bed of roses. But, I wouldn't take anything in the world for my position.

My partner and I found out that the only thing it takes to go into business on your own is sheer guts and a goal to reach for. Starting out with one set of hand tools, no money, and a lot of guts, we've built a well equipped and well stocked TV shop that is well respected. So add this success story to your list of those of poor under-paid technicians.

Even though I am a shop owner now, I will never stop fighting for better working relations for the poor under-paid technician.

So, "Mr. Big Bad Boss," it only stands to reason that if your technician is happy and content with his job, he'll make more money for you and cut your technician turnover to a bare minimum. Quit looking at your technicians as hired hands and look at them as you would an investment. Try to understand his problems, talk to him like a human being. Then see if he doesn't make you a better employee.

In closing, to you technicians, learn to realize when you've got a good thing going and when you don't have a good thing. Don't say, "There isn't anything I can do about my job." Remember, if you as a technician don't look after yourself, and your work, *who will?*

GENE HENDERSON  
TOM SAWYER T.V.

Fort Worth, Texas

### Attends First Convention

Meeting you at the Joint New Orleans Convention was a great pleasure for me. I read your magazine faithfully each month and you are doing a fine job. Also, congratulations to you for passing the C.E.T. Test.

My trip to New Orleans was very educational for me. In fact, this was my first time that I have been away

from my shop for many years. I always felt that if I closed my doors for any length of time, I would lose a lot of customers. So my wife stayed home and took care of the telephone. And guess what? Most of my customers said that they would wait until I got back. They did wait, and I am still trying to get caught up.

My main reason for attending the convention was to find out what the association could do for me. Most of the fellows were asking the same questions when I asked them to join our local association. Well fellows, I found out the answers to the questions that we all had asked.

First of all, just meeting the technicians, manufacturers, their reps and engineers, plus newspaper and magazine editors, was great. I met so many wonderful people. I had no idea that there were so many devoted people in this field knocking out their brains to better the technicians' job.

The seminars put on by many different manufacturers was of great interest. (I saw companies there that produce test instruments, antennas, MATV systems, TV sets, CRTs and component parts, plus a lot of other things.)

The set manufacturers had private suites for the technicians to visit and to speak to them about their products. We could voice our likes and dislikes about their products and what they could do to improve them to make servicing faster and easier. I think it was of great value to be able to do this, and I would like to thank each and every manufacturer who contributed to the success of our Joint Convention.

The week spent at this convention was worth every dollar spent. I am personally going to try many of the ideas put forth to better my service to customers and to upgrade our industry.

As a member of NEA and TSA of Ohio, and as secretary/treasurer of our own local ETAT of Toledo, I am now going to try to put forth to our members some of the things that I learned at New Orleans. It is a constant battle with some of these fellows to try to have them join an association. Some will never get their heads out of the sand to better themselves. Let Joe do it is their attitude.

To all the members in NEA and NATESA, plus the local associations: Let's keep plugging away for everyone's betterment and maybe what we are trying to do will rub off on the rest of the fellows so that they too will join in and help create one of the greatest associations this country has ever seen. There is still time left to help. The

*continued on page 26*



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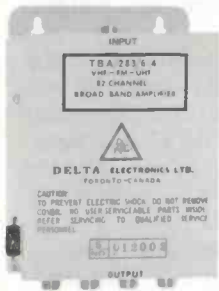
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## LETTERS...

*continued from page 24*

next time you are asked to join an association, men, join and set forth your ideas. You will be surprised at the results.

People who complain about the TV prices should pay the French Quarter a visit. Then they'd find out that staying home and watching the tube is really economical.

DAVE GARWACKI, C.E.T.

*[He and his truck are shown on this month's front cover]*

## Responds to Earlier Letter

In response to an earlier letter critical of the CET Exam, I agree that some questions are perhaps unusual, but then I'd wager you would hear the same comment from doctors, dentists, attorneys, accountants, etc., after they have taken their state exams.

You say there is too much theory while your contemporary down the street says there is too much practical work involved. There are 125 questions to this exam and 75 percent is passing. That means 94 or more cor-

rect answers. It would be possible for you to miss 31 theory questions and pass the exam, while your fellow technician could miss 31 "practical" questions and pass the exam—and you would both be competent technicians. However, I doubt that this imbalance would ever happen.

This exam is made up by service people and is constantly reviewed and revised by service people. Technicians who are CETs are asked for their help in this matter. It is not perfect, of course, so it shall be continually revised.

People who nit-pick at exams, associations, etc., give the impression that they are jealous or afraid or both. You (the author of that earlier letter) have no need to fear sir. Anyone in business as long as you, with your background and contact with new circuitry, should have no problem passing this exam.

You might also consider that the questions found in this magazine are samples and not the exact questions that you will find in the CET Exam.

To the gentlemen in the Western Service Conference who believe the exam should be made easier: The intent and purpose of this exam, I believe, is to establish a level of competence for technicians across the country. If it is made so easy that anyone could pass it, what has been gained? However, if service personnel are trained and educated so that they can pass this exam, then look at what has been gained.

CET Iowa 84 and proud of it.

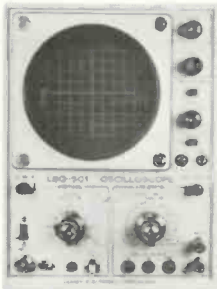
DOUGLAS HILBY

DOUG'S TV-STEREO

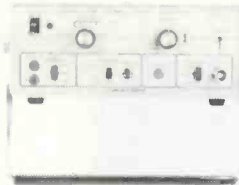
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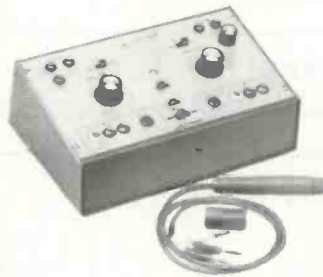
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## Supports CET Exam

A gentleman recently took a CET exam that I monitored, and the following is a note that I received from him:

"I have received word back from CET that I didn't pass the exam. I am interested in taking it again. Would you please inform me of the next dates and locations for the exam so that I can make at least one of them. Thank you."

I believe the above is a good answer to some objecting to all the theory in the exam. He is not objecting to the exam in any way, but is studying now to overcome some weaknesses he has discovered, and now realizes why some servicing problems were problems. To me that is the real purpose of the CET program. It gives a good technician an opportunity to check his overall understanding of electronics as used by many electronic technicians and to plug up the holes.

Your representative questions

should be so considered. And, also, you show how to derive the answer. In the test the answer is given (multiple choice) and only needs to be selected. Also, one is allowed 25 mistakes per 100 questions. Imagine taking 100 pieces of equipment in for repair and having 25 improperly repaired. It is easy to make excuses, but often difficult to face the truth.

After one has taken the exam, most of us will gladly accept his ideas for improvement, but then, if he is reasonably capable, he likely will not complain, for he will then know what he is talking about at least, and the CET exam is to identify qualified technicians.

P.S. I liked the "Three Brothers" editorial and very much agree with your conclusion. I do not consider myself a superman, and took the CET exam two years ago, without at that time knowing anything about it except that less than 50 percent passed—no special preparation of any kind—and passed it. Possibly to some today's exam could be more stiff, but only I believe because of change. I am servicing, and 63 years of age. All factors put together, I fail to see where a younger man has any excuse if he has any pride and wants to be fair with his customers.

SAM DAVIES, C.E.T.

### Wants to Enter Business

For the past few years some friends and I have been reading your magazine, *ELECTRONIC TECHNICIAN/DEALER*. We have found its articles to be very helpful and interesting.

We were wondering if there is any organization that sponsors young electronic students in starting their own business. During the past four years, each one of us has been taking a required course in Television and radio electronics.

When it came down to getting into the field, we found that it isn't so easy. So we wrote to various companies, but there were not too many responses. So we decided to write to you and see if there was anything you could advise us concerning getting work in this field. Or is there any way of getting further experience in the field to get a decent job in a trade that we know?

We would appreciate any assistance that you can give us as a group or individual.

GREG MCGIRT

### Finco Gift Certificates

To all Service Dealers who obtained Finco Gift Certificates in the recent

NATESA/NEA/Finco Membership Drive—if you lost or misplaced your gift certificate, please notify the Finney Co. with evidence that you joined either NEA or NATESA through the Finco membership project, and we will issue another gift certificate to you. If you neglected to obtain your Finco merchandise from your favorite Finco Wholesale Distributor before the expiration date on the gift certificate, please notify the Finney Co. so that we can send you a letter extending the expiration date and authorizing Finco Wholesale Distributors to honor

your gift certificate. If, after receiving your gift certificate, you were not able to conveniently locate a Finco Wholesale Distributor and thus did not get your Finco merchandise, please notify the Finney Co. immediately so that we can arrange for you to obtain the full value of the gift certificate in Finco merchandise.

Please—in all such correspondence to the Finney Co., indicate whether you joined NATESA or NEA, and if you did receive a gift certificate and it became void before you were able to

*continued on next page*



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## LETTERS...

*continued from page 27*

get your merchandise, be sure to give us, if possible, the serial number of the gift certificate. The Finney Co. wants each and every recipient of a Finco \$35.00 Gift Certificate to get his merchandise.

We also sincerely ask your continued enthusiastic support of your new national affiliation. It is the one sure insurance policy for the development of the image and the protection of the future interest of all Independent

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MORRIS L. FINNEBURGH, SR., E.H.F.  
Chairman of the Board  
The Finney Co.

### Error in Audio Article

In an article entitled, "Working with Commercial Audio Equipment," in the August issue of *ELECTRONIC TECHNICIAN/DEALER* [page 57 under the heading *Input Cables*] it is stated that, "if a very long microphone cable is required, use a high-impedance mike and preamplifier input to match."

I was always under the impression that a high-impedance mike picked up hum easier. Also, a high-impedance mike cable will reduce the frequency response since the conductors act as a capacitor. Thus, the longer the cable, the lower the frequency at which the losses start to occur. Therefore, wouldn't it be better to use low-impedance mikes and cable for longer runs to avoid hum pickup and frequency loss?

DAN KEEN

*I am sorry, we did let this error slip through. You are definitely correct. An audio signal that is to be conducted through any great length of cable should be of low impedance, whether from a microphone or preamplifier. Ed.*

### More on Al Forman

*In our August issue we printed a letter from one of our readers along with a reprint of an earlier Editor's Memo that had been requested. The letter had asked what became of Al Forman. The following response was received from our own printing plant in Dansville, New York.*

My advance copy of the August issue of *ET/D* (pp. 27) says you're looking for Al Forman.

As of early '72, he was president of Publication Typographics, 891 High Ridge Road at Vine, Stamford, Conn. 06905. You might want to check with him, though, before releasing this information.

Do I win a prize for first-to-respond? Or are printers not eligible?

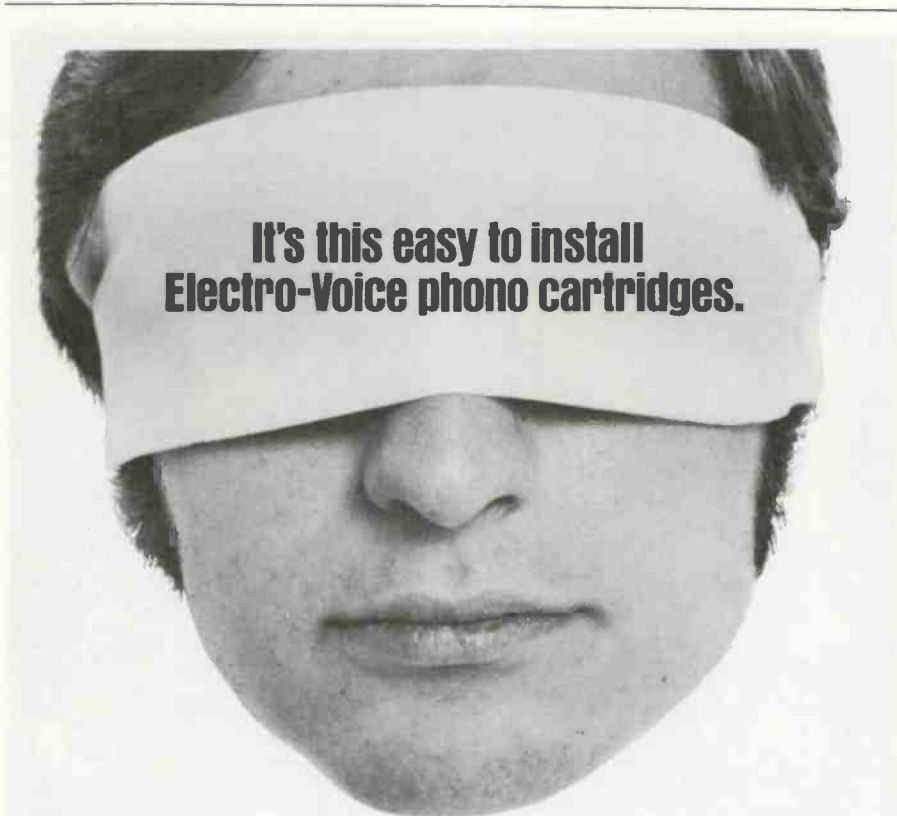
That's a helluva editorial in August. Keep up the good work.

JERRY WHITTLESEY

*We contacted Al Forman as suggested, and received the following response:*

Megathankx for the note. I'm alive and well and running this computerized typesetting company in Stamford. And if your readers think that TV sets have a poor mean-time-between-failure rate, they should see how often the big kilobuck commercial gear is down. C'est la vie électronique. I hear tell that *ET* is still the best book for TV techs. Best wishes to all in the field with long memories.

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Almost 100% original or exact replacements. But half of our competitors' cartridges are substitutes. And you know what problems that means. Like having to adjust the tracking weight and set down position of the tone arm. And changing the terminal clips on the tone arm wires. And installing a new bracket to adjust the cartridge to the arm. And, maybe, when you're finished, an output voltage difference exists.

Of course, when you specify Electro-Voice quality-assured cartridges, you avoid all this time-consuming, costly work. What's more, you don't make unprofitable double repairs. Your customer is happy the first time. And when he needs other services, he'll call you.

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

### Technicians Wanted

We are hiring CETs and those who want to become a CET and would like to live in northern Florida. We have a very fine service department with modern up-to-date equipment and a technical library. Our service operation is basically Zenith, although we are also heavy in MATV equipment, audio/background music, and two-way radio. We are interested only in those who want a permanent position. Salaries are open and we have good incentive plans for the right people.

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Gainesville, Fla. 32601

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I am in need of two adapters for a B & K Model 650 tube tester. The model numbers of the adapters are 610 and TC-615. Please write and send price wanted.

I also have a fair selection of old radio tubes in good condition too numerous to list. Please write for list.

JOHN V. SPILLMAN

286 Alameda Ave.  
Youngstown, Ohio 44504

Wanted, used Peterson Chromatic Tuners (Music) Model PT-400.

FREEMAN GILMORE

6291 Lake Dr.  
Haslett, Mich. 48840

I would like to buy a good used Television Analyst.

EARL J. BREEDING

P.O. Box 257  
Gifford, Ill. 61847

### Equipment For Sale

I have instruction manuals for a number of test instruments free upon request and some used test equipment for sale. Write for list and price.

PAUL W. ABELQUIST

5504 Norlina Rd.  
Virginia Beach, Va. 23455

I have a Lamkin Model 107 Digital Frequency Meter and Signal generator with calibrating pad included for RF and IF alignment, and sensitivity

checks for sale. The best offer takes it.

MARVIN A. ZIEGMANN

North Shore Black Hawk Lake  
Lake View, Iowa 51450

I have for sale, 15 pieces of radio and TV test equipment about one year old. Please write for list.

DANIEL SEIDLER

5827 S. Campbell Avenue  
Chicago, Ill. 60629

I have a Blonder-Tongue UHF/VHF Solid-State Field Strength Meter

for sale. The unit operates on ac or battery. Please write for price.

DON SHAPIN

691 North Hawkins Ave.  
Akron, Ohio 44313

### TV Manuals for Sale

I have a complete set of Riders TV Manuals for sale. There are 27 books in the set, with index. The manuals cover the period from 1946 through 1960. Please make an offer.

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Many servicemen buy three—one for shop; one, home; one garage.

**THE HOUR SAVER** Take SUPER FROST AID, for example. It helps find intermittents in minutes instead of hours. But servicemen have also used it as a portable small-fire extinguisher, blister-preventer (used on minor burns immediately), heatsink before soldering...and even chewing-gum remover (cold makes gum brittle).

**PUSHBUTTON PEACE & QUIET.** One spray of SUPER TROL AID or CONTACT KLEEN quiets noisy pots, switches and relays. Some servicemen make a lot of money "curing" noisy transistor radios, balky dimmers, antenna rotors...even thermostats. Not to mention tape recorders, CB sets, marine radios...

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# NEWS OF THE INDUSTRY

## Some Pictures Taken Of Joint Convention

With four conventions going on simultaneously, your editor decided to leave his camera home and rely entirely on convention photographers. The following pictures were supplied through the courtesy of Dick Glass, C.E.T., executive secretary of NEA.



A shot of NEA's delegates voting without reservation at the Joint Convention to merge with NATESA.



Les Nesvik after he received the "NEA Man of the Year" award at the Magnavox sponsored luncheon.



A shot of the delegation from Canada at the Joint Convention. Calgary, Hamilton, Toronto and Montreal were represented in this group of members of the Corporation de Electroniciens.



Larry Steckler, editor of RADIO-ELECTRONICS, receiving his brass CET Certificate from Phillip Dahlen, Chairman of ISCET and editor of ELECTRONIC TECHNICIAN/DEALER.

## Three National Organizations Conduct Nationwide Public Service Program

A project called "Open Sesame Street" is being spearheaded by the Auxiliary to the American Optometric Assn., with the support of the National Electronic Assns., and the Children's Television Workshop. This program was discussed in detail at the Joint Convention last August in New Orleans, having first been introduced in June at the optometric auxiliary's annual meeting in St. Louis.

Launching the project were Emilio Delgado, who plays the Spanish-speaking Luis on the "Sesame Street" program; Vince Lutz, director of special activities for the NEA; and Mrs. Clifford Wagner, a trustee of the AOA Auxiliary.



Reviewing the "Open Sesame Street" program guide are (l to r): Paul Lehner of KETC-TV, the educational television station in St. Louis, Mo.; Mrs. Clifford Wagner, a member of the AOA Auxiliary board of trustees; Emilio Delgado, cast member of the "Sesame Street" television program; Vince Lutz, director of special activities of the NEA; and Tony Best, public relations director of the Children's Television Workshop.

The goal of the national volunteer project is to provide over 251,000 children in some 6000 non-profit day-care centers with TV sets so that they can watch and learn from "Sesame Street" and other children's educational programs.

According to this program, used TV sets will be collected by members of the AOA Auxiliary, who will deliver them to cooperating NEA members. There they will be safety checked, without charge. Those that pass will be distributed by the auxiliary to day care centers, while those that fail to pass will be disposed of by members of the auxiliary.

More information concerning this program can be obtained by writing: AOA Auxiliary Trustee, Public Information, c/o AOA Auxiliary Administrative Office, 7000 Chippewa St., St. Louis, Mo. 63119.

# Introducing the expensive dual-trace scope that doesn't cost a lot.

The B&K Precision Model 1470.

A solid-state 5-inch scope that combines dual-trace triggered sweep with vectorscope capability.

Our DC to 10 MHz bandwidth with 10 mV/cm sensitivity makes the 1470 exceptionally versatile. And its TV-H and TV-V positions are a special plus.

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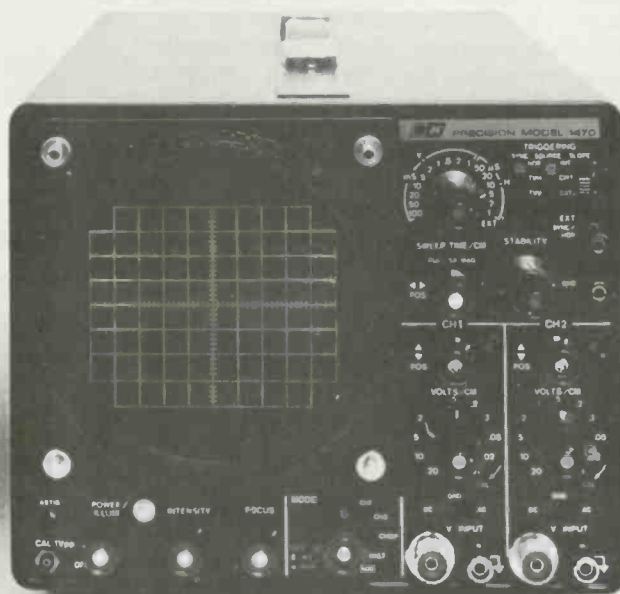
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## \$499.95



## NEW AND NOTEWORTHY

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



### TV ALIGNMENT INSTRUMENT 701

*Combines features found in three or four separate units*

The Model WR-514A TV Sweep Chanalyst combines features normally found in three or four separate test instruments. The instrument reportedly has the combined features of a TV sweep generator, marker generator, marker adder, and special system for color bandpass alignment. It provides RF, IF and video-output sweep signals for alignment of VHF tuners, IF amplifiers, video amplifiers, and color bandpass amplifiers. When used with an oscilloscope, the unit provides a continuous trace display of the bandpass characteristics of TV-receiver circuits. Some of the features of the new TV Sweep Chanalyst are: Fundamental sweep output of all VHF TV channels, for sweep alignment of VHF tuners, and FM sweep output from 88 to 108MHz for FM tuner alignment; sweep output on all IF frequencies for stage-by-stage or overall IF alignment; video sweep output from 50kHz to 5MHz for alignment of video amplifiers and chroma circuits; and a special signal for color bandpass alignment. Seven crystal-controlled IF markers are provided for checking IF response of sound, picture, chroma carriers and built-in marker adder function. The instrument incorporates BNC connectors throughout and comes equipped with basic output cables and snap-on alignment adapters. RCA/Electronic Components.



FOR MORE NEW PRODUCTS SEE PAGE 56

### CIRCUIT TESTER 700

*Warranted to withstand up to 5-ft drop*

The Model 666 solid-state circuit tester is reportedly the latest addition to the company's line of "drop-proofed" VOM's. For current measurements, the tester offers 12 ranges with the lowest full scale range beginning at  $1\mu\text{a}$ , 18 voltage ranges from 100mv full scale through 1000v, and 14 resistance ranges, featuring seven low power resistance ranges for "in circuit" measurements of semi-conductors. Other features that are said to be provided include a special differential FET input circuit providing 10M impedance. This circuit design reportedly eliminates the need for frequent battery replacement. Diode protection on the meter movement as well as protection with an externally replaceable fuse, input reversal switch, temperature and frequency compensation, and a self-shielded taut-band mechanism are all included in the design of the unit. Weston.

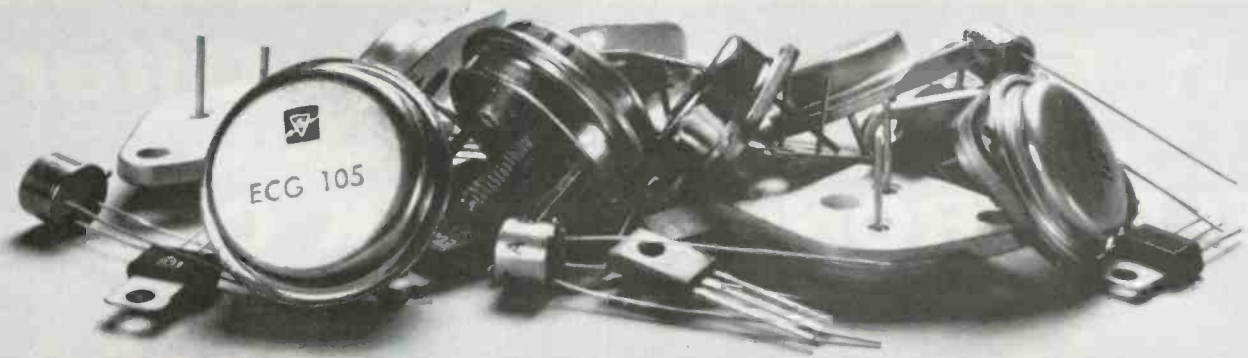


### FERROGRAPH RECORDER TEST SET 702

*Measures major parameters of magnetic recording systems*

The Model RTS-1 Ferrograph Recorder Test Set is designed to reportedly measure all major parameters of a magnetic recording system. The instrument consists of four sections: variable frequency audio generator, millivolt meter with associated attenuator, wow and flutter unit, and total harmonic-distortion measuring unit. The interconnecting of these sections in the correct sequence for any particular test, or for calibration checks, is carried out by clearly labeled push buttons. Only two leads are necessary from the test set to the equipment under test. In addition to magnetic recorders, the unit is equally applicable to disc reproducers, dictating machines, film apparatus and audio amplifiers. The unit weighs 13 lb and is 17 $\frac{3}{8}$  in. wide by 10 in. deep and over a stand 5 $\frac{5}{8}$  in. high. Elpa Marketing Industries.





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To Be Replaced	ECG Replacement	To Be Replaced	ECG Replacement
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AD138/50	121	QP 2	179
AD139	104	QP 3	179
AD140	121	QP 4	179
AD142	179	QP 5	179
AD143	179	QP 6	179
AD143B	179	QP 7	179
AD148	131	QP 8	130
AD149	104	QP-8-1	130
AD149-01	121	QP-8-P	130
AD149-02	121	QP-10	179
AD149B	121	QP-11	130
AD150	121	QP-12	130
AD152	131	QP-13	185
AD155	131	QP-14	184
AD156	131	QP8-6623N	105
AD157	131	QP-13	153
AD159	121	QP-14	152
AD16C	175	QQC61209	158
AD161	155	QQC61210	102A

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Basic Color Television Course	List Price \$9.95; Club Price \$6.95
199 Color TV Troubles & Solutions	List Price \$7.95; Club Price \$4.95
Digital Electronics: Principles & Practice	List Price \$8.95; Club Price \$5.95
Commercial FCC License Handbook	List Price \$8.95; Club Price \$5.95
RCA Color TV Service Manual—Vol. 2	List Price \$7.95; Club Price \$4.95
Citizens Band Radio Service Manual	List Price \$7.95; Club Price \$4.95
FET Applications Handbook	List Price \$14.95; Club Price \$9.95
199 Electronic Test & Alignment Techniques	List Price \$7.95; Club Price \$4.95
Electronic Musical Instruments	List Price \$7.95; Club Price \$4.95
Electronic Designer's Handbook	List Price \$9.95; Club Price \$5.95
Dictionary of Electronics	List Price \$6.95; Club Price \$5.50
Japanese Color TV Service Manual	List Price \$7.95; Club Price \$4.95
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in a matter of minutes. Repair procedures are included for dishwashers, clothes washers, dryers, water heaters, garbage disposers, and ranges, using typical models and case-history data drawn from actual experience. In every case, the material is based on practical, down-to-earth reasoning and techniques. 288 pps., over 260 illus. Hardbound.

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Here's an opportunity to close whatever gaps there are in your ability to use modern, up-to-date equipment designed specifically to save you time and money. You'll quickly grasp the author's common-sense approach to using the right instruments, thereby getting the most out of your investment in test gear. You'll improve

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## Sylvania Monochrome TV Service Manual

### SYLVANIA MONOCHROME TV SERVICE MANUAL

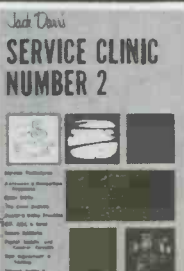


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cians can gain from the numerous troubleshooting tips, and beginners, with a few hours study, can begin to turn out profitable work in a short time. Includes shortcut methods of troubleshooting, plus general test techniques, and how to set up a radio repair bench. Covers typical receiver circuits, and the fundamentals of circuit operation. 260 pps., 36-page schematic foldout. 170 illus. Hardbound.

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## TV, Radio, Hi-Fi Hints & Kinks



If you want to get the best performance out of consumer electronics equipment, you'll find this to be the most informative and useful handbook ever published. Over 150 ideas suggest ways to customize and add accessories to any equipment setup—how to connect single and multiple accessory speakers, how to add remote controls to

TV's, radios, hi-fi systems, how to connect microphones, etc. Also includes many tips on hi-fi equipment, CB and 2-way radio equipment, antenna systems, remote monitoring techniques, intercoms, a wireless baby sitter, telephone amplifier, moisture, fire and other alarm accessories for any existing amplifier. 256 pps., over 150 illustrations. Hardbound.

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## Handbook of Semiconductor Circuits



Contains 124 examples of standard transistor circuits, complete with operational data for amplifiers, oscillators, logic and switching circuits, power supplies, and various nonlinear circuits. The broad range of circuits included were selected on the basis of application and practicality. A design philosophy section is

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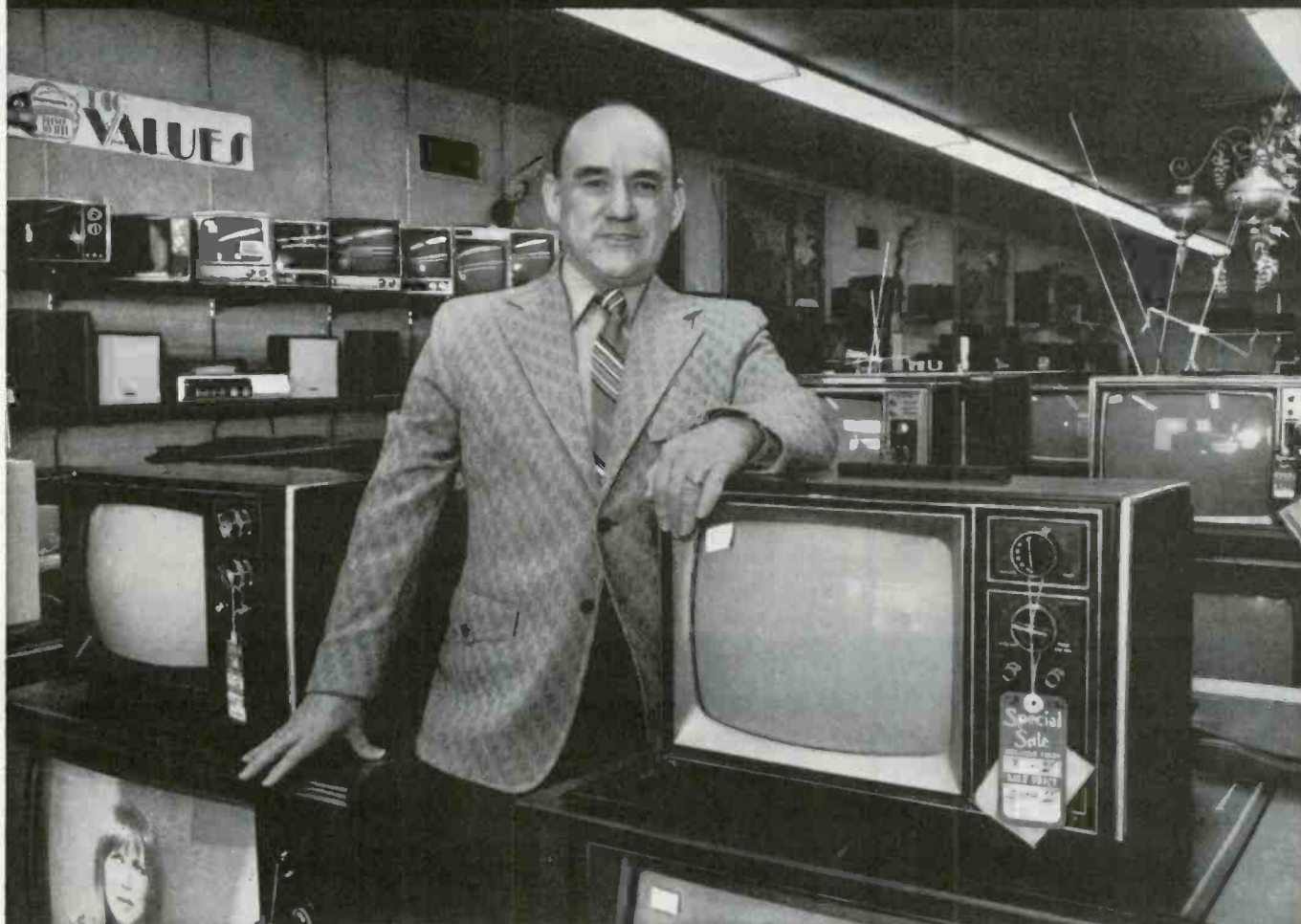
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# AN EXTRAORDINARY OFFER...

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OCTOBER 1972, ELECTRONIC TECHNICIAN/DEALER | 37

**"We get a great number of service calls from people who saw our ad in the Yellow Pages."**



"We don't just sell our products, we service them as well," says Mr. James Godwin, Godwin Radio Company, Birmingham, Alabama. "Our Yellow Pages ad has kept our phones ringing with people who want service on their radios, stereos, and televisions. We advertise under several headings, because we sell a number of different types of home entertainment equipment. So the

Yellow Pages is helpful in the area of sales as well as service. I think the Yellow Pages is a kind of final reference for people. Your ad or commercial will interest them, but they may need your phone number or address or some other piece of information. Then they head straight for the Yellow Pages."

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## TEKLAB REPORT

# Introducing General Electric's 19JA Solid-state Color-TV Chassis Part II

by Joseph Zauhar

A new One-Touch Color System  
allows the customer to make minor COLOR and TINT  
adjustments for personal preference

■ A number of automatic features are included in the One-Touch Color system employed in the Model JA7458WD Color-TV set that was sent us for review. The Automatic Chroma Control (ACC) helps to maintain color intensity in the TV set from program to program and channel to channel. The COLOR and TINT range lock circuitry locks the COLOR and TINT settings within a pleasing range while offering flexibility for minor adjustments—a feature not found in many color-TV sets. The Automatic Fine Tuning Control (AFC) employs integrated circuitry to lock-in and maintain fine tuning. A three position CUSTOMATIC TINT LOCK allows customers to select the skin tone most pleasing to their eye.

One advantage in reviewing the circuits employed in the JA chassis results from the standardized chassis approach. Once the electronic technician is familiar with this chassis, he will be able to work on those of all other size screens, 10 in. through 23 in., instead of having to become familiar with a different chassis for each size set.

Last month we reviewed the serviceability features, VHF tuner, Video IF, AGC circuits, Video amplifier and the power supply. This article continues the subject by covering some of the other important circuits employed in this

chassis. As we review these circuits, they can be followed in the August Tekfax Schematic No. 1432.

### One-Touch Color System

The color-TV set reviewed in our lab employs the new One-Touch Color system, a trade name given by General Electric for its simplified color-tuning system.

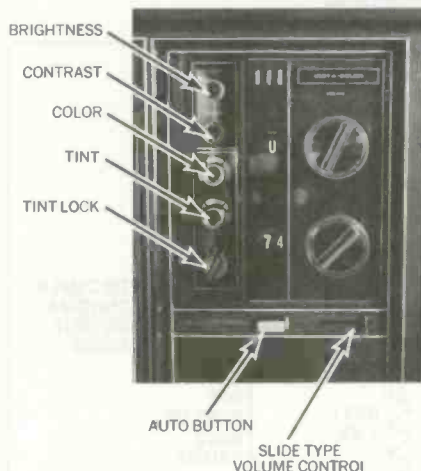
This system includes the AFC, and the COLOR and TINT range lock circuitry. With this system the customer merely presses the AUTO button for a good picture while still being able to make minor COLOR and TINT adjustments to suit his own

personal preference. When this circuit is activated, resistive networks lock the adjustment latitude of the COLOR and TINT controls to within an acceptable normal range. Acceptable TINT and COLOR saturation can then be obtained at any setting of the TINT and COLOR controls when the circuit is activated. When the AUTO button is pressed, it actively limits the range of the controls, but in effect also expands the useful range of the controls.

The tint lock part of the One-Touch Color system modifies the receiver's color reproduction so that pictures which normally appear greenish yellow or reddish-magenta will be reproduced as reddish-orange. This circuit is designed to improve transmission variations which cause skin tones to be tinted green or magenta.

On the TV-set's front control panel there is a three position TINT LOCK switch to compensate for the amount of tint correction needed for good color reproduction.

The color reproduction is modified by feeding a small portion of the inverted R-Y signal to the B-Y and G-Y amplifiers. Referring to the upper right portion of the August Tekfax Schematic No. 1432, the R-Y signal is fed to the common emitter amplifier base, transistor Q509. This signal is then amplified and inverted by Q509 before being



The customer controls are grouped and conveniently located. Also, note the detent type UHF tuner employed with lighted indicator for every UHF channel.

fed to emitter follower transistor Q510. The signal is then fed to the B-Y and G-Y amplifiers through resistors R590 and R587, or R586 and R588, and TINT LOCK switch S504. The amount of inverted R-Y signal fed to the B-Y and G-Y amplifiers is determined by the resistor values and the setting of the TINT LOCK switch. The inverted R-Y signal, when added to the B-Y or G-Y signal, alters the output of the B-Y and G-Y amplifiers to reduce the amount of green and magenta in the picture.

The function of this circuit can be readily viewed on a vectorscope display of the red and blue signals for the picture tube. The normal display of the keyed-rainbow signal vector is practically round, but with the TINT LOCK switch in Position 1,

the pattern becomes elongated along an orange-cyan axis. The fourth vector, which is normally in the magenta region, is now pushed into the red region. The tenth vector is also pushed from the green toward the blue region. When the switch is in Position 2, the elongation is more pronounced and there are almost no vectors in the green and magenta regions, producing color bars on the picture tube with shades of reddish-orange or bluish cyan tints.

### Automatic-Color Control

The automatic color control circuitry on this chassis is contained in

a module that plugs into the main circuit board. It actually consists of two circuits—an automatic color-level circuit and a color-killer circuit.

This circuit acts as a variable resistor in the emitter circuit of transistor Q501, the first chroma amplifier. It senses the amplitude of the color burst signal at the input to the crystal filter and varies the resistance in the emitter of Q501 accordingly. If the burst amplitude is low, the automatic color-level circuit will decrease the emitter resistance, increasing the amplitude of the chroma signal. A converse effect will occur if the burst amplitude is high.

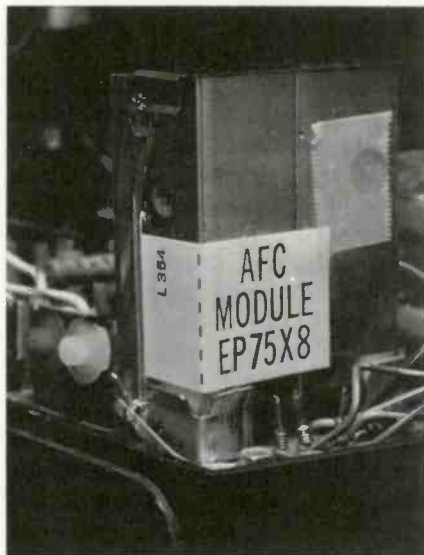
The color-killer circuitry is very similar to the automatic color level circuitry, but its operation is different since it acts as a switch at the base of transistor Q503, the chroma bandpass amplifier. When there is no color subcarrier signal at the base of transistor Q507, the subcarrier output amplifier, the circuit in effect shorts the base to ground.

### Color-Range Lock Circuit

When the advanced One-Touch Color system is employed, and the auto button is in the ON position, the color cannot be turned fully ON or OFF with the COLOR control; and as a result, the COLOR control is less critical. This is accomplished by resistor R511 and the AUTOMATIC COLOR ADJUSTMENT control, R515, shown in the partial schematic. The values of resistors R511 and R515 are high enough that when S503 is OFF, they have no effect on the operation of the COLOR control. When the switch is ON, R515 is connected across the COLOR control; and it, in conjunction with R511, sets the minimum level to which the color can be adjusted. Since the resistor is connected in series with the arm of the COLOR control and the output, it limits the maximum color saturation. Therefore, the color cannot be turned completely ON or OFF when S503 is ON and the color saturation can be adjusted to suit individual preference within the limits set by the resistor values.

### Chroma Circuits

The chroma bandpass portion of the chassis employs transistors

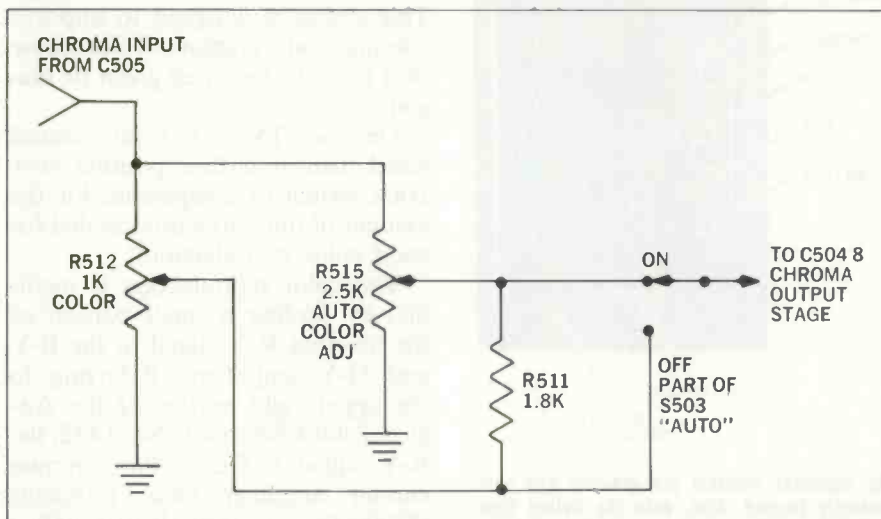


The plug-in Automatic Fine Tuning (AFC) module.



RED BLUE GREEN  
COLOR AMPLIFIER TRANSISTORS

The blue, red and green color amplifier transistors plug into sockets for easy removal and substitution.



Simplified schematic of the color range lock circuit.

Q501, Q502 and Q503. Transistor Q501 and its associated circuitry is tuned to accentuate the frequencies on the 4.1MHz side of the chroma signal, compensating for the deemphasis of these frequencies in the video IF and detector sections. The emitter of Q502 feeds chroma signals to the base of Q503 through capacitor C505 and the COLOR control, R512. It also supplies signals, through capacitor C506 and diode Y502, to the base of the burst-gate transistor, Q504.

Transistor Q503 is the output transistor for the chroma bandpass section, and from its collector the chroma signal is fed through transformer T500 to IC501, the chroma demodulator. The center tapped secondary of T500 provides a balanced chroma signal for the IC. Positive-going horizontal pulses are coupled through resistor R568 to the emitter of Q503, biasing it off during retrace. This prevents the chroma demodulator, IC501, from producing an output at burst time during the retrace interval, which would cause a colored vertical bar on the screen.

The burst-gate transistor, Q504, is gated ON by the positive-going retrace pulses from the horizontal output transformer. These gating pulses are fed to the base of transistor Q504 through resistor R566, diode Y504, capacitor C509, resistor R574 and resistor R522.

It is desirable that Q504 be gated ON only during the burst intervals, but the duration of the gating pulses is much longer than the burst interval. The pulses can, in effect, be narrowed by using only the top parts of the pulses, which are narrower than the lower sections. This is accomplished by means of R572, which supplies reverse bias to diode Y504 and consequently this diode will not conduct until the pulse voltage exceeds 22v. Transistor Q504 is ON only for the short duration of the relatively narrow pulse tips.

The TINT control circuitry (resistor R532, coil L510, capacitor C522 and a piece of coaxial cable) provides a means of varying the phase of the subcarrier signal, which is fed to the base of transistor Q506. After the TINT control circuit, a two-stage R-C coupled amplifier

(transistors Q506 and Q507) is used to amplify the 3.58MHz reference signal. Both stages are connected in common-emitter configuration. The output of the second stage is coupled by transformer T502 to the phase-shifting network (capacitor C538, coils L512 and L514, and resistors R554 and R558). This network determines the phase angle between the 3.58-MHz reference signals supplied to the chroma demodulator, IC501. This phase angle is approximately 105°, and since the components in

this circuit are not adjustable this phase angle remains fixed.

### Sync-Clipper Circuit

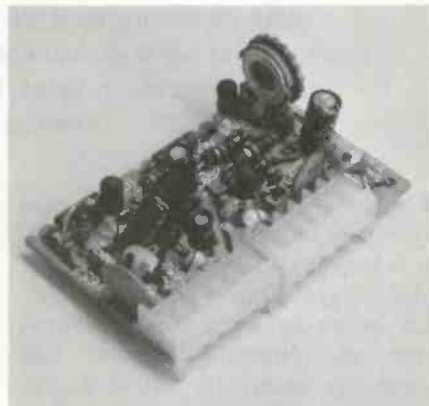
The sync clipper transistor, Q201, has a dual time-constant input circuit which is switched by diode Y212. This circuit must have the capability to handle two types of signal. One, the vertical sync block composed of six pulses of 27μs duration each, the other, the horizontal sync pulse, which lasts for 5μs.

Many solid-state sync clippers use a large value (0.22μf to 1.0μf) capacitor at the input to couple the vertical sync pulses to the clipper without distortion. The time constant of such a circuit is so large that the circuit does not always respond to individual horizontal sync pulses. However, the input circuit

*continued on page 66*



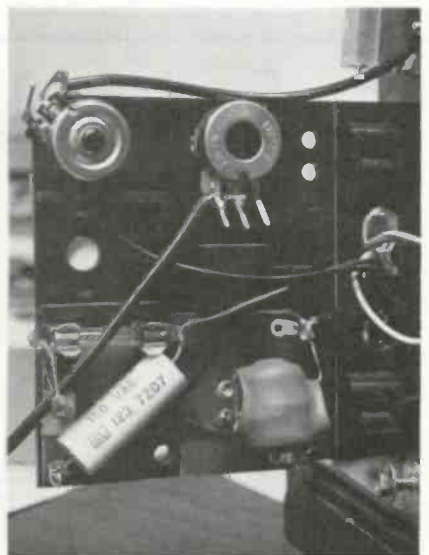
One of the labels giving the high-voltage and color adjustments is shown cemented to the inside of the TV set.



The automatic-color control module plugs into the main circuit board.



The silicon solid-state, high-voltage rectifier plugs-in like a tube.



The swing-out fuse panel has a plastic blade acting as a guide for the ac interlock. After removing one screw, complete access is provided for the fuse and line chokes, plus the SHARPNESS and FOCUS controls.

# Electronic Security

## Part I—Ultrasonic Detection Circuitry

by Terry Tuttle and Tom Turnbull

With increasing concern for security, we find a wide variety of products and services available on the market to fill this need. This poses a very real problem to someone not familiar with the new devices available as to which product to use.

■ Since there are numerous ways by which someone might gain entry to a building, devices such as tape, wires, light beams, switches, etc., can be easily circumvented. However, an ultrasonic detector will sense any movement within a prescribed area. This detection can then be transmitted to any remote loca-

tion by means of an automatic dialer. Let's take a closer look at these two devices, one at a time.

### Ultrasonic-Detector Circuitry

An ultrasonic detector is an electronic solid-state device which emits a high-frequency tone (ultrasonic), then senses motion by de-

tecting the proper change in the tone reflected from a moving object (Fig. 1).

The ultrasonic tone is typically at a frequency between 30kHz and 40kHz, which is about three times higher than the upper limit of human hearing (10kHz to 17kHz) and also well above the hearing range of most pets. The energy level of the emitted tone is quite low—well under 100mw, but still sufficient to be capable of covering 500 to 600 sq ft of floor space.

Ultrasonic sound waves are limited to a given enclosure and do not pass through walls, partitions, windows, doors, etc. However, the sound waves can be made to reflect around corners, thus enabling the unit to "see" areas not in the line of sight.

The receiving and transmitting transducers are each composed of a pizzo-electric element approximately 3/8-in. square by 1/32-in. thick. This element is suspended at its nodal points in such a manner that it is free to vibrate at its natural resonant frequency. The assembly is supported by a cushion of foam to reduce its sensitivity to shock and vibration. (Both transducers operate at a frequency determined by the parallel resonant frequency of the receiving transducer.)

The oscillator circuit, which generates the operating signal, is shown in Fig. 2. The basic circuitry is composed of the transistor, 5.4mh/3300pf tank circuit, 330pf collector-to-base capacitor and the receiving transducer. Sufficient gain and phase shift to oscillate will occur only when the resonate frequency of the tank circuit and the natural frequency of the transducer coincide.

The oscillator output level is controlled by the voltage variable resistance of a FET connected to the emitter of the transistor. The level is controlled at approximately 500mv p-p. The 2.2K resistor and 50mf capacitor provide power supply decoupling. It is also important to ac couple the transducer to pre-

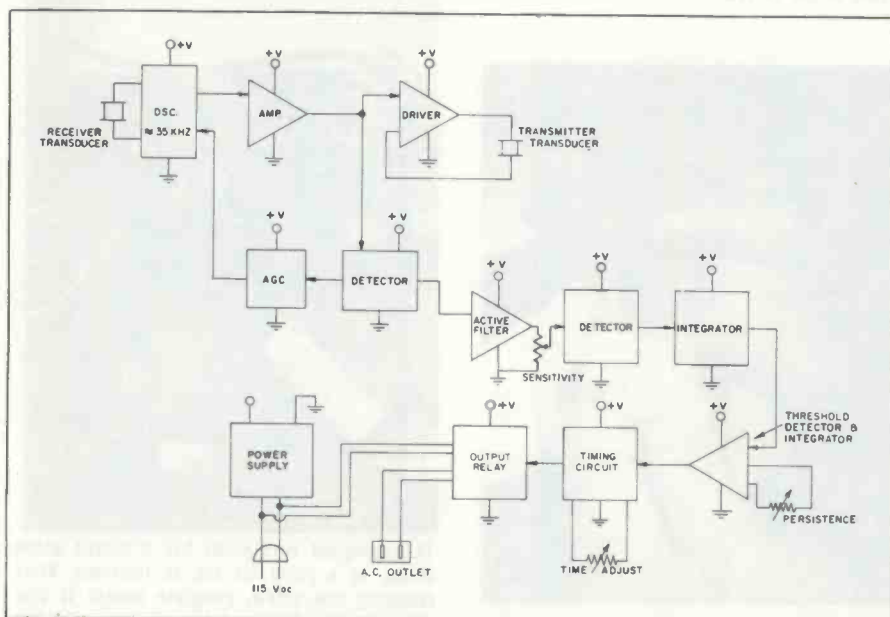


Fig. 1—Block diagram of ultrasonic unit.

Mr. Tuttle is Chief Engineer and Mr. Turnbull is Development Engineer for Delta Products, Inc.



vent electrolysis from occurring on the pizzo-electric element.

The signal from the oscillator is fed to a low-distortion amplifier (Fig. 3), using a 741 integrated circuit for the gain element. The output of the amplifier drives two circuits—the driver for the transmitting transducer and the detector for providing the AGC signal to the FET.

The transmitting transducer is driven (Fig. 4) at the same frequency as the receiver by means of a PNP/NPN driver. This circuit clips off any AM modulation that might be present on the signal coming from the oscillator/amplifier. The transducer is driven with approximately

40v p-p using the storage capability of the 16mh inductor.

Any motion in the field of the ultrasonic unit will produce amplitude modulation of the oscillator signal. This modulation is received in the detector and will then be further processed to determine if an alarm condition exists.

The returned signal is processed through an active filter (Fig. 5) using a twin tee as the feedback network. The values of the network are chosen for a voltage-transmission null at 90Hz. Above and below this frequency, conduction through the

twin tee limits the overall voltage gain to 26dB. However, at 90Hz there is no feedback via the twin tee and the overall voltage gain of the active filter soars to 60dB—the resulting response curve being like that shown in Fig. 6.

The resulting signal then passes through a detector and is integrated (Fig. 7) to produce a dc voltage that is proportional to the motion signal present.

A second detector (Fig. 8) provides persistence control. This is an adjustment by which the length of time the motion must persist can be varied. This feature makes the unit insensitive to short time disturbances, such as sonic booms, tremors produced by passing trucks, or gusty winds.

If all the processing conditions have been met by the receiving signal, the timing circuit is triggered, which in turn activates the output

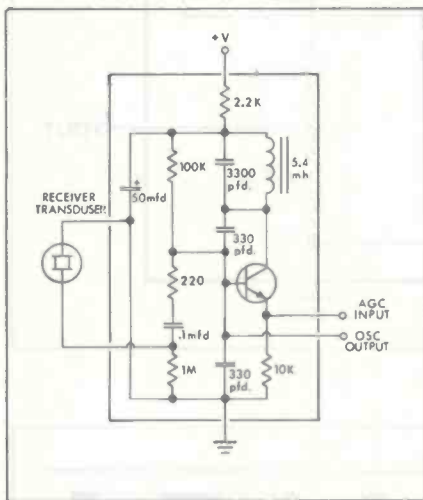


Fig. 2—The oscillator circuit.

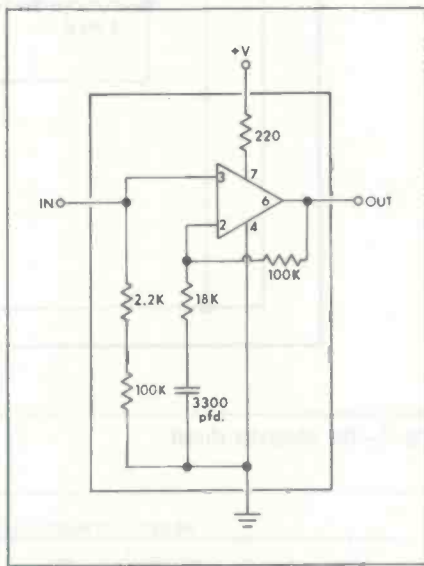


Fig. 3—The low-distortion amplifier circuit.

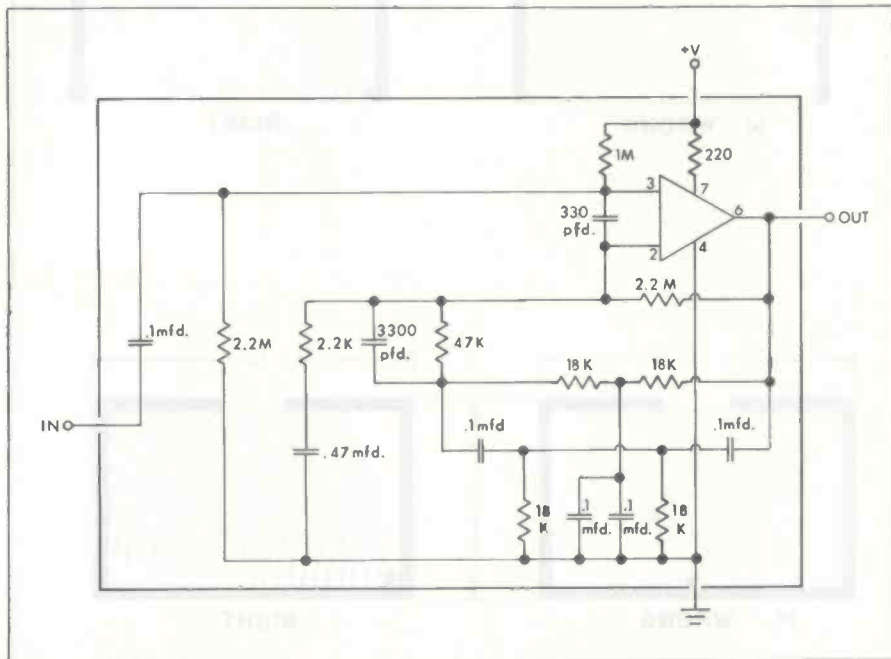


Fig. 5—The active-filter circuit.

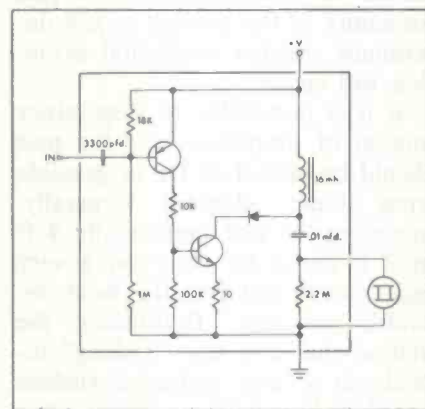


Fig. 4—The driver and output circuit.

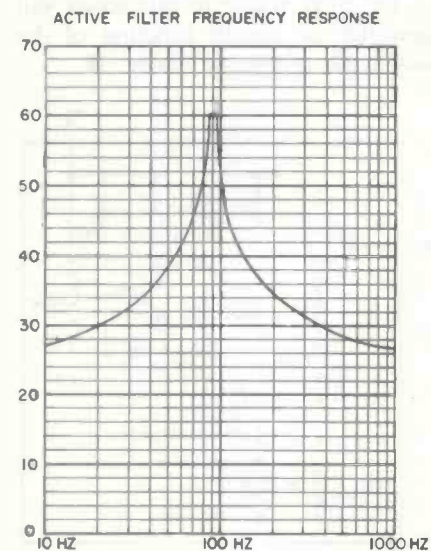


Fig. 6—Frequency response of the active filter.

relay coupling 115v ac to the outlet receptacle. The relay will remain activated as long as motion exists and will discontinue after a preset time when motion within the field of the unit stops.

### Proper Detector Installation

The unit is designed to detect motion of people moving within its field of sensitivity. However, even with the extensive signal processing, unwanted signals may still activate the system—unless reasonable care is used in making the installation.

It should not be located directly adjacent to heating or air-conditioning ducts, as the turbulent air flow may produce actuation. Any draperies, fringes on furniture, or loose paper, which move when heating or cooling systems are operating, should be tied down or removed to prevent undesirable actuation. It should be noted that the size and proximity of the moving object determines whether accidental actuation will occur.

If it is impossible to stop minor motion of draperies, etc., the unit should be placed as far as possible from these objects. Generally, mounting the unit horizontally 4 ft to 7 ft above the floor on a very rigid mount will give the most desirable coverage. Positioning the unit so that it is not "looking" directly at a large reflective surface (hard wall, windows, doors, etc.) will make the system sensitive to undesirable reflected signals.

The next article in this series will describe the circuit function of the automatic telephone dialer. ■

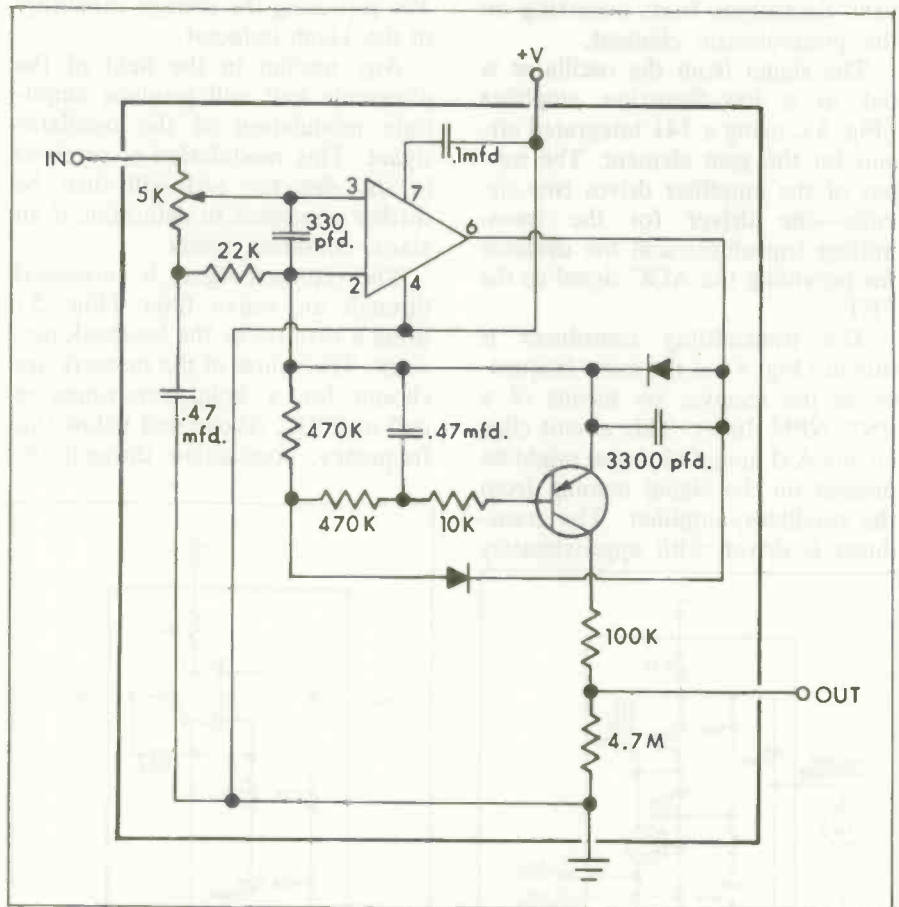


Fig. 7—The integrator circuit.

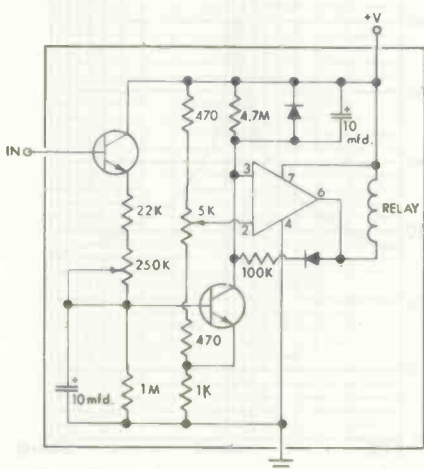


Fig. 8—The second detector and relay circuit.

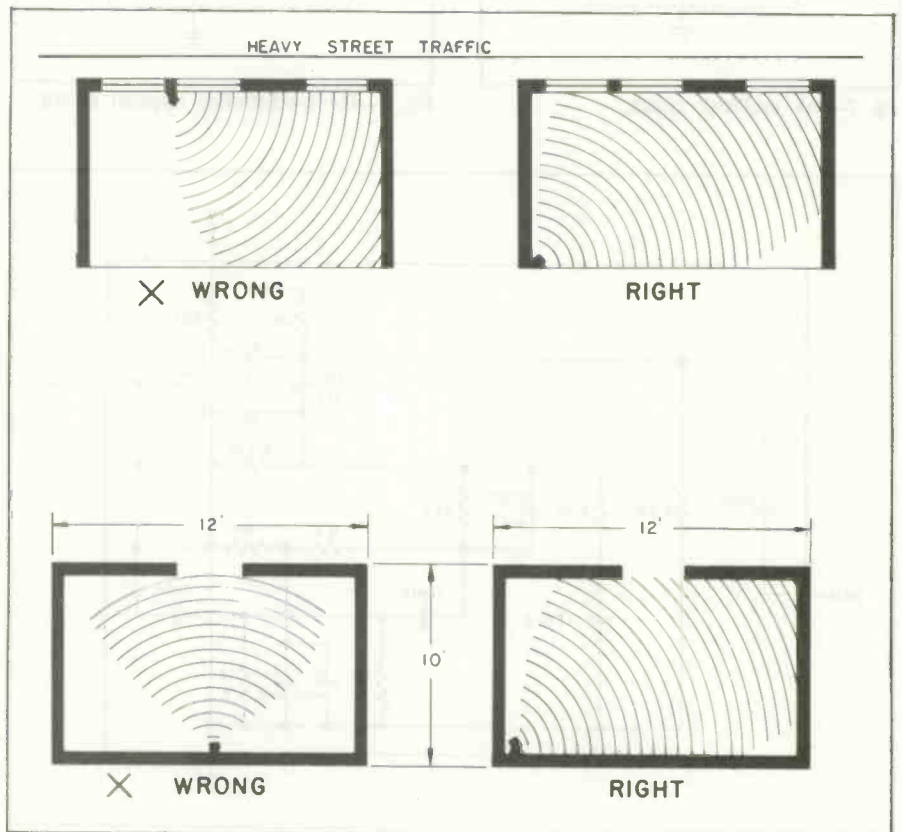


Fig. 9—Various ultrasonic detector locations.

# What's New in TV Receivers for 1973 Part I

by Joseph Zauhar

More simplified tuning devices and modular solid-state chassis with brighter picture tubes will highlight the TV sets for the coming year

■ Looking ahead into the new year we will find only moderate changes in most TV set lines, the greatest change occurring in new chassis designs, picture tubes and simplified tuning devices. More new modular solid-state color TV chassis will be introduced by a number of manufacturers—including General Electric, Magnavox, Philco-Ford—while there will be an increase in the number of solid-state chassis produced by Sylvania and Zenith TV lines.

We will see additional improvements in the large screen sizes with brighter pictures and more contrast, which in technical terms is called the "negative guard band." The 17-in. picture tube has been getting popular in the last few months, replacing some 16-in screen sizes.

Simplified tuning and picture-control devices will be expanded to almost all TV manufactures, and this in turn will allow more simplified remote control systems—dropping the price and permitting their use in many of the portable TV models.

We will also find the new "70-channel detent" type UHF tuner, designed to meet more stringent FCC requirements in many of the new TV lines. The new tuner provides click-stop action for every UHF channel and each channel number is displayed individually as tuned.

In our Teklab report each month we will be reviewing many of these new TV sets, giving an explanation of circuit functions—including photos and schematics of the TV sets.

## ADMIRAL

Extended warranty and new Color Master control highlight 33 new Admiral color-TV sets. The new



Admiral's Fortsmith Model 18T131, 18-in. (measured diagonally) color-TV set, a leading portable model. *Courtesy of Admiral.*

models include 12-, 16-, 18-, 19-, 21-, and 25-in. (measured diagonally) color-TV sets.

In addition to the standard Admiral warranty (two years on the picture tube, one year on parts and 90 days free labor) Admiral reportedly will now replace a defective picture tube with a rebuilt picture tube of the same size and type anytime during the first three years. During the first two years there is no charge for the tube, while during the last year of the warranty the customer is charged the price specified in the warranty. This price is determined by the age and size of the picture tube. After the first 90 days, service and labor charges are not covered by the warranty.

The Color Master control integrates Automatic Fine Tuning and color monitor to lock in the correct signal frequency and preferred flesh tones, plus providing pre-set COLOR and TINT controls with but a single knob.

Additional features available on the color-TV sets include solid-state remote control, Instant Play, a modular chassis receiver and decorator side panels.

Instant Play is featured on all the color receivers, providing instant sound and picture when the set is turned ON. This feature reportedly prolongs the life of the set by safeguarding components against electrical surges and humidity damage.

The SS900 modular chassis is available on three 25-in. models and is a new 90 percent solid-state chassis which consists of nine modules that snap in and out for easy serviceability.

The new, improved Super-Solarcolor picture tube is featured in six models—two 19-in portables, three 25-in. consoles and one 25-in color stereo theater. This picture tube is a combination of developments that—ac-

cording to the manufacturer—resulted in a brighter more life-like picture.

The color Playmate models are available in 12- and 16-in. sizes. They offer a Super-Brite picture tube, SS880 hybrid/tube chassis and a solid-state sound system. The VOLUME, COLOR and TINT controls are all the slide-rule type.

Basic features in the new color-TV sets include 22 to 25kv chassis, three-stage IF amplifier, automatic degaussing, two-speed transistorized VHF tuner, super-scope VHF tuner with preset fine tuning, and Alnico V speakers.

Also introduced are 17 new B/W TV sets with 9-, 12-, 16-, 19- and 22-in. (measured diagonally) screens. All of these new sets will carry Admiral's extended five year picture tube adjustment warranty.

## EMERSON

Emerson's new color-TV line will reportedly consist of 22 Emerson color-TV sets and 11 DuMont color-TV sets. Included are 14 25-in. (measured diagonally) Emerson and DuMont color-TV models and three 23-in. promotional consoles. More "Permacolor" and



Emerson's Monarch Model 25CC93S, 25-in. (measured diagonally) color-TV set employs the new modular chassis 30M20. Courtesy of Emerson.

"DuMatic" one-button tuning systems will be used throughout both the Emerson and DuMont lines.

The Permacolor feature is intended to provide the customer with a good color picture with a minimum of customer control adjustments. When the PERMACOLOR pushbutton is depressed, the BRIGHTNESS, CONTRAST, COLOR and TINT controls are set from a bank of preset controls adjustable from the rear of the TV set. The Automatic Fine Tuning (AFT) and Automatic Tint Control (ATC) circuits are also engaged at this time.

Three types of chassis will be employed in the new line. One is an advanced-type chassis with solid-state signal circuits and integrated circuitry used in the output stages. Another is an all-tube chassis replacing the previously used K-16 type, which employs a new high

voltage circuit, balanced color outputs and improved ATC. The third is the new modular hybrid M20 chassis, which features plug-in printed board assemblies that contain all the circuits other than the horizontal output and damper stages.

The DuMont Model Bravura has power tuning facilities for both VHF and UHF. This TV set does not have a VHF tuner knob, only a channel selector button. When pressed, the tuner will rotate to the next channel position.

A 12 position VHF tuner and a varactor UHF tuner are used in conjunction with an RF amplifier, the varactor tuner output being connected to the cascaded VHF tuner mixer. For this reason there isn't even one channel strip in the VHF tuner.

UHF tuning is quite different from that found on previous models. To obtain UHF tuning, press the VHF/UHF button on the control inward. This is an electrical switching action which removes the B+ voltage from the VHF oscillator and RF stages, connecting it to the UHF varactor tuner. The VHF selector knob shaft is still mechanically connected to a switch which selects the proper dc control voltage required by the UHF varactor tuner to tune in a specific UHF station.

When the VHF/UHF button is pressed inward, the tuner is powered. At the same time one of six UHF dial indicator lights will be turned ON. This arrangement is similar to the one used in the K20 UHF detent models.

In the audio module of this chassis, the control of volume is adjusted by having the VOLUME control change the dc potential applied to a terminal of the Sound IF/ and Detector IC.

The COLOR control (chroma dc gain) operates by changing the dc potential at the Chroma Amp, IC401, on the chroma processing board. In a similar manner the TINT control changes hue by varying the potential applied to the Subcarrier Regeneration IC. Since each of these controls operate by supplying a dc bias control voltage to the IC's, none of them actually handle any ac signals, thus reducing signal noise.

The convergence board assembly is mounted on the neck of the picture tube. This board also contains the pin-cushioning circuit, a WIDTH adjustment coil and a picture centering diode.

Three new tubes are used on the M20 chassis: a 6DK3 damper, a 6LW6 horizontal output and a 6MN8 color difference amplifier.

The K19 chassis layout resembles the K18 in appearance but has several new circuits and additional features, including a solid-state high-voltage tripler that eliminates the high-voltage rectifier tube, plus a focus tap with a voltage of 7kv for the focus resistor voltage divider. The low-voltage power supply now provides 400v for the video amplifier and color difference amplifier tubes.

The Quick-On feature is also slightly different. When the TV set is turned OFF, a 64Ω, 22w resistor is switched in series with the 120v ac to the picture-tube filament transformer and the receiving tube filament string. The remainder of the power supply is then completely inoperative.

A BRIGHTNESS RANGE control is used in the video amplifier circuit to limit the positive voltage applied to the BRIGHTNESS control and the negative voltage that is developed by rectifying the horizontal pulse with a diode.

A video disabling disconnect jumper is provided to remove the video from the picture tube cathodes for purity adjustments.

This chassis employs six new tubes, a 11CH11 video amplifier, 9AM10 color-difference amplifier, 10T10 audio detector and output, 26LW6 horizontal output, 19DK3 damper and 5JW8 horizontal oscillator; while the basic 32K10 chassis remains unchanged in the video IF, sound IF, sync, chroma and audio circuits.

A major change was made in the convergence system. The convergence circuit has been simplified and now consists of one set of controls (five) to provide dynamic convergence of Red/Green, the remaining controls (four) providing for convergence of the blue guns. The two pole convergence board is mounted around the neck of the picture tube and only requires three leads. Troubleshooting is simplified since there are fewer controls and only a single vertical and horizontal signal are involved.

The basic B/W chassis remain quite similar to the previous chassis except for changes in the fusing of the power supply.

## GENERAL ELECTRIC

General Electric's new color-TV line will employ two solid-state chassis. One chassis is designed to drive "carry-in" service portable receivers and the other is a modular, solid-state 25-in. (measured diagonally) chassis for "in-home" service.

The color line also features a new advanced One Touch color system, a Spectra-Brite III black matrix picture tube, plus a new generation of 10- and 19-in. (measured diagonally) remote-control models.

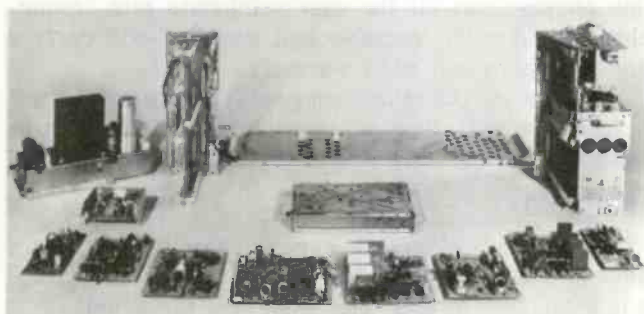
The new "JA" chassis series is completely solid-state with the exception of the picture tube. It employs 38



The Mozambique, a new 25-in. (measured diagonally) color-TV set from General Electric. Courtesy of General Electric.

transistors, 30 diodes and 3 integrated circuits. Additional solid-state components are used in the tuners and optional circuits—such as AFC, One Touch Color system and Automatic Chroma Control. The chassis has a standardized signal processing board and is used in the 10-, 16-, and 19-in. TV sets. Plug-in modules and components are used for those circuits and features which are not common to all three screen sizes.

In this and last month's Teklab report we review General Electric's Model JA7458WD color-TV set em-



General Electric's modular solid-state color-TV chassis "MA." Courtesy of General Electric.

ploying the JA chassis. A complete schematic for this chassis can be found in the August TEKFAK Schematic No. 1432.

The 25-in. (measured diagonally) line of color-TV sets employs the new "MA" chassis which is completely solid-state, except for the picture tube. It is designed to provide maximum serviceability through the medium of plug-in modules and interconnecting cable plugs. Included are five integrated circuits (in sockets), used in the first and second IF, AFC, Chroma Processing, and an audio section.

All circuit modules are designed for complete interchangeability without adjustments or alignment, beyond those normally performed in home service. As a further assistance in servicing, the basic or master board into which the modules are plugged, carries only three passive components, plus wiring and interconnection.

Major sub-assemblies—such as the high-voltage system and main power supply—are quickly detachable from the main chassis and may be completely disconnected by unplugging. The high-voltage transformer and tripler are also plug-in and no soldering is required for replacement.

A built-in neon high-voltage indicator, visible from the rear of the high-voltage compartment, glows whenever high voltage is present.

Tuning is simplified by the use of a 70 position detent UHF tuner plus AFC for both VHF and UHF. The VHF tuner IF output is resistively terminated, decoupling the tuner from the IF to avoid unstable reactive loading. This feature permits interchanging tuners and IF modules without affecting the IF alignment.

The chroma processor is a complete chroma system in one module which receives its input signal from the emitter-follower output of the video IF module. The chroma module contains two integrated circuits. One,

IC601, contains a chroma bandpass amplifier, a reference oscillator, an ACC circuit and a color killer. The other, IC602, contains a chroma demodulator, a color summing matrix and three output amplifier stages.

The horizontal transistor and damper provide switching to the yoke, while the high-voltage transformer is a conventional configuration and supplies a fifth harmonic tuned pulse to a silicon diode high-voltage tripler. A resistive focus divider provides the focus voltage for the picture tube.

An expanded line of all solid-state 19-in (measured diagonally) TV sets will use the highly serviceable "U" line chassis, and all the new solid-state sets—monochrome and color, portable and console—will carry a one year labor and parts warranty.

A new 5-in. (measured diagonally) personal TV set weighing only 10 lb is ac operated and features an illuminated digital clock and a 24 hour alarm.

### MAGNAVOX

Highlighting Magnavox's new color-TV line is a modular, all solid-state chassis featuring "Videomatic," a new advance in automatic color-TV operation.

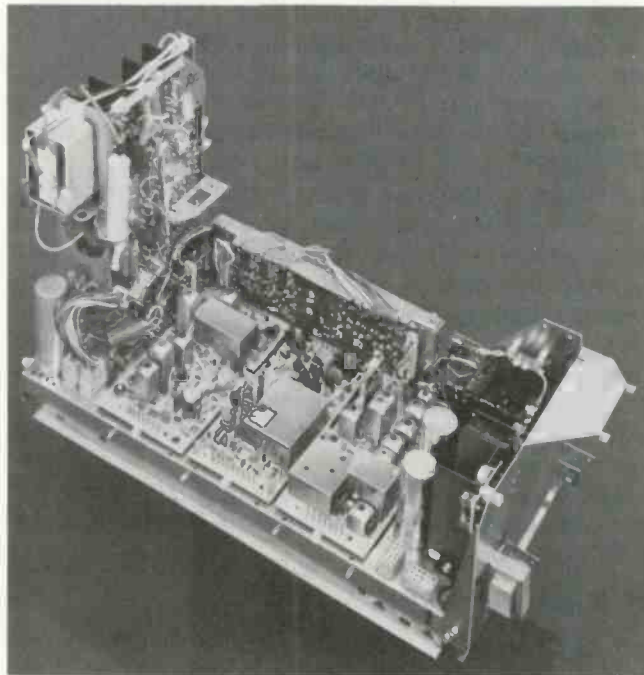
The T979 all solid-state color-TV chassis incorporates a number of serviceability features. Most of the circuitry is located on five circuit panels which plug-into the main chassis panel. The circuit modules on these panels are provided with plug-in sockets for easy removal and are screened on both top and bottom, showing component identification, wiring, test points and adjustments.

Two types of UHF tuners will be used with the chassis. One type uses a motor, in conjunction with a plug-in search board, for pushbutton non-remote UHF search tuning. The second type of UHF tuner incorporates a mechanism which provides a detent and digital readout for each UHF channel.



Magnavox's Model IC7598 TV set employing the T979 solid-state color-TV chassis. *Courtesy of Magnavox.*

A new feature called "Videomatic" is employed in this chassis. This circuit automatically adjusts the BRIGHTNESS, CONTRAST and COLOR levels to compensate for changes in ambient light. A Light Dependent Resistor (LDR) is used in the circuit and mounted in the front panel of the TV set, monitoring the room lighting. The amount of compensation introduced in the BRIGHTNESS, CONTRAST and COLOR levels is adjustable with a



The Magnavox T979 all solid-state color-TV chassis. *Courtesy of Magnavox.*

customer control called "Videomatic Range." The automatic tint and AFT are also included in the action of the switch.

The T974 color-TV chassis will also be used in the new line. It incorporates a combination of tube and solid-state circuitry. Tubes are used in the horizontal-sweep, vertical-sweep, luminance-output, chroma-demodulator and chroma-output circuits.

Special servicing features include sockets for the majority of transistors, plug-in audio modules, a plug-in IF subassembly, a plug-in low-voltage power supply with dropping resistor and filter circuit board, plus fuse holders for all fuses.

Two new chassis will be employed in the B/W TV line for the coming year. The T960 series TV set incorporates a hybrid-type chassis employing two integrated-circuit modules, seven transistors and three dual-purpose tubes. This chassis is made up of three circuit boards—one main board and two replaceable modules. The video IF module contains one IC that functions as a video IF, video detector, video driver, AGC, RF AGC driver and a transistor, which is an RF AGC inverter. The sound module uses one IC as the sound IF, demodulator and audio driver. The three tubes employed in this chassis are used in the sync-separator, vertical-sweep and horizontal-sweep circuits.

The other new B/W chassis is the T966 series, a

*continued on page 55*

# The Business Side of Things

by William Joseph

Life as your own boss is great—no time card to punch—freedom to make your own decisions—the chance for a high income and financial independence. Of course, as any service dealer knows, it's not all peaches and cream. There are plenty of headaches, not the least of which is the high risk of failure facing any small business.

■ Government figures indicate that half of all newly established small businesses will be liquidated or sold within two years. Even more scary is the fact that only one out of five can be expected to survive 10 years. To make matters even worse, service firms fare even more poorly than these general averages. With statistics such as these to face, many service dealers might well be concerned with the underlying causes behind so many business failures, and what he might do to avoid them.

The Small Business Administration consistently reports that the largest single cause of business failure is *poor management*. Dun & Bradstreet agrees. This respected firm analyzed more than a million business failures that occurred over a period of a hundred years (1857 to 1957). Their conclusion: Lack of managerial experience and aptitude accounted for some 90 percent of all failures.

It is important to note that the *management* skills referred to are entirely different from the *technical* skills usually possessed by the owners of small service firms. Obviously, then, the service dealer who wants to improve his chances for permanent

business success must be willing to invest the necessary time and effort to learn as much as he can about the science of business management.

Studies attempting to pinpoint the specific management deficiencies leading to small business failures usually reveal the failure to keep adequate records as one of the chief villains. It is perhaps understandable that the same qualities that make some men want the independence of owning their own business might also cause them to rebel at the thought of being tied down to a lot of record keeping.

This is unfortunate, since it is indisputable that the maintenance of proper records is absolutely essential for optimum business success. Furthermore, records that are properly designed and maintained actually assist the owner/operator. In the long run, they make his job easier and his business more profitable. Good records not only allow the businessman to see where he has been, but, even more important, they allow him to see in what direction he may be headed in the future.

Every business, of course, is required by law to keep certain records.

Such things as wage-hour and profit-loss information must be maintained to satisfy Uncle Sam. The purpose of such records is to establish tax liability and conformity with the law, not to assist the owner in running his business. Despite this, such mandatory records are the only ones kept by many small business operators.

One of the essential records frequently shunned by the small businessman is that of keeping and using a budget—a simple job that is of immense value to any business.

Basically, the budget can do three things for your business. First, it requires that you sit down and give thought to each item of expense and each source of income that will determine your profit or loss in the coming months. This kind of planning should be basic to the operation of any business.

Second, it will enable you to compare the actual results with the figures you have budgeted. This analysis will help you to develop considerable insight and skill in the fundamental economics involving your business.

Finally, the monthly budget will provide you with guideposts that will help you to spot financial trends during the month

in time to do something about them.

An effective budget for a service dealer need not be a cumbersome or time-consuming project. The basic form to be used is similar to that of a simple profit/loss statement. In one column, each major item of expense is listed. Normally, the first to be listed will be "fixed" expenses. These include such known expenses as rent, depreciation, taxes, insurance and fixed payroll. Next come expenses that must be estimates. This would include such items as supplies, heat, electricity, telephone, overtime payroll, etc. You may lump very small expenses together into a category called "other," but be careful not to include any major expense that should be considered separately.

Next it is necessary to estimate total income. Again this should be broken down into the various sources, such as parts sales, paid labor, and in-warranty claims. Once that is done, you have a projected performance for your business for the following month. If it did not turn out the way you would like it, the budget provides you with a road map that will pinpoint all of the areas of possible improvement.

Your accountant will probably be delighted to learn that you are interested in budgeting. In an hour, he will be able to show you how easy and how worthwhile the job can be. Do not worry if your initial attempts at budgeting miss the mark. Comparing the actual versus the budgeted figures at the end of every month is where your skill will be developed. ■

# Reducing Check Voucher Costs

Preparing and processing the paperwork required to pay out money is frequently more complicated, time consuming and costly for many service dealers than that of collecting money. The clerical work and time expended often are considered a "necessary evil" of doing business.

■ Since disbursing money involves both employees and suppliers of goods and services, it is a key factor in maintaining good employee and supplier relations. Ray T. Arvaisis, president/treasurer of the Portland Appliance Service Center of Portland, Maine, abides by such principles in his business. He has adopted a simple, efficient and economical system for processing all payments by which his company checks do "double duty."

The firm has been in business in Portland for the past 21 years, as a factory authorized service center for over 25 leading appliance manufacturers. A member of the National Appliance Service Assn., the company has operated a similar business, Suburban Appliance Servicecenter, in Watertown, Mass. for the past eight years.

"The importance of adequate business records, especially those involving payments, cannot be emphasized too strongly," reports Mr. Arvaisis, "yet they must be as simple as possible and require a minimum amount of clerical work."

Always on the lookout for methods of improving service and controlling administrative costs in his efforts to improve the profit picture, Mr. Arvaisis set up a streamlined disbursing system.

"We studied methods used by other appliance service firms as well as those used by other types of business of a similar makeup and size," Mr. Arvaisis explained. "We also called in Will Hamilton, forms system specialist from the Portland district office of Moore Business Forms, Inc., for technical data and systems help.

"We finally decided on a Moore Dual Purpose Voucher Check system in which a three-part voucher check provides all needed records at the initial writing for either our employee payroll or our accounts payables. The unusual design and construction of the check makes such multiple use possible."

## How the System Works

Here is how the one check serves two purposes:

The check form is a three-part

EARNINGS				DEDUCTIONS				NET PAY	PERIOD ENDING	EMP. NO.
TOTAL HOURS	REGULAR	OVERTIME	GROSS PAY	F.I.C.A.	WITH. TAX	INS.	P.S.			
40	40	0	100.00	5.20	12.27	1.03	1.30	80.20	8-7-71	151
TOTAL HOURS	REGULAR	OVERTIME	GROSS PAY	F.I.C.A.	WITH. TAX	INS.	P.S.	NET PAY	PERIOD ENDING	EMP. NO.

PAY STATEMENT DETACH AND RETAIN

**PORTLAND APPLIANCE SERVICE CENTER**  
PORTLAND, MAINE

---

THIS CHECK IS IN FULL PAYMENT OF THE FOLLOWING

INVOICE DATE	INVOICE NO.	DESCRIPTION	AMOUNT	DEDUCTIONS	NET AMOUNT

CANAL NATIONAL BANK  
PORTLAND, MAINE

523  
112

14505

**PORTLAND APPLIANCE SERVICE CENTER**  
252 OXFORD STREET • PORTLAND, MAINE

PAY \_\_\_\_\_ 8-12-71 DATE \$ 80.20

TO THE ORDER OF John A. Employee

**VOID**  
AUTHORIZED SIGNATURE

Treas. Mgr. Vice Pres.

⑆0112⑆0003⑆ 02⑆0362 5⑆

151  
EMP. NO.

151  
EMP. NO.

05  
ER

05  
ER

Treas. Mgr. Vice Pres.

Treas. Mgr. Vice Pres.

The dual purpose voucher check used by Portland Appliance Service Center for payrolls and accounts payables is a three-part Moore Speediset check. This example is an employee pay check with only the top pay statement portion filled out. The top perforated voucher remains attached until the employee detaches it for his records.



Speediset form with the first part made of safety paper. The parts and carbons are fastened to a top stub. The parts are perforated but the carbons are not, so that a quick snap of the stub detaches the parts—leaving the used carbons intact in the stub for easy and clean disposal.

A perforated voucher, with boxes for recording payroll data, is above the check next to the stub. This section is completed when the check is used for payrolls. Boxes on the upper left portion of the check face provide for recording payment data when the check is used for accounts payable.

### Payroll Use

For payroll use, the check forms are typed out at the end of each pay period. Hours worked, pay earned and deductions are entered in the appropriate boxes on the top voucher section. The boxes on the check face for accounts payable data are disregarded.

The parts are then detached with a quick snap of the stub and distributed as follows:

Part 1—(blue safety paper) Payroll Check, with top voucher attached—given to the employee on the pay day. The employee removes the perforated top voucher pay statement before cashing the check, and retains it for income tax or other record purposes.

Part 2—(white) Payroll Journal Copy—used to prove the payroll and for posting to the general ledger. After the payroll is proved and the postings made, the journal copy is filed numerically in a journal post binder by pay period. These copies are later used for bank reconciliation purposes.

Part 3—(buff, heavier stock) Employee Earnings Record Copy—filed alphabetically in visible index fashion in a multi-ring record binder for use in preparing quarterly and year-end tax reports as well as other payroll data.

### Accounts Payable Use

Checks for accounts payable are typed out from vendors' invoices and the invoice number, date, description and amounts are entered

in the boxes on the face of the check. The top pay statement voucher is disregarded.

Those made out for immediate payment are signed, the parts detached and distributed. Others are held in a file for either due date or discount date—or until the end of the month. If additional invoices from any of the vendors are received during the month, it is a simple matter to add these to the pending checks. This makes it unnecessary to wait until the end of the month and thus eliminates a month-end rush to get checks in the mail.

When it is time for mailing, the parts are detached with a quick snap of the stub as before. The top voucher, Employee Statement of Earnings, which was not used, is detached and discarded.

Part 1—Check—mailed to the vendor in a standard window envelope. The check is designed for such use to eliminate the extra job of addressing envelopes.

Part 2—Check Record Copy—placed in a record binder in numerical order.

*continued on page 66*

SPEEDSET® MOORE BUSINESS FORMS, INC. 1												
TOTAL HOURS	EARNINGS				DEDUCTIONS				NET PAY	PERIOD ENDING	EMP. NO.	
	REGULAR	OVERTIME		GROSS PAY	F.I.C.A.	WITH. TAX	STATE	INS.				
TOTAL HOURS	REGULAR	OVERTIME		GROSS PAY	F.I.C.A.	WITH. TAX	STATE	INS.		NET PAY	PERIOD ENDING	EMP. NO.
PAY STATEMENT DETACH AND RETAIN												
<b>PORTLAND APPLIANCE SERVICE CENTER</b> PORTLAND, MAINE												

THIS CHECK IS IN FULL PAYMENT OF THE FOLLOWING						CANAL NATIONAL BANK PORTLAND, MAINE	
INVOICE DATE	INVOICE NO.	DESCRIPTION	AMOUNT	DEDUCTIONS	NET AMOUNT	52-3 112	
8-26-71	943901	Per PO #1478	134.32	-	134.32	14506	
						<b>PORTLAND APPLIANCE SERVICE CENTER</b> 252 OXFORD STREET • PORTLAND, MAINE	
PAY _____						9-1-71 DATE \$ 134.32	
TO THE ORDER OF ABC Supply Company 132 Main Street Any City, U.S.A.						PORTLAND APPLIANCE SERVICE CENTER	
						VOID	
VOID							
AUTHORIZED SIGNATURE							

⑆011200031⑆ 0200362 511⑆

This dual purpose voucher check is used for accounts payable. The top voucher is left blank and boxed areas on the face of the check are filled in to record vendor information. The check is detached at the second perforation before mailing, and the unused top voucher is later detached and discarded.

## Dana's Model 3300 Digital Multimeter by Philip Dahlen

Designed for really rough physical environments

■ The manufacturer indicates that this digital multimeter—which is said to have a four-digit LED readout—is really designed to take physical abuse. Housed in a Lexan case of virtually unbreakable design, it will reportedly withstand dropping, banging and many other stresses. Containing low-power solid-state circuitry, the case is said to need no ventilation louvers, permitting operation under environmental conditions where dust, dirt and water often present problems to instrument performance.

Further flexibility results from the fact that this instrument may be either ac operated (10w, 50Hz to 400Hz, 90v to 125v or 180v to 250v—switch selectable) or battery operated. Specifications indicate that this instrument can operate eight continuous hours using the nickel cadmium batteries supplied with no degradation in operating performance, the batteries being recharged during 16 hours of instrument power-line use.

In addition to its ability to withstand physical abuse, the manufacturer indicates that the instrument has 250v of overload protection when making resistance measurements and greater than 1000v of protection when making ac or dc measurements ■



Dana's Model 3300 Digital multimeter. For more details circle 900 on the Reader Service Card.

Additional manufacturer specifications of interest to the electronic technician and service dealer include the following:

### Resistance

Ranges: 1K, 10K, 100K, 1M and 10M  
Resolution: 1 $\Omega$  on 1K range  
Overrange: 100% on all ranges  
Accuracy at 23°C  $\pm$ 5°C:  $\pm$ (.2% of reading + .1% of full scale) for 1K, 10K and 100K ranges  
 $\pm$ (.5% of reading + .1% of full scale) for 1M and 10M ranges

### Current Through Unknown:

.1ma maximum

### Current

Ranges: 100 $\mu$ a, 1ma, 10ma, 100ma and 1000ma  
Resolution: 10na on 100 $\mu$ a range  
Overrange: 100% on all ranges  
DC Accuracy at 23°C  $\pm$ 5°C:  $\pm$ (.2% of reading + .1% of full scale) for 100 $\mu$ a through 100ma ranges  
 $\pm$ (.4% of reading + .1% of full scale) for 1000ma range  
AC Accuracy at 23°C  $\pm$ 5°C:  $\pm$ (1.0% of reading + .1% of full scale) for 100 $\mu$ a range  
 $\pm$ (.3% of reading + .1% of full scale) for 1ma, 10ma and 100ma ranges  
 $\pm$ (.5% of reading + .1% of full scale) for 1000ma range

### DC Voltage

Ranges: .1v, 1v, 10v, 100v and 1000v  
Resolution: 100mv on .1v range  
Overrange: 100% on all ranges—1000v maximum  
Accuracy at 23°C  $\pm$ 5°C:  $\pm$ (.1% of reading + .1% of full scale)  
Polarity: Automatic, Bipolar  
Input Resistance: 1000M on .1v and 1v ranges, 10M on all other ranges

### Normal Mode

Noise Rejection: 40dB at or near line frequency

### AC Voltage

Ranges: 1v, 10v, 100v and 1000v rms  
Resolution: 1mv on 1v range  
Overrange: 100% of all ranges—1000v maximum  
Accuracy at 23°C  $\pm$ 5°C:  $\pm$ (.2% of reading + .1% of full scale) over a frequency range of 50Hz to 10kHz  
 $\pm$ (.5% of reading + .1% of full scale) over a frequency range of 10kHz to 20kHz  
Input Impedance: 1M shunted by 100pf

### General

Dimensions: 8½ in. wide by 3½ in. high by 11 in. long  
Weight: 5½ lb without batteries  
7½ lb. with batteries  
Warm-up Time: 30 minutes for full accuracy  
Operating Temperature: 0°C to 50°C (32°F to 122°F)

**Tough.  
Big in capacity.  
Quick in traffic.**

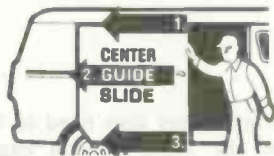


## Ford Vans ...born and bred for city work.

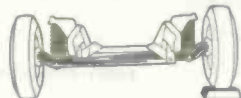
City service demands a lot from a truck. And Ford Econolines... America's No. 1 vans... really deliver.

**A choice of swinging or sliding doors**, for example... whichever might fit your needs. Only Ford offers you both. The latest sliding type rides on three tracks with true-center support... to give you smooth one-hand operation.

**Short overall length**... shorter than other comparable vans... gets you through city traffic easier... into skippy parking spots faster.



**Twin-I-Beam independent front suspension** uses two forged I-beam axles to give Econolines special toughness. And uses big coil springs to smooth the ride for driver and load alike.



**Ford's out-front servicing** saves you time in the shop, too. Just flip up the hood to reach water, oil, battery, voltage regulator and more.

**Payload ratings up to 4,250 lbs.** give Econolines the capacity for your biggest jobs. And now Ford offers the

E-300 Parcel Van with 6-foot-high walk-in bodies, 10 or 12 feet long. A wide choice of regular Van and Super Van models, too. Get the full story at your Ford Dealer's now.

Availability may be subject to Environmental Protection Agency certification.

# FORD ECONOLINE VANS

FORD DIVISION 

... for more details circle 115 on Reader Service Card

# COLORFAX

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

## GENERAL ELECTRIC

Color-TV Chassis JA—One Predominate Color with Retrace Lines

To correct this symptom check transistors Q600, Q604 and Q606. If any of them have failed, inspect resistors R624, R626 and R628 (6.8K) to see if they are the

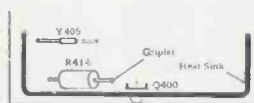
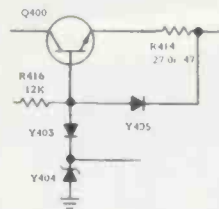


rounded end type as shown (left) in the illustration. Stackpole or Allen-Bradley resistor replacements (right) are preferred in this application.

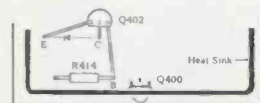
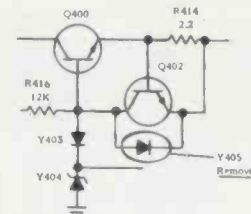
Color-TV Chassis JA—Low Brightness and Overload with Strong Signals

Low-brightness and overload with a strong signal symptom is often caused by the scan rectified 22v source not regulating properly. A possible correction to the problem is to modify the 22v regulator circuit in the following manner:

Remove diode Y405, resistor R414 and the griplet shown in the original simplified schematic. Replace, as shown in the modified circuit, resistor R414 with a 2.2Ω ½ w resistor.



ORIGINAL CIRCUIT



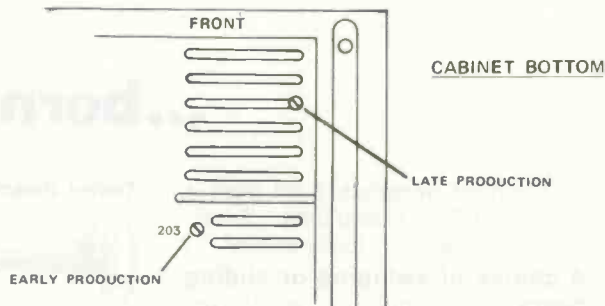
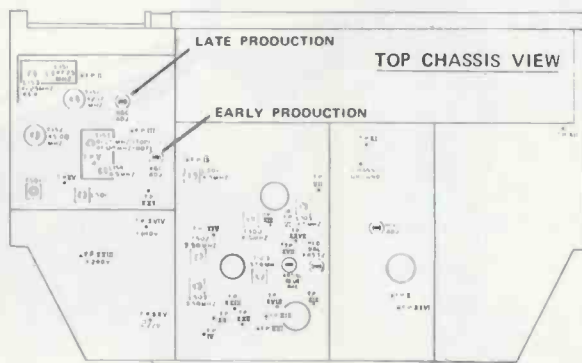
MODIFIED CIRCUIT

Replace diode Y405 with a Q402 transistor (EP15X1). A Q402 transistor and a 2.2Ω, ½ w resistor are supplied with Q400 replacement transistors (EP15X11).

Color-TV Chassis C1/L1 and C2/L2—Chroma Gain

A definite increase in color gain and contrast can be achieved by setting the AGC control, R203, as high as possible without overload. Sets produced after December 1, 1972 (5Z1N) were factory adjusted to the higher AGC setting. Sets prior to this date can, in most cases, be improved by this AGC level increase.

If the set has been in service for a time, it may be advisable to check the 8CB11, 3rd IF tube. In some rare

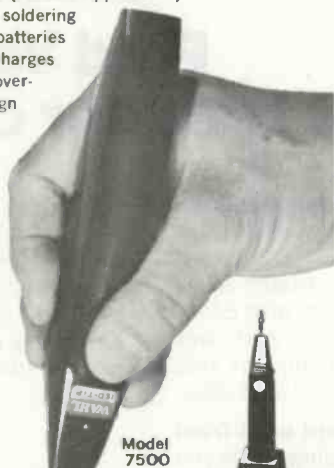


cases, the video alignment may also need to be checked.

On C chassis sets, the AGC control can be adjusted through a hole in the bottom of the early production TV sets, and through a cabinet bottom slot in later models. An insulated screw driver less than ¼-in. in diameter is required. An excellent tool for this purpose is an EP69X32 HORIZONTAL HOLD control shaft that can be sharpened to a screw driver point. See illustrations for the AGC control location on early and late production models.

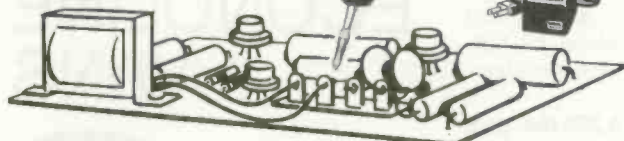
## New Cordless SOLDERING IRON greatest advance in soldering since electricity

The new Wahl "Iso-Tip" lets you solder in difficult-to-work places without a cord hindering your action; lets you move from place to place without plug or extension cord! (Patents Applied For) Just press the button and you have soldering heat in 5 seconds. Nickel cadmium batteries power up to 100 joints or more. Recharges in stand (Included) to full charge overnight. Replaceable, isolated-tip design eliminates electrical leakage and need for grounding. Tip performance equivalent up to 50 Watts. Fine tip standard. Work light and pilot light built-in. Weighs less than 6 ounces! See how fast and easy soldering can be. Only Wahl makes it — \$19.95.



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7500



Contact your local distributor or write direct.

... for more details circle 139 on Reader Service Card

# TECHNICAL DIGEST

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

## ADMIRAL

### Three Function Remote Control

Models 19TS121C, 19TS129C and 21TS711C are equipped with a three function remote control for operation of the VHF CHANNEL CHANGE, ON/OFF and VOLUME control (Low, Medium, High) functions. The tuner can be programmed to bypass unused VHF channels.

The sets may be controlled either with the usual front mounted controls or the hand-held electronic transmitter, Model R300TA. Pressing the VHF button on the transmitter transmits a 41.5kHz CW signal, the ON/OFF button a 38.5kHz CW signal and the VOLUME button a 35.5kHz CW signal.

The Model R300R amplifier receives the signals with a small microphone and selects and amplifies each signal for relay control of the TV-set circuits, as shown in the simplified diagram.

The TV set can be turned ON or OFF by using the remote transmitter or the manual switch, SW102, on the control panel. When switch SW102 is closed, ac current flows from the 120v ac source through fuse F101, switch SW102 and relay coil K261. This closes the contacts of K261, applying power to the TV set.

When an ON/OFF signal is picked up by the remote receiver, transistor Q6 is forward biased so that current will flow through the transistor and RL2 dc relay coil. This closes the relay contacts and applies power to K261, turning the TV set ON. Relay K261 is a bi-stable type; thus, the TV set will remain ON until power is again applied to the K261 coil through SW102 or RL2. A set of contacts on K261 also supplies a ground return path for the VHF motor coil and RL5 volume step relay at any time that K261 is in the ON position.

If the tuner is turned to an unused channel, the SW101 program switch will be closed by a preset program screw on the channel strip. When SW101 is closed, power will continue to be applied to the motor coil through F101, SW101 and SW103. When SW101 senses an operable channel, it will open and stop the tuner on that channel.

When a volume change signal is picked up by the remote receiver, transistor Q7 is forward biased so that current will flow through the transistor and the RL3 dc relay coil. This causes the RL3 contacts to close and apply power to the RL5 volume-step relay coil, which will step the set volume to the next level.

### Tape Recorder Model CTR571—Service Hint

A few reports indicate that the Model CTR571 tape recorder is operating at too slow a speed. This would be particularly noticeable when playing a prerecorded tape or one recorded on another machine.

Upon checking, it was noted that the problem was caused by the S3 power microswitch (2077A151-72) having a few ohms of resistance when closed. An easy way to check this is to put a jumper across the switch while the motor is operating. If the motor speeds up when the switch is bypassed, replace the switch.

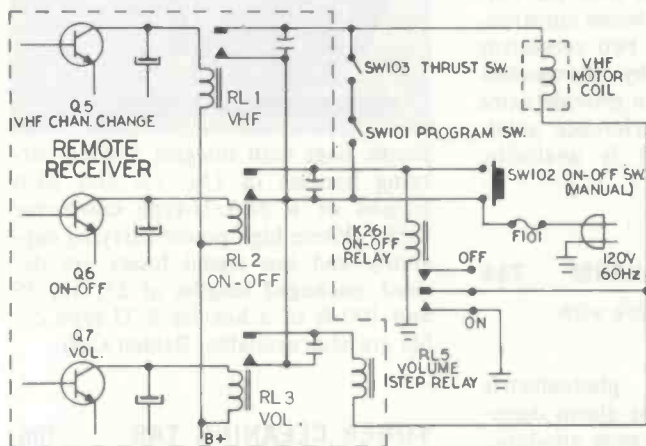
Comments from our readers are always welcome.

Address your letters to:

Phillip Dahlen, C.E.T., Editor  
Electronic Technician/Dealer  
1 East First Street  
Duluth, Minnesota 55802.

## TV RECEIVERS...

*continued from page 48*



When a channel change signal is picked up by the remote receiver, transistor Q5 is forward biased so that current will flow through the transistor and RL1 dc relay coil, thus closing the RL1 contacts and applying power to the VHF motor coil. The SW103 thrust switch closes when power is applied to the VHF motor coil—this switch prevents power from being applied to the motor through switch SW101 when the VHF is manually tuned.

hybrid type employing two integrated-circuit modules, seven transistors and three dual-purpose tubes. This chassis is similar to the T960 series in many respects, with only some variations in chassis layout, tube types and power supply.

### MOTOROLA

The Insta-Matic color tuning control is reportedly featured on all of Motorola's color-TV receivers, including a 14-in. (measured diagonally) portable model. All solid-state chassis will be featured in 18 sets, the remaining 16 receivers in the line being Quasar II color-TV units with four tube chassis and Quasar portable color-TV sets with five tube chassis.

There are nine models in the line with two-button remote control and three 1973 introductions of 23-in. (measured diagonally) Quasar II color-TV consoles.

A 14-in. (measured diagonally) portable color-TV set, Model WP412JW, is included with plug-in modules and a 70 channel detent UHF tuner; while a deluxe 16-in. (measured diagonally) Quasar color-TV portable, Model WP4500JW, features a detachable color high-light screen and includes a cart.

Introduced is a 21-in. (measured diagonally) Quasar  
*continued on page 64*



## Find Out How Selling the DeltAlert Home Alarm System Makes a Secure P & L Statement

Make money in the expanding home alarm market by selling DeltAlert, the reliable, sophisticated ultrasonic system that assures customer satisfaction. Priced right so you can forget about call-backs, it carries the kind of margin that makes it all worth while. No big cash tie-up in inventory... you order as necessary (experience shows consistent, fast reorders from dealers).

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DEPT. ETD

... for more details circle 108 on Reader Service Card

## NEW PRODUCTS

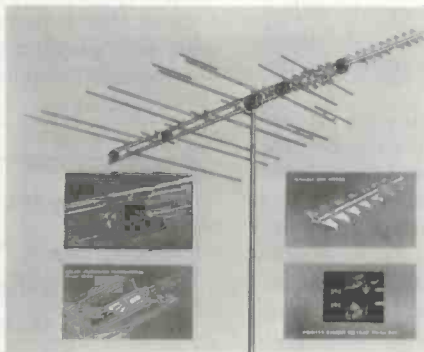
For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

### ANTENNA

703

*Reduces electrical noise and interference*

The Quantum Antenna series uses a new design concept to reduce problems of electrical noise and interference. The antenna series reportedly provides high-signal sensitivity but concentrates on supplying directivity needed to reject increasing amounts of electrical noise. The antenna series



is highly directive with front-to-back ratios reportedly up to 50% higher than the company's Color Crossfire. The line encompasses 7 VHF/FM and 8 UHF/VHF/FM models for metropolitan to fringe areas. The series is said to provide high UHF performance with a tunable sector that provides up to 40% increased power over the Color Vector series. Twin-boom construction is employed with two crossarms which are buttressed by all weather ABS mounting blocks to provide extra strength. For FM interference areas, an optional FM trap is available. Channel Master.

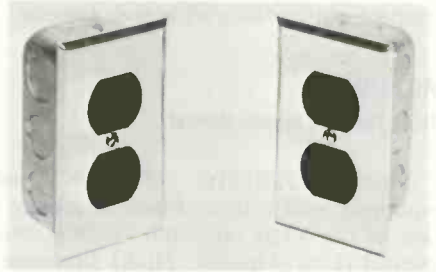
### PHOTO-ELECTRIC ALARM

704

*Light beam made invisible with an infrared filter*

A flush-mounted photoelectric beambreaker for burglar alarm detection, counting and entrance announcing, designated the Model MW-015, consists of a light source or projector, a transformer and a photocell receiver unit. The light beam is reportedly made invisible with an infrared filter. Beam interruption reduces the receiver current so that a closed or series protective circuit system will alarm. Features of the unit include 50-ft range, inconspicuous installation, ac input power

and easy alignment. Beam alignment is done without the infrared filter using 10° beam adjustments. The projector receives power from a transformer



that plugs into a wall outlet, while the receiver obtains its power from the external alarm circuit. Mountain West Alarm.

### COAXIAL CABLE

705

*Easy to install pre-terminated cable*

New coaxial cable products for two-way radio are packaged in specific lengths and fully terminated at both ends with standard PL-259 connectors. All cables are said to have low-loss foam dielectric, braid shielding, black plastic jacketing and mate with most two-way radio equipment terminals. The cable is packaged in polyethylene



plastic bags with integral molded carrying handles in 15-, 25- and 50-ft lengths of a 58A/U-type conductor cable. Where high power carrying capability and low signal losses are desired, packaged lengths of 25, 50, 75 and 100 ft of a heavier 8/U type cable are also available. Belden Corp.

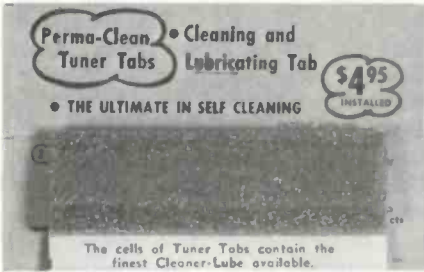
### TUNER CLEANING TAB

706

*Contains non-evaporating cleaner lubricant*

Tuner Tab is a special pad saturated with a non-evaporating cleaner lubricant that reportedly cleans and polishes the tuner contacts on strip-type VHF tuners while they are rotated. It is claimed that no other cleaners or sprays are needed with the cleaning

tab. Installation is fast and simple, just remove the tuner shield cover and place the self adhering tuner tab on

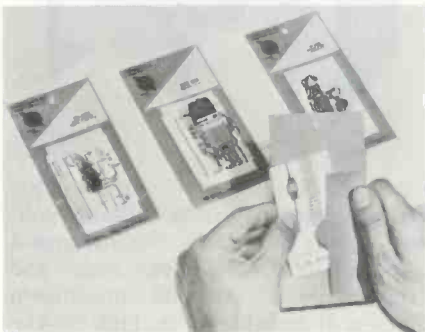


the inside of the cover. The tab is reportedly harmless to plastic and other tuner components and does not detune or cause frequency drift. Universal Tuner Tabs.

### RF COILS AND CHOKES 707

Well protected in heat-shrink packaging

An easy access packaging for RF coils, chokes and components is designed for use with the company's rack merchandisers. The units can also be used on standard peg board hooks. Complete specifications and diagrams



are packed with coils where applicable to assure maximum information to users. Shrink packaging with 5-mil clear vinyl film holds the components firmly in place and permits clear, see-through examinations of the units. J. W. Miller.

### COLOR-CODED CORRUGATED BINS 708

Available in many popular sizes

A line of corrugated bins in five eye-catching colors enables the user to identify the correct bin at a glance. These come in a choice of decorator shades of green, blue, red, orange and brown—in the most popular sizes: 12-in. deep by 2-in., 4-in., 6-in. or 8-in. wide; and 18-in. deep by 4-in. or 6-in. wide. Some are priced as low as 16¢ each. Constructed of heavy duty corrugated board, each bin carries an index panel on the side and front as a

further aid for identification and inventory control. A special cut-down



front design enables the user to see in and insert or remove contents without taking the bin from the shelf. Kole Enterprises, Inc.

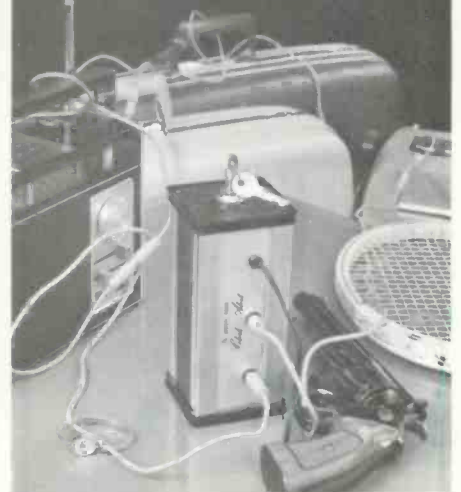
### ANTENNA DISPLAY 709

A self service display for increased sales

The Model DB-3 antenna replacement display board is a pegboard mounted display—measuring 22 in. by 22 in.—that is intended for service *continued on next page*

# Prevent Shop Lifting!

## Tie 'em up with CLERK ALERT.



Shoplifting is big business. No merchant, large or small, is immune. The results are disastrous to a P&L statement. That's why we developed Clerk Alert, a unique advancement in crime fighting devices. This completely solid state system installs with a simple plug-in, and secures any merchandise through which a light phono cable can be looped or threaded.

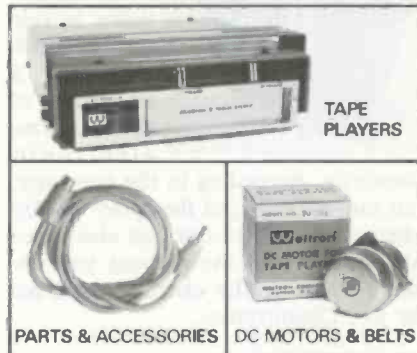
Clerk Alert is fail-safe. Turn the key and the unit is activated. Any tampering, puncturing, cutting, breaking or removal of the cables actuates the alarm. **There is no way to deactivate the unit without the key!**

Clerk Alert runs on AC and/or DC. It operates on a harmless 12 volt U.L. approved power source, plugs into any 115 volt outlet, and automatically switches to battery when the power is interrupted.

Clerk Alert weighs in at 3 pounds and measures only 3" x 3" x 7". And it's priced to sell.

Tie up your profits with Clerk Alert. Send for free literature today!

## DESIGNS OF THE NEW SHAPE OF SOUND TOMORROW



COMPLETE CATALOG AVAILABLE. CALL YOUR WELTRON DISTRIBUTOR TODAY! or write or call direct:



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Please rush me free information on Clerk Alert.

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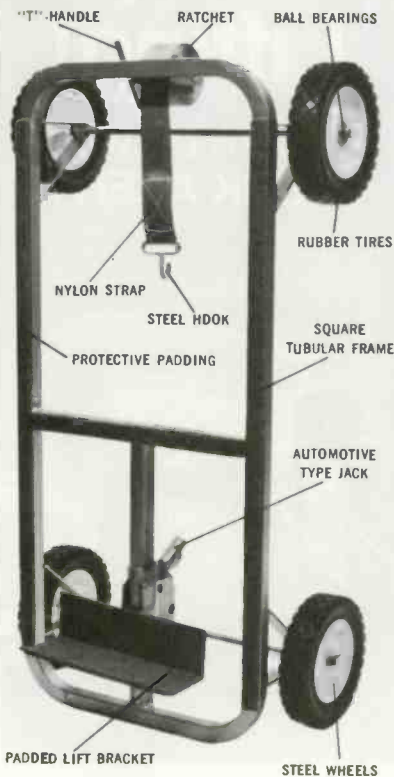
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# FINCO

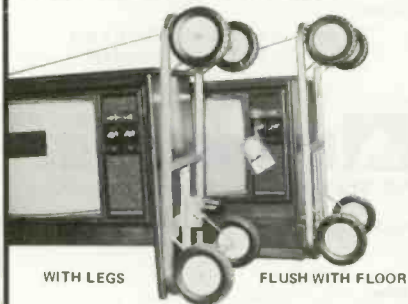
## tele-caster

LIFTS ANY STYLE TV CABINET—  
APPLIANCES, DESKS & FILES



### FEATURES

- Completely Assembled (except for wheels)
- Will clear 3 normal steps in same method used to load Service Truck.
- Can be "walked" up and down steps.
- Can be used to tip set down to work on bottom.
- Can remain attached to set enroute to or from customer.
- Can be used to move long cabinets in shop by putting Tele-Caster under one end and service man lifting other end and wheeling like a wheelbarrow, without strapping unit.
- Jack easily adjusts Tele-Caster for any length legs.
- Operator never needs to lift more than approximately one half of weight.



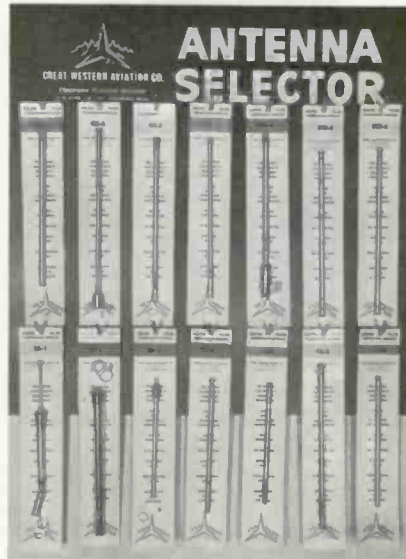
Model TC-1 DEALER NET \$89.50  
WRITE FOR CATALOG 20-621

**The FINNEY Co.**  
34 West Interstate Street  
Bedford, Ohio 44146

## NEW PRODUCTS...

continued from page 57

dealers to hang in the front of their store where customers can see it, or even over the bench for easy access



when repairing TV sets. The manufacturer indicates that their assortment of only 13 types will replace 90 to 95% of the TV and FM receivers and walkie-talkie rod antennas required for today's sets. Great Western Aviation.

### ADJUSTA-SPRAY

710

Variable valve for  
electronic chemicals

A new Adjusta-Spray package for electronic chemicals has a valve with variable spray intensity and a special spray nozzle that may be used with or without extender tubes. The variable valve is said to be available with 8 oz cans of the firms electronic



chemicals. According to the company, you can not only put the spray exactly where you want it, but can also regulate the spray to the amount you desire, permitting the exact amount for the job. Chemtronics.

### TRANSISTOR CURVE GENERATOR

711

Available as kit or  
factory wired

A Transistor Curve Generator, known as the Model TCG-1, is designed for testing transistors and other

semiconductor devices in or out of circuit when used with any scope. The scope then displays the dynamic characteristics of both NPN and PNP transistors, FET's, MOSFET's and dual-gate MOSFET's diodes, zener diodes, tunnel diodes and other devices. One special feature includes a direct transistor "Beta" readout on the front panel of the BASE-DRIVE control. NPN and PNP transistors can be tested consecutively without changing controls or switches. Vertical and horizontal channels of the oscilloscope are calibrated simultaneously for accurate

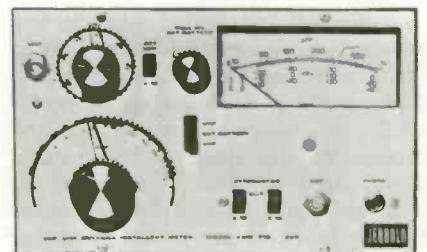


readings. In addition to displaying the collector current versus collector voltage "family of curves," the instrument also tests transistor "open base" and "shorted base" collector breakdown voltage. It measures 6 in. high by 4½ in. wide by 2½ in. deep and features a brushed aluminum front panel and black anodized aluminum cover. Darco.

### FIELD STRENGTH METER 712

Handles signals as small as  
32µv and large as 100,000µv

The Model AIM-719 Field Strength Meter is designed for fast accurate measurement of all UHF and VHF



picture and sound carriers, plus all FM stations and interference that falls



within the TV and FM frequency range. The meter provides signal strength readings directly in dBmV (decibel-microvolts) as well as microvolts. Tuning is continuous from 54MHz to 216MHz and from 470MHz to 890MHz. While input is matched to 75Ω, the meter can also accept 300Ω inputs using the plug-in matching transformer supplied. The instrument is powered by four 9v batteries and measures 9¾ in. long by 5½ in. wide by 7½ in. high, and weighs 6½ lb. Jerrold.

### SEMICONDUCTOR CHECKER

Allows checks in or out of circuit

713

The Model 17 semiconductor checker is designed for high efficiency shop operation and allows checks of diodes and transistors in-or-out of circuit. The curve tracer will reportedly operate with virtually any scope as a read-out device. Shorts, opens, leakage and unstable interconnections are detected with the scope's presentation. Features offered include controlled voltage and currents (15v p-p and 10ma p-p), test bars for out-of-circuit checks and test leads for in-circuit use. Ames Electronics, Inc.

### HOOK-UP WIRE

Packaged in clear self-dispensing container

Hook-up wire in 25-ft spools and available in different colors, is packaged in a clear plastic, self-dispensing container. The container cap has a convenient hook top for peg-board hanging. The container size measures 1¾-in. in diameter by 3-in. long. Unistrand 22 gauge, UL approved 105° C Type FR-1 wire is used. Workman Electronic Products.



### MOVING?

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

714

## SOLVE YOUR DRIVE BELT PROBLEMS IN MINUTES with ONEIDA'S all new DRIVE BELT KITS

- Eliminates "Down Time" on special and foreign belts.
- No need to stock replacement belts; makes any size in minutes.
- No molds or complicated vulcanizing processes to follow.
- No special skill required, cutting guide, cutting tools and adhesive all included.
- Special Insta-Weld® adhesive makes replacement belts as strong as or stronger than originals for lasting repairs.



- ORK-1 Round Rubber Drive Belt Kit ..... \$19.95
- ORK-2 Flat and Square Rubber Drive Belt Kit ..... \$19.95
- ORK-3 "O" Ring Kit ..... \$19.95

Get up to five times your investment back in belt sales. Each of these kits will make from 80-100 dollars or more in rubber drive belts. Included with the kit is the special cutting guide, razor blade, Special Insta-Weld® adhesive, a large quantity of rubber stock and easy-to-follow directions. Nothing has been left out. Packed in an attractive, handy, plastic box that fits into the tube caddy or on the bench. Now, you can replace over 90% of the belts found on tape recorders, phonographs and cassette recorders, both foreign and domestic, right on the spot. Check with your distributor now. If he doesn't stock them, ask him to order them for you today.

## PERMABOND ADHESIVE POWER WITH ONEIDA'S Insta-Weld®



Makes Space Age Bonds

Great for: Rubber • Plastic • Metal • Ceramics • Glass • Etc.

Insta-Weld® is new, not epoxy, nothing you have heard of before. There is no mixing, just apply and hold parts together. Just seconds are all that is required for a bond stronger than anything you could ever get before. One drop supports 2,000 pounds per square inch.

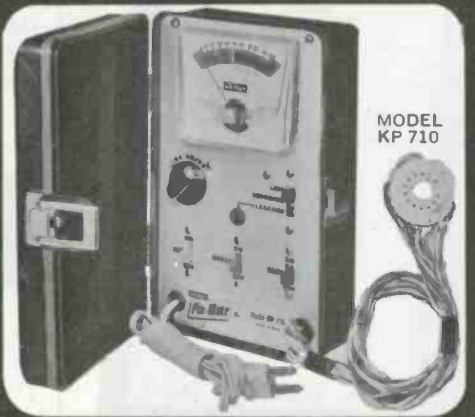
Now make economical repairs that were never before possible. Extremely economical, up to 132 bonds per tube.

NEW INSTA-WELD® only \$2.00 per 2-gram tube

**oneida** ELECTRONIC MFG., INC. MEADVILLE, PENNA. 16335

# Pix-Mate™ the crt tester you can afford to take along

only ... \$34.95



- A quality CRT tester with individual test for each gun.
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  - Test for leakage and shorts.
  - Legible 3 color scale.
  - Compact, portable, rugged.
  - Avoid recalls, check the CRT on every call.

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14 Models  
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**FREE** BUTTON EXTENSION  
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CROSS REFERENCE

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## DEALER SHOWCASE

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

### TV HARDWARE DISPLAY 715

*Designed to increase sales  
and reduce pilferage*

A compact, self-service Space Module—called the SM-3—is said to display the fastest moving TV hardware and accessories. The TV reception aids are packaged in full-color, blister-carded packs to stop pilferage and attract the customer. Automatic reorder reminder cards are also featured, which appear when it is time to reorder each product. It indicates the model number and position of each product on the display. Included in



the assortment are: FM filters, UHF-VHF signal band splitters, wire, ring and clamp sets, mast anchors, wall mounts, turnbuckles and wire hooks. There are eight products in all. Gavin Electronics.

### TWO-WAY RADIO 716

*Uses dual monolithic  
high-IF crystal filters*

A solid-state, two-way business radio, Model FM-2101, is designed for a frequency coverage of 148-174MHz. It reportedly has a sensitivity of at least  $0.5\mu\text{v}$  for 20dB quieting,  $0.35\mu\text{v}$  for 12dB Sinad, and a selectivity of 16kHz at 6dB and 30kHz at 70dB. The audio power is 2w with less than 10% distortion and the squelch range of 0.2 to  $0.8\mu\text{v}$ . The transmitter emis-



sion is 16F3 (frequency-modulated) and the frequency tolerance is .0005% from  $-30^{\circ}\text{C}$  to  $60^{\circ}\text{C}$ . The RF power output is 10w or 25w depending on the model selected. The unit measures  $6\frac{3}{4}$  in. W by  $2\frac{5}{8}$  in. H by 9 in. D without tray, and weighs 5 lb. Sonar.

### CAR STEREO CASSETTE PLAYER 717

*Controls are positioned  
for one hand operation*

The Model TC-30 car stereo cassette player automatically plays both sides of a cassette, freeing the driver from the distraction of cassette-flipping at end-of-tape. Electronic track

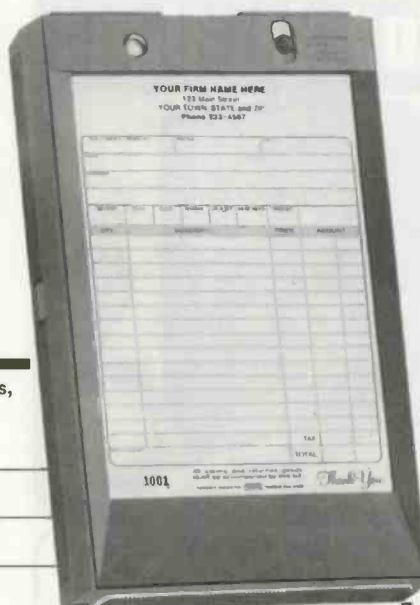


switching allows the four-channel inline head and the cassette to remain stationary while playing in either direction. This eliminates the possibility of misalignment of the head with the tape during track switching. Before the end-of-tape is reached, the cassette can be ejected, or its direction changed by

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pressing a button. The TC-30 features instaloading cassette loading, which facilitates inserting a cassette with one hand. The cassette drops down to engage a rigidly-mounted transport and head assembly. Also featured are dual-differential balanced flywheels to prevent wow and flutter from roadshock, arrows that light up to indicate direction or tape travel, locking FAST FORWARD and REWIND, separate TONE, VOLUME, BALANCE controls, and automatic eject at end-of-tape in fast forward and rewind modes. All controls are logically positioned for one-hand operation. The unit can be installed in any automobile with 12v negative ground electrical system. Price: \$149.95. Superscope, Inc.

tape guides. A cassette head demagnetizer is included, plus a splicer and supply of bleed-free Mylar splicing



tape to facilitate rapid editing and repair of .150-in. tapes. Nortronics Co.

### RECORDER/PLAYER MAINTENANCE KIT 718

For cleaning/demagnetizing cassette recorders/players

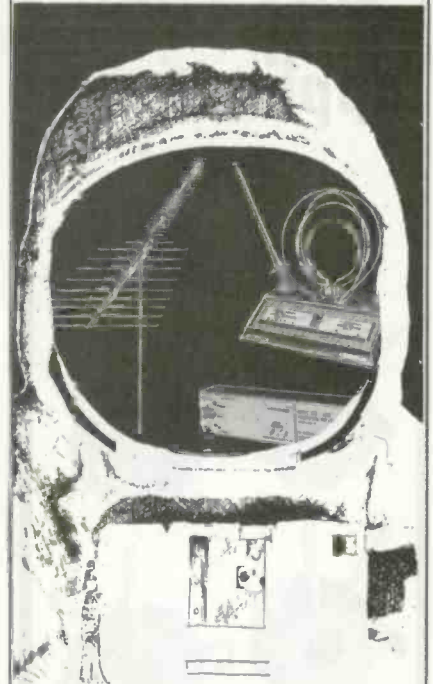
The Model QM-1 Cassette Maintenance Kit has been designed for the cleaning, maintenance and demagnetization of cassette recorders and players. The kit contains six accessories which are said to be ideally suited for routine cleaning and maintenance of heads, capstan, pressure rollers and

### 8-TRACK CLEANER AND TUNE-UP 719

Both require only 10 sec applications

Two products for eight-track maintenance, both double headers, are now available. One combines a tape-drive capstan cleaner and a beeper head cleaner end-to-end in a flip-flop cartridge case; while the other provides a non-abrasive drive cleaner and a head cleaner in similar siamese-twin fashion. The new double header cartridge  
*continued on next page*

# SUIT YOURSELF



## FROM ANTENNAS TO AMPLIFIERS!

Ride the Antennacraft rocket... land space-age sales. With new CDX color antennas, super-swept Colorfinder series, Custom Area Specials... boosted by Gavin selling power! New space-age indoor and outdoor antennas, MATV, hardware and accessories, UHF-TV converters. Get with Project Profits. Get on the M.A.P.\* with Antennacraft and Gavin!

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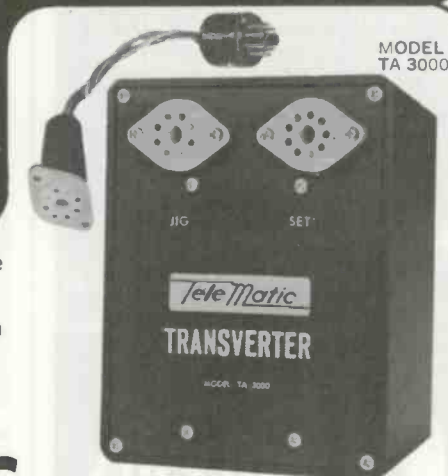
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# all test jigs GO SOLID STATE with a TELEMATIC TRANSVERTER

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RCA...etc., etc...

- Converts any test jig to service any solid state TV.
- Simple plug-in operation
- Economical — Saves buying a solid state jig.
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**Telematic**

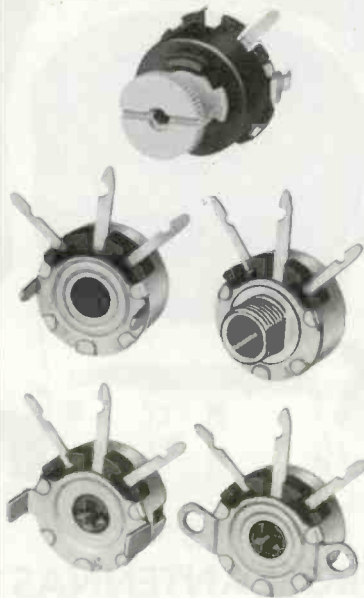
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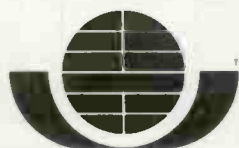
# The right control for over 1,000 applications



The right control for exact replacement is most often a Centralab miniature wirewound control. They're the time and temper savers for all your trouble shooting.

Centralab wirewounds are available in both 1½ and 3 watt ratings in four mounting styles: flange, PC, tab and bushing mount. Resistance values range from 1.5 ohm to 15K ohms. And, for added convenience, nylon plug-in shafts and tandem twin couplers are available. Ask for Centralab wirewound controls from your Centralab stocking distributor.

DISTRIBUTOR PRODUCTS



**CENTRALAB**  
Electronics Division  
GLOBE-UNION INC.

## DEALER SHOWCASE

*continued from page 61*

tridges fit eight-track players from either end. The THC-14 tune-up unit has a cleaning tape with recorded beeps to signal the number of times the player head has been contacted. It



should be run for three beeps after 40 hrs of equipment use.) Back-to-back is the capstan tape (for a 10 sec application after 40 hrs), which cleans and polishes the capstan drive to help eliminate wow and flutter and prevent tape pull-out and breakage. The second double-ended cartridge, the THC-15, includes a supply of special head-cleaning solution designed to work with the non-abrasive polyester cleaning fabric in the cartridge. One end is for cleaning the player

head after 15 hrs of use, the other for cleaning the capstan drive after 40 hrs. Both require 10 sec applications. Robins Industries Corp.

### SSB MARINE TRANSCEIVER 720

*Range of up to 500 miles*

A marine single-sideband, two-way radio, Model MHF 650, is designed for use between ships and to shore stations. Operating on any of eight channels in the frequency range from 2MHz through 6.6MHz, the unit is



powered by a standard 12v electrical supply. Designed for coastal cruising, it reportedly has a broadcasting range of up to 500 miles. The unit measures 5 in. by 11 in. by 15 in. Cubic Corp.

### STEREO HEADPHONE SET 721

*Frequency response of 15Hz to 25kHz*

The new VCH-100 stereo/mono headphone set is complete with a 15-ft coiled cord and standard three-conductor phone plug. The set reproduces sound over a wide frequency range with high quality, the reported frequency response being from 15Hz to 25kHz. Power handling capacity is 1w



and impedance is 4 to 16Ω. The headset has individual VOLUME controls and padded cushion ear rests for user comfort. List price is \$39.95. Duotone Co., Inc.

## take a quick look...



## ...at readable 23 channel CB.

Bold, illuminated numbers on the Messenger 122 make channel changing fast and sure. Its unique rotary drum dial makes these larger numbers possible. But that's only part of the picture... Inside is advanced solid-state circuitry with a ceramic filter, speech compression, and much more. U.S.-Made — backed by our full 1-year parts and labor warranty. For just \$139.95 suggested list price.

### Messenger 122.



**JOHNSON**  
Waseca, Minnesota 56093

## TECHNICAL LITERATURE

### Tools

A 184-page catalog lists tools, standard items, and those unusual hard to find items. Tools kits for every type of assembly are available in standard or design your own kit form. Techni-Tool, Inc., 1216 Arch St., Philadelphia, Pa. 19107.

### Solid-State Replacement Parts Catalog

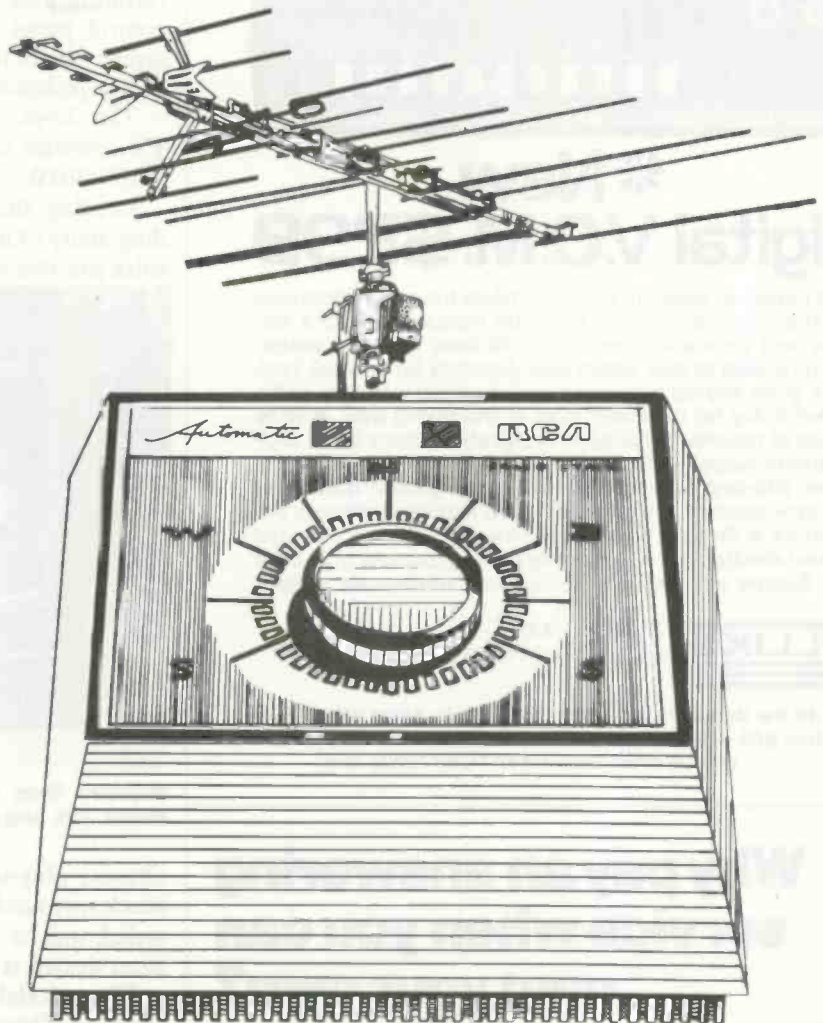
A four-page catalog on solid-state replacement and renewal parts for color TV receivers lists solid-state solid-tube high-voltage rectifiers, focus rectifiers and damper diodes, plus silicon and selenium focus cartridges, and includes diagrams showing dimensional drawings and socket connections for solid-tube solid-state replacements of vacuum tubes, with maximum ratings for pulse rectifier service. Electronic Devices, Inc., 21 Gray Oaks Ave., Yonkers, N.Y. 10710.

### Resistors

A 4-page brochure is available showing detailed data on carbon composition fixed resistors. Full characteristics on  $\frac{1}{4}$ ,  $\frac{1}{2}$ , 1 and 2w rated resistors with color coding, part numbering information and a table of standard resistance values in accordance with EIA resistance values are also included. Characteristics include resistance range, standard tolerance and full temperature specifications. International Components, a division of IESC, 10 Daniel St., Farmingdale, N.Y. 11735.

### Test Instruments

A 28-page, two-color Catalog, No. BK-73, is released covering the manufacturer's test instrument line. The listings include eight new items, three of which are oscilloscopes, while two pages are devoted to probes and other accessories. The new items include the Model 1470 Dual-Trace Triggered Sweep Oscilloscope, Model 1465 Triggered-Sweep Scope, Model 1440 "Cali-Brain" Recurrent-Sweep Scope, Model 281 Solid-State Digital Multimeter, Model 277 Solid-State Electronic Multimeter, Model 120P VOM, Model 501-A Curve Tracer, and Model HV-32 High-Voltage Probe. Dynascan Corp., 1801 W., Belle Plaine Ave., Chicago, Ill. 60613.



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## TV RECEIVERS...

*continued from page 55*

II table color-TV set, Model WT6100JW, which offers a furniture look enhanced by rosewood color around the control panel. Another color-TV set having the same screen size is the Model G06100 portable, which comes with a pedestal base containing concealed casters.

The 23-in. (measured diagonally) Quasar II color-TV consoles start with the Contemporary styled Model WU8000JW.

Leading the introductions in the 25-in. (measured diagonally) Quasar "works in a drawer" color-TV consoles are two credenzas. These units have all solid-state



Motorola's Model WU9106JW color-TV set, featuring an all solid-state chassis with plug-in modules. *Courtesy of Motorola.*

chassis, plug-in modules, UHF pushbutton tuning and black surround matrix picture tubes. The Contemporary styled unit is Model WU9106JW and the Mediterranean design is the Model WU9108JP.

Five models are included in the deluxe furniture series of Quasar "works in a drawer" color-TV consoles with 25-in. (measured diagonally) screens. These TV sets have controls hidden behind a front panel, all solid-state chassis with plug-in modules, pushbutton UHF tuning and black surround matrix picture tubes. The Model WU9114JS has Early American design and the Model WU911JP is Mediterranean styled.

Topping the 25-in line are three remote-control models with doublesided cabinets, dual speakers and the "works in a drawer" feature. The Model TL9121JW has Contemporary design, the Model TL9123JS is an Early American style and the Model TL9125JP is styled in Mediterranean.

There will also be some continued models making up the 34-model line of color-TV sets for 1973.

Motorola's line of B/W TV receivers for 1973 has the "Quick Set" tuning control on eight models and 90-day in-home coverage on six in the 21- and 22-in. (measured diagonally) screen sizes.

The six large screen models, including four consoles, have a 100 percent solid-state chassis and include UHF detent tuning. Up to eight local UHF channels may be set by the user to be accommodated by the detent tuning portion of the UHF tuner, which eliminates fine tuning of those UHF channels. ■

## EDITORIAL . . .

*continued from page 23*

technician even bother with IS CET? For the same reason that people in other fields join unions—to improve their economic future. (This, of course, also includes such additional reasons as technical advancement, pride in the profession, association with peers, etc.)

Yes, some shops that may require their employees to take the CET Exam may also give raises once they have passed the test. This is to help encourage such activity for greater future shop profits. Other shops feel—correctly so—that productivity is the real basis for salaries, and they do not give such raises merely on the basis of one's ability to pass an exam. However, by preparing for the exam, one's productivity increases with an improved understanding of the job. And on the basis of such an increase in productivity, one is entitled to a raise—once such an increase in productivity has been proven. After all, why should a service dealer pay an electronic technician more if the electronic technician isn't able to generate more revenue?

If the employer does not correlate salaries with productivity, then the highly skilled electronic technician certainly does have a right to be upset. In fact, he should seek employment

elsewhere—or better yet, go into business for himself (note the first letter in this month's Letters to the Editor Column). With such an option, unions haven't a chance.

Some readers might wonder how I can speak with such certainty concerning IS CET and its program. Well, at their last convention, I was elected IS CET Chairman. I am no longer on the outside looking in.

At that meeting I had the pleasure of issuing a certificate to one of the newest CETs—Larry Steckler, Editor of RADIO ELECTRONICS. Larry has agreed to be appointed (by me) as the new Editor of the IS CET NEWSLETTER, filling a vacancy left by Sam and Sharon Wilson, who have done an excellent job with that publication.

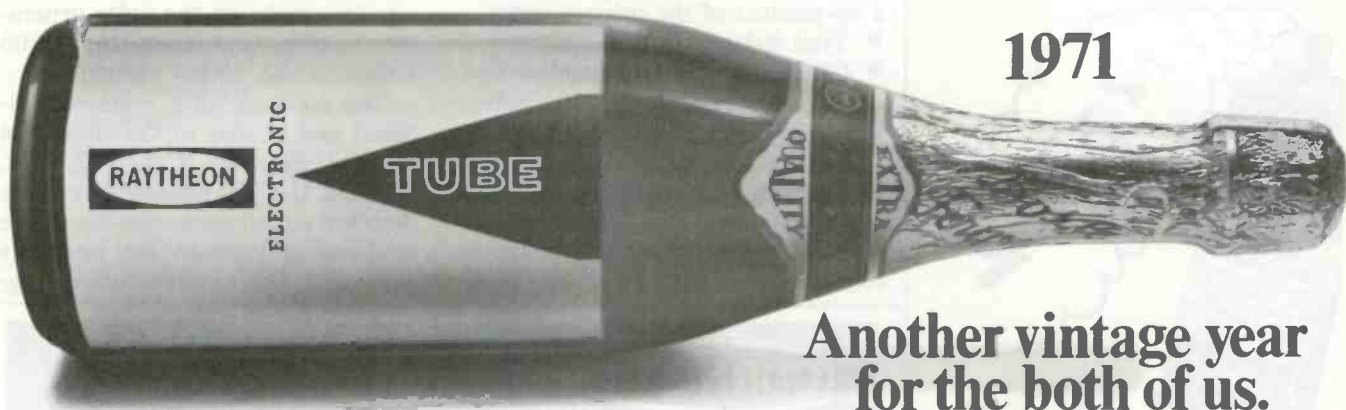
A preview copy of the preceding portion of this editorial was sent to a number of key members of IS CET for their comments. Some of the responses indicated a concern that what I have stated is just a little too strongly anti-union for publication in ELECTRONIC TECHNICIAN/DEALER. For clarification, I would like to indicate that it is my personal belief that in our profession there are alternatives preferable to unions (one excellent professional outlet being IS CET) provided the service dealers choose to reward their employees

according to the degree of professionalism attained. (I have known of instances when employees have refused expense-paid training during their free time on Saturdays. Such reluctance to self-improvement is not very professional!) Where service dealers choose not to let such a relationship exist, unions may prove to be the best alternative.

*Phillip Dahlen*



Teely's not taking any chances since he fell down a chimney yesterday.



## Another vintage year for the both of us.

1971 was a very good year. And 1972 already tastes even better. The truth is every year's a vintage year for you, the independent serviceman, and Raytheon, the largest independent tube supplier in the business. Last year, while a lot of other suppliers were running behind, even dropping out of the race, the two of us had another great year. We've come a long way together.

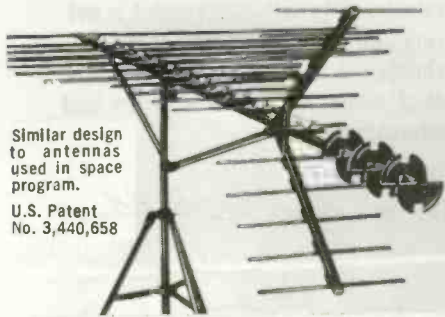
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**CHECK VOUCHERS ...**

*continued from page 51*

cal order to be totaled periodically for gross debit to accounts payable, credit to discount, and credit to cash. It is also used later for bank reconciliation.

Part 3—Voucher Register Copy—used for account distribution. It is attached to the paid voucher and temporarily placed in a file by account number. Tapes are run on the various accounts from which totals are entered each month in the general ledger. It is then filed alphabetically to become the paid invoice file.

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- One check does two jobs—payroll and accounts payable.
- All required copies produced with one typing, eliminating copying errors.
- Savings in clerical preparation time and forms costs.
- Payroll checks can be prepared in approximately half the time previously required.
- Posting of employee records is mechanical since it is just a matter of filing the prewritten check copies.
- Peak loads in preparing accounts payables are considerably reduced since most of the typing is done as a by-product of the original entry.
- Trial balances are easier.
- Check fits standard window envelope, eliminating extra addressing work.

"We have found this system to be ideally suited for our business," Mr. Arvaisis stated. "A reduction of over 50 percent of unproductive clerical time has been achieved.

Forms inventory problems have been eliminated since we have to stock only one type of check for both uses. Probably the greatest benefit, however, is the improved employee and supplier relations since there are no delays in issuing checks." ■

**TEKLAB REPORT ...**

*continued from page 41*

used in this chassis consists of capacitors C202 and C204, diode Y212, and resistors R206 and R210. It supplies a long time-constant circuit for vertical sync pulses, a shorter time-constant circuit for horizontal sync pulses and a means of automatically switching from one circuit to the other. In all other respects, the operation of the sync clipper is quite conventional.

**Horizontal-Sweep Circuits**

The horizontal sweep section is composed of four subsections which consist of the AFC, oscillator, pulse generator and output sections. The AFC section contains the phase detector diodes (Y201 and Y202) and the saw tooth generator (transistor Q207). Also included in the oscillator section are the reactance transistor, Q202, and the oscillator transistor, Q203. Transistors Q204 and Q205, and the associated circuitry make up the pulse generator section; and transistor Q206 serves as the output section.

The AFC circuit is quite conventional and similar to the circuits in General Electric's C-1, C-2, N-2, N-1 and U-1 TV chassis. The phase detector circuit compares the phase relationship between the internally generated horizontal-sawtooth sig-

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nal and the incoming horizontal-sync pulses. An output voltage, which is proportional to the phase difference between the two signals, is produced by the phase detector.

Transistor Q207 has no fixed forward bias for its base-emitter junction, and therefore it only conducts when triggered ON by positive-going retrace pulses from the high-voltage transformer. Its collector voltage waveform would be rectangular if it were not for the RC network composed of capacitors C210 and C214, and resistors R220, R218 and R226. The waveform produced is actually a sawtooth with a steep trailing edge which is used by the phase detector. The steepness allows more accurate control of the horizontal oscillator and less lateral picture shift over the pull-in range. This type of phasing leads to precise keying of the chroma burst gate, making sure the color sync is always accurately maintained.

The horizontal oscillator circuit includes the reactance transistor, Q202, and the oscillator transistor, Q203. This circuit is similar to the circuit used in the C-1, C-2 chassis and is a variation of the Hartley oscillator circuit.

The pulse generator is a unique transformer coupled monostable multivibrator, which serves two functions: It supplies constant width pulses to the output transistor and reduces loading on the horizontal oscillator to improve stability.

The horizontal output transistor, Q206, functions as a switch, which is turned ON to initiate the sweep cycle; and then at the proper time, is turned OFF to allow the oscillatory actions of other circuit components to complete the cycle.

### Summary

We welcomed the standardization approach used on this chassis because of several significant advantages. The greater number of common interchangeable parts will reduce his parts inventory and simplify troubleshooting with the substitution method. Also, after becoming familiar with one chassis the technician should have no trouble servicing a number of screen sizes.

The electronic technician will likely be pleased with the efforts made on this chassis to simplify troubleshooting methods and component removal. ■

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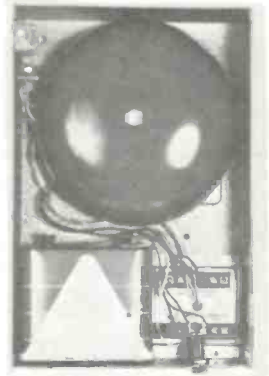
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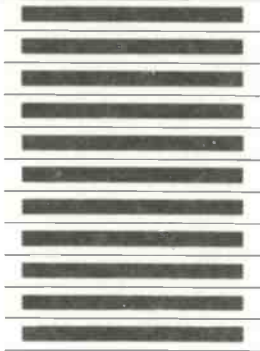
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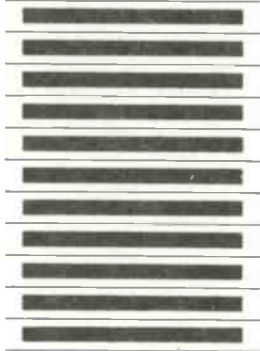
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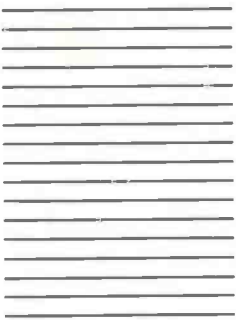
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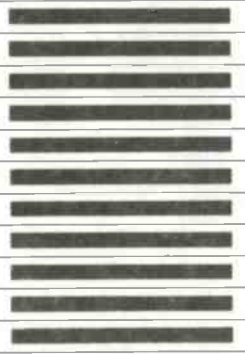


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