

# ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULAR

Independent **TV** Service  
IS BEST

Independent **TV** Service  
IS BEST



FRIM334745B2AZ 87226993AJ1  
WILLIAM M FRISSE AS  
ATLAS RD MI 48411  
XX

The Champions of Independent TV Service

On Camera at Central

Cleveland's May Co. Boasts Top Security...

# SEX

What happens when male can meets female can?

It's far more than love at first sight... it's a whole new way to use professional chemicals. In terms of convenience. And savings.

Because now, you can take it with you. "It" being the profit-making power of Chemtronics TUN-O-WASH, TUN-O-FOAM and TUN-O-BRITE.

The great "space war"

With all the tubes and parts a serviceman has to carry, he's often at a loss for space to fit in a large can of chemicals as well. Even knowing he can often make \$5.00 to \$10.00+ more per call.\*



And when he wants to do an extra-thorough job, degunking with a degreaser before using a cleaner/lubricant, the problem's even worse. Until now. The world's finest chemicals are now the world's most portable

With a Chemtronics Transfer Kit, you can carry all you need in a shirt-pocket. With the refillable "Slim-Jim" cans in each Transfer Kit (each can, no bigger than the kind you fill a butane lighter from), you can carry a complete tuner service kit in your pocket. And still save money on the "economy-size" cans you re-fill from.

Proof? Ounce-for-ounce, transfer kits can save you up to 25% or more on the world's favorite electronic chemicals. And you get two "Slim-Jim" refillable cans that make them a breeze to take along. It's the kind of idea only a serviceman would think of. It's simple—no special gadgets. Just half a minute, and the "Slim-Jim" is refilled with enough to service six to ten tuners (and the large cans are still in the shop for bench use!).

## AND THE SINGLE CAN

Why wait? It's at your local distributor's now

"Sex and the Single Can," more popularly known as the Chemtronics Transfer Kit, comes in three varieties, to meet the needs of knowledgeable technicians:

TCK-1 Double-Degreaser

Two 24 oz. TUN-O-WASH, Two "Slim-Jim" Transfer Cans

TCK-2 Degreaser & Polisher/Lubricant

One each of Bench Size TUN-O-WASH and TUN-O-BRITE, Two "Slim-Jim" Transfer Cans

TCK-3 Degreaser & Cleaner/Lubricant

One each of Bench Size TUN-O-WASH and TUN-O-FOAM, Two "Slim-Jim" Transfer Cans



## A PROFIT STORY FOR SERVICEMEN

If you want to make more profits, while you save money, stop by and pick one up today!

CHEMTRONICS INC.  
1260 Ralph Avenue  
Brooklyn, N.Y. 11236



GROUP  
**235**

SCHEMATIC NO. SCHEMATIC NO.

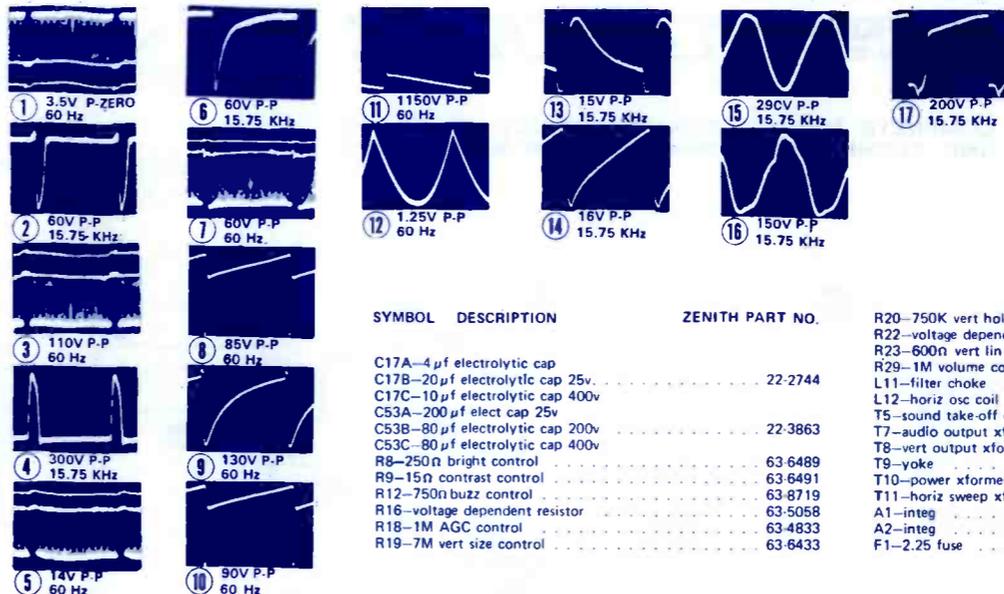
**GENERAL ELECTRIC** . . . . . 1406  
Color TV Chassis H-4

**RCA SALES CORP.** . . . . . 1408  
Color TV Chassis CTC59 Series

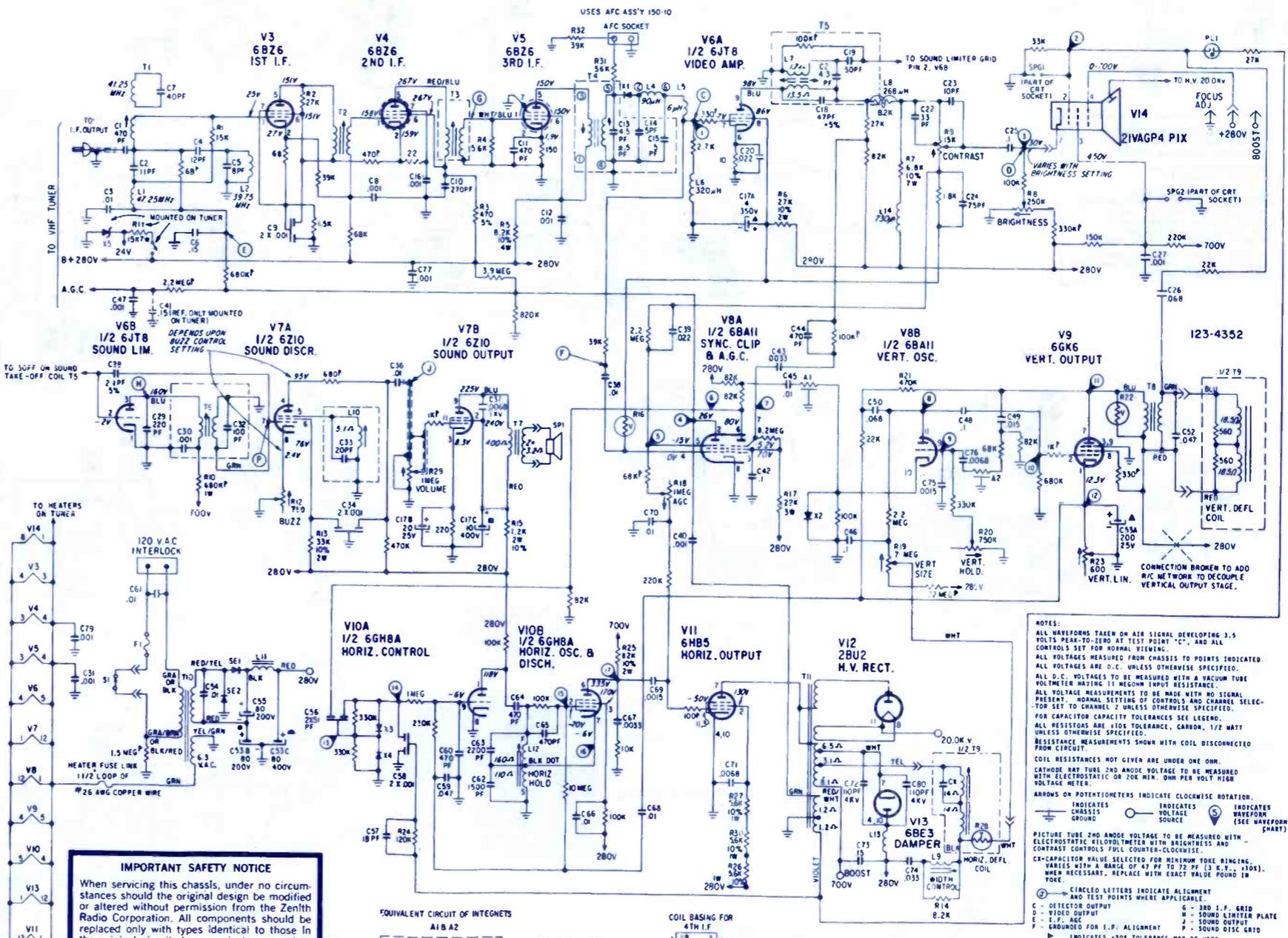
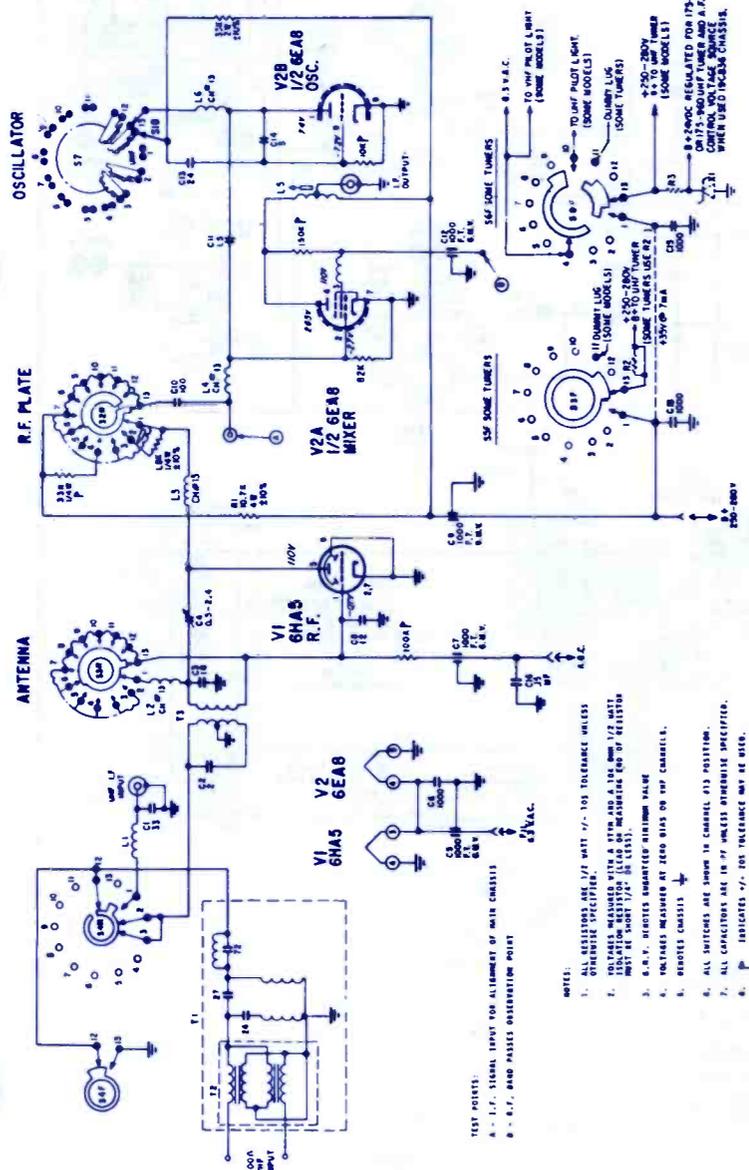
**MAGNAVOX** . . . . . 1407  
Color TV Chassis T957 Series

**SYLVANIA** . . . . . 1409  
TV Chassis A10-1

**ZENITH** . . . . . 1405  
TV Chassis 19CB36



SYMBOL	DESCRIPTION	ZENITH PART NO.	
C17A	4- $\mu$ f electrolytic cap		63-7185
C17B	20- $\mu$ f electrolytic cap 25v	22-2744	63-7447
C17C	10- $\mu$ f electrolytic cap 400v		63-8720
C53A	200- $\mu$ f elect cap 25v		63-6349
C53B	80- $\mu$ f electrolytic cap 200v	22-3863	95-2189
C53C	80- $\mu$ f electrolytic cap 400v		S-86248
R8	250n bright control	63-6489	95-2893
R9	15n contrast control	63-6491	95-2333
R12	750n buzz control	63-8719	95-2874
R16	750n voltage dependent resistor	63-5058	95-2975
R18	1M AGC control	63-4833	S-89958
R19	7M vert size control	63-6433	87-4
R20	750K vert hold control		87-5
R22	voltage dependent resistor		136-78
R23	600n vert lin control		
R29	1M volume control		
L11	filter choke		
L12	horiz osc coil		
T5	sound take-off coil		
T7	audio output xformer		
T8	vert output xformer		
T9	yoke		
T10	power xformer		
T11	horiz sweep xformer		
A1	integ		
A2	integ		
F1	2.25 fuse		



- NOTES:**
1. DIMENSIONS IN PARENTHESES ARE TOLERANCES UNLESS OTHERWISE SPECIFIED.
  2. DIMENSIONS MEASURED WITH A STEEL AND A 1/16" DIA. 1/2" WATT INSULATION RESISTOR (L14) ON MEASURING END OF RELIABLE METER (FOR SET CHANNELS 2-13).
  3. S.P.T. DIMENSIONS INDICATED WITHIN VALUE.
  4. DIMENSIONS MEASURED AT ZERO BIAS ON VHF CHANNELS.
  5. ALL DIMENSIONS ARE SHOWN IN CHANNEL 13 POSITION.
  6. ALL CAPACITORS ARE 10% UNLESS OTHERWISE SPECIFIED.
  7. DIMENSIONS IN PARENTHESES ARE TOLERANCES UNLESS OTHERWISE SPECIFIED.
  8. DIMENSIONS IN PARENTHESES ARE TOLERANCES UNLESS OTHERWISE SPECIFIED.

**IMPORTANT SAFETY NOTICE**

When servicing this chassis, under no circumstances should the original design be modified or altered without permission from the Zenith Radio Corporation. All components should be replaced only with types identical to those in the original circuit. In some instances redundant circuitry is incorporated for additional circuit protection and x-radiation safety and must be retained accordingly.

**NOTES:**

ALL WAVEFORMS TAKEN ON A1A SIGNAL DEVELOPING 3.5 VOLTS PEAK-TO-ZERO AT TEST POINT "C", AND ALL CONTROLS SET FOR NORMAL VIEWING.

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED. ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.

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

FOR CAPACITOR CAPACITY TOLERANCES SEE LEGEND.

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

RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.

COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 200 M $\Omega$  OHM PER VOLT HIGH VOLTAGE METER.

RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.

COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLTMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.

EX-CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 R.F.  $\pm 10\%$ ). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.

① CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS WHERE APPLICABLE.

C - DETECTOR OUTPUT      G - 3RD I.F. GRID  
D - VIDEO OUTPUT      H - SOUND LIMITER PLATE  
E - SOUND OUTPUT      I - SOUND OUTPUT  
F - GROUND FOR I.F. ALIGNMENT      P - SOUND DISC GRID

② INDICATES  $\pm 20\%$  TOLERANCE MAY BE USED.

③ INDICATES INSULATED BRACKET & GROUND PLANE (FOR MONOPOLY ANTENNA).

Schematic Diagram and Top View of VHF Tuner

1406

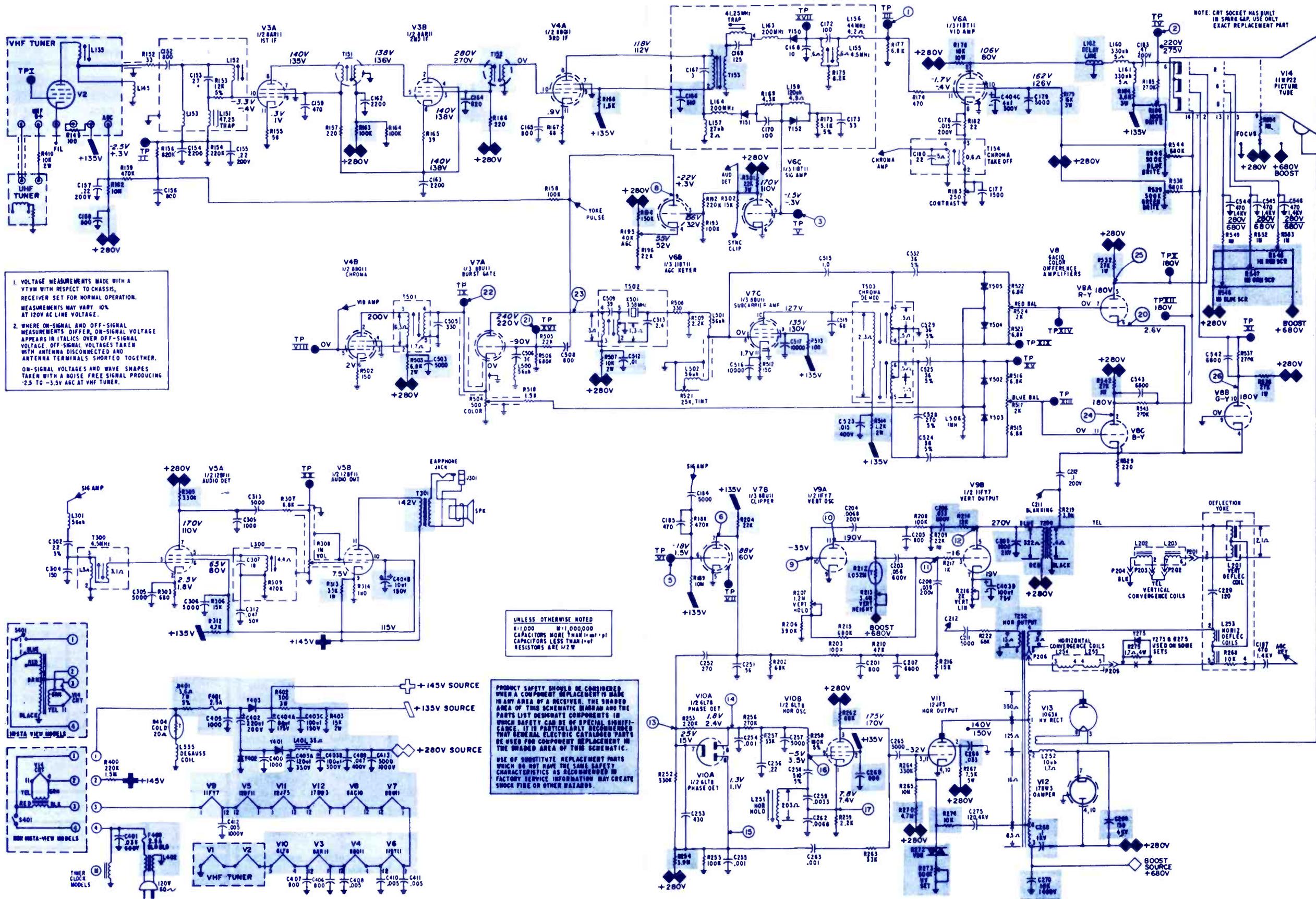
GENERAL ELECTRIC

Color TV Chassis H-4

ELECTRONIC TECHNICIAN/DEALER **TEKFAK**

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

MARCH • 1972



1. VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS, RECEIVER SET FOR NORMAL OPERATION. MEASUREMENTS MAY VARY 10% AT 120V AC LINE VOLTAGE.

2. WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS DIFFER, ON-SIGNAL VOLTAGE APPEARS IN ITALICS OVER OFF-SIGNAL VOLTAGE. OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED AND ANTENNA TERMINALS SHORTED TOGETHER. ON-SIGNAL VOLTAGES AND WAVE SHAPES TAKEN WITH A NOISE FREE SIGNAL PRODUCING 2.5 TO -3.5V AGC AT VHF TUNER.

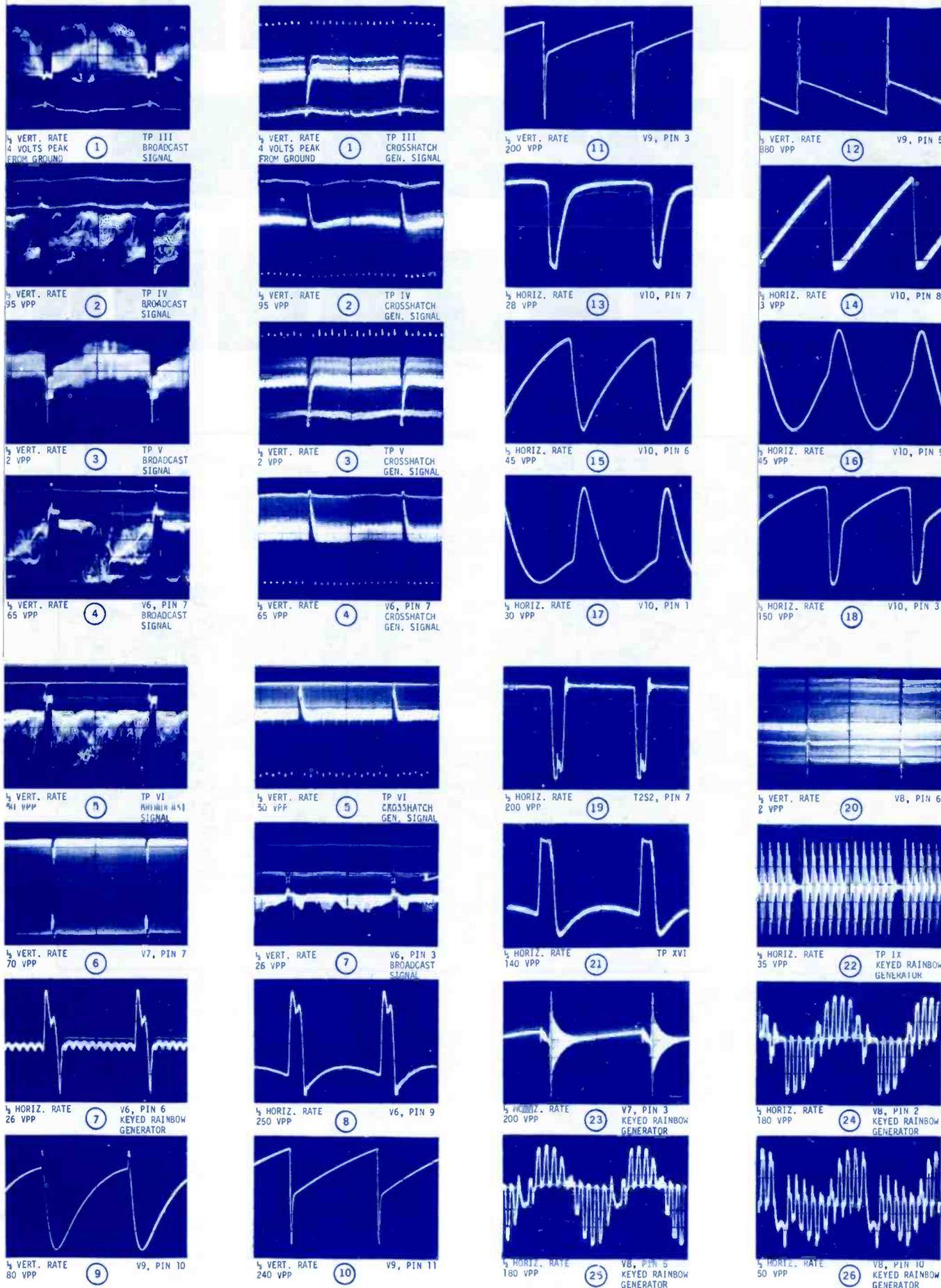
UNLESS OTHERWISE NOTED  
 K=1,000 M=1,000,000  
 CAPACITORS MORE THAN 1µF IN 1µF  
 CAPACITORS LESS THAN 1µF  
 RESISTORS ARE 1/2 W

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

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

NOTE: CRT SOCKET HAS BUILT IN SPARE GAP. USE ONLY EXACT REPLACEMENT PART

WAVEFORMS FOR POINTS INDICATED

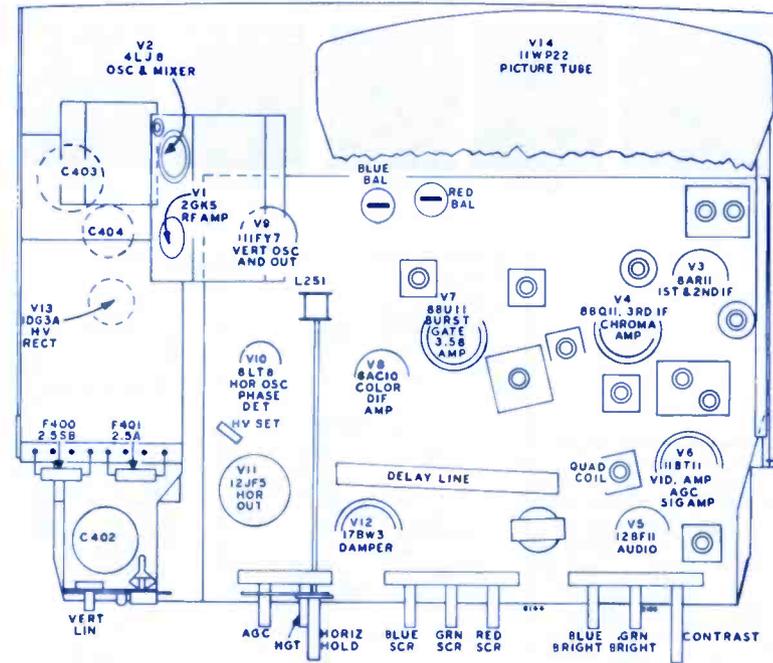


SYMBOL DESCRIPTION GENERAL ELECTRIC PART NO.

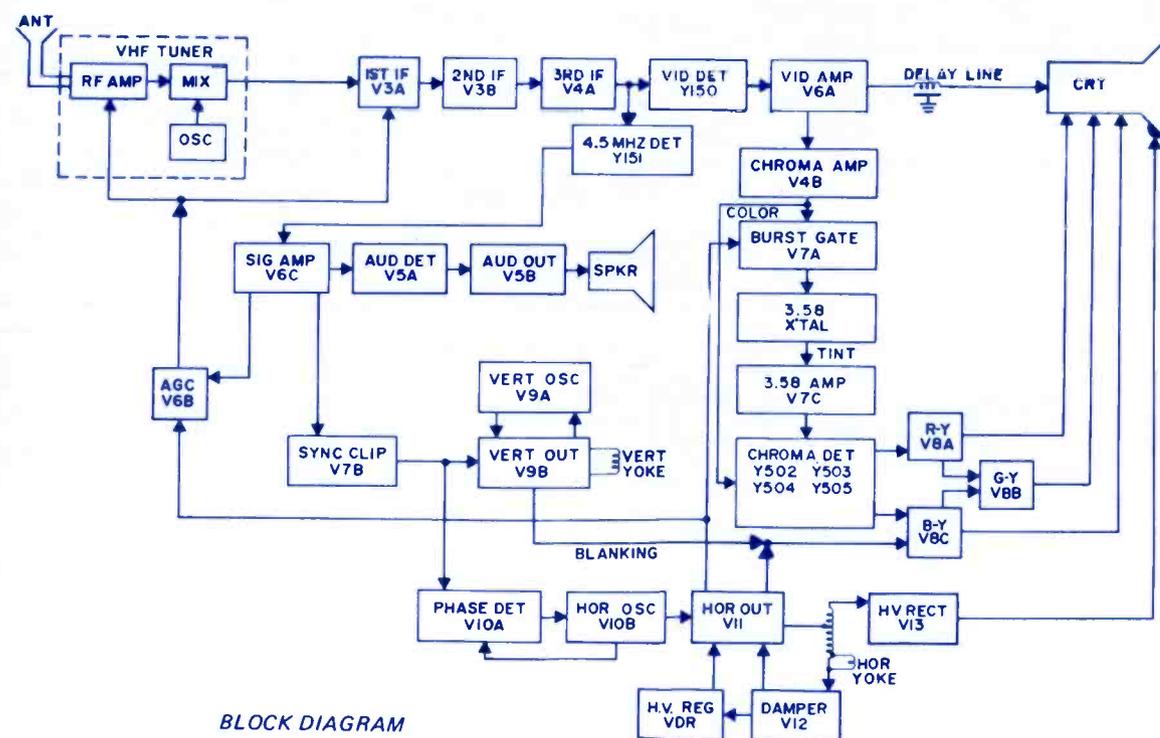
R212—thermistor 1.052M	EP14X206
R272—VDR, 1ma @850+-15%	EP13X2
R275—1.75Ω, 10%, 5WW	ET14X211
—triple control	EP49X592
R183—250Ω, contrast	
R539—500K, green bright	
R545—500K, blue bright	
—dual control	EP49X593
R195—40K, AGC	
R213—3.4M, vert height	EP49X590
R218—2K, vert lin	EP49X42
R273—HV set., 500K	EP49X591
—triple control	
R546—blue screen	
R547—green screen	
R548—red screen	
C528—270pf, 5%, silver mica	ET19X94
C403A—120μf, +100-10%, 350v	EP31X265
C403B—100μf, +100-10%, 300v	
C403C—100μf, +100-10%, 150v	
C403D—100μf, +150-10%, 75v	

GENERAL ELECTRIC  
Color TV Chassis  
H-4

C404A—80μf, +100-10%, 175v	EP31X266
C404B—10μf, +100-10%, 150v	
C404C—4μf, +100-10%, 300v	
L155—coil—4.5MHz trap w/core	EU61X121
L162—coil, delay line	EP36X809
L201—deflect yoke, horiz and vert	EP76X4
L251—coil, horiz osc, w/core	ET35X52
L300—coil, audio detect w/core	EP36X814
L501—coil, 3.58MHz peaking w/core	EP36X20
T154—xformer, chroma take-off w/core	EP61X177
T200—xformer, vert output	EP64X14
T252—xformer, horiz output w/cap & lead assembly	EP77X4
T300—xformer, 4.5MHz interstage w/core	EP36X813
T301—xformer, audio output	ET64X105



TUBE AND ADJUSTMENT LOCATOR



BLOCK DIAGRAM

1407

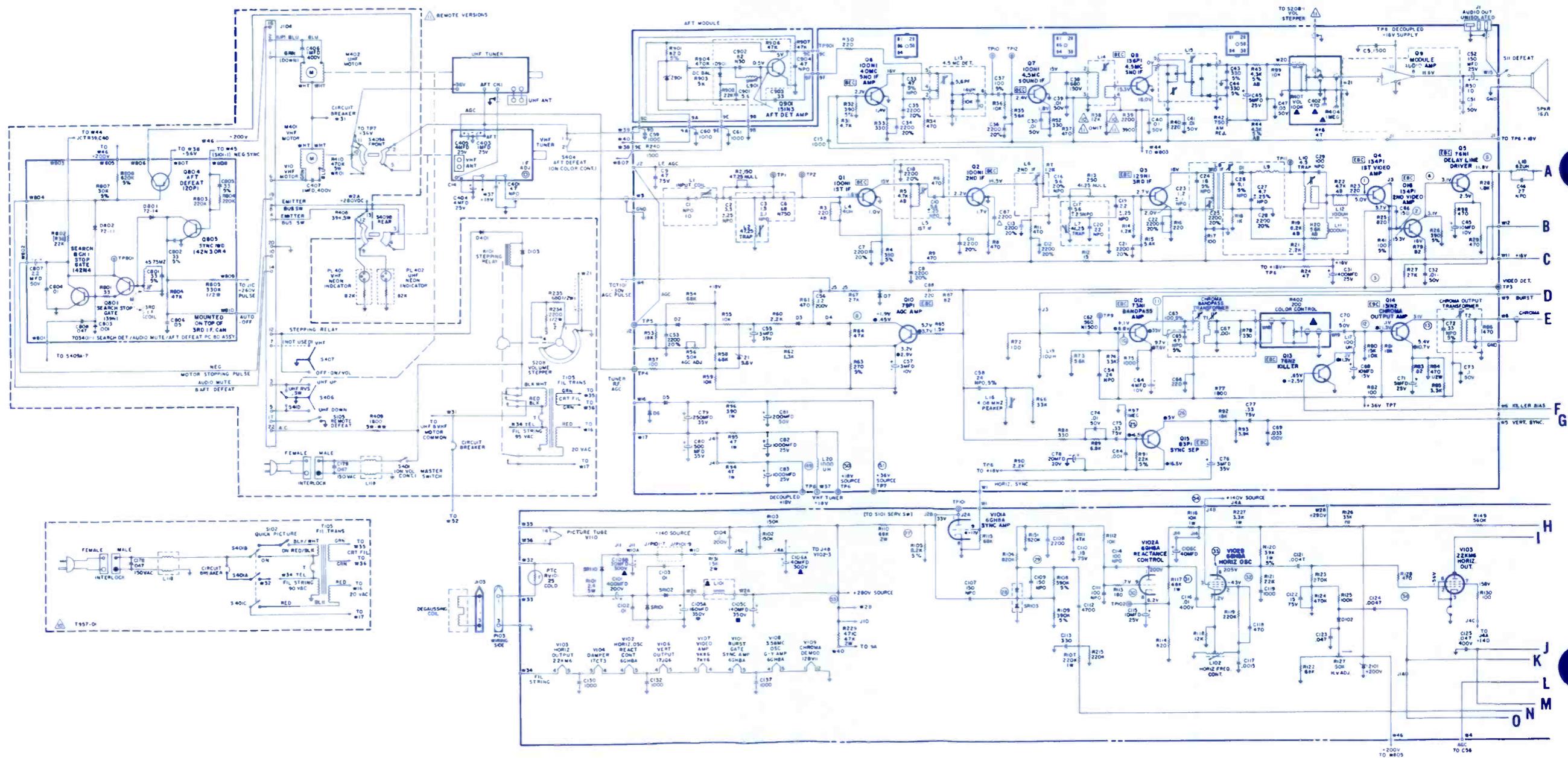
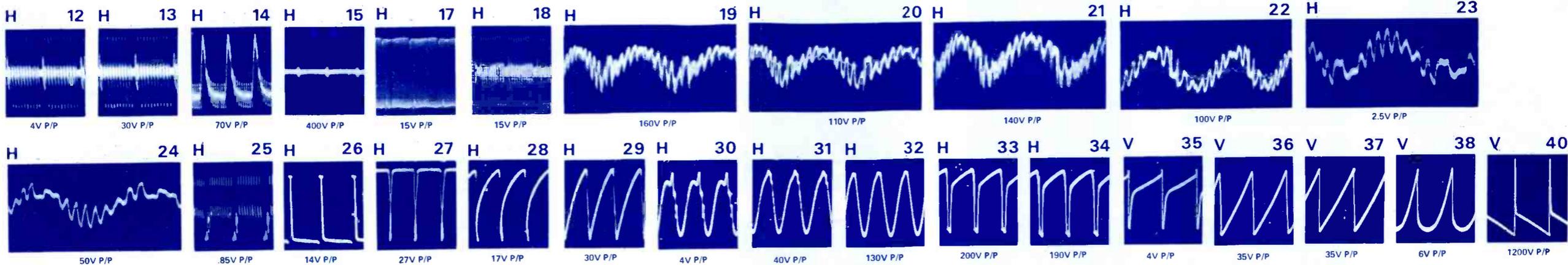
MAGNAVOX

Color TV Chassis  
T957 Series

ELECTRONIC TECHNICIAN/DEALER **TEKFAK**

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS  
AND TECHNICAL INFORMATION FOR 5 NEW SETS

MARCH • 1972



1408

RCA SALES CORP.

Color TV Chassis CTC59 Series

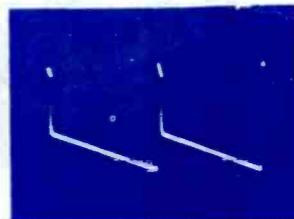
ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

MARCH • 1972

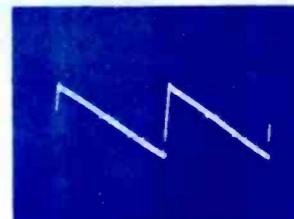
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS



28V P-P HORIZ. RATE (24)



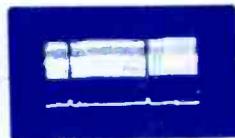
55 VPP VERTICAL RATE (25)



4 VPP VERTICAL RATE (26)



1 3.5V P-P VERT. RATE



4 1.3V P-P VERT. RATE



6 35V P-P HORIZ. RATE



9 .8V P-P HORIZ. RATE



12 60V P-P HORIZ. RATE GREEN OUTPUT



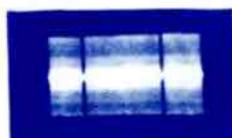
15 55V P-P VERT. RATE



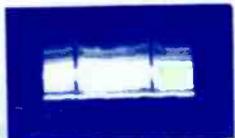
18 12.5V P-P HORIZ. RATE



21 490V P-P HORIZ. RATE



2 7V P-P VERT. RATE



5 .75V P-P VERT. RATE



7 .8V P-P HORIZ. RATE



10 210V P-P HORIZ. RATE



13 110V P-P HORIZ. RATE BLUE OUTPUT



16 3V P-P VERT. RATE



19 350V P-P HORIZ. RATE



22 1.2V P-P HORIZ. RATE



3 30V P-P HORIZ. RATE



6 35V P-P VERT. RATE



8 .4V P-P HORIZ. RATE



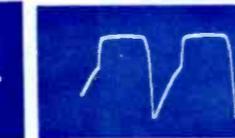
11 110V P-P HORIZ. RATE RED OUTPUT



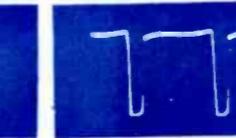
14 55V P-P VERT. RATE



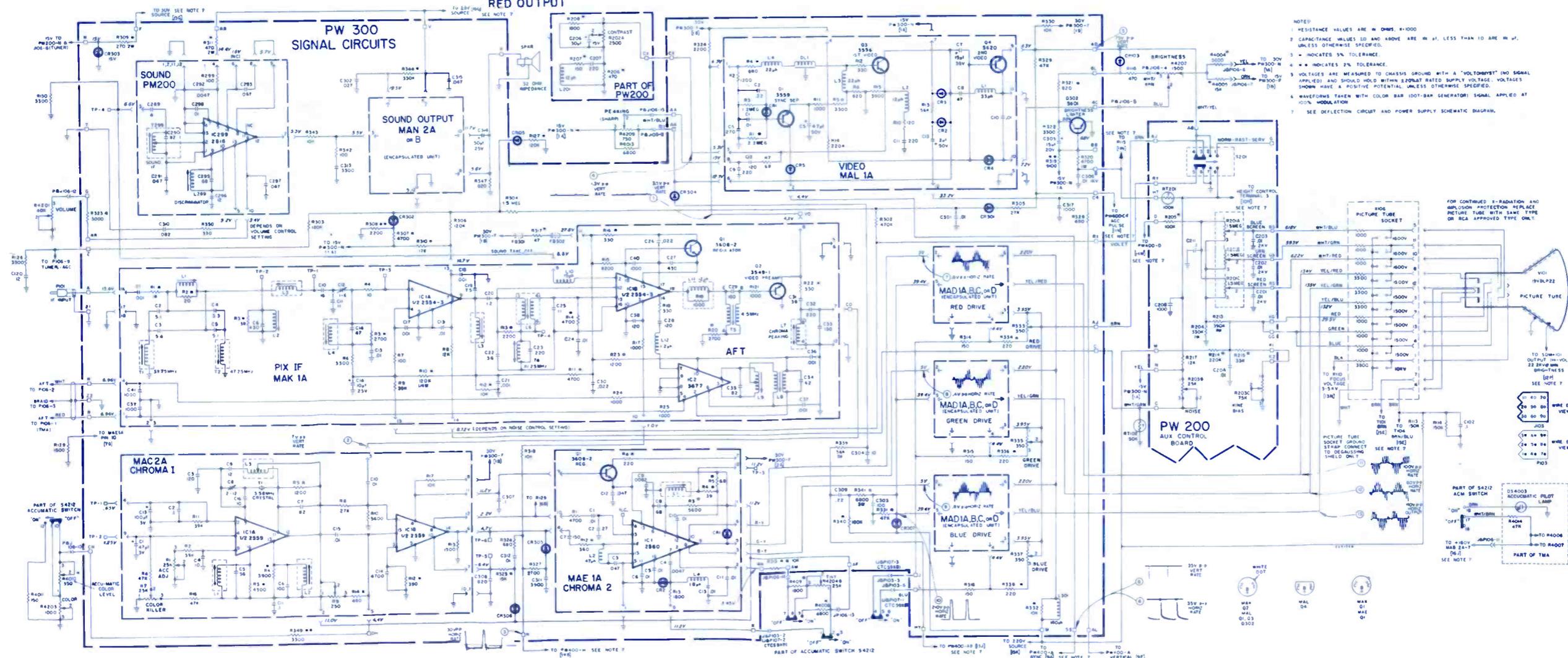
17 850V P-P HORIZ. RATE



20 28V P-P HORIZ. RATE

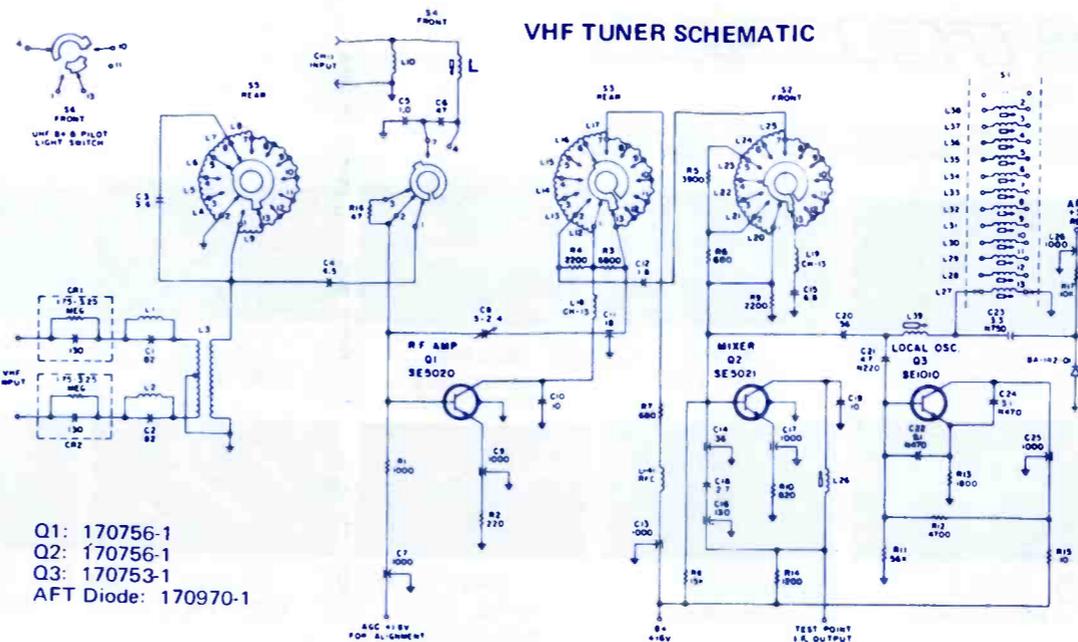
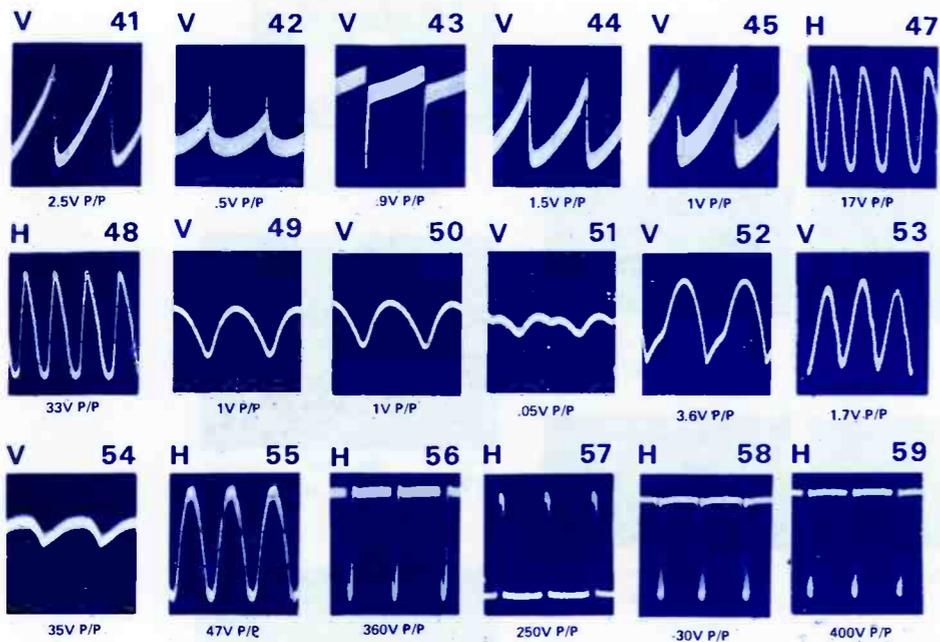


23 45V P-P HORIZ. RATE



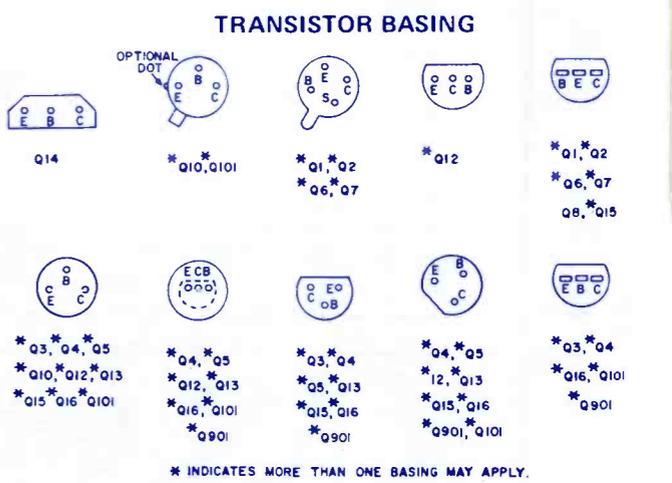
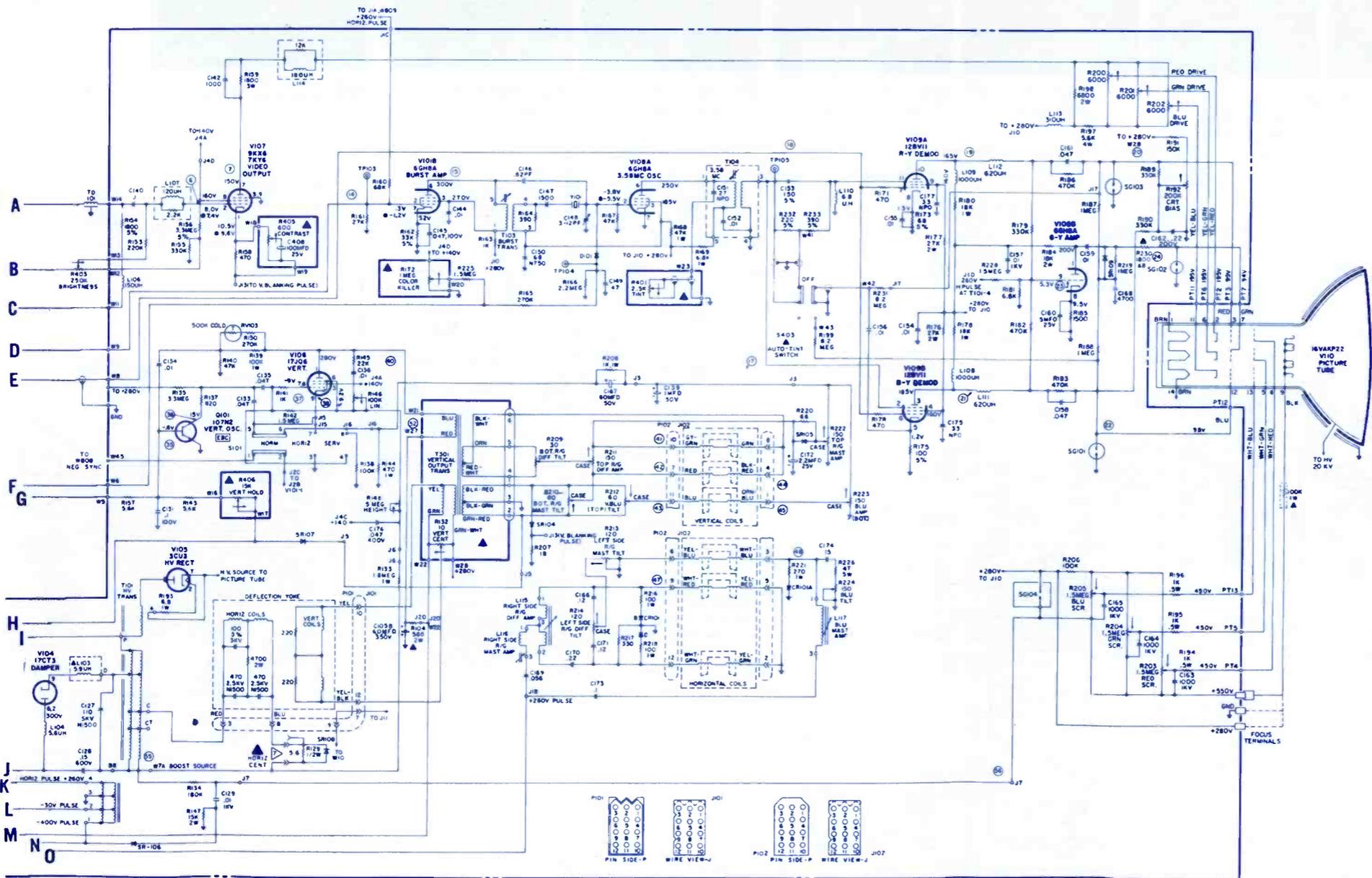
NOTES: 1. RESISTANCE VALUES ARE IN OHMS, K=1000... 2. CAPACITANCE VALUES 10 AND ABOVE ARE IN UF... 3. - INDICATES 5% TOLERANCE... 4. \*\* INDICATES 2% TOLERANCE... 5. VOLTAGES ARE MEASURED TO CHASSIS GROUND... 6. WAVEFORMS TAKEN WITH COLOR BAR (DOT-BAR GENERATOR) SIGNAL APPLIED AT 100% MODULATION... 7. SEE DEFLECTION CIRCUIT AND POWER SUPPLY SCHEMATIC DIAGRAM.

**MAGNAVOX**  
Color TV Chassis  
T957 Series



Q1: 170756-1  
Q2: 170756-1  
Q3: 170753-1  
AFT Diode: 170970-1

SYMBOL	DESCRIPTION	MAGNAVOX PART NO.
L2	47.25MHz trap	361332-1
L10	4.5MHz trap	361298-1
L13	4.5MHz sound detect coil	361336-2
L14	4.5MHz sound IF coil	361331-1
L15	ratio detect xformer	361338-1
L101	filter choke	320355-2
L102	horiz freq coil	361269-1
L118	line filter	361400-1
L901	discriminator coil	361405-1
T1	chroma bandpass xformer	361339-1
T2	chroma output xformer	361343-1
T101	horiz output xformer	361345-5
T103	burst xformer	361296-1
T104	ECO xformer	361198-1
T301	vert output xformer	320377-1
	deflection yoke	361395-3
C105	electrolytic, 160/140/160 $\mu$ f, 350v	270099-9
C106	electrolytic, 40/30/40 $\mu$ f, 300v	270099-11
R226	47, 10%, 5w WW	240080-41
R2	150 $\Omega$ , 47.25MHz trap adjust	220217-9
R13	250 $\Omega$ , 41.25MHz trap adjust	220193-18
R42	750 $\Omega$ , AM reject	220193-21
R56	50K, AGC threshold	220220-20
R127	50K, high voltage adjust	220220-20
R132	10 $\Omega$ , vert centering	220246-1
R146	100K, vert lin	Part of R132
R148	5K, vert height	220220-19
R172	1M, color killer	220208-45
R922	200K, CRT bias adjust	220220-21
RV101	thermistor (PTC) 25 cold; 5K hot	230207-1
RV103	thermistor (NTC) 500K cold	230130-6
TD101	delay line	360949-6
	circuit breaker	180723-8



- NOTES: UNLESS OTHERWISE SPECIFIED,  
 1.  $\Delta$  COMPONENT LOCATED OFF BOARD.  
 2. CAPACITANCE VALUES OF 1 OR MORE ARE IN PICOFARADS.  
 3. CAPACITANCE VALUES LESS THAN 1 ARE IN MICROFARADS.  
 4. SOURCE VOLTAGES MEASURED WITH SIGNAL. ALL OTHERS MEASURED WITH NO SIGNAL EXCEPT THOSE IDENTIFIED WITH A DOT (•).  
 5. CIRCLED NUMBERS REFER TO WAVEFORMS.  
 6. WAVEFORMS OBTAINED USING IO BAR COLOR GENERATOR, CONTRAST MAXIMUM CLOCKWISE AND BRIGHTNESS SET TO PRODUCE 150V AT PLATE OF V107 (PIN 7). COLOR CONTROL SET TO PRODUCE 4V P/P AT BASE OF Q14 AND TINT CONTROL ADJUSTED TO PRODUCE A NORMAL COLOR BAR DISPLAY (4T BAR MAGENTA).  
 7. PARTS MAY BE CONNECTED IN EITHER DIRECTION OR SHORTED AS REQUIRED FOR HORIZ CENTERING.  
 9.  $\Delta$  UNDERSIDE OF PC BOARD (COPPER SIDE).  
 $\Delta$  T957-01  
 $\Delta$  T957-02



SYMBOL DESCRIPTION

- T201—1st video IF
- T202—2nd video IF
- T401—sound IF
- T402—sound disc

SYLVANIA PART NO.

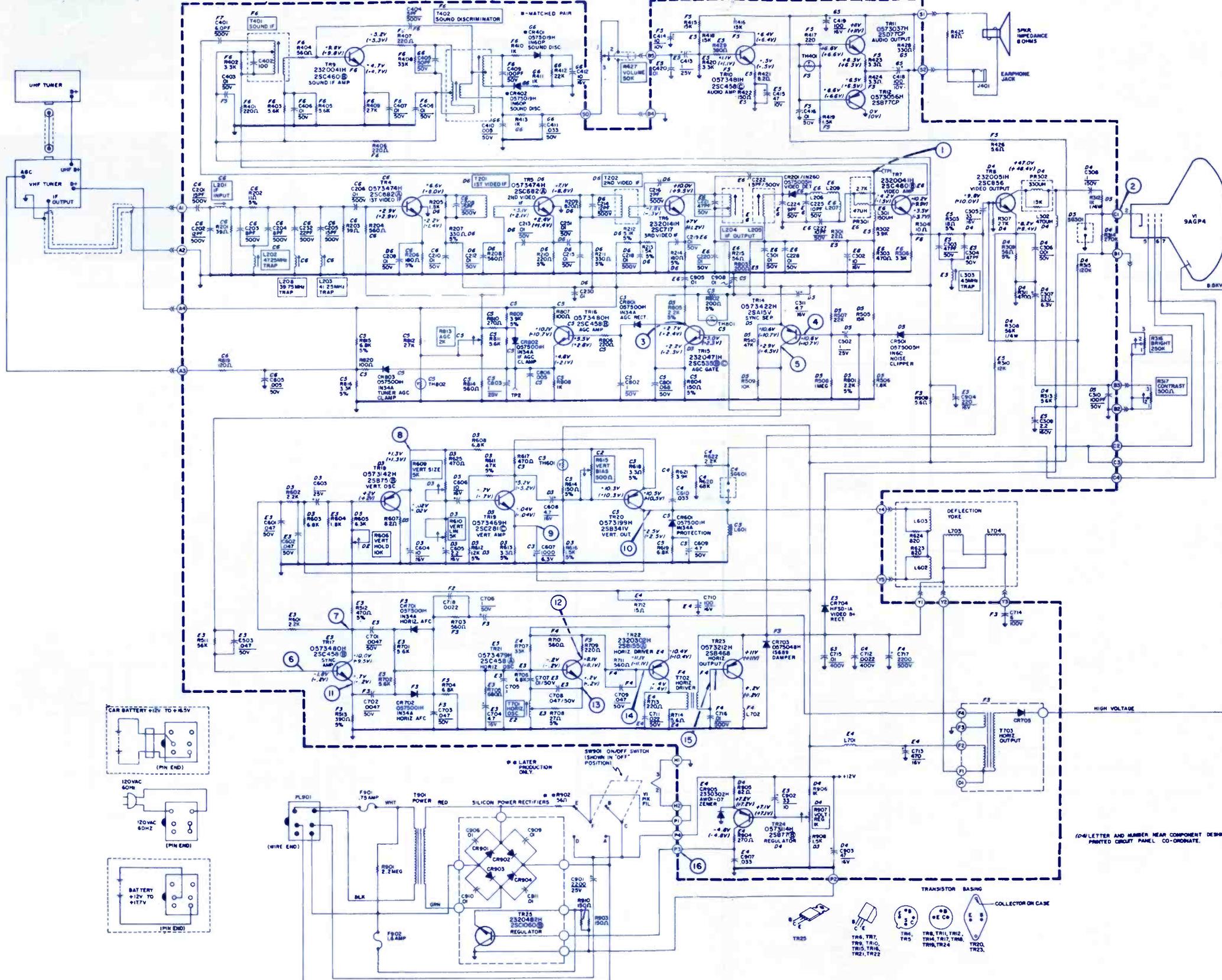
- 2140651H
- 2140652H
- 0322315H
- 0326022H

T701—horiz osc

- 0390018H
- 2430271H
- 2210023H
- 0153668H
- 0153667H

- R427—50K volume
- R606—10K vert hold
- R609—5K vert size
- R610—5K vert lfn
- R615—500n, vert bias
- R813—2K AGC
- R907—1K voltage regulator
- L202—47.25MHz trap
- L203—41.25MHz trap
- L208—39.75MHz trap
- L303—4.5MHz trap
- L601—choke
- F901—fuse 75a
- F902—fuse 1.6a
- DY—yoke deflect
- SW901—switch on/off

- 0166613H
- 0153666H
- 0151245H
- 0151245H
- 0151248H
- 0151246H
- 0151249H
- 2120197H
- 2120095H
- 2120197H
- 2120194H
- 2220031H
- 05912071H
- 2440152H
- 2610241H
- 0576038H
- 0576038H
- 0576057H
- 2420154H
- 2420611H

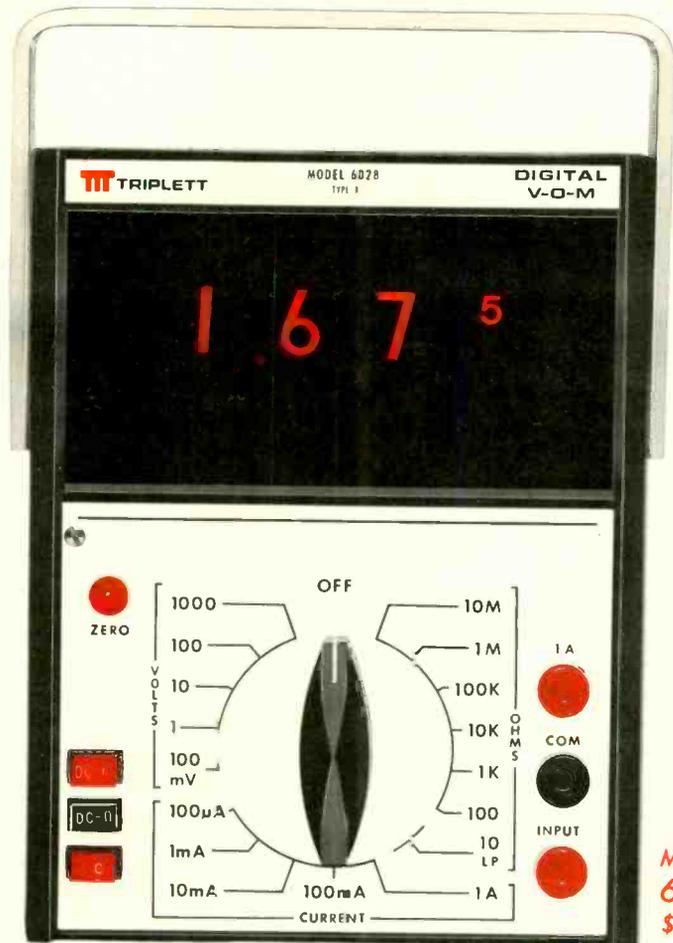


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- 1 1.5VPP Horiz.
- 2 40VPP Horiz.
- 3 3.5VPP Horiz.
- 4 .5VPP Horiz.
- 5 9.0 VPP Horiz.
- 6 9.5VPP Horiz.
- 7 6VPP Vert.
- 8 2.2VPP Vert.
- 9 1 VPP Vert.
- 10 50 VPP Vert.
- 11 6 VPP Horiz.
- 12 7 VPP Horiz.
- 13 9 VPP Horiz.
- 14 3.5VPP Horiz.
- 15 80VPP Horiz.
- 16 1.5 VPP Vert.

If you need  
**more accuracy**  
 and **resolution**  
 than a  
 2½-digit  
 V-O-M, but  
 don't want to  
 pay the price  
 of 3½-digits ...

Buy **Triplet's**  
 new **6028**



Model  
**6028**  
**\$275**

1. 2¾ DIGITS— Provides high accuracy with resolution to 500 Microvolts.
2. 10 OHMS TO 10 MEGOHMS — 7 Ohms ranges with zero adjust to null lead resistance.
3. LOW CIRCUIT LOADING — Greater measurement accuracy with 10 megohm input resistance for all AC and DC voltage ranges.

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## ALFRED A. MENEGUS

Publisher  
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(212) 572-4839

## TOM GRENEY

Publishing Director

## JOSEPH ZAUHAR

Managing Editor

## BERNICE GEISERT

Associate Editor

## GAYNELLE DAVIDSON

Production Manager

## BOB ANDRESEN

Graphic Design

## LILLIE PEARSON

Circulation Fulfillment

## JOHN KESSLER

Manager, Reader Services

## MANAGERS

### JIM SMITH

43 East Ohio Street  
Chicago, Ill. 60611  
(312) 467-0670

### CHUCK CUMMINGS

Ad Space South/West  
613 North O'Connor  
Irving, Texas 75060  
(214) 253-8678

### KEN JORDAN

DONALD D. HOUSTON  
1901 West 8th Street  
Los Angeles, Calif. 90057  
(213) 483-8530

### CHARLES S. HARRISON

CY JOBSON  
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### ROBERT UPTON

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MARCH 1972 • VOLUME 94 NUMBER 3

If you have attended just about any state or national association convention, then you are well acquainted with the couple shown on this month's cover—Morris and Frieda Finneburgh. More concerning their association activity is included in the article beginning on page 46. Photo courtesy of The Finney Co.

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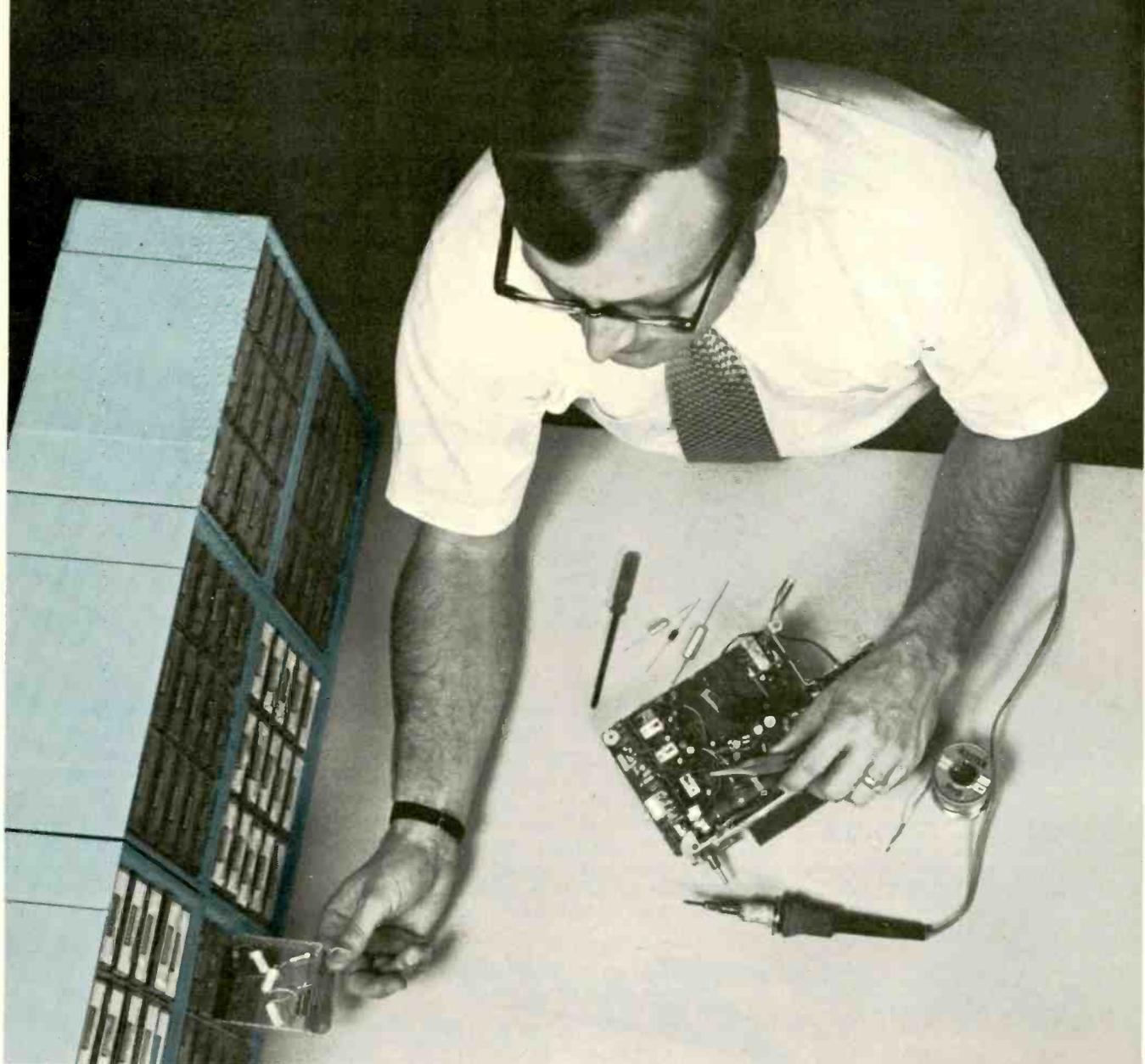
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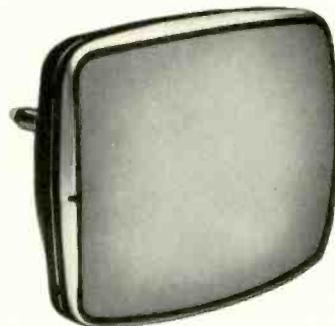
### C-25BAP22, 23VATP22 replace 39 types

23VAHP22	23VBGP22	25BCP22	25CP22A
23VAJP22	23VBHP22	25BGP22	25GP22
23VALP22	25ABP22	25BJP22	25GP22A
23VANP22	25AFP22	25BMP22	25SP22
23VARP22	25ANP22	25BRP22	25VP22
23VASP22	25AP22	25BVP22	25WP22
23VATP22	25AP22A	25BXP22	25XP22
23VAUP22	25AP22A/25XP22	25BZP22	25XP22/25AP22A
23VAXP22	25AQP22	25CBP22	25ZP22
23VBEP22	25BAP22	25CP22	



### 23VAZP22 replaces 10 types

23VAZP22	25RP22
25AEP22	25YP22
25BP22	25YP22/25BP22A
25BP22A	
25BP22A/25YP22	
25FP22	
25FP22A	



### C-25BKP22, 23VBAP22 replace 23 types

23VACP22	23VBDP22	25AXP22
23VADP22	23VBJP22	25AZP22
23VAMP22	23VBRP22	25BDP22
23VAQP22	25ADP22	25BFP22
23VAWP22	25AGP22	25BHP22
23VAYP22	25AJP22	25BSP22
23VBAP22	25ASP22	25BKP22
23VBCP22	25AWP22	

#### 2-YEAR WARRANTY

Zenith CHROMACOLOR picture tubes sold for renewal use in standard television receivers are warranted against defects in workmanship, material and construction for 24 months after date of purchase by the consumer or user. OR if tube is supplied no charge to fulfill a warranty obligation in a Zenith color television receiver, then the warranty shall be limited to the unexpired portion of said Zenith color television receiver warranty. No other warranty is expressed or implied.

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## Under the Weather

In this month's memo I had originally planned to discuss some of the interesting activities that I observed at the Electronic Industry Council and National Service Conference that were held at the end of January in Chicago. But instead of attending these important meetings, I find myself sitting in the kitchen at home writing this memo—while under the influence of the flu that has spread across our nation.

Last month's memo made reference to the extreme independence that many of us are able to experience in our industry; and why as independent people we should still be concerned with joining one or more trade associations. That memo, however, failed to include one very important personal reason for inter-industry cooperation—insurance. Not medical insurance in the usual sense, for we did cover the fact that through some of the associations such insurance can be obtained at a reduced cost through group plans.

What happens to your business when you are under the weather? The insurance company may pay your medical bills when you are ill. It may even supplement your income. But it won't answer your phone for you when you are home in bed, nor will it get those TV sets in or out of your shop.

When feeling well, it is extremely good for one's ego to know that the business is entirely dependent upon your talents. However, this feeling of pride can quickly turn to desperation when you suddenly find yourself unable to utilize these talents.

Trade associations are mutual-aid associations. Those active in trade associations—whether it be on a local, regional, state or national level—find that there is typically a warm feeling of fellowship among members. And if one member is ill, the others are there to pitch in and lend a hand.

The best insurance is a group of good friends who are there to help one another as needed. That's really the basic reason these associations exist. These are mutual aid societies, formed to help one another in matters of health, in terms of upgrading skills to meet the needs of one's job, of mutually protecting members from unreasonable government interference, for educating the public to improve customer relations.

Protect yourself. . . . See that you are well insured. . . . Join a trade association!

*Phillip Dallen*



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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.

## You Cheat 'Em . . . I'll Service 'Em

Countless articles, editorials and full-fledged industry conferences have recently attempted to pinpoint and illustrate the problems which are facing the home entertainment electronic servicing industry. Each has tried to impress me—a service dealer—that the consumer is the motivating force behind the overall problem. In addition, I have been asked to understand a new word: "consumerism." Further, I am told that if I choose to ignore "consumerism," it will result in my being told what to do, how to do it, and who to do it to—by the number one industry, UNCLE.

But not to stop there, I was graciously presented with the ultimate solution—self regulation by our own industry. I accept this recommendation and welcome the suggestion. But in accepting this solution, will all of our problems disappear, even if it works? I think not.

It has been said that "there is a moral sag in business." It has also been said that, "thousands of cheaters and chisellers operate on a scale ranging from petty deceptions to the grandest of schemes, ranging world-wide in scope." It is important to note that this statement was not leveled at the TV service industry alone, but at business enterprise in general. More to the point, it is with the definition of "cheaters" that the real issue and problem lies.

Strictly by the dictionary, cheat can be defined as: to deceive, to defraud, or to trick. But also think of it as to swindle, hoodwink, gull, dupe, delude, hoax and victimize. Do not these terms apply equally well? So it is with this term, cheat, that we should all think about, not just consumerism.

Consider the average independent service dealer. He is competent, provides courteous and prompt service, charges competitively but fairly, operates his business intelligently, offers a good warranty, and is undeniably honest. He is going to stay in business. Yet, his competitor does everything equally well—except that he cheats a little. Does an extra tube go into a set when it was not needed? Were any parts charged to the customer that were not used? Perhaps an extra \$5.00 was added to the labor for no established reason. Was the customer

charged for a shop repair when the set could have easily been serviced in the home?

This is cheating. This is fraud. This is victimizing. This is small pickings. But, just enough pickings to account for the expanding number of consumer complaints that are registered daily.

I'll let him cheat 'em. I'll service 'em. I'll be there after he is gone.

What of the sales dealers? There is no way that we can separate sales from service in this industry. It is the "total product," sales and service, that the consumer is shouting about.

The sales dealer (it matters not if he is sales-service or strictly sales only) must be completely honest in his transactions with the consumer. Those sales dealers that imply to the customer that the merchandise is service free, is completely automatic in all respects, is completely warranted against all contingencies, but does not take the time to educate the customer to his newly acquired merchandise—is really a cheat. The customer has been hoodwinked, duped and deluded. In short, the customer was not given the whole picture.

But that's alright, I'll educate the customer. I'll prepare him for expected future service. I'll take the blunt of his abuses, hold my tongue and service his product for years to come.

These are petty deceptions. These are just a few of the "small" and "medium" size cheats. Are there any "big ones," any world-wide, earth-shaking, and majestic schemes? If there are any at all in existence, they most certainly would have to be subtle, elusive, sly and very crafty.

Considering that the service industry has been making excuses for years for the manufacturers of home entertainment equipment—in one form or another—there must have been a scheme somewhere. The connotation in their advertisements and sales literature has sold millions of pieces of merchandise. No one questions the simple fact of economics that says—without sales, there can be no service. But to imply that the merchandise is service free and should never see the inside of a service shop is just another form of victimizing.

Again it is alright. I'll continue to cover for him and make excuses, and I'll service 'em.

You and I know that thousands of techniques have been devised to cheat the consumer. An equal number of countermeasures have been established to detect the frauds. But experience has proven that as the pressure is applied, the professional cheat will come up with other—and perhaps more sophisticated—ways of doing his cheating. Self regulation is the best counter-

measure yet proposed to detect and prevent open and outright fraud.

However, the real solution to the problem facing the electronic service industry is terribly simple. We must improve our ethics! The service dealer, sales dealer and manufacturer—among themselves and together—must search their conscience and insist upon honesty in their every transaction.

Meanwhile, you cheat 'em. . . I'll service 'em.

TOM THOMAS, CET

## Suggests Name

My suggestion for a name for members of the electronic and/or appliance service craft who have achieved an advanced level of technical merit is . . . "ProTech."

My reasons for suggesting this name—ProTech—are three (not necessarily in the order listed):

- ProTech suggests a technician who is master of his particular field of service.
- ProTech suggests a member who reflects the professional and ethical standards of the service organization he belongs to.
- ProTech suggests a technician concerned with the interest of the consumer.

F. J. KENNEDY

## Appreciates Publication

I read with interest, William Felsher's Letter to the Editor in the October 1971 issue, on safety precautions and practices. I have been a subscriber of ELECTRONIC TECHNICIAN/DEALER magazine for 15 or more years, and have found it to be very well written, informative and authentic. It has helped me keep abreast of this fast changing electronic business. The many editorials and articles have helped me plan and operate my business with increased profits. Keep up the good work.

I agree that safety cannot be stressed too often. I will list some precautions that will remind the old technician, and might save the life of a new technician. Safety procedures must be developed as a habit, so that when the technician is pushed with repair work, he will automatically take precautions.

Special precautions should be taken when working on equipment that carries both high voltage and high current. Transmitters and power supplies are especially hazardous, because this equipment contains circuits capable of delivering large amounts of current at

*continued on page 26*

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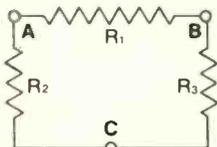


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## LETTERS...

continued from page 25

a high voltage. The filter capacitors in such equipment are relatively large and can store a large charge that can remain for long periods after the equipment has been turned OFF. Contact with a charged 4mf capacitor of the type used in transmitter power supplies can be just as deadly as touching a line circuit.

Although any piece of equipment that delivers high current can be hazardous, the danger is even greater when dampness is present, or when the hands are perspiring. Under such conditions the body resistance is low and contact with high current can be very dangerous, or even fatal. A current of only 80ma through the body can cause death. Even less current can be fatal if the victim is fatigued, or if his general health is poor. It is a good idea to stand on a rubber mat while you are at your work bench.

TV sets have many circuits that are dangerous after they are turned OFF, especially those sets that have series tube filaments with defective power supplies. Contact with voltage doubler circuits can numb your body, or under conditions mentioned above, even kill you. Watch that second anode receptacle in the picture tube. It might not have enough stored current to kill you, but it can make you hurt yourself getting out of the way! This is like the old adage, "I didn't know the gun was loaded." We all know equipment that is turned ON is dangerous. If you don't know how much voltage is at a point of measurement, look at your chart.

But we technicians, businessmen, manufacturers, editors, authors, readers, or what, should keep in mind that since "safety is an every man, every day responsibility," it is therefore ours also.

P.S. Inclosed is a check for a three year subscription renewal.

JAMES MINCHEW

### Wants Safety Tips

I agree with Mr. Felscher's suggestion of starting a "Safety Tips" column—possibly with the use of cartoons to get attention.

The following is a list of common rules for safety:

- Use the right size and type of screwdriver for the job. Do not hold the work in the palm of your hand since the screwdriver may slip and injure you.
- Do not use a file without a handle. Do not use a file for a pry, as it is

continued on page 82

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# What do RCA SK series devices have that other replacements don't?



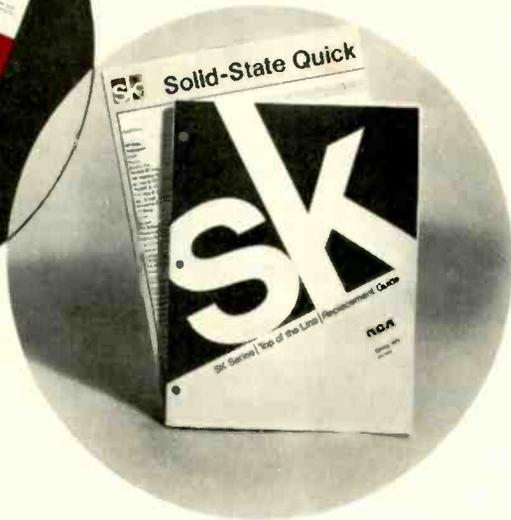
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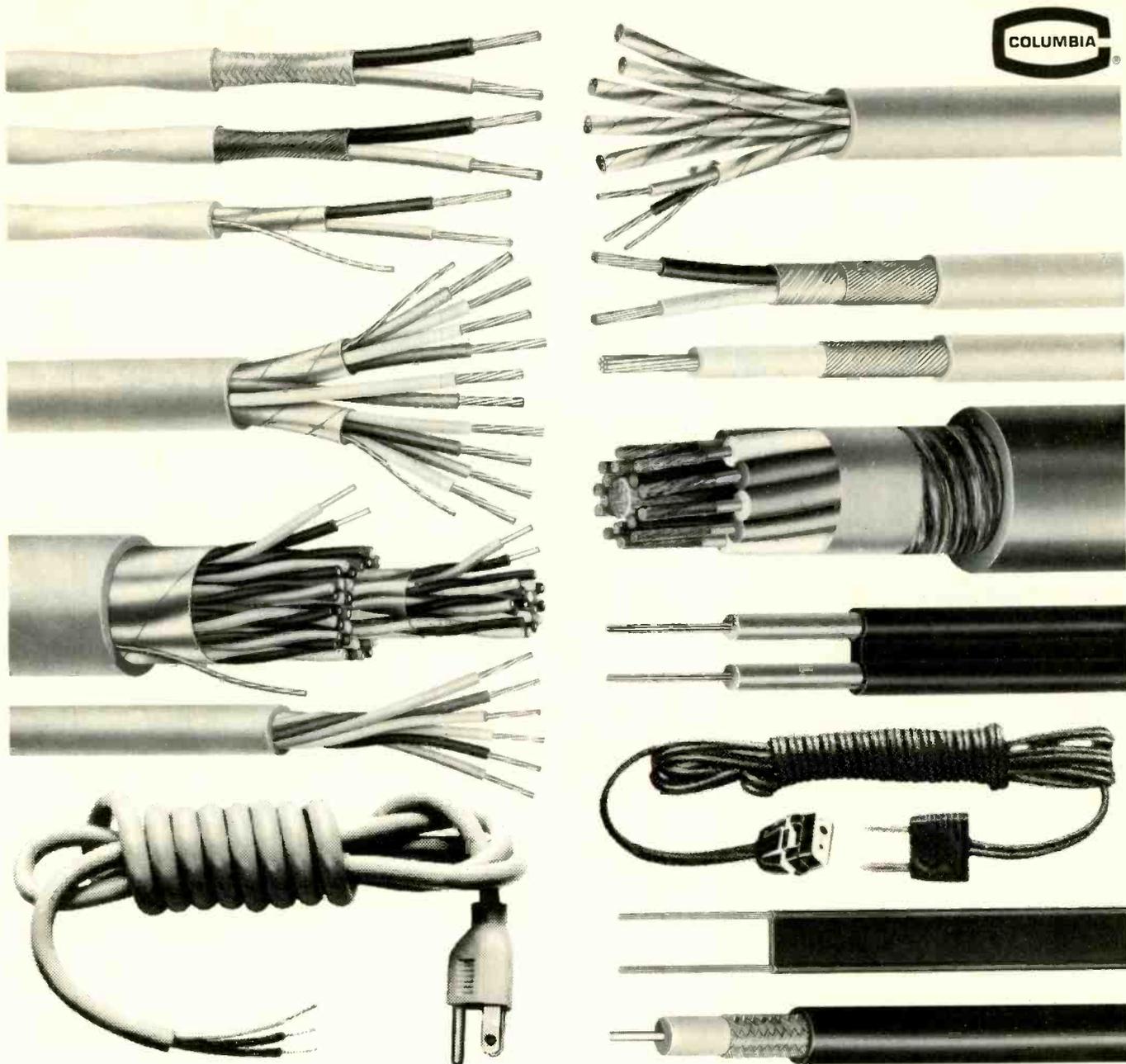
to the newest silicon audio 100-watt output types.

Designed especially for replacement use, RCA SK units are backed by electrical characteristics that make them comparable to or better than original devices. There are no cast-offs or factory seconds.

All units and the types they replace are cross-referenced in the RCA Replacement Guide, SPG-202M. There's a Quick-Selection Wall Chart, too, 1L1367A, and new Audio-Visual service aids. These spell the industry's finest informational backup for replacements — all SK, all available from your RCA Distributor. See him today for your copies.

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D. H. APPERT

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Davis, Calif. 95616

### Information and Schematics Needed

I would like information and schematics for the following—an oscillator and voltage supply for blinking Xenon Fire Tubes, 9v for portable and 12v for auto use. These are to be used for blue lights for volunteer firemen. Also, where can we purchase the Xenon fire tubes.

HENRY HOFFMAN

Kemper Ins. Bldg.  
Summit, N.J. 07901

### Information Requested

I need some service information on a Saxon 4-in. reel stereo tape recorder manufactured by Jupiter Mfg. Co., Tokyo, Japan. The Model No. 755 is stamped on the back. Is there anywhere in U.S.A. I can get schematics for this machine or other service information? I would appreciate any help.

OTIS M. COWART

Radio-TV Service  
P.O. Box 987  
Vero Beach, Fla. 32960

### Used Test Equipment Wanted

I'm a student studying TV repair on a very limited budget. I'd like to purchase some test equipment, but the only way I could afford to is by purchasing used equipment from someone who is going out of business. If anyone has this equipment for sale or knows where used TV test equipment is sold, I would sincerely appreciate hearing from them.

JOSEPH WEGNER, JR.

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**New...Heathkit  
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100 MHz counter...only 269.95\***

With the IB-1101, Heath closes the price gap in high frequency counters. Till now, "low cost" counters were confined pretty much to the 15 MHz range. Instruments above that range were complex, costly, and often more counter than you could ever use. Now, with the IB-1101, you have a truly low-cost counter in kit form with 1 Hz to 100 MHz capability and a list of features to rival counters costing much more. Compare for yourself. Exclusive Heath-designed input circuit accepts input levels from less than 50 mV to over 200V, depending on frequency, without damaging the instrument; full 5-digit readout can be expanded to 8-digit capability with range selector and over-range circuitry; decimal point automatically positioned with range selection; MHz, kHz, overrange and gating conditions indicated by illuminated legends on front panel; one megohm input impedance and low input capacitance minimize possibility of circuit loading; all solid-state circuitry with cold cathode readout tubes for instant operation; count storage circuitry gives non-blinking or count-up readout, changing only with count; stable time-base crystal has better than  $\pm 3$  ppm from 17° to 32° C; dual primary, 3-wire line cord and regulated supply for stable operation over long periods. About 10 hrs. assembly time puts the IB-1101 together. The 26 digital IC packages and readout tubes plug into sockets. All other components, including shielded MOSFET, 10 silicon transistors, 9 diodes and 2 zener diodes mount neatly on one double-sided fiberglass board. If you've been putting off buying that better counter for price considerations...consider the unprecedented low price of the new Heathkit IB-1101. Then order one today.

Kit IB-1101, 8 lbs. ....269.95\*

### New Heathkit digital multimeter...229.95\*

Now, a digital multimeter that meets lab specs at a low, low kit price! 3½ digits for 100 uV resolution on 200 mV range; 1V on 1000V; 5 DC ranges (100 uV—1000V, either polarity); 5 AC ranges (100 uV—500V); 10 current ranges (100 nA—2A AC or DC); 6 resistance ranges (0.1 ohm—20 megohms.) DC calibrator supplied for 0.2% accuracy without external equipment. Can be lab calibrated to 0.1%. Don't miss this outstanding instrument value.

Kit IM-102, 9 lbs. ....229.95\*

### New Heathkit 10 MHz triggered scope...229.95\*

A 5" triggered sweep scope at a low kit price you can't afford to pass up. AC—10 MHz response, calibrated attenuator, 50 ns sweep rate with magnification, AC-DC coupling, 50 mV sensitivity. One of the outstanding scope values on the market. Order one for your ham shack, shop, lab or classroom today.

Kit IO-103, 37 lbs. ....229.95\*



Send for your FREE 1972 Heathkit catalog describing these and other kit-form instruments designed to meet your servicing and lab needs at significant savings...plus over 350 other exciting kits for every hobby and professional interest.

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Please send model(s)\_\_\_\_\_

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Prices & specifications subject to change without notice.

\*Mail order prices; F.O.B. factory.

TE-257

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

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## Ohio Association Plans Spring State Convention

The Television Service Association of Ohio has announced plans for its spring convention, which will be held May 18-21, 1972, at the Hospitality Inn on Route 75 and Miami St. in Toledo, Ohio.

A. L. Clough, CET, executive secretary of the association, reports that participating Ohio distributors will be offering free registration certificates in conjunction with special promotion purchases. These can be redeemed to pay for dealer registration at the convention.

The hospitality room and patio party are included in the registration, and will be open Thursday for your enjoyment. The TSA Ohio block of rooms are reserved for you overlooking the patio and room. You are requested to ask for these to assure getting the best rooms.

Display booths, featuring the latest and best test instruments, will be manned by engineers, who can show you how to get your best profits. New products, customer aids, the add-on sale, and similar items will be displayed for your benefit.

Technical and business schools, plus other planned events, start at 9:00 a.m. on Friday. The TSA Ohio business meeting will be on Saturday. A special technicians "bundle" will be held on Sunday. There six leading electronic manufacturers will help electronic technicians learn more effective servicing techniques.



In attendance at the 62nd Annual Awards Dinner of The Radio Club of America, Inc., held last December in New York, were many key personnel from the elite radio-electronics scientific society, founded in 1909. Seated at the speaker's table are David Talley, treasurer of Radio Club of America; Frank Shepard, secretary of the organization; Jack R. Poppele, banquet chairman and an industry pioneer; Edgar F. Johnson, chairman of the board of E. F. Johnson Co. and principal speaker; Fred M. Link, president of Radio Club of America; John R. Brinkley, managing director of Redifon, Ltd., England; and Samuel N. Harmatuk, vice president of the club and director of communications, New York City Fire Dept. Al Menegus (left, lower photo), publisher of ELECTRONIC TECHNICIAN/DEALER and a member of Radio Club of America, is shown seated at one of the banquet tables. Seated to his left is John A. McCormick, mobile radio coordinator of General Electric Co. To Al's right is his daughter, Miss Joyce Menegus, of Design Plus, Inc. And to her right is Jack Wayman, staff vice president of the Consumer Electronics Group, Electronic Industries Association; and Mrs. Sheila Wayman.

## 3M/Wollensak Announces Service Clinic Schedule

Seminar/workshops for Wollensak audiovisual equipment servicemen will be conducted in 21 U.S. cities in 1972 by 3M Company. Taught by Wollensak technical service experts, they will cover the servicing of Wollensak open reel and cassette recorders and the cassette duplicating systems. The schedule includes: Albany, N.Y., March 7; Pittsburgh, Pa., March 9; Raleigh, N.C., March 21; New Orleans, La., March 23; Kansas City, Mo., April 4; Des Moines, Iowa, April 6; Buffalo, N.Y., April 25; Philadelphia, Pa., April 27; San Antonio, Texas, May 9; Denver, Colo., May 11; Cincinnati, Ohio, May 23; Cleveland, Ohio, May 25; Boston, Mass., Oct. 3; New York, N.Y., Oct. 5; Atlanta, Ga., Oct. 17; Chicago, Ill., Oct. 19; Seattle, Wash., Nov. 6; San Francisco, Calif., Nov. 8; Los Angeles, Calif., Nov. 10; Washington, D.C., Nov. 28; and Orlando, Fla., Nov. 30.

Reservations may be made by writing to C. B. Harris, 3M Company, Mincom Div., 3M Center, St. Paul, Minn. 55101. The registration fee is \$37.50.

## TSA of Delaware Valley Celebrates Silver Anniversary

The Television Service Association of Delaware Valley will celebrate its Silver Anniversary in the Spring of 1972. The local electronic industry is joining with them to celebrate this event.

An all-electronic industry committee has been formed consisting of representatives of the Keystone Chapter of NEDA, the Mid-Atlantic Chapter of ERA, the American Electronic Manufacturers—Eastern Div., the Television Service Association of Delaware Valley, and the Federation of Radio-Television and Service Associations of Pennsylvania.

The committee has arranged to celebrate this silver anniversary by holding a gala dinner, show and dance on April 6, 1972, at the CR Club in Philadelphia. The complete facility will be taken over for this event.

The climax of this event will be the presentation of the TSA of Delaware Valley "Man of the Year" award to Milton J. Shapp, Governor of Pennsylvania. Honors will also be presented to other leaders in our industry.

Additional information regarding this event can be obtained from Harry Lublin, 1120 Cottman Ave., Philadelphia, Pa. 19111.

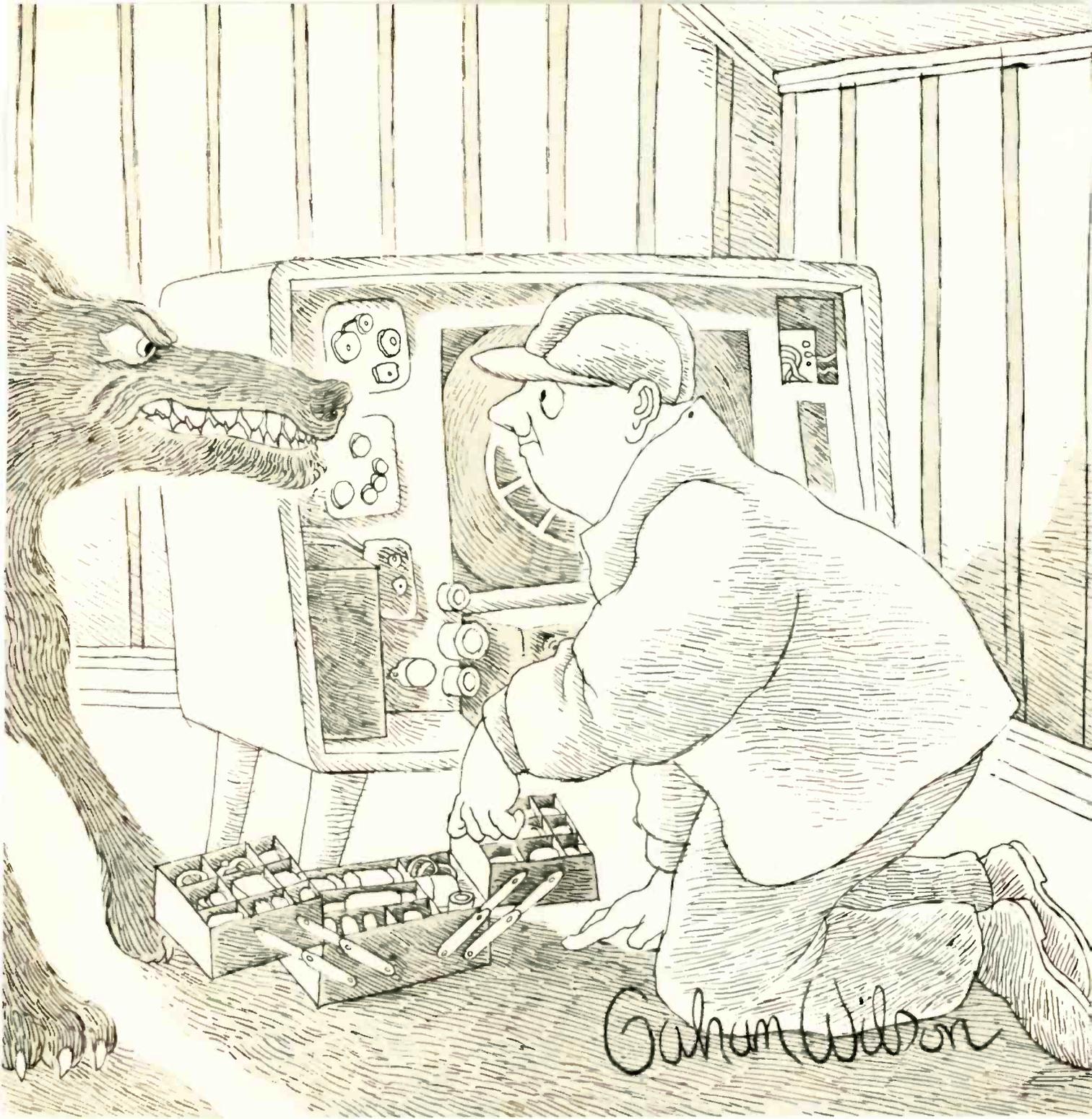
## ISCET Program Experiences Tremendous Reader Response

Ron Crow, executive secretary of the International Society of Certified Electronic Technicians, reports that hundreds of inquiries have been received in response to the coverage that ELECTRONIC TECHNICIAN/DEALER has given this organization. And this has meant that instead of having to attempt to schedule individual tests here and there across the country, they have been able to schedule technicians in groups—thus greatly simplifying the administration of this testing program.

We have been advised that March 15th has been declared a date for nationwide testing. So if you have not yet taken this exam, and are now ready to benefit from the ISCET program, phone or write their national headquarters to make your reservations for the test in your area. The address is 1309 W. Market St., Indianapolis, Ind. 46222; and the phone number is (317) 632-2469.

Last month we began printing a series of short quizzes

*continued on page 32*



## When you're in a hurry, it's nice to know GTE Sylvania has the parts.

Only 26 tubes and ECG solid-state components will solve practically all of your vertical and horizontal replacement problems.

And they're all available from your Sylvania distributor.

Because tubes are tubes, we can't promise to reduce the number you'll have to carry. But, with the Sylvania line, chances are your distributor will have the tube you need when you need it.

In semiconductors, the story is different. Just 124 ECG solid-state devices including transistors, diodes and integrated circuits will replace over 41,000 different types. In the vertical and horizontal sections alone,

only 6 ECG solid-state devices will take care of almost every job.

And they save a lot of space in your tube caddy.

When your distributor is stocked with Sylvania receiving tubes and ECG semiconductors you'll have the parts you need. And you'll get them fast.

It's like having a complete warehouse built into your telephone.

And that should take some of the dog work out of your job.

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NO RESIDUE • NON-FLAMMABLE  
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A CHEMICALLY PURE CLEANING AGENT  
WITH:

- 1. SELECTIVE CLEANING POWER** — removes greases, oils, dirt and organic soils with no effect on the article being cleaned.
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- 3. PURITY** — evaporates completely — leaves NO residue.
- 4. SAFETY** — Non-explosive, non-flammable, non-toxic.
- 5. STABILITY** — does not react chemically with other materials.

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# TV TUNER SUBBER



Transistorized Test Unit substitutes the tuner in defective TV Receiver to prove whether original tuner is good or bad.

Completely self-contained and battery operated.

Requires only two connections (antenna and i.f. cable)  
Comes complete with extension cables.

Substitutes the VHF tuner and tests the UHF tuner.

Provides signal to simplify testing of tuner, i.f. system and AGC system.

Use on the bench, or in the home; in most cases without removing tuner or chassis from cabinet.

Complete kit ..... \$22.95  
Factory wired ..... \$29.95

Add \$1.00 shipping and handling on prepaid orders. We will ship C.O.D.

**CASTLE TV TUNER SERVICE**

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## NEWS...

continued from page 30

to give you some idea of the types of questions included in the CET examination. The questions and answers given this month represent the type of material included in Section II of the CET examination.

### Section II DC Circuits

1. What is the equivalent resistance of a 100Ω resistor, a 200Ω resistor and a 400Ω resistor all connected in parallel?
2. The voltage  $V_{BA}$  would be approximately what in Fig. 1?

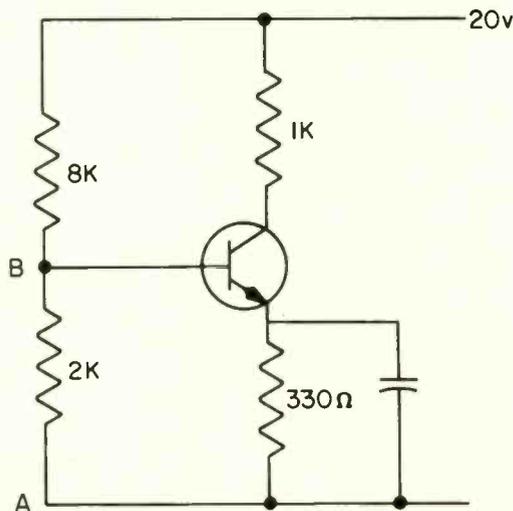


Fig. 1

3. The dc resistance of a 16Ω speaker would be 16Ω. True or False?
4. A power source will deliver its maximum output voltage when the applied load matches the internal resistance of the power source. True or False?
5. How long will it take a 0.05μf capacitor to charge through a 150Ω resistor from a 10v power source to (practically speaking) 10v?

#### Explanation

$$1. R_{\text{equivalent}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} = \frac{1}{\frac{1}{100\Omega} + \frac{1}{200\Omega} + \frac{1}{400\Omega}} = \frac{1}{\frac{4}{400\Omega} + \frac{2}{400\Omega} + \frac{1}{400\Omega}} = \frac{1}{\frac{7}{400\Omega}} = \frac{400\Omega}{7} \approx 57\Omega.$$

2. Since the transistor base current is usually small compared to the voltage divider current, we can ignore the transistor base current and still calculate the approximate voltage between points A and B.  $V_{BA} \approx \frac{20v \times 2K}{8K + 2K} = 4v.$
3. False. The dc resistance across the voice coil, like that across any inductor, is small compared to its impedance at 1000Hz (the frequency at which speaker impedances are measured), which is 16Ω.
4. False. Although the maximum power transfer would occur when the load resistance equals the power source resistance, the maximum load occurs when the load resistance is open or infinite.
5. For most practical purposes, a capacitor is considered fully charged at three times the circuit time constant. There-

fore,  $3T = 3RC = 3(150\Omega)(0.05 \times 10^{-6}f) = 22.5\mu s$ . The charge across the capacitor will be about 9.5v at the end of three time constants. Should the capacitor be allowed to charge for five time constants, the charge across the capacitor would be about 9.9v. And,  $5T = 5(150\Omega)(0.05 \times 10^{-6}f) = 37.5\mu s$ .

### Toledo Association Announces Installation of New Officers

The Electronic Technician Association of Toledo has recently installed its officers for the coming year. They include: Dan Zawodny, CET, president; Lavan Helm, CET, vice-president; David Garwacki, CET, secretary-treasurer; David Zawodny, CET, sergeant at arms; Robert Schladsch, CET, chairman of the board. Other board members include Paul Kurth; Art Sattler, CET; Russ Method, CET; and Larry Taylor, CET.

This association has been organized for at least 20 years, all members are shop owners, and all but one member is a CET (and we understand that he will soon be taking the examination).

### Survey Reveals Financial Losses Encountered by Service Dealers

Gene Dillingham, president of the Louisville Electronics Technicians Assn., has sent us some interesting statistics from a survey taken by their ladies auxiliary of 35 shops belonging to the LETA.

They report that these shops had a grand total of \$10,491 in bad checks during a year. This averaged out at \$294 per shop—there being a high of \$500 and a low of \$200.

On bad debts there was a total of \$8,663. This averages out at \$248 per shop—again with a \$500 high and a \$200 low.

There was \$12,422 worth of repaired merchandise that had not been picked up. This averaged \$355 per shop—the high being \$1000 and the low \$200. As you know, there is no easy way to dispose of this merchandise.

There was a loss of \$1750 in TV set rentals due to people moving and taking the sets with them.

Taking all 175 shops in the metropolitan area into consideration, it is estimated that there was a total of \$51,450 in bad checks and \$43,400 worth of bad debts—\$62,125 worth of unclaimed merchandise resulting in even a greater loss.

### International Electronics Sales Announces Move to New Quarters

The International Electronics Sales Corp., Div. of International Components Corp., has moved to new quarters located at 10 Daniel St., Farmingdale, N.Y. 11753.

Morty Grossman, company president, said that the new and larger facility will permit more efficient distribution of the company's tubes, capacitors and other components. He also characterized the move as a step forward in the company's plan for further expansion of its activities.

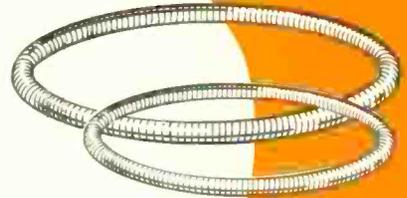
### MOVING?

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

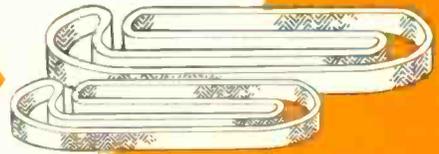
# New from GC ELECTRONICS

## TAPE RECORDER BELTS & PHONO DRIVES

### SPRING BELTS



### FABRIC DRIVE BELTS

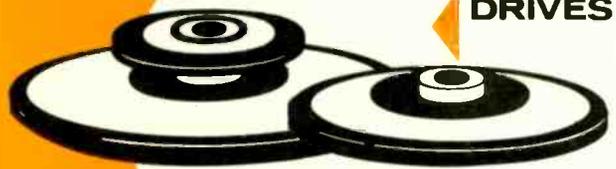


### RUBBER BELTS

### FLAT SQUARE ROUND



### PHONO & RECORDER DRIVES



### PLUS 230 OTHERS!

One each of eight most popular drives in attractive OLD WORLD men's JEWELRY CHEST—at no extra charge! Cat. No. 17-904



FREE! Cross Reference and Catalog. Ask your distributor for FR-135-W.



## GC ELECTRONICS

DIVISION OF HYDROMETALS, INC.  
ROCKFORD, ILLINOIS 61101 U.S.A.



... for more details circle 119 on Reader Service Card

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## NEW AND NOTEWORTHY

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

### 3½ DIGIT MULTIMETER 700

*Automatically adjusts for zero before every reading*

The Model 3300A is reportedly a completely portable digital multimeter which measures 27 ranges. The instrument will operate 24 consecutive hours off its internal nickel-cadmium battery before requiring a recharge. The battery is designed for 1000 recharges minimum. Both internal battery pack and ac line operation are standard with the instrument. Recharging the battery is accomplished by connecting the power cord to the ac power line. Measurements to specified accuracy can be made during the recharging. The ranges are as follows: five ac voltage ranges from 100mv to 1kv, maximum resolution is 100 $\mu$ v, accuracy is 0.5% of reading  $\pm 1$  digit. Bandwidth for ac measurements is to 100kHz. Five dc voltage ranges from 100mv to 1kv, maximum resolution is 100 $\mu$ v, accuracy is 0.1% of reading  $\pm 1$  digit. Five ac current ranges from 100 $\mu$ ma to 1ma, maximum resolution is 100nma and accuracy is 0.5% of reading  $\pm 1$  digit. Five dc current ranges from 100 $\mu$ a to 1ma, maximum resolution is 100na and accuracy is 0.2% of reading  $\pm 1$  digit. Seven resistance ranges from 100 $\Omega$  to 100M, maximum resolution is 100M and accuracy is 0.3% of range  $\pm 1$  digit. The 3½ digit display is non-blinking. The automatic zeroing circuit adjusts for zero before every reading. The decimal point is automatically positioned and polarity is automatically displayed. The out-of-range indication warns against erroneous readings. The 3300A is 8-in. high by 5⅞-in. wide by 4-in. deep, net weight is 6 lb. Price: \$435.00 including the internal battery. The Hickok Electrical Instrument Co.

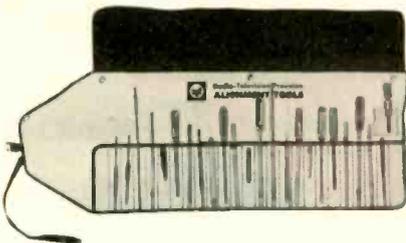


### FOR MORE NEW PRODUCTS SEE PAGE 72

#### ALIGNMENT TOOL SET 701

*Furnished in a rugged roll pouch*

Designated 23C750, this 25-piece tool kit includes virtually every alignment tool needed for work on RF electronic circuits used in mobile and marine communication, radar and TV. Included in the complement of tools are a universal aligner, long-reach core aligner, extra-thin tuning wand, bone fiber tuner, Delrin-tipped IF transformer aligner, oscillator aligners and special TV aligners. Working ends include slotted, recessed and hex styles, ranging in tip size from 1/32 to ¼-in. The tools are furnished in a rugged roll pouch which fits conveniently into a tool chest or desk drawer. The pouch is designed for easy removal and replacement of tools and has a fold-over flap which prevents tools from being lost. Jensen Tools and Alloys.



#### TELEVISION CAMERA 702

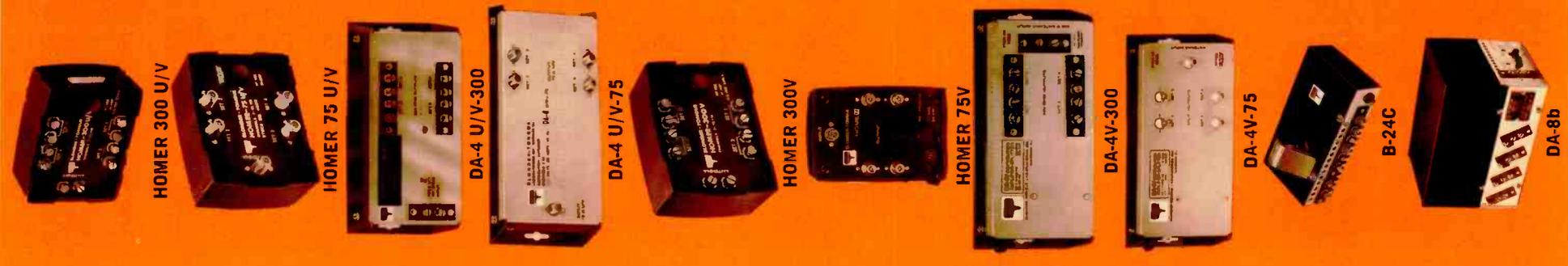
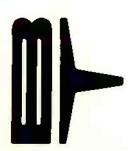
*Capable of producing 1100 line horizontal resolution*

The Model CTC-8000, a new ultra-high resolution TV camera reportedly capable of producing 1100 line horizontal resolution is available in any of eight scanning rates from 525 to 1023 lines. Horizontal resolution is 1100 TV lines at the center and 900 lines at the corners. Video bandwidth is 30MHz. Vertical resolution is up to 715 lines at the 1023 scanning rate. The image tube is an 8507 vidicon. A plumbicon version is also available. The two-piece unit comprises a 5.9 by 3.9 by 11.8-in. camera and a camera control unit connected by a 33 ft. cable. A vidicon protection circuit turns the image tube OFF automatically in case of sweep circuit failure. Both high and low dc voltages are regulated. The unit uses FET input for high signal-to-noise ratio. It is said to be sensitive enough to provide usable pictures with as little as 0.1 footcandle faceplate illumination and full resolution with 1 footcandle. List price: \$2495.00. GBC Closed Circuit TV Corp.

# PRODUCT SELECTION GUIDE

TYPE	STOCK NO.	NAME	COLOR CERTIFIED AMPLIFIER DESCRIPTION	LIST	DYNAMIC RANGE†		TYP. NOISE FIGURE (dB)	GAIN (dB)	AMP. INPUT (OHMS)	AMP. OUTPUT (OHMS)
					dB Ratio	Numerical Ratio				
CH. 2-13, FM, ALL UHF CHANNELS	4525	HOMER 300 U/V	The only economy amplified 4-way splitter available. All-channel design features four 300-ohm outputs. Excellent for moderate signal areas where passive splitter degrades TV pictures.	\$26.10	48 dB 55 dB	1:250 1:800	5.0 VHF 7.5 UHF	8.5 VHF (4) 2.5 UHF (4)	300	300 (4)
	4589	HOMER 75 U/V	Coax version of Homer 300 U/V. All-channel 75-ohm design provides picture power to four TV sets. Excellent for moderate signal areas where long life coax cable is selected.	\$30.40	48 dB 55 dB	1:250 1:800	4.7 VHF 7.5 UHF	7.0 VHF (4) 1.5 UHF (4)	75	75 (4)
	1437	DA-4 U/V-300	High performance all-channel amplifier. Four 300-ohm outputs provide superior picture power in mixed signal areas. Rugged transistor circuitry features unique patented* ICEF circuit for wide dynamic range. Three transistors; transformer power supply.	\$54.50	63 dB 47 dB	1:1400 1:220	6.6 VHF 8.0 UHF	7.0 VHF (4) 8.0 UHF (4)	300	300 (4)
	4621	DA-4 UV-75	Professional quality, four output, all-channel 75-ohm home amplifier. Ideal for mixed signal areas where coax prevents noise pickup on cables. Rugged transistor circuit features the exclusive* ICEF circuit for wide dynamic range. Three transistors; transformer power supply.	\$60.40	63 dB 47 dB	1:1400 1:220	6.3 VHF 7.0 UHF	5.0 VHF (4) 10.0 UHF (4)	75	75 (4)
VHF/FM CH. 2-13 AND FM	1436	HOMER 300V	The economical step-up from a non-powered, four-way splitter when noise is a problem. Provides enough picture power to drive four TV sets. Also amplifies FM signals. Excellent for moderate signal areas. Same patented* wide dynamic range ICEF circuit used in our more expensive indoor amplifiers.	\$23.00	56 dB	1:630	6.8	11 (1 OUTPUT) 7 (4 OUTPUTS)	300	300 (4)
	1432	HOMER 75V	Your best buy in a 75-ohm four output VHF/FM indoor amplifier. Same wide dynamic range ICEF circuit used in our more expensive indoor amplifiers. Coax cables can be installed near metal surfaces with no signal degradation.	\$27.20	56 dB	1:630	6.8	11.5 (1 OUTPUT) 6 (4 OUTPUTS)	75	75 (4)
	1435	DA-4V 300	Our best selling indoor home VHF/FM amplifier. Provides four 300-ohm outputs from a single 300-ohm input. Excellent in mixed signal strength areas. Exclusive patented* ICEF circuit for wide dynamic range. Uses the same type of transistor used in the output stage of our world famous MCA single-channel amplifier; transformer power supply.	\$33.50	63 dB	1:1500	7.5	9.5 (1 OUTPUT) 6 (4 OUTPUTS)	300	300 (4)
	4543	DA-4V-75	Coax version of DA-4V-300. Provides four amplified 75-ohm VHF outputs from a single input. Perfect for mixed signal areas. Exclusive patented* ICEF circuit for wide dynamic range. Transformer power supply.	\$40.70	63 dB	1:1500	7.5	9.5 (1 OUTPUT) 5.0 (4 OUTPUTS)	75	75 (4)
	1210	B-24C	A customer favorite for over ten years. Superior lighting proof design features ultra-reliable frame, grid, dual-triode. Single 300-ohm input, four 300-ohm outputs. Best unit for mixed signal areas with some very strong signals; transformer power supply.	\$35.30	68 dB	1:2500	6.5	8	300	300 (4)
	1201	DA-8b	The original high-output broadband amplifier. Patented* push-pull, 4 dual triode circuit. Dual impedance inputs and 8 dual impedance (75 or 300-ohm) outputs. Lighting proof with transformer power supply.	\$120.50	48 dB	1:250	10	10 dB TO EACH OF 8 OUTPUTS	DUAL IMPEDANCE 75 or 300	DUAL IMPEDANCE 75 or 300 (8)

\*All of the above Blonder-Tongue products are patented under the following U. S. Patent Nos. 2,710,315, 3,413,563, 3,016,510  
†See reverse side for Dynamic Range measure of amplifier performance.



**NEW**  
TEAR-OUT  
PRODUCTOR!

**FOR THE  
MORE THAN ONE SET FAMILY...**

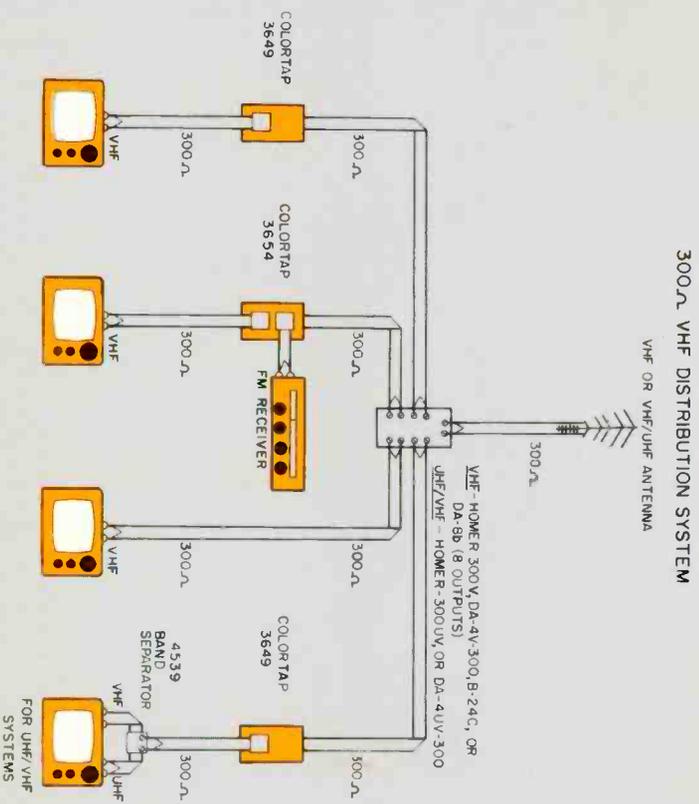
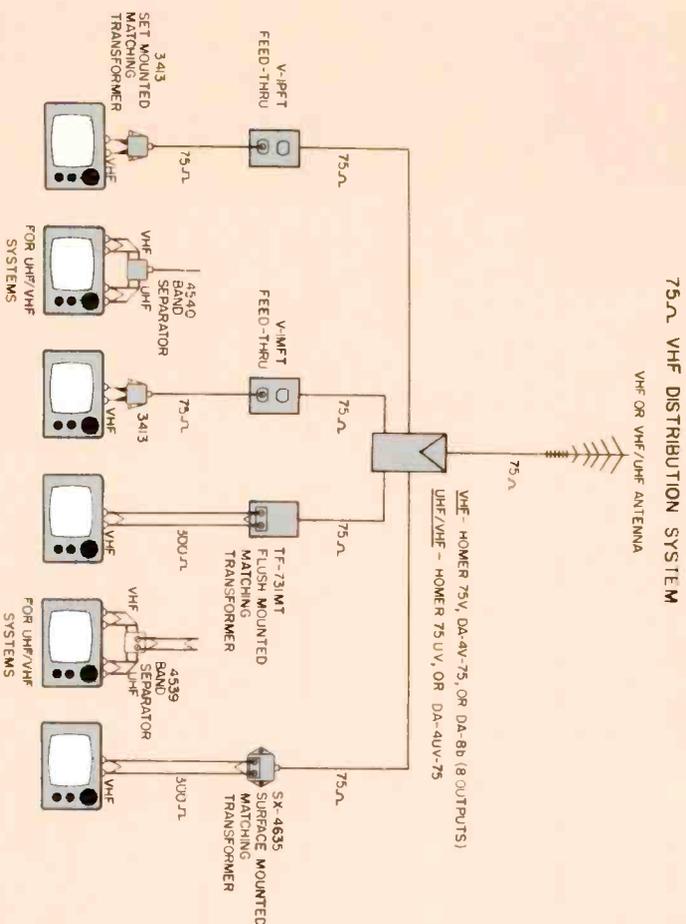
**INDOOR BROADBAND  
UHF/VHF/FM  
COLOR AMPLIFIERS BY  
BLONDER-TONGUE**

- IMPROVED FOUR-WAY LIGHTNING AND SURGE PROTECTION IN ALL PRODUCTS.
- EXCLUSIVE PATENTED ICEF CIRCUITS.
- ULTRA RELIABLE PRINTED CIRCUIT BOARDS.
- NO INTERACTION BETWEEN TV SETS.
- ECONOMY AND DELUXE MODELS FOR EACH APPLICATION.
- LOW NOISE FIGURE FOR SNOW FREE PICTURES.

**MADE IN USA**



PRODUCT SELECTION GUIDE



**MEASURING  
AMPLIFIER  
PERFORMANCE**

The Dynamic Range\* rating of an amplifier is the measure of its ability to process both weak and strong signals without distortion. More technically stated it is the ratio between the minimum input signal for a PASO Grade 3, "passable" picture, (multiplied by the amplifier's noise figure) and the maximum input signal for just perceptible cross-modulation (controlled by the amplifier's input capability). Optimal mixed performance, the processing of both weak and strong channels, can best be achieved through an amplifier having a wide dynamic range rating. In such applications, an underrated amplifier may appear inoperative on some TV channels, or produce interference lines on one or more channels. All Blonder-Tongue amplifiers are designed with the widest dynamic range for continuous trouble-free installations.

\*See 100-out chart.

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HOW WOULD YOU LIKE to earn \$5 to \$7 an hour... \$200 to \$300 a week... \$10,000 to \$15,000 a year? One of your best chances today, especially if you don't have a college education, is in the field of two-way radio.

Two-way radio is booming. Today there are more than five million two-way transmitters for police cars, fire trucks, taxis, planes, etc. and Citizen's Band uses—and the number is growing at the rate of 80,000 per month.

This wildfire boom presents a solid gold opportunity for trained two-way radio service experts. Most of them are earning between \$5,000 and \$10,000 a year more than the average radio-TV repair man.

#### Why You'll Earn Top Pay

The reason is that the U.S. doesn't permit anyone to service two-way radio systems unless he is licensed by the FCC (Federal Communications Commission). And there aren't enough licensed experts to go around.

This means that the available licensed expert can "write his own ticket" when it comes to earnings. Some work by the hour and usually charge at least \$5.00 per hour, \$7.50 on evenings and Sundays, plus travel expenses. Others charge each customer a monthly retainer fee, such as \$20 a month for a base station and \$7.50 for each mobile station. A survey showed that one man can easily

maintain at least 15 base stations and 85 mobiles. This would add up to at least \$12,000 a year.

#### How to Get Started

How do you break into the ranks of the big-money earners in two-way radio? This is probably the best way:

1. Without quitting your present job, learn enough about electronics fundamentals to pass the Government FCC License. Then get a job in a two-way radio service shop and "learn the ropes" of the business.

2. As soon as you've earned a reputation as an expert, there are several ways you can go. You can move out, and start signing up your own customers. You might become a franchised service representative of a big manufacturer and then start getting into two-way radio sales, where one sales contract might net you \$5,000. Or you may be invited to move up into a high-prestige salaried job with one of the same manufacturers.

The first step—mastering the fundamentals of Electronics in your spare time and getting your FCC License—can be easier than you think.

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## How to get into one of today's hottest money-making fields—servicing 2-way radios!



He's flying high. Before he got his CIE training and FCC License, Ed Dulaney's only professional skill was as a commercial pilot engaged in crop dusting. Today he has his own two-way radio company, with seven full-time employees. "I am much better off financially, and really enjoy my work," he says. "I found my electronics lessons thorough and easy to understand. The CIE course was the best investment I ever made."



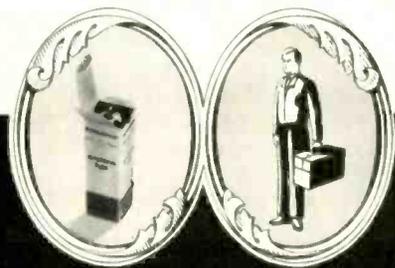
Business is booming. August Gibbemeyer was in radio-TV repair work before studying with CIE. Now, he says, "we are in the marine and two-way radio business. Our trade has grown by leaps and bounds."

... for more details circle 111 on Reader Service Card

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## TEKLAB REPORT

# Panasonic's Model CT-771 Portable Color-TV Set

by Joseph Zauhar

This miniature portable color-TV set operates on ac current, car battery, or self-contained optional battery

■ Since the introduction of integrated circuits, TV receivers have become smaller, lower in cost, lighter and operate cooler. The color-TV set described in this article is the first fully portable color-TV set that we have received. Its reduced size and weight can be attributed to successful application of transistors and integrated circuits.

Panasonic's Model CT-771 portable color-TV employs 81 solid-state devices including eight integrated circuits, and operates from an ac power line, a car battery or an optional clip-on battery—making it fully portable.

Many service technicians feel a compact chassis tends to be hard to service but this TV set seems to be an exception and we found component removal quite easy. After removing only four screws the chassis can be pulled out of the cabinet, and most boards and convergence controls are then exposed. The clearly road-mapped main and horizontal output circuit boards can be pulled out of edge connectors with swing-out sockets upon removing the hold-down screws. The power supply does not include edge connectors, but it tilts down for component replacement.

The picture tube SCREEN controls and FOCUS adjustment are located on a circuit board which is a part of the picture tube socket. The AGC, COLOR KILLER, CONTRAST, HORIZON-



Panasonic's Model CT-771 fully portable color-TV set with optional battery pack.

TAL HOLD and VERTICAL HOLD CONTROLS, plus the SERVICE SWITCH are mounted on the main chassis board and can be removed as part of the board.

The optional battery, Model TY-360, is a 12v 9 ampere-hour lead-acid rechargeable type that is reportedly able to operate the TV set for approximately three hours when fully charged. Its clip-on platform slides into guides in the bottom of the TV-set cabinet making it part of the overall design of the set. Without the optional battery the TV set

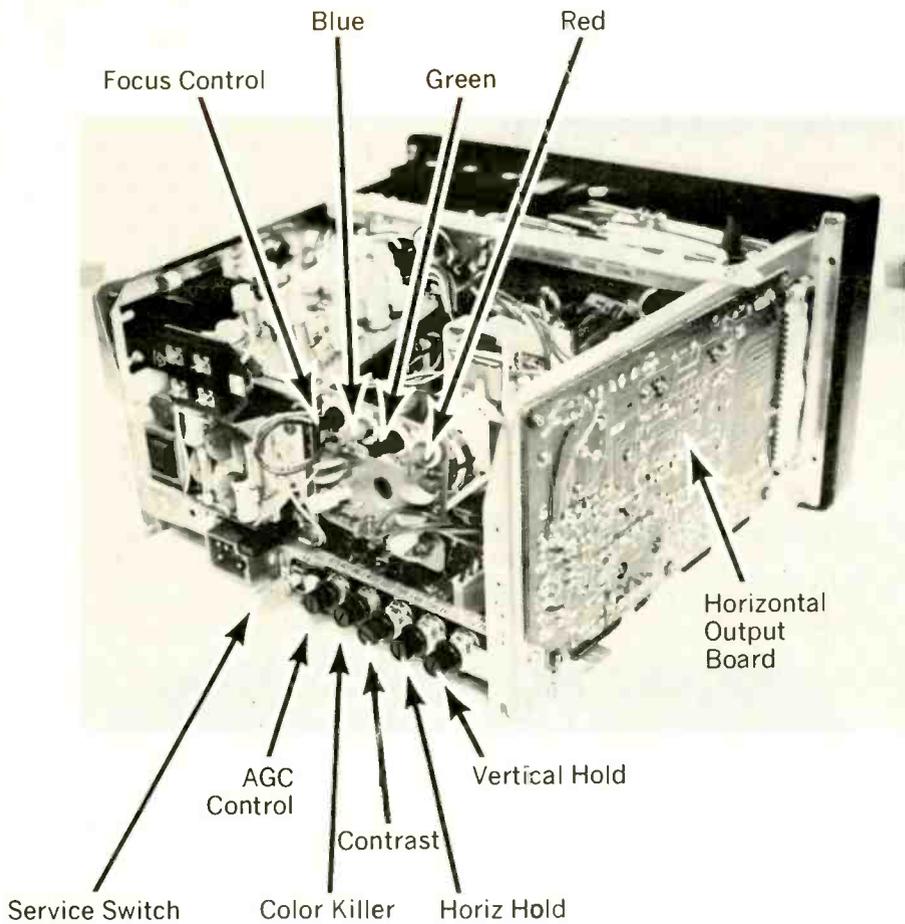
weighs 20 lb, or 35 lb with the battery.

Some of the other features include: three IF stages, keyed AGC, noise canceler circuit and automatic fine tuning. As we review some of these interesting circuits, they can be followed in the February Tekfax schematic, No. 1402.

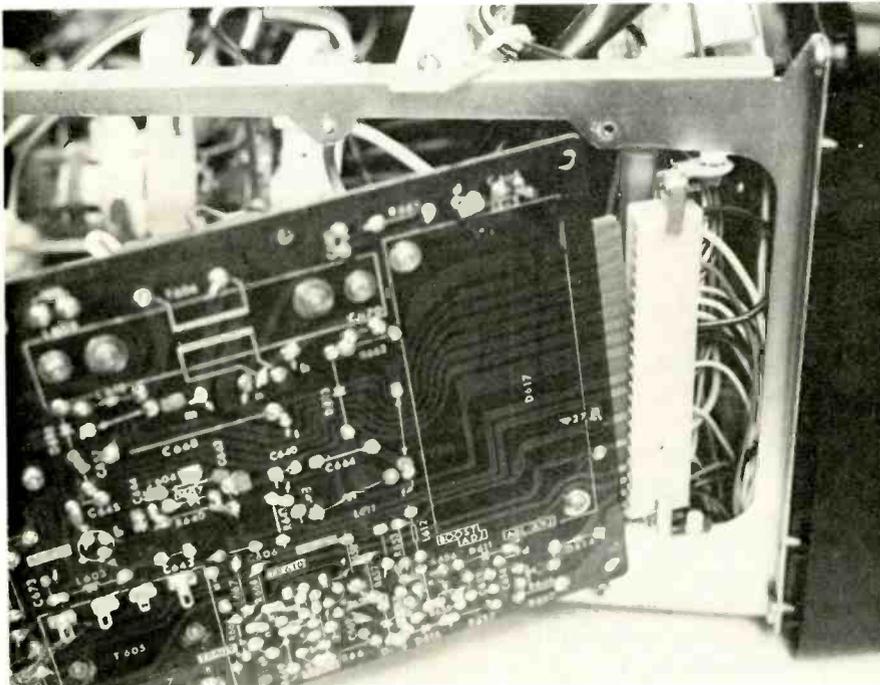
### Power Supply Circuitry

The power supply employs three circuits: an active power filter (APF), converter and automatic over charge, and an automatic deep

## SCREEN CONTROLS



After removing four screws, the TV-set cabinet slides back, exposing most of the controls and circuits boards.



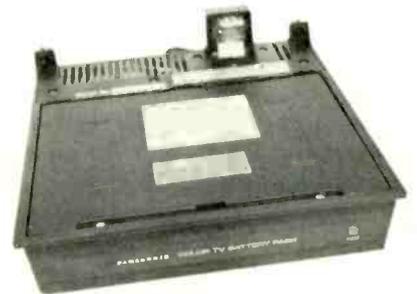
Horizontal-output board removal is simplified by employing edge connectors with swing-out sockets.

discharge protector circuit.

The converter circuit changes the 120v ac input voltage to 12v dc and is also used to charge the battery. The bridge-type silicon rectifier circuit used consists of diodes D801 through D804 rectifying the 120v ac to 160v dc, which is filtered by the active power circuit employing transistors TR801 and TR802. A blocking oscillator, transistor TR803, supplies the 15.75kHz converter oscillation, which is amplified by TR804 and fed to the base terminal of output transistor TR805—acting as a chopper. The 15.75kHz pulse voltage, with a 700v p-p amplitude and a 20 $\mu$ s pulse width, is placed across the primary winding of converter transformer T803. A 20v p-p voltage appears across the secondary of this transformer and is rectified to 16v dc by diode D808.

The automatic deep discharge protector will prevent the TV set from completely discharging the optional clip-on or auxiliary battery. This circuit consists of transistors TR811, TR813, TR814, TR815, TR816, SCR TR812, and an electro-magnetic relay.

When switch SW801 is turned ON, a voltage from the battery is applied to Terminal 4 of the power-cord socket, CO-1P. If the voltage is more than 11v, transistors TR811 and TR816 are turned ON. The collector and emitter potentials of TR811 are locked in by the 6v supplied by zener diode D819. Transistors TR812 and TR813 are then in an OFF condition. After TR816 is turned ON, TR815 will also in turn be turned ON and the relay switch—with its winding connected to the collector of TR815—is activated.



The optional battery pack Model TY-702 is a rechargeable lead-acid type which slides into guides on the bottom of the TV-set cabinet.

The load side of the receiver thereby is connected electrically to the battery.

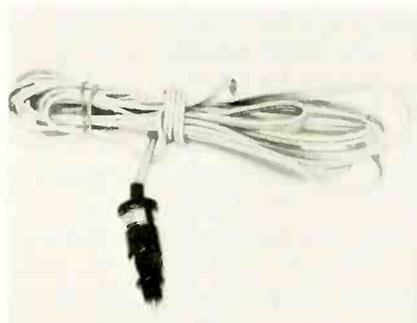
When the battery voltage drops to less than 11v, transistor TR811 is turned OFF and transistors TR812 and TR813 are turned ON—the relay switch being turned OFF by turning OFF transistor TR815. The battery is now disconnected from the load protecting it from deep discharge.

The automatic over charge protector circuit operates only when the ac cord of the receiver with a battery pack is connected to 120v ac and the POWER switch of the TV receiver is turned OFF.

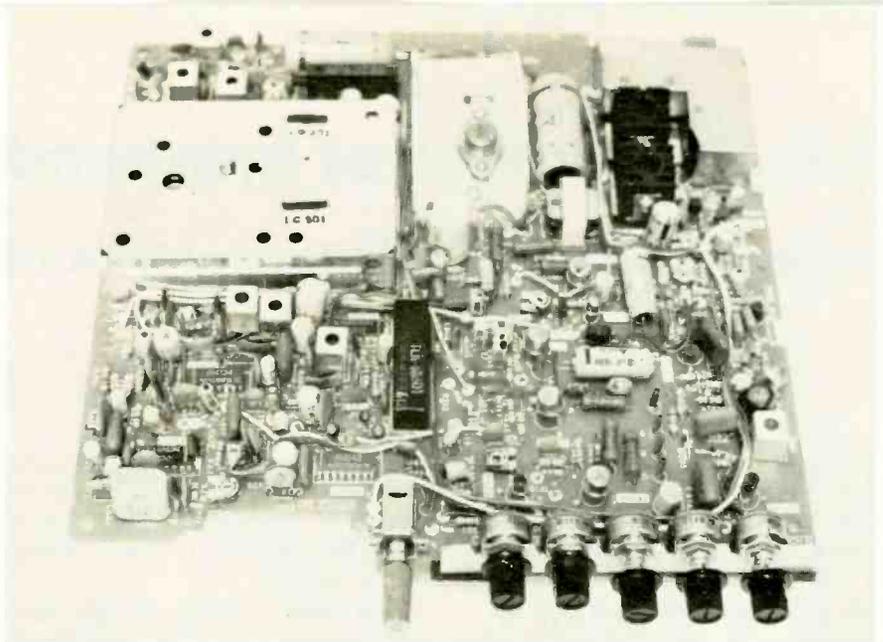
If the battery voltage decreases to less than 15.3v, the potential on Terminal 6 of power-cord socket CO-1P causes transistors TR814 and TR815 and the relay switch to turn ON. The converter circuit operates after the relay switch is turned ON, and a converter output voltage of 15v is now available. However, the receiver does not operate because the POWER switch (SW801-1) is in the OFF position. Battery charging is accomplished with a converter-output voltage of 15v. If the battery voltage increases to over 15.3v, SCR TR812 is turned ON. Transistor TR813 in turn conducts and the relay switch is turned OFF, stopping the charging action.

### Horizontal Deflection Circuitry

We found the horizontal deflection circuitry of this chassis quite different from conventional types since it employs two horizontal output transformers, one being the boost transformer (T603) and the other a high-voltage transformer *continued on page 66*

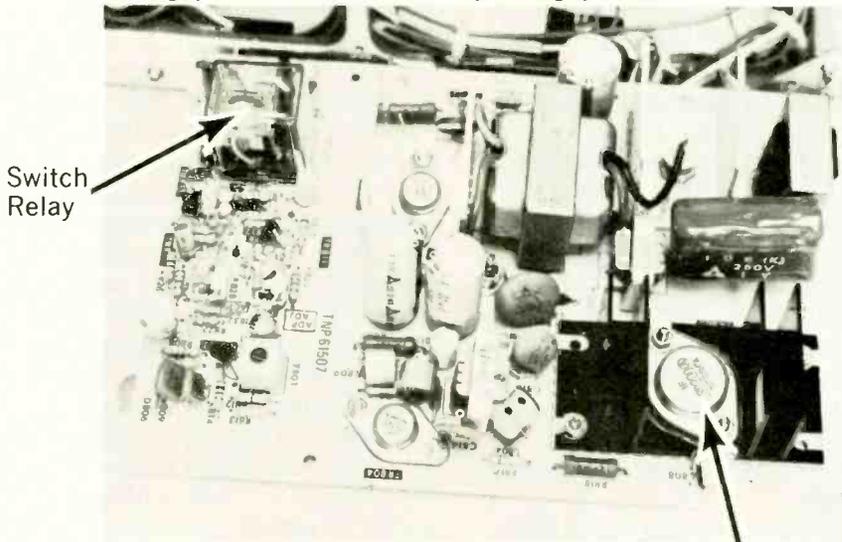


Included with the TV set is a car cord with a fused plug to fit a cigarette lighter socket.



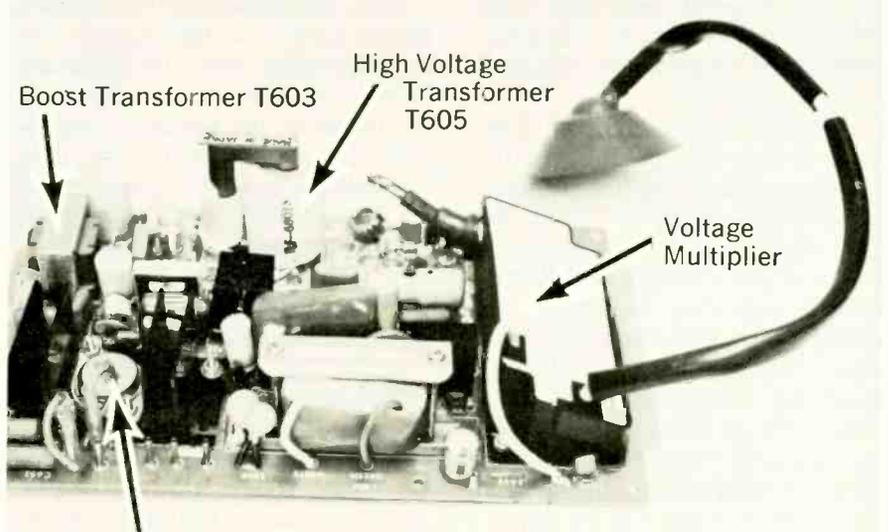
A large portion of all the TV-set's circuitry is located on but a single board.

The power supply board contains the (APF), active power filter converter and automatic overcharge protector, and an automatic deep discharge protector.



Transistor TR205

Two flyback transformers are employed on the horizontal output board to prevent horizontal output transistor breakdown from picture tube flashover and to permit a more compact chassis.



Horizontal Output Transistor TR605

# The Champions of Independent TV Service

Few people have been so highly honored by the many electronic associations

by Phillip Dahlen

■ Whether you live in the East, West, North or South, belong to the NEA, NATESA or some non-affiliated association, by now you should be well acquainted with the gentleman shown on this month's cover. You have probably taken part in the standing ovations that typically follow his *dynamic* speeches.

And even if you didn't know the gracious woman to his right, it wouldn't be any surprise to learn that she was a Texas school beauty queen—voted honorary Den Mother of the Connecticut Electronic Service Assn. and Sweetheart of the NEA at one of their national conventions.

It is generally our policy not to run articles announcing personal news that would interest few besides the product manufacturer. But, you have met Morris L. Finneburgh, Sr., and his loving wife, Frieda—or if you haven't, it's your fault, not theirs. They offer more than quality products.

Perhaps you are new in the industry and have not benefited by taking part in trade association activities—thus not meeting this inspiring couple. However, we have found Morris' and Frieda's activities truly newsworthy—warranting frequent coverage in *ELECTRONIC TECHNICIAN/DEALER*.

In the March and April 1971 issues, we gave editorial coverage to the Electronics Industry Council that was held in Dallas Texas, on February 11th. The March Editor's Memo made reference to Morris' work in upgrading the image and technology of the electronic technician. Although the April Editor's Memo did not refer to him by name when telling of activities to improve TV reception, during the EIC meeting he frequently offered the services of his field engineers without requir-

ing either a fee or publicity. The news item on page 28 of that issue shows him in the upper right portion of the first photo (I had been sitting just to his left).

Our news coverage of the next EIC meeting (page 26, July 1971 issue) reported that he would be chairman of the following meeting.

In our extensive news report, "Industry Work to Develop Voluntary Self-Regulation," (page 28, September 1971 issue), we indicated that he is co-chairman of this group. Page 52 of the same issue shows one of two fishing boats that he chartered for those of us attending the NEA convention in Portland, Oregon. (Only one salmon caught, three people got seasick, but I certainly enjoyed it.) And then there is the photo of Morris L. Finneburgh, Sr., EHF, speaking at last year's Hall of Fame Banquet (page 54, same issue). As you may know, there are only two living people on the list of those elected to this Hall of Fame—and he is one of them. This is the reason for the letters EHF behind Morris' name. (Still another photo on the same page shows the dynamic couple enjoying another banquet.)

The November 1971 Editor's Memo made brief reference to him in conjunction with the disgusting *NEW YORK TIMES* article degrading the image of the electronic technician and service dealer. We later learned that he went to the offices of the *NEW YORK TIMES*, demanded, and managed to get a retraction. Page 64 of the same issue tells of his work to improve TV reception through Project TRIP.

In the January 1972 issue we reported what occurred at the EIC meeting that he conducted (page 31), plus giving extensive coverage to Morris' decision to have The Finney Co. (he is chairman of the

board of The Finney Co.) present a \$35.00 (wholesale-value) Finco antenna merchandise certificate to the first 500 new paid-up NEA members and the first 500 new paid-up NATESA members. (Total of 1000 new affiliations at a cost of \$35,000.)

As you can see from all the coverage that we have given Morris and Frieda in *ELECTRONIC TECHNICIAN/DEALER*, this couple has put in many years, long hours and much traveling in support of their beloved "Independent Service."

There is always the skeptic who will ask, "Why's he doing me a favor? I never did anything to deserve it." The reason is really quite obvious, based on simple logic that has been handed down for centuries. In fact, it is so simple that too many of us tend to ignore it.

Morris developed a personal presentation entitled, "The Future Belongs to Those Who Prepare for It," which has since been printed in book form. Some of the philosophy included in it contains such basic truths that one begins to feel that he is reading the Psalms. We feel that his topic, "Goodwill," tells why he, his wife, and his supporting organization are going all out to support you—and it is said more beautifully than anything we might attempt to write in this article.

This basic philosophy is not only good advice for Morris, The Finney Co. and other manufacturers, it is good advice for all of us. If we serve our customers with as much enthusiasm as Morris serves us, our popularity, news coverage and business growth will be as great as his.

Morris is one of two honorary life members of NATESA, the only honorary life member of NEA (he is also a member of its advisory committee), plus being an honorary life

member of CESA, TEA, CSEA, IESA, ISEA, KEA, Tri-State Electronic Association, NESAs, and 20 other state and local TV service groups. And Frieda has received honorary awards from 15 state and local electronic TV service association chapters—traveling to all national and state conventions, where she participates in auxiliary affairs.

They met at Sunday school in September 1912, and after eight years of courtship were married in Dallas, Texas. She has been his propeller, constant companion and inspiration! (I have been with Morris when she has scolded him for getting too enthusiastic in our discussion concerning the future of electronic servicing—he being late for another meeting.) They have a son, Morris, Jr. (now President of The Finney Co.), and are the proud grandparents of three.

While living in Dallas, Morris was an outstanding amateur and professional athlete. During his early professional career in that city (between 1920 and 1930) he owned and operated a famous physical culture school (the Dallas Health Institute), owned a man's shirt factory (the Finney Shirt Factory), and was in partnership with Conrad Hilton (of Hilton Hotel fame) in a dramatic stock theatre (the Circle Theater).

When the depression came, Morris' financial resources did a nose dive to a mere \$60 and he had to start all over again in Chicago by "ringing doorbells." However, he won a national sales contest—the first prize being 10 vacuum cleaners—and selling them gave the young couple sufficient funds to enter into a small direct-mail advertising partnership with Sam Alexander, David Smart and Alfred Smart—later to be the creators, owners and publishers of *ESQUIRE* magazine. From there Morris went to the Liquid Carbonic Corp., a leading international firm in dry ice, carbon dioxide gas, oxygen, bottling machinery and soda fountain food equipment. He retired from that company in 1953, having advanced to the position of general sales manager.

In 1950 Morris went into partner-

*"the future belongs  
to those  
who prepare for it..."*

## Subject #14

### ... Goodwill

GOODWILL is the *only* asset which competition can't undersell or destroy!

In this day of professional competitive effort, we must very often depend upon the "intangible virtue" or "goodwill asset" rather than the PRODUCT and its PRICE.

Not for very long can anyone have an "exclusive product", a "secret formula", or a truly "better mouse trap". Eventually our scientific mind catches up with our neighbor, and we soon equal or better the other fellow's ideas, plans, or product. He then in turn must struggle not only to STAY AHEAD — but actually fight to KEEP UP!

Therefore, in the end, GOODWILL can be the deciding factor — the EXTRA OOMPH which defeats competition.

How do you go about it? ... Be a GO-GIVER as well as a GO-GETTER! Give of yourself, your interest, your cooperation, your know-how! *Aggressive* salesmanship is mandatory in the SUCCESS FORMULA — but never — NEVER lose sight of the POWER of GOODWILL. Even the less capable individual who has created "GOODWILL" can outsell the high-pressure artist.

Maybe it's another version of the story of the HARE and the TORTOISE.

ship with his son, Morris L. Finney, Jr., and his younger brother, Lewis Finneburgh, Jr.—who had founded The Finney Co. This company has since become one of the leading manufacturers of TV antennas, antenna accessories and MATV systems.

In speaking of future success in electronics, Morris says: "The future will be good to the 'doers' and 'go-getters'—and not so good to the procrastinators, the weak-kneed and the 'cry baby excuse boys.' Smart business people will make profits by watching 'overhead expense'—'Wiser spending of their controllable overhead'—'appealing to basic sensible buying needs and habits' and by keeping their house in good business order. Inventory? Liberal, but fresh and current!

"Some 'stupid' business people—and we do not hesitate to use the word 'stupid'—will continue to cry 'wolf.' They will try to keep their market and volume by degenerated policies of 'special discounts,' 'free goods,' 'a poorer product for less.' And, in general, messing up their own potentials by 'weak salesman-

ship,' 'poor psychology' and even 'soft credit and financial policy.' They will blame the Federal Government, the Democrats, the Republicans and, in fact, all 'isms.' Success comes from its own accomplishments and never from the failures of competitors.

"Every business failure has a bottomless pit of alibis—usually involving lack of thought, effort and dedication.

"Yes! The future will be good to those who deserve it (especially in our beloved Electronics Industry). There are those who consider 'Electronics' to be an established, experienced, well settled industry. We prefer to look upon 'Electronics' as young, inquisitive and expanding. We are still in the infancy of Electronic evolution. So much is to come that 'bad times' are not thinkable nor acceptable to those who dare to dream of tomorrow. Industry 'communication' through 'association affiliation' and cleaner 'market practice' is the 'desired icing on the cake.'" ... That is why we are so dedicated to the *welfare of "Independent Service!"* ■

# Working with Commercial-Audio Equipment

by Jack Hobbs

## Part II—Select components to fit the job and secure your technical reputation

■ Part I, the introductory article in this series, appeared in the January issue of *ELECTRONIC TECHNICIAN/DEALER*. We looked briefly at some basic components used in commercial-audio equipment systems. A practical “typical” system was detailed and general audio installation design techniques were explored. Emphasis was placed on the need for conducting a pre-installation survey by employing your ears, an audio level meter, and an on-the-spot portable audio amplifier and speaker.

In the present article we are concerned primarily with selecting amplifiers, speakers and mikes to fit particular jobs.

### Selecting Amplifiers

Although some technicians will quibble over what is most “important” in an audio installation, it is generally agreed that the quality of *all* components should be equal and that it does not pay to use a cheap or inadequate component at any point in the installation chain. At the same time, it is foolish to use a 30w amplifier, for example, to drive five 5w speakers at 2w each, or even at their full-rated power; or to specify an amplifier having a total harmonic distortion (THD) figure of 1 percent at full-rated output for a paging/intercom/background music system; or to specify a \$150 ribbon or dynamic mike for the same system.

Our job is to select an audio amplifier which will provide sufficient undistorted output to drive the system's speakers. But it may be advisable in some cases to select an amplifier that has some power reserve beyond that required at the moment—to handle an additional low-wattage speaker or two if needed, or increase the power of one or two existing speakers. If a larger

amount of expansion is anticipated in the future, this can be taken care of better by adding another amplifier having sufficient power to take care of the additional load.

Two other prime considerations are the amplifier's overall frequency response and total harmonic distortion. These two factors are important, primarily if the amplifier is to be used in a combination system providing background or regular music distribution. But make sure you know what you are getting—the manufacturer's frequency chart should be plotted at full rated output and should normally be about  $\pm 2$  percent throughout the specified frequency range. And the total harmonic (or intermodulation distortion) should not exceed 5 percent at full-rated output. In Hi-Fi systems, this figure should drop to 1 percent or below. But you do not need amplifiers of this fidelity in the “typical” application.

If a large number of speakers are employed, or if future expansion is anticipated, it is advisable to select an amplifier having both 25v and 70.7v outputs—in addition to normal impedance outputs. It should be understood, however, that this refers to those electron-tube and solid-state amplifiers which are using output transformers. The trend in some areas of solid-state technology is toward the elimination of output and line-matching transformers, and monophonic, solid-state, commercial-type amplifiers are now being made either with or without output transformers.

Stability is another important factor to consider in selecting amplifiers. In high-powered electron-tube amplifiers this consideration is especially important if directly connected, long, low-impedance speaker lines are used. And if long lines are used, make sure that the output

transformer is of high quality.

Another point to be considered is the number and types of inputs at the amplifier's front end: Whether you need high- or low-impedance microphone inputs or both; high-level phono, tape-head or AM/FM radio inputs. The sensitivity of certain inputs is sometimes important, too. And each input may need its own GAIN control to provide flexibility in some installations.

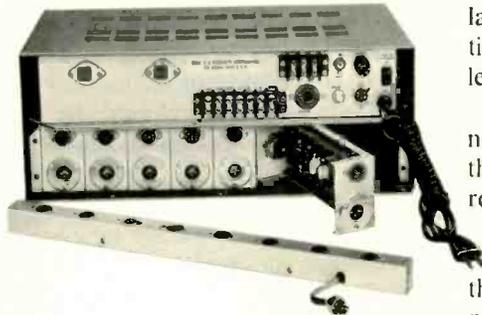
Finally, play it safe. Insist on an amplifier which is designed for a *continuous* duty cycle.

### Selecting Speakers

It is not always easy for the beginner to select speakers, except perhaps for the “typical” installation described in the introductory article in this series. This conclusion seems to be reasonable when we consider the number of different speaker types which, it is said, are designed to partially or completely solve any acoustic, audio-reinforcement or coverage problem.

Some improvements have been made in speaker designs during the past two decades. Competitive factors being what they are in the speaker area, some manufacturers engaged in making top-grade products spend considerable money on research and development. Hence, we suggest at the outset that you call on various manufacturers for as much information as you can get regarding the capabilities of their speakers and how to employ each type to best advantage.

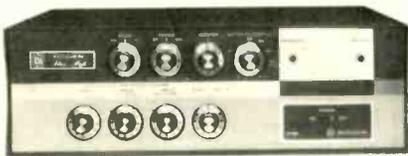
Many factors are involved in selecting speakers for any given audio system. And a thorough study of various speaker designs and their stated capabilities under different acoustical conditions can prove helpful. But no approach succeeds so well as that which employs a portable amplifier and different



Front (top) and rear (bottom) views of a Bell PA solid-state amplifier which employs modularized preamplifier and accessory units.



Front (top) and rear (bottom) views of a Grommes-Precision solid-state preamplifier/mixer/control unit.



Bogen "NT" solid-state preamplifier/mixer/amplifiers come in 30w, 60w and 120w power outputs.



Grommes-Precision solid-state preamplifier/mixer/amplifier.

speaker types to determine in actual practice what results can be obtained with various speakers. Then you select the particular speaker or speakers which prove to be most satisfactory. And if you employ this method in all your initial audio system surveys, you will soon accumulate a wealth of invaluable information which will simplify speaker selections in future installations.

Once again, the type or types, the number of speakers you select and the necessary power of each, is roughly determined by the total cubic-foot area to be covered, the acoustic characteristics of the installation environment, the noise level, plus the number of people to be served.

### Basic Speaker Forms and Types

We will be using two basic speaker forms—both employing moving voice coils. But one form has a fiber cone attached to the voice coil while the other uses a much smaller metal or plastic-impregnated diaphragm. It is enclosed in a heavy metal housing (including the magnet). The housing is threaded at the front end. This unit may be called a compression- or pressure-driver, and the threaded end receives a horn- or trumpet-shaped structure which disperses the audio.

Cone-type speakers are usually mounted on one of a variety of "baffle" boards. Some are "baffled" by mounting in walls or ceilings or by being partially or completely enclosed in cabinets.

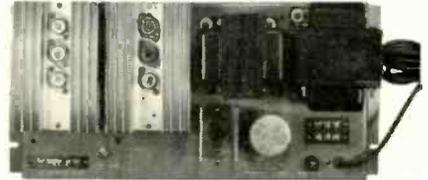
Horns used with pressure drivers can be of different lengths, widths and shapes, which makes it possible to vary both the sound-pressure level (SPL) produced by the speaker and the angle over which the audio is dispersed. Each speaker design is capable of a maximum SPL output. The SPL is specified in decibels for a given distance from, and directly in front of (on-axis), the speaker at a specified wattage input.

Round horns are designed to give narrow, medium and wide-angle dispersion over a circular area. Each type has its particular use. But the so-called radial types are particularly effective for 360° dispersion when mounted in or below ceilings.

Single rectangular, multicellular



University Sound 100w solid-state amplifiers come with or without "autoformer" outputs.



Rear view of DuKane rack-mounted Model 1A803 straight 100w solid-state power amplifier, which has an input sensitivity of 0.4v for full output.



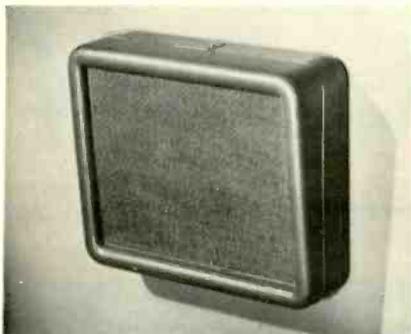
University Sound 30w driver unit.

Atlas wide-angle reflex horn.

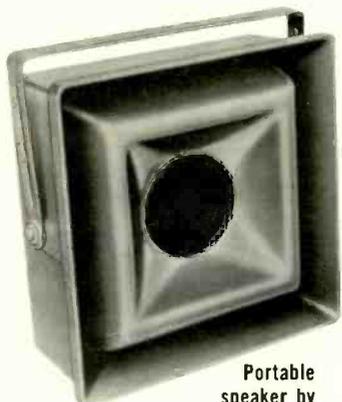


University Sound radial reflex projector.

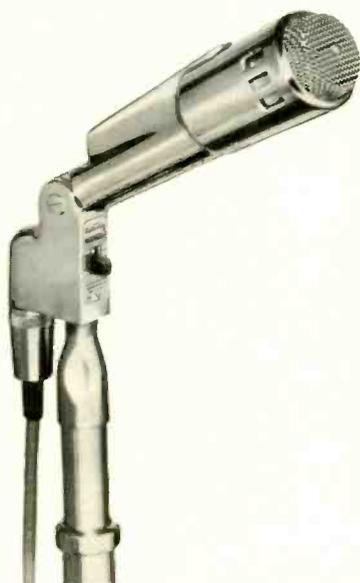




Polystyrene speaker baffle. Courtesy of Quam-Nichols.



Portable speaker by Electro-Voice.



Electro-Voice Model 664 dynamic cardioid mike.

and columnar (line-radiator) types are designed to give wide-angle dispersion in the horizontal plane and narrow-angle dispersion in the vertical plane. This method reduces echos that bounce off floors and ceilings. These speakers can be rotated 90°, of course, to reverse the dispersion pattern. The single rectangular and multicellular types can also be stacked in arrays or placed in circular clusters to increase the coverage and effective SPL and also increase the dispersion angles in one or both planes.

A specially designed paging/talk-back speaker is available and is frequently used in combination paging/intercom/music systems as both microphone and speaker.

### Microphones to Fit

Once again, we do not have the space to compare and analyze the individual characteristics of the six basic mike types—carbon, crystal, ceramic, dynamic (moving coil), ribbon and magnetic. It is an interesting subject but, actually, not a necessary task for our purpose. We are much more concerned with a mike's frequency response and pickup (directional) pattern. The mike's output, of course, must be sufficient to drive its preamplifier properly. But we should not get involved in the somewhat confusing subject of mike sensitivity and impedance. Most good low-impedance mikes made today have two- or three-point switches for selecting the proper impedance. And the high-impedance crystal and ceramic mikes are fed into a high-impedance preamplifier input.

Often, however, certain types of mikes may be desirable (all other factors being favorable) for a particular installation. A dynamic or a ribbon mike, for example, may be specified in systems where the mike or mikes are to be used for both voice and music (in choirs and bands having vocal accompaniment). In any case, we will not be using carbon mikes in our audio system applications, so we can forget them. And, although it normally has a very flat frequency response, a ribbon mike would not be recommended for the average outdoor, portable

or mobile audio installation. Most crystal mikes are also not recommended in the latter mentioned applications, unless they are especially constructed to overcome a hostile environment: moisture, high-temperature, infrared heat and shock.

In the choir and band applications previously mentioned for a dynamic or a ribbon mike, the mike's frequency response should be as wide and as smooth as possible. In fact, in all audio installations, the mike FR should be as smooth and flat as possible, no matter how wide or narrow the response spectrum. Sharp peaks or valleys should not show in the response chart. The response should be flat within  $\pm 2\text{dB}$ . If the response swings abruptly up and down  $\pm 3\text{dB}$  or more, depending on prevailing acoustic conditions and speaker placement, this may help to promote feedback. Highly sensitive peaks are to be avoided in the low- and mid-range areas of the FR spectrum.

The aforementioned statements do not refer to a gradual rise or decline in the chart or show tapering off in the low- or high-frequency area—we mean sharp peaks and valleys, especially within the medium low- and mid-frequency range. This is an important point to consider when studying mike FR charts. Built-in "roll-off," "tilt-off" or "tailored" response characteristics must be carefully noted when observing an FR chart to determine how wide and "smooth" the response of a microphone is. For example, the FR chart shown in Fig. 1 is that of a

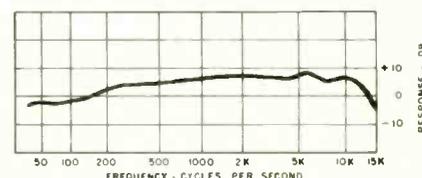


Fig. 1—A typical frequency response chart of a medium-priced dynamic cardioid mike. Courtesy of Astatic.

good, medium-priced, general-purpose dynamic cardioid mike having an acceptably smooth response from about 40Hz to 15kHz for voice, night-club orchestras, home recording and various types of outdoor applications.

A microphone for the "typical" PA, paging, intercom and music distribution system which has a reasonably smooth response from about 70Hz to 10kHz is thoroughly adequate—since music in these systems is normally fed to a preamplifier input of the amplifier. In fact, a wide choice of acceptable dynamic, magnetic, crystal and ceramic mikes, ranging in list price from about \$25 to \$50, are available for use with low- and medium-cost "typical" systems like that described in Part I of this series.

For straight PA work, a mike which has a frequency response from 200Hz to 5kHz or 6kHz is frequently used with good results—when its FR is flat over this range. Avoid using a mike which specifies an "average" frequency response figure over a given spectrum.

### Pickup Pattern

The pickup pattern, or directional characteristics of a mike, is a very important consideration.

Unidirectional mikes will no doubt be most used in our work. Some bidirectional mikes will also be needed. And, while it may not appear logical at first consideration, even omnidirectional types may be advisable in some audio-system applications.

The classical unidirectional mike is the cardioid or "supercardioid," designed to reduce pickup from both sides and practically eliminate pickup from the rear. The unidirectional polar pattern of a dynamic supercardioid is shown in Fig. 2.

The omnidirectional mike is an effective lavalier, hand-held, or when properly mounted on a stand with swivel, it makes an excellent mike for PA, group voice or orchestra work in those environments where reverberation is not a problem. A polar pattern for an omnidirectional mike is shown in Fig. 3.

The bidirectional mike is ideal for dialogs, interviews, and other applications where both front and rear pickup is required. A bidirectional polar pattern is shown in Fig. 4.

The next article in this series is concerned with the various distribution methods employed in multi-speaker audio systems. ■

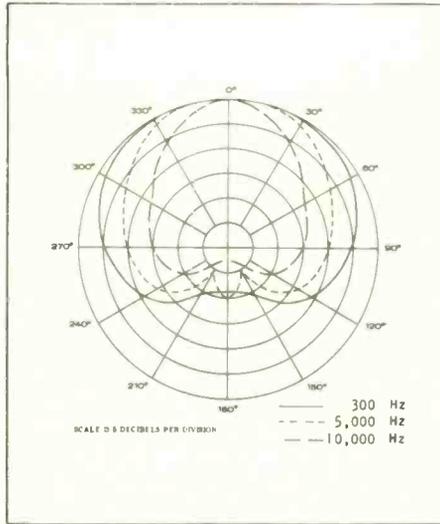


Fig. 2—Polar pattern of a unidirectional supercardioid mike. Courtesy of Electro-Voice.

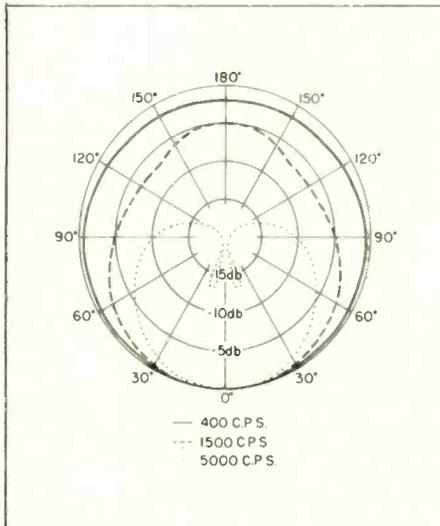


Fig. 3—Omnidirectional polar pattern. Courtesy of Shure.

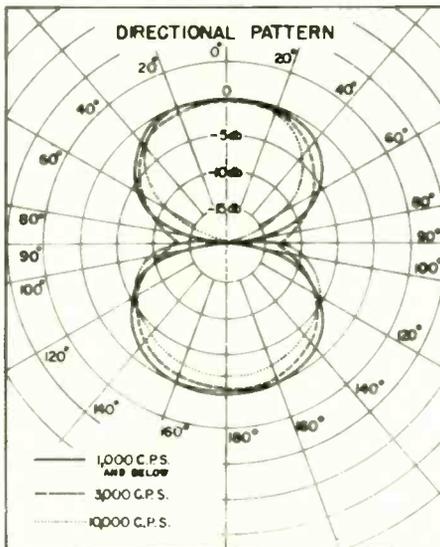
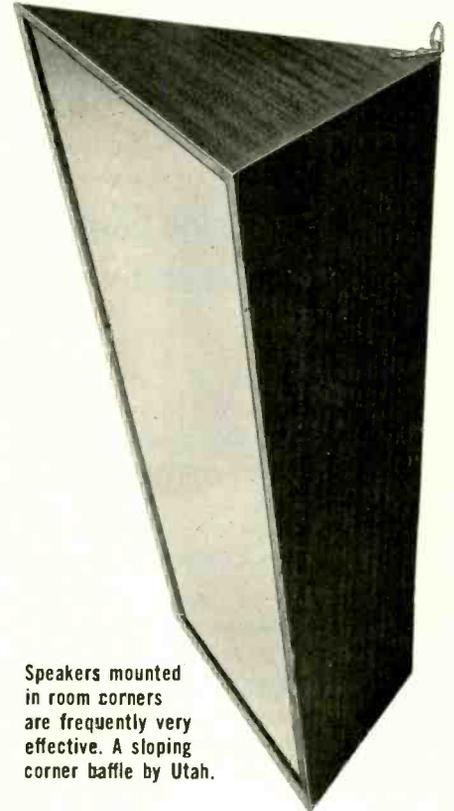


Fig. 4—Bidirectional polar pattern. Courtesy of Shure.



Speakers mounted in room corners are frequently very effective. A sloping corner baffle by Utah.



Atlas wide-angle sectional horn.



Turner Model 500 dynamic cardioid mike.

# On Camera at Central

by Joseph Zauhar

## Television programming and production are now incorporated as part of the school's curriculum

■ The students of Central High School, Duluth, Minn., now have an opportunity to help produce live and taped television productions for classroom use.

Audio-Visual Coordinator Al Carlson said a television production course, "Television: The Medium and Its Uses," is incorporated as part of the new high school's expanded curriculum. This course exposes each student to the details of television programming and production.

The main objective of the course is to enable each student to use the available equipment to produce TV presentations of acceptable quality. They are thus able to work with or assist any member of the high-school faculty in the programming and production of educational TV presentations.

Students enrolling in this two-semester course attend three classroom sessions per week, which include field trips to commercial and educational TV facilities and presentations by resource people having extensive backgrounds in TV broadcasting. Each student is graded with consideration given to scholastic record, speech ability, art and mechanical aptitude.

Recently we had the opportunity to visit the high school during a taping session where we were able to see firsthand the use of this valuable educational tool.

The closed-circuit studio and remote facilities were sold and installed by Andresen Sound Inc. of Duluth, Minn. According to Al Carlson, making the selection of video equipment and drafting layout plans required many hours of time—a thorough analysis having to first be made on how proposed units could be adapted for school educa-

tional purposes at a nominal cost. Central had an advantage over most schools since the system was designed prior to the construction of the school. The CCTV system was custom built into the school with provisions made for future expansion as the need arises.

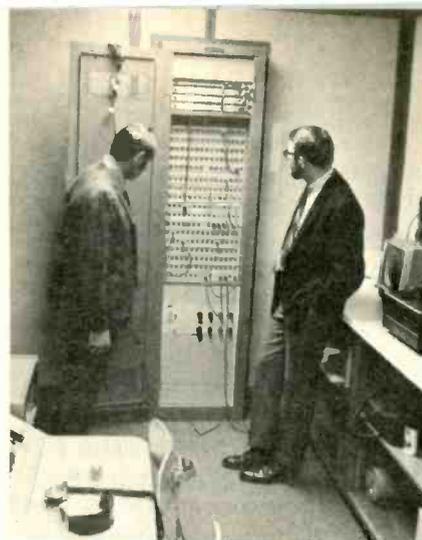
The school's studio/control room resembles a commercial studio and is a multiuse facility which can also be used as a classroom. Glass windows divide the studio and control room, permitting the production manager to view the control room and studio during a TV production training session. There are many switch controlled ac outlets for proper lighting, and 14 microphone jacks are available on the lower portion of the walls, plus two on the ceiling, which are tied in with the control console.

Three solid-state, GBC Model VF-302 cameras are employed in the studio with either video or RF outputs available.

A few problems were encountered with peaking the cameras in terms of target, but with the automatic gain controls on the video tape recorder the differences are compensated for when switching from camera to camera. When older video tape recorders are employed, the video gain must be manually adjusted.

The control room serves 82 originating points throughout the school. School originated programs are modulated on Channels 2 and 4 with the use of Dynair Model TX4A solid-state TV modulators. These channels are then tied in with the off-the-air channels (3, 6, 8 and 10) from Blonder-Tongue Model MCA solid-state single-channel strip amplifiers.

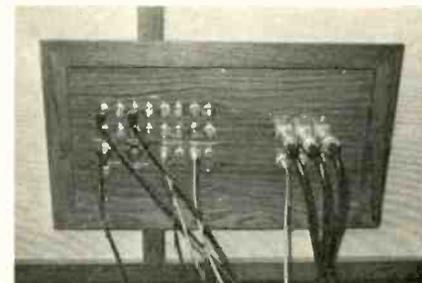
This is a two-way CCTV system



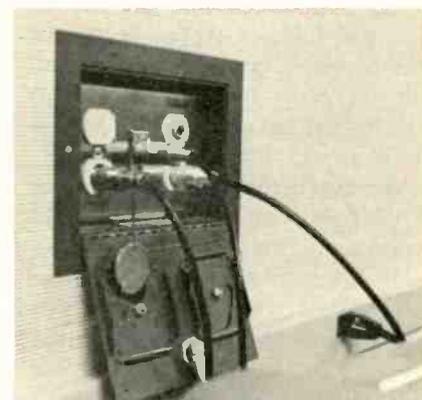
Audio-Visual Coordinator Al Carlson, right, describes the custom built distribution system rack during our visit to the Central High School.



Cameraman Paul Krzewinski operates the GBC Closed Circuit camera Model VF-302 in the school's new multi-use studio.



This main connector panel ties in all remote points, distribution system rack and studio facilities to the control console.



This Blonder-Tongue Versalock, Model 3521, is used to connect the 82 remote points throughout the school to the control console. This unit provides for the input of audio, video, intercom and RF distribution.



Three students operate the control console during a TV taping session.



The Panasonic Model AN-69V is a typical TV-monitor mounted on roll-about carts for portability to various classrooms in the school. Also shown is a Sony Model EV 200, one of the many video tape recorders used for training purposes.

which is designed to permit the use of cameras located in remote portions of the school. The video information is carried back through separate video and RF lines. By using these techniques, up to 3 cameras can be employed in the auditorium, gym or other parts of the building. Each camera is connected to the switcher input of the control console and terminated whether in use or standby. By merely pressing a button, the operator can determine which camera is to be "on the air."

Remote microphone signals are fed back to the control room through separate cables, thus eliminating the cost of audio modulators. It can then be mixed at the console and recorded with the video signal—or sent out again on Channels 2 or 4 for immediate use.

This elaborate audio and video control console was custom designed for future expansion and space has been set aside for a telecine chain to permit the distribution of movies through the CCTV system.

When important guests come to the school, it is now possible to record their presentations for viewing during normal class-room schedules—or for remote viewing, should the audience be too large. During a recent visit by the local director of human relations, they found the studio not adequate for the number of students attending the lecture; and therefore moved to the English I classroom, which has a large seating capacity. A camera was brought into the multipurpose classroom and the lecture was recorded in the control room to be played back to other classes. (Normally the studio is used because the facilities are better and 3 cameras can be employed there for special effects, along with switcher tape for variety.)

Recording guest speakers and TV production classes are not the only useful purposes for the schools CCTV system. Instructors will soon be applying the system for self-evaluation or appraisal on a voluntary basis. For this application a camera with wide angle lens can be placed in the classroom and recorded in the control room with a minimum of equipment. The tape can then be played back to evaluate the reaction of the students and various teaching techniques.

The biology class will employ a camera for long durations to observe certain types of animal behavior when humans are not present. Students will also be able to employ the system in horticulture classes with the use of time-lapse tape recorders. The school's athletic department can use the video facilities to tape and review the performance of the athletes. These are but a few of the many practical educational CCTV systems now possible.

"We are still on the ground floor and the student reaction to TV tape production has been overwhelming," said Mr. Carlson. "We don't expect the students to be fully trained technicians, but they will get a 'feel' of the TV production field. Students who use the media in the school, work with the faculty as part of the requirements for production and instructional media. This interaction actually helps improve student and

*continued on page 82*

# Cleveland's May Co. Boasts Top Security, CCTV, Mod Squads and All

It pays to advertise is an axiom among retailers. The basic reason is simple—to get more customers. However, the May Co. in Cleveland looks at some forms of advertising as a way to keep some customers out of the store. These are the shoppers who are bent on having the retailer pay for their selection of merchandise.

■ Craig Clark, security director for the May Co.'s seven stores in the Cleveland area, believes in educating the community to the fact that the stores have a sophisticated security staff that fully utilizes shoppers, two-way radios, video tape recorders and CCTV.

"If we didn't advertise the fact that we have a sophisticated security force, we would be wasting our money," Mr. Clark said. "We have an elaborate monitor room with 22 triple Panasonic monitors in the busiest lobby of our downtown store."

Shoplifting is generally included in the combination of ingredients called "inventory shortage," which covers such "sins" as sloppy accounting, disinterested sales personnel who price merchandise incorrectly, employee thefts, holdups, bad checks and credit fraud.

For many retailers, "inventory shortages" are a major problem. Industry figures indicate that losses are running at the rate of about \$8 million a day or \$3 billion annually. Some retail stores have losses running from 3 to 5 percent of their annual volume. This surely is a crisis, when one considers that most department and mass merchandising stores work on a net profit of between 2 to 4 percent.

The May Co. security force numbers over 50 people, some working in "Mod Squads" which shop the stores posing as regular customers. These teams include hippie-looking types, elderly ladies, middle-aged people and teenagers—all trained security people.

They are sent to Western Reserve University for a basic peace officer's training course which includes laws

of arrest, search procedure, firearms training and even traffic direction.

In addition to the eyes of the "Mod Squad" and the regular uniformed security people, security ef-

forts are enhanced by one of the most elaborate CCTV systems in any department store in the nation. The total Panasonic video system for the Cleveland area stores includes more than 120 video cameras. An average of eight cameras are set up on a selling floor, many equipped with "pan" and "zoom." With these, a suspect can be kept under constant surveillance no matter where he is on the floor. And should he choose to move to another



Jim Fryan of Fryan AV Sales presents a pass "key" in the form of a punched plastic card for identification and entry at one of the rear entrances of the May Co. The camera in the upper left identifies him for security and the plastic pass gives store identity. Security then releases a lock to admit him.

location in the store, the security people have the capability of keeping tabs on him.

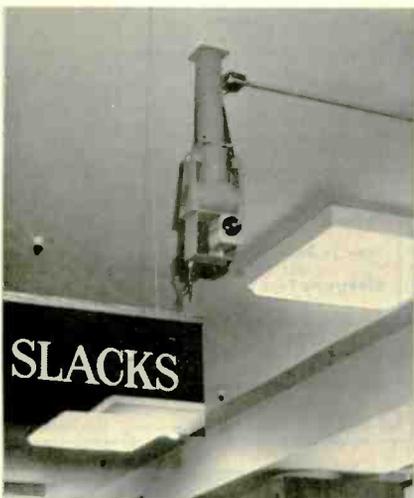
Mr. Clark emphasized that live cameras are used all the time: "There's no point in using dummy cameras except as replacements for units being serviced, which is infrequent."

In addition to the security surveillance, the Panasonic video system is invaluable for keeping selling areas staffed with sales personnel. Not only does this result in better customer service, it is also a deterrent against shoplifters.

"The best insurance against theft is still a good sales person. If we can move sales people to areas of heavy traffic, we can deter the shoplifter in that department, and with the video system we can still cover the areas that may be less crowded with customers and sales people," he explained.

Because department stores operated by the May Co. are so large, their answer to dealing with the problem of shoplifting is using a highly mobile security system involving Mod Squads with two-way radios and a security man with a video tape recorder. The extra eyes of the VTR system can be used to cover areas of a floor that the Mod Squads may be away from, and also as a record of a theft. Faced with a video tape of a theft, the shoplifter will be hardpressed to deny that he committed the act.

In each of the May Co.'s Cleve-



A selling installation equipped with pan, tilt and zoom.

land stores, special monitor rooms have been set up on each floor, which are manned on an almost continuous basis.

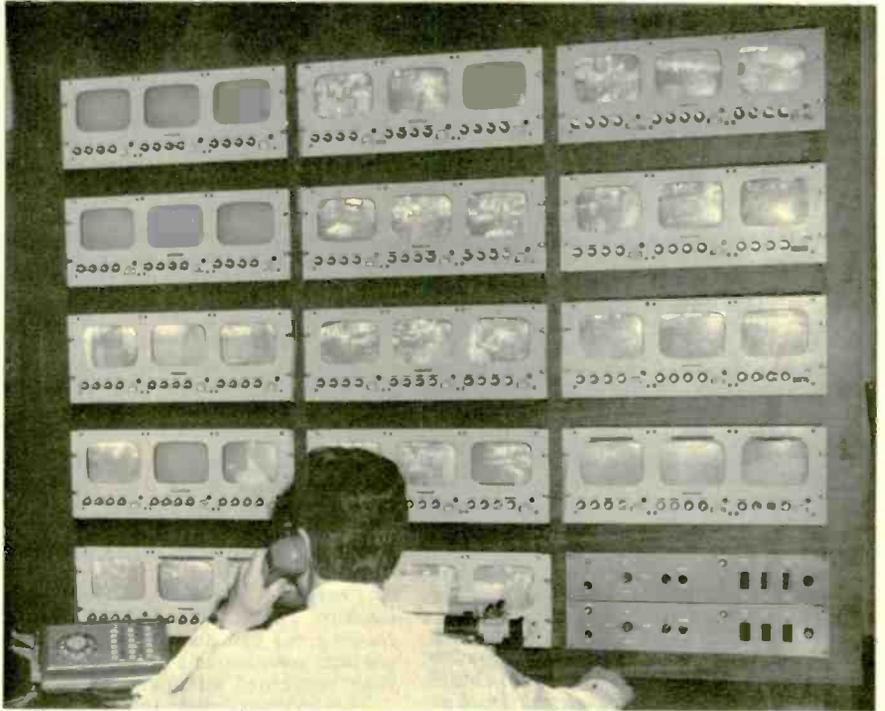
"What the video system does is give us the capability to see much faster a given area and situation. If we want to go down and check conditions on the third floor, for exam-

ple, all we do is look at the monitors," said Mr. Clark.

By spotting a situation and using the mobile radios, the security people can be dispatched to an area much more quickly.

The May Co. security force also has the aid of a computer to analyze

*continued on page 81*



Man monitoring booth at the first floor control center.



Craig Clark, a lawyer, scans a variety tape made during a shoplifting attempt for possible use as courtroom evidence.

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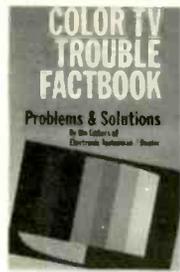
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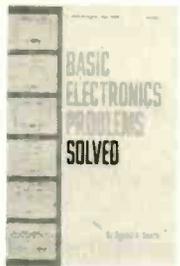


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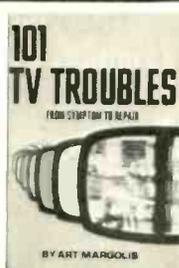


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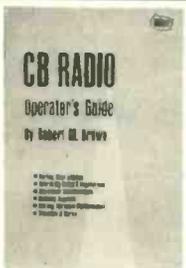
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# Semi-Tips Part V

by Jack Jaques

This is the fifth article of a series that is intended to aid and guide the service technician in using replacement semiconductors to their fullest advantage. It may be noticed by some readers that certain portions of these articles are excerpts from previous articles in this series, but that it is the author's intent to make each article stand by itself. This article refers specifically to the "power transistor," which is defined as having a collector current rating of greater than 1a and/or a maximum power dissipation of greater than 1w. The devices can be either silicon or germanium, NPN or PNP, may be in any one of a large variety of case styles, and is probably marked with some number (or group of numbers) that means absolutely nothing to anyone except the original manufacturer.

■ American transistor numbering systems, plus the many foreign types, undoubtedly cause most of the confusion and headaches for the service technician when he is faced with replacing a defective component. There are even times when standard devices (1N-, 2N-, 3N-, 1S-, 2S-, 3S-) are not readily obtainable and the technician *must* rely on one or more of the current semiconductor cross-reference guides and perform the necessary replacement by using a "universal" device. The technician should bear in mind that these cross-references are prepared in a very conscientious manner, based on published specifications and available data, and are continually reviewed and up-dated to reflect the best possible replacement.

For example, the Motorola HEP cross-references are established with an "equal-or-better" philosophy; and while this philosophy is very strictly adhered to, there are replacement pitfalls that should be avoided and certain guidelines that should very definitely be followed. In many instances, the so-called "equal-or-better" replacement fails to operate satisfactorily or just plain doesn't work at all, even though all of the basic electrical parameters appear to be actually equal or better.

Some of these instances can be directly attributed to a difference in

the actual manufacturing processes involved (alloy, planar, epitaxial, drift, etc.), however, in most cases the differences in circuit operation can be very satisfactorily compensated for by minor changes in the circuit biasing.

This brings us to what is undoubtedly the most important single

operating feature of most transistor circuits—proper biasing. Simply stated, the term "proper biasing" can be defined as an ideal set of conditions whereby the circuit input signals are faithfully reproduced at the output in an amplified form. (For the sake of simplicity, the widely used and accepted "common-emitter circuit" will be used for reference.) Since the transistor is considered to be a current amplifier (vacuum tubes as voltage amplifiers), then it becomes obvious that in order to achieve what we term as amplification, a small emitter-base current must control (amplify) a large emitter-collector current as illustrated in simplified form (Fig. 1). It should be noted that the arrows are indicating the actual direction of the flow of electrons in the circuit, and that two batteries are used only for clearer illustration. Also that the emitter-base battery has low-voltage, low-current capabilities; while the emitter-collector battery has higher-voltage, higher-current capabilities—thus establishing the correct voltage-current conditions necessary for

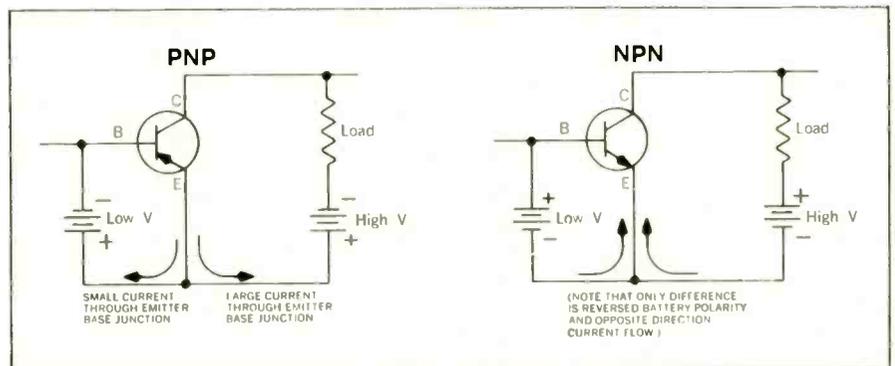


Fig. 1.—The common-emitter circuit is possibly the most frequently used basic, solid-state circuit.

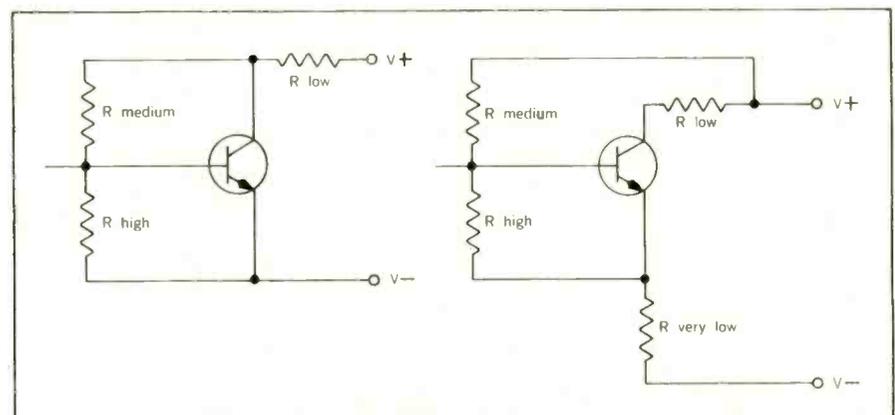


Fig. 2.—Some typical examples of how the desired bias voltages can be obtained from a single power source.

The author is HEP technical manager of Motorola Semiconductor Products, Inc., Phoenix, Ariz.

circuit operation.

There are various other methods of achieving bias, some typical examples being included in Fig. 2. In these examples, only one power source is utilized. However, the current flow and biasing are quite obvious, and such circuitry is in common use.

Now comes the crux of this whole biasing situation or problem, namely, stability under all possible circuit conditions and environments. An inherent characteristic of the transistor, as well as most semiconductor devices, is a sometimes drastic change in some of the extremely important electrical parameters—such as  $h_{FE}$  (gain),  $I_{CBO}$  (leakage), saturation voltages, etc., etc.—when the devices are subjected to temperature extremes. These changes can be very adequately compensated for, providing the circuit is biased in a manner that will provide optimum operation under all expected temperature variations. It should be noted that many of these “changing-bias” requirements are met by the use of signal diodes, zener diodes, current-limiting diodes, thermistors, etc., and that the change in characteristics of one or more of these will offset the changes in the applicable circuit.

At this point in the article the importance of proper biasing should be quite evident. However, the solution to this problem can usually be solved in a very few minutes by the expeditious use of a few inexpensive components and the pride that it takes to give a customer a job well done. It is suggested that non-inductive and adequately rated potentiometers be temporarily inserted into the circuit and adjusted for optimum circuit operation. It is then a simple matter to measure the resistance across the potentiometer and replace it with a fixed resistor of the same value and of adequate wattage.

It is also a wise precaution to thoroughly test the complete circuit under adverse conditions. Again, this procedure can be accomplished in a few minutes and at a minimum of cost. It is suggested that the circuit be allowed to perform on the bench under normal conditions until all circuit temperatures have sta-

bilized. At this time, *slowly* cool the circuit thoroughly with any one of the many available aerosol coolants. Next, allow the circuit to warm up to its original normal conditions, and then slowly heat the circuit (a small hand-held woman's hair dryer is very effective). Precautions should be taken not to change the circuit temperature too fast as many circuit components may be damaged. If these temperature-extreme tests are satisfactory, then it can be assumed that the repair was successful. However, if the circuit should fail upon heating or cooling, it is strongly recommended to return to the biasing problems. These temperature-test methods are also excellent for locating intermittent semiconductor devices as well as other defective circuit components.

Another potential source of trouble concerns adequate sinking or heat dissipation. As stated in previous articles, the movement of electrons and holes through a PN junction generates heat, and this heat *must* be removed as quickly and effi-

ciently as possible. A quick glance at the Power-Temperature Derating Curve of any power transistor will reveal the importance of this factor (presented in Fig. 3 is the derating curve for a typical high-power germanium transistor—HEP 232).

As evidenced from the curve, this typical transistor will dissipate 90w of power when the case temperature is between 0°C (32°F) and 25°C (77°F) and deteriorates in a linear manner to 50 percent its original rating, or 45w, at 60°C (140°F). It thus becomes quite evident that getting rid of this heat is a very important consideration and is a frequent cause of sets operating very satisfactorily when opened up on the bench and going sour when installed in the cabinet or when the cabinet is placed in a location that restricts good air movement and ventilation.

The use of a high-quality silicone grease should always be considered an absolute “must” when replacing any kind of semiconductor power device. This grease very efficiently aids in the transfer of heat from the

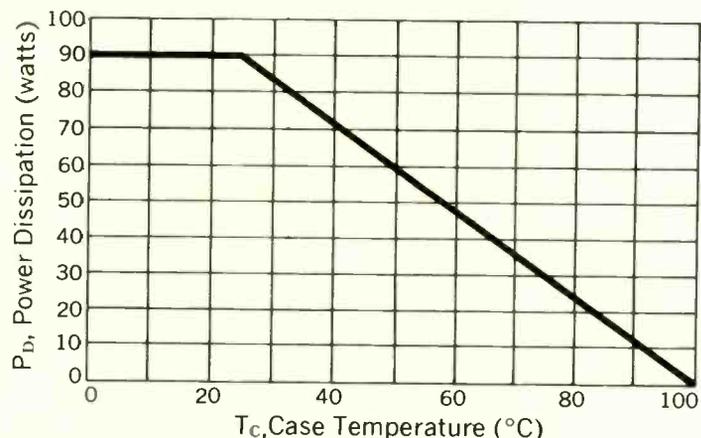


Fig. 3—The derating curve of a typical high-power germanium transistor (HEP 232).

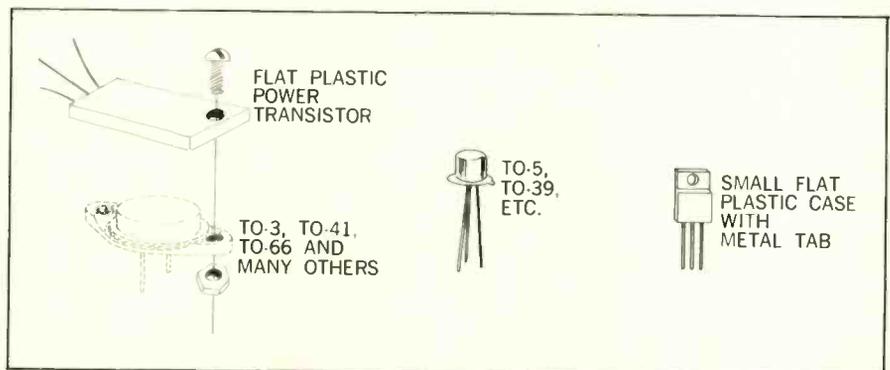


Fig. 4—A few of the most commonly encountered case-style interchanges.

case of the semiconductor to the heat sink or chassis.

Quite often it will be found that there is a physical difference between the original device and the recommended replacement. However, these differences have been carefully considered during the preparation of the cross-reference guide and in most instances the interchange can be accomplished very simply. Fig. 4 depicts a few of the most commonly encountered case-type interchanges.

For the large flat plastic power transistors, the collector is connected to the metal plate on the bottom of the case as well as to the center lead. Again, silicone grease should always be used when this type of case is attached to a heat sink or chassis and the proper insulating procedures must be followed when required.

The small flat plastic case with the metal tab makes an excellent replacement for many of the small metal-can transistors. Usually all that is required is to bend the leads to the proper configuration and then plug in or solder as required. Since the metal-can devices are usually free standing, it may become necessary to clip off the metal tab of the replacement device. This procedure should be accomplished very carefully in order not to crack or break the plastic case.

While on the subject of styles and differences, it should be noted that many import transistors using a case similar to the standard TO-66 (small diamond-shaped case) have a slightly different pin spacing. In most instances, an effective replacement can be made by carefully bending the leads to the required spacing. The author has actually witnessed devices with exactly the same part number, but made by different manufacturers, but the pin spacing was still quite different.

A very common area of servicing difficulty appears to be in the horizontal and/or vertical output stages. Quite frequently, these output transistors are destroyed by a malfunction in the preceding driver and/or oscillator stages. These stages should *always* be thoroughly checked and serviced according to

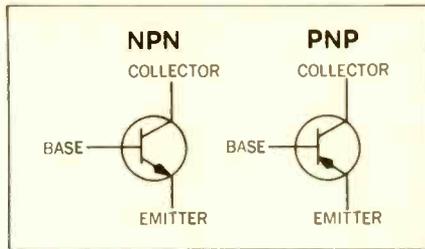


Fig. 5—The basic schematic for PNP and NPN transistors.

the particular set manufacturer's specifications before attempting any actual repair of the output section.

Another frequent source of trouble is the emitter resistor used in the output stages of many early Delco automobile radios and also many automobile tape players. These resistors have a tendency to increase in resistance value if they are subject to an overload condition. This increase can cause serious biasing problems as well as distortion and can result in permanent damage to the output transistors. These resistors are always of a low ohmic value and should be checked with an accurate ohmmeter or compared to the new reading from a new resistor of the proper value. If there is any question about the resistor, it should be replaced.

One of the most perplexing problems that faces the service technician is the replacement of a transistor for which no cross-reference is listed and no technical information is available. This situation is quite prevalent and while the solution will require a little more time and effort, it is possible to select a satisfactory replacement by following a few simple analytical procedures.

The basic physical and electrical characteristics needed to establish the essential requirements of the replacement device are: *polarity* (NPN or PNP); *material* (silicon or germanium); *voltages* (collector to base, collector to emitter, emitter to base); *current* (adequate collector current capabilities); *frequency*; *gain*; *power dissipation*; and *physical compatibility* (case style). Some of these characteristics can be determined from the manufacturer's schematic and service information and/or the schematics published monthly in ELECTRONIC TECHNICIAN/DEALER. However, there are

times when none of this material is available and the following procedures are based on this premise.

**Polarity**—This requirement can be readily determined from the schematic symbol as illustrated in Fig. 5 (note that for the NPN device the emitter arrow points *away* from the junction and for the PNP device the arrow points *toward* the junction). However, if a schematic is not available, the polarity can be easily determined in the following manner: With the circuit energized, connect the negative lead of a voltmeter to the emitter terminal of the transistor and the positive lead to the base (or collector). If the voltage reading is *positive*, then the device is nPn, while if the reading is *negative* the device is pNp. (Note that the P for positive or the N for negative indicates the middle designation—NPN or PNP.)

**Material**—As stated in a previous article, there is always a measurable voltage drop across a semiconductor junction and this voltage drop will be inherently lower for germanium devices than for silicon. The actual material determination can be made by measuring the voltage drop across the emitter-to-base junction. Connect a dc voltmeter to the emitter and base terminals. If the voltage reading is on the order of 0.6v dc, then the device is silicon.

**Voltages**—The operating voltages can be determined from a circuit schematic or by actual measurement. The voltages of concern are collector to base ( $V_{cb}$ ), collector to emitter ( $V_{ce}$ ), and emitter to base ( $V_{eb}$ ). The device that is eventually selected for replacement should have rated characteristics of at least three to four times the actual operating voltages in all three categories. This safety factor is necessary in order to protect the device against voltage spikes, transients and surges that are inherent in most circuits.

**Current**—The only current that will be considered here is the collector current. The assumption will be made that if the collector-current capabilities of the replacement device are adequate, then the base-current capabilities will also be adequate. Also, the assumption is made that

*continued on page 78*



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# FORD ECONOLINE VANS



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# Heath's Model IB-1101 Frequency Counter

by Philip Dahlen

Manufacturer improves design of basic digital instrument

■ It was just about a year ago that we printed a test instrument report for what would appear to be an identical instrument. In fact, about the only difference that can be seen from the front of this instrument is the addition of a numeral "1" to the model number. This instrument, however, has a greater frequency range—counting signal frequencies from 1Hz to over 100MHz; a gate light to indicate the counting period; and an external clock input to lock the time-base oscillator to some external frequency standard.

We have had the previously described Model IB-101 frequency counter in our lab for quite some time now—having constructed it as a kit. Since some of the basic principles of operation apply to not only this and other frequency counters, but even the volume stepping circuitry described in last month's Teklab report—plus other circuits that you will be encountering in the future—we plan to soon begin a series of articles showing the scope waveforms observed in the IB-101 counter as it functions to measure the frequency of an applied signal.

Additional manufacturer specifications for the new IB-1101 frequency counter include the following:

- Automatic trigger level input for a wide range of input signal levels.
- Five full digit readout with eight full digit readout capability—when using the over-range feature.
- MHz, kHz and over-range indicators for reading ease.
- Automatic decimal point.
- Storage circuitry for non-blinking operation.



- Computer-type digital circuitry which does not require divider chain adjustment.
- Low-drift, crystal-controlled time-base oscillator.
- BNC-type input connector complete with test cable.
- Dual primary power transformer—plus regulated power supply.
- All IC's and readout tubes in sockets for easy installation or removal.
- A sensitivity of up to 50mv at frequencies of up to 50MHz.
- A sensitivity of up to 100mv at frequencies of up to 100MHz.
- A time-base stability greater than  $\pm 3$  parts per million between 17°C and 32°C after a 30 minute warmup.
- A time-base stability greater than  $\pm 1$  part per million per month after 30 days of operation.
- Accuracy equals  $\pm$  digit  $\pm$  time-base stability. ■



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## TEKLAB...

*continued from page 45*

(T605). The circuitry used allows the chassis to be compact and protects the horizontal output transistor from picture-tube flash-over.

The horizontal oscillator (transistor TR603) and the driver stage (transistor TR604) are quite similar to those used in a B/W-TV receiver. Boost transformer T603 is coupled to the horizontal output transformer (TR605), which is operating as a deflection output transformer. The output signal for the deflection yoke is obtained from Terminal 4 of transformer T603 and Terminals 3 and 5 are used for horizontal width adjustments.

Damper diode D609 and capacitor C656 are used to boost the 12v source, obtained from Terminal 6, to 21v by charging C656 during the damper action period of D609. Coil L609 and capacitor C668 are used for linearity correction.

The boost regulation circuit consists of transformer T604 and transistors TR606 and TR608. The 12v power source for the horizontal output transistor (TR605) is obtained from the reactor transformer (T604) by way of transformer T603. An increase in boost voltage increases the base potential of transistor TR606 and lowers the base potential of transistor TR608, decreasing its collector current. As the collector current of TR608 (flowing through the magnetizing winding of transformer T604) decreases, the inductance of T604 also decreases (the inductance of T604 supplying the 12v power source increases). Input current for the horizontal output transistor (TR605) then decreases and the increased boosted voltage is reduced. As a result, the boost regulation circuit controls the potential of the boosted voltage. Potentiometer R656 is used to adjust the boosted voltage to 21v.

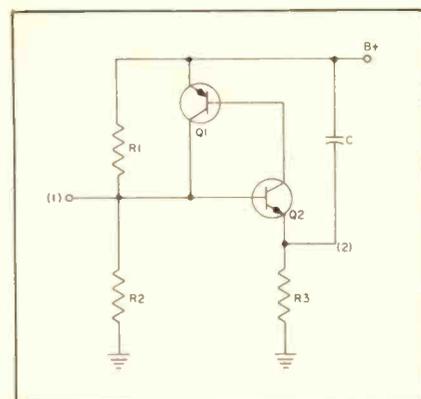
The high-voltage transformer is coupled to the collector of horizontal-output transistor TR605 through a circuit that is connected to capacitor C653 and tuned to the horizontal signal's fifth harmonic with coil L613 to obtain good high voltage regulation characteristics. Coil L613 and capacitor C661 are used for adjusting the fifth harmonic tuning by adjusting L613 to set the high volt-

age minimum potential. This adjustment of 15.5kv  $\pm$  0.5kv is also made with the use of capacitors C653 and C654. Capacitor C654 can be connected or disconnected from the collector of horizontal output transistor TR605 to regulate the 16kv at zero beam current. A doubler type diode (D617) is used as the high-voltage rectifier.

### Vertical Oscillator Circuit

The vertical oscillator circuit employed in this TV receiver is quite different from the conventional types used in the past, an SCR being used as the vertical oscillator.

A transistor circuit that is equivalent to this SCR circuit is shown in the adjacent schematic. When the



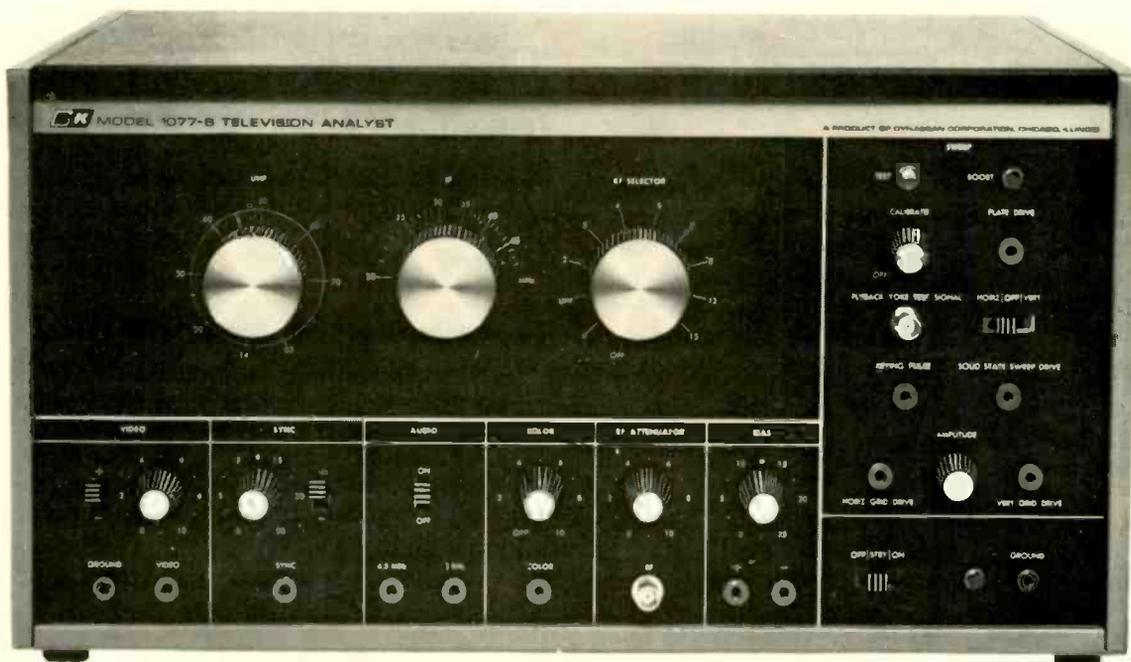
A silicon controlled rectifier (SCR) is used as a vertical oscillator.

power switch is turned ON, there is no charge across the capacitor, and Terminal 2 is approximately at the B+ supply voltage. As this capacitor begins to charge (the current flowing through resistor R3), the voltage at Terminal 2 begins to approach the voltage at voltage-divider Terminal 1. When it is within 0.7v of that voltage, the equivalent transistors begin to conduct; and shortly thereafter (depending on the current gain characteristics of these equivalent transistors) the transistors are switched fully ON—thus discharging the capacitor. The resulting voltage between Terminals 1 and 2 is then great enough to turn the transistors OFF, and the capacitor again begins to charge—repeating the cycle.

### Noise Canceler, Sync Separator, AGC and Video Amplifier Circuitry

A single integrated circuit IC301 (AN229) contains a noise canceler, AGC and a video amplifier circuit.

*continued on page 78*



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# COLORFAX

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## edi ELECTRONIC DEVICES, INC.

### Color-TV Service Tip

In addition to all other benefits, the use of a solid-state device for replacing the high-voltage rectifier tube eliminates the need for the filament winding of the flyback transformer (a frequent failure part and trouble source).

The filament winding can be severed (or ignored) saving time and often a flyback replacement.

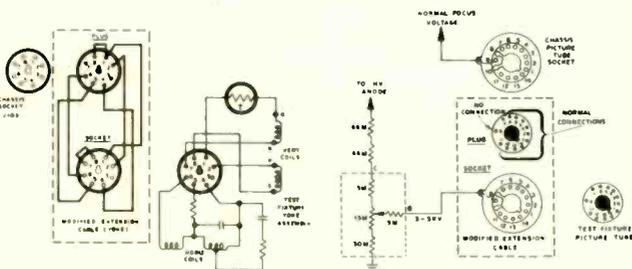
A complete line of solid-state high voltage rectifiers, damper diodes and focus rectifiers are available from edi Electronics Devices, Inc.

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### Focus and Picture Tube Cable Modification

The 20VAHP22 picture tube used with the CTC50 color-TV chassis contains an "Einzel" gun which requires a low focus voltage. The picture tube used in the CTC38 test jig requires a high focus voltage, therefore a modification must be made to provide a high-focus voltage from the CTC50 chassis. The picture tube extension cable, No. 13B113, is used for modification.

- Remove the connecting wire from Pin 9 of the extension cable plug only. All other connections between the plug and socket of the picture tube extension cable remain as



originally connected. The focus voltage is provided by an externally connected voltage divider from the high voltage anode to ground. Components needed to make up this focus system include: Two 66M resistors (Part #114651), a CTC44 focus control assembly (Part #129925) and a length of insulated high-voltage lead.

- Connect the two 66M resistors in series. (Make the junction between the resistors as short as possible.)
- Connect the insulated high-voltage lead to one end of the series resistors. (Make the connection as short as possible.)
- Connect the free end of the series resistors through the rear FOCUS control cover and solder to Point C of the FOCUS control. Cut away excess resistor lead. (Resistor end should be flush with back of control housing.)

All connections from the high-voltage lead to the focus control, including the surface area of the externally connected resistors, must be well insulated to prevent arcing. When this unit is first used, be sure to check the insulation around this area using a grounding stick.

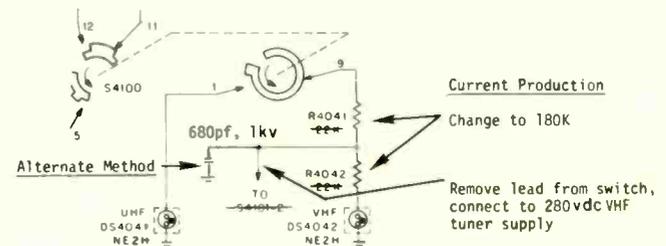
- Connect the loose end of the wire from Pin 9 of the extension cable socket, through the back cover of the focus assembly, to terminal B of the focus assembly. (Strip only enough insulation from the lead to make the solder connection.)

- Connect a ground lead to Terminal A of the focus assembly. The length of the connecting leads is up to the individual to suit his needs. Alligator clips can be used for easier connection to the high-voltage anode and ground. A bracket could be made for attaching the focus network to the chassis or test fixture.

Check all connections for mechanical and electrical quality before closing up the focus housing. It must be understood that some quality will be lost due to the absence of the pin cushion circuitry and convergence network. Also some difference exists in deflection which may require adjustment of the VERTICAL HEIGHT and LINEARITY control to obtain a full raster.

### Color-TV Chassis CTC51 Series—"Hum-Bar" Interference

There is the possibility of a hum-bar in the picture on TV sets employing this chassis when operated in weak-signal areas. The interference appears as the "silicon-bar" type normally associated with the power supply rectifiers. In some cases the interference may be from the neon channel indicator bulbs. In current production the bulbs are operated on



dc as shown in the partial schematic. An alternate method, which may eliminate the interference on one channel but not another, is to add a capacitor as shown.

## GENERAL ELECTRIC

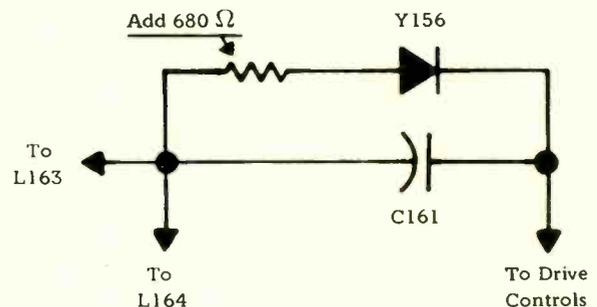
### Color-TV Chassis N-2—One Color Missing

Remove the picture tube socket and check G-2 (Pins 2, 5, 12) and G-1 (Pins 3, 13, 16) socket voltages. If one voltage is much lower than the other two, this terminal may be shorted to ground (Pin 8) through the spark gap.

If the suspect terminal reads a very low resistance to ground, replace the socket with part no. EP34X12. Do not attempt socket repair. Check resistors R531, R532, R533 for changes in value.

### Color-TV Chassis N-2—Blooming Picture

When either diode Y155 or Y156 fails, add a 680Ω, 1/2 w, 10% resistor in series with the anode side of Y156, as shown in illustration. Splice the resistor to the anode side of



Y156 and insert the assembly into the circuit board where Y156 was removed. This will correct the problem, which is basically caused by internal arcing in the picture tube.

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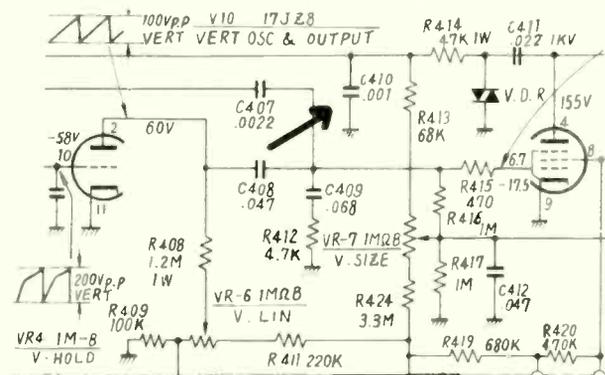
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Sylvania rare earth red phosphors	yes	yes	yes
Other manufactured rare earth phosphors	no	no	yes
All sulfide phosphors	no	no	no
X-ray inhibiting glass	yes	no	no
New glass	yes	some	some
Reused glass	no	some	some
Regunned	no	no	some
Screen blemish specs	OEM	OEM	slightly wider than OEM
White field uniformity	OEM	slightly wider than OEM	slightly wider than "RE"
Cut off; purity currents; beam shield leakage	OEM	OEM	slightly wider than OEM



### TV Chassis NEC—Vertical Sweep Failure

Vertical sweep failure (white line) may be caused by shorted capacitor C410 located in the plate feedback net-



work of the vertical oscillator and output tube, V10, in the vertical output stage.

### Tape Deck TD20—Displaced Drive Belts

A problem of displaced drive belts is generally the result of the belt slipping on the motor pulley caused by a coating of oil found on the surface of the motor pulley and inner surface of the drive belt. This condition is attributed to an oil spray liberated from the upper motor bearing as the operating temperature rises. Therefore, a cold motor may not show signs of this condition until its temperature has sufficiently increased after the first hour of operation.

To correct the displaced belt problem in this model use the following procedure:

- Completely remove drive belt from mechanism.
- Operate motor continuously (without belt) for a period of four hours.
- Wipe motor pulley and capstan pulley clean of oil coating.
- Invert belt and reinstall so that the dry side becomes the inner surface.
- Replace chassis and secure. No further problems with this condition are anticipated.

### GENERAL ELECTRIC

#### New 3DS3 High-Voltage Rectifier Tube

The type 3DS3 tube is a new high-voltage rectifier with integral x-radiation shielding used in current KE-II, C2/L2 and N2 TV chassis.

The new tube is not interchangeable with any other present rectifier tubes. Interchanging tube types will not deliver high voltage in most cases, but if high voltage is developed, the circuit is not operating properly. Slight changes in component values and circuits were made to compensate for the addition of the integral tube shielding in the tube. Always replace the 3DS3 only with the latest version of the same type, for continued protection against x-rays.

The 3DS3 high voltage rectifier tube is heavy and, without support, it could fall out of its socket during shipment. For shipping purposes, a white plastic strap is used to hold the tube in place, but when a tube is to be replaced, cut the strap off and discard. A few 3DS3 tubes were held in place in the KE-II color-TV chassis with silicone rubber applied around the tube keyway. Use extreme care in removal or the keyway may break off.

Never arc the 3DS3 tube plate cap to the chassis, because of possible damage to the x-radiation shield, creating a fire hazard.

## UPDATE WITH SOLID-STATE!



# 5<sup>TM</sup> SOLID-TUBES

replace **25** vacuum tubes



Pull out those troublesome vacuum tubes. Plug in the new SOLID-TUBES from EDI, pioneers in high voltage, solid-state devices for the TV industry.

PART NO. EDI	REPLACE VACUUM TUBE TYPES
SOLID-TUBE <sup>TM</sup> R-3A3	3A3, 3AW3, 3B2, 3CA3, 3CN3, 3CU3, 3CZ3, 2CN3, 1B3, 1G3, 1K3, 1J3
SOLID-TUBE <sup>TM</sup> R-3AT2	3AT2, 3AW2, 3BL2, 3BM2, 3BN2
SOLID-TUBE <sup>TM</sup> R-3DB3	3DB3, 3DJ3
SOLID-TUBE <sup>TM</sup> R-2AV2	2AV2, 1V2
SOLID-TUBE <sup>TM</sup> R-DW4	6DW4, 6CK3, 6CL3, 6BA3

#### CONSIDER THESE BENEFITS . . .

- consistent output
- more reliable — longer life
- no filament winding repairs
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- real cool
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Order EDI SOLID-TUBES from your parts distributor. Or call us collect. Write today for FREE new solid-state replacement parts guide.

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## NEW PRODUCTS

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

### CCTV CAMERA 703

*Operates with as little illumination as 2 ft candles*

The WV-200P CCTV camera designed for surveillance applications is capable of operating with as little illumination as 2 ft candles. Its automatic light compensation circuit reportedly accommodates lighting variations greater than 5000 to 1. This

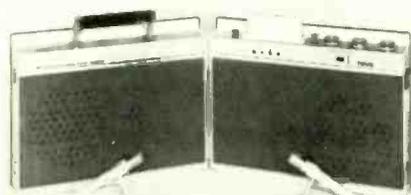


camera has horizontal resolution of more than 550 lines. It uses a 2/3-in. separate mesh vidicon for lower lag, lower video noise levels. Weight is 4.4 lb. The new diecast frame increases reliability and allows easier maintenance. Target voltage is controlled automatically, and once the beam and focus are set for normal operation, simply turning the camera ON and OFF is all that is required for surveillance operations. Matsushita Electric Corp. of America.

### RECORDER/PLAYER 704

*Operates on flashlight batteries*

The Toyo Model 403 is a completely portable 8-track stereo cartridge recorder/player with a FAST-FORWARD



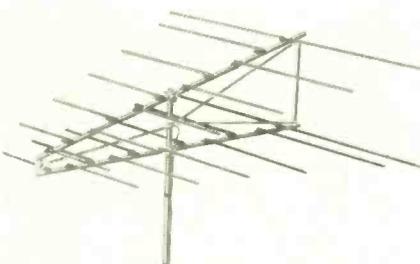
control switch for extra program selection convenience. It reportedly oper-

ates on flashlight batteries and has built-in cords for plugging into standard ac outlets or into auto/boat/plane cigarette lighters. In addition to the FAST-FORWARD switch, controls include left and right channel VOLUME controls, TONE control, MONITOR ON/OFF switch, RECORD button, AC/BATTERY switch and MANUAL/AUTOMATIC program selector with channel indicator lights. Included with the unit are two pencil-type dynamic microphones with stands, and two auxiliary cords for recording from FM-stereo tuners or any other stereo source. The cabinets have high-impact plastic, fully molded backs, with metal luggage-type fasteners and handles, and are finished in black/white/chrome with aqua grill cloths. One 6 1/2-in. speaker is in each cabinet. The two cabinets are separated for stereo listening, and snap together for easy carrying. Total weight is 17 lb. Suggested retail price: \$129.95. Toyo Radio Co. of America, Inc.

### MATV 705

*Delivers 25dB front-to-back ratio*

The new MATV Super Vector antenna reportedly is a 75Ω antenna en-



gineered to deliver front-to-back ratios, directivity and stability. It reportedly has a 25dB minimum front-to-back ratio, has ghost killing ability and provides maximum rejection of interference from unwanted channels with narrow beam width and high directivity. Channel Master.

### TV MONITOR 706

*Completely solid-state except picture tube*

The Model MV-900 is a 9-in. CCTV monitor that is completely solid-state except for the picture tube, and reportedly uses the latest advances

in integrated circuits, plus plug-in modules. It provides 450 line resolution. Video amplifier gain is said to be at least 30dB with the signal-to-noise ratio exceeding 32dB. Video bandwidth is 6 MHz. Composite video signals (1.4v, p-p) can be fed into the MV-900 through a UHF type SO-239 input connector. Video signals can be



looped through the monitor and taken out of a second SO-239 connector. A 75Ω termination switch is provided to terminate the coaxial cable when no loop-through connection is required. The monitor measures 8 1/2-in. wide by 9 1/8-in. high by 8 1/2-in. deep. It weighs approximately 9 lb and is housed in a compact cabinet. GBC Closed Circuit TV Corp.

### DAMPER DIODES 707

*Eliminate the need for soldering*

A pair of damper diodes and a special parallel clip reportedly eliminate the need for soldering. The D320 consists of two diodes physically locked



in parallel with the special clip—the complete assembly snapping into the  
*continued on page 74*

# How to tell which is the largest compact van built in America.

(No matter how you look at it.)



**If you can't close the rear doors,  
you haven't loaded a Dodge Maxivan Strong Box.**

And you'd better get one.

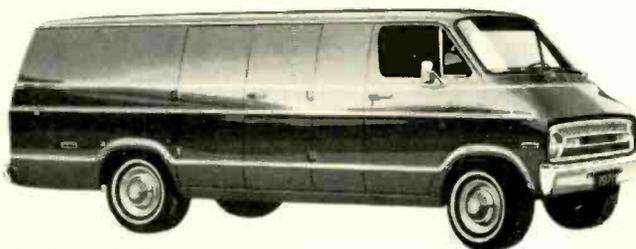
**Dodge Strong Boxes give you a lot more than just more room:** Independent front suspension and longer 127-inch wheelbase mean better handling and ride.  Shorter turning circle. Even with a 127-inch wheelbase, you have greater maneuverability.  Wind-tunnel body and curved windows reduce wind-sway effect.  Front wheels can be inexpensively aligned on passenger-car equipment.  Biggest V8 engine offered. 360 cubic inches.\*  Three-speed TorqueFlite automatic transmission\* with a choice of three engines available on all models.  Integral power steering.\*  Power brakes.  Fresh Air air conditioning\* and exclusive Fresh Air heater provide even flow of clean air. Air is not recirculated.  High-level air intake helps keep incoming air cleaner.  Front passenger's seat does not block side cargo door entrance.  Both front seats are easily adjustable.  Concealed side safety-step offers firm footing since it doesn't collect ice or snow.  Wider front doors and door steps and less wheelhouse intrusion make for easier ins and outs.  Full-foam padded bucket seats up front give softer ride and more comfort.



Two-stage door checks conveniently hold doors in two positions.  Biggest gas tank. 26 gallons.  Smaller engine cover is easy to remove for servicing. Also, easier for driver to reach back seats.  Extra rust protection on undersides, doors, and panels.  Large hood opening. Battery, dipstick, and radiator are easy to reach.  Engine can be removed quickly and easily through the front.  And the list continues at your Dodge Dealer's.



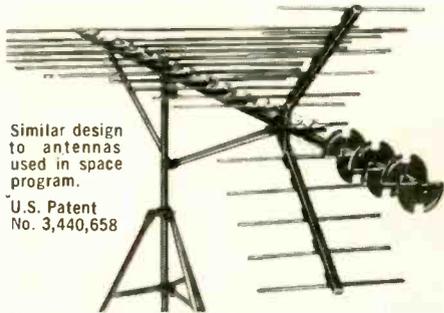
**Dodge Maxivan takes the "packed" out of compact vans!**



\*Optional at extra cost.

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**"STAR-TRACK"™ the most  
Advanced Space-Age  
VHF/UHF/FM Color  
Antennas ever introduced!**



Similar design to antennas used in space program.

U.S. Patent No. 3,440,658

- Corner Reflector Driven Disc Director Array for total UHF coverage!
- Multiple Tuned, Cut-to-Channel VHF Elements for total VHF and FM coverage!
- Maximum construction for long installation life!
- Exclusive Reynolds Aluminum COLORWELD durable baked enamel Gold finish!
- Includes RMS SP-332 VHF/UHF Splitter for economical single down-lead installation!

Model	RANGE OF RECEPTION	
	VHF	UHF
SK-716	Up to 50 miles	Up to 50 miles
SK-1117	Up to 125 miles	Up to 75 miles
SK-1519	Up to 150 miles	Up to 100 miles
SK-13	—	Up to 25 miles
SK-15	—	Up to 50 miles
SK-19	—	Up to 100 miles

Write for Catalog **RMS ELECTRONICS, INC.**  
Profit 50 Antin Place, Bronx, N.Y. 10462  
Details!— Tel. (212) 892-6700

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**NEW PRODUCTS...**

*continued from page 72*

original equipment damper diode holder. Until now damper diodes required careful lead preparation and extensive soldering to be wired in parallel. The dual diode concept resulted because of the high servicing rate of single diode configuration in the sweep generation circuitry. The D32 is available in bubble-pack cards of 10 units (20 diodes) per card. Price: \$4.80 dealer net. International Rectifier Corp.

**PRESERVATIVE COMPOUND**

*Protects metals from rust and corrosion* **708**

LPS #1 is reportedly an organic metal preservative compound that deposits a microthin, non-greasy, non-gummy film on any metal. Its moisture-proof molecular film, with capillary action, spreads evenly and easily to cover large areas at low cost. LPS #1 protects metals from rust and corrosion and penetrates existing rust and corrosion, stopping them from spreading. Specifications indicate that the compound is di-electric, drives out moisture and dries out wet motors and ignition systems in seconds. It is reportedly effective at extreme temperatures and will not oxidize, is harmless to paint, rubber, fabrics, plastics and other finishes and can be painted, plated, welded and soldered over. LPS Research Labs., Inc.



ifications indicate that the compound is di-electric, drives out moisture and dries out wet motors and ignition systems in seconds. It is reportedly effective at extreme temperatures and will not oxidize, is harmless to paint, rubber, fabrics, plastics and other finishes and can be painted, plated, welded and soldered over. LPS Research Labs., Inc.

**SOLDER TEMPERATURE METER**

*Covers temperature range between 400°F and 900°F* **709**

A compact, portable thermocouple type temperature meter designated,



Loner, is now available to set any desired temperature between 400°F and 900°F for the Loner soldering iron described in our September issue. The

meter features an expanded mirror scale offering ease of reading and close calibration accuracy. The Loner meter is supplied in a thermoplastic protective cover, and a 5-ft. general-purpose thermocouple probe is included. Edsyn Inc.

**TV FIELD STRENGTH METER**

*Battery operation, solid-state circuitry* **710**

Battery powered operation, solid-state circuitry and light-weight portability are among several features of the Model LFC-943 field strength meter. This field application instrument is used for the installation and



orientation of TV antennas, including those used in MATV and CATV systems. It features a combination dB/mv scale, a precision decade attenuator and a level indicator. It also provides a 75Ω input (VHF), 300Ω (UHF), and "F" connector; and is equipped with an earphone for audible signal checks and noise tracks. It is said to be complete with a sturdy carrying case and a neck strap for a hands-free use. Price is \$375.00. Leader Instruments Corp.

**GENERATOR** **711**

*Can calibrate scopes or audio systems*

The Tone-Burst Generator, Model TBG-4, is a gated type instrument featuring 2MHz, 3dB bandwidth. The



burst width adjusts from 1μsec to 100msec and the period varies from 10μsec to 1 sec. Overshoot and ringing are too low to measure, 170ns rise and fall times, 70ns through-put delay, 5v p-p output, and input and output Z of 10K and 2Ω respectively. Gate switching is phase coherent with the input. This instrument can be used for accurately calibrating audio sys-

**hfe** **HFE PRE-SCALERS**

**MODELS**  
300  
200



300 MHz FOR \$192.00

- **INEXPENSIVE** means to extend frequency range of existing counters
- **SENSITIVITY** sufficient to allow driving the Pre-Scaler with only an antenna (50 mv to 175 MHz, 100 mv to 250 MHz, 150 mv to 300 MHz)
- **ACCURACY** same as your existing counter
- **FREQUENCY DIVISORS:** 10, 100, or 1000
- **DRIVES** all known frequency counters
- **FREQUENCY RANGE:** 30 to 320 MHz typical
- **GUARANTEED** one year
- **PRICE:** Model 200 (250 MHz typical) . . . . . \$141.00  
Model 300 (320 MHz typical) . . . . . \$192.00  
Model 300X (360 MHz typical) . . . . . \$212.00

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tems or scope traces. Price: \$179.95 (\$105.95—Kit) TFE.

## MOTION ATTENUATOR 712

*Features adjustable damping and 4 1/8-in. range of travel*

Designed for audio mixing operations, the LM8A reportedly uses conductive plastic resistance elements and slip rings with precious metal wipers to achieve long life and low noise in audio balance applications. The LM8A features adjustable damping and a full 4 1/8-in. range of travel. The unit has the following specifications: Input impedance—600Ω or 1,000Ω std. Attenuation range—0 to 90dB stepless. Noise—20μv.

Scale accuracy—±0.5dB from 0 to 20dB; ±1dB from 20 to 50dB. Tracking—within 1dB. Insertion loss—6dB attenuator mode. Waters Mfg., Inc.



## AEROSOL EXTENSION NOZZLE 713

*Permits application of cleaning 713 spray to minute areas*

The Cobra is a flexible extension device for the precise application of many of the manufacturer's aerosol



cleansers. The extension nozzle permits application of the cleaning spray to minute, localized areas of printed-circuit boards, instrument circuits, EDP and magnetic recording heads, miniature contacts and other difficult-to-service points. The regular valve is removed from the aerosol can and the extension unit pushed firmly into place. A wire hook is engaged under the rim of the can top to permit spraying and released to relieve pressure during storage. Miller-Stephenson Chemical Co.

Wading through reams of manufacturers' references is the hard way to find transistor replacements. We know, because we checked over 40,000 types to find the "Functional Fifty" that cover 99% of your functional needs.

Now we've put them on our new Transistor Application Slide-Rule so that you can locate a replacement every time — in seconds. All you have to know is the transistor's function and polarity.

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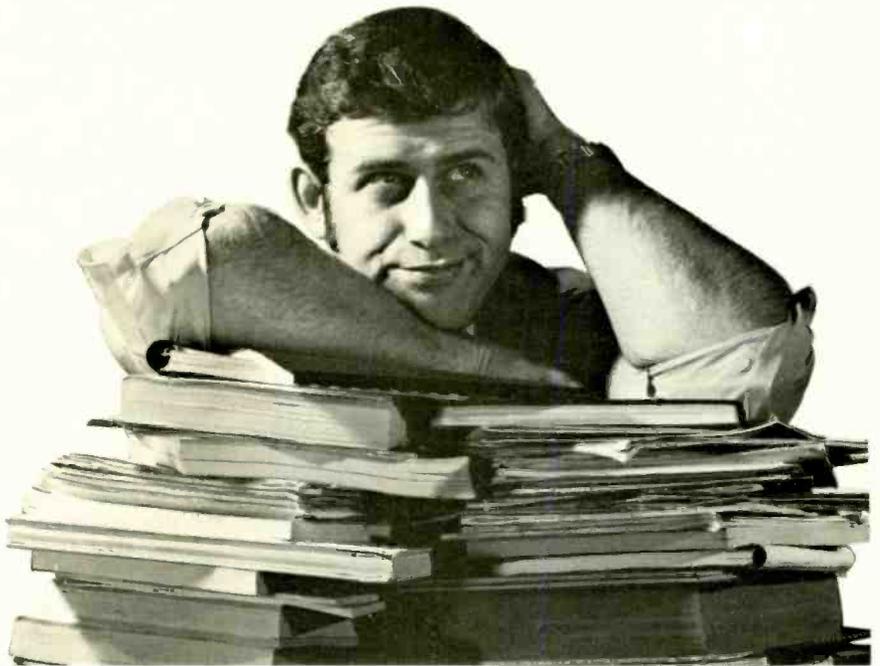
placement numbers, special sources and waiting for deliveries.

You'll save money, too. You stock fewer types to do more jobs. And when you buy ten IR premium quality transistors, you get 20% off net, not the usual 10% other brands allow.

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To Big Red... the spray foam that cleans, polishes and lubricates TV tuners to save you time and effort. Use on all color and black & white tuners to help eliminate noise and improve picture quality, without drift or detuning. It's non-flammable, non-toxic and safe for plastics. Big Red's just one of a full line of electronic spray chemicals available from your RCA Parts and Accessories Distributor.

Stay tuned with Big Red. And your customers will stay switched-on.

RCA Parts and Accessories, Deptford, N.J. 08096



## DEALER SHOWCASE

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

### TURNTABLE

714

*Has three speeds and automatic tonearm*

The BSR McDonald 6500/X is a full-size ceramic output turntable. It is said to include a full-size platter, anti-skate control, cue and pause, automatic tone arm lock, and a stylus



pressure indicator. The 6500/X is a total three-speed turntable—complete with base, dust cover, ceramic cartridge and diamond stylus—all assembled, adjusted and packed in one carton. BSR McDonald.

response— $\pm 0.1$ dB, 20Hz to 20kHz at 1w; phase response— $\pm 15^\circ$ , 20Hz to 20kHz at 1w; power bandwidth— $\pm 1$ dB, 5Hz to 20kHz at 75w; hum



and noise—110dB below 75w output; distortion—IM less than 0.05%, 0.01w to 75w or harmonic less than 0.05% at 75w; separation—better than 90dB, 20Hz to 20kHz; damping—greater than 200, 0Hz to 1kHz; input-impedance—25K adjustable; sensitivity—1.2v for full output. The weight is 22 lb. rack mounted 24 lb, and the dimensions are 17-in. wide by 5 $\frac{1}{4}$ -in. high by 9-in. deep. Price: \$399.00 without panel, \$429.00 with panel, walnut cabinet \$33.00. Crown International.

### RECORDING ACCESSORIES 715

*Display of maintenance products*

The QM-Series includes liquid and spray tape/head cleaners, cartridge and cassette head cleaners, cartridge reel-to-reel and cassette head demagnetizers, bulk tape erasers, splicers, splicing tape, reel-to-reel and cassette alignment tapes and a series of dual purpose products that clean and demagnetize

or clean head and capstan. The products are available in an eye-catching display. Nortronics Co., Inc.



### 150W AMPLIFIER 716

*Designed for large audio installations*

The dual-channel Model D-150 amplifier features the following specifications: 150w rms output on both channels at rated distortion with 8 $\Omega$  speakers (typically 100w per channel at 8 $\Omega$ , 180w per channel at 4 $\Omega$ ); frequency

### CCTV SYSTEM 717

*Features solid-state TV camera with F 1.6 lens*

The Mini-Scan CCTV system features a solid-state TV camera with F 1.6 lens, a 5-in. TV receiver with 14 sq in. diagonally measured viewing area, complete with controls for sound, brightness and contrast. A 2-way intercom connects to the TV receiver with supplied connecting cable. Also included is 30 ft of camera-monitor connecting cable. Installation reportedly is fast and simple, requiring only minutes without special tools. The 10-in. by 4-in. by 8-in. TV receiver



is encased in a black plastic cabinet with polished silver trim. The camera is interchangeable with telephoto or wide-angle lens. Shipping weight for the system is 18 lb. Kevtron Electronics, Inc.

# Fastatch II

THE RIGHT CONTROL.  
THE FIRST TIME.

Fastatch II is Centralab's precise, complete answer to control replacement in radio, TV, stereo and auto radio. It makes possible more than 9 billion combinations—thus your Centralab Fastatch II Distributor can serve you best—now. The Fastatch II snap-together control exceeds OEM requirements because of these built-in features for constant service.

- Patented, snap together, permanent locking, anti-backlash construction on dual and twin controls.
- No alignment or twisting of controls.
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Get the right replacement faster  
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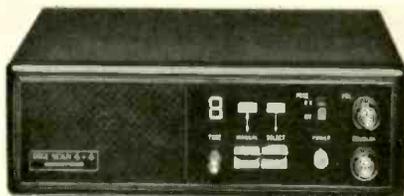
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## DIGI SCAN

718

Permits simultaneous monitoring  
of eight government channels

The Digi Scan 4+4 is an eight channel scanner designed to alleviate the problem of band selection in a receiver at a time when many Federal, State and Municipal agencies have or will change operating frequencies. The unit is said to accomplish this by permitting simultaneous monitoring of 4 channels on any two out of three



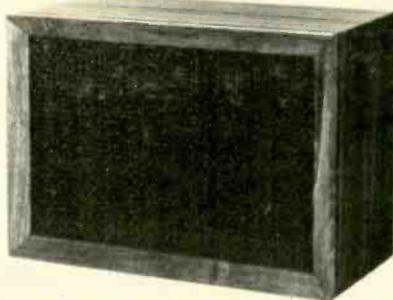
bands. Features include a front panel scan rate control, a front panel PRIORITY CHANNEL switch, priority channel carrier delay, individual channel LOCK-OUT switches for programmed listening, VHF, UHF or low band interchangeable drop-in front modules, rear panel antenna selector switch and two rear panel antenna jacks. It has a variable SQUELCH control with all test points readily accessible for quick, easy measurements and a separate pushbutton ON/OFF switch. The easy-open compartment allows for instant crystal changes. Uni-metrics, Inc.

## COINCIDENT INTRUSION ALARM

719

Features dual ultrasonic and  
ultrahigh frequency sensors

The Model RA-3 coincident intrusion alarm system reportedly combines the best features of ultrasonic and ultrahigh frequency sensors. Both must be triggered to initiate the alarm. Also



featured are individual sensitivity controls for each mode, an optional remote area ultrasonic sensor, and provision for connection to a closed loop perimeter system. The system is enclosed in a small speaker cabinet and operates on 24v ac from transformer or a self-contained, rechargeable standby power pack. Bourns Security Systems, Inc.

# Telematic

PROFESSIONAL COLOR TV  
SERVICE EQUIPMENT

## ECONO JIG Color Test Jig



\$49.95 Net  
less tube

- Complete with all components and cables.
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## ADAPT-ALLS Yoke Convergence Adaptors



- To service all sets with any test jig.
- FREE: Write for cross-reference listing thousands of sets.

## TRANSVERTERS Service Solid State TV



- On any make test jig with simple plug-in Transverter.

## MOLEX CUSTOM CABLE KIT Make all combinations of Molex Cables

CR-596 contains:

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- 18 wires, contacts attached.
- Extractor tool.



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MARCH 1972, ELECTRONIC TECHNICIAN/DEALER | 77

## TEKLAB ...

*continued from page 66*

A video signal from the video detector is fed to Terminal 10 of the IC, an input of the video amplifier, and the amplified video signal is obtained at Terminal 13. The video amplifier emitter is also contained in the IC and connected to Terminal 12, the CONTRAST control (R305) being connected through resistor R306.

Another video output signal is obtained at Terminal 11 for the chrominance bandpass amplifier. This signal is fed to a high-peak transformer, T401, through capacitor C401.

Another amplified video signal from the IC (Terminal 14) is fed back into the same IC (at Terminal 15) for sync separation, noise cancellation and AGC, respectively. This noise canceler reportedly performs better than the conventional type, because the detecting level of the noise signal is set closer to the signal level, allowing the sync separator and AGC circuit function to be more stable.

The sync signal output is obtained at Terminal 16 of the IC. A peak value AGC is employed and the characteristics are similar to keyed AGC, but with reportedly better performance against flutter, because the response speed is made faster by higher loop gain.

Next month we will review the automatic fine tuning (AFT) and the audio circuitry which consists mainly of IC's. Also, we will discuss the chrominance output circuitry employing the R-G-B direct drive system for simplified circuit composition and better color reproduction. ■

## SEMI-TIPS ...

*continued from page 62*

a high-quality replacement will be selected and therefore leakage currents will be well within the circuit tolerance. Since collector currents are rarely noted on schematics, this factor will usually have to be determined by actually inserting a dc ammeter in series with the collector

terminal. The circuit should then be driven to its maximum capabilities, and the actual current reading should be noted. The replacement device selected should have a maximum collector-current rating ( $I_c$ ) of at least three to four times this rating in order to provide an adequate safety factor.

**Frequency**—Since this article is primarily aimed at low-frequency applications (audio, horizontal output, vertical output, drivers, inverters, etc.), it will be assumed that devices having an operating frequency of 500kHz to 6MHz will serve the purpose. In most catalogs and data sheets, the typical operating frequency will be specified as  $f_c$  or  $f_{os}$  and the replacement device that is selected should have a typical frequency characteristic several times greater than the actual operating frequency of the circuit.

**Gain**—There are many different types of gain considerations, and the subject can become quite involved and complex. However, for this article the only gain parameter considered is the common-emitter dc *continued on page 80*

## Why pay an answering service when you can own your own?



Dictaphone has a machine to make sure you never lose another cent through a missed phone call or a garbled message. In fact, we have a whole line of them.

They're called Ansafones. You can buy one outright or possibly lease it for about what you're paying your answering service now. And it works for you 24 hours a day, 7 days a week.

For a free brochure describing how much an Ansafone can help you, mail this coupon now.

### ▶ Dictaphone

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Please send me full details of the Ansafone line.

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Company \_\_\_\_\_ Phone \_\_\_\_\_

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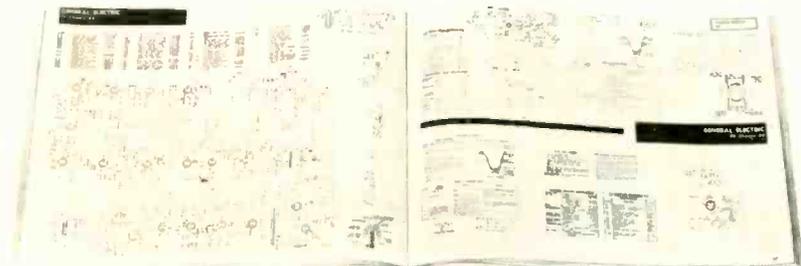
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## SEMI-TIPS...

*continued from page 78*

current gain,  $h_{FE}$ , or beta (sometimes abbreviated  $\beta$ ). This particular gain parameter is by far the most commonly used and is specified on most data sheets and catalogs.

The largest percentage of audio output, horizontal deflection and vertical deflection stages are designed around low to medium-low gain devices that will have a typical  $h_{FE}$  between 30 and 100. Driver and buffer stages are usually designed around medium to medium-high gain devices having a typical  $h_{FE}$  between 80 and 200. When attempting to replace an unknown or unlisted device, these figures can serve as a good rule-of-thumb, however, the occasional exception will be encountered and can possibly be isolated from the following generalized statements: Deflection stages will usually exhibit severe ringing and/or improper deflection if the gain is too high. If the gain is too low, deflection will be inadequate or may not occur at all. Audio stages may show signs of severe harmonic distortion if the gain is too high and will possibly have low volume accompanied by intermodulation distortion if the gain is too low.

**Power Dissipation**—This term ( $P_D$ ) is actually an indication of the heat dispersion capabilities of the transistor and should not be confused with, or interpreted as the output power ( $P_{out}$  or  $P_o$ ) capabilities, which are usually much less than the rated  $P_D$ . The output power, in watts, follows a very similar temperature derating curve as presented earlier and the importance of a high-quality silicone grease should be stressed again.

**Physical Compatibility** (case style)—As illustrated and explained earlier, many of the various case styles are easily adapted to fit the required circuit board or chassis and little technical ingenuity is required.

Many of the audio output stages encountered will be of the "single-ended" variety (using only one transistor) while others will use multiple devices. Most of the multiple-transistor stages will be either one of two types of circuitry—push-pull or complementary symmetry.

When replacing transistors in a push-pull circuit, *both* transistors

should *always* be replaced. Best performance (lowest total distortion) will be achieved by testing the replacement devices on a transistor tester and selecting two that have a very similar  $h_{FE}$  reading. In some very high-power amplifiers, several transistors may be connected in a push-pull parallel arrangement. Again, all of the devices should be replaced and selected for similar  $h_{FE}$  readings.

Complementary symmetry audio output stages have become very popular since they offer good output power capabilities, low distortion, will operate from a single power supply source, do not require a phase inverter, and the  $h_{FE}$  selecting is relatively unimportant. Complementary circuits feature the use of two devices—one that is NPN and one that is PNP, both having essentially the same characteristics but of opposite polarity (thus being complementary).

Another very important servicing facet is the use and interpretation of service-type waveforms as presented on a scope. Critical waveforms are usually presented in most of the

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available servicing schematics and their proper use can prove to be a most valuable aid.

It is sincerely hoped that the information presented here will prove beneficial in repairing those "impossible" sets, saving valuable time and presenting a high-quality repair job to the customer. After a few experimental attempts, the good technician should become quite proficient in selecting a satisfactory replacement. ■

## MAY CO. . . .

*continued from page 55*  
various theft situations. This provides valuable information on deployment of personnel.

"Everything we do is put on a complaint form and into a computer so that we can analyze the type of merchandise stolen and its value and the time of day it may have been lifted," he said.

"As a result of this data, we know how to deploy the Mod Squad—in what branch, time of day, etc. For example, we might have a school across from a store. We'll do better with an older Mod Squad for four hours in the morning and through the lunch hour. However, at 3:00 p.m. we send in a younger team because of the influx of teenagers."

Teenagers pose a serious problem for many stores, and the May Co.'s security force feels that advertising the extent of its work can be effective with many youngsters who might be bent on a "lark" at a retailer's expense.

"During the summer we hire high school girls," he explained. "We put them in a quasi-uniform type of thing—usually a culotte or mini-skirt, black boots, hat and a security patch. We put them on the floor to circulate around the store.

"We always pick the girls from different high schools. All their friends come down to the store to see them and hence get exposure to the elaborate security operation we have. This is a deterrent to any of them that might get the idea that it's easy to steal from us."

More important are the May Co.'s figures that indicate that the repeat shoplifters and also the professionals are not coming back to the stores.

"The integrated security system we have in the stores resulted in 1300 arrests in 1968, 2201 in 1969, and 2850 arrests in 1970," Mr. Clark said. "So we have had an increase in the number of arrests and at the same time our inventory situation is looking much better, especially in areas where we were hav-

ing definite theft problems. We know that as a result of using video, two-way radios, and training our people more thoroughly, we are catching more thieves. And most of these are first offenders. The number of repeats has gone down."

As for the cost of a video tape security system, he indicated that this can be written off in about four or five years.

"And there's no question in my mind that a retail store like ours should use video," he said. "But the system is going to last much longer than that, and with very little maintenance—once in a while a service call on a camera—which is handled by Fryan Audio-Visual, the Panasonic dealer we bought the video system from. They provide full back-up for our installation." ■



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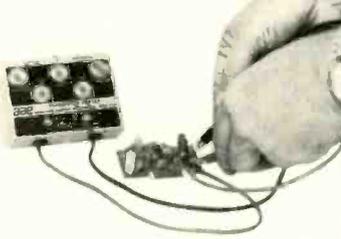
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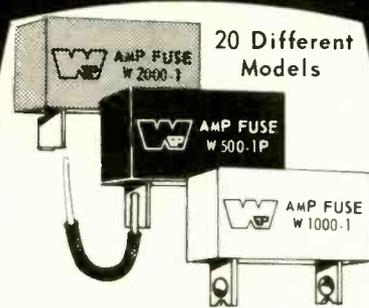
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- In using a wrench, it is better to pull than push. If it is necessary to push, use your open palm.
  - Use the proper lifting procedures: Crouch as close to the object as practical; get a good grip on it; keep your feet apart and bend your knees; lift slowly by straightening your legs (keep your back relatively straight—your leg muscles, not your back, should do the work).

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