

# ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

PREVIEW 1969 COLOR TV  
TV Remote Controls  
Breakthrough to Video Tape

FRISEX10812392N869A03A17966D  
WILLIAM W. FRISE  
7176 GALE RD  
ATLAS MI  
48411





## Another benchwarmer?

Not this one. Our new B&K Diagnostic Oscilloscope is more than re-engineering of an old model to keep pace with TV technology. It is instead a basic departure from all other oscilloscopes. A departure that has simplified a complex instrument to make it easier for you to use. But there's something else.

What this oscilloscope has is exclusive. An Intermittent Analyzer with electronic memory—and optional remote Audio/Visual Alarm.

With it, the elusive intermittent conditions that make so many TV sets tough dogs can now be detected and identified in your absence. Preset one control.



When the faulty stage is detected, you'll know about it as soon as you come back from service calls. Then run the scope overnight to check another set for an intermittent condition.

All this adds up to greater shop efficiency, more time for profit-making service calls and a lot more mileage out of a very fine diagnostic oscilloscope.

An oscilloscope that shows vector patterns exactly as specified by color TV manufacturers. (All vectorscope inputs and controls are conveniently located on the front panel.) Also allows you to read peak-to-peak voltages in all ranges on a double-scale calibrated screen—just by turning a switch. (As the range is selected, the appropriate scale lights automatically.)

Automatic synchronization locks in all patterns at any signal level or frequency. There are also fewer controls and these are positioned for easier operation.

Give our Diagnostic Oscilloscope some thought. It's worth it not to be sidelined with a benchwarmer. See your B&K Distributor or drop us a note for detailed literature on Model 1450 and our full-line test equipment catalog, AP-24.

**DIAGNOSTIC OSCILLOSCOPE**  
Model 1450, Net: \$279<sup>95</sup>



B & K Division of DYNASCAN CORPORATION  
1801 W. Belle Plaine · Chicago, Illinois 60613  
Where electronic innovation is a way of life.

... for more details circle 101 on postcard

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS  
AND TECHNICAL INFORMATION FOR 6 NEW SETS

GROUP  
**194**

	SCHEMATIC NO.	SCHEMATIC NO.
<b>AIRLINE</b> .....	1183	<b>MAGNAVOX</b> ..... 1186
Color TV Models GEN12069A, GEN12349A		TV Chassis T917 Series
<b>ELECTROHOME</b> .....	1185	<b>RCA VICTOR</b> ..... 1182
TV Chassis M4		TV Chassis KCS174 Series
<b>GENERAL ELECTRIC</b> .....	1184	<b>ZENITH</b> ..... 1187
Color TV Chassis KE		TV Chassis 13Z13

**ELECTRICAL SPECIFICATIONS**

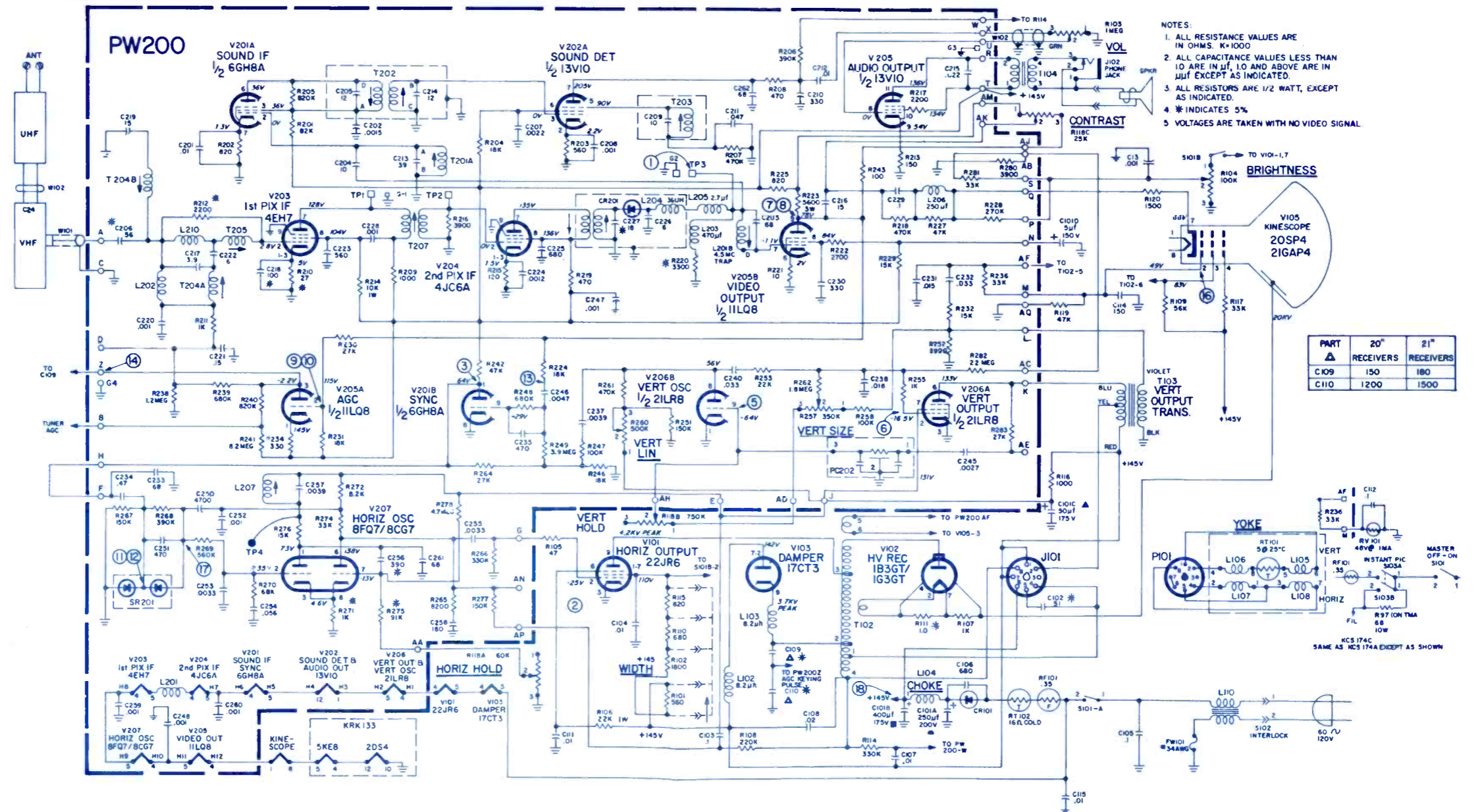
**ANTENNA INPUT IMPEDANCE** ..... 300 ohms, balanced  
**AUDIO POWER OUTPUT RATING** ..... 1.5 Watts (Max.)  
**FOCUS** ..... Electrostatic  
**POWER INPUT** ..... 120 VAC 60 Cycle  
**POWER CONSUMPTION** ..... 155 Watts

**TELEVISION R F FREQUENCY RANGE**

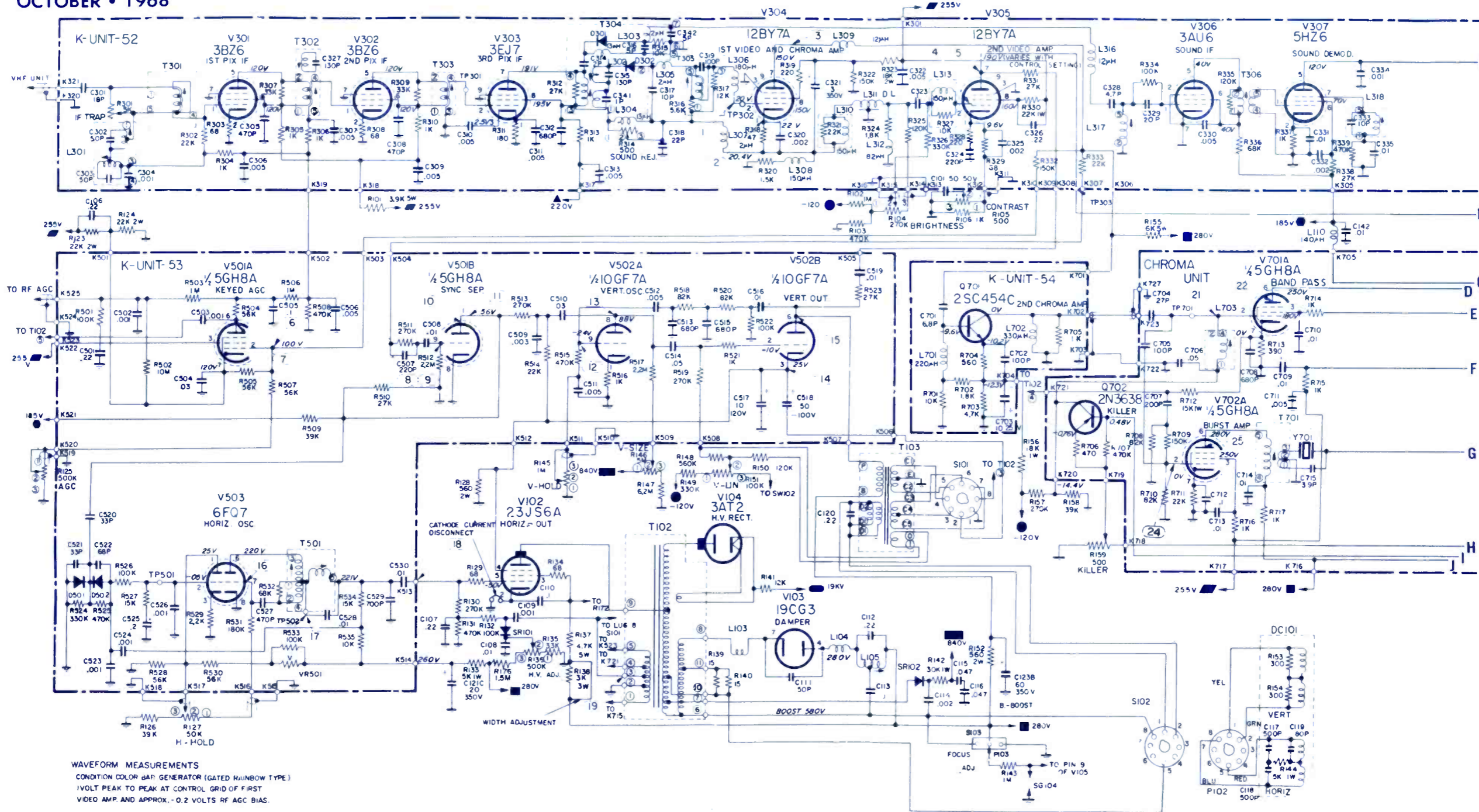
All 12 VHF Channels ..... 54 mc. to 88 mc., 174 mc. to 216 mc.  
 All 70 UHF Channels ..... 470 mc. to 890 mc.  
**VIDEO RESPONSE** ..... To 3.2 mc.  
**INTERMEDIATE FREQUENCIES**  
 Picture I F Carrier Frequency ..... 45.75 mc.  
 Sound I F Carrier Frequency ..... 41.25 mc.

SYMBOL	DESCRIPTION	RCA VICTOR PART NO.
	VHF tuner assembly	KRK 133AA, BB, BA
	UHF tuner assembly	KRK 122AC, BC
C101	4 section elect.	114845
C101A	250µf 100v	114845
C101B	400µf 175v	114845
C101C	50µf 175v	114845
C101D	5µf 150v	114845
C102	51pf 5% 2kv N1500 cer	116010
C109	150pf 5% 4kv N1500 cer KCS 174A-C	124269
C109	180pf 5% 4kv N1500 cer KCS 174B	124268
C226	6pf ±5pf 500v NPO cer	121225
C256	390pf 5% 500v N750 cer	121227
CPR101	circuit printed	109956
CPR102	circuit printed	109956
CR101	diode 400PIV 500mo	113998
CR201	diode 1N60	112524
L103	8.2µh	107385
L104	choke	124461
L110	line choke	114293
L202	AGC	114315
L203	470µh	124271
L204	36µh	116056
L205	2.7µh	107463
L206	250µh	109944
L207	stabilizer	114486

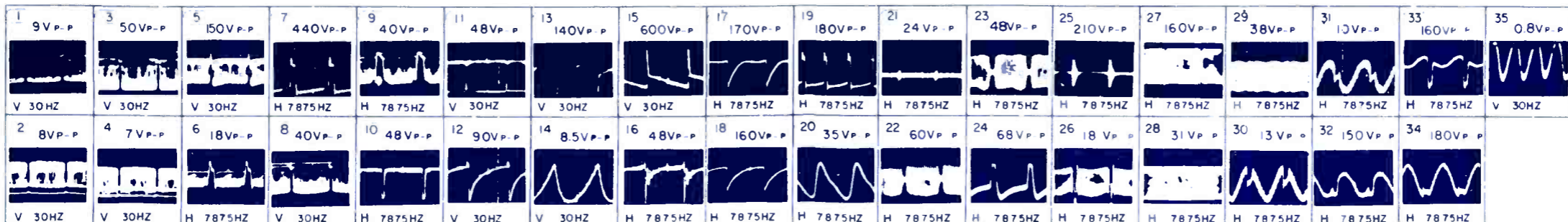
L210	RF	114314
PW200	circuit printed pix defl	124593
R118	control vert hold contrast	124279
	horiz hold KCS 1/4 1/2 A-C	124278
R118	control vert hold contrast horiz hold KCS 174B	124279
R210	27K 5% 1/2w film	239444
R212	2.2K 5% 1/2w film	228712
R220	3K 5% 1/2w film	227097
R223	5.6K 10% 3w film	104180
R257	control vert size	121223
R260	control vert lin	121944
R271	1K 5% 1/2w film	224254
R275	91K 5% 1/2w film	230848
RF101	fuse 35A 1.1a	124263
RT102	thermistor 16Ω cold	114480
RV101	varistor 48v 1mo KCS 174C	118506
T102	horiz output	124462
T103	vert output	124274
T104	audio output	124275
T201	4.5MHz	114489
T202	sound IF	118411
T203	quad	118410
T204	trap	114313
T205	IF grid	118696
T207	video IF	124276
T208	2nd det	121779
RT101	thermistor temp comp	118375
	yoke deflection AL 218, A1 242	124245
	Yoke deflection A1 306	125226



SYMBOL	DESCRIPTION	PART NO.		
C111	50pf 5kv 20% discap	TV31101	R138	3K 3w 10% carbon
C121A, B, C, D	20µf/20µf/20µf/20µf @350v elect	TV32152	R155	6K 5w 10% carbon
C123A, B	60µf/60µf @350v elect	TV32153	R171	412 20w 10% resin
C707	200pf 1kv 10% discap	TV31110	R104	270K pot bright (8V-348)
R101	3.9K 5w 10% carbon	TV23124	R105	500Ω pot bright (8V-153)
R122	2.2K 5w 10% carbon	TV23152	R111	1M pot blue screen (9V-132)
			R112	5K pot blue drive (9V-131)
			R114	1M pot green screen (9V-132)
			R116	1M pot red screen (9V-132)
			R118	5K pot green/red drive (9V-131)
			R125	500K pot AGC (9V-130)
			R127	50K pot horiz hold (8V-173)
			R136	500K pot HV adjust (8V-069)
			R145	1M pot vert hold (8V-172)
			R146	5M pot vert size (9V-128)
			R151	100K pot vert lin (9V-129)
			R159	500Ω pot color killer (9V-141)
			TV23154	
			TV23155	
			TV23159	
			TV25215	
			TV25216	
			TV25217	
			TV25218	
			TV25219	
			TV25221	
			TV25222	
			TV25223	
			TV25224	



WAVEFORM MEASUREMENTS  
 CONDITION COLOR BAR GENERATOR (GATED RAINBOW TYPE)  
 1VOLT PEAK TO PEAK AT CONTROL GRID OF FIRST  
 VIDEO AMP. AND APPROX. -0.2 VOLTS RF AGC BIAS.



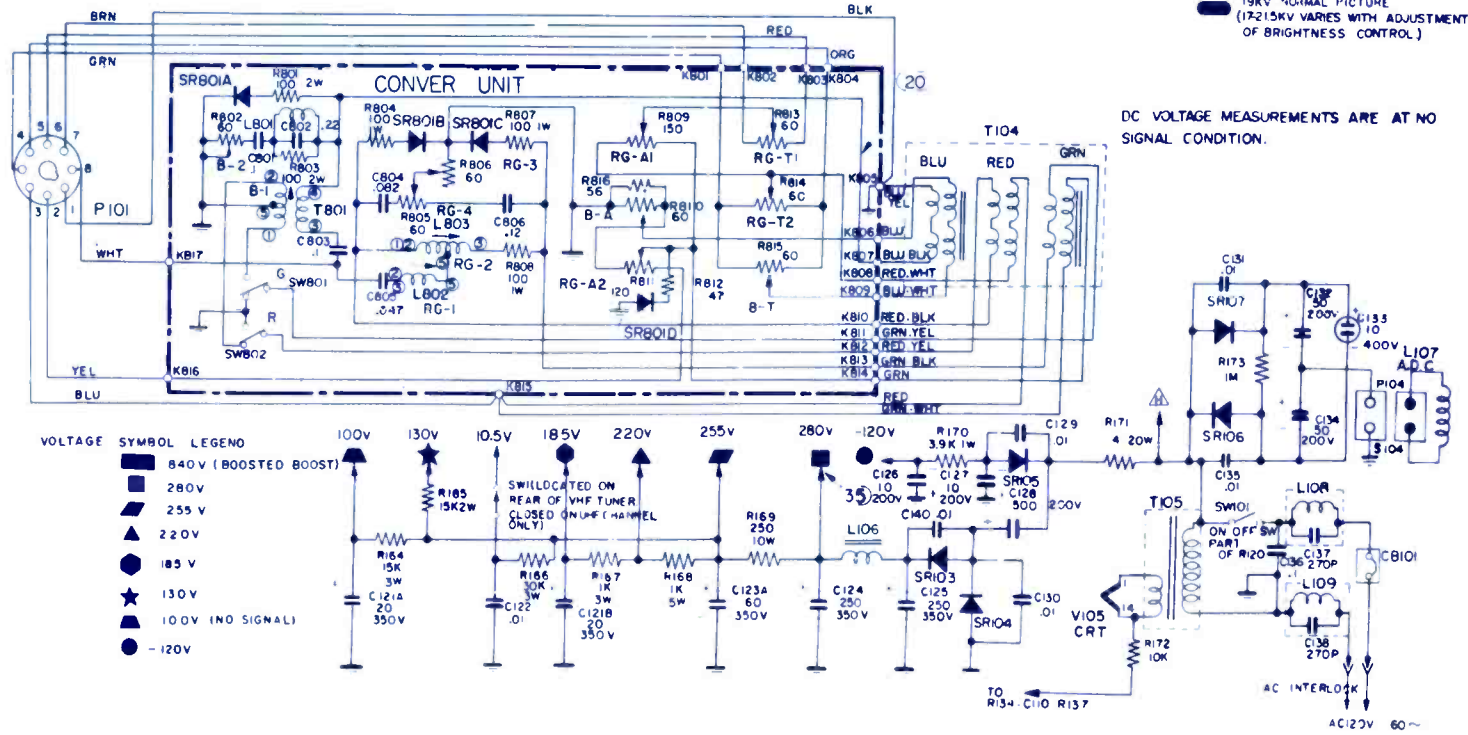
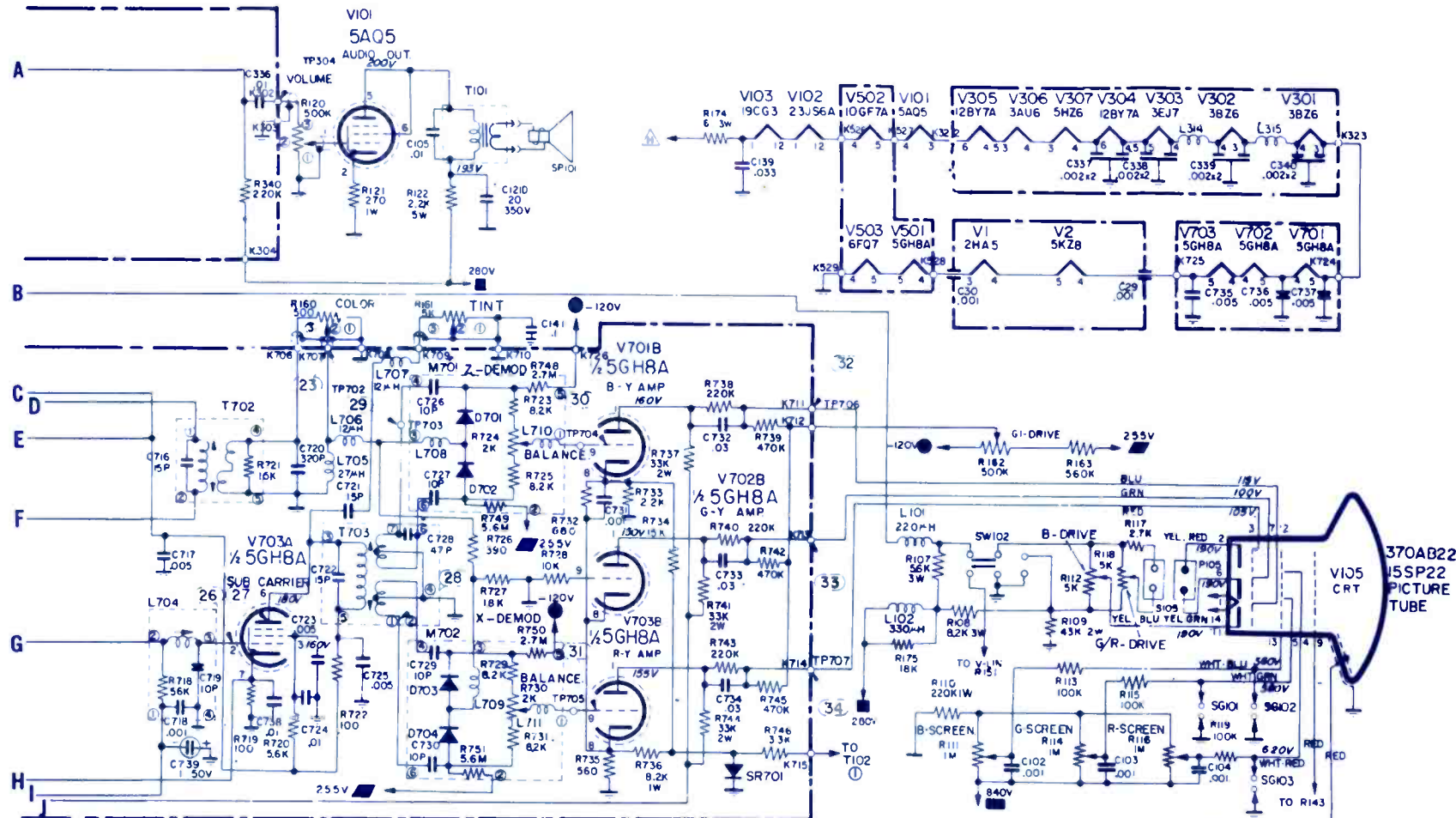
- R160 - 500Ω pot color (8V-054) TV25225
- R161 - 5K tint (9V-134) TV25226
- L101 - coil video peaking (2TL-234) TV61468
- L105 - coil horiz efficiency (2TL-904) TV61344
- L106 - coil power choke (9T-177) TV11162
- L108, L109 - coil power line filter (2TL-973) TV61455
- L301 - coil 39.75MHz & 41.25MHz trap (TIF-371) TV61456
- L311 - coil delay line (2TL-977) TV61461
- L313 - coil peaking (2TL-235) TV61462

- L317 - coil 1st sound IF (TIF-341) TV61467
- L318 - coil quadrature (TIF-384) TV61472
- L703 - coil chroma take off (2TL-982) TV61464
- L705 - coil chroma peaking (2TL-200) TV61400
- L706, L707 - coil chroma (2TL-230) TV61460
- L801 - coil blue horiz shape (2TL-937) TV61466
- T101 - xformer audio output (7T-171) TV11171
- T102 - xformer horiz output (8FT-644) TV11213

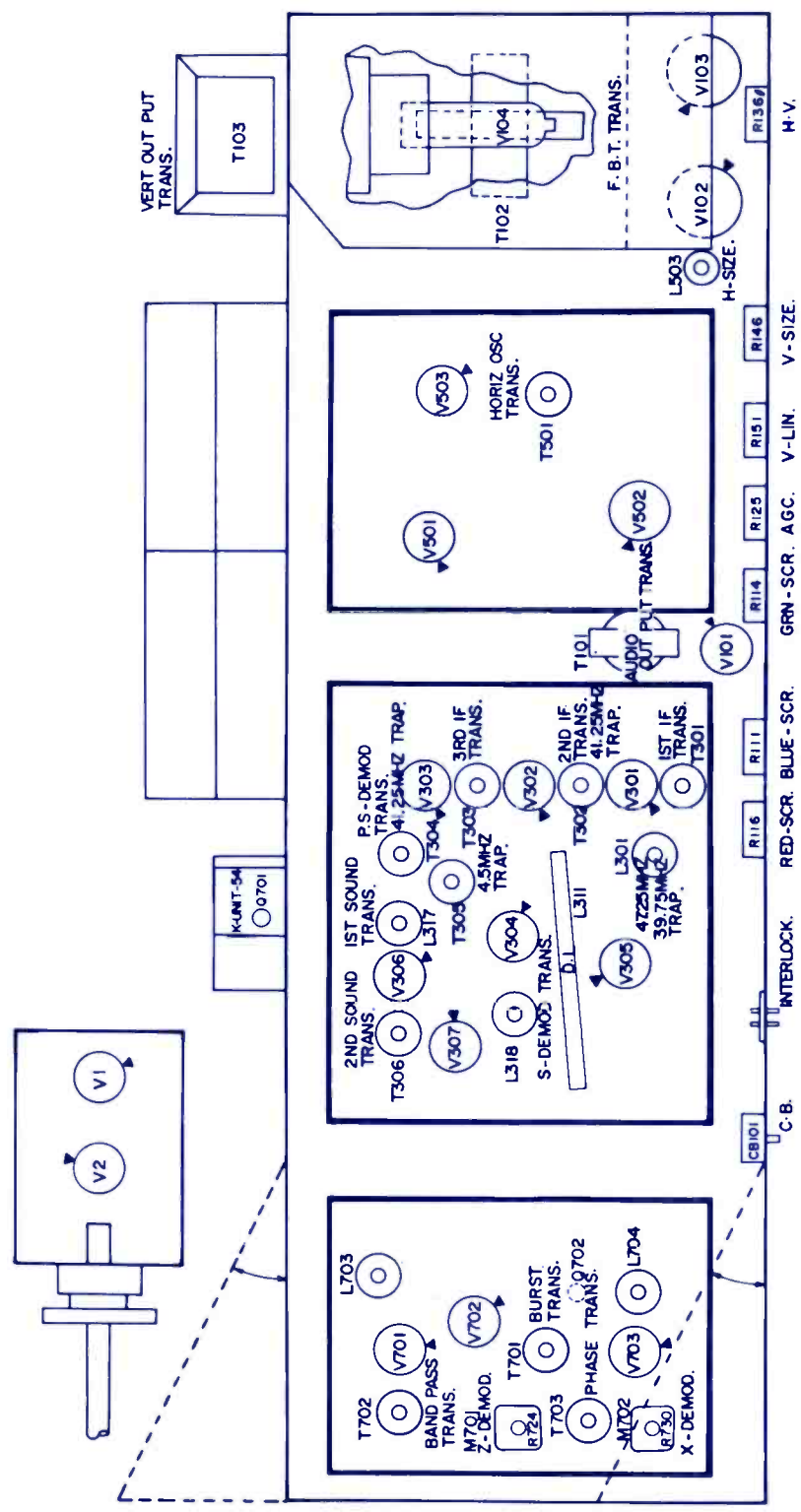
- T103 - xformer vert output (8T-182) TV11145
- T104 - xformer convergence (2TL-971) TV62327
- T105 - xformer power (5T-194) TV11214
- T301 - xformer 1st pix IF (TIF-372) TV62329
- T304 - xformer video selector assembly (2TL-978) TV62328
- T305 - xformer 4.5MHz trap (TIF-377) TV62332
- T501 - xformer horiz osc (2TL-980) TV62334
- T701 - xformer burst (2TL-947) TV61447

- T702 - xformer band pass (2TL-965) TV62335
- T703 - xformer phase (2TL-981) TV62336
- T801 - xformer B1 (2TL-950) TV62337
- M701 - Z demodulator assembly (K-unit-48) TV3489
- M702 - X demodulator assembly (K-unit-48) TV3489
- O701 - transistor 25C454C 2nd chroma amp TV24453
- Q702 - transistor 2N3638 color killer TV24363
- VR501 - varistor (TS-2171) TV24238
- Y701 - crystal 3.58MHz (crystal-800) TV24228

**AIRLINE**  
Color TV Models GEN12069A,  
GEN12349A



- VOLTAGE SYMBOL LEGEND**
- 840V (BOOSTED BOOST)
  - 280V
  - 255V
  - 220V
  - 185V
  - 130V
  - 100V (NO SIGNAL)
  - 120V

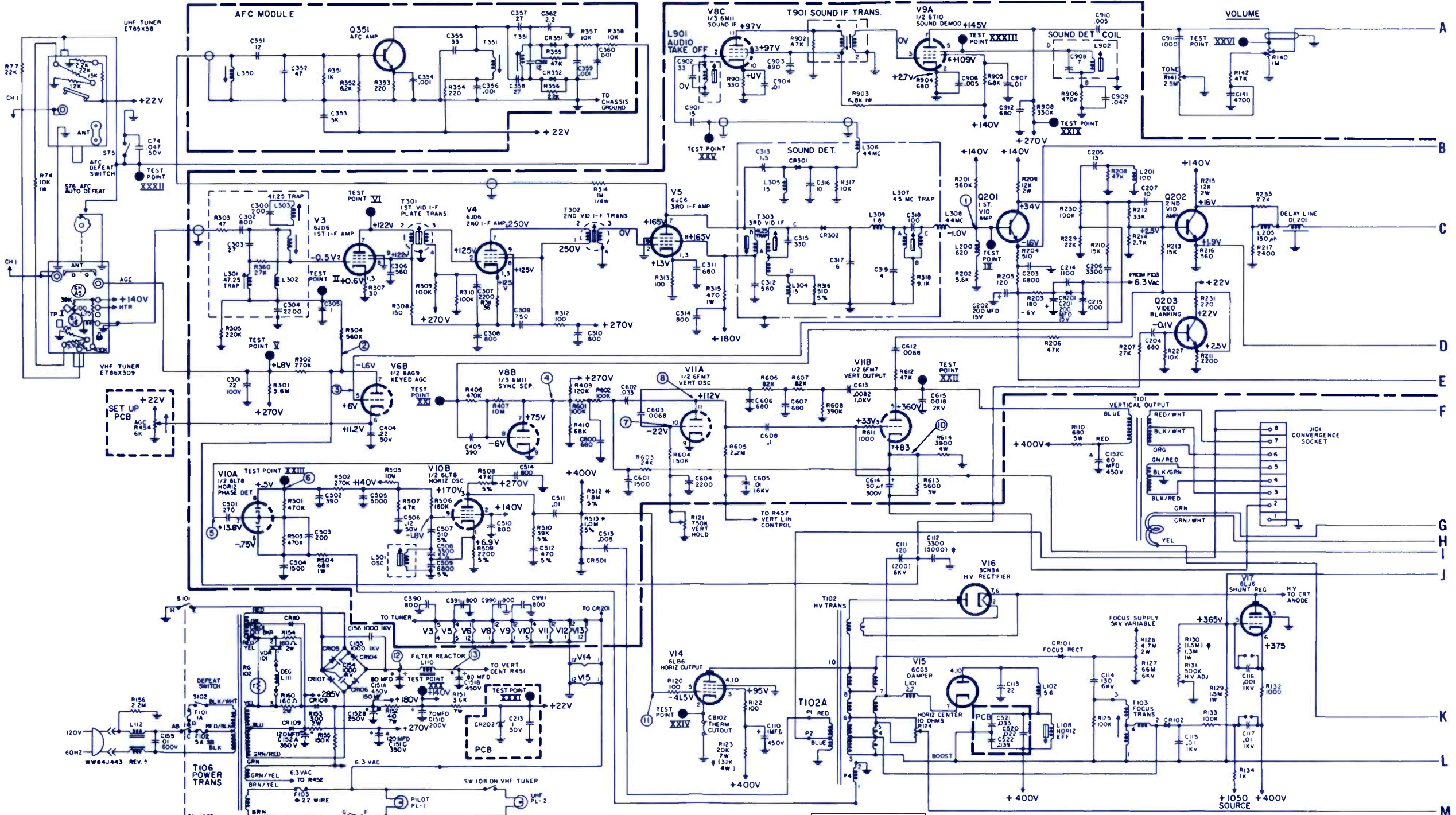


**CHASSIS LAYOUT**

SYMBOL	DESCRIPTION	GENERAL ELECTRIC PART NO.
RG101	—thermistor 120Ω cold	EU14X221
RG109	—thermistor 3.8Ω @ 25 degrees c 424Ω @ 104 degrees C	EU14X147
R123	—20K 10% 7w 23 in. sets	EU14X4
R123	—32K 10% 4w 18in & 20in. sets	EU14X220
R127	—66M 20% 6k w	EU14X186
R151	—3.6K 10% 7w	EU14X5
R152	—410Ω 10% 7w	EU14X3
R154	—80Ω 10% 10w WW E.P.	ET14X222
R154	—160Ω 5% 2w flame proof glass L.P.	EU14X6
R157	—140Ω 10% 5w WW	EU14X1
R222	—5.6K 10% 7w metal film	EU14X116
R613	—5.6K 10% 7w metal film	EU14X116

R102	—bright 250K	EU49X5
R103	—contrast 368Ω	EU49X4
R121	—vert hold 750K	EU49X3
R141	—2.5M tone	EU49X12
R451	—6Ω 20% vert centering	EU49X24
R453	—130K 30% height	EU49X27
R454	—6K 20% AGC	EU49X25
R455	—130K 30% CRT bias	EU49X26
R457	—3.4M 30% vert lin	EU49X29
R460	—6K 20% green drive	EU49X25
R462	—1.5M 30% red screen	EU49X28
R731	—1.5K 30% chroma balance	ET49X571
R801	—120Ω horiz blue left	EU49X607
R804	—150Ω vert red-green left	EU49X360
R805	—120Ω horiz red-green left	EU49X357
R813	—120Ω vert red-green	EU49X357

R814	—60Ω vert red-green master tilt	EU49X358
C111	—200pf 10% 5kv N1500 18 & 20in. sets	EU18X6
C114	—139pf 20% 6kv N2200	EU18X58
C123	—100pf 10% 4kv N1600	EU18X600
C502	—390pf 10% 500v Char D. mica	EU19X2
C503	—200pf 10% 500v Char D. mica	EU19X1
C512	—470pf 5% 500v Char D. mica	EU19X4
C707	—330pf 5% 500v Char F. mica	EU19X87
C613	—0082μf 10% 1.6kv molded	EU26X48
C151A	—80μf +50-10% 450v	EU31X1
C151B	—80μf +50-10% 450v	EU31X1
C151C	—120μf +100-10% 350v	EU31X1
C151D	—70μf +50-10% 200v	EU31X1
C152A	—120μf +50-10% 350v	EU31X2
C152B	—150μf +50-10% 250v	EU31X2
C152C	—80μf +50-10% 450v	EU31X2



UNLESS OTHERWISE NOTED  
 K=1000 M=1,000,000  
 CAPACITORS MORE THAN 1 μF  
 CAPACITORS LESS THAN 1 μF  
 RESISTORS ARE 1/2 WATT

\* MATCHED PAIR RESISTORS

C1520 — 50µf +150—10% 50v  
 CR101 — rectifier selenium 3MA focus  
 CR102 — rectifier selenium 2MA boost  
 CR202 — diode zener  
 CR701 — varactor tint  
 CR702 — rectifier chroma detector  
 Q203 — transistor video blanking  
 Q701 — transistor sub-carrier buffer  
 L108 — coil horiz efficiency  
 L110 — filter reactor 0.33 Henries Min. 350 dc MA  
 L111 — yoke deflection  
 L112 — coil dual line filter  
 DL201 — delay line  
 L203 — coil choke 270 oh +7%  
 L301 — coil 47.25MHz trap  
 L303 — coil 1st IF grid & 41.25MHz trap

EU31X2  
 EU57X32  
 EU57X31  
 EU16X2  
 EU30X87  
 EU16X19  
 EU15X27  
 EU15X27  
 EU36X10  
 EU63X1  
 EU76X47  
 EU36X856  
 EU36X9  
 EU36X5  
 EU36X742  
 EU36X8

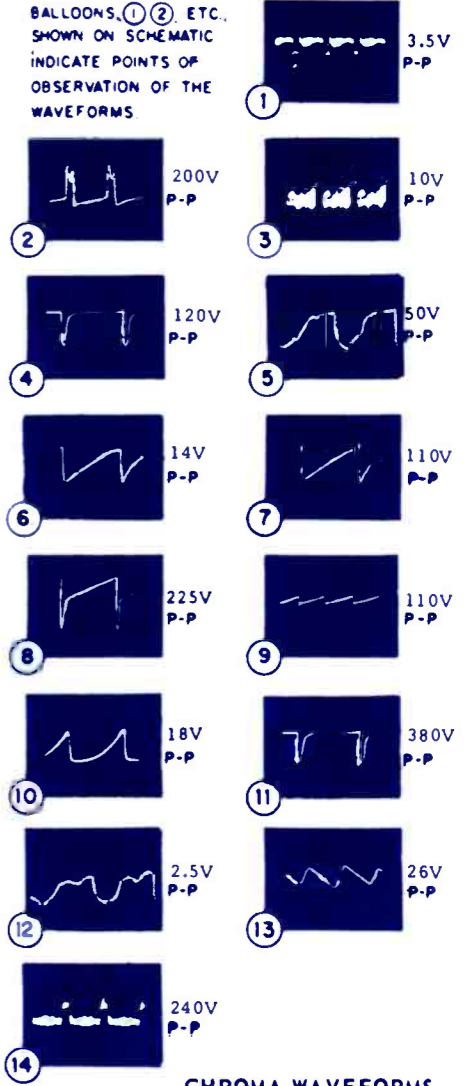
L307 — coil 4.5MHz trap  
 L350 — coil AFC input  
 L501 — coil horiz osc  
 L701 — coil chroma input  
 L705 — coil crystal tuning  
 L801 — coil right vert red green  
 L802 — coil right horiz red green  
 L804 — convergence yoke complete  
 L901 — coil sound take off  
 L902 — coil quad  
 T101 — xformer vert output  
 T102 — xformer coil horiz output w/horiz centering for 18in. & 20in. chassis  
 T102 — xformer coil horiz output w/horiz centering for 23in. chassis

EU61X1  
 EU36X13  
 EU35X1  
 EU36X6  
 EU36X7  
 EU36X87  
 EU36X820  
 EU36X287  
 EU36X793  
 EU56X1  
 EU64X1  
 EU77X116  
 EU77X115  
 EU77X115

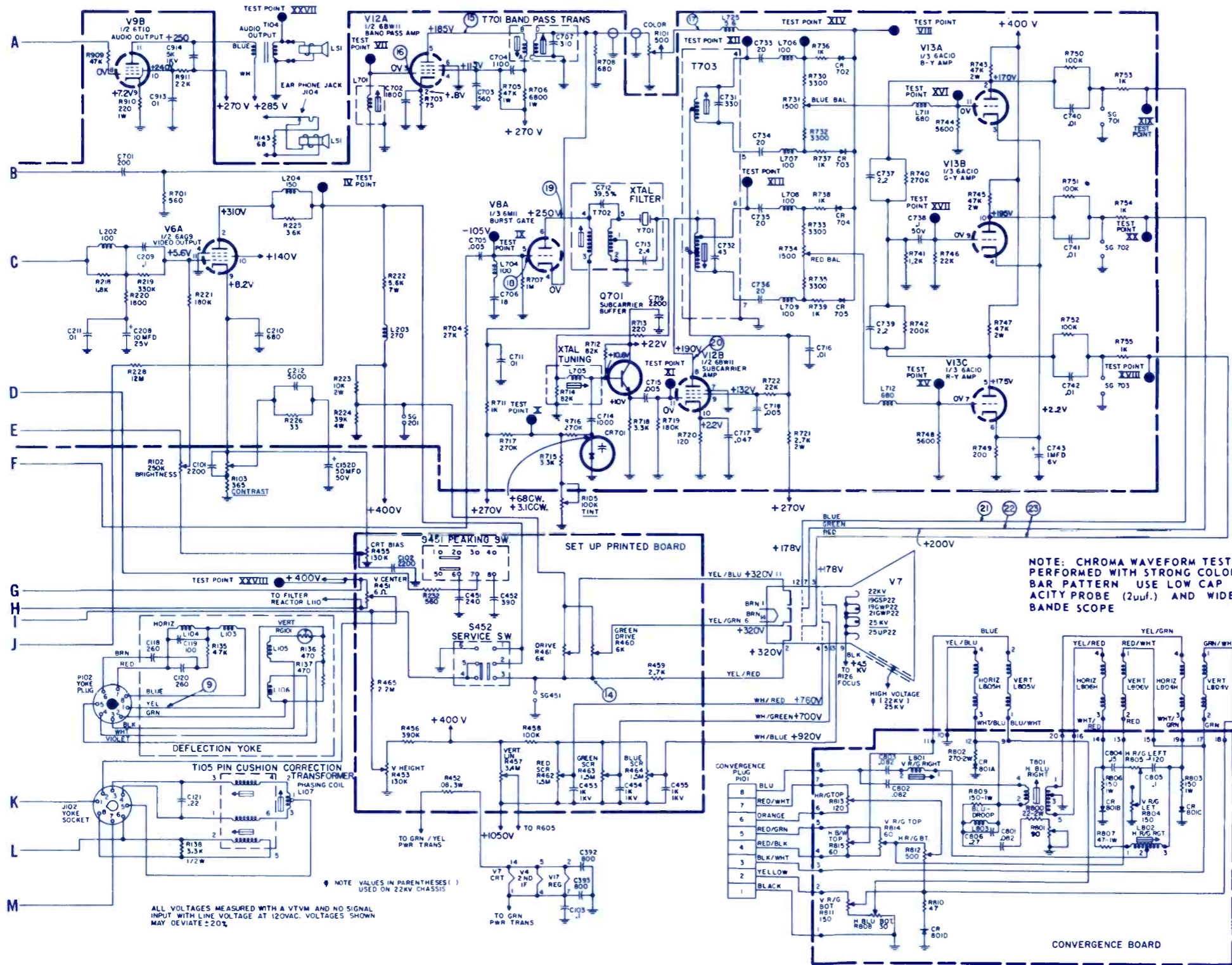
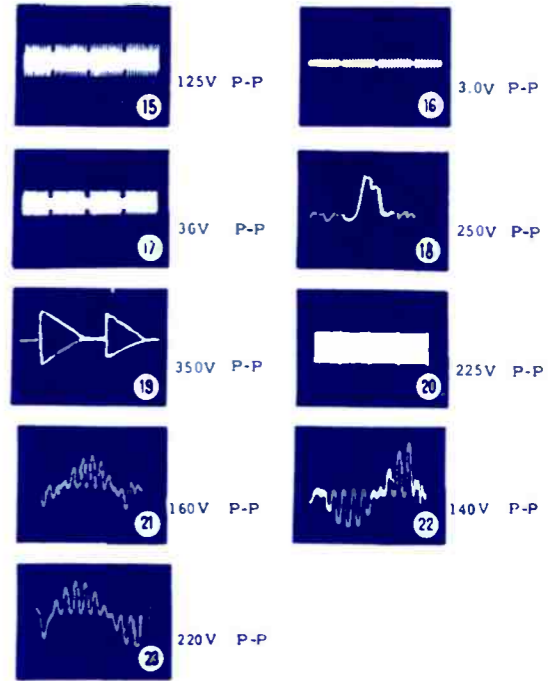
T102A — coil pulse winding for EU77X116 xformer  
 T103 — coil focus  
 T106 — xformer power non power tuned receiver  
 T351 — xformer AFC discriminator  
 T701 — xformer chroma band pass  
 T702 — xformer crystal filter  
 T703 — xformer chroma demod  
 T901 — xformer 4.5MHz interstage circuit breaker 1.2a CB101 fuse 1a 250v fast blo F101 fuse 5a 125v slo blo F102 thermal cutoff for 22kv set thermal cutoff for 23kv set tuner VHF 13 position w/AFC

**GENERAL ELECTRIC**  
 Color TV Chassis KE

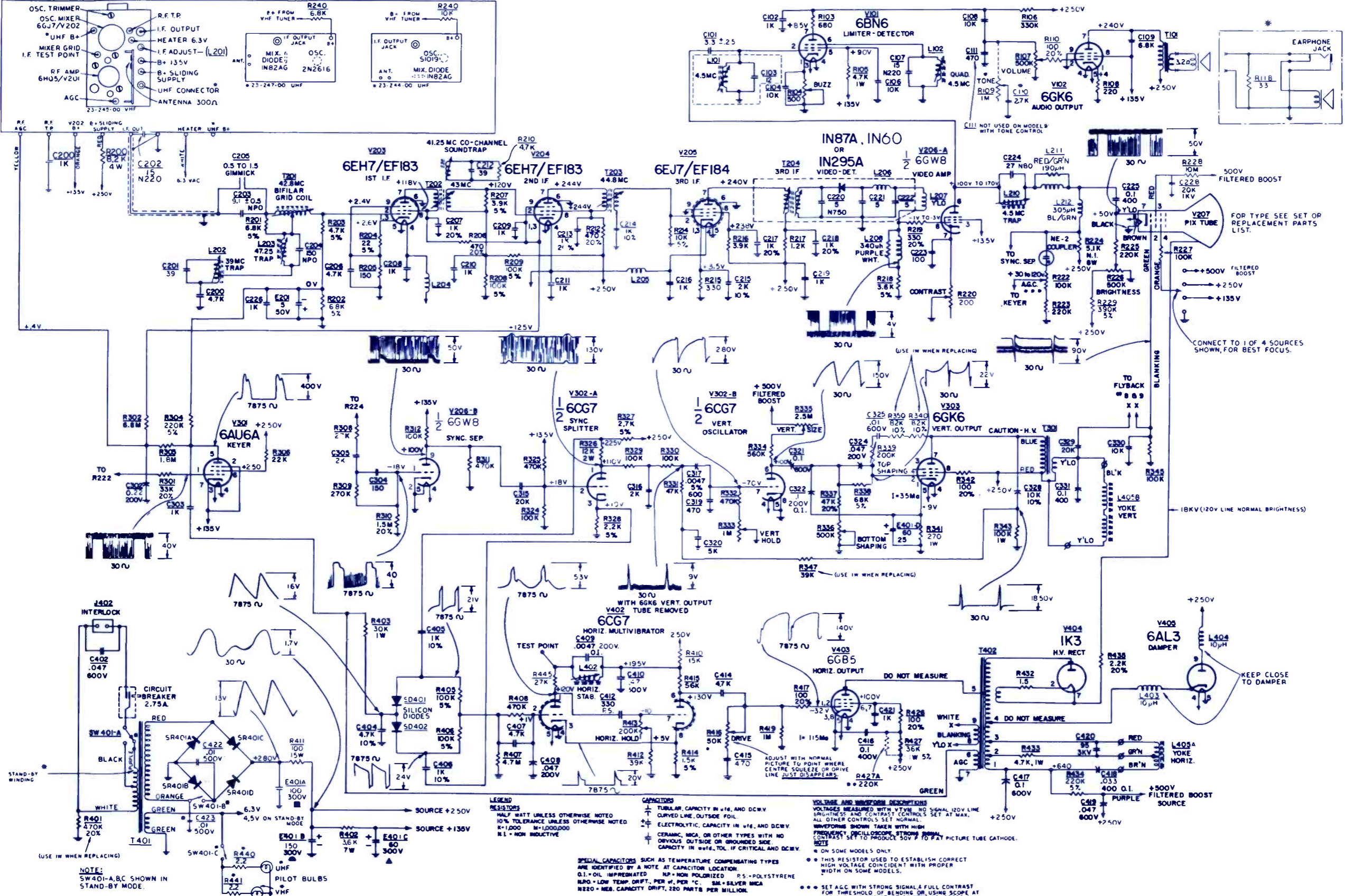
**MISCELLANEOUS WAVEFORMS**



**CHROMA WAVEFORMS**

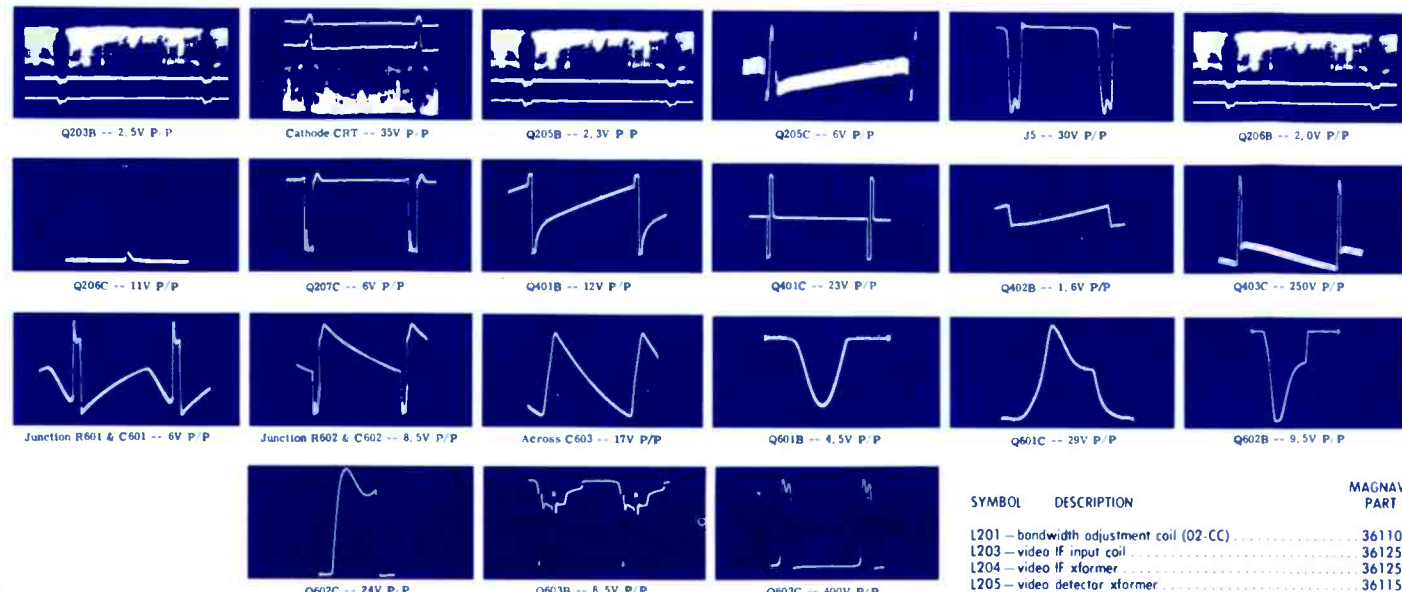


SYMBOL	DESCRIPTION	ELECTROHOME PART NO.	DESCRIPTION	ELECTROHOME PART NO.	
L405	deflection yoke and centering device	21-107-01	L202	trap 38.50MHz	21-338-03
T402	horiz output xformer	21-213-01	T202	coil interstage IF and 41.25MHz trap	21-391-01
L204, L205	RF heater choke	21-300-01	L203	trap 47.25MHz	21-394-01
L212	peaking coil	21-314-33	T204	IF output	21-390-01
L207	choke coil	21-1400-05	T101	audio output xformer	24-80008-11
L402	horiz stabilizer coil	21-334-03	T301	vert output xformer	24-100013-01 or -02
L210	4.5MHz trap	21-347-01	T401	power xformer	24-10124-01
L101	sound take off coil	21-355-02	CB401	circuit breaker	26-65-03
L102	sound quad coil	21-360-01	NE2	Neon Bulb	27-11-03
L403, L404	RF Choke 10mh	21-1400-04	SR401A, B, C, D	silicon rectifier	28-22-01
			R335	control vert size 2.5M	41-146-06
			R413	control horiz hold 200K	41-189-01
			R146	control drive 47K	41-192-07
			R222	control A G C 100K	41-192-08
			R336	control top shaping 220K	41-192-09
			R336	control bottom shaping 470K	41-192-10
			R104	control buzz 500Ω	41-228-05
			R402	resistor WW 7w 3.6K	42-21-53
			R224	resistor WW 8w 5.1K	42-8-08
			R404	resistor WW 15w 100Ω	42-21-10
			E401	elect four section 150μf	44-204-07
				150μf @ 300v	
				100μf @ 300v	
				600μf @ 300v	
				60μf @ 25v	



**LEGEND**  
 RESISTORS: HALF WATT UNLESS OTHERWISE NOTED. 10% TOLERANCE UNLESS OTHERWISE NOTED. K=1,000 M=1,000,000 N.I.=NON INDUCTIVE  
 CAPACITORS: TUBULAR CAPACITY IN μF, AND DC MV. CURVED LINE, OUTSIDE POIL. ELECTROLYTIC CAPACITY IN μF, AND DC MV. CERAMIC, MICA, OR OTHER TYPES WITH NO OBVIOUS OUTSIDE OR GROUNDED SIDE. CAPACITY IN μF, TOL. IF CRITICAL AND DC MV.  
 SPECIAL CAPACITORS SUCH AS TEMPERATURE COMPENSATING TYPES ARE IDENTIFIED BY A NOTE AT CAPACITOR LOCATION. O.I.=OIL IMPREGNATED NP=NON POLARIZED P.S.=POLYSTYRENE RND=LOW TEMP. DRIFT, PER μF, PER °C. SBL= SILVER MICA N200=NEB. CAPACITY DRIFT, 220 PARTS PER MILLION.  
 VOLTAGE AND WINDING DESCRIPTIONS: VOLTAGES MEASURED WITH VTVM, NO SIGNAL, 120V LINE. BRIGHTNESS AND CONTRAST CONTROLS SET AT MAX. ALL OTHER CONTROLS SET NORMAL. WAVEFORMS SHOWN TAKEN WITH HIGH FREQUENCY OSCILLOSCOPE, STRONG SIGNAL. CONTRAST SET TO PRODUCE 50V P-P TO P21 PICTURE TUBE CATHODE.  
 NOTE: ON SOME MODELS ONLY.  
 \* THIS RESISTOR USED TO ESTABLISH CORRECT HIGH VOLTAGE COEFFICIENT WITH PROPER WIDTH ON SOME MODELS.  
 \*\* SET AGC WITH STRONG SIGNAL, FULL CONTRAST FOR THRESHOLD OF BENDING OR USING SCOPE AT CRT CATHODE FOR START OF SYNC COMPRESSION.





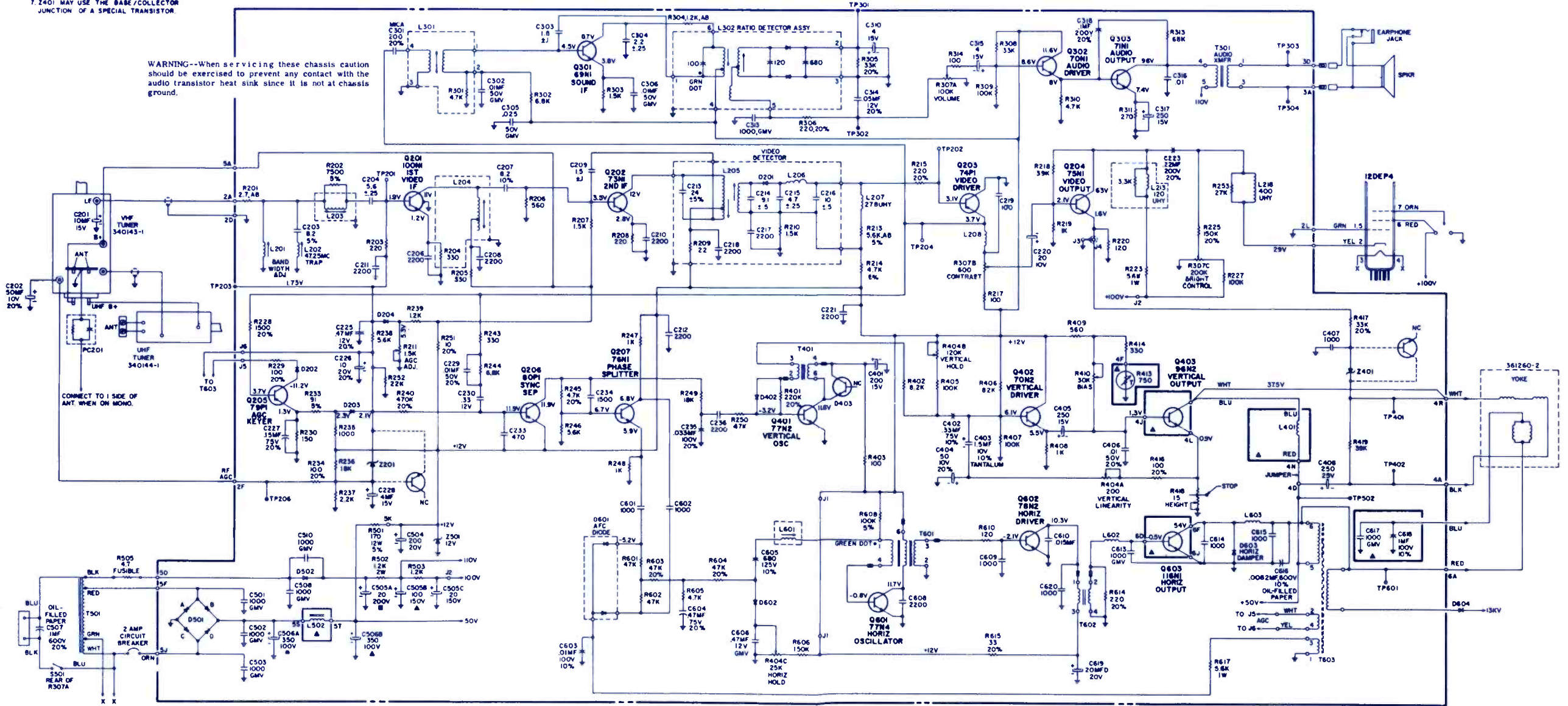
- NOTES:  
 UNLESS OTHERWISE SPECIFIED,  
 1. RESISTORS 1/2W, 10%  
 2. CAPACITORS UNLC 500V, 120%  
 ELECTROLYTICS ME-100-100%  
 3. OFF BOARD  
 4. VOLTAGES MEASURED WITH NO SIGNAL INPUT VOLUME CONTROL AT MINIMUM, NORMAL CONTRAST AND BRIGHTNESS SETTINGS, AND 120 VAC POWER  
 5. ALL VOLTAGES ARE POSITIVE UNLESS MARKED (-)  
 6. Z 201 MAY USE THE BASE/EMITTER JUNCTION OF A SPECIAL TRANSISTOR  
 7. Z401 MAY USE THE BASE/COLLECTOR JUNCTION OF A SPECIAL TRANSISTOR

P/P VOLTAGES AND WAVEFORMS

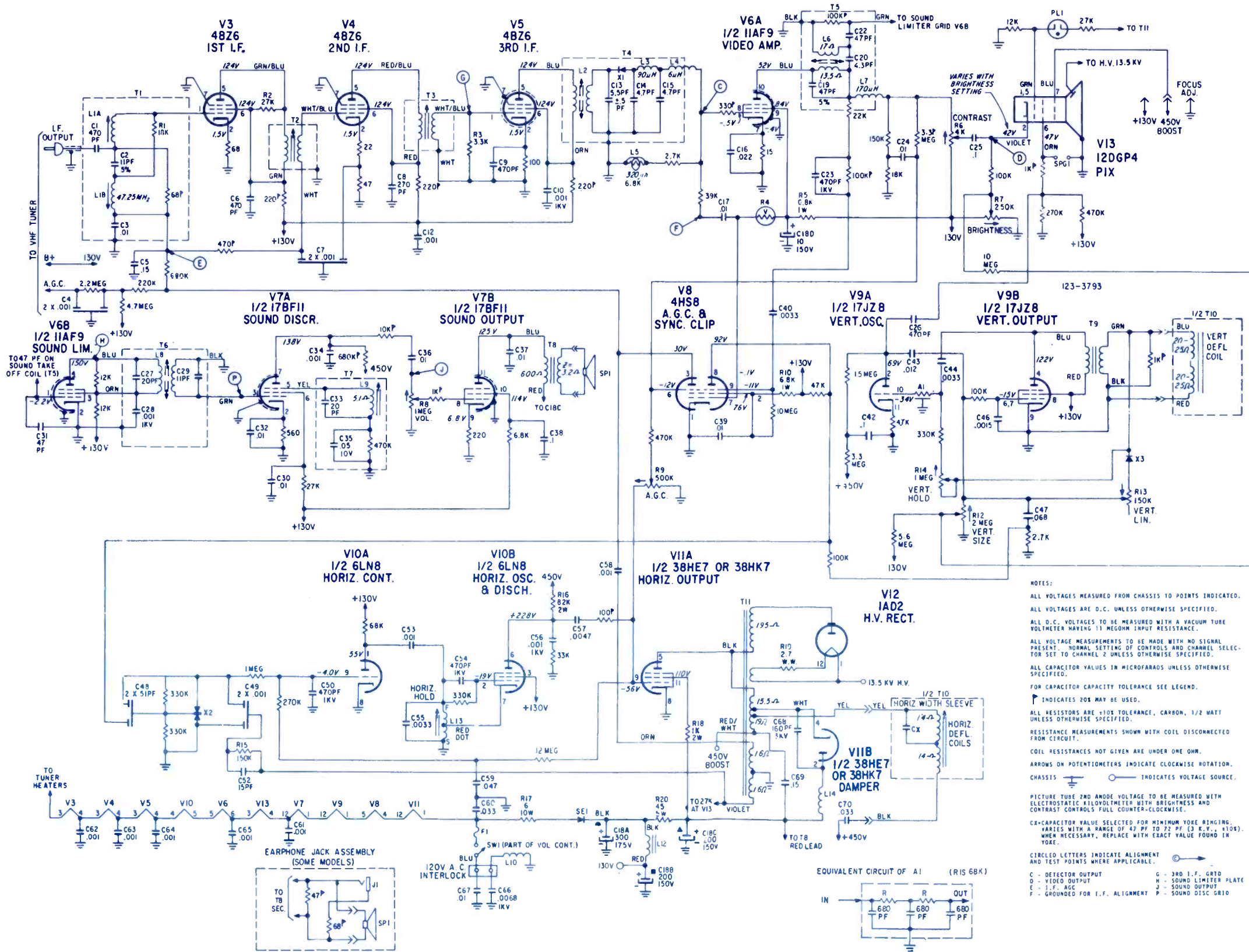
SYMBOL	DESCRIPTION	MAGNAVOX PART NO.
L201	bandwidth adjustment coil (02-CC)	361101-4
L203	video IF input coil	361257-1
L204	video IF xformer	361258-1
L205	video detector xformer	361156-2
L207	278μh peaking coil	360853-6
L208	45MHz decoupling coil	361159-1
L301	4.5MHz sound take off coil	361149-1
L302	ratio detector xformer	361150-1
L401	vert output reactance (01-AA)	320319-3
L401	vert output reactance (01-BB, 02-CC)	320319-4
L502	filter reactance (01-AA)	320321-3
L601	horiz ringing coil	361263-1
L603	suppressor coil	361077-3
T301	audio output xformer (01-AA, 01-BB)	320336-1

T301	audio output xformer (02-CC)	320336-2
T401	vert blocking osc xformer	320322-1
T501	power xformer (01-AA)	300241-1
T501	power xformer (01-BB, 02-CC)	300241-2
T601	horiz blocking osc xformer	320323-1
T602	horiz driver xformer	320338-1
T603	horiz output xformer (01-AA)	361261-1
T603	horiz output xformer (01-BB, 02-CC)	361301-1
	deflection yoke (01-AA, 01-BB)	361260-1
	deflection yoke (02-CC)	361260-2
C505	elect 20μf 200v 100/20μf 150v	270099-3
C506	elect 350/350μf 100v 100μf 75v (01-AA)	270099-2
C506	elect 350/350μf 100v (01-BB, 02-CC)	270099-4
C616	paper .01μf 10% 2kv (01-AA, 01-BB)	250290-18
C616	paper .0082μf 10% 2kv (02-CC)	250290-17
R213	5600 5%	230144-177
R214	4700 5%	230144-175
R233	9111 5% (01-BB, 02-CC)	230144-134
R413	7501 thermistor (NTC) (01-AA)	230172-2
R413	7501 thermistor (NTC) (01-BB, 02-CC)	230172-3
R501	205 5% 10w WW (01-AA)	240082-1202
R501	1701 5% 12w WW (01-BB, 02-CC)	240088-5
R502	1500 2w (01-AA, 01-BB)	230146-64
R502	1200 2w (02-CC)	230146-63
R505	4.711 fusible	240098-1
R608	100K 5% 1/2w	230144-207
R211	150012 AGC control	220217-5
R307	(A,B,C) 100K volume 600 contrast 200K bright 5501 (01-BB, 02-CC)	220231-3
R404	(A,B,C) 200 vert lin 120K vert hold	
R410	30K vert bias	220217-7
R414	1511 vert height	220167-9
Q201	100N1 silicon NPN transistor	610100-1
Q202	73N1 silicon NPN transistor	610073-1
Q203	74P1 silicon PNP transistor	610074-1
Q204	75N1 silicon NPN transistor	610075-1
Q205	79P1 germanium PNP transistor	610079-1
Q206	80P1 germanium PNP transistor	610080-1
Q207	76N1 silicon NPN transistor	610076-1
Q301	69N1 silicon NPN transistor	610069-1
Q302	70N1 silicon NPN transistor	610070-1
Q303	71N1 silicon NPN transistor	610071-1
Q401	77N2 silicon NPN transistor	610077-2
Q402	70N2 silicon NPN transistor	610070-2
Q403	96N2 silicon NPN transistor	610096-2
Q601	77N4 silicon NPN transistor	610077-4
Q602	78N2 silicon NPN transistor	610078-2
Q603	95N1 silicon NPN transistor (01-AA, 01-BB)	610095-1
Q603	116N1 silicon NPN transistor (02-CC)	610116-1
D603	dampner diode	530131-2
Z201	zener diode	530129-1
Z401	zener diode (special)	530138-1
Z501	zener diode 12v circuit breaker (01-AA)	180723-4
	UHF tuner (01-BB)	340105-2
	UHF tuner (02-CC)	340144-1
	VHF tuner (01-AA, 01-BB)	340110-2
	VHF tuner (02-CC)	340143-1
F501	fuse 1a 250v (01-AA only)	180475-8

WARNING--When servicing these chassis caution should be exercised to prevent any contact with the audio transistor heat sink since it is not at chassis ground.



SYMBOL	DESCRIPTION	ZENITH PART NO.
C2	11pf disc cap 5% 500v	22-3856
C7	2 x .001µf disc cap 10% 500v	22-21
C18A	300µf elect cap 175v	22-5506
C18B	200µf elect cap 150v	22-5506
C18C	200µf elect cap 150v	22-5506
C18D	10µf elect cap 150v	22-5506
C22	47pf disc cap 5% 500v	22-2467
C48	2 x 51pf disc cap 15% 500v	22-25
C68	160pf disc cap 10% 3kv	22-5628
R4	voltage dependent resistor	63-5472
R6	4K contrast control	63-6463
R7	250K bright control	63-5419
R8	1M volume control	63-7458
R9	500K AGC control	63-5470
R12	2M vert size cont.	63-7454
R13	150K vert lin cont.	63-6914
R14	1M vert hold cont.	63-6915
R15	150K res 10% I.R.C. 1/2w	63-4844
R19	2.7K WW res 10% 1/2w	63-3631
L1B	1st IF trap coil wind Assy	Pt. of T1
L2	4th IF wind Assy	Pt. of T4
L4	choke coil	20-2004
L5	det shunt peaking coil	20-2520
L6	sound take off coil Assy	Pt. of T5
L7	video series peaking coil	20-2014
L8	intercarrier coil wind Assy	Pt. of T6
L9	quad coil wind Assy	Pt. of T7
L10	line filter coil	20-1424
L12	filter choke	95-2567
L13	horiz osc coil wind Assy	5-56875
L14	spook coil	20-2005
T1	1st IF trap coil Assy	5-80520
T2	2nd IF trans Assy	5-66852
T3	3rd IF trans Assy	5-66853
T4	4th IF trans Assy	5-66854
T5	sound take off coil Assy	5-80558
T6	intercarrier coil Assy	5-77495
T7	quad coil Assy	5-79340
T8	sound output trans	95-2499
T9	vert output trans	95-2471
T10	yoke	95-2599
T11	horiz sweep trans	5-79557
A1	integrator	87-7
F1	fuse 1.8a	136-65
PL1	neon bulb NE2H	100-397



NOTES:  
 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.  
 ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.  
 FOR CAPACITOR CAPACITY TOLERANCE SEE LEGEND.  
 P INDICATES 20% MAY BE USED.  
 ALL RESISTORS ARE ±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.  
 ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.  
 CHASSIS INDICATES VOLTAGE SOURCE.  
 PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLTMMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.  
 CX-CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 E.V., ±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.  
 CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS WHERE APPLICABLE.

C - DETECTOR OUTPUT  
 D - VIDEO OUTPUT  
 E - I.F. AGC  
 F - GROUNDED FOR I.F. ALIGNMENT  
 G - 3RD I.F. GRID  
 H - SOUND LIMITER PLATE  
 J - SOUND OUTPUT  
 K - SOUND DISC GRID



# \$975

EFFECTIVE 8/1/67

## GUARANTEED

*Nine-seventy-five* buys you a complete tuner overhaul—including parts (except tubes or transistors)—and absolutely no hidden charges. All makes, color or black and white. UV combos only \$15.

*Guaranteed* means a full 12-month warranty against defective workmanship and parts failure due to normal usage. That's 9 months to a year better than others. And it's backed up by the only tuner repair service authorized and supervised by the world's largest tuner manufacturer—Sarkes Tarzian, Inc.

Four conveniently located service centers assure speedy in-and-out service. All tuners thoroughly cleaned, inside and out . . . needed repairs made . . . all channels aligned to factory specs, then rushed back to you. They look—and perform—like new.

*"Prefer a replacement? Sarkes Tarzian universal replacements are only \$10.45, customized replacements \$18.25. Universal replacements shipped same day order received. On customized, we must have original tuners for comparison purposes, also TV make, chassis, and model number. Send orders for universal and customized replacements to Indianapolis."*

Part #	Intermediate Frequency	AF Amp Tube	Osc. Mixer Tube	Heater
MFT-1	41.25 mc Sound 45.75 mc Video	6GK5	6LJ8	Parallel 6.3V
MFT-2	41.25 mc Sound 45.75 mc Video	3GK5	5LJ8	Series 450 MA
MFT-3	41.25 mc Sound 45.75 mc Video	2GK5	5CG8	Series 600 MA

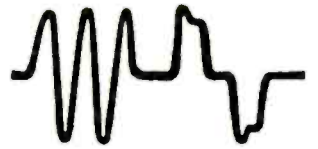
*Genuine Sarkes Tarzian universal replacement tuners with Memory Fine Tuning—UHF Plug In for 82-channel sets—Pre-set fine tuning—13-position detent—Hi gain—Lo noise—Universal mounting*

**FOR FASTEST SERVICE, SEND FAULTY TUNER WITH TV MAKE, CHASSIS, AND MODEL NUMBER, TO TUNER SERVICE CENTER NEAREST YOU**

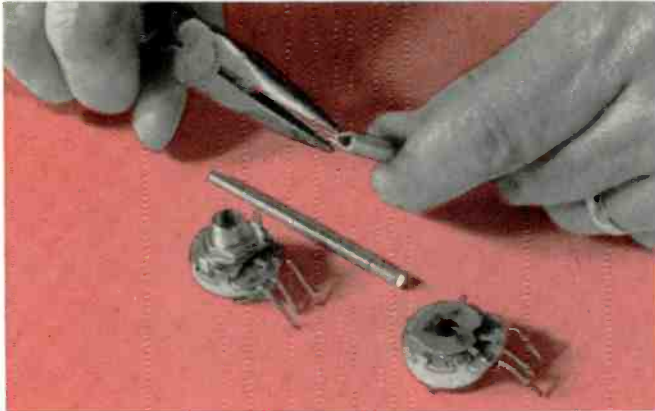


### TUNER SERVICE CORPORATION FACTORY-SUPERVISED TUNER SERVICE

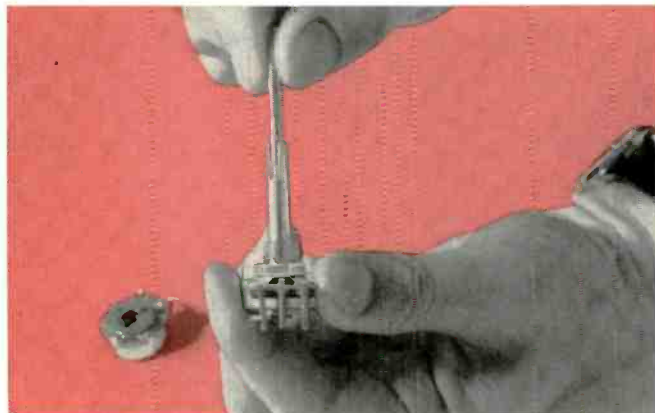
HOME OFFICE, MIDWEST . . . . . 817 N. PENNSYLVANIA ST., Indianapolis, Indiana . . . . . TEL: 317-632-3493  
 UNDER NEW MANAGEMENT, EAST 547-49 TONNELE AVE., Jersey City, New Jersey . . . . . TEL: 201-792-3730  
 SOUTH-EAST . . . . . 938 GORDON ST., S. W. Atlanta, Georgia . . . . . TEL: 404-758-2232  
 WEST . . . . . SARKES TARZIAN, Inc. TUNER SERVICE DIVISION  
 10654 MAGNOLIA BLVD., North Hollywood, California . . . . . TEL: 213-769-2720



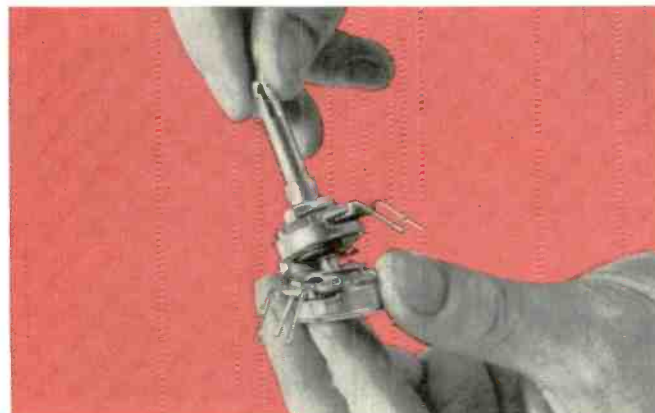
## Do-it-yourself stereo clutch controls



First, squeeze the end tines of the outer shaft together (the tines on the end of the shaft that go into the control) with a pair of pliers, until the tines just touch. Then insert the outer shaft into the front control section.



Next, insert the inner control shaft through the outer shaft from the front. You'll have to apply some pressure to force the inner shaft through the squeezed tines of the outer shaft. As you do this, the outer shaft will lock in place in the front control section.



Now push the inner shaft through the front control far enough so you can slide the rear control section in place on the shaft. Finally, attach the rear control section and snap it into place.

Many stereo sets use a dual volume control which lets you adjust volume of both channels either together or separately. As in most dual controls, there's an inner and outer shaft linked to the front and rear control sections. By means of separate knobs, you can adjust each channel simply by holding one knob and rotating the other . . . and this is how you adjust right and left balance. These controls have an extra feature: there's a friction clutch that ties the two shafts together. So once you set the balance the way you want it, you can turn just one knob and raise or lower both channels together.

When you need to replace one of these clutch controls, you may find that an exact replacement may be tough to locate. Rather than go to the delay and cost of ordering from the manufacturer, you can get the job done quickly and economically by one visit to your Mallory distributor. He'll have the parts you need in his Sta-Loc® Control cabinet. They're all standard Sta-Loc parts. It's what you do to them that's special.

And what have you got? A friction clutch dual control, tailor-made for stereo. Friction between inner and outer shafts will make both controls move when either knob is turned—or either knob can be turned separately while you hold the other.

This is just one of the many time-saving tricks you can do with the Sta-Loc Controls components immediately available from your Mallory Distributor. See him for all your replacement parts requirements. Or write Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Indianapolis, Indiana 46206.

**DON'T FORGET TO ASK 'EM** *"What else needs fixing?"*

... for more details circle 132 on postcard

**ELECTRONIC TECHNICIAN/DEALER**

# ELECTRONIC TECHNICIAN / DEALER

WORLDS LARGEST ELECTRONIC TRADE CIRCULATION

OCTOBER 1968 • VOL. 88 No. 4

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The newest in small screen portables and extended CRT warranties highlight the color line for the coming year

## 51 IS IT OR IS IT NOT THE CRT

Circuit defects, troubleshooting techniques and useful hints are outlined to help in answering this often difficult question

## 54 TV REMOTE CONTROLS

This article explains circuit operation and troubleshooting of remote systems with charts, illustrations and schematics

## 58 SELLING AND INSTALLING MATV

The fifth article in this series explains what to look for and include when estimating an installation including procedures for troubleshooting the system

## 60 SEMICONDUCTORS FROM A TO Z

The twenty-fifth article in this series describes circuits used for power conversion including converters, inverters, regulation and multiple stage units

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The video tape recorder market is new, challenging and profitable as illustrated by this West Coast dealer who is breaking into the "million-dollar" fraternity

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One way to become successful is to create an image as one TV service-dealer is proving with a unique advertising scheme

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A suburban service-dealer explains his "installed price" service policy and why it works

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This month's Testlab reviews the Knight color/pattern generator assembled from a kit and tested in our ET/D lab

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## COVER

MATV for home, business, and education is a market still in its infancy. Technicians working in this field know that the use of proper test instruments is necessary to reception-perfect system installation.

## TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • Group 194

AIRLINE: Color TV Models GEN12069A, GEN12349A

ELECTROHOME: TV Chassis M4

GENERAL ELECTRIC: Color TV Chassis KE

MAGNAVOX: TV Chassis T917 Series

RCA VICTOR: TV Chassis KCS174 Series

ZENITH: TV Chassis 13Z13

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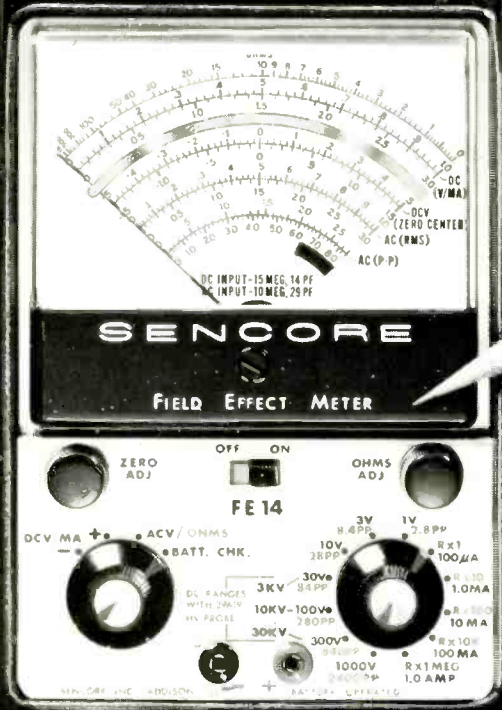


ELECTRONIC TECHNICIAN/DEALER is published monthly by Ojibway Press, Inc., Ojibway Building, Duluth, Minnesota 55802, a subsidiary of Harcourt, Brace & World, Inc. Subscription rates: One year \$5, two years \$8, three years \$10, in the United States and Canada. Other countries: One year \$9, two years \$14, three years \$18. Single copies 60c. "Second class postage paid at Waseca, Minn., and at additional mailing offices." Copyright 1968 by Ojibway Press, Inc.

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SUPERIOR  
TO  
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VOM**

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less  
money**



## NEW FIELD EFFECT MULTIMETER

Here is the revolutionary new approach to circuit testing, the solid state Sencore FIELD EFFECT METER. This FE14 combines the advantages of a VTVM and the portability and versatility of a VOM into a single low-cost instrument. This is all made possible by the use of the new space age field effect transistor that is instant in action but operates like a vacuum tube in loading characteristics. Compare the features of the FIELD EFFECT METER to your VTVM or VOM.

Minimum circuit loading — 15 megohm input impedance on DC is better than a VTVM and up to 750 times better than a 20,000 ohm per volt VOM — 10 megohm input impedance on AC is 20 times better than a standard VTVM. The FIELD EFFECT METER is constant on all ranges, not like a VOM that changes loading with each range.

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**Only Sencore offers the FIELD EFFECT METER.  
Ask for it by name at your distributor.**

**only \$69.95 (less batteries)**



**SENCORE**

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT

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### Time for a Change

It's a well known fact that people are slow to make a change — and for technicians it's no different.

I'm speaking of the change technicians must make to keep up with our rapidly advancing industry. A technician can function properly only if he knows his job. And the only way to know that job is to keep pace with new equipment and service procedures. A doctor has to do it — or give up medicine. Many of the things he learned in medical school last year are obsolete or modified now. Electronics enjoys the same problem.

Unfortunately, too many technicians don't care to take the time or trouble to stay on top of the advances. And the next time such a technician picks up a technical book or looks at a new test instrument he's going to come away mumbling because he isn't going to recognize his own industry anymore.

The effects of this sad but factual situation have been felt all over the country for some time. What's even worse is that in some cases the technician doesn't seem to care what's happening. He continues to labor away using the same old service procedures and the same old equipment he started with. Sure, he knows that scope on the shelf under 2" of dust has a purpose. But he thought when he bought it that it was supposed to give him an alpha-numeric readout of the defects of the TV set in chronological order. It didn't, and he couldn't take the time to find what it was supposed to do — soooo, back to the old wet finger — VOM procedure. It always worked before.

The truth is that those old procedures are grossly outmoded and a technician who plans to earn his bread in electronics today had better get with today's techniques. That means he had better learn all he can about the new solid-state devices, test instruments and service techniques before they get too far ahead of him. The home entertainment industry needs technicians badly — qualified technicians. However, there's one consolation for technicians who don't want to work at it — there will always be a demand for lion tamers in Northern Siberia.

### MOVING?

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

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**ELECTRONIC TECHNICIAN/DEALER**

Shocked? Don't be. Does this man *look* like a criminal?  
He's not. This man is in the business of *preventing* crime. (One of the fastest growing industries today.) He's a Radar Sentry Alarm dealer representative.

What could this possibly mean to you? Perhaps nothing. On the other hand, it could change your entire life.

As a Radar representative, you could make \$1,200 a month if you sold only one system each week. Most of our dealers make much more. Two sales a week would net you \$28,000 a year; five a week, \$46,000 a year. We make the finest solid state microwave burglar alarm system available; one that's easy to install and easy to service...for both home & business. We're presently expanding our organization of dealer representatives. We'll train you, provide you with leads and offer continuing counsel. You can operate full-time or part-time. Later, you may want to expand and organize your own sales staff.

But for now, let's get better acquainted. Fill out the coupon. In a few days, you'll receive complete details about how you can live a life of crime-and make it pay, *handsomely*.



## Radar Sentry Alarm. The Crimebuster.

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22003 Harper Ave., St. Clair Shores, Michigan 48080  
Rush me RSA Distributor Info.  
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# Live a life of crime, honestly.

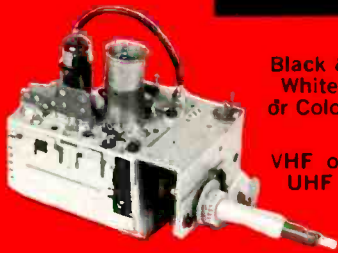


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**\$9.95**



Black &  
White  
or Color

VHF or  
UHF

UV Combo's \$16.50

Price includes all labor and parts except Tubes, Diodes & Transistors. If combo tuner needs only one unit repaired, disassemble and ship only defective unit. Otherwise there will be a charge for a combo tuner.

Ship tuners to us complete with Tubes, Tube Shields, Tuner Cover and all parts (including) any broken parts. State chassis, model number and complaint.



All tuners are serviced by FACTORY TRAINED TECHNICIANS with years of experience in this specialized field. All tuners are ALIGNED TO MANUFACTURERS SPECIFICATION on crystal controlled equipment and air checked on monitor before shipping to assure that tuner is operating properly.

**GEM CITY TUNER  
REPAIR SERVICE**

Box 6D Dabel Station  
2631 Mardon Drive  
Dayton, Ohio 45420

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**ET/D**

**LETTERS  
TO THE EDITOR**

### Urgent Need!

Your articles and circuit diagrams have been of incalculable benefit to me many times. I have frequently encountered TV sets which are so new that data is unavailable and ET/D's circuit diagrams have come to the rescue.

I would like to make a request since I know you perform this service for many of your subscribers. I am urgently in need of a Harmon-Kardon, Model CPR-2, two-channel microphone amplifier module. This model used a 12AX7 tube and is no longer available from the manufacturer. The original price was \$23.10 with the usual discount. Would you please list this request with your others for difficult-to-obtain equipment.

KEITH CROCKETT

St. Joseph, Mo.

### Free for the Postage

I am sorry to inform you that illness prevents me from further service work.

I have about 90 percent of every ET/D issue since May 1958. I would be glad to pass them on to any technician who can make use of them. All I ask is that they pay the postage.

ARTHUR W. CLENDENON

120 Fry St.  
Greenville, Tenn. 37743

### Battery Eliminator

Where can I obtain an old battery eliminator? I desperately need one, especially the kind with the BH tube, to power an old Atwater Kent.

If any ET/D reader can help me, he can call me collect at area 313, number 549-4045.

GEORGE AMBER

Royal Oak, Mich.

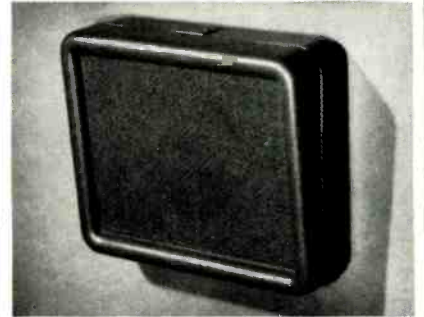
### New Theory

I have been a subscriber to ELECTRONIC TECHNICIAN / DEALER for a long time and always enjoyed your Editor's Memo column. However, in your February 1968 issue, the column advises of the potential danger of electrical shock citing a case where a woman taking a bath received a fatal shock when an electric space-heater on a shelf near the tub fell into the bath water.

I take exception to this statement since I believe the water in the tub would have been at ground potential through the connections to the hot and

## Serious Disagreement on Quam Baffles

*Perplexes Sound Industry  
Experts!*



Molded of rugged polystyrene, blonde or walnut finish. Easy installation; just hang it on the wall! (Wall bracket supplied.)

Chicago, 1968—Agreeing unanimously that Quam baffles are tops, leading sound experts differ sharply on why. Some credit the sound (exceptional low end response). Others like the modernistic, unobtrusive design. One vociferous group hails the low price, while another segment praises the ease of installation.

### Value Unquestioned

Asked to referee the raging debate, a factory spokesman declared, "The best reason for choosing Quam baffles is *value*. Whether the emphasis is on good looks, good performance, or good construction—not to mention good sound—Quam buyers know they get their money's worth!"

### Choice of Speakers

The baffles are available if desired with speakers (and transformers) premounted. Any of 10 Quam 8" background music, public address, or outdoor speakers can be selected. There is no charge for the mounting. You pay only for the components themselves.

Complete information about Quam baffles and speakers is available from the factory,

Quam-Nichols Company,  
234 E. Marquette Rd.  
Chicago, Illinois 60637.

... for more details circle 137 on postcard

ELECTRONIC TECHNICIAN/DEALER



# IT TAKES AN EXACT REPLACEMENT TO HIT THE MARK IN COLOR TV SERVICE



**TWIST-LOK<sup>®</sup> Capacitors come in the right ratings  
so you can make exact replacements**

Ask your Sprague distributor for a copy of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-109 or write to:  
Sprague Products Company, 65 Marshall St., North Adams, Mass. 01247.

**P.S.** You can increase your business 7½% by participating in EIA's "What else needs fixing?" program. Ask your distributor or write to us for details.



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600 BUCKS WORTH OF TV SET AND ANTENNA AND STILL A LOUSY PICTURE!

HERE'S A GUY WHO NEEDS BELDEN ANTENNA LEAD-IN CABLE!



Color or UHF set perfect? Antenna perfect? Then obviously there's a missing link. Check that antenna lead-in cable. Old, worn-out, weather-beaten cable, or the ordinary flat ribbon kind designed for black and white VHF, causes more fuzzy, distorted pictures than you can count. It's your opportunity to upgrade these customers to a cable matched to their particular signal reception situations. One of Belden's Big Four—the link to perfect reception.

FOR CONGESTED AREAS...

## 8290 SHIELDED PERMOHM®



In congested, in-city areas, stray electrical interference and noise are at their worst. For perfect, all-82 channel reception—color or B/W—replace old cable with Belden's 8290 Shielded PermoHM. Its aluminum Beldfoil® shielding prevents pickup of ghost signals and electrical noise by the lead-in. Weather-proof and water-proof. You can tape it right to the mast. Or install it underground, in conduits—even in rain gutters.

8290 SHIELDED PERMOHM FOR 82 CHANNEL

AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
22 (7 x 30)	Brown	.305 x .515	69.8%	7.8	57	1.7	50', 75', 100' coils have terminals attached. Available in counter dispenser. 250', 500' spool.
					85	2.1	
					177	3.2	
					213	3.5	
					473	5.4	
					671	6.6	
887	7.7						

Copperweld, 2 conductors, orange polyethylene insulation and web between conductors, cellular polyethylene oval insulation, Beldfoil shield, stranded tinned drain wire, polyethylene jacket.

FOR FRINGE AREAS...

# 8285 PERMOHM®

Antenna cable in uncongested or fringe areas picks up little electrical interference. But does get a lot of weathering, which degrades an already weak signal. These customers need encapsulated cable. Belden 8285 PermoHM. Its special polyethylene jacket protects the energy field, regardless of weather conditions. It delivers the strongest signal of any unshielded twin lead under adverse conditions. Requires no matching transformers and connectors. For all 82 channels, color or B/W.



AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
22 (7 x 30)	Brown	.255 x .468	73.3%	5.3	100	1.4	50', 75', 100' coils have terminals attached. Available in counter dispenser. 250', 500' coils and 1000' spool.
					300	2.8	
					500	3.8	
					700	4.8	
					900	5.6	

Copperweld, 2 conductors parallel, orange polyethylene insulation and web between conductors, cellular polyethylene oval jacket.

FOR LOCAL BLACK AND WHITE...

# 8275 CELLULINE®



Cracked, corroded, weathered cable, full of dirt and moisture, loses signal strength; prevents any TV set from delivering a quality picture. Upgrade B/W VHF and local UHF customers to Belden 8275 Celluline. Performance is improved because all possible moisture between conductors has been eliminated. Abrasion-resistant and weather-resistant for a long, long service life. And, it requires no end sealing.

AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
20 (7 x 28)	Brown	.300 x .400	80%	4.6	100	1.05	50', 75', 100' coils in counter dispenser. 250', 500', 1000' spools.
					200	1.64	
					300	2.12	
					400	2.5	
					500	2.98	
					700	3.62	
					900	4.3	

Bare copperweld; 2 conductors parallel, polyethylene jacket with inert gas filled unicellular polyethylene core.

EN DUOFOIL



FOR MATV AND CATV...

# 8228 DUOFOIL® COAX

Got an apartment or townhouse complex in your area? Motels or hotels? Or is CATV coming? Use Belden's new 75 ohm coaxial cable—8228 Duofoil. Shielding is 100%—sweep tested 100%. Spiral wrapped drain wires provide long flex life. Small diameter saves space in conduit installations. Use Duofoil for all coaxial color and B/W VHF, UHF and CATV applications.



AWG & (Stranding)	Color	Nom. O. D. (inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'		Standard Package Lengths in ft.
					mc	db	
18 Solid, Bare	Black	.242	78%	17.3	50	1.5	100', 500', 1000' spools.
					100	2.1	
					200	2.9	
					300	3.8	
					400	4.5	
					500	5.0	
					600	5.5	
					700	6.0	
					800	6.5	
					900	6.9	

Don't forget to ask them what else needs fixing.

See your local Belden distributor for full details or to order. For a free copy of the recent reprint article, "Electronic Cable," write: Belden Corporation, P.O. Box 5070-A, Chicago, Illinois 60680.



8-6-B

... for more details circle 110 on postcard

cold water pipes. The tub had a direct path to ground, which would give the tub (and the water in it) the same potential as the low side of electrical house wiring.

I contend that when the space-heater fell into the tub, the high side of the electrical house wiring through the heater connections, would have come in direct contact with the water (low side) and produced a short circuit.

What may have happened in this case was that the space-heater had faulty wiring which caused the metal cabinet and other exposed metal parts to be "hot." For some reason, the woman stood up in the tub and touched the space-heater. Since she was wet, her body acted as an electrical conductor between the hot side of the faulty heater and the low side of the circuit through the water in the tub. The electrical shock was fatal and as she fell back into the tub she probably knocked the space-heater into the water.

At first it would appear that the heater fell into the water and then she

died — as I have stated, she died first, then the heater fell into the tub.

FREDERIC J. CANTON  
Brooklyn, N. Y.

*One fact that Mr. Canton appears to have overlooked is that the electrical outlet is not always at the same potential as an "earth" ground. Water pipes are normally at "earth" ground and the ground side of an electric outlet is some value above this. That is one of the reasons for using a "grounded" three prong ac outlet. It is also the reason why many appliances are hazardous if not properly grounded and why you sometimes get a slight shock touching a metal ac-dc radio or similar unit.*

*There is a potential difference between an "earth" ground and electrical ground just as there is between "chassis ground and an electrical ground in home wiring. The body presents a certain amount of resistance when standing on a non-conductive surface or with properly insulated foot wear. But bare feet in water is like putting one hand on the water faucet, and sticking your other hand in an empty light socket and having some one turn on the juice — it would probably end that person's curiosity — permanently . . . Ed.*

## SNOB

“ Jackson quality built for the technician who wants more—more accuracy, more speed, more profits. After all, test instruments are the most important equipment you own, so why not get the best. ”



**\$249<sup>95</sup>**

### Model CRO-4—5" WIDE BAND OSCILLOSCOPE & VECTORSCOPE

The only 5 Mc oscilloscope in the medium-low cost class which permits the technician to measure the amplitude of waveforms (as in TV servicing) as easily as using a VTVM or a Volt-Ohm-Milliammeter. The "Readout" is an instant-removable graticule with 2 sets of calibrations exactly like a Meter scaleplate.

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**\$149<sup>95</sup>**

### Model X-100— SOLID STATE COLOR GENERATOR

Extraordinary wide range of patterns (NTSC type colors) for faster, more accurate Color TV installation and servicing. Solid State stability under extreme temperatures, push button selector switches and many other quality features make this unit one you'll be proud to own.



**\$89<sup>95</sup>**

### Model 810— DYNAMIC IN-CIRCUIT TRANSISTOR TESTER

Tests all transistors for A.C. BETA in circuit or out of circuit. Tests for leakage (Icbo). Tests diodes in and out of circuit. Exclusive features: Simplified pushbutton operation. Built-in transistorized signal-tracer generator. Plus many design advantages.

### RF Travels Slower in West

Your series Antennas — Sans Baffle and Bushwa is truly a credit to ELECTRONIC TECHNICIAN/DEALER. Were I not already a subscriber, I would subscribe for the series alone.

However, one item that I found in part three of the series didn't really solve any problems for me. Indeed, it made a new problem evident. I refer to the item I found on page 88 of the May issue — that in "many localities" the average RF signal travels about one mile on 0.186372 micro-seconds — or about 5,365,612 miles in one second.

Here on the West Coast, we keep the velocity down to around 186,000 miles per second — but this gives us problems that are seemingly insurmountable. Many has been the time that a local radio or TV station has had to alibi itself out of a listener's complaint that those who live several blocks nearer the station are getting their news first.

We even had one fellow who threatened to take another man to court because the other man had heard the winning Radio Bingo call first, and had, for that reason, been able to win. The problem is pressing enough that this little tidbit of information made me decide to take pen in hand and write you, tongue firmly in cheek, to ask: would the Junior Chamber of



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CANADA: WILLIAM COHEN CORP., 8900 PARK AVE., MONTREAL 11  
EXPORT: SINGER PRODUCTS CO., INC., 95 BROAD ST., N. Y. C. 10004, U. S. A.

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# It's your fault if she's 13-38-12.



And you have to go back and fix your repair job one week after you've fixed the set. It's your fault, and your money.

Replacement parts ought to last longer than that.

Like capacitors. They should be able to meet the requirements of high-reliability computer and missile systems, hold their rating at 125° C continuous operation.

Like Elmenco dipped Mylar® paper capacitors do.

Yet you can buy them at regular TV set prices. In any value you need from .001 mfd. to 1.0 mfd. In TV rated voltages from 400V through 1600V. Or in 100V values for

transistorized circuitry.

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So you'll only have to do your repair jobs once. Then if the lady in the set looks the same once you've finished, it's her mother's fault.

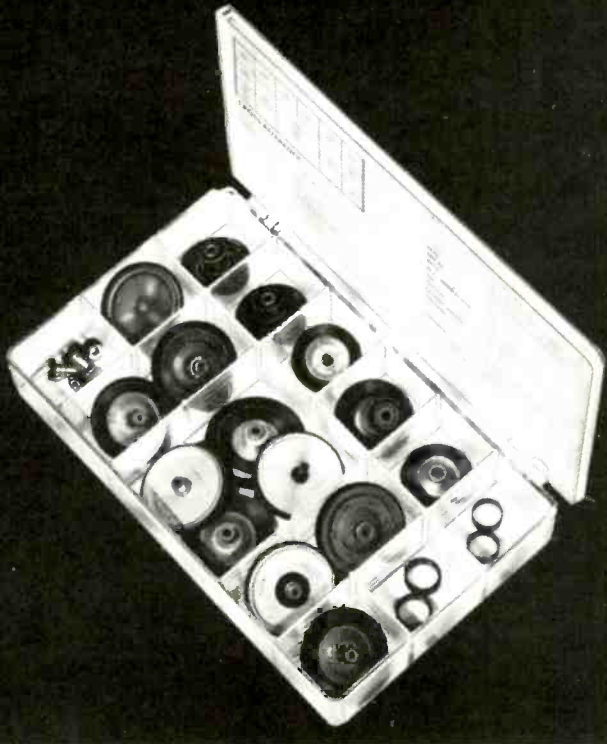
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A DIVISION OF LORAL CORPORATION LLD-501  
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For all leading  
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Here's a brand new kit consisting of twenty-four Walsco phono drives, providing a profit-building assortment of the most-commonly needed replacement drives for servicing all popular record players. Made from selected materials, these Walsco "Exact Replacement Drives" conform precisely to the rigid specifications established by the original equipment manufacturer, assure you and your customer of "like-new" performance whenever used. Packed in a reusable, partitioned plastic box complete with a handy cross-referenced part number list, this kit is a must for every dealer and serviceman. Order yours today . . . it could be the key to faster, easier service calls, more profits for you.

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## ET/D LETTERS TO THE EDITOR

Commerce of any one of these localities mind if we studied their RF signals? Catch one in a cage and maybe bring it home?

GERALD R. COOKE

Tacoma, Wash.

• We are truly sorry to hear that RF signals in the West are slower than in other localities. We will consider asking the Chamber of Commerce to send its survey team out with a copper-lined can to catch one of these rapid RF signals for you to evaluate. Please send us any extras.

It might even be a good idea to put some general speed regulation on all RF signals — like maybe 186,000 miles per second. But the only way to solve the bingo and news problems as we see it, would be to place all the listeners at the same distance from the radio station. This could also cause problems. And then, too, there are always those few signals that would not obey the law, and speed anyway — Ed.

### Schematics, Manuals and Miscellany

I am in need of a schematic for an Intercommunications System intercom, Model 2700, serial number LD5044.

CHESTER WEAVER

Pratt, Kan. 67124

I would appreciate receiving any information an ET/D reader might have on a Precise Model 630 marker generator, or an address where I might write to obtain information.

KEITH VOLLNOGLE

210 Carmel St.  
Greenville, S. C.

I recently purchased a 3 in. scope made by Allen B. Dumont Labs., Inc., Passaic, N. Y. It is a type 164-E. Would you please acknowledge my request to ET/D readers for a schematic of this unit.

JIM HARTT

2300 W. Commonwealth Ave.  
Fullerton, Calif.

We would appreciate it if any of the ET/D readers could tell us who distributes the "STEG" foreign made TV set in the United States or where we might obtain parts for these sets.

TAMPA TELEVISION LABS. INC.  
510 So. Howard St.  
Tampa, Fla. 33606

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# Join "THE TROUBLESHOOTERS"

who get paid top salaries for keeping today's electronic world running

Suddenly the whole world is going electronic! And behind the microwave towers, push-button phones, computers, mobile radio, television equipment, guided missiles, etc., stand THE TROUBLESHOOTERS—the men urgently needed to inspect, install, and service these modern miracles. They enjoy their work, and get well paid for it. Here's how you can join their privileged ranks—without having to quit your job or go to college to get the necessary training.



**J**UST THINK how much in demand you would be if you could prevent a TV station from going off the air by repairing a transmitter... keep a whole assembly line moving by fixing automated production controls... prevent a bank, an airline, or your government from making serious mistakes by servicing a computer.

Today, whole industries depend on electronics. When breakdowns or emergencies occur, someone has got to move in, take over, and keep things running. That calls for one of a new breed of technicians—The Troubleshooters.

Because they prevent expensive mistakes or delays, they get top pay—and a title to match. At Xerox and Philco, they're called Technical Representatives. At IBM they're Customer Engineers. In radio or TV, they're the Broadcast Engineers.

What do you need to break into the ranks of The Troubleshooters? You might think you need a college degree, but you don't. What you need is know-how—the kind a good TV service technician has—only lots more.

### Think With Your Head, Not Your Hands

As one of The Troubleshooters, you'll have to be ready to tackle a wide variety of electronic problems. You may not be able to dismantle what you're working on—you must be able to take it apart "in your head." You'll have to know enough electronics to understand the engineering specs, read the wiring diagrams, and calculate how the circuits should test at any given point.

Learning all this can be much simpler than you think. In fact, you can master it without setting foot in a classroom... and without giving up your job!

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he returns it the same day received, while everything is fresh in your mind.

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Two-way mobile work and many other types of troubleshooting call for a Government FCC License, and our training is designed to get it for you. But even if your work doesn't require a license, it's a good idea to get one. Your FCC License will be accepted anywhere as proof of good electronics training.

And no wonder. The licensing exam is so tough that two out of three non-CIE men who take it fail. But our training is so effective that 9 out of 10 CIE graduates pass. That's why we can offer this famous warranty with confidence: If you complete a license preparation course, you get your FCC License—or your money back.

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# measure



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**The RCA-WT-501A** in-circuit out-of-circuit transistor tester is battery operated, completely portable. It tests both low and high power transistors, has NPN and PNP sockets for convenient transistor matching for complementary symmetry applications. Only \$66.75.\*



**The RCA WC-506A** transistor-diode checker offers a fast, easy means of checking relative gain and leakage levels of out-of-circuit transistors. Compact and portable, it weighs 14 ounces, measures 3¼ by 6¼ by 2 inches. Only \$18.00.\*



**The RCA WV-98C** Senior VoltOhmyst is the finest vacuum-tube voltmeter in the broad line of famous RCA VoltOhmysts. Accurate, dependable, extremely versatile, it is a deluxe precision instrument. Only \$88.50.\* Also available in an easy to assemble kit, WV-98C (K).

For a complete catalog with descriptions and specifications for all RCA test instruments, write RCA Electronic Components, Commercial Engineering, Dept. J46WA, Harrison, N.J. 07029.

\*Optional Distributor resale price. Prices may be slightly higher in Alaska, Hawaii, and the West.

LOOK TO RCA FOR INSTRUMENTS TO TEST/MEASURE/VIEW/MONITOR/GENERATE

# RCA

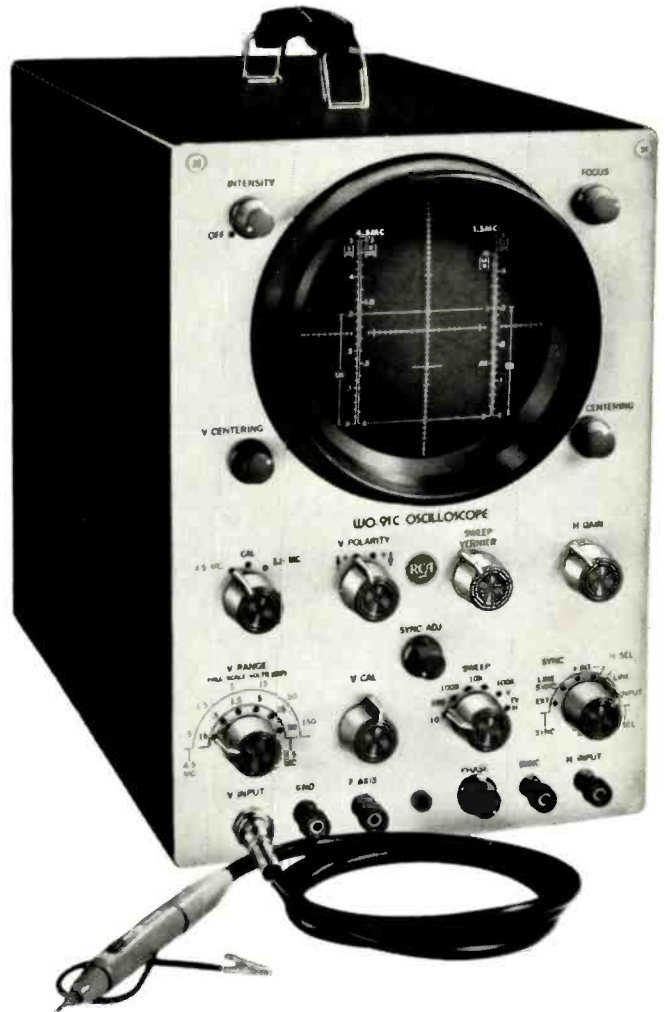


# VIEW

**The RCA WO-33A** Super-Portable 3-Inch Oscilloscope helps solve virtually any electronics servicing problem, inside or outside the shop. Its combination of exceptionally low cost and high performance have already made it popular as a monitoring and trouble shooting 'scope in black and white and color TV broadcasting studios, and in professional service. And why not? Here's a 3-inch 'scope that meets your requirements for gain, bandwidth, transient response, accuracy, versatility, and portability. AND IT'S ONLY \$139.00.\* Also available in an easy to assemble kit, WO-33A (K).



**The RCA WO-91C** 5-inch Dual Band Oscilloscope is a reliable, heavy-duty, precision 'scope in use in thousands of installations from classrooms to TV distribution systems...from service benches to broadcast stations. You probably can't find a better value. Applications include waveform analysis, peak-to-peak voltage measurement, square-wave testing, and observation of circuit characteristics. A front-panel switch gives you an easy choice of wide-band or narrow-band (high sensitivity) operation. It's easily portable, AND IT'S ONLY \$269.00.\* The WO-91C-V1 is available for 240V operation, no increase in price.



\*Optional Distributor resale price. Prices may be slightly higher in Alaska, Hawaii, and the West.

Write for a catalog with complete descriptions and specifications for all RCA test equipment: RCA Electronic Components, Commercial Engineering, Department No. J46WB Harrison, N. J. 07029

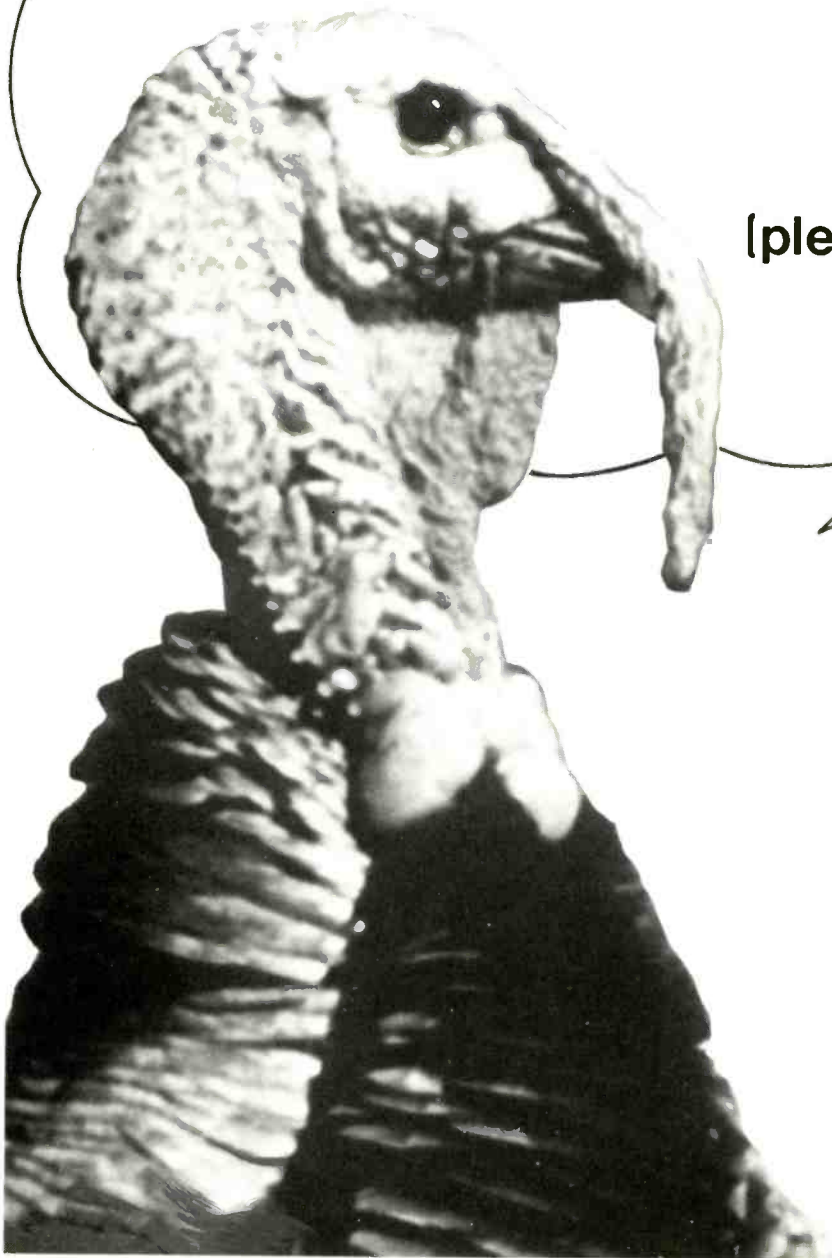
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# RCA

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Earn a complete turkey dinner and your choice of exciting toys and popular GE appliances for the whole family when you buy GE Tubes. See "Harvest of Gifts" details at right and visit your participating GE Tube Distributor today. Start earning gift points now and have a holiday on GE!

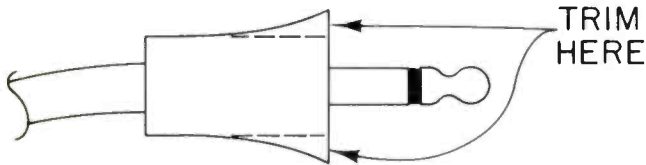
**GENERAL  ELECTRIC**  
TUBE DEPARTMENT, OWENSBORO, KY.

288-19

## MAGNAVOX

### Tape Recorder Model 1TC108 — AC Adaptor Plug

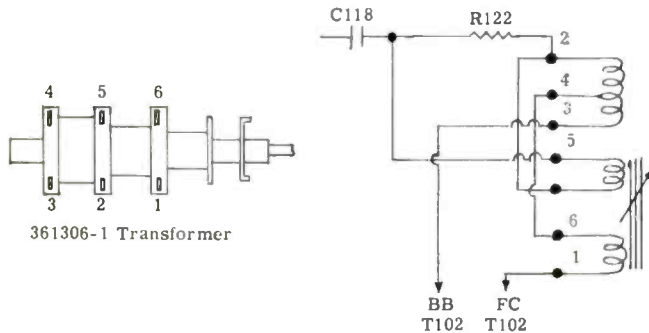
Some ac adaptors supplied for this model will not fit properly into the jack on the tape recorder because the plastic flange on the adaptor plug is slightly oversized. In



most cases the plug appears to fit but the oversized flange just holds it back, preventing a good connection. The solution is to trim the circumference of the flange using a knife or file and then sand the edge smooth.

### Correction Note on Focus Transformer 361306-2

Newsletter No. 1968-4 contained an error in the schematic wiring of the 361306-2 transformer. Terminal five



connects to the junction of capacitor C118 and resistor R122, as shown in the revised schematic.

## MOTOROLA

### Tape Player Models TM706S-1/TM707S/TM708S/TM709S — Failure To Index

This condition may be caused by two factors: the solenoid and/or cam adjustment incorrect or weak pawl spring (part No. 41A41328B01).

A solution to this problem is to make correct the solenoid plunger adjustment. Apply Molycote G (Part No. 11P40059A62) to pawls, ratchet and cam. Insert tape cartridge and adjust power supply for 11v. Use Allen wrench (or screwdriver) to turn adjustment screw clockwise while repeatedly depressing the track change switch. When pawls just fail to turn cam, back screw out 1/4 turn beyond point where cam begins to turn consistently.

Then check pawl spring. Remove the bracket which encloses the ratchet cam shaft assembly (two 1/4 in. screws).

Carefully manipulate the assembly until the solenoid plunger leaves the solenoid.

Examine assembly. If spring has enough tension to hold both pawls in contact with the ratchet, the spring is good. If the pawls actually spring out from the ratchet, replace spring (Part No. 41A41328B01). A good spring has a 45-degree angle.

Visible wear on the ratchet teeth does not interfere with normal operation.

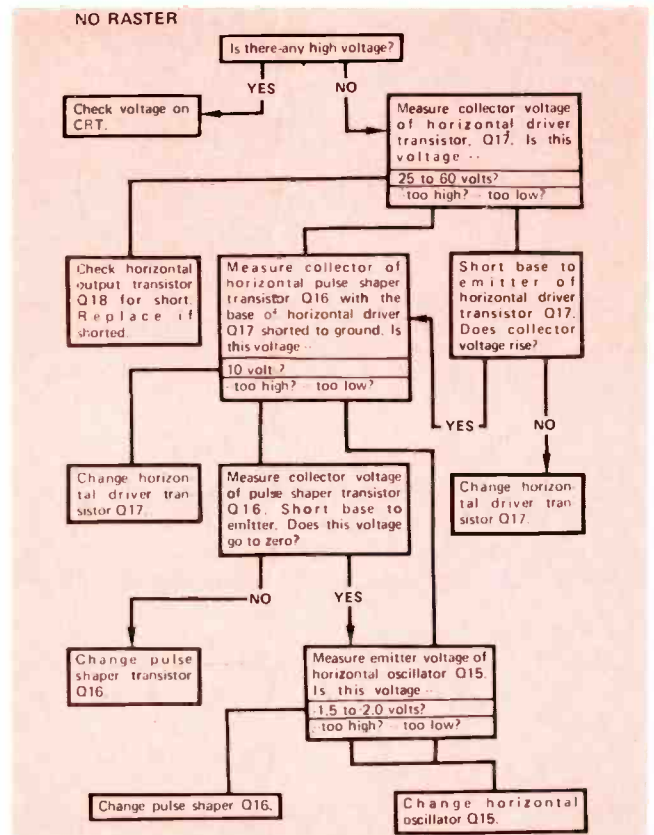
Roll pin must be removed from the plunger to make correct spring replacement. If pawls are captive when a new spring is installed, spring will be damaged. Check the tension after a new spring is installed. Repeat above solenoid adjustment.

### TV Chassis TS592 — Service Tips

**Symptom:** Critical horizontal sync. Set will perform as if horizontal phase diode E501 is defective. **Cause:** R505 (100K) resistor open. Check C510 (.005 horizontal pulse coupling) for short or leaky condition. **Solution:** Replace R505 (100K) and check horizontal frequency. Re-phase if required.

### TV Chassis TS592/TS612 — Troubleshooting by Transistor Isolation

To help determine whether a TS592 or TS612 chassis can be fixed in the home or should go to the shop, several troubleshooting charts have been written as an aid in iso-



lating a defective transistor stage. The same procedure can be used in the shop.

The primary function of the charts is to direct you to the defective stage by a "process of elimination." An important prerequisite in using these charts is to define the receiver's symptom accurately.

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Preferred by technicians for their fast heating copper tips, exclusive trigger-controlled dual heat, and high soldering efficiency. Available in 3 watt-age sizes, each with spotlight.

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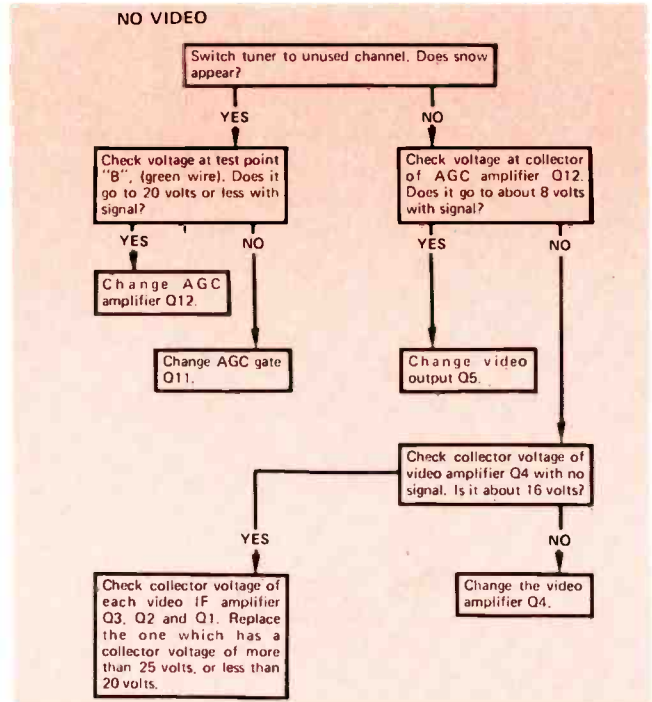
- 25-watt, 1¾-oz. Model SP-23 with 1/8" tip (In kit with extra tips, soldering aid, solder—Model SP-23K)
- 40-watt, 2-oz. Model SP-40 with 1/4" tip
- 80-watt, 4-oz. Model SP-80 with 3/8" tip
- 120-watt, 10-oz. Model SP-120 with 1/2" tip
- 175-watt, 16-oz. Model SP-175 with 5/8" tip

Complete Weller Line includes replacement tips and solder

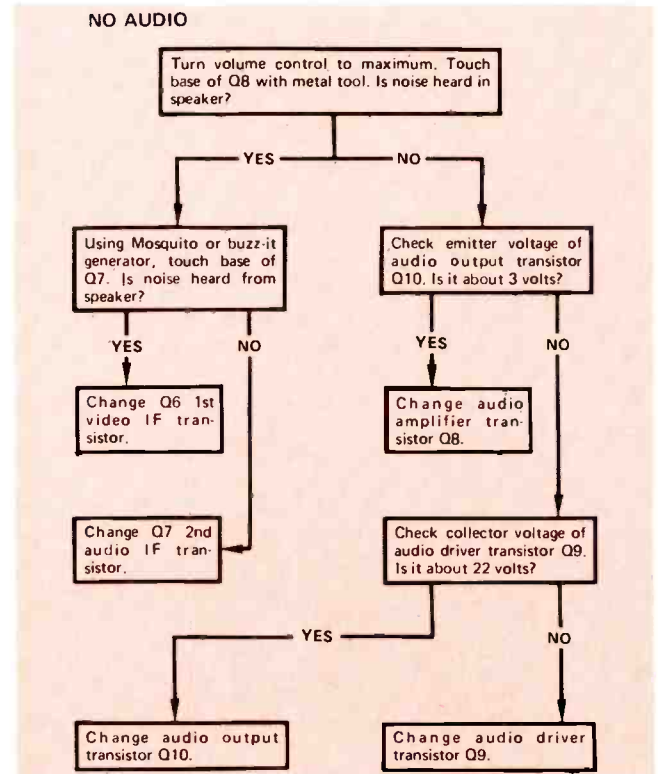
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... for more details circle 153 on postcard

## ET/D TECHNICAL DIGEST



On each troubleshooting chart is a series of blocks. Each block contains a suggested action related to the symptoms described and a question. The question asks the results obtained from the action. You are directed to the next block by answering the question with a yes or no. The last block on the chart gives the conclusion.



These charts can be used effectively with very little knowledge of the receiver's circuitry. Also, the only equipment required is an accurate VTVM or 20,000 ohm/volt VOM.

# "QT" keeps you ahead with the fastest moving RCA parts.

"QT" is a Quick Turnover Inventory system that brings you a steady supply of the fastest-moving RCA Home Instrument replacement parts. It practically guarantees you'll have the parts you need for most of your servicing jobs.

This means you get the jobs done, without backlogging and last-minute dashes to your distributor for essential "QT" parts.

A "QT" inventory helps you cut down on those stacks of dusty boxes and trays of unused parts—and the dollars you have tied up in them.

The entire system is incredibly handy and efficient

... lets you find parts quickly while you're working ... reminds you to reorder when your supply is low ... makes inventorying and reordering so fast that it's almost automatic.

Suddenly you'll find yourself with a lot more time to devote to additional servicing jobs.

Check it out with your RCA "QT" Parts Distributor. He'll discuss the different "QT" inventory plans with you and help you select one tailored to your operation.

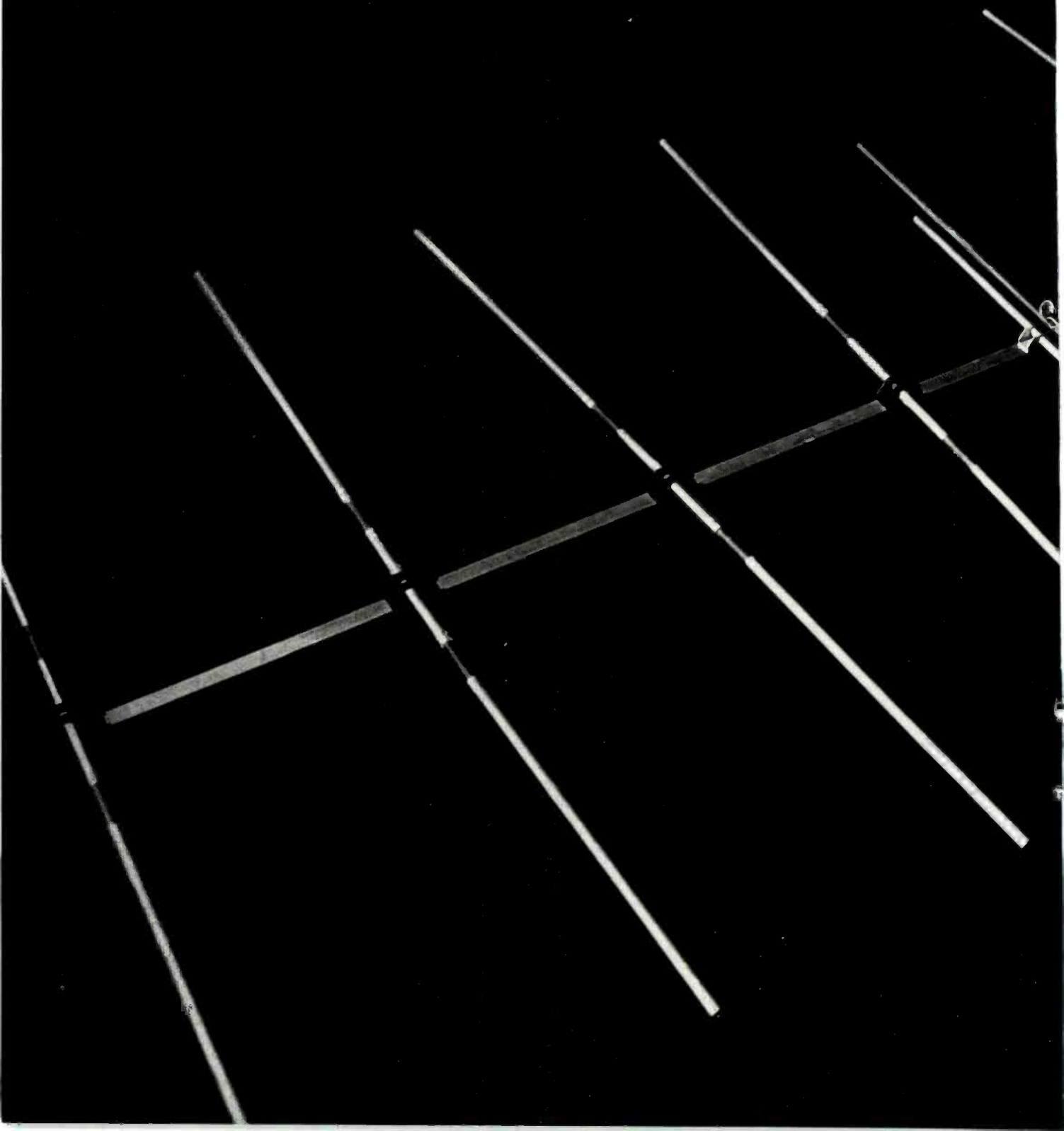
After that, things go very smoothly.

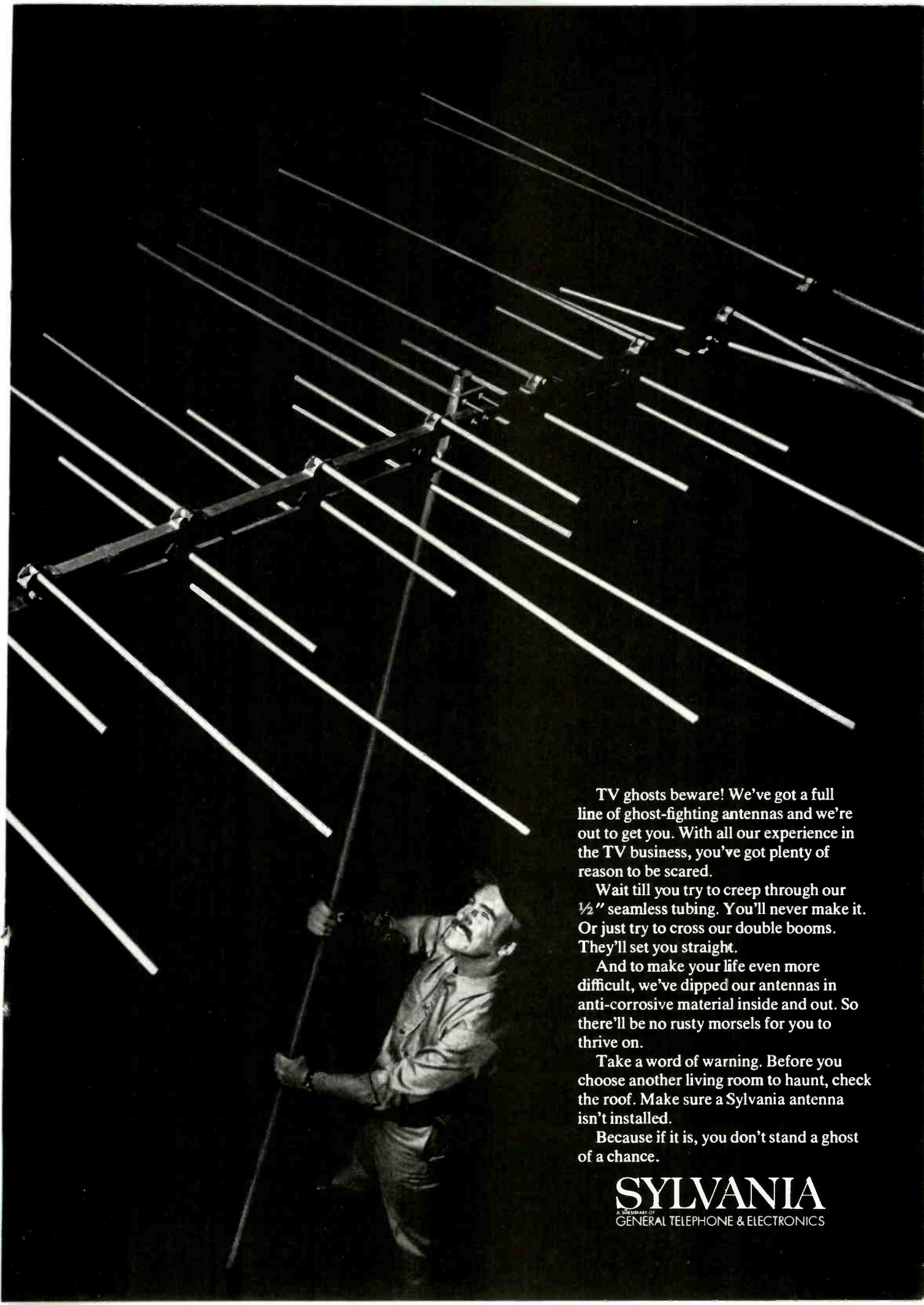
Parts and Accessories, Deptford, New Jersey.

## RCA



**Sylvania goes into the  
ghost-fighting business.**





TV ghosts beware! We've got a full line of ghost-fighting antennas and we're out to get you. With all our experience in the TV business, you've got plenty of reason to be scared.

Wait till you try to creep through our  $\frac{1}{2}$ " seamless tubing. You'll never make it. Or just try to cross our double booms. They'll set you straight.

And to make your life even more difficult, we've dipped our antennas in anti-corrosive material inside and out. So there'll be no rusty morsels for you to thrive on.

Take a word of warning. Before you choose another living room to haunt, check the roof. Make sure a Sylvania antenna isn't installed.

Because if it is, you don't stand a ghost of a chance.

**SYLVANIA**  
A SUBSIDIARY OF  
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# ALL NEW!

*NRI learn-by-doing training in*

## ADVANCED COLOR TV




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- 50 designed-for-learning color circuit experiments
- Programmed with 18 "bite-size" lesson texts

A comprehensive training plan for the man who already has a knowledge of monochrome circuits and wants to quickly add Color TV servicing to his skills. DEFINITELY NOT FOR BEGINNERS. It picks up where most other courses leave off—giving you "hands on" experience as you build the only custom Color TV set engineered for training. You gain a professional understanding of all color circuits through logical demonstrations never before presented. The end product is your own quality receiver.

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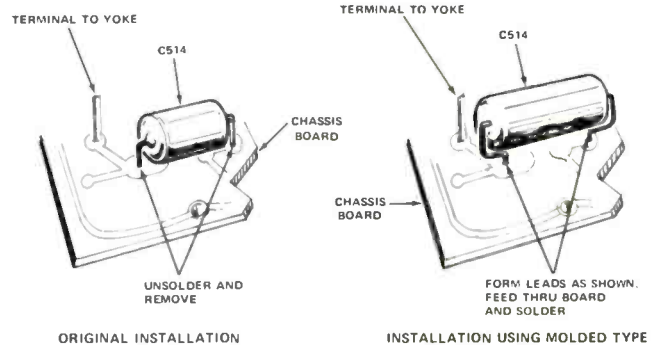


ET/D

TECHNICAL DIGEST

#### TV Chassis TS597 — Service Tips

**Symptom:** No high voltage. **Cause:** C514 shorted. **Solution:** When replacing C514 (.027 $\mu$ f in some sets, .033 $\mu$ f in others), it should always be replaced with a molded type



rather than original metalized style. The molded type is usually longer. However, it can be installed in position as shown here. Use a .056 $\mu$ f and 600v dc capacitor in all replacements.

### ADMIRAL

#### Tape Recorder Model CTR300 — Battery Life

CTR300 and ACTR310 'Porta Corder' tape recorders are designed for a small case so they can be used easily in portable applications. To maintain the small package size, smaller batteries had to be used. Customers that complain about short battery life should be reminded that small batteries cannot supply a long operating life, and that tape recorders are mechanical devices that draw more heavily on batteries than purely electronic devices.

We suggest you recommend that the customer operate these models on batteries only when ac power is not available. Whenever possible, the optional ac charger TCC9 should be used. This charger will operate the recorder even with batteries removed. If excessive current drain is suspected, check against the current drain chart in manual S1075.

#### Transistor Testing and Substitution

Reports from the field indicate that an increasing number of problems are being caused by failure of service technicians to use exact replacement transistors.

Transistors used in Admiral equipment have been carefully chosen according to gain, noise, leakage, frequency response, associated circuits, type and kind. Transistor testers do not measure all of these characteristics, and general replacement transistors can rarely match all of these characteristics. The operation of the set consequently suffers. For example, in some chassis the stages are direct coupled (no coupling capacitor) and the internal emitter to base resistance of one transistor is actually the collector load resistor for a previous stage! Any transistor other than the original type used in this position will create a problem!

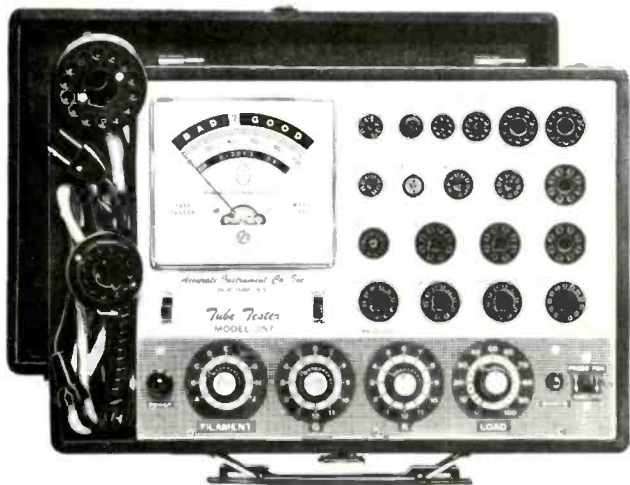
Replacing output transistors with some other matched pair will usually cause either crossover distortion or a failure of the critically valued emitter resistor which acts like a fuse.

Use the replacement parts which Admiral supplies to avoid creating problems of your own making!

ELECTRONIC TECHNICIAN/DEALER



# The New 1968 Improved Model 257 **A REVOLUTIONARY NEW TUBE TESTING OUTFIT**



- Tests all modern tubes including Novars, Nuvisitors, Compactrons and Decals.
- All Picture Tubes, Black and White and Color

## **ANNOUNCING... for the first time**

A complete TV Tube Testing Outfit designed specifically to test all TV tubes, color as well as standard. Don't confuse the Model 257 picture tube accessory components with mass produced "picture tube adapters" designed to work in conjunction with all competitive tube testers. The basic Model 257 circuit was modified to work compatibly with our picture tube accessories and those components are not sold by us to be used with other competitive tube testers or even tube testers previously produced by us. They were custom designed and produced to work specifically in conjunction with the Model 257.

**COMPLETE WITH ALL ADAPTERS AND ACCESSORIES, NO "EXTRAS"**

### **STANDARD TUBES:**

- ✓ Tests the new Novars, Nuvisitors, 10 Pins, Magnovals, Compactrons and Decals.
- ✓ More than 2,500 tube listings.
- ✓ Tests each section of multi-section tubes individually for shorts, leakage and Cathode emission.
- ✓ Ultra sensitive circuit will indicate leakage up to 5 Megohms.
- ✓ Employs new improved 4½" dual scale meter with a unique sealed damping chamber to assure accurate, vibration-less readings.
- ✓ Complete set of tube straighteners mounted on front panel.

### **BLACK AND WHITE PICTURE TUBES:**

- ✓ Single cable used for testing all Black and White Picture Tubes with deflection angles 50 to 114 degrees.
- ✓ The Model 257 tests all Black and White Picture Tubes for emission, inter-element shorts and leakage.

### **COLOR PICTURE TUBES:**

- ✓ The Red, Green and Blue Color guns are tested individually for cathode emission quality, and each gun is tested separately for shorts or leakage between control grid, cathode and heater. Employment of a newly perfected dual socket cable enables accomplishments of all tests in the shortest possible time.

The Model 257 is housed in a handsome, sturdy, portable case. Comes complete with all adapters and accessories, ready to plug in and use. No "extras" to buy. Only . . . . .

**\$47<sup>50</sup>**

## **NOTICE**

We have been producing radio, TV and electronic test equipment since 1935, which means we were making Tube Testers at a time when there were relatively few tubes on the market, way before the advent of TV. The model 257 employs every design improvement and every technique we have learned over an uninterrupted production period of 32 years.

Accurate Instrument Co., Inc.

# **SEND NO MONEY WITH ORDER** **PAY POSTMAN NOTHING ON DELIVERY**

Try it for 10 days before you buy. If completely satisfied then send \$10.00 and pay the balance at the rate of \$10.00 per month until the total price of \$47.50 (plus P.P., handling and budget charge) is paid. If not completely satisfied, return to us, no explanation necessary.

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Dept. 567 2435 White Plains Road, Bronx, N. Y. 10467

Please rush me one Model 257. If satisfactory I agree to pay \$10.00 within 10 days and balance at rate of \$10.00 per month until total price of \$47.50 (plus P.P., handling and budget charge) is paid. If not satisfactory, I may return for cancellation of account.

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Save Money! Check here and enclose \$47.50 with this coupon and we will pay all shipping charges. You still retain the privilege of returning after 10 day trial for full refund.

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If you are **NARROW  
MINDED**

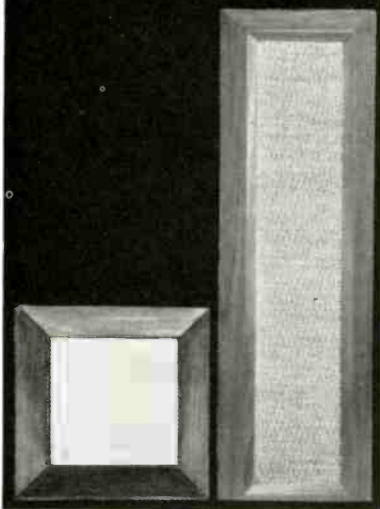
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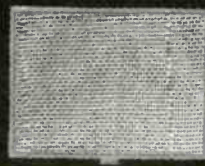
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New Mini-Column, only 17" high, dramatically demonstrates "Sound Director" focused sound.

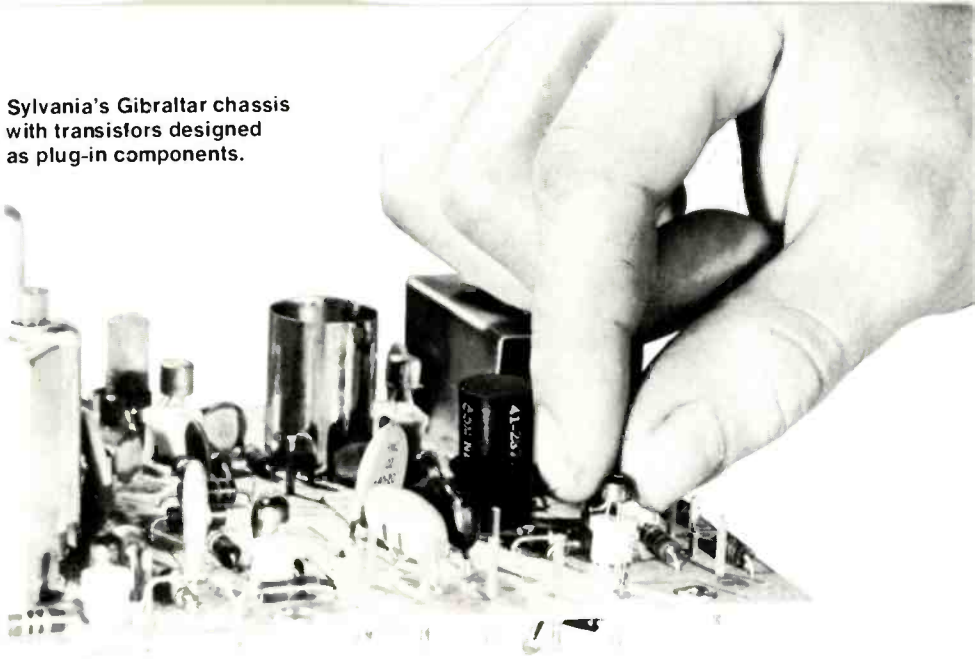


TX-200, pace setter of the exciting Decor/Oriented Hi-Fi Line.

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**ELECTRONIC TECHNICIAN/DEALER**

Sylvania's Gibraltar chassis with transistors designed as plug-in components.



## A PREVIEW OF 1969 COLOR TV

**Solid-state circuits with more small screen portables available and extended CRT warranties highlight the color line for the coming year**

■ This year we will see more applications of solid-state and integrated circuits, along with a larger variety of screen sizes and extended warranties.

It should be noted color TV sales to dealers advanced 16.1 percent over May 1967; 305,629 units vs 263,181. Total 1968 color TV sales still show a 13.7 percent edge over last year's 1,692,081 with 1,924,083 color sets sold to dealers, according to estimates released by the Electronic Industries Assn. (EIA).

Motorola is said to be the first with an all solid-state color TV receiver by replacing the HV rectifier tube with a solid-state module.

RCA Victor will introduce an all new solid-state (except HV rectifier) color television chassis incorporated in the new TransVista line of RCA color TV instruments.

Sylvania's new color line includes the nation's first color slide theater and a new series of 14in. picture screens.

Most technicians will welcome features such as plug-in sockets for transistors and plug connectors on various units in the chassis making servicing easier.

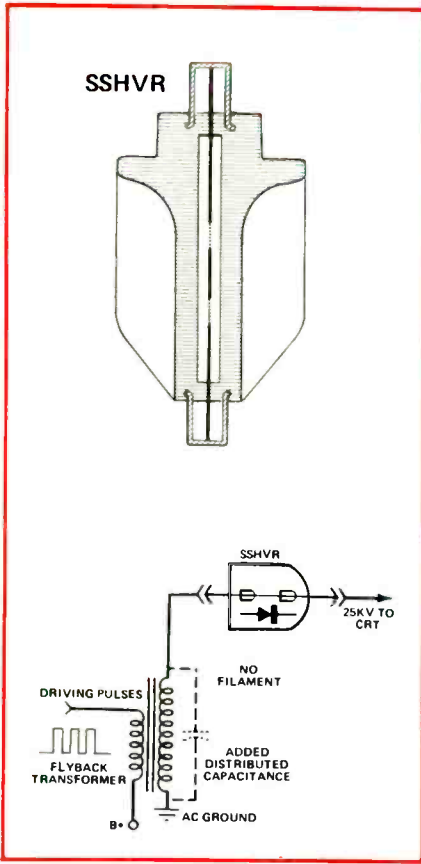
### **MOTOROLA**

The 1969 color TV line is comprised of 20 models using four versions of the basic TS915 chassis and eight versions of the TS921 tube-type color television chassis.

Motorola has developed an all solid-state HV module (see illustration Fig. 1) including a solid-state HV rectifier. This rectifier has been designed to replace the HV rectifier tube, making possible an all solid-state color TV with no receiving tubes. The new HV module can be electrically and mechanically substituted in any prior production Motorola solid-state TV receiver.

AFC/FTI circuits have been added to the TS921 chassis which is aligned and functions in the same manner as the familiar AFC/FTI circuit in the TS915 chassis.

# PREVIEW...



**Fig. 1** — Motorola's new solid-state module eliminating the 3BS2 HV rectifier tube.

With the exception of the remote chassis (AC23TS915) all functions remain the same as in the TS915 chassis. The front panel controls have been relocated to accommodate the remote control chassis.

The remote control chassis features a solid-state TRR7 remote receiver control system and a solid-state TRT6 battery-operated remote control transmitter.

The remote control system is comprised of three plug-in panels, similar to those already used in the TS915 chassis (a) Remote preamp panel "U," (b) Remote control panel "Y," (c) Remote power supply panel "X."

The control panel "Y" employs three FET transistors built into memory modules and are used to electrically control the hue, intensity, volume and on/off functions.

Solid-state circuitry is used to simulate the conventional hue, intensity and volume controls. These circuits are controlled by the FET memory modules and are activated by the remote transmitter on the front panel controls. The controls are switches; when depressed, they activate the desired function.

## PACKARD BELL

The new chassis, the 98C18 and 98C19, are identical to the 98C17 in many respects. The deflection

sub-assemblies, the ICP, the convergence assembly and the yoke assemble are unchanged with the exception of a printed board used in the convergence assembly.

The power supply is quite similar with the exception of the 140v buss which is now taken from a center tap on the power transformer. The power requirement of the set has been reduced approximately 50w permitting the use of a smaller transformer.

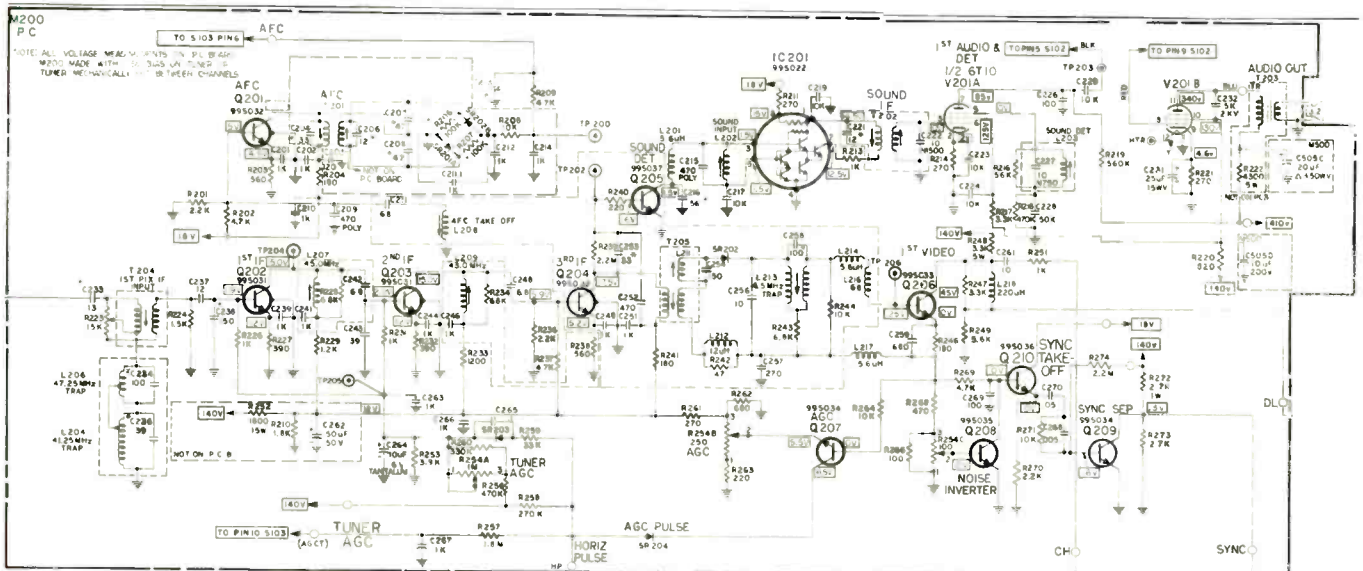
A Standard Kollsman VHF turret-type tuner is employed. This tuner is electrically similar to the previous chassis, except an addition of a voltage variable capacitance diode varactor and associated circuitry required for the AFC function.

An AFC defeat switch is provided to permit fine tuning adjustment of the tuner. A pilot light indicates when the AFC is in operation.

The major changes appear in this section of the set, which has been transistorized. This section contains the IF strip, the 1st video amplifier, ANI, AGC, sync separator and the sound system. (see schematic Fig. 2.)

The IF is a conventional three-stage system with the first two stages controlled by AGC. The coil arrangement and tuning of the strip is much the same as tube-type units.

**Fig. 2** — A major change took place in Packard-Bell's IF strip, the 1st video amplifier, noise inverter, AGC, sync separator and sound, which has been transistorized.



The AGC amplifier, sync separator and the ANI all receive their drive from the emitter of the first video amplifier. The noise inverter base is driven through a control with the collector tied to the base of the sync separator so that noise cancellation actually takes place at the sync separator base and is effective in the sync only.

The AGC system must supply a negative voltage to bias the tuner and at the same time a positive voltage to control the strip. These voltages must also vary so that the amount of control applied to the two circuits will differ under changing signal conditions. This means that at one signal level there may be little or no control of the tuner and the primary control will be on the strip, and at another signal level, the strip may be held at a more or less constant level and the primary control applied to the tuner.

The pulse from the horizontal output transformer is coupled into the AGC system at the junction of R-257 (see schematic Fig. 2) the tuner AGC filter resistor; R-258 which supplies voltage from 140v buss; R-259 which is in series with SR203, one of the AGC diodes, and SR204, which serves as a pulse rectifier. You will also see that one end of SR203 is connected to a voltage divider network be-

tween the 140v buss and ground and that this point also serves to supply the AGC voltage for the strip. C264 filters the AGC at this point so that the control voltage is pure dc. When a weak signal is received, SR203 will conduct and develop an AGC control on the strip. Under these conditions the incoming signal may not be strong enough to cause conduction through the AGC amplifier. Should this be the case, no AGC will be developed at the tuner and it will operate in its most sensitive condition, which permits best signal to noise ratio under weak signal conditions.

When the AGC amplifier receives enough signal to start conducting a negative voltage will be developed at the anode end of SR203. This will cause a reduction in the positive voltage where it meets the voltage divider network. As the signal increases, this voltage will decrease until it reaches a clamping value established by the setting of R254A, referred to as the tuner AGC control. This control actually establishes the IF AGC clamping reference point and also the cross-over point at which tuner AGC bias takes over. The point at which the AGC amplifier transistor conducts is controlled by the setting of the master AGC control R254B.

## PHILCO-FORD

The Philco-Ford Corp. has coupled its popular Color Tuning Eye with another innovation, Auto-Lock Channel Tuning (ACT), in the 1969 color TV line.

The combined tuning eye and ACT, available in 12 of the 40 models in the new line, provide color tuning ease and accuracy. An additional 22 models have the Color Tuning Eye.

The illuminated Color Tuning Eye permits quick, simple tuning for clearest picture signal on all 82 VHF and UHF channels.

With the addition of solid-state ACT, (see schematic Fig. 3) the set owner merely turns the tuning dial until the eye narrows, then flicks the ACT switch. The ACT circuit locks in the signal automatically and prevents drifting of VHF and UHF channels.

The Color Tuning Eye-ACT combination is offered in a complete series of console models starting at \$579.95. These models also have Philco-Ford's Picture Preference control which permits the viewer to adjust softness or sharpness of the picture to suit his personal taste.

The 1969 line leads off with a new 15in. (viewable diagonal) portable, model 5102WA, which has three-stage IF amplification, a solid-state signal system and a vinyl-clad

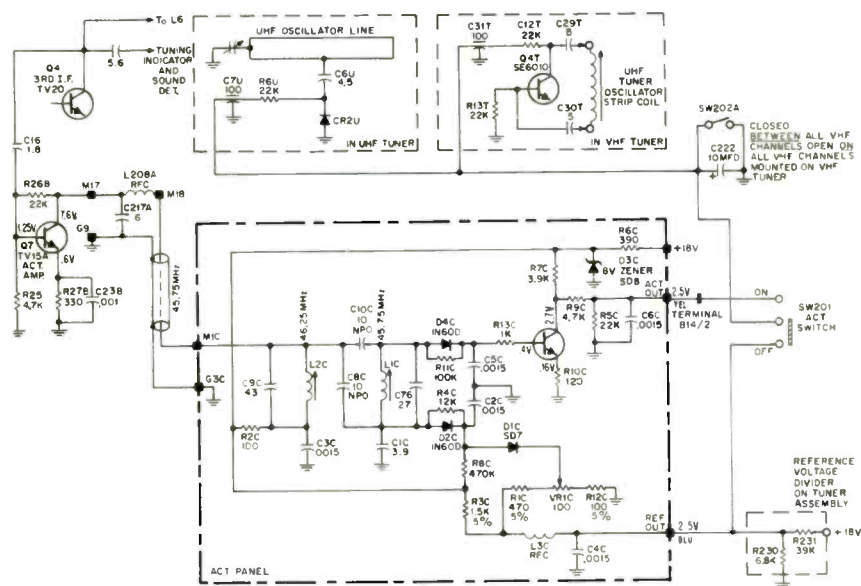


Fig. 3 — Philco-Ford's Color Tuning Eye and Auto-Lock Channel Tuning (ACT) circuits featured in the color line.

## PREVIEW ...

metal cabinet. The set carries a suggested retail price of \$329.95 and is scheduled for early fall availability.

Additional circuit descriptions and service information will be covered in a forthcoming TEKLAB report.

### RCA VICTOR

RCA Victor color TV sets will feature three new chassis: the CTC36, CTC38 and the newly announced solid-state CTC40. Several familiar chassis were reintroduced, including the CTC27X, CTC31, CTC35 and two variations of the CTC22 chassis.

Many of the 1969 color sets are equipped with the new CTC38 and 38X chassis. The sets, in a variety of cabinet styles, are equipped with either the 25XP22 or the 22-UP22 CRT.

The CTC38 chassis is physically similar to the previous CTC31. Electrically the CTC38 and 38X offer many desirable features. The most important is the big chassis performance in a small physical package which has been facilitated

by the employment of hybrid circuitry.

From the service standpoint all the new color chassis feature bottom road-mapped circuit boards and continue to use the solder-resist coating introduced last year.

This year's VHF tuners (KRK-140 and 144) feature circuit board coils and hybrid modifications (see simplified schematics Fig. 4).

The VHF tuner employs a familiar nuvistor (6DS4) RF amplifier stage. The mixer stage consists of two transistor stages in a cascode arrangement. Signal is coupled to the base of the common-emitter first mixer stage where the local oscillator signal is also injected. The first mixer then drives a common-base second stage.

Output from the VHF tuner is applied to a three-stage transistor video IF. Sound is picked off from the collector of the third IF stage and channeled through a sound section that contains new solid-state sound IF circuitry.

Detected video is applied to a three-stage video amplifier. Output from the plate of the second video stage furnishes signal to the AGC sync, chroma and color sync sections of the receiver. After a suitable delay, signal from the cathode of the

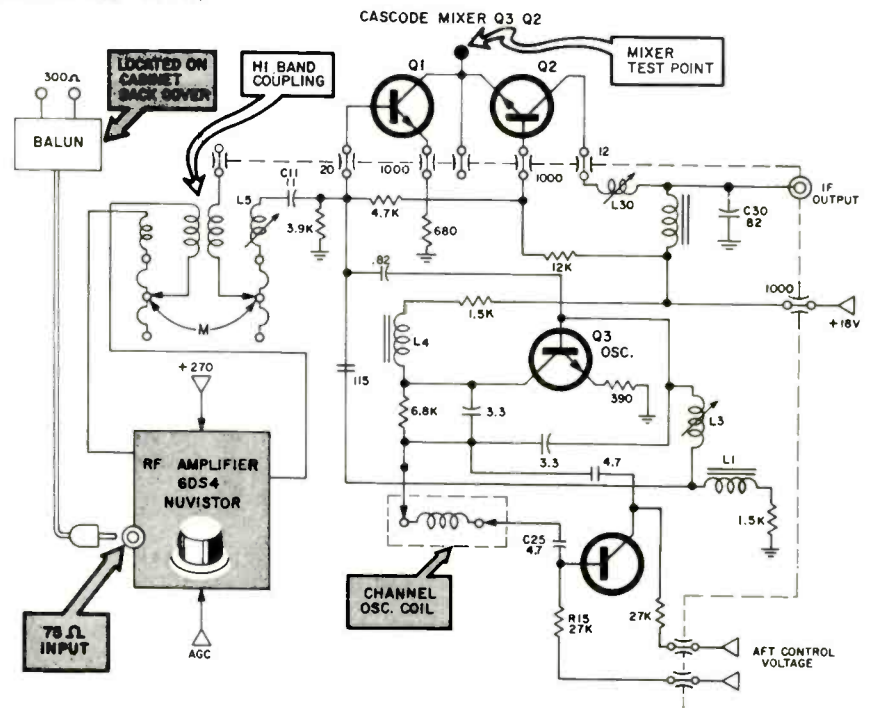
second video amplifier is applied to the video output stage to drive the CRT cathodes.

The color sync section in the CTC38 is similar in most respects to that used in the CTC31. The system is equipped with an injection-locked oscillator and employs solid-state ACC and color killer stages.

The chroma section in this new chassis is similar in some respects to the CTC31 circuitry, using two bandpass amplifier stages. Output from the bandpass amplifier stages is demodulated by a new solid-state balanced diode demodulator circuit (see simplified schematic Fig. 5). Because of the new demodulator circuit, the difference amplifiers require more gain; pentodes are now used for the red and blue difference amplifier stages — with green being matrixed from the plates of the red and blue stages. Output from the difference amplifiers is ac coupled to the color CRT grids and a familiar diode clamp circuit is used to preserve and restore the dc information.

The vertical sweep section is effectively the same circuitry used in the CTC31. The horizontal sweep section is also familiar, with minor changes in the biasing of the 6JE6A horizontal output stage, to

Fig. 4 — Simplified schematic of RCA Victor's KRK140 and 144 VHF tuner. (Courtesy of RCA Victor Sales Corp.)



provide increased reliability. Also new this year is a cathode link which is easily opened to facilitate measuring horizontal output cathode current. High voltage circuitry in this chassis is similar in most respects to the system used for several years. However, one significant change has been made in the regulator circuitry. This year, the high voltage control has been replaced with a fixed precision voltage divider network which establishes the nominal second anode voltage to very close tolerances. The remaining circuitry in the CTC38 is much like that found in the CTC31. One noteworthy exception is in the power supply area, where a "high" line voltage switch has been installed. The service technician may select the high line position when a set operates in a high voltage area.

The CTC40 is an all new solid-state (except HV rectifier) color chassis and will be employed in the new TransVista line.

A fully solid-state VHF tuner (KRK142) will be employed using an MOS field-effect transistor (FET) as an RF amplifier.

The video IF system employs three stages of amplification. A newly designed noise inverter stage is coupled to a two-stage sync separ-

ation system and a gated AGC amplifier.

The chroma circuitry employs two chroma amplifiers and a bandpass stage supplying three separate color demodulators — one for each primary color difference signal R-Y, B-Y and G-Y. The color difference signals are amplified by separate drivers and output stages before application to the CRT control grids.

The automatic chroma control circuitry is a "closed loop" system controlling the gain of the 1st chroma amplifier. The color sync AFPC system also is a "closed loop" system employing a varactor frequency controlling diode and a separate 3.58MHz CW amplifier.

The vertical deflection circuitry employs a modified Miller sweep system controlled by an electronic switch. The horizontal oscillator is a blocking oscillator with automatic frequency control provided by a diode phase comparator system.

## SYLVANIA

Sylvania's new color line includes the nation's first color slide theater and a new series of 14in. picture screens.

The 1969 color line includes 63 models in a wide range of cabinet

styles, finishes, and screen sizes. Every set features Sylvania's Color Bright 85 CRT, with "rare earth" phosphors, in 18in., 20in., 23in. or the new 14in. screen size.

All color TV sets will feature: preset fine tuning dc picture restoration, gated automatic gain control, ac circuit breaker reset button, horizontal blanking circuitry, transistorized noise suppression circuit, automatic color purifying circuitry (degausser), automatic color level monitor, transistorized UHF tuner, and illuminated VHF-UHF channel windows.

All 23in. sets in the 1969 line feature Sylvania's new Gibraltar chassis.

Two-thirds of the active components in the Gibraltar chassis are transistors. A new tube used in the chassis is Sylvania's "posted filament" tube which is said to provide longer life and superior performance over conventional receiving tubes. Transistors used in the chassis are the first designed as plug-in components which can be replaced as quickly and conveniently from top of chassis.

The Gibraltar chassis also includes a "line voltage switch."

The Sylvania 23in. color line begins with seven models in the

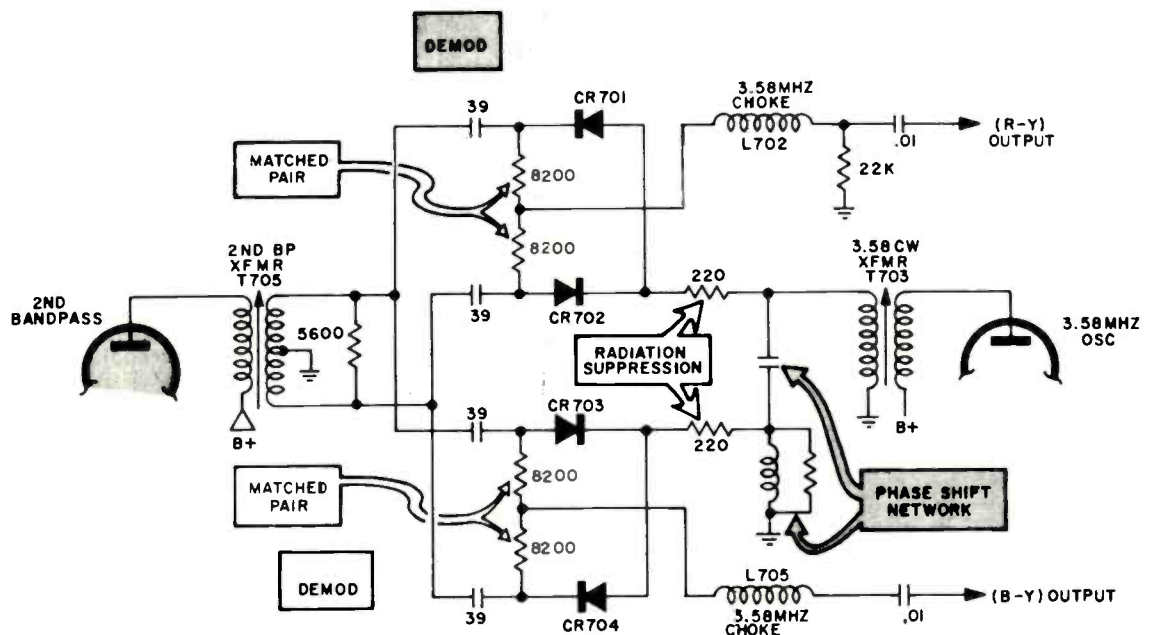


Fig. 5 — Simplified schematic of RCA Victor's new solid-state balanced diode demodulator circuit.

## PREVIEW . . .

Deluxe Color series and nine models in the Custom Color series.

Each of the color sets in the 1969 line, beginning with the Custom Color series, includes Sylvania's "Picturematic" automatic fine-tuning control.

The "plugability" concept is carried throughout the entire Gibraltar chassis. The advanced chassis has a plug-in tuner cluster, deflection yoke, convergence section, automatic degaussing section, speakers and a plug-in remote control unit.

Other changes in Sylvania's chassis include special new receiving tubes and a new HV transformer. The chassis uses the industry's first posted filament HV rectifier tube.

A second new tube is a horizontal amplifier capable of operating at supply voltages of from 250 to 450v. This tube has a radiator fin design for fast, efficient dissipation of heat, a major cause of tube failure.

In addition, the serviceability of the sets has been simplified by installing a back cover that removes with a turn of wing bolts, and a removable bottom panel which al-

lows most servicing without removing the chassis from the cabinet.

The Slide Theater can be operated as a B/W or color television set; an 'all-in-one' slide projection system with the photographs showing on the screen of the TV set, or as a tape recorder and player. "All of the component instruments in the unit can be operated independently."

The tape recorder and the slide projection system (see block diagram Fig. 6) can be synchronized to prepare slide presentation with taped narrations that also change the slides electronically on cue. The slides also can be changed manually with a remote-control switch held by the viewer.

The slide system uses a circular slide tray which can accommodate eighty 2 x 2in. color or B/W slides. A small cathode ray tube, called a "flying spot scanner," is used to transmit the photograph from the slide to the screen of the TV set.

The scanner "reads" each slide with a rapidly moving spot of light, breaking down each slide into the three basic television colors — blue, green and red. Other components in the slide projection system convert these colors into video signals which

are then fed into the TV set and displayed on the screen. The unit has a factory-adjusted fixed focus. The objective lens is set at 50mm, f3.5.

Focusing of the slide is done automatically by the spot scanner. However, it is possible for a viewer to adjust the color control of a TV set to enhance certain hues in a color slide. He also can increase or decrease the brightness of a slide with the brightness control of the TV set.

A microphone provided with the unit permits users to produce a coordinated slide-tape presentation. To accomplish this, the user describes the slides being shown and then presses a button when he wants the next slide to appear. This "change slide" signal remains on the tape and triggers a slide change during the playback. This automatic signal is a 60Hz "beep" tone.

The cassette-type cartridge tape recorder contains a record and playback feature, a recording level meter, a microphone and the control which provides the means to electronically change slides.

A forthcoming article will cover further changes made in both color and B/W sets for 1969. ■

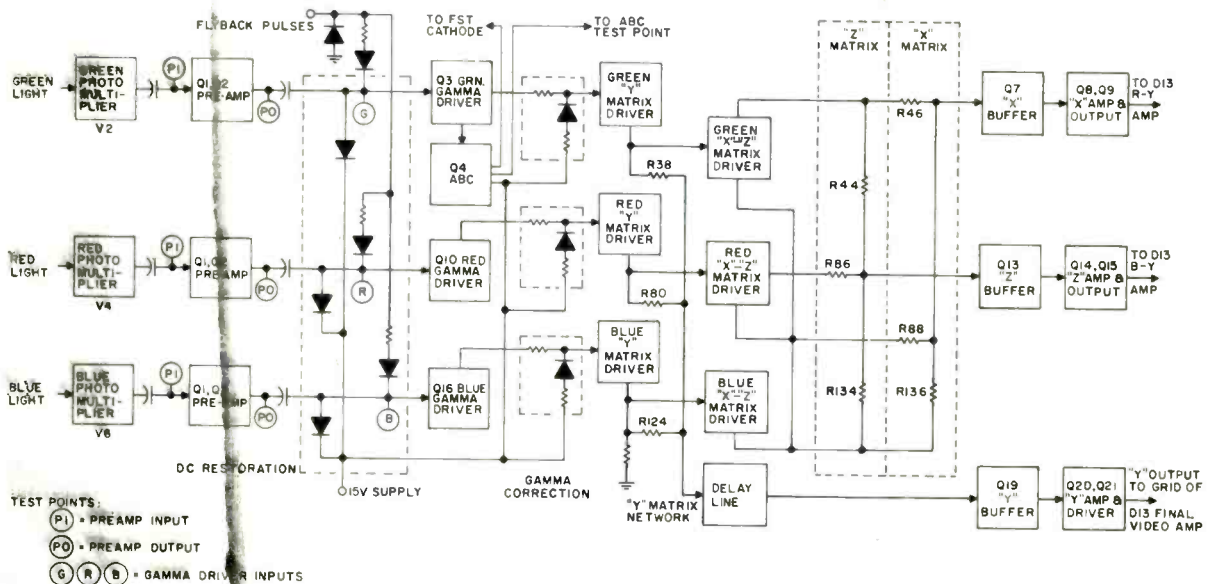


Fig. 6 — Block diagram of Sylvania's tape recorder and the slide projection system.



# Is It-or Is It Not-the Color CRT?

Learn how to answer this sometimes \$169 question

■ The new rectangular 90deg deflection color CRTs do develop problems. And it frequently takes time to chase the "bugs" out of all new things. So, while the design engineers do their homework, we'll tell you how to handle some problems you may encounter in this area of color TV servicing.

But remember one thing: When you tell a customer his color CRT is defective and needs replacing — brother, you'd better be right or you're in trouble.

## Preliminaries

Several kinds of troubles can develop in color CRTs. These include low emission and grid-cathode shorts. A grid-cathode short will "turn" the gun full on. And an open screen grid can kill or disable one gun completely. A grid-cathode short in one gun will make the over-all picture turn blue, red or green. If one gun breaks down altogether, the picture is a combination of the two remaining colors.

To begin with, a good CRT tester is a must. But remember again, the best testers can give false readings and information. If you don't have a CRT tester, buy one soon. In the meantime, use the old eye-ball-to-eyeball encounter to obtain some meaningful information. If a gun is shorted in a color CRT, we can compensate by adjusting the screen controls — but this won't tell us much.

The real control of the tube is in the variable voltage between the grid and cathode. If these elements short, the gun will not function properly.

Any malfunctioning section of a color TV that upsets the signal and voltages applied to the CRT, may cause what appears to be CRT failure. Any one of a variety of defective components in the video amplifier can cause this. Defects in the color demodulator or color amplifiers can do the same. Regular power supply and boost section faults can also do this. And finally, the focus section can sometimes become a problem child.

## Check for Balanced Emission

If you suspect one gun in the color CRT has low emission or some other defect and you do not have a CRT tester handy, first check all voltages at the CRT socket and make sure they're within tolerance. Then, using a VTVM and HV probe placed at the CRT anode, adjust all screen controls down to minimum. Note the HV reading on the VTVM. Now adjust the BLUE screen control all the way up — noting the amount of drop in the HV reading. Then adjust the BLUE screen control back to minimum again. Go through a similar procedure with the GREEN and RED screen controls — comparing the voltage drop or differences. If they are all the same, the guns have the same

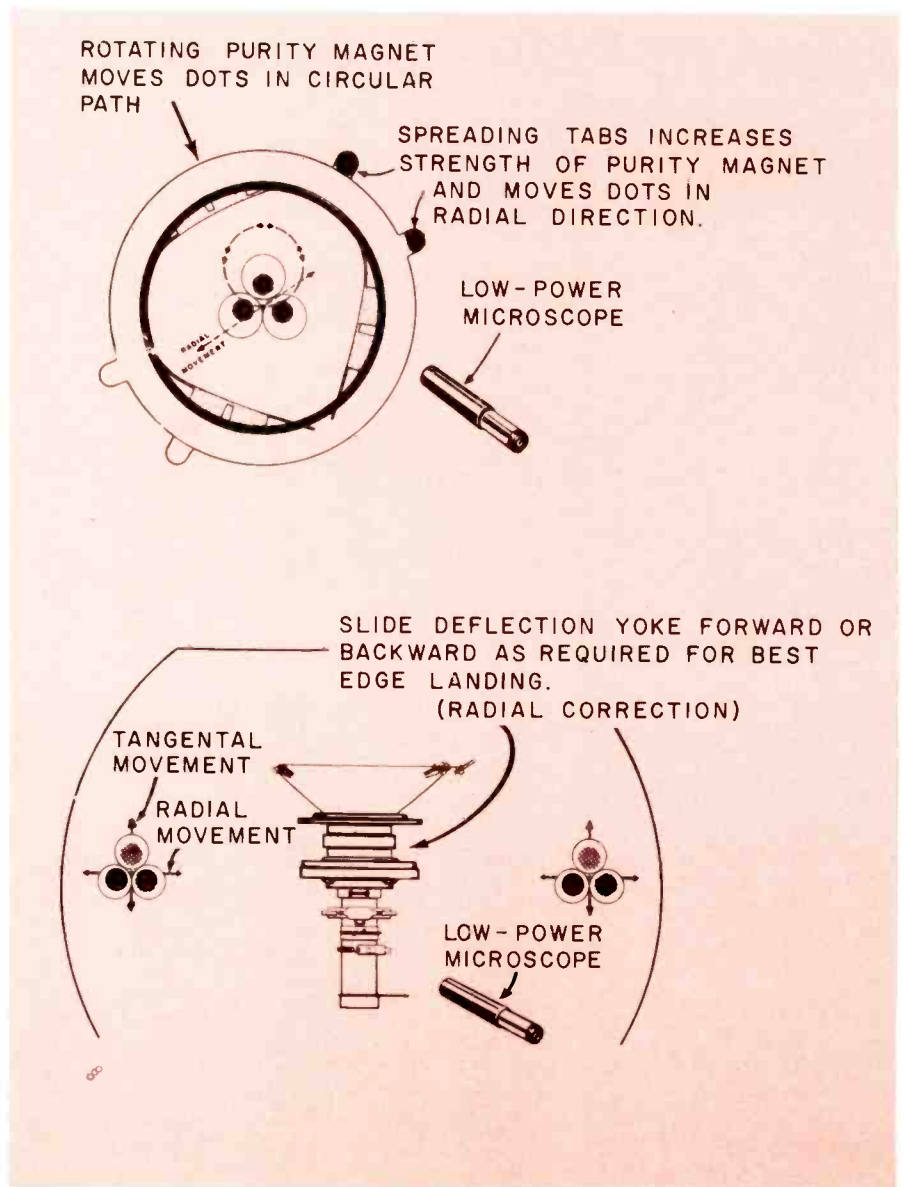
emission. But if a marked difference is noted for one gun, then that gun's emission is low.

When gray scale tracking problems are encountered in the 90deg color CRTs and the color does not appear normal, check the CRT emission. Make sure the emission is the same for each of the three guns. This is a must if you expect to obtain proper B/W and color reproduction. At this point, we can only repeat, if you don't have one, it would seem logical to invest in a top-quality color CRT tester.

Low CRT emission in one or more guns is one cause of poor balance. As you already know, one familiar clue to low emission in a B/W CRT is the "silvery" effect of the picture image — when contrast and brightness is advanced. Low emission will cause the electron gun to reach the saturation point when the peak-white areas of the picture demand high beam currents. The "silvery" effect results — with loss of detail in the bright parts of the picture. The same "lock-test" can be applied to color CRTs if you examine the picture produced by each separate gun. If you suspect a weak red gun, for example, then bias off the green and blue guns and examine the red picture alone.

When you encounter a dim, weak, washed-out picture on the color CRT screen and this symptom leads you to believe that the CRT is de-

**Fig. 1** — If after adjusting the purity magnets, sliding the yoke forward or backward for best edge landing the impurity still remains, it can be a defective CRT.



## COLOR CRT . . .

fective, make this check: first, measure the screen voltages. Many 90deg tubes use 700vdc on the screens. If you find only about 350 to 400vdc, check for an open resistor from the B+ boosted-boost diode or an open diode. This trouble has been observed on quite a few different color receivers.

One 21in. RCA color receiver we recall had an internal arc between the CRT bell and mask. When the brightness was set at a very low level, the picture was normal. But when the brightness was adjusted upward, streaks flashed across the screen and you could detect a small audible "arcing" sound. This is a rare case where you may have to substitute the CRT to determine if it is defective or not. The only check that counted here was eyeball and eardrum "metering."

What if you find too much blue on a CRT screen and the screen control won't lower the color or the control has no effect? What then? Try this: Unplug (or disconnect) the blue control grid wire from the circuit and short it to chassis ground while the set is on. Now connect it back in the circuit. If the picture is now normal and you have blue screen control, the color CRT is defective.

### Weak Phosphor or Impurities?

Sometimes you may find impurities that will not clear up or are impossible to remove. They may be small areas of color on the screen,

near the edges at times. Degauss the CRT thoroughly since the problem may be caused by some type of residual magnetism which the automatic degausser can't eliminate. If the impurity remains and no large magnetized pieces of metal can be found that might cause this, it could very well be a defective CRT. Use a low power microscope to check. If purity is incorrect, adjust the purity magnet, and slide the deflection yoke forward or backward as shown in Fig. 1.

In some "tough" purity problems, when each R, B, G raster checks out pure, but the over-all B/W raster is tinted or shows faint impurities of a complementary color (magenta, cyan or yellow), you'll find the problem is

caused by weak phosphor areas. If the blue raster has a spot where the phosphor is weak, for example, the B/W raster will show a yellow impurity. The only cure we know of is to replace the CRT. Impurities of this nature are usually weak and almost unnoticeable on color telecasts and most set owners prefer to ignore the impurity rather than purchase a new color CRT.

### Shorts or Leakage

Some color CRTs may develop shorts (or leakage) between all three screen control grids. If you cannot obtain a proper B/W picture (good gray scale tracking), then make this observation. Slide the service switch to the SETUP posi-

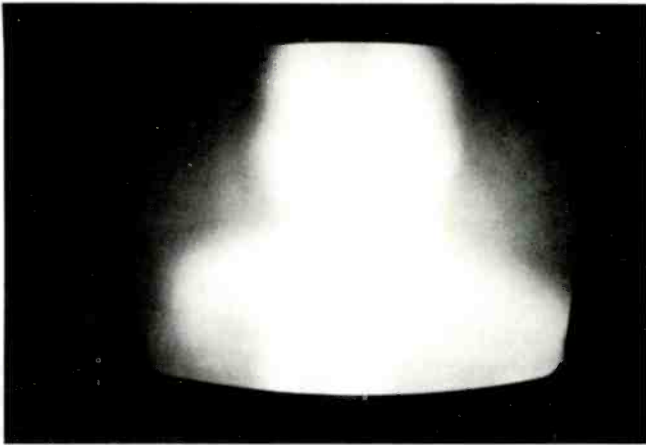


Fig. 2 — This photo shows an open focus electrode element in the CRT causing no focus action.

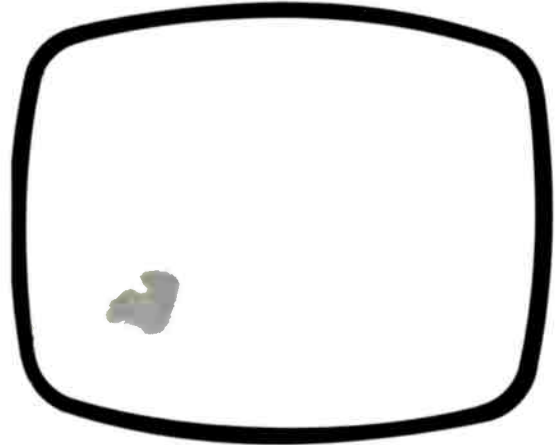


Fig. 3 — This tinted "blob" is caused by phosphor or aquadag lodged in one or more aperture mask holes.

tion. Now observe the CRT screen: When you advance the RED screen control, the BLUE and GREEN beams also come up. In this case, the screen grids of the CRT may have shorted elements. They may also have leakage to the control grids and cathodes of the gun structure. A color CRT tester should confirm if this is the case. This type short is usually caused by phosphor, aquadag or other particles in the CRT gun. These particles can sometimes be removed by placing the CRT on its face and lightly tapping the tube neck. Be careful when you do this, however, and place the tube face on a heavy cloth pad. Also, the short removal feature of some CRT testers may be used to clear the shorted grids and solve the problem.

Another trick may work in some cases. Remove the CRT socket and ground the CRT cathodes. Now, with a good insulated lead connected to the HV anode lead of the color set, are the 25kv to all other pins of the CRT. This will frequently burn out the offending particles. This method is used only as a last resort.

Another rare fault can develop in color CRTs. The condition shown in Fig. 2 appears to be caused by a defective focus system. But the focus voltage measured correct at pin 9 of the CRT. Now, if all other pin voltages check out correct, the fault can only be in the CRT. The focus electrode element is open and no focus action can take place.

### HV — but No Brightness

This one has fooled a few expert color TV technicians. We've seen the condition in a few late model Zeniths. In this case it is not a defective CRT.

The customer complains that the picture "goes fuzzy and a large black spot appears in the screen center." Later the screen blacks out completely. So now you check the set and find a very dim picture. A peek at the 3A3 HV rectifier reveals that it is running red hot. So you replace it, along with the HV regulator tube — just to make sure. With the set fired up again, still no snap, crackle, pop that indicates HV hitting the CRT. Off with the color CRT socket and guess what? Lots of high voltage now. A defective picture tube? But wait, not so fast! Flip the service switch to SETUP position and note if the vertical line appears and check if the HV now returns. If not, adjust all SCREEN controls down. Now if the HV returns but one of the screens (red, green or blue) cannot be extinguished, you'd better check or replace the 6ME8 (B-Y or R-Y) demodulator tube in the color section.

If no tubes are defective, check for a defective component in the color demodulator "Y" amplifier or other video stages. Voltage and resistance checks are the best way to isolate problems in this chroma stage. No matter how great the temptation, don't substitute the

color CRT — not until you're sure, anyway.

Quite a few of these 6ME8 demodulator tubes have been known to short and completely kill all color information. The B/W picture will come in very good and B/W tracking will remain excellent. All tubes or diodes and transistors must be checked before you tear into the color circuitry.

### Globs of Blobs

A tinted "blob" or spot may be noticed on some more recent rectangular CRTs. When the brightness control is adjusted down, the spot will vanish. It may be from 1/4 to 1 in or so in diameter. Some CRTs may have more than one spot. Sometimes it has a purplish ring around its edge, or it may be some other color. This is caused by phosphor or aquadag particles lodged in one or more aperture mask holes. The electron beam strikes this "plugged hole" and it is scattered or deflected. No picture information will appear in this spot area. It can look very weird and can be moved about with a degaussing coil. We've ignored them for a week or so and they have disappeared! Some won't, and if not, the CRT will have to be replaced. A photo of a blot is shown in Fig. 3.

For color TV servicing in general and color picture tube checks in particular, the best advice we can offer is: check, double check and then triple check! ■

# Servicing TV Remote Control Systems

Study remote control chassis circuits which will be helpful in faster troubleshooting and alignment methods

■ We find a great number of TV remote control systems in use. Basically they are quite similar and can be broken down into four sections: (1) a transmitter that radiates a control signal in the 40kHz region; (2) a receiver that converts the transmitted wave into an electrical control signal; (3) a relay driver stage that converts the electrical signal into energy for operating a control device such as a relay which in turn operates a switch or motor; (4) a motor control section performing functions normally done by hand.

Before getting into the servicing of remote control systems we should have a basic knowledge of how the unit functions and will use a Zenith "space-command" 600

series unit to illustrate the various circuits.

## Theory of Operation

Ultrasonic vibrations in the 40kHz region are emitted from a remote hand control when buttons are snapped to mechanically vibrate each rod producing inaudible sound waves.

The sound waves are picked up by a microphone at the front of the TV set which then changes these waves into electrical energy.

The microphone (shown in Fig. 1) is of the low impedance ceramic type designed for a broad peak response at 40kHz and is coupled directly to the base of the 1st amplifier transistor in the receiver.

The amplifier (complete schemat-

ic shown in Fig. 2) consists of three transistors and one tuned circuit. Resistors are connected between the collector and base of the transistors providing degeneration.

The amplitude limiter is a PNP transistor used to cut off extraneous noise pulses and assure proper control under extreme range of input signal strength. A 4.7K resistor located in the collector circuit limits the peak resonant currents by determining the limiting point of the transistor.

The relay driver stage has a  $-0.8v$  cutoff potential which is applied to the emitters of the four relay driver transistors to prevent dc collector current through the relay coils when there is no input signal.

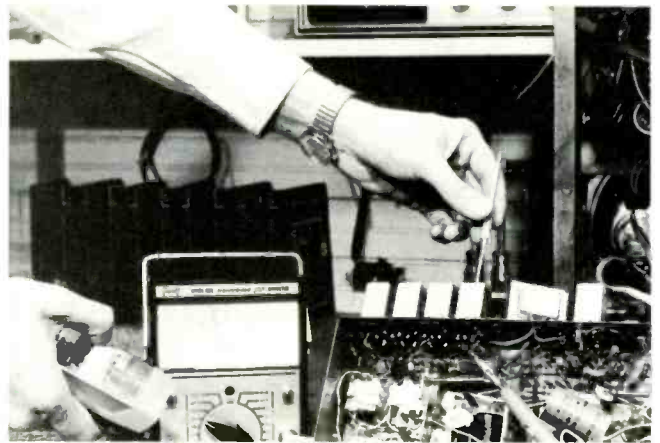


Fig. 3 — Test setup for bandpass amplifier alignment.

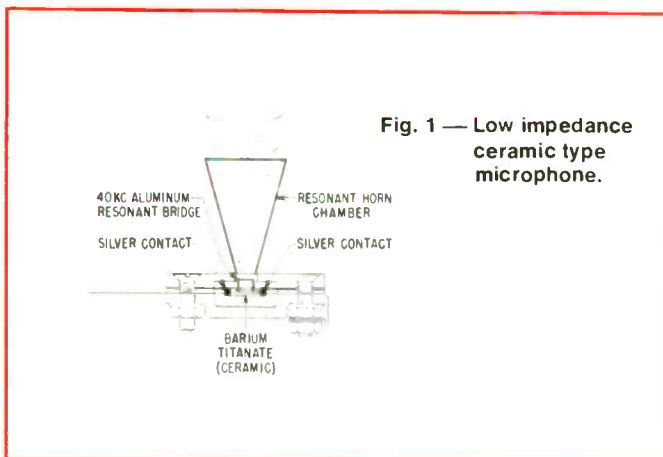


Fig. 1 — Low impedance ceramic type microphone.

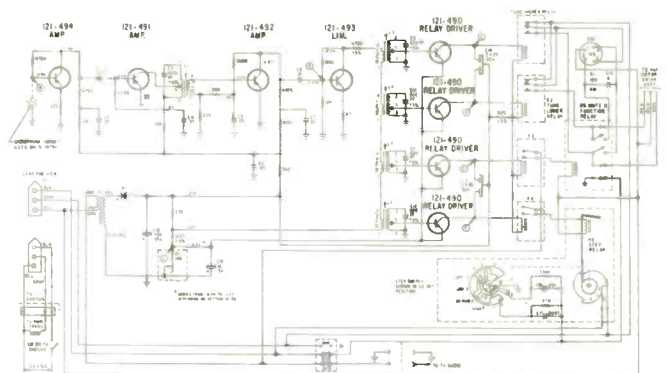


Fig. 2 — Schematic diagram of Zenith's control chassis S-74656 and S-75276. Courtesy of Zenith Radio Corp.

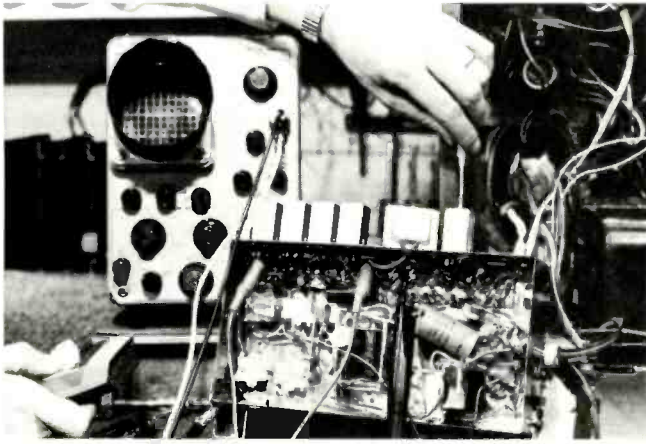
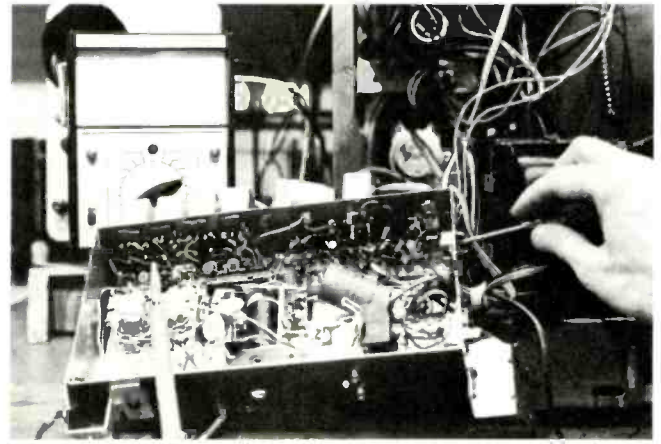


Fig. 4 — Test setup for bandpass amplifier alignment using the oscilloscope.



A technician adjusts the sensitivity control on the control chassis.

With the  $-0.8\text{v}$  on the emitter and the base at ground potential, only the negative peaks of the input sine wave source signal will cause the transistor to conduct. The base must become negative with respect to the emitter to cause conduction. The transistor when acts as a diode rectifier causing relay current to flow when RF input signals are fed to its base. The  $-0.8\text{v}$  is the recommended factory setting. This voltage is varied by the sensitivity control potentiometer R1, changing range of operation.

Electrolytic capacitors are used as an integrator in the relay driver collector circuits to provide a proper time constant or relay control and also act as filters to prevent noise pulses from causing false triggering of the receiver remote unit.

A self-contained power supply in each chassis has a power transformer with a silicon rectifier X1, filter capacitors and a resistor voltage network that provides the various dc voltage for the control chassis.

#### Motor Drive Assembly Operation

The switch contacts of the motor control relay, K1 and K2, in the control chassis are in parallel with the contacts of the switch on the motor drive assembly. When the relay is energized, ac power is fed to the motor through the relay contacts. As the motor rotates, it turns the drive cam and makes one revolution for each channel. The

pin on the cam turns the large index wheel which in turn rotates the tuner shaft.

As the drive cam rotates, it turns the switch and power is maintained to motor for one or more complete drive cycles by the switch contacts. At exact "neutral" position, movement of the switch rotor segment to the "break" or "off position" as an index lug strikes the activating bracket assembly. If the index lug is set to miss the activating bracket assembly, the drive system will continue to cycle.

Setting the index lugs tangent to the index wheel will then cause the mechanism to skip the channel, while setting the index lug outward will cause the unit to stop on the channel. The lugs are bent or turned for desired tripping.

On the two-way drive units, motor reversal is achieved by two motor windings and a series capacitor. This capacitor is switched to either motor winding to cause a phase shift resulting in a change of motor rotation. A resistor is placed in series with the capacitor to prevent the motor drive assembly switch contacts from fusing. If channel selector stops off index, loosen the three lock screws and reset the index wheel for proper channel stop.

#### Remote Receiver Alignment

The most accurate and proper way to align the unit is to use a crystal-controlled signal generator.

If the signal generator is not available, use the customer's hand-controlled transmitter and an oscilloscope or TVOM (transistor volt ohm meter) to align the remote receiver chassis.

#### Bandpass Amplifier Alignment

The following alignment procedure covers the Zenith "600" space command which is similar to many other receiver chassis.

For the signal frequency, press the "channel tune lower" button. The test setup is shown in Fig. 3 with correct test points shown in Fig. 2.

Short out the detector coil primary winding (L2 to L5) from the 4.7K resistor side to the junction of the 270  $\Omega$  and 1200  $\Omega$  resistors in the power supply.

When using the scope or TVOM for signal tracing or alignment, disable the TV receiver functions by pulling out the B+ fuse. This will eliminate spurious scope hash (noise) interference which is generated by the vertical and horizontal sweep sections of the set under test.

Connect the TVOM (ac) probe to test point B. Set the meter to the 1.5vac scale. Snap the control unit button and peak L1 for a maximum reading. A scope can also be used to tune for maximum sinewave deflection. The test setup for the scope is shown in Fig. 4.

#### Detector Coil Alignment

Remove the jumper lead shorting

## REMOTE CONTROLS . . .

the detector coil primary. Connect the TVOM (or scope set for dc) leads between chassis ground and the corresponding collector test points C, D, E and F. Use the dc probe if the scope is used. Connect the vertical amplifier lead from the test scope to pin 5 of the correspond-

ing detector coils L2, L3, L4 or L5. Then snap the proper hand control unit button and tune for maximum scope deflection. This should provide a 4.5 to 5.5v P-P reading. First back the cores out of the coils to about  $\frac{3}{8}$  in. above the top of the coil forms of L2, L3, L4 and L5.

Align in the following sequence with the TVOM set to the -50vdc scale.

Connect meter to collector test point	Coil	Press hand control unit buttons as listed below
F	(L2) 37.75kHz	On/off volume
E	(L3) 38.75kHz	Mute and color tint control
D	(L4) 40.25kHz	Tune channel lower
C	(L5) 41.25kHz	Tune channel higher

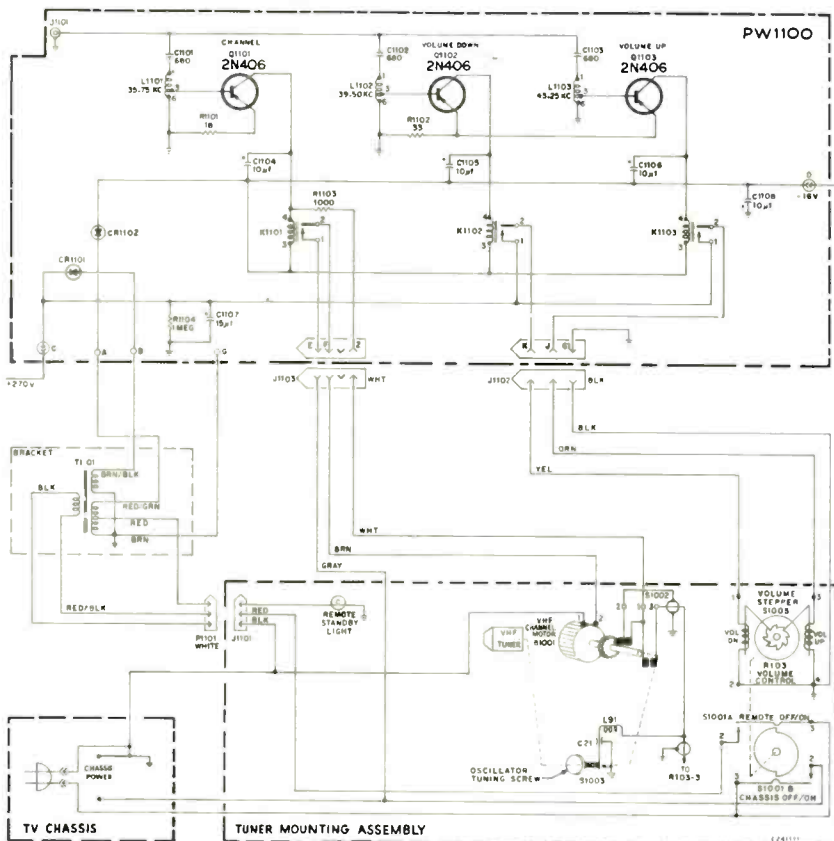


Fig. 5 — Schematic of RCA Victor KRS29A remote receiver. Courtesy of RCA Victor Sales Corp.

Press the proper hand control button and turn the corresponding coil core inward tuning for minimum reading or meter dip. Repeat this operation (two or three times) for each coil, from the lowest frequency coil (L2) to highest frequency coil (L5) as there will be some interaction. A scope can also be used for these same checks.

## Power Control

The automatic-manual switch (S1) at the rear of the remote chassis controls all power to the unit and bypasses the mute switch to assure audio even if the mute switch is locked in *sound off* position. It is set to the automatic position for remote control operation and to manual for normal manual TV operation. This auto-manual slide switch can cause trouble if it becomes dirty or has loose contacts — this may cause the remote system not to operate at all or operate in an intermittent manner. If this switch is not pushed completely over to the automatic position, the “tune higher channel” may not operate. Replace or thoroughly clean and tighten this switch if these problems are encountered.

## Sensitivity Control Adjustment

The bias reading for normal line voltage (120vac) should be about -0.9v.

When making this adjustment for abnormal conditions, such as noisy locations, the complete set (with back on) must be at normal operating temperature before making any adjustments. Always make a final check with the customer's own hand control unit at the maximum distance it is to be used and check all functions.

In installations where spurious noise triggering occurs, eliminate or reduce the noise first.

Reducing the sensitivity of the remote chassis causes an increase in the delay time and it may be necessary under extremely low sensitivity settings to hold the hand control unit button down for a longer time than normal.

The bandpass of the detector coils

will vary directly with the sensitivity. Since the bandpass narrows as the sensitivity is reduced, alignment for extremely low sensitivity settings is important.

Since individual relay driver stage gains can vary, because of coils, transistors and relays, all functions must be checked after readjusting the sensitivity control. Do not set the sensitivity any lower than necessary.

### Procedure for Localizing Trouble and Service Tips

(A) Make sure the automatic-manual switch located at rear of cabinet is in automatic position. (B) Check the customer's hand tuning control. Loss of control signal can be caused by the loose rods inside the box or broken retaining springs. Remove the four screws and take off the back cover of the control and inspect. The loose rod can be reset with a twisting motion. (C) Check or replace microphone. (D) Set the auto-manual switch to the automatic position. Remove the relay dust cover and actuate each relay with an insulated screw-driver. If this results in normal operation, the trouble is ahead of these circuits. It may be a defective microphone, tuning control unit or faulty components in the control chassis. However, if the mechanical movement has no effect, this means trouble beyond that point, such as in the motor drive assembly or cable assemblies. Check all cable and plug connections. (E) Use an oscilloscope to trace the signal from the microphone input and on up to the transistor driver stages. Keep pressing the hand control button while you trace the sinewave signal through all the amplifier stages. (F) Failure of supply voltage or transistors will result in loss of control action. Check voltages, resistance and transistors in these circuits. Should you find the  $-27v$  supply voltage low suspect an open filter capacitor C18 or defective rectifier X1. (G) Continuous motor rotation can be caused by a defective push switch at the front of the receiver. Check and replace switch. ■

### Poor Sensitivity on All Functions

- |   |  |
|---|--|
| (1) Low gain or defective transistor. Check or replace. | (3) Defective microphone. Replace mike.                            |
| (2) Open or shorted amplifier coil L1.                  | (4) Power supply. Check B-voltage at X1 which should be $-27vdc$ . |

### Poor Sensitivity on One Function

- |  |  |
|--|--|
| (1) Defective relay — check coil resistance. Check for proper mechanical action. Check volume off/on — step switch may become dirty and cause loss of volume. Clean these contacts with a non-lubricant type instrument cleaner. | set operates OK, then check the hand control unit for an improperly adjusted or bent dampener tab. A broken "spring wire" that holds the tuning rods can also cause the same channel skip problem. |
| (2) Control box — check mounting of each rod and for correct hammer action. Should the remote hand unit cause the receiver remote to skip over channels that it should stop on — but the channel push button on the              | (3) Defective microphone — low sensitivity at some range of frequencies. Replace microphone.   |
|  | (4) Shorted turns in relay coil — check resistance or try tuning the coil. The relay contacts should be cleaned with a diamond dust burnishing tool.   |

### Zenith Control Chassis S-75276 Service Hints

SYMPTOMS	CHECKS
1. All functions fail to operate	1a, 2, 3, 11, 12, 13, 14
2. VOLUME UP and DOWN (only) fail to function.	1b, 18, 20
3. VOLUME DOWN (only) fails to function.	1b, 2, 4, 5, 7, 8, 9
3. VOLUME UP (only) fails to function.	1b, 2, 4, 5, 7, 8, 9
5. CHANNEL CHANGE (only) fails to function.	2, 4, 6, 7, 8, 10, 21, 22, 23
6. Relay K1101, K1102, or K1103 chatter when transmitter function button is energized	15
7. Relay K1101, K1102, K1103 contacts remain closed after transmitter function button has been operated.	16
8. Sensitivity of receiver reduced.	1, 2, 5, 11, 12, 17, 19
9. Channel motor skips one or more channels on which it is programmed to stop.	24, 25, 26, 27

### CHECKS

NOTE: VTM ground probe to chassis

1. Measure $+270 V$ (a) at J901 (b) at K902 and K903, terminal 1.
2. Measure $-16 V$ at K901, K902, K903 terminal 4.
3. Measure $-12 V$ supply.
4. Short terminal 3 of appropriate relay to ground. This should actuate relay and cause function to operate.
5. Measure resistance of volume stepper coils, should be approximately 1000 ohms.
6. Measure resistance of channel motor coil, should be 28 ohms $\pm 20\%$ Measure collector voltage on transistors Q1101, Q1102, or Q1103 whichever unit is associated with faulty function.
8. Check resistance of coils L1101, L1102 or L1103, 55 ohms from tap +f coil to ground, 2.2 ohms from tap to ground.
9. Measure voltage ( $+270$ ) at terminals K and J when performing check 5 to determine if contacts of relays K1102 and K1103 are closing.
10. Measure voltage (120 VAC) across terminals of channel motor winding to determine if contacts of relay K1101 are closing.
11. Check voltages on transistors Q901, Q902, Q903, and Q904 in preamplifier.
12. Substitute microphone.
13. Check T901 transformer secondary continuity from terminal F to ground and primary by checking between junction of C909 and R917, and collector of Q904. (Voltage should be approximately 0.5 volts.)
14. Check coupling capacitors C902, C903, and C904.
15. Check C1104, C1105, and C1106 for open.
16. Check that R914 has not reduced in value.
17. Check emitter by-pass capacitors C905, C906, C907, and C908. Also capacitors C901 and C909.
18. Check for open ground on volume stepper coils.
19. Perform amplifier gain test.
20. Check R1102.
21. Check R1101.
22. Check capacitors C1101 thru C1106 whichever unit is associated with faulty function.
23. Check continuity of relay coil K1101 thru K1103.
24. Check current through R1103, 1K (with channel motor operating). The proper value should be $8.2 MA \pm 5\%$ . If necessary change value of R1103 to bring the current within this range.
25. Check capacity value C1104. Should not exceed 10 MFD.
26. Check adjustment of program switch on tuner.
27. Check grease in and around gears in channel motor.

### RCA Victor Control Chassis KRS29A Service Hints

# Selling and Installing

## Estimating, Selling, Installing and Maintaining Systems

Know your customer's needs and provide accurate installation bids

■ You can know all the theory there is to know about MATV system design and still not be able to make money in this business. This article will cover such important practical aspects of the MATV business as selling, installation and maintenance.

### MATV Systems Sales

There is no one success formula for selling MATV systems. MATV users are divided into five general groups: homes, hotels and motels, trailer parks, apartments houses and schools. Each requires a different approach.

You can sell systems for homes either direct or through the builder. Explain to the major housing development builders the kind of service you can provide and you may be amazed at the response. A built-in master TV system is a good feature for a builder to advertise, and its cost is relatively small. One large housing development can keep you busy for a long time.

Small hotel and motel systems are bought directly by the owners, but large ones usually involve an architect, a general contractor and a subcontractor.

The same is true of apartment houses, trailer parks and schools. In a school system, however, you may also have to deal with school board officials, audio visual experts, principals, etc. There is a tremendous need for MATV in school systems now, and 82 channel systems should be particularly easy to sell.

The architect's electrical engineer is a key man in most large MATV system sales. This man is extremely knowledgeable. He is a graduate engineer but he does not pretend to have a working knowledge of MATV. He wants and appreciates help in preparing specifications. Therefore, you should make it a

point to work closely with all the electrical engineers in your area who specify MATV systems. Call on them, give them typical specifications, recommend equipment and provide them with layouts. They will soon come to depend on your help for any MATV spec they undertake.

Once your equipment and design have been written into the spec, you have an excellent chance of getting the job. But you can't stop at the electrical engineer. MATV systems are actually part of the responsibility of the general contractor. He in turn subcontracts all the electrical work, including the MATV system, to an electrical contractor.

Be sure you become friendly with every electrical contractor in your trading area. The electrical contractor is the man who actually buys the system from you. Therefore, you must convince him of your competence and give him good service, including fast layouts and accurate bids.

Bidding and estimating are, of course, a very important part of any MATV business. All of the larger systems are sold on the basis of bids. Generally, what you have to do is to design a system in accordance with the specification, submit an outline of the equipment you will supply and how it will be installed, and tell the electrical contractor how much the MATV system will cost him.

Bidding and estimating can make or break you. Bid too high and you probably won't get the job. Bid too low and you'll actually be doing a lot of hard work just to lose money.

Here's how to protect yourself from bidding mistakes:

1. Always visit the jobsite before laying a system out and making an estimate. You never know what problems you may encounter.

2. Be sure you know precisely

how the cables will be run. Concealed wiring takes a lot more labor than outdoor wiring.

3. Be sure you know precisely where your responsibility ends and the electrical contractor's begins. If you are supposed to pull the cables yourself, add this into your estimate.

4. Make a complete system layout and a bill of materials before you compute your estimate. It's easy to forget an important item or two that could make the difference between profit and loss.

5. If in doubt about signal strength in the area, take signal measurements. A high tower, special antennas or filter traps, if needed, can be quite expensive.

Your estimate will comprise two essential parts — equipment and labor. Equipment is easy; just add up your bill of materials.

Labor is more complex because it depends largely upon conditions. A commonly used rule-of-thumb is to multiply the number of outlets in the system by two in order to arrive at the total man-hours of labor required. In other words, if you're installing a 60-outlet job, you can, under normal conditions, estimate about 120 man-hours for the entire installation, including the head end.

Rates for labor also vary by area, but a national average seems to be about \$6 per hour. Most systems involve a year's warranty, so don't forget to include this. Add about one percent of the total cost of equipment and labor.

Finally, of course, you must add a markup to allow you a reasonable profit on the job.

### Installation Practices

There are two basic types of jobs — new construction and existing construction. On existing construction you will probably make the entire installation yourself. If this is the case, you'll probably find con-



# MATV Systems

duit already installed and ready with pull wire. This simplifies the job of pulling cable. You should have the following equipment to pull wire through conduit:

- (1) wire basket (cable grips)
- (2) Fish tape (½ in. x 100ft)
- (3) Fish tape puller
- (4) Cable lubricant (preferably in aerosol can)

In buildings with no conduit, you'll have to make a surface installation. Be sure all parties concerned agree in advance exactly where, and how, cables are to be run.

On new construction, you'll probably be working with an electrical contractor. Generally, the electrical contractor's men pull the cable in accordance with your instructions. They usually work under your supervision to install the tapoffs and bring the cable up to the head end. Then, you hook up the head end, balance the system out and make it work. In some cases, however, he may want you to connect the tapoffs.

Regardless of who does the tap-off wiring, you must instruct them to do it carefully. A single loose strand of wire can short out an entire branch line. You have to expect some problems, but each connection you have to track down and repair will eat into your profits.

When you sell directly to the owner or manager of the building, you are responsible for all of the labor. However, if the electrical union is strong in your area, you may still have to let the EC's men pull cable and install gem boxes. In this case, the EC acts as a subcontractor to you. Since his services will undoubtedly cost you a lot more than those of your own people, be sure this is settled *before* you make your bid. Get a firm labor quote in writing from the EC and add this into your cost computations.

(1) Drill your own holes. don't try to take the easy way out. If you

run cable between cracks or separations, the settling of the building may crush your coax. If you try to use the holes drilled by the EC, his men may damage or crush your cable. If you run your cable alongside pipes, it will probably be burned or damaged when the plumber comes back to resolder joints. And if you try to run your cable with the telephone lines, they will definitely make you move it.

(2) Loosely staple your cable to the inside of walls to hold it until the walls are closed up. Use very short staples and just tack them in place so that they will come out easily when you want to pull out the slack.

(3) Tapoffs should be installed in 3 steps:

- (a) Leave about 8in. of slack coiled in the gem box and secured loosely with a Romex cable clamp. Use a 2in. gem box.
- (b) Once the walls are closed, remove the clamp, pull out the cable and install the tapoff. Since you've used a 2in. gem box, you'll have plenty of room to shove the slack cable back in. Tighten the tapoff in place, but don't install the cover plate. Cover the connectors with masking tape to protect them from paint.
- (c) Once the walls have been painted, install the cover plate.
- (4) Be aware of, and follow, all local and national electrical safety codes.
- (5) Terminate all branch lines properly.
- (6) Take extra care with all connections.

## Trouble Shooting

Servicing is an important part of any MATV installation. For one

thing, your reputation (and future business) depends upon your keeping the system operating normally. For another, after the first year you can sell service contracts, and these are quite profitable. Finally, many installers tie in system servicing with a contract to service the TV sets connected to the system, and this too can increase your income.

An MATV system is a lot easier to service than a TV set. To a great extent, it will tell you what is actually wrong with it. For example, suppose one branch of the system isn't working, but every other line is delivering good pictures. You can immediately eliminate the head end and look for trouble in that line. On the other hand, trouble that is seen throughout the system is probably caused at the head end.

Basically, you need two pieces of equipment to service an MATV system: a battery-operated VOM and a battery-operated field strength meter, such as shown in Fig. 1.

To track down trouble in a given trunkline, disconnect it from its splitter and measure the DC resistance with the VOM. (If the system is cable powered, forget the VOM and use the field strength meter alone.) You should read about 75 $\Omega$ , but anything between 50 and 100  $\Omega$  is fine.

If you get a very low or a very high reading, you know you've spotted the trouble. Simply divide and conquer, splitting the trunkline in half. Measure the resistance from the middle tapoff to the termination. If it's normal, the fault is higher up. If it's not, the trouble is lower down. Just keep splitting the line in half until you find the open tapoff or connection.

If the VOM shows a short or a very low resistance, it's easier to continue tracking the trouble down with the field strength meter. Con-

*(continued on page 115)*



Fig. 1 — Field strength meter can be used for checking head end systems.

# Semiconductors from A

## New servicing techniques require an understanding of solid-state power-conversion circuits

■ Only some of the battery-powered semiconductor circuits can be operated without additional circuits for converting the applied power to the required potential. Receivers plugged into an ac outlet require dc voltages from their power supplies. Batteries for driving portable TV sets do not have high enough voltages for operating the CRT. This voltage must be obtained from an appropriate power supply.

### DC-to-AC Conversion

Transformers are generally used in power supplies to increase the applied voltage to that required for operating an electronic circuit. (Some of the principles of transformer operation are described in the August 1968 article of this series.) As you know, an ac voltage applied to the primary winding of a transformer will induce an ac voltage across the transformer's secondary winding. A dc voltage applied to this primary winding,

however, will not induce either an ac or dc voltage across the transformer's secondary winding. The dc voltage must first be changed to an ac voltage before a transformer can be used in a circuit to increase or decrease a voltage or current.

Oscillators or switching circuits can, of course, perform the function of converting dc voltages to ac voltages. Previous articles in this series have indicated how a number of semiconductor circuits can be made to oscillate. These included tunnel diode oscillators (Fig. 5 and 6 in the March 1967 article), transistor oscillators (Fig. 6, 9 and 10 in the December 1967 article) and unijunction transistor switching circuits (Fig. 2 in the June 1968 article). The output of these circuits can be either applied directly to a transformer or through an amplifier to a transformer.

Fig. 1 shows an oscillator circuit commonly found in inverter power supplies. In this circuit, resistors  $R_1$

and  $R_2$  are used as a voltage divider for biasing the base of both transistors in their common-emitter circuits. (The biasing of such circuits is described in the September 1966 article.)

When a supply voltage is connected to the circuit (Fig. 1), the base of one transistor will, by chance, be a little more positive than the base of the other transistor. If the base of the transistor  $Q_1$  is more positive than that of transistor  $Q_2$ , transistor  $Q_1$  will conduct more current than the other transistor. Current will then flow through the transformer's primary winding ( $L_1$ ) between the transistor ( $Q_1$ ) and the positive supply voltage. This current through winding  $L_1$  will induce a voltage across the other winding ( $L_2$ ), making the base of transistor  $Q_2$  more positive than the base of transistor  $Q_1$ . Transistor  $Q_2$  will then conduct more current through the winding ( $L_1$ ). Since current is now flowing in the reverse direction

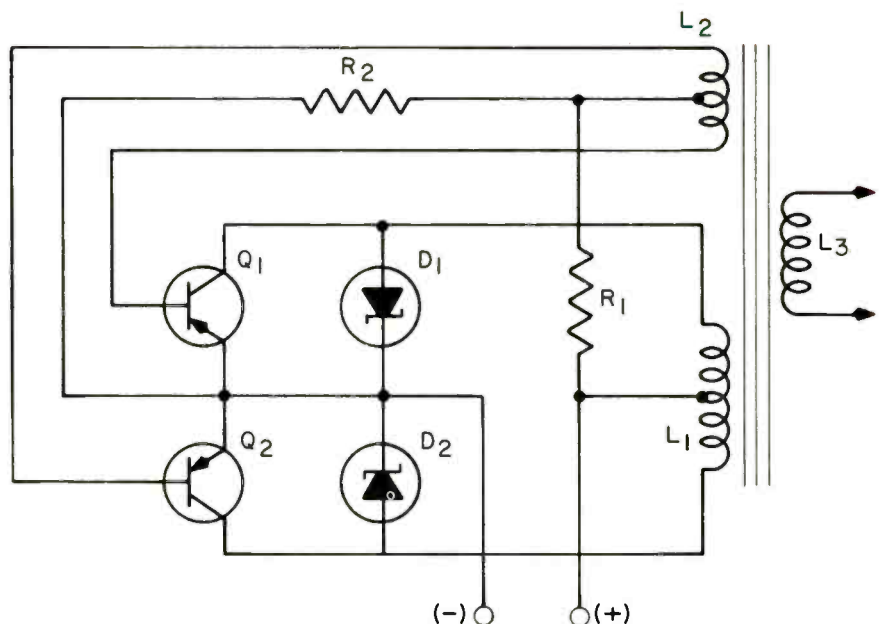
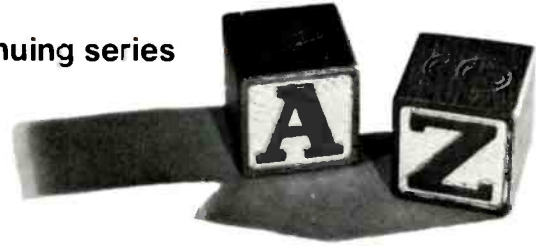


Fig. 1 — An oscillator circuit commonly found in inverter power supplies.



through the transformer's primary winding ( $L_1$ ), the voltage now induced across the other winding ( $L_2$ ) is of reverse polarity and the base of transistor  $Q_1$  is now again more positive than the base of transistor  $Q_2$ .

If no voltage was induced across winding  $L_2$  then the base voltage of both transistors would be the same, and both transistors would be in a nearly on condition — due to the base voltage from the voltage divider resistors ( $R_1$  and  $R_2$ ). When a current flows through the primary winding ( $L_1$ ) from either of the two transistor collector circuits, the resulting voltage induced across the other winding ( $L_2$ ) makes the base of the non-conducting transistor more positive (turning it on) and the base of the conducting transistor less positive (turning it off).

The conducting transistor turns itself off while turning the other transistor on. The second transistor then conducts current that

turns itself off and the first transistor on. In this manner, the circuit oscillates, each transistor alternately conducting current at the transformer's resonant frequency.

As the circuit oscillates, an ac voltage is also induced across another secondary winding ( $L_3$ ) of the transformer. The voltage across this winding ( $L_3$ ) is generally used to drive 112vac motors or electronic equipment, using energy from a 12vdc car battery.

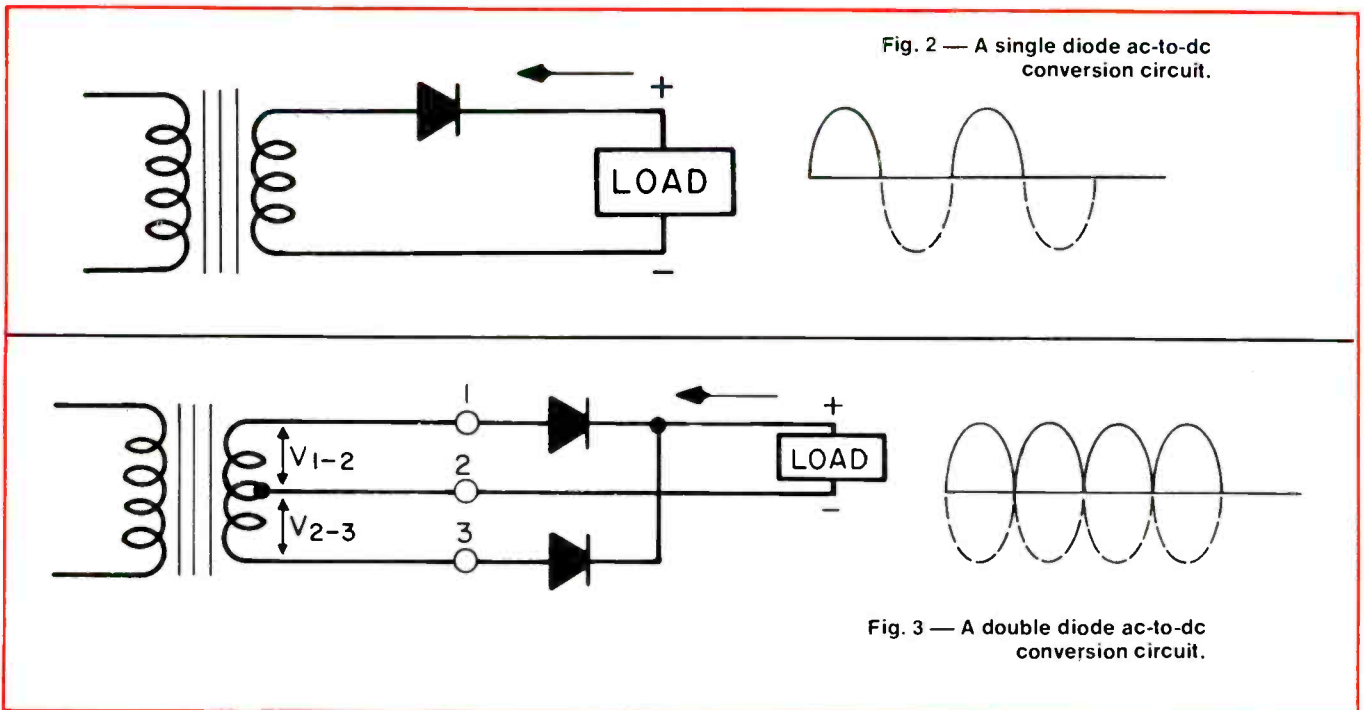
Zener diodes are also included in this circuit to extend the life of the transistors by protecting them from surge voltages that occur as one transistor turns off while the other is turning on. During this moment the greatest change occurs in the transformer's magnetic field and current induced in the primary winding ( $L_1$ ) by the changing magnetic field (as described with Fig. 4 in the August 1968 article) produces a collector-to-emitter voltage exceeding the rated capacity of the

non-conducting transistor. Two zener diodes are therefore connected in parallel with the transistors to shunt these excess voltages away from the transistors — extending their life.

### AC-to-DC Conversion

A single diode ac-to-dc conversion circuit is shown in Fig. 2. As had been indicated by Fig. 3 in the August 1966 article, current flows from negative to positive and from a diode's cathode to its anode. When terminal 1 of the transformer's secondary is more positive than terminal 2, electrons pass from terminal 2 through the load and diode  $D_1$  back to terminal 1. When terminal 1 is more negative than terminal 2, no electrons flow through this circuit since diode  $D_1$  conducts virtually no electrons from its anode to its cathode. Current can flow through terminal 1 only during positive half cycles.

A slightly different ac-to-dc con-



## A to Z . . .

version circuit containing two diodes (Fig. 3) can conduct current through the load during both half cycles. When terminal 1 is more positive than terminals 2 and 3, electrons flow through terminal 2, the load, diode  $D_1$  and terminal 1 as they did before in the single diode circuit. Then, when the polarity of the applied ac voltage reverses, terminal 3 is more positive than terminals 2 and 1; and current flows from terminal 2 through the load, diode  $D_2$  and terminal 3 — electrons traveling from cathode to anode of diode  $D_2$ .

During half a cycle diode  $D_1$  is forward biased and conducting current through the load while diode  $D_2$  is reverse biased and conducting virtually no current. Then, during the following half cycle, diode  $D_2$  is forward biased and conducting current through the load while diode  $D_1$  is reverse biased and conducting virtually no current. Each half cycle one of the two diodes conducts current so that a dc current flows through the load during both half cycles.

With the circuit shown in Fig. 2 the entire voltage across the transformer, minus the voltage drop across the diode, is applied to the load during alternate half cycles; while with the circuit shown in Fig. 3 only half the voltage across the transformer ( $V_{1-2} = V_{2-3} = \frac{1}{2} V_{1-3}$ ), minus the voltage drop across the

diodes, is applied to the load during every half cycle.

Still another circuit (Fig. 4), containing four diodes to form a rectifier bridge, can be used to apply most of the voltage across the transformer to the load during every half cycle.

Diodes  $D_1$  and  $D_2$  function in this circuit (Fig. 4) as they did in the previous circuit (Fig. 3). During each half cycle one diode or the other conducts electrons from its cathode to its anode and the transformer — diode  $D_1$  conducting when terminal 1 is positive and diode  $D_2$  conducting when terminal 2 is positive.

Diodes  $D_3$  and  $D_4$  are wired in the circuit so that their anodes, rather than their cathodes, are connected to the load. When terminal 1 is more positive than terminal 2, electrons flow from terminal 2 through diode  $D_4$ , the load, diode  $D_1$  and terminal 1 — the electrons having flowed from cathode to anode through both diodes. Then, when the polarity of the applied ac voltage reverses, terminal 2 is more positive than terminal 1, and electrons flow from terminal 1 through diode  $D_3$ , the load, diode  $D_2$  and terminal 2. During one half cycle diodes  $D_1$  and  $D_4$  are conducting while during the other half cycle diodes  $D_2$  and  $D_3$  are conducting current through the load.

## AC to Varied DC

Silicon controlled rectifiers,  $SCR_1$  and  $SCR_2$  (Fig. 5), can be substituted for two of the diodes,  $D_3$  and  $D_4$ , in the rectifier bridge circuit (Fig. 4) to vary the average dc voltage applied across a load. This voltage is controlled by trigger voltages applied to the SCR diode gates.

Fig. 11 in the September 1968 article explains how capacitor time constants (also used in the circuit shown in Fig. 5 of this article) can be used for producing a voltage to trigger the gate of a triac. Changing the resistance ( $R_1$ ) in series with the capacitor ( $C_1$ ) varies the portion of each cycle that the triac conducts current. During each half cycle the voltage developed across the capacitor ( $C_1$ ) is discharged through the thyrector and triac.

A slightly different circuit (Fig. 6) can vary the portion of each cycle a single SCR diode conducts current. These two circuits (Fig. 6 in this article and Fig. 11 in the September 1968 article) must differ because of the basic difference in the structure of an SCR diode and a triac. (The equivalent structure of an SCR diode is described with Fig. 5 in the August 1968 article, while the equivalent structure of a triac is shown in Fig. 12 of that article.)

Triacs contain the basic equivalent of two SCR diodes with the gate of one being able to handle positive

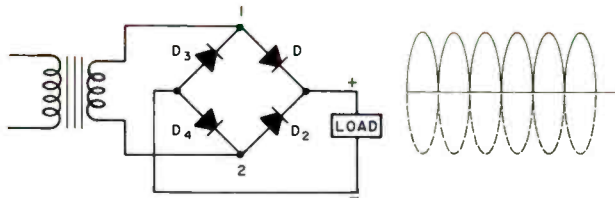
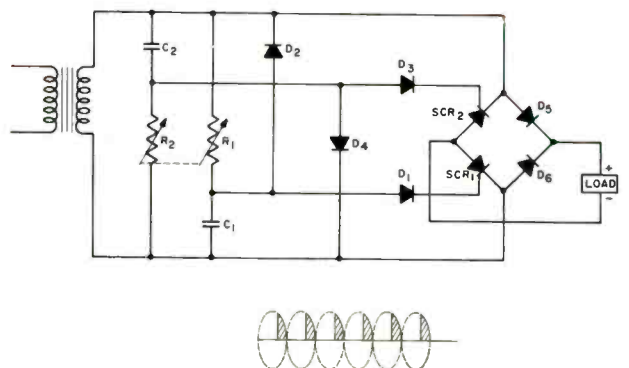


Fig. 4 — A rectifier bridge ac-to-dc conversion circuit.

Fig. 5 — A variable output, rectifier bridge ac-to-dc conversion circuit.



pulses and the gate of the other being able to handle negative pulses. SCR diodes, however, are unable to handle pulses of more than one polarity — most SCR diodes presently used functioning with positive gate pulses. For this reason, diode  $D_1$  is used in the circuit (Fig. 6) to prevent the flow of any damaging negative current through the SCR diode gate.

During the half cycle when the load (Fig. 6) is more positive than the capacitor ( $C_1$ ), electrons flow from the capacitor through the variable resistor ( $R_1$ ) to the load. As the capacitor's positive charge becomes greater than the small positive voltage at the SCR diode gate, current flows through diode  $D_1$ . This gate current turns the SCR diode on, causing the SCR to also conduct current for the remainder of the positive half cycle.

When the positive capacitor voltage becomes greater than the SCR gate voltage, diode  $D_1$  conducts current because its anode is more positive than its cathode, while diode  $D_2$  does not conduct current since its cathode is still more positive than its anode.

During the following half cycle the load is more negative than the capacitor ( $C_1$ ). The cathode of diode  $D_2$  is then more negative than its anode and the diode conducts current, the flow of electrons resulting

in a negative capacitor voltage.

When the polarity of the applied ac voltage reverses and the load is again more positive than the capacitor, electrons flow through the series resistor ( $R_1$ ) until the negative voltage across the capacitor is reduced to zero and a positive voltage is developed across the capacitor. It is this positive voltage that again permits the diode ( $D_1$ ) to conduct current to the SCR diode gate and turn it on.

The series resistor ( $R_1$ ) functions to determine the time required to develop a sufficient voltage across the capacitor to trigger the thyrector and turn the triac on (Fig. 11 in the September 1968 article). It ( $R_1$ ) also functions to determine the time required to reduce the negative voltage across the capacitor ( $C_1$ ) to zero and then to increase the positive capacitor voltage to that required to turn the SCR diode on (Fig. 6). Because the thyrector requires a higher triggering voltage from the capacitor and diode  $D_2$  provides a negative capacitor voltage that has to be removed before the capacitor can develop a positive voltage, a larger than normal flow of electrons is required to trigger the triac or SCR diode; and the series resistor ( $R_1$ ) has greater range and stability for adjusting the capacitor time constant. With these circuits the triac and SCR diode can be turned

on during almost any portion of the half cycle.

The trigger voltages for the two silicon controlled rectifiers, SCR<sub>1</sub> and SCR<sub>2</sub>, in the rectifier bridge circuit (Fig. 5) can be obtained in the same manner as the trigger voltages obtained for the single SCR diode (Fig. 6). One diode (SCR<sub>1</sub>) is controlled as before by resistor  $R_1$ , capacitor  $C_1$ , and diodes  $D_1$  and  $D_2$ ; while the other diode (SCR<sub>2</sub>) is controlled by a similar complement of components — resistor  $R_2$ , capacitor  $C_2$ , and diodes  $D_3$  and  $D_4$ . During one half cycle diode  $D_1$  supplies a positive triggering current to the gate of one diode (SCR<sub>1</sub>) and during the following half cycle diode  $D_3$  supplies a positive triggering current to the gate of the other diode (SCR<sub>2</sub>).

Just as diodes  $D_3$  and  $D_4$  conduct current in their rectifier bridge circuit (Fig. 4) during alternate half cycles, diodes SCR<sub>1</sub> and SCR<sub>2</sub> also conduct current in their rectifier bridge circuit (Fig. 5) during alternate half cycles. However, diodes  $D_3$  and  $D_4$  must conduct current through their load during each complete half cycle, while a single control connected to a pair of ganged resistors ( $R_1$  and  $R_2$ ) can be used to vary the portion of each cycle that the two SCR diodes conduct current through their load. Since the SCR diodes are either conducting

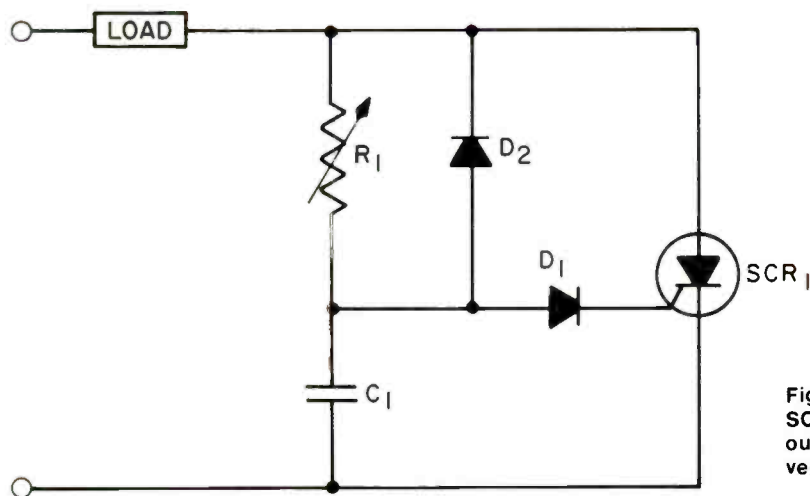


Fig. 6 — A single SCR diode, variable output ac-to-dc conversion circuit.

## A to Z . . .

current or not conducting, like a switch turned on or off, very little power is consumed in reducing the load voltage.

### AC to Regulated DC

Transformers ( $T_1$ ,  $T_2$  and  $T_3$  in Fig. 7) can be used to regulate a rectifier bridge circuit — like the one described in Fig. 4 — so that when the load draws more current, the voltage across the load increases to compensate for the additional current drain.

In this circuit (Fig. 7), transformers  $T_1$  and  $T_2$  are matched so that they produce nearly identical secondary ac voltages — but 180deg out of phase (when  $v_1$  is positive,  $v_2$  is negative and vice versa). The secondary voltages therefore tend to cancel out ( $v_T = v_1 - v_2 = 0$ ), adding no ac voltage to the load or rectifier bridge circuit.

The ac primary current through the transformers ( $T_1$  and  $T_2$ ) produces alternating magnetic fields in their cores, while the magnetic fields produced there by the dc secondary current do not alternate. These primary and secondary magnetic fields affect the alignment of magnetic domains in the soft iron core of each transformer ( $T_1$  and  $T_2$ ). (Magnetic domains are described with Fig. 2 in the September 1968 article.)

When there is no dc current through the secondary windings, the ac current through both primary windings induces alternating magnetic fields that align almost all the magnetic domains first in one direction and then in the opposite direction during each cycle.

Any dc current through both secondary windings will induce magnetic fields that will work to align the magnetic domains in but one direction. During half a cycle the dc induced magnetic fields will work with the ac induced magnetic fields to align domains in one direction, and during the following half cycle the dc induced magnetic fields will oppose the ac induced magnetic fields' work to realign domains in the opposite direction.

When the dc secondary current

induces a magnetic field to align some of the domains, the magnetic field induced by the ac primary current is greater than that required to align the remaining domains in that direction. The transformer cores contain only a limited number of domains to be aligned. During the following half cycle, when the flow of ac primary current is reversed, the number of domains aligned in the reverse direction is reduced by the dc current, which is still producing a magnetic field to align the domains in the initial direction.

With larger dc secondary currents, there is virtually no increase in the number of domains aligned in one direction — there are no more to align — and the number of domains aligned in the opposite direction the following half cycle is reduced — the larger magnetic field induced by the dc secondary current is opposing that induced by the ac primary current. In this manner, the strength of the dc secondary current affects the number of magnetic domains that alternate directions as a result of the ac primary current.

Earlier articles in this series indicated that a soft iron core can be used to concentrate the magnetic field produced in a coil. The alignment of the soft iron core's domains determines the strength of the core's magnetic field. As the alignment of the core's magnetic domains al-

ternates as a result of the ac primary current, the core's magnetic field also alternates. The strength of the core's alternating magnetic field is greater when there is a small secondary dc current and smaller when there is a larger secondary dc current, since the secondary current can reduce the number of domains that can be alternated by the ac primary current.

In transformers  $T_1$  and  $T_2$  the primary ac current induced by the cores' alternating magnetic fields opposes the applied ac primary current. The greater the cores' alternating magnetic field, the greater this resistance to the applied ac primary current — the greater the impedance of the primary coils (coil impedances were described on page 54 of the October 1967 article). In this manner, the dc secondary current can control the ac voltage drop across the primary windings of transformers  $T_1$  and  $T_2$ . The greater the dc secondary current, the smaller the cores' alternating magnetic fields and the smaller the coil impedances and the ac voltage drop across the primary coils. The smaller the dc secondary current, the larger the cores' alternating magnetic fields and the larger the coil impedances and the ac voltage drop across the primary coils.

Since the applied ac voltage remains unchanged, a reduction in the

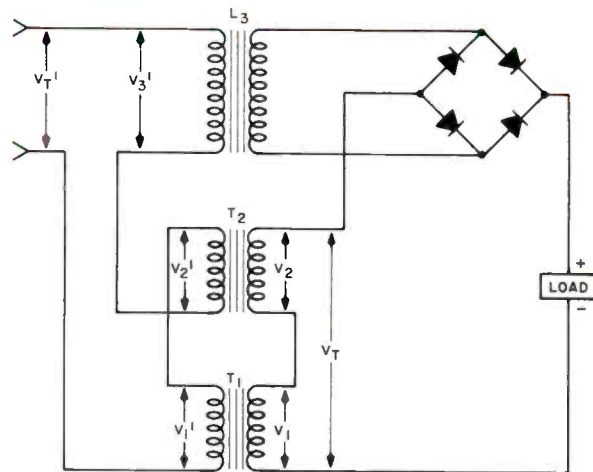


Fig. 7 — An ac to regulated dc conversion circuit.

voltage drop across the primary coils of transformers  $T_1$  and  $T_2$  will result in an increase in the voltage drop across transformer  $T_3$  [ $v_3 = V_t - (v_1 + v_2)$ ]. Transformer  $T_3$  is not a "constant-voltage" transformer and increases in its primary voltage will result in increases in its secondary voltage.

When there is a reduction in load current, there is a greater ac voltage drop across the primary coils of transformers  $T_1$  and  $T_2$  and a smaller voltage drop across the primary and secondary coils of transformer  $T_3$ . This results in a smaller voltage drop across the rectifier bridge circuit and the load. As the load current increases, the voltage drop across the primary coils of transformers  $T_1$  and  $T_2$  decreases and the voltage drop across the primary and secondary coils of transformer  $T_3$  increases. This results in a greater voltage across the rectifier bridge circuit and the load. More current can be conducted through the load as the voltage across it increases.

### Voltage Multipliers

The ac-to-dc conversion circuits that have been described in this article produce dc voltages smaller than the ac voltages applied to the circuits. Voltage multipliers, however, are able to supply dc voltages greater than the ac voltage applied

to the circuit — with a corresponding reduction in current.

During the half cycle when the transformer (Fig. 8) applies a positive voltage to capacitor  $C_3$  and a negative voltage to capacitor  $C_3'$ , electrons flow through diode  $D_3'$  — electrons flow from negative to positive, from the diode's cathode to its anode. No electrons are then flowing through diode  $D_3$  since it is reverse biased.

During the portion of the ac cycle when no voltage is applied to either capacitor ( $C_3$  or  $C_3'$ ) by the transformer, point 2 is more positive than point 1 since diode  $D_3'$  prevents the flow of electrons from point 1 back to point 2.

During the following half cycle, the transformer applies a negative voltage to capacitor  $C_3$  and a positive voltage to capacitor  $C_3'$ . Point 2 is then even more positive than point 1. It (point 2) is then also more positive than point 3, and electrons now flow from point 3 to point 2 through diode  $D_3$ .

During the next portion of the ac cycle when no voltage is applied to either capacitor ( $C_3$  or  $C_3'$ ), point 3 is more positive than point 2, which is still more positive than point 1.

This mechanism not only develops a dc voltage across capacitors  $C_3$  and  $C_3'$ , but in the same manner also develops dc voltages across capacitors  $C_2'$ ,  $C_2$ ,  $C_1'$  and  $C_1$ . In this

circuit, the voltage across the load is equal to the total voltage across capacitors  $C_1$ ,  $C_2$  and  $C_3$  ( $v_T = v_{C1} + v_{C2} + v_{C3}$ ).

With the components used in this circuit (Fig. 8), 50vac from the transformer results in 270vdc across the load, when 5ma of current flows through the load. Fewer stages of the voltage multiplier would result in a smaller dc voltage, while more stages would result in a larger dc voltage. The amount of dc voltage produced can be approximated with the equation:

$$V = 2NE - \left(\frac{2}{3} N^3\right) \left(\frac{1}{fC}\right);$$

when the value of the capacitors in each stage increases so that  $C_N = NC_1$ , and  $N$  equals the number of stages. There are three stages in the circuit shown in Fig. 8; and  $C_2 = 2C_1 = 2 \times 50\mu f = 100\mu f$ ,  $C_3 = 3C_1 = 3 \times 50\mu f = 150\mu f$ ; while  $V = 2 \times 3 \times 50 - \left(\frac{2}{3} \times 3^3\right) \left(\frac{5 \times 10^{-3}}{60 \times 50 \times 10^{-6}}\right) = 300 - 30 = 270v$ .

From the equation we can see that if the load current is increased, the dc voltage is reduced, while if the frequency of the applied ac voltage increases or the values of the circuit capacitors increases, the voltage increases.

The next article will describe dc filters, dc voltage regulation and dc current regulation. ■

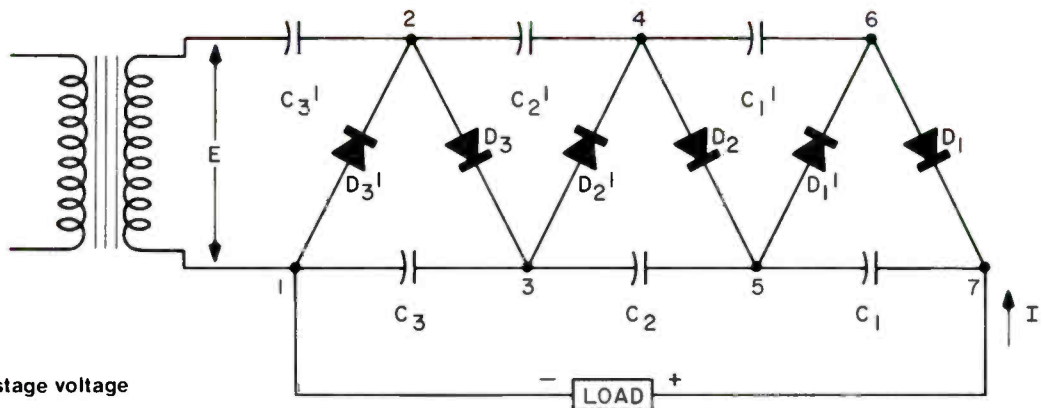


Fig. 8 — A three-stage voltage multiplier circuit.



Magnetic Recorder Co., one of the largest audio/visual dealers in the West.

## Breakthrough to Video Tape



If you have been avoiding the video tape equipment market because of its cost, you might want to reconsider. Costs are down and demands are high in this million dollar business



### DEALERFAX

ADVERTISING/MERCHANDISING/SALES/BUSINESS MANAGEMENT

■ From \$500,000 in video sales in '67 to \$1 million in '68 . . . Double again in '69 . . . A \$5 million to \$10 million audio-video enterprise within the next few years.

That's the sales projection set by "Cap" Kierulff, board chairman of Magnetic Recorders Co., Los Angeles, one of the West's largest dealers in audio and video tape recording equipment. The firm is now doing \$1 million in audio, plus a half million in video sales. Management is preparing for a booming market in "instant visual replay."

#### Video Tape Market

The present major markets for video tape recorders are educational, medical, business/industrial and government.

Video systems have been too ex-

pensive for all but the most affluent general consumer, but the cost is going down.

Mr. Kierulff predicts that in another five to ten years, video tape, both in color and B/W, will find a mass market as audio tape has done. Corner drugstores will be selling a B/W TV tape recorder for \$19.95, and video dealers will be selling in-home color systems for about \$500.

"Developing the broad market for video is up to the creative people in the electronics industry," Mr. Kierulff continues. "That's the challenge as we see it. We plan to be the catalyst that will develop the audio-video market in southern California."

#### Market Development

Cap Kierulff is an old hand at

market development. In 1956, he took over Kierulff Electronics and Kierulff Sound Co. from his father when the two companies were running more than \$30,000 in the red. He built their volume to a profitable \$25 million yearly. Then he sold out and retired.

"But I couldn't stay retired," he smiles. "In 1967, I approached my old friend, John Van Leeuwen, who founded Magnetic Recorders 22 years ago, and sold him on letting me come aboard to undertake the big marketing push we both see as the next stage in the electronics industry."

To establish a comprehensive audio-video sales base, Magnetic Recorders acquired Tri-Video in 1967. Founded in 1965 by Bob Bunnell, Tri-Video was doing



\$250,000 per year by the time it became a division of Magnetic Recorders. Net worth of the combination is a half million dollars, with \$1 million in assets.

But perhaps the major asset is that the principals (Mr. Bunzell as president of Tri-Video Div.; Mr. Van Leeuwen as president of Magnetic Recorders and of the combination; and Mr. Kierulff as chairman of the board) are all electronics engineers. They approach the big selling job ahead from the engineering viewpoint.

Operating through four divisions — instrumentation division, production systems division, audio division and video division — Magnetic Recorders has the engineering and service facilities to back up the aggressive sales program.

By the end of 1968, the firm will bring together their four divisions, now functioning at three locations, under one roof in a new 12,000sqft building to provide greater operating efficiency as the market for video expands.

### The Big Boom

Management estimates that video sales, now running \$500,000 a year, will double in 1968 and that audio sales will continue to develop.

"When television was introduced, radio didn't die," Mr. Kierulff points out. "Audio will remain an important part of our sales package as the big market for video opens wider.

"I was the second brand-name audio tape dealer in the United States — right after Bing Crosby. If anyone then had predicted today's big consumer market for audio tape, who would have believed him? The same thing is going to happen to video and so we're pioneering — with some blood, sweat and a few tears — so we'll be able to hit this market hard when it opens."

Mr. Kierulff envisions building a \$5 to \$10 million enterprise in the next few years to make Magnetic Recorders the No. 1 audio-video dealer in southern California. Confining the market to southern California gives the company the ability to solidly back up sales with service, establishing control over the service operation.

### Color Just Ahead

With the mass consumer market in the offing, Tri-Video Div., is rapidly expanding into the medical, educational and business/industrial fields. At present, Bob Bunzell notes, closed-circuit installations are mostly B/W.

"Black and white will always be important in many closed-circuit systems," Mr. Bunzell comments. "But we're all going to have to go to color on closed-circuit TV, just as it's doing in the entertainment field.

"There are many applications where color is necessary. The problem heretofore has been producing a package at a reasonable price that will meet the NTSE color standard. Now we have such a system and the opening demand is very impressive."

Last year, it cost \$40,000-\$50,000 for a closed-circuit color pack-

age. Tri-Video is now offering a package for about \$18,000, indicating that the industry is well on the way toward a color system that will be priced for the consumer market.

Tri-Video's present sales are running approximately 40 percent medical, 40 percent educational, 10 percent business/industrial, and 10 percent governmental.

With government-funded money available, educational and medical got a headstart in using video, but business and industrial applications are beginning to move forward and Mr. Bunzell estimates that closed-circuit for these three fields will balance out one-third medical, one-third educational and one-third business/industrial.

### Just Beginning

"In all the areas, I believe it

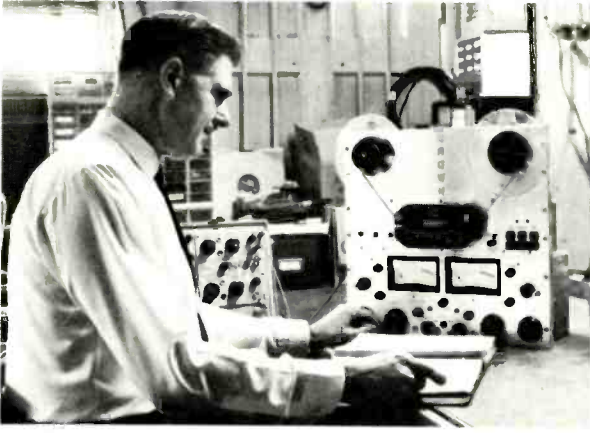
"Cap" Kierulff, board chairman of Magnetic Recorders/Tri-Video discusses future role of electronic dealers in rapidly growing video tape field.



Bob Bunzell, president of Tri-Video Div. sees color video as a wide new market.



## BREAKTHROUGH . . .



Bob Martland, vice president and chief engineer, heads the service operation.

Clark Trimble, one of Tri-Video's six technicians, checks drive assembly on video tape recorder in for service.



"Cap" Kierulff demonstrates the portable zoom lens recorder that is already breaking into the vast home entertainment market.

can be said that we're still just scratching the surface," Mr. Bunzell declares. "Hospitals, for example, are just beginning to see the vast potentials of video tape."

Quite a few hospitals, though far from all, are now taping operations, the recorder being mounted above the operating table with the lights. Surgeons in these hospitals no longer have to come out of the operating room and dictate lengthy notes: the entire operation is now recorded, providing a "legal record" as well as the opportunity for surgeons to review operational techniques.

Video tapes are being used by hospitals in training programs for interns and nurses and orientation programs for personnel. With rapid advances being made in surgery and medicine, audio-video tape is superior to books as a training medium. It can be updated by simply erasing sections as needed and re-recording.

Video is also being applied more widely in radiological work. Pictures are taken of the X-ray images and intensified. It's not necessary to subject patients to so many roentgens to provide a strong enough image for diagnosis.

Since 1966, Tri-Video has been working with the Medical Center of the University of California at Los Angeles on producing a "tape of the week" covering a variety of medical subjects. The tapes are circulated nationally and hospitals and doctors are now building tape libraries.

### Educational TV

A similar situation is developing in the educational field. At the 27th annual conference of the California Assn. of School Libraries held in San Francisco, it was estimated that at least one-fourth of the school library money is now going into audio-visual materials, and some school library money is now going into audio-visual materials, and some schools are moving toward making it 50-50.

Closed-circuit television systems

that permit the student to dial a pre-recorded lecture or film are sweeping the educational field.

Tri-Video has put together a "turnkey package" for the educational field and is working with educators on developing a supply of tapes for all school levels, including grade schools.

"Color is going to be increasingly important in the medical and educational fields," Mr. Bunzell says, "particularly in research. An example of this is a blowup we made of a fly's eye. We did it in black and white and while the blowup showed the structure, it would have provided a truer picture if it had been in color. The California Institute of Technology is one local institution that is now beginning to use color video in some research projects and we anticipate there will be many more."

### **Industrial and Business Uses**

Video is now being installed to increase productivity surveillance of delicate factory procedures.

A recent Tri-Video installation "watches" the winding of coils for micro-parts. Formerly, the women who wound the coils had to use a microscope to see what they were doing and could only work a half hour at a time. With a closed-circuit camera focused on what she's doing, the winder now follows a blown-up picture, winding the coils much faster and without eyestrain.

The "watching" job done by closed-circuit television is a rapidly growing field. Dial systems enable factory management to "visit" any part of the plant while sitting in the office. At airports, systems are being supplied for surveillance of small aircraft. Department stores are installing systems to watch for shoplifters. Missile firing, children's play areas, functioning of machinery on assembly lines are just a few of the many present "watching" uses of B/W.

Tri-Video, based on its experience with the tape of the week for UCLA Medical Center, is now planning a "businessman's video digest." The digest will summarize market trends, business outlook of the week and other pertinent information for subscribers to a tape of the week,

who will have a video tape machine in their office for playback.

### **Home Market**

The home market, now only about 1 percent of Magnetic Recorders' video sales, will begin to swing when B/W video tape systems can be sold for under \$2000.

With the portable battery-pack video tape recorder selling for \$1200 and the playback machine for \$1345, the price is getting right. At present, most of the battery packs are going to police departments who like the "instant playback" feature.

"But we're also selling them for home use," Mr. Kierulff says. "We recently brought in ten and shipped them all on the same day. We have a special situation because many television and film stars live in our trading area and they're buying the battery packs as fast as we can get them.

"What the stars have today, everyone who can afford it will want to have tomorrow. And so we're very bullish about the next decade during which color is going to be brought down to under \$1000 and black and white under \$500. Then we'll be ready to go."

### **Instant Retrieval**

Replay in both B/W and color has unlimited potential on the mass market, Mr. Kierulff declares. The public is ready to pay a reasonable price for information — information they can get right now.

"As a test, we took one of the battery packs to a wedding of one of our employees, recorded it and showed it at the reception. And we made copies for the families. Everyone was enthusiastic.

"When the consumer can get this kind of instant information at a reasonable price, he's going to do nothing but buy-buy-buy. Look, for example, at what's happened to the Polaroid camera. We can expect the same thing in our field."

Magnetic Recorders Co., has a staff of 36 employees, including 12 full-time salesmen inside and outside and eight technical engineers and service technicians. Tri-Video has its own sales staff and the six service technicians and sales-service combination is being rapidly

expanded to develop the growing video field.

### **Sales Methods**

Demonstrations, exhibitions and training courses bedrock sales. Mr. Bunzell says: "We'll put on a demonstration for any hospital, institution, association or group of businessmen who want to see what video equipment will do. Our salesmen also bring in individual prospects — we have a complete setup here for demonstrations.

"Since this area of the electronics field is relatively new, we don't try to pinpoint the market — you never know who's going to buy — and so we go out after a wide variety of prospects."

### **Custom Service**

Magnetic Recorders' engineering and service department builds special tape recorders in addition to servicing the most sophisticated equipment.

Special systems for the U.S. Air Force are a part of the sophisticated engineering and service package. A photo sync system for LIP sync recording is a recent example of specialized electronics as related to tape recording systems which the firm has introduced.

Tri-Video's six service men work mostly in the field. Top service guarantees customers that their equipment will be kept operational. Some service contracts, particularly hospital and medical, are on a 24-hour basis.

A loaner system is essential: Almost every video tape user needs to keep the equipment fully operative. Tri-Video does not expect to show a profit for some time on the service department, but a complete service department is most essential to making sales in this field.

Communications and enjoyment, Mr. Kierulff concludes, are the inseparable twins of the electronics industry.

In video, communications is breaking the ground but enjoyment is close behind. The mass market will expand tremendously within the next few years, and so Magnetic Recorders is pioneering now to assume the leading position in its trading area. ■



## PURPLE TRUCKS AND YELLOW LETTERS

■ "You should be able to service all the electronic merchandise that you sell." This is the advice of Lloyd McLeod, who 13 years ago started repairing radios in his home garage in Baton Rouge, La. At that time he was, in his own words, "flat broke."

Today, Mr. McLeod is the owner of two retail stores, selling and servicing television, radio and other electronic merchandise with sales volume of \$200,000. One store has 1200sqft where he specializes in selling, installing and repairing automobile radios.

His new store, which has 10,000 sqft, was opened in the middle of March. There, he specializes in and servicing TV, radio, stereos, tape recorders, phonographs and color TV.

Just as distinctive as his store, are his trucks and his business cards. Our ET/D reporter asked Mr. McLeod why the striking purple background and yellow letters. He shrugged his shoulders and smiled happily, "Just because it's different."

"My customers call my trucks 'Mac's Easter eggs,' he beamed. "When anyone sees one on the street he is more apt to remember it than a truck painted in ordinary colors. Of course, they have to be cleaned more often, otherwise they would look trashy."

His impressive sales volume in-

dicates the growth of a business started only seven years ago "with less than a thousand dollars." He adds, "I was worried about making enough to pay the next month's rent."

"So, I worked from midnight to eight in the morning at the telephone company here in its toll test room," he recalls, "and operated my own store until six in the afternoon. When we closed, I would go home and sleep until an hour before midnight when I had to report at the phone company. If I couldn't make it through the next day, I would take an hour's nap at noon. It was tough but I did it for ten years and put the money I made right back into my store."

Mr. McLeod kept up his back-breaking schedule until two years ago. Now he is leasing a \$40,000 building and has 12 employees, seven of whom are technicians and two trainees in his service department. He believes very strongly that "you must be able to give good repair service before you can sell."

"If you are too busy with management or selling, you should have competent technicians whose repair work you can absolutely rely on," he adds. In his own case, Mr. McLeod is protected, because in Louisiana "a man has to have a technician's license before he can get work as a technician."



McLeod's TV provides ample parking in front of its large and impressive merchandise display windows.



The same theory of dramatic spaciousness is continued in other areas.

He has devoted a generous amount of space to his service department where repair work is received from others besides his own customers to whom he has sold television, radios and other electronic equipment.

The service department is well displayed, attractive, and can be viewed by customers through the full-length all-glass front. Mr. McLeod pays his highest tribute to his staff of technicians when he says, "Where we fall down in salesmanship, we make up in the performance of our service technicians. The technician's performance sells us to our customers."

### Sure Fire Plan

McLeod's has a unique method of selling new television sets. "We set them up in the home of any prospective customer without any kind of deposit," declares Mr. McLeod. "The manner in which the technician works in setting up the new set and the fact that it will work without any of the troubles the customer may have experienced in the past, convinces him more than anything we could say in our sales talk."

Selling a new set without any deposit is done by the customer's signing a demonstration agreement and the filing of a credit application.

"We leave it in the new cus-

tomers' home for two days to prove that the set works," Mr. McLeod says. "We do not ask the customer to close the deal until the end of the second day; by then he is already pleased and showing off the new set to friends."

His unusual selling plan is a sure-fire operation judging by his sales records. "I lost only five out of 200 sales this past year in color television sets," he states. "And those five customers either didn't want a color set in the first place, or some unexpected development came up in their financial situation. There never has been any animosity shown by the customer when we had to remove the set."

### The Sales Scene

Lloyd McLeod used foresight in leasing the building he is now in. He wanted a lot of space for service and display and a particular site. "I moved to the edge of town because of economics," he says. "This gave me a building with large rooms, and that is necessary because people must see the television set in surroundings that approximate their home. Any dealer who thinks that he is not selling furniture when he is selling a television set is fooling himself," Mr. McLeod states with emphasis. He groups sets so that a shopper can be led immediately to Early Ameri-

can or French Provincial or any other period of furniture that is in their home.

Mr. McLeod tried the group-of-merchandise-idea first in his window displays. "It just did not sell in my window area," he declares, "so I tried the single piece of merchandise only. It pulls very well for me."

The lights in his store are kept on all night. "Customers can come by or stop at any time of night to see what I have displayed," he says.

Mr. McLeod decided on the generous amount of space which surrounds the television sets because he noticed that "when a customer stands back ten feet and looks at the set, it is because he is picturing it in his own home. We found that this is much more effective in selling than allowing the customer to see just the top of the set."

### Sales Approach

In approaching a new customer — or an old one seeking a new television set, Mr. McLeod asks, "What type of furniture do you have?", then, "How far away from the television set do you usually sit?" "This," he explains, "is to find out how large a set we should show the customer. Most customers buy too big a set and then sit too close to it. That, of course, spoils their viewing."

## PURPLE TRUCKS . . .



Mrs. McLeod, a working partner who is well versed in electronic merchandise, explains the features of a stereo unit.

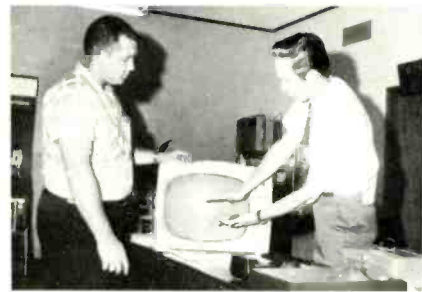
Mrs. McLeod listens to a sales talk presented by her husband and offers her highly-valued opinion.



Mr. McLeod gives detailed operating instructions even on smaller items.



The service department evaluates customer complaints of set malfunction as a step toward better customer relations and efficient service.



Mr. McLeod's extensive knowledge of TV and radio is well respected by his technicians and readily accepted when faced with a difficult circuit defect.



Mr. McLeod revealed some of his own sales technique which might be adapted and used by other retail dealers. For the customers who "want to wait" he has this ready response which has proven most effective: "The real reason you are purchasing this set is for enjoyment," he tells this customer, adding convincingly, "is there any reason why you don't want to enjoy it now?"

For customers who complain about the price, he has this piece of advice: "Agree with the customer, but ask him if there is anything their family would enjoy more for the same price?" He adds, "The wise salesman will not take no for an answer. He never stops selling, but the continued selling must always be subtle and never high pressure." In his own instance, he says "The majority of people who come in here do so because they want to buy. Of course, some are only looking."

Regardless of what happens, he says, "I always analyze myself personally if I do not make the sale." To help him in this respect, Mr. McLeod uses tape recorders in his sales room. When he fails to make a sale, he runs off the tape and listens to it carefully. "I pick my sales pitch apart and see where I went wrong," he admits. He does not rest on his own evaluation either. He also plays the tape for his wife, who has been an active working partner.

Examples of common selling failures that come to light in these evaluations: "Perhaps I failed to ask my customer to *buy* the set." "Perhaps I *described* it to my customer, but never tried to close the sale, he says, or tried to sell service but not entertainment."

Self-criticism has made him show "more honest concern for my customer's likes and dislikes, rather than my own. I often find myself talking too much. Better to bring the customer into the conversation."

As to his new store, Mr. McLeod says, "The man who had this building was in the floor covering business. He had excellent taste, and I just decided to follow in his footsteps: no banners or flags and very few signs on the walls. I am selling television sets. Circus flags and a circus atmosphere will not attract customers."

"We make sure that the customers feel the merchandise they are buying will last," he adds. "We give a one-year warranty on all new sets and three months on all parts and labor for repair work. And we do not normally sell used sets. If a used set does not work, you lose the customer or you lose the money. There is no advantage to be gained either way."

As for the future of the retailer in television, radio and other electronic merchandise, Mr. McLeod says it was never brighter. "There are new dimensions in color television," he says. "There are also video tapes being made for home television as well as many other electronic products. All of these present a fascinating challenge and a very bright future to retailers like myself. With new products coming out, the manufacturing industry has taken a bigger interest than ever before in training men to service their products."

### Personalized Commercials

Mr. McLeod believes that his high rate of sales is due to the fact that "we handle only one line of television sets. When a customer walks in here he is already presold. That's not only because of the national advertising that the manufacturer does, but also because of its liberal policy in the matter of cooperative advertising."

In his own advertising program, he uses all media. He appears on his own television commercials and his voice is used in his radio spots. "I find that it helps to get that personalized recognition, he explains."

All his advertising carries the

slogan — "McLeod's — the House That Service Built." He also stresses: "We feature sales, but specialize in service."

His television commercials carry a photograph of what he describes as "the largest display of home entertainment merchandise in the Southwest."

"We try for at least a one-minute commercial on both TV and radio every day," he says. "And we very seldom mention the price of an item."

There is just one time that price is mentioned and that is every three months, when there is either a clearance sale or the introduction of new merchandise. "Or we may do so when we are carrying Christmas specials or trying to boost sales during a slack period."

"More advertising is being done now and will be done in the future than ever before by the manufacturers," Mr. McLeod states. "This means they are doing a better job than ever before . . . in fact, an excellent job in preselling your customers and mine," he declares.

"However, to meet this bright future and profit by it, the retailer must prepare himself first with more information about the products. Due to the complexity of new items, the customers who come to you will have no understanding of the new products or how they can use them. So even with the preselling, you must know all you can. And you must also have enough imagination to be able to see that product in your customer's home or office."

"This additional knowledge of the product and its uses will make the retailer 'more professional' in the eyes of his customers. Just as technicians are becoming more accepted as technicians rather than repairmen, so should dealers build their own skills and knowledge to become more professional in the eyes of their customers. And that is when the dealer will make more sales."

### Service and Training

Mr. McLeod keeps his technicians up-to-date by allowing them to attend factory service seminars and work with factory technicians. Every three months our men attend a full day training session which gives them practical service experience on new circuits.

"This," Mr. McLeod says, "does two things for our firm. If a customer is happy with our service, he will tell others and of course mention the technician's name. That means new service calls and sales for new sets. And if the customer isn't happy, he will call the technician here. That alerts us to a problem immediately and we can act to adjust the matter successfully."

"Our crews shift hours, starting at eight in the morning." This enables us to give better service with less commotion because we work with smaller crews. It also helps us to catch late calls (service calls are taken as late as nine P.M.). Promptness is also important and we make sure our men get on a service call as soon as possible.

"Record keeping in your service shop is necessary too, Mr. McLeod stresses. "We keep an audit of how much work a man does each day, and he and the sales manager sign the sales tickets. We reward our technicians for any sales that they inspire, to give them more incentive. This will also reduce noise interference during tests."

Touring his spacious service shop, Mr. McLeod points to the 100ft work bench. "I built that myself," he boasts, "and I have plans to add partitions and doors so that each technician will have his own private workshop."

He also plans to paint the workshop a light green (proven to be easiest of all colors on the eyes) and to add air conditioning. "I want to make this a model workshop so that my men can work at their best in the most pleasant of surroundings," he concludes. ■

**ET/D**

## **DEALERFAX**

**The days of the friendly neighborhood TV-radio shop are still with us. Evidence is this small but successful Midwest service-dealer**

■ In south Minneapolis is a small, neat and impressive shop called Jim's TV, so named since early 1956 when Lloyd James first bought it. He purchased the business just before graduating from Northwestern Electronics Institute (NEI) in Minneapolis which he had been attending for two year.

His initial investment of \$4000 included the inventory, an old truck and a rented 20 by 40ft. store. This 800sqft area was divided between sales and service — "neither of which was very good then," Lloyd James reflects.

"When I first took over the business, my wife and I did all of the work." He smiles as he surveys the shop, remembering what it used to be. "Reconstructing the service, sales, inventory and shop needs kept us both pretty busy, and by that first summer I needed another full-time technician. Fortunately, I hired a good one."

Later that year Jim added two part-time technicians who were students at Northwestern. This turned out to be a continuing practice, as Jim's TV has helped many student technicians gain valuable

experience during the past 12 years.

It was also during 1956 that color TV made its debut in the Minneapolis area and Jim's TV was one of the first to provide sales and service on these sets. His gross income in 1967 was almost \$130,000.

### **Neighborhood Sales**

"Our intent is to do a neighborhood business," Mr. James told ET/D, "and that's what we do. About 75 percent of our business is within a 10-city-block radius; the rest of the trade is walk-in. We are fortunate in being located on a main street in an active, friendly community, primarily populated with relatively high-income families.

"Most of our sales come from customers whom we have served. Our policy has always been to guarantee labor and service on anything we sell. This guarantee holds for the period of the factory warranty, and it's figured into the selling price — but not so as to make money on service during the warranty. We are in business to make a profit, and we back up our sales business by giving competent service."

# **Neighborhood TV Business**



Part of Jim's TV display area shows carpeted and uncluttered use of space.



Our ET/D reporter asked "Jim" about competition in this large city with its many discount and department stores. "We sell our merchandise at a reasonable profit," he adds assumingly. "The only time we discount an item is when it is outdated or has been on the books too long. We can't, and don't try to compete price-wise with the large department stores. We all know that they can buy at a better price because they buy in larger quantity — but we do offer expert service, and that's something we can sell.

In 1966 Jim's TV bought its building. "We spent half of 1966 remodeling. We wanted a better service shop area because our primary aim is service. We wanted a shop where people could see what was being done, and we also wanted a better display area. Now we have both, including small separate rooms for Hi Fi and color TV demonstrations."

In addition to having a pleasing carpeted display room which affords the customer a pleasant and uncluttered shopping atmosphere, Mr. James has also installed unique shades of tinted plastic in his display

windows. The shades cover the entire front and side window areas and can be quickly raised and lowered to reduce glare from the sun. "This helps reduce the outside light to a proper level when a customer is looking at a color set and also prevents any possible fading of cabinet woods which are close to the windows and exposed to the sun," the owner explains.

"What about trade-ins and demo's in your sales policy?" ET/D asks. "No demos," Jim smiles. "We used to, but we don't find it necessary anymore. For example, when a customer comes in to buy a color set, we explain the principles of color reception. We tell him how it operates and we have a viewing room where he can relax and watch color programs. We explain the controls and what they are for. These days almost everyone has seen color TV programing either at a friends house or in a store — it's no big novelty any longer. But it is important that the customer realize that the difference between good and bad color reception is primarily a matter of knowing what adjustments to make — and how to make them."

### Prints Own Advertising

Advertising for Jim's TV is in some ways typical of many TV businesses. The firm uses media and programs coordinated with the TV-radio manufacturers under a co-op plan. This includes local newspapers and spots on a local FM radio station.

But Lloyd James goes a step or two further. "We make a neighborhood mailing twice a year which has been most effective. We have our own printing machine and make up our own mail advertising. We would like to do more of it if we had time because it has been a great help in building our business. We also send a service discount card to new people in the area which gives them a price break on their first service call and introduces us.

### Installed-Price Service Policy

"We are proud of our service history," "Jim" smiles. "and we try to keep our customers happy. When a customer comes in with a portable TV or a radio, we attempt to service it immediately if we see that it may be something simple like a tube. It helps us, and the customers are



Dave Bednarz, one of Jim's competent technicians, shows an interested local shopper one of the new color TVs.



Jim takes notes from a customer on a service call which will be scheduled for prompt action.

## NEIGHBORHOOD . . .

happy. We don't do it free; we have a minimum shop fee of \$2.50 on a quick tube replacement, but the customers are happy with that."

Our ET/D reporter had a chance to view Jim's service first-hand. A woman with two young children hurried into the shop carrying a portable TV. She told him that one of the children had accidentally knocked the set from its stand for

Jim cheerfully explains the features of a table radio to an old friend and customer.



Dave Bednarz works on a B/W TV using modern test instruments and techniques.



Jim and Dave team up to make some final adjustments on a color TV before delivery.



the second time and she was anxious to have it repaired before her hubby noticed it was gone.

Understanding the situation, "Jim" immediately dug into the set long enough to assure the customer that he would have it back to the house and operating before the afternoon was over (a very human incident which could happen in any community and one which Lloyd James handled expertly).

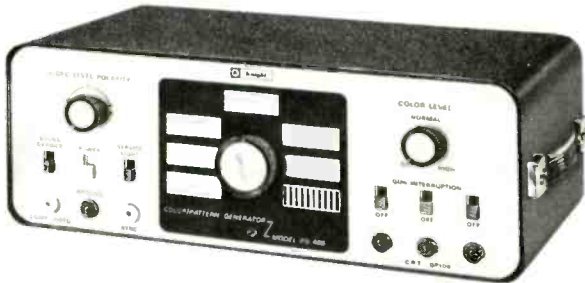
"We have two full-time technicians and one part-time now," Jim adds. "We also have two vans which are fully equipped for service calls and delivery. We don't keep time charts on our men. We use a flat rate charge on labor and an installed price system. The flat rate service charges presently look like this: home calls are \$9.50 for color and \$6.95 for B/W; re-installation and delivery is \$7.50 for color and \$5 for B/W. Our bench minimums are \$15 on B/W and \$30 on color. Tuner work is extra. We also set a minimum of \$2.50 for a tube replacement, \$7.50 for transistor radios, \$12.50 on record changers and \$15 for tape recorders.

"There are several reasons why we use the installed price system. Primarily, it helps us to make up for price differences in the amount of time necessary to do various repair jobs. The price of the part is included. It also establishes guidelines for the technicians on house calls if they have to give an estimate on a major repair. Along this line, we have found it better to estimate high and present the customer with a lower-than-estimated bill rather than the other way around — he's happier that way. And he has to be a happy customer. We don't gear our business to one service call, we want each customer to stay with us.

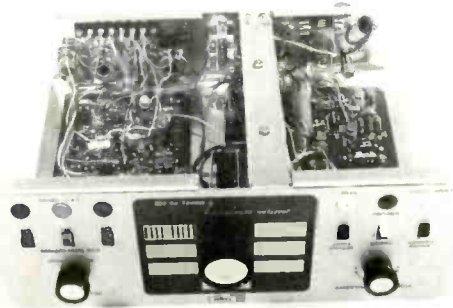
"Our rates are out of date now," Mr. James admits, so we are going to have to raise them a little. We won't raise home calls too much, but the bench rates have to be realistic because that's one area where time can slip through the fingers. Service business made up at least one-third of our gross in 1967 and it will come very close to half of our gross this year. ■

# TEST INSTRUMENTS

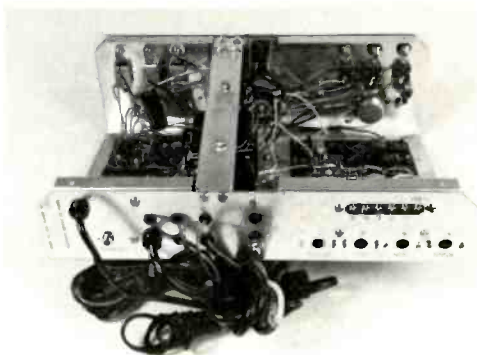
This color generator in kit form may solve your needs for an inexpensive start in color test instruments



Knight Model KG-685 Color/Pattern Generator.



Interior view showing circuit boards and rear panel controls.



Interior view showing rear and front panel controls.

■ The Knight Color/Pattern Generator, Model KG-685, was recently assembled in our ET/D lab from a kit which included all the necessary parts as well as solder and a tuning tool.

The unit is all solid-state and features two printed circuit boards with clearly marked parts locations and assembly instructions showing layout diagrams of each board with the component placement printed in bold letters for each stage of assembly. Consequently, mounting circuit board components was a breeze.

One feature we especially appreciated about the kit was that all the connecting wires were pre-cut and stripped.

The instructions were quite thorough. The only problem we had was in identification of the capacitors. The capacitor types varied and a brief descriptive identification would be helpful. Unless the technician is familiar with the new miniature capacitors, he might have trouble distinguishing between mylar and polystyrene.

The finished unit was relatively easy to align following the manufacturer's instructions. However, we found that to stabilize the generator patterns on the TV sets we connected it to, it was necessary to make minor readjustments of the various controls, especially the channel coil and vertical intensity.

The vertical intensity pot, located at the rear of the unit, is somewhat unhandy and would be more convenient on the front panel. But the unit provides all the necessary patterns and is priced at less than \$90.

It comes in an attractive cabinet with a hinged rear door providing access to the adjustments and storage space for cables. A handy polished metal mirror is also included and attaches to the bottom of the cabinet when not in use.

The color generator provides seven crystal-controlled patterns, is tunable to channels 3, 4 or 5, and comes with an RF output cable, gun interrupter leads and a service light. ■

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

## AM Radio 700

A cylindrical portable radio, the "Flint", is introduced. The radio is 8in. high and 3 1/8 in. in diameter with 2 3/4 in. speaker mounted in the top of the 10-transistor AM unit. The bot-



tom half of the unit serves as a tuning dial with a viewing window for station selection eliminating the need for a conventional dial. A decorative trim band around the center operates as an on-off switch and volume control. A built-in compartment on the bottom of the radio has a mirror and space to store makeup, keys or change. The radio also has an earphone for personal listening and comes with an adjustable carrying strap. Sears.

It is said that the unit plugs into any standard public address amplifier, booster amplifier or tape recorder employing a single connection. The unit will also drive a guitar amplifier through a simple attenuator network and operates from a nominal 117v, 50-60Hz ac power source with a power drain of 1.2w. A minor circuit modification makes it possible to power the unit from 22 1/2v battery for emergency dc operation. The frequency response is 50 to 20,000Hz, measures 5in. d x 2 1/2 in. h x 9in. w and weighs 3.5lb. Claricon.

## Chord Organ 702

An electric chord organ with a three-octave range is introduced. The unit is the company's second portable electric chord organ. It has 37 color-coded and numbered melody keys with 12 major and minor chord keys. The organ features include: variable volume control for soft, medium, and loud play; separate on/off switch; and a pilot light that illuminates when the organ is turned on. The



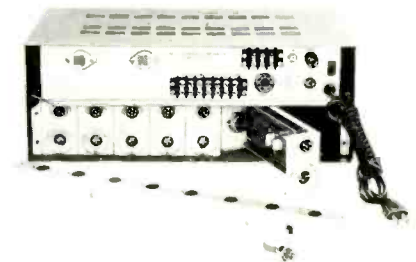
organ comes in a lightweight polystyrene cabinet with a desert sand color and plugs into any standard ac outlet. The dimensions are 28 1/2 in. wide, 10 1/2 in. high and 11 in. deep. Suggested retail price is \$34.95. General Electric.

## Modular Amplifier 703

A line of modular amplifiers is introduced called the MOD series. It consists of 20, 45, 90 and 200w solid-state amplifiers, each furnished with one high-impedance microphone preamp. Six more preamp modules may be added to satisfy the input requirements of nearly any installation. The modules are said to be simple to install in the field and require no special tools or wiring. Flexibility is offered in the line through the "stacking" principle.



Special control modules such as "priority paging" or the "limiter" module may be placed in any channel so as to mute or limit the gain of all inputs to the left of its position. In this way it is possible to control from one to all seven other inputs. All four units have fully automatic output circuit protection with indicator light;



4, 8, and 16Ω outputs, balanced with a 25 and 70v line. All units are available in package or rack mount listed at the following prices: MOD-20 \$262.50; MOD-45, \$312.50; MOD-90, \$375; MOD-200, \$475. Bell.

## Mixer Preamplifier 701

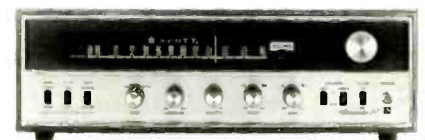
A solid-state microphone mixer preamplifier is announced. The model 44-485 is an all-silicon transistor, four-channel mixer-preamplifier. The unit increases the versatility of a sound system by providing four additional inputs from a high or low impedance microphone, tuner, crystal phonograph or tape recorder. The unit may be used for stereo, such as tape recording, and up to three units may be paralleled to provide a total of 12 inputs, each with its own volume control.



## FM Stereo Receiver 704

A 50w FM stereo receiver is introduced. The model 341 incorporates silver-plated field effect transistor front end circuitry resulting in reportedly virtual elimination of all cross modulation and drift, and providing greater usable sensitivity. Field effect transistor circuitry is also used in the tone control circuitry to produce a wider range of control. Advanced circuitry employees integrated circuits, both in the IF strip for improved capture ratio and selectivity, and in the preamplifier section for higher gain and lower distortion.

In addition the unit uses glass epoxy printed circuit boards and solderless connectors thus eliminating the



Back by popular demand-Another 1968 Krylon Giveaway



Or  
**\$100.**

Simply fill in the coupon below.  
 If you become our lucky winner, we have a pretty good idea what prize you'll choose. But we figure it this way: If you win \$100 on us, chances are you'll spend \$1.95 on us — for Krylon.<sup>®</sup>  
 (That way, you'll be a two-time winner.)  
 And while we've got you thinking about Krylon, think about our whole line of sprays. They're standard equipment for all TV/Radio installation and repair work.

**Entry rules:**

1. No purchase necessary. Print your name and address on entry coupon and mail to: Krylon Contest—Dept. 300 St. Clair Associates, 485 Madison Ave., New York, N.Y. 10022.
2. Entries must be postmarked no later than November 30, 1968.
3. Winner will be selected in random drawing by St. Clair Associates, whose decision will be final.
4. 1968 Krylon Giveaway is open to anyone in the U.S. except in Wisconsin and where prohibited or restricted by law. Employees (and their families) of Borden Inc, its affiliates and advertising agencies, or St. Clair Associates are not eligible.



Krylon Contest—Dept. 300  
 St. Clair Associates  
 485 Madison Avenue  
 New York, New York 10022

If I win, I'd prefer:

The Krylon     The Cash

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

The number on the bottom of my Krylon can is \_\_\_\_\_

I don't use Krylon.



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**MOST  
VERSATILE**

**TRIPLET**



MODEL  
850  
\$93.00

**MODEL 850  
ELECTRONIC VOLT-OHMMETER  
IS BEST FOR YOU**

**FACTS MAKE FEATURES:**

- 1** Long 7" easy-to-read scale.
- 2** .5 D.C. volt range for transistor circuits.
- 3** HIGH STABILITY. Meter connected in cathode circuit of 12AU7.

High Input Impedance (11 MEGOHMS) and wide Frequency Ranges give this extremely versatile Electronic Volt-Ohmmeter considerable advantage in the measurement of DC voltages, AC RMS and Peak-to-Peak voltages. It measures directly the Peak-to-Peak values of high-frequency complex wave forms and RMS values of sine waves on separate scales.

**ADDED PROTECTION.** Meter is shorted out in OFF position for greater damping, meter safety during transit, electrically protected against accidental overload. ZERO CENTER mark for FM discriminator alignment, plus other galvanometer measurements.

New pencil thin test probe used for all functions: DC, AC, and ohms. No need to change cables. Beautifully styled case for professional appearance and functional utility, 7 $\frac{1}{8}$ " x 6 $\frac{1}{16}$ " x 3 $\frac{3}{4}$ ".

Carrying handle can be used as a tester stand to place the tester at 25° angle for ease in reading.

Frequencies to 250 MC may be measured with auxiliary Diode Probe, \$9.00 extra. DC voltages to 50 KV may be measured with auxiliary High Voltage Probe. \$25.20 extra.

**TRIPLET ELECTRICAL INSTRUMENT COMPANY, BLUFFTON, OHIO**

DON'T FORGET TO ASK 'EM "WHAT ELSE NEEDS FIXING?"

... for more details circle 152 on postcard

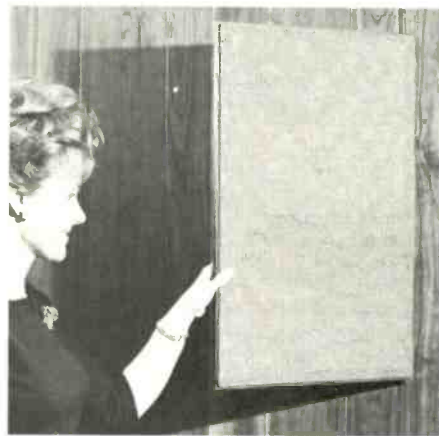
possibility of malfunction because of a bad solder connection or vibration. The silver-plated FET tuner section of the receiver achieves 2.5  $\mu$ v sensitivity with 80db of cross modulation rejection claimed by the manufacturer. The stereo multiplex section features solid-state time-switching multiplex circuitry, separation of 30db and the capture ratio of 2.5db. Amplifier output is direct coupled using silicon transistors for optimum reliability and sound quality. Additional features of the receiver include; balance control; three pairs of external stereo inputs for magnetic cartridge, tape monitoring and extra input; chassis-mounted stereo threshold control; loudness/volume compensation switch; mono/stereo switch; and center tuning meter. Price \$259.95. Scott.

**Hi-Fi Speaker**

705

Introduced is a decorator-designed, wafer type Hi-Fi speaker system that is said to match the tonal quality of

the bulky box speakers. The "Twin-XX Twenty" Hi-Fi speaker system incorporates two of the recently introduced Poly-Planer plastic speakers in a single unit about as thick as a picture frame. Encased in a simulated oiled walnut frame with solid walnut base and a cane grill



(plastic fabric), the "two speakers in one" can be shelf, floor or wall-mounted hung or hinged. A set of brass hinges is provided for the latter type of wall mounting.

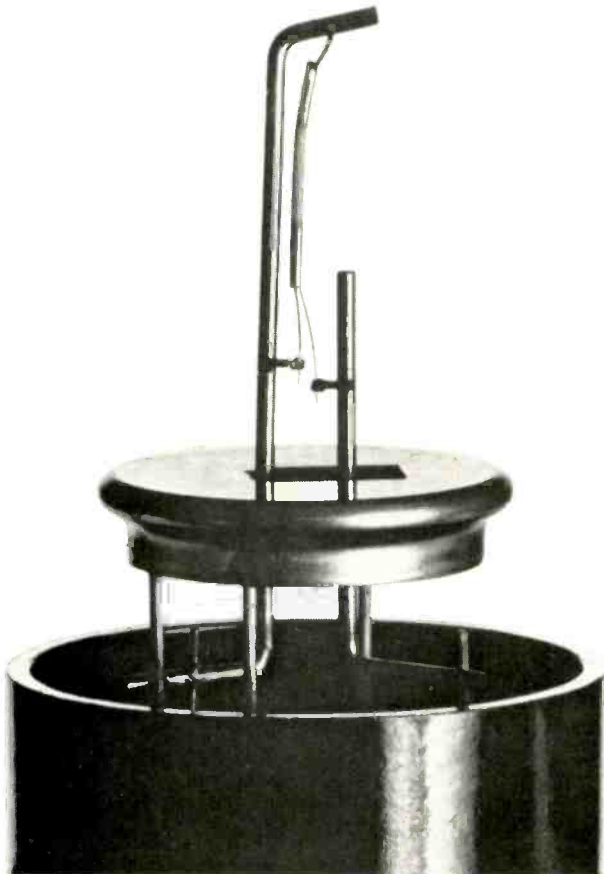
Power capability is 40w (peak) with a frequency range of 40-20,000Hz and an input impedance of 8  $\Omega$ . The unit has a figure-eight sound dispersion pattern and its dual four-way panel-type design is said to have an effective radiating surface of 216sq in. The two-in-one unit reportedly delivers the performance equivalent of two woofers, four mid-range speakers and two wide dispersion tweeters complete with dual cross-over networks. The over-all measurements are 16 $\frac{1}{2}$  in. by 25 $\frac{1}{2}$  in.; weight is 5 $\frac{1}{2}$  lb. Magistran.

**Power adapter**

706

A regulated ac adapter for 12/14v mobile transceivers for use with nearly all 5w CB and low-power amateur and business radio service vehicular communications equipment has been developed. The new universal power supply is said to be the first ac adapter ever designed to provide instant dc power for almost all transistorized in-car shortwave radio transceivers. With the model 790 Power Pedestal, the universal ac to dc adapter is said to require no special connectors, mounting straps, terminal lugs or alignment pins. The transceiver is placed atop the Power Pedestal and turned on. Electrical connections are made to two binding posts, clearly marked for polarity, at the rear of the power supply chassis. The power supply employs two magnetically impregnated rubber mounting strips to hold the transceiver in place. A transistor capacitor/mult-

# We've rectified high-voltage rectifiers.



How it used to be.

Take a look at our new "Posted filament" design. There's no delicately suspended heater-cathode system. There's no need to heat up a metal sleeve and then an oxide coating.

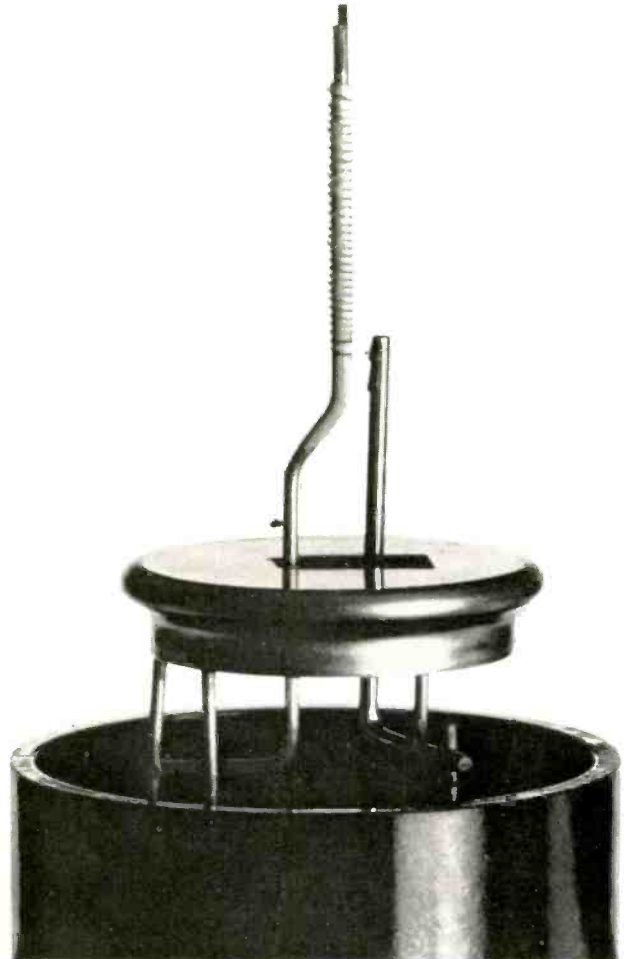
It takes less than a second for the 3CU3 to start rectifying full swing.

In case of a break, there's no way for the 3CU3's filament to fall against the anode, creating a short and knocking out other components in the circuit.

The 3CU3's filament is always perfectly centered. It emits electrons uniformly in every direction. From a much larger surface than in the old design. There's no suspension post in the way to create an "electron shadow" that cuts down the plate current.

The uniform electric field around the rigid support reduces high voltage stresses. Arcing and its resulting troubles are eliminated.

The 3CU3 is interchangeable with 3A3 and 3A3A



Our new 3CU3

high voltage rectifiers. And it's made exclusively by Sylvania.

The 3CU3 is just one of a new "posted filament" family which includes the new 3BL2 and 3BM2. They're designed for use in new color TV sets. These tubes are especially good for transistorized TV where their fast warm-up fits in with the "instant on" feature of solid state circuitry.

The new construction has higher reliability and longer life and should give you fewer and less troublesome callbacks.



From the outside you can hardly tell it's changed.

**SYLVANIA**  
A DIVISION OF  
GENERAL TELEPHONE & ELECTRONICS

# New! IRC STRIPTROL

A real time and money saver. Striptrol is a fast, convenient way to do shop replacement of side-by-side strip controls in leading color and black and white sets. Big selection of IRC/CTS adjustors, elements, and housings. No need to wait for original parts. Parts are easy to assemble. Low cost, too.

**JUST 3 PARTS...**



**ASSEMBLE  
QUICKLY...**



## 2 LOW-COST STOCKS

Your IRC Distributor offers two versatile stocks. Both include a sturdy, 12-drawer steel cabinet, dividers, labels, Striptrol assembly instruction, and replacement data.

**STRIPTROL**

Now at leading IRC Distributors



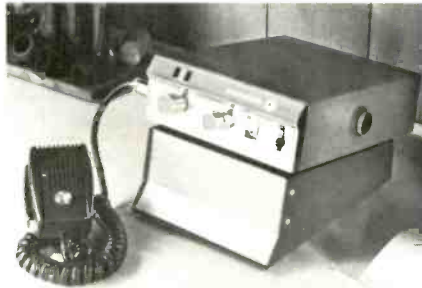
**DIVISION OF TRW INC.**

**401 N. Broad St., Phila., Pa. 19108**

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## ET/D DEALER SHOWCASE

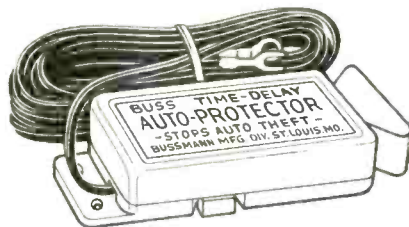
plier configuration increases circuit filtering capacity automatically as the load is varied. The power supply is



said to exhibit 5 percent output regulation with only 0.05 percent ripple (low current ripple: 0.4mv at 100ma; high current: 4mvac ripple at 1a). Output voltage is 13.5vdc nominal. The universal supply is solid-state throughout, featuring dual rectifier diodes, 2N544 transistor capacitor/multiplier and a ZA-14 zener diode voltage regulator. The unit weighs 4 lb. and measures 6in. wide by 8in. long by 3in. high. Price \$29.95. Amphenol.

### Auto Protector 707

A protective device is claimed to greatly reduce car or truck thefts. Even if thief has a key, he can't get away with car. The auto protector permits the thief to start the car then



stops engine cold, usually within a minute. Manufacturer says the device can be installed in minutes on any American or foreign car with a 6 or 12v ignition system. It wires into the ignition circuit and permits owner to operate car normally or to protect it against theft by simply changing the position of a small knob. Retail price under \$5. Buss.

### Portable Color TV 708

Introduced is the model WM226-HWD, a 10in. (viewable diagonal) Porta Color receiver, which comes in a high-impact polystyrene cabinet with woodgrain finish and die-cast fold-down handle. In addition to the all-channel tuning system, UHF and VHF antennas and 3in. front mounted speaker, it comes with earphone jack and earphone. A redesign of the

**NOW—a single instrument for the Professional TV Serviceman, MATV Systems Engineer, and Antenna Installation Expert**



## Jerrold AIM-718 Signal Strength Meter

First signal strength meter designed with the diverse technical tasks of today's TV Professional in mind.

- All solid-state
- Separate VHF and UHF tuners and channel dials
- Compact, lightweight design
- Long-life battery operation
- Audio output jack, crystal earphone provided
- Two built-in attenuators (20 dB on UHF; 20 or 40 dB VHF)
- Safety switch turns off power when cover is closed

### Loaded with profit-making uses

Since it weighs only 4 lb. 6 oz., the AIM-718 can be used at the bench or taken right up on the roof to:

- Measure incoming TV signal strength—channel by channel
- Orient antennas for best reception
- Troubleshoot MATV and CCTV systems
- Measure loss in downlead and distribution lines
- Determine noise figure, S/N ratios of TV amps and preamps
- Make power and voltage gain checks
- Check output level of signal generators
- Signal trace TV preamps, amplifiers, and tuners

### You'll satisfy more customers

when you use an AIM-718. And satisfied customers will let the word get around about you. So do the job the professional way... the business-building way... the profitable way. With the Jerrold AIM-718 Signal Strength Meter. Price: less than \$200.

For further information on the AIM-718, write: Jerrold Electronics Corporation, Distributor Sales Division, P.O. Box A, Philadelphia, Pa. 19105.



Focusing on one thing...  
better reception

GENERAL INSTRUMENT COMPANY

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ELECTRONIC TECHNICIAN/DEALER



# Know why RCA's color chassis are so easy to service?



## Because service men like you helped us design them.

First we got their advice, then we designed the whole assembly for easy servicing. For example, the chassis give you easy access. You don't have to pull out the chassis to get at the high-line voltage connection. Circuits and components on the circuit board are clearly marked so you can easily service them. The tuner assemblies are simplified for your convenience. And, we set up more test points. They're the kind of chassis we think you'd design yourself. Fact is, all our chassis designs are reviewed by a representative group of servicemen. And we appreciate their advice. We think you will, too—every time you service sets by RCA.

# **RCA**

# new miniature electronic pliers

HOLD, BEND, CUT  
ALL FINE WIRES  
WITH EASE



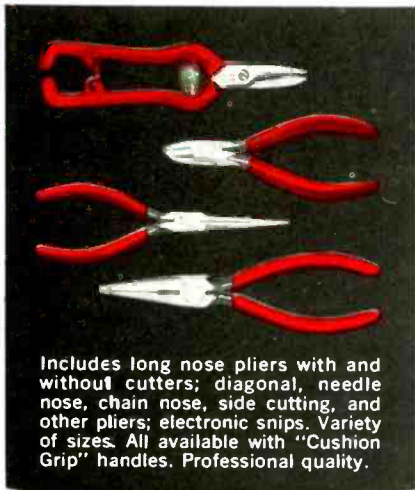
CHAIN NOSE AND  
DIAGONAL CLOSE  
CUTTING PLIERS

SPECIAL TIP  
CUTTING PLIERS

RADIO AND TV PLIERS

Idea for electronic, radio/TV, electrical service and assembly. Forged alloy steel construction. Precision machined. All have polished heads and shoulders. Comfortable "Cushion Grip" handles and coil spring openers speed work, reduce hand fatigue. Miniature round and flat nose pliers also available.

## a complete line of regular pliers and snips, too



Includes long nose pliers with and without cutters; diagonal, needle nose, chain nose, side cutting, and other pliers; electronic snips. Variety of sizes. All available with "Cushion Grip" handles. Professional quality.

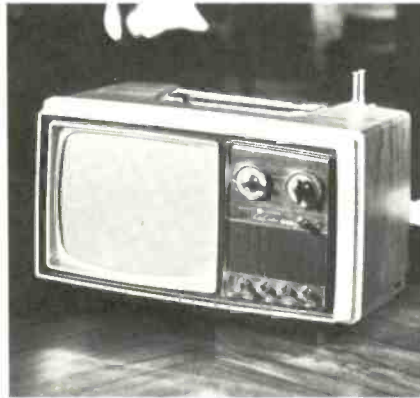
# XCELITE

XCELITE, INC., 14 Bank St., Orchard Park, N.Y. 14127  
In Canada contact Charles W. Pointon, Ltd.

... for more details circle 155 on postcard

## ET/D DEALER SHOWCASE

original 10in., in-line tube is said to produce crisper highlights in the TV picture, to improve the contrast and



to provide finer picture detail with a substantial increase in the number of color dots on the face of the picture tube. New rare earth phosphors also add to the vividness of color produced. This new chassis will employ the 11-WP22 CRT with in-line gun features. In the 10in. (viewable diagonal) category are three new models that weigh only 24 lb. General Electric.

### RF Coil Rack 709

A distributor rack promotion for RF coils is introduced. Coils can be displayed out front in an easy-to-select, easy-to-buy manner designed to minimize demands on the counterman's



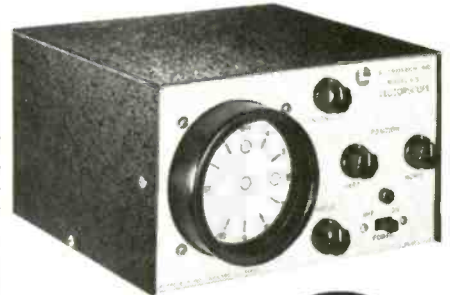
time. The rack presents 80 types of coils packaged individually in clear vinyl envelopes. Two or three of each coil are suspended from pegboard hooks. Abbreviated specifications, part number and price on each envelope permit easy selection by experimenters and technicians. Complete specifications are contained in each packet. Miller.

## take any standard color bar generator



... such as Lectrotech V6-B, RCA-WR-64, etc.

## add the Lectrotech V-5 vectorscope indicator



## and you get visual display



for the only way to accurately service color TV! Only a Vectorscope:

- Checks and aligns bandpass-amplified circuits. Eliminate weak and smeared color with proper alignment.
- Checks and aligns demodulators to any angle ... 90°, 105°, 115° ... accurately and quickly. No guesswork. Only with a Vectorscope can these odd angles be determined for those hard-to-get skin tones.
- Pinpoints troubles to a specific color circuit. Each stage in a TV set contributes a definite characteristic to the vector pattern. An improper vector pattern localizes the trouble to the particular circuit affecting either vector amplitude, angle or shape.

Color Vectorscope/Indicator ... A keyed rainbow color signal produces 10 color bars with each bar spaced 30 electrical degrees apart. If the bars are not properly spaced, the reproduced colors are not true and the fault is in the color receiver circuits. The V5 ... accurately measures color demodulation to check R-Y, B-Y and all 10 color bars for color phase angles and amplitude ... checks color amplifier gain ... adjusts color sync circuits ... properly centers range of hue control. Size 7 3/8" W. x 4 1/4" H. x 7 5/8" D. Weight 5 lbs. With leads and copy of Wayne Lemon's Book "Color TV Servicing with a Vectorscope."

Net Price 79.50

For full details, see your distributor or write ...



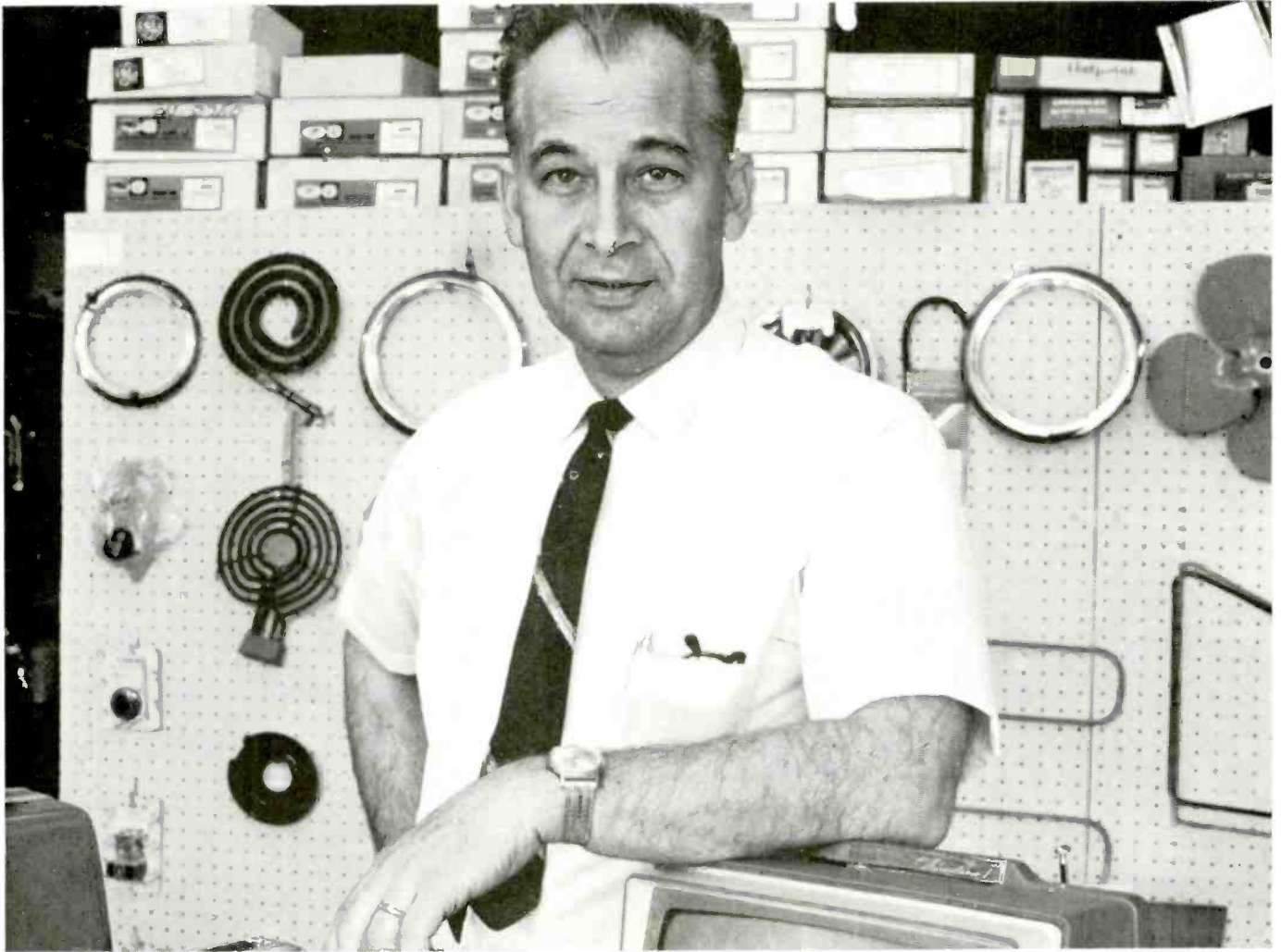
## LECTROTECH, INC.

Dept. ET-10, 1221 West Devon Ave.  
Chicago, Illinois 60626

... for more details circle 131 on postcard

ELECTRONIC TECHNICIAN/DEALER

# Customers wear out the Yellow Pages getting to New Haven Appliance



"We average ten to fifteen calls a day and the majority are from Yellow Pages," says Edward P. Jesanis, president, New Haven Appliance Servicenter, Hamden, Connecticut. "We get an awful lot of college people that move into town, and Yellow Pages is about the only place they could find us. On the other hand, if old customers have lost that slip with our name on it, then Yellow Pages is the next best place to look. We also get calls from manufacturers in the area—their purchasing agents find us in the Yellow Pages. It's also a good back-up to other advertising we might run. People who see the newspaper ad still can go to Yellow Pages for our number when something breaks down. We've come to the conclusion that Yellow Pages is our best bet to reach the greatest number of people, and to keep our name in front of them at all times."



Advertise for action...

**NEW HAVEN APPLIANCE**  
*Servicenter*

**FACTORY AUTHORIZED SERVICE ON MOST BRANDS**  
38 CONNOLLY PKWY., HAMDEN . . . . . 288-6229  
(Across from Hamden High School - Next to A & P)  
240 GEORGE ST., NEW HAVEN . . . . . 865-4116

HYVON	GENERAL ELECTRIC	REGENT
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B.V.C.	JOHNSON	SHUTTLE
EASCO	KNAPP MONARCH	SUN
CORP WELD	LEWIS	SUN LAMPS
GOPY	MANNING-HUNMAN	SUNBAM
DALEX	MCGRAW EDISON	TENSOR
DOHLESON	MILKOMATIC	TYSON
DOHMEYER	MOTOROLA	TOASTMASTER
ELECTROLUX	MORLECO	TRICLONATOR
FLORKA	OSTER	LECHS
FAMBER	P.E.T.	UNIVERSAL
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FRESH-O-MATIC	PHOCTOR	WEST BEAD
GENERAL FLOORCRAFT	RAM	
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**REPAIRING**

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CLOCK REPAIRS	HEATERS	POLISHERS
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DEEP FRYERS	IRONS (Steam Spray Dry)	RECORDERS
TOASTERS	VACUUM CLEANERS Etc.	

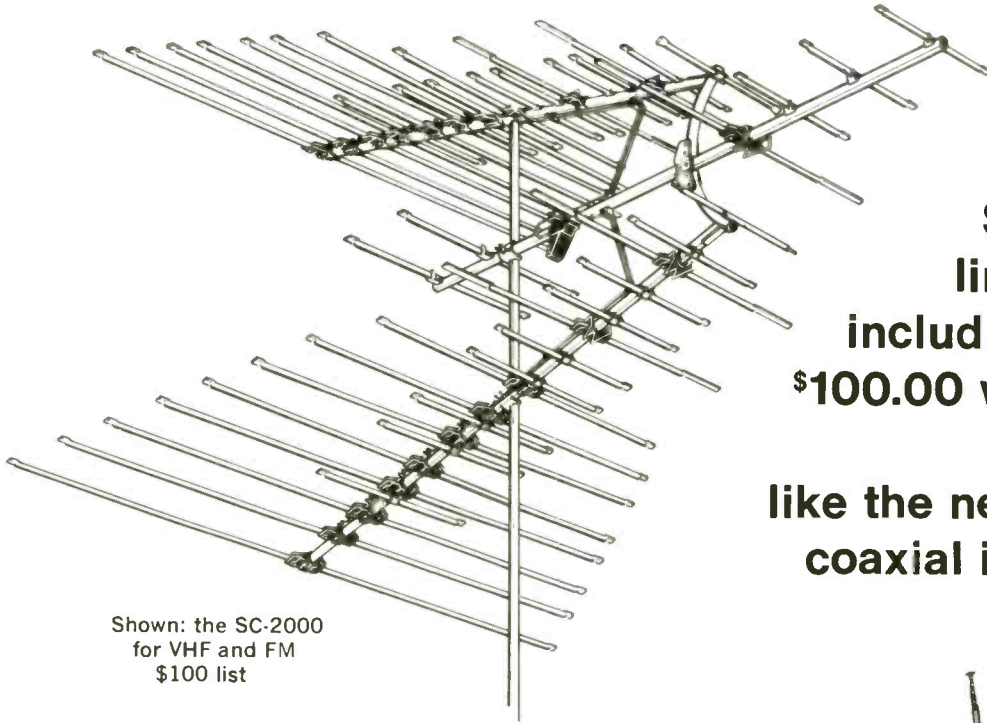
**TOASTMASTER**

MON. to FRI. 8:30 A.M. 5:30 P.M. • SAT. 9 A.M. to 1:30 P.M.

Today's customers wear out the Yellow Pages instead of themselves. This ad\*, under ELECTRIC APPLIANCES—SMALL—REPAIRING, leads them to New Haven Appliance. Call your Yellow Pages man to plan your program. Find him in the Yellow Pages under ADVERTISING—DIRECTORY & GUIDE. \*shown reduced

# WINEGARD DEAL

## Because Winegard delivers better



Shown: the SC-2000  
for VHF and FM  
\$100 list

like the great  
Super Colortron  
line of 16 models  
including the two new  
\$100.00 wedge antennas

like the new Color-Ceptor  
coaxial indoor antennas  
for super color

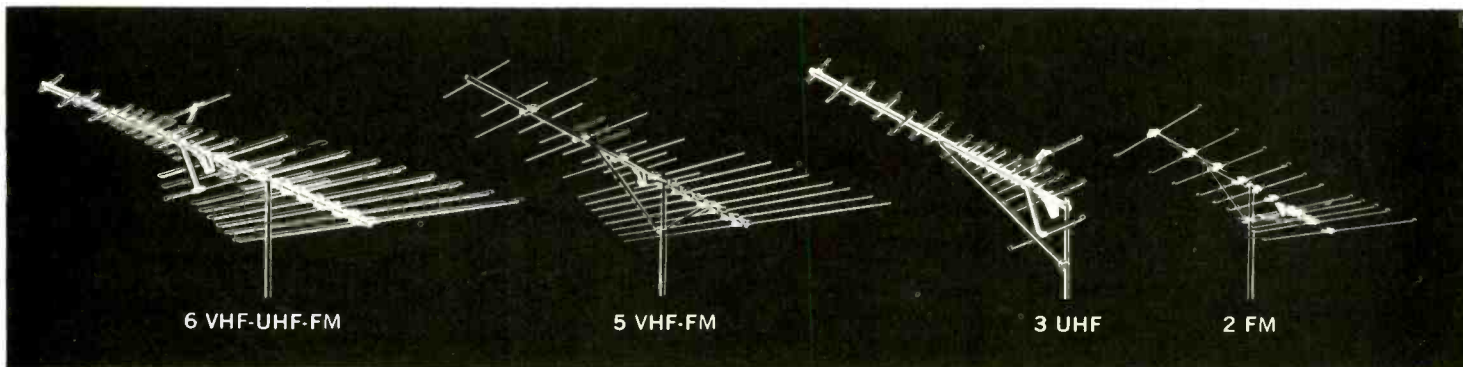
### Just a few Super Colortron features:

- Written guarantee of satisfaction
- 7 patents and patents pending
- Exclusive built-in cartridge housing
- Exclusive impedance correlators
- Super compact, easy to install
- Genuine Winegard gold anodized
- Exclusive ellipsoidal boom
- Hi-impact wrap-around insulators
- Exclusive FM control elements
- And much, much more



The  
CR-200

WINEGARD COMPANY • 3000 KIRKWOOD ST. • BURLINGTON, IOWA 52601



6 VHF-UHF-FM

5 VHF-FM

3 UHF

2 FM

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products and better sales help!

like 8 ads in  
Life and Look during  
a 3 month period...  
with a total of  
123,000,000 readers



like a steady  
stream of new  
merchandising aids



AD MATS

BANNERS, BROCHURES



LIGHTED SIGNS

INDOOR ANTENNA DISPLAYS



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# COLORFAX

## ADMIRAL

### Color TV Chassis G11/G13/H12/K15 —Loss of Blue or Red

For correction of this problem, check for failure of phase coils L506 and L507, 73B55-26 (replacement for 73B55-12). Failure of spark gaps in the CRT leads is a possible cause for failure of these coils.

Two types of spark gaps have been used. Late production uses a "Gap Cap"; early production uses a twin-lead gap. Some of these early spark gaps have been found with the insulation protruding past the ends of the wires. The ends of the wires must be exposed in order for the gap to operate. Trim the twin-lead insulation until the ends of the wires extend very slightly beyond the insulation. The exposed ends must not be moved from their original spacing.

Replacement of either L506 or L507 without checking the spark gaps may result in repeat failures.

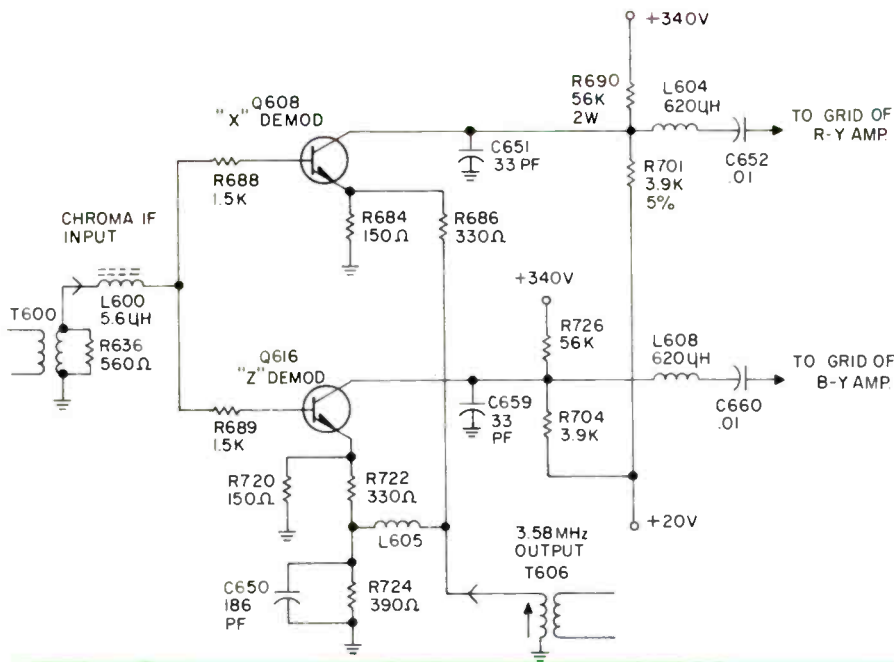
## SYLVANIA

### Color TV Chassis D12/D13 — "X" and "Z" Demodulators Circuit Description

To demodulate the chroma sidebands of the Sylvania D12 and D13 chassis, transistorized "X" and "Z" demodulators provide synchronous detection of these signals. The 3.58-MHz reference oscillator injection

voltage is applied to the emitter of these stages. This voltage is several times the chroma input amplitude of the 3.58MHz pulses in the collector circuits of the demodulators. The phase of the 3.58MHz applied to the "Z" demodulator is shifted approximately 90deg by coil L605 and capacitor C650. The actual shift is selected for best color presentation.

When chroma signals are applied to the base of the demodulators, the phase and amplitude of the chroma will influence the average amplitude of collector pulses in each demodulator. These pulses go in a less positive direction, nominally to about one-half the B+ voltage (40v). If the incoming chroma is in-phase with reference pulses, the collector will drop to less than 1/2 B+ value. If they are out of phase, collector pulses will not be able to fall as low as 1/2 B+ value. If chroma signals are 90deg out-of-phase, part of the collector pulse will be below 1/2 B+ value and part will be above 1/2 B+ value. The result is an average of zero change in collector pulses. The collector pulses are averaged by a low pass filter before application to the R-Y and B-Y amplifiers. These networks are C651 and L604 in the "X" demodulator, and C659 and L608 of the "Y" demodulator. After the collector pulse smoothing is complete, only color video remains and it is applied to the difference amplifiers through C652 and C660.

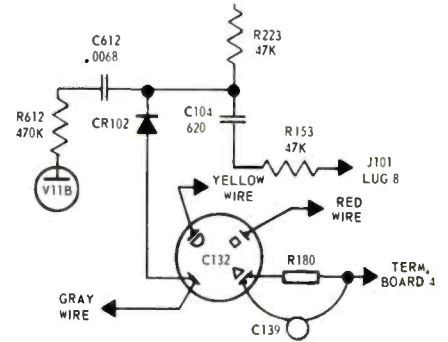


## GENERAL ELECTRIC

### Color TV Chassis KC/KD — Service Hints

You may have a few complaints of raster shading in the KC or KD chassis. This shading usually appears during periods of no video modulation (camera changes, etc). The right half of the raster appears substantially darker than the left half, with a gradual shading from the center toward the right hand side.

This raster shading may or may not be accompanied by retrace "snake." In



either case the following cure will be found very effective. (Refer to the schematic illustration.)

1. Change diode CR102 to an ET57X40 type. Move anode (ground) end of diode to + side (no code lug) of C132 electrolytic capacitor.
2. Disconnect end of R153 (47K) going to junction of C136 and C138. Now connect the open end of R153 to lug 8 of J101.

To correct complaints of vertical retrace lines, install the following changes:

1. Change R612 from 47K to 470K (1/2w). Disconnect wire going from circuit board terminal VB (or C612) to R154 at R154 end.
2. Reconnect wire to cathode side of CR102.

R154 is now excess and may be removed.

Care should be taken to insulate splices and prevent any lead dress shorts.

## MOTOROLA

### Color Chassis TS921 — Color Killer Adjustment on Chassis Coded 'B-00 and Later'

The color demodulator and color killer circuits in the TS921B-00 chassis have been redesigned to provide a more positive color killer action and increase dc coupling of the video.

The color killer adjustment procedure remains the same with one exception; if the color killer control must be adjusted, take note of the B/W background setting. Large excursions of the color killer control can affect



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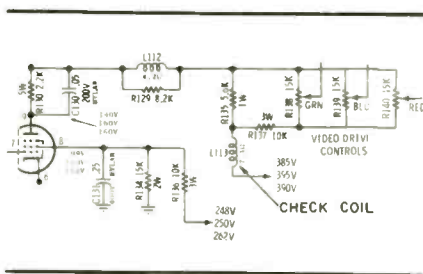
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B/W tracking. If the background setting must be readjusted, make the color killer adjustment first, then proceed with the tracking adjustment.

**Color TV Chassis TS918 — Service Tips**

**Symptom:** No video. Brightness remains on for 10 to 15 minutes, then fades out. Horizontal output tube (6JS6) runs red hot when brightness is

lost. **Cause:** Check voltage on cathodes of CRT. If low (approximately 230v is normal) or no voltage, resistance of L113 is either high or coil is open. Short across L113. See if brightness returns. **Solution:** Replace L113



and check receiver for normal operation. If set runs too long with L113 open, it may be necessary to replace the horizontal output tube (6JS6) also. If the chassis is coded TS918 "A08" or earlier, we suggest that you add a diode in the plate circuit of the horizontal oscillator to aid in starting the horizontal oscillator. Kit 1P65147A41 is available from your Motorola distributor. It contains complete instructions and necessary parts.

**Color TV Chassis TS915/TS919 — Service Tips**

**Symptom:** Circuit breaker pops when set is turned on. **Cause:** E4J diode in (255v source) power supply shorted. **Solution:** Replace E4J and check other diodes in power supply; replace if required.

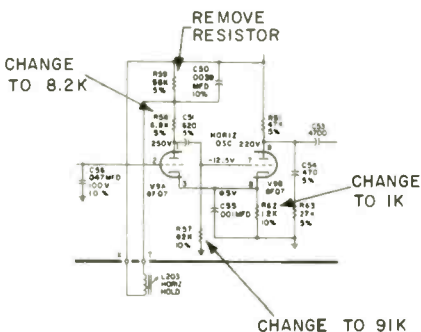
**Symptom:** Circuit breaker pops in seven to ten seconds after turned on. **Cause:** Defective Q6F or Q7F on horizontal panel. To check, remove F panel. Set should remain on. **Solution:** If after removing F panel set remains on, replace F panel.

**Symptom:** Circuit breaker pops when F panel removed. **Cause:** Q1R horizontal regulator defective. Remove Q1R, reset circuit breaker; if set remains on, Q1R is shorted. **Solution:** When set remains on after removal of Q1R, replace Q1R (horizontal regulator). If Q1R is open, little or no high voltage will be developed.

**MAGNAVOX**

**TV Chassis T927 — Christmas Tree Effect**

There have been reports of horizontal oscillator instability resulting in a symptom sometimes called



"Christmas tree effect." A production change has been made in the T927 chassis to eliminate this tendency. In this change R59 is deleted, R58 is changed from 6.8K to 8.2K, R57 from 82K to 91K and R62 from 1.2K to 1K.

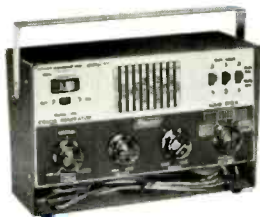
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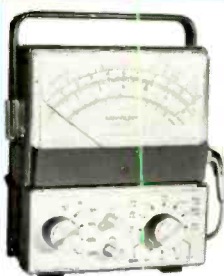
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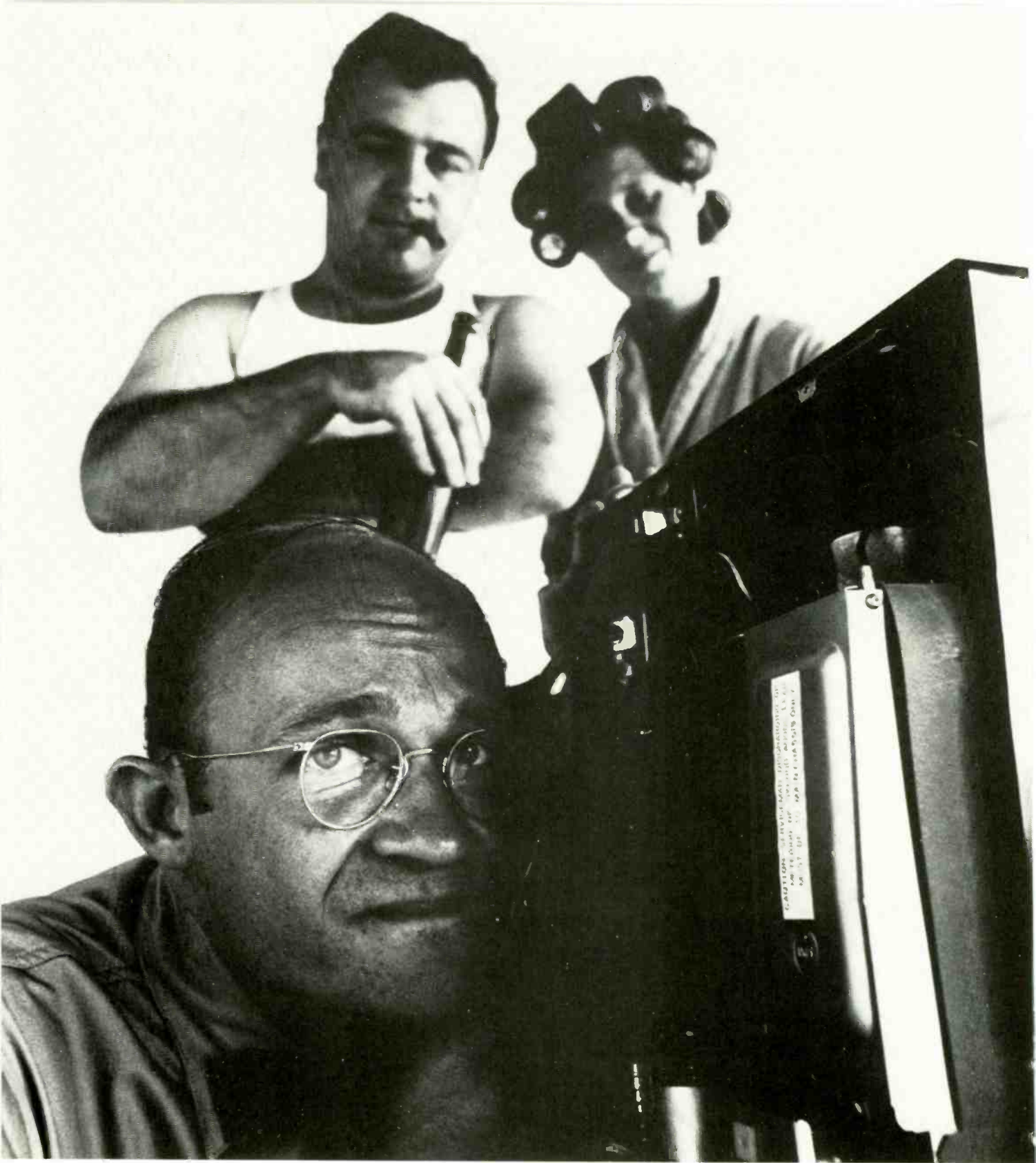
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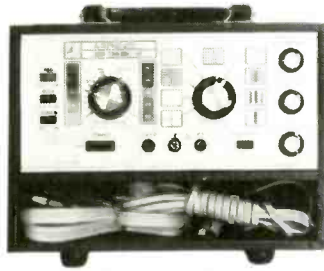
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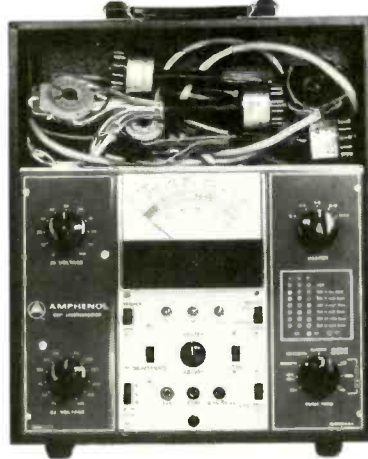
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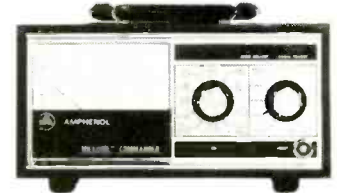
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**Color Commander, Model 860**—All solid state color bar generator, designed to cut TV receiver alignment time by as much as 40%. Nine test patterns, including three not normally found in low-price generators. \$139.95

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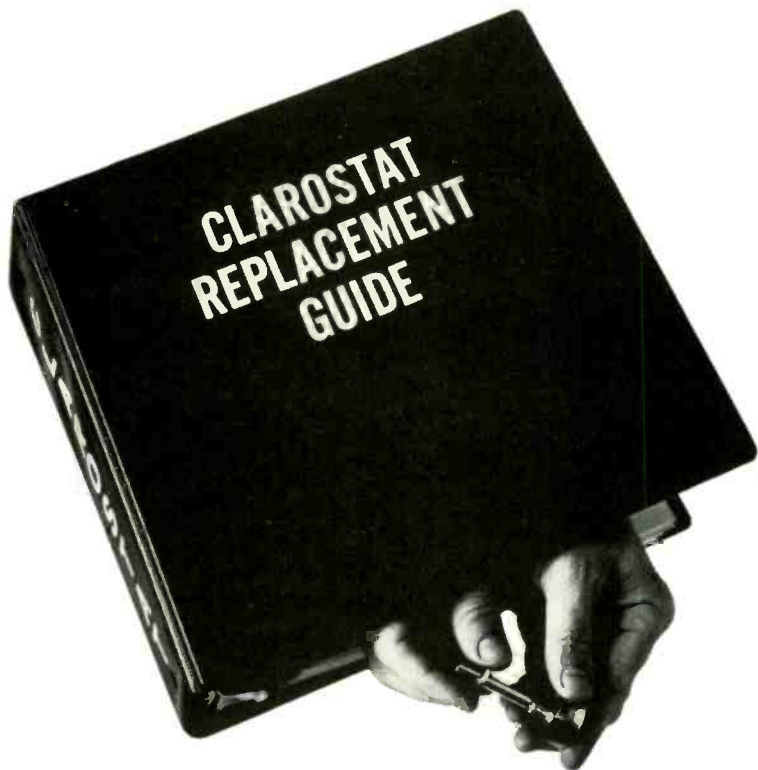
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**ET/D COLORFAX**

### OLYMPIC

**Color TV Chassis CT910 —  
Lack of Video Gain**

Video gain can be improved, if desired, by substitution of a 10KR8 tube for V9, the 10JY8 video amplifier tube. It may then be necessary to readjust the red, blue and green screen controls to a higher level in order to achieve a better brightness and contrast ratio. The 10JY8 tubes removed are not subject to warranty replacement or credit. 10KR8 tubes are available from Olympic.

**Color TV Chassis CT911 — No Sound**

Check speaker wires. The end connector of the wire may not make proper contact with the speaker's lug; when reconnecting the wire, make sure the wire connector meets the speaker's lug.

On this model, in order to disable the horizontal sweep, lift the anode connector from the 31JS6A horizontal output tube. Do not lift the ground connection from pin 2 of the 31JS6A horizontal output tube to disable the oscillator, or to measure cathode current. This is a lead with a ground lug tied to the mounting screw of the focus control located on top of the high voltage cage; do not turn the set on with this lead removed as this would result in damage to the tube and convergence board.

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One of the hottest selling transceivers to ever hit the CB market, the new Johnson Messenger 223 was designed by the same engineering team that developed the famous Messengers "I" and "Two". With the same rugged circuitry and even greater "talk power" capability, the tube-type, 23 channel "223" has at least 15 dB more audio gain than the "I" and "Two".

Ten tubes, eight diodes and six transistors form a rugged base station transceiver that can't be beat for reliable day-in, day-out performance. FCC Type Accepted and DOT Approved, the "223" has a built-in "S" meter/power meter and is ready to go on all 23 channels.

If you remember how much life the "I" and "Two" added to your CB sales, check out the "223" ... it looks even better!

In fact, with demand running far ahead of forecasts, it would be a good idea to order *TODAY* to keep your customers happy!

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

### Two-Way Radio 710

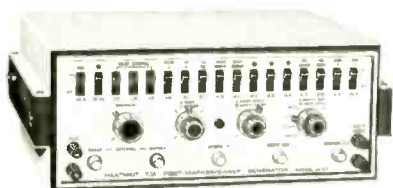
Announced is a low cost two-way mobile radio for business, industrial, public safety and governmental systems. Featuring a fully solid-state receiver and power supply, the Model



592 Trans-Fleetcom draws less than 1/10a on standby. Designed for use in areas of high density frequency usage and congestion, the guaranteed receiver performance for spurious and image rejection is said to be  $-85\text{db}$ ; and inter-modulation is  $-65\text{db}$  by E.I.A. SINAD. Audio output is 5w, which overrides background noise. Transmitter power is 25w minimum. Optional tone-call squelch keeps the speaker muted until called by a radio in the user's own system. Other optional items include front or trunk mount, and dual frequency operation. Comco.

### Marker/Sweep Generator 711

A new generator will display as many as six markers at a time, claiming to make the old, time-consuming variable marker system obsolete. Markers are provided for color band-pass alignment; picture and sound carrier frequencies for channels 4 and 10; FM tuner, FM IF and discriminator alignment; and TV sound IF adjustments. It also features built-in modulation for trap adjustment and checking and adjusting FM tuners. A variable voltage supply is also

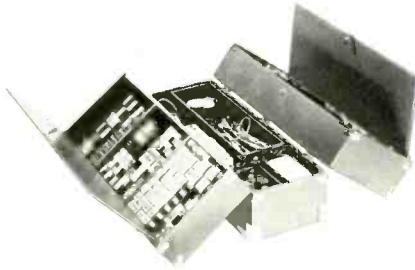


provided for use as a source of positive or negative bias.

The sweep generator portion has 5 linear sweep ranges covering the sweep necessary for TV tuned circuits in sound IF, color bandpass, video IF circuits and for proper over-all RF/IF response. Other features reportedly include a trace reversing switch, a blanking switch and a phase control so the markers will appear as in the set manufacturer's alignment instructions regardless of the scope used. Price \$135. Heath.

### Tube Caddy 712

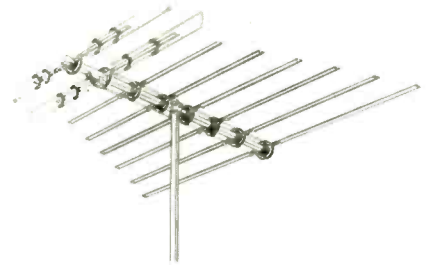
Announced is a Super 600 tube caddy with heavy 16 gauge steel runners to protect the bottom, bottom edges and bottom corners of the caddy from damage. This not only protects the most vulnerable part of the caddy, but also makes it easy to slide around without fear of damaging floors or



carpeting, the firm claims. Special construction allows the upper foldout sections and covers to rest on the floor when open giving instant access to all compartments. The case, finished in a grey vinyl, has over 3300 cu in. in volume to hold countless tubes, tools, soldering guns, meters and accessories. Argos.

### TV Antenna 713

A series of 300  $\Omega$  rooftop TV antennas that can be readily converted for use with 75  $\Omega$  Coloraxial down-leads is introduced. The antennas in the new VIP series can be converted by a snap-on transformer that is available separately. Employing the features of the Paralag Plus Series, from which the series was developed, the VHF-FM antennas are said to feature higher front-to-back ratios and sharper directivity to suppress ghosts and produce clearer pictures. Flat response of



$\pm 1\text{db}$  per channel results in optimum color fidelity. A bi-modal director system produces extra gain. Mechanical features of the antenna series include a twist-resistant square boom, high-strength insulators, vibration-proof point-contact element locks and coating for superior resistance to corrosion. The impedance-matching transformer, designed for use with the Paralag 300 Plus can be snapped over the boom of the antenna where it can be pushed into contact with two 300 $\Omega$  terminals. The antenna series comes in seven models (VIP-301 through 307), for metropolitan to deep fringe areas, with list prices ranging from \$16.95 to \$79.95. Jerrold.

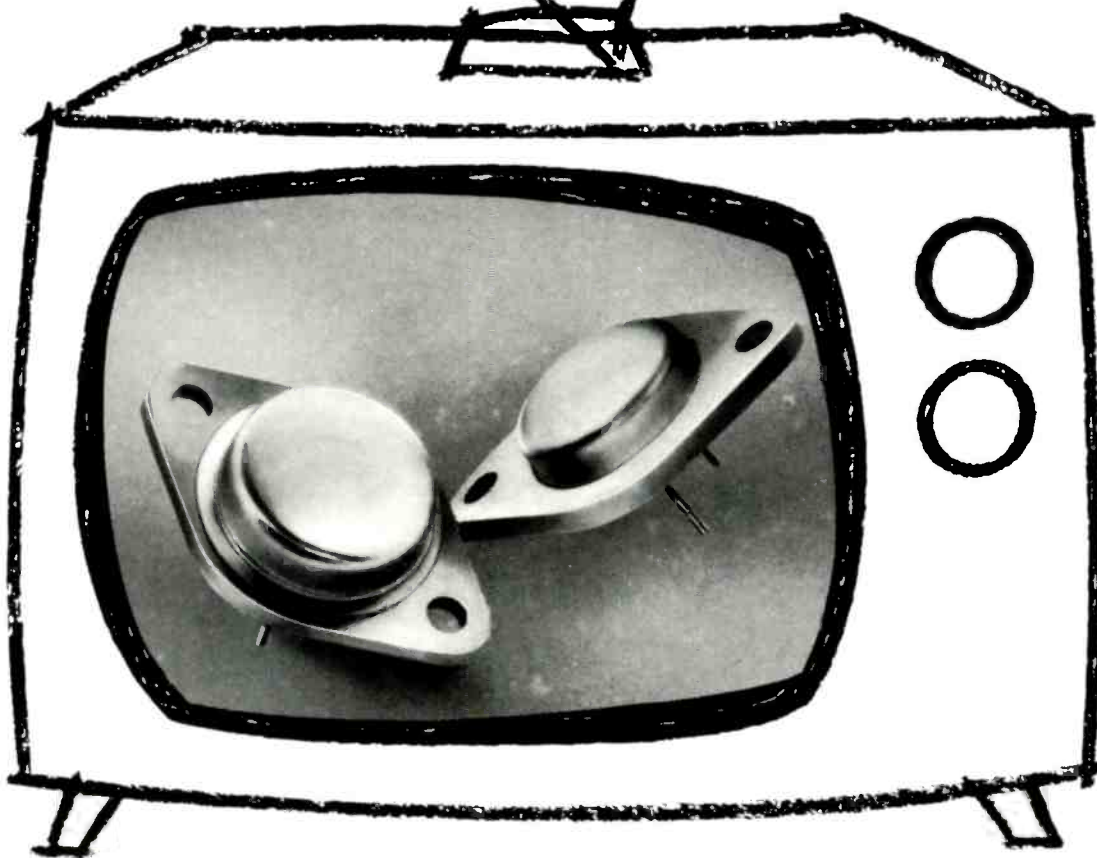
### AM/FM/FM/MPX Receiver 714

Introduced is a solid-state 150w AM-FM-FM MPX receiver, model RA999. The receiver includes a walnut finish wood cabinet (2 IC's plus FET), front panel tape recorder jacks, dual tuning meters for "center of channel" tuning, FM stereo indicator light, front panel headphone jack, flip-tab switches with illuminated slide rule dial, main and remote speaker terminals and inputs for tape recorder heads.

It also has a tuning range of 88-108-MHz FM/535-1605kHz AM. Sensitivity:  $1.5\mu\text{v}$  for 30db quieting. Stereo separation: more than 30db. Power output: 150w IHF, (75w per channel). Frequency response: 30-20,000Hz  $\pm 3\text{db}$ . Tone compensation: Bass, 50Hz  $\pm 12\text{db}$ ; treble, 10kHz  $\pm 10\text{db}$ . Loudness compensation: +13db



# Two New SK Devices Simplify Servicing of TV Deflection Circuits



More than a dozen solid-state TV sets—RCA and others—can use these two new RCA SK-Series transistors—specifically designed for replacement use in deflection circuits.

The RCA SK3034 is for replacement use in horizontal driver and in vertical-deflection-output circuits; the SK3035 is for replacement use in horizontal-deflection-output circuits.

Both units are germanium p-n-p devices in hermetically-sealed TO-3 packages, and are for use in domestic and imported TV sets with anode voltages to 18 KV and with picture tubes having deflection angles up to 114°.

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Now available . . . a comprehensive and accurate source of solid-state replacement information! It's RCA's Solid-State "Top-of-the-Line" Replacement Guide, SPG-202F. Cross-referencing RCA SK-Series Transistors, Silicon Rectifiers, and Integrated Circuits, the Guide provides replacements for nearly 12,000 solid-state devices—including U.S. industry standard EIA types, foreign types, and types identified only by device-manufacturers' or equipment manufacturers' parts numbers. SPG-202F is available through your RCA Distributor. Ask him about it. Today.

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@ 50Hz, +4db @ 10kHz. Hum and noise: -55db (mag. phono). Output impedance: 4, 8 and 16  $\Omega$ . Transistors: 25 plus 14 diodes, 1 FET and 2 IC's. Size: 18 7/16in. w x 14 1/4 in. d x 5 3/4 in. h 110-120vac. 50/60Hz. Price \$250. Olson.

## Telephone Amplifier 715

A transistorized amplifying device that attaches to any ordinary telephone piece with a snug-fitting band and is small enough to be carried in



pocket or purse is introduced. The "Astro-Com" telephone amplifier No. A1003 features an adjustable volume control and is said to be capable of amplifying any normal speaking voice up to five times. It is especially suited to overcome high noise areas in home, office and factory and is also considered a practical answer to public phone booth distractions. The amplifier is complete with 4 transistors and is battery powered. Saxton.

## Monitor Receivers 716

A line of low cost table model monitor receivers has been introduced. Designed to keep people informed no matter where they are, the CRX-103, 104 and 105 monitors are ideal for the fireman on call, policeman, the private pilot who wants to check flight conditions, emergency civil defense worker, businessman or radio enthusiast. Model CRX-103 tunes the entire low-band range from 27 to 50MHz, while model CRX-104 is a portable aviation communications center covering 108 to 135MHz.

The CRX-105 tunes from 144-174MHz, which is commonly referred to as the high band. The new table models are all solid state with features





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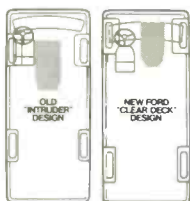


Only Ford gives you Twin-I-Beam riding smoothness. The unique front suspension made famous in Ford pickups. Two solid I-Beam axles for strength and coil springs for easy ride—the most rugged independent suspension yet!



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raised edges for use as package tray. Only Ford gives you payloads as big as 3540 pounds. Higher capacity axles and heavier construction in three new series let you carry more weight—600 lb. more payload than any other van. And still more better ideas! Long wheelbases and wide track (over 5½ feet) result in turn-pike stability even on windy days... power goes up to a 302-cu. in. V-8... self-latching doors! Get the full story at your Ford Dealer's!



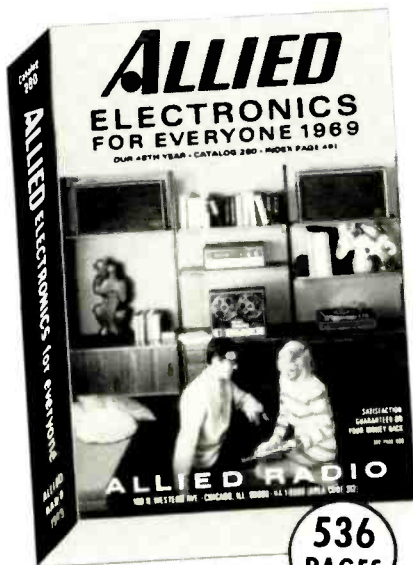
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**ET/D NEW PRODUCTS**

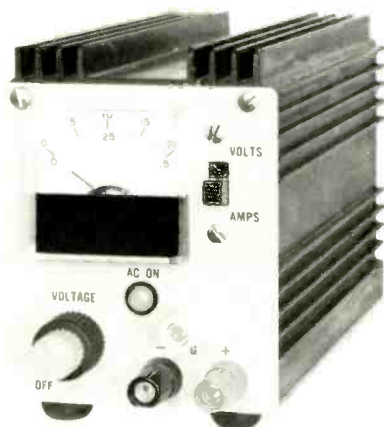
found on amateur, citizens' two-way, military and industrial communications equipment and are said to have



cool, stable operation, noise-eliminating squelch control, class "B" push-pull amplifiers, etc. Their tunable superheterodyne circuits receive both AM and FM with high sensitivity and extended range. Hallierafter.

**Power Supply 717**

Introduced is a wide range, low current, compact bench-type power supply for laboratory experimental work. The EAL series power supply is available in four ratings from 0 to 50vdc with currents from 250ma to 1a. It is said this series features .01%



regulation, .05% stability, less than .5mv RMS ripple and current limiting short circuit protection. The power supply is compact, 3 1/4 in. wide x 4 1/8 in. high x 6 1/2 in. deep, with a switchable volt/ammeter, concentric voltage adjust controls, ac power switch, and pilot light on the front panel. Price \$99. Trygon.

**Solid-State VOM 718**

A portable instrument with the input impedance of VTVM and the conveniences of a battery-powered VOM is introduced. A field effect transistor is said to handle large overloads without damage. The taut band meter movement is said to be varistor protected from even 200,000% overloads. One transistor radio type 9v battery provides over 300 hours of

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Solid State Units  
82-channel solid state — 25 dB Dist. Amplifier Separate UHF and VHF 75 ohm inputs.



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Solid State Units  
All Silicon Transistor VHF-UHF Home Amplifier — Four 75 ohm Outputs



**M-108**  
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Solid State Units  
82-Channel Mast Mounted Preamplifier 15 dB



**M-261**  
Four-Way Back Match 82-Channel Splitter/indoor



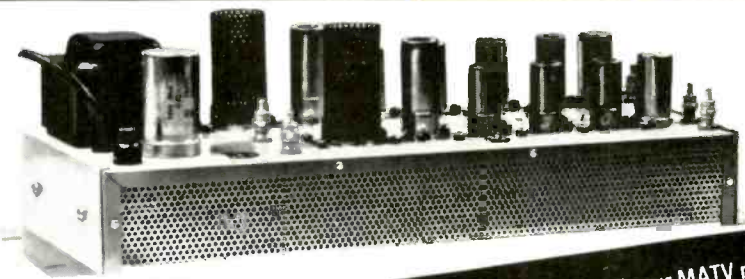
**M-206**  
Four-Way Back Match Splitter/indoor



**M-210**  
Eight-Way Back Match Splitter



from the largest  
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Dual Output Plate  
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## ET/D NEW PRODUCTS

operation. A built-in battery check and "power on" indicator are also provided.

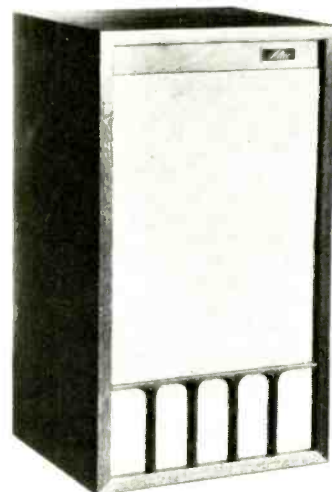
The instrument measures voltage in eight ranges from 0-0.3v up to 0-1,000v for both dc and ac inputs. In-



put impedance is 11M on dc and ac input impedance is 10M. Accuracy for both ac and dc measurements is said to be  $\pm 3\%$  of full scale with dc current ranges of 0-0.1, 1, 10, 100 and 1,000Ma. Resistance is measured in seven ranges from RX1 up to RX1M. Accuracy of resistance measurements is rated at  $\pm 3^\circ$  of arc. The 7in scale is designed for fast accurate readouts. The price complete with test leads, isolating probe and operator's manual is \$100. Simpson.

## Speaker System 719

A baffle bookshelf speaker system in hand-rubbed walnut is announced. Featuring a low frequency speaker and a high frequency die-cast aluminum compression driven exponential horn, the 892A Madera is said to



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AVAILABLE IN:  
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have a frequency range of 45Hz to 18kHz, an impedance of 8Ω and a crossover frequency of 2.5kHz. The system includes high frequency shelving in three steps of 3db attenuation above 2kHz and is designed to work with amplifiers rated up to 50w continuous power, according to the manufacturer. The unit measures 13in. high x 11 3/4in. deep x 23 3/4in. wide. Altec Lansing.

### Transistor Analyzer 720

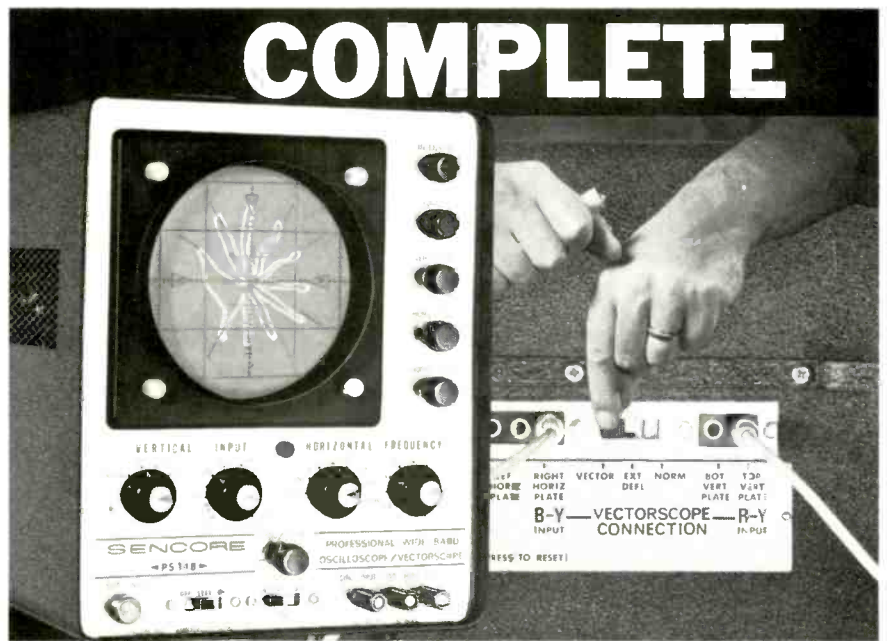
Introduced is a solid-state transistor analyzer providing a true, small-signal ac Beta test and continuous instrument monitoring. The instrument has three independent power supplies, a large 4 1/2 in. meter and makes H parameter, high current, high voltage,



ac and dc Beta measurements, reads leakage current in the na region, tests both small-signal and power transistors, diodes, rectifiers, zener diodes, SCR's and the latest FET's in the collector current range of 100μa to 30a. The model 3490-A, Type 2 provides for plotting complete transistor characteristic curves, taking single readings, plus setting up any type of transistor test. Continuous current and voltage controls are a built-in feature of the analyzer.

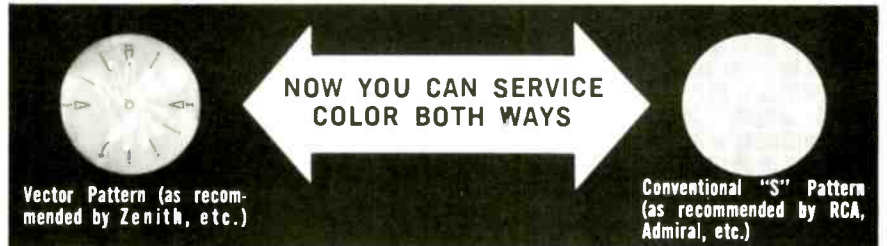
Three separate 4 1/2 in. meters are used to read static and dynamic values: emitter or base current, input volts, collector volts, reach-through voltage and collector current. The unit reportedly also tests dc Beta, ac Beta at 1kHz, leakages, Alpha, saturation voltage, floating potential, input currents to 3a and variable tetrode voltages. A small signal of 5μa is applied to the base of the semiconductor under test on the 150 Beta range. On the 600 scale the operator can go down to 1.25μa using the analyzer. The analyzer's multi-range ammeter continuously reads the collector current on any one of 11 overlapping ranges.

The instrument is designed to handle over 100dc volt-amperes of collector power with collector voltage ranges from 0 to 120v. The collector control is a variable transformer controlling primary energy to the collector supply. The input control is a vit-



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With just the flip of a switch



Vector Pattern (as recommended by Zenith, etc.)

Conventional "S" Pattern (as recommended by RCA, Admiral, etc.)

A truly remarkable service scope; complete for every servicing test recommended by any and all TV manufacturers. For the very first time, here is a scope sensitive enough to view the IF tuner output but with adequate high voltage protection to view the plate of the horizontal output tube directly. Leave the rear view switches in their normal position and you can use the PS 148 to service color TV from chroma take off to the tri-color tube following the standard RCA "S" pattern approach. Flip the VECTOR switch on the rear and you have converted to a standard vectroscope . . . and for only \$20.00 more than the Sencore scope without vectors. Compare these specifications and you will be convinced that the PS 148 is the most complete, versatile, scope on the market today.

- **Direct Peak to Peak Voltage Measurements.** Read the peak to peak waveform voltage directly from the vertical input controls. Faster and easier than a VTVM and extremely accurate.
- **Wide Band.** Vertical amplifier frequency response is flat from 10HZ to 5.2MHZ ± 1DB.
- **High Sensitivity.** Vertical amplifier sensitivity of .017 volts RMS per one inch deflection. Ultra sensitive for transistor servicing and for viewing signals directly off a TV tuner.
- **Direct and Lo-Cap Probe** on one cable for maximum versatility. The Lo-Cap probe can handle high voltage signals up to 6000 volts peak to peak.
- **Extended Horizontal Sweep Frequencies.** Horizontal sweep ranges from 5HZ all the way to 500 KHZ in five overlapping steps; allows you to look at higher frequency waveforms. Sync is so positive you would think it has triggered sweep.
- **Exclusive Vectorscope Features.** Flick one switch at the rear of the PS 148 and you have an easy to use vectorscope. This new vector pattern greatly simplifies chroma trouble shooting and bandpass alignment.
- **Minimum Circuit Loading on Vectors.** Prevents distorted vector patterns due to lead capacity loading by having vectorscope connections on rear of PS 148.
- **Special Vectorgraph Screen.** Shows exact degree of chroma demodulation.
- **Provisions for intensity modulation and direct connections to CRT deflection plates on rear for forming lissajous patterns, etc.** Just a flick of two switches; no need to disconnect leads or make special connections.

PS 148  
**\$219<sup>50</sup>**



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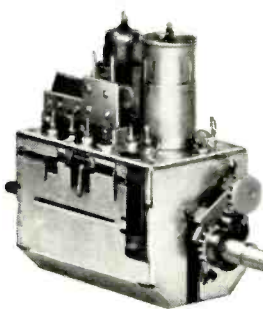
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# It costs you less to repair a tuner than to buy a new one. Right?

## Wrong!

Figure it out. Repairing costs about \$9.75. New tubes cost around \$3.00. Now add your time and cost for packing and shipping to say nothing of the money you're out while waiting for it to be returned. (And who pays for your call back if another part of the tuner fails.) A brand new SC Super Arbor Preset Tuner with mounting brackets and tubes costs \$12.95. And you can pick it up in whatever time it takes you to get to the distributor—5, 10, 15 minutes. You get a new tuner warranty—1 year from date of purchase. The new tuner costs you less in time and money. Your customer gets a brand new tuner instead of a used one. Everybody's happy. Right? Right. Available at your parts distributors.



Factory aligned SC Super-Arbor Preset Tuners fit like O.E.M.'s because they are O.E.M.'s. (Preset Height 4.58" max. to top of tubes—Length 3.61" max.—Width 2.50" max.). Shafts have extended flats. Simply cut to proper length. There's a direct UHF plug-in for fast replacement on 82-Channel sets, a universal mounting, pre-set memory fine tuning, outstanding oscillator frequency stability and 3-position Detent Turret Switch for positive lock-in tuning. Customized replacements available for only \$5.00 additional.

	MODEL		
13 Position Switch	SBR-250	SBRs-252	SBR4S-251
Antenna Input	300 ohms balanced to ground.....		
Intermediate Frequency	41.25 mc sound 45.75 mc video		
RF Amplifier Tube	6HQ5	2HQ5	3HQ5
Oscillator-Mixer Tube	6GJ7	5HB7	5GJ7
Heater	6.3 volts	600 ma	450 ma
B Plus	125-145 volts dc.....		

**sk** *Standard Components*

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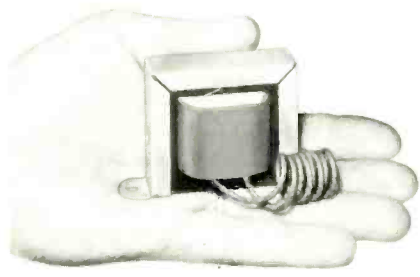
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reous power potentiometer used for adjusting the secondary ac voltage to the input supply. Each control is equipped with large knobs for convenience of adjustment and a tetrode control is provided for use with double base or tetrode transistors. In the top center section of the analyzer's panel are also mounted two transistor testing sockets. One is for the in-line types and the second for types where the leads are grouped in a circle or square on the bottom of the transistor.

A socket for one of the most commonly used types of power transistors, the JEDEC outline TO-3, is built into a solid copper bar heat sink. Binding posts are also available in the heat sink for other transistor types. Ranges of the analyzer are: Input current (emitter or base) 0-100-300 $\mu$ a, 0-1-3-10-30ma, 0-1-3-1-3a; collector current, 0-300 $\mu$ a, 0-1-3-10-30ma, 0-1-3-1-3-10-30a, Ico, Ico, Icho — 0-6-ma, 0-600 $\mu$ a, 0-60 $\mu$ a, 0-6 $\mu$ a; collector voltage 0-120v, 0-60v, 0-30v 0-12v, 0-6v, 0-3v, 0-1.2v; emitter or base voltage, 0-12v, 0-12v, tetrode — 0-10v with calibrated control. The analyzer, complete with a gray leatherette covered case, is 18 13/16in. by 15 7/16in by 8in. with removable cover and sloping etched aluminum panel. Weight 30 lb. Net price \$441. Triplett.

### Transformer 721

A standard isolation/power transformer, designed to minimize shock, is introduced. The P6411 transformer



reduces shock hazard by isolating equipment from the power line. It is rated 117v to 117v at 15va and its small size (2in. x 3 1/4in. x 1 7/8in.) makes it an excellent component for equipment manufacturers, experimenters and hobbyists. Price is less than \$6. Stancor.

### Two-way Radio 722

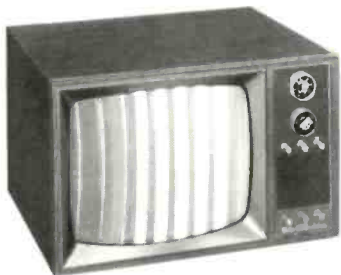
Built-in circuitry with a three-scale meter to give precise visual indications of the efficiency of operation and modern styling are key features of a Citizens Band two-way radio recently

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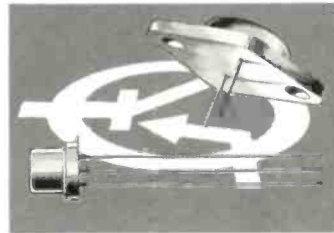
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You'll discover an easy way to an effective understanding of semiconductor technology, including characteristics of tunnel diodes, rectifiers and other solid state devices. Transistorized TV Receiver Kits also available.

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introduced. The SWR (standing wave ratio) bridge, a feature found in relatively few CB radios, is said to permit precise resonating of the antenna system with the transmitter output for minimum line losses and maximum radiated power. A flip of a front panel switch lets you read power output direct from the meter. In the receiving position, the meter reads "S" level (strength) of the incoming signal.

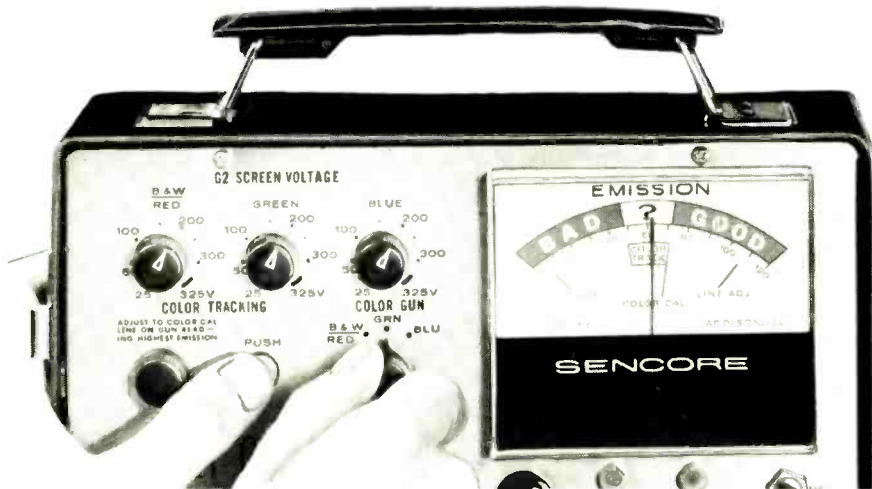
Another feature of this two-way

radio is the "Dyna-Boost" circuit which amplifies voice signals to the optimum level for greatest intelligibility regardless of whether the operator speaks quietly or loudly into the microphone. Housed in an all-metal case, the radio has a die-cast front panel finished in brushed aluminum and black. Conveniently located front panel controls include an off-on/volume control, illuminated channel selector, adjustable squelch control, receiver fine tuning control, "Dyna-Boost" off-on, meter function selector, meter calibration control, and a switch that converts the radio to public address amplifier. The microphone and



speaker/headphone jacks are also on the front panel. Completely self-contained, this unit includes a transistorized dual power supply for 117vac and 12vdc — both power cables are supplied. Ten tubes, 13 diodes and 2 transistors are employed to provide double-conversion superheterodyne reception and 23 channel 100% modulated transmission. A coiled-cord ceramic microphone with push-to-talk switch is supplied with the unit. Measuring 5 1/4 in. high by 13 7/16 in. wide by 8 1/2 in. deep, the radio weighs 16 lb. Price \$239.95. B&K.

## Now — Compare CRT Color Guns AUTOMATICALLY!



- Simplifies Color CRT Tracking Test
- Tests Each Gun in Color or B&W CRT's Completely

Now, for the first time, you can test CRT color guns for color tracking automatically; and exactly according to industry standards. No more time-consuming logging of each color gun reading at every setting of the G2 control like other testers.

Only the Sencore CRT CHAMPION has three separate G2 screen grid controls just like the color TV itself. A color tracking scale right on the meter makes the all-important tracking test easy, fast, and accurate. This is most important when claiming credit for a defective color CRT.

The CHAMPION also makes all the standard color and black and white CRT tests — short, emission, and life tests. Line Adjust control assures exceptional accuracy. An exclusive three step Automatic Rejuvenation Circuit lets you save many a faulty black and white tube or equalize gun currents in color tubes. Plug-in sockets are provided for fast testing and easy updating. Rugged vinyl-clad steel case has spacious lead compartment.

CRT manufacturers, set manufacturers, distributors, technicians all recommend the CR143 CRT tester as the only tester that does a complete job. Why not check with them before you buy.

Sencore CR143 — CRT CHAMPION ...\$99.50



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### Tape Recorder 723

Announced is a model F98 recorder designed for voice or music recording in business, education and pleasure. The instrument features all solid-state electronics, a high-power amplifier and an acoustically matched speaker for professional quality recording. The tape recorder also contains a built-in dynamic remote con-



trol microphone with a separate microphone input for conference recording. It records and plays up to an hour and a half on a single tape cassette.

The record level control is selectable — automatic or manual. Other features include VU recording level meter, tone control, cassette ejector, digital tape counter, all push-button operation, monitoring while recording, battery and house current operation with automatic battery disconnect on ac, internal storage for two tape cassettes, servo drive motor with electronic speed control and Flux-field heads. The unit measures 12 in. wide, 9 in. high, 4 1/2 in. deep and weighs 8 lb. Price under \$120. Concord.



**RCA Announces Compatible Test Jig Program**

A servicing program for RCA parts and accessories' dealers is announced.

Referred to as the ICTJ Program, the term actually stands for Industry Compatible Test Jig.

Twenty-seven new test adapters for convergence, deflection and degaussing make it possible to service other manufacturers' most popular chassis produced from 1962 through 1966 (plus some 1967 chassis) with the RCA Color Test Jigs No. 10J102 and No. 10J103.

The television manufacturers covered under the program include: Admiral, Dumont, Emerson, General Electric, Magnavox, Motorola, Packard Bell, Philco, Sears Silverstone, Sylvania, Westinghouse and Zenith.

The new adapters are small, easily stored and can be used with the standard RCA extension cables supplied in previous programs.

An ICTJ cross-reference binder will also be supplied directly to the dealer. This cross reference is in alphabetical order by manufacturer, the chassis in alpha-numeric sequence and model numbers are also referenced.

The dealer will receive periodic mailings of updated cross-reference sheets announcing the addition of new adapters or the utilization of existing adapters for servicing chassis subsequently released by other manufacturers.

Dealers enrolled in the ICTJ program will continue to receive these cross-reference sheets, data sheets, etc., on a no charge basis until June 30, 1969, at which time the dealer will resubscribe through his local distributor.

**Color CRT Sales Increase**

While factory sales of color television picture tubes were off 4.5 percent at 2.4 million units during the first five months of 1968, important gains were shown during the last two monthly periods, as reported by the Electronic Industries Assn.'s Marketing Services Dept.

Sales during May 1968 amounted to 496,270 units representing a 19 percent increase over sales of 417,046 units during May a year ago. Similarly, sales during April 1968 were up 15 percent to reach 452,178 units.

If this trend continues, according to EIA, sales of color TV picture tubes during the full year 1968 are expected to easily surpass their 1967 sales level of 6.1 million units.

**Superscope Inc. Reports Increase in Net Income**

Superscope Inc., exclusive U.S. distributor of Sony tape recording equipment, reported an increase of 19 percent in net income and 36 percent in sales for the first half of 1968 compared with a like period in 1967, it was announced by Joseph S. Tushinsky, president of Superscope.

Net income amounted to \$895,677 or 43 cents a share in the first six months of 1968 compared with \$753,587 or 42 cents a share in 1967. These figures are net after adjustments to reflect the 10 percent federal income tax surcharge. Per share figures are based on 2,100,000 shares outstanding on June 30, 1968, and 1,800,000 shares outstanding on June 30, 1967 (as adjusted for a 50 percent stock dividend declared in March 1968).

Sales for the six-month period were \$13,962,295 vs \$10,258,076 for the same period last year.

# Your next tuner cleaning job could cost somebody 15 bucks.

## You.

You blow about 15 bucks every time you have a contact cleaning call back. Isn't it worth spending a few extra minutes to save that \$15 and your customer's good will? Then do the job right the first time with ContaCare Kit III. Unlike sprays that simply push the "gunk" around to dry and harden, ContaCare does a thorough cleaning and lubricating job. You just pour the special liquid cleaner on the lint-free cloth applicator and wipe away all film, dust and dirt. Then apply a little of our permanent lubricant to the contacts. The job's done—right. And you may have saved yourself \$15. ContaCare is non-flammable, non-conductive, and provides trouble-free results for both black & white and color sets. Properly used, ContaCare Kit III will provide you with over 100 cleanings. Available at parts distributors. Price \$1.98



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A valuable booklet on repair and servicing written by one of the world's largest tuner manufacturers is packed with each kit.

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**Service Information**

Schematic diagrams and service information on specific radio and TV sets are available at a nominal charge. SUPREME PUBLICATIONS is offering to send promptly service material on almost any television, radio, stereo or changer. It is able to supply such information from its own service manuals, extensive files going back to the 1930s, from manuals of other publishers (some no longer in business) and from factory released material. The usual charge is \$1 for radio material, and \$1.50 for TV material covering a specific set.

**Anaconda Electronics Co. New Name in Communications**

A new name has appeared in the communications industry: Anaconda Electronics Co.

The company manufactures electronic equipment for the CATV industry and markets turnkey cable television systems, coaxial cable and subscriber carrier equipment. It was formed in 1965 as Anaconda Astrodata Co., a joint venture of Anaconda

Wire and Cable Co. and Astrodata, Inc. In August 1967 it became a wholly owned subsidiary of Anaconda Wire and Cable Co.

E. J. F. Regan, president of Anaconda Electronics Co., announced the new corporate name and unveiled the company's new logotype today. He noted that the changes were made to emphasize Anaconda's growing commitment to the communications industry.

**Vikoa Introduces New CATV 59U Cables**

Robert Baum, vice president marketing, announced a new series of 59U coaxial cables. A Mylar tape coated on both sides with aluminum foil with a braided shield and an all new aluminum 59U solid seamless sheath.

These cables are to be used in areas of high intensity signals and will eliminate direct off the air pickup of TV signals.

**New Electron Gun Developed For Cathode-Ray Tube**

A new electron gun developed for cathode-ray tubes by a British company, is said to be the first to have its electron beam almost completely colimated by an electrostatic focusing

system before the final aperture of the gun. Advantages include longer life, uniform brightness of spot and line, uniform spot size across the screen and increased current density.

The basic mechanical design is inherently rugged, according to the company, and the "Monocon" tubes can be operated under severe vibration. Operating conditions can, to a large extent, be decided by the customer since the tubes can be operated over a wide range of screen potentials while the gun potentials remain far below the level at which internal sparking and cold emission occur.

Widely different final anode potentials can be applied, according to application. For any potential, brightness is greater than that of a conventional tube and peak cathode loading is said to be lower than that of other guns thereby increasing life expectancy. Energy distribution (and therefore brightness) is substantially uniform across the spot and across a scanned line. The beam diameter at the point of deflection is small so that deflection distortions are minimized. The spot size is substantially constant over the whole tube face.

Electron acceleration is provided by a helix on the inside of the tube which is integral with the electron optics. Deflection coils can be placed

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# NOW—Color-Coded Schematics for 1500 TV Sets . . . at an Unbelievable 1.3¢ Per Set!

Yes, now you can speed-repair 1500 popular TV receivers for just about 1¢ each . . . with the service-man-proved COLOR-CODED TV COLORGRAMS.

If you've heard about TV Colorgrams, then you know they were a real bargain at their original total price of \$102.50. Now, at this special price of only \$19.95, they're almost a steal.

## What are TV COLORGRAMS?

They're amazing new color-coded charts that help you isolate TV receiver difficulties and with less effort than you ever dreamed possible. Each COLORGRAM chart is clearly color-coded to show signal-flow, continuity, test points, and voltages. The entire ground conductor is shown in its own distinctive color. Every component in the circuit is clearly identified, and its relationship to other components made readily recognizable. COLORGRAM charts let you concentrate on that small portion of the set most likely to be the cause of the trouble. There's no time wasted working back and forth between schematic and set looking for tests points . . . wading through superfluous information . . . identifying components incorrectly. With COLORGRAMS, everything is there, before your eyes, and very often looking just as it does in the set.

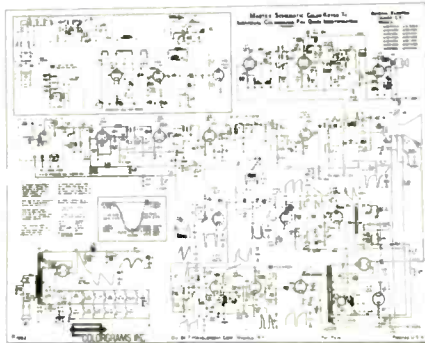
## What does a TV COLORGRAM Service-Pak include?

Everything you need to service a whole series of TV sets!



Typical COLORGRAMS SERVICE-PAK sold for \$1.95. You get 50 such PAKS . . . plus 148-page Index . . . for only \$19.95!

First of all, the Pak includes COLORGRAM charts for IF, Video, Audio, Vertical and Horizontal (showing sync and sweep circuits), B+ distribution and AGC circuits. You use the Video chart if you have a Video problem, the Audio chart if you have an Audio problem, etc.



Easy to read complete master schematic is color-keyed to the colors used in the Colorgram Charts.

Second, the Pak includes color-keyed master schematic providing an overall view of the receiver circuit. It shows the Tuner, IF, Video, Audio, Vertical and Horizontal sections, color-keyed to the colors used in individual COLORGRAM charts. It also shows test points, waveforms, voltage, resistance, capacitance, practical alignment data, etc.

## CONTENTS

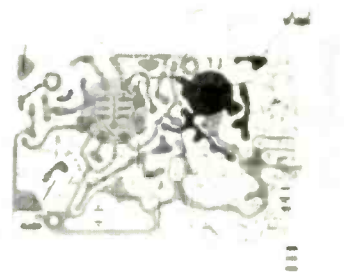
ADMIRAL	(25 CHASSIS,	179 MODELS)
EMERSON	(24 CHASSIS,	100 MODELS)
G. E.	(9 CHASSIS,	332 MODELS)
MAGNAVOX	(1 CHASSIS,	27 MODELS)
MOTOROLA	(8 CHASSIS,	63 MODELS)
PHILCO	(24 CHASSIS,	122 MODELS)
R. C. A.	(125 CHASSIS,	539 MODELS)
WSTGHSE.	(27 CHASSIS,	183 MODELS)

Third, the Pak includes a Rapid Repair Manual that is an effective guide to the use of the COLORGRAM System. It contains original manufacturer's service notes, special instructions, circuit modifications, parts list, and parts numbers. Other practical service data in the Guide are a Pictorial Tube and Component Location Chart, and a Tube Failure Guide.

## What do I get for my money?

50 complete Service-Paks . . . each Pak containing data on approximately 30 TV sets. PLUS, as an added bonus,

we'll include the 148-page MASTER-INDEX and Cross Reference Replacement Parts Guide which lists all 1500 TV sets you can quickly repair with TV COLORGRAMS. It describes the black-and-white receivers of Admiral, Emerson, General Electric, Magnavox, Motorola, Philco, RCA, and Westinghouse. These receivers are cross-referenced ( by IBM data-processing) to nine replacement parts manufacturers . . . Aerovox, Centralab, Clarostat, G. C., Merit, Stancor, Thordarsari, Triad, and TVD, covering over 25,000 parts listings. This INDEX gives you the newest, fastest, clear-



Each Colorgram chart is color-coded to show signal flow and continuity—just like a road map!

est, most practical approach to obtaining the correct replacement part in a hurry.

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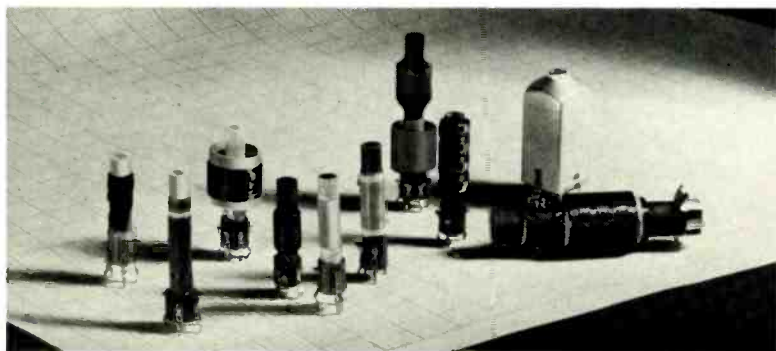
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## Ten More Popular Color TV Coil Replacements



Cat. No.	Function	Manufacturer	Part No.
6355	Dynamic Convergence	Admiral	94C305-6
6058	Chroma Bandpass	Emerson	720563
6356	Blue Phasing	GE	ET36X789
6059	Burst Phase	Hoffman	109-033700
6357	Pin Cushion	Motorola	24C65127A90
6060	Chroma Take-Off	Philco	32-4878-2
6358	Horizontal Linearity	RCA	120794
6359	Horiz-Osc. & Waveform	Silvertone	10-88-5
7150	Sound Take-Off	Sylvania	50-16206-5
6061	3.58 mHz Osc.	Wells Gardner	9A2660-001



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## ET/D NEWS OF THE INDUSTRY

over the helix to introduce a post-deflection acceleration for increased sensitivity.

The spot shape on the screen is an exact image of an aperture of the gun, and spots of any shape can be produced. Size remains constant despite increase of drive voltage, and astigmatism and coma — distortions of the spot shape — are minimized. Spot size can be varied up to 1/2 in. in diameter by adjustment of the gun potentials without loss of focus or alteration in brightness. The variable spot size is said to make the gun suitable for use in date displays where differing line widths are often required.

### Philco-Ford Adds Fifty Training Reps. To Field Force

Philco-Ford Corp. announced the addition of 50 technical training representatives to its field force in a new program designed to sharpen the skills of technicians who service the company's home entertainment products and appliances.

R. Harris Hesketh, general manager of parts and service, said the new technical training personnel will be located at service training centers that are being established throughout the United States.

"In the past, we have asked our district service managers and supervisors to handle service technician training along with their other duties," he said. "The new technical training representatives will have full-time responsibility for training. Philco-Ford has developed an entirely new training approach to insure the continuous availability of highly competent service technicians." Mr. Hesketh said.

"This has resulted in the scheduling of more than 600 service training meetings in the first five months of this year — an unprecedented effort in U.S. industry," Mr. Hesketh said.

### RCA Introduces First Two-Way Mobile Radio To Use IC's

RCA has introduced the Super-Carlone 500, claimed to be the communications industry's first standard two-way mobile radio to use integrated circuits.

E. J. Hart, manager, commercial communications systems, said the advanced circuitry which is employed in the unit's receiver provides much higher reliability than was available in earlier designs.

It features a speaker and control

ELECTRONIC TECHNICIAN/DEALER

head combined in one case instead of two separate elements for compactness and ease of installation. Cables are simply plugged into connectors at the rear of the unit.

Mr. Hart noted that in addition to its integrated circuitry radio employs solid-state components extensively. Temperature compensated crystal oscillators, contained in a plug-in module, provide on-frequency operation over a temperature range of -30 to +65C with no heating element.

The unit is available with RCA's "Quiet Channel," a tone-coded squelch system that enables the operator to mute unwanted messages on shared channels and to hear only those directed to him.

Either the transmitter, receiver or both can be supplied optionally for operation on one to four channels. Other options include a telephone-type handset, a noise-canceling microphone for use in high noise level areas and selective call systems for direct communications with a specific mobile unit or base station.

### Tyco Acquires Dynaco

Tyco Laboratories, Inc. has signed agreements to acquire Dyna and Dynaco, Inc., both of Philadelphia, for stock and cash with an aggregate value of over \$5 million. Dyna manufactures Dynaco Hi Fi stereo components and Dynakits for the hobbyist, which are distributed by Dynaco, Inc. Tyco is a research-based manufacturer of materials, electronics and controls.

### Cooperative Electronic Education Program

A new cooperative educational program is announced in a joint statement by Clifford L. Larson, president of the Northwestern Electronics Institute, and Dean Alfred L. Vaughan of the University of Minnesota General College.

The new program, available this fall, will make it possible for a student to earn a two-year college degree and at the same time receive a technical education in electronics.

"This program will provide additional opportunities for our students who are seeking a practical, well-rounded education," Dean Vaughan said.

"We are initiating this program because we believe the graduate with a college degree and a specialized electronics education is better prepared for job entry and advancement in our technological society," Mr. Larson said.

Northwestern Electronics, a non-profit school founded in 1930 and located at 3800 Minnehaha Ave. in

# 15 CRYSTAL MARKERS 3 SWEEP RANGES ONLY \$135



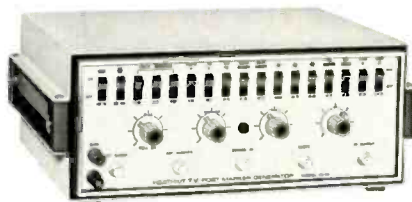
## New Heathkit IG-57 Solid-State Color TV Marker/Sweep Generator

The IG-57 combines the features of both a post marker and a sweep generator for less than you'd expect to pay for just one of these functions.

- Three linear sweep ranges for TV tuned circuits in sound IF, color bandpass, video IF circuits and proper overall RF/IF response • External attenuator provides 1, 3, 6, 10 and 20 dB steps up to 70 dB maximum • Can also be used with external sweep or marker • 15 crystal-controlled markers provided for color bandpass alignment; picture and sound carrier frequencies for channels 4 and 10; FM tuner, FM IF and discriminator alignment; TV sound IF adjustments
- All crystals included • Completely isolated 1-15 VDC variable voltage supply for positive or negative bias • Built-in 400 Hz modulation for trap adjustment and checking and adjusting FM tuners • Phase Control and Trace Reverse Switch so markers will appear from left to right as in set manufacturer's instructions, regardless of scope used • Blanking Switch eliminates return sweep and provides base line • Circuit Board Construction — three circuit boards, 27 transistors, 3 silicon diodes, 2 crystal diodes and 2 Zener diodes combine to make assembly faster with less chance of error • Bias and Scope Horiz. leads, Attenuator, Demod In, Scope Vert., RF and Demodulator cables included in kit.

Kit IG-57, 14 lbs., \$135.00; Assembled IGW-57 \$199.00

**IG-57 SPECIFICATIONS** — Marker frequencies: 100 kHz; 3.08, 3.58, 40.8, 4.50 MHz, ±.005%, 10.7, 39.75, 41.25, 42.17, 42.50, 42.75, 45.00, 67.25, 193.25 MHz ±.005%. Modulation frequency: 400 Hz. Input impedances: External Marker, External Sweep, & Attenuator — 75 ohm. Demod In — 220 k ohm. Output impedances: Marker Out, Sweep Output & Attenuator — 75 ohm. Scope Vert — 22 k ohm. Bias voltage: Positive or negative 15 volts DC at 10 milliamperes. Type of marker: Birdie. Controls: Bias control with pull-on/push-off switch; Marker/Trace — dual concentric; Sweep Width/Sweep Center — dual concentric; Marker Out — concentric with Sweep Range switch; Phase. Switches: Rocker type — separate switch for each of the above listed frequencies; Blanking, On/Off; Trace Reverse; Modulation On/Off. Transistor — Diode Complement: (19)-2N3692 transistor. (7)-2N3393 transistors. (1)-2N3416 transistor. (3)-silicon diode rectifiers. (2)-crystal diodes. (1)-13.6 volt zener diode. (1)-20 volt zener diode. Sweep frequency ranges and output voltage: LO Band — 2.5 to 5.5 MHz ± 1 dB at 0.5 volts RMS fundamentals, and 10.7 MHz on harmonics. IF Band — 38 to 45 MHz ± 1 dB, at 0.5 volts RMS, fundamentals. RF Band — 64 to 72 MHz ± 1 dB at 0.5 volts RMS fundamentals, and 192 to 198 MHz on harmonics. Attenuator: Total of 70 dB of attenuation in seven steps — 1, 3, 6, 10, 20, 10, 20 and 20 db. Power requirements: 120 volts, 60 Hz AC at 20 watts. Dimensions: 13 3/4" W. x 5 1/2" H. x 12 1/2" D.



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## ET/D NEWS OF THE INDUSTRY

Minneapolis, will administer the electronics technology portion of the cooperative training program. The general college, a two-year college of the university, will provide a general education for the student.

The basic program will include Northwestern's two-year master program in electronics plus 45 credits in the general college. Each student, however, will be permitted to plan his program to fit his individual needs and may elect to take a shorter course at Northwestern and more credits at the university. At the end of two to three years he will receive both a diploma from Northwestern and an associate of arts degree from the university.

### Perma-Power Announces New Motor and New Guarantee

Perma-Power has announced a new 1/3 hp motor for its deluxe Liftmaster garage door openers, says Robert L. Ford, vice president.

Mr. Ford states that the new motor is so dependable that Perma-Power is announcing an exclusive new warranty policy. The motor and drive train assembly in the Liftmaster G6100 and G6101 series openers will be guaranteed for three years against any operating defect.

The new warranty policy is effective retroactively to encompass all Liftmaster G6100 series openers shipped since Jan. 1, 1968, as the new motor has been in use during that period.

### Amphenol And Bunker-Ramo Combine Forming New Bunker-Ramo Corp.

Amphenol Corp. and the Bunker-Ramo Corp. announced that the two firms have been combined and will operate as The Bunker-Ramo Corp. The new firm will rank among the 500 largest industrial firms in the U.S. phenol Div.

John E. Parker, chairman of the board of Bunker-Ramo, will fill that post with the new company. Matthew L. Devine, who had been chairman of the board and chief executive officer of Amphenol, becomes president and chief executive officer of the new firm.

Dr. Milton E. Mohr, president of Bunker-Ramo, becomes a vice president of the new corporation and president of the Bunker-Ramo Div. William H. Rous, president of Amphenol, becomes a vice president of the new corporation and president of the Amphenol Div.

## This new E-V phono needle package helps you buy, sell, then sell again!



On every new E-V needle package you'll find the model number printed three extra times on pressure sensitive tabs. Here's why:

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But don't be surprised if one of the tabs is missing. Your E-V distributor may be using one to keep track of his stock — so that you always have the needle you want, when you want it.

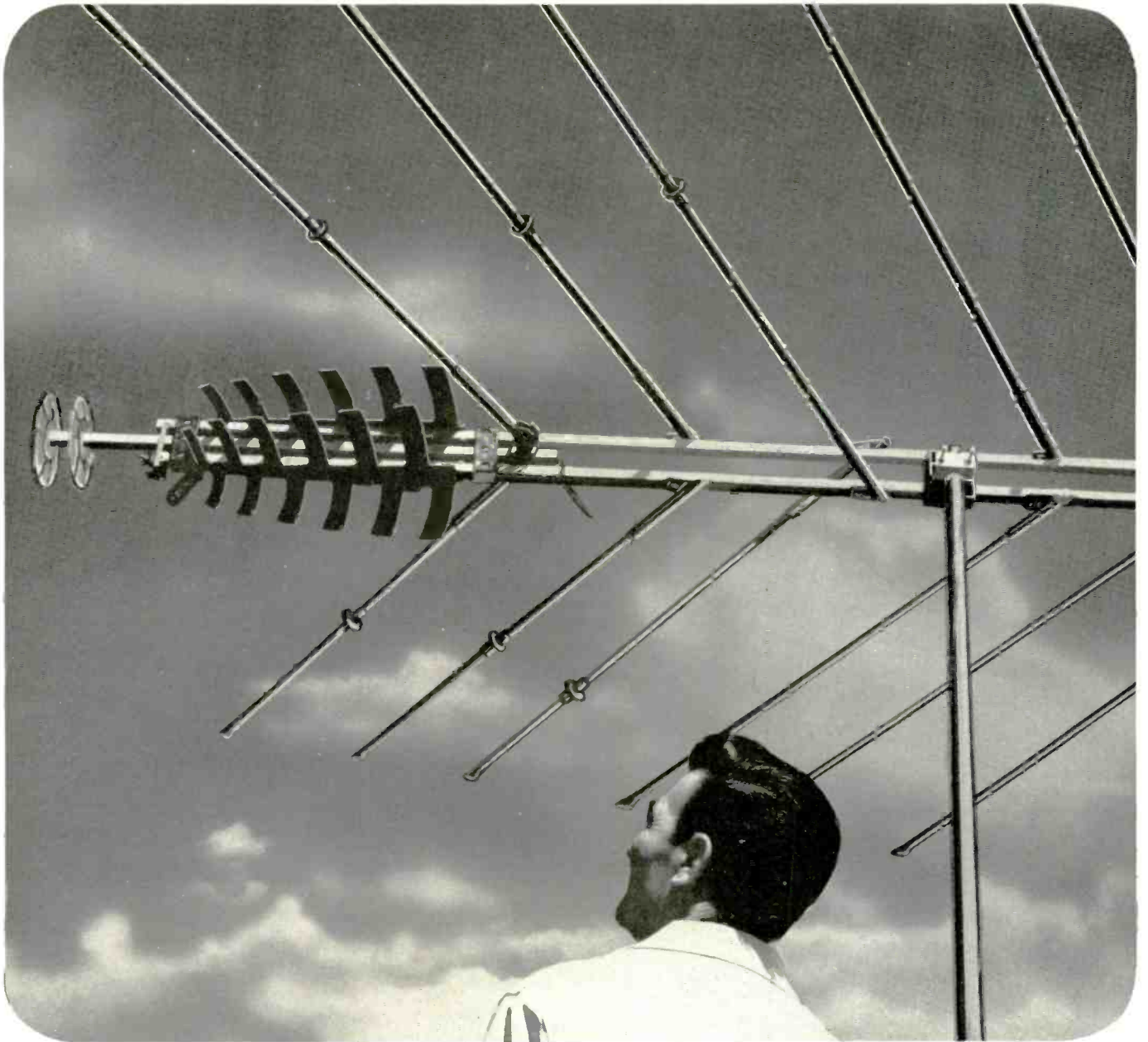
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*Did you know that JFD now markets a great new line of solid state Snow-Plow and Program Center amplifier-distribution systems? Ask your distributor!*

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## ET/D CATALOGS & BULLETINS

### Test Equipment 400

A 16-page catalog features specification and prices of professional test equipment for servicing radio, color and B/W TV, hi-fi, communications and other types of electronic equipment. B & K.

### Electronic Components 401

Three reference guides are available making zener diodes, capacitors, thyristors, rectifiers and stacks easier to locate and select. Listing only the one or two principal specifications to enable most rapid scanning, the colorful guides provide the engineer with an extensive selection of in-stock, available electronic components. More detailed data on each unit is available. Mullard.

### Antenna Rotator 402

The four-page brochure describes the first antenna rotator to combine all-solid-state circuitry with a self-lubricating dynamic spline drive. According to the publication, the Dyna-Rotor turns the largest antenna 360deg in less than 40s, twice the speed of

most rotors. The brochure states the unit consumes less than one-tenth the electric power of other rotors. The control box, according to the brochure, produces no clacking or whirring. It has potentially no troublesome mechanical switches, solenoids, relays or motors to cause interference with reception. Jerrold.

### Slide Rule 403

A free slide rule which gives rise time plus inductance/capacitance for a complete range of wire-wound bobbin resistors is offered. The guide is available at no charge to engineers who write on company letterhead giving their job title or function. Dale.

### Transistorized Amplifiers 404

A catalog sheet features the specifications and details on two transistorized amplifiers. Both units employ solid-state technology and although designed for electronic musical instrument application, these amplifiers have been employed in many diverse applications. Allen.

### Two-Way Radio 405

A 12-page booklet describes in detail how a two-radio system can increase efficiency and cut operating



midget ratchet offset

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costs for the contractor. It tells how to set up a two-way radio system, what kind of equipment is needed and how it works. The booklet answers typical questions frequently asked about two-way radio and can help an individual make an informed decision on the practicality of a two-way radio system for his business. E.F. Johnson.

**Portable Oscilloscope 406**

A four-page brochure describes a wideband, triggered, laboratory-quality oscilloscope.

This portable solid-state unit operates from an optional internal battery or from 60 or 400Hz power lines. It features a horizontal bandwidth of 20Mz with a 17ns rise time. Motorola.

**Clips and Insulators 407**

A catalog sheet describes the new bubble-packed line which contains all its best-known electric clips and insulators. Mueller.

**MATV Equipment 408**

Announced is a 16-page master TV antenna equipment catalog.

Covering many new items in its 82-channel Channel Smoothline, the new catalog includes: broadband and single channel antennas; broadband and single channel head end amplifiers, active and passive accessories; filters and traps; tapoffs, matching transformers and wallplates; preamplifiers, amplified couplers, connectors and cable. JFD.

**MATV SYSTEMS . . .**

*continued from page 59*

nect the truckline back to the splitter and turn the system on. Then all you have to do is connect the field strength meter to the output of each tapoff and read the signal level. As you approach the defective tap-off, the signal level will fall. The signal will be so low at the tapoff that's causing all the trouble that there will be no doubt as to the location of the short.

Most shorts are caused by one or two strands of cable that have strayed loose.

Use the field strength meter and a portable TV set to check out the head end. Check signals into and out of each device you suspect and you'll find the trouble rapidly.

When you do find a defective unit, be careful about trying to repair it. Remember, at VHF and UHF frequencies, a wire run close to the chassis often acts as a capaci-

tor, and the position of a coil makes a tremendous difference in response. Inspect the unit visually for obvious and easily repairable damage. If you spot an open fuse or a defective line cord, replace it. But be careful not to disturb any wires. And if the trouble is at all complex, you're better off to return the unit to its manufacturer for repair. Inexpensive, passive units, of course, can be discarded.

The MATV business is interesting and lucrative. This is an especially good time to get into it. One

manufacturer has estimated that 95 percent of all existing MATV systems are obsolete, since they cannot handle UHF on-channel, and color response is poor.

Right now, the demand for systems actually exceeds the supply. Most MATV contractors have grown so big that they refuse to handle anything under \$2000, and the customer who wants a small system has no place to turn. If you decide to help fill this void, it might well be the most profitable decision you've ever made. ■

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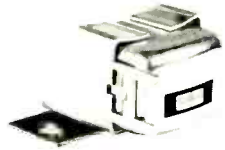
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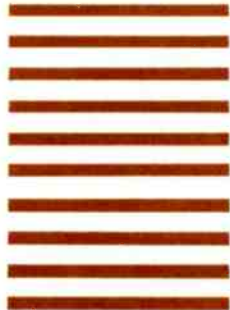
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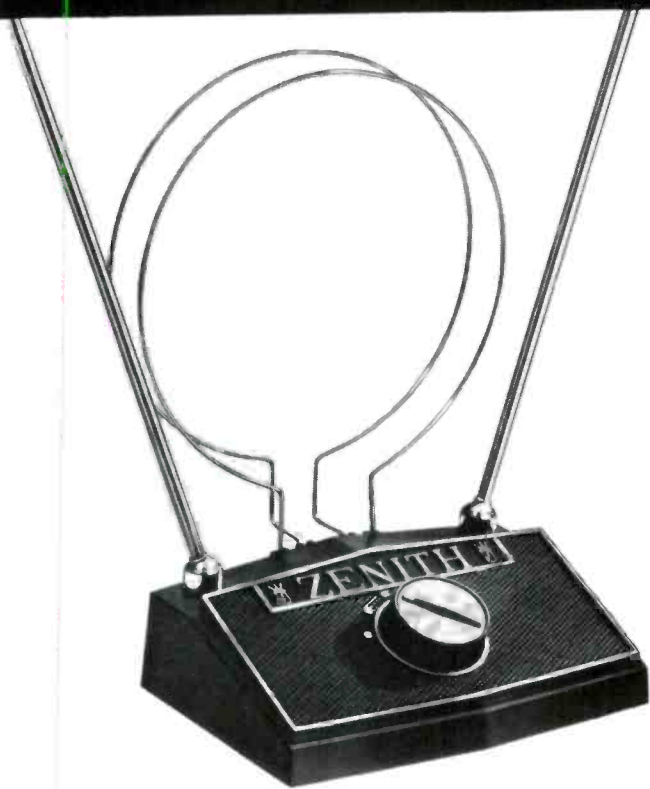
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