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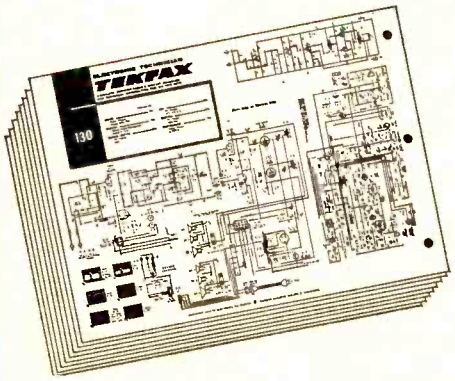
Cover

The professional 'image' of service-dealers and technicians begins with an in-home service call at the doors of 52-million homes in the nation that now have TV sets.

FEATURES

DEPARTMENTS

TEKFAX ——— 16 PAGES OF THE LATEST SCHEMATICS



MAGNAVOX: TV Chassis T910 Series
RCA VICTOR: Color TV Chassis CTC19
SILVERTONE: TV Chassis 564.10000 564.10001 564.10002 564.10003 564.10004 564.10005
SYLVANIA: Color TV Chassis DO3-2
TRUETONE: TV Model 2DC1605
ZENITH: TV Chassis 14N31

ELECTRONIC TECHNICIAN

TEKFAX

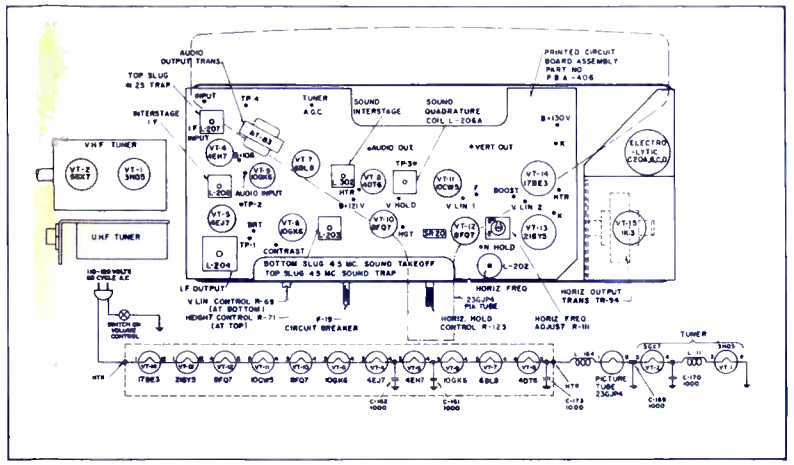
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR SIX NEW SETS

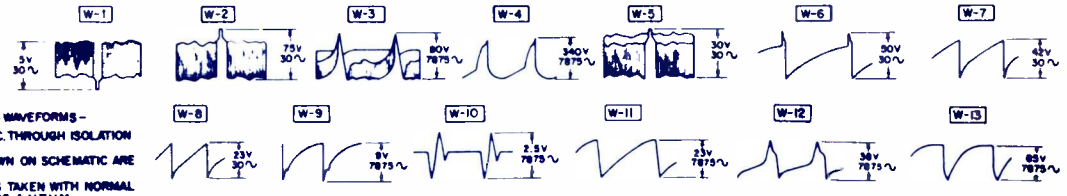
GROUP 162

	Schematic No.
MAGNAVOX	**985**
TV Chassis T910 Series	
RCA VICTOR	**984**
Color TV Chassis CTC19	
SILVERTONE	**988**
TV Chassis 564.10000 564.10003 564.10001 564.10004 564.10002 564.10005	
SYLVANIA	**987**
Color TV Chassis DO3-2	
TRUETONE	**983**
TV Model 2DC1605	
ZENITH	**986**
TV Chassis 14N31	

983
TRUETONE
TV Model 2DC1605

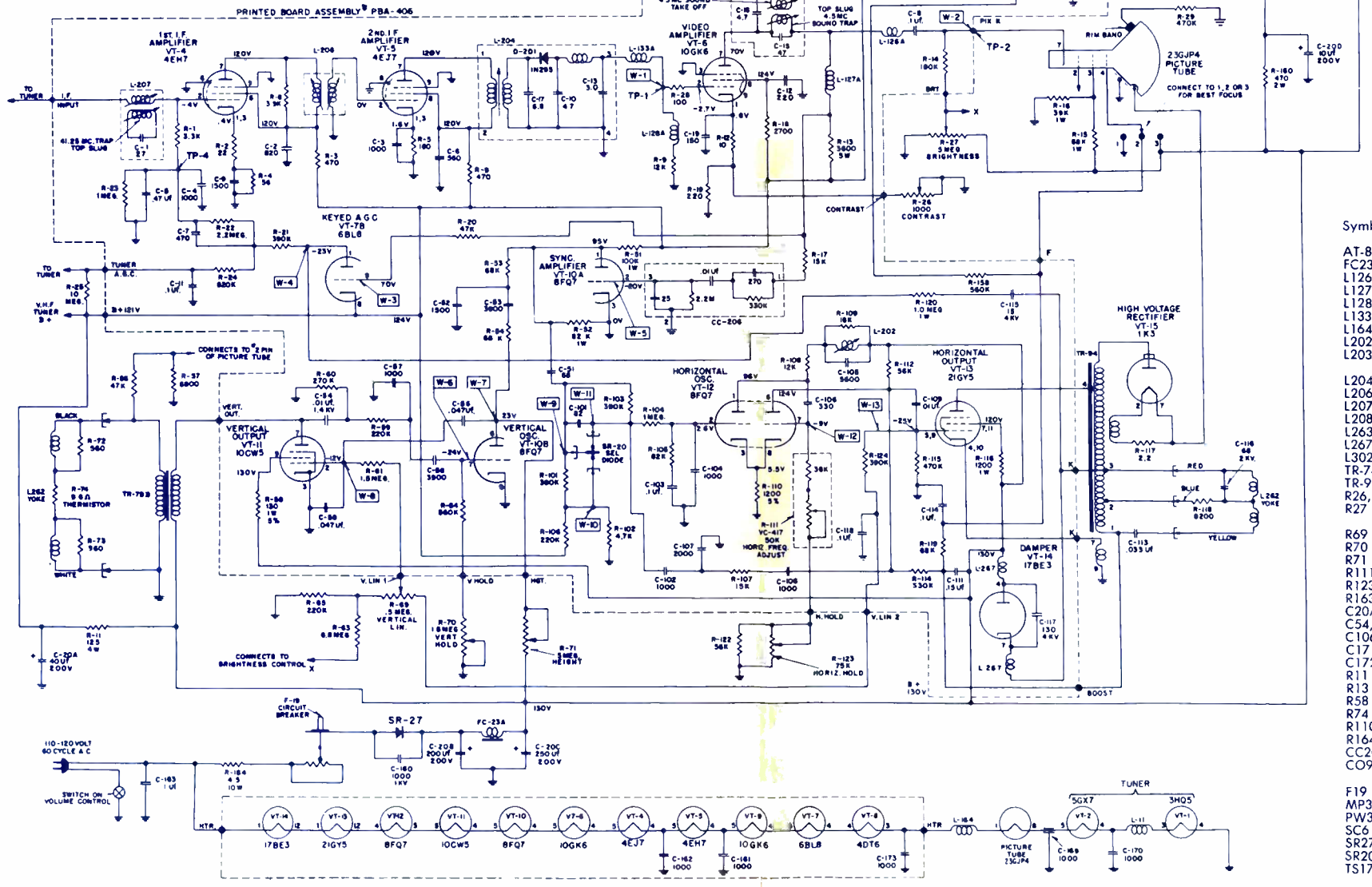
FEBRUARY • 1966





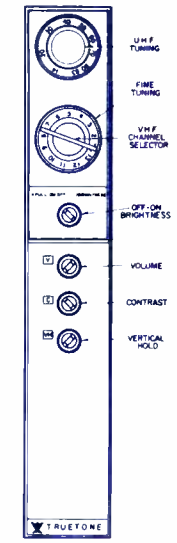
– VOLTAGES & WAVEFORMS –

1- LINE VOLTAGE 115 A.C. THROUGH ISOLATION TRANSFORMER.
2- ALL VOLTAGES SHOWN ON SCHEMATIC ARE D.C. READINGS.
3- VOLTAGE READINGS TAKEN WITH NORMAL SIGNAL INPUT USING A V.T.V.M.
4- CONTROLS SET FOR NORMAL OPERATION.
5- WAVEFORMS TAKEN WITH NORMAL SIGNAL INPUT.
6- ALL WAVEFORM VOLTAGES SHOWN ON SCHEMATIC ARE PEAK TO PEAK READINGS.



GENERAL SPECIFICATIONS

Tubes . . . .15 tubes, including Picture Tube and 1 HV Rectifier Tube, plus 1 Crystal Diode 1 Dual Selenium Diode and 1 Silicon Rectifier
Antenna . . .External or Built-in
Antenna Input . . . .300 ohms
Tuning V.H.F. . . .Channels 2 thru 13
U.H.F. . . .Channels 14 thru 83
Tuner V.H.F. . . .Standard Kollsman "Frame Grid Arbor"
U.H.F . . . .Standard Kollsman Solid State
Picture Tube 23GJP4
Deflection . . . . .110°
I.F. Sound Carrier .41.25 MC
I.F. Picture Carrier. . . .45.75 MC
Sound I.F. . . . . .4.5 MC
Power Supply. . . .110-120 Volts 60 Cycle A.C.
Power Consumption. . .150 Watts
Speaker. . . . . .4" P.M.



Symbol	Description	Truetone Part No.
AT-83	xformer, audio output	031-008300
FC23A	filter choke	032-002301
L126A	coil, video peaking	111-012601
L127A	coil, video peaking	111-012701
L128A	coil, RF choke	111-012801
L133A	coil, RF choke	111-013301
L164	choke heater	111-016400
L202	coil, horizontal oscillator	109-020200
L203	coil, sound take-off & 4.5 Mc trap	109-020300
L204	coil, IF output	109-020400
L206A	coil snd quad	109-020601
L207	coil IF input	109-020700
L208	coil IF interstage	109-020800
L263	deflection yoke	027-026300
L267	coil, choke	111-026700
L302	coil snd interstage	109-030200
TR-78B	xformer vert output	033-007802
TR-94	xformer, horiz output	033-009400
R26, 70	contrast, 1000Ω	055-039700
R27	brightness with on-off switch 5M	055-048300
R69	vert lin 0.5M	055-035000
R70	vert hold, 1.5M	055-039800
R71	height 5M	055-035100
R111	horiz freq adjust 50,000Ω	055-041700
R123	horiz hold, 75,000Ω	055-032000
R163	vol 500,000Ω	055-039600
C20A, B, C, D	250-200-40-10μf 200v elect	034-018800
C54, 159	.01μf 1.4kv 20%	826-103826
C106	330pf 500v 5% mica	045-007200
C171	.01μf 1.4kv 10%	837-103826
C172	25μf 25v elect	034-017900
R11	125Ω 4w 10%	057-059500
R13	3600Ω 5w 10% WW	053-362510
R58	130Ω 1w 5%	051-131150
R74	thermistor, 9.6Ω cold	057-056500
R110	1200Ω ½w 5%	051-122550
R164	4.5Ω 10w 10% WW	053-362510
CC206	sync take-off couplate	134-020600
CO99	connector, picture tube anode	084-009900
F19	circuit breaker	099-001900
MP367	cover, HV socket	104-036700
PW361	printed circuit board	132-003601
SC6	diode 1N295	003-000600
SR27	silicon rectifier, 500ma	004-002700
SR20	selenium diode, horiz AFC	003-002000
TS173	terminal strip yoke	154-017300

  • OJIBWAY BUILDING, DULUTH, MINNESOTA 55802

984
RCA VICTOR
Color TV Chassis
CTC19

ELECTRONIC TECHNICIAN TEKFAX

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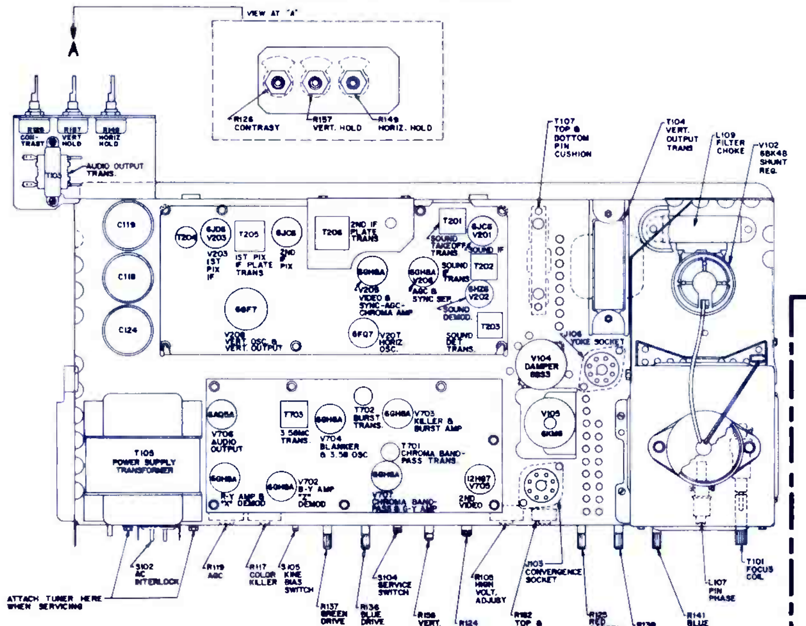
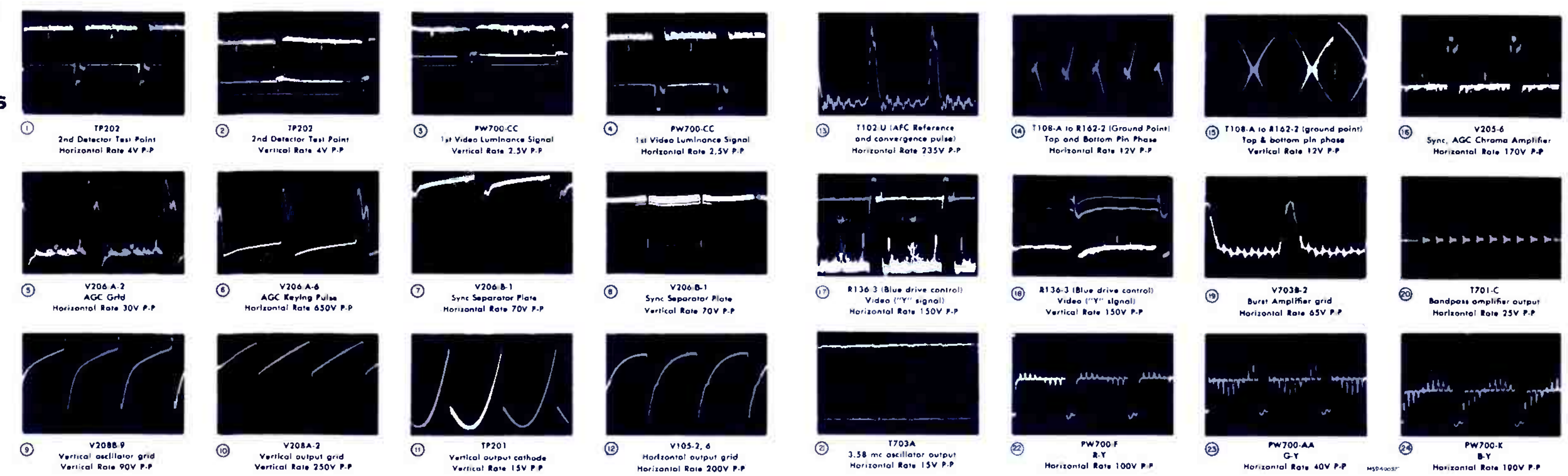
CTC19 CHASSIS LAYOUT



CTC19 CHASSIS VOLTAGE WAVEFORMS



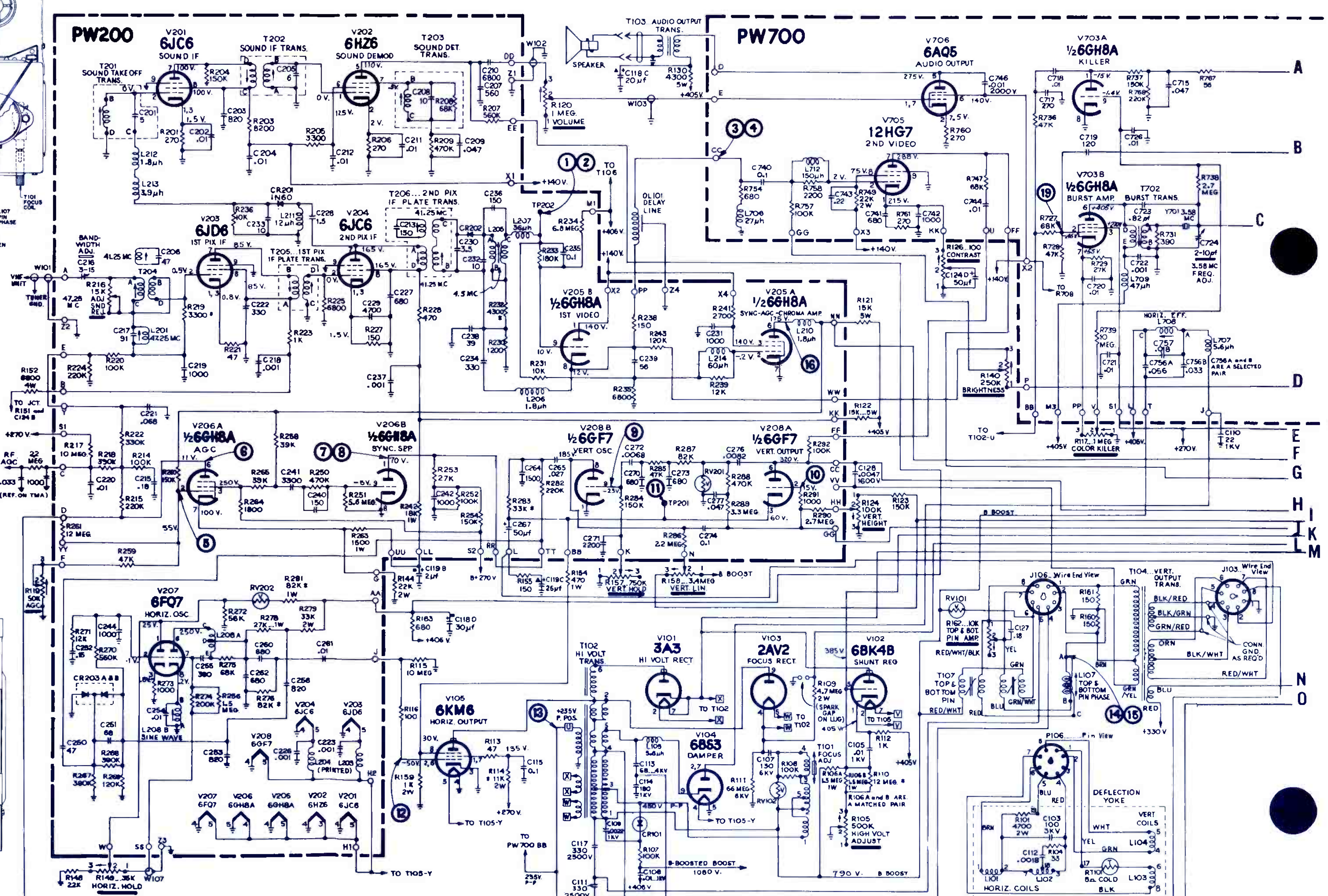
NOTE: Voltage Waveforms taken with a wideband oscilloscope using a low capacitance probe. Color Bars from the WR64A Color Bar / Dot / Crosshatch Generator used for the chroma circuit voltage waveforms.

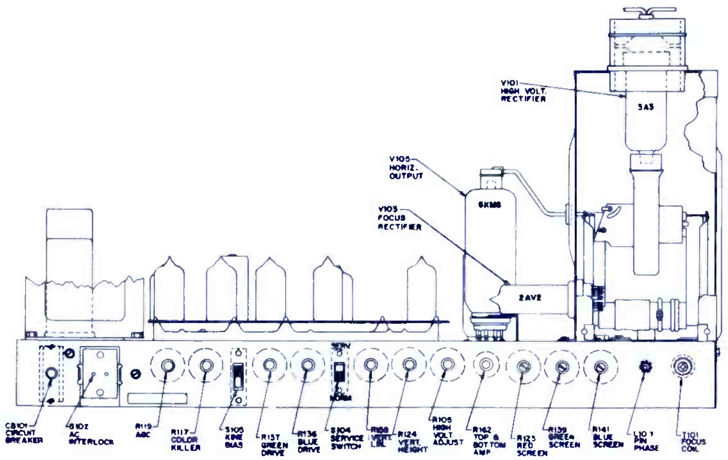
TUBE AND TRANSISTOR COMPLEMENT

V201 RCA 6JC6	Sound I-F Amplifier	
V202 RCA 6HZ6	Sound Demodulator	
V203 RCA 6JD6	1st Picture I-F Amplifier	
V204 RCA 6JC6	2nd Picture I-F Amplifier	
V205A, V205B RCA 6GH8A	Sync, AGC, Chroma Amplifier; 1st Video Amplifier	
V206A, V206B RCA 6GH8A	AGC; Sync Separator	
V207 RCA 6FQ7	Horizontal Oscillator & Control	
V208A, V208B RCA 6GF7	Vertical Output; Vertical Oscillator	
V701A, V701B RCA 6GH8A	R-Y Amplifier; "X" Demodulator	
V702A, V702B RCA 6GH8A	B-Y Amplifier; "Z" Demodulator	
V703A, V703B RCA 6GH8A	Color Killer; Burst Amplifier	
V704A, V704B RCA 6GH8A	Blanker; 3.58 mc Oscillator	
V705 RCA 12HG7	2nd Video Amplifier	
V706 RCA 6AQ5A	Audio Output	
V707A, V707B RCA 6GH8A	Chroma Bandpass Amplifier; G-Y Amplifier	
V101 RCA 3A3	High Voltage Rectifier	
V102 RCA 6BK4B	Shunt Regulator	
V103 RCA 2AV2	Focus Rectifier	
V104 RCA 6BS3	Damper	
V105 RCA 6KM6	Horizontal Output	
V108 RCA 19EYP22	Color Picture Tube	

KRK128A/120RB VHF/UHF Tuners

V1 RCA 6DS4	VHF R-F Amplifier & UHF I-F Amplifier
V2A, V2B RCA 6KE8	VHF Mixer & UHF I-F Amplifier; VHF Oscillator
RCA Q51	S1037 (Fairchild)





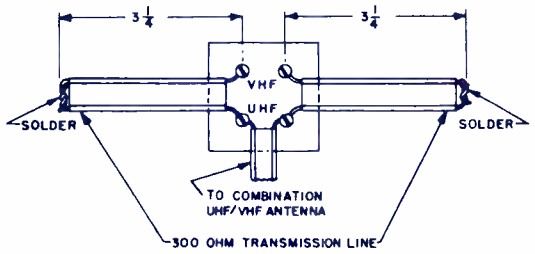
CTC19 Chassis Layout

More Data on Opposite Page

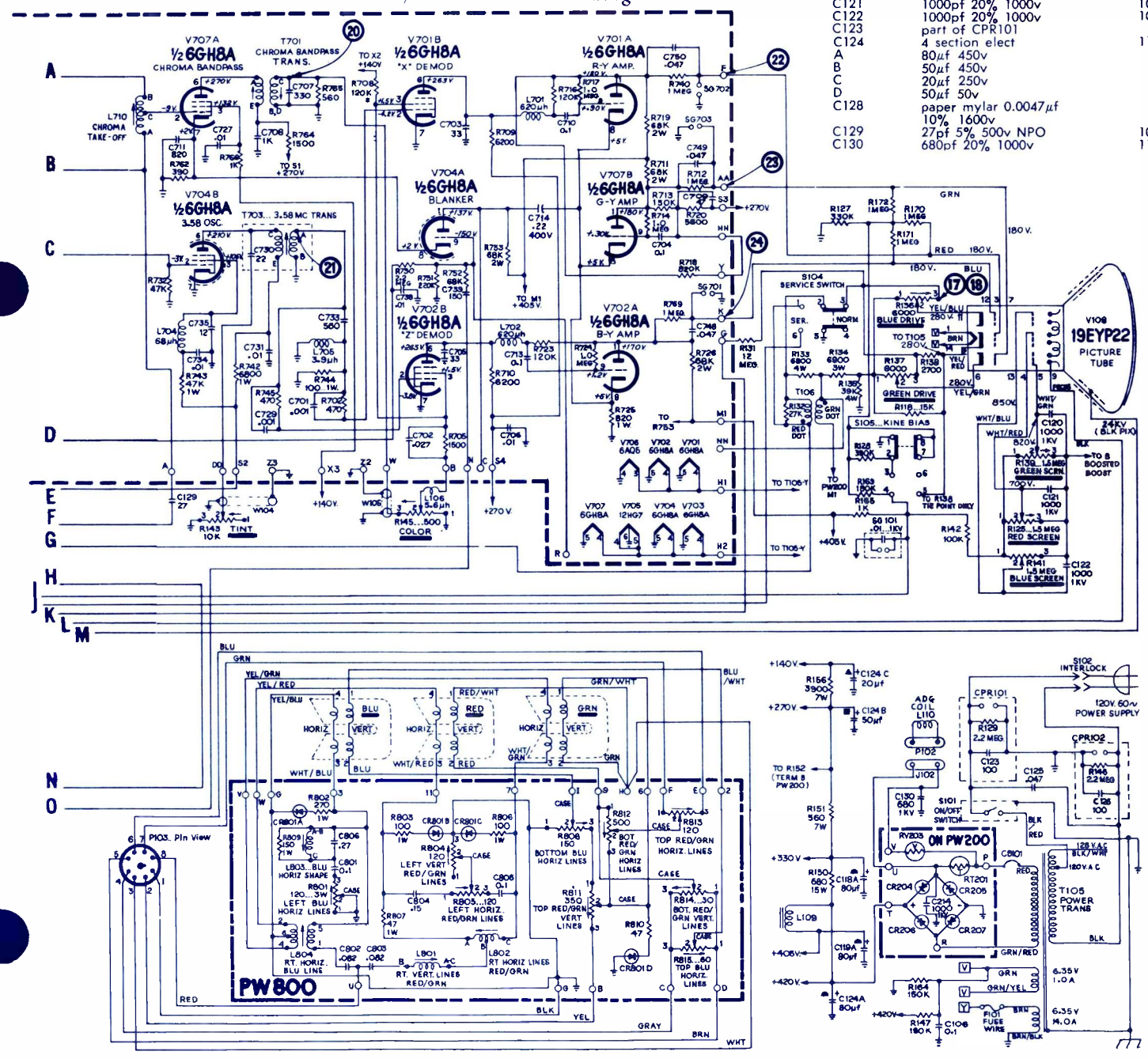
ELECTRICAL SPECIFICATIONS
Television Instrument

ANTENNA INPUT IMPEDANCE	300 ohms balanced
CONVERGENCE	Magnetic
FOCUS	Electrostatic
AUDIO POWER OUTPUT RATING	2.5 watts max.
INTERMEDIATE FREQUENCIES	
Picture I-F Carrier Frequency	45.75 mc.
Sound I-F Carrier Frequency	41.25 mc.
Color Sub-Carrier Frequency	42.17 mc. (Nominal)
PICTURE	
SIZE	Approx. 180 sq. in. (min.) on a 19EYP22 Picture Tube
POWER INPUT	120 volts AC, 60 cycle
POWER RATING	505 watts total
SWEEP DEFLECTION	Magnetic
TELEVISION R-F FREQUENCY RANGE	
All 12 VHF television Channels	54 mc. to 88 mc., 174 mc. to 216 mc.
All 70 UHF channels	470 mc. to 890 mc.

NOTES:
K=1000.
ALL RESISTANCE VALUES ARE IN OHMS.
ALL RESISTORS ARE ½ WATT EXCEPT AS NOTED.
‡ INDICATES 5% TOLERANCE ON RESISTORS.
ALL CAPACITANCE VALUES 1.0 AND ABOVE ARE IN *pf*, THOSE BELOW 1.0 ARE IN *µf*, UNLESS OTHERWISE INDICATED.
DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION.
VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A "VOLTOHMYST" (NO SIGNAL) AND SHOULD HOLD WITHIN ±20% AT RATED SUPPLY VOLTAGE.



Combination UHF/VHF Antenna Matching



More Data on Opposite Page

Symbol	Description	RCA Victor Part No.
R93	fixed film 1600Ω ±10% 3w	113960
R120	control, on-off-volume TMA96C	116564
R120	control, on-off volume TMA96C	116975
R140	control, brightness, TMA96C	116565
R140	control brightness, TMA96H	116972
R143	control tint TMA96C	116567
R143	control, tint TMA96H	116974
R145	control color TMA96C	116566
R145	control color TMA96H	116973
S101	switch on-off (part of R120)	
C105	.01µf +80 —20% 1000v	113639
C107	130pf 20% 6000v N2200	109229
C108	.01µf +80 —20% 1000v	113639
C109	paper mylar 0.0022µf ±20%, 1000v	
C110	22pf 20% 1000v N750	105233
C111	330pf 10% 2500v N1500	116504
C113	68pf 10% 4000v N1500	112847
C114	180pf 10% 1000v N1500	109844
C117	330pf 10% 2500v N2200	116504
C118	3 section elect	116503
A	80µf 450v	
B	30µf 450v	
C	20µf 450v	
C119	3 section elect	115869
A	80µf 450v	
B	2µf 350v	
C	25µf 25v	
C120	1000pf 20% 1000v	105778
C121	1000pf 20% 1000v	105778
C122	1000pf 20% 1000v	105778
C123	part of CPR101	
C124	4 section elect	112827
A	80µf 450v	
B	50µf 450v	
C	20µf 250v	
D	50µf 50v	
C128	paper mylar 0.0047µf 10% 1600v	
C129	27pf 5% 500v NPO	100352
C130	680pf 20% 1000v	113165
C203	820pf 5% 500v N2200	
C214	1000pf 20% 1000v	
C217	91pf 5% 500v NPO	
C222	330pf 20% 500v N1500	101725
C227	680pf 10% 500v N2200	102237
C228	1.5pf ±.25pf 500v N3300	103411
C230	3.5pf ±.25pf 500v NPO	
C231	1000pf +100 —0% 500v	
C232	10pf ±.5pf 500v NPO	
C233	10pf 5% 500v NPO	
C234	330pf +100 —0% 500v	
C236	150pf 5% 500v NPO	
C238	39pf 10% 500v N750	107232
C239	56pf 10% 500v N750	107745
C242	1000pf +100 —0% 500v	77252
C250	47pf 10% 500v NPO	109231
C251	68pf 10% 500v NPO	109232
C255	390pf 5% 1500v N1500	109806
C703	33pf 20% 500v N150	109260
C709	47pf 10% 500v N750	102882
C717	270pf 5% 500v N750	
C719	120pf 20% 500v N750	102209
C730	22pf 10% 500v NPO	103534
C735	12pf 5% 500v NPO	
C743	paper mylar .22µf 20% 2000v	
C750	.047µf +100 —20% 100v	117334
C756	paper mylar (matched pair)	
A	.056µf 600v	116577
B	.033µf 600v	
CB101	circuit 1.75 amp	113950
CPR101	circuit printed component (includes C123, R129)	115436
CPR102	circuit printed component (includes C126, R146)	115436
CR101	diode, power rectifier	113391
CR201	diode, rectifier 1N60	112524
CR202	diode, rectifier 1N60	112524
CR203	rectifier, selenium diode	109474
CR204	diode, silicon rectifier 1N3195	113998
CR205	diode, silicon rectifier 1N3195	113998
CR206	diode, silicon rectifier 1N3195	113998
CR207	diode, silicon rectifier 1N3195	113998
CR801	rectifier, selenium	114013
A	rectifier, selenium	
B	rectifier, selenium	
C	rectifier, selenium	
D	rectifier, selenium	
DL101	line A delay	116505
F101	fuse heater	102792
J102	connector, ADG	101998
J103	connector, 8 pin convergence	31251
J106	connector, 8 pin yoke	102787
L106	reactor, RF choke	116643
L109	reactor, filter choke	116648
L205	xformer, 4.5Mc trap	116543
L206	coil, RF choke 1.8µh	109248
L207	coil, peaking 36µh	101819
L208	coil, horiz sine wave	116506
A	coil, horiz sine wave	
B	coil, horiz sine wave	
L210	coil, RF choke 1.8µh	109248
L211	coil, RF choke 12µh	100441
L213	reactor, RF choke 3.9µh	116507
L214	coil, peaking 120µh (incl R239)	116508
L214	coil, peaking 60µh (incl R239)	116894
L708	coil, horiz efficiency	114152
L709	coil, peaking 47µh	114000
L710	xformer, chroma take off	116539
L712	coil, peaking 150µh (incl R758)	116499
L801	coil, right red/green vert lines	114597
L802	coil, right horiz red/green lines	114598
L803	coil, blue horiz shape	114595
L804	coil, horiz convergence, CTC 19A	116580
PW200	circuit, printed video circuit (less tubes)	116562
PW700	circuit, printed chroma circuit (less tubes)	116563
PW800	circuit, printed convergence board	116561
R105	control, hi-voltage adj	112842
R106	1.5M 1w (matched pair)	109235
R107	1.5M 1w (matched pair)	512410
A	1.5M 1w (matched pair)	
B	100,000Ω ±20% 1w	
R111	fixed film 66M 20% 6000v	114651
R114	fixed film 11,000M 5% 2w	
R117	control, color killer	112841
R119	control, AGC	116556
R120	control, volume (on TMA)	
R121	fixed film 15,000Ω 10% 5w	116515
R122	fixed film 15,000Ω 10% 5w	116515
R124	control, vertical height	112843
R125	control, red screen	113994
R126	control, contrast	116557
R130	fixed film 43000Ω 10% 5w	112852
R133	fixed film 6800Ω 10% 4w	107541
R134	fixed film 6800Ω 10% 3w	105662
R135	fixed film 39,000Ω 10% 4w	105753
R136	control, blue drive	113993
R137	control, green drive	113993
R139	control, green screen	113994
R141	control, blue screen	113994
R149	control, horiz hold	114018
R150	WW 680Ω 10% 15w	116644
R151	WW 560 10% 7w	116645
R152	fixed film 6800Ω 10% 4w	107541
R156	WW 3900Ω 10% 7w	102314
R162	control, top and bottom pin amplifier	116558
R216	control, sound rejection	116457
R221	47Ω 5% ½w	502047
R227	150Ω 5% ½w	502115
R232	4300Ω 5% ½w	502243
R274	200,000Ω 5% ½w	502420
R276	82,000Ω 5% ½w	502382
R279	fixed film 33,000Ω 10% 2w	
R283	33,000Ω 5% ½w	502333
R708	120,000Ω 5% ½w	502412
R709	6200Ω 5% ½w	502262
R710	6200Ω 5% ½w	502262
R711	fixed film 39,000Ω 10% 2w	
R719	fixed film 68,000Ω 10% 2w	
R726	fixed film 68,000Ω 10% 2w	
R729	27,000Ω 5% ½w	502327
R744	100Ω 5% 1w	512110
R753	fixed 33,000Ω 10% 3w	116516
R801	control, left blue horiz lines	116555
R804	control, left vert red/green lines	106320
R805	control, left horiz red/green lines	106320
R808	control, bottom blue horiz lines	109472
R811	control, top red/green vert lines	116635
R812	control, bottom red/green horiz lines	114623
R813	control, top red/green horiz lines	106320
R814	control, bottom red/green vert lines	106321
R815	control, top blue horiz lines	105059
RT101	themistor, part of yoke	
RT201	surge resistor	107191
RV101	varistor	114707
RV102	varistor	112876
RV201	varistor	112876
RV202	varistor	114862
RV203	varistor 67ma at 20v	116534
S104	switch, normal service	46760
S105	switch, kinescope bias	113398
SG101	spark gap 10,000pf 1000v	117139
SG701	spark gap .75pf 1000v	116636
SG702	spark gap .75pf 1000v	116636
SG703	spark gap .75pf 1000v	116636
T101	coil, focus control	113999
T102	xformer, hi voltage	116554
T103	xformer, prim 15,000Ω sec 4Ω	113997
T104	xformer, vert output	116537
T105	xformer, power	116553
T106	coil, video peaking	116538
T107	xformer, top and bottom pin cushion	115874
T201	xformer, sound IF	109261
T202	xformer, input demodulator (includes C205)	112870
T203	xformer, input demodulator (includes C208, R208)	106383
T204	xformer, 1st pix IF input (includes C206)	116560
T205	xformer, input 2nd pix	116545
T206	xformer, output 2nd pix IF 41.25Mc trap (includes C213)	116544
T701	xformer, band pass	116540
T702	xformer, burst phase	116541
T703	xformer, electron coupled oscillator (includes C730)	116542
Y701	crystal 3.58Mc	105330
	knob, VHF channel selector, GG-530M, W, Y	
	GG-532L	114873
	knob, VHF channel selector, FG-525E, W	115839
	knob, UHF channel selector and fine tuning, GG-530M, W, Y, GG-532L	114898
	knob, UHF channel selector and fine tuning, FG-525E, W	115842
	knob, volume and bright GG-530M, W, Y, GG-532L	114875
	knob, volume and bright, FG-525E, W	115841
	knob, color FG-525E, W	114360
	knob, color GG-530M, W, Y GG-532L	114892
	knob, tint FG-525E, W	114362
	knob, tint GG-530M, W, Y, GG-532L	114893
	knob, horiz vertical contrast FG-525E, W	114032
	knob, horiz vert contrast GG-530M, W, Y, GG-532L	114874
	speaker, 3" X 5" PM 3.2Ω FG-525E, W	112713
	speaker, 4" PM 3.2Ω GG-530M, W, Y, GG-532L	117338
RT101	thermistor, temp compensating 5Ω (part of yoke)	114742
	yoke, deflection	116324

RCA VICTOR
Color TV Chassis CTC19

985

MAGNAVOX

Tv Chassis T910

ELECTRONIC TECHNICIAN TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR SIX NEW SETS

FEBRUARY • 1966

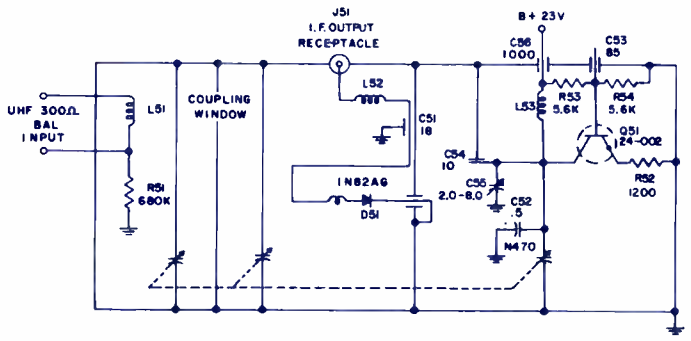
SPECIFICATIONS

Power Source Rating		IF System	
Frequency	60 cycles	Video IF	45.75MC
Voltage	117 volts	Sound IF	41.25MC
Wattage	130 watts	Intercarrier Sound IF	4.5MC
Tuning Range	Channels 2-83	Audio System	
		Output Impedance	3.2 ohms
Antenna Input Impedance	Balanced 300 ohms	Power Output	1 watt

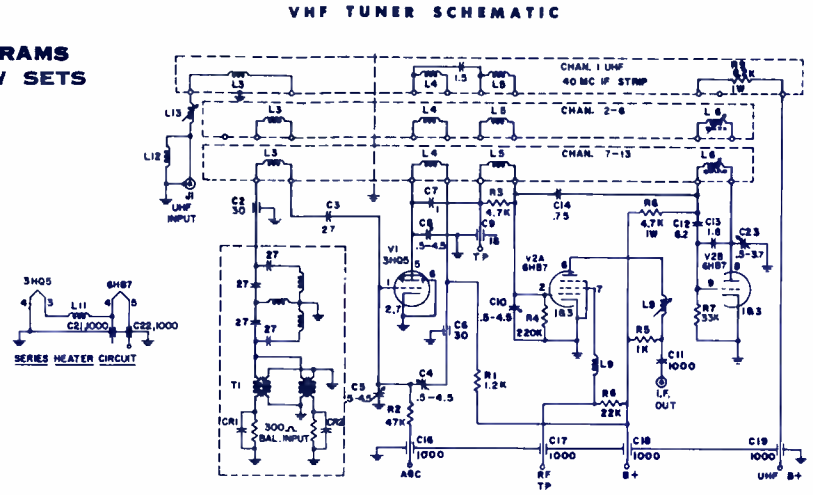
TUBE COMPLEMENT

Ref.	Function	Type	Ref.	Function	Type
V101	VHF Mixer Oscillator	6HB7	V7	Sound Detector & Audio Output	13V10
V102	VHF RF Amplifier	3HQ5	V8	Vertical Oscillator & Output	15KY8
V1	1st Video IF Amplifier	4BZ6	V9	Horizontal Oscillator	8FQ7
V2	2nd Video IF Amplifier	4BZ6	V201	Horizontal Output	18GB5
V3	3rd Video IF Amplifier	4CB6	V202	Damper	17AY3
V4	Video Amp. & Sync Separator	10GN8	V203	H. V. Rectifier	1G3GT
V5	AGC Amp. & Sync Splitter	6GH8	V204	Picture Tube	19FTP4/19FLP4
V6	Sound IF Amp.	4AU6			

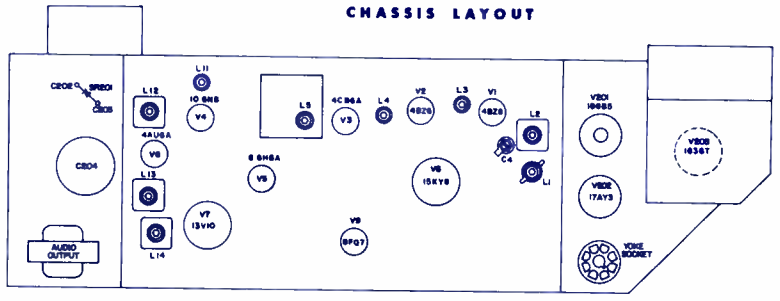
UHF TUNER SCHEMATIC

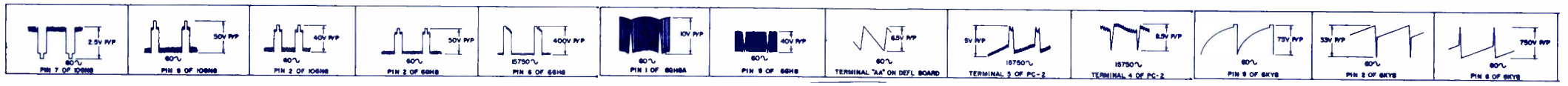


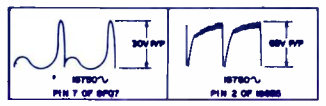
VHF TUNER SCHEMATIC

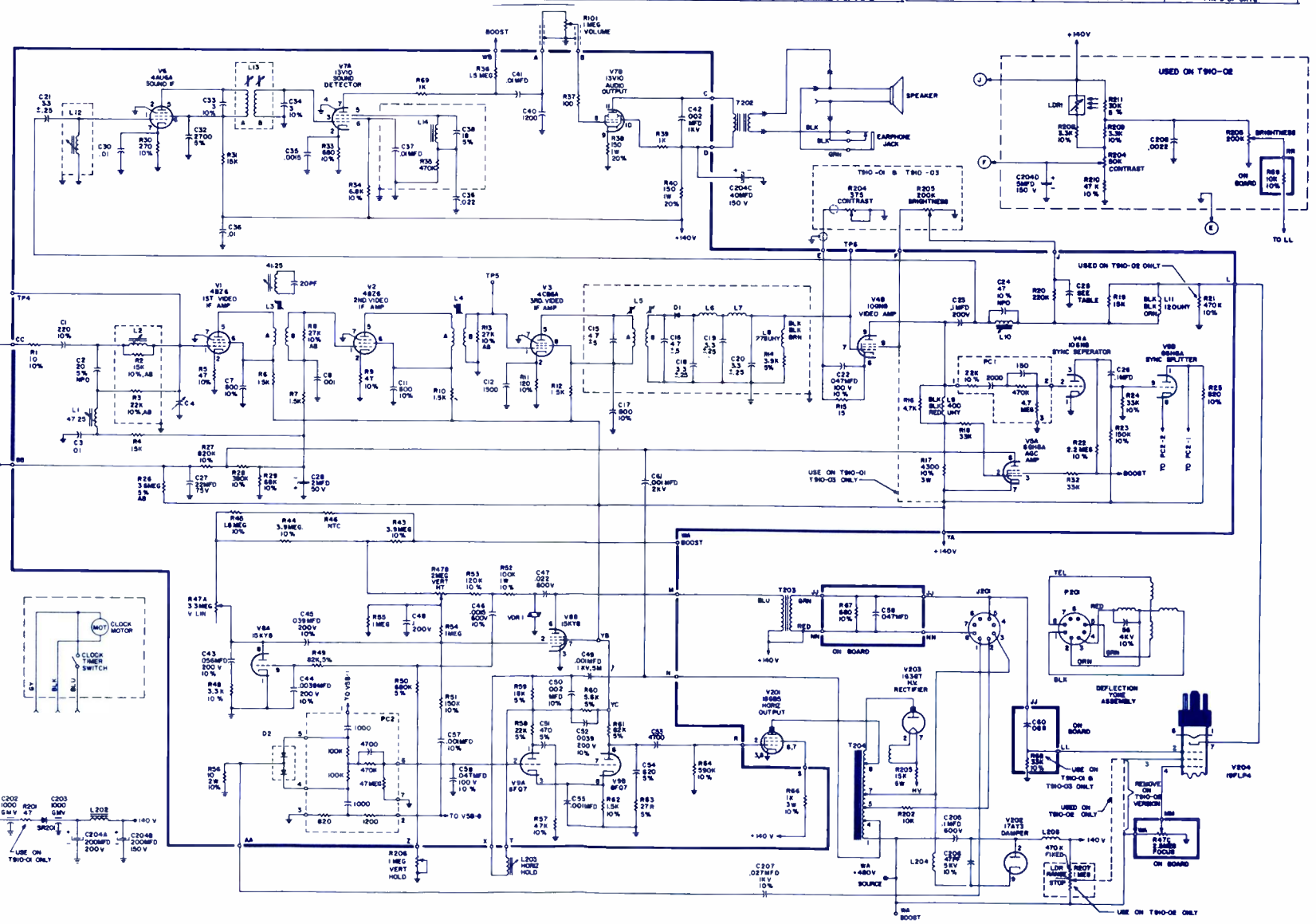


CHASSIS LAYOUT

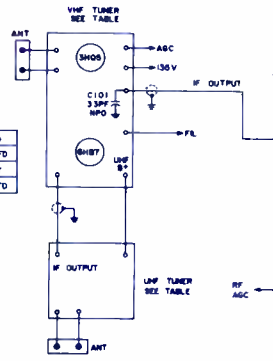








NOTE: TUNER TIE POINTS ARE SHOWN ONLY TO COMPLETE SCHEMATIC AND DO NOT SIGNIFY PHYSICAL LOCATIONS



CHASSIS	VHF TUNER	UHF TUNER	C25
910-01	340082	340084	.01 MFD
910-02	340078	340079	.01MFD
910 03	340078	340079	.01MFD

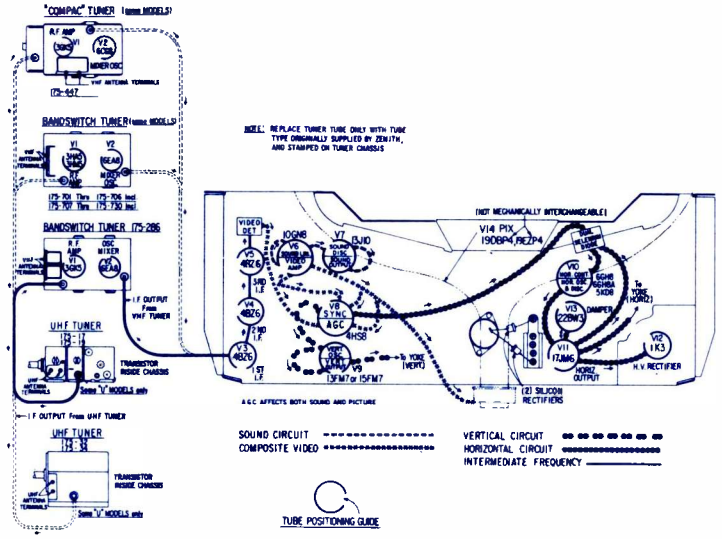
Symbol	Description	Magnavox Part No.
L1	47.25Mc trap	360842-1
L2	IF input coil	360848-1
L3	1st IF coil	361170-1
L4	2nd IF coil	360849-2
L5	3rd IF coil	361161-1
L6	90Mc tweet coil	360852-4
L7	90-160Mc tweet coil	361157-1
L8	278μh peaking coil	360853-1
L9	400μh peaking coil	360853-7
L10	4.5Mc trap	360851-1
L11	120μh peaking coil	360853-8
L12	4.5Mc sound take-off coil	360845-1
L13	4.5Mc sound IF coil	360846-3
L14	4.5Mc quad coil	360847-2
L201	line radiation choke	361075-1
L202	reactance choke	320325-1
L203	horiz osc coil	361171-1
L204	RF choke	360783-2
L205	RF choke	360783-2
T202	audio out xformer	320309-3
T203	vert out xformer	320328-1
T204	horiz out xformer	361172-1
C2	20pf 5% (NPO)	250546-2005
C4	trimmer	250371-2
C15	3.3pf ±.25pf	250546-3397
C16	4.7pf ±.25pf	250546-4798
C18	8.2pf ±.25pf	250546-8295
C19	4.7pf ±.25pf	250546-4798
C24	47pf 10% NPO	
C28	elect 2μf 50v	270082-701
C33	3pf 10% N330	250528-3099
C34	3pf 10% N1500	250529-3099
C38	18pf 5%	250527-1805
C39	.022μf GMV	
C49	silver mica, 1000pf 1000v	250542-1020
C51	polystyrene, 470pf 5%	250525-4712
C54	polystyrene, 620pf 5%	250525-6212
C204	elect 200μf 200v, 200/40μf 150v	270021-120
C204	elect 200μf 200v, 200/40/5μf, 150v	270021-121
C206	ceramic 82pf 10% 5000v	250475-30
C207	paper, .027μf 10% 1000v (special)	250290-13
R17	4300, 3w	230150-333
R26	3.6M 5%	
R46	thermistor	230130-2
R49	82K 5%	
R50	680K 5%	
R58	22K 5%	
R59	18K 5%	
R60	5600Ω 5%	
R61	82K 5%	
R63	27K 5%	
R66	1000Ω 3w	230150-318
R201	4.7 fusible	240080-19
R211	30K 5%	
R47	3.5M vert lin 2M height 2.5M focus	220218-1
R101	1M. off-on-vol (T910-02 & 03)	220135-21
R101	1M off-on-vol (T910-01)	220219-1
R204	375 contrast (T910-01 & 03)	220208-29
R204	50K contrast (T910-02)	220208-30
R205	200K brightness	220208-27
R206	1M vert hold	220208-31
R207	400K LDR range adjust	220208-26
LDR1	LDR	230168-1
VDR1	VDR	230167-2
SR201	silicon rectifier	530082-2
D1	video det diode (1N60)	530065-1
D2	dual selenium diode	530045-4
PC1	printed pac	250526-1
PC2	printed pac	250541-1
	VHF tuner (910-01)	340082-1
	VHF tuner (910-02 & 03)	340078-1
	UHF tuner (910-01)	340084-1
	UHF tuner (910-02 & 03)	340079-1

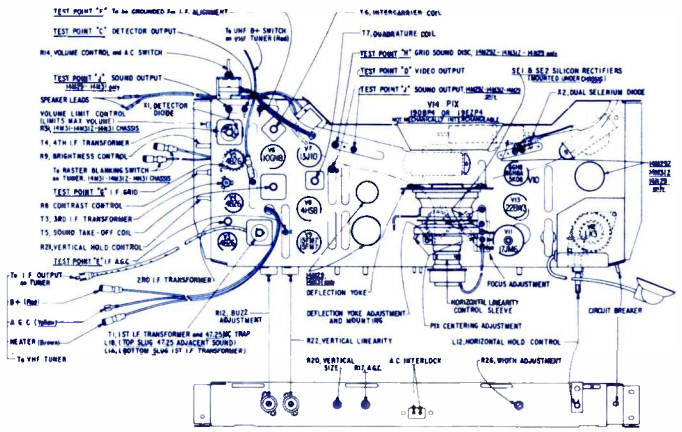
ELECTRONIC TECHNICIAN TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR SIX NEW SETS

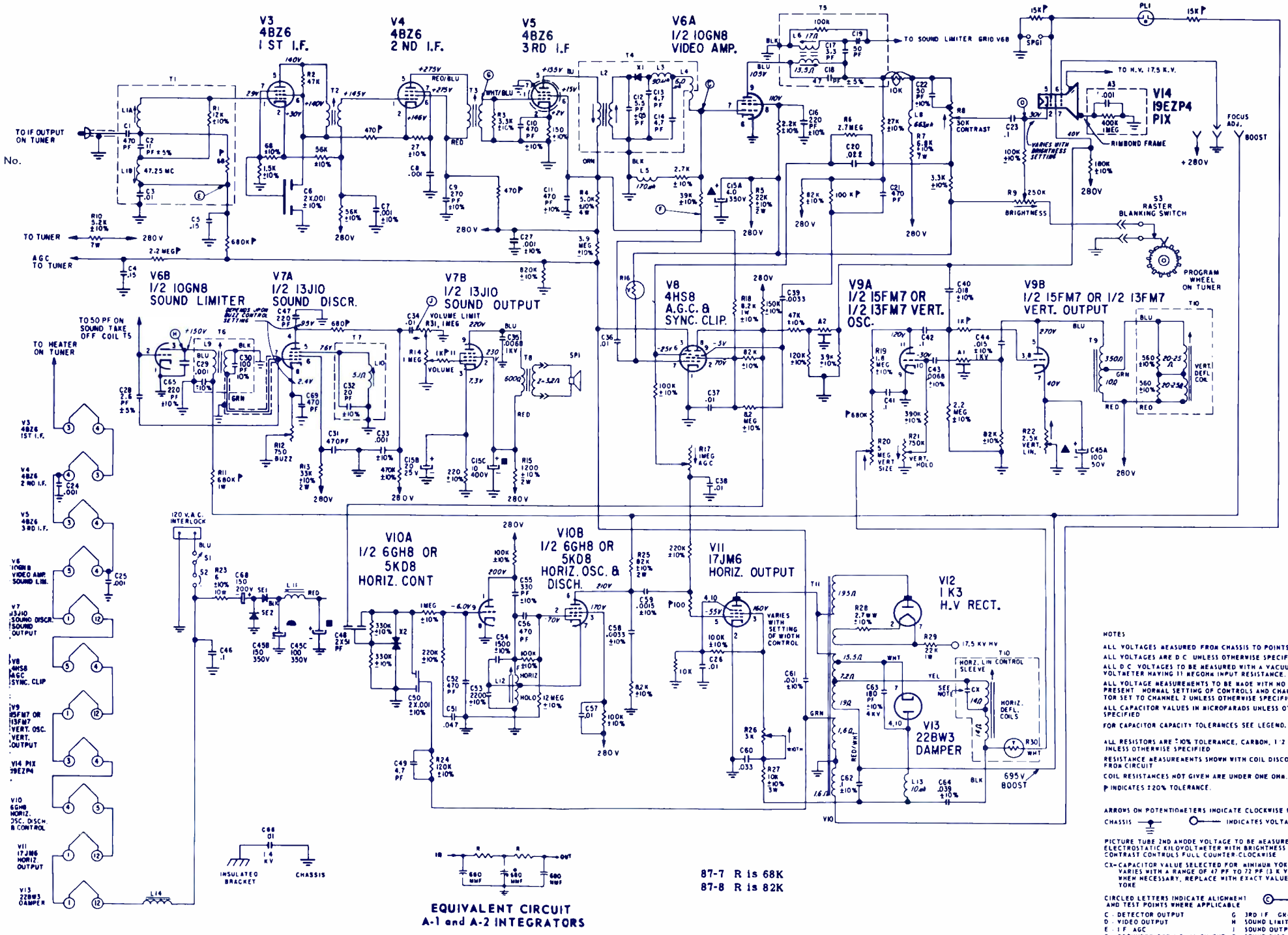
986
ZENITH
TV Chassis 14N31

FEBRUARY • 1966





Symbol	Description	Zenith Part No.
C7	.001μf disc 10% 1000v	22-17
C15A	4μf elect 350v	22-2744
C15B	20μf elect 25v	
C15C	10μf elect 400v	
C21	470pf disc 20% 1000v	22-6
C27	.001μf disc 10" 1000v	22-17
C29	.001μf disc 10% 1000v	22-3748
C30	100pf mica 10% 500v	22-9106
C35	.0068μf disc 10% 1000v	22-5021
C44	.015μf molded 10% 1000v	22-3040
C52	470pf disc 20% 1000v	22-6
C61	.001μf disc 10% 1000v	22-17
R1	12K A B only ½w	63-2845
R2	47K A B only ½w	63-2872
R3	3.3K A B only ½w	63-5384
R6	2.7M A B only ½w	63-5240
R7	6.8K 7w	63-5338
R8	30K contrast control	63-4997
R9	250K brightness control	63-5380
R10	5.2K resistor 7w	63-4754
R12	750Ω buzz control	63-5318
R14	1M volume control (AC switch)	63-6349
R16	VDR	63-5314
R17	1M AGC control	63-4833
R19	1.8M 10% A B only	63-4905
R20	5M vert size control	63-5030
R21	750K vert hold control	63-5379
R22	2.5K vert lin control	63-5309
R23	6Ω 10w	63-4450
R24	120K IRC only ½w	63-5314
R26	3K width control	63-5031
R28	2.7Ω WW ½w	63-3631
R30	thermal resistor supplied with yoke	in yoke
R31	1M volume limit control	63-4833
L1A, L1B	1st IF & trap coil winding assy	S-57621
L4	choke coil	20-2004
L5	det shunt peaking coil	20-2014
L6	sound take-off winding assy	S-54785
L7	video series peaking coil	20-2512
L8	video shunt peaking coil	20-2017
L10	quad coil winding assy	S-45229
L11	filter choke	95-1805
L12	horiz osc coil winding assy	S-56876
T5	sound take-off coil assy	S-65131
T6	intercarrier coil assy	S-71145
T7	quad coil assy	S-45831
T8	sound output xformer	95-2185
T9	vert output xformer	95-2186
T10	yoke	95-2290
T11	Horiz sweep xformer	S-71286
X1	diode crystal	103-23
X2	dual selenium diode	103-20
PL1	NE2H neon bulb	100-251
A1	integrator	87-7
A2	integrator	87-8
A3	R/C network	105-79
SE1	silicon rectifier	212-27
SE2	silicon rectifier	212-27
SPG1	spark gap	52 957
SP1	speaker	
S1	part of R14	
S2	circuit breaker	85-763
S2	raster blanking switch	85-822



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 TOLERANCES SEE LEGEND.

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.

℗ INDICATES ±20% TOLERANCE.

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

CHASSIS ⏚ ○— INDICATES VOLTAGE SOURCE.

PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLTMETER 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 K 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
P - SOUND DISC GRID

987

SYLVANIA
Color TV Chassis
DO3-2

ELECTRONIC TECHNICIAN **TEKFAX**

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR SIX NEW SETS

FEBRUARY • 1966

SCHEMATIC NOTES

IMPORTANT

READ THESE INSTRUCTIONS CAREFULLY AND OBSERVE THE CONDITIONS NOTED WHEN TAKING VOLTAGE READINGS OR OBSERVING WAVEFORMS.

PICTURE TUBE HIGH VOLTAGE ANODE MAY HAVE A POTENTIAL OF 22,000 VOLTS. OBSERVE ALL HIGH VOLTAGE PRECAUTIONS WHEN SERVICING THE CHASSIS. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COVER REMOVED. USE SAFETY GOGGLES AND GLOVES WHEN HANDLING THE PICTURE TUBE.

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED.

1. Voltage measured to chassis using VTVM.
2. AC power source 120 volt 60 cycle line.
3. Voltage readings in brackets taken with no input; channel selector set to a free channel, antenna disconnected, antenna terminals shorted together and grounded to chassis.
4. Voltage readings not in brackets taken with a strong signal input; tuner set to a strong local station.
5. Contrast and Brightness control set for normal picture.
6. Voltage values shown are average readings. Variations may be observed due to normal production tolerances.

WAVEFORM MEASUREMENT CONDITIONS

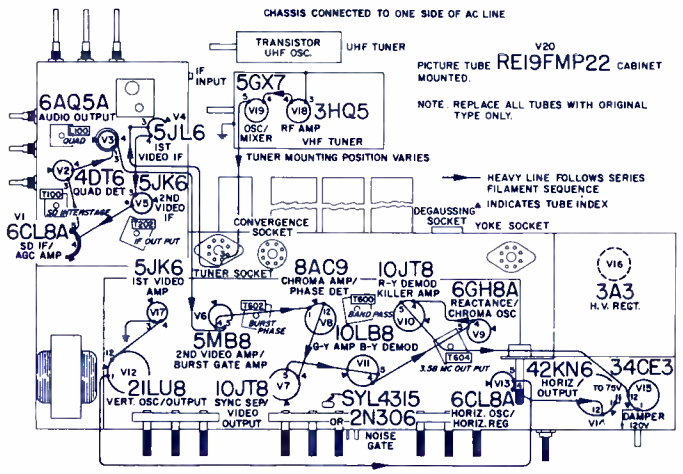
1. Waveforms taken using a strong signal (test pattern).
2. All controls set for a normal viewing picture.
3. Waveforms measured with respect to chassis using a TEKTRONIC 535 oscilloscope. (Other type oscilloscopes may alter waveform shapes or amplitude.)
4. The terms "VERT" or "HORIZ" refer to scope frequency.
5. VPP refer to peak voltage.
6. Waveforms marked with an (*) were taken using a color bar generator as signal source.

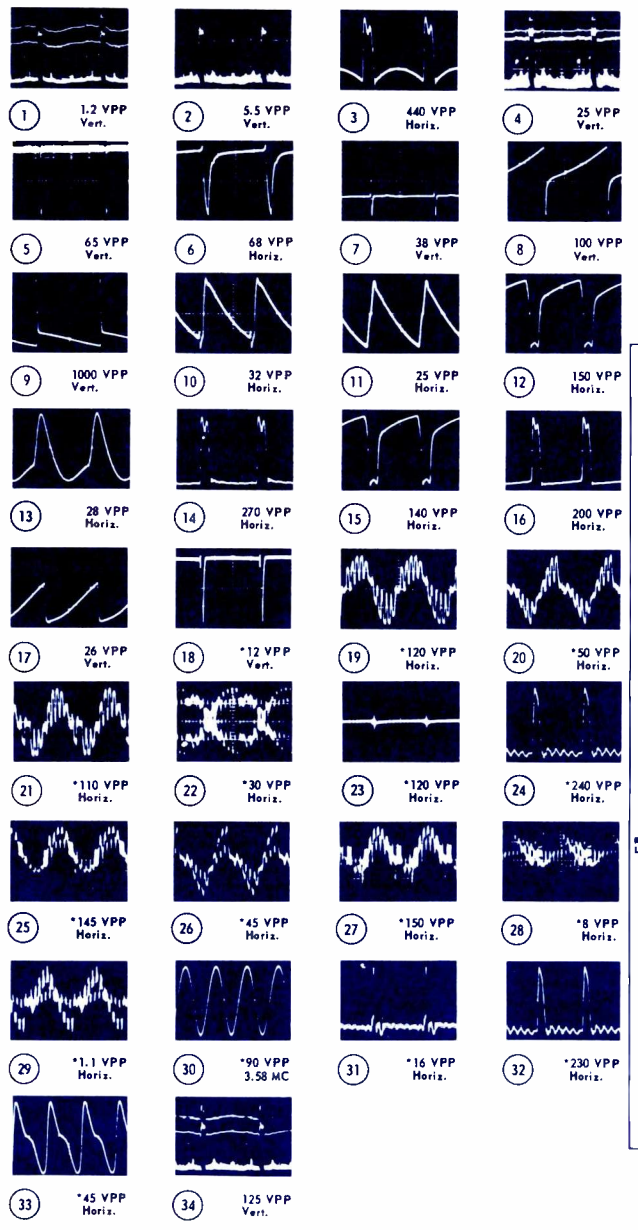
GENERAL SCHEMATIC NOTES

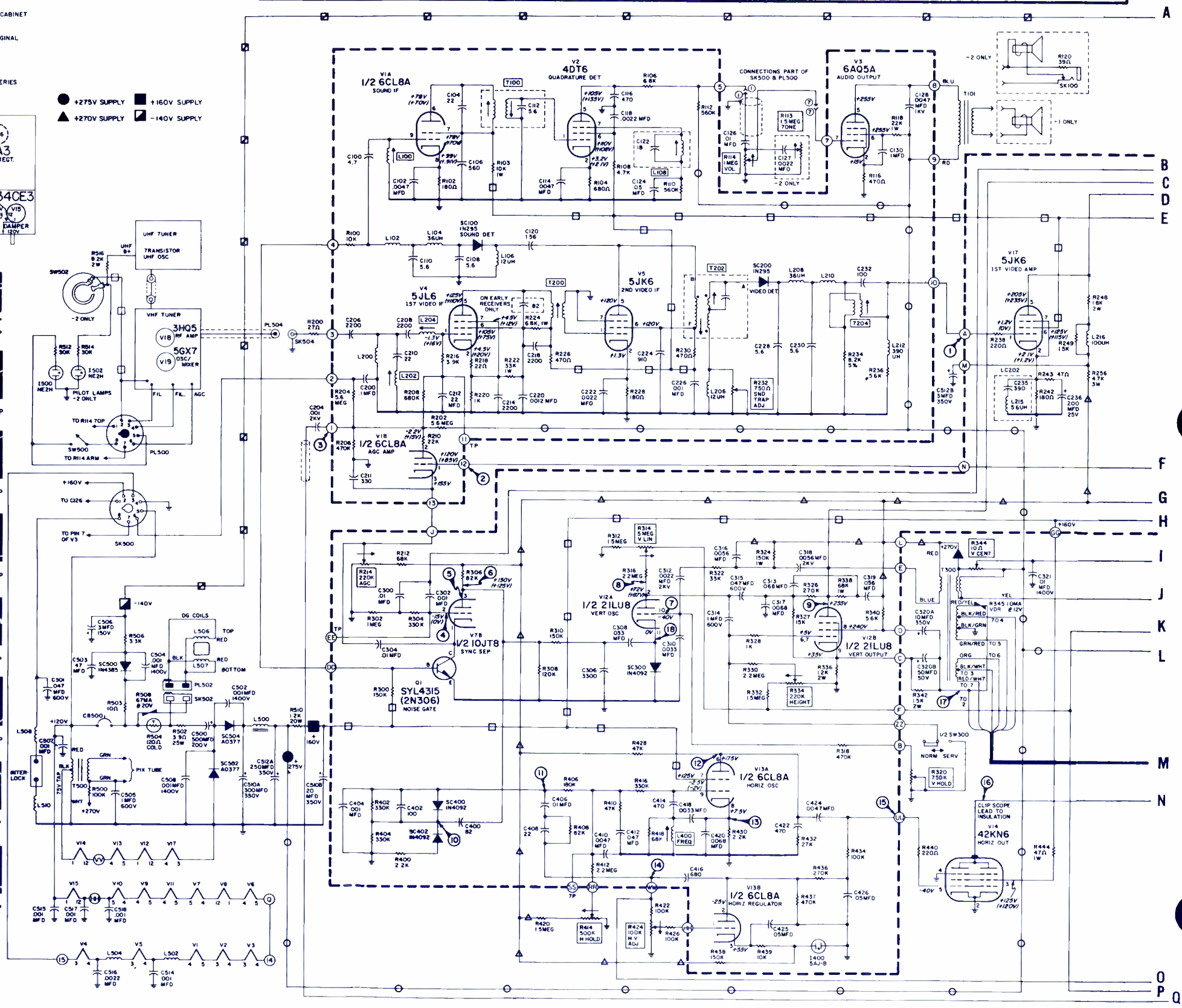
1. Encircled letters on edge of printed circuit indicate tie points, corresponding with those shown on printed board parts layout.
2. (+ -) denotes printed board areas.
3. All capacitors are in MF unless otherwise specified.
4. Arrows on controls indicate direction of clockwise rotation.

PARTS CODING

Sound Section	100-199
Video Section	200-299
Vert. and Sync Section	300-399
Horiz. and H.V. Section	400-499
L. V. Supply and Misc.	500-599
Chroma Section	600-699
Convergence Section	700-799







  • OJIBWAY BUILDING, DULUTH, MINNESOTA 55802

More Data on Opposite Page

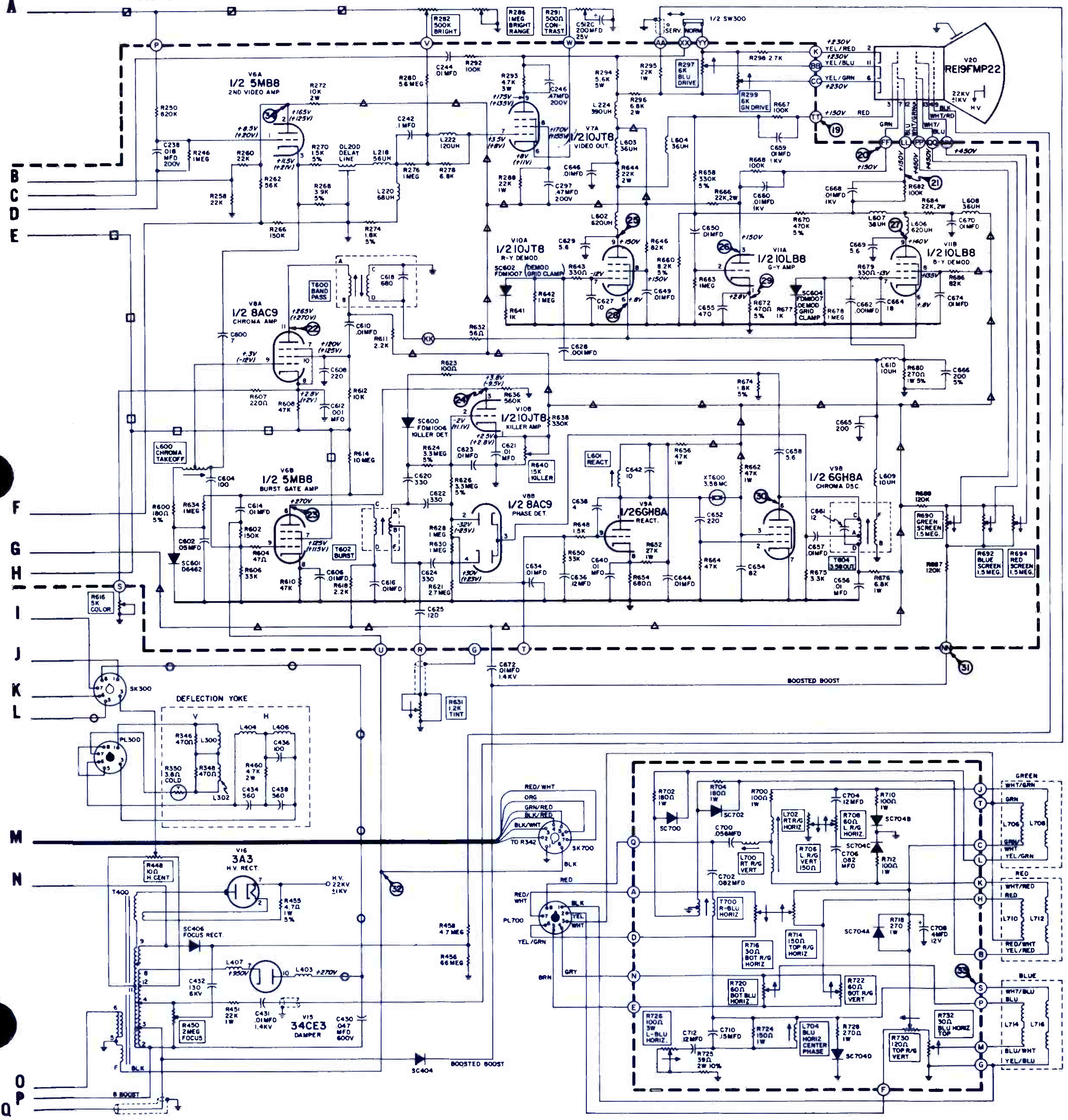
SYLVANIA
Color TV Chassis DO3-2

PICTURE TUBE REMOVAL ⟶

1. Remove Chassis, Yoke and Degaussing Coil as outlined under their removal procedure.
2. Lay cabinet face down on a soft material so as not to scratch or mar the face of the picture tube or finish on cabinet.
3. Loosen the mounting strap tightening bolt until tension is relieved on strap.
4. Remove picture tube grounding spring.
5. Remove screws securing picture tube mounting brackets to cabinet and remove brackets and strap.
6. USING GOGGLES AND GLOVES, reach under face of tube and lift tube from cabinet.

NOTE: When replacing tube exercise caution not to damage pins when reconnecting picture tube socket.

NOTE: TO REPLACE CHASSIS, TUNER CLUSTER, YOKE, PICTURE TUBE AND DEGAUSSING COIL REVERSE THE PROCEDURE GIVEN IN THEIR REMOVAL PROCEDURE MAKING CERTAIN THAT ALL GROUND CABLES ARE REPLACED IN THEIR ORIGINAL POSITION.



More Data on Opposite Page

Symbol	Description	Sylvania Part No.
C100	4.7pf NPO 500v	
C104	22pf NPO 500v	
C108	5.6pf NPO 500v	
C110	5.6pf NPO 500v	
C128	.0047µf 1kv	
C204	.001µf 2kv	43-84222-18
C210	22pf NPO 500v	
C228 }	5.6pf NPO 500v	
C230 }	5.6pf NPO 500v	
C236	200µf 25v elect	41-15820-20
C312	.0022µf 2kv	45-15907-3
C320	2 section elect	
A	10µf 350v	41-17318-1
B	50µf 50v	
C321	.01µf 1400v	169-0138
C400	82pf NPO 500v	
C402	100pf NPO 500v	
C408	22pf NPO 500v	
C431	.01µf 1.4kv	169-0138
C500	500µf 200v elect	41-17315-1
C502	.001µf 1.4kv	43-93010-2
C504	.001µf 1.4kv	43-93010-2
C506	3µf 150v elect	41-96355-12
C508	.001µf 1.4kv	43-93010-2
C510	2 section elect	
A	300µf 350v	41-17316-1
B	20µf 350v	
C512	3 section elect	41-17317-1
A	250µf 350v	
B	3µf 350v	
C	200µf 25v	
C600	7pf NPO 500v	
C604	100pf N750 500v	
C608	220pf N750 500v	
C627	18pf NPO 500v	
C629	5.6pf NPO 500v	
C642	10pf NPO 500v	
C659	.01µf 1kv	43-15012-29
C660	.01µf 1kv	43-15012-29
C664	18pf NPO 500v	
C668	.01µf 1kv	43-15012-29
C672	.01µf 1.4kv	169-0138
C708	4µf 12v elect	41-17245-1
R246	1M 2% 500v	35-16258-44
R250	1M 2% 500v	35-16258-44
R256	4.7K 3w 500v	187-0017
R268	3.9K 5% 500v	
R270	1.5K 5% 500v	
R272	10K 2w 500v	
R274	1.8K 5% 500v	
R293	4.7K 3w 500v	187-0017
R294	5.6K 5w 500v	35-92495-49
R345	VDR 1.0ma @ 12v	38-15257-7
R350	3.8Ω thermistor	part of yoke
R455	4.7Ω 5% 1w 500v	
R456	66M 500v	35-97961-3
R502	3.9Ω 25w 500v	36-92898-33
R504	120Ω cold thermistor	38-17071-1
R508	VDR 67ma @ 20v	38-17072-1
R510	1.2K 20w 500v	36-92898-35
R600	180Ω 5% 500v	
R614	10M 500v	
R624	3.3M 5% 500v	
R626	3.3M 5% 500v	
R628 }	1M 2% 500v	35-16258-44
R630 }	1M 2% 500v	35-16258-44
R644	22K 2w 500v	35-92495-87
R658	330K 5% 500v	
R660	8.2K 5% 500v	
R666	22K 2w 500v	35-92495-87
R670	470K 5% 500v	
R672	470Ω 5% 500v	
R674	1.8K 5% 500v	
R680	270Ω 5% 1w 500v	
L100	coil, quad	57-11602-1
L102	coil, filter	50-11378-1
L104	coil, tweet 36µh	50-16103-13
L106	coil, peaking 12µh	50-85953-13
L108	coil, quad	57-11602-1
L200	coil, IF link	50-17680-3
L202	coil IF trap	57-11637-1
L204	coil IF input	57-17842-1
L206	coil peaking 12µh	50-85953-13
L208	coil tweet 36µh	50-16103-13
L210	coil filter	50-11378-1
L212	coil peaking 390µh	50-15318-15
L215	"see misc elect parts"	part of LC202
L216	coil peaking 100µh	50-15318-8
L218	coil peaking 56µh	50-15318-5
L220	coil peaking 68µh	50-15318-6
L222	coil peaking 120µh	50-15318-9
L224	coil peaking 390µh	50-15318-15
L300 }	coil vert deflection	part of yoke
L302 }	coil vert deflection	part of yoke
L400	coil horiz frequency	50-17326-1
L403	coil RF choke	118-0010
L404	coil horiz deflection	part of yoke
L406	coil horiz deflection	part of yoke
L407	coil RF choke	118-0010
L500	coil B plus choke	56-17568-1
L502	coil filament choke	50-85963-2
L504	coil filament choke	50-85963-2
L506	coil degaussing	50-17113-4
L507	coil degaussing	50-17113-4
L508	coil line choke	50-17838-1
L510	coil line choke	50-17838-1

Symbol	Description	Sylvania Part No.
L600	coil, chroma take off	50-16184-4
L601	coil, reactance	50-16185-3
L602	coil, filter 620µh	50-17593-1
L603	coil, peaking 36µh	50-16103-13
L604	coil, peaking 36µh	50-16103-13
L606	coil, peaking 620µh	50-17593-1
L607	coil, peaking 36µh	50-16103-13
L608	coil, peaking 36µh	50-16103-13
L609	coil, peaking 10µh	50-85953-14
L610	coil, peaking 10µh	50-85953-14
L700	coil, convergence rt. R/G vert	50-16248-5
L702	coil, convergence rt. R/G horiz	50-16248-6
L704	coil, convergence blue horiz center	50-17850-1
L706	coil, convergence green	conv. yoke
L708	coil, convergence green	conv. yoke
L710	coil, convergence red	conv. yoke
L712	coil, convergence red	conv. yoke
L714	coil, convergence blue	conv. yoke
L716	coil, convergence blue	conv. yoke
T100	xformer, sound interstage	57-11606-1
T101	xformer, audio output	56-97301-11
T200	xformer, IF interstage	57-17339-1
T202	xformer, IF output	50-17517-1
T204	xformer, 4.5Mc trap	50-16238-5
T300	xformer, vert output	56-17559-2
T400	xformer, horiz output	50-17314-1
T500	xformer, pix tube fil	55-17325-1
T600	xformer, bandpass	50-17542-1
T602	xformer, burstphase	50-16191-2
T604	xformer, 3.58Mc output	50-17597-1
T700	xformer, convergence R. blue horiz	50-16248-8
CB500	circuit breaker	29-17312-1
DL200	delay line	32-16108-3
I400	lamp, Neon	30-17794-2
I500 }	lamp, Neon NE2H	30-97684-2
I502 }	lamp, neon NE2H	30-97684-2
LC202	coil/capacitor combination	50-17246-1
L215	5.6µh	
C235	390	
SC100 }	diode, sound det	IN295
SC200 }	diode, video det	1N295
SC300	diode, vert sync injection	1N4092
SC400 }	diode, AFC	1N4092
SC402 }	diode, AFC	1N4092
SC404	diode, boosted boost	13-16105-3
SC406	diode, focus rect	13-16106-1
SC500	diode, 140v rectifier	13-17174-1
SC502	diode, B plus rectifier	13-17557-1
SC504	diode, B plus rectifier	13-17557-1
SC600	diode, killer det	13-17596-2
SC601	diode, killer clamp	D6462
SC602	diode, demodulator grid clamp	13-17596-3
SC604	diode, demodulator grid clamp	13-17596-3
SC700	diode, silicon	13-10102-1
SC702	diode, silicon	13-10102-1
SC704	diode, silicon 4 section	13-17569-1
SW300	switch, normal/service	33-16011-5
SW500	switch, on/off	part of R114
SW502	switch, dial light	33-17709-1
XT600	crystal, 3.58Mc	26-16162-1
R113	1.5M tone 2ch	37-15229-5
R114	1M vol	37-11959-9
R214	220K AGC	37-11632-7
R232	750Ω snd trap adj	37-17321-1
R282	500K brightness	37-17073-14
R286	1M brightness range	37-17349-2
R291	500Ω contrast	37-17073-12
R297	6K blue drive	37-11632-8
R299	6K green drive	part of R297
R314	5M ver lin	part of R214
R320	750K vert hold	37-17073-11
R334	220K vert height	part of R214
R344	10Ω vert cent	37-16021-17
R414	500K horiz hold	37-17073-10
R424	100K high volt adj	37-17349-1
R448	10Ω horiz cent	37-17539-1
R450	2M focus	37-17320-1
R616	5K color	37-17073-16
R631	1.2K tint	37-17073-13
R640	15K killer	part of R297
R690	1.5M green screen	37-11632-9
R692	1.5M blue screen	part of R690
R694	1.5M red screen	part of R690
R706	150Ω L R/G vert	37-16021-7
R708	60Ω L R/G horiz	37-16021-2
R714	150Ω top R/G horiz	37-16021-7
R716	30Ω bottom R/G horiz	37-16021-6
R720	60Ω bottom blue horiz	37-16021-2
R722	60Ω bottom R/G vert	37-16021-2
R726	100Ω L blue horiz	37-16021-21
R730	120Ω top R/G vert	37-16021-5
R732	30Ω top blue horiz	37-16021-6
Q1	transistor, noise gate	4315
	magnet, blue lateral & purity	22-15948-1
	socket, tube V16	72-17924-1
	yoke, convergence	51-17083-2
	yoke, deflection	51-17570-1

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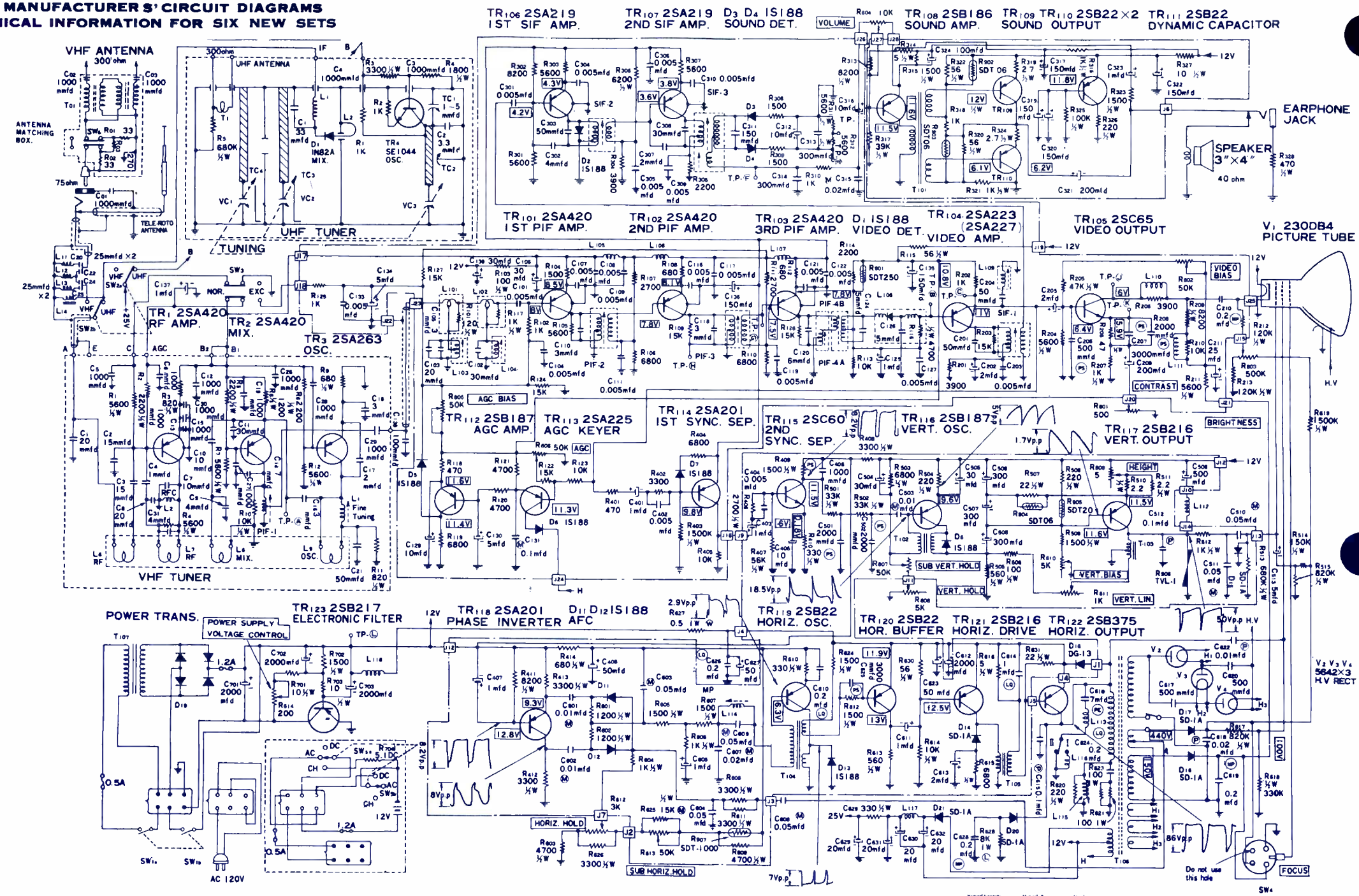
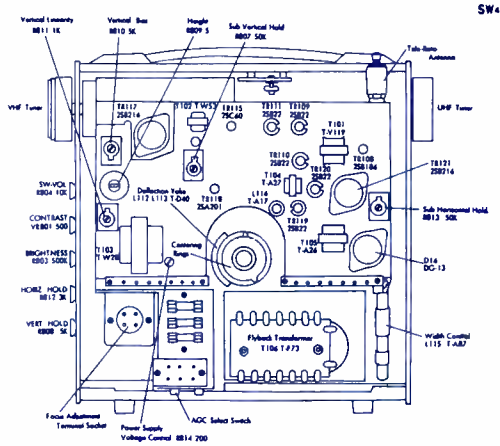
ELECTRONIC TECHNICIAN **TEKFAX**

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR SIX NEW SETS

FEBRUARY • 1966

Symbol	Description	Silvertone Part No.
C106, C504, C505, C139, C125, C137, C323, C401, C403, C407,	elect 30μf 25wv	T-C7075
C605, C611, C135, C317, C319, C320,	elect 1μf 25wv	T-C7068
C322, C136	elect 150μf 12wv	T-C7053
C202, C205	elect 2μf 20wv	T-C7070
C209, C321	elect 200μf 10wv	T-C7036
C211	elect 25μf 100wv	T-C7077
C312	elect 10μf 6wv	T-C7023
C324	elect 100μf 3wv	T-C7033
C408, C623, C627	elect 50μf 25wv	T-C7076
C506, C507	elect 300μf 3wv	T-C7092
C508	elect 300μf 10wv	T-C7093
C509	elect 500μf 12wv	T-C7038
C612, C701, C702, C703	elect 2000μf 20wv	T-C8153
C613	elect 2μf 80wv	T-C7071
C513	elect 5μf 300wv	T-C7011
C629, C630, C631, C632	elect 20μf 50wv	T-C7087
R627	0.5Ω 1w ±5%	T-HRWO. 5-JB
R801	500Ω contrast	T-G1610
R802, R806	50K AGC & video bias	T-G0035
R803	500K brightness	T-G1603
R804	10K volume	T-G1604
R805	50K AGC bias	T-G0023
R807, R813	50K sub vert hold & sub horiz hold	T-G0027
R808	5K vert hold	T-G1616
R809	5Ω vert height	T-G2021
R810	5K vert bias	T-G0029
R811	1K vert lin	T-G0030
R812	3K horiz hold	T-G1605
R814	200Ω power supply volt control	T-G1615
PIF-2	IF xformer, 2nd & 3rd	
PIF-3	video	T-S8004
PIF-4A	IF xformer, 4th A video	T-S8005A
PIF-4B	IF xformer, 4th B video	T-S8005B
L105, L106		
L107	coil, filter	T-L156
L108	video det block	T-S1015
L109	trap, 4.5Mc	T-S48V
SIF-1, SIF-2	IF xformer 1st & 2nd sound	T-S302
L110	coil, peaking	T-L2506
L111	coil, peaking	T-L2504
SIF-3	sound det xformer	T-S303
L112, L113	deflection yoke	T-D40
L114	coil, horiz stabilizer	T-A17
L115	coil, width control	T-A87
L116	coil, deflection compensate	T-L7017
L117, L118	choke, horiz filter	T-L7012
T101	xformer, sound input	T-V119
T102	xforomer, vert osc	T-W53
T103	xformer, vert output	T-W28
T104	coil horiz osc	T-A27
T105	xformer horiz drive	T-A26
T106	xformer flyback	T-F73
T107	xformer, power	T-P34A
TR101, TR102, TR103	1st, 2nd & 3rd PIF 2SA420	T-Q5038
TR104	2SA223 or 2SA227 video amp	T-Q5022
TR105	2SC65 video output	T-Q5032
TR106, TR107	2SA219 1st & 2nd SIF	T-Q5021
TR108	2SB186 sound amp	T-Q5026
TR109, TR110, TR111, TR119, TR120	2SB22 sound output, dynamic capacitor, horiz osc. horiz buffer	T-Q5025
TR112, TR116	2SB187 vert osc AGC amp	T-Q5027
TR113	2SA225 AGC keyer	T-Q5023
TR114, TR118	2SA201 1st sync separator, phase inverter	T-Q5020
TR115	2SC60 2nd sync separator	T-Q5031
TR117, TR121	2SB216 vert out, horiz drive	T-Q5028
TR122	2SB375 horiz output	T-Q5030
TR123	2SB217 elect filter	T-Q5036
D1	1S188 video det (included in L108)	T-E1031
D2, D3, D4, D5, D6, D7, D8, D11, D12, D13	1S188 sound det, sound IF limiter, noise limiter vert. osc pulse clipper, AFC phase det & horiz osc pulse clipper	T-E1031
D14, D15, D17, D18, D21, D20, D19	SD-1A reverse current stopper	T-E1029
	selenium rectifier, power supply	T-E1042
D16	DG-13 damper	T-E1045
V2, V3, V4	5642 HV rectifier (3 used)	T-Q3034





NOTES:
1. All resistance values in ohms K=1,000 M=1,000,000.
2. Types of resistors.
   (L): Carbon film (W): Wire wound resistor
   All resistance not designated as above are carbon composition resistors.
3. All resistance 1/4 watt unless otherwise noted.
4. Types of capacitors.
   (P): Paper (MF): Metalized paper
   (M): Mylar (PE): Polyethylene
   (LQ): Lacquer
   (PS): Polystyrene
   All capacitors not designated as above are ceramic capacitors.
5. Voltage reading taken with "VTVM" from point indicated to chassis ground, Tuner on unused channel, contrast at maximum, AGC at maximum clockwise, other control at normal, line voltage 120 volts.
6. All wave forms measured with strong signal input, contrast set to give normal picture and AGC line operating normally.
7. Voltage reading may vary ±20%.

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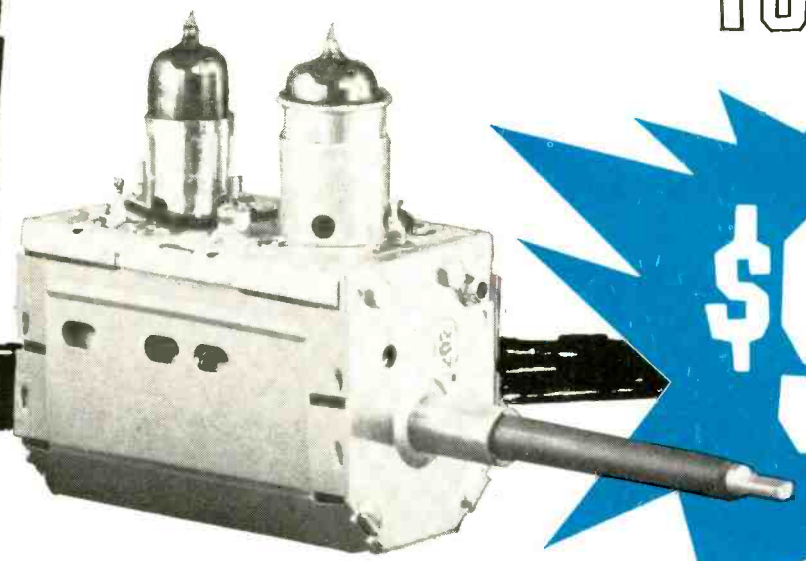
Complete TUNER REPAIR for only $9.50



Sarkes Tarzian, Inc., largest manufacturer of TV and FM tuners, offers unexcelled tuner overhaul and factory-supervised repair service. Completely-equipped and conveniently-located Service Centers offer fast, dependable and factory-supervised repair service on all makes and models. Centers are staffed by well-trained technicians, assisted by engineering personnel.

Tarzian-made tuners received one day will be repaired and shipped out the next. More time may be required on other makes. Every channel—not just the channels existing in any given area—is checked and re-aligned per original specifications. Exclusive cleaning method makes the tuner look—as well as operate—like new.

Cost, including ALL labor and parts (except tubes) is only $9.50 and $15 for UV combinations. No additional charge. No hidden costs. Too, you get a full, 12-month warranty against defective workmanship and parts failure due to normal usage.

Always send TV make, chassis and Model number with faulty tuner. Check with your local distributor for Sarkes Tarzian replacement tuners, parts or repair service. Or, use the address nearest you for fast, factory-supervised repair service.

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(Factory-supervised tuner service authorized by Sarkes Tarzian, Inc.)

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TUNER SERVICE DIVISION
537 S. Walnut Street, Bloomington, Indiana
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WEST—10654 Magnolia Blvd., N. Hollywood, Calif.
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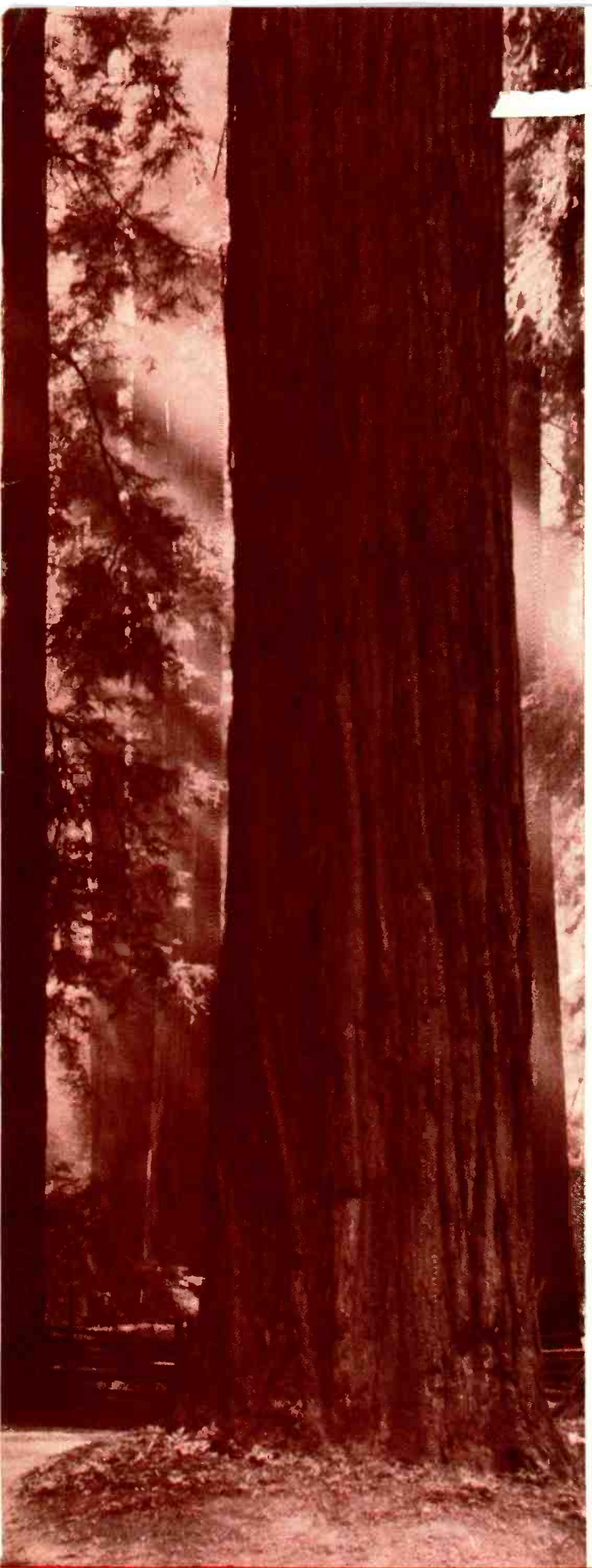

U.H.F.

HERE TO STAY

More and more UHF television stations and UHF translator stations are going on the air every day across the country. And the number is increasing rapidly. UHF is accepted . . . is here to stay.

Every new UHF station represents a whole new untapped profit area for electronics distributors and independent television repair men. Most of the existing television sets now in use were manufactured prior to 1965, and are not equipped with UHF reception. Every TV set owner in your trading area is practically a sure sale for a UHF television converter . . . *either a built-in* or "on-the-top" unit.

NOW, WHICH MAKE ARE YOU GOING TO SELL TO INSURE HIGH PROFITS?

It's always smart business to stick with a winner. Wherever UHF has gone on the air — Los Angeles, Chicago, Detroit, Boston, Philadelphia, — Standard Kollsman UHF Converters have consistently been Number 1 in distributor preference, dealer preference and consumer preference. *And in the small translator communities*, SK's superior performance at the top of the band makes it especially preferred.

Standard Kollsman quality and dependability means a Final Sale —No Returns. Reliable, service-free tuning elements. Built-in safeguards against spurious radiation. Guaranteed by the world's largest manufacturer of television tuners.

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LETTERS TO THE EDITOR

Mystery Bars

I can't explain this one but my experience may help some ET readers. An RCA Victor chassis, KCS132N, had a series of horizontal bars in the picture that varied with the sound output. The waveforms at the CRT cathode showed that the picture was being modulated. Further scoping showed the same throughout the video circuits. Horizontal and vertical sync waveforms appeared perfect and power supply ripple voltage was normal. But the grid voltage at pin 6 of the CRT (23EP4) varied.

For no reason that I can give, I tried adjusting the width coil — and it had no effect on either the width or the hum bars. I substituted the coil and the bars disappeared!

ROBERT A. DONALDSON
Paterson, N.J.

He's Fascinated With Color

Recently one of my staff of TV technicians returned to us from Halifax, Nova Scotia, after 18 months, where he was fortunate enough to have a "Color TV Crash Course." He returned with a considerable amount of literature, including ELECTRONIC TECHNICIAN in which I have been absorbed since he handed them to me.

I am simply amazed at the information and help your technicians are able to obtain from your publications and the presentation of these articles have convinced me that color TV holds a fascination that B/W lacks . . . I have been a TV technician for 13 years and at present hold the position of senior technician and foreman of the largest workshops in Rhodesia.

L. FANNING
Salisbury, Rhodesia

Needs CRT Test Adapters

About three years ago I purchased a "Realistic TK-113 Professional Tube Tester Kit" from Radio Shack. This kit is supposed to test CRTs, as well as transistors and regular tubes with a set of adapters (Model P-1, 90 deg, model P-2 100 deg). The tester did not include these adapters and I can't obtain them.

I am wondering if any ET reader can tell me if any other adapters can be used with this equipment or if anyone can furnish me with schematics of these two adapters.

WAYNE W. GREGORY
Chicago, Ill.

1,863 reasons why Sprague Twist-Lok® Capacitors help you to protect your reputation

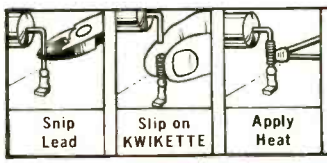
When you fool around with makeshift or "fits-all" capacitor replacements by substituting sizes and ratings, you leave yourself wide open for criticism of your work, you risk your reputation, and you stand to lose customers. With so much at stake, it just doesn't pay to use makeshifts when it's so easy to get exact replacement capacitors from your Sprague distributor.

With 1,863 different Sprague Twist-Lok Capacitors as standard catalog items, and more being added regularly, Sprague gives you the world's most complete selection of exact replacements.

We don't have to tell you that it's easier to service with exact replacements. And we don't have to tell you that it's better, too. When sets are designed, specific capacitance values are used for peak operation, so it takes exact replacements to restore original set performance.

And who better than Sprague knows which values and sizes are needed in the replacement market? Sprague, the world's largest component manufacturer, has the most complete specification file on original set requirements. That's why you're always right when you work with Sprague Twist-Lok exact replacements!

GET YOUR COPY of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-107 from your Sprague Distributor.



HAVE YOU TRIED KWIKETTE* CONNECTORS?

Not just another wire spring connector! Copperweld wire inner core, a layer of flux, and an outer coating of solder . . . all you supply is heat! Now being packed with Sprague Atom® Capacitors at no extra cost to you! See your distributor!

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LETTERS TO THE EDITOR

Call-Backs

I would like to discuss a problem that most newcomers and many old-timers in this business find difficult to understand. I am not a newcomer by any means but it seems uncanny how many call-backs we have to contend with. Few technicians dare discuss this — least of all with customers. And even other technicians seldom discuss it between themselves. We seldom admit having to make call-backs perhaps because it is generally understood that less experienced technicians make more of them than the "experts." In fact, the largest percentage of call-backs are generally the technician's fault — because of his inability to anticipate certain things as well as the more experienced man.

But, no matter how experienced a technician may be, he is occasionally deluged with call-backs. Some days, it seems, you make more call-backs than regular calls. You may coast along for weeks without one and then look back at that "unfortunate week" where call-backs cut deep into profits. You think of that week as "just one of those things" and you'll wager it won't happen again. And when you hear another technician complaining about call-backs, you just don't appreciate it. You may even go so far as to pity this poor fellow.

Then, before you know it, you're in the middle of a call-back cycle yourself! Like that job where the CRT was dead. The customer said "I had no other trouble before this happened." Then you installed a new CRT in the house and the set still didn't work properly. Then you discovered an intermittent a few days later — in the video section — which had nothing to do with the dead CRT.

Some call-backs are expected. But, the unpredictability of it all — this is one thing I'll never understand as long as I'm in this business.

OSCAR SCHECTAR

Pittsburg, Pa.

● *Most successful service-dealers have found that call-backs have little to do with individual technician experience and know-how. Call-backs can be reduced primarily by following strict servicing routines and applying servicing techniques which have been proven by experience, intelligent organization and proper management procedures.—Ed*

In Need

I need a schematic and alignment instructions for a Peterson AFM-2 AM/FM tuner. Can any ET reader help me?

R. M. LEE

Freedom, Calif.

Filing ET Articles

Here's a suggestion for J. Roulean (December ET Letters to the Editor). After I read each copy of ET I pull the binding staples, separate the pages, keeping only contents page listing and articles I want to file. Saving the covers, I punch the margin and insert in Accopress binders (BF250 EMB) available at office supply stores, with a gummed label tab for each month on the right edge of the front cover page, staggering the tabs. At the end of the year I go through each copy and circle on contents page each article I kept of special interest. One folder for each year makes a nice sized book and really saves shelf space. Until I started this system, I was ready to throw away all my years accumulation which were collecting dust in boxes taking up space.

D. L. JOHNSON

Hialeah, Fla.

FREE!

Offer extended through April 1, 1966

Get a Color-TV TEST Picture Tube with every RCA WR-64B Color Bar/Dot/Crosshatch Generator you buy

Yes! You read right!

From now through April 1, 1966—with every purchase of an RCA WR-64B Color Bar Generator—you get a FREE color-TV TEST picture tube for use in your color-TV test jig. This is a 21-inch 70° round color-TV TEST picture tube, electrically guaranteed six months from first installation date. These tubes will have minor mechanical (not electrical) defects... they're not quite good enough to go into a new TV set but perfectly adequate for testing purposes.

How to get your FREE Color Test Tube

Simply buy an RCA WR-64B Color Bar Generator—*THE* essential color-TV test instrument—between now and April 1, 1966. Fill out your warranty registration card and attach the red identification label on the WR-64B carton. Send them to RCA, Test Equipment Headquarters, Bldg. 17-2, Harrison, N.J. We send you the tube (either from Lancaster, Pa. or Marion, Ind.) freight charges collect. To allow for postal delay, we will honor cards received up until April 15th.

Don't miss out on this never-before offer. You've got to have a color-bar generator anyway—so be sure you buy it now—at the regular price—while you can get a FREE color test tube.

$189.50*

Optional distributor resale price, subject to change without notice. Price may be higher in Alaska, Hawaii and the West.

RCA WR-64B Color Bar/Dot/Crosshatch Generator

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EDITOR'S MEMO

This Shrinking World

While astronomers tell us that the universe literally expands in a continuously accelerating manner — as indicated by the "red-shift" theory— and while new telescopes above the earth's atmosphere have extended our vision farther into the universe, things on earth are getting smaller. Even distances on earth—in point of time—continue to shrink.

Some years ago we observed — under a powerful magnifying glass— an electric motor which ran and developed a certain amount of "gnat-power." It was one sixty-fourth of an inch in diameter. The motor was made under a microscope.

Not long after this, we observed— again under magnification—a number of wires which had been inserted through a hole drilled through a human hair. At that time the wire was said to be the smallest ever made.

And then we were shown a number of electronic components stacked on top of the head of an ordinary straight pin! But some other things have become smaller since.

All these things, of course, are relatively large compared with some microelectronic components manufactured today. We only mention them to show how things are shrinking in electronics.

Now comes the mock-up of a color TV set with a six-inch screen which, the manufacturer says will be about the size of an ordinary portable radio of just a few years ago. The "teeney-vision" set is expected to be on the market within a year.

These shrinking innovations have come about because of space-age necessity. Where it will end, no one knows.

Coming events always cast their shadows before them, to paraphrase an old cliche which has avoided the erosions of historical change. Thus, we call attention to a few shadows that hint of things to come.

But we've been doubting for some time if this "shadowy" coming-events barometer can survive indefinitely. Maybe you've wondered, too.

Just how small can things get and still cast a shadow?

New design for color ...and all other!

QUICK-CHECKS MORE COLOR TV TUBES WITH Gm* ACCURACY

*Makes test under actual set-operating conditions

NEW B&K model 707 DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER *with obsolescence protection*

Tests:
New and old TV and Radio Tubes. Tests Nuvistors, Novars, 10-pin tubes, 12-pin Compactrons, European Hi-Fi tubes, Voltage Regulators, and Most Industrial types.

You're always ahead with B&K. The new "707" gives you the famous B&K professional tube-testing speed and efficiency—plus the ability to test more color TV tubes with Gm* accuracy.

Provides multiple-socket section to quick-check most of the TV and radio tube types the *true dynamic mutual conductance way**—plus simplified switch section to check other tube types in Dyna-Jet emission circuit. Also includes provision for future new sockets.

You can quickly check all the tubes in the set, detect hard-to-locate weak tubes that need replacement . . . sell more tubes, save call-backs, and make more profit. *Makes test under set-operating conditions.* Checks each section of multi-section tubes separately. Checks for *all* shorts, grid emission, leakage, and gas. Makes quick "life" test. Exclusive adjustable grid emission test provides sensitivity to over 100 megohms. *Quickly pays for itself.* Net, $189.95

See your B&K Distributor or Write for Catalog AP22-R

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SYNC ON BUSINESS

It's technical data and business information program for service-dealers and technicians has been improved and expanded, according to Philco. In some technical areas the cost has been reduced. The program is called Philco Tech Data & Business Management Service. The theme of the service is, "Work Smarter, Not Harder." Participation in the plan also qualifies technicians to apply for the Tech Data Group Accident Insurance Plan, which covers shop owners, their wives and technicians.

• • •

Another Hi Fi promotion and "image-building" possibility is a booklet called "Your Tape Recorder." It can either be sold or given away to your best Hi Fi customers.

Write on your letter-head to Elpa Marketing Industries, Inc., Dept. P, New Hyde Park, N.Y. for quantity prices.

• • •

Stancor replacement transformers are now available through Columbia Electric in the Spokane and Kennewick, Wash. and Lewiston, Idaho, areas; through Kiesub Corp. in the Long Beach, Anaheim, Oxnard and San Bernardino, Calif. areas; through Lafayette Radio Electronics in the Hamden, Conn. and Falls Church, Va. areas; through Show-Me-Electronics, Inc. in Flat River, Mo.; through Wehle Electronics, Inc. in the Rochester and Binghamton, N.Y. areas; and through Land Electronics Supply Co. in Lynn, Mass.

Chuck Gravina just learned how to plan his profits the easy way.

It wasn't hard at all. Chuck took advantage of the all-new expanded Philco Tech-Data & Business Management Service. He received all the facts in the mail, liked what he read, subscribed and received Philco's Profit Planning kit *free*.

The kit contains a 24-page guide on profit planning, plus an accurate, easy-to-use profit calculator. Philco designed it especially for service-businessmen like you. You get practical, usable information that can help *you* make *your* business more profitable.

And Chuck's subscription means a wealth of factory-accurate new product manuals — mailed directly to him. So you'll know about the new products *before* they reach the retailers. You'll get monthly information on business management and customer relations. And, of course, you'll receive a full year's subscription to your Philco Service Businessman's magazine.

Chuck Gravina knew a good program when he saw it. And he subscribed. How about you? Shouldn't you subscribe right now and start planning your own profits for 1966? Philco is mailing all the details to thousands of service-businessmen right now. Watch your mail for all the information. And if you'd like any additional facts, talk to your Philco Distributor or contact Parts & Service Department, Philco Corporation, Tioga & "C" Streets, Philadelphia, Pa. 19134.

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. . . for more details circle 40 on postcard

SYNC ON BUSINESS

Sales-engineering was the title of an interesting release we received from the Timken Roller Bearing Co. recently. It dealt with "sales engineers," and contained some good information for service-dealers and electronics technicians. "Sales engineering" was defined as "selling a product in which a technical or engineering evaluation of that product plays a significant role in the buying decision. In short, it is the merchandising technique that combines selling and engineering." It was pointed out that too many people look upon selling as a battle of wits in which the salesman takes on a Machiavellian role seeking personal gain at the expense of the customer. It is the function of the sales engineer to see to it that, as a result of a sale, there is a genuine gain for both his company and the customer. In sales engineering the elements of salesmanship and engineering are of equal importance. It is not enough to just sell the product. The sales engineer must make sure that the product sold meets the needs of the customer in every way. At the same time, merely having the right answer and best design from an engineering viewpoint is not enough. It has to be sold.

The salesman must possess a high degree of personal discipline and integrity. The sales engineer operates with a minimum of supervision and consequently must be a self-starter. He must manifest a quiet and unpretentious type of confidence in himself. There is no substitute in the selling profession for genuine sincerity. You must also have the strength of character and emotional balance to be able to tolerate the vagaries and personality defects of the people with whom you must associate.

In the selling game you will have many occasions in which to experience the exhilarating sensation of genuine accomplishment and success. But, on occasion, you will also feel the bitter sting of defeat, frustration and total despair. This is why it is so essential for salesmen to have a high energy level and possess an abundance of drive, determination and singleness of purpose.

You don't have to be a superman to be a successful sales engineer. But the demands on talent and human resources are of the highest order.

Every service-dealer and technician — if he wants to — is qualified to become a sales engineer in our area of operation. Some already are. They are the most successful among us. In fact, it's about time the rest of us start being sales engineers if we want to remain in this business longer.

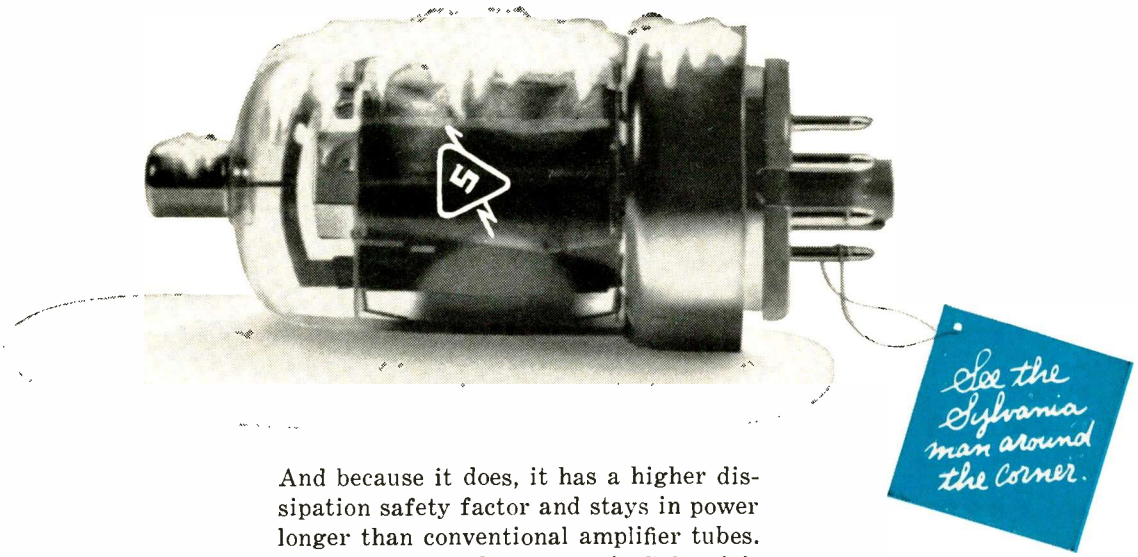
• • •

Two new VHF/UHF silicon transistors for two-way communications equipment are now available from RCA. The 40404 transistor is designed to operate up to 170Mc, deliver up to 500 mw. The 40405 is designed to operate up to 400Mc with 700 mw RF output. Additional information is available from Commercial Engineering, RCA Electronic Components and Devices, Harrison, N.J.

• • •

An "Electronic Projects" catalog listing plans for many electronic projects is available from Henry Francis Parks Laboratory, Box 1665, Seattle, Wash, 98215. The price is 25 cents.

Our 6146B has a cooling system inside.



And because it does, it has a higher dissipation safety factor and stays in power longer than conventional amplifier tubes.

The heart of the system is Sylvania's cool-running Hi-Con plate. It's iron that's copper-plated and then nickel-plated.

This combination keeps the tube cool, prevents hot spots, assures greater uniformity in heat reduction and efficient heat radiation.

The Sylvania 6146B also has increased heat transfer at a lower operating temperature because a heavy oxide insulating coating isolates the heater from the cathode. Rated power output is maintained even at reduced heater voltage.

The cathode is cold-rolled from a blend of powdered metals to eliminate peeling and flaking of the emissive coating. Emissive materials are progressively reactivated and this reduces "gm slump."

Get the 6146B and other electronic components fast, in any quantity, from your local Sylvania distributor.

Sylvania Electronic Tube Division, Electronic Components Group, Seneca Falls, New York 13148.

SYLVANIA

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TECHNICAL DIGEST

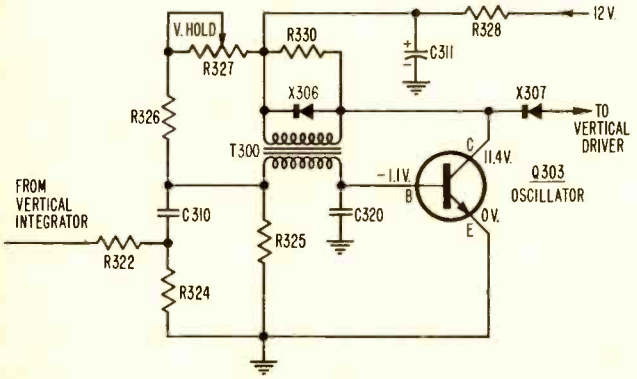
WESTINGHOUSE

TV Chassis V-2483 — Vertical Stages, Circuit Operation

Vertical Sweep

The vertical sweep section consists of three transistors; an oscillator, a driver, and an output amplifier. The oscillator which, because of the transformer coupling from collector to base, is immediately identified as a blocking oscillator. The oscillator is designed to have a free-running frequency of approximately 60cps but is synchronized by sync pulses from the vertical integrator network.

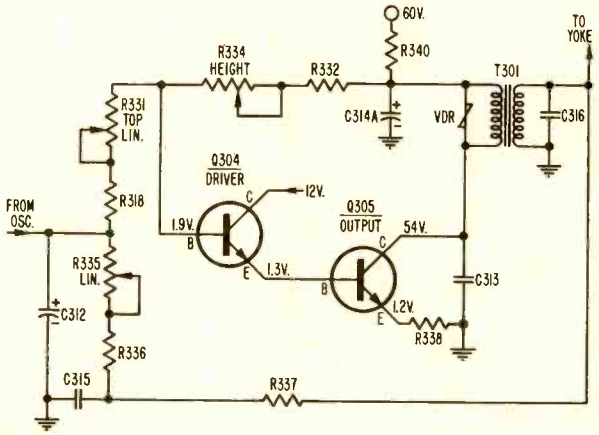
The transistor is an NPN type, which means that the base voltage should be ordinarily positive with respect to the emitter. In the case of a blocking oscillator the transistor remains cut off (blocked) for most of the cycle by the negative voltage on the base. The transistor starts conducting when B+ is applied. Collector current flows through the primary of T300 up to the time of saturation, charging C310 with the top side negative with respect to ground. When the saturation point is reached there is no further change in the magnitude of current flow through T300. The magnetic field around the primary collapses. This induces a pulse in the secondary winding which has the correct polarity to cut off the transistor. Capacitor C310 discharges slowly through R325 (150K), keeping the potential negative at the base. As soon as C310 has



discharged below the cut off point, the transistor once again conducts and another cycle is started.

Synchronization of the oscillator is provided by a positive pulse from the integrator network. This is coupled by C310 to the base of the oscillator which causes it to conduct at that instant. The negative going waveform at the collector of the oscillator is present at the cathode of X307. This diode effectively isolates the voltage on the oscillator from the voltage on the driver stage because it is connected with the most positive voltage at its cathode and is, therefore, reverse biased. The negative-going vertical pulse overcomes the reverse bias and is passed on to the driver stage.

Of the other components, two deserve mention. C311 is a 10μf electrolytic that filters the vertical signal from the 12v supply. Diode, X306, across the primary of T300, conducts immediately after collector current has reached the saturation point. At this time the field around the primary collapses and reverses direction, placing a more positive potential at the collector of the oscillator than was possible with only the applied voltage. This is an undesirable condition because the transistor could conduct again.



The polarity of the diode across the transformer is important. The anode must be connected to the transistor collector. When the polarity of the induced voltage is positive at the anode, the diode conducts and acts as a short circuit for the pulse. The pulse is effectively dampened.

Vertical Driver and Output

The negative-going pulse from the vertical oscillator is shaped by the networks in the base circuit of the driver, Q304. The shaping networks have two adjustments — one for over-all linearity (R335) and one for linearity at the top of the picture (R331). The driver is an NPN transistor connected in an emitter-follower configuration. There is a current gain, but no voltage gain, from the driver and there is no polarity inverison since the output is taken from the emitter and direct-coupled to the base of the output amplifier, Q305.

The output transistor is a high-power type mounted on a heat sink. Since this is an output device the supply is 60v. The polarity reversal caused by this amplifier makes the pulse positive-going in the primary of T301. Thus, during conduction of Q305, a sweep output voltage is developed in the primary of T301. During cutoff this collapsing field could generate a high peak voltage sufficient to damage the transistor. The VDR, however, in parallel with the transformer primary, acts to limit the voltage pulse to a safe value.

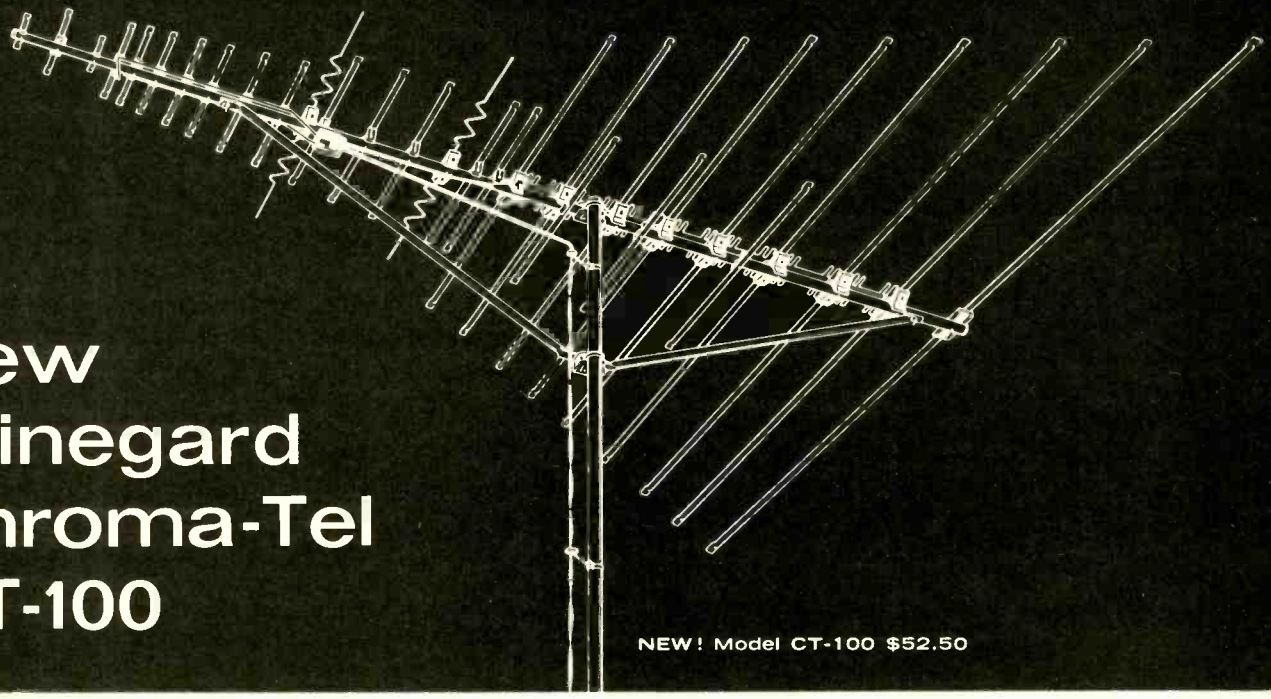
There are two filter capacitors in the output circuit. C314A (200μf) filters the 60cps vertical pulses from the supply voltage. C313 (0.01) filters any horizontal frequency that may be fed back from the blanking network through the secondary of T301.

MAGNAVOX

TV Chassis T908 and T915 — Service Information

Buzz in sound—on station. A condition of buzz, apparently only when a station is tuned-in, has been reported on some T908 and T915 chassis. This buzz can be eliminated by adding a 0.01μf capacitor from point 3A on the printed circuit board to chassis ground. This capacitor has been incorporated in later production. Also in some instances it has been reported that R312 on T908 chassis using a tone control was 470K instead of 470Ω. This will distort the frequency response of the amplifier and aggra-

First UHF/VHF/FM 2-83 antenna that really works in fringe areas



New Winegard Chroma-Tel CT-100

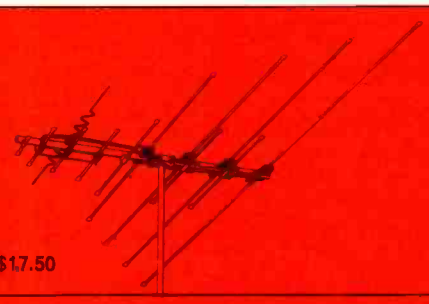
NEW! Model CT-100 $52.50

Wingard's sensational new CT-100 Chroma-Tel has 29 elements in all. And they're all working to provide the finest all-band reception (UHF-VHF-FM) even in difficult fringe areas.

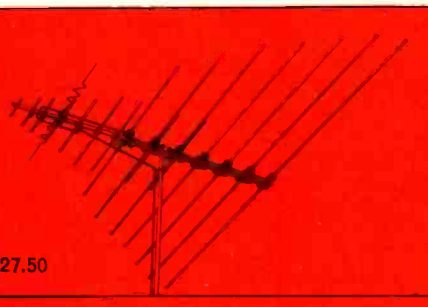
In addition to those 29 elements, the CT-100 incorporates a unique matching network that guarantees maximum signal transfer to the downlead—and on all channels 2-83 plus FM. Gives sharpest color and black & white reception.

And like all Chroma-Tels, it has Winegard's exclusive Chroma-Lens Director System (intermixes both VHF and UHF directors on the same linear plane without sacrificing performance) . . . and our Impedance Correlators (special phasing wires that automatically increase the impedance of Chroma-Tel's elements to 300 ohms).

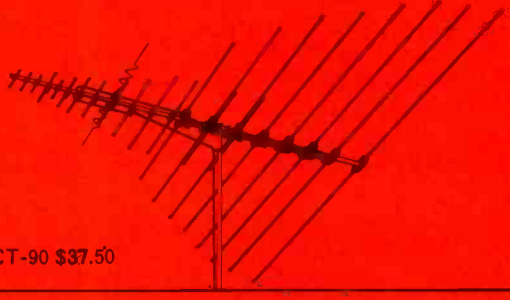
That's Winegard's new CT-100 Chroma-Tel. Bigger and better. But not too big. The full-line of Winegard Chroma-Tels still offers half the bulk; half the wind loading; half the truck space; and half the weight of all other all-band antennas—and at much lower prices. No wonder Winegard Chroma-Tels (now 4 models) are the hottest performing, hottest selling all-band antennas on the market! Better call your Winegard distributor or write for Chroma-Tel Fact Finder 242.



Model CT-40 $17.50



Model CT-80 $27.50



Model CT-90 $37.50

FREE!

Every Winegard Chroma-Tel, including the new CT-100, comes complete with free CS-283 UHF-VHF Signal Splitter. Hangs behind set and separates UHF and VHF signals coming from antenna to the two pairs of set terminals.

Winegard ANTENNA SYSTEMS Winegard Co. • 3000 Kirkwood • Burlington, Iowa 52602

for more details circle 57 on postcard

TECHNICAL DIGEST

vate the buzz condition so check the value of this resistor when making the change. **Hum In Audio.** If excessive hum is noticed on T908 or T915 chassis, the following circuit change is suggested: Remove R308, 33K resistor, in the audio driver circuit, and replace it with a series combination of a 5.6K and 27K resistor. Be sure that the 27K resistor connects to the audio driver base and the 5.6K resistor to the 12v+ source (point VC). Then connect a 5μf., 20v electrolytic capacitor between the junction of the two resistors and chassis ground.

RCA VICTOR

Record Changer RP217, -218, -219 Series — Service Information

The record changer mechanism is properly lubricated at the factory so lubrication should not be necessary for a long period of time. When lubrication does become necessary it should be remembered that excessive lubrication can be detrimental to the operation of the changer. A couple of drops of oil or a small dab of grease is normally all that is required. A light machine oil is used to lubricate the drive motor bearings, idler wheel bearings, and other fast rotating parts. A cloth impregnated with this oil is used to wipe the stabilizer arm shaft (20A), pickup arm lift rod (47) and pickup arm pivot shaft (54) after any oxidation has been removed by polishing them and the inside of their housings with crocus cloth. All other bearings and sliding surfaces such as the cycling gear, other slow rotating parts, lever pivot studs, cycling-gear-stud slot in the cycling slide (17), control lever stud (40), automatic neutral link detent lever (40), record push off lever, and points upon which the cycling slide rides, are lubricated with a medium weight clinging type non-solidifying grease. The cup of the turntable bearing is filled with grease and installed with the *cup facing up.* (A metal washer is installed on each side of this bearing.) A small dab of a heavy silicon grease should be applied to the pickup vertical pivot shaft at the point where the pickup rides. *Note:* The trip pawl (18), trip level (56) and clutch lever (57) *should not be lubricated.*

Cleaning

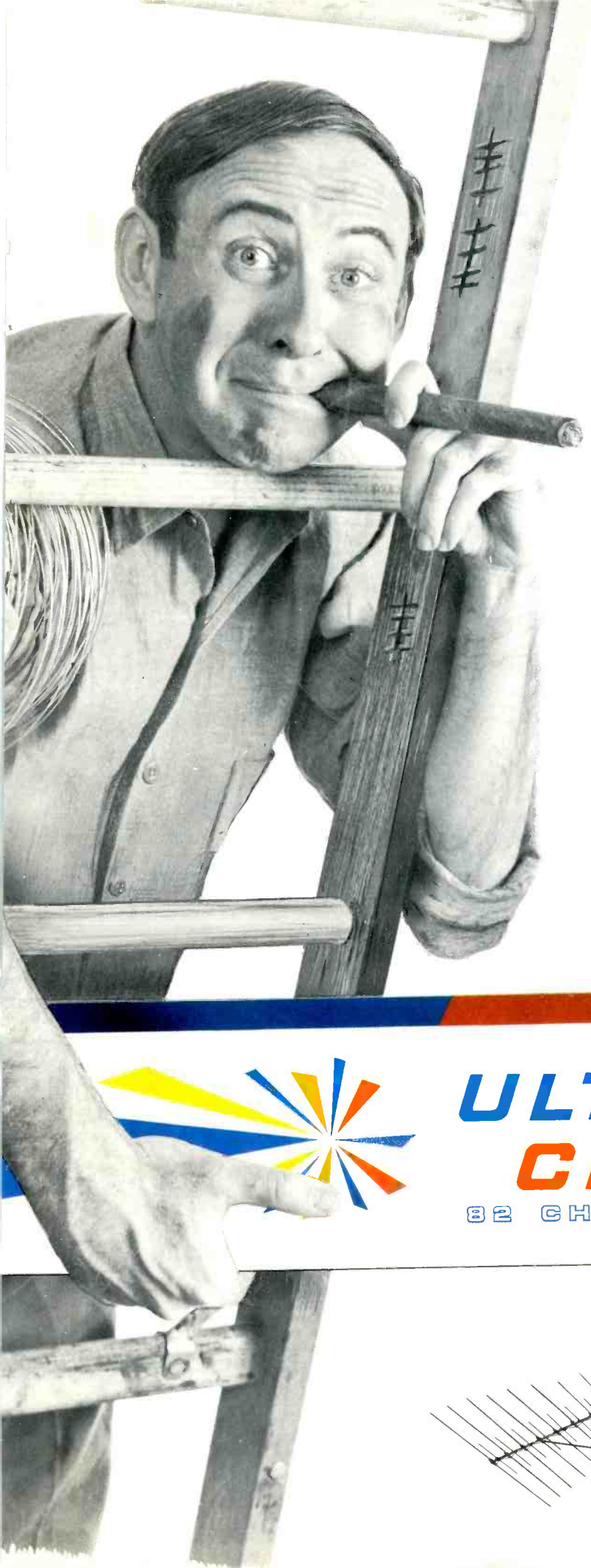
Oil or grease on any surface in the turntable drive system can cause slippage which in turn can produce wow or stalling. It is, therefore, very important that the spindle or shaft, of the motor, the idler wheel rubber tire, and the inside surface of the turntable rim be periodically cleaned to remove any accumulation of oil or grease. The surface of the landing lever (44) where it is contacted by the pickup arm pivot lever (54A) should be cleaned to avoid a condition of erratic landing. One of the causes for these conditions can be excessive lubrication, particularly of the drive motor upper bearing.

Recommended cleaning agents for the rubber parts of the mechanism are: isopropyl alcohol, or naphtha.

Adjustments

Only three adjustments are necessary for setting the proper operation of the RP217, -218 & -219 record changers provided that no parts have been misshapen. One adjustment is necessary to regulate the correct landing of the stylus on the record and two adjustments to regulate the horizontal and vertical movement of the pickup arm.

. . . for more details circle 19 on postcard →



Take Channel Master's latest color breakthrough for instance...

I know for a fact that Channel Master's Color Crossfires are the top-selling antennas in TV history. But for my hard-earned buck, these new Ultradyne Crossfires* are the greatest yet. They're really a major breakthrough ■ They've got everything because they unite the unique VHF color reception power of the famous Crossfires with a terrific new Ultradyne UHF design principle. The high gain and front-to-back ratios in this combo has those so-called "log-periodic" type antennas beat a mile ■ And with the Channel Master rotator, I can get my customers extra channels in any direction. Black and white? FM Stereo? They're a cinch. What's more, you choose from 6 different models so Channel Master sure makes it easy to pick the right one—with each geared to give top signal strength in its area. I also like the way that E.P.C. "Golden Overcoat" protects the antennas. ■ One thing I can tell you from experience: both in design and overall power each of these Ultradynes is way ahead of the competition's corresponding model. More profitable, too. The way I see it, the only color antenna worth putting up is the one that gives my customers the most satisfaction. ■ I say as long as you have to install color antennas—why not put up the best! The Ultradyne Crossfire.

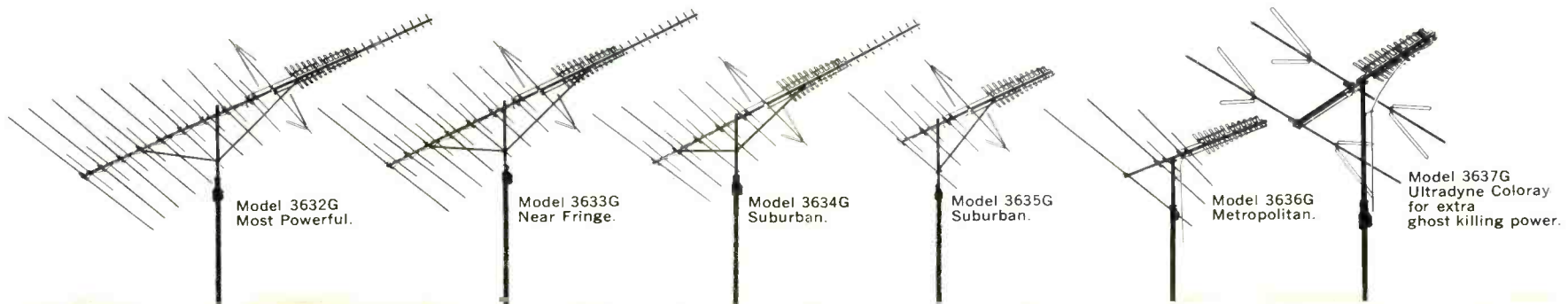
Write for complete Ultradyne literature.

ULTRADYNE CROSSFIRE*

82 CHANNEL TV/FM ANTENNA

UHF VHF COLOR TV ENGINEERED

*The only antennas covered by 5 U.S. patents, or patents pending.



COLOR?

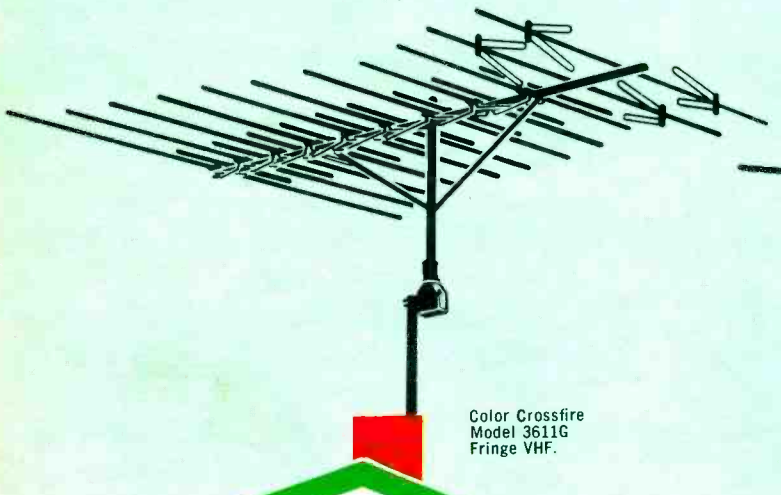
I know it's hit the roof. And brother, I'm cleaning up.

With America's best-selling antennas

CHANNEL MASTER

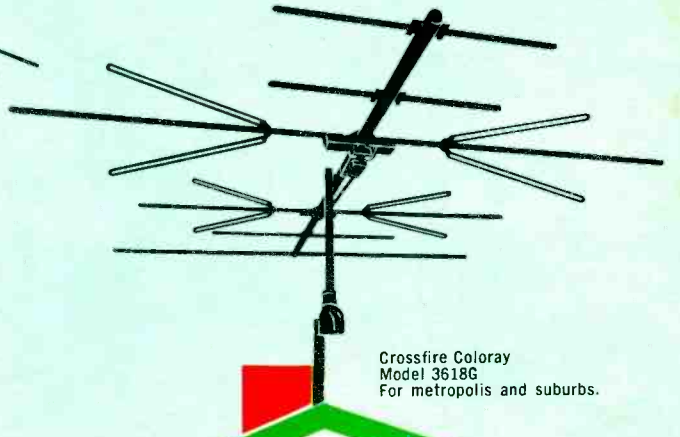
And don't forget the VHF/FM branches of America's most successful COLOR family.

Color Crossfires



Color Crossfire
Model 3611G
Fringe VHF.

Crossfire Coloray



Crossfire Coloray
Model 3618G
For metropolis and suburbs.

Each perfectly engineered for color and designed for maximum power in its area

More Crossfires* have been sold than any other antenna in TV history. A 7-model series of the world's most powerful antennas . . . now better than ever for color, black-and-white and FM stereo; from suburb to fringe to super-fringe. Combines our revolutionary principle of Proportional Energy Absorption with our exclusive Tri-Band Director System to deliver the high clean broadband gain needed for color reception. Covered by 3 separate patents.

Crossfire Coloray* . . . ghost-killer extraordinary! For weak-pocket metropolitan and suburban areas. Combines high gain characteristics of Crossfire with a unique Power Equalizer circuit that provides up to 30 to 1 front-to-back ratios. Exclusive 75 and 300 ohm impedance insures ideal color reception for MATV and co-axial home installations. Second model (3110G) available for strong-signal areas. Both models protected by remarkable money-back guarantee.

*All models protected by exclusive E.P.C. "Golden Overcoat"

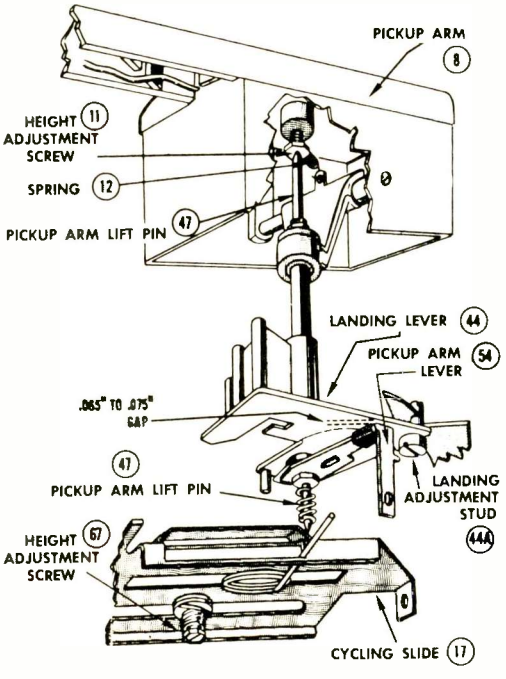
Write for the full facts on the Crossfires and the Colorays.

CHANNEL MASTER
ELLENVILLE, NEW YORK

Land Adjustment

The landing point of the stylus is controlled by an eccentric stud (44A) in the landing lever (44). When this stud is adjusted for proper landing on one size record (7 in. preferably) the points for the other two sizes are automatically set by fixed steps on the landing lever.

The landing adjustment stud (44A) is accessible from the top of the motor board through an access hole adjacent to and forward of the pickup arm pivot bearing and is also



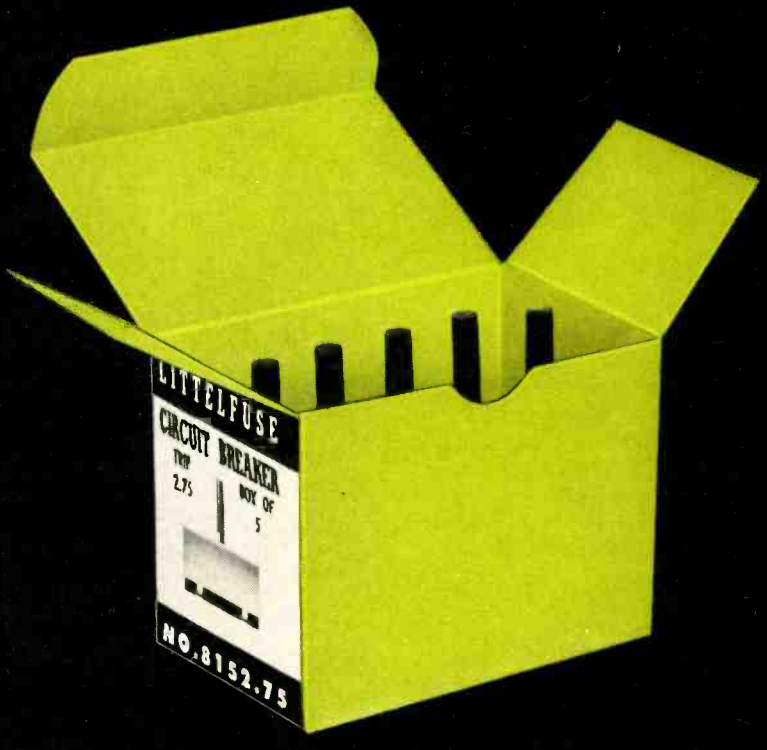
accessible from the under side of the motor board. It is adjusted as follows: **1**—Disconnect the power to the changer. **2**—Place a record on the turntable (7 in. preferable). **3**—Turn function knob to SEL and rotate turntable by hand until the pickup arm is at the end of its inward travel and just starts to lower. **4**—Turn the landing adjustment stud (44A) to position the stylus so that it will land midway between the outer edge of the record and the grooves. **5**—Check landing on other two sizes and "touch-up" adjustment as necessary.

Height Adjustments

Two height adjustments are necessary on this type of changer. One is to provide a "clutch" clearance which controls the horizontal movement of the pickup arm, and the second adjusts the vertical lift of the pickup arm to clear a stack of records. They are adjusted as follows: **1**—Rotate the turntable until the mechanism is completely "Out of Cycle." **2**—Adjust the height adjustment screw (67) to obtain a clearance between the pickup arm lever (54) and landing lever (44) of 0.07 in. to 0.085 in. (about the thickness of a penny). **3**—Trip mechanism and rotate turntable, until pickup arm has completed its inward travel and is just ready to descend. **4**—Adjust height adjustment screw (11) so that the stylus is 1 3/16 in. above the surface of the turntable mat.

EXACT REPLACEMENT direct from factory to you

packaged for your particular needs



Complete range of high quality circuit breakers to cover every replacement need, packaged for your convenience individually on a display card or 5 per box.

Also, available in 10-card assortment (9 separate ratings) or 10 breakers per unit box (9 separate ratings).

LITTELFUSE DES PLAINES, ILLINOIS

ELECTRONIC TECHNICIAN

FEBRUARY 1966

IN-HOME SERVICING

Shorten your work-week and boost returns through increased productivity

■ Did you ever wish you could work an "old fashioned" eight hour day and go home at 5 p.m. instead of working until nine — trying to finish your bench work? Ever wish the day contained thirty hours instead of twenty-four?

You *can* go home at a reasonable time — cut your working hours substantially and make more money than you ever made before — if you'll use your head and develop your in-home service techniques to a higher level. Many hours can be shaved off your work week if you can eliminate time lost carrying sets back and forth — from customer to shop, from shop to customer.

Add up the time spent, for example, dismantling sets, carting chassis back to the shop, setting them up on the bench, stripping them down again, carting them back to the customer and then setting them up again. Divide your weekly income under this system by the number of hours you work. You don't have to be reminded that it comes out to "pea-picker" wages.

Two Views

Some service-dealers say it isn't practical to repair most major breakdowns in the home. They say you can't replace parts and then wait around the house while the set "cooks" properly for hours. They say you just can't give a set the proper attention in the home — working on the living-room floor or on a kitchen table — without proper shop test instruments and tools. And furthermore, they say, when solid-state equipment is widely used, there'll be *fewer* sets serviced in the home.

Well, maybe. But until that time comes, we disagree — with certain reservations. We agree, of course, that the "tube-snatcher" type technician can't do it. We agree that the shop that pays a benchman who has nothing to do won't find it

IN-HOME SERVICING

profitable. We're talking here about a highly knowledgeable one- or two-technician operation that has telephone answering service or a shop attendant.

In some cases, of course, home-repair is not practical. And deciding which sets go to the shop and which can be successfully repaired in the home is one thing you're supposed to use your head for. We maintain that nine out of ten sets can be repaired in the home.

How It's Done

First, keep a carefully updated tube supply. And never remove a set from the home unless all suspected (and some not suspected) tubes have been substituted. When a tube is missing from your stock you'll indulge in a lot of second-guessing; it's a good way to find yourself in a blind alley. Pulling a set only to find later that the problem could have been solved simply by changing a tube doesn't justify the few extra dollars you may get for a shop job. It will lengthen your work week and reduce your average hourly income.

It is admittedly a little difficult and expensive to keep an updated tube stock — considering how the designers keep throwing new tube types at us. But we're in a professional business that must be conducted in a professional manner if we are to survive. So a complete tube stock is a must.

Second, keep a full supply of "standard" parts on hand — on/off switches, rectifiers, capacitors (regular and electrolytic), resistors, dual-diodes and a couple of indoor antennas.

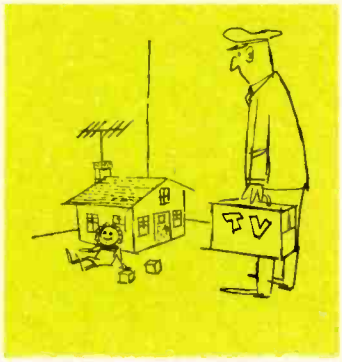
But a word of warning: don't try to carry *everything* with you. Take push-pull switches for example. Carrying a full line of different type switches in the service car or truck is not very practical. A 1M long-shaft volume control with a turn switch will do it. The shaft can be cut down, notched, even filed if necessary, and it will replace practically any single control switch you may run across. We said single control. Dual controls will normally require a second trip with the direct replacement part. Most sets being made today, however, do use singles for the volume switch combination so we have little to worry about here. As for replacing a push-pull switch with the turn switch type, you'll hear very few protests from customers. They seem to trust the older types more.

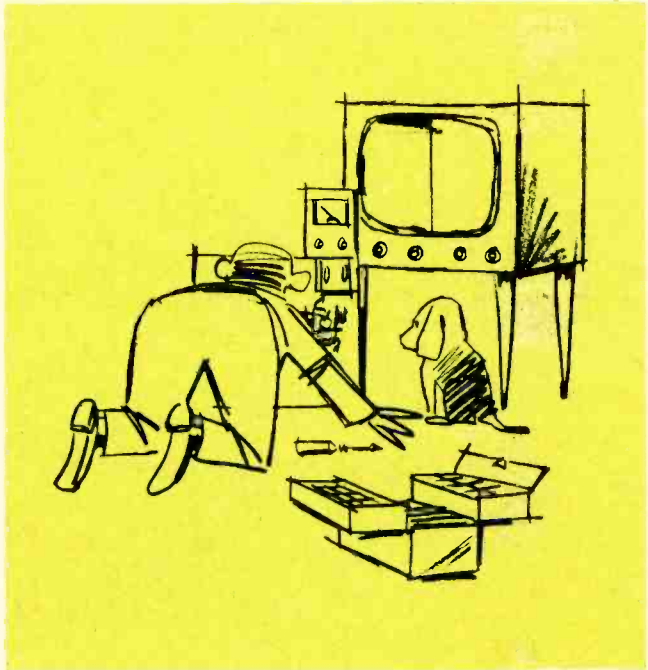
Power Supplies

Every service technician worth his salt knows weak rectifiers when he sees them and we hope replaces them in the home.

Picture shrinking all around? Losing crispness? Probably weak rectifiers. The surest test is to bridge the old rectifiers with new ones. You can also check rectifier output with a VOM. The output of a one-rectifier supply will be about 125vdc and the output of a two-rectifier supply will be about 250vdc. Silicons, of course, will read about 10 percent higher. When seleniums are weak (not shorted) it is usually expedient to wire silicons directly across the old seleniums without removing them from the chassis.

Weak rectifiers are not the only causes of picture





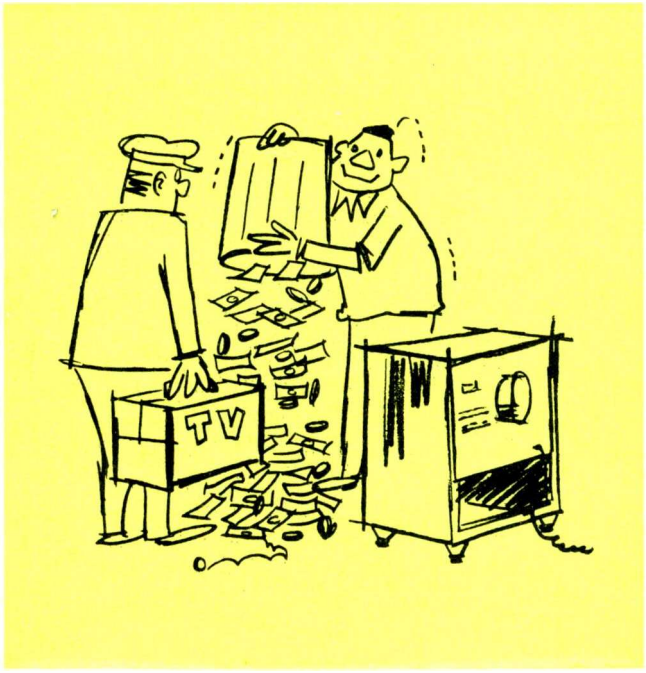
When you're heading for a shop job take out the VOM and just look around.

shrinking, however. In voltage doubler power supplies, when the solid-state rectifiers check out good, we should look for the large-capacity electrolytic that leads into the junction of the two rectifiers. Bridge it with a known-good one and watch the picture spread. Carry two 140μf, 300v electrolytics for this purpose. When this capacitor "opens" or loses all of its capacity we lose all B+ — consequently picture and sound too.

When new rectifiers and a new doubler electrolytic fail to bring B+ up to normal, we might next want to try a new input filter capacitor. This will be the one wired directly to the 5U4 heater (in tube sets) or to the output of the two solid-state rectifiers. When this capacitor goes bad you'll get a reduced picture plus traces of ac hum bars in the raster. But, in many cases — and this is important — you'll get only the reduced picture with no noticeable traces of hum.

Whenever you get strange symptoms on sets — we mean abnormal symptoms like irregularly colored rasters, whistling or screeching from the speaker, fluttering pictures or any symptom not normally associated with bad tubes — go after the filter capacitors. You can use a small hand mirror to see behind an upright chassis and then clip a substitute filter across the different filter terminals. By moving around from one terminal to the next you can find out which capacitor is open. Then solder the substitute in place — you can do this very often without having to remove the chassis. Carry three 40μf types rated at 450v. Of course, if the filter is leaking, that's another matter.

But what about vertical sweep problems? Here too filters will solve many of these problems. A 40μf in the vertical output as decoupling or a 100μf at 50v in the output tube cathode frequently goes bad.



Most customers will gladly pay for any special attention you give them.

Other Problems

Now these problems are relatively simple. How about video, sound and sync troubles? Still not so difficult when we use the proper techniques. Once we have eliminated suspicious tubes and other major components and we see that we are heading for a shop job, that is the time to look to the VOM. Check voltages, check resistors, look for overheating or burned-up components — in short, just look around.

Of course, you won't find it easy to work without a schematic unless you know your basic circuits. Here is another place you use your head. You should know how basic circuitry operates — and you should know it well enough to draw the basic circuit with a pencil. This is the difference between "tyro" and pro.

If you know basic circuits you can pinpoint the trouble area quickly. But if you don't know your circuits, how they work, how they're wired and know the approximate values of the components in each circuit, you'll probably be checking the sync circuit when you should be checking the AGC line — wasting time.

Once you decide the troubled circuit, you can then check voltages or resistances. Some technicians prefer to check resistances. Without a schematic they don't know the exact voltages to expect. But the resistors are color-coded. And with the ohmmeter you can discover shorted coupling and by-pass capacitors and off-value resistors. Carry a wide assortment of capacitors ranging from 180pf (for horizontal oscillator circuits) up to 0.5μf (frequently used as AGC filters). Other AGC circuits, requiring heavier filtering, use 2μf which is also a stock item. This same capacitor often takes the buzz from sound discriminator circuits.

Customer Relations

Now, assuming you're technically qualified and equipped to do home servicing, let's go over some additional points you'll have to keep in mind.

1. Don't begin work on a set until you put a drop-cloth on the floor and arrange your tools and test instruments in an orderly manner.

2. If the set is rather old and certain parts appear marginal in value and tolerance, recommend shop repair for the set — after you notify the customer that the particular break-down can be repaired in the home.

3. Make sure you ask the customer about other faults (perhaps intermittents) that existed before the set broke down. Remember: you can't wait around to see what else may be wrong.

4. If you suspect multiple problems that can't be properly taken care of in the home — recommend shop work. One or more call-backs can weaken your customer relations image and make your work and advice appear considerably less than "professional" in the customer's opinion.

If you are technically qualified and if you use your head you can build a profitable business with in-home servicing. When the average set owner sees to what lengths you're willing to go to repair his set in the home you'll be able to collect more for your time than you would on shop jobs. ■

Dial 'B' for Broke

Use manufacturers' diagrams and instructions to make TV-radio dial stringing pay

■ "The only thing wrong with this radio is a broken dial cord so I'll just wait until you fix it," is a common remark heard by technicians every day. And the customer usually adds quickly, "It won't cost much will it?"

Broken dial cords sound easy enough to repair, but they do take much more than a minute to replace and in some cases quite a bit of time. Small table-model radio dial cords can be replaced easier than a complicated TV dial cord.

Some points to remember include:

1. Always cut the replacement cord from four to six in. longer than the broken cord. Unless otherwise specified by the manufacturer, use a medium dial cord not a heavy cord.

2. The tied knot should have a touch of service glue applied to it. This will prevent it from coming untied.

3. Apply a small drop of light oil to the pulley bearings.

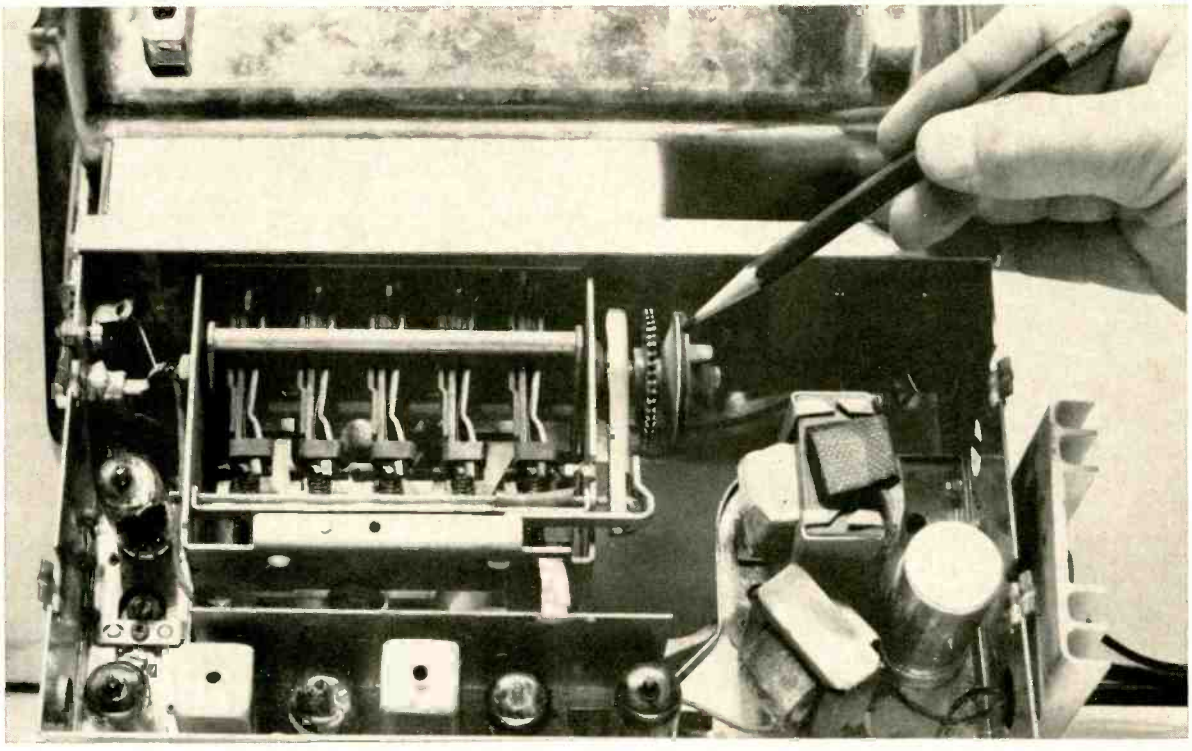
4. Clean dial bracket, glass and wipe old grease off the dial assembly. Apply a little petrolatum to the pointer base so it will slide easily.

5. Provide yourself with original manufacturers diagrams and dial stringing instructions. These instructions tell what direction to wind the cord, whether tuning capacitors are fully closed or open, number of cord turns to be made around the tuning shaft, pulleys, etc.

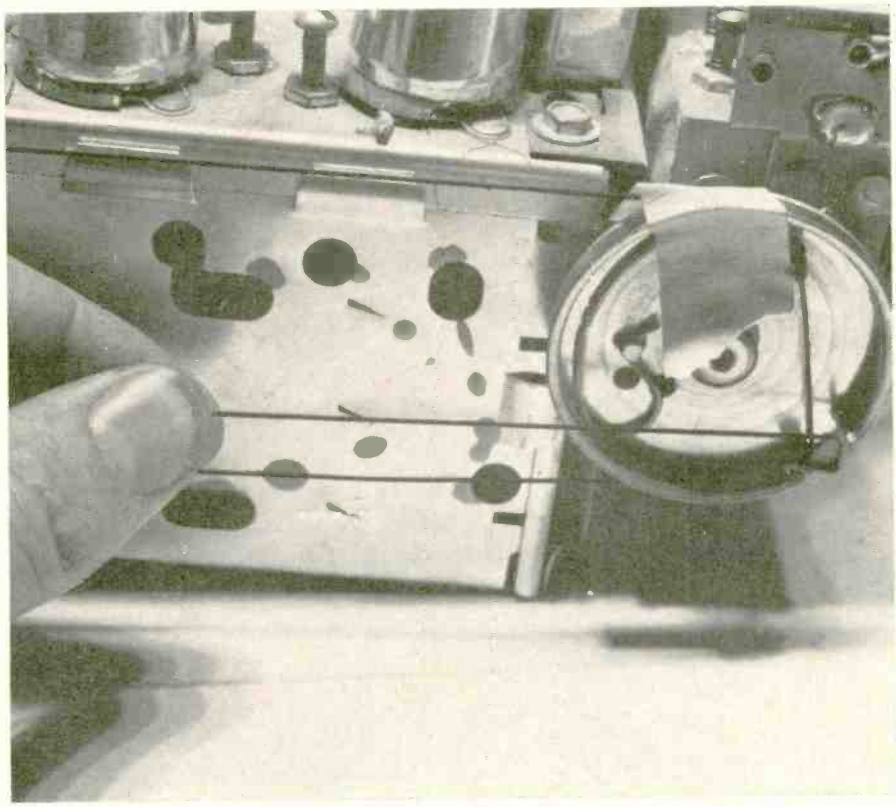
TV and Auto Radio Dials

As we know, new TV sets now have both UHF and VHF tuners. Some manufacturers use a combination of two dial cords or a dial cord and gear assembly. The dial cord can easily be replaced but broken plastic or fiber gears must be obtained from manufacturers' distributors or from the factory.

Auto radios may use a simple dial arrangement. If it is a push button type the dial may be slipping at a pressure metal plate.



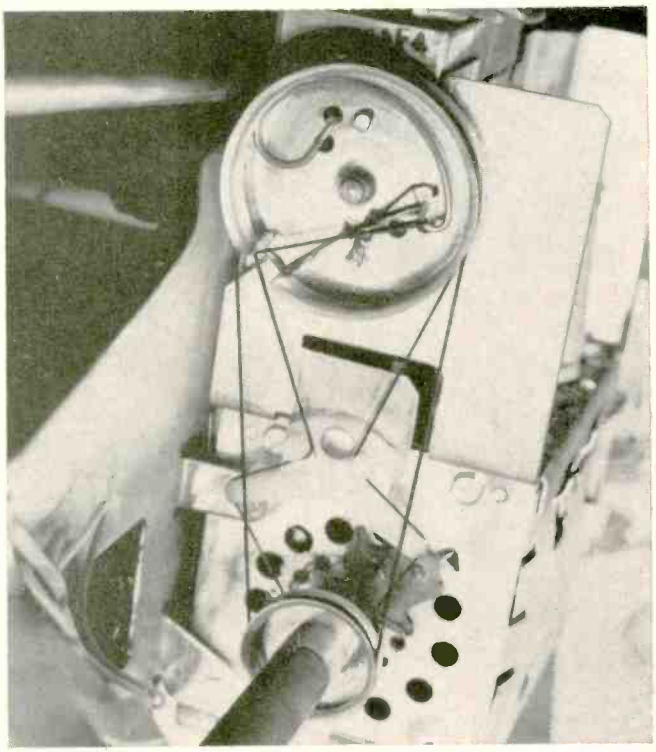
Check tension of slippage on sliding- and push-button car radios.



Use masking tape to hold dial cord in place so it will not 'pop' off.

Add two springs to take up tension on dials that want to slip.

Stringing dial cord on table radio.



Complicated UHF/VHF dial cord on G-E TV receiver.

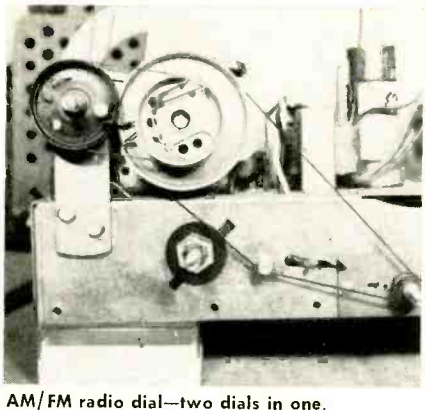
Dial 'B' for Broke

Pressure on the rubber drive between the two metal pieces can be tightened by spreading them with a screw driver. The outside metal disc can be loosened through setscrews, snugged up and then set. But be careful: if the assembly is too tight the buttons will be hard to push. Sometimes the rubber discs come loose from the metal pieces. Use rubber cement to hold them in place. Let the rubber discs dry thoroughly before reassembling the unit.

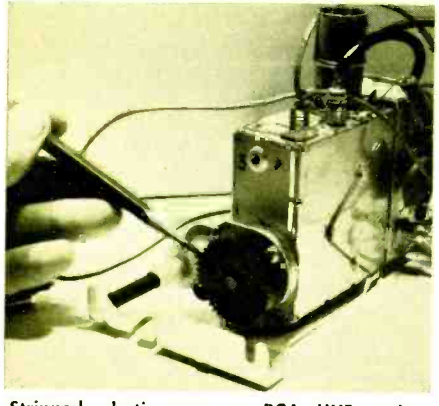
In very difficult push button drive assemblies a coating of liquid rosin may be necessary. A drop of oil on the push-rods and bearings will also help. If a dial light assembly is clipped to the dial pointer assembly, drop light oil on these mounting parts. A drop is all that is necessary. Also clean the dial assembly and the dial glass because auto radios become very dirty.

In some long dial cord drive assemblies a couple of springs may be necessary to tighten the dial cord properly. If the dial pointer is hard to see, spray red paint over it.

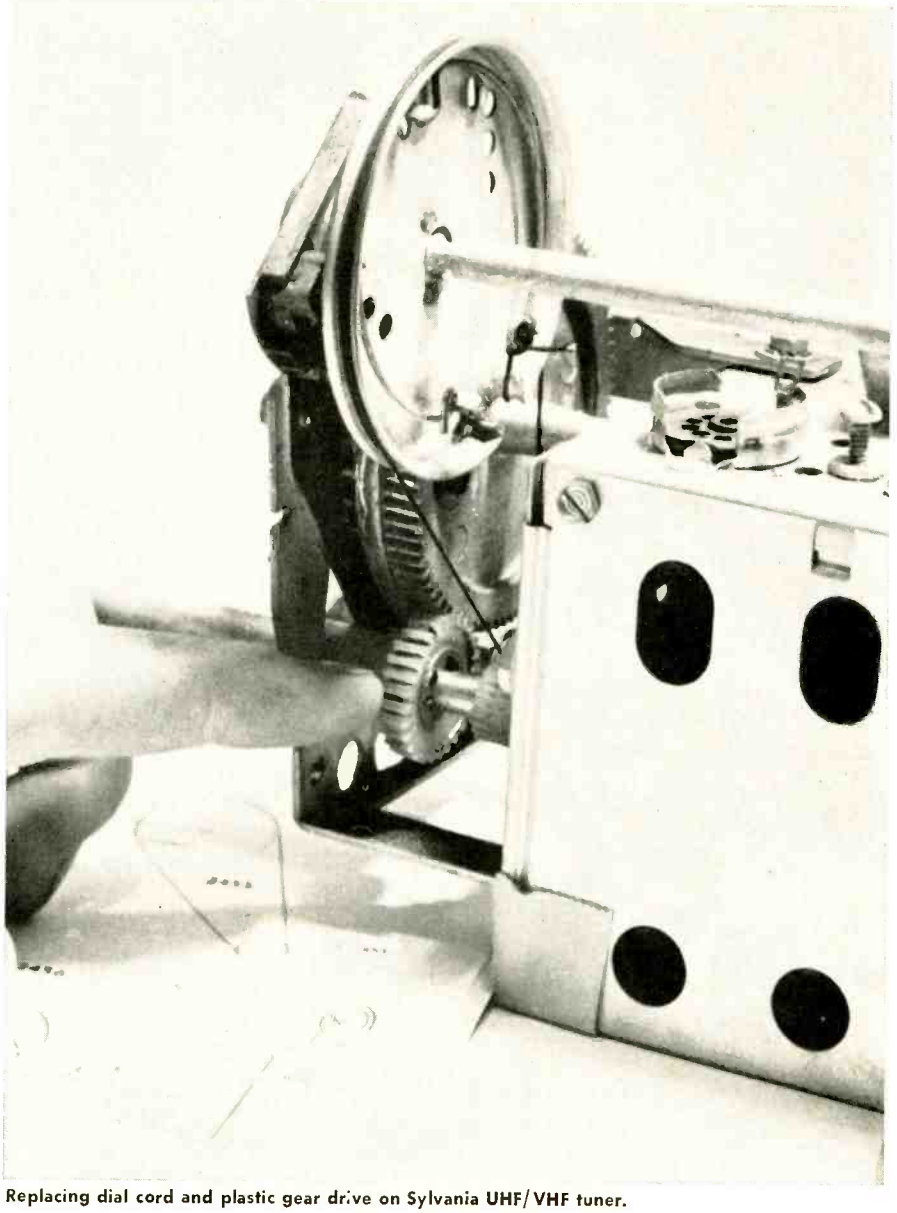
Several dial cord stringing tools are on the market and help to speed up dial cord repair. And you can use tape to hold the dial cord in place until it is completely wound. Finally, make sure the dial light is working before the radio or TV chassis is replaced in the cabinet. ■



AM/FM radio dial—two dials in one.



Stripped plastic gear on RCA UHF tuning assembly.



Replacing dial cord and plastic gear drive on Sylvania UHF/VHF tuner.

DOING MORE WITH YOUR VTVM

Two different schools of thought prevail regarding the use-value of VTVMs

■ One group of technicians holds that the VTVM (properly ETVM) should be used only on those jobs that it can perform quickly, accurately and efficiently. That is, when it is used as a wide-range ohmmeter, a small-signal ac voltmeter and low-level dc voltmeter. The other group holds that it will do almost anything well.

The first group says it can get more jobs done better and faster. And the second group counters that it can get just as many good jobs done and as quickly.

We will be concerned here primarily with some of the test jobs you can perform with a good general-purpose VTVM. Some major jobs for which the VTVM was specifically designed were outlined in "You and Your VTVM," ELECTRONIC TECHNICIAN, April 1965.

The general-purpose VTVM has a dc input resistance of not less than 10M. It will read ac/RMS, P-P, dc voltage and resistance. It has a reasonably flat frequency response from 30cps to 3Mc. A special probe will extend its frequency response to about 250Mc. Its normal maximum dc range is about 1500v but it can be used up to 30,000v with a high voltage probe. And its input resistance for ac is around 1M—shunted by about 60pf capacitance.

Current Measurement

It may be necessary under certain circumstances to measure current with a VTVM. Perhaps the only VOM in the shop is out of order or away for repairs. Although most general-purpose VTVMs were not designed for measuring current directly, a fairly reliable method of calculating current is possible with a VTVM.

To measure cathode current, which is usually the same as the plate current in a triode or the sum of plate and screen current in a pentode, measure the dc voltage across the cathode bias resistor (Fig. 1). Then determine current by dividing the indicated voltage by the resistance in ohms. To convert amp to milliamp, simply multiply by 1000.

At the same time, by switching to the proper ac voltage scale on the meter, the effectiveness of a cathode bypass capacitor can be quickly determined. If ac is present when a signal is passing through the tube, the ac is not being adequately bypassed unless the circuit was designed to be degenerative—with negative feedback being applied at this point.

The current being drawn by a beam power horizontal output tube can be approximated by measuring the voltage drop across its cathode bias resistor and then using ohms E/R formula as previouslv mentioned. If the drop across a 100Ω cathode resistor measures 10v, the

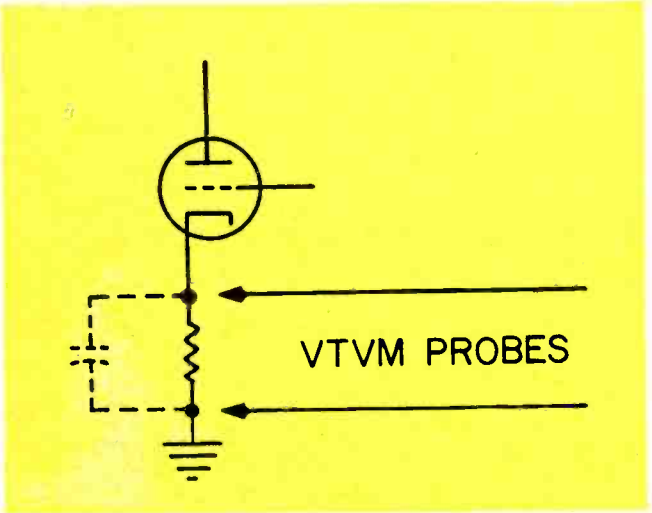


Fig. 1—Measure dc voltage across the cathode bias resistor and use ohm's E/R formula to determine approximate current.

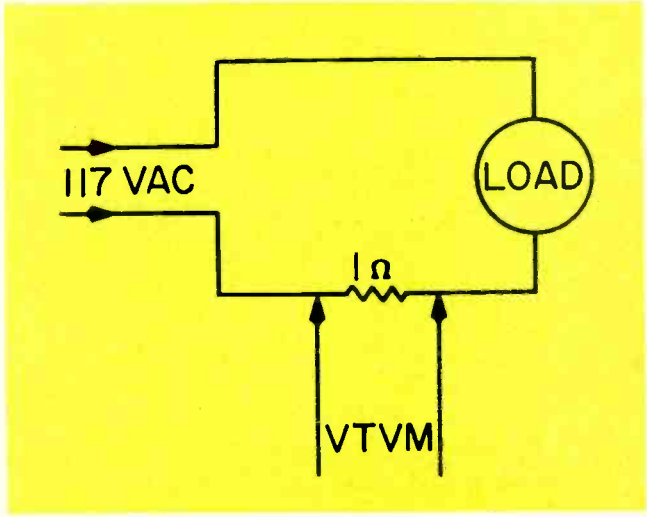


Fig. 2—Method of measuring current in an ac circuit.

tube would be drawing approximately 0.1 amp, or 100ma.

Current in an ac circuit can be approximated by inserting a known-value resistor in series with the circuit and measuring the ac voltage drop across it. Here a 1Ω resistor is inserted in series between the ac line and the device whose load current is to be measured (Fig. 2). The resistor, of course, should be large enough to handle the power involved.

If the meter indicates 1v, for example, the current is lamp. Power consumption can also be approximated by measuring the voltage across the line and multiplying the voltage by the calculated current value. The result will be volt/amp, not watts, since power factor is not taken into consideration. For most radio and TV sets and resistive devices, however, power factor is approximately unity and volt/amp is almost the same as watts.

Signal Tracing

One useful application of a VTVM is signal tracing RF, IF and AF signals. You can work your way through an AM, FM, TV or communications receiver. AF signals can be traced with the VTVM function switch set on the proper ac scale. A low-capacity probe can be used with the VTVM for IF signals to avoid excessive circuit loading. A low-capacity probe can be used for video signals by using the P-P scales of the VTVM. Some attenuation will be caused by the probe.

An off-the-air signal or a signal from a signal generator is required to provide a signal for tracing, but no test signal is needed to check receiver local oscillators, TV horizontal oscillators and 3.58Mc color TV oscillators. Simply connect the VTVM dc probes to the grid of the oscillator which has a negative dc voltage when operating. Or you can use an RF probe with the VTVM to determine if an RF signal is present.

DC Measurements

The most obvious application of a VTVM is dc operating voltage measurements — actual voltage at the plate, screen or grid of tubes and in transistor circuits.

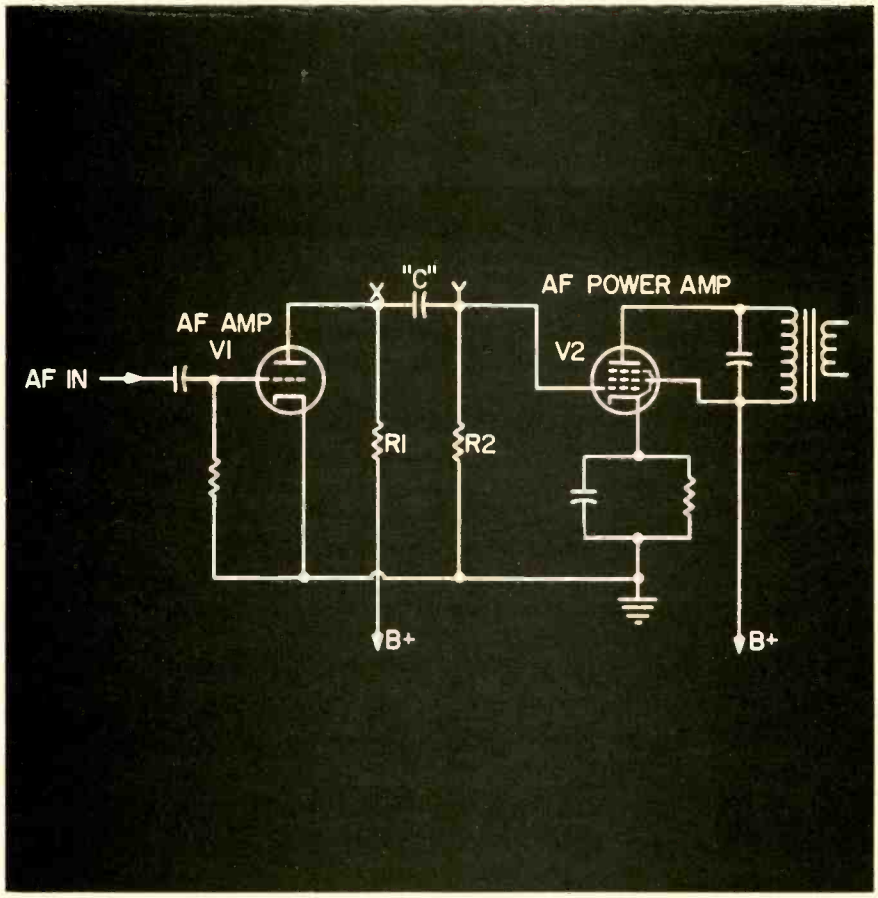


Fig. 3—Method of measuring dc leakage in audio coupling capacitor.

One common trouble in any kind of receiver is a leaky audio coupling capacitor. In the circuit shown in Fig. 3, capacitor "C" can cause audio distortion if its insulation is electrically leaky.

The end of "C" connected to R1 and the plate of V1 is at a positive dc potential. The other end of "C" should be at ground potential when there is no AF signal and after "C" has become charged through R1 and R2.

When the dc voltage is measured between "X" and the chassis or circuit ground (in ac/dc sets), you should find a high voltage whose level depends on the plate current of V1. Then place the probe at "Y." The meter should indicate no voltage. If you find a voltage there, replace "C."

Squelch Circuits

A VTVM is essential in troubleshooting squelch circuits of two-way communications receivers. A typical squelch circuit is shown in Fig. 4. The audio signal passes through V3 but only when its cut-off bias is removed. This tube is normally biased to cut-off by R1 and R2 which make the cathode positive with respect to the grid (grid is negative with respect to cathode).

The plate voltage for V2, a dc amplifier, is obtained from V3's cathode through R3 and is applied to V3's grid through R4. When V3's plate current rises, its plate becomes less positive and so does V3's grid which is negative with respect to its cathode. Hence, V3 cannot conduct and pass audio.

The dc amplifier, V2, draw plate current under no signal conditions because noise is present at the FM detector output. This ac noise, which can be measured at point "A" with a VTVM, is amplified by V1 and rectified by diode CR. Thus, a positive dc voltage is fed to V2's grid which offsets the bias applied by R5, R6 and R7 to make the

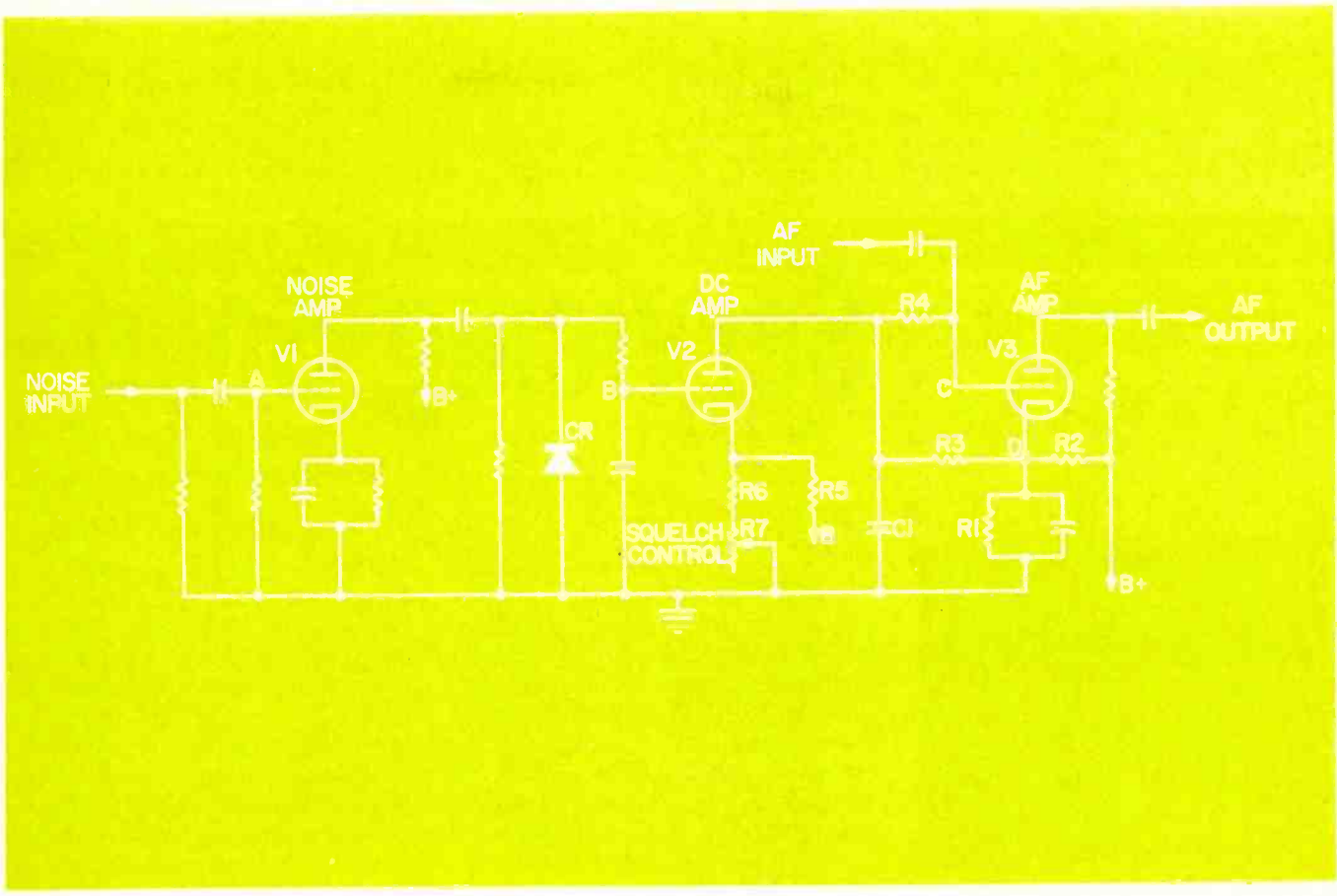


Fig. 4—Typical squelch circuit in two-way communications receiver.

cathode positive (grid negative with respect to cathode) and causes V2 to conduct. This dc voltage can be measured at "B."

When a signal is received, the noise is "quieted" and the positive dc voltage at V2's grid is made less, causing V2's plate current to decrease. The voltages at V2's plate and V3's grid becomes less positive and V3's bias is reduced — allowing it to conduct and pass the AF signal.

The dc bias on V3 can be measured with a VTVM across "C" and "D." Set the function switch to read negative dc voltage and make sure the VTVM case is not in contact with a grounded object. The voltage here varies, depending on the squelch control (R7) setting and the noise quieting effect of an incoming signal.

Alignment

A VTVM can be used to monitor audio at the detector or speaker output. A modulated test signal is used for this alignment. But many prefer to monitor AVC voltage when aligning AM receivers or limiter voltage when aligning FM receivers. In both cases the VTVM function switch is set to read negative dc voltage and the test signal may be unmodulated. The circuits are adjusted for maximum voltage indication.

The screen voltage of an AVC controlled tube may be monitored with a VTVM when aligning an AM receiver. The circuits are adjusted for maximum dc screen voltage indication since screen voltage rises with increasing AVC voltage.

FM Discriminator Adjustment

While the basic Foster-Seely discriminator is no longer widely used in FM broadcast receivers, tuners and TV sets, it is still popular in two-way communications receivers. It can be easily adjusted with a VTVM — especially if the meter has a zero center-scale.

The VTVM is connected across the double-diode output of the discriminator. An unmodulated signal, at "exactly" the IF center frequency, is fed to the grid of the immediately preceding IF limiter stage. The secondary (output) of the discriminator transformer is first detuned. The primary (input) is adjusted for maximum reading on the VTVM. The secondary is then adjusted for a zero reading on the VTVM. That's all there is to it, but make sure the output reads true zero. If the transformer secondary is mistuned, a positive or negative dc voltage reading will show — depending on whether the secondary is tuned above or below center.

A number of books are available which list, with full instructions, scores of jobs that can be done with your VTVM. These include adjusting ratio detectors used in FM broadcast receivers and tuners, gated beam FM discriminators, sharp cut-off penode detector circuits, checking CB transmitter tuning, modulation and many others. ■

Servicing Solid-

Learn how to troubleshoot and repair

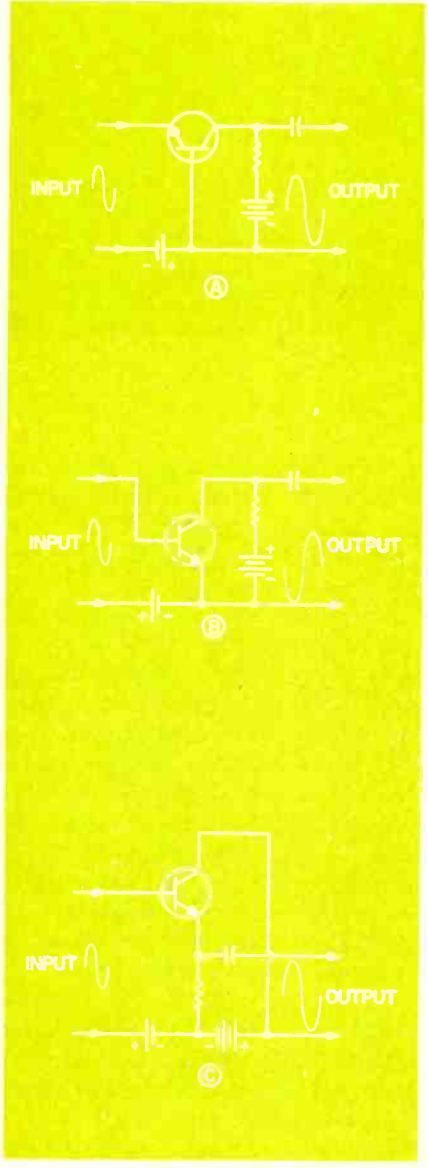


Fig. 1(A)—Common base. (B)—Common-emitter. (C)—Common-collector.

■ A look around the field indicates that a significant number of technicians are still afraid of solid-state circuitry—especially in TV sets. It appears that many technicians just don't know where to begin troubleshooting the sets. Actually, this is absurd. It appears to be a result of unnecessary fear arising from inexperience and lack of confidence. The fear can be easily dispelled by "digging into" the actual circuits, analyzing them and cautiously performing troubleshooting procedures. Confidence will grow with experience.

For most of us it's a little late to begin "rehashing" solid-state basics. We must constantly remind ourselves, however, of certain fundamentals. But we will be concerned here only with sufficient theory to understand the practical operation of these circuits and servicing techniques. We will avoid all references to the chemical composition of diodes and transistors and their complex molecular operating theory and characteristics. An understanding of these functions and characteristics is not necessary to service solid-state circuitry efficiently. Furthermore, these subjects have already been covered thoroughly in scores of available books. And when we begin to work on the actual sets soon, we'll start thinking "solid-state" automatically in the same way we now think "electron-tubes."

Basic Transistor Circuits

Before we approach the more complicated solid-state circuits used in TV sets today we'll review basic transistor circuits and a few simplified practical types employed in radios. We will review basic diode theory and operation in a forthcoming article.

We'll be working with three basic transistor circuits: common-base (grounded-base), common-emitter (grounded-emitter) and common-collector (grounded-collector) as shown in Fig. 1. Note that NPN type transistors are used in these circuits. When PNP types are used, of course, the battery (bias voltage) polarities are reversed. Note, too, that the input and output circuits are common to the base in the common-base circuit, the input and output circuits are common to the emitter in the common-emitter circuit and the input and output circuits are common to the collector in the common-collector circuit.

Let's recall and repeat to ourselves that the input signal to the common-base circuit is fed to the base-emitter and the output signal is taken from the base-collector. The input of this circuit has low impedance (from 0.5 to about 50Ω). The output has high impedance (from 1K to about 1M).

In the common-collector circuit the input signal is applied to the base-collector and the output is taken from the collector-emitter. But here the input impedance is high and the output impedance is low. This circuit functions like a tube cathode follower circuit. The voltage gain is less than unity as with the common-base circuit and

State TV Circuits

today's circuits successfully

the power gain is generally less than that in either a common-base or a common-emitter circuit.

In the common-emitter circuit the input signal is applied to the base-emitter and taken from the collector-emitter. The input impedance ranges from 20 to about 5000Ω and output impedances range from about 50 to 50,000Ω. Power gain may reach 40db or possibly more. The circuit produces both current and voltage gain.

We also recall that a signal is shifted 180 deg, from input to output, in the common-emitter circuit. Signals in the other two circuits remain in phase from input to output like it does in a tube cathode follower circuit. The common-emitter circuit is widely used as a high-gain amplifier.

Transistor Biasing

Although we will not detail biasing methods at this point, it will be necessary to touch on certain basic requirements before we proceed with practical transistorized circuitry. In fact and in practice, many trouble symptoms can be traced to off-bias conditions in transistor circuits caused by out-of-tolerance resistors or electrolytic capacitor failures. Transistors, like electron tubes, must be properly biased so they will function as required in various applications. Electron tubes require a positive plate voltage and negative grid voltage (in most applications).

On the other hand, transistors function with similar voltage polarities (either negative or positive) on both the base and collector elements. In general (for most applications) this means establishing a *forward* bias across the emitter/base junction to obtain *high* conduction and a *reverse* bias across the collector/base junction to obtain *low* conduction. This holds true for both NPN and PNP type transistors. This point should be thoroughly understood, however: When a tube has little or no bias, it draws heavy plate current. When a transistor has no bias, it is cut off—little or no current flows through it.

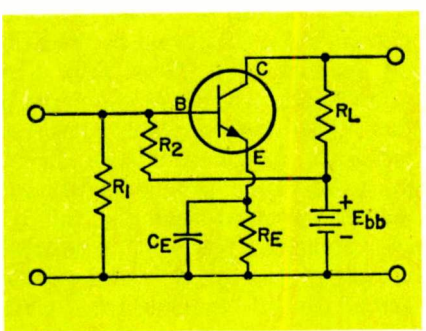
Note, too, that the emitter bias polarity is positive in PNP transistors and negative in NPN types; the collector is negative in the PNP transistor and positive in the NPN transistor; the base is negative in the PNP transistor and positive in the NPN type. Two basic biasing arrangements for common-emitter NPN transistor circuits are shown in Fig. 2. Polarity of the voltage supply is reversed for PNP transistor circuits.

In many practical cases, bias networks may include diodes or thermistors to compensate for variations caused by ambient temperatures, current or voltage variations. These components must be watched carefully in practical servicing.

We will also find practical transistorized circuits that employ both positive (regenerative) and negative (degenerative) feedback.

Forthcoming articles will deal extensively with coupling methods for transistor stages, single and double-diode circuit functions, phase splitting circuits, "forward" AGC circuits where an increase in collector current causes a decrease in stage gain and circuit troubleshooting and repair techniques of other specialized arrangements that you must know to successfully diagnose and troubleshoot solid-state TV circuits.

Soon most B/W TV sets will be transistorized and with solid-state color coming, every technician must prepare himself for this opportunity to increase his profits. ■



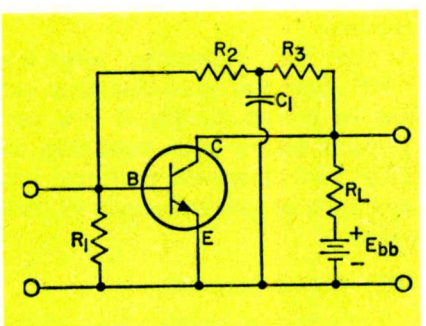
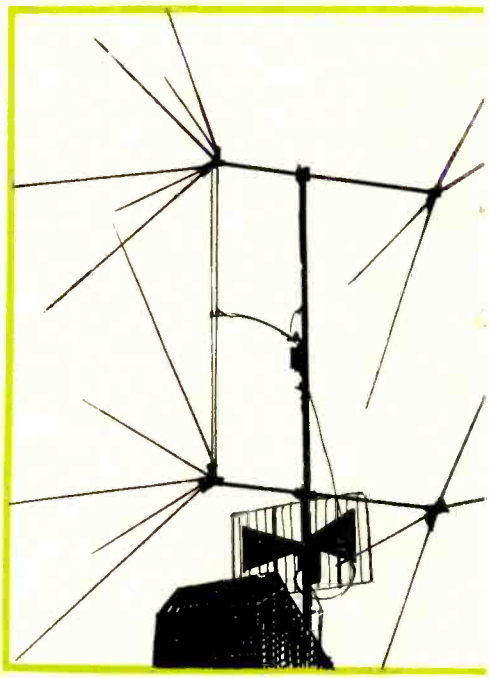


Fig. 2(A)—Bias network in common-emitter circuit uses emitter stabilizing resistor. (B)—Common-emitter circuit using split-voltage-divider bias network.



SOLVING UHF RECEPTION PROBLEMS

Reduce call-backs and give your customers the kind of reception they deserve

■ The boom in color TV has added impetus to the increasing demand for better reception on UHF channels. And the public will no longer accept the same poor-reception excuses which have been given in the past.

Tests in various parts of the country during the past decade, notably those conducted by the FCC on channel 31 in New York City a few years ago, prove conclusively that UHF can provide consistent top-grade reception. Hence, in almost every case, service dealers and technicians must bear the full responsibility for providing acceptable reception. Improved lead-in, better antennas and transistorized UHF tuners and converters have eliminated most "excuses" for poor reception.

You will encounter very few UHF reception problems that can not be solved quickly if you arm yourself with a basic knowledge of UHF and its normal problems and apply the proper techniques to their solution.

UHF Characteristics

Let's review briefly some of the important transmission and reception characteristics of UHF. (See the book "How To Service UHF TV," available through ELECTRONIC TECHNICIAN.)

To begin with, the amount of effective radiated power (ERP) of a UHF station is important. This will determine, to a great extent, the area of practical coverage. You should know what the ERP is from the UHF station or stations in your area.

UHF signals have a stronger tendency to travel in a straight line as their frequency increases. Less diffraction exists over and around tall buildings and hills. This causes problems, particularly in large cities and in suburban and rural areas where the terrain is irregular. In a word, "shadow" areas and dead spots exist. Translators are frequently used in highly populated areas to solve these problems. In New York City, for example, a translator was installed on the George Washington bridge to beam channel 31's signal into the Inwood area of Manhattan and the West Bronx area to the north which is below Ft. George and Ft. Tryon.

UHF signals — especially on the mid-range and higher frequency channels — are sometimes absorbed by obstructions, particularly steel-reinforced buildings, earth hills and vegetation.

Antenna transmission line losses (lead-in losses) increase as the UHF channel frequency increases.

Locating the Antenna

Customers are becoming concerned with the appearance of their homes and it is very difficult to convince them that UHF reception would be much better if the antenna was mounted on a separate mast away from the present VHF antenna. But the sight of two separate antennnas on the roof is something that few customers will accept. This problem can usually be avoided, however, by mounting the UHF antenna on top of the original mast.

If you work in an area which receives both VHF and UHF channels, and the customer does not want a separate UHF mast, always install the UHF antenna at least three ft above the VHF antenna—higher if possible. A five ft length of mast can frequently be u-bolted to the top of the original mast. Locating the UHF antenna in this position will give more room to adjust the antenna both vertically and horizontally. Remember: the antenna will frequently need to be moved vertically as well as horizontally to obtain the best recep-

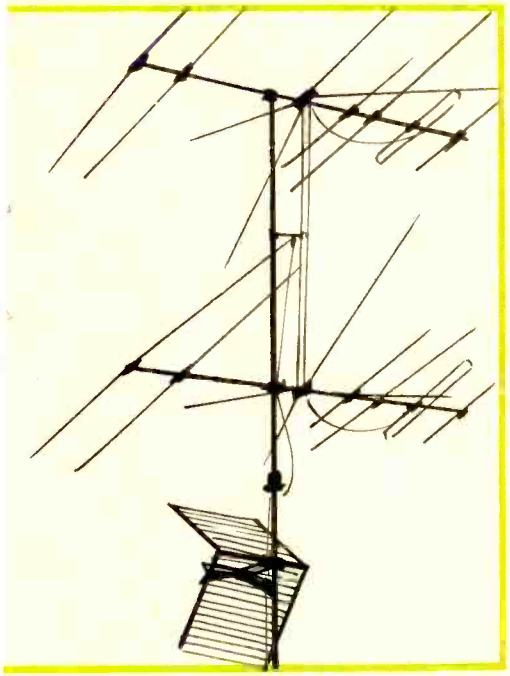


Fig. 1—UHF antennas mounted below VHF antennas make it difficult to get good reception.

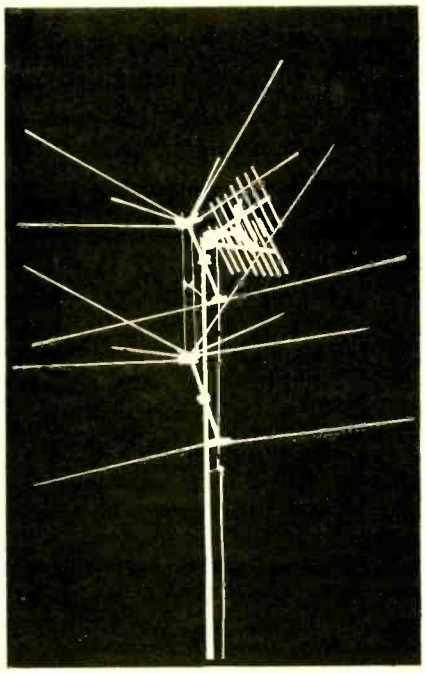


Fig. 2—A well-mounted UHF corner reflector gave poor reception because of losses in ordinary twin-lead.

UHF antennas mounted on the mast in this position can and usually will give erratic reception.

tion. When the UHF antenna is installed above the VHF antenna, interaction between them is avoided and the VHF antenna will not absorb the UHF signal. And keep the mast guy wires as low as possible. They can cause unstable UHF signals.

Two different antenna installations are shown in Fig. 1. In both cases the UHF antenna is placed *below* the VHF antenna. In both cases the UHF signals had a tendency to become unstable and erratic — depending on the weather. Higher gain UHF antennas did not help. When the original UHF antennas were moved two feet *above* the VHF antennas, reception was excellent.

In some cases when a UHF antenna is first installed below the VHF antenna the reception will be good. But don't let this fool you. If you'll look at the TV picture carefully you may notice a slight smear in the picture elements. This will warn you to get the UHF antenna from this position — above the VHF antenna and away from other surrounding objects. Otherwise, you're looking for future trouble.

If you install the UHF antenna in late autumn, winter or early spring, watch out for trees around the house that stand between the antenna and the UHF station to be received. When the leaves come on the trees (and especially after rain), you may get a call from the customer complaining of "snow." To avoid this, provide a wide margin of gain with a high-gain antenna, install a booster or put up a mast high enough to clear the tree-tops.

Lead-In

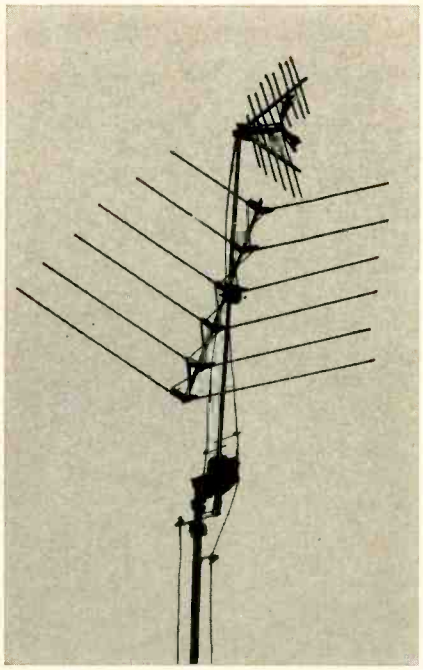
Lead-in is also an important consideration in UHF reception. The type of lead-in generally used with VHF antennas is not satisfactory for UHF antennas. This refers, of course, to flat 300 Ω twin-lead and coaxial cable. There is no excuse for using these types of lead-ins for UHF reception.

Encapsulated twin-lead is specifically designed for UHF and will give excellent over-all results with minimum attenuation. Signal losses become intolerable under bad weather conditions when flat ribbon and ordinary tubular lead-in is used. Encapsulated lead-in, as previously mentioned, is the best for improving UHF reception. This lead-in offers technicians a better chance than ever before to obtain maximum signal transfer from the antenna to the receiver. Good installation practices must be employed, however. And, we repeat, except under special conditions, regular coaxial-type lead-in is not satisfactory for UHF reception.

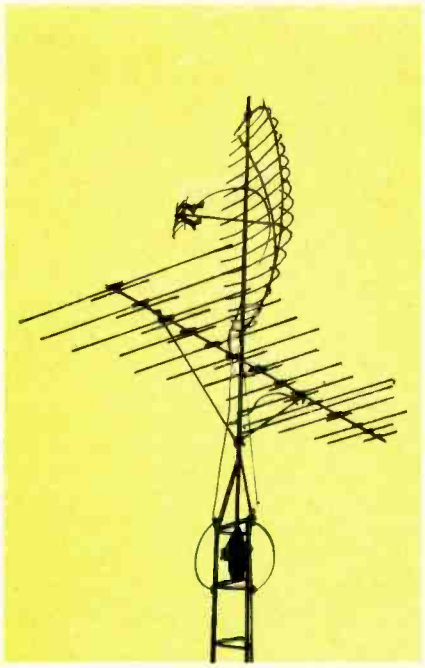
Here is a typical case that demonstrates what happens when ordinary flat twin-lead is used.

As shown in Fig. 2, you'll note stacked VHF conicals with a high gain UHF corner reflector mounted at the top of the mast. The customer's house was located only 2½ miles from the UHF transmitter. Two different antenna installers gave up on this job — trying to get good UHF reception. The reason given: antenna blocked off from the transmitting station by a slight hill in front of the house.

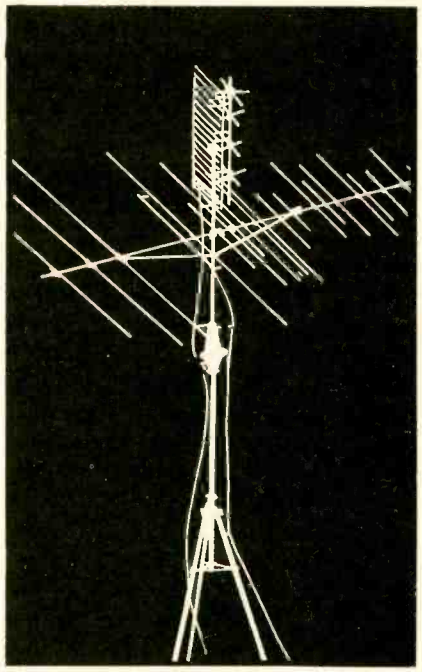
Tests with a field-strength meter showed a 40 percent signal loss from antenna to the set. Only one reason for the loss appeared evident — the lead-in being used. When the 300Ω flat lead-in was removed and replaced by encapsulated wire the reception was excellent — and it remained that way. The encapsulated lead-in was also re-routed in a way that shortened the lead-in run by eighteen feet. This helped the situation, too.



Rotor-operated antenna gives excellent results in one area—picking up all UHF channels in the area (channels 21, 25 and 49).



This cylindrical parabolic, mounted above the VHF antenna, gives very good results on channel 21 and 25 at 35 miles away.



Another ideal installation where the results are praised by the customer.

Couplers

The only reason for using a UHF/VHF coupler is to eliminate the necessity for using two lead-ins. Cheap couplers are frequently poorly matched and provide poor isolation between UHF and VHF terminals. Many technicians use these, instead of amplified couplers, and leave the way open for headaches shortly after the installation is completed. In some cases signal losses develop as high as 8db.

The Antenna

It is impossible to tell you what kind of antenna you should use for a specific job. But technicians should not allow the enormous range of shapes and sizes to confuse them. Some technicians have elected to buy antennas on the basis of cost and cost alone. This is an un-business-like approach to the problem.

Make a list of all the UHF antennas available, together with polar patterns and over-all gain. If you have a field-strength meter, run up the test dipole and make a measurement. You can then determine what antenna to use to give the signal strength necessary. The antenna should have a high front-to-back ratio in most cases. But, in the final analysis, if you're not experienced with UHF antennas in your area, you'll have to do a lot of experimenting and keeping records on conditions in various locations in your working area.

Even considering the widest variety of problems that can arise in an area, selecting a UHF antenna will not be a great problem for technicians who have had wide UHF experience in their areas of operation. For the inexperienced, some experimenting will soon reveal a particular type of antenna (most of the time) which will produce sufficient gain and the least multi-path interference. It must be remembered, of course, that it is better to have somewhat less gain and no ghost problem than to have a great amount of gain and many multi-path signals. In some areas the lobe or lobes of the antenna are more important than the overall gain. Regardless of the antenna selected, correct location and positioning is definitely the most important consideration.

Technicians must familiarize themselves with the great variety of UHF antennas on the market. They will find some that work better than others from location to location in a given area.

Other Things to Remember

1. In some locations you will get a better picture by reflection — from a high building, hill, etc. — than you will by directing the UHF antenna at the transmitting antenna.

2. On flat terrain, good UHF is possible up to 50 or more miles away, depending on the transmitter's ERP and the height of the antenna from the ground.

3. Never recommend an indoor antenna for UHF unless you *know* the set will give satisfactory results in a given location. This is especially true for color reception.

4. Under certain circumstances, a wire net screen mounted on a high spot can reflect signal into the antenna mounted in a "shadow" area to provide good reception.

5. Do not run the lead-in close to metal objects — gutters, metal siding, water pipes, nails, etc. And use non-metal stand-offs.

Learn the characteristics and nature of UHF and the precautions that must be taken. Knowledge of UHF principles will erase the mystery of poor reception. Installations will be more dependable and call-backs — because of fading, ghosts and intermittent reception — will be drastically reduced. ■

Part III (Conclusion)

Volume Limiting in Communications

Syllabic-controlled speech amplifier provides nearly-constant output

■ A previous article (January 1966 ELECTRONIC TECHNICIAN) explored the functions of Automatic Deviation Limiting (ADL) and Automatic Load Control (ALC) circuits used in various two-way transmitters. Additional volume limiting circuits will be covered here.

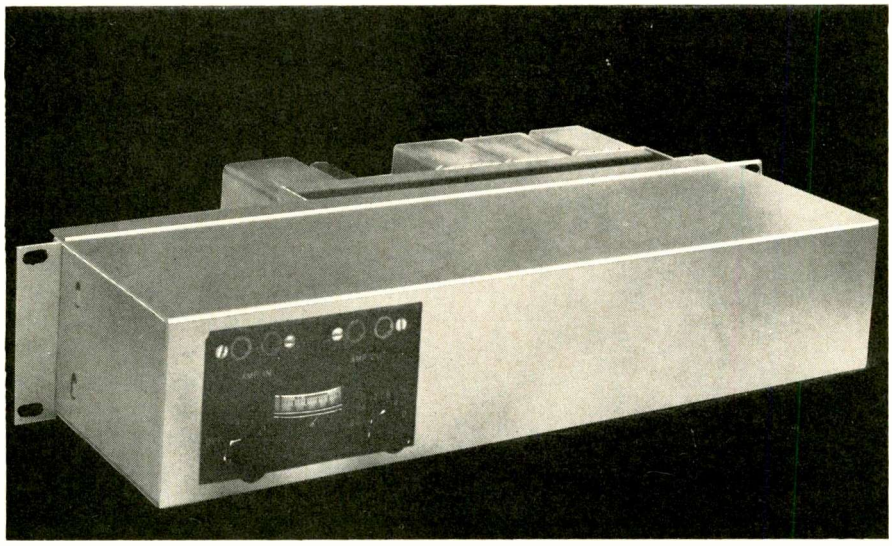
Agamp

A highly sophisticated speech-level controller, called "AGAMP" (Automatic Gain Adjusting Amplifier), is a syllable-controlled, variable-gain, speech amplifier with an input range of 40db, an output variation of only 4db, and a bandpass of 250-3000cps (Fig. 1). Developed specifically for telephone-system use, it is also employed ahead of RF transmitters. Its gain-adjusting action works two ways: Loud speech causes the gain to drop; weak speech causes it to increase. The result is a nearly-constant speech output. And gain-control occurs *only* on speech — not on noise. Furthermore, at high input levels, gain-reducing action is fast; at low levels, it's slow. With noise, of course, the circuit is in a no action state.

As shown in Fig. 1, the speech-input signal passes through the input attenuator which matches external levels to AGAMP's range. The signal is then amplified by the preamp, which compensates for the loss of the following variolosser — a variable-resistance diode bridge which is the heart of the equipment. After this, the output amplifier provides additional gain and the level-controlled signal appears at the output terminals.

The variolosser is simply an 8-diode dual bridge which forms a pad between the preamp and the output amplifier. Since the impedance of a diode varies with the current flowing through it, it follows that a dc control current fed to the variolosser will vary its impedance. Varying the impedance of this pad varies the signal level supplied to the output amplifier.

A portion of the preamp's output appears across the threshold level control. This control sets the point at which gain-increasing action occurs. (Most speech is above threshold and most noise, below; hence speech is amplified more than



Lenkurt Electric's AGAMP.

Volume Limiting

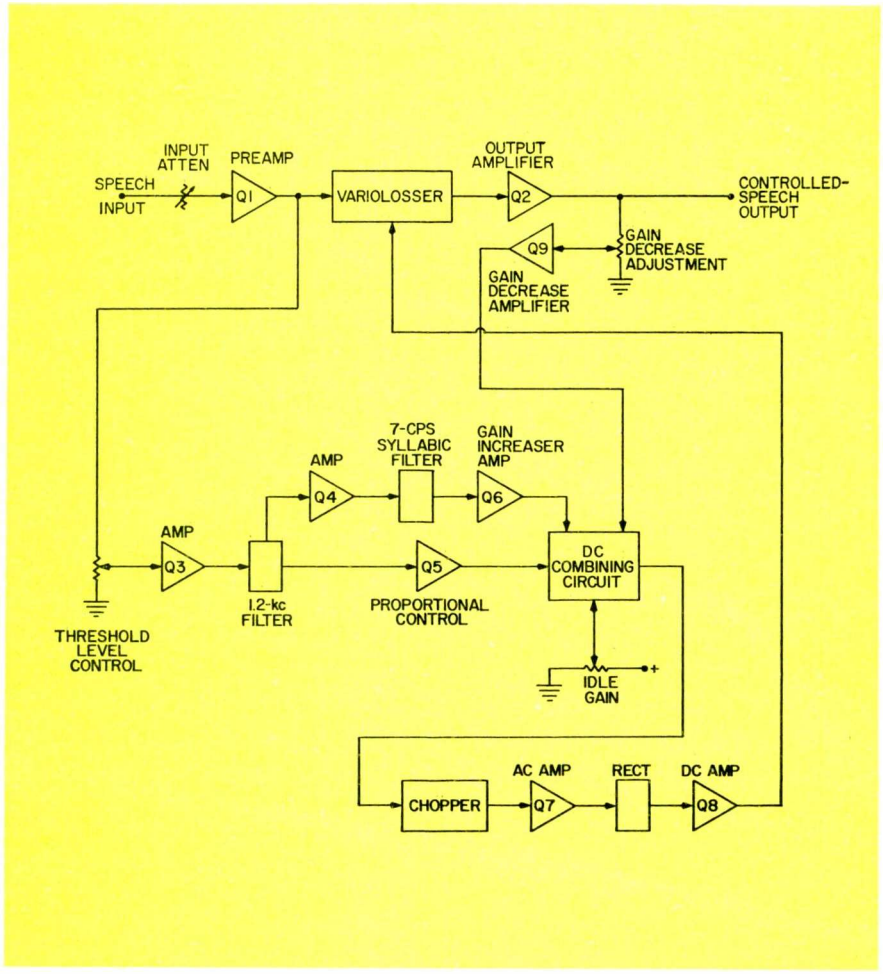
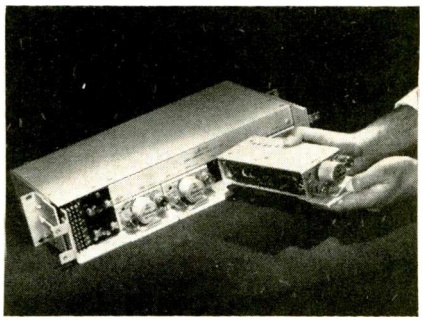


Fig. 1—Block diagram of AGAMP.



Shelf assembly containing four Compandors.

noise, raising the s/n ratio.) Signals above threshold pass through another amplifier to the 1.2kc filter. Thus the control sample is taken at a narrow band of speech frequencies only, rejecting high- and low-frequency noise. The 1.2kc filter output is split. One line is further amplified and fed to the 7cps filter, which restricts the output to speech syllables only. This line is passed through the gain-increaser amplifier, rectified, and furnished to the dc combining circuit for controlling the variolosser.

The other output of the 1.2kc filter is amplified by the proportional control. This circuit furnishes dc control voltage to the dc combining circuit of opposite polarity to that of the gain-increaser. But output does not take place until a difference exists between AGAMP's input and output levels and when this occurs, PC's output is proportional to that difference. Hence, PC permits the gain to increase for signals at threshold, but as the level rises, amplifier gain decreases. At nominal input level, PC inhibits gain-increasing action.

The proportional control also contains a time-delay circuit. At low input levels, the time required for a signal to reach full output level is great (16 syllables); at high input levels the time is very little (1 syllable or less).

The idle gain adjusts the static, or no-signal operating gain, by furnishing a fixed dc to the combining circuit. The gain decreaser operates as a conventional volume-limiting feedback loop across AGAMP's output. A portion of the output signal, determined by the position of the gain decrease adjustment, is amplified, rectified, and furnished to the dc combining circuit in such a way that the variolosser will decrease the gain, rather than increase it. The gain decreaser contains no filters and therefore functions on any and all output signals (includ-

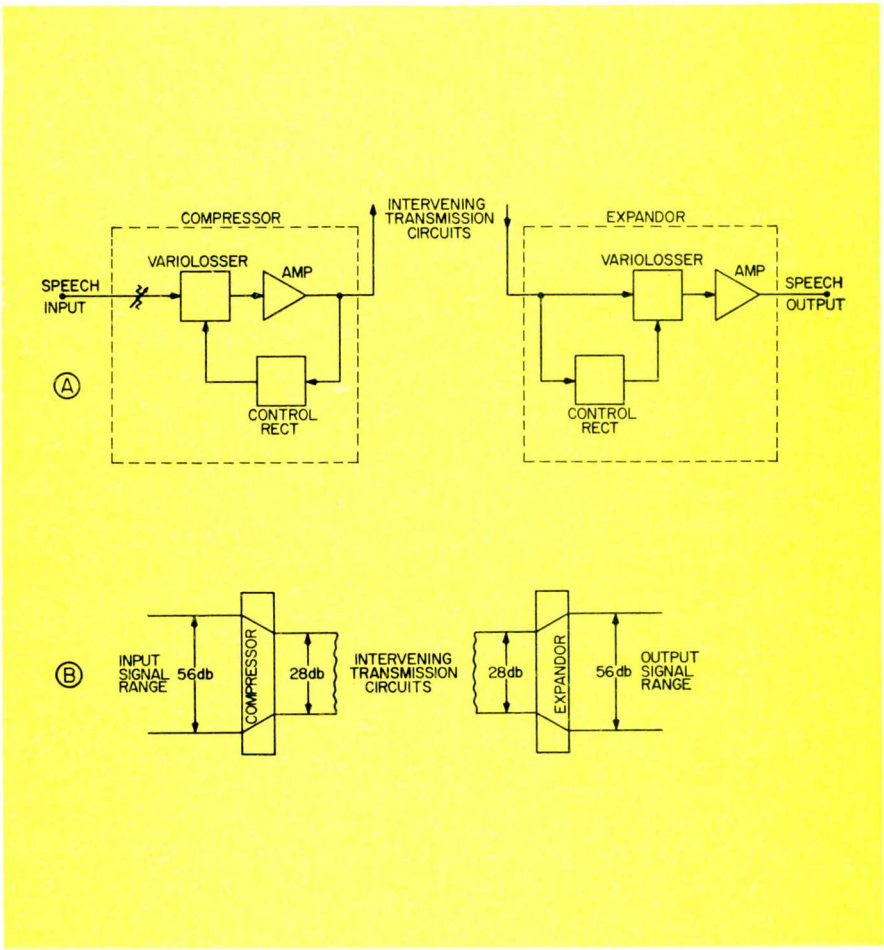


Fig. 2—The Compandor. (A)—Compressor and expandor sections. (B)—How signals are compressed and expanded.

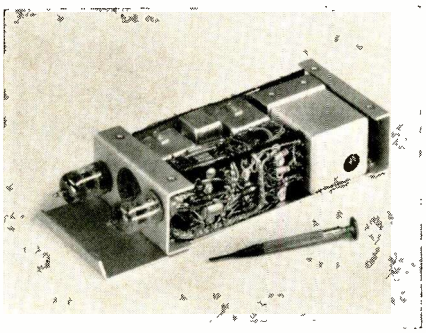
ing noise), thus preventing overload of transmitters or other equipment following AGAMP.

The dc combining circuit's output is chopped, amplified, and rectified (to avoid instability problems inherent in dc amplifiers) and fed to the variolosser as a control signal. Here it controls the signal amplitude by varying the bridge circuit impedance. Since the variolosser is resistive, no distortion occurs and thump is eliminated under gain control.

Compandor

The telephone service has used this device also in various forms for a number of years. It reduces the effects of noise and crosstalk (in both wire and RF transmission facilities), prevents overload and provides additional gain. Basically, two separate circuits, a compressor and an expandor is used. Input speech signals (Fig. 2A) pass through a manual attenuator and a variolosser element (similar to that described previously). An amplifier follows the variolosser and provides the necessary gain and signals to the line or transmitter. A portion of the output is rectified and the resulting dc is fed to the variolosser in the fashion of control current, varying its impedance. Thus input signals in a 56db range are compressed into a 28db range, as shown in Fig. 2B.

Compressed signals are then handled by the usual transmission circuits. But noise and crosstalk remain at low levels, while the compressed signals have a degree of immunity since they are handled closer to the upper limit of the amplifiers. At the other end, the expandor reverses the process. Incoming signals reach the VL first, and some input voltage is rectified and the resultant dc is applied to the VL to increase the gain. Hence, the expandor's output is restored to the original 56db range of the compressor's input. ■



Single Compandor unit.
Photos, courtesy Lenkurt Electric Co.

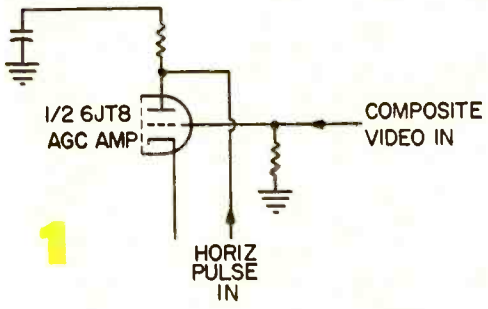


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Fig. 1—Simplified typical AGC circuit.

Fig. 2—Cancellation pulse amplitude is determined by a divider network just ahead of the sync takeoff point.

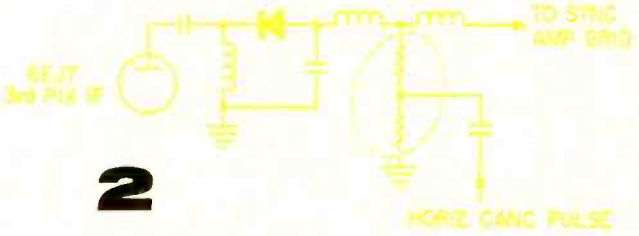

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Fig. 3—Simplified typical blanker circuit.

Fig. 4—The blanker has a cathode load resistor common with the bandpass amplifier.

Fig. 5—Simplified burst gate clipper.

Blanking and Gating in Color Sets

■ Blanking and gating are probably two of the least understood functions in color TV sets. Actually, neither adds anything to the picture or sound. If the systems work there's no reason to even think about them. When the set requires service, it rarely involves blanking or gating. So, we have a fairly reliable circuit that technicians are rarely concerned with and hence, know little about.

Why talk about it then? Well, if you've ever "tangled" with a set that *did* have blanking or gating trouble, then you know how many hours can be wasted trying to solve a problem which seems to have no relation to anything! Although the principles of monochrome TV blanking and gating are very similar to those employed in color sets, it is more involved in color sets. Hence, what you know about monochrome blanking and gating can be applied to color — and vice versa.

At the Beginning

The blanking and gating signals we are concerned with are generated in the receiver's horizontal section. Generally, the pulses are sampled from the flyback. They occur during retrace time and serve no less than seven different functions. Perhaps the general lack of understanding of these retrace-time pulses arises because many technicians do not know why they are needed. Two separate pulses are usually employed.

The pulses are used to gate various circuits both "on" and "off" and even to create continuous biases for some stages. Consequently, both positive and negative pulses are needed. In some instances a tube may be gated "on" by applying a positive pulse to the grid or it may be gated "off" by applying the same pulse to the cathode.

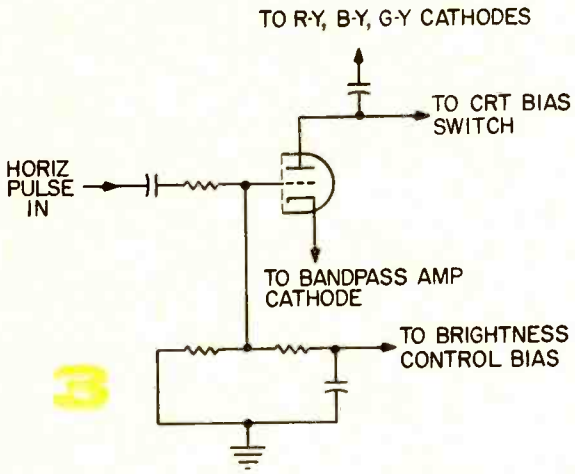
AGC Keying

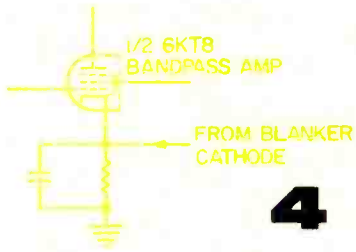
Keyed AGC is not uncommon on monochrome sets and is now generally considered best for automatic gain control. A typical circuit is shown in Fig. 1. Its operation is simple: A positive pulse is sampled from the flyback and applied to the plate of a triode which receives no other supply voltage. Hence, the tube conducts only during retrace time (when a positive sync pulse is on the control grid). Thus, we have a negative rectified voltage at the plate which is filtered and applied to the IF, tuner, etc. The pulse amplitude is directly proportional to the sync-pulse amplitude.

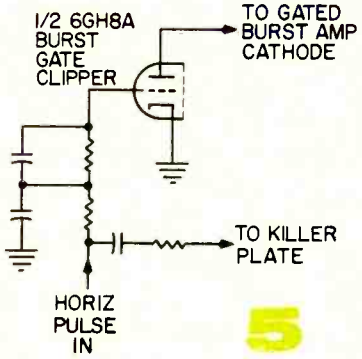
Keyed AGC systems have high gain, good noise immunity and are not affected by video changes. Because a triode is used in this circuit, the keying pulse can be "felt" at the grid of the triode and reflects back to the sync amplifier. Since this could upset sync action, a cancelling pulse is applied to the composite signal just ahead of the sync takeoff point. This cancellation pulse is the same as that applied to the AGC amplifier. The cancellation pulse amplitude is determined by a divider network at the input point. This is shown in Fig. 2.

The Blanker

The blanker serves several functions. Three outputs from a typical blanker circuit are shown in Fig. 3. The same positive pulse used for AGC keying is applied to the blanker grid. Since this is a high amplitude pulse, the blanker tube







Don't let pulse-actuated circuits 'throw' you

is forced into heavy conduction and draws grid current. The grid current causes the coupling capacitor to charge to about 80v negative. This negative voltage is applied to one end of the brightness control so it has sufficient common operating range.

The blanker has a cathode load resistor common with the bandpass amplifier. Hence, the bandpass amplifier is cut off during retrace time by the positive pulse. This is shown in Fig. 4.

The negative pulse on the blanker plate is fed to the color difference amplifiers' cathodes which determines their bias. The CRT bias switch network is the blanker plate load and determines the color difference amplifiers' bias. This bias voltage is, of course, developed during horizontal retrace time.

Other Horizontal Pulses

Horizontal retrace pulses are also used in other sections of color TV sets although they are not directly associated with those previously mentioned. A separate winding on the flyback supplies pulses to the convergence circuitry and to the color killer and burst gate clipper.

The grid of the killer amplifier is held either at cutoff or in conduction by the killer detector. When a color signal is present, the output of the detector is negative and when a B/W signal is broadcast, the signal is positive.

When the killer amplifier is in conduction, the positive pulse on its plate is rectified and the resulting voltage is applied to the chroma amplifier grid which cuts the chroma amplifier off. If, on the other hand, a color signal is received, the negative voltage from the killer detector cuts off the killer amplifier and the positive pulse is not rectified. This permits the chroma amplifier to conduct.

Burst Gate Clipper

The purpose of the gated burst circuitry is to amplify only the burst portion of the composite signal. Since the burst occurs on the back porch—during horizontal retrace time—the burst amplifier circuitry can be gated "on" during burst time by a horizontal pulse. In fact, the same pulse used to operate the killer amplifier is used to gate the burst amplifier.

The burst amplifier is supplied with the composite signal and is connected in "series" with the gating tube. Consequently, the only time the burst amplifier can conduct is when the "series" gate clipper is turned on. The gate clipper is turned on by the horizontal pulse from the flyback and allows the burst amplifier to conduct and amplify the burst signal. A typical circuit is shown in Fig. 5.

Troubleshooting

A scope and VTVM are the two best instruments to use for troubleshooting gating and blanking circuitry.

Since all the horizontal pulses are derived from the flyback, this should be a central point of investigation. Most of the circuitry is high-resistance and the ohmmeter can be of considerable help for preliminary checks even before any parts are disconnected. Don't rely on ohmmeter checks alone, however, because the high voltage pulses frequently cause breakdowns only when the set is operating. ■

COLORFAX

Sylvania DO1 and DO2 Color Chassis

Horizontal Hold

With certain signal conditions the Sylvania D01 and D02 color chassis may exhibit poor horizontal hold or may lock off sync. A better locking range and greater stability may be obtained by installing a 10M ½w resistor from the sync separator's plate to the grid.

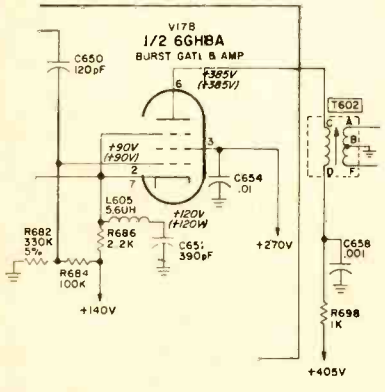
Alignment of the horizontal oscillator coil should be checked anytime there is trouble with horizontal sync. The recommended procedure follows for both the 21 and 25 in. color chassis.

Short out the sync by grounding the input to the sync separator. Short out the oscillator coil by placing a jumper from pin eight of the oscillator to ground. Adjust the horizontal hold control until the picture syncs horizontally or floats by slowly. Next, remove the short and adjust the coil for a horizontal sync or slow floating condition. After the sync short is removed the process is complete.

Unstable Color Sync

A very perplexing problem is color loss because of killer action or color sync loss. Actually, both problems are the same since killer cutoff is caused by a loss of color sync. Consequently, to determine the root of the problem the color killer must be opened. In most cases the color will exhibit a "barberpole" effect.

To correct this unstable condition, R682 (shown in schematic) located in the grid circuit of the burst gate amplifier should be changed to 330K. This resistor may presently be 270 or 240K. This change will make color sync more stable.



Other recommended changes are:

In the same stage L605 and C652, in shunt with the suppressor grid, should be removed. These two components are in one sealed unit. They should be replaced with a 1000pf disc type capacitor.

R680, located in the grid circuit of the burst gate clipper, should be changed from 180K to 68K and, finally, R601, located in the grid of the chroma amplifier, should be changed from the present 5.6 or 3.3M to 1.5M.

None of the above changes should be made without first being sure the reactance coil and the 3.58Mc output transformer is properly aligned.

"Open" the color killer to obtain sufficient color and burst during this alignment procedure. Tune in a color station. A color bar generator may be used although it is less desirable than a station transmission. Advance the chroma control to maximum clockwise. Detune fine tuning until color is barely visible. At this point, the color may fall out of sync. Adjust the reactance coil until it is centered in the locked-in range of the color signal. It may be possible to reduce the fine tuning still further to obtain a more accurate setting of the reactance coil.

Zenith Launches Expansion Program

Zenith Radio Corp. announced a $17,000,000 manufacturing facilities expansion program that will increase by more than 50 percent color picture tube production capacity before the end of 1966 and also substantially step up black-and-white picture tube output.

Joseph S. Wright, president, said the major portion of the expansion program was earmarked for the purchase and equipping of a 628,000 sq ft plant in Melrose Park, Ill., as a highly automated color TV picture tube facility.

"Despite a major expansion of our color picture tube plant about 12 months ago, demand for color receivers makes it necessary for us to expand color tube production for the fourth time," Mr. Wright said. "Our color tube plant has established new production records each month for the past several months, and is presently producing at a rate of approximately 900,000 tubes annually."

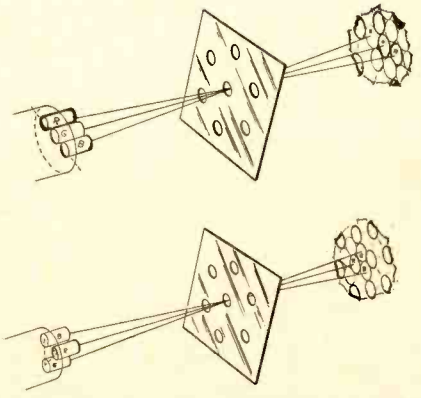
Addition of the new facility, the second color tube plant to be operated by their Rauland subsidiary, will more than double floor space available for cathode-ray tube research, engineering and manufacturing.

First phase of the new expansion program is scheduled to begin in April 1966, when the Melrose Park plant will be modified to accommodate installation of highly mechanized color tube processing equipment. Mr. Wright said that he expects color tube processing to begin at the new plant early in the second half of 1966.

"When the new facilities are in complete operation early in 1967, it will be possible for us to again step up our picture tube production capacity, to a rate of approximately two million tubes annually," the president said.

General Electric 11 in. Color CRT

The 11SP22 color CRT which G-E employes in its Porta Color TV uses the same principles as the standard aperture-mask color tube, but incorporates a different electron-gun arrangement. The three electron guns that produce the primary colors — red, green, and blue — are positioned in a straight line, instead of the "delta" or triangular arrangement used in the conventional tube. This switch to an "in-line" arrangement produces some far-reaching effect, according to the manufacturer. The convergence yoke, for example, is unnecessary and the remaining required convergence control is incorporated in the deflection yoke.



(Top) In-line gun arrangement of G-E 11SP4 color CRT. (Bottom) Gun arrangement in conventional color CRT

COLORFAX

Motorola Production Increase

A Motorola program which will increase 1966 unit production of rectangular color television receivers more than 2½ times over 1965 calls for an expansion of the company's facilities in Franklin Park and Quincy, and the acquistion of a facility in Elgin, announced Arthur L. Reese, executive vice president and general manager, consumer products division.

Major need is for more space to expand color TV output in the corporation's television receiver assembly plant at its headquarters campus in Franklin Park, Ill. To accomplish this, the company's consumer products plant in Quincy, Ill. will take over some of the black and white television receiver production now turned out in Franklin Park.

The company has purchased a 250,000 sq ft Elgin, Ill. plant from the McGraw-Edison Co., which will become a "feeder" facility supporting expanded color television assembly lines at Franklin Park.

Walter B. Scott, vice president of consumer products manufacturing, said that shifting of some black and white TV production to Quincy requires a 75,000 sq ft addition now being built, with still more construction planned during 1966. This will be the third major expansion of the Quincy factory, built in 1956, and will bring its total space to more than 425,000 sq ft.

Mr. Scott said his company will begin to occupy the Elgin plant in the first quarter of 1966. Purchase price of the Elgin plant was not disclosed. McGraw-Edison is transferring factory operations of this plant to a new facility in Iowa, but will retain its corporate headquarters in Elgin in a building to be constructed there.

Meanwhile, pilot production of rectangular color picture tubes has commenced in the company's new $10 million factory which was constructed earlier this year at Franklin Park adjacent to the television receiver facility. Volume production of color tubes, which will provide an additional source of supply to those now purchased from outside vendors, is scheduled to start in the first quarter of 1966.

Consumer products general manager Reese said that the demand for rectangular tube color TV sets has been so great that the division has been allocating finished products to its wholesale distributors across the nation since last August.

General Electric
Color Chassis — 3.58Mc Crystals

Care should be exercised when selecting the proper replacement crystal for all G-E color chassis.

ET41X27 crystal should be used in CW, CX, FY, CY and CA chassis since a shunt resonant circuit is used in these chassis. **ET41X47** should be used in the CB and HB chassis since these chassis use a series resonant crystal circuit and require different crystal characteristics for proper operation. The two types became mixed in stock so you may have received either type on orders for ET41X27. It is recommended that you check any crystals for correct units and segregate by the drawing identification numbers which appear on the crystals. ET41X27 is marked either 126J370-1 or 1107 863-1. Use in CW CX, CY, FY or CA chassis. ET41-X47 is marked 210,067-2. Use in CB or HB chassis.

RCA Victor
Canadian Expansion

RCA Victor Co., Ltd. announces plans to spend $25 million to establish a color television picture tube manufacturing facility in Canada.

The plant, to be located in Midland, Ont., 80 miles north of Toronto, will have an annual capacity of more than 300,000 rectangular color picture tubes upon its completion in mid-1967, said President John D. Houlding. The project will be financed with funds from Canadian and other sources outside the United States.

Mr. Houlding said construction of the new plant is expected to begin shortly.

"With this record expenditure, we are planning to meet the needs of Canadian color TV set manufacturers for many years to come," Mr. Houlding said.

Sylvania Capacity,
Two Million Color CRT Annually

Sylvania Electric Products, Inc. will have a manufacturing capacity approaching 2 million color TV CRTs annually on an extended shift basis when its new Ohio plant achieves full operation this year, President Gene K. Beare announces.

Demand for color TV tubes continues to outstrip supply despite repeated increases in production schedules, Mr. Beare reported.

He said approximately half of the estimated 5.4 million color sets in use on Dec. 31, 1965, were manufactured in 1965. He predicted that industry sales of color sets will increase sharply to more than 4.5 million units in 1966 and approximately 7.8 million sets in 1967.

The tube plant in Seneca Falls, N.Y., currently is operating on a "round-the-clock" schedule to help meet the demand for tubes. The new plant in Ottawa, Ohio, will soon begin producing color tubes, augmenting the production at Seneca Falls.

Philco, Hum In Picture
16M91 Chassis

In any cases of colored hum bars on monchrome pictures in models using the 16M91 color chassis, the problem may be due to poor ground connections of the eyelets to the chroma perma circuit panel or the eyelets to the chassis. Good grounding of the eyelets on the chroma panel in the vicinity of the video output tube and the 6GU7 matrix amplifiers should be checked.

In cases where the hum bars appear in black and white on monochrome pictures, the eyelets in the video and IF chain should be checked. Symptoms of color or black and white hum bars may appear at the top or bottom and may be either stationary or rolling.

NEW PRODUCTS

FOR MORE INFORMATION CIRCLE NEW PRODUCT NUMBERS ON POSTCARD INSIDE LAST COVER.

Intrusion Alarm 200

An intrusion alarm that operates on the doppler principle is introduced. A single unit can monitor an area of up to 5000 sq ft. Any human movement causes a frequency change of 2 to 4cps. This change is detected,

amplified and used to trigger an alarm which can be heard from some distance away. The microwave signal remains stable when no human movement in the area. The unit can also be used to trigger an alarm at a police station or detective agency. Radar Devices.

CRT Analyzer 201

A CRT analyzer is introduced. The unit will check both color and B/W tubes, and has a line voltage adjustment, grid-cathode leakage measurement, heater-cathode leakage check, hi-energy rejuvenation and will remove particle shorts. Color tubes are checked at the two extremes of operating conditions: maximum and minimum emission. This provides a method of comparing the three color guns, simulating the actual operating conditions of the color set in use. Lectrotech.

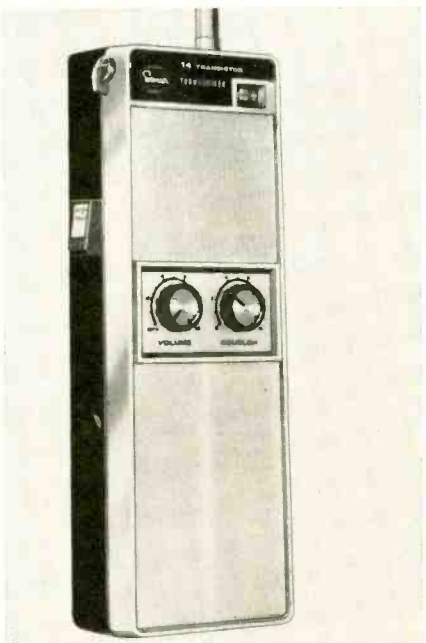
Record Changer 202

Announced is a compact record changer, called the "Minichanger," which weighs 4½ lb and measures 8⅜ x 11⅞ x 5 in. It plays 4 speeds, stereo or monophonic on

either ac or cordless battery power. It stacks six 7, 10 or 12-in. records, and will intermix the 10 and 12 in. sizes, with automatic shutoff after the last record is played. BSR Limited.

Two-Way Radio 203

A hand-held 2w, 2 channel citizens band radio is introduced. Model T2 is solid-state design and contains 14



transistors. Can be used for all types of industrial work: construction field, warehousing, material handling and police work. Sonar.

Paging Amplifier 204

An AM/FM 35w receiver and paging amplifier is announced. The Model BC350 has been designed for

music and paging systems in areas that require additional power coverage. It can be used in restaurants, stores, offices and factories. Fanon.

Screwdriver 205

Two pocket-size sets for driving "Scrulox" square recess screws are introduced. Tip sizes of the blades

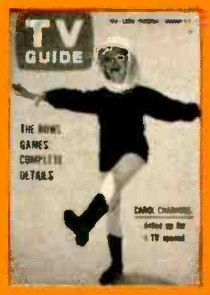
range from #00 through #3, and the set is suitable for service and assembly work involving screw sizes from #1 through #14. Xcelite.

Footswitch 206

This footswitch has a skid-proof basepad, cast iron housing and black

baked paint finish. Dimensions are 6¼ x 3½ x 1½ in. Vemaline.

You'll star in TV Guide



If you're "the right TV serviceman."

Get the jump on profitable color set repairs. Your Sylvania distributor will put your name, your town, your phone number in *TV Guide* as many as four times this year. If you're the right TV serviceman.

The right TV serviceman—Mr. Right—is any Independent Service Dealer who carries the most advanced replacement parts: our *color bright 85*™ picture tubes and our color receiving tubes. He may also carry competing brands. So he's in a position to give unbiased opinions on color set repairs.

This is what our double-page, full-color localized ads explain to *TV Guide* readers. Just see your Sylvania distributor and the ads will tell all those TV set owners about you. How about it, Star?

Sylvania Electronic Tube Division, Electronic Components Group, Seneca Falls, New York 13148.

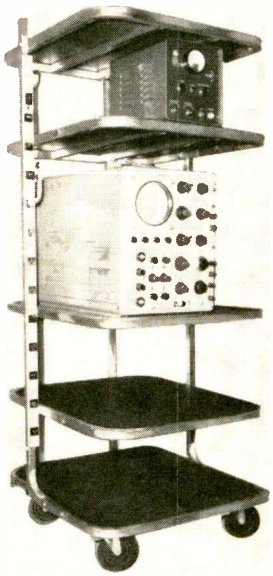
SYLVANIA

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS GT&E

NEW PRODUCTS

Instrument Carrier 207

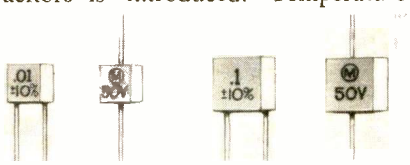
This cantilevered transport provides nearly 25 sq ft of moveable bench



space in a carrier 29½ x 26¼ x 66 in. The transport comes with 5 shelves, each adjustable to individual requirements. Waber.

Ceramic Capacitors 208

A line of subminiature ceramic capacitors is introduced. Temperature



characteristic is ±15% from —55°C to +125°C and is rated at 50dcwv. Republic.

Tube Tester 209

A tube tester for checking compactrons and other receiving tubes is announced. The Model 606 checks

for shorts, grid emission, leakage, gas and cathode emission under simulated load conditions. Each section of multisection tubes is checked. A reference index supplied with the tester contains a complete tube listing. B&K.

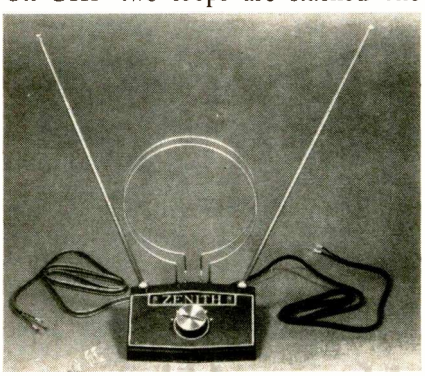
Service Cord 210

A heavy duty service cord is announced. The service cord is for

heavy duty use on refrigerators, freezers, humidifiers, washing machines, machinery, tools and electronic equipment. Birnbach.

Indoor Antenna 211

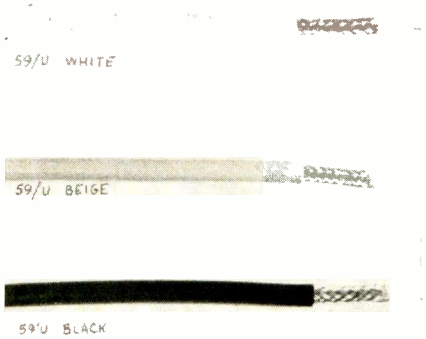
An indoor VHF/UHF TV antenna with separate VHF and UHF sections is announced. The antenna's VHF section is an adjustable rabbit ear dipole. On UHF two loops are stacked one



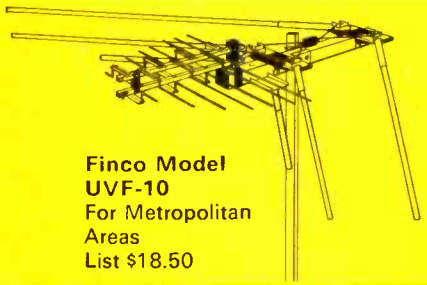
behind the other. These loops are inter-connected through a broad band, hybrid isolating network which phases them through the entire UHF spectrum. The VHF and UHF elements of the antenna have a chrome plating; the base, a brown color with silver color trim. Zenith.

Coaxial Cable 212

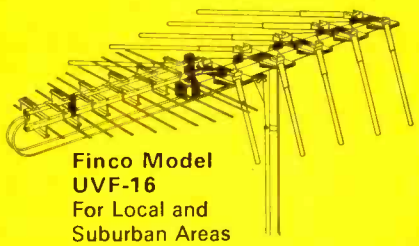
A colored jacketed 59/U 75Ω coaxial cable is announced. The cable



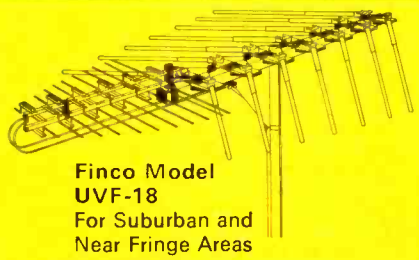
is available in gray, white or beige jacketing. Viking.



Finco Model UVF-10
For Metropolitan Areas
List $18.50



Finco Model UVF-16
For Local and Suburban Areas
List $30.50



Finco Model UVF-18
For Suburban and Near Fringe Areas
List $42.50

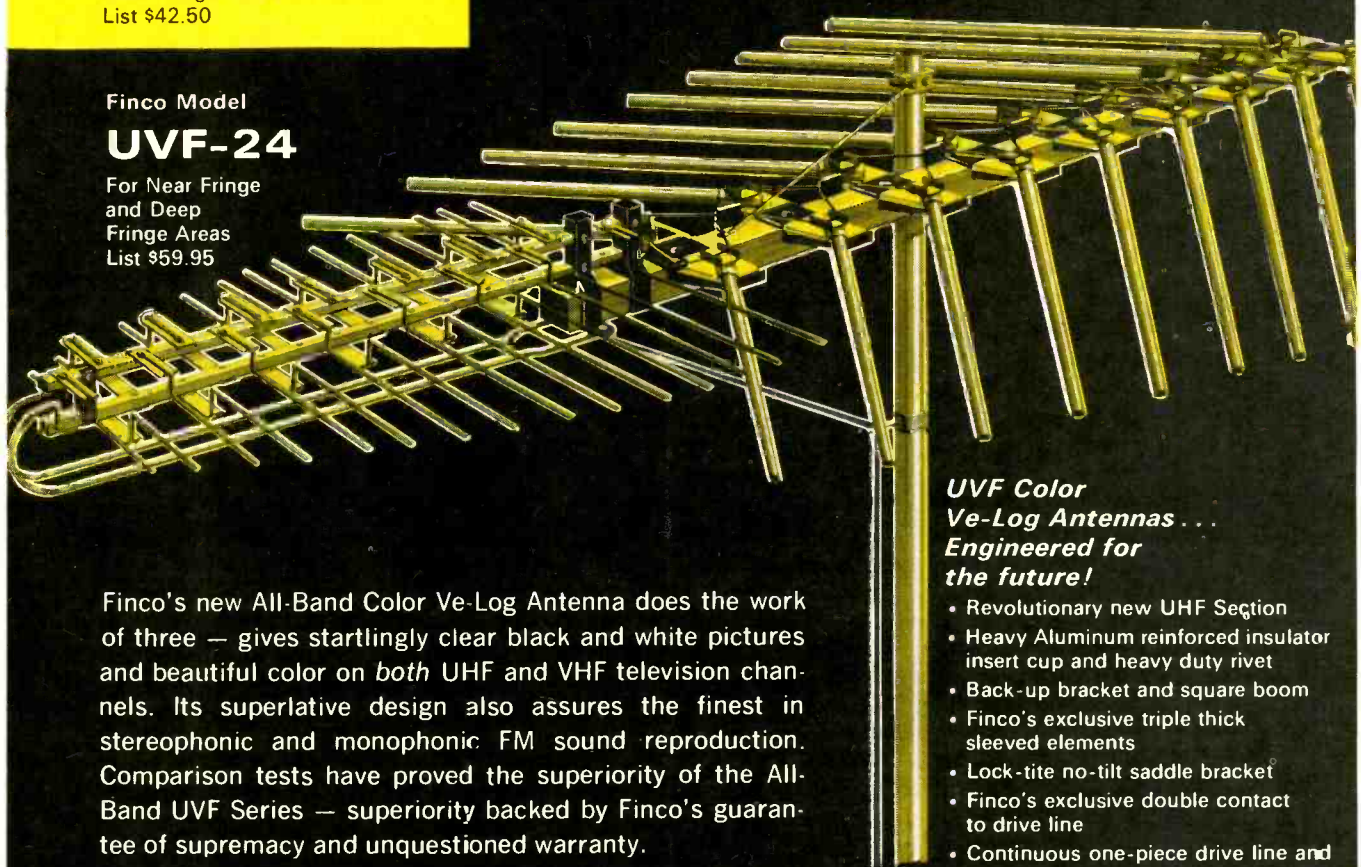
A major breakthrough in Antenna design!

FINCO

ALL BAND UHF•VHF•FM "COLOR VE-LOG"

Featuring Finco's Exclusive Gold Corodizing

Finco Model
UVF-24
For Near Fringe and Deep Fringe Areas
List $59.95



Finco's new All-Band Color Ve-Log Antenna does the work of three — gives startlingly clear black and white pictures and beautiful color on *both* UHF and VHF television channels. Its superlative design also assures the finest in stereophonic and monophonic FM sound reproduction. Comparison tests have proved the superiority of the All-Band UVF Series — superiority backed by Finco's guarantee of supremacy and unquestioned warranty.

UVF Color Ve-Log Antennas . . . Engineered for the future!

- Revolutionary new UHF Section
- Heavy Aluminum reinforced insulator insert cup and heavy duty rivet
- Back-up bracket and square boom
- Finco's exclusive triple thick sleeved elements
- Lock-tite no-tilt saddle bracket
- Finco's exclusive double contact to drive line
- Continuous one-piece drive line and exclusive air insulated polystyrene cross-over spacer

Prices and specifications subject to change without notice.

THE FINNEY COMPANY • 34 W. Interstate Street • Bedford, Ohio

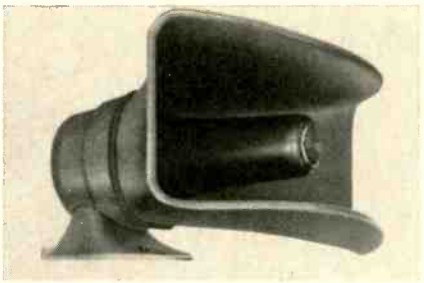
Write for beautiful color brochure Number 20-322, Dept. 110

. . . for more details circle 21 on postcard

NEW PRODUCTS

Siren Speaker 213

A speaker designed for electronic sirens, electronic foghorns and high power mobile public address amplifiers is introduced. The HPC75 fiber glass horn is low silhouette and its speaker mounting bracket is aircraft aluminum, cast in one rigid piece. Specifications: Power, 75w. Impedance, 16Ω. Frequency response, 275-8000cps. Sound level, 127db measured 4 ft on axis, rated power. Dispersion, 120 deg x 60 deg. Dimensions, 6 x 14 x 11¼ in. Shipping weight, 8½ lb. Atlas.



Two-Way Radio 214

A solid-state citizens band two-way radio is introduced. The Messenger "100" is a 5-channel transceiver 6 3/16 x 2⅓ x 8½ in. It is suited for mobile use in connection with the nationwide H-E-L-P (Highway Emergency Locating Plan) program. E. F. Johnson.

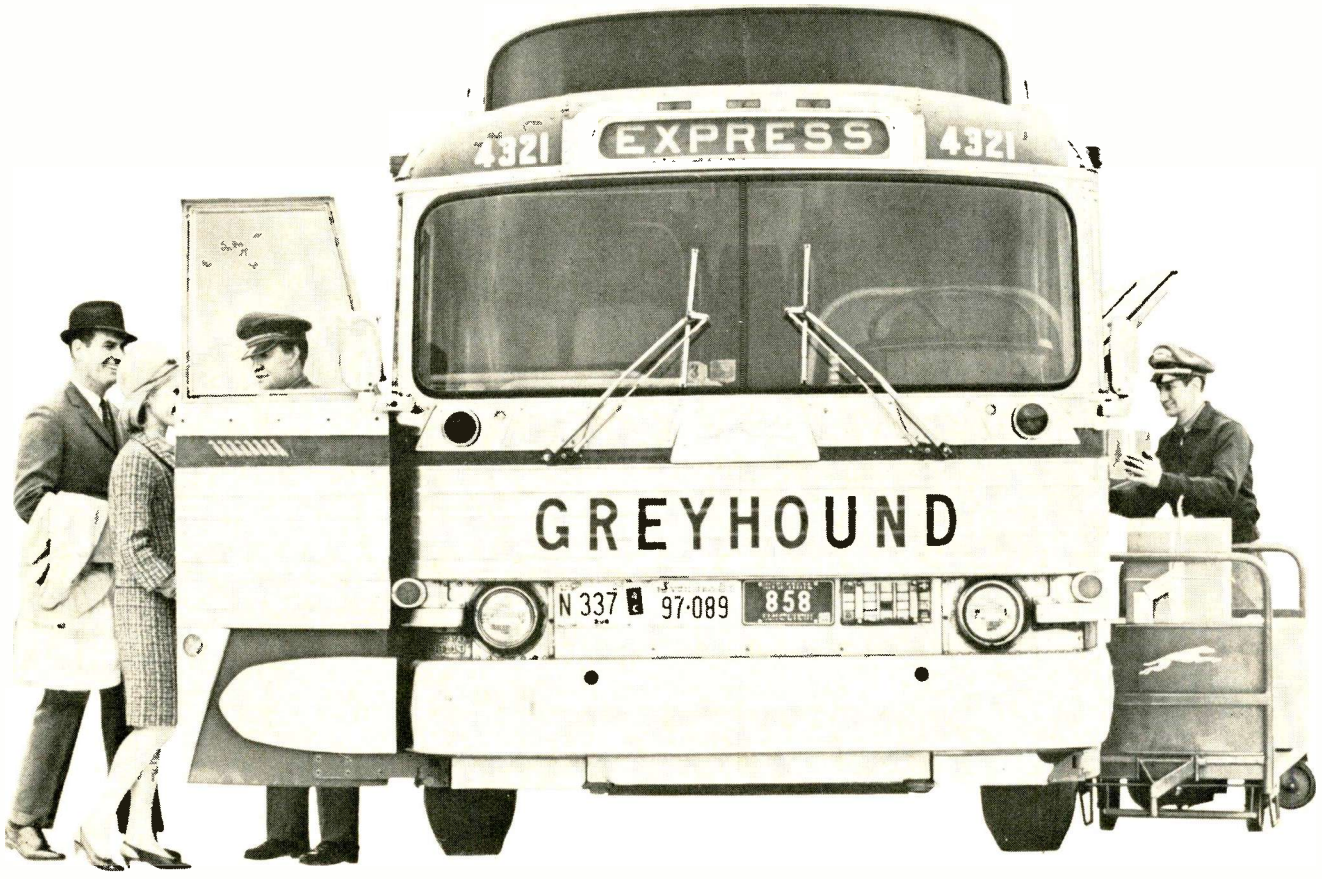
Automobile Tape Player 215

A tape-cartridge player unit for automobiles is introduced. The tape player mounts under the dashboard of most automobiles. It plays through the car radio and rear speaker. Each four track tape-cartridge plays from one half to a full hour and can optionally repeat itself as the cartridge tape is in a continuous loop. Sentry.

Auxiliary Speaker 216

A self-contained speaker with specially designed bracket and self-tapping sheet metal screws is announced. This speaker can be used in cars, cabs, trucks or as an auxiliary speaker in locker rooms, in-plant paging, etc. Voice coil is ¾ in. diameter. Oxford.

The package that rides like people!



It's there in hours and costs you less when you ship by Greyhound Package Express

Every Greyhound bus is a package carrier as well as a people carrier. When you specify Greyhound Package Express your shipments leave and arrive on fast, frequent passenger schedules. Shipments going hundreds of miles usually arrive the next morning... frequently, the very same day. Nobody has lower rates, and you can ship anytime—at your convenience—24 hours a day, 7 days a week, weekends and holidays, too. When fast service and low cost are important to you, look into Greyhound Package Express. Save time! Save money! Save trouble! Ship C.O.D., Collect, Prepaid... or open a Greyhound Package Express Charge Account.

For information on service, rates and routes, call Greyhound, or write: Greyhound Package Express, Dept. 53-B 140 S. Dearborn St., Chicago, Ill. 60603.

It's there in hours and costs you less

For Example	Buses Daily	Running Time	20 lbs.	30 lbs.	40 lbs.*
BOSTON—NEW YORK	21	4 hrs. 35 mins.	$2.00	$2.35	$2.60
LOS ANGELES—SAN FRANCISCO	25	9 hrs. 15 mins.	2.10	2.45	2.80
PITTSBURGH—CLEVELAND	11	1 hr. 50 mins.	1.80	2.05	2.40
INDIANAPOLIS—CHICAGO	10	4 hrs. 0 mins.	1.90	2.20	2.55

*Other low rates up to 100 lbs. Lot shipments, too.

GREYHOUND PACKAGE EXPRESS

One of a series of messages depicting another growing service of The Greyhound Corporation.

. . . for more details circle 23 on postcard

NEW PRODUCTS

Transceiver 217

A 5-channel, CB transceiver is announced. It has 5 crystal-controlled transmit/receive channels. The "S5S" has solid-state circuitry throughout (25 silicon transistors, 5 diodes and 1 zener diode). Low battery drain, less than 200ma dc on receive. The "S5S" is 8 x 3½ x 7 in. and weighs less than 4 lb. Squires-Sanders.

CB Transceiver 218

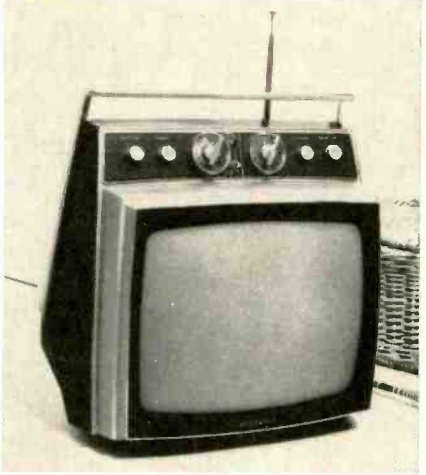
Frequency synthesis provides full 23 channel operation in this all solid-state citizens band transceiver. The CB14 requires no crystals other than those included at the time of purchase. It measures 9 x 3⅝ x 8 in. and weighs 4¾ lb. Circuitry includes 19 transistors, 8 diodes, and 2 Zener regulators. During receive operation the drain is 0.2 amp and when transmitting the maximum drain is 1.1 amp. Hallicrafters.

TVI Filter 219

Designed for communications systems operating in the 25-50Mc range, this RF filter will eliminate extraneous transmitter frequencies causing TV interference. Capable of handling up to 1000w, these filters are inserted in series between the output of any transmitter and its 50-75Ω antenna system. The filter is equipped with standard UHF coaxial fittings. B&W.

Transistorized Portable 220

A 12-in. transistorized black and white TV set is introduced. The GT12, may be played on automobile, boat, battery or ordinary household power sources. The chassis is transformer-powered and fully solid-state with the exception of the CRT. It has a complement of 24 transistors and 14 solid-state diodes including power supply and high voltage solid-state rectifiers. Optional extras include a private listening earphone and accessory power cord that may be plugged into an automobile cigarette lighter, a boat chart-light socket or to a rechargeable battery. Sylvania.



There goes another $203 out of your pocket.

(that G-E two-way radio could have saved)

Three bucks an hour you're paying him. And he just lost a two-hundred dollar customer for you.

You could've reached him. General Electric two-way radio instantly reaches those people you can't reach by phone. It gives you complete control of your business.

So you run a snappy service. Quick deliveries. Speedy pick-ups. Fast emergency calls. Instant re-routing. On-the-spot changes, cancellations and sales information.

With service like this, you keep customers. And make new ones. You also get more use out of your fleet. Waste fewer man-hours. Save on gas mileage. Save on telephone charges. Save time and more time. And that's money.

When a two-way radio is counted on for so much, it has to be good. That's why companies going for two-way systems, go for General Electric.

G-E started the two-way radio business. It's the world's largest electronics manufacturer. The world's largest manufacturer of electrical equipment. So who else could know more about it?

For big, busy companies or small, busy companies looking to get big, there's a complete line of appropriate General Electric high performance FM two-way radio equipment. Look into it.

Call your G-E communications consultant listed in the Yellow Pages under "Radio Communication." Or write for complete descriptive information. General Electric Company, Communication Products Dept., Section 11526, Lynchburg, Virginia.

. . . for more details circle 22 on postcard

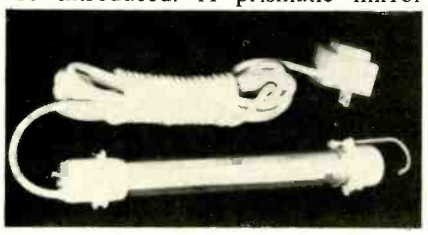
First in Two-Way Radio

GENERAL ELECTRIC

NEW PRODUCTS

Fluorescent Lights 221

A line of fluorescent shop lights are introduced. A prismatic mirror



lens gives a greater concentration of light intensity. The fluorescent tube is housed in rubberized polyethylene and the lamp is encased in a shock-resistant, plastic tube. Huston.

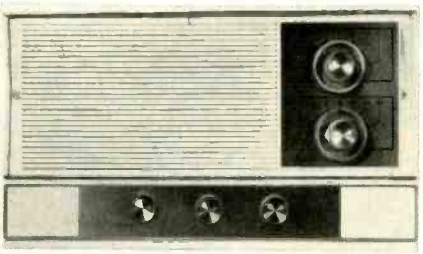
Jungle Radio 222

A commercial version of the "Jungle Radio" being used in Vietnam is announced. The unit could provide radio communications for forest rangers over long distances, forest fire fighters, explorers, prospectors, big game hunters and others who travel for distances over difficult terrain and where light weight and small size of

items to be carried are important considerations. Delco.

Intercom System 223

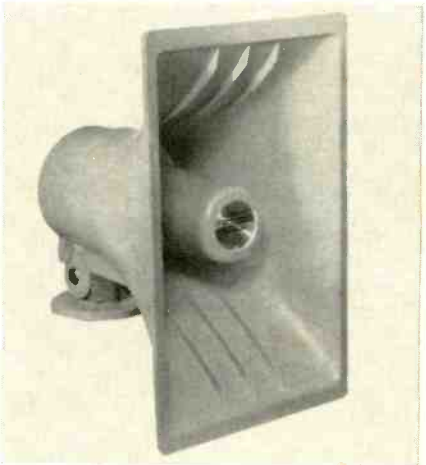
A radio/intercom system for the home is introduced. The Model 8408 radio/intercom is a solid state AM/



FM unit and includes one master control unit, one door station, and three remote control units. Intercom and radio use separate volume controls. Fasco.

Paging Projector 224

A 3w paging projector is announced. The PA30 is a re-entrant horn for public address or paging application. The rectangular horn pro-



vides a 90 deg by 120 deg dispersion angle. A swivel bracket allows the horn to be rotated to either the horizontal or vertical axis. Electro-Voice.

For more information on these NEW PRODUCTS See pages 95 and 96 READERS SERVICE

Why does Arco wind all its tv-replacement capacitors with computer-grade 99.99% pure aluminum foil?

To help cure that pain in your neck.

Impurities in aluminum foil can lead to deterioration, premature failures, lost customer confidence—and call-back time you can't charge for. Big pains in the neck.

So we wind every Arcolytic® electrolytic capacitor with the purest aluminum foil available: 99.99% pure. It meets computer manufacturer standards. And exceeds those of radio-tv manufacturers.

Result: Arcolytic capacitors last longer in your customer's set. In fact, they won't deteriorate even at high operating temperatures of 85° C.

And while we wind them with computer-grade foil, we price them for home-entertainment service. You pay no premium.

You'll find whatever discrete capacitance value you need at your Arco Distributor's. And in your choice of single- and multiple-section tubular, or twist-mount designs. (You'll also find a complete line of equivalent-quality miniature ceramic disc capacitors up to 6000 VDCW.)

Start using Arcolytic capacitors. And the next call from your customer will be because he likes your kind of reliability, and wants more of your service.

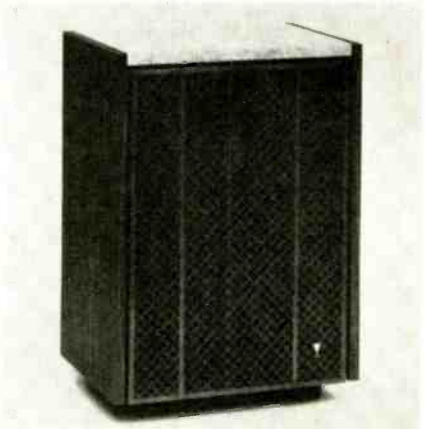
Arco Electronics
A DIVISION OF LORAL CORPORATION
COMMUNITY DRIVE, GREAT NECK, N.Y. DALLAS, TEX. PASADENA, CALIF. WRITE FOR FREE CATALOG.

. . . for more details circle 12 on postcard

NEW PRODUCTS

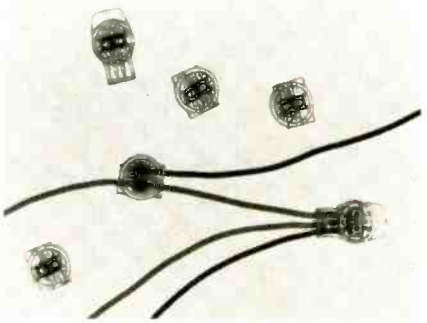
Speaker System 225

A speaker system of moderate size is announced. The speaker components include a 14-in. long-throw woofer and a horn-loaded high frequency assembly with a 14-element acoustic lens. Lansing.



Connectors 226

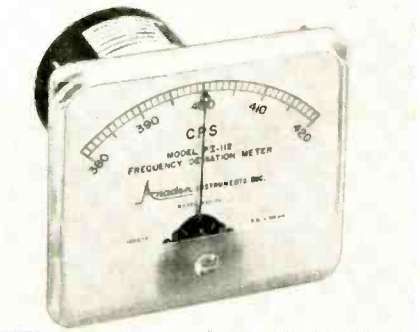
A pigtail connector and tap connector are introduced. They are a pre-insulated, self-stripping connector.



The pigtail connector is designed for connecting two or three wires. The tap connector is designed for making bridge splices on a "run" wire without interrupting or breaking the circuit. 3M.

Frequency Deviation 227

A meter for measuring frequency deviation is announced. The Model PI-112 frequency deviation meter is designed for monitoring deviations of power line frequencies, turbine flow sensors, tachometers, rotating machinery, repetition rate pickup and other frequency generating devices. Standard meter sizes are 3½ to 4½ in. wide. Anadex.

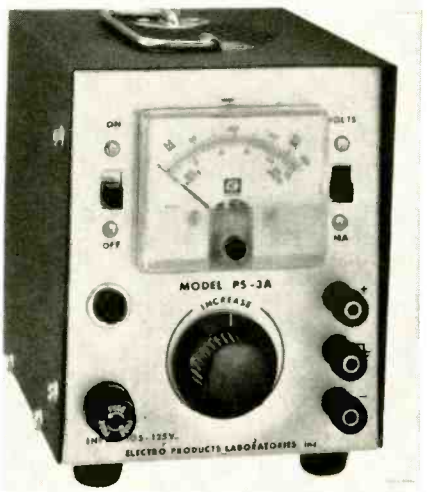


Power Supply 228

A regulated power supply providing variable regulated dc plate and bias voltages, plus ac heater voltages is announced. It has separate meters for voltage and current. The Model 780 provides regulation from 0 to 400v at high current, up to 150mc. It gives up to 6amp at 6.3vac for operation of vacuum tube heaters. Precise.

Solid-State Power Supply 229

Announced is dc power supply adjustable from 0-25vdc at 0-200ma and 0.2% line or load regulation. It has floating output terminals with separate chassis ground terminal, 2% accuracy D'Arsonval meter for monitoring voltage and current. It is 6¼ x 5 x 6 in. and weighs 3½ lb. Electro Products.



For more information on these
NEW PRODUCTS
See pages 95 and 96
READERS SERVICE

Brand NEW FROM HICKOK

DMS-3200 Digital Measuring System

DMS-3200 Main Frame **$320**
(shown with DP-100)

DP-100
DC Voltmeter
Plug-in
$175

DP-150
1 MC Counter
Plug-in
$175

DP-170
Ohmmeter
Plug-in
$240

DP-200
Capacity
Meter
Plug-in
$240

HIGHLIGHT FEATURES

3-digit Biquinary Tube Read-out
Plug-in Flexibility
All-electronic
Fully-transistorized
Modular Design
Fully Field-tested
Automatic Polarity Indication
Automatic Decimal Point Indication

AS A DIGITAL DC VOLTMETER (DP100 Plug-in)

Range 0.1 millivolts to 1000 volts
Accuracy ±0.1% FS, ±0.1% of reading
True integrating voltmeter design
10 megohms input impedance at all times

AS A DIGITAL 1 MC COUNTER (DP150 Plug-in)

±0.005% accuracy: Resolution 1 part in 10^7 (Overrange capability with sector read-out permits 3-digit display to be equivalent of a 7-digit instrument)
Frequency measurement range 0.1 cps to 1 mc
Period measurement range 0.1 ms to 999 seconds

AS A DIGITAL OHMMETER (DP170 Plug-in)

Range 0.01 ohm to 1,000 megohms
Accuracy ±0.1% FS, ±0.2% of reading

AS A DIGITAL CAPACITY METER (DP200 Plug-in)

Range 1.0 picofarad to 10,000 microfarads
Accuracy ±0.1% FS, ±0.2% of reading

The DMS-3200 is designed for rugged industrial and laboratory applications. By utilizing a design which has the optimum combination of accuracy capability and number of digit display, the DMS-3200 meets the general purpose measurement needs of industry for reliable, precision digital measurement equipment in the $400-$500 price range.

THE HICKOK ELECTRICAL INSTRUMENT CO. • 10523 Dupont Avenue • Cleveland, Ohio 44108

. . . for more details circle 25 on postcard

BUSINESS OCCUPANCY VS HOUSEHOLD EXPENSES

Some technicians may be paying too much income tax

■ Many successful service-dealers and technicians began business operations in a garage or in the basement of their homes. Some have continued operating the same way for years. Others operate on the ground floor of buildings and live in apartments on the floor above. And many have continued one or another of these arrangements for years.

There's nothing inherently wrong with these arrangements. But they do contain one concealed danger: A good many business expenses incident to these business-home arrangements are likely never to show up in accounting records as business expenses. This brings about two undesirable end results:

(1) Business expenses are understated and net earnings are overstated;

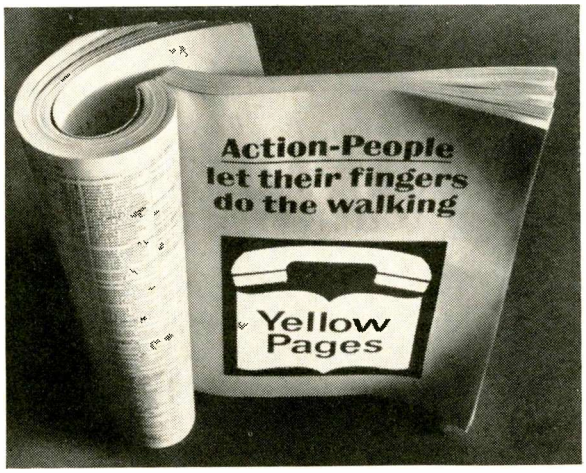
(2) The annual income tax bill is substantially larger than it should be.

Additionally, an arrangement of this type and the absence of adequate accounting records, may result in certain other adverse situations. A service technician may be contented with his apparently satisfactory earnings and service charges, even as he complains at his inability to get ahead. He may blame this on the high cost of living instead of his low service charges. Because only part of his costs of doing business are recorded, he very likely believes his cost of doing business is less than the facts would indicate. He probably believes he can do work for less than competitors not operating out of their home.

If some or all of his business occupancy costs are treated as personal expenses, a service technician's business expenses may be understated by anywhere from $500 to $1000 a year or more. This means his net earnings are overstated by a like amount. When reflected in his income tax return, this means his income tax bill is increased by $100 or $200 or more,

You've got no business advertising in the Yellow Pages.

(Unless you want more business.)



**Find it here first—fast.
Action-People do.**

even if he's in the 20 percent tax bracket. This is a heavy penalty for negligence or self deception.

Dividing Expenses

All expenses that are partly personal or household and partly business should be divided on the basis of the facts surrounding each individual case. The business part, without fail, should be charged to the business. Rationalizing any other course should be discouraged. It may be reasoned by a service technician that the same home would be occupied anyway, whether a business were conducted out of it or not. Maybe so! But, if the business actually occupies any substantial part of the premises (one room as an office, for example), then the service technician and his family has less living space for their personal use. The business should foot the bill.

Determining what part of total occupancy expenses the business should defray isn't easy. Floor space occupied by the business is probably the best formula to use. If, for example, one-sixth of floor space is occupied by the business it should pay for one-sixth of the occupancy costs.

Divisible costs may include water, gas, electricity or heating costs. If the property is rented, part of the rent is a business charge. If the tenant must maintain the premises at his own expense, a pro rata share of costs is also a deductible business expense.

If a service technician owns his premises, a pro rata share of the following expenses are deductible as a business cost: Property tax, interest on mortgage, if any, fire insurance and repairs. In addition, depreciation can be charged on that part of the property used for business purposes.

Some of the expenses of occupancy can be deducted as personal items in an income tax return; others cannot. Those that cannot be taken as personal deductions should certainly be deducted to the extent possible as business deductions. Those that can be taken as personal deductions, such as mortgage interest and property tax should still be pro rated between business and personal deductions. It will frequently result in a lower income tax.

If most or all of the garage is used for business purposes, this fact should be taken into account in arriving at business occupancy cost. Yard usage is also a factor to consider, although the value of yard space so occupied is not comparable to household space.

For business reasons, a service technician may rent or buy premises in a business area or on a main thoroughfare. If occupancy cost is higher because of this fact, a larger share of the cost may be charged to the business, not being based entirely on the footage occupied by the business.

If a business phone is installed in a home, the Internal Revenue Service will probably insist that some part of the bill be considered personal. On the basis of useage, however, a larger part of the bill may be charged to the business. Toll charges that can be identified as business should be charged in their entirety to the business. ■

successful service shop beats rising costs with B&K television analyst

"As every serviceman knows, major TV repairs represent an increasingly large part of the service business and the average time per repair has increased"...

says Willard Horne of Horne Radio and Television in Evanston, Illinois.

After more than 25 successful years in the service business, twenty of them in the same location, Mr. Horne can be considered an authority on how to keep a business profitable. Mr. Horne says, "In order to be successful, our 3-man shop has to be competitive on the large jobs as well as the small ones. With the increase in bench time that we were experiencing and the limitations on what we could charge, there was a reduction of profit that had to be stopped. Then we bought a B&K Model 1076 Television Analyst."

"Now our customers get the same extra-value service on the big repairs and the small ones," said Mr. Horne. "We use the Television Analyst for troubleshooting a wide variety of complaints,* particularly for those that require touch-up alignment, location of IF overloads and color convergence. We are more competitive now that we use the B&K Television Analyst because we spend far less time on the jobs that used to be dogs, with benefits both to the shop and our customers."

*B&K Model 1076 Television Analyst checks every stage in a black and white or color TV receiver. Nine VHF RF channels, 20 to 45 MC IF, audio, video, sync, bias voltage and AGC keying pulse are available. The model 1076 provides its own standard test pattern, white dot, white line crosshatch, and color bar pattern slide transparencies. It includes a blank slide which can be used for closed-circuit-TV display floor promotion. Its net price is **$329.95.**

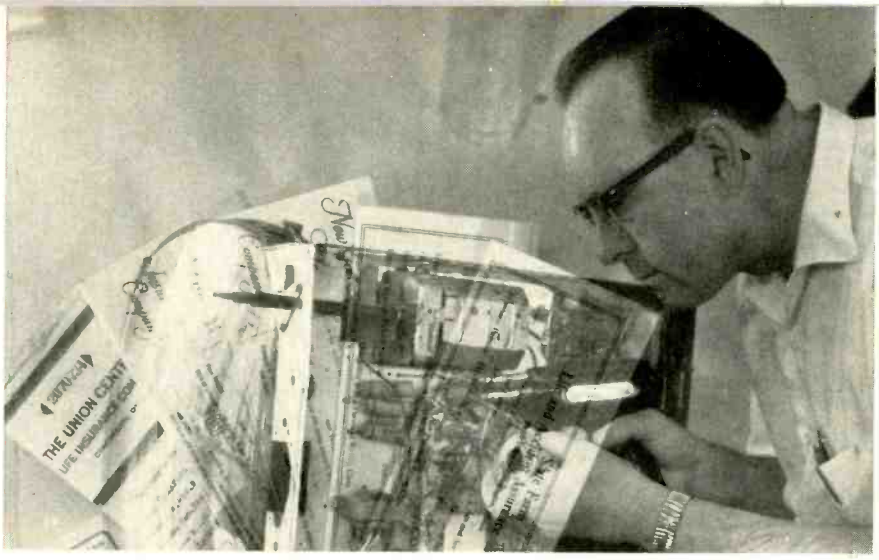
Find out how you will increase your *TV service profits with a B&K Model 1076. See your distributor or write for Catalog AP 22.*

B & K MANUFACTURING CO.
DIVISION OF **DYNASCAN** CORPORATION
1801 W. BELLE PLAINE AVE. · CHICAGO, ILL. 60613

Export: Empire Exporters, 123 Grand St., New York 13, U.S.A.

. . . for more details circle 16 on postcard

Life Insurance For the Shop Owner



Few are properly prepared when death comes

■ The value of life insurance is unquestionably recognized by most individuals but TV-radio shop owners are not ordinary individuals: They're businessmen. This status gives them greater personal freedom, a chance for greater income, but in addition, a greater burden, too.

The shop owner has sacrificed a steady income to become a businessman. Perhaps he has lost pension and other employee benefits and exposed his personal holdings to the claims of business creditors.

Individuals, no matter for whom they work (even themselves), have certain basic needs which must be met in case of death — and most recognize this by buying life insurance. The self-employed businessman, however, must go beyond these simple needs to properly provide for his family in case of his untimely death.

Insurance Needs

Few business concerns, for example, operate without credit. Adequate life insurance should be provided to pay off outstanding debts because death does not cancel debts. In contrast, your widow will be lucky to collect half of what is owed to you. Additionally, if you are a sole proprietor and no one is available to continue the business, your

Life Insurance . . .

widow will probably sell the business assets — but only for a fraction of their actual value. Shrinkage of your estate could leave your widow virtually penniless, even though you may now believe she has been adequately provided for.

If you happen to be one who has really made it, you might also consider the bite that federal estate taxes will take from your accumulated wealth (see Table I).

Most people think in terms of carrying enough insurance to cover final expenses. But these expenses are seldom itemized fully. Some of these include hospital, burial, current bills, unpaid loans, unpaid property taxes, unpaid income taxes, estate and inheritance taxes, attorney and executor or administrators fees. And there's more.

After your death, a basic income should be provided to supplement Social Security payments if children under 18 are left behind or to provide for the basic requirements of your widow if no children exist (see Table II).

Your family will have to adjust to a lower income level when you are gone and it is beneficial to have some income allowance for a readjustment period of a year or two. Also, if at all possible, an emergency fund should be set up so your family can better meet future crisis. And insurance should be available to pay off existing mortgages. Most homes are mortgaged and if you have your own building, it is probably mortgaged, too. These payments could be an oppressive burden on your widow.

Some men delude themselves by thinking their wives can go back to work. After being out of the labor market for even a few years, however, even the most skilled women have difficulty finding suitable employment.

ERRATUM

Manufacturer of the New Product, number 226, listed under "Changer" on page 82 of the October issue, should have read "BSR" instead of DuFine.

Life Insurance . . .

How To Do It

So how are you going to guarantee your family's security? First, prepare a will; second, state specifically how you want your business disposed of (and personal and real property too, of course). If you fail to do this, your executor or administrator must close out your business and liquidate it immediately, sell your estate assets to pay all debts, administrative expenses and inheritance and estate taxes, then distribute the remainder to your heirs. Even under the most favorable circumstances, a business cannot generally be liquidated at a profit — and liquidation to settle an estate is about as unfavorable a condition as you can get.

Some men delude themselves with the thought that "good old John," who may be a close relative, dear friend, or valued employee will keep things going until the business can be disposed of at a profit — or at least not at a loss. The trouble here is, if your executor or administrator decides to continue the business without specific authority in your will, he becomes personally liable for all debts incurred, yet he cannot possibly share in the profits. No man in his right mind would expect another to continue a business under these conditions.

If liquidation does take place, two points must be considered. How much is your business worth now — and how much will it be worth to your family after your death? Refer to Table III for guidance in arriving at the figures for your own business.

To prevent loss of value, several things need to be done. We have already mentioned drawing a will and naming a competent executor and granting him authority to continue your business. (In this regard, it might be wise to talk to the trust department at your local bank.) In addition, cash should be provided for your executor to pay claims of all your creditors, so the creditors won't force him into immediate liquidation. This is done by setting up a sinking fund to guarantee an amount of cash equal to the value of your business today (most logical: life insurance), which can also work to your advantage to provide income for retirement if you desire.

Of course a business doesn't have to be liquidated just because the owner dies. Perhaps your wife or son is competent and wishes to continue your business. Here again, this must be stated in your will, and sufficient cash should be available to make a smooth transition.

If this seems impractical, perhaps a valued and competent employee could carry on — and thus guarantee your heirs full value of the business. A buy and sell agreement could be drawn up which would obligate your heirs to sell and the

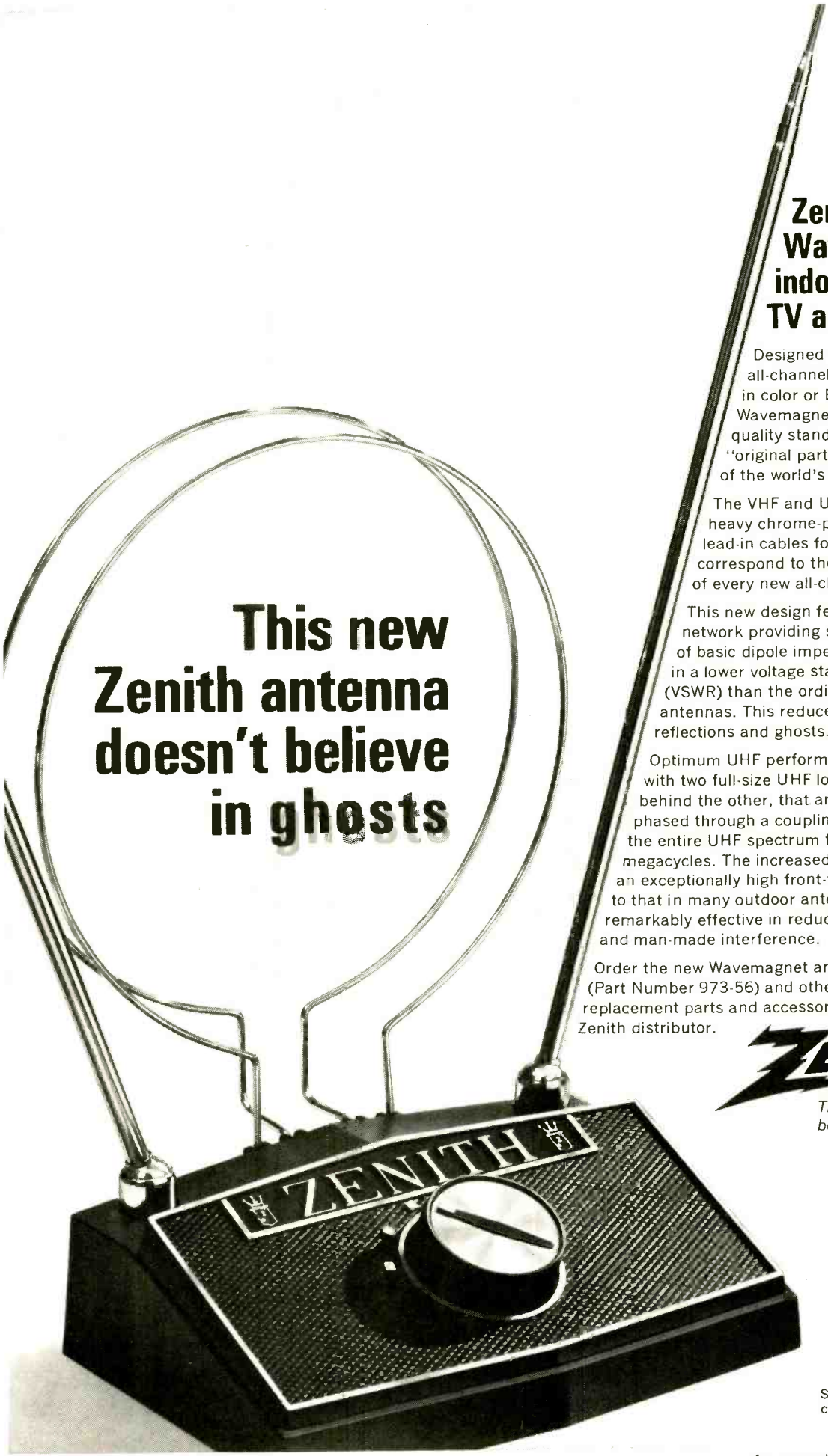
continued on page 92

TABLE I

Computation of Gross Estate Tax

Taxable estate equal to or more than — (1)	Taxable estate less than — (2)	Tax on amount in column (1) (3)	Rate of tax on excess over amount in column (1) (4)
0	$ 5,000	0	(Percent) 3
$ 5,000	10,000	$ 150	7
10,000	20,000	500	11
20,000	30,000	1,600	14
30,000	40,000	3,000	18
40,000	50,000	4,800	22
50,000	60,000	7,000	25
60,000	100,000	9,500	28
100,000	250,000	20,700	30
250,000	500,000	65,700	32

Table I
Federal estate taxes must be paid on all large estates. Life insurance proceeds are included in the estate, but there is a $60,000. specific exemption and a $60,000. marital deduction which applies to the gross estate.



This new Zenith antenna doesn't believe in ghosts

Zenith Wavemagnet® indoor TV antenna

Designed for clear, sharp, all-channel (2 to 83) reception in color or B&W, the Zenith Wavemagnet antenna meets the quality standards set for Zenith "original parts"... your assurance of the world's finest performance.

The VHF and UHF elements are heavy chrome-plated. Separate lead-in cables for UHF and VHF correspond to the input arrangement of every new all-channel TV receiver.

This new design features a special network providing substantial step-up of basic dipole impedance, resulting in a lower voltage standing wave ratio (VSWR) than the ordinary VHF indoor antennas. This reduces snow effect, reflections and ghosts.

Optimum UHF performance is achieved with two full-size UHF loops, arranged one behind the other, that are carefully phased through a coupling network through the entire UHF spectrum from 470 to 890 megacycles. The increased sensitivity develops an exceptionally high front-to-back ratio equal to that in many outdoor antennas. This is remarkably effective in reducing ghosts and man-made interference.

Order the new Wavemagnet antenna (Part Number 973-56) and other genuine Zenith replacement parts and accessories from your Zenith distributor.

ZENITH®

The quality goes in before the name goes on®

Specifications subject to change without notice

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FALLING OFF A LOG-ARITHM

Remember a few basic facts and you'll find it easy

■ Of all the tools of mathematical aid which TV-radio, Hi-Fi, audio and two-way radio communications technicians have available, logarithms are probably the least understood. Actually, an understanding of logarithms is as easy as falling off a log once you learn how.

All you need to know are a few basic but important facts to understand logarithms and decibels. With a few moments of study you can remember the logs of numbers virtually from plus to minus infinity.

Chart I lists the logs of five numbers from 1 to 10. Let's discuss a few of the points concerning these numbers. First, we take the numbers easy to remember. The log of 1 is zero and at the other end of the list we have the log of 10 which is 1. These numbers can easily be remembered. Next we pick 3 numbers which have a lasting relation to each other. These numbers are 2, 4 and 8. They have the relation 2^n, or 2^1, 2^2 and 2^3. As you would expect, their logs are also related by .3n, or .3 x 1, .3 x 2 and .3 x 3, or .3, .6 and .9

Remembering the logs of 1 and 10 and 2, 4 and 8, we now have 5 of the 10 important points (or logs) committed to memory.

Next, let's take the two remaining numbers which are related in the same manner as 2, 4 and 8. These numbers are 3 and 9 and are related by 3^1 and 3^2. Their logs are related by .477 x 1 and .477 x 2, or .477 and .954, as shown in Chart II. We commit these last two logs to memory and then leave 7 of the 10 related in a manner which is forever easy to recall. The logs for 5, 6 and 7 have no relation to the others and must be separately remembered. The logs of numbers from 1 to 10 are shown in Chart III.

Three-place accuracy from memory is obtained by remembering that the logs of 2, 4 and 8 are .301, .602 and .903 which really says 3 once, 3 twice, 3 trice. The 3-place logs for 3 and 9 were shown previously to be .477 x 1 and .477 x 2, or .477 and .954. Of course, the logs for 1 and 10 are 0 and 1, respectively, with repeating zeros to infinity.

Now let's consider logs and decibels. By definition, db = 10 log P_1/P_2 to the base 10. If P_1 is larger than P_2, we have plus db; if P_1 is smaller than P_2 we have negative

CHART I

Number	1	2	4	8	10
Log_{10} (1 place)	0	.3	.6	.9	1
(3 place)	0	.301	.602	.903	1.000

CHART II

Number	3	9
Log_{10}(1 place)	.5	.95
(3 place	.477	.954

CHART III

Number	1	2	3	4	5	6	7	8	9	10
Log_{10} (1 place)	0	.3	.5	.6	.7	.8	.85	.9	.95	1
(3 place)	0	.301	.477	.602	.699	.802	.845	.903	.954	1.000

db. P_2 is usually taken as a one watt reference so we have the relation dbw = 10 log (P/1). (Dbm in audio work.)

Now consider the method of adding and dropping zeros to go from different power levels to db or vice versa. We ask, for example, how many db is 100w above lw? We say that dbw = 10 log 100 or 10 log 10^2. Since log 10^2 is 2 (to the base 10), we have dbw = 10 x 2 or 20db. Note that we accomplish the same thing when we say that log 100 is 2 and add a zero along side the 2 to get 20db.

Let's take the case of a megawatt (Mw) related to one watt. Mega is 10^6. To the 6 we add a zero along side and get 60db. The reverse technique can be done to db to get watts. We simply cross out the zero of the 60db and get 10^6 or one Mw. Take a microwatt (μw) — that's 10^{-6} or —60dbw.

This same zero technique can be used on voltage and current expressions so long as you divide or multiply by 20 instead of 10 as with power (neglecting input and output impedances). Example: How much gain does a 120db voltage amplifier have? 120db/20 is 6, or 10^6 gain.

Let's look at numbers which do not fall in the easy area of tens, hundreds, etc. Take 2000w. We think automatically of 1000, or 10^3. We add a zero to the 3 for 30db. Since 2000 is merely twice 1000 (3 db more) we add 3db to the 30db and get 33db. Consider 57dbw. That sounds awful in terms of watts. But go up to 60db which we know is 10^6 or a Mw. Since 57db is 3db less than 10^6 (60db), we know the answer is 500,000w, or 0.5Mw. All the big numbers are really simple when broken down and analyzed.

Consider —57dbw. If we divide by 10, we get $10^{5.7}$ which is difficult to work with. Instead, go up to —60db which we know is 10^{-6}, or 1 millionth of a watt (μw). Since —57db is 3db larger than —60db, we know the answer is 2 x 10^{-6}, or 2μw. Other negative numbers can be handled in the same easy manner.

Logarithms are easy to use if we remember basic facts about logs of numbers from 1 to 10. By the method of adding or dropping a zero, it is easy to shift from power to db and back to power.

It's as easy as falling off a log! ■

NEW LITERATURE

Matching Transformers **300**
Mechanical and electrical data on a pair of matching transformers for audiophone and commercial sound applications are contained on this spec sheet. Merit.

Tools **301**
This 12-page catalog supplement describes a line of micro-miniature tools and other production aids. Specifications and prices of tweezers, pliers, soldering irons, vacuum systems, wiring aids and other items are included. Techni-Tool.

Variable Transformers **302**
This 76-page catalog gives a description of characteristics, outline dimensions, connections, charts and illustrations of a line of manual and motorized variable transformers. Superior Electric.

Storage Equipment **303**
A 48-page catalog describes a line of steel storage equipment. The catalog contains prices and other information for shelving units, shelving accessories, storage cabinets, single and multiple lockers and locker room accessories and shop equipment. Penco.

Zip Code **304**
How the new zip code requirements affect second and third class bulk mailers is explained in this 24-page booklet. Addressograph.

CB Antennas **305**
A line of CB base station and mobile antennas, mounts and accessories is covered in this catalog. Dynascan.

PA Equipment **306**
A specification sheet gives electrical and mechanical specifications for a line of PA equipment. A complete description and application of the equipment is also included. Bell.

Antenna Mount **307**
A 4-page catalog details information on a line of antenna system mounting components. A variety of clamp assemblies, masts and booms, couplers, guy wire kits, mounting ring kits and adjustment bearings are included. Jerrold.

NEWS OF THE INDUSTRY

Free Movies At Atlanta Airport

Air travelers at the Atlanta (Ga.) Municipal Airport will soon find that all the free movies aren't in the airplanes. A free-admission movie theatre for waiting passengers will open in the Atlanta airport early in February, according to Modern Talking Picture Service, Inc., New York.

William Oard, MTPS vice president, said the Skyport Cinema will feature movies on recreation, sports, business information, travel and other short subjects especially selected to entertain and appeal to the predominant number of businessmen air travelers.

The 50-seat cinema in Atlanta will join a growing group of cinemas being operated by Modern Talking Picture Service, Inc., in Cincinnati and Minneapolis-St. Paul. The Atlanta airport is the fourth largest in the nation with 11 million visitors annually. Additional theatres are planned for other metropolitan airports.

Random House, RCA Merge

David Sarnoff, chairman of the board of the Radio Corp. of America, and Bennett Cerf, chairman of the board of Random House, Inc., announce an agreement in principle for the acquisition of Random House by RCA. The agreement is subject to approval by the boards of directors of the two companies and by the shareholders of Random House. If the agreement is approved, the publishing company will become a wholly owned subsidiary of RCA. It is contemplated that Random House will continue to function as a separate entity with complete editorial autonomy in the hands of its own board of directors and no changes in its present personnel and management.

The transaction would involve an exchange of stock in the ratio of .62 share of RCA common stock for each one of the 1,274,176 shares of Random House common stock presently outstanding. Mr. Cerf will be proposed for election as a member of the RCA board of directors following the acquisition.

N.Y. Metro Area UHF Penetration

At least 28 percent of the TV homes in the New York Metropolitan area are equipped to watch television on UHF channels 14 to 83, as well as VHF channels 2 to 13. There is also every likelihood that the UHF penetration is even higher, perhaps running to 35 or 40 percent.

These are the findings reported in a new analysis of UHF figures prepared by WNJU-TV, the New York area's first and only commercial UHF station, operating on Channel 47.

Among the 350,000 homes in the area's Spanish-speaking community, which comprises WNJU-TV's prime audience, the study shows a similar 28 percent minimum penetration as of the end of 1965, for a total of 98,000 homes. This compares with the million-and-a-half UHF homes out of the total 5.5 million TV homes in the New York market.

Based on projected TV set sales for 1966, the WNJU-TV study counts another 1,200,000 all-channel units being added to New York area homes this year, with about 85,-

000 of those sets earmarked for Spanish-speaking homes. The increase would bring UHF penetration in the Latin community as well as the entire metropolitan area, too, at least 52 percent by the end of 1966.

The station says that its current and projected UHF penetration figures are minimum because of the higher estimates of every other authoritative source of figures it could obtain. Also pointed out in the study is the possibility that UHF set counts generally suffer from a lack of understanding on the part of all-channel set owners as to what UHF is and how they can receive it.

Viewing habits in the Spanish-speaking community, also covered in the Channel 47 study, continue to show the station leading in ratings in the 98,000 homes that can receive UHF among this ethnic group. As in previous rating surveys for WNJU-TV, the sets-in-use figure remains higher in Spanish-speaking homes that can receive the station than in VHF-only homes.

Black and White CRT Price Increases

Recent price increases by manufacturers of black and white picture tubes are bound to result in higher prices for monochrome TV sets, Admiral Corp. announces.

Profit margins in these sets are insufficient to permit manufacturers to absorb these price increases in picture tubes which represent the major cost of a TV receiver.

The company also said that TV set manufacturers have been faced with higher costs for components containing copper as well as for other parts during the past twelve months and cannot hold the line any longer on prices. Black and white TV sets are currently priced at the lowest level in the history of the industry, Admiral pointed out.

CDE Representative

Markal Sales Corp. is now a representative of Cornell-Dubilier Electronics (CDE) in general line distributor sales, announces John Cunningham, CDE district sales manager. The Markal Sales Corp. will service general line distributors in the Chicago district, northern Illinois, eastern Wisconsin and the counties of Lake, Porter and LaPorte in Indiana. Markal Sales is located at 5787 Lincoln Ave., Chicago, Ill.

Bozak Appoints

The R. T. Bozak Manufacturing Co. has appointed the Roy J. O'Donnell Co., of Denver as its sales representative for the Rocky Mountain states. From its offices at 2256 South Delaware St. in Denver, the O'Donnell Co. will service Bozak dealers and sound contractors in the states of Colorado, Idaho, Montana, New Mexico, Utah and Wyoming and the counties of Elko and White Pine in Nevada.

RCA Color CRT Plant

The Radio Corp. of America announces plans to build a $26 million color television picture tube manufacturing plant in Scranton, Pa. The Scranton plant is part of RCA's record $195 million program to expand and modernize its plant facilities in 1966. The largest single portion of this expenditure will provide for substantially increased production facilities for color television picture tubes and receivers. During 1965, RCA made capital expenditures of $95 million.

John B. Farese, division vice president, RCA Electronic Components and Devices, disclosed details of the new color picture tube plant at a press conference in the Jermyn Hotel.

NEWS OF THE INDUSTRY

Sales Reps

Four sales representative firms have been retained by Antennacraft Co. Named as representatives are: M. M. Richardson & Co., Minneapolis, Minn., covering Iowa, Minnesota, North Dakota, South Dakota and western Wisconsin. Larry Harriss, San Mateo, Calif., covering northern California, Hawaii, and northern Nevada. TMC Sales Co., Fort Lee, N.J., covering New Jersey and New York. A-E-S, Inc., Aurora, Colo., covering Colorado, southern Idaho, Montana, western Nebraska, New Mexico, El Paso, Texas, Utah and Wyoming.

Amphenol Stock Split

The board of directors of Amphenol Corp. split the common stock of the corporation on a two-for-one basis. The split is subject to approval by the stockholders of an increase in the authorized number of shares of common stock from 2,500,000 to 5,000,000. This authorization will be sought at the annual meeting of stockholders to be held on April 26, 1966. Assuming stockholders approve, distribution of an additional share for each share of record on May 2, 1966, would be effected on or about May 16, 1966.

Dynascan Acquires

Dynascan Corp., Chicago, announces the acquisition of the instrument line of Precision Apparatus, Inc., Glendale, N.Y. Carl Korn, president of Dynascan, said that Precision meters, oscilloscopes, generators and other test equipment will be manufactured in Chicago and will be marketed independently of Dynascan's B&K test equipment line.

RCA Tops $2 Billion

Sales of the Radio Corp. of America in 1965 will surpass $2 billion for the first time in the company's history, chairman David Sarnoff announces. Profits after taxes, he said, will be approximately $100 million, also setting a new record.

It will be the fourth consecutive year in which RCA sales and earnings have risen to new peaks, Mr. Sarnoff said. He noted that RCA's prospects for the future "have never been more promising."

Subject to the final audit, sales for 1965 will be more than 11 percent greater than for the previous year, and profits will be more than 21 percent higher. Earnings per common share will be approximately $1.70, also a new record, as compared with $1.37 in 1964, Mr. Sarnoff said. He added that total cash dividends paid to holders of common stock have more than doubled since 1962, after retroactive adjustment for a stock split and stock dividend.

Mono CRT Sales Down

Factory sales of monochrome TV CRTs were down slightly in August in units and dollar figures, but unit sales of receiving tubes were up as compared to August 1964, according to Electronic Industries Assn., Marketing Services Dept.

Sales of monochrome TV CRTs totaled 766,422 units

valued at $12,728,359, representing declines of 2.0% and 5.8% respectively from the 781,992 units valued at $13,514,078 sold in August 1964. The August totals were higher than those for the previous month of July 1965, when sales totaled 573,077 units valued at $9,398,233, representing increases of 33.7% and 35.4%, respectively.

Mono TV CRT sales for the first 8 months of 1965 totaled 5,673,946 units valued at $94,650,078, down 4.7% and 10.3% respectively from the 5,955,233 units valued at $105,495,505 sold during the January/August period of 1964.

Rise in Color TV Sales

Distributor sales of color TV receivers to dealers during the first 6 months of 1965 totaled 839,000 units, up 83.3% from sales during this period last year, while monochrome TV receiver sales at this level were off slightly (-1.6%) at 3,387,000 for the comparable period, the Electronic Industries Assn. Marketing Services Dept. announces.

According to data compiled by the department, distributors suffered sales declines of monochrome TV receivers in 6 out of 9 geographical regions of the country. Of the three regions (New England, East North Central and South Atlantic) which registered increases, the East North Central area showed a sharp, contrasting rise of nearly 9% in distributor sales (from 678,000 sets during the first half of 1964 to 739,000 sets the first half of 1965.)

Distributors enjoyed sales increases of color TV receivers in all 9 geographical regions of the U.S. during the first half of this year. West Central, East South Central and South Atlantic regions set the pace with increases of 111%, 109% and 100%, respectively. The East North Central, Middle Atlantic and Pacific regions, which historically have been the largest markets for TV receivers, showed significant gains.

Transistor Radios

A survey conducted by Sony Corp. at Shea and Yankee Stadiums, New York, shows that 7 out of 10 followers of the Jets and Giants have tiny transistor radios with them, tuned to the games they are watching. Some fans use battery operated television sets, the survey showed.

As one person pointed out, the chance to learn more about intricate plays and referee signs is made easier with the descriptions by radio announcers.

Sony said that a similar survey, conducted four years ago at Yankee Stadium during the baseball season showed that 4 out of 10 fans were resorting to transistor radios for "inside" information.

Philco Appoints

The appointment of Richard Hershey as sales training supervisor in Philco Corp.'s Consumer Electronics Div. is announced by Armin E. Allen, vice president and general manager of the division.

Mr. Hershey succeeds Frank Adler, resigned. He reports to Richard D. Levin, sales promotion manager of the division.

Admiral Record

A record fourth quarter with volume 30 percent higher than last year will push consolidated sales of Admiral Corp. to a new high of $300 million for 1965, Ross D. Siragusa, chairman of the board, announces.

Mr. Siragusa that orders placed in December indicated the company's 1966 — first quarter volume will be at the same record level as the fourth quarter.

ITT/ABC Merger

Harold S. Geneen, chairman and president of International Telephone and Telegraph Corp., and Leonard H. Goldenson, president of American Broadcasting Co., issued the following joint statement:

"The board of directors of our two companies have approved a merger of American Broadcasting Cos., and International Telephone and Telegraph Corp. on the following basis:

"ITT will issue 0.5719 of a share of common stock and 0.5719 of a share of a new convertible preference stock ($10 stated value) for each share of ABC common stock. The convertible preference stock will be convertible on a share-for-share basis into ITT's common stock, but not less than $2.40 per share. This new convertible preference stock cannot be called for ten years. In the eleventh year, the initial redemption price is $150 per share and will decrease thereafter at the rate of $5 each year to a minimum of $100.

"The transaction will involve the issuance by ITT, at the closing, of approximately 2,675,957 shares of its common stock and approximately 2,675,957 shares of the new convertible preference stock.

"The approvals by each company are subject to the execution of a mutually agreeable contract containing complete terms and conditions relating to the merger, which contract will be submitted to the boards of directors of each company for approval.

"The consummation of the arrangement is also subject to the approval of the shareholders of each company and to the approval of the Federal Communications Commission and other appropriate government agencies and the obtaining of a favorable tax ruling.

NEWS OF THE INDUSTRY

Jerrold Earnings

The Jerrold Corp. continued its record sales and earnings pattern during the third quarter of the fiscal year ending Feb. 28, 1966. Milton J. Shapp, president and chairman of the board of the Philadelphia electronics firm announces that, on an unaudited basis, net income for the third quarter was $1,207,596, equal to 56 cents per share, approaching net income for the first half of the year of $1,294,949. Consolidated sales for the third quarter were $9,084,070. Consolidated sales and net earnings for the nine months ended November 30, 1965, rose to $24,525,496 and $2,502,545 respectively.

Earnings per share of common stocks for the 9 months equalled $1.17 per common share. No provision was required for Federal Income Taxes caused by a tax loss carryover of approximately $3,000,000 from previous periods.

E-V Dividend

The Electro-Voice, Inc., board of directors declares a second semi-annual dividend of 7½ cents per share. This brings the total dividends declared this year to 15 cents as compared to 10 cents per share for the previous year. The $0.075 dividend will be paid on Jan. 24, 1966 to E-V shareholders of record date Jan. 10, 1966.

CATV System

A CATV system serving greater Harrisburg, Pa. opened recently. This is announced by Robert H. Beisswenger, executive vice president of the Jerrold Corp. of Philadelphia.

More than 12,000 subscribers have already signed for the new TV/FM reception service, which will initially provide 11 TV channels including stations from Washington, Baltimore, Philadelphia, York, Hershey, the local UHF and VHF stations, plus a locally-originated time and weather channel. In addition, subscribers will receive six FM radio stations.

Distributor Training Program

A training program on constant-voltage transformers for its distributors is inaugurated by Sola Electric, Elk Grove Village, Ill.

The training program, which consists primarily of a slide film presentation entitled "The Why and How of Constant-Voltage Transformers," will be presented by Sola salesmen to distributor sales personnel.

Sylvania's Sales Agent

Kimball Electronics, Salt Lake City, Utah, is appointed as authorized sales agent of closed circuit TV systems for the Commercial Electronics Div. Sylvania Electric Products, Inc.

Kimball Electronics will assist in the marketing of educational and commercial closed circuit TV systems in the Salt Lake City area. In addition, the company will install and service the equipment.

Sales of Imported Radios, TVs

Imported radios and television receivers sold under U.S. brand names increased markedly during the first half of 1965, the Electronic Industries Assn., Marketing Services Dept. reports.

Sales of imported radios bearing U.S. brands accounted for 10.8% (at 703,000 units) of total radio imports during the 1965 first half compared to 7.5% (at 1,017,000 units) during 1964. Sales of imported TV receivers comprised 63% (at 257,000 units) of total TV receiver imports during the first 6 months of 1965 compared to 54% (at 383,000 units) during 1964.

During 1960, total radio imports comprised only 42% of total U.S. home radio sales. Since that year, the quantity of imported radios has surpassed that of U.S. produced radios.

During 1961, imported radios amounted to 12.2 million units, or 52% of total U.S. sales. During the following 2 years imported radios maintained a level of 13.6 million units and accounted for 58% of annual U.S. radio sales. Radio imports during the first 6 months of this year amounted to 6.5 million units, comprising 54.5% of total U.S. sales.

"IRC" Now Official

At a special meeting stockholders overwhelmingly approved a change of corporate name to "IRC, Inc." from "International Resistance Co."

The firm's board of directors had recommended the change because the forty-year old corporation has been known as "IRC" almost from its founding. In fact, the initials have been used as part of the company trademark for decades.

TABLE II

Retired worker & wife, both 65	Retired worker age 65, wife age 62	Widow age 62	Widow & 1 child	Widow & 2 or more children
$190.00	$175.00	$105.00	$190.00	$254.00

Life Insurance . . .

continued from page 82

Table II
Social security benefits shown for a worker or self-employed person who has earned an average of $400.00 per month or more. A widow receives benefits only after age 62 or if there are children under age 18.

TABLE III

GOING CONCERN VALUES

ASSETS

Accounts Receivable .....$
Goods on Hand .....$
Fixtures & Equipment .....$
Real Estate .....$
Cash .....$
Others .....$
Total .....$

LIABILITIES

Accounts Payable .....$
Notes Outstanding .....$
Others .....$
Total .....$

BOOK VALUE

Total Assets .....$
Less Total Liabilities .....$
Book Value .....$

GOING CONCERN VALUES

Average Annual Earnings including "Salary" (1) .....$
Less Interest Earnings on Book Value (2) .....$
True Annual Earnings .....$
Less Annual Cost to Hire "Replacement" (3) .....$
Annual Good Will Value .....$
Estimated Years Good Will may last (4) X
Total Worth of Good Will .....$
Plus Book Value .....$
Total Going Concern Value .....$

NOTES:

(1) Should include your salary plus any profit taken from the business.
(2) This is the interest you would earn on your money if it weren't invested in your business. 4% is a conservative figure.
(3) This is the minumum annual income you could expect if you were an employee instead of the owner.
(4) Good will can be expected to last a maximum of 5 years, though 3 years is closer to an average.

LIQUIDATING VALUES

ASSETS

Accounts Receivable (5) .....$
Goods on Hand (6) .....$
Fixtures & Equip. (7) .....$
Real Estate .....$
Cash .....$
Others .....$
Total .....$

LIABILITIES

Accounts Payable .....$
Notes Outstanding .....$
Others .....$
Total .....$

TOTAL LIQUIDATING VALUE

Total Assets .....$
Less Total Liabilities .....$
Total Liquidating Value .....$

TOTAL LOSS AT DEATH

Total Going Concern Value .....$
Total Liquidating Value .....$
Total Loss at Death .....$

NOTES:

(5) People will not pay bills after the owners death or after a business has changed hands. A 50% collection figures is about average.
(6) Normal shrinkage is 50% between value at death and time of sale.
(7) Fixtures and equipment isn't new — it's all used, and will command only the used price.

Life Insurance . . .

employee to buy your business for a stipulated price. How is he to pay for it? By buying insurance on your life. The actual financial arrangements should be discussed with a competent life insurance agent, but it can be done without either of you suffering any hardship. Besides providing a guaranteed market for your business at a specified price, it also buys a great deal of employee loyalty. For example, if your man at the service bench is agreeable to this arrangement, he'll work harder and do a better job for you now because he knows that the business might be his someday, and you'll know that he won't be leaving you to work for a competitor.

Such an arrangement is all the more valuable because it relieves your widow of business worries, the administration of the estate is expedited and good will is promoted by the continuation of the business. A valuable present benefit is that your credit and financial standing is enhanced because business life insurance relieves your creditors of any danger of loss as a result of your death.

Although most service and sales shops seem to be owned by sole proprietors, there are a few partnerships. In this case the same things hold true — a will, a binding buy and sell agreement, a specified price and adequate life insurance to fund the purchase by the survivor is the only legally and financially sound way to continue the business. Without this provision, the partnership, and thus the business, dies with any of the partners.

The survivor loses his livelihood, and actually must cooperate in every way possible to help liquidate the business so his partner's widow will be able to claim her share of the business assets. Of course, it is possible to continue in business with a partner's widow — but this is almost never a satisfactory arrangement for either party.

Although we have not covered all the pitfalls one may run into, the few that have been pointed out can be avoided simply. Others can also be taken care of with the assistance of your attorney and an agent experienced in the field of business life insurance. ■

ADVERTISERS INDEX

Note On the Doorstep

by William Knapp

"Dear Sam: Sorry, forgot about the hairdresser, door is unlocked, go on in. The TV is in the bedroom. We moved it there because Ed had it apart and company came in. The knobs are in the kitchen, top drawer. The kids were watching a Western—Indians, shooting, dust and then came an awful smoke which smelled the whole house up.

"There was a big bang—then everything rolled round and round. Nearly scared us out of our wits. For a minute we thought it blew up. This might help you find the trouble.

"Ed tried to fix it, but he got 'bit' by a tube or something and dropped it like a hot potato. It's probably in the doghouse now, because Rover thought Ed was playing and ran out the door with the tube. Oh yes, the back from the set is behind the davenport with some wires Ed yanked out when the tube bit him. He sure yelled. Hope you don't get bit too. If you can't find everything, call Ed. I think he took some other things out too. He is anxious to see the big game tomorrow morning. Please lock the door when you leave. Thank you. Mrs. Herkemer."

P.S. "If the tube isn't in the doghouse, and you can't find Rover, look under the beds—he always carries things under them."

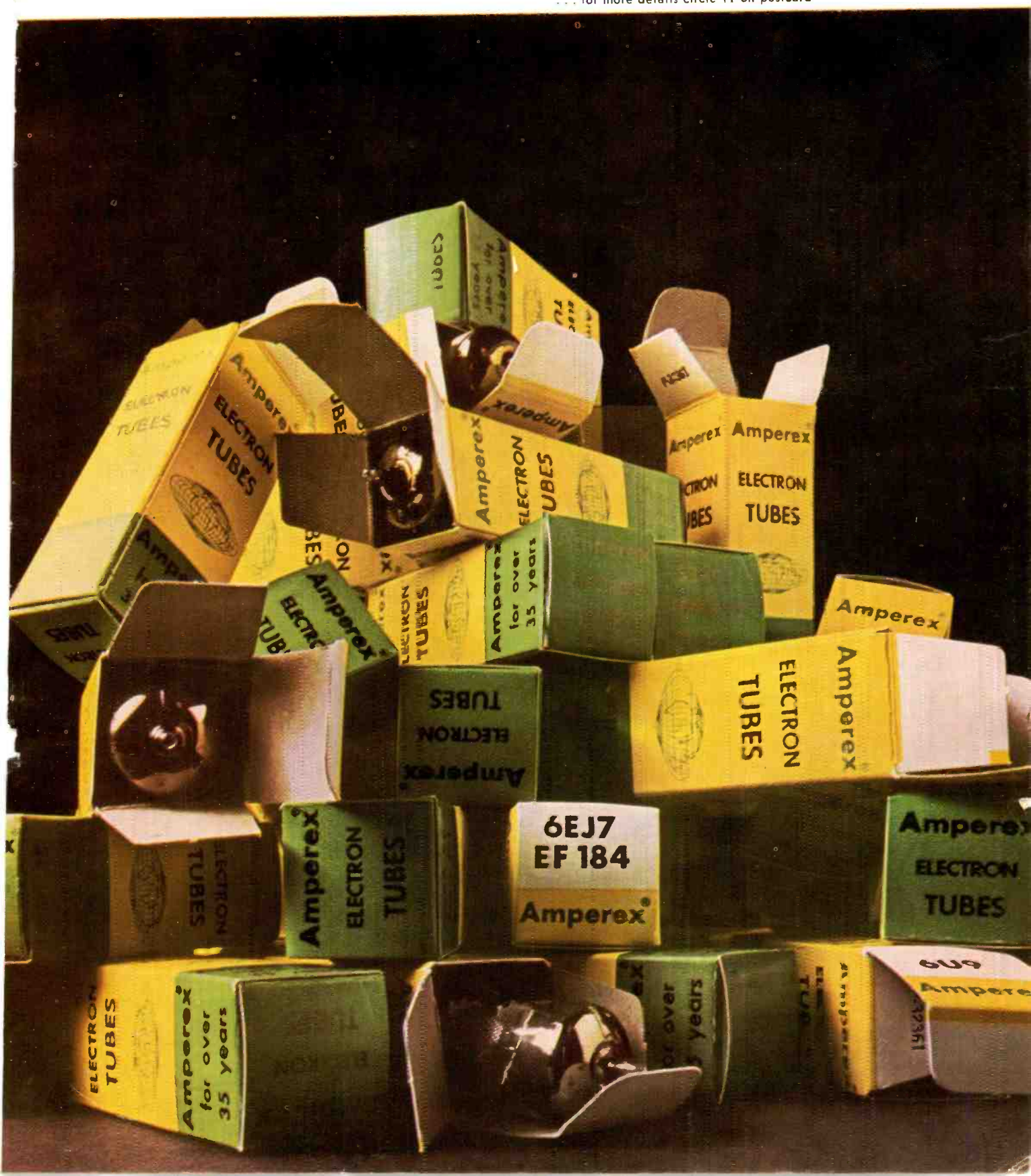
PICK ANY NUMBER FROM 1G3GT TO 19AU4 AND YOU'RE A WINNER!

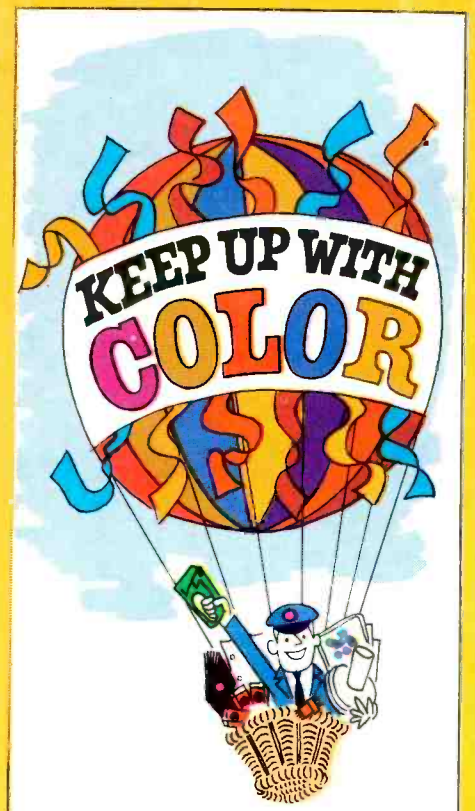
1G3GT/1B3GT	4HA5	6BZ6	6GW8	8CW5
1X2B	5HG8	6CB6A	6HA5	9A8
3BZ6	5U8	6CG7	6HG8	10CW5
3CB6	6AL5	6DT6	6S4A	12AT7
3GK5	6AU4GTA	6EH7	6SN7GTB	12AU7A
3HA5	6AU6A	6EJ7	6U8A	12AX4GTB
4BL8	6AV6	6GB5	6U9	12AX7A
4EH7	6AX4GTB	6GJ7	6X9	15CW5
4EJ7	6BA6	6GK5	6Y9	16A8
4GK5	6BL8	6GK6	8BQ5	19AU4

...AND ON AND ON. FOR THE COMPLETE LIST, WRITE

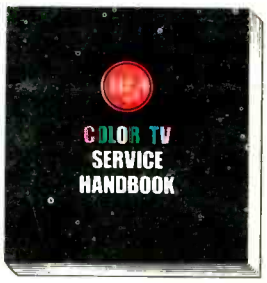
AMPEREX ELECTRONIC CORPORATION, HICKSVILLE, L.I., NEW YORK 11802.

... for more details circle 11 on postcard

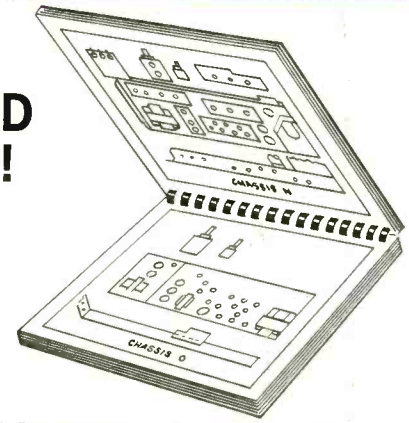




Only RCA helps you keep up with the color TV boom all these ways:



BRAND NEW!



Color TV Service Handbook (1A1553)

In one handy book... all the information you need to do routine adjustments and preliminary troubleshooting on many makes of color sets (1960 to 1966 models). Just look up the chassis number of the set you're working on and turn to the proper section. Chassis layouts, adjustments, fuses and circuit breakers, everything is here, based on the manufacturer's own service notes. You'll want to carry a copy on every color TV service call! Fits easily into your tube caddy.

For a quick and easy aid to troubleshooting, RCA offers the Color TV Troubleshooting Pict-O-Guide (1A1389). With its many true-to-life color photos, this book makes it possible for you to recognize and understand visible symptoms of troubles and maladjustments in color sets.

The Color TV Home Study Course by RCA Institutes (1A1325) is your best bet for a basic understanding of the principles and practices of color TV.

New RCA "Cycolac" Tube Caddy (1A1560)—Lightweight, with superior impact strength and unequalled durability because it's made of "Cycolac", the tough, hard plastic produced by the Borg Warner Corp. Has popular two-wing construction; holds up to 362 receiving tubes; resists scuffs, mars and staining. Boasts a color TV message on one side.

The **RCA Color TV "Quik-Measure" Kit** (1A1569)—Helps you measure both voltage and current at any tube pin in a color set without pulling the chassis from the cabinet or unsoldering leads. The kit contains 7 and 9 pin socket adaptors for miniature tubes, an 8 pin socket adaptor for octal tubes, a top cap extension lead and a current measuring probe.

New Window Display—Promote your color TV service capability with this striking day-glo circular wheel battery-operated motion display. (1A1566)

WALT DISNEY MELAMINE CHILDREN'S DINNER SETS—Mary Poppins (1A1568) shown; Mickey Mouse (1A1567)
Colorful, break resistant DISNEYWARE. Kids adore these loveable characters.

Also ask your local RCA tube distributor about: • RCA Tool Holder (1A1561) • Swingline Staple Gun (1A1570) • Four color postcards on color TV service (1A1572A, B, C) • Newspaper ad mats (1A1573A, B, C) • All weather plastic floor mat strip (1A1565)

Your local RCA tube distributor goes all out to help you KEEP UP WITH COLOR! See him for quality RCA receiving tubes for color and black and white TV, radio and hi-fi. Ask him how to obtain the items mentioned in this ad.

Electronic Components and Devices, Harrison, N.J.

The Most Trusted Name in Electronics