ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

TEKLAB REPORT ON HEATH SCOPE
SOLID-STATE AUTO RADIOS
NO-GO BUSINESS PROSPERS

AUGUST 1968

breakthrough

B&K Model 1450 first and only service-designed oscilloscope with "intermittent analyzer" and "electronic memory"

That elusive intermittent . . . how many hours have you spent trying to locate the source of the problem—how much time was wasted testing each circuit when you could have been doing more productive work? Now, B&K know-how and engineering genius have come through for you.

Result . . . the intermittent analyzer in the Model 1450 Diagnostic Oscilloscope. It will tell you *if* and *where* an intermittent occurs—even without your being there! The electronic memory will keep the intermittent indicator "on" until you return. Think of the time and money it saves.

The easiest to use 'scope ever built, its unique screen gives error-free direct readings of peak-to-peak voltages—it syncs automatically at any signal level—easily displays color reference signal. Convenient for use as a vectorscope too, all inputs and controls are on the front panel.

Deluxe in every respect, the 1450 is another B&K innovation that will make your time more profitable in solid state and color TV service. Years-ahead planning for present and future use . . . the best-value all-around 'scope you can buy. With probe. Net, **$279.95**

INTERMITTENT MONITOR. Designed to supplement the indicators on the 1450, this plug-in monitor can be placed anywhere in your shop. It flashes and buzzes when an intermittent occurs . . . and projects a professional image to your customer. Net, **$24.95**

DIAGNOSTIC B&K OSCILLOSCOPE

B&K Division of Dynascan Corporation
1801 W. Belle Plaine Avenue • Chicago, Illinois 60613

B&K

Where Electronic Innovation Is A Way Of Life

. . . for more details circle 101 on postcard

ELECTRONIC
TECHNICIAN / DEALER

TEKFAX

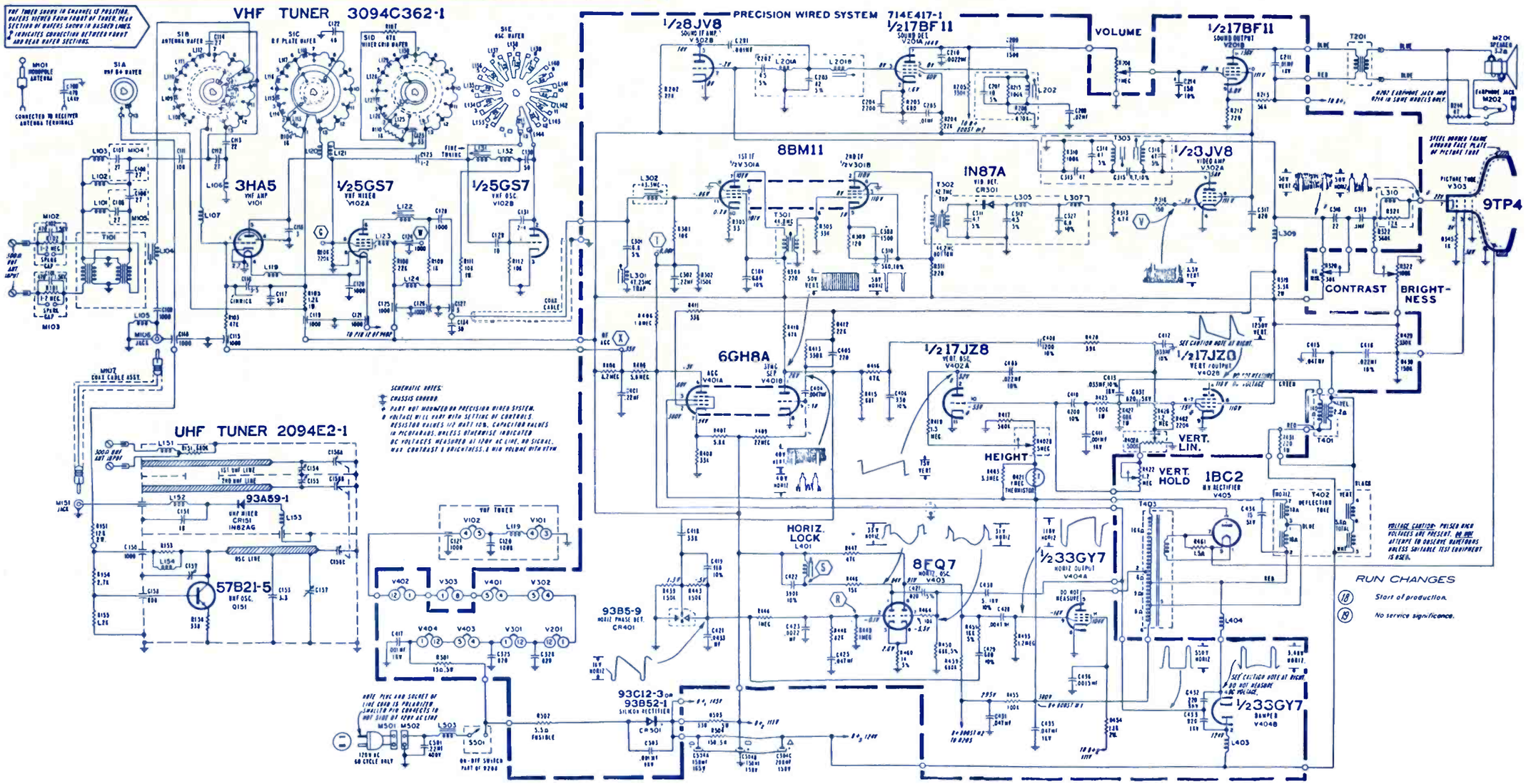
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 6 NEW SETS

GROUP 192

1170
ADMIRAL
TV Chassis TG2-1

AUGUST • 1968

SYMBOL DESCRIPTION	ADMIRAL PART NO.
R208 — 1M vol control with switch	75C120-1
R320 — 30K contrast control	75C121-3
R322 — 100K bright control	75C121-2
R402A — vert lin control dual	75C95-6
R402B — height control dual	75C95-6
R421 — 1M thermistor	61C41-2
R422 — 1.2M vert hold control	75C121-1
R454 — 1.1K 2w	61C24-226
R460 — 1K 5% ½w WW	60B28-60
R461 — 1.5Ω WW	60B28-60
R502 — 5.5Ω fuse type	61C48-1
R503 — 330Ω 5w	61C20-66
R504 — 150Ω 5w	61C20-44
C202 — 4.5pf 5% composition	65C40-57
C203 — 82pf 5% 500v cer disc	65D10-98
C207 — 18pf 5% cer disc	65D10-140
C211 — .01μf 1kv cer disc	65D10-373
C301 — 6.8pf 5% composition	65C41-141
C311 — 4.7pf 5% 500v cer disc	65D10-101
C312 — 4.5pf 5% composition	65D40-57
C314 — 47pf 5% 500v cer disc	65D10-92
C316 — 46pf 5% 500v cer disc	65D10-92
C327 — 6.8pf ¼% 500v NPO cer disc	65D10-102
C406 — 330pf 10% 5kv cer disc	65D10-266
C422 — 3900pf 10% 500v polystyrene	65C80-19
C427 — 820pf 5% 500v polystyrene	65C80-44
C432 — 240pf 3kv cer disc	65D10-395
C503 — .001μf 1kv cer disc	65D10-147
C504A — 150μf elect 165v	67D15-393
C504B — 150μf 150v elect	67D15-393
C504C — 200μf 150v elect	67D15-393
L201A & B — IF and phase coil	72C301-2
L202 — quad coil	72C132-77
L301 — 47.25MHz trap	72C296-4
L305 — RF choke	73C31-3
L307 — resonant choke	73C45-243
L309 — video peaking coil	73C55-23
L401 — horiz lock coil	94D17-17
L403 — spook choke	73C37-17
L503 — AC line choke	73C31-1
T201 — audio output xformer	79C81-23
T301 — 1st IF xformer	72C132-76
T302 — 2nd IF xformer	72C261-8
T303 — sound takeoff xformer	72C185-5
T401 — vert output xformer	79D100-17
T402 — deflection yoke assembly	750D305-34
T403 — horiz output xformer	79D117-1
CR401 — horiz phase detector	93B5-9
tuner VHF	3094C362-1
tuner UHF	2094E2-1



1171
CANADIAN GENERAL ELECTRIC
TV Chassis M638

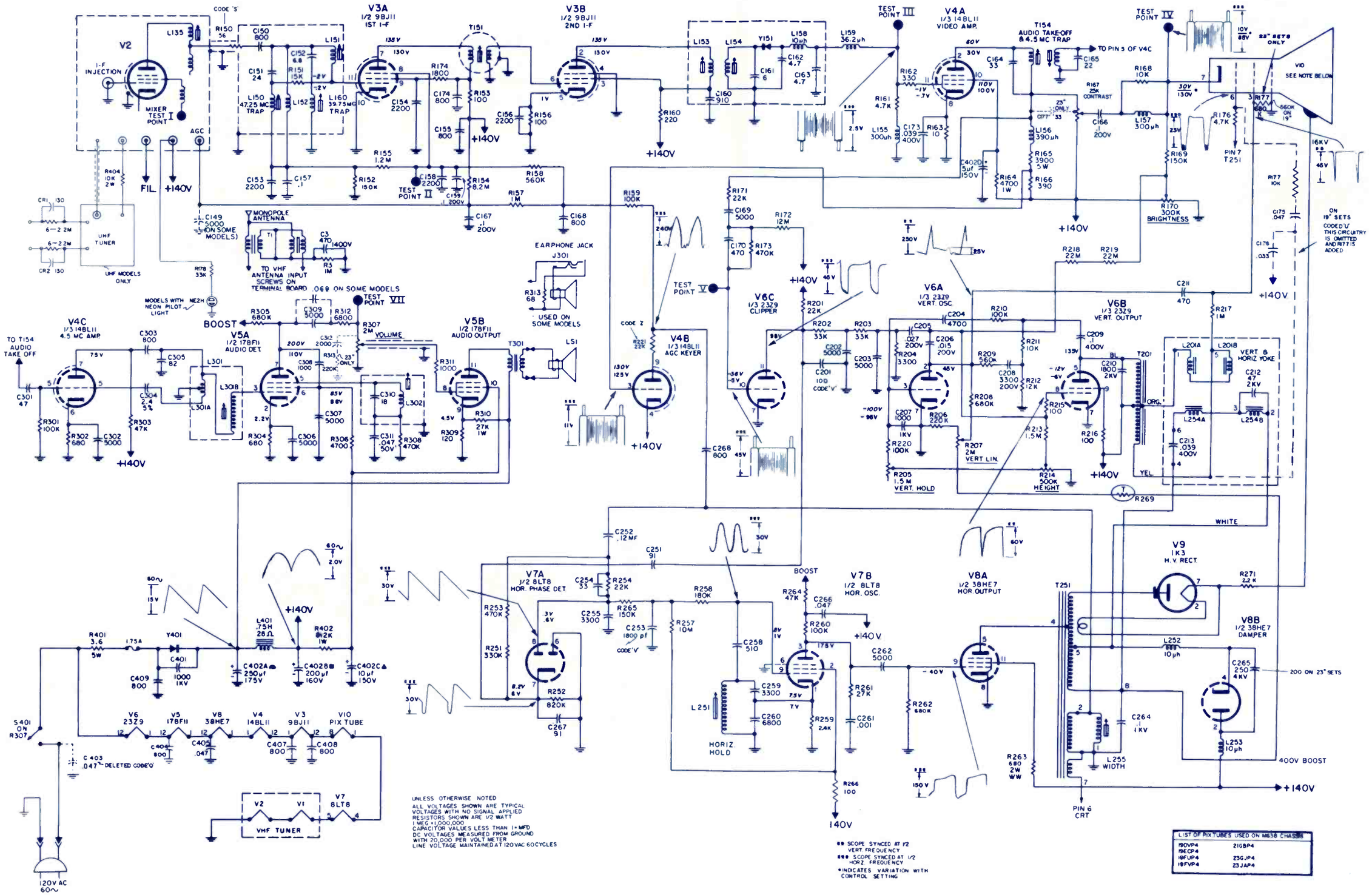
ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

AUGUST • 1968

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

SYMBOL	DESCRIPTION	CANADIAN GENERAL ELECTRIC PART NO.
R165	3.9K 10% 5w	R7441
R401	3.6K 10% 5w WW	R6993
R207	vert lin 2M	R6995
R214	height 500K	R6996
C401	1000pf GMV 1kv 'C'	
C169	5000pf GMV 500v 'C'	R5323
C202, 3	5000pf GMV 500v 'C'	R5323
C207	1000µf 20% 1kv 'C'	R6729
C210	1800pf 20% 2kv 'C'	R6746
C265	250pf 10% 4kv 'C' used on 19" sets only	R7439
C265	200pf 10% 4kv 'C'	
C402A, B, C, D	250µf 165v/200µf 160v/10µf 150v/5µf 160v 'C'	R7440
L301	quad coil	R7001
L251	horiz osc coil	R7448
T301	audio OP xformer	R6851
T201	vert OP xformer	R7450
T251	horiz OP xformer	R7575
L255	width coil	R7009
L201	deflection yoke	R7434
L150	link trap coil	R6735
L151	1st IF grid coil assembly	R6736
T151	1st IF plate coil assembly	R7572
L152	link shunt coil	
L153	coil video detector primary	R6737
L154	coil video detector secondary	R6738
T154	audio take off xformer	R7000
L155	choke coil 300µh	R7446
L156	choke coil 390µh	R4944
L157	choke coil 300µh	R7446
L160	41.25MHz trap coil	R6737
L301A, B	4.5MHz interstage coil	R6829
L401	filter reactor	R7451
L402	line choke	R7296
Y151	diode germanium	R1889
Y401	diode silicon power rectifier	R6048
F1	fuse 1.75A fast blow	R7573
R269	thermistor 150k	R7442

"If additional service information is required, copies of the complete Service Manual is available for a nominal charge from Canadian General Electric Co. Ltd., 830 Lansdowne Avenue, Toronto 4, Ontario, Canada."



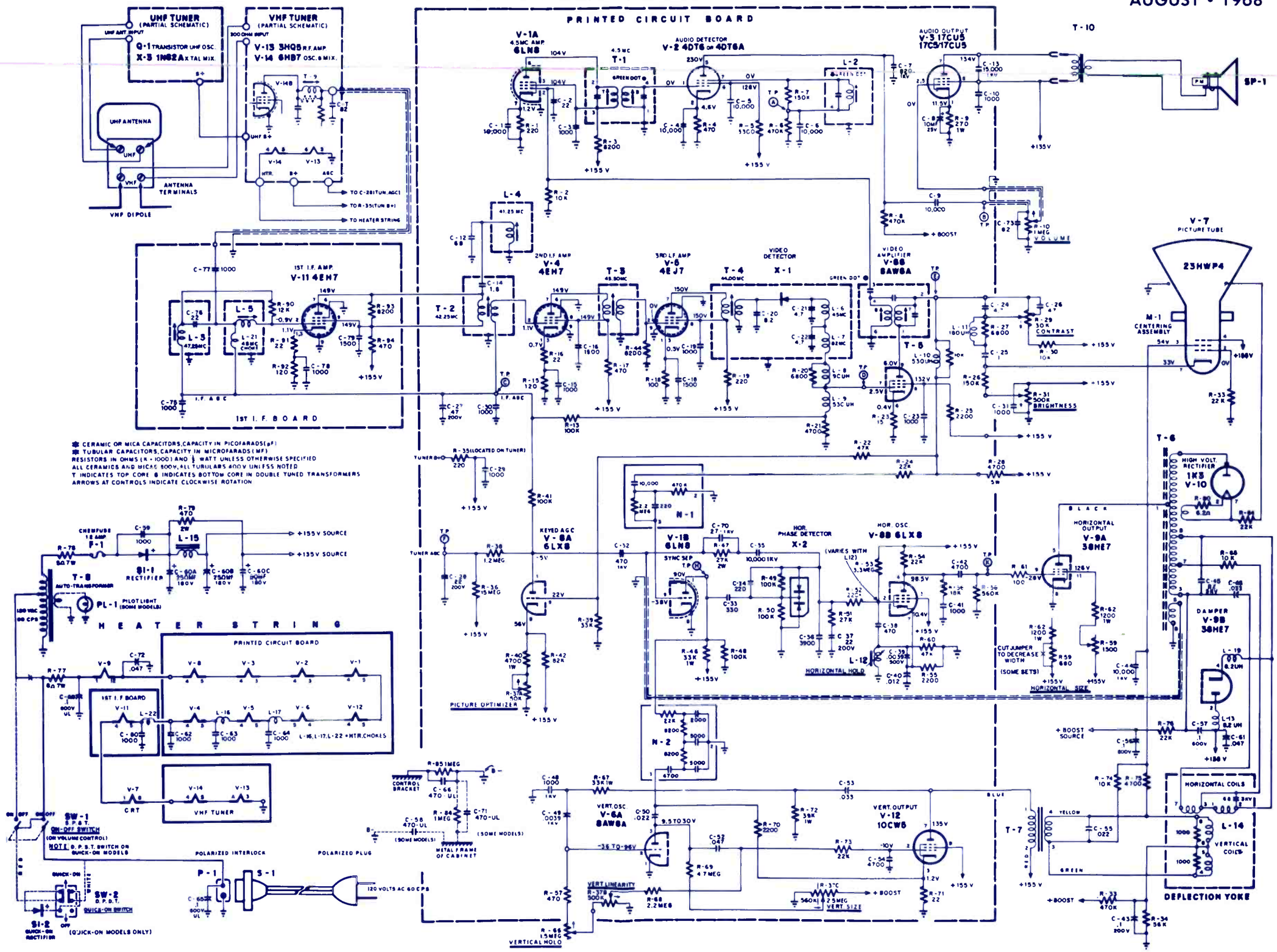
ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

1172
EMERSON
TV Chassis 120852, 853, 855

AUGUST • 1968

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

SYMBOL	DESCRIPTION	EMERSON PART NO.
R10	1M w/switch (ch 120852) vol control	390912
R10	1M w/switch (ch 120853) vol control	390911
R10	1M w/switch (ch 120855) vol control	390833
R29	30K, contrast control	390894
R31	500K bright control	390895
R37	(A) 50K, picture optimizer control	390766
	(B) 500K, vert lin control	part of R37A
	(C) 2.5M, vert size control	part of R37A
R59	1.5K, horiz size control	390927
R66	1.5M, vert hold control	390896
R77	8Ω WW 10% tol 5w resistor	394284
R78	5Ω WW 10% tol 7w resistor	394216
	CAPACITOR	
CT1	9-180pf variable trimmer	900221
C45	82pf 5% tol 5kv cer	929040
C60A, B, C	elect 250/250/50μf, 180v	925664
C70	27pf, N1500 1kv cer	929157
L2	4.5MHz sound quad coil	720404
L3	47.25MHz adj channel sound trap	720452
L4	41.25MHz self-channel sound trap	720317
L9	530μh, video amp, peaking coil	708404
L12	horiz osc coil	716151
L14	deflection yoke assy.	708481
T1	4.5MHz sound interstage xformer	720513
T2, 3	IF xformer, interstage	720540
T4	IF xformer, video detector	720455
T5	4.5MHz sound take-off xformer	720512
T6	horiz output xformer	738210
T7	vert output xformer	738193
F1	1.2a fuse	808236
N1	sync separator couplate	923059
N2	vert integrator couplate	923159

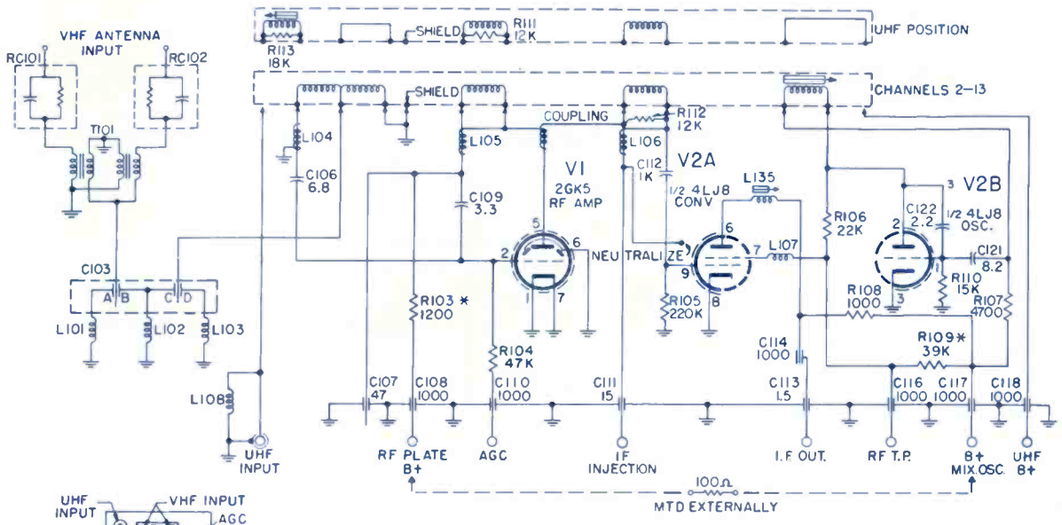


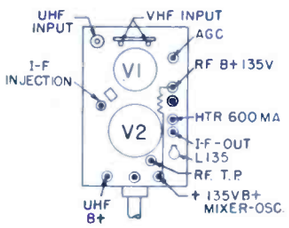
1173
GENERAL ELECTRIC
Color TV Chassis H-1

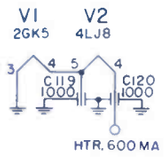
ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

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

AUGUST • 1968

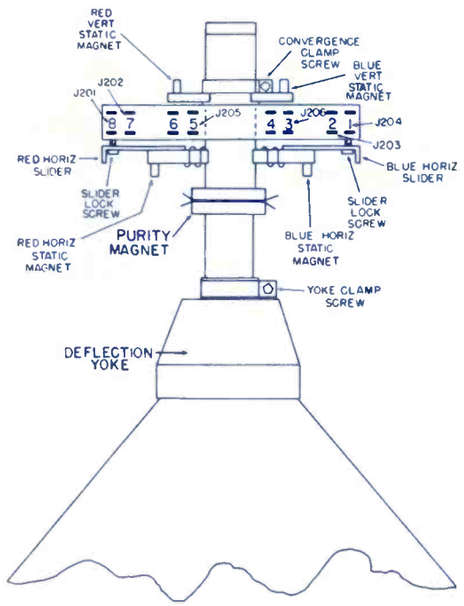






* ON LATER VERSIONS OF THIS TUNER R103 IS 1000 OHMS, AND R109 IS 47000 OHMS.

SCHEMATIC DIAGRAM



FINAL OVER-ALL PURITY:

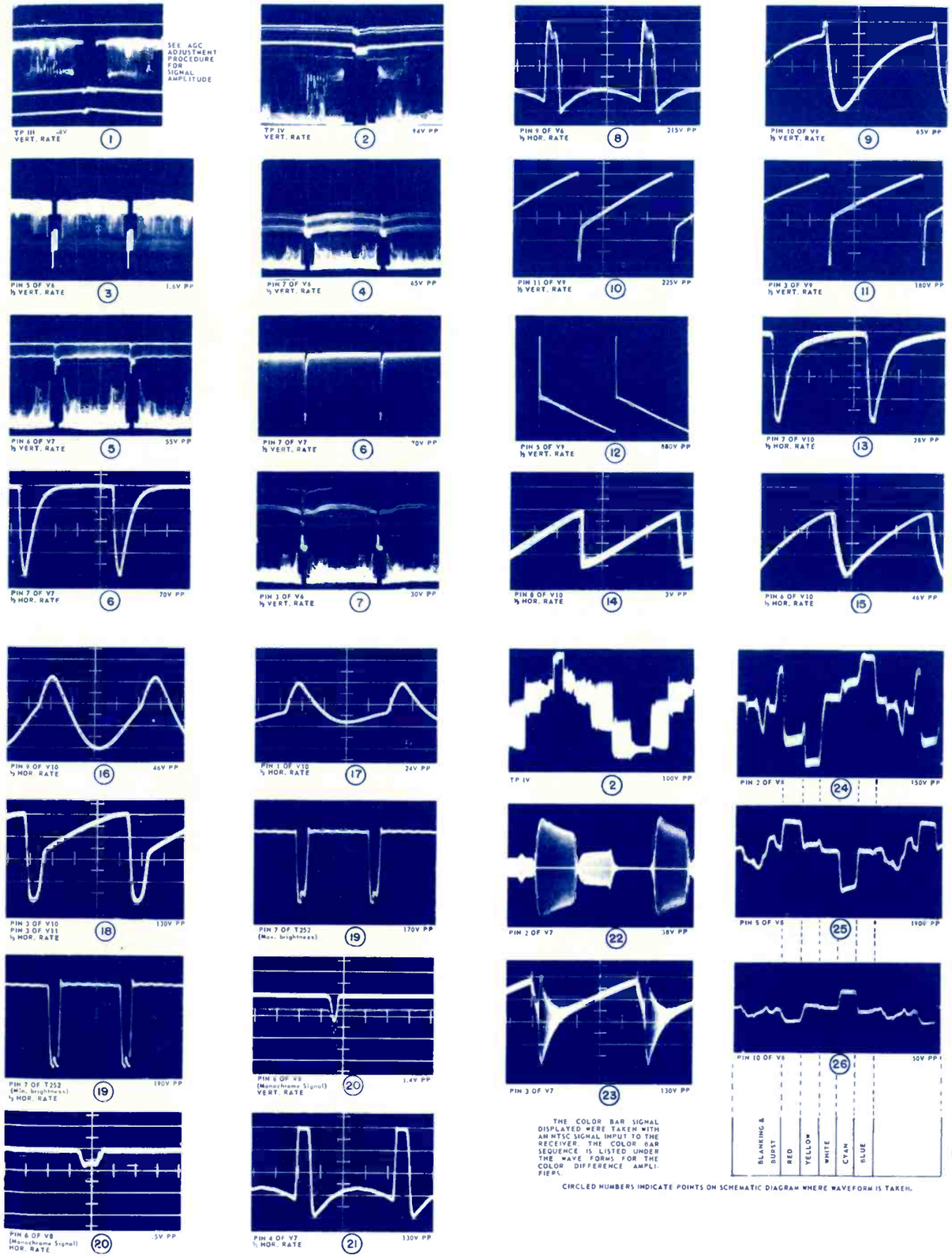
Turn the GREEN & BLUE COLOR BRIGHTNESS controls "Off" and position the yoke on the neck of the picture tube for pure overall red raster and for proper leveling of the picture. Tighten the yoke clamp screw while supporting the yoke weight with one hand. Check each color field and check overall convergence, then lock the convergence magnets in position with a drop of Glyptal cement.

COLOR TEMPERATURE ADJUSTMENTS (Grey Scale)

Tune the receiver to an active monochrome channel. Check for proper adjustment of the height, vertical linearity, and the horizontal hold controls. Check convergence and purity. Make necessary adjustments and proceed as follows:

1. Turn the 3 picture tube screen controls fully clockwise.
2. Short the antenna terminals together and switch the channel selector to an unused VHF channel. Turn the contrast control counterclockwise.
3. Turn the master BRIGHTNESS control (on front of receiver) clockwise to a point just short of defocusing the raster.
4. Adjust either/or both of the two COLOR BRIGHTNESS controls to eliminate color shading of the white raster.
5. Turn the master BRIGHTNESS control counterclockwise to a point where the raster is almost extinguished.
6. Adjust the appropriate color screen control to eliminate color shading of the dark grey raster.
7. Check the raster from highlights to low lights adjusting the controls as neeessary to maintain gradations from grey to a white raster throughout the usable brightness range. Repeat steps 3 thru 6 if necessary to produce grey scale tracking.
8. Check the positioning, or setting, of the screen controls to make certain that at least one of these controls is set at maximum.

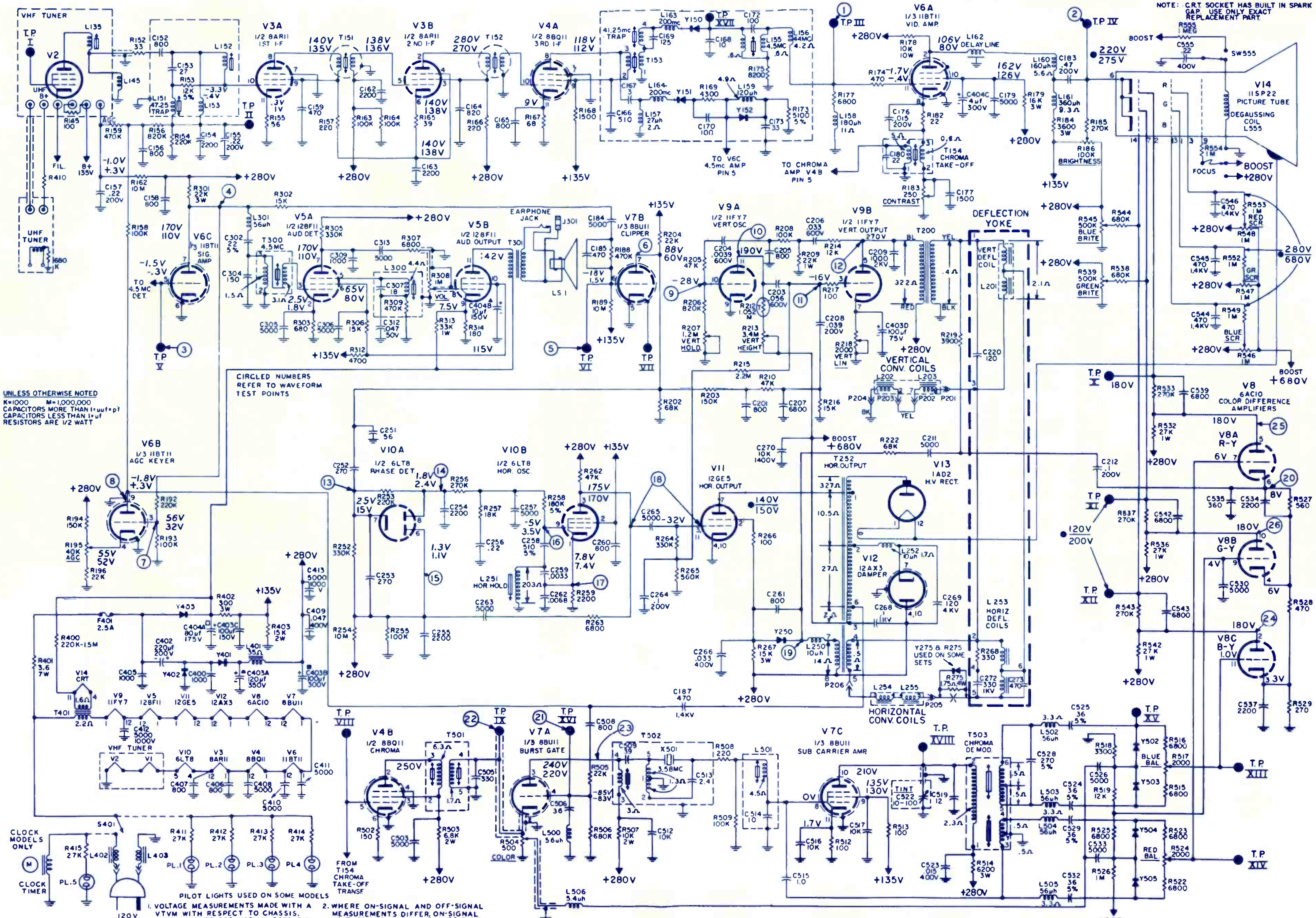
WAVEFORMS FOR POINTS INDICATED



THE COLOR BAR SIGNAL DISPLAYED WERE TAKEN WITH AN NTSC SIGNAL IMPUT TO THE RECEIVER. THE COLOR BAR SEQUENCE IS LISTED UNDER THE WAVE FORMS FOR THE COLOR DIFFERENCE AMPLIFIERS.

CIRCLED NUMBERS INDICATE POINTS ON SCHEMATIC DIAGRAM WHERE WAVEFORM IS TAKEN.

GENERAL ELECTRIC
Color TV Chassis H-1



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

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

2. WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS DIFFER, ON-SIGNAL VOLTAGE APPEARS IN *ITALICS* OVER OFF-SIGNAL VOLTAGE. OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED AND ANTENNA TERMINALS SHORTED TOGETHER.
ON-SIGNAL VOLTAGES AND WAVE SHAPES TAKEN WITH NOISE FREE SIGNAL.

● INDICATES VARIATION WITH CONTROL SETTING
# INDICATES PRODUCTION CHANGE

1174

ZENITH

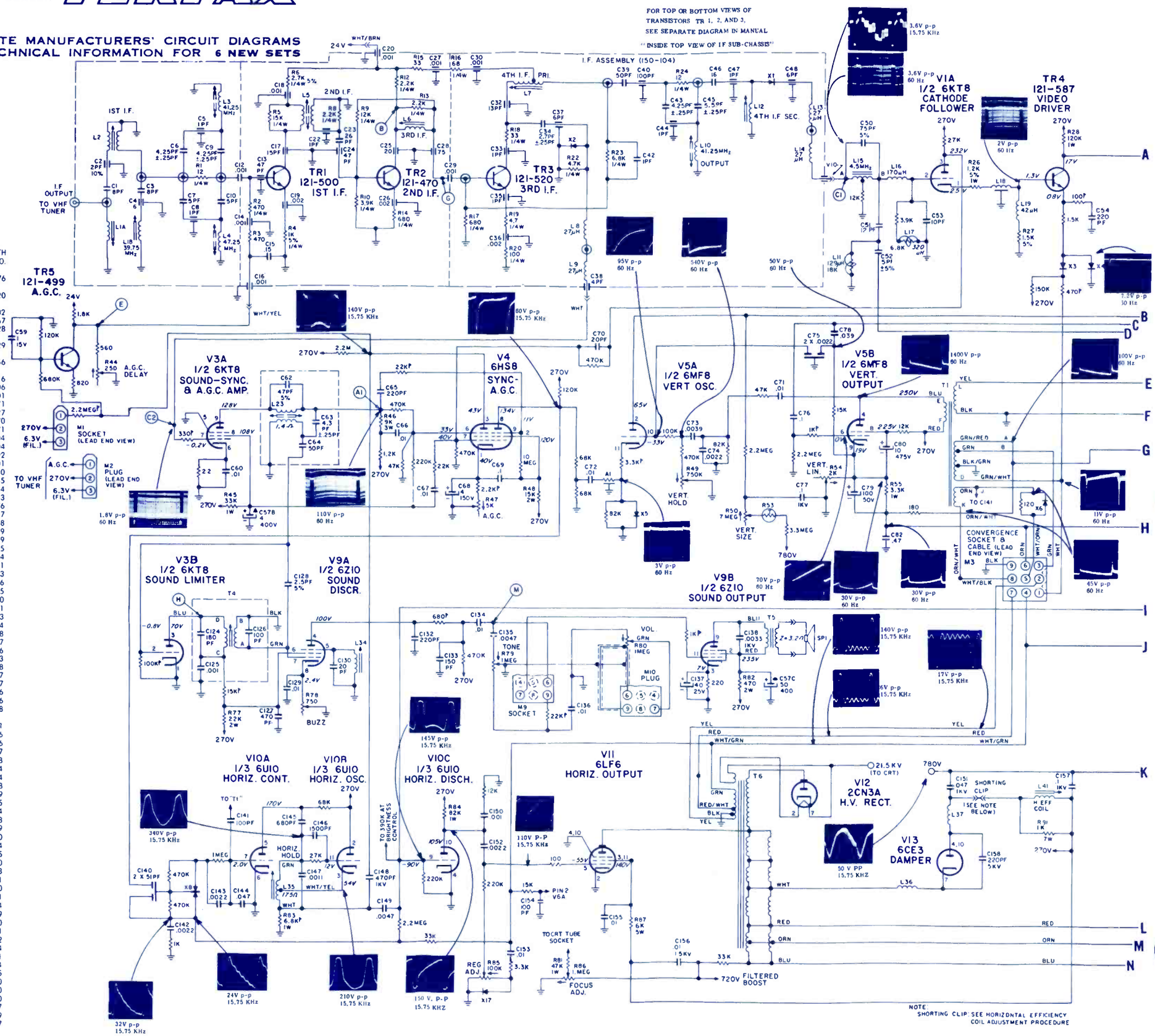
Color TV Chassis
15Y6C15

AUGUST • 1968

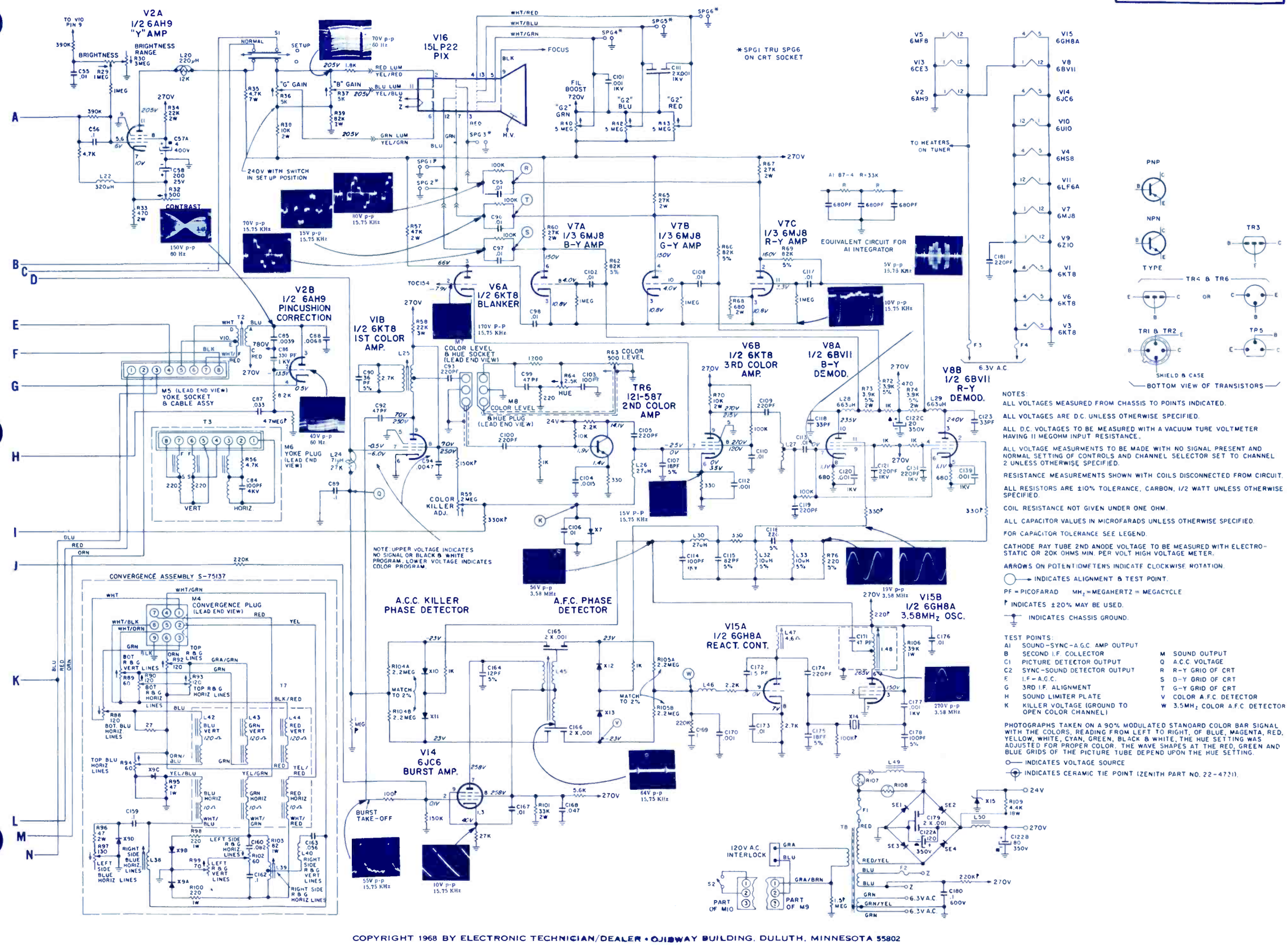
ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

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

SYMBOL	DESCRIPTION	ZENITH PART NO.
C37	1.9pf trimmer cap 500v	22-5476
C57A	4µf elect cap 400v	
C57B	4µf elect cap 400v	22-5520
C57C	50µf elect cap 400v	
C59	1µf electrolytic (non-polar) 20% 15v	22-4902
C62	47pf disc cap 5% 500v	22-2467
C75	2X .0022µf disc cap 10% 500v	22-28
C84	100pf disc cap (part of T6) 4kv	
C111	2X .001µf disc cap 20% 1kv	22-29
C122A	120µf electrolytic cap 350v	
C122B	80µf electrolytic cap 350v	22-5556
C122C	20µf electrolytic cap 350v	
C124	180pf mica cap 10% 500v	22-5216
C126	100pf mica cap 10% 500v	22-5106
C145	680pf mica cap 10% 500v	22-2901
C156	.01µf disc cap 1.5kv	22-4671
C158	220pf disc cap 10% 5kv	22-5627
R4	1K resistor 5% amperex only ⅛w	63-7470
R6	2.7K resistor 5% amperex only ¼w	63-7471
R8	2.2K resistor 10% A-B only ⅛w	63-7104
R13	2.2K resistor 10% A-B only ⅛w	63-7104
R29	1M brightness control	63-7092
R30	3M bright range control	63-7101
R32	500Ω contrast control	63-6980
R35	4.7K resistor 10% 7w	63-7455
R36	5K green gain control	63-6334
R37	5K blue gain control	63-6333
R40	5M G2 green control	63-6976
R42	5M G2 blue control	63-6977
R44	250Ω AGC delay control	63-7108
R47	5K AGC control	63-7389
R49	750Ω vert hold control	63-6979
R50	7M vert size control	63-5415
R53	thermistor	63-6824
R54	2K vert lin control	63-6951
R59	2M color killer control	63-5463
R63	500Ω color level control	63-7536
R64	2.5K hue control	63-7535
R78	750Ω buzz control	63-6950
R79	1M tone control	63-7351
R80	1M volume control & AC switch	63-6953
R85	100K regulator control	63-7434
R86	1M focus control	63-7388
R88	120Ω bottom blue horiz lines cont.	63-7347
R91	1K resistor	63-3296
R92	120Ω top red & grn vert lines cont.	63-7073
R94	60Ω top blue horiz lines cont.	63-7348
R105A	2.2M resistor (matched to ½w)	63-4607
R105B	2.2M resistor 2% ½w	63-4607
R107	voltage dependent resistor	63-7146
R108	thermistor	63-7346
R109	4.4K resistor 10% 18w	63-6968
L18	39.75MHz trap coil assembly	
L2	1st IF transformer	20-1521
L3	41.25MHz input trap coil assembly	20-1516
L4	47.25MHz trap coil assembly	20-1516
L5	2nd IF xformer	20-1597
L6	3rd IF coil	20-1458
L7	4th IF primary xformer	20-1534
L10	41.25MHz output trap coil assembly	20-1474
L12	4th IF secondary xformer	20-1458
L15	4.5MHz trap coil winding assembly	S-77669
L18	delay line winding assembly	S-79085
L23	sound take-off coil assembly	S-77414
L25	1st color amplifier plate coil assy.	S-77408
L27	2nd color amplifier plate coil assy.	S-77409
L34	quad coil assy.	S-80480
L35	horiz osc coil assy.	S-77584
L41	horiz efficiency coil assy.	S-79285
L45	burst amp & phase detector coil assy.	S-80590
L47	color osc frequently adj. coil assy.	S-77583
L48	osc plate coil assy.	S-77411
L50	filter choke	95-2490
T1	vert output xformer	95-2491
T2	pincushion coil winding assy.	S-77784
T3	deflection yoke	95-2479
T5	sound output xformer	95-2510
T6	horiz sweep transformer	S-78151
T8	power xformer	95-2572
A1	integrator	87-4
F1	lamp bel-fuse	136-71
S1	B/W set-up switch	85-994
X15	zener diode	103-105
TR1	1st IF transistor	121-500
TR2	2nd IF transistor	121-470
TR3	3rd IF transistor	121-520
TR4	video driver transistor	121-587
TR5	AGC amp	121-499
TR6	2nd color amp transistor	121-587



ZENITH
Color TV Chassis 15Y6C15



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

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

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

COIL RESISTANCE NOT GIVEN UNDER ONE OHM.

ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

FOR CAPACITOR TOLERANCE SEE LEGEND.

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

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

◯→ INDICATES ALIGNMENT & TEST POINT.

PF = PICOFARAD MH_z = MEGAHERTZ = MEGACYCLE

INDICATES ±20% MAY BE USED.

INDICATES CHASSIS GROUND.

TEST POINTS:

AI	SOUND-SYNC-A.G.C. AMP OUTPUT		
B	SECOND I.F. COLLECTOR	M	SOUND OUTPUT
C1	PICTURE DETECTOR OUTPUT	Q	A.C.C. VOLTAGE
C2	SYNC-SOUND DETECTOR OUTPUT	R	R-Y GRID OF CRT
E	I.F.-A.G.C.	S	B-Y GRID OF CRT
G	3RD I.F. ALIGNMENT	T	G-Y GRID OF CRT
H	SOUND LIMITER PLATE	V	COLOR A.F.C. DETECTOR
K	KILLER VOLTAGE (GROUND TO OPEN COLOR CHANNEL)	W	3.5MH_z COLOR A.F.C. DETECTOR

PHOTOGRAPHS TAKEN ON A 90% MODULATED STANDARD COLOR BAR SIGNAL WITH THE COLORS, READING FROM LEFT TO RIGHT, OF BLUE, MAGENTA, RED, YELLOW, WHITE, CYAN, GREEN, BLACK & WHITE, THE HUE SETTING WAS ADJUSTED FOR PROPER COLOR. THE WAVE SHAPES AT THE RED, GREEN AND BLUE GRIDS OF THE PICTURE TUBE DEPEND UPON THE HUE SETTING.

O— INDICATES VOLTAGE SOURCE

INDICATES CERAMIC TIE POINT (ZENITH PART NO. 22-4731).

1175

RCA VICTOR
TV Chassis KCS168 Series

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

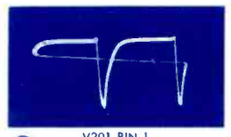
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 6 NEW SETS

AUGUST • 1968

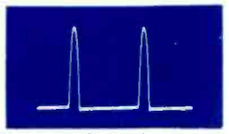

1. TP-3
SECOND DETECTOR
VERTICAL RATE 2.8V P-P

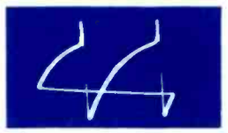

2. V205 PIN 9
VIDEO OUTPUT PLATE
VERTICAL RATE 70V P-P


3. C246 & C235 JUNCTION
ZONE 2B, PW-200
VERTICAL RATE 70V P-P


4. V201 PIN 1
SYNC PLATE
HORIZONTAL RATE 48V P-P

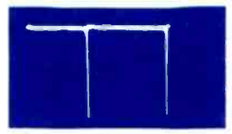

5. V205 PIN 2
AGC GRID
HORIZONTAL RATE 28V P-P


6. V205 PIN 3
AGC PLATE
HORIZONTAL RATE 350V P-P

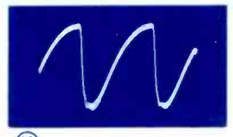

7. V206 PIN 9
VERTICAL OSCILLATOR GRID
VERTICAL RATE 150V P-P

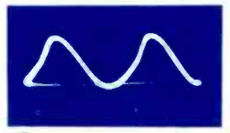

8. V206 PIN 2
VERTICAL OUTPUT GRID
VERTICAL RATE 28V P-P


9. PW-200, TERMINAL "L"
VERTICAL OUTPUT TRANSFORMER
VERTICAL RATE 350V P-P

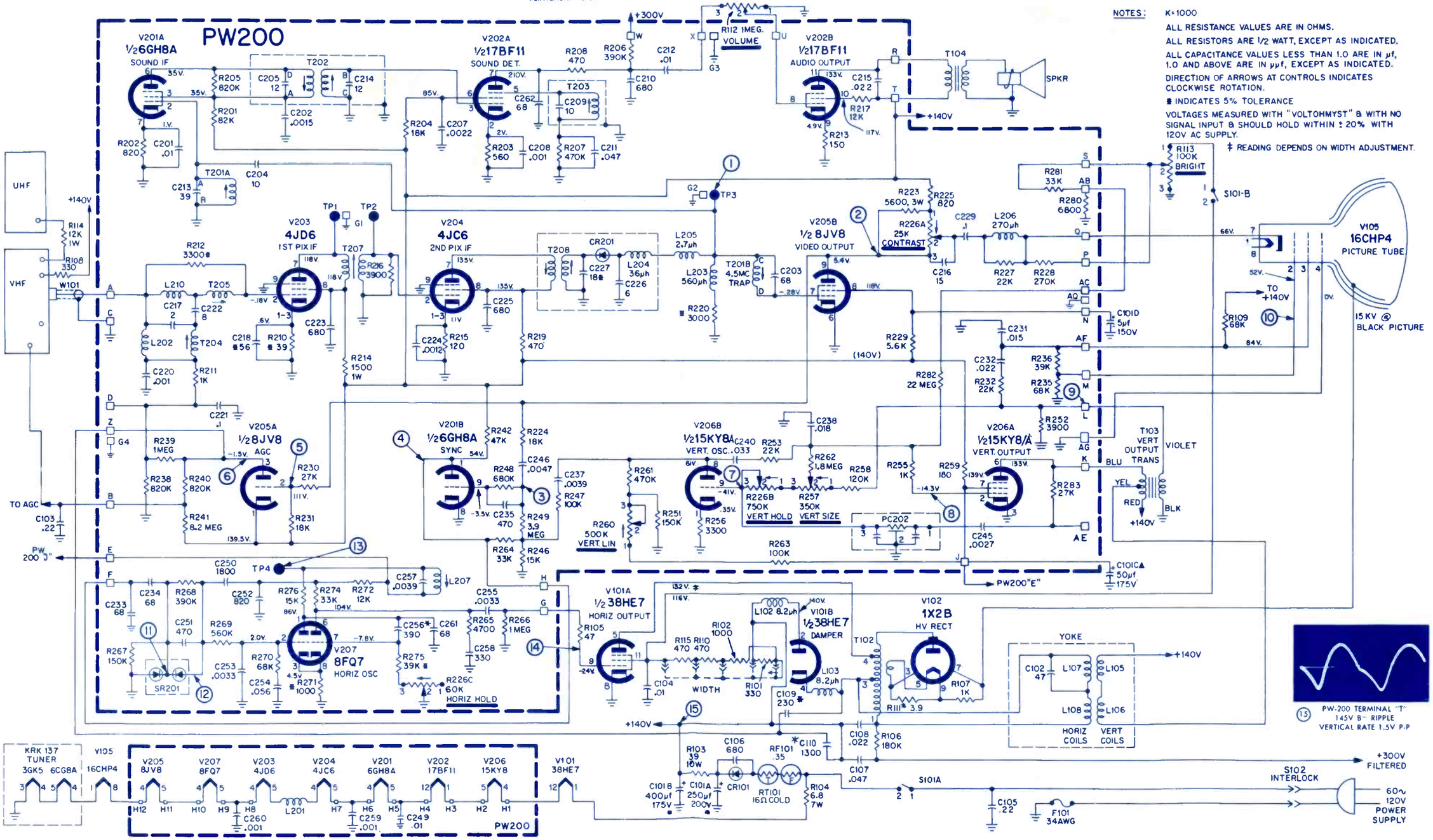

10. V105 PIN 2
PICTURE TUBE GRID
VERTICAL RATE 62V P-P


11. SR201 CATHODE JUNCTION
HORIZONTAL PHASE DETECTOR
HORIZONTAL RATE 9V P-P


12. SR201 ANODE
HORIZONTAL PHASE DETECTOR
HORIZONTAL RATE 9V P-P


13. TP-4
HORIZONTAL SINE WAVE
HORIZONTAL RATE 11V P-P


14. V101 PIN 9
HORIZONTAL OUTPUT GRID
HORIZONTAL RATE 85V P-P



NOTES:

K=1000

ALL RESISTANCE VALUES ARE IN OHMS.

ALL RESISTORS ARE ½ WATT, EXCEPT AS INDICATED.

ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN μf, 1.0 AND ABOVE ARE IN μμf, EXCEPT AS INDICATED.

DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION.

‡ INDICATES 5% TOLERANCE

VOLTAGES MEASURED WITH "VOLTOHMYST" ® WITH NO SIGNAL INPUT ® SHOULD HOLD WITHIN ± 20% WITH 120V AC SUPPLY.

‡ READING DEPENDS ON WIDTH ADJUSTMENT.

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

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

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

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

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

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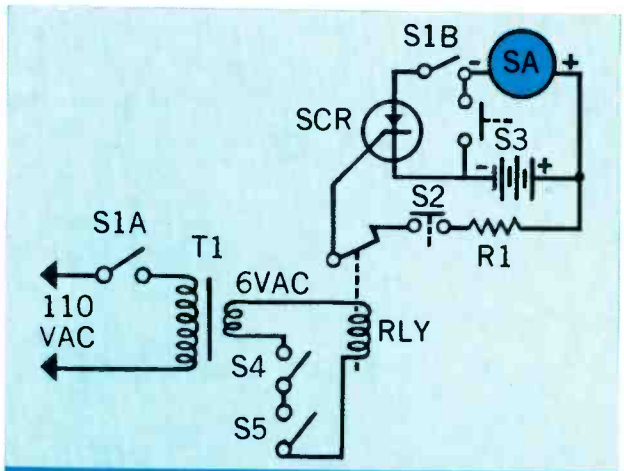
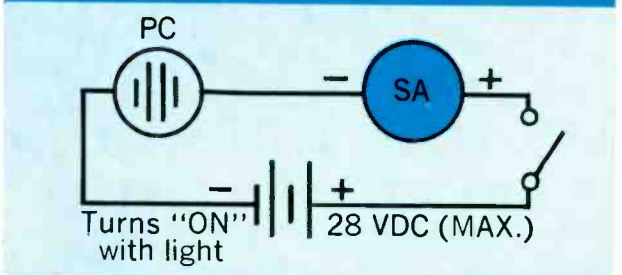
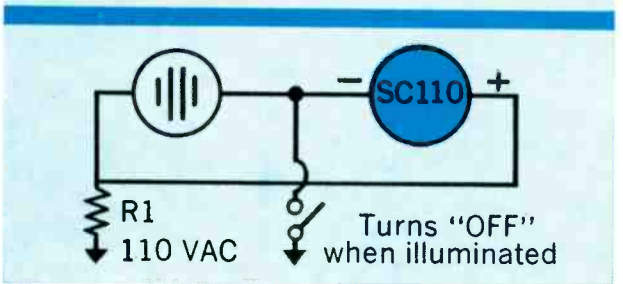
SOUTH-EAST	938 GORDON ST., S. W. Atlanta, Georgia	TEL: 404-758-2232
WEST	SARKES TARZIAN, Inc. TUNER SERVICE DIVISION 10654 MAGNOLIA BLVD., North Hollywood, California	TEL: 213-769-2720

Low-drain Sonalert® signal has dozens of uses







Most audible signals take considerable power to operate. But here's a *different* one . . . the Sonalert . . . that is completely solid state and works on a few milliamps. And because of this characteristic, it can be used in signalling, warning and testing arrangements that would otherwise be impractical, complicated or costly.

Here's an intrusion alarm circuit using the Sonalert (SA in the diagram). Switches S4 and S5 are control line contacts in a low-voltage AC circuit . . . which, when opened, will cause the relay contacts to open, gate the SCR and the Sonalert will immediately sound off. S4 and S5 can be door or window contacts, for example. This is a "fail safe" circuit. The Sonalert is powered by a battery (a 9-volt Mercury Duracell® battery TR-146X is ideal). Any loss of AC power will sound the alarm. S2 is an "arming" switch, and S3 lets you test battery condition.

By using fusible links in the S4 and S5 positions, you can convert this to a fire alarm.

In conjunction with photo cells, Sonalert can be arranged to do all sorts of tricks. Its drain is so low that it can be coupled directly to low-cost cadmium sulfide cells. Two simple circuits are illustrated; one turns the Sonalert on when illuminated, the other turns the Sonalert on when light goes off.

Other uses? Sonalert works great as a continuity checker, code practice oscillator, swimming pool splash alarm. In your automobile it can be hooked up as a water temperature or oil pressure signal, or as a "headlights on" alarm. We've published a booklet that describes how to make many different circuits. Ask your Mallory Distributor for a copy of Folder 9-406, or write to Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Indianapolis, Indiana 46206.

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

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ELECTRONIC TECHNICIAN / DEALER

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AUGUST 1968 • VOL. 88 No. 2

COVER

Two-way radio plays a big part in the popular sport of pleasure boating and is an essential asset to many resort operators.

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ADMIRAL: TV Chassis TG2-1
CANADIAN GENERAL ELECTRIC: TV Chassis M638
EMERSON: TV Chassis 120852, 853, 855
GENERAL ELECTRIC: Color TV Chassis H-1
RCA VICTOR: TV Chassis KCS168 Series
ZENITH: Color TV Chassis 15Y6C15

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ET/D EDITOR'S MEMO

"Project Transition"

In the May 1968 issue of ET/D we outlined some of the efforts by industry, business and government to train people in technical skills.

In particular, we mentioned that the government's Dept. of Defense (DOD) and the EIA have a program designed to give Army and Navy short-timers the chance to learn a skill before discharge. The program is obviously designed to train these people in some type of useful skill and prevent an avalanch of unemployed. In its basic concepts it appears to be a worthwhile plan. However, from the letters we have received there seems to be some doubt as to the military's efficiency in useful placement of enlistees *already* technically trained. One TV service-dealer tells us that his son, who attended one and one-half years of pre-engineering and later graduated from an electronic trade school, enlisted in the Armed Forces. Before enlistment he was promised continued electronic training.

Because of his previous education, he was naturally sent to a school for on-the-job training. But, the training turned out to be digging ditches, changing light bulbs and laying cable.

Ultimately, the young man was sent overseas. His job there consisted of erecting tents, laying building foundations and other general labor.

And this doesn't seem to be an isolated situation. We expect a man entering any branch of the military service will spend a certain amount of time in basic training, such as "boot" camp, where they learn to accept discipline and things like digging ditches.

But if the entire tour of duty for technically qualified people is spent in these tasks, it is obviously a gross waste of potential manpower and a definite blot on the DOD's training program.

The program, called "Project Transition," is primarily centered on training exiting military personnel and is sponsored by the Service Technician Development Program (STDP) of the EIA. And with almost one million GIs returning to civilian life this year, the program seems to be worthwhile.

However, if men with technical skills are spending their time replacing light bulbs, then the EIA and the DOD had better make a little in-house survey. If this situation is not looked into, the knowledge and skills of many of these ditch-digging technicians will be out-moded, out-dated and out of interest.

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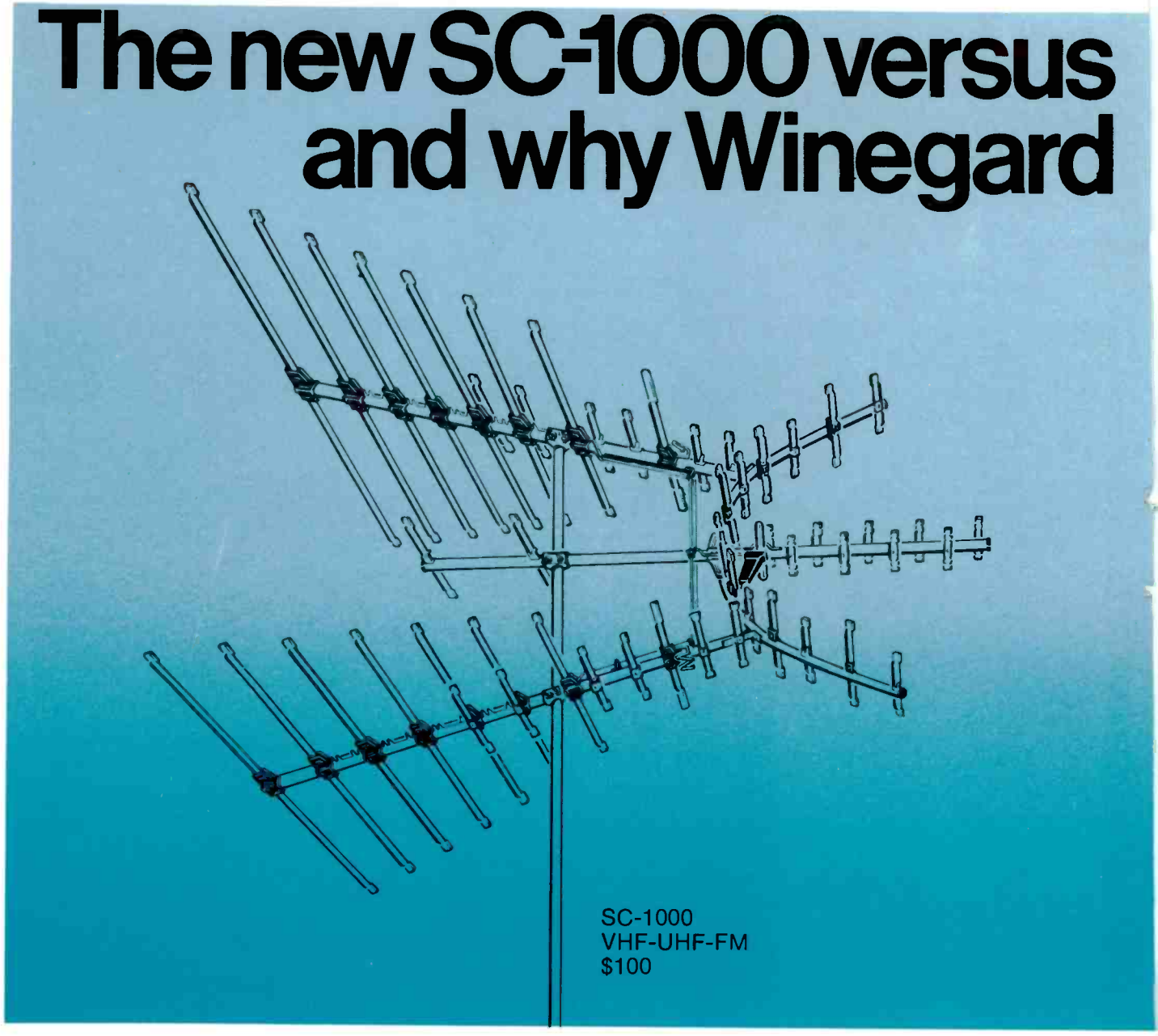
The new SC-1000 versus and why Winegard



When we created the $100 super powerful, super fringe Super Colortron SC-1000, we figured it would be a long time (if ever) before anybody could design an 82-channel VHF-UHF-FM antenna anything like it.

And we still figure it that way.

But what we have done is create a VHF-FM antenna that's just as revolutionary. And just as profitable.

The $100 SC-2000, with higher gain than any other VHF-FM antenna on the market.

The SC-1000 and SC-2000 have a lot of features in common, including their price. And uncommon to any other antennas, anywhere. At any price.

And since they're meant to complement, not compete with each other. Winegard dealers can't lose, can you?

Get all the facts.

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the newer SC-2000, dealers can't lose.

EXCLUSIVE SC-2000 ELECTRONIC AND CONSTRUCTION FEATURES

Exclusive New Compact "Wedge" Design...Plus New Vertical Beam Phasing On Each VHF Channel: Vertical Beam Phasing on all VHF channels means there is no signal pickup from above or below the antenna. It means interference from such sources as airplanes, cars and diathermy machines are shut out. And it means that ghost signals are highly rejected. And that's not all. The VHF capture area is doubled and power gain over a conventional single bay is doubled. The vertical beam is flattened and elongated and spurious vertical lobes are eliminated. All that, and the SC-2000, with its unique "Wedge" design, is still vastly shorter and more mechanically stable than any other configurations would have to be to come close to the gain of the SC-2000.

Exclusive Patented* VHF Director System: Absorbs VHF signal and focuses it onto the collector elements. Helps give the SC-2000 pinpoint directivity to knock-out ghosts, smear and snow. *U.S. Patent No. 2700105, Canada No. 511984.

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Exclusive "Impedance Correlators": Provide perfect 300 ohm VHF impedance match and produce more signal gathering power per inch of antenna—and also contribute to making the SC-2000 extremely compact.

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Exclusive Ellipsoidal Boom: Strongest boom ever used on a TV antenna. All elements of antenna are special aluminum alloy 40% stronger than used on most antennas.

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ET/D LETTERS TO THE EDITOR

Sold Back Issues

In your March 1968 issue of ET/D you printed my announcement to sell back issues of ET/D. I sold them to the first buyer. But, the response was so great that I can't possibly write and thank everyone who wrote me. Would you please print my thanks to everyone in your next issue of ET/D.

EDWIN ULRICH

Fresno, Calif.

Unknown Vintage

I purchased a "Crosley Showbox," vintage unknown as the decal is gone. The speaker has a removable cone dated 1927, England and Canada. Tubes are: two 171, three 26, one 27 and an 80 power tube. I would like to get this set operating and need a schematic. Any help from an ET/D reader would be appreciated.

ROBERT C. PITTS

4809 S. V St.
Fort Smith, Ark. 72901

Color TV for Australia

Can you please help us? We need a good second hand portable (or small cabinet) color television receiver for studying purposes. We here in Australia expect to have color in the near future as the transmitting equipment has already arrived.

We would be very grateful to any reader or dealer who could tell us where we might obtain a color set, the cost and shipping expenses.

R. A. PAL

Pal's TV Service
293 Railway Parade
Maylands
Western Australia

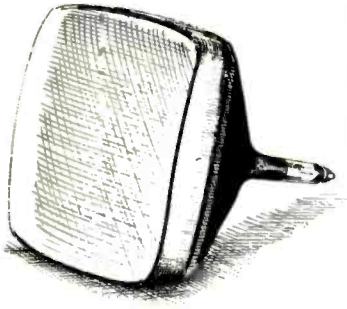
Nuts to Full Time

Reading Letters to the Editor from Harry Goldman in the March issue makes me satisfied that I am only a part timer. I don't believe I could stand it full time. Several TV shops in our small town have gone out of business. Who can make a living with a shop full of sets waiting for back orders that have been back ordered from back orders?

What are TV and radio manufacturers up to — are we to junk all older sets and sell new ones? If so, how much do we allow on a trade-in for which we can't even obtain repair parts?

It's quite a problem — I'll stay a

Why RCA is No. 1 in color TV tubes



Because RCA pioneered the color picture tube in use today.

Because no other color picture tube gives you such outstanding overall performance.

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Because RCA makes camera tubes that "take" the picture, makes transmitting tubes that "send" the picture, makes color picture tubes that reproduce the picture.

Because without RCA there would be no electronic color TV system as we know it today.

That's why!

RCA

ET/D LETTERS TO THE EDITOR

part timer. It's impossible to maintain good customer relations with back orders — it takes more time finding replacement parts than it takes to do the work.

I had one portable TV set which needed a part available only in the Midwest. I ordered a small coil which had burned out. They sent me a telescoping antenna — COD. Next they sent me a big iron core choke — also COD. Both useless. How do I get my money back? I finally put in a thermistor and explained it to the customer. In the meantime I have parts I will probably never use.

Anyway, I enjoy your magazine. I've been getting it for years and probably will for some time to come.

ROBERT F. CAREY
East Falmouth, Mass.

Military Hickok Tube Tester

I am in need of any information which will assist me in modifying a military tube tester Model TV-7 B/U (made by Hickok). At present it will not check any of the newer TV-radio tubes, especially the type common in series string filament circuits.

HAROLD D. WRIGHT
Rt. 3, Box 261
Enterprise, Ala.

Audio Spectrum Control

About 20 years ago there was a preamp and "audio spectrum control" on the market. I don't know the manufacturer, but memory associates it with B & K. I am in need of one. If an ET/D reader has one of these in his junk box or gathering dust on the shelf, please write me stating price.

THEO. P. HOVER
410 Marion Ave.
Lima, Ohio 45801

Oh My — Wet or Dry

In reference to your Editor's Memo in February 1968. Your article stated that the average healthy, adult male has a dry body resistance of less than 5K ohms measured from hand to hand and standing on both feet. We disagree.

Using an HP410B-VTVM we measured the resistance of seven men stationed here and the lowest recorded dry reading was 14K ohms — and that was aided by removing the shoes (about 1K ohm less). The lowest wet reading was 3K ohms, the dampness

New design for color ...and all other!

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*Makes test under actual set-operating conditions

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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.

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ET/D LETTERS TO THE EDITOR

produced by running to work up a sweat or by dipping fingers into a bowl of water. The readings obtained from each man, wet and dry, is logged as follows — who's right?

Name	Wet	Dry
Albanese, Vincent J.	8K	35K
Heerten, Louis F.	7K	15K
Schmitt, Mike C.	8K	50K
Morner, Fred G.	7K	15K
Spencer, Darwin	9K	45K
Torpin, Jr., Charles H.	3K	14K
Walfram, John E.	8K	45K

CHARLES TORPIN, USN
Pasadena, Calif.

When we were in the Navy, we didn't have to run to work up a sweat. Sounds like a landlubber's tea party — who ever heard of a sailor having to dip his fingers in a bowl of water to get wet. By the way, did that bowl contain salt water? Try the readings with an ohmmeter. . . . . Ed

More on PC Boards

I must rise to the defense of Mr. Neuman's letter (ET/D-December 1967) to toss a few wet noodles at Mr. Sinks' reply (ET/D-May 1968).

I have serviced over 20,000 television receivers in the past 20 years as the owner-operator of a TV-radio service shop. That should qualify me as far as experience goes.

We all seem to be out of step except Mr. Sink, who must be connected with the sale or manufacture of printed circuits, bonded copper, or precision etched, etc., etc.

Mr. Neuman indicated no quarrel with low voltage, low current PC devices. They are hard to repair at a profit due to the low hour average wage paid to workers in the foreign manufacturing plants. This results in a very low selling price.

I have *handwired* hundreds of broken printed circuit boards with wire, but have yet to use copper foil to repair a handwired set. Would Mr. Sink really have us believe it is easier to test, remove and replace a bad socket, capacitor or coil from a circuit board which usually has a metal backing under it? Easier than an open, handwired set? Who is he kidding?

As an associate once said concerning circuit board component repair; crush it, try to save the leads, then solder the WIRES together.

STANLEY R. HOFF
Klamath Falls, Ore. 97601

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GENERAL ELECTRIC

TV Chassis AY through AD — B+ Fuse

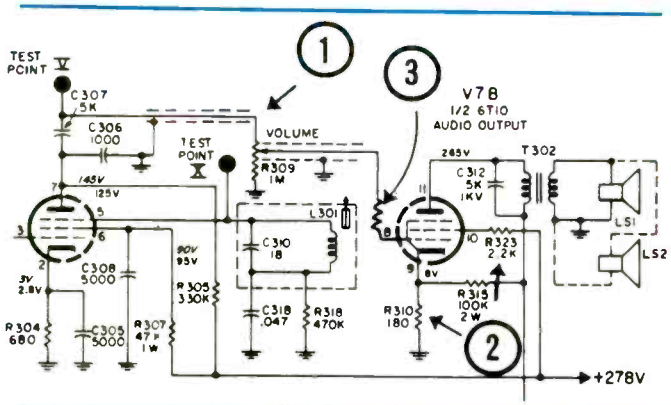
Some service technicians are replacing the B+ fuse in the "A" line chassis (AY through AD) with a slow-blow type. This type of fuse will not protect the set from damage in the event of a B+ short.

Whenever an "A" chassis ("AY" through "AD") is serviced for any reason, the B+ fuse should be checked to be sure that it is a 2a, fast-blow type, catalog No. ET10X41.

CANADIAN GENERAL ELECTRIC

TV Chassis M664 — Volume Control Damage

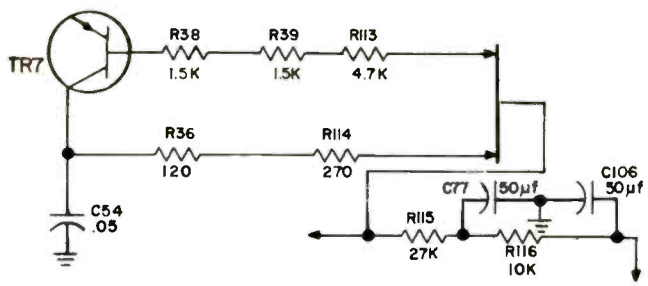
There have been a few cases where a 6T10 audio output tube has developed a grid to screen grid short, resulting in high B+ current through the volume control and damaging the element. This happens when the volume control is set for a medium to low volume when such a short occurs.

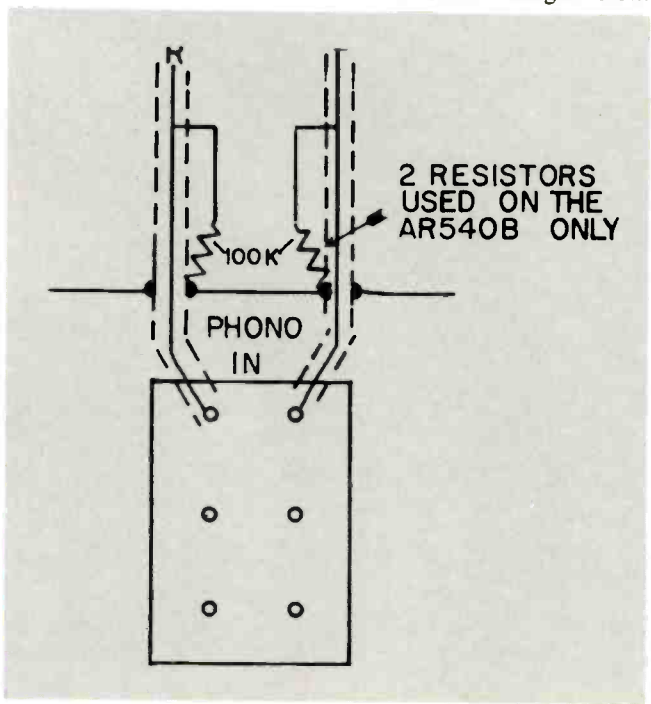


Whenever a M664 chassis is serviced for a defective volume control or 6T10 audio output tube, the following items should be checked for possible damage and a 22K resistor added to prevent future damage. 1. Volume control checked for noisy or intermittent spots. 2. Measure the screen grid resistor R323 and cathode resistor R310 for correct values. 3. Add a 22K, ½w resistor between pin 8 of 6T10 and the center arm of the volume control.

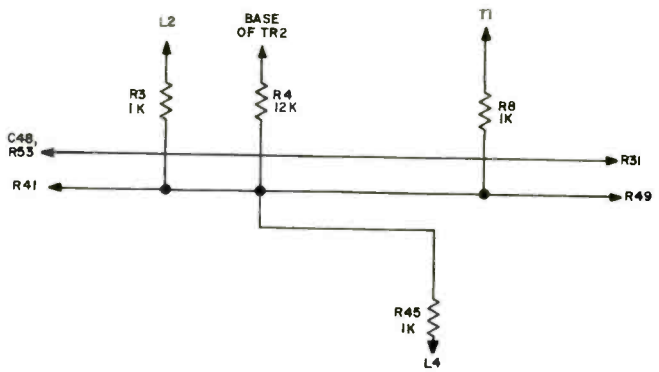
Phono Chassis M686 — Audio Circuit Alterations

Since the initial version of the M686 service note, there have been a few minor alterations to the schematic as shown: 1. Resistors R113 and R114 were used on the deluxe 12 push-button version of the M686 chassis only. They were used to lower the amount of supply voltage being fed to the tuner's regulator circuit consisting of TR7 and D5. 2. Capacitors C86 and C87 have been changed from





.01 µf to .005 µf to smooth out the bass response which initially proved to be too critical. 3. Transistors TR17 and TR18 should be shown as NPN not PNP. 4. On the AR540B chassis only — two 100K resistors have been added in the phono input circuit to decrease the amount of bass response as shown in diagram. 5. There should be a ground connection between C77 and C106 as shown on the diagram. 6. There is no connection between R4 and R53 as previously shown. There is, however, a connection to R3 as shown on the diagram.



Amplifier Chassis M683 — Poor Bass Response — Earphone Hum and Hiss

There have been a few complaints of (1) insufficient bass response and (2) hum while the set is operated with earphones connected.

ET/D TECHNICAL DIGEST

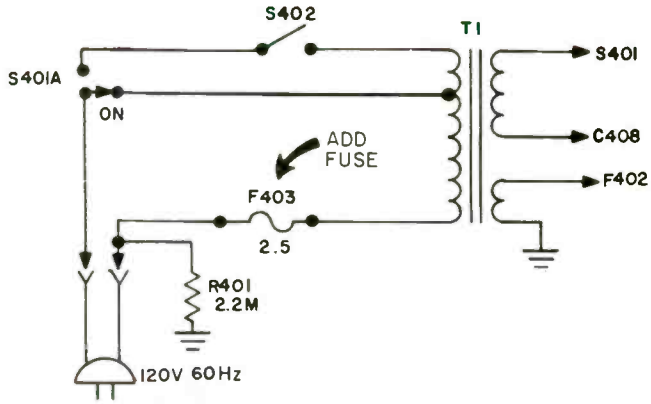
To effectively overcome the complaints of insufficient bass response, a signal divider network may be added to each channel.

To reduce the amount of earphone hum and hiss a 100 Ω resistor should be added to one lead of each earphone per channel.

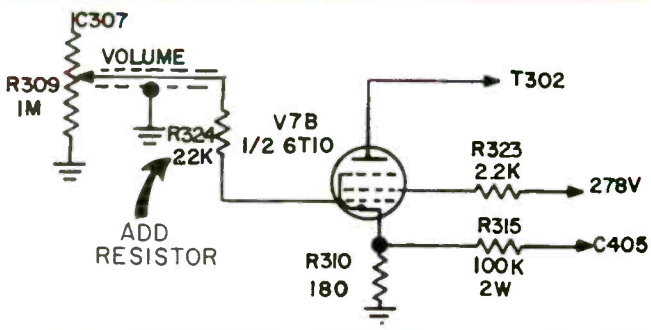
This is not intended as an instruction to rework sets, but is given as information only.

TV Chassis M664 Codes 'X' and 'W' — Production Changes

During production, fuse F403 was added in the primary circuit of T401 as shown.



In latest production, resistor R324 has been added between pin 8 of 6T10 V7B tube and the volume control R309 to prevent damage to R309.



MAGNAVOX

Distorted Audio in TV Sets

You may encounter a few cases of distorted audio because of audio drift in television chassis using a 360847-2 quadrature coil with the polypropylene coil form. This coil can be readily identified since the form is a translucent colorless material.

To eliminate drift, production is now using as a replacement a new coil which can be identified by an opaque-white coil form. Also used in production are some 360847-2 coils having a shorter, blue colored form which is also an acceptable replacement for the earlier type.

All replacement 360847-2 coils shipped from Magna-Par will be of the improved type.

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The demand for licensed men is enormous. Today there are over a million licensed broadcast installations and mobile transmitters on the air, and the number is growing constantly. And according to Federal Law, no one is permitted to operate or service such equipment without a Government FCC License or without being under the direct supervision of a licensed operator.

This has resulted in a gold mine of new business for licensed service technicians. A typical mobile radio service contract pays an average of about $100 a month. It's possible for one trained technician to maintain eight to ten such mobile systems. Some men cover as many as fifteen systems, each with perhaps a dozen units.

Opportunities in Plants

And there are other exciting opportunities in the aerospace industry, electronics manufacturing, telephone companies, and plants operated by electronic automation. Inside industrial plants like these, it's the licensed technician who is always considered first for promotion and in-plant training programs. The reason is simple. Passing the Federal Government's FCC exam and getting your License is widely accepted proof that you know the fundamentals of Electronics.

So why doesn't everybody who "tinkers" with electronic components get an FCC License and start cleaning up?

The answer: it's not that simple. The Government's licensing exam is tough. In fact, an average of two out of every three men who take the FCC exam fail.

There is one way, however, of being pretty certain that you will pass the FCC exam. That's to take one of the FCC home study courses offered by the Cleveland Institute of Electronics.

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Thomas E. Miller, Jr., Engineer, Indiana Bell Telephone Company: "I completed my CIE course and passed my FCC exam while in the Navy. On my discharge, I was swamped with job offers from all over the country. My only problem was to pick the best one, and I did—engineer with Indiana Bell Telephone. CIE made the difference between just a job and a management position."

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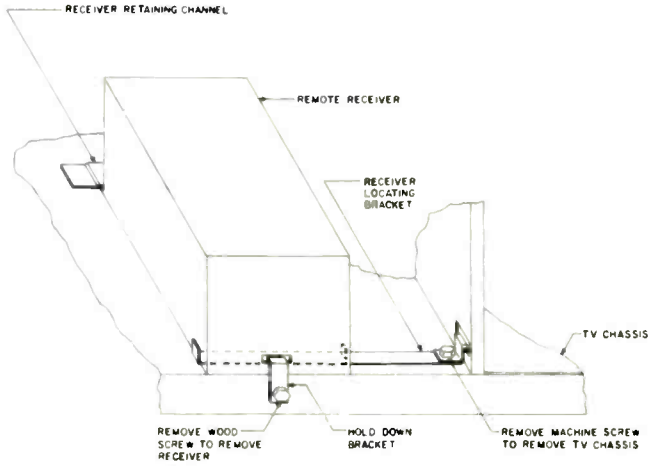
ET/D TECHNICAL DIGEST

TV Remote Control Receiver Model 704044 — Locating Bracket

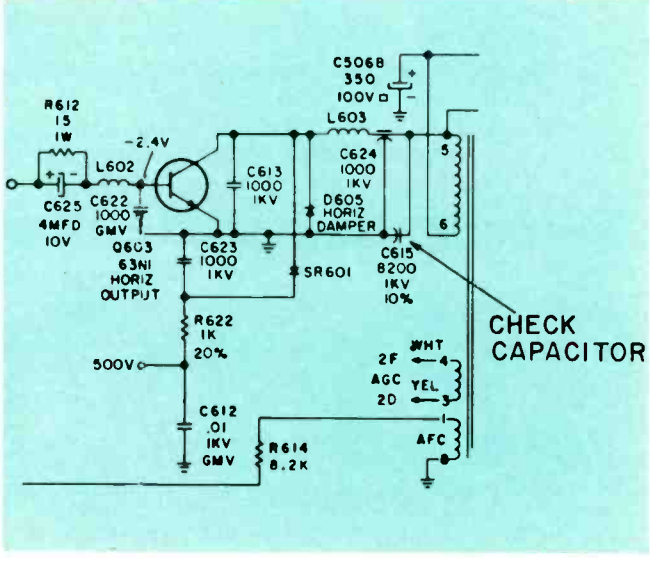
A remote receiver locating bracket is now being used in instruments which employ the eight-function remote system. The bracket maintains correct spacing between the remote receiver and the television chassis. The remote receiver may be removed, as before, by detaching the hold-down



bracket and pulling the receiver toward the rear of the instrument until it clears the retaining channel. The remote receiver and the locating bracket need not be removed when the television chassis is removed from the cabinet.

TV Chassis T908/T915 — Failure of Capacitor C615

Some reports have been received of capacitor C615 (8200pf) opening. This results in a sharp increase in resonant frequency of the horizontal output transformer with an



attendant increase in pulse voltage during retrace. This voltage can be sufficient to damage the output transistor. It is suggested that in all cases of horizontal output transistor failure, C615 should be checked and replaced as necessary before installing the new transistor. C615 has been changed in later production to a 2kv capacitor part No. 250290-17. Stock and use this capacitor as a replacement.

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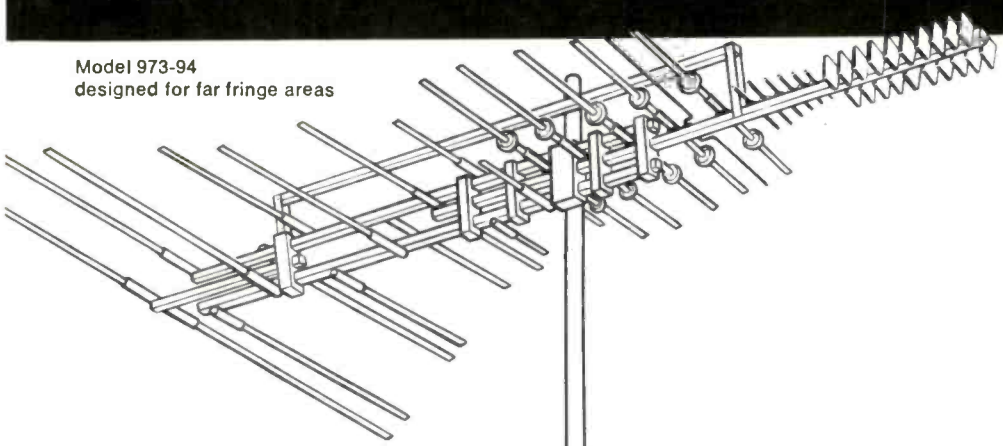

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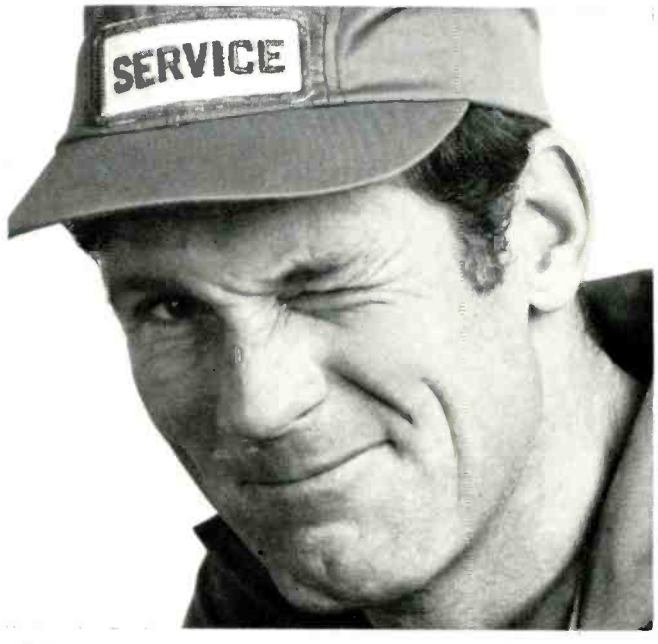

Because service men like you helped us design them.

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

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ELECTRONIC TECHNICIAN / DEALER

AUGUST 1968

Solving Difficult Solid-State Auto Radio Problems

Learn how to repair them fast by studying some actual 'tough-dog' cases described here

■ Years of troubleshooting experience convince us that most "dog-type" solid-state auto receiver problems are caused by weak or intermittent conditions. The dead radio, for example, is the easy one to repair. But with the proper test instruments and plenty of solid-state "know-how," the difficult problems can be quickly solved, too.

To troubleshoot and repair transistorized auto radios efficiently, an in-circuit transistor tester is a must item. A VTVM or low volt/ohm VOM will make the necessary voltage and resistance measurements. A good auto radio bench power supply, with built-in voltage and current meter, provides necessary power for the defective radio. The in-circuit beta tester and a scope will shorten the repair time of most intermittents and other difficult problems.

Weak and Intermittent Conditions

Weak and intermittent conditions may be caused by more than one defective component. Actually, they may be located in different sections of the solid-state auto receiver. Or perhaps there are two or more separate defects.

Transistors, capacitors and PC boards produce most intermittent conditions. A transistor will short, become leaky or open. When a test signal is applied to the base terminal of an intermittent transistor, the transistor will frequently begin to conduct. This may also happen when an in-circuit beta transistor tester is connected to the transistor. Under intermittent conditions, try to avoid shocking the suspected transistor back into operation.

A leaky or open capacitor will cause distorted and weak reception. When a poor internal connection develops within the capacitor, intermittent reception follows. Check the electrolytic capacitor for a dried or leaky condition. One easy method to check a suspected capacitor is by using a high ohmmeter scale. A good electrolytic capacitor will show a high resistance reading and then slowly drift back to zero. Shorted or leaky capacitors will have a low ohmmeter reading at the beginning.

Check the PC board for possible cracked sections. Poor circuit wiring will produce intermittent conditions. Small soldered stand-off terminals used to tie outside components to a PC board will often break at the soldered joint. Pushing gently around on the PC board, with a stiff insulated alignment tool, will often reveal many cold-solder connections. Use a lighted magnifying glass to inspect a defective PC board. And there will be frustrating moments when you will find it necessary to go over every terminal on a PC board with an iron to clear up an intermittent condition.

You will also find cracked or burned resistors that may cause weak or intermittent problems. Many times the cracked resistor may be covered by another component or hidden under the PC board. Re-

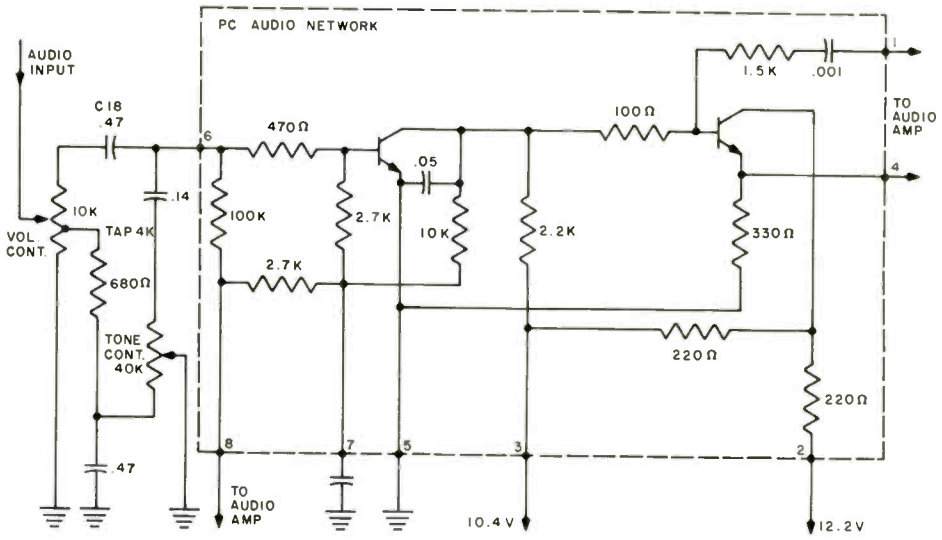


Fig. 2 — A cracked PC component caused hum and loss of reception.

AUTO RADIOS . . .

moval of the entire board may be necessary to locate a burned half-watt resistor. Be sure to check for possible burned emitter resistors after a defective power output transistor has been replaced.

Now let's tackle a few actual difficult auto radio problems and see how they are solved.

Too Much Current

The complaint on this Philco-Ford, model 7TPF, was "always blowing fuses." Most solid-state auto radios will draw from 0.25 up to 1.5a at 12.6vdc. The average current drawn by most transistorized auto radios is 1.2a. When we "fired up" this particular radio, the meter indicated 22a. That's a lot of current!

Right away we suspected a "leaky" or shorted power output transistor — but this one had already been recently replaced by someone. Perhaps the new replacement went bad because of a burned, out-of-tolerance emitter resistor. But sometimes these defective resistors do not get replaced. Sure enough, the 0.68 Ω emitter resistor (Fig. 1) was hot and was replaced. But we still had heavy current drain after replacing the output transistor with a "substitute" type.

The trouble could be in the driver circuit if direct coupling was used to the output transistor. Checking the PC board we found only three other transistors and they were in the front end of the radio. This called for a circuit schematic to locate the "missing" driver transistor. After

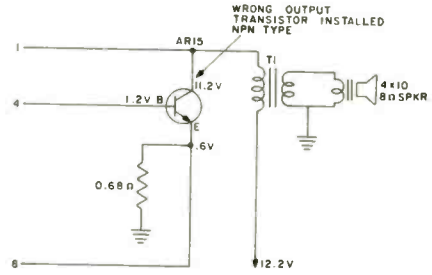


Fig. 1 — Check emitter resistor for out of tolerance when replacing output transistor.

checking the radio schematic, we located two audio stages within a PC component.

While checking the audio section on the schematic, we discovered that the power output stage should have an NPN type transistor. We had replaced it with a PNP type — like the one in the set. Here was the answer to the excessive current drain of the solid-state receiver.

The NPN power output stage is rare in auto radios — so watch out for it. This special Philco-Ford part number, 3L4-6001-01, was ordered from the distributor and after installation, the radio was back in normal operation again. Correct transistor substitution is a "must" and should be carefully watched during replacement.

In another Philco-Ford model 7PTF (Fig. 2), the complaint was "audio hum, no reception." A signal from the noise generator was fed to the volume control wiper-arm and then to the base terminal of the output transistor. The output transistor stage seemed to be working and the trouble appeared to be between the base of AR15 and the volume control.

We fed the audio signal in at terminal 6 on the PC component — still no audio output signal. Voltage checks on terminals 2 and 3 were normal. Visual checks of the PC component showed a crack between terminals 5 and 6. This PC component, 3L5-0001-01, is located at the end of the chassis PC board. Only an original replacement can restore operation of this solid-state radio.

Very Weak Stations

The complaint on a Rambler, model 5BAM (8991561), radio was "very weak volume on local broadcast stations." With an audio signal applied to the volume control, the audio sections checked out okay (see Fig. 3). The trouble must be in the front end.

Next, the noise generator signal was good at the base of the converter stage. Going to the RF transistor, we had good signal on the collector and emitter terminals. Nothing occurred on the base terminal — only a popping noise with the noise generator probe applied. Checking further, we found the RF transistor had been replaced with a Bendix DS25 — this checked out with the cross-reference replacement guide.

Voltage checks were quite close on all transistor elements. The collector potential was 1.5v but should have been 2.2v. Voltage on the base and emitter terminals was 10.1. Actually the supply voltage going to these two elements was 10.7. No

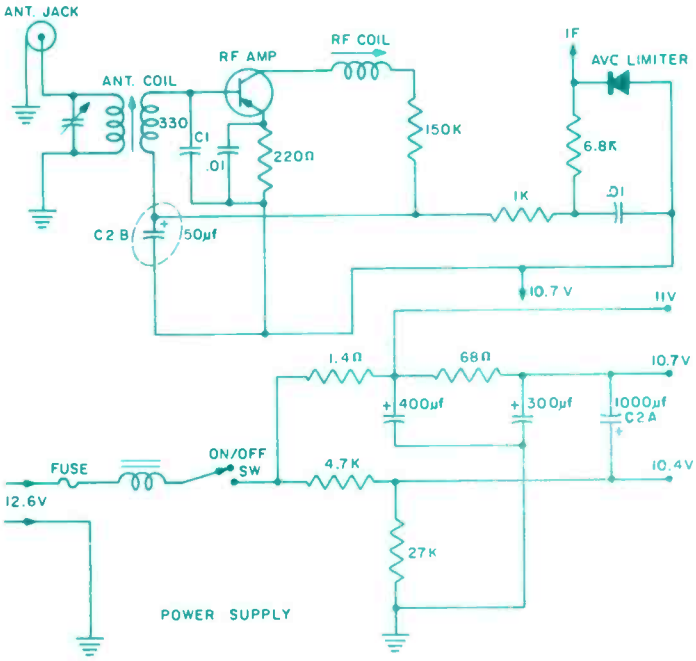


Fig. 3 — A leaky capacitor (C2B) shows up as incorrect biasing between the emitter and base.

forward bias between emitter and base! Perhaps C1 was leaky. But removing one lead proved otherwise. And the emitter resistor, R10, was exactly 220Ω. When the antenna lead was touched to the collector terminal, stations were heard across the entire dial — the RF stage was not performing!

Let's go back to that forward bias problem. Some outside component was eliminating forward bias between base-and-emitter. Checking the schematic, it was noted that a leaking C2B, a decoupling electrolytic, could cause the trouble. A similar capacitor was momentarily bridged across C2B, but still no favorable results. Of course, in this case, we wouldn't learn much by bridging the capacitor if it was leaking.

Somewhere along the line we had really "flubbd up." Again, signal and voltage checks were made at the base and emitter and since the voltages were approximately the same on both elements, the transistor was obviously not conducting because no forward bias existed between base and emitter. Since the DS25 is a PNP germanium transistor, the base would normally be about 0.2v more negative (less positive) than the emitter.

Going over the circuit again, we found C2B was part of a filter network. A 1000μf capacitor was also located in the same component shell. But how could a leaking C2B affect the forward bias of the RF transistor? Simple. Since the internal leakage resistance of C2B, plus the resistance of the antenna coil, parallels the base and emitter, a situation could exist to create a voltage balance between both elements — with little or no bias between the base-and-emitter junction. Our next steps proved this.

C2 was removed and resistance checks were made on the 1000μf section (C2A). The ohmmeter needle swung upward and slowly drifted back. But the 50μf section (C2B) had a leakage of 120Ω — here was the cause of the trouble. The resistance leakage of C2B, in effect, removed the forward bias from the RF transistor.

Since a 1000μf and 50μf capacitor at 1.5 and 3v rating was not immediately available, two separate 500μf units and a single 50μf capacitor were substituted. A 1000μf capacitor must be installed in the filter network or motorboating will occur. These three small electrolytic capacitors were taped together and soldered into the PC board. Extreme care must be exercised to return the capacitors' negative terminals to the correct point in the PC circuit.

Intermittent Transistor

The customer's complaint on a Plymouth model 250 was "stations fading in and out." We could tap on the auto dash or go over a severe bump and the radio would cut out. The intermittent receiver was pulled and "cooked" on the auto radio bench. Naturally — the set worked for hours! No matter how the radio was bumped or tapped — she still played on.

After removing the top and bottom panels, components and component leads were prodded and pulled, not-too-gently, in an effort to make it act up. This intermittent radio operated perfectly the rest of the afternoon. Hopefully, to solve the intermittent situation, the entire PC board was gone over with the soldering gun. We were careful not to allow solder to run accidently between the PC wiring. When soldering the PC board, an intermittent radio will frequently begin to operate. This one seemed okay, then.

But two days later, it was back again — intermittent reception! On the second heat-run, the defective radio worked for one hour and then cut out. A noise generator signal came through back to the collector terminal of the RF transistor. When signal was applied to the base terminal, however, the radio did not respond. Quickly, the in-circuit beta transistor tester was clipped to the RF transistor. The transistor checked good and the radio began to operate!

The intermittent trouble had to be in the RF transistor circuit. When prodding around on the emitter terminal wire, the radio cut in and out. The NPN type transitor was replaced.

In many molded-type plastic transistors, one element wire may have an intermittent connection within the transistor. These connecting terminals will turn within the plastic body, resulting in intermittent contact.

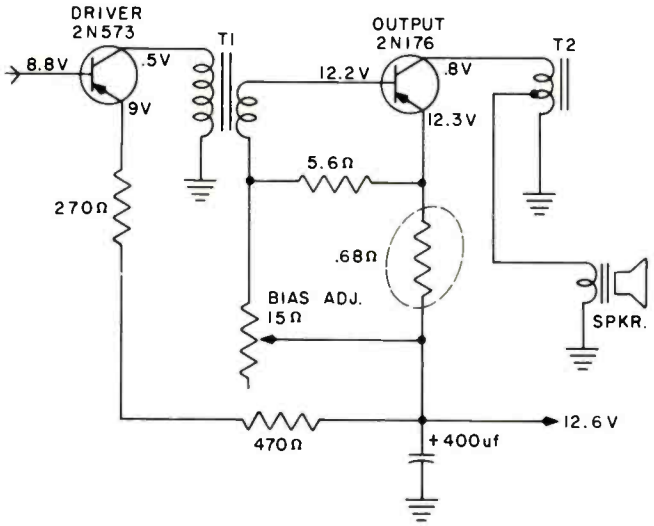


Fig. 4 — Burned emitter resistor only half-solved problem of distortion and poor sensitivity. Broken antenna lead also contributed.

CHART I

Trouble Chart

Auto Receiver Trouble	Check for Possible Trouble
Dead Receiver	1. Fuse 2. Open speaker 3. Check audio output stage 4. Fusable bias resistor 5. Front end of receiver
Weak Reception	1. Check auto antenna 2. RF transistor 3. RF tuning assembly 4. The audio stages
Intermittent Reception	1. Spray transistors with cold mist 2. PC board and connections 3. Loose wires 4. IF transformers 5. Coupling capacitors
Distorted Reception	1. Audio output transistor 2. Bias resistor 3. AF stage 4. Electrolytic coupling capacitors

Too Many Troubles

This "dead" radio, model V3MMT, was in a Mack truck. When the radio was first switched on, a thump and rush was heard in the speaker — indicating a possible working audio section. Then a 262kHz RF signal was applied to the converter transistor base. No tone was heard until the signal was injected at the collector terminal. This one was simple — a defective converter transistor.

When checking the transistor in-circuit with a tester, high leakage was noted. The defective transistor was removed and replaced. Sometimes we do get an easy one to repair — so we thought.

The radio "cooked" for one hour and quit. She would pop "in" and "out" and then die. Perhaps the newly replaced transistor was defective? After several attempts to signal trace the intermittent condition, the 1st IF transistor seemed to be the intermittent one. This transistor was quickly checked in-circuit and appeared open. POW! — the radio began to play. Replacing the 1st IF transistor solved the intermittent problem.

In many solid-state auto radios there may be more then one actual fault. Letting the chassis "cook" for several hours will help eliminate possible call-backs. Since the radio must be removed and replaced in the automobile each time it goes bad, it is important that all the "bugs" be removed on the first round — this also saves future embarrassment.

Frigid Radio

When this Chevy model 985432 Delco radio was parked outdoors, the radio refused to operate. But when it was in the garage overnight, it would perform well. It was removed from the car and set up on the radio bench.

Of course, the radio played perfectly — but we located a noisy volume control. When the control was rotated about one-fourth way through its range, the volume remained low and then suddenly became loud. Also at this point, the volume control was noisy.

Removal of the front dial assembly was necessary to get at the noisy volume control. When the dial assembly was removed, the noisy condition disappeared. We assumed the tap on the volume control was touching the metal side of the dial assembly. The tone-tap was bent inward and two layers of plastic tape were wrapped around the control wiring terminals. This solved the noisy volume control problem.

Now back to the original trouble. When cold, the auto radio refused to operate. Since transistor operation is affected directly by temperature change, we suspected a defective transistor in the front end of the radio. Sometimes RF or IF transistors are affected by temperature change but the likely culprit is the converter stage.

Cold mist was sprayed on the converter, then on the RF and IF stages. A second dose was given the converter transistor and it went dead. Replacement of the converter transistor cured the "cold" symptoms of the radio.

Rough and Distorted

A Philco-Ford auto radio, model 94MF, came in with "rough, distorted and weak volume." Distortion can be caused by faults anywhere in the audio section. An in-circuit-check of a 2N176 output transistor revealed a high leakage condition. When checked out-of-circuit, the transistor was practically shorted and was replaced. The 0.68 Ω emitter resistor was burned and it was replaced (see Fig. 4). Although the volume improved, we still detected some distortion. And this hum-type distortion reminded us of similar cases where RF base circuits were open.

Sure enough, the fault was located in the RF base circuit. The suspected RF transistor checked good. Checking the base circuit, with schematic, we detected a broken wire from antenna coil to base terminal. Since the radio was tuned to a strong local broadcast station we did not notice the poor sensitivity on weaker stations.

Although the aforementioned difficult problems involve only a few auto receivers, the troubles and troubleshooting techniques discussed here are typical and will generally apply to nearly all solid-state auto radios. After successfully servicing a few having these symptoms, you will find the next ones less difficult.

Chart I lists a few trouble symptoms and possible causes. ■

ET/D TEST LAB REPORT

TEST INSTRUMENTS

Acquire inexpensive, quality test instruments by assembling your own from commercially available kits

Heathkit Model I0-17 General Purpose Oscilloscope.

Heathkit Model I0-17 General-Purpose Oscilloscope

■ The oscilloscope is one of the most versatile instruments available. It can be used to measure ac voltage, frequency or phase and to study waveforms of complex signals.

The Heathkit Model I0-17 is a low-priced 3in. scope which includes features for the professional.

The oscilloscope was assembled in our TEKLAB. Two printed circuit boards, with easy-to-follow assembly instructions, are provided to minimize point-to-point wiring and reduce construction time.

The chassis layout is uncluttered with the power supply components grouped at one end. The CRT is completely enclosed in a nickel alloy shield.

The transformer-operated silicon rectifier power supply can be wired to operate from 105-125v, or 210-250v ac power. A fuse in the primary winding provides overload protection. Zener diode regulators are used to minimize trace bounce caused by line voltage variations.

The scope has a 5MHz vertical amplifier bandwidth and excellent input sensitivity, making it versatile for nearly all types of waveform display applications. A compensated, overlapping, X50 attenuator permits observation of higher amplitude input signals by merely pulling out on the vertical gain control knob.

This instrument has a 1v P-P reference voltage available through an output jack on the front panel.

The oscilloscope cabinet is heavy gage metal, rugged and compact, making it useful both in the field and on the bench.

The following manufacturer specifications may be of value to the technician — **VERTICAL CHANNEL:** *Input Impedance*, 1M shunted by 25pf (attenuator off) 1M shunted by 15pf (attenuator on) *Sensitivity*, 30mv P-P/division (uncalibrated) *Frequency Response*, 5Hz to 5MHz ± 3db **HORIZONTAL CHANNEL:** *Input Impedance*, 10M shunted by 15pf *Sensitivity*, 300mv P-P/div. *Frequency Response*, 2Hz to 300kHz ± 3db **TIME BASE GENERATOR:** *Sweep Generator*, Recurrent type *Frequency* 20Hz to 200kHz in four overlapping ranges *Retrace*, blanked by a pulse from blanking amp *Synchronization*, automatic type **GENERAL:** *Tube Complement* (1) 3RP1 CRT, medium persistence, green trace (3) 12AU7 sync cathode follower and blanking pulse amp; horiz input

cathode follower and horiz push-pull output stage (1) 12AX7 sweep multivibrator (1) 6GH8 vertical input cathode follower and vertical amp (1) 6BH6 vertical amp 6BQ7 push-pull vertical output stage *Power Requirements*, 105 to 125v or 210 to 250v 50/60Hz 60w *Over-all Dimensions*, 9½ x 5½ and 14½ in. These dimensions include knobs, handle, feet and fuseholder. *Net Weight* 12 lb. Price $79.95.

Heathkit Model IM-17 Solid-State Voltmeter

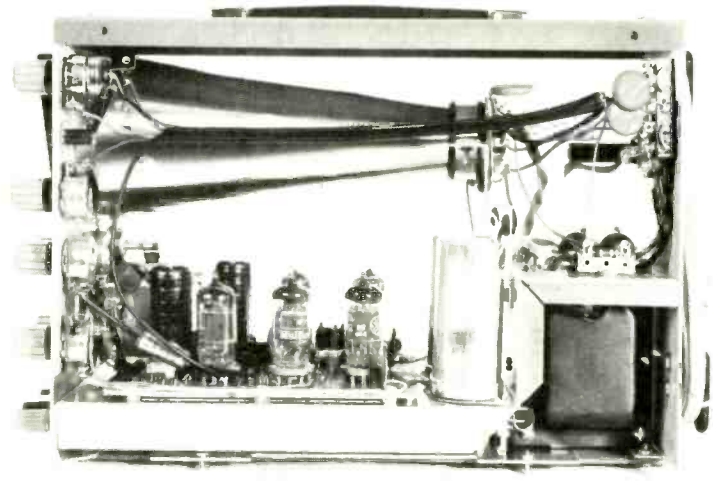
If you have been looking for a rugged, inexpensive portable voltmeter for bench or field use, the Heathkit IM-17 may be for you. It will read megohms, RMS and does not load high impedance circuits.

The IM-17 voltmeter is all solid-state — FET input, 4 silicon transistors, 1 diode, with 11M input on the dc range and 1M on ac.

The instrument is battery powered, operating on a "C" cell and a 8.4v mercury cell. These cells are common transistor radio types and the power consumption is very low.

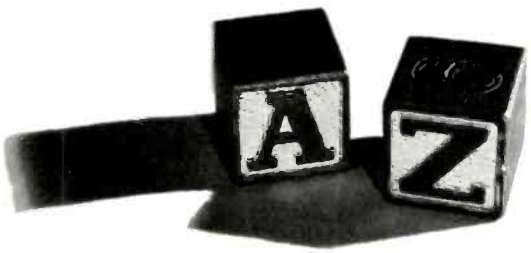
The voltmeter uses printed circuit assembly and the unit was completed in about 4 hours in the ET/D lab following the manufacturer's step-by-step instructions.

A HV test probe is available which will permit the meter to measure dc voltages up to 30kv. An RF test probe is also available for measurements up to 30v. **SPECIFICATIONS — DC VOLTMETER:** *Ranges* 0-1, 0-10, 0-100, 0-1kv full scale *Input Resistance*, 11M on all ranges *Accuracy*, ±3% of full scale **AC VOLTMETER:** *Ranges*, 0-1.2, 0-10, 0-100, 0-1kv full scale *Input Resistance*, 1M on all ranges *Input Capacitance*, approx 100pf (38pf on 1kv range) accuracy ±5% of full scale *Freq Response*, ±1db 10Hz to 1MHz (from low source impedance) **GENERAL:** *Ohmmeter Ranges*, Rx1, Rx100, Rx10K, Rx1M *Ohms Circuit*, *Power Supply*, 1.5v (C-Cell, NEDA No. 14) *Amplifier Circuit Power Supply*, 8.4v mercury cell (NEDA No. 1611) *Meter* 4½ in., 200 a, 100deg movement. *Transistor-Diode Complement*, (1) FET (field effect transistor (4) silicon transistors (2N3393, or equivalent) (1) silicon diode *Dimensions*, 8½ x 4¼ x 7¼ in. deep *Net Weight* 2½ lbs. Price $19.95 ■



Inside view showing completely shielded CRT and uncluttered chassis layout.

Heathkit Model IM-17 Solid-State Voltmeter.



The 23rd article in a continuing series

Semiconductors from A to Z

Complex diodes are now used in the regulation of new circuits that can be effectively serviced only by technicians who understand their special characteristics
The 23rd article in a continuing series

■ The previous article in this series described the characteristics of unijunction transistors, field-effect diodes, zener diodes, T.C. diodes and thyrectors. There are, however, still other semiconductors that are now being used in modern solid-state power supplies and power regulating circuits. These new diodes must also be understood if the electronic circuits in which they are used are to be effectively serviced.

Four-Layer Diodes

Four-layer diodes (sometimes called Shockley diodes in honor of William Shockley who in 1949 first predicted the possibility of a junction transistor) contain the equivalent of two transistors connected in series (Fig. 1).

When a nominal voltage is applied across this diode, only a small current leaks through the unbiased transistors. (The September 1966 article explained that the base of a transistor must be forward biased before the transistor can conduct a significant current, and Fig. 8 in the October 1966 article shows the relationship between base currents and base-to-emitter voltages.) As the applied voltage increases, the amount of leakage current through each transistor also increases until each transistor supplies the other with a sufficient base current to develop a large enough base-to-emitter voltage to forward bias the other transistor. Under these conditions the current flowing through one transistor is sufficiently large to switch the other on—each transistor maintaining the other in an *on* condition.

The right portion of the characteristic curve shown in Fig. 2 corresponds to the conditions just described. Once the voltage drop across the four-layer diode exceeds the breakover voltage (V_{BR}), there is enough leakage current to switch its equivalent transistors to an *on* condition, reducing the diode resistance and the voltage drop across the diode. Even though the voltage drop across the diode is reduced, there is still enough current flowing through each transistor to keep the other in an *on* condition.

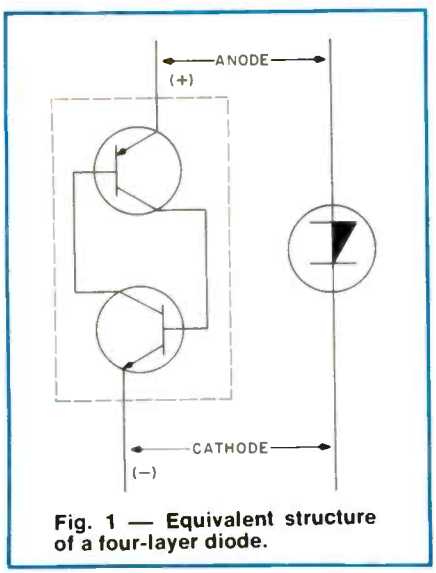


Fig. 1 — Equivalent structure of a four-layer diode.

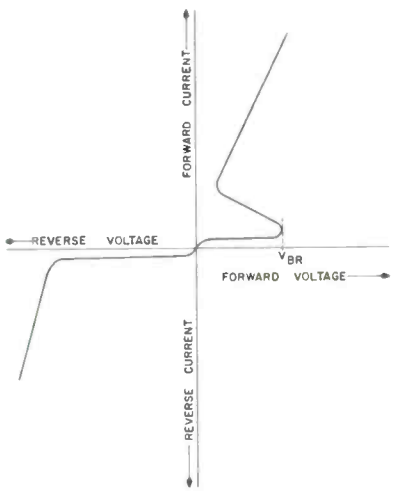


Fig. 2 — The characteristic curve of a four-layer diode.

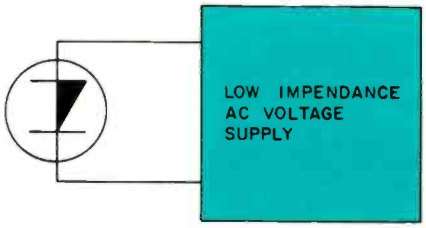


Fig. 3 — A low-impedance power supply, having an ac output voltage unaffected by changes in load resistance, is used to demonstrate the switching characteristics of a four-layer diode.

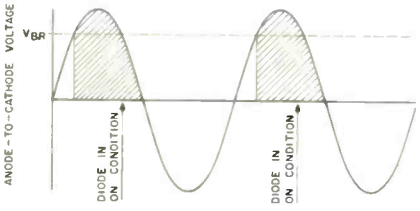


Fig. 4 — The four-layer diode is switched on when the forward-bias voltage exceeds its break-over voltage (V_{BR}).

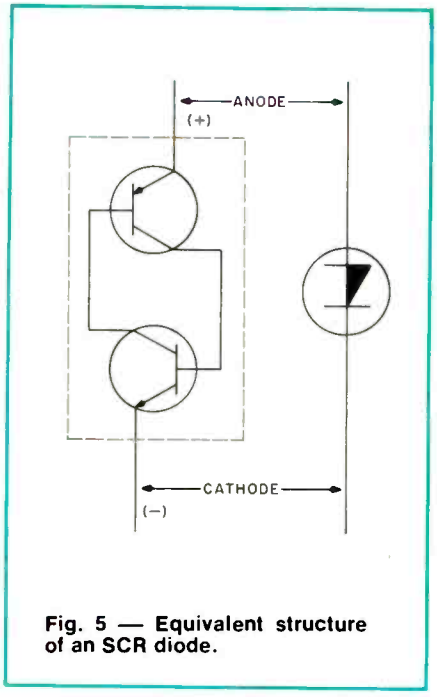


Fig. 5 — Equivalent structure of an SCR diode.

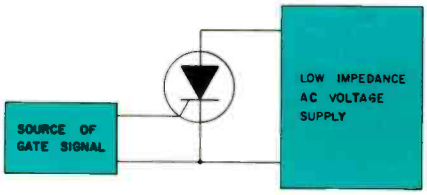


Fig. 6 — A gate pulse circuit is used to switch on the SCR diode when the ac output voltage from the low-impedance power supply is less than the breakover voltage.

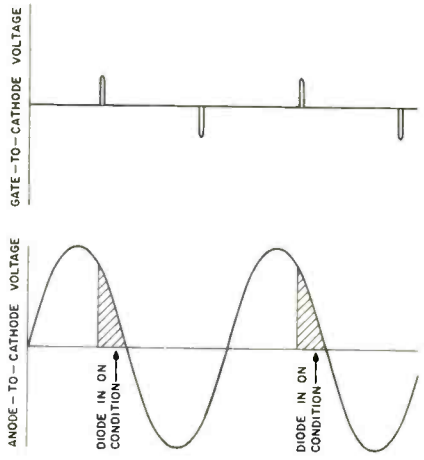


Fig. 7 — A positive cathode-to-gate voltage switches the SCR diode on when it is forward biased.

When the polarity of the applied voltage is reversed, the four-layer diode's equivalent transistors are reverse biased and block the flow of current like reverse-biased diodes (the left portion of the characteristic curve shown in Fig. 2).

A low-impedance ac voltage supply can be designed to that its output voltage is virtually unaffected by the load resistance. By connecting such a power supply directly to a four-layer diode (Fig. 3), we can see how the diode functions in response to the applied voltage (Fig. 4). From the resulting curve we see that the diode is switched on and conducts current once the forward-bias voltage exceeds the diode's breakover voltage (V_{BR}). The diode then continues to conduct current until the forward-bias voltage returns to zero. The diode will resist the flow of current as the polarity of the applied voltage changes and the diode is reverse biased, even if the reverse-bias voltage is also greater than the forward-bias breakover voltage.

SCR Diodes

The structure of an SCR (semiconductor controlled rectifier) diode is nearly the same as that of a four-layer diode (Fig. 1) except for the addition of a gate lead (Fig. 5). When the gate lead is not used, these two diodes function in the same manner. The gate lead serves merely to forward bias one of the equivalent transistors so that it can conduct enough current for the pair of transistors to be switched to an *on* condition while subject to less than the normal breakover voltage.

When an SCR diode is substituted for a four-layer diode in a low-impedance ac circuit (Fig. 3), the SCR diode will be switched on like the four-layer diode (Fig. 4) when its forward-bias breakover voltage is exceeded.

If the output of the low-impedance ac voltage supply is adjusted so that the forward-bias voltage never exceeds the breakover voltage, the SCR diode will not switch on. Under these conditions the SCR diode can be switched on by applying a

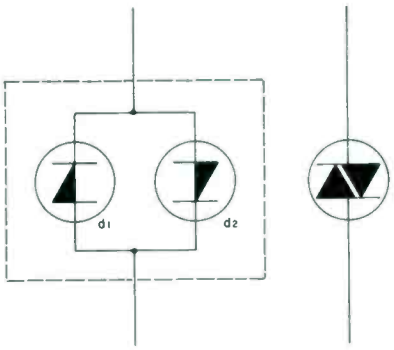


Fig. 8 — Equivalent structure of a diac.

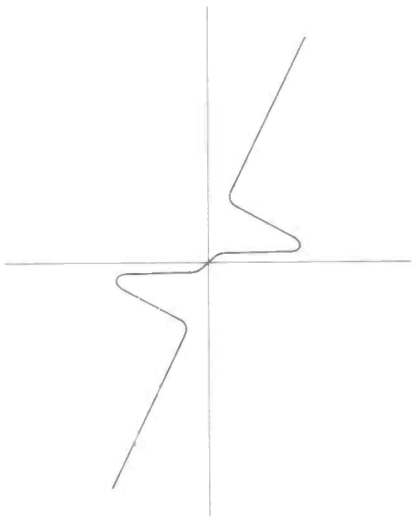


Fig. 9 — The characteristic curve of a diac.

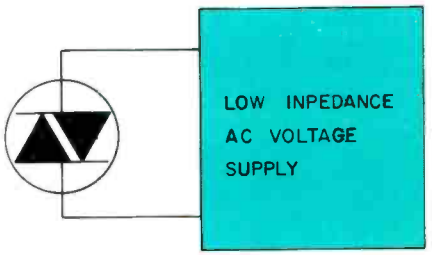


Fig. 10 — A low-impedance power supply, having an ac output voltage unaffected by changes in load resistance, is used to demonstrate the switching characteristics of a diac.

positive signal to its gate (Fig. 6).

The curves in Fig. 7 show a positive gate pulse switching a forward-biased SCR diode on. The diode then remains on until it is no longer forward biased. (The SCR diode, like the four-layer diode, will not switch on when reverse biased—even when a negative pulse is applied at its gate.)

If a positive gate pulse is not applied to the SCR diode while it is forward biased, no anode-to-cathode current will pass through the diode. When the positive gate pulse occurs, as shown in Fig. 7, less than a third of the possible average cathode-to-gate current passes through the diode. If the positive gate pulse occurs at the same frequency, but sooner (nearer the times the SCR diode becomes forward biased), the SCR diode will be in an *on* condition longer and provide a larger average cathode-to-gate current. In this manner, the timing of the positive pulse controls the average cathode-to-gate current that will flow through a circuit.

Diacs

The structure of a diac is nearly the same as that of two four-layer diodes (Fig. 8) connected in parallel. When the top lead is more positive than the bottom lead, one equivalent four-layer diode (d_2) is forward biased while the other (d_1) is reverse biased. When the applied voltage exceeds the breakover voltage of diode d_2, that diode is switched to an *on* condition while the reverse-biased diode, d_1, does not conduct significant current. The resulting characteristic curve is shown as the right portion of Fig. 9.

When the polarity of the applied voltage is reversed, the equivalent four-layer diode that had previously been switched on (d_2) is reverse biased and fails to conduct any significant current, while the other diode (d_1) is switched on as the applied voltage exceeds its breakover voltage. The resulting characteristic curve is shown as the left portion of Fig. 9.

From these conditions we see that the diac can function equally well whatever the polarity of the applied voltage.

The switching characteristics of a diac can be more clearly seen if it is connected to a low-impedance ac voltage supply (Fig. 10) like the one used with the four-layer diode (Fig. 3).

As the applied ac voltage exceeds the diac's positive or negative breakover voltage, the diac is switched on and conducts current until the portion of the cycle that the applied voltage returns to zero (Fig. 11). Since the two equivalent four-layer diodes in a diac are not actually separate components, but merely indicate the function of a complex series of diac P-N junctions, diacs are unable to switch off when the applied ac voltage is at a frequency exceeding 50 to 60Hz. Measurements indicate that at higher frequencies a diac will remain on once its breakover voltage has been exceeded.

We have seen that both diacs and thyrectors can function in ac circuits and that the current through

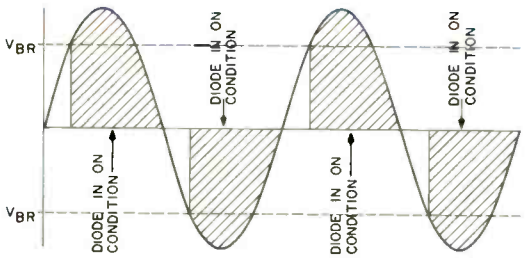


Fig. 11 — The diac is switched on when the forward- or reverse-bias voltage exceeds its breakover voltage (V_{BR}).

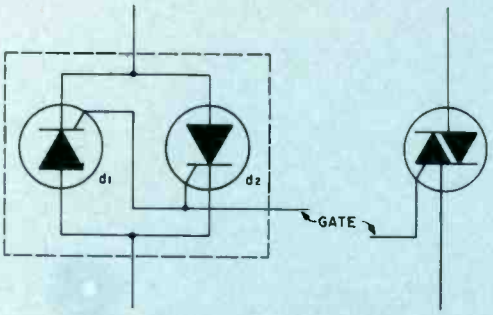


Fig. 12 — Equivalent structure of a triac.

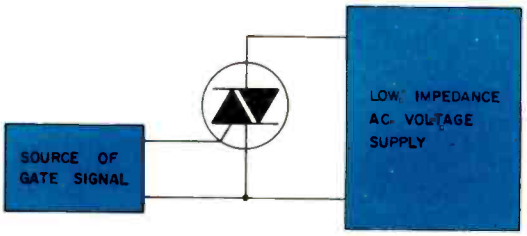


Fig. 13 — A gate pulse circuit is used to switch on the triac when the ac output voltage from the low-impedance power supply is less than the breakover voltage.

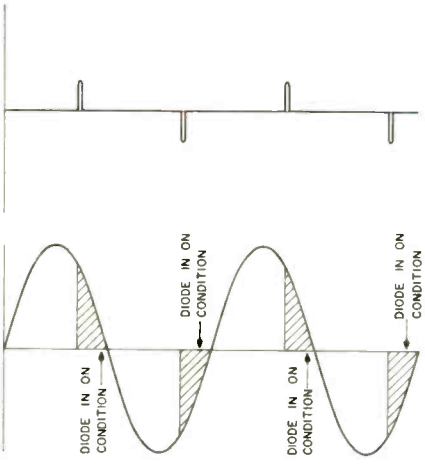


Fig. 14 — A positive gate voltage switches the triac on when it is forward biased, while a negative gate voltage switches the triac on when it is reverse biased.

both types of semiconductors increases abruptly when the applied voltage exceeds a certain amount. This, however, is where their similarity ends. The current through a thyrector returns to normal when the applied voltage returns to normal, while a diac remains in an *on* condition until the applied voltage returns to zero.

Triacs

Just as the structure of a diac is nearly the same as that of two four-layer diodes connected in parallel, the structure of a triac is nearly the same as that of two SCR diodes connected in parallel (Fig. 12). When the top lead is more positive than the bottom lead, one equivalent SCR diode (d_2) is forward biased while the other (d_1) is reverse biased. Under these conditions, SCR diode d_2 will be turned on when its breakover voltage is exceeded, while no significant current will flow through the reverse-biased SCR diode (d_1). The opposite condition will occur (diode d_1 turned on while diode d_2 is reverse biased) when the polarity of the applied voltage is reversed.

When a triac is substituted for a diac in a low-impedance ac circuit (Fig. 10), the triac will be switched on like the diac (Fig. 11) when its forward- or reverse-bias breakover voltage is exceeded. If, however, the output of the low-impedance ac voltage supply is adjusted so that the forward- or reverse-bias voltage never exceeds the breakover voltage, the triac will not switch on. Under these conditions the triac can be switched on by applying a signal to its gate (Fig. 13).

The curves in Fig. 14 show a positive gate pulse switching the triac on when it is forward biased and a negative gate pulse switching it on when it is reverse biased. The triac remains on and continues to conduct current until it is no longer forward or reverse biased. Its equivalent SCR diodes are alternately turned on, each alternately conducting current in opposite directions.

The timing of the gate pulse is just as effective a control in regulating the average amount of current flowing through a triac in alternate directions as it is in controlling the average amount of current flowing through an SCR diode in but one direction. As in the case of SCR diodes, however, triacs are effective only at lower frequencies, being primarily used at frequencies of around 50 to 60Hz.

The next article in this series will apply these semiconductors to power supplies and power regulating circuits. ■

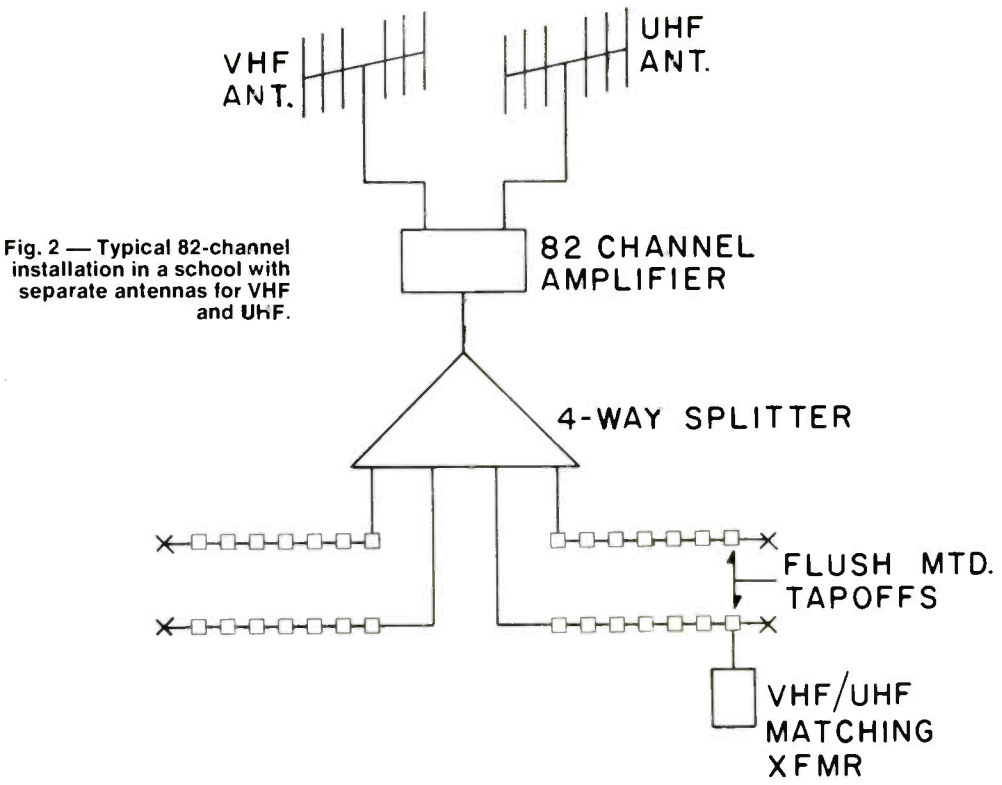


Fig. 2 — Typical 82-channel installation in a school with separate antennas for VHF and UHF.

Part four of a series

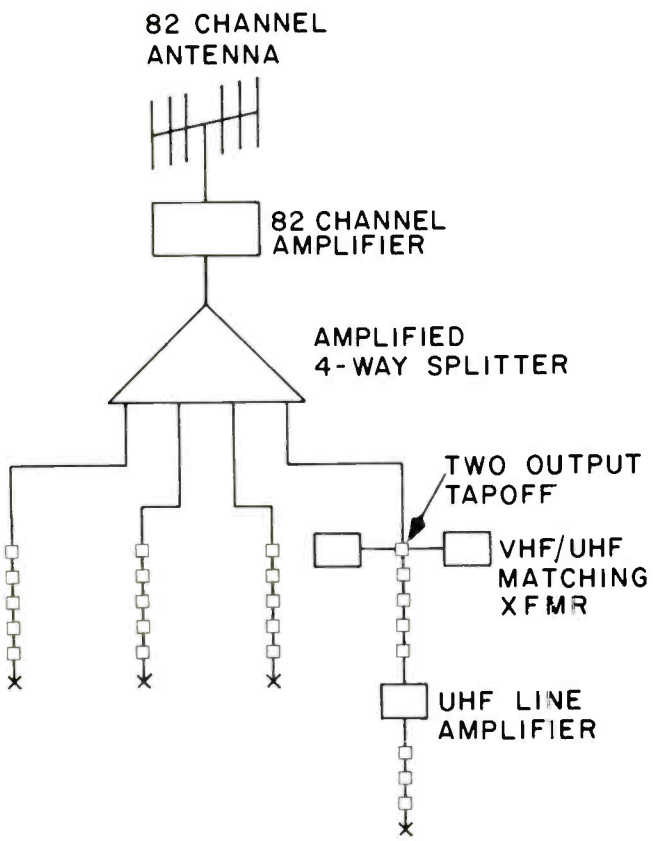


Fig. 1 — An 82-channel system for dealer showroom is designed for UHF reception.

Selling and Installing MATV Systems

Put 82-channel TV/FM distribution 'gear' in every home

■ The first three articles of this series covered conventional, VHF-only MATV systems. Until recent times, MATV systems were not designed to carry UHF channels on-channel. UHF stations were either converted to an unused VHF frequency or left off the system entirely.

Now, however, head-end and distribution equipment has been developed which is capable of handling UHF on-channel. And service-dealers have been installing 82 channel systems everywhere — even in areas where no UHF channels have yet gone on the air. One big selling point is: You're installing an obsolescence-proof system — a system that can handle all present and future TV channels.

New UHF stations have been coming on the air all over the country. Within the next few years, there will probably be more UHF channels telecasting than VHF channels. In fact, there has been some talk that the FCC may some day assign all VHF stations to UHF, giving the very desirable VHF band to the military or some

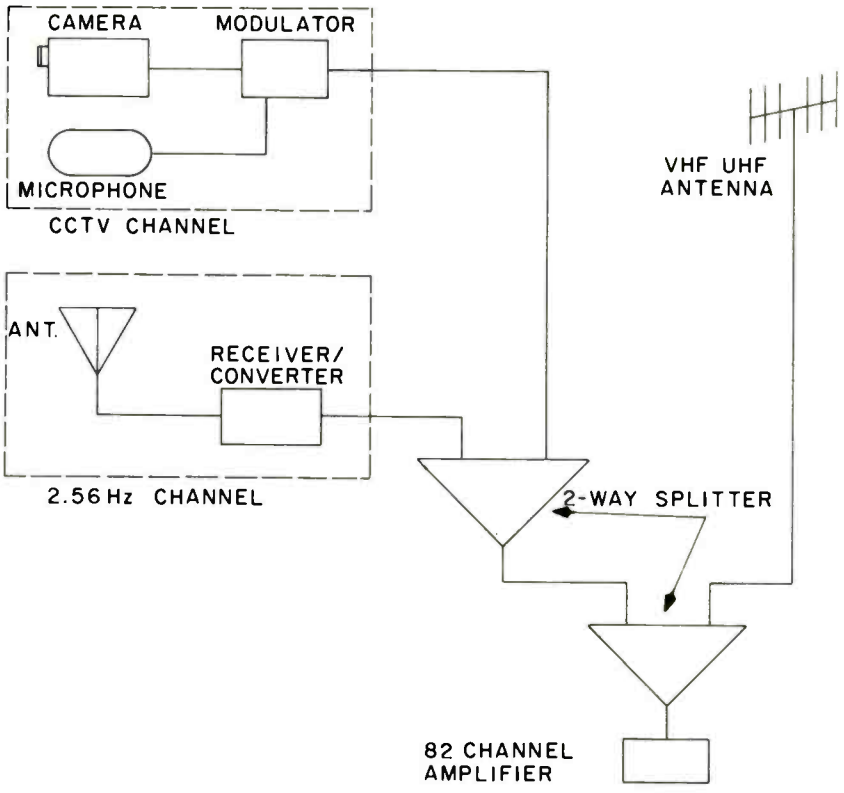


Fig. 3 — Educational TV originated at a school is shown coupled to the head end of an 82-channel system.

other non-TV services. In any case, the installer who can provide and promote 82-channel systems is a little ahead of his competitors.

Distribution Systems

One UHF distribution problem is cable loss. The higher the frequency, the more the cable attenuates the signal. The top of the UHF band, 890MHz, is more than four times 216MHz — the top of the VHF band. And you can't use just any kind of lead-in for these systems. A number of low-loss cables have been developed in recent times which show losses of only 6db or less per hundred ft at channel 83. This type of cable should be used in all 82-channel systems.

Older type tapoffs and splitters either did not pass UHF, offered poor UHF match or attenuated UHF signals severely. Be sure, then, that the distribution system equipment you choose is designed specifically for handling all channels.

Aside from these precautions, 82-channel distribution systems are like VHF-only systems. When you calculate losses, however, you must calculate the losses at both channel 13 and channel 83.

Active Distribution Equipment

In a VHF-only system, it is common to keep all active equipment at the head end. Many modern 82-channel systems, however, use active distribution equipment. There are three reasons for this: 1) You can use smaller head-end amplifiers, 2) solid-state, line-powered equipment requires little maintenance and 3) you don't have to bother with system calculations if you use active distribution equipment.

Many types of amplified distribution equipment are available, including bridgers, line splitters and straight line amplifiers. And straight line amplifiers are especially valuable since they minimize the necessity for system calculations. You simply install a good head-end amplifier and then add line amplifiers anywhere the signal is weak. There probably won't be much necessity for this in home installations, however.

Typical 82-Channel Systems

In addition to the national market for millions of home installations, another place to install an 82-channel system is in your showroom. It is very important to you to be able to demonstrate UHF on-channel. One dealer estimates that his sales of color sets have increased by 60 percent since he installed an 82-channel showroom system.

A typical 82-channel showroom system is shown in Fig. 1. All components in the system, including the cable, must be designed for UHF. The long line requires a UHF line amplifier but no problem will arise with the VHF signals. Because the line amplifier is cable-powered from the head-end amplifier, no power source is required at that point.

Schools are also prime prospects for 82-channel systems. For one thing, most ETV stations telecast on UHF. For another, no educator wants to invest in a system that may be obsolete in a few years.

A typical small elementary school system is shown in Fig. 2. Separate VHF and UHF antennas are shown on the assumption that these channels are located in different directions. Also, flush mounted tapoffs are used if construction is new.

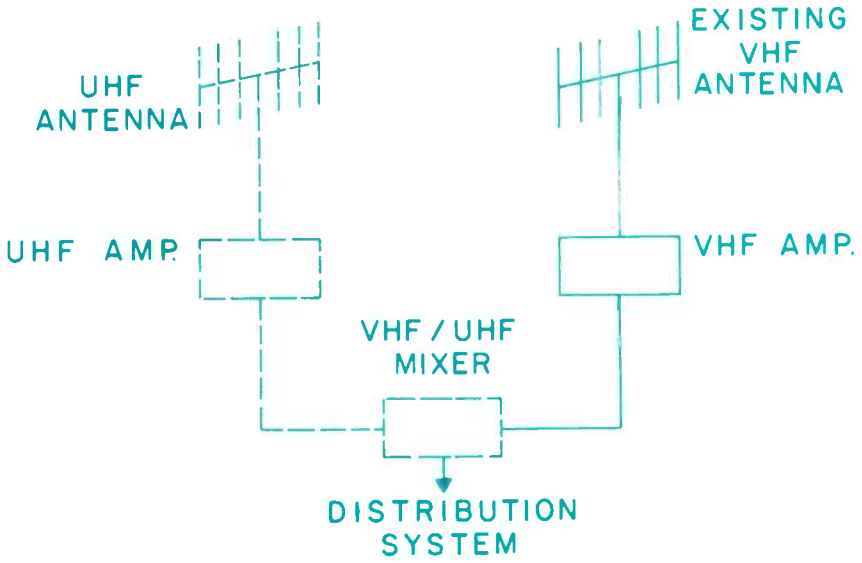
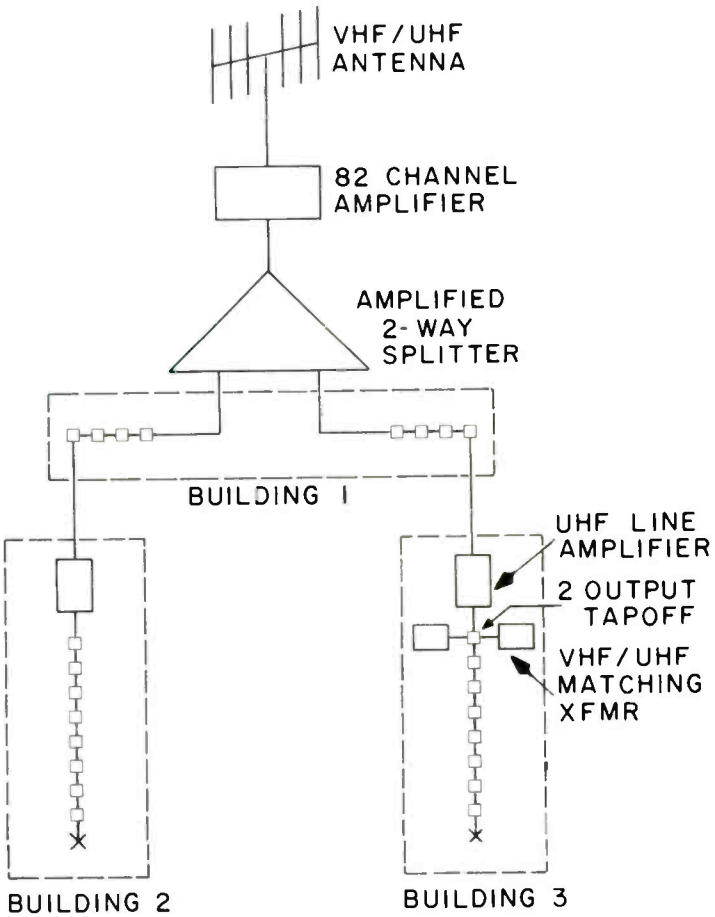


Fig. 5 — Adding UHF to an existing VHF system with stations in different directions requires UHF antenna, amp and VHF/UHF mixer.

Fig. 4 — Apartment complex with an 82-channel system uses two-way splitter and line amplifier to overcome distribution losses.



Incidentally, many schools originate their own telecasts or pick up 2.5GHz ETV programs from a central source. How these channels can easily be added into the head end is shown in Fig. 3.

A large 82-channel system used to serve a three-building garden apartment complex is shown in Fig. 4. An amplified two-way splitter and UHF line amplifiers are used to help overcome the high distribution system losses.

Adding UHF to VHF-Only Systems

If one or more good UHF channels have come on the air in your area during the past few years, you can increase your sales volume substantially by offering to upgrade existing systems. Luxury apartment houses, hotels, motels and schools are all excellent prospects for this service. The head end is quite easy. Simply add a UHF antenna (or antennas) if the UHF stations are in different directions, a UHF amplifier and VHF/UHF mixer as shown in Fig. 5.

Don't assume that the distribution system can handle UHF. It probably can't. If this is the case, replace all splitters, tapoffs and other passive equipment with 82-channel units.

It won't pay you to replace the cable, since this involves too much labor. Since losses will be high at UHF, you'll probably have to add a UHF line amplifier to each trunk line.

These 82-channel systems represent both a problem and an opportunity. If you learn how to handle them, your business should boom.

Following articles in this series will deal with sales, specifications and installation practices. ■

An exterior view of Radio Service Co.'s modern store.

ET/D **DEALERFAX**
ADVERTISING/MERCHANDISING/SALES/BUSINESS MANAGEMENT

He Took Chances and Made Them Pay

Service-dealer takes unconventional route to success

■ The Radio Service Co. in Birmingham, Ala., looks like hundreds of other successful TV-radio service-dealer establishments across the nation. It's an attractive, up-to-date, aluminum and brick building next to a 16-car parking lot that barely indicates all that's happening inside. The public can only see an enormous display of TV consoles silently waiting for someone to switch them on. But Radio Service Co. is more than just another TV-radio store. It's a complex operation that embraces several areas of the electronics field.

Once, however, it was a small, family-owned shop in the heart of downtown Birmingham. It did a constant but not sensational business and could have easily continued like that. But Richard J. Thomas, the owner of Radio Service, is an imaginative, vital man for whom a conventional, comfortable living is about as thrilling as clipping tax-free bond coupons.

He much prefers to take chances and make them pay. Sixteen years ago when his firm was feeling the pinch of expansion pains, he took the chance of moving out of the downtown area to the south side of the city where he invested in 6400sq ft of space, 1500 of which became the showroom and another 2000 the warehouse.

Four years later, when few people in the South were thinking along such lines, he took a second chance and added a commercial audio division, called Sound Engineering Service Co. Five years ago he took a third chance: at a time when most retailers were showing as varied a selection of brand name products as their stores could carry, he got rid of every line but one, and became a one-brand, exclusive dealer.

Today his sales volume is over $950,000 a year. Some $430,000 of this comes from commercial audio and $290,000 from TV-radio phonograph sales.

Commercial Audio Pays Off

In the 12 years that the audio division has been in existence, it has become the largest of its type in Alabama, with offices in Birmingham and Huntsville. Representing lines like Altec-Lansing and Stromberg Carlson, the firm takes on the installation of MATV systems in apartment houses and hospital paging units — including doctors' in-and-out registers and nurses' call, fire alarm and other inter-communications systems.

The audio division recently concluded an important installation at the Maxwell Air Force Base and is currently bidding on CATV jobs for materials and installations for individual subscribers.

The grand opening of Radio Service Co.'s new store in 1958. Richard Thomas (right) is showing a customer the first color TV the store carried. Notice screen size and price.

A section of the showroom of RSC as seen through the front window. The glass partition in the center area is the clerical and bookkeeping office.

Sell Yourself To Sell Sets

Mr. Thomas' concept of merchandising is a highly personal one which depends upon the immediacy of a retailer's identification with the product. He limits his product to one brand and establishes his identity in the minds of his customers by constantly using photos of himself and the store in every newspaper ad he places.

Up until five years ago he offered his customers a wide selection of brand names. Gradually he became dissatisfied with this system. He felt it confused the customer and, even more to the point, he felt that his store would have a more precise, retail image if it was identified with simply one manufacturer. He also felt that the manufacturer's reputation, which has been developed through nationwide advertising and public relations at a cost of millions, would work on his behalf as well.

Essentially, what he did was use the manufacturer's image to bolster his own advertising and public relations. He spends $300 a month on ads in his local newspapers. In every ad he makes sure that his photo and one of the store are in the ad copy. If he has a special sale, he may run quarter-, half- or full-page ads. He works on a co-op basis with the manufacturer.

He also spends $1200 a year on TV spots. In and around peak seasons he takes a number of spots on local stations and uses slides to aid in imparting the message. Now and again he will run a few spots on a local radio station, but that's only because there's not much to lose at $1.50 a spot. He does, however, rent 15 billboards every Christmas suggesting a color TV as a gift.

Practically 80 percent of all the sets he sells are financed by the store itself. His customers put one-third down and pay the balance in 30 and 90 days. There are no carrying charges. "In the last seven years," he reports, "we have had to reposses only three sets."

He also offers his customers a guarantee entitling them to three months of free service on any set they buy. When a customer buys a color set, he guarantees that the customer will get satisfactory color reception. To make this guarantee stick, the store installs the set and then the customer pays for it. "So far we haven't had to take back a single set," Mr. Thomas comments.

Service by Specialists

The service department accounts for merely $119,000 of the total annual gross. Yet it is probably the most important division in terms of the store's reputation. "A re-

The billboard shown on the left is a typical example of RSC's advertising using Mr. Thomas' picture.

Mr. Thomas checks out some figures in the service area of his firm.

CHANCES . . .

liable service department is every shop's greatest public relations asset," Mr. Thomas believes.

Radio Service has six service trucks equipped with two-way radios that blanket the city. Each truck has its own alloted territory and is capable of tackling almost any job.

The service area of the store itself is 1800sq ft. It's under the jurisdiction of a foreman who does billing and stock inventory in addition to supervising the shop. Each of the technicians is a specialist in his own right. Some do only color work while others do B/W. Some handle highly specialized equipment while others are experts in antenna installation.

Home service calls are $7.50 for B/W and $9.50 for color. Bench charges are $14.50 for B/W and $19.50 for color. A charge of $59.95 is made for a color antenna with UHF and there is an additional charge of $10 for every 10ft above 20ft. The department usually works a 44-hour week and the technicians receive $3.75 per hour. The foreman receives $5.

Labor Problems Diminsh with Employee Relations Program

There are 28 people working for the organization. "I treat all personnel as I would want to be treated myself," Mr. Thomas points out. To obtain and hold the best help his community can offer, he has developed a liberal employee relations program.

Every employee receives a $15,000 life insurance policy at absolutely no cost. No worker has ever been docked for being sick and Mr. Thomas paid one man, injured in a car accident, his full salary for six months. There is, of course, a two-week vacation with pay which is upped to three weeks after 15 years with the firm.

Employees are provided a house free in which to spend their vacations. Mr. Thomas takes his own cottage by the shore and rents it back to Radio Service which, in turn, lets the employees use it as they need it.

He estimates that this program costs his company $600 a month. It is tax deductible, of course, but that fact is insignificant compared to what it does for the employees' morale. It also gives the company first pick on the best available workers and first call on their loyalties, which in this day of manpower shortages is a decided asset.

Radio Service Co. is a unique institution built by a man with a willingness to take a chance and by his unselfish appreciation of his employees. ■

Office area is neatly paneled to reflect the bright, cheerful atmosphere at Zephyr Sales, Inc.

ET/D **DEALERFAX**
ADVERTISING/MERCHANDISING/SALES/BUSINESS MANAGEMENT

NO-GO RADIO BUSINESS PROSPERS

One service-dealer proved that a successful business can be built from a relatively small investment and lots of determination

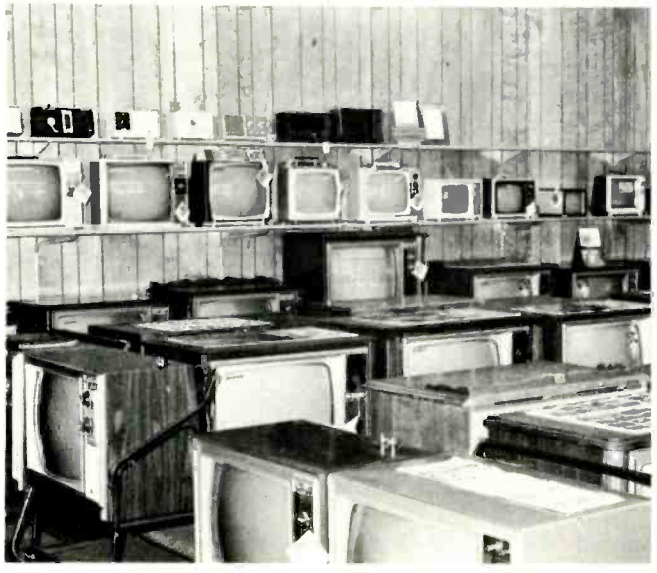
■ A banker once told Don Betzold, owner and manager of Zephyr Sales, Inc. in North Minneapolis, that a radio sales and service business would never make a go of it in this particular area. That was almost 23 years ago. "Today, that bank handles about $100,000 of our money," smiles Mr. Betzold.

"I grew up in this neighborhood and began repairing radios here when I was 16 years old — I called my shop Don's Radio then. In 1945, after attending the University of Minnesota and working part-time in other TV-radio shops, I decided to open my own full-time business — Zephyr Radio. I repaired radios and phonographs and my wife took care of the bookkeeping. You wouldn't believe our first month's business: We grossed $167 and our debts came to $148. A meager beginning, but that's what we built from."

Don Betzold tells our ET/D reporter what it was like trying to build a new business from a $15 profit. "I had a hard time trying to raise money to get started. I needed test instruments and finally borrowed the money on my car. Three months later I needed a signal generator so I went to the bank to borrow $100. The banker said no — a business of this type here just wouldn't make it. Fortunately that same day I received $100 in the mail from my brother Leonard who was still in the military service."

Wise Move

When Zephyr first opened for business in 1945 it was in a small rented building at 317 Emerson Ave. N. "We serviced and sold



Showroom floor is large enough to allow customer inspection of all models on display.

Jim Norton demonstrates a color TV to interested customer.

NO GO . . .

radios and phonographs then," Don adds, "until TV came along a short time later and we took on the sales and service of two major brands. By 1948 we were grossing $80,000.

"My brother Leonard joined me in late 1945. He did all the outside work, including antenna installations, while I took care of bench repairs.

"Five years later, when we were making more than $15 a month," Don smiles, "we built a new 50 x 50ft block building across the street from our old shop. It cost us $21,000 — but it proved to be a wise investment. To begin with, we rented out one-third of the building to a florist to help pay the mortgage. The front half of the rest of the store was used for TV-radio sales and the rear half divided equally for service and stock. That same year I added a full-time delivery man, an office girl and Jim Norton — now our sales manager. Two years later, in 1952, we took over our entire building and had to rent an adjacent building besides to handle used merchandise. As the business volume grew, so did our building. In 1958 we had to add 35ft on the back and another 35ft in 1964."

Sales and an Image

Don Betzold is proud of his store, his service and his sales team. "Jim Norton heads our sales department," Don continues. "Harvey Rohling was added to our sales staff in 1964. I believe we have the best salesmen in the city. Our sales volume has increased 10 to 20 percent every year since 1951. The best sales tool we have is our long-time service experience and because we stand behind what we sell, people in this area have learned to trust us.

"We never send TV sets out on demonstration. When we sell a color set, it is taken new from the crate and checked out before it goes into the customer's home. The customer knows we will correct any problems so we don't feel we are losing business by not giving out demonstrators. In addition, we send a letter to every customer who buys a color TV from us. The letter simply says thanks, and if you have a problem please call us. Our inventory normally amounts to approximately $130,000 which we feel gives us enough variation in merchandise to fit almost any customer's needs. We also keep a record of people who come into the store shopping and what they were interested in. Later, we call them to see if they have purchased or are still looking. A number of our sales are made through this type of follow-up."

Supplemental Advertising

"I write all of my own advertising," Don Betzold adds, "and we take advantage of all the co-op advertising we can get. Our advertising costs average $30,000 each year with the majority of it done in the local newspaper. We try to have a special sale once a month plus a spring and anniversary sale every year. This is supplemented by a communication to the customers who have stopped in the store and showed an interest in a particular item.

"Advertising brings in approximately 50 percent of our business. At least half of our customers we attribute to referrals from past customers. We also keep a file of our past TV customers. We send them letters after a few years sug-

Service technician makes voltage tests on printed circuit board of TV chassis.

Final adjustments are made to new TV set before delivery to customer.

gesting they come in and discuss their present TV as a trade-in for a new set. Our file tells us what model TV the customer has, when it was purchased and how much it is worth. From this we know in advance what to figure as a sales price when we talk to him. This helps us determine a fair market price."

Zephyr Sales believes in public image and appearance. Don Betzold indicates this as he tells our ET/D reporter: "Our window display and store front reflect our business. We engage a professional to arrange our window display and as a result we have won many "best display" awards from manufacturers. Our store is bright, cheerful and clean and this is the image we like to convey.

"We add to our image by trying to be different from the next guy in our promotions. For example, one year we gave rose bushes to the ladies and balloons to the kids. The results were very gratifying. On other occassions we have given away boxes of candy, ball-point pens and decks of cards with our name on them. This helps the customer to remember where he got them."

Preferred Service

"Our service department consists of three full-time technicians — two inside and one outside. We could use at least one more experienced man," Mr. Betzold explaines, "but it's difficult to find skilled technicians for TV service. For that reason we have had to farm out all of our antenna installations. Even so, we manage to hold our own on service work. We have two station wagons for service calls which are equipped to handle about 90 percent of the service problems. We also have two pickup trucks which are used for delivery."

Don Betzold describes Zephyr Sales' "preferred warranty" policy. "Color TV sets are sold with a one-year parts and 90-day factory warranty on labor. We go one step further and provide our customers with a preferred house call rate of $4.95 for the first half hour, whether B/W or color. It is a little extra bonus for purchasing the set from us. Our normal rates for house calls are $6.95 B/W and $9.95 on color for the first half hour and have a flat bench rate of $12 per hour. Our minimum bench charge is $2.50.

"It isn't enough to just say we have a service shop. Our service department is designed to provide customer satisfaction. The bench area is 15 x 40ft with a special area 12 x 20ft. for picture tube replacement — we could actually use double that much space. We consider our service technicians and equipment to be among the best and by sending our technicians to training schools they are kept up to date on the latest circuit designs, especially on the new solid-state units.

"Our present technical capabilities permit us to service about 12 TV calls per day but during a normal day in the service department we receive approximately 60 service calls. We are very conscious of our service work and the problems we encounter in TV repair. To augment this, we serve on the quality control board of one TV manufacturer, and our technicians maintain records of service problems. Each year a technician takes these problems to the manufacturer, who in turn evaluates them. Along with this, a technical representative from the factory visits our shop monthly to go over repair problems with us. ■

Newberry's modern, attractive store advertises "we service what we sell."

Services Only What He Sells

■ Even if you service only what you sell, it's possible to do over $65,000 in service alone, provided you sell enough, of course. And Newberry Radio Co., St. Louis, certainly sells — over $600,000 last year.

And owner Clarence Newberry started strictly as a service operation. Thirty-five years ago he opened a car radio installation and repair shop, and service has helped build his business ever since. Now he is mainly TV-stereo, but with a line of air conditioners to take care of the summer doldrums.

Merchandising Strategy

A three-part merchandising strategy parlayed the small car radio shop into a big sales-service TV business that is among the leaders in the entire St. Louis area. Mr. Newberry concentrated on one major brand, he emphasized reasonable but quality service, and he advertised heavily and honestly.

Newberry's has long pursued a one-line policy. It has a major stereo-television line and just one line of air conditioners.

"The advantages of being a one-line store are many, "Mr. Newberry says, "not the least of which is being able to buy right by buying in quantity.

"But there's another big reason for being a one-line store, and that's service. We are able to back up every set completely, even if it is out of warranty. When the customer has a legitimate gripe, such as a history of repair involving a particular part, we replace the part even if it is out of warranty. We wouldn't do this as readily or as easily if we had many lines to deal with."

Service Policy

Doing a good service job requires not only know-how and test instruments (Newberry recently spent $250 for a stereo generator), but also one other very important item. "You must have a Big Ear," Mr. Newberry smiles. "Listen to every customer's problem. Bite your tongue if he is a crank, and go ahead in an effort to please him. If you do manage to make a satisfied customer out of a crank and his friends learn about it, you will build an excellent reputation because they know what a crank he is, too."

Newberry's service rates are reasonable — $8.95 for a color serv-

Clarence Newberry personally keeps a running looseleaf inventory of every set in stock, when it is sold and by whom.

Mr. Newberry has a file envelope for each customer which shows when a set was bought, its repair history and other important information.

This old TV is prominently placed in Newberry's window with a sign. It proves two points: that TV sets have gone way down in price and that Newberry's is not a newcomer to the business.

Well-lighted and displayed merchandise is important part of successful sales program

ice call, and $4.50 minimum for a B/W set when brought to the shop.

Servicing only the sets sold by the store enhances Newberry's reputation as a specialist and an expert. A complete sales and service history is kept on every set sold — on file cards alphabetized by customer name.

"We do make a few exceptions to the service-only-what-we-sell policy," Mr. Newberry emphasized. "But it's mighty few — like the regular customer who wants repair for a small set he picked up some place else. Or the new resident who bought his set before he moved into our neighborhood.

Advertising and Promotion

How much advertising is enough? For Newberry's it's a whopping $35,000 to $40,000 a year, or a little more than 5 percent of total sales-service revenue. That's as much as the big "carload, bargain-barn" types spend — and Newberry's is a far cry from being such a "suede-shoe" type operation.

Clarence Newberry is a trade director of St. Louis Better Business Bureau and has been one of the leaders in helping bring Federal Trade Commission and BBB reputable standards to TV repair advertising in St. Louis. As a matter of fact, Newberry's never advertises to build its service business (because of the service-only-what-we-sell policy). But every ad does mention that complete service is available.

The lion's share (85 percent) of the Newberry advertising budget goes into newspapers. The remainder is shared by TV and radio.

"We spend big on advertising because it's necessary to achieve volume," Mr. Newberry declares. "Too many legitimate dealers shrug off spending what they should on advertising with the excuse they can't fight the bait-and-switch boys. But this is sure defeat. The fellow with good merchandise and service to sell must advertise as heavily as the competition."

Well-lighted and displayed merchandise is part of the successful promotion program here. The entire store interior is kept lighted all night. And right up near the front, visible from the sidewalk, is stationed an old set sold by Newberry's almost 20 years ago. A sign on top of the set announces, "This Magnavox was purchased from us December 1949. Original price $695." That sign points out how much sets have come down in price and how long Newberry's has been in business.

Newberry's has a sales floor of 3000sq ft and an upstairs "brown goods" service room of 2000sq ft. Air conditioners are serviced in a separate 30x50ft building at the rear.

There are 15 employees, including 1 full-time salesman and four others who spend part of their time on the sales floor and the remainder at other duties. Five full-time service technicians, plus four part-time technicians, handle outside and inside service. Average employee tenure is eight years.

Clarence Newberry believes in organizations, such as the BBB and NARDA, where he is also an active participant, having attended every convention for over 15 years.

Thirty-five years in business and 30 in the present location at 3401 S. Kingshighway, this prosperous St. Louis electronics sales and repair shop promises to continue thriving by pursuing the owner's three-point policy of: (1) one Line, (2) top service, (3) heavy advertising. ■

ET/D DEALER SHOWCASE

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

Admiral 9in. TV 700

Announced are two 9in. portable television receivers featuring instant picture and sound for the first time. The two 9in. sets with 42sq in. of viewing area are the model 9P14 in

beige, and model 9P27 in a deluxe walnut-grained cabinet. They are said to include gated automatic gain control, a unitized channel selector, high gain IF amplifier, front speaker, front mounted controls, polarized power plug and monopole antenna. The model 9P27 also has a built-in jack for private listening and earphone. Model 9P14 lists for $75 and model 9P27 has a open list price. Admiral.

Microphone 701

Twelve new dynamic microphones have been introduced. In three series, the 810 Ultra-Cardioid, the 820 Omni-directional Probe and the 840 Lavalier, are said to set new standards of performance, appearance and dependability. Designed particularly for public address use, the response characteristics of the new microphones make them also suitable for broadcast, recording and other sound applications. The microphones are said to be "pop" and "blast" proof and have built-in wind filters. They can be used outdoors as well as indoors. Each of the microphone series is available in two types, with or without switches; and two finishes, brushed chrome or brushed satin gold. All trim on the brushed chrome models is a long-wearing black chrome-plated finish. Astatic.

Automatic Stereo Music System 702

A stereo home music system said to be the world's first system that vertically stores and plays both sides of 50LP records automatically is now available in component units. The packaged component music system includes an automatic vertical play mechanism in an oiled hardwood walnut cabinet, a remote control selector unit, a solid-state AM/FM tuner and speakers. The unit plays one or all 100 record sides, all automatically. Once records are inserted in the record magazine and cataloged, the listener need not touch anything but the selector

unit. Record selections are programmed at the component or remote stereo stations from up to 12 locations, by selecting two numbers, as easily as using a telephone. A program book provides a listing of the albums in the record magazine. Price $995. Seeburg.

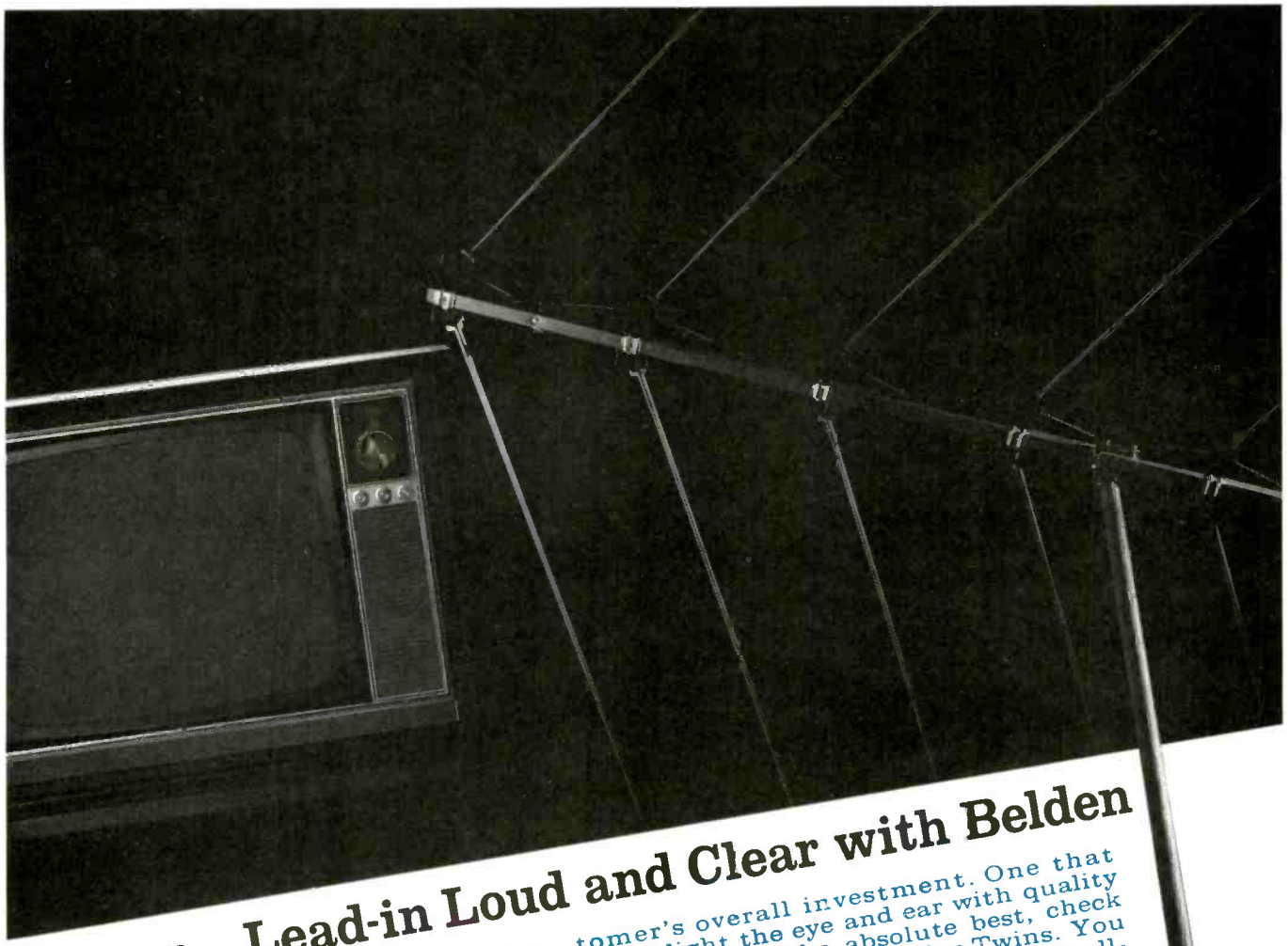
Record Display 703

Introduced is the Record-Matic, a shallow 12 x 16in. plastic tray holding up to 25 record albums firmly secured in plastic "ribs." A forward gesture on the first album triggers the device which parades the remaining albums at an even pace for viewing and easy selection. When an album is removed, the parade stops until re-

started. After playing, the album can be returned to the space from which it was removed, since a re-run of the remaining records will stop at all empty spaces. The absence of a motor makes it light weight, foolproof and easy to use. Retail price is $6.95 to $7.95. Duotone.

Transistor Analyzer 704

A compact transistor analyzer capable of doubling as a sensitive dc voltmeter is introduced. The model 830 "Transistor Commander" features simplified operation, an easy-to-read "Good/Bad" meter scale, and is said to be the only unit available that combines semiconductor checks with ability to measure supply voltages to 100vdc. The unit also functions as an diode analyzer capable of measuring both forward and reverse currents. The analyzer performs the following checks: high and low-power NPN and PNP power transistors for in-circuit dc beta characteristics, high and low-power NPN and PNP transistors out-of circuit for dc beta, ICBO and ICEO leakage, diodes and rectifiers for in-circuit open conditions, shorts and diodes out-of-circuit for forward and reverse currents. The analyzer contains a current-limiting circuit for protection against accidental burnout of transistors and diodes. In addition, it is said to feature an automatic power protection circuit that prevents shorted

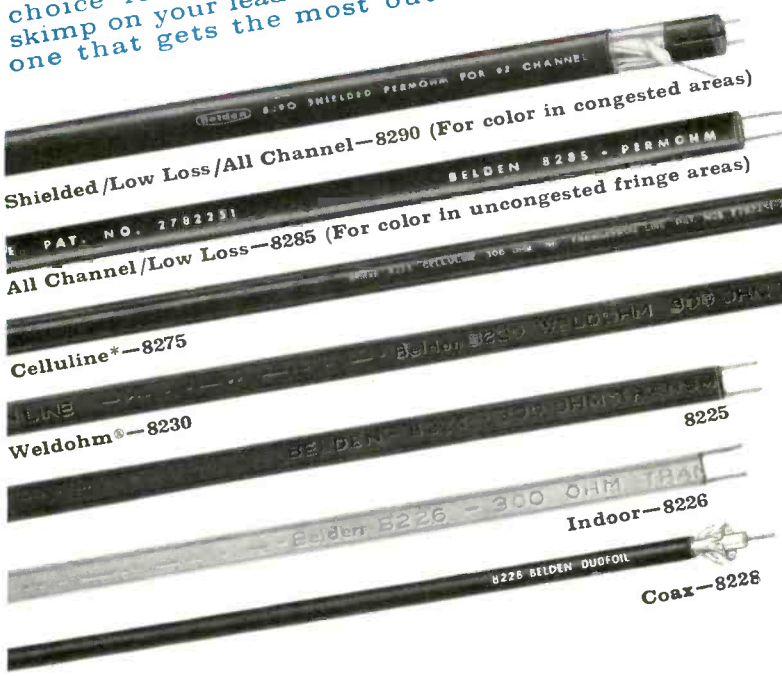


Step up...Lead-in Loud and Clear with Belden

TV lead-in. Belden makes all kinds. Indoor, outdoor, for color and black and white reception. All have one thing in common: for price and performance you won't find better lead-in anywhere. They provide a picture-perfect link between antenna and set. Since no two installations are alike, Belden gives the right choice for every situation. But don't skimp on your lead-in. Step up . . . choose one that gets the most out of the customer's overall investment. One that will delight the eye and ear with quality reception. For the absolute best, check out 8285 and 8290: the Color Twins. You won't find anything comparable for all-channel black and white as well as living color. Your Belden Distributor has all the facts. Talk to him today. Belden Corporation, P.O. Box 5070-A, Chicago, Illinois 60680.

*Belden Trademark, and Belden U.S. Pat. 2,814,666

don't forget to ask them what else needs fixing?



Shielded/Low Loss/All Channel—8290 (For color in congested areas)

All Channel/Low Loss—8285 (For color in uncongested fringe areas)

Celluline*—8275

Weldohm®—8230

Indoor—8226

Coax—8226

...the missing link in perfect picture reception

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8-5-7

. . . for more details circle 112 on postcard

ET/D DEALER SHOWCASE

transistors and diodes from damaging the instrument. In NPN/PNP transistor testing the analyzer provides a beta (hFe) range of 1 through 1000, ±5 percent, an adjustable collector current (Ic) range, of 0-10ma, a collector base leakage (ICBO) measurement of 0 through 5000μa and collector emitter leakage (ICEO) range of 0-5000μa. In diode testing, a 10ma limitation circuit is said to protect components from accidental damage. A function switch permits forward-to-reverse measurements without requiring that the diode be removed from the analyzer circuit. A high-impedance dc voltmeter input permits accurate measurements to 100vdc with same probes used in other checks. The unit measures 9¼ in. wide, 5¾ in. high and 6⅜ in. deep. Complete with built-in 117vac power supply, the unit weighs 3 lb. Suggested retail price is $79.95. Amphenol.

Transistorized Phono/Radio Console 705

Announced is Zenith's Puccini, a solid-state Hi Fi stereo record playing instrument with solid-state AM/FM/stereo FM radio. Features include a four-speed "Stereo Professional" record changer and "Micro-Touch 2G" tone arm with "free-floating" stereo cartridge, an ultraphonic stereo sound system that employs an air-suspension speaker system in a full-width sealed sound chamber: two 15in. woofers, two deluxe exponential horn treble tweeters, four 3½ in. cone-type tweeters with LC crossover networks. A solid-state 320w amplifier is said to deliver 320w of peak music power and a push-button studio control panel. Other features include stereo monaural tap input and output jacks, a lift lid cabinet, hand-rubbed cherry fruitwood veneers and select hardwood solids with Italian Provincial styling. Zenith.

Direct Reading Clock 706

Announced is the cifra 3 time machine. The clock is said to be compact, accurate and functional. Colors available are red, blue, green, beige and white. The unit is 7in. long and 3¾ in. in diameter. Price is $39.95. Digi-Time.

Anti-Wicking Clips 707

Introduced are anti-wicking clips which hold wires in place for tinning, eliminating possible damage to wires and components because of heat transfer. Two or more wires can be tinned at the same time. By completely enveloping wire, it is said to stop wicking better than standard clips. The small, compact size eliminates the use of several conventional anti-wicking clips. The clip allows tinning closer to the insulation, tinning component leads by sliding over hot lead and is claimed not affected by iron heat. Easily kept clean, solder and flux will not cling to the clip.

Model No. AWSR6 measures 1¼ in. long and jaw size 5/32in. x 1/16in.; 1½ and 1¾ in. available on special orders. For complete information, address dept SR. Macdonald.

MATV Demo Kit 708

An 82-channel MATV demonstration kit designed to help electronic distributors, dealers and TV system contractors to demonstrate a fully operative MATV system is currently available through JFD fieldmen.

Being solid-state, the display is said to be compact enough to fit in a small, lightweight case. The kit comes complete with amplifiers, splitters, tapoffs, and all necessary cables. One end of the case connects to an antenna and the other end connects to the TV set. JFD.

Headphones and Microph- 709

Headphones for stereo or monaural use are introduced. Air-cushioned earpads of hygienic plastic and foam rubber are said to assure comfort and isolation of ambient sounds. Weight is

5oz. Price $14.95. Also introduced is the model MB215 microphone which is said to have a frequency response of 60Hz-17kHz with a cardioid pattern. Included is a built-in windscreen for close up. Price $80. Stanford International.

COLORFAX

MOTOROLA

Color Chassis TS914/918 — Short Life 6JS6 Horizontal Output Tube

Slow Heating Damper Tube

Some replacement damper tubes heat slower than original equipment tubes causing excessive current drain in the 6JS6 output tube during warm-up. Kit 1P65147A41 is available from your Motorola distributor. It contains instructions and a diode which must be added to the circuit to prevent excessive 6JS6 current regardless of damper tube used.

The kit also contains a replacement screen resistor which will allow the installation of the newly developed 6LB6 output tube.

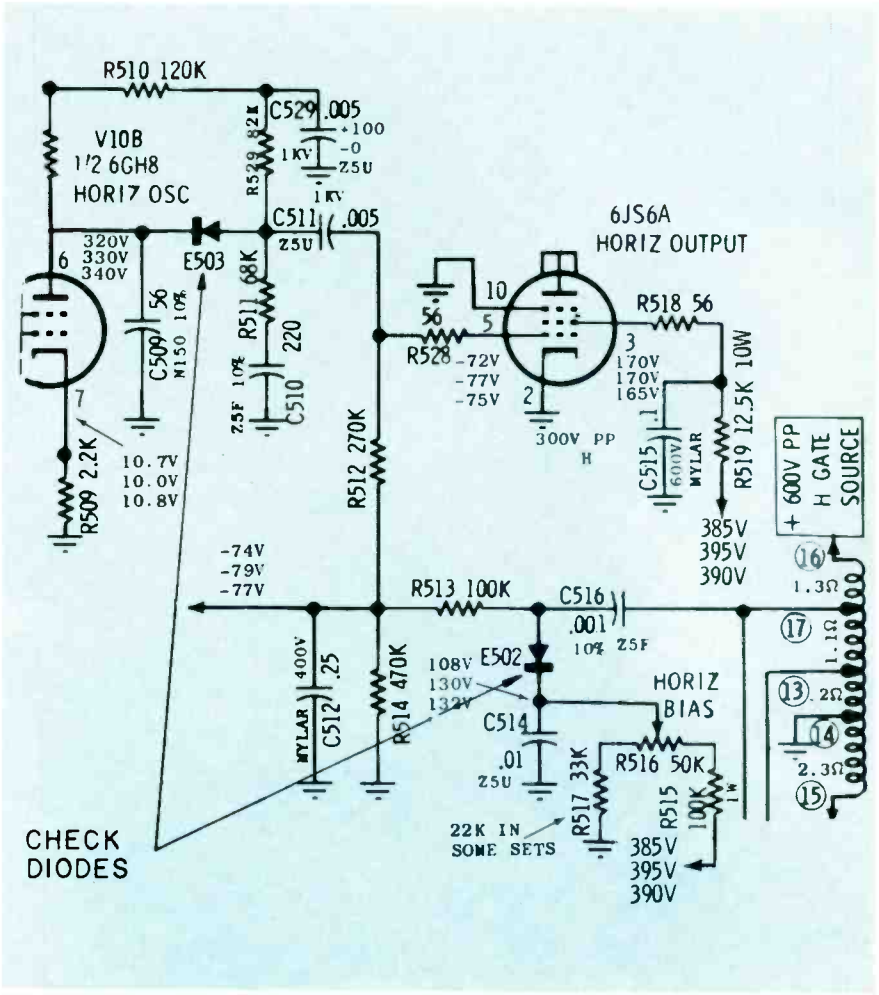
The kit may be installed at the top of the chassis in the home.

Excessive Horizontal Output Current without External Symptoms

When replacing more than a normal number of horizontal output tubes, it becomes good practice to check the current drain after installing the replacement tube. If current drain is normal, it is safe to assume that the circuit is operating properly. If excessive current is encountered, further checks should be made to determine the cause. Adaptors are available at most parts houses for measuring current drain in popular types of horizontal output tubes. Chassis TS914/918 current drain at 122v line, with proper horizontal bias setting, should be in the order of 185ma at no brightness and 240ma at normal brightness.

Some causes of excessive current: (1) shorted horizontal coupling diode E503, (2) open E502 horizontal bias diode, (3) shorted turns in the deflection yoke, improper horizontal bias setting or bias setting not adjusted to compensate for unusually high line voltage.

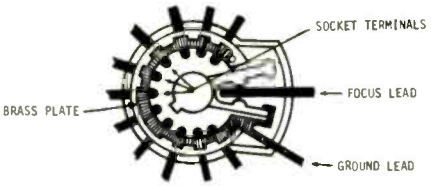
If abnormal line voltages are found, it might be advisable to contact the local power company.



GENERAL ELECTRIC

Color Chassis G-1 — CRT Socket with Built-in Spark Gap

The CRT socket used in the G-1 chassis color receiver contains a special built-in spark gap consisting of a ground brass plate placed close to the socket terminals (see sketch). An unusually high voltage on a socket terminal will arc to the brass plate rather than to an adjacent terminal, thus protecting the CRT and its associated components. This is normal, and does not necessarily mean the socket is defective, but usually indicates a problem in associated circuitry.



REAR VIEW OF SOCKET (COVER REMOVED)

For example, there are cases of a continuous arcing condition in the CRT socket caused by an open 47M resistor (R284) in the focus voltage divider circuit. To obtain best focus, this resistor is connected through a wire jumper to one of three points — boost voltage, +280v or chassis ground. A bad solder connection at the jumper or an open R284 could cause the voltage on the focus anode terminal (Pin 9) to rise, causing an arc inside the CRT socket.

Should you be called upon to service a G-1 chassis receiver which has a continuously arcing CRT socket, compare the socket pin voltages to the voltages shown on the schematic diagram. The focus voltage (Pin 9) should be between +3kv and +5kv with respect to chassis ground. If it is more than 5kv, check for an open circuit somewhere between the focus control (R283) and the low potential end of the focus voltage divider circuit.

TV Chassis G1 — High Voltage Arcing

There have been a few reports of G1 chassis receivers arcing from the HV rectifier plate cap to the metal shield can. This could be the result of drawing an arc from the plate cap with a screwdriver when checking for presence of HV. The arc sometimes carbonizes the plate cap and reduces its insulating qualities.

The HV at the plate cap can be checked with a neon bulb taped to an insulated nonmetallic rod or a similar device. Under no circumstances should an arc be drawn from the cap.

Caps which have already been carbonized can be repaired by covering

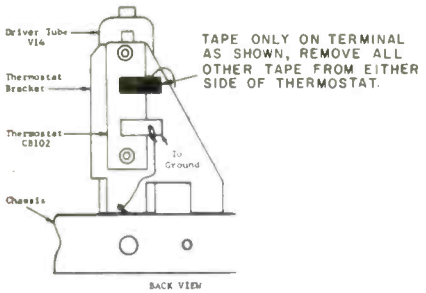
them completely with corona seal. To accomplish this, first remove the cap from the HV rectifier tube and then pull it out of the HV compartment through the opening by the transformer terminals. Apply the corona seal and then replace the cap on the HV rectifier tube. Do not exert undue strain on the cap lead or you may loosen the connection at the transformer tertiary winding.

Color TV Chassis KD — Tape on Thermostat Surface

Some KD chassis have tape applied to the surface of the thermostat.

This tape should be removed, since it may result in cutout tripping when there is no problem in the set. The only tape required is around the top terminal, as illustrated, to prevent shock. The top terminal is at B+ potential when the cutout is open.

Whenever the cutout trips and no circuit trouble can be found, check



the following: (1) Is there any tape on either side of the cutout? (2) Space between the thermostat and a properly seated horizontal output tube V14 should be ¾ ± ⅛ in.

Color TV Chassis KC Model M278CWD — Loose Antenna

There have been a few reports of loose VHF antennas on this model.

If you encounter such a complaint, it may usually be corrected by pushing the barbed retaining clip up tight to the underside of the cabinet. This is best done by using a length of metal tubing which slides over the antenna cartridge and presses evenly against the retaining clip.

If the antenna is still loose, use another clip (catalog No. ET3X618) inserted on the top of the original one and pressed up tight against it.

TV Chassis H1 — New Damper Tube

Late production H1 chassis portable color receivers use a 17BW3 damper tube instead of a 12AX3. The 17BW3 is directly interchangeable with, and is a recommended replacement for, the 12AX3.

This will increase the total filament string voltage drop from 117.5v to

121.5v and should help improve reliability. If a damper tube fails in an HC or H1 Chassis, use a 17BW3 tube as a replacement.

MAGNAVOX

TV Chassis T925 — Replacement 21KA6 Tubes

The T925 chassis (Model 1T115) uses a type 21KA6 in the horizontal output stage. Some 21KA6 tubes being uses as replacements have the screen grid connected to pin 3 rather than pin 7. These tubes can be used by connecting a jumper wire on the 21KA6 tube socket from pin 3 to pin 7. Later production of the T925 chassis will have this jumper employed.

Color TV Chassis H12 — B+ Dropping Resistor

In the H12 color chassis (manual S1062), the 1.6K B+ dropping resistor, R748, has been changed from a 15w to a 20w rating for improved reliability. The part number for the new resistor is 61C20-100. It will be substituted automatically on orders for the old 61C20-79. When changing this resistor, use the clip from the original to mount the replacement in order to assure maximum heat dissipation.

PHILCO-FORD

Color TV Chassis 14M91/15M91/16M91 —High Voltage Adjustment

Measured AC Line Voltage	High Voltage Adjustment Tolerances (-1000v +0v)
105	21kv
110	22kv
115	23kv
120	24kv
125	25kv

The chart provides information for adjusting high voltage under various ac line conditions. To use the chart, first determine the ac line voltage with an accurate ac voltmeter at the outlet to which the set will be connected. After measuring the voltage at the outlet, refer to the chart and set the HIGH VOLTAGE ADJ. control (VR8 14M91), (VR21 15M91 and 16M91) for the high voltage corresponding to the ac line voltage. Under no circumstances should the high voltage exceed the rated value indicated the the chart. Note that the tolerance of the high voltage adjustment is −1kv and +0v. If there is any question as to the voltage setting, adjust the high voltage slightly below the rated setting.

Use an accurate, reliable, high voltage meter and high voltage probe.

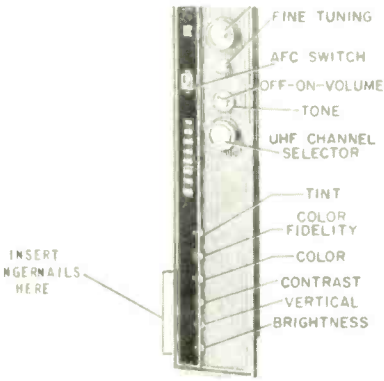
If the ac line voltage measured is somewhere between two of the voltages given in the chart, use the nearest lower ac voltage. As an example, if the line voltage measures 112vac — that is, part way between 110 and 115-vac as shown in the chart — use the 110vac figure and adjust the high voltage for 22kv. The high voltage adjustment is always made with the brightness control set at minimum (zero beam current).

Do not exceed 30kv on high voltage probe.

ADMIRAL

Color TV Chassis 4H12 — Control Cluster Removal

In models using the NC2570-1, -2, -51 and NC2596-1 tuner clusters, removal of the auxiliary control cluster



can be simplified by snapping out the lower portion of the long narrow plastic crystal that covers the knobs (see illustration). Insert fingernails under the left edge of the crystal at the bottom; press toward the right and pull upward. Lift the crystal far enough to permit removal of color fidelity knob. Then proceed with cluster removal from the back by taking out the two mounting screws, disconnecting the leads and working the assembly out past the escutcheon boss and the CRT.

When reassembling, replace knob then insert right edge of crystal carefully to avoid damage to escutcheon, then snap in left edge.

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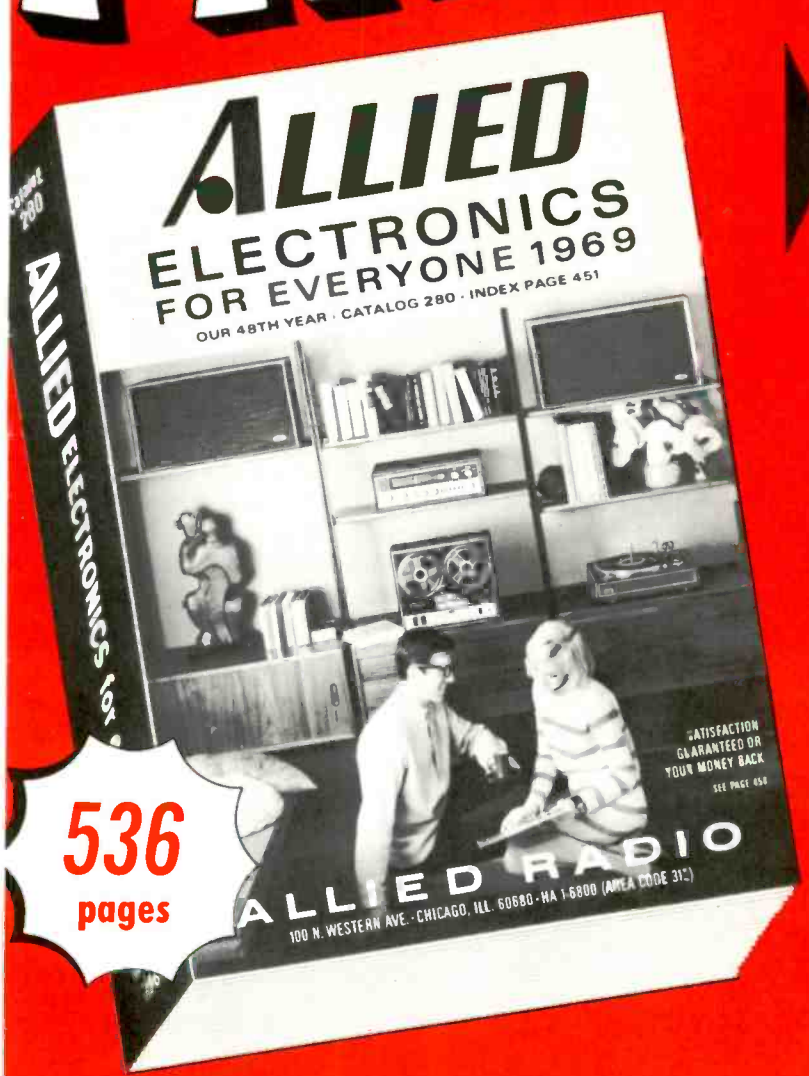

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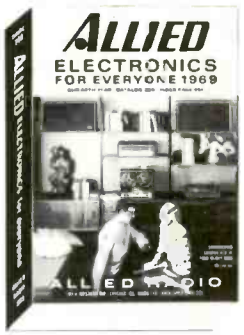

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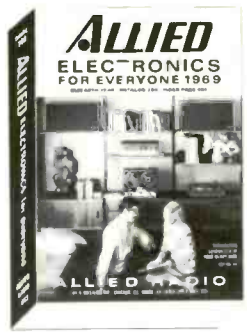

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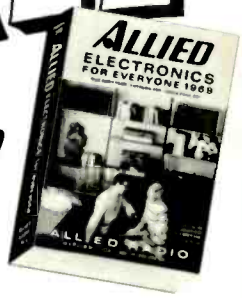

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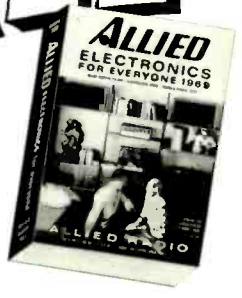

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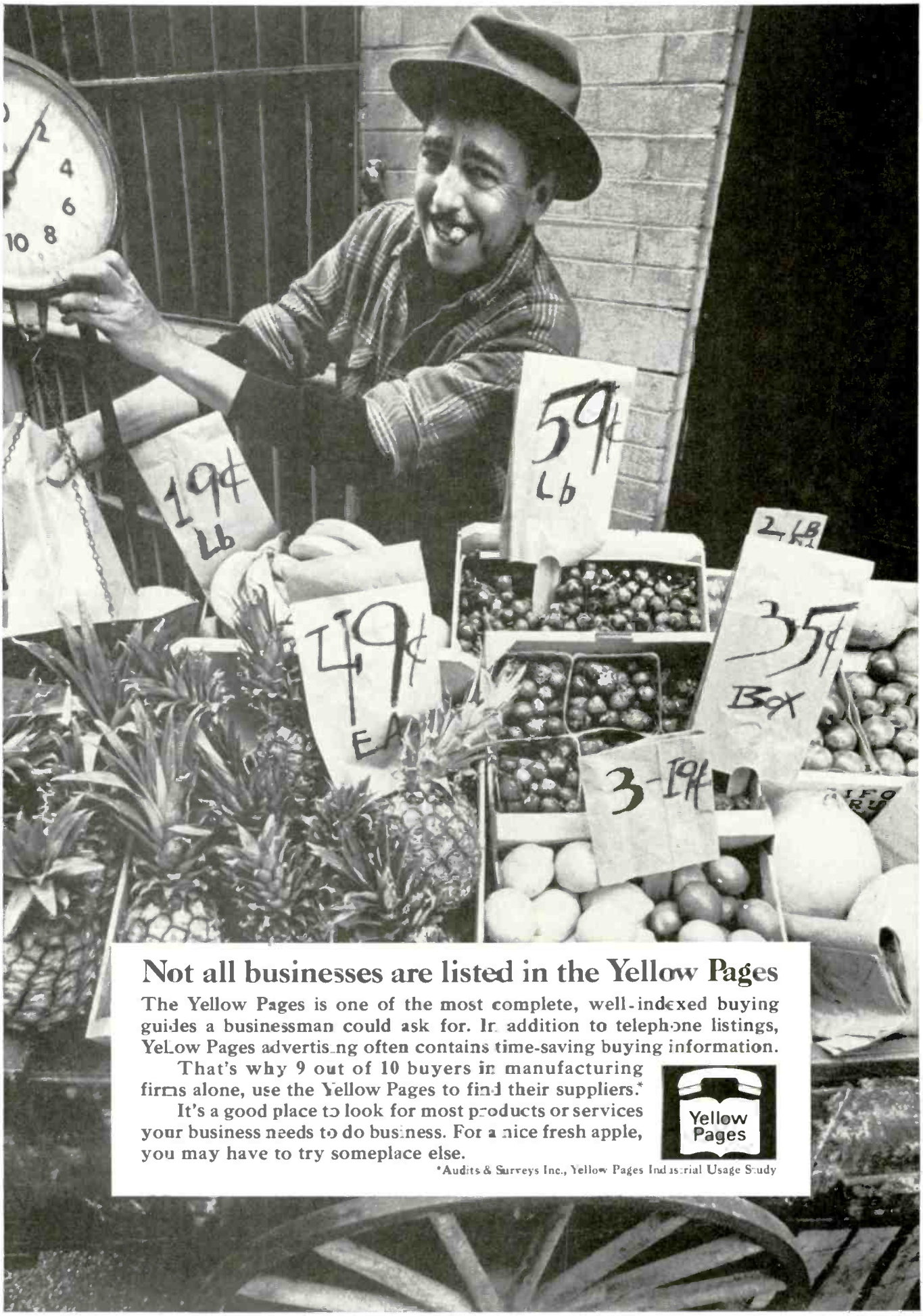

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Yellow Pages

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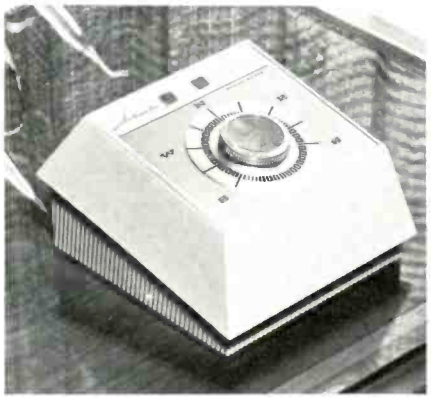
ET/D NEW PRODUCTS

Antenna Rotators 710

The manufacturer announces the addition of antenna rotators to its outdoor antenna line. Two models — No. 10W707, fully automatic; and No. 10W505, manual rotator— enable



outdoor antenna distributors to offer a complete antenna package. The drive unit on the roof is fully synchronized with the knob on the control unit. The control is said to be completely silent with positive directional indicator lamps that show instantaneous operation and direction of antenna movement. The unit is fully transistorized. When the operating cycle is complete, the unit shuts off automatically and draws no current until it is again activated. The drive unit is said to be housed in a high strength, lightweight aluminum casing. It features a special over-running gear that creates preturning momentum and will accommodate a supporting mast up to 2⅛ in. dia. and an antenna mast up to 1½ in. Corrosion-resistant materials are used throughout the drive unit. Model No. 10W707 suggested retail price $54.95. RCA.

Transistor and Diode Check 711

A portable, hand-held tester that checks transistors and diodes while they are still in the circuit is announced. The tester is said to give a quick "go—no go" check for both conduction and cutoff characteristics. The battery-powered unit measures 9 x 1¼ in. and weighs 6oz. It comes com-

plete with an adapter to test diodes, and a set of leads and clips to test either transistors or diodes out of the circuit. Priced under $90. Telvac.

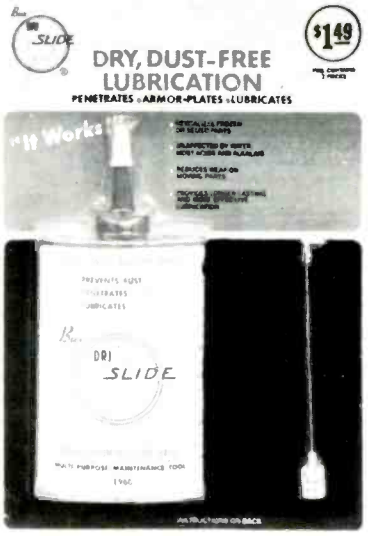
Solid-State Stereo Tape Deck Recorder 712

Announced is a model 355 solid-state stereo tape deck equipped with a noise suppressor switch and a special filter which, the manufacturer says, will eliminate undesirable hiss that may exist on older recorded tapes while not affecting the quality of sound reproduction. The unit also has tape/source monitoring and a scrape flutter filter. It operates either vertically or horizontally at three speeds—7½ 3¾, 1⅞ ips—and accommodates reel sizes up to 7in. An automatic pinch roller retracts to permit simple one-hand tape threading with a four digital tape counter to aid editing, cuing and tape indexing. Other features include a new vibration-free motor, two

VU meters and automatic tape lifters to protect heads from wear during fast forward and rewind operations. Manufacturers specifications: Freq. response 20Hz-22kHz @ 7½ ips, 20Hz-17kHz @ 3¾ ips and 20Hz-9kHz @ 1⅞ ips. Wow and flutter: .09% @ 7½ ips, .12% @ 3¾ ips and .17% @ 1⅞ ips. S/N ratio: 52db. Complete with oiled walnut finish base and protective dust cover. Price $229.50. Sony.

Dust-Free Lubricant 713

A dust-free dry lubricant is packed in a 2.146oz can with a stainless steel hypodermic type (0.0026 ID) application needle that fits on the plastic can spout. Applicator needle controls use of "Dri-Slide" to 1/3 drop for vital applications where overlubrication is not necessary such as reels, electronic components, appliances, office equip-



ment, etc. Needle also allows reaching inaccessible lubrication areas and can be hand-formed to use in impossible-to-reach areas. Dri-Slide.

Triggered Scope 714

A wideband, triggered, laboratory-quality portable oscilloscope is announced. Built for use with today's sophisticated systems, the solid-state model S1301A features a horizontal bandwidth of 20MHz with a 17ns rise time. The scope is designed for observation of low level, high frequency signals and faithful reproduction of pulses, transients and complex waveforms on a 3in. CRT (5 x 6cm display area). Automatic triggered sweep is said to provide rock-steady traces and

with the trigger level and sweep expansion controls, the waveform's smallest details can be carefully studied. Calibrated sweep provides time-frequency measurements that are accu-

rate to ±5%, specifications indicate. An internal squarewave voltage calibrator produces a squarewave at approximately 7kHz having a rise time of less than 1μs. Eight switched amplitude levels are provided: 200mv, 400mv, 1v, 2v, 4v, 10v, 20v and 40v. The 40v level can be accurately set by reference to an external 40vdc meter. All other levels are related to it with a maximum error of ±2%. The calibrated frequency-compensated switched attenuator helps measure P-P voltages within ±5%. There are eight ranges of calibrated sensitivities, from 50mv/cm 1 to 20v/cm. Eighteen ranges of calibrated sweep speeds from 200ns/cm to 100ms/cm are provided in 1, 2, 5 sequence. Motorola.

Scope Dolly 715

Announced is a scope dolly for laboratory and shop applications. It includes a 20deg viewing angle which will accommodate any popular type scope and a protective rubber gasket which prevents damage to the scope while installing or removing. The dolly has three convenient power outlets and one input, a storage area for spare preamplifiers, plus a roomy storage pan for accessories and tools. Casters are 5in. diameter, ball bearing, swivel-type with semi-hard rubber wheels. Price $59.95. Metal Dynamics.

Horizontal Deflection Amplifier Tube 716

Announced is the 6LF6, a 12-pin version of the 6KG6 antisnivet horizontal deflection amplifier tube, which operates at low B+. The 6LF6, like its 9-pin predecessor, is designed around the "cavitrap" anode, said to prevent Barkhausen oscillations and eliminate "snivets" from the TV screen. The electrical characteristics of the tube are also sufficiently flexible to permit its use as a replacement for the 6LB6, now used in some power-transformer color sets. It is claimed that the large, massive structure of the tube makes it virtually immune to physical punishment. For example, this tube can be operated for 15min without drive instead of the few seconds tolerated by conventional horizontal deflection amplifiers. Thus, a failure in a related circuit need not damage the horizontal deflection amplifier before the set can be turned off. Amperex.

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Solid State Units

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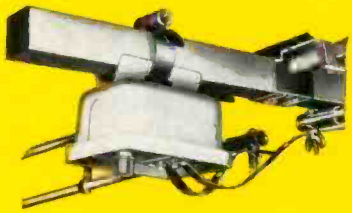
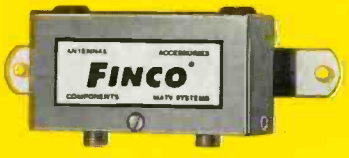


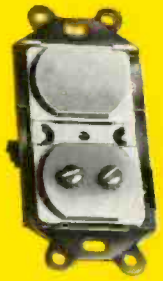
82-Channel Antenna Mounting Transformer – Die-Cast Housing

M-526



Hi-Q Single Carrier Trap– 60 dB Attenuation

M-300



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M-110

1 Volt per Channel on 9 Channels, 60 dB Distribution Amplifier

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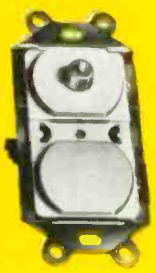
Eight-Way Back Match Splitter VHF

M-213

Matched Line Drop Tap/indoor

M-303



Single 75 Ohm Outlet Plate VHF-UHF-FM

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Solid State Units

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ET/D NEW PRODUCTS

Cassette Heads 717

Announced are plans to manufacture a complete line of heads for cassette style recorders. The model ZW4J head is said to be bi-directional to perform record, playback and erase functions in both directions. Machines equipped with the head will be able to play all information in a cassette without flipping the tape over. The bi-directional head also makes automatic changers more practical by eliminating the need for flipping each cassette to play the second half of the tape. The cassette heads are said to be compatible with Philips-Norelco equipment and circuitry. The heads are claimed to have a usable frequency response of from 50Hz to 12kHz at 1.875ips. Inductance is up to 300mh and the heads will be available for entertainment, language laboratory and instrumentation applications. The cassette system has two recorded tracks, .059in. wide separated by a guard band of .030in. on the standard .150in. tape. For compatible stereo recording, four recorded tracks, each .023in. wide, are grouped in identical adjacent pairs with .012 guard bands. The adjacent pair configuration permits playing monaural and stereo tapes on the same equipment without loss of program material. Crosstalk rejection of stereo heads is said to be in excess of 36db. There are 16 different models proposed, with three models currently in production. Available now are the bi-directional ZW4J, and ZW2J and the language lab W2JR heads. Nortronics.

Amplifier 718

A 110w amplifier for record player, tape player and tuner applications — convertible for background music or telephone paging — is introduced. The unit has three microphone inputs with individual volume controls said to convert from high to balanced low impedance for noise reduction on long microphone lines. The "Carillon 110" has two program inputs, a master gain and separate full bass and treble controls for simultaneous adjustment of all input signals. The unit offers a number of different arrangements of various speakers and/or horns through the 4, 8 and 16 speaker connections and 70 and 25v lines. The amplifier employs dc filament voltage on all pre-amp stages to reduce hum and noise to more than 65db below rated output, according to the manufacturer. Frequency response of 20Hz to 20kHz is claimed. List price is $245. Bell.

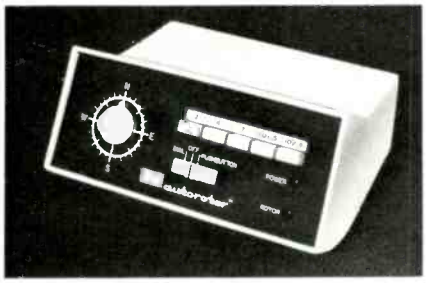
Short Open Tester 719

Announced is a tester for checking continuity and short conditions in circuitry. This solid-state short open tester incorporates two high-speed fuses in series with the test leads to protect against possible damage to

the equipment or operator in the event that the leads are placed across a source of high voltage. The model 8 is said to completely eliminate the use of buzzers and ohmmeters and continuity is indicated by a 600 cps tone from the speaker in addition to a light for visual indication. A separate Tel-tone signal provides individual circuit identification in conjunction with a loud speaker or headphones. Power is supplied by two standard 1½v "D" cell batteries. Weight 18oz. Goldak.

Antenna Rotor 720

Announced is a TV/FM antenna rotor. The AR33 Autorotor features fully automatic push-button control



and is said to be engineered with +1° position accuracy using the CDE heavy-duty "Bell" rotor. It is said to feature completely silent operation, solid-state circuitry, 360° compass dial operation and contemporary styling. Cornell-Dubilier.

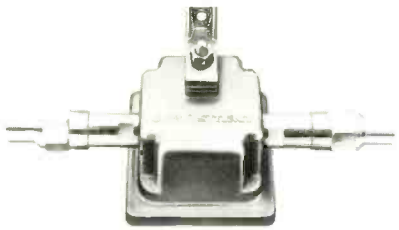
FM Radiotelephone 721

A model DP15 waterproof, hand-held two-way radiotelephone is introduced. The unit weighs 3oz. including rechargeable battery and is fully compatible with all FM land, mobile and marine radio systems. The U. S made radiotelephone contains a fully solid-state transmitter/receiver and said to be type accepted under FCC rules. There are various models available for operation on one to five channels in the 30-50MHz and 132-174MHz bands employing narrow or wide band frequency modulation. Transmitter power output is said to be 2.2w and receiver sensitivity better than .35mv

for 12db SINAD. Adjacent channel selectivity is indicated at better than -80db for 20db quieting. The unit contains plug-in block circuitry to provide quick and easy maintenance; average repair time is said to be 8min. The transceiver has a built-in telescoping antenna with provision for a flexible whip or railroad spiral antenna as optional equipment. The radiotelephone may also be used with an external antenna. Other options include CFCSS tone squelch, external speaker-microphone, railroad chest harness and leather carrying case. Kaar.

Wideband Line Extender Amplifier 722

A new wideband line extender amplifier is introduced. The Model 961 incorporates the latest, temperature-compensated, solid-state circuitry to cover 20db of feederline cable from 54 to 250MHz. The amplifier features a die-cast aluminum housing, choice of "Sure-Grip" and other popular .412 or .500 fittings regulated and employ a 18-30vac power supply. Input and output capabilities are said to be designed to accommodate typical feederline levels without cross modulation. In addition, an external −20db test point is available. Other outlet plates for house drops are optional. The amplifier is light weight and compact, only 4 x 4 x 3in. and under 2lb. for convenient pole or stand mounting. With new "Sure-Grip" 412 22 fittings, net price $52.50. Craftsman.

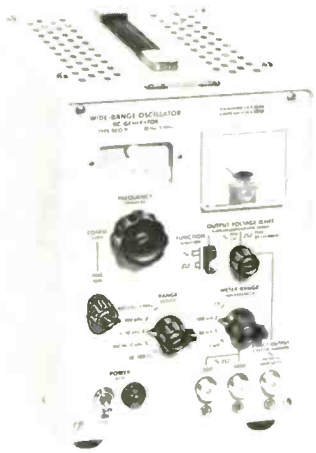


AM/FM Receiver 723

A 25w AM/FM receiver model RA30 is introduced. Input jacks are provided for phono or tape with outputs for single or multiple speakers. Output impedances: 4, 8, 16 and 500 Ω (70.7v). The receiver features slide rule tuning, built-in AM antenna and can be used in offices, stores, waiting rooms, homes, etc. Price $84.98. Olson.

Sine/Square Generator 724

Announced is a sine/square wave generator for general laboratory and production applications. It features broad frequency coverage, attenuation and meter monitoring of its 50 Ω, 600 Ω and direct (low impedance) outputs. This line-operated, transistorized, RC oscillator is said to deliver a low distortion sine wave or square wave, with 50 ns rise and fall time, in the frequency range from 10Hz to 1MHz.



Thermistor stabilization in conjunction with negative feedback is said to achieve a good waveform, good stability (better than 0.1%) and signal amplitude uniformity within ±db (ref. 1kHz) over the entire frequency range without resetting the level control. Three outputs are provided direct,

with an impedance of 10 Ω in series with 1000 μf for sinusoidal output voltages to 5v and currents to 100ma. The generator is said to have attenuated 50 and 600 Ω outputs for sine and square waves up to 1v RMS (P-P for square waves) in monitored ranges of 1v, 100mv, 10mv and 1mv full scale. Noise and hum are less than -60db and power consumption is 20va. according to the manufacturer. London.

Amplifier Equalizer 725

A new amplifier equalizer which combines a microphone preamplifier and equalizer into one unit is announced. The model AE20 unit is designed for individual microphone channel

use. The preamplifier portion is said to have a low noise transformer input stage with variable gain switching of 20, 40 and 50db. The equalizer employs a bridged tee notch filter switched from the feedback loop to the input for boosting or dipping at the selected frequency.

Other features include four low and four high frequency selectable equalization points, up to 10db boost or attenuation in 2db steps at the selected frequencies, independent switchable fixed roll-off at high and low frequency extremes, and strip size. Melcor.

Soldering Iron Tip Cleaner 726

Announced is a rotating soldering iron tip cleaner which, it is said, will remove burned-on flux and solder residues from soldering iron tips in one pass over a wet cellulose sponge. Because of its rotating action, residues deposited on the sponge when the tip is cleaned are dropped into the base, keeping sponge clean. Rotation of the sponge through the base water reservoir keeps sponge wafers uniform, thoroughly wetted and distributes

wear over the entire surface, eliminating cratering and gouging of the sponge. Chilling action of the wet sponge on the tip surface is said to have no practical effect on tip temperature, but creates thermal stress in residues causing oxides to crack and making them easy to remove by gentle wiping action without de-tinning the tip. Special acid-free, non-toxic sponge material has a fine porosity suitable for both regular and miniature tip cleaning, it is said. A special feature of the Plato tip cleaner is its heavy, non-corrosive, non-combustible vitrified porcelain base. Contamination of the tip caused by accidental touching against plastic type sponge holders is completely eliminated. Price $2.75. Plato.

CB Transceiver 727

A 23-channel CB transceiver has been designed for base station and mobile operation. The Courier 23 includes a full-time range-expand and modulation sampler. The unit has 23 crystal-controlled channels, dual conversion, built-in 12v transistor

power supply, single-knob tuning, illuminated S-RF meter and channel selector. Other features include a PA system, adjustable noise limiter, covered plug-in relay, squelch control, triple-plated chrome cabinet and stainless steel front panel. The unit is complete with crystals for all 23 channels. Price $189. Courier.

Driver Speaker 728

A new driver speaker is announced. Suitable for use in theaters, auditoriums, factories, gymnasiums, airport terminals and restaurants, this "theater type" driver speaker has been designed for high level music, speech

reinforcement and paging systems. The 288D may be used with any of the Altec multicellular horns and is said to provide a response from 500Hz to 16kHz. It has a 16 Ω impedance and is therefore adaptable to all existing Altec power amplifiers. Altec Lansing.

Socket Set 729

A 15-piece set of ¼ in. drive sockets, handles and accessories designed for electronic and appliance assembly and repair is introduced. Set No. 30115 features the super-close-acting

ratchet plus 11 thin-wall sockets, ¼ through ½ in. Also included are a 2in. extension and 6in. spinner handle. All components are double-nickel chrome-plated and plastic-sealed in a compartmentalized tray contained in a metal box 6-½ in. long. The assortment is one of four new ¼ in. drive sets offered. Suggested price $13.25. Kraeuter.

Portable 12.5MHZ Counter 730

Announced is a model 114 frequency counter. Frequency measurement is made directly to 12.5MHz. The readout includes four digits (5th and 6th optional), an auto-positioned decimal point, a "kHz" annunciator,

and display storage is said to assure error-free readings. Accuracy of readings is said to be ± 1 count ± power line frequency. For applications requiring greater precision, an optional crystal oscillator can be included. Construction of the counter features a single PC board with integrated circuits and other solid-state components mounted together with the readout indicators. Without the tilt stand the unit weighs 5 lb. and measures 3¼ in. high x 7in. wide x 8½ in. deep. Recommended sales price is $395. Concord.

For more information on these
NEW PRODUCTS
See pages 87 & 88
READERS SERVICE

. . . for more details circle 106 on postcard

ET/D NEWS OF THE INDUSTRY

Diamond Power Names CCTV Dealer in North-Central New York

W. G. Brown Sound Equipment Co., 521-527 E. Washington St., Syracuse, N.Y., is named by Diamond Power Specialty Corp. as a distributor of its closed-circuit television equipment and video tape recorders in Syracuse, Utica, Auburn and Rome, N.Y.

Brown specializes in setting up CCTV systems for educational, medical, commercial, municipal, state and federal organizations. As a Diamond Power dealer, the company will cover 14 counties in north-central New York state.

Diamond Power is a subsidiary of the Babcock & Wilcox Co.

Bowen Central Regional Manager For General Electric Radio Dept.

R. E. Bowen, central regional manager for General Electric's radio receiver department is named manager of field sales and independent distribution, with offices in Chicago, Ill.

Mr. Bowen will be responsible for all district sales representatives selling to independent distributors of the radio receiver department.

He was TV sales manager of General Electric's distribution sales operation, Cincinnati, Ohio, and held various district representative sales positions in Cincinnati and San Francisco with the radio receiver department.

Motion Picture Introduces Young Men To Electronics

"So You Want To Be an Electronics Technician," is a promotional film produced in association with the National Alliance of Television and Electronic Service Assn., (NATESA), the National Electronic Assn., Inc. (NEA) and De Vry Institute of Technology, a subsidiary of Bell & Howell. Said to be the latest and most authentic in this subject area, the film shows the important role of electronic technicians in the world in which we live. It gives a broad overview of the field, sets forth the requirements a student should have and reveals the opportunities for the young viewer in such areas as servicing, manufacturing and maintenance. It suggests the status and income which accompany this occupation and the many opportunities for advancement.

FTC Orders Dealer To Stop Using 'Bait' Ads

A final order issued by the Federal Trade Commission requires a Washington, D. C., retailer of TV sets and TV, radio and phono combinations to stop using bait advertisements, false offers of free merchandise and other deceptive sales practices.

The FTC's order cites Lawrence TV Corp., 5832 Georgia Ave., N. W., and George Harris, the concern's manager.

In taking this action, the commission adopted an initial decision by hearing examiner Eldon P. Schrup. The examiner's decision had not been appealed.

A news release summarizing the initial decision was made public last March 9, and is available from the Office of Information, Federal Trade Commission, Washington, D. C. 20580.

Satellite ETV System Developed

Educational TV programs for millions of the world's population could be sent by satellite and received by antennas similar to the 25ft. dish atop Hughes Aircraft Co's. space systems division building in El Segundo, Calif. And it could be done right now in countries such as India or Mexico at a cost of only pennies per student per year, Philip A. Rubin, Hughes scientist, told members of a satellite communications conference in San Francisco recently. Rubin holds a small model of one of eight Hughes synchronous satellites which collectively have accumulated more than 18 years of operation in space since the first Syncom satellite was put into orbit in July 1963.

NEWS OF THE INDUSTRY

Norelco Opens 13th Service Center in Denver

Broadening its national dealer-consumer service program, North American Philips Co. announces the opening of its 13th Norelco Service Center in Denver, Colo., to serve the mountain states area.

Richard Q. Kress, vice president of North American Philips and president of Norelco Service, Inc., announced the appointment of Clay Longwell as manager of the new service center located at 709-16th St. Mr. Longwell is an eight-year veteran of Norelco's service organization.

Tropical Radio Telegraph Co. To Become Subsidiary of RCA Communications, Inc.

An agreement in principle under which Tropical Radio Telegraph Co., a wholly owned subsidiary of United Fruit Co., will become a wholly owned subsidiary of RCA Communications, Inc., a subsidiary of RCA, is announced.

Organized in 1913, Tropical furnishes commercial telegraph and telephone services principally with Central American points and serves as overseas correspondent of RCA Communications in Honduras, Nicaragua and Panama.

It is reported that the transaction will involve the exchange of the Tropical common stock for 150,000 shares of RCA common stock.

An application for authority to transfer control of Tropical to RCA Communications will be submitted to the FCC in the near future.

Upon final approval, Tropical will become a wholly-owned subsidiary of RCA Communications and will continue to function as a separate entity under its own board of directors and its present management.

RCA's Information Systems Division Names Three New Division Vice Presidents

Appointment of three new division vice presidents in the marketing department of RCA's information systems division is announced by E. S. Mc Collister, division vice president, marketing:

Edward F. Kearns, formerly Western regional manager, to the new post of division vice president, marketing programs.

James P. Boyle, formerly Northeastern regional manager, to the new position of division vice president, Northeastern region.

James N. Landon, formerly Eastern regional manager, to the new position of division vice president, Eastern region.

In his new position Mr. Kearns will be responsible for product marketing, industry marketing and education and systems support with offices at the division's Cherry Hill, N. J., headquarters.

Mr. Boyle will continue to be responsible for two sales offices and the Wall Street systems center in New York City as well as offices in Hartford, Newark, Syracuse and Boston. His area includes northern New Jersey and New York, Connecticut, Rhode Island, Massachusetts, Maine, Vermont and New Hampshire.

Mr. Landon is responsible for marketing in the middle Atlantic and Southeastern states and Puerto Rico. His area includes district offices in Philadelphia, Pittsburgh, Washington, D. C., Charlotte, N. C., Atlanta, Miami and Tallahassee, Fla.

ET/D CATALOGS & BULLETINS

Tools 400

A 66-page catalog called "Tools for Electronic Assembly and Precision Mechanics" is of particular interest to electronic technicians, engineers, scientists and instrument mechanics working on fine assemblies. Over 1700 individual items are offered and described in the new catalog. Section headings include screwdrivers, wrenches, pliers, tweezers, files, shears, watchmakers tools, knives, microtools, relay tools, tool kits, drills, wire strippers, soldering irons, solder, lighting equipment, optical equipment and miscellaneous apparatus. Another feature of the catalog is the inclusion of four pages of technical data on tool selection. Jensen.

Test Instruments 401

A 16-page test equipment catalog is available giving complete operating specifications and prices for equipment serving the needs of industrial electronic and electrical testing. The catalog includes such areas as radio and TV servicing, communications, automotive, air conditioning, refrigeration and heating. Simpson.

Electronic Products 402

This 300-page catalog contains detailed product information, specifications and up-to-date prices on a wide variety of electronic equipment and supplies. It is indexed by product and manufacturer. The illustrated catalog has the added convenience of an industrial tube cross reference. Audio, high fidelity and service-oriented product listings supplement the comprehensive selection of industrial products. Fortune.

Britener Selector Charts 403

A color britener selector chart and an updated selector chart for B/W picture tubes have been announced. The selector chart for color briteners identifies the 13 color tube numbers of the small shell neodiheptal (round type) tubes and 37 color tubes of the small button diheptar (rectangular type). The chart also indicates the proper britener for each type of tube, for both britening and isolation applications. Perma-Power.

Marine Radio Communica/ 404

A folder explains the differences between low frequency, single sideband, citizens band and VHF/FM radios and answers the question raised by boatmen in the wake of the rule changes agreed upon at the recent international radio-telephone conference at Geneva. Fine for promoting marine electronic equipment sales. Raytheon.

Components and Accessor/ 405

A chart lists wire cable tubing, electronic hardware, switches, TV-radio accessories and components. Birnbach.

Soldering 406

A four-page bulletin covering how to solder materials considered difficult or impossible. The technique permits soldering magnesium, aluminum, beryllium, stainless steels, refractory metals such as titanium, tantalum and tungsten, even carbon, glass and plastics. Various actual applications are described and illustrated. Selectrons.

Video Tape Recording 407

A series of quarterly bulletins, covering subjects unique to video tape users, is announced. Called "Video Talk," the series deals with a variety of subjects pertinent to both the professional and helical video tape recording fields. The initial issue covers the subject of "Video Tape Speed." 3M.

Solid-State Products 408

A 68-page, two-color catalog describes a solid-state product line of sweep generators, attenuators, detectors, coaxial switches, portable oscilloscopes and impedance plotters as well as instruments for TV, VHF, UHF. Physical and electrical characteristics, applications, general sweep generator techniques, charts covering frequency vs. VSWR, frequency vs. db, block diagrams and outline drawings are included. Texscan.

MATV Systems 409

A 23-page pocket-sized booklet contains information on designing and installing MATV systems. JFD.

Panel Meters 410

A catalog gives complete details on over 1400 stock sizes and types of panel meters capable of meeting the broadest demand for style and performance. Products featured include seal contactless meter relays, contact type meter relays and pyrometers and low-height designer series meters. Mounting specifications and a table of stock meter characteristics and accuracy tolerances is included. Simpson Electric.

Couplers/Splitters 411

A six-page folder describes a line of indoor and outdoor TV/FM antenna splitters and couplers. GC Electronics.

ET/D AD INDEX

REVOLUTIONARY NEW FIRST FROM KAY-TOWNES

The COLOR-TUNED Family of Antennas

CT-34G
UHF-VHF

IT'S "COLOR-TUNED"

AN ENTIRELY NEW CONCEPT IN ANTENNA DESIGN!

Most conventional UHF-VHF combination antennas use the "pass through" coupling system. The VHF signals pass through the UHF antenna, acting as a section of the transmission line. The presence of the UHF elements attached to this transmission line results in a line mismatch at various VHF frequencies. The resulting standing waves are detrimental to color reception.

Kay-Townes new "Color-Tuned" concept obsoletes the old "pass through" system. The high gain, nine driven element UHF antenna is coupled to the VHF portion in a manner that actually tunes the VHF section. The antenna features a double stub UHF trap to assure 100% isolation, resulting in a no-loss coupling of the two systems to a single transmission line. A corner reflector doubles as a high gain UHF reflector and a broad, high band, high gain director on VHF channels 7-13 and reduces the space loop losses in both bands.

NOW — RECEIVE TRUE COLOR AS IT IS TRANSMITTED!

KAY-TOWNES ANTENNA COMPANY
Box 593 Rome, Ga. 30162

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Come and get it!

The RC-26 is the biggest and best receiving tube manual in the industry! Newly revised and updated, it now has 656 pages of vital data... information on the complete RCA line of home-entertainment receiving tubes, color and black-and-white picture tubes, voltage-regulator tubes and voltage-reference tubes... expanded Circuits Section featuring several circuits that illustrate the various stages of a complete color-television receiver ...extremely handy Applications Guide... Technical Data section with comprehensive data and curves for all active RCA receiving tubes.

See your RCA Distributor today for your copy of the RC-26. It's the best yet.

Be sure to ask your customers "WHAT ELSE NEEDS FIXING"?

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