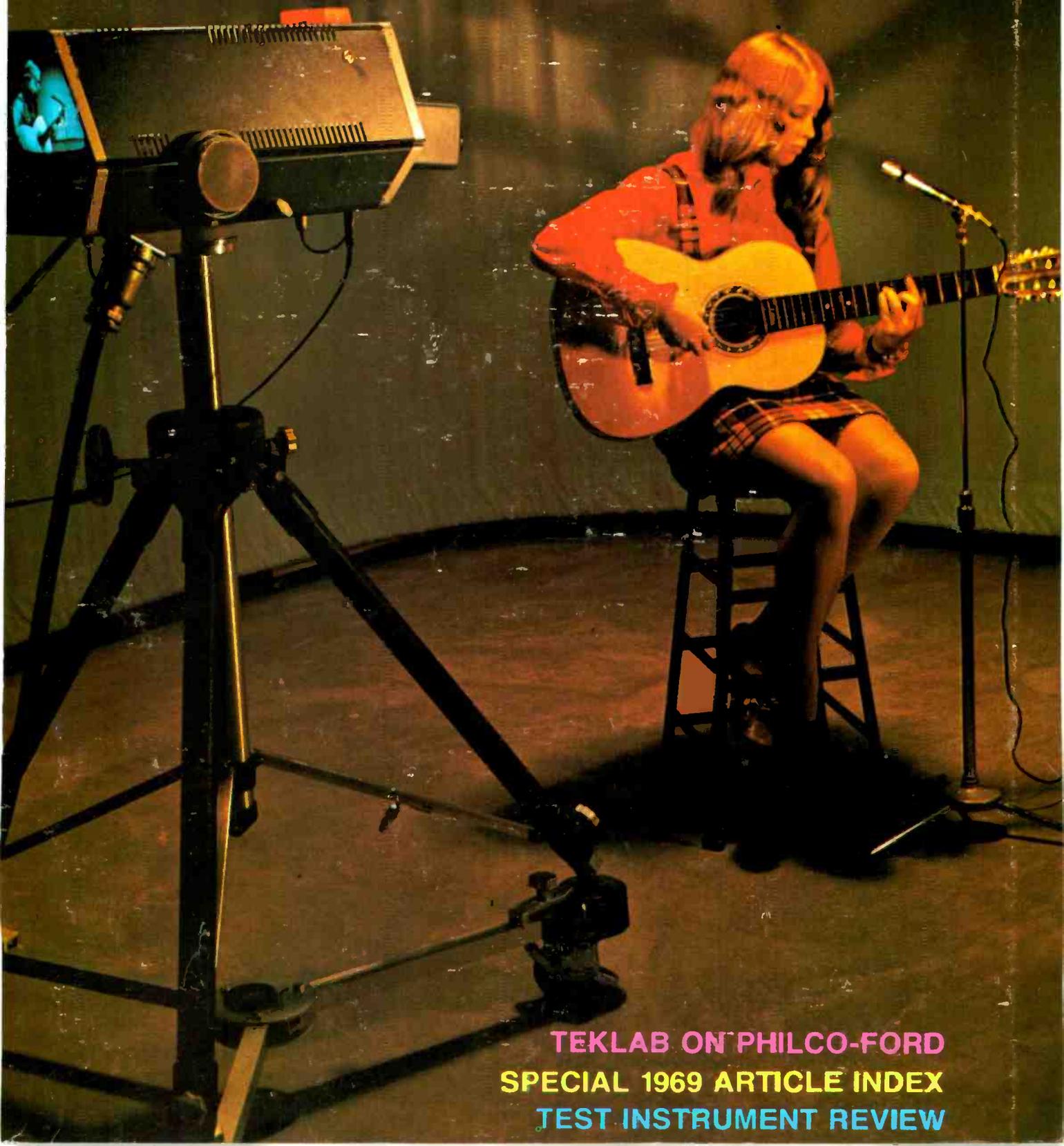


ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

DECEMBER 1969  A HARBRACE PUBLICATION



TEKLAB ON PHILCO-FORD
SPECIAL 1969 ARTICLE INDEX
TEST INSTRUMENT REVIEW

The first and only solid-state test equipment guaranteed for 5 years.

Now EICO, because of its emphasis on *reliability* in engineering and manufacture, offers the industry this breakthrough.

EICO's new line of solid-state test equipment comes with an unprecedented 5-year guarantee of performance and workmanship. (Send

for full details of this EICO 5-year GUARANTEE on factory-assembled instruments.)

Additional advanced features include: new functional design, new color-coordinated esthetics, new PC construction, new easier-to-build kit designs.

New EICO Solid-State Test Equipment



EICO 240 Solid-State FET-VOM \$59.95 kit, \$79.95 wired.

One all-purpose DC/AC OHMS Uniprobe®. Reads 0.01V to 1 KV (to 30 KV with optional HVP probe). 7 non-skip ranges, in 10 dB steps. AC or battery operated. RMS & DCV: 0-1, 3, 10, 30, 100, 300, 1000V P-P ACV: 0-2.8, 8.5, 28, 85, 280, 850, 2800V. Input Z: DC, 11 M; AC, 1 MΩ. Response 25 Hz to 2 MHz (to 250 MHz with optional RF probe). Ohmmeter reads 0.2 to 1 MΩ in 7 ranges. 4½" 200 μA movement. HWD: 8½", 5¾", 5". 6 lbs.

EICO 242 Solid-State FET-TVOM \$69.95 kit, \$94.50 wired.

All the versatility of the EICO 240 plus: AC/DC Milliammeter, 1 ma to 1000 ma in 7 non-skip ranges; single all-purpose DC/AC-Ohms — MA Uniprobe®; and large 6½" 200 μA meter movement.

EICO 150 Solid-State Signal Tracer \$49.95 kit, \$69.95 wired.

Multi-purpose troubleshooter for TV/FM/AM & Audio Equipment. Independent RF Audio inputs. Speaker and meter output indicators. 400 mW continuous power output. Substitution amplifier, output transformer, speaker. Input for rated output: 1 mV RF, 63 mV audio.

Hum 60 dB below 400 mW, 105-132 VAC, 50/60 Hz, 5VA. HWD: 7½", 8½", 5". 6 lbs.

EICO 330 Solid-State RF Signal Generator. \$59.95 kit, \$84.50 wired.

5 fundamental bands 100 kHz to 54 MHz. Vernier control 0-100%. Output 300,000 μV into 50-Ohm load. External signal modulation or internal 400 Hz, 0 to 100%. 105-132 VAC, 50/60 Hz, 1.7 VA. HWD: 7½", 8½", 5". 5 lbs.

EICO 379 Solid-State Sine/Square Wave Generator. \$69.95 kit, \$94.50 wired.

5 sine wave and 4 square wave bands. Low distortion Sultzer feedback FET circuit. Sine: 20 Hz to 2 MHz; 0-7.5V rms into hi-Z, 0-6.5V into 600 ohms Max. distortion 0.25%. Square: 20 Hz to 200 kHz; 0-10V p-p into hi-Z, pos. direction, zero ground. Rise time at 20 kHz less than 0.1 μsec. 105-132 VAC, 50/60 Hz, 10VA. HWD: 7½", 8½", 8½". 9 lbs.

New EICO High Performance Instruments



- EICO 385 — Solid-State Portable Color Generator \$79.95 Kit, \$109.95 Wired.
- EICO 465 — Wideband Vectorscope/Oscilloscope \$179.95 Kit, \$249.95 Wired.
- EICO 1025 — Solid-State Power Supply \$34.95 Kit, \$49.95 Wired.
- EICO 443 — Semiconductor Curve Tracer \$69.95 Kit, \$99.95 Wired.
- EICO 633 — CRT Tester & Rejuvenator \$69.95 Kit, \$99.95 Wired.
- EICO 635 — Portable Tube Tester \$44.95 Kit, \$69.95 Wired.

New EICO Probes for the Pros

Hi-Voltage Probe HVP-5, Wired \$19.95.

Convenient built-in voltmeter. Barrier sections isolate HV tip from handle and meter. Measures up to 30 KV. Lightweight, compact.

Solid-State Signal Injector Probe PSI-1, Kit \$5.95, Wired \$9.95.

Pen-size, 1-ounce, self-powered signal generator. Frequency range from 1kHz to 30MHz, with harmonics. Clip it to your pocket — ideal for signal tracing in the field.

Solid-State Signal Tracer Probe PST-2, Kit \$19.95, Wired \$29.95.

Flashlight-size, 2.2oz, self-powered. Hi-gain amplifier, 50Hz to 200MHz with demod tip. Input Z: 3500Ω, 35KΩ, 350KΩ; Output: 0.3 p-p volts. Noise —45dB. Distortion <5%. Complete with earphone, all probe tips, AA battery, pocket clip.



SEND FREE 1970 CATALOG

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EICO Electronic Instrument Co., Inc.
 283 Malta Street, Brooklyn, N.Y. 11207
 EICO Canada Ltd.
 20 Millwick Drive, Weston, Ontario

... for more details circle 113 on Reader Service Card

TEKFAX

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



SCHEMATIC NO.		SCHEMATIC NO.	
ELECTROHOME	1268	PHILCO-FORD	1267
Color TV Chassis C6		TV Chassis 20P24	
GENERAL ELECTRIC	1265	RCA VICTOR	1269
TV Chassis ETV A1		TV Chassis KCS176 Series	
MAGNAVOX	1266		
TV Chassis T945 Series			

COMPLETE MODEL/CHASSIS INDEX FOR ALL CIRCUIT DIGESTS AND TEKFAX FROM JANUARY 1961 THROUGH DECEMBER 1969

MONTH IN WHICH SCHEMATIC APPEARS

607-613	Jan. 1961	829-833	Jan. 1964	1055-1060	Jan. 1967
614-620	Feb. 1961	834-838	Feb. 1964	1061-1067	Feb. 1967
621-627	Mar. 1961	839-843	Mar. 1964	1068-1073	Mar. 1967
628-633	Apr. 1961	844-850	Apr. 1964	1074-1080	Apr. 1967
634-636	May 1961	851-853	May 1964	1081-1086	May 1967
637-643	June 1961	854-858	June 1964	1087-1092	June 1967
644-650	July 1961	859-863	July 1964	1093-1098	July 1967
651-656	Aug. 1961	864-870	Aug. 1964	1099-1104	Aug. 1967
657-662	Sept. 1961	871-875	Sept. 1964	1105-1110	Sept. 1967
663-669	Oct. 1961	876-881	Oct. 1964	1111-1116	Oct. 1967
670-675	Nov. 1961	882-887	Nov. 1964	1117-1122	Nov. 1967
676-680	Dec. 1961	888-893	Dec. 1964	1123-1127	Dec. 1967
681-686	Jan. 1962	894-900	Jan. 1965	1128-1133	Jan. 1968
687-692	Feb. 1962	901-908	Feb. 1965	1134-1139	Feb. 1968
693-698	Mar. 1962	909-916	Mar. 1965	1140-1145	Mar. 1968
699-705	Apr. 1962	917-923	Apr. 1965	1146-1151	Apr. 1968
706-709	May 1962	924-926	May 1965	1152-1157	May 1968
710-716	June 1962	927-934	June 1965	1158-1163	June 1968
717-723	July 1962	935-942	July 1965	1164-1169	July 1968
724-729	Aug. 1962	943-950	Aug. 1965	1170-1175	Aug. 1968
730-735	Sept. 1962	951-953	Sept. 1965	1176-1181	Sept. 1968
736-743	Oct. 1962	954-961	Oct. 1965	1182-1187	Oct. 1968
744-749	Nov. 1962	962-969	Nov. 1965	1188-1193	Nov. 1968
750-755	Dec. 1962	970-975	Dec. 1965	1194-1198	Dec. 1968
756-761	Jan. 1963	976-982	Jan. 1966	1199-1204	Jan. 1969
762-766	Feb. 1963	983-988	Feb. 1966	1205-1210	Feb. 1969
767-772	Mar. 1963	989-995	Mar. 1966	1211-1216	Mar. 1969
773-779	Apr. 1963	996-1001	Apr. 1966	1217-1222	Apr. 1969
780-784	May 1963	1002-1009	May 1966	1223-1228	May 1969
785-790	June 1963	1010-1015	June 1966	1229-1234	June 1969
791-797	July 1963	1016-1022	July 1966	1235-1240	July 1969
798-805	Aug. 1963	1023-1028	Aug. 1966	1241-1246	Aug. 1969
806-811	Sept. 1963	1029-1035	Sept. 1966	1247-1252	Sept. 1969
812-817	Oct. 1963	1036-1041	Oct. 1966	1253-1258	Oct. 1969
818-822	Nov. 1963	1042-1047	Nov. 1966	1259-1264	Nov. 1969
823-828	Dec. 1963	1048-1054	Dec. 1966	1265-1269	Dec. 1969

SCHEMATIC NO.	SCHEMATIC NO.	SCHEMATIC NO.	SCHEMATIC NO.			
ADMIRAL	404115-3	883	GTC-3914A	847	PTV-19	848
Chassis:	4G840-1	936	GTC-3944A	847		
C21B12-1, 1AG, 1AS, 1HR,	4G841-1	936	GTC-3954A	847	DUMONT	
1N, 1R, 1C	4G845-1	936	GTC-4015A	909	Chassis:	
C21B13-1	4H5	1152	GTC-4415A	909	120508-B Stereo Amp	733
C21B15-1, 1AG, 1AS	7D43-1	873	GTC-4445A	909	120591A	709
C21C15-1, 1AG, 1AS	7D413-1	873	GTC-4455A	909	120592B	709
C21C12-1AG, 1AS, 1C	8D4	883	GTC-4914A	847	120593A	709
D4	8D418-1	883	GTC-4944A	847	120800A	883
D11	8G4	944	GTC-4954A	847	120801A	883
D42-1	8G423-1	944	GTM-1583A	784	120822A	802
D44-1, 2, 4	9D410-1	883	GTM-1827A Clock Radio	814	120823B	802
D81-1, 2, 4	9D412-1	883	GTM-2583A	784	120833 Series 900	758
D412-1	9G4	944	GVC-9019A Reverb	800	120644A	802
D414-1, 2, 4	9G410-1	944	WG-1883A	748	120677A	813
D415-1	9G413-1	944	WG-2313A AM/FM Console	778	120678B	813
D410-1, 2, 4	9G416-1	944	WG-2343A	778	120679A	813
D810-1, 2, 4	15H1	800	WG-2373A BB	778	120684A	813
D781-1	16A4D, C	823	WG-2343B	778	120688A	802
D1180-2, 8	18A9, U	857	WG-2373B	778	120689A	813
D1181-2, 8	18B4C	823	WG-2683A	748	120699	888
D4117-1	18UA4D, C	823	WG-2785A	888	120706	878
G2	18UB4C	823	WG-4225A	820	120712	894
G3	18D8B	888	WG-4234A	894	120722	891
G4	1988B	888	WG-4325A	820	120725	878
G5, 2G5, 3G5, 5G5,	19K3U	816	WG-4334A	894	120760	882
7G5, 9G5	19M3U	816	WG-5220A	655	120783	882
G6	19R3U	816	WG-5226A	655	120804A, B	1071
G7 Series	19T3U	816	WG-5230A	655	120805A, B	1071
G11	19U88B	888	WG-5320A	655	120806B	1071
G13 Series	19UD8B	888	WG-5326A	655	120807A, B	1071
G61-2	20A7, B	844	WG-5330	655	120810	982
G310-1, 4	20A7	644	WG-8050B	713	120827-A	1025
G338-1	20B7	644	WG-8051B	713	120846-B	1026
G418-1, 5	20C7	644	WG-8052B	713	120847-B	1025
G417-1	20A47B	844	WG-8150B	713	120856A, B	1058
G422-1	24A2	808	WG-8152B	713	120857A, B	1058
G610-2, 3	24B2	808			120926, 28	1230
G612-1	24C2	808	ANDREA			
G613-1	24D2	808	Chassis:		ELECTROHOME (CANADA)	
G617-2	24UA2	808	VT119	830	Chassis:	
G618-4	24UB2	808	VTT323-5	818	C8	1185
G620-1, 2, 3, 4, 6	24UC2	808			M4	1188
G1181-2, 3	24UC2	808	AUTOMATIC RADIO		M6	1188
H1-1A, H2-1A	24UD2	808	Auto Radio 1959, 1960 Chev	830	M10	897
H3-1A, H4-1A, 1H4-2A	24UE2	808			CHT-213-811	897
H10			CORONADO		Model:	
H12, 1H12			Chassis:		Beaucourt	841
K15			1078-233, 243	786	Chancellor	841
T3K4-1A, T3K4-1B			1078U233, 243	786	Kalmar	726
TG2-1			10-118-254, -254U	847	Kimberly	726
TH3-1A, TH4-1A, T2H4-1A,			1174-184, 117U-184,		Orlando, U, CU	874
T3H4-1A, T8H4-1A			1188-184	831	Safari, U	854
T10H1 1AX			12-124-24U, 12-124,34U	909	Selkirk	817
TK2-1A			Model:		Vermont	841
D4			GEN-173A Radio	787		
D11			GEN-1225A Trans. Radio	753	EMERSON	
D1013-2			GEN-1268A	945	Chassis:	
D42-2			GEN-1868A	1003	120507A, 8B	895
D81-1			GEN-1887A	1036	120515C, 16D	895
D412-2			GEN-1887A	1081	120528 Trans Radio	824
D811-1, 2, 3, 4			GEN-1967A	902	120530C	848
D780-1			GEN-2485A	902	120541C, 42D	895
D781-1			GEN-8077A, GEN-8447A	1106	120548C	848
D11180-5			GEN-11269A	1208	1205500	848
D11181-5			GEN-11460A	1258	120549C	848
D1310-1			GEN-11489A	1202	1205508	870
D1311-1			GEN-11789B	1220	120551C	848
D1312-1			GEN-12089A	1183	120552E	848
D1312-1			GEN-12078A	1185	120553F	848
D1311-1			GEN-12349A	1183	120555E	848
D11155-1			GEN-12448A	1185	120556F	848
D4			GEN-13180A	1244	120557E	848
D2011			GEN-13188A	1146	120572C	718
D2042-1			GEN-13489A	1185	120573D	718
D2042-1			GEN-13788B	1238	120587A	870
D20412-1			GEN-17148A	1185	120588B	870
D20413-1, 3, 4			GEN-17158A	1185	120589C	870
D20414-1			GHJ-1468A	978	120593A	870
D20415-3			GHJ-1568A	978	120842-43 Chroma Board	870
D21183-1			GHJ-1788A	978	120855 Trans Radio	775
D24			GHJ-4518A	978	120864 Radio	775
D2421-1			GHJ-4548A	978	120864L Radio	775
D2424-1			GHJ-4558A	978	120871	872
D26832-1, 2			GHJ-3087A	1042	120873	872
D2G1156-1			GHJ-3387A	1042	120892A	791
D2G1157-1			GHJ-8247A	1100	120897	872
D2H5			GHJ-8257A	1100	120898	872
2H5, 3H5, 4H5, M2H5,			GHJ-14098A	1128	120702	872
M3H5, M4H5			GHJ-14148A	1128	120708	830
3011			GHJ-14158A	1128	120712	830
3D1180-1, 3, 4			GHJ-14549A	1223	120725	830
3D1181-1, 3, 4			GHJ-14829A, GHJ-14849B,		120732 AM/FM Tuner	880
3D1182-3			GHJ-14859B	1229	120740	872
3G3 Series			GHJ-17949A, 59A	1189	120743	872
3G811-1			GMW-1447A	1088	120744	872
3G1155-2, 3			GMW-1447A	1088	120753	872
3H5			GMW-1447A	1087	120758	829
3H10, 4H10, 5H10 Series			GMW-14457A	1087	120759	829
406			GTC-1684A	831	120760	829
4011			GTC-1894A	831	120771	938
4044-3			GTC-2684A	831		
401180-7						
401181-7						

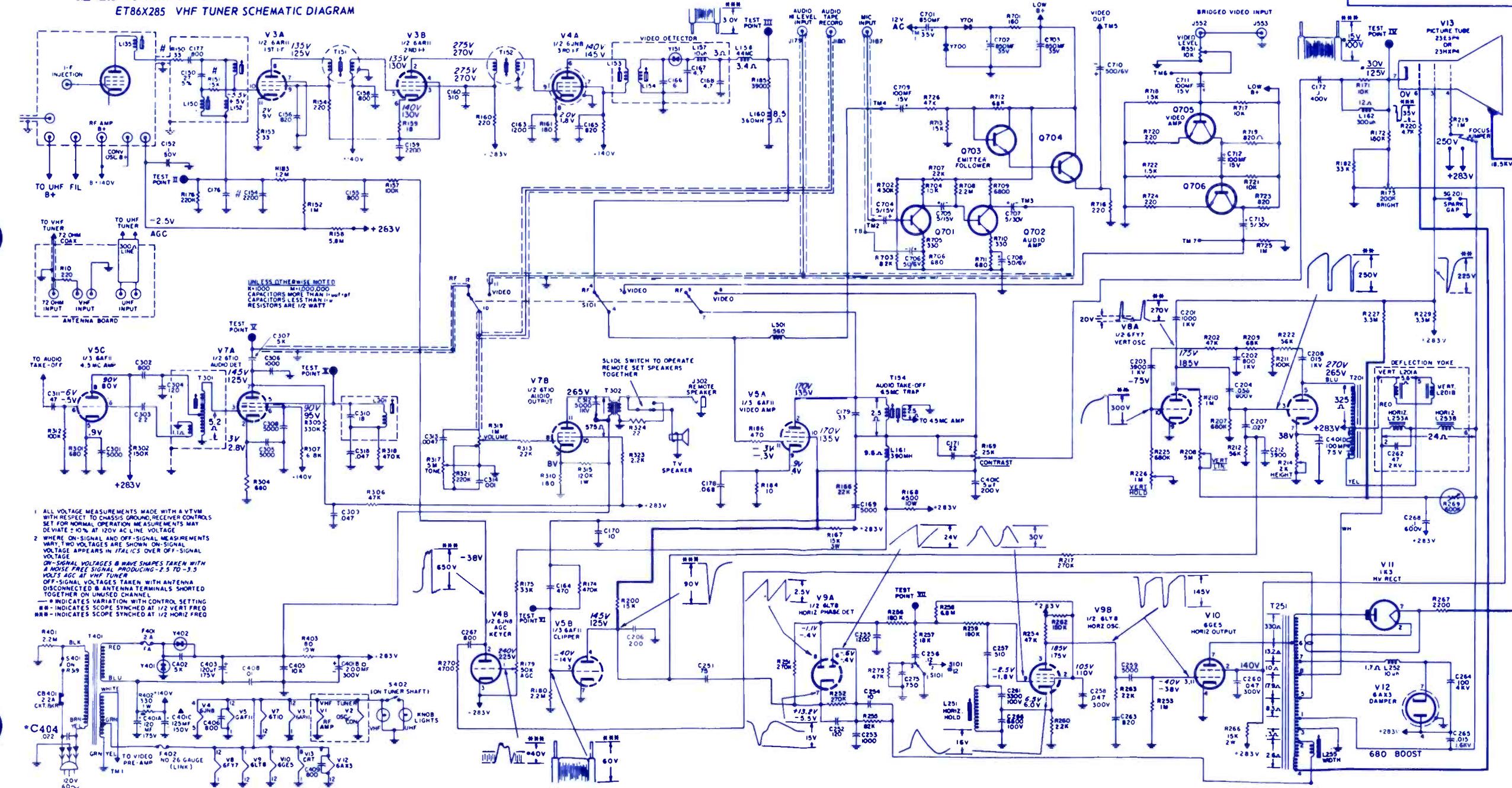
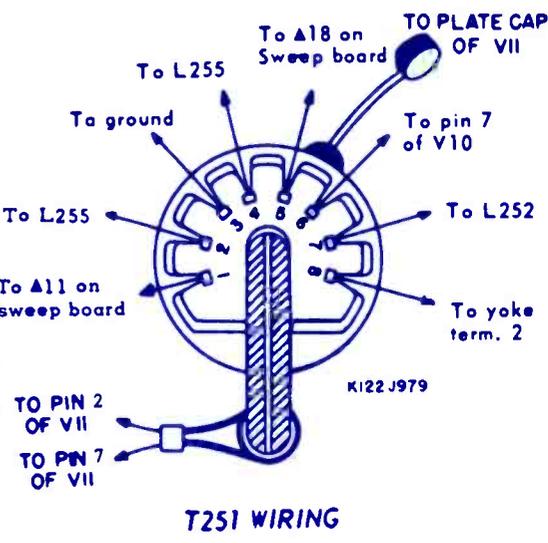
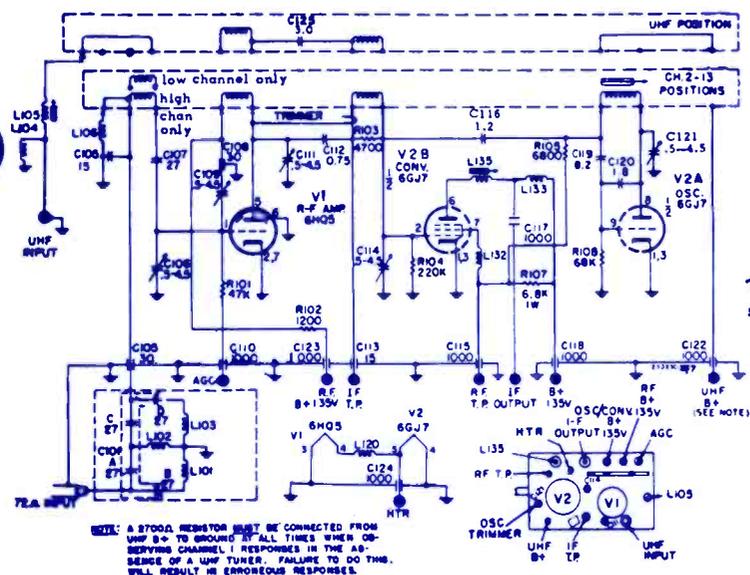
SYMBOL DESCRIPTION GENERAL ELECTRIC PART NO.

R187 - 15K, 10%, 3w glass	ET14X145
R188 - 4.5K, 10%, 10w, WW	COMMON
R289 - 800K, 25%, thermistor	ET14X192
R403 - 80Ω, 10%, 10 w WW	ET14X222
R405 - 3.3Ω, 2w, 0.75a, @ 80C fusistor	ET14X219
R189 - 25K, w/stop @ 22K, contrast	ET49X683
R173 - 200K, 20%, bright	ET49X518
R179 - 50K, 30%, AGC	ET49X871
R208 - 5M, 30%, vert lin	ET49X519
R228 - 1M, 20%, vert hold	ET49X517
R317 - dual control-1M volume	ET49X532
R319 - 5M tone, 30%, w/rotary sw S401	ET49X532
R551 - 10K, 30%, video bias	ET49X838
R802 - 10K, 30%, video level	ET49X838
C185 - 10μf, +100-10%, @175v	ET31X277
C401A - 120μf, +100-10%, @175v	ET31X289
C401B - 200μf, +100-10%, @300v	
C401C - 125μf, +100-10%, @150v	
C401D - 100μf, +100-10%, @75v	

C403 - 120μf, +100-10%, @175v	ET31X205
C284 - 100pf, 10%, 4kv, N1600	ET18X800
L150 - coil-47.25MHz trap	ET36X742
L154 - coil-video det sec	ET36X587
L251 - coil-horiz osc	ET35X51
L252 - coil-damper choke	ET36X105
L255 - coil-width control	ET38X851
L501 - coil-choke, 560μh, 7%	ET36X345
T151 - xformer-1st IF plate	ET81X158
T152 - xformer-2nd IF plate	ET81X148
T154 - xformer-audio take off & 4.5MHz trap	ET36X854
T201 - xformer-vert output	ET84X89
T251 - xformer-horiz opt	ET77X114
T301 - coil-4.5MHz interstage	ET36X778
T302 - xformer-audio	ET84X97
T401 - xformer-power	ET86X103
L201 - yoke, def	ET78X39
circbrk-2.2a, carry or hold, CB401	ET10X32
fuse-fast blo, 2a, 250v, F401	ET10X41
tuner-VHF, manual AFT	ET86X285

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December • 1969

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

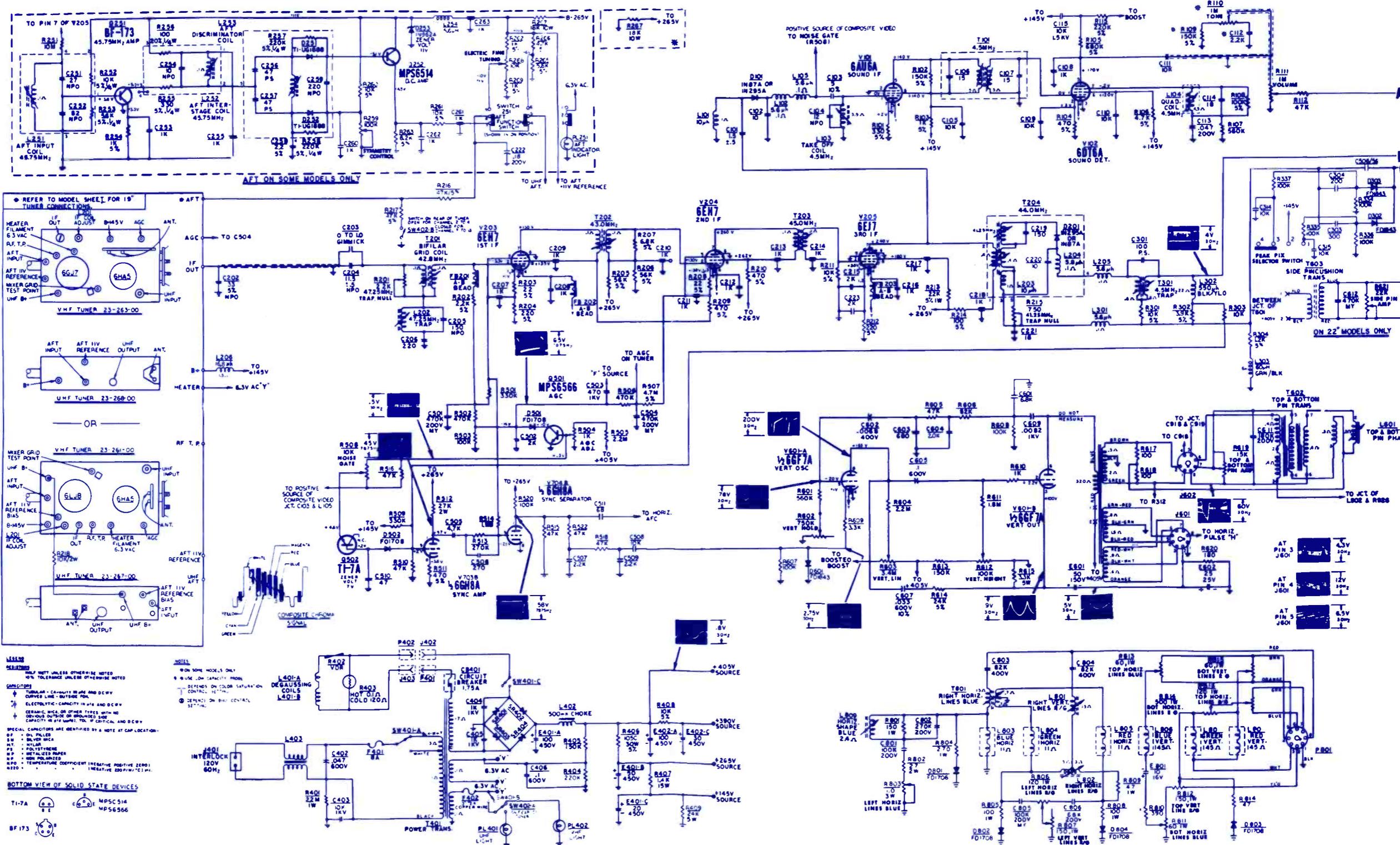
SYMBOL DESCRIPTION ELECTROHOME PART NO.

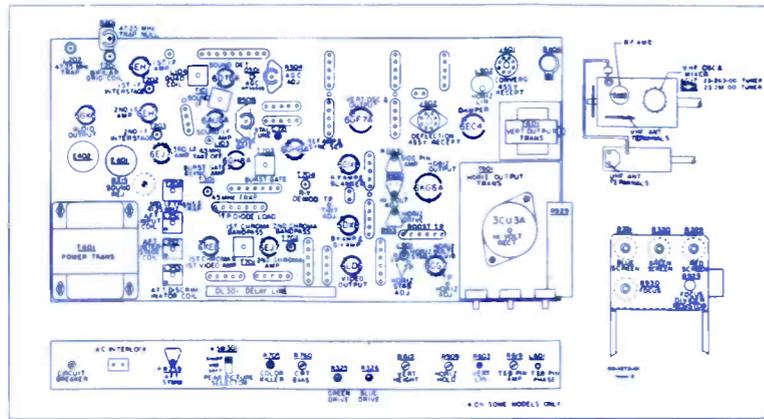
Q502 - trans T1-7A	14-515-13
Q501 - trans MPS8588	14-802-49
Q251 - trans BF 173	14-803-05
Q252 - trans MPS 8514	14-802-41
L808 - coil blue shaper horiz	21-1025-02
T703 - coil burst gate	21-1053-02
L901 - coil horiz stab	21-334-05
L104 - coil sound quad	21-1084-01
L103 - coil sound take off	21-347-02
T101 - coil sound IF xformer	21-389-01
(4.5MHz C108&107 Inc.)	

L202 - coil 47.25MHz trap (C205 Inc.)	21-1083-01
T301 - coil 4.5MHz trap	21-1000-02
L902 - coil saturable react lin	21-1055-01
DL301 - coil delay line (1.8µ sec 880Ω)	21-1054-01
L253 - coil disc	21-1040-01
L305 - peaking coil 80µh	21-314-02
L308 - peaking coil 36µh	21-314-38
L307 - peaking coil 200µh	21-314-46
L101 - RF choke 10µh	21-1400-04
L205 - RF choke 5.6µh	21-1400-03
T801 - horiz otp xformer	21-219-01
T901 - horiz otp xformer	21-220-01
L910 - def yoke	21-113-02
L403 - line choke	21-1401-01
T401 - power xformer 80Hz w/stab brkt	24-10131-01
T802 - pin cushion transf	24-14008-01
T802 - pin cushion transf	24-140004-01
T801 - vert otp xformer	24-100018-01
T102 - audio otp xformer	24-80080-02
L402 - filter choke 500mh	24-110024-10

T803 - side pinc xformer	24-140005-02
CB401 - cir brkr 1.75a	28-85-09
F401 - fuse 8a quick acting (use w/20-300010-20)	27-14-08
F402 - fuse wire line (3in. #24 copper wire)	27-18-03
SR901 - boost rec sel	28-22-19
R813 - control WW 80 (top horiz lines blu)	41-228-23
R818 - control WW 1w 120 (top horiz lines r/g)	41-228-24
R812 - control WW 1w 150 (top vert lines r/g)	41-228-25
CB401 - cir brkr 1.75a	28-85-09
R201 - control 22K ph (edj sound rej)	41-192-08
R215 - control 750ph (sound rej)	41-227-09
R504 - control 1K ph (AGC)	41-192-02
R508 - control 10K ph (noise gate)	41-192-05
R913 - control 100K ph horiz drive	41-102-08
R259 - control 100K ph (AFT symmetry)	41-192-08

R329 - control 7M (red screen)	41-227-28
R803 - control 3.4M (vert lin)	41-227-31
R812 - control 100K (vert height)	41-227-32
R780 - control 100K (CRT bias)	41-227-32
R820 - control 2.5M (HV adj)	41-227-37
R809 - control 200K (horiz hold)	41-227-34
R705 - control 2.5M (color killer)	41-227-37
R819 - control 15K (T&B pin amp)	41-227-33
R930 - control 15M (focus)	41-251-01
SG801 - focus 7kv	34-388-01
R407 - resistor 15w, 1.4K	42-41-51
R408 - resistor 30w WW 1050 (w/brkt)	42-14-13
R914 - VDR red dot	42-23-01
R932 - resistor 1w WW 4.7Ω	42-37-38
E301 - electrol 330µf, 10v	44-205-79
E401A - electrol 100µf, 450v	44-203-15
E401B - electrol 50µf, 450v	
E401C - electrol 20µf, 450v	
E402A - electrol 100µf, 450v	44-202-28
E402B - electrol 30µf, 450v	44-202-28





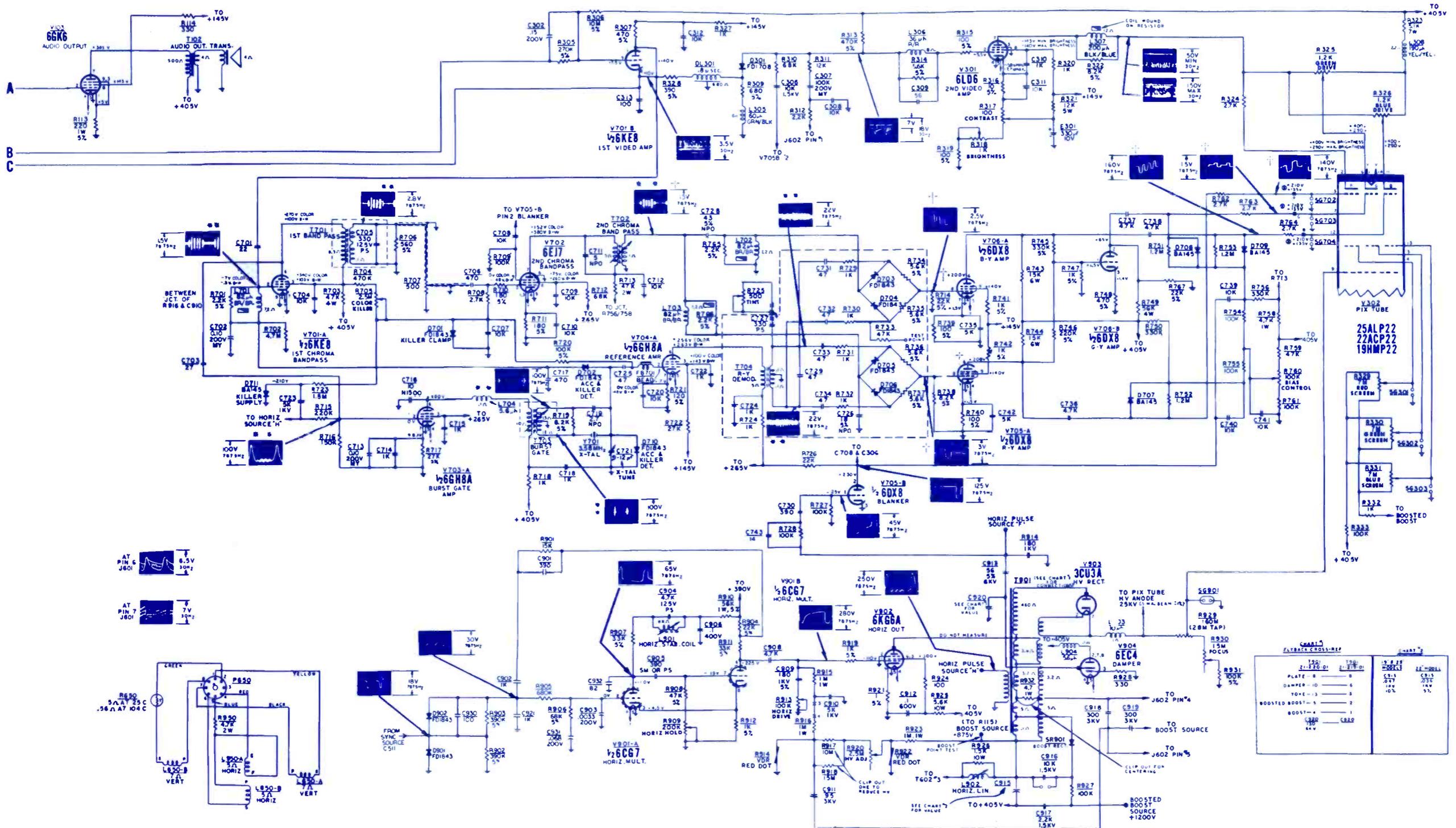
TOP CHASSIS VIEW

COMPLETE COLOR TEMPERATURE AND TRACKING ALIGNMENT

- (1) Set the blue drive R326 and green drive R325 controls to mid position.
- (2) Set the screen controls R329, R330 and R331, to center position.
- (3) Set kinescope bias control R760 one quarter turn from its maximum counterclockwise position.
- (4) Achieve a no signal, noise free raster by switching the VHF tuner between channels or by removing the 3rd IF tube.
- (5) With contrast at minimum, set the brightness control so that the raster is just visible.
- (6) Critically adjust the screen controls for a grey raster.

- (7) Advance the brightness control for normal brightness viewing. Adjust the drive controls for a white raster. If significant drive control adjustment is required here, recheck low level brightness setting and readjust screen controls if the raster is not grey.
 - (8) Brightness should now track from grey to white.
- NOTE:** It is essential that kinescope bias be reset whenever the above procedure has been carried out or picture tube damage may result.

ELECTROHOME
Color TV Chassis C6



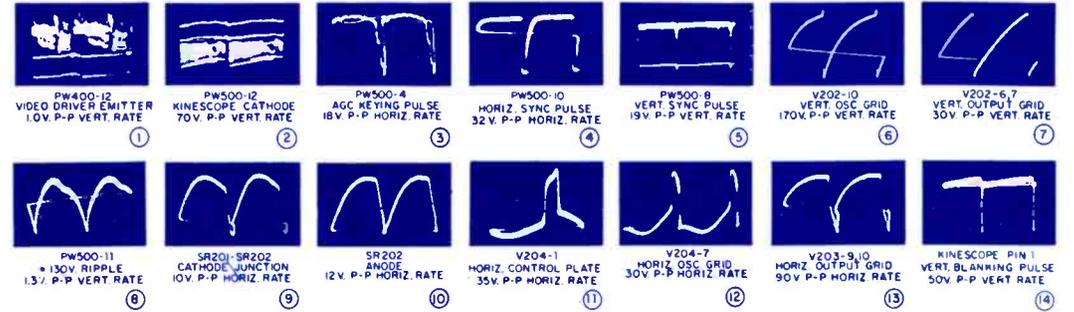
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 6 NEW SETS

December • 1969

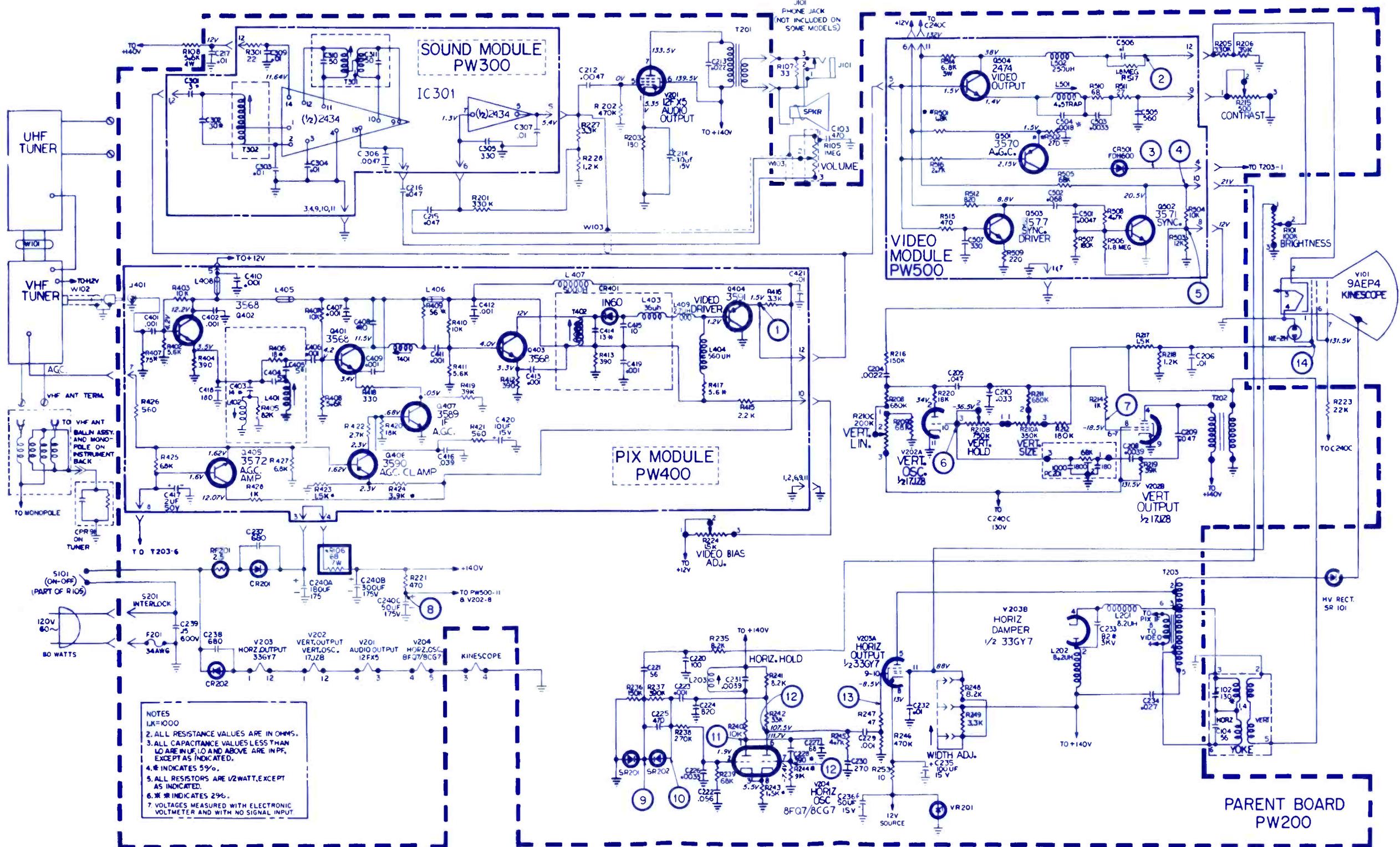
SYMBOL	DESCRIPTION	RCA VICTOR PART NO.
C240	3 section elec	128459
C240A	18µf, 175v	128459
C240B	15µf, 175v	128459
C240C	3µf, 175v	128459
IC301	circuit-integrated	126871

L202	coil-82mh	126573
L203	coil-horiz hold	125129
L403	coil-36mh	116056
L404	coil-peaking, 560mh	129705
Q401	transistor-IF	125144
Q402	trans-IF	125144
Q403	trans-IF	125144

Q404	trans-video driver	129699
Q405	trans-AGC amp	125140
Q406	trans-IF, AGC	129697
Q407	trans-IF, AGC	129698
Q501	trans-AGC	125142
Q502	trans-sync	125141
Q503	trans-sync driver	125139
Q504	trans-video output	116081
R106	resistor-68Ω, 5%, 7w, WW	129753
R210	resistor-control, vert, size, hold	128297
R215	resistor-control, contrast	128297
R224	resistor-control, video bias	128499
RF201	resistor-fuse, 2.5Ω cold	128952
T201	xformer, audio output	128473
T202	xformer, vertical output	128468
T203	xformer, horiz. output	128754
T301	xformer, det	126738
T302	xformer, sound take off	129707
T401	xformer, IF interstage	128458
T402	xformer, IF output	129706
yoke-def		128480



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NOTES
1. K=1000
2. ALL RESISTANCE VALUES ARE IN OHMS.
3. ALL CAPACITANCE VALUES LESS THAN 10 ARE IN P.F. AND ABOVE ARE IN P.F. EXCEPT AS INDICATED.
4. * INDICATES 5%.
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6. ** INDICATES 2%.
7. VOLTAGES MEASURED WITH ELECTRONIC VOLTMETER AND WITH NO SIGNAL INPUT.



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Or take our 3A3B high voltage rectifier. This one's got leaded glass for added protection. And it lasts longer too.

So next time you have to replace any of the hot ones, just cool it. You'll both last longer.

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ELECTRONIC TECHNICIAN / DEALER

WORLDS LARGEST ELECTRONIC TRADE CIRCULATION

DECEMBER 1969 • VOL. 90 NO. 6

39 TEKLAB REPORT ON PHILCO-FORD

The latest from Philco-Ford is their Model C3050TBE, 14in. color portable which our lab technicians evaluate and describe in this month's report

44 TEST INSTRUMENT-PART II

We continue our roundup of test instruments as we pick up with power supplies and follow through to FET meters with complete specifications.

56 TESTLAB REPORT ON SENCORE CG 19

This month's timely feature unveils the new Sencore Model CG19 color bar generator complete with schematics and important operating characteristics

22	EDITOR'S MEMO	64	COLORFAX
24	NEW AND NOTEWORTHY	68	NEW PRODUCTS
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30	TECHNICAL DIGEST	81	CATALOGS AND BULLETINS
58	DEALER SHOWCASE	82	AD INDEX

Cover

This month's cover depicts the gaining popularity of CCTV equipment in educational institutions as shown by the charming young guitarist being video taped for a musical learn-in at a local university.

TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • Group 208

ELECTROHOME: Color TV Chassis C6
GENERAL ELECTRIC: TV Chassis ETV A1
MAGNAVOX: TV Chassis T945 Series
PHILCO-FORD: TV Chassis 20P24
RCA VICTOR: TV Chassis KCS176 Series



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Whiz Quiz

In the October issue of ELECTRONIC TECHNICIAN/DEALER we featured an article titled the CAT Game. To refresh your memory, the article was presented as a type of quiz listing 20 questions, each with four multiple choice answers. At the end of the series of questions was a complete explanation for each of the correct answers. As a result we have been blessed with a great number of letters asking for more of the same, which we will provide. By the way, the article was written by Lambert Hunealt, a resident of Canada and a knowledgeable technician.

Next month we have another impressive line-up of goodies for think food including part two of the rotor maintenance series and the conclusion of the test instrument roundup. Following this roundup will be a complete listing of test instrument manufacturers.

Also, starting off the New Year, we plan a lab evaluation of Zenith's new color console with remote control. We have a lot of new ideas for 1970 which are sure to fire your think processes and at the same time, inject gobs of useful information.

Speaking of think food, there's an old saying that might still apply to today's generation, which says, "the reason some people get lost in thought is that it is unfamiliar territory." Fortunately, or unfortunately, depending on how you look at it, our industry is moving so fast that we don't have time to get lost. But we do sometimes tend to drift off course and the time to make corrections is before you get so far off course that a correction is almost impossible. Keep your goal in sight.



Paul H. Hunsicker

... for more details circle 130 on Reader Service Card



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Your mission . . . lead a VHF transmission line along a drainpipe, through a window and behind a radiator without having the picture self-destruct. You look in your file and summon the all-weather high performance transmission lead that handles impossible missions . . . newly engineered Channel Master 300 OHM SPECTROHM

Channel Master SPECTROHM protects a greater portion of the electrical field to give you a cleaner, sharper picture—even under impossible conditions. Our agents tested SPECTROHM against ordinary flat twin lead under drench conditions, and

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In the drizzly gloom at VHF 13, ordinary wire loses almost twice as much as SPECTROHM. At UHF 80, ordinary wire losses are 50% greater than SPECTROHM.

Under murderous squeeze conditions, SPECTROHM'S loss is 90% less than ordinary wire.

So remember . . . whenever laying lines poses intrigue, now there's a transmission impossible line.

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HIGH-VOLTAGE PROBE 700

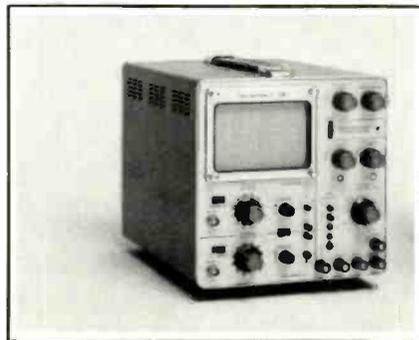
*Voltages up to 30kv
can be measured*

Announced is the HVP-5 high-voltage probe which brings a new level of convenience to servicing high-voltage circuits. The probe has a built-in voltmeter that eliminates the need for any additional equipment. Voltages up to 30kv can be measured with the new probe. Barrier sections are provided to isolate the high-voltage tip from the handle and meter sections. Lightweight and compact construction make the probe a must for TV technicians and engineers requiring accurate and rapid measurements of high-voltage circuits. The probe, designed in a modern, attractive package, is available at \$19.95. EICO.

**OSCILLOSCOPES 701**

*Solid-state design
with FET inputs*

Announced is the 54 series of oscilloscopes. This series includes the dual-trace model D54, single trace model S54A, and its companion, the S54U, which is capable of being operated from internal batteries or an external dc source as well as from the ac line. This series features solid-state design including FET inputs which are not usually available in oscilloscopes in this price range. The basic specifications of the three instruments are identical: Vertical bandwidth from dc to 10MHz. Deflection factors from 10mv/cm to 50v/cm in 12 steps, bandwidth is 10MHz at 10mv/cm sensitivity. Sweep rates from 200ns/cm to 2s/cm in 22 steps. 6 x 10cm CRT. Versatile triggering including TV line and field. The Type D54 dual-trace oscilloscope has four operating modes: Channel 1 only, Channel 2 only, Alternate and Chopped. The Type S54U can be powered from internal rechargeable Ni Cad batteries, 11.5 to 30vdc, 95 to 130 or 190 to 260vac. The S54A and D54 operate only from an ac source. Prices: S54A (shown in photo)—\$435; S54U—\$685 (including batteries); D54—\$550. Tektronix.

**TRANSISTOR TESTER 702**

*Tests all semiconductors
including FET transistors*

A low-cost tester for all semiconductors, including the new FETs, is introduced. Designated the Model 830, the unit matches efficiency and versatility, checking transistors, FETs, and other devices for critical parameters in or out of circuit, giving calibrated readings for Gm, ac and dc beta and leakage. A heavy-duty, professional grade instrument, it utilizes a large, sensitive (200 μ a) taut band meter and full-size control knobs for easy setting of function or bias levels. A big, easy-to-read meter is color-coded to match switch positions and there is also an integral voltmeter with expanded scale. The tester requires no setup books. A luggage-type carrying case with handle is standard equipment. A free modification kit is offered to all owners of earlier 830 models to update their equipment for testing FETs. List price is less than \$80. Commander.

**FOR MORE
NEW PRODUCTS SEE
PAGES 58 & 68**

Now there is a better Color-Bar Generator for your servicing work



THE RCA WR-502A

New . . . solid state . . . battery or AC operated . . . portable, weighing only four pounds.

The RCA WR-502A "CHRO-BAR" color-bar generator provides *six* separate test signals: color bars, dots, cross-hatch, vertical lines, horizontal lines, and blank raster.

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Included as part of the package — at no extra cost — is an AC adaptor for line operation. This unit was formerly available only as an accessory at a cost of \$9.00*.

The new CHRO-BAR Generator WR-502A, complete with separate AC adaptor — now only \$148.50*.

RCA Electronic Components,
Harrison, N. J. 07029.

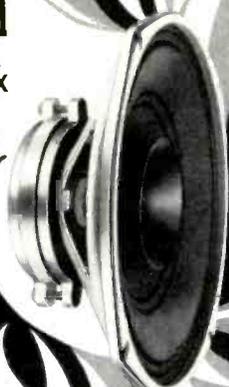
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ET/D

LETTERS TO THE EDITOR

Satisfied Reader

It appears there has been some misunderstanding concerning my letter to the editor (ETD, October 1969) in which I expressed my views on the early obsolescence of TV test equipment. I also mentioned a B&K model 700 tube tester and my belief that a section of this tester was not as advertised. I have since been assured by B&K that its tester is precisely as advertised—a complete mutual conductance tube tester.

I was not singling out B&K, but since I have used many models of B&K for many years, I could not very well mention any other brand. I have always tried to obtain first line equipment for my shop and recognize B&K as top of the line. Consequently, I felt that in the area of quality, obsolescence and the 90-day warranty, the firm should be in a position to set the standard for the industry. I anticipate purchasing the latest B&K Model 707 in the near future. To date I have had the 500, 675 and 700, so I certainly have not intended to point to B&K as a special culprit in my complaint against problems technicians have had with test equipment.

E.K. McNEIL

Hawthorne, Calif.

We were pleased to learn that B&K acted promptly on McNeil's complaint and that he has been answered to his satisfaction.....Ed.

Or Else!

As I scan your Letters to the Editor every month, I get sick of seeing you get requests for obsolete tubes and schematics for equipment that should be at the city dump. The technician complains about people watching a "clunker" but what does he do about his own test equipment?

If we were to take a TV set manufacturer's stand on usable life it would read: Color & B/W—5 to 7 years (depending on original quality), phono combination about 10 to 15 years, table radios as a tossup when unit originally cost under \$20 list, transistor radios under \$10 should be tossed and if under \$25 they should only get a fast check.

I contend that if you follow this practice, you will in the long run end up

with a happier customer, fewer headaches and more profit. Besides, you are doing the customer a favor.

After 5 to 10 years of service from a VTVM, scope or tube tester—junk it! It has served you well and paid for itself. The advantages of FET meters and improved scopes will enable you to do a better job.

We are supposed to give the customer service. This means not only fixing but advising the customer as to his set's worth. If you don't like the game, take down your sign saying electronic service and change it to "antique electronic service." It will be 1970 soon and well past the Atwater Kent days, so wake up. If you want to change the service industry, start with yourself.

A greater percentage of the successful service shops, and by that I mean the ones with satisfied, steady customers, service what they sell and many put an age limit on sets (5-7 years) on which they will work.

If you want to play with off-brands and imports, it is best to have some factory hookup like a warranty station or sales. Keep away from medical, industrial and special consumer items if you don't know them well. They have become more sophisticated lately. I can sight my own experience with electronic organs. It took me about six months before I could do the job without fumbling.

Wake up! Let's make a future for ourselves and not write our own death certificate.

R. PASELA

12 Gopojan's Trailer Park
Wallingford, Conn.

Readers' Aid

I have recently acquired a Vectron Microwave Spectrograph Analyzer Model SA-25 for which I have been unable to find a schematic or instruction sheet. The Vectron Co. which manufactured this instrument is no longer in business and I was wondering whether either you or your readers would have any information regarding this instrument. If so, I would gladly defray the cost of any information you could give me.

EDWARD D. TROPP

2118 5th Ave. SW
Great Falls, Mont. 59401

I have seen many requests for help from your readers and would like to state mine. I need a schematic and instruction manual for a Poly-Comm 2 Amateur Transceiver. I have written Polytronic Communications a number of times with no reply. I will gladly



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jacket

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How Come Dept.

Here's a black and white set owner. His receiver is in good shape.

So's his antenna. Yet, from Channels 2 to 83, he sees a lot of snow. How come?

Answer: That dirty, weathered flat twin-lead he's using.

Here's your chance to keep an old customer faithful. Or to turn a new customer into a steady one. Upgrade him to Belden 8275 Celluline lead-in. Moisture and dirt are the bugaboos of the flat twin-leads. But Celluline helps keep 'em out. And, by doing so, delivers a signal over 4 times stronger on

Channel 2 and 90 times stronger on Channel 83 (see chart).

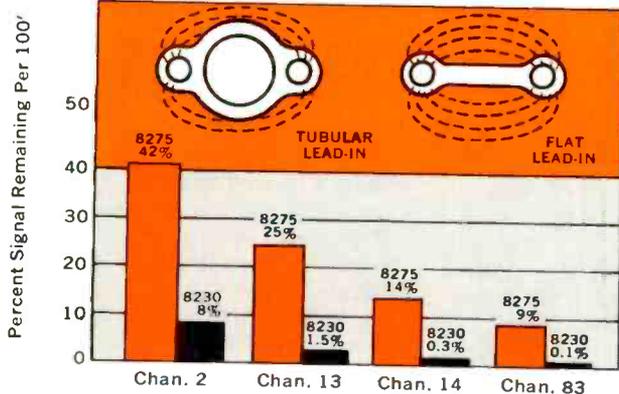
Sure, Celluline costs a couple of dollars more than flat twin-lead. But it delivers when the other's performance has gone to *#%!!!

So, upgrade your customers and keep 'em happy. Call your Belden Distributor for 8275 Celluline. He has it in 50, 75 and 100-ft. coils. And in 250, 500 and 1000-ft. spools.

If you have customers in congested, in-city areas, out on the fringes, in MATV equipped buildings—or if you're talking color—your Belden Distributor has other high-performance lead-ins that provide the right answer to these requirements.

Remember: the right lead-in is fully as important as a good antenna.

Celluline 8275 Flat Twin-Lead Catches Dirt & Moisture Between Conductors



AWG & (Stranding)	Color	Nom. O.D. (Inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100'	
					mc	db
20 (7x28)	Brown	.300	80%	4.6	100	1.05
					200	1.64
					300	2.12
					400	2.5
					500	2.98
					700	3.62
900	4.3					

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SPRAY**

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Export: Singer Products, NYC

ET/D

LETTERS TO THE EDITOR

defray the cost to get one, have a copy made of it and return it to the owner.

JIM MORRISON

242 Moreland Ave.
Twin Falls, Idaho 83301

Perhaps one of your readers could help me. I have a VOM made by Inter-Tech Instrument Corp., Model M-4100 for which I need a schematic and/or parts list. If any of your readers has the information I need, I'll be glad to pay for it or have it Xeroxed and return it to him.

DON FREDENBURG

L & D TV
Box 126
Tallman, N.Y. 10982

I need the latest chart for a Superior Instrument Co. Dynamic Tube Tester, Model 85. I also need instructions on how to use a Simpson AC VTVM Model 715. I will gladly defray the cost if one of your readers can supply me with the needed information.

JOHN HUMPHRY

685 Sterling Place
Brooklyn, N.Y. 11216

I have had a subscription to ELECTRONIC TECHNICIAN/DEALER for many years and it has helped me a great deal. I would appreciate it if one of your readers can help me locate a schematic or parts for a Zenith Super VII radio (1924) and schematics for Weston 772 VOM. Have antique radios to swap.

ROBERT A. LANE

2603 Independence Ave.
Kansas City, Mo. 64124

I have two test instruments manufactured by Superior Instrument Co. I need schematics and operating information for these tube testers, Model TV-11 and TV-40. I would appreciate any help you or your readers can give me.

RAY GILLETTE

3425 N. 9th
Lincoln, Neb.

Can someone help me find picture tubes for a 1946 Dumont RA-101 Westminster and a Sherwood Teleset. I need a 20BP4 and 15AP4 CRT, which may be new, rebuilt or still in the receivers working or not.

HENRY A. SWARTEMAN

107 Ontario St.
Corning, N.Y. 14830

I am a recent subscriber and find your magazine very informative.

I would like to obtain a schematic for a 1938-vintage Supreme Instruments Model 549 Electronic Voltmeter. Perhaps one of your readers could help me.

Thank you very much for your assistance in this matter.

SAM YUPPA

16191 Melody Lane
Huntington Beach, Calif.

More on the CAT Game

I want to thank the individual that wrote, "The CAT Game," article in this October issue of the Electronic Technician. I learned more PRACTICAL T.V. servicing from the article than I did from my entire correspondence course. Also it taught me another thing, and that is how to think out a problem.

Needless to say the article was not only educational, but interesting and stimulating at the same time. Let me thank you for the many hours that went into the preparation of this article. I do hope you will do this same thing again and again, not only for black and white, but color as well.

MR. E. F. TUMA

1305 N. Klein St.
Oklahoma City, Okla.

Enthusiastic

As a subscriber of some years' standing, let me congratulate you on the general level of your publication and particularly on "The CAT Game" (October).

Since I am not in Television Servicing as such, I am frequently not overly edified by the subject matter, but this article, I feel, is the type of thing that will really upgrade a technician far quicker than the usual approach of explaining a circuit first. With this latter approach there is a great tendency to nod one's head in agreement with the author, when actually the problem would have been incorrectly diagnosed. In this article you managed to combine information with inquiry.

I realize that your concentration on TV is by majority request (which I regret), but with this type of instructive article that asks something of the reader I wax enthusiastic. I should say that I thought the Electrolytic article and a recent one on Triggered Sweep Scopes very worthwhile and well presented.

Keep it up! By the way the last time I resubscribed was because your overdue notice showed such imagination — the open circuit.

JOSEPH G. BRADLEY, JR.

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New York, N.Y.

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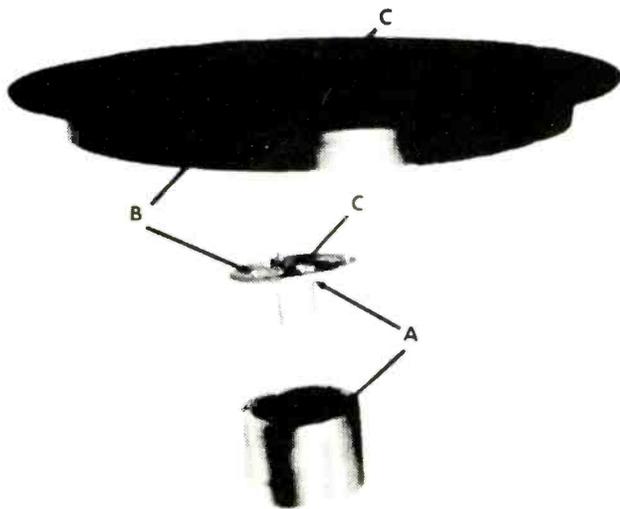
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers' or their agencies

GENERAL ELECTRIC

Record Changer—Binding Turntable Hubs

Numerous record changers with binding turntable hubs have been reported from the field. To eliminate possible future field failures, a copper-plated hub has been incorporated in factory production. For a permanent field repair the copper plated hub has been added to current replacement parts stock in Utica (Cat. No. EA2077). Installation instructions for the copper plated hub are as follows:

(1) Remove the turntable from the spindle by removing



the C ring and lifting the turntable assembly straight up, over the spindle. Note: The top thrust washer of the bearing assembly may be lifted out with the turntable assembly. This washer must be reinstalled to insure proper turntable height. (2) Remove the turntable mat. In the case of the 9in. mat, which is bonded to the turntable, carefully peel the mat off from the outer edge and avoid damaging the metal trim disc adhered to the mat. (3) Drill out the three riveted studs that secure the turntable to the hub using a 5/32in. drill bit. (4) Orient the new copper plated turntable hub on the special hub riveting anvil so that the three protruding studs on the underside of the hub are located in the three holes of the anvil. (See Fig. 1-A.) (5) Orient the turntable on the copper-plated hub so that the three studs on the hub protrude through their respective holes in the steel turntable. (See Fig. 1-B.) Make certain that the turntable is properly centered on the hub center flange and securely seated against the hub. (See Fig. 1-C.) (6) Use a hammer and peen the studs protruding through the steel turntable until it is securely mounted on the hub. (7) Replace the turntable mat. On 9in. turntables with the mat secured by adhesion, use Goodyear Pliobond or equivalent (contact cement). (8) Remove the spindle from the changer by releasing the spring and removing the securing nut. Polish the spindle bearing surfaces very slightly with crocus cloth or extremely fine emery cloth to remove any zinc which may be imbedded in or adhered to the bearing surfaces. (9) Lubricate the new copper-plated turntable hub and spindle bearing surfaces with vasoline before reinstalling the spindle and turntable assembly.

In the event the mat or trim disc should become damaged, replacement parts may be obtained from Utica parts dis-

tribution under the following catalog numbers:

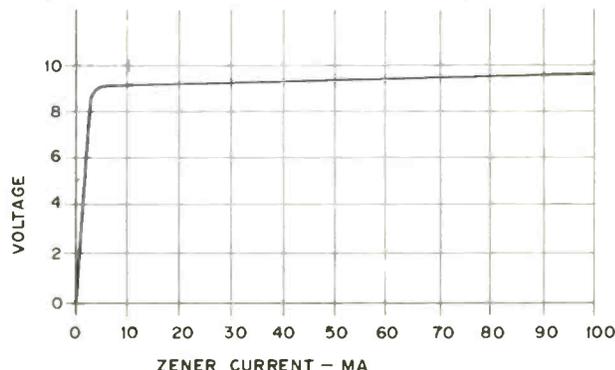
EA-1038	9in. turntable mat
EA-1836	11in. turntable mat
RS-6572	small trim disc
EA-1551	large trim disc
EA-2077	copper hub

Hub staking anvils may be obtained from General Electric Co., Product Service, Decatur, Ill., as publications no. 37-9413-69 at \$2.25 each.

RCA VICTOR

Zener Regulated Power Supplies

The avalanche-breakdown (zener) diode is no stranger in solid-state circuits. The zener diode is constructed much like a silicon rectifier diode. When forward biased, the zener conducts with minimum voltage drop. When reverse biased, however, it does not conduct until a specific breakdown voltage is reached. It is the reverse voltage characteris-



tic of the zener diode that distinguishes it from the silicon rectifier.

Zener diodes are available with a selection of breakdown voltages, wattages and tolerances. Manufacturers are furnishing the electronics industry with units having breakdown voltages ranging from as low as 3.9v to upwards of 200v.

To better understand the reverse voltage (breakdown) characteristics of zener diodes it would be well to examine the voltage/current curve chart which illustrates the voltage/current curve of a typical zener diode. Notice that the breakdown voltage remains essentially constant from a minimum sustaining current of about 5ma up to the maximum power rating of the diode.

Simple Regulator Circuit

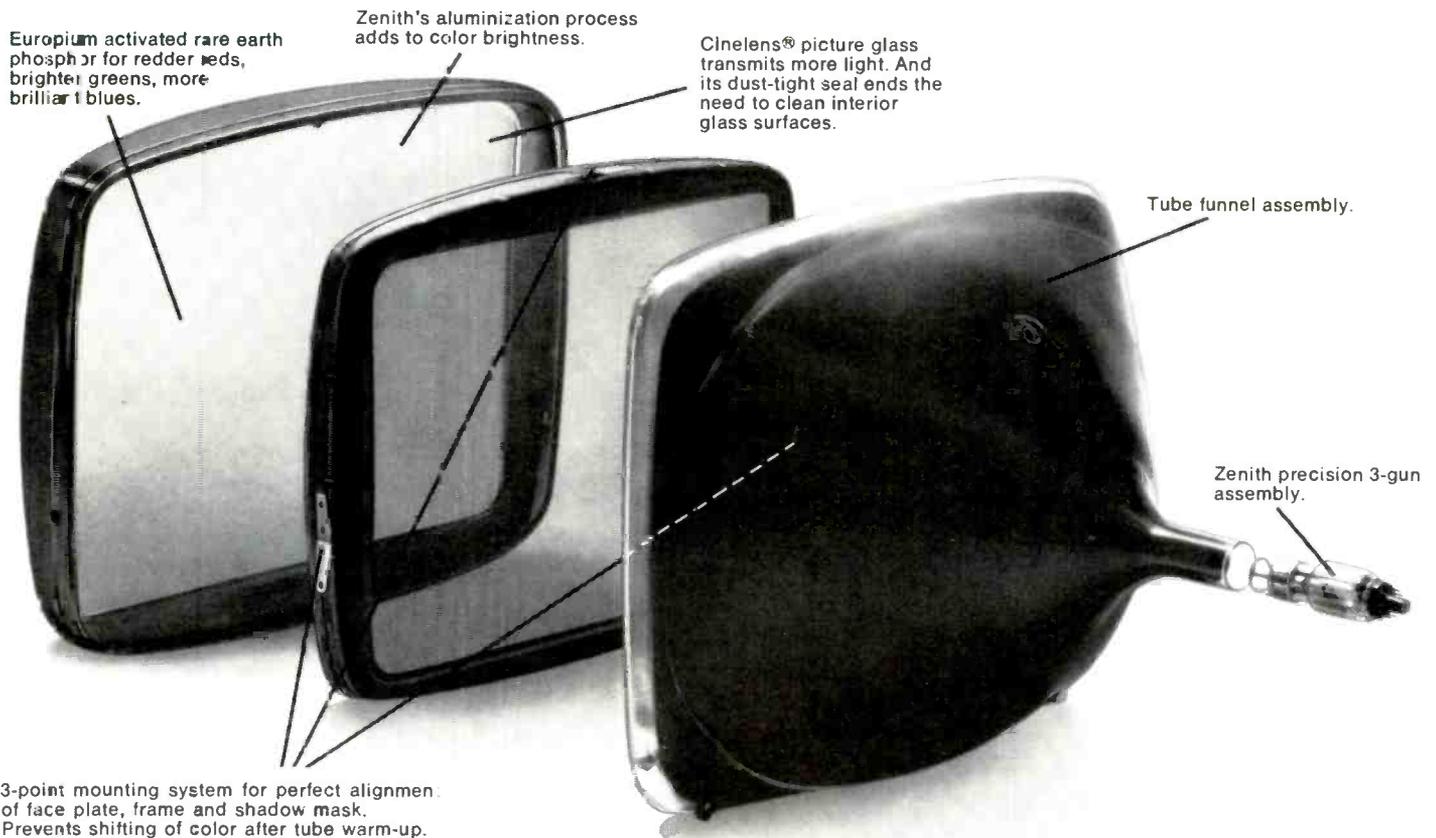
The simplified regulator circuit shown illustrates a zener regulator system often used to supply a constant dc voltage to circuits that are sensitive to voltage changes. This simple regulator might be used to supply -9.1vdc to an AM-FM radio tuner.

Several things must be known in order to design the circuit. These include the maximum and minimum dc voltage input to the regulator circuit and the maximum/minimum

Continued on page 34

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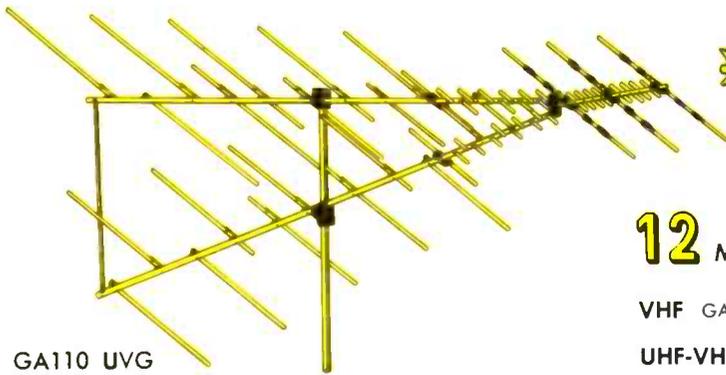
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CT-42G

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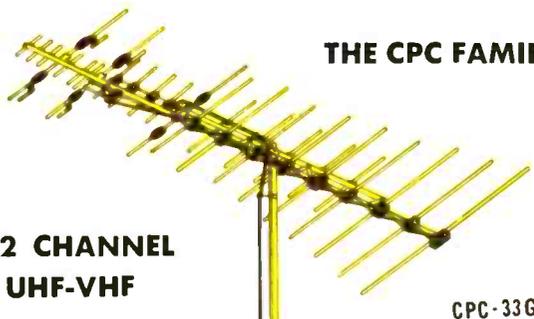
VHF GA-200G, GA-100G, GA-300G, GA-500G, GA-600G

UHF-VHF -GA110 UVG, GA210 UVG, GA310 UVG, GA510 UVG,
GA520 UVG, GA620 UVG, GA720 UVG

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82 CHANNEL
UHF-VHF



CPC-33G

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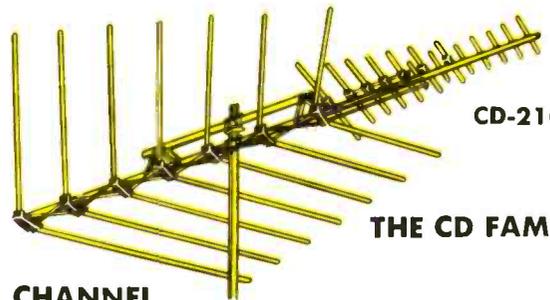
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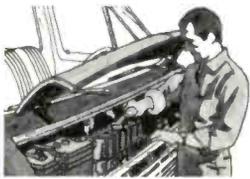
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outside service center



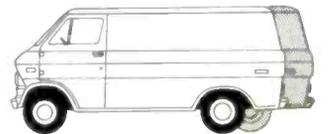
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FORD ECONOLINE VANS



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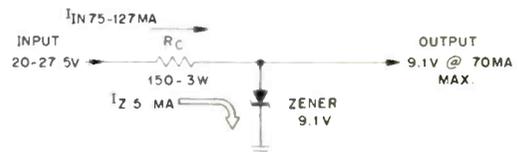
Admiral Corporation warrants this picture tube to be free from defects in material or workmanship for 3 years after date of sale to the consumer.

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Continued from page 30

dc current requirements from the regulated supply. It is also necessary to know the minimum sustaining current of the zener diode—this may be assumed to be 5ma. Upon examining the requirements for this circuit, it is found that the regulator must operate over a range of input voltages from -27.5v down to -20vdc . It is also necessary for the



regulator to provide a constant 9.1v with current loads ranging from approximately 20ma to as high as 70ma. With these considerations in mind, a circuit can be designed to provide the desired performance.

The first design consideration is low input voltage and maximum output current. With -20v input and a load current of 70ma plus the 5ma zener sustaining current, the total regulator input current is 75ma. Computation yields a value for the current limiting resistor (R_C) of $145\Omega - 150\Omega$, the closest standard value can be used.

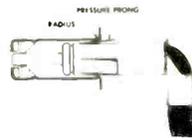
The next design step is to determine the maximum power dissipated in the zener diode under worst case conditions. This would be at maximum input voltage and minimum load—27.5v input and 15ma output. To determine the dissipated power, it is first necessary to know the total current in the circuit and hence the current through resistor R_C . This is also easily calculated. Under these conditions, the voltage drop across R_C will be the difference between 9.1v (zener voltage) and the 27.5v input—or 18.4v. This voltage is used to calculate the current in the circuit ($I = E/R$) so that the zener diode power dissipation ($P_d = E \times I$) may be calculated. This voltage drop is also used to calculate the resistor power dissipation ($P_d = E^2/R$) which is about 2.3w, so a 3w wire-wound resistor would be suitable.

The calculations above indicate that the total input current to the regulator circuit is about 127ma. The current through the zener diode is the input current less the 15ma output, or 112ma. Therefore, the power dissipated in the zener diode equals about 1.02w. This leaves the designer two choices: he must use a 2w zener, or a more sophisticated regulator circuit with a transistor amplifier stage.

DELCO RADIO

1970 Antenna Socket Snap In

A new type antenna socket is being used in some of the 1970 auto radios. One feature of it is both a blessing and a problem.



Referring to illustration, a small radius at the input lip is intended to act as a retainer for better grounds. The new lead-in cable has "pressure prongs" that snap to fit when they pass over this radius.

Also note in the drawing that the bottom of the socket is funneled for ease in locating the center terminal hole.

The problem comes when you try to plug your bench antenna into this socket. It will make connection, but not a very good one; therefore, it may be necessary for you to get an additional bench antenna with the "pressure prongs."

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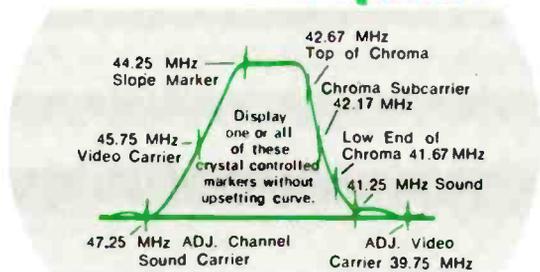
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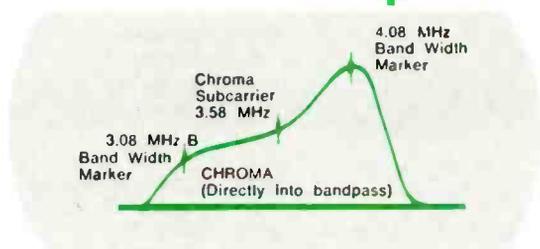
complete IF SWEEP AND CRYSTAL CONTROLLED MARKERS



View the complete IF response curve with full 15 MHz sweep width (competition has only 12 MHz, restricting view on RF and some solid state receivers that have extra traps). Press one or all of the crystal controlled marker push buttons without upsetting response curve. Post injection is used all the way to prevent overloading the TV receiver. Crystal markers are provided for all critical check points as shown on the response curve. Also sweeps 20 MHz IFs as found on older sets and new import color sets. Major competition does not cover these frequencies. Special spot align position converts the sweep generator to a regular signal generator for spot alignment or dipping odd traps. Only Sencore goes all the way.

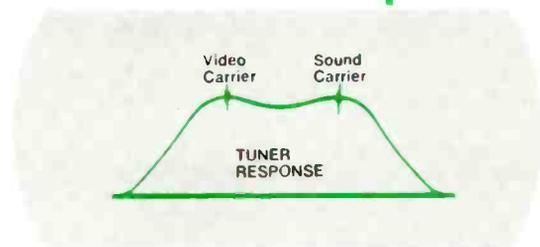
Note that Sencore has a base line giving you a reference to zero. Competitive models do not.

complete CHROMA SWEEP AND CRYSTAL CONTROLLED CHROMA MARKERS



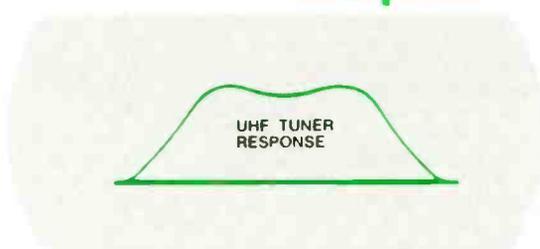
You can inject the chroma signal directly into the chroma amplifiers as shown here or through the IF amplifiers for a flat response. You are equipped to follow manufacturer's recommendation either way. Injection directly into the chroma amplifiers is a must for fast trouble shooting of color circuits.

complete ALIGNMENT SIGNALS FOR VHF TUNER OR OVERALL ALIGNMENT



The SM 152 sweeps all of the VHF channels for complete tuner check from channel 2 through 13. Competitive models sweep only two VHF channels. Push button markers are provided for channels 4, 5, 10 and 13 for both the video carrier and the sound carrier. The second low and high channels are available in case you have a station operating on the same channel . . . which will cause the patterns to be upset. You want to align on an unused channel and check it on the channel in operation for best results. Only Sencore goes all the way.

complete UHF SWEEP FROM CHANNEL 14 THROUGH 82



After completely aligning a TV set, you'll want a complete check on the UHF tuner to be sure that it is operating on all channels. Markers aren't necessary as you just view the RF or over-all curve to see that the curve looks the same as the VHF and output remains reasonably constant. Only Sencore has UHF output; all new tuners are required to cover all UHF channels and you will come up short if you own any other alignment generator than the SM 152. A UHF sweep generally costs hundreds of dollars more.

complete FM SWEEP AND CRYSTAL CONTROLLED MARKERS



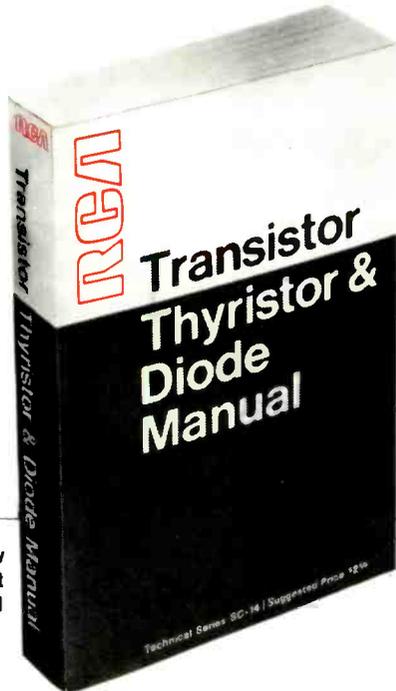
You won't be stopped with just TV alignment. You can align the IF amplifiers of the FM receivers with the 10.7 MHz crystal for maximum as indicated in service manuals. Then, throw on the scope and sweep the amplifiers and view the "S" curve if you have stereo. Two markers, 100 KHz above and below the 10.7 MHz mark the limits of the curve for good stereo. You can align the front end of the receiver too. Competitive units cover only the IFs and you find the job only half done.

There are other features too numerous to mention that makes the Sencore SM152 the most complete sweep and marker generator on the market. Ultra linear sweep, covering all frequencies that you need, from 10 MHz to 920 MHz, exclusive calibrated sweep

width that is constant on all channels and RF calibrated output for circuit trouble shooting are only a few of the things that places the SM152 in a class by itself. Dare compare and you'll see your distributor today for a good look at the SM152.

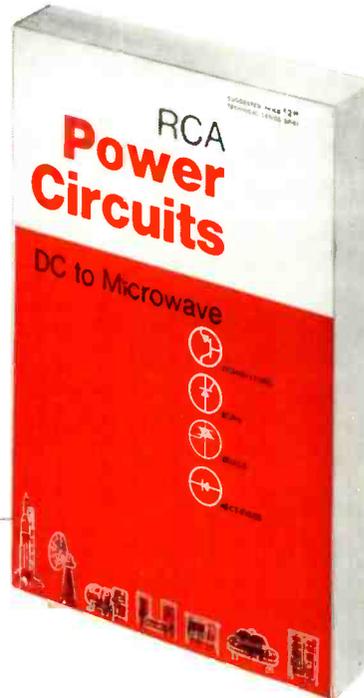
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solid state...up to date



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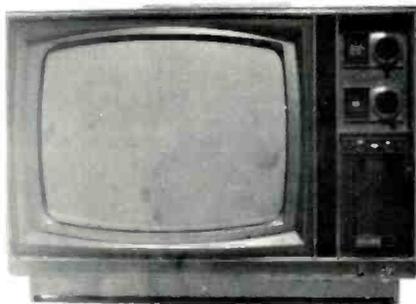
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ET/D TEKLAB REPORT

Introducing Philco-Ford's Model C3050TBE Color TV

The automatic degaussing circuit with a new mode of operation, an integrated circuit 3.58MHz osc and a new convergence panel are just a few of the features which make this set different

Philco-Ford's Model C3050TBE color TV employing the 19FT60 chassis.



■ Small screen color portables are still accounting for a good percentage of total color sets sold. Getting into the small screen TV market, Philco-Ford introduced its first 14in. color portable.

We received Philco-Ford's Model C3050TBE with the 19FT60 chassis and checked the features and type of circuits offered in this compact receiver.

The 14in. (102sqin.) screen set is housed in a molded plastic cabinet with all operating controls (except the horizontal hold control) located on the front panel.

After removing the back cover and giving the chassis the once-over, we noted a number of changes. The convergence panel (Fig. 1) employed in this chassis is a complete assembly containing dynamic convergence circuits, the static convergence

coil assembly, blue lateral and purity rings. This entire assembly is mounted on the neck of the CRT. The 15NP22 CRT has the blue gun down as well as the blue static adjustment which was up in earlier hybrid chassis. A double plug cable connects the convergence panel to the chassis. A PW edge connector similar to an amplock housing is connected to the bottom of the panel while the other end contains an octal plug which fits into a socket on the chassis. The dynamic control functions remain the same as in earlier chassis, but the control layout is entirely different and will require refamiliarization with the actual steps for set-up.

Another notable change was the addition of a red drive control in addition to the blue and green drive controls. The increased efficiency of the red phosphor used in the 15N22 CRT requires a red drive control to achieve a more uniform white balance. In this chassis you will find that the CRT grid bias control must be set to full clockwise (minimum voltage to the CRT grid G1) when making the white balance adjustment and must be rotated counter-clockwise to ignite one or more guns in the event they

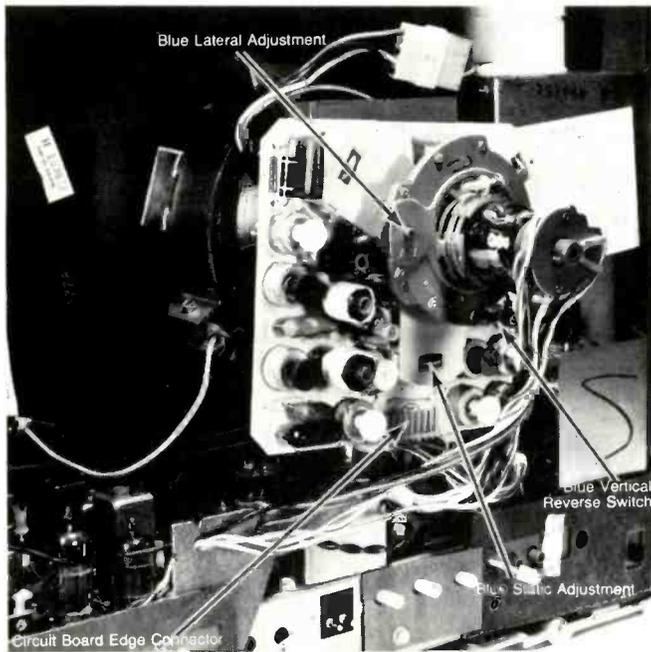


Fig. 1—The convergence panel is a complete assembly containing the dynamic convergence circuits, static convergence coil assembly, blue lateral and purity rings.

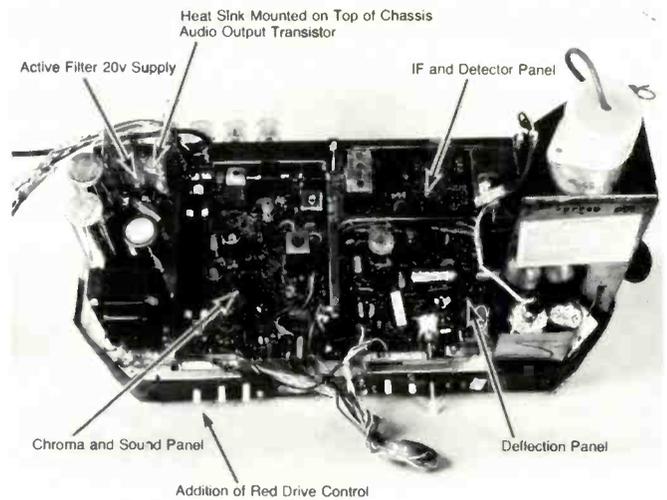


Fig. 2—Top view of the 19FT60 chassis showing the roadmapped circuit board, component location and tubes placed near the back of chassis for ease-of servicing. The chassis employs an integrated circuit, 26 transistors and seven tubes.

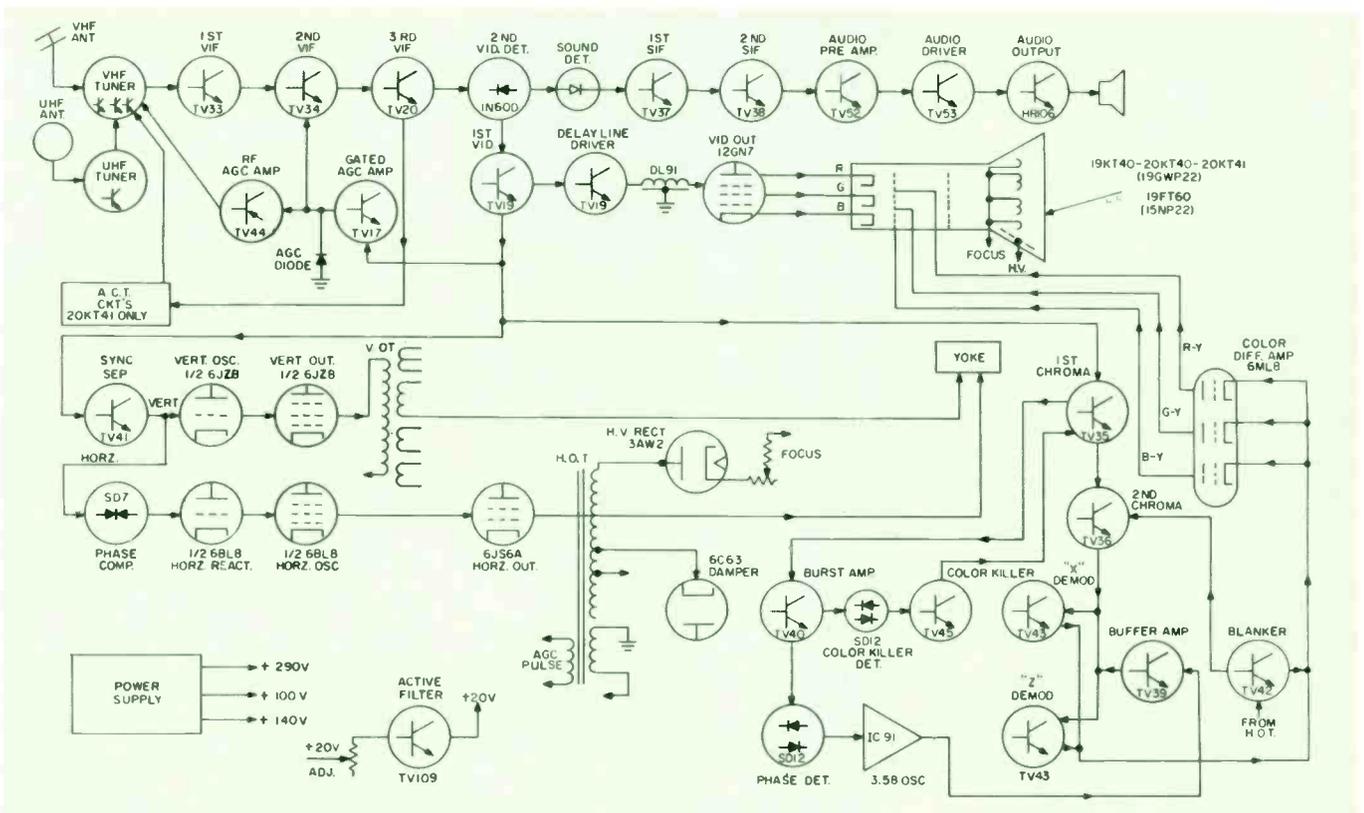


Fig. 3—Block diagram of Philco-Ford's 19FT60 color chassis.

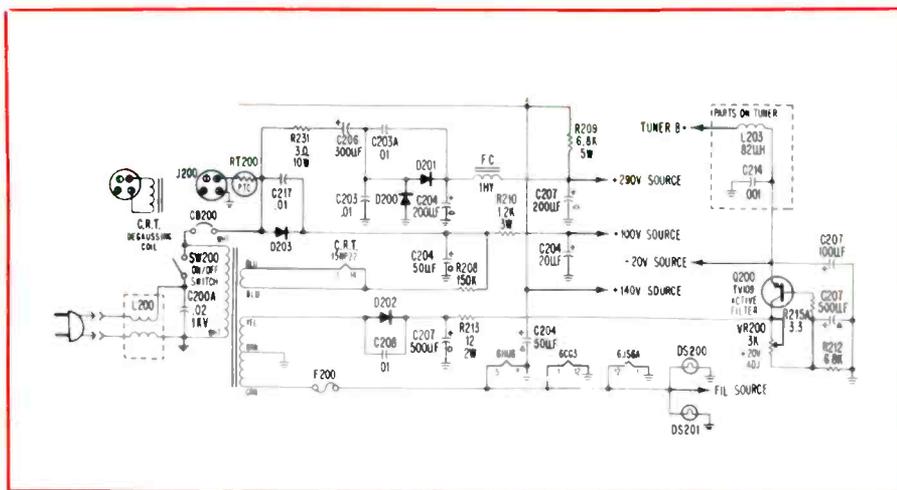


Fig. 4—Schematic of the low voltage power supply with a new automatic degaussing circuit using a posistor and not requiring a varistor.

do not appear in the service position.

The convergence panel has the addition of a blue vertical reversal switch. If the blue horizontal lines along the vertical axis cannot be converged, move the BLUE VERT REV. switch to the right. This will reverse the characteristics of the BLUE VERTICAL controls.

Taking a better look, all tubes are placed near the back of the chassis for ease of service and the printed circuits have visible identification of components as shown in Fig. 2.

The chassis employs one integrated circuit, 26 transistors and seven tubes. With more than twice the number of transistors employed in previous models, this chassis should exhibit greater reliability and longer life.

The block diagram of the chassis is shown in Fig. 3.

AUTOMATIC DEGAUSSING

The automatic degaussing employed in this chassis is a new circuit using a posistor. The same basic operation is performed as in previous hybrid chassis but it now has a new mode of operation during warmup. When the set is switched on, the posistor is at its minimum resistance and applies the full ac potential to the degaussing coil. As the tempera-

ture across the posistor rises, the resistance also rises until the posistor reaches maximum resistance, causing the ac potential to drop across the thermistor with no ac flowing through the degaussing coil, thus shutting off the system.

The degaussing system operates directly from the primary winding of the power transformer while previous degaussing systems operated from the high voltage winding of the power transformer.

The posistor system is superior to the thermistor-varistor system in that it can drive a higher initial current through the degaussing coil and produce a stronger degaussing field.

POWER SUPPLY

The 19FT60 is a hot chassis and employs a half wave doubler power supply (shown in Fig. 4) to develop a 290v and 140v source. A 100v source is developed from a halfwave rectifier while a second halfwave rectifier provides the 20v source. The 20v source is regulated by an active filter transistor (Q200).

The circuit breaker is located between the primary of the power transformer and the anode side of the rectifier. There is also a surge resistor used for current limiting and protection of diodes D200, D201, D202 as

well as the circuit breaker.

COLOR CIRCUIT

The color circuit is transistorized and the basic theory of color operation is the same but we must think in terms of transistor operation.

We find four main circuit differences which are new and not used in the earlier hybrid chassis. (1) Buffer Amplifier Stage: This stage isolates the 3.58MHz oscillator from the color difference amplifier and furnishes the required reference voltage for the Color Osc, Phase Detector, Color Killer Phase Detector and X and Z demodulator. (2) IC91—3.58MHz Oscillator: In place of a transistor an integrated circuit was employed to obtain a 3.58MHz oscillation with improved stability and reliability. (3) Varactor SD19: This chassis does not employ a reactance stage. A varactor is used in its place between the 3.58MHz crystal and the input to the IC to supply automatic frequency control of the 3.58MHz oscillator with the phase detector voltage. The 3.58MHz oscillator tuning coil (L100) is used to tune the oscillator frequency similar to the reactance coil in tube circuits. (4) Ferrite Beads (Inductance)—“X” and “Z” Demodulators: In Fig. 5 you will note in the emitter and base of the “X” and “Z” demodulators, symbols L109, L110, L111 and L112. The “L” symbols indicate that they are inductances. When a ferrite bead is placed over a lead, the resultant effect is that of an inductor.

The function of these inductors is to suppress harmonics of the 3.58MHz signal to the demodulators.

CHROMA AND SOUND CIRCUITS

The chroma panel is all new and all transistorized with the exception of two tubes. A 12 GN7 (V92) for video output and a 6ML8 triple section tri-

ode are used as a color difference amplifier supplying the B-Y, R-Y and G-Y signals to the control grids of the CRT. The chroma panel also contains the 3.58MHz oscillator (IC91).

The sound circuitry is part of the chroma panel. In previous chassis it was part of the deflection panel. All sound circuitry with the exception of the audio output transistor is mounted on the panel. The audio output transistor (Q201) is heat sink-mounted directly on the top of the chassis sub base.

The sound circuit consists of a 1st SIF (Q92) transistor, 2nd SIF (Q91) transistor, a ratio

detector circuit consisting of two 1N60D diodes, an audio preamp transistor (Q94), an audio driver transistor (Q98) and the externally mounted audio output transistor (Q201).

Also, as part of the chroma panel, a delay line (DL91) is top mounted on two plastic clips and connected into the collector of the delay line driver transistor (Q93).

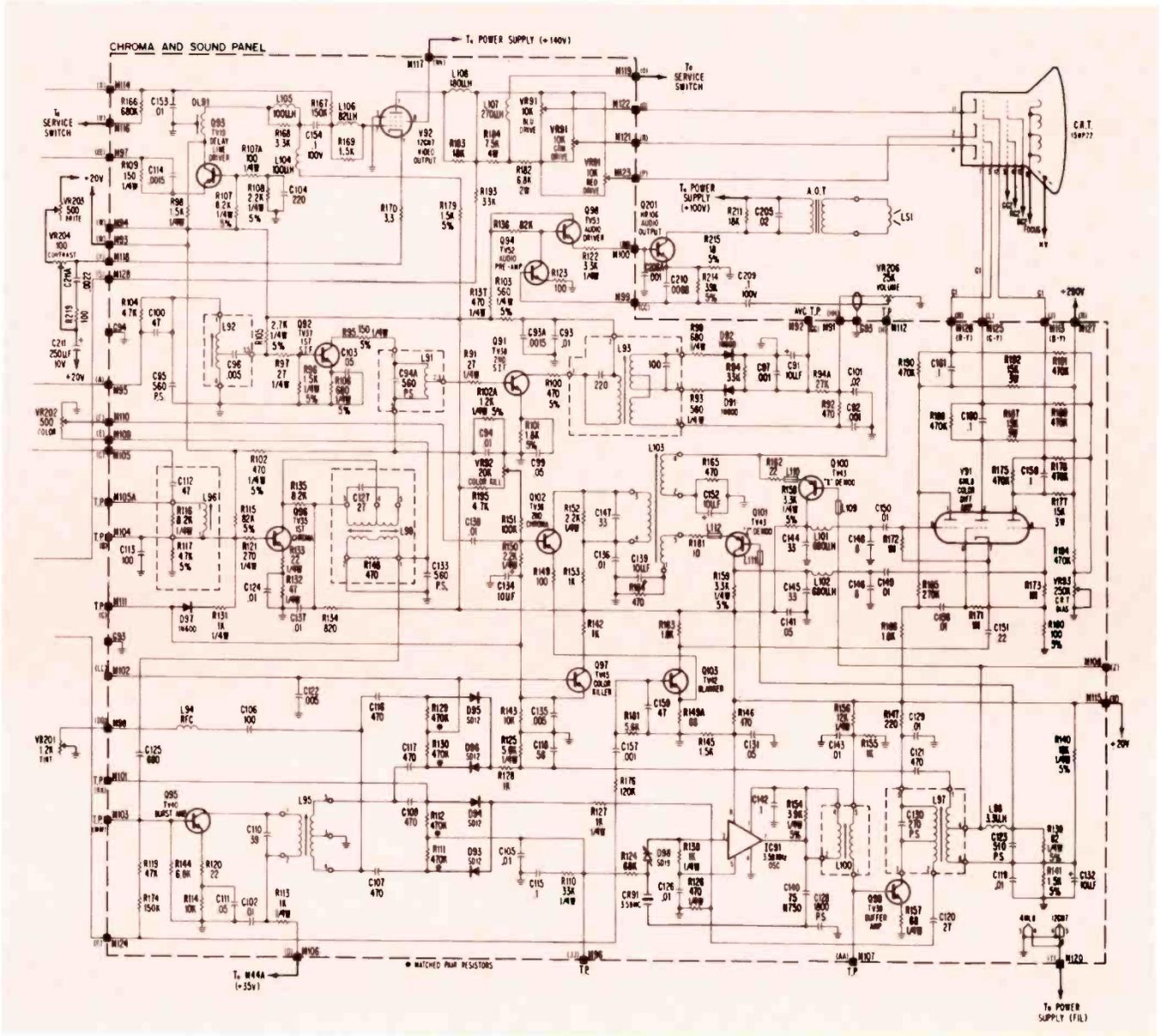
The IF panel still consists of six transistors, the three IF stages, a gated AGC amp, RF AGC amp and 1st video amp stage. All the transistors are NPN with the exception of the RF AGC amp.

The first and second IF transistors are new in that they have a lower feedback capacity between the collector and base thereby eliminating the use for neutralization. The first and second IF stages are still AGC controlled. The 1st and 2nd IF transformers are no longer Bifilar wound and have been replaced with an improved molded spring winding type with the center tap of the transformers used for capacity coupling.

IC91—3.58MHz COLOR OSCILLATOR

The 3.58MHz Color Oscilla-

Fig. 5—Schematic of the transistorized color circuit with four new circuits not employed in earlier chassis.



tor (IC91) employed in the 19FT60 is identical to the integrated circuit used in the 18QT86 chassis as a video delay line driver. Because its application is now used as a 3.58MHz oscillator, only the operating parameters have been changed. The input and output signal points, as well as the IC construction remains unchanged as indicated in Fig. 5.

The IC has two distinct advantages: it is more stable as an oscillator and has a greater reliability factor.

The IC is a frequency controlling device and is frequency sensitive. Any external loading at the signal input points (terminals 3 and 5) will cause loss of color. The only true way of evaluating whether the IC is operating is by checking signal in and out by use of a scope. Placing a low capacity probe at either signal input point will have the effect of adding capacity across the varactor D98 and 3.58MHz crystal. The addition of this external capacity will

upset the 3.58MHz signal causing loss of signal and could give the appearance of no signal being present at the input. Therefore, to properly determine if the IC is operating, look at the output signal at terminal 7 and determine if the peak-to-peak is as indicated in the drawing.

HORIZONTAL OUTPUT AND HIGH VOLTAGE

The horizontal output tube used in this chassis is a 6JS6A. The HV rectifier is a 3AW2 and the damper is 6CG3 as shown in Fig. 6. Biasing of the horizontal output tube remains basically the same as in earlier hybrid chassis. The high voltage setting controlled by the horizontal bias control VR42C is adjusted as follows:

At zero beam (minimum brightness) adjust bias control VR42C for $20.5\text{kv} \pm 1\text{kv}$. At normal viewing (1ma of beam current) the high voltage should be $17.1\text{kv} \pm 500\text{v}$.

FOCUS CIRCUIT

A completely new method of focus control is employed in this chassis. It eliminates the control, coil and focus rectifier, using only a simple bleeder network and jumper. This is because of the closer gun structure in the 15NP22 CRT. The 15NP22 is known as an Einzel lens or Einzel focus CRT.

The entire focus circuit consists of a bleeder network, three 1M resistors R228, R229 and R230 between decoupled boost and ground, and a focus link wire from the CRT socket to either a 600v, 400v, 200v or ground point. Normally, as the chassis leaves the factory the focus link will be set at the 400v point. But because of the extremely good focus regulation of the CRT, you will find that there should be very little noticeable change in focus as the link is relocated.

DEFLECTION PANEL

The 19FT60 deflection panel contains only two tubes and one transistor. One tube (V41), the 6JZ8A, is used for vertical osc and output. The other tube (V42), a 6BL8, is used for horiz. reactance and horiz. osc. The horiz. phase comparator circuit employs two SD7 or SD12 diodes. The horiz. hold in the 19FT60 chassis uses a coil mounted on the deflection panel (L41) and is adjusted from the rear of the receiver.

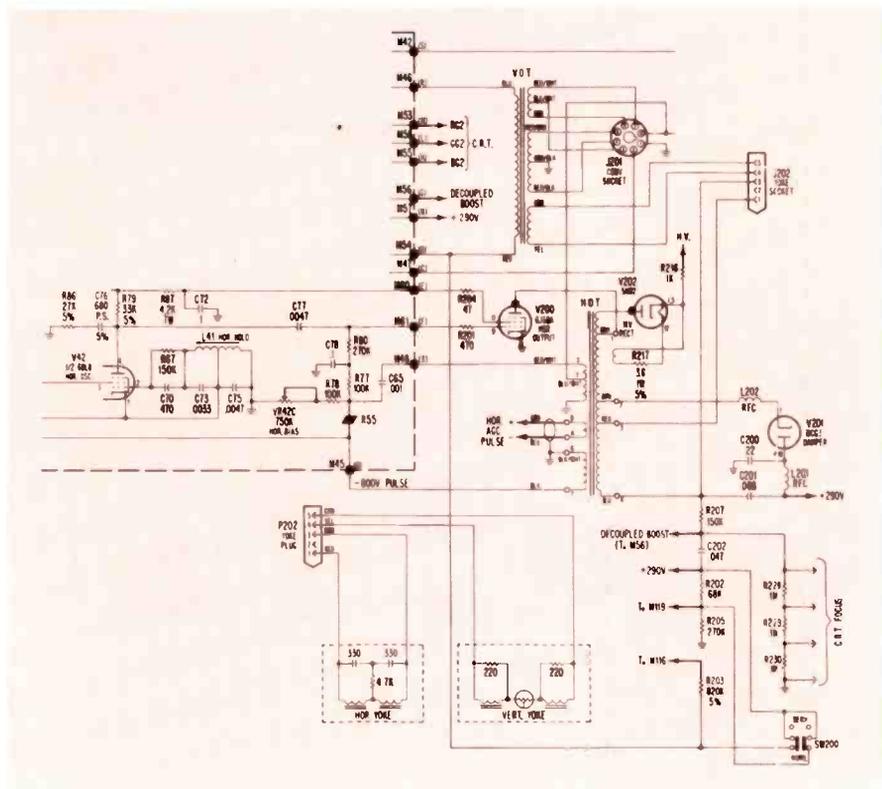
The set we evaluated only required the minimum of setup adjustments, but before attempting the white balance and purity adjustments, a review of the entire setup procedure is suggested.

An excellent stable color picture was produced on the set with enough brightness enabling it to be viewed under bright lighting conditions.

The molded plastic cabinet and new chassis have reduced its weight for easier carrying making it a truer portable.

The Model C3050TBE lists for \$279.95. ■

Fig. 6—Diagram of the horizontal output and focus circuit. A complete new method of focus control is employed which eliminates the control, coil and focus rectifier using only a simple bleeder network and jumper.



Test Instrument Review

Part II

Check the specs for a better idea of what's available in test instruments as we present part two of this feature

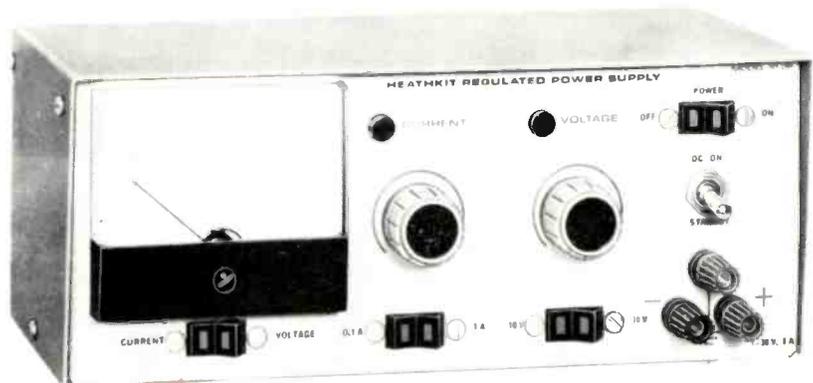


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■ In part one of this series (ELECTRONIC TECHNICIAN/DEALER, November) we provided all available data on test instruments alphabetically from Analyzers to Oscilloscopes. This section picks up with Power Supplies of all types and goes through FET/Transistor Testers. Part III will be featured next month, and concludes this review with a complete list of test instruments manufacturers and their addresses. ■



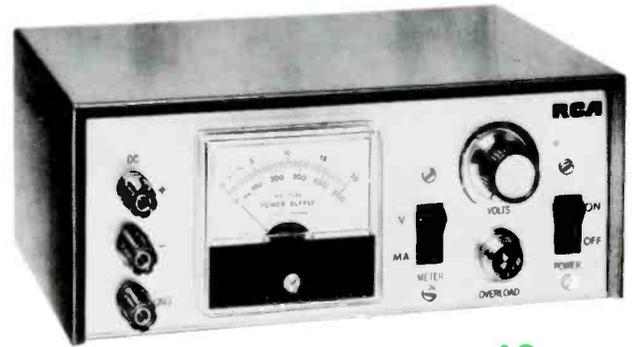
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POWER SUPPLIES

Mfg.	Model	Type	DC Output Voltage and Current Ranges	Additional Features	Price
Conar 41.	510	Solid-state	0-24v; 0-100ma	Provides fitted low voltage dc output viewed on 2 1/2in. panel meter. Circuit is burn-out protected, ac operated.	\$18.50 (Kit)
EICO 42.	1025	Solid-state	0-6 0-30 at 500ma	Adjustable in two selected ranges	\$34.95 (Kit)
Heath 43.	IP-28	Solid-state	1-10vdc at 10-100ma 1-30vdc @ 10ma-1a	Switch selected metering of both output voltage and current. External voltage sensing, "floating" output for either + or - ground. Standby switch to remove voltage from load without disturbing connections, 120/240vac optional operation	\$47.50 (Kit)
Heath 44.	IP-27	Solid-state	0.5 to 50v, 1.5A max. Four current ranges, 50ma to 1.5a	Circuit immune to overload from transients, zener regulated, adjustable current limiting 30 to 100 percent on all ranges. Regulation better than $\pm 15mV$.	\$79.95 (Kit)
RCA 45.	WP-700A WP-702A	Solid-state	0 to 20v at 200ma	The WP-700A and WP-702A are identical except the 702A is a dual unit. Each has short circuit protection, overload indicator lamps and negative feedback regulating circuits to maintain constant output.	\$37 (702A)
RCA 46.	WP-703A WP-704A	Solid-state	0 to 20v up to 500ma (WP-703A) 0 to 40v up to 250ma (WP-704A)	Both units have short circuit protection, overload indicator lamps and ripple less than $200\mu v$ RMS. Metering of output voltage or current level is also provided.	-----

continued



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AUDIO SIGNAL GENERATORS

Mfg.	Model	Sine Wave					Frequency Ranges
		Frequency Ranges	Output Voltage	dB Ranges	Output Impedance	Frequency Ranges	
Allied 47.	KG-688	20Hz to 2.0MHz in 5 ranges: X10,20Hz to 200Hz X100,200Hz to 2kHz X1K,2kHz to 20kHz X10K,20kHz to 200kHz X100K,200kHz to 2.0MHz	Adj. 0-7.5v RMS into 10K or higher, 0-6.5v RMS into 600Ω	-----	600Ω using atten.	20Hz to 200kHz in 4 ranges: X10,20Hz to 200Hz X100,200Hz to 2kHz X1K,2kHz to 20kHz X10K,20kHz to 200kHz	
EICO 48.	379	20Hz to 2.0MHz in 5 ranges	0-7.5v RMS into high Z output, 0-6.5v RMS into 600Ω	-----	-----	20Hz to 200kHz in 5 ranges	
Heath 49.	IG-18	1Hz to 100kHz	8 ranges: .003 to 10v RMS FS with 10K or higher load. 6 ranges: .003 to 1v FS with 600Ω load.	-62 to +22, -12 to +2 on the meter -50 to +20 on the amp switch in 10dB steps	10v range: 0-1000Ω; 3v range: 800-1000Ω; 1v range: 600Ω	5Hz to 100kHz	
Leader 50.	LAG-54	20Hz to 200kHz in 4 decade bands	3v RMS approx.	-----	600Ω approx.	20Hz to 200kHz	
RCA 51.	WA-504A	20Hz to 200kHz in 4 ranges	10v RMS or more	-----	100v = 0-3K 1v = ap.900 .1v = ap.91 .01 = ap.9	20Hz to 200kHz	



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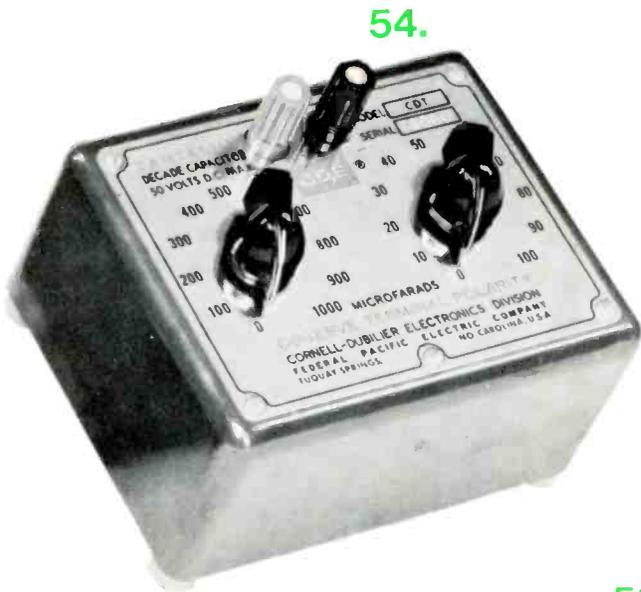
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Square Wave			Additional Comments	Price
Output Voltage	Output Impedance	Rise Time		
Adj. 0-10v P-P into high Z loads	200Ω	Less than 0.1μsec at 20kHz	Solid-state. Uses Lutzer oscillator circuit and FET transistor. Calibrated step attenuators provide up to 41dB.	\$59.95 (Kit)
0-10v P-P into high Z load	-----	Less than 0.1μsec at 20kHz	All solid-state. Maximum distortion across audio range: 0.25 percent. Provides simultaneous sine and square wave outputs.	\$54.95 (Kit)
3 ranges (P-P): .1, 1, 10v into 2000Ω load or higher	.1 and 1v ranges: 52Ω; 10v range: up to 220Ω	Less than 50μsec	All solid-state with 5 percent accuracy through range of 1Hz to 100kHz. Has 3 position atten. for square wave and floating outputs. Optional 120 or 240vac wiring.	\$67.50 (Kit)
5v P-P max.	600Ω approx.	-----	Transistorized unit with extended range uses Wien bridge sinewave osc. & Schmitt trigger for fast rise time square waves.	\$84.50
10v P-P or more	-----	Less than 1.0μsec	Solid-state including MOS-FET osc. Wide range osc. w/output through a 10 to 1 step attenuator.	-----

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FM STEREO GENERATORS

Mfg.	Model	RF Signal Frequency	Pilot Mod. Frequency	FM Modulation	Deviation	Sweep Rate
Heath 52.	IG-37	100MHz adj. by approx. ± 2 MHz	19kHz ± 2 Hz	Left chan., right chan. Phase test (left and right chan. in phase), Mono FM	Adj. to 75kHz	60Hz (used for RF and IF align)
RCA 53.	WR-52A	Carrier: 100MHz	19kHz	Left chan., right chan. int. test (L&R), Mono FM	Adj. to 75kHz	60Hz



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57.

SUBSTITUTION TEST BOXES

Mfg.	Model	Type	Component Ratings	Comments	Price
Cornell-Dubilier 54.	CDT	Tantalum Capacitor Decade	Capacitance: 10 to 100mfd Capacitance Tolerance: $\pm 5\%$ to 100mfd Operating Temp. Range: -55C to $\pm 85\text{C}$ Voltage: 50vdc working	Precision selected tantalum foil electrolytics are wired to five-way molded nylon polarized terminals.	NA
Heath 55.	IN-27	Decade Capacitor	Capacitance from 100pf to .111ufd in 100pf steps. Voltage rating: 350vdc continuous, 500vdc intermittent, 1000vdc instant test. Accuracy: $\pm 1\%$ of incremental capacity.	Silver micacapacitors are used with ceramic wafer switch selector.	\$18.95 (Kit)
Heath 56.	IN-17	Decade Resistance	Resistor values from 1Ω to $999,999\Omega$ in 1Ω steps. $1/2\%$ tolerance resistors in 6 decades. 1w rating. Minimum dc resistance: 25Ω or less at terminals w/all sw & set to zero.	Range switches are silver-alloy, make-before-break type for smooth switching.	\$27.95 (Kit)
Sencore 57.	RC146	Resistor, Capacitor & Diode Sub.	Capacitors: ten 600v units from 100pf to 0.5mfd, 10 electrolytics can be used singly or dually for up to 25 values; 2mfd to 250mfd at 450v. 12 1w resis. 10-2.5K, 12 1/2w res. 10K-5.6M. Power resis: 20w 2.5-15K. Univ. 0.5 Amp sil. & sel. rectifier.	This all in one unit provides 75 frequently used values of carbon resistors, capacitors, electrolytics, power resistors and universal rectifiers.	\$49.95

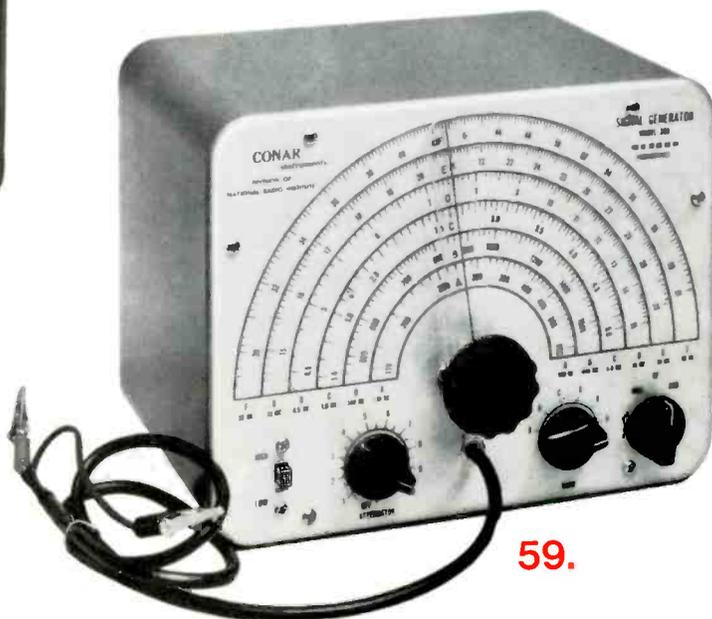
Sweep Width	Markers	Audio Output	Additional Comments	Price.
Adj. to 750kHz (for RF and IF align)	10.7, 90.95, 96.30, 101.65, 107MHz	400, 100 & 500Hz; 19kHz ($\pm 2\text{Hz}$); 38kHz & SCA (85 or 67kHz)	Provides signals for RF, IF and Multiplex FM alignment. Built-in crystal controlled marker oscillator for IF and deal tracking	\$79.95 (Kit)
Adj. to 75kHz	-----	38kHz, 67kHz, 72kHz plus 400, 1000 and 5000Hz	Compact unit provides deviation meter, RF attenuation control and separate color-coded scales for stereo and mono. Cables included.	-----

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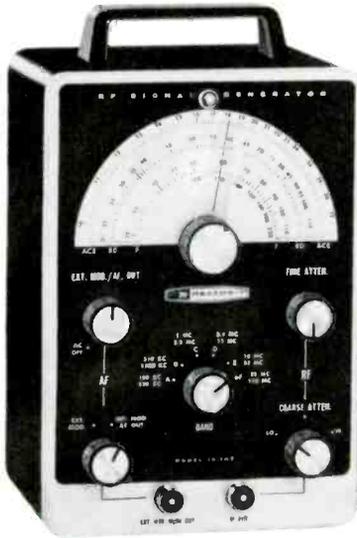
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59.

RF SIGNAL GENERATORS

Mfg.	Model	Frequency Ranges	Calibrated Harmonics	Output Voltage	Output Imped.	Modulation	Audio Output Voltage
Allied 58.	KG-686	5 Fundamental Bands A. 100-370kHz B. 370-1400kHz C. 1.4-5.1MHz D. 5.1-16MHz E. 16-54MHz	-----	Calibrated: 120,000 μ v max. to 50 Ω load Uncalibrated: (min. RMS per band) A,3v; B,2v; C,0.6v; D,E, 0.3v	50 Ω	400Hz at \pm 20 percent	-----
Conar 59.	280 μ K	6 fund. bands: 170kHz to 60MHz	Has harms.60 MHz-120MHz	-----	-----	400Hz	-----
EICO 60.	330	5 Fundamental Bands for 100kHz to 54MHz	-----	More than 300,000 μ v on any band into 50 Ω load	50 Ω	Int., approx. 400Hz from 0-100 percent	-----
Heath 61.	1G-102	6 Fundamental Bands A. 100kHz to 320kHz B. 310kHz to 1.1MHz C. 1MHz to 3.2MHz D. 3.1MHz to 11MHz E. 10MHz to 32MHz F. 32MHz to 110MHz	100MHz to 220MHz	100,000 μ v	50 Ω	Int.,400Hz 30 percent depth; Ext., approx. 3v across 50K for 30 percent	Approx. 10v open circuit
Leader 62.	LCG-12	120kHz to 22MHz on Fundamentals	-----	-----	-----	400 and 1000Hz	-----
RCA 63.	WR-50B	6 Fundamentals A. 85kHz to 200kHz B. 200kHz-550kHz C. 550kHz-1600kHz D. 1.5MHz-4.5MHz E. 4.5MHz-14MHz F. 12MHz-40MHz	-----	0.05v RMS min on all ranges (open)	-----	400Hz approx. adj. to 30%	At least 8v RMS across 15K load



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Attenuation	Additional Comments	Price
Six step atten., 21 levels to -96dB. Fine control: -10 to -2dB. Outputs to -10dB may be obtained	Solid-state unit has floating type osc. for complete isolation from chassis. Built-in 100kHz/1MHz crystal calibrator. Employs detector amplifier speaker system to provide audible "zero" beat from calibrator	\$79.95 (Kit)
Panel control	Uses Hartely osc. circuit w/six separate coils and capacitors for accuracy and ease of calibration, planetary drive tuning.	\$29.95 (Kit)
RF coarse - 3 steps RF fine - 0-100%	Solid-state instrument has provision for internal or external RF modulation, plus calibrated front panel modulation control	\$59.95 (Kit)
Fixed-step and variable	Wide tuning range unit provides 400Hz AM modulated or unmodulated RF or 400Hz AM alone. High level RF direct output available on lab version.	\$29.95 (Kit)
Level control	Solid-state instrument has provision for use of external crystal in range of 1-15MHz.	\$59.50
2-step 10 to 1 switch with fine adjustment	All-purpose generator with 85kHz to 40MHz output, Harmonics vernier tuning.	-----

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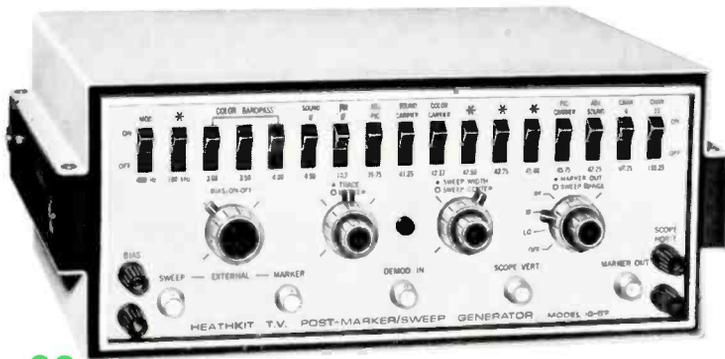


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SWEEP/MARKER GENERATORS

Mfg.	Model	Marker Frequencies	Mod. Freq.	Input Impedance	Output Impedance	Bias Voltages	Sweep Frequency
Allied 64.	KG-687	Variable on 4 bands A. 2-6.7MHz B. 6.6-21MHz C. 21-75MHz D. 65-225MHz (Harmonic) Crystal freq.: 4.5MHz	-----	75Ω	-----	-----	3-50MHz 50-120MHz 120-220MHz
B&K 65.	415	Crystal Cont:39.75, 41.25,41.67,42.17, 42.67,42.75,44.00, 45.00,45.75,& 47.25 MHz	-----	-----	75 or 300 (selected by sw on RF cable)	Three bias supplies: 2 supplies at ± 0 to 25vdc and one supply at +G to 50vdc	Video: less than 1MHz to over 6MHz; IF: 35 to 50MHz; CH4: 56.5 to 71.5MHz; CH10: 182.5 to 196.5MHz; 10.7MHz 8 to 12MHz.
Heath 66.	IG-57	100kHz. Crystal cont: 3.08,3.58,4.08, 4.50MHz at ±.01%; 10.7,39.75,41.25, 42.17,42.50,42.75, 45.00,45.75,47.25, 67.25 & 193.25MHz at ±.005%	400Hz	Ext,Mkr. Ext,sweep & atten: 75Ω. Demod in- 220K	Mkr,sweep & atten:75Ω scope vert: 22K	Pos. or neg 25vdc at 10ma	Lo band: 2.5-5.5MHz IF band: 64-72MHz
RCA 67.	WR-69A	-----	-----	-----	RF output cable:300 IF/vid:100	Adj. from 0 to -12vdc	Output freqs. on TV channels 2-13, FM-88 to 108MHz, FM/Vid-50kHz-50MHz
Sencore 68.	SM152	Crystal cont: 39.75,41.25,41.67, 42.17,42.67,44.25, 45.75, & 47.25MHz. Chroma markers: at 3.08,3.58 & 4.08MHz; FM-IF Markers: at 10.7, 10.6, & 10.8MHz plus RF video markrs for ch. 4,5,10 & 13	-----	75Ω	-----	-----	Linear sweep output on all channels from 10MHz to 920MHz. RF sweep output voltage is variable from 10μv to .1v



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Output Voltage	Attenuation	Additional Comments	Price
0.3v RMS 0.1v RMS 0.05v RMS	-----	All solid-state. Regulated power supply, dual feedback and 4-step decade attenuator with level control	\$99.95 (Kit)
-----	60dB	Solid-state unit provides IF and RF sweep on channels 4 and 10, Video sweep and 10.7MHz sweep for IF in FM receivers. Added feature is marker tilt capability.	\$349.94
± 1 db at 0.5v RMS fundamentals and 10.7 MHz on harms. ± 1 dB at 0.5v RMS. fundamentals and 192-198MHz on harmonics.	70dB total in seven steps, -1, +3, +6, +10, +10, +20	All solid-state post marker/sweep unit. Complete with cables and instructions. Provides 15 crystal-controlled markers.	\$135 (Kit)
-----	TV: 60dB FM: 60dB IF/Video: 70dB	Sweep generator only with provision for extended marker adder unit. Comes with cables and instructions.	\$295
-----	-----	Solid-state, self-contained unit provides post injected IF markers and two preset chroma outputs. Comes with cables and termination networks.	\$395

continued



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TRANSISTOR/FET TESTERS

Mfg.	Model	Test Functions	Meter Ranges
Heath 69.	IM-36	Checks transistors up to 15a and diodes to 1.5a. Tests for shorts, dc gain (Beta 0-200&200-400) Leakage (Icbo,Iceo), diode forward and reverse	Current Ranges: 15 μ a, 150 μ a, 1.5ma, 150ma, 1.5a,15a. Voltage ranges: 1.5,5,15,50,150v
Heath 70.	IT-18	In-circuit transistor tester. In-circuit tests indicate good or bad transistor (accuracy depends on circuit under test), I _{ceo} (out-of-circuit only) reads from 0-5000 μ a, I _{cbo} (out-of-circuit only) reads from 0-5000 μ a, diodes forward or reverse current from 0-5000 μ a.	DCBeta on X1 range from 2 to 100, X10 range 20 to 1000
Leader 71.	LTC-902	Transistor tester and tracer provides in or out of circuit tests. Tests Beta and I _{ceo} as well as diodes quality	0 to 20v, 0 to 50ma
RCA 72.	WT-501A	Tests I _{cbo} , I _{ceo} and dc Beta. In or out-of-circuit tests on high and low power transistors	Beta: 1 to 1000, Leakage Current: four ranges—1ma, 10ma,100ma, 1a
RCA 73.	WR-506A	Transistor/diode tests for relative gain and leakage—out-of-circuit	Gain and leakage from 0 to 10
Sencore 74.	TF17	Transistor-FET tests in or out of circuit, gain, leakage	Reads G _m gain in micro-ohms, I _{cbo} and I _{ceo} in microamps
Sencore 75.	TF155	In circuit, out of circuit FET tester	Reads G _m gain in micro-ohms, leakage in microamps and a special I _{dss} current scale for matching FET's



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Operating Controls	Supply Voltage	Comments	Price
GAIN:calibrated for dc Beta. Lever switches for BASE, CURRENT, GAIN, COLLECTOR VOLTAGE, COLLECTOR CURRENT, LEAK VOLTAGE, SHORT TEST, I _{cbo} , I _{ceo} or diode current.	Internal: seven 1.5v "D" cells provide 1.5,3,4.5,6,7.5,9v collect or supply for gain or leakage and 1.5 for bias.	Provides dc analysis of PNP and NPN transistors. Has variable bias for setting collector currents to 15a	\$60 (Kit)
BETA CAL, NPN-OFF-PNP, Beta (I _{ceo} I _{cbo}), CAL-TEST, BETA X1, or X10.	Operates from one "D" cell (not supplied)	Will measure transistor dc Beta in or out of circuit. Measures leakage out of circuit.	\$26.95 (Kit)
PNP-NPN, selector, FUNCTION switch, TRACER GAIN and BATT ADJ.	Eight 1.5v batteries	Comes with 7 test leads. Unit provides 1kHz signal plus harmonics for FM and RF signal tracing.	\$99.50
IN CIRCUIT ZERO ADJ CAL, PNP-OFF-PNP, BETA	Two 1.5v "D" cells	Unit comes with test leads and manual. It will not test MOS and FET transistors.	\$66.75
Combination PNP-NPN-FWD-REV switch, also HI-NORM switch	Operates from two 1.5v "AA" batteries	Will check from front to back diode ratios. Cannot be used for FET or MOS transistor tests.	\$18
NPN-PNP selector, ON-OFF, BETA CAL, BETA GAIN selector for transistors combined with GATE 1, GATE 2 selector for FETs		Comes with reference book of over 12,000 transistors and FETs	\$109.50
TYPE (NPN or PNP) selector, FUNCTION, GmZERO, ON-OFF		Comes with reference book of over 12,000 transistors and FETs	\$94.50

Sencore Model CG19 Color Bar Generator

This low-cost color bar generator is small enough to fit in the tube caddy and yet large enough for all service needs in the field

■ Servicing the color television set requires a number of complex test instruments.

When servicing the color set in the field, we sometimes find ourselves making a number of trips back to the service vehicle because of the size of the equipment.

This manufacturer kept the field service technician in mind and came up with a color bar generator compact enough to fit in the tube caddy reducing the number of separate pieces of instruments carried into the home.

The color bar generator is smaller than a box of cigars and almost as light. The instrument has a vinyl-clad steel case matching other instruments in the company's line and rugged enough to be carried in the tube caddy.

The unit is fully portable operating on two 5.6v mercury batteries for the power supply.

The unit provides five standard patterns: (1) ten standard color bars of the type and phase that have now become the standard in the industry; (2) crystal controlled keyed bars (with 30deg phase change between each), which is commonly found in service literature; (3) adjustable dot size which is easily adjusted with a screwdriver from the bottom of the unit; (4) the crosshatch pattern commonly used as a basic convergence pattern; (5) vertical and horizontal bars to simplify dynamic convergence.

The patterns can be produced on the entire low VHF band channels two through six by the TV channel adjustment which is lo-

cated on the bottom of the unit.

The main controls on the front panel include the POWER switch, COLOR OUTPUT control, PATTERN SELECTOR switch and INTERLACE control. The INTERLACE control is a new feature on this instrument. It enables the operator to actually adjust the interlace on the pattern and pair up individual lines on the screen to reduce their width or to get small round dots in the center of the screen, without dot bounce.

Being completely portable, the instrument operates by connecting the RF cable to the television antenna terminals and selecting the pattern.

The timer on this unit was designed so that the countdown from the 189kHz master oscillator to the 60Hz field frequency could be accomplished with three adjustments — HORIZ HOLD, HORIZ LINES and VERT STABILITY. This was done so that if the counting circuits should go out of adjustment, because of component aging or operation in very low or high temperatures, the timer could be "touched up."

All these adjustments can be made from the bottom of the unit without removing the cover.

CIRCUIT DESCRIPTION

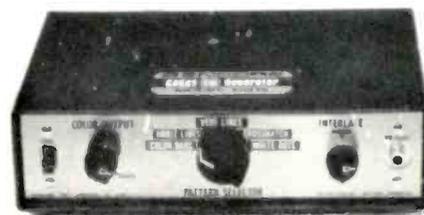
The color bar generator is a miniature transmitter that can operate over the low VHF TV band and transmits B/W and color test signals for color TV setup and troubleshooting.

The heart of the timer in the unit is the 189kHz crystal-con-

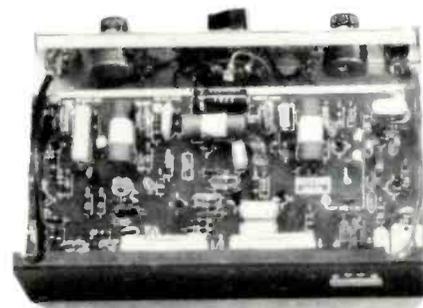
trolled oscillator TR1. Signals from this oscillator are used to gate the color signal (after shaping in stages TR2 and TR8), to form dots and vertical lines through differentiation by C19 and R26 and dot gate CR3 and to trigger the first counter stage TR3.

Only three counter stages, TR3, TR4 and TR7, are used. They are all identical except, of course, for the timing constants which determine frequency. They are essentially blocking oscillators with the timing elements in the emitters. The first counter is triggered by the 189kHz signal and divides 189kHz by 12, generating the horizontal line frequency. Output of TR3 is used to develop horizontal sync pulses in TR12 and also triggers the second timing stage, TR4. TR4 divides the 15750Hz signal alternately by 17 and 18 as controlled by the bi-stable MV, TR5 and TR6, through R14. Output from the bi-stable MV provides, through C14, one source of pulses at a 450Hz rate to the third counter, TR7. A second source of pulses, also at a 450Hz, is provided through C15 from the half line MV, TR10 and TR11. However, the second source of pulses occurs approximately midway between the first source pulses so that when

For more details circle
900 on Post Card



Sencore Model CG19 color bar generator.



Top view of generator with case removed showing circuit board and components employed in the compact unit.

mixed together they appear as a single source of 900Hz pulses. The third counting stage, TR7, divides by 15, generating the 60Hz vertical frequency. Output from TR7 is used to develop vertical sync pulses in TR12.

The half line MV fires each time TR4 divides by 17 and generates a new pulse 20 to 40 μ s later, as controlled by the INTERLACE control, R36. Since TR7 locks to this source of pulses through C15, every other time it fires (it divides by an odd number) one field (as viewed on a TV raster) can be shifted with respect to the other field approximately $\pm 10\mu$ s.

Outputs from the collectors of TR5 and TR6 are mixed together to form horizontal line pulses in TR9. Since the bi-stable MV switches each time TR4 fires, the horizontal line pulses are also generated at the same rate, i.e., spaced alternately by 17 and 18 horizontal lines. Thus, they always begin at the start of the horizontal sync pulse. The width of the horizontal line pulse is determined by R30, C21 and C22.

Signals from the color signal oscillator TR13, which are gated at a 189kHz rate through CR4, appear across the COLOR OUTPUT control R51, when the function switch S1 is in the color bar position. When S1 is in any other position, supply voltage is removed from the color oscillator and the shaper TR8 to prevent spurious operation.

Color signals from R51, vertical line or dot signals from CR3 and horizontal line signals from TR9 are selected with the function switch S1 individually or in combination (depending on the pattern selected) and are mixed with the composite sync signal from TR12 across R57 and R58.

C35 and R53 help to isolate the signal sources from the composite sync signal. CR5 clips the negative going sync signal so that sync amplitude across R57 and R58 is approximately the same as the positive signal amplitude at this point. The total P-P amplitude of the composite signal across R58 is approximately

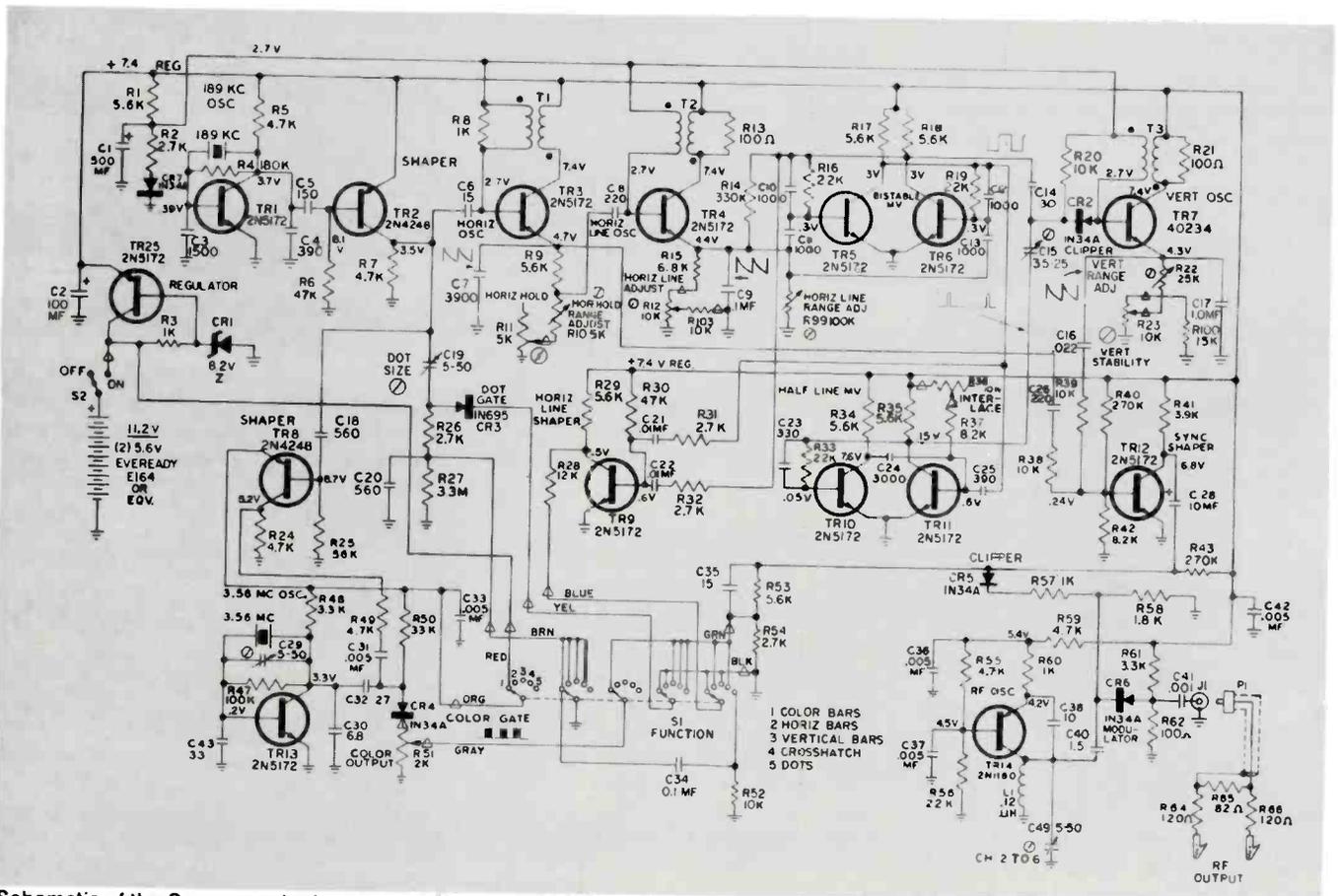
.3v.

The RF oscillator, TR14, is tunable from 55 to 84MHz (channels two through six) with C39. The output from the collector is amplitude modulated by the composite video signal in the modulator diode CR6. Modulated RF is coupled through C41 to the RF output cable, which is terminated with a resistive pad to match the 300 Ω input of a TV receiver.

The power supply for the generator consists of two 5.6v mercury batteries in series. The battery voltage is regulated down to 7.8v with zener diode CR1 and transistor TR25 which acts as a series regulator.

Jacks are provided on the back of the unit to check battery voltage. A VTVM or VOM is connected to the jacks and the power switch is turned on. If the battery voltage falls below 9.2v, the batteries should be replaced by simply removing the two screws on the bottom of the unit and sliding the chassis out of the case.

continued on page 81



Schematic of the Sencore color bar generator.



DEALER SHOWCASE

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

AM TRANSCEIVER 703

Crystal filters and dual conversion reject unwanted signals

A 15w AM business band transceiver, the Model BB-920, is introduced. All solid-state and American made, the unit combines compactness with



economy. It is FCC-type accepted for mobile 12vdc two-channel applications. The transceiver operates on the 25-40MHz band, with crystal filters and dual conversion. This unit joins the family of business band transceivers, linear amplifiers (up to 180w) and power supplies for either ac or dc operation. The linear amplifiers and power supplies are all solid-state. Commander.

ANTENNA HARDWARE 704

In specially designed blister packages

A new accessories center, a permanent merchandising display, is introduced. The display, stock number 10Y1000, is offered with an assort-



ment of 270 antenna installation hardware products selected for fast movement. Variations to the product assortment are possible for dealers who wish alternate hardware for display in their particular operations. The rack occupies only 3 1/2 sq ft of floor space. It is constructed of sturdy steel

structural supports, locked steel base shelf, 1 1/4in. perforated, tempered pegboard back and is coated with two-tone beige perma-baked enamel finish. Six-in. and 10 1/2in. heavy-duty, chrome-plated steel peg hooks hold the merchandise. RCA.

CIRCUIT COOLER 705

Designed to locate problem components by cooling

A freeze mist that reportedly cools circuits three times faster than standard circuit coolers is introduced. The product reportedly leaves no liquid

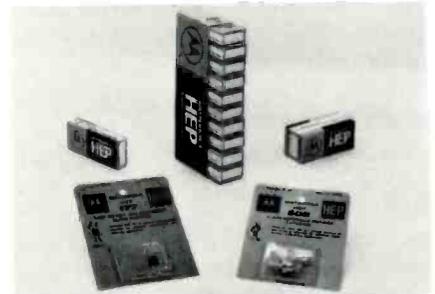


residue. The extra dry cooling agent is formulated to be non-toxic and odor-free. It is designed especially to locate defective capacitors, transistors and oxidize joints by instantly cooling components. The circuit cooler, Part No. 10-702, carries a resale price of \$2.50. GC Electronics.

SEMICONDUCTOR DISPLAY 706

Entire line of merchandise can be displayed

Introduced is a new type of display packaging that helps make semiconductor devices sell themselves. The new self-merchandising display cards are 3 1/4 x 4in. blister packages in eye-catching colors coded to indicate the type of device. They are smaller than previous HEP packages, yet contain the same extensive electrical data and preprinted suggested pricing that



are work savers for counter salesmen. Both hobbyist and replacement types are available in this new packaging. A distributor can now display the entire line, including the 600/700 series of replacement devices, on a single merchandise display. The line of devices is also available in small, vacuum-tube-type cartons for distributors who prefer this type of packaging. Motorola.

DIGITAL CLOCK 707

Engineered for any installation

Announced is the development of a 12- or 24-hour low cost tymeter digital readout clock fully enclosed for



improved appearance opportunities. The clocks are engineered for installation in any equipment or products, rack, console, cabinet and panel; and are designed for convenient economical mounting. Other features include large 5/8in. digits. . . front panel time reset facility, digits resettable individually. Size: height 3 1/2, width 5 1/2, depth 3 1/4in., weight 3 1/2 lb. Pennwood.

CONTROL AMPLIFIER 708

Kit or factory-assembled models available

A Model SCA-80 transistorized control amplifier, in a single, integrated package combining a power am-

Don't sell a color picture tube unless its been on a test ride.

Down at the bottom of the page, you have a major advance in space-age homeliness.

And a major advance in color tube testing as well.

That machine squatting down there is our beloved Iron Horse, the fully-automated, revolving carousel we use to test our color bright 85[®] tubes for emission, gas leakage, shorts, arcing and screen uniformity prior to shipment.

Now we don't intend to go into a song and dance on how total automation reduces testing error.

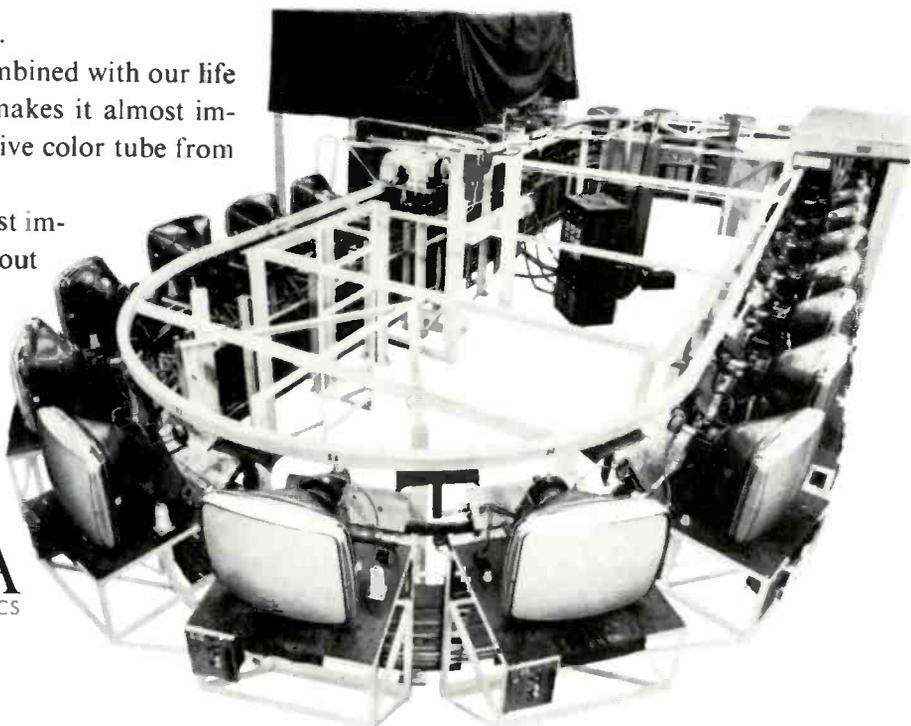
But we will tell you one thing.

Our Iron Horse test ride, combined with our life testing and 100% set testing, makes it almost impossible for you to get a defective color tube from us.

Which in turn makes it almost impossible for you to get chewed out by a customer.

Next time you need a color replacement tube, remember the great thing about the color bright 85. We don't send it to you till it's been around.

SYLVANIA
GENERAL TELEPHONE & ELECTRONICS



ET/D DEALER SHOWCASE

plifier and a preamplifier is introduced. The unit is rated at 40w continuous RMS power per channel across the audio spectrum with both channels driven simultaneously into eight ohms. Harmonic distortion is reportedly under 1/2 percent and IM is under 1/10 percent at rated output. The amplifier incorporates a patented current limiting protective circuitry which acts automatically to eliminate the need for channel fuses or circuit break-



ers and provides automatic resumption of program material once an abusive operating condition is remedied. The control section of the amplifier has complete facilities, yet is simple to operate with a basic two-knob control action for those who do not re-

quire features such as loudness, filters, blending and remote speaker switching. The kit features factory-assembled, in-circuit tested printed circuit boards which include all critical circuitry. No special test equipment is required for the kit's assembly. The cadmium-plated steel chassis is corrosion resistant and the unit is supplied complete with a metal cover. Price of the SCA-80 kit is \$169.95 and the factory-assembled model is \$249.95. Dynaco.

SEMICONDUCTORS 709

Each card contains cross reference on reverse side

A complete semiconductor merchandising program is introduced. The program includes 13 of the most popu-



lar semiconductors used by hobbyists and experimenters. Each item is packed in an attractive, easily displayed blister package and each card has a complete cross reference on the reverse side. The semiconductor merchandising program, No. 49-1075, is a standard price line and each carded item resells for 99 cents each. A starting quantity ranges from four to ten pieces on each item. GC Electronics.

MUSIC SYSTEMS 710

Ultra-compact system provides 360deg sound

Announced is a line of compact music systems. Slimline is ultra-compact and can fit into a small space on a book-

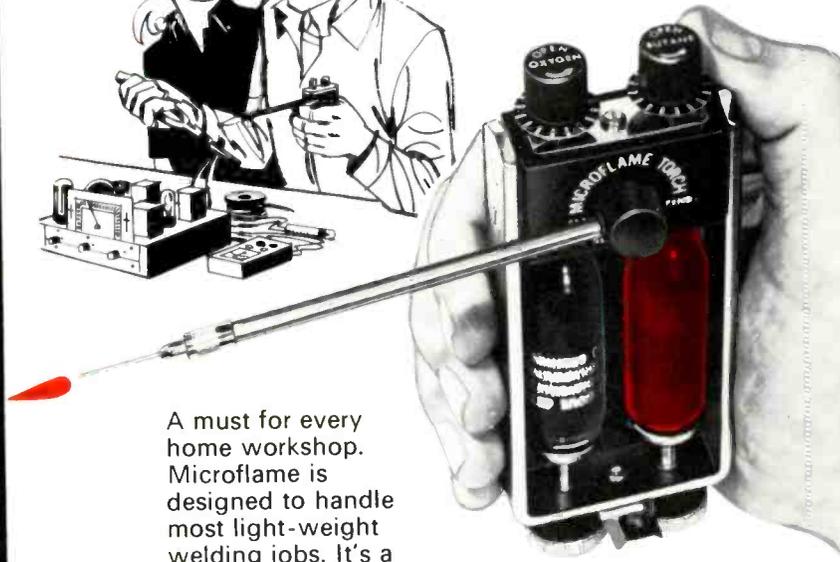


shelf or table top. It consists of four separate products. Model SL1012 is an AM/FM stereo receiver/speak-

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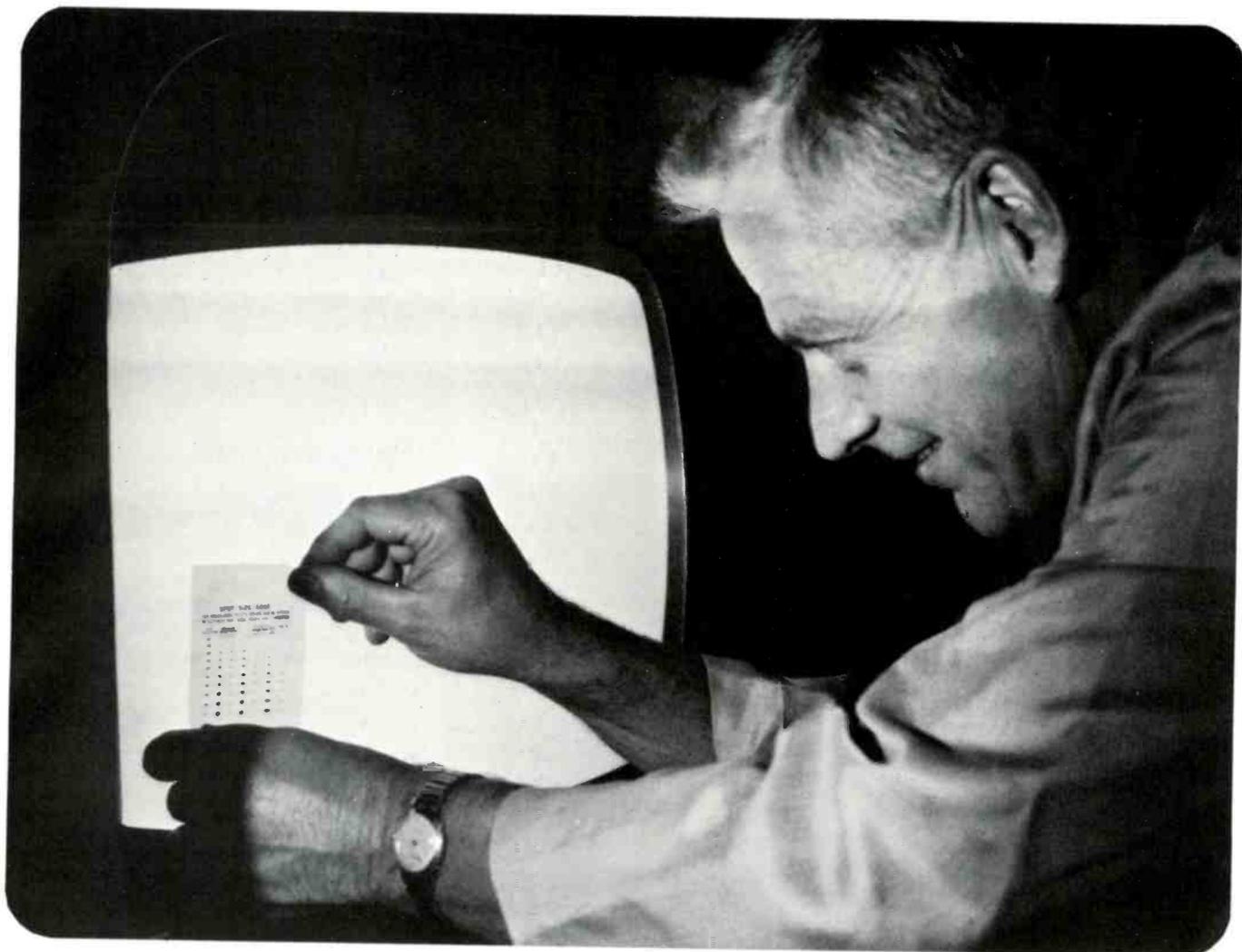
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"extra bright" rare earth phosphors down the drain because he knew a screen did not live up to Channel Master's reputation of equaling or exceeding industry quality standards.

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Call your Channel Master distributor. He's a good guy. He's your Picture Tube Headquarters.

At Channel Master YOUR Reputation is OUR Business.



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... for more details circle 107 on Reader Service Card

ET/D DEALER SHOWCASE

er combination priced at \$199.95 minimum resale. The speakers are omnidirectional and scatter sound in a 360deg circle. Model SL1112 is the same stereo receiver/speaker combination as the SL1012 only with the addition of a mini record changer and tinted plexiglas dust cover. It has a retail price of \$249.95 complete. Model SL1312 consists of an AM/FM stereo receiver/speaker combination and a mini record changer/stereo tape cassette recorder. Complete system price with dust cover for phono/cassette mod-

ule is \$349.95. The mini changer/tape cassette module will also be sold separately as the Model PC13 complete with dust cover. It is priced at \$149.95. Harman Kardon.

STANDOFF INSERT 711

Simple installation retains all types of antenna wire

Introduced is a standoff insert that retains all TV antenna wires and is very universal. The insert will hold the Belden 8290 heavy-duty shielded 300Ω wire, standard flat line, heavy-duty 300Ω line, foam-filled VHF/UHF



twin line, round hollow UHF twin line, pool and RFG Co-Ax line. The wire can be easily slipped into the slot of the standoff for fast installation and it is not necessary to take the insert out of stand-off or swing it open to insert TV wire. iE Manufacturing.

easy answers to common color complaints

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Puts back brightness

Color-Brite Picture Tube Briteners

Color-Brite brings out lost sharpness and details of fading color picture tubes. Provides increased filament voltage to boost electron emission, returns full contrast and color quality.

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for round tubes
Dealer Net \$5.85
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Puts back black-and-white

Color-Brite Isolation Briteners

No Boost. Corrects for cathode-to-filament short causing loss of black and white video drive. Isolates the short, restores the black and white information that gives the color picture its quality.

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for rectangular tubes
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Puts back full voltage

Automatic Voltage Regulator

Automatically boosts voltage 10 volts when line voltage drops below 110 volts. Eliminates shrinking, loss of brightness, loss of convergence. Combats poor line voltage regulation, overloaded circuits.

MODEL D-210
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WIRE STRIPPER 712

Cuts conductors up to size No. 6 wire

An inexpensive tool for stripping, cutting and looping all commonly used wire from Nos. 6 to 16 solid and 8 to 18 stranded is introduced. The tool, called "Little-7," has six stripping



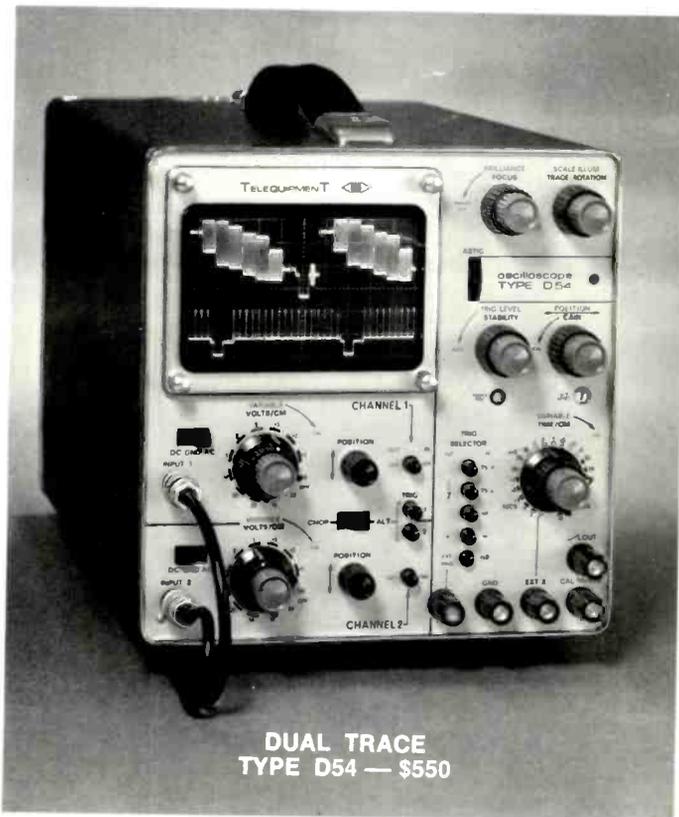
holes that are reportedly accurate and clearly marked. The cutting blade is 1/2in. long to allow cutting of copper and aluminum conductors up to No. 6 wire, also UF and Romex cable with a single snip. The nose of the tool is pointed to reach into confined areas and can also be used for reaming 1/2 and 3/4in. conduit. The handles have plastic grips and a wide span. The two halves are assembled with an adjustable "Sta-Fast" hinge bolt. Over-all length is 6in.; weight 4 oz. Holub.

Continued on page 78

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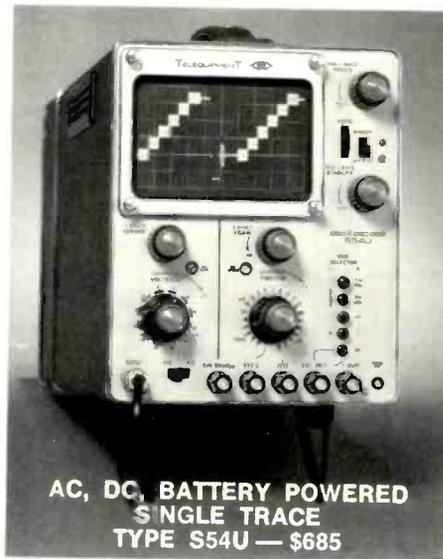
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The 54 Series represents a new standard of performance for low priced oscilloscopes. The use of field effect transistors in the input stages means that the trace is stable . . . even at a deflection factor of 10 mV/cm. The ability to trigger at TV field or line rate, coupled with magnified sweep speeds to 40 nanoseconds per centimeter, permits high resolution analysis of video signals. Want to look at the 3.58 MHz color subcarrier? You can do it with any of the 54 Series.

The Dual-Trace Type D54 lets you look at two signals *simultaneously*, a real help in aligning FM Stereo equipment.

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COLORFAX

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

ADMIRAL

Color TV Chassis G11/G13—Horizontal Output Transformer and Tube Replacement

When replacing the horizontal output transformer in a G11 or G13 series color TV chassis, it is very important that you also replace the horizontal output tube with a new Admiral branded 6KD6. The transformer failure usually damages the output tube so replacement is necessary to avoid a callback. The transformer replacement kit has been revised to include a 6KD6 tube and the part number has been changed to 98A131-3 from -2.

Some of these chassis used a pair of 6JM6s. You can either replace with new 6JM6s or a single 6KD6 (clip off the extra plate cap).

Do not return the set to the customer without setting the high voltage at 26.0kv (at zero beam current) and measuring the horizontal current which should be between 235ma and 250ma.

GENERAL ELECTRIC

Color TV Chassis KE—High Voltage Arcing

A few reports have been received concerning intermittent high voltage arcing in the KE chassis. In some cases this did not occur when the service man was present, then repeat calls were sometimes necessary to discover the defect.

If you should encounter such a condition, the receiver should be inspected for evidence of high voltage arcing in the most likely places such as defective spark gaps, spark gap capacitors C116 or C117 damaged, anode lead and connector, or arcing to the picture tube shield or neck. If no indication of a defect is found, the 6LJ6 high voltage regulator tube V17 should be replaced. Some cases of intermittent high voltage arcing have been traced to this tube.

After the problem has been rectified, it is very important that the high voltage be adjusted to the correct value for the particular receiver. If the high voltage cannot be adjusted, it is probable that the arcing has opened cathode resistor R132. The spark-gap capacitors C116 and C117 should also be checked for damage.

MAGNAVOX

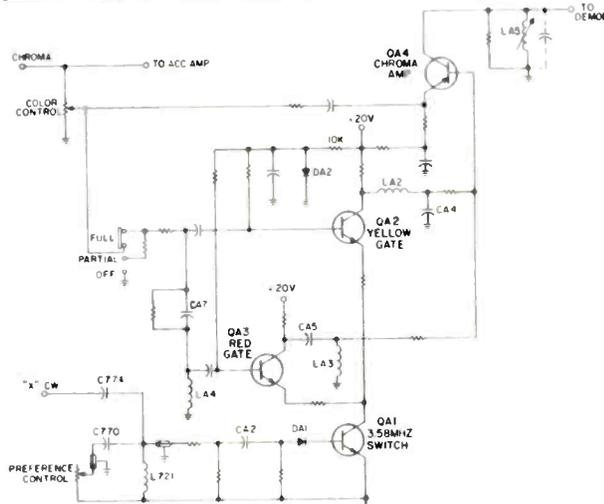
Color TV Chassis T940—Troubleshooting the ATC Circuit

The Automatic Tint Control (ATC) circuit may be checked very quickly for proper operation with the ATC switch and the PREFERENCE control. First, turn off the ATC switch and tune in a color picture. Adjust the TINT control for correct fleshtones. If the picture is normal, two assumptions can be made—the 20vdc supply to the ATC board is present and the chroma amplifier is working. If the chroma amp is not working properly, the symptom of "weak color" or "no color" will result. This symptom may also be produced by the bandpass amplifier and the killer stage. Defects in the killer detector, phase detector, and the 3.58MHz oscil-

lator may also produce this symptom. Scope checks, using a low-capacitance probe, should be made to trace the chroma signal to the point where it is lost.

With the ATC switch placed in the FULL position, the PREFERENCE control should vary fleshtones from green, through normal, to magenta, similar to the action of the TINT control. With the ATC switch in the PARTIAL position, the range of the PREFERENCE control is reduced.

A problem in either the red gate or the yellow gate may be isolated by observing the action of the PREFERENCE control with the ATC switch on FULL. If fleshtones can-



not be shifted to green, the defect is most likely in the red gate circuit. If fleshtones cannot be shifted to magenta, the defect is in the yellow gate circuit.

The gates may be checked for proper operation using a scope and a color bar signal. While scoping the collector of the yellow gate, adjust the PREFERENCE control to obtain maximum amplitude of the first bar following the horizontal blanking interval. Move the scope probe to the collector of the red gate; the third and fourth bars should have approximately equal amplitude. If no waveform is present, check the base signals and the dc voltages.

If the PREFERENCE control has little or no effect on fleshtones with the ATC switch on FULL, the problem will most likely be the 3.58MHz switch or loss of the "X" CW signal. The switch transistor and base circuit components should be checked for opens and shorts. A shorted switch transistor will allow the gates to conduct on the positive half-cycle of any chroma signal and all ten bars of a color bar pattern will be present at the collector of both gates. An open 3.58MHz switch, or loss of the "X" CW signal, will prevent the gates from conducting at any time and there will be no collector signal on either gate.

The AUTOMATIC COLOR CONTROL (ACC) circuit functions to minimize large variations in chroma amplitude so that frequent adjustment of the COLOR control becomes unnecessary. Control is accomplished by changing the gain of the bandpass amplifier with a dc voltage. The ACC circuit utilized in the T940 chassis uses two signals to develop the control voltage—the burst signal and the chroma signal. An increase in either one or both of these signals causes a negative-going voltage to be applied to the control grid of the bandpass amplifier to reduce gain. A reduction of either signal causes the gain of the amplifier to increase.

PHILCO-FORD

Color TV Chassis 16QT85 and 16NT82—Horizontal Centering Improvement

The following procedure can be used in certain instances to improve centering in the subject chassis.

1. Unsolder components R208, R209, C207 and RV 201

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produce it - us! For complete information on Columbia wire, cable and cord sets write Columbia Electronic Cables, 150 Hamlet Ave., Woonsocket, R.I. 02895; Mid-West Warehouse, 4045 North Rockwell St., Chicago, Ill. 60618; West Coast Sales Office and Warehouse, 1950 Naomi Ave., Los Angeles, Calif. 90011.



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Fast heating. Long-life tips. Exclusive trigger-controlled dual heat. High soldering efficiency. Spotlight. 3 models from 100/140 watts to 240/325 watts.



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They outperform other irons of their size and weight. Long-reach stainless steel barrels. Replaceable tips. 5 models from 25 watts to 175 watts.



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Industrial rated. Weighs 1 $\frac{3}{4}$ oz. Delivers tip temperatures to 860°F. Cool, impact-resistant handle. Model W-PS with $\frac{1}{16}$ " tip.

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WORLD LEADER IN SOLDERING TOOLS

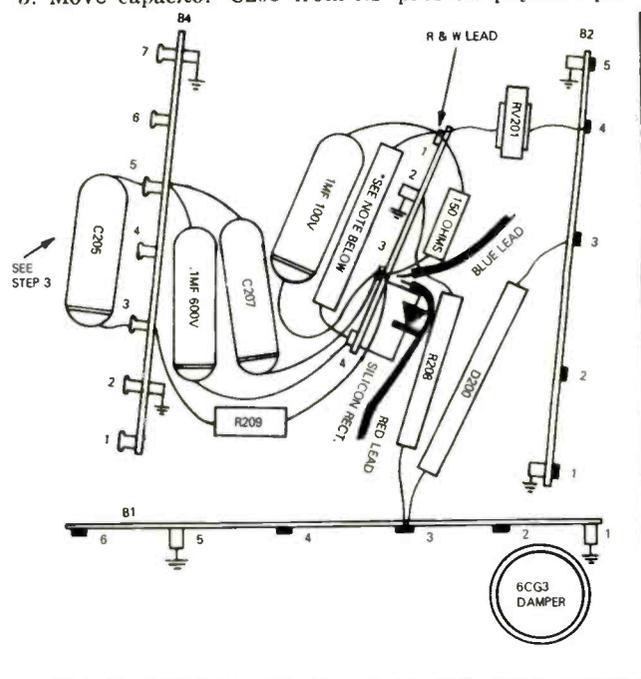
... for more details circle 136 on Reader Service Card

ET/D COLORFAX

from terminal strip B3; also the red, blue, and the red and white lead.

2. Remove terminal strip B3 and replace it with a 4-lug terminal strip (with lug #2 being the only ground lug), at an angle so that it runs parallel to the focus rectifier D200.

3. Move capacitor C205 from its present physical posi-



tion to the opposite side of terminal strip B4 and resolder to the same lugs (3 and 5).

4. Reconnect the following components to terminal strip B3 as follows: RV201 to lug #1, R208 to lug #2, R209 to lug #4, C207 to lug #3, the red and blue leads to Lug #3 and the red and white lead to lug #1.

5. Connect the 150Ω 1/2w resistor to B3 between lugs 1 and 3.

6. Connect the silicon rectifier to B3 between lugs 3 and 4 (see drawing for polarity). Anode side connects to lug #3.

7. Connect the 1µf 100v mylar capacitor to B3 between lugs 1 and 3.

8. Connect the .1µf 600v capacitor between terminal strip B4 lug #5 and terminal strip B3 lug #4.

9. Connect the 1.5K (7to 10w) resistor to B3 between lugs #1 and 4. Keep some clearance between the 1.5K and the other components because of heat.

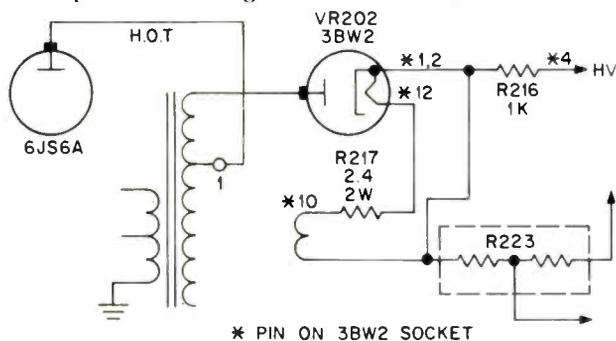
NOTE: In step 9, the 1.5K (7to 10w) resistor will shift the picture 7/16in. to the right. If you desire a greater shift, you may use a 1K (7 to 10w) resistor which will move the raster approximately 5/8in. to the right. Never go lower than 1K in an attempt to obtain a shift greater than 5/8in.

Color TV Chassis 20KT40/20KT41 — High Voltage Rectifier Tube

The 3AW2 high voltage rectifier tube originally scheduled to be used in chassis type 20KT40 and 20KT41 was changed in first production to a type 3BW2. All preliminary service data and service manual PR4165 should be corrected to show this change. The 3AW2 tube should not be used as a replacement in this chassis since production changes to the wiring of the tube socket increases the filament voltage such that the 3AW2, if used, would have a very

short life. Only a 3BW2 should be used for replacement purposes.

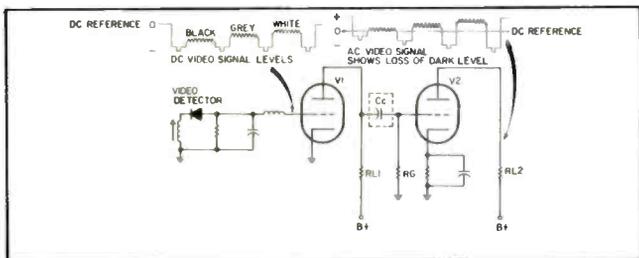
The production changes are illustrated as follows:



SYLVANIA

Color TV Chassis D12—DC Restoration

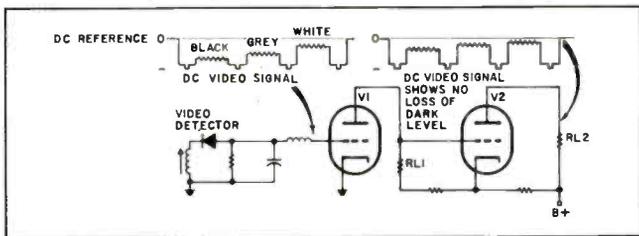
The purpose of dc restoration in a black and white television set is to maintain the black to white signal ratios present in the transmitted signal. In color television, dc restoration is needed to maintain color fidelity, from fully saturated



colors to the lighter pastel colors. If the black level changes due to the Y signal losing its dc reference, the colors desaturate.

Interstage coupling capacitors shown in the illustration remove the dc reference from the video signal making it an ac signal. The peak to peak input voltage does not change. However, the grid leak bias developed by the positive portion of the waveform changes as the signal level changes. This action shifts the conduction level of the amplifier. The voltage drop across RL2 will vary with the grid leak bias.

In the direct coupled amplifier, the average conduction level is related to the grid to cathode dc bias voltage of the



amplifier. The voltage drop across the load resistor RL1 is coupled directly to the grid of V2 developing a voltage drop across the load RL2.

When the input signal is applied to the grid of V2, the dc bias is increased or decreased by the voltage changes. The dc reference in the output signal waveform shown in schematic is maintained and saturated colors remain saturated.

When fully saturated colors are transmitted as part of the composite video signal each color has a definite brightness level, that must be maintained. DC restoration in the Y channel insure the correct brightness level for each of these colors. As an example, if saturated red is transmitted the brightness level is 30 percent. The 30 percent brightness level is maintained in the Y channel as referenced to the blanking pulse. This Y channel signal without dc restoration increase its white level as shown, the color will lose its fully saturated condition showing up as a washed out red or pink.

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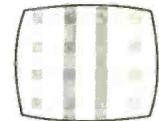
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plus
Exclusive
Heath
"3 x 3" Display**



3x3 Dot



3x3 Cross Hatch



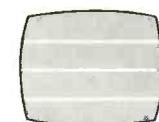
3x3 Shading



3x3 Color Bars



3x3 Vertical



3x3 Horizontal

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- Horizontal lines only one raster thick for added accuracy
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- Variable front panel positive and negative video output
- Front panel negative going sync output
- Two handy AC outlets on front panel
- Built-in gun shorting circuit with lead piercing connectors
- Front panel switchable crystal controlled sound carrier
- Copper-banded transformer to reduce stray fields
- Safe three-wire line cord
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NEW PRODUCTS

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

SINGLE CHANNEL PREAMPLIFIERS 713

Employ silicon transistor circuitry

A line of selective solid-state single channel preamplifiers for all "82" channels is introduced, using silicon



transistor circuitry. They provide 20dB gain on all UHF channels, 20dB gain on VHF channels 7 through 13 and 16dB

gain on VHF channels 2 through 6. Adjacent VHF channels are attenuated by 15dB (15dB down 6MHz from edge of desired channel). Since UHF channels are not so closely spaced, the UHF preamplifiers attenuate UHF frequencies three channels away by 15dB. Noise figure is reportedly low, only 5dB on channels 2 through 6, 6dB on channels 7 through 13 and 9dB at UHF frequencies. Input and output impedances are 75Ω. Each unit comprises a mast-mounted single-channel preamp in an unbreakable molded plastic case and an indoor remote power supply. The output of the remote power supply can be fed directly into a single channel or broadband amplifier, or mixed with other channels through a filter network. The series are model numbers SP-2802 through SP-2883, with the last two digits indicating the channel number. The SP-2888 handles the entire FM spectrum. The units list for \$75. JFD.

ing 4 lb, the unit is approximately 9w x 4h x 6in. d with a telescoping antenna which extends to 17in. Sensitivity is reportedly 1mv or better for 20dB quieting and a squelch control eliminates extraneous noise. Miniature plug-in type crystals are available for the exact frequency desired. Front panel controls include squelch, volume with power switch, manual scan, channel select and eight pilot lamps. Three basic models are offered, with frequency ranges of 30-50MHz, 150-174MHz and 450-470MHz. Suggested retail prices start at \$139.95, plus crystals. Electra.

SANS-A-FUSE 715

Circuit breaker replacement for fuse

Introduced is a line of color coded, plastic covered circuit breakers designed to replace either chemical or amp fuses. The color coded fuse fits in the same socket as the chemical or amp

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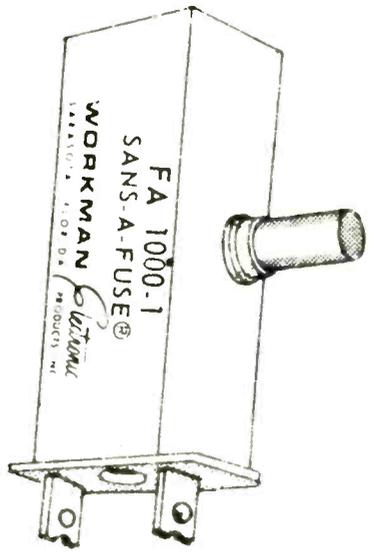
RADIO RECEIVER 714

Automatically scans any eight channels

A radio receiver that automatically scans up to eight fixed frequency channels while presenting a continuous flashing light display is announced. Known as the Bearcat, it is designed for all business and emergency radio



users. It searches at the rate of 12 channels per second, locking on the first active channel. When the transmission ends, the signal search continues. A red light blinks for each channel scanned and the light stays on during a transmission to identify the active channel. Any desired channel may also be manually selected. The radio may be used conventionally or mounted in a vehicle. A 117vac power cord, 12vdc power cord and mounting brackets are furnished. Weigh-



fuse and it eliminates time consuming, repeated replacement which may be needed until a circuit is repaired. The circuit breaker can be reset as often as necessary until the cause of the circuit defect is found; then the proper fuse may be installed. Workman.

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E-12

POINTER KNOBS 716
Unbreakable one-piece construction

The KPN series is a one-piece machined aluminum pointer knob with a straight knurl body. The unbreakable one-piece construction includes the protruding pointer that has a hair-line indicator. Serrations make up the straight knurl body and the knobs have a hard anodized finish resistant

to scratches and wear. The one-color finishes available are: natural aluminum and anodized black. The two-tone color combinations include knobs with



natural aluminum body with black top, and black anodized body with natural color top. Outside body diameter is 0.750in. and has a 1/4in. shaft diameter. This series includes 6-32 set screws in two places. The knobs

are priced at \$1.40 each in single lots, and the two-tone models are \$1.60 each. Alcocnob.

INVERTER 717
Provides reliable 117vac power from 12vac battery input

Announced is the production of two frequency stable inverters for the operation of closed-circuit television. The Continental Model 50-191-3 (275-



300w cap.) and the dual Continental Model 50-202-3 (550-600w cap.) provide reliable 117vac power from standard 12vac battery input. The frequency stable feature of both these units, $60 \pm 1/4$ Hz, provides the type of power for the operation of TV cameras, recorders and monitors. Units come complete with convenient remote control and heavy-duty 15ft copper leads. Both units are ideal for operating many pieces of peripheral equipment without wattage, capacity of unit, used in direct conjunction with CCTV systems. Other higher wattage 24v units are available at additional cost. Terado.

VOM 718
Features taut band meter movements

Introduced is the 260 series VOM with taut band meter movements. Instruments calibrated after 25 million cycles reportedly showed



a change in repeatability of less than 0.2%. The taut band movements withstand moderate shock and vibration which cause errors in pivot and jewel instruments. The response of the taut band meters reportedly offers smoother operation and eliminates noticeable overshoot. These Volt-Ohm-Milliammeters come in a broad variety of ranges and accuracies with Add-A-Tester Adapters

Insurance Analyst



**B&K
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Today, practically everything in electronics is converting to solid-state circuitry. To stay on top of the transistor market, it becomes more and more important that you be able to do a top-notch job in transistor equipment servicing. That's why B&K designed the *Insurance Analyst*. It's the transistor set analyst that far surpasses any other instrument of its kind... one that makes solid-state servicing a fast, uncomplicated operation. It's the diagnostic instrument that insures your staying on top of transistor equipment diagnosis.

The B&K transistor analyst is designed to make transistor diagnosis a simple, fast, efficient operation. It services not only transistor portables, but also auto and home radios, TV and audio amplifiers. It also provides RF and IF frequencies for FM receivers. And the FM and AM generator outputs feature pin-point vernier tuning for high speed diagnosis.

Service engineers everywhere have acclaimed the 970 as the leader in the

field. And that's understandable, when you stop to think what a precision instrument it really is. The all solid-state circuits assure minimum down time and maximum reliability. It's capable of in-circuit and out-circuit testing and *requires no unsoldering of transistors or other components*. It even has its own built-in power supply with a 5 amp output and low ripple. And the rugged, burn-out-proof DC Volt-Ohm-Milliammeter features 11 ranges for your convenience.

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which expand capabilities for VTVM, temperature measurement, audio wattmeter and many other applications. Simpson.

SOLDERLESS CONNECTOR

Requires no special tools **719**
and assembles in seconds

A solderless connector, Model PL 259, is reportedly assembled in seconds and requires no special tools. Standard in all respects with the regu-



lar PL 259, this connector (patent pending) is presently available. Also available is the GLC89 connector for 58/U cable and the GLC 90 connector for 59/U cable. Only a single cut to the inner conductor is necessary in using this connector. No adapter of any kind is needed and since no soldering is required, the connectors may be used over again. Gold Line.

TUBE TESTER

720

Solid-state devices used to test tubes

Announced is a tube tester using FETs in place of a vacuum tube, allowing the service technician to get immediate readings even when he



forgets to turn the tester on before the test. According to the manufacturer, tube-operated testers often read the leakage of the tube in the tester itself and possibly cause the technician to reject good tubes. Reportedly this is the first time in tube tester history that solid-state devices have been used in tube testers. The Mighty Mite Six, Model TC154, also has a new time-saving feature of push buttons to replace the function switch. Another socket has been added to test some of the later tubes and tubes that were seldom used in the past but have recently become popular. The unit is housed in a two-toned brushed steel and vinyl clad case with the vinyl carrying over the front panel. Price is \$89.50. Sencore.

New Coil Catalog

Catalog 170 gives specifications, prices and installation diagrams for the industry's most complete line of RF and IF coils.

Exact replacements are cross referenced for all known color and black and white TV sets, home radios and car radios.

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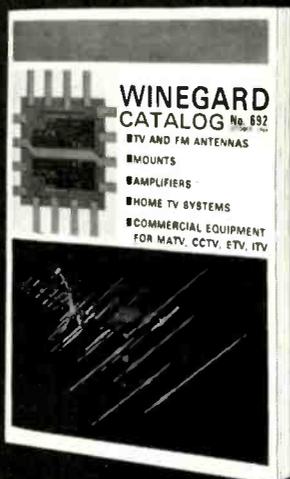
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**RCA Raises Prices on
TV Sets and Stereo Consoles**

The RCA Sales Corp. announced selective price increases averaging 2.2 percent on color and B/W television receivers and 3 percent on console stereo-radio combinations. The price increases will be effective Oct. 11, 1969, and will apply to all but a few models in the current RCA lines.

Donald P. Dickson, president of the RCA Sales Corp., said the price increases reflected rising costs which exceeded the company's ability to absorb them. Dickson pointed out that RCA had long held the price line on its consumer products through innovative cost reduction programs, but that inflationary pressures had continued to mount.

Certain portable and promotional models in the RCA lines are not affected by the price changes.

**Three-Year Warranty on
Admiral Replacement Tubes**

Admiral Corp. announced that its exclusive three-year warranty on color picture tubes in new color sets has been extended to include the company's line of Super-Brite replacement tubes. The standard replacement color tube warranty in the industry is one year.

J. J. Casale, marketing vice president-electronics division, said that owners of Admiral color sets with an expired tube warranty can purchase from any Admiral distributor or dealer a new (not rebuilt) picture tube with a three-year warranty. These include bonded tubes ranging from 12 to 23 in. in size.

Admiral Super-Brite color tubes are produced with improved rare-earth phosphors in the company's multimillion-dollar tube plant in Chicago.

**Semiconductor Sales Up 15.5 Percent
In First Seven Months**

U.S. factory sales of semiconductors totaled \$778 million during the first seven months of 1969, the Electronic Industries Assn.'s marketing services department reported.

This was 15.5 percent higher than the \$673 million in total sales during the same period in 1968.

Sales of monolithic ICs amounted to 129 million units valued at \$226 million during January-July 1969, up 80.9 and 29.6 percent respectively, from unit and dollar sales during this period a year ago.

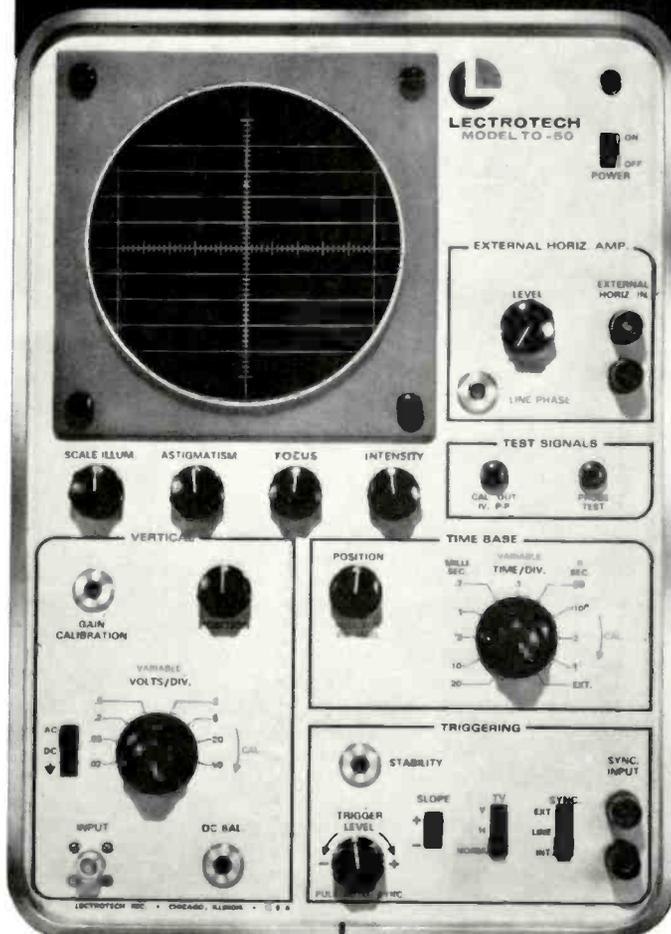
When sales of hybrid ICs are added to the monolithic types, total IC sales increased 53.4 and 26.7 percent in unit and dollar sales, respectively, reaching 205 million units valued at \$268 million.

Sales of discrete semiconductor devices were up a substantial 28.6 and 10.4 percent in unit and dollar sales, respectively, to reach 1.8 billion units valued at \$510 million during the first seven months of this year.

**Vikoa Completes Acquisition
Of Fayette CATV System**

Vikoa, Inc. (ASE), operator of CATV systems and manufacturer of coaxial cable and electronic components for CATV systems and the communications industry, announced that it had completed the acquisition of Fayette TV Cable Co.,

AT LAST ... solid state triggered sweep, wide-band at a price you can afford!



Made in U.S.A.

5" oscilloscope / vectorscope

Triggered Sweep: Easy to use. Positive sync results in absolute stability of patterns.

Solid State: For reliability and performance.

Wide Band: 10 MHz—for increased use in all servicing, industrial and educational applications.

D.C. Amplifiers: Eliminates pattern bounce. Permits viewing A.C. signals and D.C. level simultaneously. Use as a sensitive D.C. voltmeter.

plus . . . Calibrated vertical attenuator. • Calibrated horizontal time base. • Automatic sync mode. • TV sync selector. • Vectorscope input for color TV servicing. • External horizontal amplifier. • 60 cycle horizontal sweep (sine wave) with phasing control. • Compatible with all sweep generators. • Edge lit calibrated scale. • All solid state (tube protected input).

ONE YEAR WARRANTY

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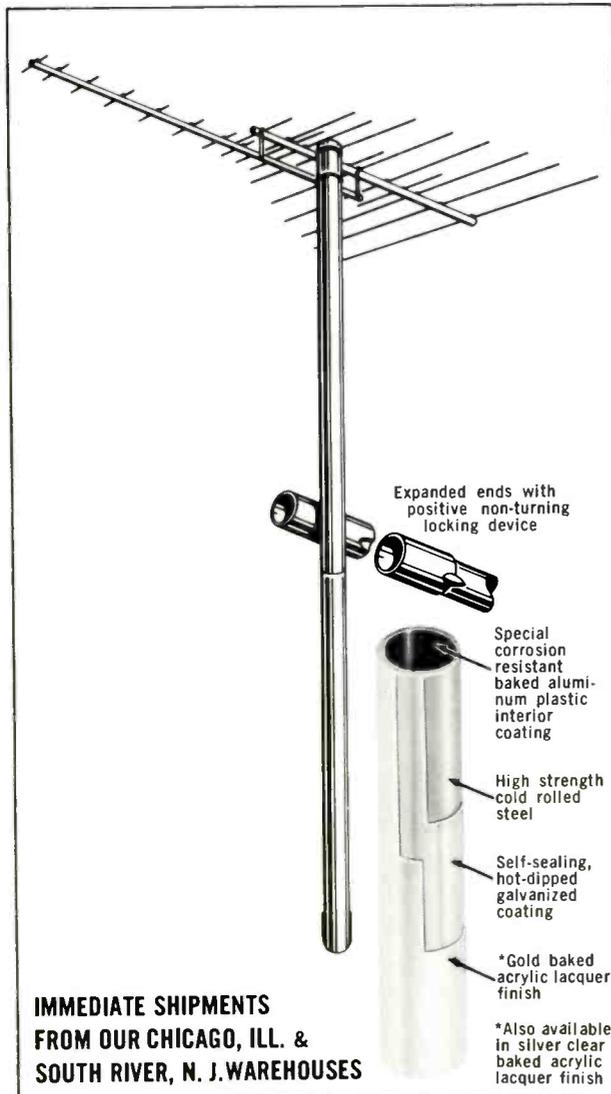
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PLUS... A SPECIAL CORROSION RESISTANT BAKED ALUMINUM PLASTIC FINISH ON THE INSIDE SURFACE.



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- Expanded ends permit combinations of 16 and 18 gauge tubing, 1 1/4" dia. to be joined securely to each other.
- Shipped in convenient 10 packs; in 5 ft. or 10 ft. interlocking lengths.

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ET/D NEWS OF THE INDUSTRY

of Uniontown, Pa., a CATV system operator for short-term notes and stock.

Fayette is a 100-mile system, currently serving 4800 subscribers in a potential market of 10,000 subscribers. The addition of Fayette increases the number of Vikoa systems currently in operation to ten, serving a total of more than 36,000 subscribers in areas with a potential market of over 100,000 homes.

James R. Kaplan Appointed Director Of Sales for Cornell-Dubilier

James R. Kaplan, formerly Central regional sales manager for Cornell-Dubilier, has been appointed director of sales, with full responsibility for all domestic sales operations for the company.

Kaplan, graduate of the College of William and Mary, joined CDE in 1961 as a sales engineer. He became a district sales manager in 1963, and a regional sales manager in 1966. Prior to joining Cornell-Dubilier, he served as missile officer (U.S. Army) Nike-Hercules Missile Site, Los Angeles.

John Glynn, formerly vice president of sales for CDE, has resigned to form a New England representative firm, JMG, Inc., operating out of Norwood, Mass.

Hitachi Extends Color Set Warranty

An extended warranty is now in effect on all Hitachi color TV sets currently being marketed by Hitachi Sales Corp. of America. Morton M. Schwartz, marketing director, stated, "All solid-state components are guaranteed for five years, the picture tube and all other parts are covered for two years, and labor costs are free for one year on a carry-in basis to any of the Hitachi service stations nationwide."

Schwartz, in making this announcement, went on to say, "Two factors make these extensions possible. First, Hitachi manufactures all the components that go into our sets and second, our labs in Japan have recently completed accelerated test-to-destruct studies that condense years of continuous transistor use into a much shorter period of time. The results of these tests confirmed the practicality of extending the warranty."

Seasonal Farm Workers To Be Retained in Electronics

Seasonal farm workers in North Carolina will be retained for jobs in the electronics industry by attending classes in a mobile Automated Training Center (ATC) developed by RCA.

The mobile ATC is a house trailer unit containing the latest electronic equipment capable of demonstrating basic theory and solving the most complex television repair problems. The facility is a recent development by RCA Service Co. for the training of television repairmen.

The Choanoke Area Development Assn. (CADA), an anti-poverty agency in North Carolina involved in retaining seasonal farm workers for jobs in industry, has purchased one of the centers for a pilot program to teach television repair to the men who have been displaced on farm operations.

CADA will initiate the project with two sessions daily

in the mobile trailer unit. The trainees to be selected for the program must first pass a basic electronic aptitude test and then work through completion of the curriculum on an individual basis.

The agency will select trainees from the Bertie, Halifax, Hertford and Northhampton counties of North Carolina.

Housed in a 10 x 45 ft house trailer that accommodates eight students per class, the facility includes complete furnishings, a specially designed self-study curriculum, student tests and laboratory materials, tools, test equipment, television receivers and accessories. There is also a reference library, and electronic trainers designed specifically to fit the curriculum.

The electronic trainers utilize more than 300 plug-in components to enable the student to complete over 150 experiments contained in the course requirements. The plug-in feature was created to simplify the mechanics involved in connecting and modifying test circuits, allowing the student to concentrate on practical aspects of circuit operation.

E. L. Klein, manager of educational programs for the RCA Service Co., said that the ATC represents a unique concept in providing comprehensive training in the field of electronics.

Klein also said that the ATC combines the convenience and flexibility of a home self-study program with the advantages of a resident training environment. The specially designed curriculum and electronic trainer enable the student to complete the entire program with minimal instructor assistance.

The eight-station center purchased by CADA is one of four being offered by RCA for use by vocational schools and in other school and training situations. The others include a highly mobile 8-station semi-trailer unit, measuring 8 x 40 ft.; a 16-station relocatable building, measuring

20 x 40 ft.; and a 24-station relocatable building, measuring 24 x 50 ft.

The complete training center equipment can be installed in an existing facility with any number of stations desired.

Admiral Reports Earnings Increase

Admiral Corp. reported a continuation of improved earnings in the third quarter and for the first nine months of 1969.

Ross D. Siragusa, Jr., president of the television-appliance manufacturer, said that profits after taxes in the first nine months were \$3,947,155, or 77 cents per share, while a loss of \$286,876 was reported a year ago.

Profits before taxes in the same period were \$7,257,284, which compares with a loss of \$1,016,734 in 1968.

Consolidated sales for the first nine months were \$277,475,142, compared with \$280,942,745 in the same period last year.

The Admiral president noted that the company's consumer business in the third quarter and the first nine months exceeded the 1968 sales volume, excluding sales of the government electronics division which was sold in March 1969. The 1969 earnings do not include the profit from the sale of the government division and other related items.

Siragusa also said that effects of the government's measures to cool off the economy had begun to be felt in the field.

Third quarter sales were \$87,676,992, compared with \$93,090,184 in the 1968 quarter. Excluding government division sales, 1968 volume was \$86,746,292.

Pretax earnings in the quarter were \$1,011,858 contrasted with \$247,813 last year. After provision for taxes, earnings were \$661,729 or 13 cents per share, compared with a profit of \$272,616 or 5 cents per share.



midget ratchet offset

Screwdriver Kit

Fastest and Strongest Driver made. Designed for getting into those difficult places where other Screw Drivers cannot be used.

3 3/4" long, stainless ratchet handle, 3 5/8" extension, two slotted & two Phillips bits, 12 hexagonal bits from 0.050" to 5/16", and one square adaptor for 1/4" wrench sockets - all in pocket-sized, plastic covered steel case with molded foam interior.

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\$79.95

LOWEST COST FET TESTER

- Tests FET's For Gm (UMHOS)
- Tests Transistors For AC Beta
- Obsolescence Proof
- No Charts Needed

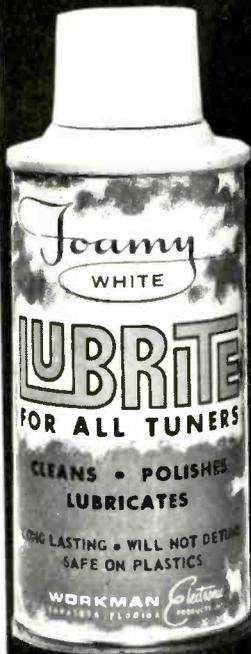
Full Line of Test Equipment

- 830-Transistor Tester
- 840-Field Strength Meter
- 857-CRT Tester/Rejuvenator
- 865-Color Bar Generator
- 880-Stereo Test System
- 870-FET Volt-Ohm Meter

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SOLVE YOUR TV REPAIR PROBLEMS WITH TV TECH AID

A monthly TV publication of actual repairs, and troubles encountered in OUR business. The information will be gathered from technicians, field reps, and all the leading manufacturers.

TV TECH AID will present up to 40 different trouble shooting cases each month. Each manufacturer will have its own page.

Each symptom will have a clearly marked schematic of the particular faulty stage. The faulty components, and corrections will be listed to aid in repair. No guess work.

It will contain current models, older models, circuit changes and modifications on various models as they occur.

The days of "Trial and Substitution" are over.

Time means money. Don't forfeit those valuable profits.

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ET/D DEALER SHOWCASE

continued from page 62

AM/VHF MONITOR RECEIVERS

Features squelch control and three-crystal operation **721**

Announced are two 3-crystal hand-held AM/VHF monitor receivers with squelch control.



Designed for police, fire, aircraft and marine broadcasts as well as weather reports, the Models APO-20H and APO-30L operate on three crystal-controlled VHF channels and AM broadcast band. Both monitors are equipped with 28in. adjustable antenna and operate on a standard 9v battery. The built-in battery meter indicates immediately when the battery should be replaced. The compact unit weighs only 1 1/2 lb and measures 6 1/4 x 2 3/4 x 1 3/4in. Specifications: Standard Broadcast AM Receiver, Tuning Range: AM band 525-1650kHz; Intermediate Frequency: 455kHz; Maximum Audio Power Output: APO-20H = 255mv @ 1kHz, APO-30L = 265 mv @ 1kHz; IF Rejection: 30dB @ 600 kHz; Police, Fire Weather Receiver, Tuning Range (MHz): APO-20H - High- 148-152, Middle- 152-168, and Low- 168-172; APO-30L - High- 25-32, Middle- 32-40, and Low- 40-49; Sensitivity for 50mw output: APO-20H = 5µv and APO-30L = 8µv; Squelch sensitivity @ threshold: 20µv, Squelch sensitivity @ stop: 100µv, Image Rejection (typical): 6dB, IF Rejection (455kHz): 55dB. Fanon.

AMPLIFIER **722**

Accepts up to four separate instrument inputs

A low cost, solid-state preamplifier and sound mixer, called Ultra-

mix I, is introduced. It accepts up to four separate microphone or electric instrument inputs and permits addi-

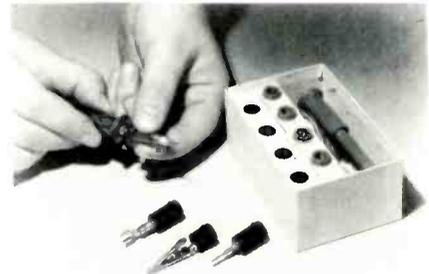


tion of tremolo and reverberation effects. Musical groups can use the instrument to blend, mix and create new sound through existing amplification equipment. The unit measures 12 wide by 5 1/2 deep by 3in. high and is list priced at \$175. Turner.

TEST PROD KIT **723**

Basic attachments are instantly interchangeable and lock automatically

A compact, time-saving test prod kit for use with instruments in taking electrical measurements is announced. Basic attachments in the 10-piece



set are instantly interchangeable and lock automatically. This automatic interchangeable locking feature makes it necessary to change the entire test lead when the need arises for a different test lead termination. Each tip attachment snaps easily into the coupler and insures a perfect low resistance connection. The complete kit consists of two sets of prod couplers, phone tips, phono needles, alligator clips and spade terminals. Additional attachments are available. They include black and red coded extension tips, universal clips, crocodile clips and banana plugs. Both the crocodile and universal clips are insulated with flexible vinylite covers. The extension prod is insulated with a rubber cover, making it valuable for deep probing. Hubbell.

AM/FM/STEREO RECEIVER

Features four ICs and FET front end **724**

Announced is a 150w AM/FM/stereo receiver featuring four ICs, FET front

end and solid-state circuitry. The walnut-finished wood cabinet has a back-lighted, tinted slide dial. Other fea-



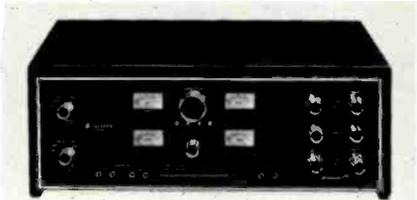
tures include: magnetic/ceramic phono, tape and auxiliary inputs, positive-action flip switches for main and remote speakers, muting, high filter, stereo/mono mode, tape monitoring and base-boosting loudness. The Model 19-560 retails for \$259.95. Midland.

STEREO AMPLIFIER 725

Reproduces four channel stereo

Introduced is the Model 499 Quadrant Amplifier.

The amplifier is designed for imme-



mediate use with the new four-channel pre-recorded tapes and playback units providing the necessary controls for operation and optimum acoustic channel balancing of both left-right as well as front-rear. The unit is totally compatible with existing two-channel stereo systems, as well as any future four-channel FM or phono applications. Control features include: acoustic dimension controls for left-to-right and front-to-rear balancing; four-channel master volume control; four-channel mode selector; four-channel microphone inputs and tape monitor; volume compensation; both high (8kHz) and low (100Hz) frequency filters; and individual bass and treble controls for each channel. Specifications of the amplifier are as follows: Power at reportedly 0.5 percent distortion, all four-channel driven, 35w per channel RMS at 8Ω; power bandwidth, 15-25kHz; frequency response - 1dB, 15-30kHz; hum and noise (phono), - 60dB; input sensitivity, high level, 0.5mv; phono 3 and 6mv; tape head, 1.0mv (NAB equalization for 7 1/2 and 3 3/4) IPS; microphone, 10mv (accepts all microphones with impedance of 100KΩ or below). Price is \$599.95. Scott.

CB TRANSCEIVER 726

3.5w PA amplifier and hybrid circuits

The Comstat 25B transceiver featuring hybrid circuitry and new styl-

ing is introduced. Synthesizer circuit provides full 23 channel transmit and receive operation. The 5w transmitter employs range boost audio circuitry for increased output power and better modulation. Dual conversion receiver reportedly boasts a sensitivity of 8/10μv and 2.5kHz "offset" vernier tuning for reception of weak signals. Built-in 117vac and 12vdc power supplies facilitate base or mobile operation. The 3.5w PA amplifier permits paging, etc., with external speaker. Other features include illuminated



S/Prf meter, variable squelch control, TVI trap, external speaker/phones jack and a jack for Priva-Com private call unit. The unit employs 11 tubes, 2 transistors and 11 diodes. It is supplied with all crystals, vari-tilt mobile/base mounting bracket and ceramic push-to-talk microphone. Exterior design is brushed aluminum, gray and black. The unit measures 12w x 8 1/2d x 5in. h. Lafayette.

Did your mother take you for your last checkup?

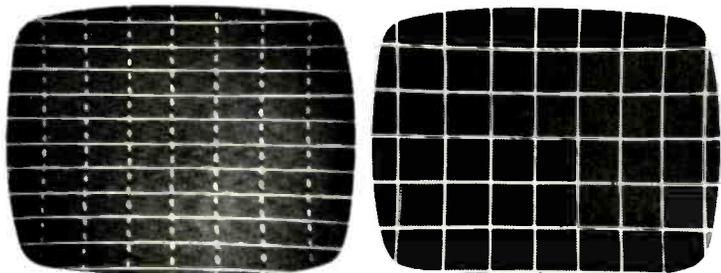


What is it about grownups? Don't they know annual checkups are the first line of defense against cancer? It's nice to find out you're as healthy as you feel. See your doctor. You'll find peace of mind beats lollipops any day! Help yourself with a checkup. And others with a check.

American Cancer Society

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Make the wiggly test.



On the left, a pattern* produced by an ordinary color bar generator. On the right, the equivalent pattern* produced by Leader's LCG-388. Perfectly stable, the instant you turn the power on.

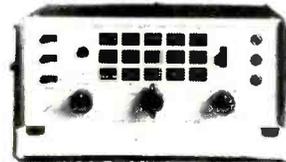
Flip the switch, and you can select from 15 patterns. Including the single dot, single cross, single horizontal and single vertical.

The magic is in Leader's binary counters and gates. Nobody else has them, and what a difference they make.

\$149.00, and you can make the wiggly test at your distributor's. For the one nearest you, just drop a line or call.

*As photographed.

Seeing is believing.



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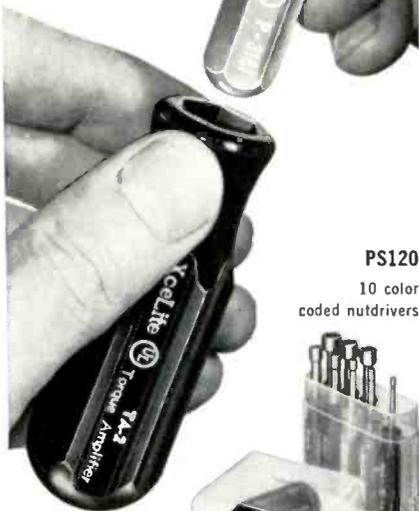
now there are 3 time & tool-saving double duty sets

New PS88 all-screwdriver set rounds out Xcelite's popular, compact convertible tool set line. Handy midgets do double duty when slipped into remarkable hollow "piggyback" torque amplifier handle which provides the grip, reach and power of standard drivers. Each set in a slim, trim, see-thru plastic pocket case, also usable as bench stand.



PS88

5 slot tip,
3 Phillips screwdrivers



PS120
10 color
coded nutdrivers



PS7
2 slot tip,
2 Phillips screwdrivers,
2 nutdrivers

WRITE FOR CATALOG SHEET N563



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Canada: Charles W. Pointon, Ltd., Toronto, Ontario

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ET/D DEALER SHOWCASE

SOUND SYSTEM 727
*Will drive 20
room assemblies*

The Model 101, the main unit for a built-in Hi Fi stereo custom sound system, is introduced. It contains the AM/FM multiplex tuner, audio processor and driver as well as all the electronics necessary to drive as many as 20 room assemblies. Small enough



to be conveniently tucked away on a book shelf, bar or in an equipment cabinet or on an end table, it features a flat black panel that conceals the tuning dial and ledger. Darome.

CASSETTE ALBUM 728
*Makes cassette storage easier
than phono records*

Introduced is a 12-unit album for cassette storage. The album, cataloged as TSA-1, is a library book with a leather-like cover. The album measures 9



1/4 x 10 3/8 in. and has tooled gold lettering on the 1 1/4 in. spine. Each compartment has built-in stops to keep the tape from going slack. List price \$3.30. Robins.

TAPE TENSION WINDERS 729
*Takes up tape slack
in the cassette*

A pair of knobs for cassette winding is offered. They're tape tension winders, engineered to mate with



all standard cassette hubs. A main function is to take up slack in the cassette that can lead to jamming and damaged tape. They're also especially useful in editing or splicing. The winders are cataloged as TCW-2 and list for \$1.50 per pair. Robins.

*Who needs a tuner
wash? Save your
money and use*
QUIETROLE

The product that cleans while it lubricates. Zero effect on capacity and resistance. Harmless to plastics and metals. Keeps color and black and white on the beam. Non-flammable.



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Spartanburg, South Carolina

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ELECTRONIC TECHNICIAN/DEALER



Two-Way Radio 400

A six-page brochure entitled, "Performance Patterns, as Measured and Pictured by the R/S FM Deviation Meter" is available. The portfolio is valuable to any technician who deals with base and mobile stations. Its use has already helped detect and locate malfunctions that have eluded some of the best technicians for weeks. The result is reduced bench time and assured compliance with FCC regulations through reference to this long needed R/S manual. RadioSpecialty.

Test Instruments 401

A 36-page precision instruments catalog is offered. Extracted from the "Buyer's Guide," the catalog contains both general purpose test equipment and special two-way radio test equipment and service aids. Motorola.

Batteries 402

A booklet which lists the battery complements used in portable radios, tape recorders, phonographs, TV remote-control units, citizen's band radios, portable automobile radios and portable TV receivers of more than 300 domestic and foreign manufacturers is available. For quick reference, large, easy-to-read model numbers are arranged alphabetically numerically by manufacturer. A battery interchange ability section which cross-references replacement batteries to those of 12 major manufacturers is also included. RCA.

Business Forms 403

A variety of service order forms, repair tags, sales forms, invoices, correspondence forms, collection aids, pressure-sensitive labels and other helpful printed items have been designed for television and appliance service firms. Samples and descriptive literature are available from New England Business Service.

Signs and Labels 404

A 64-page catalog showing more than 186 different identification products is offered. The catalog contains four-color illustrations for truck signs. Shown are new ideas, products and systems to save time and money. Extra larger-sized consecutive numbering is available. Featured is a chrome mylar label with durable "buried" printing suitable for rugged outdoor use. Seton.

Semiconductors 405

A 12-page "Design Assistance Directory" is offered describing all literature and personal consultation offered by the company to designers using semiconductor devices and integrated circuits. All available application reports, books, catalogs, brochures and design services are listed in one booklet. The application reports are cross-referenced for easy selection according to either product type or application category. Texas Instrument.

Sencore . . .

continued from page 57

SPECIFICATIONS

RF Output is set at the factory on channel 4. It can be easily changed to channel 2, 3, 5, or 6 if channel 4 is used in your area. It is adjustable from the bottom of the unit. Modulation: Any one of five patterns—color bars, dots, crosshatch, vertical bars or horizontal bars. Crystal Complement: 1-189kHz — .005 percent for timers and 1-3563.795-kHz — .001 percent for color bars. Semiconductor Complement: 10-2N5172, 2-2N4248, 1-40234, 1-2N1180, 5-1N34A, 1-8v Zener diode, and 1-1N695. Power Supply: Two 5.6v mercury batteries (not supplied) Everready number E164, NEDA number 1404 or equivalent. Power Consumption: 16ma on color and 12ma on all other patterns at 11.2v. Size: 2 1/4 high x 8 1/4 wide x 5 1/2in. deep. Net Weight: 2 1/2lb. Price: \$84.50. ■

**For More
Details
on
CATALOGS
and
BULLETINS
see page 83
Reader
Service**

Show and Sell!



Now Electro-Voice makes it even easier than ever to profit from phono needle replacement sales. This new counter top needle merchandiser is the answer to dealer requests from coast to coast.

Inside are 109 E-V needles selected from our "hot 50" list of fast-moving types. With extra room for special types that sell best in your area.

Underneath is space for your up-to-date copy of the complete E-V needle/cartridge replacement guide (up-to-date because we compile it with the aid of our computer).



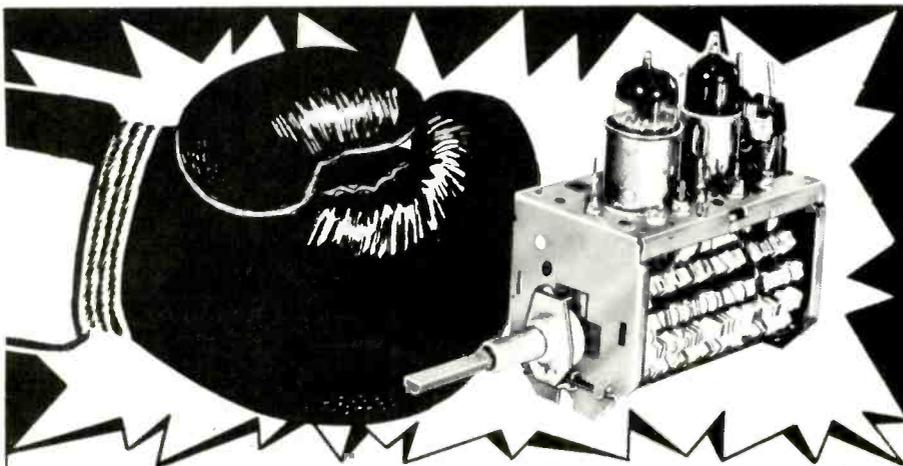
And the E-V needle merchandiser design puts your entire basic stock on display, yet discourages pilferage with its four-drawer glass covered construction.

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