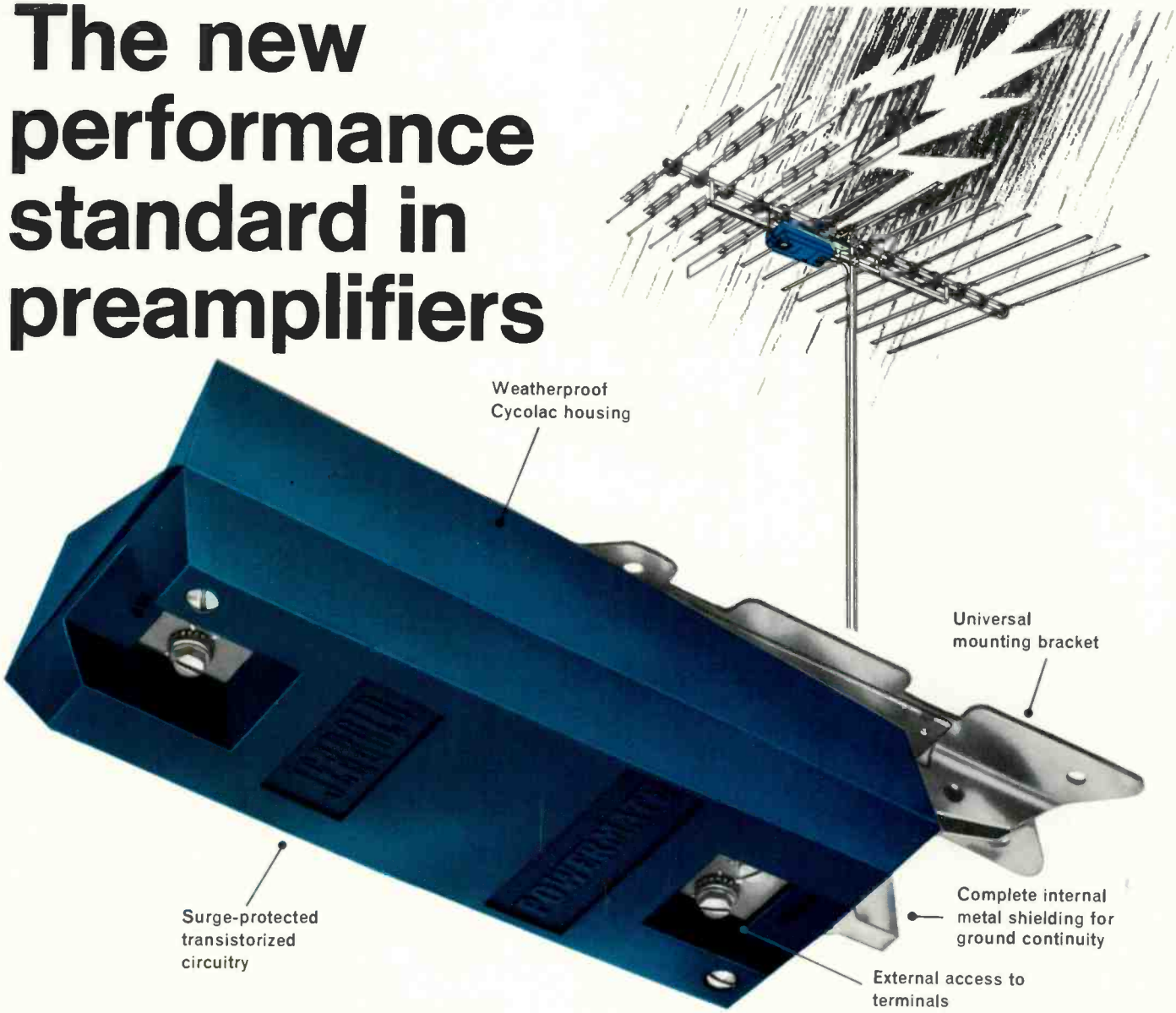
ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

December 1967

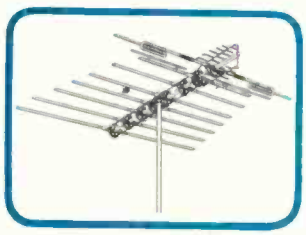
The new performance standard in preamplifiers



New Jerrold Lightning-Protected Powermate® Preamplifiers now bring you a degree of reliability never before achieved in mast-mounted solid-state preamplifiers. Our extensive field tests in lightning storms prove it. Powermate models are available for every signal situation—VHF, UHF, and FM. And you can expect them to deliver snow-free, ghost-free, line-free TV in color or black and white for plenty of reasons:

- High gain
- Extremely low noise figures
- Unusually flat response
- Elimination of cross modulation and herringbone distortion
- Excellent overload capability

Get more details on the preamplifier designed to be an antenna's best friend. The reliable, new Jerrold Lightning-Protected Powermate Preamplifier. The newest product in Jerrold's Spectrum '67. Ask your Jerrold Distributor. Or write for further information to: Jerrold Electronics Corporation, Distributor Sales Division, 401 Walnut St., Philadelphia, Pa. 19105.



Outdoor antennas

Indoor antennas

Distribution equipment

JERROLD

Focusing on one thing... better reception

. . . for more details circle 101 on postcard

ELECTRONIC TECHNICIAN

TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

GROUP 184

COMPLETE MODEL/CHASSIS INDEX FOR ALL CIRCUIT DIGESTS AND TEKFAX FROM JANUARY 1961 THROUGH DECEMBER 1967

MONTH IN WHICH SCHEMATIC APPEARS

607-613	Jan. 1961	780-784	May 1963	951-953	Sept. 1965
614-620	Feb. 1961	785-790	June 1963	954-961	Oct. 1965
621-627	Mar. 1961	791-797	July 1963	962-969	Nov. 1965
628-633	Apr. 1961	798-805	Aug. 1963	970-975	Dec. 1965
634-636	May 1961	806-811	Sept. 1963	976-982	Jan. 1966
637-643	June 1961	812-817	Oct. 1963	983-988	Feb. 1966
644-650	July 1961	818-822	Nov. 1963	989-995	Mar. 1966
651-656	Aug. 1961	823-828	Dec. 1963	996-1001	Apr. 1966
657-662	Sept. 1961	829-833	Jan. 1964	1002-1009	May 1966
663-669	Oct. 1961	834-838	Feb. 1964	1010-1015	June 1966
670-675	Nov. 1961	839-843	Mar. 1964	1016-1022	July 1966
676-680	Dec. 1961	844-850	Apr. 1964	1023-1028	Aug. 1966
681-686	Jan. 1962	851-853	May 1964	1029-1035	Sept. 1966
687-692	Feb. 1962	854-858	June 1964	1036-1041	Oct. 1966
693-698	Mar. 1962	859-863	July 1964	1042-1047	Nov. 1966
699-705	Apr. 1962	864-870	Aug. 1964	1048-1054	Dec. 1966
706-709	May 1962	871-875	Sept. 1964	1055-1060	Jan. 1967
710-716	June 1962	876-881	Oct. 1964	1061-1067	Feb. 1967
717-723	July 1962	882-887	Nov. 1964	1068-1073	Mar. 1967
724-729	Aug. 1962	888-893	Dec. 1964	1074-1080	Apr. 1967
730-735	Sept. 1962	894-900	Jan. 1965	1081-1086	May 1967
736-743	Oct. 1962	901-908	Feb. 1965	1087-1092	June 1967
744-749	Nov. 1962	909-916	Mar. 1965	1093-1098	July 1967
750-755	Dec. 1962	917-923	Apr. 1965	1099-1104	Aug. 1967
756-761	Jan. 1963	924-926	May 1965	1105-1110	Sept. 1967
762-766	Feb. 1963	927-934	June 1965	1111-1116	Oct. 1967
767-772	Mar. 1963	935-942	July 1965	1117-1122	Nov. 1967
773-779	Apr. 1963	943-950	Aug. 1965	1123-1127	Dec. 1967

SCHEMATIC NO.

120842 1033
120843 1033
120846 1033
120847 1033
120848 1033
Model:
9P50 1005
12P50 975
EP-40 Air Purifier Ionizer 618
P-1913 Stereo/Radio 790
1800/2000 Series 742

FIRESTONE

Chassis:
12-129-94U 918

FISHER

Model:
800 AM/FM Stereo Amp 693

FLEETWOOD

Chassis:
1000 632
1010 632

GENERAL ELECTRIC

Chassis:
AA 889
AB 963
AY 832
CB 953
DA 861
DB 930
DC 990
DD 1075
ETV 1046
FY 866
HB 1011
KC 1037
LW 621
LX 699
MW 717
MXT 785
QX 772
QY 828
SA 911
SB 939
SC 1018
TA 881
TB 1004
TC 1048
U5 692
VB 979
M575 609
M597 Series 745
TU 220 AM/FM Tuner 759
Model:
940A, B Radio 858
11R31, -33, T225A, -35A, -36A Radio 845
CT110, CP775 Trans Radio 619
M502XBN, EB, VY, 3XBN, EB, VY 772
M870VWD, M871VWD, R870VML, R870VWD 692
P970A Radio 809
RP2060A Stereo Phono 725
T-3000A, B, Stereo Receiver 836
W360A Radio Intercom 796

GENERAL ELECTRIC (CANADA)

Chassis:
M618 1030
M649 1101
M685 1123
M687 1112

GRANCO

Model:
704 AM/FM Radio 682

HEATH

Model:
AA-21 Stereo Amp 829
GR-22 773
GR-53 839

SCHEMATIC NO.

HOFFMAN

Chassis:
BP318 Trans Radio 703
Model:
P708 Trans Radio 703

KORTING

Model:
MT2233, 2243 Tape Recorder 865
MT3643/ 3633 Stereo Tape Recorder Constellation 853

LAYFAYETTE

Model:
KT-236 Stereo Amp 610

MAGNAVOX

Model:
77-01 AM/FM Tuner 794
Chassis:
34 Series 722
35 Series 633
36-02 Series 672
36-08, -09 Series 762
40 Series 849
43 Series 835
44 Series 812
45 Series 882
47 Series 1062
48 Series 912
49 Series 901
70-01 FM Multiplex Adapter 702
T907 Series 981
T908 Series 993
T910 Series 985
T911 Series 1088
T914 Series 954
T919 Series 1012
T920 Series 1103
T921 Series 1059
T922 Series 1072
T923 Series 1076
T925 Series 1111

MATSUSHITA

Model:
T-35 Trans Radio 719
MF800 Motional Feedback Amp 810

MONTGOMERY WARD

Model:
WG-399A FM Multiplex 768

MOTOROLA

Chassis:
436 Series 656
QTS-436 731
RTS-436 731
STS-435 614
STS-436 731
TS-435 614
TS-436 731
TS-440 700
TS-454 931
TS-458 1107
TS-460 Series 1089
TS-461 1047
TS-499 752
TS-576 681
TS-578 763
TS-584-05, -H 913
TS-586 904
TS-587 919
TS-588 964
TS-589 899
TS-594 1031
TS-596 957
TS-597 1021
TS-908C-02 thru D-02 924
TS-912A 819
TS-914A-00 thru A-07 951
TTS-587 919
VTS-587 919
WTS-435 614
WTS-436 731
Model:

SCHEMATIC NO.

202 Auto Radio 727
203 Auto Radio 727
204 Auto Radio 727
1TMC Auto Radio 673
2TMR Auto Radio 691
13MAM Auto Radio 661
14MF Auto Radio 647
19P7-1, -2, -3 700
19T5, 7, 11, 12, 13, and A19TB Series 731
109 Mopar Auto Radio 1961 Plymouth 664
C2AA-18806-M-N Auto Radio 741
C2YA-18806-E Auto Radio 741
RV2F C20Z-18875-C Auto Radio Reverb 723

MUNTZ

Chassis:
T68A14 940
T68A15 940
T68H28 947

OLYMPIC

Model:
6P28, 6P29, 6P30 992
CT-910 1064
Chassis:
9P56, 57, 58 1095
9P59, 60 1090
CTC19/21 Series 1077
JU-JCU 710
JWR 671
NB 820
NBU 820
NDP 1013

PACKARD-BELL

Model:
23DC16 748
MPX-1-1 Stereo Adapter 716
Chassis:
88-9 607
88-16 877
88-18C 941
88-19 970
98C15 1083
98D14, C 677

PEARCE-SIMPSON

Model:
CBD-5 CB Radio 638

PERMA-POWER

Model:
G230, 1, 2 Remote Control Receiver 806
G340, 50 Transmitter 806
G-500 & RC-200 Remote Control . . 797

PHILCO-FORD

Model:
J-1720R Stereo Reverb 626
L-1532 Stereo Phono 761
L-1650 Stereo 764
M-1618 Stereo Phono 822
M-1660 Stereo Phono 822
NT-600 Radio 867
Q1054 1113
RC-65 Remote Control Receiver . . . 737
T-63 Trans Radio 708
T-909 Trans Radio 824
Chassis:
N1052 935
N1200 932
N1204 932
11H25 613
11J27 613
11N56 636
12J27 676
12N50 662
13N51 754
13N52 754
13N53 754
14G20 855
14N30 871

SCHEMATIC NO.

14N50 862
15G20 905
15J25 1007
15J27 884
15M91 898
15N30 914
15N50 921
16J27 980
16JT26, A 965
16N35 971
16NT82 1017
16QT85 1017
17C21, A, V, AV 1099
17J25 1084
17J27, 27A 1063
17J28 1096
17KT50 1017
17N35 1049
17NT45 1078
18NT45 1125
18QT85 / 18MT70 1118

PHILHARMONIC

Chassis:
TSL-001 689

RAY THEON CO.

Model:
TWR-1 "Raytel" Citizens Band Radio 640
Raytheon Two-way Encoder / Decoder 895

RCA VICTOR

Model:
193-A-542-MV, MU 730
193-A-546-VM, MU 730
193-A-549-MV, -MU 730
213-G-21-M 736
213-G-23-M 736
213-G-23R 736
213-G-26M 736
213-G-27M 736
213-G-27-R 736
213-G-31-M 736
213-G-31-R 736
213-G-33-M 736
213-G-33-R 736
4VC6 Record Player 798
4VC8 Record Player 798
4VF606 Stereo Hi-Fi 827
4VF705 Stereo Hi-Fi 827
KRK105/112, KRK112 with 962709 IF Amp KRK105/KRK66 Series 856
MARK11 Citizens Band Radio 645
RFG35 Radio 863
RK-295 Stereo Adapter 721
RP-215-C1 Record Player 848
Chassis:
CTC11 706
CTC12, A, B, P, R 736
CTC16, X 885
CTC17X 952
CTC19 984
CTC20 1032
CTC22 Series 1109
CTC25 1040
KCS130F, H, K, M 687
KCS130YAB, YAC 705
KCS134 627
KCS136 669
KCS136M 1008
KCS136X 879
KCS136Y Series 744
KCS137 750
KCS138 750
KCS140A, B 730
KCS142 834
KCS142XA 982
KCS143F 906
KCS144E 998
KCS147A, B 786
KCS148 927
KCS149AA, AB, AD 942
KCS151A 917
KCS152A 915
KCS153 959
KCS154A, B 948
KCS155 966
KCS156 1019
KCS157 Series 1116

SCHEMATIC NO.

KCS158 Series 1119
KCS161 1022
KCS162 1028
KCS163 Series 1065
KCS164 1050
KCS165 Series 1104
RC-1214A Radio 792
RC-1216 Radio 863
RS-194A Reverb Amp 615
RS-200 Stereo Adapter 721
RS-206-A Record Changer 868

REGENCY

Model:
CB-27 Citizens Band Radio 658
CBM-27 Citizens Band Radio 658

SETCHELL-CARLSON

Chassis:
159 639
361A 629
401 1066

SHERWOOD

Model:
S-3000 111 FM Stereo Tuner 612

SILVERTONE

Model:
6122 1009
6150 995
6151 995
6152 995
6154 995
6155 995
6156 995
6157 995
6164 1000
7110 1026
7111 1026
7114 1026
7120 1038
7121 1038
7122 1026
7128 1026
7131 1026
7151 1098
7152 1098
7154 1098
7155 1098
7156 1098
7157 1098
7158 1098
Chassis:
456.61580 955
456.61581 955
456.70120 967
456.70121 967
528.61580 955
528.61581 955
528.70120 967
528.70121 967
528.71120 1120
528.72280 1114
528.72281 1114
528.72282 1114
529.61580 955
529.61581 955
529.70120 967
529.70121 967
562.10096 972
564.10000 972
564.10003 972
564.10000 988
564.10001 988
564.10002 988
564.10003 988
564.10004 988
564.10005 988

SONAR

Model:
"G" CB Transceiver 770

SONORA

SCHEMATIC NO.

Model:
S63P197 852
S63P197 852
S64K236M 989
S65P198 1060
Chassis:
1194-194 869

SONY

Model:
5-303W 751
8-301 667
TRW-621 Trans Radio 690

SPARTON

Model:
12M5-P Stereo Phono 732
Chassis:
19L1 765
23K2 714

STERLING

Chassis:
1/633US AM/FM/SW Radio Phono 641

STRIBEL

Auto Radio 622

SYLVANIA

Model:
4P19 Series Trans Radio 668
19L17 Series 704
21TC1-C2 851
21LC3 851
21LC12-1 851
21LC14-1 851
23E01 757
45C31-1 Stereo 738
45P36 Stereo 859
55C31-1 Stereo 738
G9400 Stereo 738
Chassis:
A02-1, -2 999
A04-1, -2 1051
A06, A07 1035
A06-1, -2 1085
B04-1, -2 968
B05-1, -2, -3 973
B06-1, -2, -3 960
B06-1, -2, -3, -4, -5 1108
B09-1, -2 1122
D01-1, -2 925
D01, -1-2, -8 1043
D03, -3 987
D05 1024
D06-1, -2 1091
D07-1, -2 1115
1-537-5, -6 611
406-3 Stereo 859
551, -2, -3, -5, -6, -7 680
552-1, -2, -9 646
558-1, -2 704
562, -3, -4 757
557, -1, -2 851
584-1 thru 7 933
585-1, -2, -4, -5 922
682-1, -2, -3 Trans Radio 668

SYMPHONIC

Chassis:
TSL-001 747

TELECTRO

Model:
215 Tape Recorder/Radio 807
MM-214 Tape Recorder 801

TELEFUNKEN

Model:
77 Stereo Tape Recorder 715

SCHEMATIC NO.

5051W Caprice AM/FM/SW Radio 674
5061W Jubilate AM/FM/SW Radio 654

TOSHIBA

Model:
9TL-3655 Trans Radio 685
Chassis:
10PG 712

TRAVLER

Model:
GTC-3014A, B 821
GTC-3114A 821
GTC-4014A 821
GTC-4044A 821
GTC-4054A 821
GTC-4114A 821
GTC-4144 821
GTC-4154A 821
Chassis:
1051-90 642
1156-89 696

TRUETONE

Model:
2DC1300B 767
2DC1300C 780
2DC1301B 767
2DC1301C 780
2DC1302B 767
2DC1302C 780
2DC1303B 767
2DC1303C 780
2DC1501A, B 894
2DC1605 983
2DC1605 1079
2DC1803 1110
2DC3555 1079
2DC3651 949
2DC3712 1073
2DC3741 1041
2DC3818 1127
Chassis:
1096-243 788
1095-232 729

UNITED SCIENTIFIC LABS

Model:
Contact 23 CB Transceiver 896

UTICA

Model:
T&C11 CB Transceiver 805

VOICE OF MUSIC

Model:
725 Tape Recorder 850

WEBCOR

Model:
1376 Stereo Phono 735
1377 Stereo Phono 735
2207 Tape Recorder 678
4210 Amp/Speaker System 749

WELLS-GARDNER

Model:
2DC3144 628
TV29491 628
WG4324, S2, S2V 628
WG4424 628

WESTERN AUTO

Model:
DC3438 Trans Radio 776
4DC7260A Tape Recorder 840

SCHEMATIC NO.

4DC7465 Tape Recorder 803

WESTINGHOUSE

Model:
H-790P6 Trans Radio 679
H-791P6 Trans Radio 679
H-883N29 Radio 846
H-M1800.01, 03 Phono 734
H-M1900, 01, 03 Phono 734
Chassis:
V-2393-4 Trans Radio 679
V-2407-4 Radio 789
V-2409-1, -2, -3 625
V-2409-4, -5, -6, -7, -8 688
V-2411-1, -3 634
V-2414-1, -2 660
V-2417-1, -2, -3, -4, -5, -6 711
V-2436 758
V-2444-1, -2, -3, -5, -6, -9, -10 . . . 795
V-2444-1, -2, -3, -9, -10 837
V-2446-1, -2, -3, -4 825
V-2451-2 CB Transceiver 774
V-2451-2 CB Transceiver 817
V-2474-1, -2, -3, -6, -7 875
V-2475-1, -4 887
V-2476-1 900
V-2478-1, -2 907
V-2483-1 1053
V-2485-11 961
V-2486 Series 996
V-2487 Series 1002
V-2490 Series 1014
V-2496 Series 1023
V-2498 Series 1029
V-2515-2 Phono 734
V-2515-6 AM/FM/Tuner 771
V-2528-3 Radio 846
V2652-2 1092
V2655-2-3-4-7-8-13 1058
V2656-1-2 1121

ZENITH

Model:
40 Radio 857
Royal 50L Trans Radio 781
Royal 150 Radio 635
Royal 490 Trans Radio 811
Chassis:
6GT42Z2 Radio 635
6JT40Z1 Trans Radio 720
6JT41Z1 Trans Radio 720
6KT40Z1 Trans Radio 781
6KT50Z8 Radio 857
7KT45Z1 Trans Radio 811
1M30T20 977
13M15 923
13X15 1034
13X18 1086
14L20 842
14L25 838
14M20 893
14M21 1054
14M23 878
14M27 916
14M32 934
14N22 1001
14N26 958
14N27 1080
14N28 1010
14N29 969
14N29Z 1067
14N31 986
14X21 1039
15M22 908
16F23, Q 616
16J28Q5 698
16K20, Q5 739
16N24 1006
17G28, Q 651
20Y1C37 1126
23XC36 1027
24NC31 994
25MC30 886
25MC36 926
26KL20, 20Q5 779
27KC20, Q 728
29JC20 675
S-54344 Hand Control 799
S-60804, 44, 1024 Remote Control 799
175-141, -142, -301, -302, -171, -172 Tuner 623

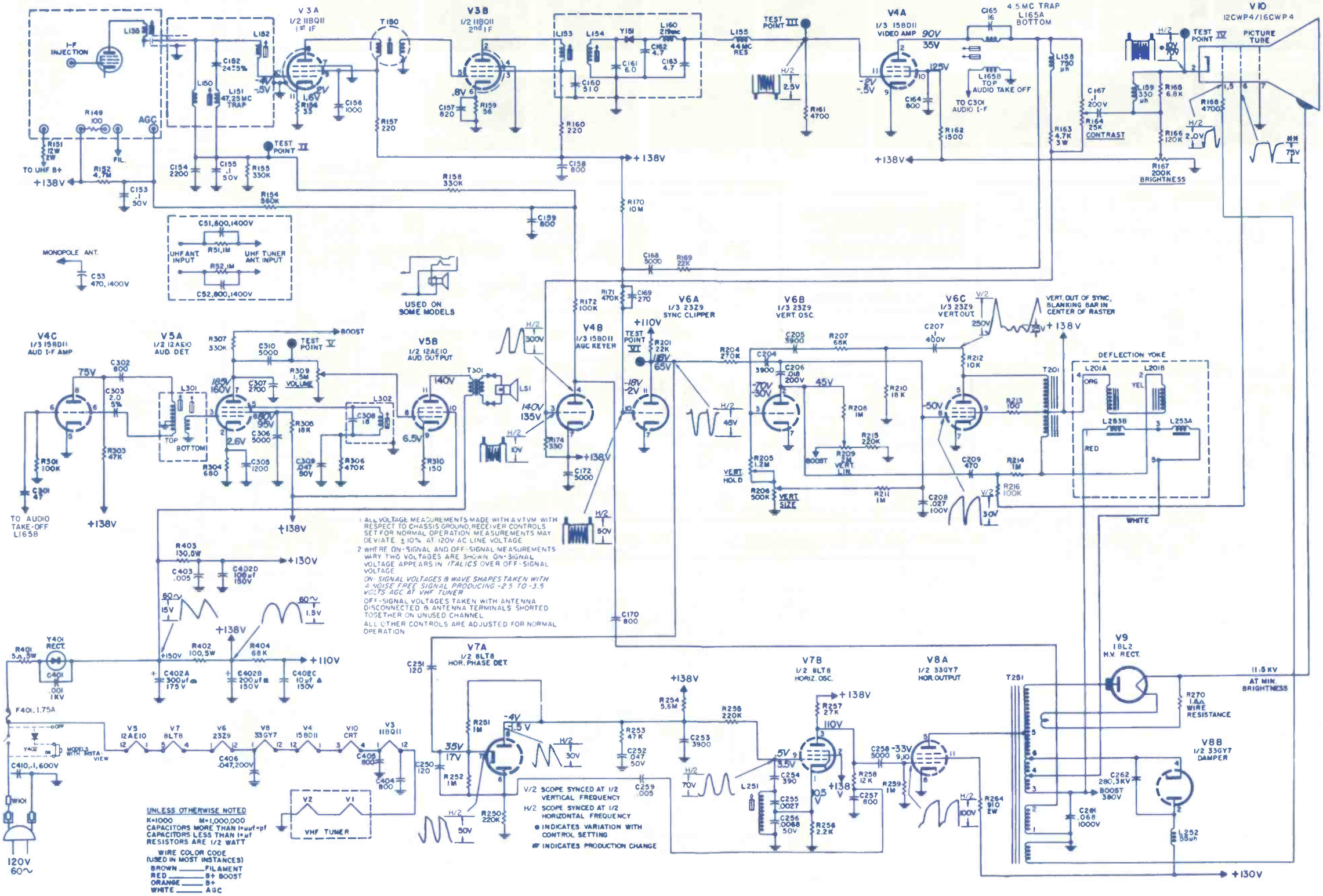
ELECTRONIC TECHNICIAN TEKFAX

1123
CANADIAN GENERAL ELECTRIC
TV Chassis M685

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

DECEMBER • 1967

SYMBOL	DESCRIPTION	CANADIAN GE PART NO.
C402A,B,C,D	capacitor-elect 300µf 175v, 200µf 150v, 10µf 150v, 100µf 150v	R7712
L151	coil-47.25MHz/s trap	R8614
L152	coil – 1st IF grid	R7717
L153	coil-video det pri	R6737
L154	coil-video det sec	R6738
L155	coil-44MHz/s choke	R8613
L158	coil-peaking 750uh	R8615
L201/253	yoke deflection	R8624
L251	coil-horiz osc	R8616
L301	coil-audio interstage	R8617
L302	coil-quad	R8618
T150	xformer-video IF	R8619
T301	xformer-audio output	R8620
T201	xformer-vert output	R7720
T251	xformer-hor output	R8787
R205,209,206	control-triple vert hold 1.2M, vert lin 2M height 500K	R8611
R167,R164,R309	control-triple brite 200K cont 25K, vol 1.5M	R8612
W101	fusible resistor-line	R8621
F401	fuse 1.75a	R7573
Y151	diode-germanium, video detector	R1889
Y401	diode-silicon, low voltage rectifier	R6048
Y402	diode-insta-view (A502D)	R6048



1124

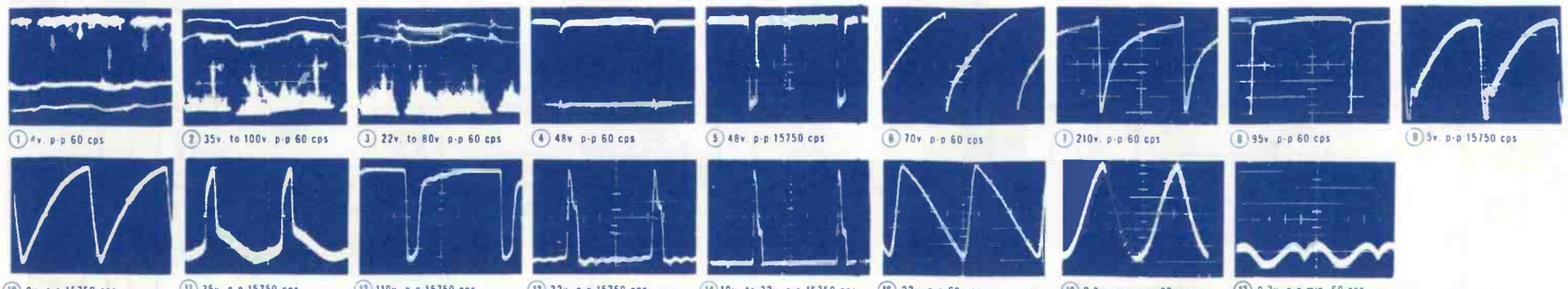
CORONADO
TV Model TV2-7110A

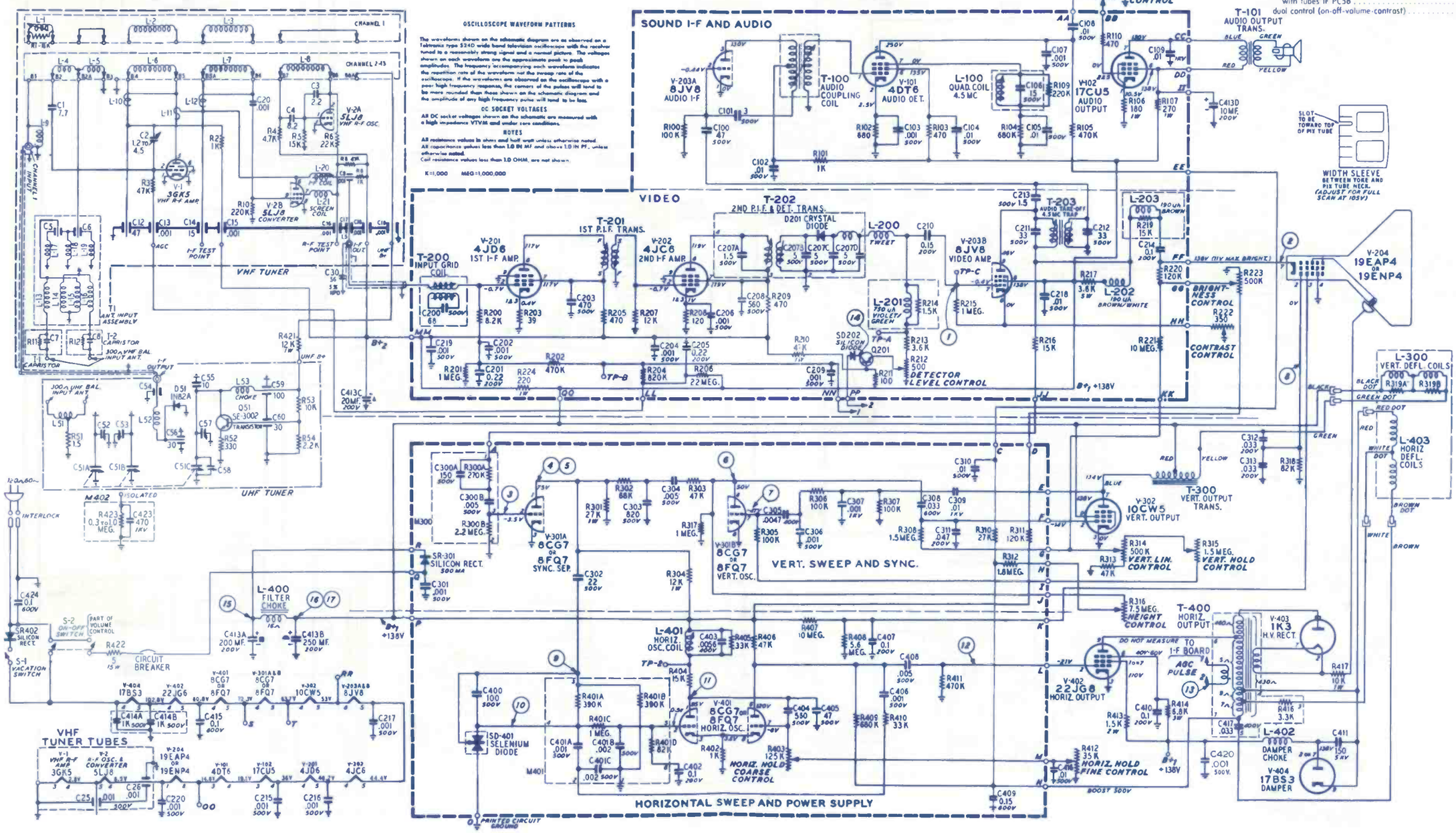
ELECTRONIC TECHNICIAN TEKFAX

DECEMBER • 1967

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

SYMBOL	DESCRIPTION	CORONADO TV MODEL PART NO.
C109	.01µf 1kv cer	80x0099-061
C404	560pf 500v poly	46x0528-005
C411	150pf 5kv cer	80x0098-009
C413A	200µf 200v dry elect	45x0519-001
C413B	250µf 200 v dry elect	
C413C	20µf 200v dry elect	45x0519-001
C413D	10µf 200v dry elect	
C414A &		
C414B	1Kpf 500v dual cer	80x0003-000
C424	0.1µf spec Mylar	350x1044-064
R413	1.5K 2w Pyrex	43x0450-013
R414	6.8K 3w Pyrex	43x0378-000
R212	500Ω det level control	40x0592-001
R223	500K bright control	40x0585-010
R314	500K vert lin control	40x0585-004
R315	1.5M vert hold control	40x0585-008
R316	7.5M height control	40x0585-002
R403	125K horiz hold control (coarse)	40x0590-002
R412	35K horiz hold control (fine)	40x0585-044
R422	5Ω 15w WW	43x0317-000
L100	quad coil	9A2595-001
L200	choke tweet filter	9A2432-000
L201	750uh peaking coil	36A0094-002
L202	190uh peaking coil	36A0094-001
L203	190uh peaking coil	36A0094-010
L400	filter choke	52x0102-006
L401	horiz oscillator coil	9A2515-000
L402	damper choke	9A2380-000
T100	sound IF coil	9A2597-001
T101	audio output xformer	51x0235-001
T200	IF input coil	9A2642-001
T201	1st IF xformer	9A2622-001
T202	2nd IF xformer	9A2650-001
T203	sound take-off coil	9A2599-001
T300	vertical output xformer	51x0229-003
T400	horiz output xformer	53x0433-001
	tuner, VHF-UHF combination	25A1272-001
	deflection yoke assembly	9A2604-001
	capristor (M402)	76x0018-000
	capristor (M300)	76x0068-001
	capristor (M401)	76x0069-001
	selenium diode (SD202)	66x0038-001
	transistor (Q201)	86x0006-001
	circuit breaker	2A0568-001
	prt cir brd & components ass'y w tubes (sweep) PC30	38A3103-000
	printed circuit board & components ass'y with tubes IF PC58	38A3505-000
	dual control (on-off-volume-contrast)	78x0062-001





ELECTRONIC TECHNICIAN **TEKFAX**

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

1125
PHILCO-FORD
TV Chassis 18NT45

DECEMBER • 1967

1 2.5 volts p/p, 15, 750 cps

2 2.5 volts p/p, 60 cps

3 115 volts p/p, 15,750 cps

4 100 volts p/p, 15,750 cps

5 100 volts p/p 60 cps

6 55 volts p/p 60 cps

7 55 volts p/p, 15,750 cps

8 50 volts p/p, 60 cps

9 85 volts p/p, 60 cps

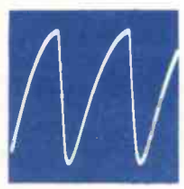
10 50 volts p/p, 60 cps

11 1300 volts p/p total, 130 volts p/p sawtooth, 60 cps

12 115 volts p/p, 60 cps

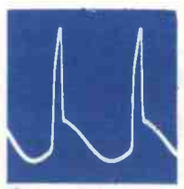
13 11.5 volts p/p, 15,750 cps

14 15 volts p/p, 15,750 cps



15 21 volts p/p, 15,750 cps

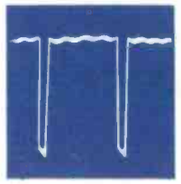
16 14 volts p/p, 15,750 cps



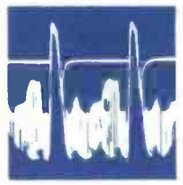
17 48 volts p/p, 15,750 cps

18 42 volts p/p, 15,750 cps

19 140 volts p/p, 15,750 cps



20 22 volts p/p, 15,750 cps



21 12 volts p/p, 15,750 cps

SYMBOL	DESCRIPTION	PHILCO-FORD PART NO.
	CAPACITORS	
C58	500µf/20v, 15v supply	30-2614-2
C59	500µf/20v, 15v supply	30-2164-2
C62	160/10/50/50µf @200v filter	30-2616-1
	DIODES	
D1	1N60C, AGC gate	34-8022-6
D2	1N60D, AGC filter	34-8022-7
D3	zener, AGC	34-8057-10
D4	dual selenium, phase comp	34-8037-1
D7	silicon rect B+	34-8054-11
	COILS	
L1	40MHz det choke	32-4837-1
L2	chan 6 dropout	32-4645-7
L3	390mh, video plate	32-4762-11
L4	60MHz, damper plate	32-4112-62
L5	3rd VIF	32-4884-5
L6	470mh 2nd det	32-4762-22
L7	60MHz damper cath	32-4112-62
L8	330mh video plate series	32-4762-20
L9	quad sound det	32-4876-1
L10	4.5MHz trap & sound take off	32-4688-13
L11	2nd VIF	32-4885-7
L12	SIF interstage	32-4745-12
L13	choke, 2nd VIF base	32-4887-2
L14	1st VIF	32-4885-6
L15	horiz stabilizer	32-4754-3
L16	tuner coupling	32-4652-96
L17	47.25MHz trap	32-4652-78
L18	41.25MHz trap	32-4652-80
L	1st base pole	32-4652-79
L20	47.25MHz trap	32-4652-78
L22	82mh, tuner AGC	32-4762-27
L23	choke, +15v supply	32-4887-2
L24	82mh, tuner +15v	32-4762-27
	NETWORKS	
N1	vert integrator	30-6030-12
N2	vert retrace	30-6024-9
N3	phase comp	30-6035-2
	TRANSISTORS	
Q1	TV20, 3rd IF	34-6000-72
Q2	TV17, AGC gate	34-6001-63
Q3	TV18, AGC amp	34-6001-64
Q4	TV15B, 2nd IF	34-6000-70
Q5	TV15A, 1st IF	34-6000-69
Q6	TV17, noise switch	34-6001-63
	RESISTORS	
R2A	6.8K 5w video plate	33-1363-82
R57	varistor, vert damp	33-1373-6
R59	2.2M boost	
R67	100K, focus	
R85	22K 2w UHF B+	33-1363-152
S1	on-off pwr (part of VR5) switch	
	XFORMERS	
AOT	Audio output	33-10039-1
FC	1h, filter choke B+	32-10010-9
HOT	horiz output	32-10065-2
PT	power	32-10064-1
VOT	vert output	32-10012-8
	CONTROLS	
VR1	25K, noise adjust	33-5613-9
VR1A	5K, AGC adjust	33-5613-5
VR2	500K vert size 2M vert lin 60K horiz hold	33-5595-12
VR3	3K, width	33-5609-9
VR5	1M vol on-off	33-5619-28
VR6	100K bright 20K contrast	33-5618-34
VR7	40K horiz hold 150K vert hold	33-5618-31
	UHF, tuner, TT152G	76-13827-7
	VHF, tuner, TT203A	76-13955-2
	yoke & cable assy	76-12942-11

NOTES
ALL RESISTANCE VALUES ARE IN OHMS ± 10%, 1/2 WATT UNLESS OTHERWISE INDICATED

ALL CAPACITANCE VALUES OF 1.0 AND ABOVE ARE IN PF ± 20%, AND ALL VALUES BELOW 1.0 ARE IN MF ± 20% UNLESS OTHERWISE INDICATED

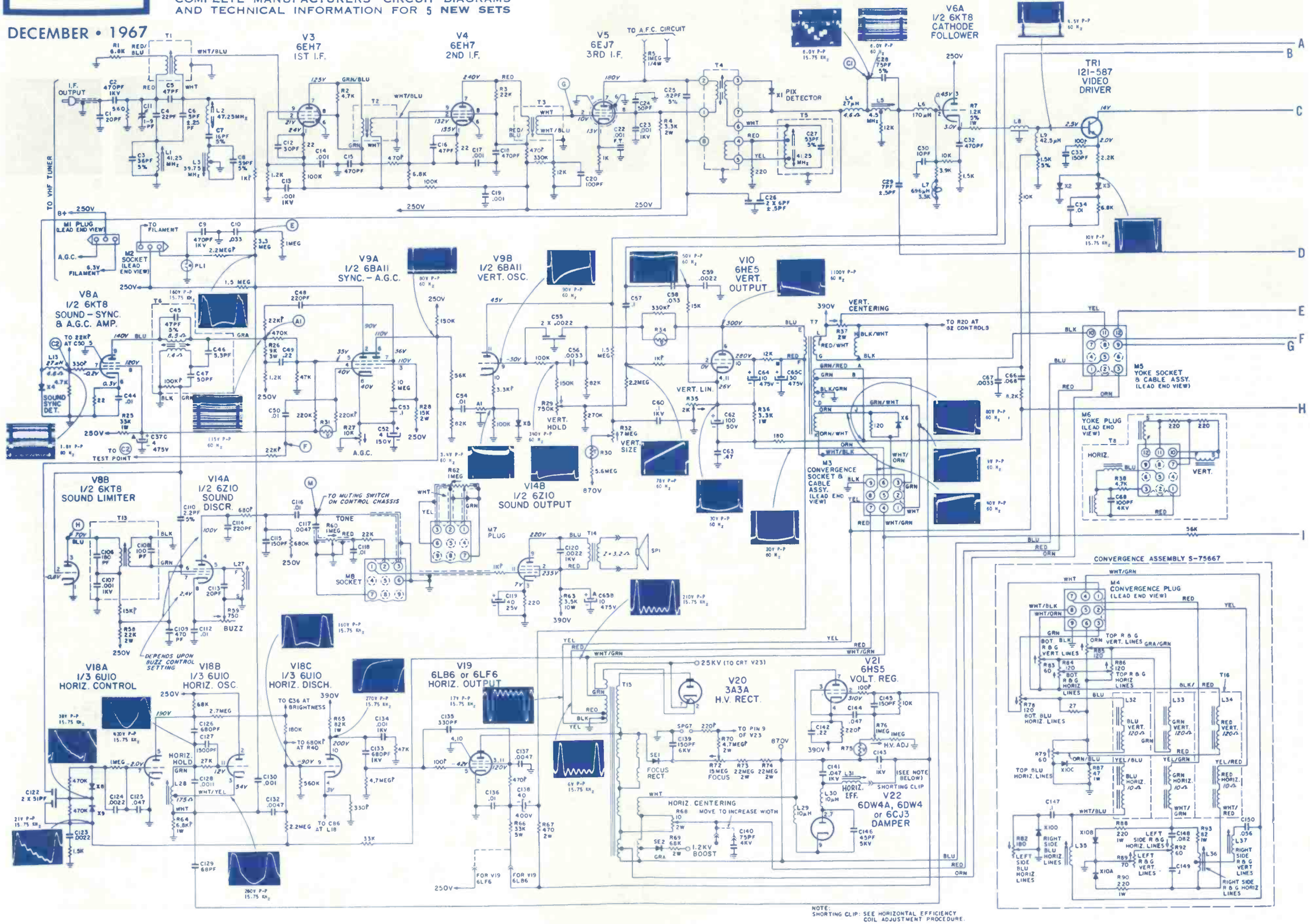
* COMPONENTS MOUNTED ON VHF TUNER C66, L22, L24, R85

1126
ZENITH
Color TV Chassis
20Y1C37

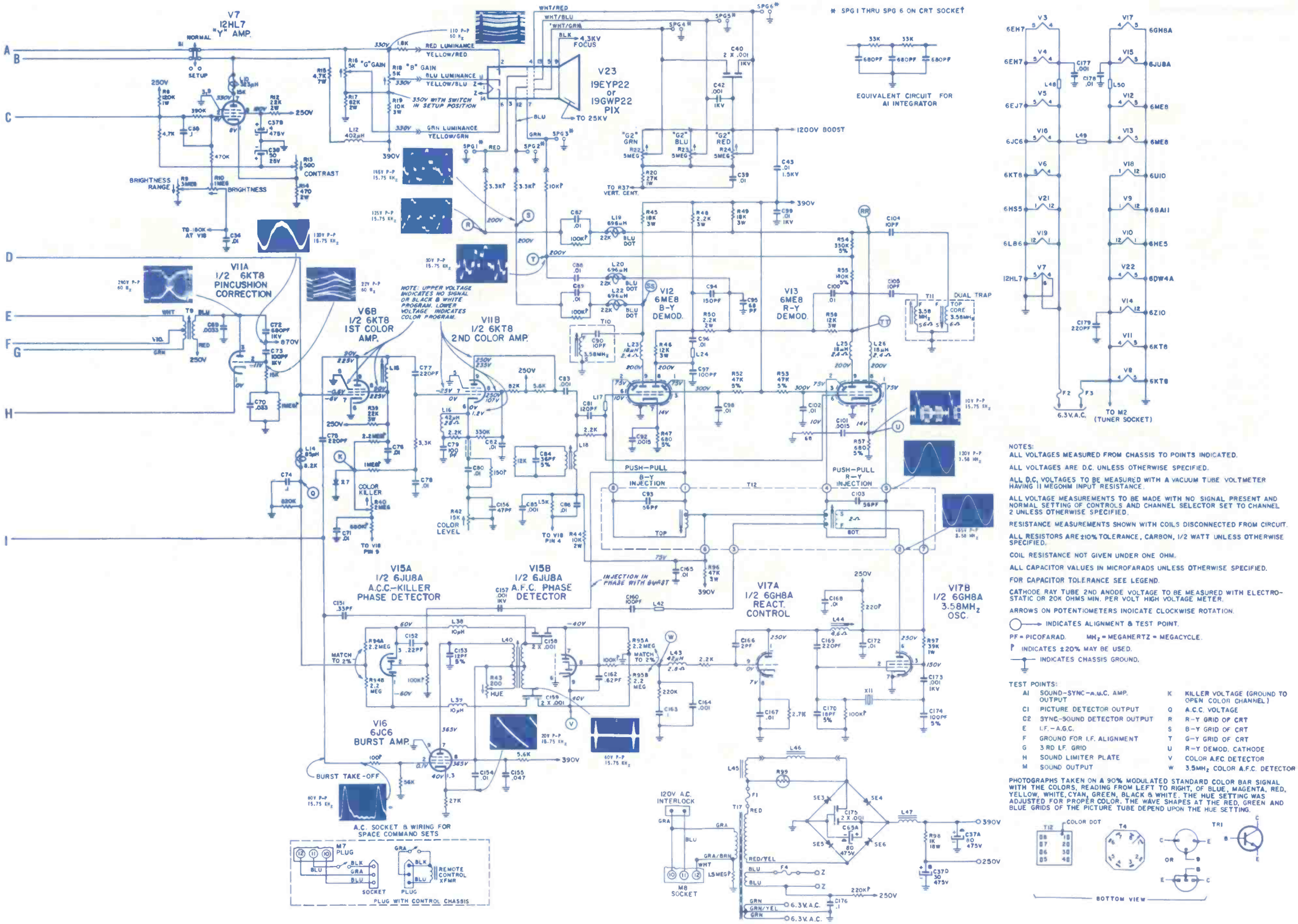
ELECTRONIC TECHNICIAN **TEKFAX**

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

DECEMBER • 1967



ZENITH
Color TV Chassis 20Y1C37



NOTES:
ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.

ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

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

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

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

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

COIL RESISTANCE NOT GIVEN UNDER ONE OHM.

ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

FOR CAPACITOR TOLERANCE SEE LEGEND.

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

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

◯→ INDICATES ALIGNMENT & TEST POINT.

PF = PICOFARAD. MH_Z = MEGAHERTZ = MEGACYCLE.

℗ INDICATES ±20% MAY BE USED.

⏚ INDICATES CHASSIS GROUND.

TEST POINTS:

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

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

1127

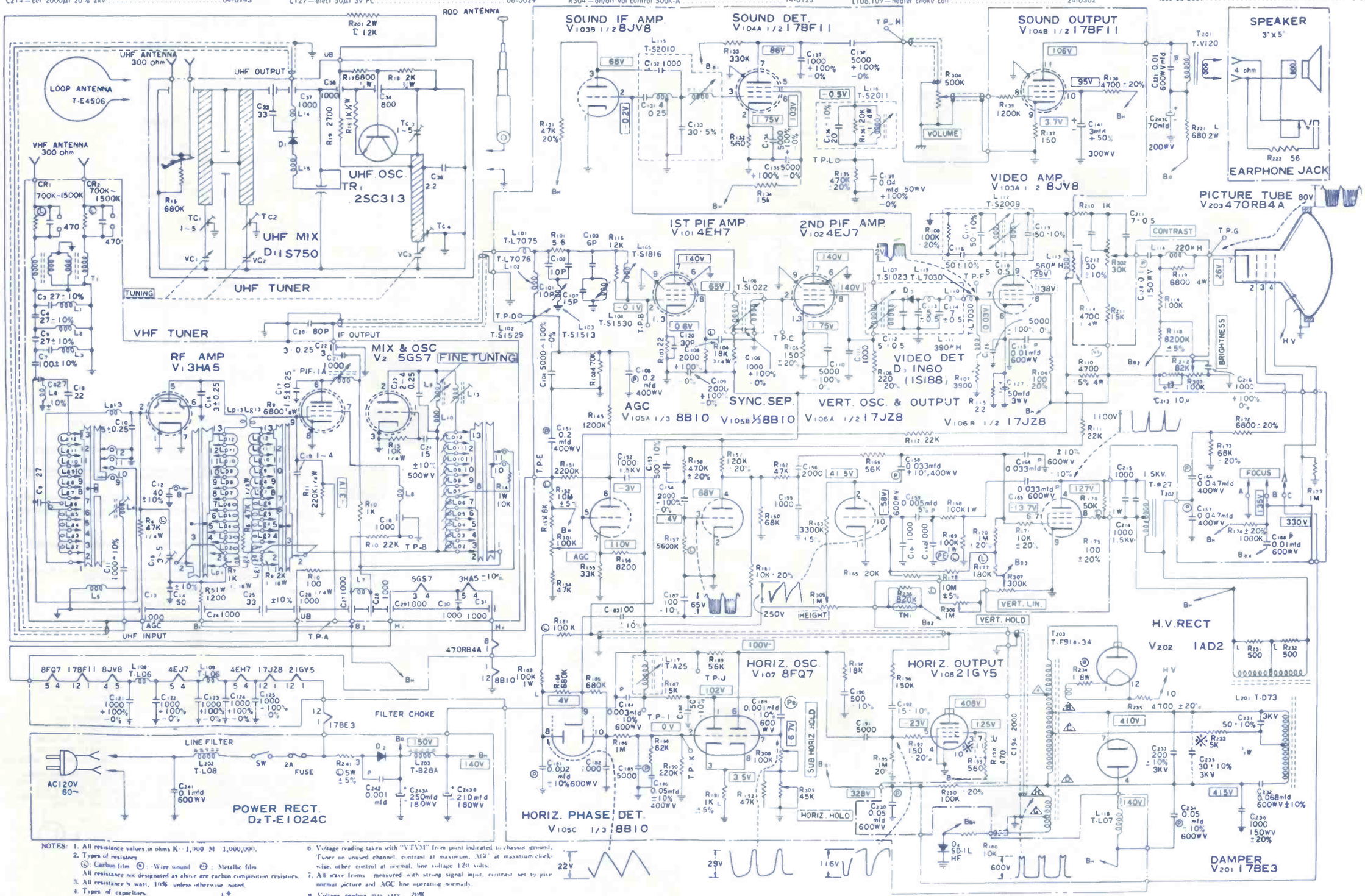
TRUETONE
TV Model 2DC3818

ELECTRONIC TECHNICIAN **TEKFAX**

DECEMBER • 1967

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

SYMBOL	DESCRIPTION	TRUETONE PART NO.
C152,236,142	cer 1000µf 20% 1.5kv	04-0142
C214	cer 2000µf 20% 2kv	04-0143
C235	cer 30pf 10% 3kv	04-0144
C189	mylar 1000µf 5% 600wv	02-0114
C106,151	mold metalized paper .2µf 20% 150v	01-0024
C243A,B,C	elect 250/210/70µf 180v	06-0064
C127	elect 50µf 3v PC	06-0029
C141	elect 3µf 300v	06-0065
C312	elect 10µf 150v	06-0041
R101	5.6Ω 5%	11-0205
R163	2.2M 5% ½w	12-0157
R157	5.6M 5% ½w	12-0158
R118	8.2M 5% ½w	12-0160
R152,179	10M 5% ½w	12-0161
R221	680Ω 10% 2w	12-0171
R201	12K 10% 2w	12-0173
R110	4.7K 5% 4w	12-0174
R241	3Ω 5% 5w WW	13-0014
D3	diode det IN60 or 1S188	32-0007 or 32-0041
TH	thermistor	16-0025
TR1	transistor UHF OSC 2SC313	31-0237
R304	on/off vol control 500K-A	14-0123
R302	contrast 30K-B	14-0145
R306	vert hold 1M	14-0146
R303	brightness 100K-B	14-0122
R308	horiz range 100K-B	14-0148
R301	variable block including R305 — AGC, height vert line and R307 — horiz hold control	14-0147
L101	combination coil-A	24-0298
L102	combination coil-B	24-0299
L103	47.25MHz trap coil	24-0300
L104	41.25MHz trap coil	24-0301
L105	video IF input trans	22-0371
L106	video IF trans	22-0372
L107	video det trans	22-0373
L108,109	heater choke coil	24-0302
L111	peaking coil	24-0303
L112	4.5MHz sound takeoff	24-0304
L113	peaking coil	24-0305
L114	peaking coil	24-0306
L115	4.5MHz sound IF coil	24-0307
L116	quad coil	24-0308
L117	horiz stab. coil	24-0309
L118	RF choke coil	24-0294
L119	filter coil	24-0295
L201	deflection yoke assembly	36-0006
L202	line filter coil	24-0296
L203	filter choke coil	24-0297
T201	sound output trans	21-0114
T202	vertical output trans	21-0115
T203	HV xformer	36-0007
	fuse 2a 250v	18-0002



NOTES:
1. All resistance values in ohms K = 1,000 M = 1,000,000.
2. Types of resistors.
   Ⓒ: Carbon film Ⓦ: Wire wound Ⓜ: Metallic film
   All resistance not designated as above are carbon composition resistors.
3. All resistance ½ watt, 10% unless otherwise noted.
4. Types of capacitors.
   Ⓟ: Paper Ⓜ: Mylar Ⓨ: Polyethylene Electrolytics
   All capacitors not designated as above are ceramic capacitors.
5. All capacitors 500V, 20% unless otherwise noted.
6. Voltage reading taken with "VTVM" from point indicated to chassis ground. Tuner on unused channel, contrast at maximum, AGC at maximum clockwise, other control at normal, line voltage 120 volts.
7. All wave forms measured with strong signal input, contrast set to give normal picture and AGC line operating normally.
8. Voltage reading may vary 20%.
* WIDTH ADJUSTMENT
   If picture is found too wide, remove the shorting wire across the resistor R200. Picture is still too wide, remove the capacitor C235 also.

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

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

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

Prefer a replacement? Sarkes Tarzian universal replacements are only $10.45, customized replacements $18.25. Shipped same day order received. Order custom tuners by TV make, chassis, and model number. Order universal replacement by part number:

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

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

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

TSC

TUNER SERVICE CORPORATION *FACTORY-SUPERVISED TUNER SERVICE*

HOME OFFICE, MIDWEST ..... 817 N. PENNSYLVANIA ST., Indianapolis, Indiana .....TEL: 317-632-3493
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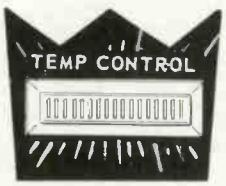
SOUTH-EAST ..... 938 GORDON ST., S. W. Atlanta, Georgia .....TEL: 404-758-2232
WEST ..... SARKES TARZIAN, Inc. TUNER SERVICE DIVISION
10654 MAGNOLIA BLVD., North Hollywood, California ...TEL: 213-769-2720

ONLY ONE COLOR GENERATOR IS WINTER PROTECTED

Sencore's Color King puts an end to cold weather instability.

Transistors just don't perform properly on those cold, cold winter days. So, when you bring in an ordinary solid state color bar generator from a freezing car or van, you wait and wait for stable patterns. Even then you can't be sure.

Only Sencore's new Color King is truly winter protected. Only the Color King has a built-in heating element surrounding the critical timing circuits. The instant you plug in the generator, this heating element warms up these circuits; also driving out excessive humidity. When optimum operating temperature is reached, a thermostat automatically turns off both the heating element and the Temp Control indicator light. Now you know the circuits are rock stable.



Protect yourself this winter. Go for the hot one. The CG141 Color King. The color generator that works when its hot and works when its COLD.

That's why the **Sencore Color King** stays sold.

Only $149.95 User Net

SENCORE

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT
426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

. . . for more details circle 122 on postcard

ELECTRONIC TECHNICIAN

WORLDS LARGEST ELECTRONIC TRADE CIRCULATION

DECEMBER 1967 • VOL. 86, NO. 6

COVER
Our innovating photographers created this one by shooting part of the front window of a local TV-radio shop through a Christmas wreath.

TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • Group 184

CANADIAN GENERAL ELECTRIC: TV Chassis M685
CORONADO: TV Model TV2-7110A
PHILCO-FORD: TV Chassis 18NT45
TRUETONE: TV Model 2DC3818
ZENITH: Color TV Chassis 20Y1C37

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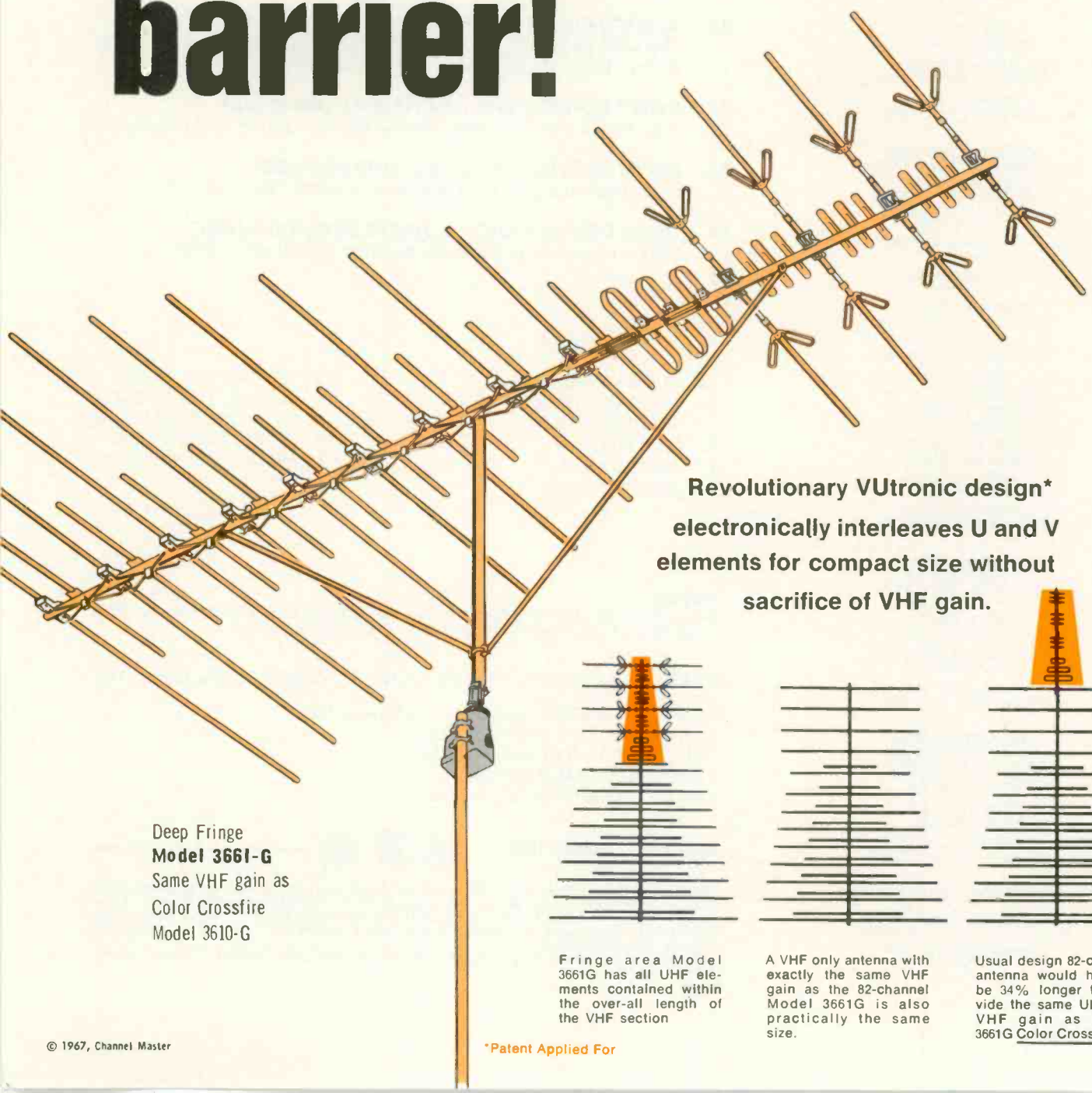
Channel Master smashes the 82 Channel size barrier!



Deep Fringe
Model 3661-G
Same VHF gain as
Color Crossfire
Model 3610-G

Revolutionary VUtronic design* electronically interleaves U and V elements for compact size without sacrifice of VHF gain.

Fringe area Model 3661G has all UHF elements contained within the over-all length of the VHF section

A VHF only antenna with exactly the same VHF gain as the 82-channel Model 3661G is also practically the same size.

Usual design 82-channel antenna would have to be 34% longer to provide the same UHF and VHF gain as Model 3661G Color Crossfire 82.

*Patent Applied For

New Color Crossfire 82

UHF/VHF Antennas plus FM/FM Stereo

Totally new concepts in UHF/VHF design are joined with Channel Master's proven Crossfire principle to produce the first 82-channel antennas that meet UHF reception needs yet also provide unsurpassed VHF gain...and with no appreciable increase in over-all size.

Here is another example of a major development from Channel Master Laboratories where, as always, leadership begins with research.

Until now, antenna manufacturers have created combination UHF/VHF antennas by coupling a UHF section to the front of a VHF antenna. To avoid costly, unwieldy, and unsightly construction, this has always meant sacrificing VHF gain. Now Channel Master fills the 82-channel gain gap with Color Crossfire 82 antennas designed for metropolitan to fringe areas where maximum VHF gain is as important as UHF reception power.

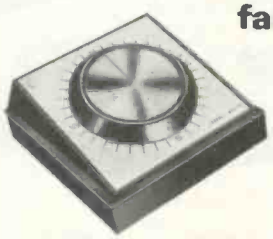
In addition to the famous Channel Master Crossfire VHF Proportional Energy Absorption Principle, these new antennas employ unique series-fed folded UHF dipoles with carefully engineered dimensions so that they literally "disappear" and operate as a perfect 300 ohm line at VHF frequencies...no "lossy" couplers required as is the case with the usual parallel-fed UHF elements.

And, of course, every Color Crossfire 82 antenna features Channel Master's famous E.P.C. golden coating and rugged preassembled construction.

COLOROTORS... for the complete U/V installation

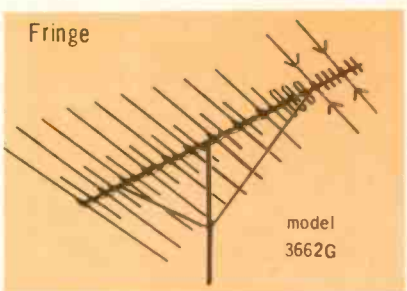
Color Crossfire-82 antennas and Channel Master Colorotors go hand-in-hand for best color on all U and V channels, crisp, clear FM, and FM Stereo reception.

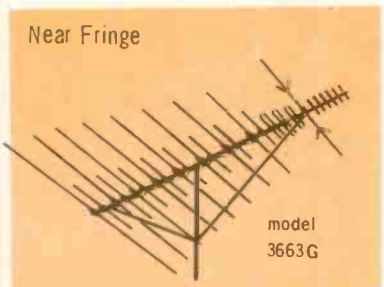
The Nation's largest, fastest-selling rotator line

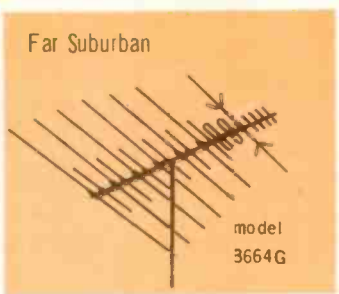


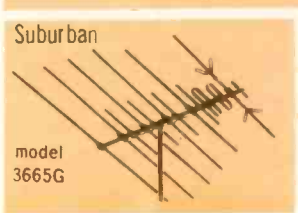
Automatic Model 9512. Also Deluxe Cabinet Automatic, Semi-Automatic, and Manual Models.

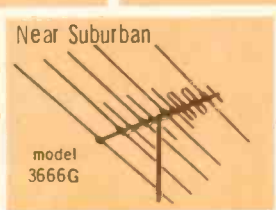
Now the first and only complete line of full VHF Power 82-channel antennas.

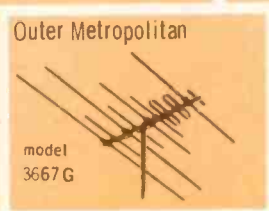


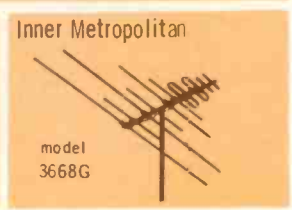












More Channel Master Crossfire Series Antennas have been sold and are being sold...than any other antenna in the history of television.

CHANNEL MASTER
Ellenville, N.Y.

. . . for more details circle 106 on postcard

EDITOR'S MEMO

Color TV vs. the Customer

How many times have you heard this: "No matter what station or program I switch to, I constantly have to adjust the color"

Sound familiar? Television servicedealers hear it every day. In most cases the complaints are justified, but not through the fault of the dealer or technician. The cause — no standardization in the transmitted color signal levels.

True, a new color TV owner should be told of the differences in color quality between a cartoon and a live broadcast. But, did you ever try to explain to a man and wife who just put out $700 for a color set, that it will require constant adjustment because the TV signal levels vary from one station to another — in fact, signal levels vary from camera to camera on the same program! Even if you did explain to them why people may look normal on one camera, but turn green when viewed by another, who cares? They didn't spend all that money for a lecture on the shortcomings of the industry. They have a legitimate gripe.

Commercials don't have to pop in with color levels high enough to bloom the picture. People on live programs don't have to vary from normal to green during a switch in cameras. But they do, and as long as they do, set owners will beat a path to the dealer's door and expect adjustment.

Television manufacturers are trying to do something about it. They are designing special circuits to stabilize a wider range of signal levels, circuits to automatically fine tune the set when changing channels — circuits designed to eliminate problems which are not normally caused by the TV set in the first place!

Sure, it's tough for a dealer selling color TV to try to explain signal levels to his customer. But it won't hurt to tell the customer that there is a little more to receiving color than what it took to get a picture on his old black and white. If the dealer explains it well, the customer will probably forget all about signal levels, and think only of the beautiful color movies or ball games and the restful hours of kiddie cartoons.

MOVING?

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

LETTERS TO THE EDITOR

Phono Needle Microscope

Further on this subject. We have used a 40x styli scope for years but they are available up to 60x. Model PM60x is listed in a catalog we received from Santronics Sales Ltd., 608 Blackford St., New Westminister, B.C., Canada.

BRYMAR TV
New Westminister, B.C.

Memoscriber Info

I'm still looking for operating instructions and parts list for Soundscribers — Memoscriber Model 77.

LEO E. SMITH
RD1 Box 375
Sandy, Utah 84070

UM80s

I read with interest in your "Letters to the Editor" column of the need which one of your readers had for a UM80 indicator tube.

I believe it will be of interest to many of your readers that AMPEREX not only includes this tube type in our line but also many other foreign tubes which may be difficult to obtain from other sources. These tubes are available from our franchised distributors.

We will be pleased to furnish information on our distributors if your readers communicate with us.

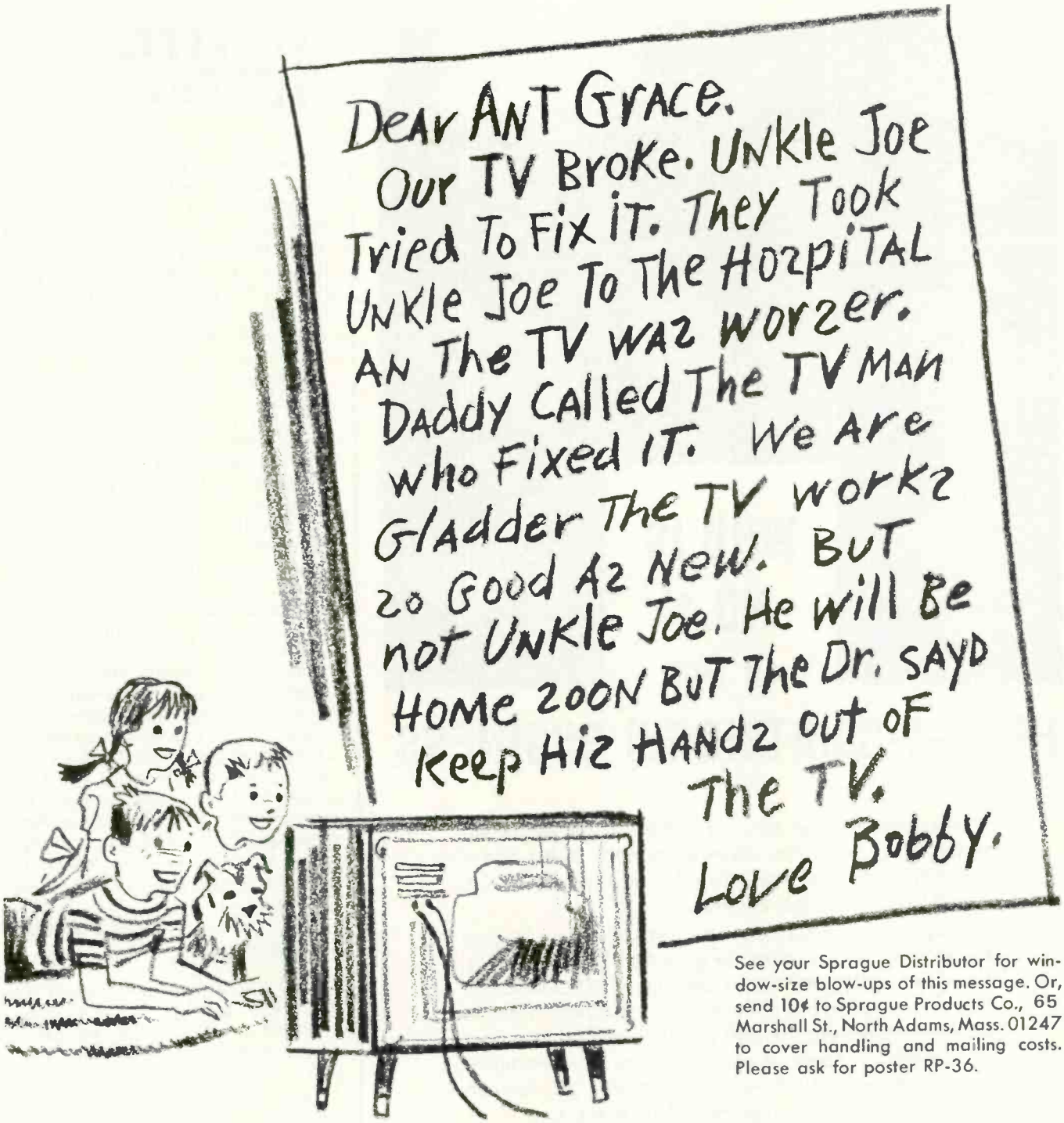
MYRON SMOLLER, MANAGER
Advertising & Sales Promotion
Amperex Electronic Corp.
230 Duffy Ave.
Hicksville, L.I., N.Y. 11802

Looking to the Future

Yours is about the last publication, on a national scale, still endeavoring to aid small service-dealers and working technicians. But the first glimmer of a real recognition of the basic ills plaguing the industry as a whole appeared in your Editor's Memo, titled "They Must Standardize," in the August 1967 issue of ELECTRONIC TECHNICIAN.

Let's face it — EIA standards began going out the window when printed circuits came in at the door. And I doubt if your brief comment will impress those who have foisted so much hard-to-service junk on the public.

"Space Technology," as sold by many companies, simply boils down to the cheapest and easiest means to get the product off the assembly line and because the technician is the low-



See your Sprague Distributor for window-size blow-ups of this message. Or, send 10¢ to Sprague Products Co., 65 Marshall St., North Adams, Mass. 01247 to cover handling and mailing costs. Please ask for poster RP-36.

Call in your neighborhood TV technician when your set first starts acting up...you'll please the family ...and SAVE money in the long run!

THIS MESSAGE WAS PREPARED BY SPRAGUE PRODUCTS COMPANY,
DISTRIBUTORS' SUPPLY SUBSIDIARY OF SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASSACHUSETTS FOR...

YOUR INDEPENDENT TV-RADIO SERVICE DEALER

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

65-7107

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LETTERS TO THE EDITOR

est man on the totem pole — that's where the buck ends up.

One of the few companies still making concessions to the servicing end of the business is now pushing "number one." He didn't get in that position on his advertising budget alone. He simply produces products which most service technicians can live with and honestly recommend.

Since few consumers plan on orbiting their color sets, stereo or whatever, I'm puzzled about the source of the future Space Age youngster who is going to work as an apprentice technician while there's a possibility of getting a college sheepskin that automatically means a higher starting income than most technicians can command after many years in the game.

Whether your publication is the means for getting or calling attention to standards that would not only give technicians a "break" but the consumer as well, is of course something for you to decide. I think, however, it would promote interest and maybe get a few technicians' heads out of TV sets long enough to write you if you were to run a "Jackpot and Lemon" column featuring manufacturers names, model numbers and a short description of why the product is a stinker to troubleshoot and repair or is a delight to work on.

HEINZ NEUMAN
South Beach, Ore.

• *Read ET carefully and you will see that many articles, including those produced in ET's* TEKLAB, *call attention to numerous servicing problems which arise because of design. The* TECDIGEST *section also covers manufacturers' design changes — changes made after previous equipment runs have proven defficient in certain ways. We honestly believe that design trends are now moving toward fewer servicing problems. Standardization would be only one factor involved in accelerating this process. — Ed.*

Long Distance Call

I have a model 153 signal generator and tracer made by Accurate Instrument Co. Understand they are no longer in existence. I need a spare variable capacitor and a complete schematic.

Y. L. ONG
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Selangor, Malaysia

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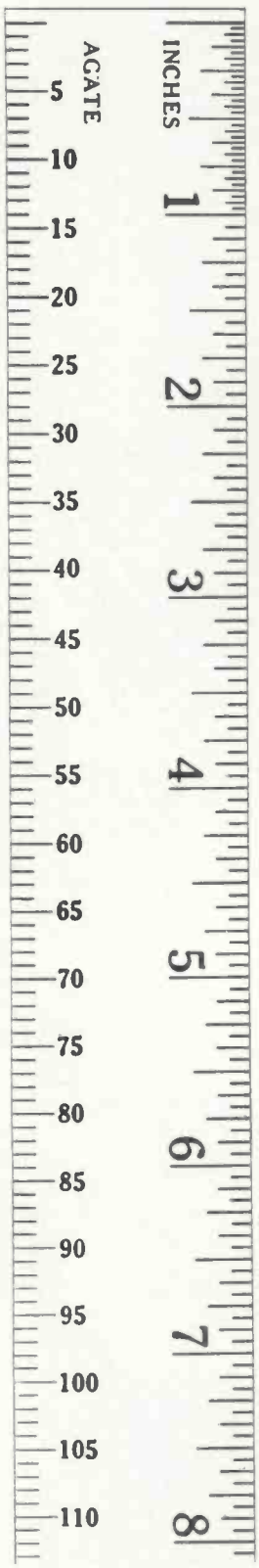

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RANGES

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DC VOLTS: 0-0.25, 1.0, 2.5, 10, 50, 250, 500, 1000 @ 20,000 Ω/v
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DC MICROAMPERES: 0-50
DC MILLIAMPERES: 0-1, 10, 100, 500
DB: −20 to +10, −8 to +22, +6 to +36, +20 to +50
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What we ask in return is that you use Sylvania tubes when you're repairing TV sets—both our own make and others.

As you know, we make color and black & white picture tubes and receiving tubes for virtually every make set on the market. In fact, 15 out of 21 color set manufacturers use some Sylvania picture tubes as original equipment.

So you shouldn't have much trouble moving a lot of our tubes, week in and week out.

When you use our tubes, you get our Sylvania Bright Guys award certificates as a bonus. They're not quite the same as money. But they will get you the kinds of things only money can buy.

Your distributor is the man to contact for details. He'll give you a Sylvania Bright Guys award kit (which includes a catalogue listing the good things we offer—about 1500 in all).

Naturally, the more tubes you buy from him, the more certificates he'll give to you.

It's a pretty fair way to work, wouldn't you say?

SYLVANIA
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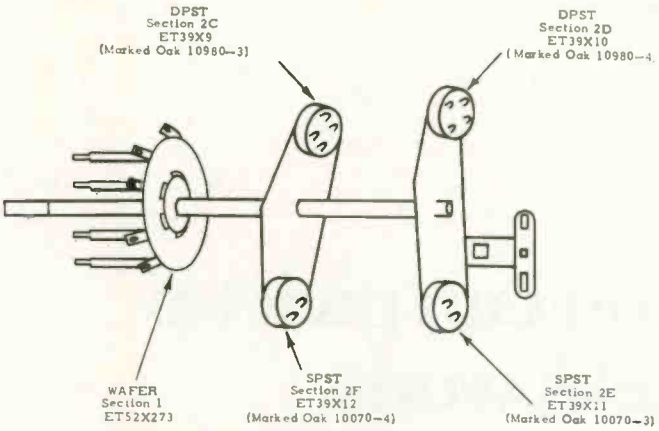
TECHNICAL DIGEST

GENERAL ELECTRIC

TV/Phono Chassis M6/MW — Function Switch Availability

Replacement function switch assemblies, used in M6 and MW chassis TV/Phono combination models, will soon become "no longer available." The switch assembly



catalog numbers are ET55X35 for the M6 chassis models and ET55X41 for the MW chassis models.

Each switch assembly includes one wafer switch, two SPST switches and two DPST switches.

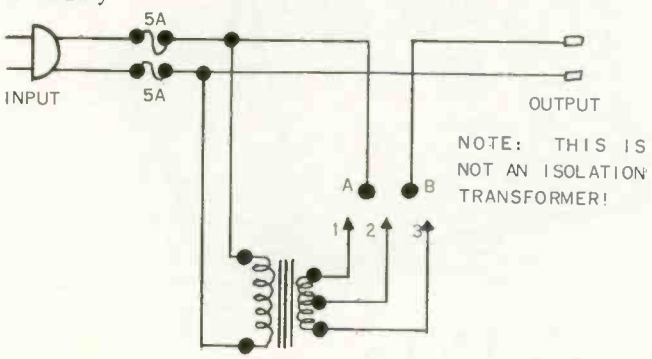
Nearly all defective switch assemblies can be repaired by replacing the faulty switch section or sections.

The illustration identifies the various individual switch sections.

Adjustable Line Voltage Transformer

Occasionally there is a desire to boost or cut the line voltage for a TV set or appliance. This can easily be done with a small filament transformer placed in series with the appliance power cord. A switch could also be added in the secondary to provide a step-variable shop supply for 'cooking out' stubborn intermittents.

The 5a unit shown has enough capacity for a color TV set (about 350w). For other requirements you can roughly calculate the transformer needed by adding 30 percent to the wattage of the appliance and dividing it by 120v. This will give you the current requirement for the transformer secondary.



FILAMENT TRANSFORMER
117V/12.6V,CT,5AMP

1. Purchase locally, a filament transformer with a 12.6v, center tapped, 5a secondary.

2. Construct unit in small metal box large enough to hold transformer (and switch, if desired). Use adequate grommet and strain reliefs where wires enter box. Cut a number of small holes in the box for ventilation. Remove all burrs!

3. Attach VTVM to output — set on 150vac scale. Connect secondary leads to A and B, two at a time, until you get the desired voltage reading on VTVM. In diagram, connecting 1 to A and 3 to B would add 12v; 3 to A and 1 to B would subtract 12v.

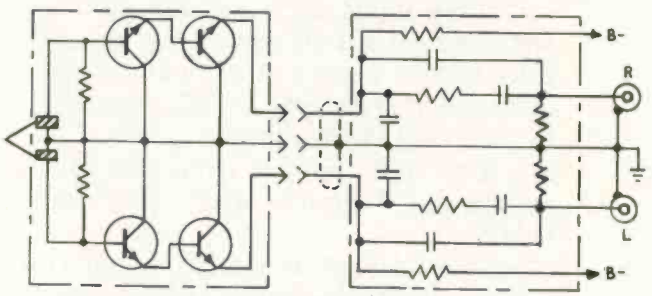
4. Tape up unused secondary lead. Label box with input and output voltages and wattage limit.

RCA Victor

Stereo Phono Cartridge RMP205-2 — Cartridge Description

RMP205-2 is a high-performance stereo phonograph cartridge assembly fitted with ceramic pickup elements and a matching isolating integrated circuit designed to operate with solid-state preamplifiers.

The precision tracking and high compliance necessary to achieve high fidelity reproduction of a phonograph record require a small, light mechanical mass at the stylus and voltage generating element in the cartridge. To achieve optimum electrical performance in the preampli-



fier, however, the pickup element should be as large as possible. To secure both of these opposed conditions, the chip effectively separates the mechanical and electrical limitations to permit each to be designed for optimum performance. To achieve a small-mass mechanical system, the ceramic elements in the 205-2 are rectangular bars approximately 0.013 x 0.030 x 0.375in.

Because ceramic and crystal pickups function as high impedance, capacitive strain/voltage generators, they must be coupled to a low-input impedance preamplifier through a matching network to maintain optimum energy transfer and to insure acceptable frequency response.

The chip is said to achieve the first of these matching parameters without the inherent insertion loss of an RC network by using a 4-NPN-transistor integrated circuit. Two transistors function in a Darlington configuration for each stereo channel. This circuitry achieves a current gain of approximately 10k. It is said that a cartridge of this type has the important advantages of excellent tracking, improved frequency response, low distortion and contributes to longer record life.

A secondary feature of a Darlington circuit is the input-

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NO UHF →		CS-V3 $10.95	CS-V5 $17.50 CS-V7 $24.95	CS-V10 $35.95	CS-V15 $48.50 CS-V18 $56.50
UHF SIGNAL STRONG →	CS-U1 $9.95	CS-A1 $18.95	CS-B1 $29.95	CS-C1 $43.95	CS-C1 $43.95
UHF SIGNAL WEAK →	CS-U2 $14.95	CS-A2 $22.95	CS-B3 $49.95	CS-C3 $59.95	CS-D3 $69.95
UHF SIGNAL VERY WEAK →	CS-U3 $21.95	CS-A3 $30.95	CS-B3 $49.95	CS-C3 $59.95	CS-D3 $69.95

NOTE: In addition to the regular 300 ohm models (above), each model is available in a 75 ohm coaxial cable downlead where this type of installation is preferable. These models, designated "XCS", each come complete with a compact behind-the-set 75 ohm to 300 ohm balun-splitter to match the antenna system to the proper set terminals.

THE FINNEY COMPANY

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TECHNICAL DIGEST

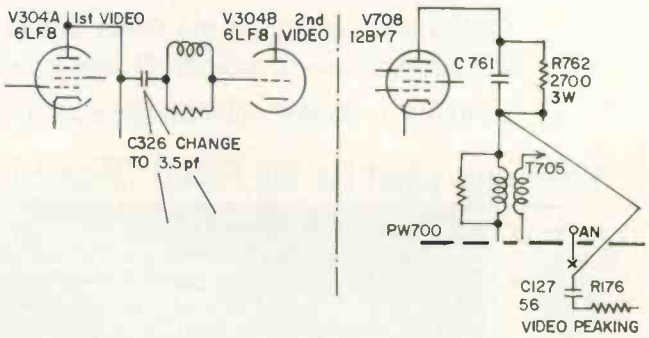
to-output impedance ratio. The input impedance to the chip is approximately 3.5M and the output impedance from the chip is approximately 22K. This matches the input of the solid-state preamplifier and is immune to capacitance effect, hum and noise pickup.

The second condition for acceptable pickup performance — frequency response — is accomplished by an RC equalizing, or compensating network having a high-frequency rolloff comparable to de-emphasis. The chip effectively isolates this network to provide optimum equalization without serious loading of the pickup element.

Color TV chassis CTC35 — Modification in Video Peaking Circuit

In some instances picture ringing and background noise may be encountered.

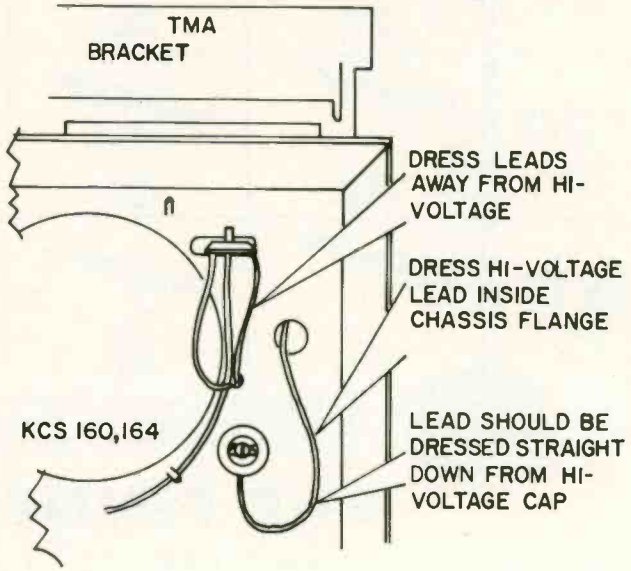
To minimize these effects, disconnect C127 from connecting point "AN" of PW700 board and reconnect to



junction of T705 and C761 and R782. Change C326 PW300 board from a 5pf capacitor to a 3.5pf Stock No. 117531.

TV Chassis KCS160/164 — Critical Lead Dress

Recent field reports indicate "arcing" of the HV may occur in humid areas, from the 2nd anode to wiring close by or to ground. This arcing may cause a breakdown and deterioration of the 2nd anode connection cap.



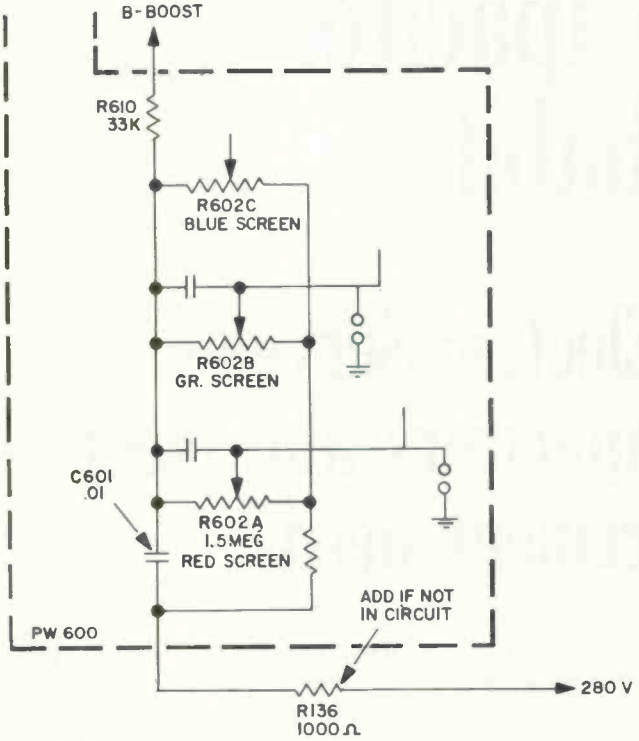
TECHNICAL DIGEST

When service is required on these chassis it is recommended that the wiring in the vicinity of the 2nd anode lead be dressed straight down as illustrated, when plugged into the CRT.

Color TV CTC22 Chassis — Capacitor Failure

Various field reports indicate some failures of C601, screen B+ boost filter. When replacement of this capacitor is required a 0.01μf 1kv ceramic capacitor, stock # 79918 should be used.

When capacitor C601 is replaced, R610, a 33K resistor



may also need replacement and R136, a 1K resistor (stock # 502210) should be added in series with B+ as shown in schematic. Late production will include this resistor.

Take advantage of the handy mail-order card in this magazine. If you would like additional information about any of the products listed on this card, return it to us and we will see to it that you receive the literature that you desire.

ELECTRONIC TECHNICIAN

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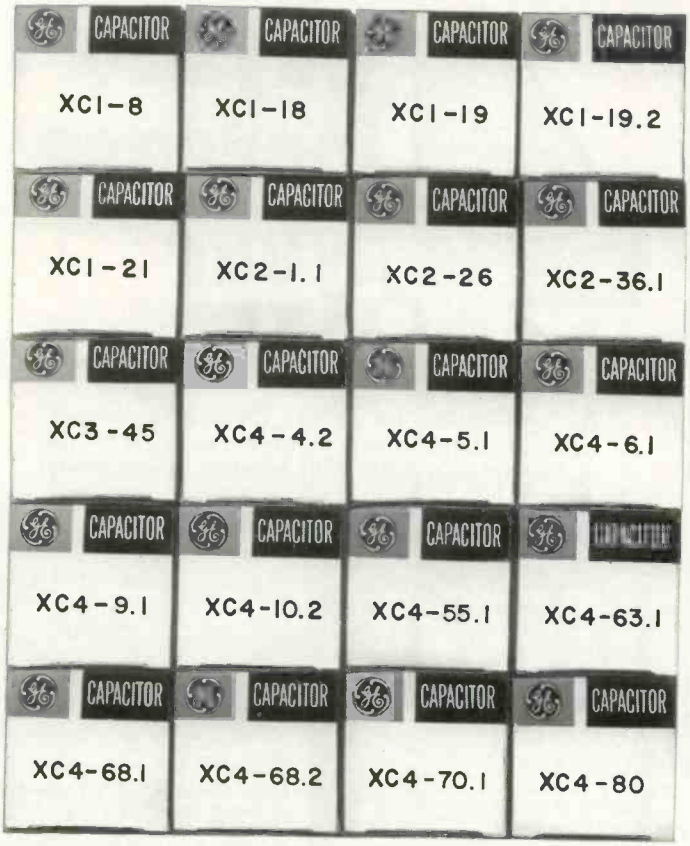

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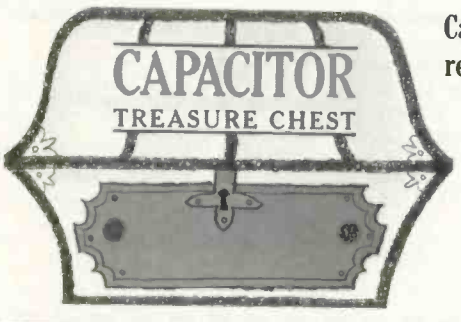

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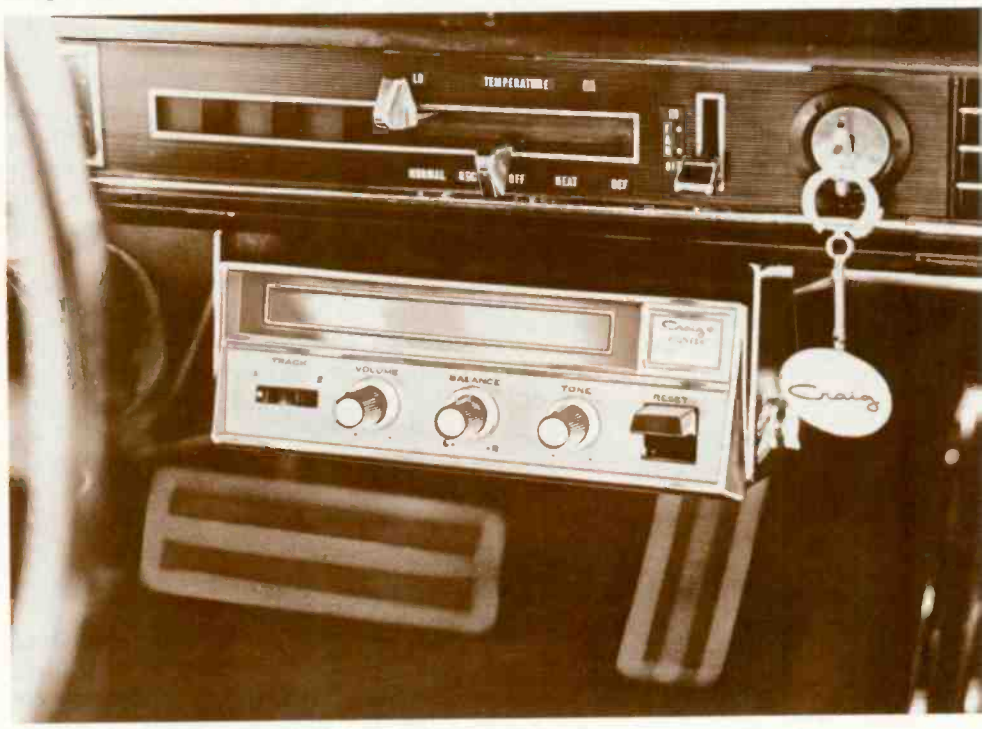
ELECTRONIC TECHNICIAN

DECEMBER 1967

INSTALLING AND SERVICING SOLID-STATE AUTO TAPE PLAYERS

Craig-Panorama model C503 mounted in automobile.



Here's another gold-plated bandwagon you can ride on

■ Auto cartridge tape players are now moving like hot cakes at a Shriner's breakfast. And thousands of TV-radio service-dealers are selling, installing and servicing them.

Today's automobile cartridge tape player is produced in 4- and 8-track types or a combination of both. Other units have a 4-track adapter that must be attached to the 8-track stereo player (See Fig. 1).

The typical unit has a frequency response from 40Hz to 15kHz. Power outputs range from 5 to 10w/channel. Some units have electrically governed motors with heavy flywheel and capstan drive.

The Lear-Jet Stereo 8 model, AS831, for example, has a direct capstan drive inverted dc motor. No belts or pulleys are used. Other units may control speed with mechanical governors, electrical and solid-state systems.

The new tape units have many features — including fast forward speed, precision pitch control and solid-state speed control. Some others have a dial light that indicates which track is being played. Still another type has a system for separate control of volume on both back and front speakers. Another feature is a fine tuning control operated from the front panel to eliminate crosstalk.

In the Automatic Radio Co.'s tape player (Fig. 2) the cartridge slot is designed to operate with eith-

SJB's model ST808, a straight 8-track stereo tape player.

Lear Jet's stereo-8 model ASR851 auto tape player.

Fig. 1 — Automatic Radio's 4-track cartridge and adapter for using 4-track cartridge on its 8-track player.

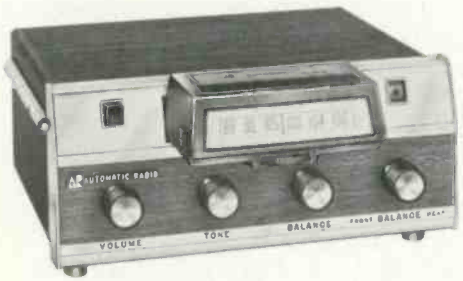


Fig. 2 — Automatic Radio's convertible cartridge tape player shown with FM radio tuner "cartridge" inserted.

er 4- or 8-track stereo cartridges. Separate AM or FM radio tuner "cartridges" are available to slip into the same slot. This model is also equipped with a built-in key-lock mechanism — protecting against theft.

Installation

Practically all tape players are mounted under the auto dash by bolting a heavy-duty mounting bracket to the underdash cowl. Several perforated holes are provided for rigid support. Slotted positioning holes are used to push the mounting bracket forward or sidewise (see Fig. 3).

Be sure to avoid mounting the equipment where it will be exposed to the sun or near the air conditioner vents. Install the player where dust, dirt and humidity are at a minimum. Mount the unit securely to minimize vibration.

In some cases it may be necessary to use only the first row of holes when mounting the unit under the dash. In this case, add a perforated strap at the rear of the unit. Attach the top of this strap to the firewall or a rigid structural point behind the dash.

Before drilling holes in the firewall or dash, make certain the drill will not penetrate into wiring or other working members.

All stereo tape units should be grounded for proper operation. This is usually accomplished with metal mounting bracket or perforated strap. In new automobiles having plastic undercarriage, bond the tape unit to the metal under dash or firewall.

Slip the tape player into the mounting bracket and level up. Do not mount the player more than 45-deg from horizontal. Simply unloosen the side bolts for easy removal (see Fig. 4).

Speaker Installation

Install two PM speakers in each front door or one on each side in both front and rear doors. The latest cars have metal cut-outs on each side of the rear deck. These are size 6x9 or 5x7. When using these two rear speakers, add only one on each side in the front doors.

Many of the new cartridge players have a custom installation speaker kit containing four PM silicone-treated speakers. Included are mounting hardware and grille covers. Correct speaker cable is included to be clipped to speakers with polarized amplifier plug.

Instant mount enclosures are also available for firewall, kick panels, or under-the-seat installation. These quick easy speaker enclosures do not require large mounting holes.

Before attempting to mount the speakers in the front door or kick panels check for speaker clearance. Make sure the magnet portion of the speaker will clear before drilling large holes in the door panels.

Phasing the Speakers

Whenever two or more speakers are connected together, they should be properly polarized and in phase. Polarity marks are located on the speaker frame near the terminals in the stereo speaker kits. Unmarked speakers should be polarized and marked.

To polarize the unmarked speaker use a small flashlight battery and clip leads. Now connect the negative end to one voice coil terminal. Momentarily touch the positive terminal to the other speaker terminal. Check to see if the cone moves in or out. Mark this connection with a plus sign on the speaker frame. Check and mark all speakers in the same manner — using either an "in" or "out" movement of the cone as the departure point (see Fig. 5 for speaker connections).

Battery Polarity

Be sure the correct battery polarity is applied to the 12v cartridge player. Check the car battery to see which terminal is grounded. All cars made in this country use the negative ground system.

Incorrect battery polarity can damage a stereo unit. During the winter months this condition can happen. The car battery can be charged backward and still operate the auto electrical system. But the transistor car radio or tape player will not perform.

Polarity switches are installed in several tape players for either positive or negative ground installa-

tions. Always connect the A" lead of the tape unit to the fuse block or ahead of the ignition switch.

Cleaning the Drive Assembly

The capstan drive and pinch roller should be cleaned periodically with chemically pure alcohol. The tape head should be cleaned after every 15 to 20 hours of playing time. You can safely bet the tape player should be cleaned every time it is repaired. A regular tape head cleaning cartridge is available which can be used to clean the tape head automatically.

Wipe off all tape drives and pinch rollers. When the belt, pulleys and capstan drives become glazed with tape dust and oxide residue, clean and then lubricate with special tape lubrication. Slow and erratic music will result if this is not done.

After cleaning the tape drive and rollers, apply one drop of oil on each bearing. Use a lightweight oil — similar to sewing machine oil. At the same time, check for a dirty thrust pad. Clean off the dust and tape oxide and wipe away all visible lubricant on any moving parts.

Head Adjustment

Crosstalk is the reproduction of two audio sources simultaneously. This will render both reproductions unenjoyable. The tape head is picking up two separate tracks of the tape. This is especially true of the 8-track stereo players. Actually, the recorded tape is only ¼ in. wide with eight channels of sound and seven silent guard channels between each recording.

Check several cartridges before attempting alignment of the head. If only one cartridge produces crosstalk, the cartridge is defective.

In the Ranger model RR41T (Fig. 6), a fine tuning control is mounted on the front panel to permit the listener to raise or lower the playback head manually. Other models have the tape head adjustment at the bottom of the tape player.

The Lear Jet stereo, for example, has a red painted screw on the bottom of the player. To adjust the head properly, place a good cartridge in the player and adjust the red painted screw. If the interfer-

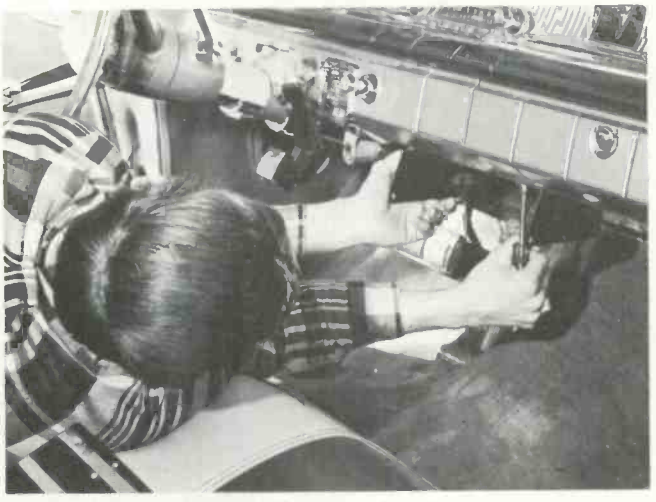


Fig. 3 — Mount the bracket tight against the metal underdash in a clear area.

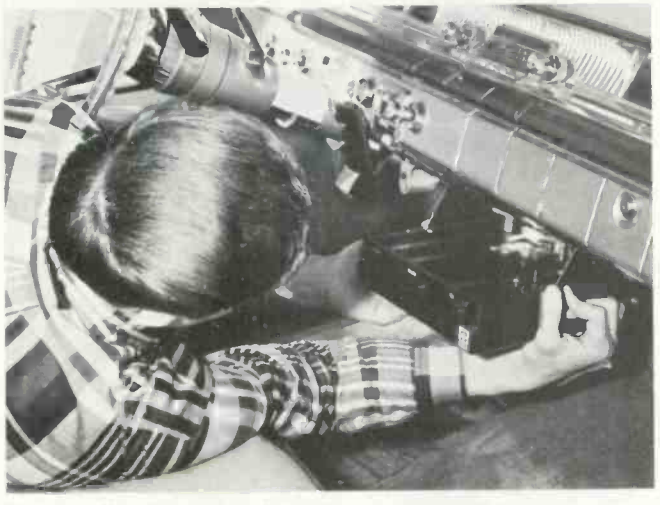


Fig. 4 — The tape player is easily removed by unloosening the two side bolts.

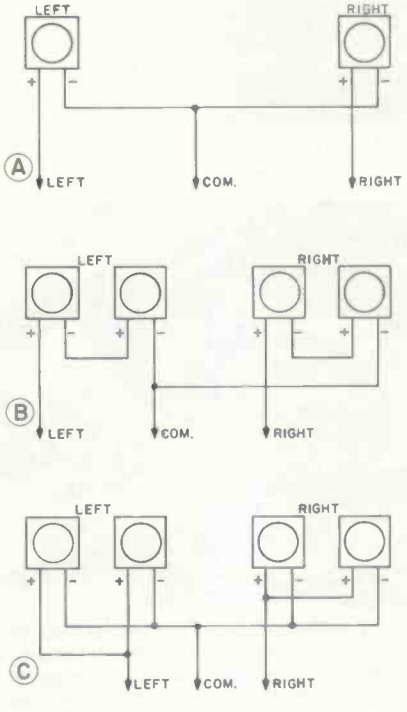


Fig. 5 (A) — Hookup for two 4 to 8ohm speakers. (B) — For four 4 ohm speakers. (C) — For four 8ohm speakers.

Fig. 6 — Ranger tape player has a crosstalk fine tuning control on the front panel.

Slotted Speed Control

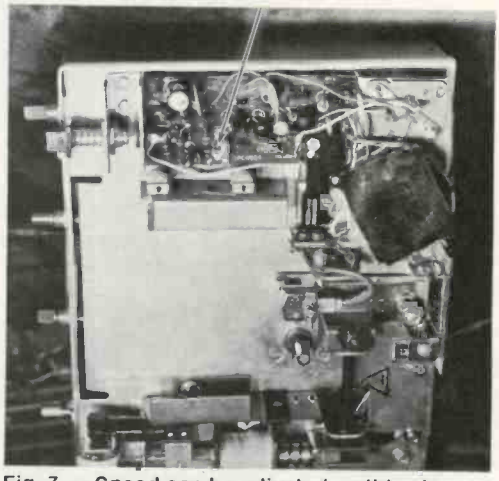
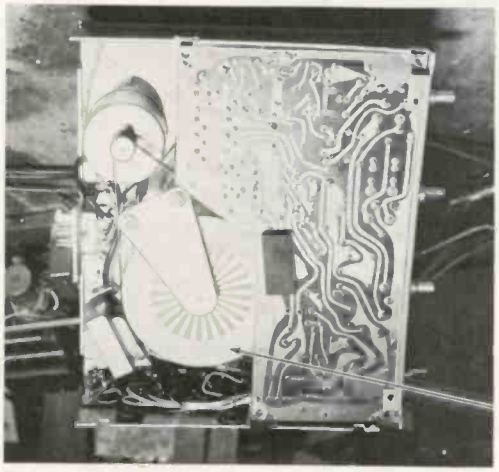


Fig. 7 — Speed can be adjusted on this player by adjusting the slotted speed control.



Speed Disc

Fig. 8 — A speed disc indicator is located on the bottom of this tape player.

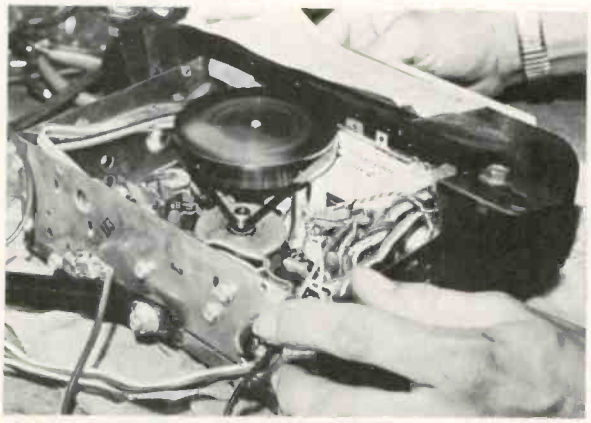


Fig. 9 — This Philco-Ford model tape player has a "shiny" belt and flywheel. Slow or erratic speeds can be eliminated by cleaning the glaze and oxide dust from belt, wheel and tape drive assembly.

ing channel becomes louder, reverse the screw adjustment until the tape plays without interference. Place rubber or plastic glue in the screw slot to prevent vibration moving it out of position.

If the tape head is sitting or angling to one side, adjust the azimuth adjustment screw until the head is perpendicular with the tape guide. Demagnetize the tape head if noisy reproduction exists. Once again, check with several tape cartridges to make sure the one being used is not defective.

Speed Checks

If the speed of the player varies, always check the suspected player by substituting a new cartridge. Now select a recording with a vocal singer and listen for the pitch of the known artist's voice. If the pitch is high, the tape player is running fast, or if the voice pitch is low, the tape is running too slow.

To adjust the speed of a Lear-Jet stereo-8 player, remove knobs on the right and insert a thin-bladed screwdriver. If the unit is running fast, a counter-clockwise rotation of the screwdriver will slow the unit. If it is running too slow, turn the control clockwise. Only a fraction of a turn will do the trick.

As shown in Fig. 7, a small rheostat is located on top of the electronic control board. Adjustments of this control will govern the speed of the drive motor. At the bottom of the large flywheel (see Fig. 8) a speed disc is located which can be seen through a small hole in the bottom of the tape player. When a neon or fluorescent light shines against the speed disc, correct speed adjustment can be made. Adjust the small speed rheostat until the lines stand still.

When checking transistors in a solid-state speed control, remove them from the circuit. Several diodes and directly coupled transistors will produce false readings with an incircuit beta tester.

Intermittent transistors can easily be checked in a beta tester. Clip the suspected transistor to the correct test leads and push the beta test switch. Carefully watch the meter hand for any movements. Spray on freeze mist and see if the meter

needle moves toward full scale or indicates "open." A transistor with any great change of beta reading should be replaced.

Low Volume with Distortion

The complaint on a Ranger model RR41T was "low volume and extreme distortion." Both troubles were isolated to the left tape channel.

Since distortion is generally caused by faults in the output stages, we began with the two push-pull power output transistors. One was replaced and the second output transistor turned out to be the culprit.

In this model the bias should be adjusted after the output transistor is replaced. Connect the player to a 13.5vdc power supply and connect a 4 Ω speaker across each speaker output. With no signal applied, carefully adjust the bias potentiometer, R133 for 7.5v at the collector of the output transistor.

Slow Speed

The owner of a Philco-Ford stereo player reported that all tapes were running very slow. Sure thing, when we placed the stereo player on the bench, it was running slow. From previous experience we checked the belt and flywheel assembly. The belt was glazed and the flywheel looked like a mirror.

We cleaned the belt and flywheel with cleaning solution. At the same time, we have found that a complete cleaning and lubrication of the tape capstan drive and pinch roller assembly are necessary. Intermittent speed and "wow" are symptoms of glazed belts or dragging tape drives (see Fig. 9).

Intermittent Speed

An Automatic tape DEK8 came into the shop with intermittent speed. We suspected a frozen or binding capstan drive, pinch roller or thrust bearing. Cleaning and lubrication of the complete tape player did not solve the problem, however. While checking the electronic speed control circuit we discovered, by pushing up and down on the PC board, that the speed would vary. All soldered connec-

continued on page 69

TROUBLE SYMPTOM	CAUSES
Fails to play	Check fuse Poor ground Faulty power switch Frozen capstan bearing Broken drive belt Dry pinch roller assembly
Tape plays slow or erratic	Belt dragging or slipping Misaligned motor or capstan assembly Glazed belt, pulleys or pinch roller Oil on capstan drive Defective motor Flat pinch roller Check electronic speed control PC board
Doesn't change channels	Indicator arm binding on top of head index cam Channel selector switch shorted or contacts spread too wide Solenoid defective — check with ohmmeter. About 10 Ω
No sound	Try another cartridge. See if unit will hum with volume control wide open Check for defective playback head Check to see if either left or right channel is dead Use audio signal generator to locate dead stages
Distorted Output	Check bias adjustment Check power output transistors Difficult-to-locate distortion (Use square wave audio signal generator and scope)
Unbalanced Output	Check balance potentiometer Check for poor ground on one speaker Clean tape head Check for weak stage
Noisy	Check for ignition noise and install capacitor on ignition coil Install suppressor in distributor lead Install new noise ignition spark plug cables for extreme conditions Check playback head and demagnetize Check drive motor flux noise by rotating motor field until magnetic null is lined up with the tape head.

TECHNICAL TIPS for

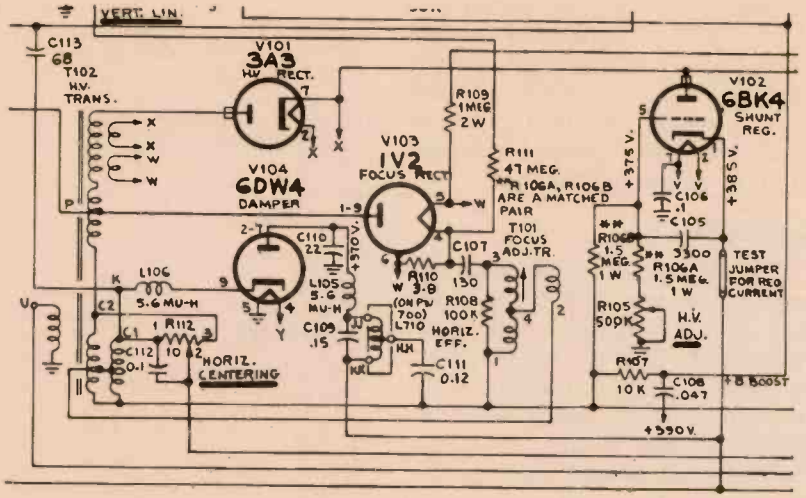
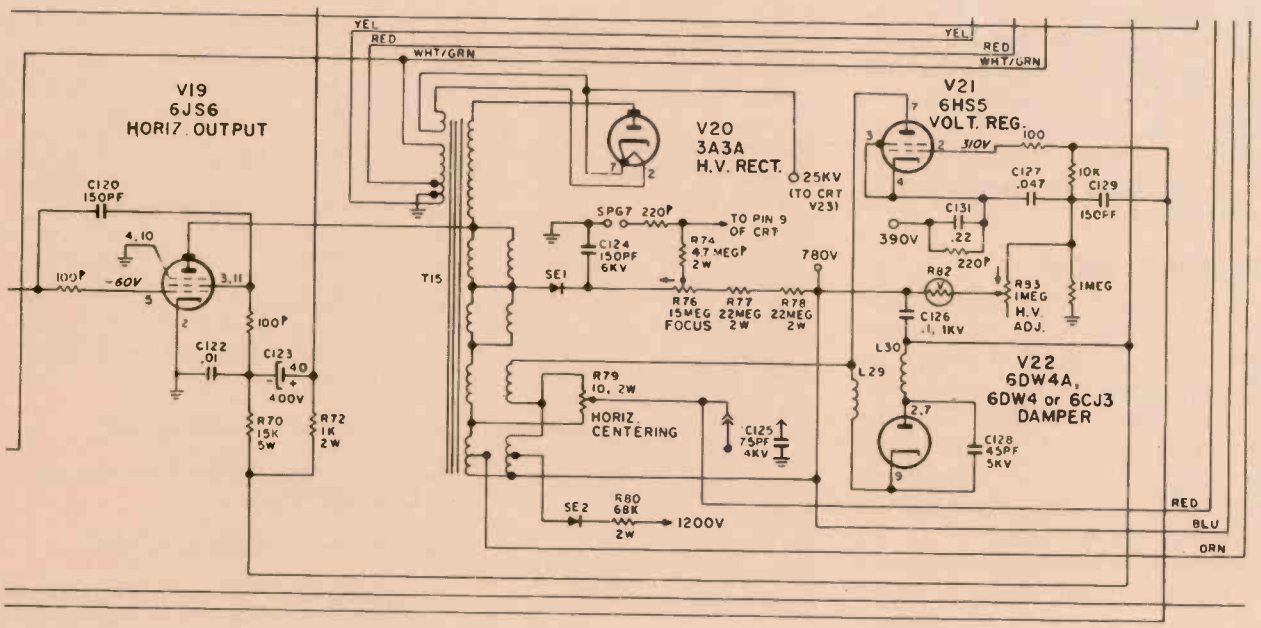


Fig. 1 — Schematic of an adjustable transformer focus control which is used in the RCA Victor CTC12 color chassis.

Fig. 2 — HV section of Zenith 20X1C36 color chassis showing selenium rectifier and adjustable pot used in focus voltage circuit.



'RAZOR SHARP' COLOR PICTURES

Keep your customers happy by using a little technical know-how to solve those troublesome HV problems

■ In addition to the stabilized HV necessary for color CRT anodes, a stable but manually variable focus voltage must also be supplied to electrostatic focus elements of color CRT guns. Some high-voltage systems have a separate focus-voltage tap on the flyback which is connected to the anode of a solid-state diode or the plate of a separate focus-voltage rectifier tube (1V2, 1AU2, etc.), as shown in Fig. 1. A focus-adjust transformer or pot may be used to vary this voltage.

The most likely cause of poor focus is a defective focus-voltage rectifier tube or diode. Use a VTVM with HV probe and check it. Note the set manufacturer's exact specifications on this. Specifications will probably call for 4.3 to 5.3kv. If insufficient voltage is present after replacing with a known-good tube or diode, check associated circuit components. Pay close attention to all high-value resistors in these circuits as they do cause considerable trouble.

When adjusting the focus transformer or pot, the brightness and contrast controls should be set as close to the proper viewing level as possible. In general, the control should be adjusted to give maximum over-all definition of fine picture detail. And you will need a VTVM with a HV probe that will handle up to 30kv for making necessary over-all HV and focus voltage measurements. Extreme caution should be observed with these voltages.

An off-value resistor in the grid circuit of the 6BK4 voltage regulator, a tube element short, cathode-to-heater or grid-to-cathode short or a shorted capacitor which normally appears across the shunt regulator grid and cathode can cause HV and focus problems.

A color chassis using a selenium rectifier for focus voltage and employing an adjustable pot is shown in Fig. 2. Focus potentiometers sometimes become pitted — causing intermittent or varying focus conditions. If a replacement control becomes pitted also, you should check the circuit for a leaking or shorting bypass capacitor in the focus circuit. These pitted pots should be replaced. No effort should be made to clean them like we frequently do with volume and other low current carrying controls.

HV and Focus

Setting the HV properly and getting the best focus are two problems which many technicians find difficult. These two problems are closely related because, with improper high voltage, it is impossible to obtain good focus.

The HV on most color sets should be 24kv. On some late model 25in. CRTs, 25kv is specified. The HV should never be less than 1kv lower than the specified voltage. This is less than 5 percent tolerance. Understanding this, you can see why it is very important for your meter to be accurate. If you use a multiplier-type probe on a general-purpose VTVM, have it checked against a good electrostatic HV meter.

Too much HV is rarely a problem — but it happens occasionally. This can cause frequent shunt-regulator HV rectifier failures and insulation breakdown. Too much soft X-ray radiation may be caused also.

It will not be possible to obtain good focus unless the HV is properly set. And even when it is properly set, the focus may change slightly with brightness level adjustments.

In some sets you may find the focus transformer running hot or it may burn up — like the one shown in Fig. 3 which went up in smoke. Generally, this is caused by a shorted winding or some defect in the focus transformer. If a new one is installed and it still runs hot, check the circuits for shorts. Also check for HV arc-over from the flyback to the focus adjustment transformer.

Selenium Focus Rectifiers

The stacked selenium rectifiers used for

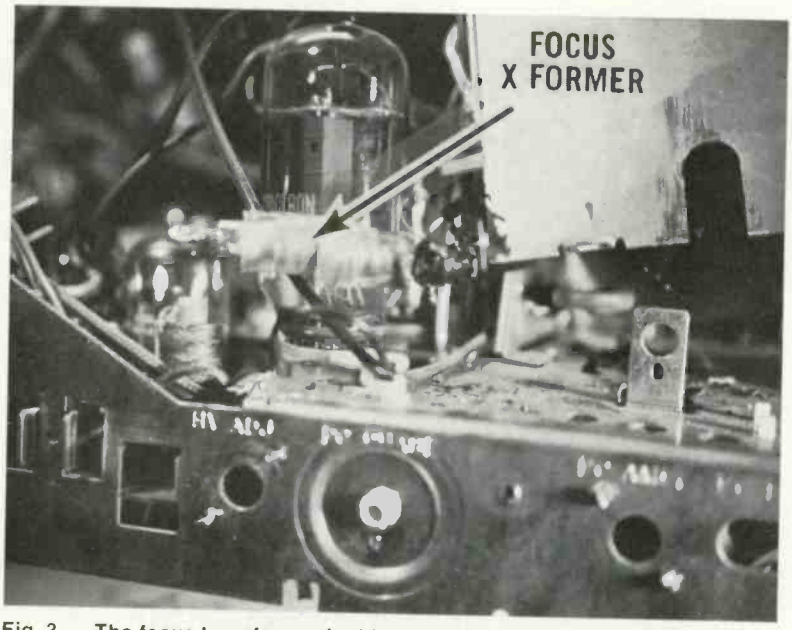


Fig. 3 — The focus transformer in this chassis went up in smoke.

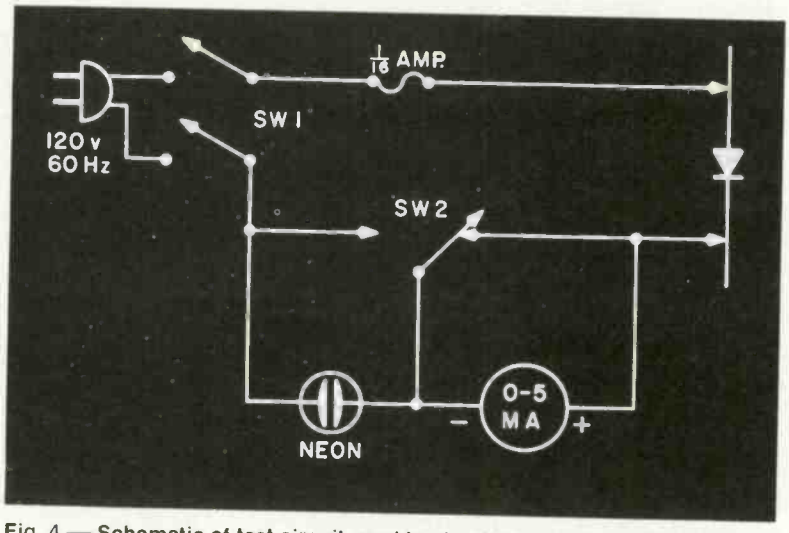


Fig. 4 — Schematic of test circuit used to check out focus-rectifier stacks.

focus voltage in some color receivers have been troublesome at times. They frequently open and you have a blurred picture. Some short and this may kill the HV.

We had a Zenith 20X1C36 chassis (see partial schematic Fig. 2) which had 4in.-wide vertical stripes that were alternately in and out of focus. At other times, streaks would dash across the screen. The technician with his ear "tuned" near the HV cage could also detect a faint arcing sound. A very close look at the individual scanning line revealed a ragged appearance. It should have been smooth. No HV arcing was located — nor loose connections. The selenium rectifier was substituted and this solved the problem.

Another Zenith 20X1C36 chassis had a very blurry picture which was full of lines and streaks. This turned out to be a defective focus rectifier. This type of selenium rectifier is made up of many rectifier units stacked or built together to properly rectify the 5kv for focus control. An arc sometimes develops between these selenium units. And this can cause all kinds of crazy focus problems.

Focus Rectifier Checks

You know that an ohmmeter check of a HV selenium rectifier will not reveal a thing. If a selenium rectifier is shorted, the ohmmeter will detect this, but these selenium units seldom become shorted.

So how can we go about checking them to determine if they are defective — except by substitution? But substitute units are sometimes defective and you can waste a lot of time this way. Also, some small all-transistor B/W TV sets use these selenium rectifier units and it is a good idea to find out which one is at fault.

The following easy-to-build test circuit can be made to check these rectifiers accurately. A schematic of this unit is shown in Fig. 4. The test circuit may be enclosed in a small metal box (see Fig. 5). SW1 should be a spring return type to assure an open circuit during these checks. SW2 is for meter protection in the event of excessive leakage and should also be a spring return type. The neon lamp should be mounted in an enclosed neon lamp assembly.

Since the unit is connected to the power line, it should either be operated through an isolation transformer or have a 1 to 1 isolation transformer built into the case.

To Check Focus Rectifiers

1). Disconnect one side of the rectifier and use an ohmmeter to check for a short-

ed unit. *Caution.* If a shorted rectifier is connected into the test circuit, it is possible for the neon lamp to explode. That is why an enclosed neon lamp assembly should be used.

2). Connect the leads of the test instrument in the proper manner so as to obtain a forward needle movement on the milliammeter. This can be done by polarizing the test instrument leads to match the leads on the rectifier. At any rate, note that the lead from the plus side of the milliammeter, when connected to the cathode end of the rectifier, will provide a forward movement of the milliammeter if the rectifier is not defective.

3). Depress SW1 and observe the neon lamp. Proper rectifier action will produce pulsating dc and only one element of the neon lamp will light. If both elements light, this indicates ac current flow and the rectifier is defective.

4). Assuming proper neon indication is obtained, depress SW2 (SW1 also remains closed); then the meter should read from 1.0 to 1.5ma when the focus rectifier is good. Readings of 1.0ma or less indicate a defective rectifier.

The aforementioned system can also be used for HV rectifier checks in transistorized B/W TV receivers. These have several rectifiers connected in series. Disassemble the units and check out individually. The meter should read over 0.5ma for a good rectifier. Readings of 0.5ma or less indicate a faulty rectifier.

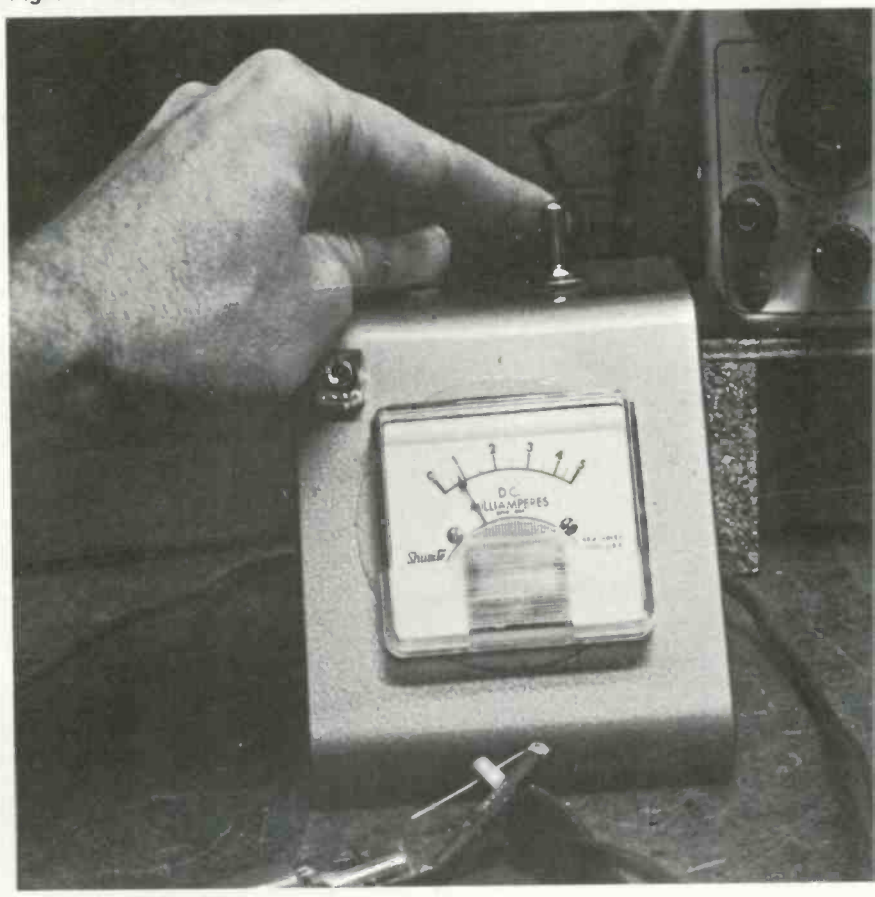
To test these units for an intermittent condition, tap the rectifier being checked and note if the neon lamp or the meter is erratic.

Green Flicks or Picture Streaks

Small green flicks and streaks in the picture have plagued some color receivers and technicians at times. This problem usually occurs in the sets with rectangular picture tubes that have small base socket pins. This problem is usually caused by corona discharge or some type of HV arc. These little flicks and dots (mostly green) may appear all the time or may be intermittent. This trouble also seems to happen more frequently in areas of the country having high humidity. The most common cause of this trouble is HV arcing at pin 9 — the focus socket connection of the CRT.

Pull the CRT socket off and inspect pin 9 for corrosion. If corroded, clean the pin and socket connection thoroughly. If the socket is badly burned or corroded, replace the complete CRT socket and wiring harness. This will usually clear up and solve the problem of flicks and dots. ■

Fig. 5 — Focus-rectifier tester built into metal box.



The Seventeenth Article in a Continuing Series

Semiconductors

An understanding of basic AM, FM and TV diode-tuning circuits will help prepare you to service future TV and radio receivers intelligently

The fundamental principles of capacitor and coil impedances developed in the October and November 1967 articles of this series can be applied to all practical tuned circuits designed for receivers currently on the market or about to be produced.

The amount of signal current flowing through a receiver's parallel-resonant circuit varies with the frequency of the signal. From the curves shown in Fig. 14, 16 and 18 of the November 1967 article, we see that a minimum amount of applied signal current flows through this circuit at a resonant frequency, while greater signal currents occur at higher or lower frequencies (Fig. 1) — the tuned circuit presenting maximum impedance to the flow of current at the resonant frequency. Because of the circuit's greater impedance at the resonant frequency, when signal currents of different frequencies but the same strength pass through a parallel-resonant circuit, a greater voltage is developed across the circuit at the resonant frequency than at higher or lower frequencies (Fig. 2).

Fig. 1 — The ac current from a constant-voltage signal generator is smallest at the resonant frequency of a parallel-resonant circuit.

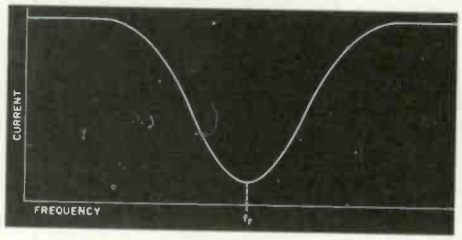
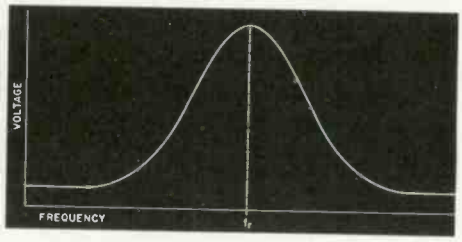


Fig. 2 — The ac voltage from a constant-current signal generator is largest at the resonant frequency of a parallel-resonant circuit.



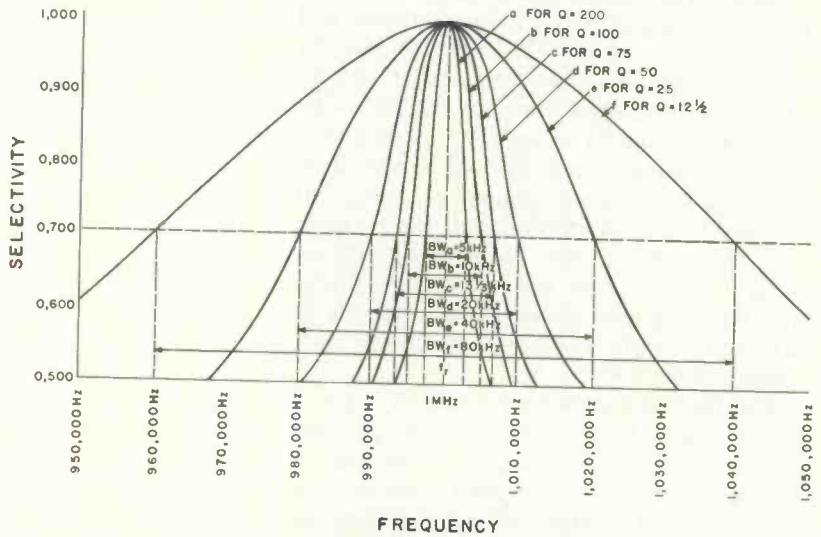
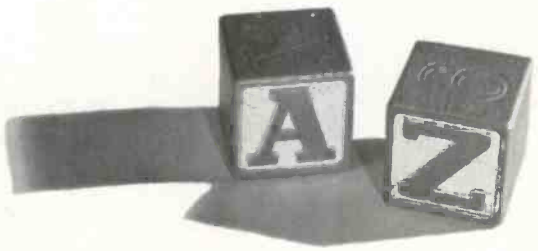


Fig. 4 — The greater a parallel-resonant circuit's quality factor (Q), the smaller the bandwidth (BW) of the resonant frequency.

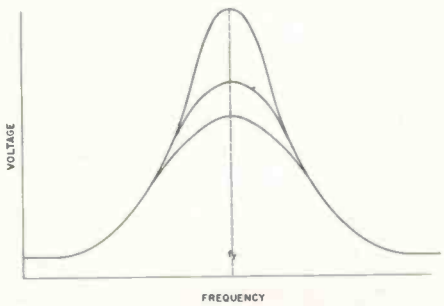
from A to Z



Resonant Circuit Q Factor

Practical tuned circuits do not have perfect characteristics. Their quality is limited. A portion of the ac current applied to a tuned circuit is unaffected by reactance. Their resonant-frequency current is not reduced to zero by the resulting impedance (Fig. 1) as theory would dictate for a perfect resonant circuit (Fig. 18 in the November 1967 article). Neither does the voltage drop developed across a parallel-resonant tuned circuit decrease to zero at frequencies above and below the resonant frequency (Fig. 2).

Fig. 3 — The resonant voltage developed across a parallel-resonant circuit increases when the quality factor (Q) of the circuit increases.



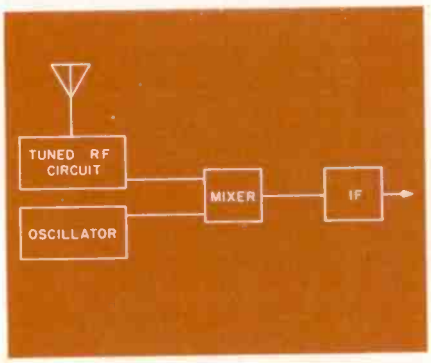


Fig. 5 — A superheterodyne circuit contains a variable-tuned radio-frequency (RF) circuit, a variable-tuned oscillator circuit and a mixer circuit, which produce an intermediate-frequency (IF) signal for additional amplification.

The quality factor (Q) of a tuned circuit, capacitor or coil, can be defined by the equation:

$$Q = 2\pi \left[\frac{\text{energy stored in electric and magnetic fields per cycle}}{\text{energy dissipated per cycle}} \right]$$

The quality factor of a parallel-resonant circuit (Q_P) is dependent on the quality factors of the capacitor (Q_C) and coil (Q_L) used in the circuit

$$\left(\frac{1}{Q_P} = \frac{1}{Q_C} + \frac{1}{Q_L}\right).$$

In the October 1967 article we saw that a capacitor's quality factor was:

$$\frac{1}{Q_C} = \frac{X_C}{R_{Cp}} + \frac{R_{Cs}}{X_C}.$$

Where: Q_C = Capacitor quality factor.

X_C = Capacitor reactance.

R_{Cp} = Capacitor's effective parallel resistance.

R_{Cs} = Capacitor's effective series resistance.

A coil's quality factor is determined in a similar manner:

$$\frac{1}{Q_L} = \frac{X_L}{R_{Lp}} + \frac{R_{Ls}}{X_L}.$$

Where: Q_L = Coil quality factor.

X_L = Coil reactance.

R_{Lp} = Coil's effective parallel resistance.

R_{Ls} = Coil's effective series resistance.

These equations can be combined to the following:

$$\frac{1}{Q_P} = \frac{1}{Q_C} + \frac{1}{Q_L} = \frac{1}{Q_C} + \frac{X_L}{R_{Lp}} + \frac{R_{Ls}}{X_L}, \text{ or}$$

$$\frac{X_C}{R_{Cp}} + \frac{R_{Cs}}{X_C} + \frac{X_L}{R_{Lp}} + \frac{R_{Ls}}{X_L}.$$

In most of the older parallel-resonant circuits the values of R_{Cp} and R_{Lp} were so large while the value of R_{Cs} was so small, with respect to X_C or X_L, that with little error the equation could be simplified to:

$$\frac{1}{Q_P} \approx \frac{1}{Q_L} \approx \frac{R_{Ls}}{X_L} \text{ or}$$

$$Q_P \approx \frac{X_L}{R_{Ls}}.$$

In the new receivers that use varicap-tuning diodes, however, the capacitor's quality factor (Q_C) is small enough to have a significant effect on the quality factor (Q_P) of the parallel-resonant tuning circuits.

The amount of voltage developed across a parallel-resonant circuit differs with the Q of the circuit (Fig. 3). The greater the Q, the greater the voltage developed and the sharper the reduction in voltage as the signal moves above or below the resonant frequency (f_r).

A tuned circuit's bandwidth (BW) is defined as the range of signal frequencies that develop a voltage across a tuned circuit that is at least 0.707 times as large as the resonant voltage. The effect of Q on tuned-circuit bandwidth can be more clearly seen with the aid of a selectivity (S) curve (Fig. 4). The amplitude of this curve is determined by the equation:

$$S = \frac{\text{nonresonant voltage}}{\text{resonant voltage}}$$

Since the peak voltage across a parallel-resonant circuit is always the resonant voltage, all curves drawn for these tuned circuits have a maximum value of one, whatever the cir-

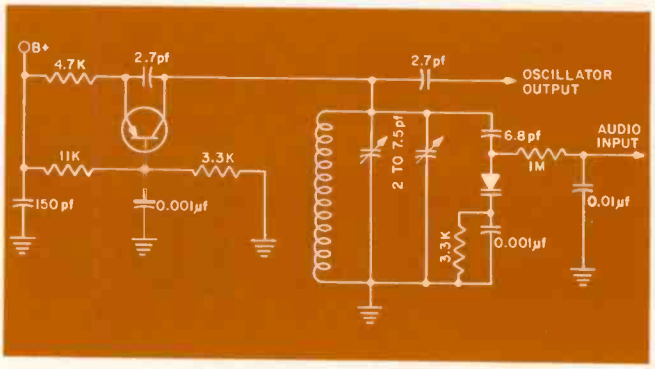


Fig. 6 — A typical AFC circuit for an FM receiver.

cuit's Q. The bandwidth for these circuits can be calculated with the equation:

$$BW = \frac{f_r}{Q}$$

Tuning Receivers

When a signal in a receiver is at the resonant frequency of the receiver's parallel-resonant circuit, the circuit's capacitive impedance equals its inductive (coil type) impedance (when $f = f_r$, $X_C = X_L$). The October 1967 article indicated that:

$$X_C = \frac{1}{2\pi fC}$$

and $X_L = 2\pi fL$. These equations can be combined, and at the resonant frequency:

$$\frac{1}{2\pi f_r C} = 2\pi f_r L.$$

With algebra, this equation can be converted to a more convenient form. $1 = 4\pi^2 f_r^2 LC$.

$$f_r^2 = \frac{1}{4\pi^2 LC}. \quad f_r = \frac{1}{2\pi\sqrt{LC}}$$

From the last equation we see that the larger the parallel-resonant circuit's inductance (L) or capacitance (C), the lower the resonant frequency; and the smaller the circuit's inductance or capacitance, the higher the resonant (tuned) frequency. Receivers can be tuned by changing either the inductance or capacitance in their parallel-resonant tuning circuits.

Some of the older receivers were mechanically tuned by changing the parallel-resonant tuned circuit's inductance by moving a metal core in-and-out of a coil, changing the effective number of windings in a coil or by varying the spacing between coil turns. Most receivers were mechanically tuned, however, by changing the parallel-resonant tuned circuit's capacitance by changing the spacing between capacitor plates or effective capacitor plate surface areas. Modern receivers can now be electronically tuned by varying the bias of varicap tuning diodes. (The theory behind all of these methods of changing capacitance or inductance was included in the October 1967 article).

Superheterodyne Circuits

Most receivers currently on the market have superheterodyne circuits (Fig. 5) containing a variable-tuned radio-frequency (RF) circuit, a variable-tuned oscillator circuit and a mixer circuit. The RF and oscillator circuits are tuned simultaneously, the oscillator circuit always being tuned to a frequency below that of the RF circuit.

Measurements indicate that when signals of two different frequencies are mixed, the combination produces a waveform having frequencies equal to both the sum and the difference between the two applied frequencies. When an FM receiver's RF circuit is tuned to a 96.0-MHz station and the oscillator is tuned to 85.3MHz, the resulting signals can be combined to produce 181.3 and 10.7MHz signals. The intermediate frequency (IF) amplifier circuits are tuned to handle only those frequencies around 10.7MHz.

Superheterodyne receivers have the advantage of containing additional amplifiers tuned only to the IF frequency, rather than additional amplifiers that must all be tuned to the frequency of the station being received.

Superheterodyne FM receivers at one time had a common problem with their oscillator circuits. As the oscillator's temperature changed, its frequency would shift. When cold, the RF circuit might be tuned to a 96.0MHz station while the oscillator frequency has shifted and is producing a 84.7MHz signal. Since the IF amplifiers are tuned to 10.7MHz, the signals passing through them must originate from a 95.4MHz station (84.7MHz osc. + 10.7MHz IF = 95.4MHz RF). Although the RF circuit is not tuned to that station, programs may still be received if that station's signal is strong. As the oscillator circuit warms up, the frequency it produces may gradually shift to 85.3MHz and the signals from the 96.0MHz station are heard. An automatic frequency control (AFC) circuit was required to prevent this apparent drifting of stations. It was in this circuit that technicians first encountered varicap tuning diodes.

FM AFC Circuits

FM receivers produce an audio input very similar to the audio input produced by integrated circuit IC201 (Fig. 1 in the September 1967 article). As the FM receiver's IF signal shifts in response to the shifting frequency of the FM station, the output voltage of the discriminator circuit (Fig. 2, 3 and 4 of the September 1967 article) also shifts. The audio signal consists of these rapid changes in output voltage.

By reversing the anode and cathode leads of diodes D3 and D4 in Fig. 4 of the September 1967 article, the induced current flow is reversed and a positive voltage is developed across capacitor C3 when the IF signal shifts above its mean frequency (4.5MHz for the TV in-

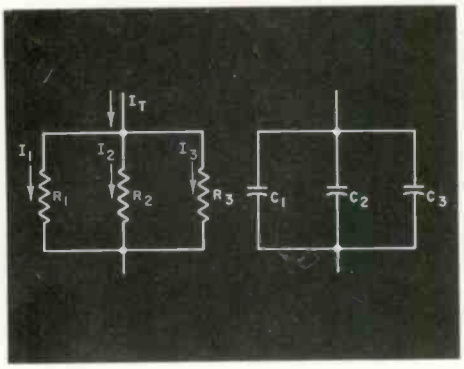


Fig. 7 — In both parallel resistor and parallel capacitor circuits, the total current passing through the circuit is equal to the sum of the currents passing through each component.

tegrated circuit, 10.7MHz for an FM receiver discriminator). It is this output voltage that regulates the AFC oscillator.

A typical FM AFC oscillator circuit is shown in Fig. 6. Any change in the transistor's emitter voltage results in an amplified change in its collector voltage — like the signals present in the common base circuit shown in Fig. 10 of the August 1966 article. A portion of the amplified signal is returned to the emitter by a 2.7pf capacitor, causing positive feedback. The maximum amount of collector signal voltage is developed across the tuned circuit at the circuit's resonant frequency. At that frequency the positive feedback is large enough to cause the tranistor to oscillate.

The tuned circuit in Fig. 6 is basically the same as the tuned circuit in Fig. 20 of the November 1967 article, except that here two capacitors, rather than one, are connected in series with the varicap. The audio signal normally present with the discriminator circuit's output voltage is filtered from the oscillator circuit with a 0.01μf capacitor and 1M resistor.

Assuming that under some bias condition the varicap has a 2pf capacitance and ignoring the negligible effect of the 3.3K resistor, we can use the series capacitance equation derived in the November 1967 article to determine the total capacitance connected in parallel with the 2 to 7.5pf tuning and trimmer capacitors.

$$\frac{1}{C_T} \approx \frac{1}{6.8\text{pf}} + \frac{1}{1000\text{pf}} + \frac{1}{2\text{pf}} = 0.147/\text{pf} + 0.001/\text{pf} + 0.500/\text{pf} = 0.648/\text{pf}.$$

$$C_T \approx \frac{1}{0.648/\text{pf}} \approx 1.5\text{pf}.$$

From these calculations we see that when capacitors are connected in series, their total capacitance is always less than that of the smallest capacitor.

An equation can also be derived to determine the total value of capacitors connected in parallel with the coil in the tuned circuit (Fig. 6).

When resistors are connected in parallel (Fig. 7), the total current passing through the circuit is equal to the sum of the currents passing through each resistor. $I_T = I_1 + I_2 + I_3$.

As you know, current is equal to voltage divided by resistance, and since the resistors are connected in parallel, the same voltage is applied across all of them.

$$I_1 = \frac{V}{R_1},\ I_2 = \frac{V}{R_2},\ I_3 = \frac{V}{R_3},$$

$$I_T = \frac{V}{R_T}.$$

By substituting the second set of equations for parts of the first, we can calculate the circuit's total parallel resistance.

$$\frac{V}{R_T} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}.$$

If both sides of the equation are divided by V, then we have the well-known parallel resistance equation:

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}.$$

The total reactance of parallel capacitors (Fig. 7) can be determined with the parallel resistance equation:

$$\frac{1}{X_{CT}} = \frac{1}{X_{C1}} + \frac{1}{X_{C2}} + \frac{1}{X_{C3}}.$$

By substituting

$$\frac{1}{2\pi fC}$$

for X_C in that equation, we get the following:

$$\frac{1}{\frac{1}{2\pi fC_T}} = \frac{1}{\frac{1}{2\pi fC_1}} + \frac{1}{\frac{1}{2\pi fC_2}} + \frac{1}{\frac{1}{2\pi fC_3}}.$$

This can be simplified to: $2\pi fC_T = 2\pi fC_1 + 2\pi fC_2 + 2\pi fC_3$. After dividing both sides of the equation by $2\pi f$, we get: $C_T = C_1 + C_2 + C_3$. The total capacitance of a parallel capacitor circuit is equal to the sum of the individual capacitances.

When the FM oscillator tuning and trimmer capacitors (Fig. 6) have a 4.0pf total capacitance, and the varicap and the two capacitors connected in parallel with it have a 1.5-pf total capacitance, the tuned circuit contains 5.5pf (4.0pf + 1.5pf) of capacitance in parallel with the coil.

As the bias voltage across the varicap changes, the total capacitance of the tuned circuit also changes. When the IF signal drifts to a frequency slightly higher than normal, the discriminator's output voltage becomes slightly larger than normal and additional reverse bias develops across the varicap. This, in turn, reduces the diode's capacitance, lowering the oscillator's resonant frequency and returning the IF signal to normal.

TV AFTC Circuits

Automatic fine tuning controls in the newer TV receivers operate basically on the same principle as FM AFC circuits. A discriminator circuit (Fig. 5 of the June 1967

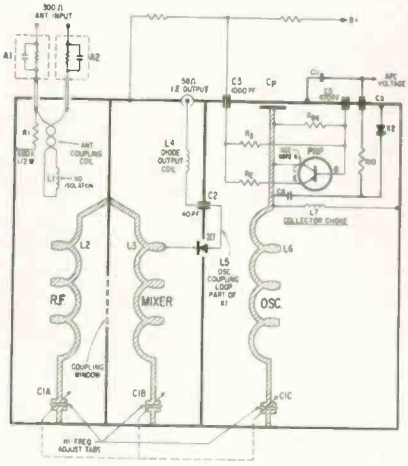


Fig. 8 — A schematic of a UHF tuner used in a TV set. Courtesy of Zenith.

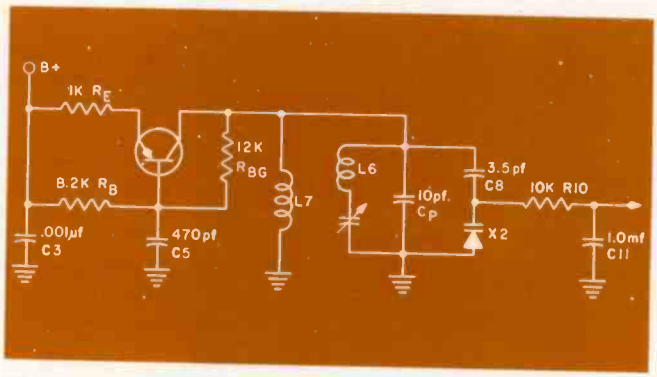


Fig. 9 — The UHF tuner's oscillator circuit is shown in a more familiar form.

TECKLAB report), operating on the same principle as the one discussed earlier (Fig. 4 of the September 1967 article in this series), is connected to the receiver's IF circuit. Its response curve is like that shown in Fig. 7 of the June 1967 TECKLAB report. When the frequency of the IF signal increases and shifts into the discriminator's negative voltage area, a smaller positive potential is applied across the varicap diode in the TV receiver's UHF tuner (Fig. 8). The tuner's oscillator section is shown in a more familiar form in Fig. 9.

In this circuit coil L7 serves merely to supply the transistor's collector with negative dc current, while the coil's impedance prevents UHF signals from passing through it to ground. This coil is required since no dc current is able to pass through coil L6 because of a variable capacitor connected in series with it. Its impedance is so much greater than that of coil L6 ($X_{L7} > X_{L6}$) that it (L7) has virtually no effect on the tuning of the oscillator circuit.

From the curves in Fig. 11 of the October 1967 article we saw that when a coil and a capacitor are connected in series and the coil's impedance is greater than the capacitor's impedance ($X_L > X_C$), the resulting ac voltage drop across the pair of components is like that across just a coil — their phase angles are the same. The capacitor has served the function of reducing the coil's effective impedance.

The effective impedance of coil L6 in the TV receiver's oscillator circuit (Fig. 9) is varied by the capacitor connected in series with it, tuning the oscillator's parallel-resonant circuit. This type of circuit is required for UHF tuners since even very small coils have relatively large impedances at these frequencies.

From Fig. 7 and 8 in the November 1966 article we see that at ultra-high frequencies (UHF) the phase shift and capacitance in a transistor results in positive feedback. At the resonant frequency of the parallel-resonant circuit (the effective impedance of coil L6 in conjunction with the capacitors connected in parallel with it), there is sufficient collector signal voltage for the transistor, with positive internal feedback, to oscillate.

The varicap diode (X2), connected in parallel with the oscillator tuning coil (L6), also has a function in tuning the oscillator circuit. As the applied dc potential from the IF discriminator circuit decreases with a higher IF frequency, the varicap's capacitance increases, and the oscillator circuit oscillates at a lower frequency. This circuit, in effect, adjusts the receiver's tuner oscillator for the best TV signal reception.

AM Varicap Tuning

The single transistor circuit shown in Fig. 10 is typical of the circuits used in many transistor radios, and it performs all the functions of a tuned oscillator circuit, tuned RF circuit and mixer circuit.

In this circuit transistor collector-current signals pass through the primary windings of transformers T2 and T3. The secondary winding of one transformer (T2) and its parallel capacitors (65.2pf maximum total parallel value components) form a parallel resonant circuit, and at their resonant frequency maximum collector signals are induced across the transformer's secondary winding (T2). These signals return through the ferrous antenna secondary (T1) and 0.02μf capacitor to the base of the transistor. This positive feedback circuit results in an oscillation at the tuned resonant frequency of the transformer's secondary (T2).

The parallel-resonant circuit, formed by the primary winding of the ferrous antenna (T1) and the capacitors connected in parallel with it (148.1pf maximum total parallel value components), is tuned to the radio frequency (RF) of the station being received. The greater the voltage induced across the antenna's primary winding, the greater the voltage also induced across its secondary winding. The largest signal voltage is induced across these windings when the tuned parallel-resonant frequency of the primary winding is the frequency of the station received.

Both the oscillator signal, induced across the secondary winding of transformer T2, and the RF signal, induced across the secondary winding of the ferrous antenna (T1), pass through the 0.02μf capacitor and are applied to the base of the transistor. The pair of signals are amplified by the transistor and the resulting collector-current signal pass-

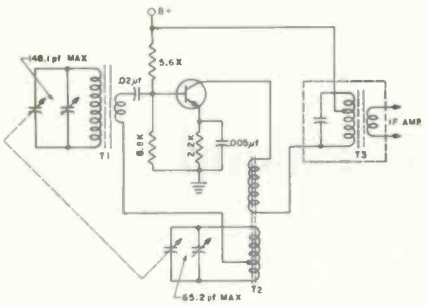


Fig. 10 — This mechanical-capacitor tuned, single-transistor circuit performs all the functions of a tuned oscillator circuit, tuned RF circuit and mixer circuit.

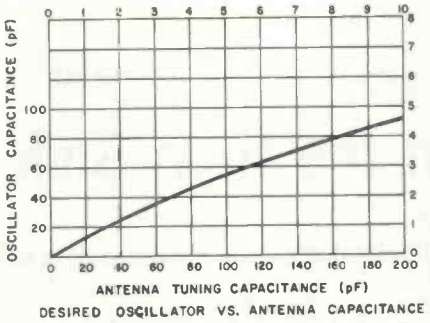


Fig. 11 — The desired combination of oscillator and antenna tuned circuit capacitances are shown for a transistor AM receiver. Courtesy of Motorola.

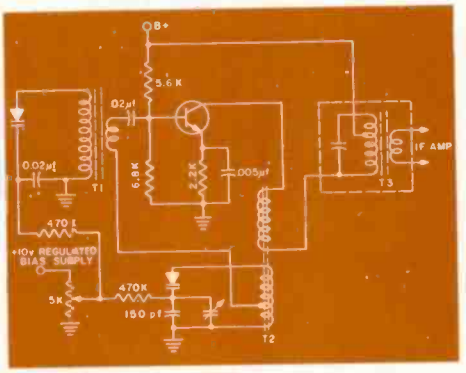


Fig. 12 — The varicap tuned, single-transistor circuit performs all the functions of a tuned oscillator circuit, tuned RF circuit and mixer circuit.

es through the primary winding of the IF transformer (T3). The primary winding of this transformer is tuned, with a capacitor connected in parallel with it, to a 455kHz resonant frequency. This frequency is the difference between the RF and oscillator frequencies.

The oscillator and RF resonant frequencies are tuned in this receiver by changing capacitor values in the oscillator and RF parallel-resonant circuits. The corresponding oscillator and RF tuning capacitor values required to maintain a 455-kHz difference in resonant frequencies are shown in Fig. 11.

The circuit shown in Fig. 10 can be modified (Fig. 12) to eliminate the mechanical tuning capacitors. The varicap diode functions in the RF tuned circuit (Fig. 12) in the same manner as it does in the parallel-resonant circuit shown in Fig. 20 of the November 1967 article. Variations in the dc potential applied across the varicap change the component's capacitance and the resonant frequency of the parallel-resonant circuit. The 5K potentiometer (Fig. 12), connected between a positive voltage source and ground, varies the varicap potential and the resonant frequency of both the RF and oscillator circuits. The 470K resistors between the potentiometer and varicaps serve to isolate IF and oscillator signals, while the varicap bias current is so small that any bias voltage drop across the resistors is insignificant.

The varicap capacitance range is more than adequate for the RF tuning circuit and, therefore, a trimmer capacitor was not required for that circuit. A trimmer capacitor, connected either in parallel with the 150pf capacitor or in parallel with both the 150pf capacitor and the varicap, is used to adjust the os-

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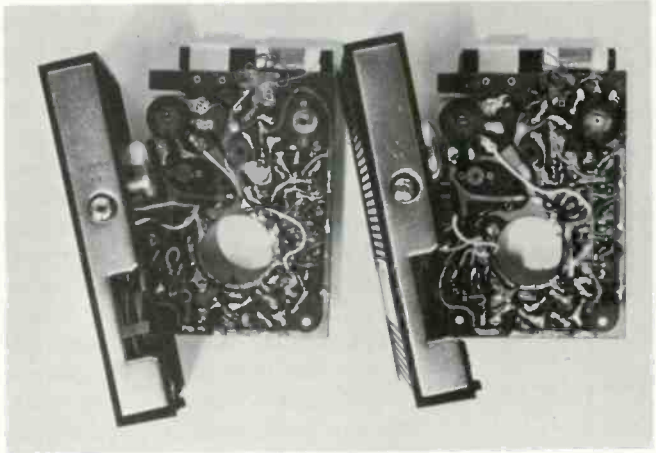


Fig. 13 — The underside of two AM transistor receiver circuit boards is shown. The left one is tuned with a mechanical-tuning capacitor and the one on the right is tuned with a varicap.

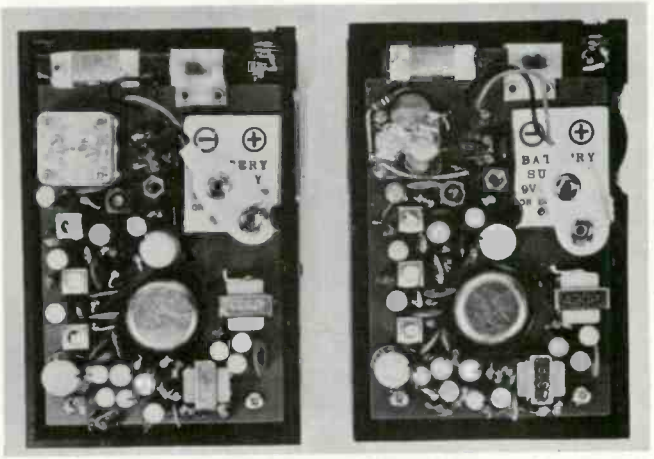


Fig. 14 — The top side of two AM transistor receiver circuit boards is shown. The left one is tuned with a mechanical-tuning capacitor and the one on the right is tuned with a varicap.

Don't Forget the Heat-Sink Compound

Silicone substance aids circuit stability

■ As electronic components get smaller and smaller, the problem of dissipating excess heat becomes greater and greater.

Heat, of course, affects solid-state circuits and components in two ways: (1) it causes long-term drift in characteristics, caused by rapid aging, and (2) it can cause catastrophic "right now" failure if the temperature gets completely out of control.

The problem also includes distributing heat so as to minimize hot spots. One step in handling heat problems is to use heat sinks, and these have become necessary in many solid-state devices. But even good heat sink design does not provide the complete answer, since in practice, it is almost impossible to have two metal surfaces — even precision machined surfaces — make perfect contact over their entire mating area. Inevitably, the resulting air spaces between component and heat sink, will act as a heat insulator.

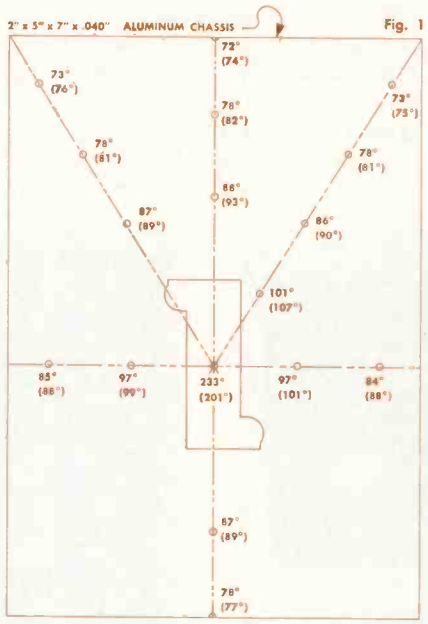
Using silicone compounds to displace this insulating barrier has become standard practice. Grease-like silicone materials are applied to the base and mounting studs of transistors, resistors, and diodes, thereby improving the heat transfer from the components to the heat sink or chassis.

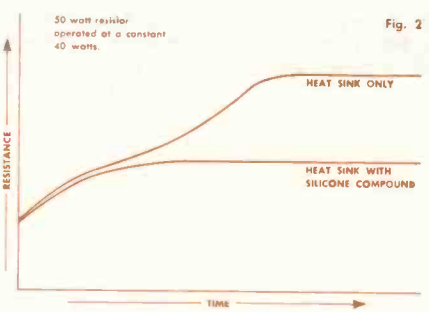
The first silicone materials used, naturally enough, were the readily available materials which had been developed to seal moisture out of connectors, and to provide a soft, nonmelting, nongumming dielectric film in a variety of applications.

More recently, a material specifically designed for this function has been introduced. This compound is heavily filled with heat conductive metal oxides. It has about twice the heat conductivity of previously available materials, and has been designed to provide minimum bleed for lasting protection.

To ascertain the value of this newer silicone heat sink compound in use, a series of 1000-hour tests were run. It was decided to use 50-watt power resistors in order to simplify the tests and to more easily relate test results. The silicone heat sink compound was used in all tests where the resistor mounting surface was treated. The properties of the compound are as follows:

Color	White, opaque
Bleed, percent after 24 hours at 200C	—
Evaporation, percent after 24 hours at 200C	0.5
Specific Gravity	2.45
Thermal Conductivity K factor, cal/cm²/C/sec/cm	0.0010





Heat Distribution and Stability Tests

For the first series of tests to determine heat distribution, a 50-watt resistor was mounted on a 0.04in. thick 5 x 7 x 2-in. aluminum chassis and operated at 40w for 1000 hours. Sixteen thermocouples were spotted on the chassis and one thermocouple was installed inside the resistor. Identical tests were run without and with the silicone compound. The heat distribution data, plotted as shown in Fig. 1, show at every point that more heat was transferred to the chassis when the resistor was sealed with the silicone material. This is also borne out by the internal temperature of the resistor: 233°C when unsealed and 201°C when sealed.

The second series of tests concerned the change in component characteristics. Again a 50w resistor was used, unsealed and sealed to the chassis using the heat sink compound. The curves in Fig. 2 reveal that for the first 300 hours the change in resistance of the sealed resistor was stable; whereas, the resistance continued to rise in the unsealed resistor. At 800 hours the resistance was stable in both cases.

So, when replacing power transistors, don't forget the silicone compound. ■

From Service to Sales-and-Service to . . . More Sales and Service

The interdependent sales-service links in the TV-radio merchandising chain can provide your operation with maximum survival and growth strength — even in the face of 'cut-throat' discounter competition

See & Hear TV is located in Oceanside, N.Y., a middleclass community.

■ Twelve years ago Ed Levitt started a home-based TV repair service. For the fiscal year ending in August this year, his Oceanside, Long Island, N. Y., shopping-center-based store, See & Hear TV, grossed $240,000. About 20 percent of the gross came from service. Mr. Levitt anticipates close to $300,000 gross in the upcoming year. The operation grossed only $120,000 in 1965.

"The change from service, to sales-and-service, was not a quick one," Ed Levitt told an ELECTRONIC TECHNICIAN field reporter recently.

Eight years ago, after discontinuing an unsuccessful phono record department, Ed Levitt decided to go into B/W TV sales. He began in a small way, investing $2000 in sets. At this point he was joined by his brother, Mack, who made all the home service calls at first. As business grew, however, it became clear to the brothers that they would have to spend all their time in the store — selling equipment and directing the operation. Technicians were hired to make home service calls.

According to Ed Levitt, one of the biggest factors in their success was the constant tie-in between sales and service.

"In this area," Mr. Levitt emphasizes, "people are price conscious but they are even more service conscious.

"But the greatest single boost we got came three years ago when the district sales manager of a leading company suggested that we carry a full line of home entertainment equipment," Ed Levitt smiles.

In addition to a Sylvania franchise, the Levitts also carry Admiral, RCA, Zenith and G.E. products.

Service Contracts

Every TV set sold by See & Hear TV is serviced at a minimum charge the first year. But, when the year is almost up, Mack Levitt calls the owner and asks if any repairs or adjustments are needed and informs the customer that the first year contract will shortly run out. Additionally, he informs the customer that a second year contract can be obtained at a cost of $70. So far, 80 percent of all customers have signed up for a second-year service contracts. "We have done the same for the third- and fourth-year contracts at a charge of $80 and $90, respectively," Mr. Levitt says.

"One important benefit you get from contracts," Ed Levitt says, "is not generally understood by most service-dealers.

"For example, when a service technician goes to a customer's home to service the set, he does not have to write up a bill and consequently the owner is usually willing to listen to a low-pressure pitch for a second set, a color console or some other home-entertainment equipment.

"Additional benefits also accrue from service contracts. During the term of the contract, for example, customers are unlikely to ever turn to another service-dealer for repairs on their other TVs or equipment in their homes."

Advertising and Promotion

Home-call technicians are instructed to mention that the store carries a line of the latest portable TVs and Hi Fi stereo equipment. But equipment prices are not discussed in the home.

"Sales promotion at See & Hear TV is carefully planned," Mack Levitt says. "For one thing, we don't put the price of anything in our ads or on equipment in the store. We are selling quality and top-grade service. We're not in the 'bargain-basement' or 'discount' business."

Ads are run regularly in local newspapers and in the local shopper's guide under manufacturers' co-op arrangements. Additionally, flyers are enclosed with all bills sent to customers.

"The purpose of our advertising," Ed Levitt explains, "is simply to let customers and prospects know what new items we are carrying. We don't try to sell price; we sell our name and service through the ads."

Mr. Levitt points out that only one new-stock item is usually mentioned in an ad, rather than flood the customer and prospect with a confusion of makes and models.

Advertising for Christmas is heaviest during October and November, although Christmas is not actually mentioned at that time. Ads are curtailed considerably in December. Ed Levitt explains that most people who are considering Christmas-present purchases, because of the expense involved, think about the purchases well ahead of time.

A youngster observes himself on CCTV monitor in the store. A CCTV monitor is also kept on from 7 p.m. to midnight in the front store show-window.

Because the Lincoln shopping center in Oceanside is very active, the Levitts have taken advantage of this activity by installing a CCTV camera and monitor plus a color TV set in the store's show window. These are switched on every evening of the week from 7 p.m. to midnight. Since the shopping center has several restaurants, a fair number of passers-by stop to look at themselves on the CCTV monitor or watch the color TV.

A CCTV camera and monitor are also kept operating in the store during the daytime. This setup serves two purposes — customers are amused (the kids go wild) to see themselves on TV and, by using a small monitor in the office, thefts of small items like transistor radios have been prevented. Ed Levitt explains that a view of the main floor is blocked from the office, and the monitor makes it easy for one person to handle telephone calls and watch the shop at the same time.

"See & Hear," originally a "Mama & Papa" operation, is now overseen by the two brothers and staffed by four technicians who are always out on service calls, installing antennas or making deliveries in the three company-owned trucks. Two permanent technicians are on the work benches. Two part-time assistants help with

A section of the sales floor at See & Hear showing TV sets on display.

Ed Levitt, who began as a service technician 12 years ago, watches one of his technicians working at the bench.

Mack Levitt at his desk. The CCTV monitor at the right covers the sales floor outside.

deliveries and antenna work and one woman in the office handles most calls and does office work.

The change from service to sales-and-service was gradual and carefully planned. And it has paid off.

"What's the advantage of providing good service to the public?" ET's reporter asked Ed Levitt.

"Quite simple," Mr. Levitt smiles. "You can't show increased sales, year after year, without providing fast and efficient service. And you won't have many sets to service if you don't sell 'em.

"Every good technician-dealer operation can provide fast and efficient service. A personal relationship develops with the customer at the time of the sale and is extended with the service. But the department stores, the big chains and the discounters just can't do it. Neither can the hardware stores and white goods outfits who play around with electronic home-entertainment equipment on the side," he concludes. ■

Open-Display Shop Boosts

Ayoob's service shop is an integral part of the sales floor.

Don't hide the technical side of

Tom Ayoob tells ELECTRONIC TECHNICIAN how open-display service shop is building sales.

■ The service shop is a part of the sales floor at Ayoob Bros., San Francisco. Customers shopping the store or coming up to the low service counter can see the array of test instruments and the technicians at work.

"This gives us a strong service image and is very good for business," Tom Ayoob says.

Mr. Ayoob has been in TV-radio sales and service for the past 20 years and is now sole owner of the firm, which he established with his two brothers. He is a service technician himself and still likes to troubleshoot sets when he can find the time.

Recognizing the importance of a proper service identity, he fixtured the open-display service shop across the rear of the sales floor when he moved to a new location two years ago.

Seeing Is Believing

"Now our customers can see something of what's involved in repair work and we're getting fewer complaints about service charges," Mr. Ayoob continues. "People tend to be suspicious about repairs, but when they see the work being done in the shop, they realize a lot of test instruments and labor-time is involved.

"Why should we keep the shop hidden from view? It's good psychology to have it out in the open. It shows we're qualified to handle everything in service."

Setting up the service shop as an integral part of the sales floor has another advantage, Mr. Ayoob points out. The technicians can take care of customers at the counter and handle repair work when not busy at the front of the store.

A chime on the entrance door alerts personnel when anyone comes in. Thus Mr. Ayoob or one of the men working in the shop has only to turn around to see if a customer is being taken care of or if he needs help.

"With our increased business, it would have been necessary to add at least two more people to handle the sales floor and the counter," he says. "By setting up sales and service as an integrated unit, we're able to make more efficient use of our time."

Service Image

A view of the service shop as seen from service counter. Everything is bright and orderly and the big look shows customers something of what's involved in repair work.

your business behind closed doors

Well-Organized Shop

The shop is 30 by 15 ft. A white-topped, waist-high service counter, running along the front, is open at both ends for access between the shop and sales floor.

Work benches along the rear wall and one side of the shop are sectionalized to provide separate work areas, each with sufficient drawer and shelf space to hold tools. A centrally located battery of drawers holds small repair parts.

The shop is light, bright, airy — and always immaculate. Floors are waxed and shined monthly, along with the rest of the store. All service technicians wear white coats or smocks.

Increased Productivity

"We expect some effort from the men to keep the service area as attractive-looking as the rest of the store," Mr. Ayoob comments. "At first, there was something of a problem in retraining, but the men have learned to pick things up and put them away. They know that we're on public display now.

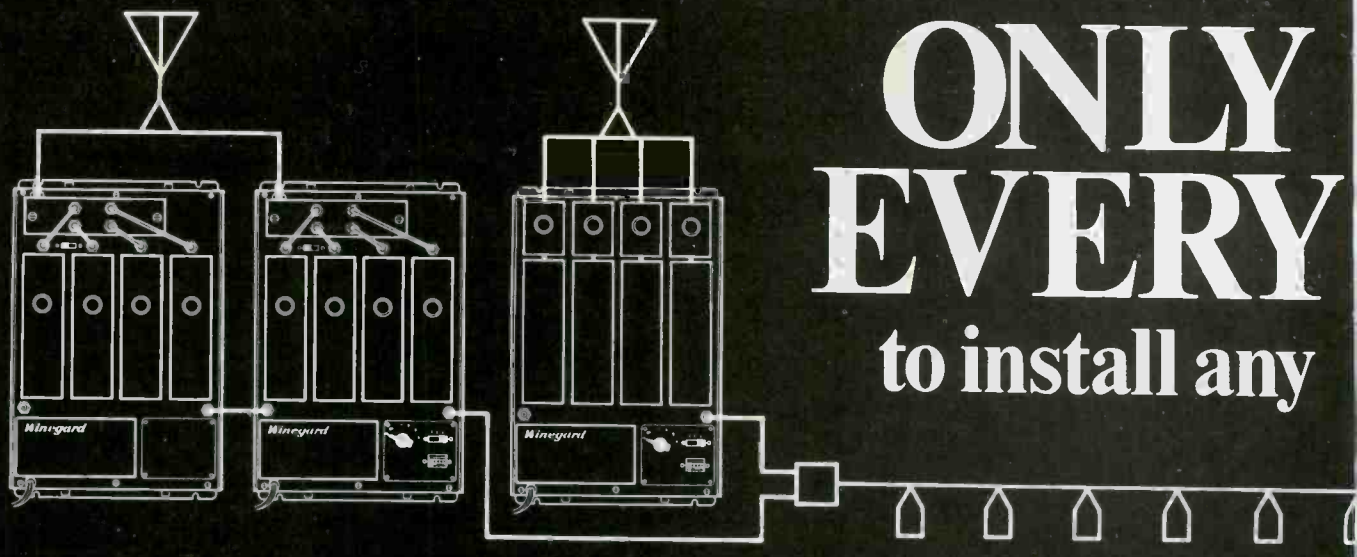
"It might seem that this would take up too much of the men's time and cut down on efficiency, but just the opposite is true. With a well-organized shop and a place for everything — and everything in its place — productivity has increased."

Ayoob's Bros. has seven service technicians and they all keep busy. When service calls and over-the-counter work fall off, they service electronic equipment for a hospital, a home for the aged and two county jails. Tom Ayoob bids for this work and finds it an excellent "time-filler" which produces a modest profit.

"Sales outside our immediate neighborhood have increased since we set up the shop on the sales floor," Mr. Ayoob smiles. "We confine our advertising to our neighborhood, so it's apparent we're getting more referral business.

"I can only conclude that emphasizing our strong service image by putting the shop on open-display is giving us more word-of-mouth advertising. It's one of our best business builders." ■

When it comes to 82-channel, ONLY EVERY to install any



Doesn't make any difference how big or how small the system, or where you plan to install it (apartment building, hotel, motel, school, home, etc.) Winegard has all the products you need from antenna to outlet.

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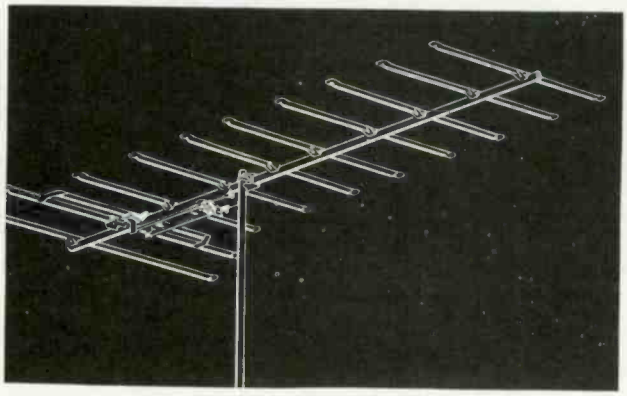
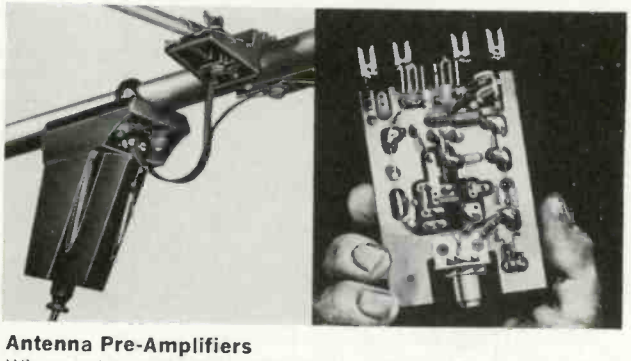


Transcoupler Yagis
Whether you're planning a master antenna system for a single set in a home, or several hundred sets in an apartment complex, it's essential that you provide the strongest, cleanest signal possible on all channels. And especially in color. It takes the best performing, longest lasting antenna available. And Winegard has them; 25 five and ten element Transcoupler yagis plus a full line of Super Colortron VHF-FM, VHF-UHF-FM, UHF and FM antennas.



Antenna Pre-Amplifiers
Winegard's exclusive solid-state, printed circuit cartridge pre-amplifiers slip into the built-in, weatherproof housing of Super Colortron antennas, or into the Model ACH-1 Universal Cartridge Housing that mounts easily on *any* antenna. Downlead connection is internal, with 100% protection from the weather. Eight different cartridge pre-amplifiers are available, enabling you to customize each antenna installation for perfect color and black & white reception on all channels. All models utilize the newest silicon overlay transistors with an unequalled input of 500,000 microvolts (½ volt). Totally eliminates overload problems regardless of location.

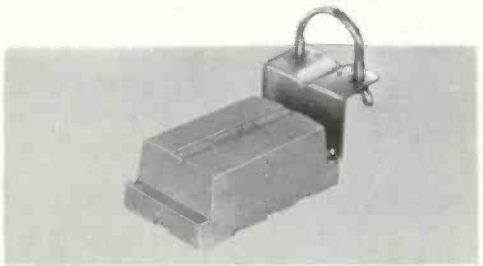
Winegard
ANTENNA SYSTEMS

Winegard Company • 3000 Kirkwood Street • Burlington, Iowa 52601

solid state, color MATV systems,

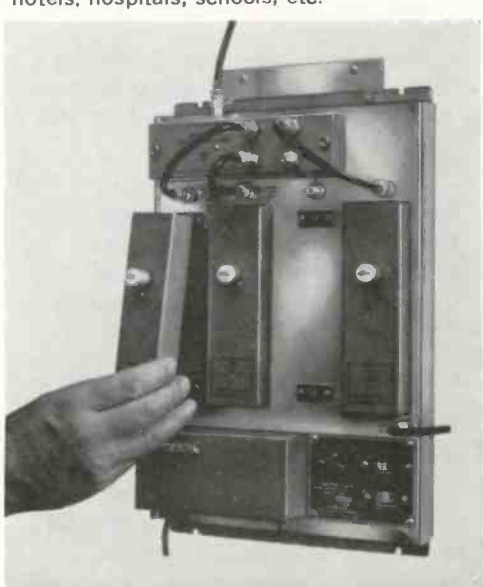
WINEGARD HAS THING YOU NEED

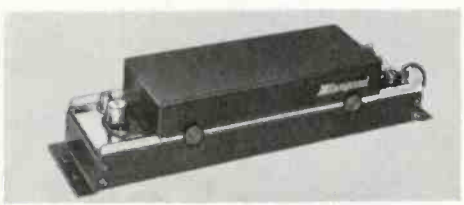
size system easily and profitably!



Channel Control Couplers
Allow you to couple any number of VHF-FM antennas, equalize the signals to a predetermined level and match the 300 ohm antennas to a 75 ohm coaxial downlead. Any coupled antenna can be attenuated from 0 to —20 db with special plug-in attenuator pads.

Ultra-Plex Distribution System
Ultra-Plex is a unique, solid state, 82-channel modular plug-in MATV distribution system. Components of the Ultra-Plex system are designed to match and work perfectly with each other. Ultra-Plex equipment will never become obsolete—new VHF stations, UHF stations and FM bands may be added at any time with negligible expense to the owner. Ultra-Plex gives the installer an unprecedented flexibility and complete signal control, regardless of system size. It works equally well in small or large systems—in apartment buildings, motels, hotels, hospitals, schools, etc.





Solid State Distribution Amplifiers
Winegard tv system amplifiers are designed to highest commercial standards with models and accessories available to provide optimum color and black & white reception to *any* number of sets. Each amplifier incorporates the most recent developments in solid state circuitry with the advantages of increased life expectancy, reliability and less power consumption. Higher gain, greater band-width, lower noise figures and improved VSWR are other advantages of Winegard's high performance amplifiers.

82-Channel Line Splitters

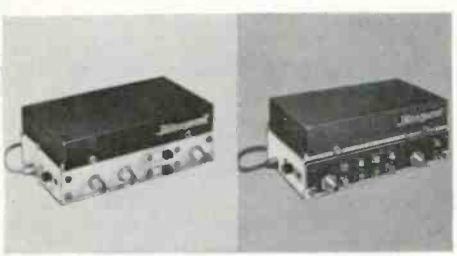
Line splitters divide the tv signals on a trunk line into equal parts and, when properly used, greatly increase the number of taps in a tv distribution system. Winegard line splitters have very low insertion loss, low VSWR and high isolation between outputs to insure perfect transmission of color tv signals.

TV Signal Equalizers
Broad band distribution amplifiers operate most efficiently when input signals are equal and total picture carrier signals are the specified level. Winegard makes equalizers that can couple and equalize up to four low band or FM single channel antennas—or couple and equalize up to four high band single channel antennas.

Variable Isolation 82-Channel Line Drop Taps
Drop taps allow the system designer to layout trunk lines in a straight line and operate outlet devices in remote locations with feeder lines. Variable isolation control from 10 to 25 db, with fast, easy adjustment, makes it unnecessary to specify and order several fixed values of tap to best utilize signals at the end of each trunk line.

Variable Isolation 82-Channel Line Tap Offs

All Winegard line taps have 82-channel capability, and can be used for VHF, UHF or FM or any combination of the three. The variable isolation feature enables the installer to independently vary the VHF and UHF isolation values from 10 to 25 db through simple adjustment of "wiper arms" located at front of tap. Use of 82-channel line taps insures that a system cannot become obsolete regardless of what channels are later added to the system. Flush and surface mounts.



Solid State Booster-Couplers
Winegard offers several transistorized booster-couplers which will handle up to 4 TV/FM outlets or sets from a single antenna —up to 16 sets using 75 ohm outlets. Seven different models: some for channels 2-13 plus FM, some for channels 2-83 plus FM. Built to finest commercial quality standards. Available in both 300 and 75 ohm models. Extremely high (500,000 microvolt) input eliminates overload problems.

82-Channel + 25 db Amplifier
New "color system" amplifier is ideal for home and smaller systems. Solid state, printed circuitry with excellent stability. Can't become obsolete when new channels come on the air. By adding Winegard's unique line amplifiers, you can lay out and install most systems without calculations of any kind. Separate VHF and UHF inputs and power for VHF and UHF preamplifiers. Easy to customize each installation to exact signal conditions.

Plus...UHF single channel converters, antenna and back-of-set matching transformers, band separators, interference rejection filters, etc.

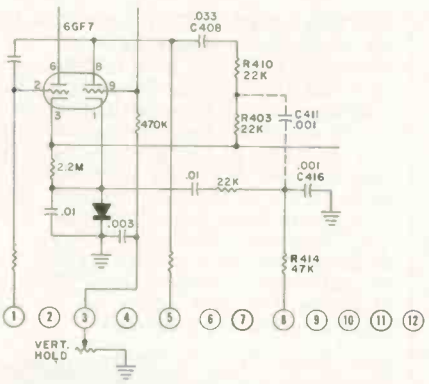
. . . for more details circle 129 on postcard

COLORFAX

Weak Vertical Sync in Setchell Carlson Color TV

The following modifications to the vertical sync circuit in the CE unit will improve the vertical hold in areas where vertical sync is weak because of low line voltage or local signal conditions.

1. Remove C411 (sync coupling capacitor which is connected to the junction of R403 and R410).
2. Disconnect pin 1 of 6GF7 from ground. (Connect this ground wire to pin 5 of the 6GF7.)
3. Install a silicon diode, a 2.2M ½w resistor, 2 0.01 μf 1kv disc capacitors and a 22K ½w resistor as shown in schematic.



Vertical oscillator drift as the receiver warms up or vertical lock-in at the end of the vertical hold control range can be caused by a defective 12M resistor (R404) in the vertical hold circuit.

Modify the vertical hold circuit to the schematic shown, removing R404 (12M), R406 (2.2M), and R405 (470K). The 470K resistor is then placed between pin 9 of the 6GF7 and terminal 3 of the plug strip (vertical hold control). A 0.003μf. 1kv disc capacitor is added between terminal 3 of the plug strip and ground.

Burst Amplifier and 3.58MHz Oscillator Circuit of the Magnavox T924 Color Chassis

The burst amplifier and 3.58MHz oscillator circuitry is shown here. The chroma signal and a positive horizontal pulse are applied to the grid of the burst amplifier. The burst amplifier conducts only during the interval that the grid is driven positive by the horizontal pulse. This coincides with the interval that the color burst reference signal is present on the grid, therefore, the burst signal is amplified but the chroma information is rejected.

If a scope is connected to the grid of the burst amplifier (scope sweep set to view horizontal rate), you can see the positive horizontal pulse with the burst signal sitting on the peak. The amplitude measured at this point is in the vicinity of 65v P-P.

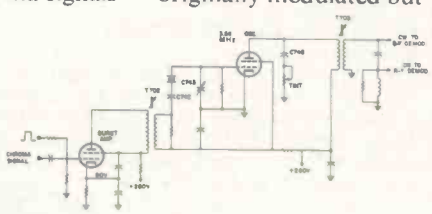
Moving the scope lead to the plate would reveal a burst signal having an amplitude of approximately 180v P-P.

This burst signal is then coupled through a low impedance link on the burst transformer to the grid circuit of the 3.58MHz oscillator. The injection of the burst signal in this fashion causes the frequency of the 3.58MHz oscillator to become "locked" with that of the burst signal.

The 3.58MHz oscillator is a version of the Pierce oscillator with the screen grid acting as the anode. Feedback is from the screen, through the link (on the burst transformer), through C742, through the crystal and back to the grid.

The free-running frequency of the oscillator can be precisely adjusted to 3.58MHz by the small trimmer capacitor, C743 (2-12pf). This adjustment is made during AFPC alignment.

The oscillator signal is electron coupled to the plate which employs a 3.58MHz tuned transformer for its load. The secondary of this transformer is used to couple the 3.58MHz CW reference signals to the R-Y and B-Y demodulators. These are identical 3.58MHz sinewaves having an amplitude of approximately 15v P-P. A phase shift network is connected across the secondary so that the CW signal to the R-Y demodulator will lag the B-Y CW signal by approximately 90deg. This relationship is necessary to demodulate the chroma signal properly. Remember that the 3.58MHz reference signals applied to the demodulators represent the reinserted carrier with which the chroma signals — originally modulated but suppressed prior to transmission. The chroma signal was modulated with a 3.58MHz signal on two different axes 90deg apart which accounts for this phase shift network in the receiver.



This phase shift network "fixes" the phase relationship between the R-Y and B-Y CW signals. Both signals can be phase shifted, however, by rotating the TINT control. Assuming the TINT control is centered and T703 is tuned to precisely 3.58MHz, the plate circuit of the oscillator will look resistive. Rotating the TINT control back and forth will cause the plate circuit to be tuned above and below resonance which causes the circuit to look capacitive and then inductive, resulting in a phase shift of the 3.58MHz signal.

This permits phase adjustment of reference signals so the demodulated signal will reproduce the same tint (or hue) on the screen of the receiver as the scene originally scanned by the television camera. (Normal phase shift is approximately ±50 deg.)

To be certain these circuits are performing their job, it may be necessary to perform an AFPC (automatic frequency and phase control) adjustment occasionally.

AFPC Adjustment

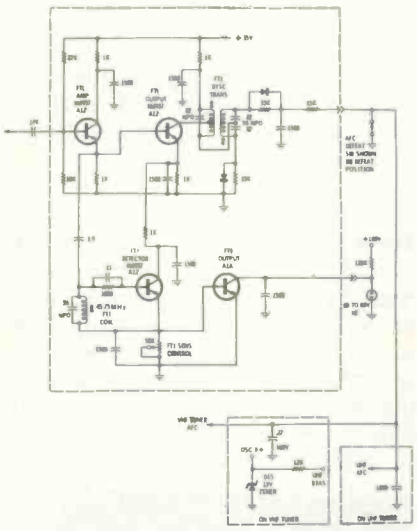
1. Tune in color bar generator.
2. Set TINT control to center of its range.
3. Ground grid of burst amplifier.
4. Connect VTVM to pin 9 of V706 (grid of killer).
5. Adjust T702 (burst transformer) for minimum dc (negative) voltage. **Note:** The 3.58MHz oscillator must be running during this adjustment.
6. Adjust oscillator trimmer capacitor, C743, for zero beat (color bars stand still or drift slowly). **Note:** At zero beat the color bars will be the same color from top to bottom.
7. Remove ground from burst amplifier grid and connect VTVM to plate of either demodulator.
8. Adjust T703 (oscillator plate transformer) for maximum dc reading.
9. Observe color bar pattern and touch-up T703 (if necessary) for correct tint. Check TINT control for sufficient range.

Motorola's Solid-State Color Chassis Fine Tuning Indicator and Fine Tuning Lock Circuit

In some solid-state color receiver models, an FTL (fine tuning lock) AFC circuit is employed to assure correct fine tuning. FTL compensates for normal tuner drift and aging of components. Also, an indicator light operates in conjunction with the

FTL to signal the customer when fine tuning is necessary.

Four NPN transistors, two diodes and a neon lamp make up the active components in the fine tuning indicator and lock circuits. This complete network is located on a single replaceable panel located on top of the video IF panel.



A selected portion of the 45.7MHz video IF carrier is coupled from the 3rd video IF collector through a 1pf capacitor to an FTL amplifier stage. Operating as a class "A" emitter-follower, the FTL amplifier minimizes loading on the video IF, sending the IF signal to the FTL output and fine tuning indicator (FTI) detector.

Located across the input of the FTI detector emitter-follower is a high "Q" 45.75MHz parallel tuned resonant tank (FTI coil). The tank selects the video IF carrier and presents the carrier to the FTI detector for detection and current amplification. The 45.75MHz video IF carrier is only present when fine tuning is correct. Here the 45.75MHz carrier is converted to a dc voltage and directly coupled to the FTI output.

Connected as a common-emitter, the FTI output is in shunt with the FTI neon indicator lamp. Conduction of the transistor extinguishes the neon lamp.

When 45.75MHz is present, indicating correct fine tuning, the FTI detector and output both conduct to extinguish the neon lamp.

If 45.75MHz is not present, indicating incorrect fine tuning, the FTI detector and output will become nonconductive, allowing the neon lamp to light. This signals the customer to re-adjust the fine tuning control.

Directly coupled from the FTL amplifier stage, the video IF signal is presented to a class "A" operated common-emitter FTL output. A discriminator transformer tuned to 45.75MHz center frequency recovers the amplified IF signal.

The discriminator secondary feeds two diodes. Rectification of the IF signal by the diodes produces opposite voltages across balanced diode load resistors. Across both diodes a dc correction voltage is coupled through a "pi" filter to a varactor (voltage-variable capacitor) across the tuner oscillator.

Tuner drift is counteracted by a varying dc correction voltage applied to the varactor from the FTL circuit.

If the tuner drifts, the 45.75MHz video IF carrier change frequency. This frequency change is sensed by the discriminator coil, causing unequal conduction of the discriminator diodes. A resultant correction voltage is developed because the voltage across each diodes is no longer equal. Coupling this correction voltage to a varactor in the tuner pulls the tuner's oscillator back on frequency.

With correct fine tuning, no correction voltage from the discriminator diodes is developed. An incorrect fine tuning adjustment will cause a corresponding dc correction voltage to be developed by the FTL for the tuner. An FTL defeat switch located in shunt with the correction voltage is provided to defeat FTL, allowing manual fine tuning, then switched back to FTL position.

NEW PRODUCTS

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

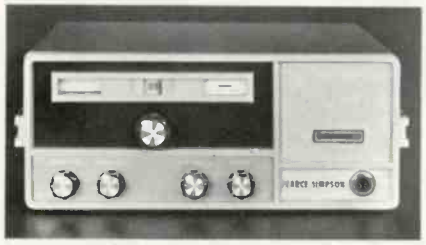
Tape Recorder/Radio 700

A system is announced for AM/FM listening and off-the-air recording on magnetic tape. Specifications

indicate that the tape recorder is detachable and may be removed for any portable tape recording or dictation elsewhere. Up to two hours of music can reportedly be recorded at 1⅞ ips on a single cassette and commercials can be eliminated by a remote control switch. Concord.

CB Base Station 701

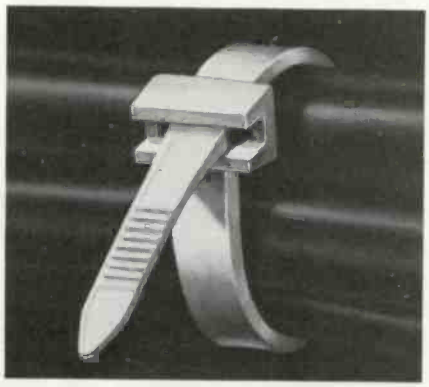
A 23 channel CB base station reportedly contains a solid-state preamplifier designed to permit its use with a high-impedance desk microphone. Specifications indicate that



this enables the operator to have both hands free while communicating, and permits the operator to remain from 1 to 1½ ft away from the mike while still retaining 100% modulation. Price $269.90. Pearce-Simpson.

Cable Tie 702

A cable tie is reportedly being made in four sizes and will fit all bundle diameters from 1/16 to 4 3/16in. Specifications indicate that the self-locking head is designed with dual-grip tie hooks that improve its tensile



strength. According to the manufacturer, it is lightweight, abrasive resistant, has good dielectric properties and is chemical resistant to common solvents, alkalies, dilute acids, oils and grease. Electrovert.

Turntable 703

A turntable is announced that reportedly features a 12in., 7½ lb balanced nonmagnetic platter. Two low-speed synchronous 16-pole motors

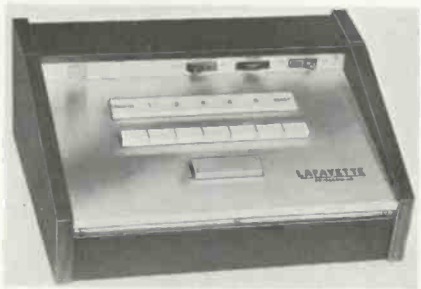
on a single rotor shaft are designed to provide 33 1/3 and 45rpm speeds. Specifications indicate that a spring-loaded suspension system minimizes vibrations and acoustic feedback. The dimensions are 15⅝ x 12⅞ x 3¼ in. Price $85. Thorens.

High-Voltage Probe 704

Announced is a CRT high-voltage test probe with a built-in voltmeter. Specifications indicate that all a technician has to do is ground the instrument, contact the high-voltage anode with the probe tip and read the voltage (up to 30kv) from the self-contained meter. The probe reportedly contains no batteries and needs no warm-up time. Net price $19.95. Pomona.

Tone Caller 705

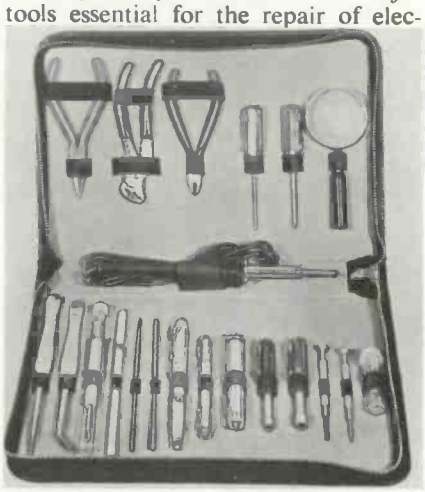
A 10-channel tone caller is announced that reportedly contains a 23-transistor, 5-tuning fork circuitry designed to permit the private push-button calling of any one, assorted quantity up to 10 or all 10 stations at one time. Calls reportedly may be initiated at the remotes or from the master



to activate mobile/base CB sets. Specifications indicate that lights visually identify the station calling, and dual-tone coding signals minimize false triggering on stray signals. The case measures 10⅛ x 7⅛ x 3¾ in. Price $129.95. Lafayette.

Electronic Tool Kit 706

A 20-piece tool set is announced that reportedly contains all the major tools essential for the repair of elec-

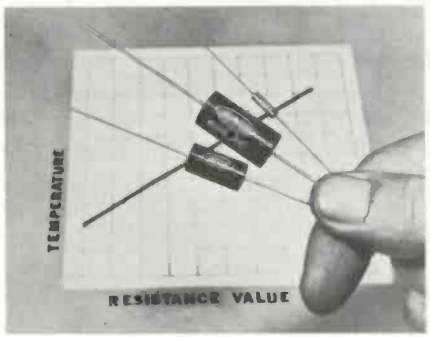


tronic equipment. The manufacturer indicates that these tools include one chain-nose plier, groove-grip plier,

diagonal cutting plier, standard screwdriver, Phillips screwdriver, round magnifier, soldering iron, bent-nose tweezer, straight-nose tweezer, solder aid, alignment tool, contact-type burnisher, pin vise, solder core, 3/16-in. nut driver, ¼in. nut driver, plus two needle files, two miniature screwdrivers and a package of 12 burnisher blades. The manufacturer's specifications indicate that these tools come in a 7 x 6in. leather zipper case that weighs 2 lb with tools included. Price $29.90. Jonard.

Temp Sensitive Resistors 707

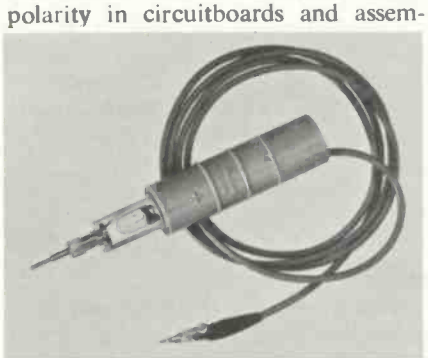
Announced is a line of bobbin wirewound resistors with resistance values that reportedly increase up to 60%



(±5%) with a temperature increase from 75 to 255°F. Specifications indicate that they are made in sizes ranging from 0.1 to 0.5w as well as in various network configurations. Dale.

Continuity Tester 708

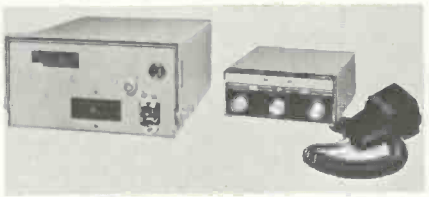
Announced is a continuity tester designed for locating open transistors and diodes, and to determine diode polarity in circuitboards and assem-



blies. Specifications indicate that the current through the circuit under test is less than 50μa. Desco.

FM Mobile Unit 709

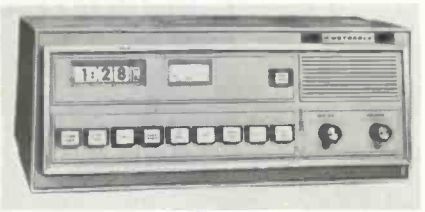
Announced is a two-way FM mobile radio that is reportedly adjustable from 120 to 220w in three steps, making it possible to use the unit on either limited power or high power channels. The 150 to 174MHz band unit will reportedly operate on six chan-



nels and has solid-state circuitry throughout, except in the final RF power amplifier stage. Kaar.

Remote Station Console 710

A solid-state, remote-control console has been designed to provide complete control of remote base stations in a radio communications system. A constant-current regulation system reportedly provides the exact



current needed at the base station regardless of wide variations in telephone line attenuation. Specifications indicate that the new unit also features lighted push-button switches which indicate the state of all control functions. Motorola.

NEW PRODUCTS

Digital Voltmeter 711

A solid-state 3-digit voltmeter is announced that reportedly features 100μv sensitivity on the 100mv range. Specifications indicate that non-segmented, in-line, high-intensity, non-blinking 3-digit readout is provided in five ranges: ±100.0-mv, 1.000v, 10.-00v, 100.0v and 1000v. It is designed to select and display the applied polarity automatically. In addition, the manufacturer indicates that a fourth digit provides over-range readout at full rated accuracy to 120% of full scale for all ranges. Rated accuracy from 60° to 105°F is ±0.1% of full scale, ± 1 count. The portable unit measures 3½ x 12 x 12-in. Price $375. Roback.

CATV Weather Channel 712

A weather channel originator has been developed for use in CATV systems and closed-circuit TV systems for hotels, motels and schools. It reportedly consists primarily of a vidicon camera focused on a rotating mirror. Specifications indicate that the mirror picks up successively the following six positions, a clock, a thermometer, a humidity indicator, a barometer, a date indicator, and a six-sided rotating card holder. All of the weather instruments reportedly come complete with outdoor sensors. The rotating card holder is designed to accept photos, drawings, diagrams and lettering. The manufacturer indicates that the output is 1.5v P-P or can be switched to RF, tunable channels 2 through 6. Price $2195. Vikoa.

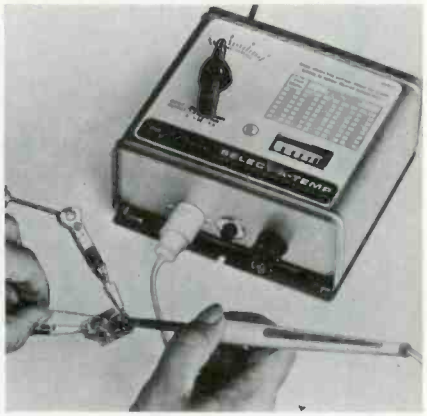
AM/FM Stereo Receiver 713

Announced is an AM/FM receiver that reportedly contains 82 semiconductors plus a nuvistor tuner front end. The manufacturer indicates that its controls include: clutch-type BASE and TREBLE for each channel, flip-type switches for MUTING, AFC, LOUDNESS, speakers ON/OFF, high and low filter, 7½ and 3¾ ips tape equalization switch, and a tape monitor switch that is combined with the stereo/individual-channel selector. Specifications indicate 1.5μv FM sensitivity, 5μv AM sensitivity and 122w total IHF power output across a 4Ω load. Allied.

NEW PRODUCTS

Soldering Station 714

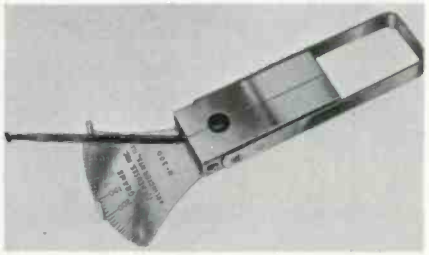
Announced is a low-voltage soldering station that reportedly consists of a light 12v soldering pen, a heat cap-



sule and a control unit that reduces the 120vac line voltage to the proper voltage for the desired temperature. The control unit includes a line-voltage meter, a power setting knob and a table that indicates the proper power setting for the line voltage and desired soldering iron temperature. Ungar.

Tension Gage 715

Announced is a spring tension gage designed to measure the tension settings of relays or springs from 0 to 300g in 10 gram steps. Specifications indicate that the scale is calibrated on



front and back for left to right or right to left readings. The frame is reportedly 4½ x 1½in. Price $7.60. Neuses.

FM Receiver 716

Announced is an FM receiver that reportedly uses integrated circuitry, a FET tuner section and silicon transistors throughout. Specifications in-

dicate that the FM stereo tuner employs a four gang tuning capacitor to provide a maximum ratio of selectivity to sensitivity. The amplifier is rated at 100w IHF music power and reportedly has a frequency response of ±1db from 15Hz to 30kHz. The manufacturer indicates that the tuner sensitivity is 1.9μv with a 2.5db capture ratio. The complete unit reportedly measures only 5⅜ x 16⅜ x 12in. and weighs 19 lb. Altec Lansing.

Stereo Preamplifier 717

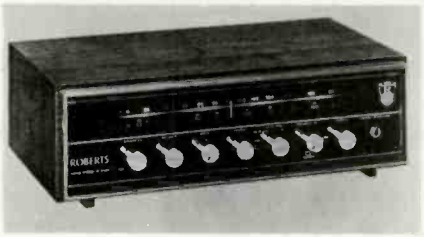
A solid-state preamplifier reportedly has a pair of tone controls with flat

frequency response when the dials are centered. Specifications indicate that some of the preamplifier's features include three steps of high frequency filtering, provision for a center channel without requiring an extra power amplifier, headphone output, front panel input that can handle an electric guitar. Dynaco.

NEW PRODUCTS

FM Receiver 718

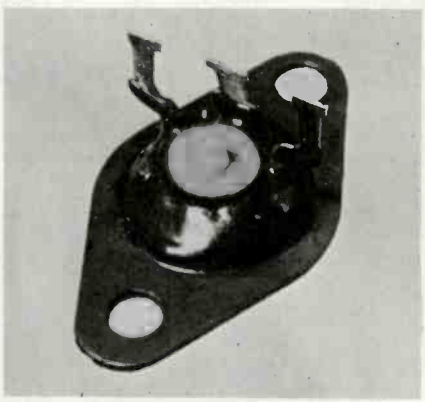
Announced is a 30w peak AM/FM and FM stereo receiver with plug-in connections for tape recorder and



record changer. Specifications indicate that the receiver has a controlled injection AFC, a broad-scale logging dial all solid-state circuitry. Rheem.

Power Transistor 719

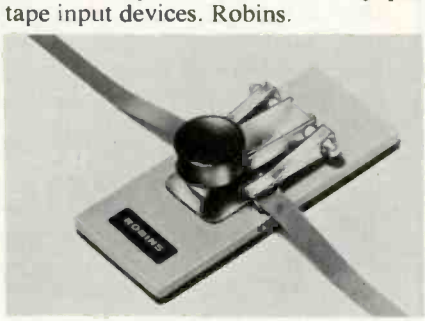
A plastic-encased silicon power transistor has been designed to provide easy mounting and collector isolation without the need for extra hardware or washers. Maximum



ratings reportedly are: $V_{CEO}=35v$, $I_C=3.0a$, $T_J=-65°F$ to $+300°F$. Specifications indicate that the h_{FE} is from 20 to 250 and 14.3w can be dissipated at 212°F. Bendix.

VTR Splicers 720

A line of video tape splicers has been developed to handle ½- and 1-in. tapes, and they reportedly use pressure-sensitive patches. This method of splicing is reportedly the same as used in the computer field on the paper tape input devices. Robins.



NEW PRODUCTS

Transistorized Microphone 721

A transistorized dynamic microphone has been designed to directly replace an assortment of carbon

mobile microphones. Specifications indicate that it contains a two transistor preamplifier that improves the quality of transmission by providing a more uniform output level. Turner.

AM/FM Receiver 722

A solid-state AM/FM stereo receiver is announced that reportedly incorporates an integrated circuit IF strip for improved capture ratio and selectivity, and a FET front end for

maximum sensitivity with minimum interference. Specifications indicate 1.9μv FM sensitivity with 90db cross modulation rejection, 2.2db capture ratio, 46db selectivity and 36db tuner stereo separation. It has a 90w rated output. Price $439.95. Scott.

. . . AUTO TAPE PLAYERS

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tions were checked and resoldered. This didn't solve the intermittent speed problem either.

The trouble turned out to be a loose speed rheostat control. On top of the midget control is a screwdriver slot that turns a small wiping contact. Replacing the speed control with a new 1K bias control solved the intermittent speed problem.

Children Must Play

After playing all channels except the last one, this Lear-Jet stereo-8 developed crosstalk. A new cartridge was inserted and the same thing happened. The player was slipped out of its mounting bracket and placed on the bench.

In this model, the tape alignment screw is located at the bottom of the player. Adjustment of this plastic-coated screw did not remedy crosstalk on the last channel. We removed the top cover and checked the head adjustment.

Now we could actually see the trouble. A piece of tin foil wrapper from chewing gun was wedged under the head assembly.

Don't forget to inform the customer of possible theft of his tape player in an unlocked car. In some cities up to 200 stereo thefts a month are taking place at the present time.

When installing a new tape player, record the model and serial number and give it to the customer for safe keeping.

Refer to Chart I for common trouble symptoms and possible causes. ■

1967 ARTICLE INDEX

TV-Radio Servicing

NEWS OF THE INDUSTRY

Amphenol and Sangamo Plan Merger

The Boards of Directors of Amphenol Corp. and Sangamo Electric Co. have announced that a proposal to combine the two companies has been approved following meetings of the respective Boards of Directors.

The terms of the transaction reportedly call for the issuance of ½ share of Sangamo common stock and 1/16 share of a new 4½% convertible preferred stock for each share of Amphenol common stock. The announcement indicated that upon surrender of the convertible preferred stock and payment of $50 in cash, each preferred share will be convertible into three shares of Sangamo common stock.

The proposed transaction is subject to the execution of definitive legal agreements, tax rulings and approval by the shareholders of each company.

Sangamo, the surviving company, will change its corporate name to Amphenol-Sangamo, Inc.

Distributor Sales Figures Shifted Slightly This Year

Comparative distributor sales figures prepared by the Electronic Industries Assn.'s Marketing Service Dept. indicate the following for the first seven months of 1966 and 1967:

Item	Year-to-Date 1966	Year-to-Date 1967
B/W TV sets	4,491,065	3,264,921
Color TV sets	2,487,037	2,729,555
Home table, clock and portable radios	7,930,104	7,014,371
Home FM radios	2,164,482	2,318,564
Auto radios	5,648,449	5,269,279
Portable and table phonographs	1,782,007	1,891,202
Console phonographs	1,051,343	801,235

NEWS OF THE INDUSTRY

Perma-Power Appoints Regional Sales Manager

O'Brien

Eugene O'Brien has been appointed regional sales manager for Perma-Power. He will coordinate the company's sales activities and work with its sales representatives in northern California, Oregon, Washington, Nevada, Utah, Arizona, New Mexico, Colorado, Montana, Wyoming and Idaho.

Supreme Court will Decide FCC Authority over CATV

The question of whether or not the Federal Communications Commission has authority to regulate the community antenna TV industry has finally reached the Supreme Court.

Using a section of the communications act that gives it authority to regulate wire communications, the FCC in 1966 asserted jurisdiction over all CATV systems. Traditionally telephone and telegraph companies have been regulated by this section.

When originally asserting its new jurisdiction, the FCC indicated that it would need additional time to prepare permanent CATV regulations but that in the interim no CATV system in the nation's 100 largest cities could handle signals from additional out-of-town TV stations without prior FCC permission.

The FCC's authority and the interim rule have been challenged by suits filed by a number of CATV systems. The Supreme Court agreed to review a case brought by three San Diego area CATV systems.

TV Antennas Designed For Travel Trailers

The Finney Co. of Bedford, Ohio, has developed two TV antenna kits for use on travel trailers and mobile homes. One reportedly consists of an all channel UHF/VHF/FM antenna mounted on a telescoping mast and a rotator mechanism that allows the antenna to be rotated from inside the vehicle. The manufacturer indicates that when traveling, the antenna is folded down, closed up and locked in a travel position below the vehicle roof top.

The second model consists of an all channel UHF/VHF/FM antenna mounted to the vehicle on a wall mount. The antenna and top mast section of this model must be removed for travel, and the preassembled antenna elements reportedly snap closed for storage.

Warranty Returns of Philco 'P' and 'Q' Line Color-TV Horizontal Output Transformers

Engineering evaluation of a large percentage of horizontal output transformers returned in warranty has shown that those tested were good and had no defects. Technicians have been returning the transformers because of wax drippings which appear on the base of the transformers. The manufacturer indicates that these wax drippings are normal and are caused by heat generated by the transformer.

Perma-Power Co. Appoints Sales Rep.

Electronic Sales Corp. has been appointed to represent Perma-Power Co. in the Pacific Northwest for its TV service and audio equipment lines. The sales territory will cover Washington, Oregon and Alaska.

CATALOGS AND BULLETINS

High-Fidelity Equipment 400

A 20-page brochure covers a line of high-fidelity components including a variety of furniture component cabinets and speaker systems. Altec Lansing.

Motor Switches 401

Manual motor starting switches for single-speed, two-speed and reversing functions are described in a four-page bulletin. G-E.

Coaxial Cables 402

Coaxial cables engineered for community antenna TV, closed circuit TV, and FM, CB and amateur antenna transmission lines are described in an eight-page catalog. Alpha Wire.

Conductor Selector Chart 403

A free slide-rule chart has been designed to provide a simple method of converting from standard copper wire gages to an equivalent of aluminum wire gage and/or strip conductor in width and thickness. It reportedly provides information automatically concerning cross-sectional area in square inch, weight and equal electrical resistance of copper and aluminum wire and strips. Included is basic data for the design of electrical windings, also factors of weight, space and current carrying capacity. Permaluster.

Write-On Labels 404

A full-color bulletin lists 130 different stock preprinted, color-coded, write-on labels for a large variety of needs. It also refers to special labels that can be designed to include trademarks, symbols, colors, shapes and whatever wording is required. W.H. Brady.

Captive Hardware 405

An illustrated eight-page catalog describes a complete line of stainless-steel captive hardware for soft or thin metal panels, parts or chassis. Listed are seven types of captive nuts and studs that reportedly will not pull, push or torque out after their press fit installation. Precision Metal.

CATV Cable 406

A complete line of transmission and drop line cable for community antenna TV applications is described in a two-color, four-page brochure. Performance charts and mechanical and electrical data are also included. Amphenol.

CATALOGS AND BULLETINS

Floor Conduit 407

Rubber over-the-floor conduit for protecting electrical cords, computer and telephone cables are described in an eight-page catalog. Also included are installation tips and painting suggestions. Ideas.

Nutdriver Set 408

A bulletin describes a compact, interchangeable, hollow-shaft nutdriver set that features a drilled handle. Included is an illustration that shows how a screwdriver blade can be passed through the drilled handle and hollow nutdriver shaft to speed and simplify the setting of combination locknut/slotted screw adjustments found on rheostats and similar controls. Xcelite.

SEMICONDUCTORS . . .

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cillator circuit capacitance so that a 455kHz difference exists between IF and oscillator frequencies.

The varicap manufacturer substituted its diode in place of the tuning capacitor in a portable AM radio. Using tuning circuits similar to those shown in Fig. 12, the capacitances in the antenna and oscillator circuits vary with the applied voltage as indicated by the curves in Fig. 15.

Tests were made in accordance with IEEE Standard 186 before and after this receiver was converted to electronic tuning. The results of these tests are shown in Table I.

The curve in Fig. 15 indicates small capacitive changes as the bias voltage is varied between 7 and 10v, and we noted that the last station at the higher-frequency end of the dial covered a much larger portion of the tuning dial than the other stations. Since the potentiometer rotates a greater number of degrees than the mechanical tuning capacitor, the stations were more widely spaced across the dial of the converted radio.

ELECTRONIC TECHNICIAN's TEKLAB has also converted one of a pair of AM portable radios (Fig. 13 and 14) for comparative studies. After the conversion was made, both radios could tune in all local stations, which in this city are spread over nearly the entire broadcast band. The reception sounded as clear on one receiver as on the other.

We found that the capacitors connected in series with the varicaps had to be ceramic types since slight capacitor leakage detuned the radio, and sometimes a pair of stations would be alternately tuned "in" and "out" without moving the dial. It was also necessary to use a separate battery for the tuning bias supply since varying audio signals could load down a common battery and provide distortion by changing the tuning. A voltage-regulator circuit could have been included to eliminate this problem and permit single battery operation.

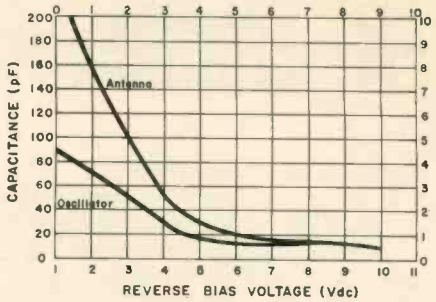


Fig. 15 — The capacitance in the antenna and oscillator circuits vary with the varicap reverse-bias voltage. Courtesy of Molorola.

The converted tuning circuit did require a little additional space, and even more space would have been required if a voltage regulation circuit was included. There was no saving in component cost when constructing the varicap circuit. Then why a varicap tuning circuit?

Varicap tuning circuits permit the construction of all electronic automatic-search-tuning circuits, eliminating the need for complicated mechanical automatic-search-tuning systems that require relays, motors or solenoids. An oscillator step-counter circuit is used in place of the mechanical components. In this circuit, an oscillator produces a signal that slowly changes the varicap bias in steps so small they seem nearly continuous. These steps in bias potential continue to change the varicap capacitance until a station is received and its audio signal blocks the oscillator circuit. The step-count circuit then maintains a constant potential across the varicap, keeping the receiver tuned to the station received. When reactivated, the varicap bias is again changed by the oscillator step-count circuit until another station is received.

Remote tuning is another advantage of varicap tuned circuits. A varicap tuned receiver can be con-

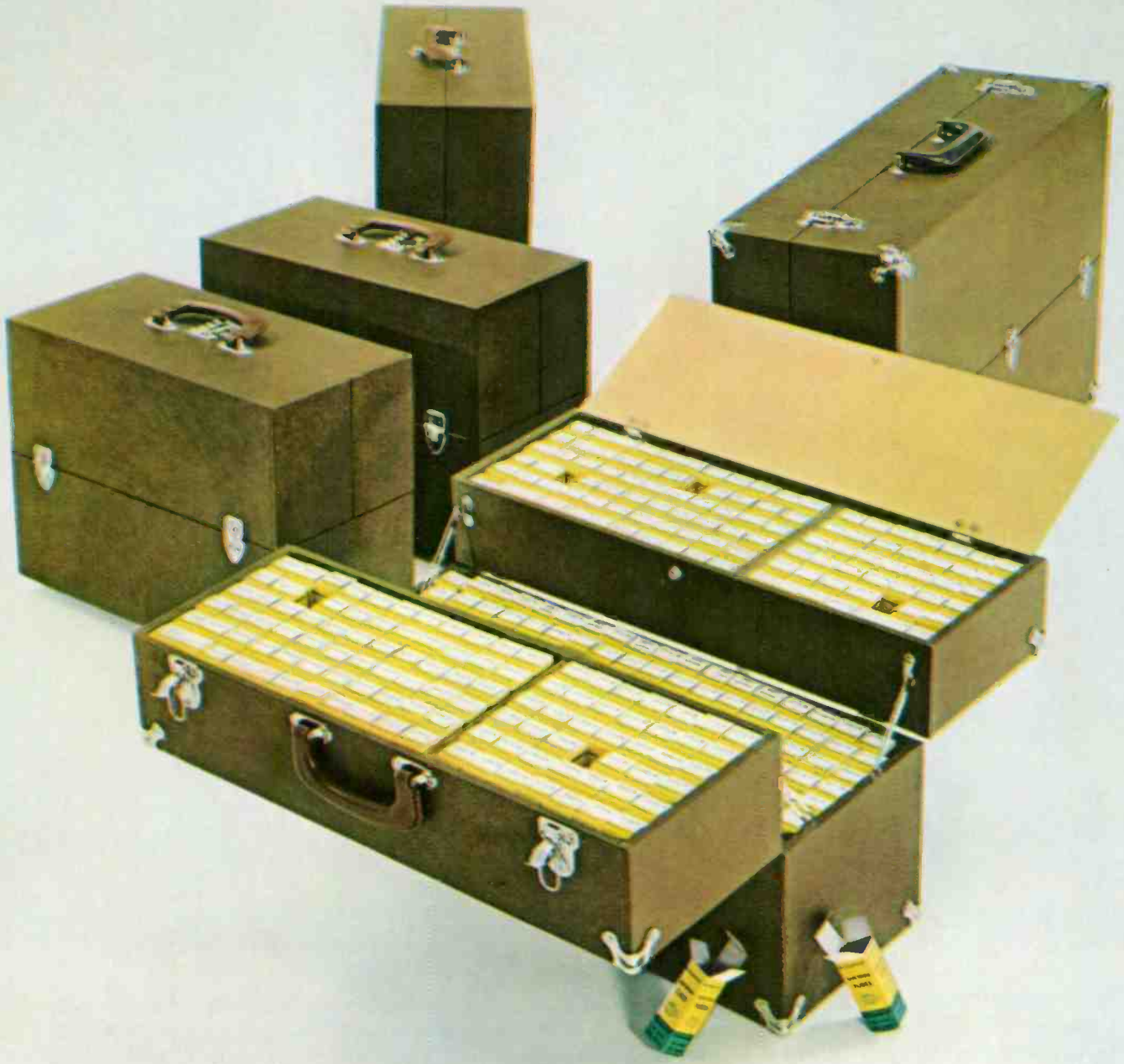
TABLE 1
Comparative Characteristics of a Mechanical Capacitor-Tuned Radio and a Diode-Tuned Radio Courtesy of Motorola

Measurement Frequency 600kHz	1000kHz	1400kHz	
Signal level (microvolts per meter) required for 6db signal-to-noise ratio $(\frac{S+N}{N})$.			
65μv/M	60μv/M	125μv/M	Mechanical Capacitor
78μv/M	106μv/M	105μv/M	Diode Capacitor
Signal level (microvolts per meter) required for 20db signal-to-noise ratio $(\frac{S+N}{N})$.			
250μv/M	250μv/M	300μv/M	Mechanical Capacitor
240μv/M	250μv/M	205μv/M	Diode Capacitor
Signal level (microvolts per meter) required to obtain 50mw output			
575μv/M	500μv/M	1000μv/M	Mechanical Capacitor
700μv/M	1250μv/M	700μv/M	Diode Capacitor
Image Rejection			
41db	40db	39db	Mechanical Capacitor
40db	29db	34.5db	Diode Capacitor
IF Rejection = 36db			Mechanical Capacitor
IF Rejection = 33db			Diode Capacitor
Tuning Range			
Minimum Frequency	Maximum Frequency		
518.2kHz	1619.3kHz		Mechanical Capacitor
461.4kHz	1614.4kHz		Diode Capacitor
Output level of 5mv/M; 1MHz, RF signal producing 10% distortion			
		0.45mw	Mechanical Capacitor
		0.36mw	Diode Capacitor

structed with a single potentiometer to control several RF tuned circuits, eliminating the need for superheterodyne circuits with IF amplifiers. Antenna lead signal loss can be reduced by locating the receiver next to the antenna, on the roof of a building or in the trunk of a car and tuning it remotely with a potentiometer.

The next article will describe photo-emissive and photosensitive semiconductors and how they are used in modern electronic equipment. ■

ADVERTISERS' INDEX



One out of every five professional servicemen has switched to Amperex TV replacement tubes

It takes a lot of quality to change the buying habits of 20% of the most knowledgeable technicians in the business. These servicemen are following the pattern set by the leading TV manufacturers, who are designing more and more of their quality lines around tubes originated by Amperex. The Amperex line of popular types is expanding all the time. Look for the green and yellow cartons at your distributor's or write: Amperex Electronic Corp., Hicksville, L.I., N.Y. 11802.

Amperex

TOMORROW'S THINKING IN TODAY'S PRODUCTS

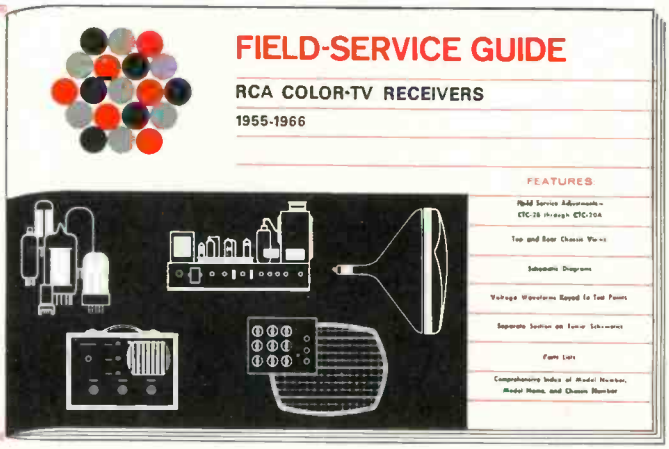
You need this guide for RCA Color Home Service Calls!

RCA'S NEW FIELD SERVICE GUIDE, ERT-200 helps you make all adjustments on all RCA color sets from 1955 to 1966 that can be performed in the home . . . including step-by-step procedure for replacing a color picture tube.

Three part index lets you look up the set you are working on by model number, name or chassis number. You'll find the ERT-200 Field Service Guide indispensable. There's nothing like it on house calls for RCA color sets.

WHAT THIS GUIDE CONTAINS:

- Schematics on all RCA color sets from 1955 to 1966
- Field service adjustments (AGC, linearity, centering, etc.)
- Convergence, purity and black and white setup adjustments
- Parts lists
- Wave forms keyed to test points for majority of chassis
- Top and rear chassis views
- Photos of typical receivers
- Index of models from CTC2 through CTC20
- Separate section on tuner schematics
- Separate section on remote tuner schematics



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