DECEMBER 1972 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

NATESA Plan to Create Confidence

Introducing Heathkit's Dual-Trace Scope

Better Merchants Make Better Profits

There must be an easier way...

There is: Sylvania's Chek-A-Color test jig.

TV servicemen were never meant to be movingmen.

But, that was before antique, modern and French Provincial units that included hi-fi, tape decks and record players were built around a large-screen color TV set.

Getting those units to the shop can be a big job.

That's why we developed our two Chek-A-Color test jig units. One, our full-house model, gives everything you need to test a chassis. The other is a basic unit that practically lets you design your own test jig.

All you have to take back to the shop is the electronic guts of the TV monsters.

Regardless of the size of the original picture, Chek-A-Color lets you see it on a benchtop 14-inch (diagonal) screen. It adapts to both high and low focus voltage sets and a full line of adapters lets you test over 5,000 different models.

A front-panel switch controls a yoke programming system that gives you a range of impedances and/or deflection voltages to closely match both tube and solid-state systems.

For actual testing, a convenient meter lets you measure anode voltage and a speaker lets you check sound performance.

Since Chek-A-Color handles tube, hybrid and solid-state chassis, there won't be many complete cabinets to lug.

With a Chek-A-Color test jig all you have to take is the chassis. Get the picture? Sylvania Electronic Components, 100 First Avenue, Waltham, Mass. 02154

GTE SYLVANIA

1450

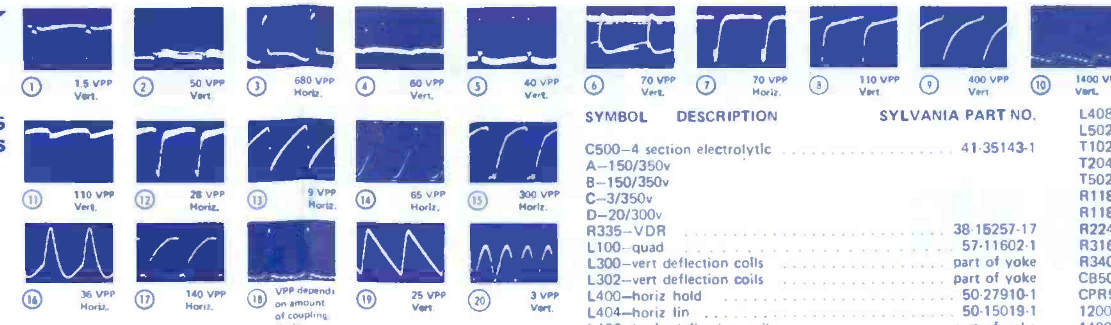
SYLVANIA

TV Chassis
B10-7/-12

ELECTRONIC TECHNICIAN/DEALER TEKFAX

DECEMBER • 1972

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 4 NEW SETS



SYMBOL DESCRIPTION	SYLVANIA PART NO.
C500—4 section electrolytic	41-35143-1
A—150/350v	
B—150/350v	
C—3/350v	
D—20/300v	
R335—VDR	38-15257-17
L100—quad	57-11602-1
L300—vert deflection coils	part of yoke
L302—vert deflection coils	part of yoke
L400—horiz hold	50-27910-1
L404—horiz lin	50-15019-1
L406—horiz deflection coils	part of yoke
L408—horiz deflection coils	part of yoke
L502—choke, power line	50-29833-2
T102—audio output	56-35693-1
T204—sound take off/4.5MHz trap	57-11604-1
T502—low voltage power (-10, -11CH)	55-11121-1
R118—1M volume (-7 CH)	37-23044-6
R118—1M volume/on/off/ (-8, -9 CH)	37-35102-3
R224—220K, AGC	37-11632-1
R316—5M, vert lin	part of R224
R340—3M, vert ht	part of R224
CB500—circuit breaker	29-88908-5
CPR502—capristor-cabinet ground (-9, -10, -11 CH)	32-11488-3
1200, 1300—lamp neon NE2H	30-33062-3
1400—lamp neon NE83	30-97684-11

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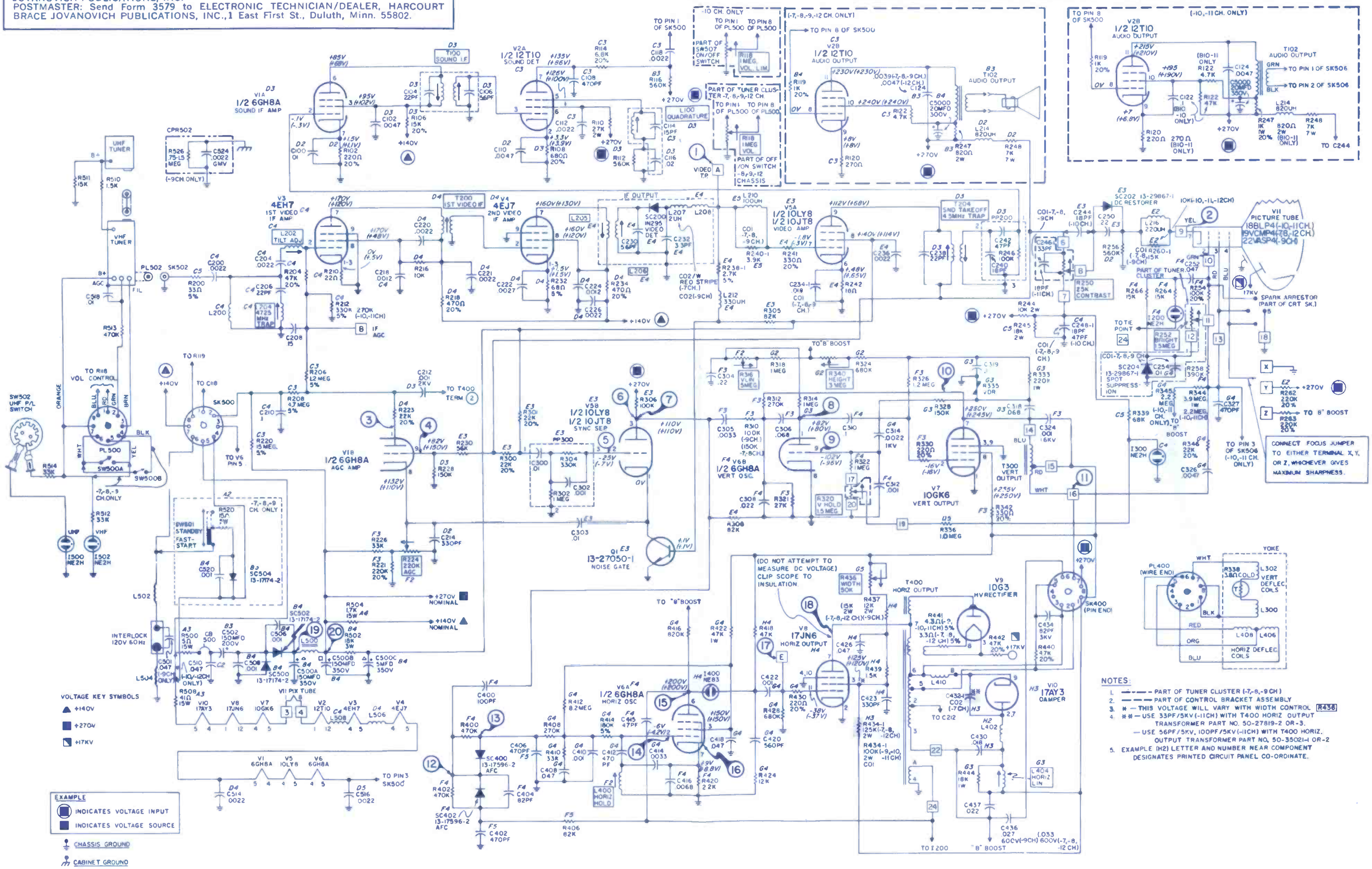
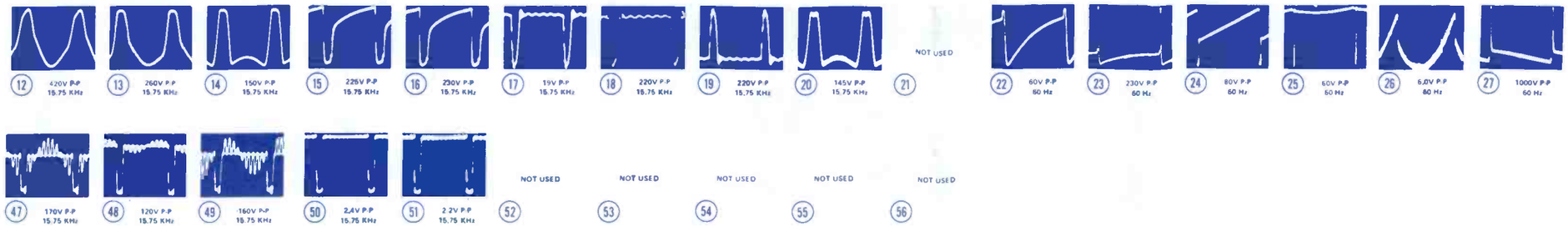
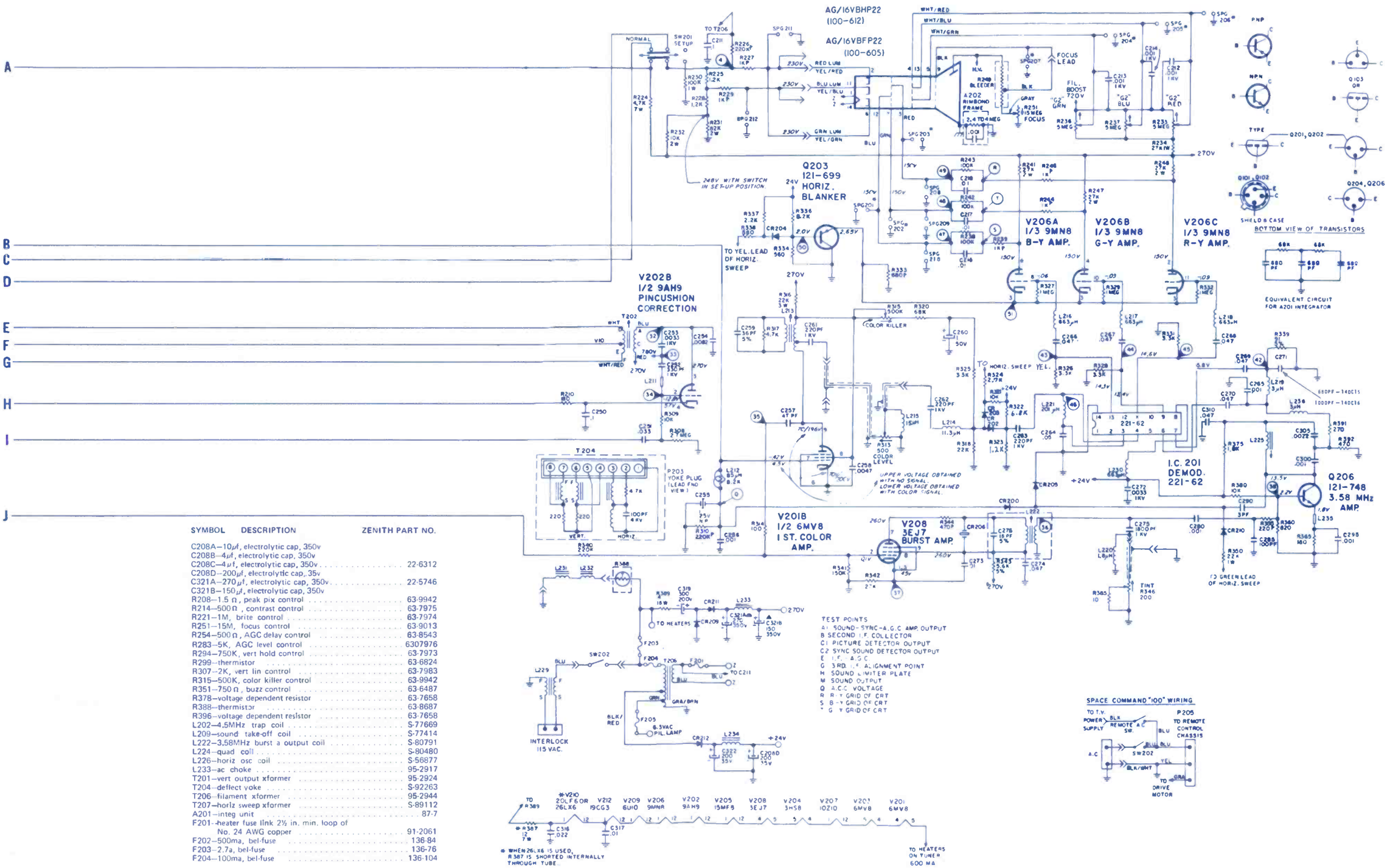


ZENITH
Color-TV Chassis
14DC15, 16





SYMBOL	DESCRIPTION	ZENITH PART NO.
C208A	10μf, electrolytic cap, 350v	
C208B	4μf, electrolytic cap, 350v	
C208C	4μf, electrolytic cap, 350v	22-6312
C208D	200μf, electrolytic cap, 35v	
C321A	270μf, electrolytic cap, 350v	22-5746
C321B	150μf, electrolytic cap, 350v	
R208	1.5 Ω, peak pix control	63-9942
R214	500 Ω, contrast control	63-7975
R221	1M, brite control	63-7974
R251	15M, focus control	63-9013
R254	500 Ω, AGC delay control	63-8543
R283	5K, AGC level control	6307976
R294	750K, vert hold control	63-7973
R299	thermistor	63-6824
R307	2K, vert lin control	63-7983
R315	500K, color killer control	63-9942
R351	750 Ω, buzz control	63-6487
R378	voltage dependent resistor	63-7658
R388	thermistor	63-8687
R396	voltage dependent resistor	63-7658
L202	4.5MHz trap coil	S-77669
L209	sound take-off coil	S-77414
L222	3.58MHz burst a output coil	S-80791
L224	quad coil	S-80480
L226	horiz osc coil	S-56877
L233	ac choke	95-2917
T201	vert output xformer	95-2924
T204	deflect yoke	S-92263
T206	filament xformer	95-2944
T207	horiz sweep xformer	S-89112
A201	integ unit	87-7
F201	heater fuse link 2½ in. min. loop of No. 24 AWG copper	91-2061
F202	500ma, bel-fuse	136-84
F203	2.7a, bel-fuse	136-76
F204	100ma, bel-fuse	136-104

1449

ZENITH

Color-TV Chassis
14DC15, 16

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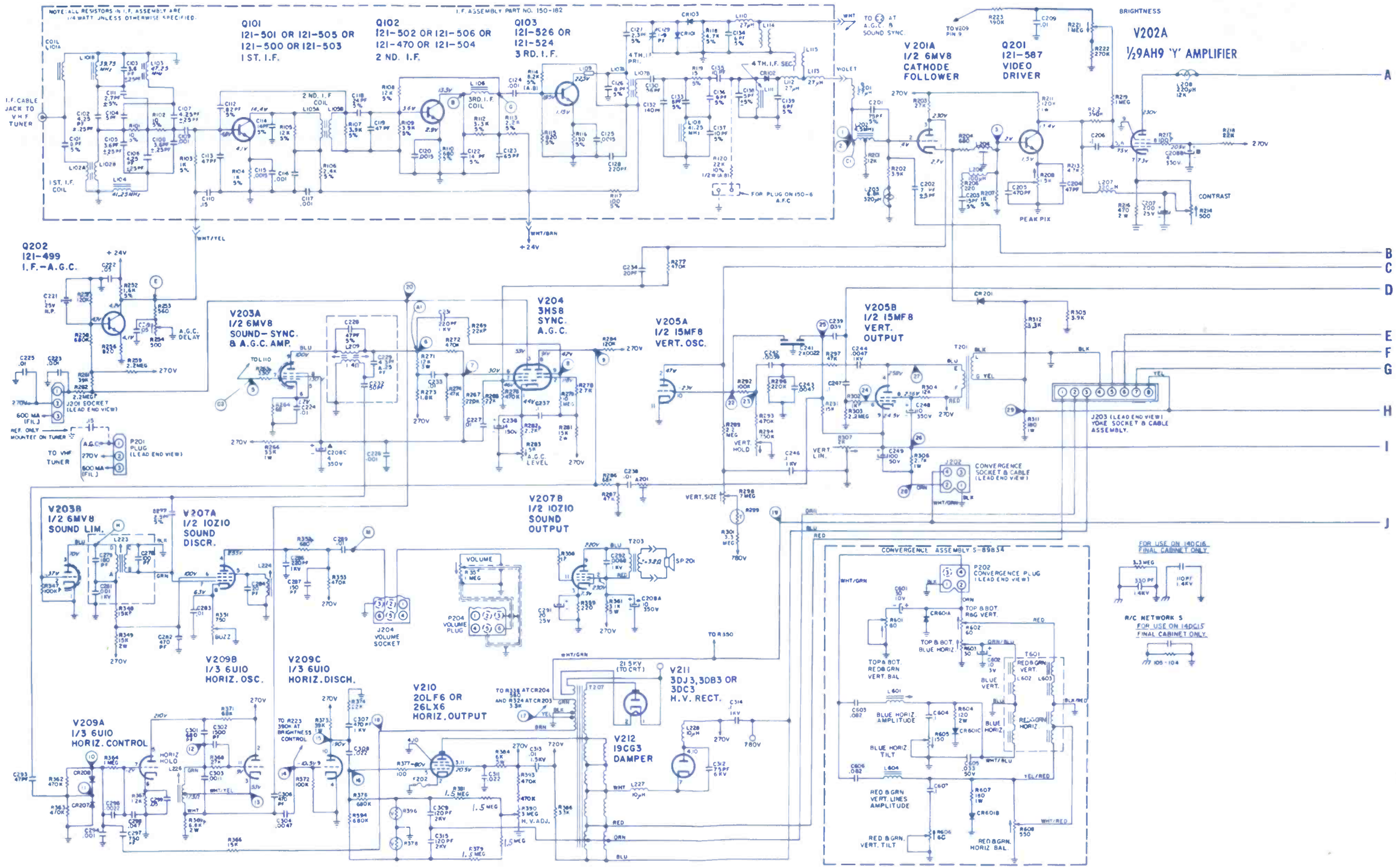
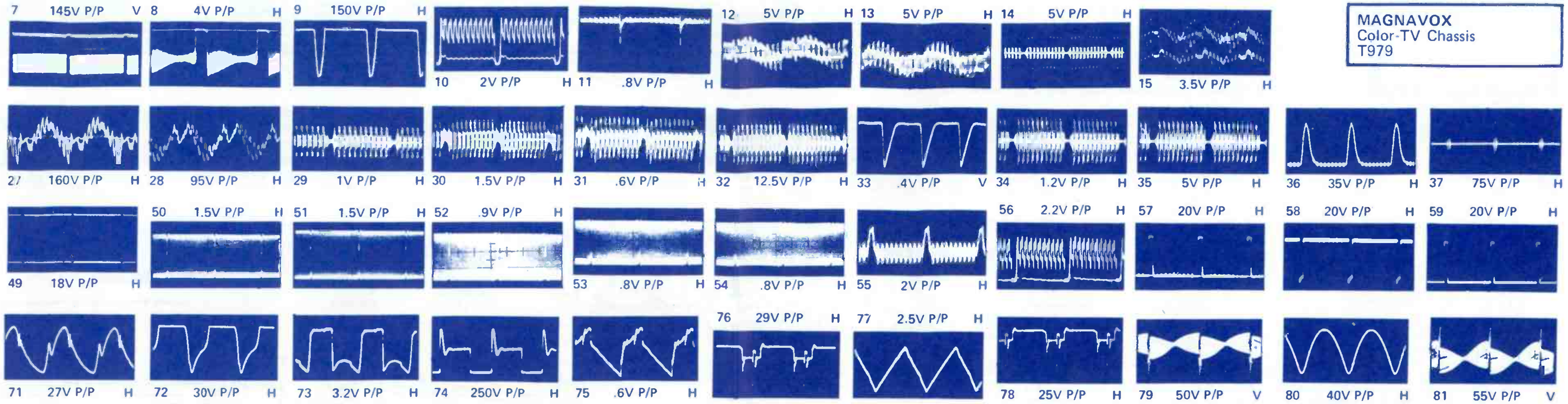
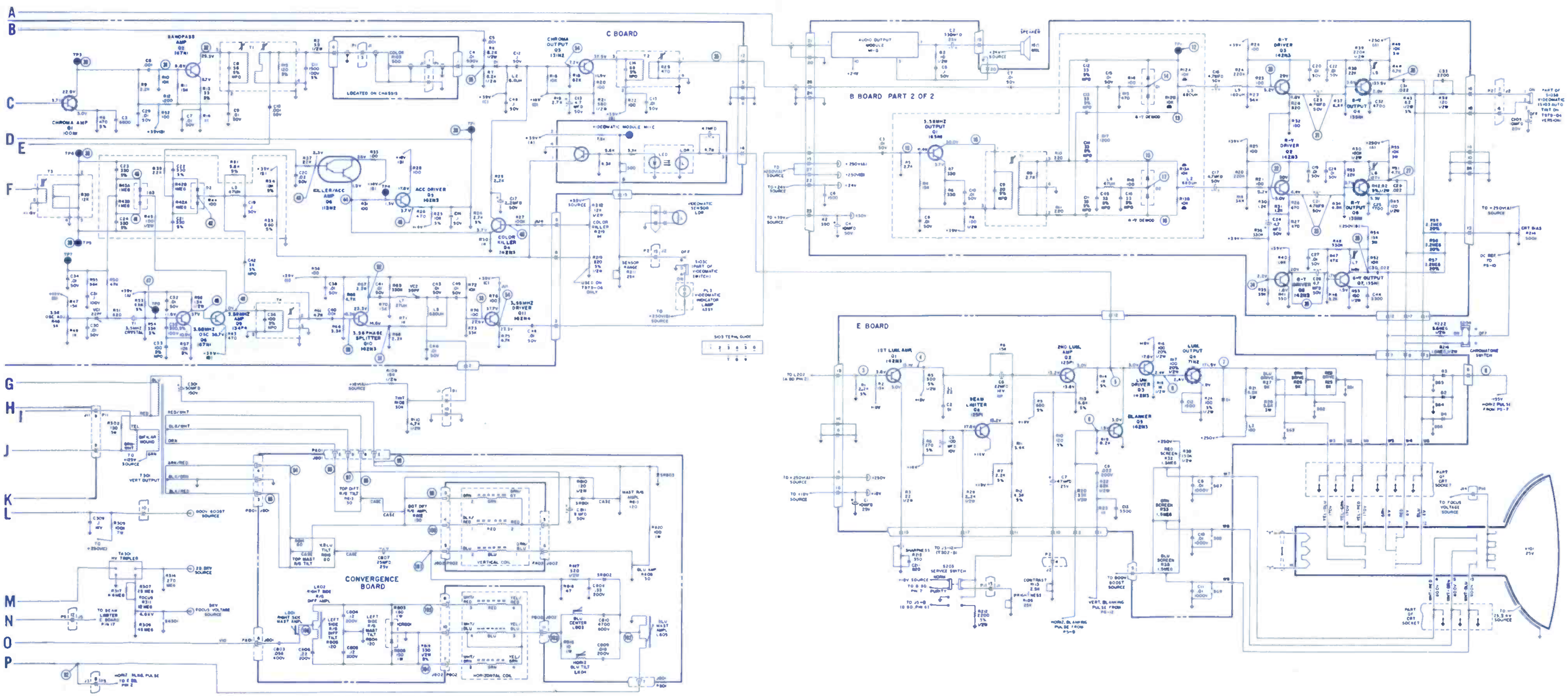


MAGNAVOX
Color-TV Chassis
T979





1448

MAGNAVOX

Color-TV Chassis
T979

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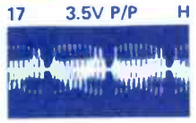
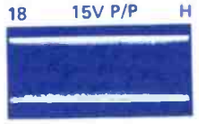
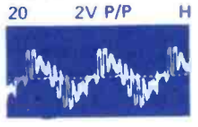
16 3.5V P/P H


17 3.5V P/P H

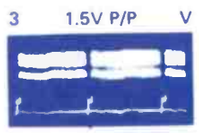

18 15V P/P H

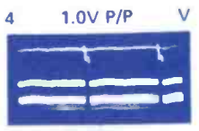

19 .8V P/P H

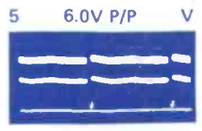

20 2V P/P H

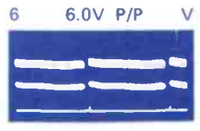

1 3V P/P

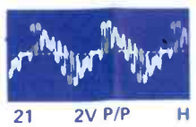

2 3V P/P

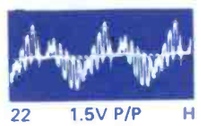

3 1.5V P/P V

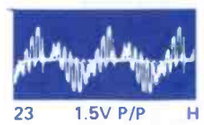

4 1.0V P/P V

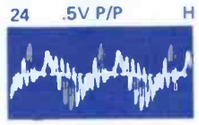

5 6.0V P/P V

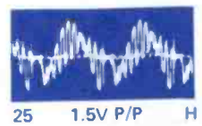

6 6.0V P/P V


21 2V P/P H


22 1.5V P/P H


23 1.5V P/P H


24 .5V P/P H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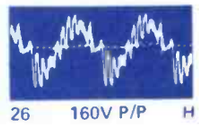
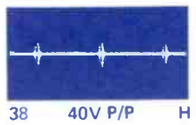
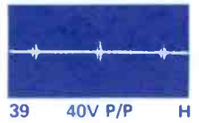
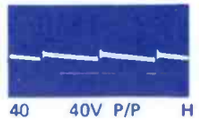
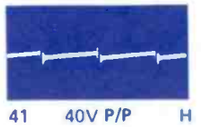

26 160V P/P H


38 40V P/P H


39 40V P/P H


40 40V P/P H


41 40V P/P H

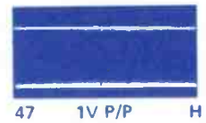

42 20V P/P H


43 .6V P/P V

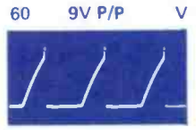

44 .6V P/P V

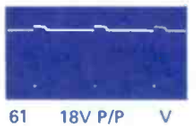

45 .6V P/P V

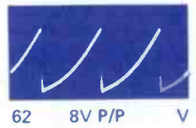

46 .3V P/P H


47 1V P/P H


48 4.5V P/P H

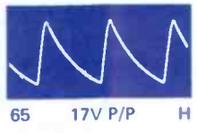

60 9V P/P V


61 18V P/P V

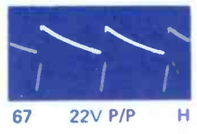

62 8V P/P V


63 8V P/P V


64 8V P/P V


65 17V P/P H


66 15V P/P H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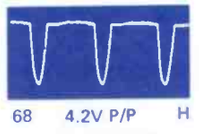
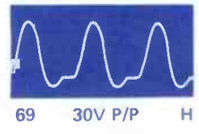
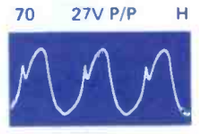

68 4.2V P/P H


69 30V P/P H


70 27V P/P H


82 35V P/P V

84 225V P/P V

85 8V P/P V

86 17V P/P H

87 900V P/P H

90 40V P/P H

91 100V P/P H

92 65V P/P H

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1447

GENERAL ELECTRIC

TV Chassis BA

SYMBOL	DESCRIPTION	GENERAL ELECTRIC PART NO.
R801	on/off vol, 10K	ES49X74
R802	brite, 500K	ES49X75
R803	contrast, 1K	ES49X77
R804	AGC, 1K	ES49X45
R805	vert hold, 30K	ES49X79
R806	vert ht, 20K	ES49X78
R807	vert lin, 20K	ES49X78
R808	focus, 2M	ES49X42
L112	deflect yoke	ES76X9
L113	coil, horiz osc	ES35X6
T109	xformer, horiz output	ES77X15
T110	xformer, power	ES88X4
IC01	sound IF pre-amp	ES84X3
IC02	audio output	ES84X1
IC03	horiz phase det	ES84X2
TH01	thermistor	ES14X39
CP01		ES57X15
CP02		ES57X16
CP03		ES57X17
CP304		ES57X16
	fuse 1a, slo blo F701	ES10X7

WF 1 (TP-C) 1.3Vp-p 60 Hz

WF-2 3.4Vp-p 60 Hz

WF-3 2.3Vp-p 15.750 Hz

WF-4 7.5Vp-p 60 Hz

WF-5 1.7Vp-p 60 Hz

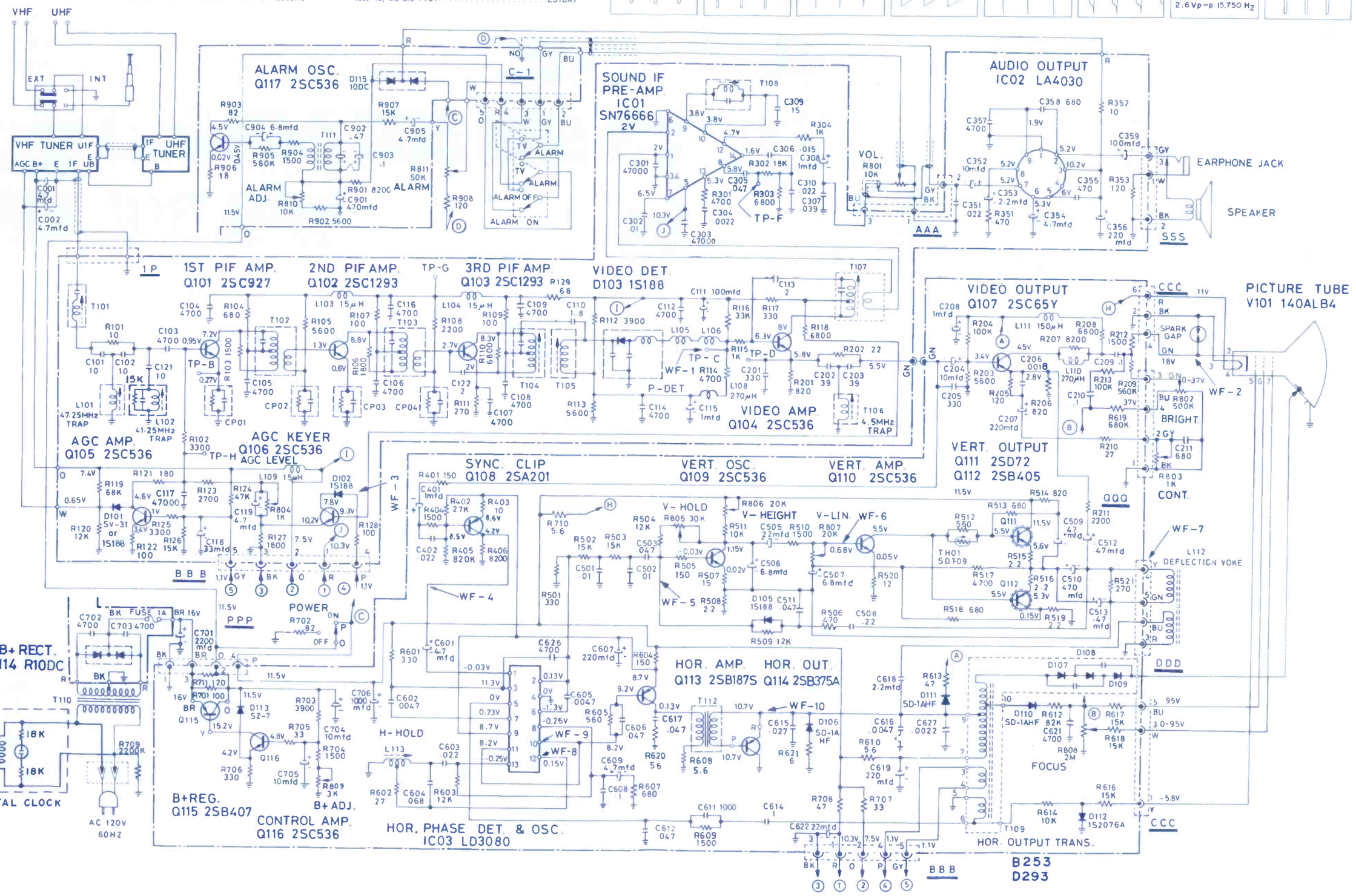
WF-6 0.3Vp-p 60 Hz

WF-7 9.8Vp-p 60 Hz

WF-8 9.5Vp-p 15.750 Hz

WF-9 2.6Vp-p 15.750 Hz

WF-10 72Vp-p 15.750 Hz



SCHEMATIC NO.

120904, 911 1239
120914A, B 1221
120921, 923 1290
120962, 964 1303
120969, 970 1288
120974B 1352
120976, 977, 980, 981, 982, 983, 984 1313
Model:
9P50 1005
11P50/12P50 1375
12HP02 1390
12P50 975
12P60/12P61/W 1280
29P10 1248
35P01/35P02 1177
P-1913 Stereo/Radio 790
T2R2-1A 1374
T8K3-1B 1442
T10K10-1D, C 1336
T25H4-1A 1446
1800/2000 Series 742

FIRESTONE

Chassis:
12-129-94U 918

FISHER

Model:
800 AM/FM Amp 693

GENERAL ELECTRIC

Chassis:
AA 889
AB 963
AC 1164
AD 1148
AY 832
A-1 1191
A-2 1370
BA 1447
C-1 1353
C-2/L-2 1376
CB 953
DA 861
DB 930
DC 990
DD 1075
D1 1214
D2 1345
ETV 1046
ETV 1A
FY 866
G-1 1156
H-1 1173
H-2 1236
H-3 1318
H-4 1406
HB 1011
JA 1432
KC 1037
KD 1141
KE 1184
L-T2 1417
LX 699
MXT 785
N-1 1412
N-2 1357
P-1 1195
QX 772
QY 828
R-2 1435
SA 911
SB 939
SC 1018
S-2 1155
S-3 1393
TA 881
TB 1004
TC 1048
T-5 1257
U-1 1398
U5 692
VB 979
V-2
M597 Series 745
TU 220 AM/FM Tuner 759
Model:
940A, B Radio 858
11P31, -33, T225A, -35A, -36A Radio 845
CT110, CP775 Trans Radio 619
M502SBN, EB, VY, 3XBN, EB, VY 772
M870VWD, M871VWD, R870VM1, R870VWD 692
9P70A Radio 809
RP2060A Stereo Phone 725
T-3000A, B Stereo Receiver 836
W360A Radio Intercom 796

GRANCO

Model:
704 AM/FM Radio 682

GENERAL ELECTRIC (CANADA)

Chassis:
M618 1030
M638 1171
M649 1101
M685 1123
M687 1112
N-1 1307

HEATH

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

HOFFMAN

Chassis:
913-000366, 386 1166
BP318 Trans Radio 703
Model:
P708 Trans Radio 703

KORTING

Model:
MT 2233, 2243 Tape Recorder 865
MT3643/3633 Stereo Tape Recorder Constellation 853

MAGNAVOX

Model:
77-01 AM/FM Tuner 794
Chassis:
34 Series 722
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
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T914 Series 954
T915 Series 1181
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T924 Series 1135
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T934 Series 1283
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T945 1266
T946 1359
T946 (Late prod.) 1384
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T949 1310
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T956 1377
T957 Series 1407
T958 1392
T959 1420
T960 1425
T961 Series 1394
T962 Series 1387
T966 Series 1443
T974 1445
T979 1448

MATSUSHITA

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

MONTGOMERY WARD

Model:
WG-399A FM Multiplex 768

MOTOROLA

Chassis:
QTS-436 731
RTS-436 731
STS-436 731
TS-436 731
TS-440 700
TS-454 931
TS-458 1107
TS-460 Series 1089
TS-461 1047
TS-465 1258
TS-467 1424
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-592 1149
TS-594 1031
TS-596 957
TS-597 1021
TS-599 1298
TS-611 1196
TS-612A 1203
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TS-908C-02 to D-02 924
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TS-914A-00 to A-07 951
TS-921 Series 1142
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WTS-436 731
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202 Auto Radio 727
203 Auto Radio 727
204 Auto Radio 727
2TMR Auto Radio 691
12MAM Auto Radio 661
19P7-1, -2, -3 700
19T5, 7, 11, 12, 13 and A19T8 Series 731
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:
3P70 1430
6P28, 6P29, 6P30 992
9P44 1275
9P45 1275
9P46 1275
9P54 1275
9P94 Series 1379
CT-910 1064
9P56, 57, 58 1095
9P59, 60 1090
9P901/9P91 1246
Chassis:
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CTC 31 1231
CTC-1940 1218
CTC 400 1255
JU-JCU 710
NB 820
NBU 820
NDP 1013
NEC 1365

PACKARD-BELL

Model:
23DC16 748
MPX-1-1 Stereo Adapter 716
MSJ-202 1134
MSJ-204 1134
Chassis:
88-16 877
88-18C 941
88-19 970
98C15 1083
98C17 1131

PANASONIC

Model:
CT-771 1402

PENNEY, J. C.

Model:
1315 1320
1316 A-89 1286

PERMA-POWER

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

PHILCO-FORD

Model:
L-1532 Stereo Phono 761
L1650 Stereo 764
M1618 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
13N51 754
13N52 754
13N53 754
14G20 855
14N30 871
14N50 862
15G20 905
15J25 1007
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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
18CT24 1305
18J32 1151
18L33 1130
18LT43 1137
18NT45 1125
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19HT15 1250
19KT40B 1242
19KT50/50B 1207
19L21 1233
19P22 1226
19QT85R 1197
19S32 1235
20HT70 1332
20HT71 1332
20L23 1264
20P22 1299
20P24 1267
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20QT75 1372
20R27 1276
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20T33 1287
20V35 1253
21HT15 1434
21KT41 1367
21L23A 1439
21ST31V 1438
21ST90, 91 1347
22LT45/R 1401
22QT79 1396

PHILHARMONIC

Chassis:
TSL-001 689

RAYTHEON CO.

Model:
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
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4VC8 Record Player 798
4VF606 Stereo Hi Fi 827
4VF705 Stereo Hi Fi 827
KR105/112, KRK112 with 96209 856
KRK105/KRK66 Series 856
Mark 11 Citizen Band Radio 645
RFG35 Radio 863
RK-295 Stereo Adapter 721
RP-215-C1 Record Player 848
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CTC12, A, B, P, R 736
CTC16, X 885
CTC17X 952
CTC19 984
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CTC22 Series 1109
CTC25 1040
CTC27X Series 1261
CTC28 Series 1136
CTC31 Series 1144
CTC35 Series 1132
CTC38 Series 1237
CTC39XAA 1319
CTC40 1219
CTC41 1314
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CTC49 1342
CTC50 Series 1381
CTC51, 52 1436
CTC54 1440
CTC55 Series 1378
CTC59 Series 1408
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KCS130YAB, YAC 705
KCS136M 1008
KCS136 ML Series 1161
KCS136X 879
KCS136Y Series 744
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
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KCS158 Series 1119
KCS161 1022
KCS162 1028
KCS163 Series 1065
KCS164 1050
KCS165 Series 1104
KCS168 Series 1175
KCS169 Series 1192
KCS169X Series 1306
KCS171 Series 1198
KCS172 Series 1385
KCS173 Series 1180
KCS174 Series 1182
KCS175 Series 1204
KCS176 Series 1269
KCS177 Series 1251
KCS178 Series 1270
KCS179 Series 1340
KCS183 1331
KCS184A 1315
KCS185 1339
KCS186 1404
KCS188 1410
RC-1214A Radio 792
RC-1216 Radio 863
RS-200 Stereo Adapter 721
RS-206-A Record Changer 868

SETCHELL-CARLSON

Chassis:
401 1066
U809/U810 1201

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
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456.61581 955
456.70120 967
456.70121 967
528.61580 955
528.61581 955
528.70120 967
528.70121 967
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528.71120 1120
528.71150 1138
528.72280 1114
528.72281 1114
528.72282 1114
528.72500 1160
528.72940 1249
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

Model:
563P197 852
563P197 852
564K236M 989
565P198 1060
Chassis:
1194-194 869

SONY

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

SPARTON

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

SYLVANIA

Model:
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
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A04-1, -2 1051
A04-3 1234
A06, A07 1035
A06-1, -2 1085
A09-1 1369
A10-1 1409
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
B10-1, -2 1209
B10-7, -12 1450
B12-1, -1 1247
B13-1 1350
B14-1 1321
D01-1, -2 925
D01-1, -2, -8 1043
D03, -3 987
D05 1024
D06-1, -2 1091
D07-1, -2 1115
D08-2 1154
D09-1, -2, -4 1150
D11-1, -2 1190
D12-20, -21 1343
D13-2 1243
D14-3-4 1301
D15-1, -2 1333
D15-3-5 1382
D16-2 1338
D17-1-2 1413
D18-1, -2, -3 1423
D19-1, -2, -3 1388
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558-1, -2 704
562, -3, -4 757
577, -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

TOSHIBA

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

TRAVELER

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:
1156-89 696

TRUETONE

Model:
2DC1300B 767
2DC1300C 780
2DC1300C 767
2DC1301C 780
2DC1302B 767
2DC1302C 780
2DC1303B 767
2DC1303C 780
2DC1501A, B 894
2DC1605 983
2DC1605 1079
2DC1803 1110
2DC2555 1079
2DC3651 949
2DC3712 1073
2DC3741 1041
2DC3815 1156
2DC3818 1127
2DC3819 1168
2DC3910 1222
2DC3918, 19 1210
2DC3920 1193
2DC4815 1178
3912 1227
Chassis:
1096-243 788
1095-232 729

UNITED SCIENTIFIC LABS

Model:
Contact 23 CB Transceiver 986

UTICA

Model:
T&C11 CB Transceiver 805

VOICE OF MUSIC

725 Tape Recorder 850

WEBCOR

Model:
1376 Stereo Phono 735
1377 Stereo Phono 735
4210 Amp/Speaker System 749

WESTERN AUTO

Model:
DC3438 Trans Radio 776
4DC7260A Tape Recorder 840
4DC7465 Tape Recorder 803

WESTINGHOUSE

Model:
H-883N29 Radio 846
H-M1800, 01, 03 Phono 734
H-M1900, 01, 03 Phono 734
Chassis:
V2407-4 Radio 789
V-2409-4, -5, -6, -7, -8 688
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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
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V-2451-2 CB Transceiver 817
V-2474-1, -2, -3, -6, -7 875
V-2475-1, -4 887
V-2476-1, -4 900
V-2478-1, -2 907
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V-2498 Series 1029
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ZENITH

Model:
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Royal 50L Trans Radio 781
Royal 490 Trans Radio 811
Chassis:
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6JT41Z1 Trans Radio 720
6KT40Z1 Trans Radio 781
6KT50Z8 Radio 857
7KT45Z1 Trans Radio 811
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13M15 923
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13X18 1086
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14A10C29 1309
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14M20 893
14M21 1054
14M23 878
14M27 916
14M32 934
14N22 1001
14N26 958
14N27 1080
14N28 1010
14N29 969
14N29Z 1067
14N31 986
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14Z21, 14Z21Z 1252
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14Z38, 14Z43 1240
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16J28QS 698
16K20, QS 739
16N24 1006
1628C19 1284
19CB36 1405
19CC19 1397
19DC20 1428
20YJ37 1126
23XC36 1027
24NC31 994
25CC55 1383
25MC30 886
25MC36 926
26KL20, 20QS 779
27KC20, Q 728
40BC50 1348
S-54344 Hand Control 799
S-60804, 44, 1013 Remote Control 799
175-141, -301, -302, -171 Tuner 823

ELECTRONIC TECHNICIAN/DEALER

TEKFAX

COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 4 NEW SETS

GROUP 244

	SCHEMATIC NO.		SCHEMATIC NO.
GENERAL ELECTRIC TV Chassis BA	1447	SYLVANIA TV Chassis B10-7/-12	1450
MAGNAVOX Color-TV Chassis T979	1448	ZENITH Color-TV Chassis 14DC15, 16	1449

COMPLETE MODEL CHASSIS INDEX FOR ALL CIRCUIT DIGESTS AND TEKFAX FROM JANUARY 1962 THROUGH DECEMBER 1972

MONTH IN WHICH SCHEMATIC APPEARS

681-686	Jan. 1962	951-953	Sept. 1965	1223-1228	May 1969
687-692	Feb. 1962	954-961	Oct. 1965	1229-1234	June 1969
693-698	Mar. 1962	962-969	Nov. 1965	1235-1240	July 1969
699-705	Apr. 1962	970-975	Dec. 1965	1241-1246	Aug. 1969
706-709	May 1962	976-982	Jan. 1966	1247-1252	Sept. 1969
710-716	June 1962	983-988	Feb. 1966	1253-1258	Oct. 1969
717-723	July 1962	989-995	Mar. 1966	1259-1264	Nov. 1969
724-729	Aug. 1962	996-1001	Apr. 1966	1265-1269	Dec. 1969
730-735	Sept. 1962	1002-1009	May 1966	1270-1275	Jan. 1970
736-743	Oct. 1962	1010-1015	June 1966	1276-1281	Feb. 1970
744-749	Nov. 1962	1016-1022	July 1966	1282-1287	Mar. 1970
750-755	Dec. 1962	1023-1028	Aug. 1966	1288-1293	Apr. 1970
756-761	Jan. 1963	1029-1035	Sept. 1966	1294-1299	May 1970
762-766	Feb. 1963	1036-1041	Oct. 1966	1300-1305	June 1970
767-772	Mar. 1963	1042-1047	Nov. 1966	1306-1310	July 1970
773-779	Apr. 1963	1048-1054	Dec. 1966	1311-1315	Aug. 1970
780-784	May 1963	1055-1060	Jan. 1967	1316-1320	Sept. 1970
785-790	June 1963	1061-1067	Feb. 1967	1321-1325	Oct. 1970
791-797	July 1963	1068-1073	Mar. 1967	1326-1330	Nov. 1970
798-805	Aug. 1963	1074-1080	Apr. 1967	1331-1334	Dec. 1970
806-811	Sept. 1963	1081-1086	May 1967	1335-1339	Jan. 1971
812-817	Oct. 1963	1087-1092	June 1967	1340-1344	Feb. 1971
818-822	Nov. 1963	1093-1098	July 1967	1345-1349	Mar. 1971
823-828	Dec. 1963	1099-1104	Aug. 1967	1350-1354	Apr. 1971
829-833	Jan. 1964	1105-1110	Sept. 1967	1355-1359	May 1971
834-838	Feb. 1964	1111-1116	Oct. 1967	1360-1364	June 1971
839-843	Mar. 1964	1117-1122	Nov. 1967	1365-1369	July 1971
844-850	Apr. 1964	1123-1127	Dec. 1967	1370-1374	Aug. 1971
851-853	May 1964	1128-1133	Jan. 1968	1375-1379	Sept. 1971
854-858	June 1964	1134-1139	Feb. 1968	1380-1384	Oct. 1971
859-863	July 1964	1140-1145	Mar. 1968	1385-1389	Nov. 1971
864-870	Aug. 1964	1146-1151	Apr. 1968	1390-1393	Dec. 1971
871-875	Sept. 1964	1152-1157	May 1968	1394-1398	Jan. 1972
876-881	Oct. 1964	1158-1163	June 1968	1399-1404	Feb. 1972
882-887	Nov. 1964	1164-1169	July 1968	1405-1409	Mar. 1972
888-893	Dec. 1964	1170-1175	Aug. 1968	1410-1414	Apr. 1972
894-900	Jan. 1965	1176-1181	Sept. 1968	1415-1419	May 1972
901-908	Feb. 1965	1182-1187	Oct. 1968	1420-1424	June 1972
909-916	Mar. 1965	1188-1193	Nov. 1968	1425-1429	July 1972
917-923	Apr. 1965	1194-1198	Dec. 1968	1430-1434	Aug. 1972
924-926	May 1965	1199-1204	Jan. 1969	1435-1438	Sept. 1972
927-934	June 1965	1205-1210	Feb. 1969	1439-1442	Oct. 1972
935-942	July 1965	1211-1216	Mar. 1969	1443-1446	Nov. 1972
943-950	Aug. 1965	1217-1222	Apr. 1969	1447-1450	Dec. 1972

SCHEMATIC NO.

ADMIRAL

Chassis:
C21B12-1, 1AG, 1AS, 1HR, 1N, 1R, 1C ... 910
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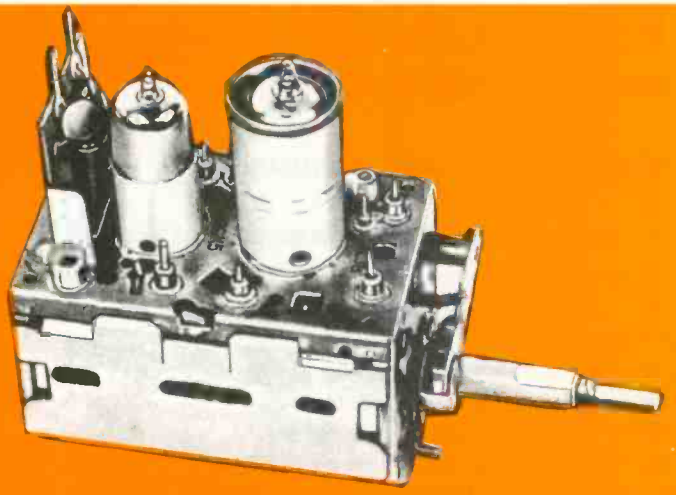

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ELECTRONIC TECHNICIAN/DEALER

DECEMBER 1972 • VOLUME 94 NUMBER 12

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EDITORIAL

Merger? We're for it!

Those publications really concerned about you and your professional future have printed much recent information concerning the activities of the National Alliance of Television Electronic Service Association (NATESA) and National Electronic Associations (NEA) as they prepare to develop a workable agreement for merger. As you probably know, NATESA is a national association of electronic service dealers (only), and NEA is a national association of electronic service dealers, plus (in many states) electronic technicians—the International Society of Certified Electronic Technicians (ISCET) also being an arm of NEA.

These groups represent the **only** national associations that we know of that are concerned **exclusively** with our phase of the electronic industry. They are to be commended for the work that has been done to improve the public image of the electronic technician and service dealer, to provide government with a more enlightened understanding of our profession, and to help those in our industry increase their revenue through more effective sales, servicing and business procedures!

Previous issues of **ELECTRONIC TECHNICIAN/DEALER** have given quite a bit of coverage to the First Joint Convention, held last August in New Orleans. Those of you who missed it, missed a sight that many of us will never forget—for as we ate together as one group, we **filled the huge** dining area—**even at breakfast!!!** And we were not the only ones impressed by our size. So were the manufacturers that came to see us!

As much as you and I cherish our personal independence, it frequently becomes apparent that individually we cannot even hope to accomplish tasks that can collectively be performed with relative ease. We simply do not have the financial, technical, business and political resources to do it alone. But just because we work together does not mean that we cannot continue to make our own personal decisions.

Show me someone active in national association activities, and I will show you a person who has developed enough personal success to become financially comfortable, or maybe even financially independent. Show me someone who is unable to maintain his business, and I will show you a person unwilling to give wholehearted support to one of these professional associations. It is just that simple! (There are, of course, others that do not fall into either category—those who have had some degree of success, but could come closer to their true potential if they really cared.)

I know quite a number of service dealers who want to take optimum advantage of association membership and thus belong to both NATESA and NEA. As an example, Jim Boyd, CET, of Rockledge, Fla., is not only Vice Chairman of ISCET but an active member of both NATESA and NEA. And he, like so many others, is very anxious to see a merger of these two great national associations—thus eliminating considerable duplication of efforts.

But we are not the only ones faced with such a duplication of efforts. Manufacturers wishing to demonstrate their support of electronic sales and servicing must (except for our joint conventions) be faced with the choice of putting up exhibit booths at either one convention or the other—or not wanting to appear partial, at both conventions or neither convention. And in the same manner, they are faced with the question of what association activities to support, and what efforts to duplicate or ignore.

It was about 10 years ago that there were disagreements among certain members of NATESA, and some left that association to form NEA. Since then, a number of those people have left their respective associations, and the two associations have become increasingly cooperative—NEA becoming the larger of the two groups.

Both of these associations are sincerely dedicated to the task of upgrading our profession. Both associations have dedicated leaders that have earned the respect of the industry. Neither association can hope to accomplish a merger without respecting the rights of the other.

Last month's issue of **ELECTRONIC TECHNICIAN/DEALER** included a detailed report of the first meeting of the Joint Merger Committee. Both associations have since had executive council or board meetings endorsing the results of this first Joint Merger Committee Meeting. The second (and possibly final) Joint Merger Committee Meeting was scheduled for December second and third in Denver, Colo.—having been held much too recently to be reported in this issue.

It is quite possible that there may not be a Joint Convention in Kansas City this coming August. By that time the members of both associations may have already approved the merger, and it may instead be a convention of the new association.

We are 100 percent behind this merger and are very pleased to see how well these efforts have proceeded. The new association will be even better able to help improve the lot of the electronic technician and service dealer.

Phillip Dahlen, CET

LETTERS

Reader comments concerning past feature articles, Editor's Memos, previous reader responses or other subjects of interest to the industry.

Still Considerable Confusion

I have read the various comments of the readers regarding CB Radio, and there still seems to be a great deal of confusion regarding what can be done and what cannot be done. I will put my two cents in for what it is worth.

I am a holder of an FCC License with a Radar Endorsement, and have held this license for 18 years. According to the letter of the law, I can maintain all types of two-way radios, including CB units. Also, I am a member of the American Association of Engineers.

I have taken care of approximately 125 60-to-100w mobile units and 5 100-to-300w base stations. This in addition to the engineering that goes with it.

I am not bragging, but setting my qualifications down on paper so that you can see that I am speaking facts as they exist.

1. What could I [if without an FCC License] fix on a CB unit? (This is a question that many TV/Radio technicians ask, both themselves and others.)
   A. You can fix (maintain) anything that does not affect the frequency nor the power. You can replace tubes in the receiver and so on. But, DO NOT REPLACE ANYTHING THAT WILL AFFECT THE FREQUENCY OR POWER.
   B. Should I make frequency checks? Yes—just as on the larger two-way radios that are around in cars and offices.
2. Do I need a copy of the rules and regulations?
   In Part 95.105, it states quite clearly that "Each licensee in this service shall maintain as a part of his station records a current copy of Part 95, Citizens Radio Service, of this chapter." This says "shall maintain." This does not mean, "could," "maybe," "when I get around to it," "next week." It means "right now." Many people who are taking care of Citizens Band radios do not have the current Part 95. This will spell out exactly what you can do and what you cannot do.

Too many TV/Radio technicians are getting all upset about what they can do and what they cannot do. From the letters that you have received, it is evident that they do not have a current copy of Part 95. As I said, this spells out what you, as a TV/Radio technician, can do and what you cannot do.

You may, by rule of thumb, replace tubes, transistors, vibrators, tighten loose bolts, and then inform the owner that "this must be fixed by a holder of a First or Second Class Radio License."

Just remember, neither you nor I make the rules, we only live by them. All the "sour grape" people will have to do is take the examination for a license and they too can fix Citizens Band radios—legally.

Your magazine is very good, but I would like to see more two-way radio articles in it.

Each of us (radio and television technicians) has his own special interest, so I realize that you cannot satisfy everyone, but in time. . . .

Thank you for listening to me spout off, but I just got tired of listening to all the people complain about the men that have FCC licenses and can fix CB radios, and they cannot (legally). It is off my chest now.

JOHN E. BUMBALCK

Holds Same View As in Editorial

Your editorial titled, "What's Wrong," that appeared in your September issue seemed very appropriate and I thought you might enjoy a few comments on your philosophical approach to ELECTRONIC TECHNICIAN/DEALER.

Your "Capitalism" came through very strong and indicated to me a type of character of which our country is becoming less familiar, namely, "The hard core middle-class America, with enough sense and understanding to criticize justly what is wrong with our society, and strong enough to hold their own individual values and pit them against an awesome tide of shallow, decaying minds, whose cures for the ills of our society are suicidal."

Our nation *is* becoming a "nation of sheep." The "follow-the-leader" attitude prevails throughout much of our society. Self respect, once an inbred quality in individuals, necessary for survival, is now a lost concept of belief. During much of our American History, a man knew his own worth because he had to work hard to eat and provide for his family. Now, it is not even necessary for a man to work to survive. Our welfare system, which

is responsible for this undertaking, in its final analysis, is the one most single factor in our history that deteriorates human self respect, the most important ingredient in the make-up of a man and a great nation.

I'm an individualist too, and a hypocrite on top of that, if that is what you call a person who has taken a good hard look at his country and dislikes what he sees. It is not our youth that is responsible for our apparent decaying condition, nor is it our government—it is simply ourselves. We as Americans must realize that as a nation we must nourish the individual in terms of self respect, creative ability, and a genuine depth of character. This philosophy is what it takes to be an independent service dealer and survive, and this philosophy is what America needs to survive. My hat is off to all independent business men throughout our country, for indeed they are the very backbone of this country, and I for one, am extremely proud to be part of that tradition.

JAMES E. OSBORNE

Afraid of Losing Business?

Is Robert O. Parsons afraid of losing some C.B. Business? If his complaint is "unqualified butchering," let him charge for these repairs. I do. When I get a "botched job," the repair price automatically increases $10.

Keep up the good work or stop all "fix-it" articles.

LES A. GOODMAN

Receives Excellent Response

I am writing to thank you for placing my free "Ad" in the Readers' Aid Section of the September issue of ELECTRONIC TECHNICIAN/DEALER.

I have received to date approximately 25 letters and cards—also a few 12A8 tubes were sent.

I would like to thank all of the kind people that responded.

The radio, which belongs to a friend of mine, is now working fine.

MR. G. I. ROBERTS

Possessions Never Found

I want to thank you—first, for featuring my letter in the September issue and, second, for sending me extra copies of that issue.

We have moved back to Mt. Prospect, after our disastrous trip to Kansas City, and are getting reestablished again.

As a direct result of printing my letter, a retired TV man in Norwich, Conn. has voluntarily sent me some of his equipment and tools—an act of generosity that I deeply appreciate.

In relation to your Crime Issue—was the ease in which this large U-Hall truck was stolen. It was parked over night at a motel near St. Louis, securely locked and in a brightly lit area 30 ft. directly in front of our motel door. The thief must have had a duplicate key.

I might add that in the past six months we have heard nothing about our stolen possessions or the 30 ft. truck that they were in. The police have never contacted us and I doubt if a search was ever made.

Thank you.

WILLIAM R. BURGESS

Field Work Hints

The new Vector voltage and current test adapters are very good, particularly for measuring cathode and screen current in the horizontal output tube. This is especially useful on house calls, because I'd rather not carry the horizontal output tube current meter around in the car.

I have to take a VOM anyway, and it takes a beating from the vehicle vibration.

Do you know that a meter should be transported face down? The reason is to put the wear and tear on the front pivot. We want to protect the rear pivot because, for best accuracy, the meter lies on its back and the movement balances on the rear pivot.

Getting back to the Vector adapter, I have one that fell apart from bouncing around in the tool box. So, I drilled a hole through the center of the base, cemented a nut in the barrel of the upper portion of the adapter and installed a nylon screw to hold it together. (The screw held the nut in place while the cement hardened.)

Now, I can disassemble the adapter for cleaning or just adjust contact tension with a turn of the screw.

EDWARD H. SAMPLE

A Smack of Arrogance

After reading many of your editorials, I am sure you do agree with me and many other CET's that licensing or certification of technicians is becoming more and more necessary. Not only from the consumer's standpoint but also from the shop owner's.

When commenting on a prospective technician from another shop owner, what can be said? "He'll be okay for your shop?" I consider this comment rather arrogant because how does this shop owner know what standard of

continued on next page

LETTERS . . .

continued from page 25

competence the other shop owner is looking for in a technician? On the other hand, certification makes the competence of a CET more uniform. Perhaps the system is not perfect, but it is far better than none or the former.

There have been many comments concerning the CET Test in your magazine. I give more support to the theory side of the test. Theoretical applications of troubleshooting are much more practical. The shotgun method (replacing part after part until either the bad one is found or he's run out of parts or butchered up the printed-circuit board) should be done away with.

I cannot be sure of someone who comes to me with no certificates, or who is not willing to take a practical theory test. Some technicians have said, "I can fix any set in your shop, but I won't take your test." This again smacks of a little arrogance. I can't understand how an uneducated technician can possibly locate open or leaky capacitors, open transformers, open or shorted transistors without the proper knowledge of the circuitry, because they certainly can't be found by just looking at them.

It is high time that a technician be capable of more than merely replacing burned resistors, picture tubes, cleaning tuners or anything that requires only the five senses. Through certification/licensing, we hope technicians will be more qualified and the standards of competence more uniform.

With proper knowledge of Ohm's law, Kirchoff's law and the fundamentals of vacuum tube and transistor theory, along with the proper use of test equipment, I am sure a technician should be well prepared to troubleshoot.

Experience will help him a lot, but with an understanding of the fundamentals he is less apt to tell his boss, "Gee, I never ran into this before," which is typical of the five-senses memory-bank-of-troubles type of technician.

The educated technician will most likely develop his own servicing techniques. He should be familiar with varactor diodes, FETs and new developments. Solid-state devices are here to stay and the more knowledge about them, the more proficient a technician will be.

ROLAND (RON) MEYER, CET

Editorial Hit Too Closely

If all the specialized fields of electronics were equated to 100 percent, the home entertainment field would be 2 to 3 percent. That's not meant to be derogatory, it's a fact. In nine years as an electronics technician, I've hit nearly 75 percent, and that's not bragging —rather, a rough way to spend nine years. It's just a shame that one of the most interesting of all the fields of work is so plagued by questionable techs and employers.

I am no longer working full time in home entertainment electronics, having gone into industrial electronics in order to make a decent living. My gross wages as a bench tech for a wholesaler near here were less than my net wages when I was discharged from the Navy, and they're both far, far less than I get in industry—along with all the benefits of a union but no union. Consumer electronics is extremely satisfying, but 'ya gotta eat!

The wholesaler that I worked for supposedly supports the local association but is not active. Even after becoming a CET, I was considered an apprentice. Words and actions never seemed to coincide. I'm afraid your June editorial fit all too closely.

I plan to continue work in consum-

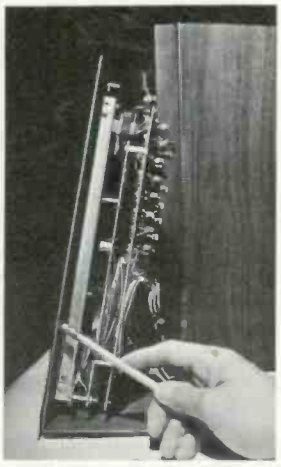
continued on page 64

NEWS OF THE INDUSTRY

TV Picture Displayed On Thin Matrix Panel

Research scientists from Zenith Radio demonstrated a newly developed thin-panel TV display employing the gas-discharge principle at the IEEE Conference on Display Devices in New York City on Wednesday, October 11, 1972. The experimental unit demonstrated at the Conference employed a Burroughs "Self-Scan" panel and showed only a portion of the TV picture.

This thin panel was operated next to a 25-in. diagonal color-TV set masked to show the same portion—12 percent



Front and side views of the thin-panel gas-discharge display. Without the associated electronics, the panel is 5/8-in. thick.

of the picture width and 43 percent of its height—with the brightness and contrast turned down to match the output of the thin-panel display.

The report indicates that other attempts to produce panel displays have been made in the past—employing incandescent lights, electroluminescence, liquid crystals and other techniques. However, the Zenith thin-panel display is said to be the first matrix device to produce a TV picture of sufficient quality to warrant comparison with a CRT.

More Virginians Take CET Exam

VEA State President John McPherson journeyed from Yorktown to Lynchburg, Va. to administer the CET Tests to interested parties in the western part of the state. The facilities of the Virginia Community College were made available to the seven persons who assembled for the test on Sunday, October 22, 1972.

The testing session followed a Saturday evening meeting of members from VEA-Lynchburg and VEA-Danville to discuss the pros and cons of state licensing.

The questions provided below are representative of those included in Section VII of the CET Exam.

Section VII

Tests and Measurements

1. What should be determined to safely use an ohmmeter on its lowest ohms range in measuring a transistor junction?
2. Use of an attenuator probe on a scope instead of a direct probe (increases/decreases) loading of a circuit under test by (increasing/decreasing) resistance and (increasing/decreasing) capacitance.

continued on next page

NEWS . . .

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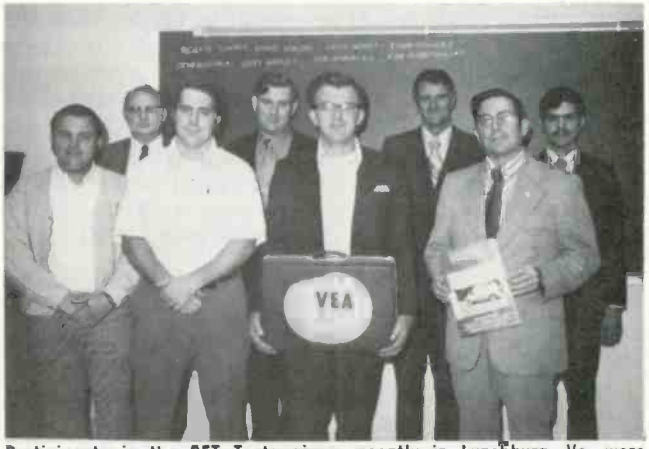
3. What is the voltage that would be measured with a dc voltmeter from a generator producing the waveform shown below? On an ac voltmeter? ($t_1 = t_2$.)
4. What should the front-to-back resistance ratio of a good silicon diode be?
5. The trouble in a set will clear up if a very leaky capacitor is bridged with a known good capacitor, if the leaky capacitor was the cause of the problem. (True/False.)

Explanation

1. Before using the lowest ohms range of a meter to measure a transistor junction, the maximum safe forward current for that junction should be known, plus the short-circuit output current of the ohmmeter. If the ohmmeter delivers 300ma for example, and the maximum current that can be safely handled by the junction is 100ma, the junction could be damaged during testing.
2. Decreases, increasing, decreasing. The ac and dc loading effects are decreased because the probe has a resistor and capacitor between the circuit under test and the input impedance of the scope. The resistor increases the resistance, and the capacitor—because it is in series with the input capacitance—decreases the capacitance.
3. The average value of the waveform is 5v, since half the time it is at 10v and half the time it is at 0v. The dc voltmeter would measure 5v. An ac voltmeter should not be used, since it is accurate only on sinusoidal ac.
4. 100-to-1. Germanium diodes could be less, with selenium even less.
5. False. A leaky capacitor has an appreciable drop in resistance, the resulting current remaining in the circuit to cause a problem. Hum may be reduced, but the problem cannot completely disappear.



Participants in the CET Tests given recently in Lynchburg, Va. were (rear, l to r) Richard Sandige and Dan Bowling, instructors at the Community College in Richlands, Va.; and Julius Morris and Edwin Fowlkes from Morris Electronics in Burkeville, Va.; (front, l to r) Joe Henderson and Jerry Hartley from the Western Virginia Community College in Lynchburg; Ted Jennings of Jennings Electronics, President of VEA-Lynchburg; and John McPherson, CET, VEA State President (displaying the October issue of ELECTRONIC TECHNICIAN/DEALER).

Anyone wishing more information concerning the CET Exam may circle Reader Service No. 717.

Anyone wishing more information concerning the International Society of Certified Electronic Technicians may circle Reader Service No. 718.

Alarm System Scares Burglar So Badly that He Leaves Car

At about the time our September issue was coming off the press, Couch's Inc. (described in that issue as the victim of many a burglary) was again being put to the test.

On September 7th, the front window at Couch's was smashed with such a powerful blow that glass flew over 15

Another smashed window, plus this time a "hot" car left behind at Couch's Inc.

ft into the store. In fact, it even chipped the picture tube face of a portable color-TV set ruined by the break.

A fine, nearly invisible wire secured to the window was, of course, also broken, triggering the amplifier-tape player shown on page 44 of our September issue. The ensuing noise (siren and voice described in that article) must have literally frightened the would-be robber away.

Arriving just moments later, the police discovered more evidence of a hasty departure. An automobile, stopped with the motor running, was still parked at Couch's back door. The car was later found to be "hot."

Before Charles Couch, Jr., CET, arrived to deactivate the alarm, many Gainesville residents phoned police to complain or inquire about the noise—some even suspecting an air raid. This certainly attested to the audibility of the system.

Thus, the cost of planning and installing an alarm system was certainly justified. The thief or thieves would almost surely have escaped with merchandise worth hundreds of dollars had the alarm not frightened them away.

continued on page 65

READERS' AID

Space contributed to help serve the personal needs of you, our readers.

Equipment For Sale

I have several pieces of service equipment for sale. Please write for listing and price.

VAL OBAL

3201 S. 73 St.
Omaha, Neb.

I have a Hewlett Packard Signal Generator Model 608D for sale. Please write for price.

JOHN V. CAVASEND

87-10 Lefferts Blvd.
Richmond Hill 18, N.Y.

One 1972 picture tube rebuilding unit manufactured by Lakeside Industries with additional supplies for sale.

CARL H. MEYER

P.O. Box 973
Vista, Calif. 92083

Used TV Analyst, oscilloscope and electronic Switch for sale. Selling due to illness. Please write for information.

JACOB PETTNER

1624 2nd Ave.
Conway, Pa. 15027

Because of employment outside of the U.S., I will sell unused CRT rebuilding equipment for any reasonable offer. Will deliver.

BERNARD STERNO

3011 Redwood St.
Brunswick, Ga. 31520

Going out of audio service and I have the following pieces of equipment for sale: Hewlett-Packard Model 205AG Audio Signal Generator and Model 330B Distortion Analyzer in good condition.

H. F. BILTERMAN, CET

110 So. Conrey
Knoxville, Iowa 50138

Back Issues for Sale

I have back issues of ELECTRONIC TECHNICIAN/DEALER, including Tekfax schematics, from Sept. 1952 to current issue for sale.

J. E. COHEN

13457 Magnolia Blvd.
Van Nuys, Calif. 91403

Business for Sale

TV business for sale in central Wisconsin, which includes a three bedroom apartment above store, also apartment and store rental.

WILLIAM RALLOFF

2016 Wisconsin Ave.
New Holstein, Wisc. 53061

I am selling a well-credited TV shop in Florida with a very good location and low rent for a reasonable price. Please write for details

M. C. DI PIERRI

213 Palm Ave.
Hialeah, Fla. 33010

Service Information

I have retired from the TV repair business and am trying to dispose of some Rider's radio manuals—No. 1 to 15 with indexes. I would like to give them away to anybody able to use them, either a school or library, etc. I also have a Rider's TV manual No. 1.

HERMAN MARCUS

4335 44th St.
Long Island City, N.Y. 11104

Equipment Wanted

We have a new radio and TV service school that opened in August for juniors and seniors in high school. We would like to purchase used test equipment and a complete set of Sams Photofacts from No. 500 to date.

RALPH DOROUGH, INSTRUCTOR

3101 Clinkenbeard Dr.
Killeen, Texas 76541

Information Wanted

I am in need of a schematic diagram, operational instructions and maintenance manual for a General Electric Oscilloscope Type SC2A. I am willing to borrow or buy the information.

ROGER FLETCHER

Cumberland/Perry Area
Vocational-Technical School
R.D. #4 Willow Mill Rd.
Mechanicsburg, Pa. 17055

Schematic Needed

I am in need of a schematic and parts list for a Citreon tape recorder Model 660. I would be glad to reproduce or pay for reproduction if anyone can provide me with the information.

ROBERT L. HELMS

1514 Auburn Dr.
Colorado Springs, Colo. 80909

BOOK REVIEWS

ELECTRONICS SELF-TAUGHT WITH EXPERIMENTS & PROJECTS *by Jim Ashe, published by Tab Books, 288 pages, hardbound $7.95, paperbound $4.95.*

Although we have stressed the importance of understanding the theory of how electronic circuitry functions, there is a lot that can also be said concerning the value of practical experience—the first-hand observation of circuit functions—for more effective servicing. This book describes such basic circuit functions and then helps you demonstrate them by experimenting with simple projects.

After a review of the history of electronics and some ideas on developing one's skills in the first chapter, the second chapter goes into some practical considerations concerning the design of an effective bench and work area, plus the selection and maintenance of appropriate tools and instruments.

In the chapters that follow the author progresses from such fundamentals as a charged comb attracting balls to the design of phase-shift oscillators. Each chapter concludes with complete circuit schematics and construction tips for proving to yourself that components do function as described in the book.

We feel that this book is excellent for improving your understanding of fundamental solid-state circuitry.

MODERN DICTIONARY OF ELECTRONICS *by Rudolf F. Graf, published by Howard W. Sams, 688 pages, hardbound, $12.95.*

Dictionaries certainly do not make the most exciting reading for a review, but on the other hand, this fourth edition does contain a lot of interesting, useful information. The publisher indicates that it includes more than 18,000 terms.

Upon looking through the dictionary we find that a good portion of the terms included in this book are those that should be known by the electronic technician. We feel that those encountering an unfamiliar term when servicing an electronic product will find the description of that term very clear and easy to understand. Illustrations are also included in many cases to help explain the term.

We feel that this dictionary is a must for all electronic technicians and service dealers that realize the importance of a resource library.

NEW AND NOTEWORTHY

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

FOR MORE NEW PRODUCTS SEE PAGE 58

EDUCATIONAL FM/SCA RECEIVER 700

Employs crystal controlled oscillator for frequency accuracy

A completely self-contained professional educational receiver, Model TR-E2, is designed for continuous use. Operation is as easy as using a standard FM receiver, with controls consisting of only a combination ON/OFF switch and VOLUME control. This unit is housed in an attractively styled metal cabinet with a beige textured finish, and a front-mounted speaker with fabric grill. The main channel sensitivity and high-Q input circuits minimize cross-talk and give wide dynamic range. The oscillator is reportedly crystal controlled to guarantee on-frequency operation, without user adjustments. Optional features include a rear mounted main/subchannel switch and headphone jack. McMartin Industries Inc.

TAPE PLAYER 702

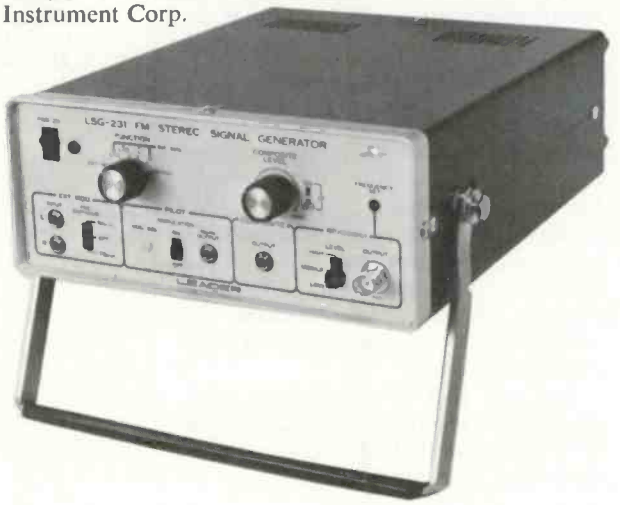
Special brackets simplify insertion and removal

For motorists who love a great tape sound but who still want to keep in tune with their local FM Stereo sounds too, a combination FM Stereo and Stereo 8 tape player is offered. The Model 12R600, with five integrated circuits plus 8 transistors, has a rated output of over 16w peak power. The tape player's alignment reportedly eliminates the need for any fine tuning controls. The unit can be installed with the company's special "Quick Release" mounting brackets, featuring smooth sliding tracks for easy insertion and removal of players, while locking a player into position with the turn of a key. RCA Parts and Accessories.

FM MULTIPLEX STEREO GENERATOR 701

Compact with dual power supply

The Model LSG-231 Multiplex Stereo Generator is said to have unusual precision and stability. The generator has a pilot signal frequency of 19kHz with a rated accuracy of ± 2Hz. The 1kHz audio signal is said to be accurate to ± 1%. Signal separation is rated at 50dB with an output voltage of 0 to 3v rms, continuously variable. Specifically designed for the field or workbench, this unit reportedly offers such high reliability that many technicians may not find it necessary to use a scope. It is said to be easy to operate, compact and complete with a handy tilt stand. The generator has a dual power supply and measures 8 in. W by 12 in. D by 3½ in. H. Weight 5.5 lb. Leader Instrument Corp.



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Save up to 40 minutes per installation

Coffee, lunch or whatever kind of break with the extra time you'll have using our new Speed-Fit replacement CRT's with premounted hardware.

Speed-Fit CRT's eliminate the need for transferring hardware from the dud to the new tube and can save you up to 40 minutes per installation. They'll do it in all RCA 25", Motorola 908, 914 and 914A and Zenith 20XIC36, 20XIC38, 23XC36, 23XC38 23XC38Z, 25MC35, 25MC36, 25MC46, 25NC38 chassis. Our Zenith Speed-Fit models even come with a one-piece shield that slips on easily!

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And we want you to have it on us---with the new Speed-Fit CRT line!

CHANNEL MASTER Speed-Fit* PICTURE TUBES

*PATENT APPLIED FOR

FROM CHANNEL MASTER PICTURE TUBE HEADQUARTERS

. . . for more details circle 105 on Reader Service Card

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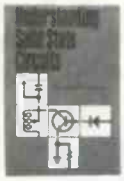
List Price $6.95 • Order No. 486

Understanding Solid-State Circuits



This brand-new book truly eliminates the mystery of solid-state circuits and devices. Written to serve the interests of anyone at the sub-engineering level (service technicians, hobbyists, students, etc.), the content thoroughly explains semiconductor circuit operation without delving into electrochemical physics and high-level mathematics. Encompasses amplification, feedback, sinusoidal and nonsinusoidal oscillators, gain control, logic circuits, and integrated circuits. Semiconductors covered include SCRs, FETs, ICs, light-sensitive and voltage-sensitive devices. The perfect text and reference on solid-state devices and basic circuit operation. 192 pps., over 150 illus.

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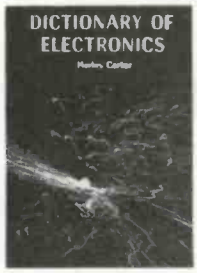
DICTIONARY OF ELECTRONICS



You'll find this huge volume extremely useful in whatever connection you have with electronics. This dictionary of electronics defines most all of the electronic terms you will run across in your everyday reading . . . from alpha particles through zoom lens . . . defines the terms you need and use most often, including those found in radio, TV, communications, radar, electronic instrumentation, broadcasting, industrial electronics, etc. It provides full, complete and easily-understandable explanations of thousands of specific electronics terms (such as transistors, acoustic feedback, alpha particles, beat oscillator, final anode, electrostatic lens, nonlinear resistance, pool cathode, etc.). A unique feature of this selection is the cross-indexing, whereby key words contained in the definitions (words that are defined more fully elsewhere in the book) are printed in small capitals so you are not left in the dark by any definition. An example of this is the definition for "Susceptance," which includes the words "Conductance," "Admittance," "Resistance," and "Reactance," indicating other applications. Appendix material includes a list of units and abbreviations, graphic symbols used in schematics, component color codes, db conversion tables, data on the electromagnetic spectrum, tube base diagrams, etc. 420 pps., 487 illustrations. Hardbound.

List Price $8.95 • Order No. 300

Practical Color TV Servicing Techniques

This brand-new updated and expanded second edition contains troubleshooting guidelines and case histories on the latest solid-state receivers, including a 4-color section with 32 trouble-symptom photos and a foldout section with 6 complete TV receiver schematics. Now included are service tips and techniques on RCA, Motorola and Zenith solid-state chassis, plus a host of case histories and current data on G.E. chassis. In fact, each of the 12 chapters is filled with information applicable to virtually any brand of color TV receiver, enabling you to solve tough-dog troubles quickly. 404 pps., 250 illus. Hardbound.

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Motorola Color TV Service Manual - Vol. 2

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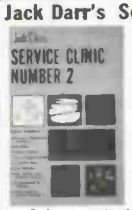

Here's more of the Jack Darr wisdom (and wit!) in book form—a valuable collection of timely service hints and trouble solutions covering color and monochrome TV, radio, stereo, phonos, recorders, QB gear, etc. Discusses the "engineering" servicing approach, efficiency, and how a technician may condition his thinking to produce more in a given time period. Like the first volume, the content was selected on the basis of usefulness to the average technician, covering a wide range of electronics devices. Each of the 10 chapters covers a general category of interest, and in each the subject matter is arranged in logical order to enable you to find what you need quickly. Provides a wealth of information. 176 pps., numerous illus. Hardbound.

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Sylvania rare earth red phosphors	yes	yes	yes
Other manufactured rare earth phosphors	no	no	yes
All sulfide phosphors	no	no	no
X-ray inhibiting glass	yes	no	no
New glass	yes	some	some
Reused glass	no	some	some
Regunned	no	no	some
Screen blemish specs	OEM	OEM	slightly wider than OEM
White field uniformity	OEM	slightly wider than OEM	slightly wider than "RE"
Cut off; purity currents; beam shield leakage	OEM	OEM	slightly wider than OEM

TEKLAB REPORT

Introducing Heathkit's Dual-Trace Oscilloscope

by Joseph Zauhar

By assembling this kit one can step-up to a professional-type dual-trace scope for but a moderate cost

■ Each year we find more trigger-sweep, dual-trace scopes introduced, but Heath's Model IO-105 is the first one that we have encountered in kit form. This scope was sent to us by the manufacturer for assembly and review. This instrument has many features found in more expensive scopes, making it a versatile tool for the service bench at but a moderate price.

The oscilloscope has calibrated vertical and horizontal circuits permitting precise voltage and frequency measurements of complex waveforms. The Channel 1 and Channel 2 circuits are identical with dc-to-15MHz wideband amplifiers. The VOLTS/CM ATTENUATOR switches provide nine sensitivities from .05 to 20v/cm, with variable sensitivities at each switch position. Any one of 18 calibrated horizontal time bases can be selected by the TIME/CM switch, providing frequency measurements of applied signals. The triggering controls allow the time base to be triggered at any point along the positive or negative slope of the input signal.

The Channel 1 and Channel 2 input signals can be individually displayed as a function of time in either the CHANNEL 1 or CHANNEL 2 mode, while the CHOP MODE samples the input signals at a 50kHz rate so that both signals appear as a function of the same time base. The ALTERNATE MODE displays the input signals alternately on successive sweeps. Trapezoidal and Lissajous patterns—which are useful in studying modulation characteristics and frequency, plus phase comparisons—can be checked by placing the VERTICAL MODE switch in the X-Y position. The inputs used are Channels 1 and 2 on the front panel of the scope.

Heathkit's Model IO-105 Dual-Trace Oscilloscope.

Assembly

Some electronic technicians feel that they do not have the time to assemble an instrument in kit form, but there are a number of advantages for those that do: Not only do you have the pride of assembling the instrument yourself, you also become familiar enough with it to correct any difficulties which you may eventually encounter in the scope, saving repair time and costs. Another important feature is the calibration of the scope, which may drift after a period of time. In many cases factory instruction manuals included with an assembled instrument only cover the calibration of the vertical amplifier and attenuator. The manual supplied with this kit clearly

instructs you on how to calibrate any circuit in the instrument.

We assembled the oscilloscope in a relatively short time, following the clearly illustrated step-by-step assembly manual provided with the instrument. We first assembled the six modular circuit boards in the following order: vertical switching, two vertical preamplifiers, horizontal amplifier, power supply and the deflection circuit board.

The vertical subchassis was the first unit completed. It contained the vertical switching circuitry and two vertical preamplifier boards. This subchassis is a drawer type unit that slides out of the main chassis and employs socket connectors on the wire harness to simplify removal if required. The assembly of this as well as other chassis units was simplified by factory assembled wire harnesses.

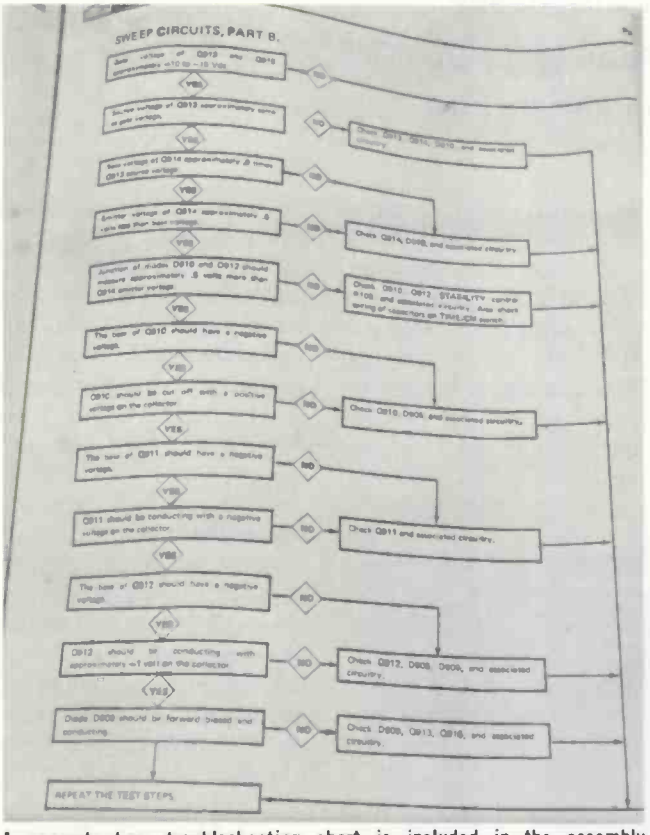
After the chassis was assembled, but before the scope was turned ON, we measured the resistance of various voltage taps to prevent component damage in case of error in assembling the unit.

When the unit was turned ON, the first check made was to measure the voltages at the given test points on a chart. When any of them did not agree with the voltages given, we went to the "In case of Difficulty" section of the manual and corrected the problem before the unit was again turned ON.

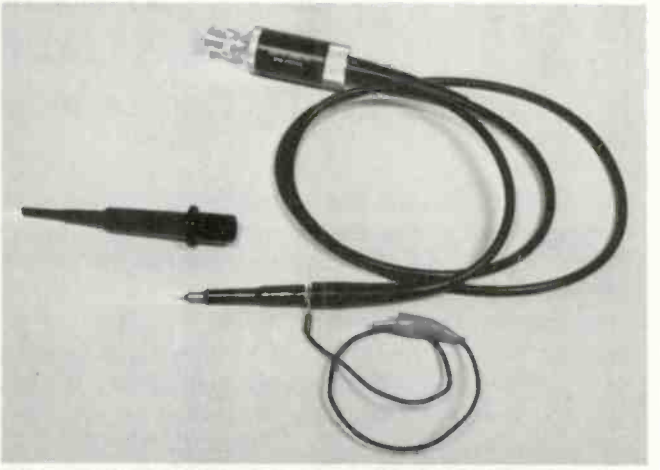
Assembling Hints

We cannot claim we did not make any errors in assembling the unit, but they were quickly corrected by going back to the step-by-step instructions of the particular circuit in question.

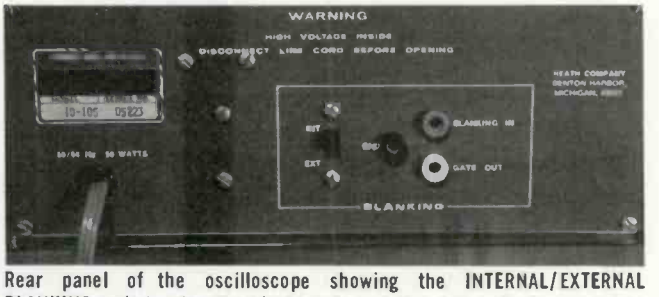
In one instance, we found the rotary VOLTS/3CM switch shield sheet-metal screws to be just a little long, shorting out the vertical preamplifier board



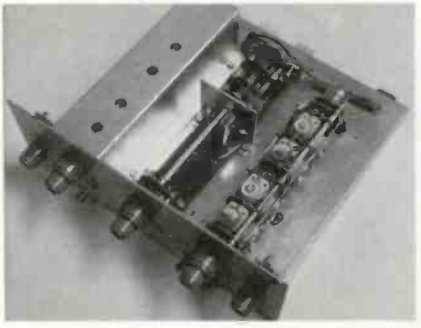
A computer-type troubleshooting chart is included in the assembly manual if service is required.



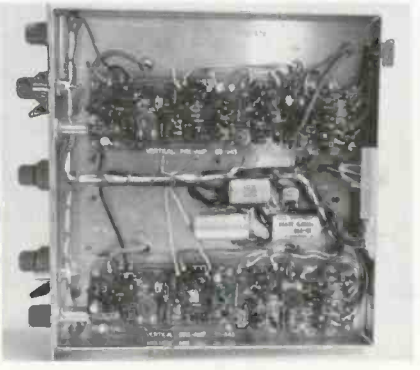
The Heath Model PKW-101 oscilloscope probe is a high-impedance, low-capacitance isolating type probe used to examine high-frequency waveforms without distorting the waveform or loading the circuit.



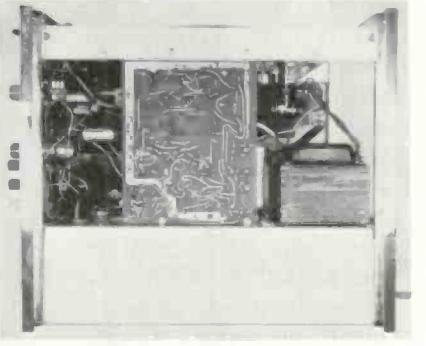
Rear panel of the oscilloscope showing the INTERNAL/EXTERNAL BLANKING switch, plus the blanking in and the gate output connectors.



The assembled vertical subchassis with the right switch shield removed.



The bottom of the vertical subchassis showing the Channel 1 and 2 vertical preamplifier circuit boards.



Side view of the assembled oscilloscope with panels removed, exposing the horizontal circuit board.

Oscilloscope Specifications

VERTICAL

Accuracy	±3%
Input Impedance	1M shunted by 35pf
Maximum Input Voltage	600v dc
Sensitivity	ac or dc: .05v/cm
Frequency Response	dc to 15MHz: 3dB with 4cm deflection
Vertical Windows	2 minimum
Rise Time	24ns
Overshoot	Less than 10%
Attenuator	9 positions in a 1, 2, 5 sequence. .05v/cm to 20v/cm. Variable gain (uncalibrated) through entire range
Vertical Display in Sweep Mode	Channel 1, Channel 2, Channel 1 and Channel 2 alternately, or Channel 1 and 2 chopped (50kHz)

HORIZONTAL

Time Base	Triggered with 18 calibrated rates: .2μs/cm to 100ms/cm in a 1, 2, 5 sequence, ±3%. Continuously variable (uncalibrated) within the same range.
Sweep Magnifier	X5 (time base accuracy is ±5% when the magnifier is being used)
External Horizontal Input	750mv/cm (uncalibrated and not adjustable). 100K minimum input impedance, dc to 100kHz

X-Y MODE

Sensitivity	.05v/cm to 20v/cm, ±3%
Frequency Response	—3dB at 100kHz (Channel 2)
Phase Shift between Channels	±5° or less from dc to 50kHz within graticule limits

TRIGGERING

Delay	Approximately 600ns
Automatic	Zero crossing to ±½cm of zero crossing
Normal	Within viewing area
Source	Channel 1, Channel 2, or Channels 1 and 2
Polarity	+ or — slope
Coupling	ac or dc
Sensitivity	Internal: ½cm. External: 100mv minimum, 7v maximum

GENERAL

Blanking In	TTL compatible (logic 0 blank)
Gate Out	3.5v minimum
Input Connections	Vertical: Coaxial, BNC. Horizontal: Binding post. External Trigger: Binding post on ¾-in. center with ground
CRT Accelerating Potential	2200v dc regulated
CRT Type	8 × 10cm rectangular, flat face, D14-107GA
Warm-up Time	CRT heating time, approximately 30 sec. For full calibration, approx. 15 min.
Graticule	8cm × 10cm grid, edge lighted
Overall Dimensions	10⅝ in. wide by 12⅜ in. high by 15 in. deep
Net Weight	28 lb

Probe Specifications

Input Resistance	10M
Input Capacitance Range	Up to 40pf
Connector	BNC
Maximum Voltage	600v dc or 600v ac p-p
Attenuation	10:1 (with oscilloscope having 1M input resistance)
Attenuation Accuracy	±3%
Frequency Range	dc to 30MHz

under the vertical subchassis. Also, a manufacturer suggested change was made to protect the input FET transistors (Q402 and Q403) from transient spikes on early production models. This was done by connecting 0.1μf/100v capacitors in parallel with resistors R407 and R408 on each vertical preamplifier board.

Calibration

The instruments needed for calibration are very minimal. In fact, about the only instrument required is a high-input-impedance voltmeter. This method of calibration is advisable unless a precision signal generator is available, because the final oscilloscope accuracy depends almost entirely upon the accuracy of the signal generator.

This simplified calibration method is made possible with an internal 100kHz crystal-controlled oscillator built into the scope just for calibration purposes. We were curious about the accuracy of the oscillator frequency, so we checked the frequency with a frequency counter and found it to be within 17Hz of the 100KHz specified, and "rock solid" without drift.

The calibration of the scope was quite easy following the step-by-step instructions given in the assembly manual. The first part of the calibration consisted of adjusting the +15 and −15v supply voltages and the dc level voltages, then the following adjustments: trace, triggering, vertical calibration, sweep calibration and input attenuator compensation adjustments. The voltage for the vertical calibration is also obtained from the regulated 15v power supply terminal found in this instrument.

The triggering adjustments were the most time consuming and critical, but after reading the instructions over a few times we got the traces to lock in very solidly.

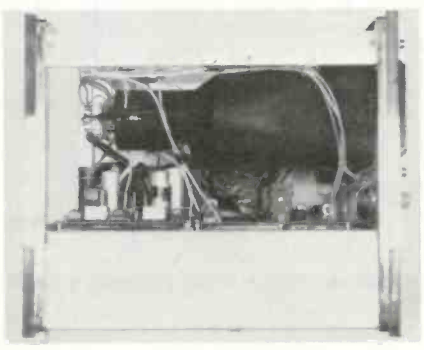
High Frequency Probe

The probe used with the scope to examine the various waveforms was the Heath Model PKW-101, a high impedance (low capacitance) isolating type probe.

This probe can be used to examine high-frequency waveforms without distorting the waveform or loading the circuit, and can also be used in any other application where a high-impedance probe is desired.

A trimmer capacitor adjustment compensates for the internal capacitance in the probe and probe cable, and at the same time it matches the probe to the particular input capacitance of the scope. We made the trimmer adjustment in the usual way by connecting the probe to the output of a sine/square-wave generator set

continued on page 65



After the side panels are removed, most of the circuits are exposed, simplifying adjustments. Note the all shielded 8 × 10cm rectangular flat-face CRT.

Electronic Security Part II—Automatic Telephone Dialer

by Terry Tuttle and Tom Turnbull

Once an intrusion has been electronically detected, the alarm must be transmitted to some location where it can do some good.

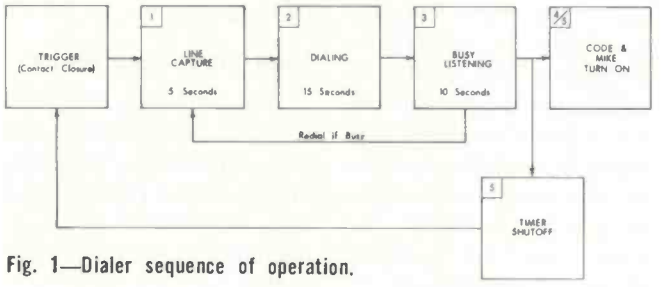


Fig. 1—Dialer sequence of operation.

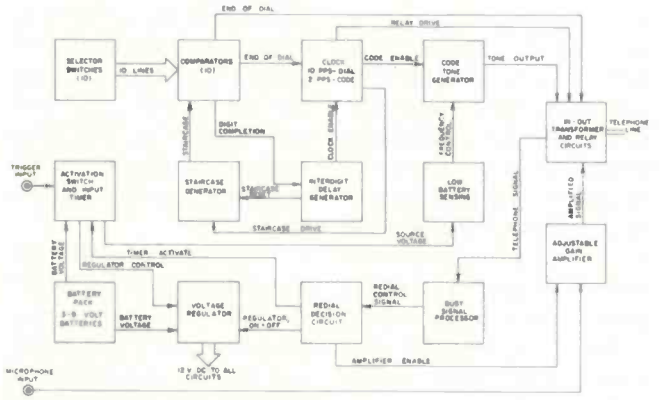


Fig. 2—Block diagram of the Dialer.

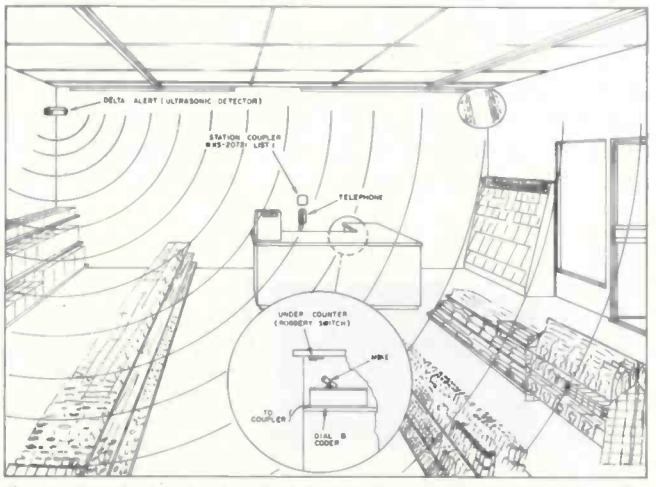


Fig. 3—Sketch showing the final installation of the electronic security system.

■ The Automatic Telephone Dialer can be programmed for dialing the police, a neighbor, friend or relative to indicate an alarm condition. Those with shops located elsewhere, may even use the system for signaling the alarm at their home. This system has the advantage of not requiring any special leased wires, dialing the desired party on existing telephone lines.

The unit described in this article is completely electronic—solid state—with no moving parts other than a reed relay. Upon receiving a contact closure for activation, the unit proceeds through the following sequence (Fig. 1):

1. Line Capture—connection is made to the telephone line and sufficient delay is provided to obtain a dial tone.
2. Digital dialing—unit proceeds to dial preset number at the rate of 10 pulses per second, with 2 sec. spacing between digits. (Break/Make ratio is 60/40.)
3. Line Busy Detection—system listens for a 10 sec. period to determine if the called number is busy. If the line is busy, the unit "hangs up," waits 15 sec., and then redials the number. This redialing continues until the line is no longer busy.
4. Listening Mode—sensitive microphone is switched ON, enabling called party to listen in on the room covered by the detection equipment.
5. Identifying Code—tone code is superimposed on the line every 12 sec., identifying calling location.
6. Automatic Reset—the Dialer "hangs up" and turns itself OFF after 1½ min. of operation.

The block diagram of the Dialer is shown in Fig. 2 with arrows indicating the direction of signal flow. Although appearing rather complex from the block diagram and circuitry involved, the Dialer and Coder operate in a straightforward manner.

The phone number and code are set in the Dialer by cross connecting the voltage taken off a voltage divider to the appropriate comparator. The cross connection is through a 10 × 10 matrixing switch (Fig. 4).

The circuit (shown in Fig. 5 on the third page of this article) is activated by shortening the trigger input jack, which latches an SCR in series with the battery pack. The battery voltage is then fed to the voltage regulator, and the voltage regulator in turn activates all circuits, providing the operating voltage.

Upon receiving an operating voltage, the output relay closes, presenting an "off hook" signal to the telephone line. The first comparator is reset by the operating voltage turn-ON. After a 5 sec. delay, dialing starts. The dial pulse generator that drives the telephone line relay also supplies the input to a staircase generator, with each pulse stepping up the output of the generator by ½ v. When the comparator senses that the staircase generator output is equal to the voltage switched from the divider, it changes state, stopping the dialing of that digit and activating the interdigital delay. The staircase generator resets to zero during the interdigital delay. The "switching" of a comparator resets the next comparator in line. This process continues until the last of the dialing digit

Mr. Tuttle is Chief Engineer and Mr. Turnbull is Development Engineer for Delta Products, Inc.

comparators activates. There are eight dialing comparators, but any comparator can be switched OFF, giving the desired number of digits.

The change of state of the eighth comparator generates the end-of-dial signal, which turns ON the busy signal processing circuitry. If a busy signal is present, the unit "hangs up" by turning OFF the power supply. The dialer redials after a short time and will continue the wait-and-redial process until it does not receive a busy signal.

The end-of-dial signal also turns ON the code tone generator and slows the frequency of the pulser to two pulses per sec. If no busy signal is present, this puts a series of beeps on the telephone line as well as connecting a microphone to the line through a high-gain amplifier. The beeps are counted by the code comparators as were the digits by the dialing comparators.

The two-digit code is produced by a recycling circuit that causes the dialer to repeat the code digits on a 12 sec. interval. This enables a person to identify the origin of the call and to hear what's going on as well.

The unit will turn OFF after about 1½ min. of "listening" generating the code.

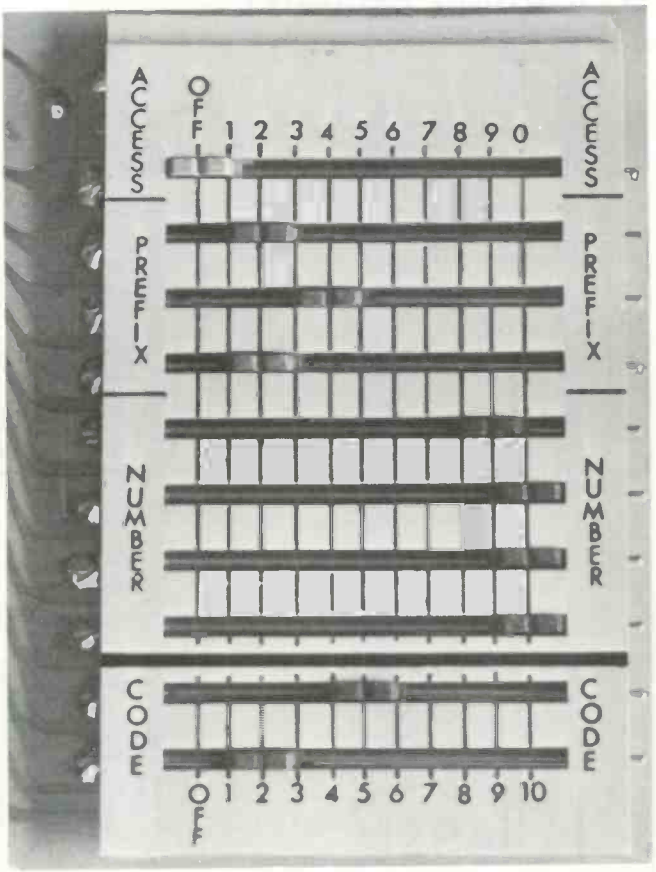
A low-battery sensing circuit has been incorporated into the Dialer and Coder for recognition of weak batteries. At approximately 16v, this circuit switches and causes a radical lowering of the code frequency. The batteries may also be checked externally, using a voltmeter connected between the trigger and microphone connections.

In most cases, the Dialer will be installed in an "out of the way" spot with the microphone located for best pickup. If the KS-20721 Station Coupler (Telephone Company installation) is used, it will probably be mounted near the telephone. To minimize the necessary interconnection wiring, locate the Dialer near the Coupler. The only wiring left is the connection between the ultrasonic detector and the trigger input of the Dialer, which requires only one pair of conductors.

To complete the system installation (using both the Automatic Telephone Dialer described in this article and the Ultrasonic unit described on page 42 of the October 1972 issue), check the ultrasonic detector for the correct setting of SENSITIVITY, PERSISTENCE and TIME controls.

A sketch showing an installed system is shown in Fig. 3. Note that the ultrasonic unit is mounted to provide adequate coverage of the counter and cash register, but not where it might be critical of door and window conditions. The Dialer is mounted under the counter where it is out of the way, and the microphone placed for adequate sound reception. The coupler has been shown installed on the wall near the telephone, but could have easily been more inconspicuously placed if desired.

It is sometimes quite reassuring to provide a daily check on the system. This can be done by using a 24 hr timer which triggers the system at a preset time (6:30 a.m. would double as an alarm clock). You would then receive a telephone call every day at that time, assuring you of proper system operation. ■



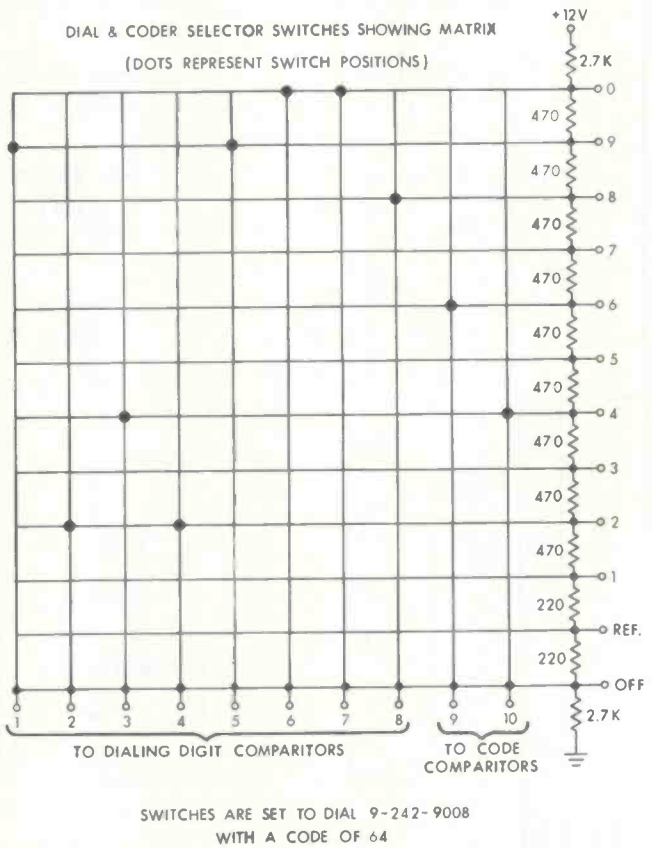


Fig. 4—The unit contains a series of 10 switches (photo above), each having 11 positions for 10 × 10 matrixing (schematic above), plus OFF.

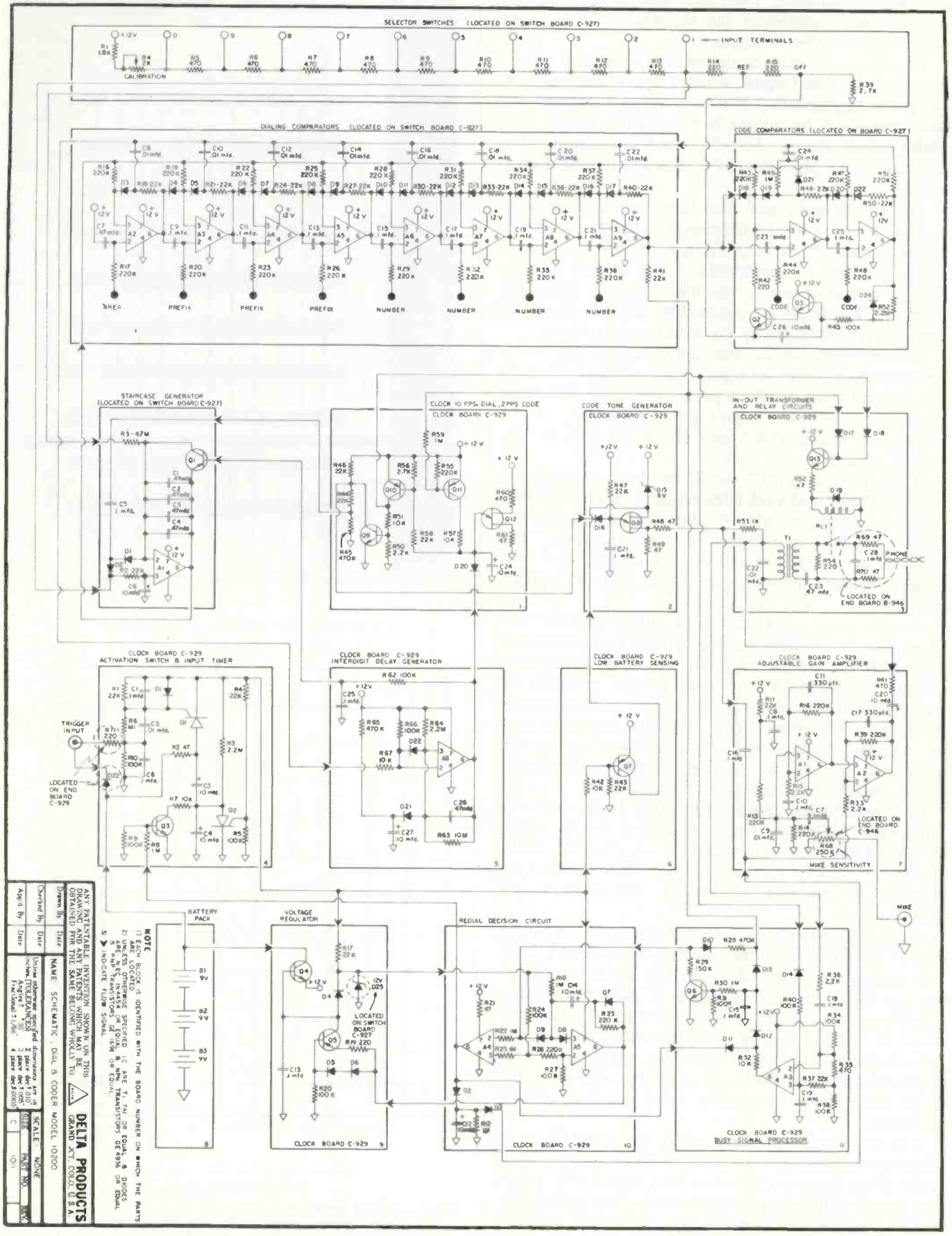


Fig. 5—Schematic diagram of the Automatic Telephone Dialer.

Basic Digital Circuitry

by Phillip Dahlen

Part II—The function of IC decade-counter circuitry

■ Last month's article introduced this series by referring to the technological changes that have resulted in a greater use of digital circuitry in consumer electronic products. Then, using the Heathkit Model IB-101 as an example of new digital circuitry, the article explained (with the aid of scope traces) how the input signal is modified into a signal that can be handled by the circuitry in this instrument's first decade counter.

Probably the most prevalent function in a frequency counter, and the one most difficult to understand, is decade counting with the use of Base-Two mathematics. The mathematics that we are most familiar with is to Base Ten. In other words, we are accustomed to counting from 0 to 9 in the first column (the right, units column), 0 to 9 in the second column (the 10's column), 0 to 9 in the third column (the 100's column), and so on. However, when working with Base Two, we count from 0 to 1 in the first binary column (the right, 1's column), 0 to 1 in the second binary column (the 2's column), 0 to 1 in the third binary column (the 4's column), 0 to 1 in the fourth binary column (the 8's column), and so on. Table I compares these two systems in counting from 0 to 15—although in this instrument, no Base-Two counting is done to any number greater than 10.

When referring to the Base-Two 1's column, we note that with the first applied count a "1" is registered, while with the second count a "0" is registered, a second "1" being registered with the third count, and so on with every other count resulting in a "1." A flip-flop circuit can be made to count in the same manner, alternately turning from one state ("1") to another ("0") with each applied pulse. (Notice that in this flip-flop the occurrence of a "1" state is at half the applied frequency, because every other cycle —or count—registers a "0." At this point, many authors introduce negative logic, a subject that we will ignore for greater simplicity of circuit descriptions.)

In the Base-Two 2's column a similar action is obtained. Just as the 1's column flip-flop is switched to register "1" (or "0") at half the frequency of the applied count, the 2's column flip-flop is switched to register "1" (or "0") at half the frequency it obtains a count from the previous 1's stage—it alternately flipping between the "1" and "0" state each time the preceding flip-flop switches to the "0" state.

We can also see that the flip-flop for the 4's column functions in the same manner—it alternately flipping between the "1" and "0" states each time the 2's column flips to the "0" state. And the same action applies to the 8's column, which alternately flips between the two states each time the 4's column flips to the "0" state. (Since we are not counting beyond 10, the 8's column is as high as we need go.)

Table I
Comparing Two Systems for Counting from 0 to 15

Base 10	Base 2
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
10	1010
11	1011
12	1100
13	1101
14	1110
15	1111

Although it may be great to have a circuit that can count, the resulting numbers will probably have little practical value to us unless they are compared to something else. (We are not interested in total numbers, like the ticket agent at a fair, but rather in rates.) For this reason, a gate circuit (ON/OFF control circuit) is provided to permit the flip-flops to function only during a predetermined period of time. After this period of time has ended, the gate circuit prevents the flip-flops from counting further. And after the count has been registered, a reset signal returns the decade circuitry to its initial "0" condition.

First Decade

Even without a frequency scaler, which may be covered in another article, this particular frequency counter is designed to directly count signals up to 15MHz. However, only the flip-flop in IC21 (shown in the schematic used in Fig. 7, Page 58 of last month's issue) need operate at so high an input frequency—since the other IC flip-flops are driven by this or later flip-flops and thus operate at no more than 7.5MHz. It is due to such high-frequency requirements that the first decade counter contains three integrated circuits (IC23 merely appears as if it were two IC's). Since the other decade counters operate at no more than a tenth of the maximum applied signal frequency (1.5MHz or less), merely a single IC has the required frequency response, at a reasonable price, to perform as a complete decade counter.

A more detailed study of the 3½ IC's incorporated in the first decade counter (Fig. 1) is required for effective servicing. This is due to the fact that the function of these IC's must differ slightly from the previous description of Base-Two numbers, since upon reaching 10 each digital counter must be capable of carrying a pulse to the next digital counter and then repeating the

0-to-9 sequence, rather than continuing on to higher numbers (no single decade counter can go beyond 9). Fig. 2 shows the signals used in this decade circuit for counting to 10.

The first flip-flop (IC21) remains in a "0" condition and does not function until the inhibit signal, generated in the master oscillator circuit, allows the input signal to be counted for a predetermined length of time (1ms in the kHz range and 1s in the Hz range). When not inhibited (B—shortly after time T_0), the first flip-flop is switched to the "1" condition (C—at time T_1) by the negative excursion of a square wave (A—at the time T_1) generated by the signal being measured (as described in last month's article). We now have the number 0001.

The second negative excursion (A—at time T_2) causes the first flip-flop to return to its original "0" condition (C—at time T_2), producing a negative excursion at C that switches the second flip-flop to the "1" condition (E—at time T_2). (This second flip-flop remains uninhibited until after the fourth flip-flop circuit has become activated.) With a "1" conditioning existing in only the 2's column, the resulting number is 0010.

With the third negative excursion from the square-wave input (A—at time T_3), the first flip-flop is again switched to the "1" condition (C—at time T_3). Since in changing from the "0" to "1" condition the IC does not apply a negative pulse to the second flip-flop, that second circuit remains in a "1" condition (E—at time T_3). We now have the number 0011.

With the fourth negative excursion of the square-wave input (A—at time T_4), the first flip-flop again switches to the "0" condition (C—at time T_4), which produces another negative excursion at C. This negative excursion in turn switches the second flip-flop to the "0" condition (E—at time T_4)—it also producing a negative excursion at E. The third flip-flop responds to this negative excursion at E and is switched to the "1" condition (G—at time T_4). We now have the number 0100.

This sequence continues with the input signal causing the first flip-flop to again switch to the "1" state (C—at time T_5) when a negative excursion is received from the square-wave input (A—at time T_5). Under these conditions, the second and third flip-flop circuits do not receive a negative going pulse from the preceding circuits and remain in their current states. We now have the number 0101.

The next negative excursion (A—at time T_6) causes the first flip-flop to return to its "0" state (C—at time T_6), producing a negative excursion at C that causes the second flip-flop to switch to its "1" state (E—at time T_6). This second IC does not produce a negative excursion at E to affect the third flip-flop, which remains in the "1" state. We now have the number 0110.

The seventh negative excursion from the square-wave input (A—at time T_7) switches the first flip-flop to its "1" state (C—at time T_7). Since the second and third flip-flops do not then receive a negative excursion from the preceding ones, they remain in their current states. We now have the number 0111.

From the information contained in Table I, it would seem as though a fourth flip-flop might be used like the others (connected directly to the third flip-flop) for switching to the "1" state with the application of another input pulse (A—at time T_8). Although this would produce the desired number (1000), such circuitry would not return to the zero condition upon receipt of the tenth negative input pulse (A—at time T_{10}). Slightly different circuitry is required for such a function.

Each of the three flip-flop circuits described thus far actually has two outputs—one that goes positive during the "1" condition (C, E and G) and one that goes negative during the "1" condition (D, F and H). Some of these outputs are used in

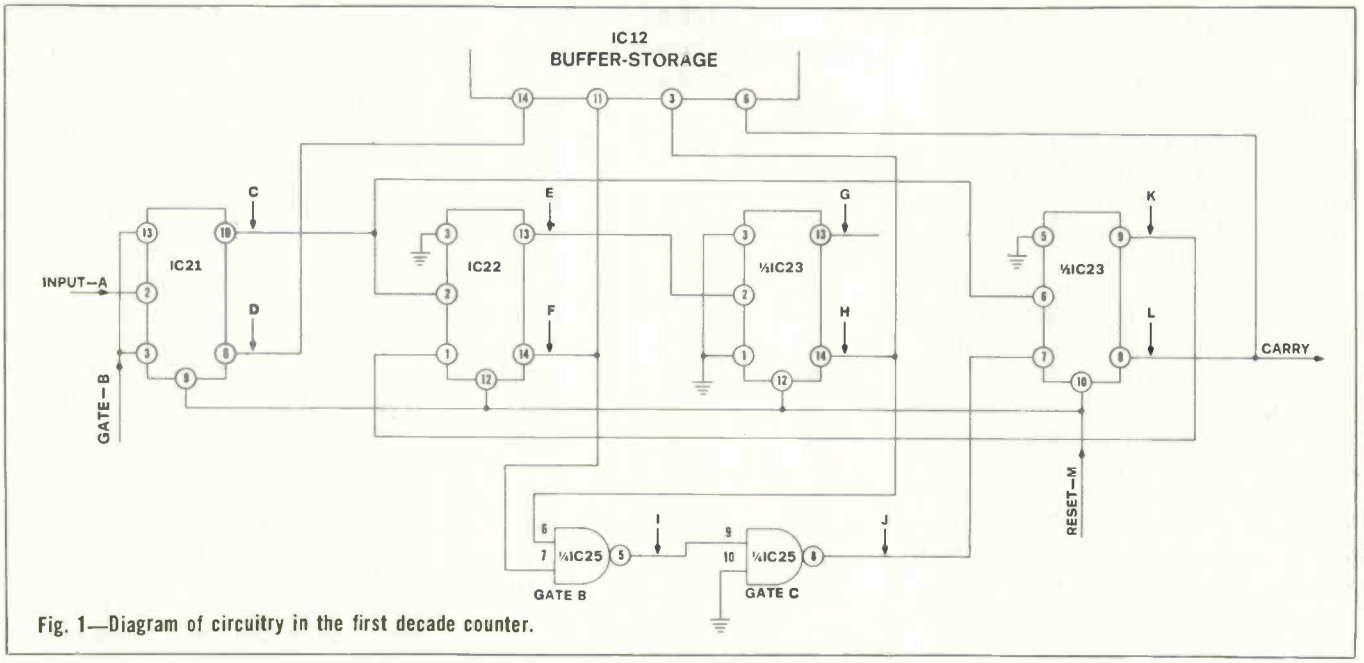


Fig. 1—Diagram of circuitry in the first decade counter.

regulating the fourth, and last, flip-flop circuit in this decade counter.

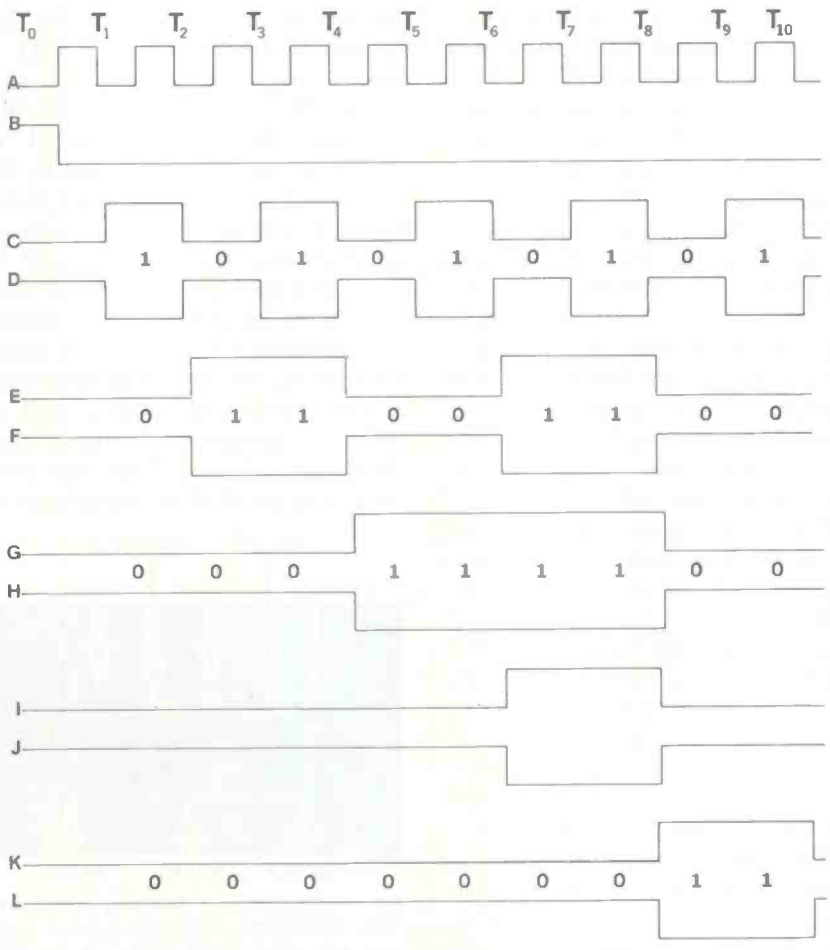
From Table I we see that the fourth flip-flop must be switched to the "1" condition when both the second and third flip-flops are in the "1" condition and the first flip-flop is switching to the "0" condition—the second and third flip-flops then also following to the "0" condition. As has been somewhat exaggerated in Fig. 2, the flip-flops do not switch simultaneously—internal circuit capacitance causing each flip-flop circuit to switch slightly after the preceding one. (The fourth flip-flop would appear to be an exception, but only if you fail to note the source of the negative excursion causing it to change state.) Thus, the second and third flip-flops are still in the "1" condition (E and G —at time T_8) as the first flip-flop is switched to the "0" condition (C —at time T_8).

Gate B (a portion of IC25) has a positive output (I—from just after time T_6 to just after time T_8) only when the applied outputs from *both* the second (F) and third (H) flip-flops represent the "1" condition. The output of Gate B (I) is inverted by Gate C, the resulting negative output (J) beginning shortly after time T_6 and ending shortly after time T_8.

Just as the first IC flip-flop is regulated by an inhibit signal applied to it (B—ceasing to inhibit shortly after time T_0), the fourth flip-flop is also regulated by an inhibit signal (J—allowing it to function from just after time T_6 to just after time T_8) —that produced by Gate C. Only during this time interval is it permitted to switch to the "1" condition upon receipt of a negative switching pulse.

The fourth flip-flop, like the second one, is switched between states by the negative-pulse output of the first flip-flop (C). But not until after time T_6 is the fourth flip-flop allowed to function—the first acceptable negative switching pulse being C—at time T_8.

With the eighth negative excursion from the square-wave input (A—at time T_8), the first flip-flop switches to the "0" condition (C—at time T_8), producing a negative excursion at C that is now permitted



Signals Present in Initial Decade Circuitry

A = Square-wave signal to be counted—applied to input of first flip-flop (IC21, Pin 2).

B = Inhibit signal—applied to first flip-flop (IC21, Pins 3 and 13).

C = Output from first flip-flop (IC21, Pin 10)—applied to input of second flip-flop (IC22, Pin 2) and fourth flip-flop (IC23, Pin 6). Output is half frequency of input.

D = Inverted output of first flip-flop (IC21, Pin 6)—applied to buffer-storage (IC12, Pin 14). This is the binary 1's column output.

E = Output from second flip-flop (IC22, Pin 13)—applied to input of third flip-flop (IC23, Pin 2). Output is half frequency of input.

F = Inverted output from second flip-flop (IC22, Pin 14)—applied to Gate B (IC25, Pin 7) and buffer-storage (IC12, Pin 11). This is the binary 2's column output.

G = Output from third flip-flop (IC23, Pin 13)—not used.

H = Inverted output from third flip-flop (IC23, Pin 14)—applied to Gate B (IC25, Pin 6) and buffer-storage (IC12, Pin 3). Output is inverted, but half frequency of input. This is the binary 4's column output.

I = Output from Gate B (IC25, Pin 5)—applied to Gate C (IC25, Pin 9). Gate B output signal "0" appears only when "1" condition occurs at the same time at both inputs.

J = Output from Gate C (IC25, Pin 8)—applied to inhibit input of fourth flip-flop (IC23, Pin 7). This gate inverts the applied signal.

K = Output from fourth flip-flop (IC23, Pin 9)—applied to inhibit input of second flip-flop (IC22, Pin 1).

L = Inverted output from fourth flip-flop (IC23, Pin 8)—applied to next decade counter (IC17, Pin 9) and buffer-storage (IC12, Pin 6). This is the binary 8's column output.

M = Reset signal—applied to return all decade flip-flops (IC21, Pin 9; IC22, Pin 12; IC23, Pins 10 and 12) to initial state after count is completed. (Signal shown only in composite photographs.)

Fig. 2—Signals used in the first decade circuitry for counting to 10.

to cause the fourth flip-flop to switch to the "1" condition—in addition to causing the second flip-flop to switch to the "0" condition. The second flip-flop, in turn, causes the third flip-flop to switch to the "0" condition. We now have the number 1000.

The ninth negative excursion of the square-wave input (A—at time T_9) switches the first flip-flop to the "1" condition (C—at time T_9). Since switching from the "0" condition to the "1" condition does not generate a negative pulse at C to activate the other flip-flops, they remain in their present state. We now have the number 1001.

The 10th negative excursion of the square-wave input (A—at time T_{10}, or T_0 if we are repeating the cycle during the 1ms or 1s counting time for a number larger than 10) switches the first flip-flop from the "1" to the "0" condition. This produces a negative excursion (C—at time T_{10} or T_0), which switches the fourth flip-flop to the "0" condition (K—at time T_{10} or T_0).

Since some time (although extremely little) is required for the fourth flip-flop to change conditions, it is still in the "1" condition at the instant that the negative excursion (C—at time T_{10}) is applied to both it and the second flip-flop. And the positive potential that does remain at output K is applied to inhibit the control gate of the second flip-flop —thus preventing it from switching to the "1" condition. In this manner, the decade circuitry is returned to 0000. However, in returning to a zero state, the inverted output of the fourth flip-flop (a positive excursion from L) is carried to the next decade—the second decade counter receiving one positive pulse each time the initial decade circuit receives 10 negative pulses from its square-wave input. (Note that in this instrument the flip-flops for the first decade require negative square-wave-type pulses, while the remaining decade counters require positive square-wave-type pulses.)

Scope Traces

Fig. 4 is a composite picture made up of 12 photographs taken of dual-trace scope waveforms obtained with a Telequipment D54 scope from various IC terminals when the frequency of the input signal (A) is about three times that of the gate signal (B), or nearly 3kHz. The first original photograph consisted of dual-trace waveforms A and B, the second consisted of dual-trace waveforms C and B, the third consisted of dual-trace waveforms D and B, . . . , and the 12th consisted of dual-trace waveforms M and B. Although the duplicate photographs of waveform B are not shown in this composite picture, they were used to align the second waveform in each dual-trace picture. Thus, we were able to align all of the waveforms in

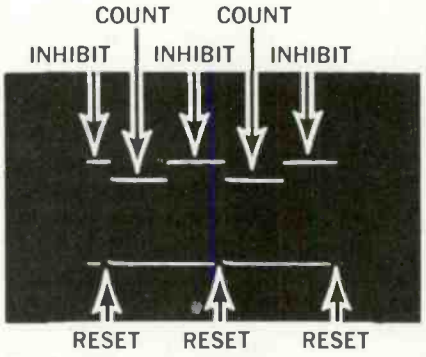


Fig. 3—Photograph of dual-trace scope waveforms showing the relationship between the inhibit gate signal (upper trace) and the reset signal (lower trace).

relation to waveform B and show the approximate relationship of each waveform to the other. [This relationship between waveforms could have been shown with a slightly greater degree of accuracy had the input signal (A) been synchronized with the gate signal (B), for it is the combination of both signals (A and B) that determines the exact phase position of the other waveforms. However, without the aid of a ruler, the resulting error is too small to be observed in this picture.]

Fig. 4 contains one more waveform (M) than shown in Fig. 2. This additional signal (M) is used to reset all the flip-flops to their "0" condition before the start of each counting interval determined by inhibit gate signal B. The relationship between these two signals is shown more clearly in Fig. 3 (the gate signal being the upper trace and the reset signal being the lower trace).

Referring to Fig. 4, we note that since the input signal frequency (nearly 3kHz) is about three times that of the gate signal (1kHz), the decade counter circuitry is allowed to count to three. Just prior to counting (the time interval just before the first vertical line drawn through the illustration), all flip-flops are in their "0" condition. Once the counting interval has ended (the time interval just after the second vertical line drawn through the illustration), the flip-flops are in a state corresponding to the number "3" (0011). By referring to scope traces L, H, F and D, we note that the voltages for L and H have remained unchanged (they

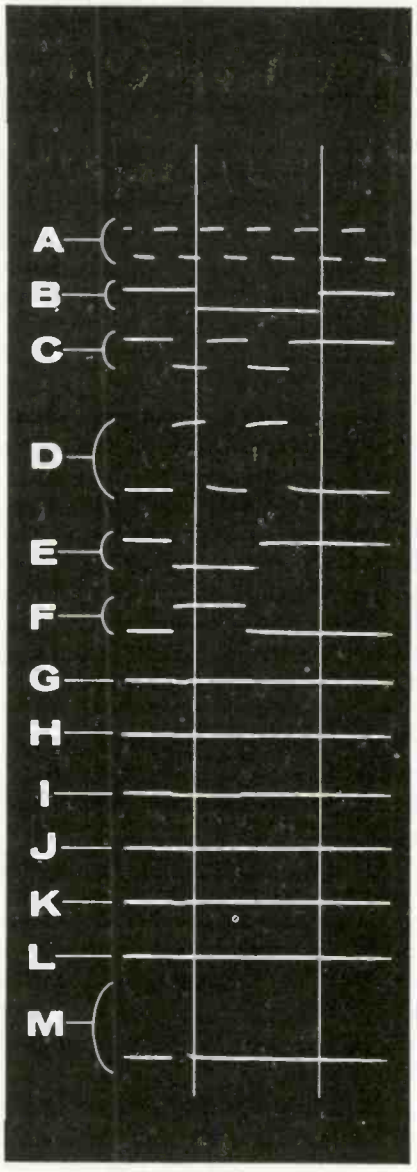


Fig. 4—Composite picture showing actual scope traces as first decade circuitry counts to three.

still represent a "0" condition). However, the voltages for F and D have been switched from that representing the "0" condition to that representing the "1" condition. Thus we do have the number "0011" or "3."

The composite picture in Fig. 5 was made from 12 photographs using the same techniques used for making the picture shown in Fig. 4. However, this time an input signal of nearly 6kHz is shown applied to the decade counter circuitry, its frequency being about six times that of the 1kHz gate signal (B). Thus, at the end of the counting interval, the flip-flops have been switched to conditions corresponding to the number "6" (0110). Scope trace L has remained in the "0" condition, trace H has switched to the "1" condition, trace F has switched to the "1" condition and trace D has switched to the "0" condition at the end of the time interval.

The composite picture in Fig. 6 was made in the same manner as the two other composite pictures, but this time an input signal of about 12kHz is used. During this time interval, scope trace L switched from the "0" condition to the "1" condition and then back to the "0" condition. As it switches from the "1" condition to the "0" condition, a pulse is transferred to the next decade counter (IC17, Fig. 7 in last month's article) to indicate the number "10." At the end of the time interval, the first decade counter circuitry (Fig. 1), merely records the number "2" (0010), since the second decade counter (IC17) must handle the 10's portion of the number. And from the composite picture (Fig. 6), we see that we do have a "0010" condition (scope trace L has returned to a "0" condition, trace H has returned to a "0" condition, trace F has been switched to a "1" condition and trace D has returned to a "0" condition).

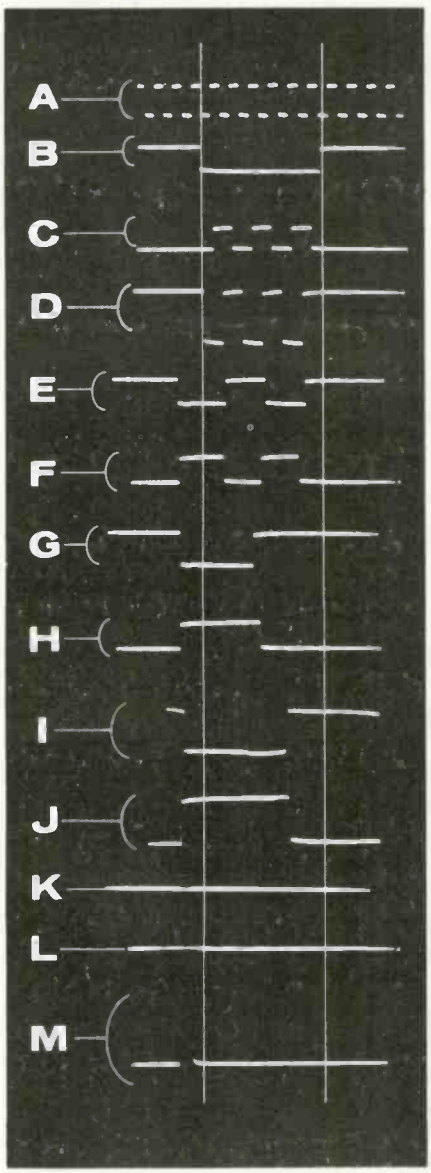


Fig. 5—Composite picture showing actual scope traces as first decade circuitry counts to six.

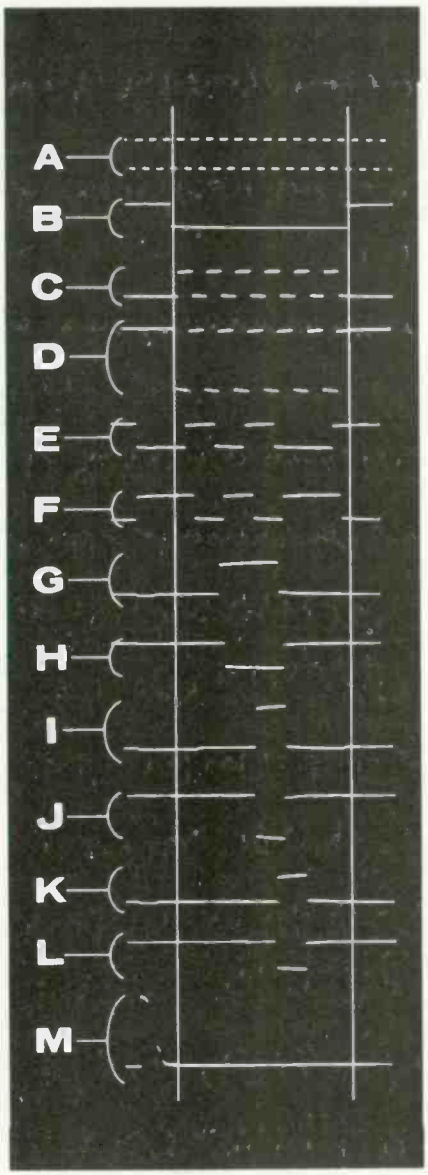


Fig. 6—Composite picture showing actual scope traces as first decade circuitry is used for counting to 12.

Counting Entire Number

Had the digital counter been switched from its "kHz" scale to its "Hz" scale, then the first decade counter would have been permitted to function for 1 sec. intervals rather than .001 sec. intervals. If under these conditions we applied a 35167Hz signal, the first decade counter circuit (Fig. 1) would record the "7" and feed 3516 pulses to the second decade counter (IC17, Fig. 7 in last month's article), which would record the "6" and feed 351 pulses to the third decade counter (IC18), which would record the "1" and feed 35 pulses to the fourth decade counter (IC19), which would record the "5" and feed three pulses to the fifth decade counter (IC20), which would record the "3." In this manner, a "0111" (7) is fed to IC12 for storage, a "0110" (6) is fed to IC13 for storage, a "0001" (1) is fed to IC14 for storage, a "0101" (5) is fed to IC15 for storage and a "0011" (3) is fed to IC16 for storage. Each buffer-storage IC then contains a condition corresponding to the frequency of the applied signal.

Conclusion

Although this is an extremely lengthy description, it concerns the basic function of *all* digital meters. The next article in this series, a relatively short one, will show how the 1kHz and 1Hz timing signals are produced from a 1MHz oscillator signal. ■

Fig. 1—Upon receiving the Safe Servicer Certificate, employees of the certified service establishment may secure the label shown at the upper right to any TV set that has been given the X-Ray Safety Check.

NATESA Plan to Create Confidence

by Phillip Dahlen

National association works to upgrade quality of work performed by employees of member shops

■ So much publicity has been given another association's certification program that we decided that publicity should also be given to the program sponsored by the National Alliance of Television & Electronic Service Associations. When contacting Frank J. Moch, Executive Director of NATESA, concerning their program, he was very helpful and sent us a large packet of material. Included was a letter from him that is quoted, in part, below:

"TV and radio being highly sophisticated devices, cause most set owners to keep hands off except for most obvious problems. They assume that he who offers his services, knows his business. They couldn't care less whether he knows all the theory in the world if the servicer doesn't approach the set problem from an effect and cause basis, and in a reasonable time.

"NATESA's Confidence Plan and Certification thus is predicated on the fact that the technician does in fact have the basic theory augmented by practical experience. It recognizes that new comers coming out of technical schools with diplomas, know theory but only after several years of experience and upgrading seminars, can they truthfully call themselves experts. When they achieve that point, they are accorded the registered title of Electronician (Fig. 2), a term understandable by the public, which long has called an expert on house wiring an electrician.

"Since the NATESA by-laws grant membership only to professional home electronics business, and recognizes that all affiliates screen their membership applicants, NATESA accepts as de-facto that employees of all members are professionals. At the same time it does police all members and customer complaints and so is in a position

NATIONAL ALLIANCE OF TELEVISION & ELECTRONIC SERVICE ASSOCIATIONS

NATESA

CERTIFICATE OF MEMBERSHIP

1972-73

Specimen

HAVING PLEDGED TO OBSERVE THE CODE OF ETHICS BELOW, HAS BEEN ISSUED

ELECTRONICIAN

*LICENSE #*_____

CODE OF ETHICS

1. Employ qualified personnel to assure proper service. No student shall be passed off as a technician.
2. Make proper arrangements for the protection of reserve funds on contracts.
3. Carry adequate insurance coverage.
4. Avoid trick advertising which offers to service or deliver materials under conditions which are questionable or unfair to the set owner or your fellow members.
5. Employ professional methods of doing installations and maintenance.
6. Issue a standard guarantee.
7. Have available sufficient and proper test equipment to assure a good job.
8. Maintain an adequate service data library.
9. Render service without undue delay.
10. Install only parts as are really necessary. Use only new parts of a quality at least equal to original.
11. Leave with, or return to customer, all parts replaced, when requested, (except where impractical).
12. Issue an itemized bill.
13. Furnish estimates upon request.
14. Service sets in home whenever possible.
15. Be honest, courteous and treat each client in a professional manner.
16. Observe the Golden Rule.

This Certificate is issued conditional upon adherence to the above Code of Ethics. Display after expiration date or after termination of membership for any cause is strictly prohibited and is subject to a license fee of $10.00 per day for each day of such unauthorized use. All communications regarding the above member should be directed to the address below:

National Alliance of Television & Electronic Service Associations

5906-08 S. TROY ST. – CHICAGO, ILLINOIS 60629

Fig. 2—After several years of experience and upgrading seminars, technical-school graduates have achieved the point at which they can be accorded the registered title of Electronician.

to recall Certification. It has done this on several occasions. In this we operate as does the AMA and BAR.

"Most current NATESA affiliates have qualified their membership in the past for the Plan to Create Confidence. All are urged to carry on (and do) a continuing program of seminars to keep up to date.

"All individual membership applicants are cleared through the nearest member, distributor, BBB or Chamber of Commerce.

"We have used special seminars and tests as at the time of the x-radiation scare when we tested knowledge of proper set-up of high voltage. See enclosure." [The corresponding material consisted of a one-page reprint of Photofax Volume 2, No. 3, dated March 1968 and entitled Color TV High-Voltage Regulation. Printed on the back side of the reprint were five multiple-choice questions that made up the NATESA High Voltage Regulation Test. At the bottom of that page was a NATESA Safe Servicer Pledge. Also included were the certificates shown in Fig. 1.]

Mr. Moch's letter continued by saying: "We urge the Qualifications Of Technicians Plan on all new Affiliates." [This plan is not just some recent brainstorm, having been outlined nearly 20 years ago in the February 1953 issue of SYLVANIA NEWS.]

Concerning that program, his current letter said: "We have updated the program to call for seminars on solid-state, FM stereo, color, modules, etc. We are readying video tape material."

Mr. Moch added, "We have adopted EIA's 'Television Symptom Diagnosis' by Richard W. Tinnell as a proper training method and will use tests in that text to supplement the NATESA current 125 multiple-choice-question test, to qualify capability of Techs."

In the 1953 reprint covering the Qualifications Of Technicians Plan, Mr. Moch explains the following:

"Refresher courses will be conducted for: 1) Association member employees and 2) outsiders who are actively engaged in the service business.

"The course consists of one lecture of approximately three hours per week (with a break of 10 minutes at the half-way point). Qualified distributors and factory service personnel will be asked to cooperate in the conduct of sessions. Courses are to consist of 10 sessions as follows: 1) Front ends, 2) Video I.F., 3) Audio I.F., 4) Vertical sweep and sync, 5) Horizontal sweep, 6) Hi-voltage systems, 7) Low-voltage systems, 8) Alignment, 9) Record changers, and 10) Antennae. The black and white course should be supplemented by a three-session color TV course.

"Upon completion of the course, a clinic will be held. All set distributors in the area will be asked to have booths fully equipped and manned to answer all technical questions on their products. The 12th week, a written examination will be given on practical theory and practice. Questions asked in the test will be determined on the basis of practical value by a committee from independent associations, distributor service managers, factory service managers and RTMA. Those that pass will be issued a certificate attesting to the fact that the applicant has taken the course and passed the requirements." ■

Better Merchants Make Better Profits

by William Joseph

The telephone can be a cruel master for electronic service dealers. When it rings, everything is fine; but when it stops, many dealers only know how to sit on their hands waiting for business to pick up again. That kind of dependency is one of the worst profit robbers in the service business.

■ Healthy profits in a service organization are the result of a high degree of efficiency, and one of the deadliest enemies of efficiency is a constantly fluctuating workload. During busy seasons, you must have the necessary manpower available to give your customers prompt service. But what happens when the workload falls off?

Some dealers know the answer to that question all too well: Either you put up with the crippling expense of a lower output per man, or you lay off help. It is hardly much of a choice, since either alternative must inevitably result in a loss of profits. Furthermore, if the scarcity of work persists long enough, it can spell financial disaster.

Fortunately, there is another choice. It is fast and easy, requires only a small investment, and will add strength and profits to your business. The answer? Teach yourself to be a better merchant.

As a basic premise, the service dealer should bring himself to understand that the product that he offers *is* a saleable commodity. There is absolutely no need to stand by helplessly when busy periods cause overtime expenses and long delays for the customers, or when a falling-off of calls sharply reduces income. This "feast or famine" tendency in the service business is both a profit killer and . . . unnecessary.

The first thing that a retail merchant learns is that there are times when customers are going to be plentiful, and times when business can be expected to fall off sharply. If he is to be successful, he must analyze these natural "seasons," staff his store so that he can adequately take care of his customers when business is good, and then take steps to bring in customers during the naturally slow periods. The idea, of course, is to attempt to level off the sharp peaks and valleys in business volume that will result if nature is left to take its course. This is precisely the same set of circumstances facing the electronic service dealer.

As is so often the case, the first step in facing up to this problem is the preparation of adequate records. A simple analysis of the number of incoming calls for service during each month of the year will give you a graphic picture of your busy and slow periods. For most dealers, this graph of business volume will be surprisingly consistent. If March and November were relatively slow months for you last year, the chances are that the same condition will repeat itself again this year—*unless you decide to do something about it!* A prime requirement in bolstering your slow periods is the knowledge, in advance, of when they are coming. Once you know when to expect a drop-off in incoming calls, you can begin your plans to combat it.

Obviously, the small service dealer cannot afford the elaborate advertising campaigns that his retailing counterparts have come to depend upon to build business when customers are scarce. Fortunately, though, he doesn't have to. Direct mail—easy and inexpensive—is a powerful sales promotion tool for the service dealer. It also has the advantage of extreme flexibility. The number of mailings can be quickly adjusted once the response has been measured, and the campaign can be turned off almost like a spigot as soon as the slow period comes to its natural end.

Frequently, the method of direct mail to small businessmen causes them to think of post cards. Forget it! Direct-mail professionals learned long ago that the simple post card has a very limited and specialized value as an advertising medium. It simply isn't adequate to tell enough of a story. If you attempt to use it, you will surely be disappointed in the results. Selling a potential customer on the reasons for choosing your service firm requires, at the very least, the dignity of a standard-sized letter.

Many service dealers make the costly mistake of dismissing direct mail because of the feeling that, "unless the letter arrives at just the time of a breakdown, it is a waste." Actually, that is a mistake for two reasons: First, a recent national survey confirms the suspicion that most TV sets give considerable advance warning to the viewer that all is not well. In this survey, 73 percent of all TV owners who recently had service indicated that their sets had been acting improperly for up to several weeks before they finally had to call for an electronic technician. In other words, they were prime prospects for a well-written advertisement suggesting service.

Second, a good number of TV-set owners are always anxious to locate an established local service dealer upon whom they can depend for all their service needs. A skillful direct-mail promotion can develop new customers from both of these categories.

The chances are that your local printer will be happy to work with you in setting up a format and letterhead. He is experienced in developing printing layouts and you should take advantage of his help.

As far as the actual text of your sales letter is concerned, you would probably be wise to seek professional help. The experts stress that skillful wording is of paramount impor-

tance in direct-mail efforts. A properly written letter has been known to bring in 10 times, or even 100 times, the response of a poorly written one. Unless you have a particular and obvious talent for that sort of thing, you would do well not to attempt to compose your own advertising.

Considering the fact that getting professional help in composing your letter is a one-time investment, and that it can be used indefinitely (with but slight modifications), spending a few dollars to get it done properly is good business.

Some dealers have had good results by calling on small local advertising agencies for help with their letters. The small dealer may not get the attention that can be given to a regular account, and he may have to wait until the agency can find time to work on his project, but the effort will usually be well worthwhile.

In many cities, freelance copywriters can be located in the Yellow Pages. If there is a lettershop in your community, you may want to check with them. Many of these shops are equipped to handle your entire project from composition to mailing.

For those who will insist on composing their own letters, here are a few tips that may prove helpful: Write your letter in the first-person (on a you and I basis), and sign your own name. The informality of a first-person letter will often improve the results for businesses located in the same general community as the addressee. While you will want your letters to reflect your own personality and that of your business, the example shown in this article may provide you with some basic ideas.

On a separate sheet, or on the reverse side of your letter, you may want to outline the various services you offer and/or the terms of your guarantee. Direct mail promotions also present a good chance to test the "two dollars off on your first service call," type of coupon. Experience shows that many people will respond to such a savings and, if the service provided is satisfactory, most will remain on as regular customers. The face amount of the coupon can be as little as a dollar, or it can be several dollars, depending on your own ideas.

Your direct-mail program can be as simple or as extensive as your needs dictate, but it should always be ready for action whenever you

continued on page 68

A. B. C. SERVICE CO.

2205 First Avenue South
Home Town, Hawaii
Phone 943-0200

Dear TV Viewer:

Satisfied with your TV-set reception lately? Is the picture as clear as it used to be? Are some channels snowy or fuzzy? In other words, are you missing out on the full enjoyment that can be provided only by a TV set in top-operating condition?

For most people, the purchase of a modern TV set represents a considerable investment. My years of experience in the electronics field has taught me that the best way to protect that investment and to get the full enjoyment built into every TV set, is to see that it gets the best possible care.

That's the kind of care that we provide here at A.B.C. Service Co. The success of our business depends on satisfied customers who come back to us time after time, and we know it. Now, we'd like to have the pleasure of adding you to our long list of satisfied customers.

If you're not happy with the way your set is working, why not call us right now at 943-0200. We'll have you back on the road to happy TV viewing in a jiffy . . . and we'll do it at the lowest possible cost to you.

Roger Smith
A.B.C. Service Co.

P.S. I hope your set is working fine at the moment. If so, please tuck the enclosed coupon away so that you'll have our number if you should need it in the future. You'll be glad you did.

COLORFAX

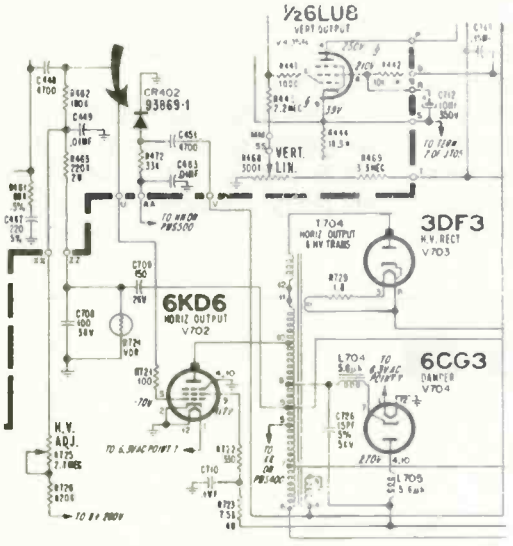
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

ADMIRAL

Color-TV Chassis K16 Series—No Control Of Brightness

This problem can be caused by defective diode CR402 (93A69-1). Check for the presence of a negative voltage at the anode of this diode, it should be approximately −130v to −160v.

This diode and associated components provide the negative voltage for the BRIGHTNESS control through the MASTER BRIGHTNESS control and for the BACKGROUND controls. The circuit is not used for high voltage regulation in this chassis, as it was in some previous chassis.

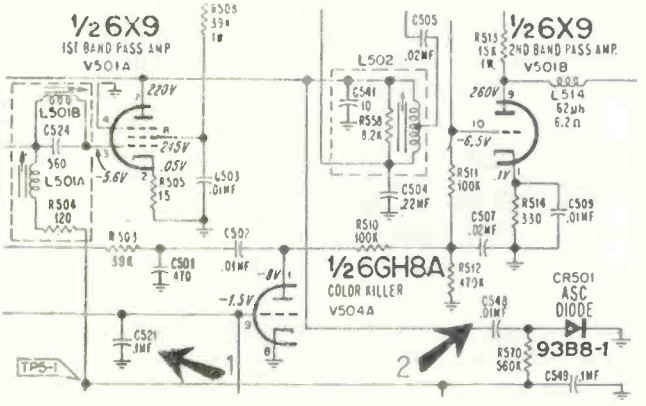


This diode can also be replaced by Part No. 93A60-3.

Color-TV Chassis G11/G13/H10/H12/K15/K16 Series—Weak Or No Color

A weak or no color complaint can be caused by defective capacitor C521.

Failure of this capacitor permits a negative voltage to be produced at the plate (Pin 1) of the color killer tube, which will bias off the second bandpass amplifier. Check



this capacitor by substitution since measuring it with an ohmmeter may not reveal a defective capacitor. Replace it with a 0.1μf of higher working voltage capacitor such as a Part No. 64A53-98 capacitor which was used in later production models.

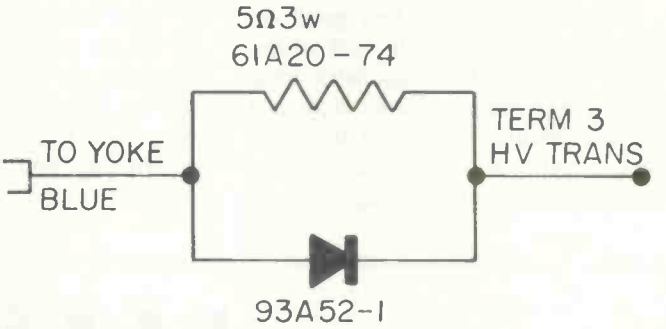
Another possible cause of a weak or no color complaint is leaky capacitor C540 in the H10 and K16 chassis, and capacitor C548 in the H12 and K15 chassis. Low plate voltage on the first bandpass amplifier probably identifies the leaky capacitor as the cause.

Color-TV Chassis G11—Installing Replacement High-Voltage Transformer

When you install a 98A131-5 replacement HV transformer kit (79A148-1 transformer) in the G11 chassis, you may find some sets which require horizontal centering.

Horizontal centering can be accomplished by adding a diode, with parallel resistor, in series with the blue lead to the deflection yoke at Terminal 3 of the transformer.

The polarity of the diode determines the direction that the picture shifts. Diode polarity shown in the illustration



will shift the picture to the left. A special diode is not required, a 500ma with 600PIV being satisfactory.

The amount of picture shift is determined by the value of the resistor. A 5Ω resistor will shift the picture approximately 1 in. (do not exceed 10Ω).

Color-TV Chassis K20—No sound

When you check out a dead audio complaint on these chassis and find that the 57C29-2 audio IC has failed; before replacing the IC, check the ground point of the TONE control capacitor (.022μf). This capacitor must be grounded to the shield braid at the VOLUME control. If, instead, it is grounded on the tuner cluster bracket, change it before you put in the new IC.

Color-TV Chassis M20—Service Hint

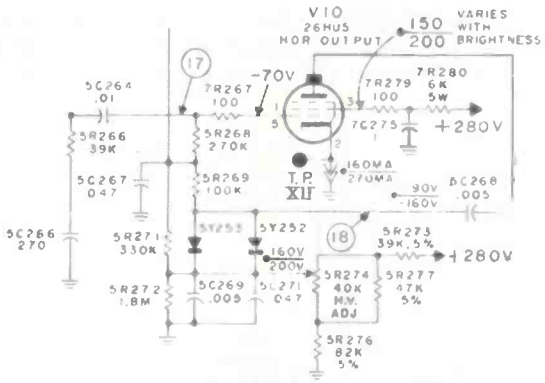
There have been reports of an unusual condition in the M20 chassis that can result from the failure of a fuse in the low-voltage power supply. You would not expect to find an open fuse causing excessive brightness, washed out video and no control of the brightness condition. However, an open fuse—F904, ½a pigtail, Part No. 84A7-16—on the power supply module is a probable cause. This fuse is found in the power transformer secondary ac supply to the 400v B+ circuit. Because of the power supply configuration, 285v remains on the 400v line when this fuse is open—the reduced voltage to the picture tube cathodes resulting in excessive brightness.

Check the circuits supplied by the 400v B+ source and the components in the supply. When repairs have been made, replace the open fuse.

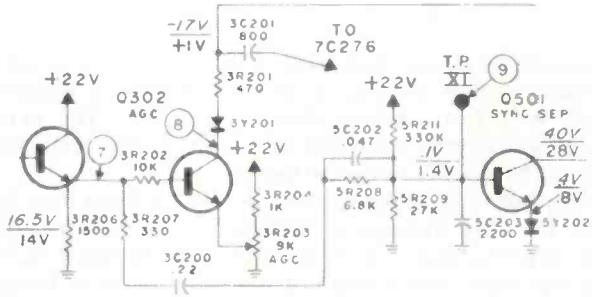
GENERAL ELECTRIC

Color-TV Chassis C-1—Troubleshooting Guide

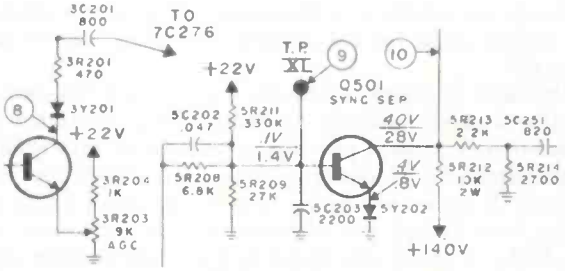
When encountering a dim raster symptom, capacitor



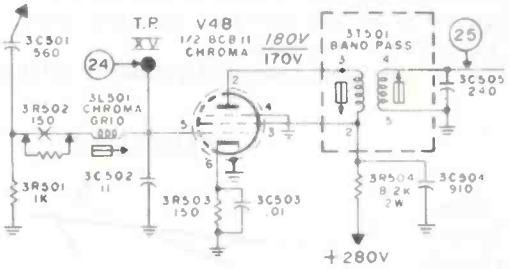
5C271 may be shorted. Replace this capacitor with one that is 400v rated, Part No. EP25X4.



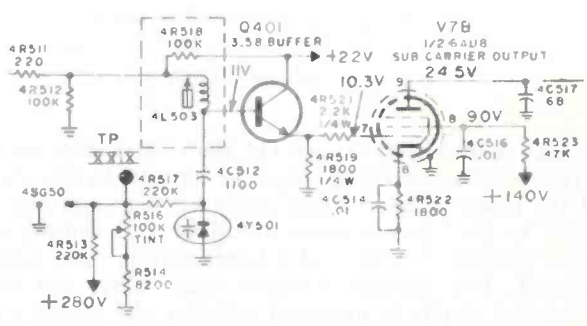
A no AGC symptom can be caused by open diode 3Y201.



A symptom of no horizontal or vertical sync can be caused by a shorted diode 5Y202.



An intermittent color or no color can be caused by a burned resistor, R504, after its leads short to the bandpass transformer can.

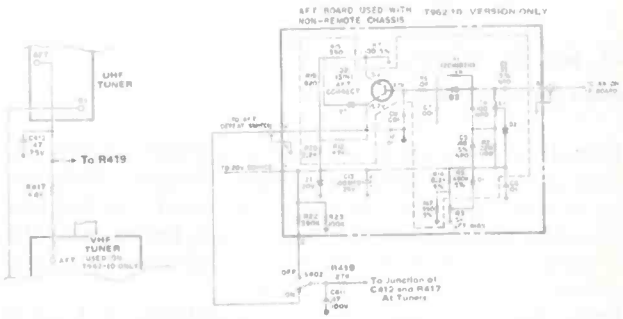


Intermittent or weak color can also be caused by a shorted buffer transistor, Q401.

MAGNAVOX

Color-TV Chassis T962-10—New Tuners and AFT Correction Circuit

The 340193-1 VHF tuner, 340190-2/340191-2 UHF tuner and the AFT board used with the T962-10 version chassis differ from those used with all other T962 chassis



versions. In the tuners, the anodes of the AFT varicaps are connected to ground reference and the AFT correction voltage supplied from the AFT board is centered around +5v, and applied to the cathodes. There is no +20v reference source applied to these tuners. Since the AFT correction voltage required for these tuners is centered around +5v rather than +15v as for the tuners of all other T962 chassis versions, the AFT circuit has been modified to provide the proper voltage range. The illustrations show both the schematic for the new AFT board and the connection of the AFT correction voltage to the tuners for the T962-10 version.

TECHNICAL DIGEST

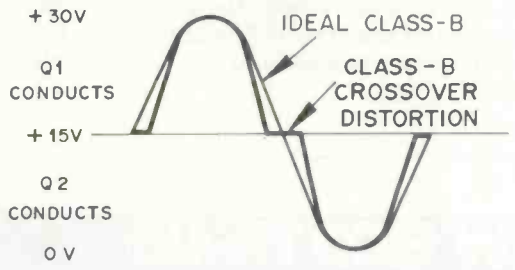
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

RCA SALES CORP.

Amplifier Crossover Diodes

Class-B complementary symmetry amplifier circuits are widely used in consumer electronics products. Although these circuits have been previously discussed, the function of the crossover diode connected between the bases of the two complementary output transistors has never been fully explained.

Basic theory reveals the output transistors of Class-B amplifiers conduct on alternate half cycles. In the example illustrated, the active devices (tubes or transistors) are assumed to be perfectly matched and linear in response to the input signal. Under these ideal conditions, a smooth, distortion-free transition is made from the conduction of one output device to the other as the instantaneous signal voltage crosses the 0v condition. In practice, however, transistors are non-linear at low currents, since it is necessary that the base signal voltage exceed 0.7v—resulting from the diode voltage drop of the base emitter junction. It can be seen that the transistor that is being driven ON remains non-conductive until the base-to-emitter voltage exceeds the 0.7v barrier potential. If a smooth transition is not made from one output transistor to the other, the signal will be distorted.



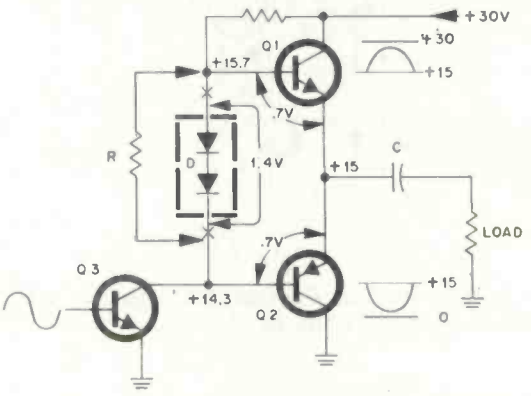
Crossover Distortion

To overcome this distortion (known as crossover distortion), Class-B amplifiers are designed so that the transistors are not driven completely into cutoff. Instead, they operate with a small value of base bias current under no signal conditions. This bias current assures that the base-to-emitter junction is always conducting so it can accept signal drive. The bias current is carefully chosen to provide minimum crossover distortion and minimum no-signal collector current. In practice, the no-signal or idle current of a Class-B output stage is quite low, being approximately 2 to 10ma. The required base bias is obtained by a resistor bias network.

Complementary Class-B Circuit

In the complementary symmetry circuit shown, complementary output transistors Q1 and Q2 are biased, in a manner to be described, to provide equal conduction under no-signal conditions. With a supply voltage of 30v, the voltage at the mid-point of the circuit (emitters of both transistors) assumes a voltage equal to half the supply voltage, or in this case 15v.

To meet the requirements for base bias, let us consider what is necessary to allow conduction of NPN transistor Q1, and PNP transistor Q2. Assuming that the mid-point

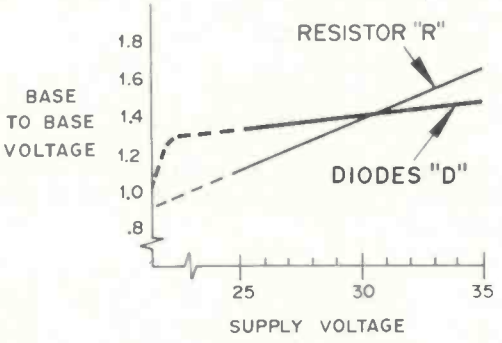


voltage of the circuit must equal 15v (½ supply voltage), it is necessary for the base of transistor Q1 to be approximately 0.7v more positive than the emitter. (The exact voltage will depend upon the transconductance characteristics of the specific transistor used.)

Thus, with 15v at the emitter, the base voltage must be 15.7v. For PNP transistor Q2 to conduct, the base must be more negative than the emitter by approximately 0.7v. This means the base voltage of transistor Q2 must be approximately 14.3 or .7v less than the supply voltage. When the voltage difference between the base of Q1 and the base of Q2 is determined, it is found to be 1.4v. It is then only necessary to calculate a resistance value which provides this voltage drop for the collector current of driver transistor Q3.

Although in theory a resistor can be used for bias, in practice a diode package is nearly always used for this application because it provides a measure of bias stability under conditions of changing dc supply voltage and temperature. It is also interesting to note that in an actual amplifier, even though the schematic symbol may show only one diode, in reality the circuit requires the junction drops of two series connected diodes, even though both are in a single package. Also, it is necessary to carefully choose the characteristics of the diodes used so that the exact voltage drop required to set the no-signal operating point of the output transistors is obtained.

If a resistor were used instead of a diode to establish the



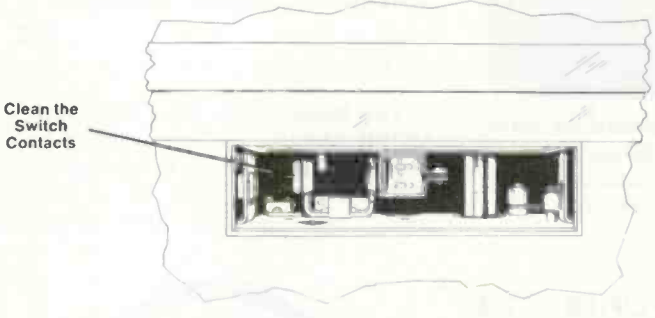
base bias of transistors Q1 and Q2, the voltage drop across the resistor is a direct function of its current. In the event that the power supply voltage increases, increased bias is applied to the base of driver transistor Q3, causing increased collector current and a larger voltage drop across resistor R. This produces a higher base voltage and base current that results in increased collector idle current and more power dissipation in the output transistors. Consider now the use of diodes.

The diodes, like the base-emitter junction of the output transistors, have an intrinsic voltage drop of approximately 0.7v that is for all practical purposes independent of current. Thus under conditions of changing collector current of driver transistor Q3, far less change in base-to-base voltage results when diodes are used. For this reason, the output stage collector current and power dissipation remain more constant under conditions of varying input voltage.

Consider the effects of elevated temperature on bias stability. As the temperature increases, the base-to-emitter voltages (V_{be}) of the output transistors decrease. In the case of the circuit using bias resistor R, the decreased V_{be} permits increased base current and correspondingly more collector current. This in turn causes more heating and finally a condition which could degenerate until thermal runaway and transistor failure occurs. In a circuit using diode D, the decrease in V_{be} is accompanied by a similar decrease in diode junction voltage. Because of the diode compensation, the effect of elevated temperature on output stage idle current and power dissipation is minimized. The preceding discussion should make clear the important function played by the crossover diode as used in Class-B complementary symmetry amplifier circuits. It's obvious that characteristics of these diodes are specified to provide the required degree of circuit stability. Thus, when servicing, it is extremely important that crossover diodes are replaced with the correct type as specified by stock number.

Tape Player Model YZD589, 593, 595—No Program Change

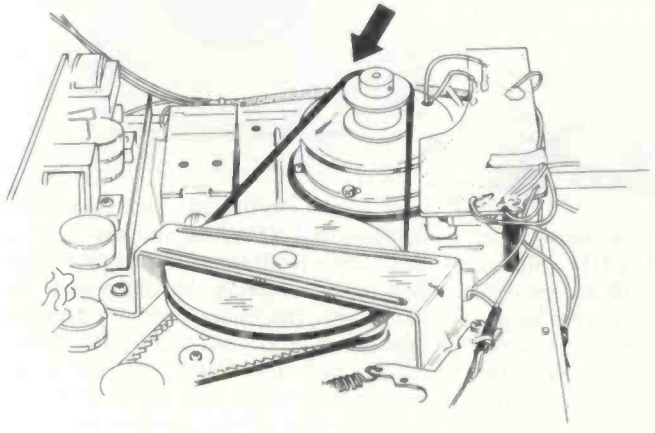
The symptom "Does not change channels manually or automatically, plays one program continuously" may be encountered in the instruments listed above. If this symptom



is evident, check the AUTO TRACK SELECTOR switch. Normal buildup of oxide from the tape can short the two switch contacts together. Clean the contacts in the same manner as that used to clean the head and capstan.

Tape Player Model YZD589—Tape Speed Too Fast

There is the possibility of the tape speed being too fast



in some Model YZD589 tape players. This can be caused by the rubber mounting inside the motor assembly, allowing the motor to tilt. As a result, the belt may ride up on the side of the pulley as shown, thereby increasing the tape speed. Change the motor, Stock No. 165814 (includes pulley), to correct this symptom. It may be necessary to adjust the pulley height after installing the motor so that the belt tracks on the flywheel.

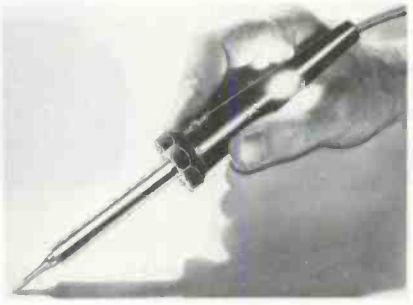
NEW PRODUCTS

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

SOLDERING IRON 703

Has light to indicate wattage selected for use

A 20w to 40w new pencil soldering iron, Model 540, has been developed that is said to have an exclusive built-in operating light inside the handle—the light indicating whether the iron is operating at 20w or 40w. A three-way handle switch selects either wattage, plus turning the unit OFF, so that unplugging is unnecessary. A special attachment is available that converts the soldering iron into a desoldering iron. Other features reportedly include an unbreakable polycarbonate handle,

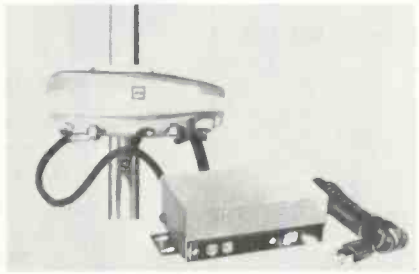


burn-resistant neoprene cord set, stainless steel element, solid-state control and ironclad tips. The iron is 8½ in. long and weighs only 4¼ oz. Enterprise Development Corp.

ANTENNA PREAMPLIFIER 704

Extremely linear frequency response

The Model SP2300-CD preamplifier provides VHF/FM amplification of signals from any VHF/FM antenna.



The silicon overlay transistor design reportedly gives 14dB VHF gain at one 300Ω output or 8.5dB at two outputs. Specifications indicate that its extremely linear frequency response makes it ideal for color reception. Included is the PS-6501 power supply that operates on 117v ac. The unit comes packed in a colorful showcase display carton. JFD.

SCREWDRIVER 705

Handle pivots 90° to form "T-handle" for maximum torque

A screwdriver, called the "Tork-It" is offered as part of a set with five interchangeable blades. It features a

handle that pivots 90° to form a "T-Handle" position when maximum turning power is desired, and then pivots back to the "in-line" position for fast spinning of screws in the normal fashion of regular screwdrivers. The T-Handle position allows the user to apply heavy downward pressure to keep the blade in the screw slot and at the same time increases the turning torque that can be applied. The set contains pivoting handle, three Phillips blades (No. 1, No. 2, No. 3), two regular slotted screw blades (3/16-in., ¼-in.), and a handy roll-up pouch. Hunter Tools.

WATTMETER-VSWR MONITOR 706

Displays the three prime RF transmission measurements

The Model 4342 Dual Wattmeter-VSWR Monitor has been designed to display three prime RF transmission measurements at once on a single meter face—forward and reflected

power are indicated by individual pointers and VSWR is monitored on a third scale from the intersection of the two power pointers. Specifications indicate that the meter does not require adjustments to full-scale deflection, or any switching before VSWR readings can be taken. The power and frequency range of the monitor depends

on two plug-in elements selected from more than eighty choices available. Full-scale power levels reportedly have ±5% accuracy from 10w to 5000w for forward indication and 1w to 500w for reflected in discrete frequency bands from 2MHz to 2.3GHz. A choice of QC Quick-Change connectors permits mating with N, BNC, TNC, UHF, C, SC, LC, HN, LT, GR type 874 and ⅞-in. EIA lines. The monitor is a portable instrument measuring about 7 in. by 4 in. by 6½ in. high and weighing only 5½ lb. Bird Electronic Corp.

TOOL SET 707

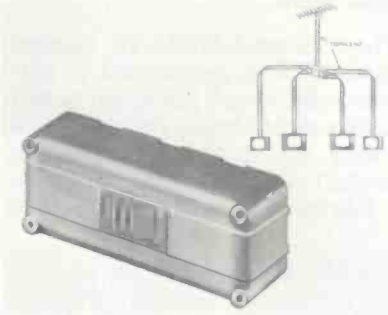
Solves all driving needs

The set, Stock No. 70191, consists of a five-piece all magnetic screwdriver with four interchangeable tips, including 3/16 and 9/32 in. regular slot and No. 1 and No. 2 Phillips cross slot. The magnetism is transmitted from the shank to the tip to the screw, providing a screw holding driver. The other part of the combination consists of a 7-piece hex drive-socket set including ¼, 5/16, ⅜, 7/16, and ½-in. sockets for turning all hex head nuts and bolts. A ¼-in. hex key wrench is included free for driving sockets in recessed or hard-to-reach places. The wrench is also useful for driving ¼-in. recessed hex head screws and bolts. Extra components are stored in the handle of each tool, offering the user extreme versatility in a minimum amount of carrying space. Vaco Products Co.

FOUR-SET COUPLER 708

Provides 90% Signal Transfer with corresponding low loss

A 300Ω high-efficiency, 82-channel TV/FM coupler is reportedly unusually efficient, providing 90% signal transfer with corresponding low loss. Designated Model MF-84, the coupler is ideal for splitting signals so that four TV sets can be attached to a single outdoor antenna with low loss and high-isolation between sets. Specifications indicate that the unit passes all frequencies between 54MHz (Channel 2) to 890MHz (Channel 83) with an insertion loss of only 7dB and the isolation between sets of at least 15dB. Encased in an attractive, compact high-impact plastic housing, the coupler can easily be mounted along a baseboard. to the back of a TV set or

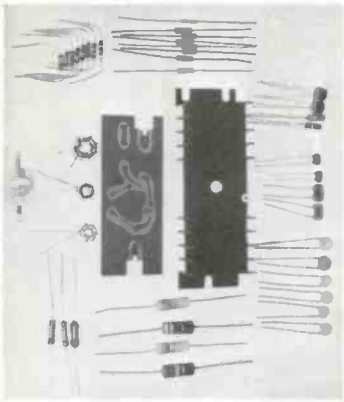


in the basement or the attic. Being weather resistant, it can even be mounted outdoors on the mast or outside of a window. Jerrold.

BROADBAND POWER AMPLIFIER KIT 709

Covers a range from 0.5MHz to 100MHz

Kit MP-100 is an all solid-state broadband power amplifier covering a frequency range of 0.5MHz to 100 MHz. Rated at 2.5w CW, it accepts inputs of AM, SSB, pulse, and other complex modulation. It delivers full power output when driven by any signal or sweep source of 0.15v over the entire frequency range—without tuning adjustments. The unit reportedly will not oscillate for any



condition of load of source impedence, withstanding 15dB overdrive, including short and open circuit loads. The kit can be assembled in approximately 3 hours. A data and specification sheet is available from the manufacturer. Larkton Scientific.

DIGITAL MULTIMETER 710

Low cost autoranging 3½ digit instrument

An automatic Digital Multimeter,

continued on next page

NEW PRODUCTS...

continued from page 59

Model 8310, reportedly features 3½ digits with 100% overrange, auto zero, auto polarity, and dual slope integration for maximum accuracy and noise

rejection. Specifications include 0.1% tolerance on the dc volts scale and 0.5% tolerance on the ac volts scale at frequencies up to 20kHz. The unit features resistance measurements to 200M, plus dc and ac current measurements to 2a. Other options include ac and dc high-voltage probes. The instrument measures less than 8¾ in. wide by 3 in. high by 8½ in. deep and weighs less than 5 lb. California Instruments Co.

SPEAKER GRILLE REPLACEMENTS 711

Kit contains easy-to-cut acoustic fabric

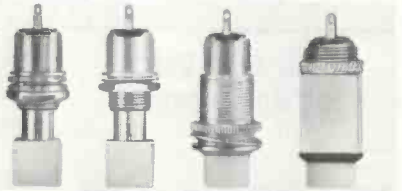
The Change-A-Grille kit consists of acoustic fabric premounted on perforated baffle board. Easily cut to size with household shears, the new grille is simply affixed with self-stick tape (included). Especially-designed acoustic fabrics in bright, decorative

weaves assure unobstructed, distortion-free passage of sound. Mellotone, div. of Wendell Fabrics Corp.

INDICATOR LIGHTS AND SWITCHES 712

Overall length less than 1¾-in.

A new line of Series 81 Indicator Lights is available in various mounting styles, which include front panel bezel mount, sub-panel mount, and bushing mount. All styles are available with either round or square button caps. Lamps are replaceable from the front of the panel. The button caps can be legended to your order. Overall length is less than 1¾-in. The indicator lights complement a line of lighted and unlighted pushbutton switches. The same color choices that are available in the



line switches are also available in this indicator light line. Lamps are not supplied, however, units accept standard T-1¾-in. midget flange lamps. Grayhill, Inc.

DIGITAL VOLTMETER 713

Accurate measurements in presence of superimposed noise amplitudes

A new low-cost digital voltmeter, designated Model PM2422, is a "3+1" instrument with three-digit resolution and an overrange digit for any of five ranges of ac or dc current and voltage, and six ranges of resistance. The instrument is said to be an integrating DVM reportedly capable of accurate measurements in the presence of large superimposed noise amplitudes. The integrating period of 20msec is reportedly accomplished through a patented "delta pulse modulation circuit" that is designed to give fast response with series mode rejection down to 1% of the original signal value. Measurements may be made either grounded or floating and common mode rejection is rated at 100dB for dc and 90dB at line frequency. Philips.

DEALER SHOWCASE

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

SCANNING MONITOR 714

Covers both VHF and UHF channels

A new scanning monitor can be set up on any combination of eight VHF and/or UHF channels with but simple jumper plug changes, requiring no soldering. In addition to auto-scan, the

radio provides lock out switches to bypass channels, as well as manual operation for continuous monitoring of a single channel. A special circuit employing two ceramic selectivity filters reportedly prevents the problem of strong, nearby FM transmissions covering up the desired broadcast. Specifications indicate that the sensitivity of the receiver eliminates the need for preamplifiers, even on UHF, even though the "front-end" circuitry is highly immune to overloading. The receiver comes complete with a built-in dual power supply for 117v ac base operation and 12v dc mobile operation. E. F. Johnson.

INDUSTRIAL SPEAKER 715

Simplified impedance selection and mechanical mounting

Ease of impedance selection and mechanical mounting are two of the attractive characteristics offered in the all-weather Model WR-5T reflex speaker. Through the use of a built-in line transformer having a screwdriver-adjustable WATTS/IMPEDANCE switch, proper line connection and sound level adjustments are achieved very quickly. The 70v impedance levels are 8000/4000/2000/1000/666Ω. The power levels that may be selected are 7.5/5/2.5/1.25/0.65w at 70v and 1/0.62/0.31w at 25v. The all-metal unit is reportedly constructed of alodine treated heavy gauge aluminum

spinning and structural aluminum die-casting, assuring weather-resistance. The speaker can also be used as a sensitive microphone for intercom talk-back applications. Manufacturers specifications include: Program power, 7.5w; frequency range, 375Hz to 10kHz; sound level, 105dB; dispersion, 120°; dimensions, 6-in. bell by 4-in. depth. Atlas Sound.

TAPE PLAYER 716

Designed for custom in-dash installation

A new "in-dash" eight-track AM/FM/FM MPX player, Model C976, is designed to meet the need for a quality theft-proof tape player that can be easily and professionally installed into the dash by most Ameri-

can car owners. The features reportedly include: five pushbutton AM/FM tuning, 8w output per channel on FM and tape, LOCAL/DISTANT switch, VOLUME and TONE controls, front to rear and left to right BALANCE control, and automatic and manual track switching. The player is said to employ a solid-state chassis with 18 transistors, 12 diodes and 4 integrated circuits—operating from 12v dc with an output impedance of 8Ω. Dimensions of the unit are 7⅝ in. w by 3⅜ in. H by 7 in. D. Audiovox Corp.

MOVING?

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

TECHNICAL LITERATURE

Metal Cutting Snips

Catalog information is available on a new line of metal and wire cutting snips. Drop forged of highest quality tool steel, the tools are said to be specially designed to yield maximum cutting power with minimum effort. The handles on all styles are reportedly equipped with dipped heavy vinyl, hand-ease cushion grips. Channellock, Inc., Meadville, Pa. 16335.

Circuit Boards and Chemicals

A 12-page catalog features new sensitized printed-circuit boards in a line of breadboard and printed circuit supplies. The catalog also provides information on chemicals used in electronic servicing and maintenance. Injectorall Electronics Corp., 98-100 Glen St., Glen Cove, N.Y. 11542.

Closed Circuit Television

Bulletin GEZ-4996 describes the Model TE-26 solid-state security and surveillance closed circuit television camera. The camera features complete "hands-off" operation, high resolution, excellent stability and picture fidelity where lighting conditions may vary. General Electric Communication Systems Div., Section P, P.O. Box 4197, Lynchburg, Va., 24502.

Tool Kits

A 16-side brochure describes a line of tool kits and cases for use in the field. The brochure describes six professional tool kits, each engineer-designed to do a particular job. Included in the publication are the JTK-17 Field Engineer Kit, which contains over 100 tools in an executive attaché case; the JTK-2 Electronic Technician Kit for industrial personnel; the JTL-16 Compact "Detective" Kit, which contains 30 multipurpose tools in a zipper case; the JTK-27/37 Electronic Lab Kit, a complete portable electronics tool kit with test instruments in two attaché cases; the JTK-90 Instrument Repair, emphasizing watchmakers' tools; and the JTK-80 Electronic Technician Roll-Pouch Kit, a lower priced kit for technicians, students and kit builders. Jensen Tools and Alloys, 4117 N 44th St., Phoenix, Ariz 85018.

Selector Chart

A new selector chart makes it easy to choose and use line switches and accessories for Fastatch II replacement controls. The detailed chart covers rotary and push-pull action line switches. Convenient wiring diagrams are illustrated for each switch. In addition, photographs provide a quick reference guide to replacement push-pull line switches and to accessories for total replacement control service. Centralab Distributor Products, 5757 N. Green Bay Ave., Milwaukee, Wisc. 53201.

Camera Tube Interchangeability Guide

A new four-page interchangeability guide, No. CAM-702A, lists over 200 vidicon TV camera tube types and their direct or similar replacement. The guide reflects the latest changes in the RCA vidicon line. RCA Commercial Engineering, 415 So. 5th St., Harrison, N.J. 07029.

Electrical Clips and Insulators

A 8-page catalog, G172, completely covers all the manufacturer's clips and insulators with illustrations and full descriptions—a complete line, from miniaturized clips to large ground clamps. The catalog includes materials, sizes, characteristics, current-carrying capacities, and shipping information. Mueller Electric Co., 1575Y E. 31st St., Cleveland, Ohio 44114.

Audio Accessories

A new catalog, A-404A, of audio accessories is released listing the company's line of phone jacks and plugs, switches, connectors, adapters and molded cable assemblies. Hundreds of items can be found quickly with the catalog's numerical-alphabetical index system. Each part is listed by number and the page on which it is found. Accessories listed include phone jacks and plugs, pushbutton and slide switches, audio and phono connectors, audio accessory kits, microphone mixers and amplifiers, Hi-Fi switches and controls, audio adapters, special purpose cable assemblies and molded cable assemblies. Switchcraft, Inc., 5555 N Elston Ave., Chicago, Ill. 60630.

Fuses and Circuit Breakers

A 4-page catalog features an extensive line of exact replacement fuse and circuit breaker caddy assortments designed for domestic and foreign electronic equipment service requirements in the field or shop. Punched for easy reference use, the new two-color cata-

log, "FCA," describes the new "One Stop Service Caddy" which provides the user with a convenient two-in-one assortment of eight popular circuit breakers and 30 of the most widely used fuses. Littelfuse, Inc., Dept. PR., 800E. Northwest Hgw., Des Plaines, Ill. 60016.

Microphone and Speaker Stands

A 4-page color brochure, Form 7201, is available which is exclusively devoted to microphone and speaker stands, stand accessories, adaptors and fittings. The publication outlines the functional and mechanical details of 14 commercial and professional floor stand models, 12 microphone desk stands, 4 boom stands and more than 50 models of stand accessories. Sales Department, Atlas Sound, 10 Pomeroy Rd.., Parsippany, N.J. 07054.

Transistors

A catalog listing operating parameters of more than 100 types of epoxy-encapsulated field-effect and bipolar transistors is available. The catalog contains a detailed FET cross-index, in addition to data on general-purpose, switching and RF FET's; and NPN/PNP bipolar devices. Siliconix Inc., 2201 Laurelwood Rd., Santa Clara, Calif. 95054.

Outlet Strips

A 16-page, two-color catalog describes a complete line of pre-wired outlet strips and instrument carriers. The line of power outlet strips includes multiple outlets, providing convenient and safe receptacles at low cost. A complete line of high quality carriers are shown, some models are available for audio-visual applications, and outlet strips are included on most models. Also shown in the catalog are motor speed controllers. Waber Electronics, Inc., 300 Harvard Ave., Westville, N.J. 08093.

Tools

A 64-page catalog of professional tools and other products lists hundreds of useful products rarely sold by industrial distributors or stores. This collection includes hard-to-find hand tools and small power tools used by technicians and service personnel. Brookstone Co., 3720R Brookstone Bld., Peterborough, N.H. 03458.

Paging Systems

A 4-page catalog, PG 192, describes paging systems for immediate, selective and private paging of personnel by means of radio signals transmitted to lightweight pocket receivers. It covers such features as ease of installation and operation, negligible operating cost, and easy add-on capability for the systems. Included are detailed specifications of systems with 20-call or 110-call capacities supplied complete with paging encoder, radio transmitter, paging receivers, antenna, coaxial and interconnect cables, batteries and accessories. Picker Briggs Corp., 4135 West 150th St., Cleveland, Ohio 44135.

Electronic Parts

A 420-page catalog is the comprehensive buying guide for everything in electronic parts and supplies. The catalog lists over 50,000 separate stock items from more than 400 manufacturers. Merchandise is grouped by sections and numerical cover margin tabs guide you quickly to the products you need. Allied Electronics, 2400 W. Washington Blvd., Chicago, Ill. 60612.

Electronic Servicing Aerosols

A complete line of aerosol products for color and B/W TV servicing is described in this new catalog. Also included is a new volume-control and contact restorer that reportedly will not harm metals or change capacities, and prevents gumming when used on automatic record changers. All the aerosol products are said to be non-toxic, contain no carbon tet, remain non-flammable and not affect plastics. W. Gottlieb, Electronic Chemical Corp., 813 Communipaw Ave., Jersey City, N.J. 07304.

Silicon Rectifiers

A 6-page catalog illustrates an extensive line of standard and fast recovery silicon rectifiers. It devotes individual pages to ratings and electrical characteristics, as well as dimensional drawings of case styles for EDI bridges, high-voltage axial-lead rectifier cartridges, high-voltage rectifier assemblies and miniature axial rectifiers. Dennis Dean, Industrial Products Sales Manager, Electronic Devices, Inc., 21 Gray Oaks Ave., Yonkers, N.Y. 10710.

LETTERS . . .

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er electronics, but only on a part time basis. Among other things, I am a qualified instructor and hope to get a chance to teach a vocation course in the area I'm moving to.

The percentages are against the majority of the field being as bad as I've seen, but I would feel it only fair to prepare potential technicians to such conditions, and the knowledge that it's hard for one man to fight employer or technical incompetence.

Unions are an extreme measure in my estimation. The company you pointed out in your editorial needed no union, nor does the company I am now with. But servicemen aren't getting what they deserve. Perhaps a temporary union with provision for continuance or abolishment after a given period would be the answer.

THOMAS E. GALKO, CET

Thanks to Those Who Made CET

Some 31 years in electronics is a long time to wait for a certificate of recognition. Back in the early 1950's in Long Island, N.Y., a group of us formed an association. We were for licensing and an upgrading of TV technicians. Time and time again we were turned down by the state legislature. Many of us, of which I was one, crawled into our shells. I lost contact with everyone and everything, worked long hours and tried to conceal the fact that I was a TV serviceman.

This year I moved to Florida and heard about CET. I purchased the necessary study material and inquired when the test would be given. Three hours a day of study and three months later, I was ready. The passing of the test was no longer important now. I had accomplished what CET and myself had set out to do. I had upgraded myself through study and knew that from now on a study program to "keep up with things" would become part of my life.

I want to thank those who carried on and made CET a reality. You have brought me back out of my shell—now I confess to being a TV Technician.

Having been an Electronics Instructor for many years, I see a way that I can help with the program. Anyone in my area can feel free to call on me and perhaps I can help them pass the test.

The test is rather difficult, but I think the computer has a heart. I believe that I passed on old age!

WARREN J. QUIBELL, CET
Viking Television
St. Petersburg, Fla.

One of the Old Timers

Being one of the "old" timers in the electronic business, I am writing you this letter. I notice that from time to time many of your readers speak of old-time radios . . . this make and that . . . and so forth.

I have in my possession, probably in as good working order as the day it was made, one of the old timers, one that many probably never hear of. This radio is a Tuska Model, Type 225, made in 1922, serial number 15146.

I have been in this business since 1921 and still going in the retail and service business . . . and probably will remain in it until it is impossible.

Thought I would let you know about this old set as it is now 50 years old and workable. "Tuska" was made by C. D. Tuska Co., Hartford, Conn. and was on the market only a few years, so they are rare.

D. A. WHITAKER

"We don't have it in stock? Well how about that antique store on Elm Street?"

TEKLAB REPORT...

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for a 1kHz square-wave output. Then, observing the square-wave trace on the oscilloscope screen, we adjusted the trimmer on the probe for an ideal square-wave pattern.

We felt that the probe is well designed for ease of operation and small enough for working in close areas. The hook on the outer probe tip is exposed by pulling back on the spring-loaded portion of the tip. This feature allows hooking on to a test point, leaving both hands free to make adjustments while observing waveforms. This spring-loaded hook can also be removed, exposing a metal pin that can also be used for making electrical contact.

Operational Waveforms

We put the oscilloscope to work checking waveforms on a new color-TV set, comparing them against manufacturer's waveforms at given test points. The optional probe used was the Heath Model PKW-101 high-impedance (low-capacitance) isolating type just described.

The first complex waveform displayed with the scope (Fig. 1) is very familiar to most TV service technicians, the video signal at the vertical sweep frequency, 60Hz. The top waveform was obtained at the first video amplifier tube grid, using the Channel 1 input; and the lower waveform was obtained at the plate of the same tube using the Channel 2 input of the oscilloscope.

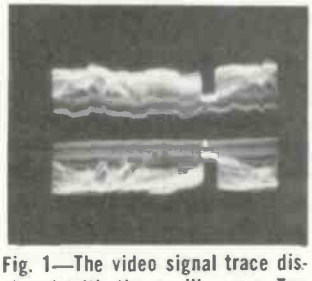

Fig. 1—The video signal trace displayed with the oscilloscope. Top trace: The video signal obtained at the first video amplifier tube grid at the TV vertical-sweep frequency, applied to scope Channel 1. Lower trace: The same video signal at the plate of the tube applied to the input of scope Channel 2.

The waveforms shown in Fig. 2 were obtained using the same TV set test points, but this time the scope was set at the horizontal-sweep frequency.

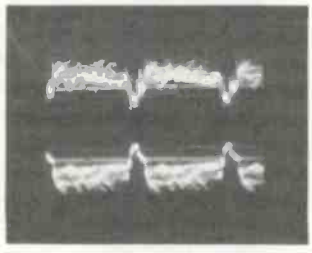

Fig. 2—The video signal obtained at the TV horizontal-sweep frequency. Top trace: The video signal obtained at the first video amplifier tube grid employing the scope's Channel 1 input. Lower Trace: The video signal obtained at the first video amplifier plate using the scope's Channel 2 input.

We also applied a 200-kHz square-wave signal (the highest that we had available) from a sine/square-wave generator to the input of Channels 1 and 2, producing the waveforms shown in Fig. 3.

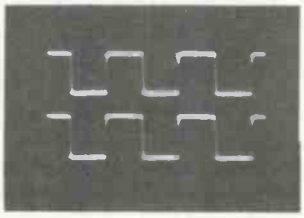

Fig. 3—Ideal square-wave traces produced by applying a 200kHz signal from a sine/square-wave generator to Channels 1 and 2.

We were very pleased with the operation of the scope and the waveforms displayed. In a future article in the series "Basic Digital Circuits" we will be seeing more waveforms produced by this impressive scope. ■

NEWS...

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John Jacobson (l), Zenith Field Engineer, and Warren Foran (r), Service Manager from Elliott & Bottom Corp., presented a service seminar in Norfolk, Va. on October 10, 1972. Approximately 140 dealers from southeastern Virginia and northeastern North Carolina attended a well presented discussion on the new solid-state Titan Chassis. A similar meeting, also well attended, was held in Richmond, Va. on October 19th.

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need additional business. Not only can a good mail campaign help to fill in the slow spots, it will also bring new customers into your business who will look to you for their future service needs. And don't forget, every customer who responds to your direct mail program will be a good prospect for a repeat in six months or a year. The names of all such customers should be carefully filed, because they will be your hottest prospects for future promotions.

The next time your telephone leaves you in the lurch, try direct mail. You will find that it is both exciting and profitable to run your business, instead of letting it run you. ■

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ADVERTISED PRODUCTS

101	110	119	128	137	146
102	111	120	129	138	147
103	112	121	130	139	148
104	113	122	131	140	149
105	114	123	132	141	150
106	115	124	133	142	151
107	116	125	134	143	152
108	117	126	135	144	153
109	118	127	136	145	154

TEST INSTRUMENTS

900	909
901	910
902	911
903	912
904	913
905	914
906	915
907	916
908	917

NEW PRODUCTS

700	709	718	727	736	745
701	710	719	728	737	746
702	711	720	729	738	747
703	712	721	730	739	748
704	713	722	731	740	749
705	714	723	732	741	750
706	715	724	733	742	751
707	716	725	734	743	752
708	717	726	735	744	753

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IMPORTANT! Please check your business classification.

Type of Business
Check One

A. ☐ Independent or Self-Employed Service Technician
B. ☐ Independent Electronic Service Organiz.
C. ☐ Retailer with Electronic Service Dept.
D. ☐ Electronics, Radio, TV Manuf
E. ☐ Industrial Electronic Service
F. ☐ Wholesale, Jobber, Distributor
G. ☐ Other (Specify) .....

Position
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H. ☐ Technician
I. ☐ Owner, Manager, Buyer
J. ☐ Service Manager
K. ☐ Other

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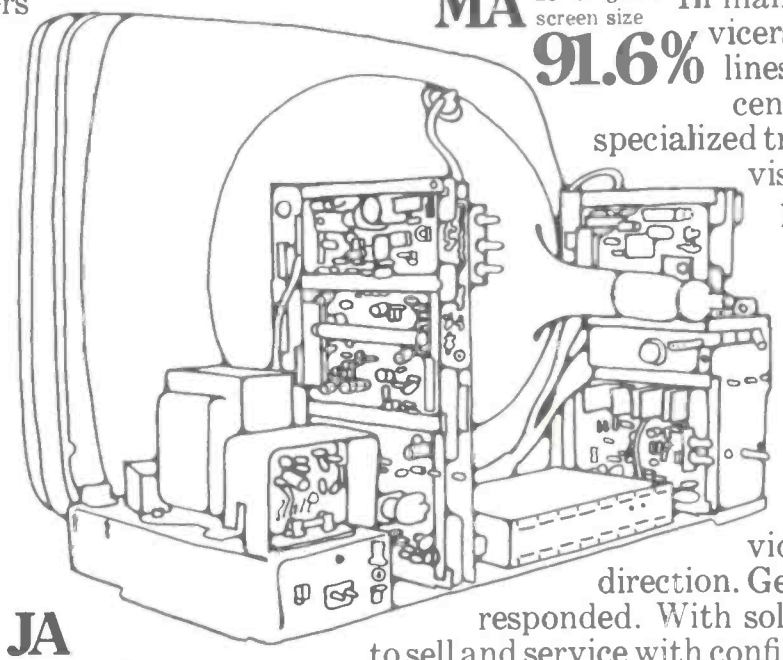
These solid state color systems are the most serviceable we've ever built. Because independent servicers helped us design them.

Independent servicers awarded us these serviceability ratings. Proof that foresight pays. The foresight of the television service industry in developing specific serviceability guidelines and urging TV manufacturers to use them. The foresight of General Electric in working side by side with independent servicers to create 100% solid state sets that are easy to service.

MA 25" diagonal screen size
91.6%

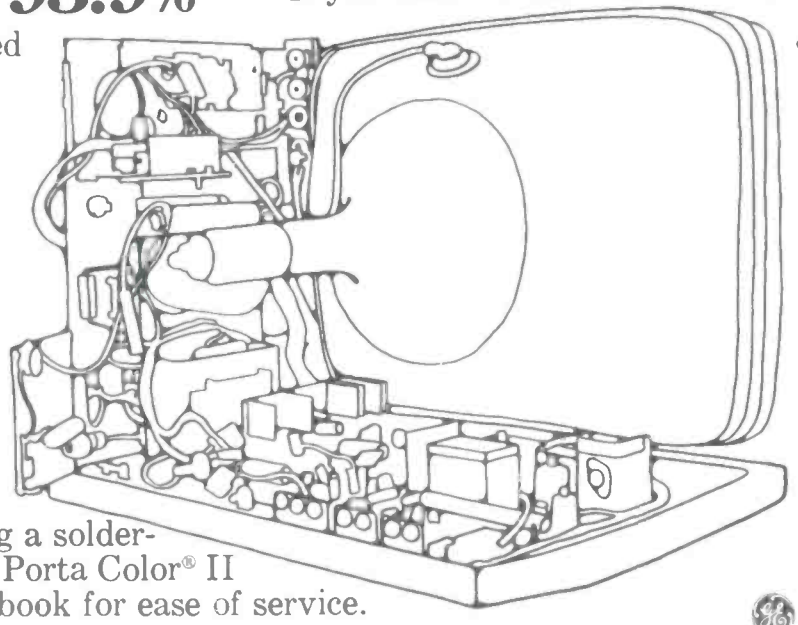


In many states, TV servicers use direct phone lines to regional parts centers. We provide specialized training. Our Television Service News provides advance information servicers need to more easily service GE monochrome and color models.

The service industry has provided foresight and direction. General Electric has responded. With solid state products to sell and service with confidence. To achieve our mutual goal of customer satisfaction.

JA 19" diagonal screen size
93.9%

If you want to know more about GE service, call collect or write "Dutch" Meyer, Television Receiver Products Department, Portsmouth, Virginia 23705. Phone (703) 484-3521.



GE's new solid state sets are designed for maximum accessibility. With extensive use of visual aids. And plug-in modules and components. Example: 95% of the total components in GE's new solid state modular color console models can be removed for servicing without using a soldering iron. Solid state Porta Color® II models open like a book for ease of service.

Impressed? That's only half the story. To improve local parts availability we are expanding parts distribution through independent parts distributors.

OUR NO. 1 GOAL: TO MAKE GENERAL ELECTRIC YOUR BEST BUY

We build every television as if we were going to use it ourselves.

GENERAL ELECTRIC

sk

The Solid-State System ...for better servicing

It all works together to help you meet today's tough demands of solid-state servicing. See your RCA Distributor now and put SK, The RCA Solid-State Replacement System, to work in your business. You'll see why you can't beat it for better servicing and profits. It's the system built from your point of view.

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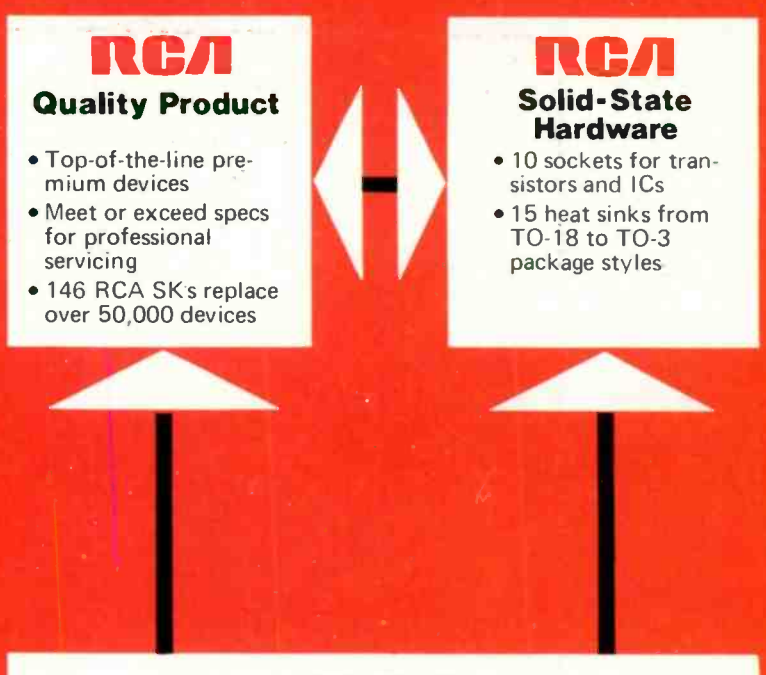
Harrison, N.J. 07029

RCA
Electronic Components



RCA
Information Support

- Replacement Guide (SPG-202M) cross-references over 50,000 domestic and foreign devices and supplies specific application information to assure correct replacement
- SK Quick Selection Wall Chart (1L1367A) . . . saves you time making the right choice
- Three slide-film/cassette tape presentations on Transistor Servicing cover Basic Techniques for Transistor Checking (1L1337), Identifying The Defective Stage (1L1377), Identifying & Replacing The Defective Component (1L1378), plus the Transistor Servicing Booklet (1L1379). Available through your RCA Distributor