MARCH 1971 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

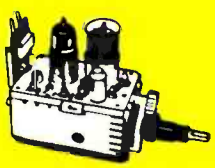
WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

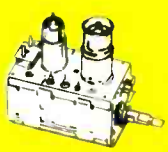
Closed Circuit Television

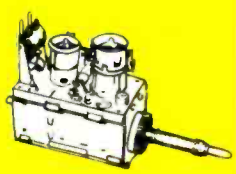
WHY REPAIR TV TUNERS?
CASTLE REPLACEMENTS
start at 8.95

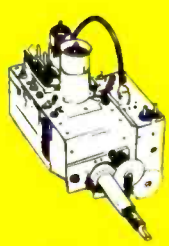
Select by part number below. Write, phone or wire order.

No mailing ... no waiting ... no nonsense!









UNIVERSAL REPLACEMENTS
Prefer to do it yourself?

These Castle replacement tuners are all equipped with memory fine tuning and UHF position with plug input for UHF tuner. They come complete with hardware and component kit to adapt for use in thousands of popular TV receivers.

*Supplied with max. length selector shaft (measured from tuner front apron to tip) . . . you cut to suit.

STOCK No.	HEATERS	SHAFT Min.*	SHAFT Max.*	I.F. OUTPUT Snd.	I.F. OUTPUT Pic.	PRICE
CR6P	Parallel 6.3v	1¾"	3"	41.25	45.75	8.95
CR7S	Series 600mA	1¾"	3"	41.25	45.75	9.50
CR9S	Series 450mA	1¾"	3"	41.25	45.75	9.50
CR6XL	Parallel 6.3v	2½"	12"	41.25	45.75	10.45
CR7XL	Series 600mA	2½"	12"	41.25	45.75	11.00
CR9XL	Series 450mA	2½"	12"	41.25	45.75	11.00

EXACT REPLACEMENTS
Purchase outright . . . no exchange needed. $15.95 ea.

Castle replacements made to fit exactly in place of original tuner. Available in the following popular numbers.

ADMIRAL

94E210-1
94E210-3
94E227-2
94E228-1
94E229-4
94E229-8
94D257-1
94D257-7
94D257-49
94E260-8H
94E260-11
94E261-1B
94E261-1C
94E261-1D
94D261-4
94C273-2
94C273-4
94C273-7
94C273-8
94C273-9
94C273-10
94C273-13
94C273-15
94C281-1K
94C286-1D
94C286-1E
94C286-1J
94C286-1L
94C286-4J
94C286-5
94C286-12
94C286-16
94C289-1

CURTIS MATHES

7A11
7A17
7A38
7A48
7A050
7A53-001
7A056-001
7A59-001

EMERSON

471351
471512
471515
471678
471682
471700

G E

ET86X188
ET86X208
ET86X212
ET86X213
ET86X214
ET86X215
ET86X221
ET86X224
ET86X227
ET86X230
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ET86X232
ET86X236
ET86X242
ET86X244
ET86X255
ET86X256
ET86X265
ET86X277
ET86X281

HEATHKIT

110-17
110-24
110-25
110-33
110-38

MAGNAVOX

340009-1
340010-1
340017-1
340038-1
340040-1
340042-1
340052-1
340053-1
340066-1
340067-1
340069-1
340078-1
340078-2
340095-2
340130-1

MOTOROLA

OPTT123C
OPTT123D
TT133A
TT133YA
LTT307A
RTT322A
CPTT332A
CPTT338B
DCPTT338B
CMTT340A
CMTT340B
TT348B
MTT348A
VTT348B
VTT349B
CPTT350B
CPTT356YA
TT361Y
OPTT361YB
CPTT366Y
CPTT366YD
OPTT366YD
NCPTT376YA
CPTT378YA
NCPTT378YA
OPTT385Y
OPTT385YA
OPTT386YA
OPTT388YA
CPTT390YA
OPTT390YB
OPTT394
SCPTT394
AOPTT399
LOPTT399Y
LOPTT399YA
OPTT399YA
OPTT402
LOPTT402
CPTT403
OPTT404
OPTT404A
CPTT405
OPTT414A

MUNTZ

PR0352-1
PR0364
PR0376
PR9021
PR9044
PR9045
PR9050
PR9058

OLYMPIC

CL4692-1
CL5220-1
CL28874-1
CL29554
CL29566
CL29650
CL33579
CL33858
CL34190
CL34835
K24013USA-1C
K50013USAH-3

PHILCO

76-12405-4
76-13579-5
76-13579-7
76-13579-8
76-13579-9
76-13851-2
76-13871-1
76-13945-1
76-13955-1
76-13955-2
76-13955-5

RCA

KRK103A
KRK103C
KRK103F
KRK103L
KRK104A
KRK104C
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KRK118C*
KRK118D*
KRK123D
KRK124AA
KRK124U
KRK127AA
KRK127AB
KRK127B
KRK127BA
KRK127E
KRK127L
KRK127T
KRK127U
KRK127W
KRK128AB
KRK128U
KRK133BC
KRK133D
KRK133U

SEARS

95-75
95-141-0D
95-358-0
95-437-0A
95-480-3B
95-480-3D
95-481-3A
95-500-0A
95-500-1A
95-500-1B

SYLVANIA

54-11644-3
54-11702-1
54-17234-1
54-17436-2
54-17436-3
54-17436-4
54-17436-5
54-17778-1
54-23853-3
54-23857-2
54-78093-1
54-88847-3B
54-89093-1
54-89720-1A
54-89720-3
54-89840-2A
54-94689-3
54-97948-6
54-97948-7

WESTINGHOUSE

470V007H03
470V019H05
470V019M01
470V030H01
470V049H01
470V149H01
470V151H01
470V158D03
470V161D03
470V188D01
470V188D02
470V190D01
470V191D01
470V191D02
470V191D03

ZENITH

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175-1177
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175-1179

MISC. INCLUDING PRIVATE LABELS

TA82
TA124
TA129
TA131
TA133
TA136
TA138
TA147
TA150
TA157
Z5A1241-002B
Z5A1241-004B
Z5A1241-005B
Z5A1241-006B
Z5A1245-005D
Z5A1245-006D
Z5A1245-009
Z5A1245-011
Z5A1246-001
Z5A1246-003
Z5A1246-004
Z5A1246-005A
Z5A1247-002
Z5A1249-001A
Z5A1249-001E
Z5A1253-001
Z5A1253-001B
Z5A1253-001D
Z5A1256-001C
Z5A1258-001A
Z5A1258-001C
Z5A1263-001
Z5A1264-001B
Z5A1265-001B
Z5A1268-001
Z5A1270-001
006-014700
006-015000
006-015700
006-016500
006-017300
006-017700
006-018600
006-020100
006-020900
006-021000

*Supplied with new channel indicator skirt knob, original illuminated dial is not used.

OVERHAUL SERVICE — All makes and models.

VHF or UHF tuner	(1960 or later)	$9.95
TRANSISTOR tuner		$9.95
COLOR tuner		$9.95

Overhaul includes parts, except tubes and transistors.

Dismantle tandem UHF and VHF tuners and send in defective unit only.

Remove all accessories . . . or dismantling charge may apply.

Your tuner will be expertly overhauled, aligned to original standards and warranted for 90 days.

CUSTOM EXCHANGE REPLACEMENTS

When our inspection reveals that original tuner is unfit for overhaul, we offer an exact replacement

If exact replacement is not available in our stock we custom rebuild the original at the exchange price.

(Replacements are new or rebuilt.)

PROFESSIONAL "CONTACT OVERHAUL" KIT

Do your own minor tuner overhauling by using this professional kit of chemicals. Dealer Net $5.50

CASTLE TV TUNER SERVICE, INC.

MAIN PLANT: 5713 N. Western Ave., Chicago, Ill. 60645 • Ph. 312—561-6354

EAST: 130-03 89th Rd., Richmond Hill, N.Y. 11418 • Ph. 212—846-5300

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

ELECTRONIC TECHNICIAN/DEALER

TEKFAX

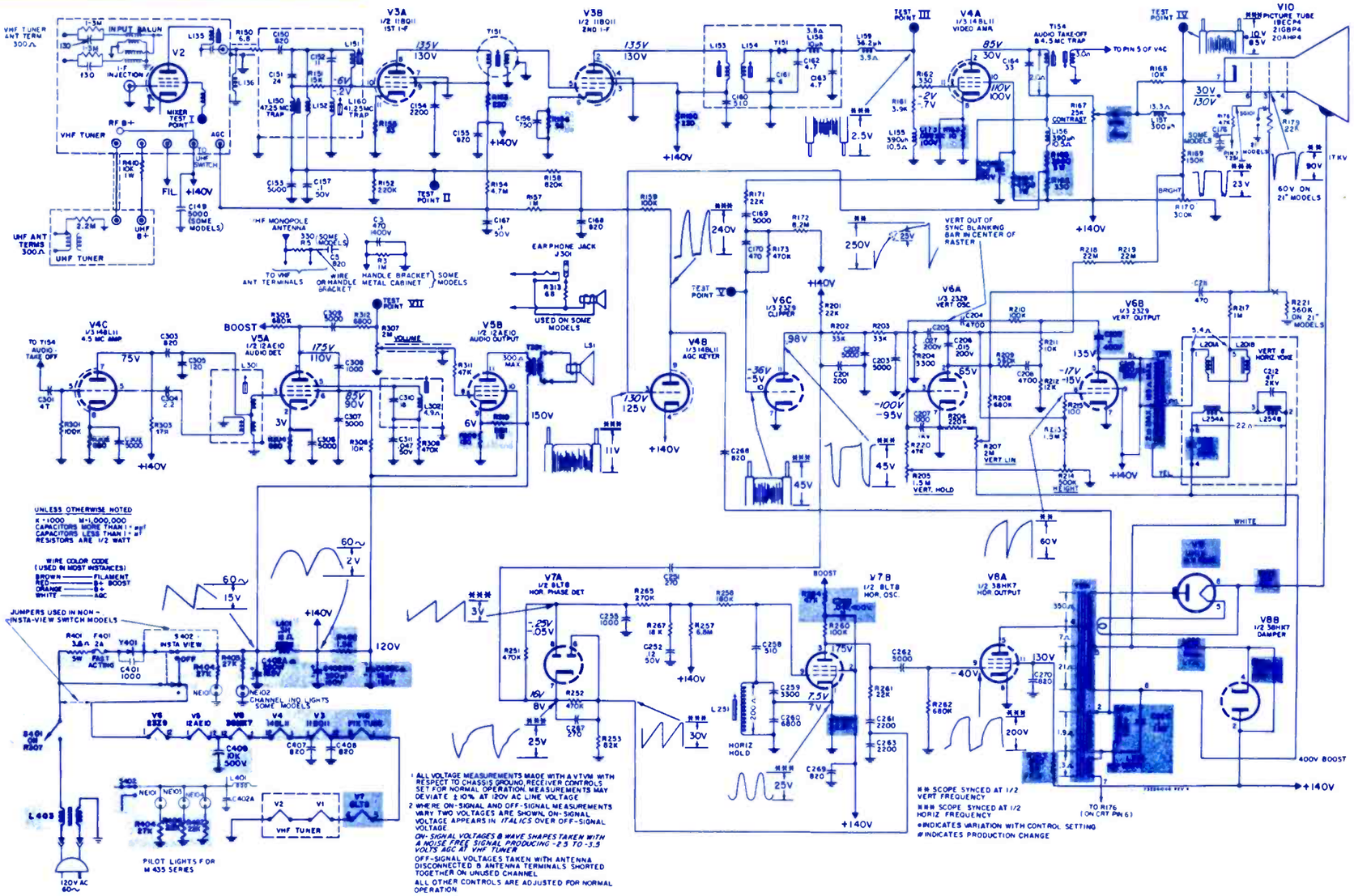
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

GROUP 223

1345 GENERAL ELECTRIC TV Chassis D2

MARCH • 1971

SYMBOL DESCRIPTION	G.E. PART NO.
R401—3.6Ω, 10%, 5w, wire wound	ET14X183
R207—2M, vert linearity	ET49X499
R214—500K, vert size	ET49X500
C402A—250 μf, +100/-10%, 165v	ET31X300
C402B—300 μf, +100/-10%, 160v	ET31X300
C402C—10 μf, +100/-10%, 150v	ET31X300
C402D—5 μf, +100/-10%, 160v	ET31X300
L150—coil-47.25MHz trap assembled with core	ET36X647
L201—yoke-deflection	ET76X56
L251—coil-horiz oscillator	ET35X51
L255—coil-width control	ET36X774
L302—coil-quadrature w/core	ET36X732
L403—coil-choke, line filter	ET36X887
T154—xformer-sound take-off, 4.5MHz trap w/core	ET36X854
T201—xformer-vert output	ET64X106
T251—coil-horiz output xformer w/cap & lead assembly	ET77X95
T301—xformer-audio output	ET64X105
fuse-2.0a fast acting	ET10X41



1346

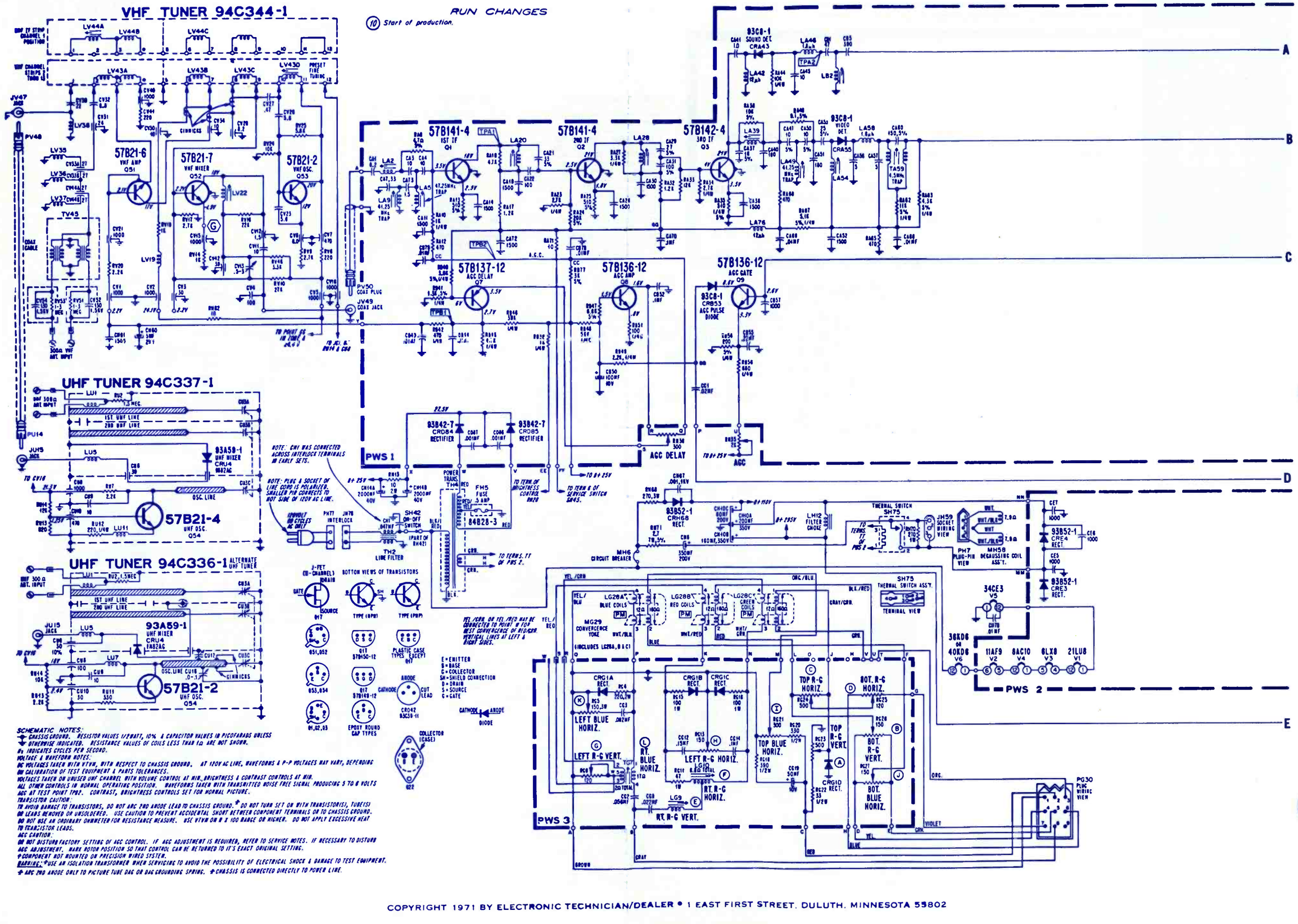
ADMIRAL

Color Chassis K10

ELECTRONIC TECHNICIAN/DEALER TEKFAX

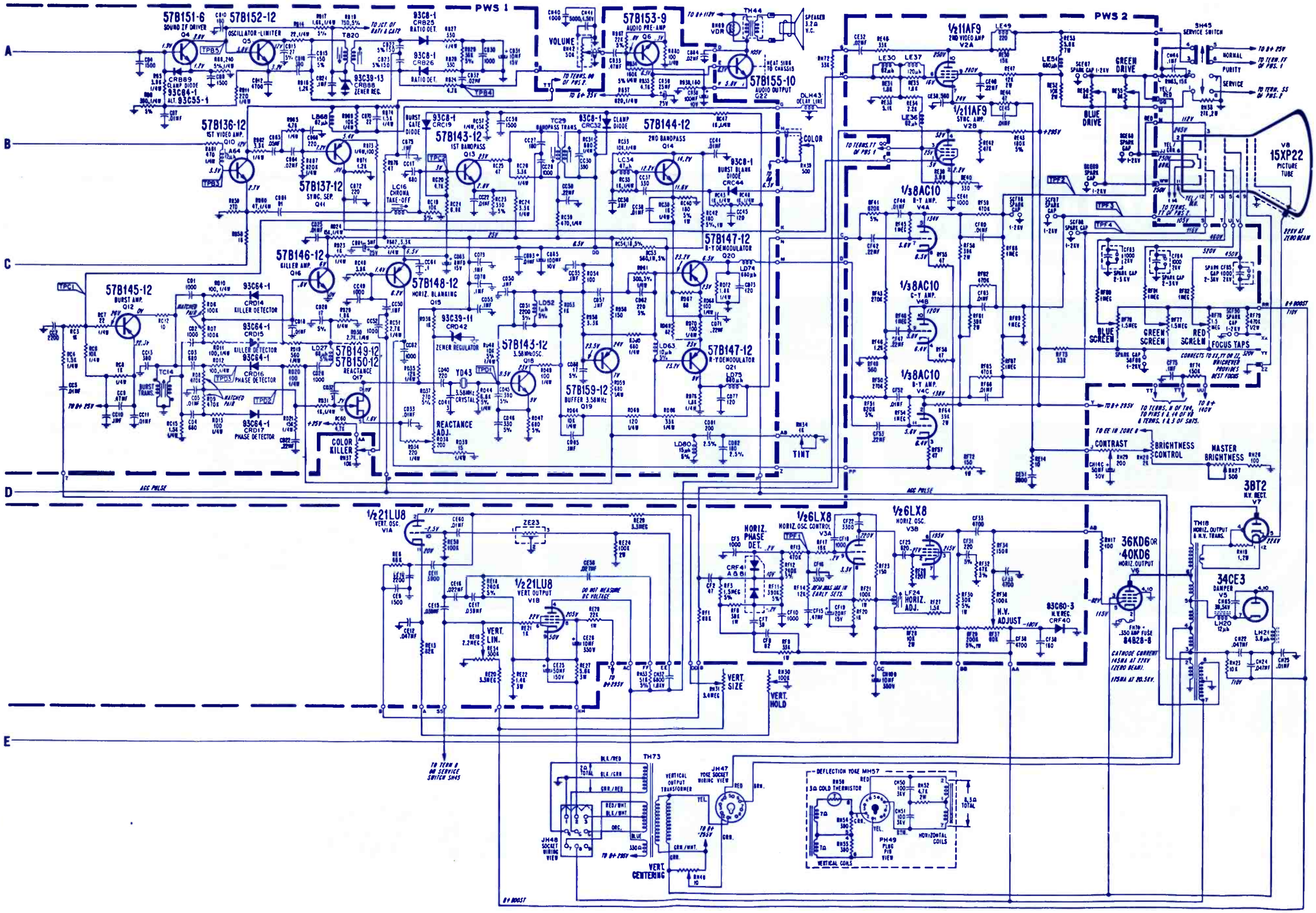
MARCH • 1971

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



SCHEMATIC NOTES:
⏚ CHASSIS GROUND. RESISTOR VALUES 1/2WATT, 10% & CAPACITOR VALUES IN PICOFARADS UNLESS OTHERWISE INDICATED. RESISTANCE VALUES OF COILS LESS THAN 1Ω ARE NOT SHOWN.
#s INDICATES CYCLES PER SECOND.
VOLTAGE & WAVEFORM NOTES:
DC VOLTAGES TAKEN WITH VTVM, WITH RESPECT TO CHASSIS GROUND. AT 120V AC LINE. WAVEFORMS & P-P VOLTAGES MAY VARY, DEPENDING ON CALIBRATION OF TEST EQUIPMENT & PARTS TOLERANCES.
VOLTAGES TAKEN ON UNUSED UHF CHANNEL WITH VOLUME CONTROL AT MIN., BRIGHTNESS & CONTRAST CONTROLS AT MID. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION. WAVEFORMS TAKEN WITH TRANSMITTED NOISE FREE SIGNAL PRODUCING 5 TO 6 VOLTS AGC AT TEST POINT TPB2. CONTRAST, BRIGHTNESS CONTROLS SET FOR NORMAL PICTURE.
TRANSISTOR CAUTION:
TO AVOID DAMAGE TO TRANSISTORS, DO NOT ARC 2ND ANODE LEAD TO CHASSIS GROUND.* DO NOT TURN SET ON WITH TRANSISTOR(S), TUBE(S) OR LEADS REMOVED OR UNSOLDERED. USE CAUTION TO PREVENT ACCIDENTAL SHORT BETWEEN COMPONENT TERMINALS OR TO CHASSIS GROUND. DO NOT USE AN ORDINARY OHMMETER FOR RESISTANCE MEASURE. USE VTVM ON R X 100 RANGE OR HIGHER. DO NOT APPLY EXCESSIVE HEAT TO TRANSISTOR LEADS.
AGC CAUTION:
DO NOT DISTURB FACTORY SETTING OF AGC CONTROL. IF AGC ADJUSTMENT IS REQUIRED, REFER TO SERVICE NOTES. IF NECESSARY TO DISTURB AGC ADJUSTMENT, MARK ROTOR POSITION SO THAT CONTROL CAN BE RETURNED TO IT'S EXACT ORIGINAL SETTING.
*COMPONENT NOT MOUNTED ON PRECISION WIRED SYSTEM.
WARNING: *USE AN ISOLATION TRANSFORMER WHEN SERVICING TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK & DAMAGE TO TEST EQUIPMENT.
* ARC 2ND ANODE ONLY TO PICTURE TUBE DAG OR DAG GROUNDING SPRING. * CHASSIS IS CONNECTED DIRECTLY TO POWER LINE.

ADMIRAL
Color Chassis K10



1347
PHILCO-FORD
Color TV Chassis
21ST90,T/21ST91

MARCH • 1971

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

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

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver AGC control adjusted for an approximate peak-to-peak output of two volts at the video detector, using an air signal. Do not reset AGC control when using color bar generator. All monochrome voltages taken with average air signal and all chroma voltages taken with a color bar generator connected to the antenna input terminals. The chroma peak-to-peak voltages were taken with the chroma control set for 0.5V peak-to-peak at Pin 2 of V40 and the tint control set for proper color bars (approximately mid-range), all other controls set for normal viewing. The frequencies shown are those of the waveforms.....not the sweep rate of the oscilloscope. All voltages taken with a wide band scope having a 5MHz bandwidth similar to B&K Model 1450.

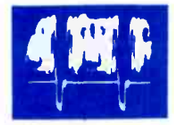

1 2 VOLTS P/P, 60 HZ (MAX. CONTRAST)

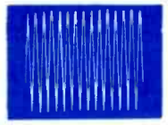

2 2 VOLTS P/P, 15,750 HZ (MAX. CONTRAST)

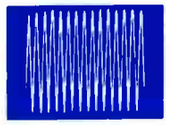

3 65 VOLTS P/P, 15,750 HZ


4 0.2 VOLTS P/P, 15,750 HZ


5 2.8 VOLTS P/P, 15,750 HZ


6 2.5 VOLTS P/P, 15,750 HZ


41 105 VOLTS P/P, 3.58 MHZ


42 9 VOLTS P/P, 3.58 MHZ


7 165 V. P/P. (MAX. CON.) 15,750 HZ

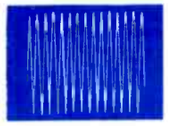

8 65 V. P/P. (MIN. CON.) 15,750 HZ

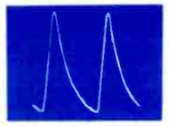

9 30 VOLTS P/P, 15,750 HZ


10 35 VOLTS P/P, 15,750 HZ


11 50 VOLTS P/P, 15,750 HZ

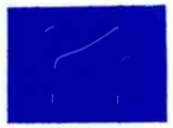

12 45 VOLTS P/P, 15,750 HZ


43 11 VOLTS P/P, 3.58 MHZ

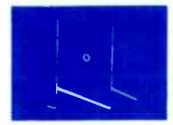

44 130 VOLTS P/P, 15,750 HZ

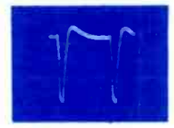

13 45 VOLTS P/P, 60 HZ


14 57 VOLTS P/P, 60 HZ

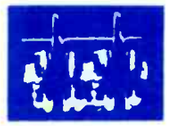

15 130 VOLTS P/P, 60 HZ


16 14 VOLTS P/P, 60 HZ


17 900 VOLTS P/P, 60 HZ (SPIKE) 150 VOLTS P/P, 60 HZ (SAWTOOTH)

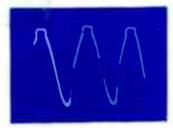

18 8.5 VOLTS P/P, 15,750 HZ

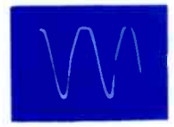

45 80 VOLTS P/P, 15,750 HZ

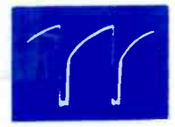

46 135 VOLTS P/P, 15,750 HZ (MAX. CONTRAST)


19 17 VOLTS P/P, 15,750 HZ

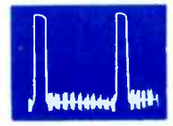

20 5.5 VOLTS P/P, 15,750 HZ

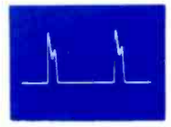

21 50 VOLTS P/P, 15,750 HZ


22 140 VOLTS P/P, 15,750 HZ

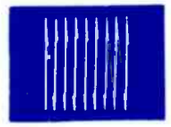

23 180 VOLTS P/P, 15,750 HZ


24 170 VOLTS P/P, 15,750 HZ

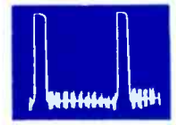

47 13 VOLTS P/P, 15,750 HZ


48 28 VOLTS P/P, 15,750 HZ

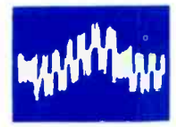

25 15,750 HZ LOOSE COUPLED

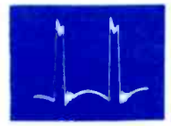

26 12 VOLTS P/P, 3.58 MHZ


27 2.5 VOLTS P/P, 15,750 HZ


28 60 VOLTS P/P, 15,750 HZ


29 .5 VOLTS P/P, 15,750 HZ


30 15 VOLTS P/P, 15,750 HZ


49 640 VOLTS P/P, 15,750 HZ


50 520 VOLTS P/P, 15,750 HZ

31 20 VOLTS P/P, 15,750 HZ

32 90 VOLTS P/P, (CHROMA) 70 V. P/P. (SYNC) 15,750 HZ

33 30 VOLTS P/P, (CHROMA) 70 V. P/P. (SYNC) 15,750 HZ

34 85 VOLTS P/P, (CHROMA) 70 V. P/P. (SYNC) 15,750 HZ

35 2 VOLTS P/P, (CHROMA) 5 V. P/P. (SYNC) 15,750 HZ

36 6 VOLTS P/P, 15,750 HZ

51 1000 VOLTS P/P, 15,750 HZ

52 360 VOLTS P/P, 15,750 HZ

53 30 VOLTS P/P, 15,750 HZ

37 230 VOLTS P/P, 15,750 HZ

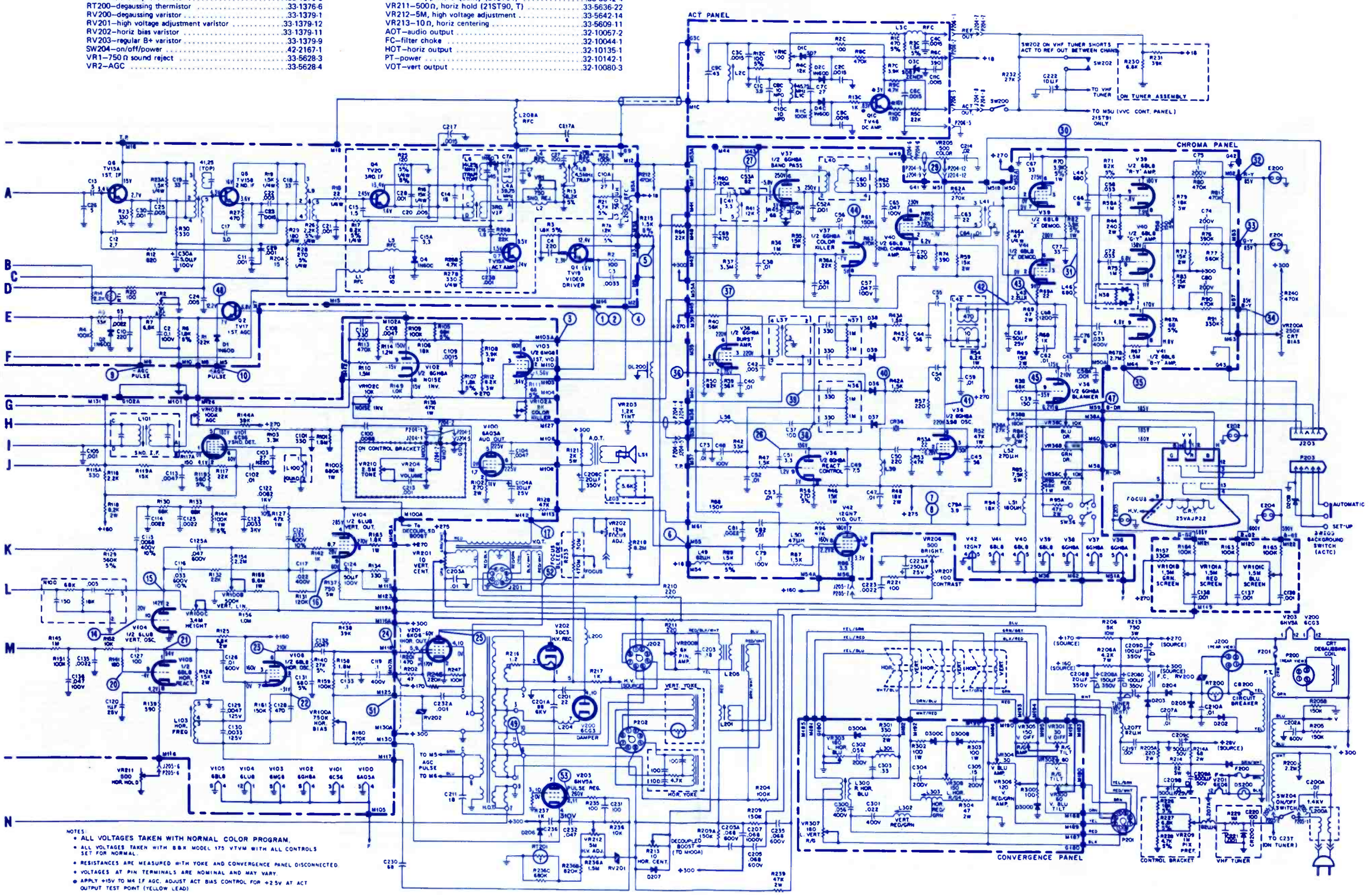
38 70 VOLTS P/P, 15,750 HZ

39 70 VOLTS P/P, 15,750 HZ

40 17 VOLTS P/P, 3.58 MHZ

PHILCO-FORD
Color TV Chassis
21ST90,T/21ST91

SYMBOL	DESCRIPTION	PHILCO-FORD PART NO.
C208	150-20-20-100/350v B+ filter	30-2616-21
C209	500-500, 500 150v 100/350v B+ filter	30-2622-2
CR200	varactor, picture preference	34-8057-21
D208	zener, background	34-8057-32
L8	xformer, 4.5MHz trap	32-4869-1
L36	tint control	32-4112-63
L39	reactance	32-4877-1
L100	quadrature	32-4876-1
L103	horiz frequency	32-4891-1
N36	phase detector	30-6055-1
N37	phase detector	30-6055-1
N38	matrix	76-14268-2
N100	vert integrator	30-6030-16
RT1	AGC comp thermistor	33-1376-8
RT200	degaussing thermistor	33-1376-6
RV200	degaussing varistor	33-1379-1
RV201	high voltage adjustment varistor	33-1379-12
RV202	horiz bias varistor	33-1379-11
RV203	regular B+ varistor	33-1379-9
SW204	on/off/power	42-2167-1
VR1	750 Ω sound reject	33-5628-3
VR2	AGC	33-5628-4
VR36	A-green drive, H-blue drive, C-red drive	33-5632-1
VR100	A-horiz bias, B-vert linearity, C-height	33-5627-2
VR102	A-color killer, B-AGC, C-noise inverter	33-5627-1
VR201	10Ω, vert center	33-5609-1
VR202	12M, focus adjustment	33-5631-10
VR203	1.2K, tint (21ST90,T)	33-5639-2
VR203	1.2K, tint (21ST91)	33-5642-1
VR204	1M, volume (21ST90, T)	33-5639-1
VR204	1M, volume (21ST91)	33-5642-3
VR206	500 Ω, brightness (21ST90, T)	33-5636-18
VR206	500 Ω, brightness (21ST91)	33-5642-7
VR207	100 Ω, contrast (21ST90, T)	33-5636-22
VR207	100 Ω, contrast (21ST91)	33-5642-5
VR208	500K, vert hold (21ST90, T)	33-5636-18
VR208	500K, vert hold (21ST91)	33-5642-8
VR209	1M, picture quality (21ST91)	33-5642-4
VR211	500 Ω, horiz hold (21ST90, T)	33-5636-22
VR212	5M, high voltage adjustment	33-5642-14
VR213	10 Ω, horiz centering	33-5609-11
AOT	audio output	32-10057-2
FC	filter choke	32-10044-1
HOT	horiz output	32-10135-1
PT	power	32-10142-1
VOT	vert output	32-10080-3



1348

ZENITH

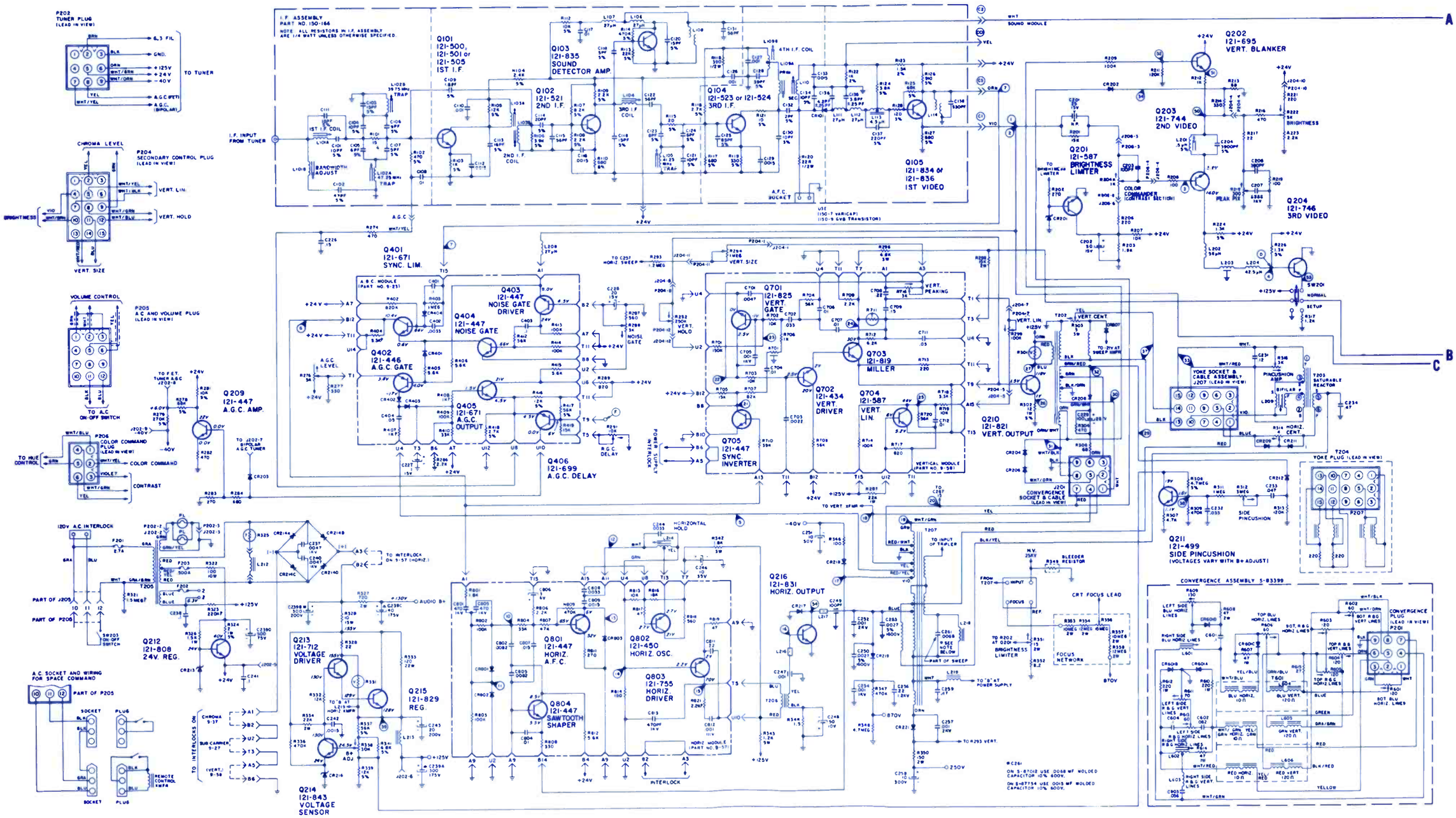
Color TV Chassis
40BC50

MARCH • 1971

ELECTRONIC TECHNICIAN/DEALER **TEKFAX**

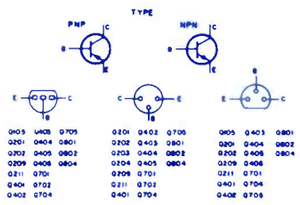
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

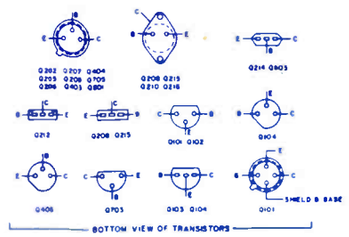
SYMBOL	DESCRIPTION	ZENITH PART NO.
C239A	300/175v electrolytic capacitor	22-6249
C239B	300/200v electrolytic capacitor	22-6249
C239C	40/175v electrolytic capacitor	22-6249
C239D	500/75v electrolytic capacitor	22-6249
R222	5K bright control	63-8201
R254	voltage dependent resistor	63-5440
R276	5K AGC level control	63-8492
R288	3K noise gate control	63-8493
R291	10K AGC delay control	63-8491
R292	250K vert hold control	63-8698
R294	1M vert size control	63-8699
R301	voltage dependent resistor	63-5472
R303	5 Ω vert centering control 3W	63-8475
R314	500Ω horiz centering control 3W	63-8956
R318	10K killer threshold control	63-8491
R319	5K chroma level control	63-8467
R325	thermistor	63-8687
R331	voltage dependent resistor	63-5440
R351	15 Ω bright limiter control 2W	63-8706
R356	15M focus control	63-8709
R711	thermistor	63-8788
R716	4K vert peaking control	63-8962
R1013	20K ACC control	63-8576
R1016	20K ACC control	63-8576
L203	delay line	S-84882
L214	horiz oscillator coil	S-56875
L901	chroma take-off coil	S-85761
T201	audio output xformer	95-2883
T202	vert output xformer	95-2915
T204	deflection yoke	95-2880
T205	power xformer	95-2878
T206	horiz driver xformer	95-2895
T1101	quadrature xformer	95-2789
A701	integrator unit	87-9
F201	2.7a bel-fuse	136-76
F203	0.5a bel-fuse	136-84



ZENITH
Color TV Chassis
40BC50

TEST POINTS	
B	BY-PASS WITH 470PF DURING 4TH I.F. ALIGNMENT.
C1	PICTURE DETECTOR OUTPUT
CC1	BIAS POINT FOR C1 ADJUST
C2	SOUND DETECTOR OUTPUT
C3	SYNC DETECTOR OUTPUT
D	BY-PASS WITH 25UF 25V ELECTROLYTIC DURING COLOR ALIGNMENT
E	I.F. A.G.C.
G	INPUT TEST POINT FOR 4TH ALIGNMENT
J/JJ	A.C.C.
K/KK	TURN COLOR TRESHOLD CONTROL TO MAX. CLOCKWISE POSITION TO OPEN COLOR CHANNEL.
M	SOUND OUTPUT
O	A.G.C. VOLTAGE
R	R-Y COLOR AMP. PLATE
S	B-Y COLOR AMP. PLATE
T	G-Y COLOR AMP. PLATE
P/RR	BRIGHTNESS LIMITER SET-UP POINTS





NOTES:

PHOTOGRAPHS TAKEN ON A STANDARD GATED RAINBOW COLOR BAR SIGNAL. THE HUE SETTING ADJUSTED FOR PROPER COLOR. THE WAVE SHAPES AT THE RED, GREEN AND BLUE CATHODES OF THE PICTURE TUBE DEPEND ON THE HUE, COLOR LEVEL (CHROMA LEVEL), CONTRAST (COLOR COMMANDER) AND PICTURE PEAKING CONTROLS.

FOR WAVEFORMS 43 THRU 49, TEST POINT "D" MUST BE BY-PASSED WITH A 0.1 MFD CAPACITOR.

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.

ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

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

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

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

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

COIL RESISTANCE NOT GIVEN UNDER ONE OHM.

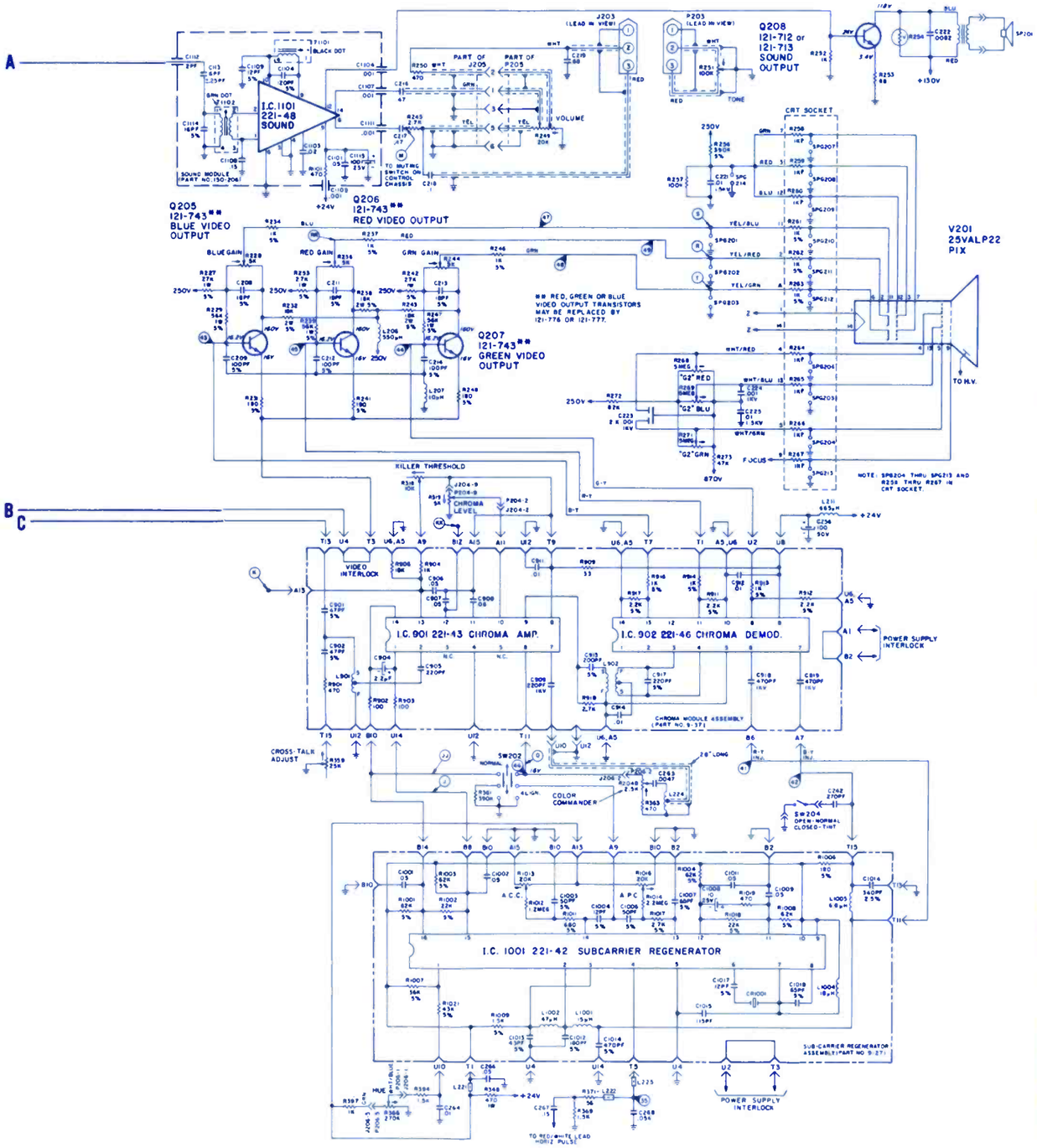
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

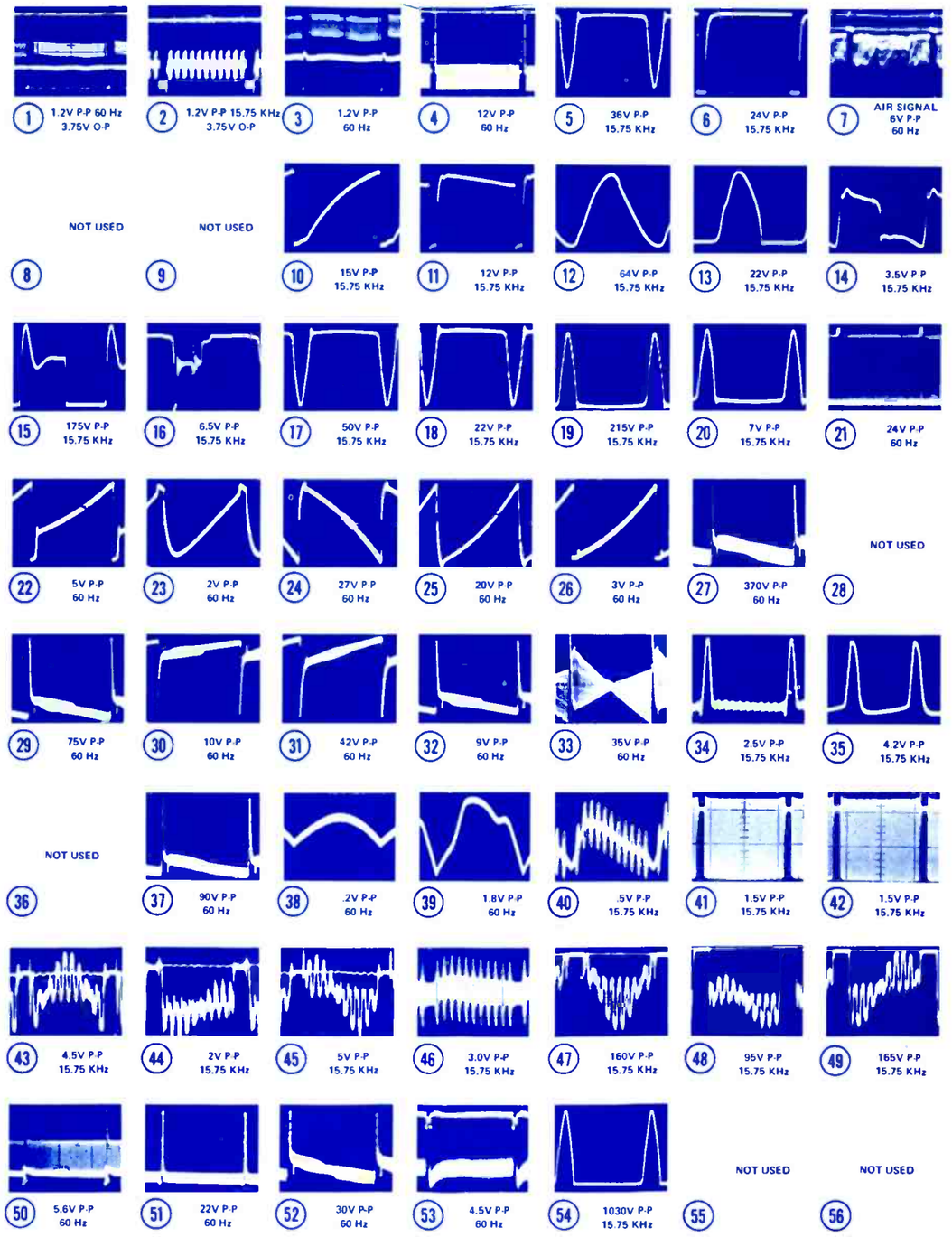
FOR CAPACITOR TOLERANCE, SEE LEGEND.

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

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

○→ INDICATES ALIGNMENT AND TEST POINT.
PF = PICOFARAD MHz = MEGAHERTZ µH = MICROHENRY
INDICATES ±20% MAY BE USED. ○— INDICATES VOLTAGE SOURCE
(2)▶ INDICATES WAVEFORM CHECK POINTS. (SEE WAVEFORM CHART)
INDICATES CHASSIS GROUND.
INDICATES MODULE BOARD
A1 INDICATES PIN NUMBER ON MODULE BOARD





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MAGNAVOX

TV Chassis
T942 Series

MARCH • 1971

ELECTRONIC TECHNICIAN/DEALER TEKFAX

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

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL VOLTAGE MEASUREMENTS MADE WITH VTVM, NO SIGNAL APPLIED, CONTRAST AT MAXIMUM, AND ALL OTHER CONTROLS SET FOR NORMAL OPERATION.
2. CAPACITANCE VALUES OF 1 AND ABOVE ARE IN PICOFARADS -- VALUES LESS THAN 1 ARE IN MICROFARADS.
3. ALL RESISTORS ARE 1/2 W, 10%.
4. ALL CAPACITORS ARE 10%, 500V.

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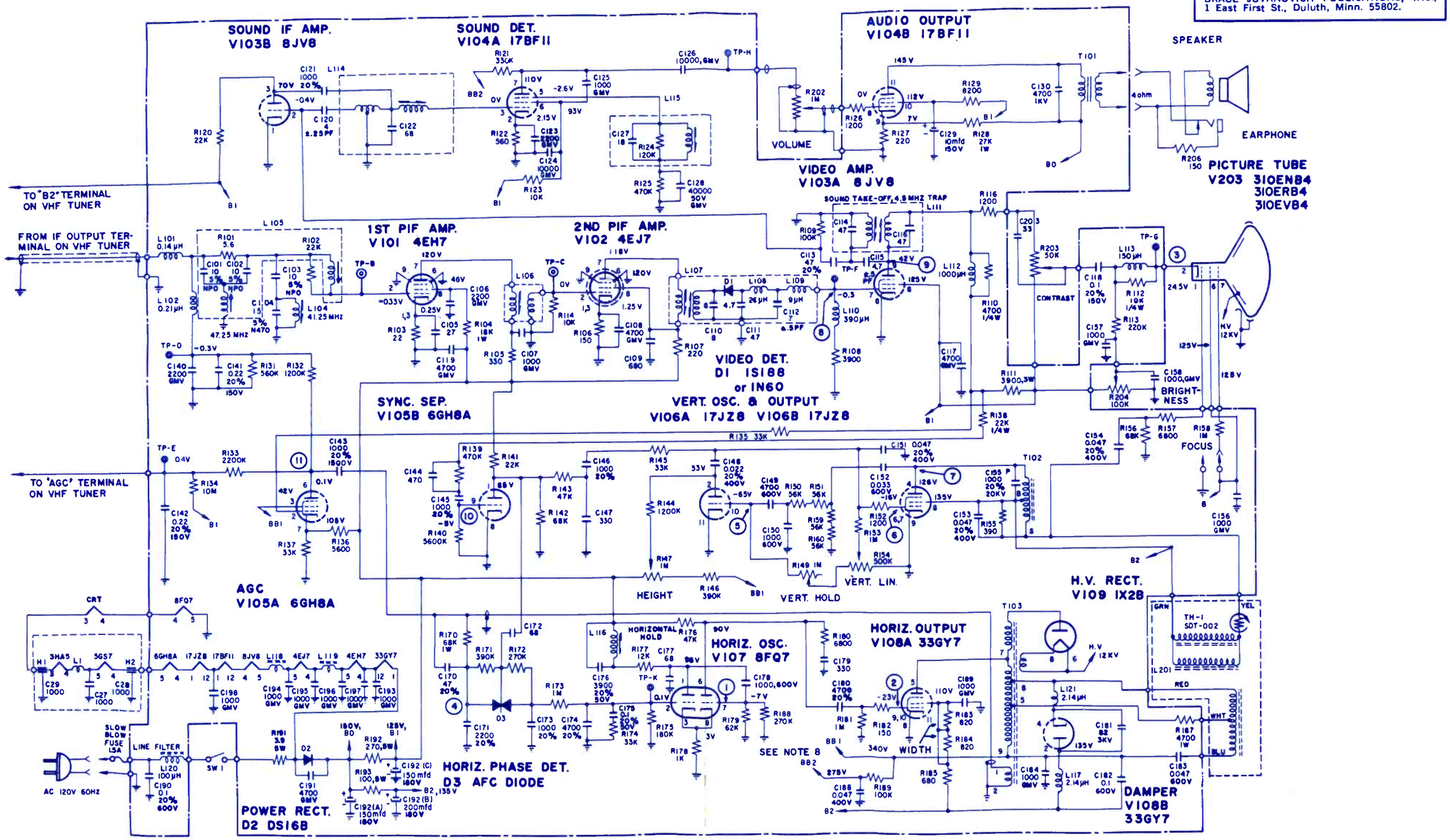

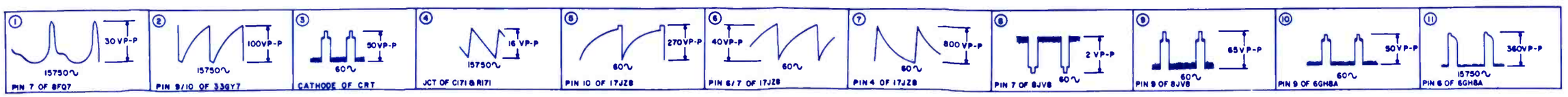

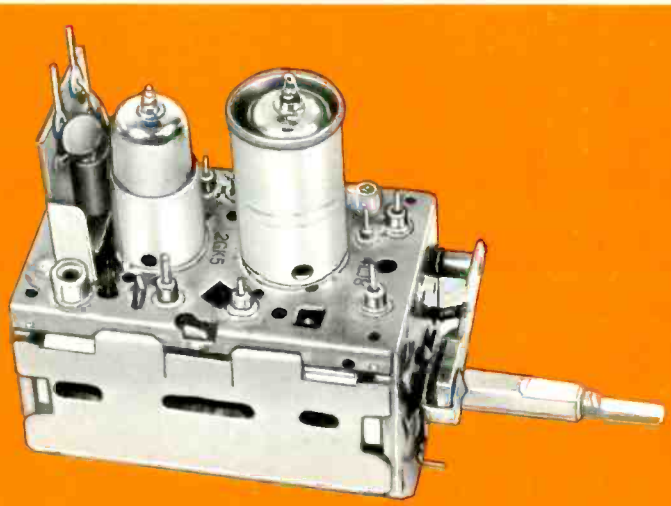

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Hi-Gain Lo-Noise

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MARCH 1971 • VOLUME 93 NUMBER 3

The rather unusual cover photo this month demonstrates one of the many new applications for closed circuit television. More details related to this photo are included in the article beginning on page 42.

FEATURES

A HARCOURT BRACE JOVANOVICH PUBLICATION

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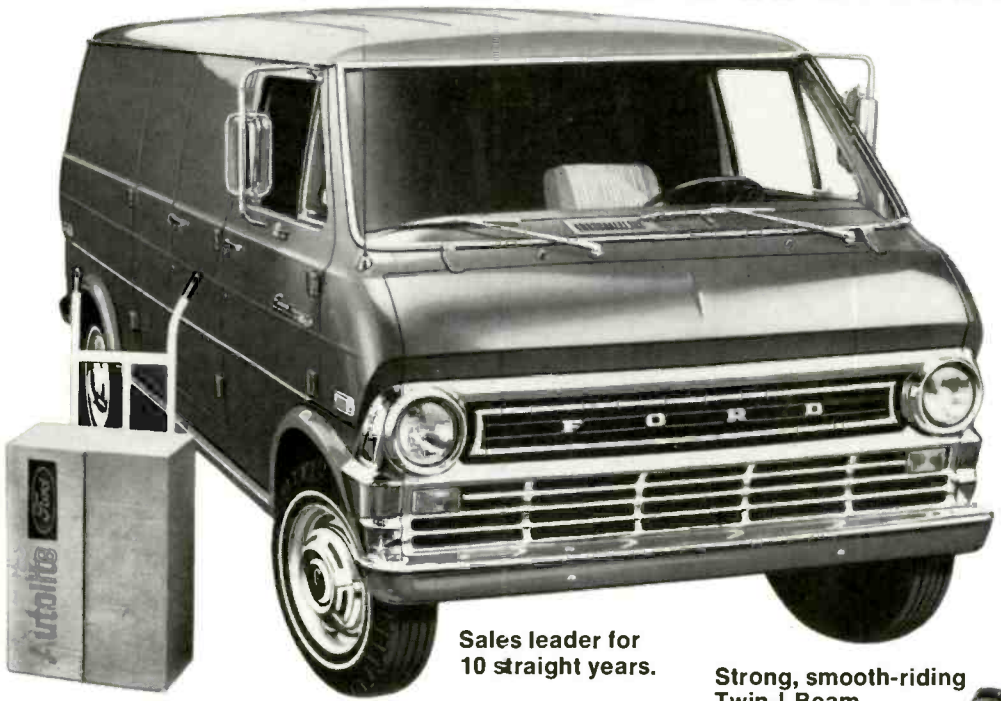
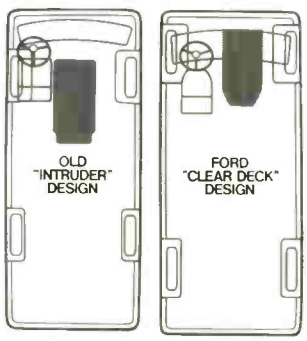
Only one van gives you all these better ideas. Ford Econoline



Sales leader for 10 straight years.

Engine clear forward

The engine is moved forward in Ford's clear-deck van—all the way out of the cargo area. Clear floor space behind driver's seat measures over 8½ ft. in Econoline Van . . . over 10 ft. in the Supervan.



Easy, out-front servicing.

Simply raise the convenient outside hood and your routine service points are right at hand: radiator, oil level, battery, windshield washer reservoir, voltage regulator, wiper motor, brake master cylinder. Better ideas make servicing fast, easy.

Strong, smooth-riding Twin-I-Beam

The independent front suspension that has revolutionized truck riding qualities. Two forged steel I-beam axles give it strength . . . big coil springs give it a smoother ride.

Shorter outside, easier to park.

Overall length of Econoline Vans is significantly shorter than other makes. This means easier parking and better maneuverability in city delivery operations—time saved on every trip.

Biggest payload of all

Husky construction and high capacity axles allow you to carry a heavier load than any other van. Maximum payload of 4320 lbs. is largest in industry.

Model	Max. Payload	Max. GVW
E-300	4320 lbs.	8300 lbs.
E-200	1800 lbs.	5400 lbs.
E-100	1120 lbs.	4500 lbs.

Wider at top for built-ins

Body sides are more vertical, wider apart at top than other vans. So built-in units fit better and leave more aisle. Modular units, designed to fit and work together allow you to custom design almost any interior you need. Job packages, such as insulated florist's van, are also available.

Driver's "walk-thru" to rear

Econoline's forward engine position clears the deck for the driver, too. He can easily step from his seat into the rear load area and exit through side or rear doors.

See your Ford Dealer and see all the better ideas in America's best-selling van—Ford Econoline.

FORD Ford

. . . for more details circle 112 on Reader Service Card

New Industry Cooperation

Riding back in the luggage compartment of a motel limousine can prove to be quite an informative experience —particularly when sharing the same cubbyhole with S. I. Neiman, president of the Electronic Information Bureau, Chicago. This comical scene occurred February 12th as we proceeded back to the Dallas airport after a remarkably worthwhile two-day session. S. I. (as most of his friends in the industry call him) was busy copying for you readers a news release that was soon to be sent out over the wire services, while I shielded him from bouncing suitcases perched threateningly near his head. "I've even written news releases during the war in submarines," he chuckled, "but this is a first." The release read as follows:

DALLAS, TEX.—The electronics industry's two national service trade associations, the National Electronics Associations (NEA) and the National Alliance of Television and Electronic Service Associations (NATESA) pledged "a full spirit of cooperation in joint endeavors" at the National Electronics Service Conference here (Feb. 12).

In a joint statement by Le Roy Ragsdale of Modern Electronics, Ft. Smith, Ark., president of NATESA and Morris Browne of Houston Television Service, Houston, Tex., president of NEA, the two groups pledged that "concrete steps shall be taken to achieve a better understanding and more harmonious relationship."

The statement:

"Whereas, the National Electronics Associations (NEA) and the National Alliance of Television and Electronic Service Associations (NATESA) are continually confronted by problems affecting their livelihood and even their very existence, the two national service associations having enjoyed an increasing spirit of cooperation in recent months in matters of mutual interest to both groups and

"Whereas, the general aims and goals of NATESA and NEA are quite similar,

"Therefore, be it resolved that the two national service associations pledge a full spirit of cooperation in joint endeavors, and

"Be it further resolved that concrete steps shall be taken to achieve a better understanding and more harmonious relationship between our groups and within our industry."

This spirit of industry cooperation was expressed by all those concerned, both at the Electronics Industry Council on February 10th and at the Fifth Annual National Service Conference on February 11th.

Representing broadcasters, manufacturers, dealers, technicians and those in virtually every field that could even vaguely be associated with the electronic communications and entertainment enjoyed by the public, the Electronic Industry Council (at the first meeting since its inaugural meeting) was primarily concerned with **you**, the electronic technician. Whatever exceptional TV programs produced, whatever hit records stamped out, whatever high-quality sophisticated electronic products produced—they are all without value unless **you** can keep the nation in a good state of electronic-product repair. As one very successful dealer present at the meeting said, "Consumerism is uniting us all—the manufacturer, distributor and dealer. We can no longer dicker as before." (The industry's attitude toward consumerism is expressed in more detail in this month's Guest Author article.) This dealer attributed much of his personal success to a continued advertising campaign indicating that all the men working in his shop are Certified Electronic Technicians (CETs).

Upgrading the image and technology of the electronic technician, and possible industry-wide certification programs, were discussed at length with the formation of a committee chaired by Morris L. Finneburg HE, HF, chairman of The Finney Company. Organizations represented in the committee include NATESA, NARDA, NEA, CESA (California Electronic Service Association) and the Service Managers Organization.

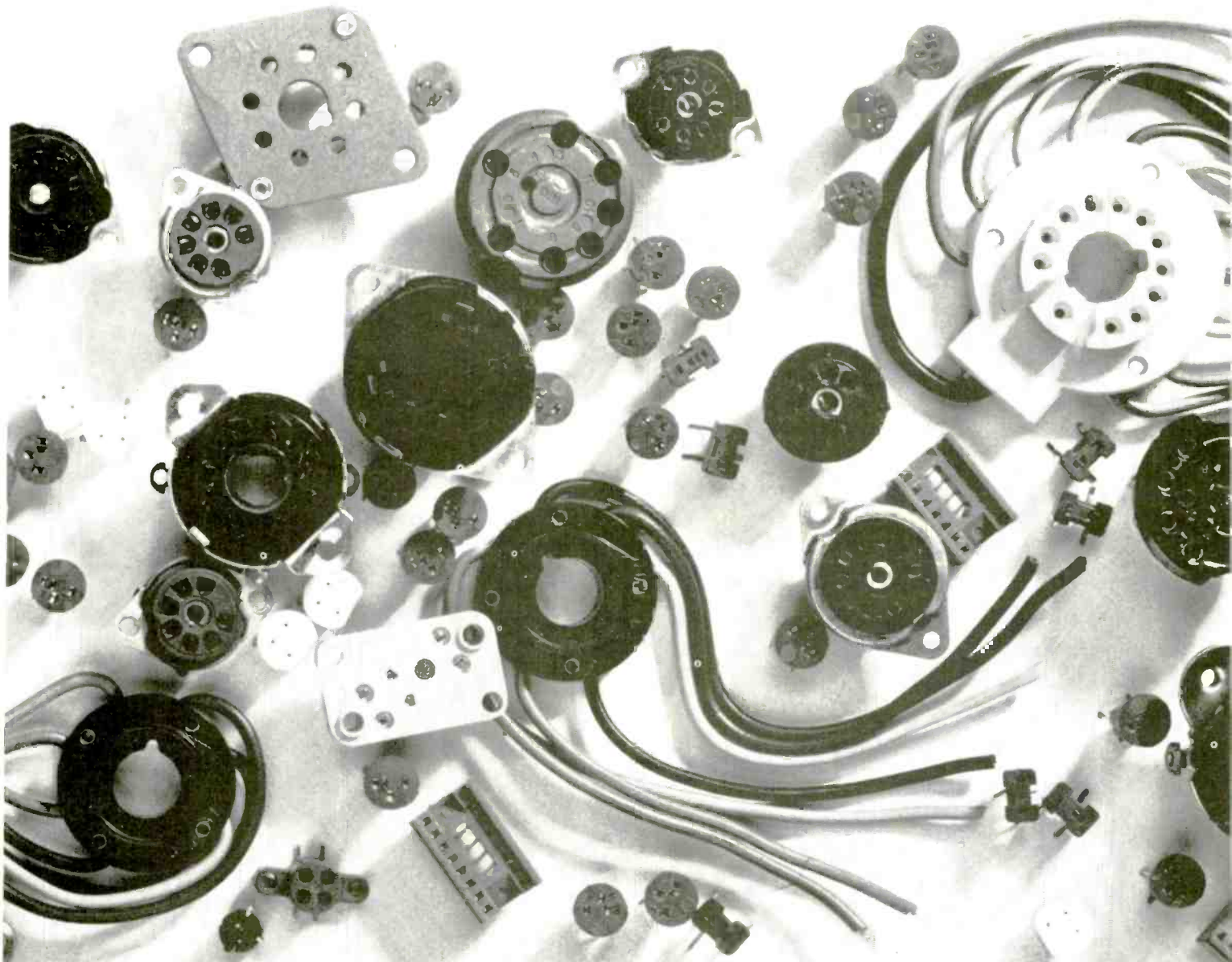
The Fifth Annual National Service Conference (which we will cover next month in more detail) was concerned with education and training, serviceability, parts availability, and technical information. One of their resolutions (presented by Harold Schulman, executive vice president of Dynascan Corp.) requested that the Electronic Industry Council hire a full time coordinator for in-industry training.

Last month's Editor's Memo stressed the importance of you taking part in your local service organization and the personal benefits that will result. I hope that this month's memo has helped impress you with the importance of these organizations on a national level. We are professionals, and as such we **must** support our professional organizations.

Phillip Dahlen

We have a boy

for every girl.



We have a tremendous line of receiving tubes—over 1000 at last count.

We have 205 different black-and-white picture tubes.

We have the industry's most complete line of color picture tubes.

We have semiconductors of all kinds: transistors, FETs, diodes, rectifiers, SCRs, Zener diodes, linear ICs.

These are our boys.

They're easy to work with.

We've organized replacement programs (like our ECG semiconductor program), so that you can keep the least amount of stock on hand to replace the most number of parts.

We publish the Sylvania Technical Manual, which is practically a replacement encyclopedia (32,000 components!).

We have loads of specialized replacement literature. And we help you with any replacement problem.

See your Sylvania distributor and get to know the family.

GTE SYLVANIA

Electronic Components Group, 100 First Ave., Waltham, Mass. 02154.

READERS' AID

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

Need Old Tekfax

I need a set of ELECTRONIC TECHNICIAN/DEALER Tekfax, starting from volume one through volume seven. If any reader has such a set and wants to sell them, I am interested in buying them.

RAYMOND R. CARLSON
3498 Kurtz Street
San Diego, Calif. 92110

Magazines for Sale

I have a complete set of ELECTRONIC TECHNICIAN/DEALER, April, 1955 through October, 1970.

Also for sale are Radio Tube Buff's: 5-UV 199's and 5-C 299's in their original cartons.

CLIFFORD PARDY
26 Pine Creek Ave.
Fairfield, Conn. 06430

Need Service Manual

I would like to refurbish and align an old Jackson, Model TVG-1, Sweep Signal Generator (vintage 1950) for use in my electronic studies. However, the Jackson Electrical Instrument Co. is no longer in business, and I cannot locate a service manual for this instrument. Can anyone advise me on where I may find a manual for the Jackson TVG-1?

ARMAND R. COTE
55 Ohio Avenue
Lawrence, Mass. 01841

I recently wrote Precise for a manual and roll chart for their Model 111 Gm and Em tube tester and was informed they are no longer available. Can anyone furnish me with a copy or an original that I can have a duplicate made from? I will pay for any expense incurred.

JIM CORLINS
2446 Vista Drive
Upland, Calif. 91786

Need Tube Cross-Reference

I need some help on cross-referencing a tube. I need to know what tube replaces tube No. EAF-801.

JOSEPH G. FONTENOT
520 Meadowlock St.
Alexandria, La. 71301

continued on page 34

NOW... the new Simpson® 260 SERIES 6 VOM

THE NEW SERIES 6 HAS ALL THESE NEW FEATURES PLUS ALL THE ADVANCEMENTS IN THE SERIES 5:

- External access battery and fuse compartment.
- Clip-type fuse holder.
- 0-1 volt DC range.
- 0-500 volt AC and DC ranges.
- Available 5000 volt adapter-type DC *safety* probe.
- Multi-purpose, screw-on test leads with combination probe and alligator clips.
- Only 2 batteries . . . one 9-volt NEDA 1604 and one 1½-volt "D" cell.
- Rugged taut band movement.
- Varistor overload protection.

260-6	$65.00
260-6M (Mirror scale)	$67.00

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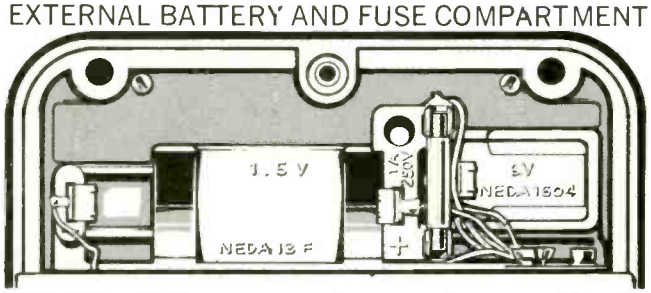

260-6RT (Roll-top protective case)	$71.00
260-6MRT (Mirror scale and roll-top case)	$73.00
260-6P (Overload protected)	$97.00
260-6PRT (Overload protected and roll-top case)	$103.00
Safety Probe: 5000 volt DC adapter type #00506	$4.50

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IN CANADA: Bach-Simpson Ltd., London, Ontario
IN INDIA: Ruttonsha-Simpson Private, Ltd., International House, Bombay-Agra Road, Vikhroli, Bombay

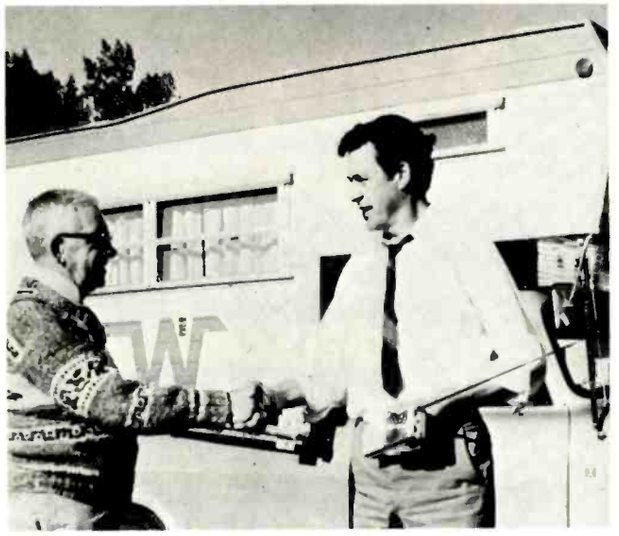
AGM DIVISION

. . . for more details circle 127 on Reader Service Card

NEWS OF THE INDUSTRY

Citizens Two-Way Radio Used by Subarctic Caravan

Citizens two-way radio recently helped a caravan of recreational vehicles become the first such organized group to reach the northern end of Canada's Ingram Trail. Radio communications kept the 32 vehicles in touch when they became separated en route and brought fast help to those vehicles that became disabled. One of the caravan members, who became lost on a wilderness road, even had his call answered by a CB radio equipped unit of the Royal



Canadian Mounted Police. Shown here is Mayor Ian Armstrong (right) of Fairfield, Alberta, and Oren Bates, associate editor of WHEELS AFIELD. Mr. Bates, who led the caravan, presented the Mayor with a Johnson Messenger 109 as a gift of appreciation for his hospitality. The radio will allow Mayor Armstrong to greet future caravans via two-way radio.

Belden Notes Big Future for CATV

The market outlook for electronic wire and cable is tied firmly to strong growth opportunities for products serving community antenna television (CATV), states Warren M. Stuart, vice-president of marketing and sales, Belden Corp., Chicago, Ill.

Mr. Stuart expects that CATV could eventually rival our present electric power and telephone systems in size and importance. He estimates that the CATV equipment market will rise from the present level of about $115 million per year to $600 million in 1980, with total cable sales growing from the current $30 million annually to $170 million in 1980.

"At present, it is estimated that only 10 percent of the homes in the U.S. are wired for CATV. Ultimately, we feel that nearly every household owning a TV set will be connected to a CATV system," states Mr. Stuart. He also said that CATV's greatest potential market, the large urban population centers, is presently off limits due to a federal ruling in 1966 which restricted importing CATV signals into the nation's 100 largest TV markets. But the FCC has been considering new regulations, which very possibly may free these markets next year.

CATV penetration into the 100 largest metropolitan markets would accelerate CATV growth, according to Mr. Stuart, eventually resulting in CATV blanketing the entire U.S. He predicted that CATV systems would mean more local programming, more programming to specialized interests, and wider use of TV for educational purposes. It also would improve reception, especially in large cities where interference problems are sometimes serious.

Mr. Stuart cautions that increased and more diversified programming only tells part of the story. "An electronic network spreading across the U.S. would set the stage for the introduction of new services not now related to TV. These could be utility metering, ordering systems, and security and alarm systems wired directly to police and fire stations. All of this data could be carried over the same CATV cables because a large number of channels may be placed in coaxial cable lines."

Study Predicts $1 Billion Video Cassette Market by 1980

World sales of video cassette recording, playback systems, and the software they will use are expected to reach $1 billion annually by 1980, according to a major study published on the rapidly developing video cassette market.

Produced by the editors of EDUBUSINESS, the report predicts that consumer use will ultimately constitute the largest single segment of the video cassette market. It gives systems manufacturers and software producers until 1975 to prepare for the impact of consumer demand on a market whose primary outlets today are education and business. Before present market expectations can be realized, according to the study, a number of significant problems must first be overcome.

One of the major hurdles is developing standardization criteria. In addition, the quality of cassette software must develop to a point where consumers have a wide choice of programs to choose from and superior to those available on commercial television.

The ability of cable TV to become a significant original programming source is expected to be a major factor in determining consumer impact on the video cassette market, according to the EDUBUSINESS report. Growth of the market as a home entertainment medium will also depend on establishing workable software distribution networks.

Tech Spray Announces a Major Expansion Program

Dick Pavek, president of Tech Spray, Inc., announced a major expansion program for the company. According to Mr. Pavek, "the plans for the construction of eight bulk storage tanks have been approved and construction is underway. These tanks will be used to store propellents and other chemicals. A specially designed pumping system will connect these tanks to our production line."

THE WORKHORSE

The industry's top replacement tube, 6GH8A, is used in so many makes of TV and in so many different applications that it will be a high volume replacement type for years to come.

RCA's versatile 6GH8A is designed to satisfy the demands of all these applications:
Multi-vibrator type horizontal-deflection-oscillator circuits, sound if-amplifier, agc-amplifier, burst-amplifier, chroma-amplifier, 3.58 MHz-oscillator demodulator circuits, video-amplifier, sync-separator, noise inverter, color killer control, matrix-amplifier and blanker applications.

Three good reasons to replace with the RCA-6GH8A:

1. Stringent performance tests eliminate shorts. Special processes and tests minimize inter-element leakage.
2. Low heater-cathode leakage.
3. Optimum gm for efficient operation in all applications.

Stock up on the industry's workhorse 6GH8A and specify RCA! See your RCA tube distributor for all your tube requirements.

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

RCA

NEW AND NOTEWORTHY

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

MULTI-BAND PORTABLE RADIO 700

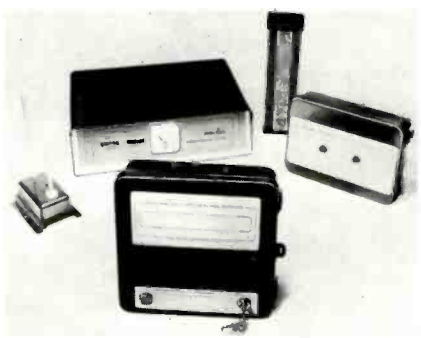
Features five separate broadcast bands

An ac/dc Model PR-635 multi-band solid-state portable receiver is said to feature five separate broadcast bands—AM, FM (with built-in AFC), short wave, police band high and marine band. Other features reportedly include a slide-rule dial, 4-in. speaker, built-in ferrite bar antenna. All weather stations are said to be marked. The unit can reportedly be operated with four "C" batteries or with standard ac current. The black vinyl cabinet measures 1½ in. W by 7 in. H by 3¾ in. D. Accessories reportedly include batteries, self-storing ac cord and earphone. Selectron International.

SECURITY SYSTEM 701

Delay circuits permit user to leave and re-enter premises

A solid-state master panel is designed to control numerous types of detection devices. It reportedly activates any of the standard signaling devices, such as bells, sirens and automatic phone dialers. The electronic controls are said to utilize integrated computer circuitry. Called Series 110 controls, specifications indicate that the series is completely transistorized and incorporates delay circuits to permit the user to leave and re-enter the premises without activating the alarm. An internal rechargeable standby power supply reportedly keeps the alarm active in the event of power failures, while special circuitry protects the system against tampering. Designed for wall mounting, the control is a compact 9½ in. by 9½ in. by 2⅝ in. The standby power will reportedly last for more than 6 hr—this being assured by a unique "float charge" circuit that keeps the sealed Gel/Cell batteries fully charged. Detectron Security Systems.



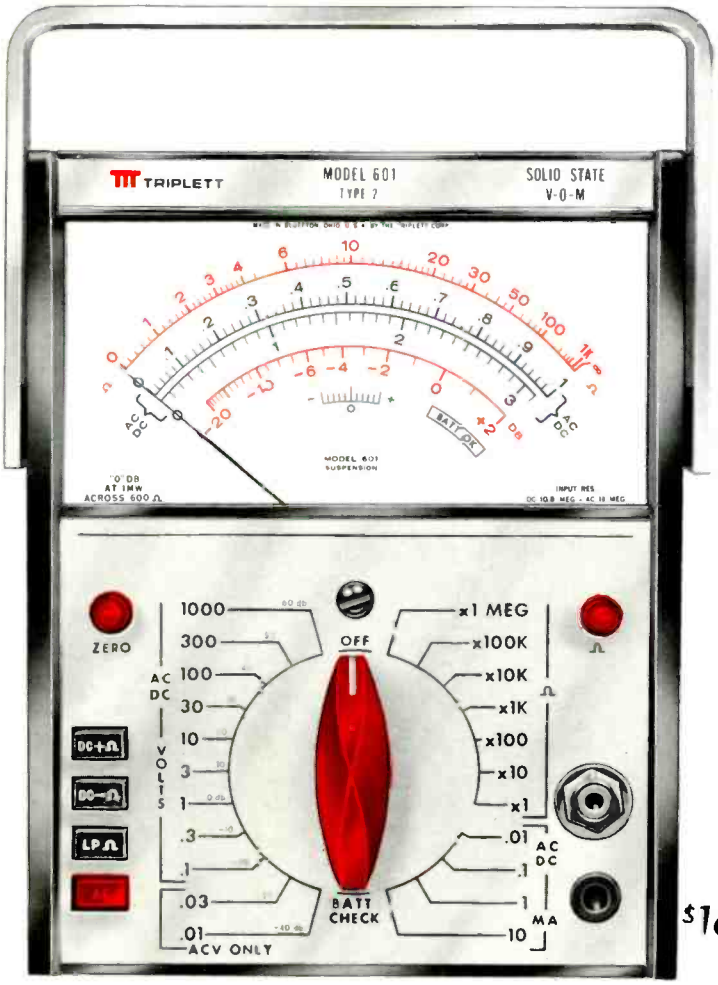
FOR MORE NEW PRODUCTS SEE PAGE 70

BATTERY MERCHANDISER 702

Each of its four sides is an easily serviced, gravity-feed roll rack

A new and different battery merchandiser, called the revolving "Carousel," is said to hold all popular types of Duracell batteries for flashlights, radios, cameras and tape recorders. Each of its four sides is said to contain an easily serviced, gravity-feed roll rack with batteries that meet every day consumer needs. The company is reportedly making it available free to dealers with the purchase of the battery assortment GDE-20. Mallory.

If your problem is in-circuit testing of transistorized and integrated circuits . . . Solve it with Triplett's 601



Model 601 $166

1. Low power ohms — 7 ranges with 75 mV power source.
2. High sensitivity — 10 mV AC full scale at 10 megohm input impedance; 100 mV DC at 11 megohm input resistance.
3. Simplified scale — only 4 arcs for all 53 ranges.

It has 7 low-power resistance ranges that apply only 75 mV to the device under test . . . does not activate or damage solid-state component . . . full-scale DC measurements down to 100 mV and 10 μA and AC as low as 10 mV and 10 μA, it's obvious the Model 601 was designed for in-circuit testing.

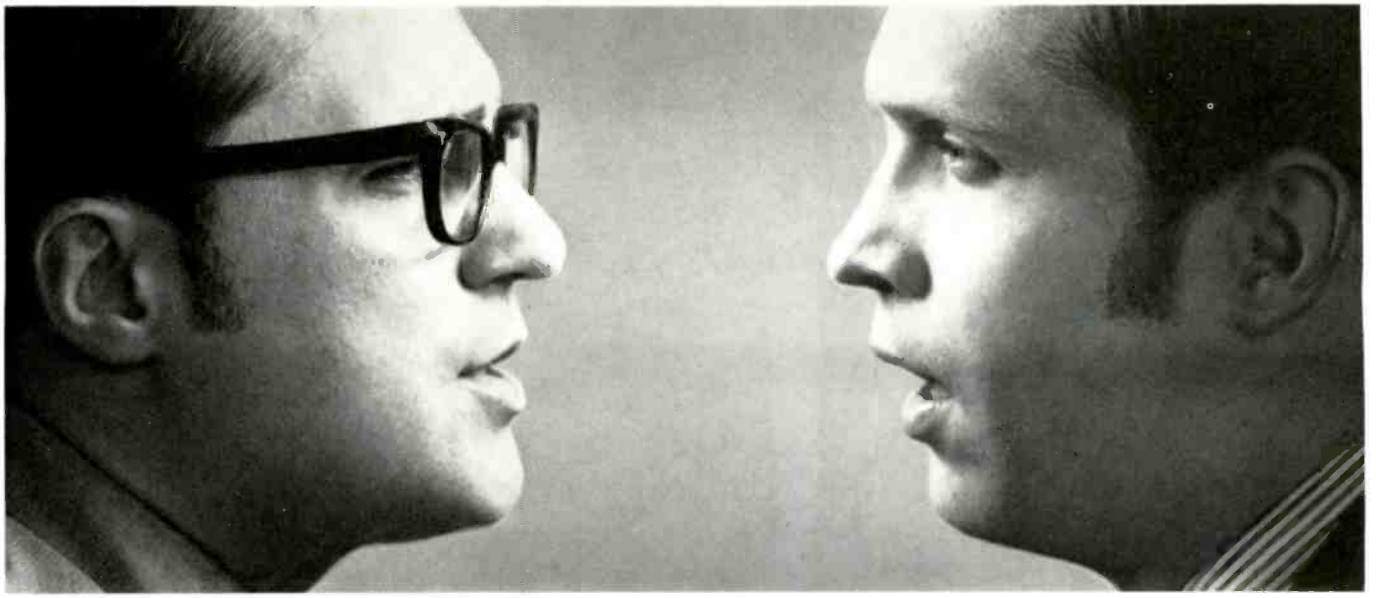
Add such features as 10 megohm input impedance on AC and 11 megohm input resistance on DC, voltage readings to 2% DC and 3% AC (current: 3% DC and 4% AC), separate range-selection and function-selection switches, and a simplified dial on which all 53 ranges are read on only 4 scales, and it's equally obvious that here's a V-O-M that has what you need to do the job better, faster and more easily.

See the capable Model 601 — priced at $166 — at your local Triplett distributor. For more information, or for a free demonstration, call him or your Triplett sales representative right away. Triplett Corporation, Bluffton, Ohio 45817.

. . . for more details circle 128 on Reader Service Card

TRIPLETT

The World's most complete line of V-O-M's . . . choose the one that's just right for you



Why do you always use RCA SK Replacement Devices?

Because SK's are specifically designed and engineered for replacement use in home-entertainment equipment. RCA doesn't make SK types unless they're needed in the field and serve the professional.

Will I need a large inventory?

Not at all. Only 67 types cover a broad range of replacements in TV, hi-fi, and other entertainment equipment. It's the shortest line of product with the broadest range of replacement applications. That's just one of the reasons I like it.

What's another reason?

Quality — it's assured! SK's are tested with the finest dynamic testing equipment, operated by the same personnel who test other RCA power, signal, and IC devices. They're even tested again at the factory warehouse before shipment.

Are you saying RCA is the only source for reliable solid-state replacements?

No. But SK's are top quality, and the SK Replacement Guide is a truly reliable source for cross-reference information. RCA only cross references types where there is engineering assurance that the SK will do the job as well as, or better than, the original.

Seriously, is the SK Replacement Guide that great?

Better! It includes technical information on the line, plus a "Quick Selection Chart" which is unique in the industry. Now I can choose the proper SK replacement for almost every type made.

I'm sold! How can I go wrong with RCA SK's?

You can't. No one can!

RCA

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

LETTERS

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

We Got Results

I want to express my sincere appreciation for the assistance which you rendered in publicizing Stanley Elmer Butler, who was being sought by the FBI, in the December issue of ELECTRONIC TECHNICIAN/DEALER.

Your cooperation in this matter materially assisted in locating him in Kailua, Hawaii, on January 15, 1971, and my associates and I are grateful for your public service on this occasion.

J. EDGAR HOOVER

Stick to What You Know

I have been a reader of your excellent publication for a good many years and an electronic service man for more years than I care to admit. My viewpoints may be highly individual, but I believe that there are many who have come along the same hard road and will agree with me that a good deal of lost time and aggravation can be avoided by the newcomer if he realizes that he must specialize and become highly proficient in only one or two outgrowths of the electronic industry—whether it be home TV sets, CCTV or whatever.

The day when you could really understand and fix anything containing a tube or electronic circuit is long gone. And the public attitude that "good old Joe," who did such a good job on my TV set, can easily fix such a simple thing as a washer, stereo or garage door opener, is understandable. However, "good old Joe" is booby trapping himself the moment he starts poking meter leads into a specialized field in which he has no more than common sense and a basic understanding as his guide. It is far better to bow out by recommending a fellow technician who does specialize in that particular field.

Excessive time, call backs, unhappy customers, parts problems and the frustration of trying to do an honest job on unfamiliar gear is a poor substitute for sticking to your guns and being honest with yourself concerning your abilities and limitations on the latest innovations in a field outside your usual work area. Believe me, your customer has far more respect for you when you tell him exactly what you will and will not repair.

JOSEPH HUMPHRIES

I agree that it is foolish to venture blindly into unexplored territory. An electronic technician can generally make far better use of his time than attempting to service everything that comes his way.

However, dual specialization can be very profitable. One of the largest TV shops in the Chicago area trains its field men in both TV servicing and air conditioner servicing. Although there might be some question concerning the amount of overlapping technology, most of the air conditioners need maintenance when there is little call for servicing TV sets, while most of the TV sets are repaired during the cooler months when there is little need for air conditioner maintenance.

Ed.

MOVING?

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

READERS' AID

continued from page 26

Shop for Sale

I have an excellent going business here in South Georgia. The people are friendly and the climate is very good, but the time has come for me to step down, due to age.

It would be an excellent opportunity for two or more younger men to take over this fully equipped and going business of 21 years. There is the 3 bedroom modern house along with the business, all on one acre of land with 250-ft frontage on the U.S. highway. I will furnish all particulars on request.

WILLIAM H. REYNOLDS, SR.
Emerson Park TV & Elect. Appl. Serv. Co.
R.F.D. 3, Box 217
Waycross, Ga. 31501

I have a complete electronics, TV and CB Shop for sale with a service center for three outstanding manufacturers at 812 Columbia Avenue, Glasgow, Ky. The town has a population of 40,000. There are living quarters next door to the shop.

We have outstanding stock and equipment with the rental field wide open and can be financed 50 percent. There are well known industries that have moved in and there will be a good fishing resort within 10 miles of town.

RICHARD LAWLESS
R. Lawless Radio & Television Co.
812 Columbia Avenue
Glasgow, Ky 42141

Old Tubes

I have better than 200 old tubes—all checking usable on a mutual conductance tester. I also have old 7 and 12 series that anyone who repairs old radios or TV sets may want. I will send a list and prices upon request.

JOSEPH HUMPHRIES
4101 Gladden Avenue
Baltimore, Md. 21213

Scope Wanted

Wanted to purchase: a good used wide-band oscilloscope suitable for color servicing at a reasonable price or will trade old tubes and test equipment.

WILLIAMS RADIO & TV SERVICE
116 West Washington St.
Lewisburg, W. Va. 24901

You can earn more money if you get a Government FCC License

...and here's our famous CIE Warranty that you will get your License if you study with us at home

NOT SATISFIED with your present income? The most practical thing you can do about it is add to your Electronics know-how, pass the FCC exam and get your Government License.

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

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

Opportunities in Plants

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

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

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

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

CIE courses are so effective that better than 9 out of every 10 CIE graduates who take the exam pass it. That's why we can afford to back our courses with the iron-clad Warranty shown above: you get your FCC License or your money back.

Mail Coupon for Two Free Books

Want to know more? Send the coupon below for free copies of our school catalog, "How To Succeed In Electronics," describing opportunities in Electronics, together with our special booklet, "How To Get A Commercial FCC License." If coupon has been removed, just send your name and address to us.

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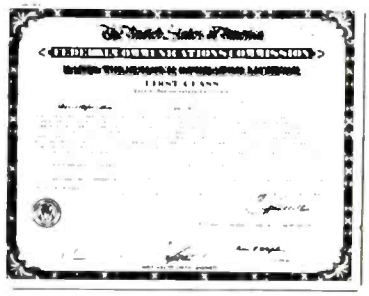
All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box in coupon for G.I. Bill information.

Cleveland Institute of Electronics

WARRANTY

OF SUCCESS IN OBTAINING A GOVERNMENT FCC LICENSE

A Cleveland Institute of Electronics FCC License course will quickly prepare you for a Government FCC License. If you don't pass the FCC exam after completing your course, CIE will refund all your tuition. You get an FCC License...or your money back!



Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE: "I give CIE credit for my First Class Commercial FCC License. Even though I had only six weeks of high school algebra, CIE's lessons made Electronics easy. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing...and am on my way up."

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

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Cleveland Institute of Electronics
1776 E. 17th St., Cleveland, Ohio 44114

Please send me without cost or obligation:

1. Your 40-page book "How To Succeed In Electronics" describing the job opportunities in Electronics today and how your courses can prepare me for them.
2. Your book "How To Get A Commercial FCC License."

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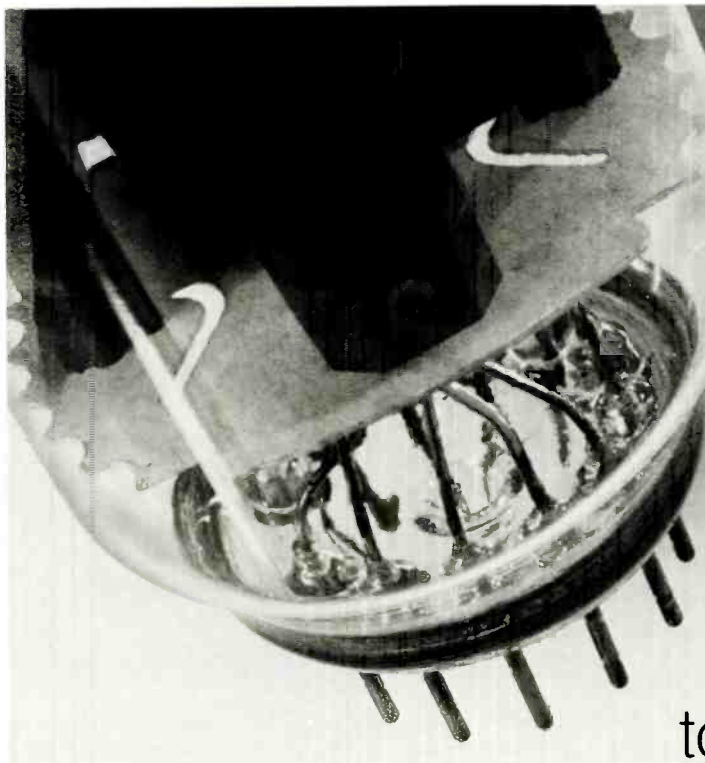


When people
turn to you
to make things
right again...

use GE receiving tubes

(made by professionals for professionals)

TUBE PRODUCTS DEPARTMENT • GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY 42301

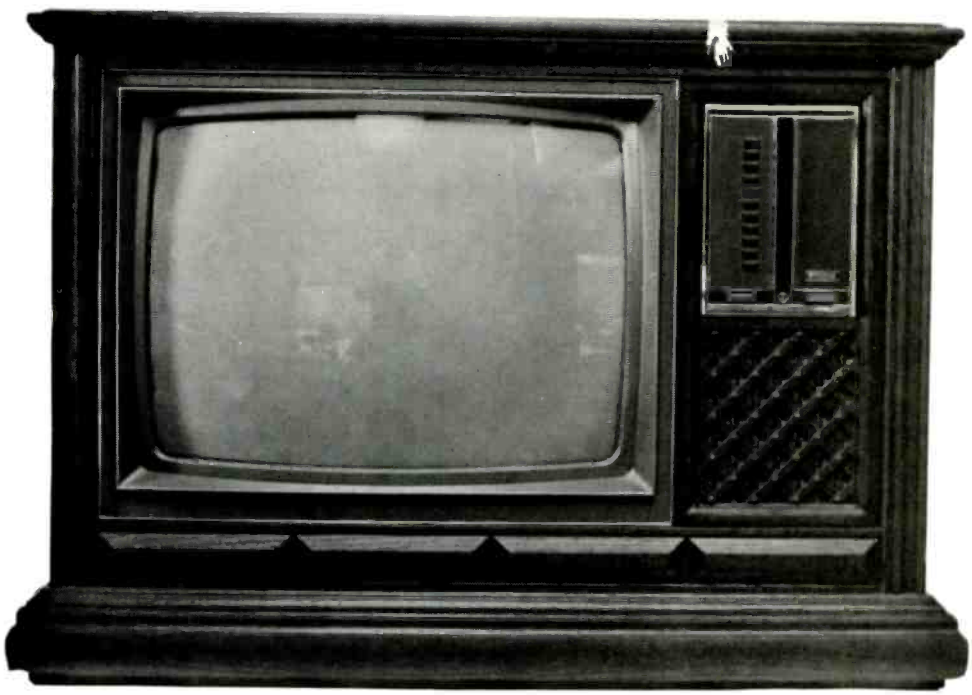
GENERAL ELECTRIC

TEKLAB REPORT

The electronic selection of 11 UHF and VHF channels is made possible by using the variable junction capacity of varactor diodes.

A Look at Sylvania's E01 Color-TV Chassis

■ The absence of the familiar channel selector knob caught our eye while unpacking the Sylvania Model CL862P-2 Color-TV set. Instead of the knob, there were 11 pushbuttons on the front panel for channel selection—probably the biggest feature change since the introduction of solid-state circuitry. With this system, one of 11 channels may be selected instantly by pressing a button —VHF or UHF frequencies, from Channel 2 through 83.



Sylvania's Model CL862P-2 color-TV set features push-button electronic channel selection and tuning.

Upon opening the control panel door, we noted the throttle slide type customer controls for ease of adjustment.

The chassis is of solid-state design, with the plugability concept carried throughout the entire chassis for simplified chassis removal. Practically all of the transistors employed have plug-in sockets, eliminating time-consuming chassis removal to check or replace them.

The chassis employs a four-stage IF amplifier. The IF board and the tuner cluster are aligned separately, and no adjustments are reportedly required when the tuner or IF boards are changed in the TV set.

The high-voltage tripler circuit employed requires only one-third the pulse voltage, relieving most of the stress from the flyback transformer. Since the tripler does not generate X-rays, the high-voltage cage is no longer needed, making the chassis more compact. These are just a few of the important features found in this new chassis.

Channel Switching

With the panel closed (Fig. 1), the channel selector buttons appear to be merely standard push buttons. However, when opening the panel door (Fig. 2), we note that these plastic buttons are used merely to depress another, more sophisticated set of buttons.

These secondary push buttons are

unique in the number of functions that each can perform. Each button, when not depressed, can be turned to any one of three positions: that for tuning the low-channel VHF band, the high-channel VHF band or the UHF band—a corresponding tuning scale coming into view for each selection. When depressed, each button can be individually rotated for tuning in the desired TV station in the frequency range previously selected. Once each button has been adjusted for receiving the desired TV station, the panel door can be closed and the stations selected merely by pressing any one of the outer push buttons.

In addition to completing the circuits required for tuning in the desired TV station, these secondary buttons make electrical contact for lighting a lamp behind the corresponding channel number. A large

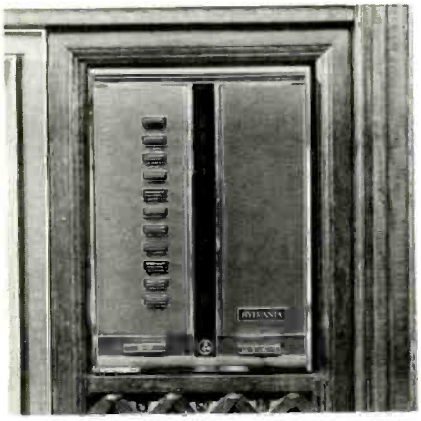


Fig. 1—The usual channel selector knob has been replaced with 11 push buttons, which can select either VHF or UHF channels.

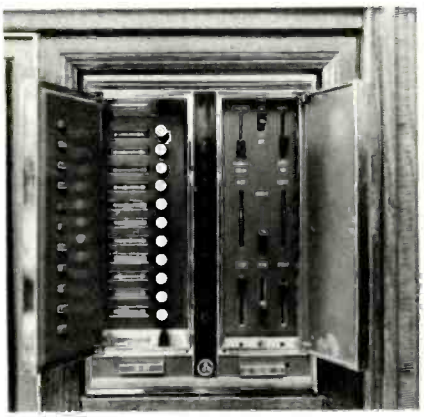


Fig. 2—Opening the control-panel doors exposes the secondary push buttons, channel indicators and throttle-type controls.

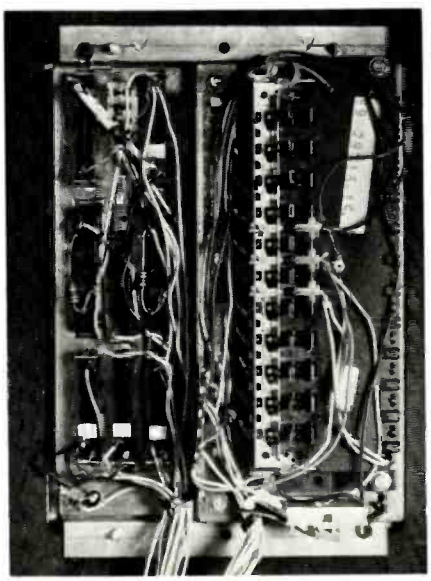


Fig. 3—Rear view of the channel-switching and control panel.

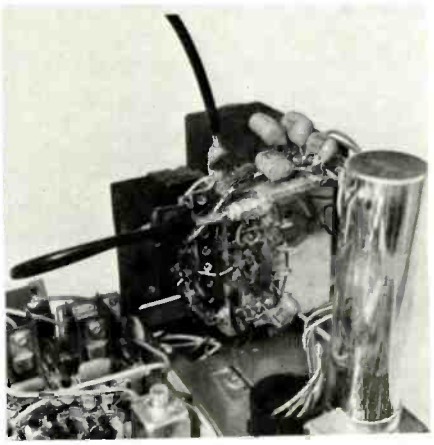


Fig. 4—The VHF and UHF varactor tuners (the UHF tuner can be seen just in front of the VHF tuner) can be located at the rear of the chassis since they have no moving parts.

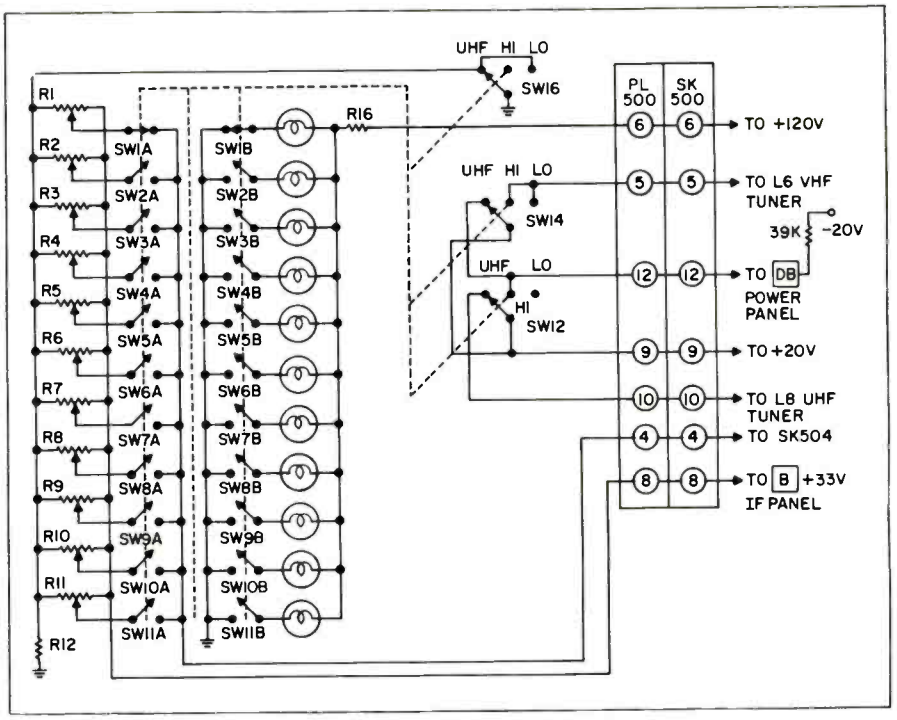


Fig. 5—Schematic of the channel-switching panel. *Courtesy of Sylvania.*

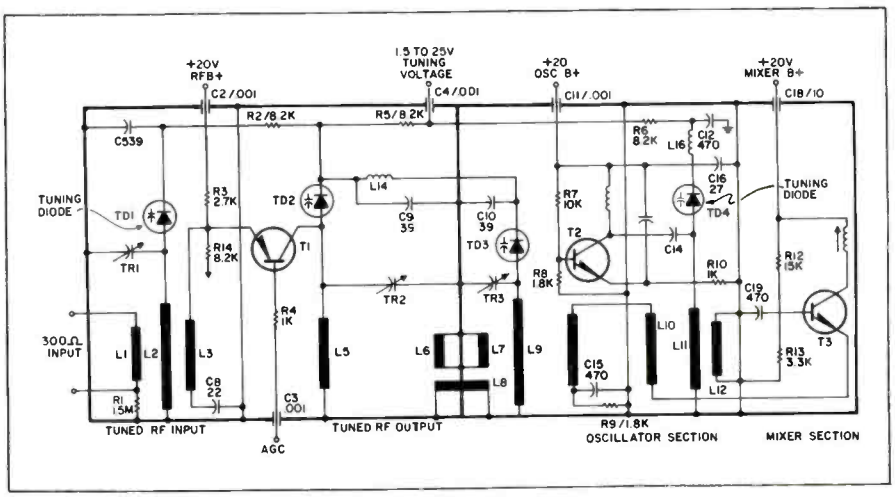


Fig. 6—Schematic of the UHF varactor tuner. *Courtesy of Sylvania.*

sheet containing channel numbers is supplied with each TV set so that one or more numbers can be inserted corresponding to each channel that can be received in that area. These VHF and UHF channels can be arranged in any desired sequence.

When looking in the chassis we see that the controls for selecting channels (Fig. 3) are separate from the VHF and UHF tuners (Fig. 4), they being mutually connected by a pair of cables which transmit only dc voltages (no RF signals are mechanically switched in this TV set).

Referring to the schematic in Fig. 5, when a push button (for which the band selector was moved to the UHF position) is depressed, switch SW16 shorts resistor R12 to ground. At the same time, switch SW14 removes the 20v supply from the VHF RF amplifier and oscillator, and forward biases the VHF band switching diodes; switch SW12 applying 20v to the UHF tuner oscillator and mixer (there is no change in the bias supplied to the VHF mixer and UHF RF amplifier). Simultaneously, switch SW1 connects the tuning potentiometer to the varactor tuning diodes TD1, TD2, TD3 and TD4, as shown in Fig. 6. An adjustment of potentiometer R1 tunes the UHF RF amplifier and oscillator to any desired UHF channel.

The VHF and UHF channels are set up in a similar manner, with the exception of the band switch. When the selector is placed in the high-band position, switches SW16, SW14 and SW12 are moved to a new function position. These functions are as follows: switch SW16 removes the short circuit from resistor R12, providing regulated tuning voltages from 3 to 33v; switch SW14 applies 20v to the VHF tuner, biasing the RF amplifier mixer and oscillator; and switch SW12 connects the 20v supply to the VHF switching diodes.

In the low-band position, these switches function as follows: switch SW16 shorts across resistor R12, providing tuning voltages from 0 to 33v; switch SW14 applies 20v to the VHF tuner, biasing the RF amplifier and oscillator; and switch SW12 opens.

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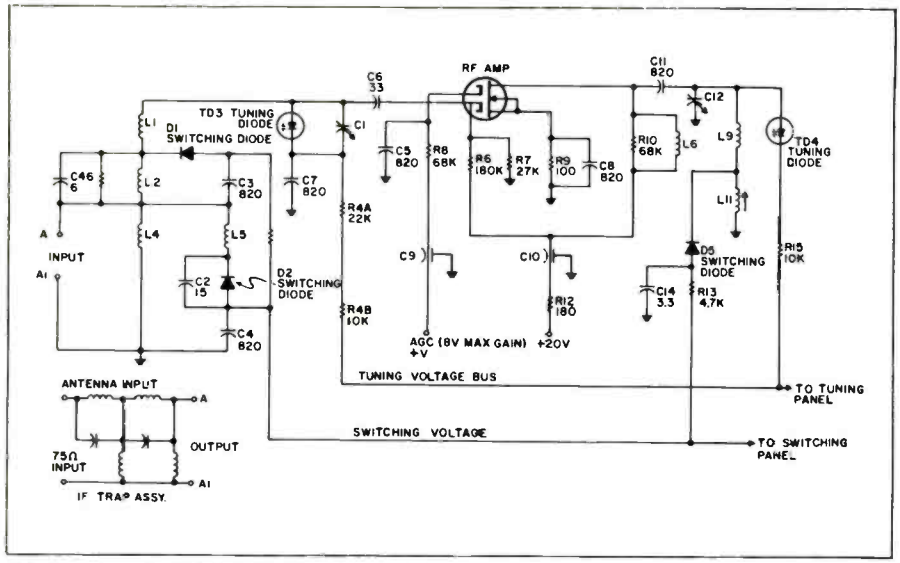

Fig. 7—Schematic of the VHF tuner's RF circuit. *Courtesy of Sylvania.*

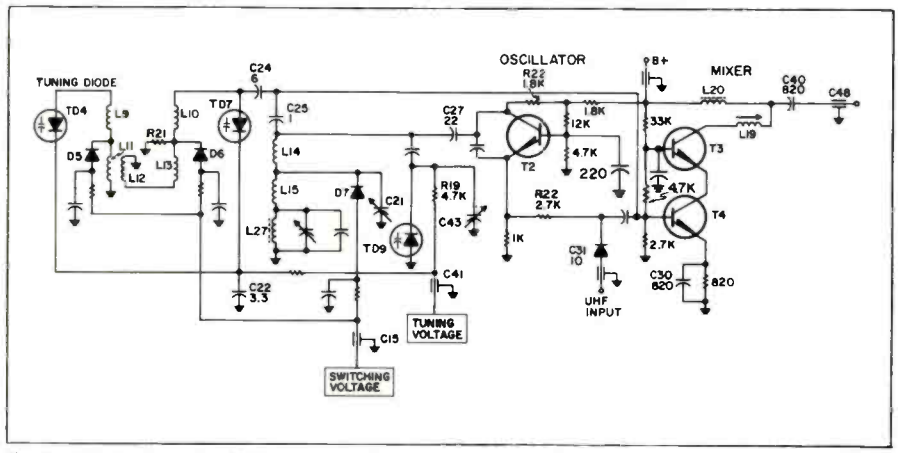

Fig. 8—Schematic of the VHF tuner's oscillator and mixer section. *Courtesy of Sylvania.*

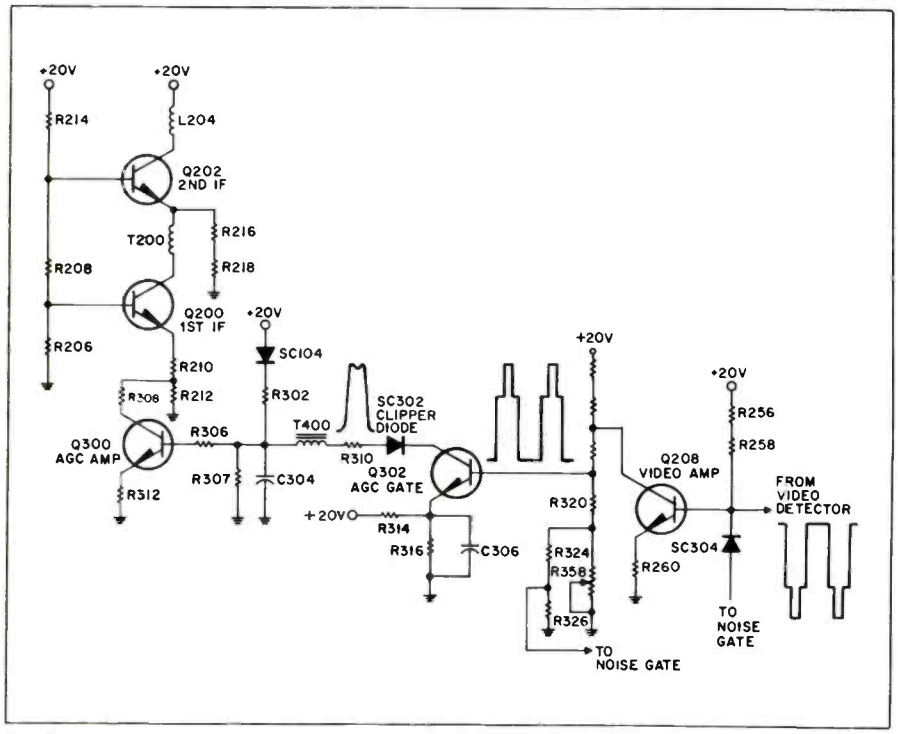

Fig. 9—The AGC circuit used is a closed-loop regulator system controlling the RF- and IF-signal gain. *Courtesy of Sylvania.*

Closed-Circuit TV for the Home

by John C. Bullock, Jr.

Recent improvements in design concepts and product techniques have made CCTV systems both feasible and practical for home owners.

■ Compact, high-quality, low-cost, easy-to-operate solid-state TV equipment now offers the home owner a great range of systems that will meet his specific needs. A dealer, using a few economical building blocks, such as a TV camera and RF modulator, can tailor a system to meet almost any imaginable need, whether it be entertainment, security, general household surveillance, monitoring of the sick or handicapped, or a combination of some or all of these uses.

A system can be as simple as a video camera and monitor, operating independent of any other equipment in the house. Or it can be a more complex system operating independently or as an integral part of an MATV system. This last feature makes CCTV also appropriate for hotels, motels and apartments where entertainment can be fed to guest rooms or where apartment residents can monitor callers in the lobby before admitting them to the building.

A home owner may choose between permanent and temporary installations, depending on his need. Surveillance of isolated grounds, for example, would involve a permanent installation, whereas monitoring a patient recovering from serious injuries incurred in an automobile accident could require only a temporary installation.

CCTV systems are generally categorized by the frequency of the signals that carry picture information from one point to another. The two most prevalent systems are video, which operates at frequencies up to 10MHz, and RF, which usually displays on Channels 2 through 6 (54 to 88MHz). However, special equipment, such as modulators and converters, may be employed in a system to permit images to be displayed on the higher VHF channels or even the UHF channels.

Cost is related directly to system complexity. Actual costs for a home CCTV system can run as low as several hundred dollars (less than a color-TV set) to several thousand dollars (or the equivalent of a top-price color-TV/stereo console).

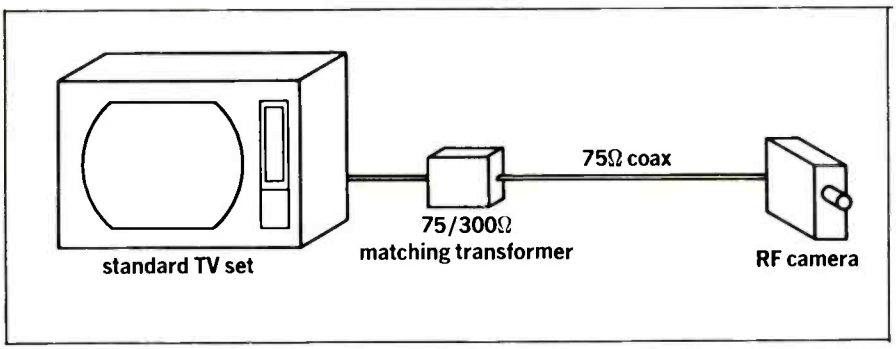

Fig. 1—Basic video CCTV system requires only a video monitor, coaxial cable and compact video camera.

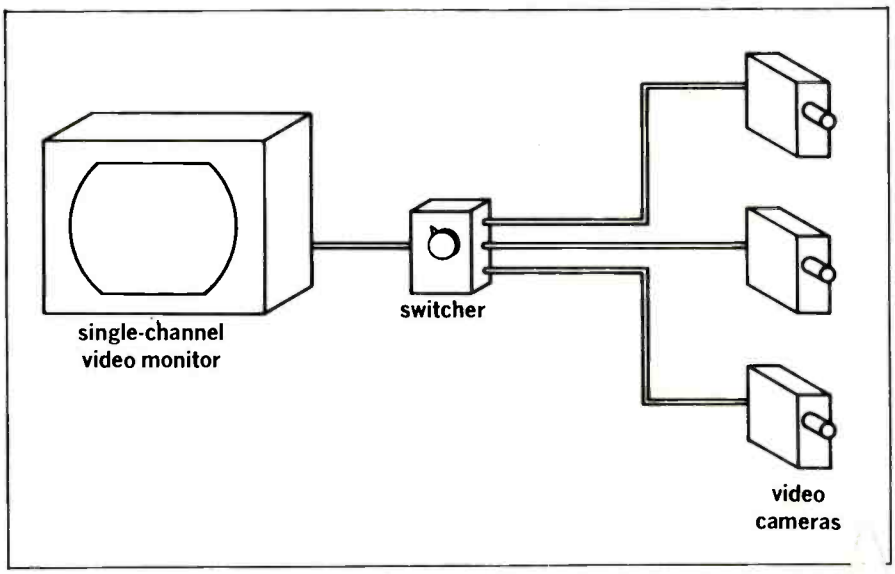

Fig. 2—Expanded version of basic system includes switcher to permit viewer to alternate between several cameras so that activities in different rooms or play areas can be monitored.

A Basic Video System

A basic video system consists of a compact video camera, a video monitor and shielded coaxial cable to interconnect the camera and monitor (Fig. 1).

Such a system is directly applicable in cases where a housewife needs a monitor in, say, the kitchen to watch a bedridden elderly person or a handicapped infant. Audio communication can be added to systems where the application so requires.

An Expanded Video System

The next system contains a video monitor, a switcher and several video cameras (Fig. 2). The system would be appropriate, for example, for use in a home where parents want to watch a child in his bedroom (note this month's cover photo, plus Fig. 3 showing the mother watching this child), the family

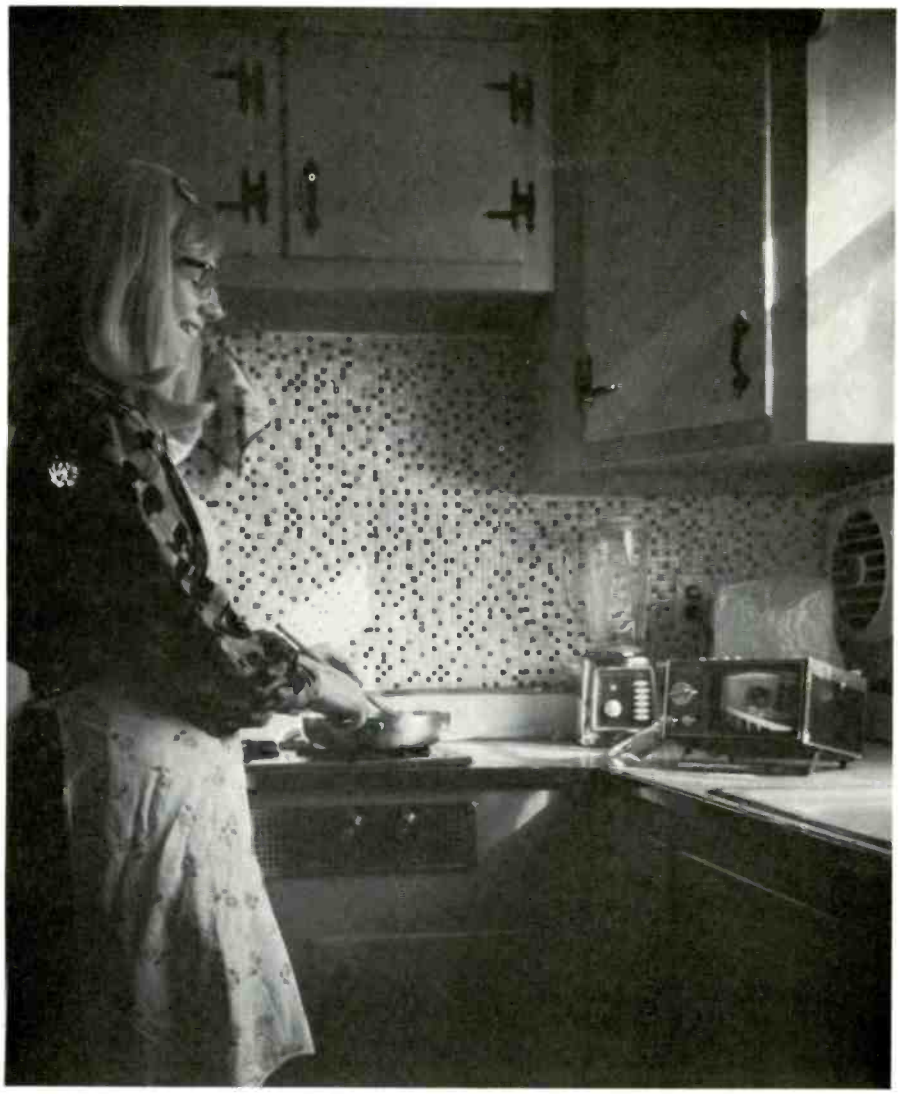

Fig. 3—With the use of a home CCTV system, a mother busily working in the kitchen can watch her child at play in the bedroom.

Fig. 4—A compact TV camera, such as the Jerrold Model TVC-500, is ideal for home CCTV systems, since it develops clear, sharp, B/W pictures and delivers them in either video or RF signal format. When switched to video format, the camera delivers its signal to a video monitor; while when switched to RF format, it feeds the signal to a standard TV set. A screwdriver adjustment permits the user to select the desired frequency for display on Channels 2 through 6.

room and a play area in the yard. Cameras may be used inside or outside. In the latter case, the buyer must specify a waterproof housing. The switch is located adjacent to the monitor so that the viewer can randomly select any camera for viewing.

Either of these systems may be supplemented with an intercom to permit one-way or two-way voice communications. The applications for these systems, however, do not usually require voice communications.

Using Available TV Set

New solid-state cameras (Fig. 4) make RF CCTV practical for the home owner. The camera purchaser can set up an inexpensive CCTV system (Fig. 5) simply by connecting the camera, through a 75Ω shielded coaxial cable and a 75/300Ω matching transformer to a standard TV set. The cameras function with ambient light and feature a full range of operating controls. The TV set will display the camera image on any channel from 2 through 6, depending on the unused channels available.

This system does have a limitation, however, in that when connected, the TV set cannot display "off-the-air" channels. This limitation exists because the coaxial cable replaces the antenna leads.

Mating CCTV to MATV

The most sophisticated, yet practical, home CCTV system is incorporated into an MATV system, where the home owner can view areas to be monitored on any one of the standard TV sets connected to the MATV system. A typical MATV system may, for example, consist of TV sets in the family room, living room and bedrooms.

Although this article is concerned basically with home CCTV systems, the CCTV/MATV approach is appropriate for apartment buildings, hotels, motels, business offices and even industrial plants where surveillance or entertainment may be either desirable or essential.

A typical application may be found in the recently opened Lansdowne Towers apartment complex in Upper Darby, Pa. Each of the four apartment buildings includes a camera focused on the building's

foyer. When a visitor presses the call button for an apartment, the resident can turn on his TV set (Fig. 6) to Channel 2 (an unassigned channel in the greater Philadelphia area) and check the identification of the caller. The added security the system offers residents has been an effective sales tool.

Similar hook ups, with one or more cameras, can monitor customers in department and specialty stores, watch unattended warehouses and parking areas for intruders, or maintain continuous surveillance over the grounds surrounding isolated private homes. The system also permits parents of ill or handicapped children to watch the children, regardless of where the parents may be in their home, provided they have a TV set in the room.

A shielded MATV system (Fig. 7) normally consists of a 75Ω all-channel antenna (capable of receiving VHF, UHF and FM signals), a line splitter (amplified or unamplified), a 75Ω coaxial cable leading to each TV tap, and 75/300Ω matching transformers at each tap. An amplified line splitter is necessary if the system is located in an area of weak signals; an unamplified unit may be used where received signals are strong. The 75/300Ω matching transformers are needed to match TV set and antenna impedances.

Although one or more TV cameras can be tied into the MATV system, care must be taken to overcome a potential problem involving adjacent channel interference. A standard TV channel occupies 6MHz of the spectrum. An industrial-type, double-sideband TV camera, on the other hand, usually has an output which covers 8 to 10MHz.

No problem of adjacent channel interference will exist if the MATV system has a limited number of off-the-air channels. For example, if VHF stations in the area broadcast on Channels 3, 8 and 12, a CCTV system could use Channel 6 for closed circuit signals. The spill over of TV-camera signals onto either Channel 5 or the lower part of the FM band would be irrelevant to system performance. Fig. 8 illustrates the method of combining the camera signal with off-the-air signals where

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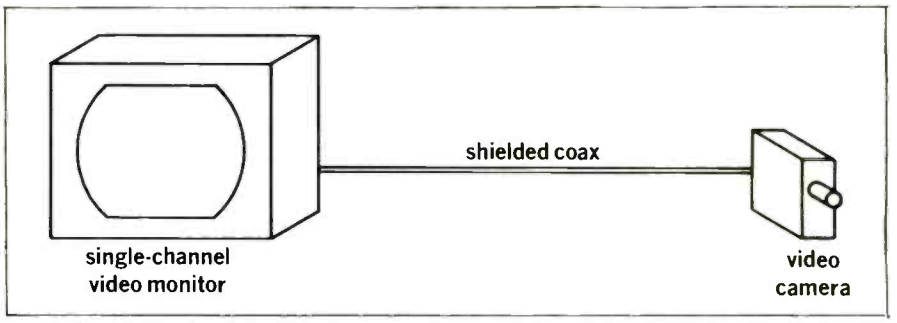

Fig. 5—Inexpensive CCTV system using a standard TV set. This type of system, however, will not permit the set to display "off-the-air" TV signals.

Fig. 6—Secretary in rental office monitors arrival of visitor in lobby of Lansdowne Towers, a luxury apartment complex in Upper Darby, Pa. This CCTV system, tied into the MATV system in each building in the complex, permits residents to identify callers before admitting them to the building.

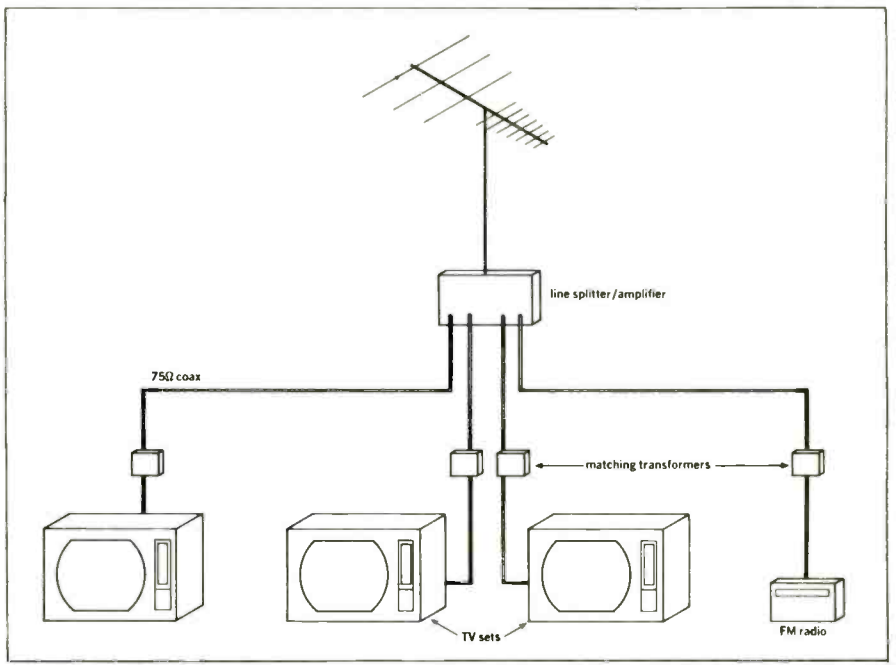

Fig. 7—Shielded MATV system for receiving VHF, UHF and FM signals may require an amplifier with the line splitter if received signals are weak.

Color Television Reception

by William I. Spero

Part I—The Antenna

This article begins a series of articles covering the analysis of signal paths through a typical TV set, from the antenna through to the display device (color picture tube), with the use of block diagrams and schematics. A short review of monochrome signal paths will be followed by a description of those circuits that are needed to produce full color reception. The function of each of these "chroma" circuits will be explored in detail. The shadow mask three-gun picture tube will be described, and the special assemblies needed for processing the three electron beams will be explained.

William Spero joined the Research Laboratories of Sylvania Electric Products in 1951 after completing the Advanced Technology Course at RCA Institutes. He worked in the areas of Navigation Systems for high speed aircraft, traveling wave tube fabrication, vacuum systems, microwave spectroscopy and millimeter wave communication systems. The latter included building and operating a 96GHz link to measure the atmospheric effects (rain, fog, snow) on propagation at these frequencies. In 1965, Mr. Spero joined the Service Group of Sylvania Electric as a Field Service Engineer, where his present duties include technical liaison between Sylvania's Home Entertainment Products Div. and the Sylvania Service Co. and training of Service Co. personnel in specialized technical areas. He holds an FCC First Class Commercial Radiotelephone License and is an active member of the Society of Motion Picture and Television Engineers.

■ The first component in the receiver chain that the TV signal encounters is the antenna. There are many types and configurations to choose from, and a great deal of confusion exists as to what to expect from an antenna for adequate color reception.

For optimum color reception, the following conditions should be satisfied:

The antenna chosen must have a flat frequency response over each channel's 6MHz band width. "Holes," especially at the upper end of the signal response curve, where the chroma sidebands are present, will not make for good color TV reception.

Fig. 1 shows a plot of relative signal gain versus frequency. The frequency scale is for any 6MHz wide TV channel (i.e., Channel 2 is 54 to 60MHz, Channel 7 is 174 to 180MHz). It is quite obvious that the gain at 58.83MHz (corresponding to the color sub-carrier, which is 3.58MHz above the video carrier) is considerably lower than the gain at the video carrier. This results in a loss of color performance.

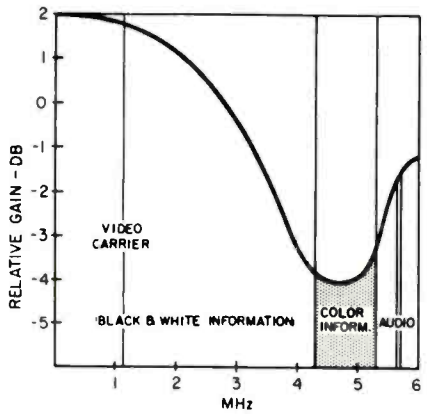

Fig. 1—A drop in antenna gain toward the high end of a TV channel results in the loss of color performance.

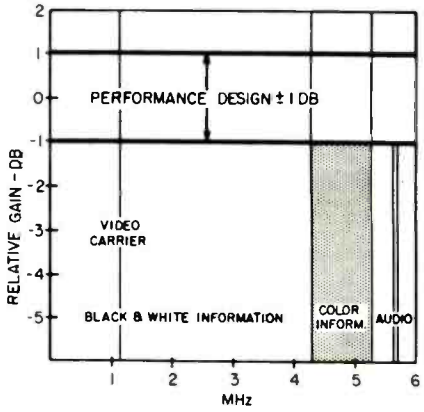

Fig. 2—A properly designed antenna must have an essentially flat (±1dB) signal gain over the entire 6MHz TV channel.

If we compare this with the response shown in Fig. 2, we find that the antenna gain over the 6MHz channel band is essentially flat (±1dB). The color information (carrier and sidebands) is not degraded.

The antenna should be mounted outside—free from trees or any obstruction which may cause multiple images due to reflections. These multiple images, or ghosts as they are commonly called, while tolerable to some degree in monochrome reception, come out multicolored when viewing a color telecast and are quite objectionable.

In some areas one may obtain adequate color with an indoor attic

antenna or rabbit ears connected to the TV set. The results are not predictable and can only be determined by empirical means.

The down lead should be of a good grade foam dielectric cable. Whether the transmission line is flat 300Ω twin-lead, or 75Ω coaxial cable with matching transformers, is predicated by the circumstances surrounding each installation.

Generally for color one has to be more careful in the placement of the down lead, as compared to an installation for monochrome reception. For example, the transmission line should not be run against metal gutters or metal down spouts. This is especially important where one wants to obtain good UHF color TV reception. The transmission line cannot be allowed to lay under snow or run where water collects on a roof during periods of rain. The effective impedance of standoff insulators should be kept to a minimum so they will not have the same effect as a shorted turn where they support the transmission line. A shorted turn looks like an impedance change where the transmission line passes through the standoff insulator. This abrupt change in impedance will most likely cause a voltage standing wave (VSW) which has a unique tendency to produce ghosts.

It is extremely important to prevent a high VSWR on the transmission line—especially at UHF frequencies. It is also important to minimize direct signal pickup on the transmission line, since this signal arrives at the receiver ahead of the signal picked up by the antenna—undesirable ghosting results.

In areas where a great amount of ignition noise is prevalent, a color picture is degraded by horizontal bands of moving colored snow. One way, of course, to alleviate these problems is to utilize a coaxial cable transmission line rather than an unshielded flat ribbon-type line.

A VSWR greater than 1.5 (return loss of less than 14dB) can degrade a color picture. One would like the return loss to be no poorer than about 20dB (VSWR 1.22). A good grade 75Ω transmission cable, when properly terminated, has a return loss of about 26dB (VSWR 1.11). (Note: Return loss is a term which expresses the quality of the impedance match. The greater the return loss, the better the match.)

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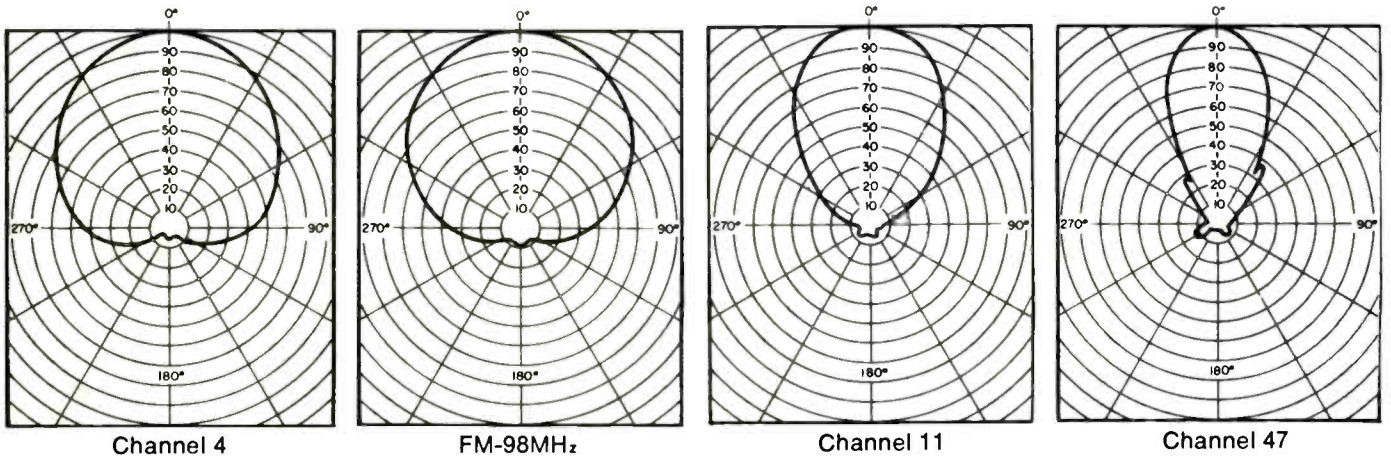

Fig. 3—Antenna polar patterns will differ with the frequency of the signal received.

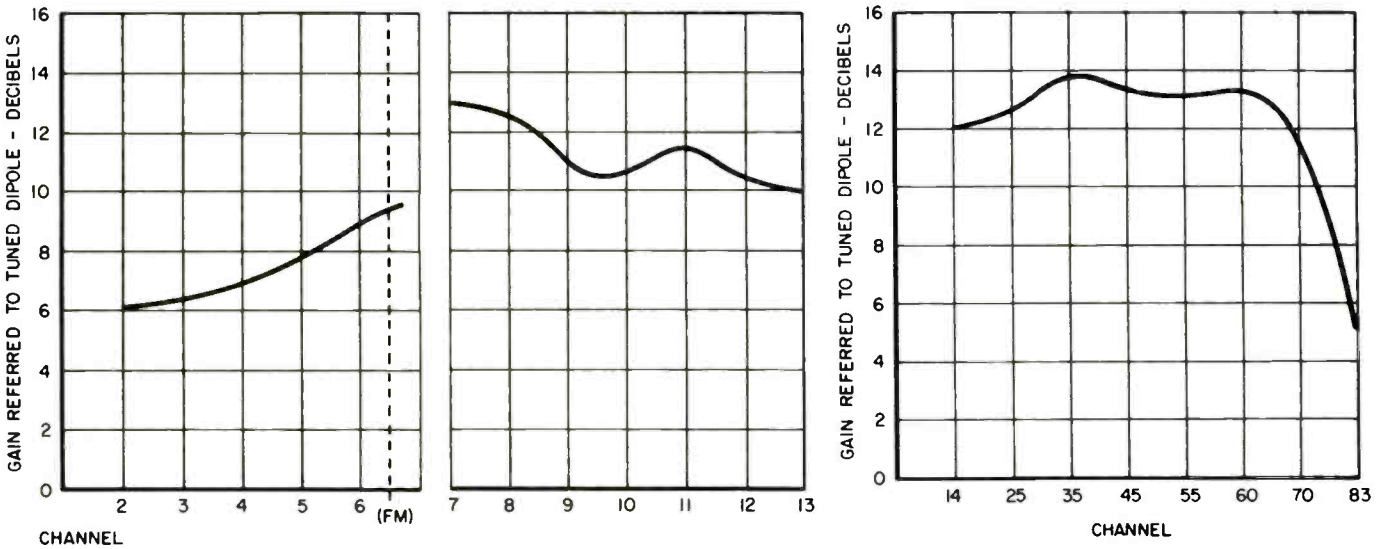

Fig. 4—Signal gain curves of a properly designed antenna.

Simplifying Color-TV Set Alignment

by Joseph Zauhar

Doing a professional servicing job requires modern sweep-alignment instruments for making RF/IF alignment simple, easy and profitable.

■ A color- or B/W-TV set's ability to handle television's complex waveforms depends on its precisely tuned IF bandpass amplifier circuits.

If the response curve is incorrectly shaped or the markers are not positioned at the proper points, misalignment is usually the problem; while shifts in the IF bandpass position on the carriers is usually caused by low-gain tubes or semiconductors, other defective components, replacement of components, normal operating stress or just plain "dittle stick drift"—trying to align the circuit by guess or without the proper instruments.

The first important step is to determine if the TV set actually needs alignment. One of the best checks basically consists of an overall RF/IF response check by injecting a sweep signal into the antenna terminals of the TV set and observing the response curve at the video detector test point.

Until recently, sweep alignment involved the cumbersome task of connecting four to six instruments with a number of interconnecting cables, which did not provide thorough and accurate response adjustments.

To simplify RF/IF alignment, Sencore introduced a national program to train electronic technicians, called the "Sencore Speed Aligner Workshop." This workshop was described on page 47 of the December 1970 issue of ELECTRONIC TECHNICIAN/DEALER.

As shown in the photo, we actually followed their simplified alignment procedure, using the alignment demonstrator with good results. The instruments used (Fig. 1) consist of Sencores' SM158 Speed Aligner, PS148 Oscilloscope/Vectorscope, BE156 Bias Supply and an Admiral K10 Alignment Demonstrator.

The demonstrator includes the tuner, IF strip, AGC, video, chroma and audio circuits of the Admiral K10 chassis.

Before getting into the actual steps of the alignment procedure, it is helpful to review Jim Smith's article, "Sweep Alignment Pointers," beginning on page 41 of the February 1971 issue of ELECTRONIC TECHNICIAN/DEALER. The article explains why the response curve is shaped the way it is and what effects will occur when it is not properly shaped.

As you probably know, each TV station is allotted a 6MHz wide band of frequencies in which it has to transmit all video, color, sound and sync information. For B/W-TV sets, the IF strip should have a bandpass of about 3.0MHz, which permits the passage of all video and sync information, but attenuates the chroma information between 3.08 and 4.08MHz—preventing interfering beats on the screen. A color-TV set, however, must have a wider IF-strip bandpass to handle these chroma frequencies along with the necessary video and sync information. A typical color-TV set will have a 4.2MHz IF bandpass; and to pass this wide a band of frequencies each of the IF tuned stages must be adjusted to a slightly different frequency within this frequency range. This is referred to as staggered tuning (Fig. 2). Because each stage must be tuned to a different frequency, the adjustment of the IF strip is quite critical and requires the use of a sweep-alignment instrument to make the necessary adjustments.

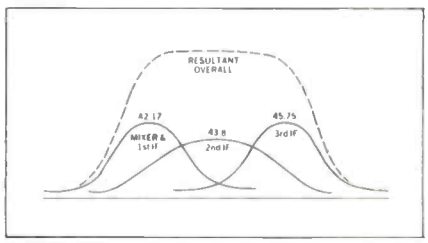

Fig. 2—To pass a 4.2MHz band of frequencies, each of the tuned stages in the IF strip must be tuned to a slightly different frequency within this frequency range. This method is referred to as staggered tuning.

To make these adjustments, the generator used must have an output covering the necessary frequencies. The one that we used is an FM oscillator operating at approximately 44.0MHz center frequency, with its RF output varying above and below this frequency. The rate of variation, or sweep rate, is normally 60Hz—obtained by using the ac line frequency. The oscillator output, varying above and below 44.0MHz, actually "sweeps" across the range of

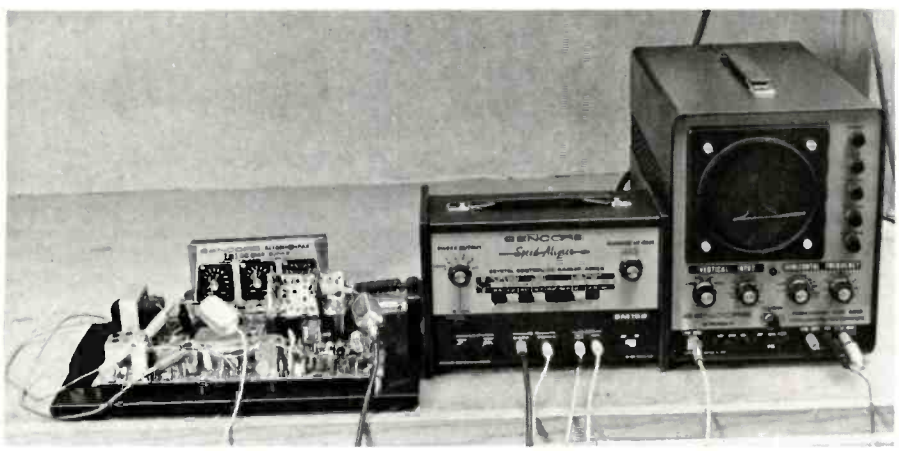

Fig. 1—Instruments used in our alignment of the Admiral K10 Alignment Demonstrator.

frequencies amplified by the IF stages. The sweep range of the generator used is adjustable to 15MHz, approximately twice that of the IF pass band.

When a scope is connected across the video detector load resistor, the dc voltage variations present as the generator sweeps across the IF band produces a response curve similar to that shown in Fig. 3. The response curve resembles a graph showing the output voltage versus frequency. The curve observed has little or no meaning unless we have a means of determining the position of a specific frequency upon it.

To determine the location of a specific frequency, we must use another generator to point out or "mark" its location on the response curve. This "mark" is the zero beat between the fixed frequency output of the marker generator and the varying output of the sweep generator—as the frequency from both becomes the same. Some sweep systems in the past have used two separate generators, with the output of both applied to the TV set. The instrument used for this article incorporates both of these generators, plus a marker adder section. (Fig. 4 shows the controls and functions of this instrument.)

The method employed to obtain markers is called the "post injection" system. The fixed marker frequencies are not applied to the tuner input of the TV set, and as a result, there is less tendency for the set to overload. These markers consist of eight crystal-controlled oscillators to provide extremely high accuracy. The marker adder section combines the marker oscillator signals and a sample of the sweep signal to produce the zero beat markers or "birdy" markers. These birdies are then applied to the vertical (or horizontal) input of the scope, along with the response curve from the TV set. The number of markers, or the amplitude of the markers, in no way affects the operation of the TV set and, as a result, will not produce any response curve distortion.

Overall RF/IF Response Check

The first step in the alignment procedure is the overall RF/IF re-

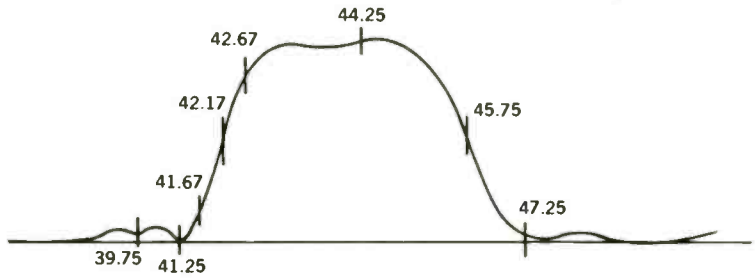

Fig. 3—The overall IF response curve seen when the scope is connected across the video detector load resistor.

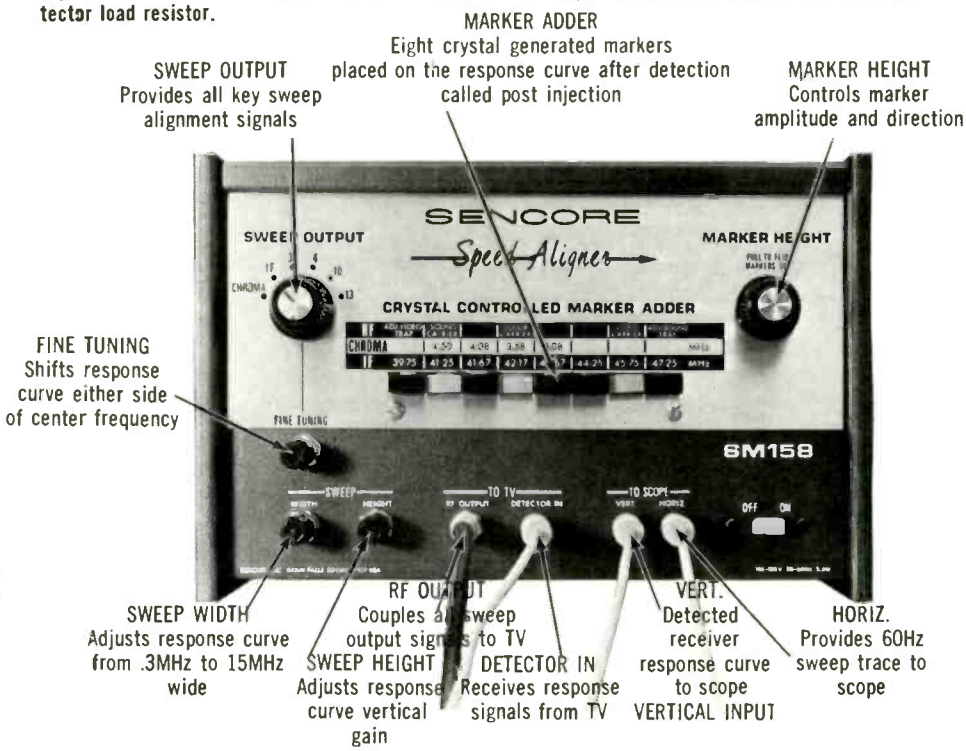

Fig. 4—The controls and functions of Sencore's SM158 Speed Aligner.

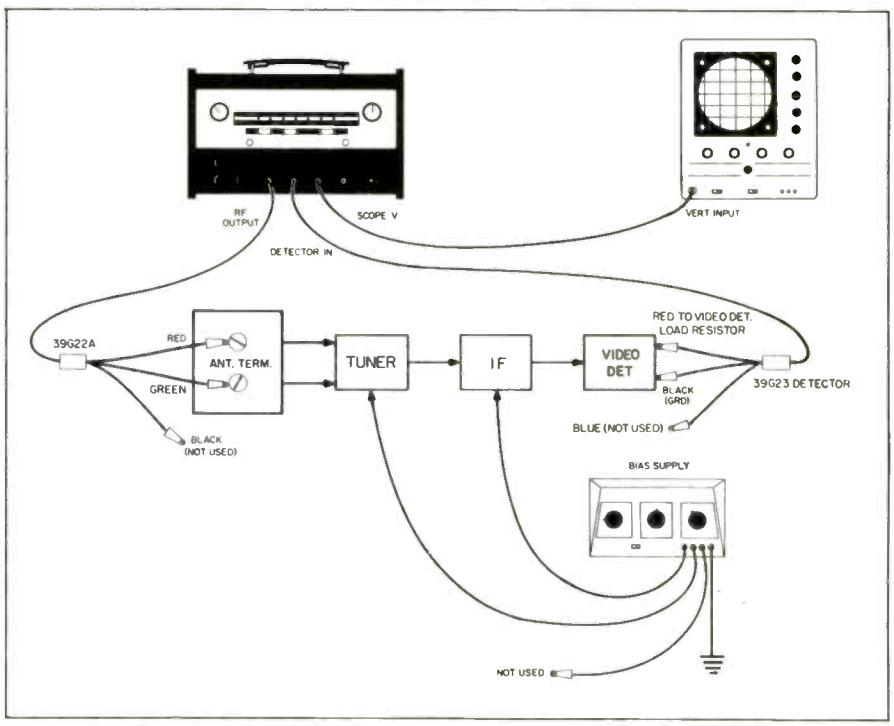

Fig. 5—Instrument-lead connections for the overall alignment check.

sponse check. This step determines whether or not the tuner and IF strip need alignment and consists of a simple touch-up alignment. (The set up for the overall check is shown in Fig. 5.)

The RF output from the sweep generator is connected to the alignment demonstrator's antenna terminals, using the 300Ω pad furnished. The connection to the circuit's video detector test point is made with another pad, offering resistive isolation between the instrument and the test point to prevent video-detector circuit overloading. (The simplified connections are shown in Fig. 5, 6 and 7.)

The scope connections required for this alignment consists of two cables from the sweep generator to the scope's vertical and horizontal inputs. The vertical input contains both the alignment demonstrator's response curve and the birdy markers developed in the marker-adder section of the sweep generator; while the horizontal input provides the scope sweep signal to insure synchronization between the sweep generator and the horizontal trace.

The only other connections provide the correct AGC voltages for the bias supply. To turn on the RF amplifier transistor to the correct operating level, +3v is applied to the RF AGC test point (TPBI) from the first section of the bias supply. The second section is connected to the IF AGC test point (TPB2) to provide +6v for the proper IF operating point. This completes the connections necessary for an RF/IF overall response check.

To obtain the response curve, we simply adjust the generator's RF sweep output switch to one of the four VHF channel frequencies provided. For this test, we adjusted the tuner to Channel 13 and the sweep-width control to the center of its range, adjusting the sweep-height control (RF output level) to obtain a response curve of 1v p-p. The response curve was centered on the scope by adjusting the fine tuning control.

In order to determine the accuracy of the response curve, we depressed marker switches to display the 41.25MHz sound-carrier marker

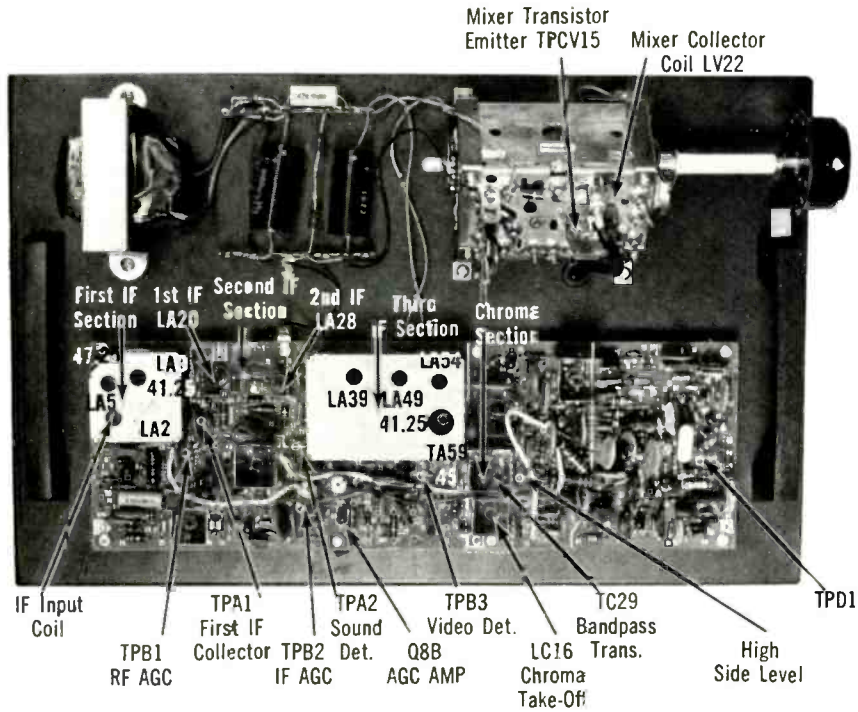

Fig. 6—Sections of the Admiral K10 chassis used for the simplified alignment procedures, including test points and coil locations.

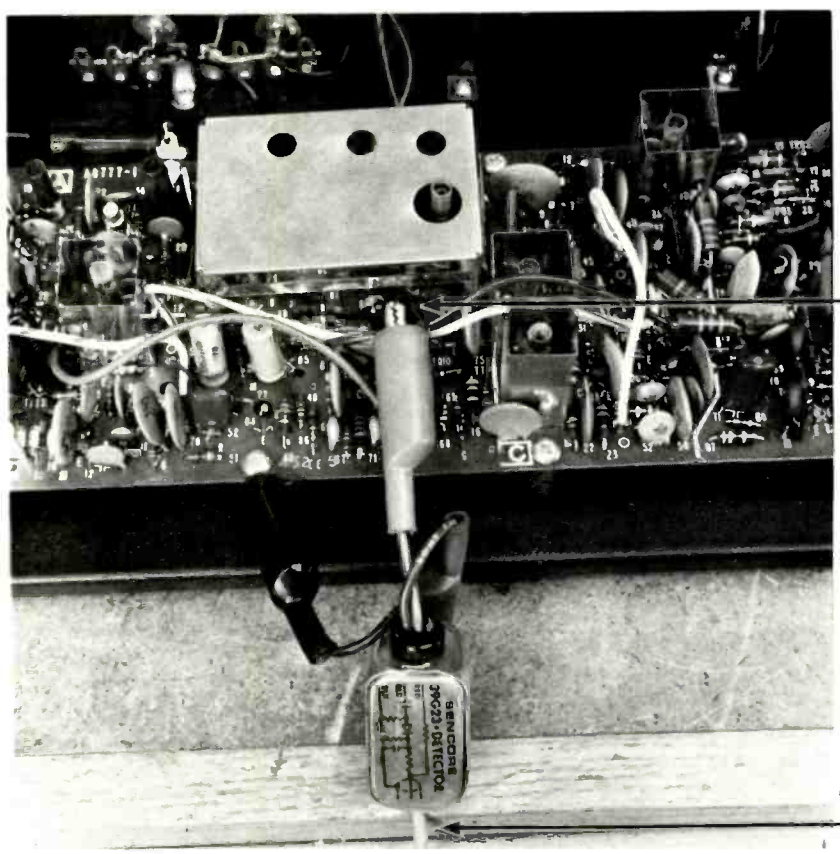

Fig. 7—The red test-instrument probe is connected to the video detector circuit, while the black probe is connected to ground.

and the 47.25MHz adjacent-sound marker. We then adjusted the alignment demonstrator's fine tuning to obtain a response curve with the trap frequencies (41.25 and 47.25 MHz) on either side of the curve on the base line—positioning the chroma carrier (42.17MHz) and video carrier (45.75MHz) at 50 percent of maximum amplitude on either side of the response curve (Fig. 8).

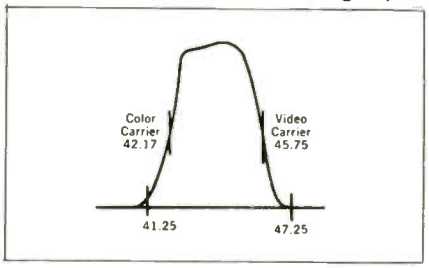

Fig. 8—The response curve with the trap frequencies (41.25 and 47.25MHz) at the base line on either side of the curve. The amplitude of chroma carrier (42.17MHz) and video carrier (45.75MHz) is 50 percent that of the maximum characteristic-curve amplitude.

The response curve that we obtained showed a slight tilt on the top rather than being flat as Admiral specified. To provide a more positive check, we viewed the response curve on the other VHF channels provided—Channels 3, 4 and 10. Since the same tilt was observed on all these channels, a touch-up adjustment on the second IF transformer (LA28) was tried, and it removed the tilt—providing the correct flat-topped response curve. In the case of this alignment demonstrator, this was all the alignment that was necessary to assure its correct operation.

Whenever a TV tuner is replaced, the TV-set's overall response curve should be checked, but with an adjustment of the tuner's mixer coil rather than the second IF transformer.

Although this alignment procedure is used on both the alignment demonstrator and Admiral TV sets, a similar procedure is required for all other TV sets.

IF Link Alignment

The first step in the Admiral alignment procedure is in the IF link circuitry. This is an intermediate step to adjust the mixer output coil in the tuner, the coaxial cable between the tuner and chassis (the link cable), and the input circuits to the first IF stage so that they are properly tuned together. To perform this alignment, the generator's sweep output is connected to the mixer test point (CV15) on the tuner, using a 75Ω pad provided with the RF cable. The response of the link is picked up at the collector of the first IF transistor with a special IF link detector probe. This link probe incorporates a voltage quadrupler, which increases the amplitude of the response at the first IF circuit to a level easily viewed on the scope. The connections between the generator and scope remain unchanged.

The RF AGC bias is reduced to 0v to cut off the RF amplifier, preventing interference; while the IF AGC bias is set to 4.5v, increasing the amplification of the first IF stage.

There are four adjustments associated with link alignment. First, the tuner mixer coil is adjusted for maximum output at 42.17MHz. This is accomplished by depressing the 42.17MHz marker to identify this frequency on the response curve, and adjusting the mixer coil to place the marker as far above the base line as possible. The 42.17MHz marker is then replaced with the 45.75MHz marker and the first IF input coil is adjusted to raise the 45.75MHz marker as far above the base line as possible. This marker switch is then released and the 41.25MHz marker switch is depressed. The 41.25MHz trap is adjusted to position the marker as close to the base line as possible. This trap is not sharp and somewhat difficult to see using the entire response curve. If the response curve is expanded by reducing the sweep width of the generator, the trap notch is easier to see and the adjustment becomes more accurate. The 47.25MHz trap in the first IF input is adjusted in a similar manner. The final adjustment is to position the 42.17MHz marker at 75 percent of the maximum response-curve amplitude by adjusting the mixer collector coil (LV22). When the Marker Height control is pulled, the markers become horizontally positioned for easier height adjustment.

Aligning Second IF Stage

The next step is to adjust the second IF stage, with all connections remaining the same as before with the exception of the response pickup point. The link detector cable is removed and the standard detector probe is again used. This probe is connected to the audio detector diode output in the collector circuit of the second IF stage (TPA2).

The procedure calls for the collector-coil adjustment of the first IF stage (LA20) and the second IF stage base coil (LA28) to produce a maximum output at 43.8MHz, but the generator does not have a marker at that frequency. However, the generator does provide markers at 42.67 and 44.25MHz. The 43.8 MHz frequency required is approximately a third of the way from the 44.25MHz marker toward the 42.67 MHz marker. By adjusting the sweep width so that the markers are six grid divisions apart on the scope, and positioning the 44.25MHz marker two divisions to the right of the center line, the center grid line becomes the 43.8MHz frequency marker (Fig. 9).

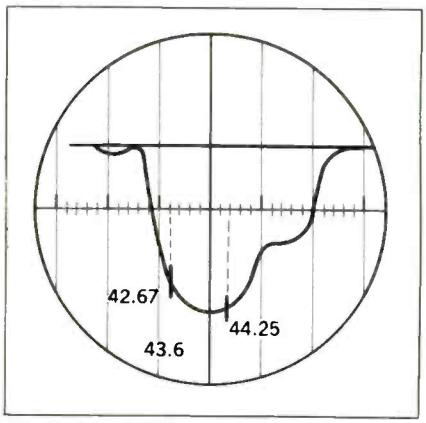

Fig. 9—The scope's grid pattern can be used as a marker for the 43.8MHz signal.

The same method can be used to locate the 45.0MHz marker called for by some manufacturers. It will fall exactly midway between the 44.25 and 45.75MHz markers.

Aligning Third IF Stage

The Admiral procedure calls for signal injection to the first IF transistor collector (TPA1) in order to adjust the third IF stage. The RF cable was therefore disconnected from the mixer test point and the 75Ω pad

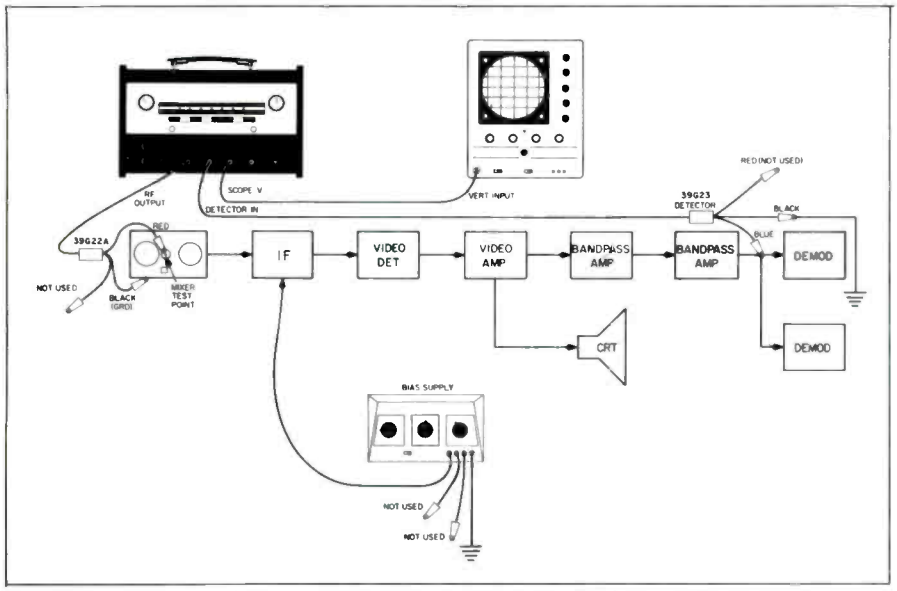

Fig. 10—Arrangement of instruments for chroma bandpass alignment through the IF circuit.

connected to the collector of the first IF transistor. The detector cable was moved to the video detector test point to obtain the alignment demonstrator's response curve, and all other connections remained the same.

The adjustment of the second 41.25MHz trap (LA49) is the first step in this procedure, and the 41.25 MHz marker switch is depressed—the response curve being expanded as it was for the traps in the link adjustment, and the trap set for 41.25 MHz. This trap has a very sharp characteristic curve and a deep notch, making it easier to set than the input traps. The marker switch was then released and the 42.17 and 45.75MHz marker switches depressed, the third IF stage coils (LA39 and LA54) being adjusted to place the markers as far from the base line as possible.

An additional check is offered to assure correct adjustments: The 47.25MHz marker, when placed on the response curve, should be at 50 percent of maximum response amplitude.

Overall IF Response Adjustment

The IF input signal must be applied at the mixer test point in order to adjust the overall IF-strip response curve, so the RF cable and 75Ω pad are again connected to the mixer (CV15). All other connections remain the same. The IF AGC bias is then raised to 6v, since all of the IF stages are again amplifying the injected signal. Upon making these adjustments, we observed that the response curve exhibited considerable tilt and the markers were not at the correct points. By working back and forth between the mixer coil, the first IF coil and the second IF coil, as suggested in the Admiral procedure manual, the desired overall response curve was obtained. Response shape and marker positions corresponded very closely to the ideal response curve. The horizontal marker feature proved very helpful in determining the exact position of the markers.

You may not always be able to obtain the ideal response curve, regardless of the amount of adjustments made. Under these conditions, try to obtain the correct marker placement without reducing the response amplitude over 25 percent. In many cases, TV-set alignment will be completed at this point.

Chroma Alignment

Alignment of the chroma circuitry consists of adjusting the chroma takeoff and chroma-bandpass transformer, the signal injection point remaining the same as for IF alignment—the mixer test point (Fig. 10). The sweep output from the generator is now set for chroma sweep, which provides a 42.17MHz sweep signal on a 45.00MHz carrier for bandpass alignment. The TV-set response is obtained at the high side of the color control. Since this point is ahead of the color demodulators, it is still an IF chroma signal and a video detector probe must be used. The standard detector probe furnished with the sweep generator not only provides the series resistor for video detector isolation when connected there, it has a built-in video detector circuit.

When beginning alignment, the IF AGC bias is changed to 7v and the 4.5MHz marker switch is pressed. The 4.5MHz video detector trap circuit is then adjusted so that this marker is just as close to the base line as possible. If the 4.5MHz trap is not correctly adjusted, the 920 kHz sound/color beat signal will be present in the picture.

After completing this adjustment, the 4.5MHz marker switch is released and the 4.08 and 3.08MHz color bandpass marker switches are depressed—the bandpass transformer being adjusted for maximum amplitude and best symmetry, with the markers positioned no lower than 80 percent of maximum response-pattern amplitude (Fig. 11).

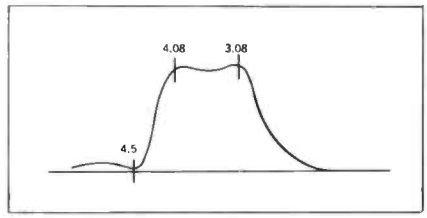

Fig. 11—The chroma bandpass response curve.

Tuner Response Check

The final step in the Admiral alignment procedure is a tuner response check. For this check, the RF output of the sweep generator is connected to the alignment demonstrator's antenna terminals, using the 300Ω pad. The RF AGC bias is then adjusted to 2v to forward bias the RF amplifier transistor. The IF output jack on the tuner is the signal response take-off point and the connection is made to this point using the detector probe. The output of the sweep generator is adjusted to one of the four VHF outputs and the three carrier frequencies are marked by depressing the sound carrier marker, video carrier marker and color carrier marker switches.

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It's what's up front that counts or

How to Turn on TV Antenna Profits

by James Sarayiotes

James C. Sarayiotes is no neophyte to advertising and electronics. After receiving his BBA degree in advertising from the Bernard M. Baruch College, Jim served as Radar Section Officer for General Patton's 6th Armored Div. He is Director of Advertising, sales promotion and public relations for JFD Electronics Corp. and owner of Delphi Advertising Agency. He is a member of the IEEE, American Marketing Assn., American Management Assn., Assn. of Industrial Advertisers, and Sales Promotion Executives Assn. Jim is currently completing studies for his MBA degree in Marketing from the City University of New York.

If you are a service dealer, dwell on these recommendations. If you are a simon-pure home electronic technician, this proposed sales program could prove solidly profitable for your service operation.

■ Let's start with an honest answer to a simple question.

Are you aware that color-TV antennas are a sizable source of profits for the home electronics technician and/or dealer?

First, before the dealer or retailer even attempts to sell antennas (or TV sets) he should heed the advice: "Doctor, heal thyself." His showroom or store should have demonstration TV sets operating with the very best reception possible. How can you expect to sell good performance if your own sets are not delivering sharp, bright pictures that impress customers?

The sale of an antenna (especially an outdoor model) can add from $30 to $90 profit to a color-TV set sale. Often, the antenna profit exceeds that realized from the sale of the set. Moreover, it clinches the set sale by helping to deliver the crisp, lifelike pictures that it was designed for. Equally important, the antenna installation keeps the customer happy with his source—*you!*

Show It Like It Should Be

Take a long critical look at the pictures on your TV sets. If you've got out-of-focus, off-color reception, how do you expect to sell the prospect on the idea of a new antenna system? **Show** your customers what good color reception looks like!

Once they have seen the clear, bright picture, you have paved the way for your color-TV antenna offer (if you have a TV set as a demonstration model in your store). Point out to the customer that since he or she is making a fairly large investment in a new color-TV set, he or she should expect to get the best possible reception from it—like from the demonstration set.

Some dealers fear that this direct approach of tieing in the antenna sale directly to the sale of the new color-TV set adds more to an already costly purchase. Smart dealers handle this situation very adroitly—and profitably. As soon as they've closed the sale, the dealers ask the customer the age of their antenna. If it's three years old or more, the dealers mention that any color-TV set needs a strong, clean signal to work at its best. They add that a modern new outdoor color-TV antenna assures the viewer the enjoyable reception and set performance he paid for. Here, the demonstration floor set working off an outdoor antenna scores impressive points.

If the customer is buying on the installment plan, then it's a simple matter to show that the added cost of the antenna amounts to only a few dollars per month.

Should the customer buy the idea of a new antenna—great! If not, at least he has been advised to do so, should his color picture quality prove disappointing because of an obsolete installation. This awareness deters the new color-TV set owner from blaming his reception woes on the TV set or the dealer. It invariably leads to a subsequent new color-TV antenna sale.

In fact, why not offer the customer a free antenna check-up, which presents you with an excellent opportunity to show him or her the difference a new color-TV antenna will make in his or her set performance? Otherwise, you could be faced with a situation similar to the following:

A large eastern mass merchandiser faced a dilemma in its TV department that many color-TV set retailers could understand. As high as 20 percent of all color-TV sets considered sold promptly "bounced" because of poor performance in the purchaser's home. In 18 percent of the instances the fault was traced, not to the set, but to the antenna. It was either inadequate or improperly installed.

As a result, the sales manager instructed his TV sales force to stress to every purchaser of a color-TV set the importance of getting a good antenna and having it properly installed. Since the implementation of this policy, returns of color-TV sets have dropped to 2 percent of the total sold.

Time and time again, sets that are sold in the store unsell themselves in the home. You can just about sum up the home situation in these words: *True color picture; sale completed! False color picture; sale defeated!*

No customer will be as tolerant of ghosts, snow or other interference in color as he once was in B/W-TV sets. You can't blame him. These defects were annoying but bearable in monochrome; in color they're in-

Technicians can use hang tag A as an antenna check-up form that can be dropped over the front door knob at the TV owner's home. Hang tag B can serve as a reminder to homeowners that their TV antenna is ready for retirement. These are a few of the many aids that take only minutes to use, but which pay off handsomely in increased TV antenna installation business.

A TV antenna and rotator, mounted on a "swing-up" mast, facilitates on-site installation sales. When preparing for a demonstration, the technician need only pull up into the driveway or in front of the home, flip up the antenna from its horizontal traveling position into a vertical receiving position, and run a lead-in wire from the antenna to the homeowner's TV set through the nearest window. This on-the-spot demonstration of the TV viewer's own set, in his own home, vividly shows the difference the new antenna makes in reception over the homeowner's existing TV antenna.

tolerable. In color, TV antenna performance is as important as the performance of the TV set itself. And with a multiplicity of UHF channels multiplying reception problems, the importance of the antenna simply cannot be stressed enough. The consumer should be made to realize that he is making a major investment when he purchases a color-TV set and is entitled to get the best possible reception and pleasure from his expenditure. Let's take a good long look at the job a good antenna *can* and *should* do.

How the Technician Can Sell

Any salesman worth his salt would literally give his eye teeth to be able to sell his product to a customer who has called him into his home. Yet, most technicians forfeit this golden opportunity to sell a new antenna while making a service call. There isn't a better time or place to sell a new antenna than in the home, while servicing the TV set. The idea could be broached by asking the set owner the age of his antenna.

You do not have to be an electrical or electronic engineer to know that an antenna, because of rust, corrosion, oxidation of terminals and other effects, can lose as much as 50 percent of its signal gathering

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GUEST AUTHOR

We hear a lot about Consumerism these days. Newspapers and magazines feature stories about this new phenomenon every week. As an example of this new vogue, I might tell you about the attorney general in New York City complaining, "It is time we clean up all the problems in the TV service business."

Consumerism and the Service Technician

by Harold Schulman

■ In response to the attorney general's statement concerning the TV service business, you would be entitled to ask, "So what else is new?" And that is what this article is all about—to tell you "what else is new."

First, let me tell you that the attorney general's remark was made at a city council meeting in New York City way back in 1952! I was a member of a subcommittee trying to bring some understanding of the nature of television to the people of New York. We were working with the better business bureau in the preparation of the first booklet to be given away to TV-set owners, describing the service requirements of TV sets.

In those days we even had to explain that "you can't get 12 channels just because you have a 12-channel tuner."

It seems that the greatest abuse in the 50's and 60's was reserved for the TV service technician and the "racket" he was in.

We are now in an entirely different climate. There are so many things people are complaining about that complaints against the service industry have to take their place in line.

It seems that the tremendous outpouring of goods and services since 1950 had reached a problem saturation level at the same time that Ralph Nader was saying Detroit was turning out some bad cars—and proving it.

The real output in goods and services has *grown* as much since 1957 as it grew in the entire time since the Pilgrims in 1620 to 1957. In 1957, our gross national product was $453 billion. It is now at a trillion dollars! This means that the additional output since 1957 is $547 billion! That's a lot of automobiles, aluminum cans, bottles, paper products, appliances and TV sets.

This is the central fact of our current existence. There is such a profusion of goods and services that something is always going wrong.

TIME Magazine ran a special cover story. FORTUNE Magazine, ESQUIRE and many, many others wrote about appliances that don't work, airplanes that stack up, cars that are unsafe, garbage that isn't collected, and in New York City, even telephones that aren't working.

I think the final proof that things had gone awry was when Rolls Royce had to recall some of their cars for a mechanical defect!

Thus the public and the media and government officials were brought together in a sort of simultaneous recognition that maybe the consumer isn't getting his just due in many areas.

Somewhere along the line we are doing too many things that pollute the air, dirty our streams, poison our food, and fill our shops with shoddy or unsafe goods.

The result is a rise in consumerism. As FORTUNE Magazine pointed out, guarantees many times don't guarantee, they just limit the buyer's right under common law. Fortune feels that "Consumerism is a reaction against mass production for mass consumption by people who want to be treated as individuals."

Mary Jane, a Federal Trade commissioner said, "Consumer power is a reality and grounded on legitimate needs and concerns."

John F. Kennedy, in a special message on consumers' interests, established the Consumers' Advisory Council with four goals: to establish on behalf of the consumer the right to be heard, the right to safety, the right to be informed and the right to choose.

From that has grown the permanent office of Consumer Affairs and a steady stream of legislation to protect the consumer. For example: In 1966, the National Traffic and Motor Vehicle Act, and the Fair Packaging and Labeling Act; in 1967, the Wholesale Meat Act; in 1968, the Consumer Credit Protection Act, etc.

At the moment there are more than 150 bills in the Congressional hopper, all aimed at one phase or another of consumer protection. Expected to pass shortly are acts to provide inspection of fisheries, protection against hurtful credit information files, defective tire recall resolutions, etc.

What is equally important is the actions being taken more and more by consumers and on behalf of consumers—plus increased consumer awareness. The Department of Justice now has a Consumer Protection Div. Class action suits may result. The FTC now has a staff of 1300 people with 500 lawyers and a $17 million budget. Consumers themselves have formed the "Consumer Federation of America" and now have 146 chapters with headquarters in Washington, D.C., and 38 paid directors.

All this is going to lead to a much

Harold Schulman was national service manager for Allen B. DuMont Laboratories and CBS-Columbia during the 1950's, and wrote the column, "Director's Corner" in DuMont's service News for many years. He was also chairman of the EIA Service Committee in 1953-54, when the first industry sponsored training course was launched. Mr. Schulman has held executive positions with Allied Radio and Fisher Radio Corp., and is now executive vice-president of Dynascan Corp., the manufacturer of B & K Test Equipment and Cobra 2 Way CB Radios.

more intelligent approach to the problem of servicing than we ever had before. I personally feel that our service industry will enjoy a status and position 5 to 10 years from now that is not now possible to imagine.

I think competency in service will be recognized and rewarded. Those few who can't keep up with the needs for competent, legitimate and honest service, will fall by the wayside. But the large majority of service technicians, who try their best to learn what's going on, will thrive and receive recognition.

How do I come to this conclusion? Well, first of all, there will be much more scrutiny of the entire service process. It will be found that the actual servicing is the smallest part of the problem. What will be opened to the public and official view is the part played by other factors in servicing: the availability of parts, the accuracy and availability of service information, the misunderstanding of warranties, and the sheer difficulty in servicing some TV sets or locating some intermittents. In some cities you can't even get around to make your service calls!

On the other hand, when officialdom is fully informed and consumer groups really learn what goes into making a qualified service technician . . . what he has to know . . . and keep up with . . . a new respect will arise.

I already see some glimmerings of this. Earl Lifshey, in a widely read column in HOME FURNISHINGS DAILY, quotes a deposition that says, among other things, "that the major share of responsibility for the deplorable situation now existing in this country, with respect to the servicing of most consumer electronic products, rests squarely upon manufacturers of such products." And then the column goes on to list all the ills of our industry that could be considered a responsibility of the manufacturer.*

This is the start of an awareness of the entire problem—not just the whining about the service technician taking advantage of the customer. The more they look into the situation, the more they will find that this isn't so.

I think we ought to take a page out of the book of the medical profession. They are "servicemen" too After all, they do not produce anything. They make service calls, use instrumentation, have difficulty with intermittents, occasionally replace or remove parts that they shouldn't, etc. (Of course, one advantage they have . . . the Maker of the product they work on doesn't claim that He makes a perfect chassis . . . and of course the model doesn't change too often.)

One of the strengths of the medical profession is their strong organization, the AMA. So far, that's missing in our trade, although there may be one developing. (At this writing the Feb. 12 conference in Dallas had not been completed.) Possibly we need two organizations . . . one a professional organization like the IEEE, where all technicians can join for professional status . . . and another organization for owners where business and trade practices become the business of the day, such as in the EIA.

The forward looking technician should join a professional organization and become active in it. He should certainly keep up with the literature and attend the schools and seminars made available to him. And finally his shop should be professional looking. How do you feel about going to a dentist who uses old, rundown equipment. Isn't your confidence and satisfaction much greater when your dentist has new high-speed, painless equipment?

I am sure you know that Uncle Sam helps pay for your equipment because as a business expense it's deducted from income, and thus you pay no tax on the amount you spend. Good equipment pays for itself—and should be written down on your books as fast as possible. Thus you will always be in a position to take advantage of new items as they are developed—and the need for them arises.

I would like to close this article with a quote from John Gardner, former Secretary of Health, Education and Welfare, in his book, "Excellence." In calling for a cultural change—one that will recognize that the person performing service is exercising power—doing something for the customer that he cannot do himself, he says, "The society that scorns excellence in plumbing, because plumbing is a humble activity, and tolerates shoddiness in philosophy because it is an exalted activity, will have neither good plumbing nor good philosophy! Neither its pipes nor its theories will hold water." ■

I will be glad to send a copy of this column to anyone who writes me at B & K.

TEST INSTRUMENT REPORT

B & K Model 1460 Triggered-Sweep Scope

by Phillip Dahlen

Virtually solid-state scope features compact circuitry but includes full 5-in. diameter screen

■ In response to a growing demand for triggered-sweep scopes, B & K has just recently come out with a completely new scope, quite unlike any that they have designed before. Although the scope is less than 10 in. in overall width, it includes a CRT that is slightly more than 5 in. in diameter for easier viewing. Except for its Z-axis input, which is easily reached at the rear of the chassis, all scope inputs are conveniently located on the front panel along with all of the switches and controls.

While observing a pilot model in the manufacturer's laboratory, we were impressed by observing well synchronized VITS (Vertical Internal Test Signal) patterns from a TV set as it was switched between the various Chicago TV network stations.

The manufacturer has compiled a long list of impressive specifications which are listed at the right:

Vertical Amplifier

Sensitivity:	0.01v/cm to 20v/cm ±5%, 11 ranges, each providing fine adjustment
DC frequency response:	DC to 10MHz (—3dB)
AC frequency response:	2Hz to 10MHz (—3dB)
Risetime:	35ns
Overshoot:	3%
Input resistance:	1M (approximate)
Input capacity:	35pf (approximate)
Tilt:	5% or less
Maximum input voltage:	300vdc + ac peak or 600v p-p

Sweep Circuit

Sweep system:	Triggered and automatic
Sweep time:	0.5μs/cm to 0.5s/cm ±5%, 19 ranges, each providing fine adjustment
Sweep magnification:	×5 for each range
Linearity:	3% or less on 0.5s/cm to 2μs/cm ranges 5% or less on 1.0μs/cm to 0.5μs/cm ranges

Triggering

Type:	Internal, line frequency and external (2v p-p or higher)
Trace slope:	Positive and negative
Range:	20Hz to 10MHz, minimum 10mm of deflection
TV horizontal synchronization:	100Hz to 1MHz, minimum 10mm of deflection
TV vertical synchronization:	100Hz to 3kHz, minimum 10mm of deflection Any portion of complex TV waveforms can be synchronized and expanded for viewing

Horizontal Amplifier

Sensitivity:	300mv/cm
Frequency response:	DC to 800kHz (—3dB)
Input resistance:	100K (approximately)
Input capacity:	40pf or less

Calibration Voltage

Signal: 1kHz square wave of 5v p-p, 5%

Intensity Modulation

Z axis: 30v p-p minimum

Probe

Attenuation: Combination 10-to-1 and direct
10-to-1 impedance: 10M, 18pf
Direct impedance: 1M, 120pf

Semiconductor Complement

6 FETs, 40 transistors and 14 diodes

Power Requirements

117vac, 50/60Hz, 20w, three-wire cord

Dimensions

9 in. H by 10 in. W by 17 in. D.

B & K's Precision Model 1460 triggered-sweep scope. For more details circle 900 on Reader Service Card.

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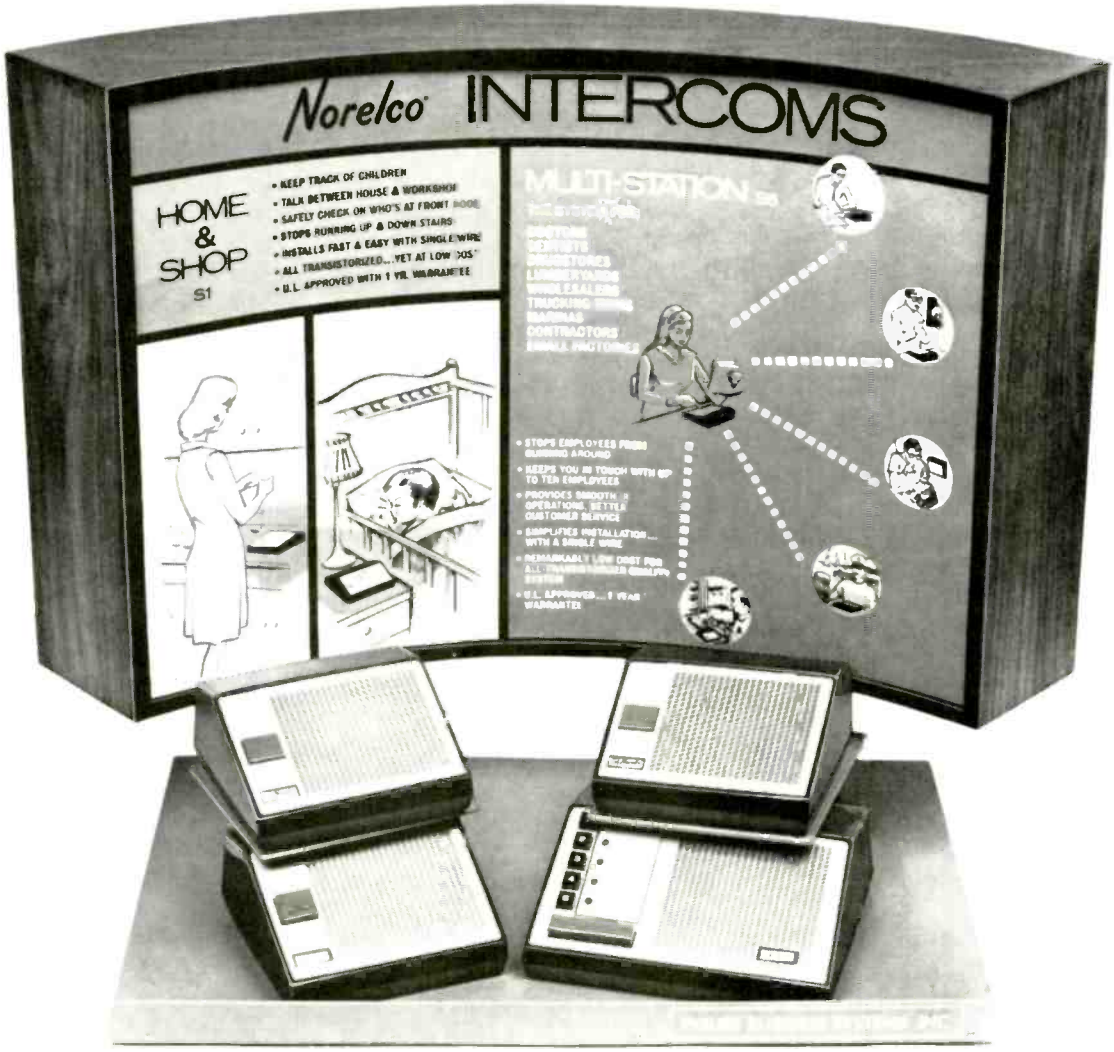

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CCTV IN THE HOME...

continued from page 44

adjacent channel interference is not a problem. The frequency splitter and terminating resistor do not allow harmonics to cause interference on the higher-frequency TV channels that are also being used.

On the other hand, metropolitan New York has regular broadcasting on Channels 2, 4, 5 and 7. A closed-circuit signal must therefore be displayed on either Channel 3 or 6, since most cameras have an RF output range from Channels 2 through 6. Adjacent channel interference thus becomes a problem. It can, however, be readily solved by substituting a single-channel passband filter or an adjacent channel audio-video modulator (see Fig. 8 and 9). Other elements needed to connect the camera to the MATV system are an attenuator to balance the camera signal with off-the-air channels and a hybrid all channel splitter to permit the distribution circuit to accept signals from two sources (antenna and camera).

If more than one camera is to be tied into the system, a separate open channel must be available, preferably within Channels 2 through 6, for each camera. Special adaptive equipment may be used, however, if a camera must be connected for display on higher frequency channels. Ideally, a home owner, who requires outputs from several cameras to be displayed on several monitors, would install a separate signal distribution system without an antenna. The system would accept only those signals emanating from the cameras. Such a system could therefore contain up to five channels (2 through 6) if each camera connection includes a passband filter to eliminate adjacent channel interference.

The ultimate choice among the available options for a home CCTV system must be predicated on two basic factors: need and price. Either can be the determining factor, depending on the user's requirements. ■

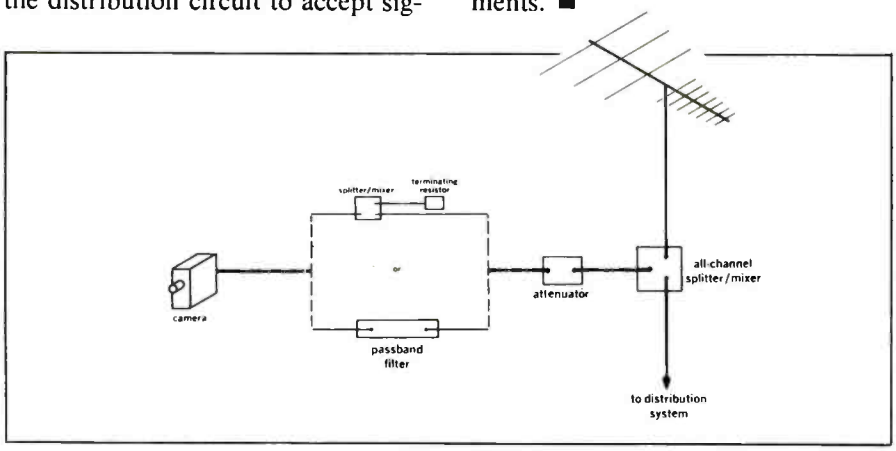

Fig. 8—A closed-circuit camera can be readily connected into an existing MATV system. If no problem exists from adjacent-channel interference, the camera can be connected through a splitter/mixer to the distribution system. If adjacent channel operation is necessary, the splitter/mixer must be replaced by a passband filter.

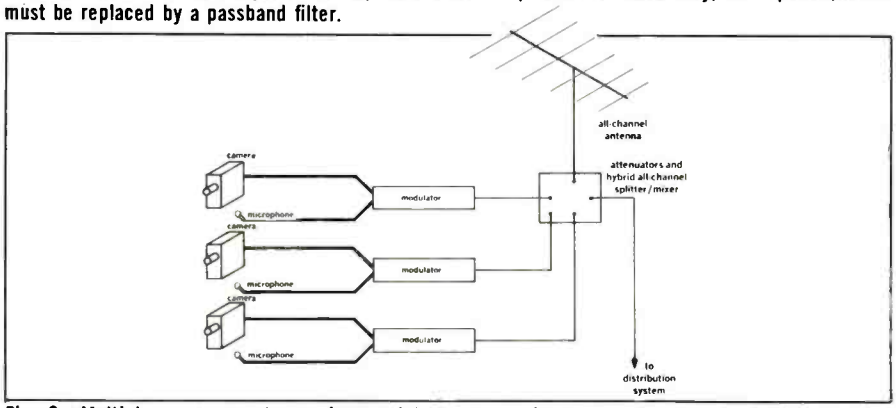

Fig. 9—Multiple camera system using modulators to facilitate distribution of adjacent channel signals.

TEKLAB...

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VHF Tuning

The low-band RF input circuit, as shown in Fig. 7, consists primarily of inductors L1, L2, L4 and L5 tuned by varactor diode TD3. When switching diodes D1 and D2 are reverse biased, capacitor C3 is switched across inductor L2, and inductor L5 is switched across inductor L4—causing the input circuit to resonate in the high-channel VHF band. The exact resonant frequency is determined by the capacity of varactor diode TD3 across the input inductors. This capacity is adjusted by varying the positive dc voltage applied to its anode. When switching to the high channel, 20v is applied to the switching diode's anode; while during low-channel reception the +20v is removed and the diode is turned OFF by applying —20v to its anode.

This same switching voltage determines whether or not switching diode D5 shorts capacitor C14 across inductor L11 for high-band reception, electronically disconnecting it for low-band reception. The same tuning voltage is used for determining the capacity of varactor diode TD4 across the RF amplifier's output circuit—causing it to resonate at the same frequency as the circuit's input.

VHF Oscillator and Mixer

The VHF oscillator, shown in Fig. 8, is a common-base, tuned-collector oscillator using varactor tuning across inductors L14, L15 and L27 on the low band and inductor L14 on the high band. The output signal is capacity coupled from the collector tank circuit to the base of the mixer transistors. The oscillator's band switching is accomplished with switching diodes D6 and D7, and tuning is accomplished with varactor diodes TD7 and TD9, using the same switching and tuning voltages as those applied to the RF stage.

Video IF Amplifier

The four-stage video IF amplifier contains an AGC circuit in its first two stages, and its frequency response is made to differ with signal strength. At maximum gain (when a weak RF signal is received), the picture carrier is amplified to have the greatest response, and the sound carrier is increased—while the chroma signal is reduced. This response change is designed to give optimum performance with weak as well as strong RF signals.

The AGC System

The AGC circuit (Fig. 9) is a closed-loop regulator system controlling both RF and IF signal gain. It is designed to maintain a relatively constant video output over a wide range of signal input levels.

The system consists of a two-stage, gate-amplifier circuit utilizing flyback pulses and sync-tip voltages for regulating the AGC amplifier's impedance. The positive horizontal flyback pulse is applied (through diode SC302) to the collector of the AGC gate transistor Q302. Simultaneously, the base of Q302 receives a positive voltage from the sync portion of the video signal present at the collector of the first video amplifier transistor (Q208). During this time Q302 will conduct current, which will result in a negative dc voltage at filter capacitor C304. The magnitude of this voltage is proportional to the current through the gate transistor and hence to the amplitude of the sync pulse. This dc voltage, in turn, controls the bias (gain) of the tuner and controlled IF stages.

Potentiometer R358, together with resistor R320 and gate-emitter, bias-network resistors R314 and R316, set the AGC threshold voltage. When no AGC voltage is developed, the AGC amplifier transistor (Q300) is biased into saturation through resistors R307, R302 and R306—the voltage at the junction of resistors R307 and R302 being 8v to produce maximum tuner gain.

With transistor Q300 in saturation, the emitter current through transistors Q200 and Q202 (which are series connected) will be determined by resistor R210. It has a relatively low value, and the IF stages will operate at maximum current.

When a negative AGC bias is developed and added to the existing bias at the base of transistor Q300, the current through Q300 is reduced, thus reducing the current and gain of transistors Q200 and Q202. With Q300 cut off by the negative AGC bias, the gain of Q200 is low and determined by resistor R212 (R210 has a low resistance). Transistor Q202 is controlled similarly by resistor R218. Further AGC voltage changes will only control the tuner gain.

Next month we will continue our coverage of the Sylvania E01 Chassis with a description of circuit functions in the chroma CW oscillator, phase control, ACC, demodulation and horizontal output sections. ■

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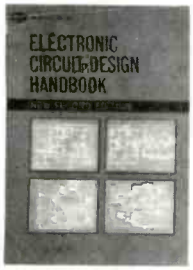

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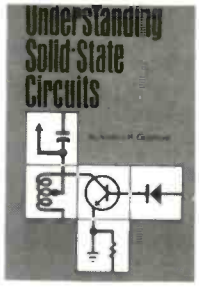

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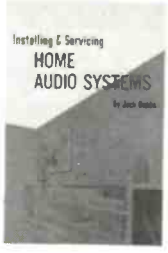

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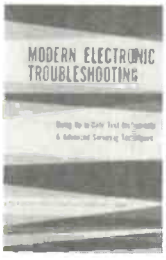

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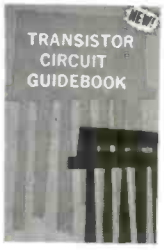

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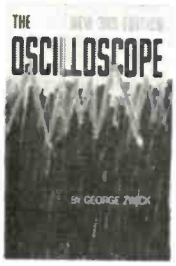

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TV RECEPTION . . .

continued from page 46

When securing coaxial cable by stapling, the metal staples should be spaced at random intervals. Equally spaced staples tend to produce "holes" at certain discrete frequencies. This leads to a loss of signal energy at those channels that correspond to the "hole" frequency. An alternative method of securing transmission cable involves the use of plastic clips with pressure-sensitive backing. These are ideal for securing a cable along a room baseboard.

The antenna should have a good front-to-back ratio so that signals coming from the rear are attenuated to a point where they do not affect the main signal. The polar patterns in Fig. 3 are typical for an antenna receiving four different frequencies.

The characteristics of an antenna are more directional at the higher frequencies. This is desirable since it reduces the effect of pickup from unwanted reflected signals impinging on the back and ends of the antenna.

The front-to-back ratio of an antenna is merely the ratio of signal amplitude (in microvolts as read on a field strength meter) when the front of the antenna is pointing in the direction of the desired station's transmitter, to the amplitude of the signal picked up at the back end of the antenna when the back of it is oriented towards the transmitter. Simply stated: Front-to-back ratio $= \frac{E\ \text{forward}}{E\ \text{backward}}$.

To convert this to a decibel value (most antenna specifications indicate the front-to-back ratio in decibels), we can consult a voltage-to-decibel conversion chart. For example:

Front signal amplitude $= 4000\mu v$.
Rear signal amplitude $= 200\mu v$.

$$\text{Front-to-back ratio} = \frac{4000\mu v}{200\mu v}$$

$= 20{:}1$.

Since all signal measurements are referenced to 0dBm (0dBm $=$ $1000\mu v$) 20:1 means $20{,}000\mu v$: $1000\mu v$ or a signal 20 times stronger than 0dBm. From a conversion chart we find that this voltage ratio is equal to 26dB. The front-to-back ratio is stated as 26dB.

The antenna must have sufficient gain for the geographic area in which it is to be used. While some manufacturers furnish gain curves, most rely on the terms metropolitan, suburban or fringe to describe an antenna for any particular area.

Fig. 4 shows the gain characteristics of an antenna. The length of antenna elements are usually cut for operating around the center of the TV band. The response, therefore, falls off at the band ends. Transmission cable, on the other hand, has a characteristic of increasing attenuation as the frequency is increased.

For example: For a particular type of RG59/U cable the decibel loss at Channel 2 (54 to 60MHz) is 2.8dB per 100 ft; on the FM Band (88 to 108MHz) it is 4.0dB per 100 ft; and at Channel 13 (210 to 216MHz) it is 5.9dB per 100 ft. To compensate for this loss, an antenna is designed so that there is a positive characteristic-curve tilt toward the lower frequencies (i.e., gain increases with frequency). At the higher frequencies, the loss in the antenna —due to the length of the elements —does not allow this same relationship. However, the *overall* antenna gain is higher (i.e., Channel 2 to 6 gain is 6 to 9dB, Channel 7 to 13 gain is 13 to 10dB). The important point is that the minimum gain in the High Band range is greater than the maximum gain in the Low Band range. At UHF frequencies the gain is just about flat from Channel 14 through Channel 68 and then falls off rapidly. For the UHF channels (both the high and low ends) we can therefore consider the antenna response almost flat.

To sum up these points, one would like to see an antenna that has:

- Wide bandwidth [i.e., covers from Channel 2 (54MHz) through Channel 13 (216MHz) including the FM Band] with good gain characteristics.
- Some sort of UHF head, either as an integral part of the antenna or separately mounted, to cover the UHF frequencies of Channel 14 to 82.
- A flat response over each 6MHz section of each channel (say ± 1dB).
- A good front-to-back ratio.

This appears to be truly a herculean task for an antenna. However, there are a few on the market that you can obtain which have these characteristics. Ask the distributor for the characteristics. ■

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TECHNICAL DIGEST

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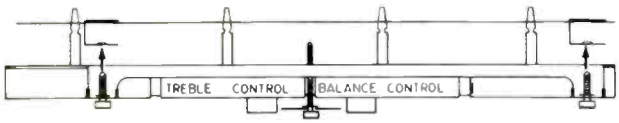
ADMIRAL

Modular Stereo Models STC731/STC741/STC751—Disassembly Instructions

To remove the changer and chassis from these models, the cabinet bottom must be removed by removing the screws in the cover. On Models STC741 and STC751, turn the two changer hold down clamps to the vertical position (accessible through holes in the bottom of the chassis). Do not pull the record changer out by its centerpost, but lift the changer part way out with your hands on each side of the base plate. Then disconnect the changer audio cable and power connector. The changer can then be lifted out and most service can be performed without removing the chassis.

If it is necessary to remove the chassis, start by pulling off all knobs. Remove the mounting nut and washer securing the stereo phone jack, the four screws holding the chassis to the cabinet and the screws holding the rear jack panel to the cabinet. Loosen the Phillips screws below the stereo phone jack supporting the control bracket. Loosen the Phillips screw under the power switch, freeing the control bracket, and then loosen the Phillips screw between the Balance and Treble controls—lowering the control bracket as shown in the illustration.



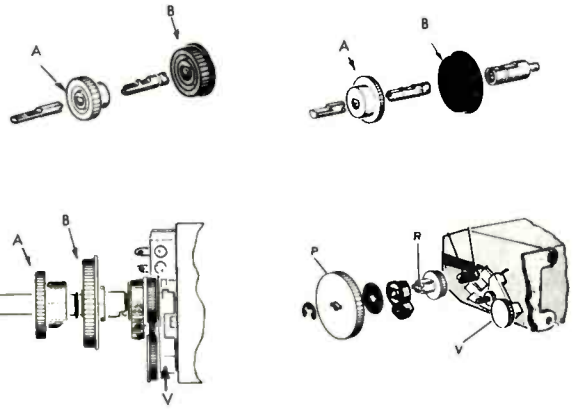
On Model STC751, the cassette recorder can be removed by taking out the four screws securing it to the chassis. Be certain to mark the audio cables as you unplug them. Carefully lift the chassis out.

Reassemble the unit in reverse order, tightening the end screws after pushing controls up into position with the center screw.

EMERSON

Tuner Gear Identification

Certain tuner gears are incorrectly identified on some service notes. Please use this as your guide when ordering the gears shown. Several configurations are illustrated.

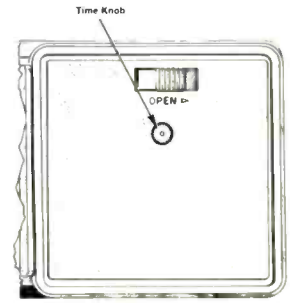


A—Drive Gear	965862	P—FT Gear (Solid)	964699
B—FT Gear	965927	R—FT Intermediate Gear	964700
		V—FT Assembly	964704

RCA SALES CORP.

Battery Powered Clocks—Starting Clocks

Many of the clocks utilized in current RCA radios are not self-starting. The clock must be started when the instrument is sold, then each time the clock battery is replaced.

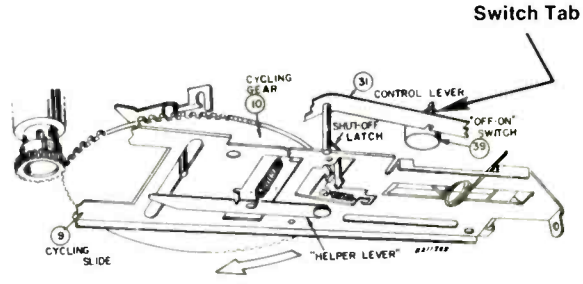


An outline of this procedure is included in the Operating Instructions packed with these instruments. To start the clock, the battery must first be installed correctly. Then pull the time knob (located on the back of the instrument), out to set the time. Releasing the time knob starts the clock motor.

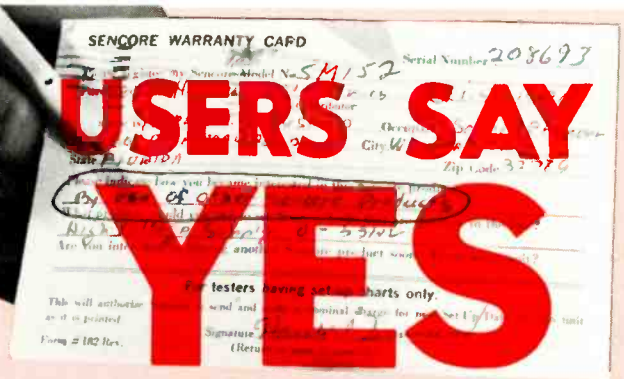
Record Changer Models RP-230/231/232/233—Erratic or Improper Function Selector Operation

Erratic or improper function selector operation of these record changers may be resolved by one of the following procedures:

If the function selector is forced toward the "Select" position during the last record shut-off cycle, the control lever may warp downward causing the switch tab on the control lever to miss the switch assembly. In the event this occurs, and the control lever (Stock No. 126066) is bent, it must be straightened or replaced. Also the switch (Stock No. 108457) may be damaged.



The operation of certain changers (some early versions utilizing two switches) may be enhanced by the addition of a piece of plastic tubing (spaghetti) over the switch tabs. Each piece of tubing must be 3/16 in. long and fit snugly on the tabs.



USERS SAY YES TO THE CR143 CRT CHAMPION

The industry's most recommended CRT Tester. Here is what users say: they say YES after using the CR143 Champion, they say YES to their friends and they are saying YES to you. They say YES, go ahead and buy the CR143 . . . it can't be beat. See these excerpts from users' warranty cards and judge for yourself.

YOU, too, will say YES if you will just try the CR143 at your local Sencore parts distributor only $119.50.

CR143 User Says YES

BEST EQUIPMENT MADE TO DATE

Richard E. Sanderferd, Radio & TV Repair
Raleigh, No. Carolina

CR143 User Says YES

I SAW IT AND I LIKED IT RIGHT AWAY

Anthony Pieczkowski, TV Service • Cicero, Illinois

CR143 User Says YES

A FINE PRODUCT

Howard Delaughter, TV & Electronics • Moultrie, Ga.

CR143 User Says YES

SPEC'S UP AGAINST OTHER COMPANIES . . . LOVE SENCORE'S STEEL CABINETS

Charles Marchese, TV Tech. • Mechanicville, New York

CR143 User Says YES

IT'S QUALITY AND AMERICAN MADE

W. L. Baker, P. T. Tech. • Sandia Base, New Mexico

CR143 User Says YES

NEEDED A NEW CRT TESTER . . . THIS HAD THE BEST FEATURES

Frank Cwynar, Pharmacist • Randallstown, Maryland

CR143 User Says YES

A GOOD PRODUCT AT A FAIR PRICE

Leo Coy, Inspector • Bettendorf, Iowa

CR143 User Says YES

HIGHLY RECOMMENDED

Roy W. Grau, Technician • Lancaster, New York

USERS SAY YES TO SENCORE

THE IDEA PEOPLE

SENCORE

3200 SENCORE DRIVE, SIOUX FALLS, SOUTH DAKOTA 57107

IN A NUTSHELL

In a nutshell, users always say yes to the CR143 Champion because it checks all CRTs, large and small, domestic and imported, and is the only CRT tester that has an automatic check on color CRT tracking. You can tell by the three G2 controls. After you see that the CR143 has replaceable sockets to prevent obsolescence and that it is a rejuvenator at no extra cost—you, too, will say yes.

. . . for more details circle 124 on Reader Service Card

COLORFAX

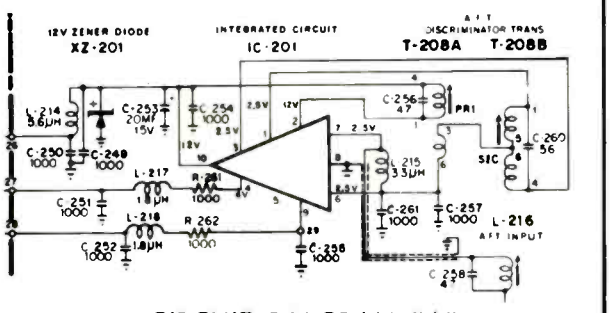
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

EMERSON

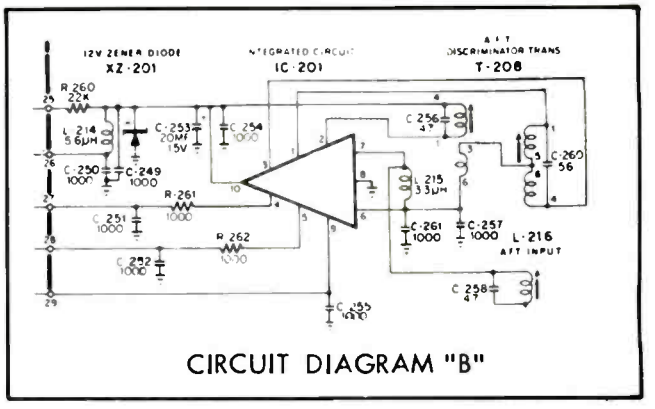
Color TV—Replacement of AFT Integrated Circuit

The AFT integrated circuit, Part No. 815215, has been redesigned and will no longer have a Pin 9 terminal. In the sets which use parallel filaments, the new version of IC 815215 is directly interchangeable with the old one.

In the chassis with series filaments, it will be necessary to check the printed board circuitry connected to the IC; and if the printed board wiring to Pin 5 is open, it will be necessary to connect a jumper between Pins 5 and 9 of the IC (see circuit diagram "A").



CIRCUIT DIAGRAM "A"



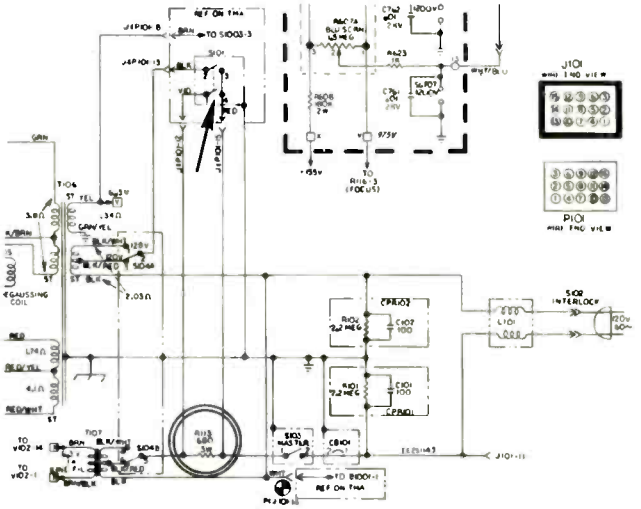
CIRCUIT DIAGRAM "B"

The new version of the IC 815215 can be used without modification if Pin 5 of the IC is connected to the AFT circuitry (see circuit diagram "B").

RCA SALES CORP.

Color TV Chassis CTC40—Color Tracking

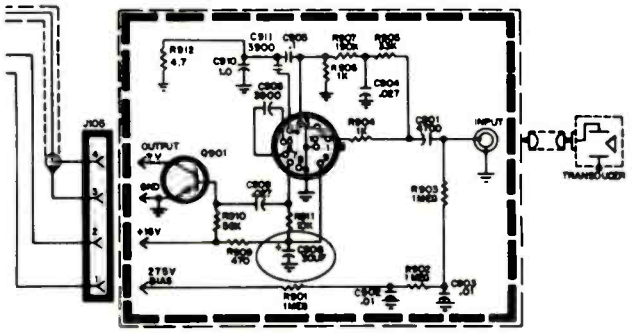
Some color tracking problems in instruments utilizing the CTC40 chassis—which seem to relate to a defective picture tube—may actually be the result of a defective ON/OFF switch. Should the section of the switch used to bypass

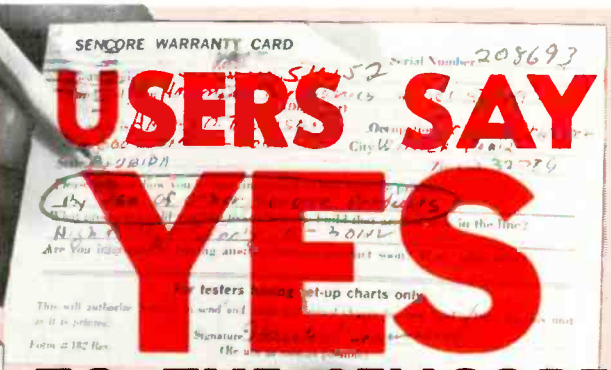


the picture tube filament dropping resistor (R113) become intermittent, the filament voltage could vary between 5 (STANDBY) and 6.3v (ON). This can cause variations in color tracking.

Color TV Chassis CTC42/43/44/47—Reduced Remote Sensitivity

Reduced remote-control sensitivity of instruments utilizing these chassis may be the result of an off-value electrolytic capacitor in the preamplifier. The capacitor is Symbol No. C908, Part No. 128058, a 30μf, 15v electrolytic capacitor. If replaced, use part No. 132062, a tantalum type 27μf, 15v electrolytic for maximum reliability.





USERS SAY YES TO THE SENCORE TC154 MIGHTY MITE TUBE TESTER

Here is why over 60,000 Mighty Mite tube testers are now being used daily. Here is how users say YES on their warranty cards after using the Mighty Mite.

COMPARED SENCORE TO OTHER MANUFACTURERS

They Say YES — Ralph Jones, Electronic Student • San Diego, Calif.

HAD EARLIER MODEL

They Say YES — H. R. Schultz, Electronic Tech.• Phoenix, Arizona

REASONABLE PRICE AND EXCELLENT QUALITY

They Say YES — George Anthony, Master TV Technician Vineyard Haven, Mass.

IT'S COMPACTNESS, TRUE INDICATOR AND LOW PRICE

They Say YES — Wallace S. Waniya, Electronic Technician Honolulu, Hawaii

SHARP EYE FOR FINE EQUIPMENT

They Say YES — Arnold F. Walter, Technician • Buffalo, New York

IT HAD THE FEATURES I WANTED

They Say YES — Karl L. Radke, Student • Pittsfield, Mass.

USING THEM— SENCORE IS THE BEST

They Say YES — Richard Sanderford, Radio & TV Service Raleigh, No. Carolina

RECOMMENDED BY MORE EXPERIENCED T.V. REPAIRMEN

They Say YES — E. A. Kirvan, Elec. Technician Specialist Minneapolis, Minnesota

JUST CHECKED AN OLD FAMILIAR NAME

They Say YES — Philip D. Walters, Electronic Tech.• Dayton, Ohio

AS FAR AS I AM CONCERNED, SENCORE IS THE BEST

They Say YES — Ira Reeves, Test Engineer • Augusta, Georgia

YOU, too, will say YES if you will just try the TC154 at your local Sencore parts distributor only $99.50

USERS SAY YES TO SENCORE

THE IDEA PEOPLE

SENCORE

3200 SENCORE DRIVE, SIOUX FALLS, SOUTH DAKOTA 57107

IN A NUTSHELL

In a nutshell, users always say yes to the Mighty Mite because it finds the tough dog tube troubles before they get a chance to cause you that expensive call back. It checks them all, large and small, foreign or domestic, and does it right with 100 megohm grid leakage sensitivity and cathode check at full rated emission. See your Sencore distributor and you, too, will say yes. Over 60,000 now in use.

. . . for more details circle 125 on Reader Service Card

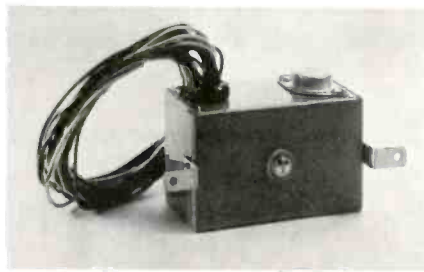
NEW PRODUCTS

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

STEREO-RADIO SPEAKER SWITCH 703

Eliminates the need for internal switching

"Switch-O-Matic," Model 30-3160, a solid-state switching device, is designed to operate the car radio through the tape system's speakers, switching them in automatically. The unit applies driver power to the speakers, eliminating the need for internal switching in the tape player system. When the tape unit is being used, the "Switch-O-Matic" is said to automatically cut itself out of the circuit.



Housed in a metal box that measures only 3¼ in. by 2⅛ in. by 1⅝ in., the unit reportedly can be mounted out of sight behind the dashboard. It is installed with connections to the tape player's and the radio's output and power leads, and connecting wires to the car's stereo speakers. Price $17.95. GC Electronics.

TUNER CLEANER 704

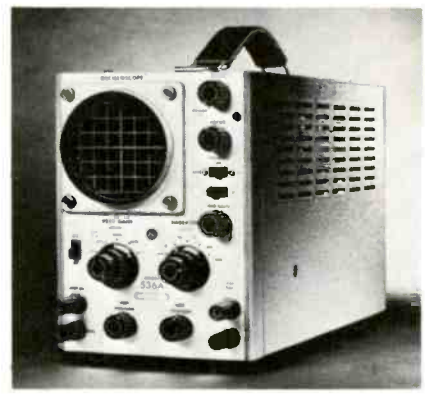
Now in "caddy size" aerosol can

Blue Shower is now available in a 12 oz "caddy size" aerosol can. The manufacturer states that the 24 oz size can is too large and cumbersome for use in the home, and that by using the "caddy size" can, it is now possible for the technician to completely clean, degrease and restore entire tuner assemblies that are contaminated. Tech Spray.

OSCILLOSCOPE 705

Frequency range from 10Hz to 100Hz

This solid-state scope, Model 536A, is designed with a 3-in. CRT face. The vertical amplifier is reportedly ac/dc coupled and fully compensated for optimum response with a sensitivity of 20mv/cm over a dc to 1.5MHz bandwidth. Specifications indicate a sweep frequency range from 10Hz to 100kHz in four ranges continuously variable in the respective ranges. Also

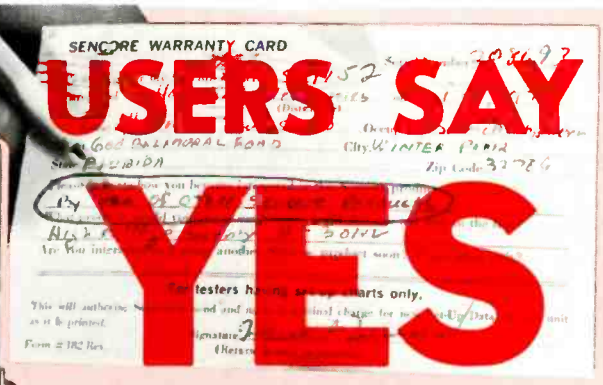


featured is a three step attenuator with a variable trimmer, plus a built-in 5% calibrator that is said to stabilize time and voltage. Dimensions are 5½ in. W by 7½ in. H by 14 in. D. Weight 15½ lb. Price $167. Kikusui Electronics.

CABLE ASSEMBLY 706

Injection molded directly onto cable jacket

The cable assembly features polyethylene collars which are said to be injection molded directly onto the cable jacket and the connector body. The resulting encapsulation reportedly forms a weather-proof seal between cable and connector, providing greater stress protection against failure due to excessive bending, flexing and twisting.



USERS SAY YES

TO THE SENCORE COLOR GENERATOR

Read how Sencore users say YES, YES, YES after they own a Sencore CG153 Color King. These are excerpts from warranty cards of Color King owners.

COMPACT SIZE AND PRICE
Yes! Thomas G. Stone, TV Service
Dansville, New York

BECAUSE OF GOOD DESIGN, ENGINEERING & PRICE
Yes! Urban M. Krier
4461 No. Prospect Ave.
Shorewood, Wisc.

LIKED THE SINGLE LINE AND DOT FEATURE
Yes! M. L. Sakraida, TV Service
Edgewood, Pennsylvania

HAVE LONG KNOWN SENCORE'S QUALITY
Yes! James Feroben, TV Repair
Jackson, Mississippi

HAVE OTHER SENCORE EQUIPMENT
Yes! George R. Hiley, Sect Foreman
Stanton, California

I HAVE NINE SENCORE UNITS NOW
Yes! Rogers Electronics
TV Service
FlagStaff, Arizona

IN MY OPINION, BEST ON THE MARKET
Yes! Upson Tutt, TV Repair
Springfield, Massachusetts

EXCLUSIVE FEATURES
Yes! Herman Schmidt
Electronic Technician
Satellite Beach, Florida

GOOD SERVICE FROM SENCORE
Yes! Frank Yingling, TV Service
Temple Hills, Maryland

ALL MY INSTRUMENTS ARE SENCORE
Yes! Peter Wiwel, Technician
Napa, California

YOU, too, will say YES if you will just try the CG153 at your local Sencore parts distributor only $169.95.

USERS SAY YES TO SENCORE

THE IDEA PEOPLE

SENCORE

3200 SENCORE DRIVE, SIOUX FALLS, SOUTH DAKOTA 57107

IN A NUTSHELL

In a nutshell, here is why all users of the CG153 Color King say YES. The Color King has rock-like standard RCA licensed patterns plus two convergence patterns—movable dot and cross. Too, it works when taken from a cold truck at far below zero in the winter (with preheated solid state circuits), but will stay rock solid at 120 degrees in the shade during the summer. It is impervious to humidity as well, as the preheater will dry out the circuits no matter where you are. You, too, will say yes if you purchase the Color King. It is the best.

NEW PRODUCTS

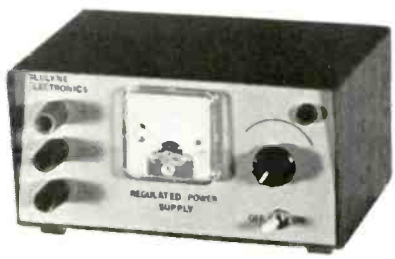
The series of cables is offered in five cable lengths, from 12 to 60 in., in RG58C/U, RG59B/U, or RG62A/U cable types. Connectors are said to be supplied with a non-tarnish finish. The

cable impedance value is molded into the inch-long collar. Pomona Electronics.

POWER SUPPLY 707

Output current is rated at 0 to 0.7a

The solid-state power supply, Model PS61C, is designed with all silicon semiconductors and reportedly provides current limiting with short circuit protection. The output voltage is said to be 1 to 15v dc with a continuous current rating of 0 to 0.7a. Specifications indicate 2% meter accuracy. The unit is reportedly enclosed in walnut clad steel case with rubber feet.

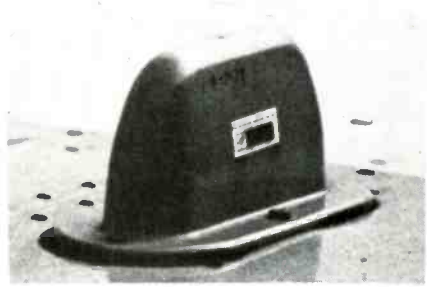


Dimensions are 3⅜ in. H by 6¼ in. W by 4⅝ in. D. Price $59.95. Blulyne Electronics.

MOBILE ANTENNA 708

Virtually impervious to forced removal or normal breakage

A mobile antenna is designed for two-way communications. The manufacturer indicates that the new antenna, known as the "Linebacker," is designed to provide optimum electrical performance while virtually impervious to forced removal or normal breakage from impact. The molded high-impact design is said to be less than 3½ in. high, while field tunable to VSWRs of 1.5:1 or better. When mounted on a horizontal surface, such as a car roof, it reportedly radiates an



efficient omni-directional pattern which is vertically polarized for compatibility and maximum performance in existing communication networks. Antenna Specialists.

SERVICE BAG 709

Contains upper and lower sections

A leather tool bag has an upper section designed to hold large tools or meters and a lower section of three sliding metal trays with divided compartments. The bag is also equipped

with an outside pocket. Dimensions of the bag are 15 in. L by 12½ in. H by 5 in. W. Price $40.00. K. Leather Products.

"There! Now we'll just see how fast this speedy TV service shop really is."

The replacement picture tube no other color tube can replace!

ZENITH®
CHROMACOLOR®

Simulated TV picture

Now you can install the revolutionary Chromacolor picture tube in almost any brand of 23" (diag.) color TV. And let your customer see the difference: a new, sharper Chromacolor picture with greater brilliance, contrast and color definition.

Zenith pioneered, developed and patented (U.S. Patent No. 3146368) the Chromacolor picture tube. And only Zenith has Chromacolor.

Chromacolor is an easy sale because people already know of Chromacolor's superiority. (Last year, after the revolutionary new Chromacolor system was introduced, Zenith giant-screen color TV sets became the No. 1 best-seller!)

Full two-year warranty.

Here's your sales clincher: Chromacolor replacement color tubes are warranted for two full years. Exactly double the warranty period for most other replacement color picture tubes.

Give your customers the best — Chromacolor replacement color tubes. Only your Zenith Distributor has them.

TWO-YEAR WARRANTY

Zenith Radio Corporation warrants the replacement CHROMACOLOR picture tube to be free from defects in material arising from normal usage for two years from date of original consumer purchase. Warranty covers replacement or repair of picture tube, through any authorized Zenith dealer; transportation, labor and service charges are the obligation of the owner.

Zenith Chromacolor picture tube pinpoints the color dots on a jet black background and for the first time fully illuminates every dot.

ZENITH®

The quality goes in before the name goes on

DEALER SHOWCASE

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

TV CORDS 710

Includes 6 and 9 ft cords in white and brown

A 20-piece TV cheater and power supply cable kit is designed for pegboard display with header and see-through plastic bag. The cable kit is said to include two each of the seven most popular cords and one each of six other types. Specifications indicate that all cords are rated at 10a, 125v,

and listed by Underwriters' Laboratories, Inc. Included are 6 ft and 9 ft lengths in white and brown, with standard and polarized caps and connectors. Columbia Electronic Cable.

MEGAPHONE 711

Wide angle coverage of distances of up to 1000 yd

The solid-state, 16w electronic megaphone, Model M-100, is designed for wide-angle coverage of distances up to 1000 yd. This self-contained megaphone is said to offer a weatherproof

detachable microphone and adjustable padded shoulder strap. When the microphone is attached to the back of the megaphone, the megaphone is operated by holding the pistol grip and pulling the "trigger" talk-switch. When the microphone is detached for remote operation with the megaphone slung over the shoulder, the talk-switch on the microphone activates the unit. The spun aluminum housing is finished in brown and tan epoxy enamel. A volume control is mounted on the microphone for adjustment to the desired volume and sound coverage. The microphone's flexible coil-cord is said to extend up to 5 ft. The unit reportedly requires eight "C" batteries, which are not included with the megaphone. Weight 5 lb. Price $99.95. Audiotronics Corp.

AUDIO CONNECTOR ADAPTER 712

Available with three, four and five pin contacts

A line of "Q-G" ("Quick-Ground") audio connector adapters, Series S (*) FM is designed for applications requiring a transformer, attenuator, or other electronic circuitry in line with a microphone input. The adapter is said to be 4 in. long with 1½ in. of useable space for extra circuitry between the unwired terminals of the male and female inserts at either end of the adapter. The connector inserts are reportedly available in three-, four- and five-pin contact configurations to accommodate a variety of standard microphones. The specific connector adapter is designated by inserting the number of contacts in place of the asterisk in

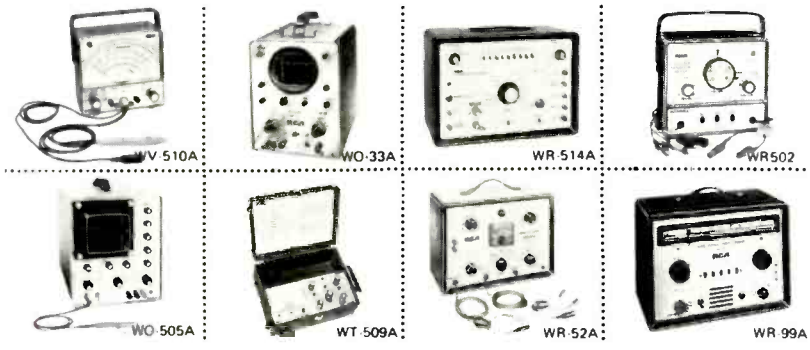
the part number. Other features are said to include positive grounding/shielding of the shells, an insert screw that can't be lost, and quick and simple disassembly and reassembly. The microphone adapter is said to have a thermosetting plastic that minimizes hum and noise problems encountered at low signal levels. These connectors adapters mate with "Q-G" cord plugs and receptacles and other connectors with similar insert arrangements and an identical number of contacts. List price of the three contact adapter is $4.50; four contact adapter is $4.80; five contact adapter is $6.30. Switchcraft.

2 FREE GIFTS FROM RCA

FREE

FREE

Buy Any of These RCA Test Instruments and get in on the bonus free gift offer.



Just send in your warranty card on any of these RCA test instruments purchased between February 25 and May 8. With each instrument purchased, you get free a leather tool holder and another gift of your own choosing from the 37 handsome offerings described in the RCA gift catalog. The catalog will be sent to you without charge when your warranty card is received. This offer is good in the U.S.A. only. See your RCA distributor for more information and an advance look at the catalog gifts. Do it now, because the offer expires on May 8.

RCA

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

. . . for more details circle 121 on Reader Service Card

ANTENNA PROFITS...

continued from page 53

capability. Often, the results are faded, grainy or ghosty pictures. With color-TV pictures, the damage is even more apparent in the form of displeasing tints and interference.

According to TV antenna industry spokesmen, 65 percent of all indoor antennas currently in use are over three years old. So, unless you are suggesting an antenna replacement on two-thirds of the service calls you make each year, you are doing your customers and yourself a disservice.

Lest we forget, an antenna is just as vital a part of the TV reception chain as a tube, lead-in or any other component. If the viewer's antenna is ready for replacement and you keep it a secret from him, you are asking for double trouble: callbacks for picture problems caused by the antenna, *not* your service, and forfeitures of substantial profits you could have earned installing outdoor antennas.

Make it a habit on every service call to ask "How's your antenna?" If you don't feel like talking, you can pin a button on your jacket (available from certain antenna manufacturers) that asks the same question. Have a sign made up for your tube caddy and service wagon that states, "**FREE** TV antenna check up." Keep TV antenna check list forms (also provided by antenna makers) handy on service calls.

These simple devices should stimulate inquiries from TV set owners and equip you to follow through with good antenna advice. This means you must know basic antenna designs and their operation.

Study your antenna check list and be ready to explain to your customer (in no more than 5 minutes) in simple, comprehensible terms why the antenna should be replaced. As a final convincer, tell the customer to call the owner of a new TV antenna you recently installed in the area for a first-hand opinion of the reception results. (Of course, be sure to first obtain permission from the new antenna owner to allow prospects to call him.)

In formulating our approach to garnering a more profitable antenna business:

- Know the reception eccentricities of your area and their causes.
- Know the antenna answers for these reception problems. Use the "good," "better," "best" antenna combination to solve each. (A "good" antenna does the job at the lowest price possible. A "better" antenna costs moderately more but offers additional signal strength, stronger construction. A "best" antenna is the costliest, but delivers the last word in design, durability and performance.) Let the TV viewer decide which antenna he wants and his purse can afford. By offering him a *choice* of alternatives, you gain a vital psychological selling edge. Regardless of which antenna type he selects, you stand to turn over a tidy profit, presupposing you've accurately priced your labor and materials to leave you a fair profit. **But**—always aim to sell the "best" antenna type to assure top customer satisfaction with performance.
- Don't forget to also suggest a rotator if the installation can benefit from it. This means more dollars for you than a rotator-*less* installation.
- Look around or ask to learn if more than one TV set is being used in the home. If it is a multi-set household, you can suggest a home master antenna system and explain its many TV viewing and FM stereo listening benefits.

Antenna Check-Up Time

Any time is antenna check-up time. You don't have to rely on good weather to make an antenna check-up. All you have to do is look up, check-up and speak up.

Keep your eye on the rooftops in the neighborhood as you make your service calls. It doesn't take much ingenuity to notice a dilapidated antenna that is ready for retirement. If you have the time, you can ring the doorbell and ask the home owner who answers if he or she would like a free antenna check-up right then and there, at no cost. Explain to the customer that such a check-up could

very possibly result in a much better reception than presently being received. Then take out your antenna check form (such as the one illustrated) and fill it out on the spot—without climbing up on the roof. Your visual inspection, based on your experience, should be adequate for you to make accurate recommendations to the customer. Should the customer want to think it over, just hand him or her the check-up sheet with your estimate and advise the prospect to call you when he or she is ready. It boils down to six simple words: Look up . . . check up . . . speak up.

There's money to be made on the rooftops in your town or city.

All that it takes is a little added effort. Whether you are a technician or a dealer, the results will pay off handsomely in substantially more profits for you and greater satisfaction for your customer from improved TV-set performance. ■

TV ALIGNMENT . . .

continued from page 51

The alignment demonstrator's fine tuning is adjusted to obtain a response curve displaying the color and video carriers opposite each other at about 50 percent amplitude and the sound carrier between 0 and

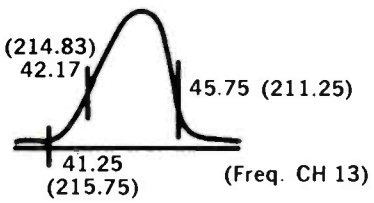


Fig. 12—Response curve obtained from the tuner.

20 percent amplitude (Fig. 12). If this check showed the tuner misaligned, the tuner adjustment would be made by expanding or compressing the coils associated with the misaligned channel. The alternative to tuner adjustment is to send the tuner to a factory repair facility, since it is felt that this adjustment is too critical for field alignment. ■

READERS SERVICE INDEX

ADVERTISER'S INDEX

NEW PRODUCTS

TEST INSTRUMENT

simulated picture

It takes time to replace a color picture tube...

GE ULTRACOLOR® works to cut back the need of replacing the replacement

sustained brightness and color purity are assured through use of advanced getter material. Gases generated by the tube's operation are removed, providing longer life and sustained color purity.

reliability and quality assurance are built in. Only the highest quality replacement components are used... and they're still expected to prove themselves. First during the manufacturing process, through continuing in-line inspections, and extensive life testing of the finished product, afterwards.

GE ULTRACOLOR® picture tubes provide the service and dependability that guarantee customer satisfaction *(Made by professionals, for professionals.)*

TUBE PRODUCTS DEPARTMENT • GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY 42301

GENERAL ELECTRIC

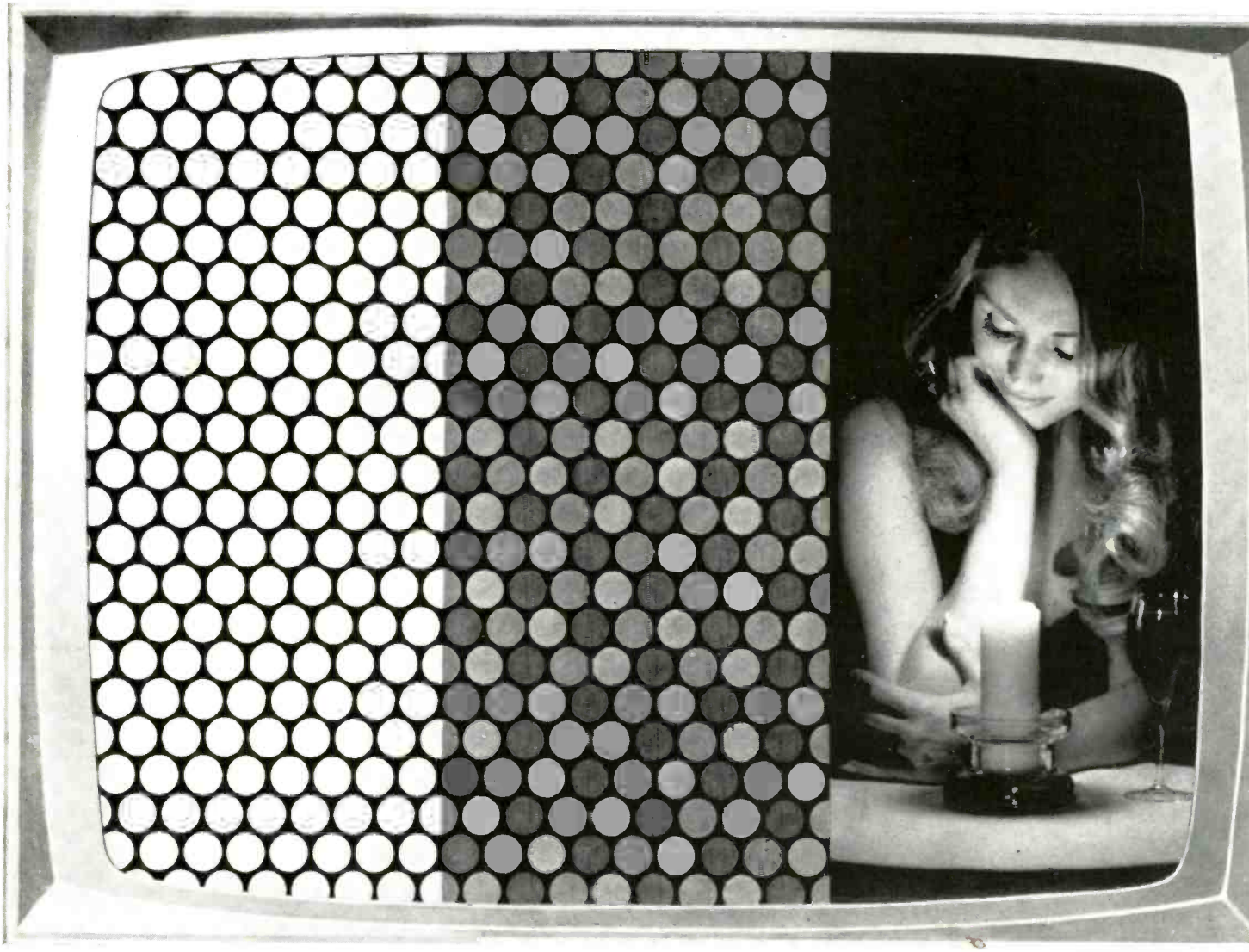
10 million reasons why it pays to promote matrix, the brightest, sharpest color picture tube in RCA history!

Reasons 1 to 10,000,000. Large-screen MATRIX can upgrade the performance of at least 10 million color TV sets now in use. The RCA MATRIX 23VALP22 is a direct replacement for the 23VANP22, 23VARP22, 25AP22A, 25BAP22 (Chromacolor), 25BCP22, 25BGP22, 25XP22, and 45 other industry types! Giant-screen sales potential for the RCA MATRIX—practically unlimited!

More RCA Color Picture Tubes are stocked and sold by distributors than any other color picture tubes in the industry. So, MATRIX is more readily available to you no matter where you are, to give your customers faster service and ring up more profitable sales.

MATRIX is the brightest and sharpest color picture tube in RCA history!

Here's why:



The RCA jet-black matrix*
It soaks up room-light normally reflected back at the viewer from the face of the tube. Result: brighter pictures because now there's no need to "filter out" brightness to maintain contrast under strong room-light conditions.

The RCA MATRIX phosphor-dot process*
First, we developed brilliant new phosphors and a unique screening process incorporating a jet-black matrix. Then we deposited the 1,200,000 red, green, and blue high-intensity phosphor dots precisely within the black matrix. Result: brightness doubled with dramatic improvement in contrast and clarity.

The RCA MATRIX picture**
Spectacular! In operation, a new, unique high-resolution gun "shoots" the phosphors with more energy than any other gun previously available. Result: black matrix + phosphors + high-resolution gun = maximum sharpness over the entire brightness range, truer colors under all viewing conditions.

New 4-color consumer flyer on MATRIX is available from your RCA Distributor.
RCA | Electronic Components | Harrison, N. J. 07029

*Magnified drawing **Simulated

RCA