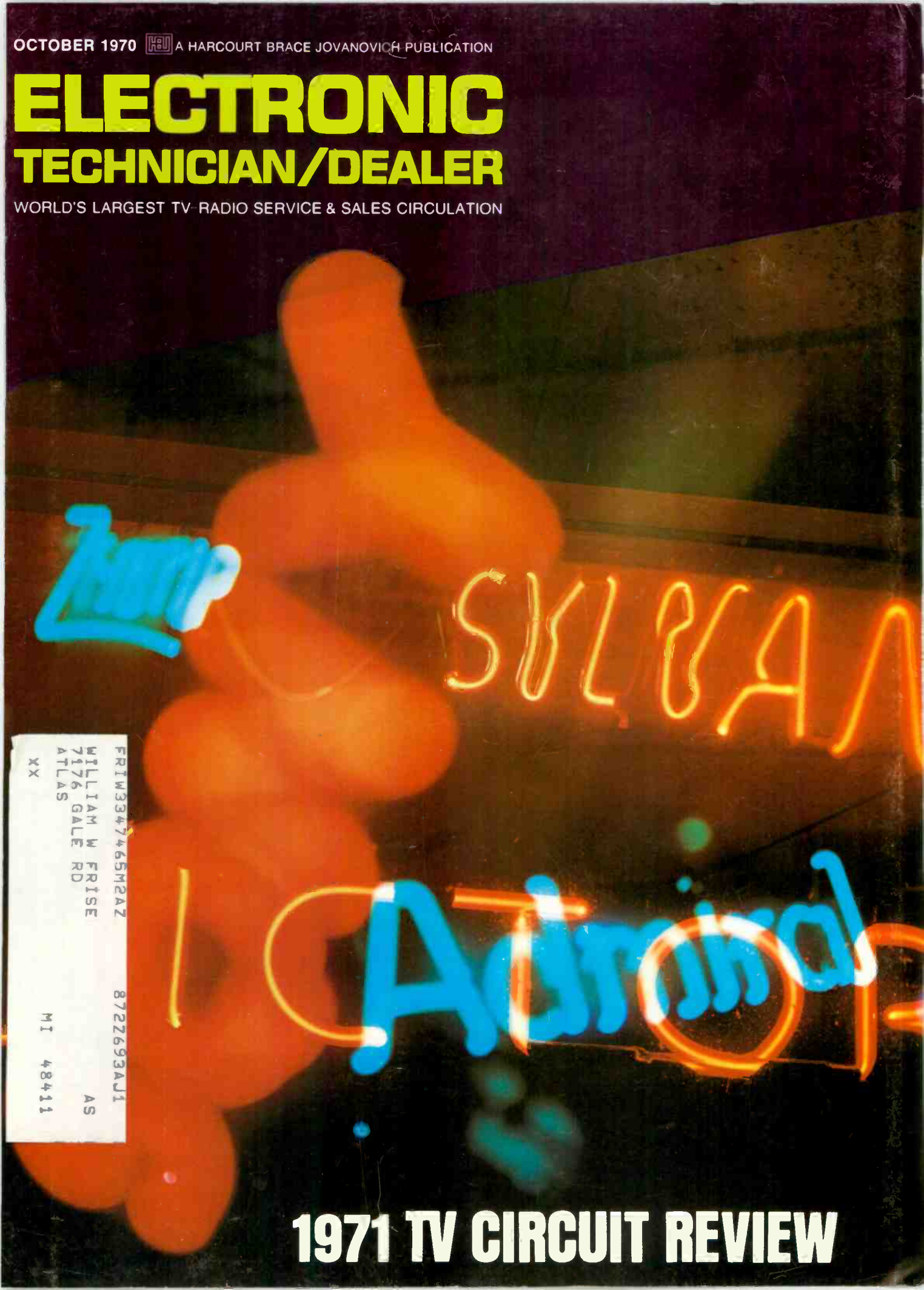
OCTOBER 1970 A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



FRIW33474 65M2AZ 8722693AJ1
WILLIAM W FRISE AS
7176 GALE RD
ATLAS
XX
MI 48411

1971 TV CIRCUIT REVIEW

FROM THE COMPANY WHO GIVES YOU
THE STRONGEST GUARANTEE IN THE BUSINESS

BUY AN INSTRUMENT. GET AN INSTRUMENT FREE.*

SIGNAL TRACER PROBE

Gain 3000 at 2 KHz. Bandwidth 50 Hz to 200 MHz. Z 3500Ω to 350 KΩ. Output 0.3 p-p volts. Noise −45db. Supplied with anti-overload probe tips: Eico PST-2, Kit $19.95, Wired $29.95.

NEW TRANSISTOR ANALYZER

Tests trans-conductance and Beta in and out of circuit. Measures FETs, bipolars, diodes, rectifiers, SCRs, UJTs. Built-in voltmeter, ohmmeter. 50μa taut band meter movement. Eico 685, Kit 89.95, Wired $139.95.

NEW CURVE TRACER

New professional transistor/diode curve tracer enables any general-purpose oscilloscope to display direct readouts of the most meaningful data. Eico 443, Kit $79.95, Wired $119.95.

SOLID STATE COLOR GENERATOR

Standard offset carrier type stable 10-bar display plus precision dots, crosshatch, individual series of V & H lines; gun killers. Feeds to ant. terminals. Portable, battery/AC. Eico 385, Kit $79.95, Wired $109.95.

NEW OSCILLOSCOPE/ VECTORSCOPE

DC-8MHz (usable to 10 MHz). 5" flat-face CRT. Sensitivity 12 MV RMS/CM. Negligible relative H & V phase shift. Excellent curve tracer with Eico 443 (below). Eico 465. Kit $179.95. Wired $249.95.

CRT TESTER AND REJUVENATOR

For all B-W & Color Picture Tubes. Each gun of Color Tube measured individually and numerically, provides required gray scale tracking information. Eico 633, Kit $69.95, Wired $99.95.

NEW SOLID STATE SINE/SQUARE WAVE GENERATOR

Provides simultaneous sine and square wave outputs. Covers 20 Hz-2MHz, 5 bands. Max. distortion 0.25%. Rise time at 20 KHz <0.1 μsec. Eico 379, Kit $69.95, Wired $94.50.

NEW SOLID STATE FET-TVM's

AC RMS/DCV: 0-1, 3, 10, 30, 100, 300, 1000V. P-P ACV: 0-2.8, 8.5, 28, 85, 280, 850, 2800V. DC Input Z 11 MΩ. Ohmmeter 0.2Ω to 1000 MΩ. 4½" 200 μA meter. Eico 240, Kit $59.95, Wired $79.95. With 6½" meter & AC/DC Current readings. Eico 242 FET-TVOM, Kit $69.95, Wired $94.50.

TUBE TESTER

Tests all standard tubes plus decals, magnovals, 7-pin nuvistors, popular TV picture tubes. Professional, compact, lightweight, and modest price. Eico 635, Kit $44.95, Wired $69.95.

NEW SOLID STATE SIGNAL TRACER

Output 400mw. Inputs: 1mv RF; 63 mv AF: Hum >60 db below 400 mv. 200 μa meter. Provides substitution output Xfmr & spkr. Eico 150, Kit $59.95, Wired $79.95.

THE TECHNICIAN'S CAUSE
EICO helps it. With . . .

1. The first and only instruments with the MOST capability-per-dollar. They do more, faster — save you more time, effort, money.
2. The first and only solid state instruments guaranteed for 5 years.
3. Now, in the teeth of inflation, EICO makes your dollars buy even more TOTAL VALUE than ever before.

OUR 25th YEAR. LABORATORY PRECISION AT LOWEST COST.

*FREE EICO TRUVOHM™ MULTIMETERS
(with purchases as described)

Model 1A1
1 K Ω/V

Model 4A3
4 K Ω/V

After purchasing any instrument on this page from your local EICO Distributor, mail EICO the sales slip, Registration Card and coupon at right. We'll ship you prepaid an EICO Truvohm Multimeter as follows: For each purchase up to $100, the Model 1A1; for each purchase over $100, the Model 4A3. Offer expires Dec. 31, 1970. Void where prohibited or taxed.

For latest catalog on EICO Test Instruments, Stereo, EICOCRAFT Projects, Environmental Lighting, and name of nearest EICO Distributor, check Reader Service Card or use coupon.

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

Offer expires Dec. 31, 1970.

Name_____

Address_____

City_____ State_____ Zip_____

EICO

EICO • 283 Malta Street • Brooklyn, N.Y. 11207

ELECTRONIC TECHNICIAN / DEALER

TEKFAX

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

GROUP 218

	SCHEMATIC NO.
MAGNAVOX — Color TV Chassis T951	1323
SYLVANIA — TV Chassis B14-1	1321
SYLVANIA — Color TV Chassis E01-1, -2, -11, -12	1322
ZENITH — TV Chassis 13A12	1325
ZENITH — Color TV Chassis 14A9C50	1324

1321

SYLVANIA

TV Chassis B14-1

OCTOBER • 1970

SYMBOL	DESCRIPTION	SYLVANIA PART NO.
C105	4 section elect	41-31Q41-1
	A — 300/175v	
	B — 400/150v	
	C — 4/150v	
	D — 20/150v	
R100	5.5 10w	36-31036-1
R304	60 7w	35-31035-4
L200	47.25MHz trap	50-31050-7
L350	quad	50-31050-12
L450	horiz stabilizer	50-31050-15
L500	horiz choke	50-31050-6
T200	IF input	50-31050-8
T201	1st IF	50-31050-9
T250	video output	50-31050-10
T300	sound take off/4.5MHz trap	57-31057-1
T350	sound IF	50-31050-13
T351	audio output	56-31056-2
T400	vert output	56-31056-1
R300	600Ω contrast	37-31037-4
R350	1M vol	37-31037-1
R400	3M vert height	37-31037-1
R410	500K vert lin	37-31037-1
R420	1.2M vert hold	37-31037-1
R450	50K horiz frequency	37-31037-2
R550	1.5M bright	37-31037-5
R600	50K AGC	37-31037-2
D250	diode video detector	1N60
D451	diode horiz AFC	13-31014-2
F100	fuse 1.2a chemical	29-31029-1
Q60	transistor keyed AGC	13-21013-1 or -2
SW101	switch ON/OFF	part of R350
	yoke deflection	51-31051-1
	UHF	54-31053-1
	VHF	54-31054-1

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED.

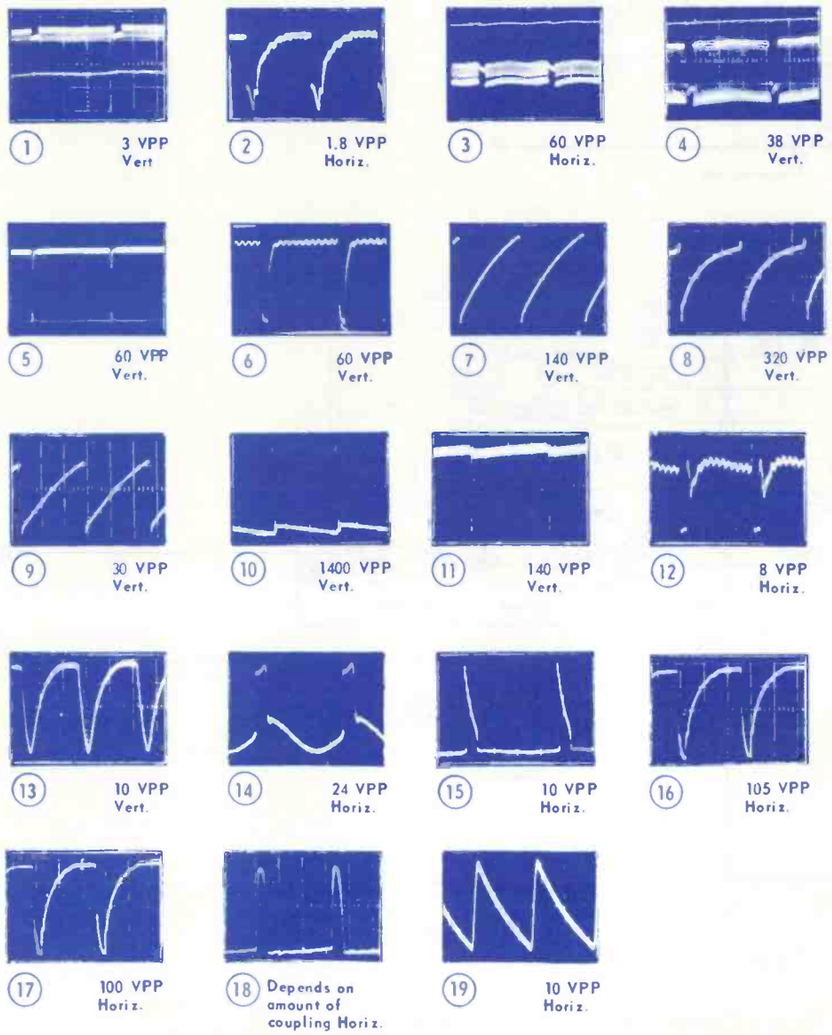
1. Voltages measured to chassis using VTVM.
2. AC power source 120 volt, 60 hertz (cycle) line.
3. Voltage readings in brackets ( ) taken with no signal, antenna terminals shorted together, tuner on unused channel, brightness control at minimum and contrast R600 set to provide -.5V at tie point J252 .
4. Voltage readings not in brackets taken using a color bar generator (rainbow bar pattern) as a signal source. Brightness control at maximum and contrast control adjusted for 60 V.P.P. voltage at tie point J550 , AGC voltage at tie point J252 was approximately +9V.
5. Voltage values shown are average readings. Variations may be observed due to normal production tolerances.

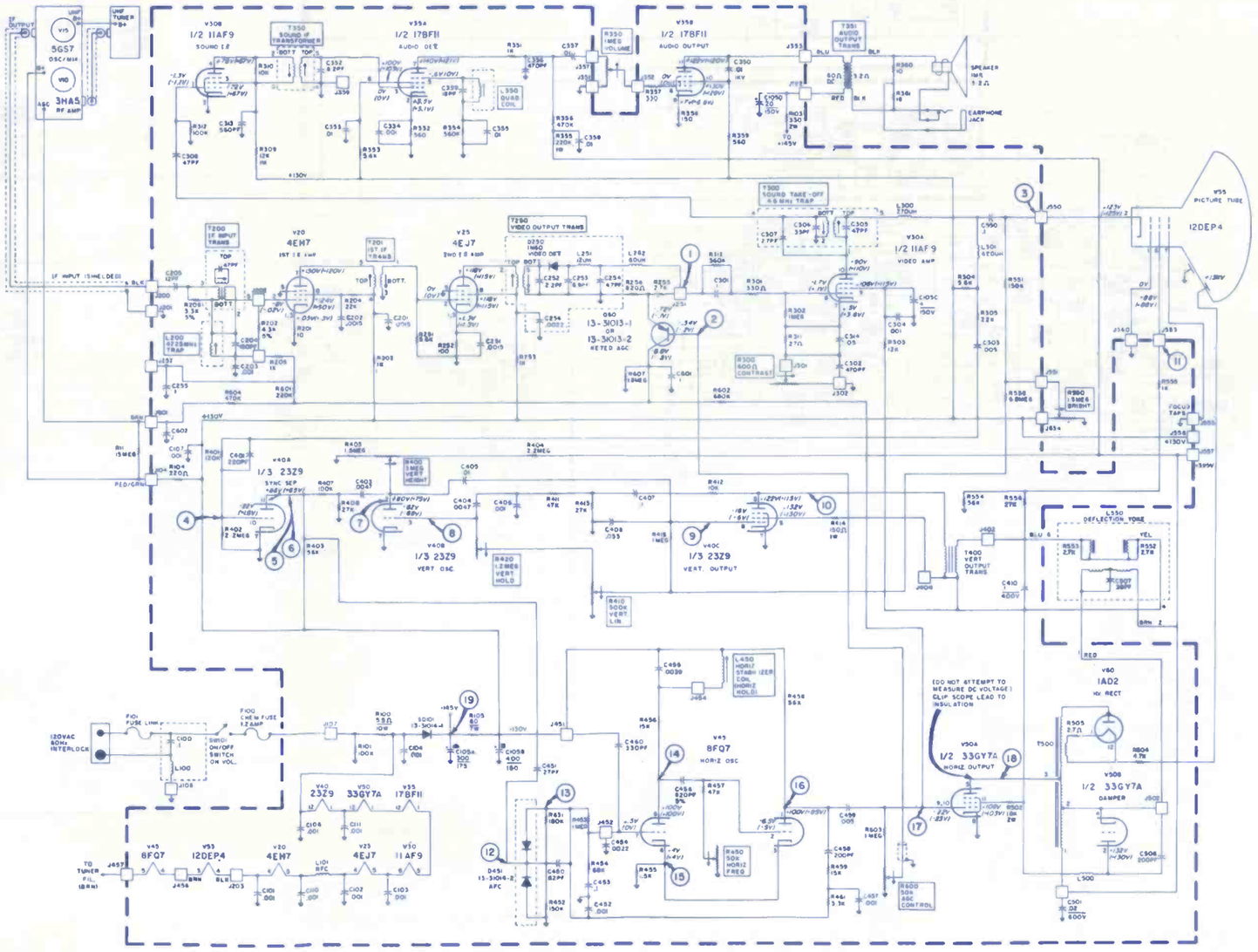
WAVEFORM MEASUREMENT CONDITIONS

1. Waveforms taken using a color bar generator, connected to the input antenna terminals, providing a gated rainbow bar pattern.
2. Brightness and contrast controls adjusted for 60 V.P.P. voltage at tie point J550 to set up reference level for all others. AGC voltage at tie point J252 was approximately +9V.
3. Waveforms measured with respect to chassis using a wide band oscilloscope. (Other type oscilloscopes may alter waveform shapes or amplitudes.)
4. The terms "Vert." or "Horiz." refer to scope frequency used.
5. VPP refers to peak to peak voltage.

GENERAL SCHEMATIC NOTES

1. All capacitors are in microfarads unless otherwise specified.
2. Arrows on controls indicate direction of clockwise rotation
3. All resistors are 1/2 Watt unless otherwise specified.
4. Squared letters on printed circuit indicate tie points corresponding with those shown on actual printed board top layout.
5. (- - -) denotes printed board area.





COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802

1322

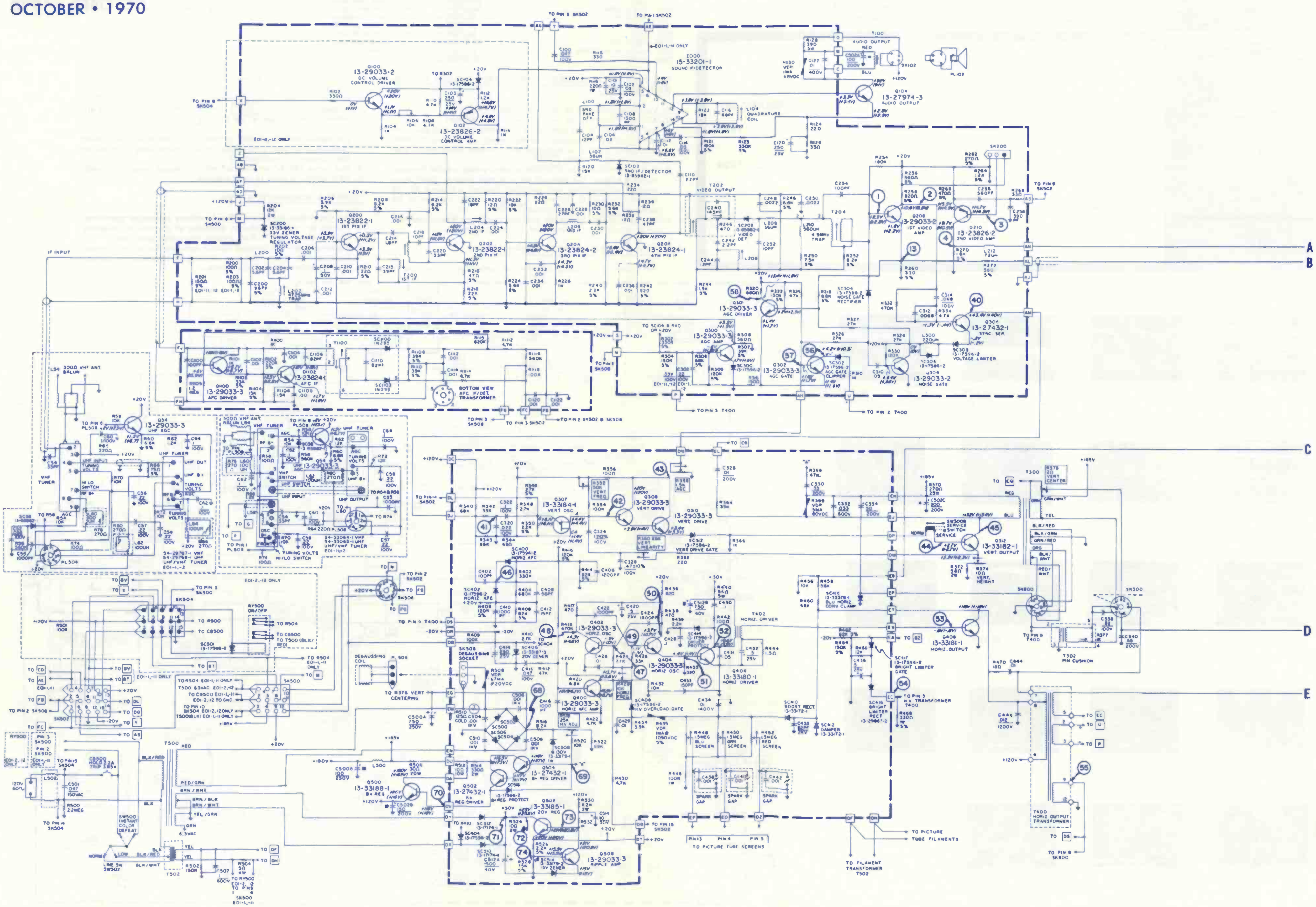
SYLVANIA

Color TV Chassis
E01-1, -2, -11, -12

OCTOBER • 1970

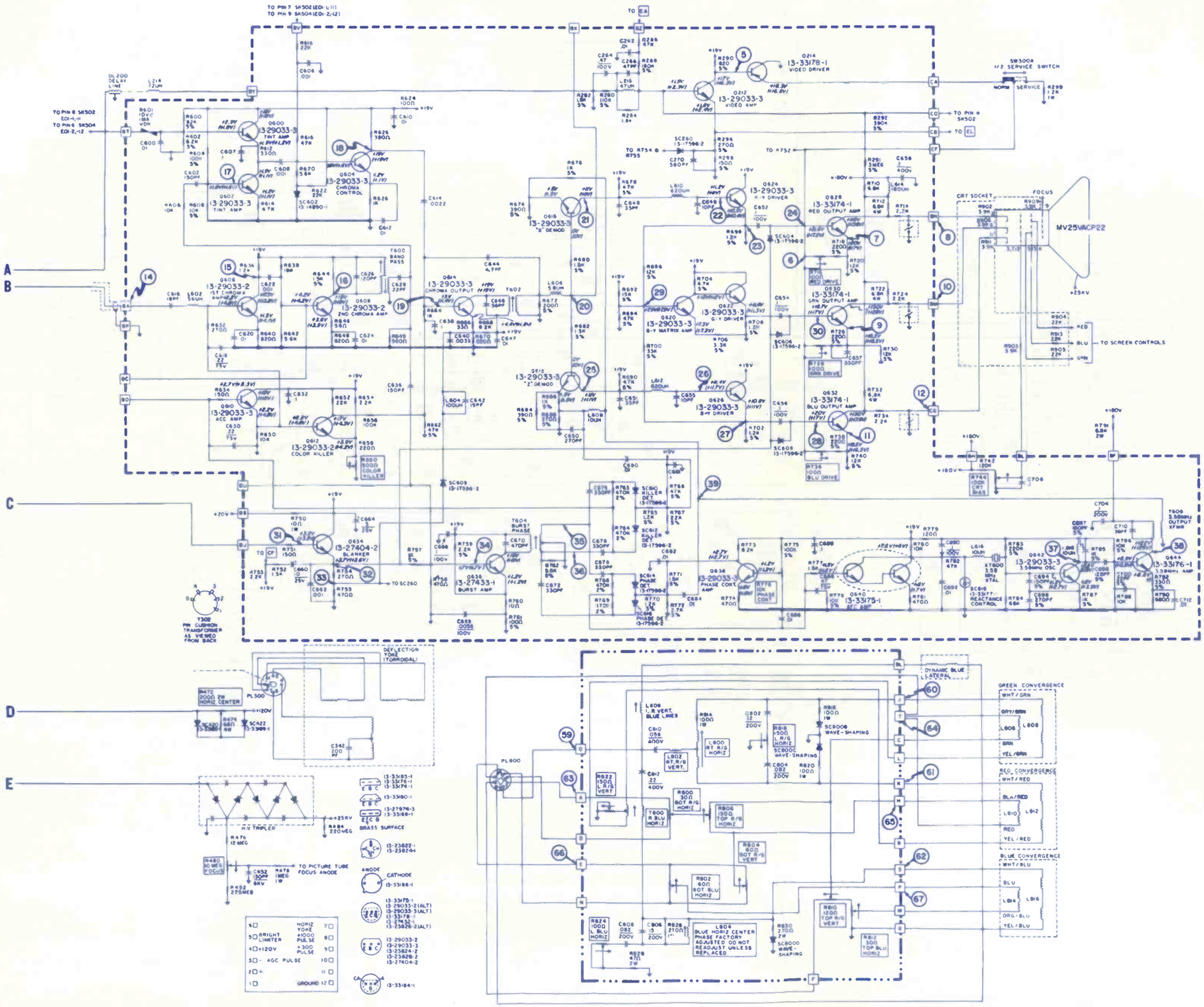
ELECTRONIC TECHNICIAN / DEALER TEKFAX

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



COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802

SYLVANIA
Color TV Chassis
E01-1, -2, -11, -12



SYMBOL	DESCRIPTION	SYLVANIA PART NO.
C101	elect - 10/25v (-7, -8, -17, -18)	41-29270-6
C103	elect - 250/25v (-8, -14, -18)	41-29270-12
C435	82pf - Z5P - 2kv	43-11028-19
C500	elect - 2 section	41-33274-1
	A — 750/250v	
	B — 100/250v	
C501	.047/150vac (-7, -8, -17, -18)	45-29668-7
C502	elect - 3 section	41-33316-1
	A — 100/200v	
	B — 150/200v	
	C — 200/200v	
C512	elect - 2 section	41-33043-1
	A — 1500/40v	
	B — 750/40v	
R130	VDR - 1ma - 68vdc (-7, -8, -17, -18)	38-15257-20
R369	VDR - 50ma - 80vdc	38-15257-19
R370	270Ω - 25w	36-92898-56
R372	8.2Ω - 2w	36-14764-68
R435	VDR - 1ma - 1090vdc - 5%	38-29959-2
R440	56Ω - 5w - WW	36-92898-57
R474	68Ω - 4w	35-92495-33
R504	5Ω - 4w	36-62454-18
R506	30Ω - 20w	36-92898-58
R508	VDR - 67ma - 20vdc	38-17072-2
R510	thermistor - 125Ω, cold	38-17071-4
R512	10Ω -10w	36-62455-25
R601	VDR - 10v - 1ma	38-15257-21
L102	tweet - 36µh	50-16103-46
L104	quad	50-33195-1
L200	link	50-23828-1
L202	47.25 MHz trap	57-23827-6
L214	RF choke - 72µh	50-16103-45
L500	choke - filter	56-33084-1
L502	choke - power line	50-29833-1
L610	filter - 620µh	50-17593-1
L804	blue horiz center phase	50-17650-1
R18	25K - vol (-7, -13, -17)	37-33097-1
R20	10K - color (-7, -13, -17)	37-33035-4
R22	10K - tint (-7, -13, -17)	37-33035-6
R24	2K - vert hold	37-33098-2
R26	180K - bright	37-33035-5
R28	2K - horiz hold	33-33098-2
R30	1K - contrast	37-33035-3
R32	10K tone	37-33035-2
R34	1K sharpness	37-33035-3
R106	10K - audio dc limiter (-8, -14, -18)	37-23063-4
R154	1K - audio driver limiter (-13, -14)	37-14576-5
R352	50K - vert frequency	37-23063-3
R358	1.5K AGC	37-33036-2
R360	25K vert lin	37-33036-2
R374	10Ω vert height	37-16021-26
R376	10Ω vert cent	37-16021-26
R472	200Ω -2w, horiz center	37-16021-25
R480	10M focus	37-17320-5
R518	25K HV adjust	37-33036-2
R660	500Ω - color killer	37-33040-1
R716	100Ω - red drive	37-33036-1
R736	100Ω - blue drive	37-33036-1
R744	100K - CRT bias	37-33040-1
R776	10K phase	37-23063-4
R802	60Ω - bot. blue horiz	37-16021-2
R818	150Ω - left R/G horiz	37-16021-7
SC200	33v Zener	13-33186-1
SC304	diode	13-17596-5
SC400	horiz AFC - 1N4092	13-15465-1
SC410	boost rectifier	13-33172-1
SC412	damper	13-33172-1
SC414	horiz driver protect	13-17596-4
SC416	blue horiz conv clamp	13-33376-1
SC417	bright limiter gate	13-17596-4
SC418	bright limiter rectifier	13-29867-2
SC420	horiz centering	13-33189-1
SC502	rectifier, power	13-17174-1
SC618	varactor - reactance cont	18-33177-1
CB500	circuit breaker	29-29563-7
DL200	delay line	32-16108-2
	— VHF (-7, -8)	54-29767-1
	— VHF (-13, -14, -17, -18)	54-33064-1
	— deflection	51-29978-1

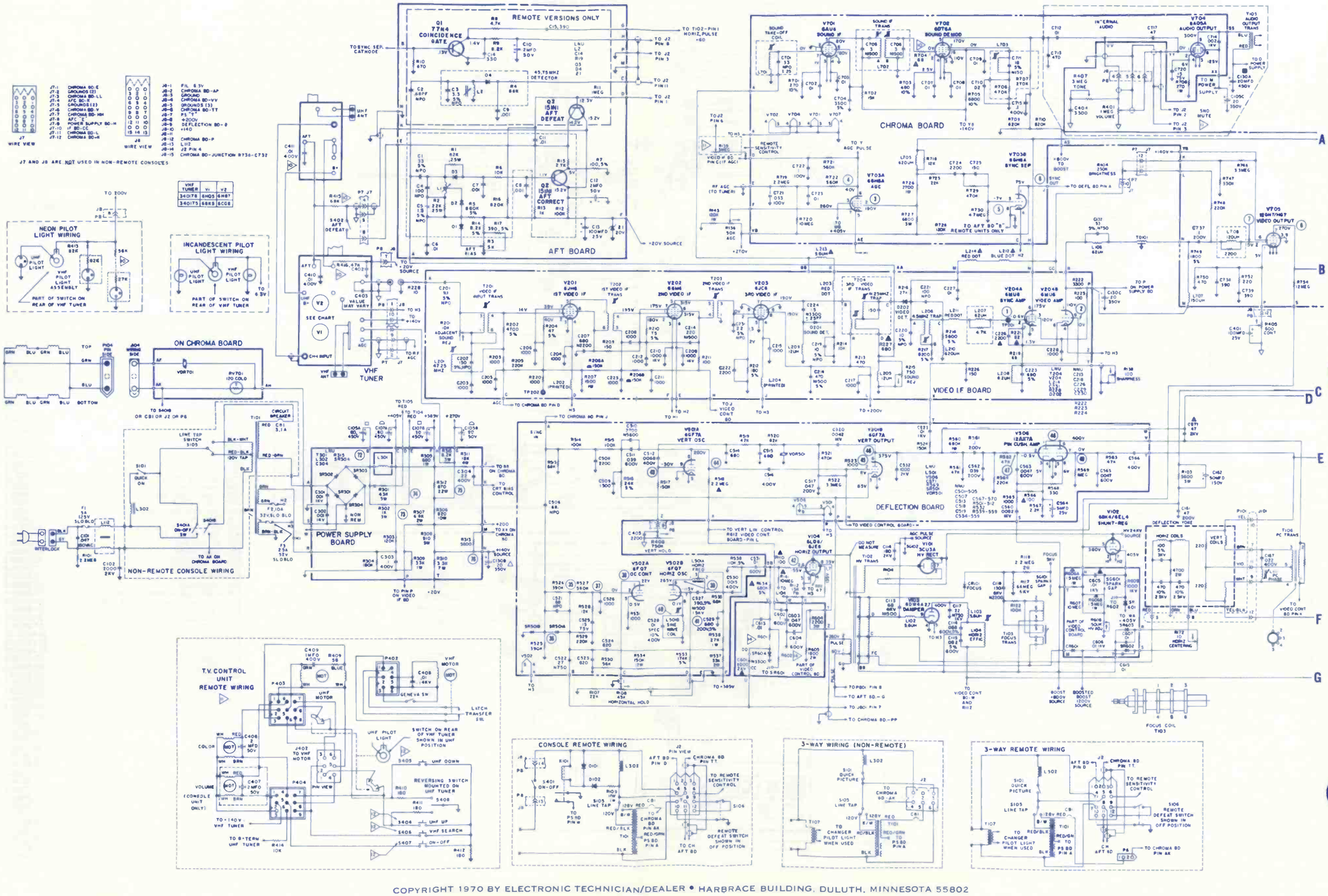
COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802

1323
MAGNAVOX
Color TV Chassis
T951

ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

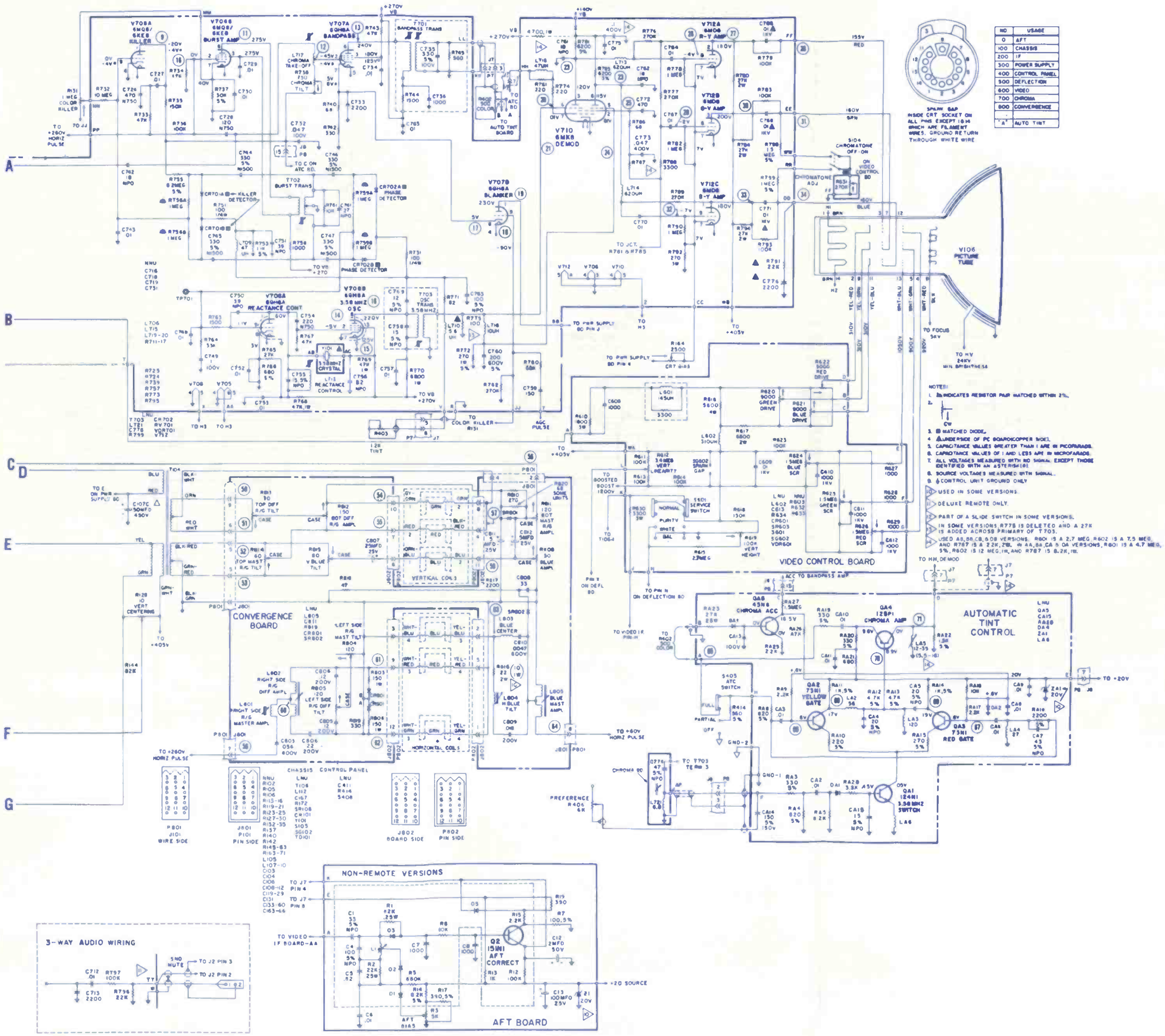
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

OCTOBER • 1970



COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802

MAGNAVOX
Color TV Chassis T951



SYMBOL	DESCRIPTION	MAGNAVOX PART NO.
L1	Discriminator Coil	361384-1
L2	detector coil	361332-1
L103	RF choke, 5.6μh	360676-5
L104	horiz efficiency coil	361022-5
L201	47.25 trap transformer	360951-4
L301	filter choke	320124-9
L501	sine wave/horiz frequency	360960-3
L701	sound take-off coil	360845-2
L702	sound IF coil	360846-3
L703	quad coil	360847-2
L712	reactance coil	360963-3
L714	peaking coil, 620μh	360853-11
L717	chroma take-off	360959-5
T101	power xformer	300251-5
T102	high voltage xformer	361375-2
T103	focus xformer	361306-1
T104	vert output xformer	320317-10
T105	audio output xformer	320130-5
T202	first IF xformer	360951-6
T701	bandpass xformer	361093-2
T702	burst xformer	361094-2
T703	3.58 oscillator xformer	361198-2
	deflection yoke	361380-1
C105	elect, 80/80μf, 450v, 20μf, 350v	270071-12
C105	elect, 80/80μf, 450v	270071-13
C107	elect, 80/30/50μf, 450v	270071-21
C130	elect, 20μf, 450v; 20/20μf, 350v	270023-42
C130	elect, 20μf, 450v; 20μf, 350v	270023-43
C529	silver mica, 680pf, 5%, 500v	250364-350
C735	silver mica, 330pf, 5%, 100v	250607-3315
R112	15K, 10%, 7w, metal oxide	230197-1539
R306	820, 10%, 10w, WW	240082-71
R312	870, 10%, 22w, WW	240088-7
R3	AFT bias, 5K	220217-13
R108	horiz hold, 45K	220146-79
R126	vert centering, 10	220181-1
R131	color killer, 1M	220208-34
R136	AGC, 50K	220208-33
R164	CRT bias, 2500	220181-11
R172	horiz centering, 10	220181-12
R201	adjacent sound, 10K	220182-5
R215	sound reject, 750	220166-4
R608	H V adjust, 500K	220166-26
R612	vert lin, 3.4M	220166-19
R619	height, 100K	220166-20
R631	chromatone adj, 270K	220193-24
CB1	circuit breaker, 3.1a	180723-2
F1	fuse, 5a, 125v, slo blo	180157-19
F2	fuse, 10a, 32v, slo blo	180948-3100
F3	fuse, 25a, 32v, slo blo	180157-42
RV701	therm, 120 cold	230170-3
TD101	delay line	361364-1
VCR501	varistor	230167-5
VDR701	varistor	230175-2
Y101	3.58MHz	530314-5

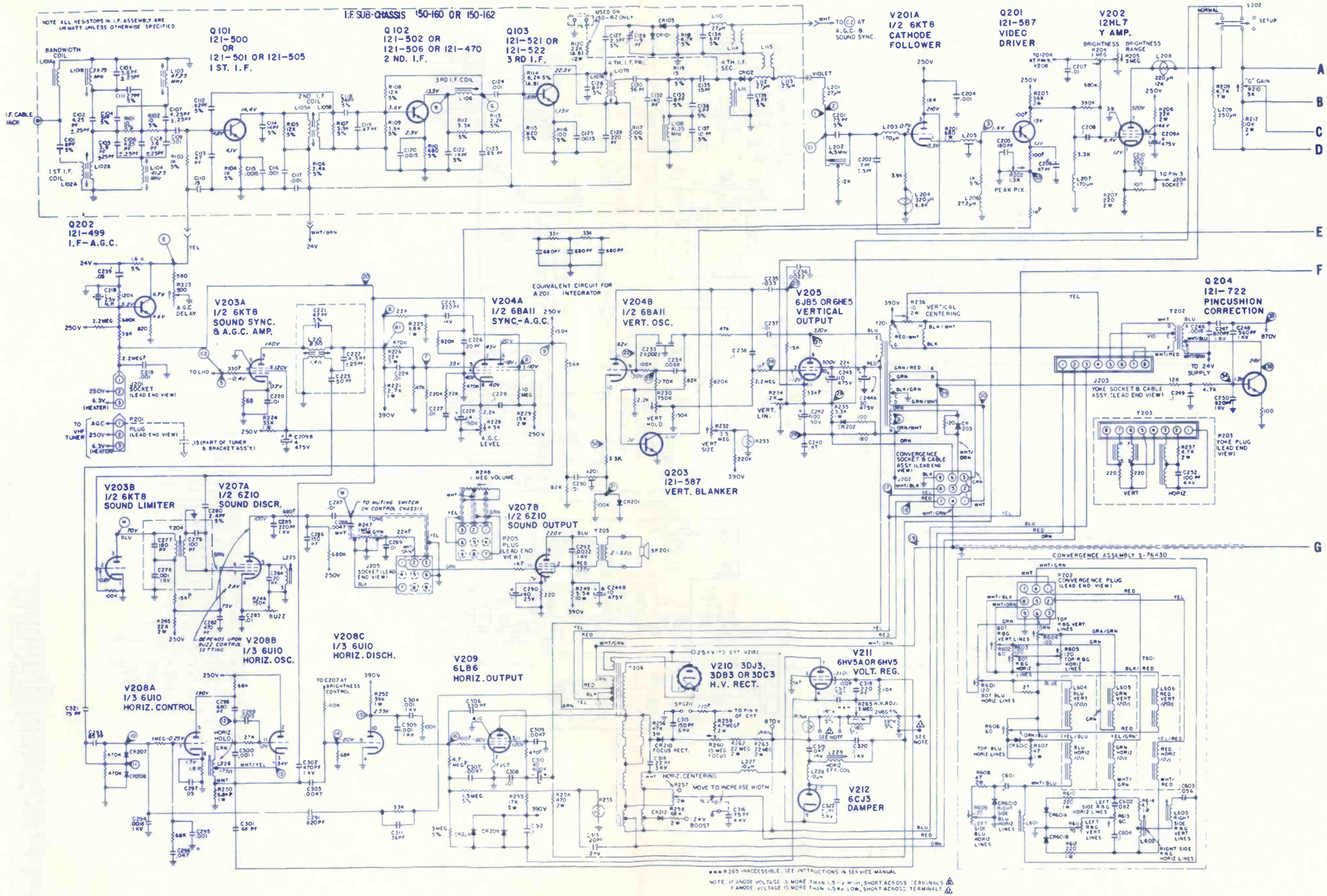
COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802

1324
ZENITH
Color TV Chassis
14A9C50

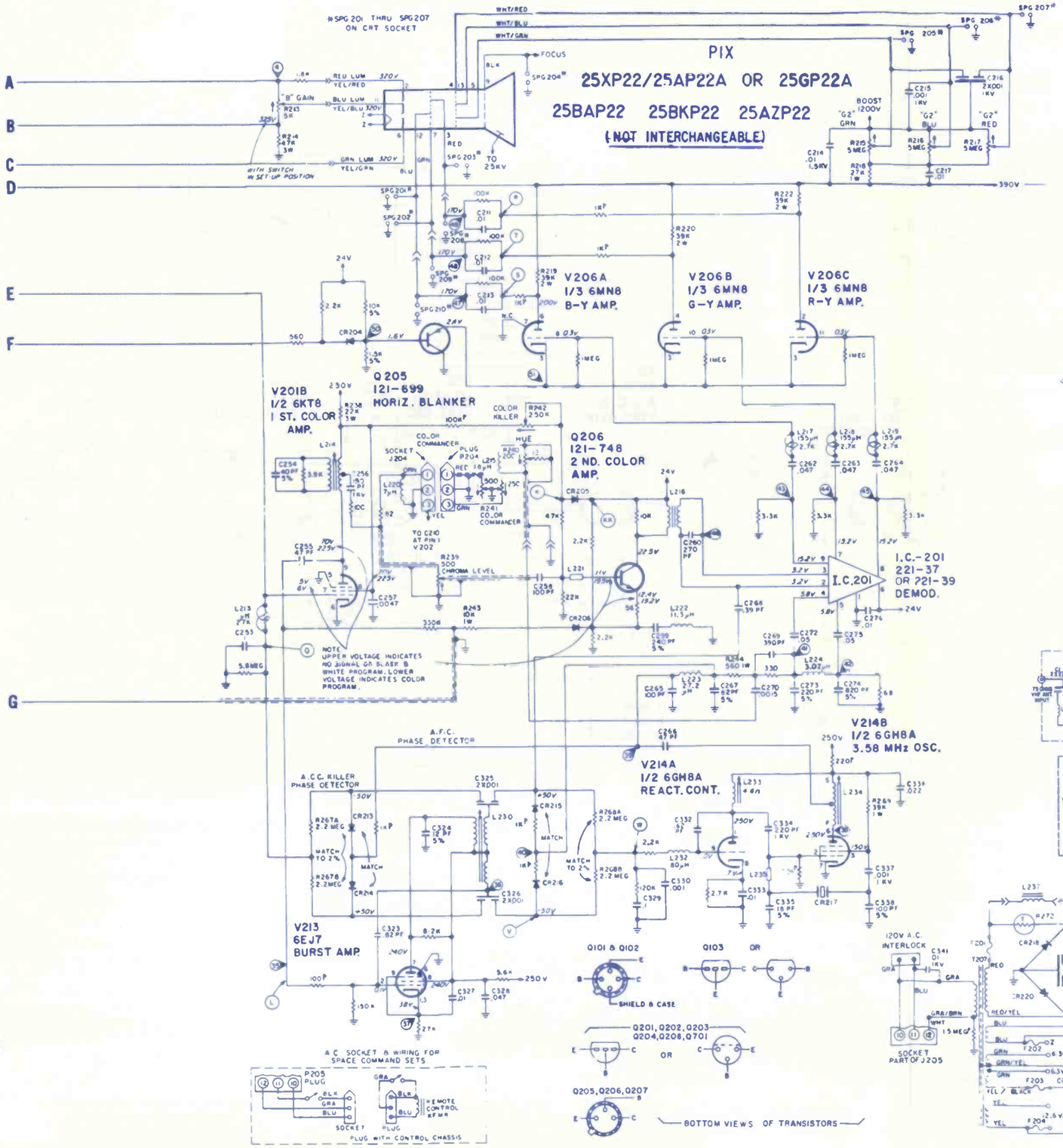
ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

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

OCTOBER • 1970



COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802



SYMBOL	DESCRIPTION	ZENITH PART NO.
C209A	— 4μf elect cap 475v	22-5360
C209B	— 4μf elect cap 475v	22-5360
C209C	— 80μf elect cap 475v	22-5360
C209D	— 30μf elect cap 475v	22-5360
C244A	— 30μf elect cap 475v	22-5513
C244B	— 10μf elect cap 475v	22-5513
C244C	— 80μf elect cap 475v	22-5513
R202	— 1.5K peak pix control	63-7613
R204	— 1M bright control	63-7092
R205	— 3M bright range control	63-7101
R208	— 500Ω contrast control	63-6980
R223	— 500Ω AGC delay control	63-8308
R230	— 750K vert hold control	63-6979
R232	— 3.5M vert size control	63-8443
R233	— varistor	63-5058
R234	— 2K vert lin control	63-6951
R236	— 10Ω vert centering control	63-7009
R242	— 250K color killer control	63-8449
R246	— 750Ω buzz control	63-6950
R247	— 1M tone control	63-7351
R255	— varistor	63-7658
R257	— 10Ω horiz centering control	63-7211
R260	— 15M focus control	63-7210
R264	— varistor	63-8161
R265	— 3M HV adjust control	63-8460
R272	— thermistor	63-7346
L202	— 4.5MHz trap coil	S-77669
L205	— delay line	S-80475
L210	— sound take-off coil	S-77414
L213	— peaking coil	20-2533
L225	— quad coil	S-86212
L226	— horiz osc coil	S-56877
L229	— horiz efficiency coil	S-77975
L230	— burst amp & phase detector coil	S-80590
L234	— 3.58MHz osc plate coil	S-77511
L238	— filter choke	95-2702
T201	— vert output xformer	95-2551
T202	— pincushion coil	S-79692
T203	— deflection yoke	95-2780
T204	— intercarrier coil	S-76920
T205	— audio output xformer	95-2796
T206	— horiz sweep xformer	S-84980
T207	— power xformer	95-2701
A201	— integrator unit	87-4
	— 1.2a bel-fuse	136-63
F207	— 0.40a fuse	136-82

COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802

1325

ZENITH

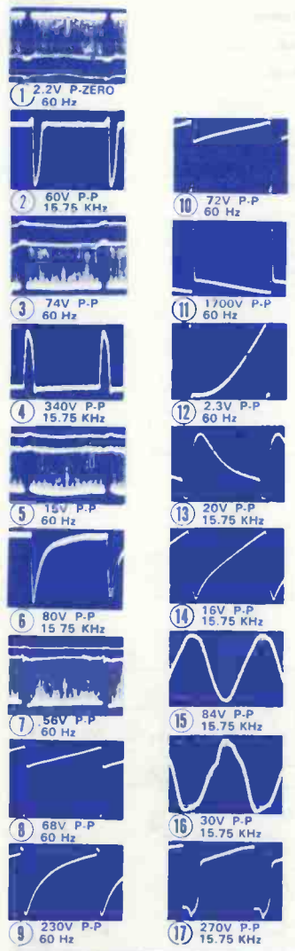
TV Chassis 13A12

OCTOBER • 1970

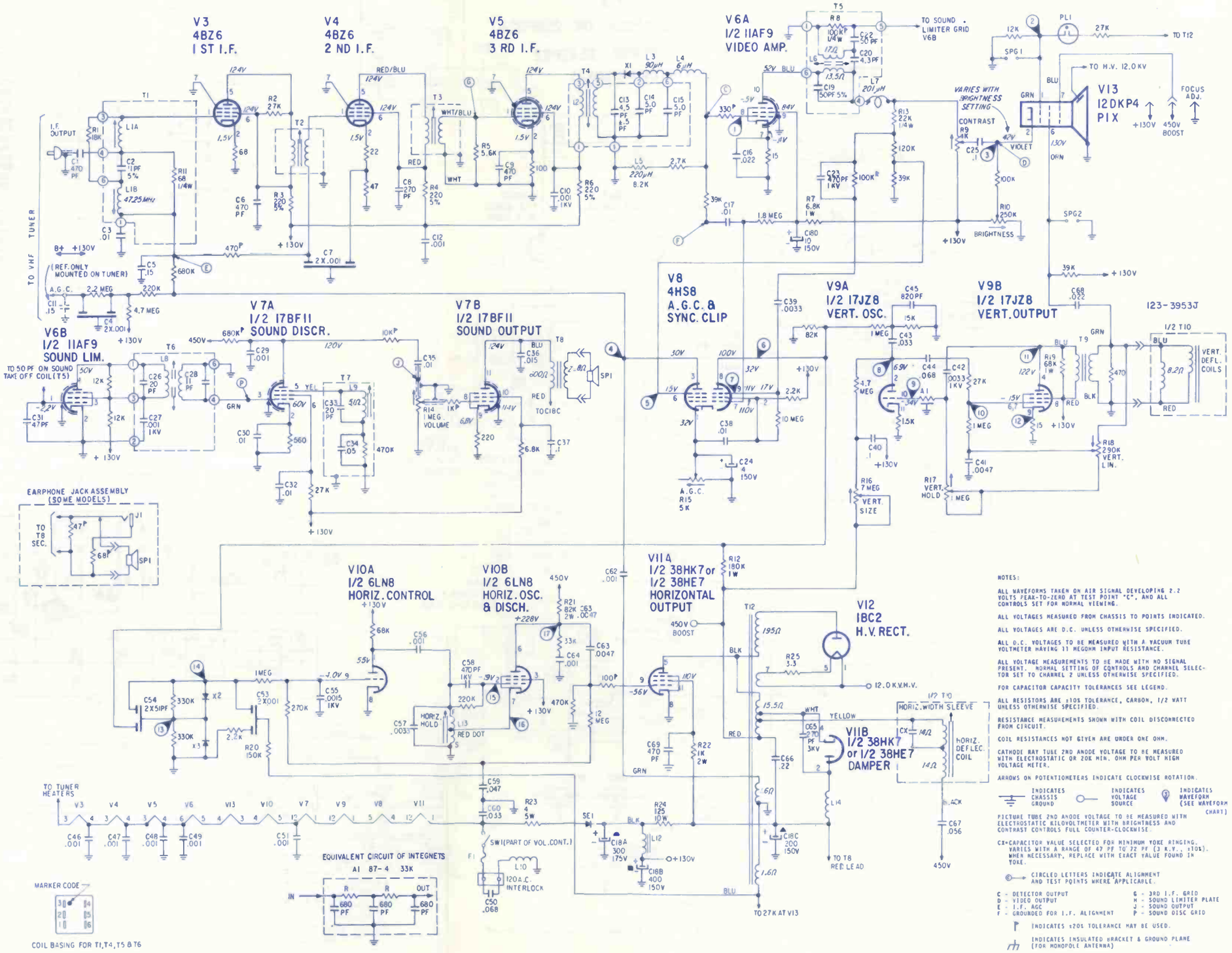
ELECTRONIC TECHNICIAN / DEALER **TEKFAX**

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

SYMBOL	DESCRIPTION	ZENITH PART NO.
C18A	300µf elect cap, 175v	
C18B	400µf elect cap, 150v	
C18C	200µf elect cap, 150v	22-5857
C18D	10µf elect cap, 150v	
C53	2 x .001µf disc cap, 10%, 500v	22-21
C54	2 x 51pf disc cap, 15%, 500v	22-25
R3	220Ω resistor, 5%, ½w	63-7236
R9	4K contrast control	63-8222
R10	250K bright control	63-8221
R14	1M vol control	63-8219
R16	7M vert size control	63-6433
R17	1M vert hold control	63-8170
R18	290K vert lin control	63-8327
R24	125Ω resistor 10%, 10w	63-6348
L4	choke coil	20-2004
L6	sound take-off coil xformer	95-2712
L8	intercarrier coil xformer	95-2713
L10	line filter coil	20-1424
L12	filter choke	95-2703
L13	horiz osc coil	S-56875
T1	1st IF and trap coil xformer	95-2708
T5	sound take-off coil xformer	95-2712
T7	quad coil xformer	S-83648
T8	sound output xformer	95-2706
T9	vert output xformer	95-2859
T10	yoke	S-83177 or 95-2779
T12	horiz sweep xformer & bracket assembly	S-82908 or S-83539
A1	integrator	87-4
F1	1.8a fuse	136-65
SW1	ON-OFF switch	63-8219



ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate offices: 757 Third Avenue, New York, New York 10017. Advertising offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial, Accounting and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: One year, $5; two years, $8; three years, $10 in the United States and Canada. Other countries: One year, $9; two years, $14; three years, $18. Single copies: 75¢ in the U.S. and Canada; all other countries: $2. Second class postage paid at Dansville, New York 14437 and at additional mailing offices. Copyright 1970 by Harcourt Brace and Jovanovich Publications. POSTMASTER: Send form 3579 to ELECTRONIC TECHNICIAN/DEALER, 1 East First Street, Duluth, Minnesota 55802.



NOTES:

ALL WAVEFORMS TAKEN ON AIR SIGNAL DEVELOPING 2.2 VOLTS PEAK-TO-ZERO AT TEST POINT "C", AND ALL CONTROLS SET FOR NORMAL VIEWING.

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. NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.

FOR CAPACITOR CAPACITY TOLERANCES SEE LEGEND.

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

RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.

COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.

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

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

⏚ INDICATES CHASSIS GROUND — ○ INDICATES VOLTAGE SOURCE — ⓖ INDICATES WAVEFORM (SEE WAVEFORM CHART)

PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLTMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.

CX=CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 K.V., ±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.

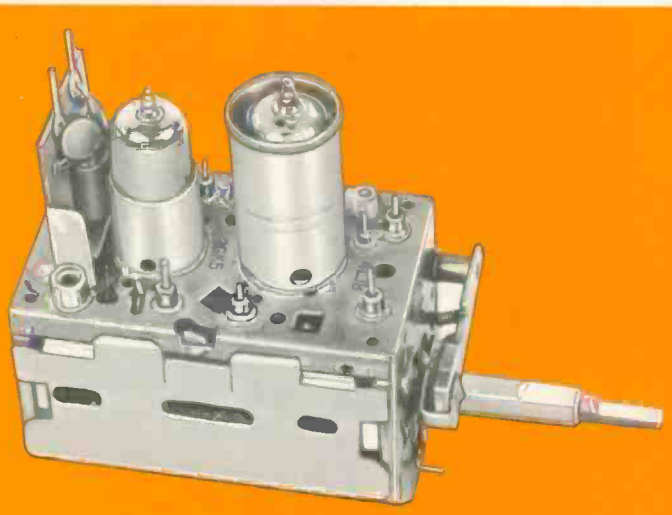
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS WHERE APPLICABLE.

C - DETECTOR OUTPUT
D - VIDEO OUTPUT
E - I.F. AGC
F - GROUNDED FOR I.F. ALIGNMENT
G - 3RD I.F. GRID
H - SOUND LIMITER PLATE
J - SOUND OUTPUT
P - SOUND DISC GRID

⏚ INDICATES ±20% TOLERANCE MAY BE USED.

⏚ INDICATES INSULATED BRACKET & GROUND PLANE (FOR MONOPOLE ANTENNA)

COPYRIGHT 1970 BY ELECTRONIC TECHNICIAN/DEALER • HARBRACE BUILDING, DULUTH, MINNESOTA 55802



$9.75

TUNER SERVICE CORPORATION

PROVIDES YOU WITH A COMPLETE SERVICE FOR ALL YOUR TELEVISION TUNER REQUIREMENTS AT ONE PRICE.

TUNER REPAIR

VHF Or UHF Any Type $9.75.
UHF/VHF Combo $15.00.

In this price all parts are included. Tubes, transistors, diodes, and nuvistors are charged at cost.

Fast efficient service at our four conveniently located service centers.

1 year guarantee backed up by the largest tuner manufacturer in the U.S.—SARKES TARZIAN, INC.

All tuners are cleaned inside and out, repaired, realigned and air tested.

TUNER REPLACEMENT

Replacement Tuner $9.75.

This price buys you a complete new tuner built specifically by SARKES TARZIAN INC. for this purpose.

The price is the same for *every* type of universal replacement tuner.

Specify heater type

Parallel 6.3V
Series 450 mA
Series 600 mA

All shafts have the same length of 12".

Characteristics are:
Memory Fine Tuning
UHF Plug In
Universal Mounting
Hi-Gain Lo-Noise

If you prefer we'll customize this tuner for you. The price will be $18.25. Send in original tuner for comparison purposes to our office in INDIANAPOLIS, INDIANA.

TSC

TUNER SERVICE CORPORATION

FACTORY-SUPERVISED TUNER SERVICE

MIDWEST . . . . . 817 N. PENNSYLVANIA ST., Indianapolis, Indiana (Home Office) . . . . . TEL: 317-632-3493
EAST . . . . . 547-49 TONNELE AVE., Jersey City, New Jersey . . . . . TEL: 201-792-3730
SOUTH-EAST . . 938 GORDON ST., S. W., Atlanta, Georgia . . . . . TEL: 404-758-2232
WEST . . . . . SARKES TARZIAN, Inc. *TUNER SERVICE DIVISION*
10654 MAGNOLIA BLVD., North Hollywood, California . . . TEL: 213-769-2720

. . . for more details circle 137 on Reader Service Card

Pierre Insists This Is The Only Way He Is Going To Get A Good Color Picture . . .

Too bad his serviceman didn't install a DuMont Replacement CRT. It guarantees reproduction of nature's true colors.

Smart servicemen insure their customers the best picture possible by installing quality DuMont replacement CRTs. Through the exclusive "2 Year Repeat Profit Plan" servicemen also insure themselves long term repeat customers and big profits. Here's how. When you install a DuMont replacement CRT the customer becomes your customer for 2 profitable years because they must call you for all future service to keep the 2nd year warranty valid. Customer warranty brochure and service identification sticker included with each CRT. With the DuMont "2 Year Repeat Profit Plan" you fight encroachments by TV set factory service organizations on your business. To learn more about the nationally recognized profitable DuMont "2 Year Repeat Profit Plan" see your distributor now.

DUMONT

NATIONAL MARKETING HEADQUARTERS 2875 Westside Blvd. / P. O. Box 12007 / Jacksonville, Florida 32209 / (904) 355-9006

. . . for more details circle 116 on Reader Service Card

ELECTRONIC TECHNICIAN/DEALER

OCTOBER 1970 • VOLUME 92 NUMBER 4

HUGH "SCOTTY" WALLACE
Publisher
43 East Ohio Street
Chicago, Ill. 60611
(312) 467-0670

PHILLIP DAHLEN
Editor
1 East First Street
Duluth, Minn. 55802
(218) 727-8511

JOSEPH ZAUHAR
Managing Editor

EMILY WILSON
Associate Editor

DEBBIE GOLDBERG
Production Editor

BOB ANDRESEN
Graphic Design

LILLIE PEARSON
Circulation Fulfillment

JOHN KESSLER
Manager, Reader Services

BERNICE GEISERT
Advertising Production

MANAGERS

ALFRED A. MENEGUS
757 Third Avenue
New York: (212) 572-4829

DEAN GREENER
43 East Ohio Street
Chicago: (312) 467-0670

DONALD D. HOUSTON
1901 West 8th Street
Los Angeles: (213) 483-8530

CHARLES S. HARRISON
CY JOBSON
57 Post Street
San Francisco
(415) 392-6794

ROBERT UPTON
Tokyo, Japan
I.P.O., Box 5056

This month's cover—a multiple exposure of some signs illuminating the front window at Mel's TV here in Duluth—depicts the mystery of the future. The brand names are shown lighting up the darkness, just as this month's special issue gives light to the 1971 color TV sets that you will encounter.

FEATURES

A HARCOURT BRACE JOVANOVICH PUBLICATION

ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate Offices: 757 Third Avenue, New York, New York 10017. Advertising Offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial, Accounting and Circulation Offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: One year $5, two years $8, three years $10, in the United States and Canada. Other countries: one year $9, two years $14, three years $18. Single copies: 75¢ in the U.S. and Canada; all other countries $2. Second class postage paid at Dansville, New York 14437 and at additional mailing offices.

Copyright 1970 by Harcourt Brace Jovanovich Publications.

POSTMASTER: Send form 3579 to ELECTRONIC TECHNICIAN/DEALER, 1 East First Street, Duluth, Minnesota 55802.

FOR BLACK & WHITE VHF, LOCAL UHF

Belden 8275 Celluline®

Strong Copperweld conductors

Tough polyethylene jacket

Unicellular polyethylene core, each cell filled with inert gas

How Come Dept.

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

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

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

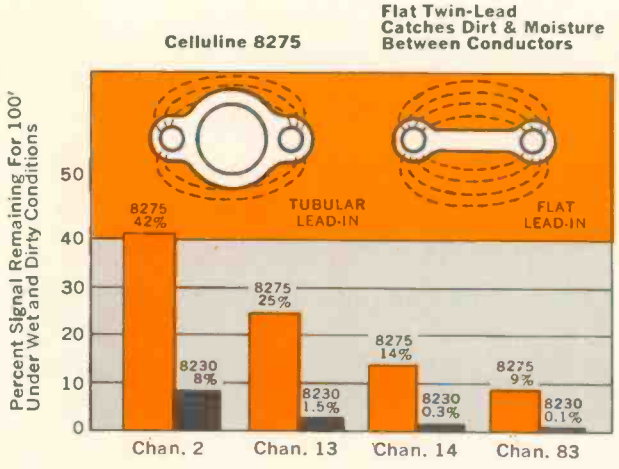
Here's your chance to keep an old customer faithful. Or to turn a new customer into a steady one. Upgrade him to Belden 8275 Celluline lead-in. Moisture and dirt are the bugaboos of the flat twin-leads. But Celluline helps keep 'em out. And, by doing so, delivers a signal over 4 times stronger on Channel 2 and 90 times stronger on Channel 83 (see chart).

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

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

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

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



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

For a reprint of the informative magazine article, ELECTRONIC CABLES, send to: Belden Corporation, P. O. Box 5070-A, Chicago, Illinois 60680.

BELDEN

. . . new ideas for moving electrical energy

8-7-9A

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

EDITORIAL

Let's Have Everyone Look Alive

A few years ago our publication contained an editor's memo criticizing television broadcasters for the quality of their color programming. It complained about the fact that as some programs (even a few of those shown on the networks) switch between cameras noticeable shifts in color occur on our TV sets.

In response to this criticism we received a rather irate letter from a TV station engineer in one of our larger metropolitan areas. He indicated that the FCC has very stringent regulations that require far greater color signal accuracy for transmission than can be obtained on the average TV set.

Editorials in this publication have never questioned calibration standards for TV-station transmitters. But during the years that have passed since that editorial we have continued to notice this problem.

We do not feel, as had been indicated by that reader, that TV sets are to fault for this problem. If a TV set can maintain beautiful, well adjusted color during the entire length of a two-hour late-night movie, then we cannot believe that this same TV set is at fault when the picture varies between pastels and extreme brilliance during local newscasts, as fleshtones alternate between the greenish casts of the "undead" to the reddish casts on one that has just died from a high fever.

Some TV manufacturers, realizing customer dissatisfaction with these shifting fleshtones, have developed circuits that can correct for TV station error, always providing nice looking fleshtones. However, in some instances a few of these sets go a little too far and also show brass fences and other non-living objects with these same healthy fleshtones.

We feel that one solution to this problem lies in the TV station control room. When touring one station I was shocked to see only one color monitor in a control room designed to handle several color cameras, plus color slide and movie projectors. With but one monitor you cannot be expected to make any necessary last minute color adjustments before switching from one picture source to the other.

If all cameras are properly adjusted, there is no need to make these color corrections in the control room. As a solution, Marconi Communications Systems Ltd. has just recently announced what they claim to be the world's first automatic color camera with computer controlled alignment and color balance. With cameras fitting their description, we would have to acknowledge that a TV station could probably get along fine with but one color monitor.

According to their news release, the automatic registration and lining-up sequence is initiated by pressing a single button. When this is done, a motor-drive shutter moves a diascope test slide into view and signal voltages are equalized, image displacement minimized and appropriate adjustments made in width, length, rotation, skew, horizontal and vertical centering and horizontal linearity—these adjustments normally taking less than a minute to make.

A second button is said to initiate the automatic color balancing sequence when the camera is pointed at a white object covering at least 10 percent of the picture area. In about 10 seconds the output voltages are then adjusted to be equal for each color. Despite containing the necessary components for all of these automatic features, the manufacturer indicates that without its lens and removable viewfinder the camera weighs only 63 lb and can be carried up a vertical ladder by one man.

Maybe this is the breakthrough that we have been waiting for. If TV stations begin using cameras with features such as these, we may soon begin to enjoy uniform color throughout each color-TV program.

Phillip Dahlen

If you don't have it, you're wasting your time.

New Model 466 CRT Checker/Rejuvenator

Now the biggest money-maker in the repair business has been improved again! To make it faster, easier to use, more obsolescent proof. And its styling makes you look more professional than ever.

It's the new Model 466 CRT Checker/Rejuvenator from B&K. With a separate G_2 control for each gun. Enough voltage range to check color CRTs to cut-off. And a new "normalize" control for instant tracking evaluation.

Better yet, an exclusive new monitoring system lets you know the exact emission change during rejuvenation. So you never have to recycle test steps over and over again. And, at the touch of a button, a new "super rejuvenate" function gives you a chance to rescue even the weakest tubes.

You get a set of multi-socket adapters that work on more CRTs than any other tester, even the new Trinitrons.

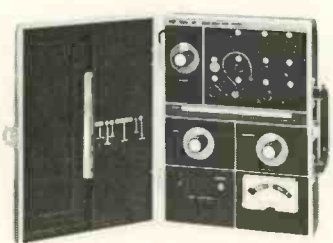
So why put up with a lot of needless extra work? The new Model 466 saves so much time it actually pays for itself. Checks and rejuvenates so many CRTs it puts big money in your pocket.

Ask your distributor or write us for complete details.

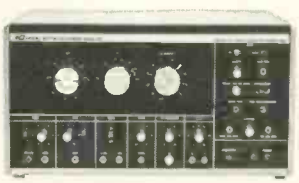
B&K
Model 466
$129.95

OTHER TIME-SAVERS FROM B&K:

Model 415 Sweep/Marker Generator $399.95



Model 607 Tube Tester $114.95



Model 1077B Television Analyst $389.95

. . . for more details circle 104 on Reader Service Card

B&K

Products of
DYNASCAN CORPORATION
1801 W. Belle Plaine
Chicago, Illinois 60613

The professional test equipment

LETTERS

Readers' Aid

I would like to thank all those who responded to my inquiry in the January issue of ET/D. Once again I need your help. Does anyone have:

- The schematic and operational instructions to the "Rejuva-Tube" CRT Rejuvenator, Model RE-1 and Model RE-2, manufactured by Central Electronics, Inc., Chicago, Ill.
- Knowledge of modifications and/or a recent roll chart including supplement for older tubes to up-date a Simpson Tube Tester "Plate Conductance" Model 1000.

Being new in the radio and TV business, I need your help and appreciate your suggestions!

DORSEY D. CROSS
ROUTE 3, BOX 114D
DENISON, TEXAS 75020

I am in need of an operator's manual for a signal generator I purchased a few years ago from Superior Electronic Test Instrument Co. Will you please help me to locate this company or a reader who may still have a manual. The Model No. is T-V 50, and the instrument is called "genometer."

Any information will be highly appreciated.

JOSEPH LEE
6735 SOUTH CARPENTER ST.
CHICAGO, ILL. 60621

I have the following available for interested readers: hand-bound volumes of ELECTRONIC TECHNICIAN/DEALER for the years 1960 through 1968.

Although I am no longer in the servicing business, I still enjoy the publication.

MAURICE LINDENAUX
2042 E. DRUID RD.
CLEARWATER, FLA. 33516

I recently purchased a Columbia Grafonola Victrola which is the old, wind-up type. It seems, however, that the elbow of the phono arm is broken, and I would like to have it replaced.

Since the Victrola is not being manufactured any more, I would like to know if and where I could obtain the part. The Victrola number is A33572. It was made by the American Graphophone Co., Bridgeport, Conn., for distribution by Columbia. The last patent date listed on the label is 1914.

DAVID WEINSTEIN
1 CHAPEL HILL APTS.
CHAPEL HILL, N.C. 27514

Comments on Articles

I hope you take seriously the suggestion given in several of the letters to the editor in the July issue—that articles in the format of "The CAT Game" are needed and appreciated.

Since I am in teaching, my interest in servicing is peripheral. However, from students of various sorts, I can see that the division between learning and application is great and that a tendency exists, when presented with a problem, to throw all thought processes out the window. The above-mentioned article gave a man a chance to try to figure out the malfunction for himself, and then check his thought processes. Even the presentation of faults and corrections in a single schematic drawing could state the trouble above and give the solution beneath—again giving an opportunity for checking one's thinking.

JOSEPH G. BRADLEY, JR.

continued on page 82

Who Needs a Tuner Wash?
Use
QUIETROLE
Mark II Spray Pack
The product that cleans and lubricates better than any product you can buy and has been used for more years than any product of its kind.
The Choice of "Better Servicemen" Everywhere

manufactured by
QUIETROLE COMPANY
Spartanburg, South Carolina

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

STANCOR "PICO" MINIATURE TRANSFORMERS

. . . pinpoint design engineers' needs

Especially designed for very low power, electronic, or transistor applications, the Stancor Pico transformers are perfect when space, weight and dependability are critical factors.

Each of these miniature transformers – we call them transistorformers – consists of a core, a coil, a nylon bobbin, high nickel alloy laminations, and 2-inch color coded lead wires. 242 basic transistorformers are available in open, crystal case metal, plastic case, or hermetically sealed styles. However, with the various mounting configurations there are over 900 different units in the Stancor Pico line.

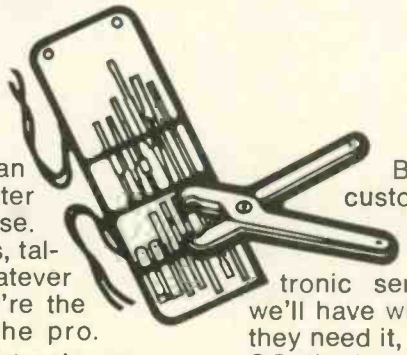
Best of all, each of these Stancor Pico transistorformers are standard designs, and are available immediately from the more than 1000 authorized Stancor distributors.

ESSEX Stancor transformers | STANCOR

ESSEX INTERNATIONAL, INC., CONTROLS DIVISION – 3501 W. ADDISON ST., CHICAGO, ILL. 60618

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

what makes a pro?



Some people can do a thing better than anyone else. Sports, hobbies, talents, jobs—whatever . . . when they're the best, they're the pro.

The pro in electronic servicing is the guy who troubleshoots with a telescopic sight. He's fast, courteous, honest, and nice to his kids. He also earns what he makes.

Best of all, he's our customer.

GC is *the* supplier to the pros in electronic servicing. They know we'll have what they need, when they need it, and at a good price. GC distributors across the country offer more than 12,000 items to the servicing pro. The complete line of GC alignment and service tools gives the pro everything he needs.

Take it from a pro . . . always buy

GC ELECTRONICS
400 SO. WYMAN STREET
ROCKFORD, ILL. 61101
A DIVISION OF HYDROMETALS, INC

. . . for more details circle 114 on Reader Service Card

PUBLISHER'S MEMO

HARCOURT HOTLINE

There has been a fantastic readership response to many of the products advertised in ELECTRONIC TECHNICIAN/DEALER. Some products receive more than 700 inquiries within a month's time.

As a result of the interest that you have demonstrated, this month we are initiating a unique service, the first in the business publication field, which will permit an *immediate* response to your requests.

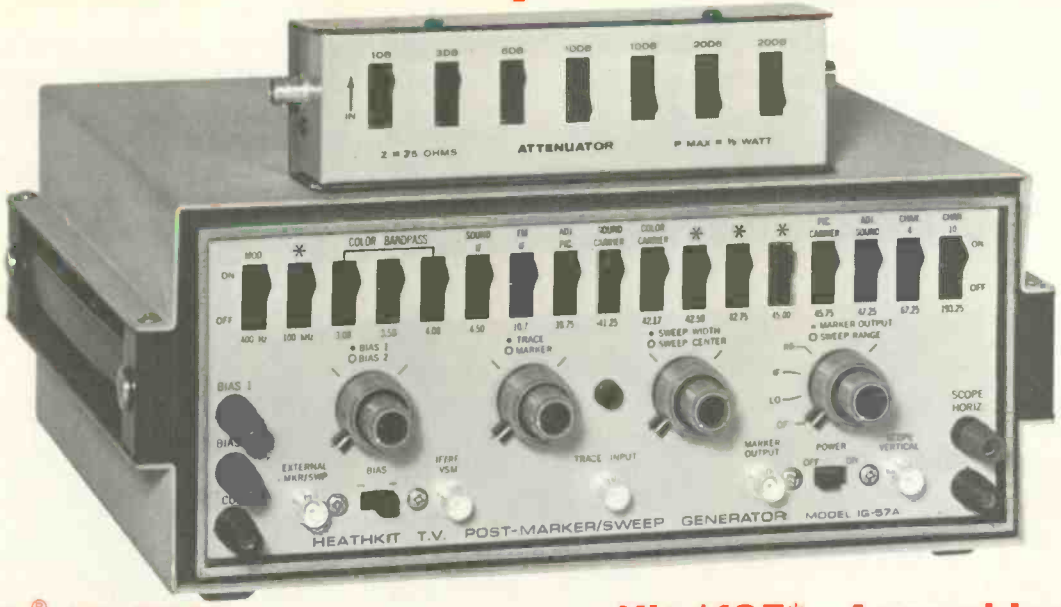
In certain ads this month the usual reader service number has been replaced with a **Harcourt Hotline** number and our new symbol. Instead of requesting information concerning their products with our convenient reader service card, you can just pick up your phone and dial that number. Your *toll-free* call will connect you with our market orientated operator here in Duluth. This operator will ask you what ad you are responding to and what information you wish to obtain. Your request will be immediately forwarded to the advertiser, who is then able to tailor his response to meet your specific needs.

We feel that this is a terrific system which will permit a more personalized response in serving the most important person in our industry—you, the man who maintains the nation's consumer electronic products.

Scotty Wallace

SCOTTY WALLACE

Compare features and cost.
See how you can save up to $260.00 with the Heathkit® Sweep-Marker Generator

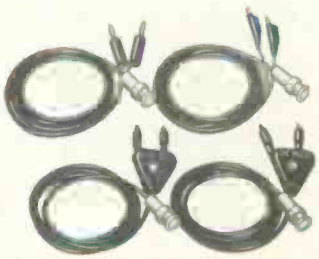


Heathkit® IG-57A — Kit $135*—Assembled $199*

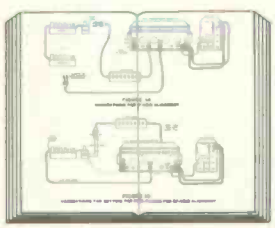
Now With Video Sweep Modulation & Second Bias Supply

Compare the Features — Compare the Cost

- **New Video Sweep Modulation** ..... allows you to inject chroma sweep directly into the IF amplifiers or through the antenna terminals . . . permits more accurate matching between color bandpass amplifiers and IF and observation of overall response.
- **Exclusive Heathkit Attenuator** ..... lets you quickly and accurately determine 6 dB points without guessing. Gives up to 70 dB total attenuation in 1, 3, 6, 10 and 20 dB steps.
- **15 Crystal-Controlled Markers** ..... provide all the most used marker frequencies . . . 3 for color bandpass, 1 for TV sound IF, 8 at the IF frequencies from 39.75-47.25 MHz including special markers for B&W bandpass. Markers also included for picture & sound carriers on channels 4 & 10. The 15th crystal marker is at 10.7 MHz for FM IF. A coil-tuned 100 kHz marker is also provided. A front-panel input accepts an external marker generator.
- **New Built-In Bias Supplies** ..... two individually adjustable bias supplies can be switched for either positive or negative output . . . up to 15 V at 10 mA.
- **400 Hz Modulated Or CW Output** ..... of any individual marker for fast, simple trap alignment and FM tuner adjustment.
- **Proven Saturable Reactor Circuitry** ..... produces stable, linear sweep signals that cover the five most used frequency ranges.
- **Complete Scope Matching Controls** ..... switchable Retrace Blanking enables accurate Phase Control adjustment. Just switch on Retrace Blanking for convenient zero output base line. Trace Reverse function permits display of markers in proper sequence.
- **Quick-Disconnect BNC Connectors** ..... for quick, easy set-up changes.
- **Complete With All Probes, Test Leads & Terminated Cables** ..... Includes terminated RF cable with built-in DC blocking capacitor . . . Demodulator Probe for envelope detection in color circuits . . . shielded Scope Vertical lead . . . shielded Clip Lead cable . . . Scope Horizontal lead . . . two Bias Leads.
- **How-To-Use** ..... the famous Heathkit manual includes a comprehensive, well-illustrated Applications Section that shows you how to align TV IF, Traps and Color Bandpass . . . how to do IF & RF Video Sweep Alignment, VHF Tuner checking, FM Tuner Tracking & IF alignment.



All Cables, Leads, & Probes are included. Nothing extra to buy.



26 pages of Instructions and Illustrations — show you exactly how to use your IG-57A for greater efficiency, greater profit.

Compare The New Heathkit IG-57A With All Others . . . you get more useable features, better performance, more versatility per dollar with the IG-57A. Order your IG-57A now . . . and keep up to $260 in your pocket.

NEW
FREE 1971 CATALOG!
Now with more kits, more color. Fully describes these along with over 300 kits for stereo/hi-fi, color TV, electronic organs, guitar amplifiers, amateur radio, marine, educational, CB, home & hobby. Mail coupon or write Heath Company, Benton Harbor, Michigan 49022.

HEATHKIT
a Schlumberger company

HEATH COMPANY, Dept. 24-10
Benton Harbor, Michigan 49022

☐ Enclosed is $_____, plus shipping.

Please send model (s)_____
☐ Please send FREE Heathkit Catalog. ☐ Please send Credit Application.

Name_____

Address_____

City_____ State_____ Zip_____

*Mail order prices; F.O.B. factory. Prices & specifications subject to change without notice. TE-228

. . . for more details circle 117 on Reader Service Card

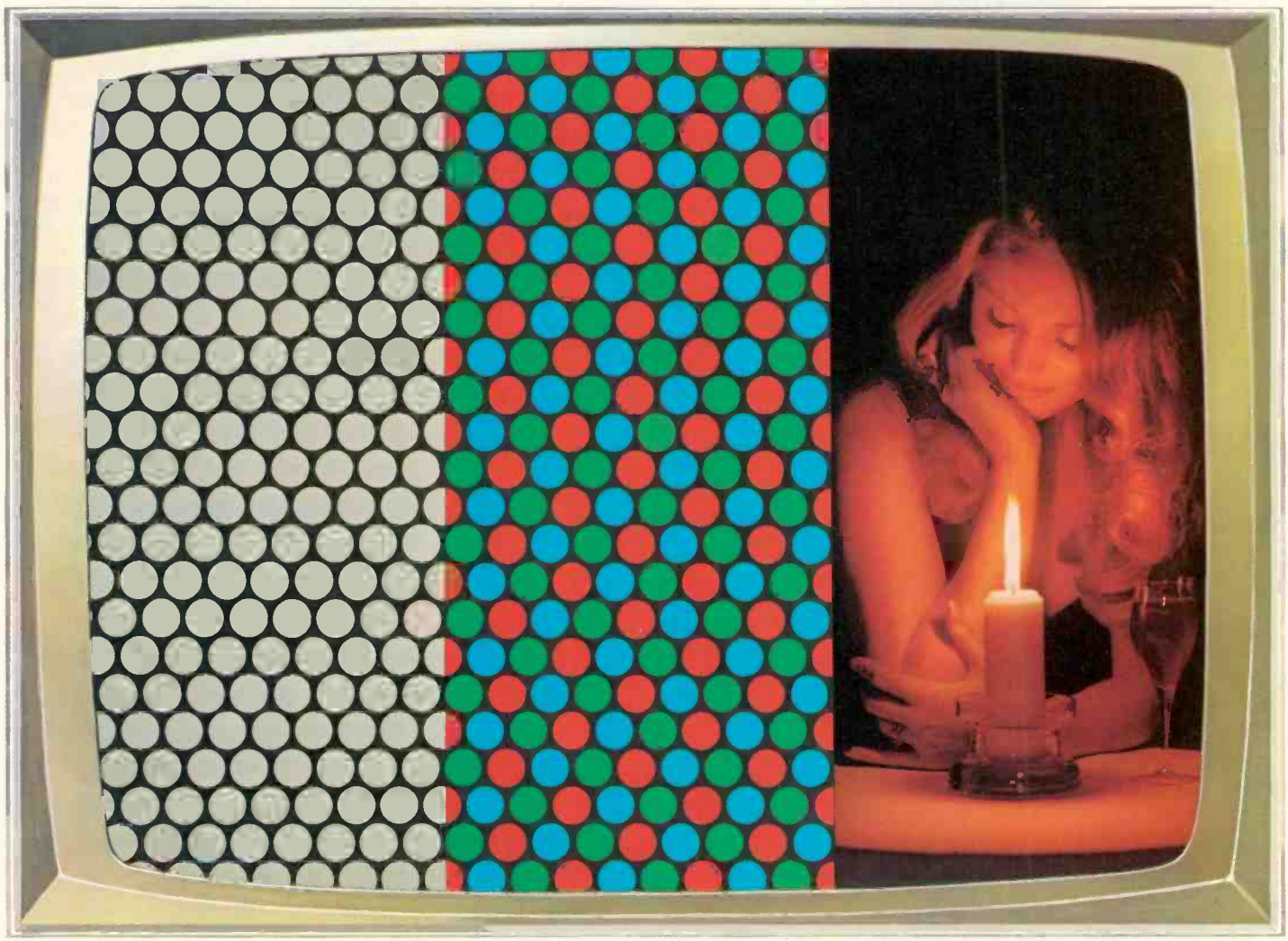
10 million reasons why it pays to promote matrix, the brightest, sharpest color picture tube in RCA history!

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 25BCP22 is a direct replacement for the 25XP22, 25AP22A, 25BGP22, 25BAP22 (Chromacolor), and 20 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

NEWS OF THE INDUSTRY

EIA Survey Taken on Possible Conversion to Metric System

The Electronic Industries Assoc. has stated that increased use of the metric system in the United States is inevitable and that the sooner it is started the less costly it will be. Based on answers to a membership survey, EIA said a majority would probably favor a metric conversion plan that called for government legislation with specific changeover dates and voluntary participation by the industry in the changeover.

The survey indicated also that there is no strong feeling on the part of electronics companies either for or against establishment of the metric system in this country. The survey, which was sent out to the 300 member companies of EIA and answered by nearly one third of them, indicated that, while over half of those companies have used the metric system more and more in the past 10 years, a larger majority—more than 90%—said they have no plans to make more changes toward its use. A nearly unanimous opinion emphasized that without a coordinated program or encouragement from the federal government no significant change would occur.

Color Tube Sales Up 21.0% During First Six Months

The Electronic Industries Assoc. Marketing Services Dept. reports that U.S. factory sales of color TV picture tubes for renewal purposes totaled 415,000 units during the January-June period in 1970, an increase of 21.0% over sales of 343,000 during the same period last year.

Exports of color tubes were up 110.1%, reaching 145,000 units during January through June, 1970. This compares with sales of 69,000 tubes at the end of June, 1969. At 2.0 million units, sales of color tubes to the initial equipment market dropped 33.5% during the first six months of 1970, compared to sales during the first six months of 1969. Overall sales of color tubes totaled 2.5 million units through June 1970, a decline of 25.0% from the 3.4 million tubes sold during the January-June period in 1969.

Sales of monochrome TV picture tubes amounted to 2.0 million units, worth $31.8 million during the first six months of 1970, off 26.6% and 28.1%, respectively, from unit and dollar sales during the same period a year ago.

Total unit sales of all TV picture tubes (monochrome and color) declined 25.7% through June, 1970, reaching 4.5 million tubes. This compares with 6.1 million tubes sold during the January-June period in 1969.

RCA Offers Microfiche Cards Giving Parts Listing and Service Reference

A microfilmed parts listing and service reference for RCA television, radio, tape recorder and record player models has been announced by RCA Parts and Accessories, Deptford, N.J.

It is described as the beginning of a whole new data system that is geared to save time and speed up replacement parts service. Offered to RCA Parts and Accessories distributors, it will be used primarily at parts counters.

The easy-to-use index and 14 uniquely arranged "microfiche" cards, designated PAR-1, shows parts lists and schematics covering a six-year period—equivalent to the data that would be contained in over 125 parts data books.

The PAR-1 package consists of: 14 "microfiche" cards (with 98 frames per card) containing complete parts lists and key schematics from RCA Service Data for the years 1962-67; an index, divided into three sections (TV model number, TV chassis number, and radio, tape recorder and phonograph model numbers), all cross-referenced to the microfiche cards.

1971 Consumer Electronics Show To Be Held at McCormick Place

Thomas A. Niland of General Electric Co. and Fred Meyer of Arvin Industries have been appointed Chairman and Co-Chairman, respectively, of the 1971 Consumer Electronics Show Committee.

The fifth annual CES will be held in Chicago's McCormick Place from Sunday, June 27, through Wednesday, June 30. The Show will reportedly occupy over 200,000 sq ft of exhibit space on the "42 Level" of McCormick Place. The new McCormick Place is designed to be the most modern and complete exposition center. In addition to the spacious exhibit areas, there will be 32 meeting rooms, six small theaters, and a number of permanent restaurants equipped to serve 20,000 people.

More than 90 percent of the 1970 CES exhibitors have requested space in the 1971 Show, and attendance is expected to be greater than the 31,419 trade-show visitors who attended the 1970 Show in New York City. The 1971 CES will be managed by The Charles Snitow Organization.

Evening Courses at William E. Grady Evening Trade School

Free evening courses for the radio-TV electronics trades will be offered at the William E. Grady Evening Trade School, located at 25 Brighton 4th Road, Brooklyn, N.Y., 11235. The courses are Basic Electronics and Radio, Black-and-White TV, Color TV, Transistor and Solid-State Circuitry.

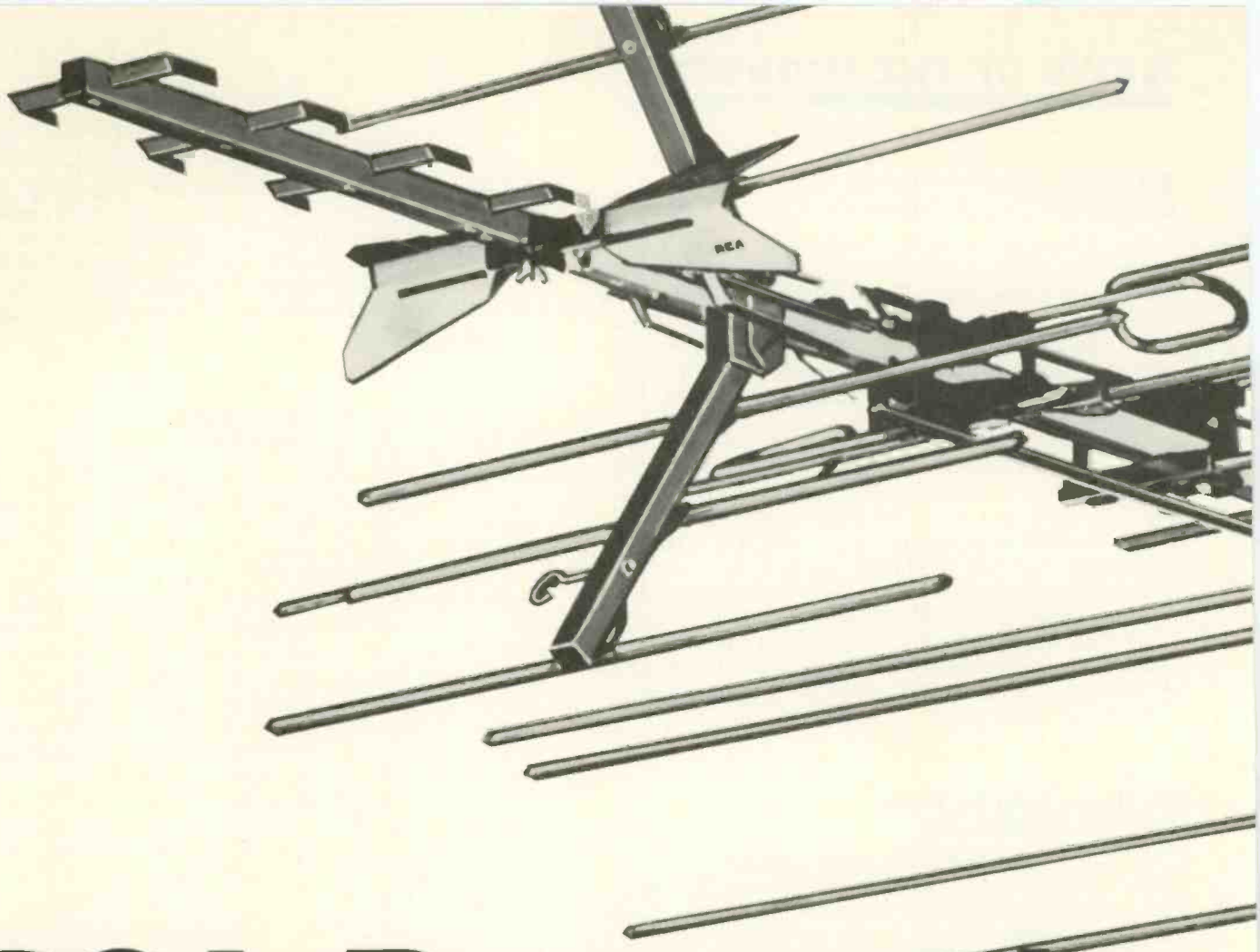
Those interested may register any Monday, Tuesday, Wednesday or Thursday evening from 7:00 to 9:00 at the school.

Zenith's Phonevision Subscription TV System Approved by FCC

Zenith Radio Corp's. Phonevision system for over-the-air subscription TV (STV) is the first system to be granted technical approval by the Federal Communications Commission. According to the FCC rules for over-the-air STV, no station application for regular STV broadcasting can be granted unless the station has an agreement to use an FCC-approved system.

Teco, Inc., Zenith's licensee for commercial development of Phonevision in North America, is now able to proceed with the selection of an STV market and to conclude negotiations with broadcasters and others around the country to establish the STV system in local markets.

Teco has the responsibility for supplying Phonovision franchise holders with encoding equipment for STV transmissions and for assisting in such areas as marketing, engineering and program services. Zenith will supply Phonevision franchise holders with decoding units for installation in subscribers' homes.

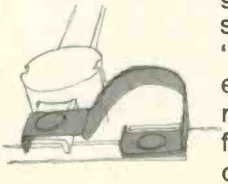


RCA Permacolor

Permacolor is not just an improved antenna, it's a completely new antenna. New in looks. New in design. Very easy to set up and install.

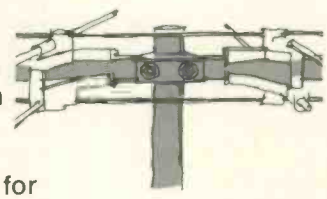
And Permacolor is manufactured exclusively by RCA. Here are a few of its many unique features:

Permanent Connections.
Any antenna is as permanent as its electrical connections. Particularly between the elements and the feed line. If a connection fails, ghosts, streaks, "noise," even total reception failure may occur.



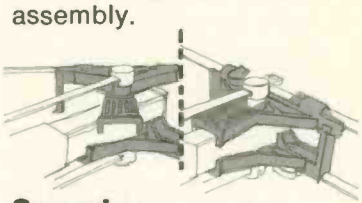
On a Permacolor an aluminum strap solidly connects every active element to the feed line. Connection failure is virtually eliminated.

Tuned Circuits.
Permacolor elements are integral parts of tuned circuits and many perform more than one function. Circuits stay "perma-tuned" because elements are permanently connected. Feed lines are unbroken aluminum strips perfectly balanced for optimum impedance match and minimum ghost pick-up.



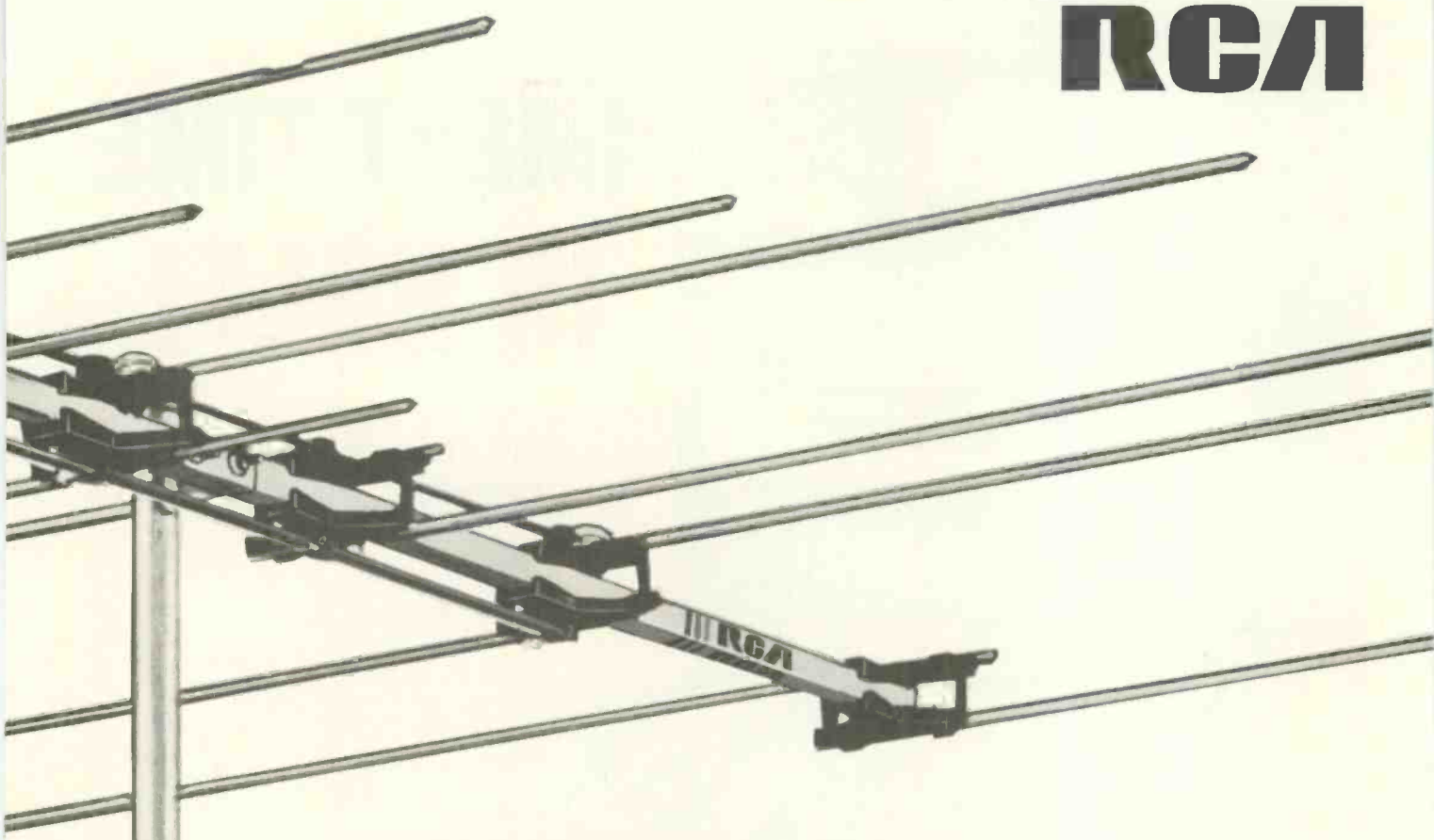
Revolutionary Insulators.
Permacolor insulators are polypropylene, a tough, flexible, water-proof plastic with superior electrical properties. Their unique design includes many ribs and barriers to make leakage paths longer.

On a Permacolor, elements do not pivot. Instead, the elements are assembled right into the insulators. Each insulator, gripping 5½ inches of element, pivots as a unit. When the Permacolor unfolds, insulators snap in place and permanently lock to form a rigid truss. There's no point of high stress along the entire assembly.

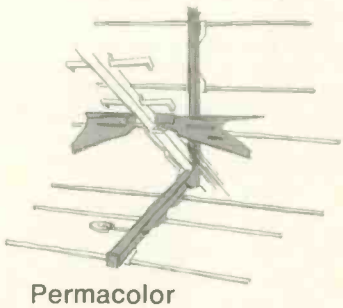


Superior Combinations.
UHF and VHF get bigger boosts on Permacolor combinations. On the corner reflector, the angle is increased to 110° for optimum efficiency. And for the first time, a bow tie is included. This best type of UHF dipole is integrated into a single downlead, made possible by a newly designed three-tuned-circuit coupling/isolating network.

RCA



Optimum signal reception. Designed-in durability.

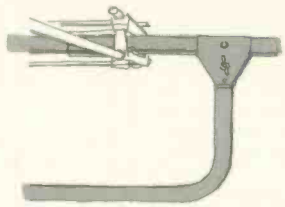


Permacolor combinations are uncompromising all-channel antennas.

Square Boom.
A square boom supports the Permacolor. And it isn't a feed line—it's at ground potential. Detuning effects that often occur when a grounded mast is coupled to a signal carrying boom are eliminated.

The mast clamp is heavy plated steel and locks around the boom without rivets. A double set of serrated teeth take a vise-like bite on the mast to prevent slipping or twisting.

Goes Up Easier.
A Permacolor goes up in one piece. On the roof. Not on the ground. There's no bag of parts. There's nothing to take apart. An installer's job has never been easier or faster.



And installation is just as easy on larger models. A double boom gives added strength, yet takes up only 10 inches on the mast. This allows Permacolor to be placed closer to a rotator, thus minimizing stress on the rotator as well as the mast.

Tough Finish.
Permacolor has a tough blue and gold vinyl finish on all aluminum parts—even the hidden areas. It's similar to the long-lasting coating on aluminum siding for homes.

There's not another antenna like the new, trim, clean RCA Permacolor.

See the complete line of Permacolor antennas today. Your RCA Parts and Accessories Distributor has them now.

Parts and Accessories
Deptford, N.J.

HARCOURT HOTLINE
Call TOLL-FREE For Further Information
(800) 346-0081
In Minnesota Call
218-727-8515

CUT TV ALIGNMENT TIME IN HALF!

with the all new SENCORE SM158

SPEED ALIGNER

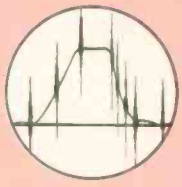
and at $120.00 less than competition!
only $275.00

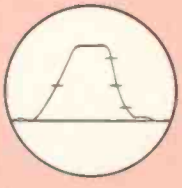
Here are 7 Reasons why we call the SM158 the Speed Aligner

AUTOMATIC ALL CRYSTAL CONTROLLED MARKERS: You will never spend any more time looking up marker frequencies or interpreting them when you own an SM158; they are automatic. For example, want the chroma carrier on any RF curve, IF curve, or chroma curve, simply push the chroma carrier marker button. Want the sound, video, adjacent carrier markers or any other marker on any curve, just push the button as directed on the panel. The SM158 is fast and saves you time . . . that's why we call it the speed aligner.

UNLIMITED MARKER AMPLITUDE: The marker height control is like a powerhouse; crank it up as far as you want, even to the point where the markers are larger than the scope screen, without upsetting the response curve. Each marker is crystal controlled on fundamental frequencies and post-injected so that you may place all markers on the curve at unbelievable heights without affecting the curve in the least. That's why we call the SM158 the speed aligner.

EASY TO CONNECT: Just four connecting cables clearly marked TO TV and TO SCOPE. It takes just seconds to connect . . . that's why we call the SM158 the speed aligner.





TWO EXTRA VHF CHANNELS: Competition has only two VHF channels; the SM158 has an extra high channel and an extra low frequency channel to prevent any co-channel interference. The SM158 is interference-free . . . that's why we call it the speed aligner.

PLENTY OF SWEEP WIDTH: A full 15 megahertz sweep signal, constant on all IF, chroma and RF curves, provides adequate sweep width to cover new solid state IF amplifiers. Competition covers only 12 megahertz. The SM158 gives you the full picture the first time . . . that's why we call it the speed aligner.

GENERATES A ZERO REFERENCE BASE LINE: You know where zero is with the SM158. All alignment instructions show a base line, yet some competitors do not generate a base line. You can follow TV manufacturers' instructions to the "T", easier and faster with the SM158 . . . that's why we call it the speed aligner.

SWITCHABLE HORIZONTAL OR VERTICAL MARKERS: want to tilt markers 90 degrees so you can view markers better in traps or for leveling? Merely pull the MARKER HEIGHT control out and markers appear horizontally — a real plus feature.

THE IDEA PEOPLE

SENCORE

3200 Sencore Drive
Sioux Falls, South Dakota 57107

HARCOURT HOTLINE

Call TOLL—FREE For Further Information
(800) 346-0081
In Minnesota Call
218-727-8515

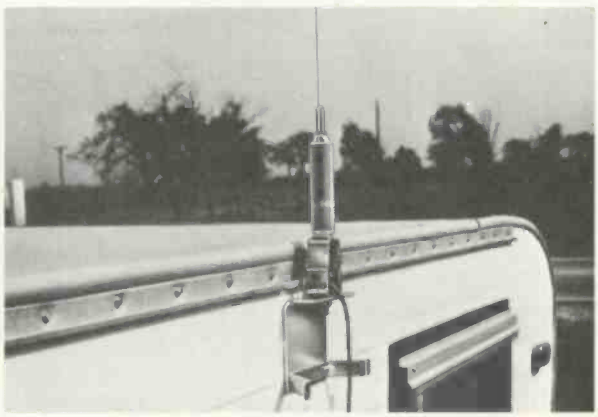
NEW AND NOTEWORTHY

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

UHF RADIO RECEIVER 700

Automatically monitors eight frequencies in 450-470MHz Band

A UHF radio receiver is designed to operate on an automatic signal search of any eight crystal controlled frequencies in the 450 to 470MHz band. At detection of a signal, the radio reportedly stops scanning, receives the entire message, then resumes the scanning process at the end of each signal. Specifications indicate that push buttons for each channel enable the receiver to be programmed for any combination of frequencies. This feature permits the receiver to hear both sides of a two-way conversation even though they may be conducted on two different frequencies. The front panel reportedly features ON/OFF/VOLUME and SQUELCH controls plus push buttons for automatic or manual reception. The back panel is said to be equipped with a standard auto antenna jack for use with external antennas. Its price of $159 includes power cords for ac or dc operation, 4-in. built-in speaker, detachable telescopic antenna and mobile mounting bracket. Regency.



TWO-WAY RADIO ANTENNA 701

Special mounting feature for level or slanted surfaces

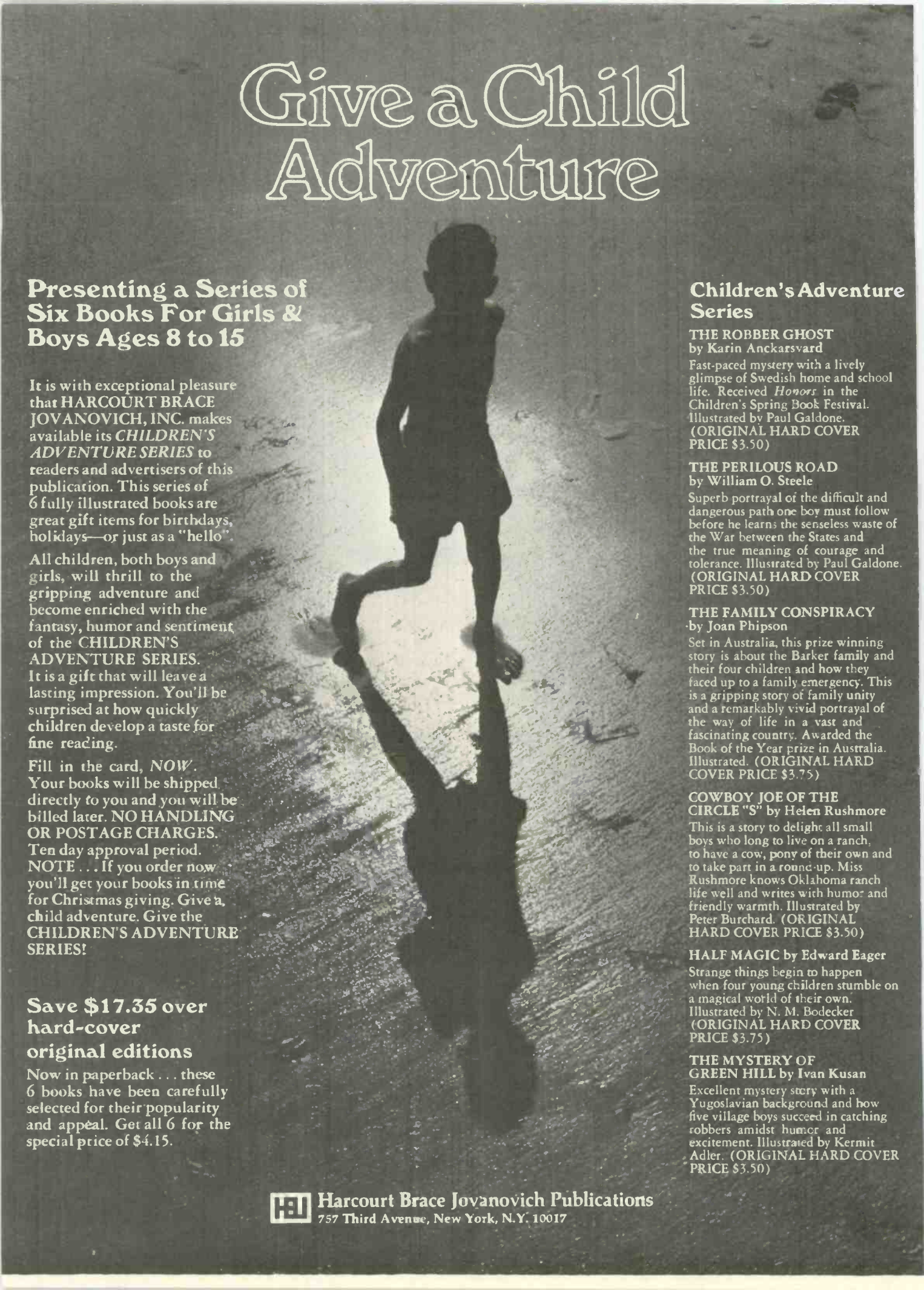
A citizens two-way radio mobile antenna designed for mounting on level or slanted surfaces reportedly features a swivel base and 90° vertical adjustment. Specifications indicate that the weatherproof antenna comes with 20 ft of coaxial cable and a connector. Price $20.95. Antenna Specialists.

FOAM TUNER CLEANER 702

Includes a plastic spray extension tube

"Magic Vista" foam tuner cleaner, which comes in an 8-oz aerosol can, is designed to clean, polish and lubricate TV tuner contacts without running off or evaporating. The aerosol can reportedly features a plastic spray extension tube for reaching into tight places and an any-angle constant discharge valve which functions in any position. Specifications indicate that the tuner cleaner is safe for plastics. Price per can $3.85. GC Electronics.

Give a Child Adventure



Presenting a Series of Six Books For Girls & Boys Ages 8 to 15

It is with exceptional pleasure that HARCOURT BRACE JOVANOVICH, INC. makes available its *CHILDREN'S ADVENTURE SERIES* to readers and advertisers of this publication. This series of 6 fully illustrated books are great gift items for birthdays, holidays—or just as a "hello".

All children, both boys and girls, will thrill to the gripping adventure and become enriched with the fantasy, humor and sentiment of the CHILDREN'S ADVENTURE SERIES. It is a gift that will leave a lasting impression. You'll be surprised at how quickly children develop a taste for fine reading.

Fill in the card, *NOW*. Your books will be shipped directly to you and you will be billed later. NO HANDLING OR POSTAGE CHARGES. Ten day approval period. NOTE . . . If you order now you'll get your books in time for Christmas giving. Give a child adventure. Give the CHILDREN'S ADVENTURE SERIES!

Save $17.35 over hard-cover original editions

Now in paperback . . . these 6 books have been carefully selected for their popularity and appeal. Get all 6 for the special price of $4.15.

Children's Adventure Series

THE ROBBER GHOST
by Karin Anckarsvard

Fast-paced mystery with a lively glimpse of Swedish home and school life. Received *Honors* in the Children's Spring Book Festival. Illustrated by Paul Galdone. (ORIGINAL HARD COVER PRICE $3.50)

THE PERILOUS ROAD
by William O. Steele

Superb portrayal of the difficult and dangerous path one boy must follow before he learns the senseless waste of the War between the States and the true meaning of courage and tolerance. Illustrated by Paul Galdone. (ORIGINAL HARD COVER PRICE $3.50)

THE FAMILY CONSPIRACY
by Joan Phipson

Set in Australia, this prize winning story is about the Barker family and their four children and how they faced up to a family emergency. This is a gripping story of family unity and a remarkably vivid portrayal of the way of life in a vast and fascinating country. Awarded the Book of the Year prize in Australia. Illustrated. (ORIGINAL HARD COVER PRICE $3.75)

COWBOY JOE OF THE CIRCLE "S" by Helen Rushmore

This is a story to delight all small boys who long to live on a ranch, to have a cow, pony of their own and to take part in a round-up. Miss Rushmore knows Oklahoma ranch life well and writes with humor and friendly warmth. Illustrated by Peter Burchard. (ORIGINAL HARD COVER PRICE $3.50)

HALF MAGIC by Edward Eager

Strange things begin to happen when four young children stumble on a magical world of their own. Illustrated by N. M. Bodecker (ORIGINAL HARD COVER PRICE $3.75)

THE MYSTERY OF GREEN HILL by Ivan Kusan

Excellent mystery story with a Yugoslavian background and how five village boys succeed in catching robbers amidst humor and excitement. Illustrated by Kermit Adler. (ORIGINAL HARD COVER PRICE $3.50)

Harcourt Brace Jovanovich Publications
757 Third Avenue, New York, N.Y. 10017

TEKLAB REPORT

The Duramodule offers greater serviceability for the receiver's integrated color processing circuits

Zenith's 4B25C19 Color-TV Chassis

by Joseph Zauhar

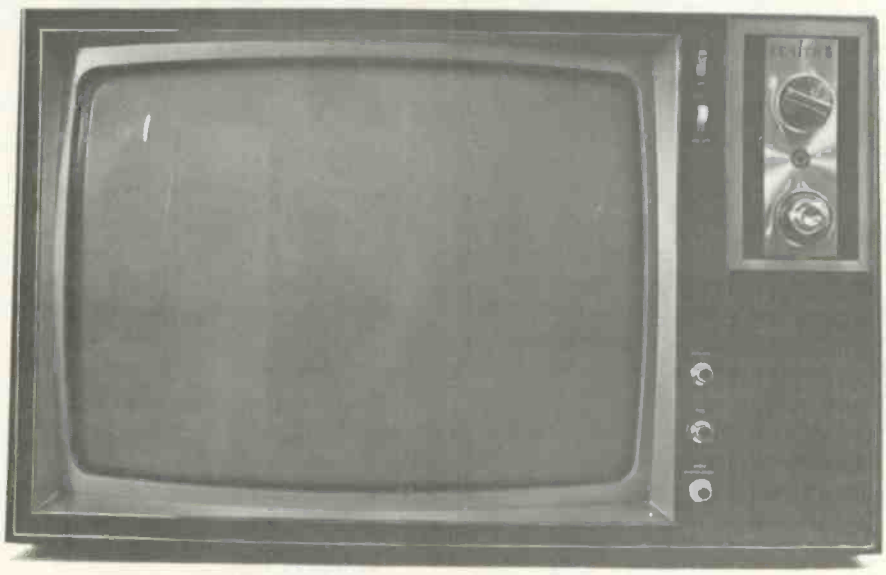
■ Consumer products have employed a substantially greater number of integrated circuits, especially in the field of color TV—as reflected in this compact receiver. The chroma demodulation, chroma amplifier and carrier regenerator currently employed in this chassis incorporate the use of such circuits.

This all new compact chassis revealed a number of interesting features, and its compact size (it has a 19-in. diagonal screen) should make the TV receiver popular for apartments or as a second set.

The hybrid 25kv chassis is horizontal in construction and mounts three of its four IC's on three Dura-Modules as follows: the Chromatic Brain color demodulator and chroma amplifier circuits; the 3.58MHz subcarrier regeneration circuits; and the sync and AGC circuits. The fourth IC—a sound IF and detector—is located on the chassis.

This chassis employs a solid-state, high-voltage-tripler rectifier system, 21 transistors and 4 tubes. Tubes are used in the horizontal output, damper, vertical output, horizontal oscillator and driver circuits.

From a technician's standpoint, we found the chassis very easy to service. After laying the set on its side, removing the back cover and a small plate under the chassis, all components were accessible. Most servicing can be accomplished by using one standard ¼-in. nutdriver. Plastic tabs are placed under the



Zenith's Model B4030 Color-TV set employing the 4B25C19 chassis.

modules for easy removal. If chassis removal is required, all wires to tuners and controls have plug-in connectors and all of the semiconductors are plugged into sockets simplifying servicing. The Dura-Modules panels are the snap-in type.

There are a number of new circuits employed in this new chassis.

SYNC., AGC, AND NOISE GATE

This module, containing six transistors and associated circuitry, performs three separate circuit functions, which are to a degree related to one another as shown in Fig. 1.

CHROMA AMPLIFIER

The Chroma Amplifier section of this chassis consists of a combination of discreet components and an integrated circuit (IC) mounted on a duramodule. Chroma information enters the circuit at terminal T13 (from test point C1) and couples to an input matching network consisting of two 47pf capacitors, a 470Ω resistor and a 25K potentiometer, which functions as a crosstalk adjustment. The crosstalk adjustment is performed while viewing color bars on the CRT screen and adjusting for optimum sharpness of both leading and trailing edges (sides) of the color bars.

A tapped coil connected between the two 47pf capacitors (C901 and C902) and ground provides for proper band-pass filtering (Fig. 2). The chroma signal is coupled from the coil tap through a 220pf capacitor (C903) to terminal 2 of the integrated circuit (Chroma Amplifier). The integrated circuit consists of a number of differential amplifiers which amplify the chroma signal. The chroma signal exits from the integrated circuit at terminal 6, couples through the Color Commander control (R312), a 0.0047μf capacitor (C225), tapped coil (L211), and re-enters the IC through a 220pf capacitor (C909) at terminal 7. Following further amplification and processing within the IC, the chroma signal exits from the IC at terminal 9 and couples to a transformer (L902) through a 200pf capacitor (C913).

The Chroma Level, and Killer Threshold controls are dc bias adjustments for the transistorized circuitry within the IC. The affect and adjustment procedures of both controls is the same as on the previous chassis. Shorting across test points K and KK defeats the color killer function and "opens" the color channel for continuous color operation.

The coupling transformer (L902) at terminal 9 of the Chroma Amplifier IC couples the chroma signal (push-pull) to terminals 3 and 4 of the Chroma Demodulator IC. The chroma signals at these two terminals are separated by 180°. The tap on the secondary coil of the transformer is held at ac ground potential through the 0.01μf capacitor (C914). Proper damping of the transformer is provided by the 2.7K resistor (R918) across its primary winding.

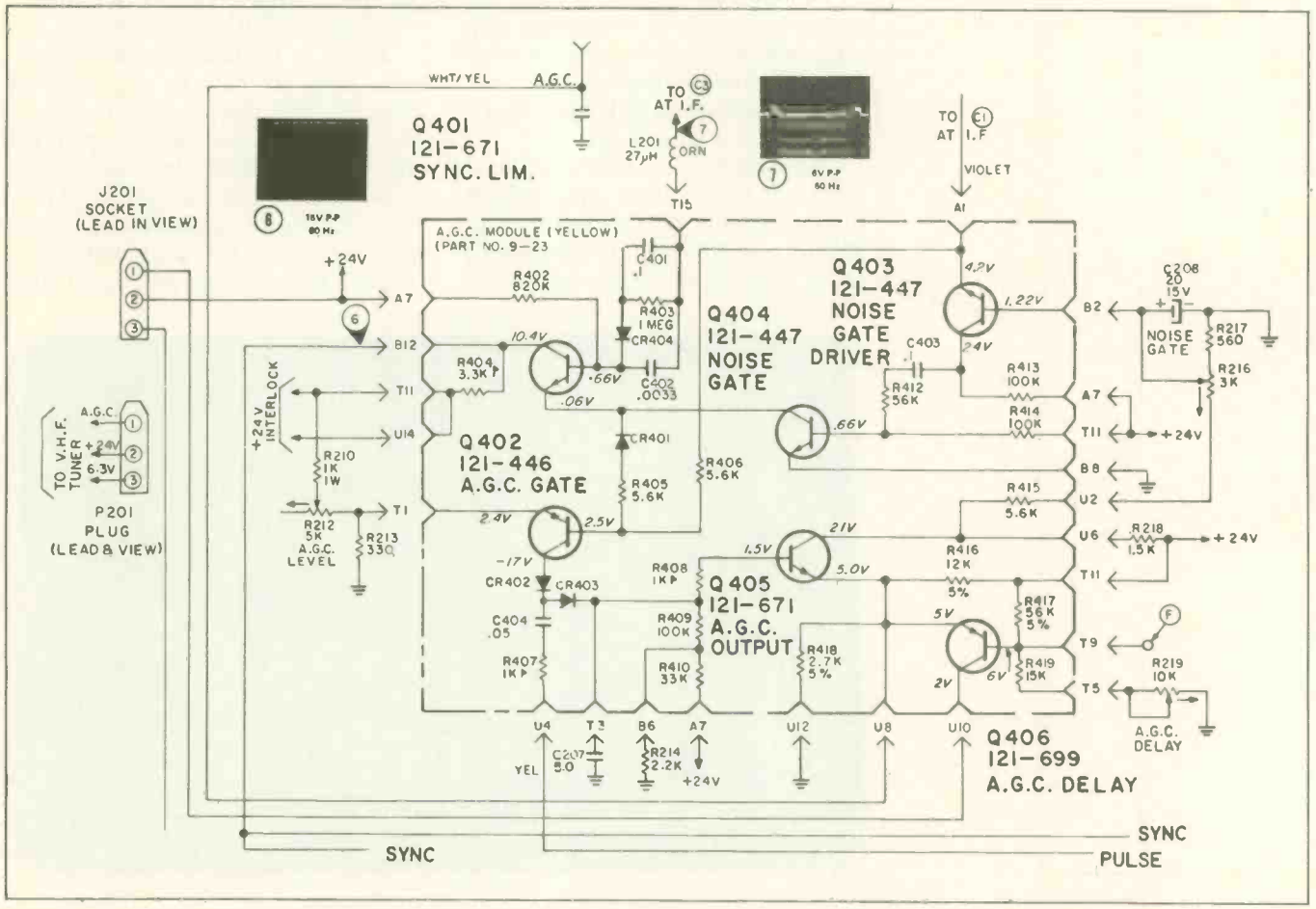


Fig. 1—The Sync, AGC and Noise Gate module, containing six transistors, performs three separate circuit functions.

CHROMA DEMODULATOR

The Chroma Demodulator IC is essentially the same as that used on previous chassis except for its physical construction which, like the Chroma Amplifier and Subcarrier Regenerator Integrated Circuits, is contained in an in-line multiterminal package that plugs into its associated socket.

The 3.58MHz CW (continuous-wave) injection signals for demodulation are coupled with the Subcarrier Regenerator circuits (Fig. 2) to terminals 6 and 7 of the IC demodulator through two 470pf capacitors (C918 and C919). Terminal 6 receives a 3.58MHz CW signal which is of —(R-Y) phase while terminal 7 receives a 3.58MHz signal which is of —(B-Y) phase. The CW injection signals are separated by 105°. The output signals from the demodulator are color video signals which represent a 105° demodulation axis. A —(B-Y) output appears at terminal 13, a —(R-Y) output appears at terminal 11 and a —(G-Y) output appears at terminal 9. Equal output load resistors appear in all three output circuits (2.2K and 1K resistors).

SUBCARRIER REGENERATOR

Low level chroma information appearing at test point Q is coupled through the "Normal-Align" switch to the junction of the 50pf and 12pf capacitors (C1003 and C1004) and enters the Subcarrier Regenerator IC at terminals 13 and 14 (Fig. 2). The capacitors mentioned and asso-

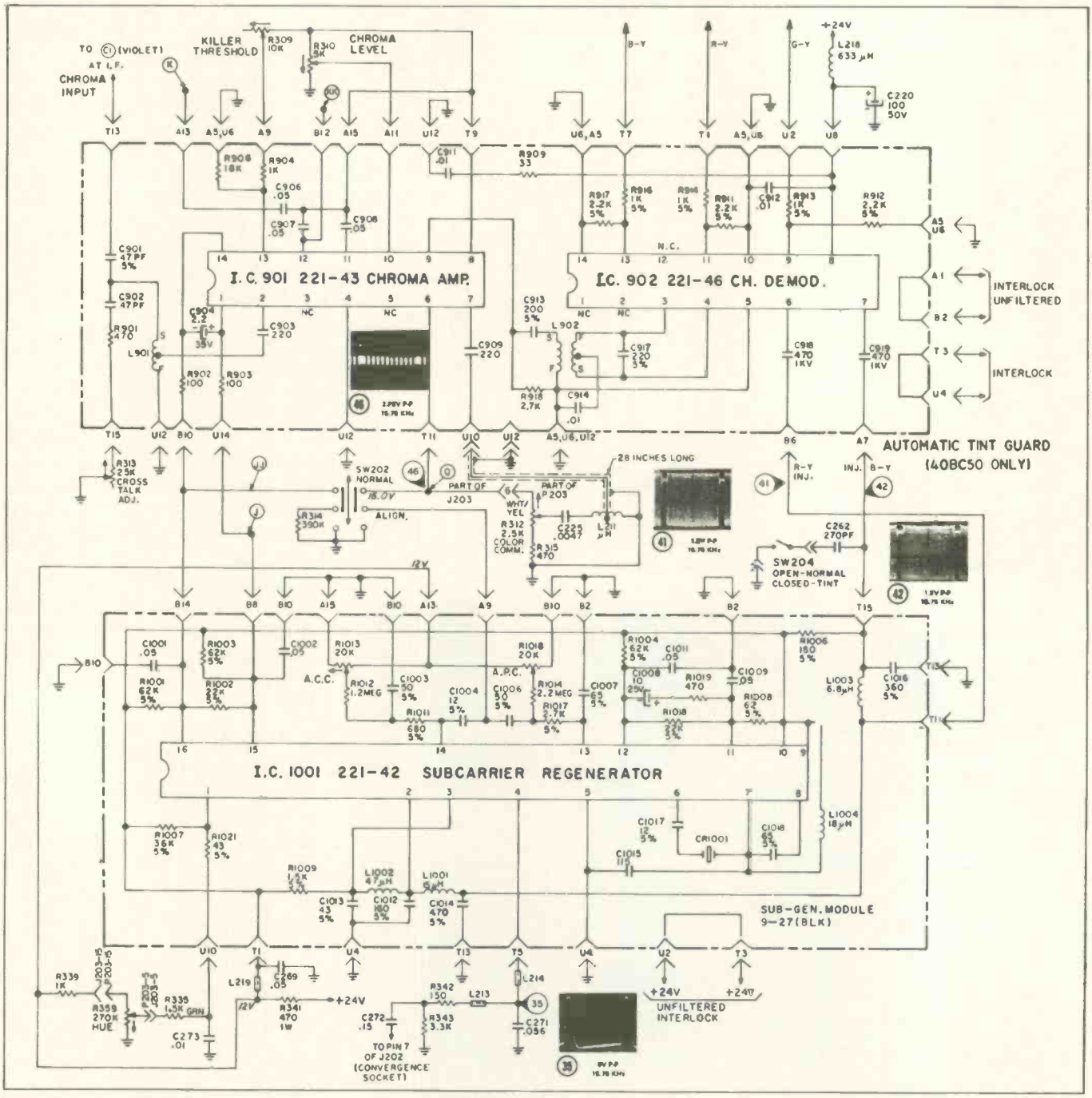
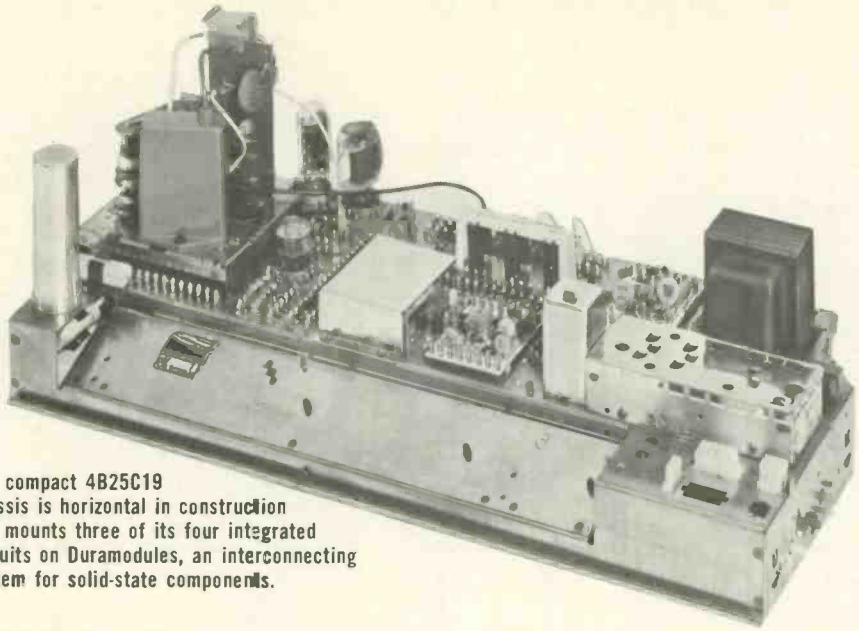
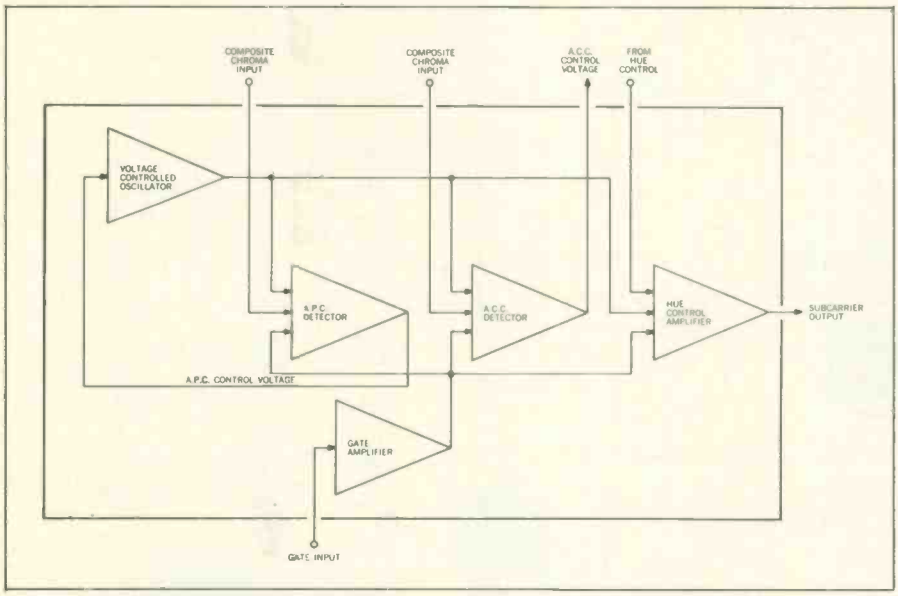


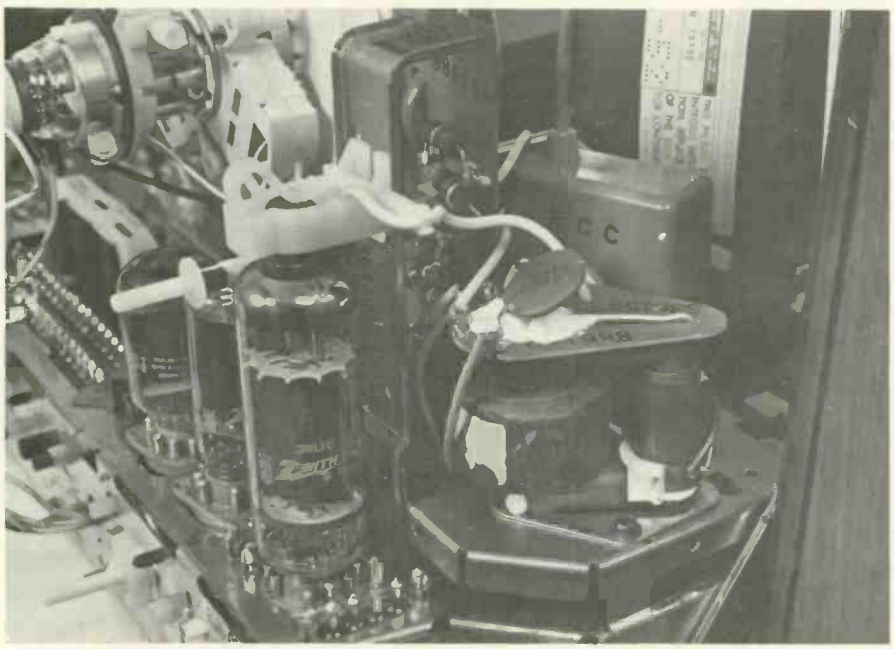
Fig. 2—The color processing circuits employed in Zenith's 4B25C19 chassis.



The compact 4B25C19 chassis is horizontal in construction and mounts three of its four integrated circuits on Duramodules, an interconnecting system for solid-state components.



Shown in the block diagram are the subcarrier regenerator circuits.



The high-voltage tripler circuit is of a "solid-state" design.

ciated circuitry form a quadrature network to provide the proper phase angle of the burst signals for developing ACC and APC (automatic phase control) voltages. ACC voltage, developed within the IC, appears across terminals 15 and 16 (test points J and JJ). Normal ACC voltage is very low in this particular design, approximately 0.035v. APC voltage, developed within the IC appears across terminals 11 and 12 and is applied to the oscillator section within the IC. Terminal 6 is the oscillator input while the oscillator output (3.58MHz CW) appears across terminals 7 and 8.

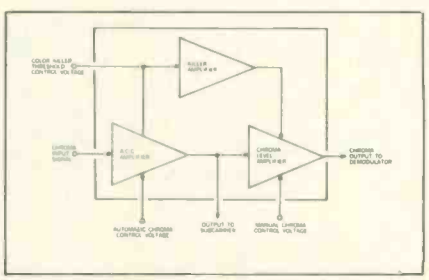
The subcarrier output signal appears across terminals 2 and 3 and is coupled to a phase delay network [15μh and 47μh coils (L1001 and L1002) and associated capacitors]. A Hue control, which functions as a dc bias adjustment, controls the phase of the subcarrier output signal, which is processed within the IC. The Hue range is approximately $\pm 45°$.

The subcarrier signal appearing at the 18μh coil (L1004) is of —(R-Y) phase and is coupled to a 6.8μh coil (L1003). From this point, the signal is injected into the Demodulator. The 6.8μh coil and 360pf capacitor (C1016) delay the subcarrier signal 105° to a —(B-Y) phase and couple the signal into the Demodulator.

A gating pulse for burst gating is coupled into terminal 4 from the horizontal sweep circuitry. The pulse is properly delayed and has a peak-to-peak value of approximately 7v to 10v.

APC AND ACC CONTROLS

The Normal-Align switch is used only when adjusting the APC and ACC controls. To adjust the APC control, a color bar pattern is tuned



Block diagram of the chroma amplifier IC employed in the color processing system.

in on the receiver. The switch is placed in the "Align" position (removing incoming burst and chroma) and the APC control is adjusted for minimum movement of color bars through the picture. This procedure is similar to that performed on previous chassis where the reactance coil was adjusted for this result.

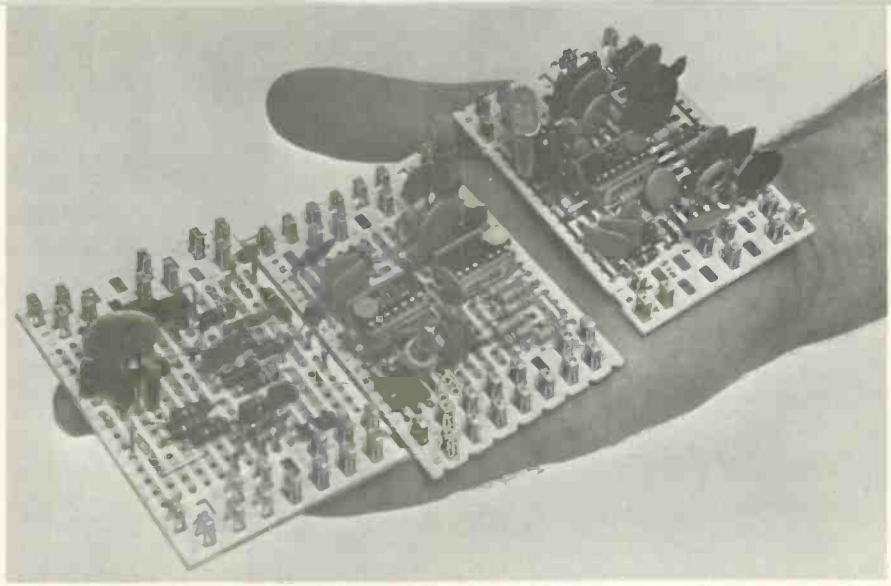
To adjust the AGC control, the switch is placed in the "Align" position and a voltmeter connected from test point Q to ground. Then, while alternately "shorting" and "opening" the contacts across test points J and JJ, the ACC control is adjusted until no change in voltage measurements occurs whether test points J and JJ are shorted or open. The ACC output voltage (approximately 0.035v) appears across terminals 15 and 16 of the Subcarrier Regenerator IC and is coupled to the Chroma Amplifier IC at terminals 1 and 14. The APC voltage appearing across terminals 11 and 12 is used internally in the Subcarrier Regenerator IC for oscillator control (Fig. 2).

PINCUSHION CORRECTION

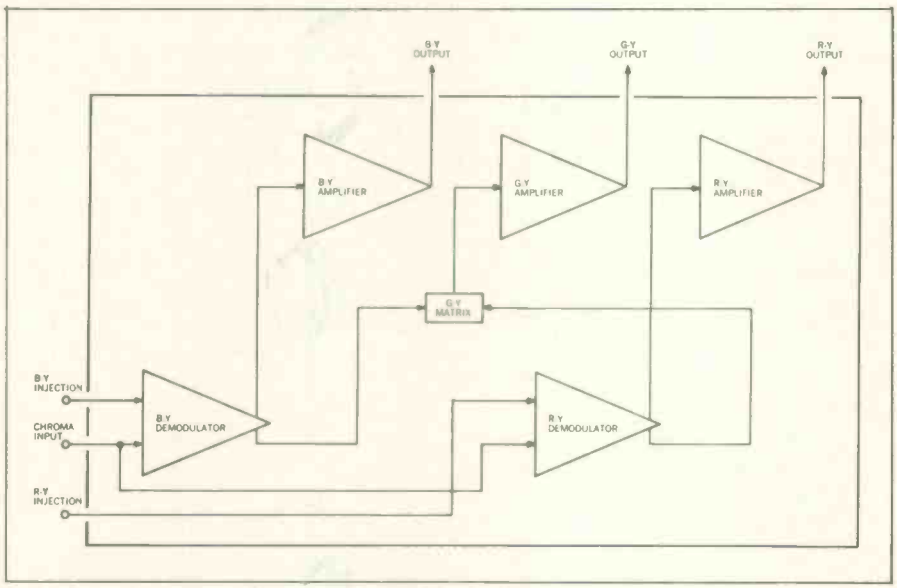
The pincushion circuit shown in Fig. 3 utilizes a saturable coil technique consisting of specially shaped ferrox-cube E-cores with windings on all three cores. The center winding, which is used for control purposes, is connected in series between the vertical deflection coils, while the outer windings (being the controlled load impedance) are connected in series with the horizontal deflection coils and in series with each other. Connecting the two outer windings in series and in opposite direction minimizes interaction between the control and load windings. However, interaction only remains low as long as the core saturation is very low. At higher core saturations, interaction does occur and is used to simultaneously obtain the required "top-bottom" and "side" pincushion corrections.

BRIGHTNESS LIMITING

This chassis incorporates a brightness limiter circuit which functions to reduce any tendency toward picture blooming should the picture tube draw excessive current. This is accomplished by "sensing" an increase or decrease in beam current



The three Duramodules, employing integrated circuits, provide a new approach to color oscillator circuits and are small in size.



Block diagram of the color demodulator integrated circuitry.

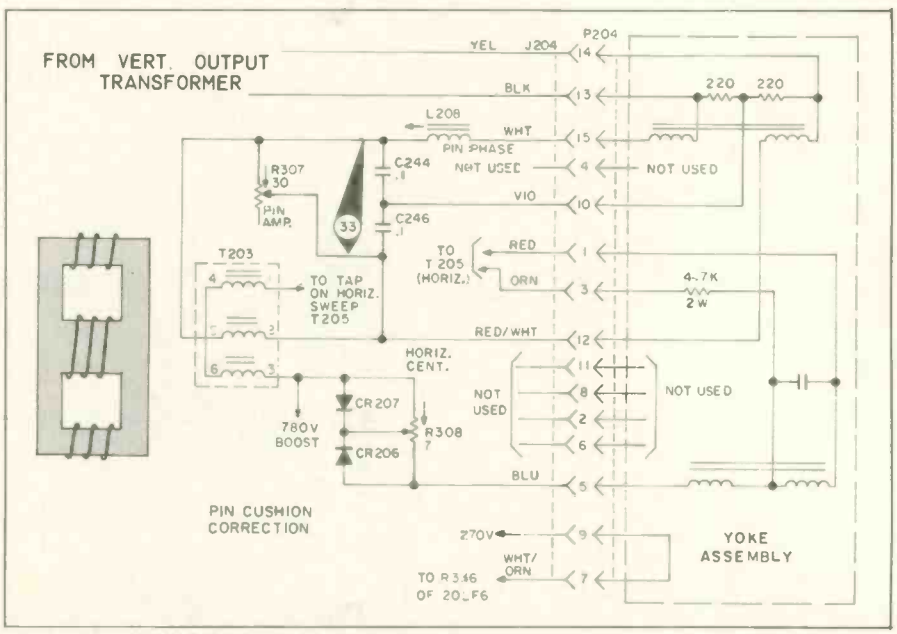


Fig. 3—The pincushion circuit utilizes a saturable coil consisting of a specially shaped ferrox cube with windings on all three cores.

at the high-voltage rectifier (tripler unit). Should beam current increase, the current through the brightness limiter control will also increase and increase the voltage drop across the control. Since the arm of the control is connected to the base of the brightness-limiter transistor, any increase in voltage will increase the forward bias on the Limiter transistor. Thus, the transistor will draw more current and its internal resistance (collector-to-emitter) will decrease. Its collector voltage will decrease and cause a decrease in the forward bias arrangement for the second video amplifier. A zener diode at the base of the Limiter transistor protects the circuit and transistor should an arc occur within the picture tube to cause excessive limiter current. The brightness limiting function also prevents excessive current from being drawn through the HV Tripler unit. Essentially, the maximum current limit is approximately 1.5 ma.

HIGH-VOLTAGE TRIPLER RECTIFIER

The high-voltage rectifier unit used in this chassis is of a solid-state design incorporating a tripler circuit configuration. Pulses from the sweep transformer (approximately 8.33kv) are coupled to the "tripler" input. These pulses cause the capacitors within the unit to charge in such a manner that their voltages become "stacked" to provide the tripling action and produce the required 25kv. Essentially, the tripling action requires 4 or 5 pulses for the process to be complete.

Different tripler units of several physical shapes and sizes may be used in this chassis. However, they are all universally interchangeable mechanically. Electrically, however, some units require one capacitor connected externally. This capacitor is connected internally in one of the units. A schematic of the HV circuit is shown in Fig. 4. ■

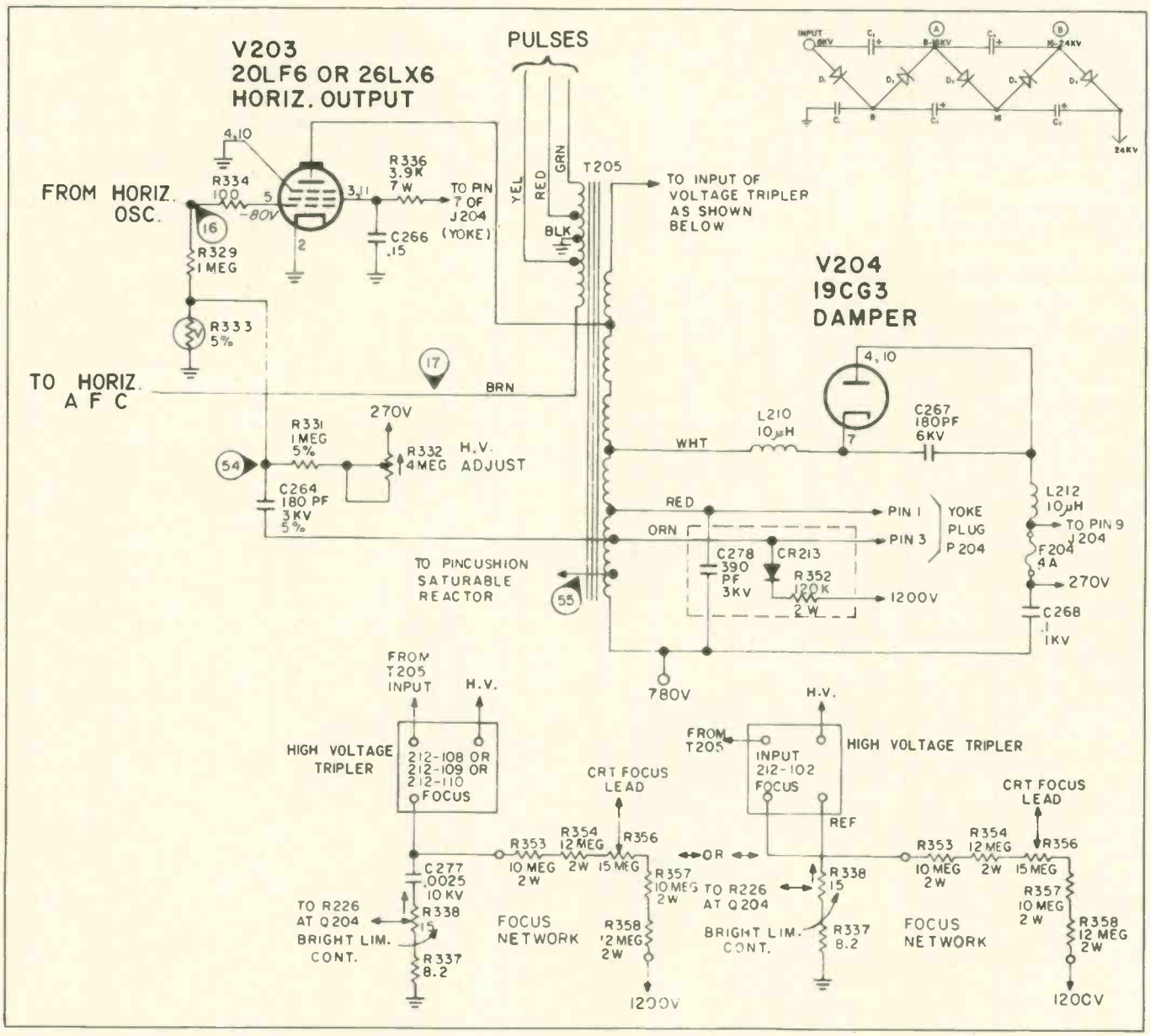


Fig. 4—The high-voltage circuits employed in the 4B25C19 chassis.

Television Circuit Review For 1971

by Joseph Zauhar

Larger picture tubes, extended warranties, all-electronic varactor tuning, and all solid-state modular chassis, are playing a major role in TV sets for the coming year

■ Many of the new features incorporated in 1971 TV sets may give our present sagging color set sales a boost and get customers back into the purchasing mood.

Most TV set manufacturers have already shown their new television line, which appears slanted at simplifying customer adjustments—automatic tint, color control, and automatic fine tuning—all aimed at preventing minor adjustments between channel changes or program variations.

Some feel that the new 25-in. diagonal CRT will stimulate the sales of large screen consoles with a better profit margin.

The black-matrix or black-surround phosphor picture tubes are now found in Sylvania sets in addition to Admiral, RCA and Zenith. The new square cornered tubes have an aspect ratio of four by three, the same as the transmitted image.

The Magnavox chassis T950 has a new color killer and automatic chroma control circuits.

Motorola introduces the "Q-Vue" VHF/UHF electronic all channel tuner, featuring a mechanism for automatic programming a combination of up to 13 VHF/UHF channels.

Electronic pushbutton tuning and a high-voltage tripler are employed in the Sylvania's first all solid-state color-TV chassis.

Zenith introduces its 40BC50 color chassis, which employs all solid-state devices and employs five Duramodules.

We will review some of the features and circuits employed in the new television sets, and a more detailed circuit description will be given on various new color-TV sets as they appear in the Teklab Report each month.

MAGNAVOX

The T950 and T951 chassis are among those recently introduced for the coming year. They incorporate changes in circuitry along with new mechanical features. A new solid-state automatic fine tuning circuit has been included. A four-function remote control system has been designed for the T950 chassis and an eight-function for the deluxe T951 chassis, though most of the new circuits are found in the T950 chassis. The major changes in the chroma circuits include a new color killer circuit, a new automatic chroma control (ACC) circuit, and a difference in the way the burst amplifier receives its input signal.

Chroma Circuits

The output signal from the bandpass amplifier is developed across the color control, as shown in Fig. 1. From the color control, the chroma signal is coupled through an amplifier on the automatic tint control (ATC) board to the color demodulators. The chroma signal is also coupled from the color control to a chroma detector and the burst amplifier. A dc voltage is developed in the output of the chroma detector, which is used to control the gain of the bandpass amplifier for automatic chroma control (ACC).

The burst amplifier is gated ON by a horizontal retrace pulse to separate the burst signal from the chroma information. The amplified burst signal appearing at the output of the burst amplifier is coupled to the 3.58MHz oscillator and to the burst detector. The burst detector produces a dc output voltage that is proportional to the amplitude of the burst signal. This dc voltage, along with the dc output voltage from the

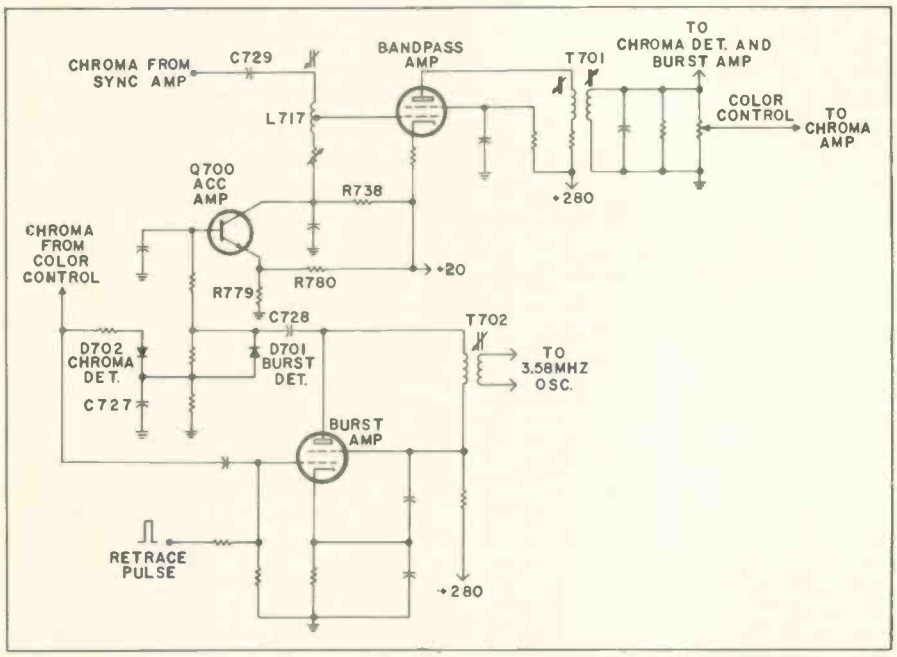
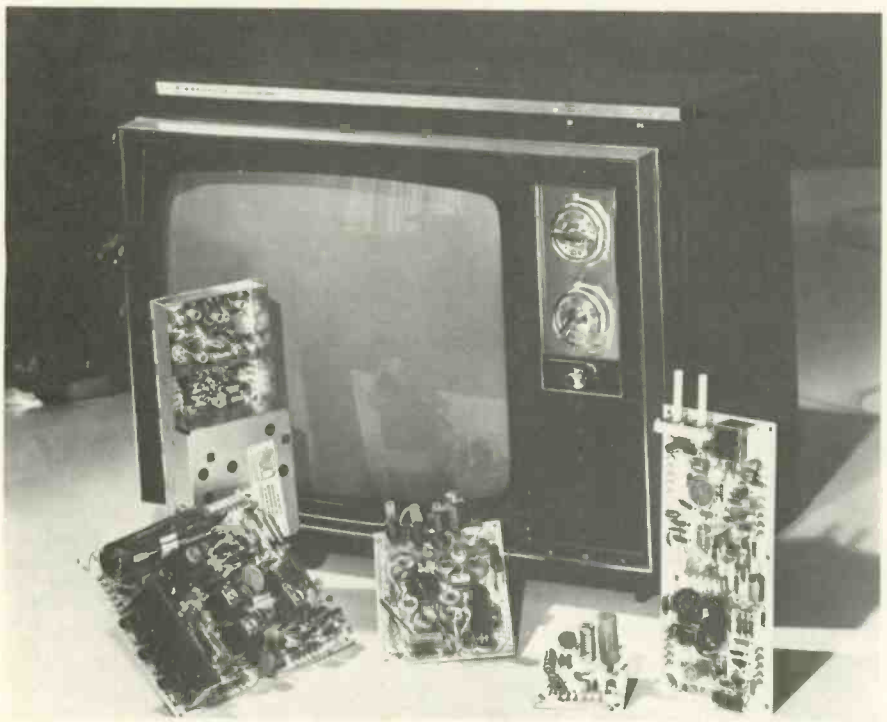


Fig. 1—Schematic of the chroma amplifier circuits employed in the Magnavox T950 color chassis.



Motorola's Model WP465G Quasar color-TV set with a modular chassis employing five mini-circuits.

chroma detector, is coupled to the ACC amplifier. The amplified voltage, in turn, controls the bias of the bandpass amplifier to maintain a relatively constant chroma output signal.

The color killer circuit turns on the chroma amplifier when burst is received so that the color information can be amplified. The chroma amplifier is cut off when there is no burst signal present. When a color signal is tuned in, the presence of the burst signal in the 3.58MHz oscillator grid circuit produces a negative-going dc voltage which controls the conduction of the killer driver, the killer amplifier, and the chroma amplifier.

The color killer circuit in the T950 chassis turns ON or cuts OFF the chroma amplifier on the ATC board (Fig. 2). In older chassis, the bandpass amplifier is controlled by the color killer circuit. Since the burst signal is taken off at the output of the bandpass amplifier in the T950 chassis, it becomes necessary to connect the killer circuit to the chroma amplifier stage.

The adjustment of the color killer control is the same as for previous killer circuits. The tuner is set to an unused channel and the control adjusted until colored snow just disappears. Then, switch to the weakest colored signal in your area to be sure that the color information is not attenuated or cut off completely.

Automatic Tint Control

The automatic tint control circuit is similar to the one used in the deluxe chassis during the past year. The principle of operation is the same, although several new circuit features have been added. The new circuit board is completely shielded as before, but it is now attached to the power supply bracket. The ATC switch uses a new method of diode switching with dc voltages. The preference control also uses dc to control the capacitance of a varicap, and a new adjustment is associated with the control that allows it to be mechanically centered for correct fleshtones.

MOTOROLA

The new Quasar is essentially the same receiver that has been used over the past three years.

Five models in the deluxe Quasar color-TV group include a new 25-in. rectangular "square corner" CRT which gives more picture area with the proper aspect ratio of vertical to horizontal viewing.

These units have all the features of the deluxe Quasar color, including push button UHF tuning, slide-action controls for hue and intensity, automatic fine tuning and a fully solid-state chassis, including the solid-state high-voltage rectifier. The deluxe Quasar has line voltage regulation in the event of fluctuating line voltage.

The "Q-Vue" VHF/UHF electronic all-channel tuner appears in two top-of-the-line deluxe Quasar consoles and two color TV Stereo combination instruments. The "Q-Vue" features a mechanism for automatic programming of a combination of up to 13 VHF/UHF channels. And the tuner couples a UHF all electronic varactor tuner and a VHF detent tuner.

A new concept of tuning the UHF television band is accomplished in this tuner with varactor diodes (varicaps). Four varicap diodes tune the resonant lines throughout the UHF band.

The antenna input circuit is tuned by varicap diode D1 and tuned line L2 as shown in Fig. 3. Tuned circuits for the RF Amplifier, and mixer (bipolar transistors), include D2 and L5 for the RF Amplifier, and D3 and L9 for the mixer stage. The transistorized oscillator stage is tuned by D4 and L11.

The varicap diode capacity is a part of the tuned circuit. When a varicap is reverse biased or is nonconductive, it has the characteristics of a capacitor. Its capacity varies inversely with the value of reverse bias applied. A low value of reverse bias causes a larger capacitance while a large reverse bias voltage decreases the capacity.

A dc voltage of 95v is applied through a resistor to a 33v temperature compensated Zener diode D6 (Fig. 3). Variable resistor R1 is one of thirteen resistors connected between the 33v regulated source and ground. Voltage at the arm of the control provides reverse bias to the four varicap diodes. Adjusting the variable resistors R1 to R13, varies the bias and changes the capacitance in the tuned circuit to a specific channel.

The IF Amplifier receives the 44 MHz IF signal from the UHF mixer Q3; it is amplified and passed to the emitter of the VHF mixer stage. To

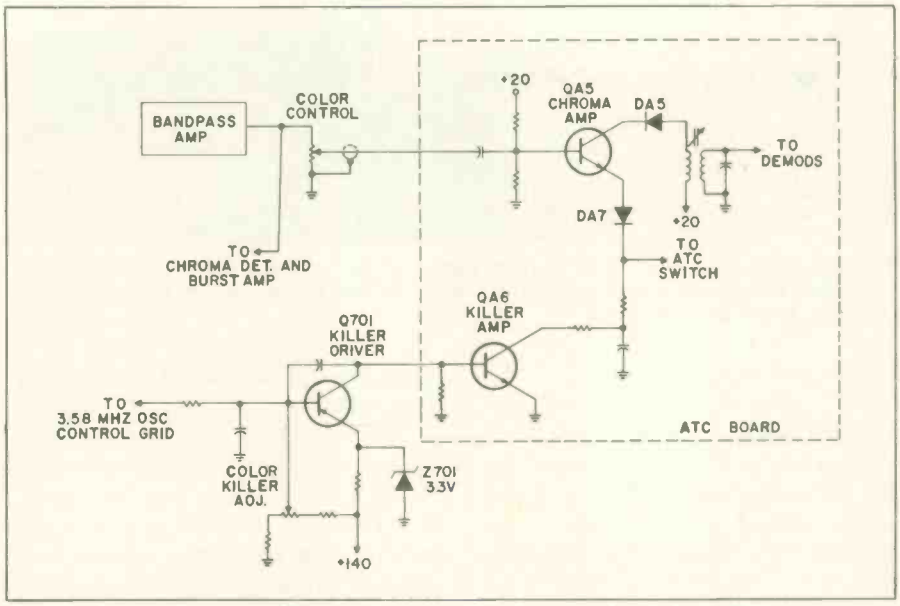


Fig. 2—Schematic of the color killer circuit used in the Magnavox T950 color chassis.

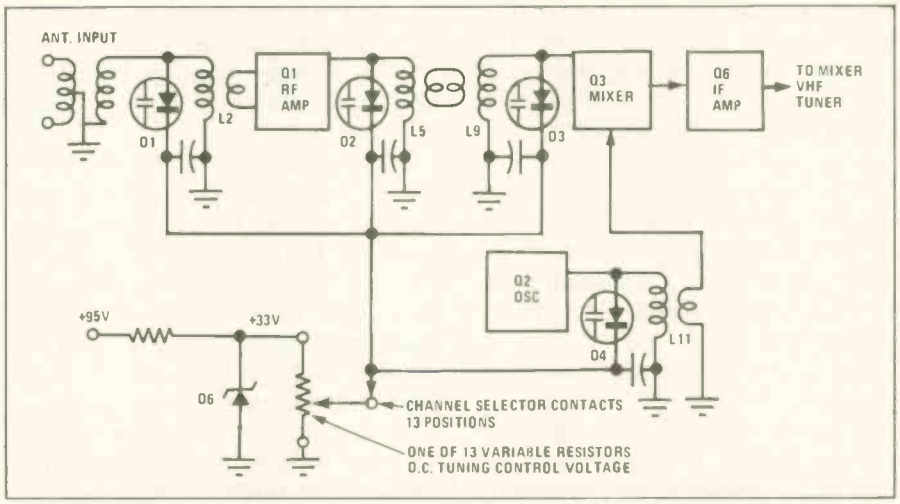


Fig. 3—Block diagram of Motorola's VHF tuner designed for tuning the UHF band with varactor diodes. Four varicap diodes tune the resonant lines throughout the VHF band.

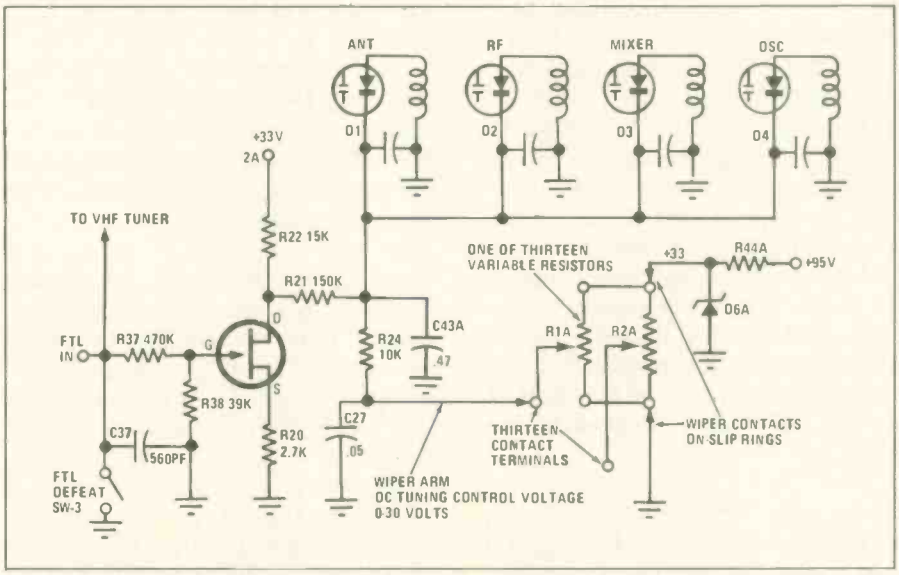


Fig. 4—Schematic showing the Automatic Fine Tuning (AFT) applied to the UHF tuner employed in the Motorola Quasar color TV.

maintain constant loading and minimize drift, all 13 variable resistors are placed across the 33v supply. These resistors are always in the circuit. A wiper contact removes the voltage from the arm of each variable resistor by means of contact switches in the circuit—one for each specific channel.

This wiper voltage is applied to four varicap diodes, reverse biasing them—the resultant capacity tuning the circuit to a specific channel.

Automatic fine tuning, applied to the oscillator of the VHF tuner, is also applied to the UHF tuner (Fig. 4). The AFT defect switch, when activated, grounds the AFT voltage allowing the UHF tuner to operate without external control.

The AFT voltage, in the area of ±2v, is divided by resistors R37 (470K) and R38 (39K), and about 10 percent of it is applied to the gate of an FET. The FET (Q5) is employed to maintain a high input and output impedance for minimum loading effect. The output voltage taken from the drain is dc coupled by resistor R21 (150K) to the varicap control voltage. If a change in AFC correction voltage occurs, a corresponding change in dc voltage to the varicap diodes tunes the circuits and maintains the proper frequency. The dc tuning control voltage will vary from 1.2v to 34.5v at the varicap diodes.

Motorola entered the 16-in. diagonal portable field with two Quasar color-TV models that use the TS929 chassis. The model WP465G has a chassis similar to that used in the previously introduced lead model, an 18-in. diagonal Quasar II color-TV portable set with the same five plug-in, plug-out mini-circuits and solid-state circuitry. A complete coverage of the circuits employed in the Quasar II can be found in ELECTRONIC TECHNICIAN/DEALER Teklab Report for May and June 1970.

Motorola has expanded its consumer registered guarantee to include one year labor—at no extra—in addition to the current parts guarantee on specified Quasar, Quasar II and Quasar portable color-TV sets unveiled in the 1971 product line.

Small screen portable TV sets featuring a swivel base and sculp-

tured continental styling highlights Motorola's monochrome line. Modular chassis construction for ease of service, headlines the large screen sector of the line. The modular series includes two 22-in. diagonal table models and one 22-in. diagonal console.

Motorola now has six models with the modular chassis in its B/W line.

SYLVANIA

Electronic pushbutton tuning and ease of servicing have been built into an all solid-state color-TV chassis introduced by Sylvania. It is the first all solid-state color chassis designed and manufactured by the company.

A solid-state high-voltage tripler assembly that eliminates the possibility of X-ray generation; 67 transistors; 2 integrated circuits; and 59 diodes are used in the new chassis. A total of 87 diodes are used in remote control versions.

Called the 100 percent Solid-State Gibraltar, the chassis is used in 12 color units in Sylvania's 1971 line.

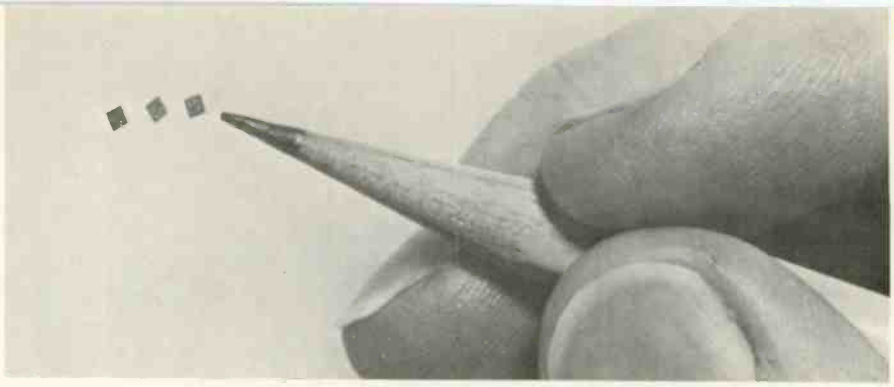
Electronic pushbutton tuning provides instant random access to all VHF and UHF channels with no moving parts in the tuner.

The tuner is operated by 11 pushbuttons and any button can be preset to any channel from 2 to 83. In areas with less than 11 available channels, stations may be repeated on the pushbuttons.

The silicon, high-voltage tripler, and a new 1400v deflection transistor, combine with other circuit elements to form the new Gibraltar chassis.

The high-voltage tripler is about the size of a pocket-size transistor radio and reportedly delivers more useful picture power than equivalent vacuum-tube circuits.

Vacuum-tube systems require that the flyback transformer generate pulses of at least 25v. The tripler requires only one-third the pulse magnitude, thereby relieving most of the stress on the flyback transformer. Other tripler advantages are said to include: elimination of any possibility of X-ray generation; less bulk through the elimination of the high-voltage cage, leading to a more compact set; optimum focus at all brightness levels; and the elimination of any warm-up time.



Three tiny chips of processed silicon, each no bigger than the head of a pin, are the heart of the first system of integrated circuits engineered to do the critical and complex job of decoding color information in a Zenith color-TV set.

The Gibraltar has a low power consumption of 200w, generating less heat, which helps to extend the life of components. A regulated power supply automatically compensates for variations in line voltage.

The four-stage IF amplifier in the new chassis incorporates a pole shifting feature that is designed to automatically adjust the set for available signal strength, thus providing optimum color performance and eliminating the need for fine-tune settings in fringe areas.

Increased picture brightness, without over-driving highlights, is said to be provided by a more linear video output circuit that makes dark gray and low-key color areas more distinct and visible.

The chassis also operates with an electronic "Chairside Control" remote control unit that uses memory devices instead of motor-operated mechanical controls. The electronic memory can "remember" control settings for up to six weeks, even if the set is not plugged in. The remote unit, which fits into a hand, performs five functions—ON, OFF, TUNING, VOLUME, and TINT.

The new Gibraltar was designed for ease of serviceability. Easily plugged-in components include transistors, tuning cluster, yoke, convergence circuit and speaker. The chassis is of flat-bed construction and all parts are readily accessible to the service technician through removable back and bottom panels. For a complete schematic, see this month's Tekfax Sylvania Schematic No. 1322.

ZENITH

Zenith's 1971 line of color-TV sets expands the choice of rectangular screen sizes to seven and introduces the 25-in. and 19-in. diagonal Chromacolor TV screens.

Introduced is a compact color chassis 4B25C19 with the following features: its chassis employs three Duramodules; a color section consisting of a subcarrier regenerator; chroma amplifier and demodulator which utilizes three IC chips for three functions; a new pincushion circuit, a high-voltage rectifier; brightness limiter and RGB system.

The circuits employed in this chassis are reviewed in this month's Teklab report.

Also introduced is the 40BC50 chassis which employs all solid-state devices, has five Duramodules, color circuitry identical to the 4B25C19 chassis, a new sweep transformer with fifth harmonic tuning, solid-state sweep circuits, regulated power supply, RGB system, and automatic hue circuit (automatic tint guard).

Many of the circuits are similar to the 4B25C19. Most of the changes are made in the solid-state horizontal output sections plus a number of special features, such as automatic tint guard which we will review.

The automatic tint guard feature of several 1971 Zenith color-TV sets permits the operator to select one of two different options from the color demodulator matrix. The selection is made by pulling out the hue control knob (a push-pull switch) or operating a slide switch (in certain models) to select the modified matrix. With the selection switch in the NORMAL or OFF position, the operation of the receiver is identical to that provided by the previous receiver line.

Modification of the color matrix is accomplished by closing the switch S_1, shown in Fig. 5. When S_1 is closed, a 680pf capacitor is connected in parallel with the 820pf ca-

pacitor and 68Ω resistor that provide the termination impedance for the demodulator injection phase shifting network. The result of adding the 680pf capacitor to the network is an increase in the angle between the R-Y and B-Y demodulator outputs and a decrease in the G-Y amplitude.

Operation of the switch from the normal to the modified position (while viewing a gated rainbow signal) will cause the blue bars to move to the observer's right and the red bars to move to the observer's left.

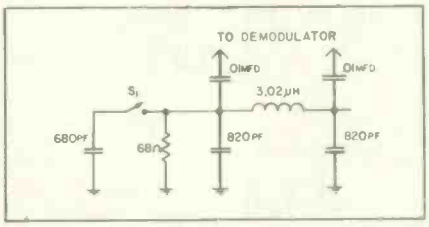


Fig. 5—The automatic tint guard employed in several Zenith color-TV sets permits the operator to select one of two different options of color demodulator matrix.

A new CRT socket is incorporated in the 40BC50 chassis. The new socket incorporates several resistors at the pin terminals of the CRT elements for improved arc protection. Should an arc occur in the picture tube, the energy would be dissipated across the resistor(s) near the source of the arc. Spark gaps are employed at each end of the resistors. If the arc energy is not completely dissipated by the first spark gap and resistor, the following spark gap would dissipate it.

A portion of the horizontal sweep circuitry in the 40BC50 chassis is mounted on a Duramodule. Stages include the horizontal phase comparator, AFC, oscillator, driver and saw-tooth shaper circuits. The horizontal output stage, shown in Fig. 6, flyback, damper, focus, and related circuits are chassis mounted. Customer and service adjustments are limited to horizontal hold and focus adjustments. The set contains no high-voltage adjustment. High-voltage regulation is accomplished by regulating the B+ and using a new type of flyback that is tuned to the fifth harmonic of the pulse frequency. This provides inherent regulation without a separate regulator stage.

Zenith has a line of 19 B/W television receivers, ranging from 12-in. diagonal portables to 22-in. diagonal consoles.

The Melbourne, a highlighted receiver, is a 19-in. diagonal portable model (B2044), featuring Zenith's Space Command "300" remote control system for VHF tuning.

The 12-in. B/W receivers in the line weigh 17 lb and have compact cabinets.

The Duramodule is used as a carrier and interconnecting system in four of the horizontal, vertical, AGC, and video circuits used in these 19-in. receivers. ■

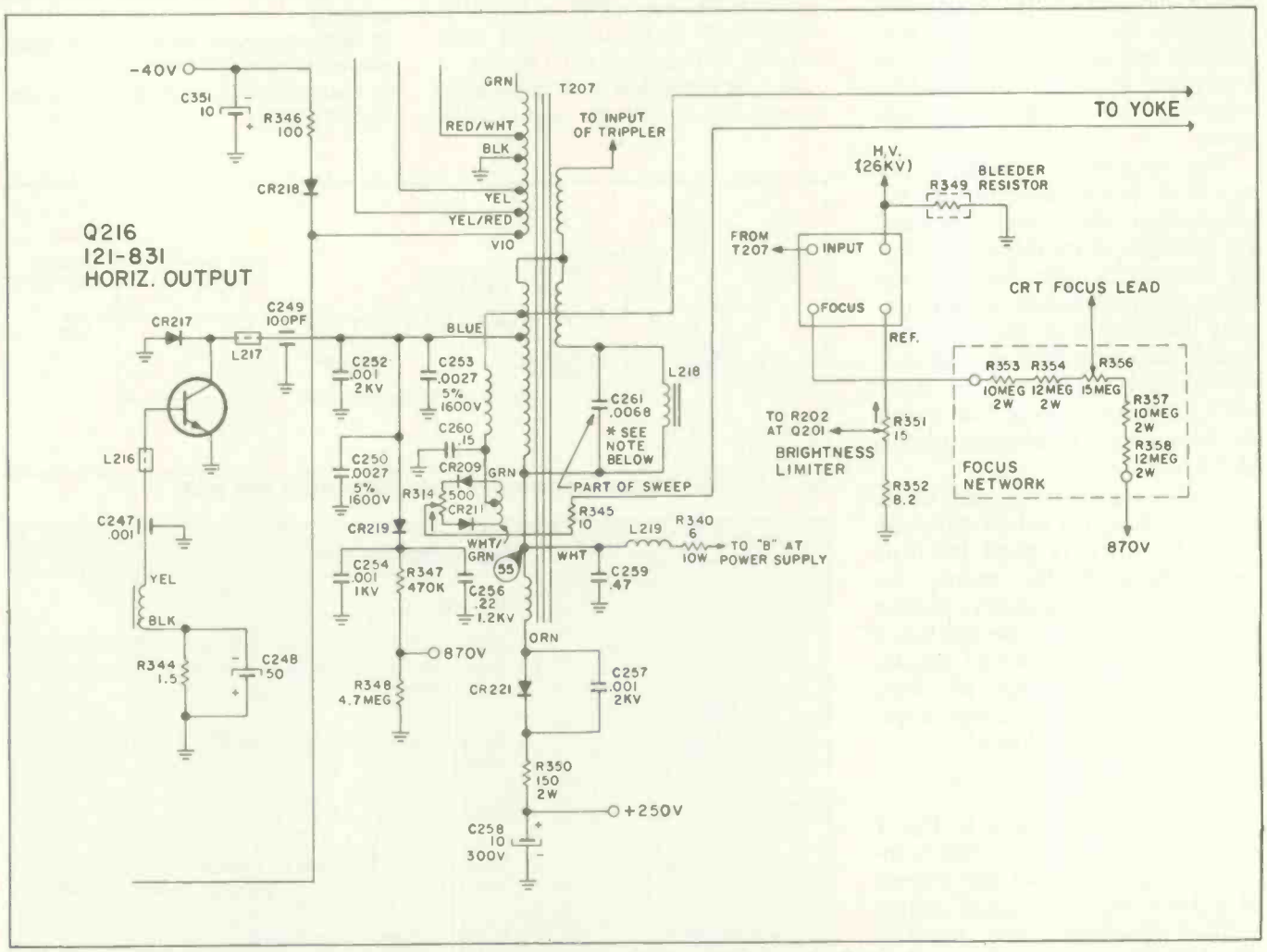


Fig. 6—Schematic of the horizontal sweep circuits employed in Zenith's 40BC50 solid-state color-TV chassis.

Servicing CCTV Systems

by C. A. Tuthill

Part II—Corrective maintenance techniques reduce system down time, increasing profits

■ Practical aspects of preventative maintenance for CCTV systems were presented in Part I as an aid in reducing the amount of actual repair or replacement required during corrective maintenance. Part II tells of tests for video and audio signal adequacy, the analysis of waveforms and performance evaluations.

TROUBLE SHOOTING

Test procedures and test equipment required to troubleshoot the major units in a CCTV system are generally described in the manufacturer's manuals. However, these instruments are not always available. The test instruments listed in Table I represent the minimum equipment necessary for corrective maintenance.

The isolation of a faulty section or unit is often expedited by the visual displays and speakers at hand. For example, if one display or monitor fails, while others function normally, the malfunction is automatically localized. If no picture is produced, but a normal raster appears, use a signal generator for signal tracing. (Signal tracing is described in more detail in another portion of the article.)

Faulty or aging tubes often create a malfunction. Try substitution with a tube known to be good, but if no improvement results, restore the original tube. If necessary, remove the faulty assembly to the test bench for voltage and resistance checks. But, before reverting to these checks, refer to the various waveforms shown in this article.

WAVEFORMS

The waveforms shown in Fig. 1 are arranged according to their complexity. Fig. 1A shows the absence of a horizontal sync signal during vertical blanking. The resulting waveform has completely random interlace. When trouble develops in such a system, you are on your own. Use a voltmeter to check all power supply and grid voltages, as they are critical here. Use your dated data file, described in the previous article, and check for proper voltages at all significant test points.

The waveforms in Fig. 1B shows that a definite timing relationship exists to more or less lock vertical and horizontal scanning. Here again, there are no actual synchronizing pulses, and this system is therefore limited to smaller or less complex applications. The trick is to make adjustments to reestablish the relationship shown when drift sets in.

A sync signal has been introduced in Fig. 1C to ride the top of each

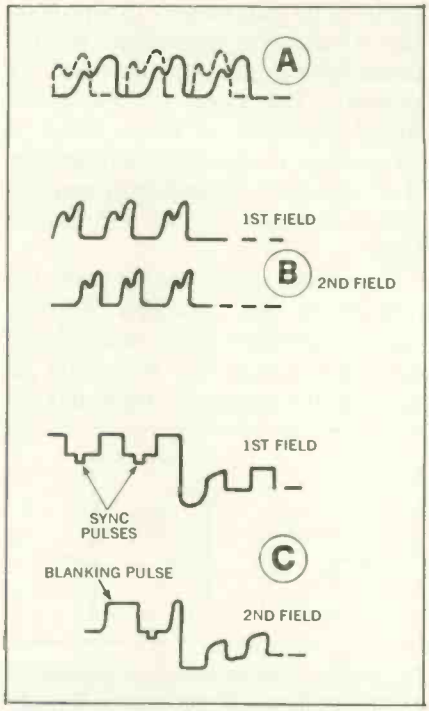


Fig. 1—Waveforms from CCTV systems shown in order of complexity.
(A) No interlace, no lock between vertical and horizontal.
(B) Vertical-horizontal timed scanning locked without deliberate sync pulses.
(C) Vertical-horizontal scanning locked by adding sync pulses.

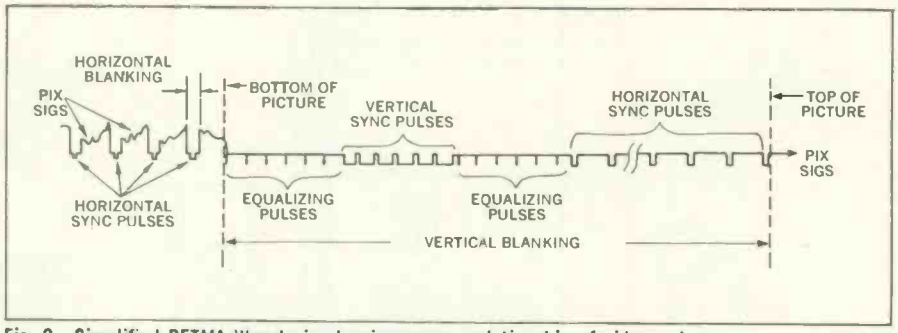


Fig. 2—Simplified RETMA Wavetrain showing proper relationship of video pulses.

Table I—Test Equipment

Equipment	Function
Oscilloscope	Indispensable for checking waveforms, adjusting waveforms, measuring pulse rise times and widths, and measuring voltages
Signal Generator	Signal tracing with modulated RF, IF and audio test signals
Electronic Voltmeter	Measure voltages and grid biases
Video Sweep Generator	Measure signal amplitude as a function of frequency, provide a sweep or pulsed output from 100kHz to 10MHz
Typical Test Pattern	Overall or partial system check

horizontal blanking pulse. Adjust for the best possible pattern (referring to Fig. 2 and 3) to ensure synchronization.

Higher grade systems can approach or equal the performance indicated in Fig. 2. Here, in simplified form, the standards of RETMA video requirements are shown as a wavetrain to give the technician a picture of pulse comparisons, and what to expect on his scope.

A closer view of basic waveforms appears in Fig. 3. Note that the horizontal sync pulses are much shorter in duration and ride upon the blanking pulses. Also note that the rectangular vertical sync pulses exceed by far the duration of the horizontal pulses. This provides pulse width discrimination.

Adjust for the best possible conformance with the waveforms shown. But, remember that the system will function even when the waveforms obtained are not exactly like those desired. Remember also that obtaining the proper voltages from a regulated power supply is also a *must*. If the fundamental checks described here do not produce results, revert to voltage and resistance checks to locate and remove the faulty component.

VOLTAGE AND RESISTANCE CHECKS

Extreme caution is required when voltage and resistance checks are necessary to pinpoint a faulty component. RF circuits can cause bad burns, and high voltages are frequently exposed. The following suggestions should be followed:

- After determining that the power supply is producing the proper voltages, remove *all* power sources from the equipment to be tested.
- Remove all tubes from their sockets and remove any other unpluggable components. They should all later be returned to their original sockets.
- If point-to-point resistance charts have not been supplied by the manufacturer, develop one when time permits during normal operation.
- Many circuits contain parallel elements. Thus, to determine the true value of a resistor or a capacitor, it may be necessary to disconnect (unsolder) one end of the component. **Caution**—never unsolder or solder until the equipment is completely disconnected from all power sources.
- For a quick capacitor check, connect the capacitor in series with an ohmmeter. Note the ballistic kick from the charging current. Then substitute a checked capacitor of known value and compare.

When corrections cannot be obtained through the adjustment of internal variable controls, replace components as required and record in your dated files exactly what changes were made. This will expedite future repairs.

BASIC SYNC SIGNALS

Whether there is a simple sync generator or a sync separator in the system, use a scope and check all outputs with reference to your files, data from the vendor, and the information given in Fig. 2 and 3. Vertical and horizontal sync separation is accomplished through a complex resistor-capacitor network, with signals tapped off at the proper point. Functions of the sync generator were described in the previous article.

In combination, the picture, sync, blanking, and driving impulses comprise the overall or composite video. To trace sync signals from the composite video, connect the vertical scope input progressively through the sync circuits. Check the pulse shapes for hum, poor interlacing and horizontal irregularities. For the better systems there should be absolute synchronization of the horizontal and vertical sweep circuits.

SIGNAL TRACING

Signal injection from a standard signal generator serves well for signal tracing. Test connections are shown in Fig. 4. With this arrangement, a series of horizontal bars will

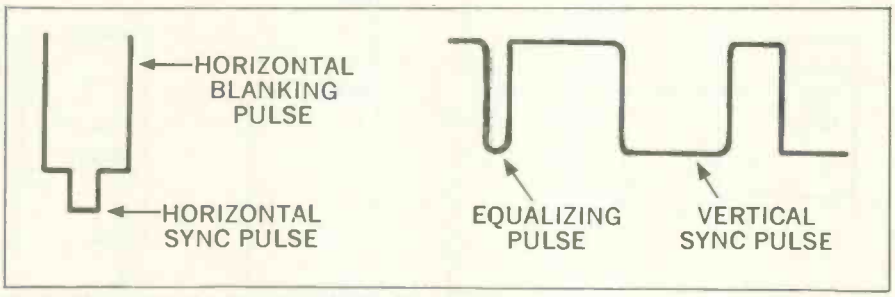
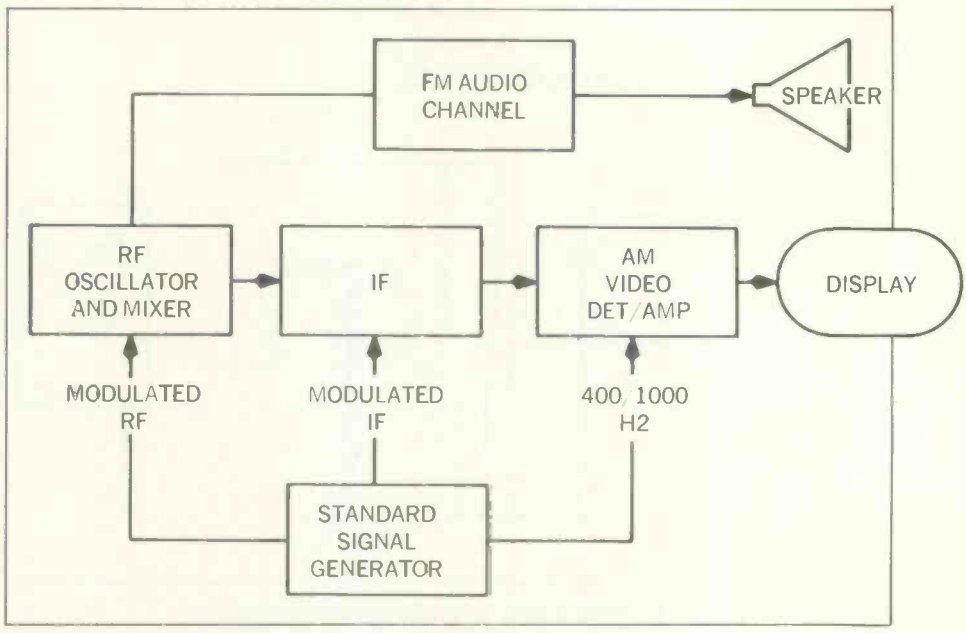


Fig. 3—Closer view of pulses shown in Fig. 2.

Fig. 4—Signal tracing arrangement for receiver-monitor.



appear on the display when a 400 or 1000Hz audio signal is injected into normal video circuits. If this pattern does not appear, check each stage individually. Replace tubes and check again before performing any extensive tests. If there is still no improvement, restore the original tubes to avoid the need for recalibration. If there is no output, or more likely an inadequate one, feed a signal of proper frequency into the faulty stage and measure the output with an electronic voltmeter or scope. Compare this measurement with the normal readings recorded in your card file. Then proceed with voltage and resistance checks until the defective component is pinpointed. Replace that component and make an entry in your dated file.

In the receiver RF and IF sections, the modulated test signals from the generator (Fig. 4) are applied to each amplifier stage from the IF section output back toward the input, until the faulty stage is obvious. The modulated signal injected into the IF section must be of the normal video IF amplifier frequency. Use the RF picture carrier frequency when checking the RF section. If necessary, follow this with tube replacement and/or voltage and resistance checks.

The electronic voltmeter used in earlier tests may also be used to check for proper negative voltages at the grid of an amplifier or oscillator tube, or from the FM sound detector.

Audio stage test connections are shown in Fig. 5. Use a sinewave input to check for individual stage clipping or overloading, which will be recognized by a flattening of the sinewave.

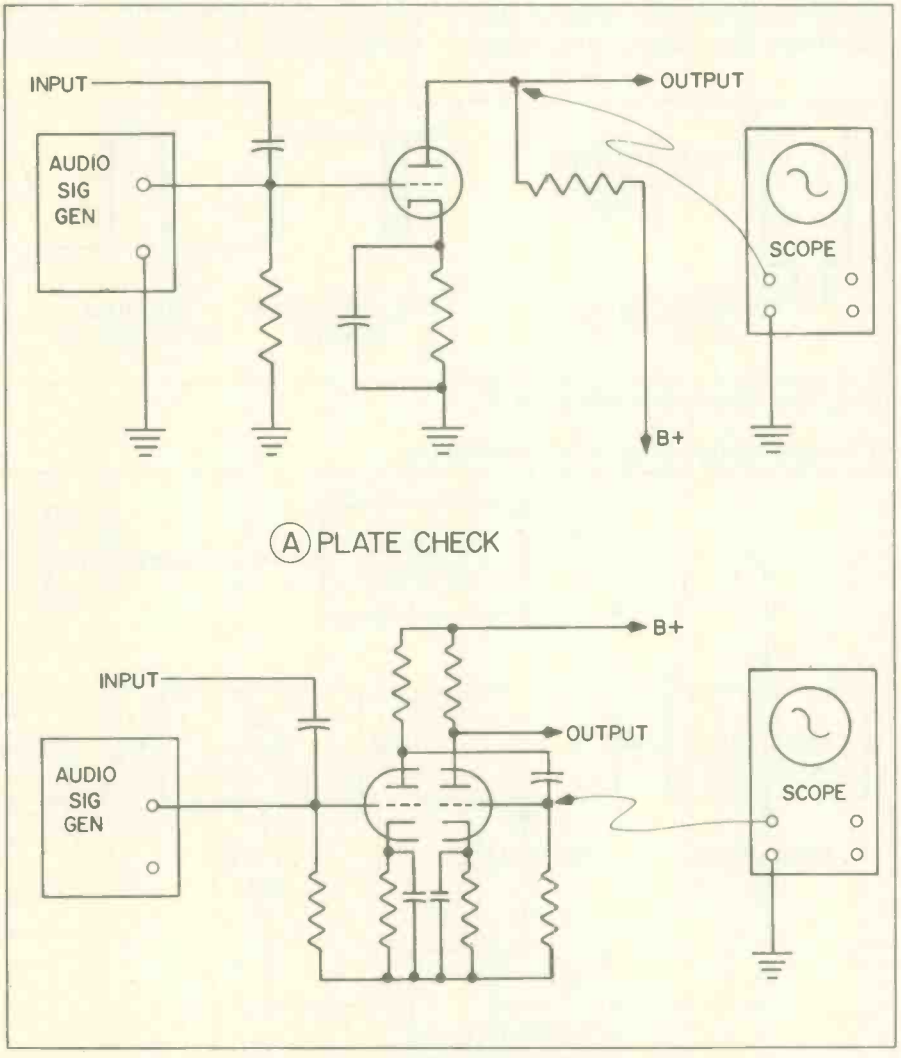


Fig. 5—Test connections for checking audio circuits for signwave conformity.

PICTURE SHAPE

Geometric, or picture shape, distortion may be produced by scanning circuits in either the pickup camera or in the display monitor. Use a scope to check the sawtooth sweep generator for nonlinear operation. Such a fault can cause compression or expansion from the proper picture frame. An improper distribution of windings in the deflection yoke, due to an accidental dislodgement, can contribute to geometric distortion (see Fig. 6).

"S-bend" lateral distortion may result from an irregular axial field in the camera pickup tube, or from improper voltages applied to the tube. Refer to previously recorded waveforms and to tube manuals for specified potentials. Check the power supply and adjust for proper voltages.

Lateral drift, yaw or skewing of the picture to the right or left is corrected by slightly adjusting for a perpendicular relationship between the horizontal and vertical deflection yokes of either the camera or display tube. A trapezoidal, instead of a rectangular frame, may be corrected by moving slightly the deflection yokes of either tube to obtain an equidistant arrangement. If the result is worse, naturally the change has been made in the wrong direction. The vertical and horizontal deflection coil axes should bisect each other.

Use a picture monitor and superimpose two test patterns for comparison while correcting geometric distortion. Use a pattern from a grating generator or the equivalent for comparison with a RETMA Linearity Chart, available from local distributors. Adjust the camera linearity controls for as nearly identical a pattern alignment as possible, and the camera should then be

continued on page 59

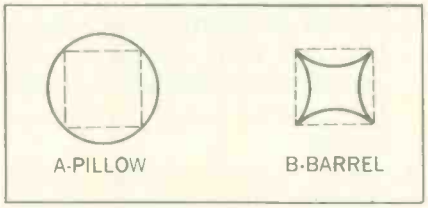


Fig. 6—Geometrical distortion of picture shape.

Chemicals Speed Servicing

by Al Friedman

Every technician knows that good test instruments and other tools can speed servicing, but few technicians make maximum use of another very important servicing tool—chemicals

■ Today's aerosol chemicals can save you time in many ways. Tuner cleaners are an excellent example. Since it only takes a few seconds to spray a tuner, you should clean and lubricate the tuner of every set you service. Use a tuner wash, followed by a lubricant/cleaner if the contacts are badly "gunked up." You can increase your revenue on house-calls by charging $2 to $4 extra for cleaning the tuner. If you use a top quality product, most of your customers will be delighted at the difference they feel when they change channels. And, of course, a good tuner spray usually melts away "snow" on the TV screen.

There's a tremendous difference in tuner spray quality, as well as price. What you save on the cost of a can of spray, you more than lose in time. Poor tuner sprays do not clean very well and provide lubrication for only a short time. What's more, they cause detuning, which can lead to callbacks.

The best tuner sprays keep tuner drift within 0.5MHz, minimizing the possibility of callbacks. They also provide more thorough cleaning and a heavy duty lubricant with staying power. It will pay you to try the top brands available today and choose the best tuner spray you can find, even if it costs more per can.

Incidentally, tuner sprays are good for a lot of things besides tuners. Tuner washes, for example, are excellent for cleaning phono spindles, drive wheels, gears and motors, picture tube anodes, relays, switches and tight seal controls. Tuner lubricant cleaners do a good job in restoring corroded tube sockets (especially picture tube sockets), unfreezing stuck coils, lubricating controls, freeing sticking indoor antenna monopoles and acting as a heat sink for power transistors.

Aerosol circuit coolers are also excellent time savers. They are invaluable in locating thermal intermittents. All you have to do is let the set "cook" until the trouble either appears or disappears. Then, spray each component in the suspected circuit until you see or hear a dramatic change. No other servicing method can locate intermittent components as rapidly or accurately, yet technicians often waste hours with meters and scopes.

Here are a few tips on using circuit coolers to best advantage.

- Do not spray hot tubes. Sudden cooling can crack the glass.
- Use a circuit cooler that comes in a seamless can (see Fig. 1). This may sound silly, but it does make a difference. To get really rapid cooling, you need very high pressure. If you use a cooler from a can with seams, you have to spray each component longer. If you do not cool a component sufficiently, you may waste a lot of time in other circuits, or repeating your servicing procedure.
- Use a circuit cooler that doesn't run or leave a residue. Some coolers drip, cooling parts other than those you have sprayed and causing confusion. Other coolers leave a film which makes the customer think you have done something to his set to make it require another service call in a short while. Good circuit coolers stay where they are sprayed and disappear within a few minutes.
- Use a good circuit cooler to check transistors. A quick shot of cooler often causes a dramatic change in a faulty transistor.
- Use a good circuit cooler to locate hairline cracks on a printed-circuit board. When you spray a board, the conductor portion frosts up, but the crack doesn't, making it very easy to see.

These are the major ways you can save time with chemical servicing tools, but it will pay you to become familiar with the broad line of other chemicals available to you. Penetrating and lubricating oils, insulating sprays and liquids, drive restorers, plastic and glass cleaners, glues and cements, etc., can all help you to make maximum use of your time. ■

Fig. 1—The law requires that high-pressure aerosol cans, required for really fast circuit cooling, be made without seams.

Comparing Vectorscope Patterns

by Phillip Dahlen

Much has been said concerning TV-set adjustments for proper vectorscope-type patterns, but do you use the proper scope or techniques for viewing these color signals?

■ Last month's article, "Why a Trigger-Sweep Scope," graphically compared the waveforms obtained from a $399.50 oscilloscope/vectorscope and those obtained from a less expensive scope (costing in the neighborhood of $100 in kit form) with the waveforms indicated by Zenith, the TV-set manufacturer. One set of waveforms obtained from the two scopes deserves further attention —they being the signals applied to the red and blue grids of the color-picture tube.

From the waveforms shown in the previous article and repeated this month in Tekfax Schematic No. 1324, we are able to see that the signal applied to the red grid of the picture tube (Test Point 47, Fig. 60 on page 46 of the September issue) appears nearly identical to that applied to the blue grid of the same tube (Test Point 49, Fig. 62 in that article) except for a drastic difference in phase angles of the color signals. With the eye it appears as though the color-bar-generator signal at the red grid is positive, while negative at the blue grid.

The relative phase angles of the two color signals are extremely difficult to determine when viewed in a conventional manner (with the color signal providing the vertical segment of the scope trace, while the scope's internal sweep signal provides the horizontal segment of the scope trace—the two together providing the waveforms to which we are accustomed). The only way in which the two signals can be adequately compared for critical color adjustments is by supplying one to the scope's vertical input while supplying the other to the scope's horizontal input. The resulting image, a vector display, accurately indicates the relative phase angles of the two signals.

VECTORSCOPE FEATURES

Although many oscilloscopes have external horizontal-trace inputs, which permit their effective use in forming vector patterns from TV color signals, vectorscopes are designed to offer the added convenience of terminals labeled for blue- and red-signal input (Fig. 1) and a pair of OSCILLOSCOPE/VECTORSCOPE switches that provide appropriate, and equal, horizontal- and vertical-trace sensitivity for the two color signals. In addition, these instruments include a plastic grid pattern of vector angles that can be substituted for the conventional, rec-

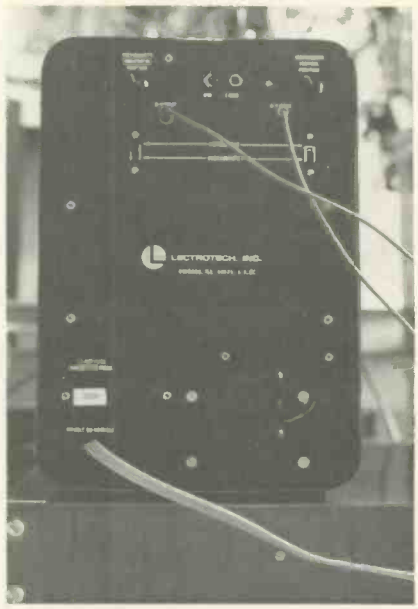


Fig. 1—The back of this instrument contains the B-Y and R-Y signal inputs, two switches for changing the instrument from an oscilloscope to a vectorscope, plus horizontal and vertical vectorscope centering controls. (As with other vectorscopes, a ground lead must also be connected between the instrument and the TV set.)

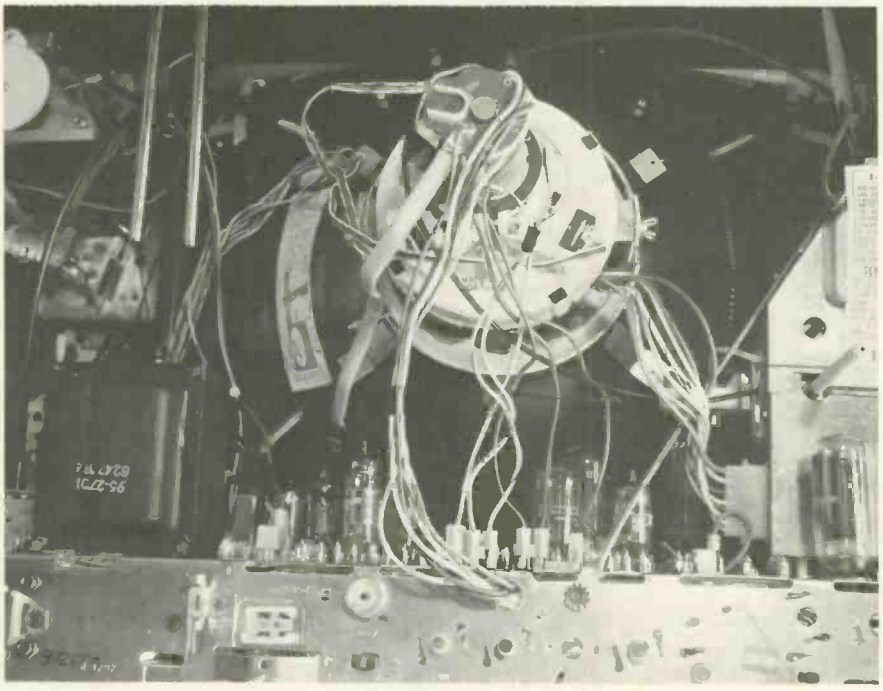


Fig. 2—The B-Y and R-Y leads are insulated their entire length between the picture-tube socket and TV-set chassis. This is a good safety feature but makes it more difficult to find a place for securing test-instrument probes.

tangular scope-trace grid. (Although the less expensive scope did not have any provision for the use of a vector-type grid, double exposures with the scope camera made them appear in article illustrations. To do this we first took an exposure of the vectorscope grid with the trace on that instrument turned OFF and then we exposed the same film to the trace present on the less expensive scope.)

WHAT NOT TO DO

There is one mistake that is easily made when attempting to obtain proper vectorscope patterns. As can be seen from the photo of the back of this Zenith TV set (Fig. 2), all leads are enclosed within the TV tube socket. This provides additional safety but prevents us from connecting the vectorscope probes directly to the socket. The red- and blue-grid leads do pass through the terminal strip shown, using plug-in connectors. But the connectors are also safely insulated, preventing satisfactory probe connections there. However, the undersides of these terminals are accessible for connecting vectorscope leads (Fig. 3). This is the location of Test Points 47 and 49, which are also shown in the schematic (Fig. 4).

This all sounds good, but there is one problem. This just does not work—not on either this TV set or most others. As the following photos will illustrate, the impedance of the leads between the test points and the pins on the color-picture tube is sufficient to distort the vectorscope patterns.

Fig. 5A shows the distorted vector image produced on the vectorscope when Test Points 47 and 49 are used and the color generator is switched to GATED RAINBOW for producing color bars; while Fig. 5B shows the instrument under the same conditions with the color generator switched to R-Y, B-Y, —(R-Y)—the signal for producing the three primary colors on the TV-set screen. The color generator was switched to RAINBOW for producing the waveform shown in Fig. 5C. The long "tail" shown in these and other vectorscope patterns corresponds to the horizontal sync signal as shown in last month's waveforms obtained from the same test points. Similar, though more distorted, images were produced (Fig. 6A, B, C) when the horizontal and vertical inputs of the less expensive scope were substituted for the vectorscope inputs.

Merely as a matter of interest, we also connected these test points to the horizontal and vertical inputs of the oscilloscope portion of the oscilloscope/vectorscope, obtaining the vector image shown in Fig. 7. Unlike some instruments, signals applied to the oscilloscope's horizontal input appear 180° out of phase with those applied to the vectorscope's horizontal input. This is not a matter of concern, but it does account for the signal appearing as the mirror image of those seen in the other illustrations.

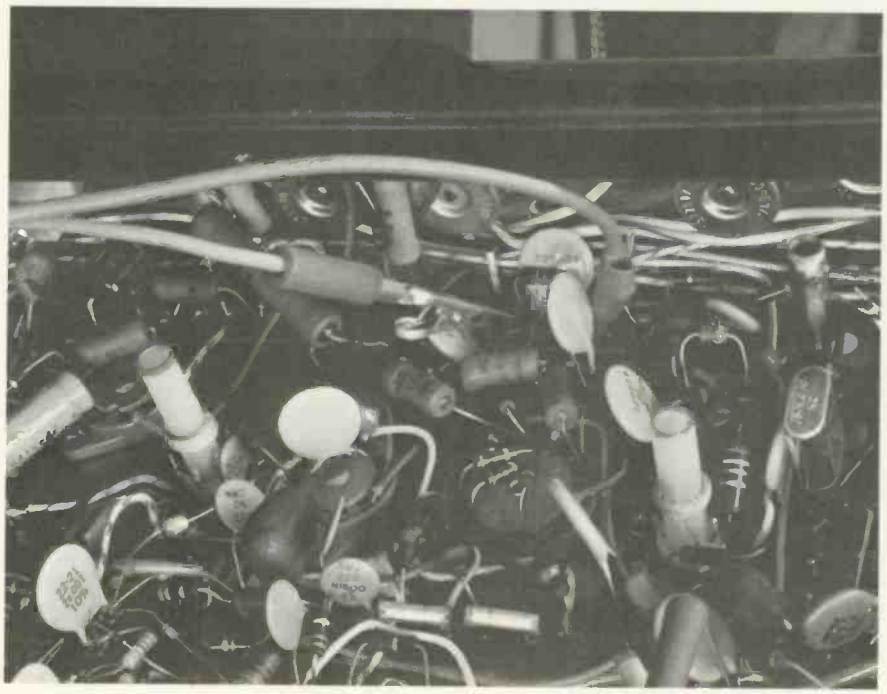


Fig. 3—Test-instrument probes were connected to Test Points 47 and 49 from the underside of the chassis.

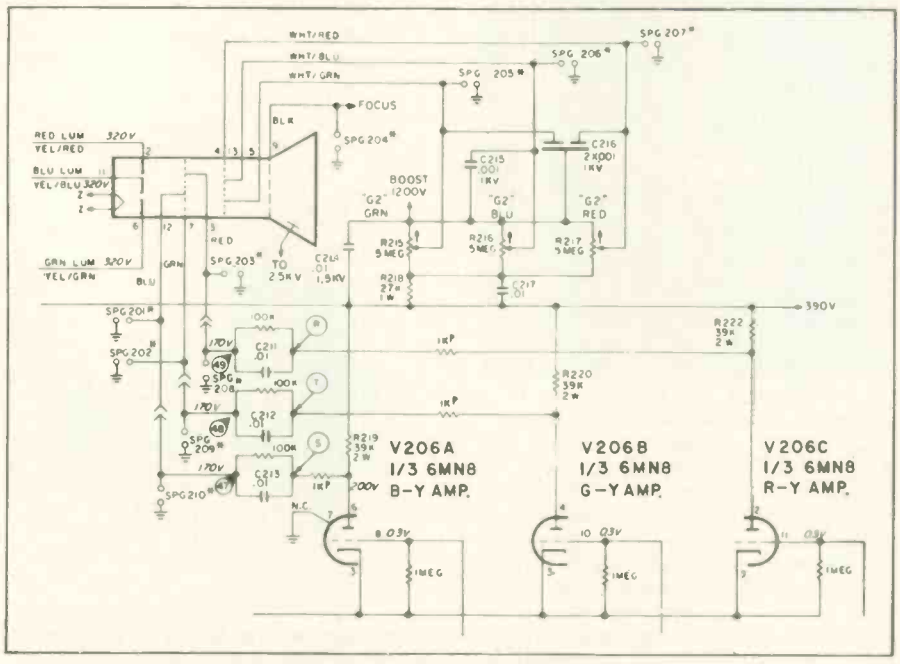


Fig. 4—Schematic showing circuit location of Test Points 47 and 49.

HOW TO DO IT RIGHT

One unsatisfactory solution to this problem of vector distortion

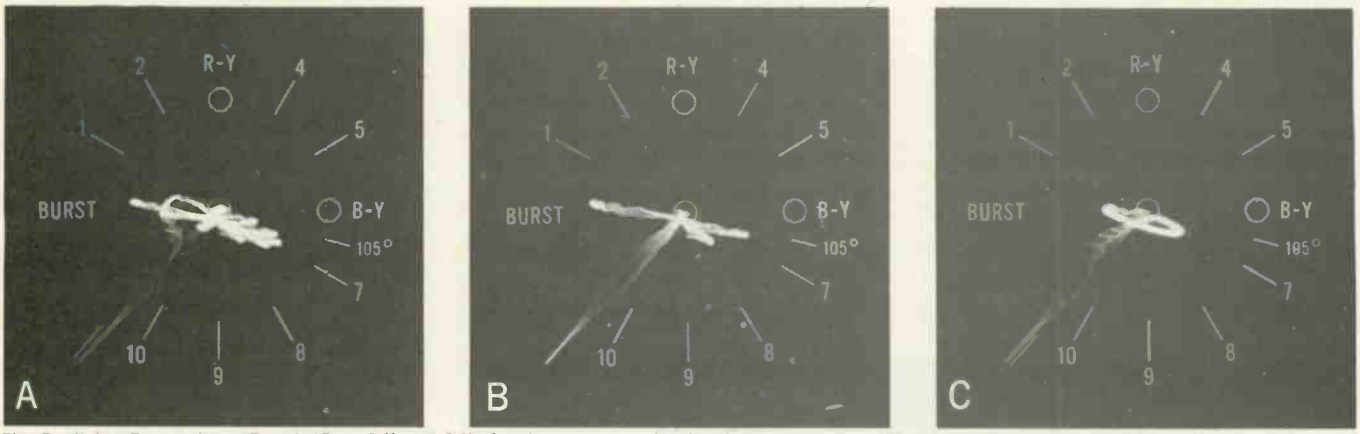


Fig. 5—Using Test Points 47 and 49 as B-Y and R-Y signal sources results in distorted vector patterns on the vectorscope. These traces were produced when switching the color generator to GATED RAINBOW (A); R-Y, B-Y, —(R-Y) (B); and RAINBOW (C).

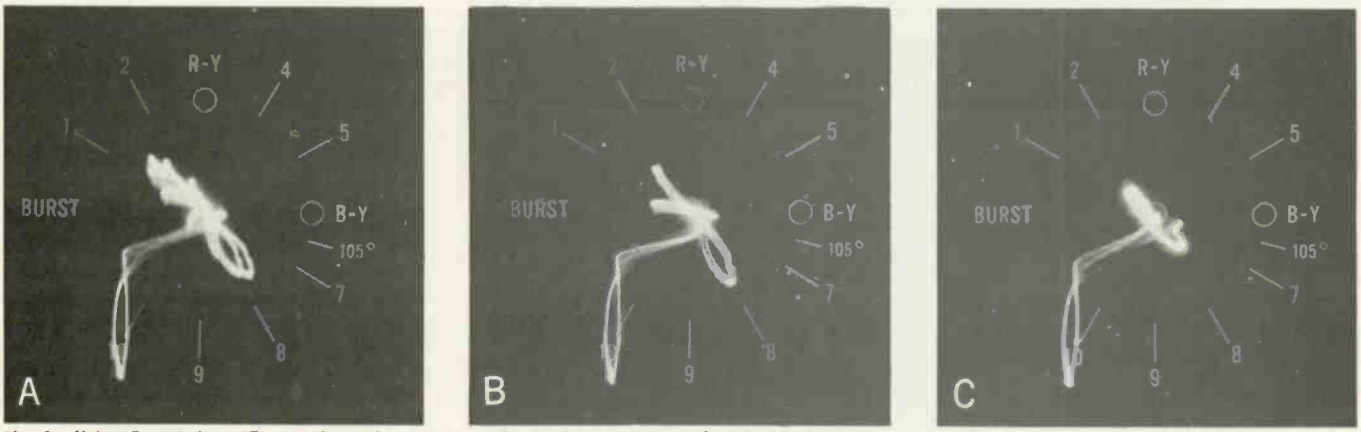


Fig. 6—Using Test Points 47 and 49 as signal sources for horizontal and vertical inputs to the less expensive oscilloscope results in distorted vector patterns. These scope traces were produced when switching the color generator to GATED RAINBOW (A); R-Y, B-Y, —(R-Y) (B); and RAINBOW (C).

would be to use sharp probe clips and actually cut into the grid lead wires near the picture-tube socket. A safer and less destructive method is to use a test socket like the one shown in Fig. 8. By plugging the picture tube into the test socket and test socket into the picture-tube socket, the picture tube can be connected and operated in a normal manner while test points are made available adjacent to the tube.

By connecting our test leads to the numbered test terminals, corresponding to tube-pin numbers, we are able to obtain the red- and blue-grid signals almost directly from the picture tube (Fig. 9) and obtain the desired vector patterns.

Each of the 10 "legs" of the vector image shown in Fig. 10A represent a differently colored bar formed on the screen of the TV set when the color generator is switched to GATED RAINBOW. The angular position of each leg determines the color of the corresponding bar while the length of each "leg" determines the brilliance of that color.

The three "legs" shown in Fig. 10B represent the R-Y, B-Y —(R-Y) signals used to produce red, blue and green bars on the screen. The phase angle of these "legs" determines the purity of each corresponding primary color.

When the color generator is switched to RAINBOW a continuous spectrum of color appears on the picture tube and a nearly complete

continued on page 79

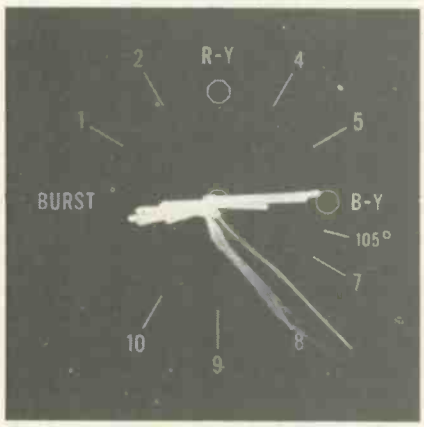


Fig. 7—Connecting Test Points 47 and 49 to the vertical and horizontal inputs of the oscilloscope portion of the oscilloscope/vectorscope produced this vector pattern when the color generator was switched to GATED RAINBOW. Unlike some scopes, this instrument inverted the horizontal input signal so that the resulting vector pattern was virtually the mirror image of the previous distorted vectorscope pattern. This signal inversion is of no consequence since it is the vectorscope portion of this instrument that is intended for forming vector patterns.

Fig. 8—With this test socket we can connect the test-instrument leads almost directly to the pins of the color picture tube, thus eliminating the vector-pattern distortion.

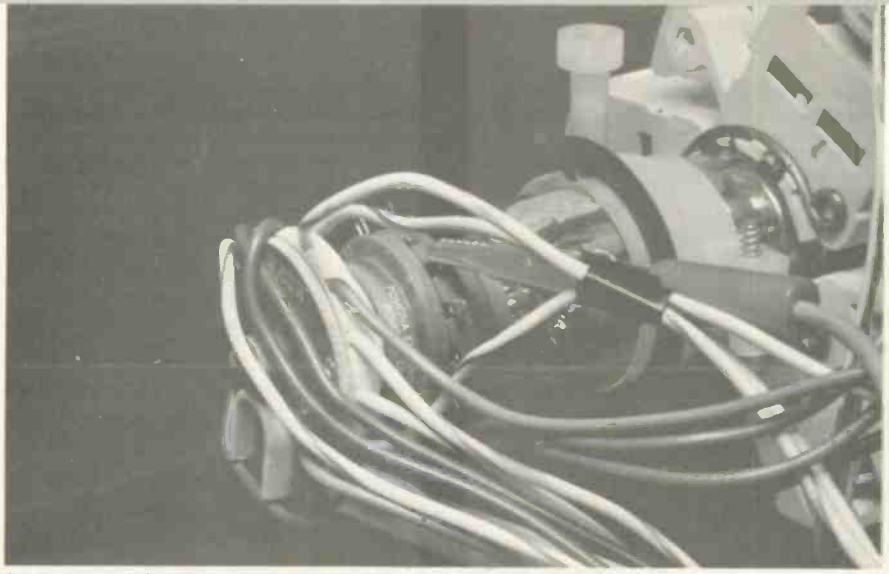
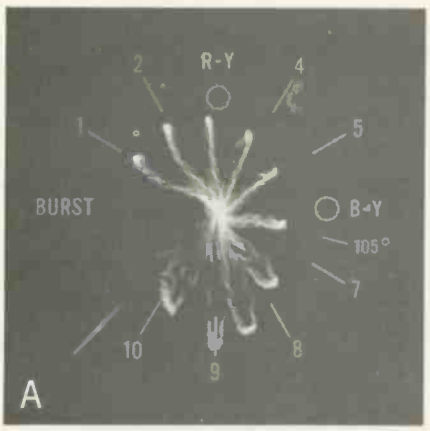
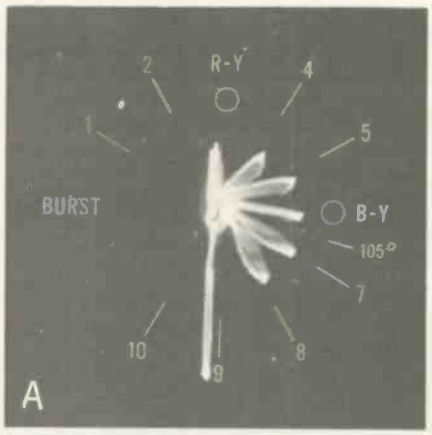
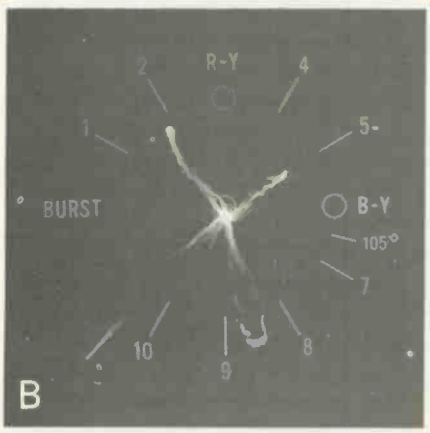
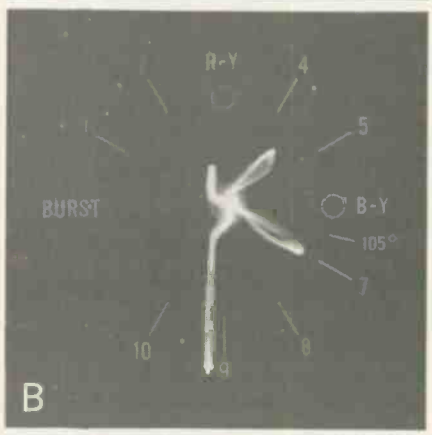


Fig. 9—By plugging the test socket in between the color picture tube and its socket, we were able to obtain our test signals almost directly from the grids of the color picture tube.









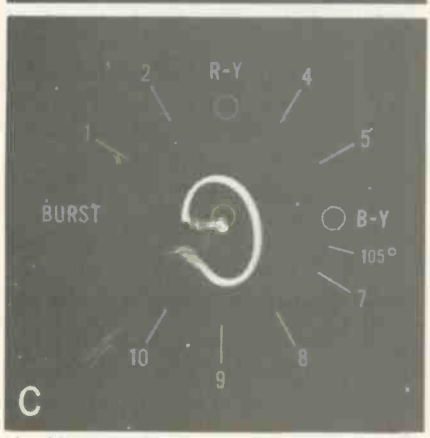


Fig. 10—Using the test socket as B-Y and R-Y signal sources resulted in well shaped vector patterns on the vectorscope. These traces were produced when switching the color generator to GATED RAINBOW (A); R-Y, B-Y, —(R-Y) (B); and RAINBOW (C).

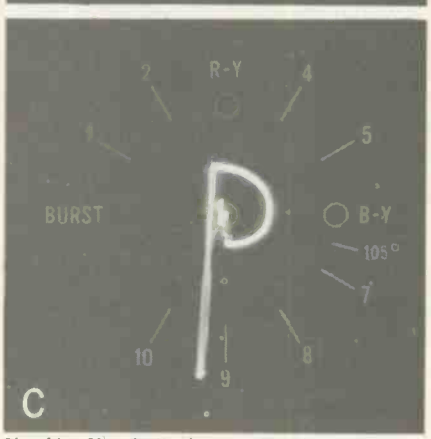


Fig. 11—Signal clipping results when using the test socket as B-Y and R-Y signal sources for forming vector patterns on the less expensive oscilloscope. Thus distorted traces are produced when switching the color generator to GATED RAINBOW (A); R-Y, B-Y, —(R-Y) (B); and RAINBOW (C).

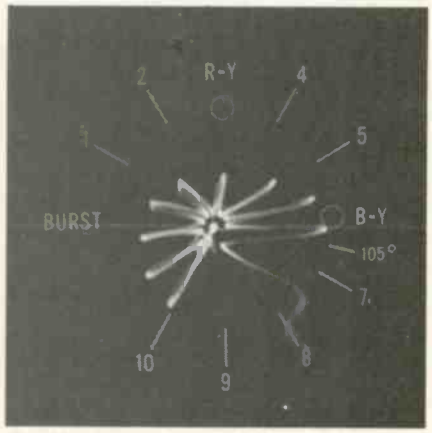
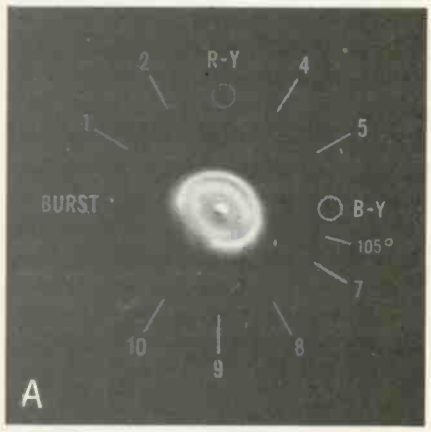


Fig. 12—Connecting the B-Y and R-Y signals from the test socket to the vertical and horizontal inputs of the oscilloscope portion of the oscilloscope/vectorscope at first produced the same type of clipped vector pattern as what was obtained on the less expensive oscilloscope. This difficulty was eliminated by reducing the horizontal input sensitivity and switching the horizontal sweep to a times five scale. As before, the resulting trace was virtually a mirror image of a normal vector obtained when the color generator is switched to GATED RAINBOW. This is not a problem since there should not be any reason for using the instrument in this manner.



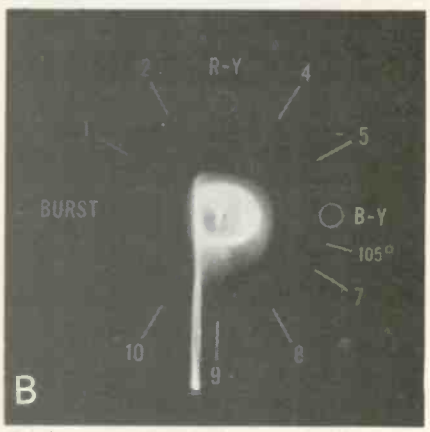


Fig. 13—Somewhat similar vector patterns appear on both the vectorscope (A) and less expensive oscilloscope (B) when the TV-set fine tuning is just enough out of adjustment to loose color sync. Under these conditions the color vectors appear to spin rapidly while the "leg" corresponding to the horizontal sync signal remains stationary.

Servicing Solid-State Stereo

by Norman H. Crowhurst

Part V—The function of various components in a feedback-type equalization circuit must be thoroughly understood if that portion of an audio system is to be effectively serviced

■ The previous article explained the need for equalization and showed the response curves used for various purposes—RIAA and CCIR phonograph playback, NARTB and CCIR magnetic tape playback, and receiver de-emphasis. Also included were the basic circuit configurations for achieving each type of response in a passive network inserted between stages. The feedback-type equalization circuit described this month (Fig. 1) is taken from a Hi-Fi stereo system in current use; and it also provides for both phonograph and magnetic-tape equalization.

DIRECT-COUPLED TRANSISTORS

The two stages (transistors Q1 and Q2) are direct-coupled to avoid low-frequency instability problems—there being only one capacitor in the feedback loop (the 10μf capacitor at the collector of transistor Q2), apart from the feedback-equalization capacitors.

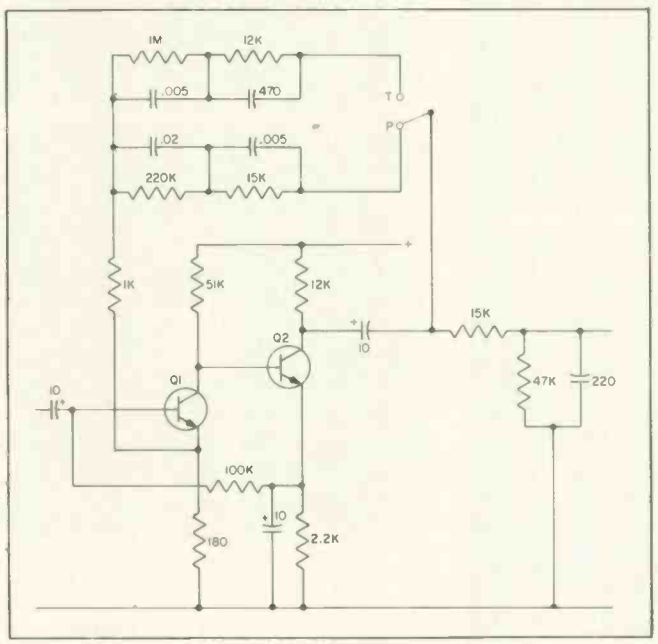


Fig. 1—Schematic of an actual negative-feedback equalization circuit currently used in a stereo Hi-Fi system.

DC NEGATIVE FEEDBACK

DC voltage stability is provided the two-transistor circuit with dc negative feedback supplied by a 100K resistor connected between the emitter of transistor Q2 and the base of transistor Q1. If transistor Q1 conducts too much current, there will be a greater voltage drop across the 51K collector resistor, reducing the forward bias at the base of transistor Q2. With its base less forward biased, there is a smaller voltage drop across the 2.2K emitter resistor and thus less forward bias voltage through the 100K resistor to the base of transistor Q1, reducing the dc current transistor Q1 conducts. Since a 10μf capacitor shunts to ground any ac signal that would otherwise appear across the 2.2K resistor, no ac signal is fed back through the 100K resistor to transistor Q1.

EQUALIZATION FEEDBACK

A second negative feedback circuit is used to provide equalization. The function of this circuit can be more readily understood if the various audio frequencies are first ignored when describing the signal-feedback route. Then variations in the circuit, according to audio frequencies, will be covered.

When a positive signal voltage is applied to the base of transistor Q1, it conducts more current, resulting in a greater voltage drop across its 51K collector resistor. The resulting negative signal voltage is applied to the base of transistor Q2, causing it to conduct less current. While conducting less current, there is a smaller voltage drop across the transistor's 12K collector resistor. The resulting positive signal voltage passes through the 10μf collector capacitor, the equalization circuit and the 1K resistor to the emitter of transistor Q1.

As a result of this circuit design, positive audio signal voltages applied to the base of transistor Q1 are amplified and result in positive signal voltages being applied to the emitter of the same transistor. (Conversely, negative signal voltages applied to the base of transistor Q1 are amplified and result in negative signal voltages being applied to the emitter of the same transistor.)

If the negative feedback circuit is making the transistor's emitter go positive as its base goes positive, it is, in effect, reducing the base-to-emitter signal voltage and the amount of signal actually available for amplification by transistor Q1 and the remainder of the circuit.

The negative-feedback equalization circuit is designed so that audio signals passing readily through it experience a reduction in effective circuit gain, while signals passing less readily through it experience only a minor reduction in gain.

PHONOGRAPH EQUALIZATION

When the circuit is switched to the phonograph position, the equalization circuit consists primarily of a 0.02μf capacitor in parallel with a 220K resistor and a 0.005μf capacitor in parallel with a 15K resistor.

At very low frequencies neither capacitor conducts a significant ac current as compared to their parallel re-

continued on page 59

GUEST AUTHOR

Recessions?? Not for Technicians

by Dick Pavek

One of the last things a technician ever needs to worry about is how his business will suffer if the country gets into a recession. Not that he shouldn't expect to lose a certain amount of business. He may. But he will not suffer as much as other types of businesses.

■ Most TV technicians are too young to remember the depression, but those that do should remember that, by and large, the service businesses generally stayed in operation while friends of theirs with furniture stores and other retail establishments failed.

Dick Pavek, President of Tech Spray, Amarillo, Tex., chemical manufacturing firm, has been involved in electronics most of his life. He is a former TV technician and shop owner, has taught electronics, and lectured on servicing and business problems to technicians. His articles have appeared in various technical magazines.

The main reason any service business is less vulnerable to a recession or depression is simply this: People will have less money to buy new, and will repair the old instead. This is especially true with TV and radio sets.

One of the few businesses to prosper during the depression of the 30's was the movie theater business. During periods of emotional stress over long periods people need relief, some type of escape valve. The movies provided the relief that was needed. No matter how bad your lot was, you could always forget about it for a couple of hours a week in the movies. The movies are still with us, of course, but the job of diversion has largely been taken over by TV and radio.

TV sets that go out will be the first thing repaired. True, a two- or three-set family may not have all their sets repaired and running, but you can bet that at least one will be kept working.

A prudent shop will understand this and plan its direction carefully. Extra attention to appearance of the set, knobs, finish, etc., will be especially appreciated by the customer who really wanted to purchase a new set but had to settle for repairing the old one. This is an excellent time to remind the customer that when he is ready to buy a new set you would be happy to serve him.

It goes without saying that there will be more requests for credit. Your own financial position will not be strong enough to handle all requests, and you are going to have to pick and choose carefully in order to give credit only to the better risks. Remember that the service business is always plagued by the customer's feeling that he has spent money for no real progress when he repairs something he owns. This feeling is often translated into a subtle resentment for the serviceman. During a recession this tendency will be likely to increase. The result is that the customer may be slower in paying his serviceman than other creditors. You can be sure that if you have given him good competent service he will want to use you again, and when he does, you will be paid up.

When credit is extended, it can be very helpful to put it on a more personal basis. A big company has the advantage of having credit managers, collection letters and procedures, but the small serviceman has an advantage that he rarely uses. He is a human being, with flesh and blood, that has been invited into the customer's home. He pats the dog, talks to the kids while working on the set and compliments the lady of the house on her furniture. (You do all these things, don't you?) In short, the TV serviceman is much more than just a company with which the customer is doing business —he is a friend, and this friendship will help him get paid, and paid sooner. Let the customer know that you are not in a position to extend credit to everyone because your capital is limited. When he understands that your extending credit to him is an act of friendship on your part, you can be sure that your chances of being repaid promptly have gone up a thousand percent.

A recession should be tackled like anything else in this world—with a little common sense. If you attack the problems in your corner of the recession this way, it won't be nearly as bad for you as for others. ■

TEST INSTRUMENT REPORT

Leader's Model LBO-501 Trigger-Sweep Oscilloscope

Leader's Model LBO-501 trigger-sweep oscilloscope. For more details circle 900 on Reader Service Card.

by Phillip Dahlen

Scope includes horizontal-sweep selector positions for observing horizontal and vertical TV signals.

■ Even at first glance, the controls on this small chassis (10½- by 8- by 16½-in.), lightweight (20-lb) scope appear clearly marked and simple to adjust. For those of us that have bad memories and must rely on paper and pencil to determine the microsecond per centimeter equivalent of TV receiver horizontal and vertical sync frequencies, the scope provides a position on the horizontal sweep-rate selector for each of these two frequencies—adding considerable convenience for technicians frequently switching between the two.

The 5-in. trigger-sweep scope also provides for three calibrated voltages should the technician wish to make use of the variable volts/centimeter adjustment in selecting a more convenient scale.

In order to maintain control of the triggered operation, the level control is adjusted so that the sweep-gating multivibrator is prevented from free-running. When this control is set counter-clockwise, the sweep-gating multivibrator will be in a free state, which is similar to the operation of a conventional scope.

Specifications indicate that the dc vertical input is direct coupled with six stages of amplification.

The manufacturer has compiled a very impressive list of additional instrument specifications, which include the following:

VERTICAL AMPLIFIER

Sensitivity	20mv to 10v/cm calibrated in nine steps, accuracy within ±3%; uncalibrated continuous control between steps and up to approximately 25v/cm.
Bandwidth	DC or 2Hz to 10MHz
Rise Time	0.035μs.
Input Impedance	1M/33pf
Max. Input Voltage	600v (dcv + peak ac)

TIME BASE

Sweep Speeds	1μs to 0.2s/cm calibrated in 17 steps, accuracy within ±5%; uncalibrated continuous control between steps and up to approximately 0.5s/cm. TV Vertical: 33.3ms/10cm TV Horizontal: 127μs/10cm
Magnifier	X5 at any portion of displayed sweep (maximum speed, 0.2μs/cm)
Sweep Mode	Triggered and automatic
Trigger Source	Internal and external, — and +
Triggering Level	Freq: 50Hz to 10MHz — 20Hz to 10MHz INT: 10mm display — 20mm display EXT: 1v P-P input — 2v P-P input

HORIZONTAL AMPLIFIER (External Input)

Deflection Sensitivity	1v P-P to 10v P-P/cm with continuous control; 200mv P-P/cm with X5 magnifier
Bandwidth, at —3dB	2Hz to 200kHz

CALIBRATION

Voltages	0.05, 0.5 and 5v P-P, within ± 5%; square waveform at approximately 1kHz.
Operating Temp. Range	32° to 113°F
Cathode-Ray-Tube	Type 130ARB1 Total Accelerating Potential: 1500v.
Power Supply	115v, 50/60Hz (Primary tapped for 100, 115, 200, 215 or 230v inputs).■

SOLID STATE...

continued from page 56

sistors. However, as the audio frequency increases to 50Hz, the reactance of the 0.02μf capacitor decreases to about ¾ the value of its parallel resistor ($X_c = \frac{1}{2\pi fc} = \frac{1}{2 \times 3.14 \times 50Hz \times 0.02\mu f} = 159.3K$) resulting in some negative feedback to reduce the gain of that frequency signal.

Calculations indicate that at 362Hz the reactance of the 0.02μf capacitor equals the value of the 220K resistor and we have reached the circuit's low-frequency turnover point—virtually equal to that of the CCIR phonograph equalization curve ($f = \frac{1}{2\pi CX_c} = \frac{1}{2 \times 3.14 \times 0.02\mu f \times 220K} = 362Hz$). At this frequency the 0.005μf capacitor has an 879K reactance ($X_c = \frac{1}{2\pi fC} = \frac{1}{2 \times 3.14 \times 362Hz \times 0.005\mu f} = 879K$), a value too large to be of any significance.

Similar calculations indicate that at 2124Hz the reactance of the 0.005μf capacitor equals the value of the 15K resistor and the circuit has approached its high-frequency turnover point—virtually equal the frequency indicated on the RIAA phonograph equalization curve ($f = \frac{1}{2\pi CX_c} = \frac{1}{2 \times 3.14 \times 0.005\mu f \times 15K} = 2124Hz$) shown last month. At this frequency the reactance of the 0.02μf capacitor has been reduced to a mere 3742Ω ($X_c = \frac{1}{2\pi fC} = \frac{1}{2 \times 3.14 \times 2124Hz \times 0.02\mu f} = 3742\Omega$).

MAGNETIC-TAPE EQUALIZATION

When the circuit is switched to the magnetic tape position, the equalization circuit consists primarily of a 0.005μf capacitor in parallel with a 1M resistor and 470pf capacitor in parallel with a 12K resistor.

Calculations indicate that the first pair of parallel components has a 31.8Hz low-frequency turnover point ($f = \frac{1}{2\pi CX_c} = \frac{1}{2 \times 3.14 \times 1M \times 470pf} = 31.8Hz$), while the second pair of components has a 28,240Hz high-frequency turnover point ($f = \frac{1}{2\pi CX_c} = \frac{1}{2 \times 3.14 \times 12K \times 470pf} = 28{,}240Hz$). Since these calculations ignore transistor and other component capacitance, plus series resistances, they can be considered remarkably close to the NARTB magnetic tape equalization curve shown in the previous article.

CONCLUSION

This and the previous article describe two different types of equalization circuits—one that filters out undesired audio signals (last month) and one that allows them to pass through (this month) for neutralization. ■

SERVICING CCTV...

continued from page 50

properly adjusted.

DEVIATIONS

Local oscillator drift can prove to be a serious problem. This drift may be caused by heat, humidity and variations in B+ voltages. Where the environment is such that it cannot be changed, heat problems may be compensated for by using components having a low temperature coefficient. For example, a slug-tuned coil may replace a variable capacitor having a high temperature coefficient. But, of course, after any such change the oscillator must be recalibrated. Humidity effects may be reduced by use of an impregnated tank circuit, thus keeping out the moisture. Always use a regulated power supply to stabilize the B voltages during either normal operation or troubleshooting procedures.

Impedance matching is always a must for either audio or video circuits. Any appreciable mismatch between circuits will cause waveform distortion. A mismatch between the horizontal output amplifier and the succeeding deflection coils can distort a TV raster. It may be worthwhile to check for carelessness during the original installation, making a point after point check with a scope fed from a test pattern.

Incorrect tuning of resonant circuits can produce unwanted frequency attenuation or emphasis. Apply a known frequency, or preferably a complex pattern, and, using a scope, check succeeding stages to pin point a fault.

CAMERAS

A lens system external to the camera tube focuses the scene to be emplaced upon the photocathode of the tube. Use lens tissue to remove any foreign dust or other matter from the lens system or the face of the tube.

Warning—use extreme caution when working on the camera since lethal voltages may be exposed.

When camera pickup tube replacement is necessary, it is safer if shatter-proof glasses and gloves are worn. Injury from implosion, due to the sealed-in vacuum, may follow accidental damage to the tube during installation.

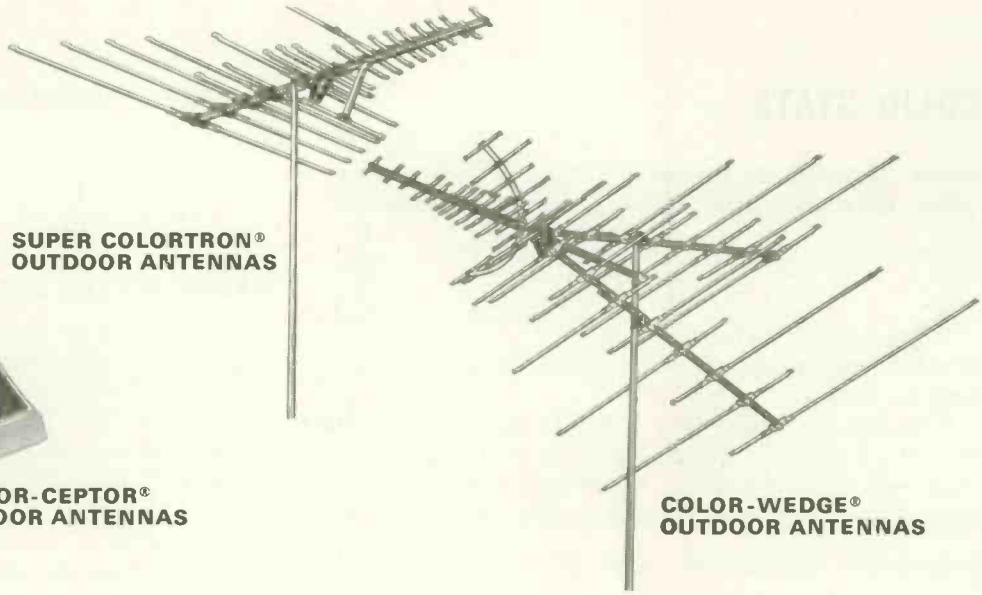
POWER SUPPLIES

Rectifiers and output tubes under load operate at high currents and may therefore be troublesome. In most systems power supplies are regulated to avoid voltage variations that may result in drift in key circuits, such as oscillators. Use *caution* at all times while servicing power supplies. Extremely high voltages may be present and exposed.

When 10,000v or more are required for scopes or displays, RF power units are often used. Input power to the step-up transformer is

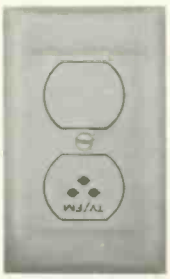
continued on page 80

COLOR-CEPTOR®
INDOOR ANTENNAS



SUPER COLORTRON®
OUTDOOR ANTENNAS

COLOR-WEDGE®
OUTDOOR ANTENNAS



TV OUTLETS AND
LINE TAP-OFFS

The line of vision. Winegard.

Everything for everybody. Outdoor and indoor TV and FM antennas. Home TV systems equipment. Wire. Cable. Preamplifiers. Commercial systems equipment. Advertising. Merchandising. Packaging. Sales. Profits.

Only Winegard can hand you a line like that. The line of vision. Call your Winegard distributor today.

MOLDED MATCHING
TRANSFORMERS

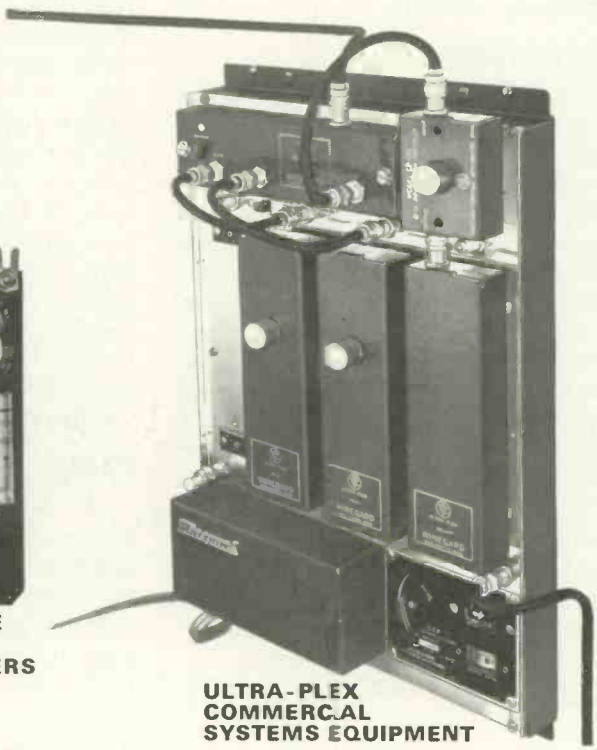
2- AND 4-SET
BOOSTER-COUPLERS

2- AND 4-WAY
LINE SPLITTERS

COAXIAL CABLE AND
TWIN LEAD

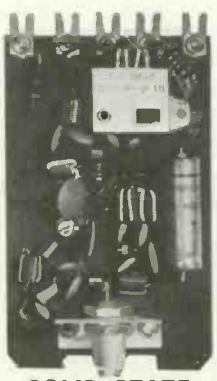
Winegard
ANTENNA SYSTEMS

WINEGARD COMPANY
3000 KIRKWOOD STREET
BURLINGTON, IOWA 52601

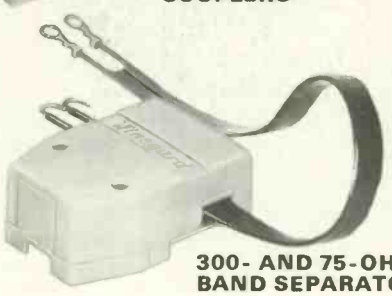


ULTRA-PLEX
COMMERCIAL
SYSTEMS EQUIPMENT

MULTI-SET
COUPLERS



SOLID-STATE
CARTRIDGE
PREAMPLIFIERS



300- AND 75-OHM
BAND SEPARATORS

. . . for more details circle 139 on Reader Service Card

PREMIUMS ON PARADE

You can make the parade of premiums come right to your home. Take your pick of anything in the parade – it's yours through your purchases of GE tubes.
Offer is for a limited time only. Ask your participating GE tube distributor for details today.

1. Presto® Deluxe Automatic Hot-Dogger – 125 Points
2. Osrow® Stanley Steamer – 150 Points
3. GE Four-Slice Toaster – 520 Points
4. GE Hair Curler – 255 Points
5. Schick® Electronic Hot Lather Dispenser – 275 Points
6. Child's Melamine Dinnerware Set – 50 Points
7. GE Lighted Makeup Mirror – 500 Points
8. Agfa Film & GE Cube Kit – 200 Points
9. Columbia Three Album Stereo Record Package – 260 Points
10. Agfa Camera Kit – 200 Points
11. GE Cassette Tape Recorder – 730 Points
12. GE Manicure Set – 445 Points
13. GE Coffeemaker – 425 Points
14. GE Baby Dish – 215 Points
15. Cannon Percale Sheets (4 each twin & double) & 6 Pillow Cases – 850 Points
16. GE Digital Clock – 370 Points

Tube Department, Owensboro, Kentucky

GENERAL ELECTRIC

288-35

An Extraordinary Offer

to introduce you to the benefits of Membership in

ELECTRONICS BOOK CLUB

for a limited time only you can obtain

ANY 3 OF THESE UNIQUE BOOKS (Combined List Price $33.85) ... yours for only 99¢ each ...with Trial Club Membership

May we send you your choice of any three books on the facing page as part of an unusual offer of a Trial Membership in Electronics Book Club?

Here are quality hardbound volumes, each especially designed to help you increase your know-how, earning power, and enjoyment of electronics.

These handsome, hardbound books are indicative of the many other fine offerings made to Members . . . important books to read and keep . . . volumes with *your* specialized interests in mind.

Whatever your interest in electronics—radio and TV servicing, audio and hi-fi, industrial electronics, communications, engineering—you will find that Electronics Book Club will help you.

With the Club providing you with top quality books, you may broaden your knowledge and skills to build your income and increase your understanding of electronics, too.

How You Profit From Club Membership

This special offer is just a sample of the help and generous savings the Club offers you. For here is a Club devoted exclusively to seeking out only those titles of direct interest to you. Membership in the Club offers you several advantages.

1. Charter Bonus: Take any three of the books shown (combined values up to $33.85) for only 99¢ each with your Trial Membership.

2. Guaranteed Savings: The Club guarantees to save you 15% to 75% on all books offered.

3. Continuing Bonus: If you continue after this trial Membership, you will earn a Dividend Certificate for every book you purchase. Three Certificates, plus payment of the nominal sum of $1.99, will entitle you to a valuable Book Dividend which you may choose from a special list provided members.

4. Wide Selection: Members are annually offered over 50 authoritative books on all phases of electronics.

5. Prevents You From Missing New Books: The Club's FREE monthly *News* gives you advance notice of important new books . . . books vital to your continued advancement.

This extraordinary offer is intended to prove to you, through your own experience, that these very real advantages can be yours . . . that it *is* possible to keep up with the literature published in your areas of interest . . . and to save substantially while so doing.

How the Club Works

Forthcoming selections are described in the FREE monthly *Club News*. Thus, you are among the first to know about, and to own if you desire, significant new books. You choose only the main or alternate selection you want (or advise if you wish no book at all) by means of a handy form and return envelope enclosed with the *News*. As part of your Trial Membership, you need purchase as few as four books during the coming 12 months. You would probably buy at least this many anyway . . . without the substantial savings offered through Club Membership.

Limited Time Offer!

Here, then, is an interesting opportunity to enroll on a trial basis . . . to prove to yourself, in a short time, the advantages of belonging to Electronics Book Club. We urge you, if this unique offer is appealing, to act promptly, for we've reserved only a limited number of books for new Members.

To start your Membership on these attractive terms, simply fill out and mail the postage-paid airmail card today. You will receive the three books of your choice for 10-day inspection. SEND NO MONEY! If you are not delighted, return them within 10 days and your Trial Membership will be cancelled without cost or obligation. Electronics Book Club, Blue Ridge Summit, Pa. 17214.

Typical Savings Offered Club Members on Recent Selections

Philco Color TV Service Manual
List Price $7.95; Club Price $4.95

Dictionary of Electronics
List Price $6.95; Club Price $5.50

Home-Call TV Repair Guide
List Price $6.95; Club Price $2.95

Sylvania Color TV Service Manual
List Price $7.95; Club Price $4.95

How to Repair Home & Auto Air Conditioners
List Price $7.95; Club Price $4.95

How to Use Test Instruments in Electronics Servicing
List Price $7.95; Club Price $4.95

Computer Circuits & How They Work
List Price $7.95; Club Price $4.95

G. E. Color TV Service Manual
List Price $7.95; Club Price $4.95

125 One-Transistor Projects
List Price $6.95; Club Price $3.95

How to Fix Transistor Radios & Printed Circuits
List Price $7.95; Club Price $4.95

Commercial Radio Operator's License Study Guide
List Price $7.50; Club Price $5.95

Electronic Integrated Circuits & Systems
List Price $12.95; Club Price $8.95

Solid State Circuit Design & Operation
List Price $9.95; Club Price $5.95

How to Build a Working Digital Computer
List Price $7.95; Club Price $3.95

Small Appliance Repair Guide
List Price $7.95; Club Price $4.95

How to Repair Solid-State Imports
List Price $7.95; Club Price $4.95

Zenith Color TV Service Manual
List Price $7.95; Club Price $4.95

Servicing Electronic Organs
List Price $7.95; Club Price $4.95

Digital Computer Analysis
List Price $10.95; Club Price $7.95

How to Use Your VOM, VTVM & Scope
List Price $6.95; Club Price $4.95

Elements of Tape Recorder Circuits
List Price $7.95; Club Price $3.95

Servicing Modern Hi-Fi Stereo Systems
List Price $7.95; Club Price $4.95

Electronic Test & Measurement Handbook
List Price $7.95; Club Price $4.95

Pinpoint TV Troubles in 10 Minutes
List Price $8.95; Club Price $4.95

Practical Color TV Servicing Techniques
List Price $8.95; Club Price $5.95

Mathematics for Electronics
List Price $10.95; Club Price $7.95

Electronic Musical Instruments
List Price $10.00; Club Price $7.95

AN EXTRAORDINARY OFFER...

Magnavox Color TV Service Manual

All the data you need to repair Magnavox color TV receivers—from the Series 37 to T940 chassis—including 12 full-size schematic diagrams complete with oscilloscope waveforms. Singled out for special treatment is the Magnavox T936 hybrid chassis. The special servicing data given will enable you to master this unique chassis. Also included are 34 tuner schematics, and a host of case history solutions and factory modifications. You'll find numerous alignment shortcuts and tips on troubleshooting tricky solid-state circuits. In addition, as a bonus there are chapters on general color TV troubleshooting, antennas and transmission lines, and another on test equipment techniques. 160 pps., 8½" x 11", plus 36-page foldout section containing 12 full-size schematic diagrams. Long-life vinyl cover.

List Price $7.95 ● **Order No. 526**

Electronic Circuit Design Handbook

New Third Edition—A brand-new, enlarged edition of the ever popular circuit designer's "cookbook," now containing over 600 proven circuits, for all types of functions, selected from thousands on the basis of originality and practical application. Now you can have, at your fingertips, this carefully-planned reference source of tried and tested circuits. Selected from thousands submitted by distinguished engineers, these "thought-starters" are a collection of original circuits selected on the basis of their usefulness. This detailed compilation of practical design data is the answer to the need for an organized gathering of proved circuits . . . both basic and advanced designs that can easily serve as stepping stones to almost any kind of circuit you might want to build. 384 pps., 19 big sections, over 600 illus., 8½" x 11".

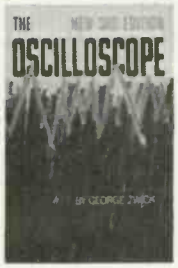
List Price $17.95 ● **Order No. T-101**

Tape Recording For Fun and Profit

Shows you how to get the most out of all types of recorders—domestic and foreign makes. This profusely illustrated guide tells how recorders work and shows specifically what to look for in a recorder when you buy one (including foreign makes). This complete 224-page text also contains a searching analysis of various microphones for a wide range of applications, wireless microphones, remote controls, mixing and switching circuits, recording from a telephone, reverberation, editing, recording film sound tracks, plus chapters on video tape recording, eavesdropping devices, and tape duplication. Truly an up-to-date guidebook for both professionals and amateurs alike. 224 pps., over 200 illus., 21 chapters. Hardbound.

List Price $7.95 ● **Order No. 497**

The Oscilloscope



An all-new revised third edition of the classic work on understanding and using oscilloscopes. Completely expanded and updated to include triggered sweeps, dual-trace scopes, electronic switches for multi-waveform displays, DC-to-DC supplies, DC-to-AC inverters, and DC-to-DC converters, this brand-new book is right up-to-date. Revised to include the latest information in keeping with technology. It is a virtual handbook on the subject, explaining scope operation from the simplest to the most intricate uses. Beginning where the scope manual stops, the author covers basic waveforms (DC, sine, sawtooth, trapezoid, and pulse) clearly detailing their generic characteristics and how they are interpreted in oscillography. 256 pps., over 179 illus., 8 chapters.

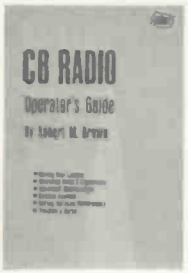
List Price $7.95 ● **Order No. 498**

Basic Math Course For Electronics

Here's the quick and easy way to understand math as it applies to electronic shop practice. (Example: You have to replace a new stereo cartridge which feeds a 70 db preamp. The power amps each require 2 volts input for full rated output. What is the output requirement of the replacement cartridge?) In no time at all you will master the wide variety of such basic math computations which arise in everyday work—from Ohm's law to network algebra, from J operator to vector analysis. Clear worked-out examples, diagrams and tables, plus step-by-step learning, make this an invaluable aid for anyone who has trouble with math. 160 pps. Hardbound.

List Price $7.95 ● **Order No. G100**

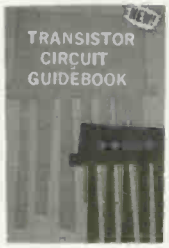
CB Radio Operator's Guide



An all-in-one handbook on Citizens Band radio, and how to make the best use of available equipment. Tells you everything you must know to get on the air, with complete details on what you can and can't do right down to the "nitty gritty" rules and regulations! What's more, you receive expert advice on the type of equipment to buy, and how to get the best performance out of your "system." The information contained in this book will save you time and money in short order! With this one book, you can become an expert on CB Radio, and how to use the service most successfully. You'll learn about antenna systems, including how they are used in CB. 224 pps. Hardbound.

List Price $7.95 ● **Order No. 499**

Transistor Circuit Guidebook



Regardless of your niche in the world of electronics, you'll find this collection of transistor and solid-state circuits of value. Section titles read like an electronic circuit "Who's Who": tuners and receivers — amplifiers — test devices — power - controlling — light - controlling — transmitter — audio — special receiver — automotive — computer — TV circuits, and many, many others. Within each section is a wide variety of circuits touching virtually every point of interest. Each circuit is accompanied by a description of how it works, pointing out unusual features and applications. Technicians who acquire a familiarity with these circuits will be far better equipped to cope with present and future equipment troubles. 13 big sections, 104 circuits in all, 224 pps. Hardbound.

List Price $7.95 ● **Order No. 470**

On The Color TV Service Bench

A handy benchmate for practicing color TV technicians and B & W experts who want to break into color TV servicing. This new practical volume describes causes and cures for both the usual everyday color TV troubles, as well as those tough dogs you run into once in a blue moon. Here are commonsense service bench approaches for solving all sorts of color TV troubleshooting problems, many of them adapted from well-established B & W techniques. Definitely not a textbook, the content explains how to tackle specific problems in a logical, professional way. Moreover, the author clearly explains how the operation of each circuit is affected by specific faulty components. 192 pps. 14 Chapters. Hardbound.

List Price $7.95 ● **Order No. 489**

TV Troubleshooter's Handbook —New 2nd Edition

A completely updated, quick-reference source for scores of tried-and-tested solutions to "tough-dog" TV troubles. This detailed compilation of practical help is the answer to the need for a well-organized file of proven troubles and cures, field factory changes, new and unusual circuits and descriptions of how they work, etc. This brand-new edition represents the only known up-to-date digest of specific TV troubles and cures, for both color and monochrome sets, up to and including 1969 models. Every major brand is included, from Admiral to Zenith, as are such "off" brands as Gamble Skogmo, Packard Bell, and Montgomery Ward. All troubles are categorized by make and model. Included in the color TV section are hints for troubleshooting chroma circuits, making adjustments, etc. 288 pps., over 150 illus.

List Price $7.95 ● **Order No. 521**

SEND NO MONEY! Simply fill in and mail postage-paid Airmail card today!

. . . for more details circle 106 on Reader Service Card

professional hands require years of training

professional TV service dealers insist on GE ULTRACOLOR picture tubes

(made by professionals for professionals)

GENERAL ELECTRIC

TUBE DEPARTMENT
OWENSBORO, KENTUCKY 42301

TECHNICAL DIGEST

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

GENERAL ELECTRIC

TV Receivers—Schematics with a New Look

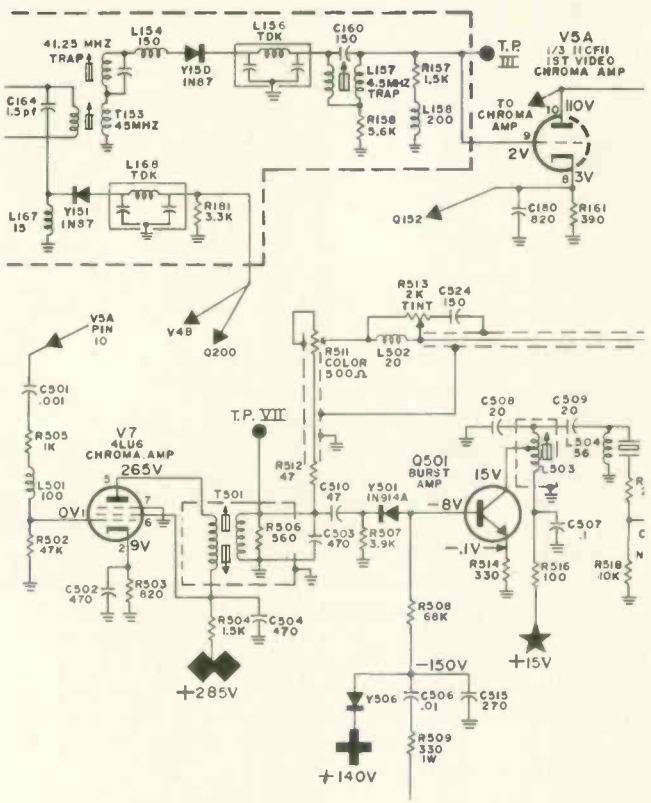
With recent designs stressing serviceability, it is becoming easier for technicians to find their way around TV receivers. It is only logical then that schematics also be easier to read.

Circuits can be difficult enough without further confusion from cluttered schematics. Especially difficult to trace are interrupted lines connecting one section of a schematic to another separated section.

Typical interrupted lines are: interstage coupling, feedback, and B+.

More convenient point-to-point schematic reading might be possible if there were no interrupted lines at all. But this then would result in many crisscrossing lines, and would still be confusing. So another solution must be found.

When the purpose of interrupted lines is considered, an obvious answer to the problem becomes evident. Since these lines show a signal going from one point to another point, the direction of the interconnection could be shown. In this way, one can "visualize" the point-to-point connection between interrupted lines.

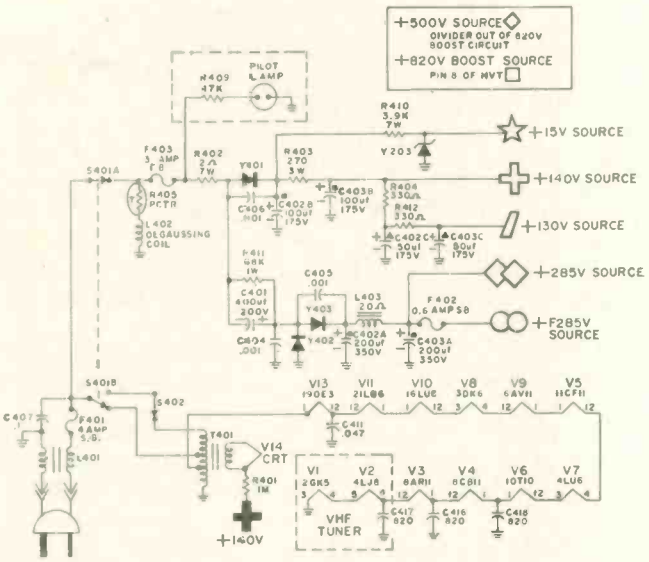


The partial schematic shown illustrates this idea. There are two specific things about these interrupted lines:

- different slopes, and
- arrowheads.

A line going from a point is at the same slope as a line going to another point being connected. Also, an arrowhead shows the from-to direction of signal flow. Then, to complete the line identification, reference points are given.

Notice in the illustration, for example, how easy it is to trace the line from V5A, pin 10, to C501.



Also to be noticed are the different symbols used for various B+ lines. Such eye-catching symbols help in quickly identifying power distribution throughout a schematic. To further aid in recognizing B+ distribution, each power source symbol is white, and each load is black. And as shown in the illustration, all the different symbols and their voltage level are conveniently referenced in the power supply section of the schematic.

Schematics for General Electric portable TV receivers are taking on this new look—using these features of interconnection lines and B+ symbols. The first one is with General Electric's new 16-in., N-1 color chassis.

All Chassis Using Printed Circuit Board Mounted Audio Output Transformers—Intermittent—No Audio

Symptom: Audio intermits at intervals during warm-up. Cause: Intermittent solder connections at circuit board where transformer leads pass through board. Correction: De-solder leads, one at a time, and use a knife to scrape the transformer lead clean to insure a good solder flow when the lead is resoldered to the board. Resolder. Caution: Visual inspection of the solder connection can be misleading. The solder fillet may look perfectly good and still be making a poor electrical connection.

MAGNAVOX

Amplifier A577—Motorboating

Models such as the 1K8851 component tuner, which utilize the A577 Amplifier, may exhibit a motorboating condition when headphones are used and the speakers are cut off. This condition can be corrected by removing capacitors C1 and C51 from the amplifier chassis. Later versions have had this change made in production.

Solid-State TV Chassis T908 and T915

An earlier newsletter reported that failure of the horizontal output transistor (Q603) may be caused by failure of capacitor C615. Recent field reports indicate a need for re-emphasizing the importance of checking this capacitor. Whenever it is necessary to replace the horizontal output transistor, capacitor C615 should be replaced at the same time using Magnavox Part No. 250290-17, which is an 8200pf capacitor rated at 2kv.

COLORFAX

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

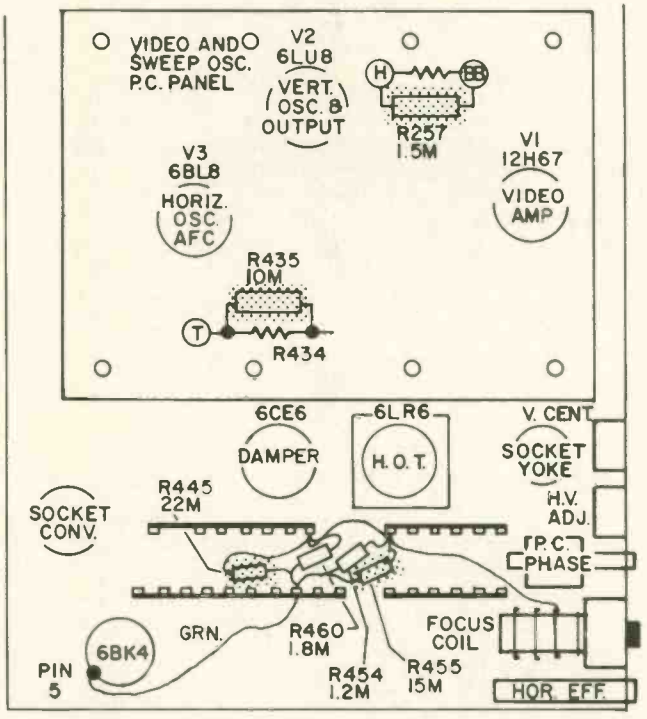
SYLVANIA

Why Change a CRT First?

What seemingly could be a soft CRT may be just a shift in circuit parameters caused by variances in resistors, transistors, vacuum tubes, and the CRT.

These slight changes can add up one way or the other, affecting either or both the second anode voltage and CRT brightness parameters.

See illustration for chassis D12 trim resistor's location identified by the shaded area. Removal of specified resistors will correct one or both of the conditions mentioned.



However, prior to trimming the second anode voltage and/or brightness to specified standards, the screen and drive control must be adjusted by the normal set-up practices for proper grey scale and grey scale tracking.

HV Trimming

If necessary, trim up the high voltage to specification using a black raster (no beam current). First, measure the second anode voltage, make any adjustment to raise or lower it to 25kv by turning potentiometer R456, the HV adjust control.

Should the second anode voltage not meet the 25kv mark during adjustment, a voltage change is required across the 6BK4 bias network R456, R455 and R454, R460 and R445.

The bias network IR drop ratios are changed by removing one or the other trim resistors, R445 or R455.

When the HV adjust is made, and the second anode voltage falls below 25kv, R445, a 22M resistor, is removed, making the grid voltage less positive, decreasing the 6BK4 conduction, raising the second anode voltage.

If any high voltage set up conditions develop that require a high voltage reduction beyond the HV adjust control range, the IR drop ratios can be changed by removing R455, a 15M resistor, making the 6BK4 grid voltage more positive (increasing its conduction), and lowering the HV.

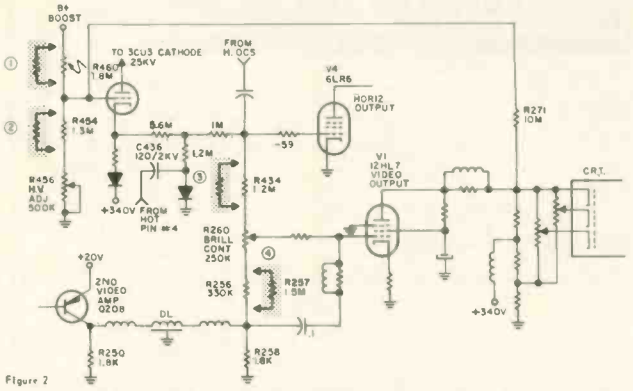
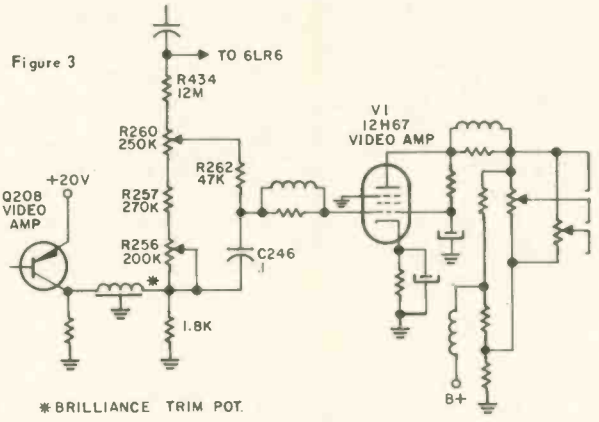


Figure 2

Brilliance Trimming

Brightness parameters are observed by using full contrast and brightness control setting, with the second anode voltage as previously adjusted, and a 90% brightness raster. This condition may be developed in the field by connecting a cross hatch generator to the set, and detuning either the set or the generator to show black lines.

When the brightness is varied, the raster may compress, but this is normal if raster edges are not viewable.



However, should the raster edge show, its condition is fixed by removing a 1.5M resistor, R257, from the brightness control resistance network. The voltage ratios across the divider changes, placing the brightness control in a more negative voltage range. Now, the video amplifier conduction lowers, raising its plate voltage, making the CRT cathodes more positive turning down beam current.

Should the brightness level be too low, and the raster not compressed during brightness control changes, be certain R257, a 1.5M resistor, is in the circuit and then remove R435, a 10M resistor. This resistance change will shift the IR drop ratios, placing the brightness control in a less negative voltage range. This change shifts the video amplifier's dc level, lowering its plate and CRT cathode voltage, thus increasing the brightness.

Trim Pot (Brightness Range Pot)
Chassis D12-09-09 D12-15-07 D12-21-50 D12-11-06 D12-20-50

Brightness trimming resistors R257 and R256, a 330K and 1.5M, have been replaced by a trim pot R256 and a 270K resistor R257. The brightness range pot has been added between R258, a 1.8K resistor and R257. The brightness range pot adjustment accomplishes the same effect for brightness control as the trim resistors.

NOW you can measure resistors accurately

IN CIRCUIT!

in solid state devices

FE20 HI-LO
with hi-voltage probe and large six-inch meter $129.50

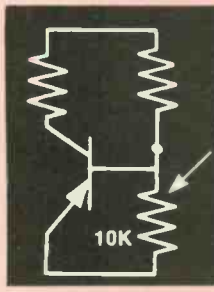
FE21 HI-LO with 4½-inch meter $99.50

WITH THE NEW HI-LO FIELD EFFECT MULTIMETERS

USES ONLY .08 VOLTS TO POWER OHMMETER TO PREVENT TRANSISTORS FROM CONDUCTING AND UPSETTING READINGS

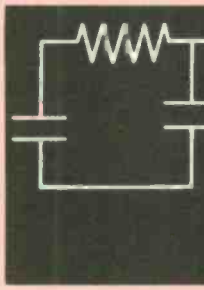
Look at these extra features to see why the Hi-Lo meter belongs on your want list:

- Unbelievable specifications of 15 megohm input impedance on DC and 12 megohms on AC
- Laboratory accuracy of 1.5 percent on DC and 3 percent on AC
- 9 DC voltage ranges from as low as .1 volts full scale to 1000 volts
- 3 hi-voltage ranges of 3 KV, 10 KV and 30 KV
- 9 DC zero center ranges from .05 volts to 500 volts . . . a must for delicate transistor bias measurements
- 7 resistance ranges from 1000 ohms full scale to 1000 megohms
- 9 DC current ranges from 100 microamps to 1 amp
- Automatic built-in battery test . . . never a worry about rundown batteries, just push the switches under the meter and read.
- Standard .6 amp fuse to protect the ohms and milliamps scales if voltage or overload is accidentally applied. No more need to return the meter to factory for repair . . . just replace the fuse.
- Special probe with 100K isolation resistor in probe to prevent AC pickup or to prevent loading oscillator circuits. Leave in normal position for most tests.



Low voltage of .08 volts prevents transistors from conducting and misreading circuit. Resistor will now read 10K as it should. Also prevents any damage to transistor.

Here is why you should have both Hi and Lo battery voltages for correct in-circuit resistance measurements in solid state circuits:



Higher voltage of 1.5 volts causes semiconductors to conduct to read proper front-to-back ratio or conductivity of transistors. Meter would not be complete without hi-ohms reading.

SENCORE INC. 3200 Sencore Drive • Sioux Falls, South Dakota 57107

HARCOURT HOTLINE
Call TOLL—FREE For Further Information
(800) 346-0081
In Minnesota Call
218-727-8515

The replacement picture tube no other color tube can replace!

Simulated TV picture

ZENITH®
CHROMACOLOR®

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!)

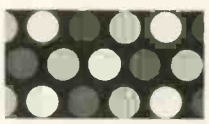
Full two-year warranty.

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

NEW PRODUCTS

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

COIL CORES 703

Designed to cover 0.2 to 300.0MHz

Coil cores have been designed to cover frequencies from 0.2 to 1.5MHz through 40.0 to 300.0MHz. The cores reportedly come in vinyl packages with specifications and dimensional drawings. Price $0.98 per pack and up. Miller.

BULLHORN KIT 704

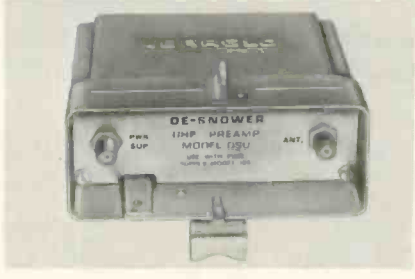
Solid-state, lightweight

A bullhorn kit designed for outdoor communication is reportedly able to punch up to 400 ft through dense and high-noise areas. Specifications indicate that the solid-state unit features a handle trigger, variable volume control and carrying strap. The bullhorn weighs 2½ lb and measures 11 in. long. Price $15.95. EICO.

UHF/VHF PREAMPLIFIER 705

Employs stripline-constructed transistors and low inductance

The Model DSU-105 is a high-gain, low noise, 75Ω impedance preamplifier intended for channels 14 through 83. It is said to employ stripline-constructed transistors with low radial lead inductance to reduce the noise figure over the entire UHF band, 470 to 890MHz. Contained in a mast-mounting aluminum casting, the preamplifier is reportedly radiation-proof and ready for immediate installation. Systems installers might be interested in knowing that the unit is designed as a match for the Model J-275 antenna. The manufacturer's specifications are: Gain—470 to 800MHz: 26dB, 800 to 890MHz: 23dB. Flatness of Response—±1.25dB. Noise figure—470MHz: 6.5dB, 800MHz: 7dB, 890MHz: 7.5dB. Output capacity—+40dBmv for 3 channels at —46dB cross-mod. The preamplifier is said to measure 5½ in. by 5¼ in. by 2 in. and weigh 2 lb. An indoor mounting power supply, Model 105, is reportedly also supplied. Unit list price $150. Jerrold.



TAPE HEAD CLEANER 706

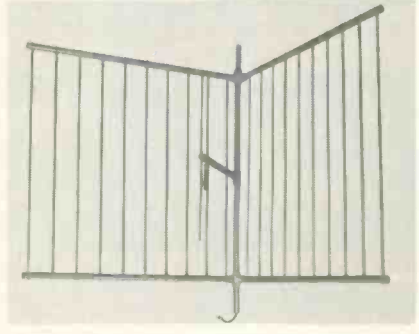
Eliminates the need to clean heads manually

An automatic tape head cleaner has been designed for stereo cartridge tape players. The device is said to eliminate the need to clean player heads manually. The cleaner consists of a small, spring-loaded arm attached to the inside of the chassis. The arm has a soft swab at the tip that is positioned directly in front of the tape head. As a cartridge is inserted into the player, it contacts a guide on the cleaner arm, causing the swab to move gently across the surface of the play head. As the cartridge is removed, the swab passes down over the head again and comes to rest. Tenna.

ANTENNA 707

Designed for point-to-point communications installations

A corner reflector antenna has been designed to cover the 148 to 160MHz band without tuning. Specifications indicate that the antenna is constructed of a non-corrosive aluminum alloy and that it produces a directional gain of 8dB over a ½-wavelength dipole reference. There is also a UHF version of the antenna which covers the 450 to 470MHz band. Both types reportedly handle 500w of transmitted power. Antenna Specialists.



HEX KEYS 708

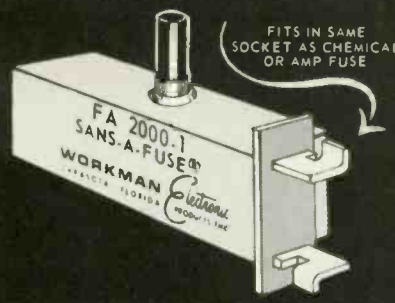
Snap into straight-out or right-angle position

Three sets of fold-up Hex keys are said to cover a range from 0.050 in. through ⅜ in. with beveled ends. The wrenches reportedly snap into either a straight-out or right angle position for additional leverage. Specifications indicate that the sizes are: small—eight key sizes from 0.050 in. through 5/32 in., handle length 3 in., medium—nine key sizes from 5/64 in. to ¼

A NEW AND IMPORTANT DEVELOPMENT FOR TV SERVICING

12 MODELS

SANS-A-FUSE®



COLOR CODED CIRCUIT BREAKER REPLACEMENT FOR CHEMICAL OR AMP FUSE

•

SAVES TIME AND FUSES WHEN LOCATING SHORTS IN TELEVISION CIRCUITS

•

DEVELOPED AND MANUFACTURED BY

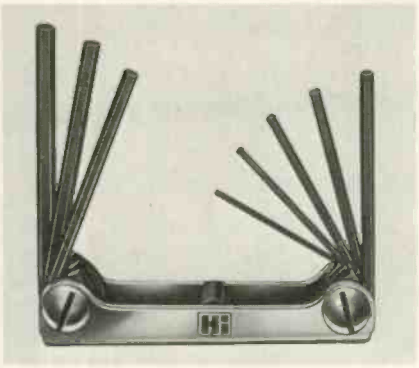
WORKMAN Electronic PRODUCTS, INC.

BOX 3828 SARASOTA, FLA. 33578 TELEPHONE: Area Code 813 955 - 4242

. . . for more details circle 140 on Reader Service Card

NEW PRODUCTS

in., handle length 4¼ in., large—five key sizes from 3/16 in. to ⅜ in., handle length 5¼ in. Holub Industries.



PANEL METER 709

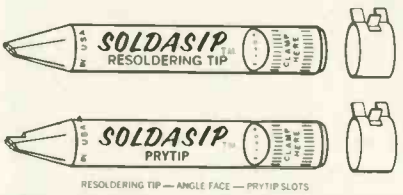
Shallow barrel for front panel mounting

A jumbo-size 8-in. industrial panel meter with a non-static glass front, long scale, dust-proof gasket and a shallow barrel has been designed primarily for front panel mounting. The meter can reportedly be obtained in various ranges and types. The ac iron vane version is equipped with "viscous damping" which is said to provide the meter user with a faster reading response time than previously obtainable. The meter weighs 25 oz. Price $20 to $30. Triplett.

RESOLDERING TIP 710

Tip retains its original shape without being filed

A resoldering tip has been designed for both solder application or solder



RESOLDERING TIP — ANGLE FACE — PRYTIP SLOTS

You need both! VECTORSCOPE/ COLOR BAR GENERATOR

One Year Warranty

MODEL V-7

Unique all-in-one unit

- Checks, aligns demodulators to any angle
- Checks, aligns bandpass-amplifier circuit
- Pinpoints troubles to a specific color circuit
- Portable for field or shop

Exclusive Features: Self-Calibrating—adjust timing circuit without external test equipment. Plus: All Crosshatch, Dots, and Color Patterns; Voltage Regulated. Free copy, Wayne Lemon's "Color TV Servicing Simplified with Vectorscope".

$199.50 NET

See your distributor or write Dept. ET-10

LECTROTECH, INC.

4529 N. Kedzie Ave., Chicago, Illinois 60625

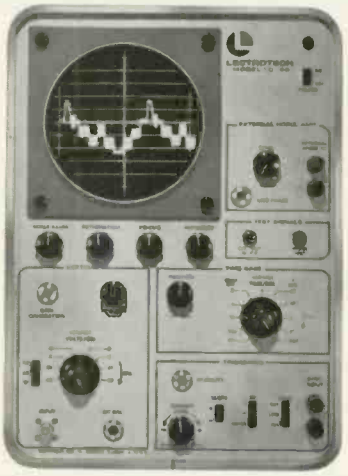
. . . for more details circle 124 on Reader Service Card

TRUE TRIGGERED SWEEP

OSCILLOSCOPE/VECTORSCOPE

MODEL TO-50

- DC to 10 mhz frequency response
- .02 volt sensitivity
- Calibrated vertical attenuator
- Calibrated time base
- Supplied with combination direct/locap probe
- 5 X magnifier
- Automatic triggering mode
- 5" flat face tube edge-lit graticule



One Year Warranty All American Made $339.50 NET

See your distributor or write Dept. ET-10

LECTROTECH, INC.

4529 N. Kedzie Ave., Chicago, Illinois 60625

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

With all that free loot, no wonder the chips are starting to fly.

Nearly everybody who uses Sylvania receiving tubes (and that's nearly everybody in the business) is saving those Sylvania chips. And why not? Everybody can come out a winner. You can redeem the chips for blenders, broilers or binoculars; toasters, tools or TV sets; cameras, clothing, or cutlery. If you haven't seen Sylvania's "In the Chips" catalogue yet, ask for one at your local participating Sylvania distributor. And don't wait for Christmas for the gift you've wanted.

"In the chips" promotion. SYLVANIA
GENERAL TELEPHONE & ELECTRONICS

GREATEST TV Schematic Bargain EVER Offered
NOW-Complete TV Schematics for less than 5¢ each

COLOR TV
Covers ALL Color Sets 1960 - 1968

BLACK & WHITE
Coverage for 23 U.S. Brands 1965 - 1968

TV TECH/MATICS-8 Giant Volumes

Cover 99% of Color TV-4 Years B&W!

Here are FABULOUS savings on nationally-known TV schematic and service data. Here is everything you need to fill your vital service data needs for TV model years 1965 through 1968 . . . plus COLOR TV coverage from 1960 through 1968! What it amounts to is a low, low cost of less than $7.50 per year for your TV service data . . . with an extra 5 years of Color TV coverage thrown in for good measure!

SERVICE DATA FOR MORE THAN 20 BRANDS

TV TECH/MATICS is the ideal Service Data package for today's modern technician. It includes complete schematic diagrams and vital servicing data for every TV receiver produced by more than 20 leading American Manufacturers for 1965, 1966, 1967, and 1968. All diagrams and servicing details are completely authentic, based on information provided by the original equipment manufacturers. Each year's coverage is permanently bound into two convenient-to-use volumes which open flat to 11″ x 29½″, ready to provide you with instant service data at your workbench. Some of the diagrams are as large as 58″ x 22″.

EASY TO USE

TV TECH/MATICS is easy to use. Brand names are arranged alphabetically by model year. No more hunting through several file drawers to find the schematic you need! And at the special low price, think of the savings you will enjoy on your schematic needs . . . think of the time you'll save by having the schematics you need right at your fingertips in handy, permanently-bound form!

TV TECH/MATICS is the ideal way to cut down your schematic expenses, and to enjoy the convenience of having all your data needs right at your fingertips.

HERE'S WHAT YOU GET

You receive 8 BIG volumes in all, two for each year from 1965 through 1968. Included is a clearly detailed and annotated TV schematic diagram for each specific model. You also get complete replacement parts lists, alignment instructions, tube and component location diagrams, plus key waveforms and voltage readings . . . all the information you need to service over 90% of the TV receivers you'll encounter!

Compare that with the over $100 a year you may now be paying for comparable information.

8 BIG Volumes
Regular Price $79.60
...NOW YOURS
for only $29.95

STREAMLINED AND CONVENIENT

All the information for a given model is contained on two facing sheets. The special bound-leaf format allows pages to lie flat when open. Each volume is organized alphabetically by manufacturer, then numerically by model number. In addition, a handy Chassis/Model Finder is bound into each volume.

Regular list price for each year's coverage — 2 BIG volumes — is $19.90. All 8 volumes normally sell for $79.60. Your price is ONLY $29.95 . . . a savings of nearly $59.00!

MONEY-BACK GUARANTEE

You MUST be satisfied that TV TECH/MATICS is the greatest bargain in TV Schematics ever offered. Order at our risk for FREE 10-day examination. Prove to yourself they are worth many times the price. You can return them in 10 days for full refund or cancellation of invoice. No need to send money. But, the supply is limited, so fill-in and mail the NO-RISK coupon today to obtain these time-saving, money-making manuals.

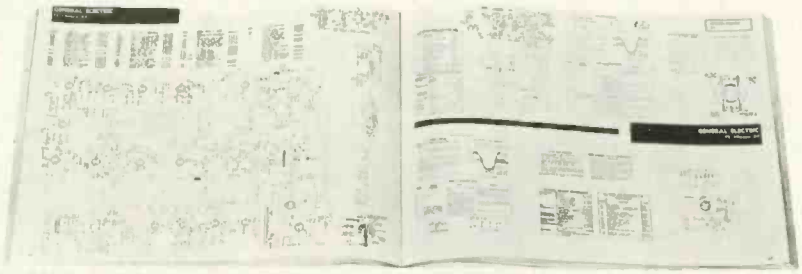
-CONTENTS-

CONTENTS 1965 MODELS
Covers all 1965 models for: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Electrohome, Emerson, Firestone, General Electric, Magnavox, Motorola, Muntz, Olympic, Packard-Bell, Philco, RCA Victor, Sears-Silvertone, Setchell-Carlson, Sylvania, Truetone, Westinghouse, and Zenith . . . plus all color sets 1960-1965, at no extra cost!
PUBLISHER'S LIST PRICE $19.90

CONTENTS 1966 MODELS
Covers all 1966 color and B & W models of: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco, RCA Victor, Sears-Silvertone, Setchell-Carlson, Sonora, Sylvania, Truetone, Westinghouse, and Zenith.
PUBLISHER'S LIST PRICE $19.90

CONTENTS 1967 MODELS
Covers all 1967 color and B & W models of: Admiral, Airline, Andrea, Coronado, Curtis Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco-Ford, RCA Victor, Sears-Silvertone, Setchell-Carlson, Truetone, Westinghouse, and Zenith.
PUBLISHER'S LIST PRICE $19.90

CONTENTS 1968 MODELS
Covers all 1968 color and B & W models for: Admiral, Airline, Andrea, Coronado, Curtis-Mathes, Dumont, Emerson, General Electric, Hoffman, Magnavox, Motorola, Olympic, Packard-Bell, Philco-Ford, RCA Victor, Sears-Silvertone, Setchell-Carlson, Sonora, Sylvania, Truetone, Westinghouse, and Zenith.
PUBLISHER'S LIST PRICE $19.90



LARGE PAGES contain complete circuit schematics, replacement parts lists, alignment instructions critical part locations, important waveforms and voltage readings.

NO RISK COUPON—MAIL TODAY

TAB Books, Blue Ridge Summit, Pa. 17214

☐ I enclose $29.95 for which please send me your complete 8-Volume Tech/Matics Schematic offer postage prepaid.

☐ Please invoice me for $29.95 plus postage. Same return privileges.

Name .....

Company .....

Address .....

City ..... State ..... Zip .....

(Paid orders shipped prepaid. Pa. resident add 6% Sales Tax. Outside USA 10% extra.)

ET107

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

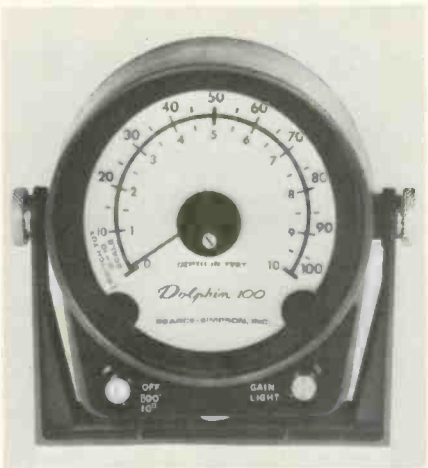
NEW PRODUCTS

removal by means of capillary slots cut across the bevel end. Temperature adjustments of high, medium and low regulate heat flow. The tip will reportedly retain its original shape throughout its life without needing to be filed. Price $1.95. Edsyn.

DEPTH SOUNDER 711

Solid-state construction and plug-in transistors

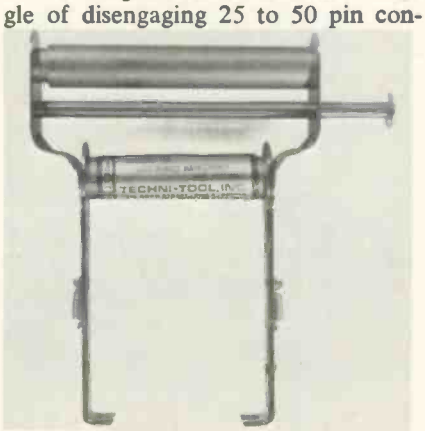
A solid-state meter type depth sounder reportedly features fiberglass circuit boards and plug-in transistors. Specifications indicate a 250° scale for shallow water viewing and dual range operation. Changes of depth reportedly observable are 18 in. to 10 ft on the low scale and 10 ft to 100 ft on the high range. Price $129.95. Pearce-Simpson.



CONNECTOR EXTRACTOR 712

Slight finger pressure separates large connectors without damage

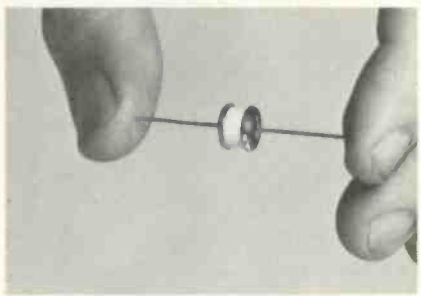
The 4925 Connector Extractor is a device designed to eliminate the struggle of disengaging 25 to 50 pin connectors. A slight pressure of the fingers can reportedly separate connectors. The unit is said to utilize an even pressure without a chance of damaging individual connector pins or marring connectors. Techni-Tool.



SURGE ARRESTER 713

Protects against both external and internal surges

A line of two-electrode, gas-filled, subminiature surge arresters has been designed to suppress external surges as well as to protect against internally generated surges caused by short circuits and switching of inductive components. The arresters are said to be guaranteed for 50 discharges under maximum load conditions. If failure occurs, it will reportedly do so typically in the fail-safe direction. Five voltage ratings of 90, 230, 350, 470



ACA
ANTENNA CORPORATION of AMERICA
HARRY E. RHEINSCHMIDT
General Manager
BROOKS TOWERS
SUITE 22-D
1020 15TH STREET
DENVER, COLORADO
80202
(AC-303) 892-1481
CLIP and SAVE!
ANNOUNCING...
a new line of patented TV antennas from a most reliable source
The new ACA antenna line offers a complete selection of VHF, UHF, FM reception in color and black/white. Priced for today's market, with all of the top quality features you expect, including gold-anodized, high tensile aluminum elements, die cut impedance correlators, dual action director/reflector screen and tetrapole collector element.
Also, available from ACA — antenna preamplifiers, booster couplers, matching transformers. Line up today with ACA!
For complete details, write or call:
ACA ANTENNA CORPORATION of AMERICA
Brooks Towers, Suite 22-D • 1020 15th St. • Denver, Colo. 80202 • Tel. 303/892-1481
. . . for more details circle 102 on Reader Service Card

Tele Matic ECONO-JIG

COLOR TEST JIG KIT
UNDER $50.00

IDEAL FOR SETTING UP AND EXPANDING COLOR SERVICING FACILITIES

STURDY METAL CABINET FOR PORTABLE, BENCH OR HANGING OPERATION

ECONO-JIG INCLUDES ALL COMPONENTS LESS PICTURE TUBE—

YOU SAVE BY PROVIDING YOUR OWN 19" COLOR TUBE

FOR THE ECONO-JIG, AND ALL OTHER TEST JIGS—TELEMATICS COLOR TEST JIG ADAPTORS—ALLOW SERVICING OF ALL MAKES OF COLOR SETS, FREE CROSS REFERENCE—OVER 2500 DOMESTIC AND FOREIGN SETS LISTED.

TELEMATIC DIV. U.X.L. CORP. 2245 PITKIN AVENUE, BROOKLYN, N.Y. 11207

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

WEIRD SPOOKY SPECIAL
(Just in Time for Halloween)

BUY A CAN OF
BLUE SHOWER
and get a bag of
HALLOWEEN CANDY—FREE

Clean up on the weird, spooky things caused by contamination in the tuner and at the same time get ready for the weird, spooky things that come to your door October 31st. *

BLUE SHOWER FOR TUNERS cleans and restores detuned and dirty tuners to like new condition quickly and easily. Cleans out neutralizing capacitors that have drifted or oscillated. (Since ***BLUE SHOWER*** leaves absolutely no residue we recommend lubricating the contacts with ***BLUE STUFF FOR TUNERS*** for continuous lubrication and cleaning in the future.) Packed with two extensions and nozzles, one for a heavy spray and one for a drenching spray.

Write for a copy of COMMON SENSE APPROACH TO TUNER CLEANING,—we'll send one for each of your technicians if you want.

*(At participating jobbers only, offer expires October 31, 1970).

TECH SPRAY chemical tools for technicians
P. O. Box 949 • Amarillo, Texas 79105

. . . for more details circle 134 on Reader Service Card

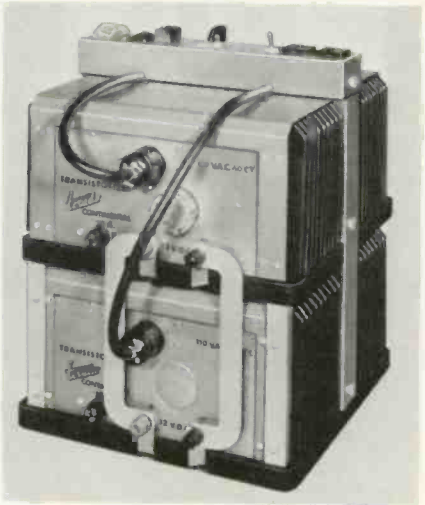
NEW PRODUCTS

and 800vdc are reportedly obtainable. Signalite.

INVERTER 714

Converts 12vdc battery to ac power with ½Hz accuracy

The Quad-Continental inverter, Model 50-110, reportedly changes standard 12vdc to 117v 60Hz ac while maintaining a frequency within ¼ Hz regardless of input voltage or load. The inverter, which has a 1000 to 1200w rated capacity, is said to be completely filtered for operation of sound equipment, complete with control harness, and contains solid-state circuitry and uniform forced air cooling. Specifications indicate that the inverter is even capable of operating medium size compressor-type refrigerators and that it is completely silent while in operation. Terado.



ALARM SYSTEM 715

May be triggered by alarm system sensors

The MK X Dialalarm is a single-channel emergency communication system designed to protect businesses, homes, industry and governmental installations. Twin channel capability is

reportedly provided by coupling a second unit. Preprogrammed on a tape

In spite of all the TV service giants there's still plenty of room for the independent service dealer...thanks to the Opti-Vue Color CRT with full three year warranty!

Opti-Vue not only gives your customer 1971-style color that's as good as anything the big guys have, but guarantees him up to 3 times his money's worth.

If he's thinking of junking his set he may think again when he hears about the three year deal. Then you've locked up his business whenever any other part of his set needs work.

That's how you can beat the giants...or become one!

OPTI-VUE Color and Black & White CRT's...with the 3 year warranty

CHANNEL MASTER

DIV. OF AVNET INC., ELLENVILLE, N.Y. 12428

. . . for more details circle 108 on Reader Service Card

Sell it with pride—profitably!

THE ULTIMATE ANTENNA
by Jerrold

The new Jerrold VU 937—THE ULTIMATE ANTENNA—is one deep fringe antenna that needs no apologies. For the performance. For the construction. For the price. VU 937 beats all the really tough fringe area reception problems without creating any new ones:

- Picks up Color, UHF, VHF, and Stereo FM loud and clear
- No ghosts, interference, smears, or snow
- 16-foot boom features preassembled snap-lock construction and *goes up all in one piece*
- Snap-on transformer converts antenna from 300-ohm to 75-ohm Coloraxial cable use
- Double square boom construction stays ramrod rigid

The Jerrold VU 937 has performance that you've got to see to believe. For total reception power, see your Jerrold Distributor about full data on THE ULTIMATE ANTENNA today. Or write Jerrold Electronics Corporation, Distributor Sales Division, 401 Walnut St., Philadelphia, Pa. 19105.

JERROLD™
a GENERAL INSTRUMENT company

Focusing on one thing... better reception

. . . for more details circle 119 on Reader Service Card

NEW PRODUCTS

cassette to place emergency calls of all types, the alarm is reportedly compatible with and may be triggered by the sensors of any alarm system. It is said to transmit the recorded emergency message to preselected phone numbers. Specifications indicate that this message can be repeated several times and be combined with other formats. Price for basic unit $98. Dialalarm.

VECTORSCOPE . . .

continued from page 55

circle is formed on the screen of the vectorscope (Fig. 10C).

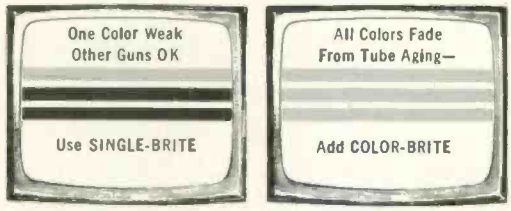
The less expensive scope clips the horizontal signal when the gain is increased to make the vector pattern large enough for viewing (Fig. 11A, B, C). This clipping does not occur when using the oscilloscope portion of the oscilloscope/vectorscope (Fig. 12) since we are able to turn the gain down and switch to a times five horizontal amplification. But, as before, the pattern that results is the mirror image of the one desired.

With both test instruments properly connected to the blue and red grids and the TV-set fine tuning just enough out of adjustment to lose color sync, the color vector signals appear to spin rapidly (Fig. 13A, B) while the "leg" corresponding to the horizontal sync signal remains stationary.

CONCLUSION

This and the previous article were too concerned with the capabilities of scopes and their effective use to deal with TV-set alignment. This and other subjects will be covered in more detail in future issues of ELECTRONIC TECHNICIAN/DEALER. As before, it is important to stress the fact that before any of us can do a first-class job of servicing, with whatever brand of scope we select, we *must* know that our scope has adequate sensitivity, gain, stability, sweep rates and frequency response for the job encountered. We can otherwise spend too much time attempting to correct for distortions that are actually in our test instrument rather than in the unit being serviced. ■

When one gun fades
restore color balance
with a Perma-Power
single-brite
COLOR GUN CONTROL



MODEL
B-150
$8.00 Suggested List Price

Here's a unique new product that lets you restore color picture balance when a single gun weakens. You just adjust the bias between the G1 and G2 grid leads of the weakened gun, permitting color intensity variation as needed for a balanced picture. Installation is easy . . . just two simple connections, no soldering. Now available at your parts distributor.

CHAMBERLAIN MANUFACTURING CORPORATION
845 Larch Avenue • Elmhurst, Illinois 60126 • Phone: (312) 279-3600

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

FOR ALL FIRE • POLICE • SECURITY • INDUSTRIAL • BUSINESS USE

we get thru — where others fail
OPERATES ANYWHERE—INDOORS, OUTDOORS . . . STEEL BLDGS.
SONARCOM
FM TRANSCEIVERS

*Model 2301 $375.00
132-174 MHz
VHF-FM 1 CHANNEL
1 pair of crystals and 1 set of standard batteries.

Model 2301A $475.00
132-174 MHz
VHF-FM 2 CHANNELS
1 pair of crystals and 1 set of standard batteries.

Model 2302 $595.00
450 to 470 MHz
UHF-FM 1 CHANNEL
1 pair of crystals, 1 set of standard batteries and Tone.

Model 2303A $475.00
32.5-41 — 42-50 MHz
Available in 2 Frequency Ranges
LF-FM 2 CHANNELS*
1 pair of crystals, 1 set of standard batteries less tone*
*Model 2303A available with tone at additional charge.

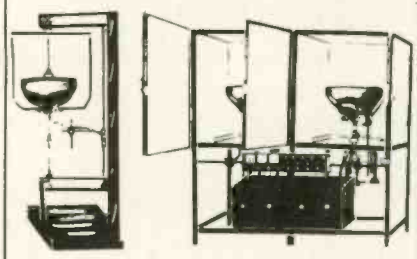
Professional performance! Perfectly designed for efficient dependable and continuous heavy duty use. Provides instant voice contact with base stations mobile units and other portable transceivers • Compatible with all 2-way systems • Receiver and transmitter operates on independent frequencies • sensitive, noise immune squelch • external connections for antenna, earphone and charger • 1.6 watt output. FCC TYPE ACCEPTED & D.O.C. APPROVED—U.S. BUREAU OF MINES APPROVED

SONAR RADIO CORPORATION
73 Wortman Avenue, Brooklyn, N.Y. 11207

Please send information on the SONARCOM. Dept. 214
Name
Address
City State Zip

. . . for more details circle 133 on Reader Service Card

REBUILD YOUR OWN PICTURE TUBES?



With Lakeside Industries precision equipment, you can rebuild any picture tube!

EASY TO OPERATE!

Requires only 4 x 8 ft. of space.

Your cost to rebuild black and white—$1.50.

Your cost to rebuild Color—$5.80.

For complete details, mail coupon.

LAKESIDE INDUSTRIES
5234 N. Clark St.
Chicago, Ill. 60640
Phone: 312-271-3399

☐ Free demonstration appointment
☐ Send me more information

Name .....
Address .....
City ..... State .....

. . for more details circle 121 on Reader Service Card

SERVICING CCTV . . .

continued from page 59

usually taken from a 50kHz to 500 kHz RF oscillator instead of from a 60Hz power line (see Fig. 7).

COAXIAL CABLES

Flexible coaxial cables often have stranded inner conductors and braided outer conductors. Either can be tinned for soldering. These should be inspected periodically for partial breakage or separation from terminal conductors. Flexible cables are used when a moderate loss is acceptable—for short hauls. Otherwise rigid lines are installed at less cost for the longer hauls.

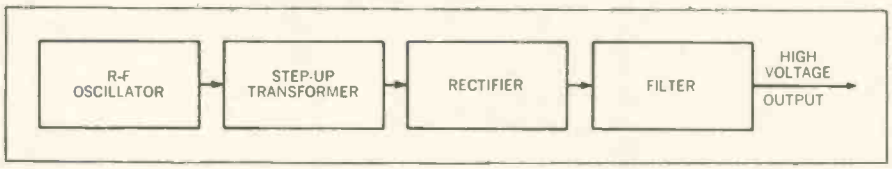
MECHANICAL COMPONENTS

Mechanical items require occasional light lubrication and frequent cleaning. Such components include: lens turrets, iris controls, mechanical focus controls, moving parts that permit the camera to be tilted and panned smoothly, and the wheels and slewing turret of a camera dolley. Remember, microphones pick up squeaks.

Motion picture film and slide projectors need periodic cleaning, scant lubrication. Never over lubricate. Wipe clear any evidence of excess lubrication. Film roller and sprocket mounts should never show leakage from over lubrication. The sound track pickup gate, for film tracks, must be kept meticulously clean or the loss of higher audio frequencies will ensue.

Multiplexers provide the optical link to select one of several projectors. Movable mirrors and reflecting surfaces must be kept clean, and sparsely lubricated whether motor or relay driven. ■

Fig. 7—Block diagram of RF high-voltage power supply.



THE GREAT PUT-ON CRC CONTACT CLEANER

Put it on rotary switches, computer heads, tuners, jeweled bearings, gyros . . . those sensitive contacts that must be microscopically clean.

A quick spray and it penetrates. Degreases. Cleans away dirt, moisture, oils. Lifts solids right out of metal pores.

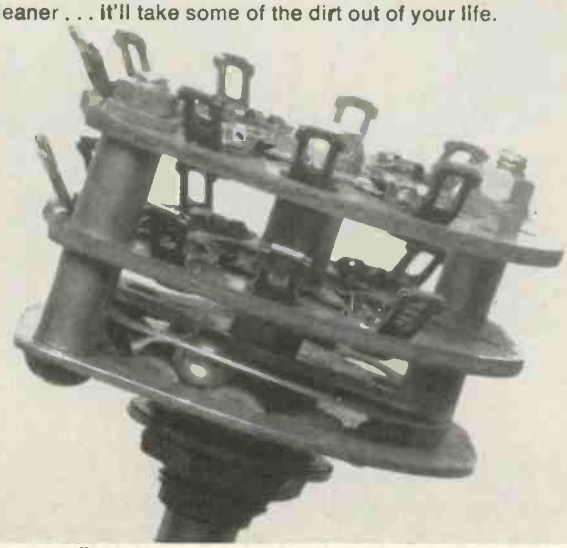
It evaporates completely. So no residue sticks behind to change critical electrical characteristics.

And it's safe. No flashpoint, won't burn. Low toxicity too.

CO Contact Cleaner . . . it'll take some of the dirt out of your life.

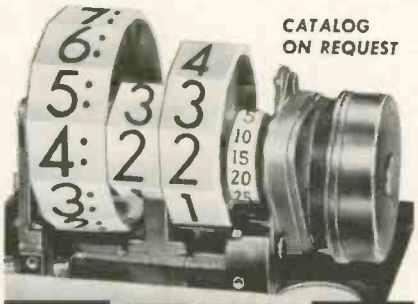
CRC

CRC Chemicals
Division of C. J. Webb, Inc.
Dresher, Pa. 19025



. . . for more details circle 111 on Reader Service Card

CATALOG ON REQUEST



12 HOUR 5/8 Digits

TYMETER® "Time At A Glance"

24 HOUR 5/16 Digits

CLOCK MOVEMENTS

DIGITS RESETTABLE INDIVIDUALLY

Available in 50, 60 cy., all voltages, AC. UL approved motor, cord. One Year Guarantee.

#130 . . . . 12-HOUR #131 . . . . 24-HOUR

#96 LARGE FIGURE COUNTER

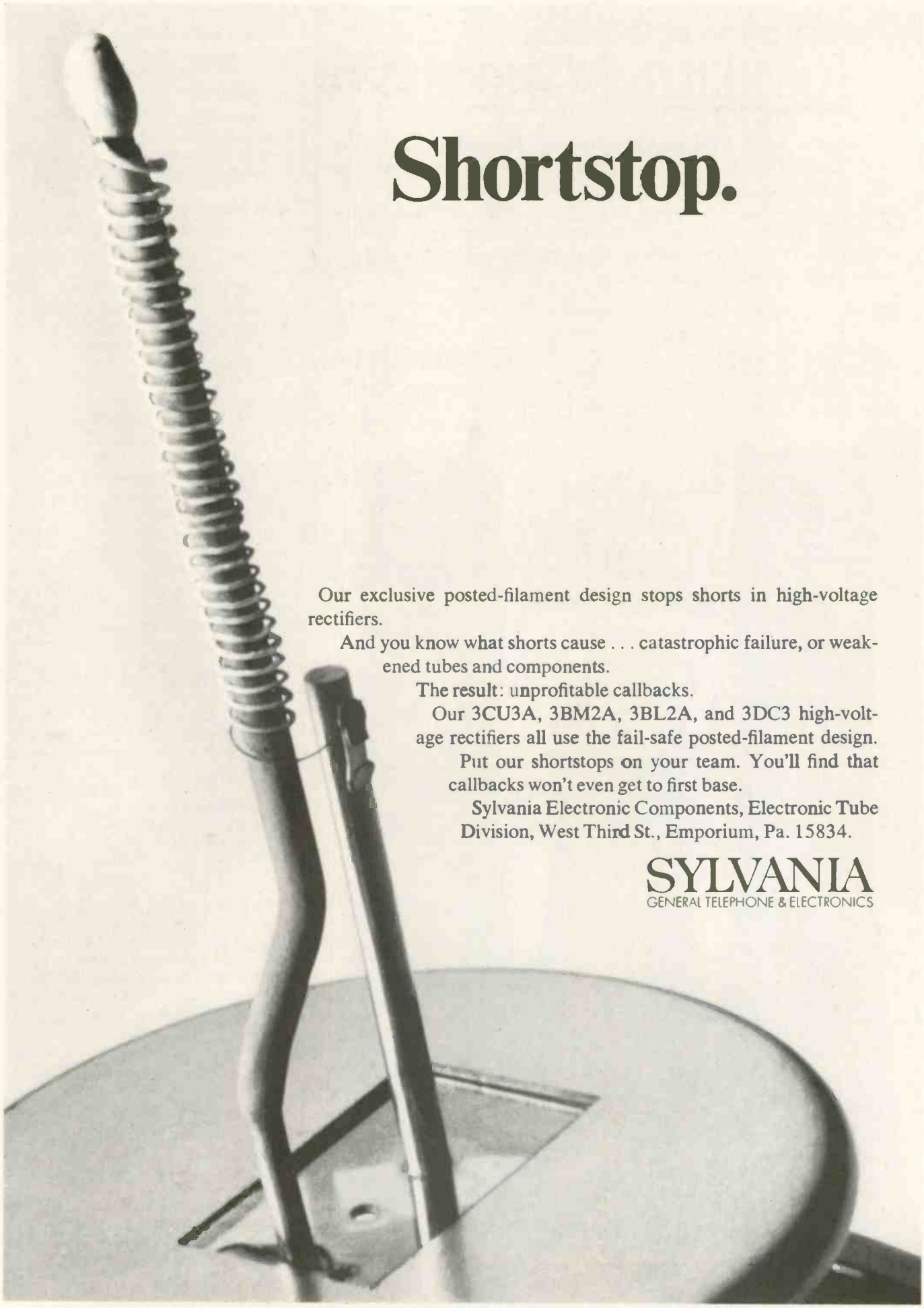
In tenths of seconds, seconds, tenths of minutes, minutes, tenths of hours, hours

Made in U.S.A.

Complete Line: Delay, Interval and Cycle Timers, Digital Computers

PENNWOOD NUMECHRON CO.
TYMETER ELECTRONICS
7249 FRANKSTOWN AVE., PITTSBURGH, PA. 15208

. . . for more details circle 126 on Reader Service Card



Shortstop.

Our exclusive posted-filament design stops shorts in high-voltage rectifiers.

And you know what shorts cause . . . catastrophic failure, or weakened tubes and components.

The result: unprofitable callbacks.

Our 3CU3A, 3BM2A, 3BL2A, and 3DC3 high-voltage rectifiers all use the fail-safe posted-filament design.

Put our shortstops on your team. You'll find that callbacks won't even get to first base.

Sylvania Electronic Components, Electronic Tube Division, West Third St., Emporium, Pa. 15834.

SYLVANIA
GENERAL TELEPHONE & ELECTRONICS

If you're not using these tools of the trade, YOU'RE LOSING MONEY!

That's right. The combination of TUN-O-WASH and TUN-O-BRITE for tuners increases customer satisfaction and eliminates costly callbacks. Super Frost Aid is far superior to other circuit coolers in tracking down thermal intermittents. Without these professional chemical tools of the trade, you're wasting hours of labor and a lot of referral business from satisfied customers.

TUN-O-WASH

GETS TUNERS REALLY CLEAN!

NO. 2400

TUN-O-WASH is completely unlike any other tuner spray on the market. TUN-O-WASH contains no lubricants. All of the power of its high pressure spray is designed to do just one job superlatively well—to melt away grease, oil, dust, dirt, corrosion and any other foreign material that may be on the tuner contacts. No other spray can even approach TUN-O-WASH in pure cleaning power. TUN-O-WASH restores the tuner to its original condition, leaving parts and contacts like new. Especially good for removing old, encrusted tuner sprays.

SUPER FROST AID

TAMES THERMAL INTERMITTENTS FAST!

LEAVES NO LIQUID RESIDUE

NO. 1550

Just let the chassis "cook" for an hour or so and then spray each component in the suspected circuit until you see a dramatic change on the TV screen or hear it on the speaker. The last component you have sprayed is usually the defective one.

Some component coolers don't work fast enough to enable you to be sure, but with Super Frost Aid, the reaction is fast and definite—as though you had clicked a switch.

TUN-O-BRITE

THE HEAVY DUTY TUNER SPRAY WITH BUILT-IN CONTACT BRIGHTENERS!

NO. BT-8

Polishes tuner contacts, removing all dirt and corrosion. Can't damage precious metal platings because polishing particles are hollow — disintegrate after initial wiping action. Leaves film of thick, protective lubricant with more body and staying power than any other aerosol lubricant on the market.

CHEMTRONICS CHEMTRONICS INC 1260 RALPH AVENUE BROOKLYN, N. Y. 11236

. . . for more details circle 109 on Reader Service Card

LETTERS

continued from page 25

For Sale

I have Sams Photofacts for sale. They range from 1 to 905. I will sell them by lots, if desired. I also will sell TV equipment and file cabinets.

REUBEN'S TV
1006 13TH AVE.
GREEN BAY, WIS. 54304

I have for sale some older test equipment in good condition, along with manuals, etc. I have also a large stock of obsolete tubes which I will sell or trade.

WILLIAMS RADIO & TV SERVICE
116 W. WASHINGTON ST.
LEWISBURG, W. VA. 24901

After being a subscriber to your magazine for the past 15 years both up north and down south, I find it impossible to evaluate the benefits I have derived from your publication.

I am now offering my TV sales and service business to any snowbird who feels he has had it up north. My store is located in a shopping center on the Florida east coast about five miles north of Ft. Lauderdale.

It would be an excellent opportunity for someone to take over a fully equipped and going business since I am forced to step down due to ill health. Full particulars will be given upon request.

IRV MARGOLIES
AVON ELECTRONICS
2476 N. FEDERAL HIGHWAY
LIGHTHOUSE POINT, FLA. 33064

The July article, "Installing a Mobile Transceiver," by Phillip Dahlen, contained a lot of good material, and it stressed workmanship of a better quality than is commonly used. One point, however, seems to have been missed. Noise will be reduced and output stabilized if a copper braid is run from transceiver ground to battery ground and if this braid is insulated where it passes through holes in the car body. This procedure is especially effective for pickups used on rough roads, and on four-wheel drive vehicles.

RONALD L. IVES

MOVING? BE SURE TO LET US KNOW YOUR NEW ADDRESS.

DEALER SHOWCASE

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

MODULAR AMPLIFIERS 716

Display rack features eight amplifier modules

Eight audio amplifier modules, designed for the hobbyist and do-it-yourselfer, are reportedly featured in a display rack. Specifications indicate that the prewired kits can be installed in the accessory cabinet/chassis kit which is also included in the display. Modules in the line are said to range from a 1w monophonic amplifier to a 20w stereo amplifier and a 30w guitar amplifier. GC Electronics.

MONITOR SCANNER 717

Can be converted to low band, VHF or UHF

A crystal-controlled, 8-channel, digital readout monitor scanner reportedly features an interchangeable front-end module which is designed to convert the unit to low band, VHF or UHF monitoring. The scanner reportedly features individual channel lockout switches which permit programmed listening. Unimetrics.

TAPE CARTRIDGE SYSTEM 718

Four speakers surround the listener with sound

A four-channel tape cartridge system reportedly uses an 8-track tape cartridge and reproduces four separate channels of material through four separate speakers. The four speakers are said to be placed so as to surround the listener with sound. Specifications indicate that the tape player has four separate volume controls, two separate bass controls and two separate treble controls for front and rear speaker sets. Lear Jet Stereo.

STEREO HEADPHONES 719

Soft rubber cushioned earcups and adjustable headband

A set of stereo headphones in kit form is guaranteed by the manufac-

NOW A ONE STOP SHOPPING CENTER FOR YOUR AUTO RADIO AND 8 TRACK STEREO PARTS. AT FACTORY DISCOUNTS

WE ARE AUTHORIZED PARTS DISTRIBUTORS FOR:

DELCO, BENDIX, MOTOROLA, LEAR JET, TENNA, METRA, AUTOMATIC, ON GUARD, CRAIG, PANASONIC, PHILIPS, BELLE WOOD, WARD, QUICKMOUNT, DEWEKO, AC SPEEDO, KING SEELEY, STEWART WARNER

STERO LOCK MOUNTS

SEND YOUR ORDERS WITH PART NUMBERS TO

Laran Electronics, Inc.

3768 BOSTON ROAD
DEPT. 100 BRONX, N.Y. 10469

OR SEND MODEL, MAKE AND DESCRIPTION OF PART WANTED.

. . . for more details circle 122 on Reader Service Card

the Electronic Industry's Best CONTROL CLEANER/LUBRICANT

SUPER TROL AID

NO. 820 8oz. SPRAY CAN ONLY $1.98 dealer net

- WITHSTANDS HIGH CHASSIS TEMPERATURES WITHOUT EVAPORATING OR OXIDIZING (–40°F to 280°F)
- DUAL ACTION – CLEANS OFF CORROSION AND DIRT, THEN LEAVES PROTECTIVE LUBRICATING COATING
- EXCELLENT FOR CONTROLS, SWITCHES RELAYS – ALL CONTACT DEVICES

CHEMTRONICS 1260 RALPH AVE. BROOKLYN, N.Y. 11236

. . . for more details circle 110 on Reader Service Card

IF YOU ARE A TV REPAIR MAN YOU NEED

TV TECH AID

TV TECH AID is the best trouble shooting guide available today. It takes all the guesswork out of TV repair and is designed to help you solve your problems quickly and economically.

Each month you receive updated information on up to 40 different trouble-shooting cases. This important information is supplied to us by technicians, field reps and all the leading TV manufacturers. You will find every symptom pictured with a clearly marked schematic of the particular faulty stage. The faulty components and corrections will also be listed to aid in repair.

You go right to the source of the trouble without guesswork. In addition you get valuable information on current models as well as older models along with circuit changes and modifications as they occur.

TV TECH AID is the best investment you can make in your own business. The cost to you is only $7.95 for a full year's subscription.

Limited supply of 1969 TV TECH AID series available for $4.95

TV TECH AID
P.O. BOX 603
KINGS PARK, L. I.
NEW YORK 11754

ENCLOSED IS A CHECK OR M.O. FOR $7.95. PLEASE SEND 12 ISSUES OF TV TECH AID
TO:

NAME .....

ADDRESS .....

CITY .....

STATE ..... ZIP .....

. . . for more details circle 138 on Reader Service Card

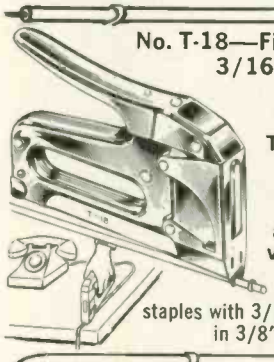
ARROW AUTOMATIC STAPLE GUNS

CUT WIRE & CABLE INSTALLATION COSTS

. . . without cutting into insulation!

SAFE! Grooved Guide positions wire for proper staple envelopment! Grooved Driving Blade stops staple at right depth of penetration to prevent cutting into wire or cable insulation!

No. T-18—Fits wires up to 3/16" in diameter.



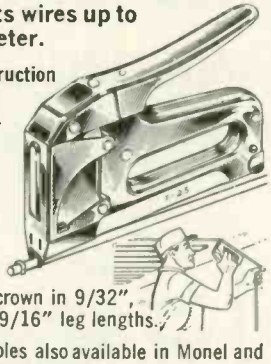
BELL, TELEPHONE, THERMOSTAT, INTERCOM, BURGLAR ALARM and other low voltage wiring.

Uses T-18 staples with 3/16" round crown in 3/8" leg length only.

No. T-25—Fits wires up to 1/4" in diameter.

Same basic construction and fastens same wires as No. T-18.

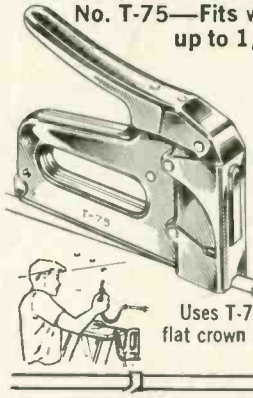
Also used for RADIANT HEAT WIRE



Uses T-25 staples with 1/4" round crown in 9/32", 3/8", 7/16" and 9/16" leg lengths.

T-18 and T-25 staples also available in Monel and with beige, brown and ivory finish at extra cost.

No. T-75—Fits wires and cables up to 1/2" in diameter.



RADIANT HEAT CABLE, UF CABLE, WIRE CONDUIT COPPER TUBING or any non-metallic sheathed cable.

Also used as DRIVE RINGS in stringing wires.

Uses T-75 staples with 1/2" flat crown in 9/16", 5/8" and 7/8" leg lengths.

Arrow Automatic Staple Guns save 70% in time and effort on every type of wire or cable fastening job. Arrow staples are specially designed with divergent-pointed legs for easier driving and rosin-coated for greater holding power! All-steel construction and high-carbon hardened steel working parts are your assurance of maximum long-life service and trouble-free performance.

Ask your Electrical Supply Dealer or write for further details.

ARROW FASTENER COMPANY INC.
Saddle Brook, New Jersey 07663
"Pioneers and Pacesetters For Almost A Half Century"

. . . for more details circle 103 on Reader Service Card

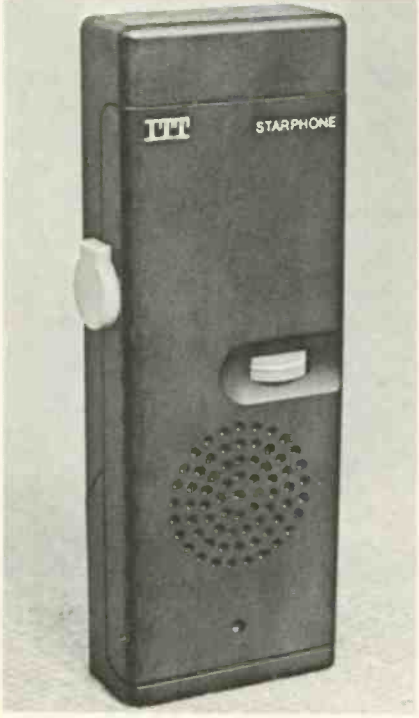
DEALER SHOWCASE

turer to give full-range stereo response and separation. The headphones reportedly feature cushioned earcups of soft rubber and an adjustable headband. Specifications indicate that the headphones weigh 11 oz and come with a 6-ft coiled cord and ¼-in. phone plug. Price $8.95 in kit form. EICO.

TWO-WAY RADIO **720**

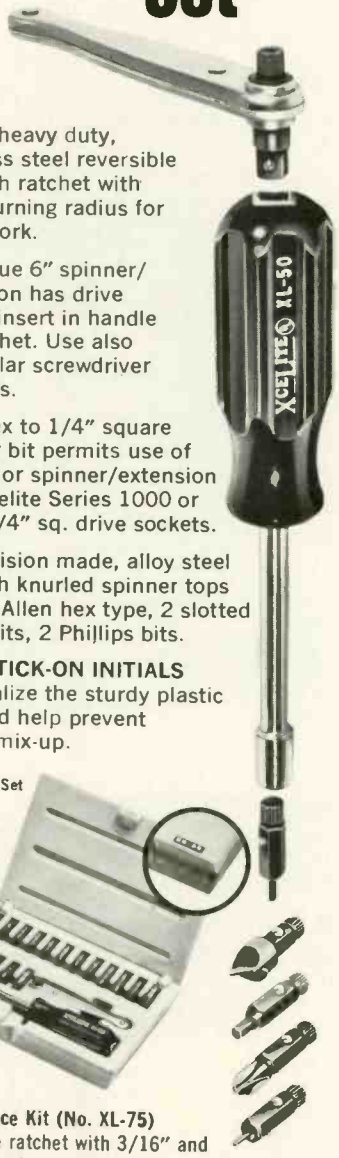
Solid-state unit needs no external antenna

A line of UHF two-way radio systems reportedly features a portable



new

19-piece midget reversible ratchet offset screwdriver set



3-3/4" heavy duty, stainless steel reversible 20-tooth ratchet with short turning radius for close work.

Unique 6" spinner/extension has drive socket insert in handle for ratchet. Use also as regular screwdriver with bits.

1/4" hex to 1/4" square adapter bit permits use of ratchet or spinner/extension with Xcelite Series 1000 or other 1/4" sq. drive sockets.

16 precision made, alloy steel bits with knurled spinner tops . . . 12 Allen hex type, 2 slotted screw bits, 2 Phillips bits.

FREE STICK-ON INITIALS personalize the sturdy plastic case and help prevent loss or mix-up.

No. XL-70 Set

Made in U. S. A.

Also 5-Piece Kit (No. XL-75) Reversible ratchet with 3/16" and 1/4" slotted screw bits, #1 and #2 Phillips bits, all in a durable plastic, pocket size, snap fastener case.

nationwide availability through local distributors

REQUEST BULLETIN N770

XCELITE®

XCELITE, INC., 14 Bank St., Orchard Park, N. Y. 14127
In Canada contact Charles W. Pointon, Ltd.

. . . for more details circle 142 on Reader Service Card

unit which provides instant, intelligible two-way speech up to 3 miles from base. Specifications indicate that the solid-state unit operates in the 450 to 470MHz band and that its reception is virtually free from interference. The unit is said to weigh less than 16 oz and needs no external antenna. ITT.

RADIO DIRECTION FINDER 721

6-band reception with rotating antenna

A portable six-band radio direction finder reportedly features reception for AM, FM, Beacon Band, Marine Band, VHF Band and Aircraft Band. The unit is said to include FM station lock-in, RF gain control, built-in ac adaptor and self-contained batteries. The rotating antenna reportedly acts as a direction finder to fix the user's exact position. The radio, contained in a black leatherette case, is said to feature an illuminated dial, null and tuning control meter, and a switch to prevent drift. Price $99.95. Pearce-Simpson.

HI-FI TURNTABLE 722

Fine speed adjustment, low wow and flutter

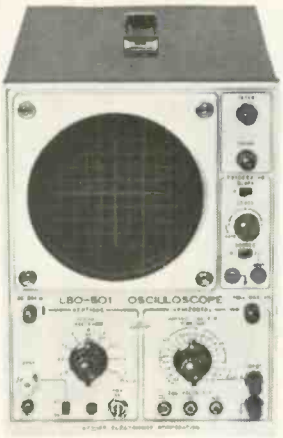
A direct-drive Hi-Fi turntable deck has been designed to greatly reduce wow and flutter by means of the electronic commutator phonograph motor that reportedly runs at the record's revolving speed. Specifications indicate that the phonometer speed is changed to 33⅓ or 45 rpm electronically. A strobe ring for fine speed adjustment is said to be fixed on the under side of the turntable. Price $349.95. Panasonic.

Introducing the world's only $339 triggered scope.

Before you say you don't need a triggered scope, look what's happening to TV servicing: tubes are out, transistors and IC's are in.

With tubes you could play hit-or-miss, knowing the tube would take the overload. Try the same thing now, and good-bye transistors.

For new-era circuitry, Leader introduces a new-era troubleshooter. A triggered scope, just like the ones the TV designers use.



Now the wave shape is locked in and continuously displayed. Now you can look at a waveform containing high and low frequency components. Now you can determine voltage directly and instantly.

Before you say $339 is a lot of bread, look what it buys: Leader's LBO-501 5-inch triggered scope, with a bandwidth of DC to 10MHz and a solid state package.

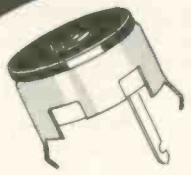
Going like hotcakes at your Leader distributor.

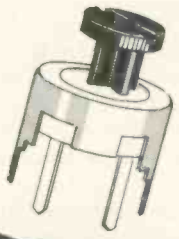
Seeing is believing.

LEADER INSTRUMENTS

37-27 27th Street, Long Island City, N.Y. 11101, (212) 729-7411

. . . for more details circle 123 on Reader Service Card





COLOR TV CONTROLS

- Audio Controls
- Convergence Controls
- A.G.C. Delay Controls
- Vertical Linearity Controls
- Horizontal Linearity Controls

EXACT REPLACEMENTS FOR

RCA • SILVERTONE
ADMIRAL • ZENITH
GENERAL ELECTRIC

COLOR CODED KNOBS SAME AS MANUFACTURER'S SPECS.

NOW AVAILABLE FROM

WORKMAN Electronic PRODUCTS, INC.
P.O.BOX 3828 SARASOTA, FLORIDA 33578

. . . for more details circle 141 on Reader Service Card

NUMERO UNO

TECH SPRAY chemical tools for technicians

P. O. Box 949 o Amarillo, Texas
Canada: Wm. Cohen, Montreal
Export: Empire Exporters, N.Y.C.

. . . for more details circle 135 on Reader Service Card

TECHNICAL LITERATURE

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

Antennas 400

In addition to the 20-page CB antenna catalog, two additional catalogs are offered. The 1970 Ham catalog details new and improved antenna models for fixed station and mobile, HF, VHF and UHF amateur band coverage, mobile antenna accessories and SWR bridges. To cover every requirement, product coverage has been doubled in the catalog and illustrates a complete line of auto replacement AM-FM antennas for domestic and foreign cars, "Signal Probe" and "Hot-Rod" models universal and exact replacement masts and multi-length extension leads. New-Tronics.

Selenium Rectifiers/ Transient Suppressors 401

A 40-page illustrated Engineering Brochure B-108 containing Selenium Rectifiers, Klip-Sel Transient Voltage Suppressors and Contact Protectors is offered. Each type of Selenium device or assembly is presented in an individual section, giving application information and features along with illustrative drawings, graphs, charts and photographs. Replacement lists are included in the book giving other part numbers cross-referenced to the equivalent device. IR.

RF Components 402

A 72-page product catalog has been published which provides complete specifications on the manufacturer's sweep generators, RF attenuators and other related RF components. An 8-page technical section is included to explain flatness, linearity, isolation and how these sweep generator specifications can affect measurements. Texscan.

Electronic Products 403

A 68-page dealer catalog which contains a selection of the manufacturer's fast-selling electronic products has been published. The catalog has a full-color cover and two-color inside pages, with a numerical index of parts numbers. The items included are divided into 16 product groupings. North American Electronics.

TV Distribution 404

A catalog entitled "Systems and Products for TV Distribution" contains all of the components and equipment needed for installing a TV distribution system. The catalog is said to include specification tables and application notes and to discuss systems antennas and accessories, head-end equipment, distribution equipment and components, and installation aids. Jerrold.

TTL Catalog Supplement 405

A TTL integrated circuit catalog supplement provides data on 25 transistor/transistor-logic functions. These include 14 medium-scale integration (MSI) and 11 small-scale integration (SSI) circuits. MSI functions described are drivers, demultiplexers, a 256-bit read-only memory, a 4-bit arithmetic logic unit, a look-ahead carry generator, adders, counters, shift registers, multiplexers and comparators. SSI ICs listed are buffer/drivers, gates and flip-flops. The 196-page supplement contains comprehensive data sheets for 19 integrated circuits in the manufacturer's Series 54/74 standard family, 5 in the Series 54L/74L low power line, and 1 in the Series 54H/74H high-speed family. Information on flat pack, plastic and ceramic dual-inline packages augments each specification sheet. A 16-page cross-reference guide shows the manufacturer's nearest equivalents to competitive devices. Circuits recommended for new designs are also listed. Texas Instruments.

Transistors and Rectifiers 406

A cross-reference provides a listing of universal replacement transistors and popular universal rectifiers in convenient pocket size form. The guide, small enough to fit into a shirt pocket, serves as a ready reference on distributor, dealer and electronic technician levels. The most popular transistor and rectifier types are listed in numerical order, and cross-referenced for replacement by a line of universal semiconductors. Transistor and rectifier specifications, for the devices listed, are presented in a quick reference tabular format. IR

Turntables 407

A 6-page color brochure contains the entire line of Thorens transcription turntables as well as illustrations of such accessories as dust covers, mounting frames and maintenance equipment. Elpa Marketing Industries.

BOOK REVIEWS

WAVE GENERATION AND SHAPING *by Leonard Strauss. Published by McGraw-Hill Book Co., 800 pages, hard cover, $16.50.*

The second printing of this book has been revised to incorporate the many new semiconductors and integrated circuits now available for generating and modifying electronic signals. Written primarily as a text designed for a senior or graduate electronics course, the author has assumed that the reader is already familiar with the transient analysis of linear networks, plus simple bipolar transistor and FET circuits. However, review material is incorporated in the text where first needed. We found the book well illustrated with simple circuits, equivalent circuits, characteristic curves and waveforms, and equations—relying heavily on calculus—for analyzing circuit functions. The book is definitely too advanced for most electronic technicians, though it is well suited for advanced electronic engineering students or electronic engineers in industry interested in keeping abreast of the theory behind circuits incorporating advanced solid-state technology.

ELECTRONIC TEST & MEASUREMENT HANDBOOK *by John J. Schultz, published by TAB Books, Inc., 224 pages, 100 illustrations, 5½ x 8½, $4.95 softbound, $7.95 hardbound.*

There are eight chapters in this book dealing with basic test instruments, test procedures, and the use of the test instruments in practical troubleshooting and measurement. The first two chapters describe briefly what test procedures mean and the second chapter tells about meters, scopes, attenuators and dozens of other test units for all types of electronic servicing.

Chapters three and four cover receiver and transmitter circuits with information on alignment, frequency response, power measurement, modulation and gain checks. The receivers and transmitters discussed are primarily those used in CB, commercial and amateur use. These include single sideband as well as AM, FM and CW units. Chapter five goes along with the units in chapters three and four as it provides information on antennas, feedlines, VSWR and antenna matching for radio communication. Chapter six is somewhat broad in that it covers audio and video equipment with line levels, audio amplifiers, video amplifiers, microphones, distortion and power tests and even provides some information on video recorders. For the most part the chapter only briefly tells the reader what to look for when testing this particular equipment.

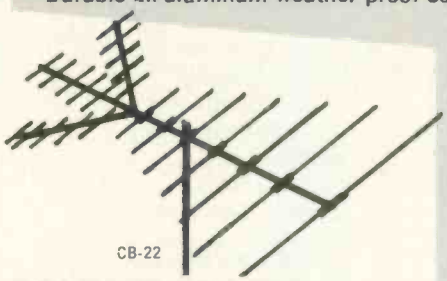
Chapter seven is entitled Accessory Equipment and Components and discusses units such as FSK converters, teletype, telephone line patching, inverters and finally ends up with some information on testing components such as transistors, FET's, MOSFET's, printed circuit boards and IC's. The information is somewhat brief, but seems out of place when included with teletype and FSK equipment descriptions.

It would probably have been better to have more material on component testing and placed it at the front of the book in the general testing section. Chapter eight gives some information on system interference tests in which it describes multiple receiver installations, ground loops between units, spurious signals and touches on re-radiation of transmitted signals.

This book is for the communications technician and is rather brief in many of its descriptions as it does cover a large number of equipment.

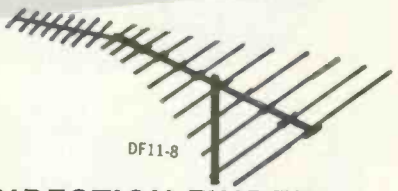
TOP PERFORMING UHF/VHF ANTENNAS FOR ALL AREAS!...

Color engineered for best reception on UHF/VHF Channels 2 to 83!
Exclusively features Reynolds Aluminum durable Colorweld Gold finish!
Single down-lead for economical, simple installation!
Durable all-aluminum weather proof construction for long installation life!



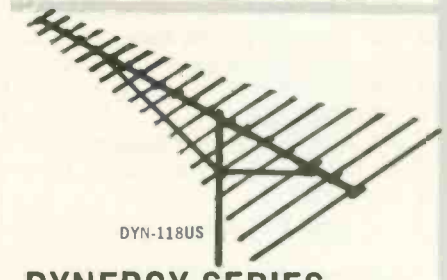
COLOR-BOOSTER SERIES

Model	Number of elements VHF	UHF	Reflector	Total	Range of Reception VHF up to	UHF up to
CB-22	7	5	10	22	50 miles	35 miles
CB-28	11	7	10	28	125 miles	60 miles
CB-34	15	9	10	34	150 miles	80 miles



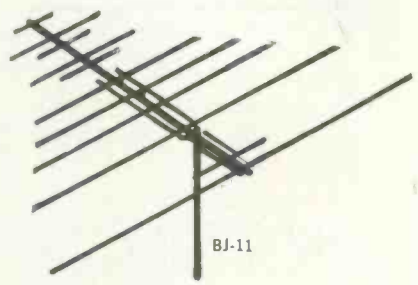
DIRECTION-FINDER SERIES

Model	Number of elements VHF	UHF	Total	Range of Reception VHF up to	UHF up to
DF3-3	3	3	6	30 miles	20 miles
DF5-4	5	4	9	45 miles	40 miles
DF7-8	7	8	15	50 miles	75 miles
DF7-11	7	11	18	50 miles	100 miles
DF11-8	11	8	19	75 miles	75 miles
DF11-11	11	11	22	75 miles	100 miles
DF15-8	15	8	23	100 miles	75 miles
DF15-11	15	11	26	100 miles	100 miles
DF19-8	19	8	27	125 miles	75 miles
DF19-11	19	11	30	125 miles	100 miles



DYNERGY SERIES

Model	Number of elements VHF	UHF	Total	Range of Reception VHF up to	UHF up to
DYN- 33US	3	3	6	35 miles	20 miles
DYN- 54US	5	4	9	60 miles	30 miles
DYN- 66US	6	6	12	65 miles	50 miles
DYN- 88US	8	8	16	125 miles	75 miles
DYN-118US	11	8	19	125 miles	75 miles
DYN-158US	15	8	23	150 miles	75 miles



BIG SHOT JR. SERIES

Model	Number of elements	Area Used
BJ- 8	8	Metropolitan and Suburban
BJ-11	11	Metropolitan and Suburban
BJ-12	12	Semi-Fringe

For complete specs and Profit picture—Write:

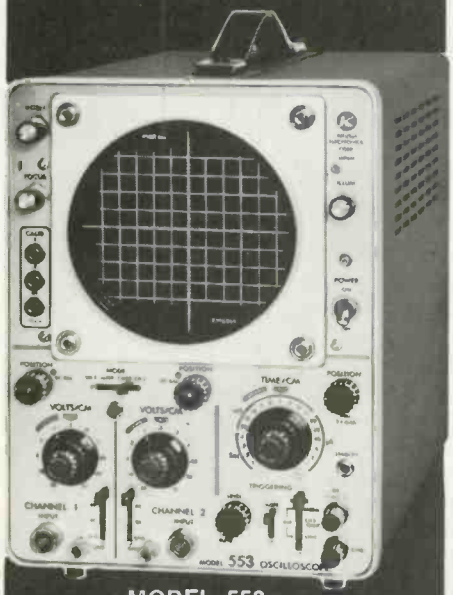
RMS ELECTRONICS, INC.

50 Antin Place, Bronx, N.Y. 10462 • Tel. (212) 892-6700

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

NEW

DUAL TRACE 5" TRIGGERED OSCILLOSCOPE



MODEL 553

Compare these features:

- Solid state circuitry
- High sensitivity—10MV/cm
- Low heat dissipation
- Extra wide bandwidth—7 MHz
- Lightweight—only 8½" high
- Simplified controls makes for easy operation
- Extremely reliable performance
- Built-in square wave oscillator for calibration functions
- Vertical channels
- AC/DC inputs
- FET protected input
- Wide sweep range—1 μ s/cm

ORDER ONE TODAY!

ONLY $538.00 COMPLETE

Call or write for FREE specification catalogs

kikusui ELECTRONICS CORP.

Address all inquiries to:

Marubeni-Iida (America) Inc.
200 Park Avenue, New York, N. Y. 10017
Telephone 212-973-7152

. . . for more details circle 120 on Reader Service Card

READERS SERVICE INDEX

ADVERTISER'S INDEX

TECHNICAL LITERATURE

NEW PRODUCTS

TEST INSTRUMENT

Technicians, Earn Your Associate

DEGREE

mostly by correspondence

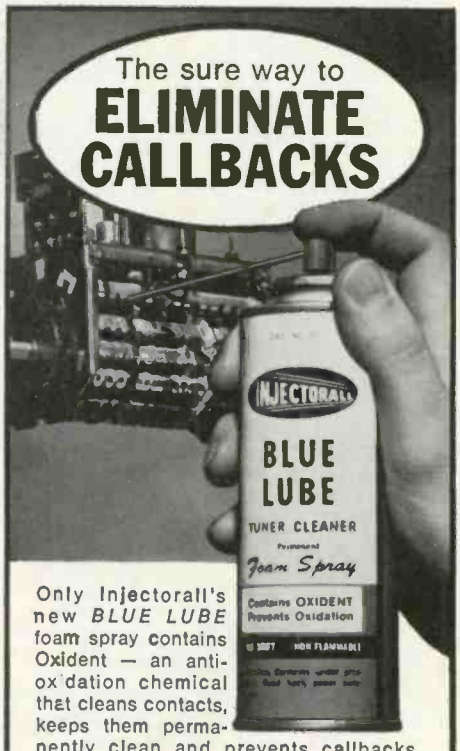
Accredited by the Accdt. Comm. of National Home Study Council. G.I. Bill Approved. Free catalog. Write: Dept. T

Grantham School of Engineering

1505 N. Western, Hollywood, Calif. 90027

. . . for more details circle 115 on Reader Service Card

The sure way to ELIMINATE CALLBACKS



Only Injectorall's new *BLUE LUBE* foam spray contains Oxident — an anti-oxidation chemical that cleans contacts, keeps them permanently clean and prevents callbacks. Eliminates picture streaking and intermittents with one application.

INJECTORALL ELECTRONICS CORPORATION
Great Neck, N.Y. 11024

In Canada:
CANADIAN GENERAL ELECTRIC LTD.
Ontario

. . . for more details circle 118 on Reader Service Card

GET MORE FACTS

NO POSTAGE NECESSARY

Circle the Reader Service numbers of those items of interest to you.

OK

FOR MORE INFORMATION fill out and mail today!

Please send more information on items circled.

ADVERTISED PRODUCTS

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

TEST INSTRUMENTS

900	901	902	903	904	905	906	907	908

NEW PRODUCTS

700	701	702	703	704	705	706	707	708
709	710	711	712	713	714	715	716	717
718	719	720	721	722	723	724	725	726
727	728	729	730	731	732	733	734	735

CATALOGS & BULLETINS

400	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417

Note: Inquiries serviced until January 5, 1971.

(Please type or print) 10/70

Name .....

Position .....

Company .....

Street .....

City .....

State ..... Zip Code .....

Please describe your type of business.

.....

FOR MORE INFORMATION fill out and mail today!

Please send more information on items circled.

ADVERTISED PRODUCTS

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

TEST INSTRUMENTS

900	901	902	903	904	905	906	907	908

NEW PRODUCTS

700	701	702	703	704	705	706	707	708
709	710	711	712	713	714	715	716	717
718	719	720	721	722	723	724	725	726
727	728	729	730	731	732	733	734	735

CATALOGS & BULLETINS

400	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417

Note: Inquiries serviced until January 5, 1971.

(Please type or print) 10/70

Name .....

Position .....

Company .....

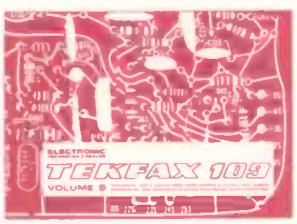
Street .....

City .....

State ..... Zip Code .....

Please describe your type of business.

.....



GET THIS FREE BONUS WITH YOUR PERSONAL SUBSCRIPTION TO ELECTRONIC TECHNICIAN/DEALER!

Enter your subscription for a two- or three-year term and we'll send you the new TEKFAX 109 Book of Schematics—FREE!

☐ $10 for 3 Years ☐ $8 for 2 Years ☐ $5 for 1 Year

☐ Payment Enclosed ☐ Bill Me Later

Name .....

Title .....

Firm .....

Street .....

City .....

State ..... Zip .....

PLEASE CHECK BELOW:

1. In the TV, Radio and other consumer products fields, is your firm PRIMARILY a: (check most descriptive item)
   - ☐ Retailer with service department
   - ☐ Service/repair firm with some retail
   - ☐ Industrial electronics service firm
   - ☐ Manufacturer
   - ☐ Other (please describe)

2. Title: (please check one)
   - ☐ Owner, manager, buyer, other executive
   - ☐ Service manager
   - ☐ Service repairman or other employee

☐ If you are renewing your subscription, check here and attach your address label. If you renew your subscription for 2 to 3 years, you are still eligible to receive the TEKFAX 109 as your free bonus.

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
PERMIT NO. 665
DULUTH, MINNESOTA

POSTAGE WILL BE PAID BY

Reader Service Department

ELECTRONIC
TECHNICIAN / DEALER
1 EAST FIRST STREET, DULUTH, MINNESOTA 55802

GET MORE FACTS
NO POSTAGE NECESSARY

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
PERMIT NO. 665
DULUTH, MINNESOTA

POSTAGE WILL BE PAID BY

Reader Service Department

ELECTRONIC
TECHNICIAN / DEALER
1 EAST FIRST STREET, DULUTH, MINNESOTA 55802

GET MORE FACTS
NO POSTAGE NECESSARY

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

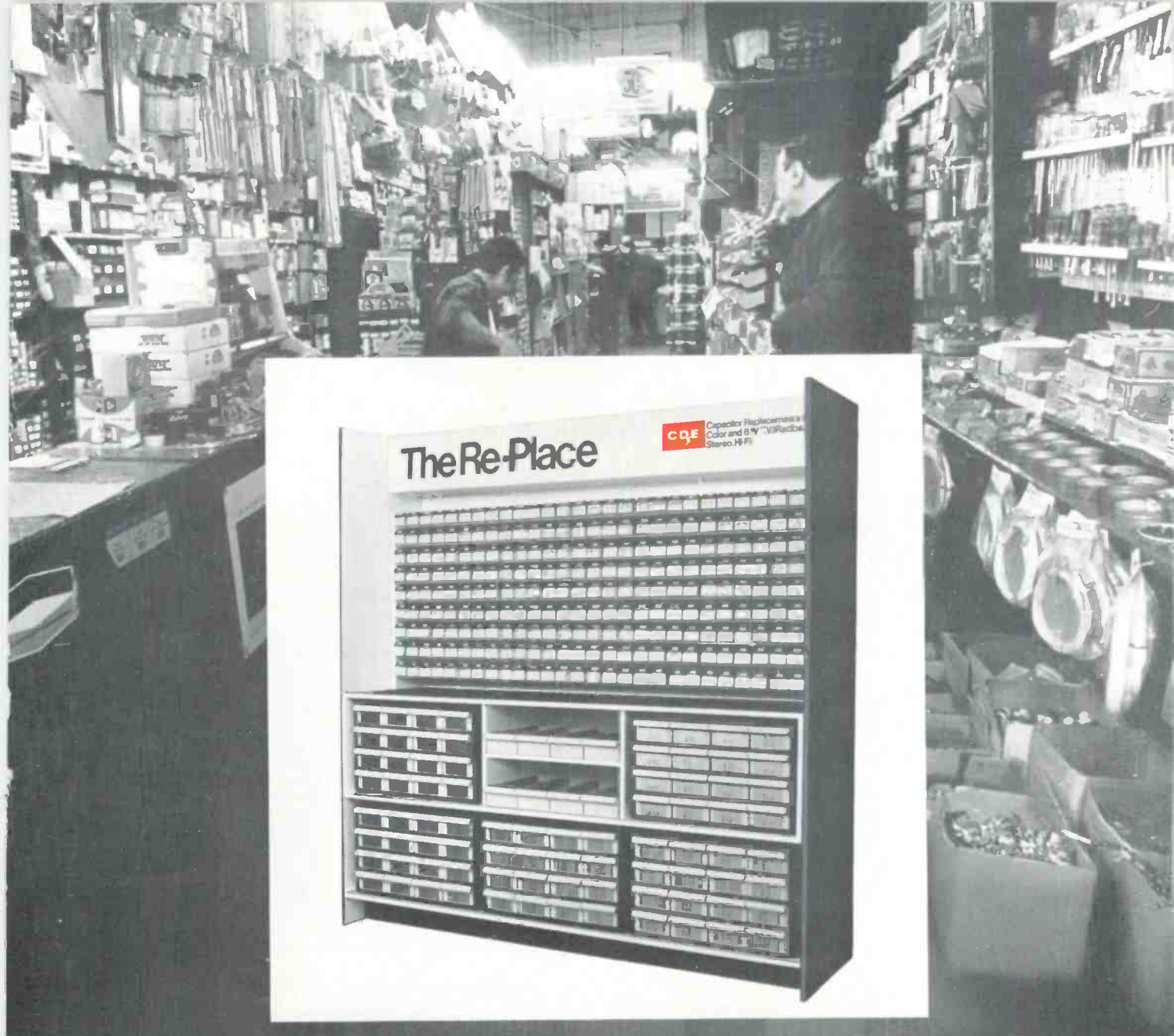
FIRST CLASS
PERMIT NO. 665
DULUTH, MINNESOTA

POSTAGE WILL BE PAID BY

Circulation Department

ELECTRONIC
TECHNICIAN / DEALER
1 EAST FIRST STREET, DULUTH, MINNESOTA 55802

FOR ONLY PENNIES PER MONTH— YOUR OWN PERSONAL COPIES



Put your parts in order.

All it takes is genius to arrive at simplicity. This new display stand is deceiving. It's more than a display stand. It's set up to operate like a store within your store for instant servicing.

Here, within this unit, is a complete stock of all the wide range twist prongs you'll need plus micas, miniature electrolytics, ceramics, wide range tubulars and dipped paper Mylar.* The selection was based on an extensive study of all capacitors used in the replacement market. Now, with the Re-Place, you're in the capacitor replacement business. The Re-Place only takes 2′ x 5′ in space and you have all your parts in order.

Interested? Write for our new catalog on The Re-Place™ capacitor line. "The Replacers" —the most complete line of replacement capacitors in the smallest possible package.

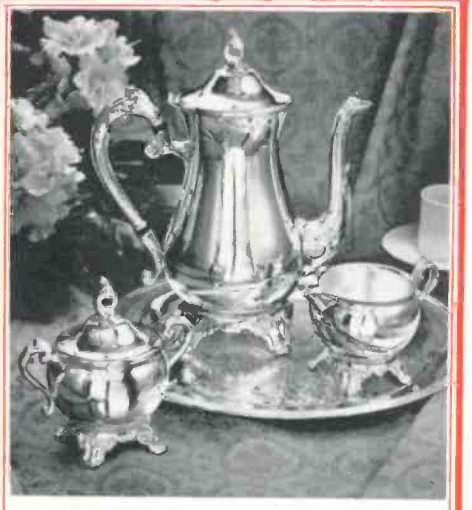
CDE CORNELL-DUBILIER

*Du Pont Trademark

. . . for more details circle 101 on Reader Service Card

BRING ON THE GIFTS WITH RCA

All these attractive gifts are available with your purchases of RCA entertainment receiving tubes from your local participating RCA tube distributor. See your participating RCA tube distributor for complete details . . . and bring on the gifts at holiday time!



Westchester by Gorham Silverplated 4 Piece Coffee Server (1A1877) This elegantly styled set includes coffee server with 9 cup capacity, a sugar server, a 6 ounce creamer with cap, and a beautiful oval tray.

Oster Deluxe Beauty Salon Hair Dryer (1A1874) Ladies can enjoy professional hair drying right in the home. Gentle filtered air, adjusts to cool, warm, medium or hot, provides quiet, fast drying.

Bob Cousy Professional Basketball (1A1880) The players in your family will appreciate the basketball endorsed by Mr. Basketball himself. Hide-toned, official in size and weight.

Bart Starr Official Size Football (1A1879) Boys will get a charge out of playing with the football endorsed and approved by the great Green Bay Packer quarterback, Bart Starr.

Mickey Mouse Folding Alarm Clock (1A1875) Kids will love this one. Mickey Mouse points out the time with his animated hands in this unique 40 hour folding-case alarm clock.

"Spartan" Wrist Watch (1A1878) For boys or girls, the "Spartan" by Vantage is a "this-minute" watch with wide band, heavy link styling that is very much part of the contemporary youth scene.

The New Kodak Instamatic X-15 Self Powered Flash Camera Kit (1A1876) The Magicube Type X is the newest, easiest way to take great flash pictures every time. No flash batteries are required in this new breed of camera.

Electronic Components, Harrison, N.J.

RCA