

ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

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~TEKLAB REPORT
ON MAGNAVOX

SELLING CCTV

STEREO SERVICING
WITH A SCOPE

The big difference in Color TV Alignment packages: Ours Works.

Here it is! Big savings on everything you need for color TV alignment. And it works. Because B & K products really do what they're designed for. And they're designed to do so much more.

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And, of course, the B & K Model 1450 Oscilloscope/Vectorscope. An oscilloscope featuring the exclusive *intermittent analyzer*, with electronic memory and optional audio/visual remote alarm. A vectorscope with exclusive amplified inputs and controls on the front instead of the back. Which means you can troubleshoot at high level or at low level from the demodulator.

Save time, money, and headaches. With the B & K color TV alignment package —3 versatile products that really work!

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

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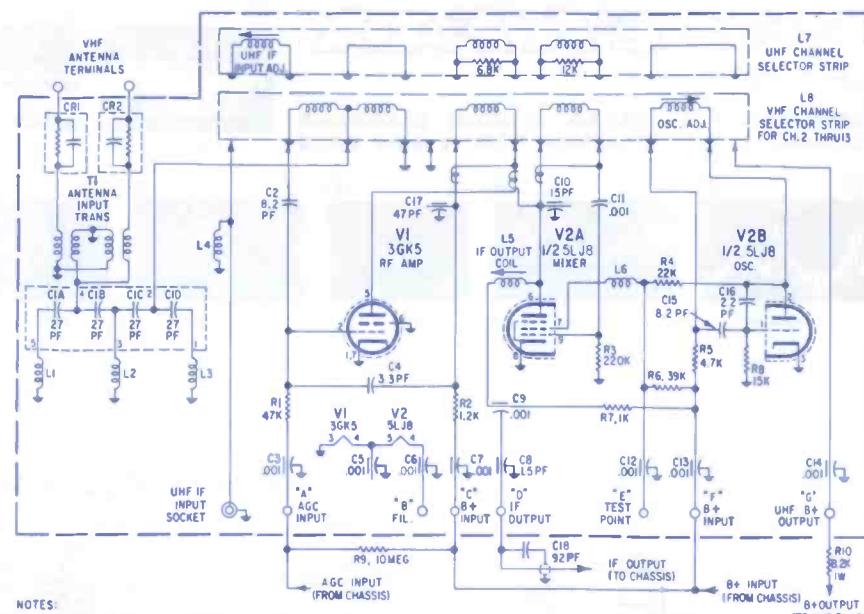
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 6 NEW SETS

GROUP
211

SCHEMATIC NO.

AIRLINE 1282
TV Model GCI-13668B

SCHEMATIC NO.

J C PENNEY CO. 1286
TV Model 1316A-89MAGNAVOX 1283
Color TV Chassis T934 SeriesPHILCO-FORD 1287
TV Chassis 20T33MAGNAVOX 1285
TV Chassis T935 SeriesZENITH 1284
Color TV Chassis 16Z8C19

NOTES:
1. ALL RESISTORS ARE 1/2 WATT, UNLESS OTHERWISE NOTED.
2. CAPACITOR VALUES ARE IN MFD, UNLESS OTHERWISE NOTED.
3. TUNER IS SHOWN IN VHF CHANNEL POSITION.

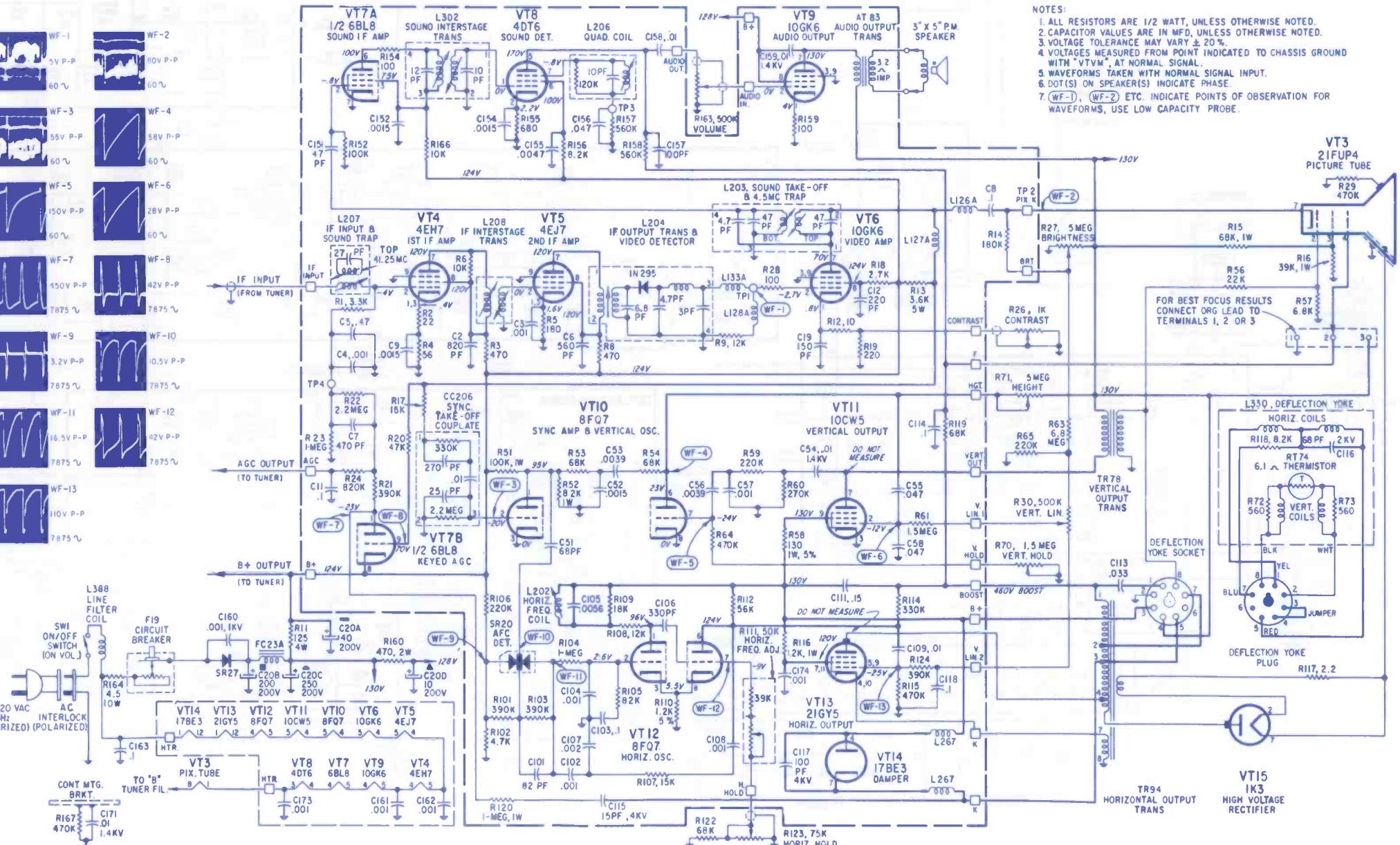
VHF TUNER CIRCUIT SCHEMATIC DIAGRAM

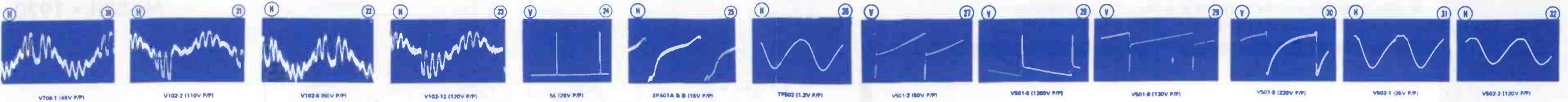
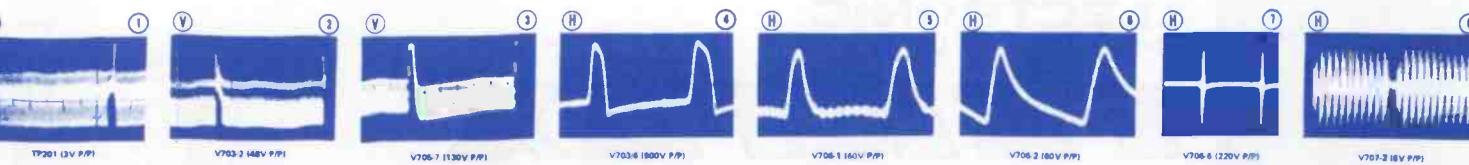


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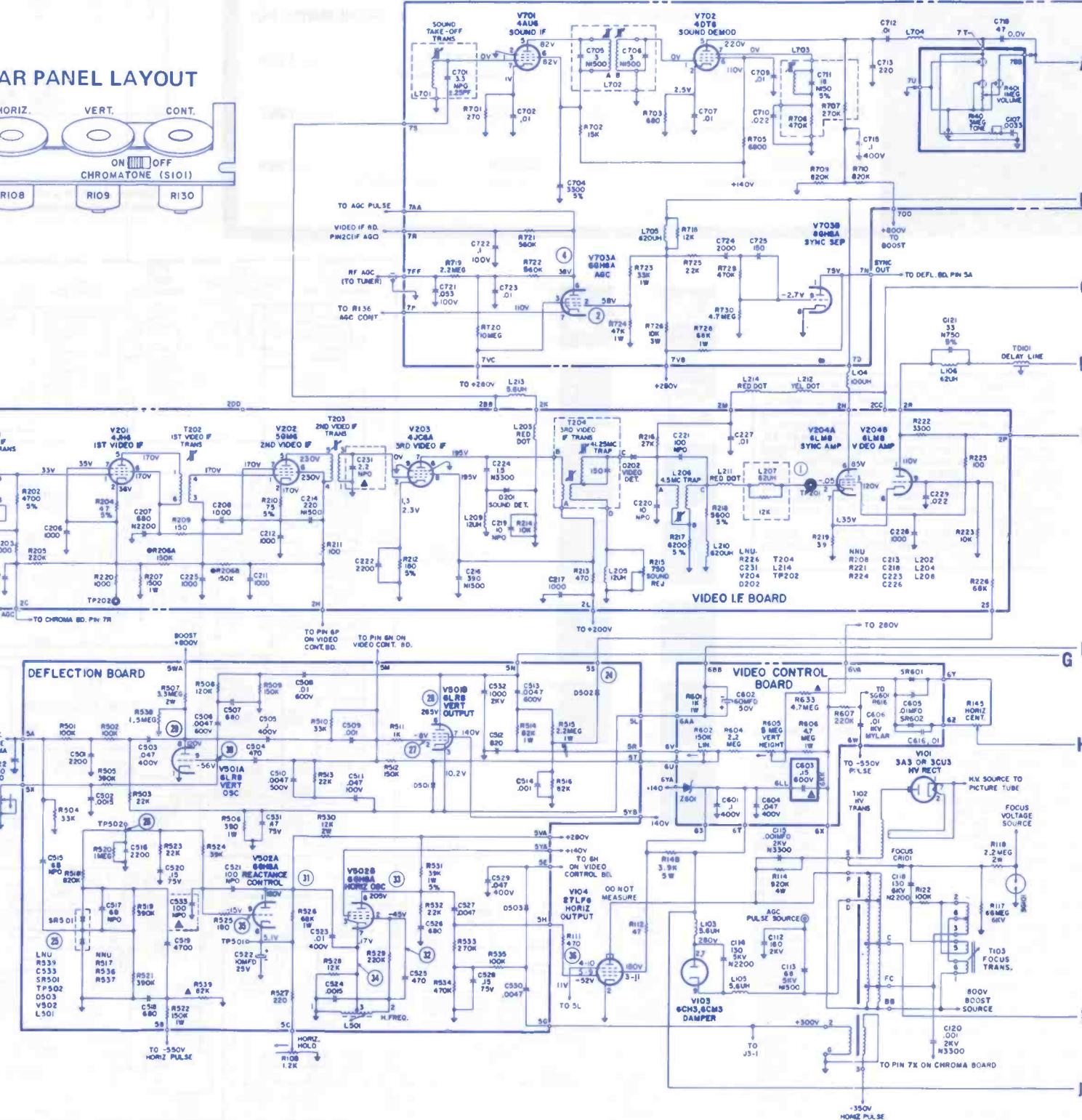
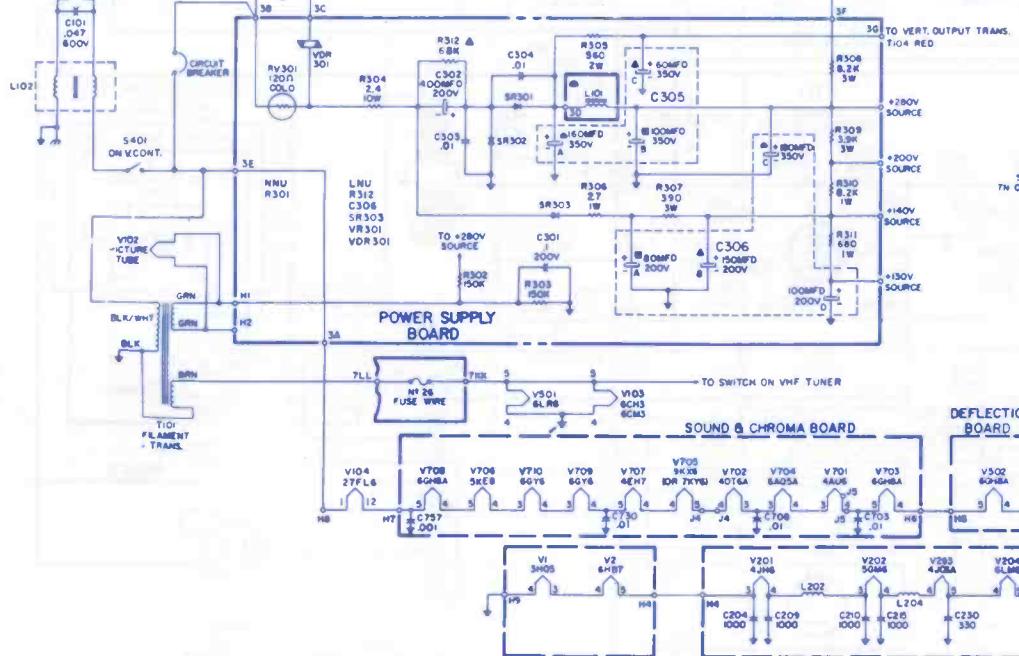
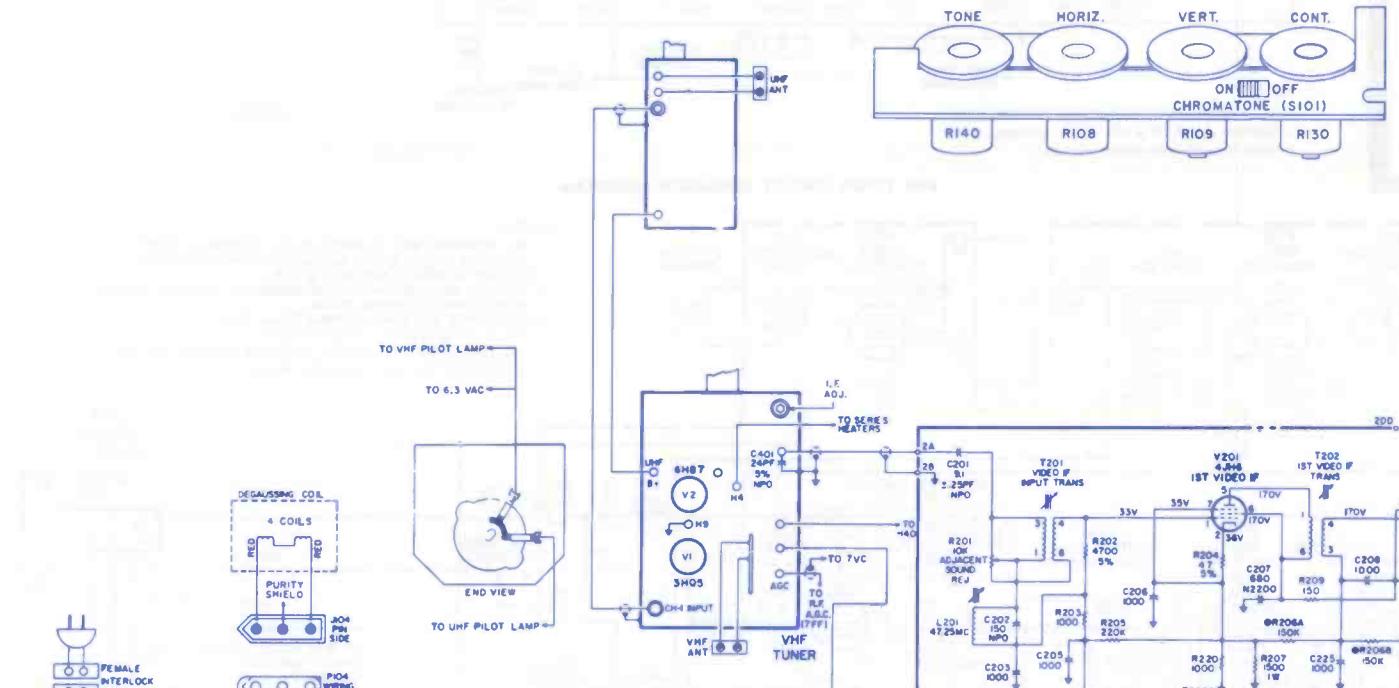
POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, Harbrace Building, Duluth, Minnesota 55802.

SYMBOL	DESCRIPTION	AIRLINE PART NO.
C20A	40μF, 200v, elect.	034-018800
C20B	200μF, 200v, elect.	034-018800
C20C	250μF, 200v, elect.	034-018800
C20D	10μF, 200v, elect.	034-018800
C106	330pf, 5% 500v, mica	045-007200
R11	125Ω, 10%, 4w, film	054-059500
R13	3600Ω, 10%, 5w, WW	053-362510
R162	4.5Ω, 10%, 10w, carbon	053-458110
R26	contrast, 1000Ω	055-060400
R27	bright, 5M	055-032100
R30	vert lin, 500K	055-035000
R70	vert hold, 1.5M	055-060300
R71	height, 5M	055-035100
R111	horiz freq adj, 39K	055-041700
R123	horiz hold, 75K	055-032000
R163	volume, 500K, & on/off sw	055-059700
SR20	diode, AFC det.	004-002900
SR27	rectifier, silicon	004-002700
AT83	audio optoformer	031-008301
FC23A	filter choke	032-002301
L202	horiz freq coil	110-020200
L206	quad coil	109-020601
L208	IF interstage trans.	109-020800
L302	sound interstage trans.	109-030200
L330	def yoke ass'y, inc R72, R73, R74, R118 & C116	027-033000
L388	line filter coil	111-038800
TR78	vert opto trans	033-007802
TR94	horiz opto trans	033-009400
F19	printed cir bd	132-003601
CC206	coupled sync take-off	099-001900
	tuner, VHF	006-019300
	tuner, UHF	006-023600

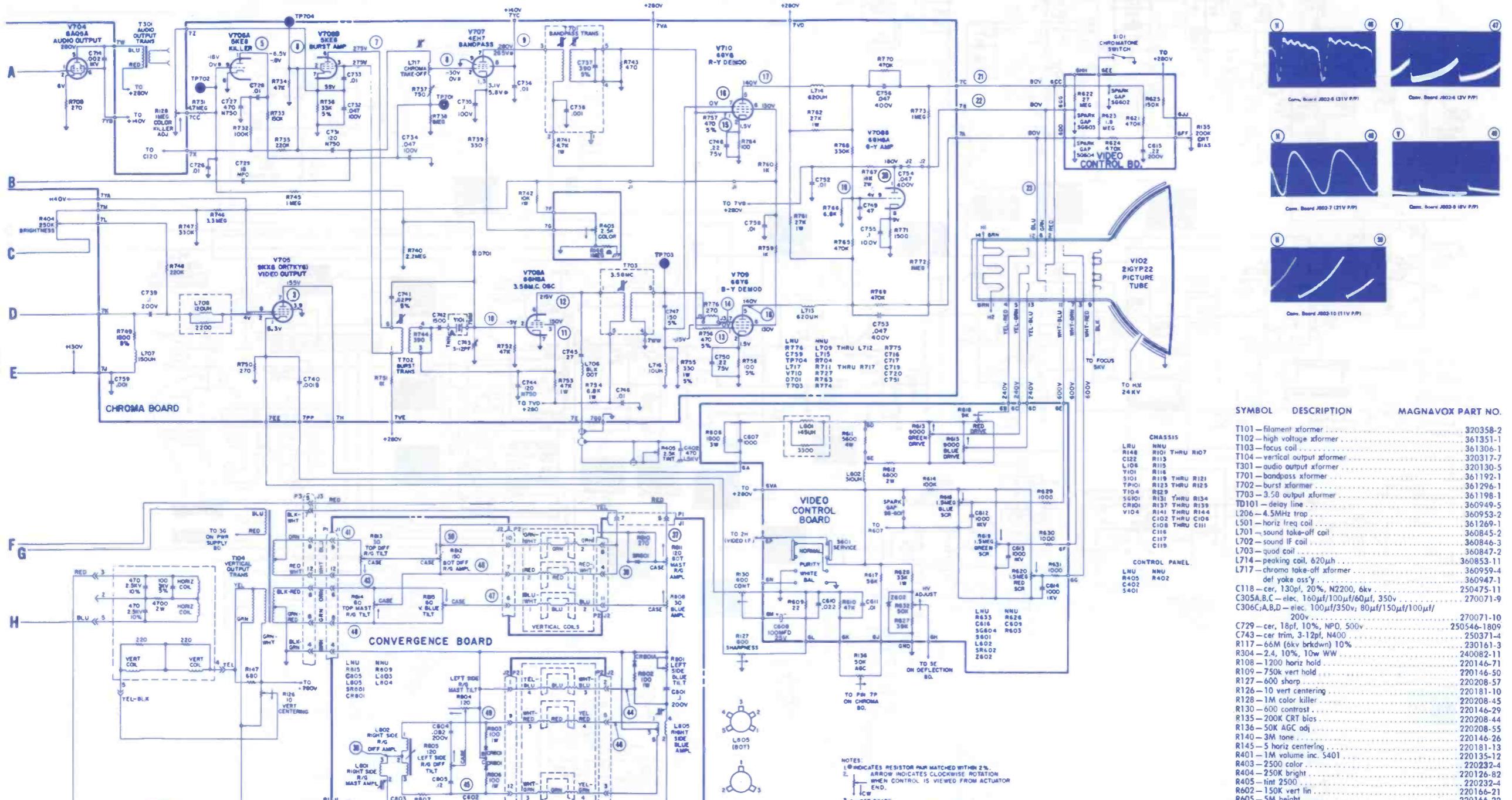
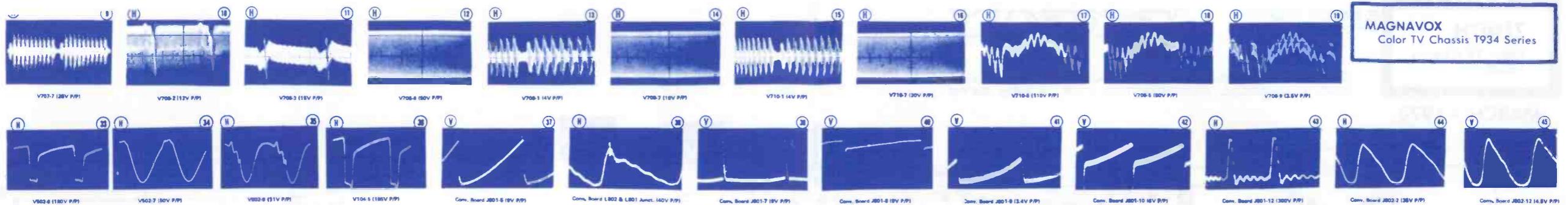




REAR PANEL LAYOUT



MAGNAVOX
Color TV Chassis T934 Series

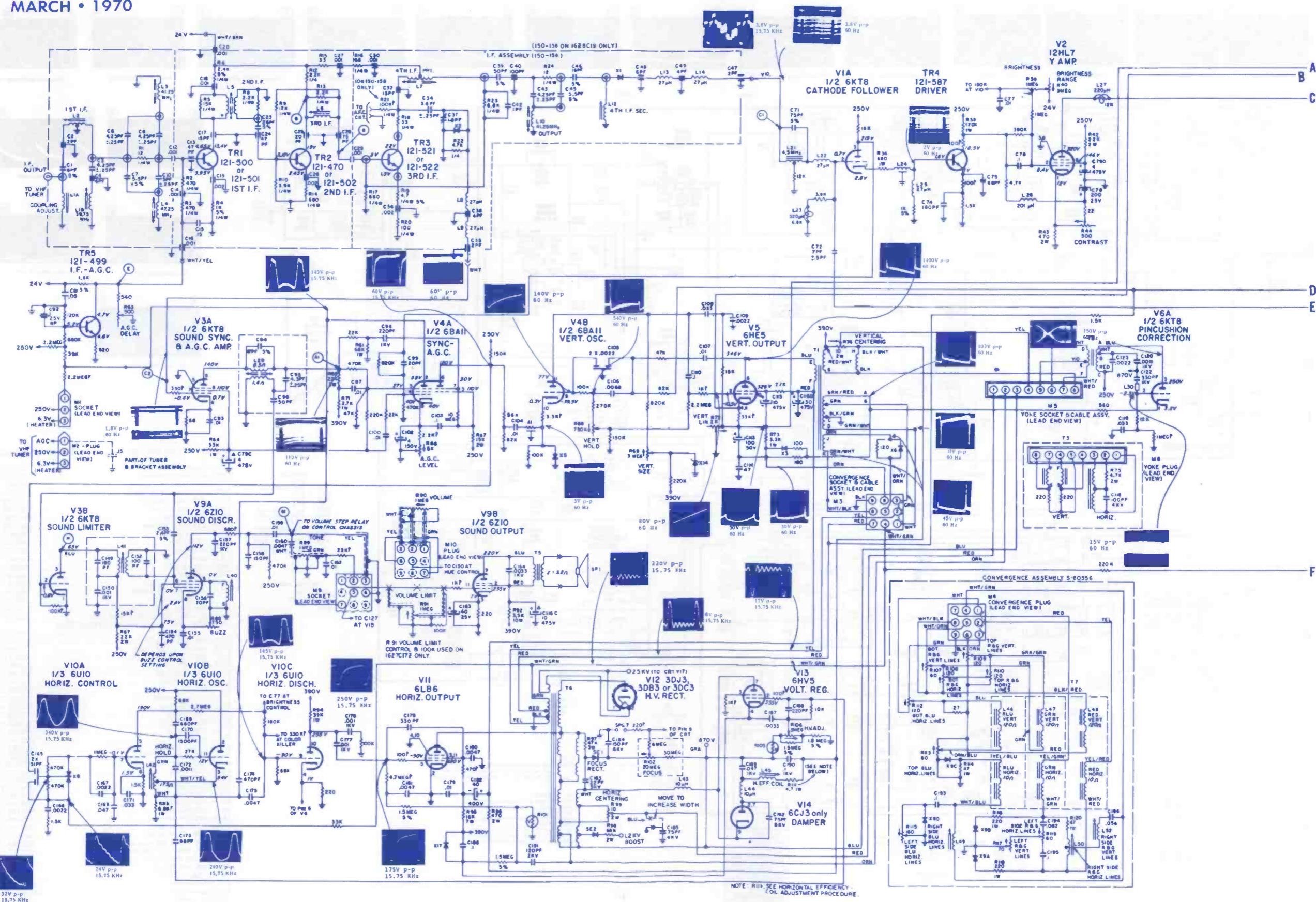


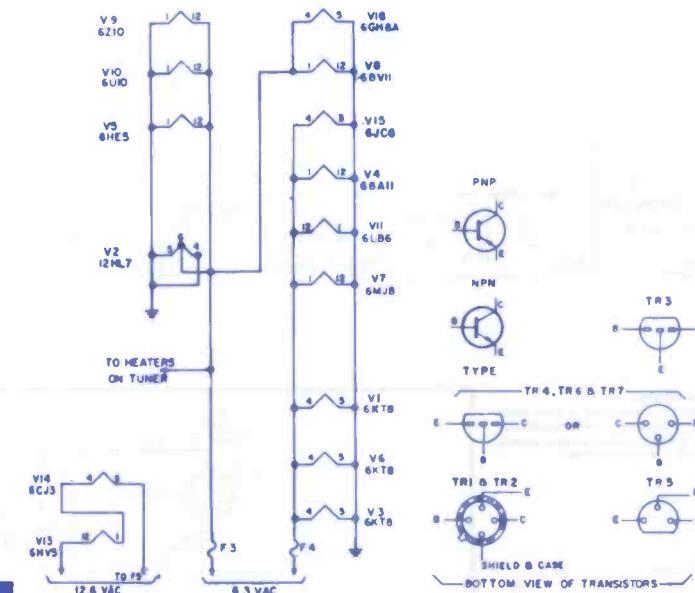
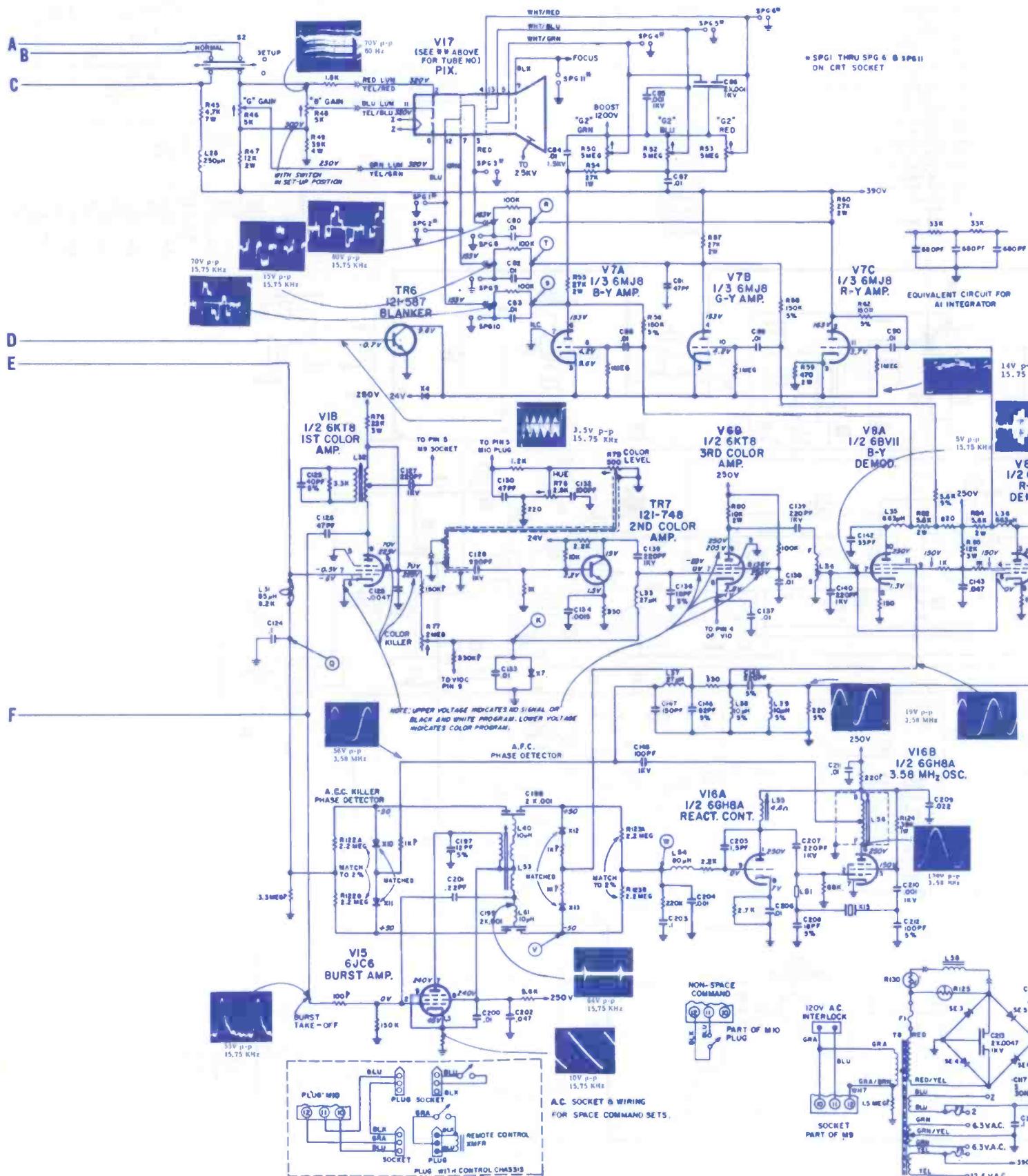
NOTES:
 1. INDICATES RESISTOR PAIR MATCHED WITHIN 2%.
 2. ARROW INDICATES CLOCKWISE ROTATION
WHEN CONTROL IS VIEWED FROM ACTUATOR
END.
 3. 1 CW
 4. 400V SIDE OF PC BOARD (COPPER SIDE).
 5. CAPACITANCE VALUES GREATER THAN 1ARE
IN PICOFARADS.
 6. CAPACITANCE VALUES OF 1 OR LESS, ARE IN
MICROFARADS.
 7. ALL VOLTAGES MEASURED WITH NO SIGNAL
EXCEPT THAT IDENTIFIED WITH AN ASTERISK (*).
 8. SOURCE VOLTAGES MEASURED WITH SIGNAL.

NR	USAGE
1	TUNER
100	CHASSIS
200	IF
300	POWER SUPPLY
400	CONTROL PANEL
500	DEFLECTION
600	CONTROL BOARD
700	CHROMA
800	CONVERGENCE
900	AFC/UHF UBED

SYMBOL	DESCRIPTION	MAGNAVOX PART NO.
T101	filament xformer	320358-2
T102	high voltage xformer	361351-1
T103	focus coil	361306-1
T104	vertical output xformer	320317-7
L105	R101 THRU R107	320130-5
R113	R113	361192-1
L106	R115	361296-1
R115	R115	361198-1
L101	R121	361192-1
T101	bandpass xformer	361299-1
T102	burst xformer	361049-5
T103	3.50 output xformer	360949-5
T104	delay line	360949-5
L206	4.5MHz trap	360953-2
L501	horiz freq coil	361269-1
L701	sound take-off coil	360845-2
L702	sound IF coil	360846-3
L703	quad coil	360847-2
L714	peaking coil, 620μH	360853-11
L717	chroma take-off xformer	360859-4
C118	cer, 130pf, 20%, N2200, 6kv	360947-1
C305A,B,C	cer, 160μf/100μf, 350v	250475-11
C306C,A,B,D	elec, 100μf/350v; 80μf/150μf/100μf/	270071-9
200v	200v	270071-10
C729	cer, 10pf, 10%, NPO, 500v	250546-1809
C743	cer trim, 3-12pf, N400	250371-4
R117	66M (6k) brkdwn 10%	230161-3
R304	2.4, 100, 10W WW	240082-11
R108	1200 horiz hold	220146-71
R109	750K vert hold	220146-50
R127	600 sharp	220208-57
R126	10 vert centering	220181-10
R128	1M color killer	220208-45
R130	600 contrast	220146-29
R135	200K CRT bias	220208-44
R136	50K AGC adj	220208-55
R140	3M tone	220146-26
R145	5 horiz centering	220181-13
R401	1M volume inc. 5401	220135-12
R403	2500 color	220232-4
R404	250K bright	220166-82
R405	tint 2500	220232-4
R602	150K vert lin	220166-21
R605	5M height	220166-22
R613	9000 gm drive	220166-23
R615	9000 blu drive	220166-24
R618	9000 rd drive	220166-25
R620	1.5M red screen	220166-18
R737	750 chromo tilt odj	220217-10
R811	120 bottom R/G most amplitude	220167-13
R812	150 bottom diff. R/G tilt	220167-12
R813	30 top diff. R/G tilt	220167-11
R814	top most R/G tilt	220167-10
CR101	focus rectifier	530132-1
Z601	zener diode	530073-1020
Z602	zener diode	530073-1016
VDR301	varistor	230175-2
cir brkr	cir brkr	180723-2

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NOTE: R111. SEE HORIZONTAL EFFICIENCY
COIL ADJUSTMENT PROCEDURE.



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

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 1 MEGOHM INPUT RESISTANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT AND NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.
ALL RESISTORS ARE ±10% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
COIL RESISTANCE NOT GIVEN UNDER ONE OHM.

ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
FOR CAPACITOR TOLERANCE SEE LEGEND.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K OHMS MIN. PER VOLT HIGH VOLTAGE METER.
ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

(—) INDICATES ALIGNMENT & TEST POINT

pF = PICOFARAD MM₂ = MEGAMHZ = MEGACYCLE PER SECOND.

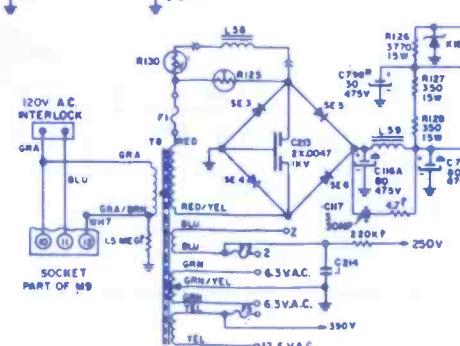
— INDICATES ±20% MAY BE USED.

— INDICATES VOLTAGE SOURCE

— INDICATES INSULATED FEED-THRU TERMINAL (ZENITH PART NO. 86-491)

SYMBOL DESCRIPTION ZENITH PART NO.

C79A	— 80μf elect cap 475v	22-5360
C79B	— 30μf elect cap 475v	22-5360
C79C	— 4μf elect cap 475v	22-5360
C79D	— 4μf elect cap 475v	22-5360
C116A	— 80μf elect cap 475v	22-5513
C116B	— 30μf elect cap 475v	22-5513
C116C	— 10μf elect cap 475v	22-5513
C184	— 150pf disc cap 10% 6K	22-4614
R39	— 1M bright control	63-7092
R40	— 3M bright range control	63-7101
R44	— 500Ω contrast control	63-6980
R46	— 5K gray gain control	63-6334
R48	— 5K blu gain control	63-6333
R63	— 500Ω AGC delay control	63-8308
R66	— 5K AGC level control	63-7389
R69	— 3M vert size control	63-6979
R72	— 2K vert lin control	63-6951
R74	— 10Ω vert can control 4.7K resis 2w	63-7009
R77	— 2M color killer control	63-5463
R88	— 750Ω burst control	63-6950
R89	— 1M tone control	63-7351
R99	— 10Ω horiz cen control	63-7211
R101	— voltage dependent resistor	63-7658
R102	— 20M focus module control	63-7145
R105	— varistor	63-8161
R106	— 3M high voltage adj control	63-7628
R125	— thermistor	63-7346
R130	— voltage dependent resistor	63-7146
L24	— delay line	S-80475
L29	— sound take-off coil	S-77408
L32	— 1st color amp output coil	S-77408
L40	— quad coil	S-80411
L41	— intercarrier coil	S-74445
L42	— horiz osc coil	S-56877
L45	— horiz efficiency coil	S-77975
L53	— burst amp & phase det coil	S-80590
L55	— color freq adj coil	S-66627
L59	— filter choke	95-2702
T1	— vert output xformer	95-2663
T3	— del yoke	95-2667
T5	— audio output xformer	95-2660
T6	— horiz sweep xformer	S-84548
T8	— power xformer	95-2700
A1	— integrator	87-4
F1	— lo-buf fuse	136-71
X16	— zener diode	103-105

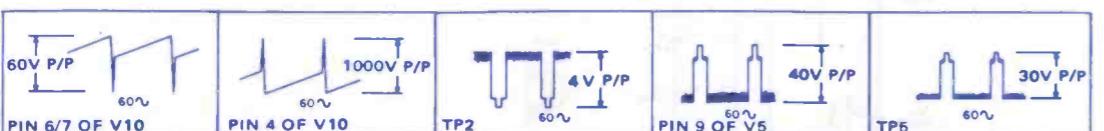
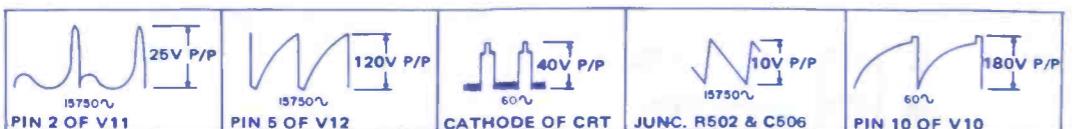


MAGNAVOX
TV Chassis
T935 Series

ELECTRONIC
TECHNICIAN/DEALER TEKFAX

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

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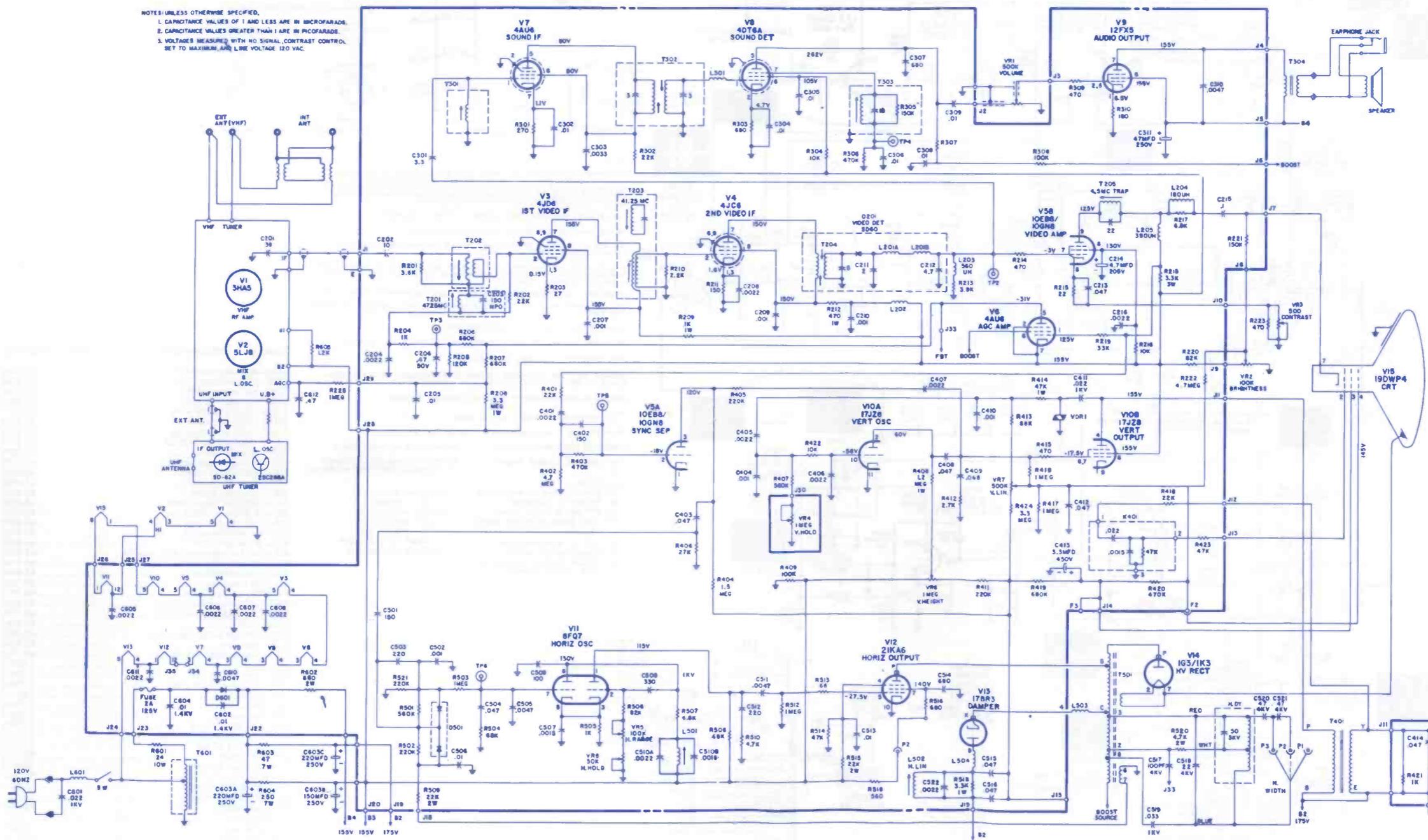
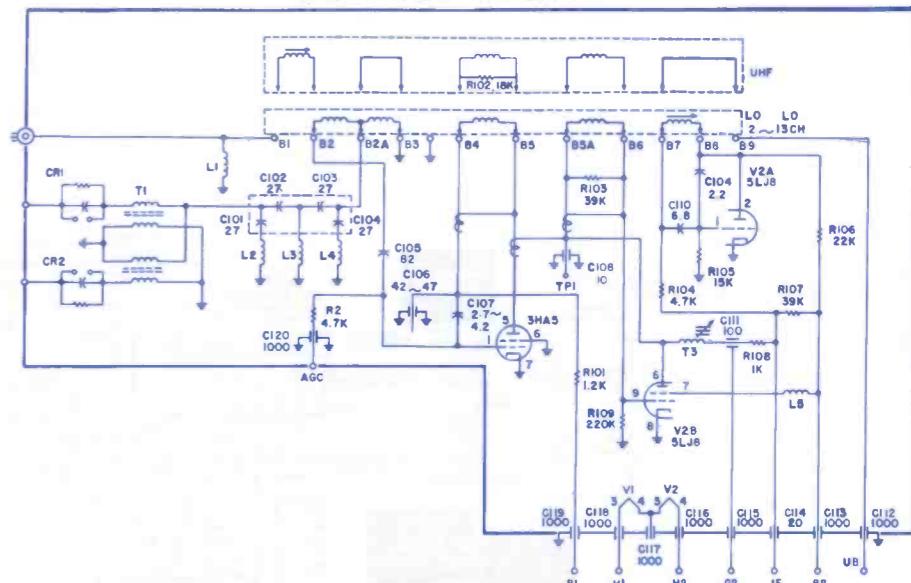


NOTES: UNLESS OTHERWISE SPECIFIED,
1. CAPACITANCE VALUES OF 1 AND LESS ARE IN MICROFARADS.
2. CAPACITANCE VALUES GREATER THAN 1 ARE IN PICOFARADS.
3. VOLTAGES MEASURED WITH NO SIGNAL, CONTRAST CONTROL
SET TO MAXIMUM, AND LINE VOLTAGE 120 VOLTS.

SYMBOL DESCRIPTION MAGNAVOX PART NO.

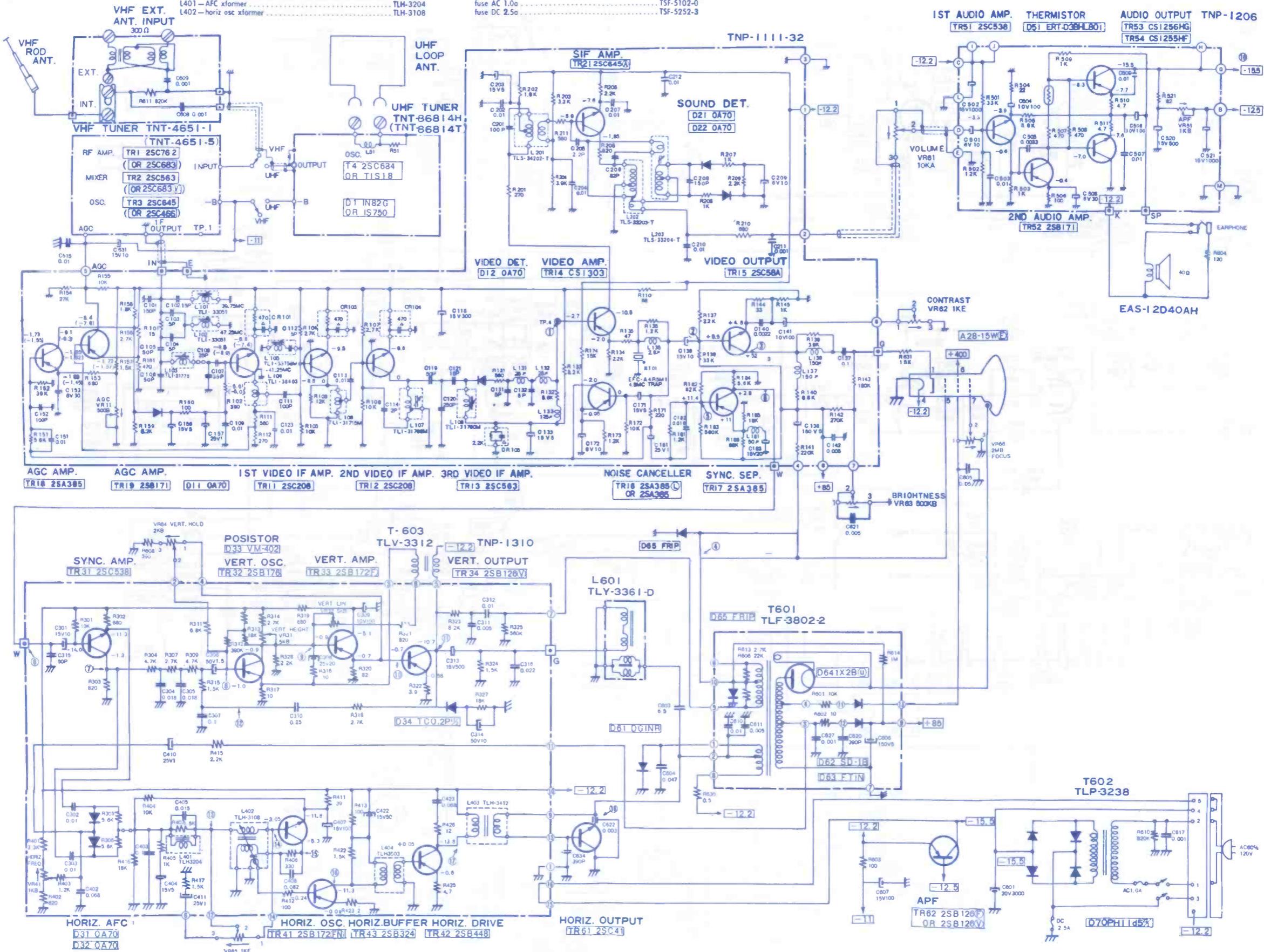
L203	-560 μ H peaking coil	36A023-12
L204	-180 μ H peaking coil	36A023-15
L205	-390 μ H peaking coil	36A023-13
L501	horiz osc coil	36A023-9
L502	horiz lin coil	36A023-10
L601	line choke	36A023-16
T203	video IF xformer	36A023-3
T205	-4.5MHz trap	36A023-5
T301	sound input xformer	36A023-6
T302	sound IF xformer	36A023-7
T303	quad coil	36A023-8
T304	audio output xformer	32A007-1
T401	vert output xformer	32A007-1
T501	horiz output xformer	32A007-1
T601	power xformer	30A007-1
	deflection yoke	36A037-1
C203	-cer, 150 μ F, 5%, 150v (NPO)	25X023-1515
C602	-cer, 0.01 μ F, GMV, 1400v	25X016-1030
C603	elect., 220/220/150 μ F, 250v	27A010-1
R601	-24, 10%, 10w metal oxide	23A004-9
R603	-47, 10%, 7w metal oxide	23A004-11
R604	-250, 10%, 7w metal oxide	23A004-10
VR1	-500K, off-on-volume	22A006-1
VR2	-100K, bright	22A006-2
VR3	-500, contrast	22A006-3
VR4	-1M, vert hold	22A006-4
VR5	-100K, horiz range	22A006-5
VR6	-1M, vert fin	Part of VR5
VR7	-1M, height	Part of VR5
VR8	-50K, horiz hold	22A006-6
VDR	-varistor	23A002-2
	fuse	18A008-1
	VHF tuner	34A002-1
	UHF tuner	34A003-1

VHF TUNER SCHEMATIC



COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
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SYMBOL	DESCRIPTION	PENNEY PART NO.
VR11	500Ω AGC control	EVL-S2AA00B52
VR31	5K vert height	EVL-S0AA00B53
VR32	5K vert lin	EVL-S0AA00B53
VR41	1K horiz freq	EVL-S0AA00B13
VR51	1K AFC control	EVL-S2AA00B13
VR61	10K off/on volume control	EVC-B0BL20A14
VR62	1K contrast control	EVH-FOAL17E13
VR63	500K bright control	EVH-BOAL17B55
VR64	2K vert hold	EVH-BOAL17B23
VR65	1K horiz hold	EVD-N7AS10826
VR66	2M focus control	EVD-N7AS10826
L105	sound trap coil 41.25MHz	TLI-3375BM
L132	peaking coil, 25μH	TLD-02501-5
L133	peaking coil, 125μH	TLD-12501-5
L136	peaking coil, 150μH	TLD-15001-5
L201	SIF xformer	TLS-34202-T
L202	discriminator, primary	TLS-33203-T
L203	discriminator, sec	TLS-33204-T
L401	AFC xformer	TLM-3204
L402	horiz osc xformer	TLM-3108
T1	horiz drive xformer	TLH-3412
L404	horiz buffer xformer	TLH-3503
L601	def yoke	TLY-3361-D
T601	flyback xformer	TLF-3802-2
T602	power xformer	TLP-3238
D33	vert choke	TLY-3312
D34	posistor	VM-402
D51	theristor	ERT-038HL801
VHF tuner	TNT-4651-1	TNT-4651-1
UHF tuner or TNT-86814H	(TNT-86814T)	TNT-86814H
fuse AC 1.0A		TSF-5102-0
fuse DC 2.5A		TSF-5252-3



PHILCO-FORD
TV Chassis 20T33

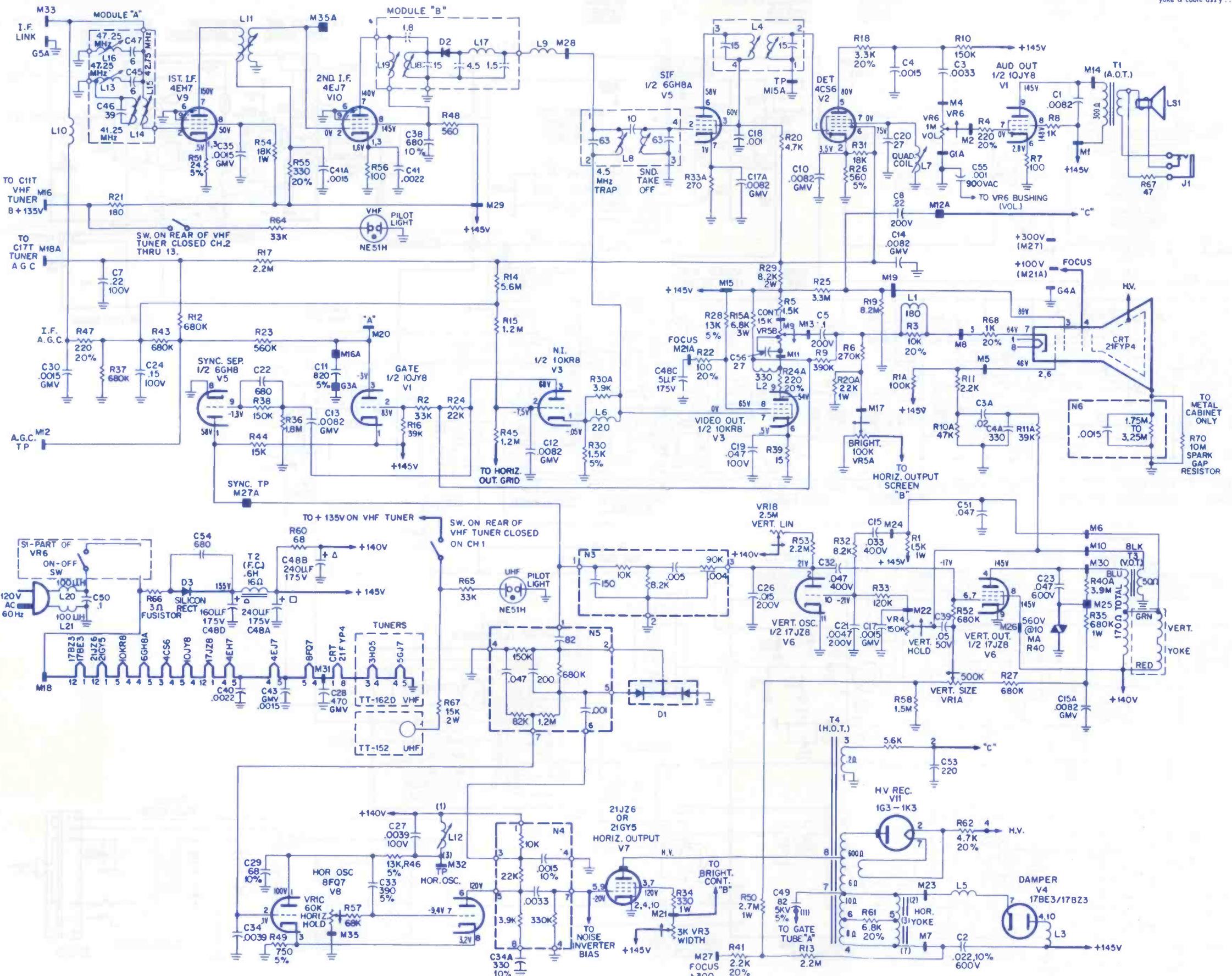
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SYMBOL	DESCRIPTION	PHILCO-FORD PART NO.		
C48 - 240/240/160/5 μ	@200v B+ filter	30-2601-33	L18 - video def	32-4652-79
L3 - choke, 60MHz, damper ph		32-4112-62	N3 - vert int	30-6030-12
L6 - 220 μ h, noise inv		30-4762-25	N4 - horiz osc	30-6057-1
L7 - quad, snd det		32-4876-1	N5 - phase comp	30-6035-2
L10 - tuner cplg		32-4652-96	N6 - isolation, CRT	30-6058-2
L12 - horiz stab		32-4754-3	R40 - varistor, 560v @10ma	33-1373-6
L14 - 41.25MHz nrcp		32-4652-80	R66 - fusistor	33-1381-5
			T1 - audio output	32-10013-4
			T2 - B4 filter output	32-10118-3

3 - vert output	32-10012-10
4 - horiz output	32-1008-7
R1 - 500M vert size, 2m vert lin 60K horiz hold	33-5595-8
R3 - 3K. width	33-5620-4
R4 - 150K vert hold	33-5623-22
RS - 100K, bright 15K contrast	33-5618-32
R6 - 1M. vol-on-off	33-5634-6
tuner UHF, TT152	76-13827-1
tuner VHF, TT162D	76-13945-3
yoke & cable ass'y	76-14170-1





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1 year guarantee backed up by the
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SARKES TARZIAN INC.

All tuners are cleaned inside and out,
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Replacement Tuner \$9.75.

This price buys you a complete new
tuner built specifically by SARKES TAR-
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The price is the same for every type
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Specify heater type

Parallel 6.3V
Series 450 mA
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All shafts have the same length of 12".

Characteristics are:

Memory Fine Tuning
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Universal Mounting
Hi-Gain Lo-Noise

If you prefer we'll customize this
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Send in original tuner for comparison pur-
poses to our office in INDIANAPOLIS,
INDIANA.



TUNER SERVICE CORPORATION FACTORY-SUPERVISED TUNER SERVICE

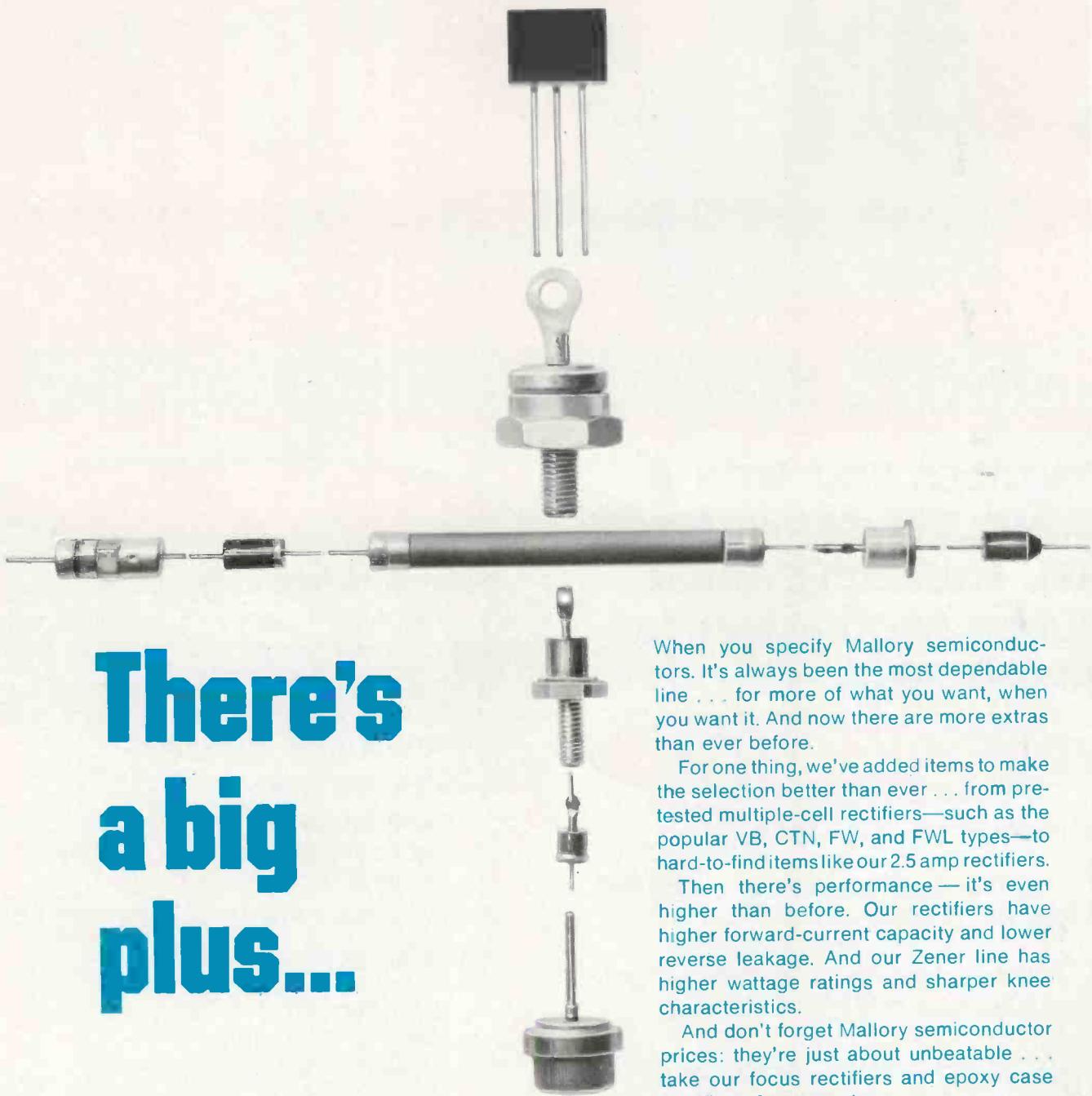
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SOUTH-EAST 938 GORDON ST., S. W., Atlanta, Georgia TEL: 404-758-2232

**WEST SARKES TARZIAN, Inc. TUNER SERVICE DIVISION
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... for more details circle 141 on Reader Service Card



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WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

MARCH 1970 • VOL. 91 NO. 3

39 TEKLAB REPORT

This month's report completes our review of the Magnavox T940 color chassis with an analytical look at the eight-function remote control system.

45 SOLDERING IS AN ART

By Donald W. Moffat. Here is a feature full of practical facts on soldering and techniques handed down through the years plus a discussion of the cause of "cold solder" joints.

48 SELLING CCTV

In part two of this series you'll find practical information on studio systems, video tape recorders, service procedures and helpful hints on maintenance.

54 STEREO SERVICING WITH A SCOPE

By Robert L. Goodman. In this article you'll find many practical approaches to solid state stereo troubleshooting with a dual trace triggered scope plus some handy service hints on IC circuits.

59 TESTLAB REPORT

This month's Testlab evaluates the Leader LCG-388 color bar pattern generator and reports on its stability after several hours exposure to the 20 below zero temperatures of the cold, cold North.

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33 DEALER SHOWCASE

COVER

Our cover picture this month depicts in a whimsical way the vast changes in the relative sizes of electronic components that have occurred since the advent of solid state circuits. The man behind the mike 'in the land of the giants' is Bob Hawkins of Seattle.

TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • Group 211

AIRLINE: TV Model GCI-13668B

MAGNAVOX: Color TV Chassis T934 Series

MAGNAVOX: TV Chassis T935 Series

J. C. PENNEY CO.: TV Model 1316A-89

PHILCO-FORD: TV Chassis 20T33

ZENITH: Color TV Chassis 16Z8C19



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POSTMASTER: Send form 3579 to ELECTRONIC TECHNICIAN/DEALER, Harbrace Building, Duluth, Minnesota 55802.

Adventure In Phoenix

I think one of the nicest things about a business trip in the dead of winter is a visit to a warm climate when you live in a very cold one. Such was the case when I made a trip to attend a national service meeting in Phoenix, Arizona at the invitation of the Motorola people.

Art Baldensperger, the H.E.P sales manager met me at the Phoenix airport and escorted me to the motel which had been literally taken over by the Motorola people and their guests. As the saying goes, "you can't tell the players without a program," so all the Motorola personnel wore white cowboy hats and red western style neckties embossed with the words "Quasar TV".

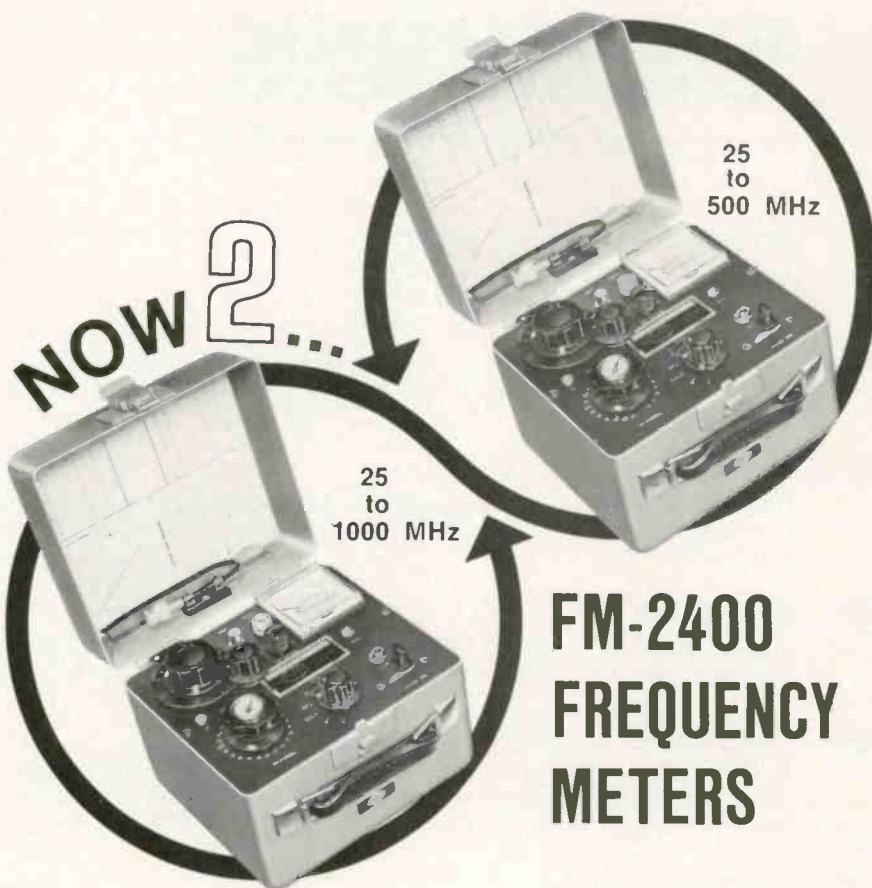
Motorola's service clinic on the Quasar II was the theme of the service program. The idea behind the clinic was to acquaint technicians and dealers with the new innovations in the Quasar II over the previous Quasar I.

The Motorola service training team gave a practical demonstration of the serviceability of the Quasar unit and followed through with a complete explanation of circuit operation. Many of the questions fired at the Motorola service staff during the session showed that technicians have a definite interest in providing good service. I felt that most everyone at the meeting came away enthused with the Motorola service technique.

The meetings were topped off on the last day by an excellent tour of the Motorola semiconductor plant. The tour members were each given a small transistor radio and earphone. The tour guide simply broadcast the information to them via a wireless mike and everyone got the message. It worked great. Only one thing wrong with it—we had to turn our radios back in after the tour.



Paul A. Konzler



FM-2400 FREQUENCY METERS

FM-2400CH (New)

- Tests Predetermined Frequencies 25 to 1000 MHz
- New Extended Range Covers 950 MHz Band
- Pin Diode Attenuator

FM-2400C

- Tests Predetermined Frequencies 25 to 500 MHz

The new FM-2400CH and the FM-2400C provide an accurate frequency standard for testing and adjustment of mobile transmitters and receivers at predetermined frequencies. The FM-2400CH with its extended range covers 25 to 1000 MHz. The Model FM-2400C covers 25 to 500 MHz. The frequencies can be those of the radio frequency channels of operation and/or of the intermediate frequencies of the receiver between 5 MHz and 40 MHz.

Frequency Stability: $\pm .0005\%$ from $+50^\circ$ to $+104^\circ F$

Frequency Stability: with built-in thermometer and temperature corrected charts.
 $\pm .00025\%$ from $+25^\circ$ to $+125^\circ$
 $(.000125\%$ special 450 MHz crystals available)

Both the FM-2400CH and the FM-2400C are self contained in small portable cases. Complete solid state circuitry. Rechargeable batteries.

FM-2400CH (meter only) \$595.00

RF crystals (with temperature correction) 24.00 ea.

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IF crystals catalog price

FM-2400C (meter only) \$445.00

RF crystals (with temperature correction) 24.00 ea.

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IF crystals catalog price

Write for catalog



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10 NO. LEE • OKLA. CITY, OKLA. 73102

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

Krylon® Crystal Clear is standard equipment for all installation and service work. It prevents many of the causes of picture

fading and high voltage losses and keeps lead-in connections tight. It's the repairman's handiest repaircan.



Borden Chemical, Division of Borden Inc

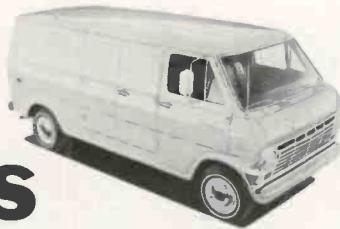


radio-tv repaircan

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

You'll see better ideas clear through Ford's Econoline

Small wonder it outsells all other vans



Twin-I-Beam ride. The independent front suspension made famous by Ford pickups: Twin-I-Beam. Two I-beam axles for strength... big coil springs for easy ride. Twin-I-Beam gives you greater stability, less wind wander, and a better ride. Only Ford has it.

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FORD ECONOLINE VANS

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





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5-watt CB
transceiver*

Johnson Messenger 125

\$99⁹⁵



Only the famous Johnson "talk-power" is big as ever on Johnson's radically new Messenger 125! Virtually every vehicle on the road, including the 1969 and 1970 models, can easily accommodate this versatile new radio. Its far-ahead features make operation extremely simple and enjoyable. Best of all, we sliced the most out of the price!

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- 5 push button channels—no knobs ■ slide-lever vol. and squelch
- World's smallest panel configuration— $1\frac{1}{16}$ " by $4\frac{1}{2}$ ", just 7" deep
- 4 watts output at 13.8 VDC ■ Accessories for portable use



E. F. JOHNSON CO.
WASECA, MINNESOTA 56093

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



TWO-WAY RADIO 700

Medium priced with solid-state design

Announced is the availability of a new medium-priced solid-state FM two-way mobile radio. Designated the MOCOM 70 radio, this unit has four frequency capability and is available with 30 and 45w RF power output high band and 50w output for low band operation. This solid-state design feature means instant communications since no warm-up time is required, low current drain, consistent power output and continuous duty capability. The sensitivity of the receiver— $0.3\mu V$ in low band and $0.35\mu V$ in high band—provides improved range and effectiveness. The unit also provides maximum protection against adjacent channel interference with a reported selectivity more than 80db down in low band and more than 90db down in high band. The compact radio complements the automobile interior if mounted under dash, but can also be mounted in the trunk or in any other convenient locations. Motorola.

DUAL BANK VHF MONITOR RECEIVER 701

"Modular concept" shortens assembly time

Introduced is the Monitor III solid-state receiver kit which tunes both the high and low (152-174 and 30-50 MHZ) VHF FM public service bands. The kit can be assembled easily even by beginners because of its new "modular concept." Most parts are already soldered to the printed circuit boards and all critical adjustments have been made at the factory. All the builder does is solder the connections between circuit boards. The circuit design includes four IF stages, tuned RF and mixer to provide greater sensitivity and selectivity. The receiver also has convenience features, such as an adjustable squelch, a headphone jack and an illuminated slide-rule dial with a logging scale. An automatic volume control (AVC) circuit is featured with a push-pull audio output signal level constant. The receiver kit is priced at \$59.95 complete with gray metal case, 5-7/16by11-7/8by7-3/4 in. Allied.



PROTECTION SYSTEM 702

Plug-in cords designed for simple installation

Introduced is a master protection system for home and office. This first complete customer installed system has a full line of sensors to protect from fire, flood, power failure, smoke, and intrusion. The Model C-7360 is battery operated and claimed fail safe in operation. A solid-state circuit accepts all sensor in a single plug-in system. Activation of any sensor in the system sets off a horn system with noise level above 95dB. Only a turn off at the key-lock switch can deactivate the alarm. The master unit measures 5 1/4 x 7 x 2 1/2in. and is powered by two "D" cells. One or all sensors can be connected to a single master unit. A complete protection manual is supplied with each master unit for installation and use. The master unit is priced at \$19.95 and sensors are priced from \$2.95. James.

**FOR MORE
NEW PRODUCTS SEE
PAGES 33 & 75**



FOR BLACK & WHITE VHF, LOCAL UHF

UHF TRANSMISSION LINE PAT. NOS. 2782251-2814666

Tough polyethylene jacket
Unicellular polyethylene core, each cell filled w/ inert gas

Strong Copperweld conductors

Belden
8275
Celluline®

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.

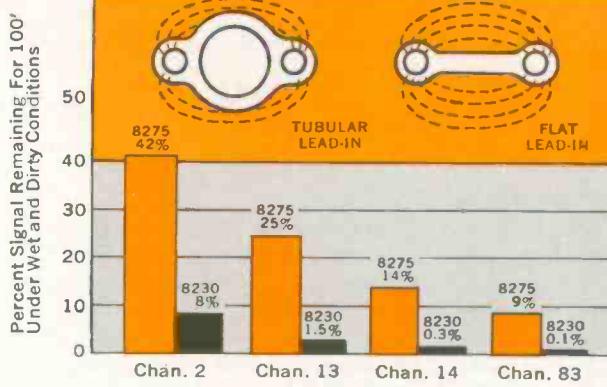
So, upgrade your customers and keep 'em happy. Call your Belden Distributor for 8275 Celluline. He has it in 50, 75 and 100-ft. coils. And in 250, 500 and 1000-ft. spools.

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.

Celluline 8275

Flat Twin-Lead Catches Dirt & Moisture Between Conductors



AWG & (Stranding)	Color	Nom. O.D. (Inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft.)	Nom. Attenuation per 100' mc	db
20 (7x28)	Brown	.300 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?

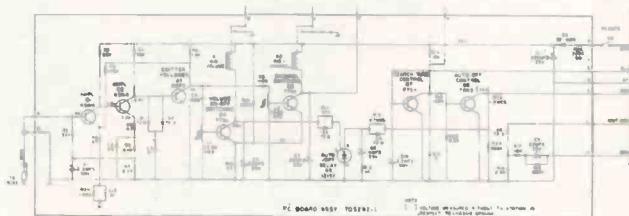
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

MAGNAVOX

Remote Receiver Model 704053—Bench Service

The remote receiver can be powered and checked, with the receiver disconnected from the TV instrument, as follows:

Note: Referring to the schematic diagram, terminal "G" is the common connection and the connections to terminal "G" are indicated as connection to the chassis. This is correct as far as the TV chassis is concerned, however, terminal "G" is not connected to the remote chassis. Terminal "G" connections are isolated from the remote receiver chassis by the network R25/C13.



(1) Connect 120vac between terminals six and eight of P401. Turn remote switch on. Use isolation transformer between receiver and ac line or connect a 26vdc supply between terminal "G" and the cathode of D5, with the negative side of the supply to terminal "G". (2) Press the LOUDNESS ON-OFF function button on the transmitter while watching K1 for momentary operation. (3) Press STATION SELECT button on the transmitter while watching K2 for momentary operation. (4) A. Connect a jumper between terminals "H" and "C". This connects transistor Q7 collector to the collector of transistor Q5 as though a VHF search tune function was in progress. B. Forward bias places transistor Q7 into conduction by applying about +.6v to the base. This can be accomplished by connecting a low voltage bias supply between terminals "G" and "E", with the negative side of the supply to terminal "G". Check K2 for operation as transistor Q7 is biased into conduction.

RCA VICTOR

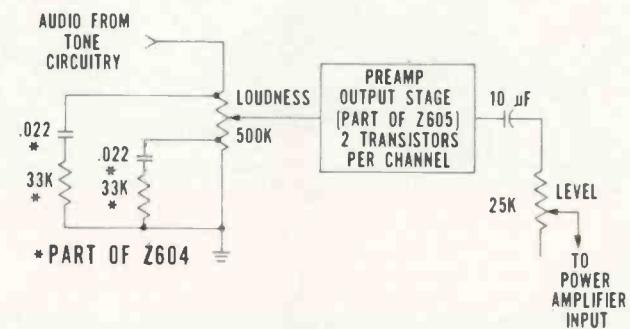
C/COS Tuner Chassis RC1233/RC1238/RC1239— Loudness and Level Controls

The new line of C/COS stereo tuners features a level control in addition to the familiar tone-compensated loudness control. Because the level control is new this year in RCA products, it should be of interest to the reader to learn the theory behind the level and loudness controls and method of adjustment.

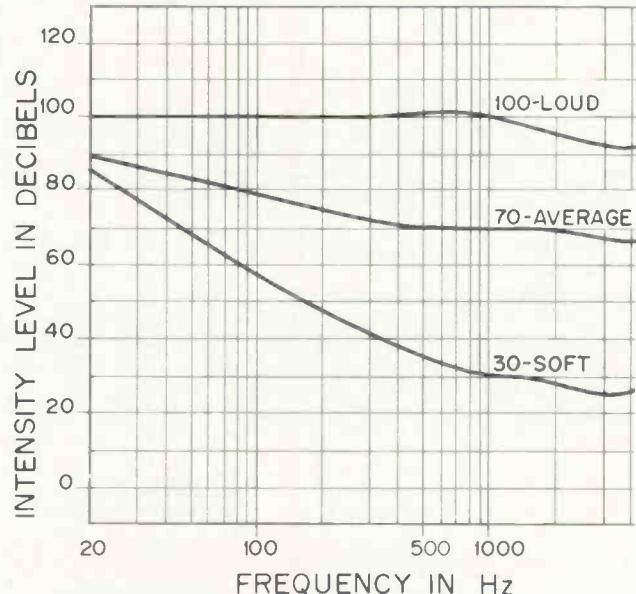
The level control is an uncompensated volume control which is located between the audio preamplifier and the input of the power amplifier as illustrated in simplified block diagram.

The loudness control serves to compensate for a physiological phenomenon of the listener's ears that makes them less sensitive to low frequency sounds as the listening level

is reduced. This acoustical effect, known as the Fletcher-Munson effect makes it necessary to gradually boost bass



as the listening level is reduced. The curve graph indicates that little or no bass boost is required at high listening levels and as the sound level is decreased from loud to soft, increasing amounts of bass boost must be supplied to reproduce



the lower frequencies in balance with the mid frequency and high frequency sounds. This is the function of a loudness control circuit, as used in the new radio tuners.

Controls Adjustment

One adjustment procedure for level and loudness is to adjust the level control to maximum and the loudness control to a comfortable listening level. If the sound seems to have excessive bass at this setting of the loudness control, the level control setting should be reduced and the loudness control advanced until a pleasing tone balance is achieved.

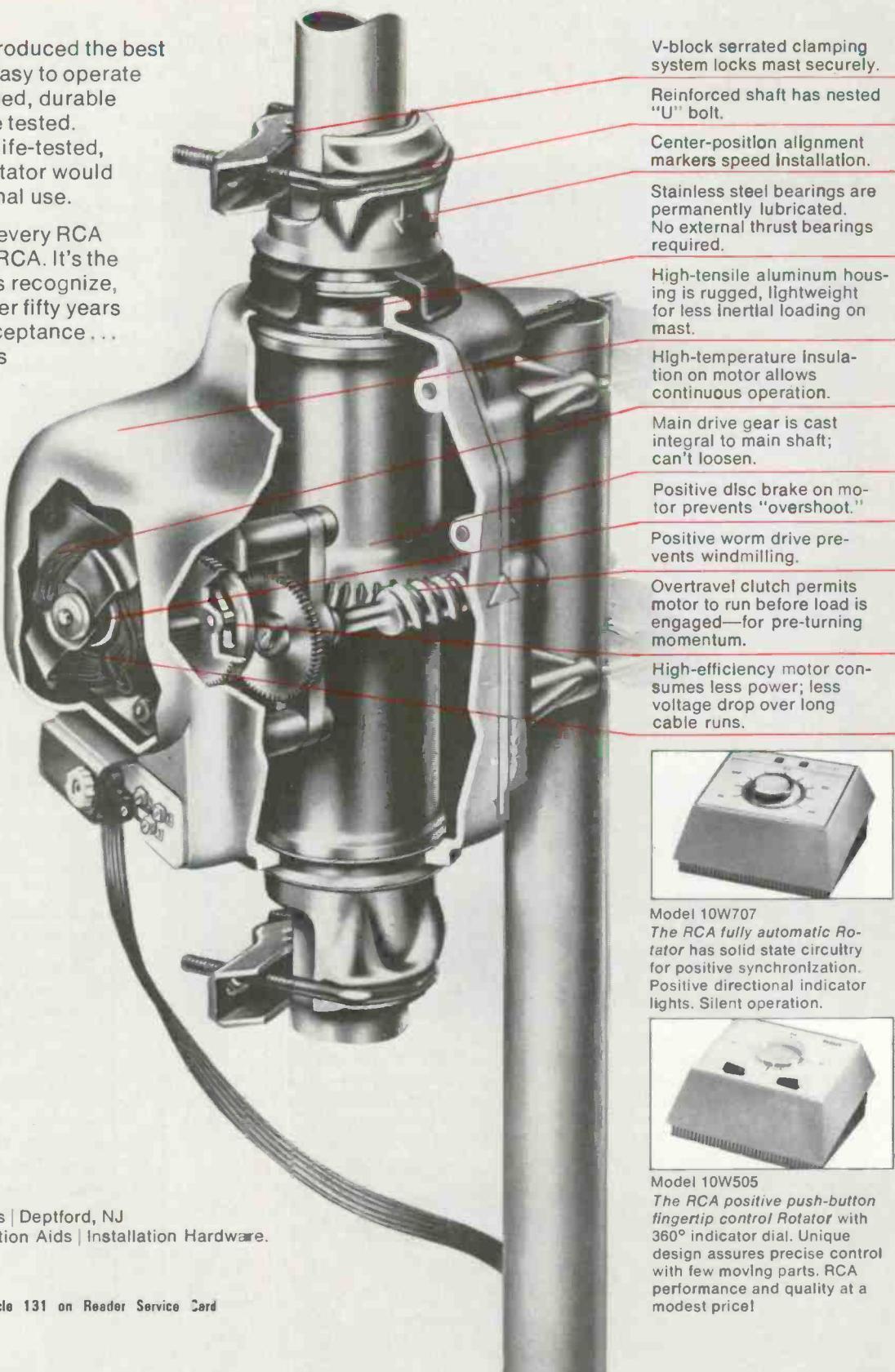
Once the level control is set, the loudness control should be used to regulate the sound intensity, as it will retain tone balance of a fairly wide change in loudness.

The RCA rotator has many features your customers won't understand. It has one that everyone recognizes: the name, RCA.

RCA engineers have produced the best in rotators. Beautiful, easy to operate control cabinets. Rugged, durable drive units. And they're tested. Continuous operation life-tested, under conditions no rotator would ever encounter in normal use.

The "extra feature" in every RCA rotator is the name . . . RCA. It's the feature your customers recognize, rely upon. It's taken over fifty years to build this kind of acceptance . . . acceptance that means more sales for you.

RCA
Rotators



V-block serrated clamping system locks mast securely.

Reinforced shaft has nested "U" bolt.

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High-tensile aluminum housing is rugged, lightweight for less inertial loading on mast.

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Main drive gear is cast integral to main shaft; can't loosen.

Positive disc brake on motor prevents "overshoot."

Positive worm drive prevents windmilling.

Overtravel clutch permits motor to run before load is engaged—for pre-turning momentum.

High-efficiency motor consumes less power; less voltage drop over long cable runs.



Model 10W707
The RCA fully automatic Rotator has solid state circuitry for positive synchronization. Positive directional indicator lights. Silent operation.



Model 10W505
The RCA positive push-button fingertip control Rotator with 360° indicator dial. Unique design assures precise control with few moving parts. RCA performance and quality at a modest price!

RCA | Parts and Accessories | Deptford, NJ
Rotators | Antennas | Reception Aids | Installation Hardware.

. . . for more details circle 131 on Reader Service Card

Better To Repair

After reading R. Pasela's letter "Or Else" in the December issue, he strikes me as being a poor serviceman. He also gives an inkling of how things are made today, made so if anything goes wrong, don't repair it—throw it out and buy a new one. A true serviceman can repair and improve much of his old equipment for today's ser-

vice. Also, he won't tell a young child that his little transistor radio should be junked. If he is smart he will fix it because he stands a better chance of getting the parent's business. Telling other servicemen to stay clear of custom made sets is not the word of a real serviceman either. Mr. Pasela isn't going to like the December issue of ET/D because several readers asked for information on old units. Many a time I've wished they would ask for something I have on hand so I could help.

PETER LEGON

Malden, Mass

Needs Fused Line Plug

I have a slight problem which an ET/D reader may be able to solve. We are trying to locate a source of replacement or substitution for a "fused current tap" which we currently use. This item is stamped with the notation "B & M", but so far we have been unable to trace it to a manufacturer so we could buy more of them. Any help would be greatly appreciated.

HOWARD W. ROKUS

John Oster Co.
5055 North Lydell Ave.
Milwaukee, Wisc. 53217

We received a sample of this item from Mr. Rokus and it looks much like an ordinary AC line plug which is made to accept another AC plug in the top. However, the plug is fused to provide protection for any appropriate appliance plugged into it.....Ed.

Reader's Aid

I purchased a Simpson Model 330 Tube Tester but I am having quite a time finding an up to date tube chart and manual. I am hoping that perhaps one of your readers could tell me where I can get them. The manufacturer can no longer supply these items. This is a good tester and I would hate to shelve it. Any help would be appreciated.

MATT McCREADY

7809 Riverview Ave
Pittsburgh, Penna 15218

I have retired from the two-way radio servicing business and have the following test equipment in excellent condition for sale: one Lampkin 105-B frequency meter with charts, one Lampkin PPM crystal calibrator

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Erratum

In the Test Instrument Review, Part III of our January, 1970 issue, we listed a Model 166 Instrument Calibrator (Pages 68 and 69). This unit was incorrectly listed on page 69 as being manufactured by Western Instruments, Div. of Western Instruments, Inc. It should have been listed as Weston Instrument Division of Weston Instruments, Inc. The price of the Model 166 is given on page 68 as being \$41.95. This is in error, it should read \$4195.00. Our thanks to Mr. Eliot Warner at Weston Instruments, Inc., for his cooperation and for calling these errors to our attention.

Do you want the
same things
Dick DeVroeg wants in capacitors?

Then you'll ask for
Sprague Twist-Lok® Capacitors when
you need twist-prong electrolytics.



As manager of S&R TV in Lake Forest, Illinois, Dick DeVroeg knows the importance of using quality components. The 8-man S&R organization has built a name for itself in northern Chicago suburbs over the past 18 years. "To maintain our reputation in servicing everything in electronics," Dick says, "we just can't compromise on dependability. That's why we prefer Sprague Twist-Lok Capacitors."

Ask your Sprague distributor for a copy of Sprague's Electrolytic Capacitor Replacement Manual K-109 or write to:
Sprague Products Company, 65 Marshall St., North Adams, Mass. 01247.

P.S. You can increase your business 7½% by participating in EIA's "What else needs fixing?" program. Ask your distributor or write to us for details.

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

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UV Combo's \$16.50

Price includes all labor and parts except Tubes, Diodes & Transistors. If combo tuner needs only one unit repaired, disassemble and ship only defective unit. Otherwise there will be a charge for a combo tuner. When sending tuners for repair, remove mounting brackets, knobs, indicator dials, remote fine tuning arrangements and remote control drive units.

All tuners must have remote control units and/or mounting brackets removed before tuner can be cleaned and repaired. Please remove these accessories before shipping, as we will not be responsible for loss or damage.



All tuners are serviced by FACTORY TRAINED TECHNICIANS with years of experience in this specialized field. All tuners are ALIGNED TO MANUFACTURER'S SPECIFICATION on crystal controlled equipment and air checked on monitor before shipping to assure that tuner is operating properly.

GEM CITY TUNER REPAIR SERVICE

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2631 Mardon Drive
Dayton, Ohio 45420

ET/D

LETTERS TO THE EDITOR

and one Lampkin 205 Modulation meter. This is an excellent opportunity for one of your readers to acquire the test equipment necessary to set up a two-way radio service shop at a reasonable cost.

ROBERT KELLY

616 N. Bristow
Moore, Oklahoma

"Laying It On"

In the Letters to the Editor section of the December 1969 issue of ET/D, there appeared a letter from a gentleman "laying it on" those of us who take on the task of repairing old sets and that of keeping our test equipment rather than throwing it away. I take issue with the remarks and I can offer proof that the idea of junking old equipment is not always a good rule of thumb. For instance, I live in a small community where jobs are scarce and the average income rather low. The majority of sets are old. But a \$20 repair bill is much less than the price of a new set and much less than the 4, 5 or more monthly payments that might go by before the set needs additional service. I do not know about the gentleman's location or how his service runs. However, I do know that if we only service sets that are about five years old, there would be very little service work to do. Therefore, my technicians and I would all be out looking for other jobs.

I think you will admit that continuous service is rough on any equipment, especially if it is used every day. I think it would also be agreed that this would be true regardless of how well the equipment is built. The point is that we service many radio stations, and the average age of the transmitting gear is 15 years old! Maintenance costs run about \$200 per year which is darn good considering the original cost of the equipment.

In regard to test equipment, I feel that if I buy it new and live with it every day, I can tell when it ceases to function properly. I then make repairs. If it will not do the job, then is the time to replace it. I would like to drive a new car every year too, however, my old one does the same job as a new one—it gets me there and back.

WALTER L. JOHNSON, JR.

Lillington, N. C.

It costs only



New Easy Dispenser Pak 60/40 18 S.W.G.*

1/100 of 1¢ more



Latest PC (Printed Circuit) Pak
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ELECTRONIC TECHNICIAN/DEALER

DEALER SHOWCASE

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

TAPE PLAYER

Padded front edge matches auto dash

An eight track tape player, Model #SS-548, is introduced. The unit, which has an output of 16w (8w per channel), contains 12 silicon trans-



sitors and four diodes. Its padded safety front edge matches an automobile's padded dash. The channel selector button offers automatic or manual selection of tapes which show up by a lighted channel indicator with numbers one to four. VOLUME, BALANCE and TONE control knobs are included. The unit measures 6 1/2in. w by 3in. d by 8 1/2in. long and weighs 5 lb. Weltron.

DIGITAL DECODER

Operates between receiver and speaker

Introduced is the Model SD40 integrated decoder designed for selective call alerting through radio. Applied to two-way radio systems, the decoder selects from 6,561 discrete codes to alert the individual of his calls. It sounds the horn, starts four-way flasher systems, connects a speaker and lights a call lamp so that even



an unattended mobile gets the message. Additional memory is provided for an emergency "all-call" and up to sixty-four "group-call" codes in each unit. Code changes are programmed in the field without the need for extra cost plug-in elements, reeds or modules to stock or exchange. A di-

703

gital filter and error detector circuit assure highly reliable signaling, even in conditions too poor for voice. See code.

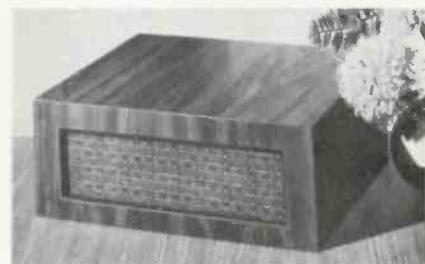
TAPE DECK

Three motors and four tape heads

Announced is the Model 407, first of a new generation of solid-state tape decks. The unit incorporates three motors—one each for supply and take-up reels, and a hysteresis synchronous capstan drive motor; four heads for erase, record, playback and reverse playback; "life tested" push button solenoid-operated controls for instant activation of tape motion; automatic reverse through conductive strips, dual VU meters; automatic tape letters; automatic shut-off switch. Because the tape deck has a separate playback head, the machine is capable of recording sound with sound, sound on sound and echo effects. The tape heads are contoured to assure a maximum contact tape wrap as well as a wide gap record head to produce a wide range frequency response (30-20,000 Hz at 7.5ips). The playback heads for forward and reverse play are ultra narrow gap units. Price \$379.95. Astrocom/Marlox.

705

its calls through and the dialer in no way interferes with normal phone operation. A positive-start tape transport virtually eliminated the possibility of the message system being



unable to play-out the emergency messages because of a jam... a common problem with less sophisticated automatic dialing units. Other features include a special delay circuit for quick and easy "arming," without the annoyance of accidental set-off and can be made as elaborate as desired. The unit comes complete with all necessary installation components, including its set up instructions and a tape cartridge that holds six one-minute messages. ACRO-GUARD measures 12 x 12 x 4in. and weighs 11lb. Acron.

INTRUSION ALARM

707

No installation for ultra-sonic system

The Model ACA-140, an ultrasonic intrusion alarm system is introduced. A completely self-contained unit, housing a sensitive detection device and eight inch alarm bell in a walnut wood cabinet. Identical in appearance to a bookcase speaker cabinet, the system protects a home or small business by projecting a high-frequency (ultrasonic) beam which effectively

INTRUDER DETECTOR/AUTO PHONE DIALER

Special programming guarantees telephone message transmission

Announced is a completely self-contained, furniture-styled ultrasonic intruder detection system, complete with automatic emergency phone dialing and installed in just minutes. Fire detection can be added and the system will call the fire department to inform them of the emergency. Items such as "panic buttons," bells, sirens, light switching... virtually anything can be added to the system. Anti-false alarm features are built into the unit. The response threshold of the system is such that power line transients or power interruptions, normal building vibrations, and the like, will not trigger the unit. The system even "hangs up" on anyone trying to jam phone circuits during an emergency or break-in, capturing the line to get

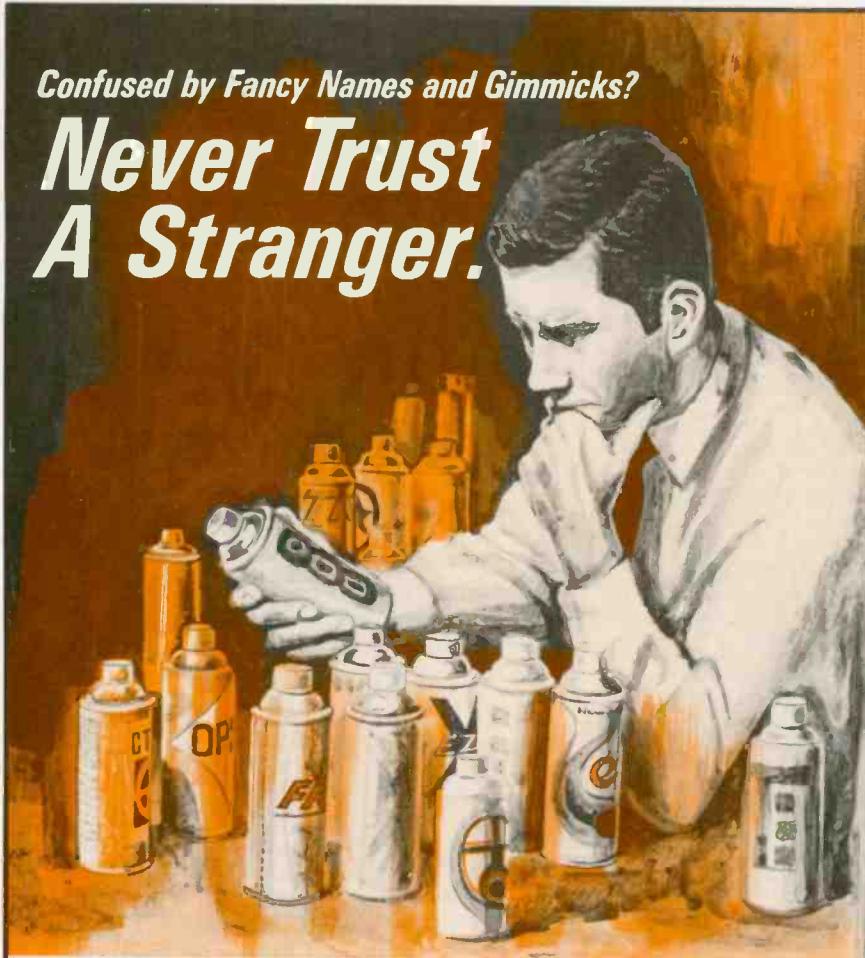


"blankets" a given area. Any intruder interrupting this beam activates the system turning on a light and in about

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CASSETTE ALBUM

708

*Stores twelve
cassettes like books*

A new concept in storing tape cassettes is introduced. The cassette album holds up to 12 cassettes and when fully opened all titles can be plainly read. Cassettes are simply snapped



in and out. Album is a compact 9 1/2 x 10in. and only 1 1/4in. thick and can be stored on a book shelf like library books. Made in attractive vinyl colors: black, red, navy blue, and walnut wood grain. Suggested retail price \$3.98. Penn State.

MICROPHONE

709
*Complete replacement
blister-packed models*

Introduced are four different styles of microphones, which cover most of the entire market's requirements. The company's one-time-only offer consists of any combination of 48 units of the four models, at a special price. A cross-reference directory, which serves as a wall chart, provides customers with instant information as to which replacement mike goes best with their particular tape recorder. The microphones represent a range of high and low impedance dynamic performers. A multiple-type plug is included with each unit—ready for consumer plug-in. Through this sys-

continued on page 63

"My shop's been loaded since I got my FCC License...and I could kick myself for not getting it sooner. I'm pulling in all kinds of mobile, marine and CB business that I couldn't touch before; have even had some calls to work on closed-circuit television. I've hired two new men to help out and even with them, I'm two weeks behind."

And so it goes. Once you have that FCC ticket, you open the door to all kinds of new business. And that's not all. The knowledge you need to pass the FCC exam gives you a fundamental understanding of *all* electronics. You'll find you can do more work in less time...work on almost *any* kind of electronics gear.

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companies...and our trade has grown by leaps and bounds."

Ed Dulaney is another example. He started his own part-time service business after training with CIE and passing the FCC License exam. This worked out so well that he then opened a full-time business. Today, he reports, "I manufacture my own two-way radio equipment, with dealers who sell it in seven states, and have seven full-time employees."

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ET-56



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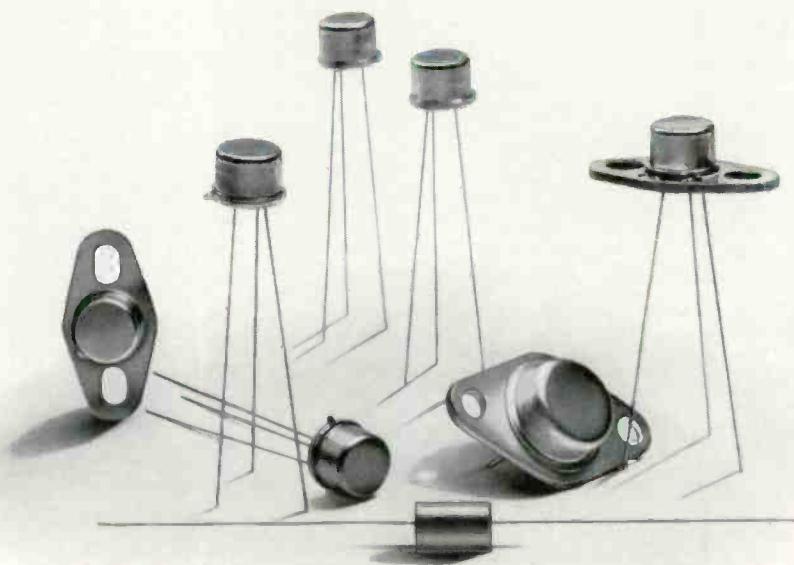
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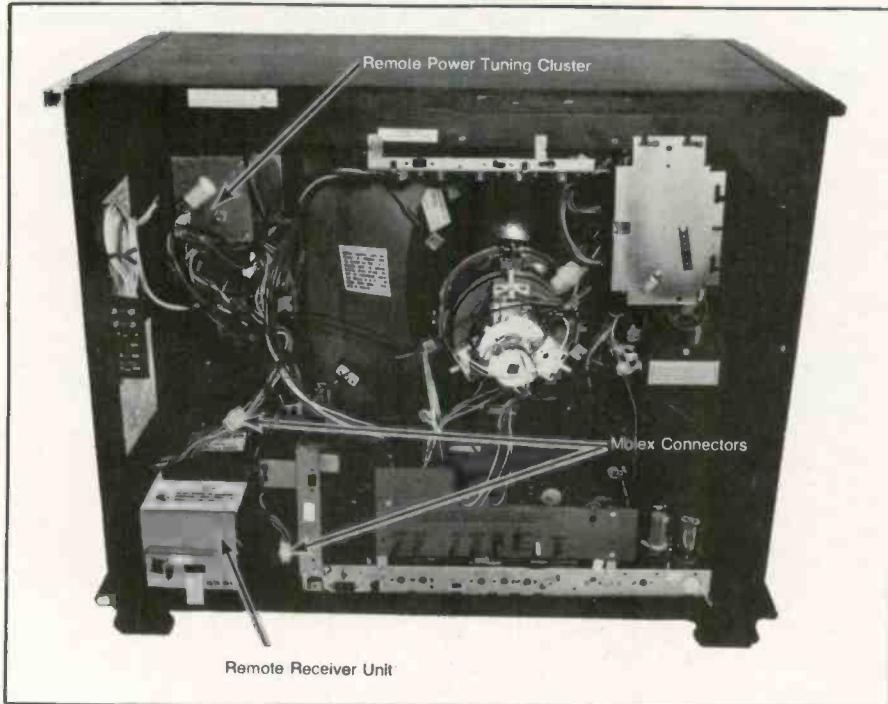


TEKLAB REPORT ET/D

Magnavox Eight Function Remote Control System

Keep up to date on remote control systems as we review the VHF/UHF search tune and automatic-off circuits employed in this color receiver

Rear view of the television set showing the tuner and the remote power tuning control cluster. The remote receiver unit is shown to the left of the TV chassis and easily pulled by removing one screw and unplugging the Molex connectors.



Last month our Teklab Report covered the circuits in the Magnavox Model 2C6927 with the T940 total automatic color chassis.

We will now review the interesting circuits used in the Model 704054 remote control system of the same set.

As shown in the rear view illustration, the remote control receiver unit is located to the left of the TV chassis and is easily pulled by removing one chassis screw. Molex connectors are used to connect the receiver to the TV chassis, tuner and radio. The main TV chassis can be switched on without the remote chassis by using a shorting plug which is provided.

This unit allows the customer to perform the following operations from a remote location: (1) Switch the receiver on and off. (2) Adjust the volume level. (3) Adjust the color control up and down. (4) Adjust the tint control for proper flesh tones on instruments without automatic tint control. (5) Rotate the VHF tuner. (It will automatically stop on station). A record may be rejected on stereo theatre instruments; the radio may be tuned and automatically stopped on station when a search tune radio is included in a stereo theatre instrument. (6) The UHF tuner may be tuned up or down and automatically stopped on station. There is also a special circuit which automatically turns the TV off a short time after the station leaves the air.

REMOTE CONTROL TRANSMITTER

When a transmitter button is depressed, one of eight frequencies will be generated and radiated to the receiver in the 35.5kHz to 46.0kHz range. The microphone on the receiver picks up the signal which is amplified by a four stage, broad band amplifier and coupled to eight tuned circuits. Each circuit is resonant to a specific frequency. A driver transistor and relay coil are associated with each tuned circuit. The signal is then coupled only through the tuned circuit which is resonant to the signal frequency. The signal then switches on a driver transistor which in turn, energizes a relay. All eight driver transistors and their associated relays operate in this manner. Only the frequency to which their input circuit is tuned is different.

REMOTE RECEIVER

The remote receiver chassis is constructed in two sections as shown in Fig. 1. The circuits which amplify the transmitted signal and actuate each of the eight functions are located on a circuit board

inside the metal enclosure. Additional relays and the search board are mounted on the top of the receiver enclosure.

The receiver circuit board contains a power supply, four amplifier stages, eight tuned circuits, eight driver transistors and eight relays. The receiver microphone is identical to the one used in the transmitter and is mounted in the front of the cabinet and plugs into the receiver chassis. In short, the receiver operates in the following manner: Refer to the simplified schematic, Fig. 2.

1. Each pushbutton on the transmitter causes a specific frequency to be radiated and picked up by the receiver microphone. The signal then passes through four stages of amplification.

2. The secondary winding of L201 couples the signal to the input circuits of all relay driver transistors (Q205 through Q212). The tuned input circuits accept only the frequency to which they are tuned and reject all others.

3. The signal is coupled through the tuned circuit to the associated relay driver transistor where it "turns on" the emitter-base junction and causes collector current to flow.

4. Collector current flows through the relay coil which controls the relay contacts. The contacts control application of 120vac to the controlled circuit.

UHF SEARCH TUNE CIRCUIT

To activate the UHF search tune circuit, the VHF tuner must be in the UHF position. Only in this position is the necessary voltage applied to the circuit enabling the UHF search to continue after the UHF select switch is released.

A UHF search tune sequence is begun by a 43.0kHz (UHF UP) or 41.5kHz (UHF DOWN) frequency from the transmitter or by one of the front panel UHF switches as shown in Fig. 3. Either condition will cause RL207 for the up function,

or RL208 for the down function, to energize.

The UHF search tune function incorporates a phase shift motor to permit the tuner to be rotated up or down. Reversing switches are used to change the direction of motor rotation as the tuner reaches the end of the dial. The gear reduction train provides a drive speed of two RPM.

The ac "holding" voltage for both the UHF and VHF tuning motors is supplied through the normally-closed contacts of the search relay. The wiper switch is operated by the VHF tuner shaft. When the VHF tuner is rotated to the UHF position the

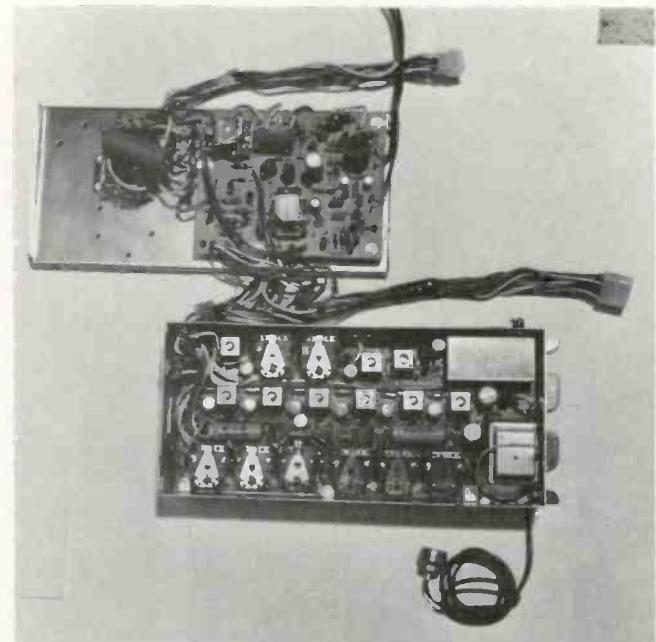
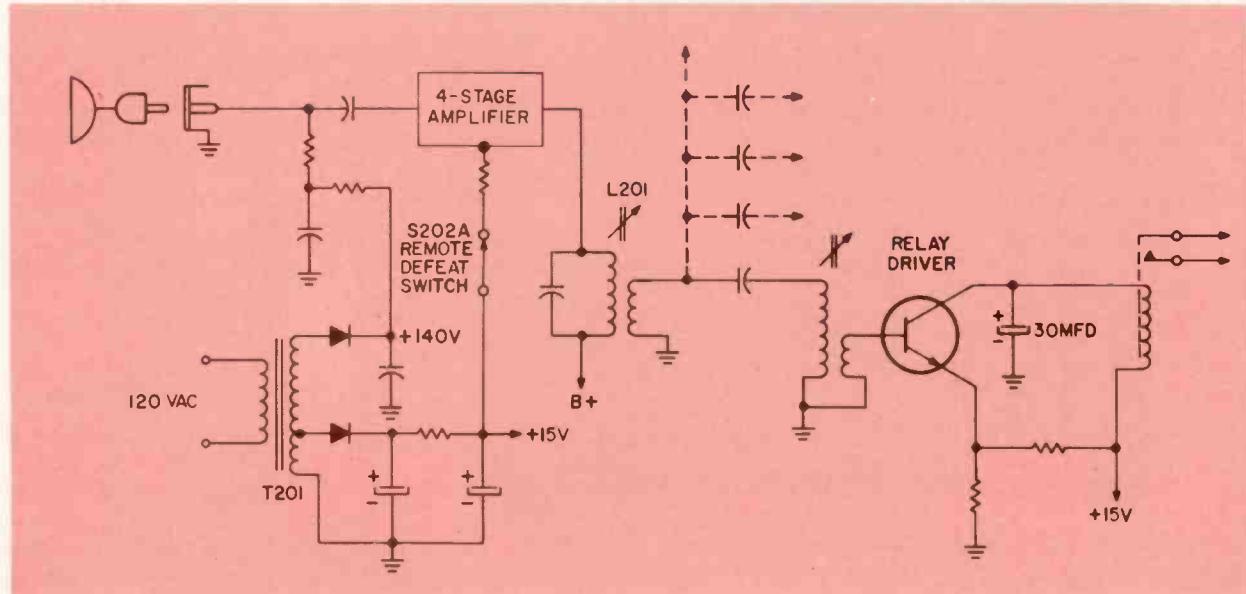


Fig. 1—The remote receiver is constructed in two sections; one amplifies the transmitted signal and actuates each of the eight functions, the other board contains a power supply, four amplifier stages, eight tuned circuits, eight driver transistors and eight relays.

Fig. 2—Simplified schematic of the Remote Control receiver.



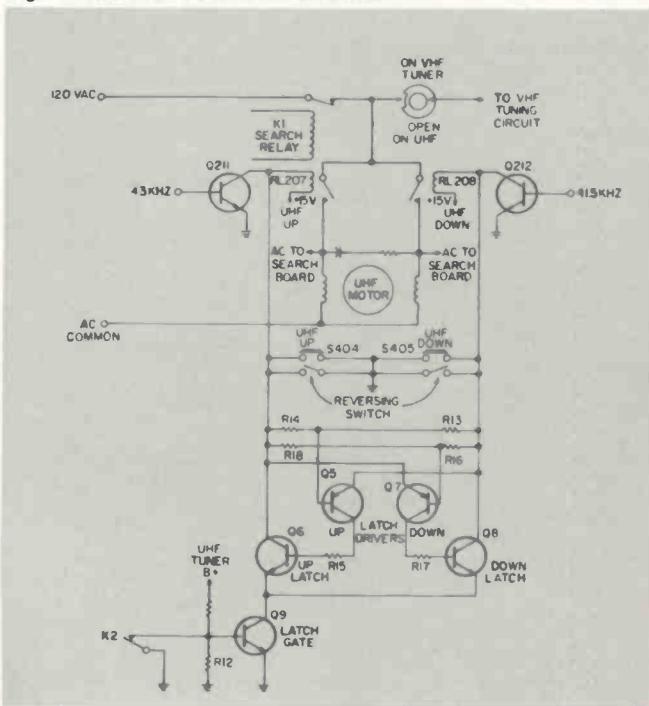
switch is opened to remove voltage from the VHF motor. When the VHF tuner is in the UHF position, a set of contacts on the UHF strip in the VHF tuner supplies B+ voltage to the UHF tuner. This UHF B+ voltage is also supplied to the base bias circuit of the Latch Gate transistor, Q9, to "enable" the UHF Latch Circuit.

The contacts on RL207 control the "UHF Up" function by supplying voltage directly to the "up" winding of the UHF motor and through the phase shifting capacitor to the "down" winding. This causes the motor to rotate in the "up" direction.



The remote control transmitter, not much larger than the palm of your hand, will generate eight frequencies.

Fig. 3—The UHF Search Tune Circuit.



The contacts on RL208 control the "UHF Down" function by supplying voltage directly to the "down" winding of the motor and through the phase shifting capacitor to the "up" winding. This causes the motor to rotate in the "down" direction. The voltage applied to the motor winding is also supplied to the search board where it will energize the search board power supply and cause relay K2 to energize, thus removing the ground from the base of Q9.

The latching circuit energizes the motor and power supply circuits until a UHF channel is searched out or the VHF button is pressed. Perhaps the best way to explain the circuit is to describe the sequence of events which takes place when the circuit is activated. Assume that a UHF Up function is selected and RL207 energizes.

The UHF motor, power supply and K2 are energized. The ground is removed at the base of Q9 by the opening of the contacts and the base is forward biased by the voltage drop across R12. This closes the emitter-collector circuit of Q9 (in either direction of search).

The circuit will be held in operation by keeping RL207 energized. This is accomplished by the Up Latch transistor, Q6, and an Up Latch Driver transistor, Q5. The collector voltage on Q211, drops to near zero when RL207 is energized, while the collector voltage at Q212 remains at 15v, the receiver supply voltage. Resistors, R16 and R18 form a voltage divider which reverse biases Q7. R13 and R14 divide the voltage in such a manner that the base of Q5 is forward biased, closing the emitter-collector circuit of Q5 and applying forward bias to the base of Q6 through R15. The emitter-collector circuit of Q6 is closed by the forward bias at its base and a low impedance path is provided through the emitter-collector circuits of Q9 and Q6 which completes the circuit for RL207 thus keeping it energized.

Assuming that the search operation is not interrupted by a station signal during its upward travel, the down reversing switch is closed by a plastic arm driven by the UHF dial shaft when the upper limit of travel is reached. Closure of this switch energizes RL208 and reduces the collector voltage on Q212 to near zero. Equalizing the potential across the latch circuit places zero bias on Q5. This releases the latch by zero biasing Q6 and opens RL207. The collector voltage of Q211 returns to 15vdc. Voltage divider resistors R13 and R14 now reverse bias Q5, while R16 and R18 forward bias Q7. The collector voltage of Q7 forward biases the base of Q8 and holds RL208 energized by presenting a low impedance path across Q212 through the emitter-collector circuits of Q8 and Q9.

The direction of search can be reversed in the manner described above by pressing either button of the opposite function during UHF search. The remote transmitter is shown in illustration. The latch circuit is disabled in the VHF positions.

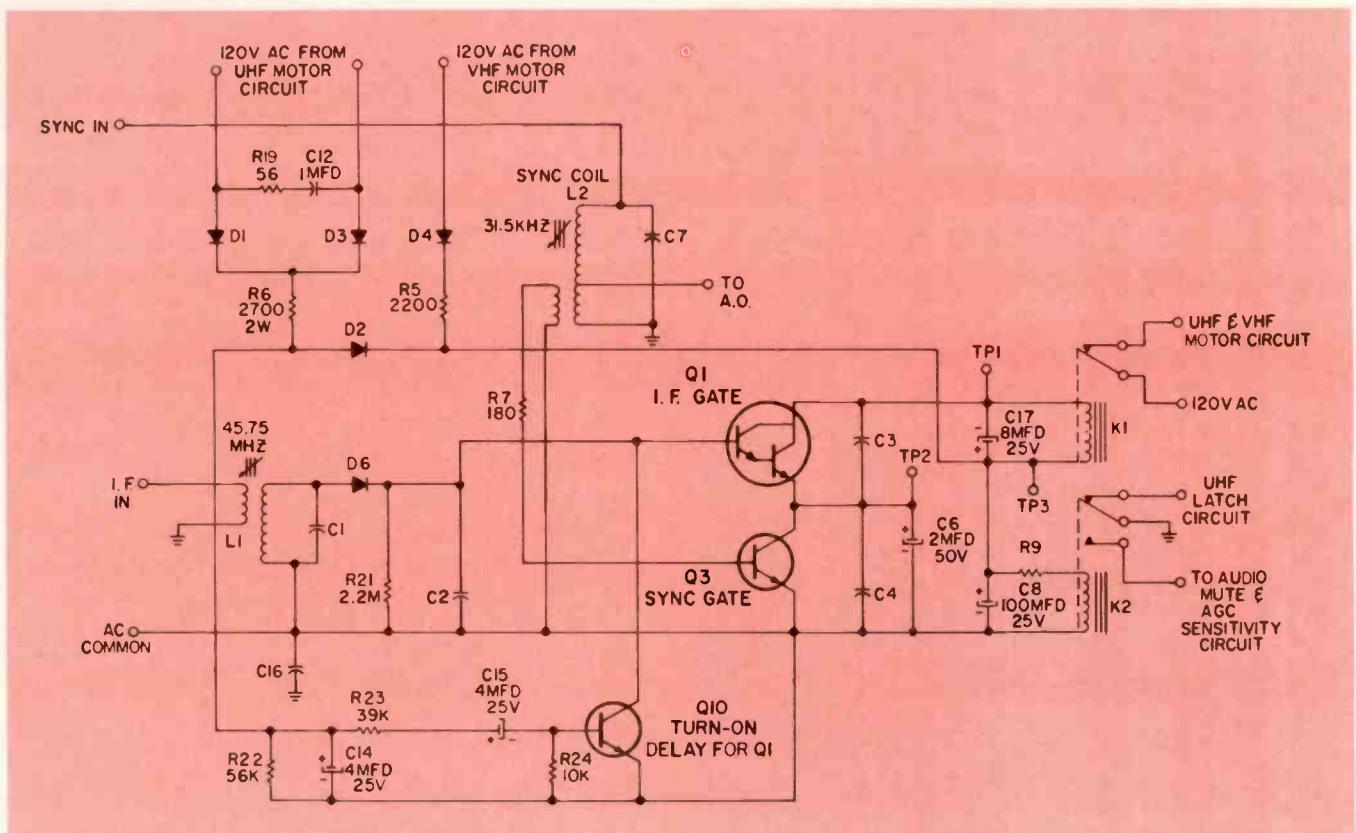
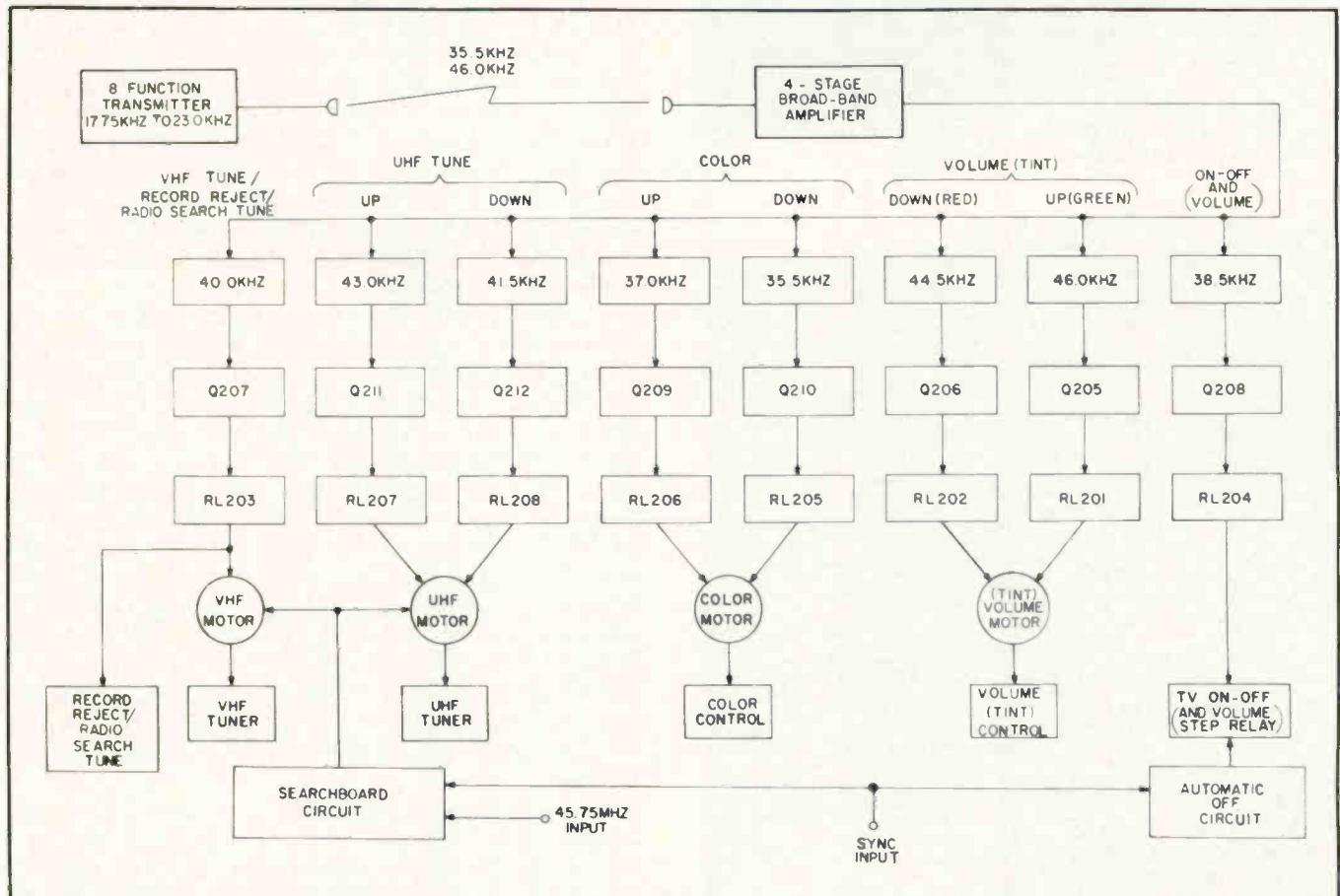


Fig. 4—Search board search circuit schematic.



Block diagram of the remote control system.

by the removal of B+ from the UHF tuner.

When a tuning function is selected, the ac voltages that appear across the tuning motor also appear across the power supply diodes: (See Fig. 4) D4 for VHF, and D1 and D3 in series with D2 for UHF. These diodes rectify the ac and cause current to flow from ac common through K2 and its series resistor, and R5 or R6. Because of the voltage drops, C8 is charged to approximately 27v as referenced to ac common. Diode D2 is an isolation diode for VHF operation to block the developed 27v at the junction of R5 and D2 from appearing at the base circuit of Q10.

The contacts on K2 perform functions in both the energized and de-energized positions. In the de-energized position, the contacts place a ground on the base of Q9, the latch gate transistor in the UHF latching circuit (refer to Fig. 3) to disable the circuit. During a search tune cycle, K2 is energized and the contacts change state. In the energized state the ground is removed from the UHF latch gate transistor and is transferred to both the audio and the AGC circuits.

A ground is supplied to the junction of R714 and SR108 in the receiver to provide audio muting by lowering the dc voltage to the audio IF amplifier screen. Ground is also supplied to the search sensitivity potentiometer, R139, and provides a means of adjusting the AGC voltage applied to the receiver IF circuits during search time. This allows the AGC voltage to be adjusted to prevent the tuner stopping on signals too weak to present a good picture.

The 27v also appears at the collector of Q1. The circuit is now ready to allow the tuners to search for a station and stop when a station is received.

The 27vdc is developed only while the receiver is searching for a station. During VHF search, diode D2 blocks bias voltage from the base of Q10, the turn-on delay transistor to make it inactive. Otherwise, the search circuitry functions the same for both UHF and VHF search.

The presence of a station is indicated by the arrival of the 45.75MHz IF picture carrier and composite sync pulses. These two signals cause the search relay, K1, to energize momentarily and open the ac voltage to the tuning motor which stops the search cycle. The dc voltage is then removed from the transistors until the VHF or UHF search tuning function is started again.

The 45.75MHz picture IF signal is picked up from the discriminator coil on the tuner AFT Board. A one-turn link is soldered to the lid of the discriminator shield which is positioned around the coil. The picture carrier is then coupled to a tank circuit, L1 on the search board. Diode, D6 rectifies the signal which develops a positive potential on C2. This potential forward biases Q1 and sets it up for conduction as soon as a current path in its emitter circuit is established.

Both Q1 and Q3 are in series with the search relay coil and both transistors must be turned on

before the relay will be energized. Q1 is turned on by the picture IF signal and Q3 is turned on by the composite sync signal. The sync signal is obtained from the output of the sync separator stage and contains the 15,750 cycle horizontal blanking and sync pulses. To prevent interaction between the circuit on the search board and the sync circuits in the receiver chassis, the input circuit, L2, is turned to the second harmonic of the horizontal pulses. Because of the ringing action in the tank circuit, the signal applied to the base of Q3 is a clean sine wave and Q1 can now conduct through Q3. Q3 becomes forward biased on the positive half-cycles. Capacitor C6 will provide a conduction path for Q1 during the time when the negative half cycles are present on the base of Q3 it is cut-off. C6 will discharge through Q3 during the time it conducts.

The sync pulses and picture IF signal are both present when the receiver is tuned to a station. Both Q1 and Q3 conduct and the search relay becomes energized. The relay contacts open and stop the tuning motor. When the VHF motor stops, the VHF hold switch will open to remove the path for ac. AC is also removed from the dc power supply diodes which removes the 27v supply from K1 and K2 causing them to de-energize. When K2 de-energizes, its contacts change state and ground out the UHF latch circuit thereby removing the holding circuit for the UHF motor. These contacts also remove the ground from the audio circuit and the remote sensitivity control.

During UHF search, dc is developed by diodes D1 and D3 in series with D2. The anode of D2 will be approximately 27v positive with respect to ac common. This voltage is applied to the base of the turn-on delay transistor, Q10 which controls Q1.

The turn-on delay circuit for Q1, the 45.75MHz amplifier, is incorporated on the search board to allow the UHF oscillator time to pull free of the AFT board's lock-in range. Without the delay circuit, pressing and releasing the UHF search button would cause the AFT board to correct the UHF oscillator frequency and the search board would lock back in on the same channel. Operation of this circuit is as follows:

At the instant a UHF search cycle is initiated, the positive 27v at D2 is applied to the base circuit of Q10 slowly charging C15 toward the positive supply through resistor R23 and the base-emitter junction of Q10. The forward bias on Q10 causes it to appear as a short circuit to any positive voltage that would attempt to appear on the base of Q1, thus keeping Q1 cut-off and K1 de-energized. After a time delay sufficient for the tuner to be driven out of the AFT pull-in range, capacitor C15 will become charged and base current through Q10 will drop to zero. Q10 will cut-off and remove the short at Q1 base. Q1 is restored to normal operation and the search relay will energize when a station signal is received.

continued on page 84

Soldering Is an Art

by Donald W. Moffat

Many of us take the simple task of soldering for granted when it is actually an often overlooked important phase of circuit repair and the cause of many a 'cold-solder' joint

■ One of the first rules we learned in soldering was that "every joint should be mechanically as well as electrically secure." Along with a few other guidelines, some habits were formed and carried through the years. The importance of proper soldering techniques is even greater today with the widespread use of printed circuits.

NEVER USE ACID FLUX

Simply exposing metal to air will cause oxides to form on the surface and the heat of a soldering iron hastens the process. Since metal surfaces to be soldered must be clean, flux is used. It takes a strong flux to remove surface oxides and many are available, but we also have to be sure the joint is protected from further action once the soldering is completed. The answer is to use a flux whose strength depends on heat—one which is strong at soldering temperatures and completely inactive at room temperatures.

At ordinary room temperatures, neither acid nor rosin fluxes are active fluxing agents. Both types remove oxides when heated to soldering temperatures. So far, both seem satisfactory, but what happens after the connection is finished and a residue is left?

Some fluxes leave a residue of chlorides which are hygroscopic; they absorb moisture from the air. These are the acid fluxes. When they absorb moisture, they become corrosive and sometimes conductive, leaving the equipment vulnerable to progressive damage which

can continue for years. On the other hand, when rosin flux cools, it remains inactive.

This explanation shows that the rule restricting the use of acid solder is as valid today as it was when we first learned it. Let's examine another one about flux.

REMOVING FLUX RESIDUE

We were told that removing flux residue is the final step in a good connection but the reasoning behind the rule was never explained.

We said that rosin flux is completely inactive at normal temperatures. Why, then, should anyone even suggest removing it? Two reasons: not too many years ago much less was known about flux and it was considered safer to remove residue than to take a chance on unknown after-effects. Today there is no question about it—a high quality rosin flux becomes inactive after it cools and there is no possibility of continued action.

The second reason for removing residue, is that military and other specifications demand residue removal to allow for visual inspection. If residue remains, it can hide a piece of foreign matter, rosin joint or similar defect. However, do not consider that brushing away the residue is an alternate for the use of high quality flux; electronic wiring must be chemically clean to ensure a good connection.

If your soldering is controlled by specifications, you must of course, abide by the rules. But if you work in a lab or service

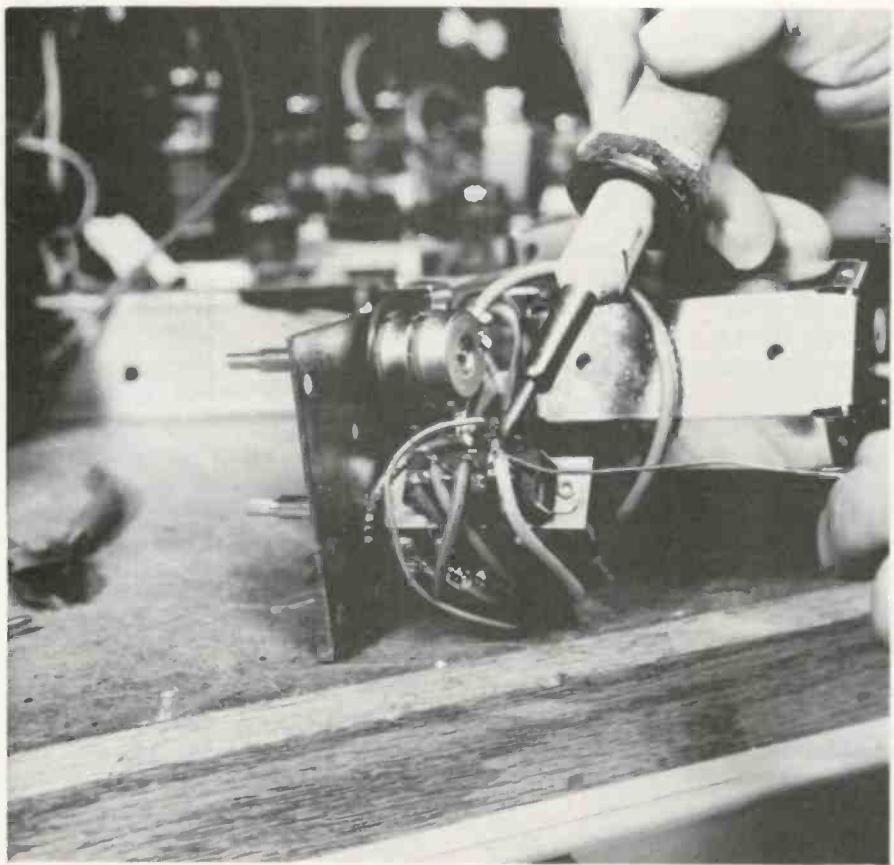
shop where you are free to do what the occasion demands, you can now formulate your own rule on this subject. During soldering, when both solder and flux are molten, flux floats to the top where some boils away and some spreads out to both conducting and insulating surfaces. When the joint cools, any flux which collects in a visible quantity is usually found at the point where solder fuses into other metal. Now, unless specifications require removal of residue, you can decide for yourself whether this step would contribute anything. If you can see every part of the soldering (100% visual inspection should always be a self-imposed requirement, even on the crudest breadboard) leave the residue, but if it hinders visual inspection, remove it. Fortunately, rosin flux cools extremely brittle and, for your own inspection, just a nudge from a soldering aid is all that is needed to remove the entire piece.

DON'T APPLY SOLDER BY PICKING IT UP WITH THE IRON

Sometimes you have to hold the work with one hand, hold the iron with the other hand, and if you had one more hand it would be easy to apply the solder. In desperation, we sometimes melt some solder on the tip of the iron and transfer it to the work that way. By doing this we violate a long-standing rule, and here's why.

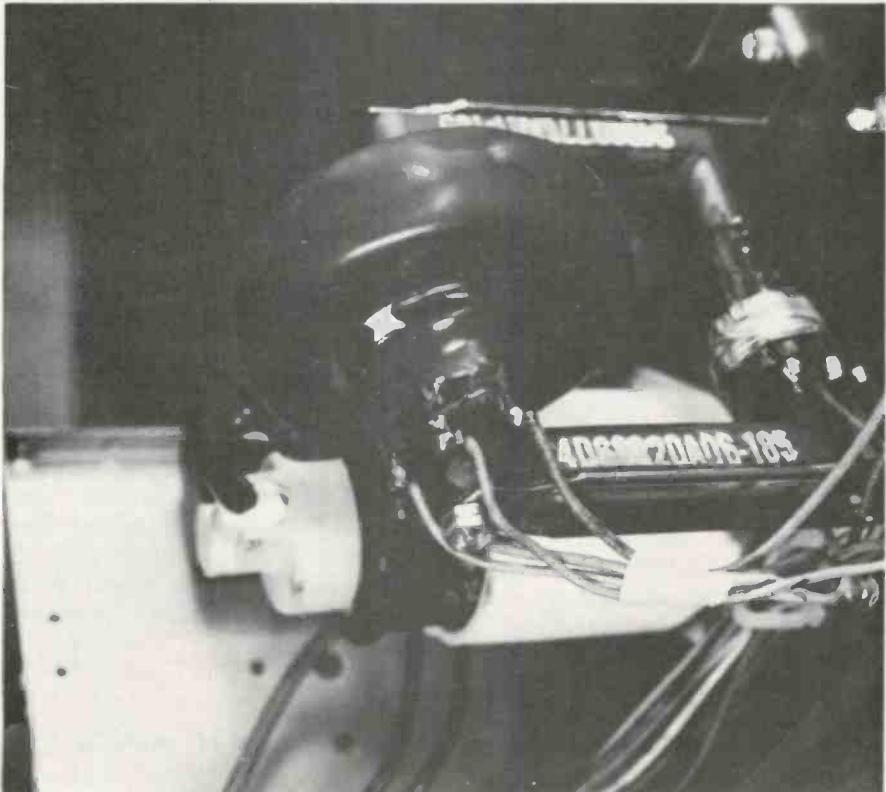
Tin-lead solders used in electronics require nearly 400° to melt and it is recommended that soldering be done about 100° above the melting temperature. Flux boils at this temperature. A soldering iron which will bring the work to 500° usually has an open-air rating of at least 700° . Flux boils away rapidly at this temperature.

Cored solder has been prepared so that the cross-sectional ratio of solder to flux is correct for normal methods of application. Therefore, when solder is trans-



Soldering iron is applied to one side of connection, solder to the other. A small amount of solder on the iron is used to effect a more efficient and faster heat transfer.

Solder connections on a TV flyback transformer show rounded solder buildup. Pointed and sharp points edges are eliminated to prevent corona arcing.



ferred on the iron, not only does most of the flux boil away, but any which might remain has been heated to beyond its optimum temperature. High resistance joints often result when fluxing action is missing or incomplete.

DON'T APPLY SOLDER AND IRON TOGETHER

We were also taught to hold the iron to the work until the entire joint reached soldering temperature and then apply solder to a point opposite to that of the iron. There is a very good reason for bringing the work up to temperature before applying solder—solder forms a connection by literally dissolving copper (silver, gold or whatever the conductors are made of) and forming a new tin, lead, copper alloy. Just as sugar will dissolve better in hot tea than in iced tea, copper dissolves better in solder which is thoroughly heated. Hence the "cold solder joint" occurs where solder has not properly alloyed with other parts of the connection.

Even though the reasoning behind this rule is sound, many technicians drift away from it because they find it takes too long for heat to reach the opposite side of the material. Long before solder starts to melt, heat spreads along wires destroying fragile components, melting insulation, and worst of all, forming oxides at the very place where solder is supposed to alloy. The reason it takes so long for sufficient heat to reach the opposite side is because a dry iron makes poor thermal contact with the relatively rough surface of the connection. Therefore it seems there are evils to either following the rule or abandoning it.

The answer is to first violate the rule, then follow it. If you first apply the iron to the work and almost immediately apply a *small* amount of solder at the same point, it will form a highly efficient heat path into the work. Then take the solder to the oppo-

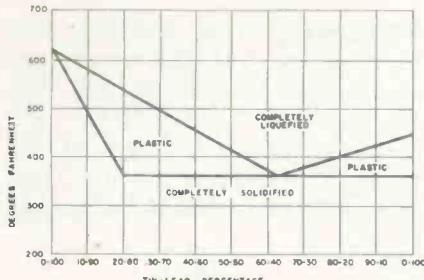


Fig. 1—Chart shows various tin-lead solder combinations and their respective regions at specific temperatures.

site side of the work and in no time at all it will melt into the joint. Although the whole procedure has been speeded up, you are not soldering at a lower temperature. The efficient heat path has simply allowed the proper temperature to be reached much sooner.

An added benefit is that the tiny amount of flux which was melted along with the first application of solder will vaporize and pervade the connection while heat is traveling through it. It then cleans away oxides preparing the way for proper alloying when solder flows in, whereas if no solder is applied until temperature is reached, the buildup of heat does just the opposite—it forms oxides.

Using this more efficient method of heat transfer will allow you to do away with the heavy iron that used to be needed for transferring heat across poor thermal contacts. In addition, research by soldering iron manufacturers has shown them how to make better use of each watt. It used to require between 60 and 75w for ordinary chassis soldering. The general rule today is that 20 to 30w will supply all the heat needed for most electronic work.

USE HIGH QUALITY SOLDER

While we are on the subject of soldering temperature we should consider solder quality. Fig. 1 shows that a solder composed of 63% tin and 37% lead is the eutectic combination. That means it passes directly from solid to liquid and has a low melting point. At a ratio of 60-40, the 11° plastic region is not annoy-

ing, but beyond that point the plastic region becomes troublesome. When there is a plastic region, the solder upon cooling must first pass from liquid to a plastic phase and then from plastic to solid. Poor solder joints often result because it is easy to mistake plastic solder for solid and the technician may allow the wires to move.

Impurities in solder can extend the plastic region making it even more difficult to hold parts still while the solder hardens.

Another objection to the use of a solder alloy which is far from the eutectic is the method in which noneutectics cool. The plastic region exists because solder automatically forms into the eutectic ratio for solidifying at one temperature and the excess (either lead or tin as the case may be) will solidify at a different temperature. This selective solidifying does not allow uniformly good joints.

A good rule to follow is to use only quality 60-40 solder with a rosin core.

SECURE SOLDER JOINTS

Solder has a very low tensile strength and should be used only to bond joints—not to form connections. However, the day of thoroughly wrapping every wire connection has passed. Now many specifications recommend 1/2 to 3/4 of a turn and expressly prohibit more than one full turn of a wire.

No matter how conservative the design, there is the possibility that a part will have to be changed someday. It is during this repair procedure that many a good component has been ruined. Heat has to be applied a long time in order to undo wires which have been thoroughly wrapped. Damage caused by this process frequently does not result in failure until some time after the equipment has been put back into operation.

Many turns of wires on a lug can act as a heat sink and require up to three times as much heat (as well as additional solder) as the same number of wires

wrapped with less than a full turn. After the iron is removed, the heavy connection is loaded with molten solder which has now stored a considerable amount of heat energy. Since "energy can be neither created nor destroyed," this heat must be dissipated. Some of it radiates into the air, but it finds an easier path along wires and into fragile components.

Therefore, quality control groups now agree that wrapping of wires at a connection reduces reliability in two ways:

1. More heat must be applied to the joint at the time of initial soldering producing a situation where heat can continue to damage components even after the iron has been removed.
2. When a repair is necessary, more heat must be applied to melt the solder and the repair takes longer.

SOLDER SHOULD FLOW FREELY

Put a drop of ink on a sheet of waxed paper and you can push the drop all over. It never becomes attached to the paper. Even if the drop of ink is allowed to stand in one place until it evaporates and a dark spot is formed, the spot is easily wiped off. Oxidation and foreign matter on metal surfaces have much the same effect on solder as wax does on ink. If the solder forms in beads, as the ink does on the waxed paper, it is not alloying properly with other metals at the connection. When solder is applied to clean, solderable metals, it should spread out much as a drop of ink spreads out on a piece of blotting paper.

Freely flowing solder indicates that fluxing action is taking place and sufficient heat is being applied. If either one of these items is missing, it is impossible to have metal from the connection alloy properly with the solder.

REVIEW

This review of some of our *continued on page 82*

A prospective CCTV service-dealer should learn all he can about the equipment and problems related to his field before he ventures into it. It boasts a rewarding and relatively untouched market. It is the purpose of this article to provide a better understanding of the applications, limitations and service problems associated with CCTV

Selling CCTV

■ Part one of this series (August 69) outlined many of the typical systems applications. It also gave the reader an idea of how schools, for example, go about buying CCTV equipment. There are hundreds of CCTV applications other than in education. Most systems include more than just a camera and a monitor. CCTV systems are used in TV broadcast studios, sporting arenas, concert halls, museums and many of these also include the use of a video tape recorder (VTR).

STUDIO SYSTEMS

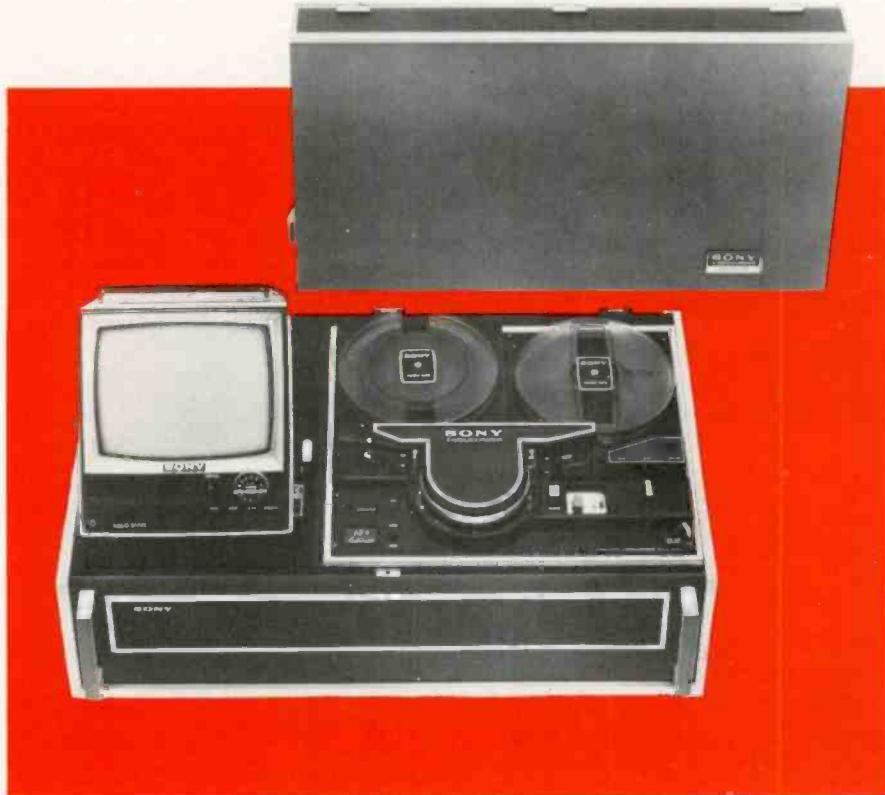
At this point, we'll deal very briefly with studio systems, as there are many excellent books on the market which cover television studios in great depth.

Basically, a television studio is composed of a video system, an audio system, lighting facilities, pulse forming and distribution systems, and not much more.

In CCTV studios, you'll find simple systems using "industrial" equipment and the more complicated, "commercial" systems.

The video systems are composed of the cameras, video-distribution amplifiers, video-switchers and video-monitors. The camera feeds distribution amplifiers (DA) which, in turn, feed the many loads, such as monitors, switchers and video-tape recorders. Transmitters, if used, would also be fed from the video DA's. Distribution amplifiers are used





Sony Model TCV-2110 Videocorder with receiver/monitor features automatic recording levels for audio and video.

to provide for proper isolation and termination of the sources and loads.

The video-switchers are generally of the type which allow for superimposing of sources, direct switching and the use of special effects.

Audio systems in CCTV studios amount to a sound mixer-amplifier, audio distribution amplifiers, monitor amplifiers and speakers; also, audio-tape recorders, mikes and turntables.

Pulse-forming systems are those which make up the synchronizing signals. A sync generator is the heart of a studio video system. Without sync pulses, clean switching is not possible, nor is special-effects work. (An example of a "special-effect" in television would be the "removal" of the upper-left-hand corner of the picture and "inserting" some other picture.) A sync generator puts out the standard EIA sync-pulse used by open-circuit TV stations. The sync signal used in industrial cameras is either "random-scan" or a "two-to-one" interlace. (For additional data on these terms, consult television engineering books.)

Pulse-distribution systems are those which feed the various sync pulses to units needing them. There are four sync pulses: blanking, horizontal drive, vertical drive and sync. This means that four separate pulse DA's are needed to handle them. Pulse systems use the same 75Ω impedance common to video systems.

Lighting systems in CCTV are those needed to provide proper scene illumination for a production. The lights are of the type commonly seen in most TV stations. The light units are large and require special ac power consideration. Individual lights are controlled from a master console which contains switches for each and every light in the studio as well as dimmer units which allow lights to be raised and lowered in intensity.

Cameras of the industrial variety will operate quite nicely without any more light than is normally found in most schools and businesses. Studio lighting is used with cameras which are not this sensitive or where special lighting will add to the value of a program.

One thing that should be men-

tioned, is that the depth-of-field of a camera decreases as the F-stop is opened or as the F-ring is moved nearer the lowest number. This means that with the lens opened all the way, something more than a foot away from the subject would be out of focus. This explanation is really quite oversimplified, but it should make this matter of "depth" a little more clear. This brings up another reason for using extra lighting. To get the best average depth-of-field, an F-stop near f-11 should be used. This, then, means that a light intensity of approximately 225 foot-candles will be needed for most vidicon cameras. That's a lot of light!

Cameras, such as the image-orthicon camera, can get by with less light, but these cameras are in the \$20,000 category, so we'll ignore them. Another camera uses the plumbicon tube. This may well become as common in CCTV as the vidicon. Another pickup tube is the sensicon. We mention these only to illustrate that the vidicon isn't the only type used in television cameras.

VIDEO-TAPE RECORDERS

Video-tape recorder (VTR) formats, or configurations, are many and varied. The smallest of those currently available is the 1/2in. (referring to tape width) helical-scan, video-tape recorder. There are 1/4in. units in various stages of research and development, but none have really hit the current consumer market as yet. Next in line, and the most popular, is the 1in. helical-scan unit. These are to be found in all states, and have become very popular. There are a number of manufacturers in this area. Next is the 2in. helical-scan unit, and this is followed by the 2in., transverse-scan recorder. The transverse, or quadruplex units, are found mostly in broadcast television stations, although a number of large CCTV installations use these expensive (\$20,000 to \$120,000) machines. We'll ignore these commercial units in this discussion.

In helical-scan machines, the

video-tape is wrapped around the head-drum, whereas in transverse machines, the tape simply passes by the scanning head or video head. Helical-scan machines have either one or two video heads attached to the head-drum, whereas transverse, or quadruplex machines, have four heads on the headwheel.

Since the 1/2- and the 1-in. helical machines are the most common, we'll deal only with these. They range in price from just under \$1000 to in excess of \$15,000, depending on the number of refinements and accessories desired. The higher priced helical machines are used for recording and reproducing color signals, as well as signals usable for broadcasting on an open-circuit basis. The most common unit is that in the \$1000 range. This unit will do an amazingly good job of recording and reproducing. It does not have as high a level of frequency response, or ability to resolve detail, as the more expensive units, but the response is more than adequate for handling most jobs encountered in non-critical areas of education and industry.

Another drawback common to the smaller, less expensive machines, is the lack of speed in fast-forward and rewind modes. It takes a few minutes to go from one end of a full hour reel to the other end. This is not too serious, though. Brake tensions are not too easily maintained in the cheaper machines either. But once the operators become familiar with these limitations, there are no problems to speak of.

The actual video-tape for these machines comes in two distinct types and two winds. The types are helical orientation and transverse. The particles of oxide are laid on the tape to conform to the direction of head travel. It's possible to use transverse oxide-orientation tape on a helical machine, and vice versa, but you'll note an increase in noise due to improper saturation of the oxide during the record cycle. Always use the proper tape.

Tapes are wound in two ways; one has the oxide-side, or dull



Ampex Model VR7800 solid-state portable video-tape recorder featuring 1in. helical format.

Ampex Model 7100 video trainer system for industrial or commercial applications in plants, schools and hospitals.



side out, and the other has the backing, or shiny side out. Once again, be sure you're using the proper wind. The oxide-side must come in contact with the video heads in order for recording to take place. The same is true when playing a tape. In some cases where a video-tape recorder has been brought in with the complaint that it would not play or record, the problem turned out to be tape which was used and had not been re-wound after the previous use. The operator did not know about the need for having the oxide surface in contact with the heads and didn't think to try another reel of tape. This is a simple sort of problem, but it can come up.

SERVICING VTRs

In helical recording, it's common to have but one video head on the head drum. Should this single head become dirty or clogged, record and playback are not possible. Cleaning is achieved through the use of a Q-tip saturated in a solvent made for this purpose. Tape surfaces should be cleaned with solvent at least once a week, or more often when the machine is subjected to heavy use. The Q-tip is brought in contact with the video head only after the head has come to a complete halt. Pass the Q-tip past the head in an up-and-down motion. Excessive pressure on the head can cause

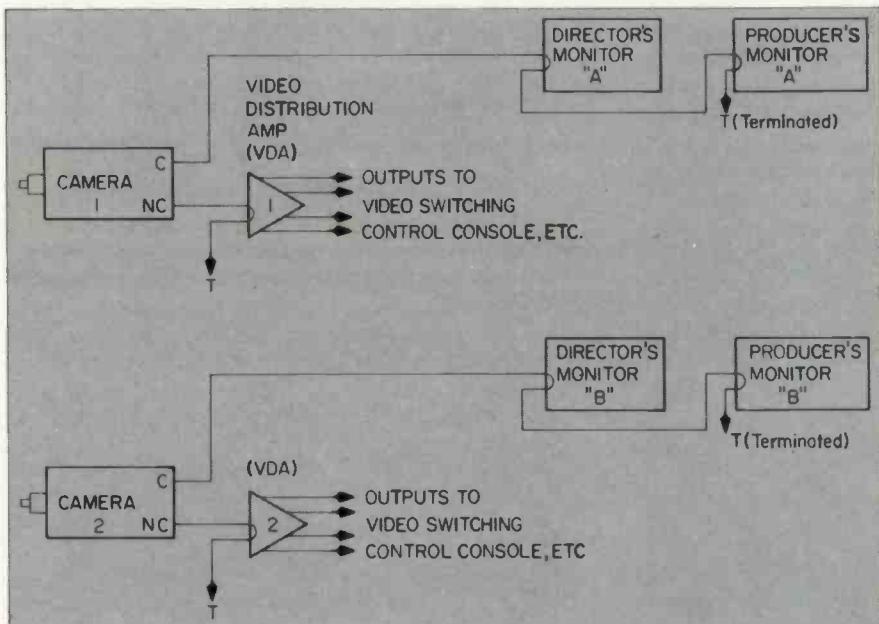
it to come loose. Never scrub the heads briskly, or allow metal to come into contact with them. Never use an abrasive on any of the surfaces that see contact with the video-tape. Video-recorders are precision units and must be treated accordingly.

A clogged or dirty video head will either produce no picture, or a very grainy picture. Always clean the heads before attempting more serious repair work. Also, make sure the tape-path is clean. Remember, oxide and dirt will build up on surfaces that come in contact with the videotape. Allow the solvent to evaporate before threading tape on the machine. Some solvents actually dissolve the oxide and a tape could be damaged if a residue is left when the tape is put on the machine. It takes but a few seconds for solvents to evaporate completely.

It is too time-consuming to interrupt playback to clean a clogged tape head, but during record, it's impossible to tell if a head has become clogged. You have to wait until playback to determine the quality of the recording.

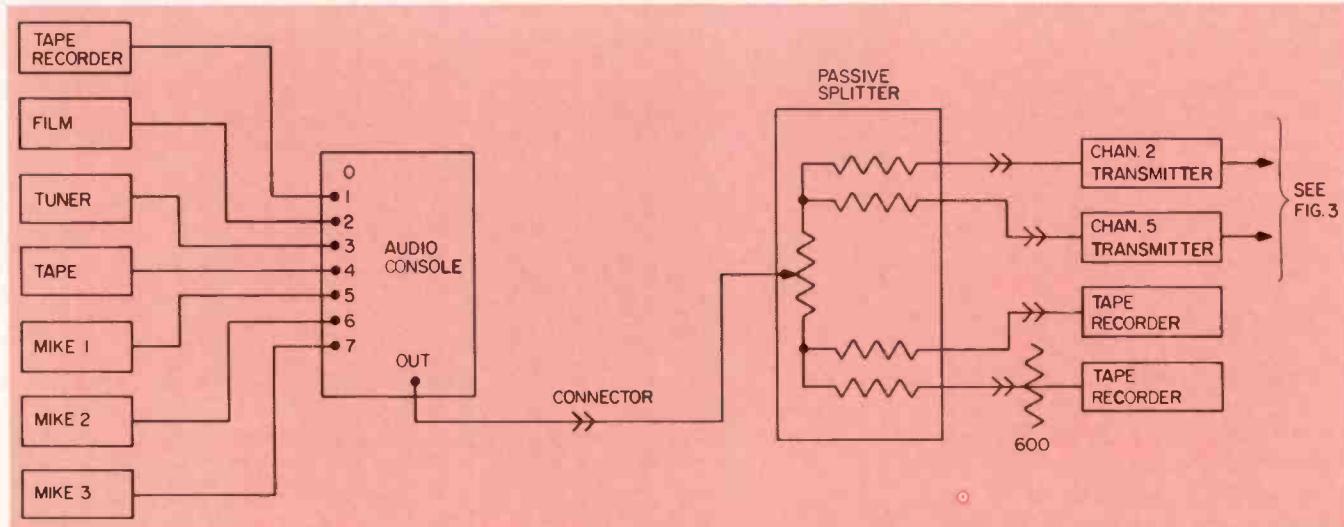
Don't use alcohol or carbon tetrachloride for cleaning videotape units.

Demagnetizing the metal surfaces of the video-tape transport section is also vital. This should be done on a weekly basis. Bring the de-gausser or demagnetizer within 1/16in. of the metal sur-



A simplified video flow chart used in an education CCTV system.

A simplified diagram of audio distribution used in an education CCTV system.



face (such as a guide-post), turn the de-gausser on (making sure the recorder is off), and slowly withdraw it until you are about 1ft away. Then turn the de-gausser off and proceed to the next post, head or guide. All surfaces that come in contact with the tape should be de-gaussed regularly.

Carbon brushes are commonly used for getting the electrical information to the rotating video-heads during record. In the play mode, these same brushes take the information from the heads and feed it to the preamps. These brushes are carbon and are subject to damage during transportation, as well as subject to becoming inoperative due to a buildup of dirt between the brush and the commutator. Since the head drum rotates rather rapidly, some self-cleaning takes place, but it also results in brush wear. It's generally necessary to remove the electronics assembly surrounding the commutator post in order to gain access to the brush holder. This procedure must be done with great care to avoid damaging the head drum or the assembly itself. Follow the manufacturer's instructions.

Spare brushes should be a standard item in your parts inventory. A chipped brush is not something you should attempt to repair; replacement is the only satisfactory service procedure.

While checking and cleaning the brushes, it's a good idea to

check the protrusion of the heads or head at the same time, since access to both the head and the brushes is gained through the same procedural route. Video head protrusion is measured with a micrometer which can be obtained from the recorder manufacturer. These cost anywhere from \$50 to \$150. There are some plastic protrusion gauges available which cost in the vicinity of 50 cents, but they are not the best devices for the precision adjustment. Video heads protrude from the edge of the head drum in the order of .003 to .005in. Once again, if in doubt, check the spec sheet on your machine. Contouring of the head after pole-tip adjustment is necessary. This is done by using a special contouring tape which is more abrasive than regular video-tape. Check pole-tip readings after contouring to be sure the protrusion is still within specifications.

MAINTENANCE HINTS

Video heads for the small helical-scan recorders cost in the neighborhood of \$75 each. You should maintain a stock which includes at least one of each type for the machines you service. Don't replace a head unless you're positive this is the cause of the trouble. Many symptoms which might look like head trouble are actually caused by dirt.

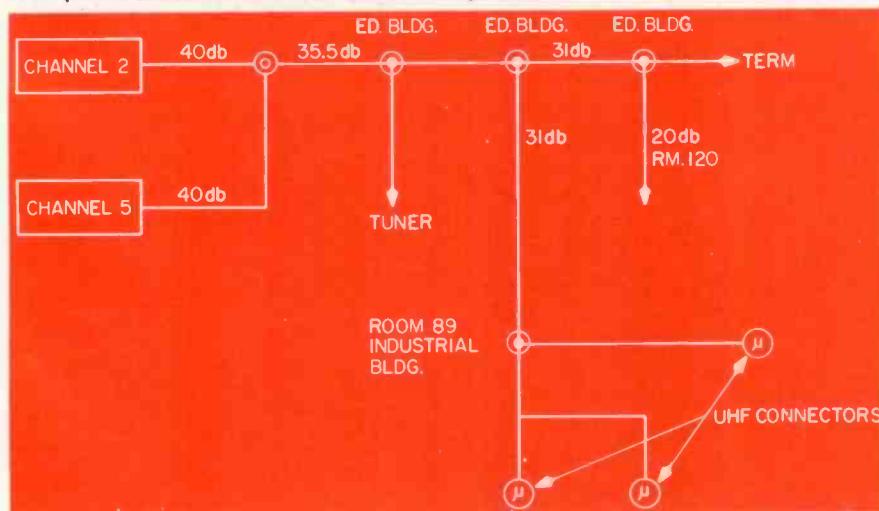
Generally speaking, the users of low-cost video-tape units know little about the theory of video-

tape operation, and as a result, are not able to be specific when describing machine failures. This means you will have to run a complete check each time a unit comes up for service. A standard test-tape for each type of machine in your service territory is a wise investment. This tape is the first thing used when a defective machine comes in. If the Standard Tape (available through the manufacturer) plays back properly, you're that much closer to the isolation of the problem. The next step is to make a recording of both picture and sound. It's a good idea to have a CCTV camera in your service shop to allow recording of pictures. Any high impedance microphone will serve as the source of sound. (Most of the inexpensive recorders use high impedance inputs as well as outputs for sound.)

If, after these tests, you find the machine plays and records properly, you can then assume the customer is doing something wrong. (At least 30 percent of the calls will be nothing more than a case of operator failure.) Improper threading of the recorder accounts for a large number of "failures." Most of the machines have a record interlock that is included on the recorder to prevent accidental erasure of material. Customers often forget to release the interlock when they want to record and will call saying that their machine is defective. Be prepared to spend time with the customer explaining operation. Patience will be one of your best tools.

A common complaint is in the area of the buttons that actuate the machine. These buttons actuate microswitches that, in turn, operate relays and solenoids. Occasionally, the microswitches come loose in their mountings. The cure is a simple mechanical job. Sometimes the switch cannot be tightened without first removing some of the trim on the machine. Pay attention to the location of parts as you disassemble the unit and you'll save much time and energy when it comes to reassembly.

A simplified education CCTV RF distribution system.



Most of today's portable recorders are carried about. Since many of the connections are of the press-on type, vibration may shake them loose. Common-sense analysis of the situation will quickly lead you to the problem area. This brings up the problem of background in the video-tape area. There are a number of good schools in operation around the country which offer one- and two-week short courses in operation and maintenance of CCTV gear. Check with the manufacturers of course availabilities and costs (\$200 for a one-week servicing course is not unusual).

It is important to learn all you can about this medium. Time and customers will be lost by the shop that tries to "bluff" its way into business. While a one-week course won't make you an expert, it'll go a long way toward getting you started in the business.

Earlier in this article we mentioned video distribution systems. There are other ways of getting the signal from the source to the load. RF (radio-frequency) distribution of one of them. This means modulating a carrier with video and another carrier with audio information, combining the two, and sending them out, via cable—in this case, to the receivers. We will not go into great detail since there are many excellent books on MATV (Master Antenna Television), CATV (Community Antenna Television) and CCTV distribution via RF modulators and amplifiers. Check with your local electronics wholesaler regarding pertinent books.

A relatively new creature in the distribution area is the 2500MHz system. This is a method used when it becomes necessary to send signals to a number of buildings in your area, but which are not connected by tunnels or conduits. The 2500MHz systems boil down to RF transmitters and receivers which use carrier frequencies in the 2500MHz region. This system does require FCC (Federal Communications Commission) approval before installation. The rules and regulations are available through

the government printing office in Washington, D.C. One other thing: once you've sent the signal from one building to another via 2500MHz transmitters and receivers, you still have to distribute the signal within the building by means of video-audio or RF.

It would be advisable to thoroughly familiarize yourself with these matters. They're all relatively new, and they'll be with us for some time. Now's as good a time as any to get up to date.

Servicing video-tape recorders and cameras is as simple or difficult as you wish to make it. Proper training and a well-equipped shop will make money for the enterprising man.

Two tools that are a must in a shop which intends doing work with CCTV gear are a dual-trace scope and a reliable transistor analyzer. A thorough understanding of solid-state devices is mandatory. Tube-technology won't suffice.

REPLACEMENT PARTS

Finally comes the matter of parts stock. Keep a representative supply of transistors and diodes as well as one spare video-head for each different recorder type. Audio and control-track heads seldom fail so there's no need to stock these. (Regional parts stocks can generally supply emergency orders within 48 hours, so you have little need to stock motors, housings, etc., either.) Universal transistor types are available which will cover many varying types of transistors making it unnecessary to carry a large supply of transistors. Carry those which are quite specialized; they may sit on the shelf awhile, but they aren't that expensive.

In summary, make certain that you are *not* short on savvy. Spend all the time you need to get ready for the break into the CCTV field. It's better to get in late than to fall on your face because you were in a rush. It's hard to get back customers that have had a bad first experience with you. ■

Stereo Servicing With A Scope

A wealth of audio frequency performance characteristics can be obtained from each waveform when employing the square-wave generator and scope combination, a technique more accurate than the ear.

■ A split-beam or dual-trace triggered oscilloscope can be used to good advantage for isolating troubles in stereo amplifiers and FM multiplex circuitry. Some technicians think of a complex, expensive instrument when you mention a triggered scope. A triggered scope is actually easier to use than most service scopes and a versatile instrument for stereo circuit troubleshooting.

In the future, and even now, much of your solid-state electronic troubleshooting will require an oscilloscope of this caliber. Most triggered scopes are now in a price range that most service shops can afford. The oscilloscope is an instrument with many applications for use in industrial electronics, color

TV-stereo troubleshooting and the electronics educational training fields.

OSCILLOSCOPE SETUP

After the scope has been warmed up for 15 minutes, adjust the control knobs on the front panel of the scope until a steady, sharp trace is observed. Then apply probe tips to the proper test points of the chassis under test and make sure all equipment is properly grounded. The low-capacitance probe (LC) should be used. In some cases, if your scope does not have enough amplification, the direct probe may be used. Now you're ready to observe the waveforms and after some actual experience, properly interpret the waveforms. You will be able to determine

if the waveform has the proper or improper characteristic pattern shapes and P-P voltage amplitudes. When put to proper use, each waveform viewed on your oscilloscope can provide a wealth of diagnostic information.

DUAL-TRACE OSCILLOSCOPE TESTING

The basic technique for checking stereo amplifiers is that of comparing the good channel with the defective one. This method will enable you to quickly isolate a defective stage or component in a solid-state stereo amplifier or an FM multiplex system, and many of these same tests can be applied to tube type amplifiers.

Before the scope is used, some initial checks should be made on the defective unit for problems such as excessive current drain, overheating of transistors, burnt resistors, cracked or broken circuit board and cold solder joints. Once these preliminary checks are made, connect the unit to the test setup using a split-beam triggered scope and a sine-square wave generator is shown in Fig. 1. A square-wave signal fed into an amplifier will display a number of audio-frequency performance characteristics.

Feed a square-wave signal into the left and right amplifier input channels. The A and B probes of the dual-trace scope are connected on the same but opposite channel test points of the stereo amplifiers left and right circuits. The square-wave patterns are then displayed on the scope to compare the properly working amplifier with the defective one. Both channel wave-shapes can be superimposed to detect even the very slightest distortion or loss of gain.

When observing the square-wave test signal on the scope, do not expect to find a perfect square-wave from even a properly operating stereo amplifier. Design and quality of the amplifier under test will have to be taken into consideration. Check the service date speci-

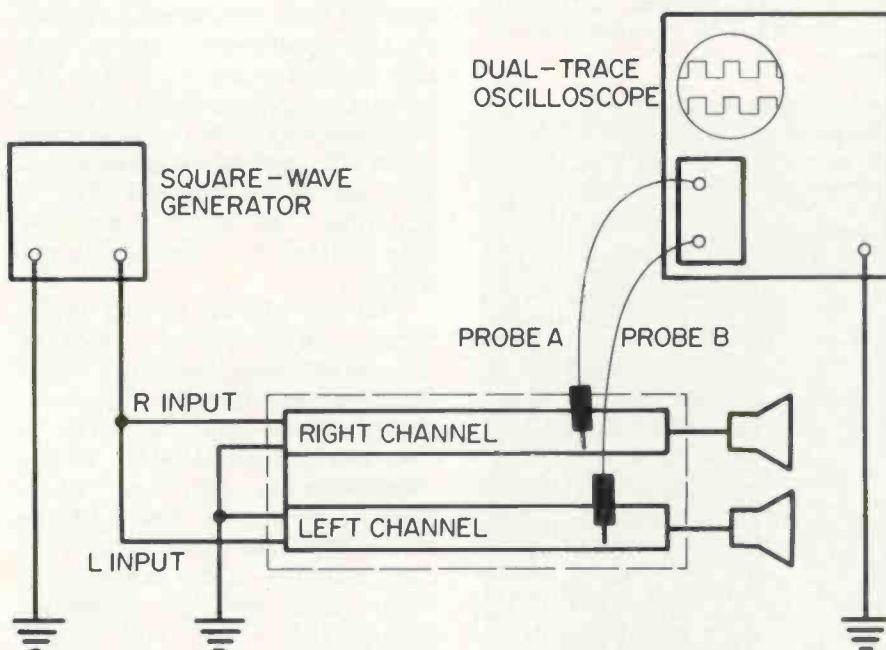


Fig. 1—The test set-up using the dual trace scope and square wave generator with probes connected to the right and left channel of the stereo amplifier.

fications as to its frequency response and design capabilities. In some of the lower priced amplifiers, you may notice an overshoot or a rounded wave-shape which indicates a poor high frequency response. Shown in Fig. 2 is a scope display of a square-wave as fed into the amplifier. Figure 3 shows the same square-wave being observed on the dual-trace scope at the speaker output of a lower priced stereo amplifier.

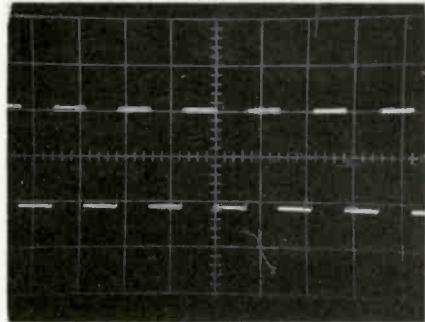


Fig. 2—A normal scope waveform of a square-wave signal fed into the amplifier.

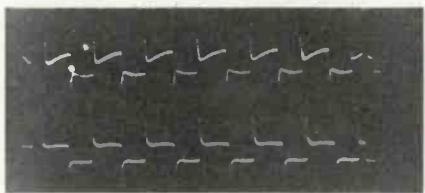


Fig. 3—The square wave pattern at the output stage as displayed on the scope being fed into a stereo amplifier with poor frequency response. Note the waveforms are not square.

After a little experience with several different types of amplifiers, you will know what to expect, and with this comparison method you have a scope pattern for comparison. To illustrate a few of the oscilloscope test procedures, we will run

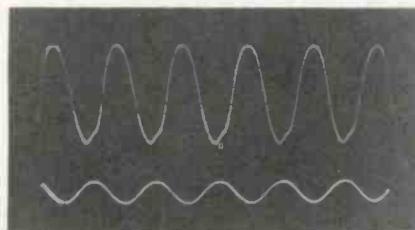


Fig. 5—A proper waveform as displayed on the scope from the right channel output (top trace). The same waveform taken at the left channel with low sine-wave P-P voltage (bottom trace).

a check on a General Electric Model T15 amplifier. Refer to the schematic in Fig. 4 for the left channel components. A 1kHz sine wave signal was fed into the amplifier inputs and a scope probe connected to base of TR1 (right channel). A proper waveform appeared as shown in Fig. 5, top trace. At the base of TR1 (left channel), the sine-wave P-P voltage was very low as shown in Fig. 5, bottom trace. Moving the probe to the other side of capacitor C13 the signal was found to be correct, indicating a defective C13 coupling capacitor.

A similar amplifier had a slightly different malfunction—a noisy right channel. After a few preliminary checks with no results, a dual trace scope was used. A signal was injected into both channel inputs with a square-wave generator and one scope probe connected to the collector of transistor TR1 (see Fig. 4). A fuzzy scope pattern was noted as shown in the top trace of Fig. 6. Note the hash or "grass" on this wave-form while the other scope probe connected to the base of TR1 indicated the clean square-pattern shown in the bottom trace of Fig. 6.

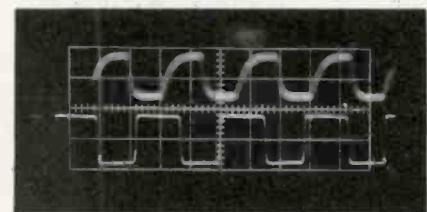


Fig. 6—With scope probe connected to the collector of transistor TR1, a fuzzy pattern was noted (top trace). The scope probe was connected to the same point on the other channel and the waveform was normal (bottom trace).

Transistor TR1 proved to be noisy and was isolated in a very short time.

The oscilloscope wave-form illustrated in Fig. 7 shows the effect of tone control adjustments on the square-wave signal with the generator set at 5kHz. The bottom wave-form of Fig. 7 shows what happens to the square-wave when adjusted for bass response. The top wave-trace of Fig. 7 illustrates the effect when the tone control is in the treble position.

This tip will be helpful in locating intermittent troubles in stereo amplifiers or other electronic equipment. The amplifier volume may increase or decrease intermittently or go completely out. And many times, it may operate for hours before acting up. Another time saving method is to inject a square-wave signal into the suspected channel and connect both A and B probes of the scope into different sections of the amplifier as shown in Fig. 8. When the

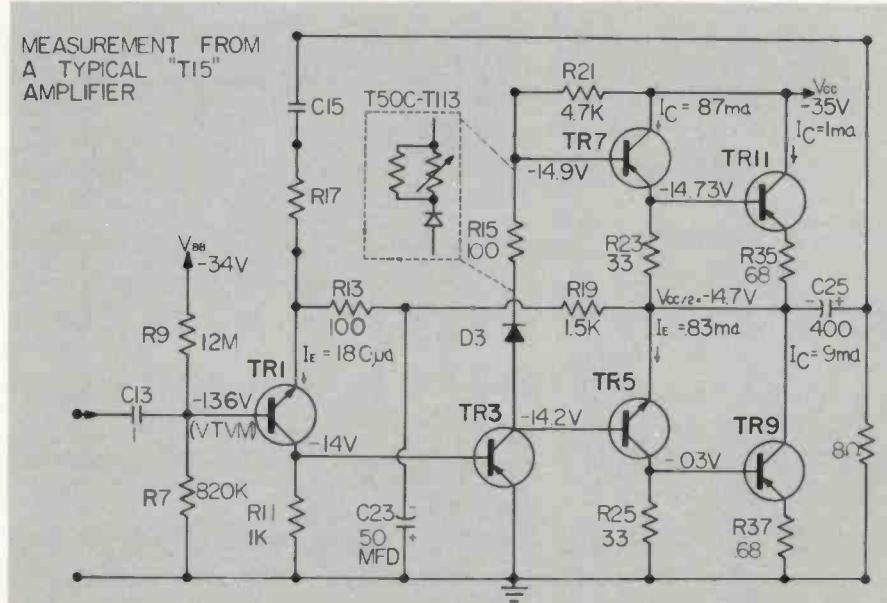


Fig. 4—A schematic of the left channel on a General Electric Model T15 amplifier.

LEADER Model LCG-388 Color Bar Pattern Generator

The LCG-388 color bar generator exhibits good pattern stability even under sub-zero conditions

Fig. 7—The top waveforms illustrate the effect on the waveform display when the tone control is in the treble position for a brilliant response. The bottom waveform shows what happens to the scope display when adjusted for bass.

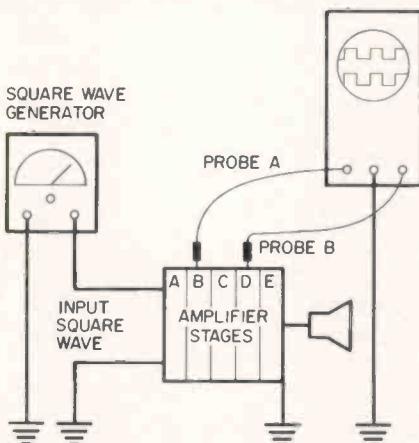


Fig. 8—A test set-up for isolating an intermittent or distorted amplifier stage.

volume fluctuates, glance at the scope and note any wave-trace changes. If no change in the pattern is observed, move the probes to different stages. This system will help you isolate the defective stage very quickly. The technique of employing a dual-trace scope and square-wave generator can simplify those tough dog intermittent stereo amplifier problems. Part two of this feature will cover much more in the practical application of this generator-scope technique using several popular amplifier circuits as examples. Watch for it in the April issue. ■

... for more details circle 900 on Reader Service Card



Leader Model LCG-388 Color Bar Pattern Generator.

■ We have finally found something worthwhile about the frigid winter temperatures of the North Country. They give us a wonderful opportunity to check electronic test equipment for stability under adverse conditions.

For example, we recently left the new LEADER LCG-388 color bar pattern generator out in 20 below zero cold for over three hours, and it came through the test with flying colors. The control knobs were covered with frost and so cold they were hard to handle. But when we connected the 300Ω feed line to the antenna input terminals of the TV receiver and turned on the generator, an extremely stable rainbow pattern appeared. And the stability and clarity remained through all of the other patterns. We allowed almost no warm-up time for the test even though the generator was as cold as

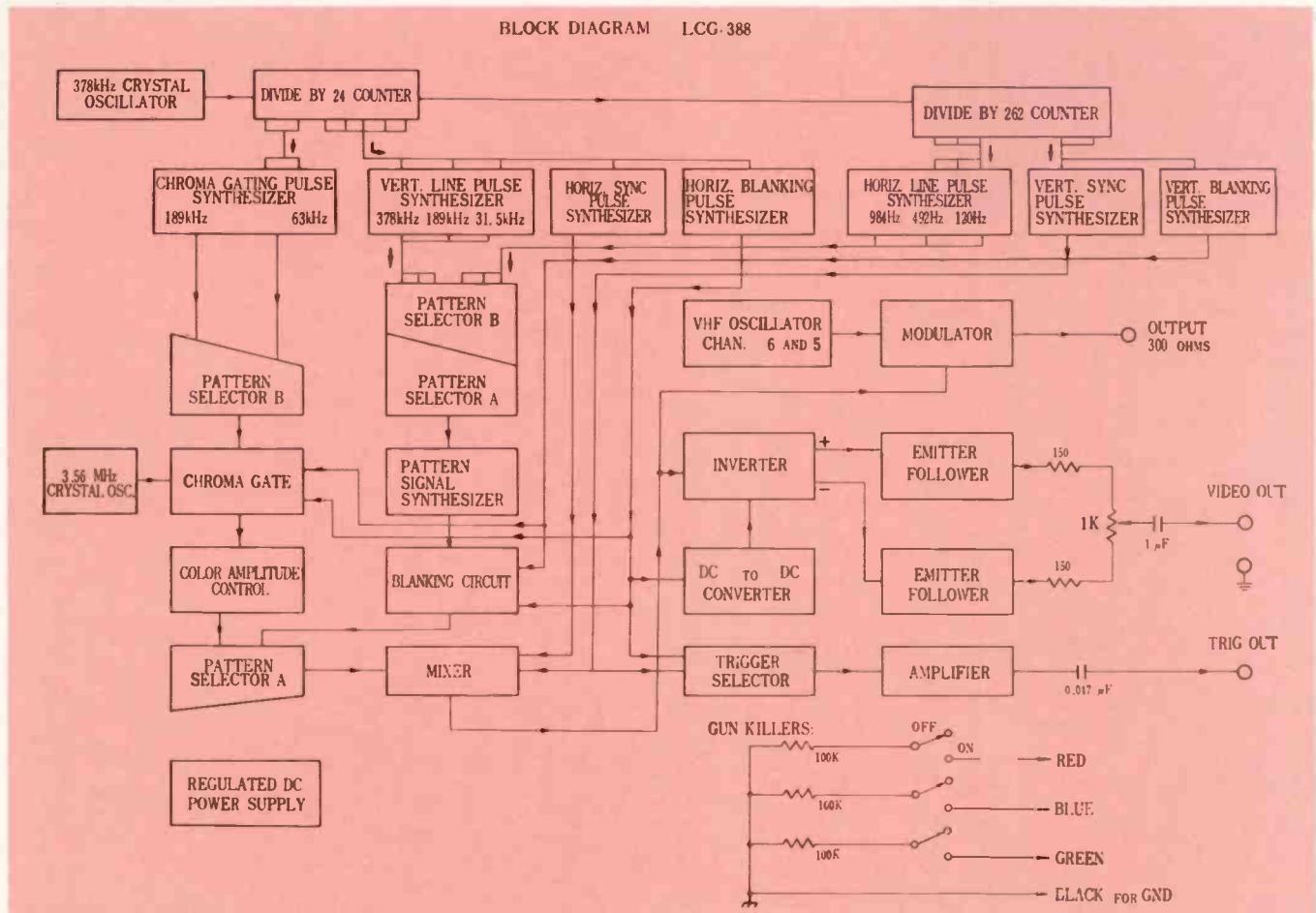


Fig. 1—A block diagram of the new color bar generator.

TEST LAB REPORT . . .

a block of ice. This feature should please technicians who make house calls in the cold, winter-time climates of some states.

The immediate stability of the signals for the patterns is achieved in this new unit by full utilization of flip-flop and logic circuitry. In our tests, we found there was no need for temperature compensation in the frequency dividers nor the tedious preliminary checking and adjusting usually required with some other color bar generators. A regulated power supply is also incorporated to eliminate the effects of changes in line voltage.

The large number of patterns available, 15 in all, is another welcome feature of this new generator. Selection of the desired pattern is a simple matter of aligning the two panel

switches to the display desired. In addition to the keyed, three-bar and gated rainbows, the single patterns centered on the raster such as the dot, cross-bar, vertical and horizontal line are available. The bars, cross-hatches and dots are equally spaced for maximum performance.

A block diagram of the pattern signal generation is shown in Fig. 1. The reference frequency for the pulse signals is produced by a 378kHz crystal oscillator. The output is then fed to a series of countdown circuits, or frequency dividers, where the pulses to be used are formed. The countdown circuits are made up of flip-flops consisting of two transistors, two or three diodes and associated resistors and capacitors. The output pulses are synthesized in AND or NOR logic gates depending on the

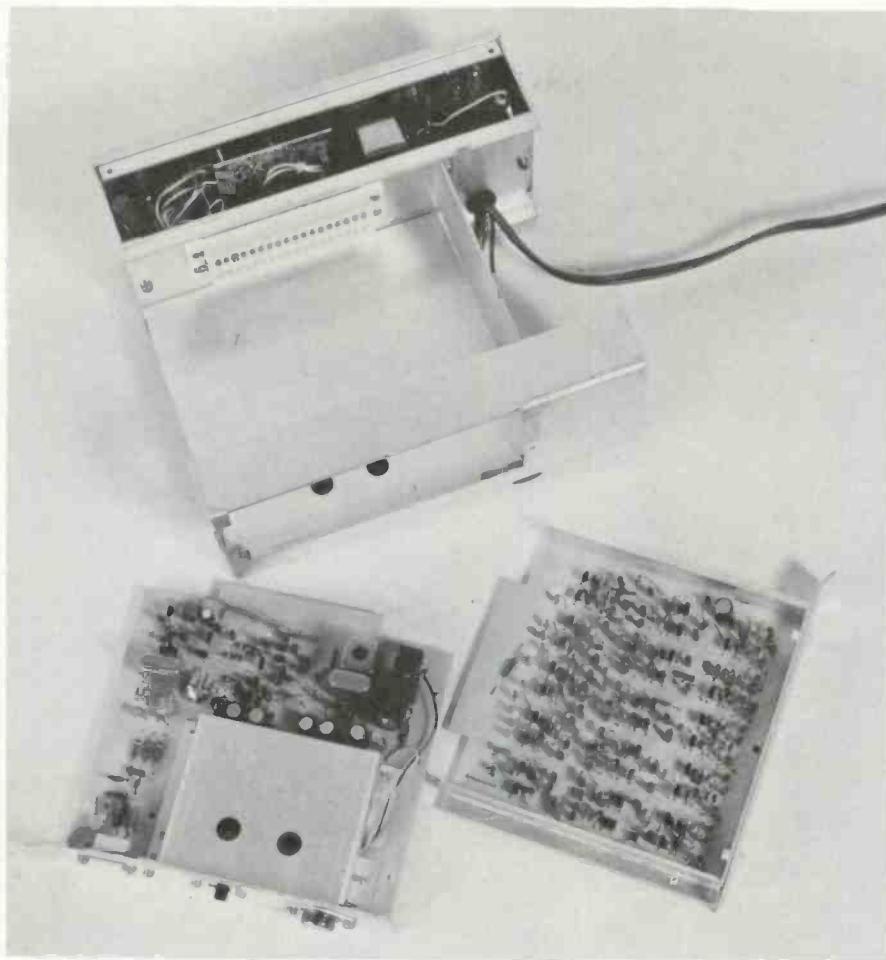


Fig. 2—A top view of the generator with circuit boards removed and placed component side up.

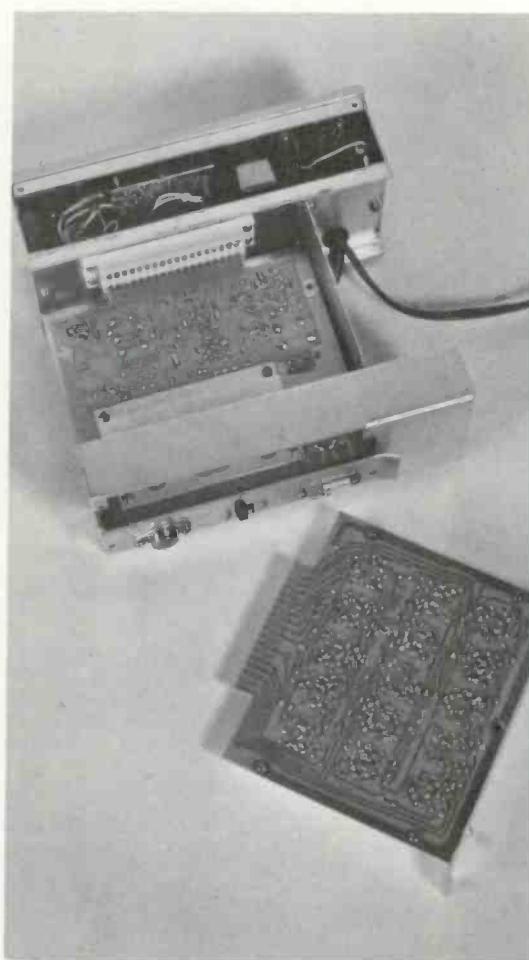


Fig. 3—A top view of the generator with top circuit board removed and showing copper side up.

pattern desired. A total of 15 flip-flops and 14 logic circuits are assembled on a single PC board of the plug-in type which should make any necessary servicing a relatively simple matter.

The conventional offset carrier type oscillator is employed for the color signals with an adjustable amplitude. Modulation is performed directly at the VHF oscillator output by means of a grounded base transistor.

A video signal output with adjustable polarity, - to +, is available for the in-circuit testing of receiver circuits, and a trigger signal output can be used for synchronizing the scope when tracing the pattern signals.

The LCG-388 also features three switches and leads for cutting out the red, blue and

green guns of the CRT. Each lead is equipped with a $100\text{k}\Omega$ fixed resistor in series to permit easy adjustments of the convergence and white balance in the receiver.

Two of the most appealing features of the new LCG-388, outside of pattern stability, is the size. The LCG-388 is about the same size and weight of an average VTVM.

SPECIFICATIONS

OUTPUT SIGNALS: RF output channels are 5 (77.25MHz) and 6(83.25MHz) within $\pm 0.5\%$. RF output is: 10mV approx. on open circuit; impedance is 300 ohms, balanced. Video signal output has polarity of + or -; amplitude is continuously adjustable. Output of video

signal is -3 to +3 volts P-P approx. on open circuit; impedance is approx. 150 to 350 ohms at 100kHz. Trigger signal output on the horizontal has pulse width of 10 microseconds and amplitude of -10 volts. Vertical has pulse width of 190 microseconds and amplitude of -10 volts.

PATTERNS: Color bars produced include: Gated rainbow; R-Y, B-Y and -(R-Y); and rainbow. Level adjustable from 0 to 100% of the sync signal. Dots include: fine, 15 x 21; coarse, 7 x 11, with single crossbar intersecting at center of raster. Vertical lines include: fine, 21; coarse, 11; single, at center. Horizontal lines include: fine, 15; coarse, 7, and single at center.

SIZE & WEIGHT: 4-1/8in. high x 7-3/4in. wide x 7-3/4in. deep; 4.3 lbs. in weight. ■

'Turned On' Sales

■ "If we put a TV on the floor and turn it on, it sells almost immediately," according to Gary Canada. He and his partner, Don Lott, are the owners of Hazelwood Television, a service and sales shop in suburban St. Louis. The three-year-old shop is planning to move late this year to a facility three times as large as their present shop, so their operating ideas must be good ones. They have a relatively small salesroom but with proper use of the space they manage to display 30 consoles and 18 portable TV sets with an entire rear wall devoted to radios.

Hazelwood TV's biggest display attraction is a side wall with TV sets two rows high, and all turned on. The floor row holds six sets while the chain suspended shelf above it holds five.

"Having these sets in operation really sells them," Lott declares. "This technique has been proven in specialty TV sales shops and department stores and yet, very few TV service/sales shops bother to use it. Many of our customers when buying a set specify that they want the very same one that they have been watching on the floor."

Another customer-winning program at Hazelwood TV is a complete customer satisfaction policy. "We guarantee the picture and the set," Canada explains. "We graciously replace the set if the customer doesn't like the picture, or even give him another brand if he doesn't like the one he purchases. If necessary, we will completely refund his money. While no one yet has asked for a refund, we did have one customer who wasn't satisfied until we had delivered four sets and two different brands."

Because of this liberal customer-



Wall space is at a premium in Hazelwood TV's present quarters, but every inch is used to the best advantage.



Don Lott believes in an active display. The background shows chain-suspended, carpeted shelf with operating color sets.

Gary Canada makes two-way communications pay off with effective control of service trucks.



If you doubt the effect of sales through demonstration, here's one dealer's way of proving that turned-on TV display sets sell

satisfaction policy, Hazelwood TV has a strict inspection routine before releasing a set for delivery. Each set sold is turned on and operated in the shop for several hours to make sure that any obvious bugs are detected beforehand.

"One Saturday, we rejected four sets which were to be delivered that day," Canada states. "Our suppliers are accustomed to hearing complaints from us, but they are usually cooperative since our sales continue to increase."

Hazelwood TV normally delivers a set within 24 hours after it is purchased. Policy is to always have at least one in the warehouse to back up every one on the floor.

Antennas are a big item at this suburban St. Louis shop. Three popular models are displayed on the ceiling and each contains all the parts necessary for installation. Hazelwood TV encourages a do-it-yourself installation. Their charge for a normal installation on a one-story house is \$40 and only a small percentage of antennas are sold on a do-it-yourself basis.

SERVICE MOST IMPORTANT

Even though service does a smaller dollar business than sales, it still is regarded as the most important by the partners, who worked as servicemen at the same shop for six years before opening their own three years ago. Both of them sometimes work until midnight in order to keep up with repair orders, most of which are completed within two days—almost virtually unheard of in the busy St. Louis area.

"If our repairs start stacking up, we just quit taking calls," Canada says. "But of course we always take care of merchandise we sell to our

own customers as soon as possible.

House calls are \$7.95 for black and white and \$9.95 for color. Carry-ins are priced according to the job, which is always given a rough estimate before repair. An exact estimate involves more time and costs the customer \$4.95.

All repair jobs get a thorough cleaning, including the outside of set—particularly portables, which often require a brisk rubbing with ammonia water to remove the traces of young jelly-encrusted hands. Minor things such as broken or loose knobs are fixed free of charge.

Hazelwood TV operates three service trucks, all radio dispatched. Two are used for delivery and repair while the third is outfitted just for antenna installation. The \$700 investment for radio dispatching is money well spent, the partners concede, because it helps routing and prevents doubling back. Also, the driver can radio in for a part and it is ready the next morning. Hazelwood TV gets three replacement parts deliveries a day, one each from its three suppliers.

GOODWILL SELLS

"Many of our customers are young factory workers—quite a few with some engineering know-how," Canada explains.

To cater to the do-it-yourselfer, Hazelwood TV has a tube tester on the sales floor just inside the entrance. "This makes our customer feel free to bring in his tubes for testing and also frees us from having to do it for them," Canada says. "However, we will help anyone. Often a customer comes in, tells us what the trouble is and asks us to prescribe a tube or part without having examined the set. Whenever we can, we do so gladly."

The sales floor is separated from the shop at the rear by a wall. To allow either of the partners to work in the shop at the rear and still keep an eye on the sales floor, there is a closed circuit television system focused on the sales floor.

For their new, larger shop, the partners plan a more elaborate closed circuit TV installation, which they will equip to automatically pan the sales floor area.

Other merchandising innovations at Hazelwood TV include keeping a color set in the window which is turned on at dusk and off at midnight. Its speaker can be heard outside the store, and for any popular program there often is a crowd outside. In fair weather, it's almost like a small drive-in movie. People buy an ice-cream cone at the dairy next door and sit in their cars or stand on the sidewalk to watch color TV.

Hazelwood prices its sets competitively, but doesn't "throw in" accessories such as an antenna. "Even though antennas are sold and never given away, 70 percent of our TV sales result in an antenna sale, too," Canada reports.

There's no price haggling at Hazelwood TV. The first price quoted is the bottom price and it's the same to everyone.

The combination of a fair price, guaranteed satisfaction and two-day expert service is just too good to pass up for many customers—they become unpaid salesmen for Hazelwood TV. "It's surprising how many customers go out of their way to put in a plug for us," Canada comments. "When we sell a set on any block, chances are we will sell at least two or three others on that same block within the year. That kind of customer goodwill is the name of the game." ■

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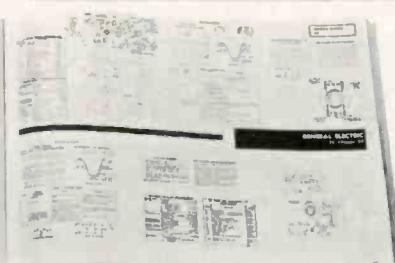
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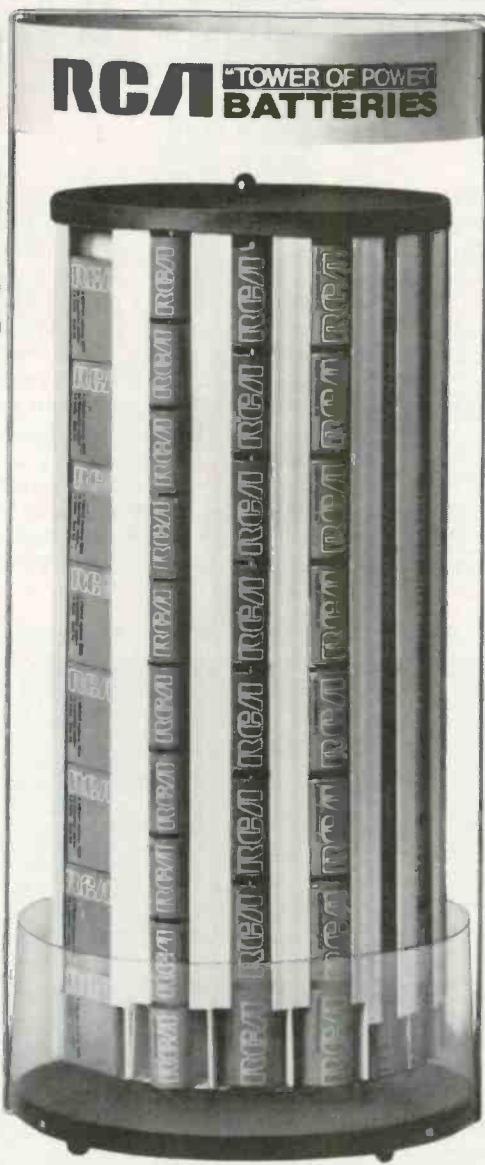
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ET37

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RCA's new "Tower of Power" merchandiser does almost everything for you but make change. It holds over 10 dozen batteries—in just 10 inches of counter space!

Its gravity-feed means automatic stock rotation. It rotates at the touch of a finger (great for impulse sales). It tells your salesmen what they need to know—battery data and prices. And it has individual channels for each of the popular sizes, 9-Volt, "D", "C", and "AA" cells.

Another great feature. If you're concerned about pilferage, the "Tower of Power" can be set up so only

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Designed to display any or all of the top 10 types that cover 9-out-of-10 customer needs...Zinc Carbon, Alkaline, or Mercury.

Think round, think today. Get the "Tower of Power" and you'll sell more batteries without even trying. Contact your RCA Battery Distributor for complete details or write RCA Electronic Components, Commercial Engineering, Section c205N, Harrison, N. J.

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RCA

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We've come up with a lot of exciting new products since we introduced the first Winegard antenna. But we've never seen a product capture the imagination of dealers and consumers as completely as Color Wedge has. Or as quickly.

You see, we knew there had never been an antenna as different as our Color Wedge series of Super Colortron antennas.

And not just different. Dramatically different. In design, in performance and in construction. And since the differences can be dramatically shown, Color Wedge has arrived. Big!

Dealers are discovering that a demonstration of Color Wedge is all the selling that's needed. But if they want to talk about Color Wedge, there's plenty to talk about.



Well, Color Wedge has not only come. It has arrived!

- A unique wedge design that provides an increased signal capture area in a much shorter and compact antenna.
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- The utilization of booms as both supporting members and phasing lines.
- New truss construction that has given new meaning to the word "rugged." And, of course, they can talk about all the now famous Super Colortron features, including the built-in cartridge housing with its solid state preamplifiers.

The way it looks now, it will be a long time before anybody creates an antenna series that can compare with Color Wedge. And that's something to talk about, too. If you're a Winegard dealer.

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A complete line of 8 models.
Shown: CW-96

 **Winegard**
ANTENNA SYSTEMS

continued from page 34

tem, any one of the microphones fits more than one kind of cassette recorder . . . up to three different types of input. All four microphones (impedance:



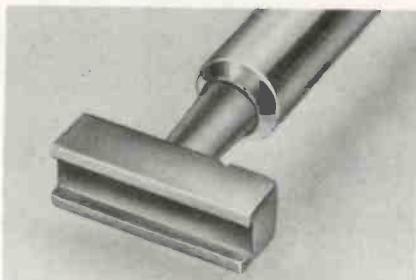
200Ω , 500Ω , $50K$) feature highly advanced design in appearance and construction. List prices range between \$6 and \$7. Mura.

SOLDERING TIP

710

Will span leads on a dual in-line pack

An accessory tip for desoldering and removal of dual inline flat packs from PC boards is introduced. The style DIT-1 tip assembly is a low cost accessory for use with the company's Models W-TCP-L and W-TCP soldering station and complements a previously introduced style FPT-1 tip for removal of flat packs. The tip is



wide enough to span all fourteen leads of a dual in-line pack simultaneously. Conversion of a soldering station from standard soldering capability to desoldering and back again takes only moments. The basic soldering station is a controlled output unit, possible component and board damage is greatly minimized. Available as an accessory or with a complete soldering station. Weller.

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.



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This video tape recorder is a precision engineered unit designed for professional, commercial and home use. It has many outstanding features such as the unique inductive coupling between the rotating record/playback head and the rest of the system.

ELECTRONIC SPECS

Camera (video) Input: EIA, random interlace, industrial (30 cycle frame rate) sync: BNC receptacle, 75 Ohm 1 V., positive.

TV Rec Sig: (IF) input pix carrier 45.75 mc/s; Sound carrier, 41.25 Mc/s., 20 Mv (100% mod). BNC receptacle, 75 Ohm .

Video Output: BNC 75 Ohm , 1V. for 100% mod.

VHF Output: 300 Ohms.

Choice of three channels: 2, 3 or 4.

Uninterrupted recording can be made in excess of 1 hour duration on 9" reel. (st. 8" reel allows up to 40 min. play time).

Mike Input: Phone-jack; sens, 1 Mv, int. res, 1K Ohm

Phone Input: Phone-jack; sens 200 Mv., int. res. 500 Ohm

Audio Output: Phone-jack, output, 1V., source res. 20K Ohm

Freq. Range: 120-12,000 Cps. (6 db)

Distortion: 5%

Signal to Noise Ratio: 50db

Signal to Hum Ratio: 40 db



This VTR is based on the helical scan principle and will accept any composite video signal (random, 2:1 or EIA) fed from a single coaxial cable. A TV camera, off-the-air tuner, tape duplicator and monoscope generator are all acceptable inputs. These units are brand new, complete with head, and instruction manual in original factory cartons. Original list price was in excess of \$3000. Limited quantity—shipped by truck or REA, transportation charges collect—check with order only. \$585. Net. Stock #29,503. For additional information order Free Flyer 970J2.

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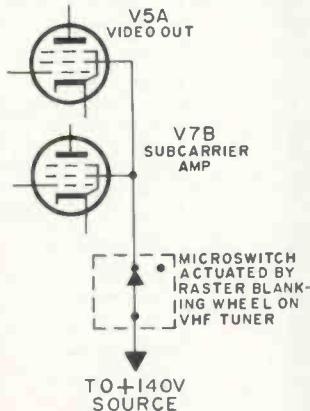


COLORFAX

GENERAL ELECTRIC

Color TV Chassis C-1—Brightness Elimination

Channels on which the picture tube raster is to be blanked may be programmed for brightness elimination without removing the cabinet back as follows:

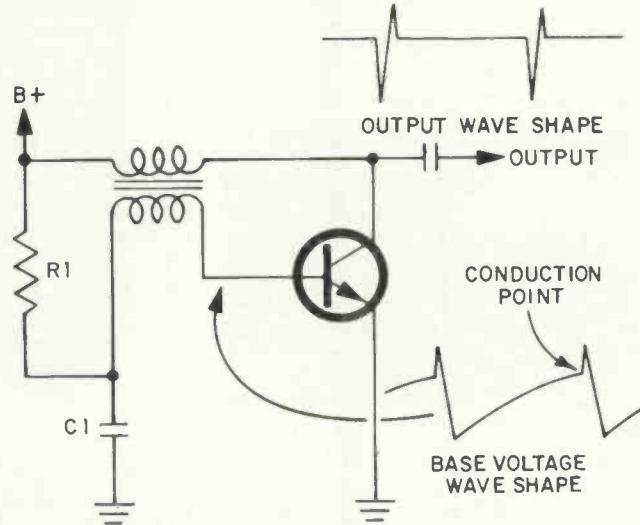


nel number. When not in position for programming, the buttons normally lie lengthwise, forming a circle, with their round ends pointing clockwise. To place a button in the programmed position, turn it a quarter-turn counterclockwise until it detents with the rounded end pointing straight out from the wheel center.

RCA VICTOR

Solid-State Blocking Oscillator—Circuit Description

Although the operation of a transistorized blocking oscillator is similar in most respects to the operation of the vacuum-tube counterpart, an examination of the solid-state circuit is warranted. Shown in the illustration is the basic circuit.

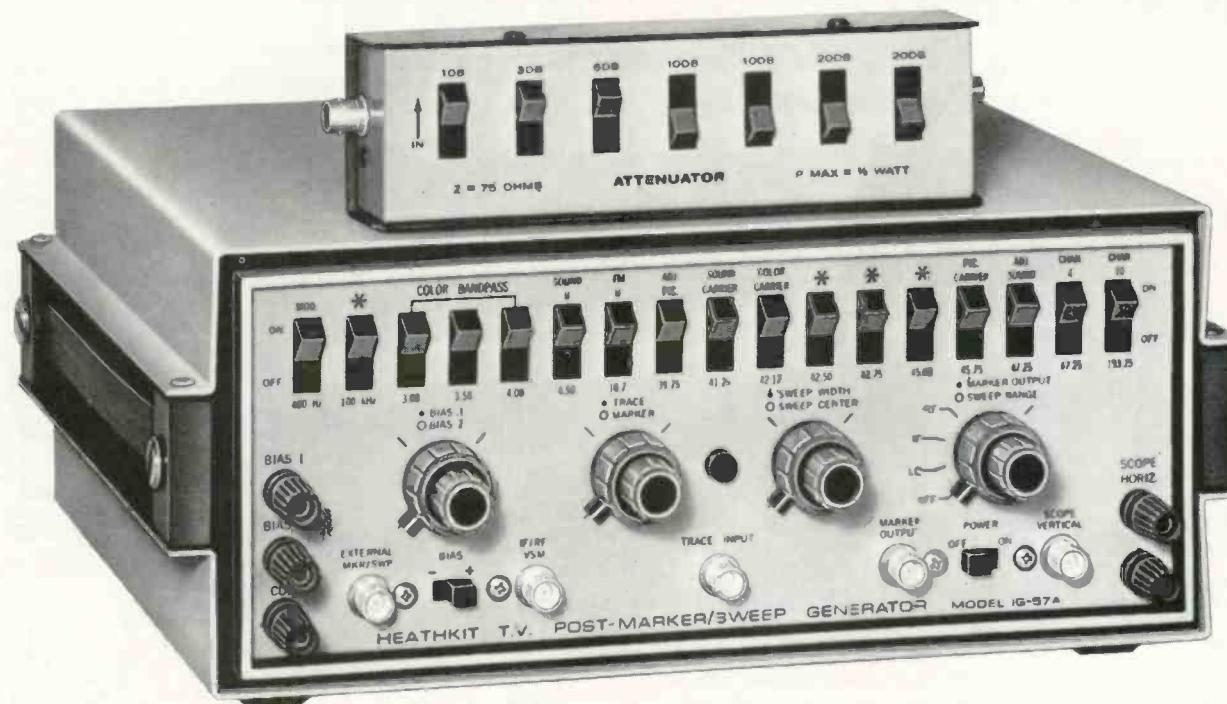


Assume that B+ has just been applied. The transistor is slightly forward biased by the large resistance between the base and B+, allowing it to conduct, causing a voltage drop across the primary of T1 (collector transformer). This drop is transformed to a positive-going voltage in the secondary which drives the transistor base further positive.

COMPARE Sweep-Marker Generators vs. Cost

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Heathkit IG-57A	✓	✓	Calibrated Steps 1-70 dB	✓	RF & IF	✓	4 & 10	✓	✓	✓	✓	✓	\$135* Kit \$199* Wired
Brand "A"	✓	✓	Variable	✓	IF	✓	4 & 10	✓	✓	✓	✓	✓	\$399.95
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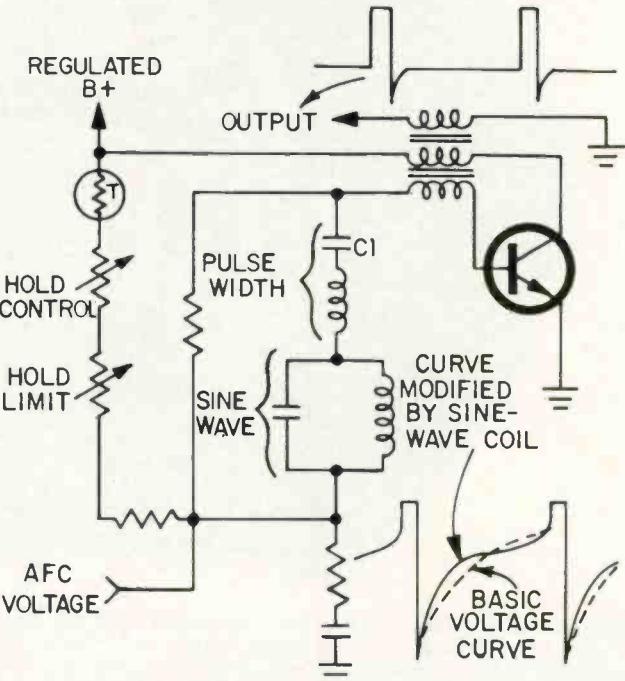
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COLORFAX

The base current is substantial during this time, charging C1. When current saturation (collector) is reached, the magnetic field in T1 can't increase and the secondary voltage falls towards zero. This allows capacitor C1 to begin discharging through resistor R1 to B+, causing the transistor base to be driven negative. This cuts off collector current, allowing the collector voltage to return to B+ potential and also driving the base to its maximum negative voltage.

The charging path for C1 has very little resistance but the discharge path through R1 has high resistance. Therefore, the transistor is biased below cutoff for an appreciable length of time which depends on the RC time constant of R1 and C1. When enough of the charge on C1 has leaked off to allow the transistor base to resume conduction, the entire process is repeated.

Several modifications of the basic circuit normally are made to improve overall performance. A typical horizontal blocking oscillator circuit incorporating these changes is shown in the schematic. In the basic circuit, there are



but two windings in the transformer, and the output is taken from the collector. A third secondary winding is often used to provide the output, particularly if a positive pulse is required.

The output of a blocking oscillator characteristically has rapid rise time, a spiked crest and an equally rapid decay. Sharp rise time is normally desirable, but it is usually necessary for the output pulse to have a flat top. This may be accomplished by inserting a suitable delay network between the pulse transformer and the transistor base. By using a resonant circuit, C1 may be made part of the delay circuit. By choosing the correct resonant frequency, the rise time of the output remains short, but the negative-going signal fed back to the base is delayed until the resonant circuit has completed about one-half cycle. As a result the device remains in saturation for the desired period thus producing a flat-topped output.

The base waveform shows that between pulses the base voltage rises along an exponential curve. Since the amount *continued on page 74*

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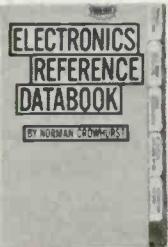
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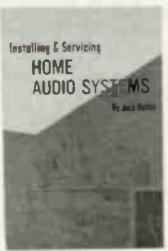


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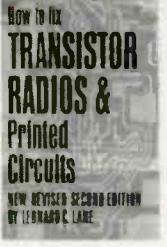
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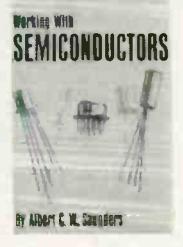
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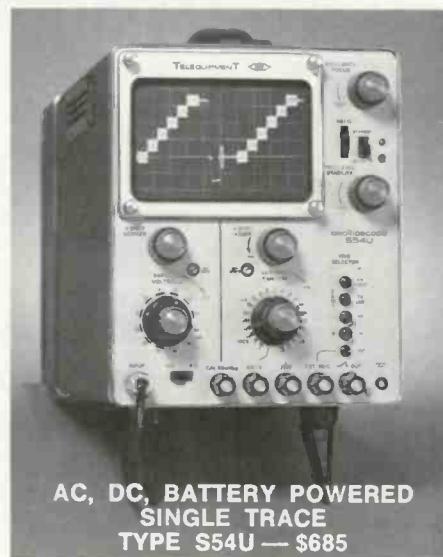
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of rise per unit of time is relatively small at the time when the base is approaching its conduction point, minute variations in bias voltage, stray fields etc. may cause slight shifts in frequency called pulse jitter. This may be eliminated by modifying the base voltage so that it rises rapidly into conduction. A parallel resonant circuit tuned slightly above the oscillator frequency may be connected between base and ground to change the base-voltage waveshape to make the frequency more stable.

The frequency of a blocking oscillator may be controlled (within limits) by varying the voltage supplied to the bias resistor. By making this voltage more positive, the base returns to the forward-bias point more quickly and frequency is increased. If it is made less positive, the frequency will decrease. In a horizontal-oscillator application, the correcting voltage, which is derived from the horizontal AFC system, is added to the base bias voltage to achieve automatic frequency control of the oscillator.

The hold control and hold-limit control shown in illustration allows the oscillator to be adjusted to the correct frequency by changing the RC time constant of the base circuit. Once this frequency is set near 15,750Hz, the control voltage from the AFC circuit will hold the oscillator in synchronism with the horizontal sync pulses.

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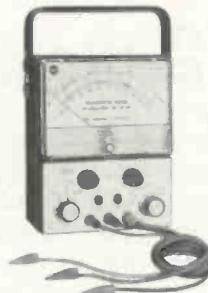


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RCA Electronic Components, Harrison, N. J. 07029

RCA

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Now the Chromacolor revolution comes to replacement tubes too!

Now you can install Zenith's patented Chromacolor picture tube that outcolors, outbrightens, outcontrasts and outdetails every other 23" diag. color picture tube.

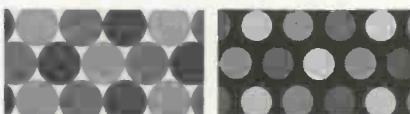
With a full 2-year warranty!

After years of pioneering research and development, Zenith has perfected a color TV picture tube different than any other on the market. So revolutionary that it outcolors, outbrightens, outcontrasts and outdetails every other 23" diag. color tube. And it's a Zenith exclusive—covered by U.S. Patent No. 3,146,368.

Before Chromacolor, every giant-screen color picture was made up of tiny dots on a gray background.

But Zenith made the dots smaller, surrounded them with jet black and, for the first time, fully illuminated every dot. Result: the brightest, sharpest picture tube in giant-screen color TV.

The Zenith Chromacolor tube will readily replace the 23" diag. tube in almost any TV, whatever brand. And, unlike most replacement tubes, it's warranted for two full years.



Magnified drawing of ordinary color TV screen before Chromacolor

Magnified drawing of Zenith Chromacolor TV screen

Order the Zenith Chromacolor picture tube from your Zenith distributor for your next installation. And put your customer in a better light.

At Zenith, the quality goes in before the name goes on.®

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.



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mentation is completely compatible with TTL-designed data handling equipment. The 100/500 Series has been designed specifically to meet the need for moderately priced high performance measurement instrumentation. Specifications: Count-1 to 10^5 ; Frequency-5Hz to 50MHz; Period - $10\mu\text{sec}$ to 10^6 sec; resolution range from $1\mu\text{sec}$ to 10sec.; Multiple-Period Average - Range is $1\mu\text{sec}$ to 0.1sec with $1\mu\text{sec}$ resolution. Number of periods averaged, 1 to 10^5 in decade steps; Ratio - Measures the ratio of events at input A to a selectable fraction of the events at input B. The fraction is selectable in decade steps from 1 to 107 by the Multiplier switch. Input A: 5Hz to 50MHz. Input B: 5Hz to 1MHz; Time Interval - 10sec to 10^6 sec; resolution from $1\mu\text{sec}$ to 10 sec; Time A-B - (Starts counting scaled clock pulses when signal at A reaches trigger level) Range, $10\mu\text{sec}$ to 10^6 sec; Test - 1MHz. Price \$7.95. Monsanto.

RADIO-FREQUENCY VOLTmeter 713

Without amplification no power supply is needed

Introduced is the Model 500 Radio-Frequency Voltmeter covering the frequency range from 20kHz to 500MHz with a voltage range from $200\mu\text{V}$ to 15v RMS. From 20kHz to 100MHz, measurements are claimed to be accurate to three percent of full scale. From 100 to 200MHz, accuracy is five per-



cent, and from 200 to 500MHz, voltages are read from a calibration curve, and relative measurements in dB can be taken directly. Sensitivity is reduced approximately three db at 500MHz, with a source impedance of 50Ω . The unit is especially useful for production-line checking, troubleshooting, service-

Now it costs less to own the best oscilloscope you need.



The best you need is the new 5-inch RCA WO-505A, all solid-state oscilloscope. It makes yesterday's general-purpose 'scopes look old-fashioned.

At just \$298.50† the WO-505A offers an unmatched list of features usually found only in more expensive, laboratory type instruments. For example there's the all solid-state circuitry... an illuminated graph screen calibrated directly in volts, and a deep-lip bezel for exceptional clarity. The regulated power supply minimizes trace bounce and provides excellent stability. And the camera mounting studs offer still more evidence of the functional value built into the new WO-505A.

But you've got to see this new RCA 'scope in operation—see the sharp, clean trace it provides—to appreciate it. Some statistics:

- High-frequency response, usable to 8 MHz.
- High Sensitivity (.05 V p-p range).
- DC vertical amplifier; DC/AC input.
- Return trace blanking... Trace polarity reversal switch... Phase control.
- High-frequency horizontal sweep; solid lock-in on 5 MHz.
- Preset TV "V" and "H" frequencies for instant lock-in.
- Built-in square-wave signal for calibrating P-P voltage measurements.
- Provision for connection to vertical deflection plates of CRT.

Some statistics! For complete details, contact your RCA Distributor.

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

RCA

*Inexpensive Quality

†Optional Distributor Resale Price

ing, maintenance and other applications where portability and low cost are significant. Ability of the unit to provide these functions is inherent in the special probe construction. Having a bifurcated design, the probes exhibit low capacitance, permitting the technician, using one hand, to pick up the RF voltage and its associated and adjacent ground point simultaneously. This minimizes errors arising from probe lead inductance. High Frequency Engineering.

VIDEO RECORDER 714

View an entire recorded surveillance day in forty-eight minutes

Announced is a surveillance video recorder, making it possible to view an entire recorded surveillance day in 48 minutes. Under the system, a standard one-hour roll of video tape is able to record pictures for 30 hours. The unit employs a modified Sony Videocorder and a camera taking one picture every second. Normal film

picture taking is 16 or 24 frames per second. When the tape plays back at regular speeds, 30 frames or 60 fields appear each second thereby capsuling time, missing no activity. The system can also be modified to



record at speeds other than one frame per second. Applications include traffic control; time and motion study; bank, department store surveillance; machinery utilization; architectural, and scientific uses. Optional automatic rewind eliminates operator intervention need for a 30-day period. Priced at under \$2,000. Odetrics.

Announced is a solid-state oscilloscope Model LBO-501. The 5in. scope has a bandwidth of DC to 10MHz making it ideal for every phase of color TV servicing, laboratory and production line testing. Features such as triggered sweep, calibrated vertical input and calibrated time base, puts the instrument into the professional category. A size and weight reduction has been effected by the use of semiconductors including a solid-state high voltage power supply. DC coupling enables the user to make measurements in the dc millivolt region where a meter becomes useless. The triggered sweep makes it useful for viewing complex waveforms and special sweep positions for viewing horizontal and vertical TV are provided. Among the conveniences offered are a lighted graticule, sharp rise time calibration square waves and a tilt stand for easier viewing. The vertical sensitivity reportedly is 20mv P-P/cm and bandwidth is dc to 10MHz. Triggered sweep range is from 0.2μs/cm to over 0.2sec/cm. Specifications: Vertical Amplifier Sensitivity: 20mvpp/cm to 10v pp/cm, 9 steps in 2-5-10 sequence and uncalibrated continuous

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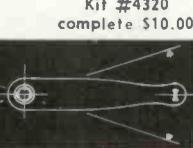
You may purchase from your local Supply-House or direct from

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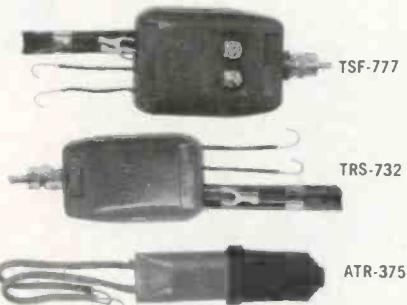
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adjuster. Bandwidth, 3dB: DC or 2Hz to 10MHz. Rise Time: 35nsec. Input Impedance: 1M, 33pf in shunt. Calibration: Square Wave Voltage 0.05, 0.5 and 5v p-p; 1kHz approx. Horizontal Amplifier: Sensitivity 200mvp-p/cm or better. Bandwidth, -3dB 2Hz to 200kHz. Input Impedance 1M, 40pf



in shunt. Time Base: Sweep speeds 1μs/cm to 0.2s/cm. 17 steps in 1.2-5 sequence and uncalibrated continuous adjuster; TV: V (for 30Hz) and H (for 15.75kHz/2). Magnification X5 (max. speed 0.2μs/cm). Sweep Mode Triggered and automatic. Trigger Slope + and -. Synchronization internal and external: + and -. Power Supply: 115v 50/60Hz; 50va, approx. Size and Weight: 10H x 8W x 16-1/2in. D. 20lb. Price \$339.50. Leader.

ANTENNA GROUNDING 716 BLOCK

Gas filled surge voltage protector

Introduced is a surge protected grounding block for outside installation utilizing an aluminum casting. The Model VGB1200SFG Grounding Block is intended to provide protection from surges because of lightning,



power surges or just static build-up. Besides furnishing a sturdy ground wire clamp that will accommodate up to #10AWG wire, the device has a built-in gas filled surge voltage protector of the repeating arc discharge type. The unit is available also with-

Now it costs less to own the best VOM you need.



The New RCA WV-510A Solid-State Master VoltOhmyst®

The best you need is the new solid-state RCA WV-510A Master VoltOhmyst®. The most functional VOM we've ever produced, the 510A has all the features you'll ever need no matter what your requirements may be.

And we've added some extra features you won't find in any competitive VOM, at any price... features designed to make your work easier, help you get the job done faster.

For example: The RCA WV-510A operates from batteries or AC. Remove the detachable AC line cord while you're taking a measurement and the batteries take over immediately without a flicker of the pointer. And you'll get maximum life from the batteries because they're always on trickle charge during AC operation. Stability? Switch from range to range and watch a whole series of measurements without constantly having to zero-adjust the meter.

Some statistics:

Current:

0.01 millampere to 1.5 amperes in 8 ranges.

Resistance:

0.02 ohm to 1000 megohms in 7 ranges.

DC Volts:

0.01 volt to 500 volts in 8 ranges.

AC Volts:

0.2 to 1500 rms AC volts in 7 ranges plus peak-to-peak voltages of complex waveforms.

21 megohm resistance on all DC ranges.

And it's only \$128.† complete with DC/AC ohms probe and flexible shielded input cable with BNC connector, and removable AC line cord.

Some statistics! For complete details, contact your local RCA Distributor.

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†Optional Distributor Resale Price

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Nobody likes a quitter!

So we're introducing a color replacement tube that's guaranteed not to leave anybody in the dark after a year or two ... Channel Master Opti-Vue!

Every Channel Master Opti-Vue Color CRT is guaranteed color perfect for a full three years.

This gives you the finest color available in a tube that's built to last longer than the one that just quit. A strong warranty builds consumer confidence in you as well as the product. It ties the customer to you for all his servicing needs.

Now you're going to be awfully busy because nobody likes quitters, and you'll be installing the one that won't ... Opti-Vue!

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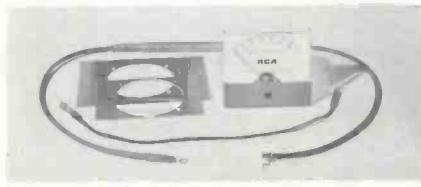
ET/D NEW PRODUCTS

out the surge protection feature and either model may also be obtained with foam encapsulation. The two-way and four-way splitters and the directional taps are available with the grounding feature which makes them economically advantageous as compared with using either device and a separate grounding attachment. View-All.

HIGH VOLTAGE METER KIT 717

Safe, accurate and continuous monitoring CRT anode voltage

Introduced is the Model 10J110 meter kit enabling servicing technicians to adjust the high voltage output



of the manufacturers' specifications, avoiding excessive voltage and possible abnormal x-radiations. The kit has been designed for quick and easy

installation into any of the RCA Color Test Jigs...10J102, 103, 104, 105 and the 11A1015A. It can also be adapted for universal mounting in any other test jig. The kit consists of: a 3-1/2in. rectangular 50 μ A meter of high quality and accuracy (\pm 2 percent FS) with a core type self-shielding movement and jewel pivot bearings. The dial scale is calibrated for a range of 0 to 35kvdc with 70 scale divisions. A meter multiplier and cable assembly comprised of a high voltage resistor which is calibrated under operating conditions and double encapsulated with insulation to withstand voltages as high as 50kvdc. A meter ground lead to allow grounding of the meter to the ground connection of the test jig. Meter mounting hardware and instructions for installation in the RCA color test jigs, or universal mounting. RCA.

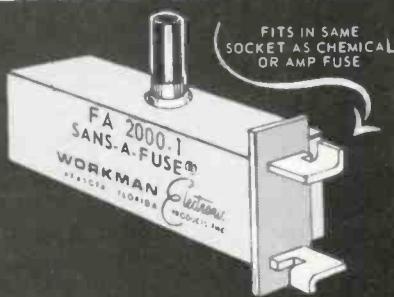
MIDGET PLIERS 718

Measure 4-1/2in. with insulated grip

Offered is a series of miniature pliers designed to make repair and assembly of miniature electronic equipment faster, easier and safer. Each tool features an insulated "comfort-grip" which allows working around "live" circuitry and tends to reduce operator fatigue. The pliers measure 4 $\frac{1}{2}$ in. and are avail-

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BLUE STUFF ...the one with muscle in it's punch

Well, I guess we started something when we introduced a whole new concept of tuner cleaning with **BLUE STUFF FOR TUNERS**. There are all sorts of copies and imitations out now and we feel complimented that other chemical manufacturers are following our lead. But we

are also proud that when the test results came in they showed that **BLUE STUFF** is still the champion in cleaning ability and long term protection, the two things the technician needs most from a tuner cleaner.

BLUE STUFF : Cleans and polishes every time the channel selector is rotated - for months and months and months.

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Insist on the champion - **BLUE STUFF FOR TUNERS** - from TECH SPRAY, manufacturers of chemical tools for the technician.

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ET/D NEW PRODUCTS

able in the following configurations:

Stock No.	Tool
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(9102)	Round Nose
(9201)	Diagonal Cutter
(9202)	End Cutter
(9501)	Flat Nose

The pliers carry a lifetime guarantee.
Vaco.

CLEANER/LUBRICANT 719

*Protective spray film
cleans and lubricates*

A quick, easy to use non-flammable cleaner and lubricant for electrical

switches and contacts is available. The product, Switch & Contact Cleaner/Lube, is a non-conductive mixture of cleaners and lubricants and DuPont "Freon" propellant. Sprayed on electrical contact points, it forms a long lasting, protective film that cleans, lubricates and extends the life of electro-mechanical components, reducing maintenance time and expense. The cleaner and lubricant reportedly does not affect plastics or other materials used in surrounding com-



ponents. The thin film formed does not inhibit electrical contacts since it has low dielectric properties. The cleaner is packed in 6oz. aerosol con-

ainers complete with special pinpoint spray nozzle for spot application in hard to reach places. Crown.

SOLDERING . . .

continued from page 46
early soldering techniques proves that many techniques are still valid and some need revising. A high quality non-acid flux should always be used along with a quality 60-40 solder. Unless removal of flux residue is specifically required, use your own judgment. But be sure flux residue does not interfere with visual inspection of all solder work. Apply solder and heat directly to the work. When solder is picked up on the iron and transferred to the work, the flux will either boil away or it will reach a temperature beyond that which is optimum for proper flux action. In order to heat the work quickly and remove the iron before it can damage fragile components, form an efficient heat path by melting some solder at the point where the iron touches the work. ■

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ELECTRONIC TECHNICIAN/DEALER

New Picture Tube Numbering System

A new system for numbering the cathode ray picture tubes used in a television set has been adopted by the Electronic Industries Assn.'s to more accurately indicate the usable picture diagonal dimension of a television screen.

As developed and approved by the EIA's Electron Tube Council of the Joint Electron Device Engineering Councils, the new "type designation system" replaces the previous method of assigning numbers which indicated the outside dimension of the bulb itself.

EIA maintains a "type registration" office for cataloguing and registering numbers of all electron tubes manufactured by the industry for use in electronic products.

Under the new system, the letter "V" will be added to the type designation to distinguish picture tubes based on the new system.

A color picture tube under the previous system having a picture diagonal of 28-1/4in., for example, might be assigned type number 30ABP22. Under the newly adopted system, the designation would be 28VABP22, accurately reflecting the actual picture diagonal measurement.

Receiving Tube Exports Climb 19.7 Percent

Exports of receiving tubes continued to climb, posting a 19.7 percent gain to reach 11.8 million units during the first nine months of 1969, the Electronic Industries Assn.'s Marketing Services Department reported.

Total unit sales of receiving tubes during the January-September, 1969 period, however, were down 4.6 percent at 213.6 million as compared to 223.8 million during the same period in 1968.

At 111.4 million units, sales to initial equipment manufacturers declined 9.8 percent from the 123.5 million level during the first nine months in 1968. Renewal sales slipped .04 percent at 82.2 million, while direct shipments to government fell .5 percent to reach 8.1 million during the January-September period of 1969.

RCA Plans Plant in Puerto Rico

A new \$4.8 million RCA facility for the manufacture of shadow masks used in color television picture tubes was announced today by John B. Farese, Executive Vice President, Electronic Components.

"Construction of the new 48,000sqft production plant is already underway and the building will be completed by the end of this year," Mr. Farese said. "Production of shadow mask assemblies on a limited basis will then begin immediately with full production scheduled for the middle of 1971."

The new facility, to be known as RCA del Caribe, Inc., is a wholly-owned subsidiary of RCA de Puerto Rico, Inc., and receives its technical guidance from the Electronic Components activity of the RCA Corporation.

This new facility is being established to support RCA's color television picture tube manufacturing operations in the United States. Initially, the plant will operate on a single-shift, five-day-a-week basis.

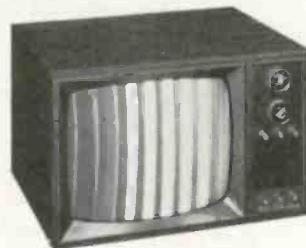
Mr. Farese pointed out that more than 100 employees will be required to operate the plant when it is in full production. All of the new employees will be recruited in Puerto Rico.

Emilio Puigdollers, Jr., has been appointed Plant Manager

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RCA Institutes has an easy approach
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During this course you'll perform over 50 experiments—and receive all parts and instructions to build your own color TV.

The cost of the Color TV Kit is included in the tuition in both the beginner's program and the advanced course in color TV servicing.

Course is based on the latest receiver circuitry and equipment.



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New courses include the latest findings and techniques in this field. Information you must have if you are to service the multitude of solid state instruments and devices used in TV, Digital, and Communications equipment.

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of the new operation. Puigdolers has been Manager, Engineering, at the RCA de Puerto Rico, Inc., facility in Juncos for the past three years.

Jerrold Schedules Seminars

Experienced CATV engineers and technicians will have an opportunity to update themselves on equipment and practices through a series of free seminars scheduled by Jerrold Electronics Corp. for this coming December, January and February.

Len Ecker, director of Jerrold's CATV Technical Training Institute, said that the series of four two-day seminars will include systems problems and solutions, especially some specific problems that beset those attending the seminars; there will be thorough briefing on preventive maintenance to forestall such problems. The seminar agenda will cover design and applications of new products aimed at modernizing systems, plus new test procedures and instrumentation (with test set-ups). The capping session of each seminar will be a look into the future toward trends and developments in CATV.

The seminars are set for Dec. 9 and 10, Holiday Inn, Marion, Ohio; January 13 and 14, Charlotte, N.C.; Feb. 10 and 11, Horne's Motor Hotel, Orlando, Fla.; and Feb. 18 and 19, Los Angeles, Calif. Ecker and his assistant director, Helmut Hess, will conduct the seminars; both men are staff engi-

neers with Jerrold's CATV Systems Div.

Interest technicians and engineers, who have not been invited directly, should contact Miss Janis Lerman, Jerrold Electronics Corp., 401 Walnut St., Philadelphia, Pa. 19105.

TEKLAB REPORT . . .

continued from page 43

AUTOMATIC-OFF CIRCUIT

The Automatic-Off circuit shown in Fig. 5 provides a method of turning the TV receiver off when the station sync information has been lost for a period of time.

Transistor Q1 is a silicon controlled switch (SCS). The basic characteristics of the SCS which are

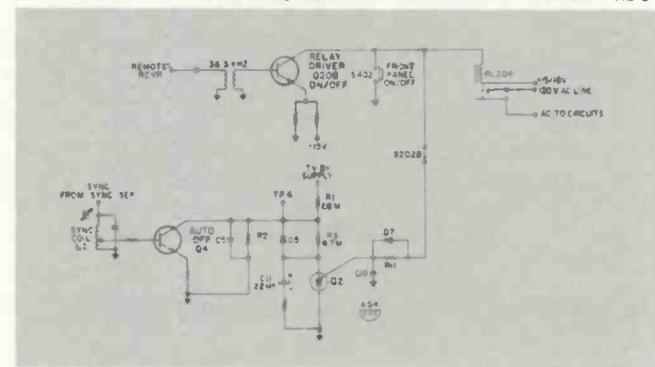
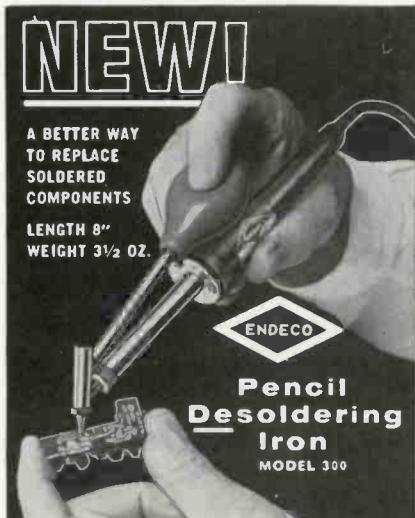


Fig. 5—Simplified Auto-Off Circuit.

of interest to us in this circuit are: (1) In a non-conducting state it exhibits a high resistance between cathode and anode, and between cathode and gate. (2) When it conducts, it exhibits a very low resistance between cathode and anode, and between cathode and gate. (3) The anode potential must at least equal the gate potential before it will conduct. (4) When it is in a conducting state, the anode voltage must be reduced to near cathode voltage to cause it to turn-off.

The voltage divider consisting of resistors R1 and R2 will develop a voltage of 33v at TP4. Capacitor C11 will tend to charge to this voltage through the resistance of R3. When the sync is being received, Q4 will be turned on during the positive half cycles of the 31.5kHz frequency developed in its base tank circuit. When Q4 conducts it acts as a short circuit across C11 in series with D5 and this keeps C11 discharged to a very low level. When sync is not present, C11 will be allowed to charge toward the positive voltage.

The gate of the SCS is connected to one side of RL204. The other side of RL204 is connected to +15v/18v depending upon the groups (15v for groups 1 & 5; 18v for groups 2,3&4). When the SCS is not conducting, the gate will be at +15/18v. If a station is not selected, the charge on C11 will continue to increase until after a period of 70 to 90 seconds, the potential at the anode of the SCS will equal the gate potential and it will turn on. The gate side of RL204 will be near ground potential and the relay will energize. At the same time, C11 will discharge through the low resistance of the SCS and the SCS will turn on. ■



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ET/D
**CATALOGS &
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Product Selector Guide**400**

The 56-page Selector Guide aids in the selection and procurement of more than a million and a half indicator lights, readouts and illuminated push button switches. Data is given in illustrated sections and each section is devoted to indicators by size (Sub-Miniatures, Miniatures, Large) or by product groupings. Separate sections of the guide are also devoted to illuminated push button switches and readouts. Four indexes, including one with military cross references, assist the user in obtaining the desired information. Dialight.

Digital Equipment**401**

The 404-page Small Computer Handbook is designed to acquaint readers with Digital Equipment, the PDP-8 family of small computers. The handbook explains both the PDP-8/1 and PDP-8/L central processors and how they are interfaced and operated. The 13 chapters cover standard system operation, basic programming and instructions for the memory and processor, data break, internal operations, input and output equipment instructions and facilities, programmed data transfers and data break transfers, digital logic circuits, interfacing, and system installation and planning. Appendices list abstracts of programs, tables of instructions and codes, tape loader sequences, scales of notation, the powers of two, and octaldecimal conversion. Digital Equipment.

Power Supply Systems**402**

A complete line of standard power supply systems will be described and illustrated in a catalog now available. Described are four standard rack sizes accommodating up to 16 single or dual output power supplies. Each system is supplied with standard power controls, systems metering panel and cables so that a customer can order a complete power system ready for hook-up to his system. Because standard power supplies and accessories are used, customers may select from over 350 power supply models from stock. Accessories are also standard stock units. A Systems Power Sequencer and Systems Power Protector are also described. These accessory units are available with each power system. Full rack and sub-rack packages are provided. Lambda Electronics.

TV Service Aid**403**

A monthly TV publication that is gaining rapid and wide acceptance among TV servicemen throughout the country contains valuable tips for technicians. It is written and prepared by an active and enterprising TV serviceman who knows the TV service field. Its distinction lies in the fact that it represents a field effort and problems encountered in actual field and shop calls are thus presented. TV TECH AID.

Tools**404**

A 32-page catalog listing special purpose slide rules, calculators, kits, books, precision measuring tools and other information aids is available. Besides the many items with broad engineering and management appeal, products for specific fields such as mechanical, electronic, reliability and fluids are covered with special emphasis on quality control and inspection. INFO.

**Speedy solutions to servicing problems
from LECTROTECH**



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Now—positive Good/Bad in-circuit and out-of-circuit testing. Also tests diodes and rectifiers. In-circuit testing measures dynamic AC gain. No transistor leads to unsolder or disconnect. Out-of-circuit testing measures transistor Beta on 2 scales: 0 to 250 and 0 to 500. Automatic biasing . . . no calibration required. PNP or NPN determined immediately. The TT-250 measures transistor leakage (I_{cbo}) directly in micro-amperes and, for diodes and rectifiers measures reverse leakage and forward conduction directly to determine front-to-back ratio. Simple Good/Bad test instantly determines condition of power transistors. Panel has Power Transistor Socket. Measures leakage current of transistor electrolytics at test voltage of 6 volts. Size 10½" x 7" x 4". Wt. 5½ lbs. NET \$87⁵⁰



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WARRANTY**

CRT-100 Picture Tube Analyzer

Features line voltage adjustment to insure all tube voltages are correct regardless of line voltage. Critical Grid-to-Cathode Leakage is read on sensitive meter for greatest accuracy. Leakage in all other elements indicated on neon lamp. Tests all black and white and all color tubes for leakage, shorts and emissions and tests each color gun separately to a standard set of test conditions. With variable G-2 voltage, each grid is normalized to a reference cut-off voltage. This method, used by tube manufacturers, simulates tube performance in color receiver. Rejuvenates, removes shorts from picture tubes for increased brightness and tube life. Life expectancy test predicts remaining useful life of all type picture tubes. Complete with Plug-in Type Test Cables and Set-up Chart. NET \$89⁵⁰



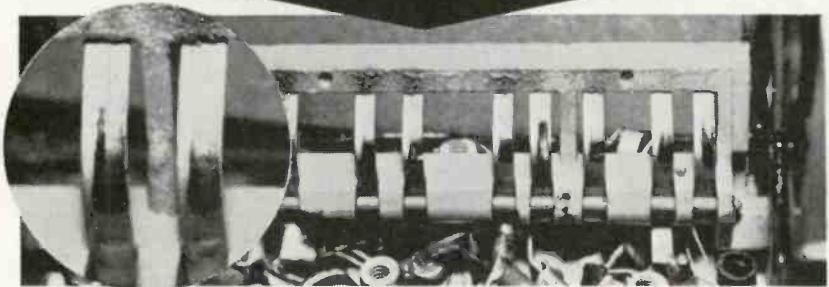
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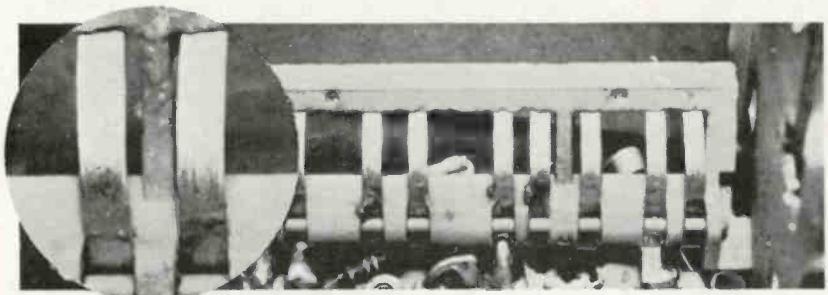
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- 708 Cassette Album
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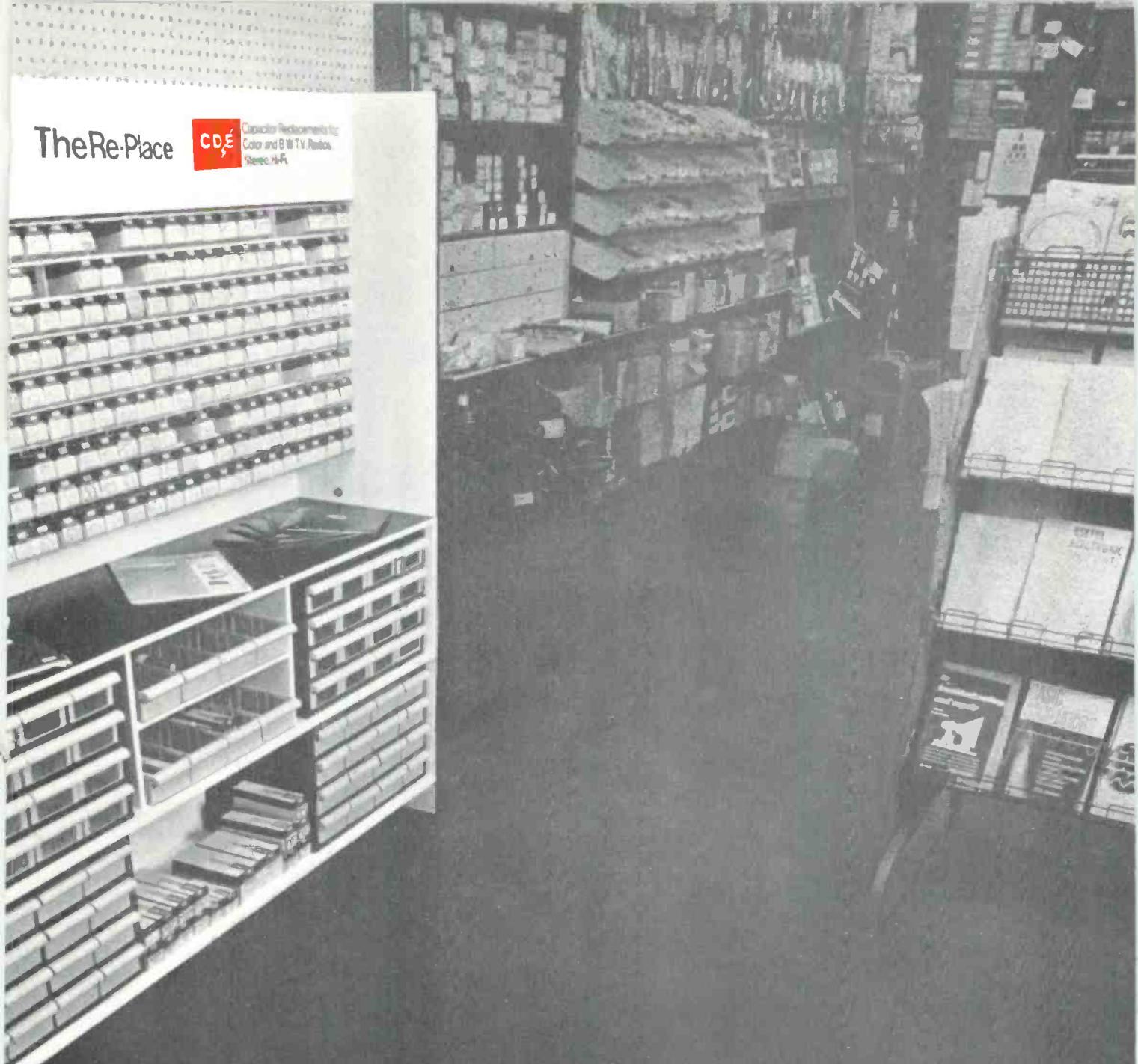
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