ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

Upgrading Audio Music Systems

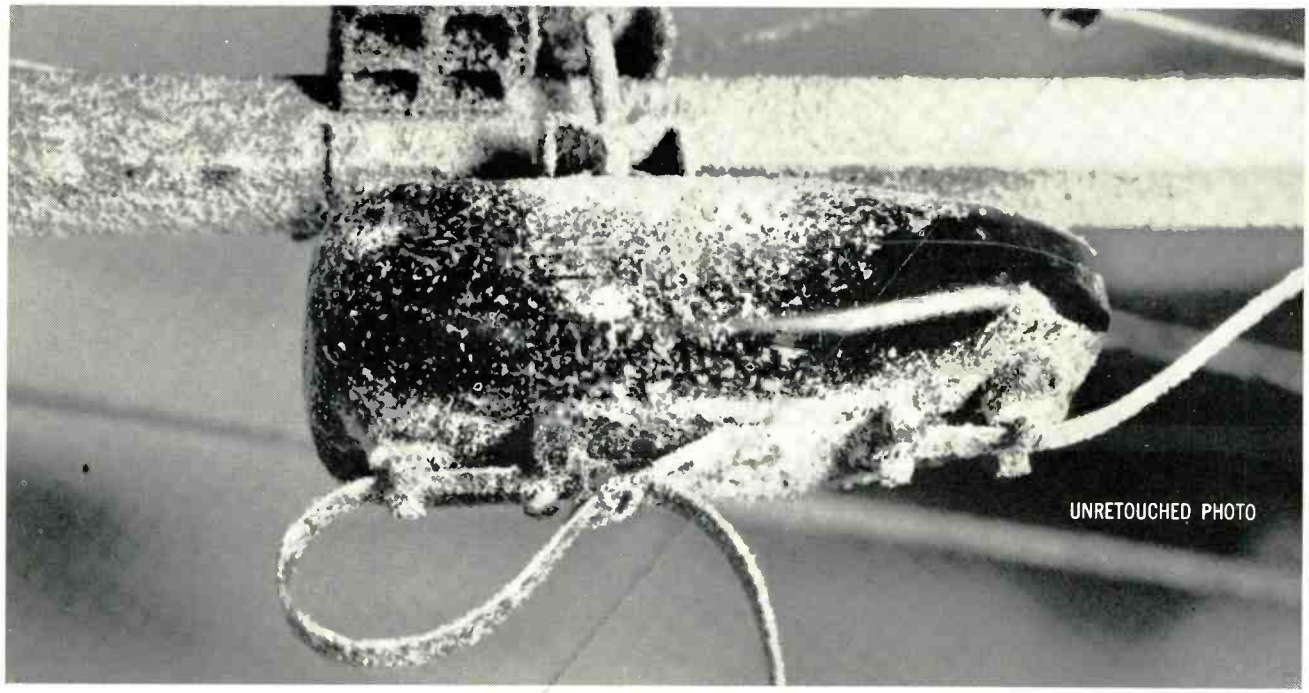
The Booming Battery Business

Phono Needles and Cartridges

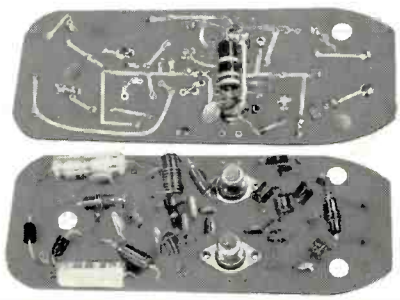
MARCH 1965

Who says a high gain TV amplifier can't be reliable?

204 HOUR TEMPERATURE/HUMIDITY/SALT SPRAY MIL-SPEC TESTS* PROVE JFD TELE-AMP STORM-PROOF RELIABILITY



AND—INCIDENTALLY—*ALL* THE *GAIN* YOU NEED IS THERE—WITH LOTS MORE TO SPARE!



UNRETOUCHED PHOTOS OF **PRINTED CIRCUIT** AND **POTTED COMPONENT** SIDES OF **TELE-AMP** AMPLIFIER BOARD **AFTER** 204-HOUR **WEATHER-TORTURE TESTS**

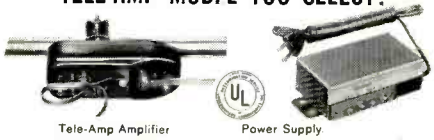
This production-line Tele-Amp was first subjected to a 72-hour temperature cycle test ranging from —40°C through +60°C. It was then placed in a humidity chamber where it ran for 66 hours in a 95% humidity at 85°F. simulated atmosphere. Next, the same Tele-Amp was placed in a 25% salt-spray chamber for 66 hours. The Tele-Amp was them field-installed on a TV antenna where **it performed with no change in characteristics. Laboratory tests that followed showed all components and circuits well within original specifications.**

JFD FACTORY-SEALED AERO-SPACE DESIGN MAINTAINS 100% RELIABILITY DESPITE SNOW, ICE, RAIN, MOISTURE, SOOT AND OTHER CORROSIVE AGENTS

What good are gain, low noise, 300 ohm match—if reliability is missing?

Now—new JFD **aero-space** design adds the vital "missing link" to today's antenna amplifiers — RELIABILITY! Result: the amplifier that **continues** to work like new under year-round exposure to all kinds of weather.

PROOF POSITIVE OF THE RELIABILITY YOU CAN EXPECT — REGARDLESS OF TELE-AMP MODEL YOU SELECT!



Tele-Amp Amplifier Power Supply

Model	Type	List
VUT-3	3 Transistor—VHF/UHF/TV	$49.95
VN-2	2 Nuvistor—VHF/TV	39.95
VT-2	2 Transistor—VHF/TV	39.95
VT-1	1 Transistor—VHF/TV/ FM	34.95
UHT-1	1 Transistor—UHF/TV	39.95
UHT-2	2 Transistor—UHF/TV	44.95
FT-1	1 Transistor—FM/STEREO	34.95

NEW JFD AERO-SPACE ENGINEERING BUILDS IN SUPERIOR RELIABILITY

- **Aero-space Poly-U coated circuit board** and housing seals out moisture, snow, rain, ice, sleet, dust and other contaminants — locks in trouble-free color and black/white performance.
- **"OFT"—Offset Free-space Terminals** suspend vital twin-lead contacts away from housing —prevent signal leakage.

- **Silicone-sealed micro-fitted case** with fitted "O" rings further insures circuit integrity by stopping entry of blown corrosive agents.
- **Weather-Brake Terminal-Kote** sealant included for coating terminals to maintain positive and permanent signal continuity.
- **Failure-free, solid state** transistor and nuvistor design.
- **Printed circuit** maintains uniform performance over the years.

*Tele-Amp corrosion tests far exceeded *MIL-STD-202C military specifications and were equivalent to four years of continuous operation under actual seasonal extremes.*

SEE YOUR DISTRIBUTOR OR WRITE FOR FORM 785

JFD ELECTRONICS CORPORATION
15th Avenue at 62nd Street, Brooklyn, N. Y. 11219
JFD Electronics-Southern Inc., Oxford, North Carolina
JFD International, 64-14 Woodside Ave., Woodside 77, N. Y.
JFD Canada, Ltd., 51 McCormack Street, Toronto, Ontario, Canada

ELECTRONIC TECHNICIAN
TEKFAX
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR EIGHT NEW SETS

GROUP 151

ELECTRONIC TECHNICIAN
TEKFAX
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR EIGHT NEW SETS

909

AIRLINE
TV Chassis 12-124-24U and 12-124-34U

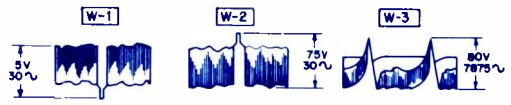
March 1965

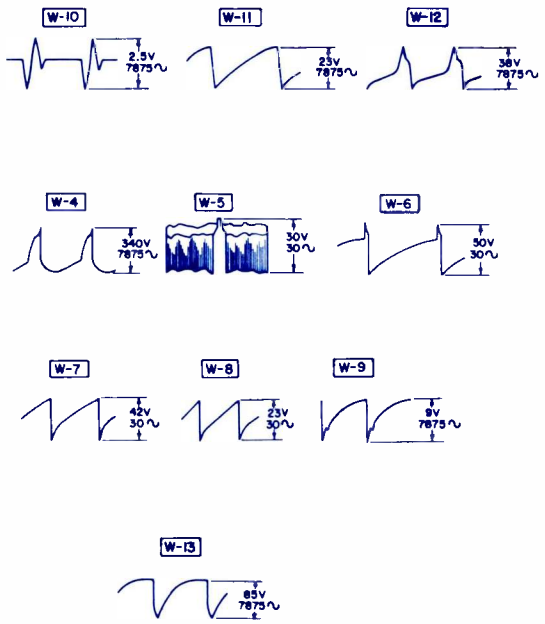
— VOLTAGES & WAVEFORMS —

1- LINE VOLTAGE 115 A.C. THROUGH ISOLATION TRANSFORMER.
2- ALL VOLTAGES SHOWN ON SCHEMATIC ARE D.C. READINGS.
3- VOLTAGE READINGS TAKEN WITH NORMAL SIGNAL INPUT USING A V.T.V.M.
4- CONTROLS SET FOR NORMAL OPERATION.
5- WAVEFORMS TAKEN WITH NORMAL SIGNAL INPUT.
6- ALL WAVEFORM VOLTAGES SHOWN ON SCHEMATIC ARE PEAK TO PEAK READINGS.

— SCHEMATIC NOTES —

7- C-52, 820MMF. IN EARLY PRODUCTION MODELS.
8- R-64, 560K 1/2W. IN EARLY PRODUCTION MODELS.
9- R-122, 56K 1/2W. IN EARLY PRODUCTION MODELS.





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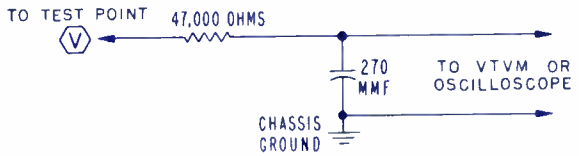
910

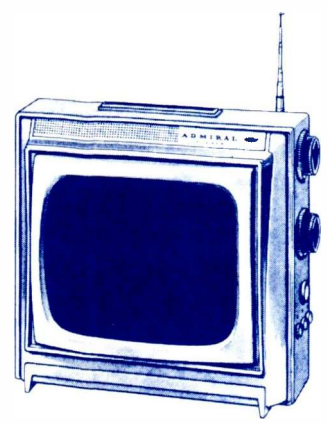
ADMIRAL
TV Chassis
C21B12-1, 13-1,
C21C12-1, 13-1,
15-1

March 1965

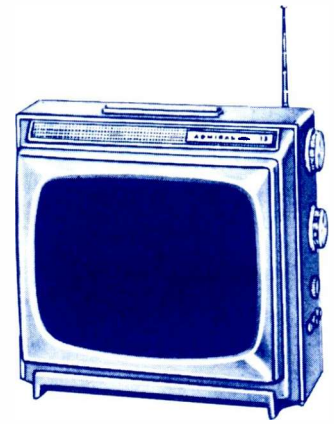
ELECTRONIC TECHNICIAN TEKFAX

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

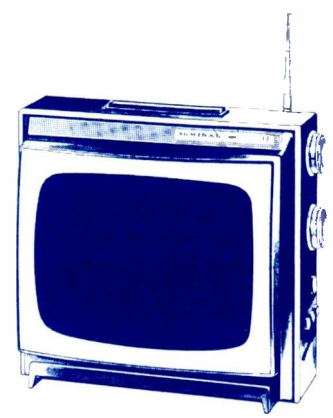




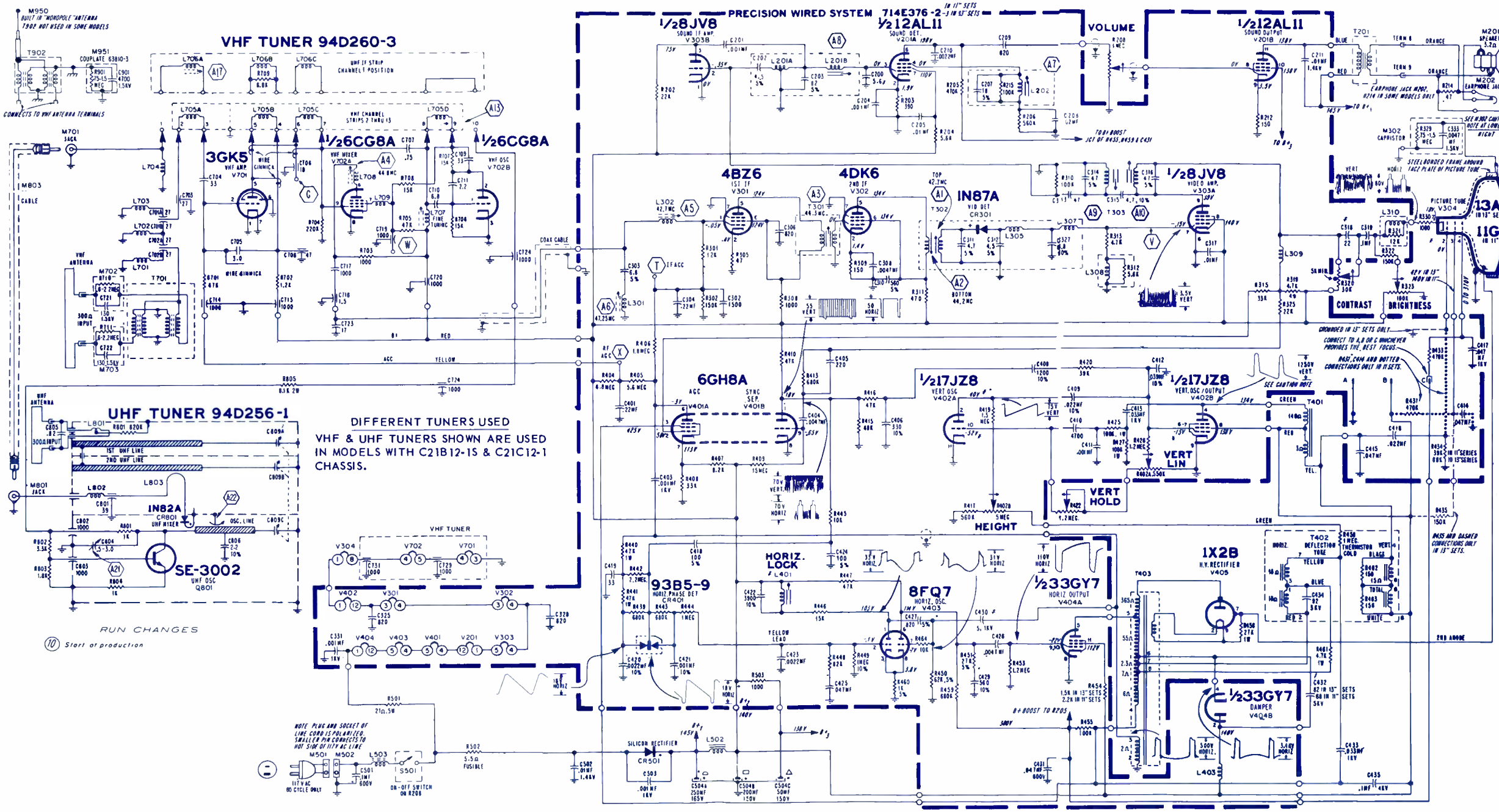
PD1124 &
PD1130 SERIES



PD1304



PD1310 SERIES



ELECTRONIC TECHNICIAN
TEKFAX

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
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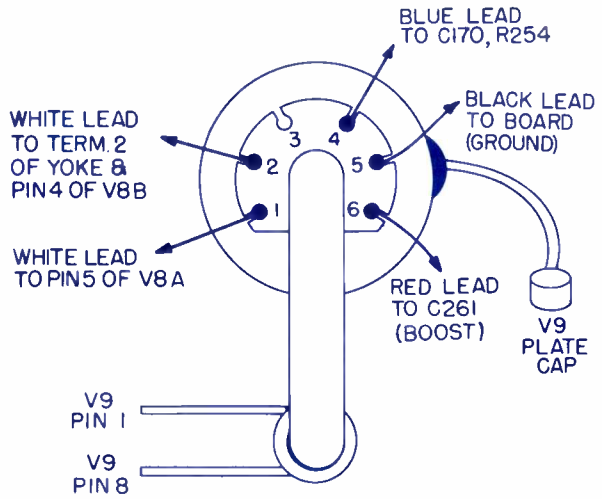
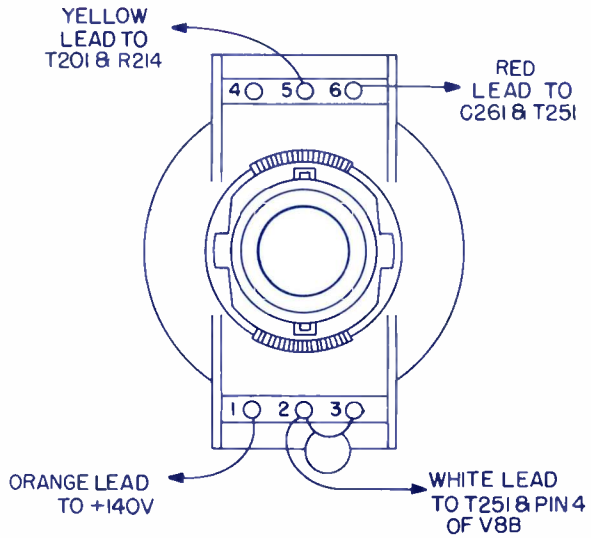
911

GENERAL ELECTRIC
TV Chassis SA

March 1965





UNLESS OTHERWISE NOTED
K=1000 M=1,000,000
CAPACITORS MORE THAN 1=μμf=pf
CAPACITORS LESS THAN 1=μf
RESISTORS ARE 1/2 WATT

WIRE COLOR CODE
(USED IN MOST INSTANCES)
BROWN ____ FILAMENT
RED ____ B+ BOOST
ORANGE ____ B+
WHITE ____ AGC

1 ALL VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS GROUND. RECEIVER CONTROLS SET FOR NORMAL OPERATION. MEASUREMENTS MAY DEVIATE ±10% AT 120VAC LINE VOLTAGE.

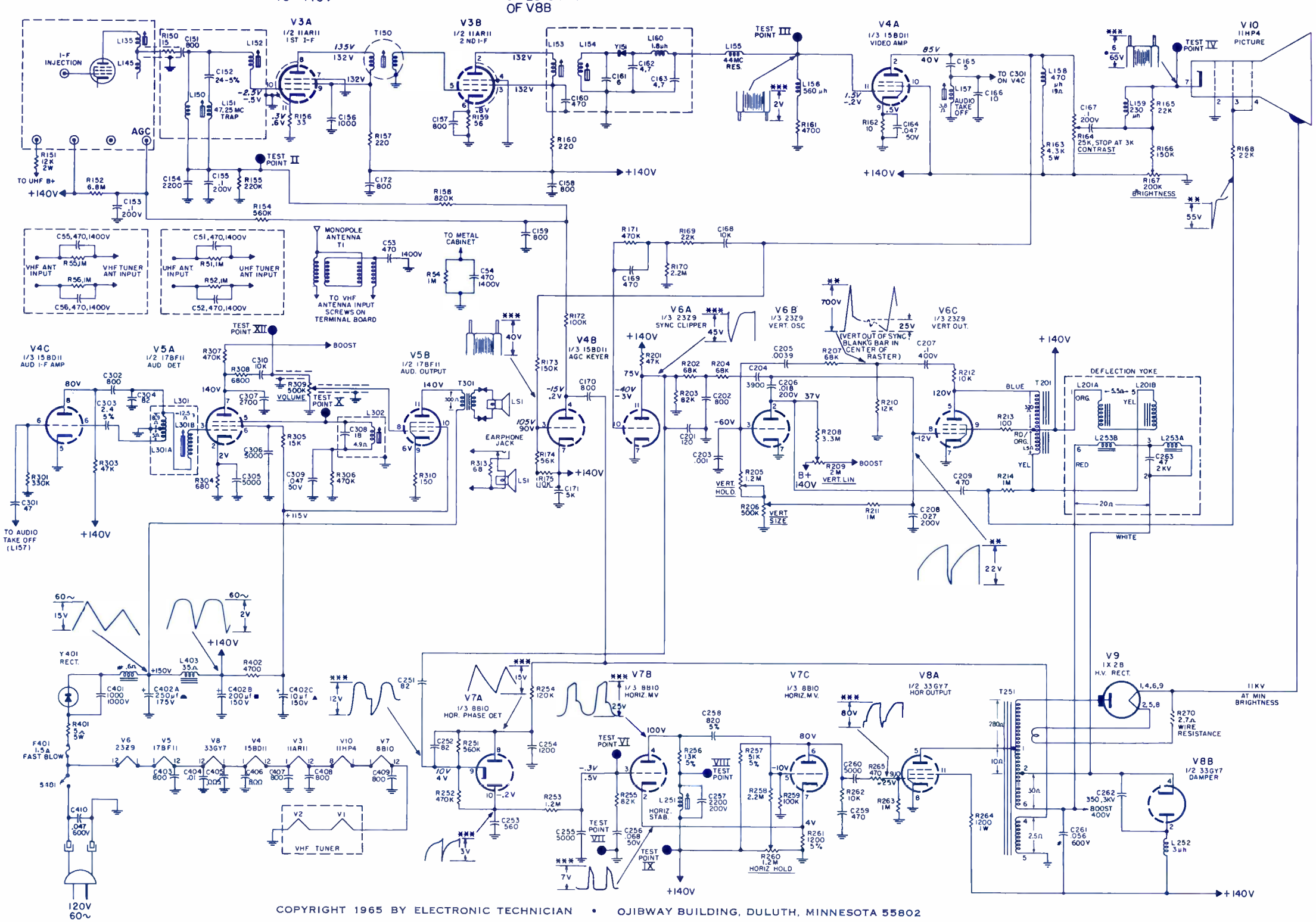
●— INDICATES VARIATION WITH CONTROL SETTING.

** INDICATES SCOPE SYNCHED AT 1/2 VERTICAL FREQUENCY.

*** INDICATES SCOPE SYNCHED AT 1/2 HORIZ FREQUENCY

# INDICATES PRODUCTION CHANGE

2 WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS DIFFER, ON-SIGNAL IS SHOWN IN *ITALICS* OVER OFF-SIGNAL VOLTAGE. NOISE-FREE SIGNAL PRODUCING -2 TO -3V AGC AT VHF TUNER USED IN ON-SIGNAL AND WAVESHAPE MEASUREMENTS. OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED AND ANTENNA TERMINALS SHORTED.



912

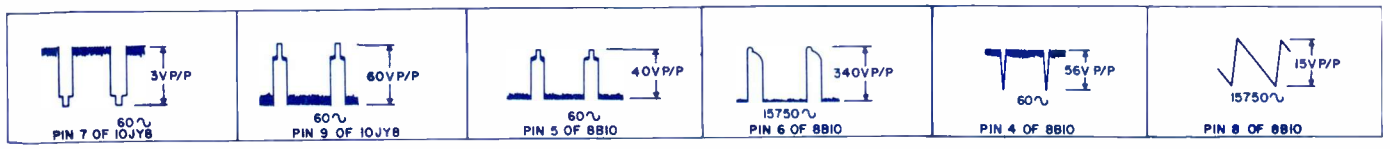
ELECTRONIC TECHNICIAN TEKFAX

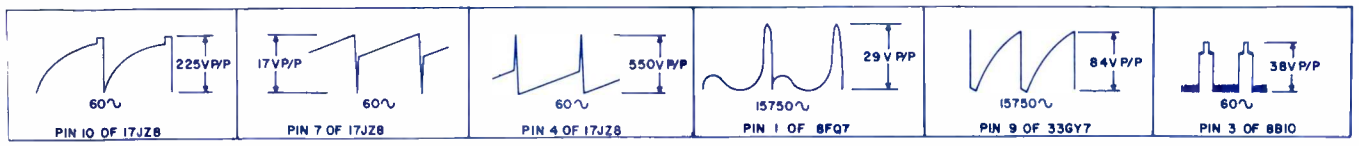
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR EIGHT NEW SETS

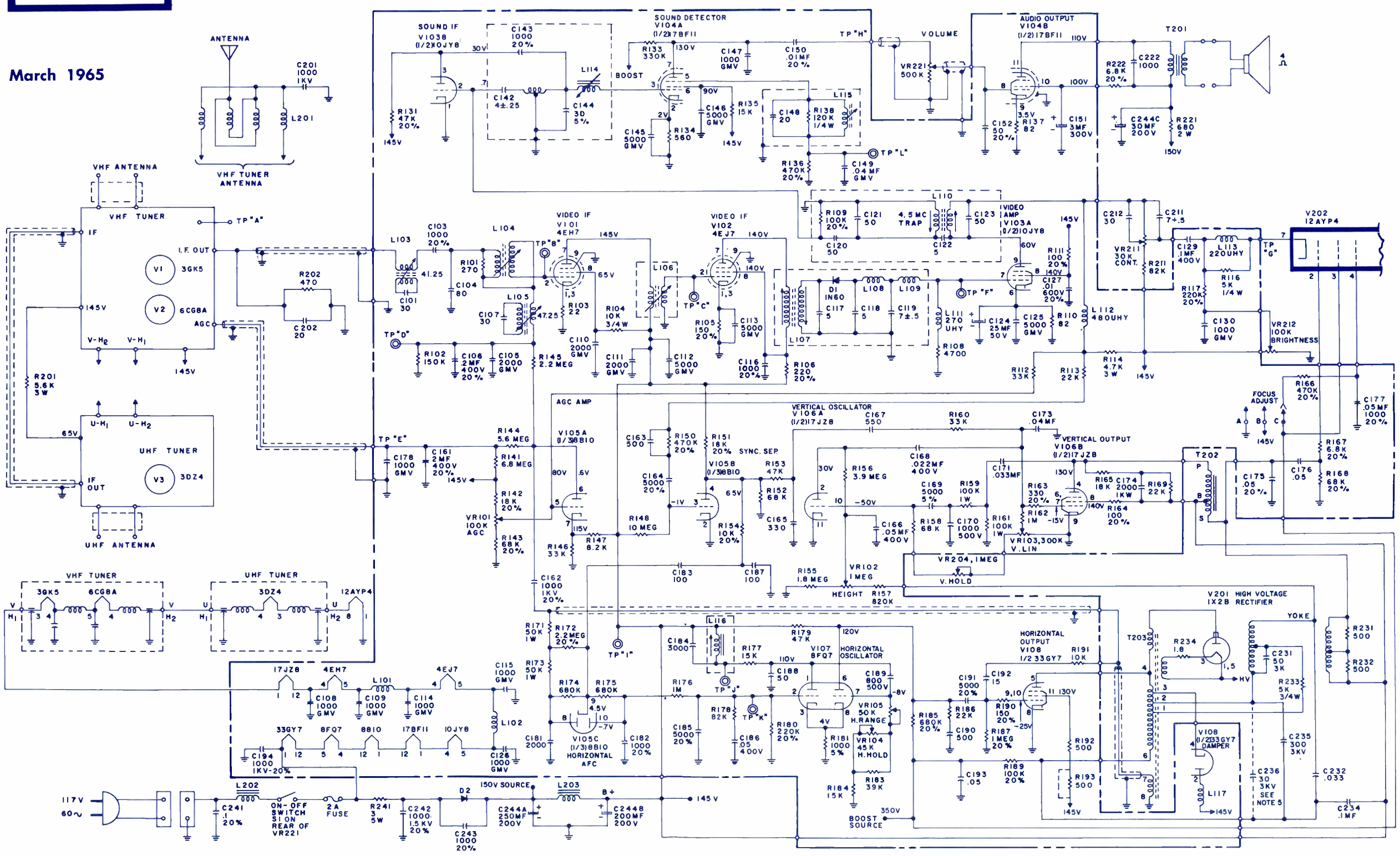
MAGNAVOX
TV Chassis 48 Series

March 1965

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL PAPER CAPACITORS ARE 600V ± 10%.
2. ALL CERAMIC CAPACITORS ARE IN MMF 500V ± 10%.
3. ALL RESISTORS 1/2 W 10%.
4. VOLTAGES MEASURED WITH NO SIGNAL CONTRAST CONTROL MAX., OTHERS FOR NORMAL SETTING
5. C236 MAY NOT BE USED ON SOME CHASSIS.







ELECTRONIC TECHNICIAN
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COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
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March 1965

913

MOTOROLA
TV Chassis TS-584-05-H

NOTE: WHEN REPLACING YOKE RES-CAP, USE ORIGINAL VALUE IN CONJUNCTION WITH ASSOCIATED COMPONENTS AS LISTED BELOW

E503 RES-CAP C515 & C516	R511	C518 NOT USED IN ALL MODELS	R507
DUAL 91 MMF PART NO. 51D67056A06	INCLUDES 6.8K 1W	27 MMF	6.8K 2W
DUAL 150 MMF PART NO. 51D65239A23	EXCLUDES 6.8K 1W	82 MMF	6.8K 2W
320 MMF PART NO. 51D65239A18	EXCLUDES 6.8K 1W	- -	10K 2W

NOTES:
VOLTAGE MEASUREMENTS
1. TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM. ±20%
2. LINE VOLTAGE MAINTAINED AT 120V AC.
3. VOLTAGES INDICATED BY AN ASTERISK WILL VARY WITH ASSOCIATED CONTROL SETTINGS.
4. TAKEN WITH CONTRAST CONTROL AT MINIMUM AND ALL OTHER CONTROLS IN NORMAL OPERATING POSITION WITH NO SIGNAL INPUT
5. TUNER ON CHANNEL 13 OR CHANNEL OF LEAST NOISE WITH ANTENNA TERMINALS SHORTED

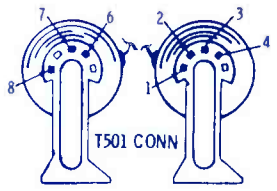
WAVEFORM MEASUREMENTS
1. TAKEN FROM POINT INDICATED TO CHASSIS WITH A WIDE-BAND OSCILLOSCOPE.
2. OSCILLOSCOPE SYNCED NEAR SWEEP RATE INDICATED
3. TAKEN WITH STRONG SIGNAL, CONTRAST CONTROL AT MAXIMUM; ALL OTHER CONTROLS IN NORMAL OPERATING POSITION.

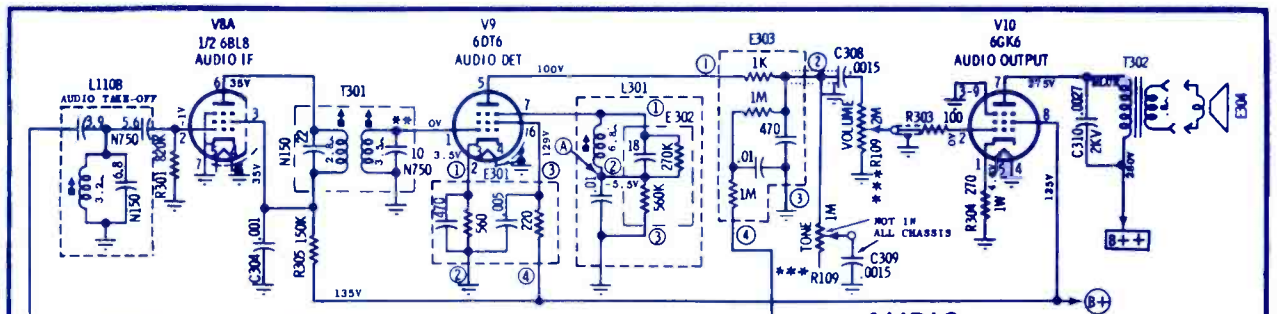
CAPACITORS: UNLESS OTHERWISE SPECIFIED, VALUES LESS THAN ONE IN MF; ALL OTHERS IN MMF

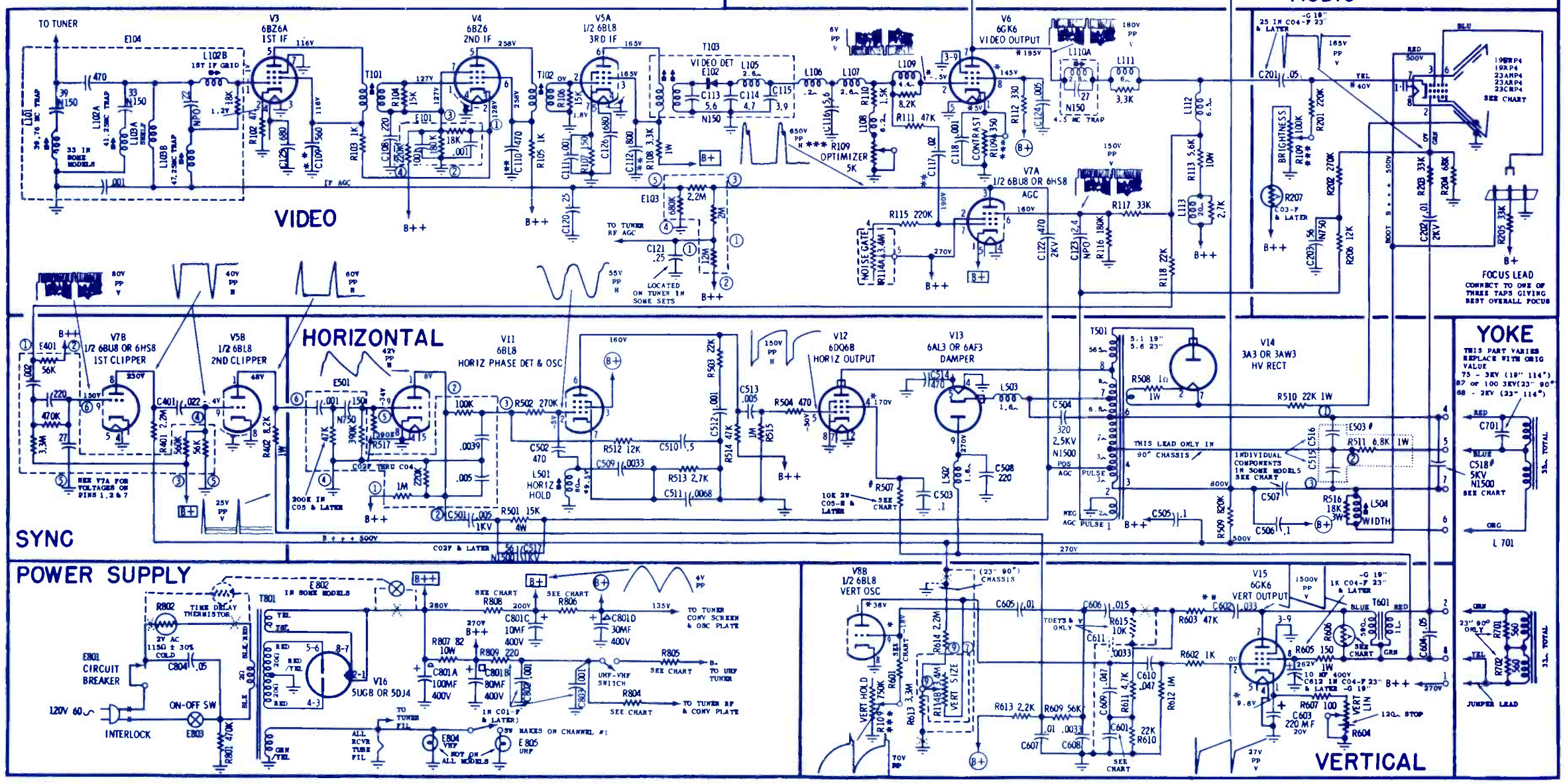
* INDICATES VOLTAGE VARIES WITH CONTROL SETTINGS.
** INDICATES SPECIAL COMPONENTS

NOTE: TO IDENTIFY CHASSIS, USE THE LAST 3 LETTERS PRECEEDING THE CHASSIS NUMBER ONLY.

CHASSIS	CRT	C507	C515	C516	C601	R507	R601	R805	R806	R808	R606	R804
--DTS584	19XP4 OR 19BRP4 114° DEFL	.03	320 2.5KV N1500	320 2.5KV N1500	.5MF 50V	10K 2W	470K 1/2W	15K 3W	2K 3W	2.2K 4W	VDR	10K 3W
--KTS584	23CMP4 OR 23ARP4 110° DEFL	.03	#	#	.5MF 50V	#	470K 1/2W	15K 3W	2K 3W	2.2K 4W	VDR	10K 3W
--ETS584	23AHP4 90°	.05			.3MF 50V	6.8K 2W	560K 1/2W	15K 3W	2K 3W	2.2K 4W	NOT USED	10K 3W







914

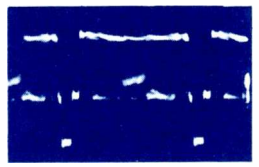
PHILCO
TV Chassis 15N30

ELECTRONIC TECHNICIAN
TEKFAX

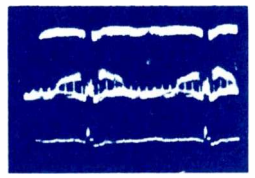
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR EIGHT NEW SETS

OSCILLOSCOPE WAVEFORM PATTERNS

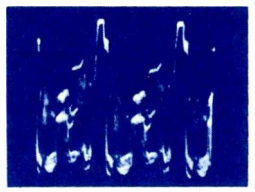
These waveforms were taken with the receiver adjusted for an approximate output of 2.5V p/p at the video detector. Voltage readings taken with raster just filling screen and all controls set for normal picture viewing except for photos 1, 2 and 3 where contrast was at maximum. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms...not the sweep rate of the oscilloscope. All readings taken with Model ES-550B Precision Oscilloscope.



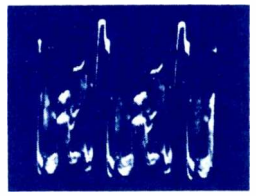
1 2.5 volts p/p, 15,750 cps (max. contrast)



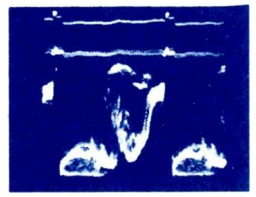
2 2.5 volts p/p, 60 cps (max. contrast)



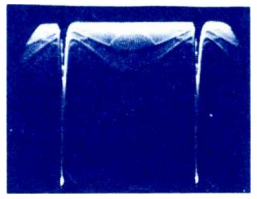
3 100 volts p/p, 15,750 cps (max. contrast)



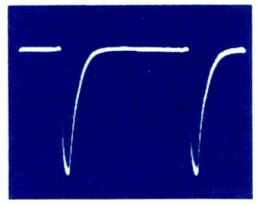
4 70 volts p/p, 15,750 cps



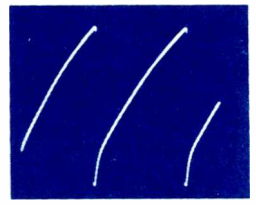
5 70 volts p/p, 60 cps



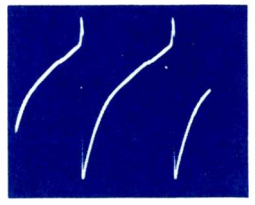
6 45 volts p/p, 60 cps



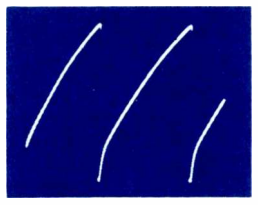
7 45 volts p/p, 15,750 cps



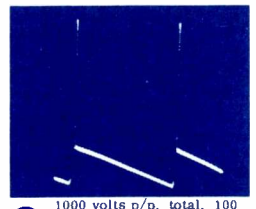
8 40 volts p/p, 60 cps



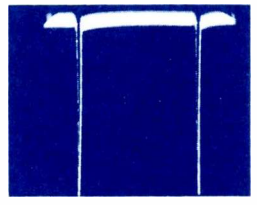
9 50 volts p/p, 60 cps



10 40 volts p/p, 60 cps

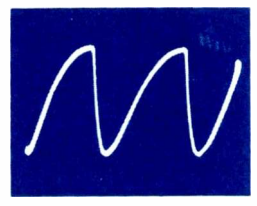


11 1000 volts p/p, total, 100 volts p/p, sawtooth, 60 cps

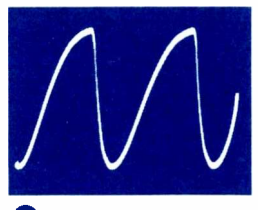


12 50 volts p/p, 60 cps

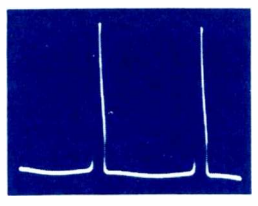
13 10 volts p/p, 15,750 cps



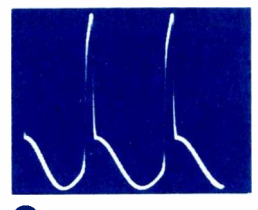
14 7 volts p/p, 15,750 cps



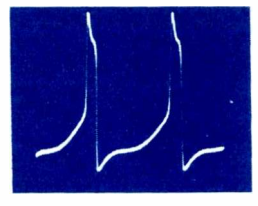
15 9 volts p/p, 15,750 cps



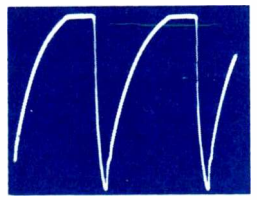
16 8 volts p/p, 15,750 cps



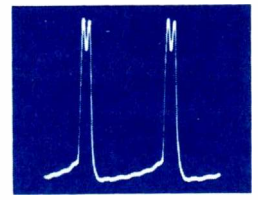
17 30 volts p/p, 15,750 cps



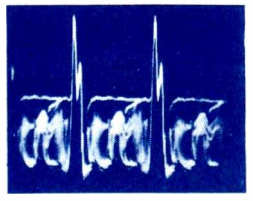
18 25 volts p/p, 15,750 cps



19 100 volts, 15,750 cps



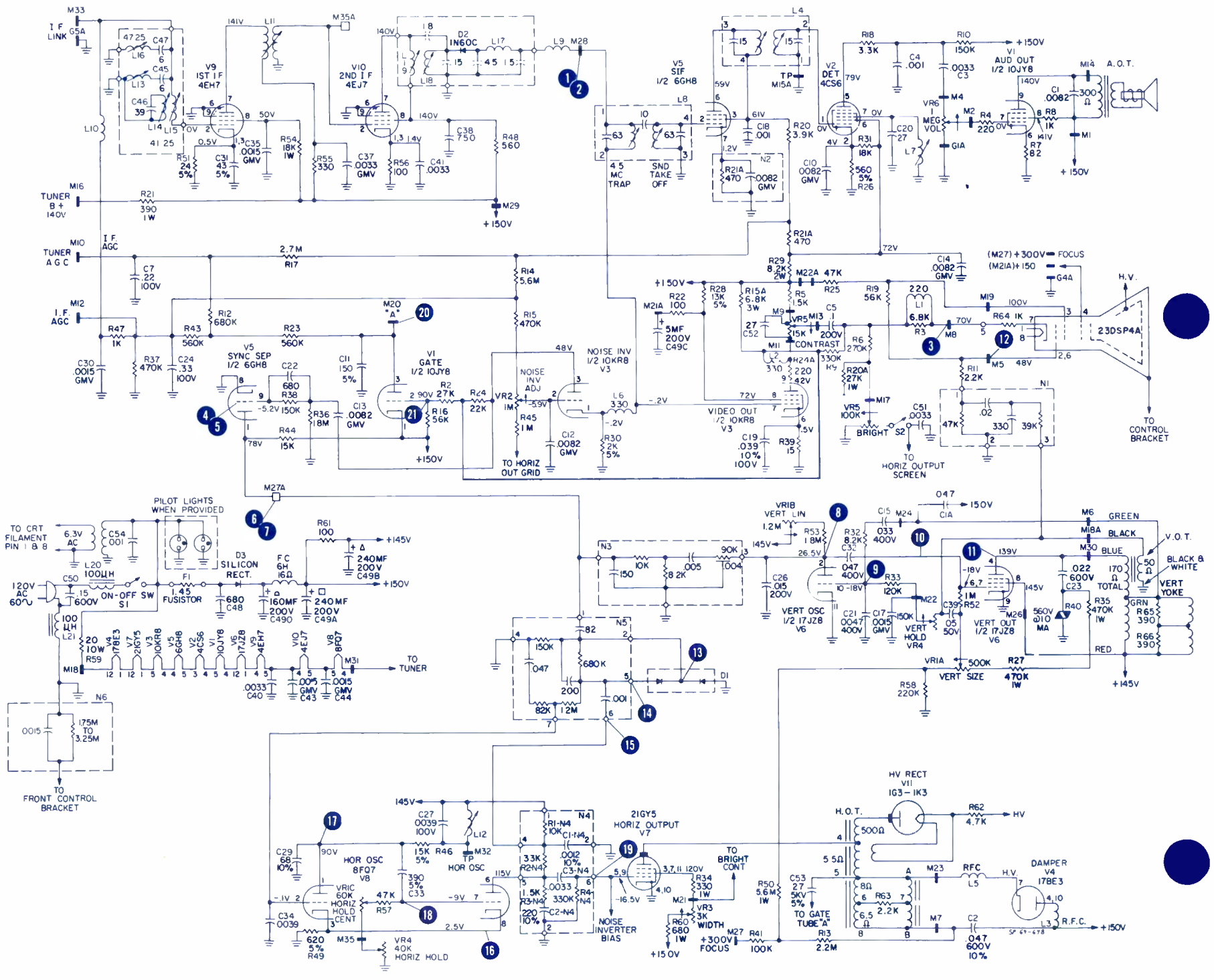
20 330 volts p/p, 15,750 cps



21 70 volts p/p, 15,750 cps

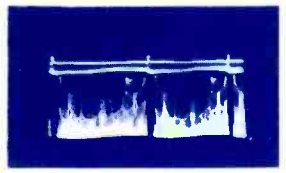
NOTES:

1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.
2. VOLTAGES MEASURED WITH A V.T.V.M. FROM POINT INDICATED TO CHASSIS GROUND.
3. COIL RESISTANCES READ WITH COIL IN CIRCUIT.
4. BALLOONS (10) (11) ETC., SHOWN ON SCHEMATIC, INDICATE WAVEFORM TEST POINTS.
5. CONTROL SETTINGS:
   VOLUME - MINIMUM
   CONTRAST - MID-RANGE
   BRIGHTNESS - MID-RANGE
   ALL OTHER CONTROLS SET FOR NORMAL OPERATION.

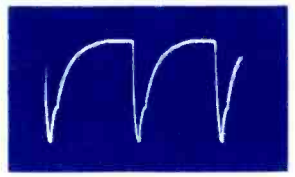


VERT. RATE 1.5 V P-P
SECOND DETECTOR
TP-3

VERT. RATE 90 V P-P
V205B PIN 9
VIDEO AMPLIFIER PLATE



VERT. RATE 90 V P-P
R224 & C246 JUNCTION
(ZONE 7A PW200 BOARD)



HORIZ. RATE 110 V P-P
V101 PINS 2 & 6
HORIZONTAL OUTPUT GRID

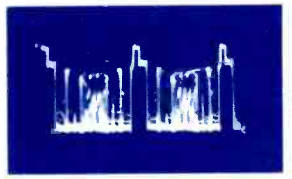
ELECTRONIC TECHNICIAN TEKFAX

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

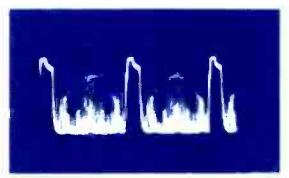
915

RCA VICTOR
TV Chassis KCS
152A

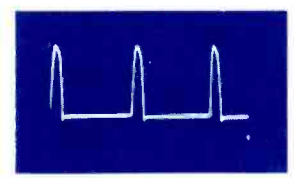
March 1965



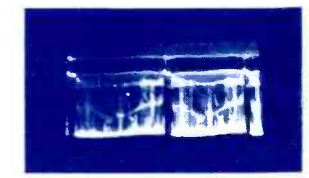
HORIZ. RATE 90 V P-P
V205B PIN 9
VIDEO AMPLIFIER PLATE



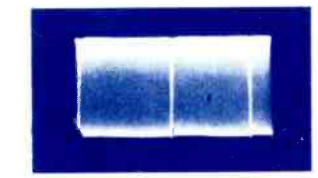
HORIZ. RATE 90 V P-P
R224 & C246 JUNCTION
(ZONE 7A PW200 BOARD)



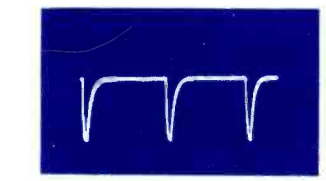
HORIZ. RATE 360 V P-P
V205A PIN 3
AGC PLATE



VERT. RATE 40 V P-P
V205A PIN 2
AGC GRID



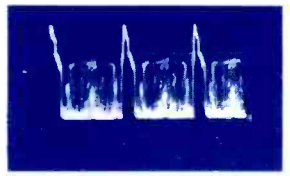
VERT. RATE 65 V P-P
V201B PIN 1
SYNC PLATE



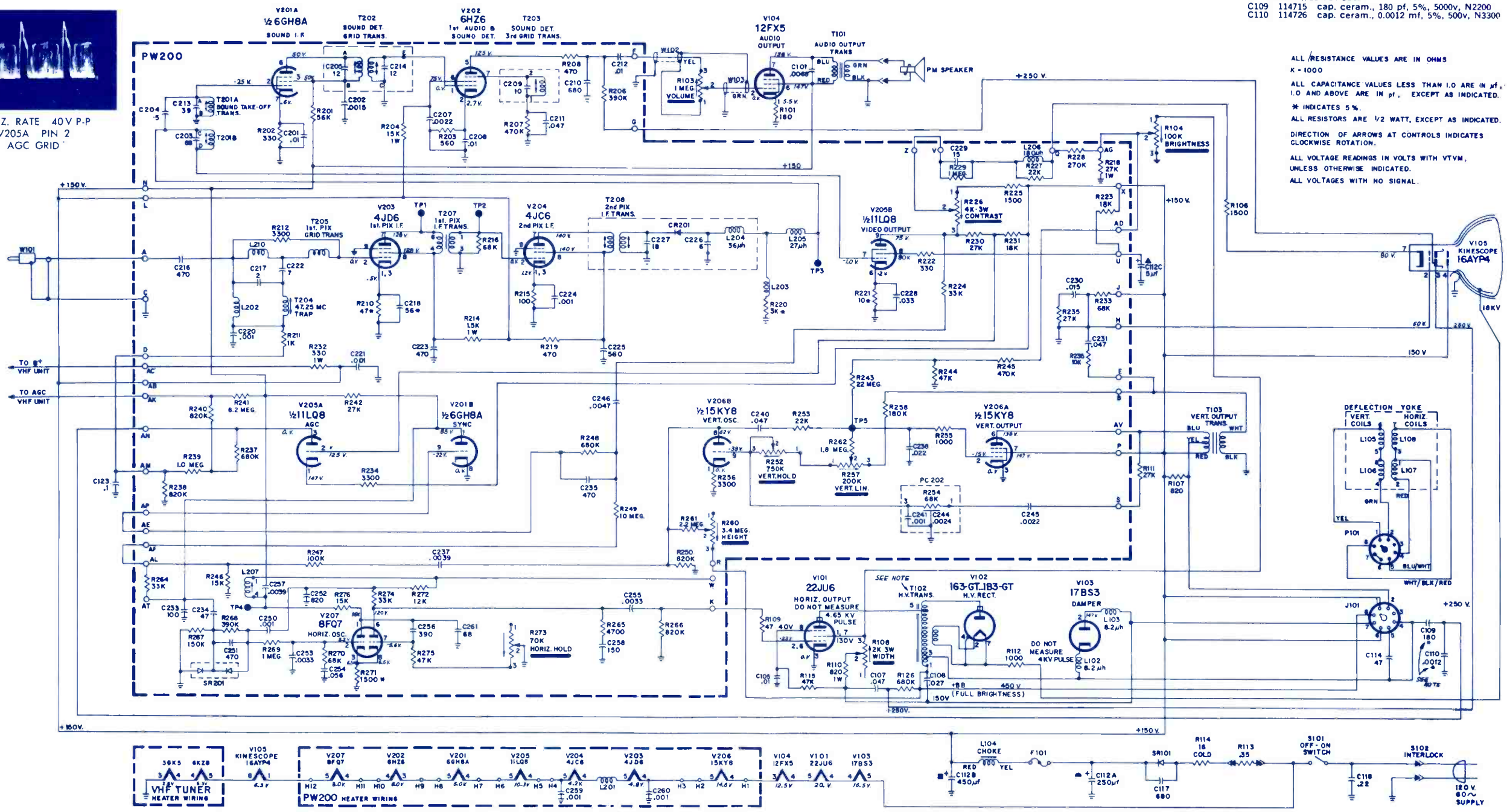
HORIZ. RATE 65 V P-P
V201B PIN 1
SYNC PLATE

NOTE:
with Transformer T102 marked 906183-501 RCA
Stock #114498 use:
C109 114478 cap. ceram., 150 pf, 5%, 5000v, N2200
C110 cap. ceram., 0.001 pf, 5%, 500v

with Transformer T102 marked 906195-501 RCA
Stock #114714 use:
C109 114715 cap. ceram., 180 pf, 5%, 5000v, N2200
C110 114726 cap. ceram., 0.0012 mf, 5%, 500v, N3300



HORIZ. RATE 40 V P-P
V205A PIN 2
AGC GRID



ALL RESISTANCE VALUES ARE IN OHMS
K = 1000

ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN µf, 1.0 AND ABOVE ARE IN µf, EXCEPT AS INDICATED.

* INDICATES 5%.

ALL RESISTORS ARE 1/2 WATT, EXCEPT AS INDICATED.

DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION.

ALL VOLTAGE READINGS IN VOLTS WITH VTVM, UNLESS OTHERWISE INDICATED.

ALL VOLTAGES WITH NO SIGNAL.

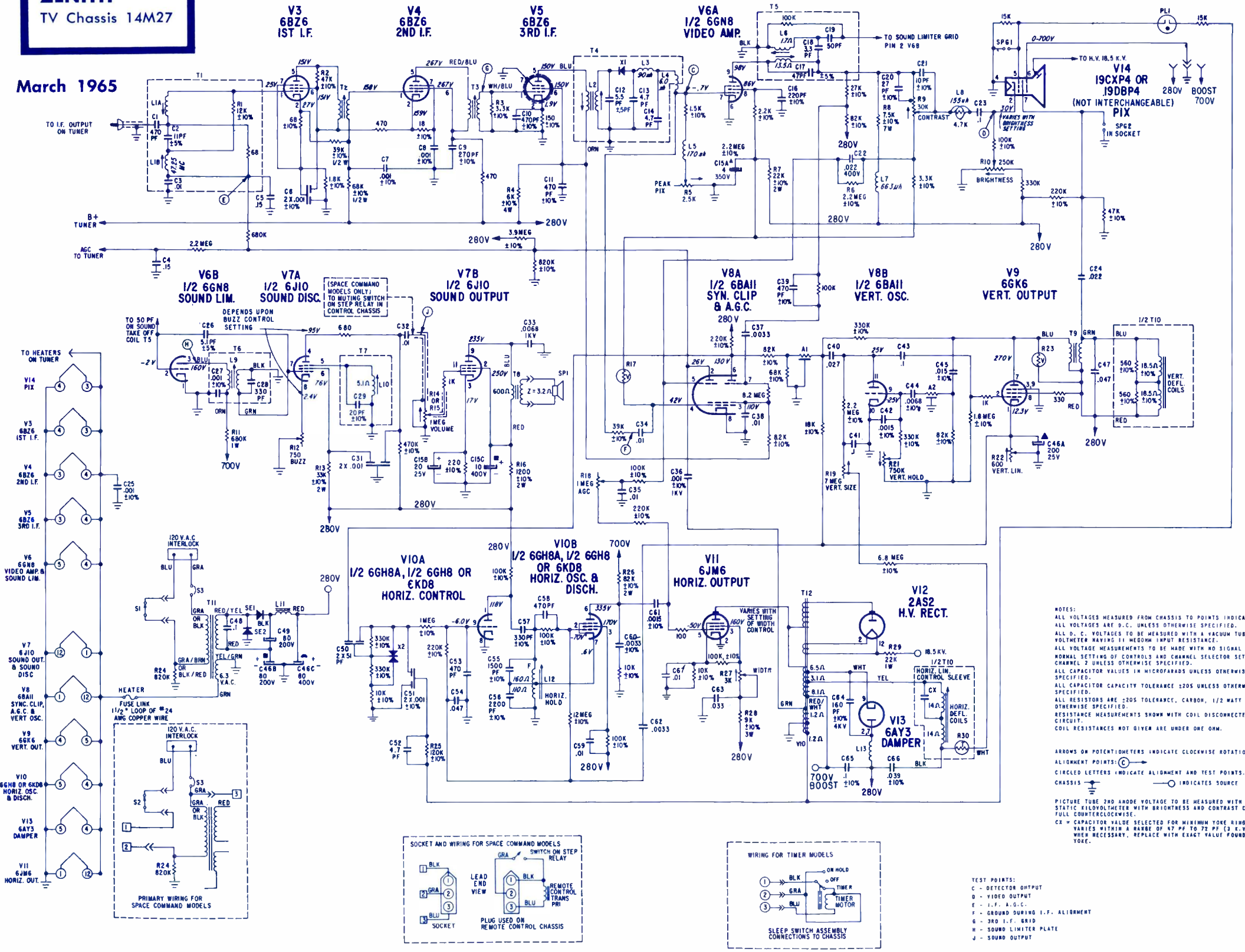
916

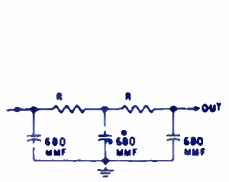
ELECTRONIC TECHNICIAN TEKFAX

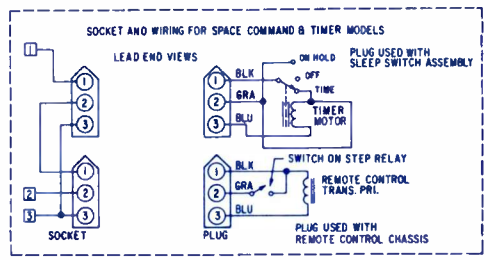
COMPLETE MANUFACTURER'S CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR EIGHT NEW SETS

ZENITH
TV Chassis 14M27

March 1965







ITEM NO.	PART NUMBER	DESCRIPTION	
C1	22-3217	470 PF DISC	500 V
C2	22-3866	11 PF DISC ±5%	500 V
C3	22-3	.01 MFD DISC	500 V
C4	22-3126	.15 MFD MOLDED	200 V
C5	22-3126	.15 MFD MOLDED	200 V
C6	22-21	2 X .001 MFD DISC ±10%	500 V
C7	22-17	.001 MFD DISC ±10%	1000 V
C8	22-17	.001 MFD DISC ±10%	1000 V
C9	22-3140	270 PF DISC ±10%	500 V
C10	22-16	470 PF DISC ±10%	500 V
C11	22-3363	470 PF DISC ±10%	500 V
C12	22-3221	5.6 PF ±.5 PF	500 V
C13	22-1516	4.7 PF BIMINICE	500 V
C14	22-1516	4.7 PF BIMINICE	500 V
C15A		4 MFD ELECTROLYTIC	350 V
C15B	22-2746	20 MFD ELECTROLYTIC	25 V
C15C		10 MFD ELECTROLYTIC	400 V
C16	22-2	220 PF DISC ±10%	500 V
C17	22-2467	47 PF DISC ±5%	500 V
C18	22-2363	3.3 PF BIMINICE	500 V
C19	22-3615	50 PF DISC	500 V
C20	22-3066	27 PF BIMINICE ±10%	500 V
C21	22-3250	10 PF DISC ±10%	500 V
C22	22-3884	.022 MOLDED ±10%	400 V
C23	22-3239	.1 MFD MOLDED	400 V
C24	22-3037	.022 MFD MOLDED	400 V
C25	22-17	.001 MFD DISC ±10%	1000 V
C26	22-3702	5.1 PF DISC ±5%	500 V
C27	22-3748	.001 MFD MYLAR ±10%	1000 V
C28	22-2866	330 PF MICA ±10%	500 V
C29	22-3139	20 PF DISC ±10%	500 V
C31	22-21	2 X .001 MFD DISC	1000 V
C32	22-3	.01 MFD DISC	500 V
C33	22-3021	.0068	1KV
C34	22-3	.01 MFD DISC	500 V
C35	22-3	.01 MFD DISC	500 V
C36	22-17	.001 MFD DISC ±10%	1000 V
C37	22-11	.0033 MFD DISC	400 V
C38	22-3	.01 MFD DISC	500 V
C39	22-6	470 PF DISC	1000 V
C40	22-5103	.027 MFD MOLDED	400 V
C41	22-3577	.1 MFD MOLDED	400 V
C42	22-12	.0015 MFD DISC ±10%	500 V
C43	22-3239	.1 MFD MOLDED	400 V
C44	22-3756	.0068 MFD MOLDED ±10%	200 V
C45	22-2264	.015 PAPER MOLDED ±10%	600 V
C46A		200 MFD ELECTROLYTIC	25 V
C46B	22-3863	80 MFD ELECTROLYTIC	200 V
C46C		80 MFD ELECTROLYTIC	400 V
C47	22-3537	.047 MFD MOLDED	200 V
C48	22-3230	.1 MFD MOLDED	400 V
C49	22-3985	80 MFD ELECTROLYTIC	200 V
C50	22-28	2 X 51 PF DISC	500 V
C51	22-21	2 X .001 MFD DISC ±10%	500 V
C52	22-1518	4.7 PF BIMINICE	500 V
C53	22-6	470 PF DISC	1000 V
C54	22-3537	.047 MFD MOLDED	200 V
C55	22-3916	1500 PF POLYSTYRENE ±10%	500 V
C56	22-3940	2200 PF MOLDED ±10%	400 V
C57	22-2667	330 PF MICA ±10%	500 V
C58	22-3938	470 PF DISC	500 V
C59	22-3	.01 MFD DISC	500 V
C60	22-13	.0033 MFD DISC ±10%	500 V
C61	22-12	.0015 MFD DISC ±10%	500 V
C62	22-11	.0033 MFD DISC	200 V
C63	22-3218	.033 MFD MOLDED	400 V
C64	22-3683	160 PF ±10%	4KV
C65	22-3172	.1 MFD MOLDED ±10%	600 V
C66	22-3905	.039 MFD ±10%	600 V
C67	22-3	.01 MFD DISC	500 V
R1	63-2845	12K OHM A.B. ONLY ±10%	1/2 W
R2	63-2872	47K OHM A.B. ONLY ±10%	1/2 W
R3	63-5304	3.3K OHM A.B. ONLY ±10%	1/2 W
R4	63-3579	6K OHM ±10%	4 W
R5	63-5181	2.5K OHM VIDEO PEAK PICTURE CONTROL	
R6	63-4077	2.2 MEGOHM A.B. SPEAR ±10%	1/2 W
R7	63-5726	22K OHM ±10%	2 W
R8	63-5260	7.5K OHM ±10%	7 W
R9	63-4097	30K OHM CONTRAST CONTROL	
R10	63-4098	250K OHM BRIGHTNESS CONTROL	
R11	63-6188	680K OHM	1 W
R12	63-3284	750 OHM BUZZ CONTROL	
R13	63-5166	33K OHM ±10%	2 W
R14	63-5126	1 MEGOHM VOLUME CONTROL & SWITCH	
R15	63-5156	VOLUME CONTROL ON SPACE COMMAND MODELS	
R16	63-5673	1200 OHM ±10%	2 W
R17	63-5314	VOLTAGE DEPENDENT RESISTOR	
R18	63-4833	1 MEGOHM AGC DELAY CONTROL	
R19	63-5415	7 MEGOHM VERTICAL SIZE CONTROL	
R21	63-4995	750K OHM VERTICAL HOLD CONTROL	
R22	63-5127	600 OHM VERTICAL LINEARITY CONTROL	
R23	63-5058	VOLTAGE DEPENDENT RESISTOR	
R24	63-4667	820K OHM	1/2 W
R25	63-5315	120K OHM I.B.C. ONLY ±10%	1/2 W
R26	63-5750	82K OHM ±10%	2 W
R27	63-3988	3K WIDTH ADJUSTMENT	
R28	63-5005	9K OHM ±10%	3 W
R29	63-6125	22K OHM	1 W
R30	63-5187	THERMAL RESISTOR MOUNTED IN YOKE	
L1A	5-57621	IST I.F. & TRAP COIL WINDING ASSEMBLY	
L1B			
L2	5-55140	4TH I.F. WINDING ASSEMBLY	
L3	20-2013	DETECTOR SERIES PEAKING COIL	
L4	20-2004	CHOKE COIL	
L5	20-2014	DETECTOR SHUNT PEAKING COIL	
L6	5-56785	SOUND TAKE-OFF WINDING ASSEMBLY	
L7	20-2017	VIDEO SHUNT PEAKING COIL	
L8	20-2501	VIDEO SERIES PEAKING COIL	
L9	5-51945	INTERCARRIER COIL WINDING ASSEM.	
L10	5-55229	QUADRATURE COIL WINDING ASSEMBLY	
L11	95-2189	FILTER CHOKE	
L12	5-56876	HORIZONTAL OSCILLATOR COIL ASSEM.	
L13	20-2005	SPOOK COIL	
T1	5-63559	IST I.F. & 47.25 MC TRAP COIL ASSEMBLY	
T2	5-57623	2ND I.F. TRANSFORMER ASSEMBLY	
T3	5-57624	3RD I.F. TRANSFORMER ASSEMBLY	
T4	5-57625	4TH I.F. TRANSFORMER ASSEMBLY	
T5	5-58035	SOUND TAKE-OFF ASSEMBLY	
T6	5-60851	INTERCARRIER COIL ASSEMBLY	
T7	5-55831	QUADRATURE COIL ASSEMBLY	
T8	95-2142	SOUND OUTPUT TRANSFORMER	
T9	95-2146	VERTICAL OUTPUT TRANSFORMER	
T10	95-2207	YOKE	
T11	95-2141 OR 95-2088	POWER TRANSFORMER	
T12	5-63280	HORIZONTAL SWEEP TRANSFORMER	
X1	103-23	DIODE CRYSTAL	
X2	103-20	DUAL SELENIUM DIODE	
A1	87-8	INTEGRATOR	
A2	87-7	INTEGRATOR	
CX		SUPPLIED WITH YOKE	
PL1	100-251	NEON BULB (NE2H)	
S1		SWITCH USED ON R14 VOLUME CONTROL NON-SPACE COMMAND MODELS	
S2	85-797	A.C. SWITCH ON SPACE COMMAND MODELS ONLY	
S3	85-703	CIRCUIT BREAKER	
SE1	212-27	SILICON RECTIFIER	
SE2	212-27	SILICON RECTIFIER	
SPG1	52-957	SPARK GAP SPECIAL VALUE	
SP1		SPEAKER	

NOTES:
ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
ALL D. C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT.
NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
ALL CAPACITOR CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE ±20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.
COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.

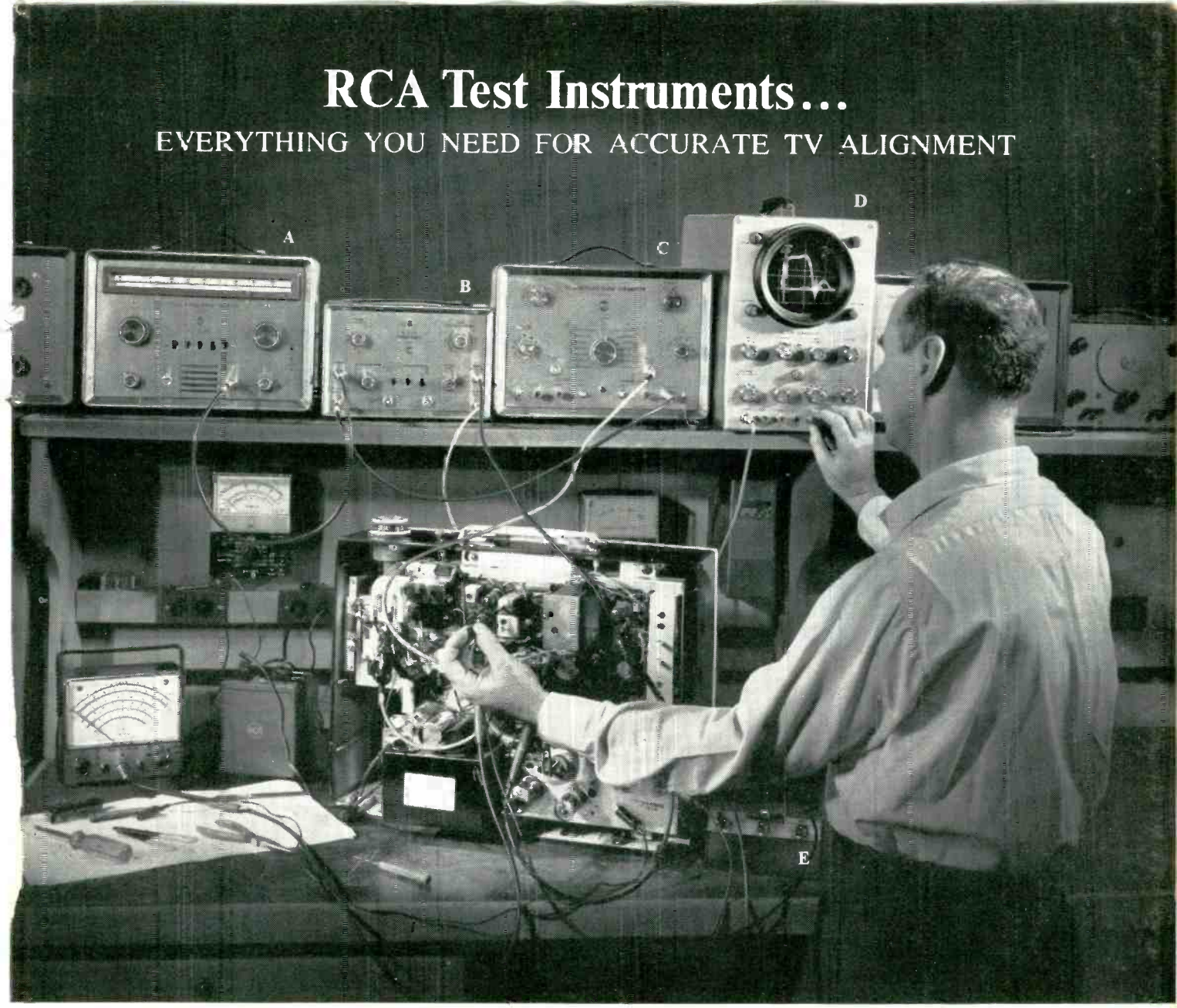
ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
ALIGNMENT POINTS: (C)
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS.
CHASSIS ⏚ —○ INDICATES SOURCE

PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLTMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTERCLOCKWISE.
CX = CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITHIN A RANGE OF 47 PF TO 72 PF (3 K.V., ±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.

TEST POINTS:
C - DETECTOR OUTPUT
D - VIDEO OUTPUT
E - I.F. A.G.C.
F - GROUND DURING I.F. ALIGNMENT
G - 3RD I.F. GRID
H - SOUND LIMITER PLATE
J - SOUND OUTPUT

RCA Test Instruments...

EVERYTHING YOU NEED FOR ACCURATE TV ALIGNMENT



Checking overall frequency response (RF and IF) in a portable B&W TV receiver using the test instruments described below. Pattern on oscilloscope screen is an overall response curve with dual markers: one at picture-carrier frequency and one at sound-carrier frequency.

(A) RCA WR-99A CRYSTAL-CALIBRATED MARKER GENERATOR

Supplies a fundamental frequency RF carrier of crystal accuracy for aligning and trouble-shooting color and B&W TV receivers.

- Most-used IF and RF frequencies indicated on the dial scale
- Sound and picture carrier markers available simultaneously

$256.50* complete with output cable.

(B) RCA WR-70A RF/VF/IF MARKER ADDER

For use with a marker generator and a sweep generator. Used for RF, IF, and VF sweep alignment color and B&W TV receivers. In visual alignment techniques, it eliminates distortion of sweep response pattern.

$74.50* complete with four coaxial cables.

(C) RCA WR-69A TELEVISION FM SWEEP GENERATOR

For visual alignment and trouble-shooting of color and B&W TV receivers, and FM receivers.

- IF/Video output frequency continuously tunable from 50 Kc to 50 Mc
- Sweep-frequency bandwidth continuously adjustable from 50 Kc to 20 Mc on IF/Video and FM; 12 Mc on TV channels

$295.00* complete with RF output cable and IF/Video output cable.

(D) RCA WO-91A 5-INCH OSCILLOSCOPE FOR COLOR-TV

A heavy-duty, wideband precision scope, essential for TV alignment and troubleshooting.

- New 2-stage sync separator assures stable horizontal sweep lock-in on composite TV signals
- Dual bandwidth: 4.5 Mc at 0.053 volt rms/in. sensitivity. 1.5 Mc at 0.018 volt rms/in. sensitivity

$249.50* including direct/low capacitance probe and cable, ground cable, and insulated clip.

(E) RCA WG-307B TV BIAS SUPPLY KIT

Three separate dc output voltages each adjustable from 0 to −15 volts provide bias voltages for aligning RF, IF and other circuits of COLOR and black and white TV receivers. **$11.95***

See them all at your Authorized RCA Test Equipment Distributor.

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MARCH 1965
VOL. 81 NO. 3

ELECTRONIC TECHNICIAN

WORLD'S LARGEST ELECTRONIC TRADE CIRCULATION

AN OJIBWAY PUBLICATION

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Ojibway Building, Duluth, Minn. 55802

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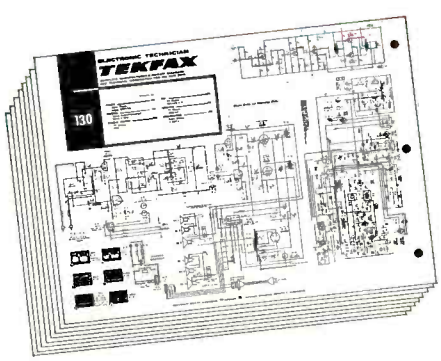
Cover

The TV-radio, Hi Fi and industrial electronics distributor is an important cog in the giant $16-billion-plus electronics industry wheel. He's attending National Electronics Week parts distributor shows in New York at the end of this month.

FEATURES

DEPARTMENTS

TEKFAX ——— 16 PAGES OF THE LATEST SCHEMATICS



ADMIRAL: TV Chassis C21B12-1, 13-1, C21C12-1, 13-1, 15-1

AIRLINE: TV Chassis 12-124-24U and 12-124-34U

GENERAL ELECTRIC: TV Chassis SA

MAGNAVOX: TV Chassis 48 Series

MOTOROLA: TV Chassis TS-584-05-H

PHILCO: TV Chassis 15N30

RCA VICTOR: TV Chassis KCS 152A

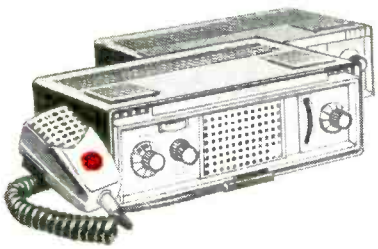
ZENITH: TV Chassis 14M27

FREE from RCA!

WIN ONE OF BRAND-NEW 1965

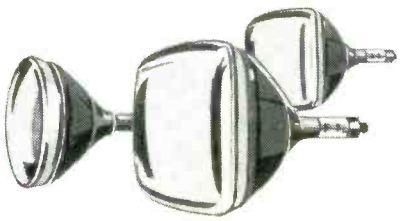
Plus over 100 additional prizes awarded in

EACH GRAND PRIZE CHEVY-VAN LOADED WITH THESE RCA PRODUCTS



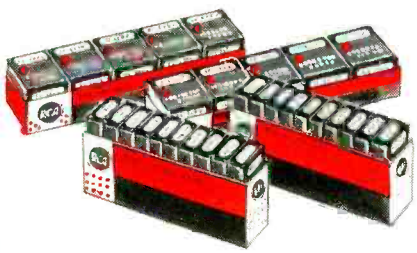
A.
A pair of new RCA Mark-Nine CB radio units for fastest shop-to-truck communication in your neighborhood.

B.
An RCA Treasure Chest Tube Caddy fully loaded with the fastest selling RCA replacement receiving tube types.

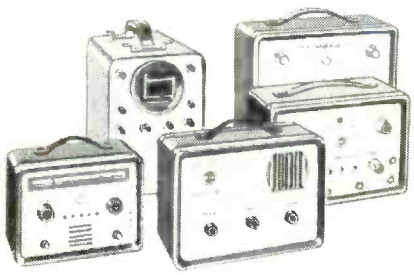


C.
One RCA Colorama picture tube and two popular RCA Silverama black-and-white replacement picture tubes.

D.
A colorful, attractive counter merchandiser fully stocked with RCA transistor radio batteries.



E.
Two complete kits of RCA's "Top-of-the-Line" replacement transistors for entertainment-type equipment.

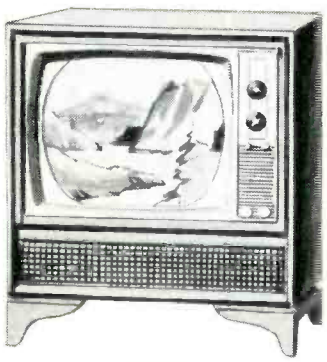


F. Five RCA popular and versatile test instruments:
RCA WR-64A Color Bar/Dot/ Crosshatch Generator
RCA WO-33A Super-Portable 3" Oscilloscope
RCA WR-69A Television/FM Sweep Generator
RCA WR-99A Crystal-Calibrated Marker Generator
RCA WR-70A RF/IF/VF Marker Adder

THESE NINE CHEVY-VANS !!!

nine separate regions of the United States!

ADDITIONAL PRIZES INCLUDE:



18

SECOND PRIZES:
RCA Victor Color TV Sets

27

THIRD PRIZES:
RCA Victor Black-and-White Portable TV Sets

72

FOURTH PRIZES:
RCA Victor Portable Transistor Radios

RCA's 1965 Regional Sweepstakes is for Radio/TV/Hi-Fi Service Dealers and Technicians EXCLUSIVELY!

NO JINGLES TO WRITE—NOTHING TO GUESS—NOTHING TO BUY! Simply pick up and fill out an entry blank and official rules at your RCA Distributor.

Enter as often as you like. Each entry must be submitted and mailed separately. See your Participating RCA Distributor right away.

This offer not made in states and localities where restricted or prohibited, such as Wisconsin and Florida.

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

The Most Trusted Name in Electronics

247 WAYS TO MAKE MORE

From now on, color-TV work is going to bring in a bigger and bigger part of your income. And RCA has EVERYTHING to make color-TV service MORE PROFITABLE for you.

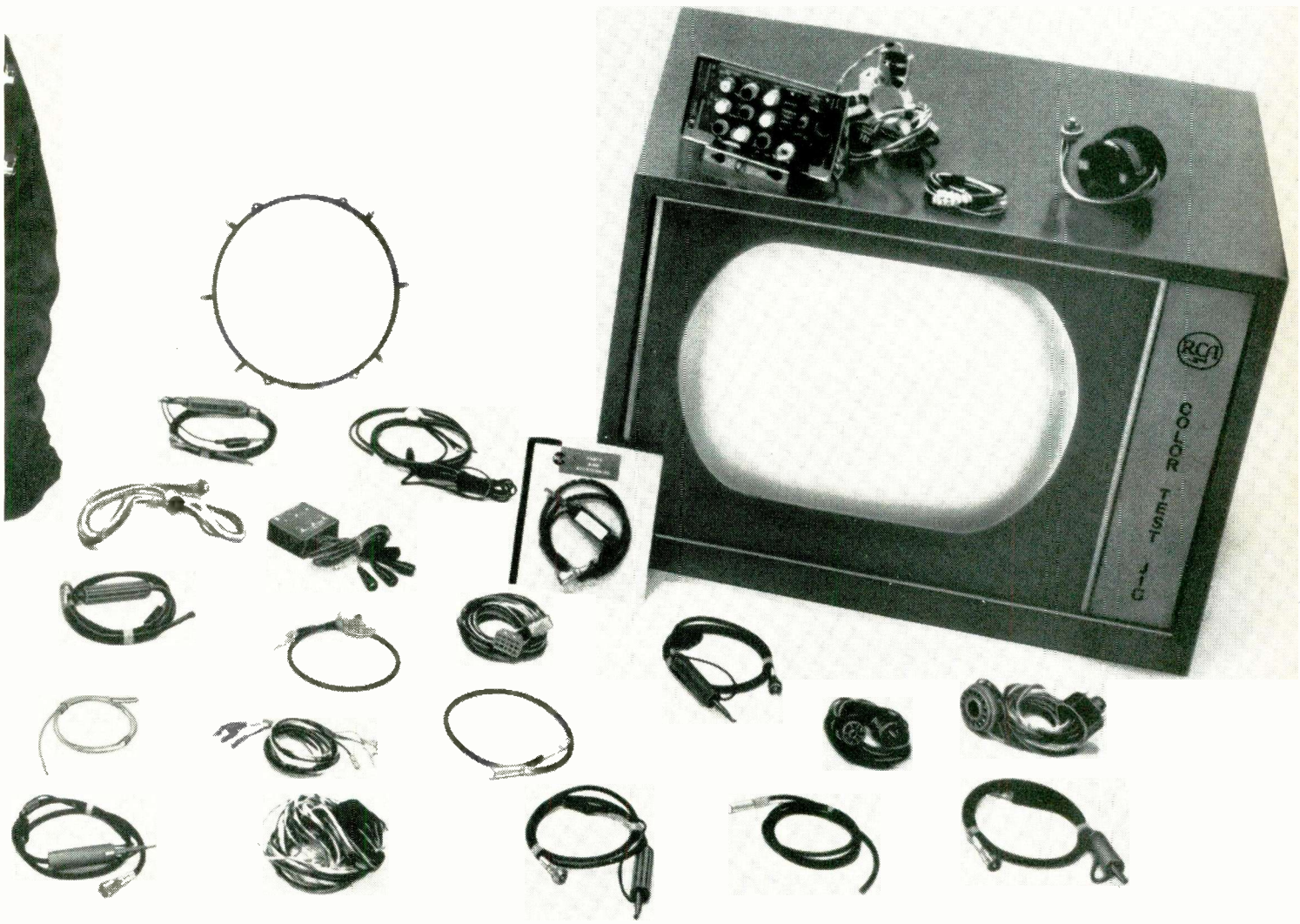
To save you money and manhours.

To increase your efficiency so you can get more jobs out in the same time.

To eliminate those time-wasting extra phone calls and trips to the distributor.

Take the famous RCA Color-TV Test Jig (large unit at right). *It cuts manhours in half* on a color house call. Without it, when you have to pull a set into the shop, it takes two men. With it, it takes just one (you pull the chassis only—leave the color tube and the cabinet). That means MONEY *... extra money for you.*

Take the RCA Color Parts Rack (large unit at left). The rack is FREE when you buy the basic complement of 120 most-needed color service parts. Keeps your color parts neatly organized, all in one place. Simplifies restocking, lets you know what you're short of. No more running out of a vital part just when you need it—which slows down a job.



MONEY IN COLOR-TV SERVICE

That means MONEY... *extra money for you.*

Take the other color service parts arrayed in the photo and listed at right. Degaussing coils, transformers, chokes, yokes, connectors, cables, replacement parts... each with a special function to save you time, to increase the quality and accuracy of your work, to help you cut down on call-backs. That means MONEY... *extra money for you!*

245 specialized color service parts in all. The Rack and the Jig make it 247. And all of them mean MONEY... *extra money for you.*

RCA PARTS AND ACCESSORIES, DEPTFORD, N.J.

The Most Trusted Name in Electronics

RCA Parts and Accessories for color-TV service include: *Color Test Jig*—to test all RCA color-TV chassis • *Color Parts Rack*—sturdy, well-organized unit containing complement of 120 most-needed color-service parts • *Degaussing coils*—to demagnetize picture tube and chassis • *Special-purpose extension cables*—to extend kinescope socket, deflection yoke, convergence magnet and kinescope high-voltage leads when chassis is removed from cabinet for servicing • *Special alignment probes*—video detector test blocks, IF test blocks, sound detector test blocks, mixer grid matching pad, tuner IF input head • *High-voltage interlock plug*—to by-pass high-voltage shorting switch • Plus sockets, transformers, fixed and variable capacitors, reactors, resistors, diodes, switches, coils... EVERYTHING to save you time and make *more money for you* in color-TV service.

LETTERS TO THE EDITOR

More on Certification

Read the article "Look Up — Move Up" in the August issue with considerable interest. Would appreciate further information.

WINTON TESTON
Thomson, Ga.

Have read the article on page 68 of the August issue of ELECTRONIC TECHNICIAN and am most interested in certification.

OREN E. SEIDEL
East Palestine, Ohio

Have read your article, "Look Up — Move Up," by Louis E. Frenzel . . . It was a wonderful article and a wonderful idea.

FRANK G. R. BOBER
East Granby, Conn.

Have been a subscriber of ET for many years. Have been in electronics twenty-five years . . . Am interested in technician certification . . .

ANTHONY MAZZELLA
Yonkers, N. Y.

I am extremely interested in the certification program . . .

WILLIAM J. WYANS
Butte, Mont.

Just read Frenzel's article in the August issue . . . A great opportunity!

NELSON DELISLE
St. Clair, Mich.

We are interested in obtaining further information and application materials on how to become a certified engineering technician . . .

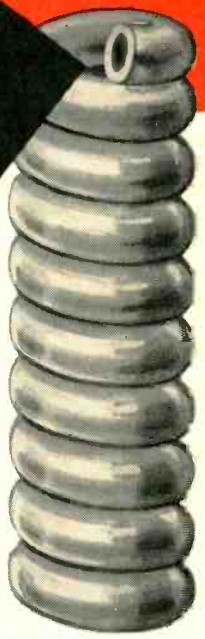
G. H. AULT
Senior Technician
Cleveland, Ohio

Just completed reading the article "Look Up—Move Up" in ELECTRONIC TECHNICIAN and was quite impressed . . .

FRANK DOUCET
Dartmoth, N. S., Canada

Have you tried new QUIG® connectors?

Not just another wire spring connector!
The 3-in-1 QUIG is brand new and different . . . Copperweld wire inner core, a layer of flux, and an outer jacket of solder . . . all you need is heat!
Makes one-handed soldering possible!



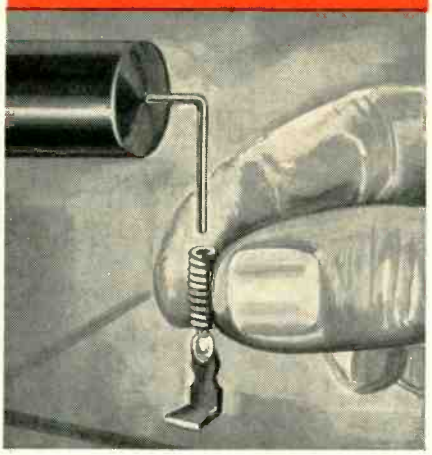
Ten times actual size

Once again, Sprague helps the TV-radio service industry by solving two increasingly serious problems . . . parts replacement in those "inaccessible" chassis nooks, such as crowded tube sockets, as well as soldering onto the delicate circuitry of printed wiring boards.

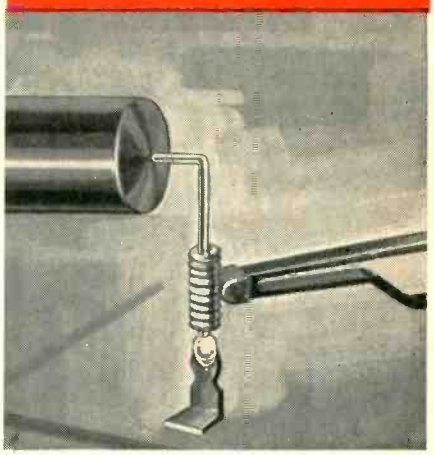
Mechanically sturdy and electrically reliable, the revolutionary QUIG provides fast, expertly-soldered connections as easy as A-B-C!

A Snip Lead

B Slip on QUIG



C Heat QUIG, Connection Made!



NOBODY ELSE HAS QUIG CONNECTORS... YOU GET 'EM ONLY FROM SPRAGUE PRODUCTS!

QUIGS are now being packed with Sprague Atom® Capacitors *at no extra cost to you!* Whenever you need tubular electrolytics, insist on pre-packaged Sprague Atoms from your parts distributor and you'll automatically get your QUIG component connectors . . . the biggest boon to the service technician since the soldering gun!

SPRAGUE®
THE MARK OF RELIABILITY

WORLD'S LARGEST MANUFACTURER OF CAPACITORS

65-4104

LETTERS TO THE EDITOR

Time Flies

One can hardly realize it has been 3 years since I first received ELECTRONIC TECHNICAN. How time flies . . . I am well pleased with ET. . . Please renew my subscription for another 3 years.

S. BIRCH

Camden, N. J.

Needs TEKFAX

I need TEKFAX folders 345 through 388 for 1957, 473 through 542 for 1959 and 773 through 811 for 1963. Can anyone help me?

IRWIN KAMNER

Philadelphia, Pa.

Haywired

Please forward this to Bill Ganglinger. "Enjoyed your interesting article 'Sound—The Easy Section' in November 1964 ELECTRONIC TECHNICIAN. But something seems haywire. Referring to Fig. 1, I should think that increasing volume will reduce the voltage on the audio grid, reduce plate current—reducing IF B+. And I am curious to know what kind of meter you used to make your voltage checks in connection with Fig. 4. . . But carry on, there's plenty of room for good practical stuff like yours."

BOB ELDRIDGE

Vancouver, B.C.

. . . Regarding Ganglinger's article "Sound—The Easy Section," it seems to me that when you increase your volume (Fig. 1) you will be moving your control wiper toward the voltage amplifier plate voltage (which is a lower voltage), not toward the B+ voltage. It would appear that this would cause the tube to conduct *less* (not more) and the voltage developed across the cathode resistor (7.5K) will be less, therefore the supply voltage to the IF would be less.

JOSEPH ELLIS

Milford, Conn.

• *This should have read: ". . . increasing the volume control setting allowed less positive voltage to leak onto the output grid. This caused the tube to conduct less, reducing the supply voltage to the IF." It's easy to get mixed up when oversimplifying what takes place when a fault develops in this tricky circuit. It should have been explained too that when the bias on this tube is increased negatively, the internal resistance of the tube rises and increases the B+ dropped across the tube. Less voltage will then be available at the cathode.—Ed.*

Friends In Need

I need a schematic for a Shell S10 tube checker made by the Shell Electronic Mfg. Co. . . Can anyone help me? . . . Thanks for publishing a top-notch magazine for technicians.

GERALD J. WENIGER

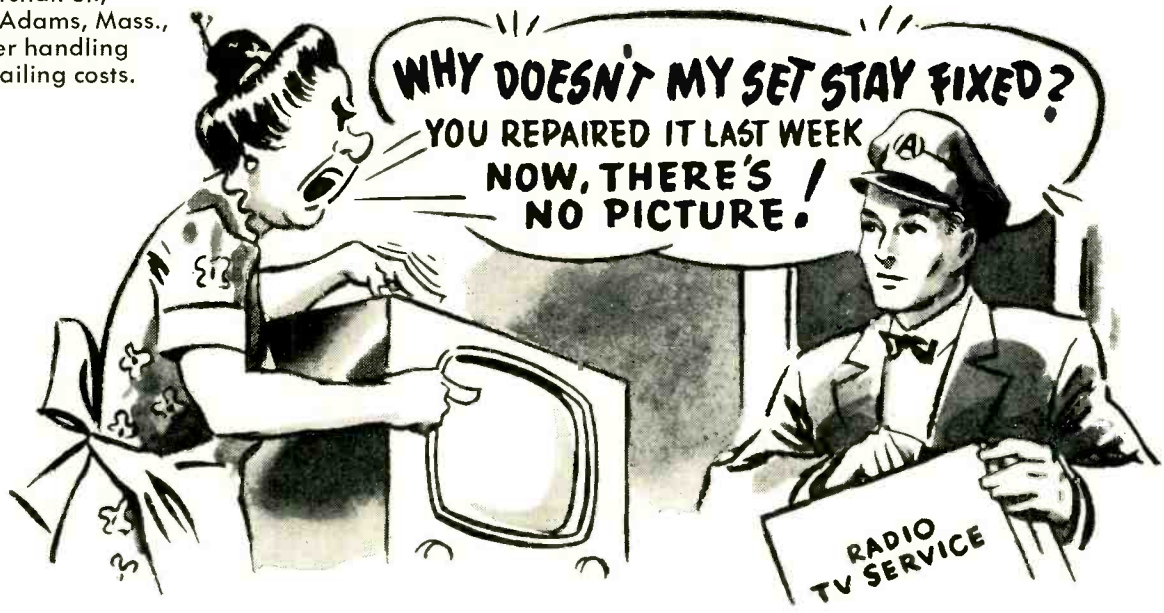
Honesdale, Pa.

. . . And I have a tube tester/VCM combination, model 804A Radio City Products instrument. Is this manufacturer out of business? I need their or absorbing company's address.

RANDY ACORMAN

Camden, N.J.

For window-size blow-ups of this message, send 10¢ to Sprague Products Co., 65 Marshall St., North Adams, Mass., to cover handling and mailing costs.



HERE'S YOUR ANSWER, MR. AND MRS. SETOWNER!

999 times out of a thousand, when this happens . . . *don't blame your service technician!*

The repair to your television receiver made several days ago or even several months ago probably had no relation to the new trouble that developed today.

Actually, there are more than 300 electrical parts in even a small table model television receiver. Trouble in any one of them might cause the picture or sound to disappear or to be received poorly.

Take your automobile for instance. Tuning up the motor today is no guarantee against a tire blowout tomorrow!

Such a thing is easier to understand because most of us are more familiar with automobiles than with today's highly complicated TV and radio sets. But such unconnected troubles occur in TV and radio nevertheless—and because they are so hard to explain in non-technical terms, it is always embarrassing to your service technician when they do.

His continued business existence is based on gaining the full confidence of you and other set owners like you. He isn't in business to "gyp" you or to overcharge you. His success is based on doing each and every job to the level best of his ability, at a fair price for his skilled labor. It's only when you patronize the shops that feature "bargains" at ridiculously low prices that you need worry. Good radio and TV service can't be bought on the bargain counter! Set owners who recognize this aren't likely to get "gypped."

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

YOUR INDEPENDENT TV-RADIO SERVICE DEALER

65-6101

EDITORS' MEMO

Keeping up with the Times

We would like to direct your attention to an article in this issue titled "Comes the Revolution." It touches briefly — and belatedly — on just one facet of a broad subject. We hope this article will start many ELECTRONIC TECHNICIAN readers thinking in a certain direction: *Keep abreast of technological developments; keep going to school.*

In certain respects, we live in an age unlike any other age recorded by man. We have all heard about the information and knowledge explosions; how technological developments are taking place at a very rapid rate. In fact, it seems clear that technological developments during the past 50 years have been moving at an exponential rate—at a more rapid rate each decade. Many skilled jobs do not last as long now as they did only a few decades ago.

For example, over a few decades, we have observed three distinct techniques and skills in a single, specialized area evolve to a high level in succession and then become obsolete.

First came the Morse telegraph in 1843 which eventually developed into a new industry and created jobs for skilled American Morse telegraphers. Then came radio, followed eventually by international point-to-point communications—after World War I. This technique required a different breed of Morse telegrapher—the International Morse telegrapher. Within less than three decades after this, both the American Morse and International Morse telegrapher were being replaced by high-speed teleprinters which required only the skill of a typist. Now—within less than two decades—higher-speed computer-controlled hardware transmits messages at fantastic speeds; and it routes the messages to their destination automatically!

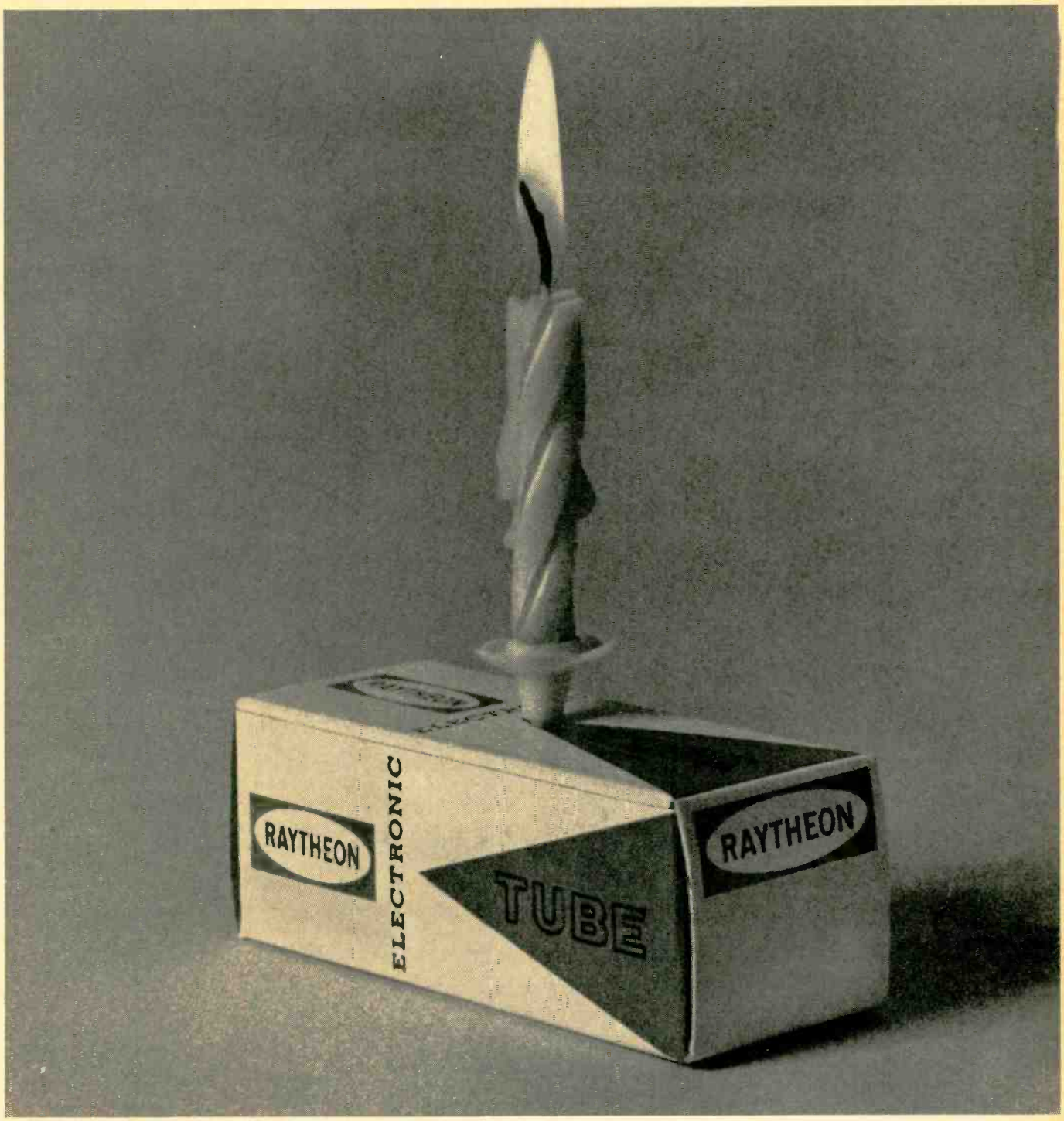
An outstanding educator has said recently that many of the skills now in existence will disappear completely before children now beginning grade school can graduate from college.

How can working electronic technicians keep abreast of this on-rushing technological tide? If you are not near a school where you can attend evenings, then home-study courses may be a solution to your problem. And you can set your own study speed.

But, before you begin to augment your knowledge, you need to select a reputable school. A good way to go about this is to contact the National Home Study Council, 1601 18th Street, N.W., Washington 9, D.C. They can furnish you with a list of accredited schools in the home-study area.

MOVING?

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



thank you

This year Raytheon celebrates its 40th anniversary of manufacturing top quality receiving tubes. Your acceptance of Raytheon products has helped make this possible.

During these forty years we have introduced many new and improved types to provide you with more reliable, better performing and more profitable products. Millions of Raytheon tubes serve in critical government and industrial applications as well as in the finest TV sets ever made.

In the future we will continue to meet your needs with high quality, low-cost receiving tubes designed to improve your profits through fewer call-backs and increased customer satisfaction.

And, Raytheon will always serve the best interests of you — the independent service dealer and technician.

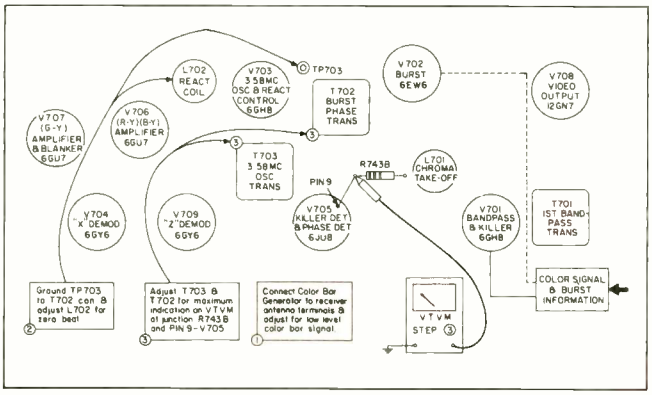
RAYTHEON thank you

TECHNICAL DIGEST

WESTINGHOUSE

Color Chassis V-2476-1 — Color Demodulator Phasing Adjustment, Field Procedure (See TEKFAX No. 900 Jan 1965)

To check the color demodulator phasing adjustment in the field, connect a rainbow type color bar generator to the antenna terminals of the receiver and adjust for a normal color bar pattern on the screen of the color picture tube. Then proceed as follows: (1) Set the tint control to the center of its range, and turn the killer control fully counterclockwise. Shunt the green and blue picture tube grids to ground through 100,000Ω resistors at points "MM" and "L" on Chroma Board. (2) Observe the bar pattern on the picture tube with the tint control at the center of its range, adjust T702 so that the sixth bar is about the same brightness as the background. (3) Rotate the tint



control from one extreme to the other. At one extreme, the seventh bar should be about the same brightness as the background. Repeat the adjustment of T702 until the above conditions are obtained at or near the extremes of the tint control range. After adjustment, return the tint control to the mid-position where the sixth bar is the same brightness as the background. (4) Move the 100,000 Ω shunt from "L" to "H" and observe the bar pattern on the picture tube for correct B-Y output, (third and ninth bars at same brightness level as the background). (5) Move the 100,000 Ω shunt from "MM" to "L" and check for correct G-Y output. The first and seventh bars should be the same brightness level as the background. Readjust the killer control, using color snow, so that color just disappears from the raster. Check on color signal to assure setting is not killing on color.

GENERAL ELECTRIC

TV Chassis TA, Horizontal Buffer Amplifier, Horizontal Output and High Voltage Circuits — Circuit Operation

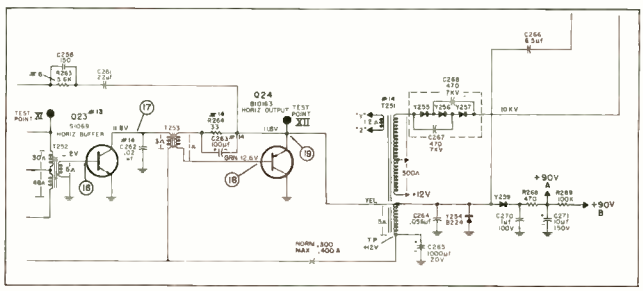
The negative horizontal oscillator signal which is present across the primary windings of T252 is inductively coupled to the secondary. The secondary winding of T252 is phased so that the signal which is fed to the base of Q23, the horizontal buffer amplifier, is a positive-going pulse. The signal is amplified by the transistor and appears in its collector circuit across the primary winding of T253.

Q23 is an NPN silicon transistor. The collector voltage is supplied from the 12 v supply through the primary winding of T253. The presence of C262 from the collector to ground will damp the oscillations that are present across the primary of T253 during flyback time. The effective capacity of C262 across the primary of T253 will lower the frequency and amplitude of these oscillations.

The horizontal output transistor, Q24, is a germanium PNP type which is connected as an emitter-follower. For simplicity, this transistor can be considered to function as a switch. The transistor conducts during trace time and is cut off during retrace time by the positive horizontal pulse which is applied to its base from the secondary of T253.

When power is first applied to the horizontal circuit, C266 will charge to the polarity shown in the main schematic diagram. During the time Q24 is conducting it presents a low impedance current path to chassis ground and C266 will discharge. Since the yoke horizontal windings are in series with C266, current will flow through the yoke when the capacitor is discharging through Q24. This current will rise linearly to produce the sawtooth waveform which is needed to deflect the picture tube electron beam, thus creating horizontal sweep.

The positive horizontal pulse arriving at the base of Q24 cuts off the transistor at the end of trace. The timing of this pulse initiates the horizontal retrace period. While this pulse is present it reverse biases the emitter-base junction of Q24 to the point that it causes the junction to break down, and through zener diode action, reverse current will flow through the junction, charging C263 with



base end negative. This is in such a direction as to help to keep the transistor on during the entire trace period.

When the positive pulse at the base of Q24 cuts the transistor off, the energy which is stored in the magnetic field of the yoke collapses. This action will shock the resonant circuit, which consists of L251A, L251B, C266, C264 and the primary winding of T251; into oscillation at a frequency of approximately 50 kc. The resonant frequency of this circuit dictates the horizontal flyback time which is equal to 10μs. This circuit would continue to oscillate if it were not for the damper diode Y254. The damper diode will conduct during the first negative half-cycle of this oscillation, thus damping the circuit to a point where it

LET'S GET DOWN TO BUSINESS

...in Color-TV Service

Make your shop look like it means business. You can with business-like technical, promotional, business and service aids from RCA... with the emphasis on color TV service. Remember, more and more of your service jobs will be color TV jobs.

TECHNICAL AIDS... to help you further develop your professional skills.

The famous RCA Color TV Troubleshooting Pict-O-Guide. Completely revised and updated, it's the quick and easy, all in one, profusely illustrated guide to proper troubleshooting and alignment of color TV sets. A **MUST** reference book, if you want to make money in color TV service. Form #1A1389.

Also available (not shown): **RCA Institutes Color TV Home Study Course,** the basic definitive course in color servicing; 8 graded lessons, counselling and examination service. Form #1A1325.

PROMOTIONAL AIDS... to help you attract more customers.

Illuminated Flashing Window Display (at left on counter).
A real attention grabber for your window or counter. Alternates between full color and black and white to dramatize both services. Form #1A1491.

Color TV Service Banner (on wall). In rich red satin, for door, wall or window display. Form #1A1492.

Also available, (not shown) are a transparent window streamer, ad mats for local newspapers, post cards and envelope stuffers all promoting your color TV service capabilities.

BUSINESS AND SERVICE AIDS... to help make your job easier.

RCA Receiving Tube Floor Merchandiser (left) Spacious, 6 foot gravity feed metal shelving unit in bright red baked enamel finish. Seven shelves with adjustable dividers for each shelf. Helps you keep a really good supply of tubes in one well organized area. Form #1A1504.

RCA Receiving Tube Wall Merchandiser (rear) Three feet high and three feet wide, a metal gravity feed shelving unit finished in red baked enamel to hang on wall or rest on counter. Form #1A1503.

RCA TV Tool Kit (on counter) Contains 12 most needed TV tools: 3 aligners, aligning wrench, tuning wand, 3 trimming tools, standard and recessed screwdriver, solder aid, heat sink and clamping type tweezers... just about everything you need on a service call in one container; also handy in the shop. Form #1A1509.

RCA Superweld Tube Caddies. Large "Treasure Chest" caddy (1A1001A) shown on counter at right holds up to 362 receiving tubes. Junior version (1A1002A) (not shown) holds up to 234. Both feature a Superweld vinyl covering that protects like armor.

You'll also want to ask your RCA distributor about store hours signs, door knob hangers, and weekly work schedule pads from RCA.

These are the aids you really need in your business.

AVAILABLE THROUGH YOUR LOCAL AUTHORIZED RCA TUBE DISTRIBUTOR.

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N. J.
The Most Trusted Name in Electronics

TECHNICAL DIGEST

cannot oscillate. While the damper diode is conducting, current will flow through the yoke which will charge C266 and start the horizontal trace period again. The diode will furnish most of the current for the first one-half of the trace time; however, some current will flow through Q24 during this time. The entire current will flow through Q24 during the latter one-half of the trace period.

When the magnetic yoke field collapses there is a positive pulse generated across the primary winding of T251 which is caused by the oscillatory action of the resonant circuit. This pulse is inductively coupled to the secondary windings of T251 through its autotransformer action. The positive pulse that appears across the lower end of the secondary winding is rectified by Y259, the high B+ rectifier. The rectified voltage will appear at the junction of R268 and C271 at a potential of 90 v. The combination of C270, R268 and C271 represents a pi filter network to smooth the ripple out of the 90 v supply.

The positive pulse which appears at the top of the secondary winding of T251 is coupled to a voltage doubler circuit consisting of Y255, Y256, Y257, C267 and C268. The output of this circuit is approximately 10KV which supplies the anode voltage for the picture tube.

MAGNAVOX

TV Chassis 48 Series — Circuit Description (See TEKFAX No. 912 this issue)

The 48 Series TV chassis are series filament types designed for portable television instruments. The majority of the components used are contained on a single printed board. Major components are located elsewhere on the main chassis assembly.

These chassis have a video bandpass of approximately 3.0 Mc at the 6 db level. The video IF circuit employs a 4EH7 tube and a 4EJ7 tube. The first IF stage is AGC controlled. Traps are provided in the input which are tuned to 41.25 Mc and 47.25 Mc. A IN60 diode is used as the video detector and this diode is mounted on the coil form.

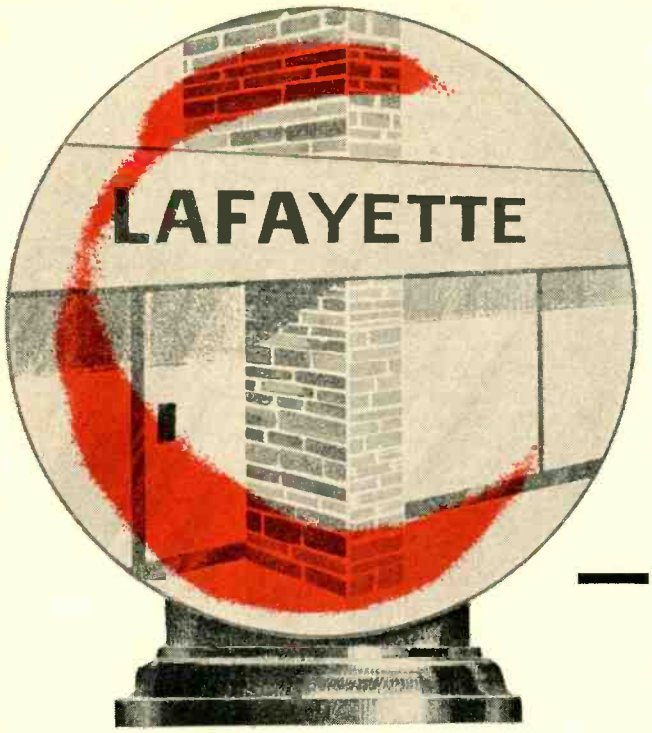
The pentode section of a 10JY8 tube is used as the video amplifier. Contrast variation is obtained by a variable control which functions as part of the plate load thus controlling the gain of this stage. A double-tuned 4.5 Mc trap, located in the plate circuit of this video amplifier, serves two functions. First it is used to keep the 4.5 Mc from the video signal being coupled to the picture tube and second it is used as the sound take-off coil.

The audio section employs the triode section of the 10JY8 as the sound IF amplifier and a 17BF11 which functions as a gated beam detector and audio output.

An 8B10 type tube containing three triodes function as the AGC amplifier, sync separator and horizontal AFC.

The triode which functions as the AGC Amplifier has its control grid connected to the +145 v source through the AGC control and also to the plate of the Video amplifier. The cathode, although containing a cathode resistor to ground is also returned to the boost source. Under normal conditions, the positive potential at the cathode, being greater than that at the grid will bias the tube well below cut-off. The signal appearing at the grid is a sync positive composite video signal. Components are chosen so only the sync pulses will drive the grid out of cut-off. The

NO ONE CAN GUARANTEE YOUR FUTURE



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TECHNICAL DIGEST

instant the sync pulse appears on the grid, the plate which is capacitively coupled to a tap on the HV transformer, is driven positive by the pulse obtained from the HV transformer thus allowing the tube to conduct. Since the tube will only conduct when its plate is positive, any noise pulses which may occur between sync pulses cannot cause the tube to conduct, therefore, the noise pulses will have no effect on the AGC voltage.

The second triode section of the 8B10 tube functions as the sync separator. The sync-positive composite signal coupled in at the grid strips the video from the signal allowing only the sync pulses to appear at the plate. The vertical pulses are coupled to the vertical circuit through the 560 pf. capacitor (C167). The horizontal pulses are coupled to the horizontal AFC circuit through the 100 pf. capacitor (C183).

The third triode section of the 8B10 tube functions in an unbalanced horizontal AFC circuit. This circuit compares the phase difference between the sync pulses from the sync separator and the horizontal retrace pulse supplied from the horizontal output transformer. Circuit design and components are chosen to provide a zero dc reference level at the grid of the horizontal oscillator.

The vertical output stage consists of a 17JZ8 tube connected in a conventional multivibrator-output circuit. The vertical linearity controls the bias on the grid of the output stage. The height control, connected in the plate circuit of the triode section controls the gain of the oscillator stage. The vertical hold determines the bias on the grid of the oscillator stage.

The horizontal oscillator circuit consists of a single 8FQ7 connected in a common cathode multivibrator circuit. The L C network in the plate circuit of the first section is used to set the horizontal frequency. The range control (VR105) is used as a coarse frequency adjust and the horizontal hold control (VR104) acts as a fine-frequency adjustment.

The modified sawtooth appearing at the output of the multivibrator is coupled to the grid of the pentode section of a 33GY7 tube which functions as the horizontal output tube. The diode section of this same tube is used as the damper tube A B+ boost voltage of approximately 350 v is obtained.

RCA

Color CRT 25AP22 — Description

This 25-in. rectangular glass picture tube is a triple-gun shadowmask type. The screen has nearly straight sides with sharply rounded corners. A small neck diameter makes possible a high sensitivity deflecting yoke. This permits the wide angle deflection with approximately the same power required to scan a color picture tube having 70° deflection angle and 2 in. neck diameter.

It uses electron-gun assembly with unitized cathode construction supported by glass beads. The heaters are also supported from the same glass beads. The tube has an integral glass-button base having straight-through leads fitted with a keyed wafer. It has an integral protective window which is sealed to the faceplate with a clear resin. This construction eliminates the need for a separate safety-glass window and its companion dust seal in the receiver.

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You'll find your Sylvania Distributor a specialist in industrial and commercial tube types for your equipment inventories, automatic maintenance programs, new product improvements...and at the right prices.

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Electronic Tube Division, Sylvania Electronic Components Group.

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NEW CAPABILITIES IN: ELECTRONIC TUBES • SEMICONDUCTORS • MICROWAVE DEVICES • SPECIAL COMPONENTS • DISPLAY DEVICES

SYNC ON BUSINESS

An electric wall display clock is being offered to Norelco tape recorder dealers for in-store use by North American Philips Co. The price is $14 and its purchase can be applied against accumulated cooperative advertising funds, according to Wybo Semmelink, manager Hi Fi products dept. The dial has a blue background with black numerials and the phrase "Norelco Tape Recorders" appears in white across the face.

• • •

Hi Fi has become too highbrow, says Karl Jensen, president of Jensen Industries. "Instead of selling home entertainment, which is what Hi Fi primary constitutes, we've been confusing and confounding the public with technical verbiage. Instead of talking about what comes out of Hi Fi, we've been selling what's in Hi Fi — instead of music, we've been talking about the notes. Instead of Beethoven and Brahms, we've been selling woofers and tweeters. We've been talking in a foreign language — and it's about time we started offering some translations." He said that "People want a Hi Fi set for the pleasure of listening, not for gimmicks and gadgets. When the industry recognizes that truism and quits the highbrow kick, Hi Fi will find high sales can make sweet music indeed."

• • •

A rolling test equipment clinic has started on a 10,000 mile, 37 state tour and has scheduled 85 dealer meetings featuring color TV servicing demonstrations, FM stereo multiplex demonstrations and informative programs in a

17 week period. The Sencore "Service Wagon" is completely outfitted with specialized equipment, films, black boards, color TV, FM stereo units. The meetings are being conducted by two field engineers, Don Multerer and Jim Smith.

• • •

A popular type color TV receiving tube package is being sent to distributors by RCA. Called RCA's receiving tube color pack, it offers an assortment of the 17 most popular color types. Tube types included are: 1V2, 3A3/3B2, 3AT2, 6AW8A, 6BK4A, 6DQ5, 6GF7, 6RW4, 6EA8,6EW6, 6GH8A, 6GM6, 6GU7, 6GY6, 6HF5, 6JE6 and 12BY7A. The tubes are packed in a fiberglass thermo insulated utility bag which can be used as a lunch, overnight or travel bag.

• • •

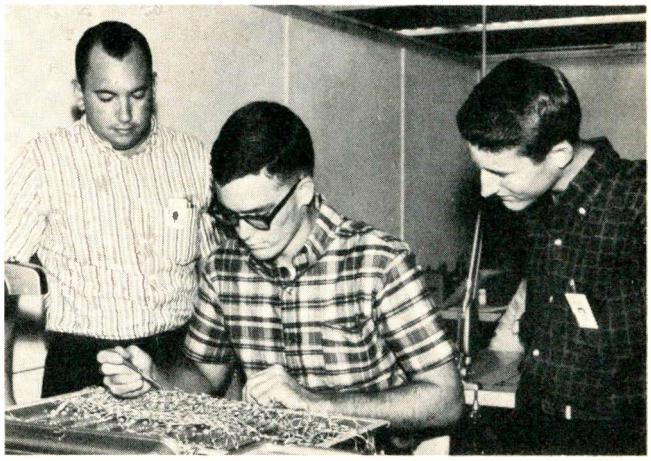
Long Playing and stereo records need special care. Elpa Marketing Industries has a 1-page manual, said to be the most complete guide to the care and treatment of records ever written. It can be used as a fine promotional piece with your best Hi Fi customers.

SYNC ON BUSINESS

Worn tape recorder pressure pads frequently cause tape squal, loss of highs and irregular tape motion. Robins Industries say they have a self-stick pre-cut pressure pad that does not require glue or cement for installation. Pressure sensitive adhesive is attached. Pads are supplied in packages of 44 in two thicknesses, precut to fit most recorders. Each package also contains additional pads that can be cut to fit odd makes and models. At your distributor.

• • •

Student engineers divide time between work and study at Electronic communications plant. This arrangement adds practical experience to book knowledge. ECI pays the co-op students a salary while they are on the job, and their schools get progress reports on their work.



• • •

All existing model FM-3 Gertsch frequency meters can now be factory converted to comply with new FCC requirements. Accuracy is increased to ± .0003%. If interested, contact Gertsch Products, Inc., 3211 S. La-Cienega Blvd., Los Angeles 16, Calif.

• • •

'Walkie-talkies' that fit in the palm of the hand are being added to Westinghouse Electric's 1965 transceiver line. It is said the transceivers are ideal for person-to-person communications while hunting, camping or boating, in construction work and around the house. A single 9-v battery powers the units.

• • •

Battery-powered consumer products are boosting the battery business. Nickel-cadmium batteries are used today to power a great many different consumer products, including completely cordless portable drills and wrenches, hedge clippers, vacuum cleaners, carving knives, dictating machines, cigarette lighters, food mixers, typewriters and some 400 working models of cordless consumer products. movie cameras. One manufacturer has already exhibited

• • •

A lavalier microphone is now available from Shure for public address systems. See your jobber.

How to be down-but not out!

Electronic dealers of America—wake up and act now to save your business!

Having the rug pulled out from under you by manufacturers who sell to national mail order catalog houses is no fun. It leaves you without a "profit leg" to stand on.

If you've looked into the catalogs lately, you know what we mean. Antennas, rotators, and boosters; picture and receiving tubes, and other TV products; you name it—and these outfits *advertise it* for sale at prices close to what you *pay*.

Your customers can read, too. Alongside the catalog prices, your own *honest* prices must seem excessive by contrast.

Naturally, these "1-step" houses (and their captive chain discount stores) have got you down. But don't be discouraged—nobody says you have to be *out*.

Just don't quit. Support only the manufacturer who supports you.

Channel Master feels that the very least we owe the dealer who sells our products is a good living. So, as a matter of policy, we're dead set against selling to outlets that by-pass the dealer, and advertise to consumers at dealer prices.

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Are we on the same wave length? Let's get together.

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ELLENVILLE, N.Y.

The VHF-FM antenna that challenges all competition

VL-10 (Illustrated)
9 driven elements
1 parasitic element
List price $34.95

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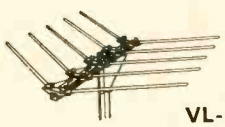
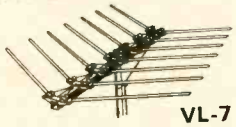
Finco's Color Ve-Log challenges all competition on color or black and white reception and stands behind this challenge with a "Guarantee of Supremacy". The swept element design assures the finest in brilliant color and sharply defined black and white television reception – as well as superb FM monaural and stereo quality. FINCO precision-engineered features make these advanced-design antennas indispensable to good home sight-and-sound systems. And, of course, they carry the famous unconditional guarantee from the leading manufacturer in the field – FINCO. Promote the Color Ve-Log Antennas with pride, sell them with confidence, and profit handsomely.

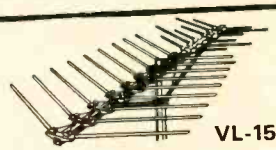
Featuring Finco's Exclusive Gold Corodizing



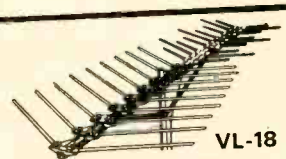
VL-5
5 element VHF-FM
5 driven elements
List price $16.95



VL-7
7 element VHF-FM
7 driven elements
List price $23.95



VL-15
15 element VHF-FM
9 driven elements
6 parasitic elements
List price $46.95



VL-18
18 element VHF-FM
9 driven elements
9 parasitic elements
List price $54.50

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Write for color brochure #20-307, Dept. **110**

ELECTRONIC TECHNICIAN

MARCH 1965

Selecting Replacement YOKES

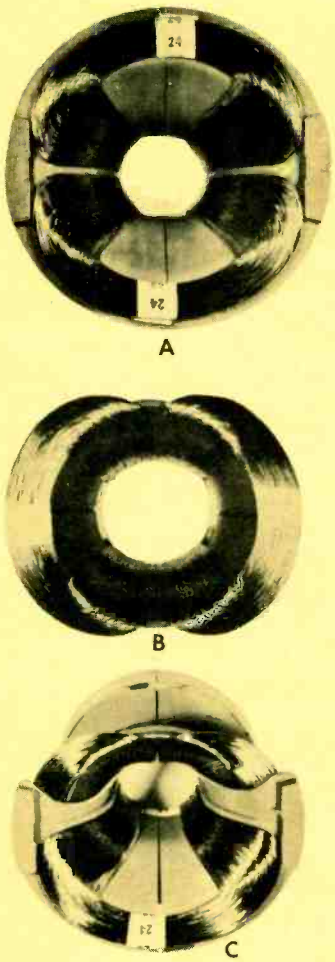


Fig. 1 (A)—A 110 deg yoke shown in operating position with horizontal coils normally visible. (B)—Vertical coils are largely obscured by external yoke construction. (C)—Yoke with one horizontal coil and a portion of the liner removed to show relative position of coils.

Give your customers the 'good-picture' insurance that comes only from an optimum replacement component

by Robert E. Coy

Triad Distributor Div.
Litton Industries

■ It was estimated a few years ago that over four thousand different TV deflection yoke types were in use. Even with a trend toward standardized yoke design, this number has steadily increased because of wider deflection angles, toroidal winding advances and widespread acceptance of transistorized TV and color sets.

It might appear that selecting a correct yoke could develop into a complicated process. Experienced TV technicians will quickly realize however, that all yokes can be grouped into a small number of basic types. A glance at any parts distributor's shelves will tend to verify this statement. The 60 to 70 types on even the most completely stocked shelves will supply all but a few of today's replacement needs.

In fact, selecting a replacement yoke is a fairly simple process. It's usually not difficult to obtain part numbers for a suitable replacement yoke supplied by your jobber. Your jobber or replacement parts manufacturer can supply you with cross reference data. In some cases, however, very little service data is available. Part and chassis numbers are not easily obtained. Hence, a basic knowledge of yoke construction and yoke-selection considerations will prove helpful in these cases. And if yoke selection time can be saved and the replacement operates as well or better than the original, you can make a better profit in many cases and give greater customer satisfaction.

Yoke Construction

Deflection yokes have one purpose — to produce a raster by deflecting the electron beam horizontally and vertically — when supplied with proper current from vertical and horizontal output circuits. A yoke is basically four coils mounted on an insulating liner.

The yoke's two horizontal coils are placed nearest the CRT neck.

Replacement YOKES . . .

The vertical coils are separated from the horizontal coils by an insulating liner and are positioned on the left and right sides of the CRT. Relative positions of the yoke coils are shown in Fig. 1. It may be easier, however, to understand this winding placement by referring to Fig. 2 which illustrates the principle of deflection produced by the horizontal winding. Remember: the electron beam is deflected at right angles to the coils' magnetic field.

The most widely used method of numbering yoke terminals or connections is shown in Fig. 3. Some yokes have terminals mounted on a flat terminal board in these positions, while others have terminals mounted on the wall of the liner, as shown. The top horizontal coil is connected to terminals 1 and 2 and the lower coil to 3 and 7. The vertical windings are connected to 6 and 8, and to 5 and 4. Windings are usually connected in series by a jumper between the starts or finishes of the winding. As yoke coils are wound on a form, like any other coil, the start lead is the lead which comes from the inside of the coil and the finish, of course, from the outside. Typical jumper and winding connections are also shown in Fig. 3.

It will be helpful to become familiar with both winding placement and terminal arrangement discussed here. Although manufacturers may vary from this arrangement, it is the one most commonly encountered in modern yokes.

In replacing a yoke, leads should be connected to the same circuit points as leads from the same relative winding of the original. For example, if high P-P voltage was applied to the top horizontal coil in the original, it should also be connected to the top horizontal winding in the replacement. The same rule is true, of course, for the vertical windings. Connections should not be made on the basis of lead colors alone.

Sometimes the replacement will have the internal jumper on the winding starts, while the original had the finishes connected. In this case, the picture may be upside-down, or backwards if we observe the aforementioned instructions. The simplest rule to follow in this case is to reverse the leads of the affected winding. Be sure to change the horizontal network to the winding with P-P voltage applied if you reverse the leads on the horizontal winding.

Deflection Angle

The first consideration in selecting a suitable replacement yoke is the deflection angle required. Although practically all B/W sets now being produced use 90 or 110 deg deflection systems, 53 and 70 deg systems will still be encountered. Many technicians will recognize the deflection angle of a set by the physical characteristics of the CRT or those of the original yoke. It is a good idea, however, to refer to a tube manual when in doubt.

The replacement yoke must, of course, be capable of providing the same deflection as the original. Physical differences normally prevent satisfactory substitution of types with different deflection angles. Replacement yokes are clearly designated as to their deflection capabilities.

L and R Matching

After the deflection angle has been determined, the next consideration should be matching the inductance and resistance values of the original yoke. Proper matching is important. A yoke with lower inductance than the original may produce a reduced raster with fold-over and nonlinearity, while a yoke with inductance values much higher than the original may produce too large a raster where part of the picture is lost.

The replacement yoke inductance values should match those of the original as closely as possible. Values within twenty percent of the original vertical inductance can be tolerated in most cases, but a maximum of ten percent should be observed in matching the horizontal values. The horizontal inductance is more critical because of the horizontal sweep frequency. These are rules-of-thumb and in most cases a replacement yoke will be available which matches the original yoke even closer than those tolerances.

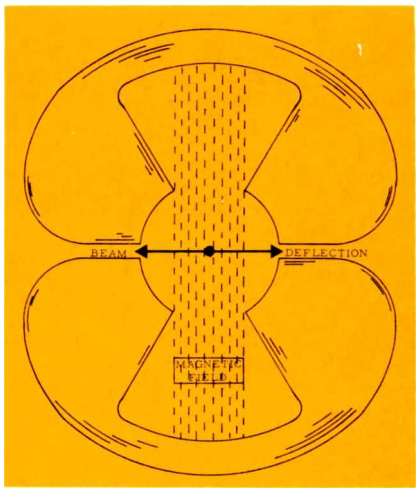


Fig. 2—Basic reflection principle for horizontal winding as shown in Fig. 1A. The complex magnetic lines-of-force pattern has been greatly simplified to show basic winding deflection.

Although resistances are not as critical as inductance values, an attempt should be made to select a replacement which closely matches the original resistance, especially in the vertical winding.

Assuming that inductance values are not specified in service data or parts lists, the quickest and most accurate way of determining the inductance of the original yoke is to measure it on an inductance bridge. Some service shops, however, do not have inductance measuring equipment, or perhaps the replacement is being made in the customer's home where only a tube tester and a VOM are available. Fortunately, there is a method of approximating inductance which can be used in these cases.

When a yoke designer wishes to increase the inductance of a winding he adds turns, which also increases the dc resistance. The chart in Fig. 4 shows a correlation between inductance and dcr values. We know that other factors — wire

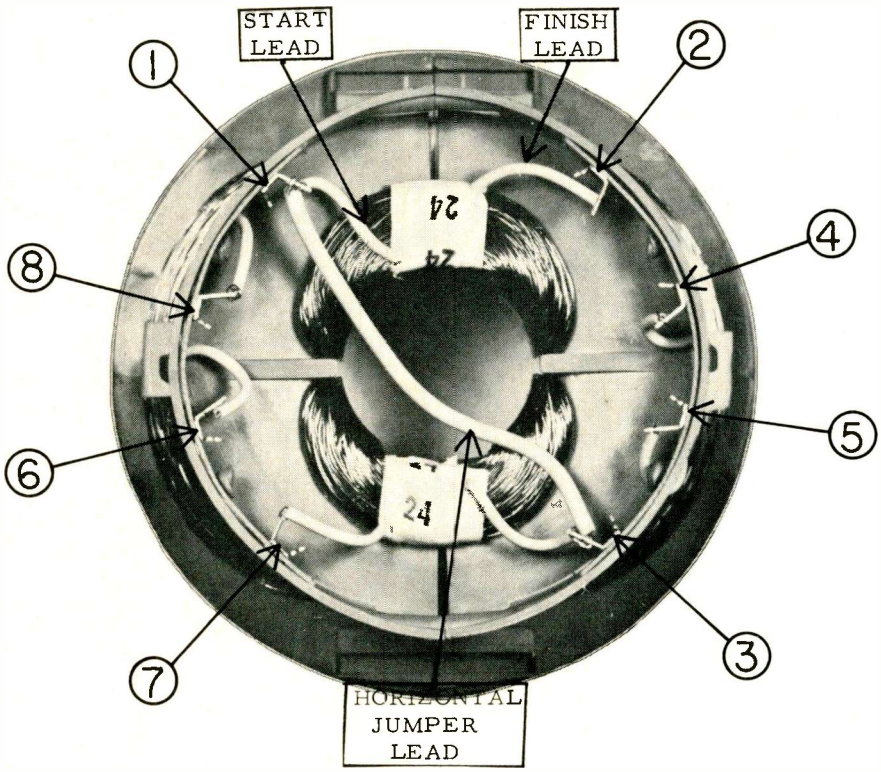


Fig. 3—Rear view of a 110 deg yoke with cover removed. Terminals are indicated by circled numbers. Note leads to terminals 6, 8, 5 and 4—vertical windings—not visible in photo. The vertical jumper lead has been omitted for clarity too.

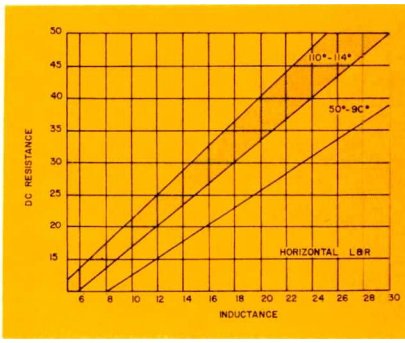


Fig. 4—Relationship of L and R values in typical series connected horizontal yoke windings. Assuming a 110 deg yoke measures 35 ohms across the horizontal winding, then the chart can be used to determine that the inductance is 17 to 21 mh for a typical yoke of this type. A standard replacement with a 35 ohm, 18 mh winding should be suitable. A chart like this is not necessary for vertical windings since the resistance (in ohms) very nearly equals the inductance (in mh) for all types.

size and winding variations — also affect resistance, so a chart like this cannot be one hundred percent accurate. It should be used to determine inductance only where more complete information is not available. Always refer first to your service data. In the absence of a better method, however, this one can be used with satisfactory results. Simply measure the dc resistance of a winding with your ohmmeter and refer to the chart for the approximate inductance value.

Two things should be remembered while taking these measurements. First, network components will have an influence on resistance values and should in all cases be disconnected while measurements are being made. Second, if one coil of the yoke has been burned or if shorts exist between turns of the winding, the readings across the entire winding may be inaccurate for determining inductance. For this reason it is a good idea to measure both halves of the winding. If both are equal, simply add the values obtained. If unequal values are obtained, double the larger of the two and use that resistance value to determine inductance by the chart.

Networks

Variations in network components are responsible for a large percentage of the different yoke types mentioned previously. It would be practically impossible for your parts distributor to handle enough yoke types to exactly duplicate all the network requirements encountered in day-to-day service work.

Replacement parts manufacturers attempt to supply replacement yokes with network components that will satisfactorily replace the most commonly used types. Where pre-wired yoke types are recommended, either on service data or manufacturers' cross reference data, the network will be close enough to the original to assure satisfactory operation.

Some fairly universal types have more than one component wired across the applicable yoke windings. Here, the component not required to duplicate original values in a particular application is simply removed from the winding. Even with these efforts to cut service time and provide pre-wired yokes, it is sometimes necessary to add or change network components to duplicate those in the original yoke. This may be slightly more time-consuming, but in many instances the net result is worth the additional effort.

Familiarization with yoke winding placement will prove time-saving in installing network components. Vertical damping resistors are connected across the vertical windings on the left and right sides of the yoke, usually terminals 6-8, 5-4. The horizontal balancing capacitor and sometimes a series resistor are connected across the winding receiving high RF. If this network is connected across the wrong winding, or if incorrect values are used, horizontal ringing can actually be worse than if no network were installed! A balancing resistor, often 4700Ω, may be wired in series with the horizontal center-tap lead. It is placed between the horizontal winding center-tap and the centertap terminal on the flyback's yoke winding. Be sure that proper value components are used, and across the right terminals. Even where a pre-wired yoke is installed it may be necessary to change the horizontal net-

Replacement YOKES . . .

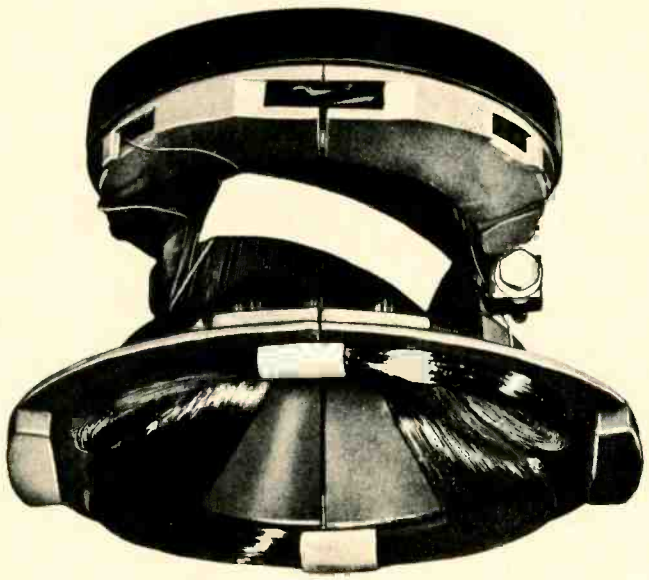


Fig. 5—Yoke with toroidal wound vertical windings, common in some late TV receivers.

work to the opposite coil to meet a particular application requirement.

Internal Circuitry

Sometimes a yoke may have unusual or unique circuit variations. You should be on the lookout for these, especially where specific replacements are not recommended. Additional network components and jumpers may be found on the original yoke which are not on the replacement. These components should be added to the replacement to duplicate the original. One circuit variation is the fifth lead, or so-called "gimmick" lead, which is often used. This lead should be added to the replacement yoke and taped to the yoke cable in the same manner as the original. Another variation is where an internal jumper is used to complete the boost circuit to the vertical output stage. Naturally, this jumper must be added to the replacement, to obtain proper vertical deflection.

Many yokes employ a thermistor in series with the vertical coils. The thermistor generally improves the over-all vertical performance by maintaining a constant total dc resistance as the yoke temperature increases, thus maintaining the raster's vertical size.

It should not be necessary to remove a thermistor from a replacement yoke, even if the original did not use one. Where the original yoke incorporated a thermistor it is a good idea to use a replacement yoke with one or install the original thermistor in the replacement to insure against vertical shrinkage as the set warms up.

Physical Differences

In a majority of cases, the replacement need not look exactly like the original. Very little difficulty should be encountered when using a replacement of the same deflection angle as long as the replacement fits within the space limitations of the set and mounts satisfactorily. Mounting may require brackets from the original installation or rear cover and mounting clamps which are available (as standard items) from your parts distributor.

Most replacement yokes are designed to correct "pin cushion" effect Some installations, however, may require magnets from the original yoke. This is quite simple to accomplish and the magnets from the original are simply installed in the recesses on the outer edges of the yoke liner or glued in the same relative position as on the original.

Many TV models use a metal sleeve between the CRT neck and the horizontal yoke windings for width control. This sleeve absorbs a portion of the horizontal power, controlling the raster width by the distance it is inserted into the yoke. Be sure that width sleeves are sufficiently insulated from the yoke windings. Some yokes are provided with an insulator. An insulator should be fabricated from kraft paper or other suitable insulating material where a liner does not exist. The high P-P voltages in the yoke's horizontal section can cause breakdown where adequate insulation is not provided.

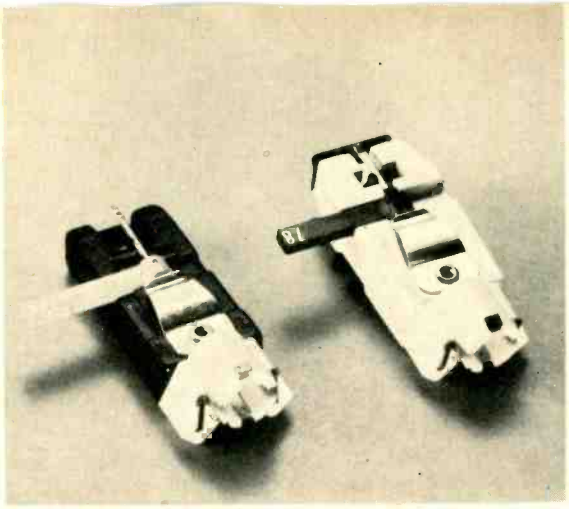
Toroidal Yokes

One further variation in yokes that should be mentioned is a rather recent innovation which has been increasing in popularity over the past two or three years. This is the yoke with toroidal vertical windings. If you are not already familiar with this type you will undoubtedly run across it, as it is becoming more widely used.

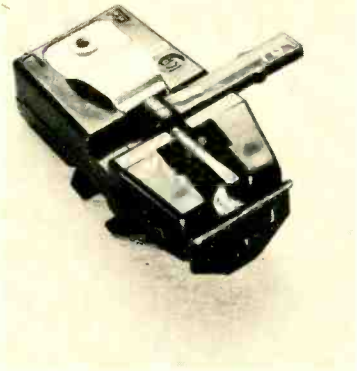
In toroidal winding, the turns of the vertical coil are wound directly around the yoke core. This results in elimination of many ft of wire required to obtain the same inductance in a conventional winding. The winding's dc resistance can be reduced, resulting in higher Q and greater vertical section efficiency. It also makes higher inductance possible than previously obtained in conventional yokes.

A replacement yoke with toroid vertical windings is shown in Fig. 5. Note that the toroidal coils are positioned directly over the horizontal coils, which seems to contradict our previous discussion of winding placement. Because of the arrangement of turns, the open space on the core corresponds to the open area or "window" on the conventional winding. Hence, the same magnetic field is produced by these windings as in the standard unit.

A conventional yoke will seldom replace a toroidal yoke with satisfactory results. Replacement yokes with toroidal vertical coils are available and should be used to replace yokes of this type. ■



Replacement cartridges that are 'look-alike' as well as electrical duplicates of the original equipment. Typical 'exact' replacement units are shown here.



The Concealed Service Bonanza

It's time you rediscover the phono needle and cartridge market

by William E. Ranshous

Electro-Voice, Inc.

■ Thousands of alert service-dealers and technicians are making money replacing defective phono needles and cartridges. Other thousands are missing the boat.

Needles and cartridges are two of the simplest devices you can come into contact with. Few opportunities open to the great majority of service-technicians can yield such rich financial rewards for the time required. So little technical knowledge is involved. So little investment in equipment and inventory is required. There's just one flaw in the business:

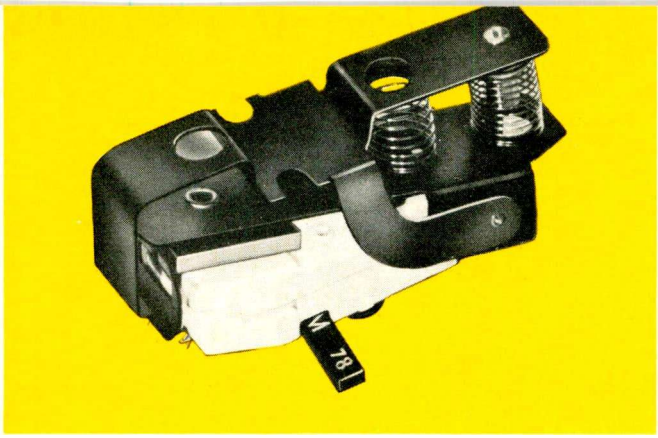
You will seldom be called upon to perform repairs on phono needles and cartridges. The need for the service seldom calls immediate and dramatic attention to itself. The devices seldom suddenly "go bad." A gradual deterioration in tonal quality usually takes place and the owner is seldom acutely aware of it until distortion or loss of volume become problems. Unfortunately, by this time, the owner may have already done irreparable damage to his expensive records.

Considering this, you owe it to your customers — and to yourself — to be on the lookout for possible trouble. A routine check of stylus and cartridge in any set you work on should become a standard part of your service.

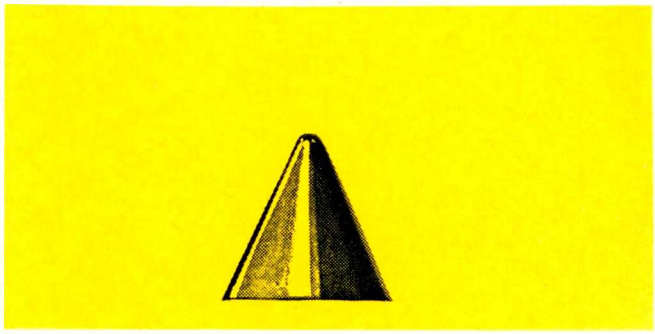
"Has your phonograph needle been replaced recently?" will start the ball rolling and result in a number of unforseen jobs. You will frequently be amply repaid in extra business for the few minutes of your time. And the customer goodwill developed will pay handsome interest in the long run.

How It's Done

You begin a cartridge checkup by turning on the set, allowing it to warm up, and by touching the stylus tip with the end of your finger. If the set's gain is turned up to a moderate level, this should produce a "rumbling or roaring" sound. A finger placed on the cartridge output terminals will also produce a loud



A typical replacement cartridge.



(A)—Approximate shape of new needle.

AVERAGE NEEDLE LIFE

Tip material	Playing time	Check after
Steel	1 or 2 plays	.....
Osmium	5 to 20 hours	.....
Sapphire	30 to 60 hours	2 weeks
Diamond	750 to 1500 hours	6 months

sound — usually a hum — if the cartridge is working. If no sound is produced by touching the stylus, but an audible sound results from touching the cartridge output terminals, the trouble is obviously in the cartridge, and replacement is indicated. If no sound is produced by either step, the difficulty is elsewhere — possibly in a connection to the tone arm leads or in the amplifier output circuit. Routine continuity, voltage, and tube checks will pinpoint most troubles in these areas.

If *both* tests produce sound, the cartridge and needle assembly may still be faulty, however. (Up to now, you have determined only whether there is output.) Play an "expendable" record on the unit, turning the gain up to a moderate level, and listen for "fuzzy" tone or the "garbled" sound of audio distortion. Excessively low output is still another sign of cartridge deterioration. If the cartridge is a crystal unit, you may be fairly certain that it has outlived its usefulness when any of these symptoms are produced, especially if they are missing when the unit is playing on "radio" or "TV" modes. Most crystal cartridges have a definite, predictable life which seldom exceeds a few years and may be considerably less in climates which are fairly humid.

Even if there's little distortion, the cartridge may not be giving satisfactory performance. Small internal plastic and rubber parts deteriorate with age and use. If it is a fairly old unit, supplied as original equipment more than five years ago, you would do well to discuss the advisability of replacement with the owner.

Model for model, nearly all modern replacement cartridges made by leading manufacturers are markedly superior to their counterparts of a few years ago. An up-to-date replacement will not only yield better sound, but will restore lost compliance (resilience) needed to properly track today's high fidelity records.

Service Aids

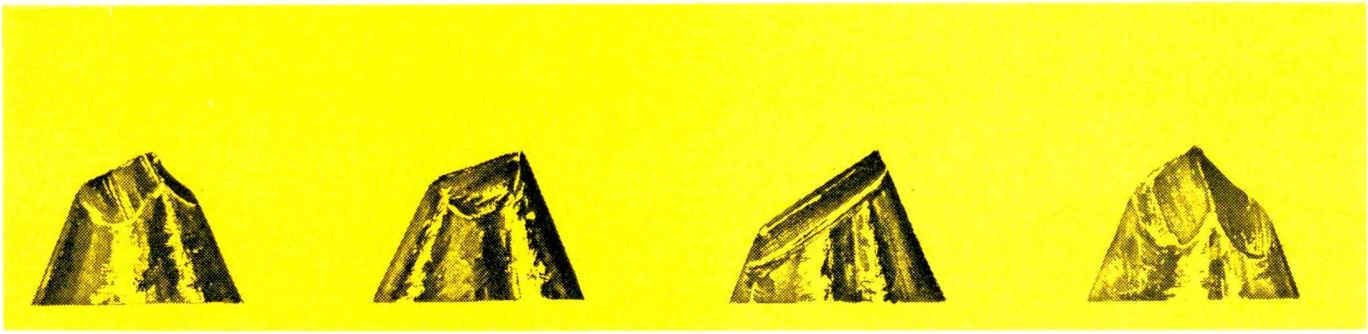
As though time, long hours of hard use, climatic conditions were not enough to contend with, the phono cartridge and needle assembly must also undergo the well-meant but inept maintenance efforts of the set's owner, and the technician is therefore well-advised to determine whether the stylus in the cartridge is the recommended type. Two types of reference material — both of which are provided by leading cartridge manufacturers — will assist you in this. If the cartridge model number is discernible, a cartridge-to-needle cross reference will quickly produce the required information, including a picture of the correct stylus. (Don't go by the picture alone, however; the tip size of the stylus determined by playing speed, is also important for identification.)

If the cartridge manufacturer's model number cannot be deciphered, a set-to-needle cross-reference booklet will help you find what needle type is normally installed in the set-maker's model number. Armed with this information, you can then check back to a standard stylus guide to make certain the stylus is the correct one.

Though all of these steps may sound tedious, they actually require only a few minutes' time—and virtually no special equipment. An inexpensive stylus pressure gage, to check tracking force, and a small screwdriver are about the only tools needed.

Above all, don't allow yourself to be overawed by the seeming multitude of replacement cartridges now on the market. Cartridges, like electronic tubes, may be quickly and easily classified, according to their appearance and function. In determining whether a given cartridge is a correct replacement, remember: once you have determined if the replacement is stereo or monophonic, you have already divided the field neatly in two. Then, after you have determined if the unit is a one-or two-needle type, you have subdivided it into one fourth the original assortment. Cartridge manufacturers' replacement charts, indexed by original manufacturers' numbers and related information will help you make short work of the rest.

To aid you in visual identification, most cartridge manufacturers' listings also contain accurate drawings or photos of the replacement units with index numbers



Various worn needle shapes.

or letters to help you locate them. So much for cartridges.

Needles

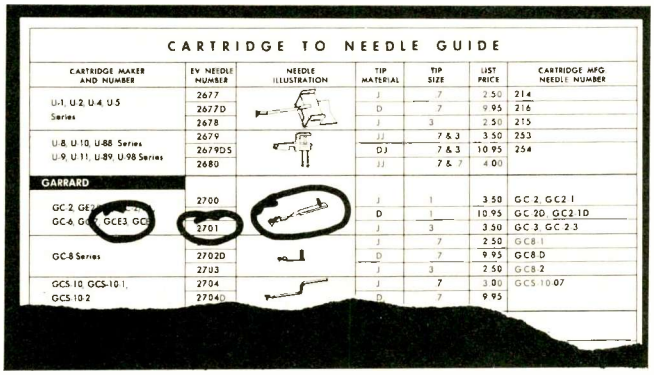
The job of trouble-shooting styli is even simpler, since the phono stylus is a physical instrument, pure and simple, and may therefore be checked by physical means alone. Your equipment for nearly all needle replacements need be no more elaborate than a reasonably good pocket magnifier—50 to 75 power— and a small screwdriver. A pair of ordinary tweezers may also be helpful.

Remove the suspect stylus, taking care not to force it in any way. Visual inspection will quickly provide the key to safe removal from the cartridge. After the stylus has been removed, look it over carefully for visible deformation of the shaft itself. Children, pets, or accidents may have twisted or bent the metal part, preventing the stylus from contacting the record grooves at the proper angle. The metal parts of styli are usually brass, copper, or phospor bronze, and they may normally be restored to shape without much risk.

The stylus should now be subjected to careful scrutiny under the magnifier, and in strong light. Inspect it from all angles, watching especially for minute chips or irregularities in the contour. (Don't expect the stylus to come to a sharp point. If properly shaped, it will have the approximate outline of the end of a ball-point pen, with evenly-rounded tip.) After looking at it from every side, look straight down on the tip to determine whether there are any flat spots worn on it. These points of wear need not be large to be dangerous. To be on the safe side, *always* advise replacement when there's any sign of damage or wear or when playing time has exceeded the average "safe" life of the needle material. If your customer is dubious about this, remind him that one LP record costs more than the average stylus and that a damaged tip may, before the damage is discovered, ruin a good many records.

Having determined that replacement is indicated, you must now make certain that the correct replacement is made. Again, manufacturers' literature will stand you in good stead. Standard needle catalogs, available from all leading manufacturers, will enable you to quickly cross index cartridge model numbers to replacement styli numbers. Outlines of the styli, shown in the catalogs, will aid in rapid identification.

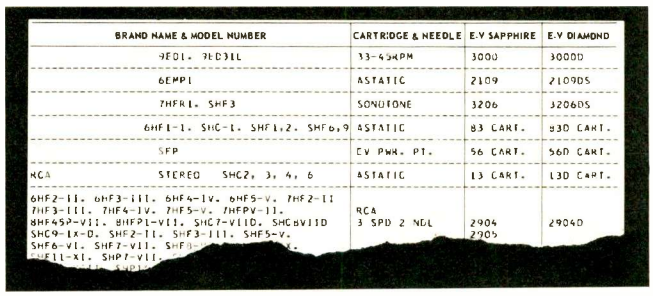
Continued on page 82



CARTRIDGE TO NEEDLE GUIDE

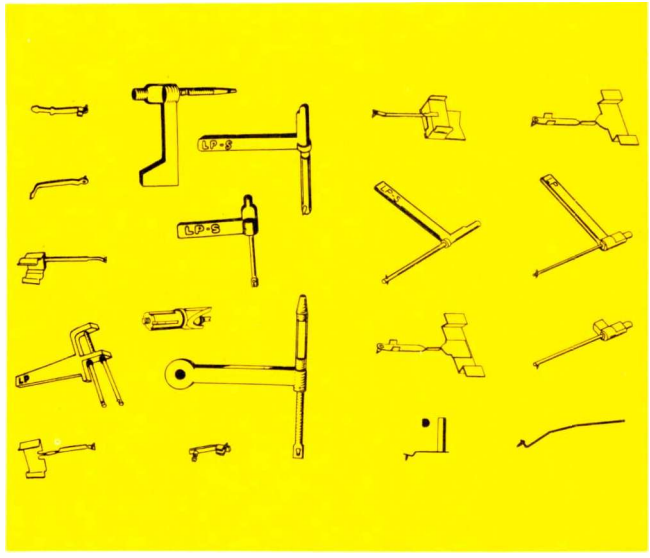
CARTRIDGE MAKER AND NUMBER	EV NEEDLE NUMBER	NEEDLE ILLUSTRATION	TIP MATERIAL	TIP SIZE	LIST PRICE	CARTRIDGE MFG NEEDLE NUMBER
U-1, U-2, U-4, U-5 Series	2677		J	7	2.50	214
	2677D		D	7	9.95	216
	2678		J	3	2.50	215
U-8, U-10, U-88 Series U-9, U-11, U-89, U-98 Series	2679		JJ	7 & 3	3.50	253
	2679D5		DJ	7 & 3	10.95	254
	2680		JJ	7 & 7	4.00	
GARRARD						
GC-2, GE2, GC-4, GC-6, GC-8, GCE3, GC	2700		J	1	3.50	GC-2, GC-2.1
	2701		D	1	10.95	GC-20, GC-2.1D
			J	3	3.50	GC-3, GC-2.3
GC-8 Series	2702D		J	7	2.50	GC-8.1
	2703		D	7	9.95	GC-8.D
	2704		J	3	2.50	GC-8.2
GCS-10, GCS-10.1, GCS-10.2	2704D		J	7	3.00	GCS-10.07
			D	7	9.95	

The easiest method of identification is by original cartridge manufacturer's model number.



BRAND NAME & MODEL NUMBER	CARTRIDGE & NEEDLE	E-V SAPPHIRE	E-V DIAMOND
9ED1, 9ED3EL	33-45RPM	3000	3000D
6EMP1	ASTATIC	2109	2109DS
7HFR1, SHF3	SONOTONE	3206	3206DS
6HF1-I, SHC-1, SHF1,2, SHF6,9	ASTATIC	83 CART.	83D CART.
SFP	EV PWR. PT.	56 CART.	56D CART.
RCA STEREO SHC2, 3, 4, 6	ASTATIC	13 CART.	13D CART.
6HF2-II, 6HF3-III, 6HF4-IV, 6HF5-V, 7HF2-II 7HF3-III, 7HF4-IV, 7HF5-V, 7HFPV-II, 8HF4SP-VII, 8HFP1-VII, SHC7-VIID, SHC8VIID SHC9-IX-D, SHF2-II, SHF3-III, SHF5-V, SHF6-VI, SHF7-VII, SHF11-XI, SHP7-VII,	RCA 3 SPD 2 NDL	2904 2905	2904D

A set-to-needle guide provides replacement number if cartridge model is not available.



Some typical replacement styli.

Upgrading Audio Music

Use modern ceramic cartridges to satisfy sophisticated customers' demands and increase your business

■ A phonograph cartridge may be considered the heart of an audio music system. For example, just as the over-all performance of an automobile engine is greatly dependent on the quality of the fuel used, the music quality of an audio system will depend on the quality of the cartridge signal that goes to the amplifier.

The cartridge must convert mechanical energy into an electrical-energy replica of the information "stored" in the delicate record grooves. If this job is done with precision, the amplifier and speakers have a good chance to produce quality music. Hence, what happens at the business-end of a tonearm is important.

Service-dealers and technicians are aware of the different cartridge models made by various manufacturers. But why so many?

It's easy to understand why so many cartridges are listed today if we take a brief glance at the history of cartridges, taking particular note of the rapid strides that have been and are being made in transducer technology.

Cartridge performance today — when compared to performance 20 years ago — is revolutionary. But this development did not occur overnight. We arrived at this revolutionary performance through a relatively slow evolutionary process.

Over the years, with each product improvement, with each new and refined transducer material discovery and development, with each newly-learned construction technique, more cartridges came into existence at almost every step. During this evolutionary process, cartridge-model listings in manufacturers' catalogs grew accordingly.

But the situation is not as confusing as it seems at first glance. Actually, there are only *three* basic cartridge designs found in phonographs: crystal, magnetic, ceramic; and one of them, the ceramic, can often be used to replace the other two. Before pursuing this point, however, lets look briefly at the operating principles of each cartridge type. This will help us to further understand the entire subject.

Crystal Cartridges

Transducer elements in crystal cartridges look somewhat like a paper match stick. The transducer is made of a material that produces a voltage when flexed. The force that flexes the element is supplied by the stylus assembly when it is

Systems

by Donald Grossman

Sonotone Corp.

pushed back and forth and up and down by the undulations of the record groove. Characteristic advantages of crystal cartridges are low cost and high output voltage to drive small, low-cost amplifiers. They do an excellent job in the application for which they are intended. They can be harmed, however — rendered weak or completely inoperative — by extreme temperature and humidity conditions or physical shock.

Magnetic Cartridges

Magnetic cartridges produce a voltage through magnetic induction. This may be accomplished by having the stylus assembly move a magnet in the vicinity of coils, thereby inducing a small signal in the coils, or the coils may be moved about the magnet with similar results. Excellent frequency response and light tonearm tracking forces can be obtained from good magnetic cartridges. Because of the minute signal developed in a magnetic cartridge, extra stages of preamplification are needed in the amplifier. A magnetic cartridge, depending on its degree of shielding, can produce hum from nearby magnetic fields

Ceramic Cartridges

Because ceramic cartridges are widely used, they are frequently encountered by service technicians.

The mechanical operation of ceramic cartridges is similar in principle to crystal operation. Transducer elements produce a voltage when flexed by a moving stylus assembly. Because the mechanical operation of ceramic and crystal cartridges is similar, this, perhaps, explains why many persons believe crystals and ceramics are one and the same thing. This is not true, of course. The voltage producing material or chemistry of the ceramic element is quite different and produces different results. And the ceramic cartridge is immune to induced hum from nearby magnetic fields created by transformers, phono motors and other producing components in an audio system. It is unaffected by wide temperature and humidity variations and will stand up for long periods in virtually all climates. This is especially important in hot, humid regions, permanent or seasonal, where crystal designs could develop malfunctions from climate surroundings, whether installed in a customer's phonograph, or on a distributor's or service-dealer's shelf.

Furthermore, high quality ceramic designs have exceptional frequency response, fine channel separation for good stereo, and have light tracking forces. They can also absorb a high degree of physical shock from accidental tone-arm dropping without harmful effects.

Ceramic cartridges are available in a wide variety of output voltages from about 0.2 to 1.3 v. They can drive many phono amplifiers, regardless of the original cartridge used. Accordingly, ceramics can frequently be used to replace other cartridge types while offering customers the many inherent benefits mentioned previously.

New Designs

A number of ceramic cartridges have been designed with flexible stylus assemblies to prevent damage to expensive styli (See Fig. 1). One has the stylus shaft mounted in a flexible rubber link. The shaft can be rotated in a 360 deg orbit; even when bent backward on the car-

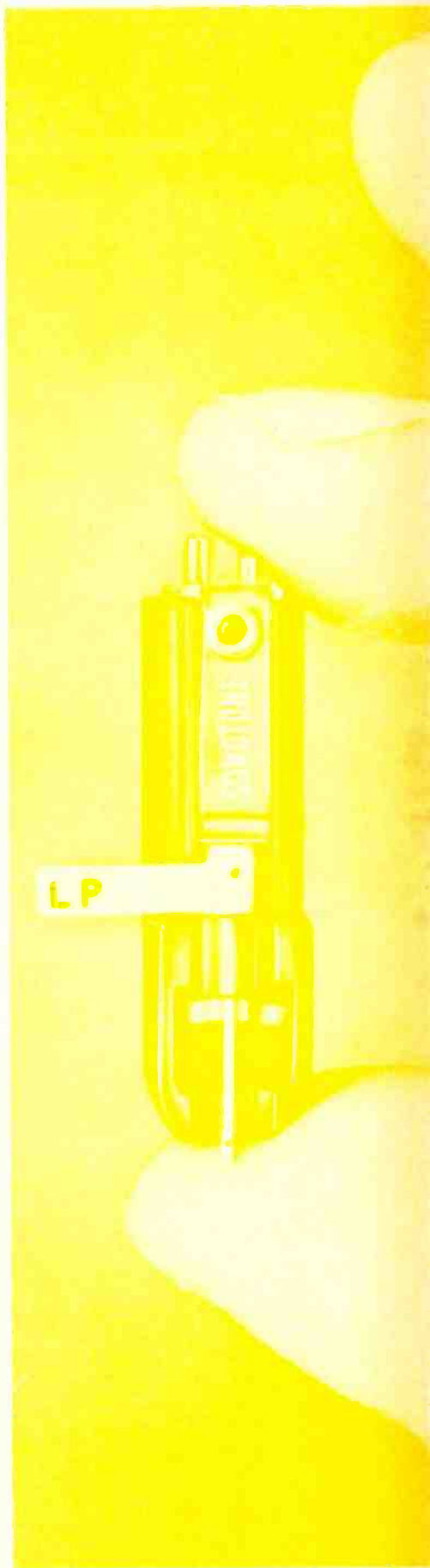


Fig. 3—Miniaturized micro-ceramic, stereo cartridge.

tridge body, it will spring back to playing position unharmed. As an example, some equipment owners flick dust off the stylus tips with their finger, instead of using a soft brush. This can deform or break some styli. The flexible-type stylus is bad-habit-proof. Its inherent flexibility provides lower tonearm tracking forces, gentle tracking of record grooves — resulting in longer record and stylus life. The flexible-type stylus will frequently fit older cartridges having standard type styli.

The *retractable cartridge* is another modern-day development. It is available in a family of ceramics which minimizes record scratching and chipped styli. If a retractable ceramic cartridge equipped tonearm is accidentally dropped, the cartridge will instantly retract into the tonearm — removing the stylus from the record surface — and prevent scratched records and chipped styli. "Bottoming buttons" on the bottom of the cartridge also prevent the undercarriage from causing surface damage to the record (See Fig. 2).

Nothing is more annoying to the enjoyment of recorded music than the click — click — click of a scratched record, or distorted music from a chipped stylus. A chipped stylus usually goes undetected by the user until worn records reveal sound quality deterioration. Record replacement is costly. The moderate cost of a retractable ceramic cartridge is a worthwhile investment and can help preserve the music lover's record collection. Some retractable ceramic cartridges are also available with the flexible type stylus, offering double-barrel benefits.

Replacements

Ceramic cartridges can also be used to replace magnetic cartridges. As previously pointed out, the output voltage of a magnetic is much smaller than a ceramic. And a different type circuit is required for each at the audio input. How then, can a direct substitution be made? It's really simple. Plug-in equalizers are available for a number of ceramic cartridges which contain a circuit network to alter the ceramic unit's output to simulate that of the magnetic. By inserting the plug-in equalizers between the ceramic cartridge output and the magnetic input on the preamp, the magnetic input circuit "sees" the type of voltage and signal it needs. These equalizers require no tools or wiring; they just plug into the magnetic phono input.

Sometimes a customer will complain that a phonograph isn't producing satisfactory bass. A conventional ceramic cartridge is a high impedance device which normally works into a load of about 2 MΩ at the phono input of a tube-type amplifier. The bass response can be adjusted (without affecting the rest of the audio spectrum) by increasing the load resistance of the amplifier phono input. Progression from a 2 MΩ load resistor to a 5 MΩ load resistor, for example, will proportionately increase bass response and, very likely give customer satisfaction. This represents another way a ceramic cartridge can be used to satisfy customers.

Ceramic cartridge design has also kept in tune with the special requirements of two new trends in the phonograph industry: transistorized amplifiers and slim, low mass, tubular aluminum - type tonearms. Transistor type amplifiers have lower impedance than tube-types and need low impedance cartridges. Ceramic cartridges of appropriate impedances are available for this application. The physical appearance is, of course, similar to conventional high impedance ceramics, but the chemistry of ceramic transducer elements is specially formulated for low impedance characteristics.

The previously mentioned slim, low mass tonearms, recently appearing in a new generation of record changers, offer improved tracking of record grooves and lower distortion. Since the tonearm and cartridge must work together as an integral unit, however, a small, light, high compliance cartridge is used to achieve a proper marriage for optimum results. This is where miniaturization of the ceramic cartridge takes place to achieve a total lightness and low mass of the entire cartridge/tonearm system. The small size of a typical miniaturized ceramic cartridge only 1½ in. long, is shown in Fig. 3, page 53.

It can be seen that ceramic cartridge design has become sophisticated. The available features and benefits offered — immunity to induced hum, dependability in all climates (thus fewer call-backs), flexible-link type stylus, retractability, tube and transistor applications, miniaturization for the latest type tonearms etc. — shows broad versatility contributing to faithful music reproduction for many phonographs, old or new. By installing them in your customer's equipment, you can often improve performance and update the phonograph to meet current standards. It is also a good way, from a business viewpoint, to show customers that they are getting value received for dollars spent when a cartridge needs replacement. Psychologically, it is no longer just a repair or an unwanted expense: it is an improvement in the equipment — a desirable addition to the original need of restoring the phonograph to operating condition. ■

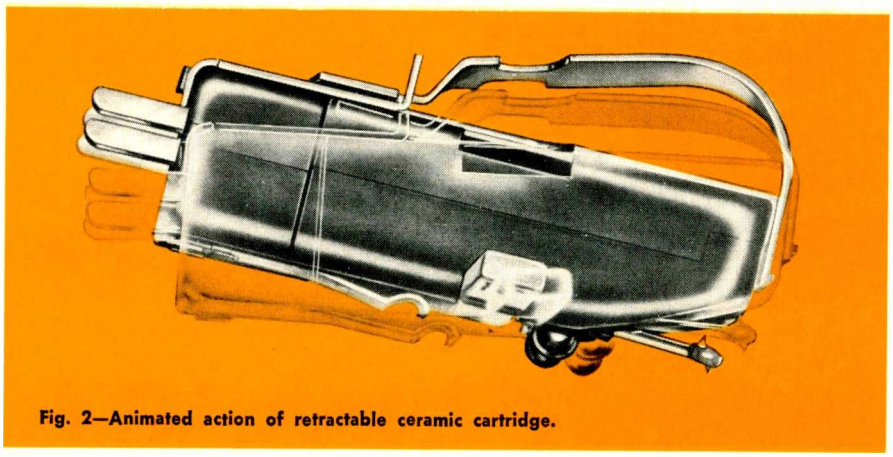


Fig. 2—Animated action of retractable ceramic cartridge.

PART I

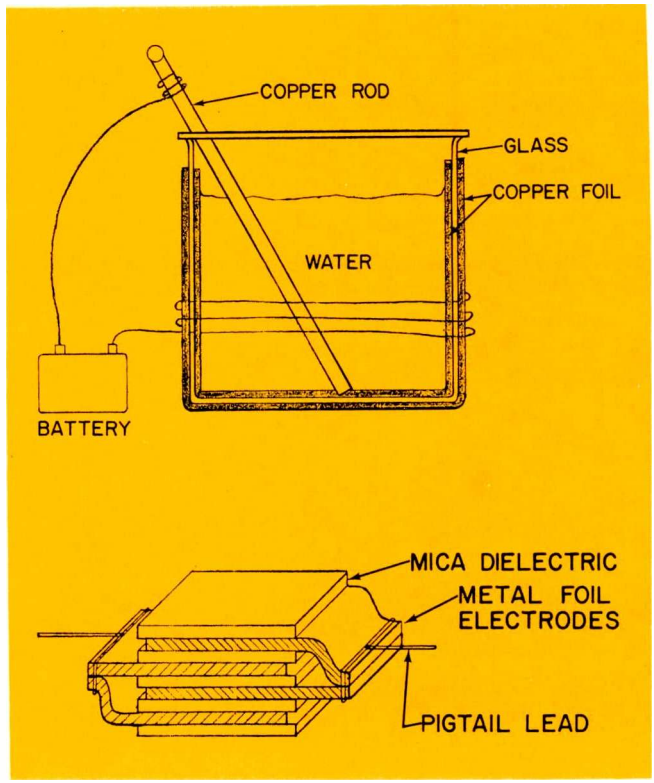


Fig. 1—(top) Leyden jar.

Fig. 2—Original capacitors were made by stacking alternate mica and foil layers.

Capacitor industry began with Dutch research 'accident'

A Prolific Service Component

by C. C. Turnbaugh
Chief Engineer, Mallory Distributor Products*
*A Division of P. R. Mallory & Co.

■ Replacing capacitors in electronic equipment is a routine job today. But many questions frequently arise regarding capacitors.

If I place a high voltage unit in a low voltage circuit, for example, will it work? Will it blow up? What does power factor mean? What is the "Q" of a capacitor? Can I replace the same value mica with a ceramic?

Basic Views

Technicians work with two basic capacitor types: *electrostatic* and *electrolytic*. The dictionary defines electrostatic as "an electric current at rest." This definition fits this type capacitor well because most can hold an electrical charge from several minutes to several days — depending on size (capacity), the dielectric material and charging voltage.

It may be helpful to digress briefly and refresh our memories regarding the history of capacitor development.

The earliest form of electrostatic capacitor was the Leyden jar, (Fig. 1) discovered in Leyden, Holland, in 1745 by K. Von Musschenbroek. Material used in this early version was a simple glass jar lined with copper foil inside and out. Musschenbroek, it is said, stumbled on capacitive effect by accident. He was actually trying to electrify water. After failing in this attempt, the battery he used was removed and while he emptied the water from the jar, he received a mild shock.

From this modest beginning, other methods of mak-

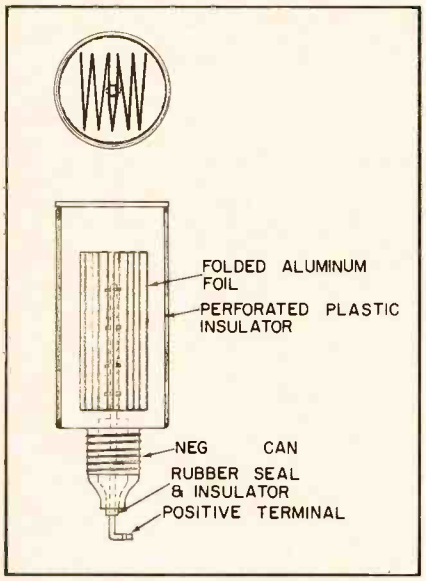


Fig. 3—Early version of wet electrolytic had folded 'accordion' aluminum anode.

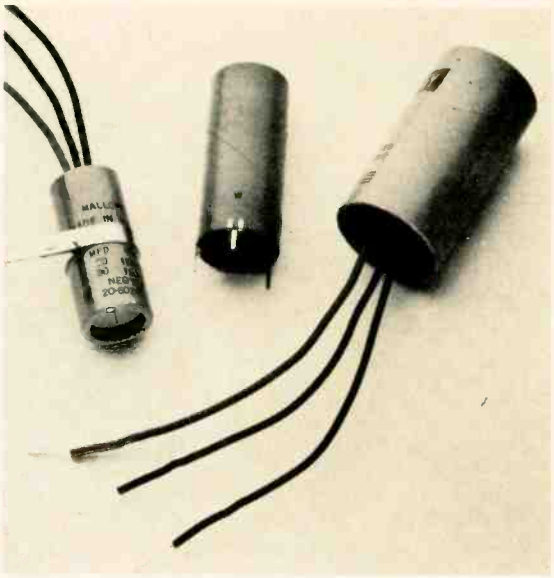


Fig. 5—Examples of dry electrolytics.

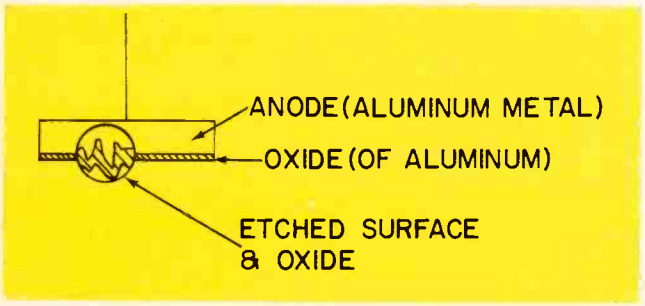


Fig. 4—When oxides are formed on most any material they will act as an insulator.

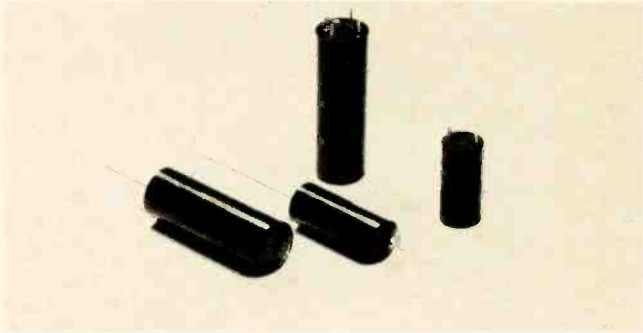


Fig.6—Bakelite-shell capacitors.

ing capacitors were devised. By 1845, capacitors were made by stacking alternate mica and foil layers as shown in Fig. 2. There's little difference between this and the present method of constructing micas.

The search for more capacity in a smaller package went on, and it was discovered that these sheets of paper between thin layers of foil made a pretty good capacitor. The paper was flexible and could be rolled with the foil into a rather neat package. It was also discovered that by impregnating the capacitor with wax or oil, the capacity would increase over those readings made before impregnation.

Soon after this, the first electrolytic capacitor was discovered. (Remember, this is the other basic type mentioned previously). Early versions of wet electrolytics were constructed by using an aluminum anode folded similarly to an accordion and situated in a tall can with a threaded neck for mounting (See Fig. 3). The electrolyte solution was a mixture of ammonium borate and water. Chemists know this solution as a fairly good conductor.

More Recent Developments

Now we have an anode plate separated from the can (cathode) by a conductor. Ordinarily, these conditions are ideal for a first class *shorted* capacitor. But, hold on a minute — we forgot to add one important detail: how the anode plate was prepared before it was placed in the can! The preparation involved running the plate through an electrochemical process called a forming bath. This process developes an aluminum oxide film on the plate. The thickness of the oxide film varies with voltage. To visualize how thin the oxide film actually is, let's suppose we could strip the film (formed from the highest voltage which would be the maximum for this type capacitor) from the plate; it would require forty sheets of film stacked together to make a thickness of 1/1000 of an inch. Despite the film thinness, it is still thick enough to withstand the preselected voltage at which the capacitor must operate.

When oxides are formed on most any material (See Fig. 4) they will act as an insulator. Iron oxide, for example, formed on laminations of a transformer, will isolate one lamination from another. Before scientists were aware of this, they used to insulate with varnish. The aluminum oxide on the anode plate of a capacitor has an unusual characteristic; it is polar, conducts easily in one direction and blocks or acts as an insulator in the other. In the capacitor, the electrolyte solution completely immerses the anode plate — making close contact with all the oxide coated surface as well as the walls of the can.

It was later discovered that prior to placing the alu-

Fig. 7—Radial lead mica capacitor.

minum oxide on the anode, the plain aluminum foil could be run through an acid bath. The acid would eat away at the aluminum surface, leaving it extremely rough. This roughened surface would increase the available surface area by a factor of three to one and more. (A factor of 20 to 1 has been reached with modern material and methods, and this is not necessarily the limit.) After the acid was removed, the oxide film was applied.

When this etched or roughened surface is placed in a capacitor, the electrolyte solution makes intimate contact with all the cavities created by the acid bath. One of the major advantages of the electrolytic type capacitor can be seen immediately. With a large increase in surface area for a given amount of plate, the result is more capacity in a smaller volume than comparable electrostatic types.

The original electrolytics using wet electrolytes soon gave way to the dry type electrolytics (See Fig. 5). These capacitors work on the same principle as the wets except the electrolyte solution now becomes a wet paste material. This permitted revolutionary changes in the packaging of electrolytic capacitors. The open vent (explained later) is no longer necessary; consequently, the capacitor could be essentially sealed in wax coated cardboard containers of rectangular configuration, later replaced by tubular configurations which are now being replaced by plastic encapsulated containers. The latest of these is a completely molded aluminum electrolytic.

In discussing aluminum plate processing to provide more surface area, we must also mention the fabricated plate. This plate was manufactured by using a pure piece of gauze, drawn between two metallizing guns which sprayed molten aluminum on both sides of the gauze. The aluminum solidified on contact with the gauze. This process resulted in a uniform but extremely rough surface with an area ratio of 15 to 1 over plain aluminum. The material was then subjected to the same forming bath as the etched plate method which we mentioned in a previous paragraph.

Now it may sound like we have reached the ultimate in capacitor construction. But all is not "gravy." We have dc leakage, power factor, ESR, dissipation factor, dielectric strength, dielectric constant and dielectric absorption to deal with, each playing an important part in selecting the correct capacitor to do a job. This accounts to a degree for the multiplicity of capacitor types on the market today.

Electrostatics

We left our friends, the electrostatics, standing at the discovery of the electrolytic process, and it's only fair to bring them up-to-date before proceeding.

Paper was used as a dielectric or insulator in the electrostatic process of capacitor manufacturing for many years; in fact, it is still used in many applications. It was continually improved, however.

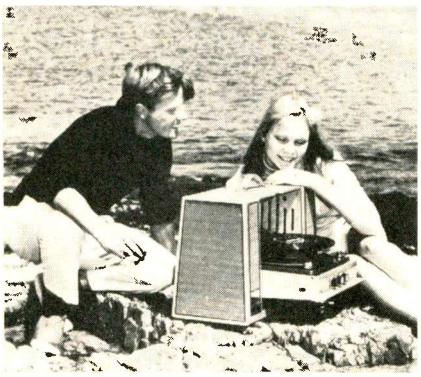
For many years, wax impregnated paper dielectric capacitors, contained in wax-dipped tubes or sleeves with wax end fills, were the only replacements in radio work. This method provided only mediocre protection for the capacitor from the old enemy moisture. Consequently, failures on shelf and in application were frequent. Wax impregnation of the paper separators increased the dielectric constant over dry paper. Oil also protects the capacitor from failure caused from ionization of air bubbles trapped in the winding. The air bubbles ionize under voltage and conduct — burning a path from one plate to another. Oil impregnation prevents this by forcing the air out and filling the voids.

In spite of these improvements, old devil moisture continued to take his toll in paper capacitors to the extent that the government, during World War II, had to set up standards for the industry. It insisted that all tubular paper capacitors be sealed with a grommet in a metal case; and later when glass to metal encased units were perfected, a hermetically sealed metal encased unit was requested. This eliminated the moistur problem for the military, but it didn't help much for consumers products because a hermetically sealed capacitor ran from $3 to $5 each by the end of World War II. Consequently, a better material (less expensive) had to be devised and along came bakelite (See Fig. 6). Early versions of this material left something to be desired. Also, there was a problem of finding an adequate end seal. With the advent of epoxy, however, these problems cleared up and the industry then had a paper dielectric capacitor that would provide up to five years of service in radio and TV sets.

Things changed rapidly from this point on — mica capacitors (Fig. 7) went to radial leads and a dipped epoxy coating. Paper tubulars gave way to a new dielectric material called "Mylar." Mylar was one of the first plastics to be used as a dielectric. Since then, polystyrene, polycarbonate and "Teflon" have been added to the growing list of quality dielectrics.

Many varieties of capacitors make it necessary to consider several factors when selecting the correct capacitor for a specific application. We will dig into this subject in a forthcoming issue. ■

Rayovac's self-service display with tester.



V-M stereo phonograph runs on rechargeable battery power.

RCA battery display.

The Booming

Establish your shop as neighborhood

■ We heard the owner of a radio shop complaining recently that the drug stores, hardware stores, filling stations, and grocery stores up the street were taking the battery business away from him. He made it clear and we agreed, that the battery business belongs to him.

With increasing numbers of battery operated TVs, radios, phonographs, toys, toothbrushes, and tools coming into the market, electronic service technicians are still the best information authorities on battery replacements.

Changing Times

There was a time in the battery business when the local radio shop or technician was the only source for such information, and his store was the only place you could buy batteries. But times have changed. Almost every channel of trade sells batteries today.

Consider for a moment: The profit from the sale of just two batteries per house call might cover the entire overhead cost of making a call. By establishing your shop as neighborhood battery headquarters, the extra profits from the sale of batteries could cover the entire overhead cost of running your shop.

Today's electronic technician who doesn't get his share of the battery business might do well to ask himself what the drug, grocery and hardware store managers are doing to take it from him. He might take a lesson in merchandising from his mass merchandising friends.

The real battery story of the past ten years is that the demand for batteries has grown. Batteries today are sold on "impulse," which means people buy them when, in one way or another, they are reminded they need them. That's why self-service retailers, accustomed to selling other merchandise in this manner, find it profitable to sell batteries this way also. Yet, through it all, the electronic technician remains far more of an authority on batteries than the average drug, hardware, or grocery clerk. And with the variety of batteries and battery powered products on the market, this point of difference may be even more significant today than it was in the past.

History of Merchandising

The history of radio battery merchandising is the same as the history of merchandising for any product. As the product finds wider acceptance, it becomes profitable for manufacturers to spend more money distributing the product.

Portable radios, in the beginning, were powered by standard flashlight batteries. There were several reasons for this: Flashlight batteries were a ready source of power; they were inexpensive; people were familiar with the flashlight loading principle of installing them into the portable device; and they were sold in virtually every kind of store.

Later the demand grew for radio batteries with a special mix. People needed radio batteries on week-ends and holidays when they were on the road. The drug store and filling station, open at these times, began to divert some of the battery traffic from the usual electronic outlets. In a matter of a few years, there were few types of stores which did not "cash in" on the radio battery business.

To backtrack for a moment, let's consider the common means by which batteries were sold in the retail electronic outlet before mass merchandising arrived. Store managers generally resorted to counter cartons. The electronics dealer in particular — with many specialty products to sell, batteries being just one — used this approach. Store managers found it easy to set the old battery carton under the counter and in the back room and wait for customers to ask for batteries. This was not satisfactory from the

Battery Business

portable power headquarters and earn your total overhead cost

manufacturer's viewpoint. An impulse item must be seen to be bought. Shoppers have to see it displayed and be reminded of their need for it. Consequently, manufacturers took the merchandising initiative and designed attractive, eye catching point-of-purchase displays and other materials which were in tune with trends in merchandising. Window banners promoted stores as neighborhood battery headquarters. And it is perhaps even a credit to U.S. battery manufacturers that in this short time a radio battery of such quality was produced to allow it to carry its own guarantee; and to keep pace with non-chemical and non-perishable products.

Potential

Today, in large part because of the availability of batteries, virtually every household you will come in contact with on a service call, and every shopper who walks into your store, is a potential battery buyer. Industry reports indicate that dry cells are consumed in this country at the rate of seven per man, woman and child annually. When and where these batteries are bought depends on when and where people are reminded of their need.

Since the electronics industry has a well grounded stake in the battery business, and since the business is booming, you will do well to learn something about merchandising, be it verbal reminders to potential battery customers, while you are on house calls, or attractive point-of-purchase displays in your shop.

Selling Aids

Battery manufacturers often offer eye catching displays and other point-of-purchase materials free or at substantially reduced costs because they buy them in large quantities. Take advantage of them. Ask about them from your supplier.

Displays are custom built. One may be put near a window so it is seen from the street. Window shoppers seeing the display inside the store, are reminded of their battery needs, and come in to buy. In the same manner, window banners attract the casual shopper. Most manufacturers pack window banners along with their battery display packages.

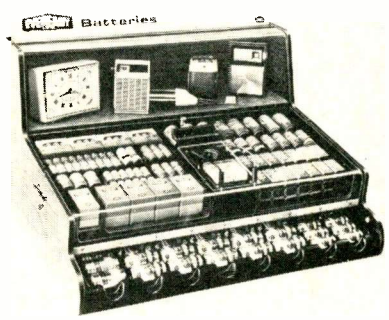
Other battery displays have built-in testers. The idea that both old and new batteries can be tested at the point of purchase may establish electronic shops as neighborhood headquarters for batteries.

TV-radio service-dealers and technicians should evaluate blister packed batteries. These appear attractive to the customer, are simple to display, practically eliminate pilferage, and actually help sell the customer. Though all popular types are not available in blister pack, such packaging does offer distinct advantages. They can also be easily and attractively displayed by hanging on simple pegbord setups, and the blister over the battery protects it from dust.

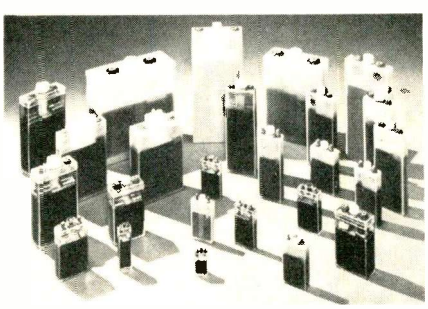
Reminding parents and teenagers of their battery needs while making a house call or when they visit your shop, can mean enough extra profit to cover the entire overhead cost of running your business.

Good merchandising is good showmanship — and selling requires a good deal of showmanship. Good merchandising can be your powerful and silent salesman. It may take the form of a simple, verbal reminder to your customer that he needs batteries, or it may be an entire series of point-of-purchase displays, banners and other eye catching materials. Whatever it is you need for your shop, battery manufacturers may supply it at no cost. Good merchandising can get you your fair share of the ever booming battery business — a business that rightfully belongs to you.

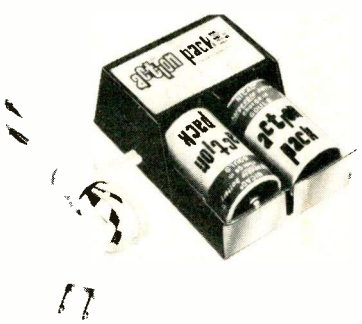
C. J. Coward of G-E demonstrates his company's transistorized, battery-powered portable phono.



Eveready self-service display with tester.



Sonotone's nickel-cadmium batteries.



Goulds nickel-cadmium charger with two cells.

YOU and

■ Color TV is here and it's here to stay. But the fast pace of technological development has brought us to the age of *continuing education*. If you want to keep up with color TV, you'll need not only to know it from A to Z, you'll have to keep up with new developments.

Every experienced technician is familiar with the expert's maintenance approach to electronic equipment: diagnose — isolate — repair. But do you know how to successfully apply this technique to color TV?

What do you know about the nature of light, for example; about the characteristics of the human eye; details of the compatible color TV system; color receiver circuits and how they operate; blanker circuits; color killer circuits; color CRTs; convergence, and a score of other important technical aspects of color?

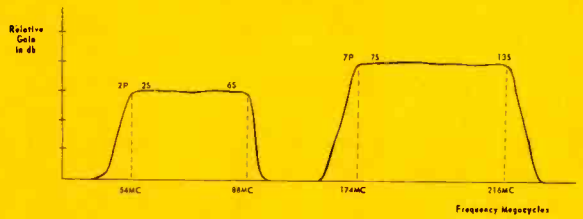
Whether you've finished the best color course available and now actively engage in servicing color or you now work only as an apprentice while studying color, you'll need to know *more* about color every day to keep up with changing service problems. Some of these problems will prove formidable if you don't know all about color fundamentals. And to learn all the fundamentals, you'll have to begin at the beginning and when you've finished, you must continue reviewing those fundamentals from time to time. Hence, in this new series of practical articles on color TV servicing, we'll begin by briefly outlining some basic considerations. Then, as we progress into the future, we'll cover each specific subject in greater detail.

Block Diagram

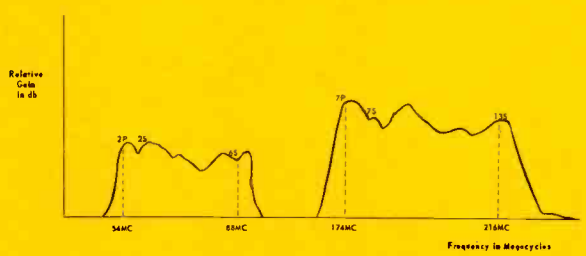
The block diagram in Fig. 1 shows all stages used in a modern color TV receiver. You will note that most of the stages, up to and including the video amplifier, are very similar to those used in B/W TV sets.

The signal that contains phase modulated color information and burst pulses, in addition to the luminance component with its associated sync pulses, is picked up by the antenna. It is boosted by the tuner and IF amplifiers. It is then demodulated, the sound

CHART I



Frequency vs. gain response curve showing ideal flat response for color TV reception of an antenna.



Frequency vs. gain curve showing peak and valleys which cause very poor reception.

portion is taken off and fed to the sound circuits, and the composite video signal is fed to the first video amplifier. From this amplifier, the luminance signal takes one path and the chroma information another.

The Antenna

The importance of the color TV antenna system cannot be overstressed. The antenna necessary for good color reception will depend on many factors: channels being received, distance from the station, field strength of the signals, and other propagation factors.

In many cases, even in excellent signal areas, an ordinary indoor antenna will not provide satisfactory color reception — so an outdoor antenna is generally recommended.

The main requirement of a color antenna is flat

COLOR TV

Introduction to a series of articles covering the expert's maintenance concept: diagnose — isolate — repair

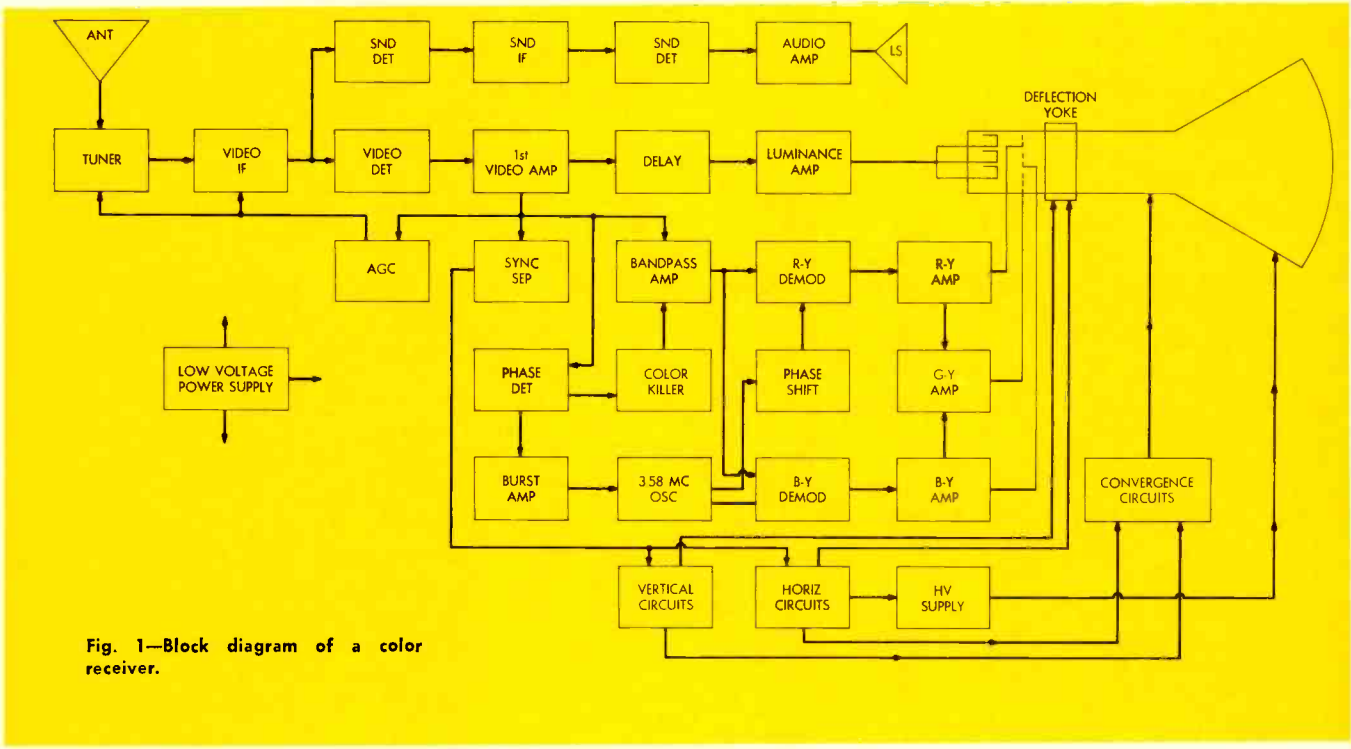


Fig. 1—Block diagram of a color receiver.

response, preferably accentuating the color subcarrier frequencies (See Chart I). In many cases, the antenna which provides excellent B/W reception will yield very poor color pictures. And when RF boosters or distribution amplifiers are employed in a color system they should also be capable of broad frequency response.

The Tuner

Most well-designed tuners used in B/W receivers perform satisfactorily for color. But tuners used on color sets are designed for broader frequency response (See Fig. 2). The two most desirable requirements for a color TV tuner are: low standing wave ratio (SWR) and high signal-to-noise ratio. Unlike B/W, color TV cannot tolerate tuner mismatch and noise. And frame grid triodes have contributed to higher signal-to-noise ratios.

Gassy or weak tubes and other tuner problems could cause loss of color or incorrect color rendition while providing normal B/W reception. We cannot overemphasize that a degradation or total loss of color is not necessarily confined to the chroma circuits but may be the result of a fault in the antenna, tuner, IF or video circuits.

Video IF Amplifiers

The complete signal received by the antenna, amplified and converted by the tuner, is fed to the video IF amplifiers. Bandpass requirements of the video IF stages in color sets are more stringent than for B/W. The IF response curve must be broad and accurately shaped to properly pass color information at the low end in addition to the high video fre-

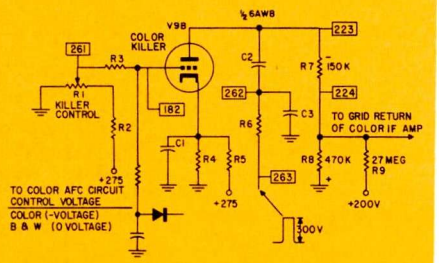


Fig. 5—Color killer circuit employed in Motorola BTS-908 chassis.

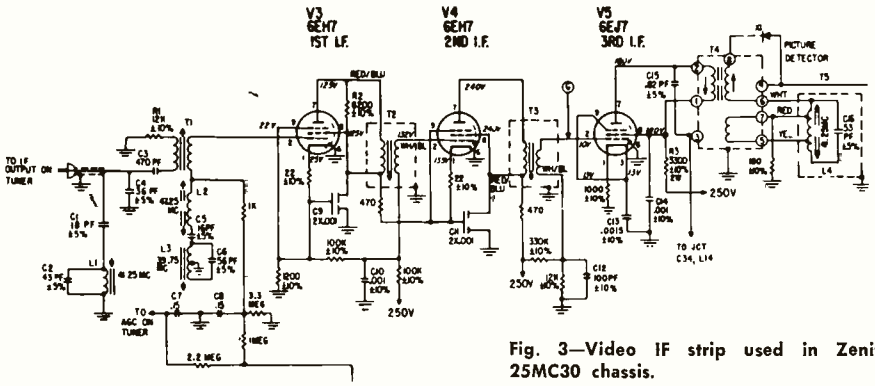


Fig. 3—Video IF strip used in Zenith 25MC30 chassis.

quencies. The wideband response is achieved by stagger tuning and the addition of properly designed filters and traps. Early color TV sets contained up to five video IF stages but higher gain frame grid tubes made it possible to employ only three and sometimes as few as two IF stages in newer designs.

A gassy or weak IF tube or any other component causing reduced amplifier gain can adversely affect the color output. In many instances, IF trouble, which would not normally be noticed in B/W, will allow very little if any color to be produced.

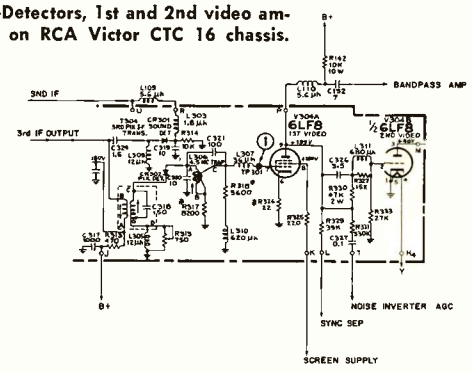
Proper alignment of the video IF stages in a color receiver is very important. In aligning a B/W set, technicians may depart somewhat from manufacturers instructions but this cannot be tolerated in color work. The instructions should be followed explicitly. A typical IF section is shown in Fig. 3.

Detectors and Video Amplifier

Following the final video IF stage two diodes are usually employed as detectors, one for the picture portion and the other to detect the 4.5 Mc heterodyne FM sound signal. From this point on the sound is handled in the same manner as in a B/W receiver.

Output of the video detector contains a normal black and white signal with vertical and horizontal sync pulses, an interleaved color signal and color burst pulses. This composite signal is fed to the first video amplifier which becomes an important junction point. At the output of this amplifier, the composite signal is channeled to different points in the set and the desired portion is retained by circuits in each section. A typical detector and video amplifier schematic is shown in Fig. 4.

Fig. 4—Detectors, 1st and 2nd video amplifiers on RCA Victor CTC 16 chassis.



The luminance component (which contains the monochrome information) is advanced to additional stages for further amplification. The bandpass amplifier extracts the color sidebands and the burst pulse is advanced to the color sync circuits. An AGC sampling is also provided by the first video amplifier. In some sets the signal separation takes place immediately after the picture detector. Both vertical and horizonal pulses receive the same treatment they do in a B/W receiver, and the deflection circuitry used in a color set is similar to its B/W counterpart. But one difference is the high voltage requirements of a color set. A higher voltage output and better regulation is important here.

Luminance Section

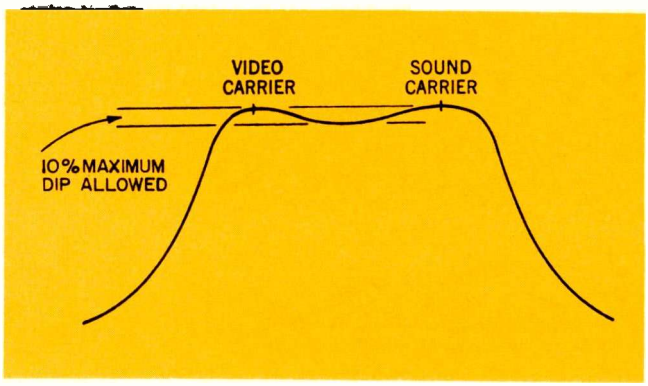
The luminance signal is fed through a delay line to additional video amplifiers. The color information is delayed when it passes through narrow bandpass filters to keep all the segments of the video in step, an equivalent delay is introduced in the luminance channel. The delay line presents a low impedance — hence, one of the video stages is usually a cathode follower. This type circuit forms an impedance match for coupling into the delay line.

Provisions are made for controlling brightness and contrast in one of the luminance amplifiers. A vertical retrace blanking pulse is usually applied in the final video amplifier.

After the brightness signal has been delayed and amplified it is fed through the blue and green drive controls to the CRT. The red gun is supplied directly.

Variations will be found in luminance circuitry

Continued on page 83



Comes the Revolution . . .

The one-man TV-radio operation can swim with the tide, but it'll have to learn some new strokes

by Robert J. Mueller
Distributor Sales Manager
International Rectifier Corp.

■ Like the little "Momma and Papa" grocery store on the corner, the one-man TV-radio service-dealer-technician operation is in danger of becoming extinct. But unlike the little grocery store owner, the technician can recover.

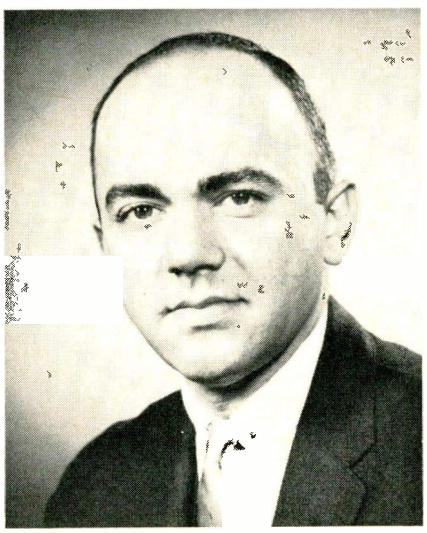
During the past three years many warnings have been sounded that a crisis was approaching. Last year, small TV-radio service shops led the nation in business fatalities — either through bankruptcy or voluntary closing of doors. The replacement parts market shrunk from a healthy $500-million-a-year business to just under $300 million.

Why, then, with the sale of TV sets setting new records, are we faced with this situation?

It is historically true that "service businesses" show their greatest rate of growth during a healthy and prosperous economy. And the total "service industry" of the nation has been booming now for years. But the service business within our industry is at an all-time low today. The "revolution" is here, and those who refuse to recognize it will become just another statistic next month or next year.

Many reasons exist for this decline in TV-radio service. I will direct attention to only some of them.

1. Higher reliability and better design of radios, TVs, phonographs, etc.
2. Higher reliability and longer life on the individual components used in the manufacture of equipment.
3. Some of the mystery has been taken out of electronics, and the average man-of-the-house is no longer afraid to replace tubes or attempt small repairs. This "do-it-yourself" market trend (even though primarily replacement of tubes) accounts for several million dollars in lost service calls.
4. "Moonlighting" continues to grow at an accelerated pace. This part-time repairman has always been with us, but even more so today. Almost 90 percent of the technicians who previously had their own shops — but were forced to close and take another job — still do repair work in the evenings and on weekends for their "old customers" and relatives and friends.



Robert J. Mueller is a 17-year veteran in the electronics industry, who has headed his own sales rep company and guided IR's distributor and consumer division. He is a graduate of UCLA with a degree in Business Administration, and attended Harvard School of Business and Lafayette College for post-graduate work.

Although these are the principal reasons for the drop in TV-radio repair work for the independent shop, they have caused additional changes among those left. The big shops get bigger — to stay in business and to increase their volume. The larger service shops (primarily in metropolitan areas) are expanding the area they cover, and adding more trucks for home servicing. This gives them a distinct advantage over the one-man shop. When Mrs. Housewife calls to have a set repaired she wants it done immediately. Prompt service can only be available through shops with more than one technician. These larger shops can also afford newer and better equipment — can carry reasonable inventory on replacement parts — both of which spell time-saving and faster service to the customer, which in turn builds volume.

Factory service has been with us for a long time and will continue to be. More and more factories are finding it necessary not just to establish warranty service depots, but to insist that their distributors have service and repair facilities available to properly sell their equipment. They are forced to do this because the average small service shop has neither the equipment

Comes the Revolution . . .

nor the knowledge to properly service their equipment.

Another trend has been one of specialization. Some shops have started to specialize in the sales and service of specific equipment. For example, we now have specialists in Hi Fi, commercial sound, commercial two-way radio communications, citizen band radio, intercoms and communications systems of all types — including burglar alarms, door announcers, etc. Many of these shops eventually become franchised dealers, selling and servicing specific lines, and are no longer in the realm of independent service shops.

What will the independent electronic service shop of the future be like? I firmly believe a vast new untapped potential market exists for alert, aggressive, knowledgeable service technicians.

Electronic parts and components are finding their way into literally hundreds of new consumer products and applications. Controlled rectifiers are being used as motor speed controls in household appliances and hand tools. Zener diodes are used in audio equipment, controls and power supplies. Simple electrical circuits of yesterday are becoming electronic circuits today.

One fine example of this point is a situation that I recently encountered. The battery on my car was discharging at all times and at all speeds. I took the car to the dealer from whom it was purchased. The trouble was diagnosed as being in the alternator.

Since I am in the semiconductor business and alternator diodes are part of our line, I knew, of course, that it was probably one defective diode, or possibly two, but not all six. The service department manager, however, informed me that they could sell me a whole new alternator cap with the six diodes installed in it at a cost of $26.00, or, if I wanted to wait until his "special alternator man" came by, which is once a week or when called, perhaps he could replace the defective diode for me. This was a very large new car dealer with a large repair department, but they were *afraid* to do anything with the alternator, particularly replace a single rectifier. They didn't know how to test it or find out which one was defective. I took the car back to my headquarters and one of our technicians replaced the diode. Selling price of this alternator rectifier was $1.60, and it took approximately 15 minutes to replace it.

The purpose of this example is to point out what I sincerely believe will become one of the additional new specialties in the field. I am sure many of you can remember years ago when the first radios were put into automobiles. The average automobile shop could not repair them and the average radio shop could not repair them. A whole new service industry grew up on auto radio repairs.

Just as the radio created an auto radio specialist, I believe the advent of transistorized auto ignition systems — the wider use of alternators, etc. — will force development of an electronic service shop specializing in auto systems.

Many articles have been written in the past which took the independent service technician to task for being a "poor business man." Unfortunately, this has been true for a long time, but in addition to learning how to become a good businessman, the independent operators must become aware of revolutionary changes taking place within his profession.

It is the day and age of the specialist, and I believe the service business will have to specialize to survive. A few medium-size and larger electronic service shops will be able to diversify — cover a broad range of electronic repairs — because they will have specialists in three or four fields working for them. The future can be bright. There's a vast potential and a new group of products that will require servicing. Such things as household appliances, all types of electric hand tools, all types of communications equipment, transportation equipment, and on and on.

If the independent service-dealer can learn to be a good business man, if he can quickly become aware of the radical changes taking place within his profession, the battle is half won. The final and last step is one of technical education. I recently called a television repair man to my home to repair a TV set. We have two TV sets, and one has a printed circuit chassis. While there, he was asked to adjust and check over the set with the printed circuit. He did adjust it, but when he saw that it was a printed circuit chassis he said, "I hate printed circuits and I hope I never have to repair this set."

We talked for a few minutes and I told him that I expected more and more consumer and industrial equipment would use printed circuits in the future. He replied, "When this happens I'll get out of the business."

I wonder if he realizes how true that statement is, because if he doesn't get out of the business voluntarily he surely will be forced out. Manufacturers supply all kinds of technical papers, books and schematics, helpful hints on learning new circuitry or new and better ways of repairing the equipment they make. Trade publications are crammed full of information that can be used to good advantage. All types of training and educational programs — including manufacturer and technician-association sponsored seminars — are made available to service-dealers and technicians.

It is a never-ending challenge to try and keep up with our fast-moving industry. But after all, isn't that true in any profession? Like it or not, the successful service-dealer and technician will have to achieve a professional status to keep up with the demands of the industry and the advancement of technology. ■

1965 ELECTRONIC TECHNICIAN'S DIRECTORY

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AC Electronics Div GMC 1925 E Kenilworth Milwaukee Wis
ATR Electronics 300 E 4th St Paul Minn
Acme Electric Corp 31 Water St Cuba NY
Acoustic Research 24 Thorndike St Cambridge Mass
Acro Products 369 Shurs Lane Philadelphia Pa
ADC Inc 2833 13 Ave S Minneapolis Minn
Adler TV Specialties PO Box 2005 Atlantic City NJ
Admiral Corp 3800 W Cortland St Chicago Ill
Advance Relay 2435 N Naomi St Burbank Calif
Aerovox Corp 740 Belleville Ave New Bedford Mass
Akro-Mils 820 Market St Akron O
Allen-Bradley 136 W Greenfield Ave Milwaukee
Alliance Mfg Co Alliance O
Allied Radio 100 N Western Ave Chicago Ill
Alpha Wire Corp 180 Varick St New York
Altec-Lansing 1515 S Manchester Anaheim Calif
American Concertone 9449 W Jefferson Blvd Culver City Calif
American Electronic Labs Inc Colmar Pa
American Geloso Electronics 251 4 Ave New York NY
American Microphone Div see Electro Voice
American Telephone & Telegraph 195 Bdwy New York NY
American Trading Co Blaustine Building Baltimore Md
Amp Inc 3822 Eisenhower Blvd Harrisburg Pa
Amperex Electric 230 Duffy Ave Hicksville NY
Ampex Audio Inc 934 Charter St Redwood City Calif
Ampex Corp 25564 Willow Pond Lane Los Altos Hills Calif
Amphenol-Borg Electronics 2801 S 25 Ave Broadview Ill
Amprobe Instrument 630 Merrick Rd Lynbrook NY
Analab Instrument 30 Canfield Rd Cedar Grove NJ
Anasphone Corp 10912 La Cienega Blvd Inglewood Calif
Andrea Radio 27-01 Bridge Plazza N Long Island City NY
Antennacraft 1215 Angency St Burlington Iowa
Antenna Designs Inc 802 Washington St Burlington Iowa
Antenna Products Co Box 110 Mineral Wells Tex
Antenna Specialists 12435 Euclid Ave Cleveland O
Antronic Corp 4942 West Div St Chicago Ill
Arco Electronics Community Drive Great Neck NY
Arcturus Electronics 420 Kearny Ave Kearny NJ
Argos Products 600 South Sycamore Genoa Ill
Arkay Int'l 88-06 Van Wyck Expressway Richmond Hill LI NY
Armco Steel Corp 703 Curtis St Middletown O
Arrow Fastener Co 1 Junius St Brooklyn NY
Arrow-Hart & Hegeman 103 Hawthorne St Hartford Conn
Artisan Organs 2476 N Lake Avenue Altadena Calif
Arvin Industries Columbus Ind
Astatic Corp Jackson & Harbor Sts Conneaut O
Astron Corp 255 Grant Ave East Newark NJ
Atlas Sound 1449 39 St Brooklyn NY
ATR Electronics 300 E 4 St St Paul Minn
Audax Inc 109-01 37 Ave Corona NY
Audio Devices 444 Madison Ave New York NY
Audio Dynamics 1677 Cody Ave Ridgewood NJ
Audio Empire Div Dyna Empire 1075 Stewart Ave Garden City LI NY
Audio Corp 514 Bdwy New York NY
Audio-Master Corp 17 E 45th St New York NY
Audiotex Mfg 400 S Wyman St Rockford Ill
Audiotex Mfg 3225 Exposition Pl Los Angeles
Auricord Corp 34-43 56th St Woodside NY
Automatic Electric Co Northlake Ill

B

B&K Instruments (Bruel & Kjaer) 3006 W 106 St Cleveland O
B&K Mfg Co 1801 W Belle Plaine Chicago Ill
BSR (Birmingham Sound Reproducers) Ltd College Point LI NY
Ballantine Labs Boonton NJ
Barber-Colman Co Rockford Ill
Barker & Williamson Bristol Pa
Barry Electronics 512 Bdwy New York
Beauchaine Sales Corp 584 Union Avenue Laconia NH
Beckman Instruments Berkeley Div 220 Wright Ave Richmond Calif
Belden Mfg 415 S Kilpatrick Chicago Ill
Bell & Howell 7100 McCormick Rd Chicago Ill
Bell Sound Systems 6325 Huntley Rd Columbus
Bell Telephone Labs 463 West St New York NY
Benco TV Assoc 27 Taber Rd Rexdale Ont Canada
Bendix Radio Div Industrial Electronic Prods Baltimore 4 Md
Benjamin Electronic Sound 97-03 43 Ave Corona NY
Berns Mfg 9853 Chalmers Detroit Mich
Bird Electronics Corp 30303 Aurora Rd Solon O
Birnbach Radio 145 Hudson New York NY
Bliley Electric Union Station Bldg Erie Pa
Blonder-Tongue Labs 9 Alling St Newark NJ
Bogen-Presto PO Box 500 Paramus NJ
Boonton Radio Boonton NJ
Don Bosco Elec Inc Littell Road Hanover NJ
Bourns Labs Box 2112 Riverside Calif
Bozak Co RT Box 1166 Darien Conn
Brach Manufacturing Corp 200 Central Ave Newark NJ
Bright Star Industries Clifton NJ
British Industries Port Washington LI NY
Browning Labs 100 Union Ave Laconia NH
Brush Instruments 37 St & Perkins Cleveland
Bud Radio 4605 E 355 St Willoughby O
Burgess Battery Exchange St Freeport Ill
Burroughs Corp 6072 2 Ave Detroit Mich
Bussmann Mfg 2538 W University St St Louis

C

Cabinart Inc 35 Geyer St Haledon NJ
Cadre Industries Box 150 Endicott NY
Calbest Electronics 4801 Exposition Bldg Los Angeles Calif
Cannon Electric 3208 Humbolt St Los Angeles
Capehart Corp 87-46 123 St Richmond Hill NY
Castle TV Tuner Service 5710 N Western Ave Chicago Ill
Centralab 900 E Keefe Ave Milwaukee Wis
Channellock Inc South Main St Meadville Pa
Channel Master Corp Ellenville NY
Charles Engineering Inc 3421 N Knoll Drive Los Angeles Calif
Chem Spray Corp 67-27 Cadillac St Houston Tex
Chemical Electronic Engineering Jackson & Ravine Drive Matawan NJ
Chemtronics Inc 870 E 52 St Brooklyn NY
Cinch Jones Div Cinch Mfg 1026 S Homan Ave Chicago Ill
Cisin Co Harry G Amagansett NY
Clairex Corp 19 W 26 St New York NY
Clarostat Mfg Dover NH
Clear Beam Antenna Corp 9754 Deering St Chatsworth Calif
Cletron Inc 1974 E 61 St Cleveland O
Cleveland Institute of Electronics 1776 E 17 St Cleveland O
Cohu Electronics Massa Div 5725 Kearny Villa Rd San Diego Calif
Colman Tool & Electric Products PO Box 2965 Amarillo Tex
Colorgrams Inc 58 Old Stewart Ave New Hyde Park LI NY
Columbia Products Co Route 3 Columbia SC
Columbia Wire & Supply Co 2850 Irving Park Rd Chicago Ill
Communications Co 300 Greco Ave Coral Gables Fla
Communication Electronics PO Box 1272 Scottsdale Ariz
Communications Products Co Route 79 Marlboro NJ
Conar Instrument 3939 Wisconsin Ave Washington DC
Conrac Inc 19217 Foothill Blvd Glendora Calif
Continental Electronics 1050 N Central Expressway Dallas Texas
Cornell-Dubilier Electronics 50 Paris St Newark NJ
Creative Products Inc 8120 Blue Ash Rd Cincinnati O
Crown Int'l Box 261 Elkhart Ind
Cush Craft 621 Hayward St Manchester NH
Cutler-Hammer 436 N 12 St Milwaukee Wis

D

Dale Electronics 1378 28 Ave Columbus Neb
Harry Davies Molding Co 1428 North Wells St Chicago Ill
Daystrom Inc Archbald Pa
DeJur-Amsco 45-01 Northern Blvd Long Island City NY
Delco Radio Div GMC Kokomo Ind
Delmonico Int'l 120-20 Roosevelt Corona Ill
DeWald Radio 35-15 37 Ave Long Island City NY
Dialight Corp 60 Stewart Ave Brooklyn NY
Diamond Tool 4602 Grand Ave W Duluth Minn
D F Dickey Inc 4863 Rivoli Dr Macon Ga
Drake Mfg 4626 N Olcott Chicago Ill
DuKane Corp St Charles Ill
DuMont Labs Allen B 750 Bloomfield Clifton NY
DuPont de Nemours Wilmington Del
Duotone Co Locust St Keyport NJ
Dutch Brand Div Johns-Manville 78 S Woodlawn Ave Chicago Ill
Dymo Industries 2725 10 St Berkeley Calif
Dynaco Inc 3912 Powelton Ave Philadelphia Pa
Dyna-Empire 1075 Steward Ave Garden City LI NY

E

ECI Electronic Communications 352 N Macquesten Pkwy Mt Vernon NY
ELPA Industries Ortofon Div New Hyde Park Ill
E-Z Hook Products 1536 Woodburn Ave Covington Ky
E-Z Way Towers Inc PO Box 5797 Tampa Fla
Eby Sales 148-05 Archer Ave Jamaica LI NY
Eitel-McCullough 301 Industrial Way San Carlos Calif

Directory . . .

Eico Corp M St below Erie Philadelphia Pa
Eico Electronic Instrument Co 139-01 39th Ave Flushing NY
Electric Auto Lite 3529 24 St Port Huron Mich
Electric Storage Battery 1717 E 9 St Cleveland
Electro Acoustic Prods 2135 Bueter Rd Ft Wayne Ind
Electro Products Labs 6125 W Howard St Chicago Ill
Electronic Chemical Corp 813 Comminpaw Ave Jersey City NJ
Electronic Communications Inc 56 Hamilton Ave White Plains NY
Electronic Measurements Lewis St & Maple Ave Eatontown NJ
Electronics-Missiles & Communications Inc 262 E 3rd St Mt Vernon NY
Electronic Organ Arts 4949 York Blvd Los Angeles
Electronic Prods Div Victoreen Instrument 111 E 3 St Mt Vernon NY
Electronic Publishing 133 North Jefferson St Chicago Ill
Electronic Technician Ojibway Bldg Duluth Minn
Electro-Sonic Labs 627 Bdway New York NY
Electro-Voice Inc Buchanan Mich
Elgin Advance Relays 2435 W Naomi St Burbank Calif
Elpha Marketing-Thorens Atlantic & Steward Ave New Hyde Park NY
Eltec Labs 14 Alsop Ave Middletown Conn
Emerson Radio & Phono 14 & Coles Jersey City NJ
Empire Scientific 1075 Steward Ave Garden City LI NY
Enterprise Development Corp 1102 E 52nd St Indianapolis Ind
Entron 2141 Industrial Pkway Silver Springs Md
Ercona Corp 16 W 46 St New York NY
Essex Wire 1601 Wall St Indianapolis Ind
Euphonics Corp PO Box 2746 Rio Piedras Puerto Rico USA
Eveready Batteries (see Union Carbide Co)
Exide Industrial Div Electric Storage Battery 52 S 15 St Philadelphia Pa

F

Fanon-Masco 439 Frelinghuysen Ave Newark NJ
Fidelitone Inc 6415 Ravenswood Ave Chicago Ill
Finney Co 34 W Interstate St Bedford O
Fischer Special Mfg Co 446 Morgan St Cincinnati O
Fisher Radio 21-24 44 Dr Long Island City NY
Foxboro Co Newponset Ave Foxboro Mass
Freed Transformer 1718 Weirfield St Brooklyn NY

G

GAM Electronics 138 Lincoln St Manchester NH
Gator Probe Corp 2751 San Juan Road Hollister Calif
GC Electronics 400 S Wyman St Rockford Ill
Garrard Sales 80 Shore Rd Port Washington NY
Gavin Instruments Depot Square & Div St Somerville NJ
General Dynamics/Electronics 1407 N Goodman St Rochester NY
General Electric Audio Products Div Decatur Ill
General Electric Communications Products Div Lynchburg Va
General Electric Receiving Tube Dept Owensboro Ky
General Electric Receiver Div Utica NY
General Instrument 65 Gouveneur St Newark NJ
General Precision GPL Div Mt Kisco NY
General Radio West Concord Mass
General Radiotelephone Co 3501 W Burbank Blvd Burbank Calif
Gertsch Products 3211 S La Cienega Blvd Los Angeles Calif

H

H & H Equipment Co Laotto Ind
Hallamore Electronics 714 N Brookhurst St Anaheim Calif
Hallicrafters Co 4401 W 5 Ave Chicago Ill
Hallmark Electronics 436 N 31 St Philadelphia
Hallmark Instruments 2620 Freewood Dr Dallas Tex
Hammarlund Mfg 53 W 23 St New York NY
Harman-Kardon 15th & Lehigh Ave Philadelphia Pa
Hartley Products 521 E 162 St Bronx NY
Hathaway Instrument 5800 E Jewell Ave Denver Colo
Heath Co Benton Harbor Mich
Hewlett-Packard 1501 Page Mill Rd Palo Alto Calif
Hickok Electrical Instrument 10514 Dupont Ave Cleveland O
Hi-Lo Mfg 1122 Newport St Chicago Ill
Hitachi (see Sampson Co)
Hoffman Electronics Consumer Prods Div 3761 S Hill St Los Angeles Calif
Hollywood Television Wuerth Surgitron Div 1949 Moffett St Hollywood Fla
Honeywell Commercial Residential Div 2753 4 Ave Minneapolis Minn
Hunter Sales RN 9851 Alburtus Ave Santa Fe Springs Calif
Hycon Electronics 1030 S Arroyo Pkwy Pasadena Calif
Hy-Gain Antenna Products 8566 NE Highway 6 Lincoln Neb
Hysol Co 322 Houghton Olean NY

I

I E H Manufacturing Co 102 Prince St New York NY
IERC Div Box 271 Burbank Calif
Illumitronic Engineering 680 E Taylor St Sunnyvale Calif
I-T-E Circuit Breaker 601 E Erie Ave Philadelphia Pa
ITT Components 100 Kingsland Rd Clifton NJ
ITT Distributor Products 250 Broadway New York NY
Injectorall Co 4 North Great Neck NY
Institute of Electrical & Electronic Engineers (IEEE) 72 West 45th St New York NY
Int'l Business Machines 590 Madison Ave New York
Int'l Correspondence Schools Scranton Pa
Int'l Crystal Mfg 18 N Lee Oklahoma City Okla
Int'l Electronics 316 South Service Rd Melville LI NY
Int'l Rectifier 233 Kansas St El Segundo Calif
Int'l Resistance 401 N Broad Philadelphia Pa
Int'l Tel & Tel 320 Park Avenue New York NY

J

Jackson Electrical Instrument 124 McDonough St Dayton O
J-B-T Instruments 61 Hamilton New Haven Conn
Jensen Industries 301 Interstate Rd Addison Ill
Jensen Mfg 6601 S Laramie Chicago Ill
Jensen Tools 3630 East Indian School Rd Phoenix Ariz
Jerrold Electronics 15th & Lehigh Ave Philadelphia Pa
Jersey Specialty Co Box 576 Mt View NJ
Jetronic Industries 4312 Main St Philadelphia Pa
JFD Electronics 15 Avenue at 62 St Brooklyn NY
Johnson Co EF Waseca Minn
Jones & Laughlin 401 Liberty Pittsburgh Pa
Jones Div Cinch Mfg 1026 S Homan Chicago Ill
JW Electronics 1538 W Jarvis Chicago Ill
JW Electronics PO Box 51 Bloomington Indiana

K

KLH Research & Devel 30 Cross St Cambridge Mass
KTV Tower & Comm Equip Co PO Box 294 Sullivan Ill
Kaar Engineering Co 2998 Middlefield Rd Palo Alto Calif
Karg Laboratories 162 Ely Avenue S Norwalk Conn
Karlson Assoc 1610 Neck Rd Brooklyn NY
Kay Electric 14 Maple Pine Brook NJ
Kay-Townes Antenna 1511 Dean Rome Ga
Kenwood Electronics 3700 South Broadway Pl Los Angeles Calif
Kepco Inc 131-38 Sanford Ave Flushing NY
Kester Solder 4201 Wrightwood Chicago Ill
Klipsch & Assoc PO Box 96 Hope Ark
Kinematix Inc 2040 West Washington Chicago
Knob Corp of America 469 Jericho Tpk Mineola NY
Koss Inc 2227 N 31 St Milwaukee Wis
Kraeuter & Co 585 18 Ave Newark NJ
Krylon Inc Ford & Washington St Norristown Pa
Kwikheat Mfg 3731 San Fernando Rd Glendale Calif

L

LA Tuner Exchange 4611 West Jefferson Los Angeles Calif
Lafayette Radio Electronics 111 Jerico Tpk Syosset LI NY
Lambda Electronics 515 Broad Hallow Huntington NY
Lampkin Labs Bradenton Fla
Lance Antenna 1730 1st St San Fernando Calif
Lansing Sound James B 3249 Casitas Ave Los Angeles Calif
Lavoie Labs Morganville NJ
Leach Corp 18435 Susana Rd Compton Calif
Lectrotech Inc 1731 West Devon Ave Chicago
Ledex Inc 123 Webster Dayton O
Leeds & Northrup 4907 Stenton Philadelphia
Lesa of America 11 W 42 St New York NY
Littelfuse Inc Des Plains Ill
Litton Industries 336 North Foothill Beverly Hills Calif
Los Angeles Turner Exchange 4611 W Jefferson Los Angeles Calif

M

3M Electrical Products Div 900 Bush Ave St Paul Minn
McIntosh Labs 2 Chambers St Binghamton NY
Magnavox Co 2131 Bueter Rd Ft Wayne Ind
Magnecord Div Midwestern Instrument PO Box 7186 Tulsa Okla
Magnetrack Box 147 Caroline Puerto Rico
Majestic Int'l 743 N LaSalle St Chicago Ill
Mallory & Co PR 3029 E Washington Indianapolis Ind
Marantz 25-14 Bdwy Long Island City NY
Marconi Instruments 111 Cedar Lane Englewood NJ
Matsushita Electric Co 200 Park Ave New York
Mercury Electronics 111 Roosevelt Ave Mineola NY
Mercury TV Tuner Service 890 River Bronx NY
Merit Coil & Transformer Merit Plaza Hollywood Fla
Methode Mfg 7447 W Wilson Ave Chicago
Metrex (UXL Corp) 819 Blake Avenue Brooklyn
Michigan Magnetics Vermontville Mich
Milgray/NY 136 Liberty St New York NY
Millen Mfg James 150 Exchange Malden Mass
Miller Co JW 5917 S Main Los Angeles Calif
Milo Electronics 530 Canal New York NY
Monarch Elec Int'l Inc 7035 Laurel Canyon Blvd North Hollywood Calif

Monitoradio Div Idea 7900 Pendleton Pike Indianapolis Ind
Mosley Electronics 4610 N Lindberg Brideton Mo
Moss Electronics 2435 White Plains Rd Bronx NY
Motorola Communications Div 4501 W Augusta Chicago Ill
Motorola Consumer Prods 9401 W Grand Ave Franklin Park Ill
Mueller Electric 1583 E 31 St Cleveland O
Mullard (see Int'l Electronics New York NY)
Multicore Div British Industries 80 Shore Rd Port Washington NY
Multitron Corp 309 Queen Ann Rd Teaneck NJ
Muzak Co 220 4 Ave New York NY

N

Neshaminy Electronics Neshaminy Pa
Newark Electronic 223 W Madison Chicago Ill
Newcomb Audio Products Co 6824 Lexington Ave Hollywood Calif
Newtronics Corp 3455 Vega Ave Cleveland O
North American Philips (Norelco) 100 East 42 Street New York NY
Nortronics Co 8133 10th Ave N Minneapolis
Nutone Inc Cincinnati O

O

Oak Mfg Co Crystal Lake Ill
Oaktron Industries Monroe Wis
Oelrich Publications 4308 Milwaukee Ave Chicago Ill
Ohmite Mfg 3673 Howard St Skokie Ill
Olson Radio 500 S Forge Akron O
Olympic Radio & TV 34-01 38 Ave Long Island City NY
Ortron Electronics 29 Lincoln Ave Orange NY
Oxford Elec Corp 2331 North Washtenaw Ave Chicago Ill

P

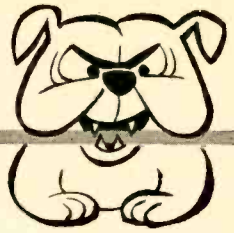
Packard Bell Electronics 12333 W Olympic Blvd Los Angeles Calif
Pacotronics Inc 70-31 84 St Glendale LI NY
Palmer Electronics Laboratories Lowell Rd Carlisle Mass
Parker Metal Goods Co 85 Prescott St Wooster Mass
Pearce-Simpson 2295 NW 14 St Miami Fla
Perma-Power Co 5740 North Tripp Ave Chicago
Phaostron Instrument & Electronics 151 Pasadena Ave South Pasadena Calif
Phelps Dodge Communications Products Div Route 79 Marlboro NJ
Philco Corp "C" and Tioga Sts Philadelphia Pa
Philharmonic Radio & TV 235 Jersey Ave New Brunswick NJ
Pickering & Co Sunnyside Boulevard Plainview NY
Pilot Radio 100 Electra Lane Yonkers 4 NY
Pioneer Electric & Research Forest Park Ill
Planet Mfg Corp 225 Belleville Avenue Bloomfield NJ
Pomona Electronics Co Inc 1500 East Ninth St Pomona Calif
Potter & Brumfield 107 N 10th St Princeton Ind
Precise Electronics & Devel 76 E 2 St Mineola LI NY
Precision Apparatus 819 King St Woodmere LI NY
Precision Electronics Inc 9101 King Ave Franklin Park Ill
Precision Tuner Service PO Box 272 Bloomington Ind
Pyramid Electric Co Darlington SC

Q

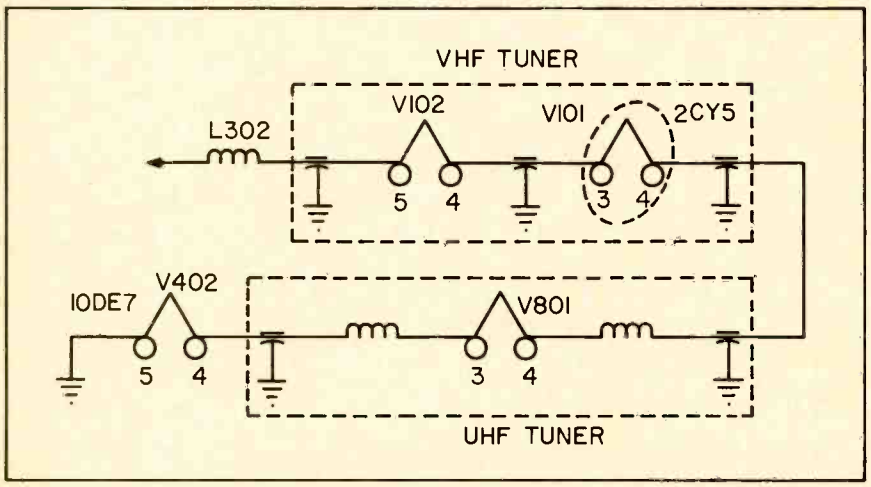
Qualitone Industries 102 Columbus Ave Tuckahoe NY
Quam-Nichols 234 E Marquette Rd Chicago Ill

Continued on page 86

TOUGH DOG CORNER



Difficult Service Jobs Described by Readers



Intermittent cathode to heater short in tuner tube caused lack of vertical sweep in Admiral 15UA2 chassis.

Two Intermittent 2CY5s

A service call was made on an Admiral chassis 15UA2, the complaint was lack of vertical sweep. The technician noticed that the 10DE7 vertical osc-output tube filaments were not lit. He replaced the 10DE7 and the set started to work normal. The next day we received a call from the same customer, the set again had a bright horizontal line with normal sound.

The set was then brought into the shop. After removing the back, I saw that the 10DE7 filaments were not lit and also that the UHF tuner tube was out. This was an intermittent condition because most of the time the set operated normal. This made it difficult to localize the trouble. Before I could make any further checks the set started working. The set worked fine on the bench for two days. When it was switched ON the third day the 10DE7 was again out.

The filament string diagram indicated that the 10DE7 and the UHF tuner tube were on the ground side of the VHF tuner tubes with the 10DE7 the last tube in the string. The problem was then localized to the tuner. I replaced both tuner tubes but the trouble still existed. I tested the original 2CY5 and 5CG8 and both checked OK. I have known of cases where the insert capacitors have shorted out so I tied the filament wire directly to the tube pins. After this was done, the set operated normally. The original tubes were reinserted and the set was returned to the customer.

Two days later the customer called, he was very angry as the set had only a bright horizontal line again. The set was brought into the shop and the trouble appeared when the set was switched ON. The 2CY5 was again replaced, this time with a different tube than the first replacement. The TV then worked fine. The 2CY5 we used for the replacement the first time was still on the shelf. I tested this tube and when I applied an increased filament voltage a heater-to-cathode short was indicated. The same was true for the original 2CY5.

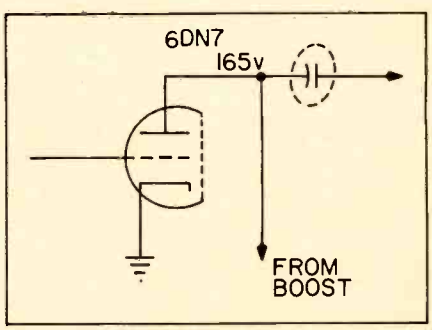
The set worked perfectly for two days with the third 2CY5 so it was returned to the customer. The TV has functioned perfectly ever since. In this case, I was led astray by assuming that all tubes on the shelf are OK. *Homer Davidson, Fort Dodge, Ia.*

Shorted Vert Capacitor Kills HV

A General Electric Model 21T3429 TV was brought into the shop. The complaint was lack of high voltage. A substitution of all high voltage tubes was made with negative results. The waveform on the grid of the horizontal output tube was normal. The boosted B plus was very low, (300v) and the low voltage supply read 275 v. This indicated probable trouble in the horizontal output or damper circuit.

A resistance check of the flyback showed that the resistance between terminals 4 and 5 of the horizontal output transformer was 25 Ω high. The transformer was changed on the strength of this indication but to no avail as the trouble still persisted after replacement was made. Resistance readings in the damper circuit were normal. Yoke replacement was also not the answer.

I then proceeded to check out the circuits fed by the boost supply. While checking the vertical oscillator circuit I removed the 6DN7 vertical oscillator-output tube. The high voltage snapped on immediately upon removal of the tube. A new 6DN7 was inserted and the HV again disappeared. A resistance check of the plate circuit (pin 5 6DN7) revealed a shorted .022 μf coupling capacitor. Replacement of this component restored the set to normal operating conditions. *Ed Sachleben, Louisville, Ky.*



Shorted capacitor in vertical circuit disables HV of G-E M-6 chassis.

TOUGH DOGS WANTED

$10.00 paid for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photographs are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth, Minnesota 55802.

1+1=2 in 1

FOR IN-SHOP B&W AND COLOR TV TROUBLESHOOTING
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compact, portable
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You get double use from two top-quality instruments in one—at less cost!

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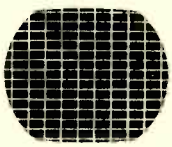
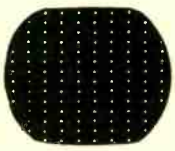
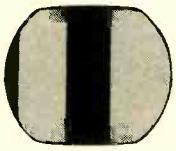
All horizontal lines and dots are just one scanning line high (finest in the industry). This avoids confusing overlaps or double images.







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Uses famous B&K point-to-point signal injection technique. Supplies your own TV signals at any time. Makes it quick and easy to pinpoint any TV trouble in any stage throughout the video, audio, r.f., i.f., sync and sweep sections. Saves a lot of time and work on tough dogs and intermittents.

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Model 1074 Net, $249.95

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NEW PRODUCTS

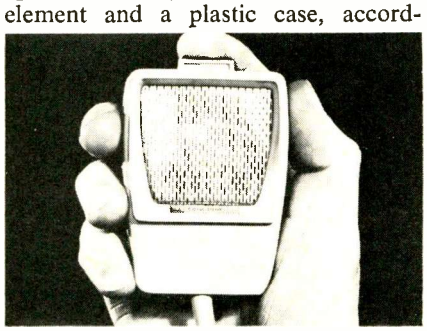
Fog Horn/Hailer

An electronic boating accessory, a fog horn is announced. Designated

model MD-24, the new unit performs three boating functions: fog horn, hailing, and boat horn. Heathkit.

Ceramic Microphone

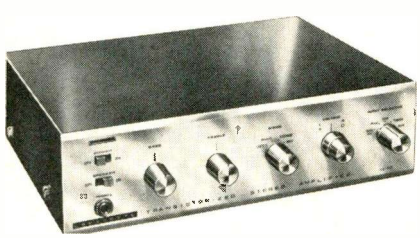
This low impedance CB microphone has a response of 170 to 7000 cps, a sensitivity of -62 db, a ceramic element and a plastic case, accord-



ing to specifications. It comes with a spiral cord and is available with a magnetic dash mount. Sonotone.

Stereo Amplifier

A solid state amplifier with 20 w IHFM output for each channel is introduced. The unit has a front panel stereo headphone jack and switch to



silence speakers, concentric volume control, and separate ON/OFF power switch with pilot lamp. Specifications listed by manufacturer are: Response ±1 db 30-20,000 cps; 1 percent harmonic distortion; Hum & Noise - 70 db tuner, Aux, -56 db magnetic phone, tape head. Outputs 4-16Ω impedance. Lafayette.

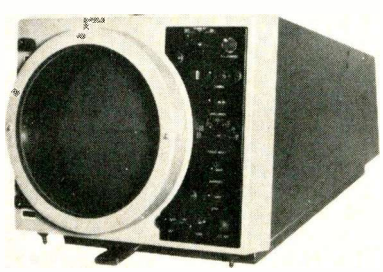
Scubadiver Microphone

A piezoelectric microphone designed for use by scubadivers is announced. It is approximately 1¼ x ⅓ in. The microphone can be incorporated in-

to divers' face masks. It is waterproof and capable of withstanding pressures well in excess of diving depths, the manufacturer says. Technical Dynamics.

Boat Radar

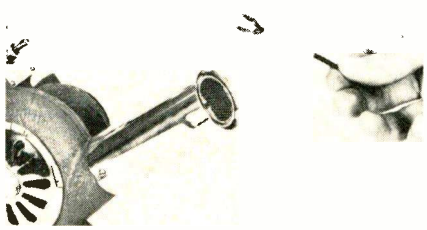
A transistorized radar for boat use is introduced. The Model 2502 radar is rated at 20,000 w and peak power with a range from 30 ft. out to 48 mi.



away. The unit has six range markers with variable intensity controls on all seven ranges: ½, 1½, 3, 6, 12, 20, and 48 miles. Raytheon.

Shrinkable Tubing

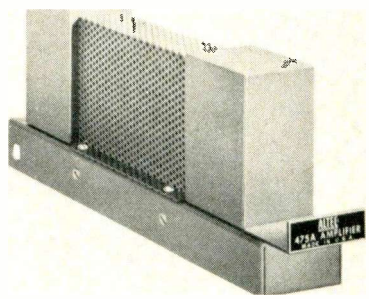
A polyolefin type heat-shrinkable tubing with a 2:1 shrinkage ratio is



announced. FIT-221 is marketed in standard packages of 4-ft lengths, 6-in. lengths and small quantity assortments of 6-in. lengths. Alpha.

Program Amplifier

A direct plug-in replacement for the tube-type 458A preamp and 459A program amplifier, the 475A, is in-



troduced. The solid state unit employs silicon transistors. Altec.

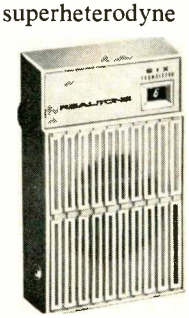
Stereo Receiver

A stereo multiplex AM-FM tuner/amplifier combines on a single chas-

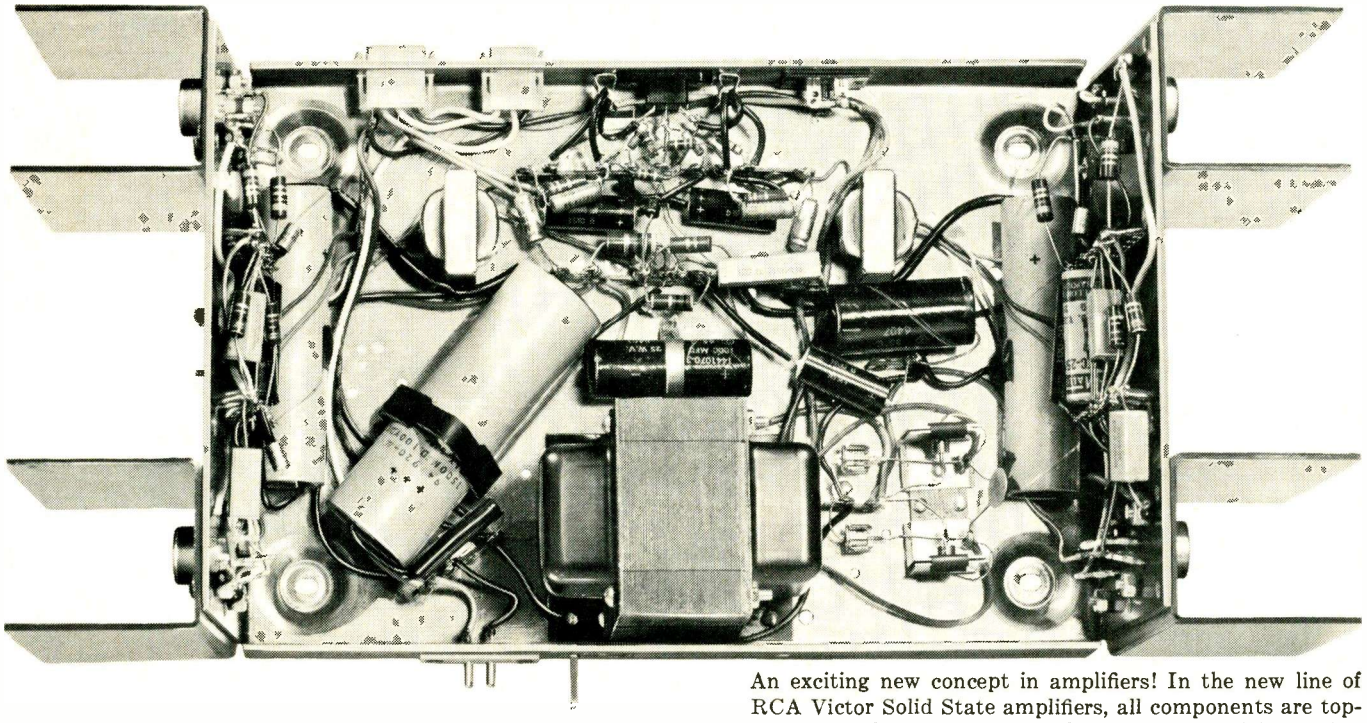
sis a stereo amplifier, individual AM and FM tuning sections, multiplex circuitry and dual preamplifiers for records and tapes. Allied Radio.

Transistor Radio

This six transistor pocket portable uses a superheterodyne circuit with



a diode for audio detection. Accessories include earphone jack, leather field case with easel/handle and 9 v battery. Size is 4½ x 2¾ x 1⅓ in. Realtone.



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It takes an advanced system of highest quality components to make a top-performance home entertainment instrument. Short cuts or shortcomings anywhere along the line make it difficult for you to get top performance out of a set—and top performance, not excuses, is just what a service customer expects for his money.

For your peace of mind . . . and profits . . . it's good to know that every RCA Victor instrument is a fully engineered, fully integrated, fully tested system of advanced components. Add your know-how to this kind of engineering excellence and you're sure of one thing: satisfied customers every time!

An RCA Data Service subscription, including the service industry product information digest, "Plain Talk and Technical Tips," is available from your local RCA Victor distributor.

See Walt Disney's "Wonderful World of Color," Sundays. NBC-TV Network.

HIS MASTER'S VOICE

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NEW PRODUCTS

Portable Display

A display showcase for assorted portable radios, tape recorders, and television sets is introduced. Strikingly distinctive in red, black, and gold — the "Jr. Circus Wagon" can be used in two ways. As a counter top model, it requires 36 in. of counter space and provides 8 ft. of display space on its three shelves. When used together with the wire floor stand, it becomes a standing display with an additional shelf below. Channel Master.

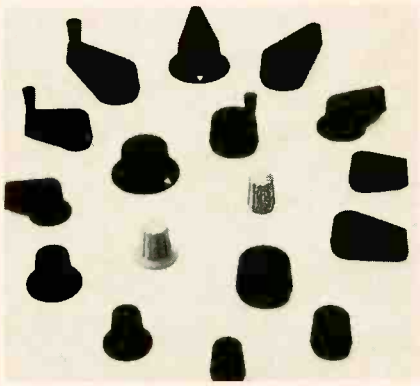
Base/Cover Combination

An integrated base and cover combination for Dual automatic turntables is announced. The cover of the model

DCB-1 has side panels of oiled walnut to match the base, with smoke-tinted plexiglass on the other surfaces. United Audio.

Knobs

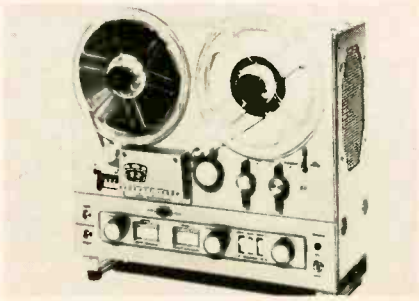
A line of control knobs for instruments and communications, industrial and other commercial equipment is introduced. The series comprises 10



styles in a choice of eight colors. Included are cranks, pointers, and round knobs with and without dial skirts. Raytheon.

Stereo Tape Deck

The Model 1660-D 4-track stereo tape deck mounts for vertical or horizontal operation. The manufacturer says that this instrument features two



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Your Sylvania Distributor will be awarding weekend holidays between now and May 31. So *now* is the best time to stock up for a busy spring and summer with the quality, fast-moving line of tubes. It may take you to your vacation paradise. Ask your participating Sylvania Distributor for details.

Electronic Tube Division, Sylvania Electronic Components Group.

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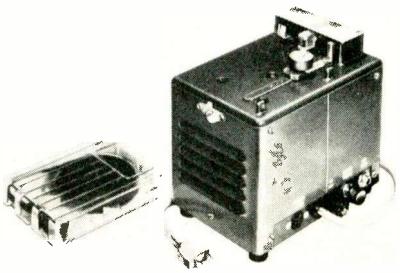
NEW PRODUCTS

heads, 2 speeds, automatic stop, edit guide, pause edit lever, 2 VU meters, 3-digit index counter, frequency response from 30 to 18,000 CPS at 7½ IPS. Roberts.

Tape Cartridge Player

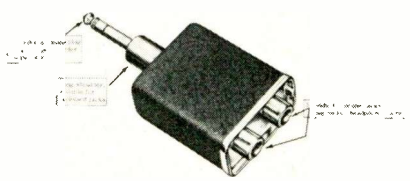
A tape cartridge player accepts almost all standard continuous loop cartridges and is designed for commer-



cial operation. Tape cartridge players are used to play back messages in synchronization with slide or filmstrip projectors. Tape Cartridge.

Stereo Adapter

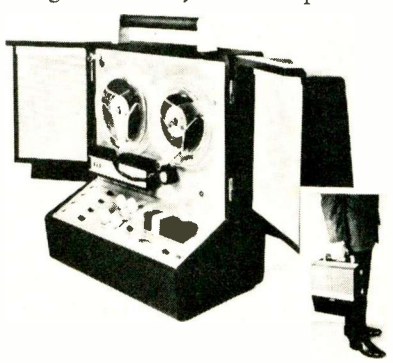
A plug-in type stereo headphone adapter, allowing two stereo headphones to be used with a stereo tape



recorder, even though the recorder has only one output, is introduced. The adapter is housed in a metal cabinet 2-1/6 x 1-13/16 x 1-1/6 in. Switchcraft.

Stereo Recorder

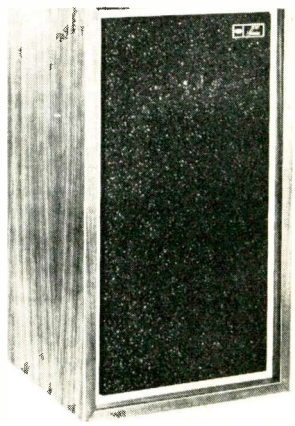
A battery-operated portable stereo tape recorder is introduced. The recorder may be operated on standard flashlight batteries, on 12 v power in



autos, planes, campers, boats, etc., or on standard 110/120 vac. The Saxon 755 has 14 transistors — 7 per channel — and will operate approximately 15 hr. on standard 1½ v D cells. Tape speeds are 7½, 3¾ and 1⅞ ips, with fast forward and fast rewind functions. Frequency response extends from 50 to 15,000 cps. Kouyoh International.

Two-way Speaker

A two-way speaker system that eliminates conventional crossover net-



works is now available. Called Model 303A, this bookshelf speaker sells for $95. Audio Dynamics.

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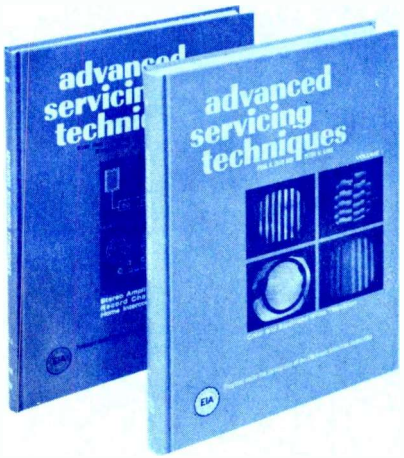
ELECTRONIC TECHNICIAN *Magazine*



ADVANCED SERVICING TECHNIQUES, 2nd Edition

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This completely revised and up-to-date book contains the latest techniques for locating and eliminating radio and TV interference. The latest electronic components are discussed at length, and their applications analyzed. Extremely practical in its approach, this book tells you what to look for, what to do and how to do it. 168 pages, illustrated, paper—$2.90.

REPAIRING TRANSISTOR RADIOS

by Sol Libes

Presents methods for the repair of transistor radios. Includes basic transistor theory transistorized circuitry, design and superheterodyne radio receiver principles. Cover step-by-step procedures, trouble check points, charts, test equipment and tools. 159 pages, illustrated, paper—$3.50.

HOW TO SERVICE TAPE RECORDERS

by C. A. Tuthill

Gives you complete information on tape recorder repairs. Contains lucid discussion on the basic principles of magnetic recording, tape recording, mechanisms, circuitry and troubleshooting procedures. Explains the tape recorder and its operations with many fine illustrations. 160 pages, illustrated, paper—$2.90.

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Various techniques for using electrical and electronic test instruments are completely explained in this up-to-date book. An extremely wide range of test instruments are covered, from very simple VOM to the distortion analyzer and oscilloscope.

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Providing complete understanding of the fundamentals, this book covers the elements of television through every section of the black-and-white and color TV receiver. Emphasis is placed on circuits, both transistor and tube, used in the latest models. Troubleshooting and alignment details are given for each receiver function. 304 pages, illustrated, cloth—$9.95.

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Here is a complete report on the vitally important and rapidly expanding concept of closed circuit TV, its utility and functioning. Includes authoritative discussion system organization, planning space requirements, cost of installation, manpower, applications and every facet of operation. 264 pages, illustrated, cloth—$10.00.

PRACTICAL OSCILLOSCOPE HANDBOOK

by Rufus Turner

This brand new, two-volume handbook, introduces the oscilloscope and explains its applications—without using technical jargon—for technicians, radio operators, servicemen and hobbyists.

The first volume covers operation principles, structure and characteristics of the instrument. In addition, step-by-step instructions explain general tests and measurements in current, frequency, phase and specialized applications, such as receiver and transmitter testing. Vol. II clearly explains specific tests and measurements. The book avoids theory wherever possible and uses simple diagrams instead of detailed circuits. 240 pages, illustrated, paper—$5.90, cloth—$6.95.

MATHEMATICS FOR ELECTRONICS AND ELECTRICITY

by National Radio Institute Staff

Beginning with a complete review of arithmetic, the book progresses through algebra, trigonometry, Boolean Algebra, and the binary number system. It relates every topic to its electronics applications such as finding resistor tolerance with percentages, and solving complex vector problems with trigonometry.

There are several other valuable sections which help you to save time in setting up equations, simplifying a-c and d-c circuit calculations, constructing and applying many types of widely used graphs, etc. Example problems throughout are worked out in detail. 256 pages, illustrated, paper—$3.95, cloth—$5.60.

HOW TO READ SCHEMATIC DIAGRAMS

by David Mark

Of particular use to beginners in the field of electronics, this compact volume covers all the essential symbols and abbreviations used in schematic diagrams for electronics work. Thoroughly practical in approach, it progresses in easy-to-understand stages from individual components right up to complete receivers and similar equipment. All major components and circuits are identified and explained, including C-C and A-C circuits, electronic equipment power supply circuits, and audio amplifier circuits. Of special interest is the section on interpreting complete schematics for radio and tv circuits. 160 pages, 5½ x 8½, illustrated, paper—$3.50.

HOW TO USE GRID-DIP OSCILLATORS

by Rufus P. Turner

Deals with the construction and use of this versatile instrument as well as its application to all kinds of radio and television receivers. Chapters include: Principles and Circuits; Grid-Dip Adaptors; Resonant Circuit Measurement; Capacitance Measurements; Inductance Transmitter Applications; Antenna and Transmission-Line Tests; Applications; Commercial Grid-Dip Oscillators. 112 pages, illustrated, paper—$2.50.

HOW TO SERVICE UHF TV

by Allan Lytel

Explains some of the peculiarities and special characteristics of uhf, so that the serviceman will have no trouble with its trouble-shooting. First, the book treats the general characteristics of uhf signals and then discusses in detail essential equipment features, uhf tuner and converter circuitry, special uhf channel strips and completely illustrated, step-by-step servicing procedures for different uhf tuners and converters. 127 pages, 5½ x 8½, illustrated, paper—$3.50.

METALLIC RECTIFIERS AND CRYSTAL DIODES

by Theodore Conti

In comprehensive style, this book presents basic information for understanding and applying these components with sure results. Discussion includes construction of metallic rectifiers and crystal diodes, their characteristics and notation, basic design data, applications, troubleshooting, repair and replacement. 164 pages, illustrated, paper—$3.50.

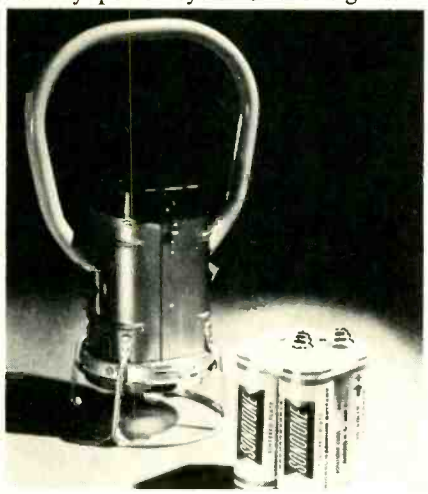
LASERS AND MASERS

by Stanley Leinwoll

In his new book, the author introduces a fascinating area of technology. He clearly explains what lasers and masers are, how they work, and what they can be made to do in the future. Mr. Leinwoll begins with the development of the maser. Then he discusses the ruby, gas and injection laser with applications to medicine, biology, chemistry, weapons systems and communications. The last chapter discusses the various lasers that are commercially available, as well as some of their component parts. Includes information of do-it-yourself kits. 96 pages, illustrated, paper—$1.95.

Nickel-Cadmium Battery

A rechargable nickel-cadium battery, designed for emergency lights, railroad lantern lamps and other small standby power systems is being mar-



keted. The battery has four cylindrical "F" size, 1.25-v nickel-cadmium sealed cells, arranged 2 x 2, totaling a 5-v battery pack (equivalent to a 6-v dry cell lantern type battery). Sonotone.

Tubular Capacitors

A line of dipped tubular capacitors,

in tolerances as low as ±1 percent, is announced. Designated as types MD and MPD, the capacitors are available in 100, 200, 400 and 600 vdcw ratings. Arco.

Driver Unit

A public address system unit for reflex trumpets in speech and music systems with moderate sound level requirements, is introduced. Model PD-20 driver unit specifications are:

Power, 20 w. Impedance 16Ω. Frequency response, 120-7,000 cps. Sound level, 125 db measured 4′ on axis at rated power with 6′ air column. Driver threads, 1⅜ in.-18 standard. Atlas Sound.

Automatic Turntable

An automatic turntable that plays individual records is announced. A unique cueing device, built into the 18H, permits the turntable's arm to be lowered or raised gently into any desired band or groove. The four-speed unit has a Papst hysteresis-synchronous motor, heavy balanced

turntable platter and transcription arm. The 18H carries a suggested retail list price of $119.50 — less cartridges and base. Specifications listed are: rumble -55db; wow and flutter, less than 0.1%, and stylus force gauge, 1 to 5 g. Benjamin Electronic.

COLORFAX

Rare Earth Phosphors

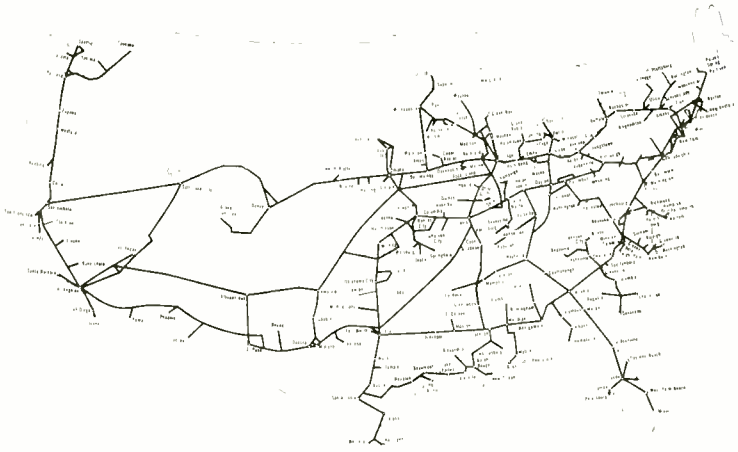
Both RCA and Sylvania are now using rare earth phosphors in their 25 in. color CRTs. Sylvania is using a phosphor based on the rare earth element europhium. RCA did not disclose the type of phosphor it is using. It is also reported that Zenith is using Sylvania's rare earth phosphors in its 21 in. color tube. RCA, the only manufacturer supplying 25-in. color tubes to other manufacturers, is now selling the 25 in. bonded color CRT to producers for $130, compared to the original price of $152.50. This compares with the producer price of $98 for the bonded 21 in. color tube. Sylvania's and Zenith's set manufacturing divisions are using the total output of 25 in. rectangular tubes of their respective color tube manufacturing units. Both companies are expanding their facilities and will be able to supply other manufacturers when this expansion is completed. National Video, supplier of the 23 in. rectangular tubes, and Philco, and Admiral will also be manufacturing 25 in. rectangular color tubes later this year.

AT&T Color TV's Interstate Carrier

Color is an integral part of the vast Long Lines Department of AT&T; less than 1500 miles of the 115,040 "channel miles" of the Bell System are monochrome-only. The remainder of the system, which is fed via microwave relays and coaxial cables, is colorized.

AT&T, in fact, keeps well ahead of the amount of color actually being fed by networks. If all three networks decided to colorize their entire night-time schedules in 1965 (an interesting but unlikely thought), AT&T would have no trouble handling the color traffic. (See map of AT&T color routes, right.)

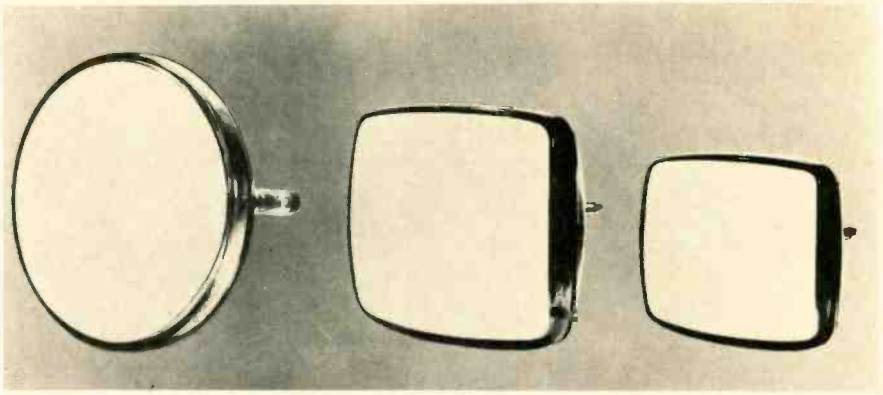
AT&T began adapting its network to color in 1953. By the start of 1954, there were 8000 colorized miles. A year later, the figure was up to 50,000 miles. It is also understood that AT&T will enter international color TV through satellites.



COLORFAX

Sylvania Expansion

With completion of an expansion program by the middle of 1965, Sylvania will double its color CRT output. The company has renovated additional space and installed equipment which is able to handle all types of color tubes now being manufactured plus many of the new sizes being considered. Sylvania is currently manufacturing a 21 in. round and a 25 in. rectangular tube and should be in production with a 19 in. rectangular color tube later this year. Rare earth phosphors are incorporated in all color CRTs now being manufactured by Sylvania.



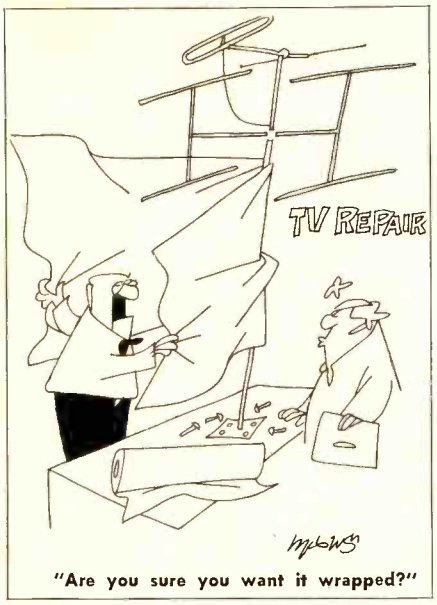
Sylvania's 21 in. round, 25 in. rectangular and 19 in. rectangular color CRT.

Three Color Tube Sizes

With the addition of 23 and 25-in. rectangular color TV consoles to its 21-in. line, it is said that Admiral became the first manufacturer to offer a complete choice of big screen color TV sizes. These new tubes provide the cabinet designer with greater flexibility and permit the use of more compact cabinets, the report indicated.

Westinghouse Color TV

Westinghouse announces it will begin manufacturing its own color TV sets this year. W. C. Fortune, marketing manager for home entertainment products, said the company will introduce a line of 21. in and 25 in. color sets in June, with a 19 in. scheduled for fall showing.



"Are you sure you want it wrapped?"

Zenith Increases Color CRT Output

A major color tube production facility expansion has been announced by Zenith Radio Corp. This expansion when completed will almost double the company's present color tube output. The new facilities will be devoted to the production of 25 in. and 19 in. rectangular color CRTs. Joseph S. Wright, Zenith president, announced that this present expansion was required to meet the growing demand for 25 in. color TV sets. He said that after this expansion Zenith will be able to produce approximately one million color CRTs annually.

RCA Expansion

RCA is expending $4.6 million for facilities to increase the production of 25 in. and 19 in. rectangular color CRTs. The demand for the 25 in. tube has necessitated the expansion, according to an announcement by Douglas Y. Smith, vice president, RCA Electronic Components and Devices. This project is being carried on in addition to the $8 million expansion began at the Lancaster, Pa. CRT plant last fall. The major portion of the funds will be used to convert the Lancaster plant to the production of 25 in. tubes with some of the money earmarked for accelerated 19 in. output. Funds for investigation of smaller screen color tubes are also included in the appropriation. Screening equipment is being modified to process rare earth phosphors. All of RCA's current output of 25 in. rectangular tubes contain rare earth phosphors.

Motorola to Manufacture 23 in. Color CRT

Motorola will begin manufacturing its 23 in. rectangular color CRT, it is announced by Elmer H. Wavering, president. National Video is currently sole supplier of this color tube. To provide color tube facilities, some 60,000 sq ft of space is being prepared. The parts and service department, now occupying this space, will be moved to another building of similar size.

Network Colorcasts

According to the TV-radio weekly magazine "Sponsor," NBC has scheduled 2200 hours of colorcasting in 1965. It said that the other two networks—ABC and CBS—are both programing specials in color, and that ABC has scheduled at least two series plus its movies. Sponsor also pointed out that both ABC and CBS plans to go into color in a big way when color becomes a "significant factor," according to sentiments expressed by executives of both networks. It was understood that CBS studios have been designed, constructed and equipped so that color cameras, monitors and a minimum of other equipment can be moved in to begin heavy color schedules on a moment's notice.

. . . . SERVICE BONANZA

Continued from page 51

One word of caution: Do not make the mistake of assuming that a 0.7 mil-tipped stylus may be substituted for a standard monophonic stylus. The compliance of a mono cartridge is much lower than a stereo unit, and a stereo-tipped stylus will ruin records.

The final step in selection and replacement is the one in which most technicians are notably deficient, since it calls for some consumer education which many TV-radio service technicians would prefer to avoid. It is often caused by a feeling that, in "selling up" to a more expensive stylus, he may be thought guilty of trying to extract an unfair price.

Nothing could be further from the truth! Of all places to economize, the phono needle is one of the worst, since the less expensive styli are almost invariably the most costly, in the long run. The inexpensive osmium-tipped needles, for example, have a useful life of only a few hours, after which they begin gouging out important parts of the record groove walls. Sapphire-tipped units, though somewhat more expensive, are also subject to wear within a relatively short time. Only the diamond, of all substances in nature, is hard enough to stand up well under the continual abrasive effects of record playing and technicians are performing a valuable service for their customers when they point out that a diamond costs considerably *less,* per hour of playing time, than any other stylus tip. Even the diamond is not a "permanent" needle, usually averaging

between 750 and 1500 playing hours before record wear becomes a problem. And make sure you use a quality product.

Explaining the facts to your customer may take a litle extra time, but it is one of the easiest investments you can make in exploiting the "concealed service bonanza." A regular program of needle and cartridge service can easily add a substantial number of dollars to your net monthly income. Also it can yield you handsome returns in customer confidence and future repeat business. ■

. . . YOU AND COLOR

Continued from page 62

but the basic function remains the same — to amplify the brightness portion of the signal and channel it to the CRT. The luminance signal applied to the cathodes and the color information applied to the grids are combined to form a proper picture. Trouble in the set's luminance section can cause both incorrect color reproduction as well as improper B/W reception.

Chrominance Section

The composite video signal from the first video amplifier output or in some cases from the video detector output, is applied to the bandpass amplifier. This stage separates and amplifies the color information which appears as sidebands of a suppressed 3.58 Mc carrier. The bandpass amplifier rejects all other frequencies. In some sets this circuit is known as a color IF and in many cases more than one stage of amplification is employed.

Operation of the color circuits during B/W transmission would cause unwanted color blobs to appear on the CRT, hence, the bandpass amplifier is cut off during monochrome transmission. This is accomplished by the color killer circuit (See Fig. 5).

Output of the bandpass amplifier is fed to the demodulators with a 3.58 Mc signal also applied (in quadrature). This 3.58 Mc signal, which replaces the previously suppressed color sub-carrier and permits demodulation, is generated by a crystal-controlled oscillator. The phase modulated color signals are detected with the R-Y and B-Y signal voltages appearing at the plate of their respective demodulators. The R-Y and B-Y signals are applied to separate amplifiers and with common cathode connections, a third amplifier driven by portions of the R-Y and B-Y signals, supplies the G-Y information.

The output of these amplifiers is then applied to the respective grids of the CRT. This color information, combined with the luminance signal on the cathodes, forms a duplication of the picture being transmitted.

Color Synchronization

Information containing the color burst pulse is taken off at the bandpass amplifier and the pulse is

then separated in a circuit similar to a B/W sync separator. The burst signals are applied to a phase detector circuit which compares them with the 3.58 Mc oscillator output. If an error in phase occurs between the two, a dc correction voltage is applied to a reactance tube which in turn corrects the phase of the oscillator. Although the same variations exist basic color sync circuitry remains in most modern color TV receivers.

Convergence Circuits

The color CRT used today could be considered as three monochrome kinescopes in one envelope. To present true color reproduction, three electron beams must be properly controlled to strike their respective color phosphor dots. This is accomplished with the addition of a shadow mask, convergence magnets and additional circuitry.

There are two types of convergence, static and dynamic. Static convergence — converging of the beams near the center of the tube — is accomplished with fixed magnetic fields. As the electron beams move toward the edges of the CRT the electrons travel a greater distance so the beam angle must be varied to obtain proper convergence. This is called dynamic convergence and is accomplished by obtaining voltages from the horizontal and vertical deflection circuits and applying them to electromagnets located on the CRT neck. A direct relationship exists between the convergence necessary at any one point and the values of the instantaneous vertical and horizontal deflection voltages.

With provisions made to vary the dynamic convergence voltages and adjustable static convergence magnets combined with a good dot-bar generator, a fairly well converged image can be obtained.

Power Supply

Most current model color sets use a conventional low voltage power supply employing silicon rectifiers and a power transformer. B plus voltages ranging from 275 to 390 v are necessary. Some sets use a voltage doubler circuit and many older receivers employ electron tube rectifiers in a conventional manner

The nomenclature of stages may vary and the circuitry may appear different in a color TV but these are basic electronic circuits. By using proper test equipment these circuits will respond to normal maintenance procedures: diagnose — isolate — repair. ■

NEWS . . .

Continued from page 42

Raytheon Franchises Marine Dealer

Nine additional firms who will sell and service electronic equipment for navigation, communications and safety have been franchised by Raytheon. Sales manager Walter C. Grove said the new dealers are: Haig's Marine, Montgomery, Alabama; Pacific Electronics, Inc., Richmond, Calif.; Electronautical Equipment, Inc., Niantic, Conn.; Charles A. Carroll, Newburyport, Mass.; Delano's Corsi Marine Service, Inc.,

Arlington, Mass.; Quincy Electronics Co., Quincy, Mass.; Texas Nautical Co., Inc., Houston; Randy's Marine and Industrial Electronics, Seabrook, Texas; and Shipyard Marina, Inc., Providence, R. I.

What Else Needs Fixing?

Radio, television and phonograph service-dealers in the Indianapolis area have been asking customers "What else needs fixing?" during a local tryout of what may become a nation-wide Electronic Industries Association sponsored program to promote the servicing trade and, as it follows, boost sales of electronic replacement parts. The test run of the "sell service" programs, brainchild of the EIA Distributor Products Division, involves Indianapolis distributors of replacement parts, who are urging service dealers to remind their customers that other radios, TV sets or phonos lying unplayable about the house can be restored.

Raytheon Suspends Bonded Dealer Program

Effective January 1st, the Raytheon Tube Company discontinued its bonded dealer program after 18 years of dealer participation. The company cites as its reasons: (1) stronger service dealer associations, (2) licensing of technicians in several states, and (3) controls established by Better Business Bureaus. It is said that these factors have made it appear that need for the bonded dealer program no longer exists.

Continued on page 88

Technician's Directory . . .

Continued from page 67

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Quan-Tech Labs 60 Parsippany Blvd Boonton NJ
Quietrole Co 395 St John St Spartanburg SC
RCA Components and Devices Div 415 S 5 St
RCA Components and Devices 415 S 5 St Harrison NJ
RCA Institutes 350 W 4 St New York NY
RCA Parts and Accessories 2000 Clements Bridge Rd Deptford NJ
RCA Set Div 600 N Sherman Dr Indianapolis Ind
RMS Electronics Inc 2016 Bronxdale Avenue Bronx 62 NY
Racon Electric 1261 Bdwy New York NY
Radiart Co 2900 Columbia Indianapolis Ind
Radio Receptor 240 Wythe Brooklyn NY
Radio Shack 730 Commonwealth Boston Mass
Rauland Corp 4245 N Knox Chicago III
Ray-O-Vac Co 212 E Washington St Madison Wis
Raytheon Distributor Products Div 55 Chapel Newton Mass
R-Columbia Products 305 Waukegan Ave Highwood III
Recoton Corp 52-35 Barnett Long Island NY
Reeves Soundcraft Great Pasture Rd Danbury Conn
Regency Electronics 7900 Pendleton Pike Indianapolis Ind
Rego Insulated Wire 830 Monroe Hoboken NJ
Rek-O-Kut Co 38-19 108 St Corona NY
Rawn Co Spooner Wis
Roberts Electronics 829 N Highland Ave Hollywood Calif
Robert Bosh Corp Blaupunkt Car Radio Div 40-25 Crescent Long Island City NY
Robins Industries 1558 127 St College Pt NY
Rockbar Corp 650 Halstead Mamaroneck NY
Rohn Mfg 116 Limestone St Peoria III
Rustrak Instrument 130 Silver Manchester NH

S

S&A Electronics 202 W Florence St Toledo O
Sadelco Inc 601 West 26th St New York NY
Sampson Co 2244 S Western Ave Chicago III
Sangamo Electric 1301 N 11 St Springfield III
Sargent Gerkhe Co 323 West 15th St Indianapolis Ind
Sarkes Tarzian Tuner Div E Hillside Dr Bloomington Ind
Sarkes Tarzian Semiconductor Div 415 N College Ave Bloomington Indiana
Schematic Library 809 North 7th St Phoenix Ariz
Schober Organ 43 W 61 St New York NY
W H Scott Inc 111 Powdermill Rd Maynard Mass
Seco Electronics 1201 W Clover Dr Minneapolis Minn
Semitronics Corp 265 Canal St New York NY
Sencore Inc 426 S Westgate Dr Addison III
Sentry Electronics Inc 707 South Okfuskee Wewoka Okla
Setchell-Carlson New Brighton St Paul Minn
Sherwood Electronic Labs 4300 N California Ave Chicago III
Shure Brothers 222 Hartrey Ave Evanston III
Simpson Electric 5200 W Kinzie St Chicago III
Slep Electronic Co Automotive Division PO Box 178 Ellenton Fla
Smith Inc Herman H 2326 Norstrand Brooklyn NY
Snyder Mfg 22 & Ontario Philadelphia Pa
Sola Electric 1717 Busse Rd Elk Grove Village III
Sonar Radio 73 Wertman Avenue Brooklyn NY
Sonotone Corp Elmsford NY
Sony Corp of America 580 5 Ave New York NY
Sorensen Prods Div Raytheon South Norwalk Conn
Soundolier Inc PO Box 3848 St Louis Mo
South River Metal Prods 377 Tpk Rd South River NJ
Sprague Products Marshall Street North Adams Mass
Stackpole Carbon Electronics Div St Marys Pa
Stancor Electronics 3501 W Addison Chicago III
Standard Instrument Corp 657 Broadway New York NY
Standard Kollsman Industries 2085 N Hawthorne Melrose Park III
Stromberg-Carlson Div General Dynamics 1400 N Goodman St Rochester NY
P A Sturtevant Co Addison III
Superior Electronics 208-212 Piaget Ave Clifton NJ
Swing-O-Lite Inc 13 Moonachie Rd Hackensack NJ
Switchcraft Inc 5555 N Elston Chicago III
Sylvania Electric Products 730 3 Ave New York NY
Symphonic Radio & Electronic 10 Columbus Circle N New York NY 10019

T

TACO Sherburne NY
TV Tuner Service 2103 W 3 St Bloomington Ind
TV Tuner Service 118 Third St West Twin Falls Idaho
Talk-APhone Co 5013 N Kedzie Ave Chicago III
Tandberg of America 83 Ave Pelham NY
Tap-A-Line Mfg PO Box 563 Pompano Beach Fla
Tech-Master 75 Front St Brooklyn NY
Techni-Parts Corp 156 Hempstead Tpk West Hempstead LI NY
Techpress Inc Brownsburg Ind
Tektronix Inc PO Box 500 Beaverton Ore
Telerad Div Lionel Corp Route 69-202 Flemington NJ
Telex Inc 3054 Excelsior Mpls Minn
Telex/Aemco Div Teles Inc Mankato Minn
Teleonic Industries 60 N 1 Ave Beech Grove Ind
Tenatronics Ltd 1011 Power Ave Cleveland O
Tenna Mfg 19201 Cranbrook Pkway Cleveland O
Tennalab 10 & State Sts Quincy III
Terado Co 1068 Raymond Ave St Paul Minn
Texas Crystals 1000 Crystal Dr Ft Myers Fla
Thomas Electronic Organs 8345 Hayvenhurst Ave Sepulveda Calif
Thordarson-Meissner 7 & Belmont Mt Carmel III
Thorens Div Atlantic & Stewart Avenues ELPA Mktg Industries New Hyde Park NY
Toshiba Mitsui & Co 530 5 Ave New York NY
Trav-Ler Radio 571 W Jackson Chicago III
Triad Transformer 4055 Redwood Ave Venice Calif
Trio Mfg Griggsville III
Triplett Electrical Instrument 286 Harmon Road Bluffton O
Tung-Sol Electric 1 Summer Ave Newark NY
Turner Co 909 17 St NE Cedar Rapids Iowa

U

Ullmann Devices Ridgefield Conn
Sid Ungar Co 8810 Rayford Dr Los Angeles Calif
Union Carbide 270 Park Ave New York NY
Useco Div Litton Industries Inc 13536 Saticoy St Van Nuys Calif
Utah Electronics 1123 E Franklin St Huntington Ind
U-Test-M Mfg 4325 W Lincoln Milwaukee Wis
Ungar Electric Tools 2701 W El Segundo Blvd Hawthorne Calif
United Transformer 150 Varick St New York NY
University Loudspeakers Div Ling-Temco-Vought 9500 W Reno St Oklahoma Okla

Up-Right Towers 1013 Pardee St Berkeley Calif
Utah Radio & Electric Corp 1123 E Franklin St Huntington Indiana
Utica Drop Forge & Tool 2415 Whitesboro Utica NY
Utica Electronic Communications 2714 W Irving Pk Chicago Ill

V

V-M Corp 4 & Park Sts Benton Harbor Mich
Vaco Products 317 E Ontario St Chicago Ill
Valley TV Tuner Service 5641 Cahuenga Blvd North Hollywood Calif
Vector Electronic 1100 Fowler St Glendale Calif
Victoreen Instrument 5806 Hough Ave Cleveland O
Vidaire Electronics 365 Babylon Tpk Roosevelt LI NY
Video Industries Co 242 Madison Avenue Portchester NY
Viking Cable Co 400 9th St Hoboken NJ
Viking of Minn 9600 Aldrich St Minneapolis Minn
Vitramon Inc Box 544 Bridgeport Conn
Vocaline Co of America 133 Coulter St Old Saybrook Conn
Volkswagen of America 476 Hudson Terrace Englewood Cliffs NJ

W

Waber Electronics Hancock & Somerset Sts Philadelphia Pa
Walco Electronics 60 Franklin St East Orange NJ
Waldom Electronics 4625 W 53 St Chicago Ill
Wall Mfg Co P Grove City Pa
Waller Corp Crystal Lake
Wallin-Knight Industries 3321 McKinley St NE Minneapolis Minn
Walsco Electronics S Wyman St Rockford Ill
Ward Leonard Electric 115 McQueston Pkwy Mt Vernon NY
Ward Products Edsom Street Amsterdam NY
Weathers Industries 66 E Gloucester Pike Barrington NJ
Webcor Inc 5626 Bloomingdale Ave Chicago Ill
Weller Electric 601 Stone Crossing Rd Easton Pa
Wells-Gardner 2701 N Kildare Ave Chicago Ill
Wen Products 5810 Northwest Hwy Chicago Ill
Western Electric Co Inc 195 Broadway New York
Western Tuner Rebuilders 1140 N Vermont Ave Los Angeles Calif
Westinghouse Electric Radio-TV Dept Metuchen NJ
Westinghouse Electric Corp Tube Division PO Box 284 Elmira NY
Wilco Co 4425 Bandini Boulevard Los Angeles Calif
Windsor Electronics 999 N Main St Glen Ellyn Ill
Winegard Co 3019-28 Kirkwood Burlington Iowa
Workman TV Inc Box 5297 Sarasota Fla
Worner Electronic Rankin Ill
Wuerth Tube-Saver Corp PO Box 66 Hollandale Fla
Wurlitzer Co N Tonawanda NY

X

X-Acto Inc 48-41 Van Dam St Long Island City NY
Xcelite Inc Thorne Ave & Bank St Orchard Park NY

Y

Yeats Appliance Dolly 2124 N 12 St Milwaukee Wis

Z

Zenith Radio 6001 Dickens Ave Chicago Ill

hood television is acquiring 100 percent interest in Benco. B-T had purchased controlling interest in Benco in the fall of 1961. Benco manufactures full lines of translator and community antenna television products. Neighbourhood Television owns and operates CATV systems in Canada.

Mallory Sales Territories

Mallory Distributor Products Co. has established two new sales territories. Norval W. Armstrong is the Mallory sales reperesentative for the Rocky Mountain states and Lee Crowell is the representative for Florida. In making the announcement, Frank P. Vendely, General Sales Manager, stated that these appointments will result in improved service to franchised Mallory distributors.

Winegard to Double Capacity

A plant addition which will double the production capacity of the Winegard Co., Burlington, Iowa has been announced. The new addition will house their research laboratories in addition to facilities for increased antenna production.

Zenith Distributor

Woodson and Bozeman, Inc. has been named distributor of Zenith television, radio, phonograph and high-fidelity instruments for the Memphis area. L. C. Truesdell, Zenith Sales Corp. president, said that the new distributor replaces McGregor's, Inc. which has served Zenith in the Memphis area since 1956.

NEWS OF THE INDUSTRY

Continued from page 85

Nortronics to Expand

Plans to expand the product areas of the distributor division to include complete replacement heads and accessories for broadcast, professional and audio visual equipment, in addition to the present consumer replacement program, were revealed by Leonard E. Kronfield, president, Nortronics. Nortronics is one of the major suppliers of original equipment magnetic tape heads for tape recorders.

RCA Capital Outlay

RCA plans a $90-$95 million capital expenditure during 1965 according to David Sarnoff, Chairman of the Board. The largest single investment will be made in color TV with stepped up capital spending in computers and world-wide communications.

Benco Sold to Canadian Firm

Blonder-Tongue Laboratories, Inc. of Newark, N. J. and Benco Television Associates, Ltd., Toronto, announced the sale of Benco to Neighbourhood Television, Ltd., of Guelph, Ontario. According to Harry A. Gilbert, Blonder-Tongue vice president and general manager, Neighbour-

from $154,807,212 for the same period of 1963. Unit factory sales of receiving tubes for November 1964 totaled 32,041,000, down 0.1 percent from the figure of 32,042,000 units in November 1963, and the 11 months 1964 figure was 336,365,000 units, down 7.8 percent from the 364,987,000 total in the same 1963 period.

Phil Bettan Joins Rep Firm

Marty Bettan Sales, Inc. manufacturers representatives of Flushing, N. Y. announces the appointment of Phil Bettan as a member of its staff. He will help represent the firm in the Metropolitan N. Y. area and participate in marketing and promotional activities. Mr. Bettan was formerly marketing services manager for JFD Electronics Corp.

Business Forum

A number of topics of interest to people associated with the consumer electronics industry will be discussed in business forums held during National Electronics Week. These business forum sessions will be held at the New York Hilton Hotel on Wednesday, March 31 and Thursday April 1. These meetings will be highlighted by informative speeches given by experts in their field with pro and con debates to be held on the controversial issues. The discussions will cover sales, administrative, financial and production problems confronting Hi Fi and sound business firms, manufacturers and distributors. More than 100 top representatives from all areas of the industry, plus invited professional experts, will participate.

Call for Technical Papers

The 1965 National Electronic Conference (NEC) Technical Sessions on Consumer Electronics, to be held October 25-27, at McCormick Place, Chicago, Illinois, has called for 75 word abstracts. Deadline is May 3, 1965. Contact: James S. Aagaard, Electrical Engineering Dept., Northwestern University, Evanston, Ill. 60201. Sessions are sponsored by IEEE Audio, Broadcast/TV Receiver and Electron Devices Groups.

CDE Marketing Change

Arch T. Hoyne has been named Distributing Marketing Manager for Cornell-Dubilier. The distributor marketing organization is now headquartered at Des Plaines, Ill., the site of the CDE redistribution center. Previous operations had been conducted from the CDE headquarters in Newark, N. J.

TV CRT Sales

Factory sales of television CRTs during November 1964 totaled 854,678 units, up 16.4 percent from the 734,266 units sold in November 1963, Electronics Industries Association's Marketing Services Department said. Dollar volume for TV picture tube sales also increased to $14,182,350 from the figure of $13,702,633 in November 1963, a rise of 3.5 percent. TV CRT sales for the first 11 months of 1964 were up in quantity to 8,751,196 units, a rise of 5.5 percent from the 8,289,396 unit total for the corresponding period of 1963, but the 11-month dollar volume in 1964 was down 1.6 percent to $152,269,173

NEW LITERATURE

SOLDER CONNECTORS

This bulletin describes the design and possible uses of connectors which are used as soldering aids in replacing components in inaccessible portions of TV chassis. Sprague.

ETV PLANNING

A 14-page booklet covers all basic phases of ETV planning, including a section on costs and budgeting. The relative needs of elementary and secondary schools and colleges and universities are discussed in detail. Descriptions of actual installations at various educational institutions around the country are used to illustrate the many ways in which ETV can be employed. Blonder-Tongue.

INSTRUMENTATION REEL

A four-page brochure describes the characteristics, specifications and uses of a phenolic hub instrumentation reel. 3M.

DUAL VOICE COIL SPEAKERS

This bulletin contains information and specifications on two loudspeaker models. Sample applications are also given for these speakers which each contain two separate voice coils. Oxford.

REPLACEMENT TRANSFORMERS

This series of bulletins contains information on a line of exact replacement transformers. Included in the series are vertical output and 3rd channel audio output matching transformers. Merit.

TRANSISTORIZED BOOSTERS

This four-page brochure describes a line of nuvistorized and transistorized antenna-mounted boosters. Also included is information on a combination rotator-pre-amplifier. Channel Master.

ZENER RELIABILITY

The results of a year long reliability evaluation of a line of zener diodes are contained in a 12-page brochure. In addition to the data and conclusions presented, a discussion of the importance of reliability tests is a part of the booklet. Motorola.

OSCILLOSCOPE ACCESSORIES

A 52-page catalog contains descriptions and prices of items which extend oscilloscope utility. The items described are: cameras, probes, cables and oscilloscope carts. Tektronix.

SILICON TRANSISTORS

A six-page bulletin lists the maximum rating and electrical characteristics of a series of NPN silicon power transistors. Westinghouse.

SEMICONDUCTOR CHART

A chart contains a list of exact replacement semiconductors. This chart details information on transistor interchangeability as well as data on price and application. Transistors converted by the list include entertainment type and power transistors, crystal and dual sync diodes, silicon rectifiers (entertainment types) and a cross reference chart of auto radio transistors. I. E. H.

STEREO SYSTEM

This 2-page bulletin describes a component stereo system. Specifications and prices of the system are also included. Acoustic Research.

SPECIAL PLIERS

A four-page bulletin describes a line of pliers for use in the electronics industry. A chart which lists model number, application and characteristics of each plier is included. It also

contains diagram drawings and dimensions of each plier nose. ETM.

DISTRIBUTION AMPLIFIER

This bulletin contains specifications and technical information on a distribution amplifier which can be used as a bridging amplifier or a distribution line extender amplifier in antenna systems. Entron.

MOBILE ANTENNAS

A bulletin illustrates and describes a line of base station and mobile antennas and accessories. These antennas are for Amateur as well as CB use. New-Tronics.

BOOK REVIEWS

TRANSISTOR SELECT-A-SPEC. *By the Editorial Staff of TechPress Publications. Published by TechPress. Brownsburg, Ind. 136 pages, soft cover. $3.95.*

This book contains the specifications of over 5,000 transistors representing sixty manufacturers — both domestic and foreign. It is programed so anyone desiring a transistor having specific characteristics can choose the proper unit for his needs. For example, if a transistor that dissipates 50 mw and operates on a 6 v circuit is needed, a section in the book lists transistors according to collector dissipation. A suitable 50 mw transistor is chosen and its voltage characteristics are checked against information in another portion of the book. The transistor will be useable if it meets your voltage requirements. Transistors are also rated according to their maximum collector current, V_{CE}, V_{CB}, or V_{EB}. This book can be a valuable asset to engineers and technicians who work with transistors.

ADVANCE SERVICING TECHNIQUES. *By Electronic Industries Association (EIA), Service Committee. Published by John F. Rider Publisher, Inc. 178 pages, hard cover. $5.95.*

Volume II of this informational EIA series contains the latest installation and service techniques covering a number of home entertainment products other than TV. Troubleshooting procedures for Hi Fi and stereo amplifiers, FM and FM multiplex, record changers, tape recorders, home intercommunication equipment and combination receivers are described. Each piece of equipment is carefully considered in detail with easy-to-follow text. The book is fully illustrated with block diagrams, photographs, charts, circuit schematics and graphs. A clear, concise and easy-to-understand theoretical analysis is made of each type of equipment. And each description is followed by the latest repair and maintenance methods. This volume naturally makes an ideal companion to Volume I of this series. The two books can make an effective team to help professional technicians increase their efficiency.

COMING EVENTS

March 22-26: IEEE International Convention, Hilton Hotel and Coliseum, New York.

March 23-26: Spring Convention and Technical Sessions, Audio Engineering Society, Hollywood Roosevelt Hotel, Los Angeles.

March 29-April 4: National Electronics Week "Sound Theatre" exhibit, Americana Hotel, "Electronic Showcase" exhibit Hilton Hotel, New York.

May 6, 7, and 8: National Symposium on Human Factors in Electronics, Boston-Sheraton Hotel, Boston.

ADVERTISERS INDEX

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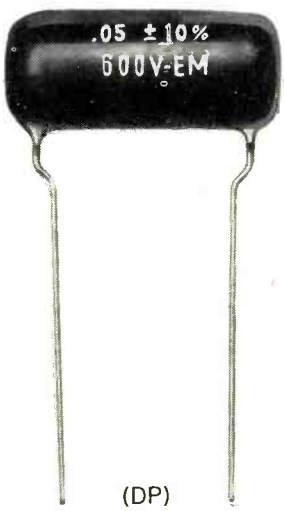

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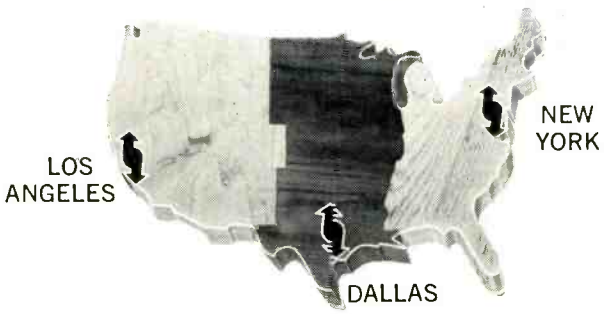

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