

### CABINET-REAR VIEW MISCELLANEOUS ADJUSTMENTS

#### HORIZONTAL SWEEP CIRCUIT ADJUSTMENT

Tune in a TV station and set all controls for normal operation. Short across Horizontal Stabilizer coil, L21. Set Horizontal Hold control, R5, to center of its range.

Adjust Horizontal Range control, R11 until picture floats across screen. Remove jumper from Horizontal Stabilizer coil and adjust B1 until pic-

ture locks in or floats across screen. Check all available channels for proper sync.

#### VIDEO AMPLIFIER BIAS ADJUSTMENT

Connect DC probe of VTVM to Point  $\diamond$ , low side to ground. Set Channel Selector to any non-interfering channel. Adjust R13, Bias control for +2.75V on VTVM.

### DISASSEMBLY INSTRUCTIONS

#### CHASSIS REMOVAL

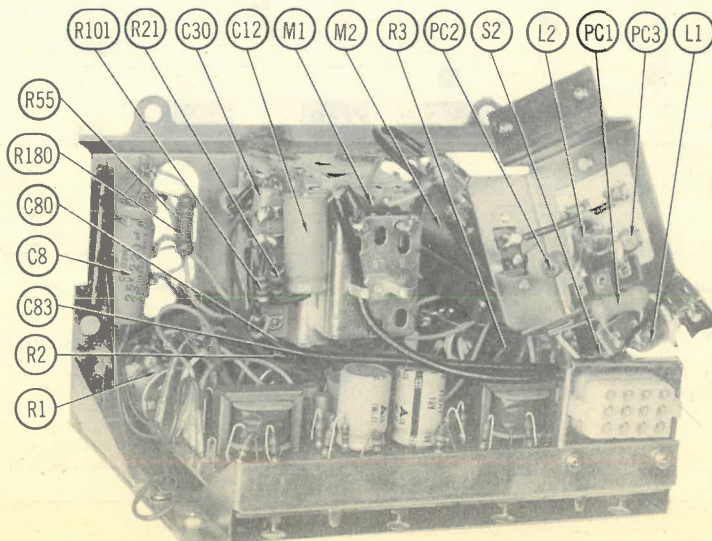
1. Remove 6 screws holding rear cover, disconnect antenna leads, and remove rear cover from the set. Remove all knobs from the set.
2. Remove picture-tube socket and deflection-yoke leads. Remove 4 chassis mounting screws and pull chassis out far enough to remove high-voltage anode lead.
3. Remove 4 screws holding tuner and control mounting bracket. Disconnect speaker leads, pilot lamp leads, and ground strap.
4. Remove AC plug and 2 input plugs from tape player deck. Lift tuner and control mounting bracket and TV chassis from the cabinet.

#### TAPE PLAYER REMOVAL

1. See Step 1 under "Chassis Removal" for rear cover removal.
2. Remove AC plug and 2 input plugs from the tape player deck.
3. Remove 4 chassis screws securing tape player to the cabinet and remove tape player from the cabinet.

#### PICTURE TUBE REMOVAL

1. Follow "Chassis Removal" procedure. Lay set face down on a soft protective surface.
2. Remove 4 nuts from picture-tube mounting bracket and remove picture tube from the cabinet. Do not lift picture tube by the neck.



TUNER ASSEMBLY

SET 1033 FOLDER 1

NIVICO  
MODEL 3310

PHOTOFACT® Folder

with CIRCUITRACE™

NIVICO  
MODEL 3310

For Supplier Address See PHOTOFACT Index



FOR SERVICE INFORMATION ON TAPE PLAYER - SEE SIMILAR TAPE PLAYER IN MANUAL HTP-5.

### SAFETY PRECAUTIONS

Make sure line voltage does not exceed rating of set.

Check high-voltage regulation and adjust to correct value.

Be sure shields and rear cover are in place and secure.

Beware of shock from high voltage or AC line. Discharge high voltage to HV cage only.

Use extreme care when handling picture tube. Do not bump, scratch, or exert undue strain.

### SERVICING IN THE FIELD

#### SAFETY GLASS

For picture tube and safety glass cleaning, it is necessary to remove the chassis. (See "Disassembly Instructions.")

#### FUSE OR FUSE DEVICE

A 1.2-amp. fuse is used for AC protection. (For location, see "Cabinet - Rear View.")

#### VHF OSCILLATOR ADJUSTMENT

Set fine tuning at the center of its range and adjust oscillator slug (one for each channel) for best sound and picture.

#### AGC

The AGC may be varied by means of an AGC control. (See photo "Cabinet - Rear View" for location.)

#### HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal hold is accomplished by the proper setting of the Horizontal Stabilizer coil, Horizontal Hold and Horizontal Range controls. (For location, see "Transistor Placement Chart".)

#### FOCUS

The focus may be varied by means of a Focus control. (See photo "Cabinet - Rear View" for location.)

#### CENTERING

Centering is accomplished by 2 magnetic rings located on yoke rear cover.

REMEMBER TO ASK— "What else needs fixing?"

HOWARD W. SAMS & CO., INC. Indianapolis, Indiana 46206

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. UC186 109876543

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DATE 6-69 SET 1033 FOLDER 1

NIVICO  
MODEL 3310

SET 1033 FOLDER 1

X2

R177

C114

Q29

R175

X3

125

C4

⏏

EBC

Q29

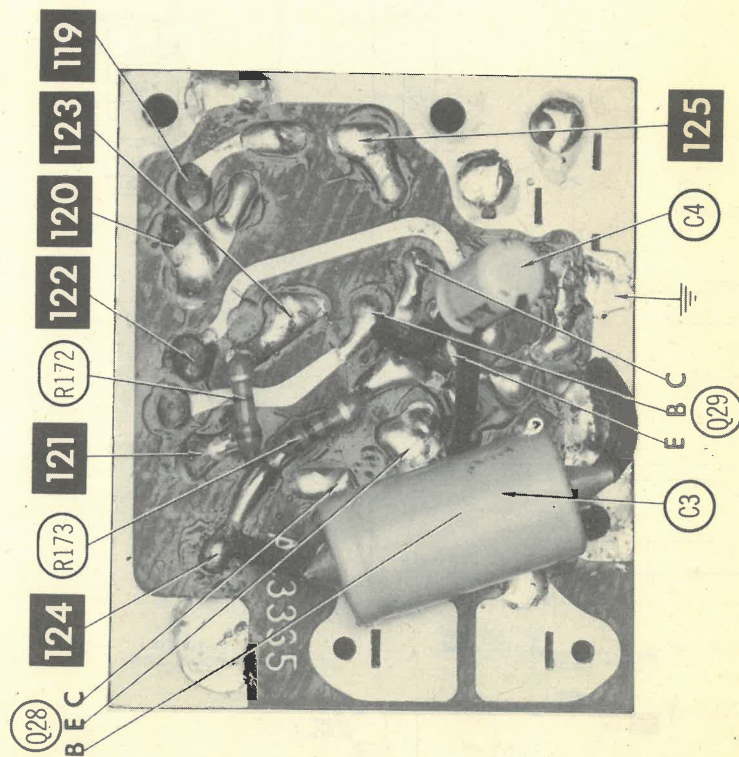
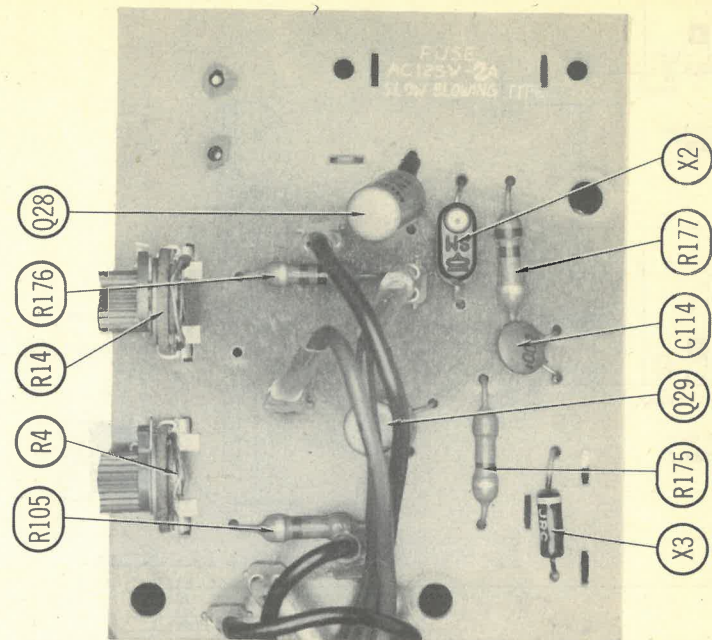
C3

TRACE Photo

NIVICO  
MODEL 3310

FOLDER 1

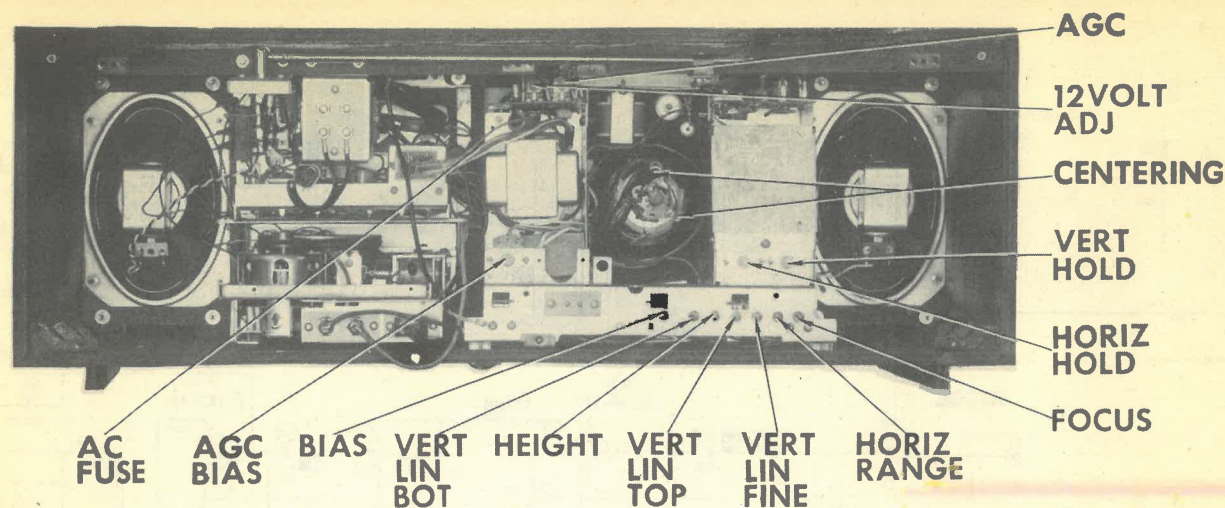




A Howard W. Sams CIRCUITRACE Photo  
VOLTAGE REGULATOR BOARD

NIVICO  
MODEL 3310

FOLDER 1



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### DISASSEMBLY INSTRUCTIONS

#### CHASSIS REMOVAL

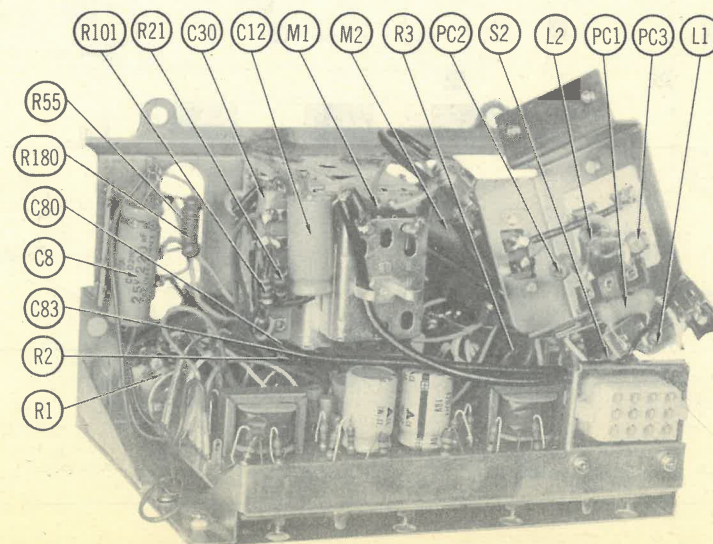
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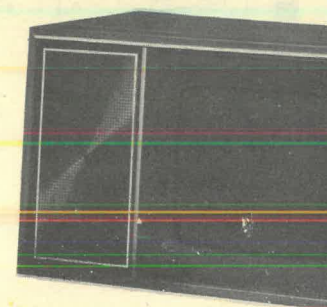
TUNER ASSEMBLY

SET 1033 FOLDER 1

NIVICO  
MODEL 3310

PHOTOFACT® Folder with CIRCUITRACE

For Supplier Address See



FOR SERVICE INFORMATION ON TAPE PLAYE

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- Be sure shields and rear cover are in place and secure.

### SERVICING I

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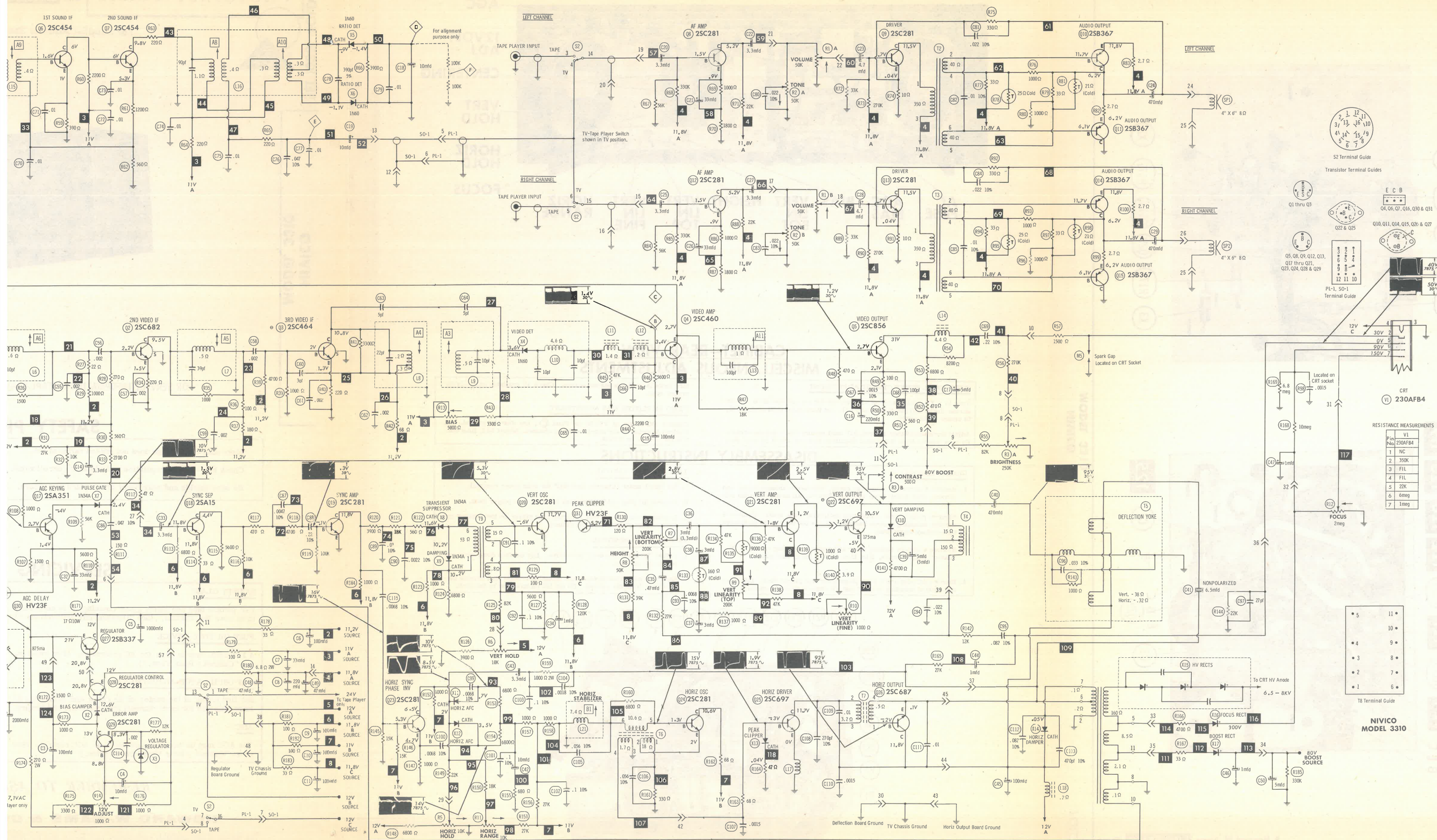
REMEMBER TO ASK

HOWARD W. SAMS & CO

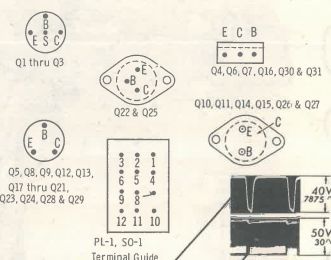
The listing of any available replacement part herein does not constitute any case a recommendation, warranty or guaranty by Howard W. Sams Inc., as to the quality and suitability of such replacement part. The number of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. UC186 10 9 8 7 6 5 4 3







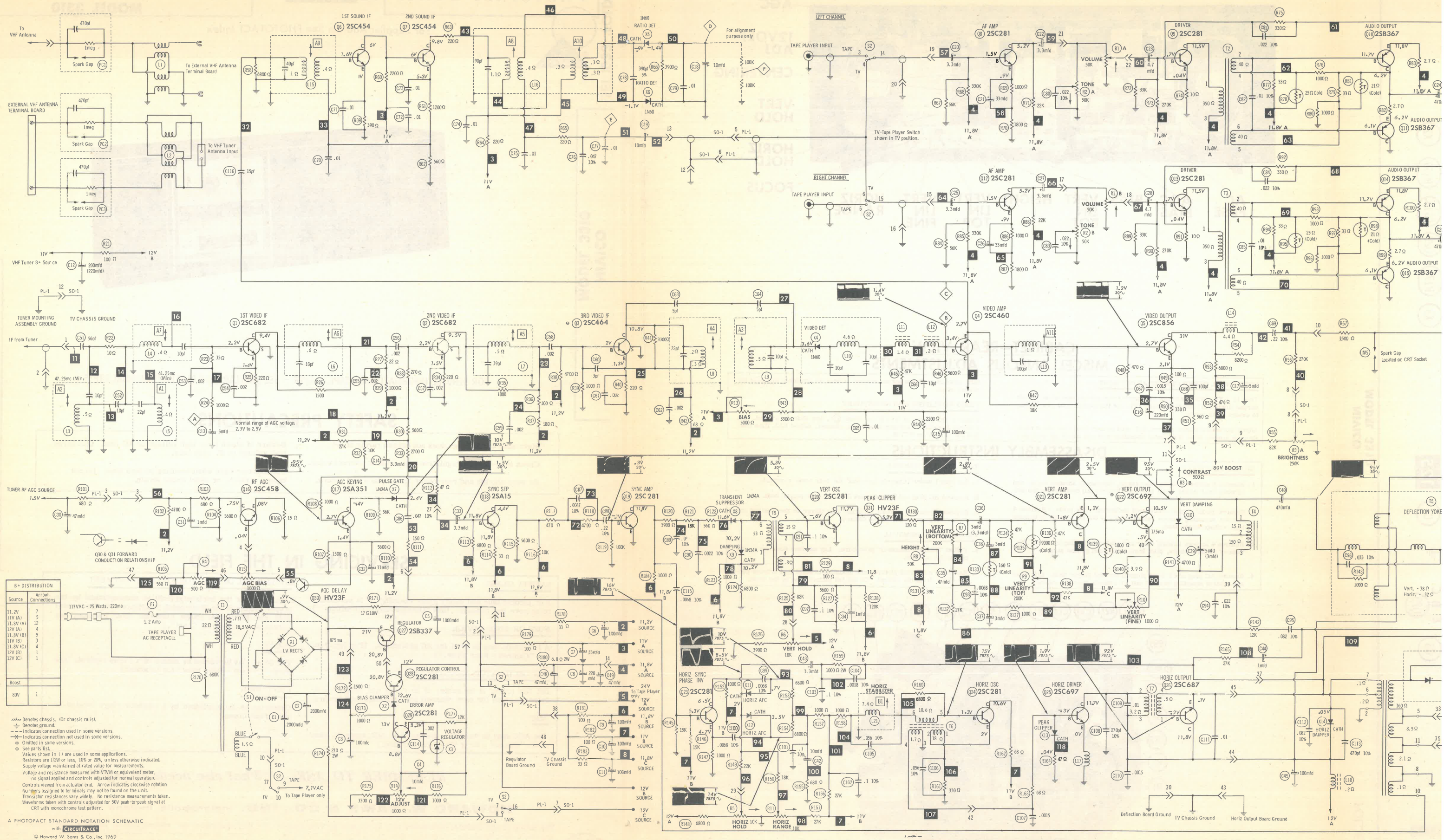
S2 Terminal Guide



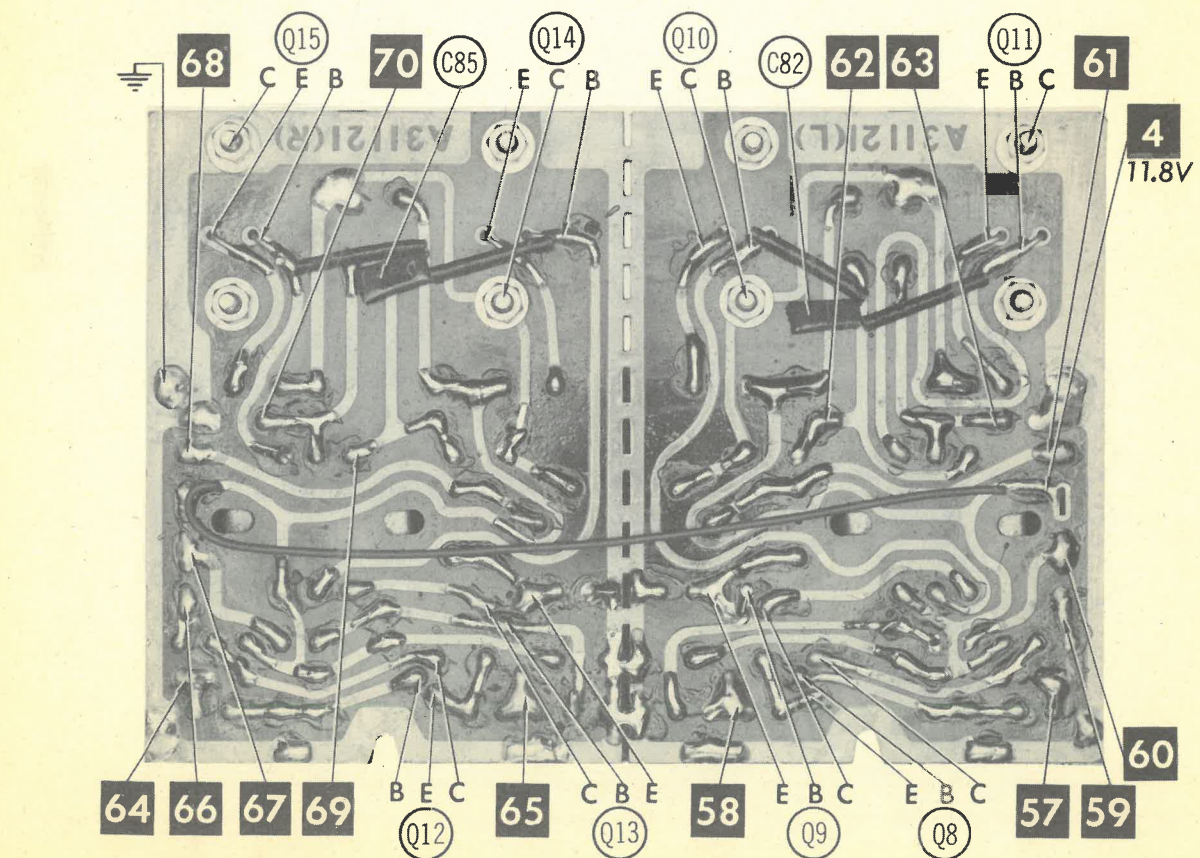
Pin No.	V1
1	NC
2	350K
3	FIL
4	FIL
5	22K
6	6meg
7	1meg

## T8 Terminal Guide





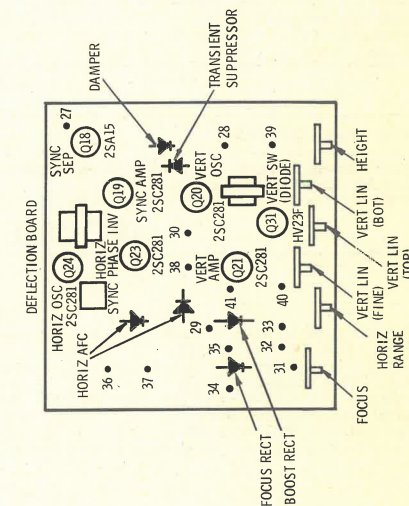
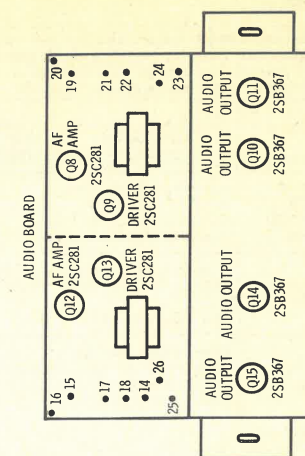
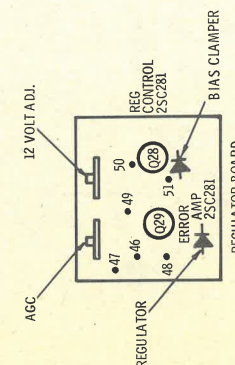
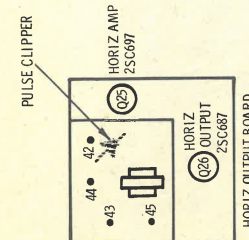
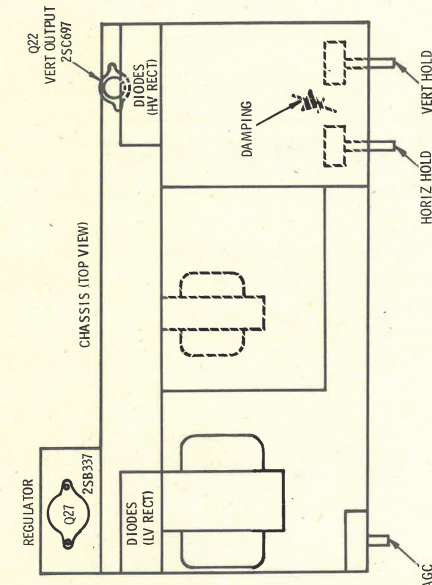
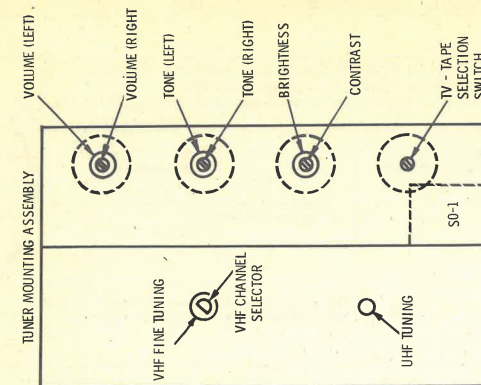




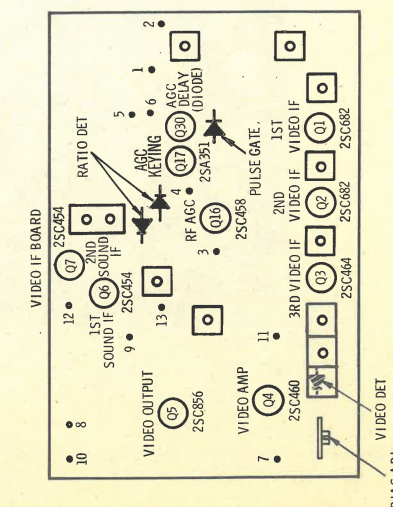
A Howard W. Sams CIRCUITRACE Photo

## SOUND PRINTED BOARD

## TRANSISTOR PLACEMENT CHART



• DOTS INDICATES SLIP  
CONNECTOR PLUGS



**NIVICO**  
**MODEL 3310**

**FOLDER 1**



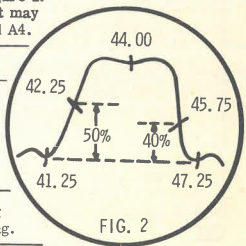
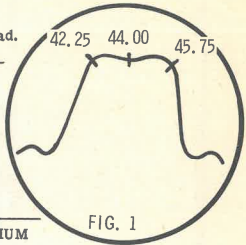
ALIGNMENT INSTRUCTIONS

Use an isolation transformer and maintain voltage at 117 volts. Allow a 20-minute warm-up period for the receiver and test equipment.  
Suggested Alignment Tools: A1 thru A7 ... GENERAL CEMENT #9440 ..... WALSCO #2501  
A8 thru A11 ... GENERAL CEMENT #8868, 8987, 9089 ... WALSCO #2531-X, 2541, 2587

VIDEO IF ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. Use only enough generator output to provide a usable indication. Note: Response may vary slightly from those shown. Connect a +3 volt bias supply to the IF AGC line (point  $\diamond$ ) and adjust to obtain a response curve which shows no indication of overload. Set the Channel Selector to any non-interfering channel.

INDICATOR	GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	ADJUST	REMARKS
1.	Connect DC probe of a VTVM thru a 47K resistor to point $\diamond$ . Common to ground.		41.25MC 47.25MC	A1 A2	Adjust for MINIMUM.
2.	Connect vertical input of a scope to point $\diamond$ . Low side to ground.	44MC (10MC Sweep)	42.25MC 44.00MC 45.75MC	A3 A4	Adjust for maximum amplitude and MINIMUM tilt with markers as shown in Figure 1.
3.	Connect vertical input of a scope to point $\diamond$ . Low side to ground.	44MC (10MC Sweep)	41.25MC 42.25MC 44.00MC 45.75MC 47.25MC	A5, A6, A7 and Mixer Col- lector Coil	Adjust for maximum gain and symmetry of response with markers as shown in Figure 2. In order to obtain a proper response, it may be necessary to slightly retouch A3 and A4.



SOUND IF ALIGNMENT

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	Connect high side thru .02mfd to Point $\diamond$ . Low side to ground.	4.5MC (Unmod.)	DC probe to Point $\diamond$ . Low side to ground.	A8, A9	Adjust for maximum.
5.	"	"	DC probe to Point $\diamond$ . Low side to Point $\diamond$ .	A10	Adjust for zero. A positive or negative reading will be obtained on either side of correct reading.

4.5 MC TRAP ALIGNMENT

6. Tune in a strong TV signal and set the Contrast at maximum. Adjust the Fine Tuning until a beat pattern is visible on the screen. Adjust A11 for MINIMUM beat interference.

TROUBLESHOOTING CHECK CHART

The following chart lists component failures most likely to produce indicated symptoms.

SWEEP

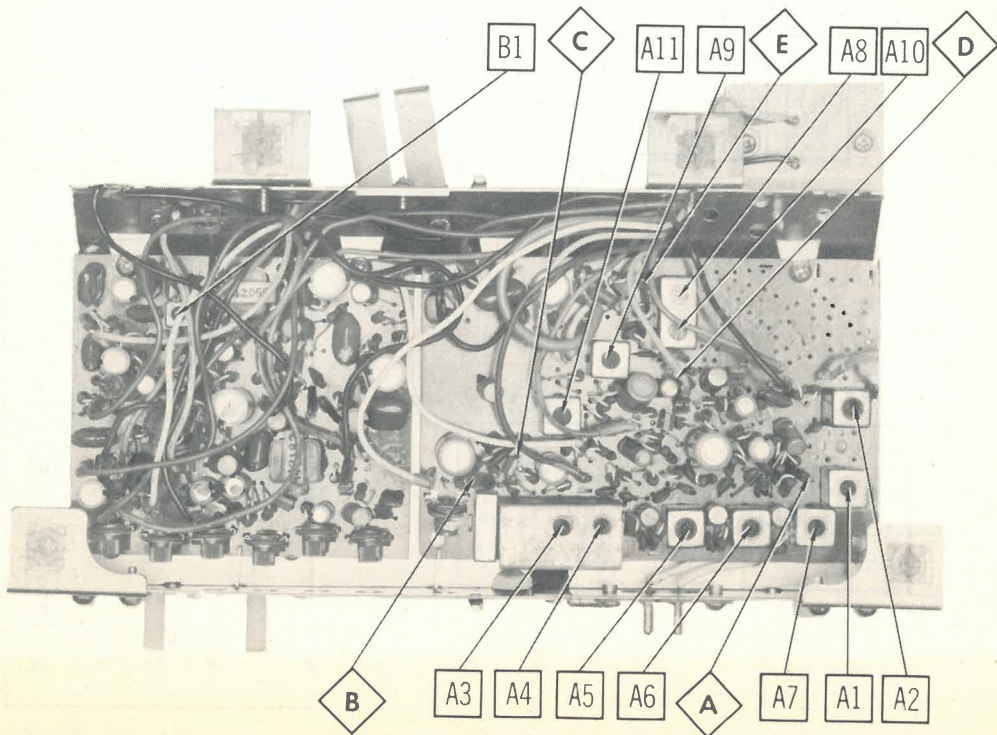
No raster, has sound Q24 thru Q26, X14, X15, V1  
No vert. deflection Q20 thru Q22, Q31  
Poor vert. lin. or foldover Q20 thru Q22, Q31  
Poor horiz. lin. or foldover Q26, X14  
Narrow picture X1, Q27 thru Q29, Q24, Q25, Q26, X14  
Vert. off freq. Q20 thru Q22, Q31  
Horiz. off freq. Q23, X11, X12, Q26

PICTURE OR SOUND

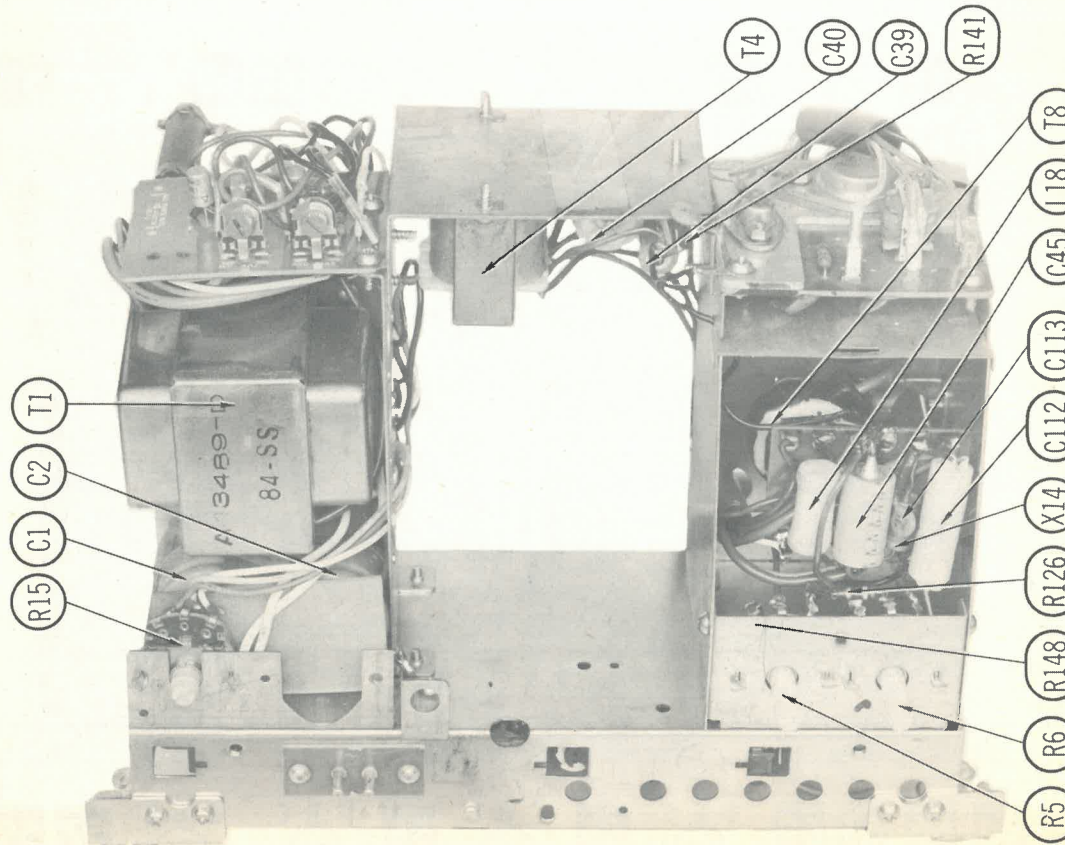
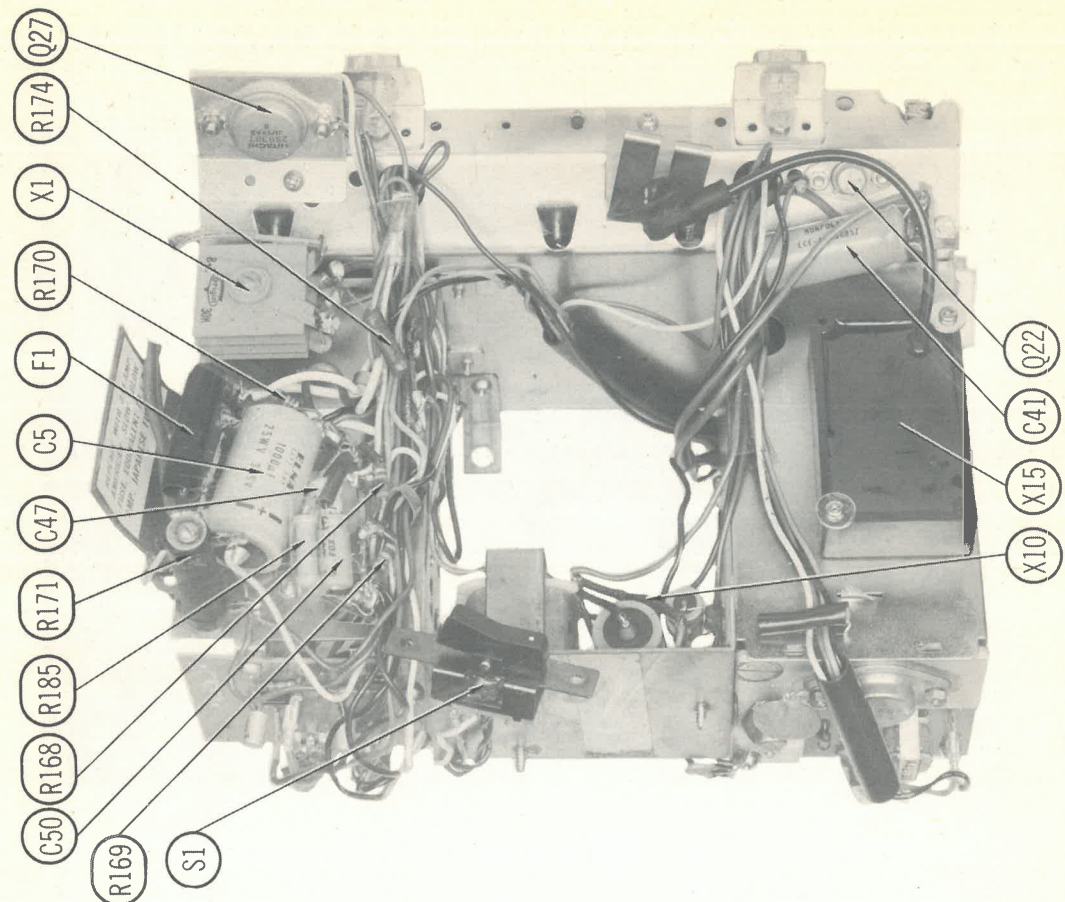
No pic, no sound, no raster F1, X1, Q27 thru Q29  
No pic, no sound, has raster Q1 thru Q3, Q202  
No pic, no sound, has snow Q201 thru Q203  
No pic, has sound, no raster V1  
No pic, has sound, has raster X4, Q4, Q5, V1  
Has pic, no sound Q6 thru Q15, X5 & X6  
Overloaded picture Q16, Q17, Q30

SYNC

No vert. sync Q18, Q19  
No horiz. sync Q18, Q19  
No vert. or horiz. sync Q18, Q19, Q23

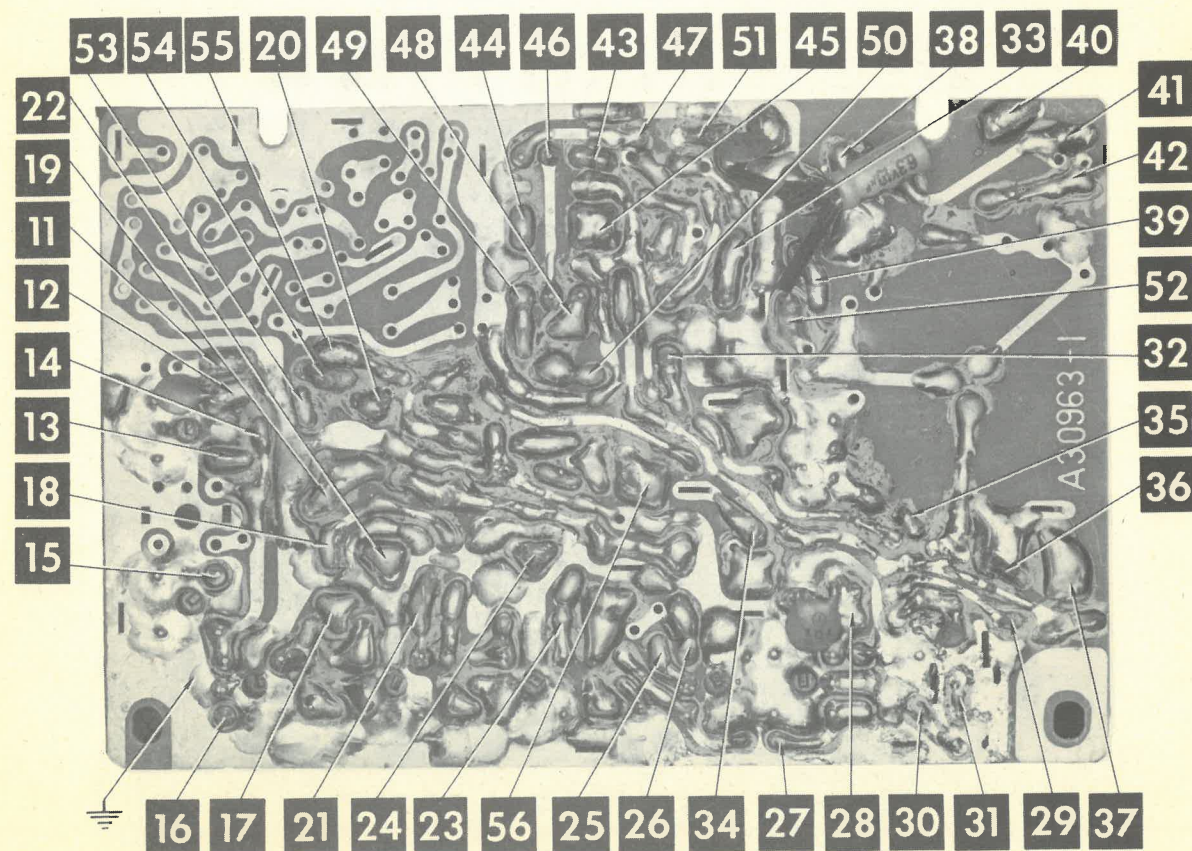
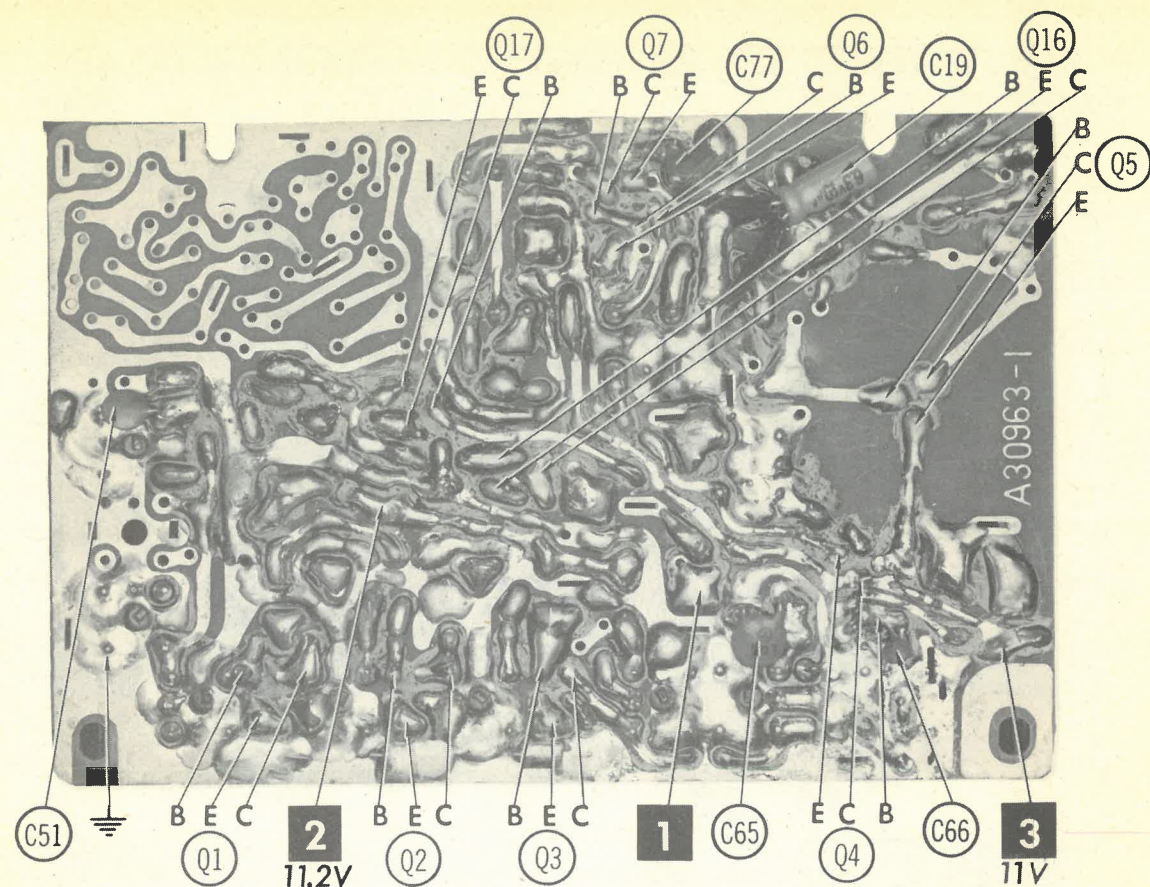


CHASSIS—BOTTOM VIEW



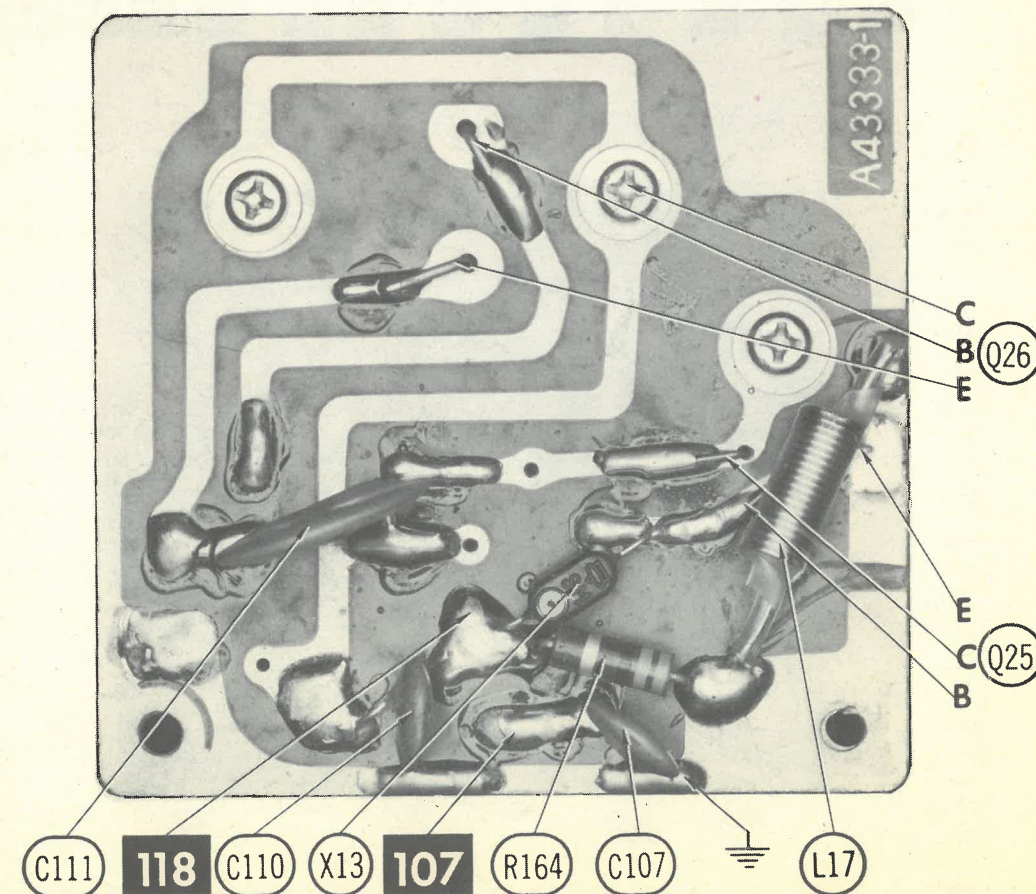
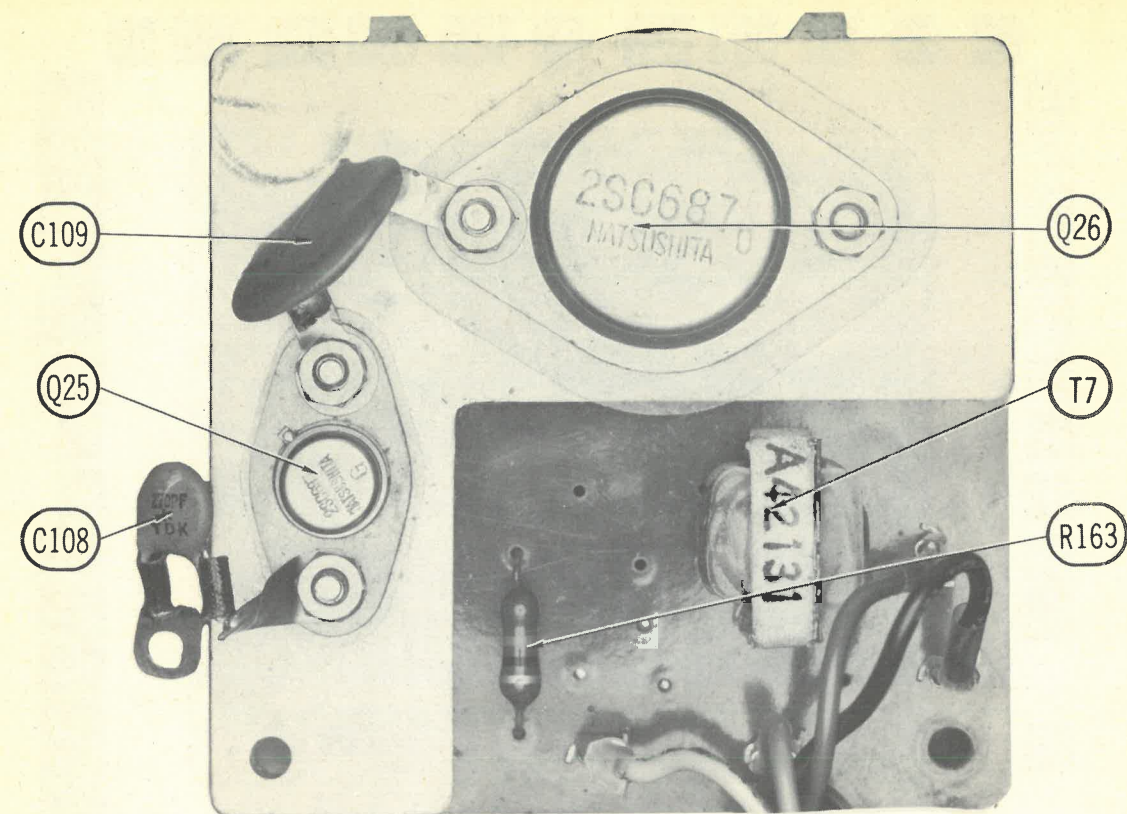
CHASSIS VIEW





A Howard W. Sams CIRCUITRACE Photo

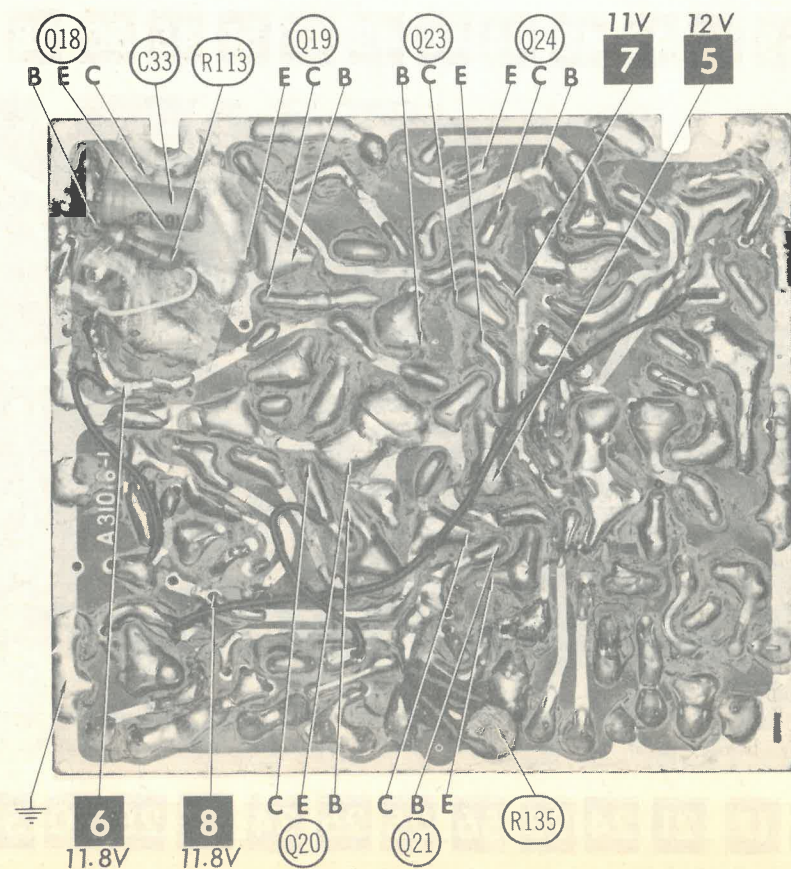
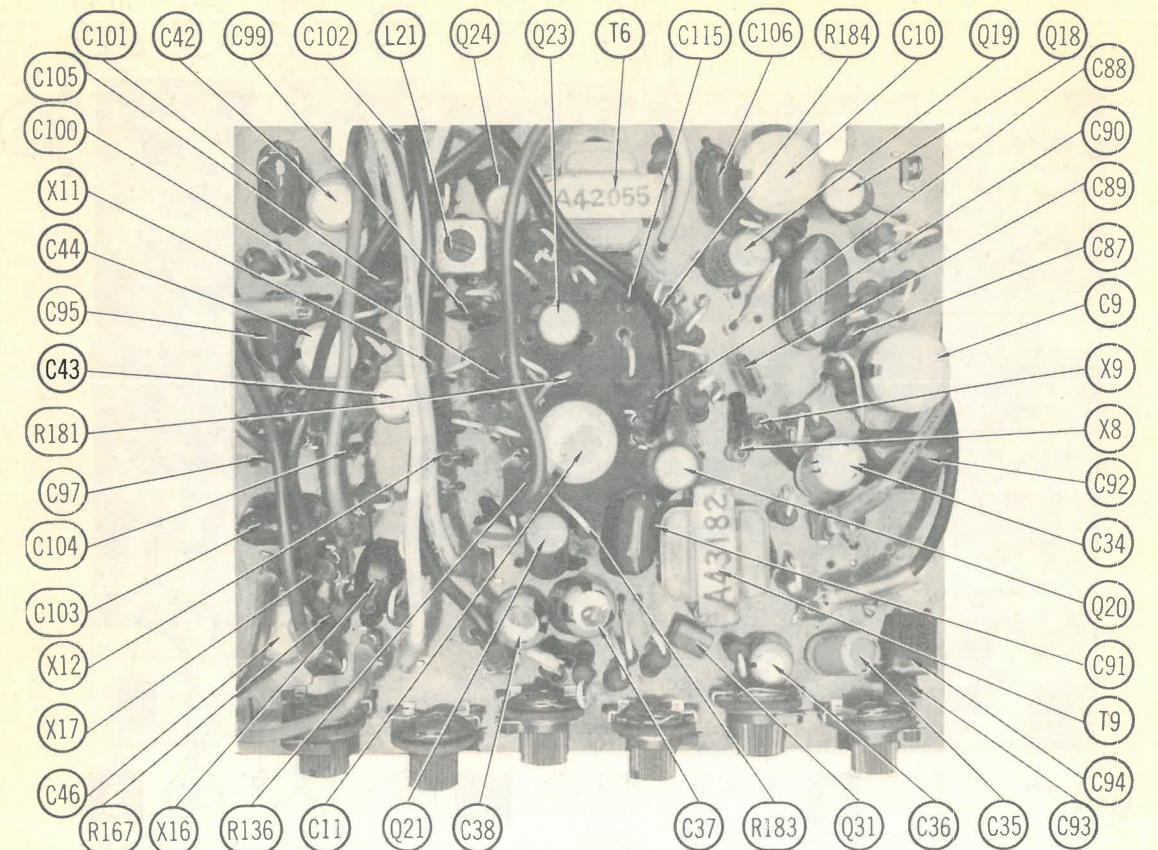
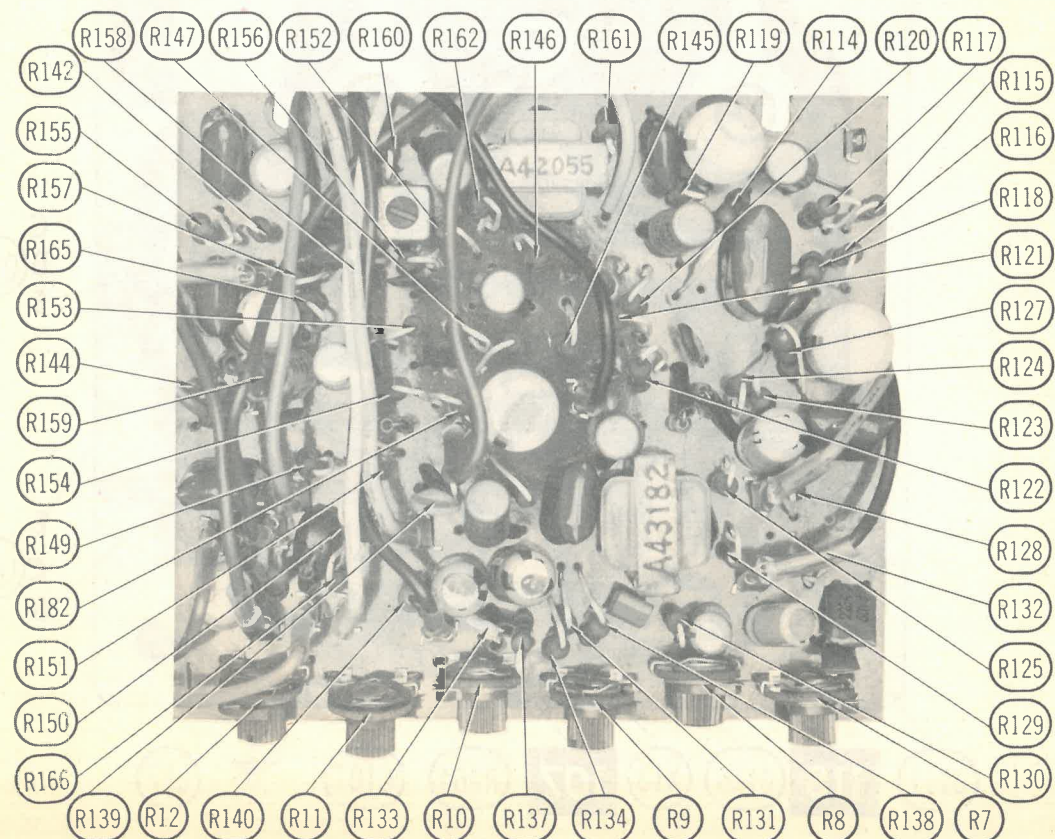
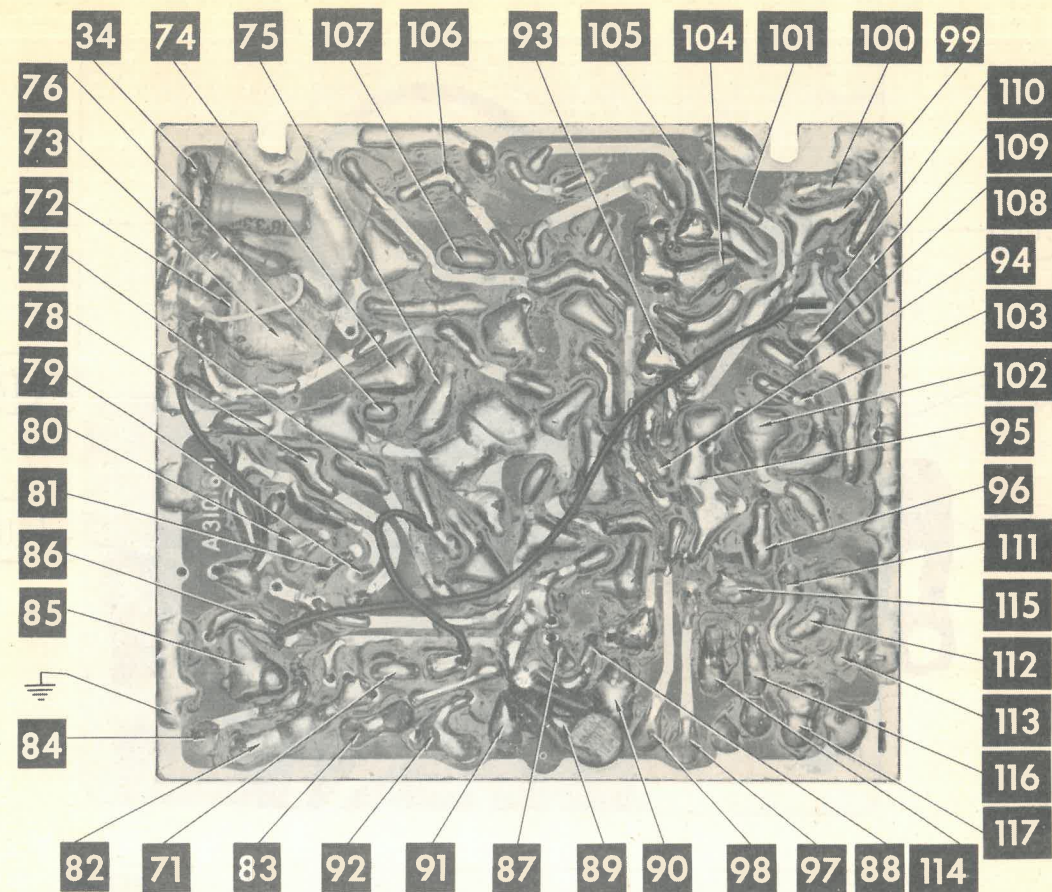
SIGNAL PRINTED BOARD



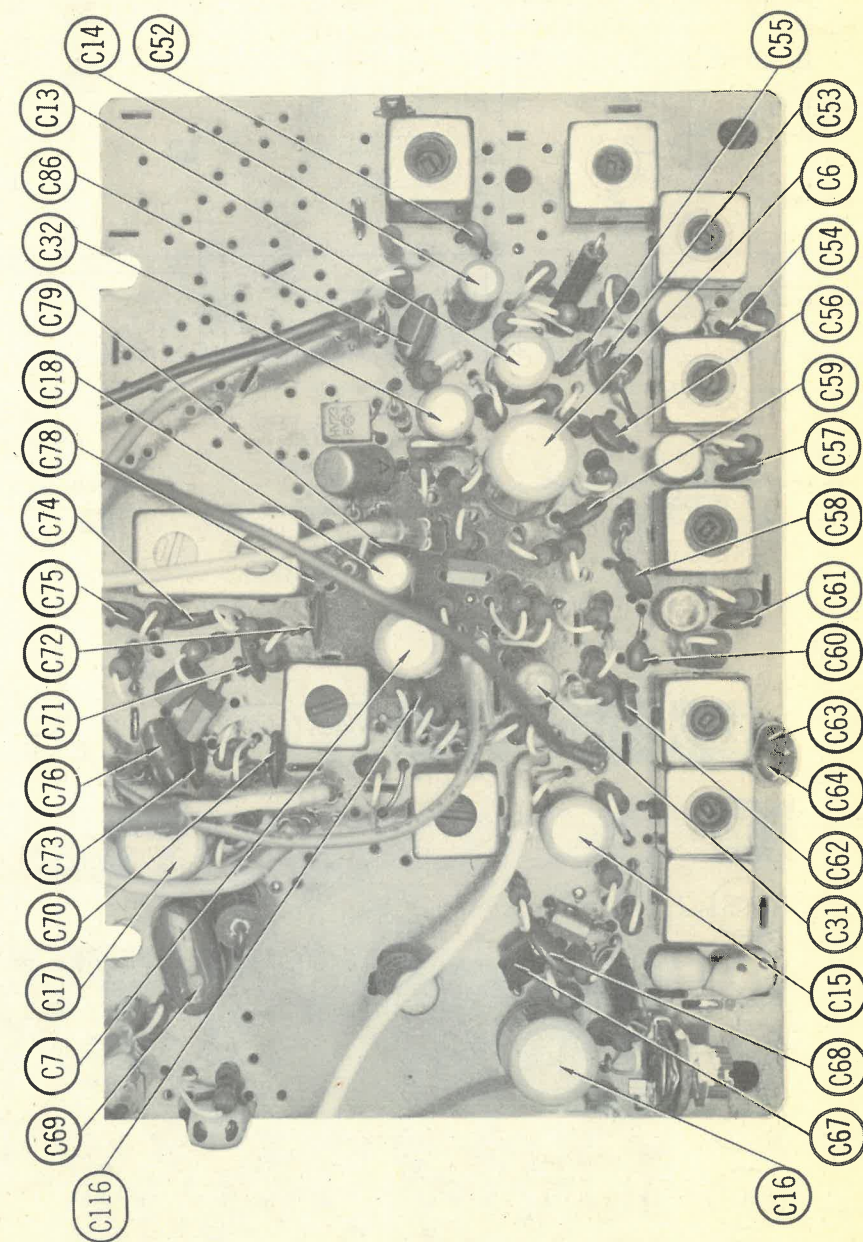
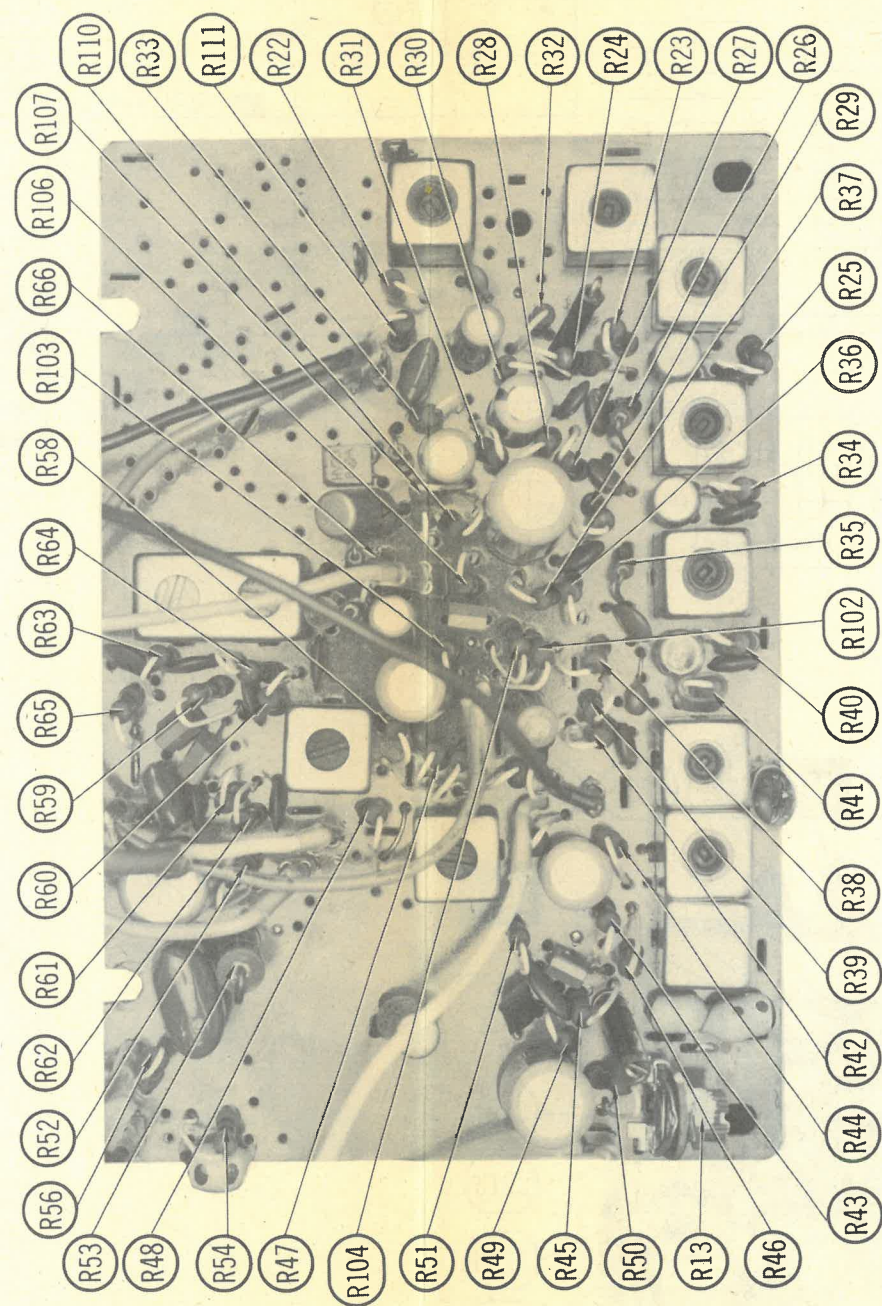
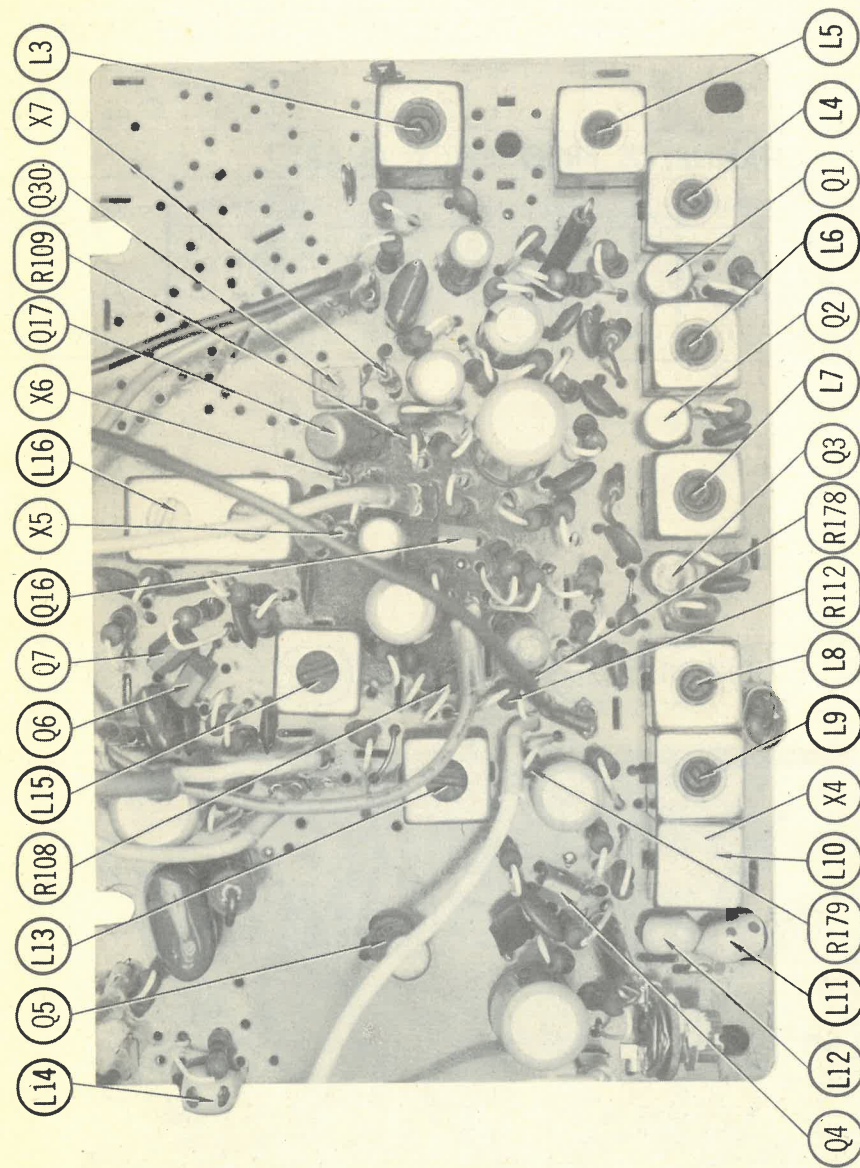
A Howard W. Sams CIRCUITRACE Photo

HORIZ OUTPUT BOARD



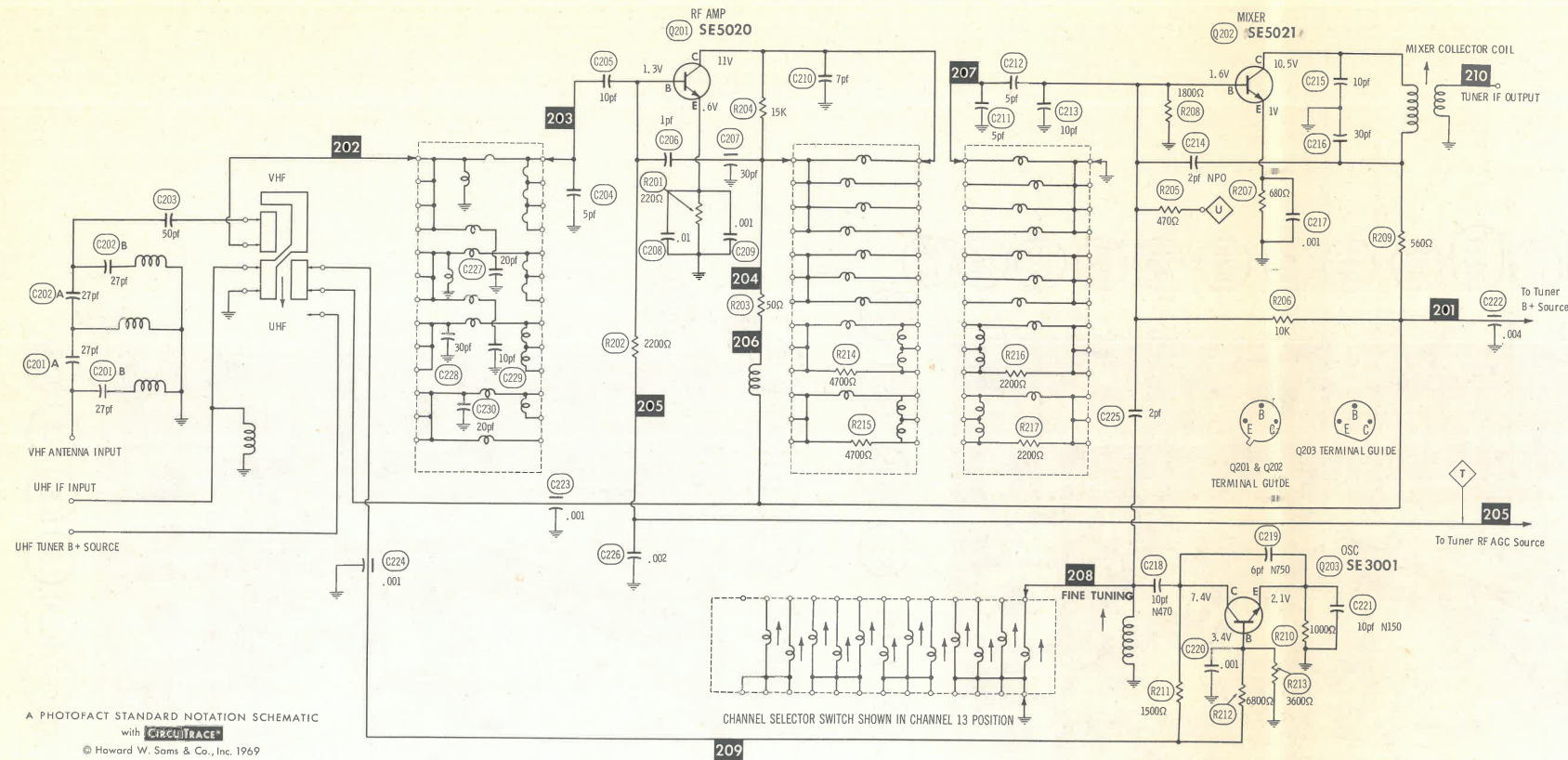






SIGNAL PRINTED BOARD





A PHOTOFACT STANDARD NOTATION SCHEMATIC  
with **CIRCUITRACE**  
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## VHF TUNER ALIGNMENT INSTRUCTIONS

### OSCILLATOR ADJUSTMENTS

The individual oscillator slugs are accessible through a hole in the front of the tuner. Set the fine tuning to the center of its range. Starting with the highest channel in the area, adjust the appropriate oscillator slugs in descending order for best picture and sound.

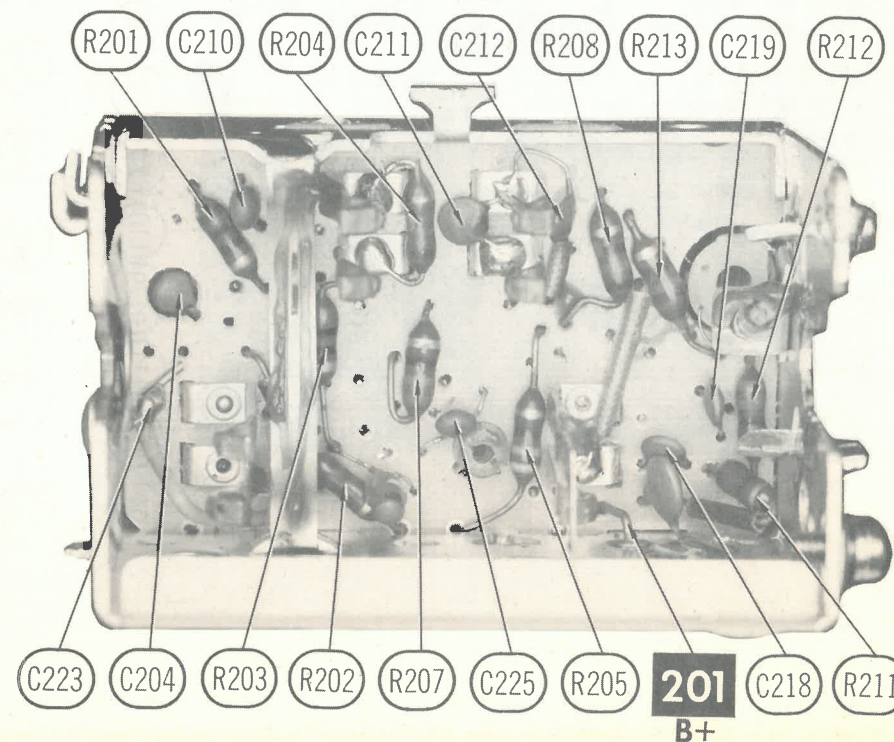
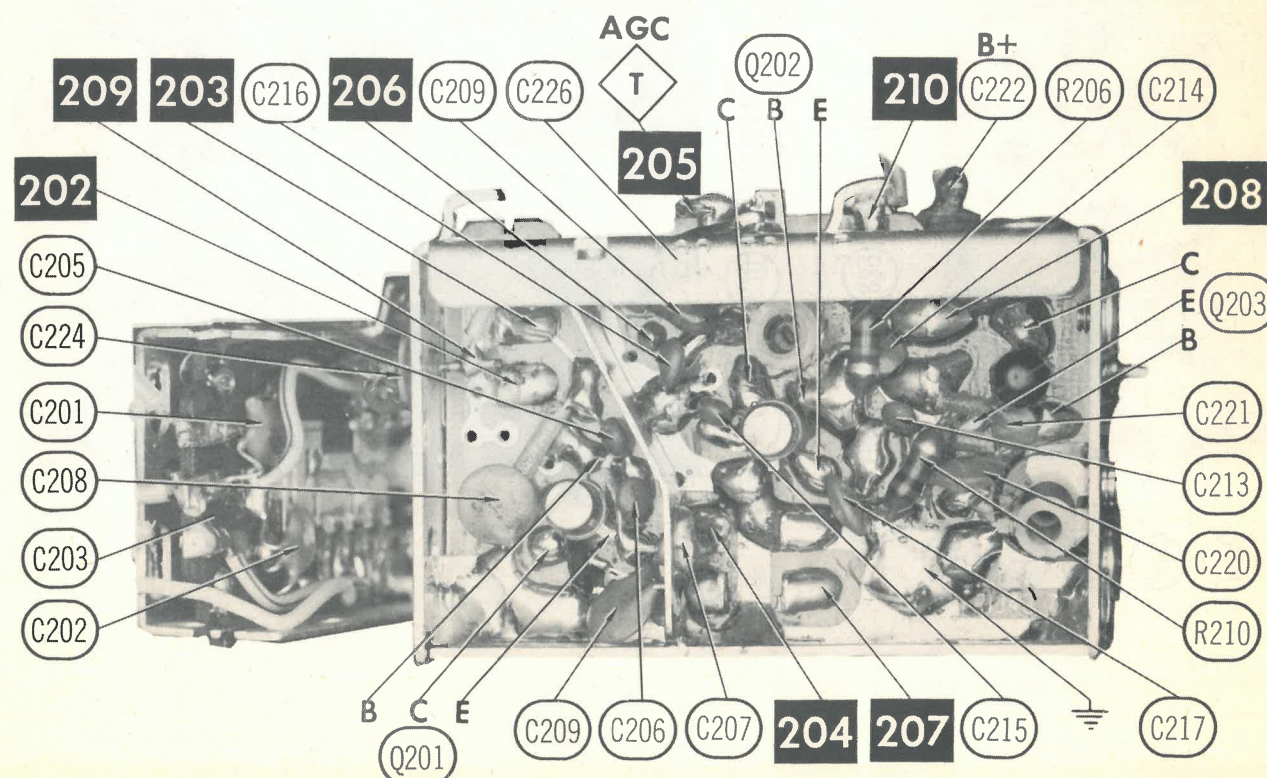
### RF AND MIXER ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. Use 10MC sweep unless otherwise noted. Connect a variable bias to the RF AGC line at point  $\nabla$ . Adjust bias to obtain response curve which shows no indication of overloading.

	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Across antenna terminals with 120Ω in each lead.	213MC	211.25MC 215.75MC	13	Vert. Input to Point $\nabla$ , low side to ground.		Expand or compress appropriate coils for maximum gain and symmetry of response similar to Fig. 201 with markers as shown.
2.	"	195MC	193.25MC 197.75MC	10	Across Video Det. load resistor.		Increase bias to -15 volts and adjust for MINIMUM amplitude of response.
3.	"	See Chart	See Chart	12 thru 2	Vert. Input to Point $\nabla$ , low side to ground.		Decrease bias. Check all channels and make compromise adjustments by expanding or compressing appropriate coils if required.

### CHANNEL & FREQUENCY CHART

SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	SOUND	VIDEO
57MC	55.25MC 59.75MC	2	85MC	83.25MC 87.75MC	6	195MC	193.25MC 197.75MC	10		FIG. 201
63MC	61.25MC 65.75MC	3	177MC	175.25MC 179.75MC	7	201MC	199.25MC 203.75MC	11		
69MC	67.25MC 71.75MC	4	183MC	181.25MC 185.75MC	8	207MC	205.25MC 209.75MC	12		
79MC	77.25MC 81.75MC	5	189MC	187.25MC 191.75MC	9	213MC	211.25MC 215.75MC	13		



## VHF TUNER

A Howard W. Sams **CIRCUITRACE** Photo



VHF TUNER PARTS LIST

TRANSISTORS

ITEM No.	TYPE No.	FUNCTION	REPLACEMENT DATA						
			MFGR. PART No.	DELCO PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	MOTOROLA PART No.	RCA PART No.	SYLVANIA PART No.
Q201	SE5020	RF Amp			GE-11	TR-22	HEP56	SK3018	ECG 108
Q202	SE5021	Mixer			GE-11	TR-22	HEP56	SK3018	ECG 108
Q203	SE3001	Oscillator			GE-11	TR-22	HEP720	SK3018	ECG 108

CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMenco PART No.	MALLORY PART No.	SPRAGUE PART No.
C201A	27			TCZ-27		CCTO-270	CNO427	10TCC-Q27
C202A	27			TCZ-27		CCTO-270	CNO427	10TCC-Q27
C203	50			TCZ-27		CCTO-270	CNO427	10TCC-Q27
C204	5			DTZ-50		CCTO-050		10TCC-Q50
C205	10			DTZ-10		CCTO-100	CNO410	10TCC-Q10
C206	1			TCZ-1		CCTO-100	CNO510	10TCC-V10
C207	30							
C208	.01							
C209	.001							
C210	7							
C211	5							
C212	5							
C213	10							
C214	2							
C215	10							
C216	30							
C217	.001							
C218	10							
C219	6							
C220	.001							
C221	10							
C222	.004							
C223	.001							
C224	.001							
C225	2							
C226	.002							
C227	20							
C228	30							
C229	10							
C230	20							

\* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

UHF TUNER PARTS LIST

TRANSISTORS

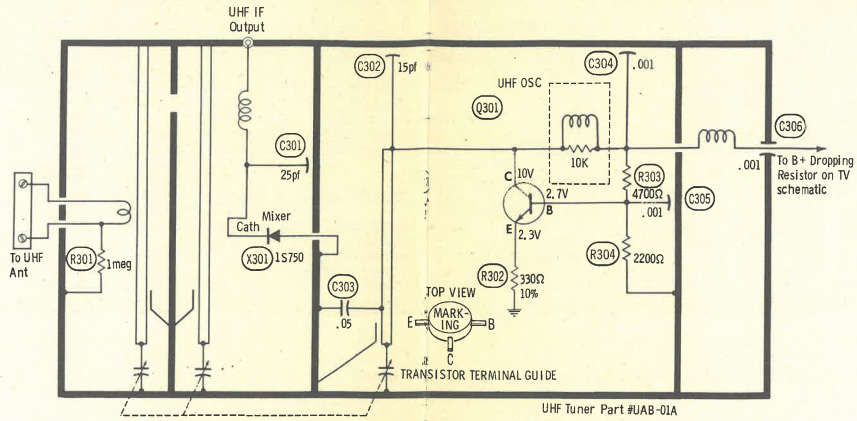
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Q301	2SC684	UHF Oscillator			GE-11	TR-24	HEP-56	SK-3019	ECG 108

POWER RECTIFIERS & SIGNAL DIODES

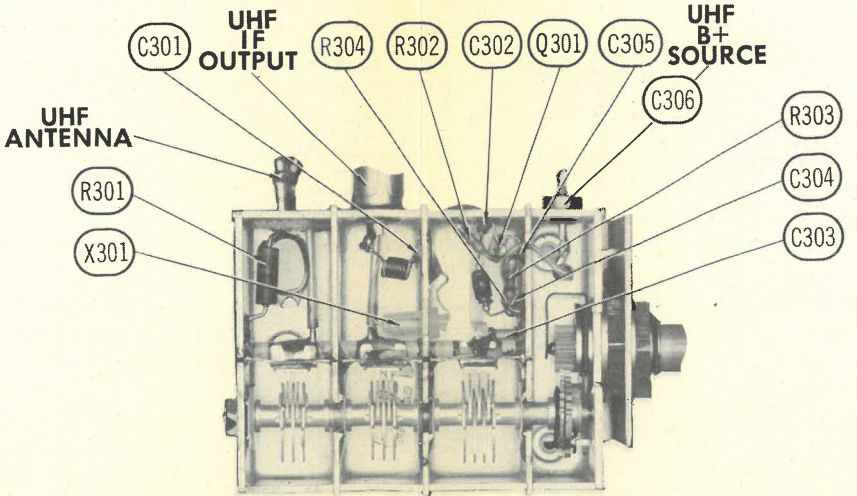
ITEM No.	MFGR. PART OR TYPE No.	REPLACEMENT RECTIFIERS & DIODES			REPLACEMENT RECTIFIERS		NOTES
		GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	SYLVANIA PART No.	RCA PART No.	SARKES TARZIAN PART No.	
X301	1S750	1N82A	1N82AG	ECG 112			

CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMenco PART No.	MALLORY PART No.	SPRAGUE PART No.
C301	.25							
C302	15							
C303	.05							
C304	.001							
C305	.001							
C306	.001							



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UHF TUNER

PARTS LIST AND DESCRIPTION

(When ordering parts, state Model, Part Number, and Description.)

Replacement parts shown may be superseded by the availability of newly introduced replacements.  
Have your local distributor check Sams COUNTER FACTS for the most up-to-date replacement.

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869 (17KV)
Shielded Hook-up Wire	Use BELDEN No. 8885 (Single Conductor)
	8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in 12 Colors
	8524 (Stranded) Available in 12 Colors
300Ω Tuner Input Lead	Use BELDEN No. 8225
300Ω Antenna Lead-in	Use BELDEN No. 8230 or 8275
Antenna Rotor Cable	Use BELDEN No. 8464 (Flat) or 8484 (Round) - 4 Conductor
	8485 (Round) - 5 Conductor
	8488 (Round) - 8 Conductor

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	MFGR. PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V1	230AFB4				

TRANSISTORS

ITEM No.	TYPE No.	FUNCTION	REPLACEMENT DATA						
			MFGR. PART No.	DELCO PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	MOTOROLA PART No.	RCA PART No.	SYLVANIA PART No.
Q1	2SC682(A)	1st Video IF							
Q2	2SC682(A)	2nd Video IF							
Q3	2SC464 (2SC717)	3rd Video IF							
Q4	2SC460(B)	Video Amp.		DS-74	GE-17	TR-21			ECG 128
Q5	2SC856	Video Output							
Q6	2SC454(L,A)	1st Sound IF		DS-74	GE-17	TR-21	HEP50		ECG 108
Q7	2SC454(L,A)	2nd Sound IF		DS-74	GE-17	TR-21	HEP50		ECG 108
Q8	2SC281(B)	AF Amp.		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q9	2SC281(B)	Driver		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q10	2SB367	Audio Output							
Q11	2SB367	Audio Output							
Q12	2SC281(B)	AF Amp.		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q13	2SC281(B)	Driver		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q14	2SB367	Audio Output							
Q15	2SB367	Audio Output							
Q16	2SC458(B)	RF AGC		DS-66	GE-10	TR-21	HEP53		ECG 123
Q17	2SA351(B)	AGC Keying		DS-26	GE-2	TR-14	HEP640		ECG 102
Q18	2SA15	Sync Separator			GE-2	TR-14	HEP639		ECG 102
Q19	2SC281(B)	Sync Amp.		DS-66	GE-18	TR-21	HEP50		ECG 123
Q20	2SC281(B)	Vert. Oscillator		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q21	2SC281(B)	Vert. Amp.		DS-66	GE-18	TR-21	HEP50		ECG 123
Q22	2SC697 (2SC680)	Vert. Output							
Q23	2SC281(B)	Horiz. Sync Phase Inverter		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q24	2SC281(B)	Horiz. Oscillator		DS-66	GE-18	TR-21	HEP50	SK3020	ECG 123
Q25	2SC697	Horiz. Driver							
Q26	2SC687	Horiz. Output							ECG 130
Q27	2SB337	Regulator		DS-520	GE-3	TR-01	HEP232	SK3009	ECG 104
Q28	2SC381(B)	Regulator Control		DS-66	GE-18	TR-21	HEP50		ECG 123
Q29	2SC381(B)	Error Amp.		DS-66	GE-18	TR-21	HEP50		ECG 123
Q30	HV23F	AGC Delay							
Q31	HV23F	Peak Clipper							

① Matched Pairs

POWER RECTIFIERS & SIGNAL DIODES

ITEM No.	MFGR. PART OR TYPE No.	REPLACEMENT RECTIFIERS & DIODES			REPLACEMENT RECTIFIERS	NOTES
		GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	SYLVANIA PART No.		
X1	A04231A	GE-504A ①	18DB2A or 8D4 ①	ECG 116 ① or ECG 117 ①	SK3030 ① or SK3031 ①	① Four required.
X2	A04093-X (SM-150-02)	GE-504A	8D4 or 5A4-D	ECG 116 or ECG 117		② Zener Diode
X3	A04234-2 (1S333) ②		1ZM3.2T5 or Z-1108	ECG 109		③ Matched Pairs
X4	1N60	1N60	1N60	ECG 109		
X5	1N60	1N60	1N60	ECG 110 ③		
X6	1N60	1N60	1N60	ECG 109		
X7	1N34A	1N34AS	1N34A	ECG 109		
X8	1N34A	1N34AS	1N34A	ECG 109		
X9	1N34A	1N34AS	1N34A	ECG 109		
X10	A04093-X (SM-150-02)	GE-504A	8D4 or 5A4-D	ECG 116 or ECG 117		
X11	1N34A	1N34AS	1N34A	ECG 110 ③		
X12	1N34A	1N34AS	1N34A	ECG 116 or ECG 117		
X13	A04093-X (SM-150-02)	GE-504A	8D4 or 5A4-D	ECG 116 or ECG 117		
X14	A04230-A (DG1NR)	GE-504A	8D4 or 5A4-D	ECG 116 or ECG 117		
X15	FU10	GE-504A	8D6 or 5A6-D	ECG 116 or ECG 117		
X16	FU1K	GE-504A	8D4 or 5A4-D	ECG 116 or ECG 117		
X17	A04093-A (SM-150-a)	GE-504A	8D4 or 5A4-D	ECG 116 or ECG 117		



## ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA						
		NIVICO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	GENERAL ELECTRIC PART No.	MALLORY PART No.	SPRAGUE PART No.
C1	2000 25V	Q03579-11	PR51296		BR2000-25		TC2520	TL-1220
C2	2000 25V	Q03579-11	PR51296		BR2000-25		TC2520	TL-1220
C3	100 25V		CRE623A	EA30-100	NLW100-25	MTI-20	MTA100F35	TL-1211
C4	10 16V		BCD25010	EP15-10	NLW100-15	MTI-5	MTV10CB50	TE-1155
C5	1000 16V	Q03579-11	PR51296	EA30-1000	BR100-25		TC2510	TL-1218
C6	100 16V	Q03108-100	PR51296	EP15-100	NLW100-15	MTI-19	MTV100CF15	TE-1162
C7	33 16V	Q03108-30	BCD15025	EP15-25	NLW30-15	MTI-14	MTV30CB25	TE-1158
C8	220 25V		PR51280	EA30-250	BR250-25	QTI-28	MTA200F25	TL-1214
C9	100 15V		BCD15100	EP15-100	NLW100-15	MTI-19	MTV100CF15	TE-1162
C10	100 15V		BCD15100	EP15-100	NLW100-15	MTI-19	MTV100CF15	TE-1162
C11	100 15V		BCD15100	EP15-100	NLW100-15	MTI-19	MTV100CF15	TE-1162
C12	200 15V		CRE481A	EA15-250	NLW200-15	MTI-23	MTA200F25	TE-1164
C13	5 15V	Q03144-5	BCD25005	EP15-5	NLW5-15	MTI-3	MTV5CB50	TE-1152
C14	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C15	100 6.3V		BCD10100	EP6-100	NLW100-12	MTI-19	MTV100CB6	TE-1102
C16	220 6.3V	Q03104-200	BCD6200	EA6-250	NLW200-12	MTI-25	MTV200CK10	TE-1104
C17	5 150V	Q03151-5	CRE954A		NLW5-150	MTI-4	TC40A	TE-1504
C18	10 6.3V		BCD25010	EP6-10	NLW10-6	MTI-5	MTV10CB50	TE-1087
C19	10 6.3V		BCD25010	EP6-10	NLW10-6	MTI-5	MTV10CB50	TE-1087
C20	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C21	33 6.3V		BCD15025	EP6-25	NLW30-6	MTI-13	MTV30CB25	TE-1132.1
C22	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C23	4.7 16V	Q03108-5	BCD25005	EP15-5	NLW5-15	MTI-3	MTV5CB50	TE-1152
C24	470 16V	Q03107-500	BCD15500	EA15-500	BR500-15	QTI-30	MTV500DN15	TL-1166
C25	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C26	33 6.3V		BCD15025	EP6-25	NLW30-6	MTI-13	MTV30CB25	TE-1132.1
C27	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C28	4.7 16V	Q03108-5	BCD25005	EP15-5	NLW5-15	MTI-3	MTV5CB50	TE-1152
C29	470 16V	Q03107-500	BCD15500	EA15-500	BR500-15	QTI-30	MTV500DN15	TL-1166
C30	47 16V	Q03105-50	CRE487A	EA15-50	NLW50-10	MTI-16	MTA50EA5	TL-1133
C31	1 50V	Q03112-1	BCD50001	EP50-2	NLW1-50	MTI-1	MTV1CB50	TL-1300
C32	33 6.3V		BCD15025	EP6-25	NLW30-6	MTI-13	MTV30CB25	TE-1132.1
C33	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C34	1 50V	Q03112-1	BCD50001	EP50-2	NLW1-50	MTI-1	MTV1CB50	TL-1300
C35	1 150V							
	.47 25V				TYR13BF474K		TAS474K050POA	150D474X 9035A2
	.5 10V				TYR13BF474K		TAS474K050POA	150D474X 9035A2
C36	3 15V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C37	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C38	3 50V	Q03124-3	BCD50003	EP50-5	NLW3-50	MTI-3	MTV3CB50	TL-1302
C39	3 50V	Q03124-3	BCD50003	EP50-5	NLW3-50	MTI-3	MTV3CB50	TL-1302
C40	5 150V	Q03151-5	CRE954A		NLW5-150	MTI-4	TC40A	TE-1504
C41	3 150V		CRE954A		NLW5-150	MTI-4	TC40A	TE-1504
C42	470 16V	Q03107-500	BCD15500	EA15-500	BR500-15	QTI-30	MTV500DN15	TL-1166
C43	6.5,25VNP	A03054-655	PR57315		BRNPI10-400	NBQT-3	TCN5010	TVAN1203.8
C44	10 15V		BCD25010	EP15-10	NLW10-15	MTI-5	MTV10CB50	TE-1155
C45	10 16V		BCD25010	EP15-10	NLW10-15	MTI-5	MTV10CB50	TE-1155
C46	3.3 16V	Q03108-3	BCD50003	EP15-5	NLW3-25	MTI-3	MTV3CB50	TE-1150
C47	1 150V	Q03152-5	CRE950A		NLW1-150	MTI-2	TT150X1	TE-1500
C48	1 150V	Q03152-5	CRE950A		NLW1-150	MTI-20	MTA100F35	TL-1211
C49	47 25V	Q03110-50	BCD25050	EP30-50	NLW50-25	MTI-17	MTV50CD25	TE-1209
C50	47 25V	Q03110-50	BCD25050	EP30-50	NLW50-25	MTI-17	MTV50CD25	TE-1209
C51	5 150V	Q03151-5	CRE954A		NLW5-150	MTI-4	TC40A	TE-1504

## CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMENCO PART No.	MALLORY PART No.	SPRAGUE PART No.
C51	56		NPO-DI 10	DTZ-10	CZ601CG100J	CCTO-560	CNO456	10TCC-Q56
C52	10		GPD X5F202K	DM-202	JBX601YP202K	CCTO-100	CNO410	10TCC-Q10
C53	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	10S-D20
C54	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C55	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C56	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C57	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C58	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C59	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C60	3		NPO-DI 3.0	DTZ-3R3	CZ601CH5R0D	CCTO-3R3	CNO533	10TCC-V30
C61	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C62	.002		GPD X5F202K	DM-202	JBX601YP202K	CCD-202	GP220	2SS-D20
C63	5		NPO-DI 5.0	DTZ-4R7	CZ601CH5R0D	CCTO-050	CNO547	10TCC-V50
C64	5		NPO-DI 5.0	DTZ-4R7	CZ601CH5R0D	CCTO-050	CNO547	10TCC-V50
C65	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C66	10		NPO-DI 10	DTZ-10	CZ601CG100J	CCTO-100	CNO410	10TCC-Q10
C67	.0015	10%	V1614D15	CPR-15000J	W MFI1D15	6DP-1-152	PV C8215	225 P15291
C68	100		GPD X5F101K	DM-101	JBZ601YP101K	CCD-101	GP310	10TS-T10
C69	.22	50V 10%	V1612 P22		DMFI P22	1DP-3-224	PVC1022	225 P2249R75
C70	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C71	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C72	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C73	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C74	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C75	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C76	.047	50V 10%	V1612S47		DMFI S47	1DP-2-473	PVC1147	225 P47391
C77	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C78	390	25V 5%			CD15F391J500	DM-15-391J	SK339	MS-339
C79	.01		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C80	.022	50V 10%	V1612S22		DMFI S22	1DP-1-223	PVC1122	225 P22391
C81	.022	50V 10%	V1612S22		DMFI S22	1DP-1-223	PVC1122	225 P22391
C82	.01	50V 10%	V1612S1		W MFI S1	1DP-1-103	PV C211	225 P10391
C83	.022	50V 10%	V1612S22		DMFI S22	1DP-1-223	PVC1122	225 P22391
C84	.022	50V 10%	V1612S22		DMFI S22	1DP-1-223	PVC1122	225 P22391
C85	.01	50V 10%	V1612S1		W MFI S1	1DP-1-103	PV C211	225 P10391
C86	.047	50V 10%	V1612S47		DMFI S47	1DP-2-473	PVC1147	225 P47391
C87	.0047	10%	V1612D47		W MFI D47	6DP-1-472	PV C8247	225 P47291
C88	.22	50V 10%	V1612 P22		DMFI P22	1DP-3-224	PVC1022	225 P2249R75
C89	.01	50V 10%	V1612S1		W MFI S1	1DP-1-103	PV C211	225 P10391
C90	.0022	10%	V1614D22		W MFI D22	6DP-1-222	PV C8222	225 P22291
C91	.1	50V 10%	DBE2 P1		DMFI P1	1DP-2-104	PVC101	225 P10491
C92	.1	50V 10%	DBE2 P1		DMFI P1	1DP-2-104	PVC101	225 P10491
C93	.0068	10%	V1612D68		W MFI D68	1DP-1-682	PV C6268	225 P68291
C94	.022	50V 10%	DMFI S22		W MFI S22	1DP-1-223	PVC1122	225 P22391
C95	.082	50V 10%	DBE6S82		W MFI S82	6DP-4-823	225 P82391	
C96	.033	10%	V1612S33		DMFI S33	1DP-1-333	PVC1133	225 P33391

## PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

Replacement parts shown may be superseded by the availability of newly introduced replacements.  
Have your local distributor check Sams COUNTER FACTS for the most up-to-date replacement.

## CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMENCO PART No.	MALLORY PART No.	SPRAGUE PART No.
C97	27		NPO-DI 25	TCZ-27	GPD X5F152K	DD-152	CNO427	10TCC-Q27
C98	.0015		GP220	10S-D20	CCD-152	GP220	2SS-D20	10TS-D15
C99	.0068	10%	V1612D68	CPR-6800J	W MFI D68	1DP-1-823	PVC6268	225 P68291
C100	.0068	10%	V1612D68	CPR-6800J	W MFI D68	1DP-1-823	PVC6268	225 P68291
C101	.1	50V 10%	DBE2 P1		DMFI P1	1DP-2-104	PVC101	225 P10491
C102	.1	50V 10%	DBE2 P1		DMFI P1	1DP-2-104	PVC101	225 P10491
C103	.1	50V 10%	DBE2 P1		DMFI P1	1DP-2-104	PVC101	225 P10491
C104	.0018	10%	DBE6D18	CPR-1800J	W MFI D18	16DP-2-182	PVC1156	225 P6391
C105	.056	50V 10%	DBE6S56		W MFI S56	1DP-2-563	PVC1156	225 P6391
C106	.056	50V 10%	DBE6S56		W MFI S56	1DP-2-563	PVC1156	225 P6391
C107	.0015	10%	GPD X5F152K	DD-152	GPD X5F271K	DD-271	GP215	10TS-D15
C108	270	10%	TTT-P-01	CK-103	HOY101ZV103P	CCD-103	GP215	10TS-D15
C109	.01		GPD X5F152K	DD-152	CK-103	CCD-152	GP215	10TS-D15
C110	.0015		TTT-P-01	CK-103	HOY101ZV103P	CCD-103	GP215	10TS-D15
C111	.01		DBE6S82	6DP-4-823	PKM4S82	CCD-471	GP347	225 P47391
C112	.082	400V 10%	GPD X5F471K	DD-471	JBZ601YP471K	DM-202	GP220	2SS-D20
C113	470	10%	GPD X5F202K	DM-202	JBZ601YP202K	DM-202	GP220	2SS-D20
C114	.002		V1612D68	CPR-6800J	W MFI D68	1DP-1-823	PVC6268	225 P68291
C115	.0068	10%	NPO-DI 15	DTZ-15	CZ601CG150J	CCTO-150	CNO415	10TCC-Q15

## CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM No.	FUNCTION	RESIST-ANCE	REPLACEMENT DATA				
			MFGR. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	CTS-IRC PART No.	MALLORY PART No.
R1A	Volume (Left)	50K	Q03816-1-M				
B	Volume (Right)	50K					
R2A	Tone (Left)	50K	Q03816-1-M				
B	Tone (Right)	50K					
R3A	Brightness	250K	Q03832-1-M				
B	Contrast	500Ω					
R4	AGC	500Ω	04061-17-M (04061-17)	TT-4 or (F1-500, SNK01 0, AK-38)	B47-500-S or (NP-500-S, NML-A-300, TT-2)	B11-103, TM4 or (BU11-CF4, SS6) *	PTA52L or (RU52L, SL37, SNI 000) or (UA52LⓈ, SNI 000)
R5	Horiz. Hold	10K	04065-15-M (04065-15)	TT-14 or (F1-10K, SNKI 00, AK-38)	B47-10K-S or (NP-10K-S, NML-A-300, TT-2)	B11-116, TM4 or (BU11, CF9, SS6) *	TA141 or (RU14L, SL37, SNI 000) or (UA14LⓈ, SNI 000)
R6	Vert. Hold	10K	04065-15-M (04065-15)	TT-14 or (F1-10K, SNKI 00, AK-38)	B47-10K-S or (NP-10K-S, NML-A-300, TT-2)	B11-116, TM4 or (BU11, CF9, SS6) *	TA141 or (RU14L, SL37, SNI 000) or (UA14LⓈ, SNI 000)
R7	Vert. Linearity (Bottom)	200K	Q04850-2	T-250K		X201R254B	MTC254L1
R8	Height	50K	Q04848-2	T-50K		X201R503B	MTC54L1
R9	Vert. Linearity (Top)	200K	Q04850-2	T-250K		X201R254B	MTC254L1
R10	Vert. Linearity (Fine)	1000Ω	Q04843-3	T-1000		X201R102B	MTC13L1
R11	Horiz. Range	10K	Q04846-4	T-10K		X201R103B	MTC14L1
R12	Focus	2meg	Q04853-2	T-2meg			MTC26L1
R13	Bias	5000Ω	Q04845-2	T-5000		X201R502B	MTC53L1
R14	12-Volt Adjust	1000Ω	Q04843-3	T-1000		X201R102B	MTC13L1
R15	AGC Bias	1000Ω	Q04843-3	T-1000		X201R102B	MTC13L1