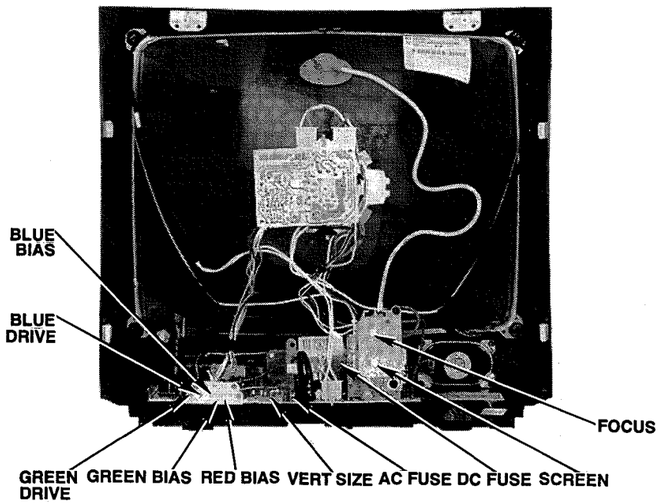
CABINET - REAR VIEW



TEST JIG HOOKUP

Function	Chek-A-Color Adapter No.	PC Board Plug No.	Pin	Color
CRT	B239	P4451	H-Red	Red
Yoke	D4124		H-Brn	Blue
Yoke Setting	YP3		V-Yel	Yellow
Comments	Focus Tap		V-Grn	Green

Printed in the United States of America 5 4 3 2 1

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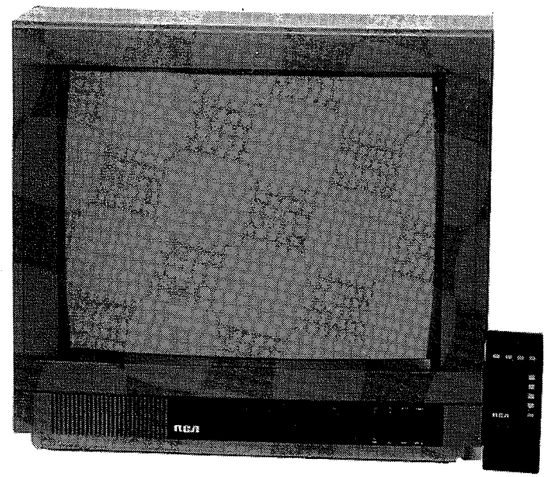
PHOTOFACT® Technical Service Data

INDEX

For Supplier Address, See PHOTOFACT Annual Index

RCA

Model X20162GSA04 (Chassis CTC146L/LA)



Complete coverage for servicing a television receiver...

- **Schematics**
- **Parts lists**
- **Component locations**
- **Troubleshooting guide**

Coverage includes these additional models and chassis:

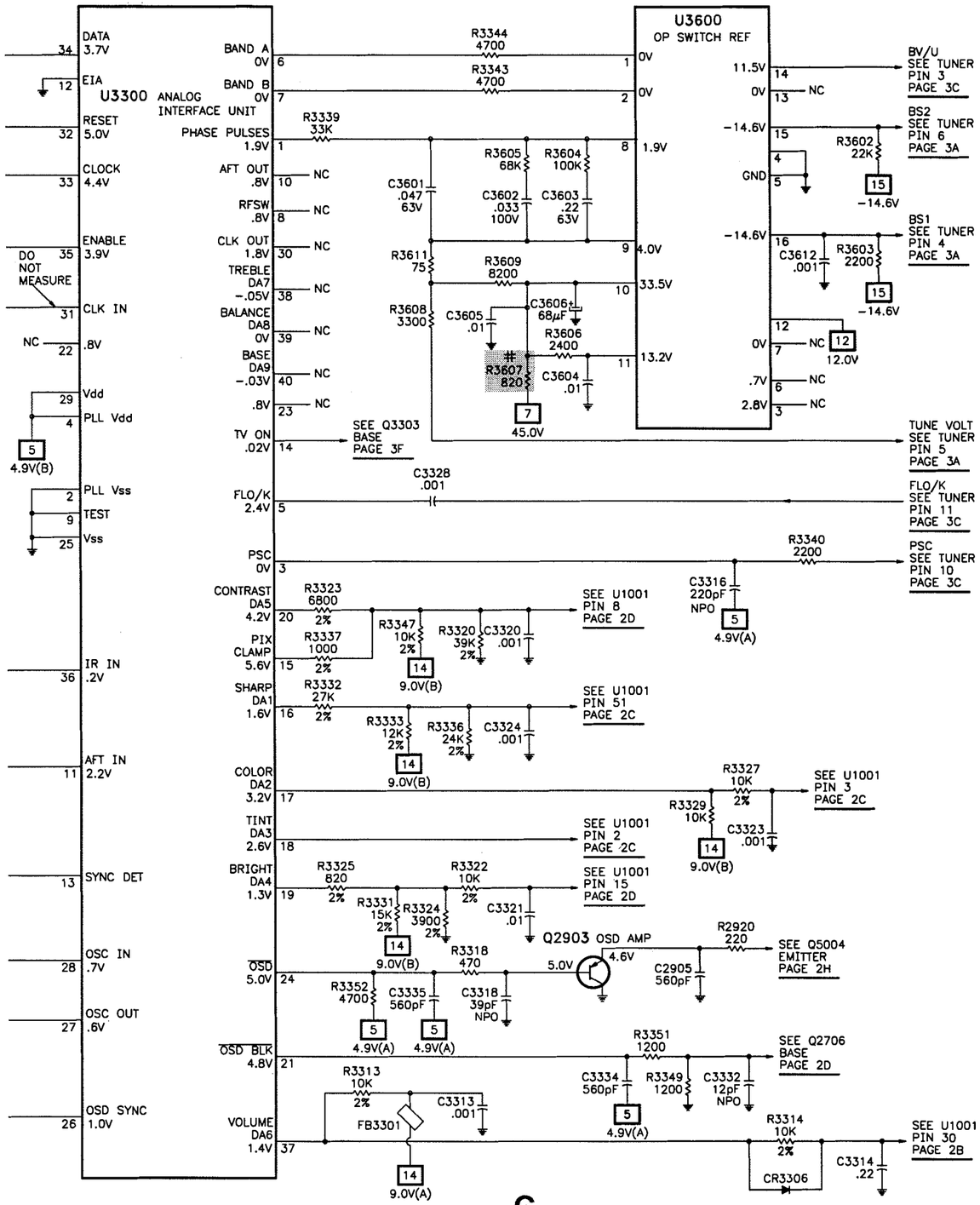
MODEL	CHASSIS
X20162GSA02	CTC146H/L
X20162GSN02	CTC146H/L
X20162GSN04	CTC146H/L

HOWARD W. SAMS & COMPANY

AUGUST 1993 SET 3200

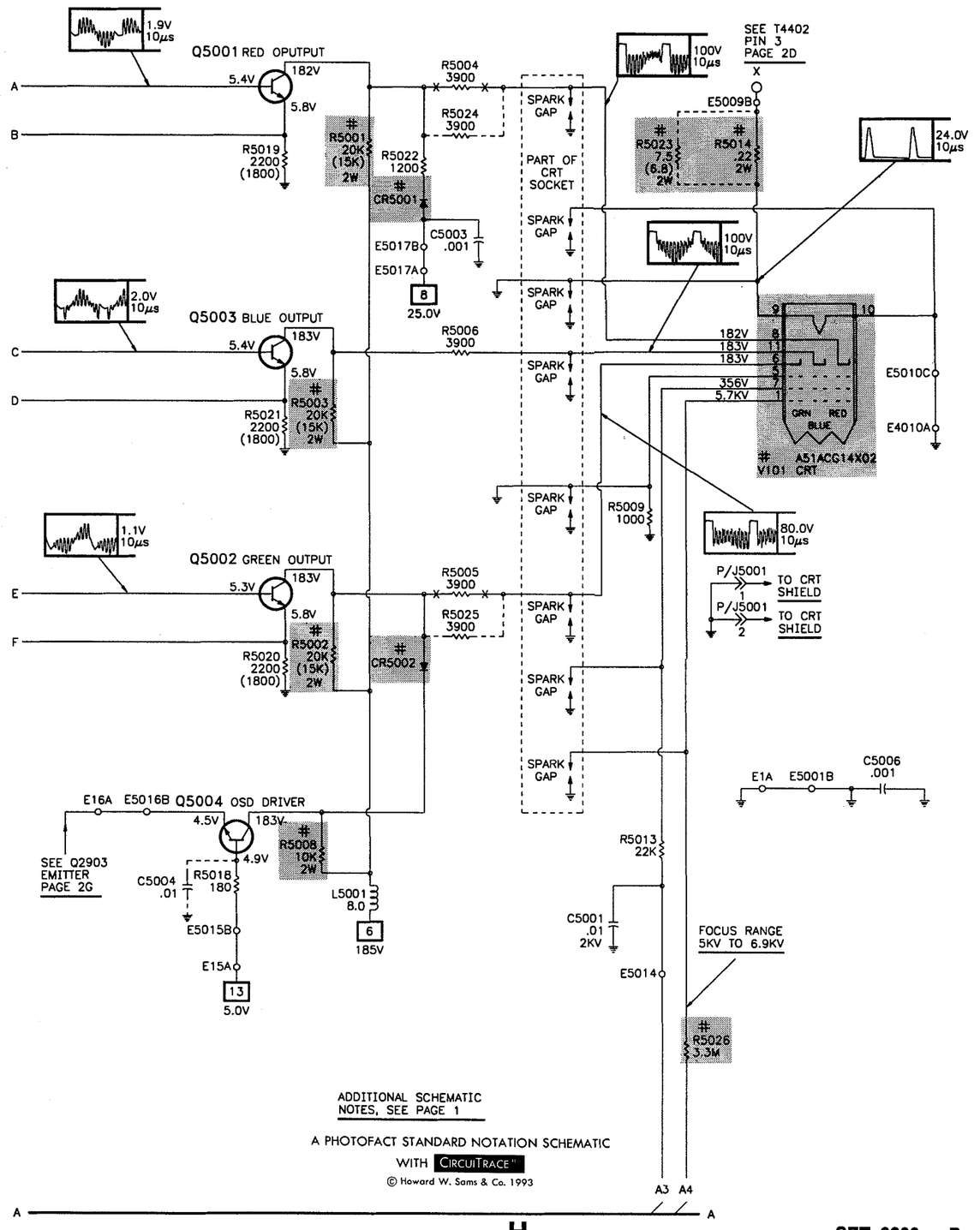
3200

MICROCOMPUTER SCHEMATIC continued



G

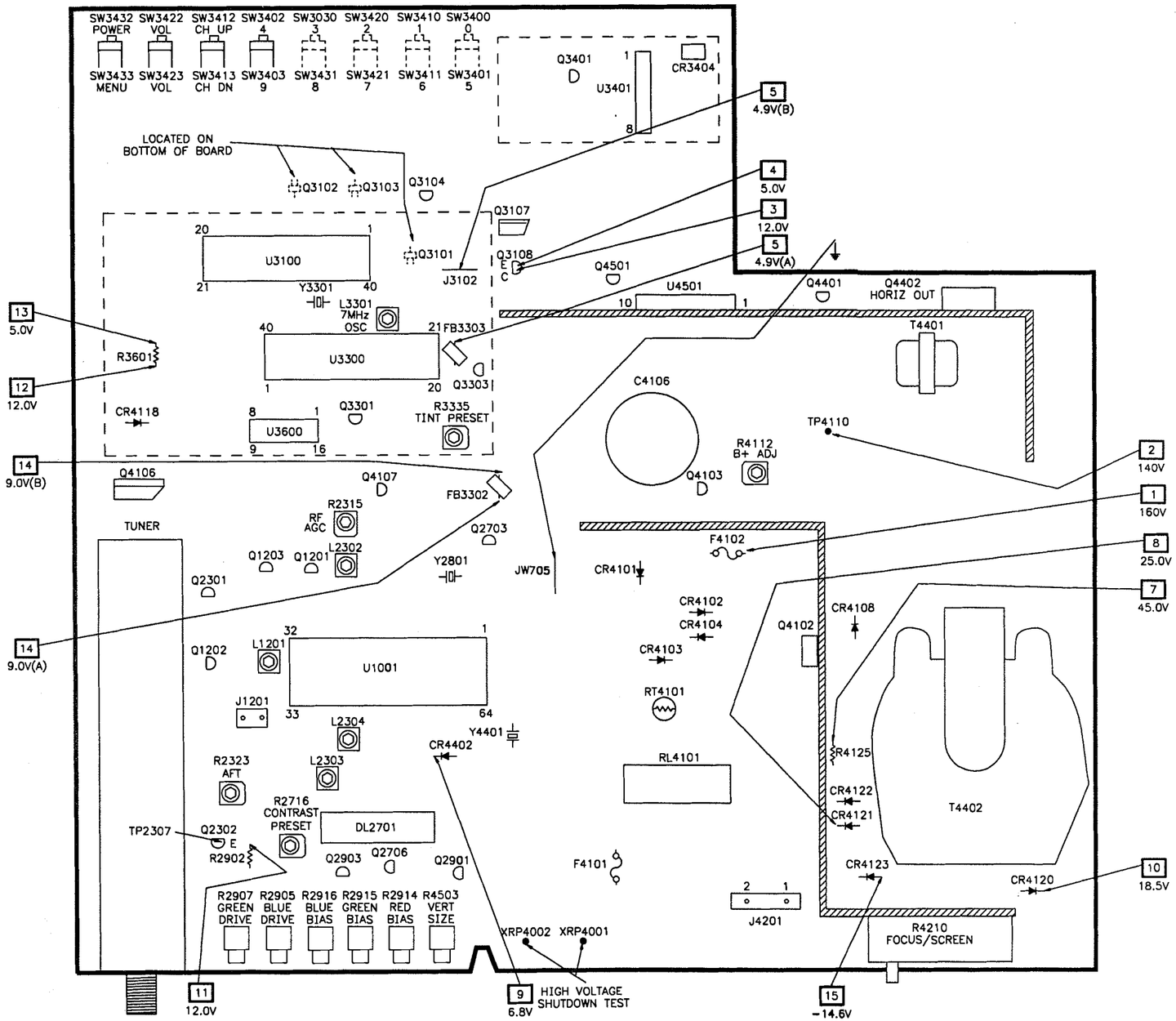
CRT SCHEMATIC



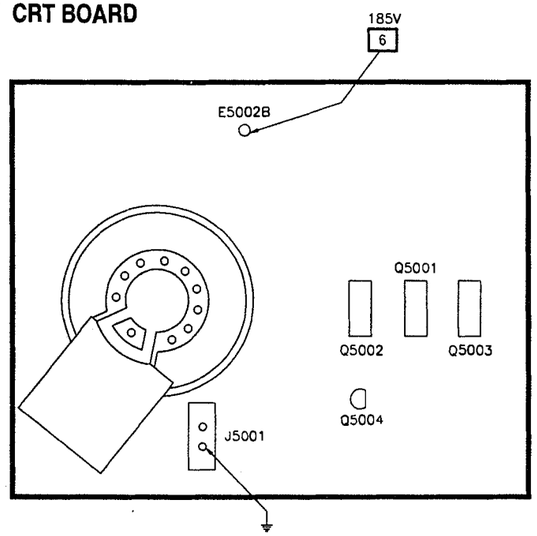
H

PLACEMENT CHART

MAIN BOARD



CRT BOARD



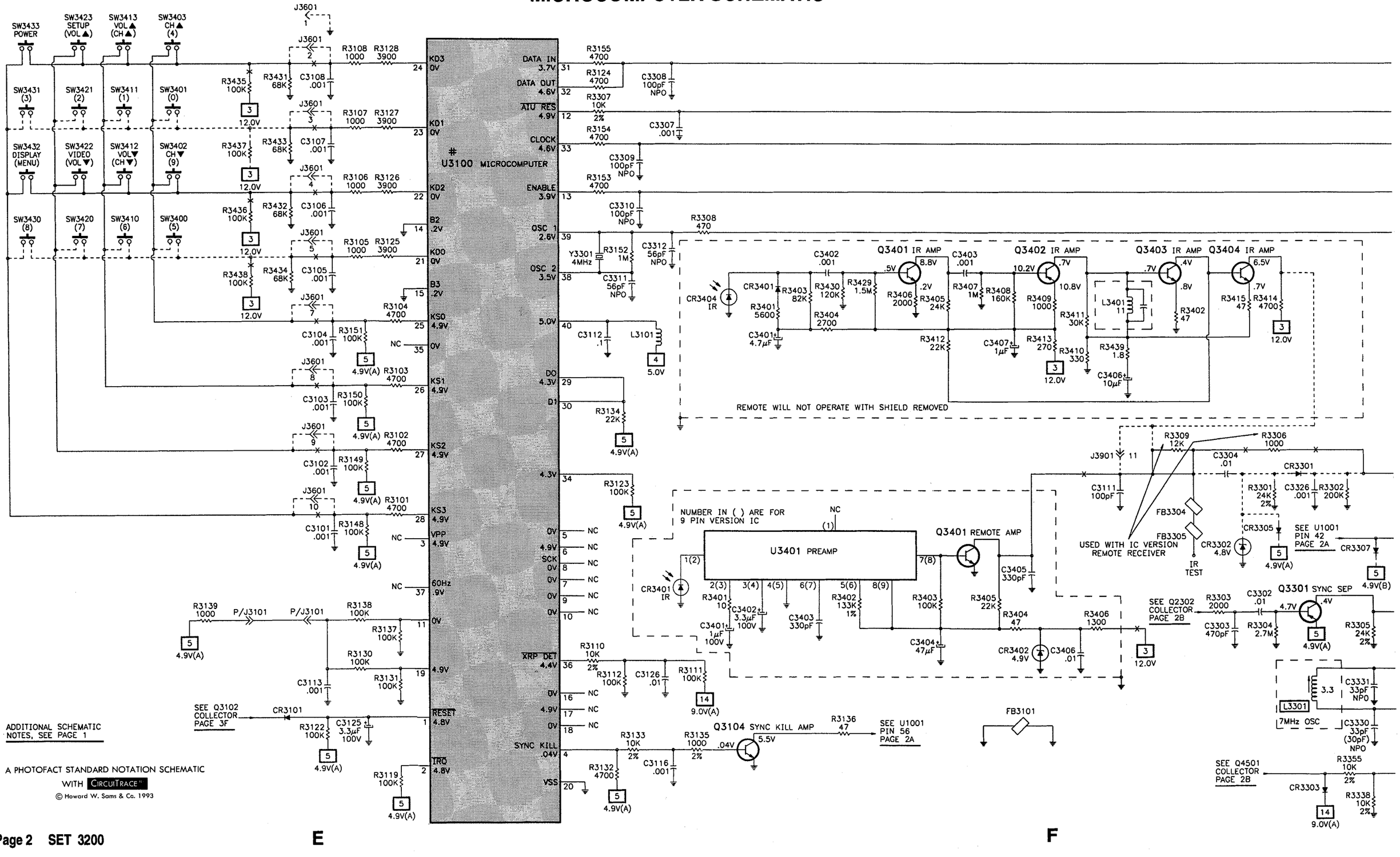
SCHEMATIC NOTES

 # For SAFETY use only equivalent replacement part, see parts list.

- Circuitry not used in some sets.
- Circuitry used in some versions.
- Ground
- Chassis ground
- Common tie point
- Taken from common tie point
- 11 Schematic Circuitrace
- A Cabling: Heavy lines reduce use of mutiple lines.

Waveforms and voltages are taken from ground, unless noted otherwise.
Waveforms taken with triggered scope and keyed rainbow generator. Waveform voltage is peak to peak. Timebase is per division. Waveforms shown at 10 divisions.
Item numbers in rectangle appear in adjustment instructions.
Supply voltages maintained as seen at input.
Voltages measured with digital meter and no signal.
Controls adjusted for normal operation.
Capacitors are 50 volts or less, 5% or greater unless noted.
Electrolytic capacitors are 50 volts or less, 20% or greater unless noted.
Resistors are 1/2 W or less, 5% or greater unless noted.
Value in ( ) used in some versions.
Measurements with switching as shown, unless noted.
Rated voltage shown on Zener Diodes.

MICROCOMPUTER SCHEMATIC



SAFETY PRECAUTIONS

SERVICE WARNING

ONLY qualified service technicians who are familiar with safety checks and guidelines should perform service work. For continued SAFETY:

1. Before replacing parts, disconnect power source to protect electrostatically sensitive parts.
2. Do not attempt to modify any circuit unless so recommended by the manufacturer.
3. When servicing chassis, use an isolation transformer between the line cord and power receptacle.

SERVICING HIGH VOLTAGE AND PICTURE TUBE

Use EXTREME CAUTION when servicing the High Voltage circuits.

1. To discharge static High Voltage, connect a 10 kilohm resistor in series with a test lead between chassis and picture tube anode lead.
2. DO NOT lift picture tube by the neck.
3. ALWAYS wear shatterproof goggles when handling picture tube to protect eyes in case of implosion.

X-RAY RADIATION AND HIGH VOLTAGE LIMITS

Be aware of the instructions and procedures covering x-ray radiation. In solid-state receivers and monitors, the picture tube is the only potential source of x-rays.

1. Keep an accurate High Voltage meter available at all times. Check meter calibration periodically.
2. Whenever servicing a chassis, check High Voltage at various brightness levels to be sure it is regulating properly.
3. Keep High Voltage at rated value, NO HIGHER. Excessive High Voltage may cause x-ray radiation or failure of associated components. DO NOT depend on protection circuits to keep voltage at rated value.
4. When troubleshooting a set with excessive High Voltage, avoid close contact with picture tube. DO NOT operate set longer than necessary. To locate the cause of excessive High Voltage, use a variable AC transformer to regulate voltage.
5. In present chassis, many electrical and mechanical components have safety-related characteristics which are not detectable by visual inspection. Such components are identified by a # on both the schematic and the parts list. For SAFETY, use only equivalent replacement parts when replacing these components.

SAFETY CHECKS – FIRE AND SHOCK HAZARD

Cold Leakage Checks for Sets with Isolated Ground

1. Unplug the AC cord, connect a jumper across the plug prongs, and turn the power switch ON.
2. Use an ohmmeter to measure the resistance between the jumpered AC plug and any exposed metal cabinet parts such as antenna screw heads, control shafts, or handle brackets. Exposed metal parts with a return path should measure between 200 kilohms and 5 megohms. Parts without a return path must register infinity.

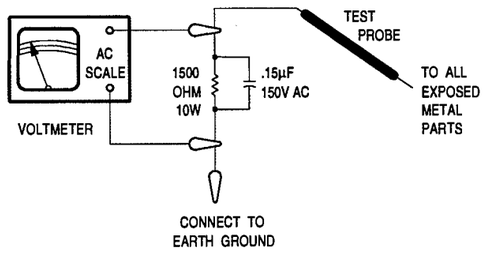
Hot Leakage Current Check

1. Plug the AC cord directly into AC outlet. DO NOT use an isolation transformer.
2. Use a 1500-ohm, 10-watt resistor in parallel with a .15-microfarad 150 Volts AC capacitor to connect between any exposed metal parts on the set and a good earth ground. (See figure below.)
3. Use an AC voltmeter with at least 1000 ohms-per-volt sensitivity to measure the voltage across the resistor. Check all exposed metal parts and measure voltage at each point.
4. Voltage readings should not exceed .75 volts RMS (5 milliamps AC). Any value exceeding this limit constitutes a potential shock hazard and must be corrected.
5. If AC plug is not polarized, reverse the AC plug and repeat exposed metal part voltage measurement at each point.

GENERAL GUIDELINES

Perform a final SAFETY CHECK before returning set to customer.

1. Check repaired area for poorly soldered or de-soldered connections, and check entire circuit board for solder splashes.
2. Check inner board wiring for pinched wires or wires contacting any high-wattage resistors.
3. Check that all control knobs, shields, covers, grounds and mounting hardware have been replaced. Be sure to replace all insulators and restore proper lead dress.



TROUBLESHOOTING

POWER SUPPLY

Check F4101 and F4102.

If F4101 is open:

Check CR4101 thru CR4104 and C4102 thru C4106.

If F4102 is open:

Check Q4102 and Q4402.

Apply 120VAC and check for 160V at the cathode of CR4103. If this voltage is missing:

Check the voltages and components associated with the L4101, R4101, and RL4101.

If 160V is present at the cathode of CR4103, check for 140V at TP4110. If this voltage is missing:

Check the voltages and components associated with Q4102 and Q4402.

If the proper voltage is present at TP4110:

Refer to the "Horizontal" section of this Troubleshooting guide.

AUDIO

Select an active TV channel and check for an audio waveform at pin 28 of U1001.

If there is no audio:

Check the voltages, waveforms, and components associated with pins 28 thru 41 of U1001.

If audio is present:

Check the voltages, waveforms, and components associated with Q1201 thru Q1203.

VIDEO

Inject a video signal at TP2307 and check for video on the CRT. If video is present:

Refer to the "IF-AGC" section of this Troubleshooting guide.

If there is video on the CRT, check for a video waveform at pin 13 of U1001. If video is missing:

Check the voltages, waveforms, and components associated with pins 8, 14, 15, 17, 51, 52, and 53 of U1001.

If the waveform is present at pin 13:

Check the voltages, waveforms, and components associated with Q2706, Q2901, and Q5001 thru Q5003.

IF-AGC

Inject an IF signal at the IF input and check for video on the CRT. If video is present:

Check the tuner, tuner control circuits, and tuner AFT circuits.

If there is no video on the CRT, check for a video waveform at TP2307. If video is present at TP2307:

Refer to the "Video" section of this Troubleshooting guide.

If video is missing at TP2307, apply AGC bias to pin 22 of U1001. If video is now present at TP2307:

Check the voltages, waveforms, and components associated with pins 18, 22, and 46 of U1001.

If there is still no video at TP2307:

Check the voltages, waveforms, and components associated with Q2301, Q2302, and pins 18 thru 24 and 42 thru 47 of U1001.

A defective AGC circuit can cause an overloaded picture, excessive snow or loss of audio and video. See the AGC Voltage Chart for AGC voltages with signal.

AGC VOLTAGE CHART

U1001

Pin 18	2.0V
Pin 22	5.2V
Pin 46	6.2V

CHROMA

Check for the proper waveforms at pins 9, 10, and 11 of U1001.

If these waveforms are missing:

Check the voltages, waveforms, and components associated with pins 2 thru 7, 9, 10, 11, 20, and 49 of U1001.

If the proper chroma waveforms are present:

Refer to the "Raster" section of this Troubleshooting guide.

HORIZONTAL

Determine if the TV is shutdown, refer to the "High Voltage Shutdown" section of this Troubleshooting guide.

If the TV is not in shutdown, inject a horizontal drive signal at the base of Q4402.

If horizontal deflection is now present:

Check the voltages, waveforms, and components associated with pins 58 thru 64 of U1001 and Q4401.

If there is still no horizontal deflection:

Check the voltages, waveforms, and components associated with Q4402 and T4402. Check CR4120 thru CR4122 and associated components for defects.

The high voltage rectifier is part of T4402 and if defective will affect the performance of the horizontal circuits.

Horizontal linearity or foldover problems may be caused by Capacitors C4415 thru C4417 being defective.

TELEVISION SCHEMATIC continued

Q1202 AUDIO OUTPUT
Q1203 AUDIO OUT
Q2706 OSD BLANK
Q2901 LUMINANCE BUFFER
Q2703 BEAM LIMIT
TAKEN WITH BAR SWEEP GENERATOR
PART OF #U1001 IF/AFT/SIF/CHROMA/DEFL
L501 YOKE
PART OF T4402
R4210 RESISTOR PACK
FOCUS
SCREEN
HV ANODE 23.5KV TO 24KV
SEE POWER SUPPLY PAGE 3E
SEE CRT FILAMENTS PAGE 2H
SEE U3300 PIN 16 PAGE 2G
SEE U3300 PIN 17 PAGE 2G
SEE U3300 PIN 18 PAGE 2G
SEE U3300 PIN 19 PAGE 2G
SEE U3300 PIN 20 PAGE 2G
SEE U3300 PIN 21 PAGE 2G
TINT PRESET
CONTRAST PRESET
BLUE DRIVE
GREEN DRIVE
RED BIAS
BLUE BIAS
GREEN BIAS
VERT SIZE
ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE

TROUBLESHOOTING continued

HIGH VOLTAGE SHUTDOWN

The high voltage is monitored by CR4401, rectifying pulses from T4402. Should the high voltage increase, the rectified voltage at the cathode of CR4401 will also increase and trigger CR4404 into conduction, shutting down the set. After 2 seconds the set will reset and turn on again. If the fault is still present, the high voltage will increase until shutdown again occurs. This process will continue until the fault is removed or the set is turned off.

To troubleshoot:

Remove CR4401 from the circuit and use a variable transformer for AC power. Start at 90VAC and increase as necessary to locate and repair the defect. Return CR4401 to the circuit.

NOTE: Care should be taken in defeating the high voltage shutdown circuit, as this may cause excessive X-radiation and damage to the CRT, T4402, and the associated components. Monitor the high voltage and troubleshoot.

Voltages taken with TV in shutdown

U1001	
Pin 1	0V
TP4110	164V

HIGH VOLTAGE SHUTDOWN TEST

Apply 120VAC to set. Turn set on and adjust for normal operation. Momentarily short XRP4001 to XRP4002. The set should lose raster and sound for about 2 seconds then the set should resume normal operation. If the set does not lose raster and sound, the shutdown circuit should be repaired. To resume normal operation, remove AC power, wait for 2 seconds, then turn set on.

VERTICAL

Inject a vertical drive signal at pin 54 of U1001.

If vertical deflection is now present:

Check the voltages, waveforms, and components associated with pins 54 and 55 of U1001.

If there is still no vertical deflection:

Check the voltages, waveforms, and components associated with U4501.

Vertical linearity or foldover problems may be caused by vertical feedback and bias circuits. Check C4501, C4503, C4504, C4505, C4510, and C4511 for defects.

RASTER

Check the CRT and CRT voltages. If there is no red:

Check the voltages, waveforms, and components associated with pin 9 of U1001 and Q5001.

If there is no green:

Check the voltages, waveforms, and components associated with pin 10 of U1001 and Q5002.

If there is no blue:

Check the voltages, waveforms, and components associated with pin 11 of U1001 and Q5003.

If the raster has height or width problems:

Refer to the "Vertical", "Horizontal", and "Power Supply" sections of this Troubleshooting guide.

TEST EQUIPMENT

Test equipment listed by participating manufacturer illustrates typical or equivalent equipment used by Sams engineers to obtain measurements. This equipment is compatible with most types used by field service technicians.

Equipment	Sencore No.	Equipment	Sencore No.
Oscilloscope	SC3100	Isolation Transformer	PR57
Generators		Capacitance Analyzer	LC101, LC102
RGB	CM2000	CRT Analyzer	CR70
Multiburst Signal	VG91	AC Leakage Tester	PR57
Color Bar	VG91	Inductance Analyzer	LC101, LC102
TV Stereo	VG91	Flyback Yoke Tester	TVA92
Digital VOM	SC3100	TV Stereo Power Monitor	SR68, PA81
Frequency Meter	SC3100	Field Strength Meter	SL750
Hi-Voltage Probe	HP200	Transistor Tester	TF46
Accessory Probes	TP212	Video Analyzer	VG91, TVA92

MISCELLANEOUS ADJUSTMENTS

PRETUNING

NOTE: All procedures require an antenna connected and power applied to the set.

Cable/Air Mode

1. Press the setup button until antenna/air is displayed.
2. Press the + or - button until the desired mode is shown.

Auto Program

1. Press the setup button until auto program is displayed.
2. Press the + button. All available channels are scanned and stored in memory.

Add /Erase Channel

1. Press the setup button until edit channels is displayed.
2. Select channel.
3. Press the + button to add channel or the - button to erase channel.
4. Repeat step two and three to add or erase other channels.

B+ ADJUSTMENT

Tune in a picture. Connect a voltmeter to TP4110. Adjust B+ Adjust control R4112 for 140V ± .5V.

HIGH VOLTAGE CHECK

Connect a high voltage probe to the CRT anode. Tune in a picture. Set brightness and contrast to minimum. High voltage should measure 23.5KV to 24KV. High voltage must never exceed 29.8KV.

RF AGC

Tune in a picture. Adjust RF AGC control R2315 clockwise until snow appears and then counterclockwise until snow just disappears.

DISPLAY POSITION

Tune in a picture. Press video button SW3422. Adjust 7MHz oscillator coil L3301 to center the display.

CONTRAST PRESET

Tune in a picture. Set brightness and color to minimum, contrast to midrange. Adjust the contrast preset control R2716 to a point where highlights are visible.

TINT PRESET

Tune in a color bar pattern. Connect an oscilloscope to the red cathode. Adjust tint preset control R3335 to balance the 1st and 4th and 2nd and 3rd bars of waveform.

COLOR TEMPERATURE

Tune in a crosshatch pattern. Set red bias control R2914, blue bias control R2916, green bias control R2915 and screen control to minimum. Set blue drive control R2905 and green drive control R2907 to midrange. Advance screen control until pattern is just visible. Note color of pattern and adjust two remaining bias controls to obtain a white pattern. Set brightness and contrast to maximum. Adjust the blue and green drive controls for best black and white picture. Check tracking at low and high brightness.

CONVERGENCE

Note: This procedure cannot be performed on sets with bonded yokes. If this procedure is required, replace the bonded yoke with adjustable yoke part no. 192204.

Connect a color bar generator to the antenna input and tune in a dot pattern. Adjust the 4 pole magnets to converge the red and blue dots at the center of the screen. Adjust the 6 pole magnets to converge the red/blue dots over the green dots at the center of the screen. Note: Rotate the two tabs of each set of magnets equally and opposite to converge vertically and rotate both tabs in the same direction to converge horizontally. 4 and 6 pole magnets interact, repeat adjustment until center convergence is correct. Tune in a crosshatch pattern. Remove the rubber wedges between deflection yoke and the CRT. Tilt the deflection yoke up or down to converge the vertical lines at the top and bottom of the screen and the horizontal lines at the right and left sides of the screen. Tilt the deflection yoke to the right or left to converge the horizontal line at the top and bottom of the screen and the vertical line at the right and left sides of the screen. Replace the rubber wedges. Tighten the clamp screw.

PURITY

Note: This procedure cannot be performed on sets with bonded yokes. If this procedure is required, replace the bonded yoke with adjustable yoke part no. 192204.

Operate the set for 15 minutes to allow warm-up of CRT. Use a degaussing coil to demagnetize the CRT. Tune in a green raster. Slide the deflection back to produce a vertical band. Adjust purity tabs to center the vertical green band. Slide the deflection yoke forward to produce a uniform green screen.

TELEVISION SCHEMATIC

A

B

SEE U3300 PIN 11 PAGE 2F

R3342 24K 2%

R3341 24K 2%

C3301 .001

R2324 7500 (6800)

C2315 .001

TP2342

L2312

C2327 .001

R2323 AFT 15K

11 12.0V

L2303

L2304

C2316 .001 250V

2.5V 10µs

R2322 820

C2318 22pF NPO

R2317 5600

C2311 33pF

C1212 33pF NPO

R1217 200

L2305

R2319 1000 2%

CF1201 4.5MHz FILTER

C1214 18pF NPO

L1202 1

C1220 33pF NPO

C1211 .1

SEE U3300 PIN 37 PAGE 2G

PART OF #U1001 IF/AFT/SIF/CHROMA/DEFL

R1221 5600

C1219 1µF 100V

R1215 10K 2%

L1201

C1222 10pF NPO

R1201 3000

C1202 10µF

C1217 100µF

R1202 4700

C1201 .056

C1218 .01

R1216 10

14 9.0V(A)

C1208 1µF 100V

R1212 100K

R1214 1500

R1206 4700 2%

R1213 43K 2%

NPO

R1204 5600

C1203 1µF 100V

Q1201 AUDIO AMP 9.2V .8V .2V

R1203 56

C1205 470pF

TP2303

IF SEE TUNER PIN 8 PAGE 3C

R2305 18

C2301 .001

R2303 1500

Q2301 IF AMP

FB2301

9.8V 1.9V 1.1V

R2307 10

R2301 120 2%

R2304 390

L2301

C2304 .001

TP1221

SF2301 FILTER

R2309 560

R2311 510

L2302

C2305 .01

C2302 .001

R2308 56

R2302 100

C2303 .001

11 12.0V

RF AGC RANGE 3.1V TO 8.0V

AGC SEE TUNER PIN 2 PAGE 3A

R2327 1000

R2314 39K 2%

R2313 390K

14 9.0V(A)

R2316 5100

C2308 .01

R2315 RF AGC 25K

14 9.0V(A)

C2329 .001

TP2305

IF AGC RANGE 5.5V TO 8.4V

R2312 51

C2307 .47µF 100V

C2309 .022

R2310 150K

L2310

14 9.0V(A)

L2307

C2313 22pF N150

C2312 .22

R2318 180

L2306

R2326 1000 2%

CF2301 4.5MHz FILTER

TAKEN WITH BAR SWEEP GENERATOR

2.5V 10µs

2.4V 10µs

Q2302 VIDEO AMP

TP2307

R2321 1000

R2320 620

10 18.5V

SEE Q3301 BASE PAGE 2F

1.7V 10µs

1.7V 5ms

2.6V 5ms

2.7V 5ms

52.0V 5ms

R2601 300

C2603 1µF 100V

R2602 330K

C2602 .001

9 6.8V

CR2601

SEE Q3104 COLLECTOR PAGE 2F

C2601 1µF 100V

R2603 3.9M

3.0V 10µs

2.8V 10µs

2.8V 5ms

1.8V 5ms

C4513 330pF 250V

R4514 180

C4514 .0068

U4501 VERT OUT

30.0V 5ms

32.0V 5ms

C4511 100µF

CR4501

R4513 20 2%

R4515 20 2%

8 25.0V

C4510 470µF

C4507 .01

C4508 270pF 250V

C4512 .001

XRP4001

R4422 .001

CR4404 10V

R4422 22K 2%

C4421 .001

C4425 10µF

XRP4002

R4402 11K 1%

R4401 10K 1%

R4423 8200

C4401 .1 63V

CR4401

R4419 2200

R4421 100

C4406 .01

R4426 3300

C4407 .0082

R4406 4700

SEE Q4106 BASE PAGE 3E

C4405 .022

C4402 .001

C4404 10µF

Y4401 32MHz

R4408 620 2%

R4404 2400 2%

R4403 1000 2%

C4403 .001 63V

C4409 100pF NPO

R4405 3000

R4417 100K

C4411 .0047

R4418 12K

L4403

C4509 820pF

R4517 100K

.7V .5V

Q4501 OSD SYNC

R4518 10K

CR4506

8 25.0V

SEE U3300 PIN 26 PAGE 2F

R4501 24

C4410 39pF (27pF)

250V NPO

.3V

Q4401 HORIZ DRIVER

85.5V

C4413 470pF 250V

R4409 560

R4416 1100

R4410 470

9 6.8V

T4401

R4411 4700 3W

2 140V

R4121 10K

CR4124

Q4402 HORIZ OUT

FB4401

-.1V

139V

FB4403

FB4403A

FB4402

15.0V 10µs

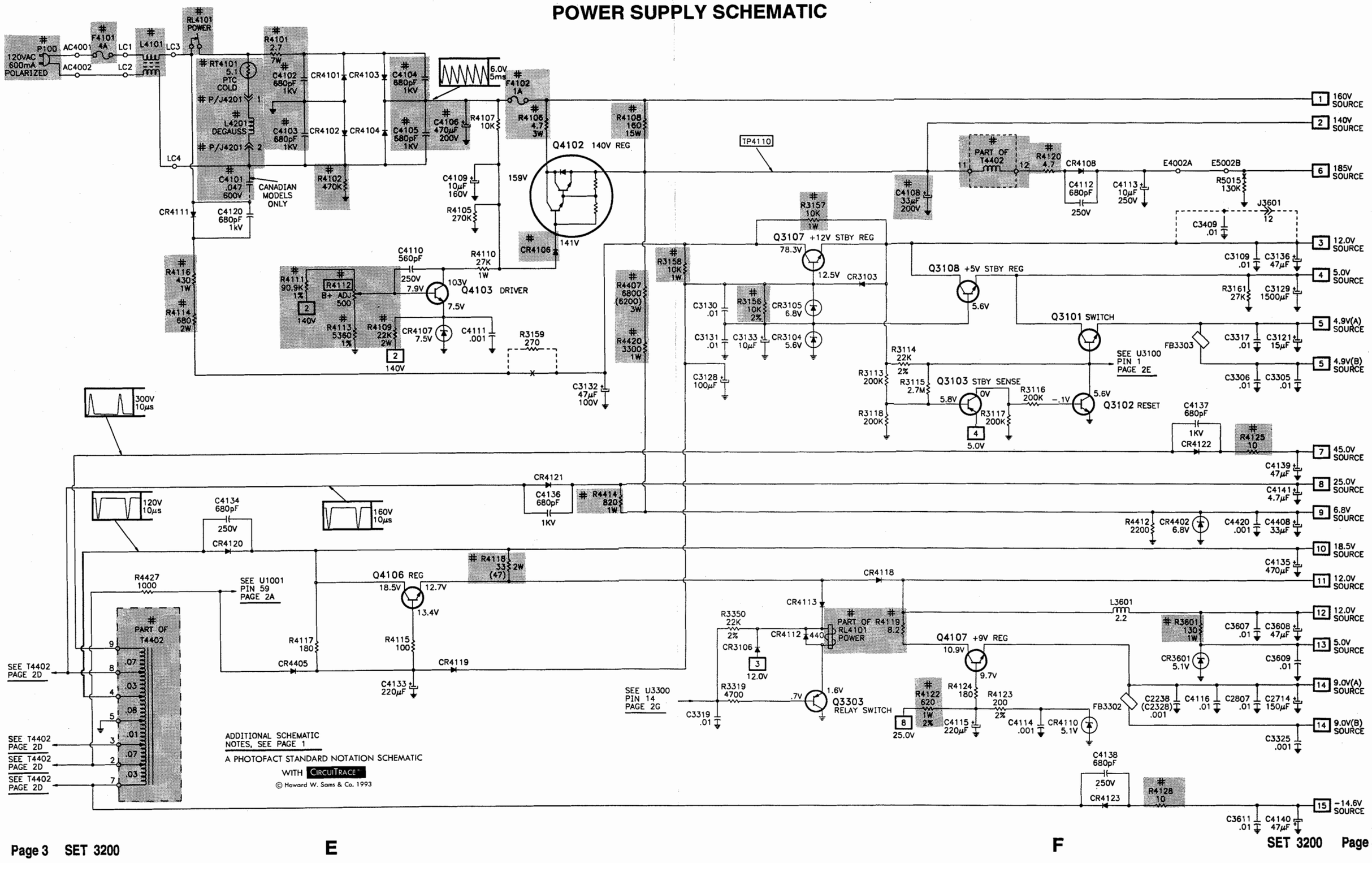
C4416 680pF 1.5KV

C4417 .0073 1.6KV

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE™

A1 A2 A1 A

POWER SUPPLY SCHEMATIC



SEMICONDUCTORS continued

(Select replacement for best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
TUNER (TCHR-1A)					
CR151, 52	-	181465	-	-	-
CR153	-	129095	NTE553	ECG553	SK3322
CR202	-	129095	NTE553	ECG553	SK3322
CR203	-	181466	-	-	-
CR204, 05	-	181467	-	-	-
CR251	-	181467	-	-	-
CR252	-	181466	-	-	-
CR253, 54	-	129095	NTE553	ECG553	SK3322
CR255	-	181466	-	-	-
CR256	-	181467	-	-	-
CR257 Thru					
CR259	-	129095	NTE553	ECG553	SK3322
CR301 Thru					
CR303	-	181465	-	-	-
CR304	-	129095	NTE553	ECG553	SK3322
CR401	-	174381	-	-	-
CR402	-	129095	NTE553	ECG553	SK3322
Q101	-	195927	-	-	SK3830
Q151	-	192067	-	-	-
Q201	-	195928	-	-	SK3831
Q202	-	179740	NTE2406*	ECG2406*	SK10097*
Q301	-	195928	-	-	SK3831
Q401	-	192067	-	-	-
Q402	-	179741	NTE2407*	ECG2407*	SK10098*
Q403	-	192067	-	-	-
U501	-	195946	-	-	-

* Lead configuration may vary from original.

Created with pride by the employees of Howard W. Sams & Company.

J. Barker, B. Bryant, B. Buchanan, T. Clensy, D. Cobb, G. Farrell, B. Fink, M. Herkless, J. Kocha, J. Limp, F. Malek, B. Medaris, R. Raus, B. Skinner, J. Young

COILS & TRANSFORMERS

	Item No.	Function/Rating		Mfr. Part No.	On-Unit No.
	FB2701	Ferrite Bead		154052	-
	FB2702	Ferrite Bead		152102	-
	FB3101	Ferrite Bead		153328	-
	FB3301	Ferrite Bead		153328	-
	FB3302	Ferrite Bead		153328	-
	FB3303	Ferrite Bead		153328	-
	FB3304	Ferrite Bead		154052	-
	FB3305	Ferrite Bead		154052	-
	FB4401	Ferrite Bead		154052	-
	FB4402	Ferrite Bead		154052	-
	FB4403	Ferrite Bead		154052	-
#	**L501**	Yoke 90 °	Horiz 3.1mH Vert 22.9mH	(1)	2G270006-503
	L1201	SIF		190504	-
	L1202 (2)	28µh		161245	-
		18µh		195711	-
	L2301	.82µh		193051	-
	L2302	.96µh		193052	-
	L2303	AFT		190506	-
	L2304	VIF		190503	-
	L2305 (2)	46µh		250085	-
		1.8µh		160143	-
	L2306	8.2µh		181472	-
	L2307	-		207766	-
	L2310 (2)	2.2µh		143893	-
		2.0µh		190553	-
	L2312 (2)	2.2µh		143893	-
		2.0µh		190553	-
	L2701	68µh		149167	-
	L2802	8.2µh		149170	-
	L3101	10µh		160518	-
	L3301	7MHz Oscillator		190505	-
	L3601	100µh		161243	-
#	**L4101**	Line Filter		193053	-
#	**L4201**	Degaussing		191794	-
#	**L4402**	Linearity		196126	-
	L4403	6.8µh		193056	-
	L5001	150µh		176622	-
	T4401	Horiz Drive		196128	2104-1A
#	**T4402**	Horiz Output		193081	2G25003-501
	TUNER (TCHR-1A)				
	L251	1µh		181473	-

 # For SAFETY use only equivalent replacement part.
(1) Yoke is bonded to CRT.
(2) Select part with the same value as original part.

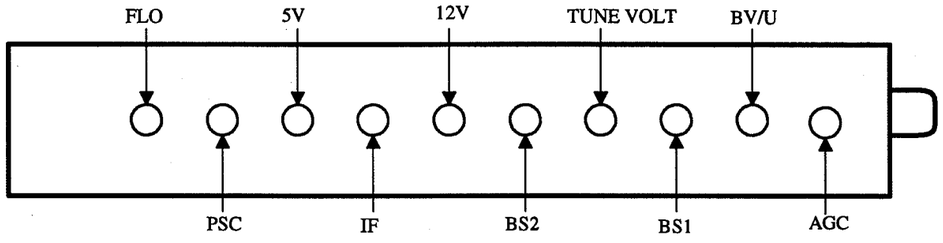
TUNER INFORMATION

TUNER VOLTAGE CHART

Pin	VHF Low Band	VHF High Band	UHF Band
AGC	8.0V	8.0V	8.0V
BV/U	11.5V	11.5V	.2V
BS1	-14.6V	11.1V	11.2V
TUNE VOLT	2.8V	12.5V	1.9V
BS2	-14.6V	-12.4V	-12.4V
12V	12.0V	12.0V	12.0V
5V	5.0V	5.0V	5.0V
PSC	.07V	.07V	.07V
FLO/K	3.6V	3.6V	3.7V

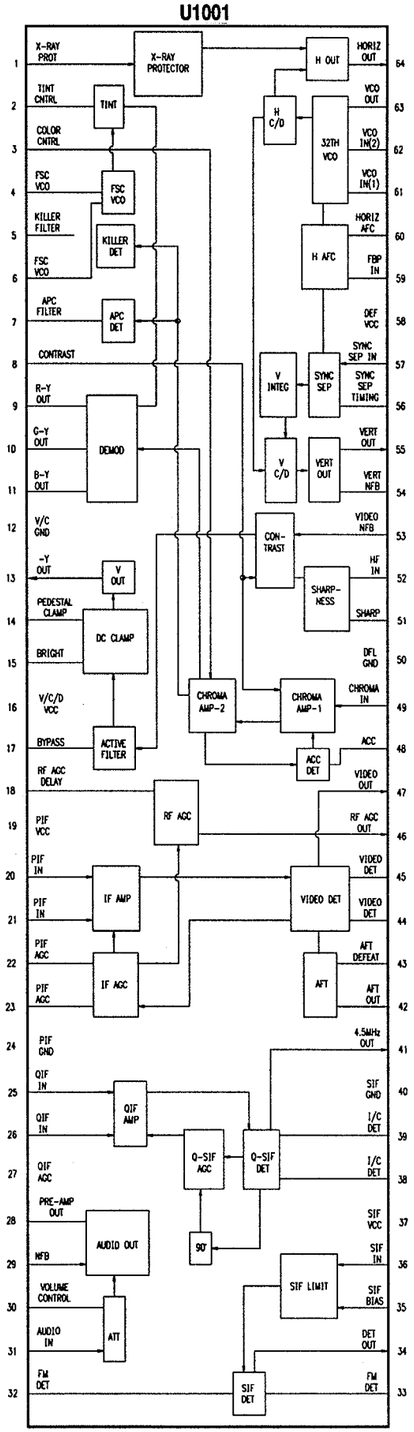
Note: VHF Low Band voltages taken on channel 2.
VHF High Band voltages taken on channel 7.
UHF Band voltages taken on channel 14.

TUNER TERMINAL GUIDE

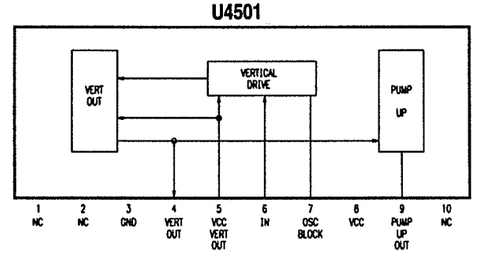


IC FUNCTIONS

U1001



U4501



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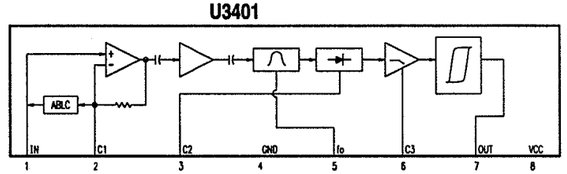


PARTS LIST

SEMICONDUCTORS

(Select replacement for best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
CR1201, 02	-	164874	NTE177	ECG177	SK9091
CR2601	-	164874	NTE177	ECG177	SK9091
CR2701 Thru					
CR2704	-	164717	NTE519	ECG519	SK3100
CR2707 Thru					
CR2709	-	164717	NTE519	ECG519	SK3100
CR3101	-	164874	NTE177	ECG177	SK9091
CR3103	-	164717	NTE519	ECG519	SK3100
CR3104	-	176746	NTE5011A	ECG5011A	SK5A6
CR3105	-	132616	NTE5071A	ECG5071A	SK6V8
CR3106	-	164717	NTE519	ECG519	SK3100
CR3301, 02 (1)	-	164874	NTE177	ECG177	SK9091
CR3303, 04, 06	-	164874	NTE177	ECG177	SK9091
CR3601	-	146320	NTE135A	ECG135A	SK5V1
CR4101 Thru					
CR4104	-	147993	NTE580	ECG580	SK5012
# **CR4106**	-	174489	NTE177	ECG177	SK9091
CR4107	-	180338	NTE138A	ECG138A	SK7V5
CR4108	-	176296	NTE125	ECG125	SK5010A
CR4110	-	146320	NTE135A	ECG135A	SK5V1
CR4111	-	147993	-	-	-
CR4112, 13	-	164717	NTE519	ECG519	SK3100
CR4118	-	147015	NTE125	ECG125	SK5010A
CR4119	-	164874	NTE177	ECG177	SK9091
CR4120 Thru					
CR4123	-	176296	NTE125	ECG125	SK5010A
CR4124	-	164717	NTE519	ECG519	SK3100
# **CR4401**	-	157301	NTE177	ECG177	SK9091
CR4402	-	132616	NTE5071A	ECG5071A	SK6V8
# **CR4404**	-	159429	NTE5019T1	ECG5019T1	SK9970
CR4405	-	164717	NTE519	ECG519	SK3100
CR4406 (1)	-	176296	NTE125	ECG125	SK5010A
CR4501	-	147015	NTE125	ECG125	SK5010A
CR4502, 03	-	164717	NTE519	ECG519	SK3100
CR4506	-	164717	NTE519	ECG519	SK3100
# **CR5001** (2)	-	139706	NTE177	ECG177	SK9091
	-	174489	NTE177	ECG177	SK9091
# **CR5002**	-	174489	NTE177	ECG177	SK9091
Q1201	-	146847	NTE123AP	ECG123AP	SK3854
Q1202	-	177788	NTE31*	ECG31*	SK3866A*
Q1203	-	177789	NTE32*	ECG32*	SK3867A*
Q2301	-	146848	NTE229*	ECG229*	SK3246A*
Q2302	-	146847	NTE123AP	ECG123AP	SK3854
Q2703	-	143806	NTE159	ECG159	SK3466
Q2706	-	146847	NTE123AP	ECG123AP	SK3854
Q2901, 03	-	143806	NTE159	ECG159	SK3466
Q3101, 02	-	179740	NTE2406*	ECG2406*	SK10097*

 # For SAFETY use only equivalent replacement part.
* Lead configuration may vary from original.
(1) Used in some versions.
(2) Select part with the same value as original part.

SEMICONDUCTORS continued

(Select replacement for best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
Q3103	-	179741	NTE2407*	ECG2407*	SK10098*
Q3104	-	146847	NTE123AP	ECG123AP	SK3854
Q3107	-	153677	NTE255	ECG255	SK9412
Q3108	-	146847	NTE123AP	ECG123AP	SK3854
Q3301	-	143802	NTE159	ECG159	SK3466
Q3303	-	146850	NTE159	ECG159	SK3466
Q4102	-	193057	-	-	-
Q4103	-	193058	NTE382	ECG382	SK9137
Q4106	-	157627	NTE54	ECG54	SK9366
Q4107	-	177788	NTE31*	ECG31*	SK3866A*
Q4401	-	146851	NTE287	ECG287	SK3433
Q4402	-	177791	NTE2302	ECG2302	SK9422
Q4501	-	146847	NTE123AP	ECG123AP	SK3854
Q5001	-	153677	NTE255	ECG255	SK9412
Q5004	-	146851	NTE287	ECG287	SK3433
# **U1001**	-	193082	NTE1790	ECG1790	SK9850
# **U3100**	-	196129	-	-	-
U3300	-	179732	-	-	-
U3600	-	179733	-	-	-
U4501	-	176853	NTE1797	ECG1797	SK9753
REMOTE RECEIVER (DISCRETE VERSION)					
CR3401 (2)	-	164874	NTE177	ECG177	SK9091
	-	150711	-	-	-
CR3404	-	150711	-	-	-
Q3401 (2)	-	148061	NTE123AP	ECG123AP	SK3854
	-	146847	NTE123AP	ECG123AP	SK3854
Q3402	-	145410	NTE159	ECG159	SK3466
Q3403, 04	-	148061	NTE123AP	ECG123AP	SK3854
REMOTE RECEIVER (IC VERSIONS)					
CR3401	-	150711	-	-	-
CR3402	-	182827	NTE5010A	ECG5010A	SK5A1
Q3401	-	146847	NTE123AP	ECG123AP	SK3854
U3401	-	195885	-	-	-
REMOTE TRANSMITTER (CRK53K)					
# **CR1**	-	153342	-	-	-
Q1	-	148996	NTE123AP	ECG123AP	SK3854
U1	-	181040	-	-	-
TUNER (TCHR-1A)					
CR101	-	181466	-	-	-
CR102	-	181467	-	-	-
CR103	-	129095	NTE553	ECG553	SK3322
CR104	-	181467	-	-	-
CR105	-	129095	NTE553	ECG553	SK3322

 # For SAFETY use only equivalent replacement part.
* Lead configuration may vary from original.
(2) Select part with the same value as original part.

A

B

UHF/VHF TUNER (TCHR-1A) SCHEMATIC

J1
FB701
C701 .0012
R701 3.9M
CPR701
C702
L1
C1 4pF
C4 120pF
L5
C5 22pF
L6
L7
C320
CR301
L301
R301 100K
C302 470pF
R930 2200
C303 470pF
C313 470pF
R303 270K
R311 270K
Q301 UHF RF AMP
G1
G2
D
S
C307 1pF (1.5pF)
L302
C321
C301 10pF
R305 430K
R304 22
C315 470pF
R307 1500
C304 470pF
R302 2.2M
C305 470pF
R306 270
C314 470pF
R931 47
C930 .001
C316 470pF
C317 470pF
R314 10
C312 470pF
C322
CR302
L303
L304
CR303
C318 1pF
C310
L305 470pF
R309 22K
R310 22K
C308 27pF (33pF)
C309 20pF
R308 1000
CR304
R269 330K TUNING VOLTAGE
Q202 UHF KILL
R268 100K
R271 10K
L251
TP4
R253 33
R203 2,2M
R208 22
C202 470pF
C211 1pF
Q201 RF AMP
C208 470pF
CR205
L9
L10
C7 120pF
C8 150pF
L203
L202
C205 .001
C209 1pF
CR203
CR204
L204
R209 22K
C207 120pF
R210 22K
R212 270K
R264 47
L206
CR202
C210 5pF
L205 (4pF)
C206 470pF
R207 2200
R263 47
C901 .001
R276 47
R202 4700
C201 .22
R201 330K
C602 .001
R206 22K
R270 47
R277 100
C604 .001
C606 .01
R944 100
C251 .001
R251 270
R252 1500 2%
R211 330K
R275 100
C252 470pF
CR251
R254 22K
C253 150pF
R255 22K
C258 100pF
CR256
C259 1.5pF
L259
L260
R272 33
L261
R267 82
C262 .001
CR259
TP2
R401 2200
L250
L252
R274 1500
CR252
CR255
L253
L257
CR254
L254
L256
L255
CR253
R273 1000
R257 2200
R258 2200
C254 470pF
C255 .001
R259 2200
R922 220
C921 .001
C256 .001
C257 470pF
R921 220
R256 2200
R260 4700
C260 .001
CR257
CR258
C261 .001
R261 4700
C946 .001
R262 1000
R920 1000
C922 .001
R109 100
R910 22
R101 22K
C605 .001
C945 .001
R941 47
BS2
R102 2200
C941 .001
C101 .001
CR101
L101
CR102
C106 470pF
R942 47
BS1
R103 2200
C942 .001
C102 180pF (150pF)
CR103
C113 1.5pF
L102
C112 .5pF
R184 10K
L103
CR104
C111 39pF
L105
R105 22K
C105 27pF
R944 100
C606 .01
C604 .001
R108 220K 2%
C107 5pF
C108 12pF
R106 220K 2%
R107 330 2%
Q101 VHF OSC
C110 470pF
R111 150K 2%
CR105
L104
R912 22
R943 22
C943 .001
C948 .001
C603 .001
C153 3pF
Q151 UHF OSC
CR151
L151
C151 470pF
R160 22
CR153
R151 22K
CR152
C160
R152 22K
R154 3900
C154 4pF
R156 300
C152 5pF
R155 47
C155 470pF
R153 10K
C156 470pF
R157 47
C951 470pF
R911 22
C157 470pF
R158 1000

ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

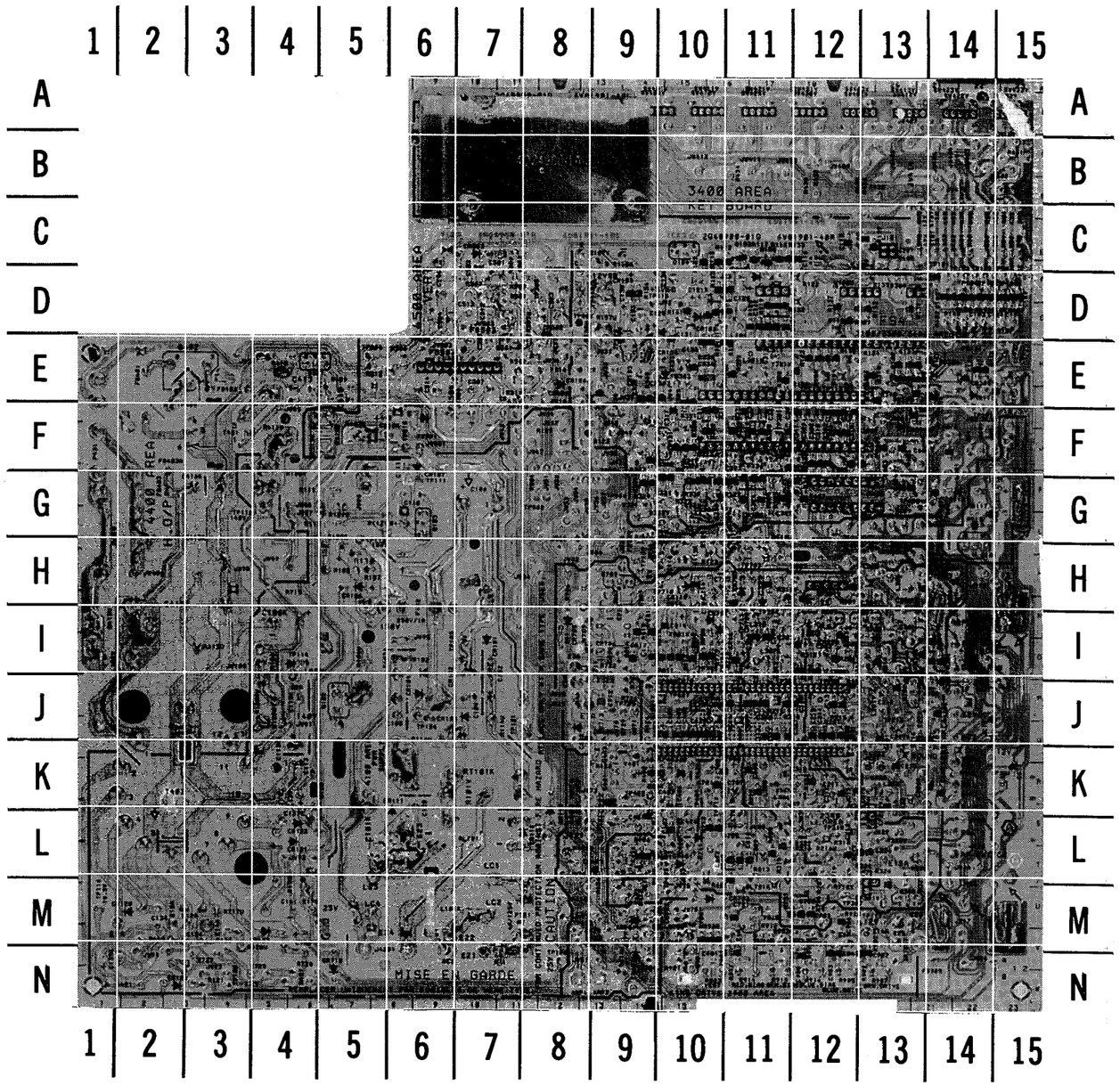
2 SEE AGC PAGE 2A

4 SEE BS1 PAGE 2G

6 SEE BS2 PAGE 2G

5 SEE TUNE VOLT PAGE 2G

MAIN BOARD - BOTTOM VIEW

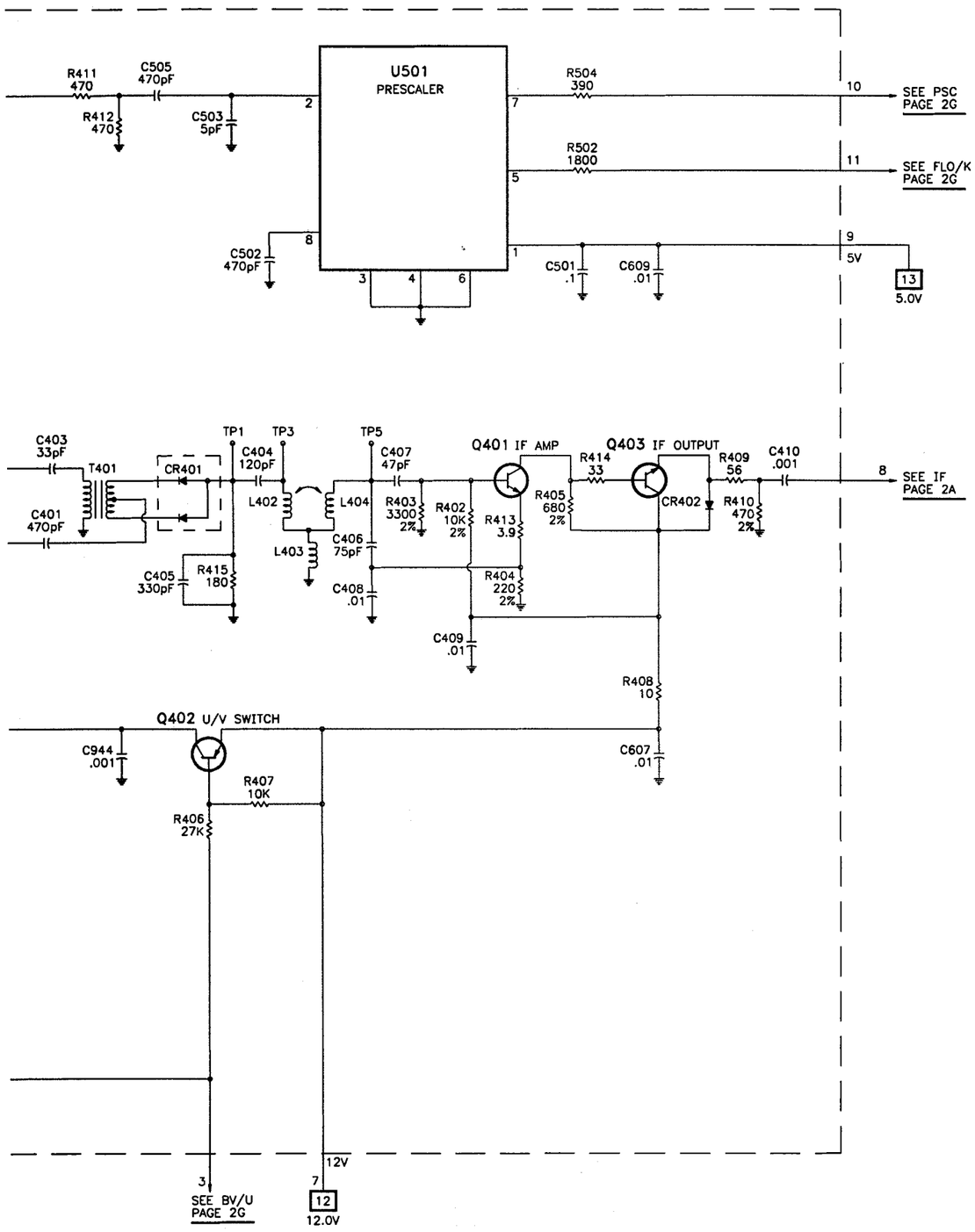


A HOWARD W. SAMS GRIDTRACE™ PHOTO

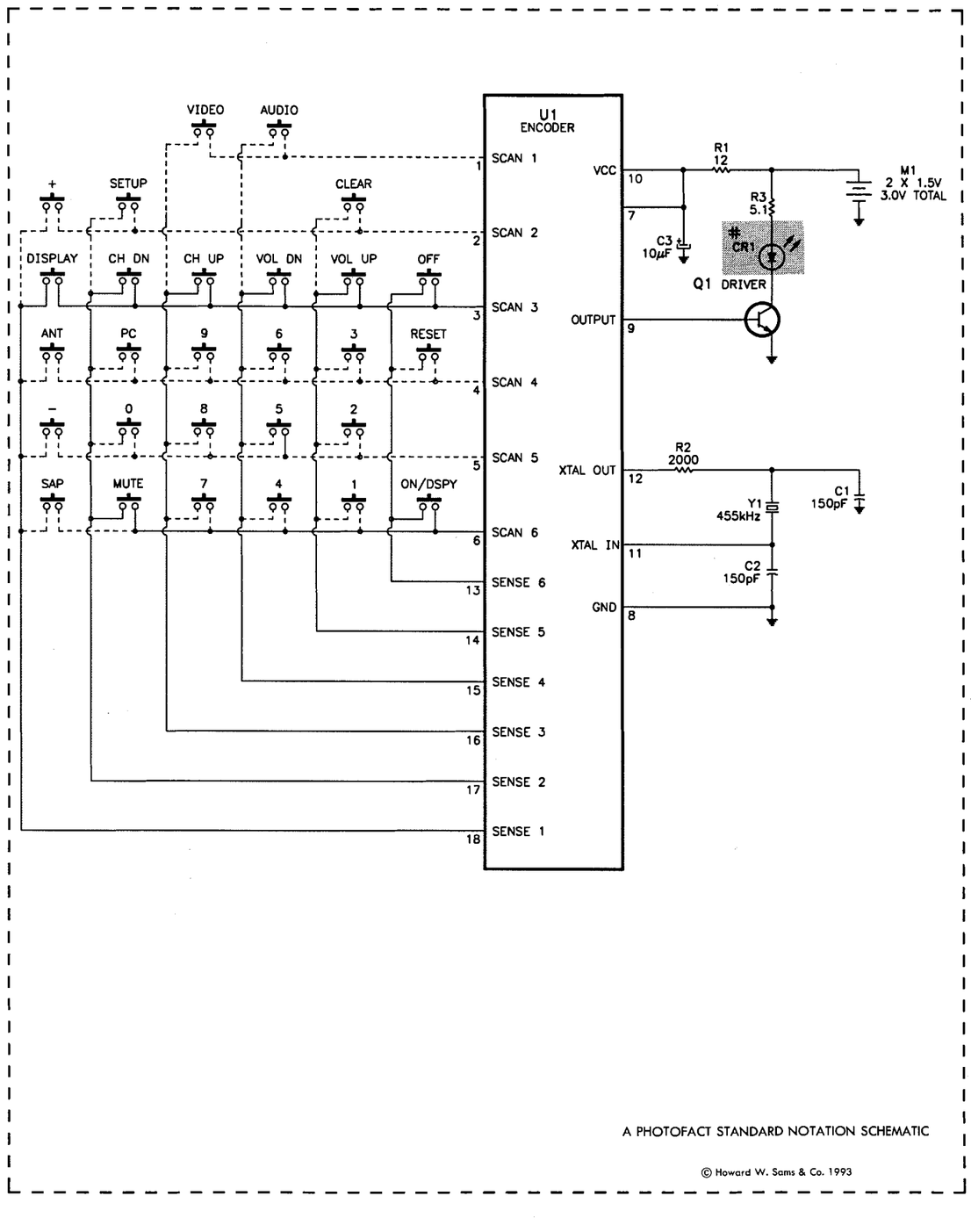
MAIN BOARD - BOTTOM VIEW, GRIDTRACE LOCATION GUIDE

C1201	J-13	C3130	D-9	R1208	J-14	R3119	D-11	R3351	E-10
C1205	I-12	C3131	E-10	R1212	J-13	R3123	E-12	R3355	E-11
C1211	J-12	C3301	G-11	R1214	I-13	R3124	E-12	R3604	F-13
C1212	L-12	C3302	F-11	R1215	J-12	R3125	E-14	R3605	F-13
C1214	K-13	C3303	F-11	R1217	L-13	R3126	E-13	R3611	G-14
C1215	K-13	C3305	E-10	R2301	I-14	R3127	E-13	R4115	G-14
C1216	J-13	C3306	F-12	R2303	I-13	R3128	E-13	R4403	J-10
C1218	J-12	C3307	F-11	R2304	I-14	R3130	D-13	R4404	K-10
C1220	K-13	C3308	F-12	R2305	J-14	R3131	D-13	R4408	K-9
C1222	J-13	C3309	F-12	R2308	H-13	R3132	D-11	R4416	L-9
C2301	I-14	C3310	F-12	R2309	H-12	R3133	C-11	R4417	L-9
C2305	I-11	C3311	D-11	R2310	J-11	R3135	C-10		
C2308	J-11	C3312	D-11	R2311	H-12	R3137	D-12		
C2309	J-12	C3313	F-12	R2312	I-12	R3138	D-13		
C2311	K-12	C3314	E-14	R2313	J-11	R3139	C-13		
C2312	I-12	C3316	F-12	R2314	L-11	R3148	D-13		
C2315	K-12	C3317	F-10	R2316	J-11	R3149	D-14		
C2318	K-11	C3318	F-10	R2317	J-11	R3150	D-14		
C2327	J-11	C3319	F-11	R2318	L-12	R3151	D-14		
C2328	I-11	C3320	F-10	R2319	K-11	R3152	E-12		
C2329	H-11	C3321	G-10	R2322	K-12	R3153	D-13		
C2602	J-10	C3322	G-10	R2324	L-13	R3154	E-12		
C2708	K-11	C3323	G-11	R2326	M-13	R3155	E-12		
C2709	K-10	C3324	G-11	R2601	M-11	R3156	D-9		
C2711	J-9	C3325	G-10	R2603	M-9	R3161	D-10		
C2712	J-9	C3328	F-12	R2705	L-10	R3304	G-11		
C2713	J-9	C3330	F-11	R2707	L-12	R3305	F-11		
C2720	M-12	C3331	F-11	R2708	I-10	R3307	D-12		
C2722	K-9	C3332	E-9	R2712	L-10	R3308	E-11		
C2803	L-11	C3334	E-10	R2713	I-10	R3309	D-13		
C2805	K-11	C3335	E-10	R2720	I-11	R3313	E-13		
C2807	J-11	C3604	G-13	R2731	H-11	R3314	E-13		
C2812	I-10	C3605	G-13	R2733	M-11	R3318	F-10		
C2816	L-11	C3607	G-12	R2735	M-9	R3319	F-10		
C2817	I-9	C3609	F-13	R2808	L-11	R3320	F-10		
C2901	M-10	C3611	K-15	R2810	I-9	R3322	G-10		
C2902	N-13	C3612	K-14	R2811	I-10	R3323	F-10		
C2903	N-12	C4114	H-10	R2812	I-10	R3324	G-9		
C2905	M-12	C4402	J-10	R2813	L-11	R3325	G-10		
C2907	N-11	C4405	J-10	R2815	I-10	R3327	G-11		
C2908	M-11	C4406	K-10	R2906	M-10	R3330	G-10		
C2909	N-12	C4407	L-10	R2908	M-10	R3331	G-9		
C3101	D-14	C4409	J-10	R2909	N-13	R3332	G-11		
C3102	D-14	C4411	L-9	R2910	N-12	R3333	G-11		
C3103	D-14	C4420	J-10	R2911	N-11	R3336	G-11		
C3104	D-14	C4422	J-9	R2912	M-11	R3337	F-11		
C3105	D-14	C4509	J-10	R2913	N-12	R3338	F-11		
C3106	D-15	Q3101	D-11	R3110	D-12	R3339	F-13		
C3107	D-15	Q3102	C-11	R3111	E-15	R3340	F-12		
C3108	D-15	Q3103	C-11	R3112	E-14	R3341	F-11		
C3109	C-13	R1201	J-12	R3113	D-10	R3342	F-11		
C3111	D-13	R1202	J-12	R3114	D-10	R3343	F-12		
C3112	D-11	R1203	I-12	R3115	C-10	R3344	F-12		
C3113	C-12	R1204	I-12	R3116	C-11	R3347	F-9		
C3116	C-12	R1205	J-14	R3117	C-11	R3349	E-9		
C3126	E-14	R1206	I-12	R3118	C-11	R3350	F-10		

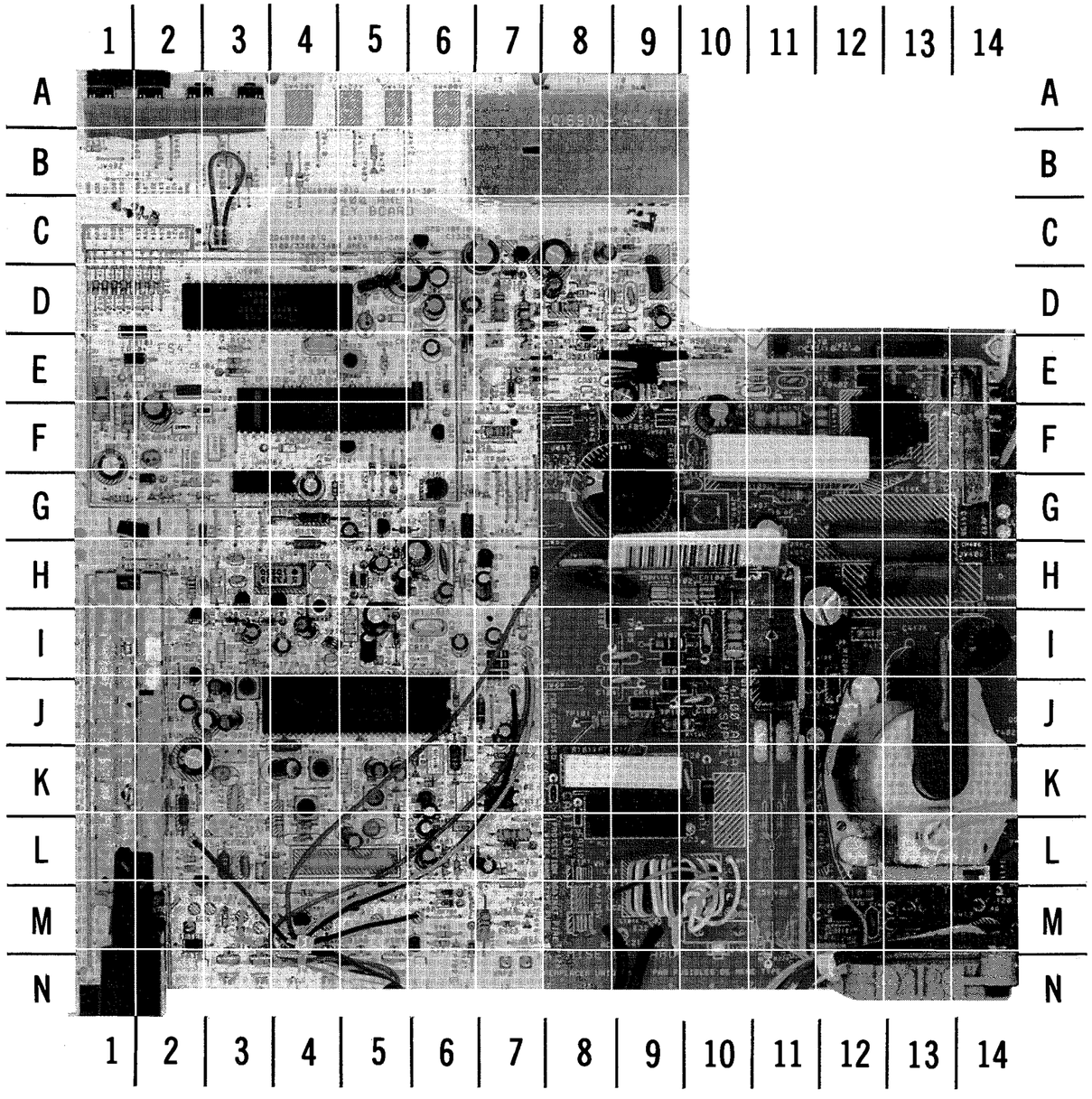
C
UHF/VHF TUNER (TCHR-1A) SCHEMATIC continued



D
REMOTE TRANSMITTER (CRK53K) SCHEMATIC



MAIN BOARD - TOP VIEW



A HOWARD W. SAMS GRIDTRACE™ PHOTO

MAIN BOARD - TOP VIEW, GRIDTRACE LOCATION GUIDE

C1202	J-3	C4109	G-11	CR3104	D-6	L2304	K-4	R2722	I-7	R3608	G-2	R4512	E-10		
C1203	I-4	C4110	G-10	CR3105	D-6	L2305	K-5	R2724	I-7	R3609	G-2	R4513	F-11		
C1206	K-2	C4111	F-10	CR3106	E-7	L2306	L-3	R2726	I-7	R4101	K-9	R4514	E-7		
C1207	J-3	C4112	J-11	CR3303	E-6	L2307	I-4	R2727	M-13	R4102	I-9	R4515	F-11		
C1208	I-3	C4113	J-12	CR3304	F-5	L2310	I-5	R2728	N-12	R4105	H-11	R4517	E-8		
C1217	K-4	C4115	H-6	CR3306	E-3	L2312	K-4	R2729	J-7	R4106	I-10	R4518	E-7		
C1219	J-3	C4116	H-6	CR3401	A-9	L2701	K-5	R2734	M-4	R4107	H-10	RL4101	K-9		
C1221	J-2	C4120	K-10	CR3402	B-8	L2802	L-5	R2809	H-6	R4108	F-11	RT4101	K-9		
C2302	H-3	C4126	M-13	CR3601	F-2	L3101	D-5	R2814	I-9	R4109	G-11	SF2301	H-4		
C2303	H-3	C4133	F-1	CR4101	I-9	L3301	E-5	R2901	M-6	R4110	G-10	SW3402	A-3		
C2304	H-3	C4134	M-13	CR4102	I-9	L3601	F-2	R2902	M-3	R4111	F-11	SW3403	A-3		
C2307	I-4	C4135	M-14	CR4103	J-9	L4101	M-9	R2903	M-6	R4112	G-10	SW3412	A-2		
C2313	I-4	C4136	L-11	CR4104	J-9	L4402	I-14	R2905	N-3	R4113	G-11	SW3413	A-2		
C2316	L-4	C4137	K-11	CR4106	H-10	L4403	K-6	R2907	N-3	R4114	J-8	SW3422	A-2		
C2601	L-7	C4138	M-12	CR4107	F-10	Q1201	H-4	R2914	N-5	R4116	J-9	SW3423	A-2		
C2603	L-6	C4139	K-11	CR4108	I-12	Q1202	I-2	R2915	N-4	R4117	G-1	SW3432	A-1		
C2701	L-5	C4140	M-11	CR4110	H-6	Q1203	H-3	R2916	N-4	R4118	F-1	SW3433	A-1		
C2705	H-5	C4141	M-11	CR4111	K-10	Q2301	I-2	R2920	M-3	R4119	G-4	T4401	F-12		
C2706	H-5	C4401	K-6	CR4112	L-8	Q2302	M-2	R3101	D-2	R4120	J-12	T4402	K-13		
C2707	K-5	C4403	K-6	CR4113	K-8	Q2703	H-7	R3102	D-2	R4121	N-13	TP2307	M-2		
C2714	I-5	C4404	K-6	CR4118	G-2	Q2706	M-5	R3103	D-2	R4122	F-7	TP4110	G-12		
C2715	G-5	C4408	L-6	CR4119	G-6	Q2901	M-6	R3104	D-2	R4123	H-5	U1001	J-6		
C2717	I-5	C4410	E-11	CR4120	M-14	Q2903	M-4	R3105	D-1	R4124	G-5	U3100	D-5		
C2718	H-7	C4413	E-11	CR4121	L-11	Q3104	C-6	R3106	D-1	R4125	K-11	U3300	F-3		
C2725	N-12	C4415	G-13	CR4122	L-11	Q3107	C-7	R3107	D-1	R4128	M-12	U3401	A-9		
C2809	L-5	C4416	G-13	CR4123	M-12	Q3108	E-7	R3108	D-1	R4210	N-13	U3600	G-4		
C2810	I-6	C4417	H-13	CR4124	N-13	Q3301	F-5	R3122	D-4	R4401	K-7	U4501	E-10		
C2811	H-6	C4421	K-7	CR4401	M-6	Q3303	F-6	R3134	E-3	R4402	K-7	XRP4001	N-7		
C2813	I-9	C4425	J-7	CR4402	L-6	Q3401	B-8	R3136	L-7	R4405	K-6	XRP4002	N-7		
C2814	I-10	C4501	C-8	CR4404	J-7	Q4102	J-11	R3157	D-7	R4406	L-6	Y2801	I-6		
C2818	I-7	C4502	C-9	CR4405	L-7	Q4103	G-10	R3158	D-7	R4407	F-11	Y3301	E-4		
C2820	I-6	C4503	D-8	CR4501	F-9	Q4106	G-1	R3303	G-4	R4409	E-11	Y4401	K-6		
C3121	E-6	C4504	D-9	CR4502	D-8	Q4107	G-5	R3306	E-3	R4410	E-12				
C3125	D-5	C4505	C-8	CR4503	C-9	Q4401	E-11	R3321	G-6	R4411	F-12				
C3128	D-6	C4506	D-9	CR4506	E-7	Q4402	E-13	R3326	F-5	R4412	L-6				
C3129	D-6	C4507	E-9	DL2701	L-4	Q4501	D-8	R3329	F-5	R4413	I-12				
C3132	C-7	C4508	D-9	F4101	M-8	R1209	I-3	R3335	G-6	R4414	M-7				
C3133	D-6	C4510	F-10	F4102	H-9	R1210	I-3	R3352	E-5	R4415	I-14				
C3136	D-6	C4511	E-9	FB3101	D-1	R1211	K-2	R3401	B-9	R4418	M-7				
C3401	B-9	C4512	D-9	FB3301	E-2	R1213	I-3	R3402	B-9	R4419	M-14				
C3402	B-9	C4513	D-9	FB3302	G-6	R1216	L-4	R3403	B-9	R4420	L-7				
C3403	B-9	C4514	E-9	FB3303	E-6	R1221	I-3	R3404	B-9	R4421	N-13				
C3404	B-8	CF1201	K-3	FB3304	E-1	R2302	G-3	R3405	B-9	R4422	K-7				
C3405	B-7	CF2301	L-3	FB3305	M-2	R2307	H-2	R3406	B-8	R4423	M-7				
C3406	B-8	CR1201	I-3	FB4401	E-13	R2315	H-4	R3431	B-1	R4424	J-6				
C3601	F-2	CR1202	I-3	FB4402	E-12	R2320	L-2	R3432	B-3	R4426	K-6				
C3602	F-2	CR2601	L-6	FB4403	F-13	R2321	L-2	R3433	B-4	R4427	N-12				
C3603	F-3	CR2701	H-5	IR TEST	M-2	R2323	L-3	R3434	B-5	R4501	D-8				
C3606	F-2	CR2702	M-5	J1201	L-3	R2327	L-4	R3435	B-3	R4502	C-8				
C3608	G-4	CR2703	M-6	J3101	C-3	R2602	L-6	R3436	B-3	R4503	N-5				
C4102	I-9	CR2704	I-5	J4201	M-10	R2706	H-7	R3438	B-4	R4504	G-8				
C4103	I-10	CR2707	H-5	L1201	J-3	R2711	K-5	R3601	F-1	R4505	D-8				
C4104	J-9	CR2708	H-5	L1202	K-3	R2715	H-12	R3602	K-1	R4506	C-8				
C4105	J-10	CR2709	M-6	L2301	H-3	R2716	L-4	R3603	K-1	R4507	D-9				
C4106	G-9	CR3101	D-5	L2302	I-4	R2717	M-12	R3606	G-2	R4508	E-10				
C4108	H-12	CR3103	D-7	L2303	L-4	R2719	L-4	R3607	H-4	R4509	D-8				

CONTROLS & RESISTORS continued

	Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
#	**R4414**	820 5% 1W Nonflammable	175349	1W182
#	**R4415**	1000 5% 2W Nonflammable	180175	2W210
#	**R4420**	3300 5% 1W Nonflammable	831A33	1W233
#	**R4421**	100 5% 1/2W	176796	HW110
#	**R4422**	22K 2% 1/4W	175054	QW322
#	**R4423**	10K 5% 1/4W	175317	QW310
	R4502	5100 2% 1/8W	161042	EW251
	R4503	150 Vertical Size	193062	-
#	**R4505**	3 5% 1W Nonflammable	179256	1W3D0
	R4507	20K 2% 1/8W	161032	EW320
	R4508	22K 2% 1/4W	175054	QW322
#	**R4513**	20 2% 1/4W	829020	QW020
#	**R4515**	20 2% 1/4W	829020	QW020
#	**R5001**	15K 5% 2W Nonflammable	179236	2W315
		20K 5% 2W Nonflammable	209855 (1)	2W320
#	**R5002**	15K 5% 2W Nonflammable	179236	2W315
		20K 5% 2W Nonflammable	209855 (1)	2W320
#	**R5003**	15K 5% 2W Nonflammable	179236	2W315
		20K 5% 2W Nonflammable	209855 (1)	2W320
#	**R5008**	10K 5% 2W Nonflammable	176656	2W310
#	**R5014**	.22 10% 2W Wirewound	193108	-
#	**R5023**	7.5 10% 2W Wirewound	-	-
		6.8 10% 2W Wirewound	193109	-
#	**R5026**	3.3M 10% 1/2W	181896	HW533
#	**RT4101**	5.1 Cold PTC	207768	-

TUNER (TCHR-1A)

R106	220K 2% 1/10W SMT	192093	-
R107	330 2% 1/10W SMT	195929	-
R108	220K 2% 1/10W SMT	192093	-
R111	150K 2% 1/10W SMT	195931	-
R252	1500 2% 1/8W	161041	EW215
R402	10K 2% 1/10W	195937	-
R403	3300 2% 1/10W SMT	195938	-
R404	220 2% 1/10W SMT	192089	-
R405	680 2% 1/10W SMT	195939	-
R410	470 2% 1/10W SMT	194926	-
# **R701**	3.9M 5% 1/2W	182843	HW539

REMOTE TRANSMITTER (CRK53K)

R3	5.1 2% 1/4W	829A51	QW5D1

 # For SAFETY use only Equivalent Replacement Parts.
(1) Used in chassis CTC146LA only.

MISCELLANEOUS

	Item No.	Description	Mfr. Part No.	Notes
	CF1201	Filter	195702	4.5MHz
	CF2301	Filter	209740	4.5MHz
	DL2701	Delay line	177795	-
#	**F4101**	Fuse	177793	4 Amp, 125V AC
#	**F4102**	Fuse	193050	1 Amp, 250V AC
#	**P100**	Cord	182239	AC, Polarized
#	**RL4101**	Relay	193078	Power
	SF2301	Filter	176852	SAW
	SP1	Speaker	183163	2.25" x 3.5", 32 Ohms
	SW3402	Switch	193087	Channel -
	SW3403	Switch	193087	Channel +
	SW3412	Switch	193087	Volume -
	SW3413	Switch	193087	Volume +
	SW3422	Switch	193087	Video
	SW3423	Switch	193087	Setup
	SW3432	Switch	193087	Display
	SW3433	Switch	193087	Source
#	**V101**	CRT	A51ACG14X02	-
	Y2801	Crystal	161235	3.58MHz
	Y3301	Crystal	182839	4MHz
	Y4401	Resonator	179267	32MHz
		Board (1)	193106	CRT (PW5000)
		Board (1)	191564	Remote Transmitter (PW1000)
			210839 (2)	-
		Remote Transmitter	197031	CRK53K
		Socket	189986	CRT
		UHF/VHF Tuner (1)	195687	TCHR-1A

REMOTE TRANSMITTER (CRK53K)

Y1	Crystal	157804	-

TUNER (TCHR-1A)

# **CPR701**	Capristor	195926	-

 # For SAFETY use only equivalent replacement part.
(1) Contact PTS Electronics Corporation for replacement; order by manufacturer's part number.
(2) Used in chassis CTC146LA only.

CAPACITORS & ELECTROLYTICS continued

Item No.	Rating	Mfr. Part No.
TUNER (TCHR-1A)		
C316	470pF NPO 50V 10%	192040
C317	470pF NPO 50V 10%	192040
C318	1pF NPO 50V .25pF	192041
C401	470pF NPO 50V 10%	192040
C403	33pF NPO 50V 10%	195921
C404	120pF NPO 50V 10%	192055
C405	330pF NPO 50V	195922
C406	75pF NPO 50V 10%	195923
C407	47pF NPO 50V 10%	195924
C502	470pF NPO 50V 10%	192040
C503	5pF NPO 50V .5pF	195909
C505	470pF NPO 50v 10%	192040
# **C701**	.0012 1.4KV 20%	150724
# **C702**	.001 125VAC +80% -20%	195947
C951	470pF NPO 50V 10%	192040

 # For SAFETY use only Equivalent Replacement Parts.

CABINET PARTS

Item	Mfr. Part No.
Cabinet Front	MK1112
Cabinet Rear	BK0832
REMOTE TRANSMITTER (CRK53K)	
Battery Door	191570
Bottom Case	191568
IR Window	191569
Top Case	191567

Important Parts Information

- The parts listed here are those not usually available from a well-stocked supply cabinet or bin.
- Where items may be replaced with equivalent parts, several alternates are shown from participating vendors.
- On the parts lists, safety items are marked with a # to remind you that only exact replacements are recommended for these items.
- When ordering parts, state the model number, part number, and description.

Obtaining Parts

Many of these parts are available from your local Sams authorized distributor or the manufacturer of the equipment. Call Sams for the name of your nearest distributor:

800-428-7267

Or consult the Sams *Annual Index* for the address of the original equipment manufacturer.

Participating Vendors

Information on test equipment and replacement parts is listed in these pages for the following participating vendors. Consult the Sams *Annual Index* for their current address.

- Custom Components Corporation (Chek-A-Color)
- NTE Electronics, Inc. (NTE)
- Philips ECG Company (ECG)
- PTS Electronics Corporation (PTS)
- Sencore, Inc.
- Thomson Consumer Electronics, Inc. (SK, TCE)

PARTS LIST continued

CONTROLS & RESISTORS

	Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
	R1206	4700 2% 1/8W SMT	178287	-
	R1208	1000 2% 1/8W SMT	190462	-
#	**R1209**	2.2 5% 1/4W	152829	QW2D2
#	**R1210**	2.2 5% 1/4W	152829	QW2D2
#	**R1211**	5.6 5% 1/2W Nonflammable	830A56	HW5D6
	R1213	43K 2% 1/8W	161038	EW343
	R1215	10K 2% 1/8W SMT	174364	-
#	**R1216**	10 5% 1/4 Nonflammable	829010	QW010
	R2301	120 2% 1/8W SMT	181485	-
#	**R2302**	100 5% 1/4W Nonflammable	829110	QW110
	R2307	10 5% 1/4W Nonflammable	829010	QW010
	R2314	39K 2% 1/8W SMT	161030	-
	R2315	25K RF AGC	193059	-
	R2319	1000 2% 1/8W SMT	190462	-
	R2323	15K AFT	193060	-
	R2326	1000 2% 1/8W SMT	190462	-
	R2708	10K 2% 1/8W SMT	174364	-
	R2715	113K 1% 1/4W	194892	-
	R2716	300 Contrast Preset	190525	-
#	**R2717**	22K 5% 1W Nonflammable	179259	1W322
	R2731	1000 2% 1/8W SMT	190462	-
	R2733	27K 2% 1/8W SMT	193061	-
	R2809	1500 2% 1/8W	161041	-
	R2810	1000 2% 1/8W SMT	190462	-
	R2905	150 Blue Drive	193063	-
	R2907	150 Green Drive	193062	-
	R2908	120 2% 1/8W SMT	181485	-
	R2909	120 2% 1/8W SMT	181485	-
		180 5% 1/8W SMT	181491 (1)	-
	R2910	120 2% 1/8W SMT	181485	-
		180 5% 1/8W SMT	181491 (1)	-
	R2914	4500 Red Bias	190533	-
	R2915	4500 Green Bias	190533	-
	R2916	4500 Blue Bias	190533	-
	R3110	10K 2% 1/8W SMT	174364	-
	R3114	22K 2% 1/8W SMT	174367	-
	R3133	10K 2% 1/8W SMT	174364	-
	R3135	1000 2% 1/8W SMT	190462	-
#	**R3156**	10K 2% 1/8W SMT	174364	-
#	**R3157**	10K 5% 1W Nonflammable	180029	1W310
#	**R3158**	10K 5% 1W Nonflammable	180029	1W310
	R3305	24K 2% 1/8W SMT	181061	-
	R3307	10K 2% 1/8W SMT	174364	-
	R3313	10K 2% 1/8W SMT	174364	-
	R3314	10K 2% 1/8W SMT	174364	-
	R3320	39K 2% 1/8W SMT	161030	-

 # For SAFETY use only equivalent replacement part.
(1) Used in chassis CTC146LA only.

CONTROLS & RESISTORS continued

	Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
	R3322	10K 2% 1/8W SMT	174264	-
	R3323	6800 2% 1/8W SMT	178281	-
	R3324	3900 2% 1/8W SMT	157377	-
	R3325	820 2% 1/8W SMT	176814	-
	R3327	10K 2% 1/8W SMT	174364	-
	R3331	15K 2% 1/8W SMT	192835	-
	R3332	27K 2% 1/8W SMT	193061	-
	R3333	12K 2% 1/8W SMT	174365	-
	R3335	10K Tint Preset	181107	-
	R3336	24K 2% 1/8W SMT	181061	-
	R3337	1000 2% 1/8W SMT	190482	-
	R3338	10K 2% 1/8W SMT	174364	-
	R3341	24K 2% 1/8W SMT	181061	-
	R3342	24K 2% 1/8W SMT	181061	-
	R3347	10K 2% 1/8W SMT	174364	-
	R3350	22K 2% 1/8W SMT	174367	-
	R3355	10K 2% 1/8W SMT	174364	-
	R3402	133K 1% 1/4W	195752	-
#	**R3601**	130 5% 1W Nonflammable	175783	1W113
#	**R3607**	820 5% 1/2W Nonflammable	193065	HW182
#	**R4101**	2.7 10% 7W Wirewound	194300	-
#	**R4102**	470K 10% 1/2W	180243	HW447
#	**R4106**	4.7 5% 3W Nonflammable	193068	3W4D7
#	**R4108**	160 5% 15W Wirewound	193069	-
#	**R4109**	22K 5% 2W Nonflammable	179956	2W322
	R4110	27K 5% 1W Nonflammable	831327	1W327
#	**R4111**	90.9K 1% 1/2W	193071	-
#	**R4112**	500 B+ Adjust	181112	-
#	**R4113**	5360 1% 1/4W	193072	-
#	**R4114**	680 5% 2W Nonflammable	194895	2W168
#	**R4116**	430 5% 1W Nonflammable	831143	2W143
#	**R4118**	47 5% 2W Nonflammable	176806	2W047
		33 5% 2W Nonflammable	196014 (1)	2W033
#	**R4119**	8.2 5% 1/2W Nonflammable	120595	HW8D2
#	**R4120**	4.7 5% 1/2W Nonflammable	830A47	HW4D7
#	**R4122**	620 2% 1W Nonflammable	193092	1W162
	R4123	200 2% 1/4W	175363	QW120
#	**R4125**	10 5% 1/4W Nonflammable	829010	QW010
#	**R4128**	10 5% 1/4W Nonflammable	829010	QW010
#	**R4210**	Focus/Screen	193075	-
#	**R4401**	10K 1% 1/2W	160155	-
#	**R4402**	11K 1% 1/2W	193076	-
	R4403	1000 2% 1/8W SMT	190462	-
	R4404	2400 2% 1/8W SMT	192829	-
#	**R4407**	6800 5% 3W	-	3W268
		6200 5% 3W Nonflammable	179219	3W262
	R4408	620 2% 1/8W SMT	181493	-
#	**R4411**	4700 5% 3W Nonflammable	175368	3W247
#	**R4413**	820 5% 1W Nonflammable	175349	1W182

 # For SAFETY use only equivalent replacement parts.
(1) Used in chassis CTC146LA only.

PARTS LIST continued

CAPACITORS & ELECTROLYTICS

Item No.	Rating	Mfr. Part No.
C1205	470pF NPO 50V 10%	174416
C1212	33pF NPO 50V 5%	174408
C1214	18pF NPO 50V 5%	174405
C1220	33pF NPO 50V 5%	174408
C1222	10pF NPO 50V 1%	174402
C2313	22pFN150 50V 5%	157199
C2318	22pF NPO 50V 5%	174406
C2709	68pF NPO 50V 5%	174410
C2720	68pF NPO 50V 5%	174410
C2722	12pF NPO 50V 5%	174403
C2803	56pF NPO 50V 5%	190542
C2805	15pF NPO 50V 5%	174404
C2813	10pF NPO 50V 5%	174402
C2816	12pF NPO 50V 5%	193033
C2907	220pF NPO 50V 5%	178188
C2908	220pF NPO 50V 5%	178188
C2909	220pF NPO 50V 5%	178188
C3111	100pF NPO 50V 5%	174412
C3308	100pF NPO 50V 5%	174412
C3309	100pF NPO 50V 5%	174412
C3310	100pF NPO 50V 5%	174412
C3311	56pF NPO 50V 5%	190542
C3312	56pF NPO 50V 5%	190542
C3316	220pF NPO 50V 5%	178188
C3318	39pF NPO 50V 5%	181090
C3330	33pF NPO 50V 5%	174408
C3331	33pF NPO 50V 5%	174408
C3332	12pF NPO 50V 5%	174403
# **C4101** (2)	.047 600V 20%	144658
# **C4102**	680pF 1KV 20%	190538
# **C4103**	680pF 1KV 20%	190538
# **C4104**	680pF 1KV 20%	190538
# **C4105**	680pF 1KV 20%	190538
# **C4106**	470µF 200V +30% -10%	179809
# **C4108**	33µF 200V 20%	193038
C4120	680pF 1KV 20%	190538
C4136	680pF 1KV 20%	160131
C4137	680pF 1KV 20%	160131
# **C4401**	.1 63V 10%	159640
C4409	100pF NPO 50V 5%	174412
C4410	39pF NPO 250V 5%	-
	27pF NPO 250V 5%	143755
# **C4415**	.35 250V 5%	193048
# **C4416** (1)	680pF 1.5KV 5%	194445
	330pF N150 1.5KV 5%	146822
# **C4417**	.0073 1.6KV 2%	193879
# **C4421**	.001 50V 10%	143879
# **C4422**	.001 50V 10%	181460
# **C4425**	10µF 50V 10%	179229
C5001	.01 2KV 20%	193107

 # For SAFETY use only equivalent replacement part.
(1) Select part with the same value as original part.
(2) Used in canadian models only.

CAPACITORS & ELECTROLYTICS continued

Item No.	Rating	Mfr. Part No.
TUNER (TCHR-1A)		
C1	4pF NPO 50V ±.25pF	181456
C4	120pF NPO 50V 10%	192055
C5	22pF NPO 50V 10%	195740
C7	100pF NPO 50V 10%	195695
C8	150pF NPO 50V 10%	192056
C102	180pF NPO 50V 10%	-
	150pF NPO 50V 10%	192056
C105	27pF NPO 50V 5%	192050
C106	470pF NPO 50V 10%	192040
C107	5pF NPO 50V ±.5pF	195909
C108	12pF NPO 50V 10%	195910
C110	470pF NPO 50V 10%	192040
C111	39pF NPO 50V 10%	195911
C112	.5pF NPO 50V ±.25pf	194910
C113	1.5pF NPO 50V ±.25pF	194904
C114	470pF NPO 50V 10%	192040
C151	470pF NPO 50V 10%	192040
C152	5pF NPO 50V ±.25pF	195914
C153	3pF NPO 50V ±.25pF	195915
C154	4pF NPO 50V 10%	195916
C155	470pF NPO 50V 10%	192040
C156	470pF NPO 50V 10%	192040
C157	470pF NPO 50V 10%	192040
C202	470pF NPO 50V 10%	192040
C206	470pF NPO 50V 10%	174416
C207	120pF NPO 50V 10%	192055
C208	470pF NPO 50V 10%	192040
C209	1pF NPO 50V ±.25pF	192041
C210	5pF NPO 50V ±.25pF	-
	4pF NPO 50V ±.25pF	194901
C211	1pF NPO 50V ±.25pF	192041
C252	470pF NPO 50V 10%	192040
C253	150pF NPO 50V 10%	192056
C254	470pF NPO 50V 10%	192040
C257	470pF NPO 50V 10%	192040
C258	100pF NPO 50V 10%	195695
C259	1.5pF NPO 50V 10%	194904
C302	470pF NPO 50V 5%	195918
C303	470pF NPO 50V 10%	192040
C304	470pF NPO 50V 10%	192040
C305	470pF NPO 50V 10%	192040
C307	1pF NPO 50V ±.25pF	-
	1.5pF NPO 50V ±.25pF	181461
C308	27pF NPO 50V ±.5pF	-
	33pF NPO 50V ±.5pF	195919
C309	20pF NPO 50V ±.25pF	195920
C310	470pF NPO 50V 10%	192040
C312	470pF NPO 50V 5%	195918
C313	470pF NPO 50V 10%	192040
C314	470pF NPO 50V 10%	192040
C315	1.5pF NPO 50V ±.25pF	181461