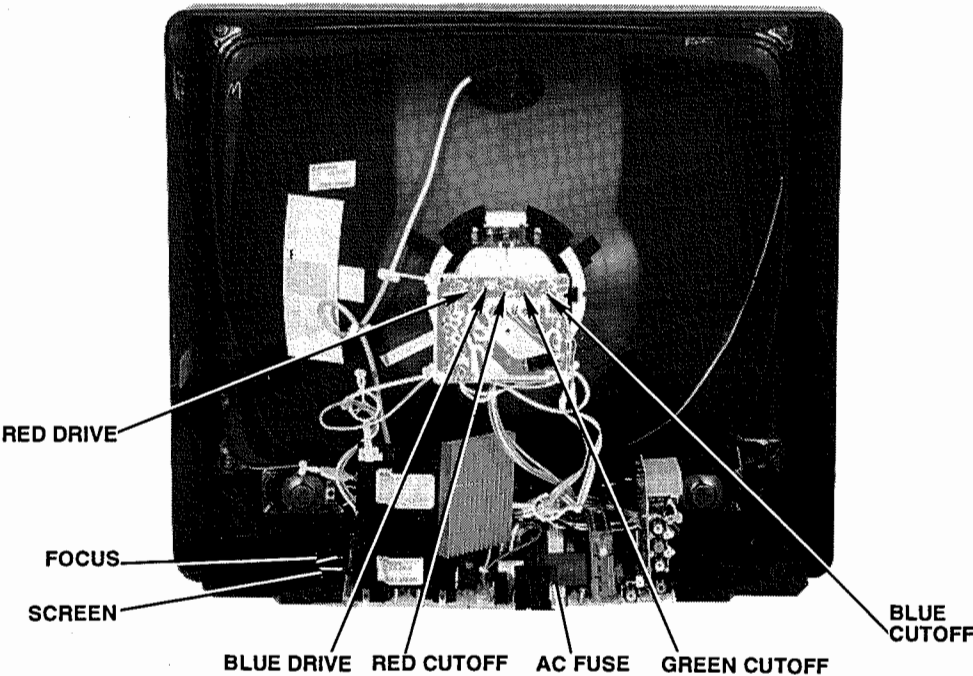


CABINET - REAR VIEW



TEST JIG HOOKUP

Chek-A-Color		PC Board		
Function	Adapter No.	Plug	Pin	Color
CRT	B239	DY-H	Red	Red
Yoke	D482		Blue	Blue
Yoke Setting	YP2A	DY-V	Brown	Black
Comments	Focus Tap		Yellow	Yellow

The listing of any available replacement part herein in no case constitutes a recommendation, warranty, or guarantee by Howard W. Sams & Company as to the quality and suitability of such replacement part. The numbers of the listed parts have been compiled from information furnished to Howard W. Sams & Company by the manufacturers of the specific type of replacement part listed.

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PHOTOFACT® Technical Service Data

SET 3186

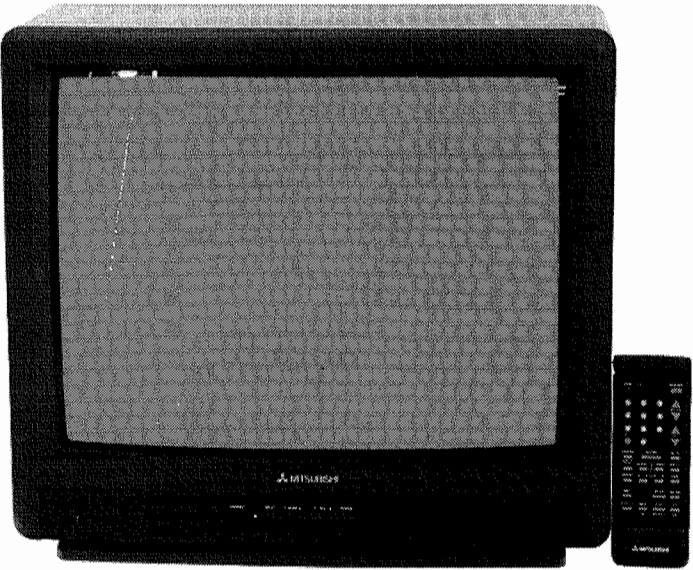
MODEL CS-20SX1 (CHASSIS XL-B-CSX1)

MITSUBISHI

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MITSUBISHI  
Model CS-20SX1 (Chassis XL-B-CSX1)



Complete coverage  
for servicing a television receiver...

- Schematics
- Component locations
- Parts lists
- Troubleshooting guide

Coverage includes these additional models:

CS-21SX1C  
50LC03

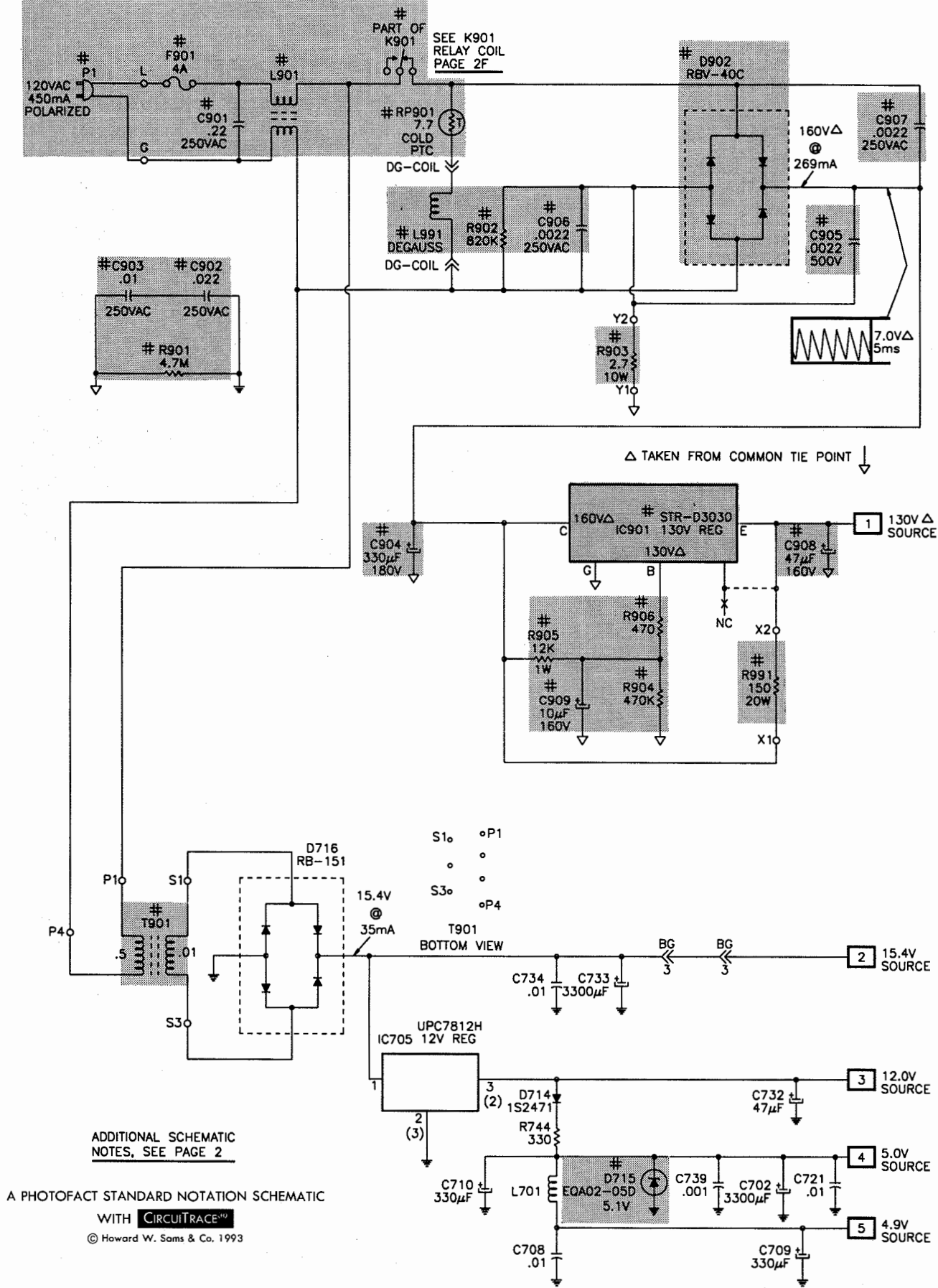


HOWARD W. SAMS & COMPANY

JULY 1993 SET 3186

For Supplier Address,  
See PHOTOFACT Annual Index

POWER SUPPLY SCHEMATIC



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
  - II Schematic Circuittrace
  - A Cabling: Heavy lines reduce use of multiple 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.

ADDITIONAL SCHEMATIC  
NOTES, SEE PAGE 2

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STEREO ADJUSTMENTS

Note: The following adjustments were made with TV/Stereo generator connected to the antenna terminals.

COMPOSITE LEVEL

Select pilot, 1kHz audio frequency, and L+R modulating signal. Select stereo mode on receiver. Connect an oscilloscope to TP-M0. Adjust comp level control VR301 for 1V p-p.

STEREO FILTER

Select SAP, 1kHz audio frequency, and L-R modulating signal. Select SAP mode on receiver. Place a 2200uF capacitor between pin 25 of IC101 and ground. Connect an oscilloscope to TP-M5. Adjust filter control VR3B0 for minimum. Remove capacitor.

STEREO VCO

Select pilot, 1kHz audio frequency, and L-R modulating signal. Select stereo mode on receiver. Connect a frequency counter to TP-M1. Place a 100K resistor between TP-L1 and TP-M4. Place a 2200uF capacitor between TP-M0 and ground. Adjust ST-VCO control VR3B3 for 15.75kHz. Remove resistor and capacitor.

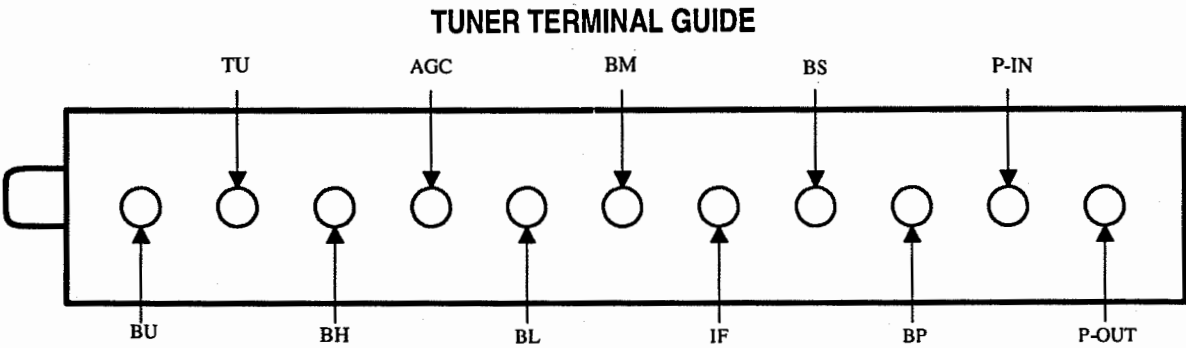
SEPARATION AND SPECTRAL

Select pilot, 300Hz audio frequency, and L modulating signal. Select stereo mode on receiver. Connect an oscilloscope to TP-M2. Adjust separation control VR3B1 for minimum amplitude of waveform. Select 8kHz audio frequency. Adjust spectrum control VR3B2 for minimum amplitude of waveform. Repeat adjustments until no further decrease in waveform amplitude occurs.

TUNER INFORMATION

TUNER VOLTAGE CHART			
Pin	VHF Low Band	VHF High Band	UHF Band
P-OUT	2.5V	2.5V	2.6V
P-IN	0.9V	0.1V	0V
BP	5.0V	5.0V	5.0V
BS	11.2V	11.3V	0.1V
IF	0V	0V	0V
BM	12.2V	12.3V	12.0V
BL	12.0V	0.3V	0V
AGC	3.1V	2.9V	3.4V
BH	0V	12.2V	0V
TU	1.3V	3.7V	7.4V
BU	0V	0V	11.9V

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



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

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

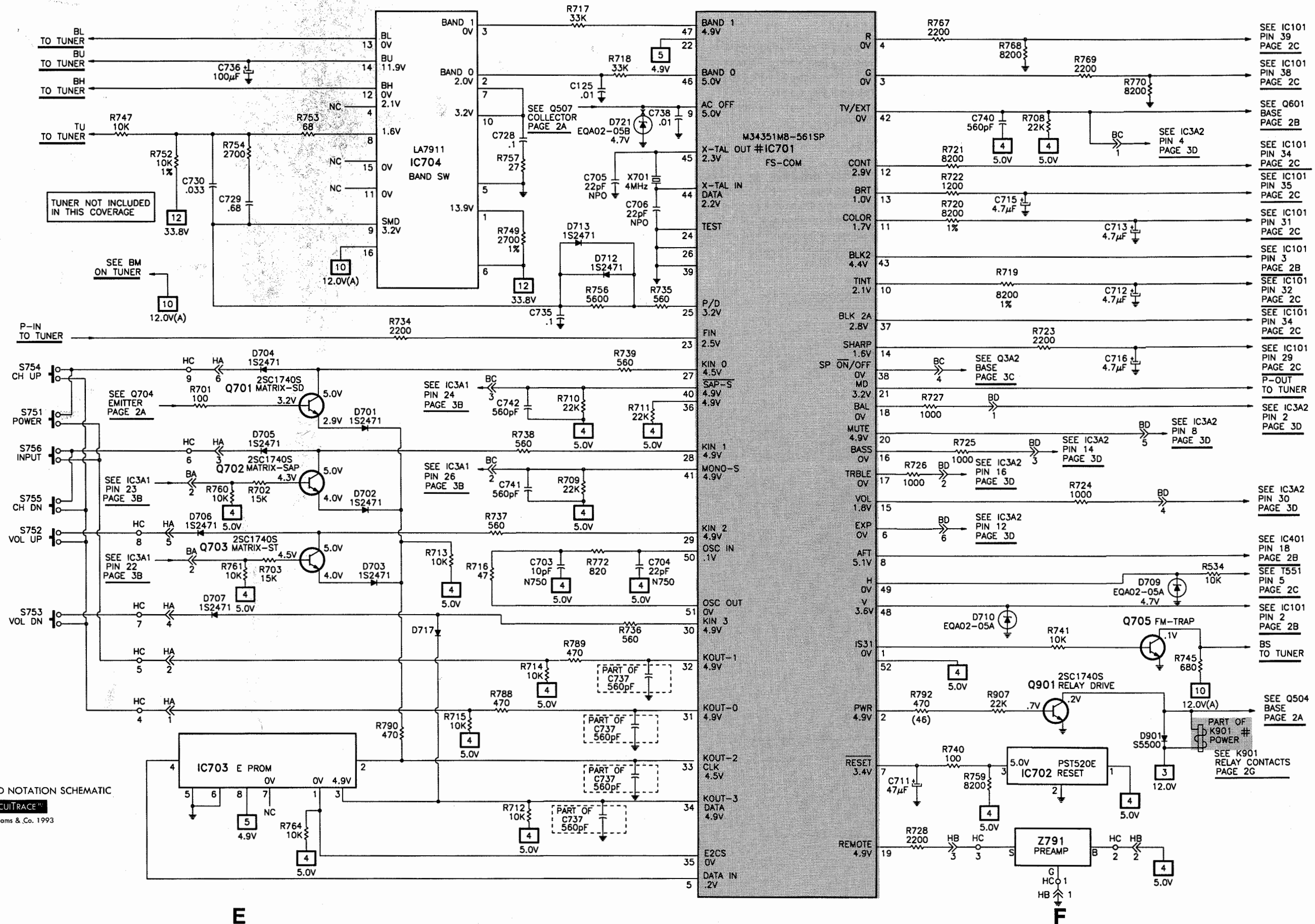
Or consult the Sams *Annual Index* for the address of the original equipment manufacturer.

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) | ▪ PTS Electronics Corporation (PTS)            |
| ▪ NTE Electronics, Inc. (NTE)                  | ▪ Sencore, Inc.                                |
| ▪ Philips ECG Company (ECG)                    | ▪ Thomson Consumer Electronics, Inc. (SK, TCE) |

# MICROPROCESSOR SCHEMATIC



ADDITIONAL SCHEMATIC  
NOTES, SEE PAGE 2

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WITH **CIRCUITRACE**  
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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.

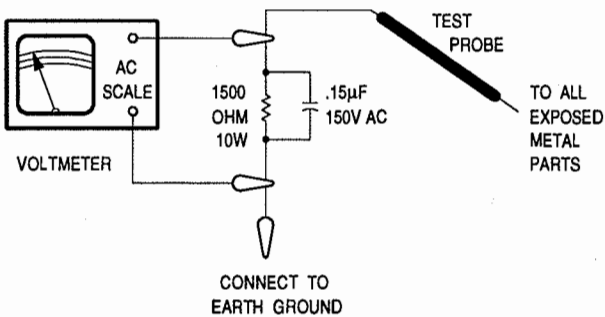
Hot Leakage Current Check

- 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 F901. If F901 is open:

Check Q503, D716, D902, IC705, IC901, C733, C734, and C904 thru C908.

Check for approximately 15.4V at the "+" pin of D716. If 15.4V is missing:

Check voltages and components associated with L901, T901, and D716.

If 15.4V is present, apply 120VAC and check for 130V\* at the E pin of IC901.

If 130V\* is missing:

Check the voltages and components associated with IC901, K901, and D902..

If 130V\* is present:

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

\* Taken from common tie point.

HORIZONTAL

Inject a horizontal signal at the base of Q503. If horizontal deflection is now present:

Check the voltages, waveforms, and components associated with Q501, Q508, and pins 5, 6, and 30 of IC101.

If horizontal deflection is still missing:

Check voltages, waveforms, and components associated with Q503, and T551. Check voltages, and components associated with D503, D504, D505, and D506.

The high voltage rectifier is part of T551 and if defective will affect performance of horizontal circuit.

Horizontal linearity or foldover problems may be caused by C506 and C521 being defective.

VERTICAL

Inject a vertical signal at pin 2 of IC401. If vertical deflection is now present:

Check voltages, waveforms, and components associated with pins 2 and 3 of IC101.

If vertical deflection is still missing:

Check the voltages, waveforms, and components associated with IC401.

Vertical linearity or foldover problems may be caused by C402, C403, C405, C406, C410, and C411 being defective.

IF AGC

Inject a video IF signal at IF input and check for video on CRT.

If video is present:

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

If video is missing, check for a video waveform at base of Q102. If waveform is present:

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

If waveform is missing at base of Q102, apply AGC bias to pin 16 of IC101. If video is now present at base of Q102:

Check the voltages, waveforms, and components associated with pins 10 and 16 of IC101.

If video waveform is still missing from base of Q102:

Check the voltages, waveforms, and components associated with Q101, and pins 9 thru 22, 27, and 28 of IC101.

VIDEO

Inject a video signal at base of Q102 and check for Video on CRT.

If video is present on CRT:

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

If there is no video on CRT:

Check the voltages, waveforms, and components associated with Q102 and pins 8 thru 12, 29, 30, 33, 34, and 35 of IC101

CHROMA

Check for the proper waveforms at pins 40, 41, and 42 of IC101.

If waveforms are missing:

Check voltages, waveforms, and components associated with pins 31, 32, and 36 thru 42 of IC101. Check the 3.58MHz oscillator at pin 36 of IC101.

If proper waveforms are present at pins 40, 41, 42 of IC101:

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

RASTER

Check the CRT and CRT voltages.

If red is missing:

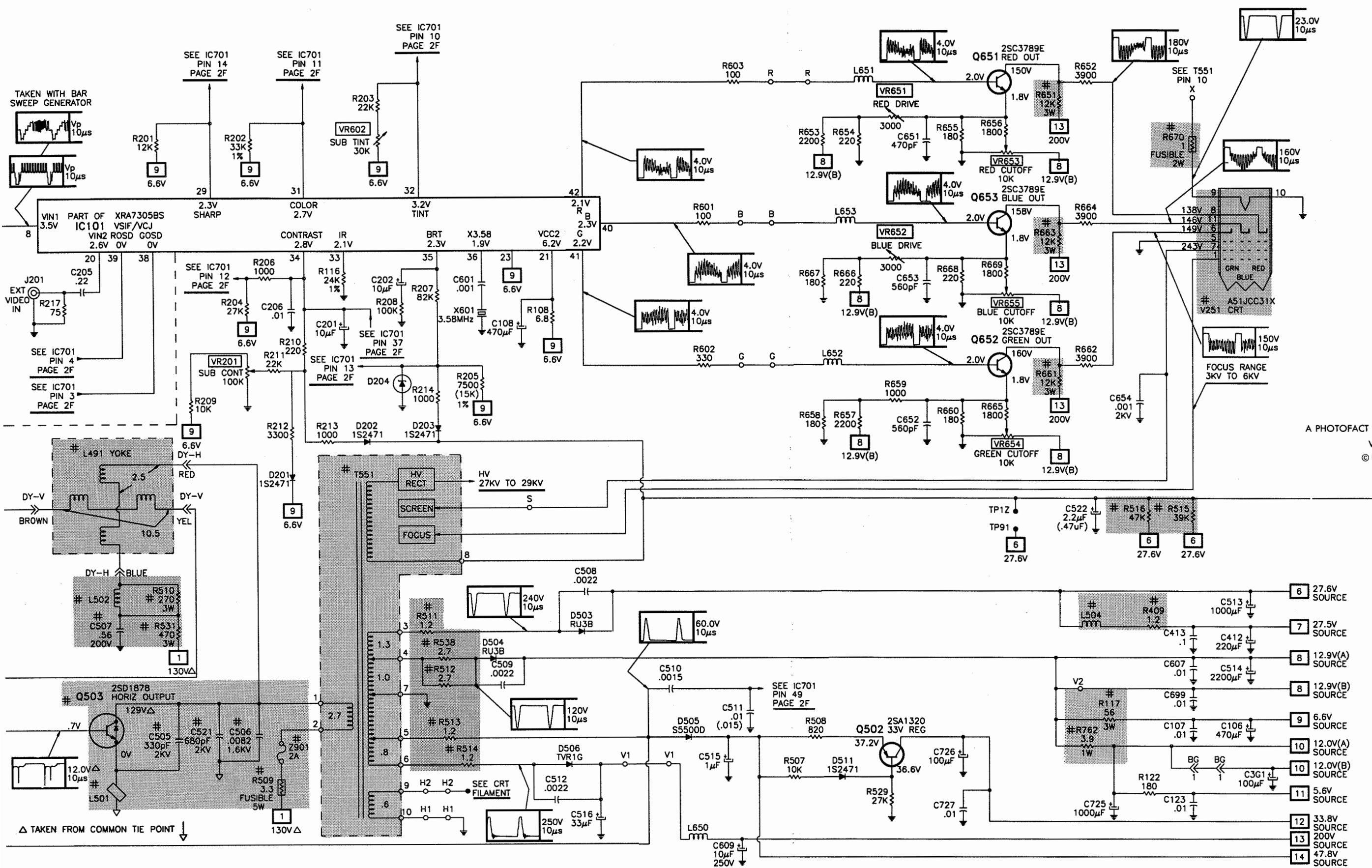
Check voltages, waveforms, and components associated with pin 42 of IC101 and Q651.

If green is missing:

Check voltages, waveforms, and components associated with pin 41 of IC101 and Q652.

If blue is missing:

# TELEVISION SCHEMATIC continued



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# TROUBLESHOOTING continued

Check voltages, waveforms, and components associated with pin 40 of IC101 and Q653.

If raster has keystone shape:

Check the deflection yoke L491.

If raster has height or width problems:

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

## AUDIO

Select an active TV channel and check for an audio waveform at pin 1 of IC3A1. If waveform is missing:

Check voltages, waveforms, and components associated with pins 14, 24, 25, and 26 of IC101.

If audio waveform is present at pin 1 of IC3A1, check for audio waveforms at pins 23 and 25 of IC3A2.

If audio waveforms are missing at pins 23 and 25 of IC3A2:

Check voltages, waveforms, and components associated with IC3A1 and IC3A2.

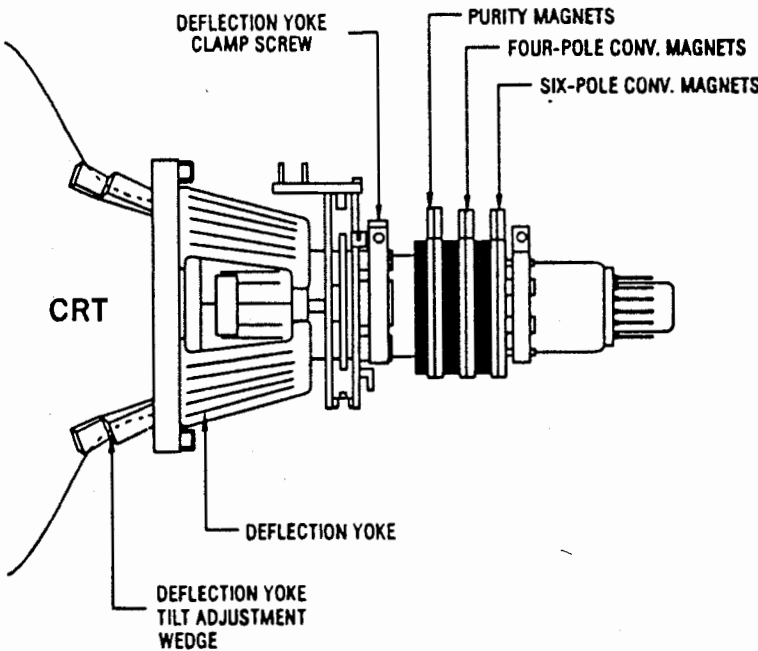
If audio waveforms are present at pins 23 and 25 of IC3A2:

Check voltages, waveforms, and components associated with Q3A2 and IC3A3.

The voltage at pin 30 of IC3A2 will be 1.2V with minimum volume, and 11.4V with maximum volume.

The voltage at pin 8 of IC3A2 will be 4.99V with the mute "ON", and 0.1V with mute "OFF".

## CRT NECK ASSEMBLY



# MISCELLANEOUS ADJUSTMENTS

## PRETUNING

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

### Auto Memory

1. Press the mode button until auto program is displayed on screen.
2. Press the adjust left or right button to select TV or CATV.
3. Press the enter button, available channels are scanned and stored into memory.

### Add/Delete Channel

1. Press the mode button until channel memory appears on screen.
2. Select channel. Use direct channel access buttons.
3. Press the enter button to add or cancel button to erase channel.
4. Repeat steps two and three to add additional channels.
5. Press mode button to end process.

## HIGH VOLTAGE CHECK

Connect a high voltage probe to CRT anode. Tune in a picture. Set brightness, color, and contrast controls to minimum. High voltage should read 27.0KV to 29.0KV.

## RF AGC

Tune in a picture. Adjust RF AGC control VR101 counterclockwise until snow appears in picture. Then adjust clockwise until snow just disappears.

## SUB CONTRAST

Tune in a crosshatch pattern. Set brightness and color to minimum, contrast to midrange. Adjust the sub contrast control VR201 for a just visible pattern. Set brightness to maximum and check for blooming.

## SUB TINT

Tune in a color bar pattern. Connect an oscilloscope to the red cathode. Adjust sub tint control VR602 to balance the 3rd and 4th bars of waveform.

## COLOR PURITY

Caution: Some sets employ a CRT with neck assembly permanently bonded. Do not attempt to remove these assemblies.

Operate receiver for at least 15 minutes. Use a degaussing coil to demagnetize the CRT and mounting hardware. Tune in a green raster. Loosen the deflection yoke clamp screw and remove rubber wedges. Slide deflection yoke forward to produce a vertical green band. Adjust the purity tabs to center green band on the screen. Slide deflection yoke back until a uniform green screen is obtained. Replace the rubber wedges. Tighten deflection yoke clamp screw. Check red and blue purity.

## COLOR TEMPERATURE

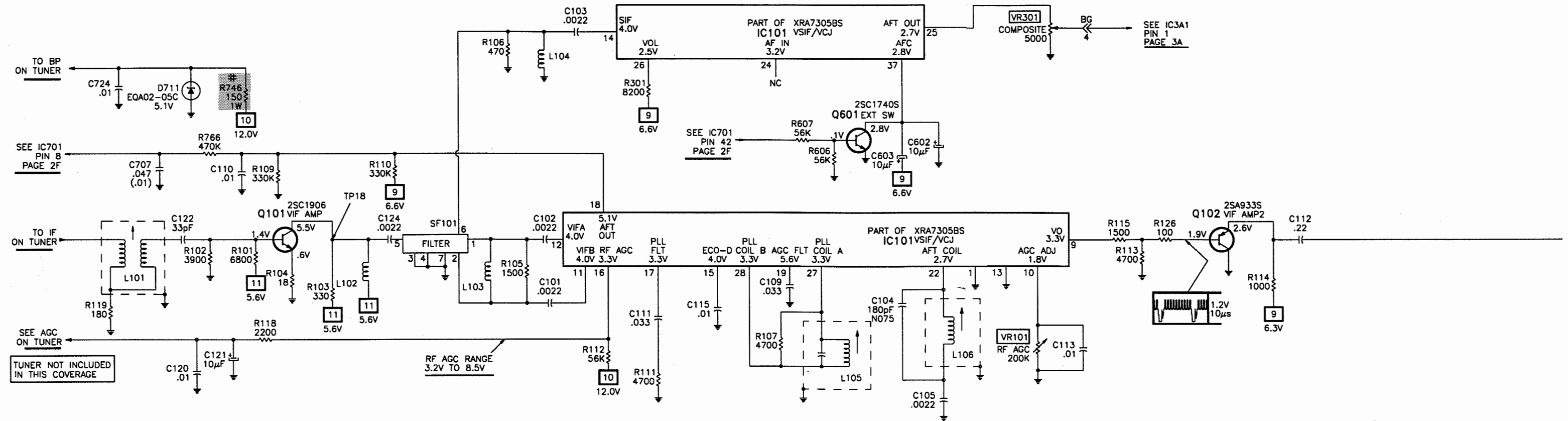
Tune in a crosshatch pattern. Set brightness, contrast, color, red cutoff control VR653, green cutoff control VR654, blue cutoff control VR655, and screen control to minimum. Set red drive control VR651, and blue drive control VR652 to midrange. Slowly advance screen control until crosshatch is just visible. Note color of pattern and adjust the other cutoff controls for a white pattern. Set brightness, and contrast to maximum. Adjust the blue and red drive controls for best black and white picture. Check tracking at low and high brightness. If necessary, readjust controls for best white balance.

## CONVERGENCE

Caution: Some sets employ a CRT with neck assembly permanently bonded. Do not attempt to remove these assemblies.

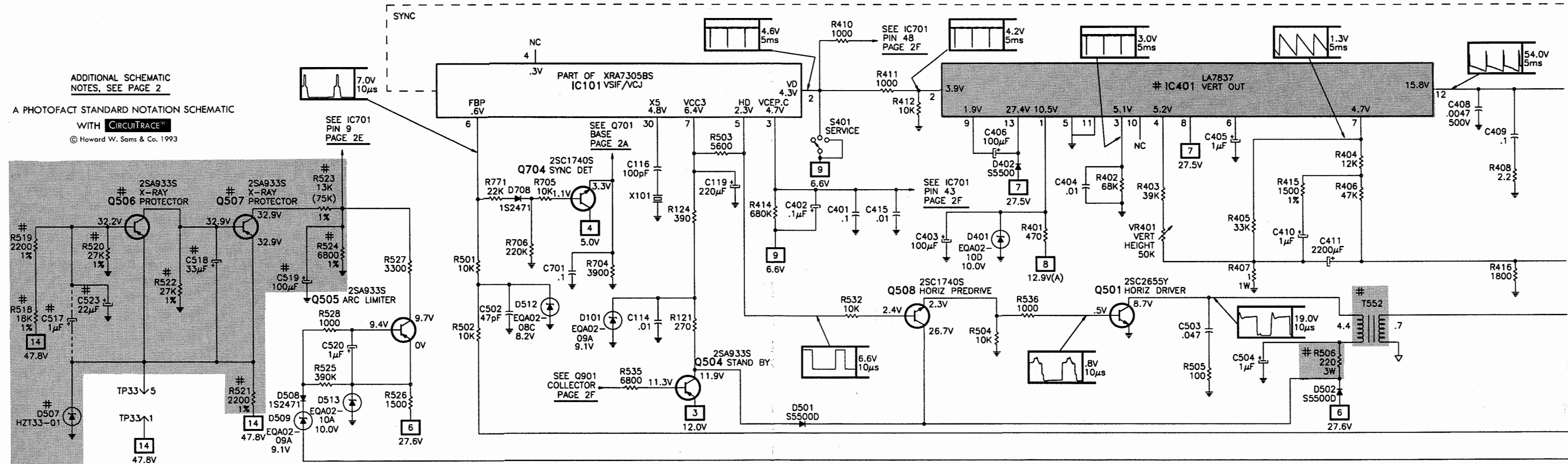
Operate receiver for 15 minutes. Tune in a dot pattern. Adjust 4 pole magnets to converge the red and blue dots at the center of the screen. Loosen the magnet locking ring. Adjust the 6 pole magnets to converge the red/blue dots over the green dots. Note: Rotate the tabs of each set of magnets equally and opposite to converge vertically and rotate the tabs of each set of magnets equally and in the same direction to converge horizontally. 4 and 6 pole magnets interact, repeat adjustment until center convergence is correct. Tighten the magnet locking ring. Tune in a crosshatch pattern. Loosen the deflection yoke clamp screw. Remove the rubber wedges. 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 left and right of the screen. Tilt the deflection yoke left and right to converge the horizontal lines at the top and bottom of the screen and the vertical lines at the left and right side of the screen. Replace rubber wedges and tighten the deflection yoke clamp screw.

## TELEVISION SCHEMATIC



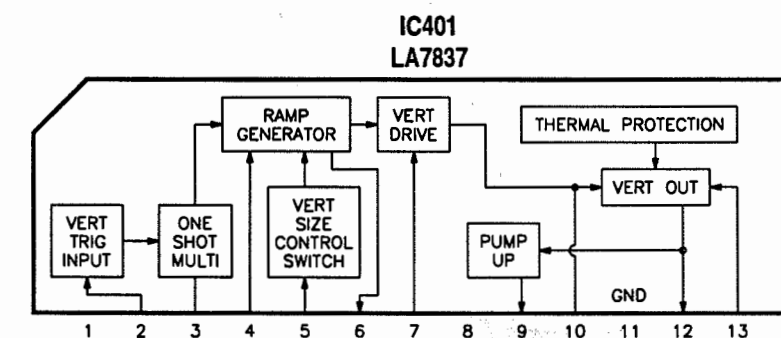
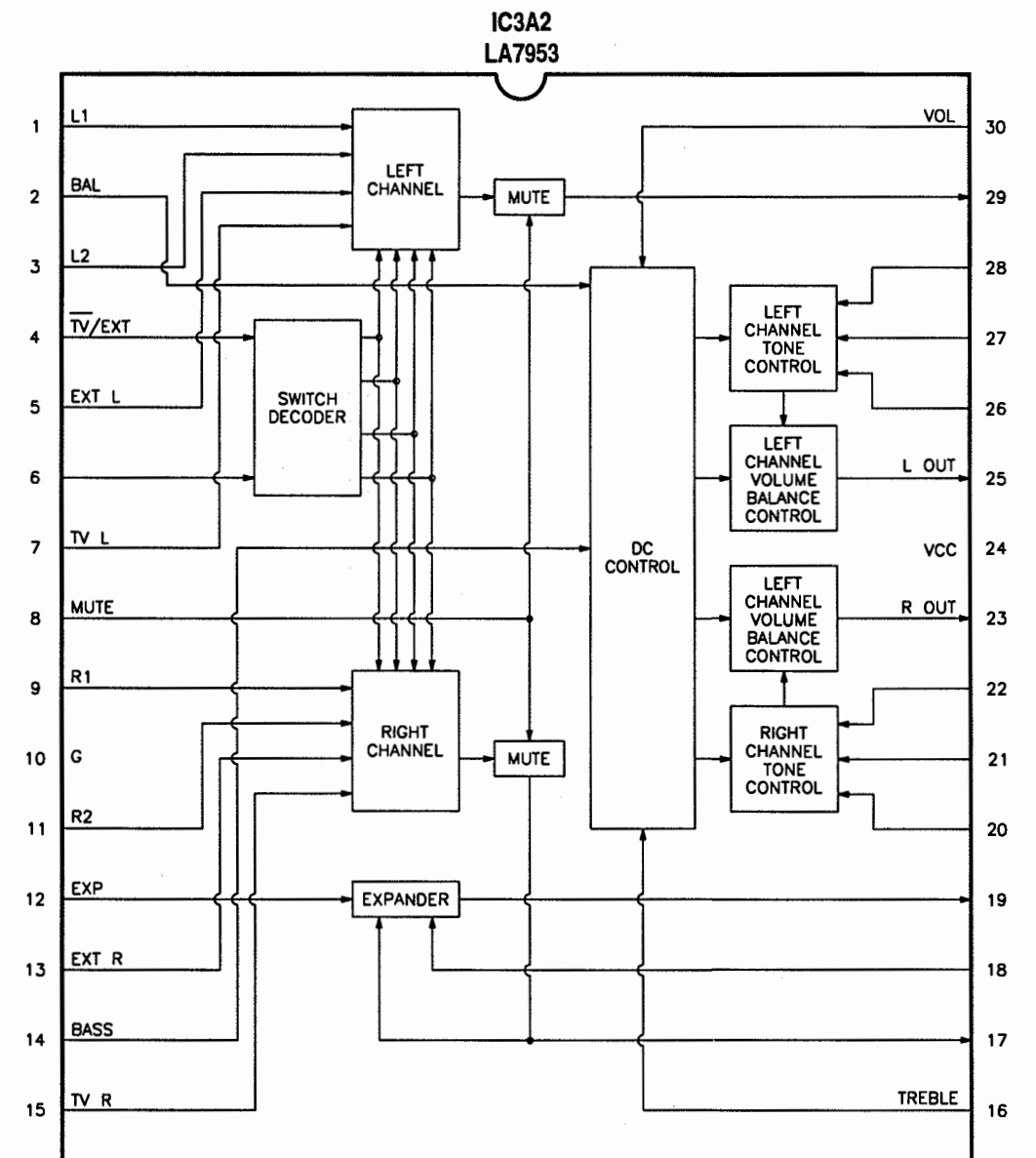
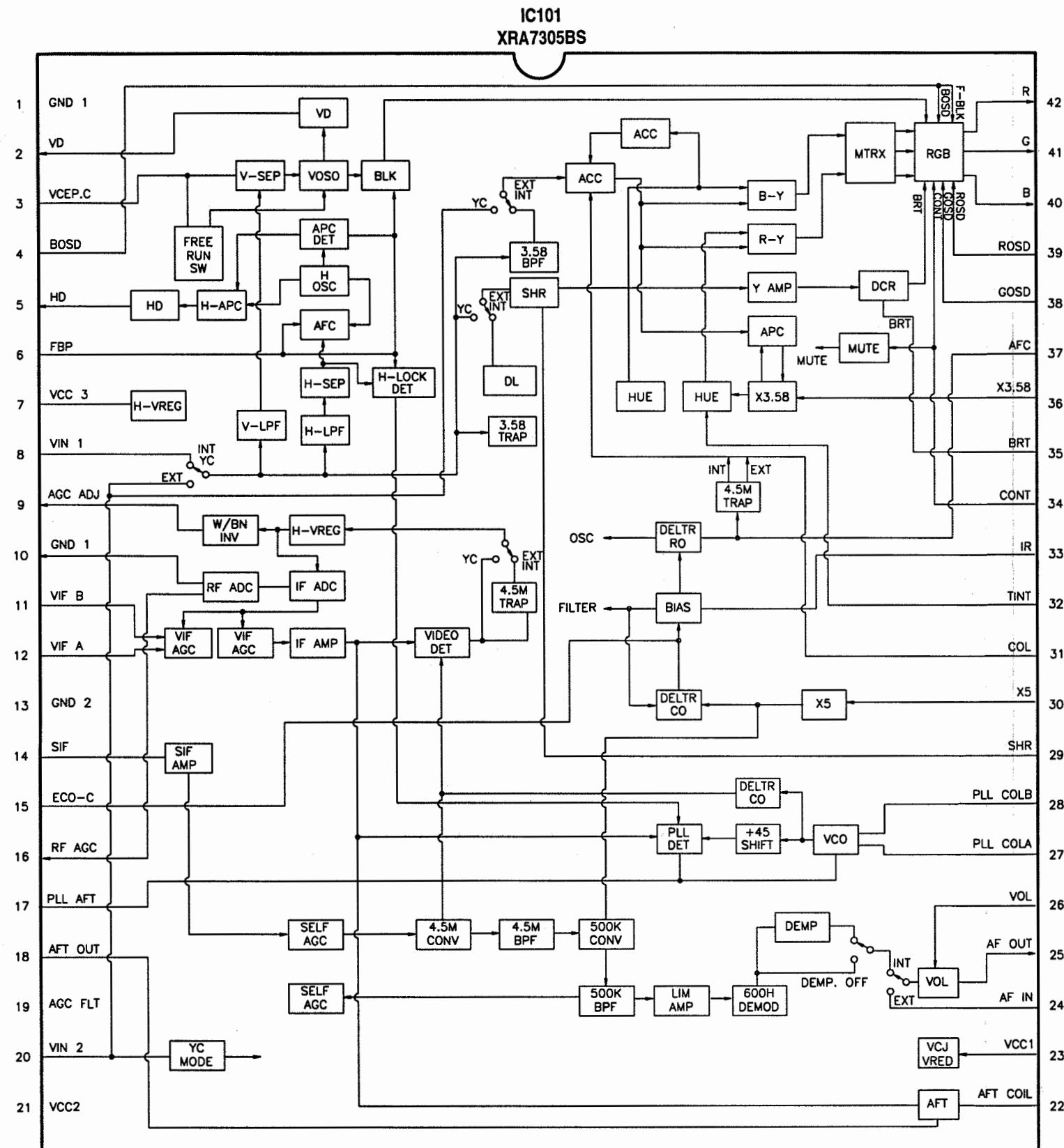
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## IC FUNCTIONS

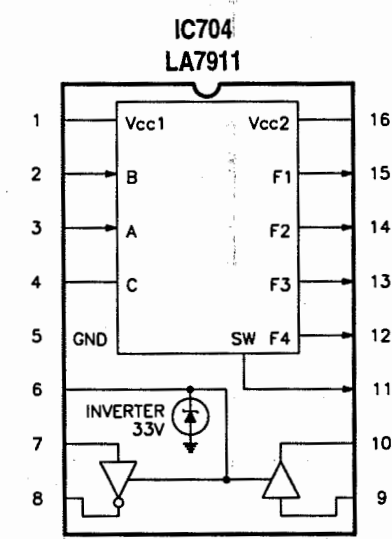
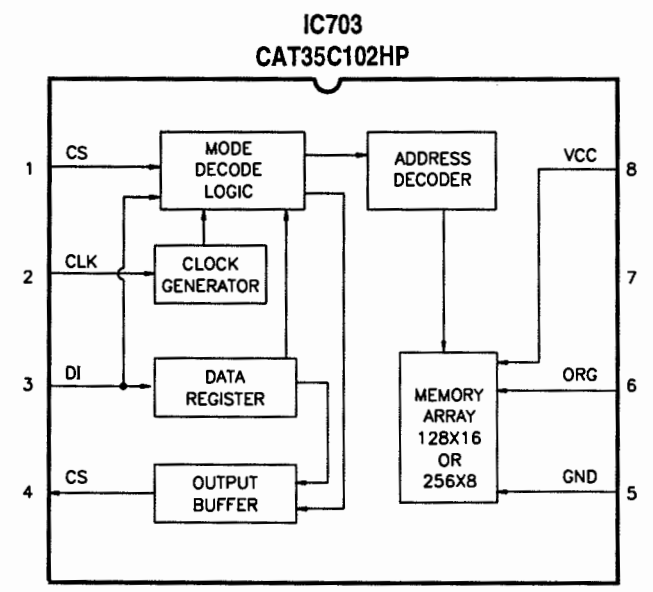
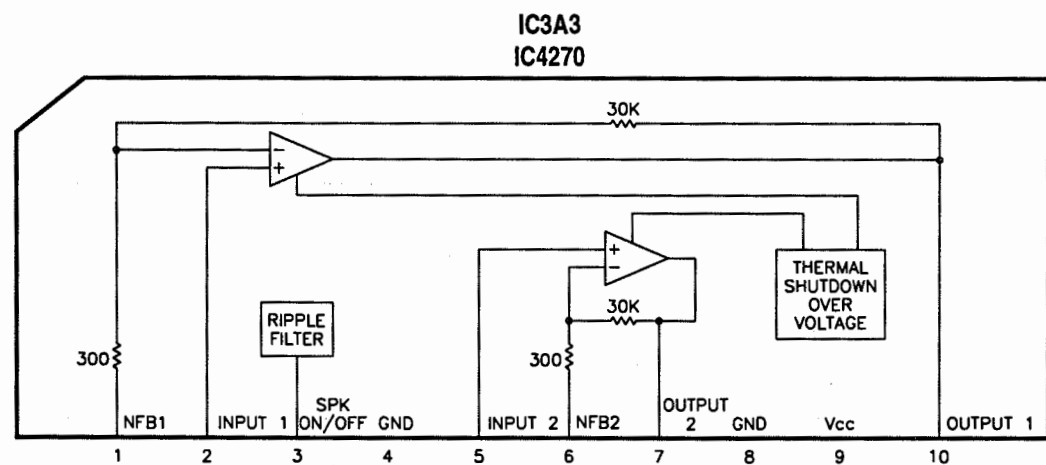
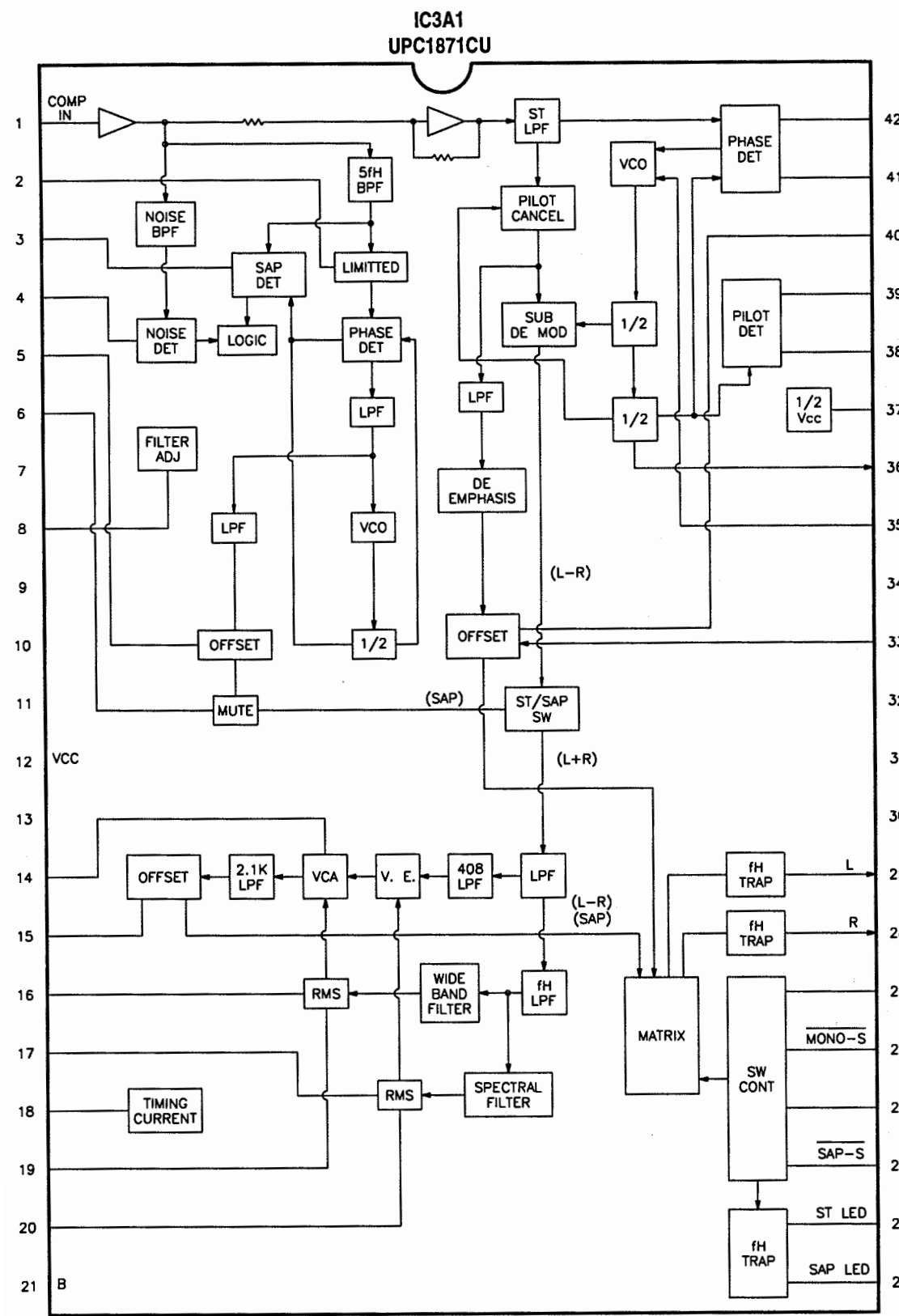


MAIN BOARD, GRIDTRACE LOCATION GUIDE

BA	C-9	C512	I-2	D101	J-11	J201	N-13	R204	E-11	R531	I-4	R759	D-4
BC	C-6	C513	G-3	D201	G-9	K901	K-8	R205	E-10	R532	I-10	R760	B-9
BD	F-8	C514	G-2	D202	F-9	L101	I-13	R206	F-11	R534	C-4	R761	B-9
BF	M-14	C515	G-1	D203	F-8	L102	H-13	R207	F-11	R535	J-9	R762	I-11
BG	I-14	C516	H-2	D204*	E-11	L103	H-12	R208	F-11	R536	I-8	R764	C-6
C101	H-12	C518	C-3	D401	C-2	L104	H-13	R209	G-9	R538	J-2	R766	F-7
C102	H-12	C519	D-3	D402	C-1	L105	F-13	R210	F-10	R601	F-10	R767	F-9
C103	H-13	C520	D-3	D501	G-7	L106	F-14	R211	G-9	R602	F-10	R768	G-11
C104	E-14	C521	H-5	D502	F-3	L501	H-6	R212	G-9	R603	F-10	R769	F-9
C105	E-14	C522	H-1	D503	H-3	L502	G-5	R213	F-10	R606	G-10	R770	G-9
C106	F-13	C523*	C-3	D504	H-2	L504	F-2	R214	F-9	R607	G-10	R771	D-9
C107	F-13	C601	G-11	D505	H-2	L701	D-9	R217	H-14	R701	B-9	R772	C-5
C108	G-14	C602	F-11	D506	I-2	L901	L-8	R301	E-13	R702	B-9	R788	C-7
C109	G-14	C603	G-11	D507	C-3	Q101	H-13	R401	F-2	R703	B-8	R789	C-7
C110	F-14	C607	F-10	D508	E-3	Q102	H-11	R402	C-2	R704	C-9	R790	C-7
C111	G-14	C701	C-9	D509	F-4	Q501	I-7	R403	D-2	R705	C-9	R792	F-7
C112	H-12	C702	D-4	D511	H-8	Q502	H-8	R404	E-3	R706	C-9	R901	H-3
C113	H-12	C703	C-4	D512	H-11	Q503	I-6	R405	E-2	R708	B-6	R902	L-7
C114	J-11	C704	C-4	D513	E-3	Q504	J-9	R406	F-2	R709	B-6	R903	J-6
C115	H-13	C705	B-5	D701	B-9	Q505	D-3	R407	E-2	R710	B-6	R904	H-4
C116	F-12	C706	B-5	D702	B-9	Q506	C-3	R408	D-1	R711	C-6	R905	I-3
C119	H-12	C707	E-5	D703	B-8	Q507	C-3	R409	D-2	R712	C-7	R906	J-5
C120	N-10	C708	D-8	D704	B-8	Q508	I-9	R410	C-4	R713	B-7	R907	I-8
C121	N-12	C709	D-8	D705	A-8	Q601	G-10	R411	E-4	R714	B-3	R991	I-2
C122	I-13	C710	E-4	D706	B-8	Q701	A-9	R412	E-3	R715	A-5	RP901	K-8
C123	I-12	C711	D-5	D707	B-8	Q702	A-9	R414	H-11	R716	C-5	S401	G-11
C124	H-13	C712	E-5	D708	D-9	Q703	B-8	R415	E-2	R717	B-4	SF101	K-12
C125	M-13	C713	E-6	D709	B-5	Q704	C-9	R416	F-1	R718	B-4	T551	M-3
C201	F-11	C715	E-7	D710	B-5	Q705	K-11	R501	H-11	R719	E-6	T552	H-7
C202	F-10	C716	F-7	D711	K-11	Q901	J-8	R502	H-11	R720	E-6	T901	M-10
C205	H-14	C721	E-4	D712	K-13	R101	I-12	R503	H-11	R721	E-6	TP-0C	E-6
C206	F-10	C724	K-10	D713	K-13	R102	I-13	R504	I-8	R722	E-6	TP-33	B-1
C216	F-12	C725	K-13	D714	I-9	R103	I-13	R505	I-7	R723	E-6	VR101	I-12
C401	H-11	C726	M-13	D715	E-4	R104	H-13	R506	G-7	R724	E-6	VR201	G-10
C402	H-11	C727	M-13	D716	K-9	R105	H-12	R507	G-8	R725	E-7	VR301	E-13
C403	C-2	C728	L-13	D717	C-8	R106	H-13	R508	G-8	R726	E-7	VR401	F-2
C404	C-2	C729	K-13	D721	F-5	R107	F-13	R509	I-3	R727	E-7	VR602	E-12
C405	C-2	C730	L-12	D901	J-8	R108	G-14	R510	G-4	R728	E-7	X101	F-12
C406	C-1	C732	J-9	D902	K-7	R109	F-14	R511	I-2	R734	E-7	X601	G-11
C408	D-1	C733	K-10	DG-COIL	J-7	R110	F-14	R512	J-2	R735	G-9	X701	C-5
C409	D-1	C734	J-10	DY-H	D-6	R111	H-14	R513	J-2	R736	C-7		
C410	E-2	C735	L-13	DY-V	F-1	R112	I-13	R514	J-1	R737	C-7		
C411	E-1	C738	E-4	F901	M-8	R113	H-12	R515	G-1	R738	C-7		
C412	D-2	C739	B-6	HA	B-6	R114	H-10	R516	G-1	R739	C-8		
C413	C-2	C740	B-6	HB	B-2	R115	H-12	R518	C-3	R740	D-4		
C415	H-10	C741	B-6	IC101	G-12	R116	F-12	R519	C-3	R741	H-8		
C502	H-11	C742	B-6	IC3A1	H-3	R117	H-10	R520	C-3	R744	H-9		
C503	I-7	C901	N-7	IC3A2	D-3	R118	L-11	R521	B-3	R745	K-11		
C504	I-8	C902	G-3	IC3A3	C-8	R119	I-12	R522	C-3	R746	K-11		
C505	H-6	C903	G-4	IC401	C-2	R121	J-11	R523	C-3	R747	M-12		
C506	I-5	C904	J-4	IC701	D-6	R122	I-12	R524	C-3	R749	M-13		
C507	H-4	C905	J-6	IC702	D-4	R124	I-11	R525	E-3	R752	L-13		
C508	H-2	C906	K-7	IC703	D-8	R126	H-12	R526	E-3	R753	L-13		
C509	H-2	C907	J-7	IC704	M-12	R201	E-12	R527	D-3	R754	L-13		
C510	H-2	C908	K-5	IC705	J-10	R202	F-12	R528	D-3	R756	L-12		
C511	F-2	C909	I-3	IC901	N-6	R203	F-12	R529	H-8	R757	L-13		

\* Located on  
bottom of board

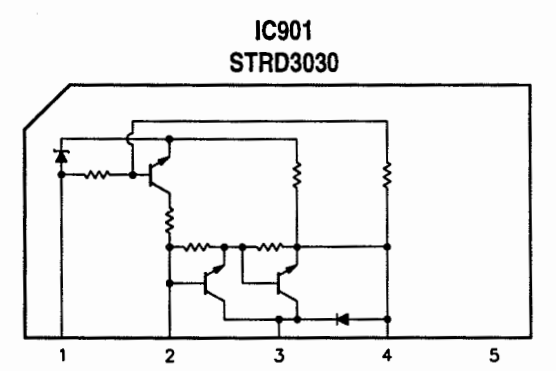
IC FUNCTIONS continued



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

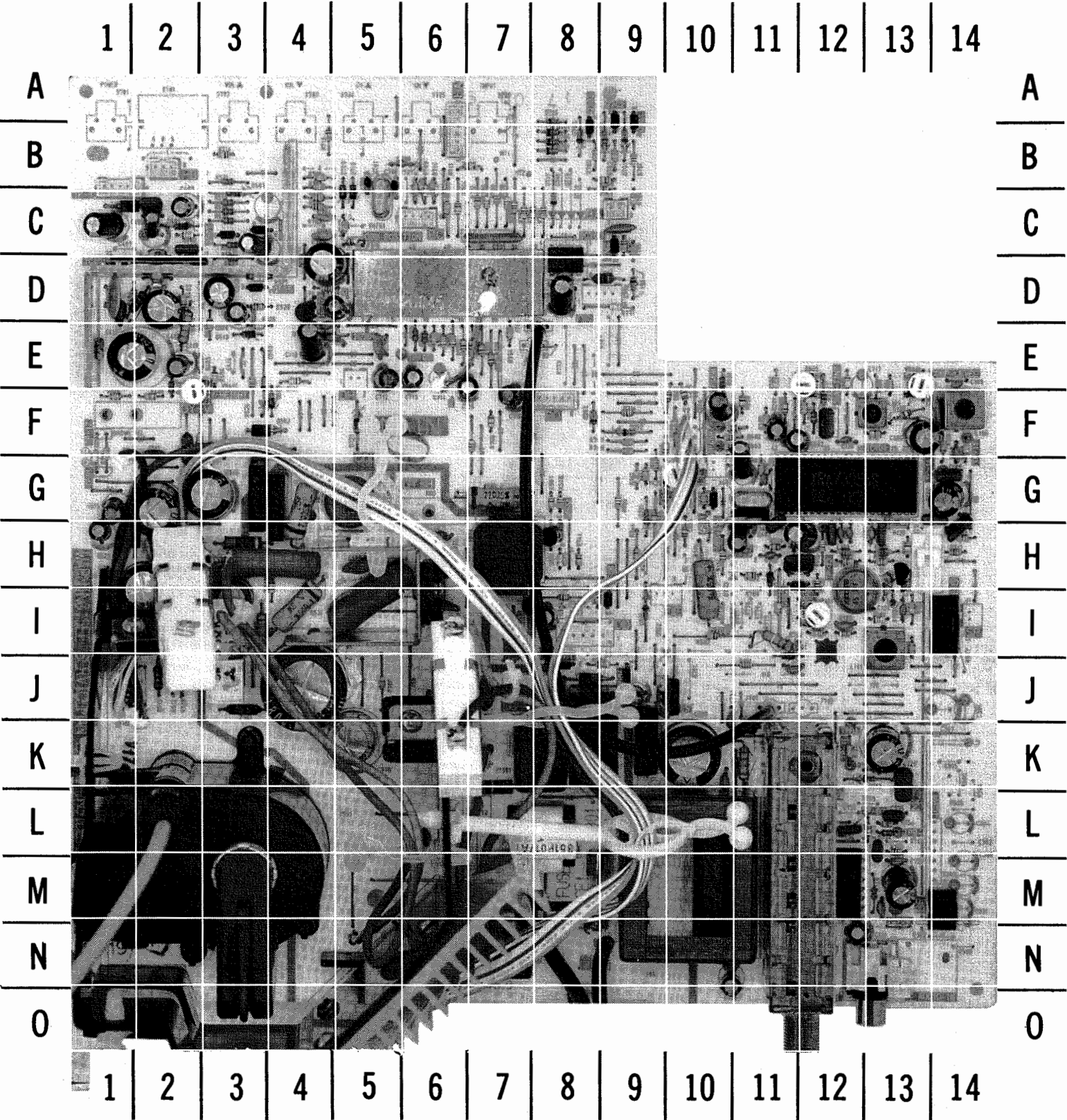
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MITSUBISHI

MODEL CS-20SX1 (CHASSIS XL-B-CSX1)

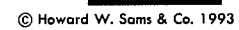
MAIN BOARD



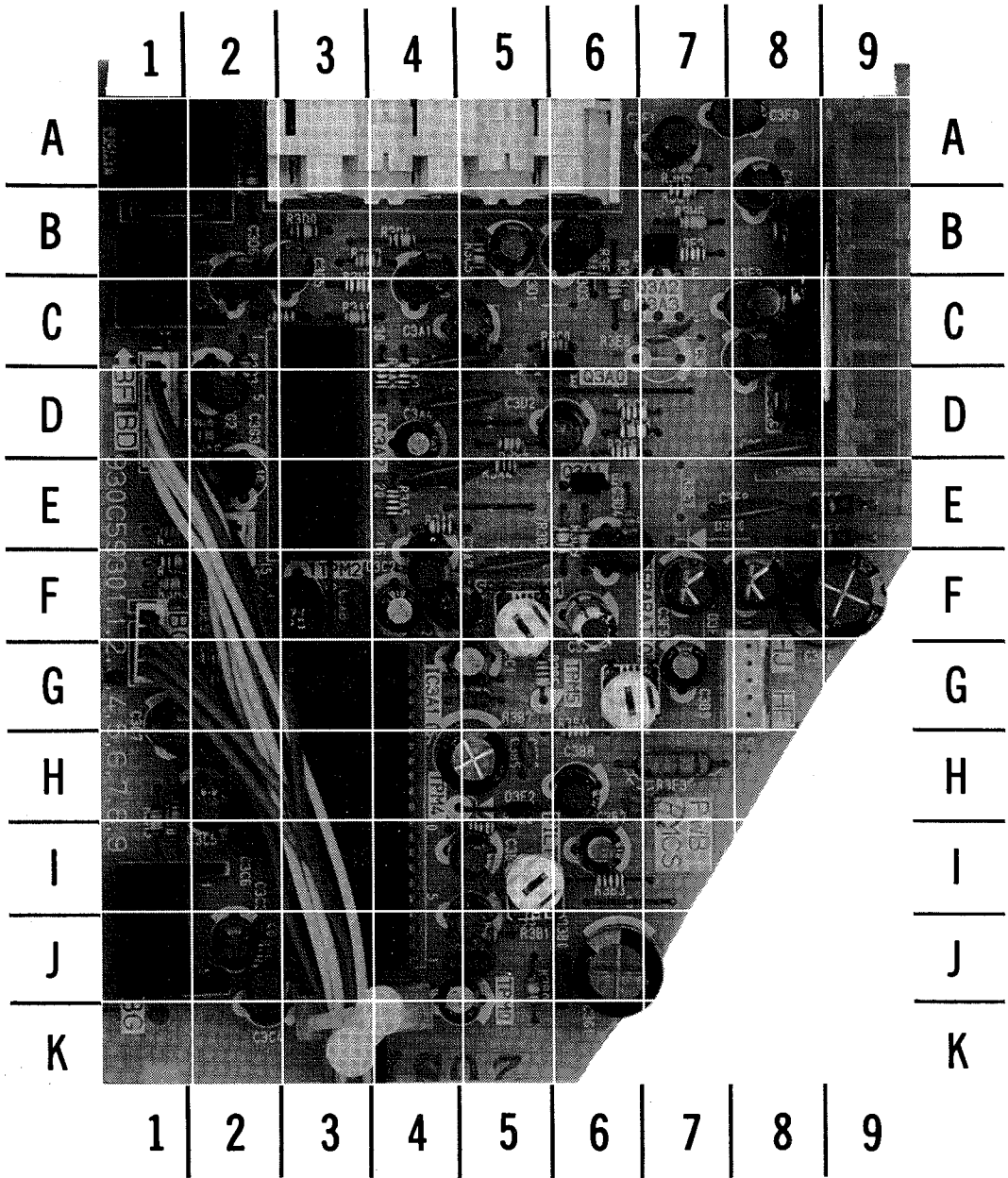
A HOWARD W. SAMS GRIDTRACE™ PHOTO



SEE IC101  
PIN 25  
PAGE 2B



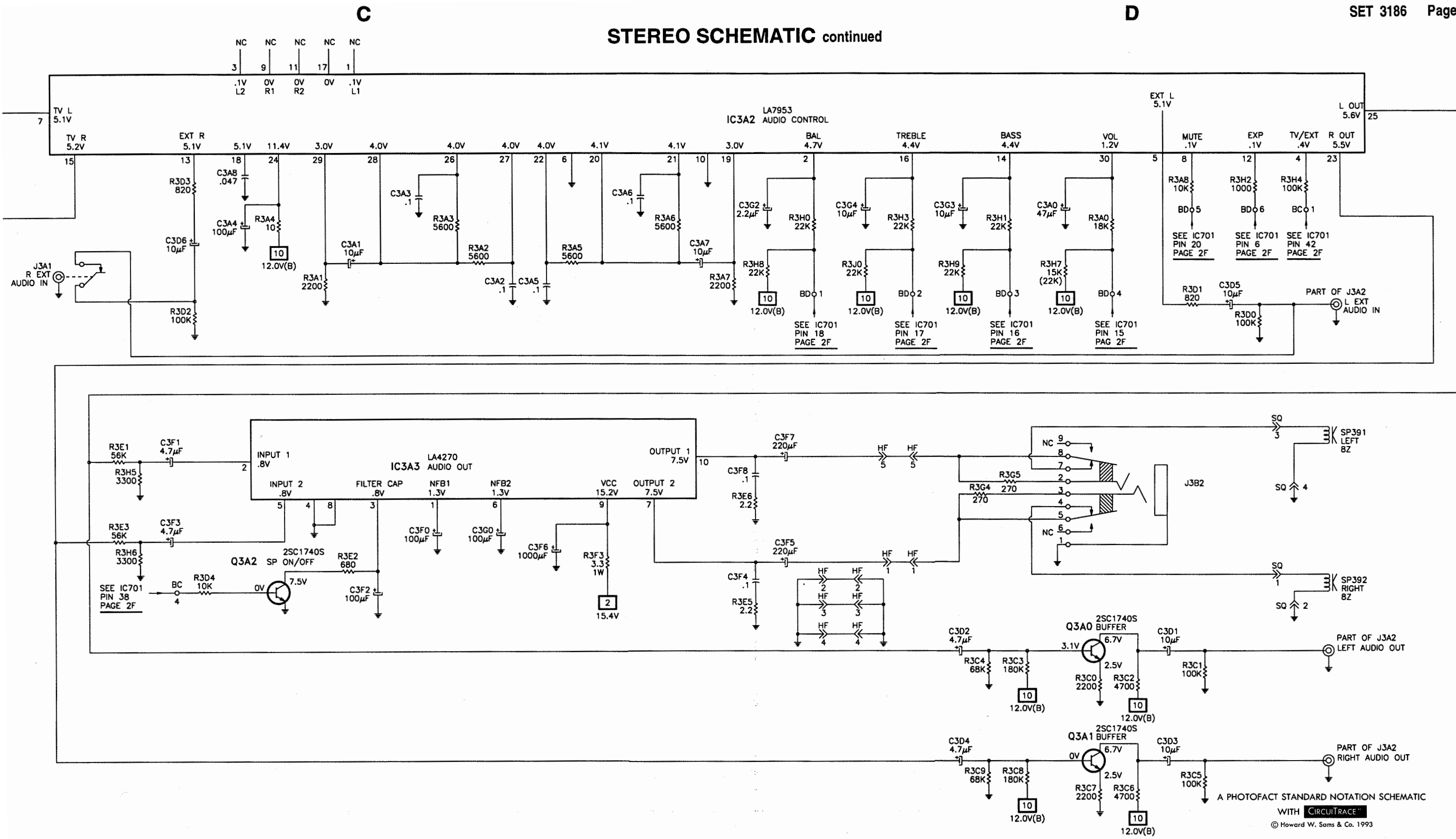
MCS BOARD



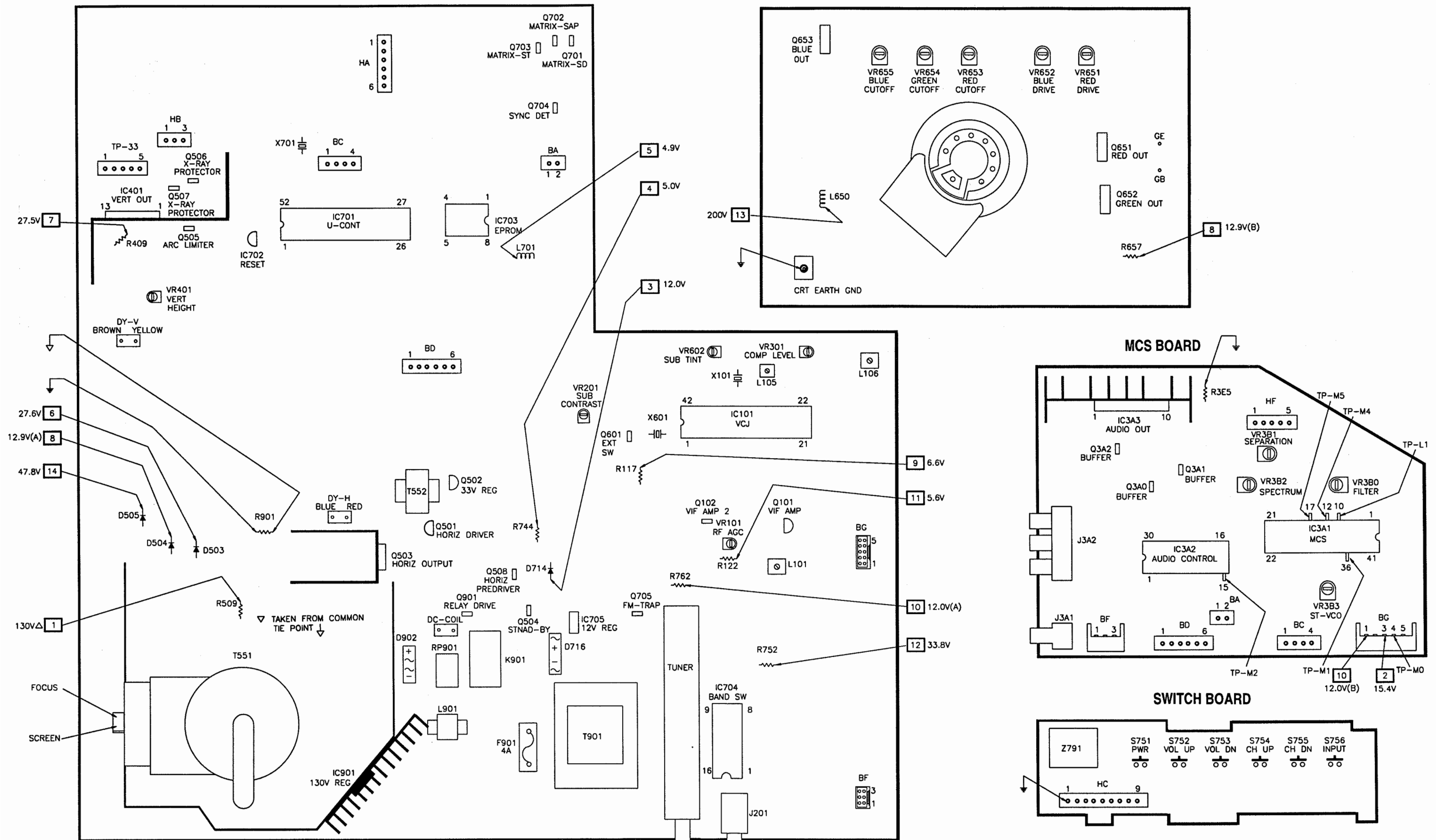
MCS BOARD, GRIDTRACE LOCATION GUIDE

BA	E-2	C3C2	F-4	C3G3	E-2	R3B8	H-2	R3F3	H-7
BC	G-1	C3C3	J-2	C3G4	F-4	R3B9	J-2	R3F4	I-2
BD	B-1	C3C4	J-2	D3F2	H-5	R3C0	C-6	R3H0	D-1
BF	B-1	C3C5	H-2	HF	G-8	R3C1	B-7	R3H1	E-1
BG	J-1	C3C6	I-2	J3A1	A-1	R3C2	D-6	R3H2	E-1
C3A0	B-4	C3C7	G-1	J3A2	A-4	R3C3	D-6	R3H2	F-1
C3A1	C-5	C3C9	F-3	Q3A0	C-6	R3C4	D-5	R3H3	F-1
C3A2	C-4	C3D0	F-2	Q3A1	E-6	R3C5	B-5	R3H5	A-7
C3A3	D-4	C3D1	B-5	Q3A2	B-7	R3C6	D-6	R3H6	B-7
C3A4	D-4	C3D2	D-6	R3A0	C-3	R3C7	E-6	R3H7	C-3
C3A5	E-4	C3D3	B-6	R3A1	C-5	R3C8	E-6	R3H8	B-3
C3A6	F-5	C3D4	E-6	R3A2	D-4	R3C9	E-6	R3H9	H-1
C3A7	F-4	C3D5	B-3	R3A3	D-4	R3D0	B-3	R3J0	H-1
C3A8	F-3	C3D6	B-2	R3A4	E-5	R3D1	C-3	TP-L1	I-4
C3B0	J-4	C3F0	A-8	R3A5	E-4	R3D2	A-2	TP-M0	J-1
C3B1	J-6	C3F1	A-7	R3A6	E-4	R3D3	C-2	TP-M1	I-1
C3B2	J-5	C3F2	A-8	R3A7	F-5	R3D4	D-5	TP-M2	F-2
C3B3	J-5	C3F3	C-8	R3A8	D-2	R3E1	C-6	TP-M4	H-4
C3B4	I-5	C3F4	D-8	R3B0	J-5	R3E2	B-7	TP-M5	G-4
C3B5	H-5	C3F5	F-7	R3B1	J-5	R3E3	B-6	VR3B0	I-5
C3B6	H-5	C3F6	F-9	R3B2	I-5	R3E5	E-9	VR3B1	G-6
C3B7	I-6	C3F7	F-8	R3B3	I-6	R3E6	E-9	VR3B2	F-5
C3B8	H-6	C3F8	E-8	R3B4	H-6	R3E9	F-2	VR3B3	G-2
C3B9	G-7	C3G0	C-8	R3B5	G-5	R3F0	F-2		
C3C0	F-6	C3G1	J-6	R3B6	G-5	R3F1	G-2		
C3C1	F-5	C3G2	D-2	R3B7	G-5	R3F2	G-2		

STEREO SCHEMATIC continued



**CRT BOARD**





PARTS LIST

SEMICONDUCTORS					
(Select replacement for best results.)					
Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
D3F2	EQA02-09C	264P463080	NTE5018A	ECG5018A	SK9A1
	RD9.1EB3	-	NTE5018A	ECG5018A	SK9A1
D101	EQA02-09B	246P463070	NTE5018A	ECG5018A	SK9A1
D201 Thru					
D203	1S2471	264P045040	NTE519	ECG519	SK3100
	1S2076A	-	NTE519	ECG519	SK3100
D401	EQA02-10D	246P464060	NTE5019A	ECG5019A	SK10A
D402	S5500D	264P285010	NTE116	ECG116	SK3313
D501, 02	S5500D	264P285010	NTE116	ECG116	SK3313
D503, 04	RU3B	264P102020	NTE552	ECG552	SK3318A
D505	S5500D	264P285010	NTE116	ECG116	SK3313
D506	TVR1G	264P295020	NTE552	ECG552	SK9000
	ES1	-	NTE552	ECG552	SK9000
# D507	HZT33-10	264P244020	NTE615P	ECG615A	SK9976
D508	1S2471	264P045040	NTE519	ECG519	SK3100
	1S2076A	-	NTE519	ECG519	SK3100
D509	EQA02-09A	246P463060	NTE5018A	ECG5018A	SK9A1
	RD9.1EB1	-	NTE5018A	ECG5018A	SK9A1
D511	1S2471	264P045040	NTE519	ECG519	SK3100
	1S2076A	-	NTE519	ECG519	SK3100
D512	EQA02-08C	264P463020	NTE5016A	ECG5016A	SK8A2
	RD8.2EB2	-	NTE5016A	ECG5016A	SK8A2
D513	EQA02-10A	246P464030	NTE5019A	ECG5019A	SK10A
D701 Thru					
D708	1S2471	264P045040	NTE519	ECG519	SK3100
	1S2076A	-	NTE519	ECG519	SK3100
D709, 10	EQA02-05B	264P460050	NTE5009A	ECG5009A	SK4A7
	4.7EB3	-	NTE5009A	ECG5009A	SK4A7
D711	EQA02-05C	264P460060	NTE5010A	ECG5010A	SK5A1
	RD5.1EB1	-	NTE5010A	ECG5010A	SK5A1
D712 Thru					
D714	1S2471	264P045040	NTE519	ECG519	SK3100
	1S2076A	-	NTE519	ECG519	SK3100
# D715	EQA02-05D	-	NTE5010A	ECG5010A	SK5A1
	RD5.1FB2	264P483080	NTE5010A	ECG5010A	SK5A1
D716	RB-151	264P544010	NTE5304	ECG5304	SK3106
D717	1S2471	264P045040	NTE519	ECG519	SK3100
	1S2076A	-	NTE519	ECG519	SK3100
D721	EQA02-05B	264P460050	NTE5009A	ECG5009A	SK4A7
	4.7EB3	-	NTE5009A	ECG5009A	SK4A7
D901	S5500D	264P285010	NTE116	ECG116	SK3313
# D902	RBV-40C	264P512020	NTE5311	ECG5311	SK5031
IC3A1	UPC1871CU	272P351020	-	-	-
IC3A2	LA7953	272P139010	-	-	-
IC3A3	LA4270	272P140010	NTE1798	ECG1798	SK9745
IC101	XRA7305BS	272P837020	-	-	-
# IC401	LA7837	272P239030	-	-	-
# IC701	M3451M8-561SP	274P156010	-	-	-
IC702	PST520E	266P130030	-	-	-
IC703	CAT35C102HP	263P170030	-	-	-
# For SAFETY use only equivalent replacement part.					

SEMICONDUCTORS continued					
(Select replacement for best results.)					
Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
IC704	LA7911	266P197010	-	-	-
IC705	UPC7812	-	NTE966	ECG966	SK3592
	UPC7812H	266P934020	NTE966	ECG966	SK3592
# IC901	STRD3030	-	-	-	-
	STR-D3030	267P925010	-	-	-
Q3A0 Thru					
Q3A3	2SC1740S	-	NTE85	ECG85	SK3122
	2SC1740S-S	260P559030	NTE85	ECG85	SK3122
	2SC1740S-R	-	NTE85	ECG85	SK3122
	2SC2603-E	-	NTE289A	ECG289A	SK9137
	2SC2603-F	-	NTE289A	ECG289A	SK9137
Q101	2SC1906	260P356010	NTE107	ECG107	SK3293
Q102	2SA933S	-	NTE290A	ECG290A	SK9132
	2SA933S-S	260P560040	NTE290A	ECG290A	SK9132
	2SA933-R	-	NTE290A	ECG290A	SK9132
	2SA1115-E	-	NTE290A	ECG290A	SK9138
	2SA1115-F	-	NTE290A	ECG290A	SK9138
Q501	2SC2655-Y	260P325030	NTE293	ECG293	SK3849
Q502	2SA1320	260P469020	NTE288*	ECG288*	SK3434*
	2SA1321	-	NTE288*	ECG288*	SK3434*
# Q503	2SD1878	260P607010	NTE2331	ECG2331	SK10088
Q504, 05	2SA933S	-	NTE290A	ECG290A	SK9132
	2SA933S-R	-	NTE290A	ECG290A	SK9132
	2SA1115-E	260P256030	NTE290A	ECG290A	SK9138
# Q506, 07	2SA933S	-	NTE290A	ECG290A	SK9132
	2SA933S-R	-	NTE290A	ECG290A	SK9132
	2SA1115-E	260P256030	NTE290A	ECG290A	SK9138
Q508	2SC1740S	-	NTE85	ECG85	SK3122
	2SC1740S-E	260P559050	NTE85	ECG85	SK3122
	2SC2603-G	-	NTE289A	ECG289A	SK9137
Q601	2SC1740S	-	NTE85	ECG85	SK3122
	2SC1740S-S	260P559030	NTE85	ECG85	SK3122
	2SC1740S-R	-	NTE85	ECG85	SK3122
	2SC2603-E	-	NTE289A	ECG289A	SK9137
	2SC2603-F	-	NTE289A	ECG289A	SK9137
Q651 Thru					
Q653	2SC3789E	-	NTE157	ECG157	SK3747
	2SC3789-E	260P571010	NTE157	ECG157	SK3747
	2SC3789-D	-	NTE157	ECG157	SK3747
Q701 Thru					
Q705	2SC1740S	-	NTE85	ECG85	SK3122
	2SC1740S-R	-	NTE85	ECG85	SK3122
	2SC1740S-S	260P559030	NTE85	ECG85	SK3122
	2SC2603-E	-	NTE289A	ECG289A	SK9137
	2SC2603-F	-	NTE289A	ECG289A	SK9137
Q901	2SC1740S	-	NTE85	ECG85	SK3122
	2SC1740S-E	260P559050	NTE85	ECG85	SK3122
	2SC2603-G	-	NTE289A	ECG289A	SK9137
# For SAFETY use only equivalent replacement part.					
* Lead configuration may vary from original.					

PARTS LIST continued

MISCELLANEOUS

Item No.	Description	Mfr. Part No.	Notes
# F901	Fuse	283D038070	4 Amp 125VAC Fast Acting
J201	Jack	451C159010	Ext Video In
J3A1	Jack	451C160010	L/R Audio In
J3A2	Jack	451C162010	L/R Audio Out
J3B2	Jack	451C119010	Headphone
# K901	Relay	287P049040	Power
# L501	Ferrite Bead	411P011010	-
# L901	Filter	351P017010	Line
# L991	Degaussing	409B109010	
# P1	Cord AC	242C499040	Polarized
S401	Switch	434C021010	Service
S751	Switch	432P066030	Power
S752	Switch	432P066030	Volume Up
S753	Switch	432P066030	Volume Down
S754	Switch	432P066030	Channel Up
S755	Switch	432P066030	Channel Down
S756	Switch	432P066030	Input
SF101	Filter	296P126010	Saw
SP391, SP392	Speaker	480P653010	2 7/8" X 1 5/8"
		480P653A10	On Unit Number
TU701	U/V Tuner	295P273020 (1)	-
# V251	CRT	251P275040	A51JCC31X
X101	Ceramic	299P170010	Resonator
X601	Crystal	285P029050	3.579MHz
X701	Crystal	285P029030	-
Z791	Preamp	939P296090	Remote
# Z901	Fuse	283P030060	2 Amp 125V AC Fast Acting
	Antenna	281C039010	Rod
	Board	920D341002 (1)	Control
	Board	920D428020 (1)	CRT
	Board	930B560002 (1)	Main
	Board	930D420030 (1)	MCS
	Board	930C593013 (1)	HJ
	CPM	338P016010	-
	Magnet	412D022010	Convergence
	Socket	449C081090	CRT
	Transmitter	290P004010	Remote
	Wedge	641D758010	3 Used

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

CABINET PARTS

Item	Part No.
Cabinet Front Assembly	701B224030
# Cabinet Back	700C144030
# For SAFETY use only equivalent replacement part.	

CONTROLS

(All wattages 1/2 watt or less, unless otherwise listed.)

Item No.	Function	Resistance	Mfr. Part No.
VR3B0	Filter	20K	127C080090
VR3B1	Separation	5000	127C080070
VR3B2	Spectrum	5000	127C080070
VR3B3	ST-VCO	50K	127C091010
VR101	RF AGC	200K	127C081030
VR201	Sub Contrast	100K	127C081020
VR301	Composite	5000	127C080070
VR401	Vert Height	50K	127C081010
VR602	Sub Tint	30K	127C081000
VR651	Red Drive	3000	127C030060
VR652	Blue Drive	3000	127C030060
VR653	Red Cutoff	10K	127C030080
VR654	Green Cutoff	10K	127C030080
VR655	Blue Cutoff	10K	127C030080

COILS & TRANSFORMERS

Item No.	Function	Mfr. Part No.	On-Unit No.
# L491	Yoke 90° Horiz 1.93mH Vert 26.5mH	330P152030	-
# L502	Horiz Lin	333P027060	-
# T551	Horiz Output	334P210010 (1)	-
# T552	Horiz Drive	336P012040	-
# T901	Power	350P571010	-

# For SAFETY use only equivalent replacement part.  
(1) Focus and Screen controls are part of T551.

PARTS LIST continued

RESISTORS

Item No.	Rating	Mfr. Part No.	NTE Part No.
R3B6	56K 1% 1/6W Carbon Film	-	-
R3B7	56K 1% 1/6W Carbon Film	-	-
R3B8	82K 1% 1/6W Carbon Film	-	-
R116	24K 1% 1/6W Carbon Film	-	-
# R117	56 5% 3W Metal Oxide	103C191000	3W056
R202	33K 1% 1/6W Carbon Film	-	-
R205	7500 1% 1/6W Carbon Film	-	-
# R409	1.2 5% 1/4W Carbon Film	103P338010	QW1D2
R415	1500 1% 1/6W Carbon Film	-	-
# R506	220 5% 3W Metal Oxide	103P291070	3W122
# R509	3.3 10% 5W Wirewound	109D055060	5W3D3
# R510	270 5% 3W Metal Oxide	103C291080	3W127
# R511	1.2 5% 1/4W Carbon Film	103P338010	QW1D2
# R512	2.7 5% 1/4W Carbon Film	103P338050	QW2D7
# R513	1.2 5% 1/4W Carbon Film	103P338010	QW1D2
# R514	1.2 5% 1/4W Carbon Film	103P338010	QW1D2
# R515	39K 5% 1/6W Carbon Film	103P714040	-
# R516	47K 5% 1/6W Carbon Film	103P714050	-
# R518	18K 1% 1/4W Metal Oxide	103P465050	-
# R519	2200 1% 1/4W Metal Oxide	103P463030	-
# R520	27K 1% 1/4W Metal Oxide	103P465090	-
# R521	2200 1% 1/4W Metal Oxide	103P463030	-
# R522	27K 1% 1/4W Metal Oxide	103P465090	-
# R523	13K 1% 1/4W Metal Oxide	103P465020	-
# R524	6800 1% 1/4W Metal Oxide	103P464050	-
# R531	470 5% 3W Metal Oxide	103C292010	3W147
# R538	2.7 5% 1/4W Carbon Film	103P338050	QW2D7
# R651	12K 5% 3W Metal Oxide	103C193080	3W312
# R661	12K 5% 3W Metal Oxide	103C193080	3W312
# R663	12K 5% 3W Metal Oxide	103C193080	3W312
# R670	1 5% 2W Fusible	103P438000	F2W1D0
R719	8200 1% 1/6W Carbon Film	-	-
R720	8200 1% 1/6W Carbon Film	-	-
# R746	150 5% 1W Metal Oxide	103C171050	1W115
R749	2700 1% 1/6W Carbon Film	-	-
R752	10K 1% 1/6W Carbon Film	-	-
# R762	4.7 5% 1W Metal Oxide	103C178080	1W4D7
# R901	4.7M 10% 1/2W Carbon Film	109D036020	HW547
# R902	820K 10% 1/2W Carbon Film	101P824030	HW482
# R903	2.7 10% 10W Wirewound	109D067070	10W2D7
# R904	470K 5% 1/6W Carbon Film	103P715070	-
# R905	12K 5% 1W Metal Oxide	103C173080	1W312
# R906	470 5% 1/6W Carbon Film	103P712010	-
# R991	150 5% 20W Wirewound	109D104010	-
# RP901	7.7 Cold PTC	265P047040	-

# For SAFETY use only equivalent replacement part.

COILS (RF-IF)

Item No.	Rating	Mfr. Part No.
L101	Trap	320P026030
L102	1.8uH	325C120040
L103	1.2uH	325C120020
L104	1.5uH	325C120030
L105	VIF	323P172010
L106	45.MHz	323P171010
# L504	1.0uH	321C030010
L650	180uH	325C162080
L651	10uH	325C111030
L652	10uH	325C111030
L653	10uH	325C111030
L701	10uH	325C111030

# For SAFETY use only equivalent replacement

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

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CAPACITORS

Item No.	Rating	Mfr. Part No.
C104	180pF N075 5%	-
# C505	330pF 2KV 10%	154P241020
# C506	.0082 1.6KV 5%	172P171020
# C507	.56 200V 5%	189P071010
# C521	680pF 2KV 10%	154P251060
C654	.001 2KV 10%	-
C703	10pF N750	-
C704	22pF N750	-
C705	22pF NPO	-
C706	22pF NPO	-
C737	560pF X 4 50V	149D811040
# C901	.22 250VAC 20%	189P133080
# C902	.022 250VAC 20%	189P133020
# C903	.01 250VAC 20%	189P133010
# C905	.0022 500V +100% -0%	142P014000
# C906	.0022 250VAC +80% -20%	189P060060
# C907	.0022 250VAC +80% -20%	189P060060

# For SAFETY use only equivalent replacement part.

ELECTROLYTIC CAPACITORS

Item No.	Rating	Mfr. Part No.
# C517	1 50V 20%	181P185020
# C518	33 50V 20%	181P355070
# C519	100 50V 20%	181P186000
# C523	22 50V 20%	181P355060
# C904	330 180V 20%	185D064040
# C908	47 160V +30% -10%	181P191020
# C909	10 160V 20%	181P188060

# For SAFETY use only equivalent replacement part.

mitsubishi

MODEL CS-20SX1 (CHASSIS XL-B-CSX1)

## NOTES

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MODEL CS-20SX1 (CHASSIS XL-B-CSX1)