SAFETY PRECAUTIONS

SERVICE WARNING

Only qualified service technicians who are familiar with safety checks and guidelines should perform service work. Before replacing parts, disconnect power source to protect electrostatically sensitive parts. Do not attempt to modify any circuit unless so recommended by the manufacturer. When servicing the receiver, use an isolation transformer between the line cord and power receptacle.

SERVICING THE HIGH VOLTAGE AND CRT

Use EXTREME CAUTION when servicing the high voltage circuits. To discharge static high voltage, connect a 10K ohms resistor in series with a test lead between the receiver and CRT anode lead. DO NOT lift the CRT by the neck. Always wear shatterproof goggles when handling the CRT 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 CRT is the only potential source of X-rays. Keep an accurate high voltage meter available at all times. Check meter calibration periodically. Whenever servicing a receiver, check the high voltage at various brightness levels to be sure it is regulating properly. 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. When troubleshooting a receiver with excessive high voltage, avoid close contact with the CRT. DO NOT operate the receiver longer than necessary. To locate the cause of excessive high voltage, use a variable AC transformer to regulate voltage. In present receivers, 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.

GENERAL GUIDELINES

Perform a final SAFETY CHECK before returning receiver to customer. Check repaired area for poorly soldered connections, and check entire circuit board for solder splashes. Check inner board wiring for pinched wires or wires contacting any high wattage resistors. 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.

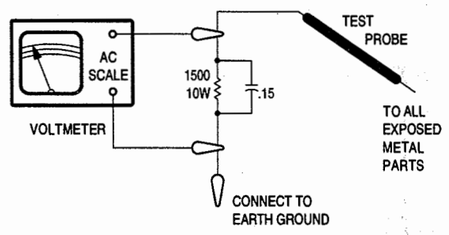
SAFETY CHECKS -- FIRE AND SHOCK HAZARD

Cold Leakage Checks for Receivers with Isolated Ground

Unplug the AC cord, connect a jumper across the plug prongs, and turn the power switch on (if applicable). Use an ohmmeter to measure the resistance between the jumped 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 1M ohms and 5.2M ohms. Parts without a return path must measure infinity.

Hot Leakage Current Check

Plug the AC cord directly into an AC outlet. DO NOT use an isolation transformer. Use a 1500 ohms, 10W resistor in parallel with a .15µF capacitor to connect between any exposed metal parts on the receiver and a good earth ground. (See figure below.) Use an AC voltmeter with at least 5000 ohms per volt sensitivity to measure the voltage across the resistor. Check all exposed metal parts and measure voltage at each point. Voltage measurements should not exceed .75VAC, 500µA. Any value exceeding this limit constitutes a potential shock hazard and must be corrected. If the AC plug is not polarized, reverse the AC plug and repeat exposed metal part voltage measurement at each point.



TEST JIG HOOKUP

Chek-A-Color Function	Adapter No.	PC Board Plug No.	Pin	Color
CRT	B239	P602 (K)	1	Red
Yoke	D4137		2	Blue
Yoke Setting	YP1		4	Yellow
Comments	Focus Tap		5	Green

HIGH VOLTAGE SHUTDOWN TEST

Check for 11.4V at pin 3 of P651. Apply an external 13.8V to pin 3 of P651. The receiver should go into shutdown. If the receiver fails to go into shutdown, the high voltage shutdown circuit requires repair. To return the receiver to normal operation, remove the power and short pin 1 of P651 to pin 2 of P651. Restore power and check for normal operation. Remove short.

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SET 3790

MODELS 27H-S100, 27H-S120, CH27S12

SHARP

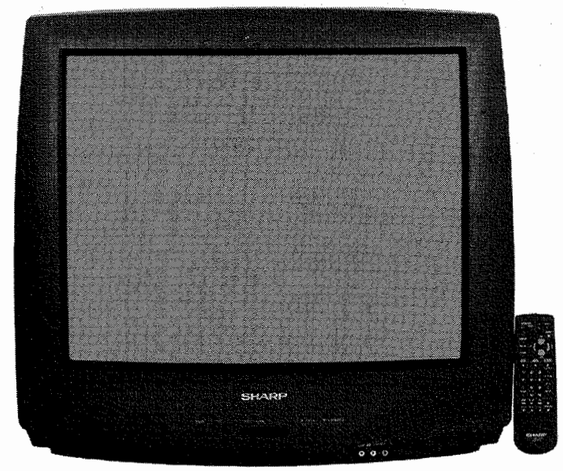
PHOTOFACT® Technical Service Data

INDEX

For Supplier Address,
See PHOTOFACT Annual Index

SHARP

Models 27H-S100, 27H-S120, CH27S12



Model 27HS100

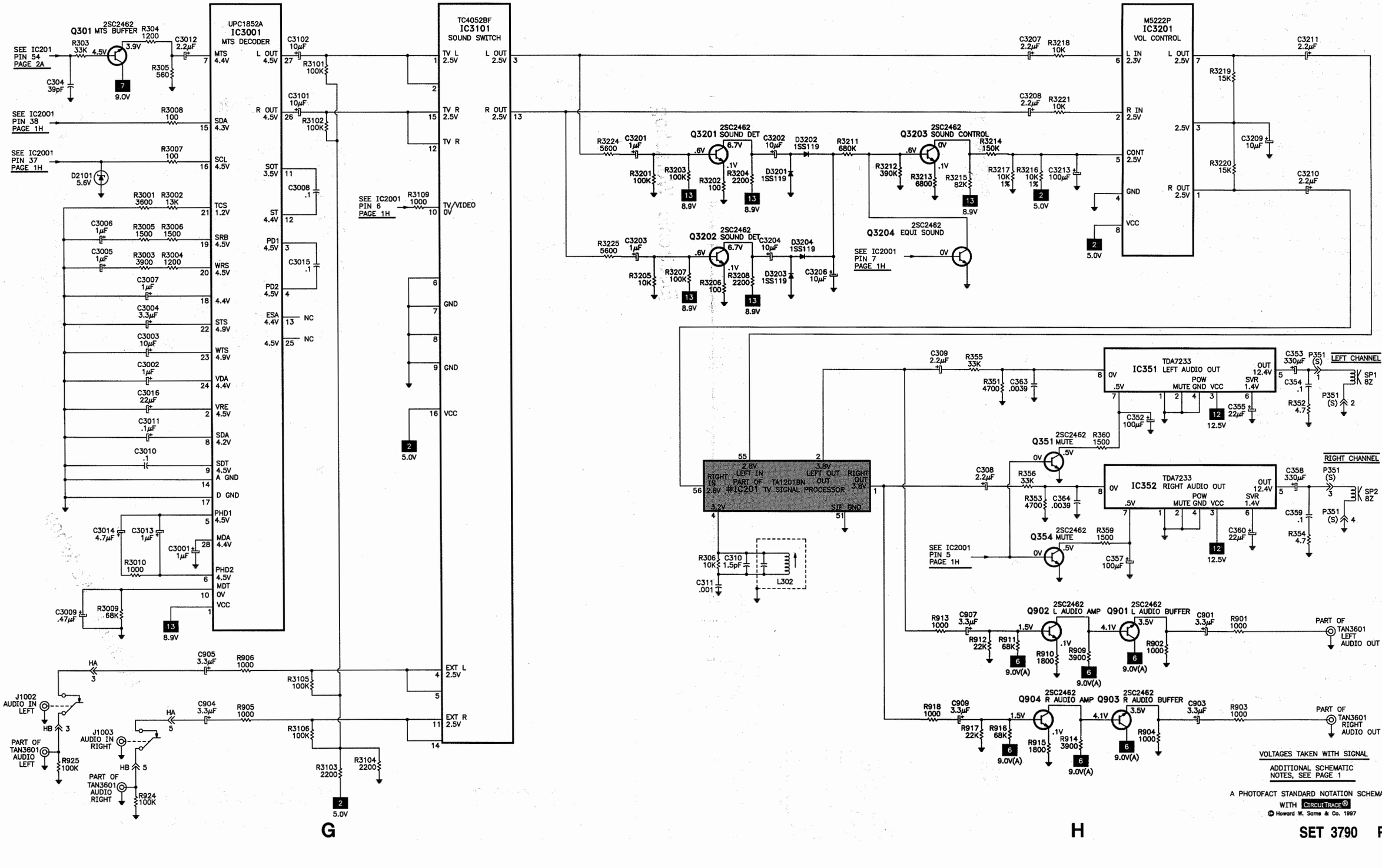
Complete coverage for servicing a television receiver...

- Schematics
- Parts list
- Component locations
- Troubleshooting guide

HOWARD W. SAMS & COMPANY
MARCH 1997 SET 3790

3790

AUDIO SCHEMATIC

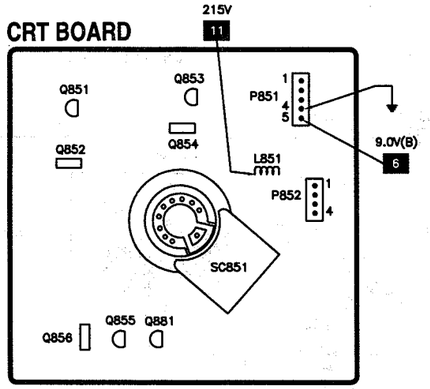


G H

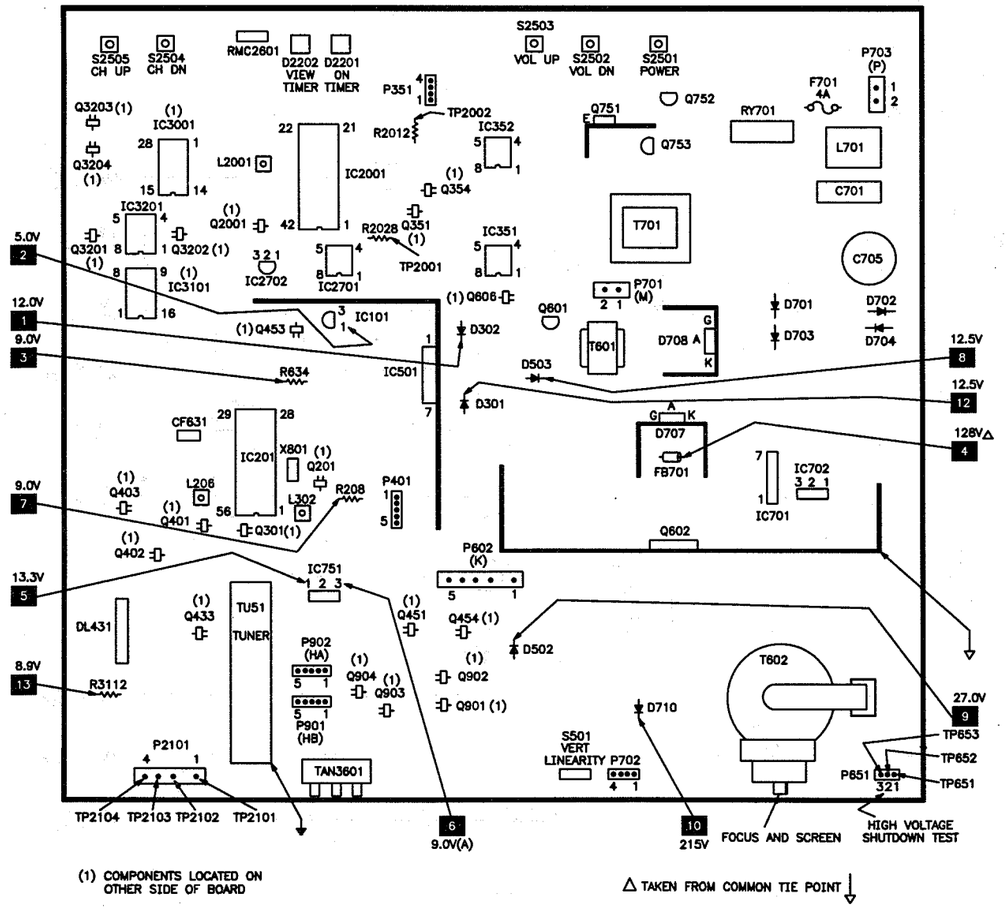
SHARP MODELS 27H-S100, 27H-S120, CH27S12

PLACEMENT CHART

CRT BOARD



MAIN BOARD

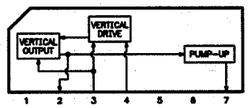


(1) COMPONENTS LOCATED ON OTHER SIDE OF BOARD

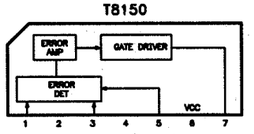
△ TAKEN FROM COMMON TIE POINT

IC FUNCTIONS

IC501 TA8427K

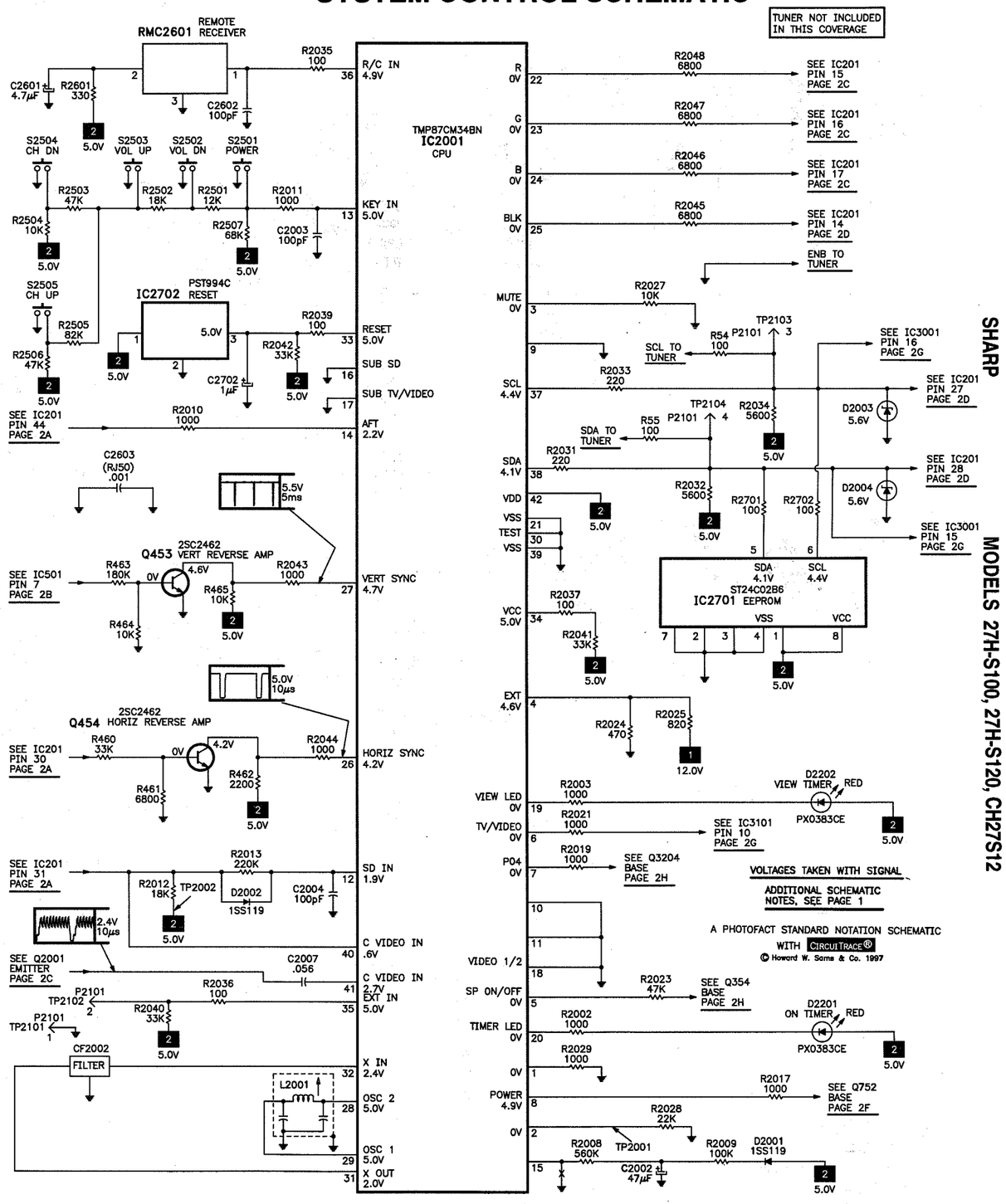


IC701 T8150



SYSTEM CONTROL SCHEMATIC

TUNER NOT INCLUDED IN THIS COVERAGE



VOLTAGES TAKEN WITH SIGNAL

ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

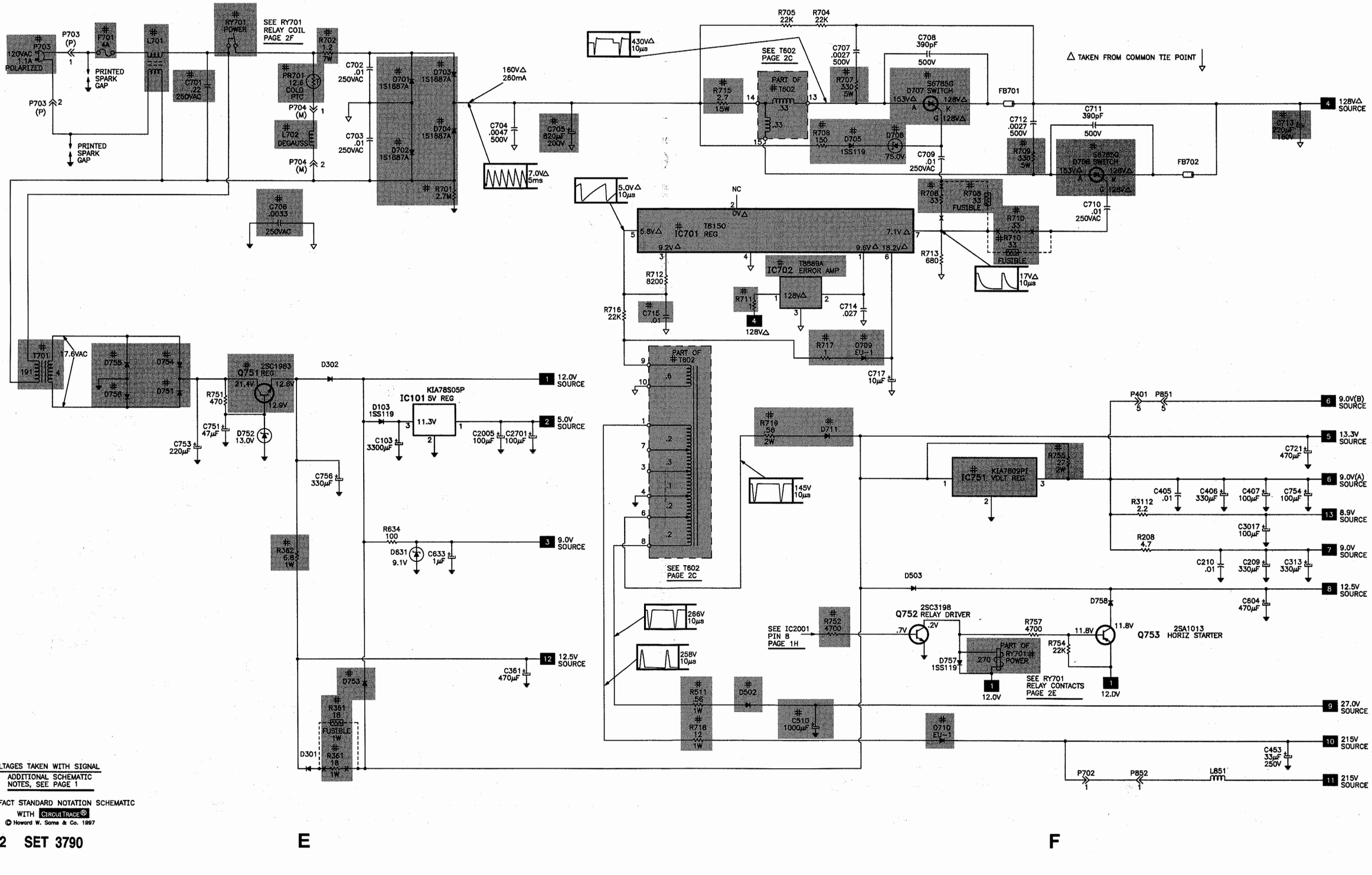
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

SHARP

MODELS 27H-S100, 27H-S120, CH27S12

H

POWER SUPPLY SCHEMATIC



VOLTAGES TAKEN WITH SIGNAL
ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

E

F

MISCELLANEOUS ADJUSTMENTS

HIGH VOLTAGE CHECK

Tune in a picture. Set brightness, color, picture, and screen control to minimum. Connect a high voltage probe to CRT anode. High voltage should measure 26kV to 28kV.

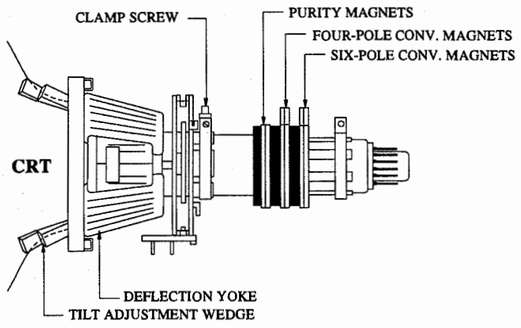
CONVERGENCE

Operate the receiver for 15 minutes. Connect a color bar generator to the antenna terminals and tune in a dot pattern. Adjust the 4-pole magnet tabs to converge the red and blue dots at the center of the screen. Adjust the 6-pole magnet tabs 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. The 4-pole and 6-pole magnets interact, repeat adjustment until center convergence is correct.

Tune in a crosshatch pattern and remove the rubber wedges between the deflection yoke and the CRT. Tilt the deflection yoke up or down to converge the vertical lines at top and bottom of screen and the horizontal lines at the right and left sides of the screen. Tilt the deflection yoke right or left to converge horizontal lines at top and bottom of screen and the vertical lines at the right and left sides of the screen. Repeat convergence procedure if necessary to obtain best overall convergence. Apply adhesive to wedges and carefully replace on the CRT.

CRT NECK ASSEMBLY



SERVICE INFORMATION

Service mode adjustments are required if IC201, IC2701, or CRT is replaced. CRT replacement requires CRT adjustments only. Service mode adjustments should not be required if only IC2001 is replaced.

Perform the following after replacement of IC201. Check the voltage at pin 3 of P651. It should measure 11.4V. Perform the "High Voltage Shutdown Test".

Perform the following after replacement of IC2701. Press and hold the channel up and down buttons on the front of the receiver for more than 2 seconds. This will write the initial values into IC2701. Refer to the "Service Mode Adjustment Chart".

Entering Service Mode

Turn receiver on and use reset function in the video adjustment menu to ensure that customer controls are in their proper reset position. Momentarily short test points TP2001 and TP2002 to enter the service mode. The next time TP2001 and TP2002 are shorted, MTS mode is entered. The third time TP2001 and TP2002 are shorted, the service mode is exited.

When in the service mode a letter S with a number is displayed in the lower left part of the screen and a letter D with a number is displayed in the lower right part of the screen. When in the MTS mode a letter M with a number is displayed in the lower left part of the screen and a letter D with a number is displayed in the lower right part of the screen. The S or M number is the service adjustment and it is changed by pressing the channel up / down buttons on the receiver or remote transmitter. The D number is the present data value of the service adjustment and it can be changed by pressing the volume up / down buttons on the receiver or remote transmitter. For a complete listing of the service adjustments, refer to the "Service Mode Adjustment Chart".

RF AGC

Tune in a picture. Enter the service mode and select S08. Set the data value to a point where no snow (noise) appears in picture. Exit the service mode to select another channel. Check all channels for proper operation.

VCO

Connect a digital voltmeter to pin 44 of IC201 and ground. Tune in a local channel. Enter the service mode and select S10. Set the data value to obtain 2.2V on the digital voltmeter.

White Balance

Operate the receiver for 15 minutes. Enter the service mode and select S03. Set the data value to 0. Set brightness for a visible raster. Alternately adjust data value of S14 and S15 until a good gray scale with normal white is obtained. Select S03. Set the data value to achieve normal color level.

Gray Scale

Connect a digital voltmeter across R852 on the CRT board. Tune in an active channel. Set color, brightness, and picture to minimum. Enter the service mode and select S03. Set the data value to 0. Select S08, record the data value, and set the data value to 0. Select S04, adjust the data value to obtain .26V on the digital voltmeter. Adjust screen control, if necessary, to obtain a barely visible raster. Adjust S11, S12, and S13 for a good gray scale with normal white at high and low brightness. Select S08 and set the data value to that which was recorded above. Select S03 and adjust the data value to achieve normal color level. Adjust screen control for normal brightness.

MTS ADJUSTMENTS

MTS Level

Connect an MTS/TV stereo generator to the antenna input jack. Select pilot, 300Hz audio frequency, and right modulating signal. Enter the MTS adjustment mode (see "Entering Service Mode" section) and select M01. Connect an oscilloscope to pin 26 of IC3001. Adjust the data value for 1.4Vp-p.

Stereo VCO/SAP VCO

Disconnect the antenna. Connect a 2.2µF 50V electrolytic capacitor to pin 7 of IC3001 and ground. Enter the MTS adjustment mode (see "Entering Service Mode" section) and select M02. Connect a frequency counter to pin 26 of IC3001. Adjust the data value for 15.734kHz ± .1kHz. Select M06 and adjust the data value for 78.67kHz ± .5kHz.

Separation

Connect an MTS/TV stereo generator to the antenna input jack. Select pilot, 300Hz audio frequency, and right modulating signal. Enter the MTS adjustment mode (see "Entering Service Mode" section) and select M04. Connect an oscilloscope to pin 27 of IC3001. Adjust the data value for minimum amplitude of the waveform. Select 8kHz audio frequency on the generator. Select M05 and adjust the data value for minimum amplitude of the waveform.

Filter

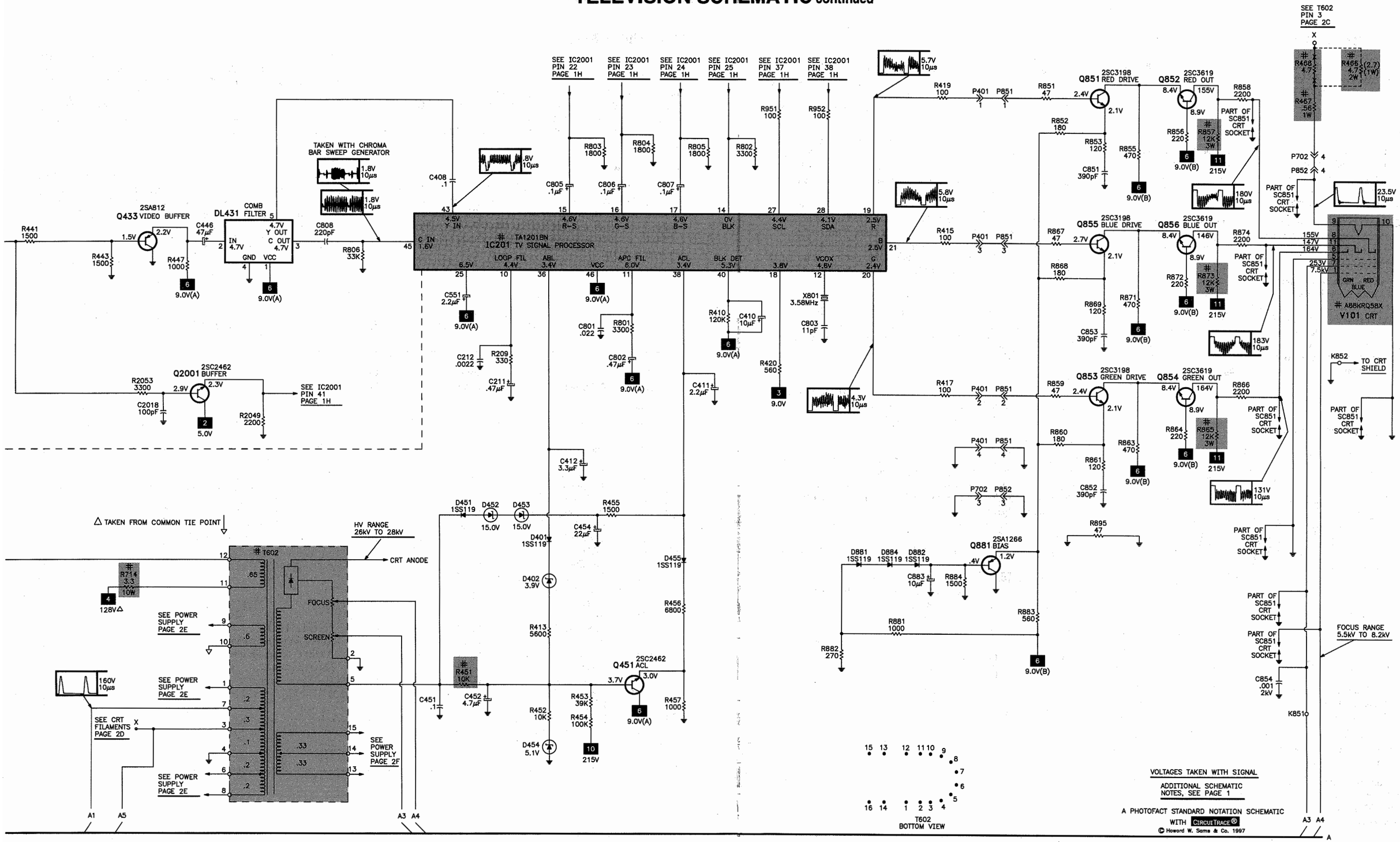
Connect an MTS/TV stereo generator to the antenna input jack. Select pilot, 300Hz audio frequency, and L-R modulating signal. Enter the MTS adjustment mode (see "Entering Service Mode" section) and select M03. Connect a DC voltmeter to pin 11 of IC3001. Adjust the data value for 3.4V.

Note: This is a coarse adjustment. It may be necessary to set the data value to the on-set value for proper audio.

SERVICE MODE ADJUSTMENT CHART

Service No.	Adjustment	Data Range	Initial Value	On-Set Value	Notes
S00	Default	-	-	-	-
S01	Sub Picture	00-7F	55	56	Set brightness to minimum, picture to maximum. Adjust for normal contrast range.
S02	Sub Tint	00-7F	46	46	Adjust for normal flesh tones.
S03	Sub Color	00-7F	32	36	Adjust for normal color level.
S04	Sub Brightness	00-7F	40	50	Adjust for normal brightness level.
S05	Sharpness	00-3F	24	24	Adjust for proper sharpness of screen. Center of range is 28.
S06	Vertical Phase	00-07	00	00	Must be set to 00.
S07	Horizontal Position	00-1F	12	12	Adjust for best horizontal centering on screen.
S08	RF AGC	00-3F	23	21	0 produces a black raster.
S09	Vertical Size	00-3F	20	16	Adjust for proper vertical size with best linearity.
S10	VCO	00-3F	3C	31	-
S11	Red Cutoff	00-FF	00	0A	-
S12	Green Cutoff	00-FF	00	00	-
S13	Blue Cutoff	00-FF	00	07	-
S14	Green Gain	00-FF	7F	72	-
S15	Blue Gain	00-FF	7F	7C	-
S16	3.58MHz Trap	00-01	00	01	00= On, 01= Off
S17	Balance	00-3F	20	20	Adjust for proper audio balance. Center of range is 20.
S18	Closed Caption Position	00-7F	17	17	Adjust to center the black box on the screen.
S19	Option	00-FF	00	BF	Must be set to 82.
M01	MTS Level	00-3F	1B	26	-
M02	Stereo VCO	00-3F	16	17	-
M03	Filter	00-3F	15	13	-
M04	Low Separation	00-3F	1B	15	-
M05	High Separation	00-3F	1C	3B	-
M06	SAP VCO	00-3F	2B	1D	-

TELEVISION SCHEMATIC continued



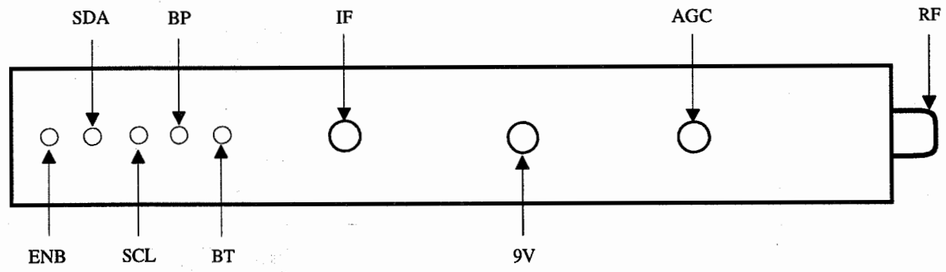
TUNER INFORMATION

TUNER VOLTAGE CHART

Pin	VHF Low Band	VHF High Band	UHF Band
ENB	0V	0V	0V
SDA	4.2V	4.2V	4.2V
SCL	4.3V	4.3V	4.3V
BP	5.0V	5.0V	5.0V
BT	32.4V	32.4V	32.4V
IF	0V	0V	0V
9V	9.0V	9.0V	9.0V
AGC	2.8V	3.0V	3.0V

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



SCHEMATIC NOTES

#	**For SAFETY use only equivalent replacement part, see parts list.**
-x-	Circuitry not used in some versions.
---	Circuitry used in some versions.
⏚	Ground
⏚	Chassis ground
⏚	Common tie point
△	Taken from common tie point
3	Schematic CIRCUITRACE ® Voltage source tie point.
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 colorbar signal. Waveform voltage is peak to peak. Timebase is per division. Waveforms shown at 10 divisions.
Supply voltages maintained as seen at input.
Voltages measured with digital meter and a 1000µV RF signal, with colorbar pattern, applied to antenna terminal.
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 1/2W 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.

TROUBLESHOOTING

POWER SUPPLY

Check F701. If F701 is open, check C701 thru C705, D701 thru D704, and T701. Apply 120VAC and check for 5.0V at pin 1 of IC101. If 5.0V is missing, check T701, D751, D754, D755, D756, Q751, D752, D103, and IC101. Turn receiver on and check for 160V* at the cathode of D704. If 160V* is missing, check R702, C705, and RY701. If 160V* is present, check for 128V* at the cathode of D707. If 128V* is missing, check D707, D708, pins 13, 14, and 15 of T602, IC701, and IC702. If 128V* is present, refer to the "Horizontal" section of this Troubleshooting guide.

* Taken from common tie point.

HIGH VOLTAGE SHUTDOWN

CAUTION: Care should be taken in defeating the high voltage shutdown circuit, as this may cause excessive X-radiation and damage to the CRT, T602, and associated components.

The high voltage from T602 is monitored and rectified by D651. Should the high voltage increase, the rectified voltage at the cathode of D651 will also increase and trigger pin 29 of IC201 (via D652, D653, and D654) into shutting down the receiver. To troubleshoot, disconnect the cathode of D651. Use a variable AC transformer for AC power, start at 90VAC and increase as necessary to isolate and correct the defect.

Voltage Taken in Shutdown

IC201 Pin 29 4.0V

HORIZONTAL

To determine if the receiver is in shutdown, refer to the "High Voltage Shutdown" section of this Troubleshooting guide. If receiver is not in shutdown, inject a horizontal signal at the base of Q602. If horizontal sweep returns, check Q601, Q606, T601, and pins 26, 30 thru 34 of IC201. If horizontal sweep is still missing, check Q602, T602, D502, D503, D710, D711, and IC751 for defects. The high voltage rectifier is part of T602 and may be defective. Poor horizontal linearity or foldover problems may be caused by C607, C608, C612, and C614.

VERTICAL

Inject a vertical drive signal at pin 4 of IC501. If vertical deflection returns, check pins 22, 23, and 24 of IC201. If vertical deflection does not return, check IC501 and deflection yoke. Vertical linearity or foldover problems may be caused by C502, C508, C513, C514, and C515 being defective.

RASTER

Check the CRT and CRT voltages. If red is missing, check Q851, Q852, and pin 19 of IC201. If green is missing, check Q853, Q854, and pin 20 of IC201. If blue is missing, check Q855, Q856, and pin 21 of IC201. If the raster has a keystone shape, check deflection yoke. If the raster has height or width problems, refer to the "Vertical," "Horizontal," or "Power Supply" sections of this Troubleshooting guide.

VIDEO/CHROMA

Inject a video signal at pin 47 of IC201 and check for video on the CRT. If video is present, refer to the "IF AGC" section of this Troubleshooting guide. If video is missing, check for a video waveform at pin 37 of IC201. If missing, check Q401, Q402, and Q403. If the waveform is present, check for a video waveform at pin 43 of IC201. If video waveform is missing, check pins 37, 39, and 41 of IC201, DL431, and Q433. If waveform is present, check for the proper waveforms at pins 19, 20, and 21 of IC201. If waveforms are missing, check pin 12 of IC201 for 3.58MHz and check IC201. If the proper waveforms are present, refer to the "Raster" section of this Troubleshooting guide.

IF AGC

Inject an IF signal at the IF input and check for video on the CRT. If a picture is present on the CRT, check the tuner and AGC circuits. If the picture is missing, check for a video waveform at pin 47 of IC201. If the waveform is present, refer to the "Video" section of this Troubleshooting guide. If the waveform is missing, apply AGC bias to pin 5 of IC201. If the waveform is now present, check pins 3, 7, 8, and 44 of IC201. If the waveform is still missing, check Q201 and pins 3, 5, 6, 42, 47 thru 50, and 54 of IC201. A defective AGC circuit can cause an overloaded picture, excessive snow or loss of audio and video.

AUDIO

Select an active channel and check for an audio waveform at pins 55 and 56 of IC201. If the waveforms are missing, check pin 54 of IC201, Q301, IC3001, and IC3101. If waveforms are present, check pins 1, 2, 4, 51, and 56 of IC201, IC351, IC352, Q351, and Q354.

A

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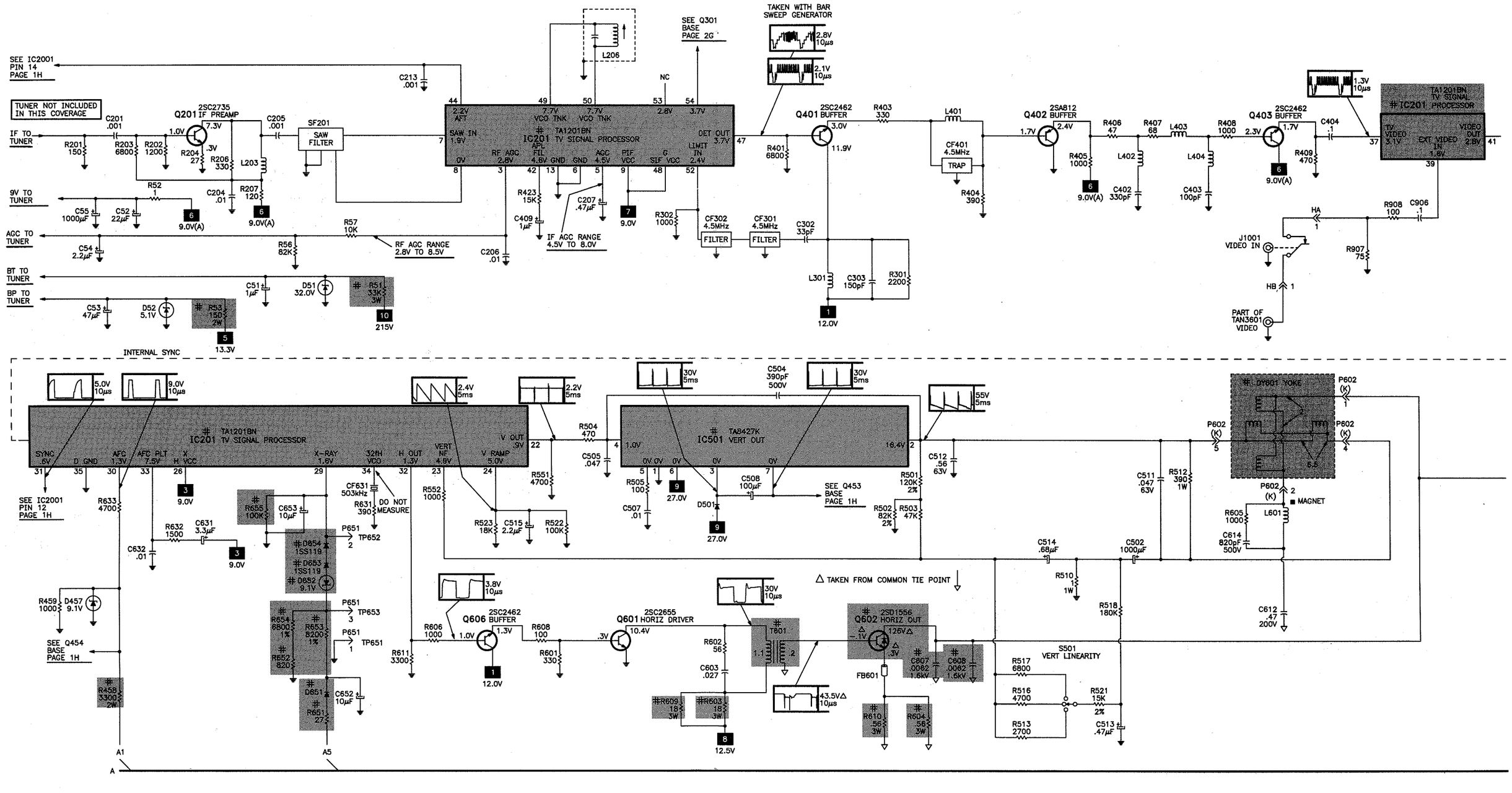
TELEVISION SCHEMATIC

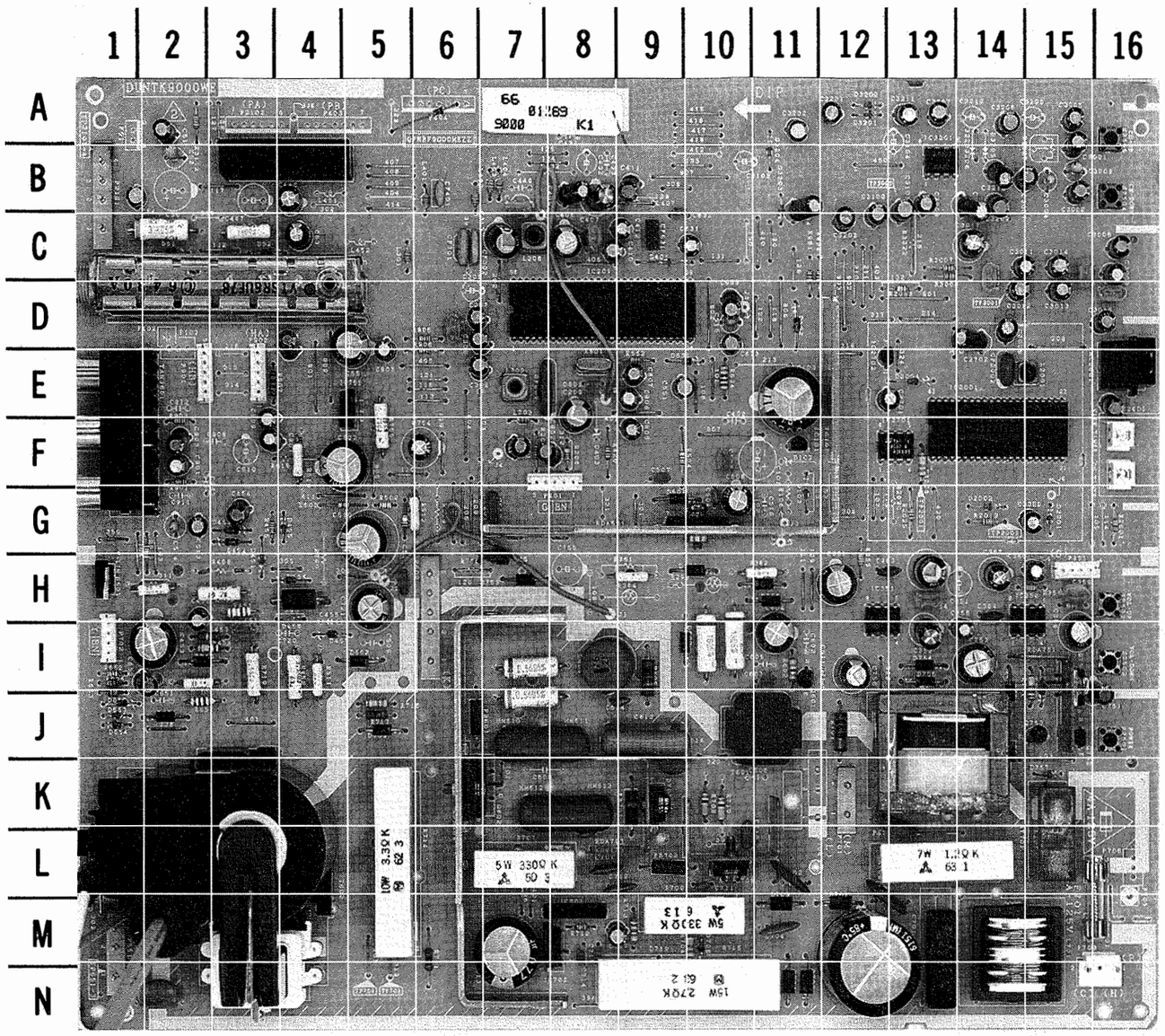
VOLTAGES TAKEN WITH SIGNAL

ADDITIONAL SCHEMATIC NOTES, SEE PAGE 1

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®



MAIN BOARD - TOP VIEW



A HOWARD W. SAMS GRIDTRACE™ PHOTO

MAIN BOARD - TOP VIEW, GRIDTRACE LOCATION GUIDE

C51	A-2	C708	L-8	D51	C-2	IC2702	E-12	R701	J-12
C52	B-2	C709	K-9	D52	C-3	IC3201	B-13	R702	L-13
C53	C-4	C710	L-10	D103	G-11	L203	F-7	R704	M-10
C54	B-1	C711	L-10	D301	H-10	L206	C-7	R705	N-10
C55	D-5	C712	L-9	D302	H-11	L301	C-5	R706	N-10
C103	E-11	C713	M-7	D401	C-9	L302	E-7	R707	L-7
C207	D-6	C714	M-8	D402	D-11	L401	B-6	R708	K-10
C209	E-8	C715	M-8	D451	H-3	L402	B-6	R709	M-10
C211	F-7	C717	M-8	D452	G-3	L403	B-7	R710	K-10
C308	D-6	C721	H-5	D453	G-3	L404	B-7	R711	M-6
C309	E-6	C751	J-16	D454	H-4	L601	I-8	R712	M-8
C313	C-7	C753	I-14	D455	G-5	L701	M-14	R713	M-9
C352	I-13	C754	F-6	D457	I-4	L2001	E-15	R714	L-5
C353	H-13	C756	I-12	D501	G-9	P351	H-15	R715	N-10
C354	H-13	C801	E-8	D502	I-5	P401	F-8	R716	J-5
C355	I-14	C802	F-8	D503	I-9	P602	I-6	R717	J-5
C357	H-14	C805	F-9	D631	E-10	P651	N-1	R718	I-2
C358	I-15	C806	E-9	D651	J-2	P701	K-12	R719	I-3
C359	H-15	C807	E-9	D652	J-1	P702	I-1	R751	I-15
C360	H-15	C901	F-2	D653	J-1	P703	N-16	R755	F-5
C361	H-12	C903	F-2	D654	J-1	P901	E-2	R901	F-2
C363	H-13	C904	D-4	D701	M-12	P902	E-3	R903	F-2
C364	H-14	C905	E-5	D702	N-11	P2101	C-1	R905	D-6
C404	B-7	C906	D-6	D703	M-11	PR701	L-13	R906	E-6
C406	C-8	C907	F-3	D704	N-11	Q601	I-11	R907	E-3
C407	B-8	C909	F-3	D705	N-9	Q602	K-6	R951	C-11
C408	C-8	C2002	G-15	D706	M-10	Q751	I-15	R952	C-11
C409	B-8	C2005	D-14	D707	K-9	Q752	J-15	R2012	G-14
C410	C-8	C2601	E-16	D708	L-10	Q753	J-15	R2025	G-13
C411	B-9	C2701	E-13	D709	J-5	R51	C-2	R2028	F-13
C412	C-9	C2702	D-14	D710	I-2	R53	C-3	R2043	D-2
C446	B-4	C3001	A-15	D711	H-4	R207	F-7	R2053	D-13
C451	I-3	C3002	B-15	D751	J-14	R208	F-8	R2601	G-16
C452	H-2	C3003	B-15	D752	I-15	R354	H-15	R3007	C-13
C453	I-2	C3004	B-15	D753	H-7	R355	H-12	R3008	C-13
C454	G-3	C3005	A-15	D754	I-13	R356	H-15	R3112	A-2
C502	F-4	C3006	C-16	D755	I-13	R361	H-9	RMC2601	E-16
C504	G-10	C3007	B-15	D756	J-14	R362	H-11	RY701	K-15
C505	F-10	C3008	C-14	D757	K-15	R420	F-8	S501	H-1
C507	F-9	C3009	C-16	D758	H-11	R451	H-3	S2501	J-16
C508	G-10	C3010	D-16	D2001	G-15	R453	J-2	S2502	I-16
C510	G-5	C3011	C-14	D2002	G-14	R454	J-2	S2503	H-16
C511	H-5	C3012	D-14	D2003	D-14	R455	G-3	S2504	B-16
C512	G-7	C3013	D-15	D2004	E-13	R458	I-4	S2505	A-16
C513	G-2	C3014	C-15	D2101	A-6	R466	H-3	SF201	E-7
C514	G-2	C3015	C-15	D2201	F-16	R467	H-2	T601	J-11
C515	D-10	C3016	D-16	D2202	F-16	R501	G-5	T602	L-3
C551	E-9	C3017	C-14	D3201	A-12	R502	G-5	T701	J-13
C603	I-11	C3101	B-13	D3202	A-12	R503	G-4	TAN3601	E-1
C604	I-11	C3102	B-13	D3203	B-11	R504	F-9	TP651	M-1
C607	J-7	C3201	A-12	D3204	B-11	R510	F-4	TP652	M-1
C608	K-8	C3202	A-11	DL431	B-4	R511	I-4	TP653	N-1
C612	J-9	C3203	C-12	F701	L-16	R512	G-5	TP2001	F-13
C614	J-9	C3204	B-11	FB601	J-6	R521	G-2	TP2002	G-14
C631	C-10	C3206	A-14	FB701	K-9	R552	E-9	TP2102	B-1
C632	C-9	C3207	A-13	FB702	L-9	R602	I-11	TU51	C-1
C633	D-10	C3208	C-13	IC101	F-11	R603	I-10	X801	E-8
C652	I-2	C3209	B-14	IC201	D-7	R604	I-7		
C653	D-10	C3210	B-14	IC351	I-12	R605	I-9		
C701	M-13	C3211	A-13	IC352	I-14	R609	I-10		
C702	L-11	C3213	B-14	IC501	G-10	R610	J-7		
C703	M-13	CF301	C-6	IC701	M-8	R634	E-10		
C704	M-11	CF302	C-6	IC702	M-8	R651	J-2		
C705	N-12	CF401	B-6	IC751	E-5	R652	I-1		
C706	N-2	CF631	C-9	IC2001	F-13	R653	J-1		
C707	L-8	CF2002	E-14	IC2701	F-12	R654	I-1		

PARTS LIST

SEMICONDUCTORS

(Select the replacement that gives the best results.)

	Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
	D51	-	RH-EX0701GEZZ	-	-	-
	D52	-	RH-EX0293CEZZ	-	-	-
	D103	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D301	-	RH-DX0441CEZZ	-	-	-
	D302	-	RH-DX0441CEZZ	-	-	-
	D401	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D402	-	RH-EX0092CEZZ	NTE5006A	ECG5006A	SK3A6
	D451	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D452, 53	-	RH-EX0217CEZZ	NTE5023A	ECG5023A	SK14A
	D454	-	RH-EX0293CEZZ	-	-	-
	D455	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D457	-	RH-EX0313CEZZ	NTE139A	ECG139A	-
	D501	-	RH-DX0441CEZZ	-	-	-
#	**D502**	-	RH-DX0131CEZZ	NTE552	ECG552	SK9000
	D503	-	RH-DX0441CEZZ	-	-	-
	D631	-	RH-EX0312CEZZ	NTE5018A	ECG5018A	SK9A1
#	**D651**	-	RH-DX0131CEZZ	NTE552	ECG552	SK9000
#	**D652**	-	RH-EX0655CEZZ	-	-	-
#	**D653, 54**	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
#	**D701 Thru**					
#	**D704**	1S1887A	RH-DX0154CEZZ	NTE552	ECG552	SK9000
#	**D705**	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
#	**D706**	-	RH-EX0238CEZZ	NTE5093A	ECG5093A	-
#	**D707, 08**	S6785G	VHSS6785GLB2E	NTE5424%	ECG5424%	-
#	**D709, 10**	EU-1	RH-DX0131CEZZ	NTE552	ECG552	SK9000
#	**D711**	-	RH-DX0444CEZZ	-	-	-
#	**D751**	-	RH-DX0441CEZZ	-	-	-
	D752	-	RH-EX0019TAZZ	NTE5022A	ECG5022A	SK13A
#	**D753 Thru**					
#	**D756**	-	RH-DX0441CEZZ	-	-	-
	D757	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D758	-	RH-DX0441CEZZ	-	-	-
	D881, 82, 84	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D2001, 02	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	D2003, 04	-	RH-EX0296CEZZ	NTE5011T1	ECG5011T1	-
	D2101	-	RH-EX0296CEZZ	NTE5011T1	ECG5011T1	-
	D2201, 02	PX0383CE	RH-PX0383CEZZ	-	-	-
	D3201 Thru					
	D3204	1SS119	VHD1SS119//-1	NTE519	ECG519	SK3100
	IC101	KA78S05P	VHiKA78S05P-1	-	-	-
#	**IC201**	TA1201BN	RH- iX2701CEZZ	-	-	-
	IC351, 52	TDA7233	VHiT5DA7233/-1	-	-	-
#	**IC501**	TA8427K	VHiTA8427K/-1	-	-	-
#	**IC701**	T8150	RH-iX0758CEZZ	-	-	-
#	**IC702**	T8889A	VHiT8889A//-1	-	-	-
#	**IC751**	KIA7809PI	VHikA7809Pi-1	NTE1966	ECG1966	-
	IC2001	TMP87CM34BN	RH-iX2717CEZZ	-	-	-
	IC2701	ST24C02B6	RH-iX2448CEN1	-	-	-
	IC2702	PST994C	VHiPST994C/-1	-	-	-
	IC3001	UPC1852A	VHiUPC1852A-1	-	-	-
	IC3101	TC4052BF	VHiTC4052BF-1	-	-	-
	IC3201	M5222P	VHiM5222P//-1	-	-	-
	Q201	2SC2735	VS2SC2735//1E	NTE2402	ECG2402	SK10095
	Q301	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q351	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q354	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q401	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q402	2SA812	VS2SA812-M51E	NTE2409	ECG2409	SK10100
	Q403	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099

**For SAFETY use only equivalent replacement part.**
% Use Insulating hardware supplied with replacement.

SEMICONDUCTORS continued

(Select the replacement that gives the best results.)

	Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
	Q433	2SA812	VS2SA812-M51E	NTE2409	ECG2409	SK10100
	Q451	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q453	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q454	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q601	2SC2655(Y)	VS2SC2655Y/-1	NTE293	ECG293	SK3849
	Q602	2SD1556	VS2SD1556//1E	NTE2331	ECG2331	SK10088
	Q606	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
#	**Q751**	2SC1983	VS2SC1983//-2	NTE56	ECG56	SK3929
	Q752	2SC3198	VS2SC3198-Y-1	NTE85	ECG85	SK9229
	Q753	2SA1013	VS2SA1013//1E	NTE32	ECG32	SK3867A
	Q851	2SC3198	VS2SC3198-Y-1	NTE85	ECG85	SK9229
	Q852	2SC3619	VS2SC3619LB1E	NTE157	ECG157	SK3747
	Q853	2SC3198	VS2SC3198-Y-1	NTE85	ECG85	SK9229
	Q854	2SC3619	VS2SC3619lB1E	NTE157	ECG157	SK3747
	Q855	2SC3198	VS2SC3198-Y-1	NTE85	ECG85	SK9229
	Q856	2SC3619	VS2SC3619LB1E	NTE157	ECG157	SK3747
	Q881	2SA1266	VS2SA1266-Y-1	NTE290A	ECG290A	SK9132
	Q901	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q902	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q903	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q904	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q2001	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q3201	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q3202	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q3203	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099
	Q3204	2SC2462	VS2SC2462-C-1	NTE2408	ECG2408	SK10099

**For SAFETY use only equivalent replacement part.**

CABINET PARTS

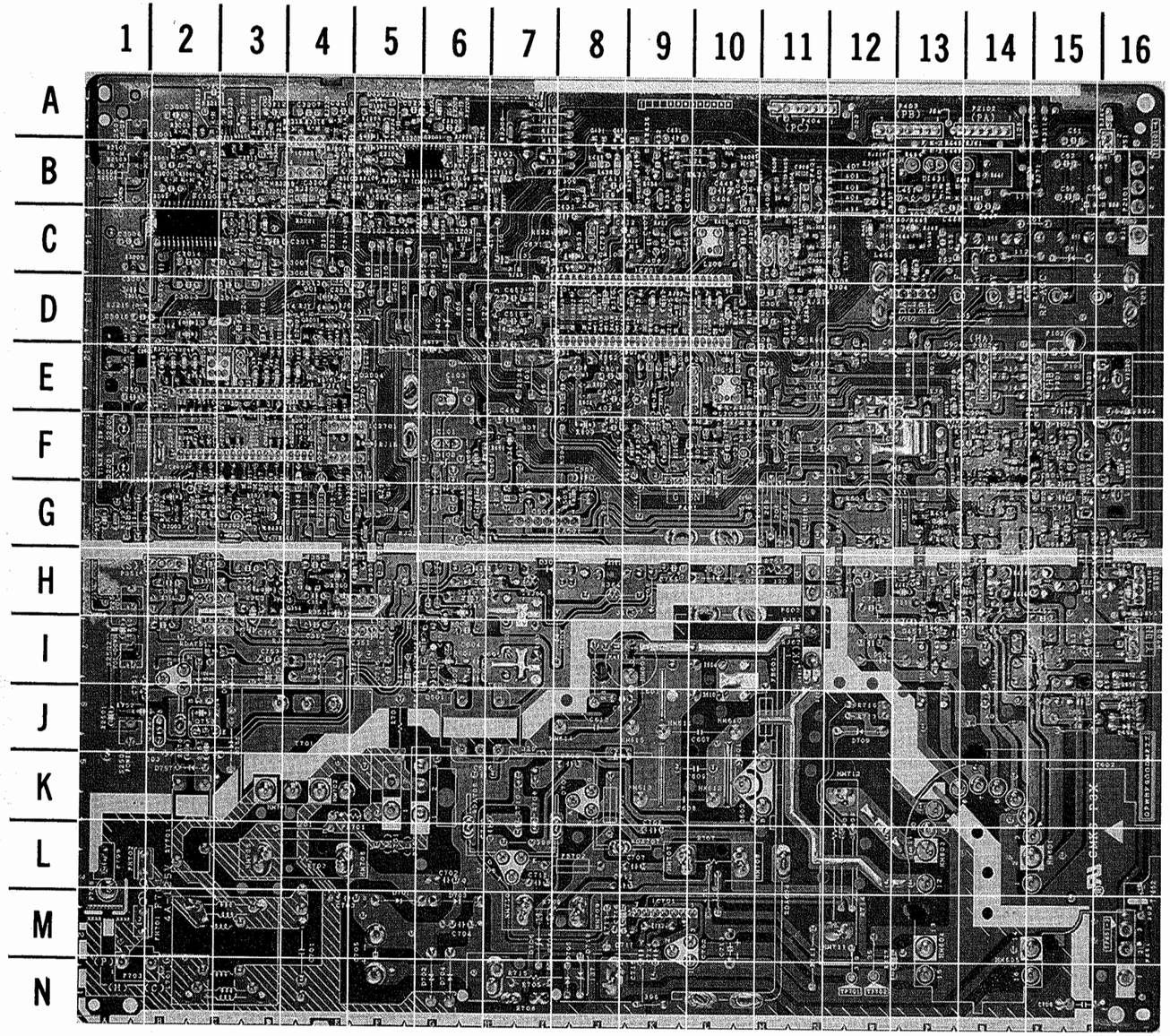
Item	Mfr. Part No.
Model 27H-S100	
Badge, SHARP	HBDGB1009MESA
Buttons, Channel Up/Down	JBTN-1058MEKA
Buttons, Power and Volume Up/Down	JBTN-1057MEKA
Cabinet Assembly	CCABA1257MES0
Cabinet Rear	GCABB1119MEKA
Window	GMADT0093MEKA
Models 27H-S120 and CH27S12	
Badge, SHARP	HBDGB1009MESA
Buttons, Channel Up/Down	JBTN-1089MEKA
Buttons, Power and Volume Up/Down	JBTN-1088MEKA
Cabinet Assembly	CCABA1258MES0
Cabinet Rear	GCABB1119MEKA
Window	GMADT0099MEKA

CONTROLS & RESISTORS

	Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
#	**PR701**	12.6 Cold PTC	RMPTP0026CEZZ	-
#	**R51**	33K 5% 3W	VRS-RG3LB333J	3W333
#	**R53**	150 5% 2W	VRS-RG3DB151J	2W115
#	**R361**	18 5% 1W	VRS-RG3AB180J	1W018
#	**R361** (5)	18 5% 1/2W Fusible	VRG-RL2HB180J	-
#	**R362**	6.8 5% 1W	VRN-RL3AB6R8J	1W6D8
#	**R451**	10K 5% 1/2W	VRS-RG2HC103J	HW310
#	**R458**	3300 5% 2W	VRS-RG3DB332J	2W233
#	**R466** (3)	2.7 5% 1W	VRN-RL3AB2R7J	1W2D7
#	**R466** (2)	1.8 5% 2W	-	2W1D8
#	**R467**	.56 5% 1W	VRN-RL3ABR56J	1WD56
#	**R468** (3)(4)	4.7 5% 1W	VRN-RL3AB4R7J	1W4D7
	R501	120K 2% 1/8W	VRD-RA2BE124G	EW412
	R502	82K 2% 1/8W	VRD-RA2BE823G	EW382
#	**R511**	.56 5% 1W	VRN-RL3ABR56J	1WD56
	R521	15K 2% 1/8W	VRD-RA2BE153G	EW315
#	**R603**	18 5% 3W	VRS-RG3LB180J	3W018
#	**R604**	.56 5% 3W	VRN-RL3LBR56J	-
#	**R609**	18 5% 3W	VRS-RG3LB180J	3W018
#	**R610**	.56 5% 3W	VRN-RL3LBR56J	-
#	**R651**	27 5% 1/2W	VRS-RG2HC270J	HW027
#	**R652**	820 5% 1/8W	VRD-RA2BE821J	EW182
#	**R653**	8200 1% 1/8W	VRN-RA2BK822F	EW282
#	**R654**	6800 1% 1/8W	VRN-RA2BK682F	EW268
#	**R655**	100K 5% 1/8W	VRD-MN2BE104J	EW410
#	**R701**	2.7M 10% 1/2W	VRC-UA2HG275K	HW527
#	**R702**	1.2 10% 7W Wirewound	VRW-KQ3NC1R2K	-
#	**R706**	150 5% 1/2W	VRS-RG2HC151J	HW115
#	**R707**	330 10% 5W Wirewound	VRW-KQ3HC331K	5W133
#	**R708**	33 5% 1/2W	VRD-RM2HD330J	HW033
#	**R708** (1)	33 5% 1/2W Fusible	VRG-RC2HB330J	-
#	**R709**	330 10% 5W Wirewound	VRW-KQ3HC331K	5W133
#	**R710**	33 5% 1/2W	VRD-RM2HD330J	HW033
#	**R710** (1)	33 5% 1/2W Fusible	VRG-RC2HB330J	-
#	**R711**	1 5% 1/4W	VRN-GA2EB1R0J	QW1D0
#	**R714**	3.3 10% 10W Wirewound	VRW-KQ4AC3R3K	10W3D3
#	**R715**	2.7 10% 15W	VRW-KQ41C2R7K	-
#	**R717**	1 5% 1/4W	VRN-GA2EB1R0J	QW1D0
#	**R718**	12 5% 1W	VRS-RG3AB120J	1W012
#	**R719**	.56 5% 2W	VRN-RL3DBR56J	2WD56
#	**R752**	4700 5% 1/8W	VRD-MN2BE472J	EW247
#	**R755**	27 5% 2W	VRS-RG3DB270J	2W027
#	**R857**	12K 5% 3W	VRS-VV3LB123J	3W312
#	**R865**	12K 5% 3W	VRS-VV3LB123J	3W312
#	**R873**	12K 5% 3W	VRS-VV3LB123J	3W312
	R3216, 17	10K 1% 1/10W	VRS-TV1JD103F	-

 # For SAFETY use only equivalent replacement part.
(1) Used in model CH27S12.
(2) Used with CRT A68KRQ58X.
(3) R466 (2.7 1W) and R468 used with CRT A68KRQ58X in some models.
(4) Used with CRT A68AGL12X.
(5) Used in some models.

MAIN BOARD - BOTTOM VIEW



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MAIN BOARD - BOTTOM VIEW, GRIDTRACE LOCATION GUIDE

C201	E-11	Q3202	B-6	R456	G-13	R915	F-15	R2507	G-1
C204	F-10	Q3203	B-3	R457	G-13	R916	F-14	R2701	E-4
C205	F-10	Q3204	B-3	R459	I-13	R917	F-14	R2702	E-4
C206	D-10	R52	D-14	R460	H-13	R918	E-13	R3001	B-2
C210	D-9	R54	C-13	R461	H-13	R924	E-16	R3002	B-2
C212	D-9	R55	C-13	R462	H-13	R925	F-16	R3003	A-2
C213	D-9	R56	B-16	R463	F-7	R2002	G-2	R3004	B-2
C302	C-11	R57	B-16	R464	F-7	R2003	G-2	R3005	B-2
C303	C-11	R201	F-11	R465	F-6	R2008	G-3	R3006	B-2
C304	D-10	R202	F-10	R505	G-8	R2009	G-2	R3009	C-1
C310	E-10	R203	F-10	R513	H-16	R2010	G-3	R3010	C-2
C311	E-10	R204	E-10	R516	H-16	R2011	G-3	R3101	B-5
C402	B-11	R206	F-10	R517	H-16	R2013	G-3	R3102	B-4
C403	B-10	R209	E-9	R518	G-15	R2017	G-3	R3103	B-4
C405	D-9	R301	C-12	R522	D-8	R2019	G-3	R3104	B-5
C803	E-9	R302	D-10	R523	D-8	R2021	G-3	R3105	A-5
C808	B-11	R303	D-11	R551	D-8	R2023	G-4	R3106	B-5
C2003	F-3	R304	C-11	R601	I-6	R2024	F-4	R3109	B-6
C2004	F-3	R305	C-11	R606	I-6	R2027	F-4	R3201	A-5
C2007	E-4	R306	E-10	R608	I-6	R2029	F-4	R3202	A-5
C2018	D-4	R351	H-5	R611	H-6	R2031	E-4	R3203	A-6
C2602	D-1	R352	H-4	R631	C-8	R2032	E-4	R3204	A-6
C2603	D-1	R353	H-3	R632	C-8	R2033	E-4	R3205	B-5
IC3001	C-2	R359	H-3	R633	C-8	R2034	E-4	R3206	B-6
IC3101	B-6	R360	H-4	R655	D-7	R2035	F-3	R3207	C-6
Q201	E-10	R401	C-10	R752	J-1	R2036	E-3	R3208	C-6
Q301	D-11	R403	C-11	R754	J-2	R2037	E-3	R3211	A-3
Q351	H-4	R404	B-11	R757	J-2	R2039	E-3	R3212	A-2
Q354	H-3	R405	B-11	R801	E-9	R2040	E-3	R3213	A-2
Q401	C-11	R406	B-11	R802	D-9	R2041	E-3	R3214	B-3
Q402	B-11	R407	B-10	R803	F-8	R2042	D-3	R3215	C-3
Q403	B-10	R408	B-10	R804	E-8	R2044	D-2	R3216	A-4
Q433	C-13	R409	B-10	R805	E-8	R2045	E-2	R3217	B-3
Q451	G-13	R410	C-9	R806	D-9	R2046	E-2	R3218	A-4
Q453	F-6	R413	E-6	R902	F-15	R2047	E-2	R3219	B-3
Q454	H-13	R415	F-8	R904	F-15	R2048	E-2	R3220	B-3
Q606	I-6	R417	F-9	R908	E-13	R2049	E-4	R3221	C-4
Q901	F-14	R419	F-9	R909	F-14	R2501	J-1	R3224	A-5
Q902	F-14	R423	C-9	R910	F-14	R2502	I-1	R3225	B-5
Q903	F-15	R441	C-12	R911	F-14	R2503	B-1		
Q904	F-15	R443	C-13	R912	F-13	R2504	B-1		
Q2001	D-4	R447	B-13	R913	F-13	R2505	B-1		
Q3201	A-5	R452	H-14	R914	F-14	R2506	B-1		

PARTS LIST continued

CAPACITORS & ELECTROLYTICS

	Item No.	Rating	Mfr. Part No.
	C52	22µF 10% 16V Tantalum	VCSATA1CE226K
#	**C510**	1000µF 35V	VCEAGA1VW108M
	C514	.68µF 10% 35V Tantalum	VCSATA1VE684K
	C515	2.2µF 16V Tantalum	VCSATA1CE225K
#	**C607**	.0062 +50%-10% 1.6kV	VCFPPD3CA622H
#	**C608**	.0062 +50%-10% 1.6kV	VCFPPD3CA622H
#	**C701**	.22µF 250VAC	RC-FZ012SGEZZ
	C702, 03	.01 +80%-10% 250VAC	RC-KZ0029CEZZ
#	**C705**	820µF +80%-10% 200V	RC-EZ0395CEZZ
#	**C706**	.0033 +80% -20% 250VAC	RC-KZ0311CEZZ
	C709, 10	.01 +80% -20% 250VAC	RC-QZ0010CEZZ
#	**C713**	220µF 20% 160V	VCEAGW2CW227M
#	**C715**	.01 10% 50V	RC-QZA103TAYK
	C854	.01 +80%-10% 2kV	RC-KZ0024CEZZ
	C3003	10µF 16V Tantalum	VCSATA1CE106K
	C3004	3.3µF 16V Tantalum	VCSATA1CE335K

 # For SAFETY use only equivalent replacement part.

COILS & TRANSFORMERS

	Item No.	Function/Rating	Mfr. Part No.
#	**DY601** (2)	Yoke Horiz 1.27mH Vert 14.3mH	RCiLH0076MEZZ
#	**DY601** (3)	Yoke	RCiLH0075MEZZ
	FB601	Ferrite Bead	RBLN-0037CEZZ
	FB701, 02	Ferrite Bead	RBLN-0037CEZZ
	L203	1.2µH	VP-XF1R2K0000
	L206	IF	RCiLi0588CEZZ
	L301	8.2µH	VP-XF8R2K0000
	L302	IF	RCiLi0605CEZZ
	L401	6.8µH	VP-XF6R8K0000
	L402	3.3µH	VP-XF3R3K0000
	L403, 04	8.2µH	VP-XF8R2K0000
	L601	-	RCiLZ0621CEZZ
#	**L701**	Line Filter	RCiLF0087CEZZ
#	**L701** (4)	Line Filter	RCiLF0090CEZZ
#	**L702**	Degaussing	RCiLG0029MEZZ
	L851	82µH	VP-MK820K0000
	L2001	Oscillator	RCiLB0131CEZZ
#	**T601**	Horizontal Driver	RTRNZ0168CEZZ
#	**T602** (1)	Horizontal Output (1)	RTRNF0017MEZZ
#	**T701**	Power	RTRNP0416CEZZ

 # For SAFETY use only equivalent replacement part.
(1) Focus and screen controls are part of T602.
(2) Used with CRT A68KRQ58X.
(3) Used with CRT A68AGL12X.
(4) Used in model CH27S12.

MISCELLANEOUS

	Item No.	Description	Mfr. Part No.	Notes
	CF301	Filter	RFiLC0029TAZZ	4.5MHz
	CF302	Filter	RFiLC0267CEZZ	4.5MHz
	CF401	Trap	RFiLC0013CEZZ	4.5MHz
	CF631	Crystal	RFilA0034CEZZ	503kHz
	CF2002	Filter	RFiLC0121GEZZ	-
	DL431	Filter	RCiLZ0938CEZZ	Comb
#	**F701**	Fuse	QFS-B4023CEZZ	4Amp, 125VAC, Slow Blow
		Fuse	QFS-B4021CEZZ	4Amp, 125VAC, Slow Blow
	J1001	Jack	QJAKE0054GEZZ	Video In
	J1002	Jack	QJAKE0054GEZZ	Left Audio In
	J1003	Jack	QJAKE0054GEZZ	Right Audio In
#	**P703**	Line Cord	QACCD3036CESA	AC, Polarized
	RMC2601	Receiver	RRMCU0053GEZZ	Remote
#	**RY701**	Relay	RRLYU0036CEZZ	Power
		Relay	RRLYU0028CEZZ	Power
	S501	Switch	QSW-B0015CEZZ	Vertical Linearity
	S2501	Switch	QSW-K0079GEZZ	Power
	S2502	Switch	QSW-K0079GEZZ	Volume Down
	S2503	Switch	QSW-K0079GEZZ	Volume Up
	S2504	Switch	QSW-K0079GEZZ	Channel Down
	S2505	Switch	QSW-K0079GEZZ	Channel Up
	SC851	Socket	QSOCV0929CEZZ	CRT
	SF201	Filter	RFiLC0236CEZZ	SAW
	SP1, SP2	Speaker	VSP0080PBK98A	3", 8 Ohms, 2W
	TAN3601	Jack	QTANJ0523CEZZ	Assembly
#	**TU51**	Tuner (1)(2)	VTUVTSR6UF78/	UHF/VHF
#	**V101**	CRT	VB68KRQ58X/*S	A68KRQ58X
		CRT	VB68AGL12X/*S	A68AGL12X
	X801	Crystal	RCRSB0001PEZZ	3.58MHz
		Fuse Holder	QFSHD1013CEZZ	For F701(2 Used)
		Fuse Holder	QFSHD1014CEZZ	For F701(2 Used)
		Magnet	PMAGF3004MEZZ	Purity/Convergence
		PC Board (1)	DUNTK8639WEK2	A/V
		PC Board (1)	DUNTK8604WEK8	CRT
		PC Board (1)	DUNTK9000WEK1	Main
		PC Board (1)(3)	DUNTK9000WEL3	Main
		Transmitter	RRMCG1237CESA	Remote
		Wedges	PSPAG0012MEZZ	Yoke Positioning (3 Used)

 # For SAFETY use only equivalent replacement part.
(1) Contact PTS Electronics Corporation for replacement; order by manufacturer's part number.
(2) Contact TNI Electronics for replacement; order by part number on tuner.
(3) Used in model CH27S12.

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.
- Terrell & Nobis (TNI Electronics)
- Thomson Consumer Electronics, Inc. (SK, TCE)

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J. Barker, N. Beck, A. Bonner, B. Buchanan, T. Clensy, G. Farrell, B. Fink, M. Herkless, J. Kocha, F. Malek, B. Medaris, R. Raus, B. Skinner

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