

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.

TEST JIG HOOKUP				
Function	Chek-A-Color Adapter No.	PC Board Plug No.	Pin	Color
CRT	B239	KX	1	Red
Yoke	D4137		3	Blue
Yoke Setting	YP1A		4	Yellow
Comments	Focus Tap		5	Green

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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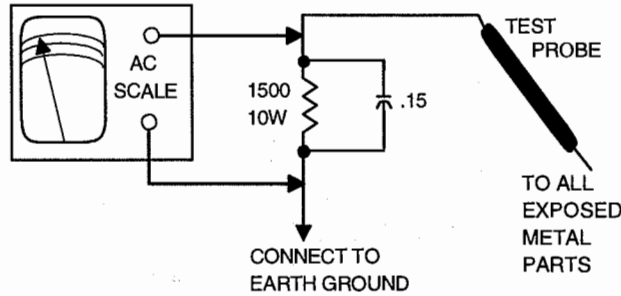
SAFETY CHECKS -- FIRE AND SHOCK HAZARD

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.



HIGH VOLTAGE SHUTDOWN TEST

Apply 120VAC, turn the receiver on, and set all customer controls for normal operation. Measure the voltage at TP7. Voltage should measure between 16.5V and 21.0V. If voltage exceeds this range the circuit should be repaired. Momentarily connect a jumper between TP7 and the cathode of D421. The receiver should lose raster and sound. If receiver does not lose raster and sound, the shutdown circuit should be repaired. To resume normal operation, remove AC power and wait 30 seconds, then turn the receiver on.



98PF01282



PHOTOFACT® Technical Service Data

SET 3956

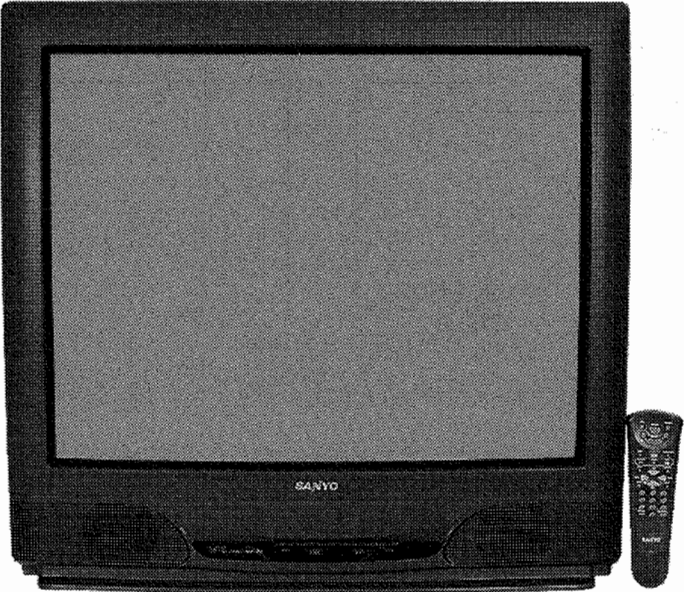
MODEL DS31650 (CHASSIS 31650-02/03/04)

SANYO

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SANYO
Model DS31650 (Chassis 31650-02/03/04)



Chassis 31650-02
Complete coverage
for servicing a television receiver...

- Schematics
- Parts list
- Component locations
- Troubleshooting guide



HOWARD W. SAMS & COMPANY

MARCH 1998 SET 3956

For Supplier Address,
See PHOTOFACT Annual Index

TROUBLESHOOTING

POWER SUPPLY

Check F601. If F601 is open, check D602 thru D605, C601, C604, C605, C606, and IC601. Apply 120VAC and check for 5.0V at the emitter of Q622. If 5.0V is missing, check D621, D623, and Q622. Turn receiver on and check for 130V at pin 4 of IC601. If voltage is missing, check IC601, Q621, Q623, RL601, R601, and D602 thru D605. If 130V is present, refer to "Horizontal" section of this Troubleshooting guide.

HIGH VOLTAGE SHUTDOWN

NOTE: Care should be taken in defeating the high voltage shutdown circuit as this may cause excessive X-Ray radiation and damage to the CRT and T402. Monitor the high voltage and troubleshoot.

The high voltage from T402 is monitored and rectified by D482. Should the high voltage increase, the voltage at the cathode of D422 will also increase and trigger D422 and D421. This will cause deflection portion of IC101 to shut down the horizontal drive signal at pin 23 of IC101, causing the receiver to lose sound and raster. To troubleshoot, remove R482. Supply power with a variable AC transformer. Start at 90VAC and increase as necessary to isolate and repair the malfunction. Replace R482.

Voltages Taken in Shutdown

IC101
Pin 22 0V
Pin 23 0V
Pin 24 .7V

HORIZONTAL

To determine if the TV is in shutdown, refer to the "High Voltage Shutdown" section of this Troubleshooting guide. If TV is not in shutdown, inject a horizontal signal at base of Q402. If horizontal deflection is now present, check Q401, T401, and pins 22 thru 27 of IC101. If horizontal deflection is still missing, check Q402, D483, D484, D486, D481, D1011, IC1481, Q491, Q3601, and T402. The high voltage rectifier is part of T402 and if defective will affect the performance of the horizontal circuits. Width or foldover problems may be caused by C411, C412, C413, C414, C416, C417, and L413 being defective.

VERTICAL

Inject a vertical signal at pin 2 of IC501. If vertical deflection is present, check pin 28 of IC101. If there is still no vertical deflection, check IC501 and the deflection yoke. Vertical linearity or foldover problems may be caused by sweep shaping and bias circuits, check C501, C503, C504, C506, C461, C462, and C507. Also check Q461 and Q462.

IF AGC

Inject a video IF signal at the IF input and check for video on the CRT. If video is present, check the tuner and tuner control circuits. If video is missing on the CRT, check for a video waveform at pin 44 of IC101. If video waveform is present, refer to the "Video" section of this Troubleshooting guide. Apply AGC bias to pin 2 of IC101 and check for a video waveform at pin 44 of IC101. If video waveform is present, check pins 2, 10, 47, and 49 of IC101. If there is no video waveform, check IC101.

VIDEO

Inject a video signal at pin 44 of IC101 and check for video on CRT. If video is present, refer to the "IF AGC" section of this Troubleshooting guide. If there is no video on CRT, check for video waveform at pin 38 of IC101. If the waveform is missing, check pins 38 and 42 of IC101 and Q161. If the waveform is present, check for video waveform at pin 34 of IC101. If the waveform is missing, check Q202, Q303, and Q306. If the waveform is present, check for video waveform at pin 21 of IC101. If the waveform is present, check Q281 and SW701. If the waveform is missing, check IC101.

CHROMA

Check for a chroma waveform at pin 36 of IC101. If the waveform is missing, check Q304. If the waveform is present, check for the proper waveforms at pins 18, 19, and 20 of IC101. If the proper waveforms are missing, check pins 12 thru 20, 36, and 41 of IC101. Check for 3.58MHz at pin 13 of IC101. If the proper waveforms are present, refer to the "Raster" section of this Troubleshooting guide.

RASTER

Check the CRT and CRT voltages. If red is missing, check pin 18 of IC101 and Q705. If green is missing, check pin 19 of IC101 and Q703. If blue is missing, check pin 20 of IC101 and Q701. If the raster has a keystone shape, check the deflection yoke. If the raster has height or width problems, refer to the "Vertical," "Horizontal," and "Power Supply" sections of this Troubleshooting guide.

AUDIO

Tune in an active station transmitting a stereo signal and check for an audio waveform at pin 39 of IC3401. If the audio waveform is missing, check Q3431 and pins 1, 4, and 48 of IC101. If the waveform is present, check for audio waveforms at pin 4 of IC001 and pin 4 of IC021. If audio waveforms are missing, check IC3401 and IC3601. If audio waveforms are present, check IC001, IC021, Q043, and pin 5 of IC801.

POWER FAILURE DETECTOR

This receiver uses a power failure detector, pin 43 of IC801, which checks for an abnormal failure of power supply circuits. If an unexpected failure is caused by any one of three conditions, the receiver will shut itself off in about 2.5 seconds to prevent damage.

The three conditions are:

- 1. Failure within the power supply.
- 2. A short circuit on the load side of the power supply.
- 3. Stoppage of horizontal oscillation caused by shutdown circuits.

MISCELLANEOUS ADJUSTMENTS

HIGH VOLTAGE CHECK

Tune in a picture, set brightness, contrast, and color to minimum. Connect a high voltage probe to CRT anode. High voltage range should be between 26kV and 29.5kV.

RF AGC

Turn receiver on and tune in an active station. Turn VR141 fully clockwise, then counterclockwise to a point where snow just disappears.

SUB BRIGHTNESS

NOTE: Perform RF AGC, white balance, and high voltage check before performing sub brightness adjustment.

Tune in a color bar pattern. Set picture and brightness to normal. Connect positive lead of a digital voltmeter to TP51 and the negative lead to TP50 (across R491). Disconnect AC line cord, while pressing the menu (preset) button on the front of the receiver, reconnect AC line cord. "SUBBRIGHT ADJUST" display appears on the screen. Adjust sub brightness level with volume up or down button for 650mV ±10mV. Press the menu (preset) button on the receiver to turn off the subbright adjust display.

VERTICAL CENTERING

Tune in a crosshatch pattern. If pattern is low, install R513. If pattern is high, install R512.

VIDEO INPUT LEVEL

Inject a video signal at the video input, set the receiver to video mode, connect oscilloscope to the emitter of Q202. Adjust VR1023 for 1Vp-p.

DISPLAY PLL

Turn receiver on and tune in an active station. Adjust VC801 for a stable channel display with no oscillation. Check every active channel, repeat the process if necessary.

COMB FILTER

Turn receiver on and tune in a color bar pattern. Set the picture adjust mode to Auto. Connect oscilloscope to the base of Q281. Adjust VR300 and C305 for minimum chroma component.

HORIZONTAL WIDTH

Tune in a crosshatch patter and adjust VR461 for slight horizontal overscan.

WHITE BALANCE

Turn receiver on. Allow a 10 to 30 minute warm up time. Tune in an inactive channel. Set screen, VR703, VR702, and VR701 to minimum. Set VR704 and VR705 to midrange. Set SW701 to service position. Advance the screen control until a faint line of one predominant color appears on the screen. Adjust VR701, VR702, and VR703 for a dim white line. Set SW701 to normal position. Adjust VR704 and VR705 for best black and white picture on screen.

PURITY

NOTE: Operate the receiver for 15 minutes to allow warm-up of CRT.

Use a degaussing coil to demagnetize the CRT. Tune in a green raster. Slide deflection yoke back as far as possible. Adjust purity tabs to center the vertical green band. Slide the deflection yoke forward to produce a uniform green screen.

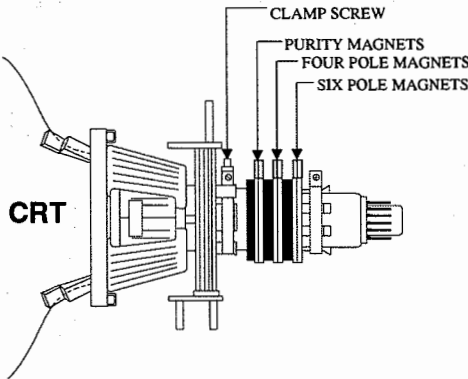
CONVERGENCE

Tune in a dot pattern. Loosen the clamp screw. 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. The 4 and 6 pole magnets interact, repeat adjustment until center convergence is correct.

Tune in a crosshatch pattern. Remove the tilt adjustment 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. Repeat convergence procedure if necessary to obtain best overall convergence. Replace the tilt adjustment wedges.

CRT NECK ASSEMBLY



STEREO ADJUSTMENTS

All adjustments were made using an MTS TV/stereo generator connected to the antenna terminals. Set customer controls to normal listening levels.

1.5fH BPF

Select SAP mode on the receiver. Set generator to SAP, 1kHz, and L-R modulated signal. Connect oscilloscope to pin 42 of IC3401. Adjust VR3403 for maximum amplitude of waveform.

Stereo VCO

Set generator to pilot, 1kHz, and L-R modulated signal. Connect oscilloscope to pin 26 of IC3401. Adjust VR3406 for maximum amplitude of waveform.

Separation

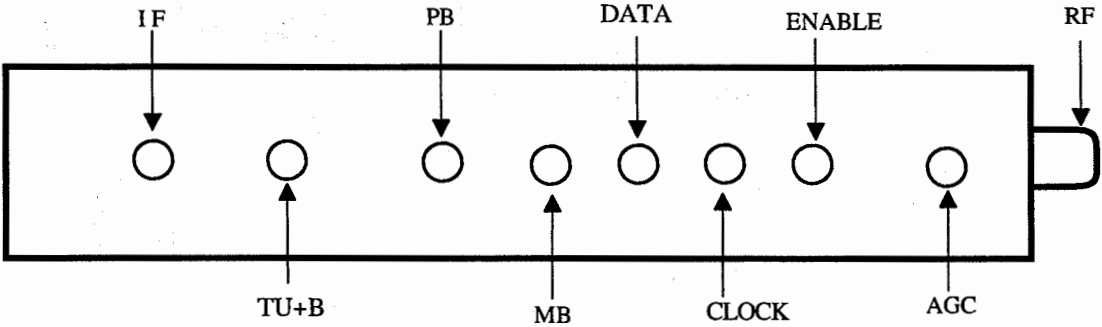
Set generator to pilot, 300Hz, and left modulated signal. Connect oscilloscope to pin 17 of IC3401. Adjust VR3421 for minimum amplitude of waveform. Change the generator signal frequency to 8kHz and adjust VR3411 for minimum amplitude of waveform.

TUNER INFORMATION

TUNER VOLTAGE CHART			
Pin	VHF Low Band	VHF High Band	UHF Band
AGC	5.0V	5.5V	5.4V
ENABLE	.1V	.1V	.1V
CLOCK	0V	0V	0V
DATA	5.0V	5.0V	0V
MB	9.0V	9.0V	9.0V
PB	5.0V	5.0V	5.0V
TU+B	33.0V	33.0V	33.0V
IF	0V	0V	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

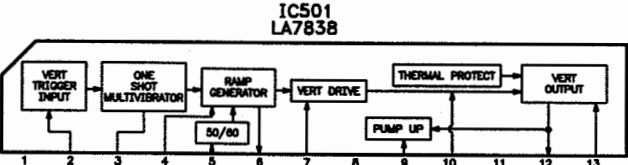
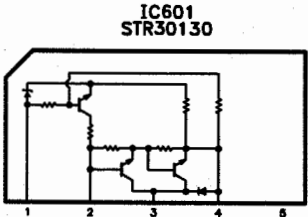
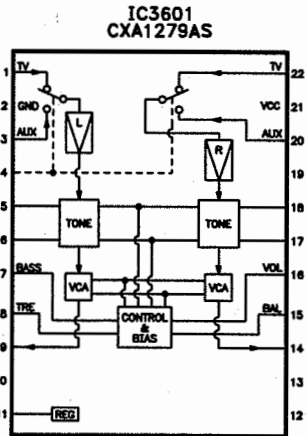
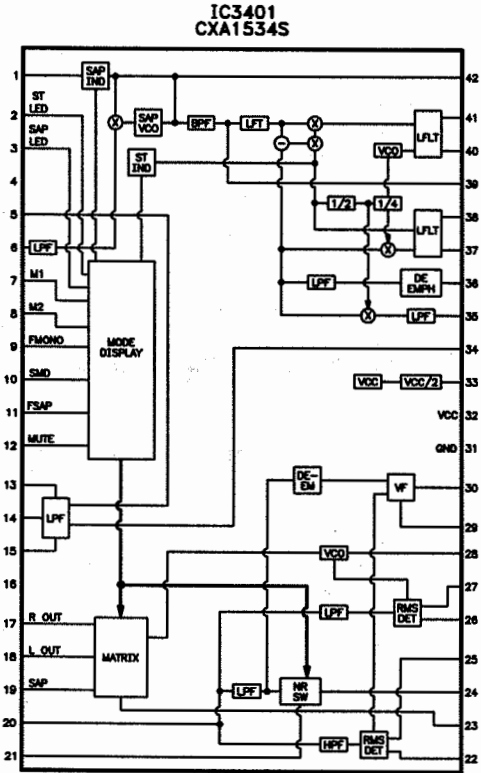
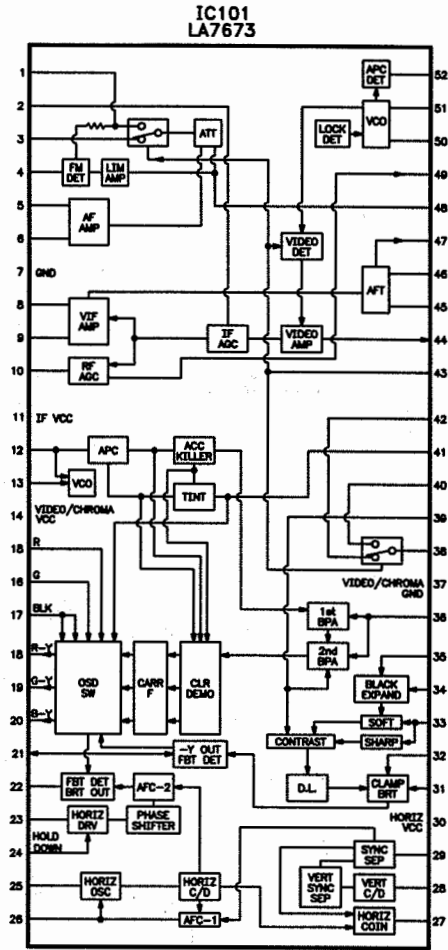


SCHEMATIC NOTES

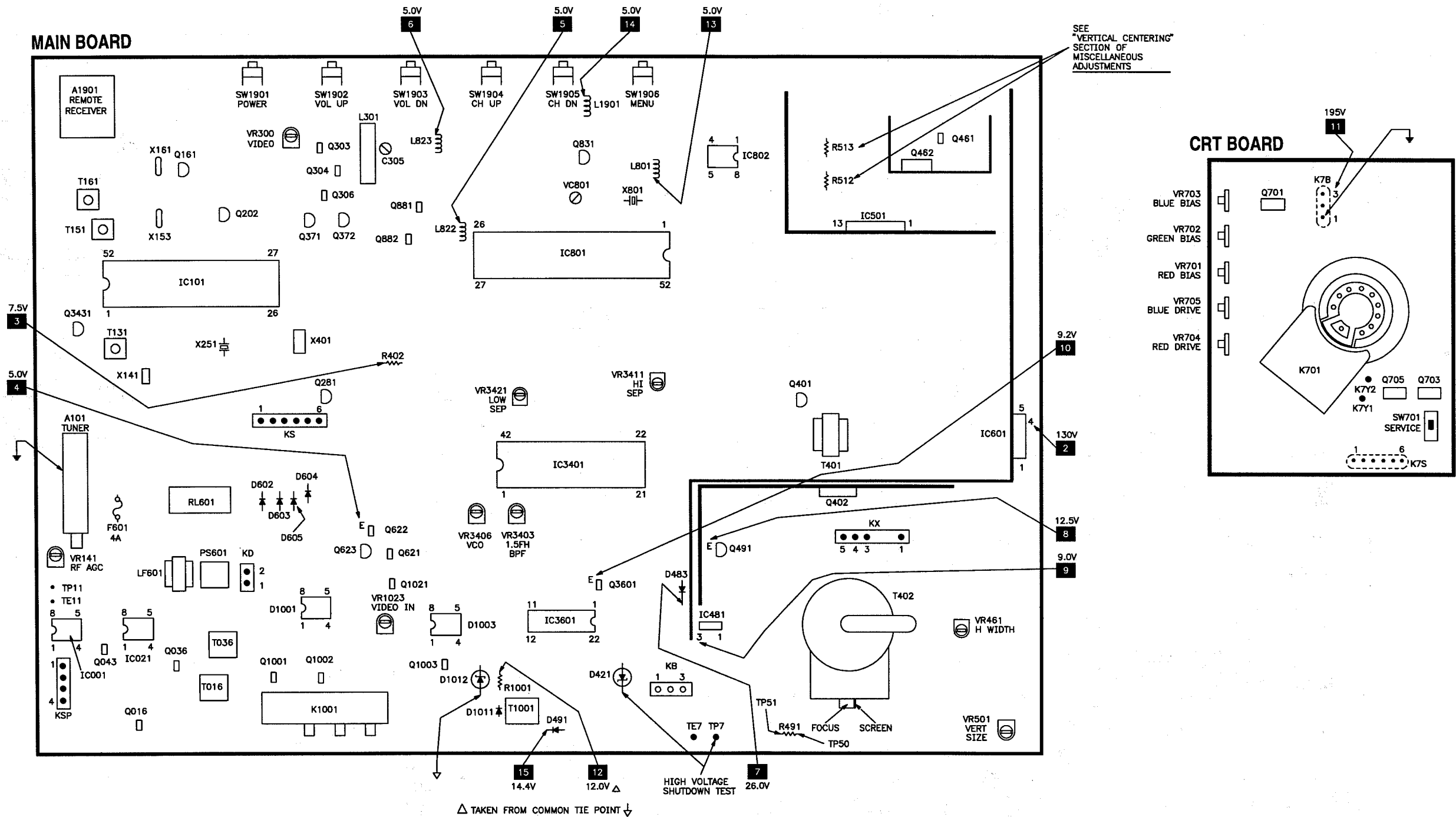
- # For SAFETY use only equivalent replacement part, see parts list.
- ✕ Circuitry not used in some versions.
- Circuitry used in some versions.
- ⏏ Ground
- ⏏ Chassis ground
- ⇩ Common tie point
- △ Taken from common tie point
- 3 Schematic **CIRCUITRACE**® Voltage source tie point.
- A— Cabling: Heavy 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.

IC FUNCTIONS



PLACEMENT CHART



SANYO

MODEL DS31650 (CHASSIS 31650-02/03/04)

A.

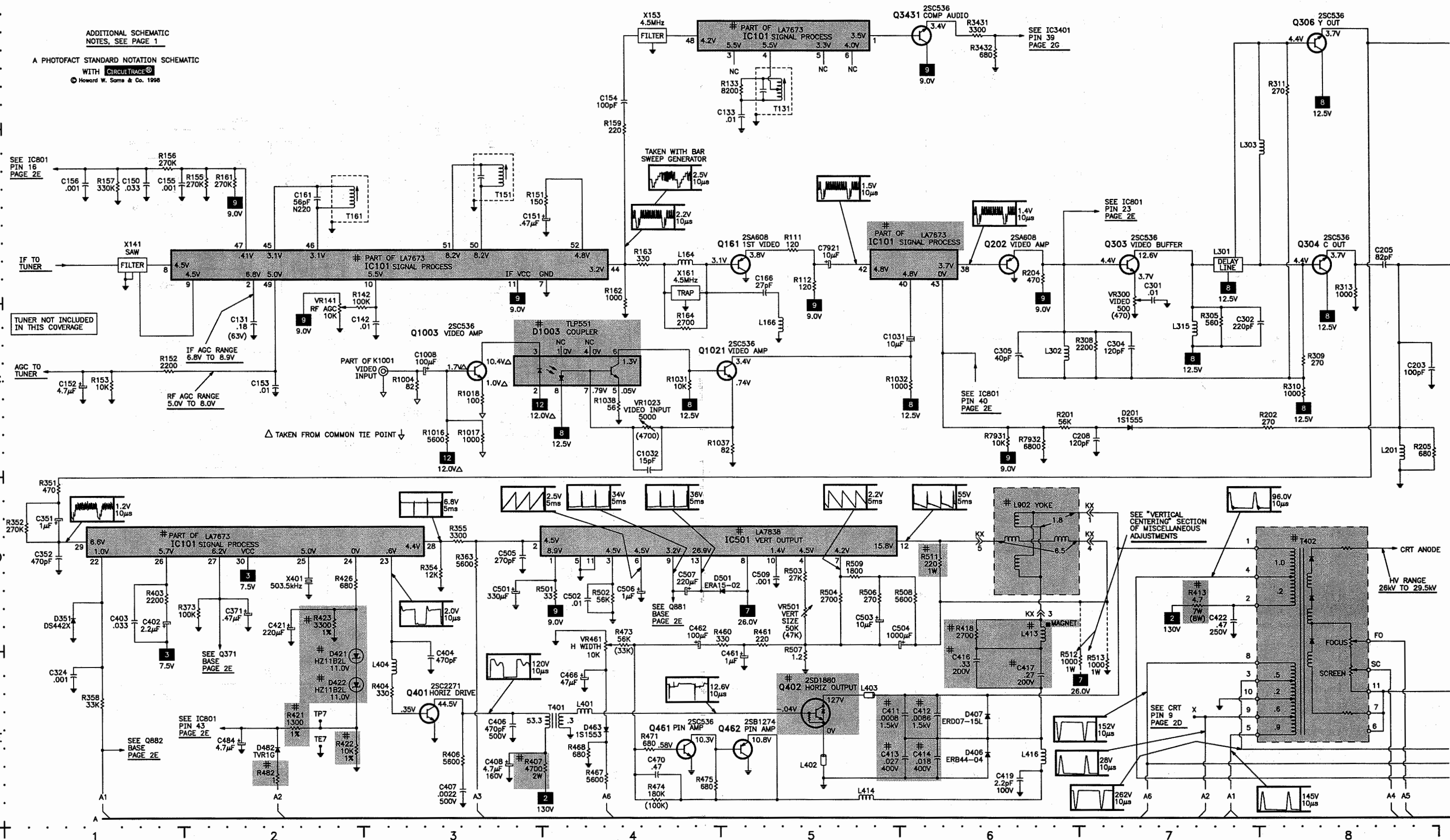
WITH **CIRCUITRACE®**
Howard W. Sams & Co. 1998

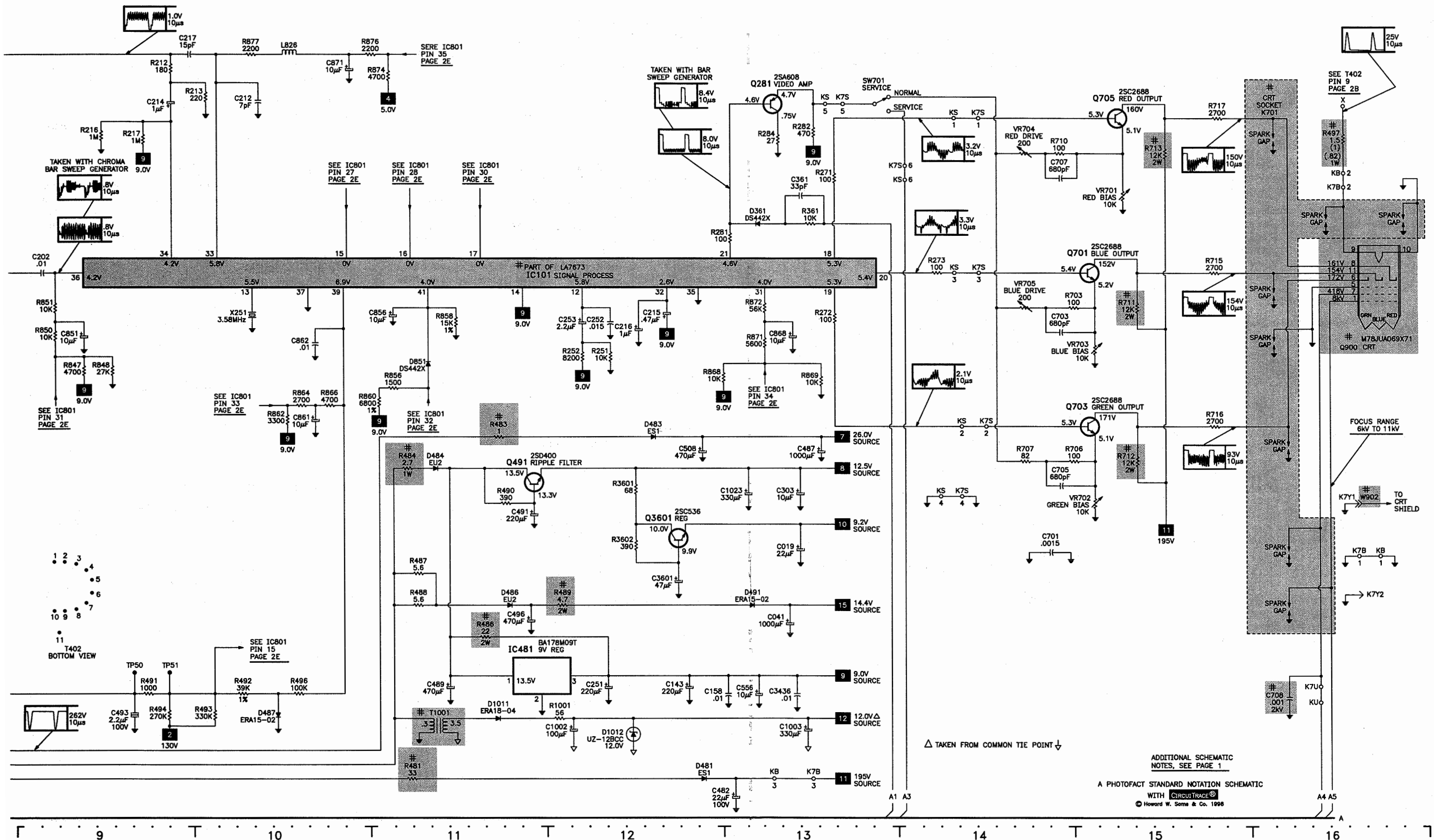
B

C

D

F

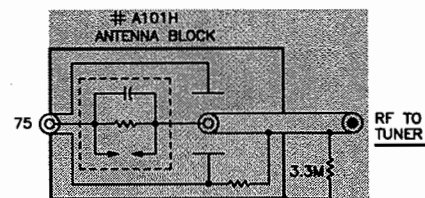
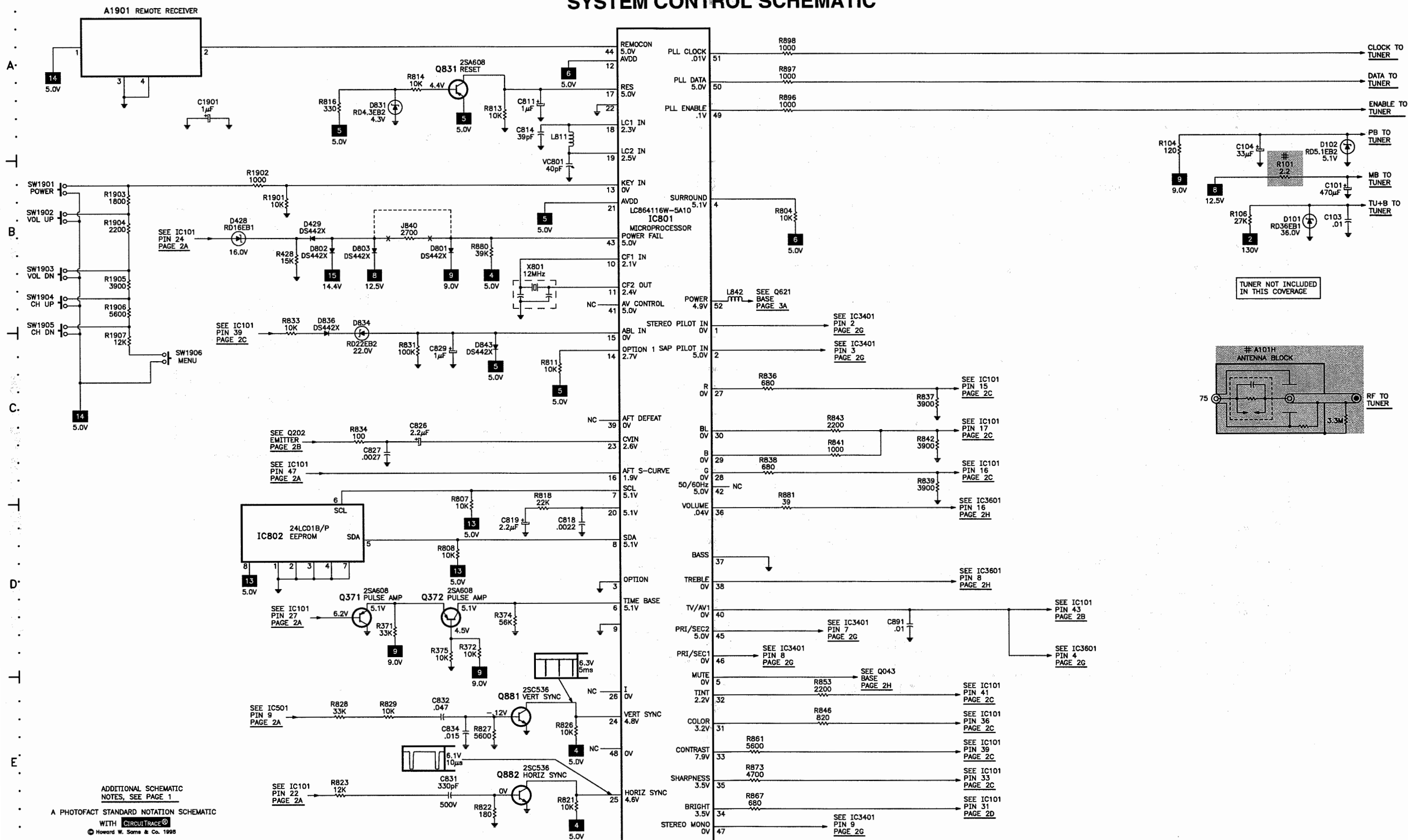




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F

SYSTEM CONTROL SCHEMATIC

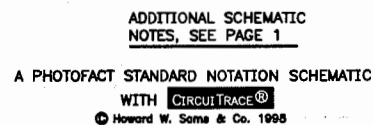


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ADDITIONAL SCHEMATIC
NOTES, SEE PAGE 1



A.
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 E.



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

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	PR570
Generators		Capacitance Analyzer	LC102
RGB	CM2125	CRT Analyzer	CR7000
Multiburst Signal	VG91	AC Leakage Tester	PR570
Color Bar	VG91	Inductance Analyzer	LC102
TV Stereo	VG91	Flyback Yoke Tester	TVA92
Digital VOM	SC3100	Field Strength Meter	SL753
Frequency Meter	SC3100	Transistor Tester	TF46
Hi-Voltage Probe	HP200	Horizontal Analyzer	HA-2500
Accessory Probes	TP212	Video Analyzer	VG91, TVA92



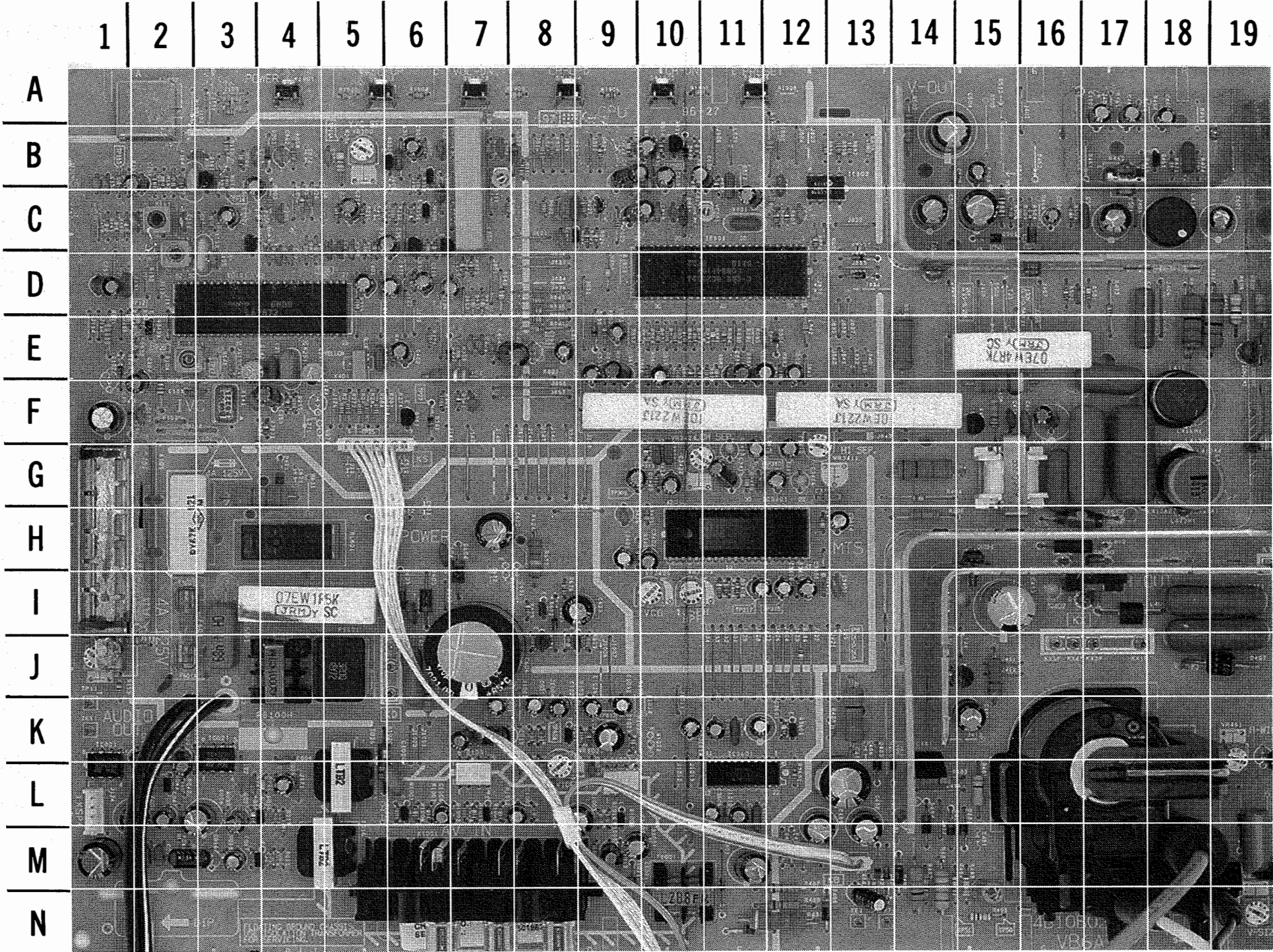
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SCHEMATIC COMPONENT LOCATION GUIDE

A1901	A-17	C412	E-6	C892	C-29	D621	D-34	Q303	B-7	R213	A-10	R502	D-4	R848	C-9	R3414	B-29
C001	D-29	C413	E-5	C1002	E-12	D622	D-34	Q304	B-8	R216	B-9	R503	D-5	R850	C-9	R3418	B-30
C002	D-30	C414	E-6	C1003	E-13	D623	E-35	Q306	A-8	R217	B-9	R504	D-5	R851	C-9	R3421	B-31
C003	D-30	C416	E-6	C1006	E-25	D801	B-19	Q371	D-18	R251	C-12	R506	D-5	R853	E-21	R3424	B-30
C006	D-31	C417	E-6	C1007	D-25	D802	B-18	Q372	D-19	R252	C-12	R507	E-5	R856	C-11	R3426	B-30
C007	D-31	C419	E-6	C1008	C-3	D803	B-18	Q401	E-3	R271	B-13	R508	D-6	R858	C-11	R3431	A-6
C008	D-30	C421	D-2	C1020	E-27	D831	A-19	Q402	E-5	R272	C-13	R509	D-5	R860	C-11	R3432	A-6
C016	C-29	C422	D-7	C1022	D-27	D834	C-18	Q461	E-4	R273	B-14	R511	D-6	R861	E-21	R3601	D-12
C017	C-31	C461	E-5	C1023	D-13	D836	C-18	Q462	E-5	R281	B-13	R512	E-6	R862	C-10	R3602	D-12
C019	D-13	C462	E-4	C1026	D-27	D843	C-19	Q491	D-11	R282	B-13	R513	E-7	R864	C-10	R7931	C-6
C021	D-29	C466	E-4	C1027	D-27	D851	C-11	Q621	E-34	R284	B-13	R601	A-35	R866	C-10	R7932	C-6
C022	D-30	C470	E-4	C1031	C-6	D1001	D-26	Q622	D-35	R305	C-7	R602	C-33	R867	E-21	RL601	A-34
C023	E-30	C482	E-13	C1032	D-4	D1003	C-4	Q623	E-35	R308	C-7	R604	C-34	R868	C-12	RL601	D-34
C026	D-31	C483	C-36	C1901	A-18	D1011	E-11	Q701	B-15	R309	C-8	R605	C-34	R869	C-13	SP901	D-31
C027	E-31	C484	E-2	C3401	A-31	D1012	E-12	Q703	C-15	R310	C-8	R606	C-34	R871	C-13	SP902	D-31
C036	E-29	C487	C-13	C3402	A-31	F601	A-33	Q705	B-15	R311	A-8	R607	C-34	R872	C-13	SW701	A-13
C037	E-31	C489	E-11	C3404	B-31	IC001	C-30	Q831	A-19	R313	C-8	R608	C-35	R873	E-21	SW1901	B-17
C041	D-13	C491	D-11	C3406	B-31	IC021	D-30	Q881	E-19	R351	D-1	R609	C-35	R874	A-11	SW1902	B-17
C042	E-28	C493	E-9	C3407	A-26	IC101	A-5	Q882	E-19	R352	D-1	R610	C-34	R876	A-10	SW1903	B-17
C101	B-24	C496	D-11	C3408	A-26	IC101	B-12	Q900	C-16	R354	D-3	R611	C-36	R877	A-10	SW1904	B-17
C103	B-24	C501	D-3	C3409	B-28	IC101	B-3	Q1001	E-26	R355	D-3	R621	C-34	R880	B-19	SW1905	C-17
C104	B-23	C502	D-4	C3411	A-27	IC101	B-5	Q1002	D-26	R358	E-1	R622	C-34	R881	D-21	SW1906	C-17
C131	C-2	C503	D-5	C3412	B-28	IC101	D-2	Q1003	C-3	R361	B-13	R623	E-36	R882	D-28	T016	C-31
C133	B-5	C504	E-5	C3413	B-29	IC481	E-11	Q1021	C-4	R363	D-3	R624	D-34	R884	D-28	T036	E-31
C142	C-3	C505	D-3	C3414	B-29	IC501	D-5	Q3431	A-6	R371	D-19	R625	D-35	R886	D-29	T131	A-5
C143	E-12	C506	D-4	C3416	B-29	IC601	C-35	Q3601	D-12	R372	D-19	R626	D-35	R892	C-29	T151	B-3
C150	B-1	C507	D-4	C3417	A-29	IC801	B-20	R001	D-30	R373	D-2	R627	E-34	R893	C-29	T161	B-2
C151	B-3	C508	C-12	C3418	B-30	IC802	D-18	R002	D-30	R374	D-19	R628	E-34	R896	A-21	T401	E-3
C152	C-1	C509	D-5	C3419	B-30	IC3401	A-28	R003	D-31	R375	D-19	R629	E-34	R897	A-21	T402	D-8
C153	C-2	C556	E-13	C3422	A-29	IC3601	D-28	R016	C-30	R401	C-35	R703	C-14	R898	A-21	T1001	E-11
C154	A-4	C601	A-33	C3423	B-25	J840	B-19	R017	C-30	R402	C-35	R706	C-14	R1001	E-12	VC801	B-20
C155	B-1	C604	A-35	C3424	B-30	K1001	C-3	R018	C-30	R403	D-1	R707	C-14	R1002	E-25	VR141	C-2
C156	B-1	C605	B-35	C3426	B-30	K1001	C-32	R019	C-30	R404	E-3	R710	B-14	R1003	D-25	VR300	C-7
C158	E-13	C606	C-36	C3436	E-13	K1001	D-25	R021	D-29	R406	E-3	R711	C-15	R1004	C-3	VR461	D-4
C161	B-2	C607	C-34	C3601	D-12	K1001	E-32	R022	D-30	R407	E-3	R712	C-15	R1006	E-26	VR501	D-5
C166	C-5	C611	B-34	C3602	D-28	L164	B-4	R023	D-31	R413	D-7	R713	B-15	R1007	E-26	VR701	B-15
C202	B-9	C622	D-34	C3603	D-28	L166	C-5	R036	E-30	R418	D-6	R715	B-15	R1008	E-26	VR702	D-15
C203	C-8	C623	E-36	C3604	C-28	L201	C-8	R037	E-29	R421	E-2	R716	C-15	R1011	D-26	VR703	C-15
C205	B-8	C701	D-14	C3606	C-27	L301	B-7	R038	E-30	R422	E-2	R717	B-15	R1012	D-26	VR704	B-14
C208	C-7	C703	C-14	C3607	D-29	L302	C-6	R039	E-30	R423	D-2	R804	B-21	R1013	D-26	VR705	C-14
C212	A-10	C705	D-14	C3608	D-28	L303	B-7	R041	D-30	R426	D-2	R807	D-19	R1016	C-3	VR1023	C-4
C214	A-9	C707	B-14	C7921	B-5	L315	C-7	R042	E-30	R428	B-18	R808	D-19	R1017	C-3	VR3403	B-27
C215	C-12	C708	E-16	D101	B-24	L401	E-4	R043	E-28	R460	E-4	R811	C-20	R1018	C-3	VR3406	B-27
C216	C-12	C801	E-35	D102	B-24	L402	E-5	R101	B-24	R461	E-5	R813	A-19	R1020	E-27	VR3411	B-28
C217	A-9	C802	E-36	D201	C-7	L403	E-5	R104	B-23	R467	E-4	R814	A-19	R1021	D-27	VR3421	B-28
C251	E-12	C806	E-36	D351	D-1	L404	E-3	R106	B-23	R468	E-4	R816	A-18	R1022	D-27	W601	A-33
C252	C-12	C811	A-19	D361	B-13	L413	D-6	R111	B-5	R471	E-4	R818	D-19	R1023	D-27	X141	B-1
C253	C-12	C814	A-19	D406	E-6	L414	E-5	R112	B-5	R473	E-4	R821	E-20	R1026	E-27	X153	A-4
C301	C-7	C818	D-20	D407	E-6	L416	E-6	R133	A-5	R474	E-4	R822	E-19	R1027	D-27	X161	C-4
C302	C-7	C819	D-19	D421	E-2	L801	E-35	R142	C-2	R475	E-4	R823	E-18	R1031	C-4	X251	C-10
C303	D-13	C821	D-36	D422	E-2	L811	A-20	R151	B-3	R481	E-11	R826	E-20	R1032	C-6	X401	D-2
C304	C-7	C826	C-19	D428	B-18	L822	D-35	R152	C-1	R482	E-2	R827	E-19	R1037	C-5	X801	B-19
C305	C-6	C827	C-19	D429	B-18	L823	E-35	R153	C-1	R483	C-11	R828	E-18	R1038	C-4		
C324	E-1	C829	C-19	D463	E-4	L826	A-10	R155	B-2	R484	D-11	R829	E-19	R1901	B-18		
C351	D-1	C831	E-19	D481	E-12	L842	B-20	R156	B-1	R486	D-11	R831	C-19	R1902	B-18		
C352	D-1	C832	E-19	D482	E-2	L901	B-34	R157	B-1	R487	D-11	R833	C-18	R1903	B-17		
C361	B-13	C834	E-19	D483	C-12	L902	D-6	R159	B-4	R488	D-11	R834	C-18	R1904	B-17		
C371	D-2	C851	C-9	D484	D-11	L1901	E-35	R161	B-2	R489	D-12	R836	C-21	R1905	B-17		
C401	C-36	C856	C-11	D486	D-11	LF601	A-33	R162	C-4	R490	D-11	R837	C-22	R1906	B-17		
C402	D-1	C861	C-10	D487	E-10	PS601	A-34	R163	B-4	R491	E-9	R838	C-21	R1907	C-17		
C403	D-1	C862	C-10	D491	D-13	Q016	C-30	R164	C-4	R492	E-10	R839	C-22	R3401	A-31		
C404	E-3	C868	C-13	D501	D-4	Q036	E-30	R201	C-6	R493	E-10	R841	C-21	R3402	A-25		
C406	E-3	C871	A-10	D602	A-35	Q043	E-28	R202	C-7	R494	E-9	R842	C-22	R3403	B-26		
C407	E-3	C883	D-28	D603	B-35	Q161	B-5	R204	B-6	R496	E-10	R843	C-21	R3404	B-27		
C408	E-3	C886	D-29	D604	A-35	Q202	B-6	R205	C-8	R497	B-16	R846	E-21	R3406	B-27		
C411	E-5	C891	D-21	D605	B-35	Q281	A-13	R212	A-9	R501	D-4	R847	C-9	R3407	A-26		

MAIN BOARD



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MAIN BOARD, GRIDTRACE LOCATION GUIDE

A101	G-1	C411	I-19	C1007	L-6	D802	M-11	Q462	B-17	R308	B-7	R606	D-19	R886	E-11	T402	L-17
A1901	A-2	C412	J-19	C1008	L-8	D803	M-10	Q491	J-15	R309	C-7	R607	E-18	R892	E-12	T1001	N-10
C001	K-7	C413	F-17	C1020	M-9	D831	B-10	Q621	J-9	R310	B-8	R608	F-10	R893	E-12	TE7	N-13
C002	L-2	C414	G-16	C1022	L-6	D834	D-13	Q622	I-8	R311	C-7	R609	F-13	R896	B-12	TP7	N-13
C003	L-2	C416	G-17	C1023	K-7	D836	D-13	Q623	J-8	R313	B-6	R610	D-19	R897	B-13	TP50	N-15
C006	L-2	C417	G-17	C1026	K-9	D843	B-10	Q831	B-10	R351	C-6	R611	E-14	R898	B-13	TP51	N-15
C007	N-2	C419	E-18	C1027	K-9	D851	E-9	Q881	C-9	R352	C-5	R621	H-2	R1001	M-10	VC801	C-11
C008	K-4	C421	E-8	C1031	K-8	D1001	L-7	Q882	C-9	R354	C-5	R622	G-4	R1002	L-7	VR141	J-1
C016	M-2	C422	M-19	C1032	K-9	D1003	L-9	Q1001	L-6	R355	D-5	R623	J-8	R1003	L-8	VR300	B-5
C017	M-3	C461	A-17	C1901	L-9	D1011	N-9	Q1002	L-7	R358	E-7	R624	H-8	R1004	L-8	VR461	N-19
C019	K-7	C462	A-18	C3401	H-9	D1012	M-9	Q1003	L-9	R361	F-7	R625	I-8	R1006	L-6	VR501	L-19
C021	K-8	C466	L-19	C3402	H-10	F601	I-2	Q1021	K-8	R363	F-6	R626	I-8	R1007	L-6	VR1023	L-8
C022	L-3	C470	B-18	C3404	I-11	IC001	L-1	Q3431	E-2	R371	C-6	R627	J-8	R1008	L-6	VR3403	I-10
C023	L-2	C482	M-13	C3406	I-12	IC021	L-3	Q3601	K-12	R372	D-7	R628	G-8	R1011	L-7	VR3406	I-10
C026	L-3	C483	I-15	C3407	I-13	IC101	E-2	R001	L-2	R373	D-6	R629	J-9	R1012	L-7	VR3411	G-12
C027	M-2	C484	N-13	C3408	I-12	IC481	L-14	R002	L-2	R374	C-6	R804	C-12	R1013	L-7	VR3421	G-11
C036	L-4	C487	L-13	C3409	G-13	IC501	D-16	R003	N-2	R375	D-7	R807	C-12	R1016	L-9	X141	F-3
C037	L-3	C489	M-12	C3411	G-11	IC601	G-19	R016	M-3	R401	G-14	R808	C-12	R1017	M-9	X153	D-3
C041	M-1	C491	K-15	C3412	G-12	IC801	D-12	R017	M-4	R402	E-7	R811	B-10	R1018	L-9	X161	B-2
C042	L-2	C493	N-15	C3413	G-11	IC802	B-13	R018	M-3	R403	E-6	R813	B-11	R1020	L-5	X251	E-4
C101	F-1	C496	M-11	C3414	H-13	IC3401	H-10	R019	M-4	R404	G-14	R814	B-10	R1021	L-8	X401	E-5
C103	F-2	C501	C-17	C3416	G-12	IC3601	L-12	R021	L-4	R406	F-15	R816	B-9	R1022	L-8	X801	C-11
C104	F-2	C502	C-17	C3417	G-12	J840	E-13	R022	L-3	R407	F-15	R818	C-10	R1023	L-8		
C131	D-1	C503	B-15	C3418	G-11	K1001	M-6	R023	M-2	R413	E-16	R821	C-9	R1026	K-8		
C133	F-2	C504	B-15	C3419	G-11	KB	M-13	R036	L-4	R418	G-18	R822	C-8	R1027	K-8		
C142	F-3	C505	D-16	C3422	G-10	KD	J-6	R037	L-4	R421	N-13	R823	E-8	R1031	K-9		
C143	E-4	C506	C-16	C3423	G-9	KS	G-5	R038	L-3	R422	M-12	R826	C-9	R1032	K-9		
C150	B-11	C507	C-14	C3424	G-10	KSP	L-1	R039	L-3	R423	K-13	R827	C-9	R1037	K-9		
C151	B-2	C508	C-15	C3426	G-10	KX	J-17	R041	L-2	R426	E-6	R828	B-13	R1038	K-9		
C152	D-1	C509	B-15	C3436	H-9	L164	B-2	R042	L-2	R428	L-14	R829	B-9	R1901	A-3		
C153	C-2	C556	E-9	C3601	K-11	L166	B-3	R043	M-2	R460	A-18	R831	B-10	R1902	A-3		
C154	C-3	C601	J-3	C3602	K-11	L201	D-4	R101	E-1	R461	A-17	R833	C-13	R1903	A-5		
C155	D-3	C604	H-6	C3603	K-11	L301	B-7	R104	F-2	R467	N-16	R834	B-8	R1904	A-6		
C156	B-1	C605	I-6	C3604	K-10	L302	B-8	R106	H-14	R468	M-19	R836	D-8	R1905	A-8		
C158	B-1	C606	J-7	C3606	L-11	L303	C-6	R111	B-3	R471	B-18	R837	D-7	R1906	A-9		
C161	C-2	C607	C-19	C3607	L-11	L315	B-6	R112	B-3	R473	D-17	R838	E-8	R1907	A-10		
C166	B-3	C611	J-6	C3608	L-11	L401	H-17	R133	E-2	R474	B-18	R839	D-7	R3401	H-9		
C202	D-4	C622	H-7	C7921	C-3	L402	H-16	R142	F-3	R475	B-18	R841	E-8	R3402	I-12		
C203	D-4	C623	I-9	D101	F-2	L403	I-17	R151	B-1	R481	L-15	R842	D-7	R3403	I-11		
C205	C-4	C801	B-12	D102	E-1	L404	E-7	R152	D-2	R482	N-14	R843	D-8	R3404	I-11		
C208	B-3	C802	C-11	D201	B-4	L413	G-18	R153	J-1	R483	L-14	R846	E-10	R3406	I-11		
C212	C-5	C806	C-12	D351	E-7	L414	C-18	R155	C-1	R484	N-14	R847	E-9	R3407	I-12		
C214	C-5	C811	B-10	D361	F-6	L416	F-18	R156	C-1	R486	K-13	R848	E-9	R3414	H-12		
C215	D-7	C814	C-10	D406	G-16	L801	C-12	R157	B-1	R487	N-12	R850	E-9	R3418	G-11		
C216	D-6	C818	C-10	D407	J-19	L811	C-10	R159	C-3	R488	N-12	R851	C-4	R3421	I-10		
C217	C-5	C819	B-10	D421	M-12	L822	C-9	R161	C-1	R489	N-12	R853	E-10	R3424	G-10		
C251	E-4	C821	C-10	D422	M-12	L823	B-8	R162	B-2	R490	J-14	R856	E-10	R3426	G-10		
C252	E-4	C826	B-9	D428	M-13	L826	C-4	R163	B-2	R491	N-15	R858	B-4	R3431	E-2		
C253	F-4	C827	B-10	D429	M-13	L842	E-12	R164	B-2	R492	N-14	R860	E-10	R3432	E-2		
C301	B-5	C829	B-11	D463	M-19	L1901	B-12	R201	B-3	R493	N-13	R861	E-10	R3601	L-12		
C302	B-6	C831	C-8	D481	M-15	LF601	J-4	R202	C-4	R494	N-12	R862	E-10	R3602	K-12		
C303	B-6	C832	C-8	D482	M-14	PS601	J-5	R204	B-5	R496	J-12	R864	E-10	R7931	F-4		
C304	B-7	C834	C-9	D483	L-13	Q016	M-3	R205	C-3	R497	M-14	R866	E-10	R7932	E-1		
C305	B-7	C851	E-8	D484	M-14	Q036	L-6	R212	C-6	R501	D-17	R867	E-11	RL601	H-4		
C324	E-7	C856	E-9	D486	N-12	Q043	L-2	R213	C-6	R502	D-16	R868	E-10	SW1901	A-4		
C351	C-6	C861	E-9	D487	M-14	Q161	B-3	R216	C-5	R503	C-16	R869	E-10	SW1902	A-5		
C352	C-5	C862	B-4	D491	N-11	Q202	C-3	R217	C-5	R504	C-16	R871	E-10	SW1903	A-7		
C361	F-7	C868	E-10	D501	C-15	Q281	F-6	R251	F-4	R506	C-15	R872	C-4	SW1904	A-8		
C371	D-6	C871	E-9	D602	H-5	Q303	B-6	R252	F-4	R507	B-14	R873	E-11	SW1905	A-10		
C401	D-5	C883	E-11	D603	I-6	Q304	B-6	R271	F-5	R508	C-15	R874	E-11	SW1906	A-11		
C402	E-6	C886	E-11	D604	I-7	Q306	C-6	R272	F-5	R509	C-16	R876	E-10	T016	M-5		
C403	E-5	C891	E-12	D605	I-6	Q371	C-6	R273	F-5	R511	J-15	R877	C-4	T036	L-5		
C404	E-7	C892	E-12	D621	G-4	Q372	C-7	R281	F-5	R601	I-4	R880	D-9	T131	E-2		
C406	F-15	C1002	M-9	D622	H-6	Q401	F-15	R282	F-6	R602	J-6	R881	E-11	T151	C-2		
C407	F-16	C1003	L-8	D623	I-8	Q402	I-17	R284	F-5	R604	E-19	R882	E-11	T161	C-2		
C408	F-16	C1006	L-6	D801	E-12	Q461	B-18	R305	B-6	R605	E-19	R884	E-11	T401	G-15		

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.
D101	RD36EB1	407 056 2307	NTE5037A	ECG5037A	SK36A
D102	UZ-36BCA	407 163 9503	-	-	-
	RD5.1EB2	407 056 8002	NTE5010A	ECG5010A	SK5A1
	RD5.1EB3	407 056 8200	NTE5010A	ECG5010A	SK5A1
	UZ-5.1BCB	407 151 8402	-	-	-
D201, D351, D361	UZ-5.1BCC	407 163 8209	-	-	-
	DS442X	407 005 4505	NTE519	ECG519	SK3100
	GMA01	407 007 9904	NTE519	ECG519	SK3100
	1SS133	407 012 4406	NTE519	ECG519	SK3100
	1SS176	407 012 5809	NTE177	ECG177	SK9091
	1S1555	407 013 1206	NTE177	ECG177	SK9091
	1S2076	407 013 4207	NTE177	ECG177	SK9091
	1S2473	407 013 7109	NTE177	ECG177	SK9091
	1N4148	408 008 2406	NTE519	ECG519	SK3100
	ERB44-04	407 006 4108	NTE552	ECG552	SK9000
	D406	407 095 8001	NTE506	ECG506	SK3925
	D407	407 158 1307	NTE5020A	ECG5020A	SK11A
	# D421, 22	407 054 7007	NTE5025A	ECG5025A	SK16A
	D428	407 054 7205	NTE5025A	ECG5025A	SK16A
	RD16EB1	407 163 9305	-	-	-
	RD16EB3	407 164 7201	-	-	-
D429, 63	UZ-16BCA	407 005 4505	NTE519	ECG519	SK3100
	UZ-16BCC	407 007 9904	NTE519	ECG519	SK3100
	DS442X	407 012 4406	NTE519	ECG519	SK3100
	GMA01	407 012 5809	NTE177	ECG177	SK9091
	1SS133	407 013 1206	NTE177	ECG177	SK9091
	1SS176	407 013 4207	NTE177	ECG177	SK9091
	1S1555	407 013 7109	NTE177	ECG177	SK9091
	1S2076	408 008 2406	NTE519	ECG519	SK3100
	1S2473	407 013 1008	NTE177	ECG177	SK9091
	1N4148	407 013 4306	NTE519	ECG519	SK3100
	1S1553	407 013 6508	NTE519	ECG519	SK3100
	1S2076A	408 008 2406	NTE519	ECG519	SK3100
	1S2471	407 007 6606	NTE552	ECG552	SK9000
	1N4148	407 124 5506	NTE552	ECG552	SK9000
	D481	407 124 6404	NTE552	ECG552	SK9000
	ES1	407 011 4407	NTE552	ECG552	SK9000
D482	RMPG06G	407 007 6606	NTE552	ECG552	SK9000
	ERA18-04	407 124 5506	NTE552	ECG552	SK9000
	TVR1G	407 124 6404	NTE552	ECG552	SK9000
	D483	407 007 6606	NTE552	ECG552	SK9000
D484, 86	RMPG06G	407 124 5506	NTE552	ECG552	SK9000
	ERA18-04	407 124 6404	NTE552	ECG552	SK9000
	EU2	407 007 7603	NTE552	ECG552	SK9000
	D487, 91, 501	407 005 8602	NTE552	ECG552	SK9000
# D602, 03, 04, 05	S5277B	407 011 3004	NTE552	ECG552	SK9000
	MPG06D	407 088 6502	NTE552	ECG552	SK9000
	IN4002ID	408 009 9404	NTE116	ECG116	SK3311
	1S1887A	407 013 3200	NTE552	ECG552	SK9000
	EM2B	407 005 7605	NTE125	ECG125	SK3081
	GPI5G	407 008 8606	NTE125	ECG125	SK3081
	ERA15-02	407 005 8602	NTE552	ECG552	SK9000
	S5277B	407 011 3004	NTE552	ECG552	SK9000
	MPG06D	407 088 6502	NTE552	ECG552	SK9000
	IN4002ID	408 009 9404	NTE116	ECG116	SK3311
	D622	407 005 4505	NTE519	ECG519	SK3100
	DS442X	407 007 9904	NTE519	ECG519	SK3100
	GMA01	407 012 4406	NTE519	ECG519	SK3100
	1SS133	407 012 5809	NTE177	ECG177	SK9091
	1SS176	407 013 1206	NTE177	ECG177	SK9091
	1S1555	407 013 4207	NTE177	ECG177	SK9091
	1S2076	407 013 7109	NTE177	ECG177	SK9091
	1S2473	408 008 2406	NTE519	ECG519	SK3100
	1N4148	408 008 2406	NTE519	ECG519	SK3100
# For SAFETY use only equivalent replacement part.					

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.
D623	RD5.1EB2	407 056 8002	NTE5010A	ECG5010A	SK5A1
D801, 02, 03	UZ-5.1BCB	407 151 8402	-	-	-
	DS442X	407 005 4505	NTE519	ECG519	SK3100
	GMA01	407 007 9904	NTE519	ECG519	SK3100
	1SS133	407 012 4406	NTE519	ECG519	SK3100
	1SS176	407 012 5809	NTE177	ECG177	SK9091
	1S1555	407 013 1206	NTE177	ECG177	SK9091
	1S2076	407 013 4207	NTE177	ECG177	SK9091
	1S2473	407 013 7109	NTE177	ECG177	SK9091
	1N4148	408 008 2406	NTE519	ECG519	SK3100
	D831	407 056 4707	NTE5008A	ECG5008A	SK4A3
	RD4.3EB2	407 164 9601	-	-	-
	UZ-4.3BCB	407 055 2902	-	-	-
	D834	407 164 8109	-	-	-
	RD22EB2	407 005 4505	NTE519	ECG519	SK3100
	UZ-22BCB	407 007 9904	NTE519	ECG519	SK3100
	D836, 43, 51	407 012 4406	NTE519	ECG519	SK3100
# D1001	DS442X	407 012 5809	NTE177	ECG177	SK9091
	GMA01	407 013 1206	NTE177	ECG177	SK9091
	1SS133	407 013 4207	NTE177	ECG177	SK9091
	1SS176	407 013 7109	NTE177	ECG177	SK9091
	1S1555	408 008 2406	NTE519	ECG519	SK3100
	1S2076	407 176 6209	-	-	-
	1S2473	407 145 3703	-	-	-
	1N4148	407 176 6100	-	-	-
	TLP521-2-BL	408 000 0301	NTE3092	ECG3092	SK9770
	PC827C	407 007 6606	NTE552	ECG552	SK9000
	PC827D	407 124 5506	NTE552	ECG552	SK9000
	# D1003	407 124 6404	NTE552	ECG552	SK9000
	D1011	407 162 5308	-	-	-
	ES1	409 343 0409	-	-	-
	RMPG06G	409 274 3302	-	-	-
	ERA18-04	409 367 2809	NTE1966	ECG1966	-
# IC001, 021	UZ-12BCC	409 370 0007	-	-	-
	TDA7231A	409 366 7904	-	-	-
	LA7673	409 173 2802	NTE7039	ECG7039	-
	BA178M09T	409 243 0806	NTE1777	ECG1777	SK9870
	MC78M09CT	410 252 7304	-	-	-
	UPC78M09AHF	409 321 0902	-	-	-
	LA7838	409 270 0008	-	-	-
	STR30130	409 321 7307	-	-	-
	LC864116W-5A10	410 243 3803	-	-	-
	24LC01B/P	409 272 3205	-	-	-
	ST24C01B1	409 279 3109	-	-	-
	XLS24C01AP	405 011 8500	NTE85	ECG85	SK3122
	AT24C01A-10PC-2.5	405 011 8401	NTE85	ECG85	SK3122
	IC3401	405 011 8609	NTE85	ECG85	SK3122
	IC3601	405 012 2002	NTE85	ECG85	SK3124A
	Q016, 036, 043	405 012 2101	NTE85	ECG85	SK3124A
# IC601	2SC1740S-R	405 012 2309	NTE85	ECG85	SK3124A
	2SC1740S-Q	405 019 1909	NTE85	ECG85	SK3245
	2SC1740S-S	405 019 2708	NTE85	ECG85	SK3245
	2SC1815-GR	405 019 3804	NTE85	ECG85	SK3245
	2SC1815-0	405 020 7501	NTE85	ECG85	SK3124A
	2SC1815-Y	405 020 7709	NTE85	ECG85	SK3124A
	2SC536-E-NP	405 020 7907	NTE85	ECG85	SK3124A
	2SC536-F-NP	-	-	-	-
	2SC536-G-NP	-	-	-	-
	2SC945A-PA	-	-	-	-
	2SC945A-QA	-	-	-	-
	2SC945A-RA	-	-	-	-
	IC801	-	-	-	-
	IC802	-	-	-	-
	IC802	-	-	-	-
	IC802	-	-	-	-
# For SAFETY use only equivalent replacement part.					

PARTS LIST continued

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.
Q161, Q202, Q281	2SA1015-0(SAN)	405 001 7407	NTE290A	ECG290A	SK9132
	2SA1015-Y(SAN)	405 001 7605	NTE290A	ECG290A	SK9132
	2SA564A-Q(CU)	405 004 3109	NTE290A	ECG290A	SK3932
	2SA564A-R(CU)	405 004 3208	NTE290A	ECG290A	SK3932
	2SA608-E-CTV-NP	405 004 4205	NTE290A	ECG290A	SK3114A
	2SA608-F-CTV-NP	405 004 4809	NTE290A	ECG290A	SK3114A
	2SA933S-Q	405 006 1707	NTE290A	ECG290A	SK9132
	2SA933S-R	405 006 1806	NTE290A	ECG290A	SK9132
	2SA933S-Q	405 006 1707	NTE290A	ECG290A	SK9132
	2SC1740S-Q	405 011 8401	NTE85	ECG85	SK3122
Q303, 04, 06	2SC1740S-R	405 011 8500	NTE85	ECG85	SK3122
	2SC1740S-S	405 011 8609	NTE85	ECG85	SK3122
	2SC1815-GR	405 012 2002	NTE85	ECG85	SK3124A
	2SC1815-0	405 012 2101	NTE85	ECG85	SK3124A
	2SC1815-Y	405 012 2309	NTE85	ECG85	SK3124A
	2SC536-E-NP	405 019 1909	NTE85	ECG85	SK3245
	2SC536-F-NP	405 019 2708	NTE85	ECG85	SK3245
	2SC536-G-NP	405 019 3804	NTE85	ECG85	SK3245
	2SC945A-PA	405 020 7501	NTE85	ECG85	SK3124A
	2SC945A-QA	405 020 7709	NTE85	ECG85	SK3124A
Q371, 72	2SC945A-RA	405 020 7907	NTE85	ECG85	SK3124A
	2SA1015-0(SAN)	405 001 7407	NTE290A	ECG290A	SK9132
	2SA1015-Y(SAN)	405 001 7605	NTE290A	ECG290A	SK9132
	2SA564A-Q(CU)	405 004 3109	NTE290A	ECG290A	SK3932
	2SA564A-R(CU)	405 004 3208	NTE290A	ECG290A	SK3932
	2SA608-E-CTV-NP	405 004 4205	NTE290A	ECG290A	SK3114A
	2SA933S-Q	405 006 1707	NTE290A	ECG290A	SK9132
	2SA933S-R	405 006 1806	NTE290A	ECG290A	SK9132
	2SC2271-D-CTV	405 013 6207	NTE399	ECG399	SK9352
	2SC2271-E-CTV	405 013 6306	NTE399	ECG399	SK9352
Q401	2SC2271-D	405 029 7106	NTE399	ECG399	SK9352
	2SC2271-E	405 029 7205	NTE399	ECG399	SK9352
	# Q402	2SD1880	NTE2353	ECG2353	-
	2SD1880-CTV-YB	405 112 7600	NTE2353	ECG2353	-
Q461	2SC1740S-Q	405 011 8401	NTE85	ECG85	SK3122
	2SC1740S-R	405 011 8500	NTE85	ECG85	SK3122
	2SC1740S-S	405 011 8609	NTE85	ECG85	SK3122
	2SC1815-GR	405 012 2002	NTE85	ECG85	SK3124A
	2SC1815-Y	405 012 2309	NTE85	ECG85	SK3124A
	2SC536-F-NP	405 019 2708	NTE85	ECG85	SK3245
	2SC536-G-NP	405 019 3804	NTE85	ECG85	SK3245
	2SC945A-PA	405 020 7501	NTE85	ECG85	SK3124A
	2SC945A-RA	405 020 7907	NTE85	ECG85	SK3124A
	Q462	2SB1274-Q-RA	405 064 7307	NTE153	ECG153
Q462	2SB1274-R-RA	405 064 7406	NTE153	ECG153	SK3274
	Q491	2SD400-E-MP	405 023 5009	NTE382	ECG382
Q491	2SD400-F-MP	405 023 5306	NTE382	ECG382	SK3849
	Q621, 22	2SC1740S-Q	405 011 8401	NTE85	ECG85
Q621, 22	2SC1740S-R	405 011 8500	NTE85	ECG85	SK3122
	2SC1740S-S	405 011 8609	NTE85	ECG85	SK3122
	2SC1815-GR	405 012 2002	NTE85	ECG85	SK3124A
	2SC1815-0	405 012 2101	NTE85	ECG85	SK3124A
	2SC1815-Y	405 012 2309	NTE85	ECG85	SK3124A
	2SC536-E-NP	405 019 1909	NTE85	ECG85	SK3245
	2SC536-F-NP	405 019 2708	NTE85	ECG85	SK3245
	2SC536-G-NP	405 019 3804	NTE85	ECG85	SK3245
	2SC945A-PA	405 020 7501	NTE85	ECG85	SK3124A
	2SC945A-QA	405 020 7709	NTE85	ECG85	SK3124A
Q621, 22	2SC945A-RA	405 020 7907	NTE85	ECG85	SK3124A

For SAFETY use only equivalent replacement part.

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.
Q623	2SA1015-0(SAN)	405 001 7407	NTE290A	ECG290A	SK9132
	2SA1015-Y(SAN)	405 001 7605	NTE290A	ECG290A	SK9132
	2SA564A-Q(CU)	405 004 3109	NTE290A	ECG290A	SK3932
	2SA564A-R(CU)	405 004 3208	NTE290A	ECG290A	SK3932
	2SA608-E-CTV-NP	405 004 4205	NTE290A	ECG290A	SK3114A
	2SA608-F-CTV-NP	405 004 4809	NTE290A	ECG290A	SK3114A
	2SA933S-Q	405 006 1707	NTE290A	ECG290A	SK9132
	2SA933S-R	405 006 1806	NTE290A	ECG290A	SK9132
	Q701, 03, 05	2SC2688(1)-L	405 067 1008	NTE157	ECG157
	2SC2688(1)-K	405 066 9903	NTE157	ECG157	SK3747
Q701, 03, 05	2SC2688(1)-M	405 067 0107	NTE157	ECG157	SK3747
	2SC2621-D-RA	405 041 6507	NTE157	ECG157	SK3747
	2SC2621-E-RA	405 041 6705	NTE157	ECG157	SK3747
	2SC2621-C-RA	405 066 4304	NTE157	ECG157	SK3747
	Q831	2SC3620(LB-SAN-1)	406 000 3605	NTE157	ECG157
	2SA1015-0(SAN)	405 001 7407	NTE290A	ECG290A	SK9132
	2SA1015-Y(SAN)	405 001 7605	NTE290A	ECG290A	SK9132
	2SA564A-Q(CU)	405 004 3109	NTE290A	ECG290A	SK3932
	2SA564A-R(CU)	405 004 3208	NTE290A	ECG290A	SK3932
	2SA608-E-CTV-NP	405 004 4205	NTE290A	ECG290A	SK3114A
Q881, 82	2SA608-F-CTV-NP	405 004 4809	NTE290A	ECG290A	SK3114A
	2SA933S-Q	405 006 1707	NTE290A	ECG290A	SK9132
	2SA933S-R	405 006 1806	NTE290A	ECG290A	SK9132
	2SC1740S-Q	405 011 8401	NTE85	ECG85	SK3122
	2SC1740S-S	405 011 8609	NTE85	ECG85	SK3122
	2SC1815-GR	405 012 2002	NTE85	ECG85	SK3124A
	2SC1815-0	405 012 2101	NTE85	ECG85	SK3124A
	2SC1815-Y	405 012 2309	NTE85	ECG85	SK3124A
	2SC536-E-NP	405 019 1909	NTE85	ECG85	SK3245
	2SC536-F-NP	405 019 2708	NTE85	ECG85	SK3245
Q1001, 02, 03, 21	2SC536-G-NP	405 019 3804	NTE85	ECG85	SK3245
	2SC945A-PA	405 020 7501	NTE85	ECG85	SK3124A
	2SC945A-QA	405 020 7709	NTE85	ECG85	SK3124A
	2SC945A-RA	405 020 7907	NTE85	ECG85	SK3124A
	2SC1740S-Q	405 011 8401	NTE85	ECG85	SK3122
	2SC1740S-S	405 011 8609	NTE85	ECG85	SK3122
	2SC1740S-R	405 011 8500	NTE85	ECG85	SK3122
	2SC1815-GR	405 012 2002	NTE85	ECG85	SK3124A
	2SC1815-0	405 012 2101	NTE85	ECG85	SK3124A
	2SC1815-Y	405 012 2309	NTE85	ECG85	SK3124A
Q3431, Q3601	2SC536-E-NP	405 019 1909	NTE85	ECG85	SK3245
	2SC536-F-NP	405 019 2708	NTE85	ECG85	SK3245
	2SC536-G-NP	405 019 3804	NTE85	ECG85	SK3245
	2SC945A-PA	405 020 7501	NTE85	ECG85	SK3124A
	2SC945A-QA	405 020 7709	NTE85	ECG85	SK3124A
	2SC945A-RA	405 020 7907	NTE85	ECG85	SK3124A
	2SC1740S-Q	405 011 8401	NTE85	ECG85	SK3122
	2SC1740S-R	405 011 8500	NTE85	ECG85	SK3122
	2SC1740S-S	405 011 8609	NTE85	ECG85	SK3122
	2SC1815-GR	405 012 2002	NTE85	ECG85	SK3124A
Q3431, Q3601	2SC1815-0	405 012 2101	NTE85	ECG85	SK3124A
	2SC1815-Y	405 012 2309	NTE85	ECG85	SK3124A
	2SC536-E-NP	405 019 1909	NTE85	ECG85	SK3245
	2SC536-F-NP	405 019 2708	NTE85	ECG85	SK3245
	2SC536-G-NP	405 019 3804	NTE85	ECG85	SK3245
	2SC945A-PA	405 020 7501	NTE85	ECG85	SK3124A
	2SC945A-QA	405 020 7709	NTE85	ECG85	SK3124A
	2SC945A-RA	405 020 7907	NTE85	ECG85	SK3124A

PARTS LIST continued

CONTROLS & RESISTORS

Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
# PS601	6.8 PTC Cold / 263 Cold	408 021 9109	-
	-	408 021 9208	-
	-	408 002 5205	-
# R101	2.2 5% 1/4W	401 015 6603	QW2D2
# R401	5600 5% 2W	401 068 8807	2W256
# R402	3900 5% 1W	401 061 7401	1W239
# R407	4700 5% 2W	401 068 4700	2W247
# R413	4.7 10% 7W Wirewound	402 072 9002	-
	4.7 10% 8W Wirewound	402 072 8906	-
# R418	2700 5% 1/2W Nonflammable	401 009 1607	HW227
# R421	1300 1% 1/6W	401 052 8608	-
# R422	10K 1% 1/6W	401 052 6802	-
# R423	3300 1% 1/6W	401 053 2605	-
# R481	33 5% 1/2W Nonflammable	401 009 4905	HW033
# R482	1 5% 1/4W Nonflammable	401 011 9004	QW1D0
# R483	1 5% 1/2W Nonflammable	401 006 7701	HW1D0
# R484	2.7 5% 1W	401 060 0403	1W2D7
# R486	22 5% 2W	401 066 5204	2W022
# R489	4.7 5% 2W	401 068 1600	2W4D7
	R492 39K 1% 1/6W	401 097 3903	-
# R497	1.5 5% 1W	401 057 9907	1W1D5
# R497 (1)	1 5% 1W	401 057 8009	1W1D0
# R497 (2)	.82 5% 1W	401 057 7507	1WD82
# R511	220 5% 1W	401 060 2704	1W122
# R601	1.5 10% 7W Wirewound	402 072 7503	-
	1.5 10% 8W Wirewound	402 072 7404	-
# R602	1M 5% 1/2W	401 007 2903	HW510
# R606	47 5% 1/2W Nonflammable	401 010 2600	HW047
# R607	12 5% 2W	401 065 1801	2W012
# R608	220 5% 10W Wirewound	402 076 2603	10W122
	220 10% 10W Wirewound	402 060 4606	10W122
# R609	220 5% 10W Wirewound	402 076 2603	10W122
	220 10% 10W Wirewound	402 060 4606	10W122
# R610	12 5% 2W	401 065 1801	2W012
# R611	1800 5% 2W	401 066 1404	2W218
# R621	820 10% 6W	402 057 4107	-
	820 10% 6W	402 057 4206	-
# R622	270 5% 2W	401 067 0000	2W127
# R624	330 5% 1W	401 061 2505	1W133
# R711, 12, 13	12K 5% 2W	401 065 4604	2W312
	R858 15K 1% 1/6W	401 052 9308	-
	R860 6800 1% 1/6W	401 053 4708	-
	R3401 10K 1% 1/6W	401 024 7400	-
	R3403 45.3K 1% 1/6W	401 103 1503	-
	R3404 47K 1% 1/6W	401 095 0409	-
	R3421 43K 1% 1/6W	401 180 8006	-
	VR141 10K RF AGC	645 006 5422	-
	10K RF AGC	645 011 6988	-
	10K RF AGC	645 019 6003	-
VR300	470 Video	645 006 5590	-
	500 Video	645 008 8254	-
	500 Video	645 022 9589	-
VR461	10K Horizontal Width	645 006 5422	-
	10K Horizontal Width	645 011 6988	-
	10K Horizontal Width	645 019 6003	-
VR501	50K Vertical Size	610 232 8479	-
	47K Vertical Size	645 006 5613	-
	50K Vertical Size	610 022 9602	-

For SAFETY use only equivalent replacement part.
(1) Used in chassis 31650-03.
(2) Used in chassis 31650-04.

CONTROLS & RESISTORS continued

Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
VR701	10K Red Bias	645 020 2605	-
VR702	10K Green Bias	645 020 2605	-
VR703	10K Blue Bias	645 020 2605	-
VR704	200 Red Drive	645 020 2612	-
VR705	200 Blue Drive	645 020 2612	-
VR1023	5000 Video In	610 232 8455	-
	4700 Video In	645 006 5606	-
	5000 Video In	645 022 9596	-
VR3403	22K 1.5fH Bandpass Filter	645 006 5521	-
	20K 1.5fH Bandpass Filter	645 008 8247	-
	20K 1.5fH Bandpass Filter	645 022 9541	-
VR3406	22K VCO	645 006 5521	-
	20K VCO	645 008 8247	-
	20K VCO	645 022 9541	-
VR3411	4700 High Separation	-	-
	5000 High Separation	610 232 8455	-
	5000 High Separation	645 022 9596	-
VR3421	10K Low Separation	645 006 5422	-
	10K Low Separation	645 011 6988	-
	10K Low Separation	645 019 6003	-

CABINET PARTS

Item	Mfr. Part No.
Badge	610 236 9274
Buttons	610 245 5816
Cabinet Back	610 262 1488
Cabinet Front	610 257 8645
Remote Transmitter	
Battery Cover	610 259 4522

PARTS LIST continued

CAPACITORS & ELECTROLYTICS

Item No.	Rating	Mfr. Part No.
C161	56pF 5% N220	403 028 2009
C305	40pF Trimmer	610 003 0381
# C411	.0008 +50% -10% 1.5kV	404 068 6200
# C412	.0086 +50% -10% 1.5kV	404 069 6407
# C413	.027 5% 400V	403 083 4901
# C414	.018 5% 400V	403 083 3904
# C416	.33 5% 200V	403 082 9808
# C417	.27 5% 200V	403 082 9006
C493	2.2µF 20% 100V NP	404 056 5307
# C601	.068 10% 250VAC	404 072 7903
	.068 20% 250VAC	404 073 7506
# C604, 05	.001 10% 500V	403 075 7101
# C611	.01 5% 200V	403 082 6302
# C708	.001 +100% -0% 2kV	403 077 7903
	.001 +100% -0% 2kV	403 175 3409
# C1020	.0022 20% 125VAC	404 008 6802
C1031	10µF 20% 16V NP	403 085 4008
C3413	3.3µF 10% 10V Tantalum	403 090 6004
	3.3µF 10% 10V Tantalum	403 124 7908
C3416	10µF 10% 10V	403 090 3607
	10µF 10% 10V	403 090 3706
VC801	40pF Trimmer	610 003 0381

For SAFETY use only equivalent replacement part.

COILS & TRANSFORMERS

Item No.	Function/Rating	Mfr. Part No.
L164	22µH	645 003 9782
	22µH	645 016 2831
L166	33µH	645 003 9812
	33µH	645 016 2985
L201	10µH	645 001 4567
	10µH	645 016 2534
L302	15µH	610 029 7388
	15µH	645 007 9627
L303	18µH	610 029 7425
	18µH	645 007 9719
L315	8.2µH	610 029 7883
	8.2µH	645 008 0395
L401	Filter	610 032 4381
	Filter	610 032 4404
	Filter	645 021 2727
L402	Ferrite Bead	610 031 9998
L403	Ferrite Bead	610 078 4635
L404	120µH	645 008 2771
	120µH	645 016 2626
# L413	Horizontal Linearity	610 000 0971
	Horizontal Linearity	610 205 0103
L414	6800µH	645 019 5990
L416	350µH	645 013 8676
	-	610 208 3781
L801	5.6µH	645 008 2894
	5.6µH	645 016 3104
L811	5.6µH	610 029 7760
	5.6µH	645 008 0180
L822, 23	5.6µH	645 008 2894
	5.6µH	645 016 3104
L826	120µH	645 008 2771
	120µH	645 016 2626
L842	5.6µH	645 008 2894
	5.6µH	645 016 3104
# L901	Degaussing	645 020 9116
# L902	Yoke	-
	Horiz .955mH	-
	Vert 24.4mH	-
L1901	5.6µH	645 008 2894
	5.6µH	645 016 3104
# LF601	Line Filter	610 031 5938
	Line Filter	610 223 1212
# T016, 36	Audio Output	645 009 0035
T131	FM Detect	610 037 7615
T151	VCO	645 000 5206
T161	AFT	610 037 6564
T401	Horizontal Drive	610 000 1663
	Horizontal Drive	610 223 1663
# T402 (1)	Horizontal Output	645 018 9579
# T1001	Pulse	610 229 9007
	Pulse	645 011 6032
	Pulse	645 011 8081

For SAFETY use only equivalent replacement part.

(1) Focus and screen controls are part of T402.

MISCELLANEOUS

Item No.	Description	Mfr. Part No.	Notes
# A101 (1)	Tuner	645 012 2163	UHF/VHF
	Tuner	645 023 3340	UHF/VHF
# A101H	Block	645 018 9685	Antenna
A1901	Receiver	645 007 1546	Remote
# F601	Fuse	423 007 1601	4Amp
	Fuse	423 007 1809	4Amp
	Fuse	423 018 8101	4Amp
F601A, B	Fuse Holder	610 012 4356	For F601
	Fuse Holder	645 006 4760	For F601
# K701	Socket	610 010 4181	CRT
	Socket	645 017 2588	CRT
K1001	Jack	645 001 6097	Assembly
L301	Delay Line	610 030 0828	-
	Delay Line	610 009 6013	-
# Q900	CRT	M78JUA069X71	-
# Q900 (2)	CRT	A78LKU30X07(M)	-
# Q900 (3)	CRT	A79AEJ15X01	-
# RL601	Relay	645 000 4155	Power
	Relay	645 011 2713	Power
	Relay	645 015 8629	Power
SP901, 02	Speaker	645 013 6306	4" X 4", 8 Ohms, 3W
SW701	Switch	610 011 4227	Service
SW1901	Switch	645 004 3062	Power
SW1902	Switch	645 004 3062	Volume Up
SW1903	Switch	645 004 3062	Volume Down
SW1904	Switch	645 004 3062	Channel Up
SW1905	Switch	645 004 3062	Channel Down
SW1906	Switch	645 004 3062	Menu
# W601	Line Cord	645 014 2444	AC, Polarized
X141	Filter	421 006 3206	SAW
X153	Filter	610 015 2945	4.5MHz
X161	Trap	610 015 3059	4.5MHz
X251	Crystal	610 012 0655	3.58MHz
	Crystal	610 204 4195	3.58MHz
	Crystal	610 245 9746	3.58MHz
X401	Crystal	610 012 2970	503.5kHz
	Crystal	645 003 4107	503kHz
X801	Crystal	645 000 5299	12MHz
	PC Board	610 262 9248	CRT
	PC Board	610 262 7985	Main
	PC Board (2)	610 263 2989	Main
	PC Board (3)	610 263 7694	Main
	Transmitter	645 014 5346	Remote

For SAFETY use only equivalent replacement part.

(1) Contact TNI Electronics for replacement; order by part number on tuner.

(2) Used in chassis 31650-03.

(3) Used in chassis 31650-04.