

CABINET-REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

Remove eleven screws holding cabinet back and remove back. Disconnect HV anode, CRT socket, deflection yoke connectors, degaussing coil connector, speaker connectors, ground leads and all required cabling. Remove four screws holding Surround Sound Board (B-Board) to Speaker Housing and remove assembly from cabinet. Remove four screws holding Baseband Decoder Board (M-Board) to Right Speaker Housing and remove assembly from cabinet. Slide Power Board (P-Board) from cabinet. Remove two screws holding Dolby Transformer to cabinet bottom and remove from cabinet. Release four tabs holding Main Board (A-Board) and slide assembly from cabinet. The remaining boards may be accessed after removing the Main Board (A-Board) assembly. Remove three screws from front control panel and remove

control panel bracket from cabinet. Release two latches to remove LED Board (L-Board). Release three latches to remove Key Board (Q-Board). Release two latches to remove Input Board (G-Board). Release two latches to remove Remote Receiver. Release one latch to remove Power Switch Board (K-Board).

CRT REMOVAL

Caution: Some sets employ a CRT with neck assemblies permanently bonded to CRT. **DO NOT** attempt to remove these assemblies.

Follow "Chassis Removal" procedure and lay set facedown on a soft protective surface. Loosen and remove CRT neck assemblies. (See Caution) Remove four nuts holding CRT to cabinet front and lift CRT out of cabinet. **DO NOT** lift CRT by the neck.

SERVICING IN THE FIELD

CRT IMPLOSION PROTECTION AND CLEANING

Implosion protection is an integral part of the picture tube, cleaning accomplished without CRT removal.

FUSE DEVICES

A 4.0-amp fuse is used for low-voltage power supply protection. (See photo, B-Board - Top View.)

A 4.0-amp fuse is used for AC line protection. (See photo, Cabinet - Rear View.)

LED DISPLAY ACCESSIBILITY

See Disassembly Instructions.

CHANNEL TUNING

Channel Up and Down buttons are provided for channel scanning with ten numbered buttons (on remote

transmitter) provided for one or two digit entry direct access channel selection. Fine tuning is automatic.

HIGH VOLTAGE

For High Voltage Procedure refer to the Miscellaneous Adjustments.

WIDTH

The width may be varied by a width control. (See Miscellaneous Adjustments.)

FOCUS

The focus may be varied by a Focus control. (See photo, Cabinet - Rear View.)

RF-AGC

The RF-AGC may be varied by an RF-AGC Control. (See photo, Main Board)

SET 2826 FOLDER 1

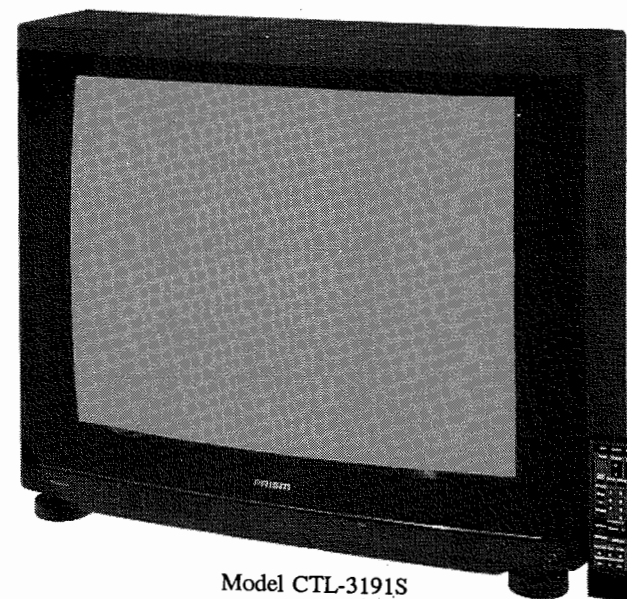
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Model CTL-3191S

SAFETY PRECAUTIONS

See Page 1.

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SAMS

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

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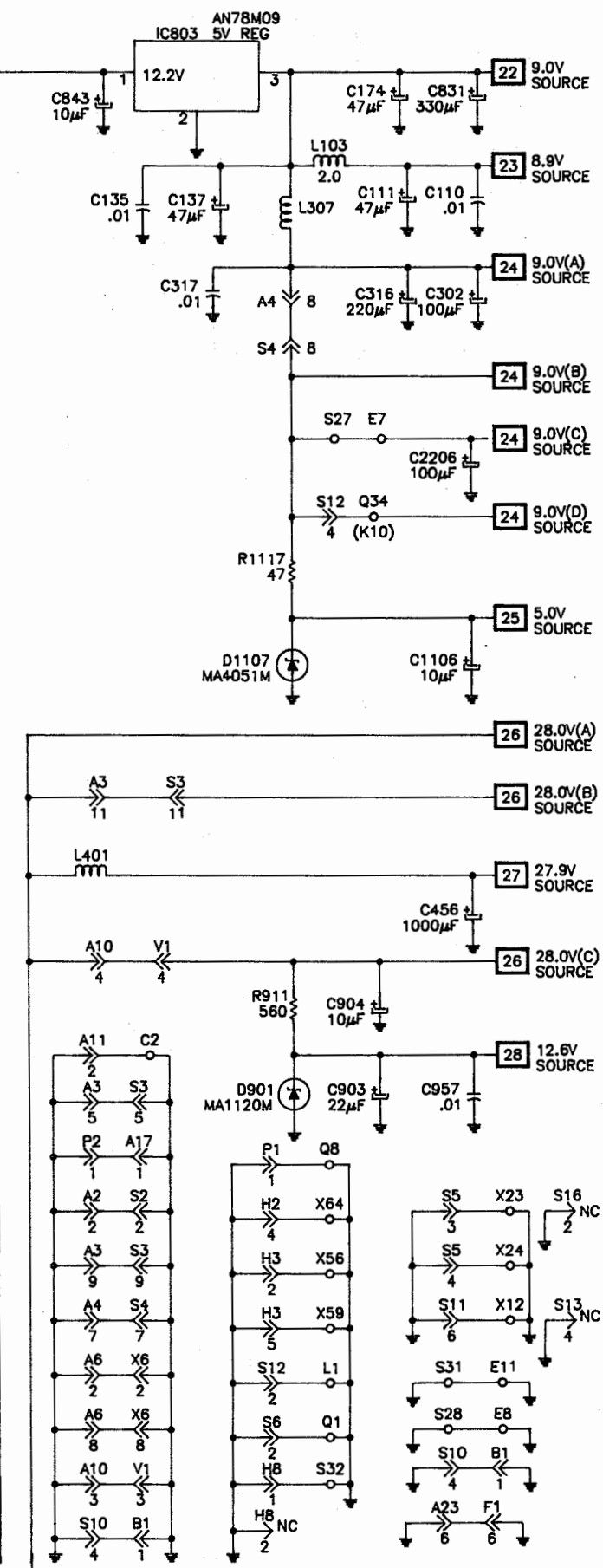
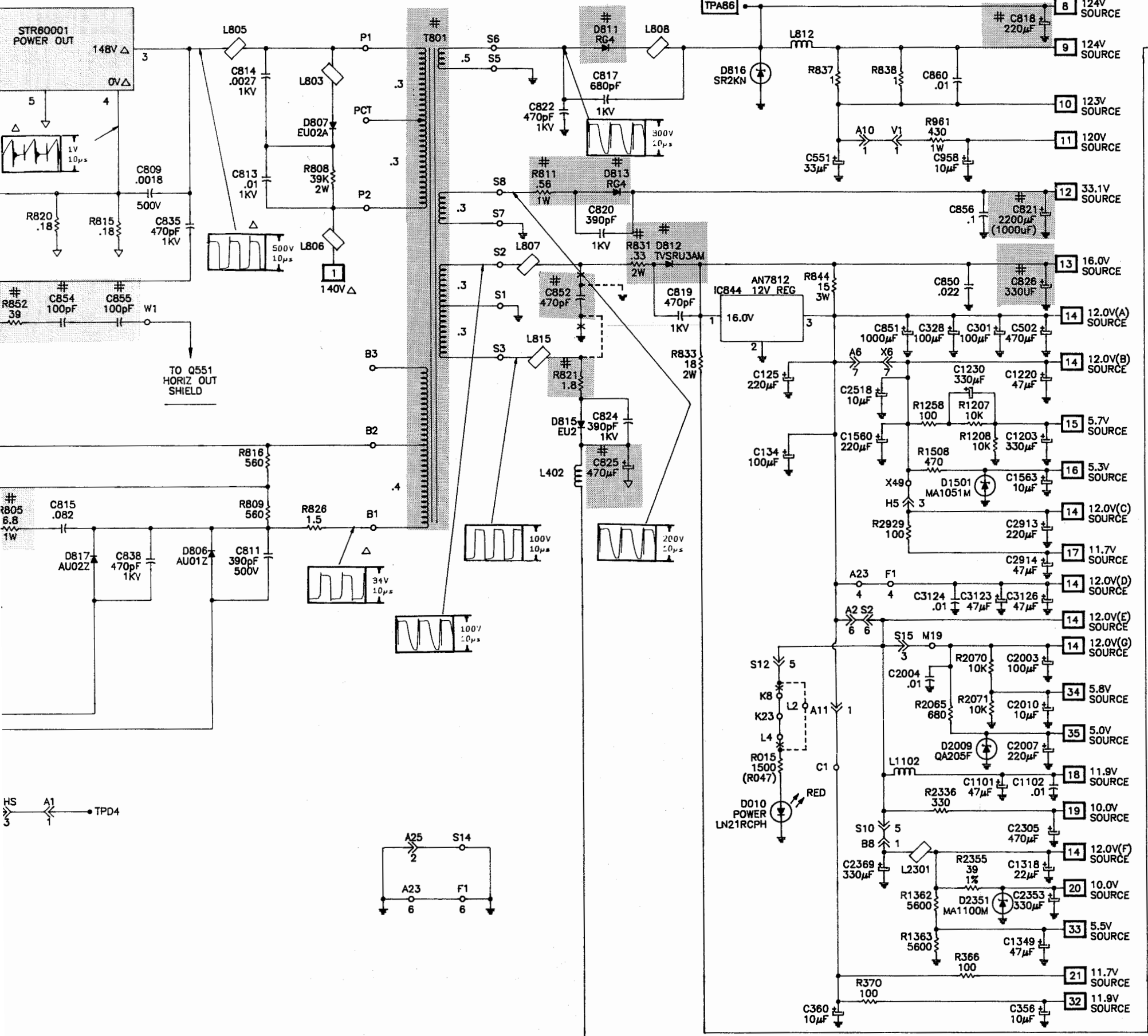
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SET 2826 FOLDER 1

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SET 2826 FOLDER 1



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MODEL CTL-3191S

SAFETY PRECAUTIONS

SERVICE WARNING

Service work should be performed only by qualified service technicians who are familiar with safety checks and guide lines.

- 1. For continued safety, no modification of any circuit should be attempted unless recommended by manufacturer.
- 2. Disconnect power source before replacing parts as some parts may be electrostatic sensitive.
- 3. Use an isolation transformer between the line cord and power receptacle, when servicing chassis.

SERVICING HIGH VOLTAGE AND PICTURE TUBE

When servicing the High Voltage circuits, extreme caution should be used.

- 1. Discharge static High Voltage by connecting a 10 kohms resistor in series with a test lead between chassis and anode lead of picture tube.
- 2. Wear shatter-proof eye protection (goggles) when handling the picture tube in case of implosion.
- 3. DO NOT lift picture tube by the neck.

X-RAY RADIATION AND HIGH VOLTAGE LIMITS

Service personnel should be aware of the procedures and instructions covering x-ray radiation. The only potential source of x-ray in present day solid state receivers and monitors is the picture tube.

- 1. It is only when High Voltage is excessive that x-ray radiation is capable of being emitted from shell of picture tube. Be sure the High Voltage is set at specified level.
- 2. An accurate High Voltage meter should be available at all times. Meter calibration should be checked periodically.
- 3. High Voltage should be kept at rated value - NO HIGHER. Higher voltages may cause x-ray radiation or failure of other associated components. DO NOT depend on protection circuit to keep voltages at rated value.
- 4. Every time a chassis is serviced, High Voltage should be checked at various brightness levels to be sure it is regulating properly.
- 5. While troubleshooting a set with excessive High Voltage, avoid being close to picture tube. DO NOT operate longer than it is necessary to locate the cause of excessive High Voltage. Use a variable AC transformer to regulate voltage.
- 6. Many components, electrical and mechanical, in present chassis have safety related characteristics which are not evident with visual inspection. When these components are known, they are identified with a # on the schematic and in the parts list. When replacing these components, for SAFETY, use only an equivalent replacement part.

SAFETY CHECKS-FIRE AND SHOCK HAZARD

Cold Leakage Checks (Sets with isolated ground.)

- 1. Unplug the AC cord and connect a jumper across the two prongs on the plug.
- 2. Turn on power switch.
- 3. Measure the resistance, with an Ohm meter, between the jumpered AC plug and any exposed metal cabinet parts on the set such as: antenna screw heads, control shafts, handle brackets. Exposed metal parts that have a return path should measure between 200 kohms and 5 megohm. Parts without a return path must measure infinity.

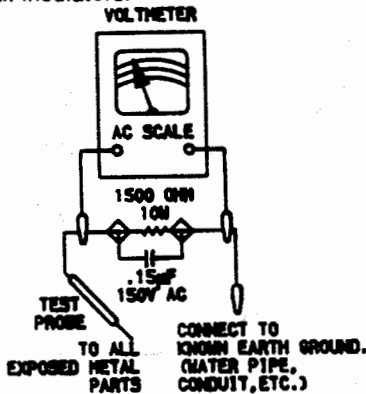
Leakage Current Hot Check

- 1. Plug the AC cord directly into AC outlet. DO NOT use an isolation transformer.
- 2. Connect a 1500 Ohm 10 watt resistor, in parallel with a .15µF 150V AC capacitor, between any exposed metal parts on the set and a good earth ground such as a water pipe. (See Figure below.)
- 3. Using an AC volt meter, with 1000 Ohms per volt or more sensitivity, measure the voltage across the resistor. Check each exposed part and measure voltage at each point.
- 4. Reverse the AC plug and repeat voltage measurement at each point.
- 5. The voltage at any point should not exceed .75 volts RMS. This corresponds to .5 milliamps AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected.

GENERAL GUIDE LINES

A final SAFETY check before returning the set to customer.

- 1. Check area repaired for poorly soldered or de-soldered connections. Check entire circuit board surface for solder splashes.
- 2. Check interboard 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.



TROUBLESHOOTING AID

Note: Waveforms taken with triggered scope, Keyed-Rainbow generator. Schematic voltages measured with digital meter, no signal. Controls adjusted for normal operation.

PICTURE OR SOUND

NO PIC, NO SOUND, NO RASTER: Check AC power supply and sources generated from Horizontal Output Transformer (T551). Refer to "Troubleshooting" Power Supply and Horizontal circuits.

NO PIC, NO SOUND, HAS RASTER: Check IF-AGC and source voltages from Horizontal Output Transformer (T551). Refer to "Troubleshooting" IF-AGC and Horizontal circuits.

NO PIC, HAS SOUND, NO RASTER: Check Horizontal Output Transformer (T551) sources and Video circuit. Refer to "Troubleshooting" Horizontal and Video circuits.

NO PIC, HAS SOUND, HAS RASTER: Refer to "Troubleshooting" Video circuit.

HAS PIC, NO SOUND: Refer to "Troubleshooting" Audio circuit.

OVERLOADED PICTURE: Refer to "Troubleshooting" IF-AGC circuit.

LOW OR EXCESSIVE BRIGHTNESS: Check Video and Luminance circuits. Refer to "Troubleshooting" Video circuit.

SWEEP

NO RASTER, HAS SOUND: Check HV rectifier, Part of Horizontal Output Transformer (T551). Refer to "Troubleshooting" Horizontal circuit.

NO RASTER, NO SOUND: Refer to "Troubleshooting" Horizontal circuit.

NO VERT DEFLECTION: Refer to "Troubleshooting" Vertical circuit.

POOR VERT LIN OR FOLDOVER: Refer to "Troubleshooting" Vertical circuit.

POOR HORIZ LIN OR FOLDOVER: Refer to "Troubleshooting" Horizontal circuit.

NARROW PICTURE: Refer to "Troubleshooting" Horizontal circuit.

VERT OFF FREQUENCY: Refer to "Troubleshooting" Vertical circuit.

HORIZ OFF FREQUENCY: Refer to "Troubleshooting" Horizontal circuit.

SYNC

NO VERT/HORIZ SYNC: Refer to "Troubleshooting" Sync circuit.

RASTER

YELLOW (NO BLUE): Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

CYAN (NO RED): Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

MAGENTA (NO GREEN): Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

COLOR (B/W operating normally)

NO COLOR: Refer to "Troubleshooting" Chroma circuit.

WEAK COLOR: Refer to "Troubleshooting" Chroma circuit.

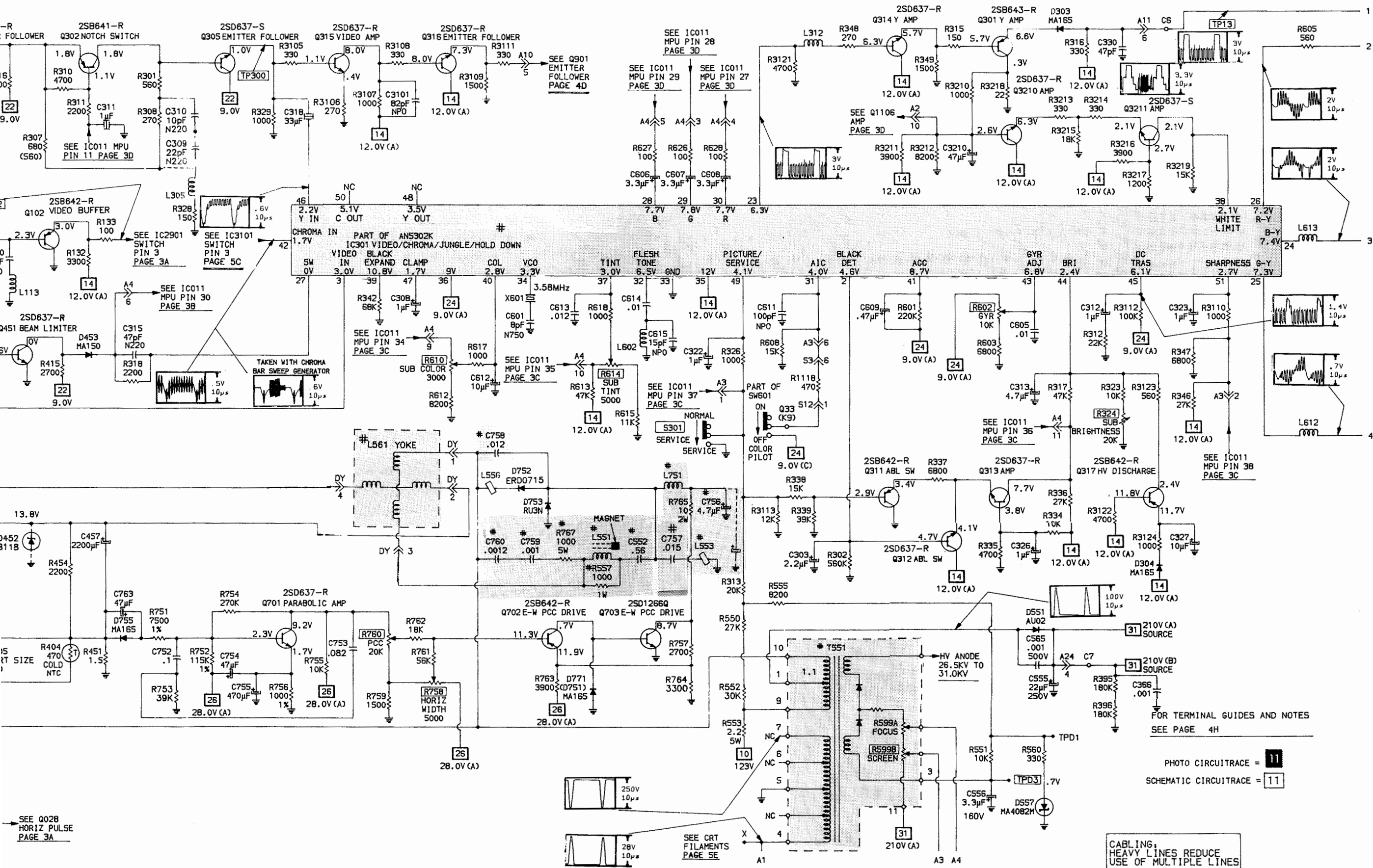
NO COLOR SYNC: Refer to "Troubleshooting" Chroma circuit.

NO GREEN: Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

NO BLUE: Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

NO RED: Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

INCORRECT HUE (TINT): Refer to "Troubleshooting" Chroma circuit.



MAIN BOARD

TROUBLESHOOTING

POWER SUPPLY

Check AC Fuse (F001). If Fuse F001 is open, check Bridge Rectifier Diodes (D801 thru D804), Capacitors (C802, C804, C805, C806 and C833). If these components check good, check the Horizontal Output Transistor (Q551) and associated components. Apply 120VAC, depress Power Switch and check for 140V* at the cathode of Diode D802. If 140V* is missing, check Power Relay Transistor (Q001), Power Relay (RL001) and Line Filters (L801, L802). If 140V is present at the cathode of Diode D802, check for 13.0V at the cathode of Rectifying Diode (D004). If 13.0V is missing, check voltages and components associated with Diodes D001, D003, D004, Power Supply Transformer (T001), Capacitors C006, C007, C019 and Electrolytics C008, C009, C040. Check for 124V at TPA68. If this voltage is missing, check the voltages and components associated with the Power Out IC (IC801), Switch Mode Power Transformer (T801) and Power Drive Transistor (Q801), Over Voltage Protector Transistor (Q802) and Error Amp IC (IC804). If 124V is present at TPA68, refer to the "Horizontal" and "High Voltage Shutdown" sections of this Troubleshooting guide.

*With respect to isolated ground.

HORIZONTAL

Determine if the TV is in shutdown and refer to the "High Voltage Shutdown" section of this Troubleshooting guide. If the TV is not in shutdown, inject a horizontal signal at the base of the Horizontal Output Transistor (Q551). If horizontal deflection is now present, check the voltages, waveforms and components associated with the Horizontal Drive Transistor (Q501) and pins 15 thru 22 of the Video/Chroma/Deflection IC (IC301). If there is still no horizontal deflection, check the voltages, waveforms and components associated with Transistor Q551 and the Horizontal Output Transformer (T551). Check Diodes D551, D508 and D752 and associated components for defects. The High Voltage Rectifier is part of Transformer (T551) and if defective it will affect the performance of the horizontal circuits. If the Horizontal Oscillator is off frequency, check the voltages, waveforms and components associated with pins 17 and 18 of IC301 and refer to the "Horizontal Oscillator Disable" section of this Troubleshooting guide. Horizontal linearity or width problems may be caused by Capacitors C553, C554, C557, C558, C559, C561, Linearity Coil (L551) and Pincushion Transformer (L751).

VERTICAL

Inject a vertical signal at pin 6 of the Video/Chroma Jungle Hold-Down IC (IC301). If vertical deflection is present, check the voltages, waveforms and components associated with pins 4 thru 11 of IC301. If there is still no vertical deflection, check the voltages, waveforms and components associated with the Vertical Output IC (IC451). Vertical linearity of height problems may be caused by vertical

feedback and bias circuits, check Electrolytics C402, C404, C405, C451, C456 and C457.

RASTER

Check the CRT and CRT voltages. If there is no Red, check the voltages, waveforms and components associated with pin 26 of the Video/Chroma Jungle/Hold-Down IC (IC301) and the Red Output Transistors (Q351, Q354, Q357 and Q360). If there is no Green, check the voltages, waveforms and components associated with pin 25 of IC301 and the Green Output Transistors (Q353, Q356, Q359 and Q362). If there is no Blue, check the voltages, waveforms and components associated with pin 24 of IC301 and the Blue Output Transistors (Q352, Q355, Q358 and Q361). If the raster has height or width problems, refer to the "Vertical", "Horizontal" and "Power Supply" sections of this Troubleshooting guide.

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, Tuner Control and Tuner AFC circuits. If there is no video on the CRT, check for a video waveform at TP12. If video is present at TP12, refer to the "Video" section of this Troubleshooting guide. If there is no video at TP12, apply AGC bias to TP14. If video is now present at TP12, check the voltages and components associated with pins 1, 5, 6 and 7 of the VIF/SIF/AFT/DET IC (IC101). If there is still no video at TP12, check the voltages, waveforms and components associated with pins 1 thru 10 and 20 thru 30 of IC101. A defective AGC circuit can cause an over-loaded picture, excessive snow or loss of audio and video. See the AGC Voltage Chart for AGC voltage with signal.

AGC VOLTAGE CHART	
IC101	
Pin 5	3.7V
Pin 6	4.6V
Pin 7	4.6V

VIDEO

Inject a video signal at TP12 and check for video on the CRT. If video is present, refer to the "IF-AGC" section of this Troubleshooting guide. If there is no video on the CRT, check for a video waveform at the emitter of Video Buffer Transistor (Q2510). If the video waveform is missing at the emitter of Transistor Q2510, check voltages, waveforms and components associated with Switch ICs (IC2502, IC2901), Audio/Video Switch IC (IC2001), Video Emitter Follower Transistor (Q2010) and Video Buffer Transistor (Q102). If the video waveform is present at the emitter of Transistor Q2510, check for a video waveform at pin 10 of Switch IC (IC302). If the video waveform is missing at pin 10 of IC3102, check voltages, waveforms and components associated with Buffer Transistors (Q3101, Q3115, Q3113, Q3120, Q3122), Y-Amp Transistors

TROUBLESHOOTING (Continued)

(Q3116, Q3104, Q3105, Q3121) and IC3102. If the video waveform is present at pin 10 of IC3102, check for a video waveform at pin 46 of the Video/Chroma Jungle/Hold-Down IC (IC301). If there is no video at pin 46 of IC301, check the voltages, waveforms and components associated with Emitter Follower Transistors (Q304, Q305) and Notch Switch Transistor (Q302). If video is present at pin 46 of IC301, check for a video waveform at TP13. If waveform is missing, check voltages, waveforms and components associated with pins 2, 23, 44 thru 49 and 51 of IC301 and the Y-Amp Transistors (Q301, Q314). If the brightness is inadequate or cannot be controlled, check the voltages, waveforms and components associated with pin 44 of IC301 and pin 7 of the CRT.

CHROMA

Check for a chroma waveform at the emitter of Chroma Buffer Transistor (Q3106). If the waveform is missing, check voltages, waveforms and components associated with CCD IC (IC3101) and Chroma Buffer Transistors (Q3106, Q3102, Q3117, Q3103). If the chroma waveform is present at the emitter of Transistor Q3106, check for a chroma waveform at pin 42 of the Video/Chroma Jungle/Hold-Down IC (IC301). If the waveform is missing, check the voltages, waveforms and components associated with Switch IC (IC3102), Chroma Buffer Transistors (Q3108, Q3109, Q3110, Q3111, Q3114, Q3123, Q3124, Chroma Amp Transistor (Q3107) and Switch Transistor (Q3127). If a chroma waveform is present at pin 42, check for the proper waveforms at pins 24, 25, 26 of IC301. If these waveforms are missing, check the voltages, waveforms and components associated with pins 2, 3, 23 thru 51 of IC301. Check the 3.58MHz oscillator at pin 34 of IC301. Check the voltages and components associated with the Sub-Color Control and pin 40 of IC301. If there is no color sync, check the voltages, waveforms and components associated with pin 31 and 41 of IC301. If there is inadequate tint range, check the voltages and components associated with the Sub-Tint Control and pin 37 of IC301. If the proper chroma waveforms are present at pins 24, 25, 26 of IC301, refer to the "Raster" section of this Troubleshooting guide.

SYNC

If there is no vertical or horizontal sync, check the voltages, waveforms and components associated with pins 4, 5, of the Video/Chroma Jungle/Hold-Down IC (IC301). If the proper waveforms are present at pins 4, 5 of IC301, check for vertical waveforms at pins 6 thru 11 of IC301 and horizontal waveforms at pins 15 thru 21 of IC301.

HIGH VOLTAGE SHUTDOWN

The high voltage is monitored by the Diode D506, rectifying pulses from the Horizontal Output Transformer (T551). Should the high voltage increase, the rectified

voltage at pin 12 of IC301 will also increase and trigger the X-ray protect circuit at pins 14 and 17 of IC301. This action throws the Horizontal Oscillator off frequency, lowering the voltage. To troubleshoot, remove Resistor R523 from the circuit and use a variac for AC power. Start a 90VAC and increase as necessary to locate and repair the defect. Return R523 to the circuit.

NOTE: Care should be taken in defeating the high voltage shutdown circuit, as this may cause excessive X-radiation and damage to the CRT, Transformer T551 and associated components. Monitor the high voltage and troubleshoot.

Voltages Taken With TV In Shutdown	
IC301	
Pin 12	6.0V
Pin 14	6.0V
Pin 17	2.7V

HORIZONTAL OSCILLATOR DISABLE TEST

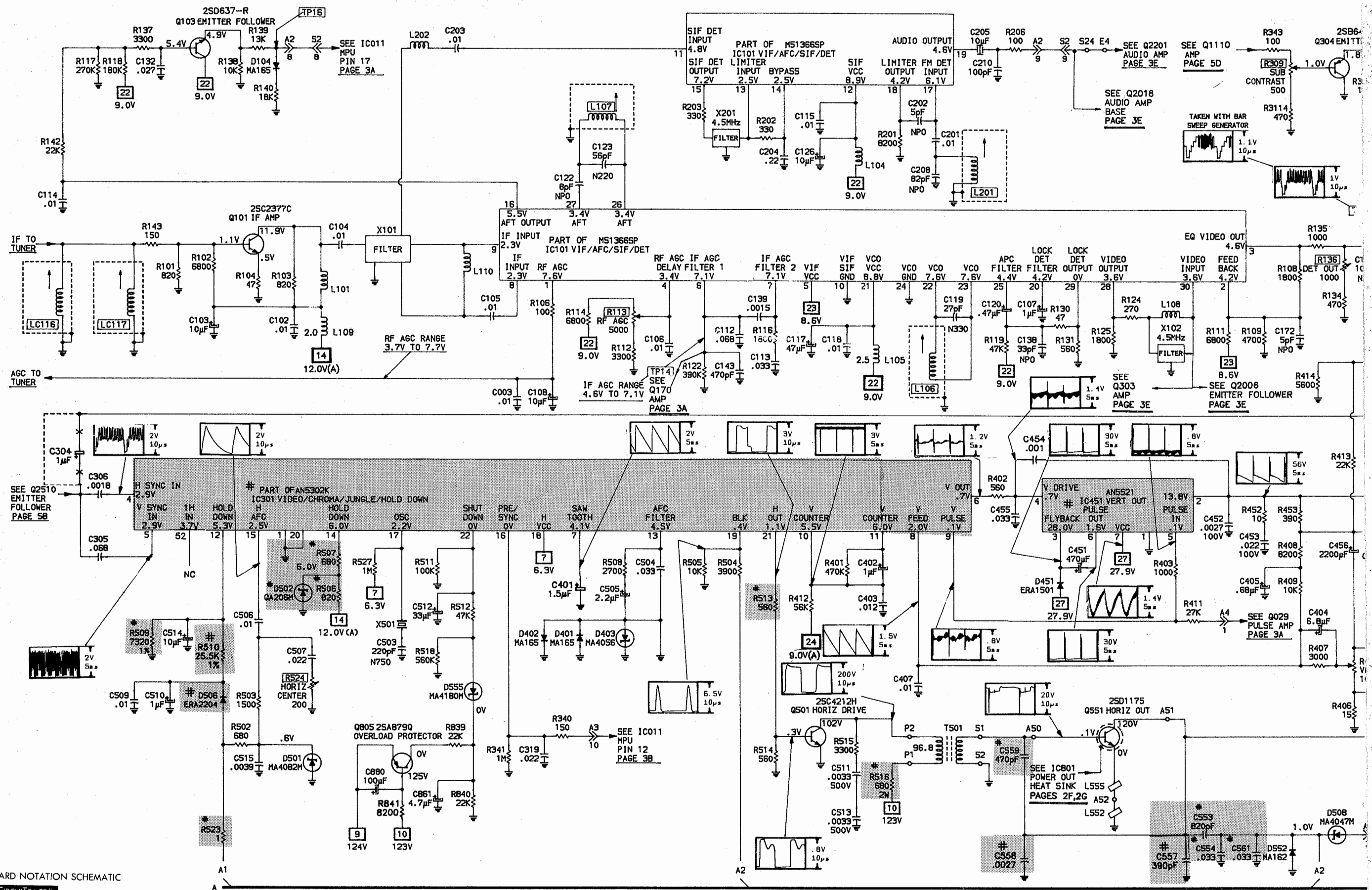
Connect a variable 30V power supply through an isolation diode to pin 2 of Error Amp IC (IC804). The Horizontal Oscillator should go out of sync when the power supply voltage reaches 25.5V and High Voltage should be less than 35.9KV. If the horizontal oscillator does not go out of sync, or the High Voltage increases above 35.9KV, the X-ray protect circuit needs repair.

AUDIO

Select an active channel and check for an audio waveform at pin 19 of the VIF/SIF/AFT/DET IC (IC101). If there is no audio, check the voltages, waveforms and components associated with pins 11 thru 15, 17, 18, 19 of IC101. If waveform is present at pin 19 of IC101, select a station that is transmitting a stereo signal and check for audio waveforms at pins 17 and 18 of the Multi-Sound Decoder (IC2200). If waveforms are missing, check the voltages, waveforms and components associated with IC2200 and pins 5, 13, 18, 39 thru 42 of MPU IC (IC010). Select a station that is transmitting a SAP signal and check for audio waveforms at pins 17 and 18 of the IC2200. If waveforms are missing, check the voltages, waveforms and components associated with IC2200 and pins 5, 13, 18, 39 thru 42 of IC010. If audio is present at pins 17 and 18 of IC2200 in Mono, Stereo and SAP modes, check for audio at pins 3 and 10 of the Audio Control IC (IC2303). If audio is missing, check the voltages, waveforms and components associated with IC2901 of Amp Switch IC (IC1201), Op Amp IC (IC1205), Op Amp (IC1501), Op Amp (IC1503), Op Amp (IC1502), GE Control IC (IC1502), Audio Control IC (IC2303). If audio is present at pins 3 and 10 of IC2303, check the voltages, waveforms and components associated with the Power Amp IC (IC2301). Check the voltage at pin 12 of IC2303, it should measure 0.2V at mute and 10.2V at Maximum volume.

A

B



MAIN BOARD

TEST JIG HOOKUP

FUNCTION	Chek-a-Color ADAPTER NO.
CRT YOKE YOKE SETTING COMMENTS	B239 D4157 YP1A FOCUS TAP

PLUG #
DY

PIN 1	PIN 2	PIN 3	PIN 4
RED	GREY	BLUE	YELLOW 1

TEST EQUIPMENT

Test equipment listed by manufacturer illustrates typical or equivalent equipment used by SAMS' engineers to obtain measurements and is compatible with most types used by field service technicians.

Equipment	B&K Precision No.	SENCORE No.
Oscilloscope	1541A, 2120, 2125, 2160, 2190, 2522	SC61
Generators		
RGB	1249A, 1260	RG67
Multiburst Signal	1251, 1260	VA62A
Color Bar	1211A, 1249A, 1251, 1260	VA62A, CG25, NT64
TV Stereo	2009	ST65, ST66
Analog VOM	114, 117, 177, 214	
Digital VOM	377, 388HD, 2700 Series, 2831A 2860, 2900 Series	DVM37, DVM56A, SC61
Frequency Meter	1803A, 1804A, 1805, 1822, 1851, 1855	FC71, SC61
Hi-Voltage Probe VOM/DMM Accessory probes	HV-44 PR-28(HV)	HP200 TP212
Isolation Transformer	TR110, 1604,1653,1655	PR57
Capacitance Analyzer	810A, 815, 820, 830	LC76, LC101, LC102
CRT Analyzer	480, 490	CR70
Temperature Probe	TP-28, TP-30	
AC Leakage Tester	1655	PR57
Logic Probe	DP21, DP51	
Logic Pulser	DP31, DP101	
Inductance Analyzer	875A	LC76, LC101, LC102
Flyback Yoke Tester	875A	VA62A, LC76, LC101, LC102
TV Stereo Power Monitor		SR68
Field Strength Meter		FS73, FS74
Transistor Tester	510, 520B, 530	TF46
Video Analyzer		VA62A
Modulator/Converter	1201	

TV ALIGNMENT INSTRUCTIONS

Use an isolation transformer,or observe polarity, and maintain line voltage at 120VAC. Allow a 20 minute warm-up period for reciever and test equipment. Suggested Alignment tools: GC-THORSEN	
Alignment COILS: L106, L107, L201, LC116, LC117	RECOMMENDED TOOLS: 9440

TV ALIGNMENT INSTRUCTIONS (CONTINUED)

PRELIMINARY INSTRUCTIONS

Select highest unused channel. Set scope sweep to external or vector mode. Connect scope vertical input to scope vertical input on sweep/marker generator. Connect scope external horizontal input to scope horizontal input on sweep/marker generator. Ground test equipment to tv chassis unless specified otherwise. Use only enough generator output to provide a usable indication. Sweep Generator frequency is 44MHz with 10MHz Sweep.
NOTE: Response may vary from that shown.
Connect a 4.5 VDC bias to TP14.

VIDEO IF ALIGNMENT (SWEEP MARKER GENERATOR)

DIRECT PROBE FROM SWEEP GENERATOR	SWEEP GENERATOR OUTPUT	MARKER GENERATOR FREQUENCY	REMARKS
TP12	TP ON TUNER.	45.75 MHz	Adjust LC116, and LC117 for best symetry and response of waveform. Adjust L106 to place marker as shown. See Figure 1

VIDEO IF ALIGNMENT (BAR SWEEP GENERATOR)

BAR SWEEP GENERATOR	SCOPE INPUT	REMARKS
To Antenna terminals.	TP12	Perform Video IF alignment per sweep marker generator instructions. See Figure 2

SOUND IF ALIGNMENT

Tune in a station and adjust L201 for maximum sound. Reduce signal strength at the antenna terminals until distortion appears. Continue to reduce the signal while aligning for undistorted output by adjusting L201.

AUTOMATIC FINE TUNING ALIGNMENT

Connect as explained in preliminary instructions unless specified otherwise.			
DIRECT PROBE FROM SWEEP GENERATOR	SWEEP GENERATOR OUTPUT	MARKER GENERATOR FREQUENCY	REMARKS
TP16	TP ON TUNER	45.75 MHz	Adjust L107 to place marker as shown. See Figure 3

FIGURE 1

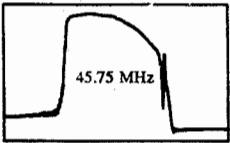


FIGURE 2

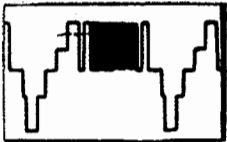
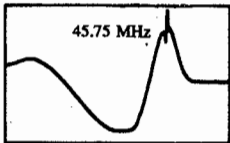
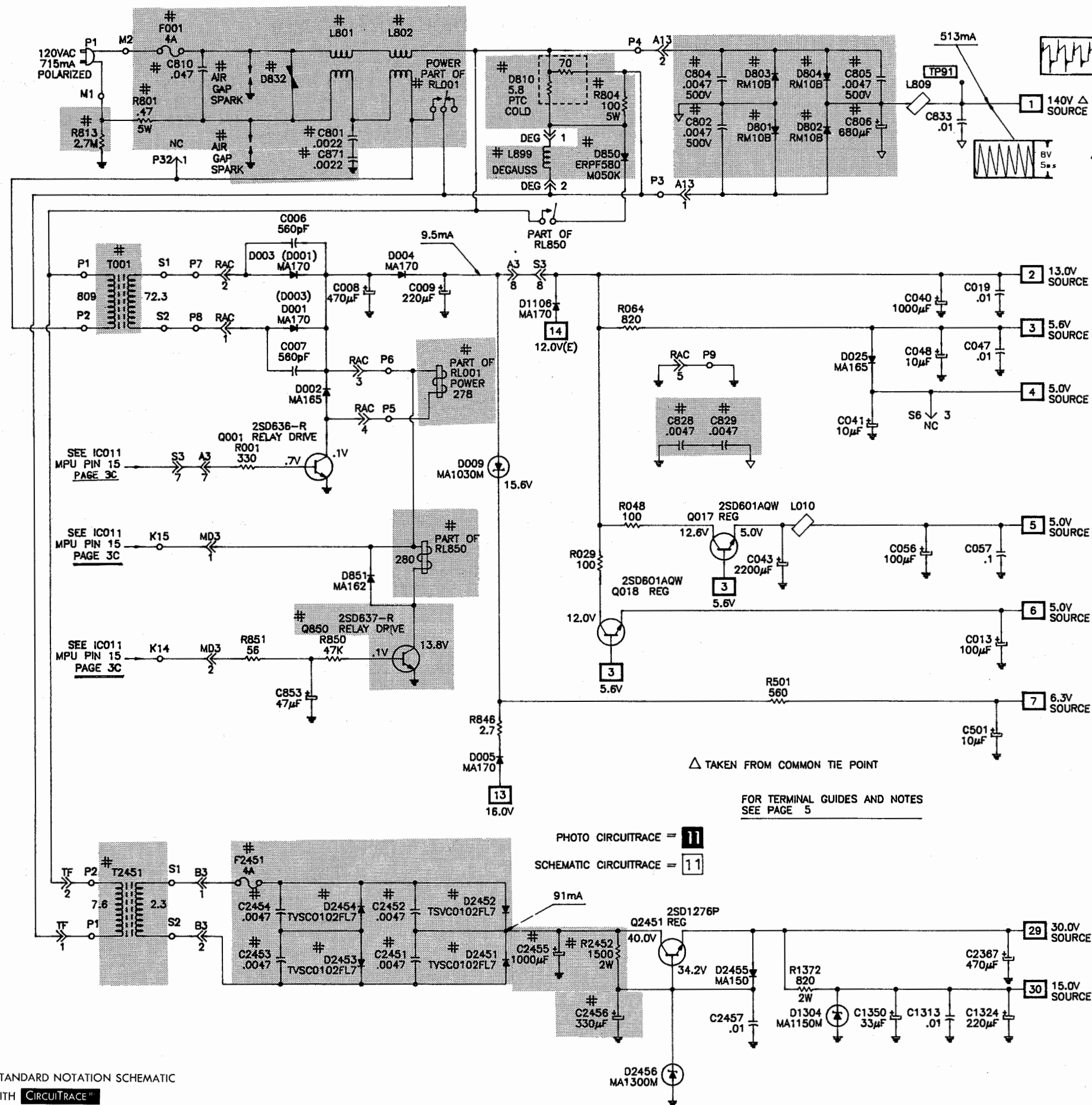


FIGURE 3

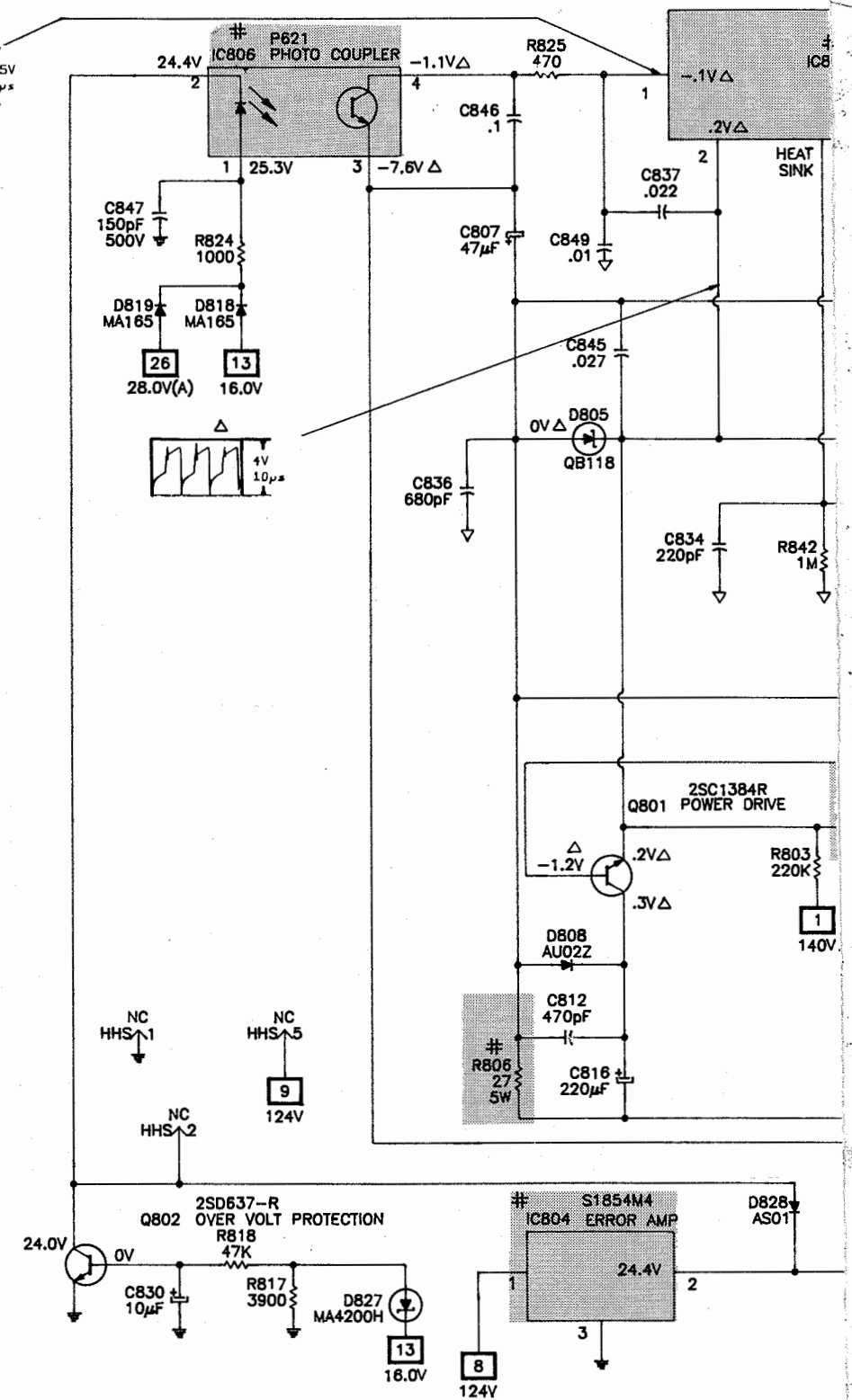


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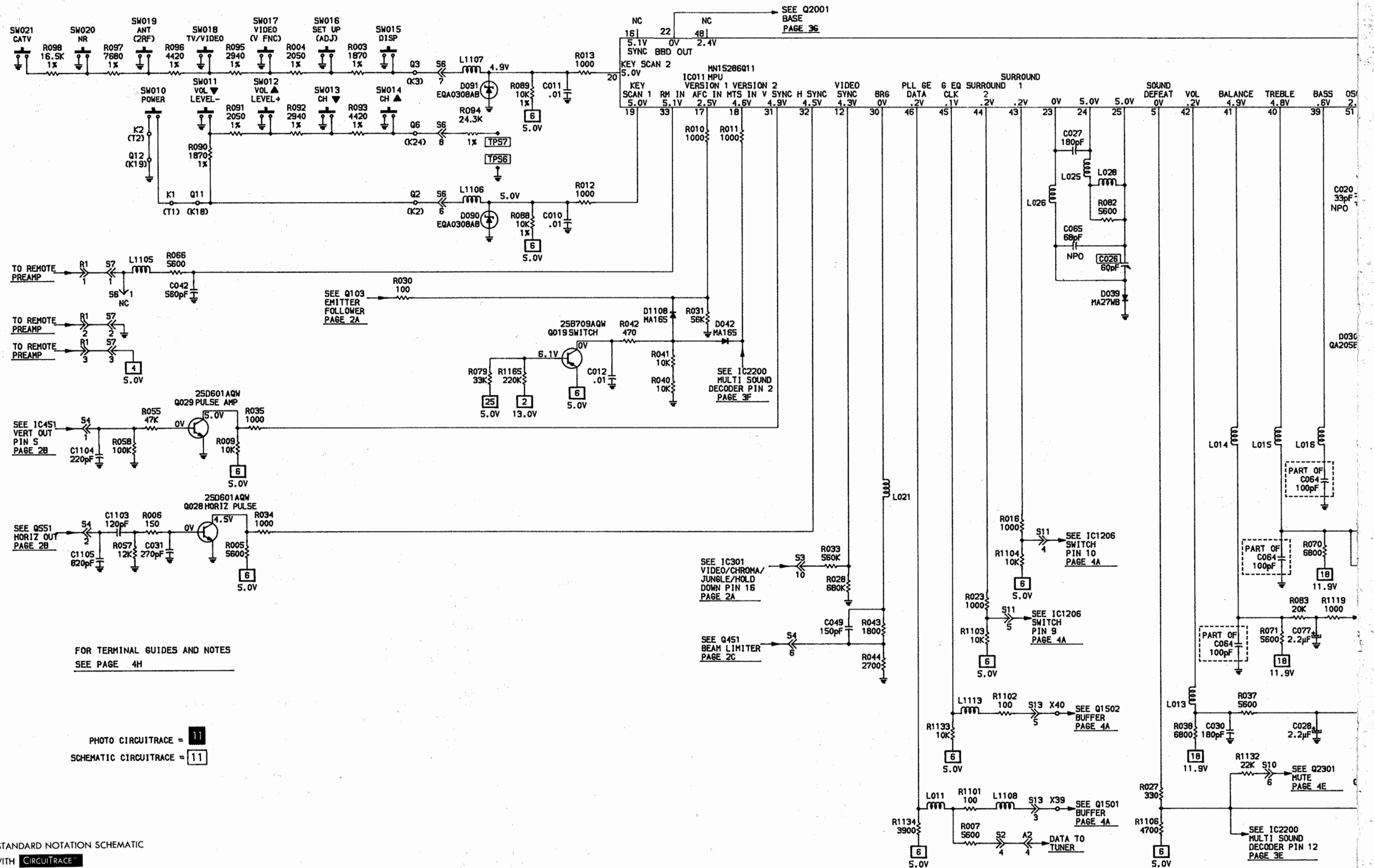
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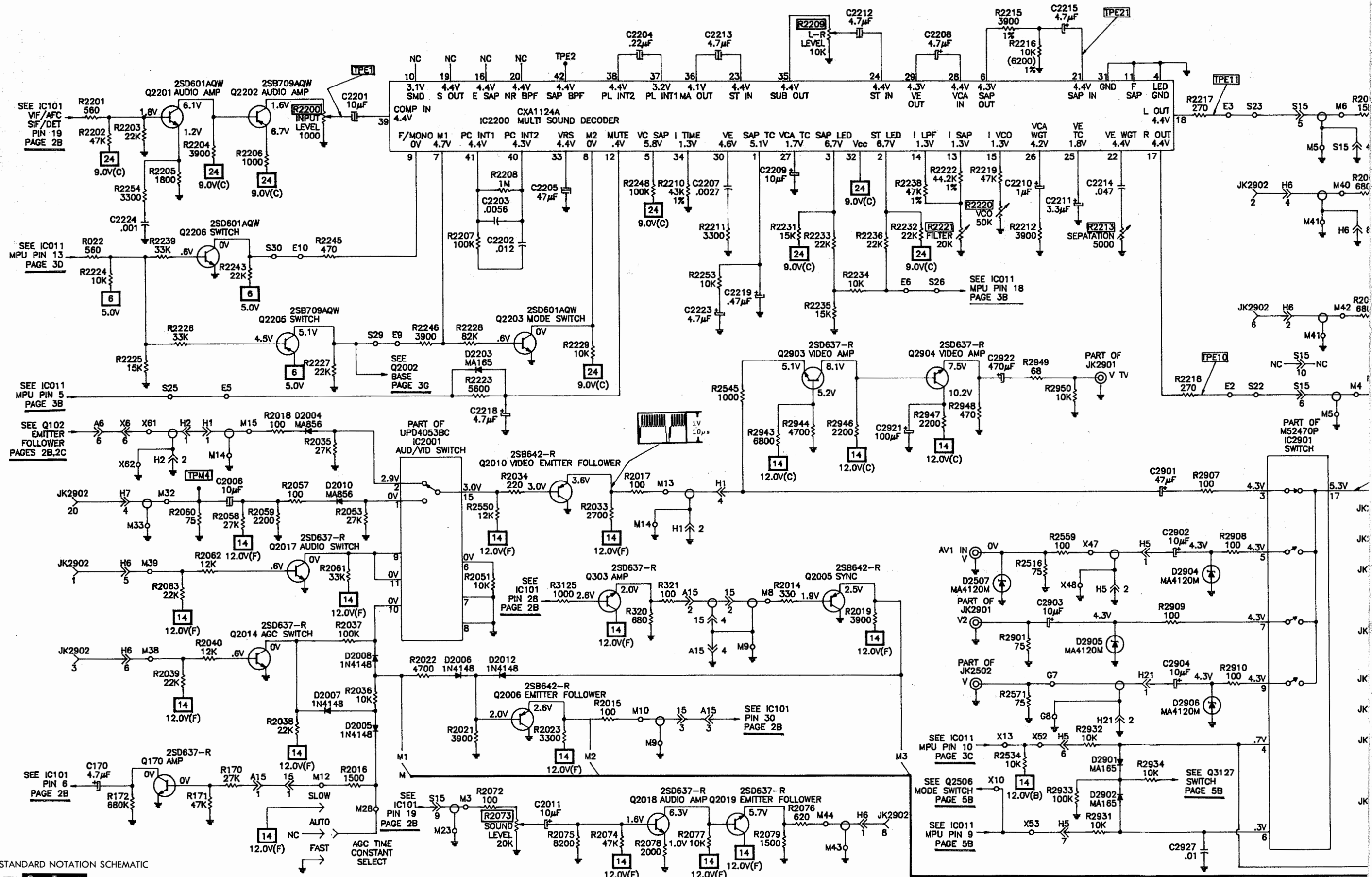
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A

B

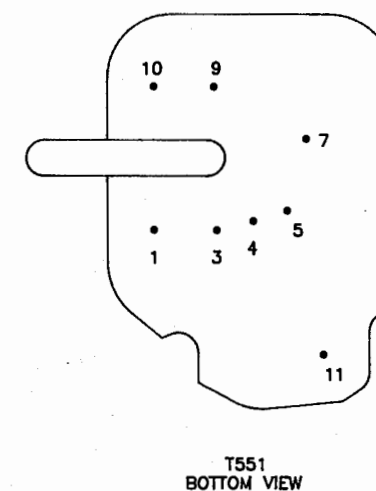
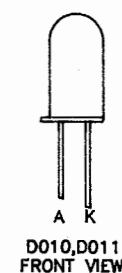
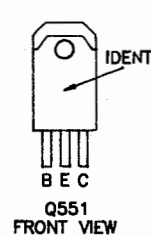
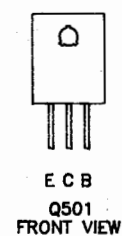
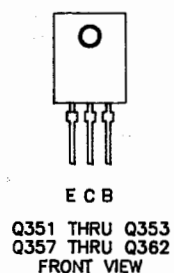
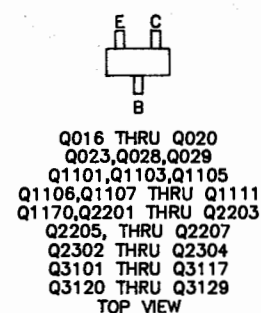
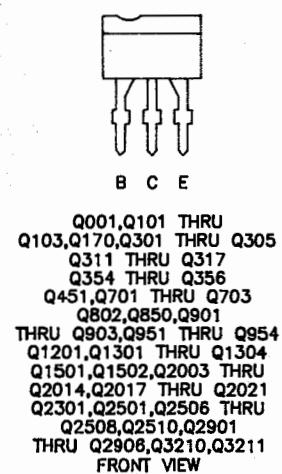
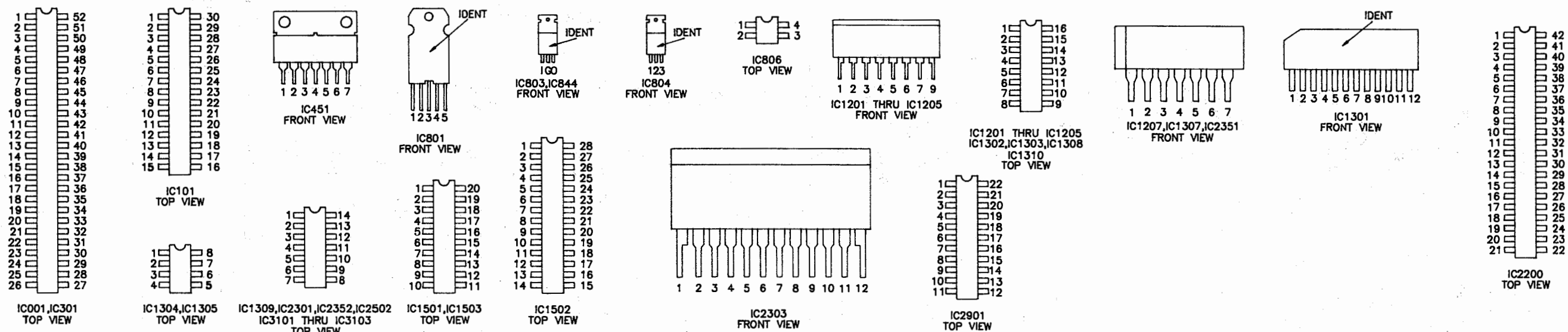




A PHOTOFAC STANDARD NOTATION SCHEMATIC

WITH CIRCUITRACE™

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

— Circuitry not used in some versions
--- Circuitry used in some versions

* Nominal value
⊥ Ground
⊥ Chassis
Common tie point

Waveforms and voltages are taken from ground, unless noted otherwise.

Waveforms: triggered scope, keyed rainbow generator.
Item numbers in rectangles appear in the alignment/ad-
justment instructions.

Supply voltage maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

Capacitors are 50 volts or less.

5% or greater unless noted.

Electrolytic capacitors are 50 volts or less.

20% or greater unless noted.

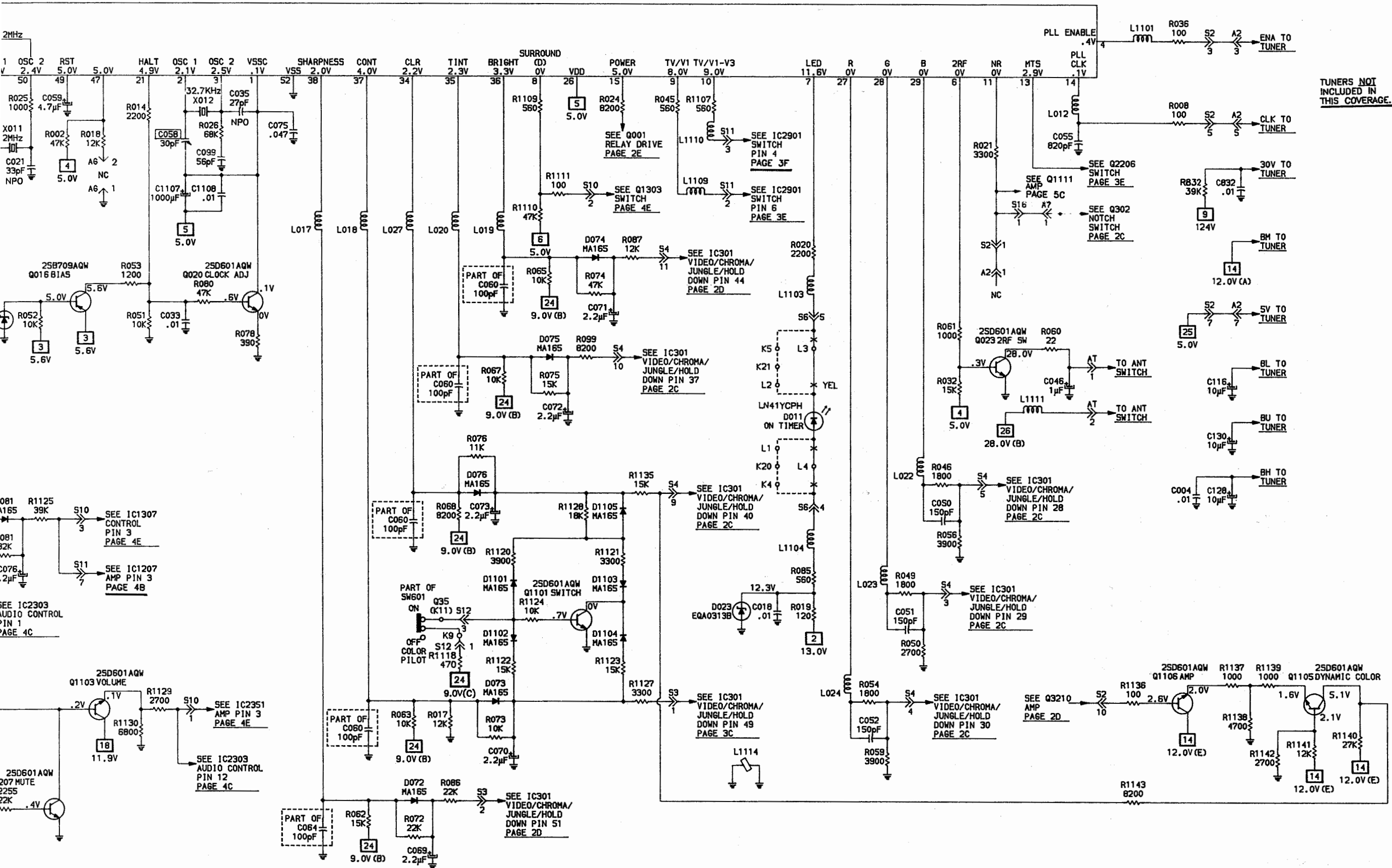
Resistors are 1/2W or less.

5% or greater unless noted.

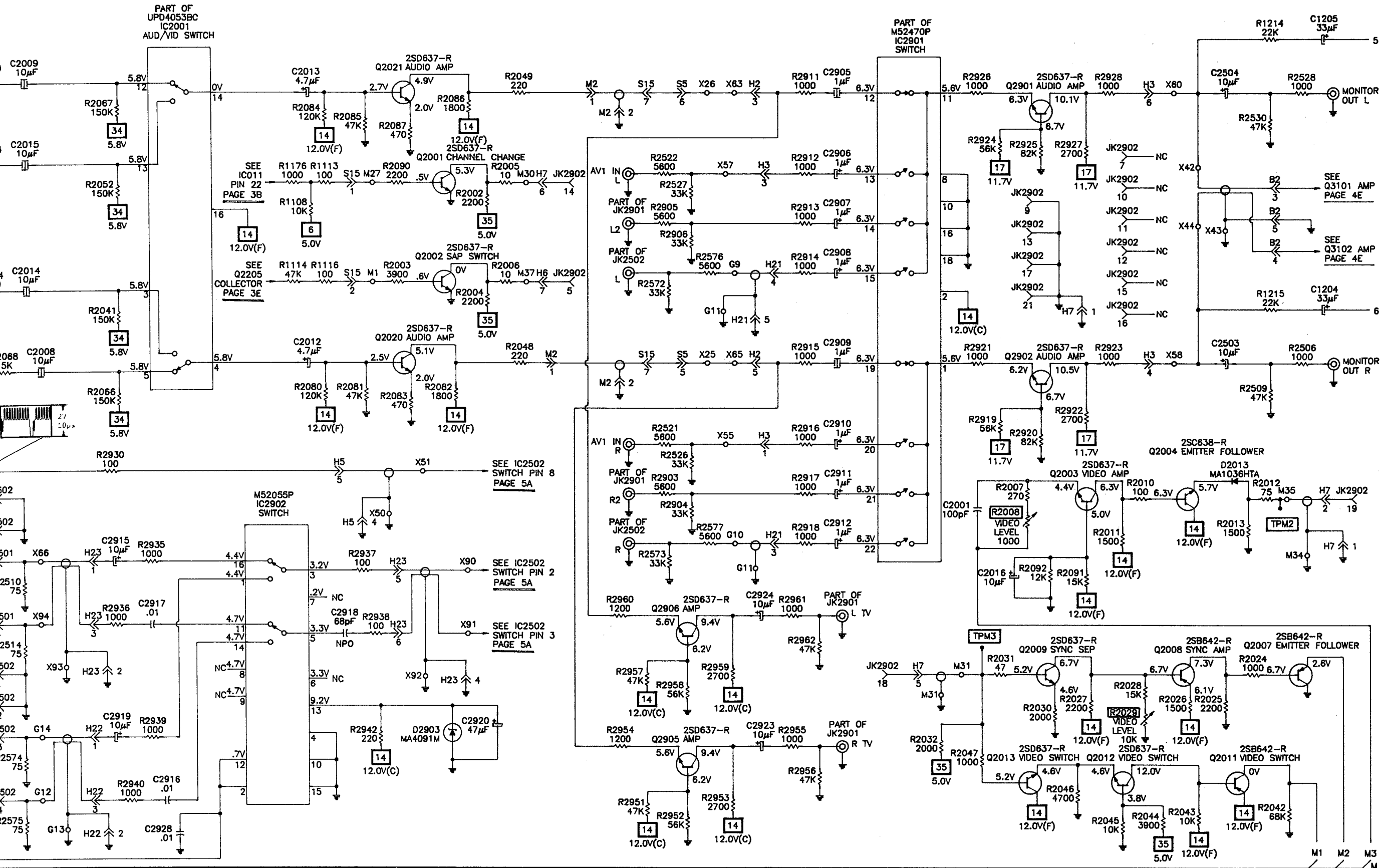
Value in () used in some versions.

Measurements with switching as shown, unless noted.

TERMINAL GUIDES & NOTES







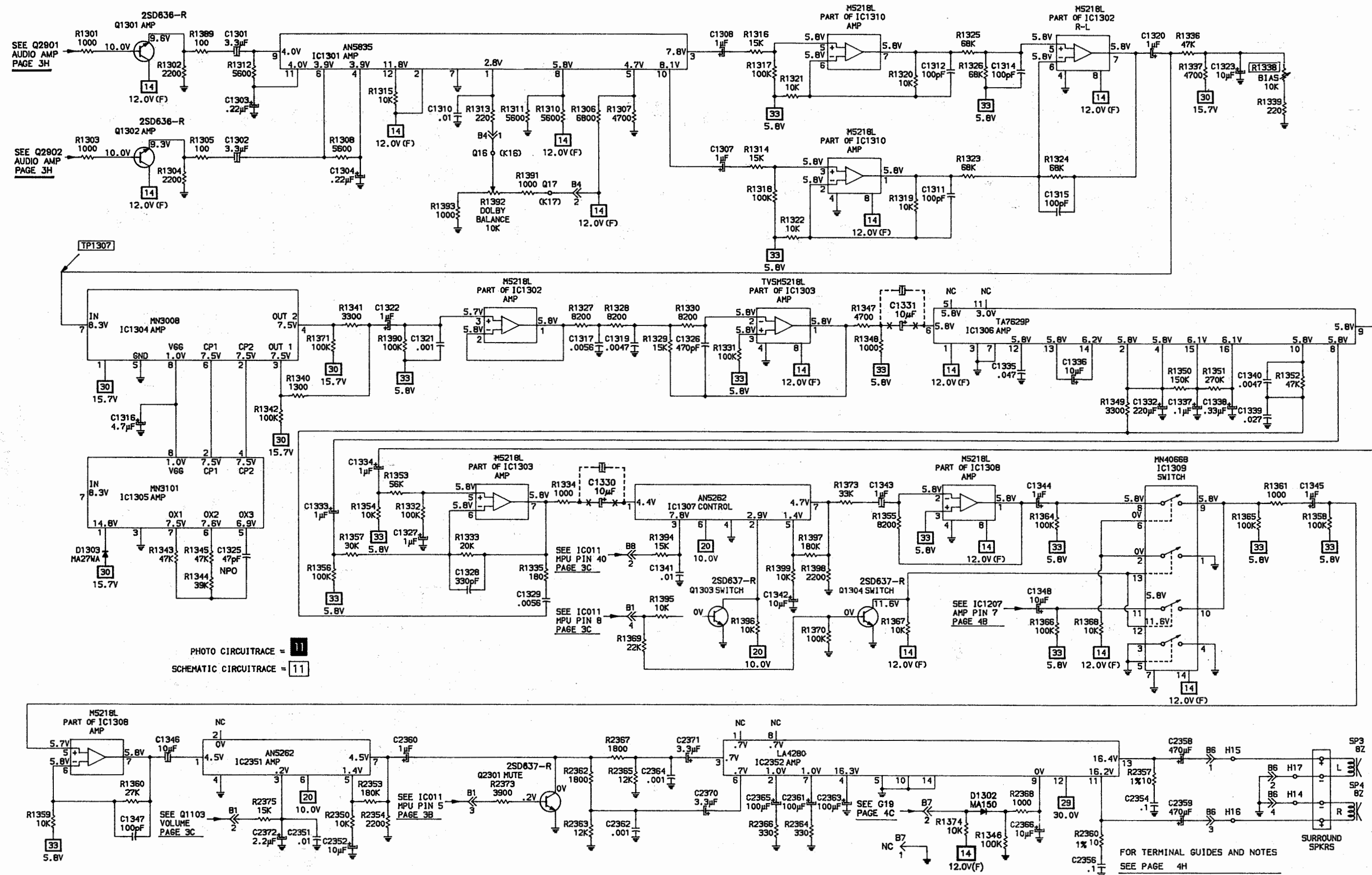
PANASONIC
MODEL CTL-3191S

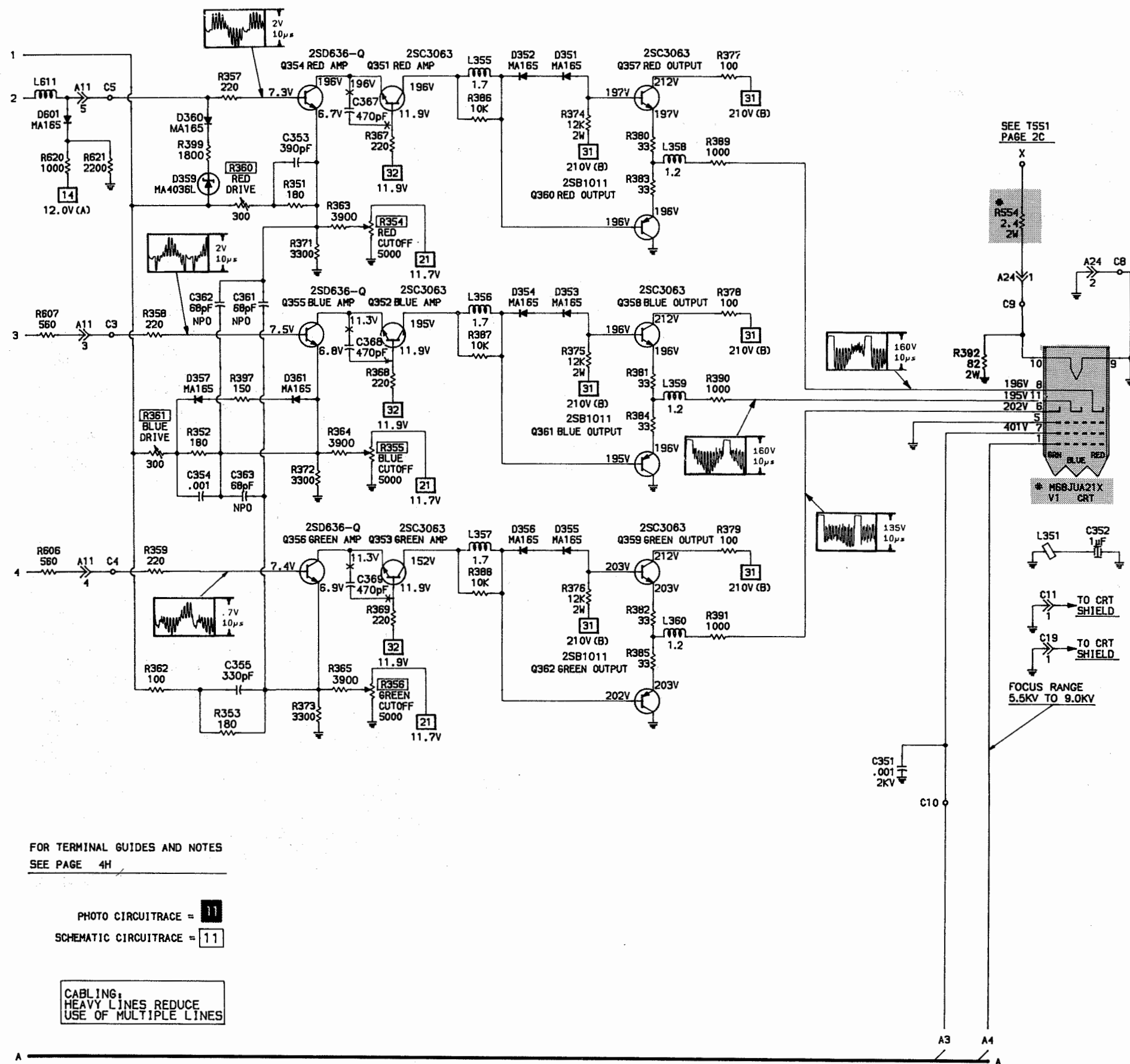
MULTISOUND/DECODER

G

H SET 2826 FOLDER 1

Page 3

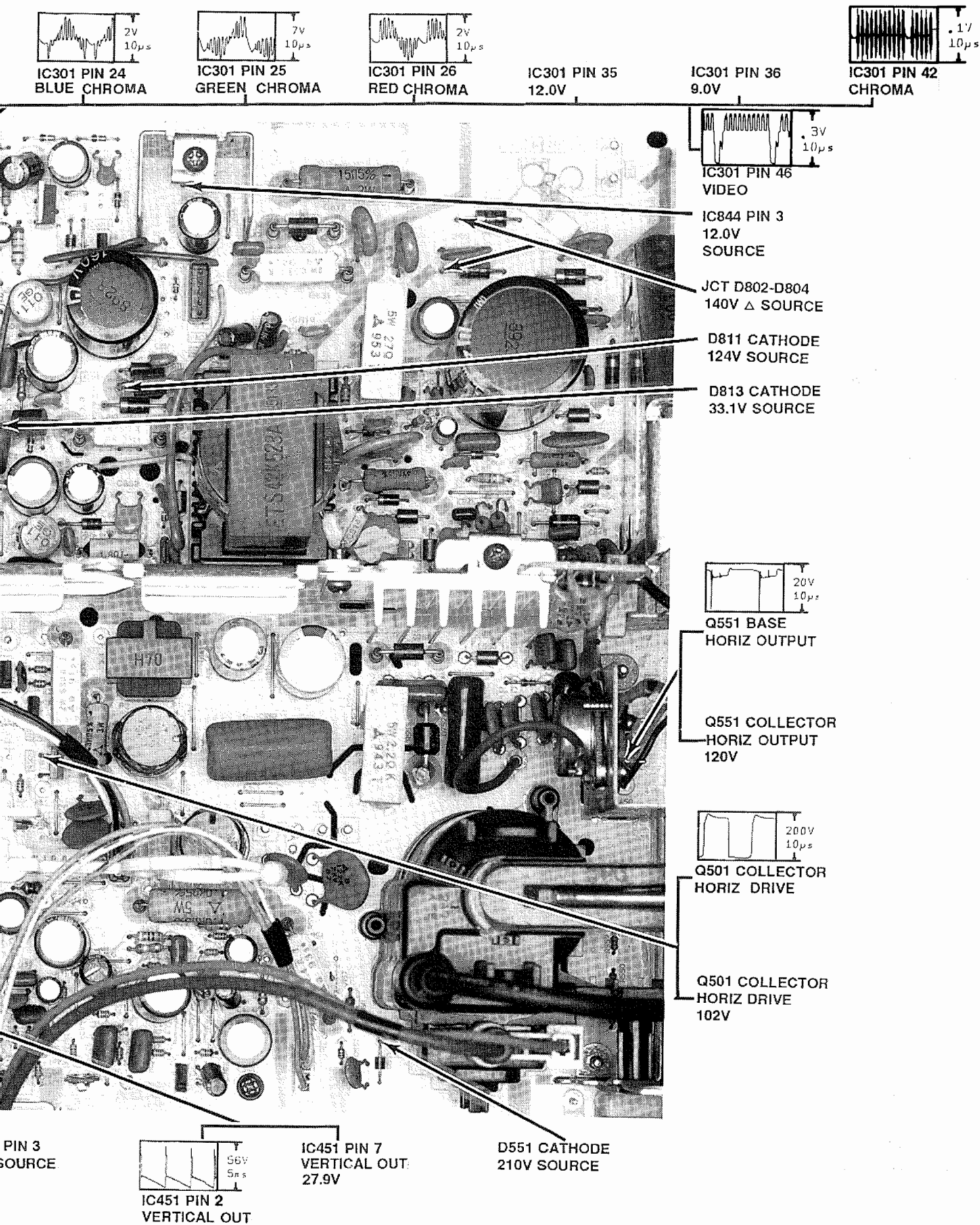




FOR TERMINAL GUIDES AND NOTES
SEE PAGE 4H

PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11

CABLING,
HEAVY LINES REDUCE
USE OF MULTIPLE LINES



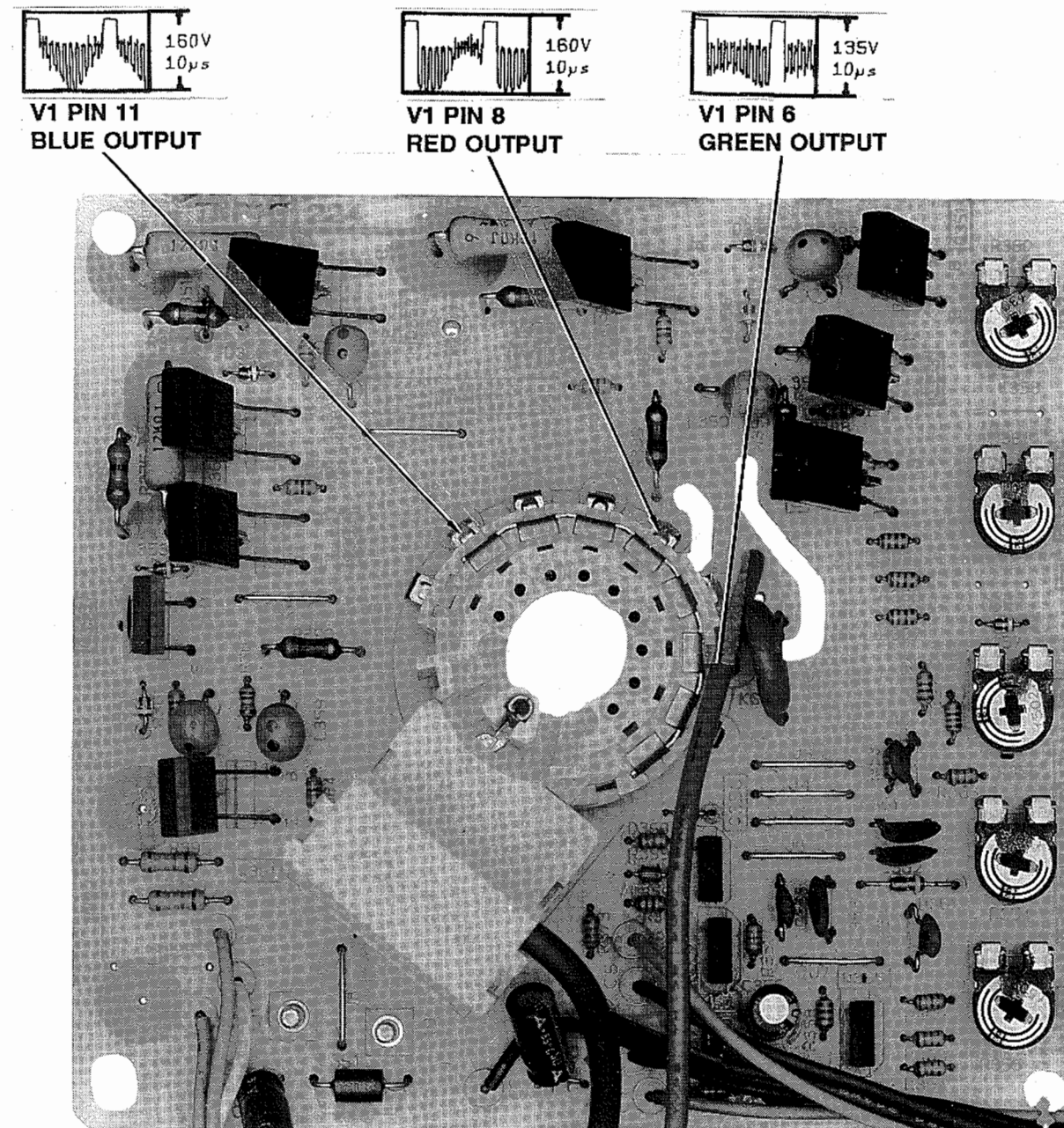
TOP VIEW

A HOWARD W. SAMS QUICK-CHECKS™ PHOTO

CRT BOARD

SET 2826 FOLDER 1

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PANASONIC
MODEL CTL-3191S



STEREO ADJUSTMENTS

All adjustments were made using a B&K Model 2009 MTS TV/Stereo generator connected to the antenna terminals, (equivalent generator may be used) with the Customer Controls set to Normal listening levels. Select Stereo mode.

BASEBAND VIDEO LEVEL ADJUSTMENT

Place a jumper between Test Points TPM2, TPM3 and TPM4. Connect an oscilloscope to TPM2 and adjust Video Level Control (R2029) for 2.0V from white level of waveform to DC ground. Adjust Video Level Control (R2008) for 1.0V from sync pulse to DC ground.

BASEBAND AUDIO LEVEL ADJUSTMENT

On generator, select SAP and 300Hz audio frequency. Connect an oscilloscope to Terminal M44, low side to ground. Adjust Sound Level Control (R2073) for 1.0V p-p.

INPUT LEVEL ADJUSTMENT

On generator, select Pilot, 1kHz audio frequency and L-R modulating signal. Connect an oscilloscope to TPE1, low side to ground. Adjust Input Level Control (R2200) for 1.2V p-p.

L-R LEVEL ADJUSTMENT

On generator, select Pilot, 1kHz audio frequency and L-R modulating signal. Connect an oscilloscope to TPE11, low side to ground. Adjust L-R Level Control (R2209) for 500mV p-p.

VCO ADJUSTMENT

On generator, select Pilot, 1kHz audio frequency and L-R modulating signal. Set volume control for an audible signal (about 15). Set VCO Control (R2220) fully counterclockwise. Adjust VCO Control clockwise until a clear signal is heard.

FILTER ADJUSTMENT

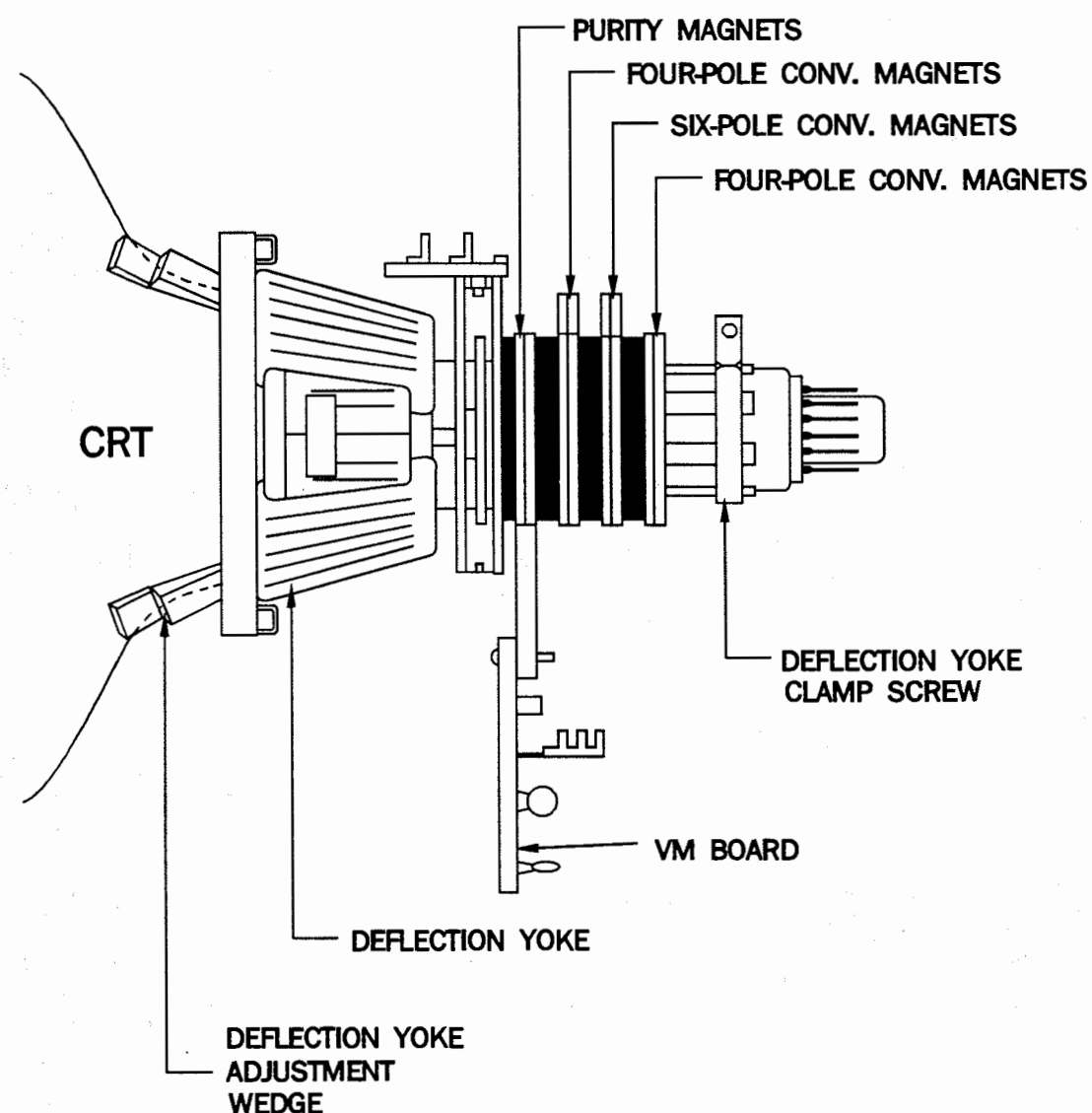
Select SAP mode on receiver. On generator, select SAP, 1kHz audio frequency and L-R modulating signal. Connect an oscilloscope to TPE21 (IC2200, pin 21), low side to ground. Adjust Filter Control (R2221) for MINIMUM.

SEPARATION ADJUSTMENTS

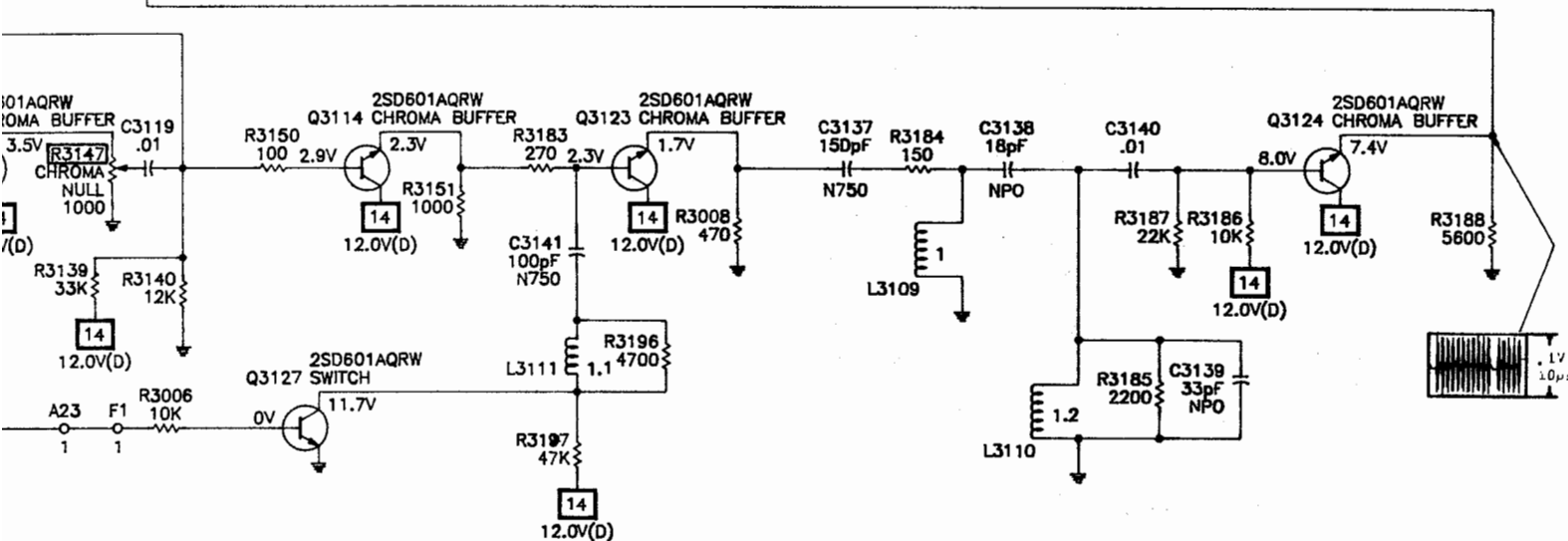
On generator, select Pilot, 8kHz audio frequency and Left modulating signal. Connect an Oscilloscope to TPE10, low side to ground. Adjust Separation Control (R2213) for MINIMUM amplitude of waveform.

DOLBY LEVEL ADJUSTMENT

On generator, select Pilot, 1kHz audio frequency, and L-R modulating signal. Set Dolby Balance (R1392) to Mid-range. Connect a DC Voltmeter to TP1307, low side to ground. Adjust dolby Level Control (R1338) for 8.0VDC +/- 0.1VDC



CRT NECK ASSEMBLY



VIDEO / CHROMA SWITCH

MISCELLANEOUS ADJUSTMENTS

PRETUNING

Note: All procedures require an antenna connected and power applied to the set. Select TV/CATV Switch setting.

AUTO MEMORY

1. Press the Set-Up button until the arrow points at "Auto Ch".
2. Press the Plus button. Available channels are scanned and stored in memory.

ADD CHANNEL

1. Select channel.
2. Press the Set-Up button until the arrow points at the channel display.
3. Press the Plus button.
4. Repeat steps one through three to add other channels.

DELETE CHANNEL

1. Select channel.
2. Press the Set-Up button until the arrow points at the channel display.
3. Press the Minus button.
4. Repeat steps one through three to erase other channels.

CLOCK SETTING

1. Press the Set-Up button until the arrow points to the "Time Display".
2. With the clock hours boxed, press the Plus button to advance hours, Minus button to decrement hours.
3. Press the Set-Up button to box the clock minutes.
4. With the clock minutes boxed, press the Plus button to advance minutes, Minus button to decrement minutes.

ON/OFF TIMER SETTING

1. Press the Timer button until the arrow points to the "On Time Display".
2. With the On Time hours boxed, press the Plus button to advance hours, Minus button to decrement hours.
3. Press the Timer button to box the On Time minutes.
4. With the On Time minutes boxed, press the Plus button to advance minutes, Minus button to decrement minutes.
5. Press the Timer button until the Off Time hours is boxed.
6. With the Off Time hours boxed, press the Plus button to advance hours, Minus button to decrement hours.
7. Press the Timer button to box the Off Time minutes.
8. With Off Time minutes boxed, press the Plus button to advance minutes, Minus button to decrement minutes.
9. Press the Timer button until Daily "Yes" or "No" is boxed.
10. Press the Plus button to select "Yes" or "No".

11. Press the Timer button until the channel number is boxed.
12. Press the Plus button to select the desired channel. (only programmed channels are accessible).
13. Press the Timer button until set "Yes" or "No" is boxed.
14. Press the Plus button to select "Yes" or "No".

SLEEP TIMER

Press the Sleep button, unit can be set to turn off after 30, 60 or 90 minutes by pressing the Sleep button.

This set employs Digital Customer Controls. All adjustments were performed at Reset unless otherwise indicated. CATV Switch (SW021) to TV, Color Pilot Switch (SW601) to Off.

B+ CHECK

Connect a digital DC voltmeter to TP91, low side to isolated ground. Set Brightness, Picture and Color Controls to MINIMUM. With AC line voltage set to 120VAC, B+ should read 140VDC.

HIGH VOLTAGE CHECK

Tune in a picture, set Brightness, Picture and Color Controls to MINIMUM. Connect a high voltage probe to CRT anode. High Voltage must read 26.5KV to 31.0KV.

RF AGC ADJUSTMENT

Tune in a picture. Adjust AGC Control (R113) counter-clockwise until snow appears in picture, then clockwise to a point just past where snow disappears.

SUB-BRIGHTNESS ADJUSTMENT

Tune in a picture, set Brightness, Picture and Color Controls to MINIMUM. Adjust Sub-Brightness Control (R324) for just visible highlights. Set Brightness, Picture and Color Controls to Maximum. Check for blooming, readjust if required.

SUB-CONTRAST ADJUSTMENT

Tune in a color bar pattern, set Picture to Maximum, Brightness to Midrange. Connect an oscilloscope to TP13, low side to ground. Adjust Sub-Contrast Control (R309) for 2.0V p-p level of the video portion of the waveform.

HORIZONTAL CENTERING/WIDTH ADJUSTMENT

Tune in a picture, adjust Horizontal Width Control (R758) for MINIMUM width. Adjust Horizontal Centering Control (R524) for best horizontal centering. Adjust Horizontal Width for a slight overscan.

MISCELLANEOUS ADJUSTMENTS (Continued)

PINCUSHION ADJUSTMENT

Tune in a crosshatch pattern, adjust PCC Control (R760) for straightest vertical lines at the right and left sides of the screen.

DETECTOR OUTPUT (VIDEO LEVEL) ADJUSTMENT

Tune in a color bar pattern, connect an oscilloscope to TP13, low side to ground. Adjust Detector Output Control (R136) for 3.0V p-p.

COMB FILTER ADJUSTMENT

NOTE: Do not make comb filter adjustments unless repairs have been made to the Comb Filter Board (F-Board). Adjustments are made with Comb Filter Board removed from set.

Remove Comb Filter Board from set. Connect a 12V power supply to pin 4 of Connector F1. Connect power supply ground to pin 6 of Connector F1. Place a 47uF capacitor between pins 4 and 6 of Connector F1. Connect a Multibrust/NTSC color bar generator to pin 30 of Connector F1 and Supply Multiburst Signal. Connect an oscilloscope to TPC1 and adjust Comb Filter Control (R3011) for Maximum burst amplitude. Connect an oscilloscope to TPC2 and adjust Frequency Trimmer (C3142), Chroma Null Timer (C3115) and Chroma Null Control (R3137) for MINIMUM burst amplitude. Supply NTSC color bar signal to pin 3 of Connector F1. Connect an oscilloscope to pin 7 of Connector F1 and adjust Chroma Null Controls (R3147, R3143) for MINIMUM burst amplitude.

MPU REFERENCE OSCILLATOR

Adjustment is not recommended, if adjustment must be performed, proceed as follows: Tune in Channel 13, connect a frequency counter to TPS3 and ground. Short TPS7 to ground. Adjust MPU Reference Oscillator Control (C058) for exactly 32768.0Hz +/- 0.1Hz.

REFERENCE GYRATOR ADJUSTMENT

Tune in an NTSC color bar pattern, set Brightness and Picture to Midrange. Connect a dual trace oscilloscope to TP300 (Q305 Emitter), low side to ground and channel two to TP13. Invert the channel two trace. Select Chop and 20 microsecond delay time. Place trace one over trace two so that they are equal. Expand by 10X. Adjust the horizontal position on the oscilloscope to view a vertical transition. Adjust Reference Gyrator Control (R602) for 315nS +/- 10nS delay between signals.

SUB-TINT/SUB-COLOR ADJUSTMENT

Tune in a color bar pattern, place Auto Color Switch (SW601) to On. Connect an oscilloscope to the CRT Red

Cathode, low side to ground. Adjust Sub-Tint (R614) to balance the second and third bars. Adjust Sub-Color (R610) for 130V p-p.

DISPLAY POSITION ADJUSTMENT

Tune in a picture. Press EQ button on remote transmitter. Adjust Display Position Control (C026) to center the display.

COLOR PURITY ADJUSTMENT

Tune in a station and allow a 60-minute warm-up time. Place a jumper between TP14 and ground to produce a blank raster. Adjust Blue (R355) and Red (R344) Cutoff Controls to obtain a green raster. Adjust Red (R360) and Blue (R361) Drive Controls if necessary. Loosen the clamp holding Deflection Yoke and unlock the purity rings. Place the purity tabs at 12 o'clock position. Use a degaussing coil to demagnetize CRT and mounting brackets. Move Deflection Yoke back against the purity magnet. Adjust purity tabs to place the green bar in the center of the screen. Move the Deflection Yoke forward until a uniform green raster is obtained. Adjust purity correctional magnets if necessary. Tighten yoke clamp and purity rings. Remove jumper.

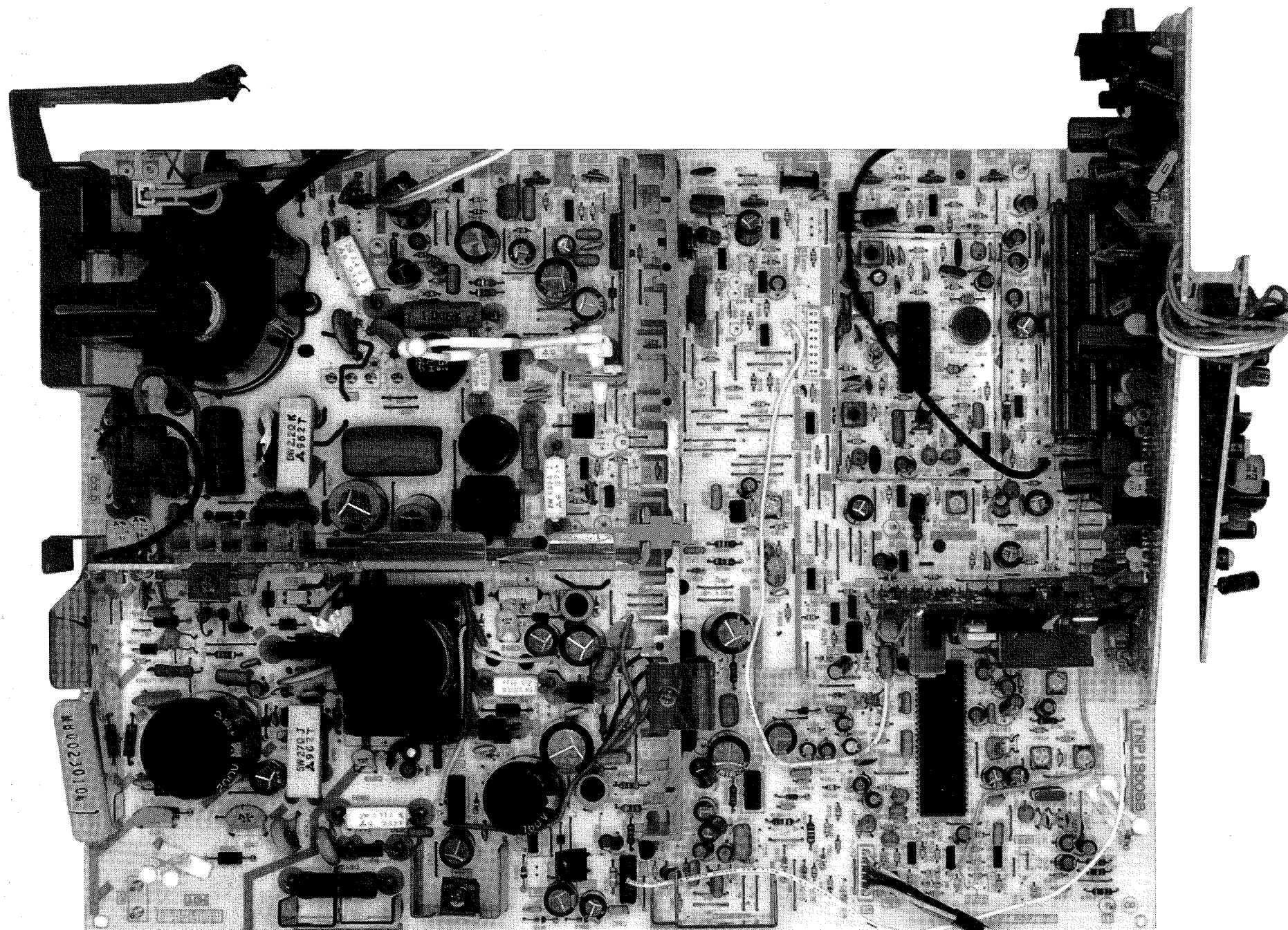
COLOR TEMPERATURE ADJUSTMENT

Tune in a picture, set Brightness, Picture, Color, Screen (R599B), Red (R354), Blue (R355) and Green (R356) Low Light Controls to MINIMUM. Set Service Switch (SW301) to Service position. Slowly advance screen control to obtain a horizontal line of one color. Adjust two low light controls not of visible color to obtain a white line. Place Service Switch in Normal position. Set brightness and Picture Controls to Maximum. Adjust Red and Blue Drive Controls for best black and white picture. Check tracking at high and low brightness, readjust as necessary.

CONVERGENCE ADJUSTMENT

Connect a color bar generator to antenna terminals and tune in a dot pattern. Adjust 4-pole magnets to converge the red and blue dots at the center of the screen. Adjust 6-pole magnets to converge the red/blue dots over the green dots at the center of the screen. Tune in a crosshatch pattern. Remove rubber wedges between the Deflection Yoke (DY1) and the CRT. Tilt 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 Deflection Yoke to the right or left to converge the horizontal lines at the top and bottom of the screen and the vertical lines at the right and left sides of the screen. Repeat convergence procedure if necessary to obtain the best overall convergence. Replace rubber wedges.

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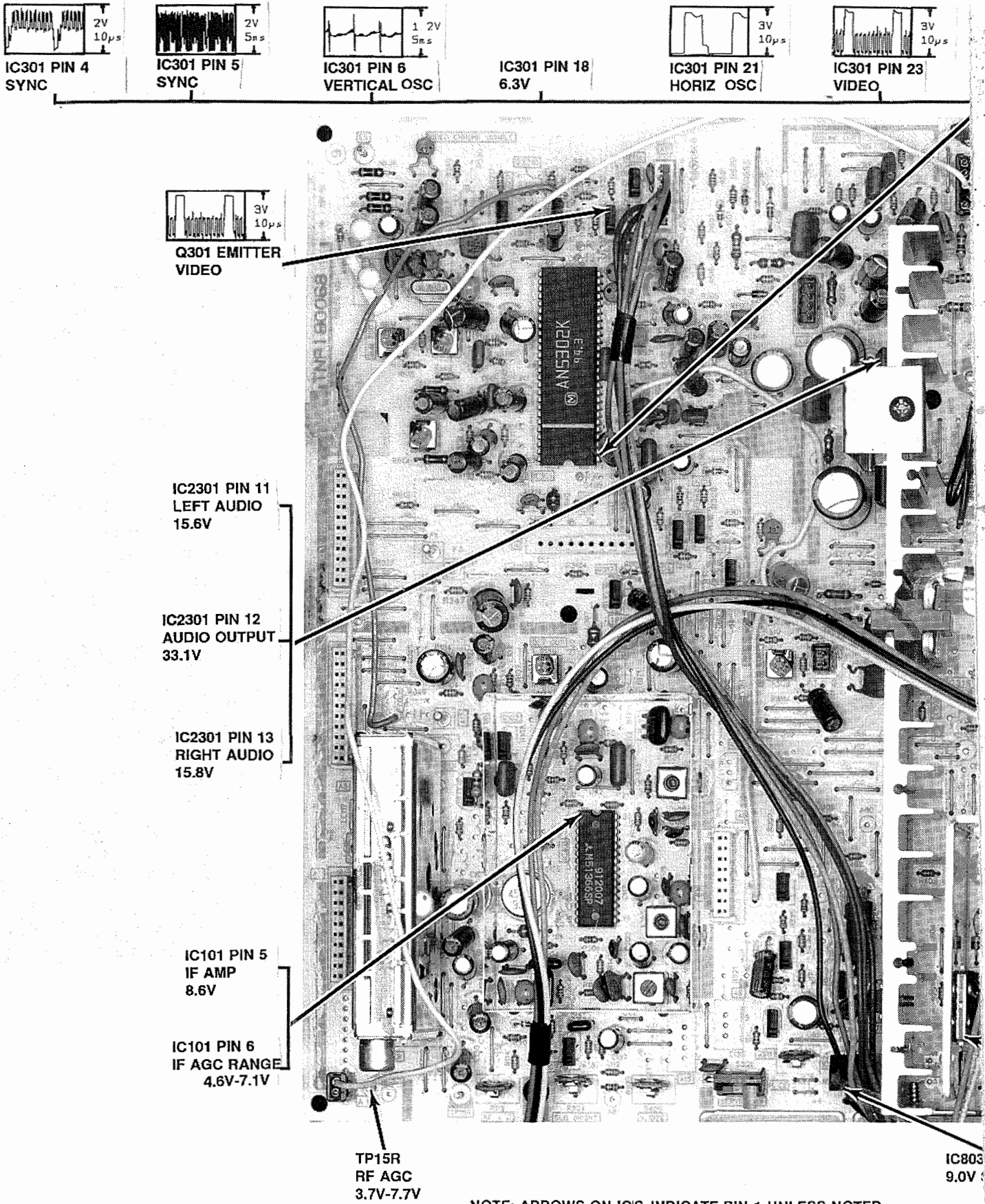
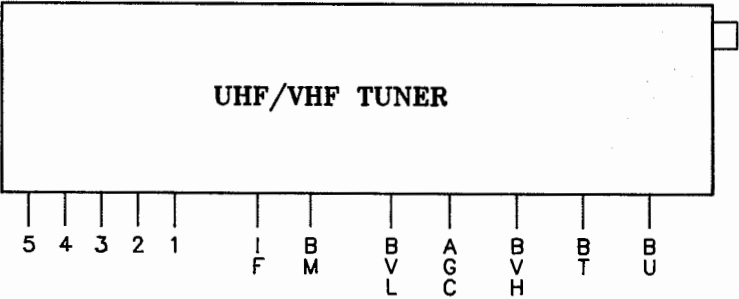
CHASSIS OVERALL

TUNER VOLTAGE CHART

	5	4	3	2	1	IF	BM	BVL	AGC	BVH	BT	BU
VHF Low Band	3.8V	5.1V	.1V	.8V	.4V	1.2V	11.7V	11.6V	7.7V	0V	1.0V	.1V
VHF High Band	6.8V	5.1V	.1V	.8V	.4V	1.2V	11.7V	.5V	7.7V	11.5V	4.1V	.1V
UHF Band	8.0V	5.1V	.1V	.8V	.4V	1.2V	11.7V	.1V	7.7V	0V	5.3V	11.4V

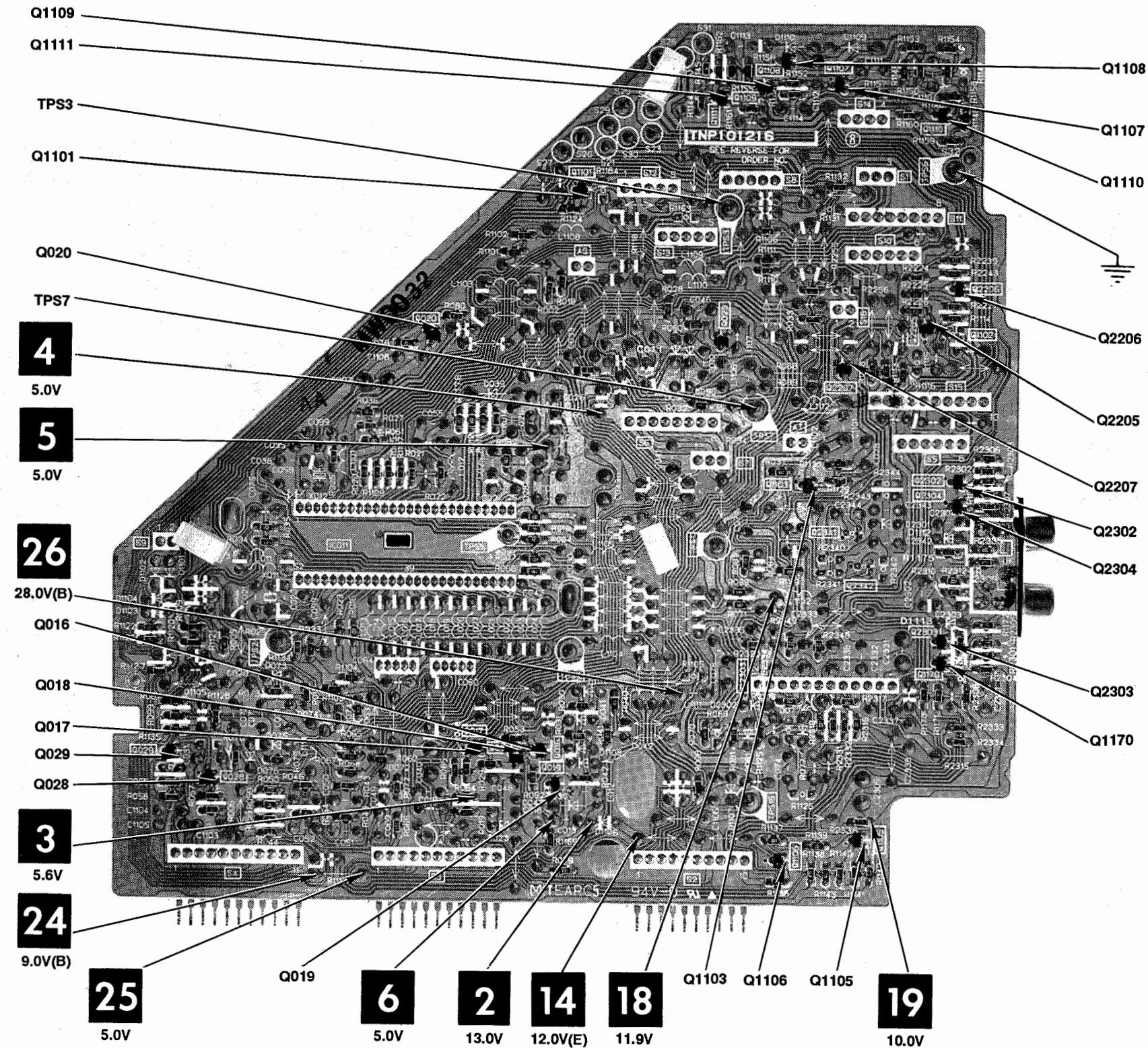
NOTE: VHF Low Band voltages taken on channel 2.
VHF High Band voltages taken on channel 7.
UHF Band voltages taken on channel 14.

TUNER TERMINAL GUIDE



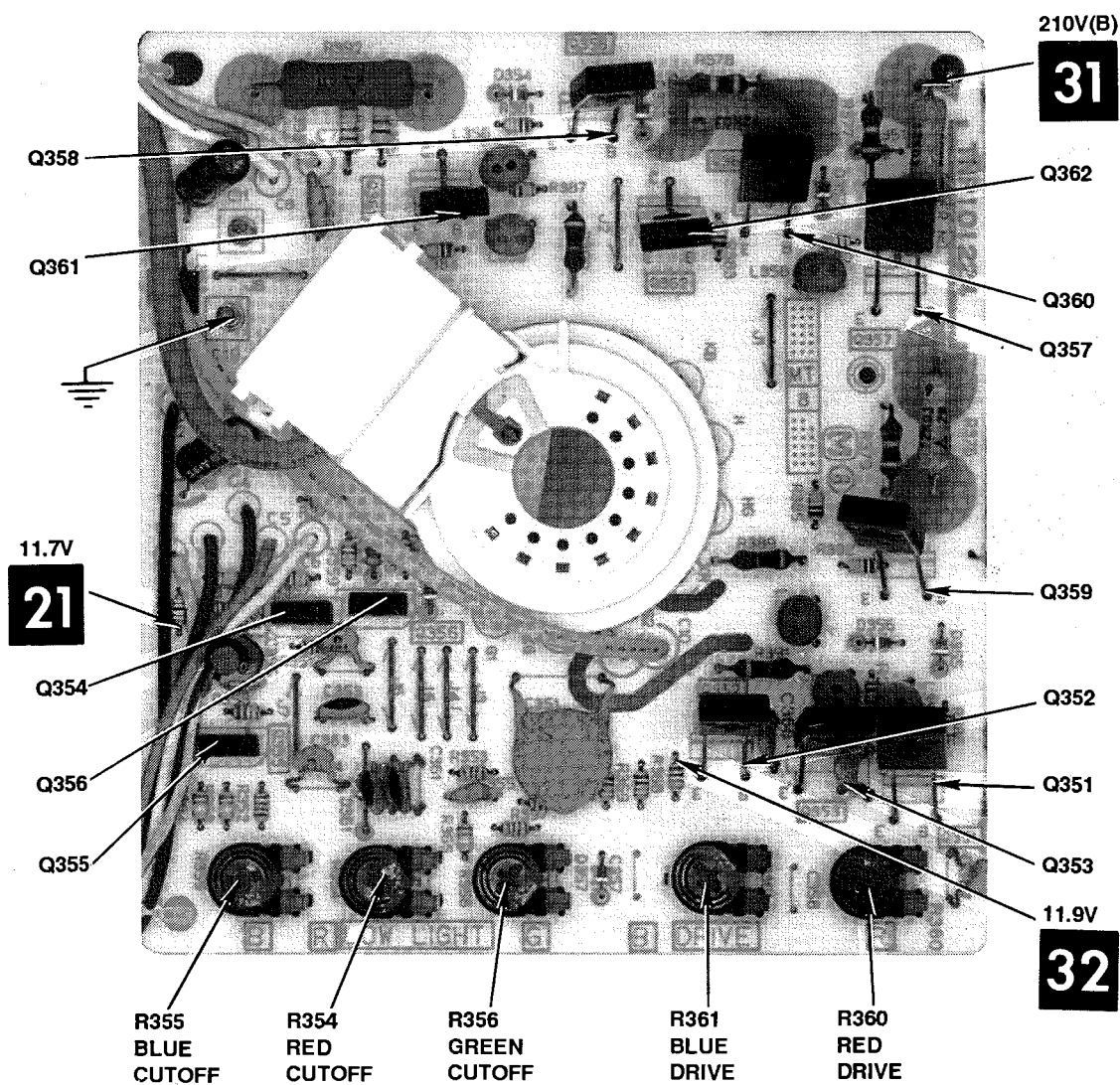
NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED
NOTE: ARROWS ON TRANSISTORS INDICATE BASE UNLESS NOTED

MAIN BOARD

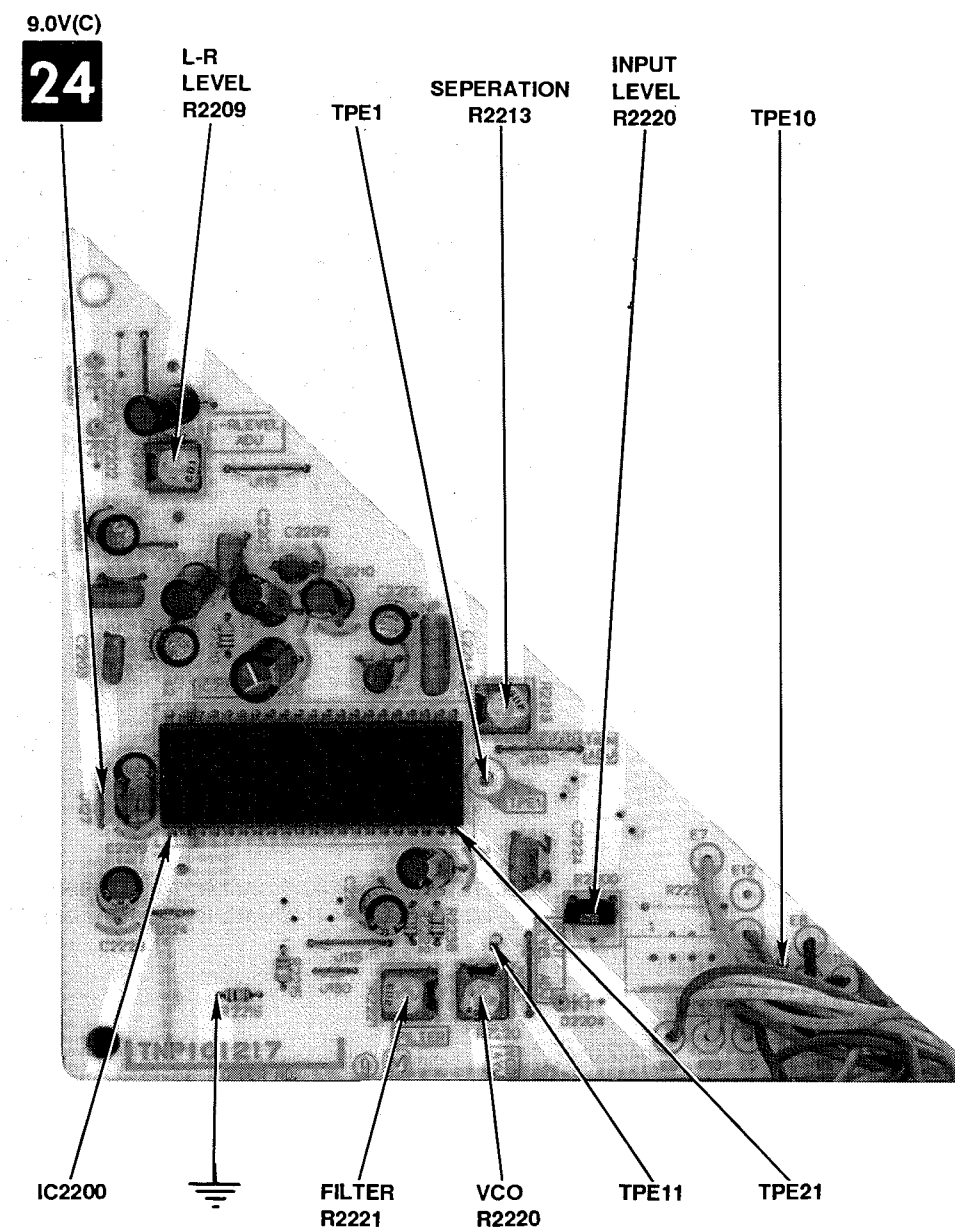


NOTE: ARROWS ON TRANSISTORS INDICATE BASE UNLESS NOTED

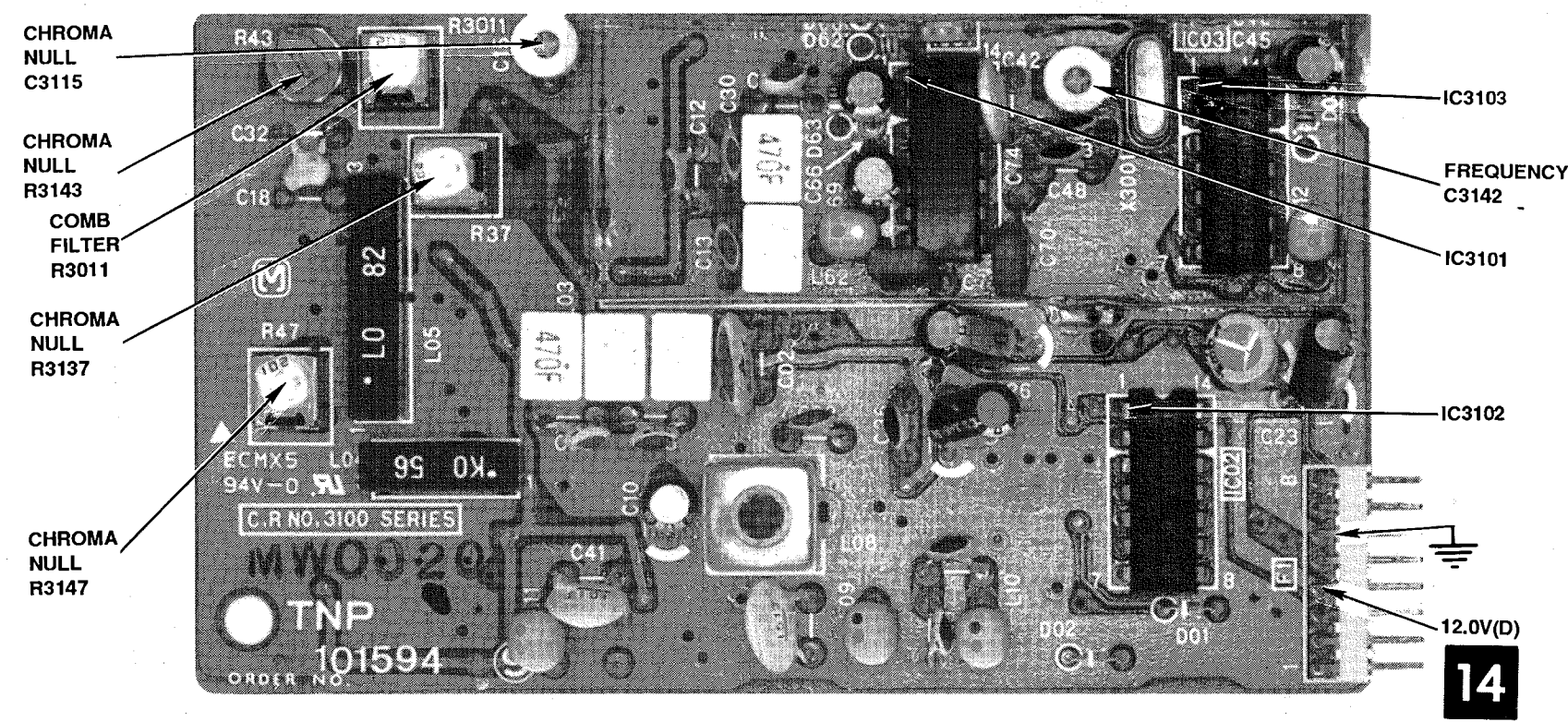
PANASONIC
MODEL CTL-3191S



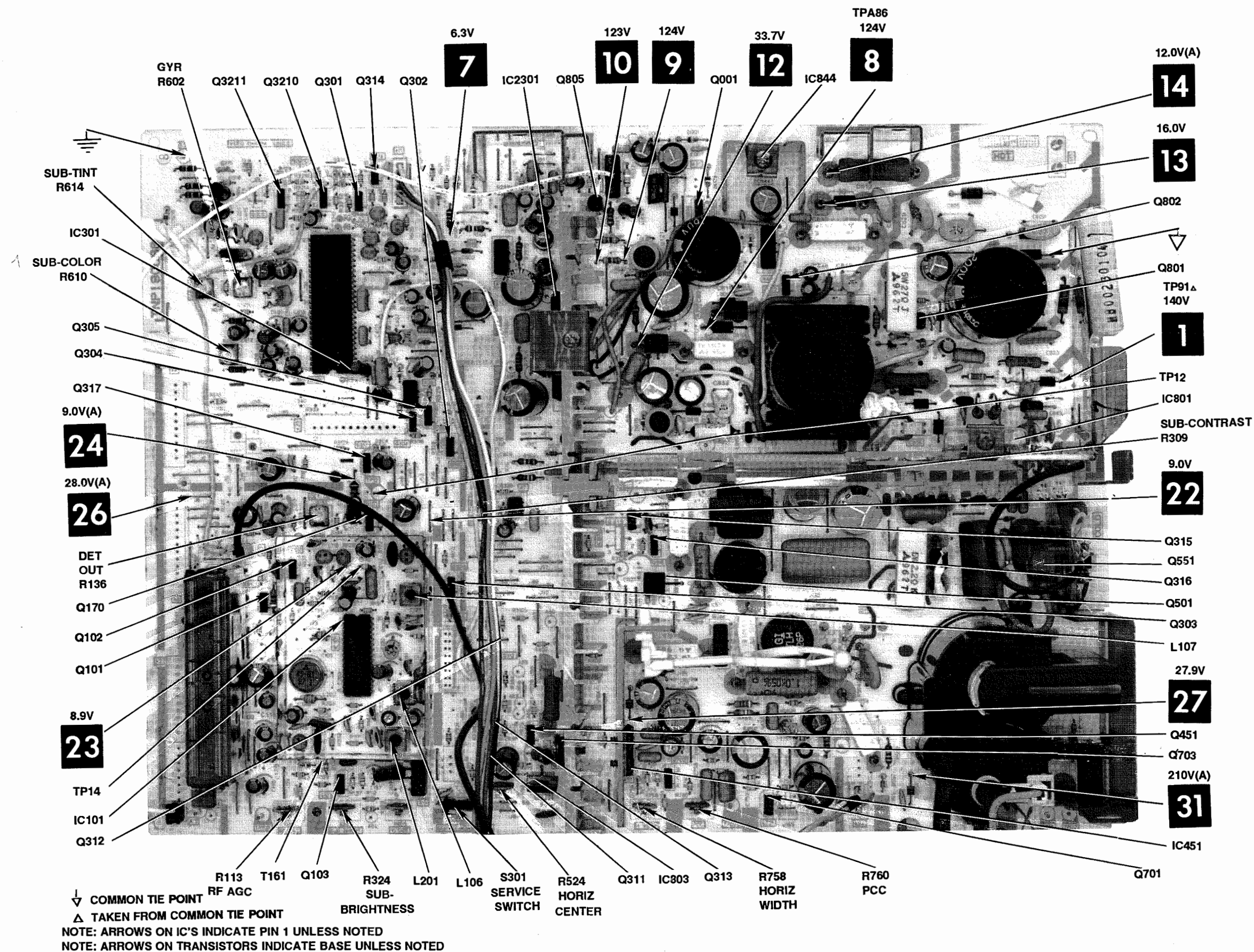
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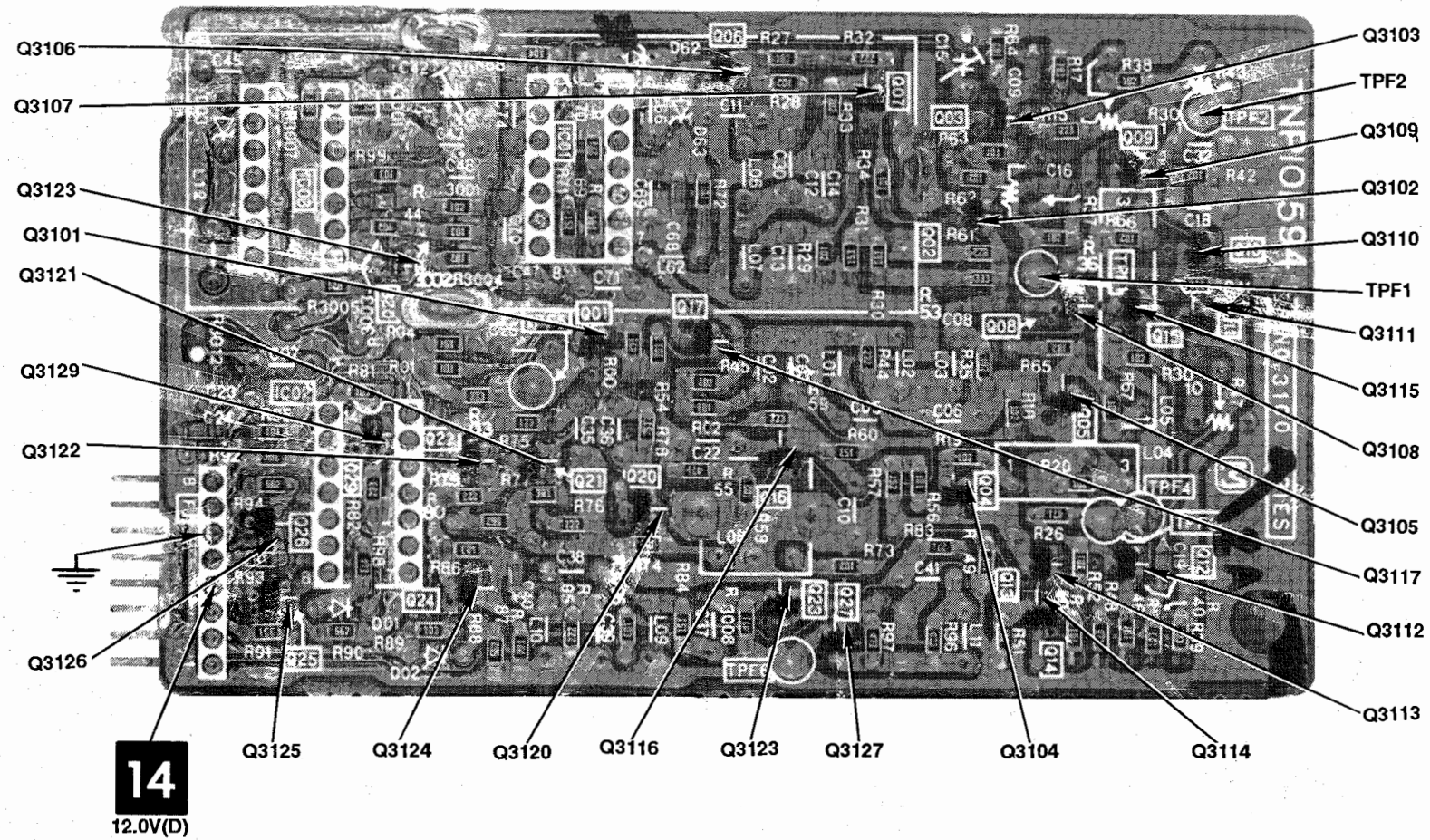
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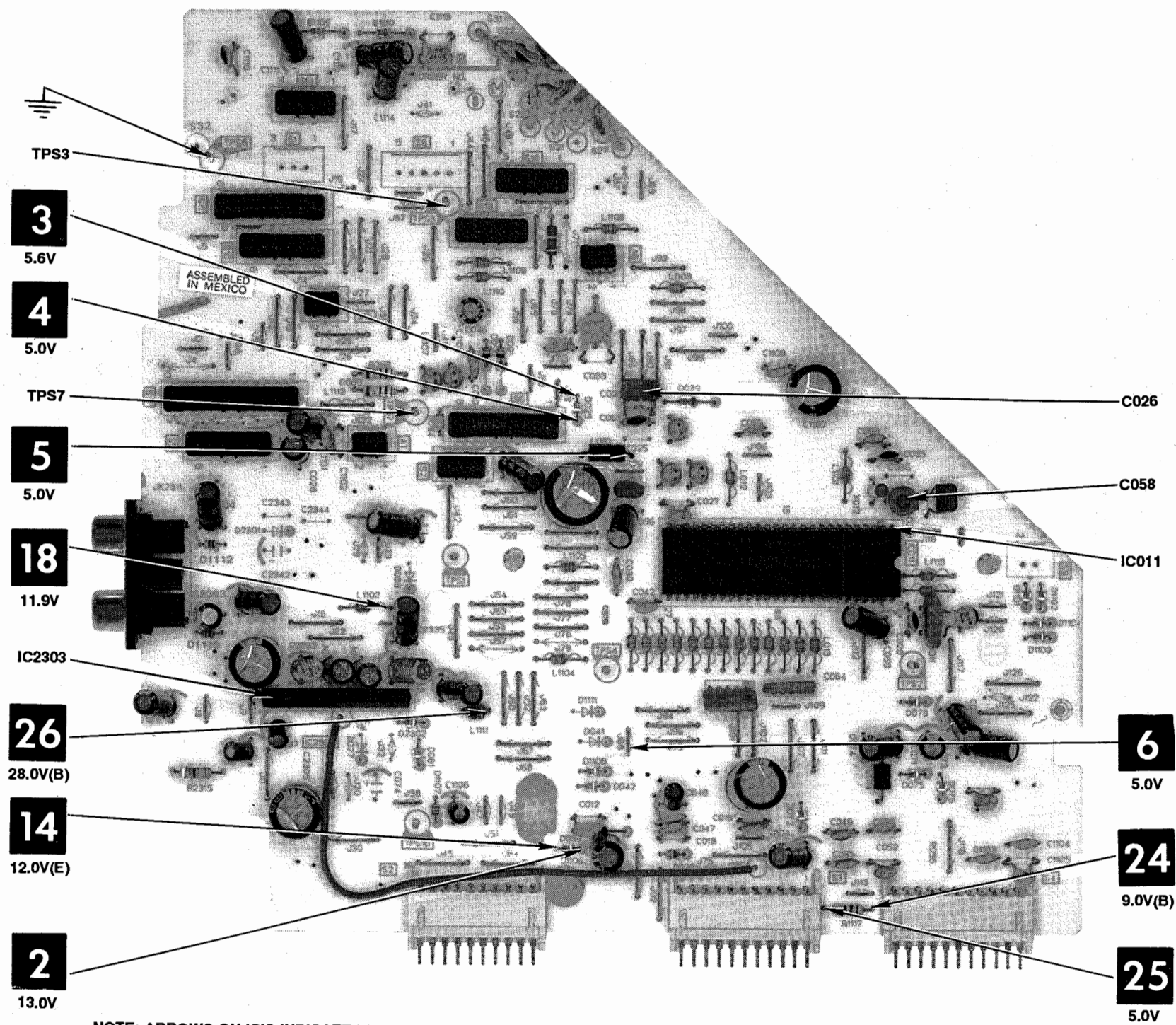
NOTE: ALL TWO DIGIT CALLOUTS 3100 SERIES
NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED.



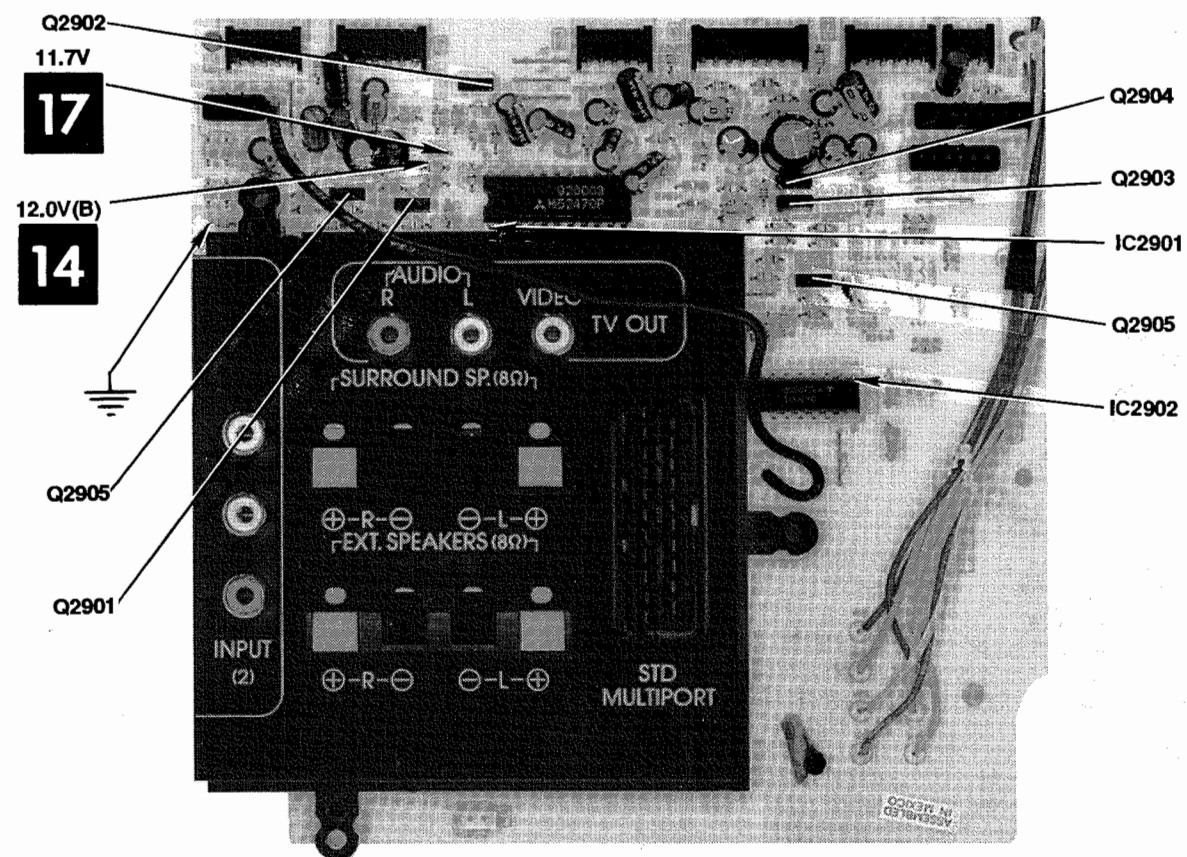
MAIN BOARD-TOP VIEW



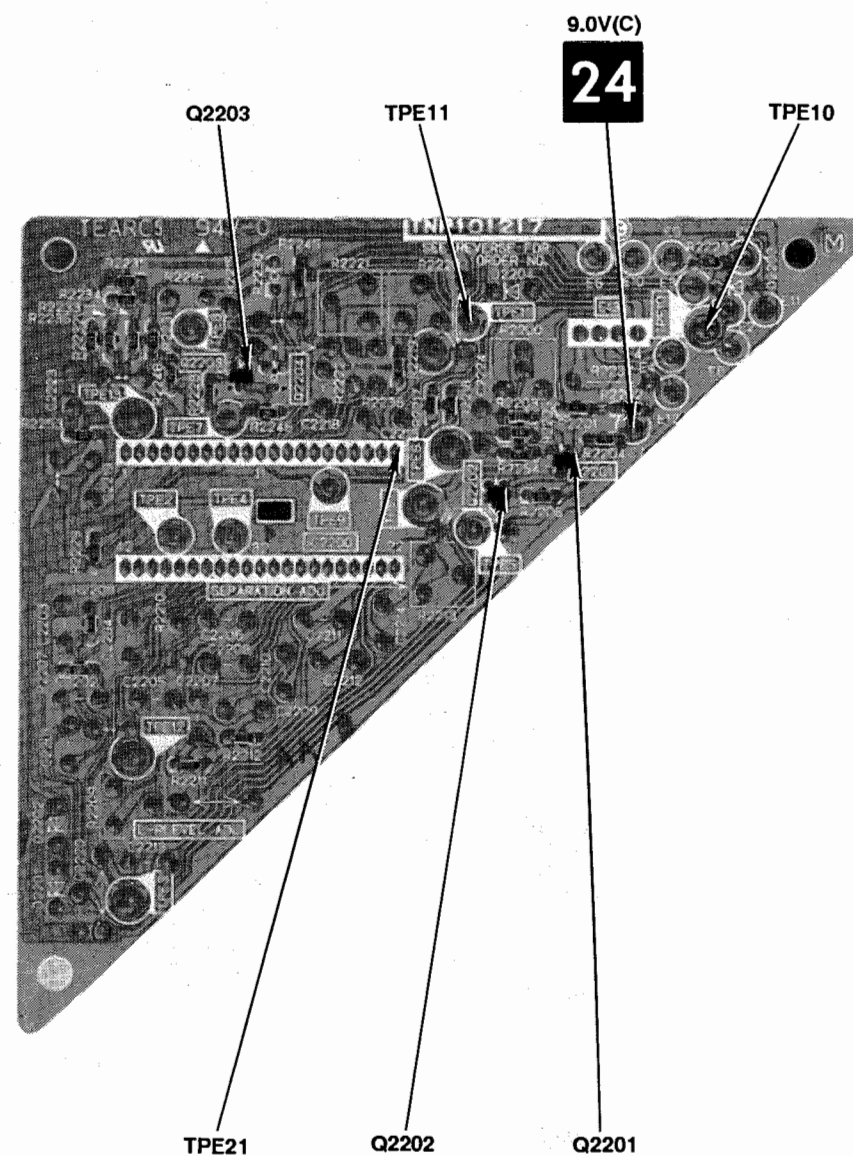
NOTE: ALL TWO DIGIT CALLOUTS 3100 SERIES
NOTE: ARROWS ON TRANSISTORS INDICATE BASE UNLESS NOTED.



NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

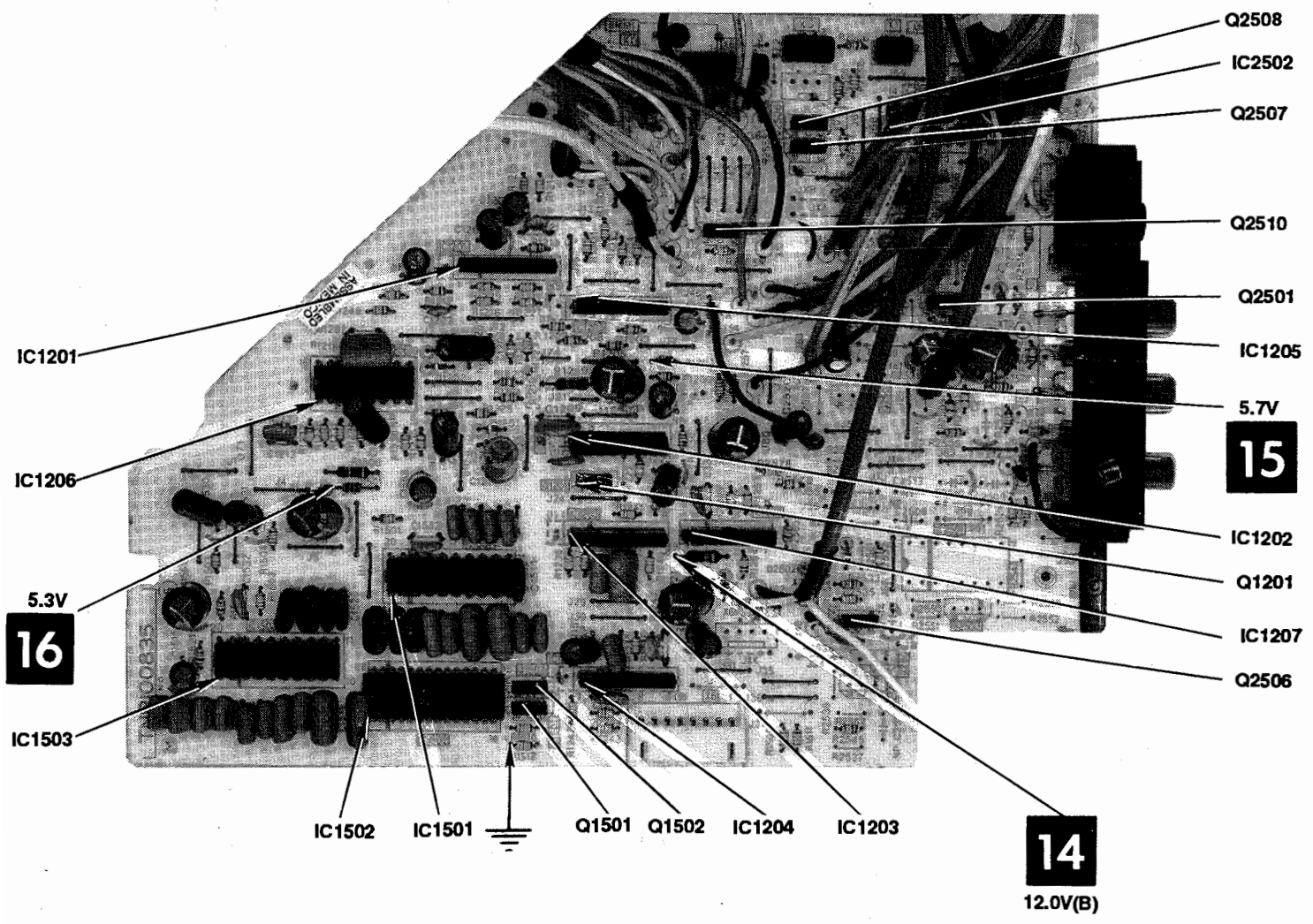


NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED
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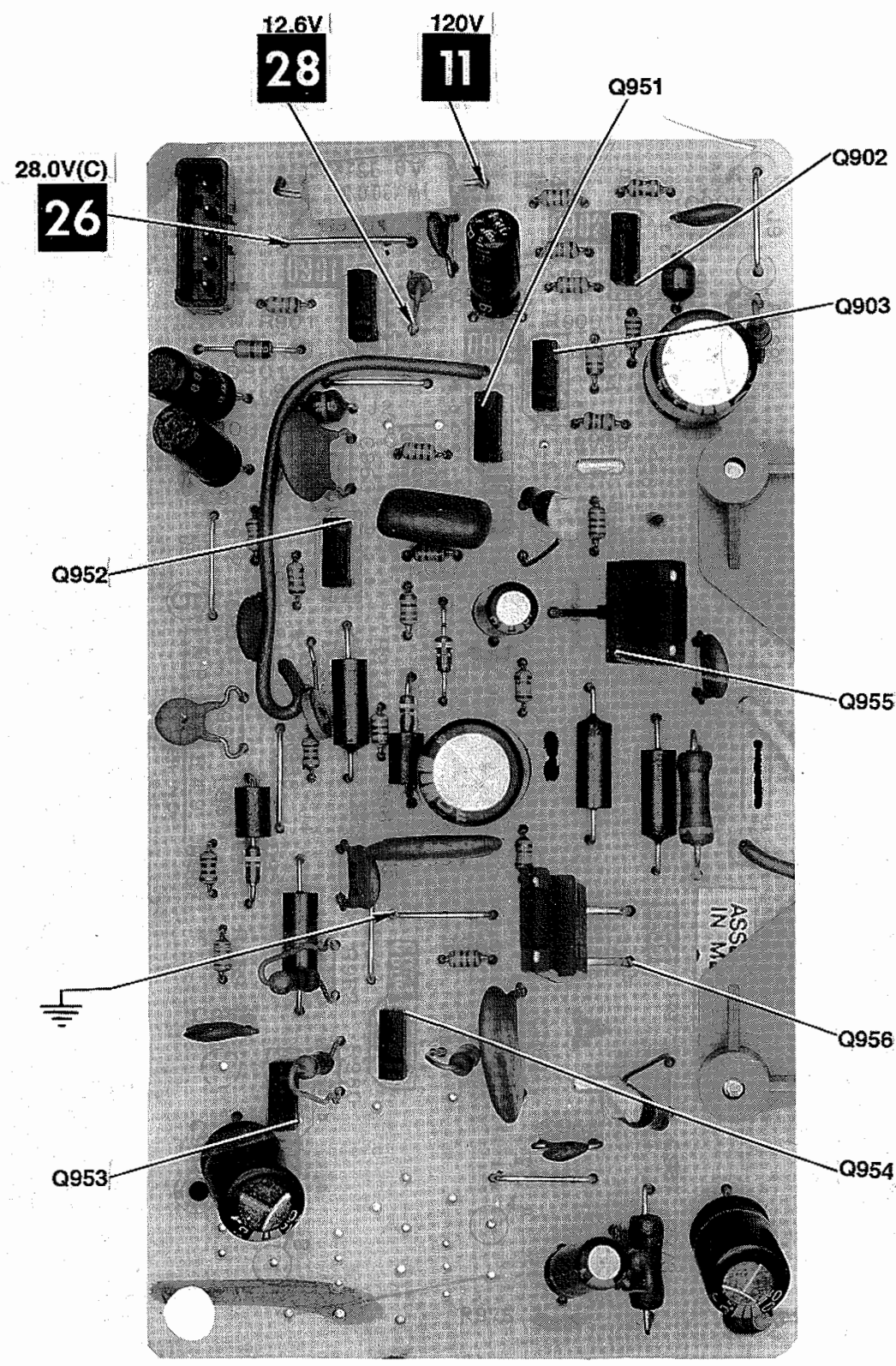


NOTE: ARROWS ON TRANSISTORS INDICATE BASE UNLESS NOTED.

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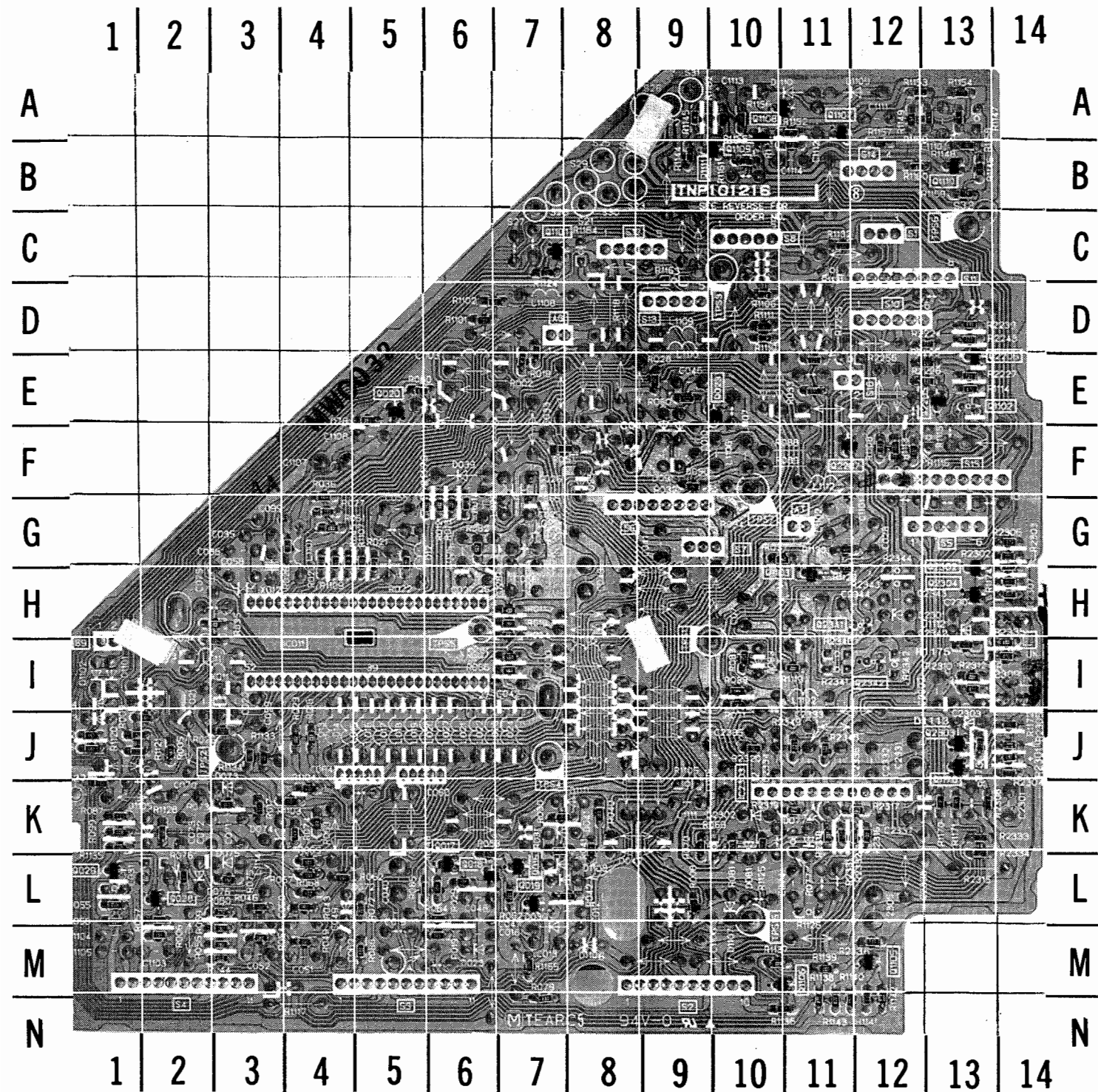


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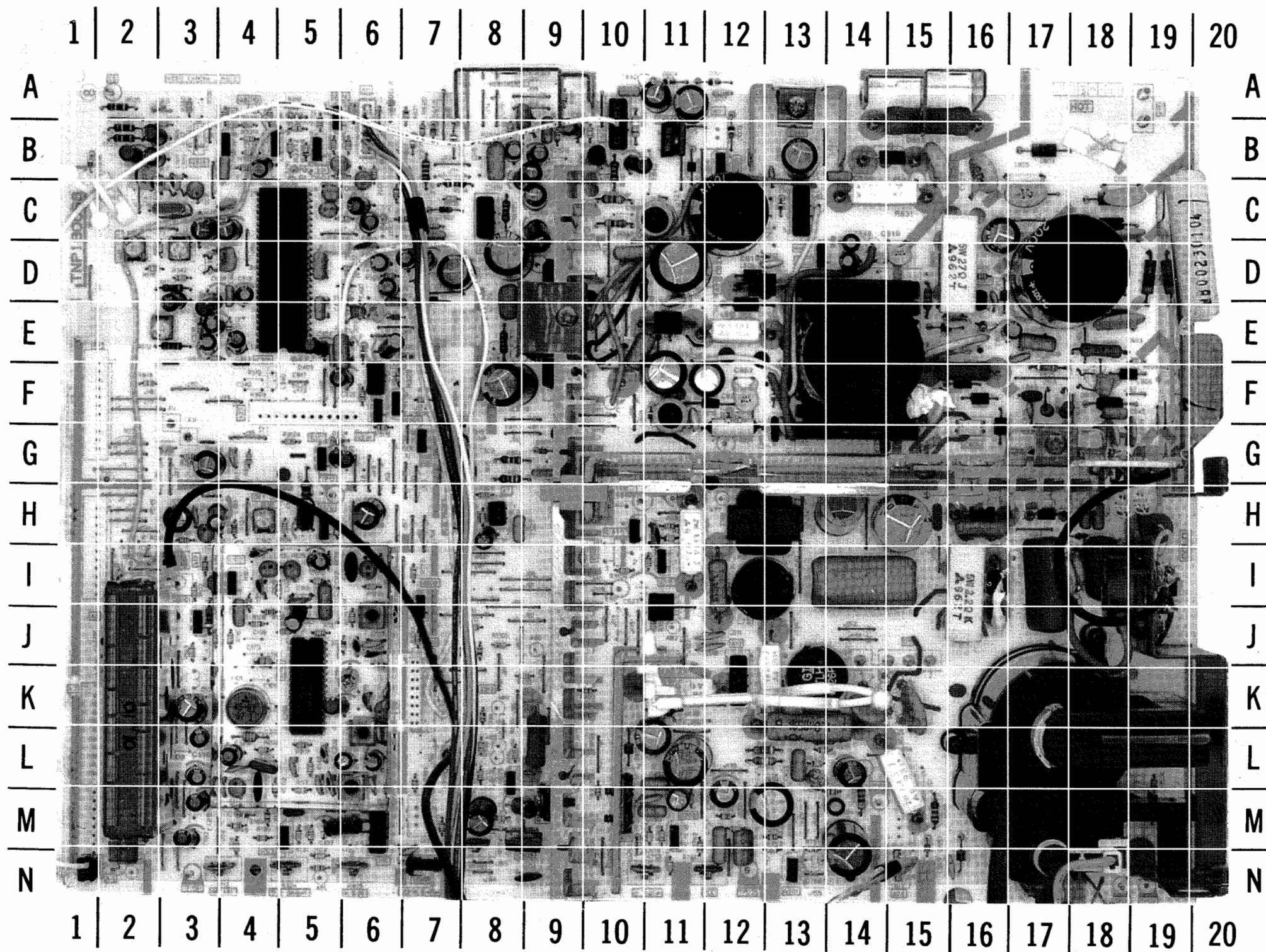


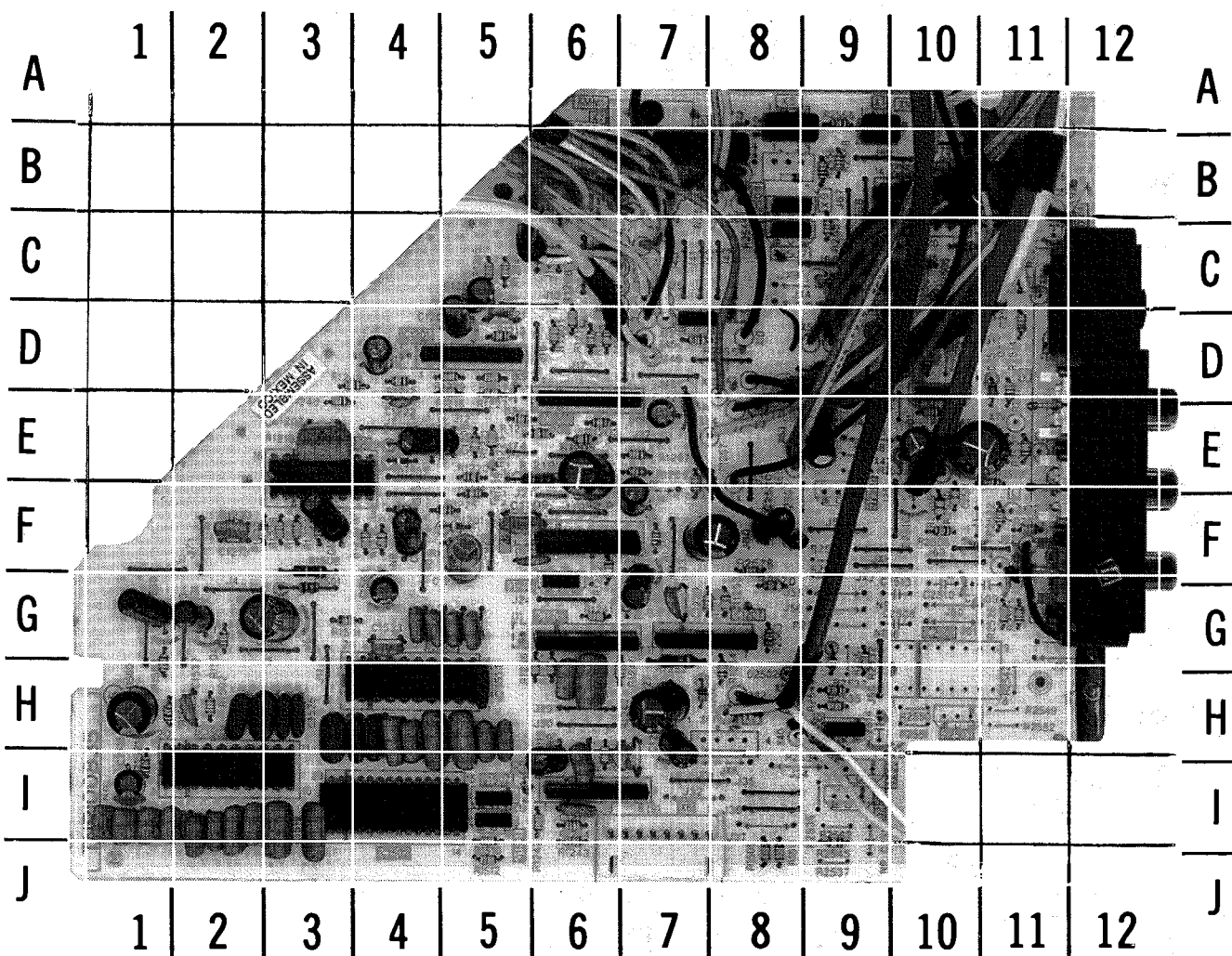
NOTE: ARROWS ON TRANSISTORS INDICATE BASE UNLESS NOTED

SYNTHESIZER BOARD-BOTTOM VIEW-GridTrace LOCATION GUIDE



Q016	L-7	R045	G-4	R1129	H-11	R2320	J-10
Q017	L-6	R046	L-3	R1130	G-11	R2331	K-11
Q018	L-6	R048	L-6	R1132	C-11	R2332	K-12
Q019	L-7	R049	M-4	R1133	J-3	R2333	K-13
Q020	E-5	R050	L-3	R1134	J-3	R2334	L-13
Q023	E-10	R051	F-8	R1135	K-1	R2335	I-14
Q028	L-2	R052	L-7	R1136	N-11	R2336	M-12
Q029	L-1	R053	L-6	R1137	M-10	R2348	J-11
Q1101	C-7	R054	M-3	R1138	N-11	R2349	J-11
Q1103	H-11	R055	L-1	R1139	M-11		
Q1105	H-12	R056	M-3	R1140	N-11		
Q1106	M-11	R057	M-2	R1141	N-12		
Q1107	A-11	R058	M-1	R1142	N-12		
Q1108	A-11	R059	M-3	R1143	N-11		
Q1109	A-10	R060	E-9	R1144	B-9		
Q1110	B-13	R061	G-4	R1145	A-9		
Q1111	B-10	R062	L-4	R1146	B-13		
Q2205	E-13	R063	K-4	R1148	A-13		
Q2206	E-13	R064	L-6	R1149	A-12		
Q2207	F-12	R065	L-4	R1150	A-13		
Q2302	H-13	R066	I-7	R1151	B-11		
Q2303	J-13	R067	L-4	R1152	A-11		
Q2304	H-13	R068	L-4	R1153	A-12		
R002	E-7	R070	K-9	R1154	A-13		
R005	J-2	R071	I-10	R1155	A-10		
R006	H-2	R072	L-5	R1156	A-10		
R007	I-7	R073	K-3	R1157	B-12		
R008	L-7	R074	K-4	R1158	B-13		
R009	J-1	R075	L-3	R1159	B-13		
R010	H-7	R076	L-2	R1160	B-12		
R011	H-7	R078	E-5	R1161	B-10		
R012	G-6	R079	N-7	R1162	A-10		
R013	G-6	R080	E-5	R1165	M-7		
R014	G-6	R081	K-10	R1170	K-13		
R016	J-4	R082	G-6	R1171	K-13		
R017	K-3	R083	I-10	R1172	J-14		
R018	E-7	R085	L-5	R1173	J-13		
R019	M-6	R086	M-5	R1174	H-14		
R020	G-4	R087	K-1	R1175	I-13		
R021	G-5	R099	K-1	R1176	G-6		
R022	G-5	R1101	D-6	R2224	D-13		
R023	J-4	R1102	D-7	R2225	E-13		
R024	H-7	R1103	K-4	R2226	E-13		
R025	J-3	R1104	K-4	R2227	E-13		
R026	G-4	R1106	L-6	R2239	D-13		
R027	G-4	R1107	G-5	R2243	D-13		
R028	E-9	R1108	F-12	R2255	E-11		
R029	L-6	R1109	G-4	R2301	J-14		
R030	K-7	R1110	D-10	R2302	G-14		
R031	L-7	R1111	D-10	R2303	H-14		
R032	F-9	R1113	F-12	R2304	J-14		
R033	E-11	R1114	E-13	R2305	J-14		
R034	I-3	R1116	F-12	R2306	G-14		
R035	H-3	R1119	I-11	R2307	H-14		
R036	G-4	R1120	J-1	R2308	K-13		
R037	G-10	R1121	J-1	R2309	I-14		
R038	I-10	R1122	J-1	R2310	I-13		
R040	K-8	R1123	J-1	R2312	I-13		
R041	L-8	R1124	C-7	R2316	K-12		
R042	L-7	R1125	K-10	R2317	K-12		
R043	L-4	R1127	K-1	R2318	K-11		
R044	M-3	R1128	K-2	R2319	K-11		

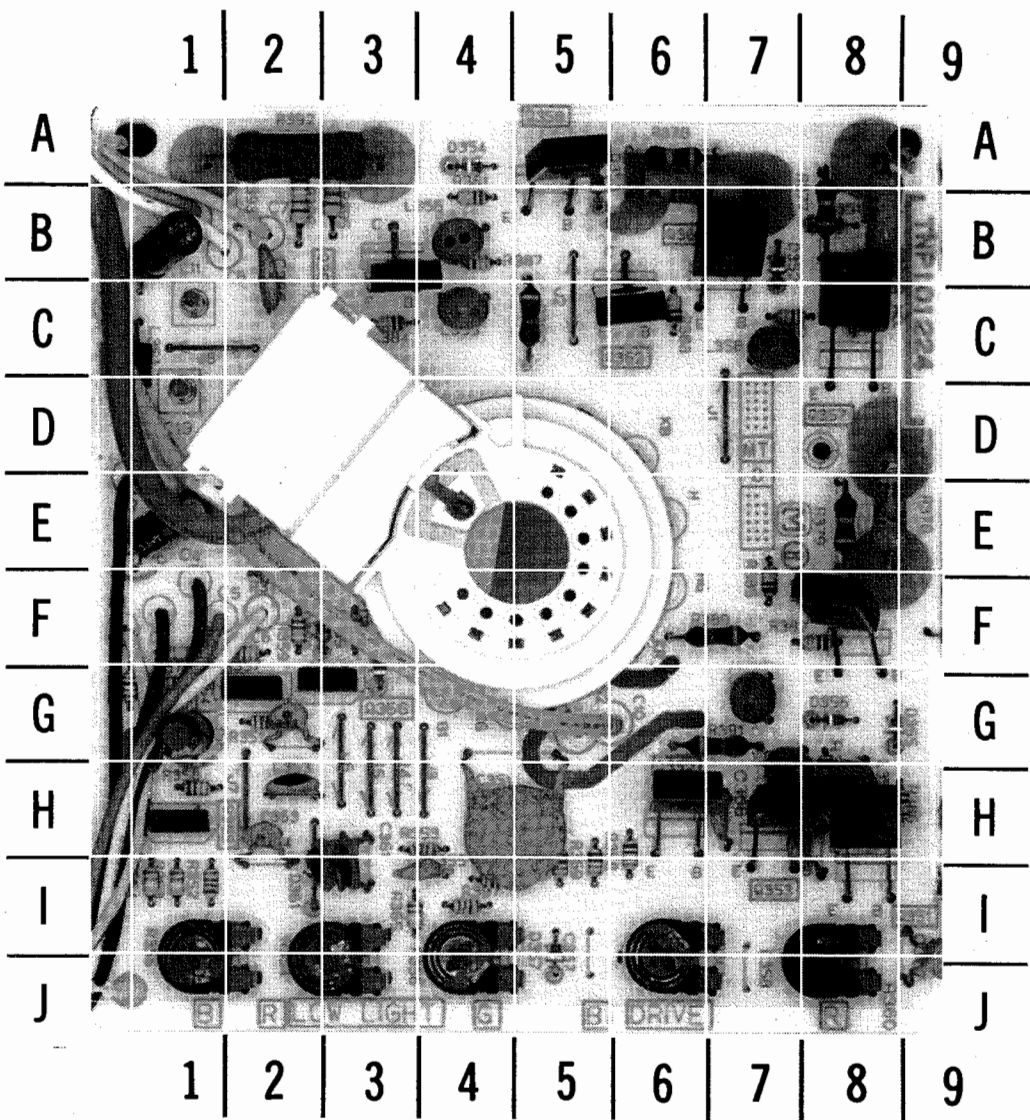




SURROUND SOUND BOARD-GridTrace Location Guide

C1203	E-6	C1563	G-4	R1228	F-3	R2526	G-11
C1204	D-5	C2501	E-10	R1229	D-5	R2527	F-11
C1205	C-5	C2502	E-11	R1230	F-4	R2528	E-11
C1206	D-4	C2503	D-9	R1231	F-3	R2530	F-10
C1207	E-7	C2504	E-9	R1232	F-2	R2532	G-9
C1208	E-5	C2518	C-9	R1233	F-3	R2533	H-9
C1209	F-5	C2520	F-8	R1234	F-3	R2534	H-9
C1210	H-6	D1201	F-5	R1235	F-4	R2535	H-9
C1211	H-6	D1202	E-4	R1236	H-6	R2545	I-9
C1213	F-2	D1203	E-4	R1237	H-6	R2546	B-10
C1214	F-5	D1204	H-7	R1238	H-6	R2547	C-10
C1215	I-6	D1501	G-3	R1239	G-7	R2553	B-8
C1216	F-4	D2501	G-9	R1240	H-6	R2554	B-7
C1217	I-6	D2505	D-10	R1241	G-6	R2555	C-8
C1218	I-6	D2506	B-11	R1242	I-6	R2556	B-9
C1219	I-7	D2507	D-11	R1243	I-6	R2557	C-9
C1220	G-7	IC1201	D-4	R1244	I-6	R2558	B-9
C1221	D-5	IC1202	F-6	R1245	I-7	R2559	D-10
C1222	E-4	IC1203	G-6	R1246	I-6	R2563	G-8
C1223	F-3	IC1204	I-6	R1247	H-2	R2564	C-10
C1224	F-7	IC1205	E-6	R1248	E-3	R2565	D-7
C1225	H-7	IC1206	F-3	R1249	D-4	R2566	A-9
C1226	E-7	IC1207	G-7	R1250	F-4	R2570	G-8
C1227	H-7	IC1501	H-4	R1251	F-5	R2578	F-8
C1229	G-7	IC1502	I-3	R1252	G-7	X1	A-9
C1230	F-2	IC1503	I-1	R1253	G-8	X5	A-8
C1231	F-6	IC2502	B-9	R1254	H-8	X6	I-7
C1501	H-3	JK2501	C-12	R1255	G-7	X7	B-6
C1502	H-4	Q1201	G-6	R1256	E-7	X8	B-7
C1503	H-4	Q1501	I-5	R1257	E-8		
C1504	H-5	Q1502	I-5	R1258	F-2		
C1505	H-5	Q2501	D-10	R1501	G-3		
C1506	H-5	Q2506	N-9	R1502	H-2		
C1507	G-4	Q2507	C-8	R1503	H-1		
C1508	G-4	Q2508	B-8	R1504	G-2		
C1509	G-5	Q2510	D-7	R1508	F-3		
C1510	G-5	R1201	D-6	R1509	J-8		
C1511	H-5	R1202	E-5	R1510	J-5		
C1512	H-4	R1203	E-6	R1511	J-8		
C1513	H-4	R1204	D-6	R1512	J-5		
C1514	H-6	R1205	E-6	R1513	H-1		
C1515	I-1	R1206	D-6	R1514	G-2		
C1516	I-3	R1207	E-9	R1515	B-7		
C1517	H-2	R1208	E-6	R1516	B-6		
C1518	H-2	R1209	E-7	R1521	I-1		
C1519	I-3	R1211	D-6	R2501	D-10		
C1520	I-2	R1212	D-4	R2502	D-10		
C1521	I-2	R1213	D-5	R2503	E-11		
C1522	I-1	R1214	C-5	R2504	E-10		
C1523	I-1	R1215	C-5	R2505	E-11		
C1524	I-1	R1216	D-5	R2506	F-10		
C1525	I-1	R1217	D-5	R2509	F-10		
C1526	H-3	R1218	E-3	R2510	C-11		
C1527	H-3	R1219	E-6	R2511	A-11		
C1528	I-2	R1220	E-5	R2514	D-11		
C1529	I-2	R1221	E-5	R2515	C-10		
C1530	G-1	R1222	F-6	R2520	C-9		
C1531	G-2	R1223	E-5	R2521	G-11		
C1532	H-2	R1224	F-5	R2522	F-11		
C1533	G-4	R1225	F-5	R2523	B-11		
C1560	H-1	R1226	E-4	R2524	B-11		
C1561	G-3	R1227	D-5	R2525	B-11		

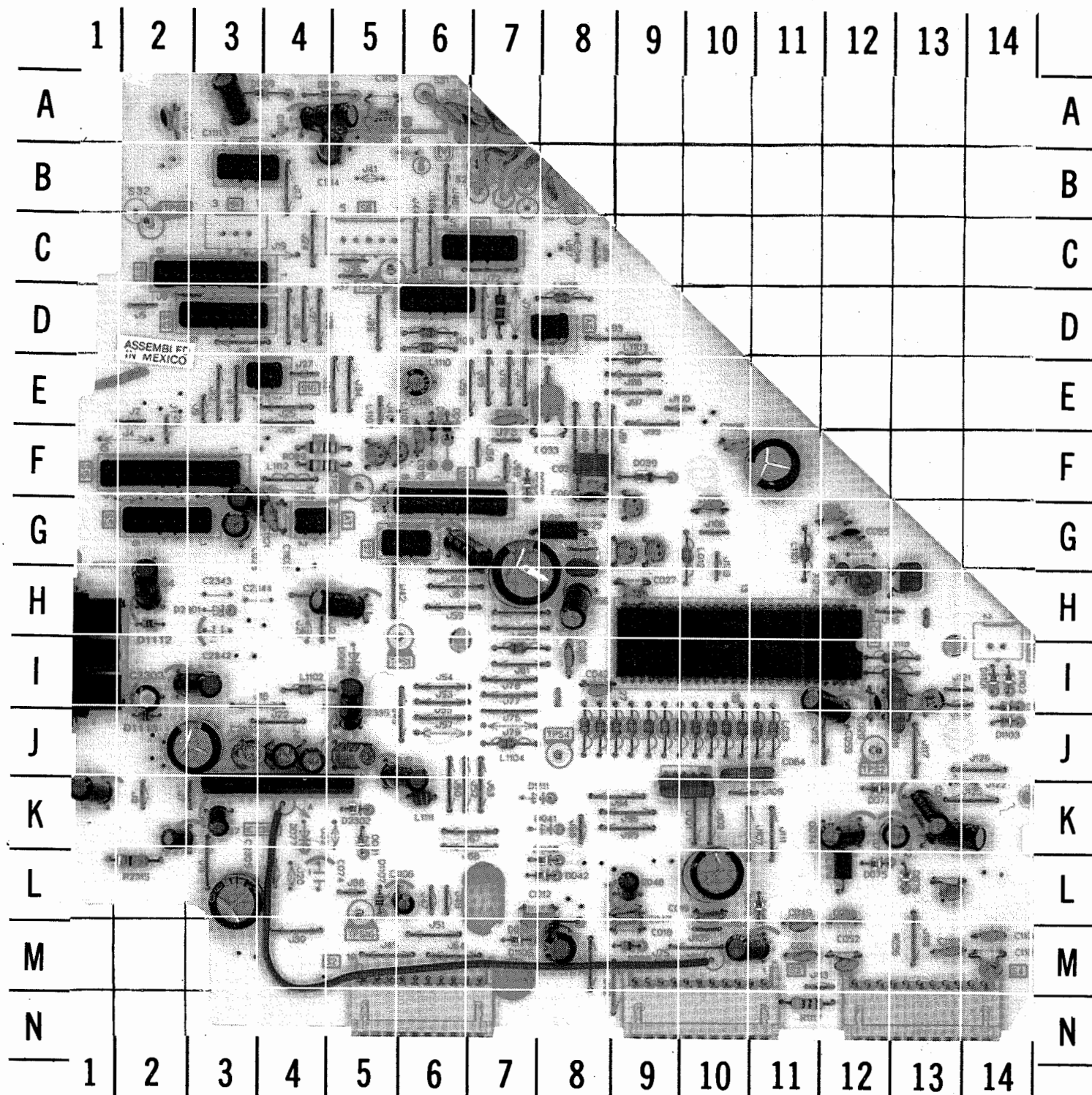
PANASONIC
MODEL CTL-3191S



CRT BOARD-GridTrace Location Guide

C351	H-4	R370	G-1
C352	B-1	R371	F-1
C353	G-2	R372	H-1
C354	H-2	R373	F-2
C355	I-4	R374	B-8
C356	G-1	R375	A-6
C360	E-1	R376	E-8
C361	I-3	R377	B-8
C362	I-3	R378	A-6
C363	H-2	R379	E-8
C366	B-2	R380	B-7
C367	J-9	R381	B-4
C368	H-7	R382	F-8
C369	H-8	R383	C-6
D351	B-8	R384	C-3
D352	B-7	R385	F-7
D353	A-5	R386	H-9
D354	A-4	R387	B-4
D355	G-8	R388	H-8
D356	G-8	R389	F-7
D357	I-5	R390	C-5
D359	F-3	R391	G-7
D360	G-3	R392	A-2
D361	I-2	R395	C-3
L351	C-1	R396	C-2
L355	H-8	R397	I-4
L356	B-4	R399	F-3
L357	H-7		
L358	C-7		
L359	C-4		
L360	G-7		
Q351	I-8		
Q352	H-6		
Q353	H-7		
Q354	G-2		
Q355	H-1		
Q356	G-2		
Q357	C-8		
Q358	A-1		
Q359	F-8		
Q360	B-7		
Q361	B-3		
Q362	C-6		
R351	G-2		
R352	I-1		
R353	H-4		
R354	J-2		
R355	J-1		
R356	J-4		
R357	F-2		
R358	H-1		
R359	F-2		
R360	J-8		
R361	J-6		
R362	I-4		
R363	I-1		
R364	I-1		
R365	I-3		
R366	G-1		
R367	I-5		
R368	I-5		
R369	H-6		

SYNTHESIZER BOARD-TOP VIEW



SYNTHESIZER BOARD-TOP VIEW-GridTrace Location Guide

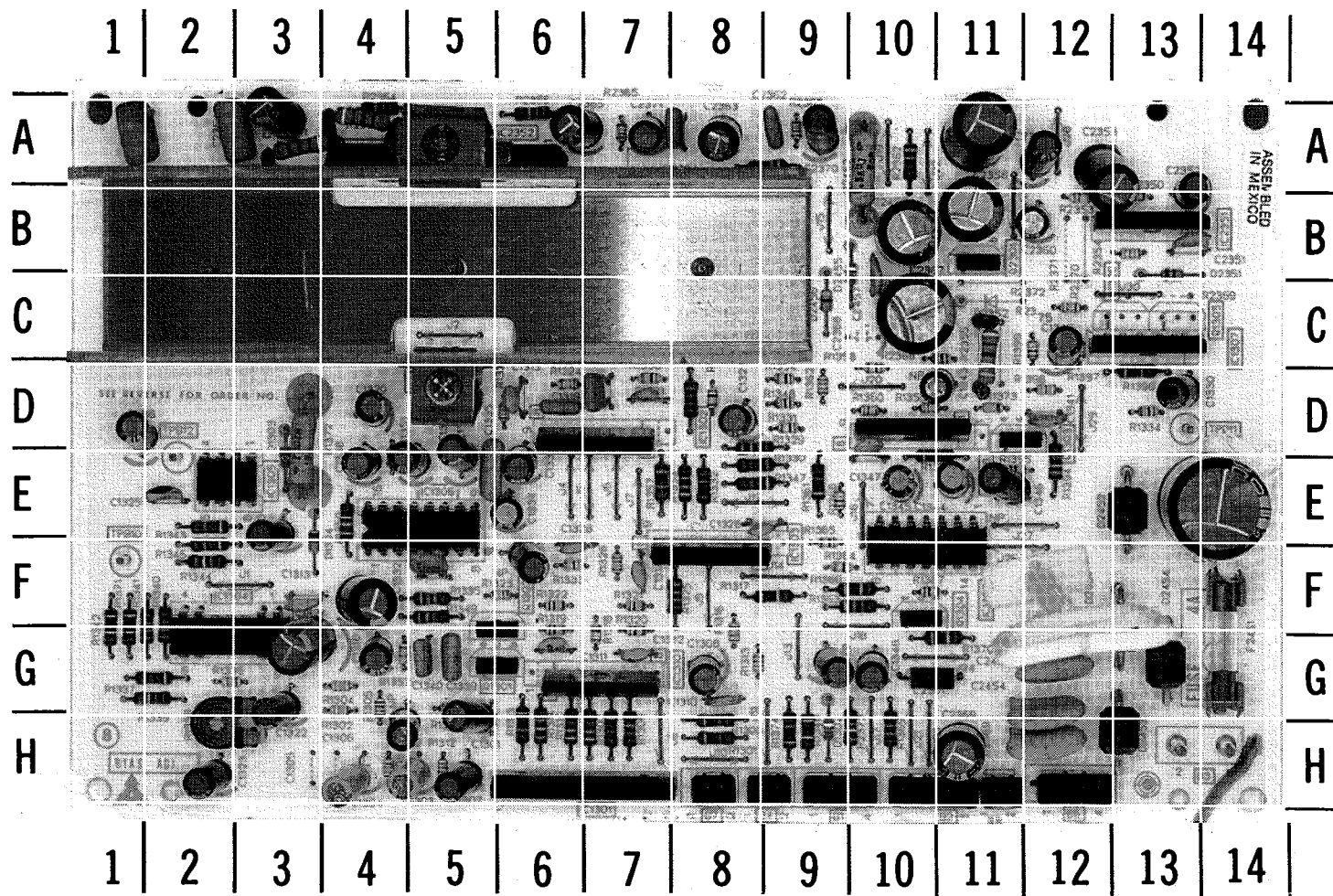
AG	D-8	C2305	L-3	L1105	I-7
AT	G-4	C2331	J-3	L1106	F-6
C010	F-6	C2332	J-3	L1107	F-5
C011	E-7	C2333	J-4	L1108	D-8
C012	L-8	C2334	J-5	L1109	D-6
C013	M-8	C2335	J-5	L1110	D-6
C018	M-9	C2336	J-4	L1111	K-6
C019	L-10	C2337	K-3	L1113	J-13
C020	I-12	C2338	K-2	L1114	L-12
C021	I-13	D023	M-9	R088	F-4
C026	F-8	D025	F-7	R089	F-4
C027	H-9	D030	M-8	R1117	N-12
C028	G-3	D039	F-9	R1118	D-7
C030	I-8	D042	L-8	R2315	L-2
C031	L-13	D072	L-11	RL001	C-6
C033	E-8	D073	K-12	S2	H-2
C035	G-12	D074	K-12	S3	H-11
C040	L-10	D075	L-12	S4	H-14
C041	G-6	D076	L-13	S5	G-3
C042	I-8	D081	K-5	S6	G-7
C043	H-7	D090	F-6	S7	G-6
C046	E-6	D091	F-6	S10	D-3
C047	L-9	D1101	I-14	S11	C-3
C048	L-9	D1102	I-14	S12	C-7
C049	M-11	D1103	J-14	S13	D-6
C050	L-12	D1104	J-7	S14	B-4
C051	M-11	D1105	I-7	S15	F-3
C052	M-12	D1106	F-6	S16	E-4
C055	G-10	D1107	F-5	TP57	F-5
C056	H-8	D1108	L-8	TPS3	C-5
C057	G-8	D1109	A-4	X011	I-13
C058	H-12	D1110	D-6	X012	G-12
C059	I-12	D1112	H-2		
C060	J-10	D1113	J-2		
C064	J-11	D2302	K-5		
C065	F-8	F001	D-2		
C069	M-11	IC011	H-12		
C070	K-13	L010	G-8		
C071	K-12	L011	I-13		
C072	K-13	L012	G-10		
C073	K-13	L013	J-11		
C075	H-13	L014	J-11		
C076	K-5	L015	J-10		
C077	H-5	L016	J-10		
C099	G-12	L017	J-10		
C1101	G-3	L018	J-10		
C1102	G-4	L019	J-10		
C1103	M-18	L020	J-10		
C1104	M-14	L021	J-9		
C1105	M-14	L022	J-9		
C1106	L-6	L023	J-8		
C1107	F-11	L024	J-8		
C1108	F-10	L025	G-9		
C1110	A-2	L026	G-9		
C1111	A-3	L027	J-9		
C1112	A-4	L028	G-9		
C1113	A-5	IC2303	K-3		
C1114	B-5	JK2311	H-1		
C2301	K-1	L1101	G-11		
C2302	I-2	L1102	I-4		
C2303	I-2	L1103	E-9		
C2304	H-4	L1104	J-7		

MAIN BOARD-TOP VIEW-GridTrace Location Guide

A1	N-1	C301	C-4	C606	B-2	C861	B-9	IC101	J-5	Q317	G-5	R321	L-7	R555	M-19	R844	A-14
A2	K-1	C302	E-6	C607	B-2	C880	B-10	IC301	E-5	Q451	L-8	R323	N-5	R557	K-13	R846	D-10
A3	H-1	C303	C-3	C608	B-2	C2306	C-9	IC451	M-10	Q501	I-11	R323	N-5	R560	M15	R851	B-9
A4	F-1	C304	E-5	C609	D-3	C2307	B-9	IC801	G-18	Q551	I-19	R324	N-5	R601	D-3	R852	H-18
A6	K-7	C305	E-6	C611	C-2	C2308	B-9	IC803	M-8	Q801	D-16	R326	F-6	R602	D-3	R2321	B-8
A7	H-8	C306	E-5	C612	E-3	C2309	A-9	IC804	B-11	Q802	D-13	R328	H-8	R603	D-3	R2322	B-9
A10	J-12	C308	E-3	C613	D-3	C2311	C-9	IC806	F-16	Q805	B-10	R329	F-6	R605	B-6	R2323	B-8
A11	A-6	C310	F-7	C614	C-4	C2312	D-8	IC844	A-13	Q3210	B-4	R334	K-8	R606	B-6	R2324	B-8
A12	C-8	C311	H-8	C615	C-3	C2313	F-8	IC2301	D-9	Q3211	B-4	R335	K-8	R607	B-6	R2325	C-8
A13	A-19	C312	E-3	C752	M-12	C2317	B-9	L101	I-3	R001	A-9	R336	L-8	R608*	C-2	R2326	E-8
A15	M-6	C313	D-4	C753	M-12	C2318	B-8	L103	I-5	R101	H-3	R337	L-8	R610	E-3	R3105	J-8
A17	I-3	C315	A-3	C754	M-11	C2319	B-8	L104	M-4	R102	I-3	R338	L-7	R612	E-3	R3106	I-10
A24	N-15	C316	G-3	C755	M-12	C2320	E-8	L105	K-6	R103	I-3	R339	M-7	R613	F-2	R3107	H-11
A25	F-6	C317	G-4	C756	M-14	C2321	D-10	L106	L-6	R104	J-3	R340	A-1	R614	D-2	R3108	H-11
C003*	L-3	C318	G-7	C757	H-16	C3100	H-11	L107	J-6	R106	J-4	R341*	C-5	R615	D-2	R3109	I-11
C004*	L-3	C319	B-4	C758	I-17	C3210	B-4	L108	I-6	R108	J-4	R342	D-3	R617	D-3	R3110	G-4
C006	B-13	C322	F-6	C759	L-14	D001	A-12	L109	H-3	R109	I-4	R346	G-3	R618	D-4	R3111	J-11
C007	A-12	C323	E-4	C760	K-15	D002	C-13	L110	J-4	R111	J-5	R347	G-3	R620	B-7	R3112	E-4
C008	A-11	C326	L-7	C802	C-18	D003	B-12	L113	I-4	R112	N-5	R348	B-6	R621	A-7	R3113	J-7
C009	A-11	C327	G-6	C804	C-19	D004	A-11	L201	M-6	R113	N-4	R349	B-5	R626	A-2	R3114	I-8
C102	H-3	C328	H-6	C805	C-17	D005	E-11	L202	L-4	R114	M-4	R401	D-6	R627	B-2	R3116	G-6
C103	H-3	C330	A-6	C806	D-18	D009	C-11	L305	G-8	R116	J-4	R402	K-9	R628	B-2	R3121*	C-5
C104*	K-3	C401	E-6	C807	E-17	D104	M-4	L307	H-5	R117	M-5	R403	K-10	R751	N-13	R3122*	G-6
C105*	K-4	C402	D-6	C809	G-19	D303	A-5	L312	B-5	R118	M-5	R404	N-9	R752	M-13	R3123	E-3
C106	M-4	C403	E-5	C811	E-17	D304	G-5	L401	K-11	R119	J-6	R405	N-6	R753	M-12	R3124	G-5
C107	L-6	C404	M-14	C812	D-16	D401	E-6	L402	F-11	R122	I-5	R406*	N-10	R754	M-13	R3125	I-6
C108	L-3	C405	L-13	C813	E-16	D402	E-7	L551	K-13	R124	I-6	R407	M-14	R755	N-12	R3210	B-5
C110	I-5	C407	E-6	C814	F-15	D403	E-6	L552	I-19	R125	J-6	R408	L-13	R756	M-12	R3211	A-4
C111	J-5	C451	L-11	C815	E-17	D451	L-10	L553	H-17	R130	J-6	R409	L-13	R757	M-10	R3212	B-5
C112	I-5	C452	L-11	C816	C-16	D453	B-7	L555	I-19	R131	J-5	R411*	G-8	R758	N-11	R3213	B-4
C113	J-4	C453	L-13	C817	D-13	D501	G-9	L556	J-16	R132	H-4	R412*	D-5	R759	M-11	R3214	B-4
C114	L-5	C454	M-11	C818	C-12	D502	C-7	L602	C-3	R133	H-4	R413	L-9	R760	M-12	R3215	B-4
C115	L-4	C455	M-11	C819	D-15	D506	D-7	L611	B-6	R134	H-5	R414	L-8	R761	M-11	R3216	B-4
C116	L-3	C456	L-11	C820	D-11	D508	B-1	L612	C-12	R135	I-4	R415	M-8	R762	M-11	R3217	A-4
C117	K-5	C457	M-13	C821	D-11	D551	N-16	L613	C-12	R136	H-4	R451	L-13	R763	M-11	R3218	B-5
C118	L-6	C501	C-6	C822	E-13	D552	H-18	L751	I-12	R137	M-5	R452	L-12	R764	M-11	R3219	D-4
C119	K-6	C502	D-7	C824	F-11	D555	B-7	L803	F-16	R138	M-4	R453	L-12	R765	K-11	RAC	C-13
C120	K-6	C503	D-6	C825	F-12	D557	M-15	L805	F-16	R139	M-4	R501	B-7	R767	K-13	S301	N-7
C122	J-6	C504	D-5	C826	F-11	D601	B-7	L806	F-19	R140	M-4	R502	G-8	R803	E-19	T501	H-12
C123	J-6	C505	D-6	C828	B-15	D752	I-16	L807	F-13	R142	L-5	R503	G-8	R805	E-18	T551	L-18
C125	K-3	C506	C-7	C829	B-10	D753	H-16	L808	D-12	R143	J-3	R504	C-7	R806	D-16	T801	E-14
C126	L-4	C507	H-8	C830	D-14	D771	M-9	L809	E-18	R170	I-7	R505	C-7	R808	F-16	TP12	H-5
C128	M-3	C509	E-6	C831	M-8	D801	C-18	L812	C-11	R171	H-5	R506	C-7	R809	E-16	TP14	I-5
C130	M-3	C510	D-7	C832	A-10	D802	B-17	L815	G-13	R172	I-5	R507	C-7	R811	E-12	TP91	F-19
C132	M-5	C511	J-12	C833	E-18	D803	C-18	LC116	J-2	R201	L-5	R508	D-6	R815	F-17	TP161	M-4
C134	H-3	C512	C-6	C834	D-19	D804	C-17	LC117	J-2	R202	M-4	R509	D-6	R816	D-16	TP186	E-12
C135	N-7	C513	J-12	C835	G-18	D805	F-18	Q001	B-12	R203	L-4	R510	D-7	R817	D-14	X101	K-4
C137	M-5	C514	D-7	C836	F-17	D806	E-17	Q101	J-3	R206	L-6	R511	C-6	R818	D-14	X102	I-6
C138	J-6	C515	G-9	C837	G-18	D807	F-16	Q102	I-4	R301	F-7	R512	B-7	R820	F-17	X201	M-4
C139*	J-4	C551	H-15	C838	E-16	D808	D-16	Q103	M-5	R302	J-8	R513	I-9	R821	G-12	X501	D-5
C140	I-4	C552	I-14	C843	M-8	D811	D-12	Q170	H-5	R307	G-7	R514	I-11	R824	F-12	X601	C-3
C143*	K-5	C553	I-18	C845	F-18	D812	B-15	Q301	B-5	R308	F-7	R515	I-12	R825	F-17		
C170	I-5	C554	H-18	C846	F-17	D813	E-11	Q302	G-7	R309	H-8	R516	H-11	R826	D-15		
C172	I-5	C555	N-14	C847	G-13	D815	F-12	Q303	I-7	R310	H-7	R518	C-6	R831	C-14		
C174	H-5	C556	L-14	C849	F-18	D816	E-12	Q304	F-6	R311	H-8	R523	M-14	R832	B-10		
C201	L-5	C557	I-18	C850	B-14	D817	E-16	Q305	F-6	R312	E-3	R524	M-8	R833	L-19		
C202	L-5	C558	I-18	C851	B-13	D818	F-13	Q311	M-7	R313	J-8	R527*	C-5	R837	C-10		
C203*	K-4	C559	I-18	C852	F-12	D819	F-11	Q312	K-8	R315	B-5	R550	L-19	R838	C-10		
C204	L-4	C561	H-18	C854	H-18	D827	F-12	Q313	L-8	R316	A-5	R551	M-19	R839	B-10		
C205	L-6	C565	N-16	C855	H-19	D828	B-11	Q314	A-5	R317	J-8	R552	L-19	R840	B-10		
C208	L-8	C601	C-3	C856	E-10	DY	J-15	Q315	H-10	R318	B-3	R553	J-16	R841	B-10		
C210	L-6	C605	D-4	C860*	C-10	HHS	A-10	Q316	I-11	R320	J-7	R554	L-15	R842	D-19		

* Located On
Bottom Of Board

PANASONIC
MODEL CTL-3191S

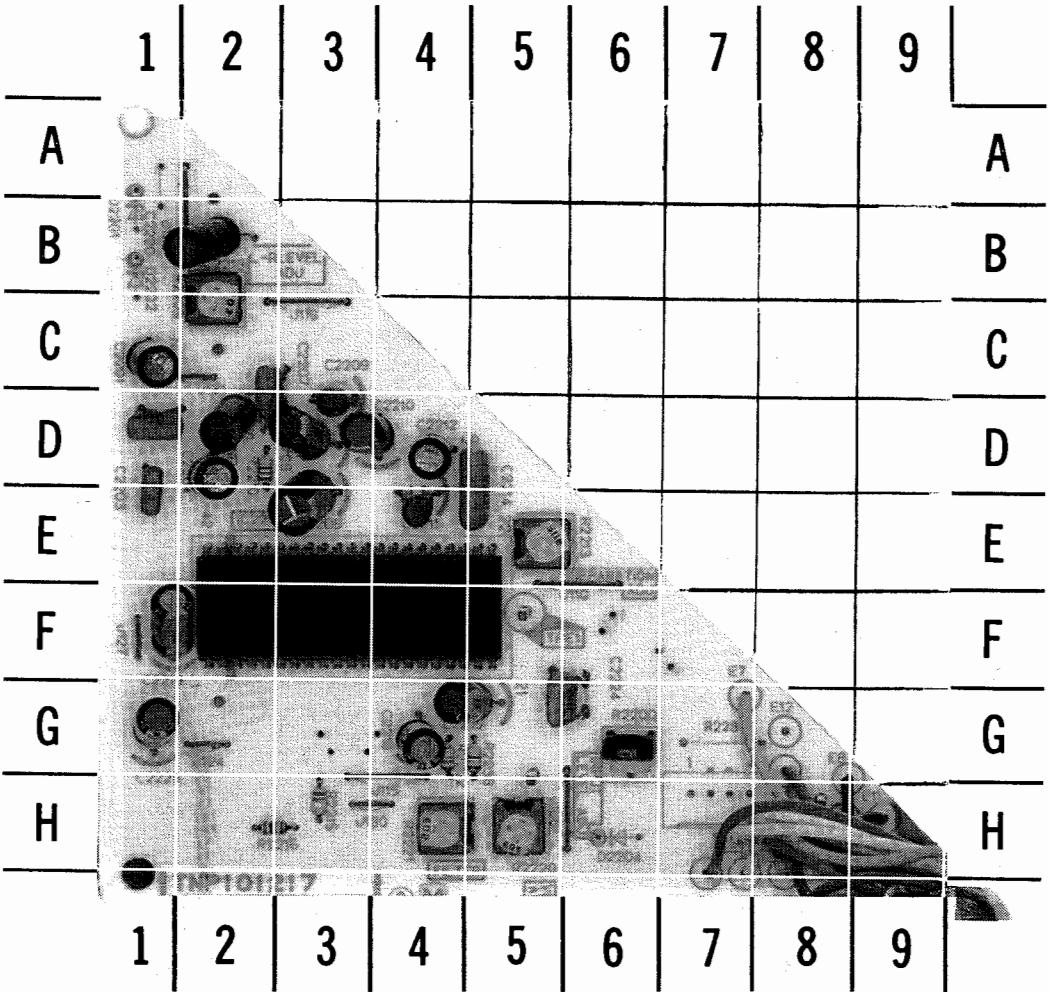


DOLBY DECODER BOARD-GridTrace Location Guide

C1301	H-5	C2369	H-11	R1323	F-6	R2354	B-13
C1302	H-4	C2370	A-9	R1324	D-6	R2355	C-11
C1303	H-5	C2371	A-7	R1325	F-8	R2357	A-3
C1304	H-4	C2372*	B-13	R1326	F-7	R2360	A-4
C1307	H-5	C2451	G-12	R1327	D-8	R2362	A-10
C1308	G-8	C2452	G-12	R1328	D-6	R2363	A-9
C1310	G-8	C2453	H-12	R1329	D-8	R2364	A-4
C1311	G-6	C2454	G-12	R1330	E-8	R2365	A-7
C1312	G-7	C2455	E-14	R1331	D-9	R2366	A-6
C1313	F-3	C2456	B-10	R1332	E-8	R2367	A-9
C1314	F-7	C2457	B-10	R1333	F-6	R2368	C-11
C1315	D-6	D1302	H-9	R1334	D-13	R2373	H-10
C1316	D-1	D1303	D-3	R1335	F-5	R2375	C-12
C1317	D-7	D1304	E-3	R1336	G-2	R2452	A-10
C1318	G-4	D2351	B-13	R1337	G-2	TP1307	G-2
C1319	D-6	D2451	F-13	R1338	H-2		
C1320	D-4	D2452	E-13	R1339	G-2		
C1321	D-7	D2453	H-13	R1340	G-2		
C1322	G-3	D2454	G-13	R1341	G-2		
C1323	H-2	D2455	B-10	R1342	G-1		
C1324	G-3	D2456	C-9	R1343	E-2		
C1325	E-2	F2451	G-14	R1344	F-2		
C1326	E-8	IC1301	H-7	R1345	F-2		
C1327	D-8	IC1302	D-7	R1346	H-9		
C1328	F-6	IC1303	F-8	R1347	E-8		
C1329	F-5	IC1304	F-3	R1348	D-9		
C1330	D-13	IC1305	E-3	R1349	F-5		
C1331	F-6	IC1306	F-4	R1350	E-4		
C1332	F-4	IC1307	C-13	R1351	E-4		
C1333	E-6	IC1308	D-11	R1352	G-4		
C1334	E-6	IC1309	E-11	R1353	E-8		
C1335	E-5	IC1310	G-6	R1354	D-9		
C1336	E-5	IC2351	B-13	R1355	D-10		
C1337	E-4	IC2352	A-6	R1356	D-8		
C1338	E-4	L2301	G-10	R1357	E-7		
C1339	G-5	Q1301	G-6	R1358	D-10		
C1340	G-5	Q1302	F-2	R1359	E-11		
C1341	D-12	Q1303	D-12	R1360	D-10		
C1342	C-12	Q1304	F-10	R1361	E-10		
C1343	D-11	Q2301	B-11	R1362	D-9		
C1344	E-11	Q2451	D-5	R1363	F-10		
C1345	E-10	R1301	H-8	R1364	F-9		
C1346	E-11	R1302	G-4	R1365	F-9		
C1347	D-10	R1303	H-8	R1366	F-10		
C1348	G-10	R1304	G-4	R1367	F-10		
C1349	G-9	R1305	G-4	R1368	E-9		
C1350	E-3	R1306	H-7	R1369	H-10		
C2351	B-13	R1307	H-7	R1370	G-11		
C2352	A-13	R1308	H-4	R1371	G-1		
C2353	A-12	R1310	H-6	R1372	D-3		
C2354	A-2	R1311	H-7	R1373	D-11		
C2356	A-1	R1312	H-5	R1374	H-9		
C2358	B-11	R1313	G-8	R1389	G-5		
C2359	A-11	R1314	H-6	R1390	D-7		
C2360	B-12	R1315	H-6	R1394	E-12		
C2361	A-3	R1316	G-8	R1395	E-11		
C2362	A-9	R1317	F-9	R1396	D-13		
C2363	A-8	R1318	G-7	R1397	C-12		
C2364	A-8	R1319	G-6	R1398	D-12		
C2365	A-6	R1320	G-7	R1399	C-12		
C2366	A-12	R1321	F-7	R2350	B-13		
C2367	C-10	R1322	F-6	R2353	B-12		

TV/VIDEO SWITCH BOARD-GridTrace LOCATION GUIDE

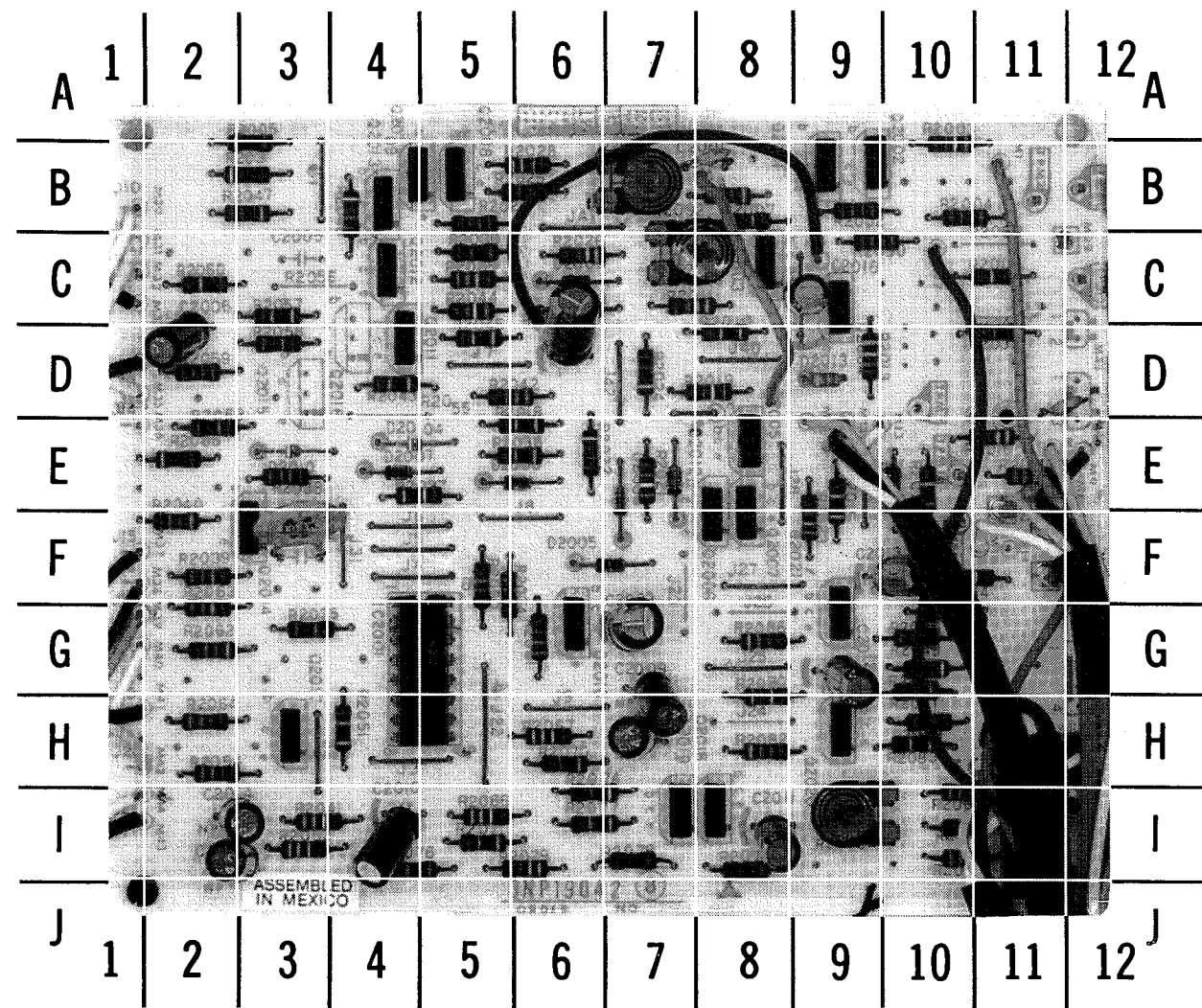
C2901	B-8	R2918	B-5
C2902	B-6	R2919	B-4
C2903	B-2	R2920	B-3
C2904	B-4	R2921	B-4
C2905	B-6	R2922	B-4
C2906	B-6	R2923	B-4
C2907	C-6	R2924	C-4
C2908	B-5	R2925	C-3
C2909	B-2	R2926	C-3
C2910	B-3	R2927	C-4
C2911	B-5	R2928	C-4
C2912	B-5	R2929	B-4
C2913	B-3	R2930	B-7
C2914	B-3	R2931	C-7
C2915	B-8	R2932	B-7
C2916	E-8	R2933	C-7
C2917	E-9	R2934	B-7
C2918	D-8	R2935	E-9
C2919	B-9	R2936	D-9
C2920	B-8	R2937	C-8
C2921	B-7	R2938	C-9
C2922	B-7	R2939	D-9
C2923	B-3	R2940	B-9
C2924	B-8	R2942	B-8
C2927	C-7	R2943	C-7
C2928	E-8	R2944	C-7
D2901	C-6	R2945	B-8
D2902	C-6	R2946	C-8
D2903	C-8	R2947	C-8
D2904	B-6	R2948	C-7
D2905	C-2	R2949	D-7
D2906	B-4	R2950	D-7
H1	B-1	R2951	C-3
H2	A-2	R2952	C-3
H3	A-3	R2953	C-3
H5	A-7	R2954	C-2
H6	B-9	R2955	C-2
H7	C-9	R2956	C-3
H8	I-4	R2957	D-8
H21	A-5	R2958	D-8
H22	A-9	R2959	D-7
H23	A-8	R2960	B-8
IC2901	C-5	R2961	D-7
IC2902	E-7	R2962	D-7
JK2901	F-2		
JK2902	F-6		
R2901	C-1		
R2903	C-1		
R2904	B-1		
R2905	C-1		
R2906	B-1		
R2907	B-7		
R2908	C-6		
R2909	C-2		
R2910	C-4		
R2911	B-6		
R2912	B-6		
R2913	B-6		
R2914	B-6		
R2915	C-2		
R2916	B-2		
R2917	B-5		



A HOWARD W. SAMS GRIDTRACE™ PHOTO STEREO/SAP BOARD-TOP VIEW

STEREO/SAP BOARD-TOP VIEW-GridTrace Location Guide

C2201	C-1	C2223	G-1
C2202	D-1	C2224	G-6
C2203	E-1	D2203	H-8
C2204	D-2	IC2200	F-3
C2205	D-2	R2200	G-6
C2206	E-3	R2209	C-2
C2207	D-2	R2210	D-2
C2208	D-3	R2213	E-5
C2209	D-3	R2215	H-3
C2210	D-3	R2216	H-3
C2211	E-4	R2220	H-5
C2212	D-4	R2221	H-4
C2213	B-3	R2222	G-4
C2214	D-5	R2238	G-5
C2215	G-4	TPE1	F-5
C2218	G-4		
C2219	F-1		



CABLE DECODER INTERFACE

CABLE DECODER INTERFACE-GridTrace Location Guide

C2001	B-8	R2022	E-6	R2086	G-8
C2003	G-7	R2023	F-9	R2087	G-10
C2004	F-3	R2024	D-7	R2090	C-9
C2006	C-2	R2025	B-6	R2091	C-6
C2007	D-6	R2026	C-6	R2092	B-8
C2008	H-7	R2027	B-5		
C2009	G-7	R2028	B-6		
C2010	I-4	R2029	B-7		
C2011	I-8	R2030	C-5		
C2012	G-9	R2031	B-3		
C2013	F-10	R2032	D-11		
C2014	I-3	R2033	E-10		
C2015	I-2	R2034	F-5		
C2016	C-9	R2035	G-3		
C2099	D-12	R2036	E-6		
D2004	E-4	R2037	E-4		
D2005	F-7	R2038	E-3		
D2006	E-7	R2039	F-2		
D2007	E-4	R2040	F-2		
D2008	E-6	R2041	I-3		
D2009	C-6	R2042	D-5		
D2010	E-4	R2043	D-4		
D2012	E-7	R2044	C-5		
D2013	D-9	R2045	D-5		
IC2001	G-4	R2046	B-4		
Q2001	B-9	R2047	B-3		
Q2002	B-9	R2048	H-10		
Q2003	C-8	R2049	G-10		
Q2004	C-9	R2050	F-5		
Q2005	E-8	R2051	H-4		
Q2006	F-8	R2052	I-3		
Q2007	F-8	R2053	E-2		
Q2008	B-5	R2054	H-2		
Q2009	B-4	R2057	C-3		
Q2010	G-6	R2058	D-3		
Q2011	D-4	R2059	D-2		
Q2012	C-4	R2060	C-2		
Q2013	b-4	R2061	G-6		
Q2014	F-3	R2062	G-2		
Q2017	H-3	R2063	G-2		
Q2018	I-8	R2064	H-2		
Q2019	I-7	R2065	C-5		
Q2020	H-9	R2066	I-5		
Q2021	G-9	R2067	H-6		
R2002	B-9	R2068	H-10		
R2003	B-10	R2069	I-10		
R2004	B-10	R2070	H-6		
R2005	B-3	R2071	I-5		
R2006	E-2	R2072	I-10		
R2007	B-8	R2073	I-9		
R2008	C-7	R2074	I-6		
R2010	D-8	R2075	I-8		
R2011	C-7	R2076	I-4		
R2012	C-11	R2077	I-6		
R2013	D-9	R2078	I-7		
R2014	E-11	R2079	I-6		
R2015	E-9	R2080	H-8		
R2016	E-11	R2081	G-10		
R2017	E-10	R2082	H-8		
R2018	E-6	R2083	H-10		
R2019	D-8	R2084	F-11		
R2021	E-7	R2085	G-10		

PARTS LIST AND DESCRIPTION
When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR TYPE No.	MFR PART No.	NTE PART No.	ECG PART No.	TCE PART No.
D001	MA170	TVSQA205E	NTE519	ECG519	SK3100
D002	MA165		NTE519	ECG519	SK3100
D003,4,5	MA170		NTE519	ECG519	SK3100
D009	MA1030M		NTE5004A	ECG5004A	SK3A0
D010	LN21RCPH		NTE3022	ECG3022	SK2022
D011	LN41YCPH		NTE3021	ECG3021	SK2021
D023	EQA0313B		NTE5013A	ECG5013A	SK6A2
D025	MA165		NTE519	ECG519	SK3100
D030	QA205E		NTE5010A	ECG5010A	SK5A1
D039	MA27WB		NTE605A	ECG605A	SK7952
D042	MA165		NTE519	ECG519	SK3100
D072 - D076	MA165		NTE519	ECG519	SK3100
D081	MA165		NTE519	ECG519	SK3100
D090,1	EQA0308AB				
D104	MA165		NTE519	ECG519	SK3100
D303,4	MA165		NTE519	ECG519	SK3100
D351 - D357	MA165		NTE519	ECG519	SK3100
D359	MA4036L	TVSQB118			
D360	MA165		NTE519	ECG519	SK3100
D361	MA150		NTE177	ECG177	SK9091
D401,2	MA165		NTE519	ECG519	SK3100
D403	MA4056		NTE5011A	ECG5011A	SK5A6
D451	ERA1501		NTE552	ECG552	SK9000
	EM1Z		NTE552	ECG552	SK9000
D452	QB118		NTE5077A	ECG5077A	SK18V
D453	MA150		NTE177	ECG177	SK9091
D501	MA4082M		NTE5016A	ECG5016A	SK8A2
D502	QA206M		NTE5012A	ECG5012A	SK6A0
D506	ERA2204		NTE552	ECG552	SK9000
D508	MA4047M		NTE5009A	ECG5009A	SK4A7
D551	AU02		NTE552	ECG552	SK9000
D552	MA162		NTE519	ECG519	SK3100
D555	MA4180M		NTE5027A	ECG5027A	SK18A
D557	MA4082M		NTE5016A	ECG5016A	SK8A2
D601	MA165	TVSRU3N	NTE519	ECG519	SK3100
D752	ERD0715		NTE551	ECG551	SK3125A
D753	RU3N		NTE580	ECG580	SK5036
D771	MA165		NTE519	ECG519	SK3100
D801 - D804	RM10B		NTE125	ECG125	SK3081
D805	QB118		NTE5077A	ECG5077A	SK18V
D806	AU01Z		NTE552	ECG552	SK9000
D807	EU02A		NTE552	ECG552	SK9000
D808	AU02Z		NTE552	ECG552	SK9000
D810					
D811	RG4		NTE580	ECG580	SK5036
	RG4LFM1		NTE580	ECG580	SK5036
D812	RU3AM		NTE580	ECG580	SK3318A
D813	RG4		NTE580	ECG580	SK5036
	RG4LFM1		NTE580	ECG580	SK5036
D815	EU2		NTE552	ECG552	SK9000
D816	SR2KN				
D817	AU02Z		NTE552	ECG552	SK9000
D818,19	MA165	TVSSR2KN	NTE519	ECG519	SK3100
D827	MA4200H				
D828	AS01		NTE552	ECG552	SK9000
D832			NTE2V150	ECG2V150	SKMV150J

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR TYPE No.	MFR PART No.	NTE PART No.	ECG PART No.	TCE PART No.
# D850		ERPF5B0M050K			
D851	MA162		NTE519	ECG519	SK3100
D901	MA1120M				
	QA211CD		NTE5021T1	ECG5021T1	SK9971
	MA150		NTE177	ECG177	SK9091
D951,2		ERTD2ZFL351S			
D953					
D954	MA150		NTE177	ECG177	SK9091
D1101 - D1106	MA165		NTE519	ECG519	SK3100
D1107	MA4051M		NTE5010A	ECG5010A	SK5A1
D1108	MA165		NTE519	ECG519	SK3100
D1109,10	MA700		NTE584	ECG584	
D1201,2,3	MA165		NTE519	ECG519	SK3100
D1204	MA4100M		NTE5019A	ECG5019A	SK10A
D1302	MA150		NTE177	ECG177	SK9091
D1303	MA27WA		NTE605A	ECG605A	SK7952
D1304	MA1150M				
D1501	MA1051M		NTE5010T1	ECG5010T1	SK9967
D2004	MA856		NTE519	ECG519	SK3100
D2005 - D2008	1N4148		NTE519	ECG519	SK3100
D2009	QA205F		NTE5010A	ECG5010A	SK5A1
D2010	MA856		NTE519	ECG519	SK3100
D2012	1N4148		NTE519	ECG519	SK3100
D2013	MA1036H				
D2203	MA165		NTE519	ECG519	SK3100
D2302	MA165		NTE519	ECG519	SK3100
D2351	MA1100M		NTE5019T1	ECG5019T1	SK9970
# D2451 - D2454		TVSC0102FL7			
D2455	MA150		NTE177	ECG177	SK9091
D2456	MA1300M		NTE5035A	ECG5035A	SK30A
D2501	MA165		NTE519	ECG519	SK3100
D2505,6	MA856		NTE519	ECG519	SK3100
D2507	MA4120M		NTE5021A	ECG5021A	SK12A
D2901,2	MA165		NTE519	ECG519	SK3100
D2903	MA4091M		NTE5018A	ECG5018A	SK9A1
D2904 - D2906	MA4120M		NTE5021A	ECG5021A	SK12A
D3101,2	MA165		NTE519	ECG519	SK3100
D3103	MA4047M		NTE5009A	ECG5009A	SK4A7
D3162,3	MA4091M		NTE5018A	ECG5018A	SK9A1
IC011	MN15286Q11				
IC101	M51366SP		NTE1847	ECG1847	
# IC301	AN5302K				
# IC451	AN5521		NTE1782	ECG1782	SK9730
# IC801	STR60001				
	STR60001F51				
IC803	AN78M09		NTE1902	ECG1902	SK3962
# IC804	S1854M4				
	S1854LBM-4				
# IC806	P621	TLP621GR	NTE3098	ECG3098	SK9763
IC844	AN7812		NTE966	ECG966	SK3592
IC1201,2,3,4,5	M5218L		NTE778S	ECG778S	
	UPC4570HA			ECG1844	
IC1206	D4052BC		NTE4052B	ECG4052B	SK4052B
	UPD4052BC		NTE4052B	ECG4052B	SK4052B
	TC4052BP		NTE4052B	ECG4052B	SK4052B
	MN4052B		NTE4052B	ECG4052B	SK4052B
	M4052BP		NTE4052B	ECG4052B	SK4052B
IC1207	AN5262		NTE1783	ECG1783	SK9873

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR TYPE No.	MFR PART No.	NTE PART No.	ECG PART No.	TCE PART No.
IC1301	AN5835	TVSM5218L	NTE778S	ECG778S ECG1844	
IC1302,3	M5218L UPC4570HA MN3008				
IC1304	MN3101				
IC1305	TA7629P				
IC1306	AN5262	TVSM5218L	NTE1783 NTE778S	ECG1783 ECG778S ECG1844	SK9873
IC1307	M5218L				
IC1308	UPC4570HA				
IC1309	MN4066B				
IC1310	M5218L UPC4570HA	TVSM5218L	NTE4066B NTE778S	ECG4066B ECG778S ECG1844	SK4066B
IC1501	M5229P				
IC1502	LC7522				
IC1503	M5229P				
IC2001	D4053BC	TVSUPD4053BC	NTE4053B NTE4053B	ECG4053B ECG4053B	SK4053B SK4053B
IC2200	UPD4053BC				
# IC2301	CXA1124A				
	CXA1124AS				
	LA4280				
	LA4280-TV				
IC2303	AN5836		NTE1780 NTE1783	ECG1780 ECG1783	SK9731 SK9873
IC2351	AN5262				
IC2352	LA4280				
	LA4280-TV				
IC2502	D4066BC	TVSUPD4066BC	NTE4066B NTE4066B NTE4066B NTE4066B NTE4066B	ECG4066B ECG4066B ECG4066B ECG4066B ECG4066B	SK4066B SK4066B SK4066B SK4066B SK4066B
	UPD4066BC				
	TC4066BC				
	MN4066B				
	M4066BP	TVSTC4066BP	NTE4066B NTE4066B NTE4066B NTE4066B	ECG4066B ECG4066B ECG4066B ECG4066B	SK4066B SK4066B SK4066B SK4066B
IC2901	M52470P				
IC2902	M52055P				
IC3101	L5005				
	CXL5005P	TVSTC4069UBP	NTE4066B NTE4066B NTE4066B NTE4069	ECG4066B ECG4066B ECG4066B ECG4069	SK4066B SK4066B SK4066B SK4069UB
IC3102	TC4066BP				
	M4066BP				
	MN4066B				
IC3103	UPD4066BC	TVSTC4069UBP	NTE4066B NTE4069 NTE16 NTE16 NTE16 NTE85 NTE85 NTE2409 NTE2408 NTE2409 NTE2408	ECG4066B ECG4069 ECG16 ECG16 ECG16 ECG85 ECG85 ECG2409 ECG2408 ECG2409 ECG2408	SK4066B SK4069UB SK9664 SK9664 SK9664 SK9229 SK9229
Q001	2SD636-R				
	2SD637RS				
	2SD637				
	2SC1685		NTE85 NTE85 NTE2409 NTE2408 NTE2409 NTE2408	ECG85 ECG85 ECG2409 ECG2408	SK9229
Q016	2SC1685RS				
Q017,18	2SB709AQW				
Q019	2SD601AQW				
Q020,23,28,29	2SD601AQW	TVSTC4069UBP	NTE15 NTE15 NTE107 NTE19 NTE19 NTE19 NTE290A NTE290A	ECG15 ECG15 ECG107 ECG19 ECG19 ECG19 ECG290A ECG290A	SK9663 SK9663 SK3122 SK3912 SK3912 SK3912 SK3932 SK3932
Q101	2SC2377-C				
	2SC2377C				
	2SC1047C				
Q102	2SB642-R		NTE19 NTE19 NTE19 NTE290A NTE290A	ECG19 ECG19 ECG19 ECG290A ECG290A	SK3912 SK3912 SK3912 SK3932 SK3932
	2SB642				
	2SB642RS				
	2SA564A				
	2SA564RS				

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR TYPE No.	MFR PART No.	NTE PART No.	ECG PART No.	TCE PART No.
Q103	2SD637-R 2SD637 2SD637RS 2SC1685 2SC1685RS		NTE16 NTE16 NTE16 NTE85 NTE85	ECG16 ECG16 ECG16 ECG85 ECG85	SK9664 SK9664 SK9664 SK9229 SK9229
Q170	2SD637-R 2SD637 2SD637RS 2SC1685 2SC1685RS		NTE16 NTE16 NTE16 NTE85 NTE85	ECG16 ECG16 ECG16 ECG85 ECG85	SK9664 SK9664 SK9664 SK9229 SK9229
Q301	2SB643-R 2SB643 2SB643RS 2SA684 2SA684RS		NTE19 NTE19 NTE19 NTE294 NTE294	ECG19 ECG19 ECG19 ECG294 ECG294	SK3912 SK3912 SK3912 SK3841 SK3841
Q302	2SB641-R 2SB641 2SB641RS 2SA564 2SA564RS		NTE19 NTE19 NTE19 NTE290A NTE290A	ECG19 ECG19 ECG19 ECG290A ECG290A	SK9667 SK9667 SK9667 SK3932 SK3932
Q303	2SD637-R 2SD637RS 2SC1685RS		NTE16 NTE16 NTE85	ECG16 ECG16 ECG85	SK9664 SK9664 SK9229
Q304	2SB642-R 2SB642 2SB642RS 2SA564A 2SA564RS		NTE19 NTE19 NTE19 NTE290A NTE290A	ECG19 ECG19 ECG19 ECG290A ECG290A	SK3912 SK3912 SK3912 SK3932 SK3932
Q305	2SD637-R 2SD637 2SD637RS 2SC1685 2SC1685RS		NTE16 NTE16 NTE16 NTE85 NTE85	ECG16 ECG16 ECG16 ECG85 ECG85	SK9664 SK9664 SK9664 SK9229 SK9229
Q311	2SB642-R 2SB642 2SB642RS 2SA564A 2SA564RS		NTE19 NTE19 NTE19 NTE290A NTE290A	ECG19 ECG19 ECG19 ECG290A ECG290A	SK3912 SK3912 SK3912 SK3932 SK3932
Q312 - Q316	2SD637-R 2SD637 2SD637RS 2SC1685 2SC1685RS		NTE16 NTE16 NTE16 NTE85 NTE85	ECG16 ECG16 ECG16 ECG85 ECG85	SK9664 SK9664 SK9664 SK9229 SK9229
Q317	2SB642-R 2SB642 2SB642RS 2SA564A 2SA564RS		NTE19 NTE19 NTE19 NTE290A NTE290A	ECG19 ECG19 ECG19 ECG290A ECG290A	SK3912 SK3912 SK3912 SK3932 SK3932
Q351,2,3	2SC3063 2SC3063RL		NTE157 NTE157	ECG157 ECG157	SK3747 SK3747
Q354,5,6	2SD636-Q 2SD636 2SD636QRS 2SD637 2SD637QRS 2SC3311A 2SC3311AQRS		NTE16 NTE16 NTE16 NTE16 NTE16 NTE16	ECG16 ECG16 ECG16 ECG16 ECG16 ECG16	SK9664 SK9664 SK9664 SK9664 SK9664 SK9664

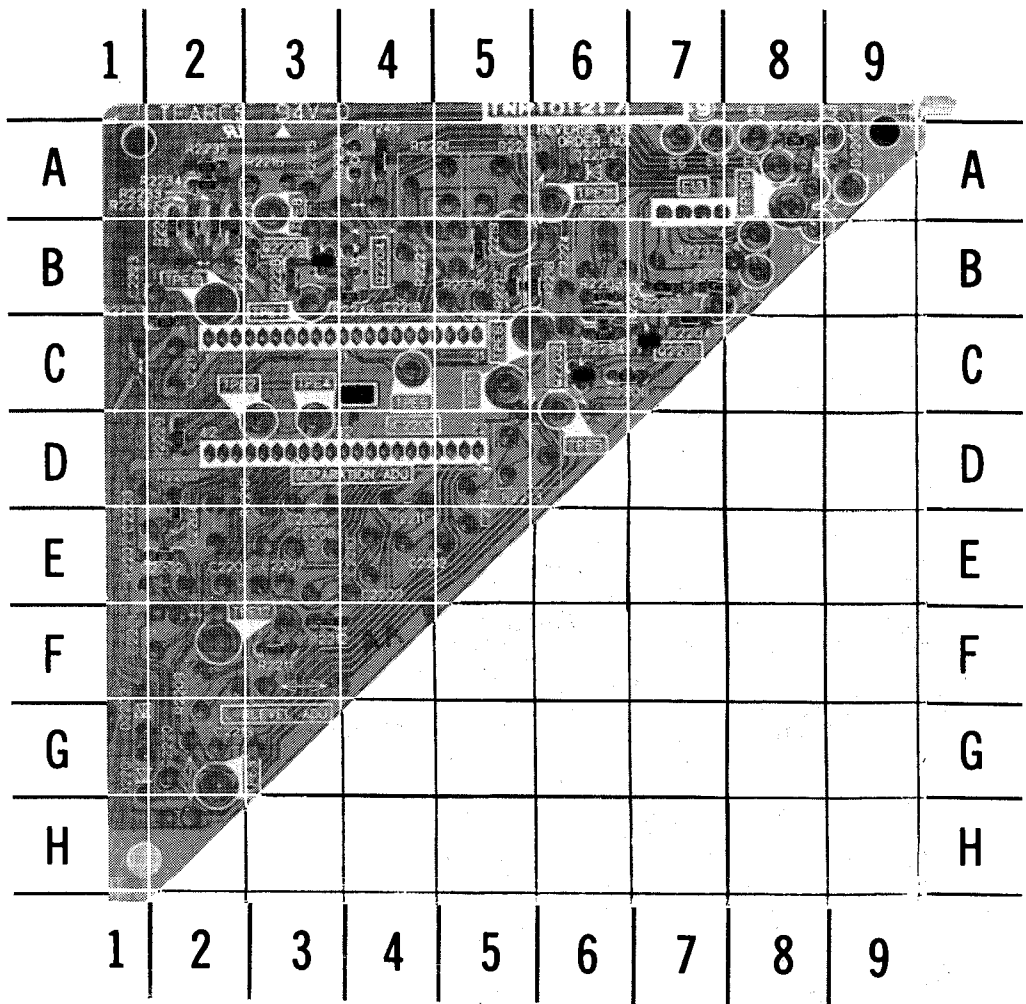
PANASONIC
MODEL CTL-3191S



A HOWARD W. SAMS GRIDTRACE™ PHOTO COMB FILTER BOARD-BOTTOM VIEW

COMB FILTER BOARD-BOTTOM VIEW-GridTrace Location Guide

R3001	C-4	R3130	C-8	R3159	E-1
R3002	C-4	R3131	C-8	R3196	H-9
R3003	C-3	R3132	A-8	R3197	H-8
R3004	C-4	R3133	B-8	R3198	G-2
R3005	D-2	R3134	C-8	R3199	B-3
R3006	H-5	R3135	E-10		
R3007	B-2	R3136	C-10		
R3008	H-7	R3138	A-11		
R3010	E-11	R3139	H-12		
C3108	D-10	R3140	H-12		
C3109	A-10	R3141	D-12		
C3114	C-8	R3142	B-12		
C3116	C-10	R3144	E-8		
C3119	G-12	R3145	E-6		
C3124	E-1	R3146	H-11		
C3140	G-4	R3148	H-11		
C3144	C-3	R3149	G-10		
C3146	C-1	R3150	H-11		
C3147	D-4	R3151	H-10		
C3167	A-5	R3152	G-11		
C3168	C-6	R3153	D-10		
Q3101	D-5	R3154	D-6		
Q3102	C-10	R3155	F-6		
Q3103	B-10	R3156	F-9		
Q3104	F-1	R3157	F-9		
Q3105	E-11	R3158	F-7		
Q3106	B-7	R3159	E-7		
Q3107	B-8	R3160	F-8		
Q3108	D-11	R3161	C-10		
Q3109	B-11	R3162	C-10		
Q3110	C-12	R3163	B-10		
Q3111	D-11	R3164	A-10		
Q3112	G-11	R3165	D-10		
Q3113	G-10	R3166	C-11		
Q3114	H-10	R3167	E-11		
Q3115	D-11	R3168	A-4		
Q3116	F-7	R3169	C-5		
Q3117	D-6	R3170	B-5		
Q3120	F-6	R3171	C-5		
Q3121	F-4	R3172	C-6		
Q3122	F-4	R3173	G-8		
Q3123	G-7	R3174	G-6		
Q3124	G-4	R3175	E-4		
Q3125	G-1	R3176	F-5		
Q3126	G-1	R3177	F-5		
Q3127	H-8	R3178	E-6		
Q3128	C-3	R3179	F-4		
Q3129	E-3	R3180	F-4		
R3100	D-6	R3181	E-2		
R3101	E-3	R3182	F-3		
R3102	E-6	R3183	G-9		
R3103	E-4	R3184	H-6		
R3104	D-3	R3185	H-5		
R3115	B-11	R3186	G-4		
R3117	A-11	R3187	H-4		
R3118	E-10	R3188	H-4		
R3119	F-9	R3189	H-3		
R3120	F-11	R3190	H-2		
R3126	F-10	R3191	H-1		
R3127	A-7	R3192	F-1		
R3128	A-7	R3193	G-1		
R3129	C-8	R3194	F-1		

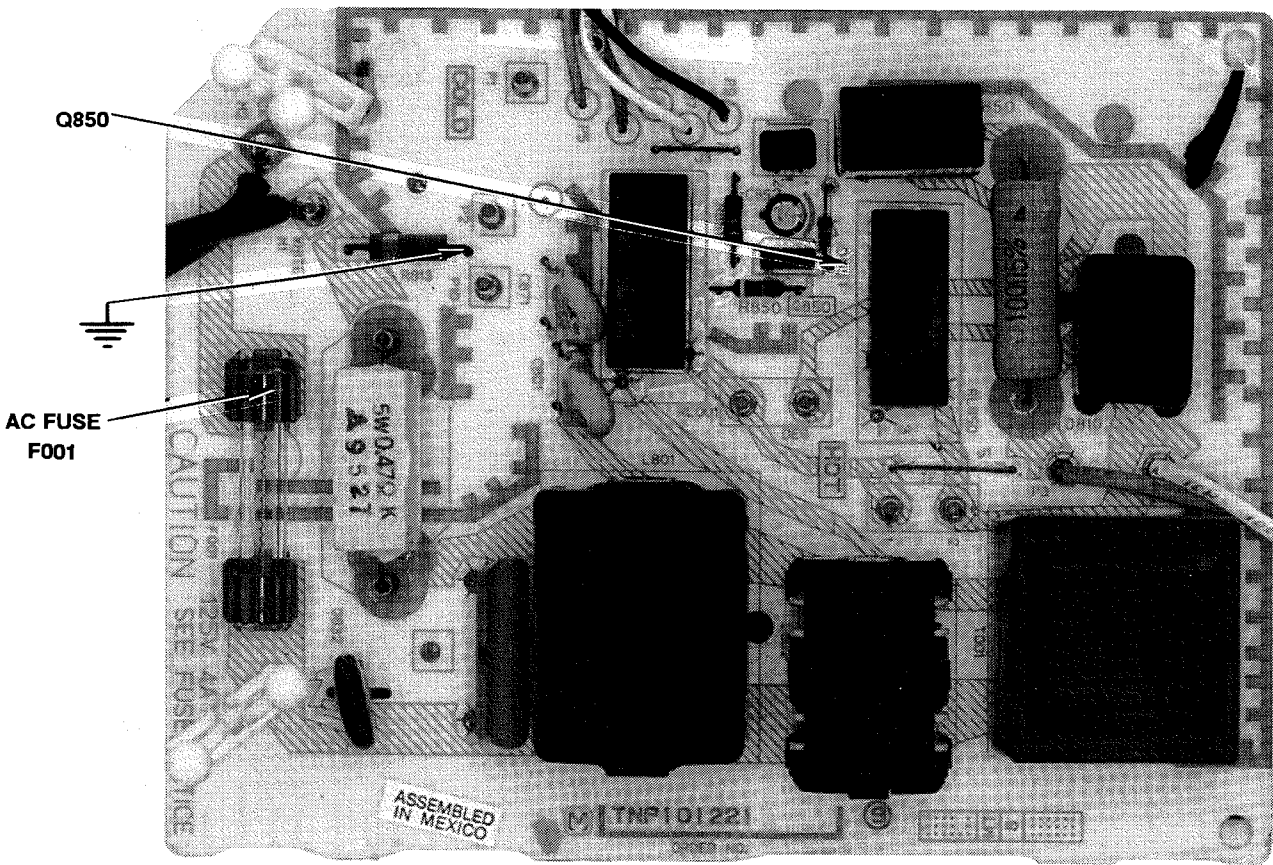


A HOWARD W. SAMS GRIDTRACE™ PHOTO

POWER BOARD

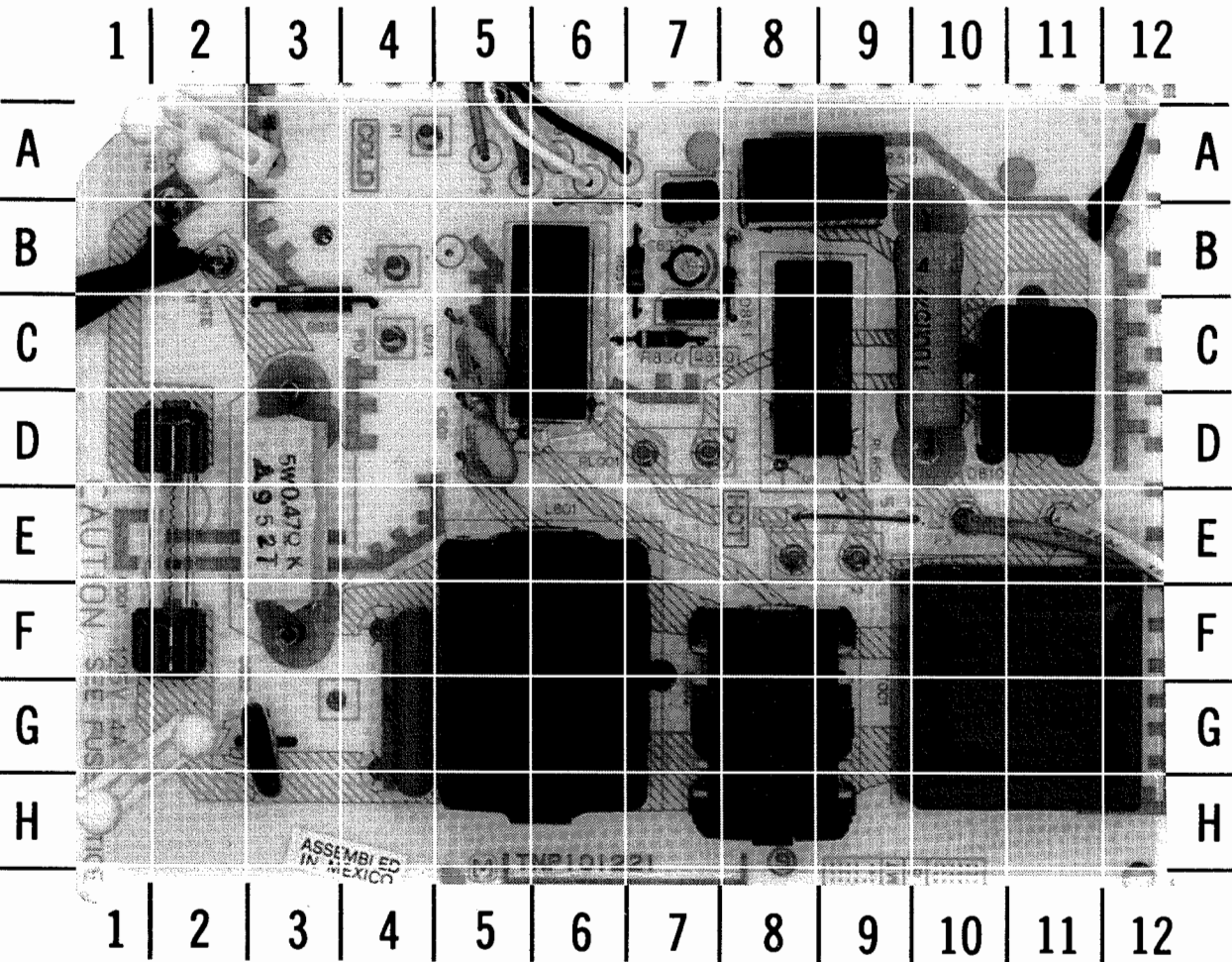
POWER BOARD-GridTrace Location Guide

Q2201	C-7	R2228	B-3
Q2202	C-6	R2229	D-2
Q2203	B-3	R2231	B-2
R2201	B-7	R2232	B-2
R2202	B-7	R2233	B-2
R2203	B-6	R2234	A-2
R2204	C-7	R2235	A-2
R2205	B-6	R2236	B-2
R2206	C-7	R2245	A-4
R2207	E-2	R2246	B-4
R2208	E-2	R2248	B-3
R2211	F-3	R2253	C-2
R2212	F-3	R2254	C-6
R2217	B-5	TPE3	G-2
R2218	B-6	TPE5	D-6
R2219	B-5	TPE10	A-8
R2223	A-8	TPE12	F-2



NOTE: ARROWS ON TRANSISTORS INDICATE BASE UNLESS NOTED

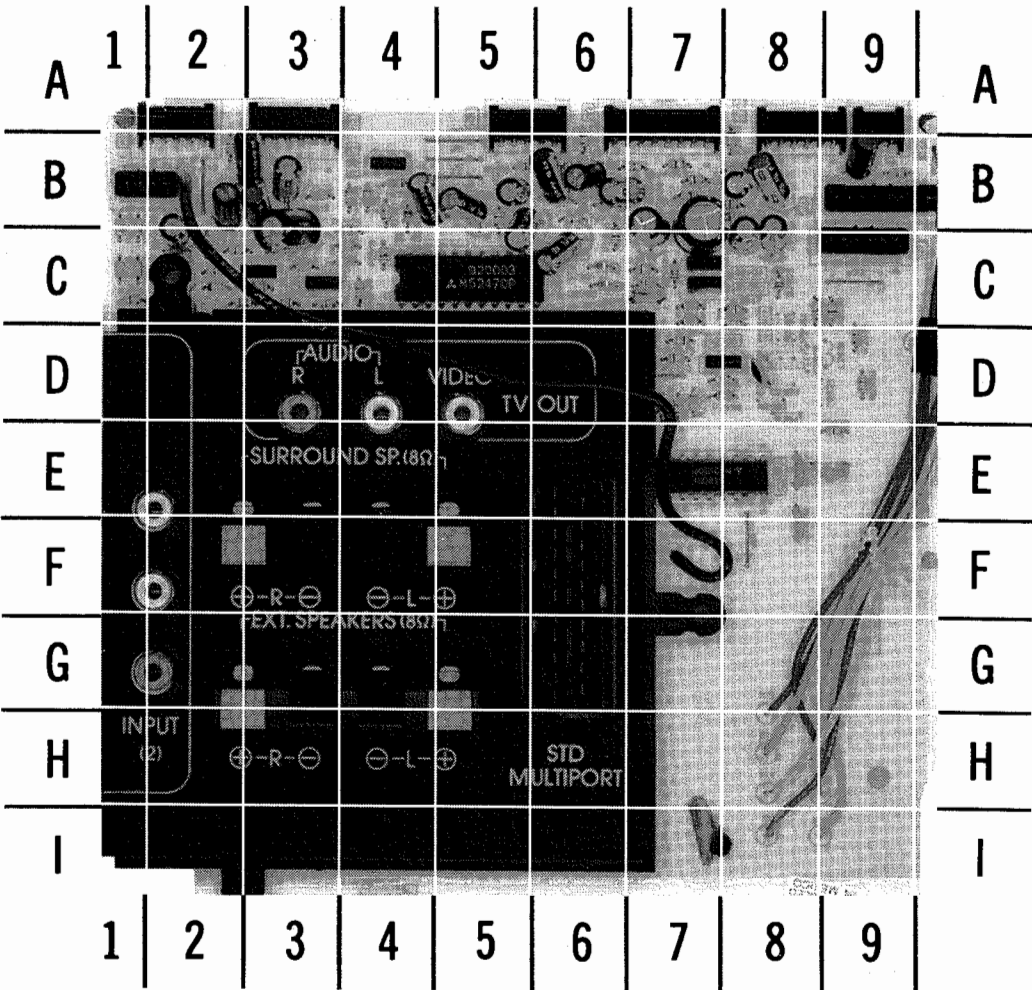
POWER BOARD



A HOWARD W. SAMS **GridTrace™** PHOTO **POWER SUPPLY**

POWER SUPPLY-GridTrace Location Guide

C003	L-3
C004	L-3
C801	D-5
C810	G-4
C853	B-7
C871	C-5
D810	D-11
D832	G-3
D850	A-9
D851	B-8
DE6	D-7
F001	D-2
L801	E-6
L802	G-8
MD3	A-7
P2	B-4
P10	C-4
Q850	C-7
R801	E-2
R804	C-10
R813	C-3
R850	C-7
R851A	B-7
RL001	C-6
RL850	D-9
TF	E-8



TV/VIDEO SWITCH BOARD

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR TYPE No.	MFR PART No.	NTE PART No.	ECG PART No.	TCE PART No.
Q357,8,9	2SC3063		NTE157	ECG157	SK3747
Q360,1,2	2SC3063RL		NTE157	ECG157	SK3747
Q451	2SB1011				
	2SB1011RL				
	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637RS		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
Q501	2SC4212H				
	2SC4212HLB				
	2SC2653H		NTE198	ECG198	SK3220
# Q551	2SD1175		NTE89	ECG89	SK9411
Q701	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
	2SC1685QR		NTE85	ECG85	SK9229
Q702	2SB642-R		NTE19	ECG19	SK3912
	2SB642		NTE19	ECG19	SK3912
	2SB642QR		NTE19	ECG19	SK3912
	2SA564A		NTE290A	ECG290A	SK3932
	2SA564QR		NTE290A	ECG290A	SK3932
Q703	2SD1266Q		NTE377	ECG377	SK9112
	2SD1266LVPQ		NTE377	ECG377	SK9112
Q801	2SC1384R		NTE293	ECG293	SK3849
	2SC1384		NTE293	ECG293	SK3849
	2SC1384RS		NTE293	ECG293	SK3849
Q802	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637RS		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
	2SC1685RS		NTE85	ECG85	SK9229
Q805	2SA879Q		NTE288*	ECG288*	SK3434*
	2SA879		NTE288*	ECG288*	SK3434*
# Q850	2SD637-R		NTE16	ECG16	SK9664
	2SD637RS		NTE16	ECG16	SK9664
	2SC1685RS		NTE85	ECG85	SK9229
Q901,2,3	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
Q951,52,53	2SD637-Q		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
Q954	2SB642-S		NTE19	ECG19	SK3912
	2SB642		NTE19	ECG19	SK3912
Q955	2SB940P		NTE398	ECG398	SK9363
	2SB940PLB		NTE398	ECG398	SK9363
	2SB940APLB		NTE398	ECG398	SK9363
Q956	2SD1264P		NTE375	ECG375	SK9118
	2SD1264PLB		NTE375	ECG375	SK9118
	2SD1264APLB		NTE375	ECG375	SK9118
Q1101,3,5,6	2SD601AQW		NTE2408	ECG2408	
	2SD601A-QW		NTE2408	ECG2408	
Q1007 - Q1110	2SD601AQW		NTE2408	ECG2408	
	2SD601A-QW		NTE2408	ECG2408	
Q1111	2SB709AQW		NTE2409	ECG2409	
	2SB709A-QW		NTE2409	ECG2409	

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR TYPE No.	MFR PART No.	NTE PART No.	ECG PART No.	TCE PART No.
Q1170	2SD601AQW		NTE2408	ECG2408	
	2SD601A-QW		NTE2408	ECG2408	
Q1201	UN1213		NTE2359*	ECG2359*	SK9959
Q1301 - Q1304	2SD636-R		NTE16	ECG16	SK9664
	2SD636QR		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
	2SC1684QR		NTE289A	ECG289A	SK3124A
	2SC1685QR		NTE85	ECG85	SK9229
Q1501,2	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
	2SC1685QR		NTE85	ECG85	SK9229
Q2001,2	2SD637-R		NTE16	ECG16	SK9664
	2SD637PQR		NTE16	ECG16	SK9664
Q2003	2SD637-R		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
Q2004	2SD638-R		NTE18	ECG18	SK3911
	2SD638PQR		NTE18*	ECG18*	SK3911*
2005 - Q2008	2SB642-R		NTE19	ECG19	SK3912
	2SB642PQR		NTE19	ECG19	SK3912
Q2009	2SD637-R		NTE16	ECG16	SK9664
	2SD637PQR		NTE16	ECG16	SK9664
Q2010	2SB642-R		NTE19	ECG19	SK3912
	2SB642QR		NTE19	ECG19	SK3912
Q2011	2SB642-R		NTE19	ECG19	SK3912
	2SB642PQR		NTE19	ECG19	SK3912
Q2012,13,14	2SD637-R		NTE16	ECG16	SK9664
	2SD637PQR		NTE16	ECG16	SK9664
Q2017 - Q2021	2SD637-R		NTE16	ECG16	SK9664
	2SD637PQR		NTE16	ECG16	SK9664
Q2201	2SD601AQW		NTE2408	ECG2408	
Q2202	2SB709AQW		NTE2409	ECG2409	
Q2203	2SD601AQW		NTE2408	ECG2408	
Q2205	2SB709AQW		NTE2409	ECG2409	
Q2206,7	2SD601AQW		NTE2408	ECG2408	
Q2301	2SD637-R		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
	2SC1685QR		NTE85	ECG85	SK9229
Q2302	2SD601AQW		NTE2408	ECG2408	
Q2303,4	2SB709AQW		NTE2409	ECG2409	
Q2451	2SD1276P		NTE261	ECG261	SK3896
	2SD1276PLB		NTE261	ECG261	SK3896
	2SD1276QLB		NTE261	ECG261	SK3896
Q2501	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
	2SC1685QR		NTE85	ECG85	SK9229
Q2506	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
Q2507	2SD637-R		NTE16	ECG16	SK9664
	2SD637		NTE16	ECG16	SK9664
	2SD637QR		NTE16	ECG16	SK9664
	2SC1685		NTE85	ECG85	SK9229
	2SC1685QR		NTE85	ECG85	SK9229

For Safety use only Equivalent Replacement Parts.

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

ELECTROLYTIC CAPACITORS Items not listed are normally available at local distributors.

ITEM No.	RATING	MFGR PART No.	ITEM No.	RATING	MFGR PART No.
C311	1 50V	ECEA1HN010S	C2006	10 16V NP	ECEA1CN100S
C318	33 10V NP	ECEA1AN330S	C2008	10 16V NP	ECEA1CN100S
C352	1 50V NP	ECEA1HN010S	C2009	10 16V NP	ECEA1CN100S
C401	1.5 25V	ECsz25EF1R5	C2014	10 16V NP	ECEA1CN100S
# C756	4.7 63V NP	ECEA63W4R7Y	C2015	10 16V NP	ECEA1CN100S
# C806	680 200V	ECES2DG681U	C2201	10 16V NP	ECEA1CN100S
# C818	220 160V	ECES2CG221	C2204	.22 50V NP	ECEA1HNR22
# C821	1000 35V	ECEA1VGE102	C2205	47 16V NP	ECEA1CU470
# C825	470 35V	ECEA1VGE471	C2209	10 16V	ECSZ16EF3R3
# C826	330 25V	ECEA1EF331	C2211	3.3 16V	ECSZ16EF3R3
C901	10 16V NP	ECEA1CN100S	C2212	4.7 25V NP	ECEA1EN4R7S
C1114	10 16V NP	ECEA1CN100S	C2213	4.7 25V NP	ECEA1EN4R7S
C1206	3.3 25V NP	ECEA1EN3R3S	C2333	10 16V NP	ECEA1CN100S
C1208	3.3 25V NP	ECEA1EN3R3S	C2336	10 16V NP	ECEA1CN100S
C1214	33 16V NP	ECEA1CN330S	# C2455	1000 50V	ECEA1HU102
C1215	10 16V NP	ECEA1CN100S	# C2456	330 50V	ECEA1HU331
C1216	10 16V NP	ECEA1CN100S	C2520	10 16V NP	ECEA1CN100S
C1223	10 16V NP	ECEA1CN100S	C2905	1 50V NP	ECEA1HN010S
C1224	10 16V NP	ECEA1CN100S	C2909	1 50V NP	ECEA1HN010S
C1301	3.3 50V NP	ECEA1HN3R3S	C3107	22 16V NP	ECEA1CN200S
C1302	3.3 50V NP	ECEA1HN3R3S			
C1330	10 16V NP	ECEA1CU100			

For Safety use only Equivalent Replacement Parts.

CABINETS & CABINET PARTS (When ordering specify model, chassis and color.)

ITEM	PART No.	ITEM	PART No.
Cabinet Back	TXFKU159SER	Panel,Right	TKP1811003
Cabinet Front	TXFKY149SER	Holder, Button	TMM16969
Upper Case-Trans	TXFKY159SER	Speaker Grille	TKP1757491-2
Bottom Case-Trans	UR51VCS436C	Overlay	TKP1511933
Battery COVER	UR51VEC445	Assembly, Cont DR	TKP1511892-3
Panel,Left	TKP1811003	Lens, Infra -Red	TKP1511062

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR PART No.	OTHER IDENTIFICATION	NOTES
# DY1	Yoke 110° Horiz .77mH Vert 25.5mH	TLF1552F1	TLY15452F1(1)	HPY1D (1)
# L751	Pincushion Transformer	TLH13711		
# T001	Power	ETP28Z181AY	P181(1)	
# T501	Horizontal Driver	ETH19Y70AY	H70(1)	
# T551	Horizontal Output	TLF15543F	TLF15543f (1)	
# T801	Switch Mode Power	ETS42K5OSA	ETS42K5oSA (1)	
# T2451	Dolby	ETP66PU164A	ETP66PU164A (1)	

For Safety use only Equivalent Replacement Parts.

(1) Number on Unit.

COILS (RF-IF)

ITEM No.	RATING	MFGR PART No.	ITEM No.	RATING	MFGR PART No.
L011	Peaking (5.6uH)	ELEXT5R6KA	L357	Peaking (56uH)	TLT560K991R
L012	Peaking (5.6uH)	ELEXT5R6KA	L358	Peaking (27uH)	TLT270K991R
L013	Peaking (5.6uH)	ELEXT5R6KA	L359	Peaking (27uH)	TLT270K991R
L014	Peaking (5.6uH)	ELEXT5R6KA	L360	Peaking (27uH)	TLT270K991R
L015	Peaking (5.6uH)	ELEXT5R6KA	L401	RF Choke (12uH)	TLQ120K236
L016	Peaking (5.6uH)	ELEXT5R6KA	L402	RF Choke	ELC10B011
L017	Peaking (5.6uH)	ELEXT5R6KA	L602	RF Choke (82uH)	TL820K991R
L018	Peaking (5.6uH)	ELEXT5R6KA	L611	Peaking (2.2uH)	TLT022K991R
L019	Peaking (5.6uH)	ELEXT5R6KA	L612	Peaking (2.2uH)	TLT022K991K
L020	Peaking (5.6uH)	ELEXT5R6KA	L613	Peaking (2.2uH)	TLT022K991R
L021	Peaking (5.6uH)	ELEXT5R6KA	L812	RF Choke	ELC10B011
L022	RF Choke (5.6uH)	ELEXT5R6KA	L901	Peaking (33uH)	ELEPH330KA
L023	RF Choke (5.6uH)	ELEXT5R6KA	L951	Peaking (15uH)	ELEPH150KA
L024	RF Choke (5.6uH)	ELEXT5R6KA	L1101	Peaking (5.6uH)	ELEXT5R6KA
L025	Peaking (1.0uH)	TLTACC1R0KA	L1102	RF Choke (5.6uH)	ELEXT5R6KA
L026	Peaking (1.0uH)	TLTACC1R0KA	L1103	Peaking (5.6uH)	ELEXT5R6KA
L027	Peaking (5.6uH)	ELEXT5R6KA	L1104	Peaking (5.6uH)	ELEXT5R6KA
L028	Peaking (6.8uH)	TLTACC6R8KA	L1105	Peaking (5.6uH)	ELEXT5R6KA
L101	Peaking (1.2uH)	ELEQE1R2JA	L1106	Peaking (5.6uH)	TLTACC5R6KR
L103	Peaking (68uH)	TLT680K991R	L1107	Peaking (5.6uH)	TLTACC5R6KR
L104	RF Choke (68uH)	TLT680K991R	L1108	Peaking (5.6uH)	ELEXT5R6KA
L105	RF Choke (150uH)	TLT151K991R	L1109	Peaking (5.6uH)	ELEXT5R6KA
L106	VCO	EIVEN053B	L1110	Peaking (5.6uH)	ELEXT5R6KA
L107	AFT	EIV7EN052B	L1111	RF Choke (5.6uH)	ELEPH5R6KA
L108	Peaking (15uH)	TLT150K991R	L1113	Peaking (5.6uH)	ELEXT5R6KA
L109	RF Choke (68uH)	TLT680K991R	L3101	RF Choke (4.7uH)	TLQ047J205C
L110	Peaking (.56uH)	ELEQER56JA	L3102	RF Choke (18uH)	TLQ180J205C
L113	RF Choke (100uH)	TLT101J991R	L3103	RF Choke (47uH)	TLQ470J205C
L201	Quadrature	EIS7ES004B	L3106	Peaking (47uH)	TLQ470J205C
L202	Peaking (1.2uH)	ELEQH1R2JA	L3107	Peaking (47uH)	TLQ470J205C
L305	Peaking (56uH)	TLT560K991R	L3109	RF Choke (10uH)	TLT100J991R
L307	RF Choke (4.7uH)	TLQ047K236	L3110	RF Choke (15uH)	TLT150J991R
L312	Peaking (2.2uH)	TLT022K991R	L3111	Peaking (12uH)	TLT120J991R
L340	Peaking	-----	L3112	RF Choke (4.7uH)	TLT047K991R
L355	Peaking (56uH)	TLT560K991R	L3162	RR Choke (4.7uH)	TLT047K991R
L356	Peaking (56uH)	TLT560K991R			

SPEAKERS

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR PART No.	QUAM PART No.	
M001	Assembly Speaker and Housing Left	EAB1064LC		
M002	Assembly Speaker and Housing Right	EAB1064RC		
M001	4" x 6" 16 Ohms Oval With Corner Mounts	EAS15D115KAG (1)	46C3Z8	
M002	2" 140 Ohms	EAS5FP10AAG (1)		

(1) Used in Models CTL-3197S, CTL-3199S, PC-33T97S, CTM-3197S, CTM-3199S.

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR PART No.	NTE PART No.	
# D810	70 COLD PTC TAP 5.8	ERPWSB0M050D		
# D850		ERPF5B0M050K		
D953		ERTD2ZFL351S		
R003	1.87K 1% 1/4W Mtl Flm	ER025CKF1871	----	
R004	2.05K 1% 1/4W Mtl Flm	ER025CKF2051	----	
R088	10K 1% 1/4W Mtl Flm	ER025CKF1002	----	
R090	1.87K 1% 1/4W Mtl Flm	ER025CKF1871	----	
R091	2.05K 1% 1/4W Mtl Flm	ER025CKF2051	----	
R092	2.94K 1% 1/4W Mtl Flm	ER025CKF2941	----	
R093	4.42K 1% 1/4W Mtl Flm	ER025CKF4421	----	
R094	24.3K 1% 1/4W Mtl Flm	ER0S2CKF2432	----	
R095	2.94K 1% 1/4W Mtl Flm	ER025CKF2941	----	
R096	4.42K 1% 1/4W Mtl Flm	ER025CKF4421	----	
R097	7.68K 1% 1/4W Mtl Flm	ER025CKF7681	----	
R098	16.5K 1% 1/4W Mtl Flm	ER025CKF1652	----	
R404	Thermistor 470 ohms	ERPF3A2M471M	----	
R452	10 5% 1/4W Fusible	ERQ14AJ100	----	
# R506	820 5% 1/4W Cbn Flm	ERDS2TJ821	QW182	
# R507	680 5% 1/4W Cbn Flm	ERDS2TJ681	QW168	
# R509	7.32K 1% 1/4W Mtl Flm	ER0S2CKF7321	----	
# R510	25.5K 1% 1/4W Mtl Flm	ER0S2CKF2552	----	
# R513	560 5% 1/4W Cbn Flm	ERDS2TJ561	QW156	
R515	3300 5% 3W Mtl Flm	ERG3SJS332	3W233	
# R516	680 5% 2W Fusible	ERQ2CJ681	F2W168	
# R523	1 5% 1/2W Cbn Flm	ERDS1FJ1R0	HW1D0	
R553	2.2 10% 5W WW	ERF5ZK2R2	5W2D2	
# R554	2.4 5% 2W Fusible	ERQ2CJ2R4	F2W2D4	
# R557	1000 5% 1W Fusible	ERQ1CJP102	F1W210	
R751	7500 1% 1/4W Mtl Flm	ER0S2CKF7501	----	
R752	105K 1% 1/4W Mtl Flm	ER0S2CKF1053	----	
R756	1000 1% 1/4W Mtl Flm	ER0S2CKF1001	----	
R765	10 5% 2W Fusible	ERQ2CJP100	F2W010	
# R767	1000 5% 5W Mtl Flm	ERG5SJ102	----	
# R801	.47 10% 5W WW	ERF5AKR47	5WD47	
# R804	100 5% 5W Mtl Flm	ERG5SJ101	----	
# R805	6.8 5% 1W Mtl Flm	ERX1ANJ6R8	1W6D8	
# R806	27 5% 5W WW	ERF5ZJ270	5W027	
# R811	.56 5% 1W Fusible	ERQ1CKR56	----	
# R813	2.7M 10% 1/2W Cbn Comp	ERC12ZGK275	HW527	
# R821	1.8 5% 1/2W Fusible	ERQ12HJ1R8	----	
R825	470 5% 1/4W Fusible	ERQ14AJ471	----	
# R831	.33 10% 2W Fusible	ERQ2CKR33	2WD33	
R844	15 5% 3W Mtl Flm	ERG3ANJ150	3W015	
# R852	39 10% 1/2W Cbn Comp	ERC12GK390	HW039	
R961	150 5% 1/4W Fusible	ERQ12HJ151	----	
R969	39 5% 1/4W Fusible	ERQ14AJ390	----	
R2210	43K 1% 1/4W Mtl Flm	ER0S2CKF4302	----	
R2215	3900 1% 1/4W Mtl Flm	ER0S2CKF3901	----	
R2216	6200 1% 1/4W Mtl Flm	ER0S2CKF6201	----	
R2222	44.2K 1% 1/4W Mtl Flm	ER0S2CKF4422	----	

For Safety use only Equivalent Replacement Parts.

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR PART No.	NTE PART No.	
R2238	47K 1% 1/4W Mtl Flm	ER0S2CKF4702	----	
R2315	33 5% 1/4W Fusible	ERQ14AJ330	----	
R2355	39 5% 1/2W Fusible	ERQ12AJ390	----	
R2357	10 5% 1/2W Fusible	ERQ12AJ100	----	
R2360	10 5% 1/2W Fusible	ERQ12AJ100	----	
# R2452	1500 5% 2W Mtl Flm	ERG2SJS152	2W215	

For Safety use only Equivalent Replacement Parts.

CAPACITORS Items not listed are normally available at local distributors.

ITEM No.	RATING	MFGR PART No.	ITEM No.	RATING	MFGR PART No.
C020	33 NPO 50V 5%	ECCCF1H330JC	# C801	.0022 125V AC	ECKCFL222ZE
C021	33 NPO 50V 5%	ECCCF1H330JC	# C802	.0047 500V	ECKD2H472PE
C026	Trimmer 60pf	ECRHB060G81	# C804	.0047 500V	ECKD2H472PE
C035	27 NPO 50V 5%	ECCCF1H270JC	# C805	.0047 500V	ECKD2H472PE
C058	Trimmer 30pf	ECRHA030E41	# C810	.047 125V AC	ECQU1A473KH
C060	Cap Network	EXFP4101MF	# C828	.0047 125V AC	ECKCFL472ZE
C064	Cap Network	EXFP4101MF	# C829	.0047 125V AC	ECKCFL472ZE
C122	8 NPO 50V .5pf	ECCCF1H080DC	# C852	470 1KV 10%	ECKD3A471KB
C123	56 N220 50V 5%	ECCCF1H560JR	# C854	100 125V AC	ECKCFL101ME
C138	33 NPO 50V 5%	ECCCF1H330JC	# C855	100 125V AC	ECKCFL101ME
C140	10 NPO 50V .5pf	ECCCF1H471KB	# C871	.0022 125V	ECKCFL222ZE
C172	5 NPO 50V .5pf	ECCCF1H050DC	C1110	33 NPO 50V 5%	ECCCF1H330JC
C202	5 NPO 50V .5pf	ECCCF1H050CC	C1325	47 NPO 50V 5%	ECCCF1H470JC
C208	82 NPO 50V 5%	ECCCF1H820JC	# C2451	.0047 500V	ECKD2H472PE
C310	10 N220 50V .5pf	ECCCF1H100DR	# C2452	.0047 500V	ECKD2H472PE
C315	47 N220 50V 5%	ECCCF1H470JR	# C2453	.0047 500V	ECKD2H472PE
C361	68 NPO 50V 5%	ECCCF1H680JC	# C2454	.0047 500V	ECKD2H472PE
C362	68 NPO 50V 5%	ECCCF1H680JC	C2918	68 NPO 50V 5%	ECCCF1H680JC
C363	68 NPO 50V 5%	ECCCF1H680JC	C3101	82 NPO 50V 5%	ECCCF1H820JC
C503	220 N750 50V 5%	ECCCF1H221JU	C3102	470 N750 50V 5%	ECCCF1H471JU
# C552	.56 200V 5%	ECQF2H564JZ	C3105	33 N750 50V 5%	ECCCF1H300JU
# C553	820 2KV 5%	ECJD3D821JB	C3106	68 N750 50V 5%	ECCCF1H680JU
# C554	.033 50V 5%	ECQM1H333JV	C3111	18 N750 50V 5%	ECCCF1H180JU
# C557	390 2kv 5%	ECKD3D391JB	C3112	47 N750 50V 5%	ECCCF1H470JU
# C558	.0027 1.2KV 5%	ECWH12H272JS	C3113	18 N750 50V 5%	ECCCF1H180JU
# C559	470 2KV 5%	ECKD3D471JB	C3115	Trimmer 50pf	ECRHA050G41
# C561	.033 50V 5%	ECQM1H333JV	C3122	47 N750 50V 5%	ECCCF1H470JU
C601	8 N750 50V 5%	ECCCF1H080DU	C3132	68 N750 50V 5%	ECCCF1H080DU
C615	15 NPO 50V 5%	ECCCF1H150JC	C3136	33 NPO 50V 5%	ECCCF1H330JC
# C757	.015 400V 5%	ECQM4153JZ	C3137	150 N150 50V 5%	ECCCF1H151JP
# C758	.012 1.2KV 5%	ECWH12H123JS	C3138	18 NPO 50V 5%	ECCCF1H180JC
# C759	.001 2KV 5%	ECKD3D102KB	C3139	33 NPO 50V 5%	ECCCF1H330JC
# C760	.0012 2KV 10%	ECKD3D122KB	C3141	100 N150 50V 5%	ECCCF1H101JP
			C3142	Trimmer 50pf	ECRHA050G41

For Safety use only Equivalent Replacement Parts.

PANASONIC
MODEL CTL-3191S

MISCELLANEOUS

ITEM No.	DESCRIPTION	MFGR PART No.	NOTES
# F001	4.0A 125V AC	XBA1F40NU100	
# F2451	4.0A 125A AC	XBA1C40NS1	
L010	Ferrite Bead	TSC935-4	
L351	Ferrite Bead	EXCELSA35B	
# L551	Linearity	TLH6626P	
L552	Ferrite Bead	EXCELSA35B	
# L553	Ferrite Bead	EXCELSA35B	
L555	Ferrite Bead	TSC911	
L556	Ferrite Bead	TSC910	
# L801	Line Filter	ELF18D850C	
# L802	Line Filter	ELF18D666A	
L803	Ferrite Bead	EXCELSA35B	
L805	Ferrite Bead	EXCELSA35B	
L806	Ferrite Bead	EXCELSA35B	
L807	Ferrite Bead	EXCELSA35B	
L808	Ferrite Bead	EXCELSA35B	
L809	Ferrite Bead	EXCELSA35B	
L815	Ferrite Bead	TSC937	
# L899	Degaussing	OLK19014F	
L952	Ferrite Bead	EXCELSA39E	
L953	Ferrite Bead	EXCELSA39E	
L954	Ferrite Bead	EXCELSA39E	
L955	Ferrite Bead	EXCELSA39E	
L956	Ferrite Bead	EXCELSA39E	
L957	Ferrite Bead	EXCELSA39E	
L960	Ferrite Bead	EXCELSA39E	
L961	Ferrite Bead	EXCELSA39E	
L1114	Ferrite Bead	EXCELSA35B	
L2301	Ferrite Bead	EXCELSA35B	
L3105	Delay Line	ELB4L082	
L3108	Delay Line	ELT10Z360	
# P1	Line Cord,AC	TSX5165X	
# RL001	Relay	TSE1864	
# RL850	Relay	TSE1864	
SW010	Switch	EVQQS605T	Power
SW011	Switch	EVQQVC13T	Volume Down
SW012	Switch	EVQQVC13T	Volume Up
SW013	Switch	EVQQVC13T	Channel Down
SW014	Switch	EVQQVC13T	Channel Up
SW015	Switch	EVQQVC13T	Display
SW016	Switch	EVQQVC13T	Set Up
SW017	Switch	EVQQVC13T	Video
SW018	Switch	EVQQVC13T	TV/Video
SW019	Switch	EVQQVC13T	Ant
SW020	Switch	EVQQVC13T	NR
SW021	Switch	ESB64613	CATV
SW301	Switch	EVQR7AL13	Service
SW601	Switch	ESB64613	Color Pilot
SW801	Switch	EVQQVC13T	Picture Clarifier
SW2301	Switch	ESD7034	TV/External
SW2501	Switch	ESD1512250	S-Video

For Safety use only Equivalent Replacement Parts.

MISCELLANEOUS

ITEM No.	DESCRIPTION	MFGR PART No.	NOTES
# V1	CRT		
X011	Crystal	TAFCSA2.00MG	Clock 2MHZ
X012	Crystal	TSS1013-D	32.7kHz OSC
X101	Filter	EFCH45MNQ1	Saw
X102	Trap	EFCS4R5MW3BA	Trap
X201	Filter	EFCS4R5MS4W	4.5MHZ BandPass
X501	Crystal	TAFCSB503F38	Clock
X601	Crystal	TSS816MX	3.58MHZ Osc
X3001	Crystal	TSS816MX	3.58MHZ Osc
	Holder	TJC6319	For Fuse
	Socket	TJS1A5180	For CRT
	Pad Rubber	TMN27504	For Yoke
	U/V Tuner	ENV56849G3	

For Safety use only Equivalent Replacement Parts.

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

ITEM No.	FUNCTION	RESISTANCE	MFGR PART No.	NOTES
R113	RF/AGC	5000	EVN60AA00B53	
R136	DET OUT	1000	EVND4AA00B13	
R309	Sub Contrast	500	EVND4AA00B52	
R324	Sub Brightness	20K	EVN60AA00B24	
R354	R Low Light	5000	EVN49AA00B53	
R355	B Low Light	5000	EVN49AA00B53	
R356	G Low Light	5000	EVN49AA00B53	
R360	Red Drive	300	EVN49AA00B32	
R361	Blue Drive	300	EVN49AA00B32	
R405	Vert Size	100	EVN60AA00B12	
R524	Horiz Centering	200	EVN60AA00B22	
# R599A	Focus	---	(1)	
# R599B	Screen	---	(1)	
R602	GYR	10K	EVND4AA00B14	
R610	Sub Color		3000EVND4AA00B33	
R614	Sub Tint	5000	EVND4AA00B53	
R758	Horiz Width	5000	EVN60AA00B53	
R760	PCC	20K	EVN60AA00B24	
R1338	Bias	10K	EVN49AA00B14	
R1392	Dolby Balance		10KEVUF2AM20B14	
R2008	Videl Level	1000	EVN49AA00B13	
R2029	Video Level	10K	EVN49AA00B14	
R2073	Sound Level	20K	EVN49AA00B24	
R2200	Input Level	1000	EVND1AA00B13	
R2209	L-R Level	10K	EVND4AA00B14	
R2213	Seperation	5000	EVND4AA00B53	
R2220	VCO Adj	50K	EVND4AA00B54	
R2221	Filter	20K	EVND4AA00B24	
R3011	Comb Filter	20K	EVND4AA00B24	
R3137	Chroma Null	2000	EVND4AA00B23	
R3143	Chroma Null	1000	EVM38GA00B13	
R3147	Chroma Null	1000	EVND4AA00B13	

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(1) Part of Horizontal Output Transformer # T551 TLF15543F

PANASONIC
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