



WELLS-GARDNER ELECTRONICS CORPORATION

19" IN LINE COLOR MONITORS



MODELS

**19K4901
19K4902
19K4903
19K4906
19K4911**

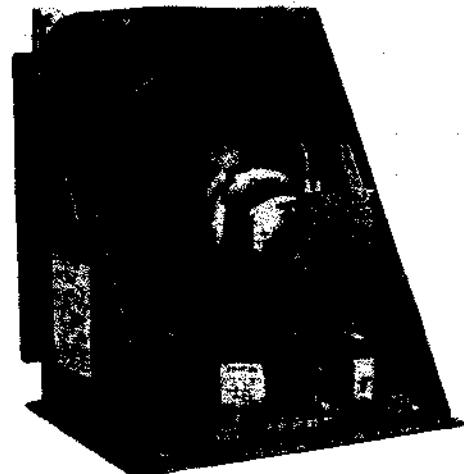
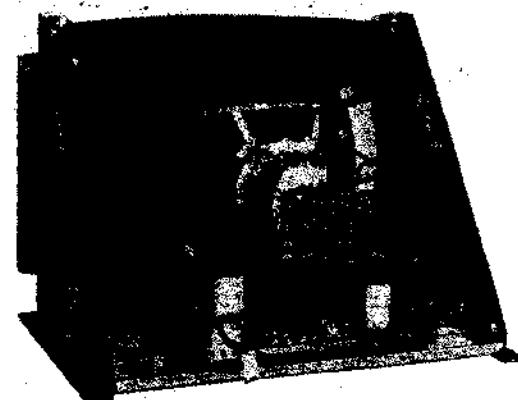
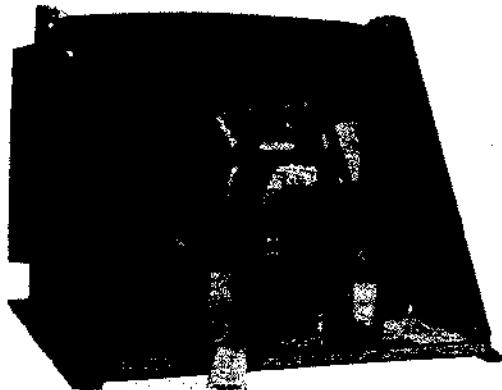


MODEL 19K4904



MODELS

**19K4951
19K4952
19K4953
19K4956
19K4956R
19K4961**



**WELLS-GARDNER ELECTRONICS
CORPORATION**

**2701 NORTH KILDARE AVENUE
CHICAGO, ILLINOIS 60639**

THIS MANUAL APPLIES TO THOSE MONITORS WITH SERIAL NUMBERS OF 576001 AND ABOVE.

WARNINGS

1. Power Up Warning—

An isolation transformer must be used between the AC supply and the AC plug of the monitor before servicing or testing is performed since the chassis and the heat sink are directly connected to one side of the AC line which could present a shock hazard.

Before servicing is performed, read all the precautions labelled on the CRT and chassis.

2. X-RAY RADIATION WARNING NOTICE

WARNING: PARTS WHICH INFLUENCE X-RAY RADIATION IN HORIZONTAL DEFLECTION, HIGH VOLTAGE CIRCUITS AND PICTURE TUBE ETC. ARE INDICATED BY (*) IN THE PARTS LIST FOR REPLACEMENT PURPOSES. USE ONLY THE TYPE SHOWN IN THE PARTS LIST.

3. High Voltage—

This monitor contains HIGH VOLTAGES derived from power supplies capable of delivering LETHAL quantities of energy. Do not attempt to service until all precautions necessary for working on HIGH VOLTAGE equipment have been observed.

4. CRT Handling—

Care must be taken not to bump or scratch the picture tube as this may cause the picture tube to implode resulting in personal injury. Shatter proof goggles must be worn when handling the CRT. High voltage must be completely discharged before handling. Do not handle the CRT by the neck.

5. PRODUCT SAFETY NOTICE

WARNING: FOR CONTINUED SAFETY REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER RECOMMENDED PARTS. THESE PARTS ARE IDENTIFIED BY SHADING AND BY (Δ) ON THE SCHEMATIC DIAGRAM.

AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDÉES PAR LE FABRICANT.

For replacement purposes, use the same type or specified type of wire and cable, assuring the positioning of the wires is followed (especially for H.V. and power supply circuits). Use of alternative wiring or positioning could result in damage to the monitor or in a shock or fire hazard.

PERFORMANCE AND OPERATING DATA

1. Apply a suitable power source to the monitor through an isolation transformer.

2. Apply a suitable signal source to the monitor PCB by means of P201 and P202

3. Set Up Controls.

All controls are preset at the factory, but may be adjusted to suit program material.

1.0 Supply

Voltage 108 VAC-132 VAC

Frequency 50 Hz-60 Hz

Note: Apply supply voltage through an isolation transformer with 1 Amp. minimum capability.

2.0 High Voltage (EHT)

For 19"V models 24.3 ± 0.8 K.V. at 0 Beam; 22.8 ± 0.8 K.V. at 1 mA Beam

Note: Condition for above: A.C. = 120V

3.0 Service Set-Up Controls

MAIN PC BOARD

- 3.1 Vertical Hold Control, VR301
- 3.2 Vertical Size Control, VR303
- 3.3 Horizontal Hold Control, VR351
- 3.4 Vertical Raster Position Control, VR 901
- 3.5 Horizontal Raster Position Adjustment Jumper (3 positions)
- 3.6 Screen Control (Part of H.V. Unit, T352)
- 3.7 Focus Control (Part of H.V. Unit, T352)
- 3.8 Horizontal Width Coll, L352
(L601 on Model K4904)
- 3.9 Black Level Control, VR201

- 3.10 Horizontal Video Position Control, (Horizontal Shift) VR352
- 3.11 Vertical Damping Control, VR302

NECK PC BOARD

- 3.12 Video Drive Controls, Red VR401
Green VR402
- 3.13 CRT Cut Off Controls, Red VR403
Green VR404
Blue VR405

SERVICE INSTRUCTIONS

NOTE: All monitors are equipped with automatic degaussing coils (L701) which demagnetize the picture tube every time the monitor is turned on after being off for a minimum of 5 minutes. Should any part of the chassis become magnetized it will be necessary to degauss the affected area with a manual degaussing coil. Move the coil slowly around the CRT face area and all surrounding metal parts. Then slowly withdraw for a distance of 6 feet before turning off.

Horizontal vs. Vertical:

Some models have the picture tube mounted vertically rather than horizontally. That is, the picture tube is mounted in the frame such that the long dimension of the tube is up and down. Examples of this include (but are not limited to) Models K4951, K4952, K4956, K4956R, and K4961 as in the pictures on the bottom of the front cover. Other than the physical orientation of the picture tube, there is no electrical difference between these models and their horizontal counterparts. The same circuits, the vertical circuits, produce and control deflection along the short dimension of the tube in all models.

The same circuits, the horizontal circuits, produce and control deflection along the long dimension of the tube in all models. Therefore, wherever "vertical" appears in this manual or on the monitor, it refers to the short dimension of the picture tube; wherever "horizontal" appears, it refers to the long dimension of the picture tube.

1.0 BLACK LEVEL CONTROL ADJUSTMENT

This control has been set at the factory and should not need further attention. However, when the game is connected a slight adjustment of VR201 may be necessary to obtain the proper black level (the black portion of the picture just extinguished).

2.0 VERTICAL SIZE (HEIGHT)

Location of this control is shown in Fig. 1. This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct vertical proportions.

NOTE: This adjustment interacts with the vertical damping adjustment described in the paragraph below. It may be necessary to readjust the vertical size after the vertical damping control has been adjusted.

3.0 VERTICAL DAMPING

Adjustment of this control is required only if the monitor is being used with a game in which the top several raster lines are visible on the screen. Adjust the vertical damping control for uniform spacing of the top raster lines.

4.0 CIRCUIT PROTECTION

A 4.0A pigtail fuse, mounted on the Main Board has been provided to protect the Power Output Circuit.

5.0 FOCUS

Adjust the Focus control, located on the HV unit (T352), for maximum over-all definition and fine picture detail.

6.0 HORIZONTAL HOLD CONTROL ADJUSTMENT, VR351 (See Fig. 1a or 1b)

A warm-up period of at least five minutes should be allowed before alignment is carried out. With the monitor being driven from the game signal, short TP601 to TP31. Adjust VR351 until the picture stops sliding horizontally. Remove the short.

7.0 HORIZONTAL VIDEO POSITION

If the video is off center on the raster, some compensation can be made by adjusting this control.

8.0 VERTICAL RASTER POSITION ADJUSTMENT

If the video is off center vertically, (short dimension of picture tube) some compensation can be made by turning the vertical raster position control.

9.0 HORIZONTAL RASTER POSITION ADJUSTMENT

If the video is off center horizontally (long dimension of the picture tube), some compensation can be made by moving the horizontal raster position adjustment jumper to either positions "R" or "L".

NOTE: This adjustment is not provided on Model K4903.

10.0 HORIZONTAL WIDTH ADJUSTMENT

The horizontal width coil is a hexagonal tuning tool adjustment. This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct horizontal proportions.

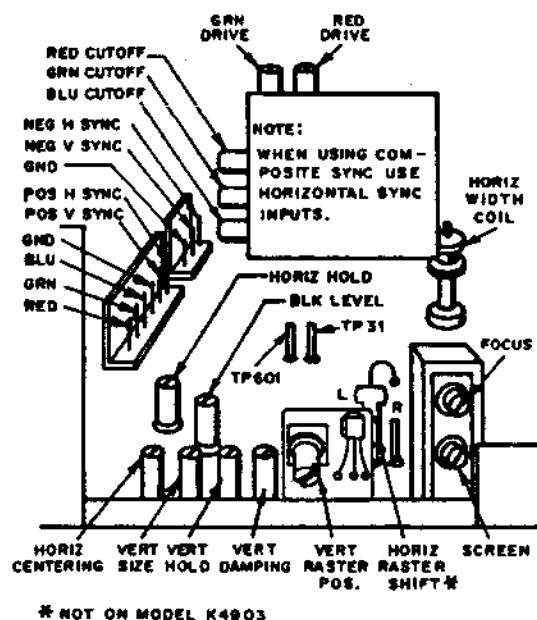


Figure 1(a)

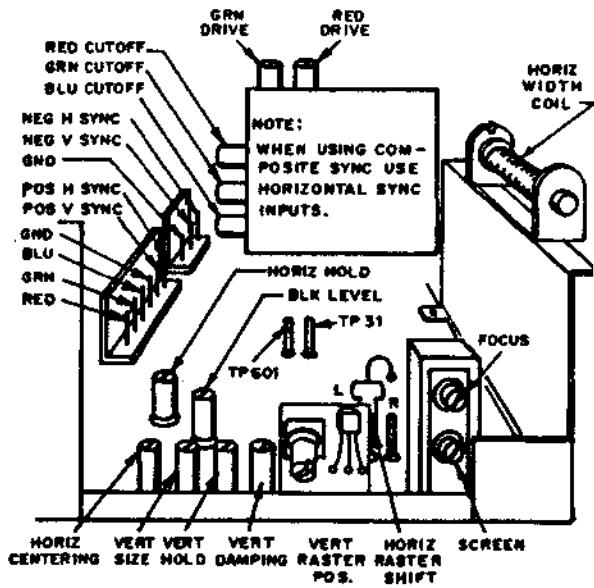


Figure 1(b)

INSTALLATION AND SERVICE INSTRUCTIONS

NOTE: All of the following procedures have been performed at the factory and should require no further attention. If the monitor is serviced for any reason, it should be observed afterward to determine whether any of these procedures need to be performed again.

OUTLINE OF CONVERGENCE AND SET-UP PROCEDURE

- 1.0 **DEGAUSSING:** Demagnetize the shadow mask and all surrounding metal parts with an external degaussing coil.
 - 2.0 **PURITY:** Adjust the purity magnets and the yoke position.
 - 3.0 **STATIC CONVERGENCE:** Converge Red and Blue on Green in the center of the screen.
 - 4.0 **DYNAMIC CONVERGENCE:** Converge Red and Blue at the edges of the screen.
 - 5.0 **WHITE BALANCE:** Set Gray and White brightness tracking.
- NOTE: Number 2.0 and 3.0 adjustments interact.

1.0 DEGAUSSING

The monitor is equipped with an automatic degaussing circuit. However, if the CRT shadow mask has become excessively magnetized, it may be necessary to degauss it with a manual coil. Do not switch the coil OFF while the raster shows any effect from the coil.

2.0 COLOR PURITY ADJUSTMENT

- 2.1 For best results, it is recommended that the purity adjustment be made in the final monitor location. If the monitor will be moved, perform this adjustment with it facing west or east. The monitor must have been operating 15 minutes prior to this procedure.
- 2.2 Set the converger assembly on the CRT neck with the center line (of the Purity Adjustment Magnet) over the gap between grids no. 3 and 4. (See Figures 2 and 6)
- 2.3 Make certain that the magnetic ring-pairs are in their correct positions before starting procedure. This produces a zero-correction condition on the CRT beam and helps facilitate adjustments.
- 2.4 Vertical raster position control must be at the center of its rotation.
- 2.5 Remove the R-G-B signal from the monitor.
- 2.6 Turn the Green Cut off Control (VR404) on the Neck Board fully CW. (See Fig. 3)
- 2.7 Turn the Red and Blue Cut off Controls (VR403 & VR405) fully CCW.
- 2.8 Pull the Deflection Yoke backward so that the Green belt will appear. (See Fig. 4)
- 2.9 Decrease the horizontal width of the raster, if necessary, in order to be able to see the right and left edges of the raster.
- 2.10 Move the two Purity Magnets with respect to each other in order to center the raster horizontally on the screen and the Green belt on the raster horizontally.
- 2.11 Push the Deflection Yoke forward gradually and fix it at the place where the Green screen becomes uniform throughout.
- 2.12 Turn the Cut off and Drive Controls and confirm that each color is uniform.
- 2.13 If the color is not uniform, re-adjust it, moving the Purity Magnets slightly.

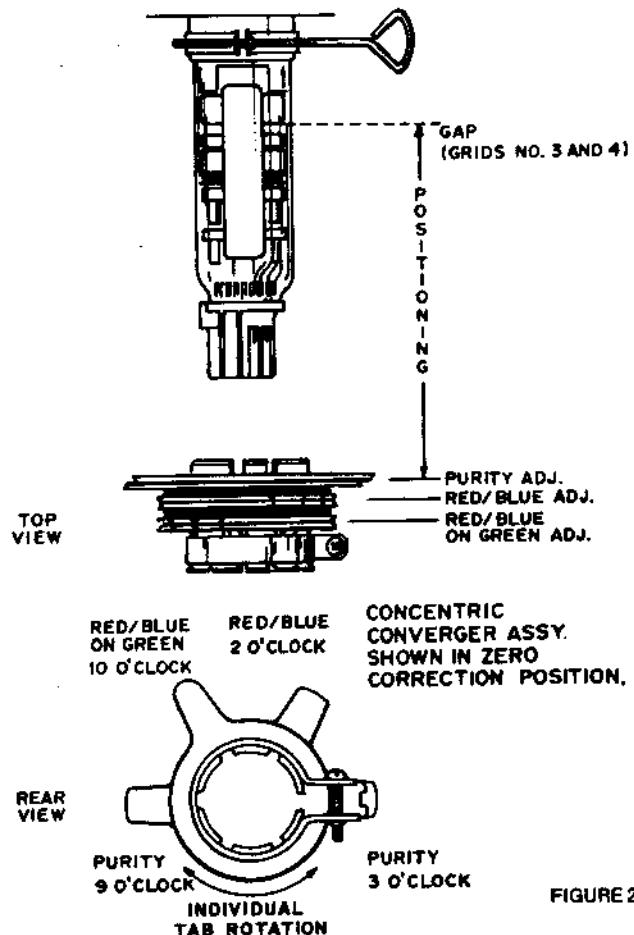


FIGURE 2

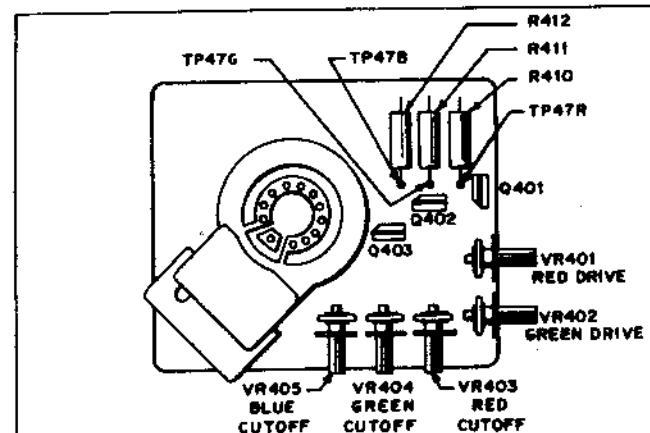


FIGURE 3: Component Side of Neck Board
(with horizontally mounted CRT)

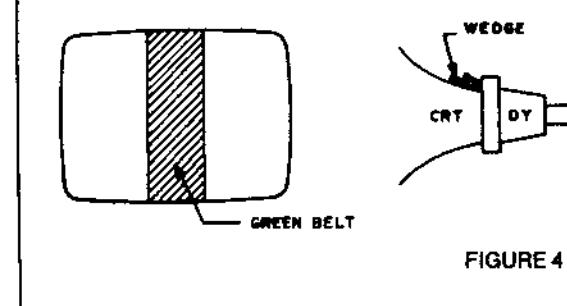


FIGURE 4

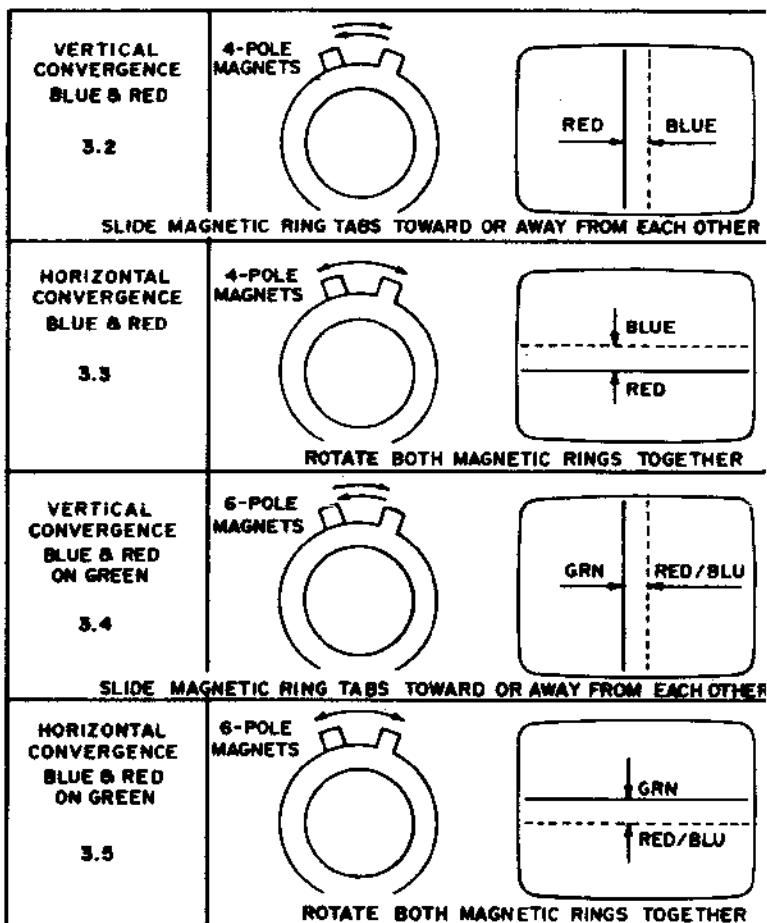
- 2.14 Turn all three cut off controls fully counterclockwise (CCW). Slowly turn up (CW) the Red cutoff control until a Red raster is just barely visible.
- 2.15 Slowly turn up the Green and Blue cutoff controls such that their associated colors, mixing with the Red, results in a White or Gray raster.
- 2.16 Confirm that the white or gray color is uniform throughout the screen.
- 2.17 Insert a wedge temporarily as shown in Fig. 4 and adjust the angle of the Deflection Yoke.

3.0 STATIC CONVERGENCE ADJUSTMENT

4-Pole Magnets and 6-Pole Magnets are for static convergence.

- 3.1 A cross hatch signal should be connected to the monitor.
- 3.2 A pair of 4-Pole Convergence Magnets is provided and adjusted to converge the blue and red beams (See Fig. 6). When the Pole opens to the left and right 45° symmetrically, the magnetic field maximizes. Red and blue beams move to the left and right (See Fig. 5). Variation of the angle between the tabs adjusts the convergence of red and blue vertical lines.
- 3.3 When both 4-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of the red and blue horizontal lines is adjusted.
- 3.4 A pair of 6-Pole Convergence Magnets is also provided and adjusted to converge the magenta (red + blue) to green beams (See Fig. 6). When the Pole opens to the left and right 30° symmetrically, the magnetic field is maximized. Red and blue beams both move to the left and right (See Fig. 5). Variation of the opening angle adjusts the convergence of magenta to green vertical lines.
- 3.5 When both 6-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of magenta to green horizontal lines is adjusted.

GREEN GUN IS THE CENTER GUN.
CONVERGE THE RED AND BLUE.
THEN CONVERGE RED AND BLUE ON GREEN.



REPEAT 3.2 & 3.3 IF ALL LINES ARE NOT CONVERGED AT CENTER

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FIGURE 5

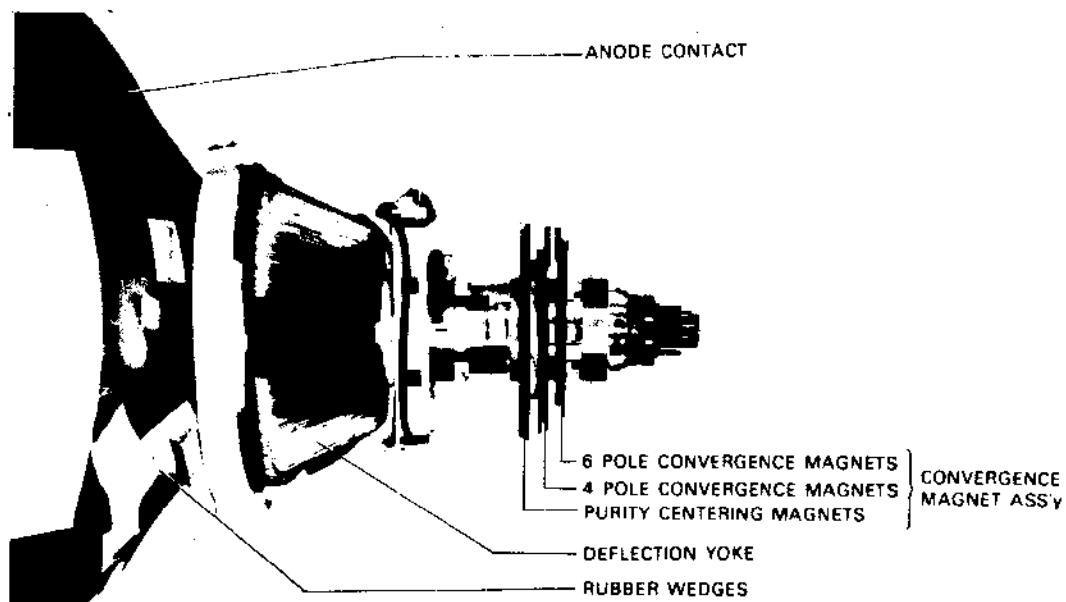


FIGURE 6

4.0 PRECISE ADJUSTMENT OF DYNAMIC CONVERGENCE (See Fig. 7, 8 and 9)

- 4.1 Feed a cross hatch signal to the monitor.
 - 4.2 Insert a wedge temporarily and fix the Deflection Yoke so as to obtain the best circumference convergence (See Fig. 8 and 9)
- NOTE:
The wedges may need to be moved during adjustments.
- 4.3 Insert three rubber wedges to the position as shown in Fig. 7 to obtain the best circumference convergence.

NOTE:

- 1) Tilting the angle of the yoke up and down adjusts the crossover of both vertical and horizontal red and blue lines. See Fig. 8 (a) and (b).
- 2) Tilting the angle of the yoke sideways adjusts the parallel convergence of both horizontal and vertical lines at the edges of the screen. See Fig. 9 (a) and (b).
- 3) Use three rubber wedges (tapered rubber wedges are used for a purpose).
- 4) The position of each rubber wedge is shown in Fig. 7.
- 5) Do NOT force the permanent wedges in. They are to be inserted until they just make contact with the yoke—after the yoke has been positioned.
- 6) Fix the three permanent rubber wedges with chloroprene rubber adhesive.
- 7) After the adhesive has dried enough to hold the wedges in place, carefully remove the temporarily installed wedge.

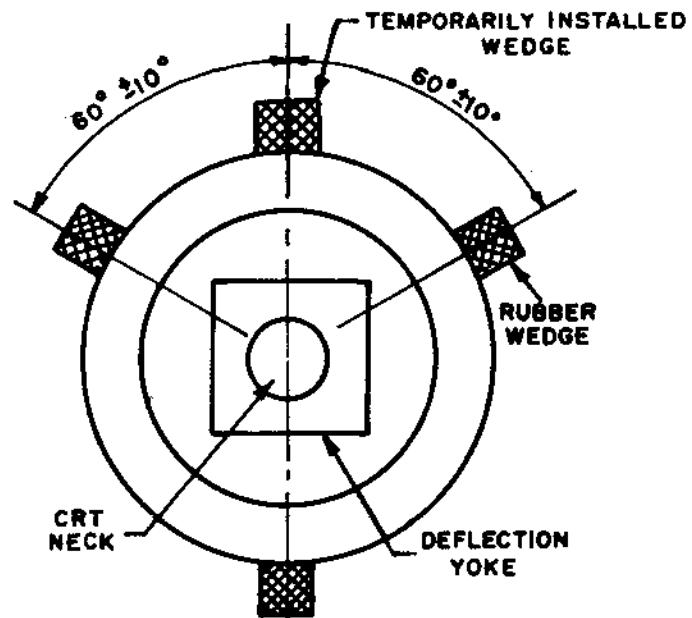
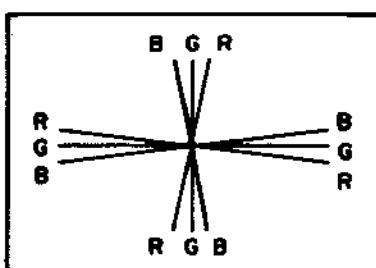
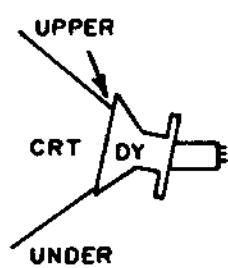


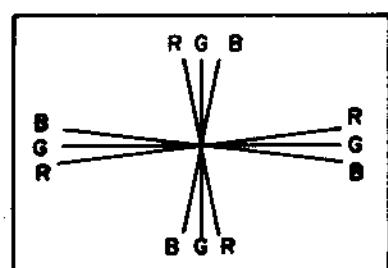
FIGURE 7



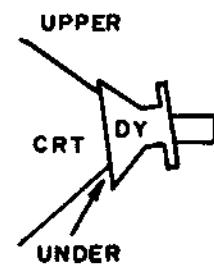
CRT SCREEN (a)



INSERT RUBBER WEDGE
FROM UPPER SIDE

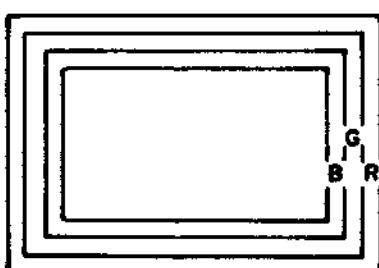


CRT SCREEN (b)

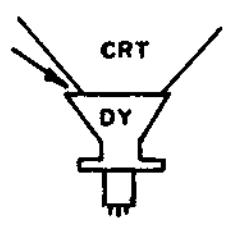


INSERT RUBBER WEDGE
FROM LOWER SIDE

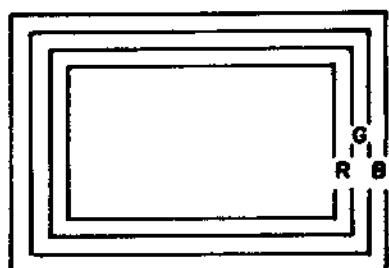
FIGURE 8



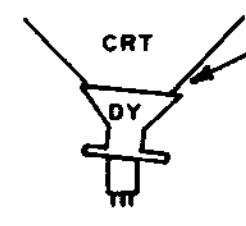
CRT SCREEN (a)



INSERT RUBBER WEDGE
FROM LEFT SIDE



CRT SCREEN (b)



INSERT RUBBER WEDGE
FROM RIGHT SIDE

FIGURE 9

5.0 WHITE BALANCE

- 5.1 Equipment Required: An oscilloscope with a DC coupled mode in the vertical amplifier, or a digital multimeter, or a VOM with a DC input impedance of at least 20,000 ohms/volt.
- 5.2 Referring to Fig. 1(a) or 1(b) and 3, do the following adjustments in subdued light after degaussing and setting the purity of the CRT.
- 5.3 Ground the R/G/B video inputs.
- 5.4 Set the Red and Green drive controls, VR401 and VR402, to approximately 80% of full CW rotation.
- 5.5 Set the screen and R/G/B cutoff controls to their minimum (fully CCW) positions.
- 5.6 Connect the oscilloscope, multimeter, or VOM, to the collector of a video output transistor (Q401, Q402, or Q403) on the CRT neck PCB at TP47R, TP47G, or TP47B as shown in Fig. 3.
- 5.7 Adjust the black level control (VR201) to obtain the waveform shown in Fig. 10 or a +150 volt DC reading on the multimeter or the VOM.
- 5.8 Slowly turn the screen control CW until the raster is just visible. The color of this raster is called the lead color gun. DO NOT adjust its associated cutoff control. It must remain fully CCW.
- 5.9 Adjust the screen control CCW until the raster is just extinguished. Then adjust the black level control for a dim raster.
- 5.10 Adjust the two remaining cutoff controls (NOT the lead color gun cutoff control) for best gray uniformity.
- 5.11 Adjust the black level control for a bright raster but not maximum brightness. Adjust the R/G drive controls, if necessary, for best neutral white.
- 5.12 Repeat steps 5.10 and 5.11 until good tracking of white balance is achieved.
- 5.13 With the oscilloscope, multimeter, or VOM connected to the collector of the lead color video output transistor (See Fig. 3), adjust the black level control to obtain the waveform in Fig. 10 or a +150 volt DC reading on the multimeter or VOM.

BLANKING PULSES

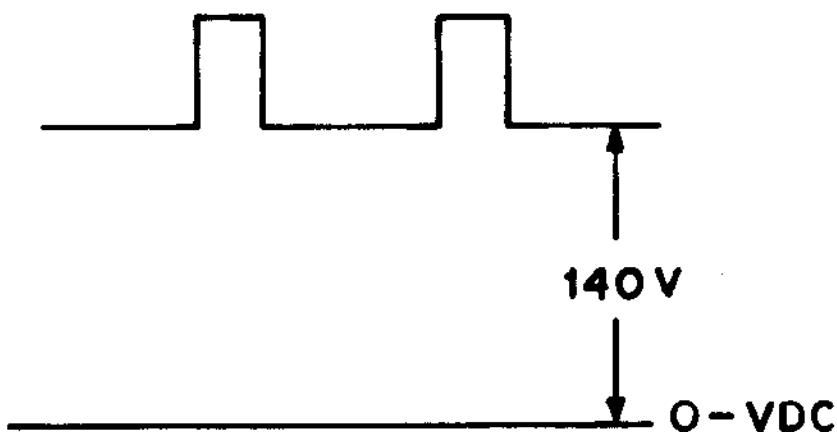


FIGURE 10

REPLACEMENT PARTS LIST

MODELS K4901, K4906, K4951, and K4956

This monitor contains circuits and components included specifically for safety purposes.

For continued protection no changes should be made to the original design, and components shown in shaded areas of schematic, or **△★** on parts list should be replaced with exact factory replacement parts.

The use of substitute parts may create a shock, fire, radiation or other hazard. Service should be performed by qualified personnel only.

MAIN BOARD

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description			
RESISTORS								
R201	203X6500-845	1K Ohm, 5%, 1/4W Carbon	R370	203X6501-002	33K Ohm, 5%, 1/4W Carbon			
R202	340X2331-934	330 Ohm, 5%, 1/4W Carbon	R371	203X9014-584	1K Ohm, 5%, 1W Metal Oxide			
R203	203X6500-405	100 Ohm, 5%, 1/4W Carbon	R372	203X9104-809	12K Ohm, 5%, 2W Metal Oxide			
R204	203X6700-327	100 Ohm, 5%, 1/2W Carbon	R375	203X9104-724	3.9K Ohm, 5%, 1W Carbon			
R205	203X6700-421	270 Ohm, 5%, 1/2W Carbon	R376	203X9104-404	270 Ohm, 5%, 2W Metal Oxide			
R206	203X6500-540	390 Ohm, 5%, 1/4W Carbon	R377	203X6500-447	150 Ohm, 5%, 1/4W Carbon			
R207	340X2221-934	220 Ohm, 5%, 1/4W Carbon	R378	203X6500-888	10K Ohm, 5%, 1/4W Carbon			
R208	203X6500-540	390 Ohm, 5%, 1/4W Carbon	R379	203X6500-888	10K Ohm, 5%, 1/4W Carbon			
R209	340X2221-934	220 Ohm, 5%, 1/4W Carbon	R380	203X6500-885	8.2K Ohm, 5%, 1/4W Carbon			
R210	203X6500-540	390 Ohm, 5%, 1/4W Carbon	R381	203X6500-724	2.2K Ohm, 5%, 1W Metal Oxide			
R211	340X2221-934	220 Ohm, 5%, 1/4W Carbon	R383	203X9014-387	150 Ohm, 5%, 1W Metal Oxide			
R214	203X6500-845	1K Ohm, 5%, 1/4W Carbon	R384	203X6501-088	68K Ohm, 5%, 1/4W Carbon			
R215	203X6501-126	100K Ohm, 5%, 1/4W Carbon	R385	340X2122-934	1.2K Ohm, 5%, 1/4W Carbon			
R216	203X6500-845	1K Ohm, 5%, 1/4W Carbon	R387	340X2224-934	220K Ohm, 5%, 1/4W Carbon			
R217	203X6500-405	100 Ohm, 5%, 1/4W Carbon	R389	340X5183-633	18K Ohm, 5%, 2W Metal Oxide			
R218	203X6500-845	1K Ohm, 5%, 1/4W Carbon	R390	340X4222-633	2.2K Ohm, 5%, 1W Metal Oxide			
R219	203X6501-126	100K Ohm, 5%, 1/4W Carbon	R502	203X6500-888	10K Ohm, 5%, 1/4W Carbon			
R220	203X6500-845	1K Ohm, 5%, 1/4W Carbon	R503	204X1700-535	150 Ohm, 5%, 15W Metal Oxide			
R221	203X6500-405	100 Ohm, 5%, 1/4W Carbon	R504	203X9014-267	47 Ohm, 5%, 1W Metal Oxide			
R222	203X6500-762	3.3 Ohm, 5%, 1/4W Carbon	R505	203X6501-209	220K Ohm, 5%, 1/4W Carbon			
R224	203X6500-169	10 Ohm, 5%, 1/4W Carbon	R506	204X1425-196	15 Ohm, 5%, 5W Wire Wound			
R225	203X6500-169	10 Ohm, 5%, 1/4W Carbon	R507	203X5602-185	330K Ohm, 5%, 1/2W Comp.			
R226	203X6500-189	10 Ohm, 5%, 1/4W Carbon	△★ R601	204X1625-058	3.3 Ohm, 5%, 10W WW			
R227	203X6501-044	47K Ohm, 5%, 1/4W Carbon	R701	203X9105-141	2.2 Ohm, 5%, 2W Metal Oxide			
R228	340X2152-934	1.5K Ohm, 5%, 1/4W Carbon	R702	203X6206-441	2.2 Ohm, 5%, 1/2W Carbon			
R229	203X6700-421	270 Ohm, 5%, 1/2W Carbon	VR201	204X2070-072	2K Ohm-B Semi-Fixed			
R230	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.	VR301	204X2070-084	5K Ohm-B Semi-Fixed			
R231	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.	VR302	204X2070-084	5K Ohm-B Semi-Fixed			
R232	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.	VR303	204X2070-055	500 Ohm-B Semi-Fixed			
R233	203X6500-468	180 Ohm, 5%, 1/4W Carbon	VR351	204X2070-072	2K Ohm-B Semi-Fixed			
R234	340X2820-934	82 Ohm, 5%, 1/4W Carbon	VR352	204X2070-072	2K Ohm-B Semi-Fixed			
R235	340X2820-934	82 Ohm, 5%, 1/4W Carbon	RESISTORS (Cont.)					
R236	340X2820-934	82 Ohm, 5%, 1/4W Carbon	CAPACITORS					
R301	203X6500-506	270 Ohm, 5%, 1/4W Carbon	C201	203X0014-088	1000 uF, 16V, Electrolytic			
R302	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon	C202	202X7200-064	330 pF, 500V, Ceramic			
R303	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon	C203	202X7200-043	220 pF, 500V, Ceramic			
R304	203X6500-724	2.2K Ohm, 5%, 1/4W Carbon	C204	202X7200-043	220 pF, 500V, Ceramic			
R305	203X6500-842	6.8K Ohm, 5%, 1/4W Carbon	C205	203X0014-076	470 uF, 16V, Electrolytic			
R306	203X6003-201	7.5K Ohm, 2%, 1/4W Carbon	C206	203X1810-149	0.1 uF, 125V Mylar			
R307	203X6500-825	5.8K Ohm, 5%, 1/4W Carbon	C207	349X2232-109	.022 uF, 100V Mylar			
R309	203X6500-965	22K Ohm, 5%, 1/4W Carbon	C301	203X0014-065	330 uF, 50V Electrolytic			
R310	203X6500-988	39K Ohm, 5%, 1/4W Carbon	C302	203X1800-563	.022 uF, 50V Mylar			
R311	203X9014-709	3.3K Ohm, 5%, 1W Carbon	C303	203X0629-037	2.2 uF, 50V Electrolytic			
R312	203X9014-741	4.7K Ohm, 5%, 1W Metal Oxide	C304	203X1600-368	.0068 uF, 50V Mylar			
R313	204X1527-528	470 Ohm, 5%, 7W Carbon	C306	203X0412-012	2.2 uF, 16V Tantalum			
R314	203X6500-481	220 Ohm, 5%, 1/4W Carbon	C307	203X1600-634	0.033 uF, 50V Mylar			
R315	203X6500-169	10 Ohm, 5%, 1/4W Carbon	C308	203X0025-163	2.2 uF, 50V Electrolytic			
R317	203X6700-061	8.2 Ohm, 5%, 1/2W Carbon	C309	203X1207-100	0.068 uF, 100V PP			
R318	203X6500-584	560 Ohm, 5%, 1/4W Carbon	C310	203X0629-061	10 uF, 100V Electrolytic			
R319	203X6500-645	1K Ohm, 5%, 1/4W Carbon	C311	203X0041-162	4.7 uF, 160V Electrolytic			
R320	203X6501-002	33K Ohm, 5%, 1/4W Carbon	C312	202X7050-248	1000 pF, 500V Ceramic			
R321	203X6501-224	270K Ohm, 5%, 1/2W Carbon	C313	203X0040-068	100 uF, 160V Electrolytic			
R322	203X6500-886	10K Ohm, 5%, 1/4W Carbon	C314	203X1201-096	0.039 uF, 200V PP			
R351	203X6500-886	10K Ohm, 5%, 1/4W Carbon	C315	203X0629-023	1 uF, 50V Electrolytic			
R352	203X6500-785	3.9K Ohm, 5%, 1/4W Carbon	C351	203X0629-023	1 uF, 50V Electrolytic			
R353	203X6501-088	68K Ohm, 5%, 1/4W Carbon	C352	203X0619-045	47 uF, 25V Electrolytic			
R354	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon	C353	203X1190-015	0.0082 pF, 50V Mylar-PP			
R355	203X9205-143	6.8K Ohm, 5%, 3W Metal Oxide	C354	203X0619-045	47 uF, 25V Electrolytic			
R358	340X3683-934	68K Ohm, 5%, 1/2W Carbon	C355	203X1600-368	0.0068 pF, 50V Mylar			
R360	203X6500-561	470 Ohm, 5%, 1/4W Carbon	C356	203X1130-287	0.0047 uF, 50V, Mylar			
R361	203X6500-886	10K Ohm, 5%, 1/4W Carbon	C359	202X8065-608	100 pF, 500V Ceramic			
R362	203X9014-645	1.8K Ohm, 5%, 1W Metal Oxide	C360	202X7050-386	0.0033 pF, 500V Ceramic			
★ R363	204X1450-516	3.9K Ohm, 5%, 5W Metal Oxide	C361	202X7050-483	0.01 uF, 500V Ceramic			
R364	203X6500-246	22 Ohm, 5%, 1/4W Carbon	C362	202X7203-032	0.01 uF, 50V Ceramic			
R365	340X2183-934	18K Ohm, 5%, 1/4W Carbon	△★ C363	203X1270-911	8700 pF, 1.5 KV PP			
R367	203X6500-886	10K Ohm, 5%, 1/4W Carbon	C366	203X1201-265	0.33 uF, 200V PP			
R368	203X5602-185	330K Ohm, 5%, 1/2W Comp.	C366	203X0019-026	22 uF, 25V Electrolytic			
R369	203X5602-329	880K Ohm, 5%, 1/2W Comp.						

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
CAPACITORS (Cont.)					
C367	202X8065-162	6 pF, 500V Ceramic	Q203	200X4056-280	Transistor (PNP) 2SA562-Y-TM
C368	202X7203-032	0.1 uF, 50V	Q204	200X4056-280	Transistor (PNP) 2SA562-Y-TM
C369	203X1207-087	0.047 uF, 100V, PP	Q205	200X4056-280	Transistor (PNP) 2SA562-Y-TM
C372	203X1207-125	0.1 uF, 100V PP	Q206	200X3181-523	Transistor (NPN) 2SC1815GR
C373	203X0029-021	1 uF, 50V, Electrolytic	Q207	200X3181-523	Transistor (NPN) 2SC1815GR
C380	202X7200-087	470 pF, 500V Ceramic	Q208	200X3181-523	Transistor (NPN) 2SC1815GR
C381	80X0099-006	470 pF, 500V, Ceramic	Q209	200X3181-523	Transistor (NPN) 2SC1815GR
△ C501	203X1810-149	0.1 uF, 125V Mylar	Q210	200X3181-523	Transistor (NPN) 2SC1815GR
△ C502	202X7050-282	1500 pF, 500V Ceramic	Q301	200X3181-523	Transistor (NPN) 2SC1815GR
△ C503	202X7810-214	2200 pF, 125V Ceramic	Q302	200X3207-306	Transistor (NPN) 2SC2073LBGL2
△ C504	202X7810-214	2200 pF, 125V Ceramic	Q303	200X3207-306	Transistor (NPN) 2SC2073LBGL2
C505	203X0220-075	560 uF, 200V Electrolytic	Q351	200X3248-217	Transistor (NPN) 2SC2482BK
C506	203X0040-034	22 uF, 180V Electrolytic	Q352	200X4589-802	Transistor (NPN) 2SD898B
C507	203X0041-057	47 uF, 180V Electrolytic	ZD301	66X0040-031	Diode, Zener 24V, 3%, 1/2W
C701	203X0019-092	1000 uF, 25V Electrolytic	IC301	200X2300-033	IC HA11423
C702	203X0634-061	10 uF, 100V Electrolytic		200X2600-183	IC STR381
C703	202X7050-248	1000 pF, 500V Ceramic	△★ IC501		
SEMICONDUCTORS					
D203	201X2010-150	Diode, IS2076-27	■ L351	201X4710-134	Coil, (RF Choke)
D204	201X2010-159	Diode, IS2076-27	★ L352	201X5000-083	Coil, Horiz. Size
D205	201X2010-159	Diode, IS2076-27	L701	611X0005-005	Coil, Degaussing
D206	201X2010-159	Diode, IS2076-27	△★ T352	202X1300-080	Transformer, Hor. Drive
D207	201X2010-159	Diode, IS2076-27		200X9720-301	HV-Unit M-11
D208	201X2010-159	Diode, IS2076-27	■ L351		Omitted from late versions
D209	201X2010-159	Diode, IS2076-27	△ F501	204X7120-073	
D302	201X2010-159	Diode, IS2076-27	J402	206X5008-632	Fuse, 4 Amp. 125V
D303	201X2010-159	Diode, IS2076-27	P201	204X9600-468	Recep W Wire 3P-M-BG
D304	201X2120-009	Diode, RH-IV	P202	204X9601-477	Plug, PWB 3P-J
D305	201X2120-009	Diode, RH-IV	P401	204X9600-298	Plug, PWB 6P-Q
D306	201X2010-159	Diode, IS2076-27	P601	204X9600-249	Plug, PWB 4P-B
D307	201X2010-165	Diode, ISS81	P601	204X9600-304	Plug, PWB 2P-B
△ D501	201X3120-216	Diode, RM-1AV	TH501	201X0100-112	Plug, PWB 4P-C
△ D502	201X3120-216	Diode, RM-1AV			Thermistor
△ D503	201X3120-216	Diode, RM-1AV			
△ D504	201X3120-216	Diode, RM-1AV			
D505	201X3120-216	Diode, RM-1AV			
D506	201X3120-216	Diode, RM-1AV			
D701	201X2130-234	Diode, RU-2V			
D702	201X2120-009	Diode, RH-IV			
Q201	200X3181-523	Transistor (NPN) 2SC1815GR	△★ 88X0138-506	19VLTP22 Pix Tube	
Q202	200X3181-523	Transistor (NPN) 2SC1815GR	205X9800-158	Lateral/Purity Assembly	
			△★ 202X1111-258	Yoke Deflection	
			or 202X1111-264		
			291X5004-262	Automatic Degaussing Coil Unit	

NECK BOARD

RESISTORS			CAPACITORS		
R401	203X8000-729	220 Ohm, 5% 1/4W Carbon	C401	202X7050-269	1200 pF, 500V Ceramic
R402	203X8500-540	390 Ohm, 5% 1/4W Carbon	C402	202X7050-248	1000 pF, 500V Ceramic
R403	203X6000-661	820 Ohm, 5% 1/4W Carbon	C403	202X7050-248	1000 pF, 500V Ceramic
R404	203X8000-729	220 Ohm, 5% 1/4W Carbon	C404	202X7050-282	1500 pF, 1.5KV Ceramic
R405	203X8500-540	390 Ohm, 5% 1/4W Carbon	C405	202X7050-483	0.01 uF, 500V Ceramic
R406	203X8000-881	820 Ohm, 5% 1/4W Carbon			
R407	203X6000-729	47 Ohm, 5% 1/4W Carbon			
R408	203X6000-998	270 Ohm, 5% 1/4W Carbon			
R409	203X6000-661	820 Ohm, 5% 1/4W Carbon			
R410	203X9104-824	15K Ohm, 5% 2W M.O. Forming	Q401	200X3206-800	Transistor (NPN) 2SC2068LB
R411	203X9104-824	15K Ohm, 5% 2W M.O. Forming	Q402	200X3206-800	Transistor (NPN) 2SC2068LB
R412	203X9104-824	15K Ohm, 5% 2W M.O. Forming	Q403	200X3206-800	Transistor (NPN) 2SC2068LB
R413	203X6000-998	2.7K Ohm, 5% 1/2W Comp.			
R414	203X6000-998	2.7K Ohm, 5% 1/2W Comp.			
R415	203X6000-998	2.7K Ohm, 5% 1/2W Comp.			
R416	203X9105-154	2.2 Ohm, 5% 2W Metal Oxide			
R419	203X6500-741	2.7K Ohm, 5% 1/4W Carbon			
R420	203X6500-741	2.7K Ohm, 5% 1/4W Carbon			
R421	203X6500-741	2.7K Ohm, 5% 1/4W Carbon	J401	206X5009-296	MISCELLANEOUS
VR401	204X2115-014	500 Ohm, -B Semi-Fixed	P402	204X9800-254	RECEP W WIRE 4P-E
VR402	204X2115-014	500 Ohm, -B Semi-Fixed	P403	204X9800-981	Plug, PWB 3P-A
VR403	204X2115-006	5K Ohm, -B Semi-Fixed	P701	204X9801-020	Plug, 1 Pin
VR404	204X2115-006	5K Ohm, -B Semi-Fixed		204X9301-255	Plug, PWB 4P-E
VR405	204X2115-006	5K Ohm, -B Semi-Fixed			CRT Socket
SEMICONDUCTORS					
SEMICONDUCTORS					
MISCELLANEOUS					

VERTICAL POSITION BOARD (P344)

RESISTORS			SEMICONDUCTORS		
VR901	40X0645-001	25K Ohm Vert. Position Control	Q901	86X0127-001	Transistor (NPN) TPS98

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
MODELS K4902, K4952					
Same as K4901, K4906, K4951, K4956 except:					
C365 R389	46X0536-021	0.27 uF, 200V, PP Omitted from certain versions of these models.	C365 R389 L351	46X0536-022	0.15 uF, 400V, PP Omitted from these models. Omitted from late versions of these models.
L351		Omitted from late versions.	C365	Add the following to late versions: 46X0536-037	820 pF, 1600V, PP, 5%
MODELS K4911, K4961					
Same as K4901, K4906, K4951, K4956 except:					
MAIN BOARD					
RESISTORS					
R206 R208 R210 R229	340X2221-934 340X2221-934 340X2221-934 340X3391-934	220 Ohm, 5%, 1/4W Carbon 220 Ohm, 5%, 1/4W Carbon 220 Ohm, 5%, 1/4W Carbon 390 Ohm, 5%, 1/2W Carbon	L351		Omitted from late versions.
CAPACITORS					
C202 C203 C204	80X0099-020 80X0099-012 80X0099-006	680 pF, 500V, Ceramic 560 pF, 500V, Ceramic 470 pF, 500V, Ceramic	C406 C407	80X0099-020 80X0099-020	680 pF, 500V, Ceramic 680 pF, 500V, Ceramic
TRANSFORMERS AND COILS					
NECK BOARD					
CAPACITORS					
MODEL K4904					
Same as K4901, K4906, K4951, K4956 except:					
MAIN BOARD					
RESISTORS					
R391	340X221-934	220 Ohm, 5%, 1/4W Carbon	L352 ★ L601 L351	9A2813-003 9A2822-001	Coil, Horiz. Lin. Coil, Horiz. Size Omitted from late versions.
CAPACITORS					
C365 C390	46X0536-025 46X0544-004	0.56 uF, 200V, PP 0.012 uF, 100V, PP			
TRANSFORMERS AND COILS					
MODEL K4956R					
* Same as K4901, K4906, K4956, except add the following:					
RELAY BOARD (P 340)					
RESISTORS					
R801 R802 R803 R804 R805	340X2162-934 340X2473-934 340X2222-934 340X2514-934 340X2102-934	1.6K Ohm, 5%, 1/4W Carbon 47K Ohm, 5%, 1/4W Carbon 2.2K Ohm, 5%, 1/4W Carbon 510K Ohm, 5%, 1/4W Carbon 1K Ohm, 5%, 1/4W Carbon	K801 K802 J801 P802 P803	2A0685-001 2A0685-001 3A0627-004 6A0393-004 6A0406-001	Relay, 12V, DPDT Relay, 12V, DPDT Socket, 4 Pin Plug, 3 Pin, Right Angle Plug, 4 Pin
MISCELLANEOUS					
SEMICONDUCTORS					
D801 Q801 Q802	66X0046-001 86X0113-001 86X0113-001	Diode, Silicon FDH-444 Transistor (NPN) 2N3904 Transistor (NPN) 2N3904			

*NOTE: L351 omitted from all late versions of all models included in this manual.

OSCILLOSCOPE WAVEFORM PATTERNS

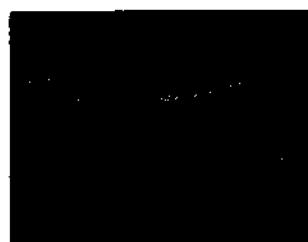
The waveforms are as observed on the wide band oscilloscope with the monitor turned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak amplitudes. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corner of the pulses will tend to more rounded than those shown and the amplitude of any high frequency pulse will tend to be less.

A



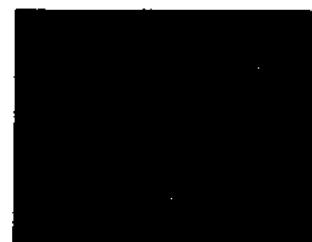
2V/DIV 100uSEC/DIV

TP-81



0.5V/DIV 2mSEC/DIV

Q351 COLLECTOR



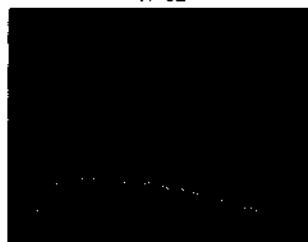
20V/DIV 10uSEC/DIV

TP-31 DC COUPLED
BOTTOM LINE = 0 VDC



2V/DIV 100uSEC/DIV

TP-82



20V/DIV 2mSEC/DIV

D



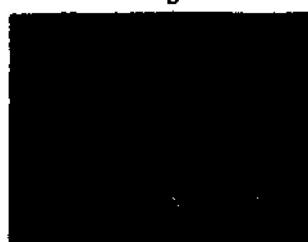
2V/DIV 10uSEC/DIV

TP-31, AC COUPLED



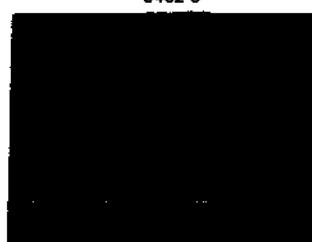
0.5V/DIV 100uSEC/DIV

B



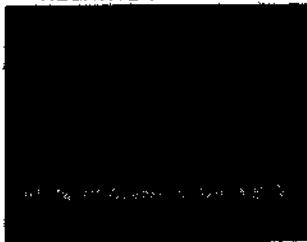
0.2V/DIV 20uSEC/DIV

J402-3



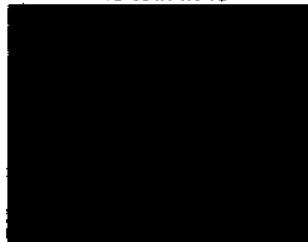
5V/DIV 10uSEC/DIV

NEGATIVE SIDE OF C303



1V/DIV 2mSEC/DIV

IC 301/PIN 13



1V/DIV 20uSEC/DIV

F



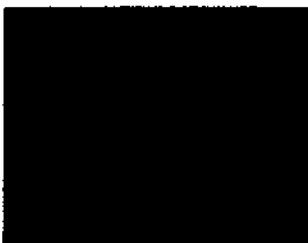
1V/DIV 2mSEC/DIV

IC 301/PIN 3



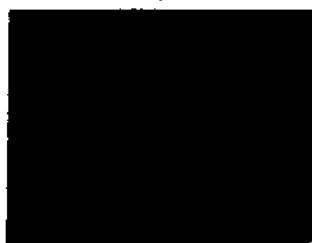
0.5V/DIV 5mSEC/DIV

IC 301/PIN 15



1V/DIV 10uSEC/DIV

F



1V/DIV 100uSEC/DIV

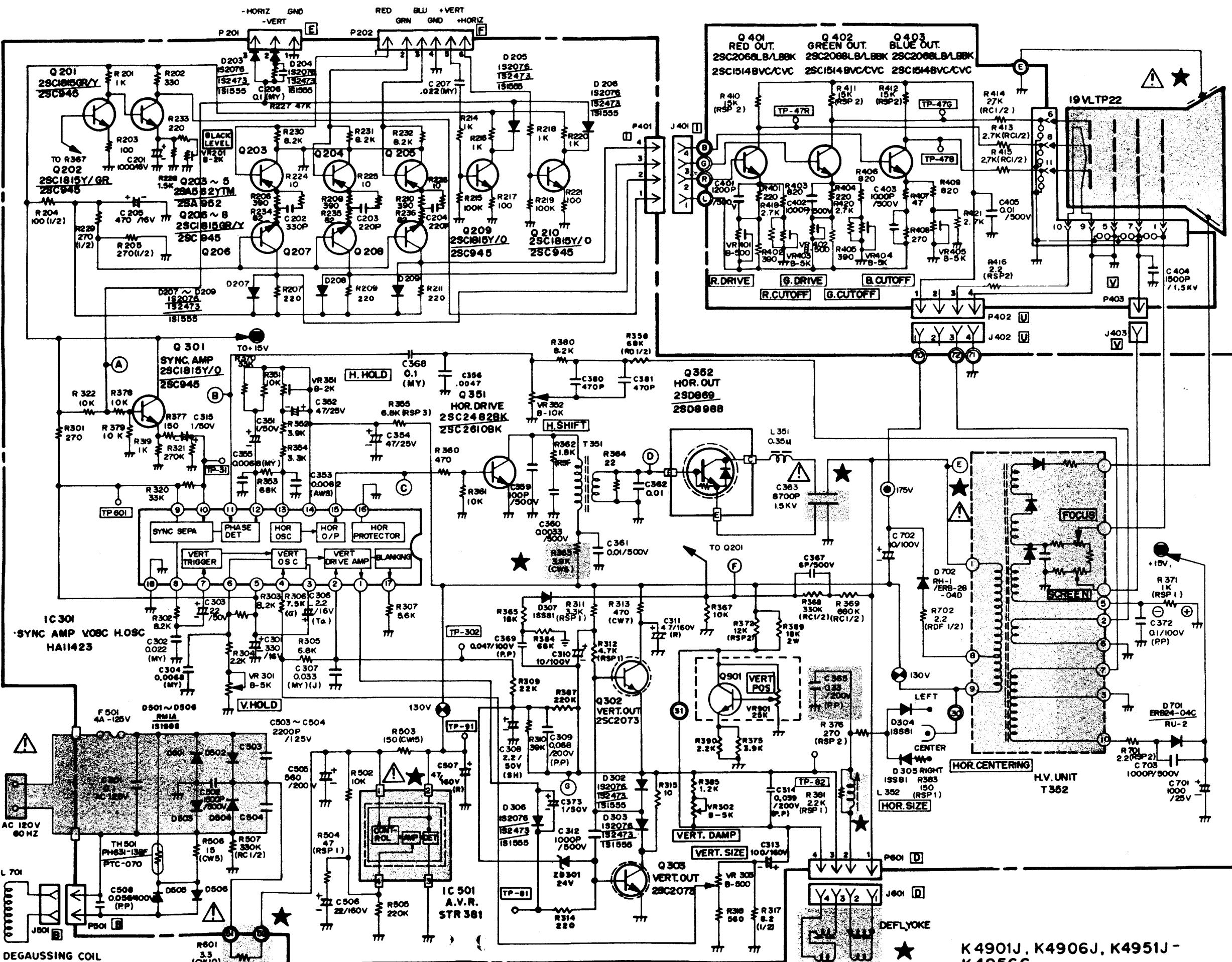
Power Supply Voltage and Symbols

Symbol	Voltage	Operating Circuit
●	15V	Vert. Osc. Sync Blanking CRT Cut-Off
●	130V	Horiz. Osc. Horiz. Drive Horiz. Output Vert. Output
●	175V	Video Output

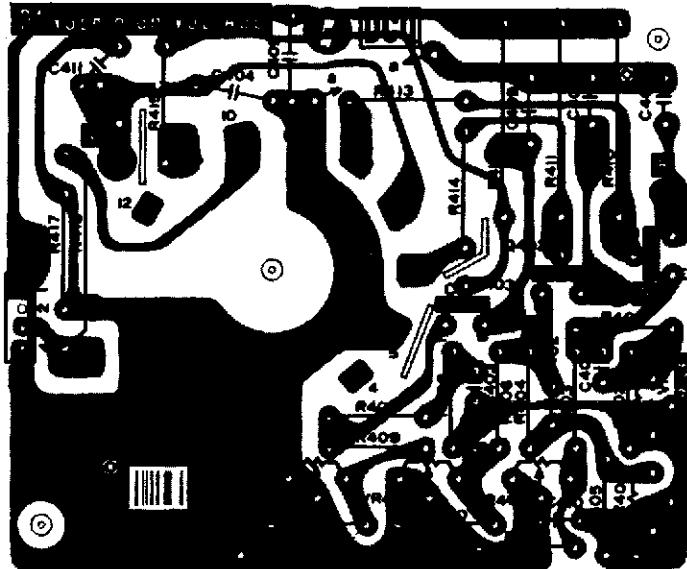
**CAUTION: FOR CONTINUED SAFETY,
REPLACE SAFETY CRITICAL COM-
ONENTS ONLY WITH MANUFAC-
TURER'S RECOMMENDED PARTS.**
**AVERTISSEMENT: POUR MAINTENIR
LE DEGRE DE SECURITE DE L'APPAREIL
NE REMPLACER LES COMPOSANTS
DONT LE FONCTIONNEMENT EST
CRITIQUE POUR LA SECURITE QUE PAR
DES PIECES RECOMMANDÉES PAR LE
FABRICANT.**

**SERVICE TECHNICIAN WARNING
X-RAY RADIATION PRECAUTION:**

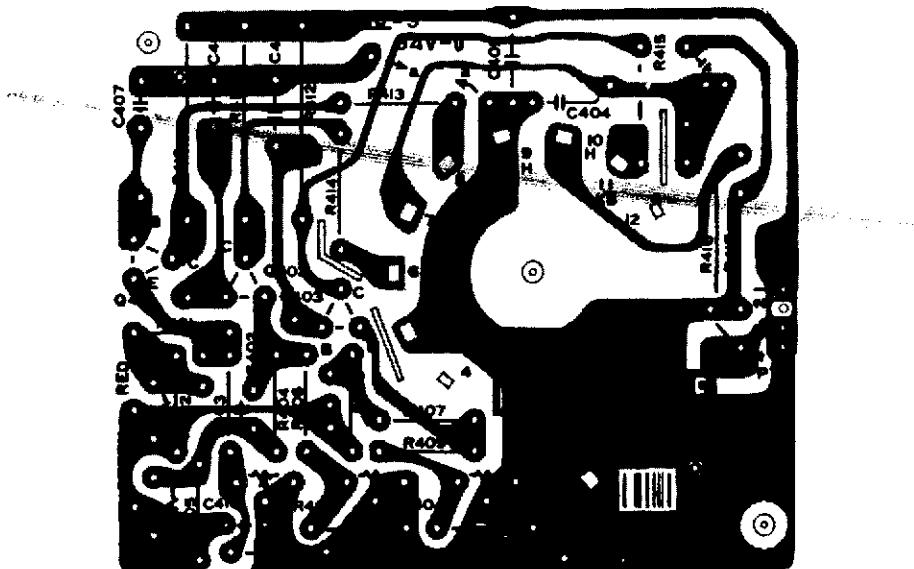
THIS PRODUCT CONTAINS CRITICAL
ELECTRICAL AND MECHANICAL PARTS
ESSENTIAL FOR X-RAY RADIATION
PROTECTION.
FOR REPLACEMENT PURPOSES, USE
ONLY TYPE PARTS SHOWN IN THE
PARTS LIST.



PC BOARD LAYOUT



VIEW OF COMPONENT SIDE



VIEW OF FOIL SIDE

FIGURE 12 NECK PC BOARD

PC BOARD LAYOUT

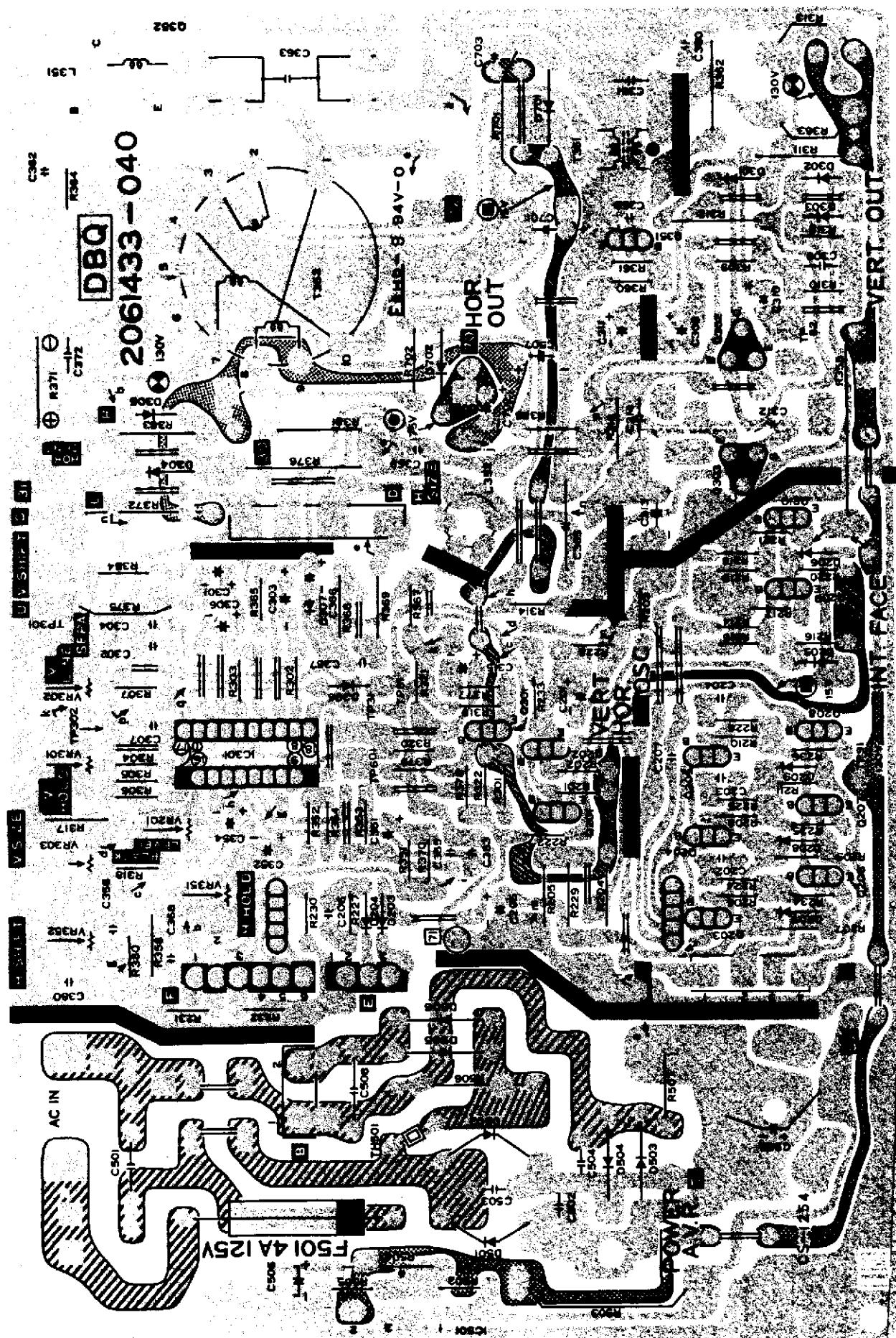
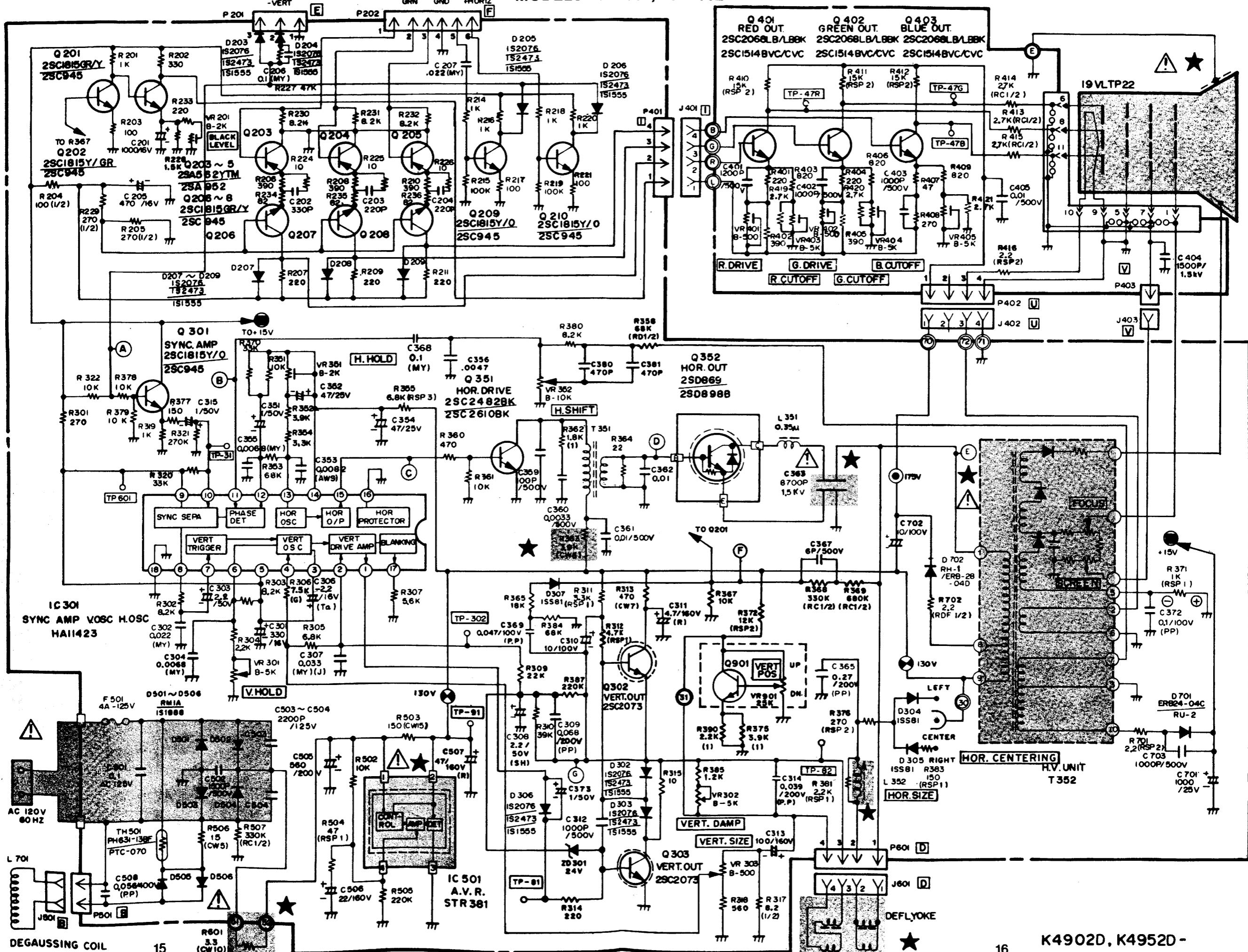


FIGURE 13 VIEW OF FOIL SIDE, MAIN PC BOARD

MODELS 19K4902, 19K4952



PC BOARD LAYOUT I

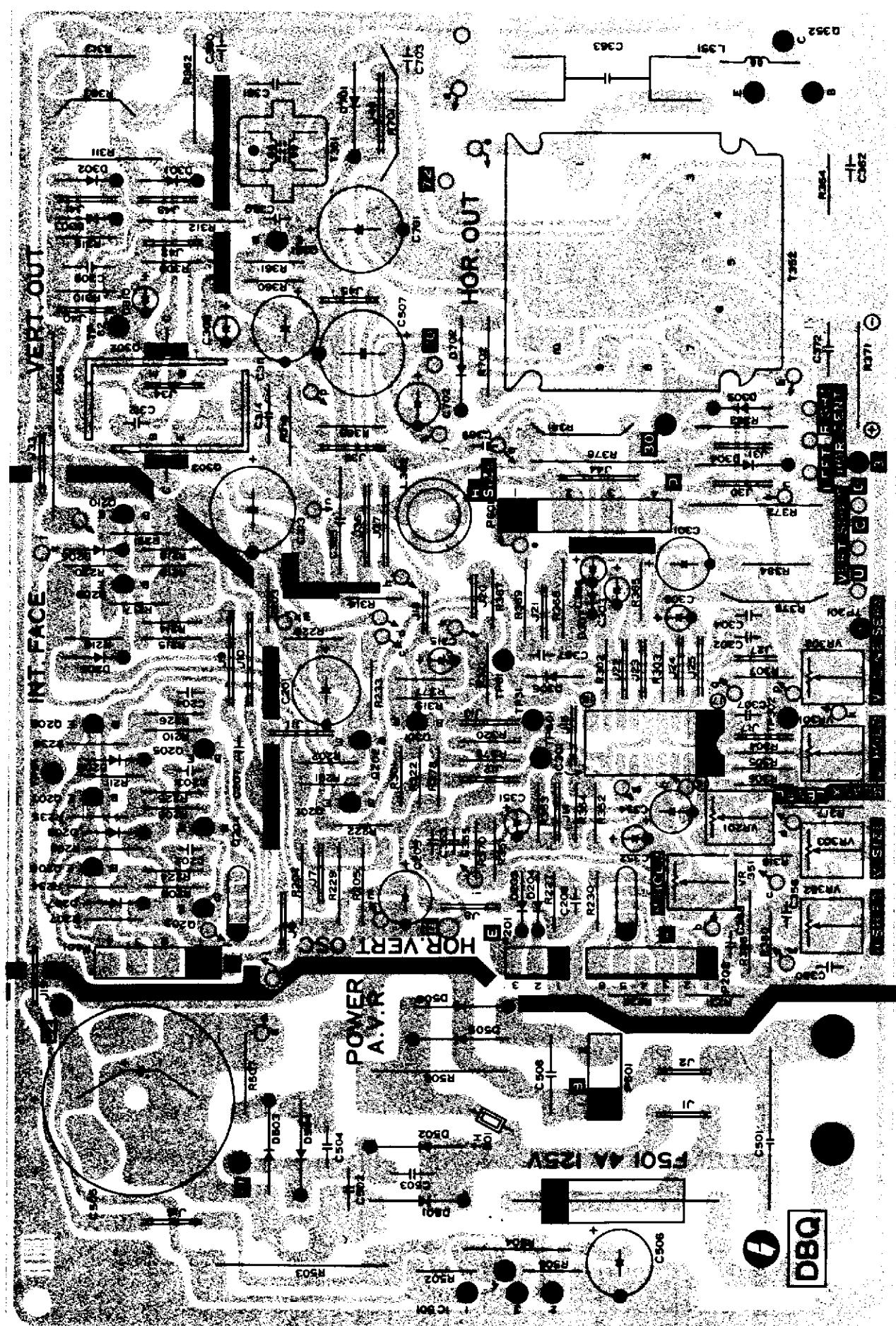
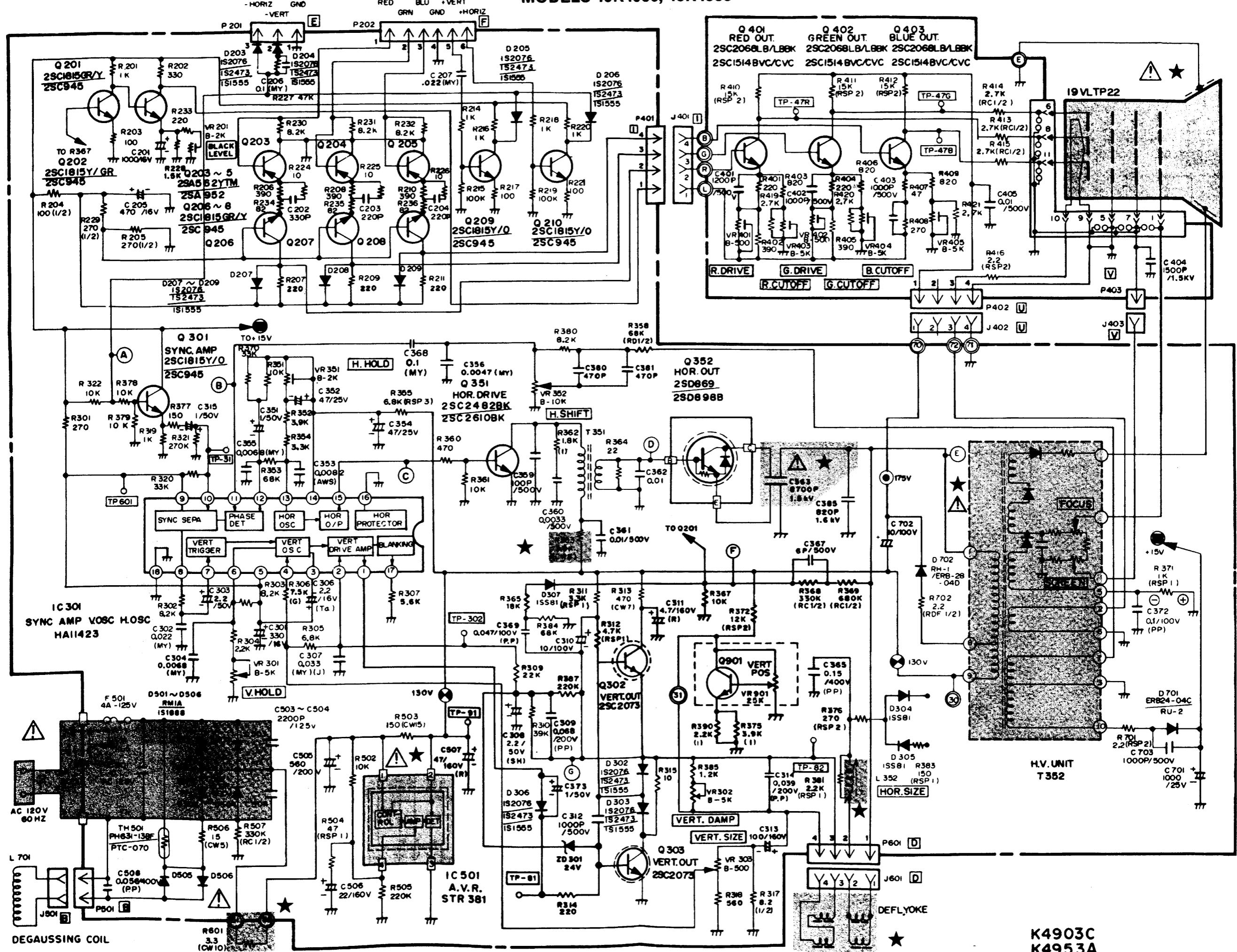


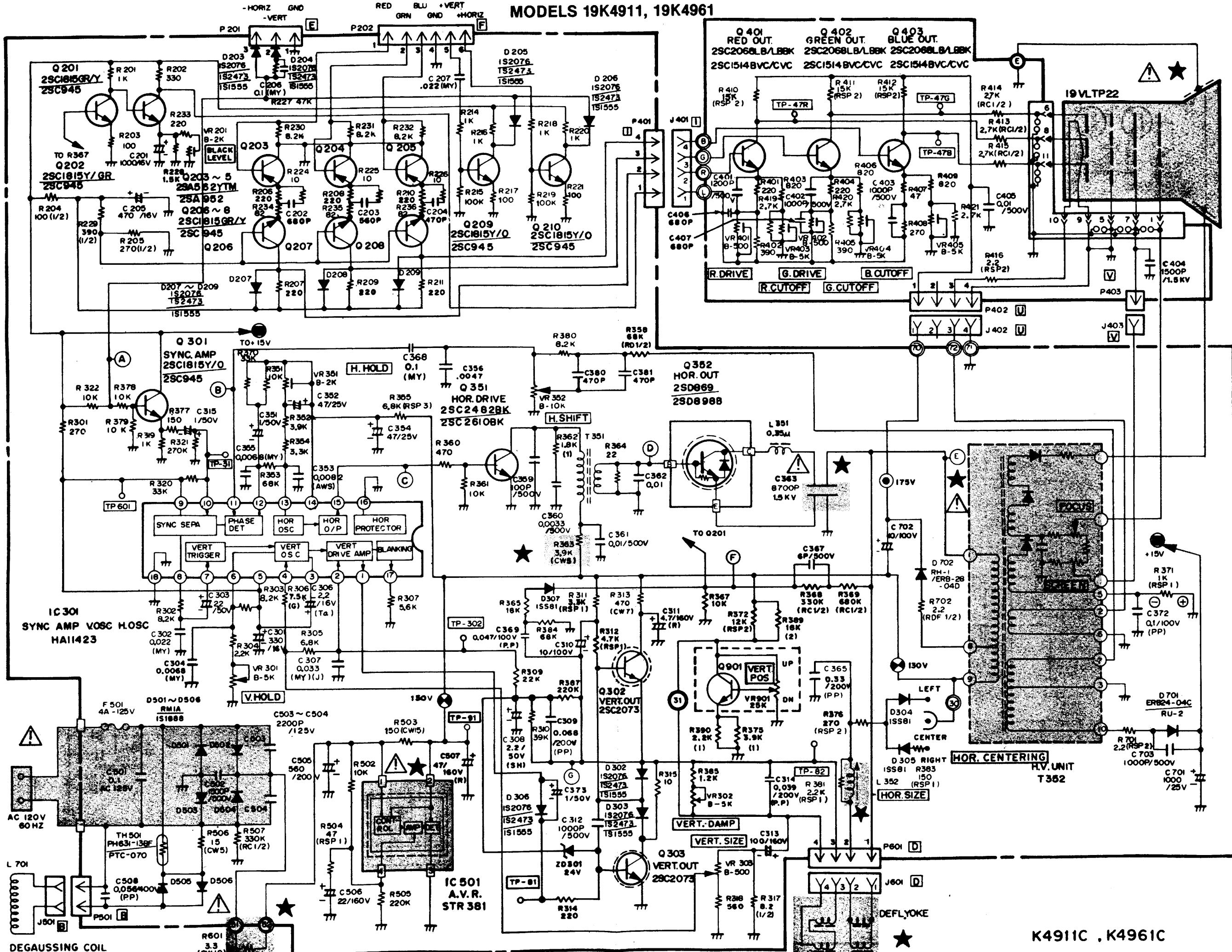
FIGURE 14 COMPONENT SIDE, MAIN PC BOARD

MODELS 19K4903, 19K4953



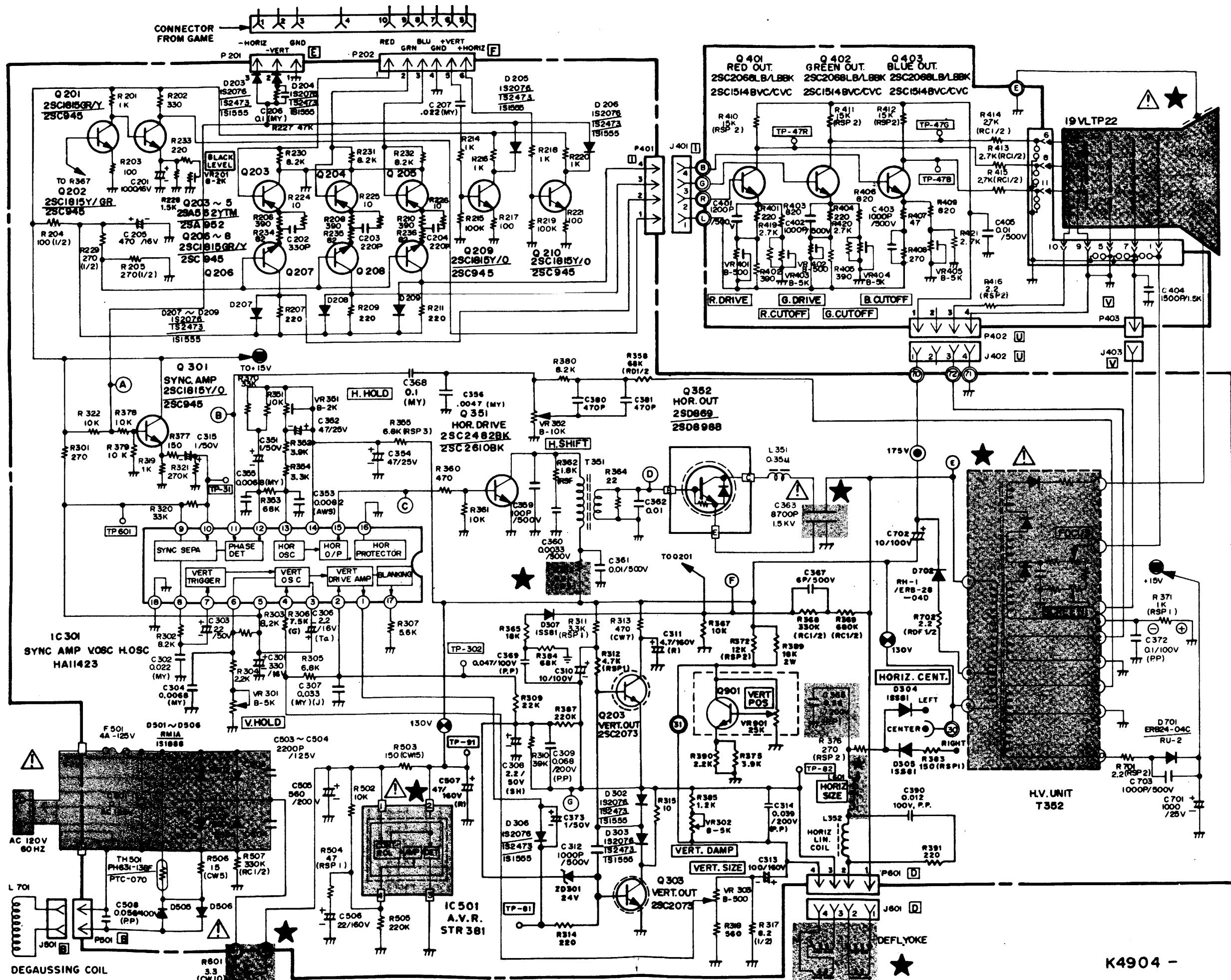
K4903C
K4953A

MODELS 19K4911, 19K4961



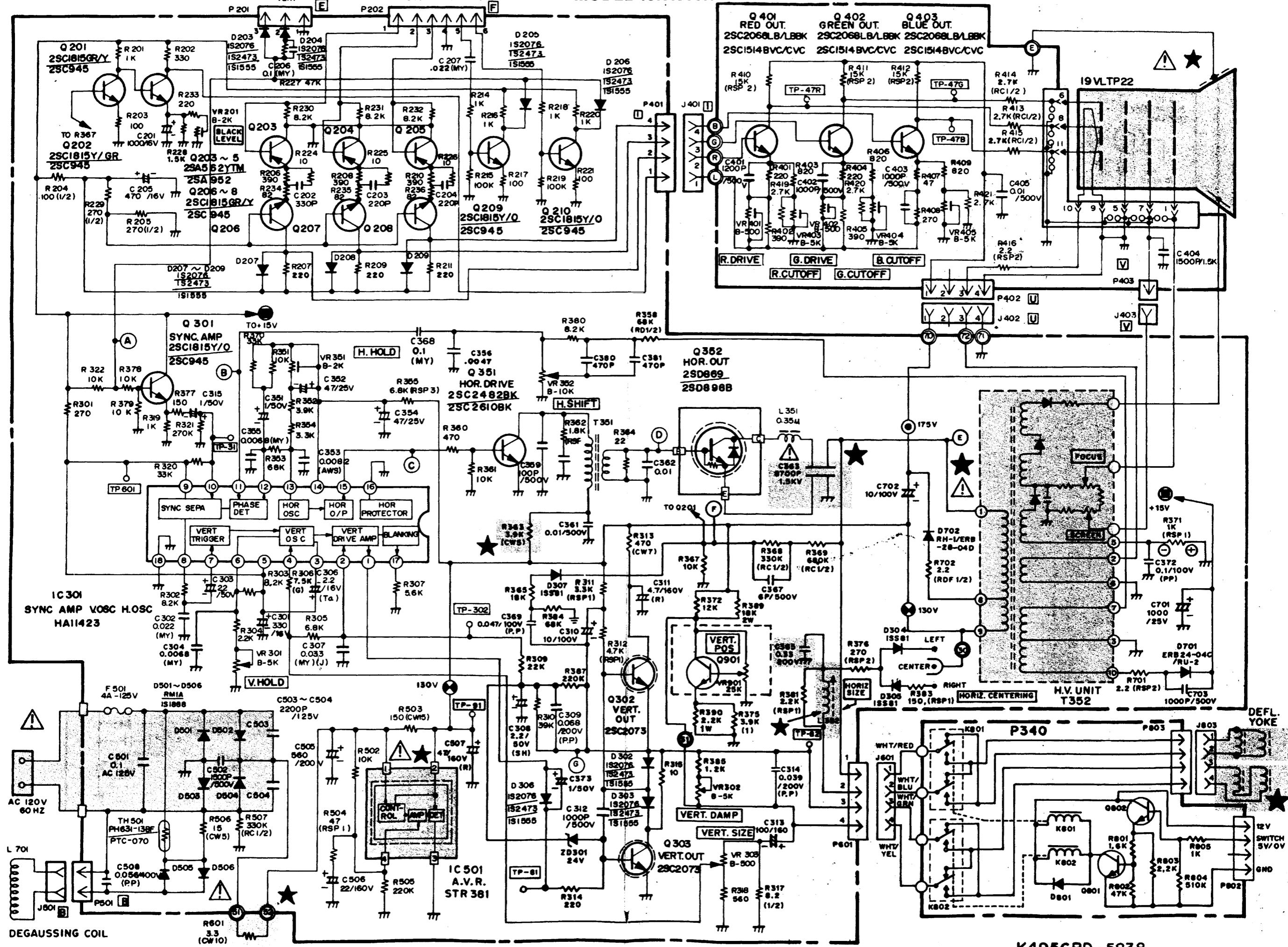
K4911C , K4961C

19" COLOR MONITOR SCHEMATIC DIAGRAM MODEL 19K4904



K4904 -

MODEL 19K4956R



TYPICAL DC VOLTAGES WITH INPUT SIGNAL

TRANSISTOR NO.	TERMINAL		
	COLLECTOR	BASE	EMITTER
Q201	8.1	0.43	0.36
Q202	9.8	8.1	9.3
Q203	0	0.35	1.0
Q204	0	0.35	1.0
Q205	0	0.35	1.0
Q206	9.7	5.5	4.8
Q207	9.7	5.5	4.8
Q208	9.7	5.5	4.8
Q209	15.4	-0.30	0.01
Q210	14.0	0.31	0.17
Q301	15.5	4.7	4.2
Q302	79	37.8	37.7
Q303	37	0.51	0
Q351	41.4	0.41	0
Q352	DO NOT MEASURE	-0.03	0
Q401	139	9.7	9.3
Q402	139	9.7	9.3
Q403	139	9.7	9.3

I.C. 301	
PIN NO.	VOLTAGE
1	1.16
2	4.0
3	6.8
4	3.9
5	12.1
6	4.1
7	4.1
8	1.9
9	12.2
10	14.2
11	3.6
12	7.9
13	6.8
14	12.8
15	1.52
16	0
17	0.83
18	0

I.C. 501	
PIN NO.	VOLTAGE
1	163
2	130
3	0
4	132

