

Radio Shack

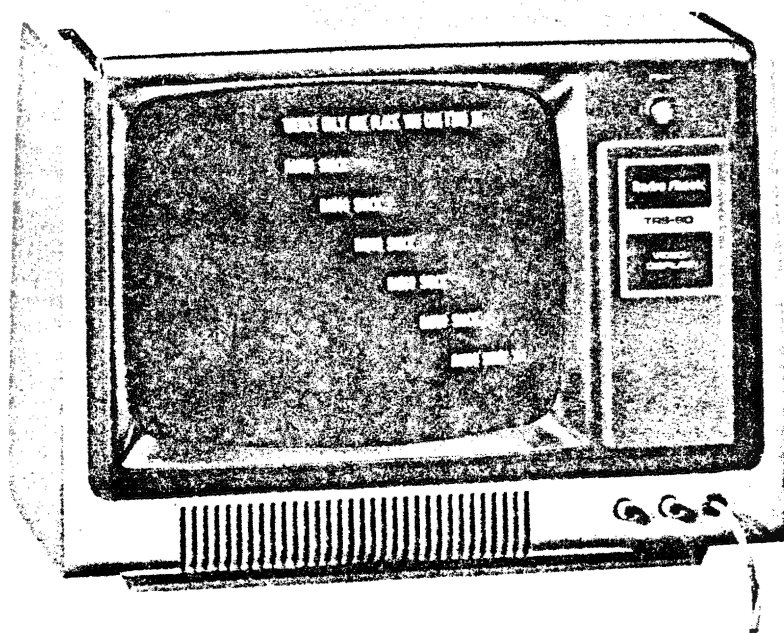
ADDENDUM


Service Manual

TRS-80 VIDEO DISPLAY

(KTR123S)

Catalog Number 26-1201



CUSTOM MANUFACTURED IN U.S.A. FOR RADIO SHACK  A DIVISION OF TANDY CORPORATION

INTRODUCTION

Radio Shack's TRS-80 Video Display consists of RCA's model AB123W Television set which has been modified for use in Radio Shack's TRS-80 Microcomputer System. Radio Shack's model number for the Display is KTR 123S. This manual contains complete service information for the TRS-80 Video Display (KTR123S only).

Sections of this manual are a direct pickup from RCA's Television Service Data, File 1977 B-2. Radio Shack has been granted permission to reproduce those sections of the manual by RCA Corporation, Consumer Electronics, 600 N. Sherman Drive, Indianapolis, IN 46201.

SPECIFICATIONS

Power Input 120 Volts AC, 60 Hz
Power Consumption 37 Watts at 120 VAC

SAFETY PRECAUTIONS

NOTE: Before servicing this chassis, read and follow these precautions and the "Product Safety Notes" in the REPLACEMENT PARTS section.

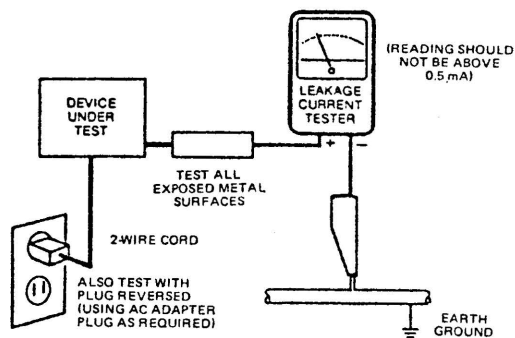
Before returning any instrument to the customer a safety check of the entire Video Display Monitor should be made. The service technician must be sure that no protective device built into the instrument by the manufacturer has become defective or inadvertently defeated during servicing.

1. Comply with all caution and safety related notes located on or inside the receiver cabinet and on the monitor chassis or picture tube.
2. **WARNING:** Alterations of the design or circuitry of this video display monitor should not be made. Any design alterations or additions such as, but not limited to, circuit modifications, auxiliary speaker jacks, switches, grounding, active or passive circuitry, etc may alter the safety characteristics of this instrument and potentially create a hazardous situation for the user. Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacturer of responsibility for personal injury or property damage resulting therefrom.
3. **HOT CHASSIS WARNING:** The chassis of some video display monitors are connected to one side of the AC supply. "Hot" chassis equipment in which the chassis is solidly connected to one side of the AC line cord may be serviced without using an isolation transformer if the power plug is inserted so that the chassis is connected to the grounded side of the AC supply. Check with an AC voltmeter to see if a potential exists between the chassis and a known earth ground. A zero or very low AC reading should be obtained. If a significant reading is obtained, reverse the power plug and recheck for a zero or low meter reading.
Some chassis have a secondary ground system in addition to the main chassis ground. The secondary ground is **NON-ISOLATED** in respect to the power line. The two ground systems are separated by insulating material which must not be defeated or altered in any way. Other chassis have an 85V RMS potential from chassis to earth ground, regardless of the polarity of the AC supply. Service on these types of chassis should only be

performed with an isolation transformer inserted in the power line between the receiver and the AC supply for protection of both personnel and test equipment.

4. Observe the original correct lead dress. Extra precaution should be taken to assure proper lead dress in the following areas: (a) near sharp edges. (b) that wire or components do not touch thermally hot parts. (c) AC supply area. (d) high voltage area. (e) video input wiring. (f) inspect for pinched, out-of-place, or damaged wiring in all areas.
5. Components that indicate evidence of overheating should be replaced.
6. **WARNING:** The picture tube in this monitor employs integral implosion protection. Replace with a tube of the same type number for continued safety. Do not remove, install or handle the picture tube in any manner unless shatterproof goggles are worn. People not so equipped should be kept away while picture tubes are handled. Keep picture tube away from the body while handling. On "In-Line" type picture tubes, the deflection yoke is an integral part of the picture tube and is permanently attached. Do not attempt to remove "permanently attached" yoke from CRT because of possible tube breakage and hazard to the servicer.
7. Protective shields are provided on this chassis for the protection of both the service technician and the customer. Protective shields removed for servicing convenience must be correctly re-installed and **ANY MISSING SHIELDS MUST BE REPLACED. DO NOT OPERATE THIS INSTRUMENT WITHOUT THE PROTECTIVE SHIELDS IN POSITION AND PROPERLY SECURED.**
8. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as: non-metallic control knobs, insulating fish papers, adjustment and compartment covers/shields, isolation resistor capacitor networks, etc.
9. **VIDEO INPUT COLD CHECK**
With the AC plug removed from the 120 VAC source, place a jumper across the two plug prongs. Turn the instrument AC switch on. Using an ohmmeter, connect one lead to the jumpered AC plug and touch the other lead to each exposed coaxial connector. The resistance measured should not be less than 20 megohms. Any resistance value below this range indicates an abnormality which requires corrective action. Repeat the test with the AC switch in the OFF position.
10. **LEAKAGE CURRENT HOT CHECK (ON COMPLETELY ASSEMBLED INSTRUMENT)**
Plug the AC line cord directly into a 120 VAC outlet (do not use an isolation transformer for this check). Use a Leakage Current Tester or a metering system which complies with American National Standards Institute (ANSI C101.1 "Leakage Current for Appliances") and Underwriters Laboratories (UL) 1410, (50.7). Measure for current with the AC switch "on" and repeat with the AC switch "off" from all exposed metal parts of the cabinet (plugs, jacks, handle bracket, metal cabinet, screwheads, metal overlays, control

shafts, etc.) to a known earth ground (waterpipe, conduit, etc); particularly any exposed metal part having a return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse plug in the AC outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND CORRECTIVE ACTION MUST BE TAKEN BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**



AC Leakage Test

11. X-RADIATION AND HIGH VOLTAGE LIMITS

The primary source of potential x-radiation in solid state video display monitors is the picture tube. The picture tube is specially constructed to prohibit x-radiation emissions. For continued x-radiation protection, the replacement tube must be the same type as the original. The shields and mounting hardware for picture tubes have an x-radiation protection function and

must be properly in place.

High voltage must be checked each time any service is required that involves B+, horizontal deflection or high voltage. Where used, x-radiation Protection Circuits (may also be referred to as horizontal disable or hold-down) must be checked for proper operation each time the x-radiation Protection Circuit is serviced. Refer to the Technician x-radiation warning note on the Chassis Schematic in the Basic Service Data and Instrument Labels for specific high voltage limits of each chassis and, where used, x-radiation Protection Circuits specifications.

High voltage is maintained within specified limits by the use of close tolerance safety related components and adjustments in the high voltage circuit. If high voltage exceeds specified limits, check each component specified on the chassis schematic diagram and take necessary corrective action.

12. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in television sets have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Data and its Supplements and Bulletins. Electrical components having such features are identified by shading on the schematics and by (*) on the Parts List in this Data and its Supplements and Bulletins. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the Parts List in this Data and its Supplements and Bulletins, may create shock, fire, or other hazards.

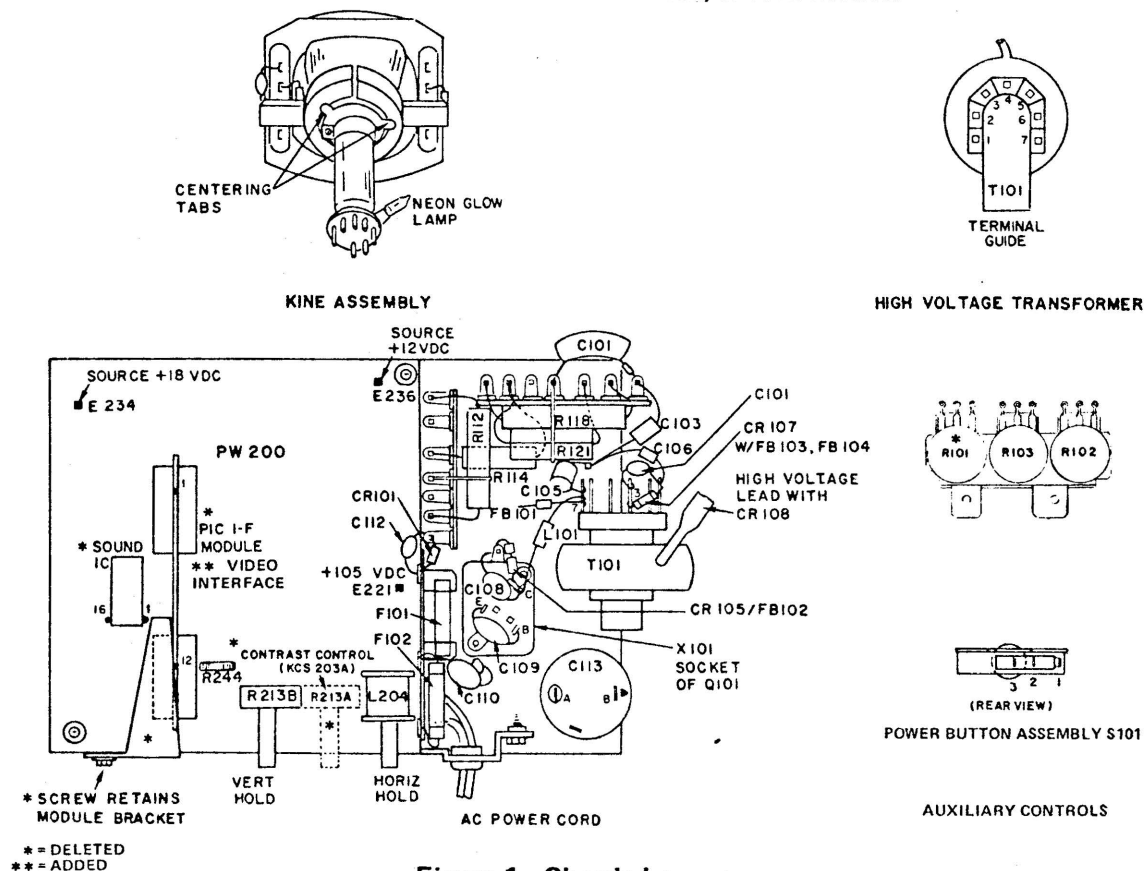


Figure 1. Chassis Layout

SERVICE INFORMATION

CHASSIS DESCRIPTION

The chassis assembly consists of discrete components mounted on a circuit board (PW200 — Figure 3) and one plug-in Video Interface module (Figure 4). High wattage resistors, a high voltage transformer and electrolytic capacitor, C113, are mounted on the chassis at the right side (Figure 1). The horizontal output transistor, Q101, is mounted on a heatsink at the bottom of the chassis (refer to Figure 1).

CIRCUIT PROTECTION DEVICES

Fuse		Physical Location
F101	1.0 A/250V clip-in	Terminal strip above
F102	5A/250V pig-tail	AC power (Figure 1)

Power is supplied from a half wave rectifier (CR101) and associated components C113A, B, R114 and R118 to operate the horizontal output stage and to start the horizontal oscillator and driver stages immediately when the set is turned on. All other power (12VDC and 18VDC) is derived from the secondary winding of the high voltage transformer (T101).

CAUTION

The wide blade of the polarized power plug is grounded to the chassis. Read "Safety Precautions" on page 2, paragraph 3, of this service data before servicing the chassis.

CENTERING

The picture is centered on the screen by rotating the two disc magnets (centering tabs) located on the neck of the picture tube directly behind the yoke (Figure 1). To view the left and right edge of the picture, reduce the AC line voltage using a variac transformer. To view the top and bottom edges of the picture, reduce height with the vertical size control (R244 — Figure 1). Rotate the two disc magnets either separately or together to center the picture on the screen. Restore AC line voltage and height to normal.

VERTICAL SIZE

Adjust AC line voltage to 108 VAC using a variac transformer. Adjust contrast, R102, and brightness, R103, controls (Figure 1) fully CW. Adjust vertical size control (R244 — Figure 1) until picture just fills the mask at top and bottom. Restore full AC line voltage. The picture should slightly overscan the mask at sides and at top and bottom.

HORIZONTAL HOLD CHECK

Pull-in — From either direction should be a minimum of three bars and a maximum of ten bars.

Range — When fully rotated in either direction the picture should fall out of sync when signal is interrupted.

Phase — Immediately after pull-in from either side, the picture should be within 1/4" of center.

INSTRUMENT DISASSEMBLY

Cabinet Rear Cover Removal — Disconnect the AC power cord. Remove five 1/4" hex head screws: two in the cabinet handle mold, one next to the AC power cord and two on the bottom of the cabinet. The rear cover is now free to be completely removed.

Power Switch and Control Brackets on Chassis — Remove two 1/4" hex head screws from each bracket.

DANGER

The 2nd anode lead on the picture tube's envelope supplies high voltage. Keep hands and test probes away from the left side of the picture tube while making voltage measurements. Always discharge the 2nd anode lead to the chassis before inserting or extracting the Video Interface board. The picture tube may hold a charge for a long time. **Remember — always discharge!**

Chassis Removal (Figure 2) — Remove one 1/4" hex head screw at left side of chassis to disconnect ground (black) lead. Disconnect high voltage lead from picture tube and leads from speaker. Remove the 3/16" hex head/slot head from the yoke clamp. Remove two 1/4" hex head screws from the bottom of chassis frame. Pull off the kine cap and slide chassis back (yoke leads are soldered to chassis). The yoke must be removed with the chassis.

Remove Module from Chassis — Remove the module; if the module is to be replaced, unsolder the bracket from the module and retain bracket for use with replacement module.

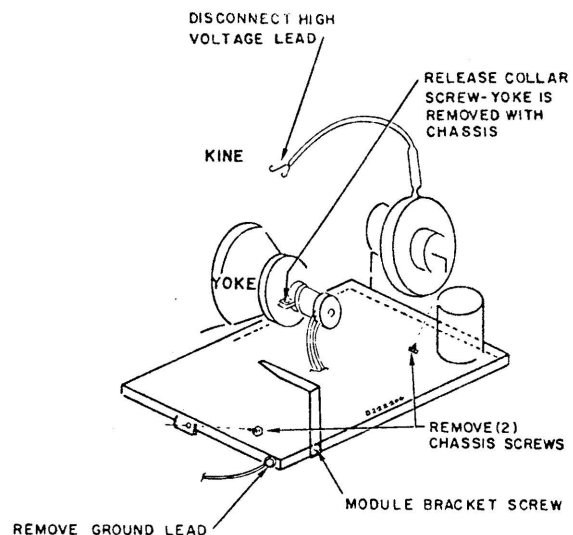


Figure 2. Disassembly

VIDEO INTERFACE

The Video Interface Board has two main purposes. First, it supplies a convenient method of providing video from the computer to the Video Display. Second, it isolates the hot chassis in the Display from the computer ground. The isolating function is performed by Z1, a high-speed optical isolator.

TROUBLESHOOTING THE VIDEO INTERFACE BOARD

All voltages, shown enclosed in circles on the Video Interface Schematic (Figure 5), are measured with the Video Display plugged into an Isolation Transformer, the computer

connected and R1 shorted. Remember — there are two commons for each side of Z1. Be sure you have selected the proper common points or your readings will be wrong. All voltages are measured with a Digital Voltmeter having an input impedance of 10 megohms.

All waveform measurements are made with R1 not shorted to ground. Be sure to use an Isolation Transformer and use the proper common for the Oscilloscope. The waveforms should be present when the word "READY" appears on the Video Display.

SERVICE CHECK CHART

Symptoms	Probable Cause
Set inoperative	AC supply to set (wall plug) F101 open R112 open C113 shorted
No brightness	CR108 L202 open Q101 T101
No raster No kine heater voltage	Horizontal system dead Q212 horizontal driver transistor Q211 horizontal oscillator transistor L204 horizontal hold control open L205 horizontal driver transformer open Filter C270 shorted
Brightness — none or intermittent	Q202 video output transistor
Raster — narrow	T101 high voltage transformer C105 open
Fold over — horizontal, left side	CR106 damper open
Vertical deflection — none	R213B vertical hold control R254 open
Vertical sync. — weak or none	C235 open

CRITICAL LEAD DRESS

GENERAL PRACTICE

All components, leads and mechanical parts listed below are related to safety. When replacing components, wiring, spacers, etc., observe original lead length and spacing. Replace all components, leads, wire ties and cable clamps exactly as in the original circuit. Also refer to "SAFETY PRECAUTIONS" on page 2 of this service data.

When replacing flame proof, power or high wattage (over 1 watt) resistors, keep body of resistor a minimum of 1/8" (or more where specified below) away from terminal board. Dress all leads away from these types of resistors.

AC wiring connections should be inspected for solder splash, teardrop solder and frayed ends. Wire ends protruding from connection should not be more than 1/16" long. Make sure no "near short" condition exists.

Seat all modules firmly with retainers in place.

Dress leads away from any rotating parts, such as function switch S-7.

VHF TUNER AND I-F MODULE

1. I-F module (MAF) is to be seated firmly in connector and held in place by a retainer bracket.
2. VHF Tuner — dress C91 down toward tuner and away from antenna filter.
3. Dress all leads away from UHF/VHF splitter assembly.

CHASSIS

1. Neon glow lamp — dress lamp (on kine socket) toward front and close to neck of kine to give clearance for back cover.

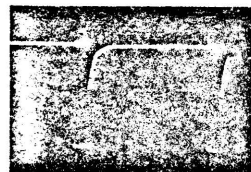
2. Wires or components should not touch body of flame-proof or power resistors.
3. AC power cord — dress through strain relief. The power cord in front of the strain relief should be 3-1/2" long.
4. C113 — terminal "A" of this electrolytic is to be covered with heat shrink.
5. Leads of power resistors R112, R114, R118 and R121 should be dressed through both holes of their respective terminal strips and soldered at both holes. These resistors should be 1/8" away from terminal strips and dressed away from each other.
6. R118 — not to be more than 1-1/2" from chassis to top of resistor.
7. CR106, C108 and C109 — leads to be kept as short as possible.
8. C105 — dress body of capacitor against terminal of T101 and away from frame of T101.
9. C103 and C106 — dress away from frame of T101.
10. L101 — dress away from tire of T101.
11. C101 — dress away from R118.

HIGH VOLTAGE

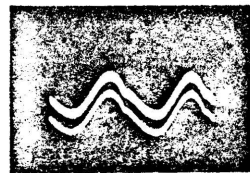
1. Dress high voltage stick rectifier directly to high voltage anode button connection with any excess lead on the anode end looped toward top of kine. High voltage lead must not touch cabinet.
2. Dress all leads and components away from tire of high voltage transformer (T101).

PW200 COMPONENT
LOCATION GUIDE

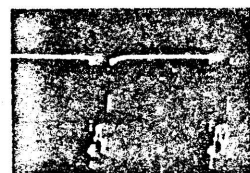
C1	2-C	R7	1-C
C2	2-C	R8	1-C
C3	1-C	R9	1-A
C4	1-C	R10	2-C
C5	1-C	R13A	3-D
C6	1-C	R13B	3-D
C8	1-C	R14	1-D
C9	2-A	R15	2-D
C10	2-A	R16	2-D
C11	1-C	R17	1-D
C12	1-C	R18	2-D
C13	1-C	R19	1-D
C14	1-B	R20	1-D
C15	2-C	R23	4-A
C16	2-B	R24	4-A
C17	2-C	R25	3-B
C18	1-D	R28	2-C
C22	2-D	R29	2-C
C23	2-D	R30	2-B
C24	1-D	R31	2-B
C25	3-B	R32	2-B
C26	4-C	R34	2-A
C27	4-A	R35	3-D
C29	3-B	R36	3-C
C33	2-C	R37	3-D
C34	2-C	R38	2-C
C35	2-C	R39	3-C
C38	3-C	R40	3-B
C39	3-B	R41	2-C
C40	2-C	R42	3-D
C41	3-D	R43	3-D
C42	3-C	R44	2-D
C43	3-C	R45	3-C
C44	2-A	R46	3-C
C45	3-B	R47	3-C
C48	3-A	R48	3-B
C49	3-B	R49	4-C
C50	2-A	R50	3-C
C56	2-D	R51	3-B
C57	2-C	R52	3-C
C59	3-A	R53	3-D
C60	3-B	R54	4-D
C61	3-A	R55	3-C
C62	3-A	R59	3-B
C63	4-B	R60	3-B
C64	4-B	R61	1-A
C65	4-D	R62	1-A
C66	4-C	R64	3-A
C68	4-C	R65	3-A
C69	4-B	R66	3-B
C70	4-A	R67	3-A
		R68	4-B
		R69	4-B
CR1	1-B	R70	4-C
CR2	2-B	R71	4-C
CR4	3-B	R72	4-C
CR6	3-C	R73	4-C
CR7	4-C	R74	4-D
CR8	3-C	R75	4-C
CR9	3-A	R76	4-B
CR10	3-B	R77	4-B
CR12	3-A	R78	4-A
CR13	3-A	R79	4-A
CR14	2-A	R80	4-A
CR17	3-A		
CR18	3-B		
CR19	4-A	T1	1-C
CR20	4-A		
STAKES			
FB1	3-A	E1	1-C
FB4	4-B	E2	1-C
FB5	4-B	E3	2-A
FB6	4-A	E4	1-D
FB7	4-A	E5	1-D
		E6	2-D
L1	1-B	E7	1-B
L2	1-D	E13	1-D
L3	2-D	E14	2-D
L4	4-D	E15	1-D
L5	4-B	E16	2-D
		E17	3-A
		E18	3-A
Q1	2-B	E21	4-C
Q2	2-D	E22	4-C
Q3	2-B	E23	3-B
Q4	3-C	E26	2-A
Q5	3-C	E27	3-C
Q6	3-C	E28	4-B
Q7	3-B	E30	3-A
Q8	3-B	E31	2-A
Q9	4-D	E32	3-A
Q11	4-C	E33	1-A
Q12	4-B	E34	1-A
		E35	1-A
R1	1-A	E36	4-A
R2	1-B	E37	4-B
R3	1-B	E38	4-B
R5	1-C	E39	4-A
R6	1-C	E40	1-B



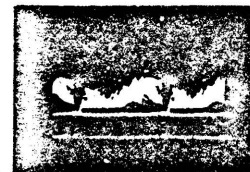
7B 20V P-P HORIZ RATE
SYNC OUTPUT



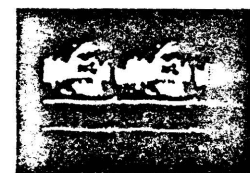
17 1V P-P VERT RATE
SOURCE B +18V DC



3 74V P-P AGC
PULSE HORIZ RATE



2 2V P-P SOUND
(4.5MHz)
VERT RATE



1 2V P-P VIDEO
VERT RATE



4 60V P-P VIDEO DRIVE TO
KINE CONTRAST MAX VERT RATE

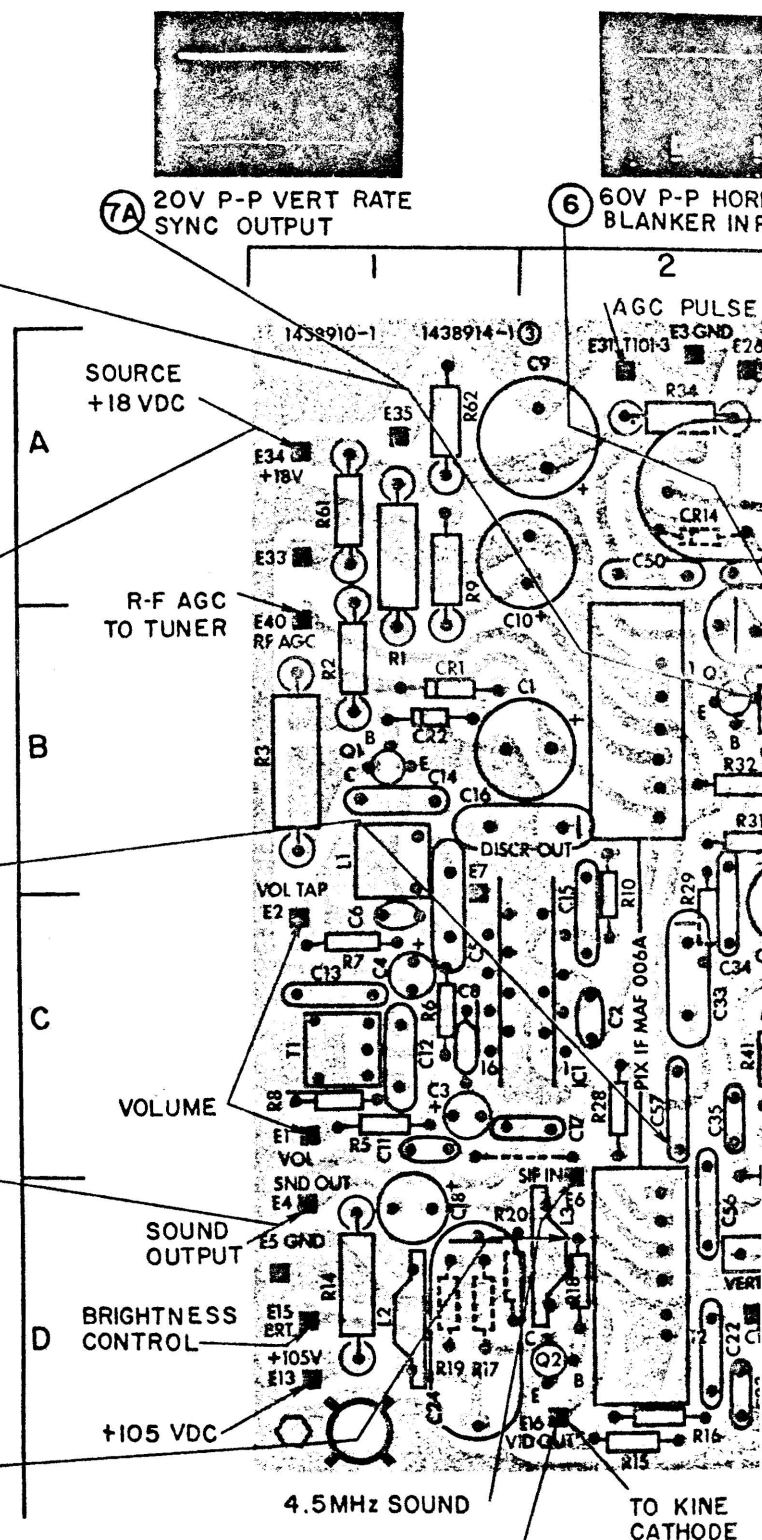
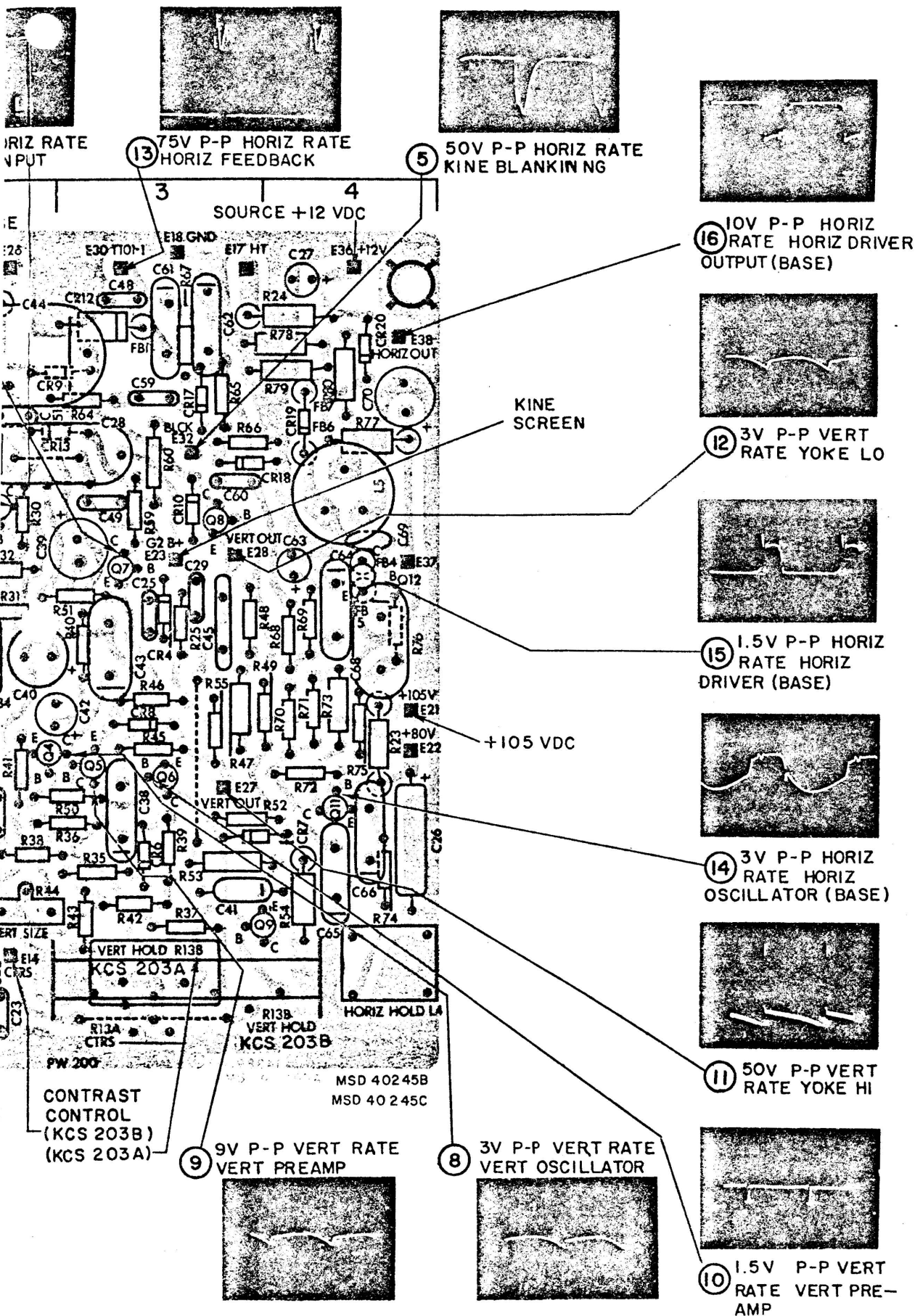
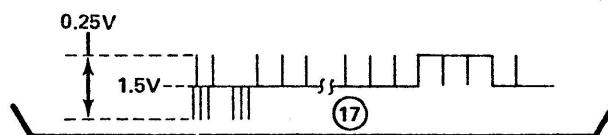


Figure 3. Component I





NOTES

1. RESISTOR VALUES ARE IN OHMS K = 1000
2. CAPACITOR VALUES GREATER THAN 1.0 ARE IN μ F THOSE 1.0 AND LESS ARE IN MFD. UNLESS OTHERWISE DESIGNATED
3. VOLTAGES MEASURED WITH RESPECT TO \pm UNLESS A "VOLTOMYST" NO SIGNAL CONDITION, AND SHOULD HOLD WITHIN $\pm 20\%$
4. ALL RESISTORS ARE 1/4 WATT, EXCEPT WHERE OTHERWISE INDICATED
- * INDICATES GROUND
- INDICATES 5% TOLERANCE
- INDICATES 2% TOLERANCE
- INDICATES 1% TOLERANCE
- () RELATES TO ZONING ON PERIMETER OF DRAWING
- () VOLTAGES MEASURED WITH SIGNAL

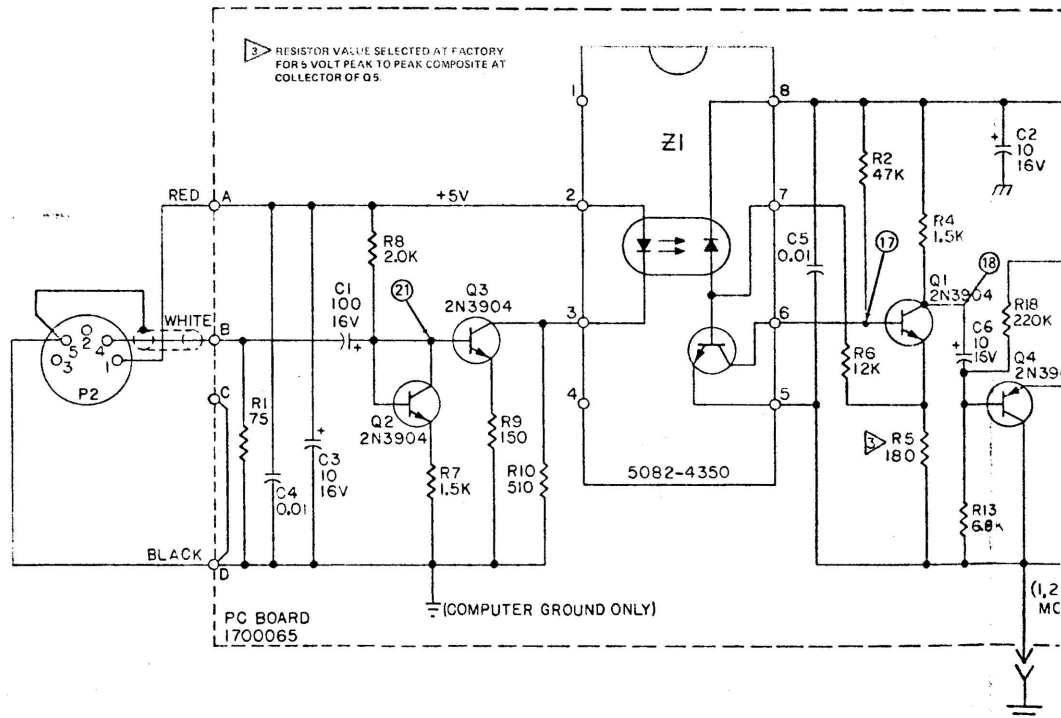
PRODUCT SAFETY NOTE

SHADED COMPONENTS HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS READ CAREFULLY THE PRODUCT SAFETY NOTICE ON PAGE 2 OF THIS SERVICE DATA. DON'T DEGRADE THE SAFETY OF THE SET THROUGH IMPROPER SERVICING.

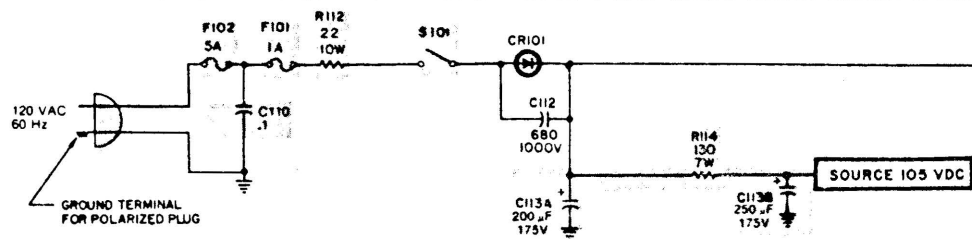
TECHNICIAN X-RADIATION WARNING - KCS 201

THIS TV CONTAINS CRITICAL PARTS TO PROTECT AGAINST X-RADIATION. NOMINAL 2ND ANODE VOLTAGE IS 13.0kV AT 120VAC AND MUST NOT EXCEED 18.0kV UNDER ANY VIEWABLE CONDITION. TO MEASURE—SET BRIGHTNESS FOR VERY DIM PICTURE—USE A HIGH IMPEDANCE METER. CONNECT (—) TO CHASSIS GROUND AND (+) TO 2ND ANODE.

THIS INSTRUMENT CONTAINS NO HIGH VOLTAGE ADJUSTMENT. SEE SERVICE DATA FOR REPLACEMENT PARTS AND INFORMATION. CAUTION: RESETTNG WIDTH MAY AFFECT HIGH VOLTAGE.



WARNING
-SHOCK HAZARD-
USE ISOLATION TRANSFORMER
WHEN SERVICING



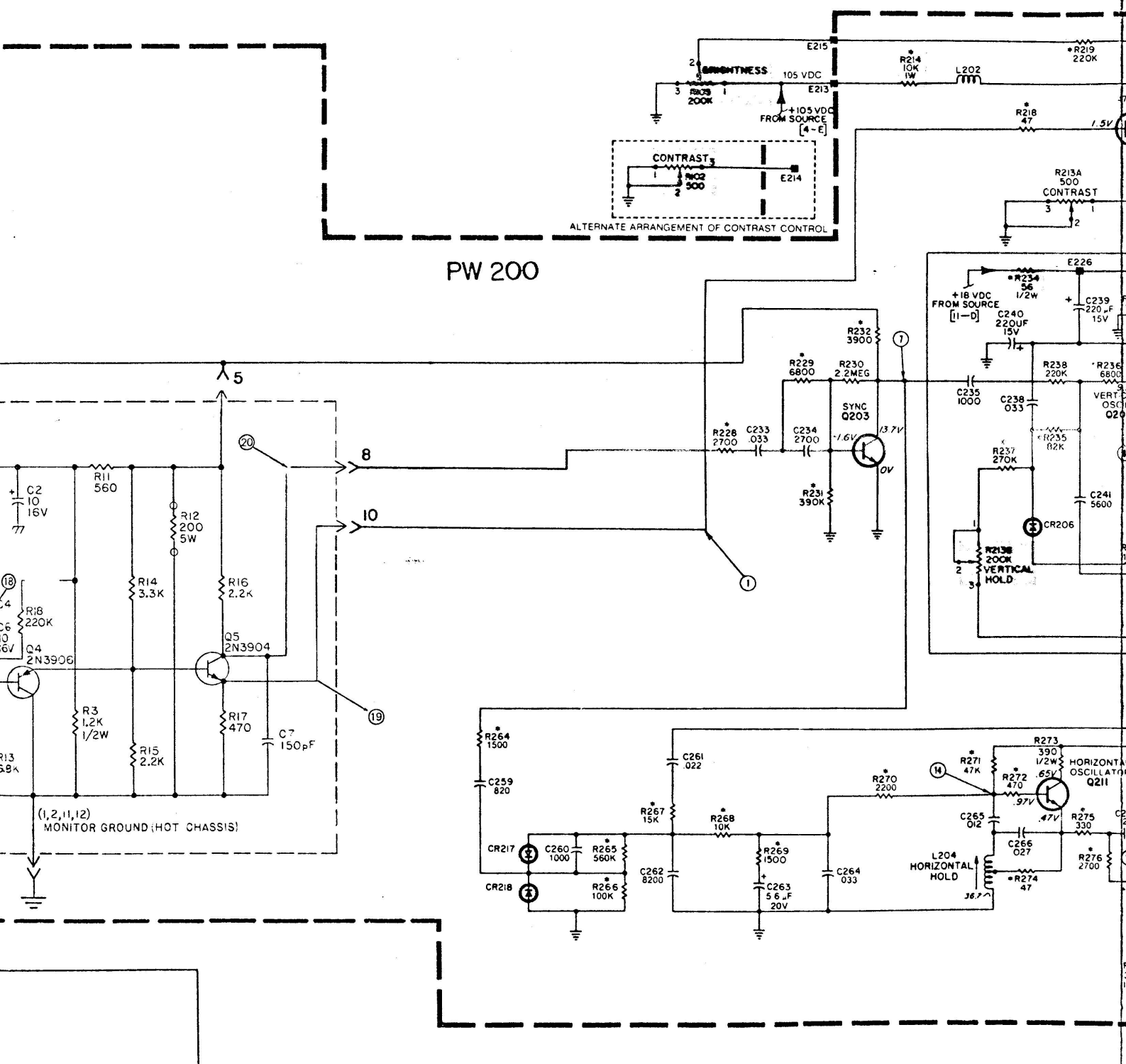
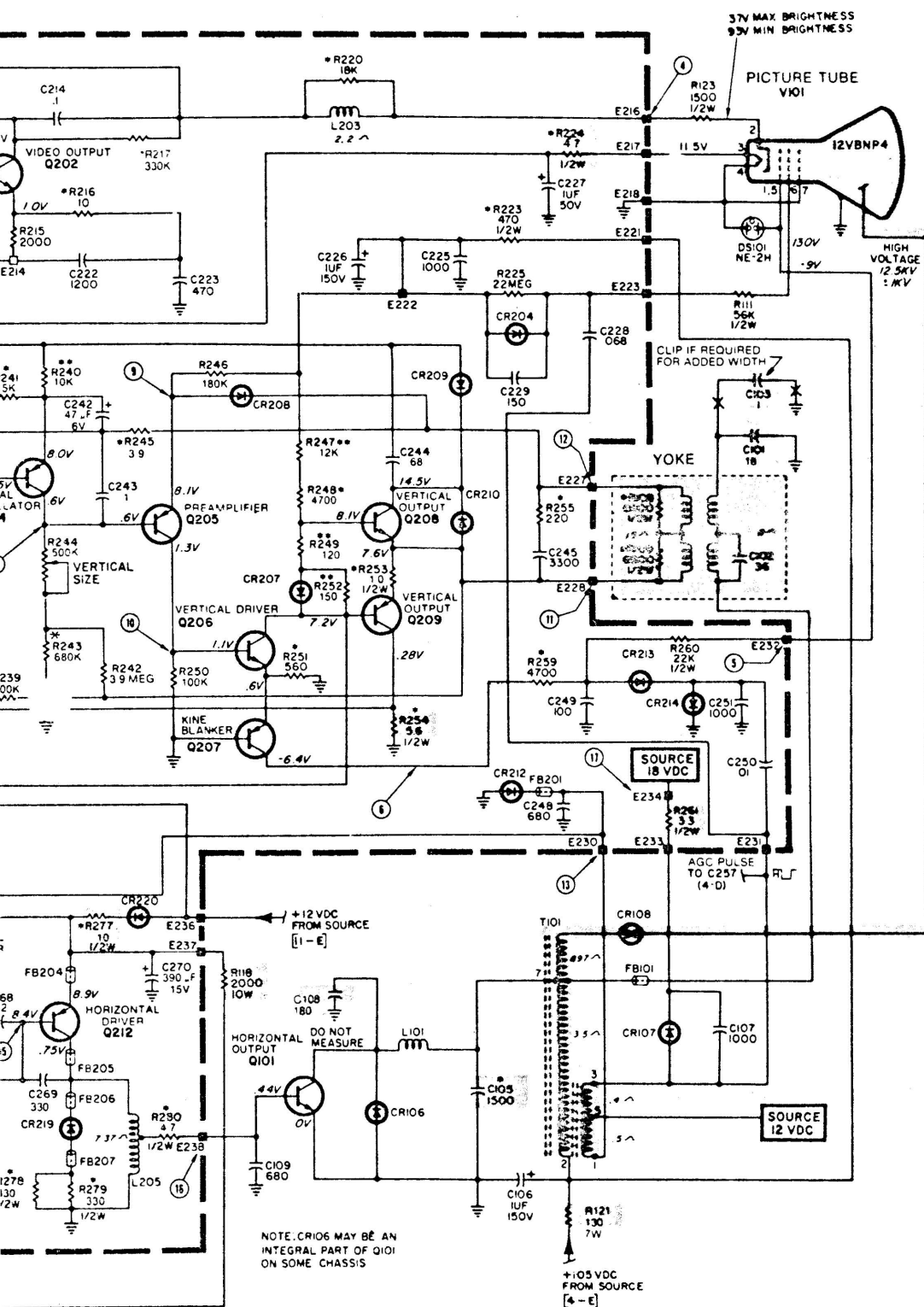


Figure 5. Video Display Schematic



REPLACEMENT PARTS

WARRANTY STATUS OF ASSEMBLIES AND PARTS

† Eligible for warranty exchange for new or rebuilt unit.

‡ Complete assembly eligible for warranty replacement with new or rebuilt unit.

All other parts except cabinet parts are eligible for warranty replacement as discrete components. Cabinet parts must have prior approval of RCA for warranty replacement.

Warranty status of assemblies and parts is subject to change without notice.

PRODUCT SAFETY NOTE — Components marked with a (*) have special characteristics important to safety. Before replacing any of these components, read carefully the **PRODUCT SAFETY NOTICE** on page 2 of the Basic Service Data. Don't degrade the safety of the set through improper servicing.

Symbol No.	Stock No.	Drawing No.	Description	Symbol No.	Stock No.	Drawing No.	Description
CHASSIS ASSEMBLY				133540	147682-9		Socket — for Q101
KCS203W				143036	1465916-506		Socket — kine
				137746	1446251-1		Spring — clip module
				143045	1463734-503		★Yoke — deflection
CAPACITORS				PW200			
C101	139318	973991-78	★				
C102	142023	942966-224	★				
C103	242290	973991-75	★	PW200	143035	1458929-502	●Circuit — complete
C105	141496	1479864-16	★	CAPACITORS			
C106	239742	984655-38	1 μ F 150V electrolytic	C209	141432	1446668-661	470 μ F 25V electrolytic
C107	77252	942545-13	1000 pF GMV 500V Z5U disc	C210	141029	1446668-361	270 μ F electrolytic
C108	143029	945304-154	★	C222	102230	1420193-59	470 pF 10% 500V Z5P disc
C109	104135	945304-11	680 pF 10% 500V Z5P disc	C223	139199	1420193-51	100 pF 10% 500V Z5P disc
C110	133343	142487-225	★	C224	137088	973999-75	0.1 μ F 10% 200V film
C112	113165	945304-111	680 pF 20% 1kV Z5P disc	C225	120832	1420193-13	1000 pF 20% 500V Z5P disc
C113	140969	972187-65	★2 section electrolytic	C226	228181	984655-38	1 μ F 150V electrolytic
CR101	141489	99203-6	Diode — silicone	C227	139378	1446665-181	1 μ F 50V electrolytic
CR106	140972	1476171-34	Diode — silicone	C228	133058	973999-23	0.068 μ F 20% 200V film
CR107	138173	1476171-31	Diode — silicone	C229	103852	1420193-3	150 pF 20% 500V Z5P disc
CR108	140955	1465914-501	Diode — part of T101, high voltage transformer	C233	134778	1472442-69	0.033 μ F 10% 100V film
DS101	122608	1442539-4	Lamp — neon (on kine socket)	C234	104131	1420193-68	2700 pF 10% 500V Z5P disc
F101	426973	990157-8	★Fuse	C235	120832	1420193-63	1000 pF 20% 500V Z5P disc
F102	99328	985994-9	★Fuse	C238	134778	1472442-69	0.033 μ F 10% 100V film
FB101	138013	1443391-8	Bead — ferrite	C239	139285	1446668-241	220 μ F 15V electrolytic
FB102	128456	1443391-6	Bead — ferrite	C240	139285	1446668-241	220 μ F 15V electrolytic
FB103	119971	1443391-2	Bead — ferrite	C241	133398	1449092-112	5600 pF 10% 50V film
FB104	119971	1443391-2	Bead — ferrite	C242	137331	1446657-321	47 μ F 6V electrolytic
L101	143038	1478663-502	Coil — bead choke	C243	139444	1472442-75	0.1 μ F 10% 100V film
Q101	140976	1490008-1	Transistor — 7366-1, horizontal output	C244	127167	1442134-56	0.68 μ F 10% 75V film
RESISTORS				C245	104205	1420193-69	3300 pF 10% 500V Z5P disc
R102	140980	1472242-43	★Control contrast	C248	104135	1420193-61	680 pF 10% 500V Z5P disc
R103	140711	1472242-40	★Control brightness	C249	139199	1420193-51	100 pF 10% 500V Z5P disc
R108	830310	993151-249	★	C250	137654	945354-21	0.01 μ F 20% 200V Z5U disc
R109	134390	993151-249	★	C251	—	—	1000 pF
R111	—	—	56K, 1/2 Watt	C256	121671	1420193-17	2200 pF 20% 500V Z5P disc
R112	143030	945312-109	★	C257	121671	1420193-17	2200 pF 20% 500V Z5P disc
R114	209895	945311-128	★	C259	131764	1420193-12	820 pF 20% 500V Z5P disc
R118	249398	945312-157	★	C260	120832	1420193-63	1000 pF 20% 500V Z5P disc
R121	209895	945311-128	★	C261	135048	1472442-67	0.022 μ F 10% 200V film
R123	—	—	1500 ohm, 1/2 Watt	C262	126826	1472442-62	8200 pF 10% 200V gim
S101	142639	1438740-3	★Switch — On/Off	C263	141028	1446666-151	5.6 μ F 20V electrolytic
T101	140995	1465914-501	★Transformer — high voltage with CR108	C264	134778	1472442-69	0.033 μ F 10% 100V film
	141006	1478642-1	★Bracket — power input	C265	138743	1472442-64	0.12 μ F 10% 200V film
	142453	1461964-11	★Cable — AC power	C266	126343	1472442-68	0.027 μ F 10% 100V film
	137748	1442970-6	Insulator — for Q101	C268	133904	1472442-79	0.22 μ F 10% Z5V film
	114918	990327-128	Nut — .375-32, control mounting	C269	105301	1420193-57	330 pF 10% 500V Z5P disc
				C270	141027	1446668-541	390 μ F 15V electrolytic
				CR204	139706	1471872-14	Silicon
				CR206	119597	1471872-6	Silicon
				CR207	119597	1471872-10	Rectifier - power switching
				CR208	119597	1471872-6	Silicon
				CR209	119597	1471872-6	Silicon
				CR210	119597	1471872-6	Silicon
				CR212	138173	1476171-31	Silicon
				CR213	139706	1471872-14	Silicon
				CR214	139706	1471872-14	Silicon

REPLACEMENT PARTS (Continued)

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Symbol No.	Stock No.	Drawing No.	Description	Symbol No.	Stock No.	Drawing No.	Description
CR217	119597	1471872-6	Silicon	R244	138145	1473359-27	Control vert size
CR218	119597	1471872-6	Silicon	R246	—	—	180K, 2 watts
CR219	119597	1471872-2	Silicon	R247	132855	993154-551	12K, 5%, 1/2 watt, film
CR220	139706	1471872-8	Silicon	R248	—	—	4700 ohm, 2 watts
FB201	119971	1443391-2	Bead — ferrite	R249	—	—	120 ohm, 2 watts
FB204	128456	1443391-6	Bead — ferrite	R250	—	—	100K, 2 watts
FB205	128456	1443391-6	Bead — ferrite	R251	—	—	560 ohm, 2 watts
FB206	128456	1443391-6	Bead — ferrite	R252	—	—	150 ohm, 2 watts
FB207	128456	1443391-6	Bead — ferrite	R253	—	—	10 ohm, 1/2 watt
L202	109946	973966-6	Coil — Peaking	R254	143031	993151-171	★
L203	130131	973966-25	Coil — peaking	R255	—	—	220 ohms, 2 watts
L204	141017	907454-501	Coil — Horizontal hold	R259	—	—	4700 ohms, 2 watts
L205	141021	1478648-1	Coil — horizontal driver	R260	—	—	22K, 1/2 watt
TRANSISTORS				R261	139324	993151-165	★
Q202	141295	1417362-3	7362-3, video output	R264	—	—	1500 ohms, 2 watts
Q203	141330	1417306-1	7306-1, sync separator	R265	—	—	560K, 2 watts
Q204	132830	1471112-8	1112-8, vert oscillator	R266	—	—	100K, 2 watts
Q205	132830	1471112-8	1112-8, vert preamp	R267	—	—	10K, 2 watts
Q206	139268	1417318-2	7318-2, vert driver	R268	—	—	10K, 2 watts
Q207	137155	1473666-1	3666-1, blanker	R269	—	—	1500 ohms, 2 watts
Q208	141008	1417349-2	7349-2, vert output	R270	—	—	2200 ohms, 2 watts
Q209	137340	1417303-1	7303-1, vert output	R271	—	—	47K, 2 watts
Q211	137875	1473614-3	3614-3, horiz oscillator	R272	—	—	470 ohms, 2 watts
Q212	137340	1417303-1	7303-1, horiz driver	R274	—	—	47 ohms, 2 watts
RESISTORS				R275	—	—	300 ohms, 2 watts
R201	832075	1491353-198	★	R276	—	—	2700 ohms, 2 watts
R202	832075	1491353-198	★	R277	830010	993151-177	★
R209	830010	993151-177	★	R278	230560	993154-213	330 ohm, 5%, 1/2 watt, film
R213B	141022	1473351-2	★	R279	230560	993154-213	330 ohm, 5%, 1/2 watt, film
R214	—	—	5.6K, 2 watts	R280	140986	993151-169	★
R215	—	—	200 ohms, 2 watts	VIDEO INTERFACE			
R216	—	—	10 ohms, 2 watts	1700065	Printed Circuit Board, Video Display		
R218	—	—	47 ohms, 2 watts	CAPACITORS			
R219	—	—	330K, 2 watts	C1	1500054	100 μ F, 16V, electrolytic, axial	
R220	—	—	10K, 2 watts	C2	1500036	10 μ F, 16V, electrolytic, axial	
R223	830147	993151-217	★	C3	1500036	10 μ F, 16V, electrolytic, axial	
R224	140986	993151-169	★	C4	1500047	0.01 μ F, 10%, 25V, disc	
R225	—	—	22 Meg, 2 watts	C5	1500047	0.01 μ F, 10%, 25V, disc	
R228	—	—	2700 ohms, 2 watts	C6	1500036	10 μ F, 16V, electrolytic, axial	
R229	—	—	6800 ohms, 2 watts	C7	1500046	150 pF, 10%, 50V, disc	
R230	—	—	22 Meg, 2 watts	RESISTORS			
R231	—	—	390K, 2 watts	R1	4704023	75 ohms, 5%, 1/4 watt	
R232	—	—	3900 ohms, 2 watts	R2	4704080	47K, 5%, 1/4 watt	
R234	830056	993151-195	★	R3	4708049	1.2K, 5%, 1/2 watt	
R235	—	—	82K, 2 watts	R4	4704050	1.5K, 5%, 1/4 watt	
R236	—	—	6.8K, 2 watts	R5	4704030	180 ohms, 5%, 1/4 watt	
R237	—	—	270K, 2 watts	R6	4704070	12K, 5%, 1/4 watt	
R238	—	—	220K, 2 watts	R7	4704050	1.5K 5%, 1/4 watt	
R239	—	—	100K, 2 watts	R8	4704053	2K, 5%, 1/4 watt	
R240	—	—	10K, 2 watts	R9	4704028	150 ohms, 5%, 1/4 watt	
R241	—	—	15K, 2 watts	R10	4704040	510 ohms, 5%, 1/4 watt	
R242	—	—	3.9 Meg, 2 watts				
R243	—	—	680K, 2 watts				

REPLACEMENT PARTS (Continued)

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Symbol No.	Stock No.	Drawing No.	Description
R11		4704041	560 ohms, 5%, 1/4 watt
R12		4717002	200 ohms, 10%, 5 watt
R13		4704065	6.8K, 5%, 1/4 watt
R14		4704058	3.3K, 5%, 1/4 watt
R15		4704054	2.2K, 5%, 1/4 watt
R16		4704054	2.2K, 5%, 1/4 watt
R17		4704039	470 ohms, 5%, 1/4 watt
R18		4704092	220K, 5%, 1/4 watt
TRANSISTORS			
Q1		4822001	MPS3904 NPN
Q2		4822001	MPS3004 NPN
Q3		4822001	MPS3904 NPN
Q4		4822003	MPS3906 PNP
Q5		4822001	MPS3904 NPN
INTEGRATED CIRCUIT			
Z1		3106001	Optical Isolator HP5082-4351

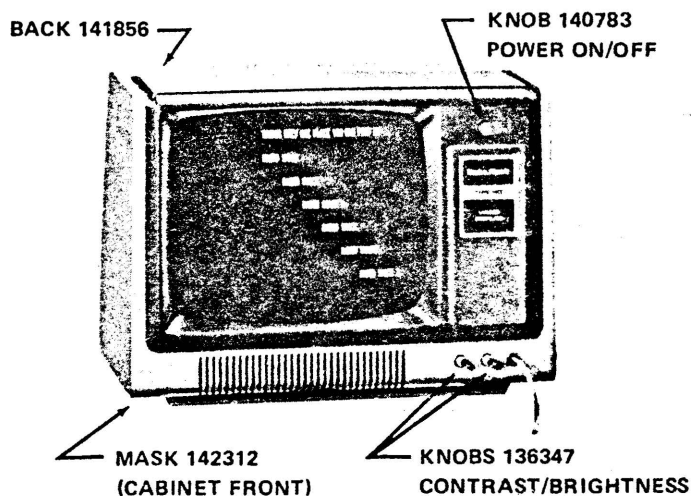
PICTURE TUBE

12VBNP4/
12VBYP4 ★Picture tube

Symbol No.	Stock No.	Drawing No.	Description
INSTRUMENT MISCELLANEOUS			
	141856	1437817-5	Back, Cabinet
	142794	1466322-1	Bracket—chassis mounting (left)
	142795	1466322-2	Bracket, chassis mounting (right)
	140964	1441375-4	Bracket — kine mounting
	140783	1478652-501	Button — On/Off
CPR3	109956	973973-4	★Circuit — encapsulated
	121134	1442419-4	Clamp — yoke
	128161	1444615-1	Clip — Back retaining
	132272	1445477-11	Cushion — kine mounting
	140779	1478626-1	Knob — fine tune
	136347	1461997-511	★Knob — for controls
	124313	1444647-1	★Knob — horiz control
	142312	1437816-7	Mask - Cabinet front
	115984	1442072-7	Spring — for fine tune knobs
	139797	1442072-13	Spring — control knobs
	140963	1464349-4	Wire — kine mounting

ACCESSORIES

10EB151 1465531-1 ★Antenna
Book -- customer instruction



KTR123S CABINET PARTS IDENTIFICATION