

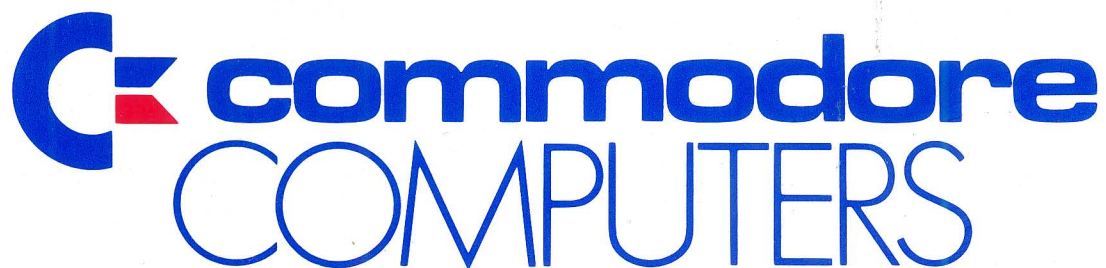
SERVICE MANUAL

PC 1901

MONOCHROME MONITOR

APRIL, 1987

PN-314970-01



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IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all NAPCEC Equipment. The service procedures recommended by NAPCEC and described in this service manual are effective methods of performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that this manual contains various CAUTIONS and NOTICES which should be carefully read in order to minimize the risk of personal injury to service personnel. The possibility exists that improper service methods may damage the equipment. It also is important to understand that these CAUTIONS and NOTICES ARE NOT EXHAUSTIVE. NAPCEC could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, NAPCEC has not undertaken any such broad evaluation. Accordingly, a servicer who uses a service procedure or tool which is not recommended by NAPCEC must first satisfy himself thoroughly that neither his safety nor the safe operation of the equipment will be jeopardized by the service method selected.

WARNING

Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol ▲ on the schematics or exploded views.

Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards.

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*Broken line: — · — · — · — · — · — ·

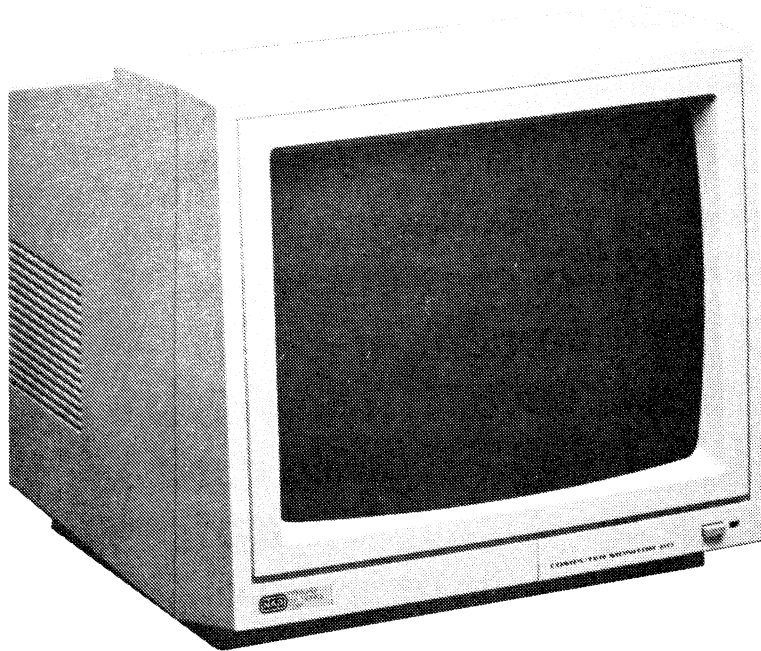
TABLE OF CONTENTS

TITLE	PAGE
SPECIFICATIONS	1
SAFETY GUIDELINES.....	2
CIRCUIT DESCRIPTION.....	4
ADJUSTMENTS	4
CHASSIS REMOVAL.....	5
PICTURE TUBE REMOVAL.....	5
MEASUREMENTS	6
PARTS LIST.....	7
PCB LAYOUT.....	10
SCHEMATIC DIAGRAM.....	12

CAUTION

USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING.

**PC 1901
MONOCHROME MONITOR
(NAP - 7BM613)**



SPECIFICATIONS

Picture Tube:	12" measured diagonally with glare reducing surface treatment	Video Amp Bandwidth:	20MHz
Deflection Angle:	90°	Horizontal Resolution:	800 lines (BM7513, BM7523) 1,000 lines (7BM613, 7BM623)
Phosphor Type:	P39 Green (BM7513, 7BM613) LA Amber (BM7523, 7BM623)	Character Field:	25 lines of 80 characters (2,000 total)
Video Input Signal:	TTL level digital video, separate horizontal and vertical syncs. (7BM613, 7BM623)	Power Supply:	120Vac \pm 10%, 50-60Hz
		Power Consumption:	30 Watts
		Dimensions:	11.9"W x 11.1"D x 10.9"H
		*Subject to Modification	

NAPCEC SAFETY GUIDELINES FOR THE PROFESSIONAL SERVICE TECHNICIAN

Safety Checks

After the original service problem has been corrected, a complete safety check should be made. Be sure to check over the entire set, not just the areas where you have worked. Some previous servicer may have left an unsafe condition, which could be unknowingly passed on to your customer. Be sure to check all of the following:

Fire and Shock Hazard

1. Be sure all components are positioned in such a way as to avoid the possibility of adjacent component shorts. This is especially important on those chassis which are transported to and from the service shop.
2. Never release a repaired receiver unless all protective devices such as insulators, barriers, covers, strain reliefs, and other hardware have been installed according to the original design.
3. Soldering and wiring must be inspected to locate possible cold solder joints, solder splashes, sharp solder points, frayed leads, pinched leads, or damaged insulation (including ac cord). Be certain to remove loose solder balls and all other loose foreign particles.
4. Check across-the-line components and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length and dress.
5. No lead or component should touch a receiving tube or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces or edges must be avoided.
6. Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol on the schematics. Replacement parts without the same safety characteristics may create shock, fire or other hazards.
7. When servicing any receiver, always use a separate isolation transformer for the chassis. Failure to use a separate isolation transformer may expose you to possible shock hazard, and may cause damage to servicing instruments.
8. Many receivers use a polarized line cord (one wide pin on the plug). Defeating this safety

device may create a potential hazard to the servicer and the user. Extension cords which do not incorporate the polarizing feature should never be used.

9. After re-assembly of the set, always perform an ac leakage test or resistance test from the line cord to all exposed metal parts of the cabinet. Also, check all metal control shafts (with knobs removed), antenna terminals, handles, screws, etc. to be sure the set is safe to operate without danger of electrical shock.

* Broken line: — · — · — · — ·

Implosion

1. All picture tubes used in current model receivers are equipped with an integral implosion system. Care should always be used, and safety glasses worn, whenever handling any picture tube. Avoid scratching or otherwise damaging the picture tube during installation.
2. Use only replacement tubes as specified by the manufacturer.

X-radiation

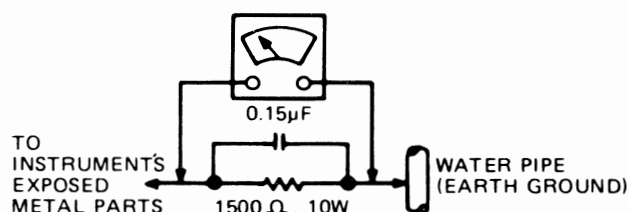
1. Be sure procedures and instructions to all your service personnel cover the subject of X-radiation. Potential sources of X-rays in TV receivers are the picture tube and the high voltage circuits. The basic precaution which must be exercised is to keep the HB at the factory recommended level.
2. To avoid possible exposure to X-radiation and electrical shock, only the manufacturer's specified anode connectors must be used.
3. It is essential that the service technician has available at all times an accurate HV meter. The calibration of this meter should be checked periodically against a reference standard.
4. When the HV circuitry is operating properly there is no possibility of an X-radiation problem. High voltage should always be kept at the manufacturer's rated value—no higher—for optimum performance. Every time a color set is serviced, the brightness should be run up and down while monitoring the HV with a meter to be certain that the HV does not exceed the

specified value and that it is regulated correctly. We suggest that you and your service technicians review test procedures so that HV and HV regulation are always checked as a standard servicing procedure, and the reason for this prudent routine be clearly understood by everyone. It is important to use an accurate and reliable HV meter. It is recommended that the HV reading be recorded on each customers' invoice, which will demonstrate a proper concern for the customers' safety.

5. When troubleshooting and making test measurements in a receiver with a problem of excessive high voltage, reduce the line voltage by means of a Variac to bring the HV into acceptable limits while troubleshooting. Do not operate the chassis longer than necessary to locate the cause of the excessive HV.
6. New type picture tubes are specifically designed to withstand higher operating voltages without creating undesirable X-radiation. It is strongly recommended that any shop test fixture which is to be used with the new higher voltage chassis be equipped with one of the new type tubes designed for this service. Addition of a permanently connected HV meter to the shop test fixture is advisable. The CRT types used in these new sets should never be replaced with any other types, as this may result in excessive X-radiation.
7. It is essential to use the specified picture tube to avoid a possible X-radiation problem.
8. Most TV receivers contain some type of emergency "Hold Down" circuit to prevent HV from rising to excessive levels in the presence of a failure mode. These various circuits should be understood by all technicians servicing them, especially since many hold down circuits are inoperative as long as the receiver performs normally.

Leakage Current Cold Check

1. Unplug the ac line cord and connect a jumper between the two prongs of the plug.
2. Turn on the power switch.
3. Measure the resistance value between the jumpered ac plug and all exposed cabinet parts of the receiver, such as screw heads, antennas and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be between 1 megohm and 5.2 megohms. When the exposed metal does not have a return path to the chassis, the reading must be infinity. Remove the jumper from the ac line cord.



Leakage Current Hot Check

1. Do not use an isolation transformer for this test. Plug the completely re-assembled receiver directly into the ac outlet.
2. Connect a 1.5k ohm, 10 watt resistor paralleled by a 0.15uF. capacitor between each exposed metallic cabinet part and a good earth ground such as a water pipe, as shown above.
3. Use an ac voltmeter with at least 5000 ohms/volt sensitivity to measure the potential across the resistor.
4. The potential at any point should not exceed 0.75 volts. A leakage current tester may be used to make this test; leakage current must not exceed 0.5 milliamps. If a measurement is outside the limits specified, there is a possibility of shock hazard. The receiver should be repaired and re-checked before returning it to the customer.
5. Repeat the above procedure with the ac plug reversed. (Note: An ac adapter is necessary when a polarized plug is used. Do not defeat the polarizing feature of the plug.)

Picture Tube Replacement

The primary source of X-radiation in this television is the picture tube. The picture tube utilized in this chassis is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement must be the same type as the original, including suffix letter, or an N.A.P. Consumer Electronics Corp. (NAPCEC) approved type.

Parts Replacement

Many electrical and mechanical parts in NAPCEC 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. The use of a substitute part which does not have the same safety characteristics as the NAPCEC recommended replacement part shown in this service manual may create shock, fire or other hazards.

CIRCUIT DESCRIPTION

This monitor can be used as an alphanumeric and graphic display unit for the home and personal computers. The screen is anti-reflecting which means that the legibility of the image is extremely good. The monitor has composite video signal input.

The monitor operates on a supply of 120V, 60Hz ac. The Power Transformer and CRT are mounted internally to the cabinet. The main panel has a Video Preamplifier, Sync Channel, Vertical and Horizontal Sweep Circuitry, Power Supply Horizontal AFC, and Blanking Circuits. The On/Off control Video Gain Control and Brightness Control are mounted on the main panel and extend through the cabinet front. The circuit adjustments are mounted to the main panel.

Power Supply

120 volt, 60Hz ac operation. The ac section of this receiver is designed for operation on 120 volt, 60Hz alternating current only. Never connect power cord to a supply having a different frequency or voltage.

Overload Protection

This receiver incorporates a .5 amp Slow-Blow fuse and a 2 amp fuse in the ac circuit. These fuses provide protection to the chassis against certain electrical overloads.

ADJUSTMENTS

B+ Adjust (R106)

Connect dc voltmeter to the collector of TS101 and allow receiver and test equipment to warm up for 20 minutes. Using a non-metallic tool, adjust R106 to obtain 11Vdc \pm 1% on voltmeter.

Focus (R336)

Adjust Focus Control for best overall detail in the center portion of the picture.

Horizontal Oscillator Adjustment (R513)

Short C503 and R544 to ground. Adjust R513 for horizontal stability of picture. Remove short between C503 and R544.

Vertical Size (R425)

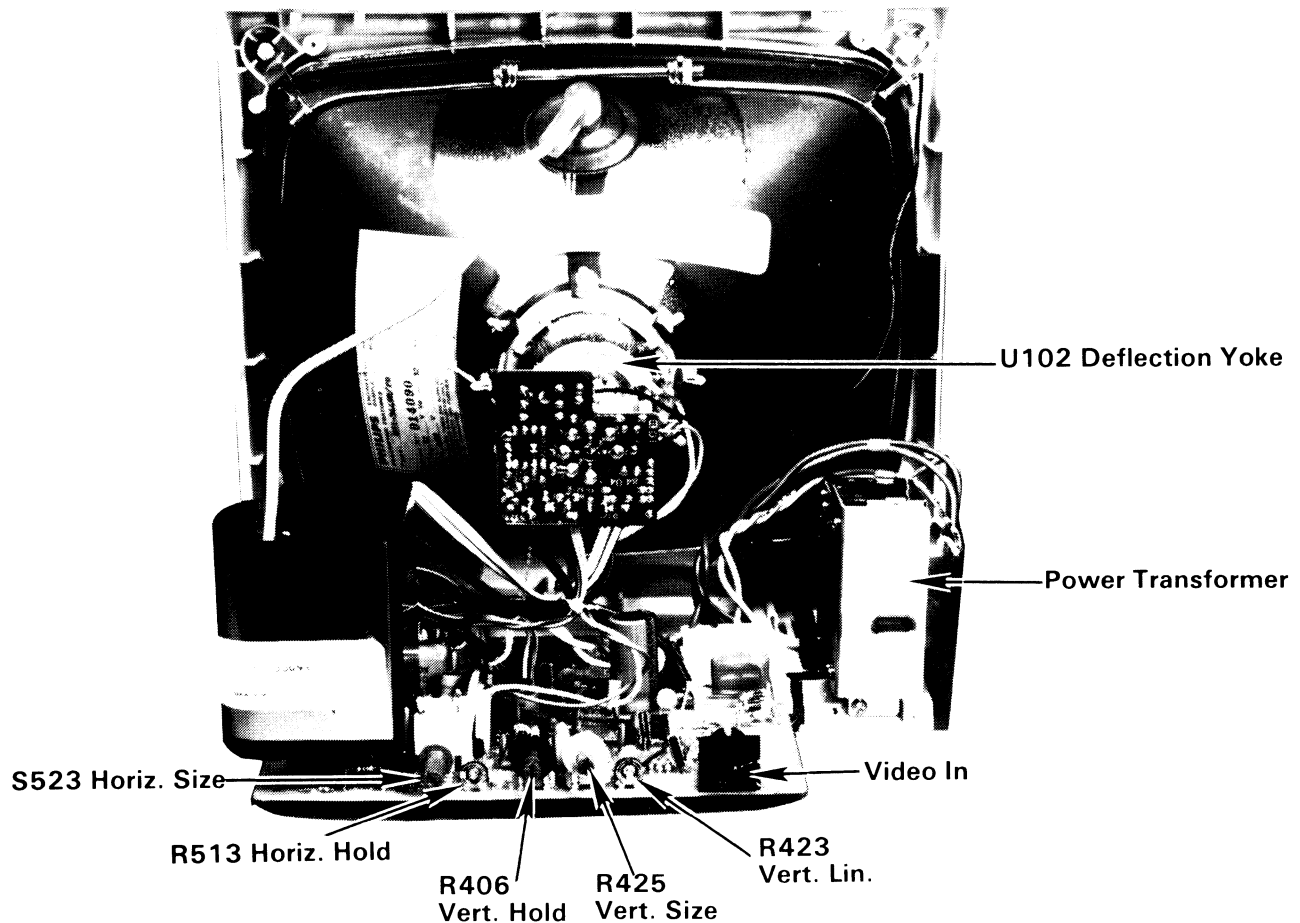
Adjust the Vertical Size control (R425) to fill the screen vertically.

Horizontal Size (S523)

Adjust horizontal size to fill up screen.

Vertical Linearity (R423)

Adjust vertical linearity control for equal spacing of horizontal lines at the upper portion of the center of the screen.



Adjustment Location — Rear View

Chassis Removal

1. Remove six (6) screws, four (4) of which are securing cabinet back to cabinet front.
2. Lay cabinet face down on a soft material to protect picture tube and cabinet finish.
3. Chassis Removal — Slide printed circuit board assembly to rear as far as leads will allow for servicing.
4. Place chassis on the heat sink of TS101. In this position the monitor remains stable on the work bench.
5. Disconnect the picture tube socket and high voltage anode lead at picture tube.
6. Loosen clamp screw securing deflection yoke to picture tube. Slide the yoke to the rear until clear of the neck of the picture tube.

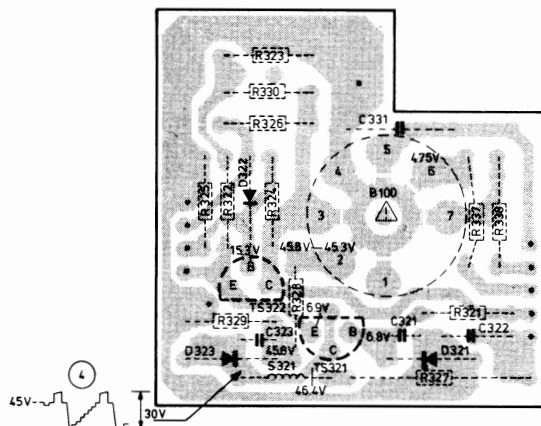
Caution: Before removing high voltage lead at picture tube, discharge picture tube high voltage anode to ground only.

7. To replace components, reserve the above procedure.
8. **Note: Backcover Replacement - Printed Circuit Board must slide into proper tracks in backcover.**

Picture Tube Removal

1. Disconnect HV anode lead and picture tube socket from picture tube. Loosen clamp screw securing deflection yoke and slide yoke off neck of picture tube.
2. Lay cabinet face down on a soft material so as not to scratch or mar the face of the picture tube or finish on cabinet.
3. Slide printed circuit board assembly out of track.
4. Remove screws from each of four (4) brackets holding picture tube in place. Slip mounting wire over neck of tube.
5. Using goggles and gloves, reach under face of tube and lift from cabinet. **Do not grasp neck of picture tube at any time.**
6. To install picture tube, reverse the preceding steps. Exercise caution not to scratch face of picture tube.

CRT Board



MEASUREMENTS

Important

Read these instructions carefully and observe the conditions noted when taking voltage readings or observing waveforms.

Picture tube high voltage anode may have a potential 10kV. Observe all high voltage precautions when servicing the chassis. Use safety goggles and gloves when handling the picture tube.

Voltage Measurement Conditions Unless Otherwise Specified

1. Voltages measured to chassis using a digital voltmeter.
2. AC power source 120V, 60Hz line.
3. Voltage readings not in brackets taken using a pattern generator (PM5519) as a signal source.
4. Brightness control set at minimum, and contrast control to maximum.
5. Voltage values shown are average readings. Variations may be observed due to normal production tolerances.

Special Voltage Measurement Conditions

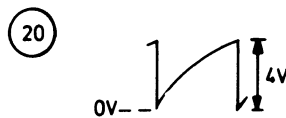
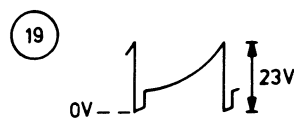
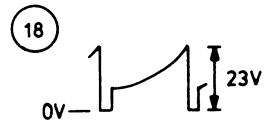
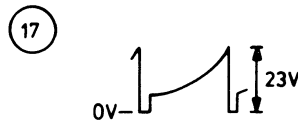
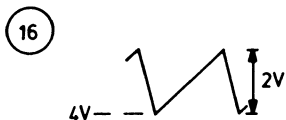
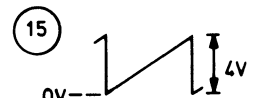
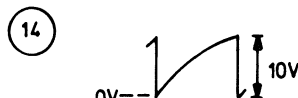
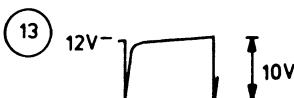
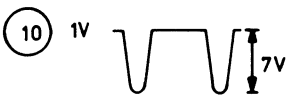
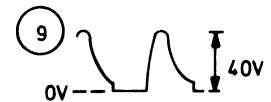
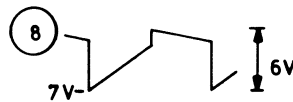
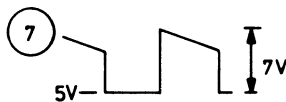
Picture tube anode voltage measured with VTVM high voltage probe at line voltage of 120 volts at 100 μ A beam current.

Waveform Measurement Conditions

1. Waveforms taken using a pattern generator connected to the input plug of the monitor.
2. The video output signal of the generator adjusted to 1 volt.
3. Brightness control and contrast control set at maximum.

General Schematic Notes — See “Notes” on Schematic Diagram


Waveforms



REPLACEMENT PARTS LIST

**TO ENSURE OPTIMUM PERFORMANCE AND RELIABILITY
ALWAYS USE GENUINE FACTORY REPLACEMENT PARTS**

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*Broken line: _ . _ . _ . _ . _ .

CAPACITORS (All Ceramic, 50V unless otherwise specified)				CAPACITORS (Continued)			
S C101	2.2nF., 100V, Cer. Disc.			C512	1.5nF., 100V, Cer. Disc.		
S C102	2.2nF., 100V, Cer. Disc.	4H12231989		C513	5.6nF., 100V, Polyester	4H12150625	
S C103	2.2nF., 100V, Cer. Disc.	4H12231989		C514	10nF., 250V, Cer. Disc.		
C104	3300µF., 25V, Electrolytic	4H12421466		C515	100nF., 250V, Cer. Disc.		
C105	100pF., 50V, Cer. Disc.	4H12232156		C521	47nF., 25V, Electrolytic		
C106	10nF., 63V, Electrolytic			C522	47nF., 25V, Electrolytic		
C107	330nF., 16V, Electrolytic			C523	22nF., 63V, Cer. Disc.		
S C110	47nF., 125V, AC	4H12141348		C524	100nF., 500V, Cer. Disc.		
S C111	2.2nF., 125V, AC	4H12232194		C525	22nF., 100V, Electrolytic		
S C112	2.2nF., 125V, AC	4H12232194		C526	560pF., 100V, Cer. Disc.		
C301	2.2nF., 63V, Electrolytic			C527	4.7µF., 160V, Electrolytic	4H12440387	
C302	470nF., 100V, Cer. Disc.			C528	13nF., 400V, Polyester	4H12142192	
C303	22nF., 63V, Cer. Disc.			C531	10nF., 500V, Foil	4H12142191	
C304	100nF., 25V, Electrolytic			C602	22nF., 63V, Cer. Disc.		
C305	27pF., 100V, Cer. Disc.			C603	22µF., 16V, Electrolytic	4H12440189	
C321	22nF., 63V, Cer. Disc.			C604	10nF., 100V, Cer. Disc.		
C322	100nF., 100V, Cer. Disc.			COILS & TRANSFORMERS			
C323	100nF., 100V, Cer. Disc.	4H12421678		S321	6.8µF., Coil - Choke	4H15751998	
C331	100nF., 400V, Cer. Disc.			S523	Coil - Horizontal Width	4H15751717	
C341	1nF., 63V, Electrolytic			S524	Coil - Linearity	4H15751914	
C342	15nF., 63V, Cer. Disc.			S T110	Transformer - Power	4H14630509	
C343	10nF., 63V, Electrolytic			S T521	Transformer - Horiz. Output	4H15050051	
C401	10nF., 100V, Cer. Disc.			S T522	Transformer - Line Output	4H14010264	
C402	10nF., 100V, Cer. Disc.			CONTROLS & SWITCHES			
C403	4.7nF., 100V, Cer. Disc.			S SK1	Power Switch - On/Off	4H27611161	
C404	3.3, 100V, Cer. Disc.			R106	4.7k. B+ Adjust	4H10010236	
C405	270pF., 100V, Cer. Disc.			R303	470 ohm, Contrast	4H10020121	
C406	10nF., 400V, Cer. Disc.			R331	1 Meg., Brightness Pre-set	4H10010103	
C421	220nF., 100V, Cer. Disc.			R332	470k, Brightness	4H10020122	
C422	56nF., 100V, Cer. Disc.			R336	2 Meg., Focus	4H10120727	
C423	820pF., 50V, Cer. Disc.	4H12232157		R406	10k, Vertical Hold	4H10110547	
C424	220pF., 100V, Cer. Disc.			R423	47k, Vertical Linearity	4H10010076	
C431	270pF., 100V, Cer. Disc.			R425	330k, Vertical Size	4H10110548	
C432	100pF., 50V, Cer. Disc.	4H12232156		R513	330 ohm, Horizontal Hold	4H10020054	
C433	100nF., 25V, Electrolytic			RESISTORS (unless otherwise specified, all are 5%, 1/4W)			
C434	220nF., 25V, Electrolytic			R101	150 ohm		
C435	4.7nF., 100V, Electrolytic			R102	1k		
C501	2nF., 400V, Cer. Disc.			R103	1.2k		
C502	680pF., 100V, Cer. Disc.						
C503	15nF., 400V, Cer. Disc.						
C504	560pF., 500V, Cer. Disc.						
C505	4.7nF., 100V, Cer. Disc.						
C506	10nF., 100V, Cer. Disc.						
C507	4.7nF., 63V, Electrolytic						
C508	270pF., 100V, Cer. Disc.						
C511	1.5nF., 100V, Cer. Disc.						

Commodore Part Numbers are not available at this time.

REPLACEMENT PARTS LIST (Continued)

RESISTORS (Continued)			RESISTORS (Continued)		
R104	27k		R502	150k	
R105	15k		R504	10kR50512k	
R107	15k		R506	2.2k	
R108	1k		R511	560 ohm	
R301	100 ohm		R512	2.7k	4H11652918
R302	680 ohm		R514	2.2k	
R304	47 ohm		R515	8.2k, Metal Film	4H11652865
R305	18k		R516	8.2k	
R306	4.7k		R517	6.8k, Metal Film	4H11653064
R307	100 ohm		R518	18k	
R308	100 ohm		R519	3.9k	
R309	470 ohm		R520	1.2k	
R310	100k		R522	220 ohm	
R311	1k		R523	8.2 ohm, 1/4W, Safety Resistor	4H1130506
R312	68k		R524	1.8 ohm	
R313	4.3k		R525	390 ohm	
R314	75 ohm		S R526	1k, 1/4W, Safety Resistor	4H11130561
R316	68 ohm		S R527	5.6 ohm, 1/4W, Safety Resistor	4H11130502
R317	68 ohm		S R528	100 ohm, 1/4W, Safety Resistor	4H11130535
R321	1k (BM7513), (BM7523)		R529	470 ohm	
R321	820 ohm (7BM613), (7BM623)		R601	1k	
R322	680 ohm		R602	1k	
R323	1k		R603	1k	
R324	47k		R604	1k	
R325	18k		R605	1.2k	
R326	2.2k		R606	1.2k	
R327	1k, 1/4W, Metal Film	5H11654403	R607	470 ohm	
R328	120 ohm, 1/2W	4H11043083	R608	560 ohm	
R329	330k		R609	120 ohm	
R330	120 ohm		SEMICONDUCTORS - DIODES		
R333	390k		S D101	Diode - Bridge Rectifier	4H13031174
R335	270k		S D102	Diode - Bridge Rectifier	4H13031174
R337	33k	4H11150482	S D103	Diode - Bridge Rectifier	4H13031173
R338	33k	4H11150482	S D104	Diode - Bridge Rectifier	4H13031173
R341	1.5 Meg.		D105	Diode - Zener	4H13034167
R342	2.2k		D321	Diode - Zener (BM7513), (BM7523)	4H13034278
R343	1k		D321	Diode - Zener (7BM613), (7BM623)	4H13030861
R344	1k		D322	Diode - Silicon	4H13030847
R345	27k		D323	Diode - Silicone	4H13030621
R401	6.8k		D331	Diode - Zener	4H13034197
R402	15k		D401	Diode - Zener	4H13034398
R403	24k		D431	Diode - Silicon	4H13030847
R404	100k		D432	Diode - Zener	5H13031931
R405	27k		D441	Diode - Silicon	4H13030621
R406	10k		D501	Diode - Silicon	4H13030847
R407	33k		D502	Diode - Silicon	4H13030847
R408	560 ohm		D511	Diode - Silicon	4H13030847
R421	180k		D512	Diode - Silicon	4H13030847
R422	120k		D513	Diode - Silicon	4H13030621
R424	270k		D521	Diode - Silicon	4H13031168
R426	330k		D522	Diode - Zener	4H13034499
R427	100k		D523	Diode - Silicon	5H13034979
R428	430 ohm		D524	Diode - Silicon	4H13034189
R429	1k		D525	Diode - Silicon	4H13034189
R431	12k		D526	Diode - Silicon	4H13041487
R432	10k		D601	Diode - Zener	4H13034233
R433	150 ohm		SEMICONDUCTORS - TRANSISTORS		
R434	5.6 ohm		TS101	Transistor - NPN	4H13042239
R435	6.8k		TS102	Transistor - PNP	4H13044197
R436	1k				
R437	4.7 ohm				
R438	330 ohm				
R501	180k				

Commodore Part Numbers are not available at this time.

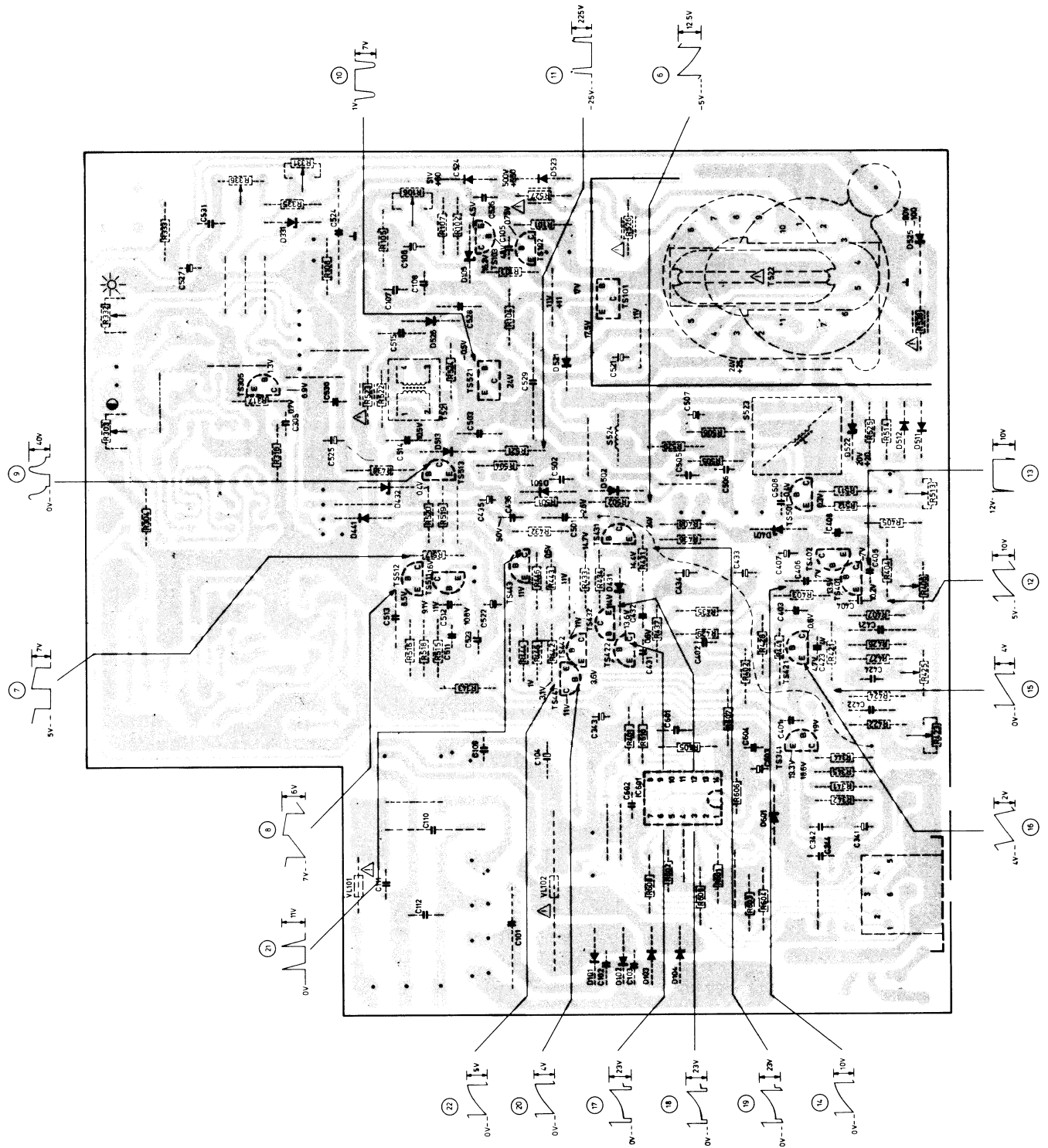
REPLACEMENT PARTS (Continued)

SEMICONDUCTORS - TRANSISTORS		
TS103	Transistor - NPN	4H13044196
TS305	Transistor - NPN	4H13044246
TS321	Transistor - NPN (BM7513), (BM7523)	BF422
TS321	Transistor - NPN (7BM613), (7BM623)	4H13041589
TS322	Transistor - NPN	4H13044246
TS341	Transistor - PNP	4H13044197
TS401	Transistor - PNP	4H13044197
TS402	Transistor - NPN	4H13044196
TS421	Transistor - PNP	4H13044358
TS422	Transistor - NPN	4H13044196
TS431	Transistor - NPN	5H13044349
TS432	Transistor - PNP	4H13044283
TS441	Transistor - NPN	4H13044196
TS442	Transistor - NPN	4H13044196
TS443	Transistor - PNP	4H13044197
TS501	Transistor - PNP	4H13044358
TS511	Transistor - PNP	4H13044197
TS512	Transistor - PNP	4H13044197
TS513	Transistor - PNP	4H13041041
TS521	Transistor - NPN	4H13042241
SEMICONDUCTORS - INTEGRATED CIRCUITS		
IC601	5H20984997	
MISCELLANEOUS		
S	CRT - Amber (7BM623), (BM7523)	M31344LAPD
S	CRT - Green (7BM613), (BM7513)	M31344GRPD
S	CRT - Socket	4H25570189
S U102	Deflection Yoke	4H15010188
S VL101	Fuse - .5A, 250V (7BM613), (7BM623)	4H25361006
S VL101	Fuse - .5A, 250V (BM7513), (BM7523)	4H25310059
S VL102	Fuse - 2A, 250V	4H25310045
S	Fuse - Thermal	4H25220007
	Socket - Jack	4H26720241
	Plug - Micro - Connector (BM7513), (BM7523)	4H26520235
	Din Plug (7BM613), (7BM623)	4H26440026
S SK1	Power Switch - On/Off	4H27011161
CAPACITORS (unless specified, all are ceramic, 50V)		
C321	22nF., 63V	
C322	100nF., 100V	
C323	100nF., 100V	4H12421678
C331	100nF., 500V	

RESISTORS (unless specified, all are 5%, 1/4W)		
R321	1k (BM7513), (BM7523)	
R321	820 ohm (7BM613), (7BM623)	
R322	680 ohm	
R323	1k	
R324	47k	
R325	18k	
R326	2.2k	
R327	1k	
R329	330k	
R330	120 ohm	
R337	33k	4H11150482
R338	33k	4H11150482
SEMICONDUCTORS - DIODES		
D321	Diode - Zener (BM7513), (BM7523)	4H13034278
D321	Diode - Zener (7BM613), (7BM623)	4H13030861
D322	Diode - Silicon	4H13030847
D323	Diode - Silicon	4H13030621
SEMICONDUCTORS - TRANSISTORS		
TS321	Transistor - NPN (BM7513), (BM7523)	BF422
TS321	Transistor - NPN (7BM613), (7BM623)	4H13041589
TS322	Transistor - NPN	4H13044246
LED BOARD		
D106	Diode - LED/Green (7BM613), (BM7513)	4H13042242
D106	Diode - LED/Amber (7BM623), (BM7523)	4H13032341
CABINET PARTS		
S	Block Retainer f/AC Power Cord	4H46691447
	Cabinet (7BM613)	4H43070323
	Cabinet (7BM623)	4H43070327
	Cabinet (BM7513)	4H3070305
	Cabinet (BM7523)	4H43070304
	Adjusting Spindle f/Vert. Hold Horiz. Width & Vert. Size (3 used)	4H53591695
	Adjusting Spindle - Horiz. Phase	4H53570797
	Knob - Volume, Contrast, Brightness (3 used)	4H41023595
	Knob - Push Button (7BM613), (7BM623)	4H41024148
	Knobs (2 used) (7BM613), (7BM623)	4H41310239
	Foot f/Cabinet (7BM613), (7BM623)	4H46240788
	Foot f/Cabinet (BM7513), (BM7523)	4H46240699
	AC Power Supply Cord	4H32110109
	Owner's Manual (BM7513), (BM7523)	4H73650736
Owner's Manual (7BM613), (7BM623)	IB46060001	

Commodore Part Numbers are not available at this time.

MAIN PANEL ASSEMBLY



Bottom View

Note: See page 6 for waveforms corresponding to respective waveform numbers.




SCHEMATICS NOTES

UNLESS OTHERWISE SPECIFIED

1. ALL CAPACITORS ARE IN MFD. 50V UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE $\frac{1}{4}$ WATT, 5% UNLESS OTHERWISE SPECIFIED.
3. ARROWS ON CONTROLS INDICATE DIRECTION OF CLOCK-WISE ROTATION.
4. RESISTANCE SHOWN (COILS/TRANSFORMERS) ARE IN-CIRCUIT MEASUREMENTS.
5. SCHEMATIC SYMBOLS ③ ARE WAVEFORM TEST POINTS.
6. C613 IS USED FOR FACTORY ADJUSTMENT PURPOSES AND MAY NOT BE INCLUDED IN SOME RECEIVERS.
7. $1\text{nF.} = .001\mu\text{F.}$, $10\text{nF.} = .01\mu\text{F.}$, $100\text{nF.} = .1\mu\text{F.}$

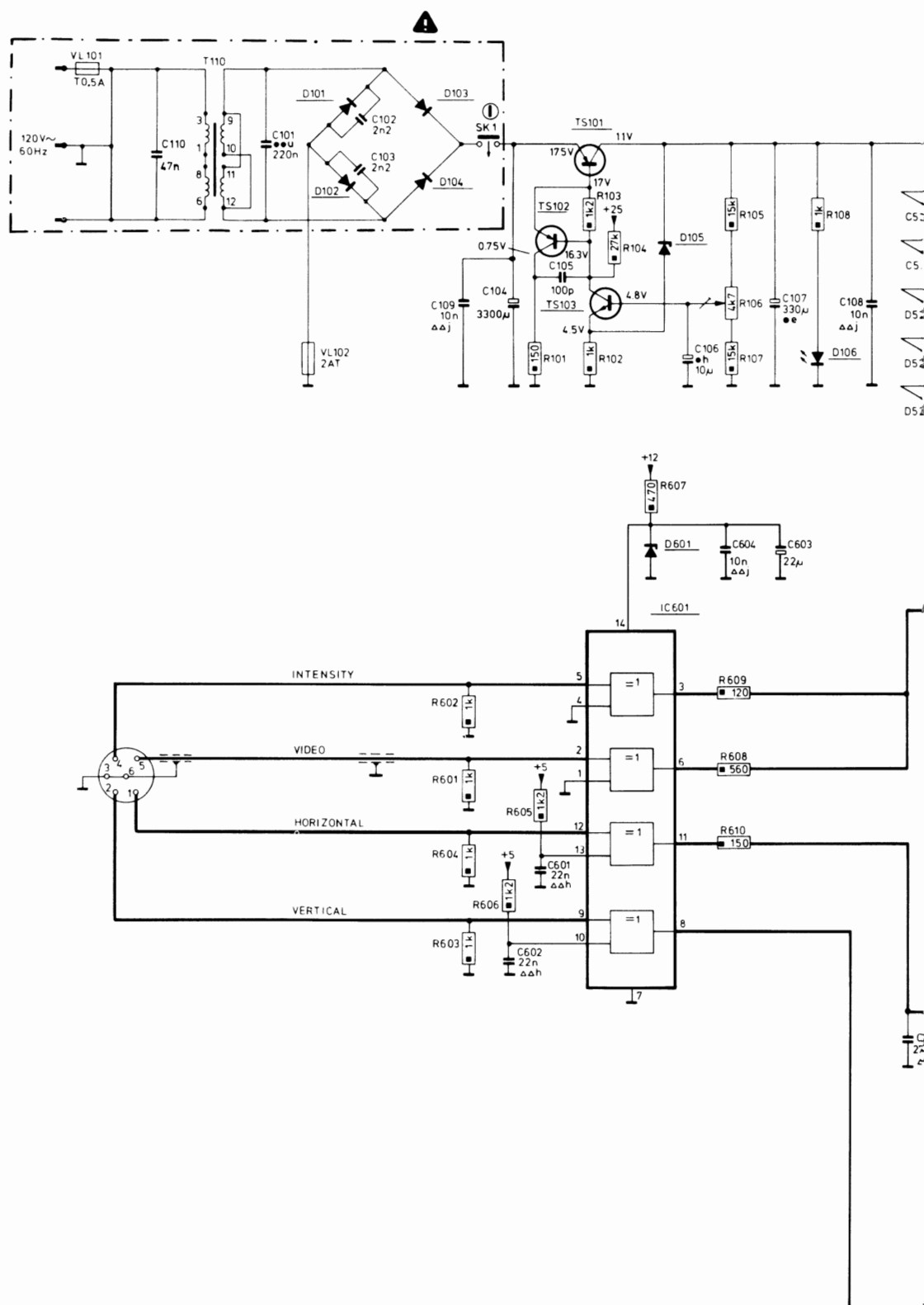
WARNING

Critical components having special safety characteristics are identified with an S by the Ref. No. in the parts list and enclosed within a broken line* along with the safety symbol  on the schematics or exploded views.

Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards.

Under no circumstances should the original design be modified or altered without written permission from the N.A.P. Consumer Electronics Corp. NAPCEC assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

*Broken line: — . — . — . — . — . — .



SCHEMATIC DIAGRAM



DOCUMENT REGISTRATION

Date: _____

Manual Name: _____

Part Number: _____

Issue Date: _____

The return of this information is essential to the maintenance of your documentation. If necessary, document updates and changes will be distributed to registered persons. Subsequent versions and editions of this document must be purchased.

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Service Documentation



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