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**Commodore International Spare Parts GmbH
Braunschweig, West Germany**

SERVICE MANUAL

**1960
SUPER VGA COLOR MONITOR**

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INTERNATIONAL EDITION

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TABLE OF CONTENTS

SPECIFICATIONS 1

SAFETY PRECAUTIONS AND NOTICES..... 4

ALIGNMENT AND ADJUSTMENT..... 6

ASSEMBLY AND DISASSEMBLY..... 13

BLOCK DIAGRAM..... 14

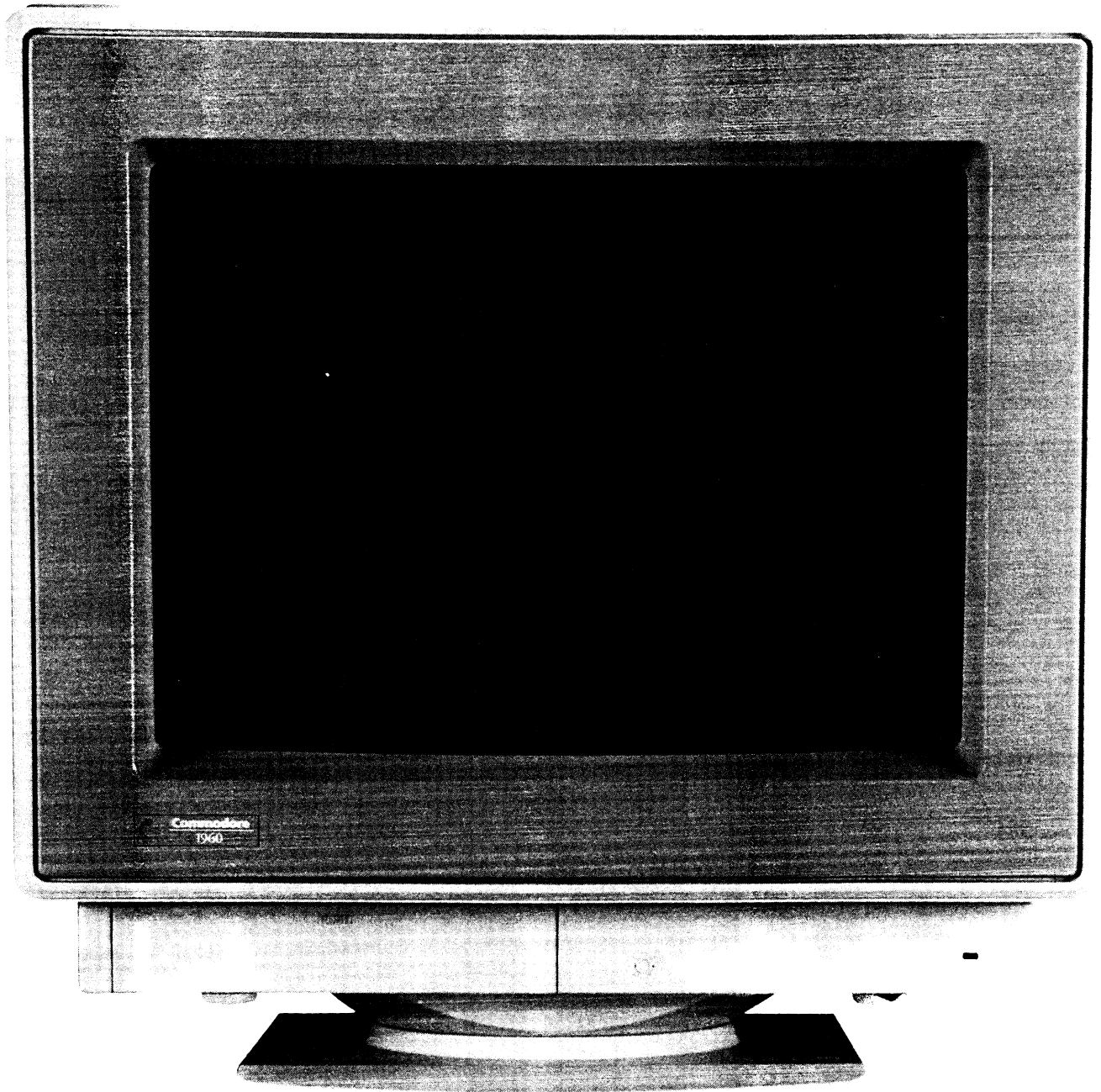
TROUBLESHOOTING CHART..... 15

PARTS LIST..... 18

SCHEMATICS..... 19

SPECIFICATIONS

Application:	A typical data display device for graphics & text PC applications.
Power Input:	80 watts (nominal) AC rated voltage. Refer to R/C label.
Video Signals:	Analog: 0.7 Vp-p, RGB positive.
Sync. Signals:	Separate Sync: Horiz./Vert., TTL, positive or negative.
Sync. Frequencies:	Horizontal: 15.75 to 38 KHz Vertical: 50 - 87 Hz
Signal Connectors:	15-pin/ 9-pin (Analog) D-shell connectors.
Display Tube:	14" 90 degrees, 575R, 29.1o neck, 0.28/ 0.29mm dot pitch, in-line gun, non-glare screen. Type number: M34KBV80X11/ M34ECL12X36
Display Area:	240 x 180mm (H x V)
Display Colors:	Infinite
Display Characters:	80 char. x 60 rows on a 10x10 matrix.
Maximum Resolution:	1024 dots x 768 lines
Misconvergence:	Center Area: <=0.3mm Corner Area: <=0.4mm
User Controls:	Power ON/OFF, Brightness, Contrast, Voltage Selector, Horiz. Phase, Vert. Size, ADD Width, Mono/ Color Select.



COMMODORE 1960 SUPER VGA COLOR MONITOR

Service Controls: PWB-1011: R-BKG, G-BKG, B-BKG ,
R-Bias, G-Bias, B-Bias.

PWB-1015: G1 Voltage Adjust.,
Pincushion, Horiz. Width, Horiz. Hold 1,
Horiz. Hold 2, Horiz. Phase 1, Horiz. Phase 2,
Vert. Size, Vert. Center, Vert. Linearity,
Vert. Hold, Screen.

Environmental
Conditions: Operation: 10 to 35 degrees C ambient.
Storage: 0 to 65 degrees C ambient.
Humidity: 8% to 80% (non-condensing).
Altitude: up to 7000 ft. above sea-level.

Dimensions: 388mm (H) x 370mm (W) x 420mm (D).

Gross Weight: 14 kgs.

SIGNAL CABLE PIN CONNECTIONS

Analog:

Pin	Signal	Pin	Signal
1	Red Signal	8	Blue Return
2	Green Signal	9	No Pin
3	Blue Signal	10	Digital Ground
4	Monitor Sense Ground to Pin 10	11	Jumper to Pin 10
5	Ground	12	No Pin
6	Red Return	13	Horizontal Sync.
7	Green Return	14	Vertical Sync.
		15	Jumper to Pin 10

TTL:

Pin	Signal	Pin	Signal
1	Ground	6	Green Prime
2	Red Prime	7	Blue Prime
3	Red Signal	8	H Sync
4	Green Signal	9	V Sync
5	Blue Signal		

SAFETY PRECAUTIONS AND NOTICES

SAFETY PRECAUTIONS

1. Observe all cautions and safety related notes located inside the monitor cabinet and on the monitor chassis.
2. Operation of the monitor outside its cabinet or with the cover removed involves the risk of shock from the monitor power supply. Repair work on the monitor should not be attempted by anyone who is not thoroughly familiar with all necessary safety precautions and procedures for working on high voltage equipment.
3. Do not install, remove, or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept at a distance during handling of the picture tube. Keep the picture tube away from the body during handling.
4. The picture tube is constructed to limit X-radiation to 0.5mR/HR at 300 micro-amperes anode current. For continued protection, use the recommended replacement tube only, and adjust the voltages so that the designated maximum rating at the anode will not be exceeded.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have been specially inspected for safety, and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage etc. Before replacing any of these components, read the Spare Parts List at the end of this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as those specified in the Spare Parts List may result in shock, fire, X-radiation or other hazards.

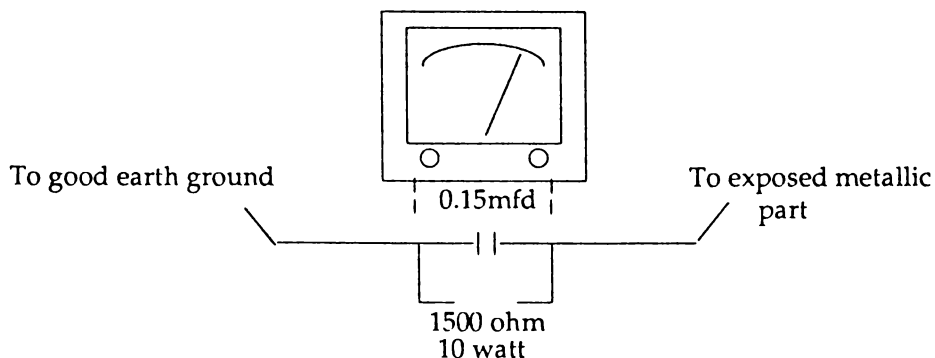
SERVICE NOTES

1. When replacing parts or circuit boards, clamp the lead wires around the terminals before soldering.
2. When replacing a high wattage resistor (>0.5 W metal oxide film resistor) in the circuit board, keep the resistor about 1 cm (1/2") away from the circuit board.
3. Keep wires away from high voltage or high temperature components.
4. Keep wires in their original positions so as to minimize interference.

SAFETY TEST

Before returning a serviced monitor to the customer, a thorough safety test must be performed to verify that the monitor is safe to operate without danger of shock. Always perform an AC current leakage check on the exposed metallic parts, such as screw heads, as follows:

1. Plug the AC line cord directly into a rated AC. Do not use a Line Isolation Transformer during this check).
2. Use an AC voltmeter having at least 5000 ohms per volt sensitivity as follows: Connect a 1500 ohms 10 watt resistor, paralleled by a 0.15mfd, AC type capacitor between a known good earth ground (such as a water pipe or conduit etc.) and the exposed metallic part simultaneously. Measure the AC voltage across the combination of 1500 ohms resistor and 0.15mfd capacitor.
3. Reverse the AC plug at the AC outlet and repeat the steps for AC voltage measurements for each exposed metallic part.
4. Voltage measured must not exceed 0.3 volts RMS. This corresponds to 0.2 milli-amps AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



ALIGNMENT AND ADJUSTMENT

1. ADJUSTMENT CONDITIONS

Power Supply: AC 220V, 60 Hz

Warm-up Time: The monitor should be powered on for at least 15 minutes before any adjustments are made, except for convergence, when 30 minutes are required.

Signal Input:

1. Video: RGB Analog, 0.7 Vp-p, positive;
RGB TTL positive.
2. Sync. : Horiz. and Vert. separated, positive or negative.
3. Scanning Frequencies: FH: 15.75 to 38 KHz/ 15.75 to 45 KHz
FV: 50 - 87 Hz
4. All adjustments should be made using a signal of FH=31.468 KHz, unless otherwise defined.

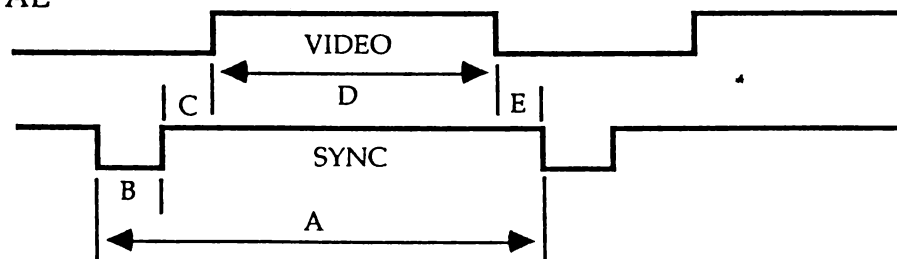
2. Parameter list of signal timings generated:

1024x768 Interlaced Mode: (35.52 KHz)

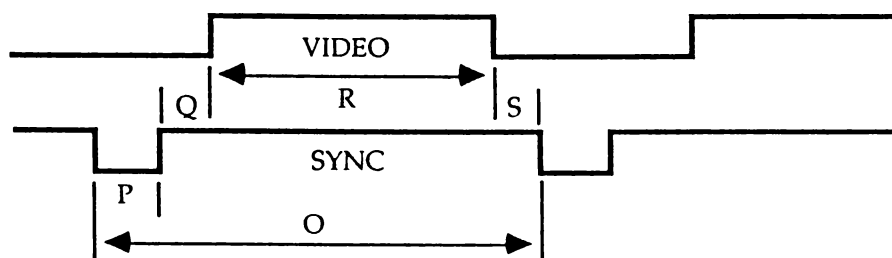
Horiz. Sync. Polarity	POS
Vert. Sync. Polarity	POS
Total PELs per Line	1264
Active PELs per Line	1024
Line Blanking Time (PELs)	240
Line Sync. Pulse Width (PELs)	176
Line Front Porch Width (PELs)	8
Line Back Porch Width (PELs)	56
Total Lines per Frame	817
Active Lines per Frame	768
Fields per Frame	2
Field Blanking Time (E/O Lines)	25/24
Field Sync. Pulse Width (E/O Lines)	4
Field Front Porch Width (E/O Lines)	0.5/0.0
Field Back Porch Width (E/O Lines)	20.5/20
PEL Time (ns)	22.27
Total Line Time (us)	28.15
Total Frame Time (ms)	23.00
Frame Rate (Hz)	43.48

Vertical Lines	350	400	480	600	CGA	EGA
Horizontal Freq.	— 31.468 KHz—			35.52 KHz		
Sync. Polarity	POS	NEG	NEG	POS	POS	POS
A us	31.78	31.78	31.78	28.44	63.5	45.76
B us	3.81	3.81	3.81	2.00	4.50	5.60
C us	1.91	1.91	1.91	3.66	7.80	1.00
D us	25.42	25.42	25.42	22.22	44.50	39.37
E us	0.64	0.64	0.64	0.67	6.70	-0.20
Vertical Freq.	60 Hz	70 Hz	60 Hz	56.25 Hz	60 Hz	60 Hz
Sync. Polarity	NEG	POS	NEG	POS	POS	NEG
O ms	14.27	14.27	16.68	17.78	16.637	16.75
P ms	0.06	0.06	0.06	0.06	0.19	0.60
Q ms	1.91	1.11	1.05	0.63	2.30	0.08
R ms	11.12	12.71	15.25	17.07	12.576	16.02
S ms	1.18	0.38	0.32	0.03	1.60	0.05

HORIZONTAL



VERTICAL



3. ADJUSTMENT EQUIPMENT

- a. Volt-ohm-A meter (Sanwa FD-750C or equivalent).
- b. 30KV high voltage probe (HP34111A).
- c. Oscilloscope (TEK2235 or equivalent).
- d. White balance adjuster (Minolta Color Analyzer II).
- e. Signal generator (IBM PC with VGA card or equivalent).
- f. Screwdriver.

4. SWITCHING POWER SUPPLY - Regulator Adjustment (PWB1001)

The regulated B+ control has been preset in the factory and needs no adjustment. However, if any repairs are made on the equipment, the following readjustment procedures are recommended.

- a. Allow the monitor to warm-up for about 5 minutes.
- b. Apply the VGA (31.468 KHz) signal to the monitor.
- c. Connect a DC meter to TP1 (on the main PCB), and adjust VR831 for 86V DC.
- d. If a fuse is broken during adjustment, remember to replace it with the exact same type of fuse.

5. ALIGNMENT PROCEDURES

A) SYNCHRONIZATION ADJUSTMENT

Input Signal: Cross Hatch Pattern

Connect the DC meter to TP2 and adjust VR128 to obtain the F/V output for 5.7V.

Adjust H-Hold VR136 until the cross hatch pattern is stable.

B) PICTURE SIZE ADJUSTMENT

Input Signal: Cross Hatch Pattern

Horiz. Width:

480 mode: Adjust L402 so that the horiz. width of the picture is 240mm +/- 3mm

Vert. Height:

350 mode: Adjust VR111 so that the vert. height of the picture is 180mm +/- 3mm

400 mode: Adjust VR108 so that the vert. height of the picture is 180mm +/- 3mm

480 mode: Adjust VR110 so that the vert. height of the picture is 180mm +/- 3mm

768 mode: Adjust VR109 so that the vert. height of the picture is 180mm +/- 3mm

CGA mode: Adjust VR113 so that the vert. height of the picture is 180mm +/- 3mm

EGA mode: Adjust VR115 so that the vert. height of the picture is 180mm +/- 3mm

C) WHITE BALANCE ADJUSTMENT

Input Signal: Full White Video - VGA mode

Drive VRs: VR502, VR532, VR562.

Bias VRs: VR910, VR940, VR970.

- 1a. Set Brightness & Contrast to minimum.
 - b. First adjust VR940 to its center position.
Then adjust VR970 so that $Y = 0.329$
and adjust VR910 so that $X = 0.313$
- 2a. Set Brightness & Contrast to maximum.
 - b. Adjust VR532 for 45Vp-p of the G. gun input at the cathode.
- 3a. Set Brightness to center detent & Contrast to 10 Fl.
 - b. First adjust VR562 so that $Y = 0.329$
then adjust VR502 so that $X = 0.313$
- 4a. Set Brightness to maximum & the G2 voltage just before the raster appears.
 - b. Check the white balance in the VGA mode.
- 5a. Set Brightness just before the raster disappears.
 - b. Repeat steps 2b. to 5b. until the best white balance is obtained.

D) FOCUS ADJUSTMENT

Input Signal: Dot Test Pattern

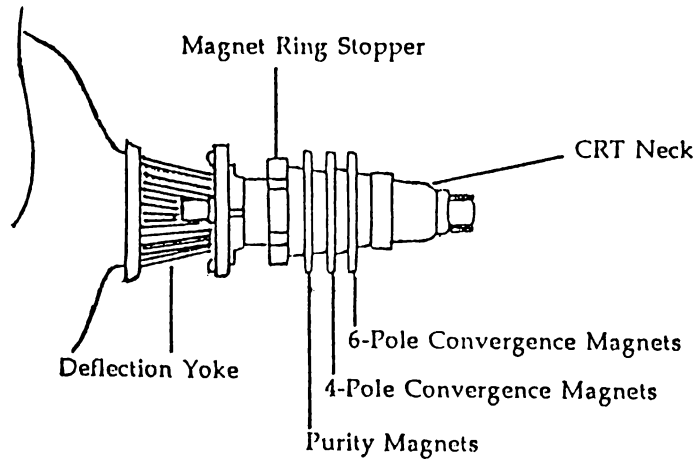
1. Set Brightness & Contrast for a normal display.
2. Adjust the focus control at the high voltage resistor block to obtain the best focus over the entire display area.

E) STATIC CONVERGENCE ADJUSTMENT

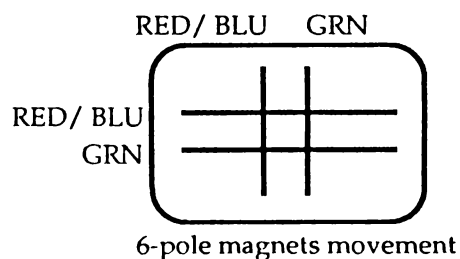
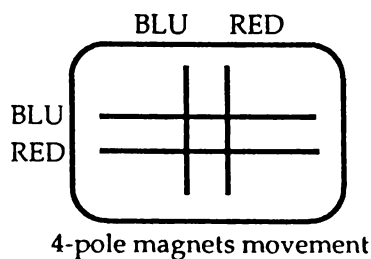
NB: The monitor should be operated for at least 30 mins. before any convergence adjustments are made.

Input Signal: Cross Hatch Pattern

1. Set Brightness & Contrast so that a well-defined pattern is obtained.
2. Ensure that the convergence magnets on the CRT are in the correct position.



3. Turn the 2 tabs of the 4-pole magnets independently to adjust their angles. Align the red & blue vert. lines at the center of the screen.
4. Turn the 2 tabs of the 4-pole magnets simultaneously to keep their angles constant. Align the red & blue horiz. lines at the center of the screen.
5. Turn the 2 tabs of the 6-pole magnets independently to superimpose the red/blue vert. line on the green one.
6. Turn the 2 tabs of the 6-pole magnets simultaneously to superimpose the red/blue horiz. line on the green one.
7. Repeat steps 3, 4, 5 & 6 until the best convergence is obtained.
NB: The 4-pole magnets & the 6-pole magnets interact, making dot movements complex.



F) DEGAUSSING

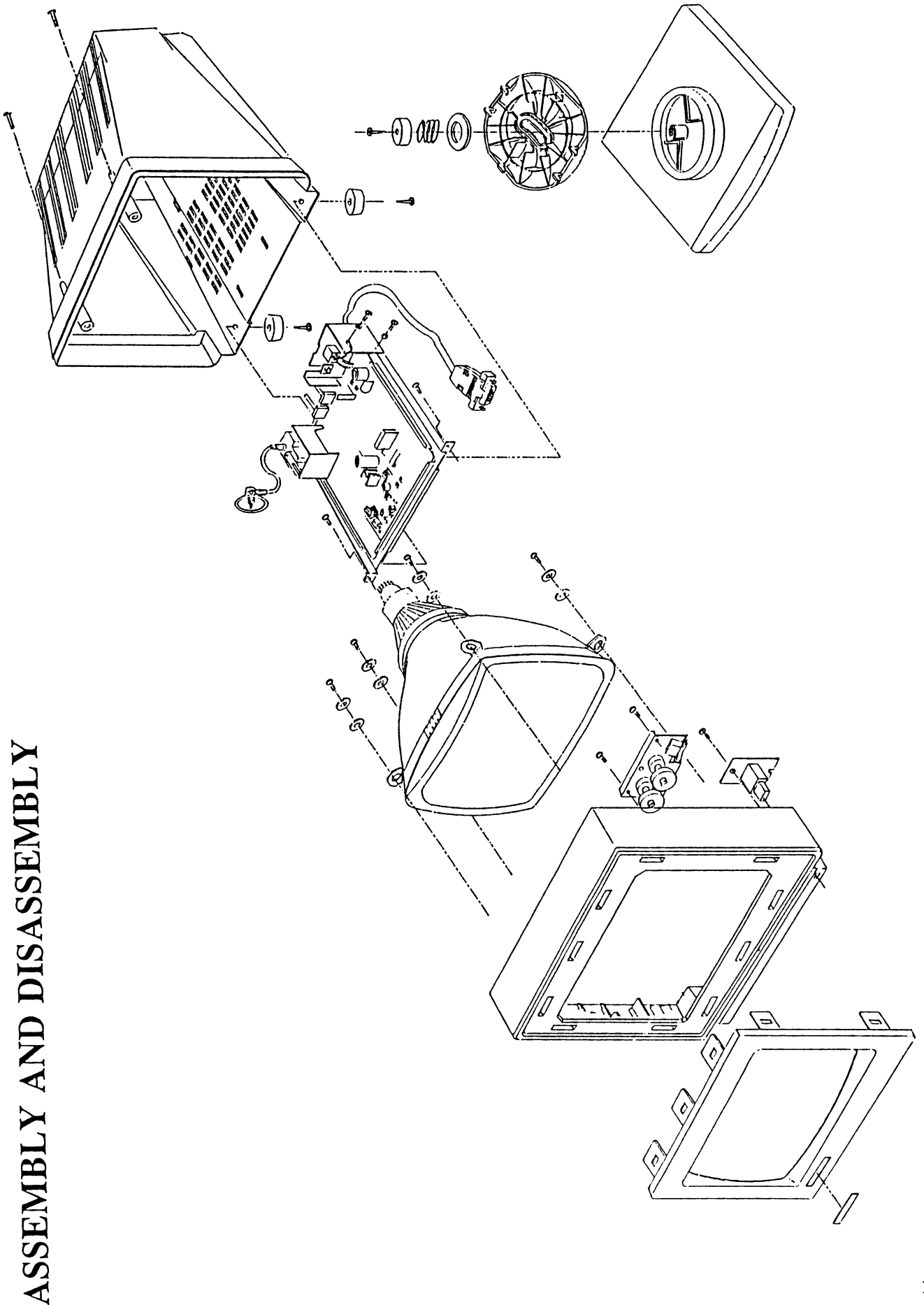
Degaussing is required when poor color purity appears on the screen. This monitor uses an automatic degaussing circuit that is activated at power ON. Automatic degaussing will be fully functional within 15 minutes.

The degaussing effect is confined to the picture tube since the coils are mounted at the back of the tube. Should any part of the chassis or cabinet become magnetized, it will be necessary to degauss the affected area with a manual degaussing coil.

Manual Degaussing

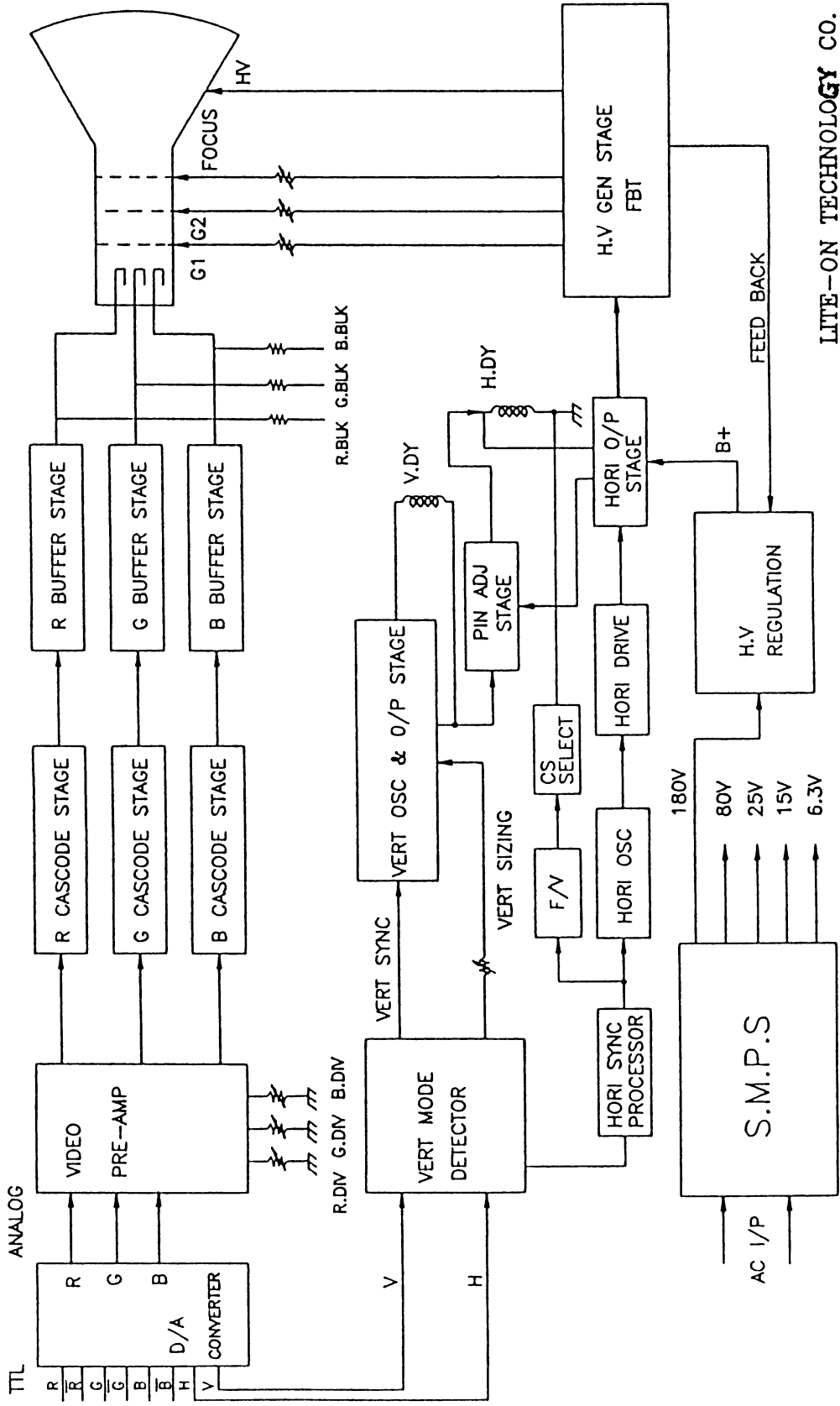
- a. Apply line voltage to the degaussing coil and move it in a rotary motion over the front, sides, and top of the monitor. The coil should be kept away from the rear of the monitor to avoid damaging the magnetic neck components.
- b. Slowly rotate and back the coil away from the monitor to about 6 feet beyond the point where no effect on the CRT will be noticeable.

For proper degaussing, it is essential that the field be gradually reduced by moving the coil slowly away from the monitor. The degaussing coil must never be shut off or disconnected while near the monitor, as this would introduce a strong field instead of cancelling the effect of the stray fields.



ASSEMBLY AND DISASSEMBLY

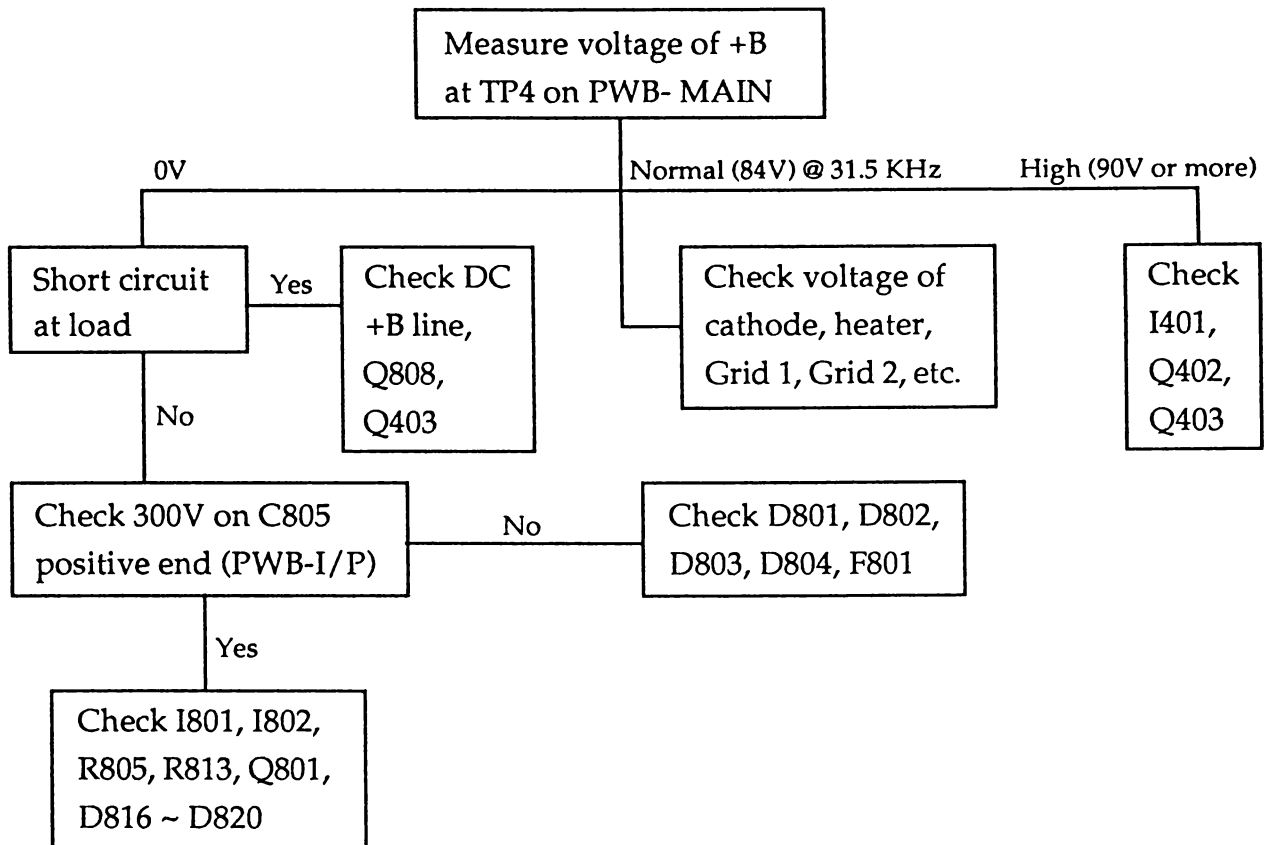
CM1438M
CM1445M
THE BLOCK DIAGRAM OF COLOR MONITOR



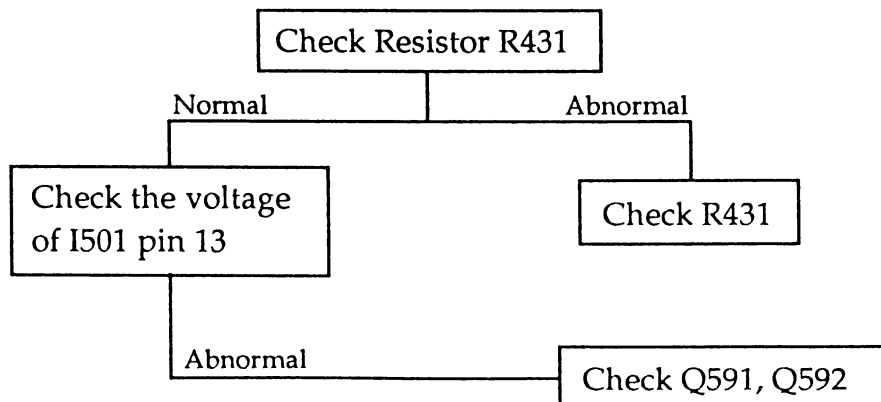
LITTE-ON TECHNOLOGY CO.

TROUBLE-SHOOTING CHART

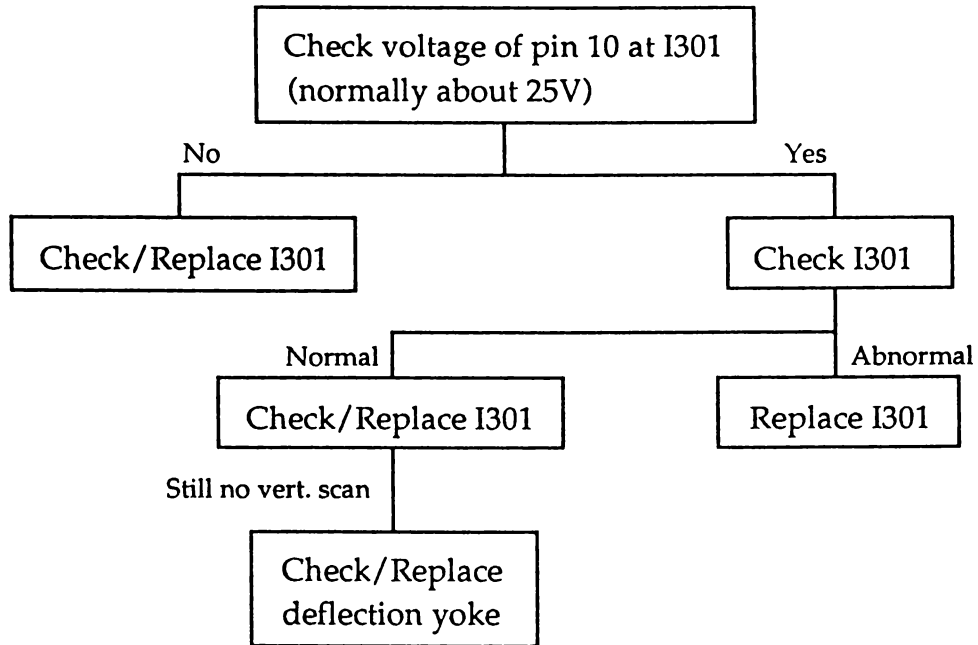
1. NO RASTER



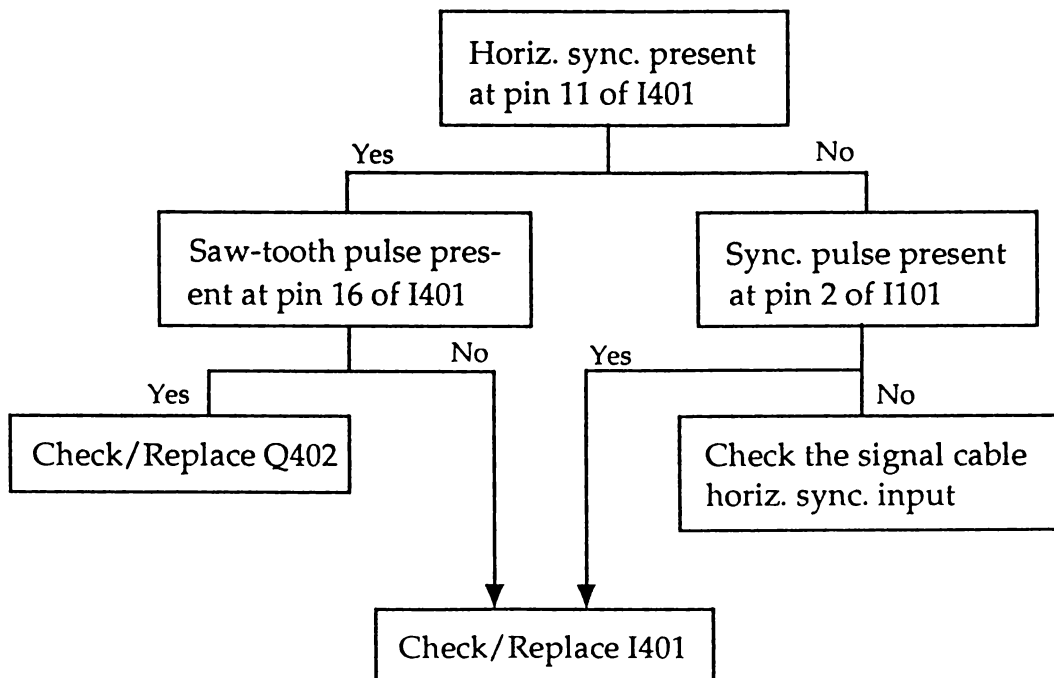
2. AUTOMATIC BRIGHTNESS LIMITER NOT FUNCTIONING



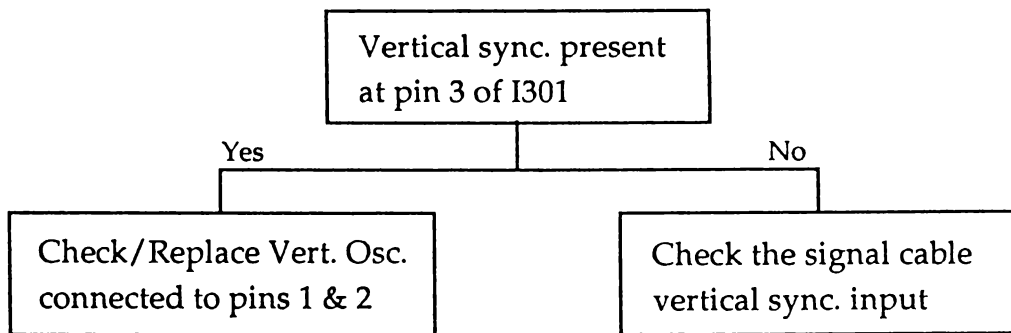
3. NO VERTICAL SCAN (RASTER IS ONE HORIZ. LINE)



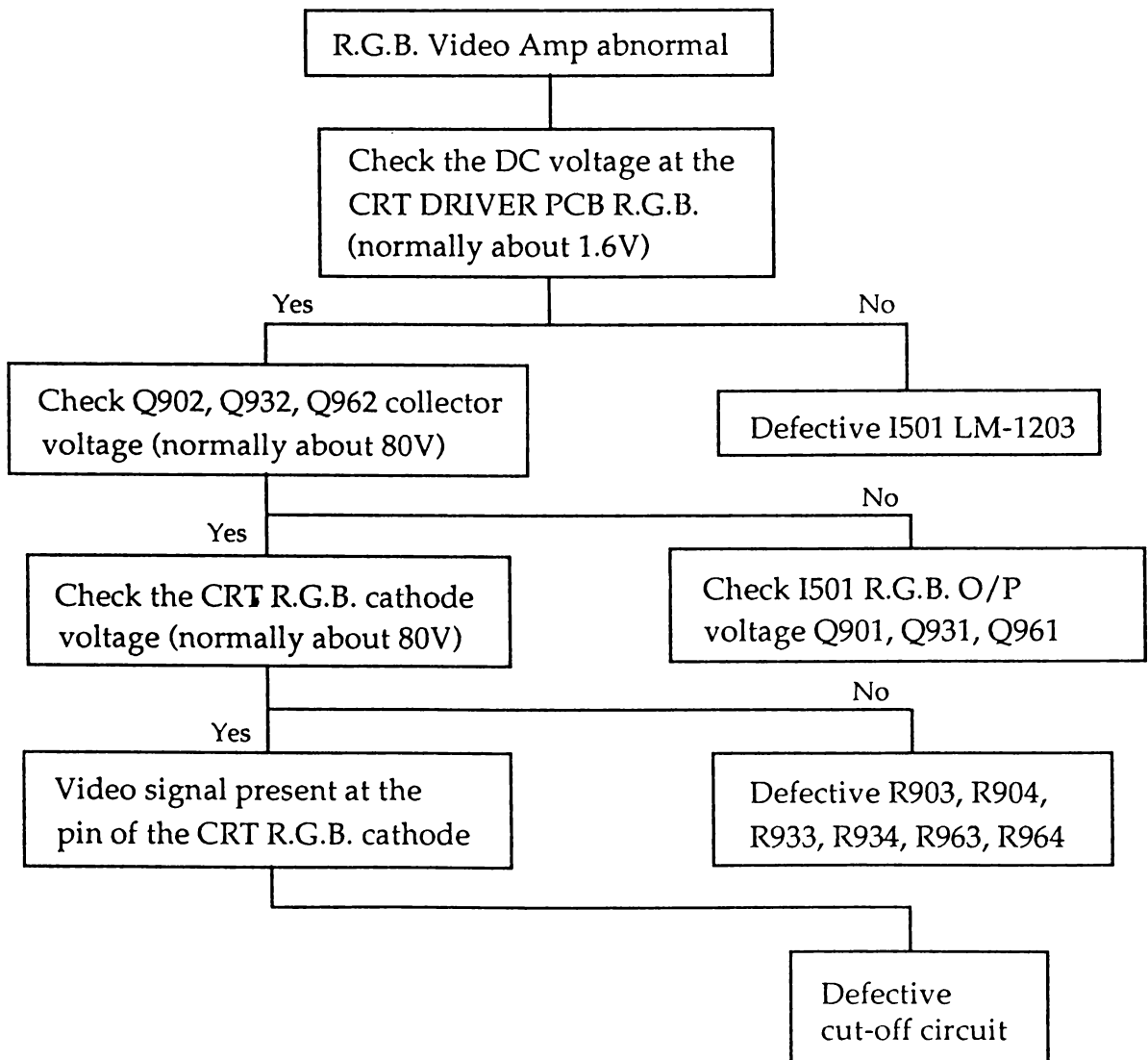
4. OUT OF HORIZ. SYNC.



5. OUT OF VERTICAL SYNC.



6. VIDEO AMP ABNORMAL



Commodore International Spare Parts List 1960 PCB Assembly

Commodore part numbers are provided for reference only and do not indicate the availability of spare parts from Commodore. Industry standard parts (Resistors, Capacitors, Connectors) should be secured locally. Part number information may vary according to country, some parts may not be available in all countries.

602319-001	COIL	L901,L931,L961	602319-021	FET	Q801
602319-002	RES CF	R905	602319-022	FET	Q808
602319-003	RES MOF	R642	602319-023	IC	I105
602319-004	RES MOF	R813	602319-024	IC	I501
602319-005	DIODE SW	D814	602319-025	IC	I104
602319-006	DIODE SW	D801-D804	602319-026	IC	Q594
602319-007	DIODE SW	D816	602319-027	IC	I804
602319-008	DIODE SW	D806	602319-028	IC	I802
602319-009	DIODE SW	D819	602319-029	IC	I803
602319-010	DIODE ZENER	D111	602319-030	IC	I106
602319-011	DIODE ZENER	D402	602319-031	IC	I107,I805
602319-012	DIODE ZENER	D811	602319-032	IC	I301
602319-013	DIODE ZENER	D101	602319-033	IC	I401
602319-014	TR NPN	Q403	602319-034	IC	I801
602319-015	TR NPN	Q802,Q806	602319-035	IC	I101
602319-016	TR NPN	Q106,Q401,Q593	602319-036	IC	I103
602319-017	TR NPN	Q904	602319-037	IC	I102
602319-018	TR NPN	Q302	602319-038	IC	I601
602319-019	TR PNP	Q903	602319-039	IC	I602
602319-020	TR PNP	Q807	602319-040	FUSE 4A/250V	F801

Cabinet Parts

602319-041	FRONT BEZEL	602319-044	PEDESTAL
602319-042	BACK COVER	602319-045	CRT
602319-043	NAMEPLATE	602319-046	FRONT DOOR PANEL

