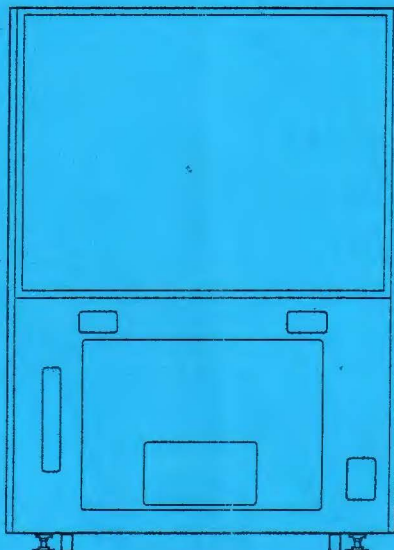


PROJECTION TELEVISION  
GM2 CHASSISMODEL  
**50P-GHS63****CAUTION**

Before servicing this chassis, it is important that the service person reads the "SAFETY PRECAUTIONS" in this service manual.

**SPECIFICATIONS**

- Chassis : GM2
- Power Input : AC100V ; 50/60Hz
- Power : 250W
- Consumption
- Input Terminal
  - RGB Input : 0.7Vp-p 75Ω Straight Polarity
  - SYNC Input : Composite SYNC Signal 3.0~5.0Vp-p  
0.7kΩ Negative Polarity
- Reception : Horizontal Frequency 24.39±1.00kHz
- Frequency : Vertical Frequency 50~70Hz  
(RGB Signal)
- Operating : 0°C to 30°C
- Temperature
- Relative : 20 % to 80 %
- Humidity
- Screen Size : 1016 (W) × 762 (H) / 1271 (Diagonal) mm
- Cabinet : 1098 (W) × 1488 (H) × 698 (D) mm
- Dimensions
- Weight : 90 kg

- Weight and dimensions shown are approximate.
- Design and specifications are subject to change without notice.

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# SAFETY PRECAUTIONS

**NOTICE :** Observe all cautions and safety related notes located inside the receiver cabinet and on the receiver chassis.

## WARNING

1. Operation of this receiver outside the cabinet or with the cover removed presents a shock hazard from the receiver power supplies. Work on the receiver should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high-voltage equipment.
2. 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 away while the picture tube is being handled. Keep the picture tube away from the body while handling.

## X-RADIATION WARNING

The surface of the picture tube may generate X-Radiation. Take precautions when servicing and, if possible, the use of a lead apron is recommended for shielding while handling.

When replacing the picture tube, use only the designated replacement part since it is a critical component with regard to X-Radiation as noted above. No high-voltage adjustments are provided. The high-voltage specification is described on the cover page.

## LEAKAGE CURRENT CHECK

Before returning the receiver to the customer, it is recommended that leakage current be measured according to the following methods.

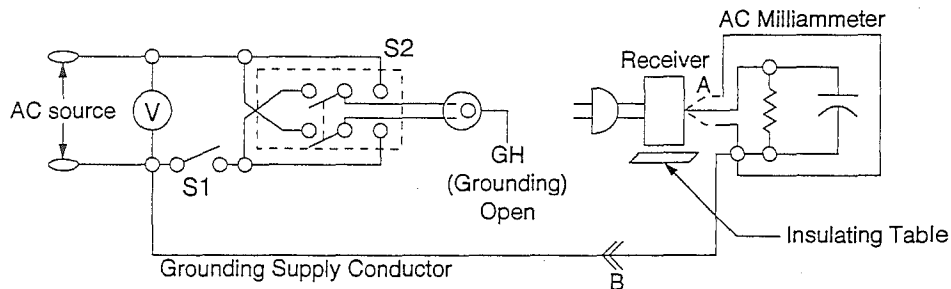
### 1. Cold Check

With the AC plug removed from the AC source, place a jumper across the two AC plug prongs. Turn the receiver AC switch on. Using an ohm-meter, connect one lead to the AC plug and touch the other lead to each exposed metal part (antennas, handle bracket, metal cabinet, screwheads, metal overlays, control shafts, etc.), particularly any exposed metal part having a return path to the chassis. Exposed metal parts having a return path to the chassis should have a minimum resistance reading of 1 megohm. Any resistance below this value indicates an abnormality which requires corrective action. Exposed metal parts not having a return path to the chassis will indicate an open circuit.

### 2. Hot Check

Use the circuit in the Figure below to perform this test.

- (1) With switch S1 open, connect the receiver to the measuring circuit. Immediately after connection, measure the leakage current using both positions of switch S2, and with the switching devices in the receiver in all of their operating positions.
- (2) Switch S1 is then closed, energizing the receiver. Immediately after closing the switch, measure the leakage current using both positions of switch S2, and with the switching devices in the receiver in all of their operating positions. Current measurements of items (1) and (2) are to be repeated after the receiver has reached thermal stabilization. The leakage current must not be more than 0.5 milliampere.



## **CLEANING**

### **Cautions when cleaning**

- Since the Lenticular Screen is made of Acrylic Resin and susceptible to damage, please pay careful attention to its handling.
- Do not wipe it with benzine or thinner. It might be a cause of deterioration or removing the paint. Please follow the instructions of a chemical cloth if you choose to use one.  
Please make sure to unplug the power cord before cleaning the inside of the product because high voltage is applied to its inside.
- Please pay careful attention not to touch the surface of the lens by hand or damage it.

### **Cleaning**

- Please wipe it lightly with a soft cloth. When the screen is very dirty, please soak a soft cloth into a diluted mild detergent. Wipe it and finish cleaning with a dry cloth.
- Wipe the lenticular screen along the streak.
- Clean the Fresnel Lens and Mirror or Lens with a cleaner effective for prevention of static electricity.

## **DEW CONDENSATION**

### **Dew Condensation of Lens**

- Dew condensation may occur on the optical unit and the picture may become unclear at the moment when suddenly raising room temperature. In this case, leave it in the condition of turning on the power for 1 to 2 hours to return to normal.

# PCBs LOCATION

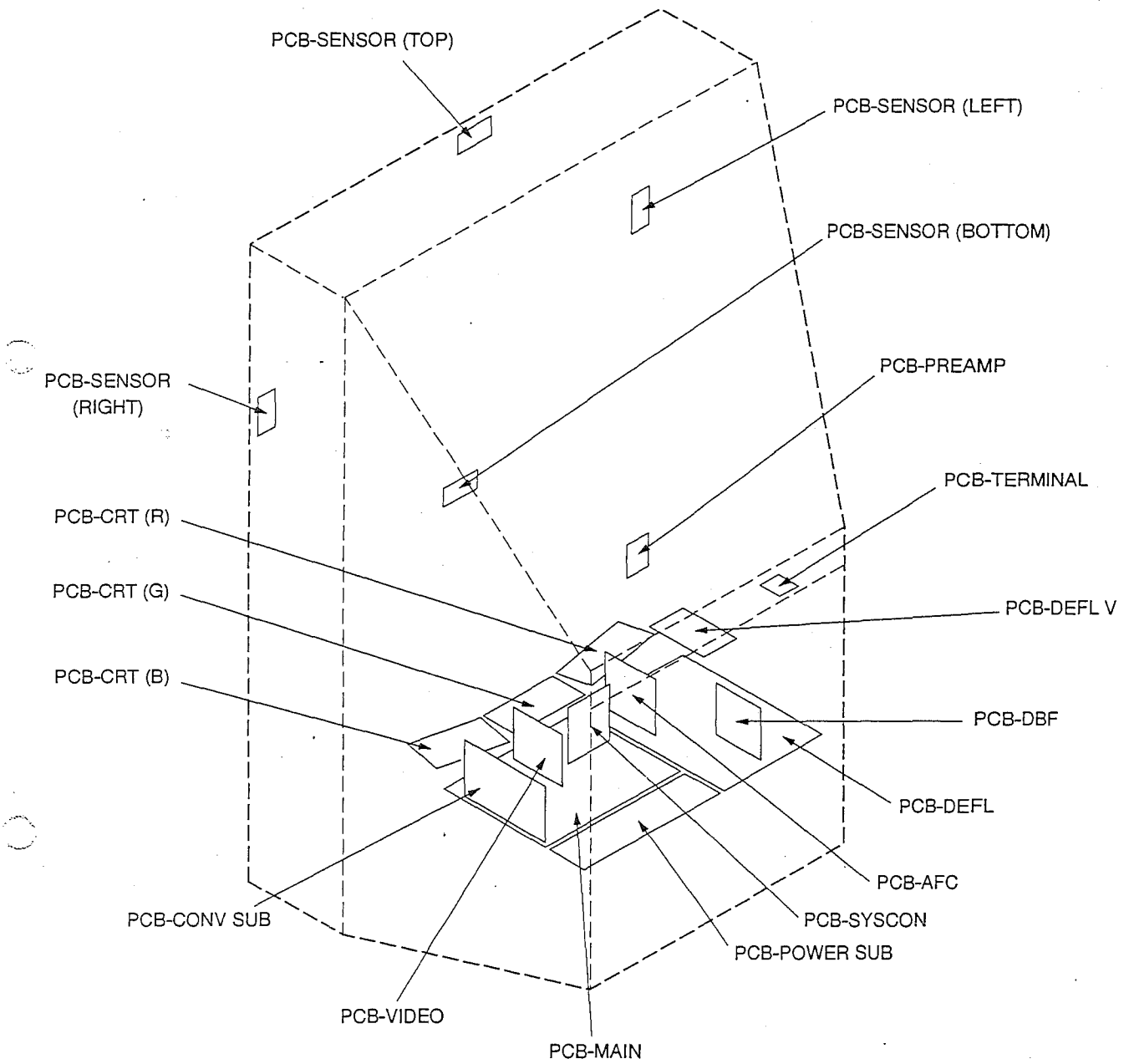


Fig. 1

# REMOVING FRONT AND REAR CABINET COMPONENTS

Refer to PARTS LIST for Parts Number.

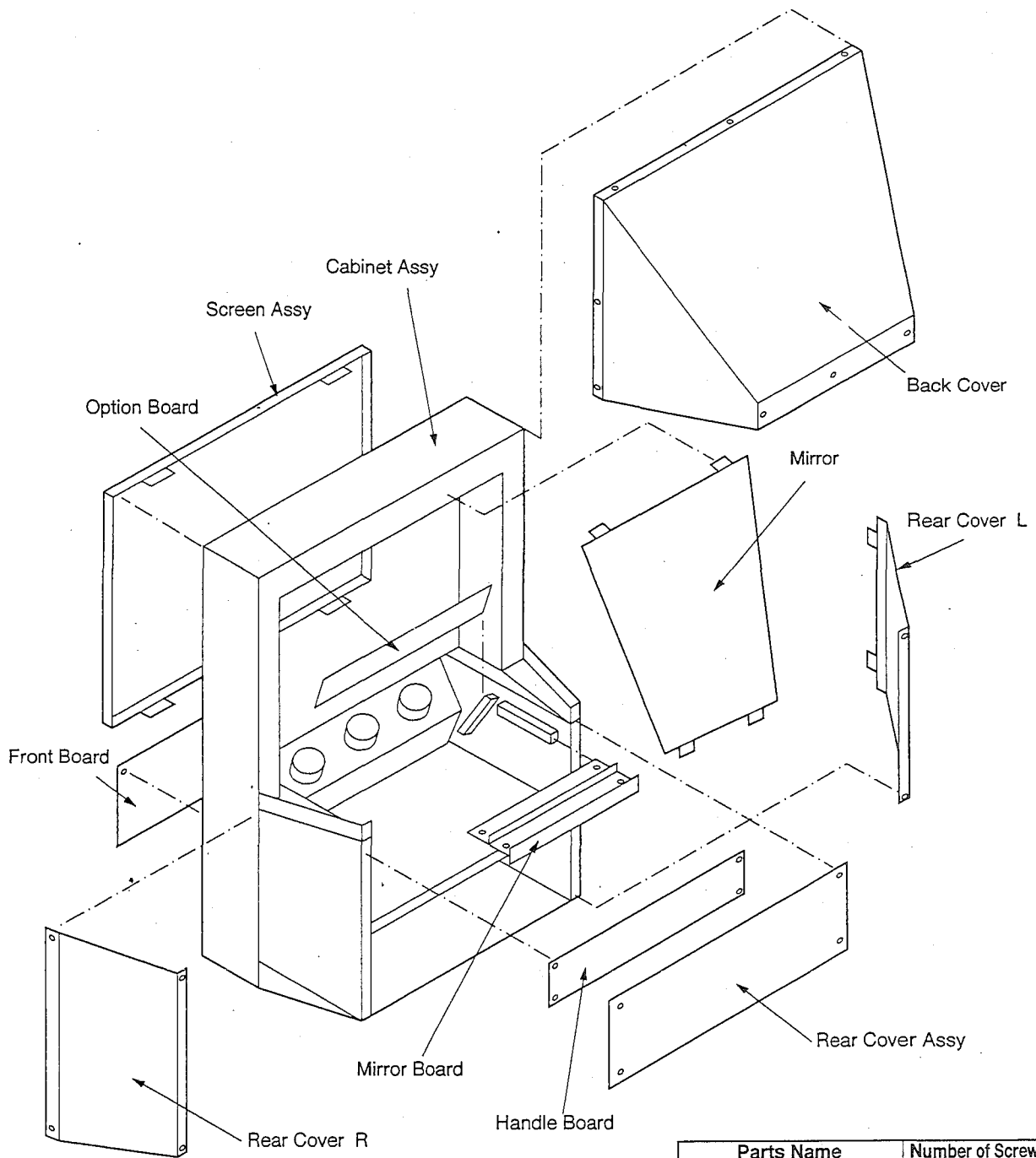







Fig. 2

Parts Name	Number of Screws
Screen Assy	2
Front Board	2
Back Cover	10
Rear Cover Assy	8
Handle Board	4
Mirror Board	4
Option Board	2
Mirror	4
Rear Cover L	4
Rear Cover R	4

# LEAD DRESS

**Note :** The inner wires are clamped so that they do not come close to heat generating or high voltage parts.  
After servicing route all wires in their original position.

- The Anode Lead Wires are routed so that no tensile strength applied to the caps. If the route of the Anode Lead Wires are changed, return them to the initial route.
- Clamp the Lead Wires along the clamping zone with mark \* shown in the figure below.
- Take care so that the Lead Wires are not slack.

	Optical Unit
	Focus Pack
	*Clamping Zone
	*Hidden Clamping Zone
	Aerial Clamp

\* Clamping Zone shows the route of the Lead Wire bundle the High Voltage Lead Wire and the Lead Wire on the primary side.

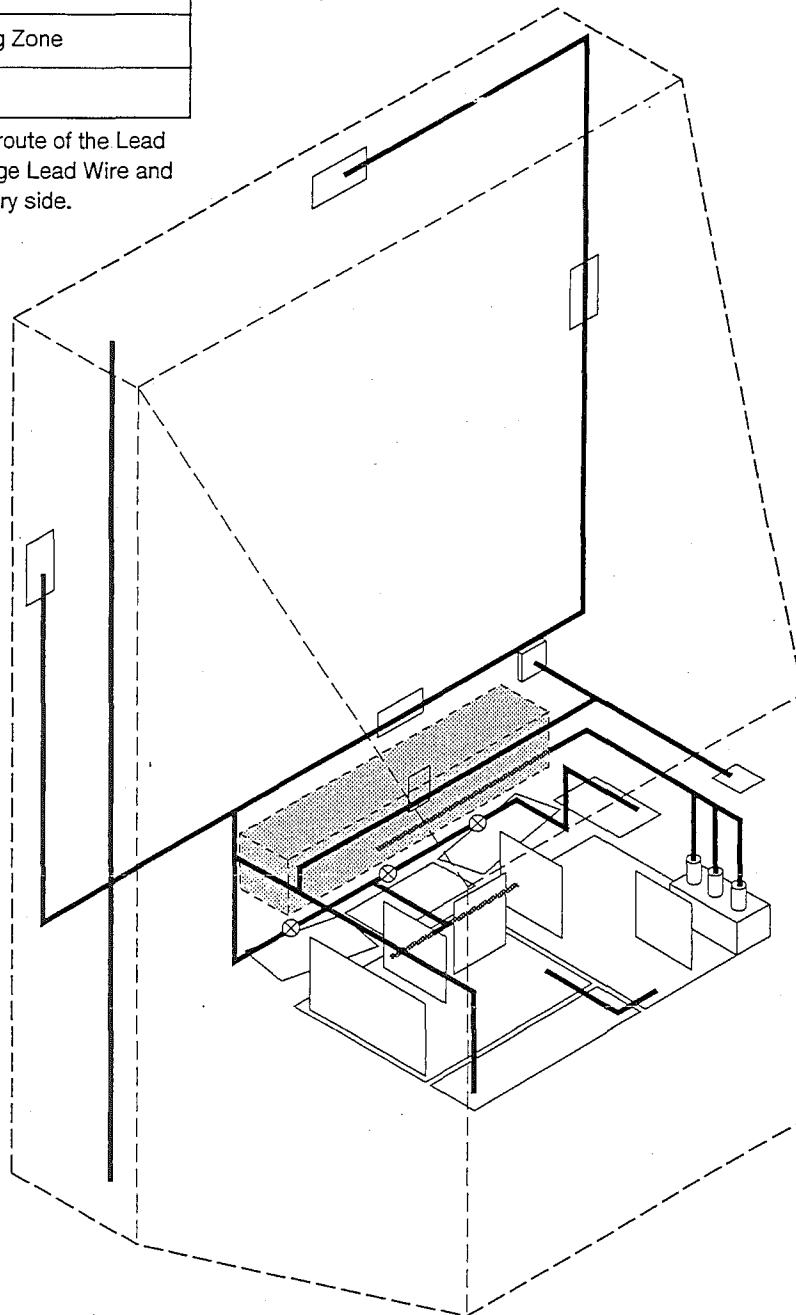


Fig. 3

# SERVICING OF THE LENTICULAR SCREEN AND FRESNEL LENS

## Cautions when handling the Lenticular Screen and Fresnel Lens

1. Wear gloves when handling the Lenticular Screen and Fresnel Lens. (This prevents cuts and fingerprints.)
2. Do not place the Fresnel Lens in the sun. (This can cause a fire and burn.)
3. Store in a dry place. (High humidity causes deformation of the Lenticular Screen and Fresnel Lens.)

## Removal of the Lenticular Screen and Fresnel Lens

1. Remove 8 screws (a) retaining the Screen Frame.
2. Remove the Lenticular Screen, Fresnel Lens and Monitor Glass. (Fig. 4-1)  
Warm the connection portion between the Lenticular Screen and Fresnel Lens with a dryer etc. and remove the Double Coated Tape. (Fig. 4-2)

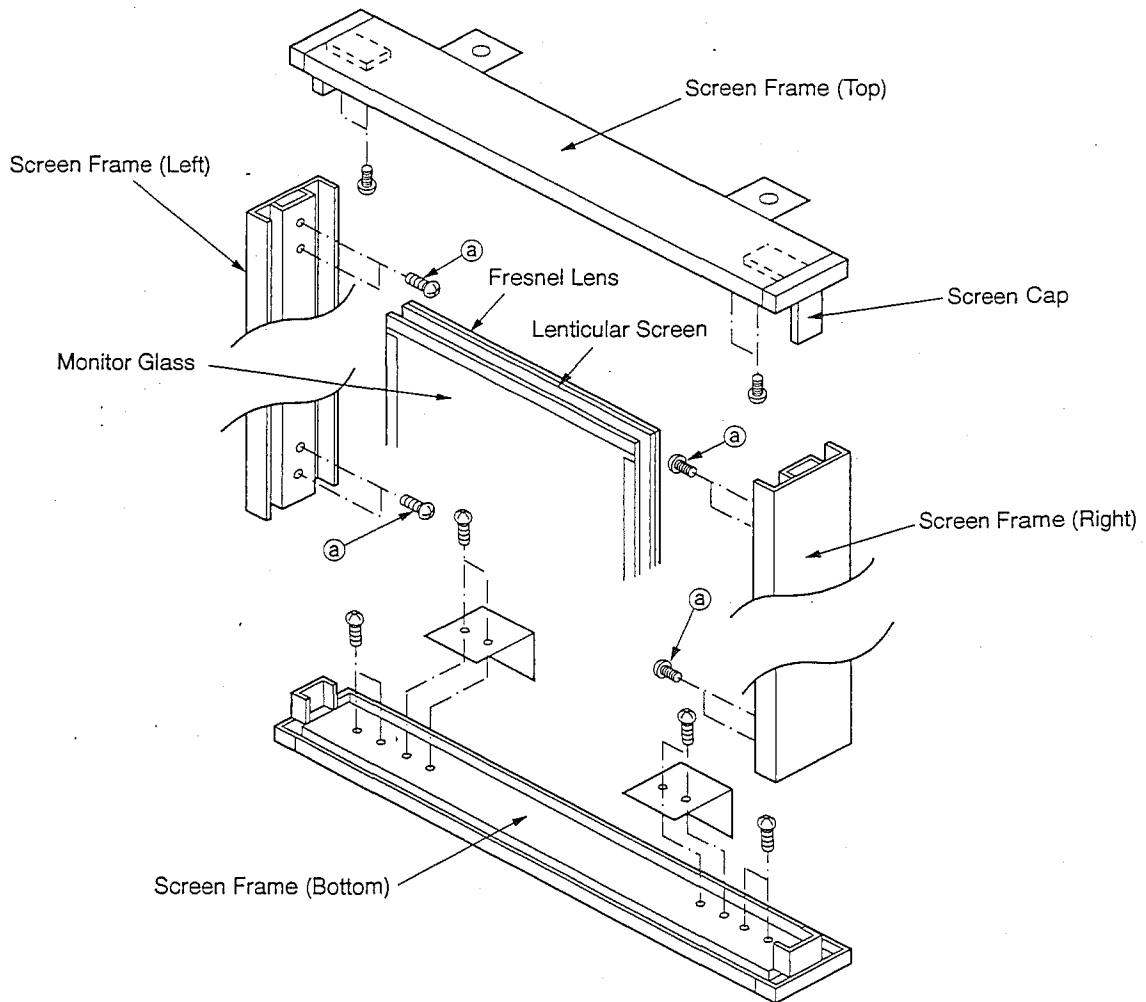


Fig. 4-1



## Installation of the Lenticular Screen and Fresnel Lens

1. Join the Lenticular Screen and Fresnel Lens together by applying a Double Coated Tape. (Fig. 4-2)
2. Install cushions on the Monitor Glass. (Fig. 4-3)

**Note :** Bend the front side of the cushions at 10mm or less so as not to cover the back side.

3. Insert the Monitor Glass into the Screen Frame. (Fig. 4-4)
4. Insert the Lenticular Screen and Fresnel Lens into the Screen Frame.
5. Install 8 screws @ retaining the Screen Frame. (Fig. 4-1)

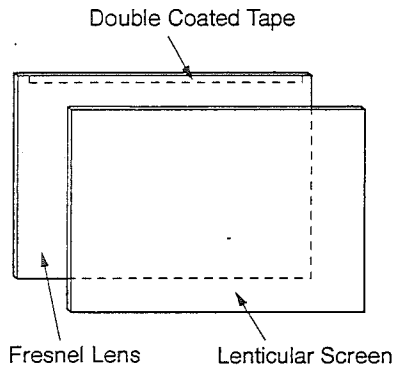


Fig. 4-2

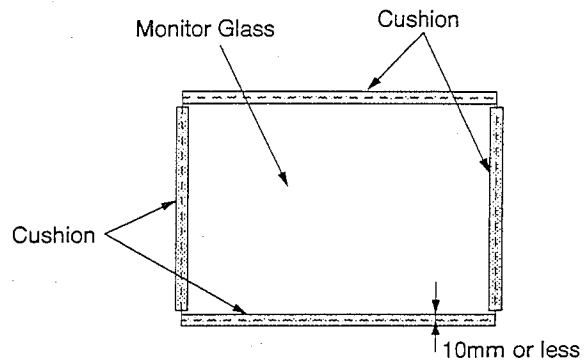


Fig. 4-3

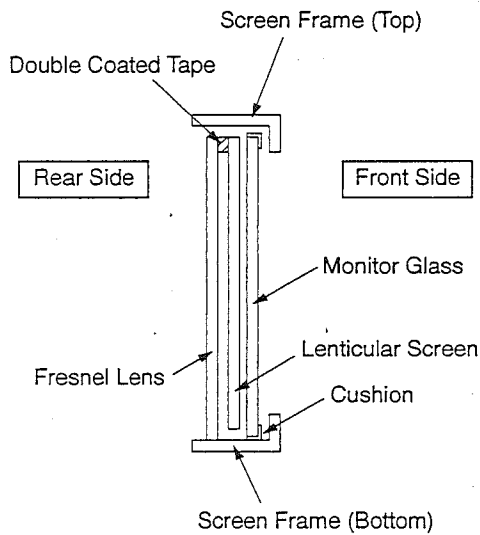


Fig. 4-4

# CRT REPLACEMENT

## Removal of the CRT

Replace the CRT one by one. Each time one CRT is replaced, energise. After roughly adjusting the focus, the middle of the screen and convergence, replace the CRT in sequence while confirming there is no big misconvergence on the screen.

1. Remove the Rear Cover Assy. (Fig. 2)
2. Disconnect the Anode Lead Wires from the Flyback Transformer. Contact the Anode Lead Wires with the Radiator for Transistor to discharge the residual charge inside the CRT. (Fig. 5-1)
3. Remove the Back Cover, Mirror Board and Option Board. (Fig. 2)
4. Remove 4 hex-nuts (a) retaining the Optical Unit. (Fig. 5-2)

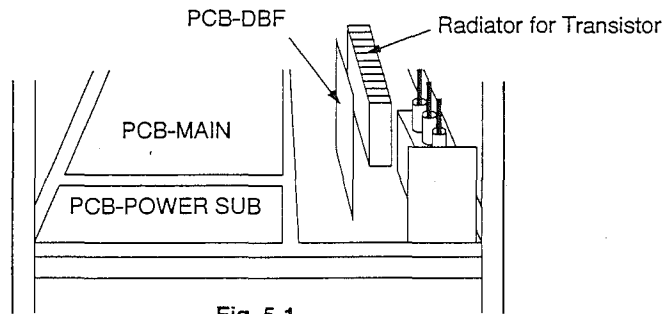


Fig. 5-1

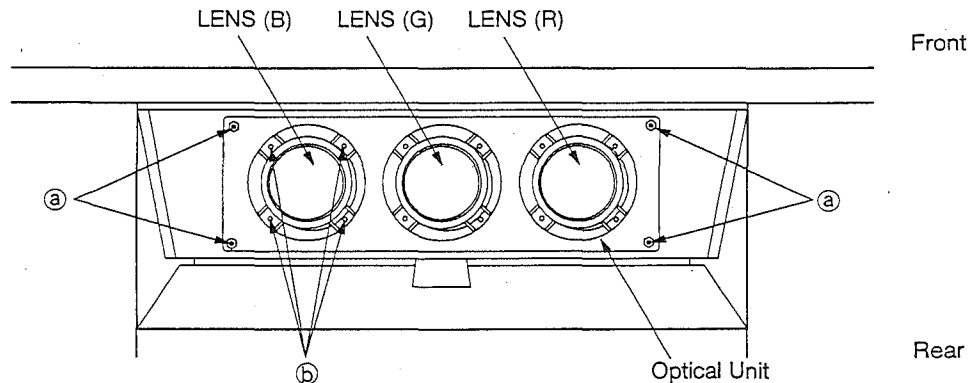


Fig. 5-2

5. Remove 4 screws (b) retaining the Lens while supporting the CRT. (Fig. 5-2)
6. Remove 4 screws (c) retaining the CRT while supporting the CRT. (Fig. 5-3)

The CRT is removable from the Optical Unit in this condition.

**Note :** Never loosen the colored screws and screws with spring. This can cause a leakage of cooling liquid. If the cooling liquid should leak and stick to the surface of the Lens, wipe it with a soft cloth. If the cooling liquid should enter into the Lens, replace it.

7. Remove the PCB-CRT, Deflection Yoke and Convergence Purity Assy (Green only).

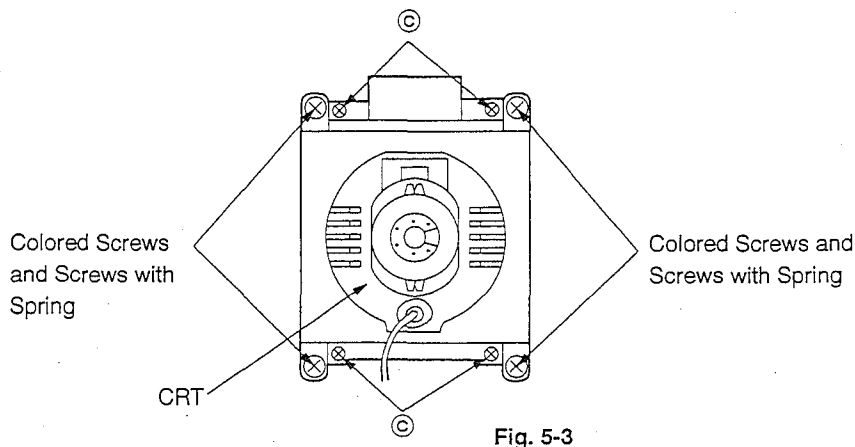


Fig. 5-3

## Installation of the CRT

**Note :** If the cooling liquid should stick to the Lens, wipe it with a soft cloth.

If the cooling liquid should enter into the inside of the Lens, replace the Lens.

1. Fix the Deflection York on the CRT neck temporarily.
2. Install the CRT on the Optical Unit. (Fig. 5-3)
3. Insert the Lens into the Optical Unit. (Fig. 5-2)
5. Install the PCB-CRTs.
4. Install the Deflection York in place. (Fig. 5-4)
6. Insert the Optical Unit into the Cabinet. (Fig. 5-2)

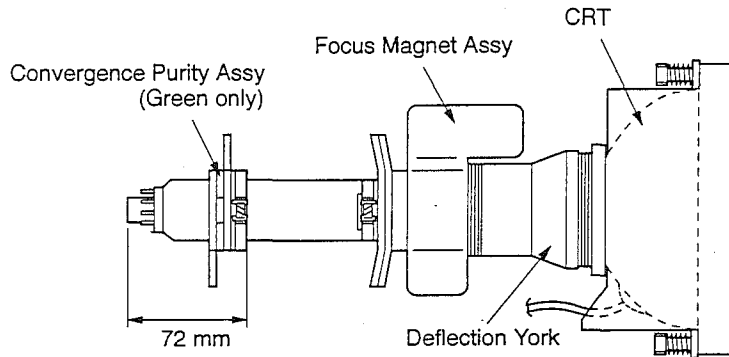


Fig. 5-4

## Adjustment procedures after replacing the CRT

After replacing the CRT, perform the following adjustments.

1. Cut Off Adjustment
2. Centering Adjustment
3. Focus Adjustment
4. Ellipticity Adjustment
5. White / Brightness Adjustment
6. Dynamic Convergence Adjustment

## Confirmation after replacing the CRT

1. Raster Size
2. Raster Distortion

# CIRCUIT ADJUSTMENT MODE

On this model, the following adjustment items are performed using the remote hand unit :

- Item 3 (Cut Off) ~ Item 5 (Raster Size)
- Item 8 (White, Brightness)
- ~ Item 11 (Screen Character Position)

To perform these adjustments using remote hand unit, set the product to the circuit adjustment mode beforehand. Use the following procedure to activate the circuit adjustment mode.

## 1. Change to the Circuit Adjustment Mode

1. Press the "TEST" button on the remote hand unit.  
The built-in cross-hair test pattern will appear.
2. Press the "1", "1", and "8" on the remote hand unit in that order and change to the circuit adjustment mode. The display as shown on the right will appear.

**Note :** Repeat the step 1 to 2 when not changing to the circuit adjustment mode.

## 2. Selection of Adjustment Functions and Adjustment Items

To select an adjustment item in the circuit adjustment mode, select first the adjustment function, that includes the specific adjustment item to be selected, and next select the adjustment item.

1. Press the "R/B" button to select an adjustment function.  
Each time the button is pressed, the adjustment function changes as follows.

└─ HOUR-TIMER ─┬─ CONV ─┬─ ATC ─┬─ HR ─┬─ DAC ─┘

2. Press the "▲" or "▼" button on the remote hand unit to select a specific adjustment item.
  - Press the "▲" button. The adjustment Item Number will increase.
  - Press the "▼" button. The adjustment Item Number will decrease.

## 3. Changing data

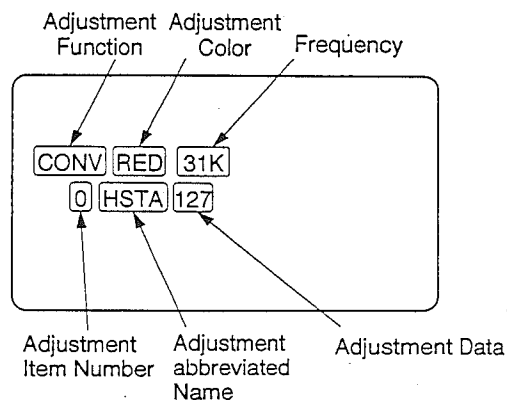
1. After selecting an adjustment item, press the "◀" or "▶" button to change the adjustment data.
  - Press the "◀" button. The adjustment data will decrease.
  - Press the "▶" button. The adjustment data will increase.
2. Press "ENTER" to save the adjustment data in memory. The screen characters turn red for approximately 2 to 3 seconds in this step.

## 4. Terminating the circuit adjustment mode

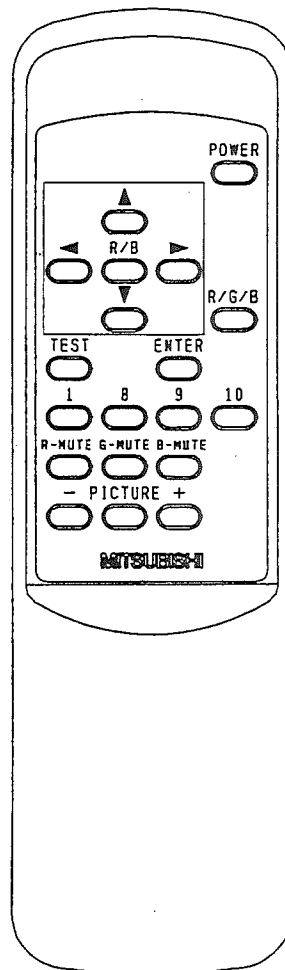
Press the "TEST" button on the remote hand unit to terminate the circuit adjustment mode.

**Note :** The circuit adjustment mode can also be terminated by turning the power off.

TEST 1.1.8 Mode Display



Remote Hand Unit



# LIST OF ADJUSTMENT FUNCTIONS AND ADJUSTMENT ITEMS

- Replace the EEPROM saving the following adjustment data to initialize all the adjustment data. Therefore, readjust the data indicated in the "Data" column after replacing the EEPROM Note that the data in ( ) is reference data. Perform the ADJUSTMENT PROCEDURES given in the "Note" column.

Function Display			CONV		RED : IC801 BLUE : IC802 GREEN : IC803		
No.			Abbreviated Name	Adjustment Name	Range	Data	Note
R	G	B					
0	[60]	120	HSTA	Horizontal Static	0~254	(127)	# 9 (Raster Distortion) or # 10 (Dynamic Convergence)
1	[61]	121	VSTA	Vertical Static	0~254	(127)	
2	—	—	HPCC	[SIDE-PCC]	0~254	(127)	
—	62	—	VPCC	[T-B-PCC]	0~254	(127)	
—	—	122	KOFS	[Keystone Off Set]	0~254	(127)	
3	63	123	TILT	Horizontal Tilt	0~254	(127)	
4	64	124	BOW	Horizontal Bow	0~254	(127)	
5	[65]	125	VWID	Vertical Height	0~254	(127)	
6	[66]	126	VLIN	Vertical Linearity	0~254	(127)	
7	67	127	SKEW	Skew	0~254	(127)	
8	68	128	VBOW	Vertical Bow	0~254	(127)	
9	[69]	129	HWID	Horizontal Width	0~254	(127)	
10	70	130	HLIN	Horizontal Linearity	0~254	(127)	
11	71	131	HSDL	Horizontal Side Linearity (L)	0~254	(127)	
12	72	132	HSDR	Horizontal Side Linearity (R)	0~254	(127)	
13	73	133	HISL	Horizontal Inside Linearity	0~254	(127)	
14	74	134	HCNL	Horizontal Left Pin Correction	0~254	(127)	
15	75	135	HCNR	Horizontal Right Pin Correction	0~254	(127)	
16	76	136	VCNL	Vertical Left Pin Correction	0~254	(127)	
17	77	137	VCNR	Vertical Right Pin Correction	0~254	(127)	
18	78	138	HKLT	Horizontal Keystone (Left Top)	0~254	(127)	
19	79	139	HKLB	Horizontal Keystone (Left Bottom)	0~254	(127)	
20	80	140	HKRB	Horizontal Keystone (Right Bottom)	0~254	(127)	
21	81	141	HKRT	Horizontal Keystone (Right Top)	0~254	(127)	
22	82	142	VKLT	Vertical keystone (Left Top)	0~254	(127)	
23	83	143	VKLB	Vertical Keystone (Left Bottom)	0~254	(127)	
24	84	144	VKRB	Vertical Keystone (Right Bottom)	0~254	(127)	
25	85	145	VKRT	Vertical Keystone (Right Top)	0~254	(127)	
26	86	146	H03	Y3	0~254	(127)	
27	—	147	H04	Y4	0~254	(127)	
—	87	—	H24	Horizontal Seagull Balance	0~254	(127)	
28	—	148	H06	Y6	0~254	(127)	
—	88	—	H26	X2Y6	0~254	(127)	
29	89	149	H11	Horizontal Keystone	0~254	(127)	
30	90	150	H12	Side PCC	0~254	(127)	
31	91	151	H13	X3 Keystone	0~254	(127)	
32	92	152	H14	Horizontal Seagull	0~254	(127)	
33	93	153	H16	X1Y6	0~254	(127)	
34	94	154	H21	Horizontal Keystone Balance	0~254	(127)	

# INITIAL SET UP

## 1. Setting up E2RESET

**Note:** All the data that has already been set changes to the adjustment data when setting E2RESET.

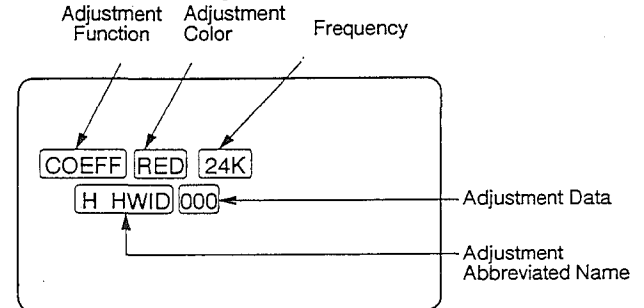
- ① Press the "TEST" button on the remote hand unit. The built-in cross-hair test pattern will appear.
- ② Press the "1", "1", and "9" on the remote hand unit in that order to display the Option Menu.
- ③ Select the "E2RESET" pressing the "▲" or "▼" button on the remote hand unit and press "ENTER" to select "Initial".

## 2. Setting up Self Auto Convergence

**Note:** Immediately after setting up "E2RESET" as above, set up the data for "Correction Coefficient" for Self Auto Convergence.

- ① Supply a standard signal.
- ② Press the "TEST" button on the remote hand unit and then press the "1", "1", and "►" buttons to set to the Self Auto Convergence display.
- ③ Select an item pressing "▲" or "▼" button on the remote hand unit. Select the color using "R/G/B" button.
- ④ Set the data in shown below pressing "◀" or "►" button.
- ⑤ After finishing the set up, write the data into memory by pressing "ENTER".
- ⑥ Press the "TEST" button on the remote hand unit to terminate the adjustment mode.

### Self Auto Convergence Display



### Correction Coefficient

Item	Color				Item	Color			
	RED	GREEN	BLUE	ALL		RED	GREEN	BLUE	ALL
H HWID	0	—	0	—	V VKLT	0	0	0	—
H HLIN	+87	+52	-36	—	V VKLB	0	0	0	—
H VKLT	0	0	0	—	V VKRB	0	0	0	—
H VKLB	0	0	0	—	V VKRT	0	0	0	—
H VKRB	0	0	0	—	V HPCC	—	—	—	+44
H VKRT	0	0	0	—	V VPCC	—	—	—	-14
H HKLT	0	0	0	—	V HCNL	+44	0	-5	—
H HKLB	0	0	0	—	V HCNR	+61	0	-37	—
H HKRB	0	0	0	—	V H11	-17	-25	-17	—
H HKRT	0	0	0	—	V H21	0	0	0	—
H HPCC	—	—	—	0	V H32	0	0	0	—
H VPCC	—	—	—	-70	V V11	-51	0	+22	—
H HCNL	+38	0	+49	—	V V12	+14	0	-12	—
H HCNR	+18	0	-36	—	V V23	0	0	0	—
H VCNL	-42	0	-39	—					
H VCNR	-16	0	-54	—					
H H11	-42	-27	-39	—					
H H21	+25	0	-27	—					
H H32	0	0	0	—					
H V11	-47	-12	+11	—					
H V12	0	0	0	—					
H V23	0	0	0	—					

Function Display				CONV			RED : IC801 BLUE : IC802 GREEN : IC803
No.			Abbreviated Name	Adjustment Name	Range	Data	Note
R	G	B					
35	95	155	H22	PCC Balance	0~254	(127)	# 9 (Raster Distortion) or # 10 (Dynamic Convergence)
36	96	156	H23	X3 Keystone Balance	0~254	(127)	
37	97	157	H30	X3	0~254	(127)	
38	98	158	H32	Horizontal Inside PCC	0~254	(127)	
39	99	159	H42	Horizontal Corner Pin Balance	0~254	(127)	
40	100	160	H51	Horizontal Inside Keystone	0~254	(127)	
41	101	161	V03	Y3	0~254	(127)	
42	102	162	V11	Vertical Keystone	0~254	(127)	
43	103	163	V12	Vertical Keystone Balance	0~254	(127)	
44	104	164	V13	Vertical Inside Keystone	0~254	(127)	
45	105	165	V21	T/B PCC	0~254	(127)	
46	106	166	V22	Vertical PCC Balance	0~254	(127)	
47	107	167	V23	Vertical Inside PCC	0~254	(127)	
48	108	168	V31	Y3 Keystone	0~254	(127)	
49	109	169	V41	Vertical Seagull	0~254	(127)	
50	110	170	V42	Vertical Seagull Balance	0~254	(127)	
51	111	171	V51	X5Y1	0~254	(127)	

Note 1 : The contents of the adjustments in [ ] indicate operation in full colors.

Note 2 : The contents of the adjustment No. in [ ] indicate that the operation is impossible.

Function Display				ATC			
No.			Abbreviated Name	Adjustment Name	Range	Data	Note
R	G	B					
0	-	6	HSTA	Horizontal Static	-50~+50	0	
1	-	7	VSTA	Vertical Static	-50~+50	0	
2	4	8	TILT	Tilt	-50~+50	0	
3	5	9	SKEW	Skew	-50~+50	0	

Function Display		HR			
Abbreviated Name	Adjustment Name	Range	Data	Note	
HR	Character Position	0~30	(12)	# 11 (Screen Character Position)	

Function Display		DAC			
No.	Abbreviated Name	Adjustment Name	Range	Data	Note
0	SUB-BRIGHT	Sub-Brightness	-127~+127	(0)	# 8 (White, Brightness)
1	SUB-CONT	Sub-Contrast	-127~+127	(0)	
2	R-GAIN	Red-Gain	-127~+127	(0)	
3	B-GAIN	Blue-Gain	-127~+127	(0)	# 4 (Centering) and # 5 (Raster Size)
4	H-POSI	Horizontal Position	-127~+127	(0)	
5	H-WIDTH	Horizontal Width	-127~+127	(0)	
6	V-POSI	Vertical Position	-127~+127	(0)	
7	V-WIDTH	Vertical Height	-127~+127	(0)	

## SETTING UP THE USER MODE

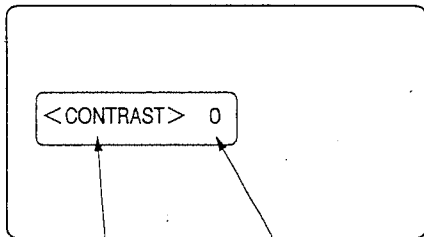
Each time the "PICTURE" button on the remote hand unit is pressed, the adjustment mode is changed (This adjustment mode is referred as User Mode hereinafter).

Set each adjustment mode to the data shown in the chart below by pressing the "+" button or "-" button.

**Note :** The automatic cancellation function in the adjustment mode will function to return to the normal picture, if you do not press any buttons for more than 6 seconds even if during the adjustment of each item.

Video Adjustment Mode Abbreviation	Adjustment Name	Range	Data	Note
CONTRAST	CONTRAST	-127 ~ +127	0	
BRIGHT	BRIGHTNESS	-127 ~ +127	0	
H-POSI	H-POSI	-127 ~ +127	0	
H-WIDTH	H-WIDTH	-127 ~ +127	0	
V-POSI	V-POSI	-127 ~ +127	0	
V-WIDTH	V-WIDTH	-127 ~ +127	0	
AUTO CONV	AUTO CONV	—	—	

### User Mode Display



Adjustment Name

Adjustment Data

## SETTING UP THE OPTION MENU

1. Press the "TEST" button on the remote hand unit to change to the Option Menu.  
The built-in cross-hair test pattern will appear.
2. Press the "1", "1", and "9" on the remote hand unit in that order to display the Option Menu.
3. The adjustment items can be selected pressing the "▲" or "▼" button. The setting can be changed by pressing "ENTER".

Function Display		OPTION		
Abbreviated Name	Adjustment Name	Range	Setting	Note
INITIAL	----	—	—	----
E2RESET	----	—	—	----
HOUR-RESET	Reset of an integrating timer	—	—	This is a measure for replacement time for CRT.
POWER ON DELAY	Power On Delay	2~20sec	2sec	----

**Note :** Perform HOUR-RESET to reset the time to 0 after replacing the CRT.



# ELECTRICAL ADJUSTMENTS

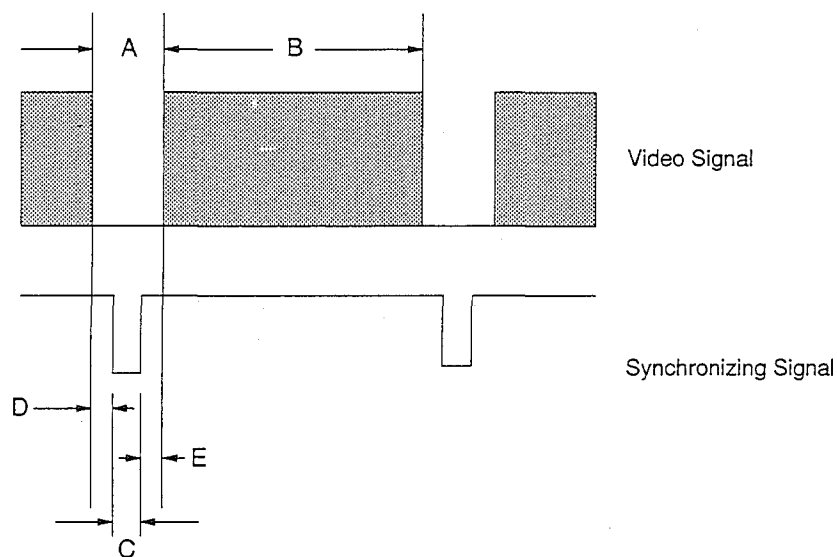
Perform only the adjustments required.

## Measuring Equipment and Jigs

- Oscilloscope (Unless otherwise specified in particular, use 10 : 1 probes.)
- RGB Signal Generator (VG-814 made by Astrodesign)
- Frequency Counter
- DC Voltmeter
- DC Ampere Meter
- Electrical Tools

## Test Signal

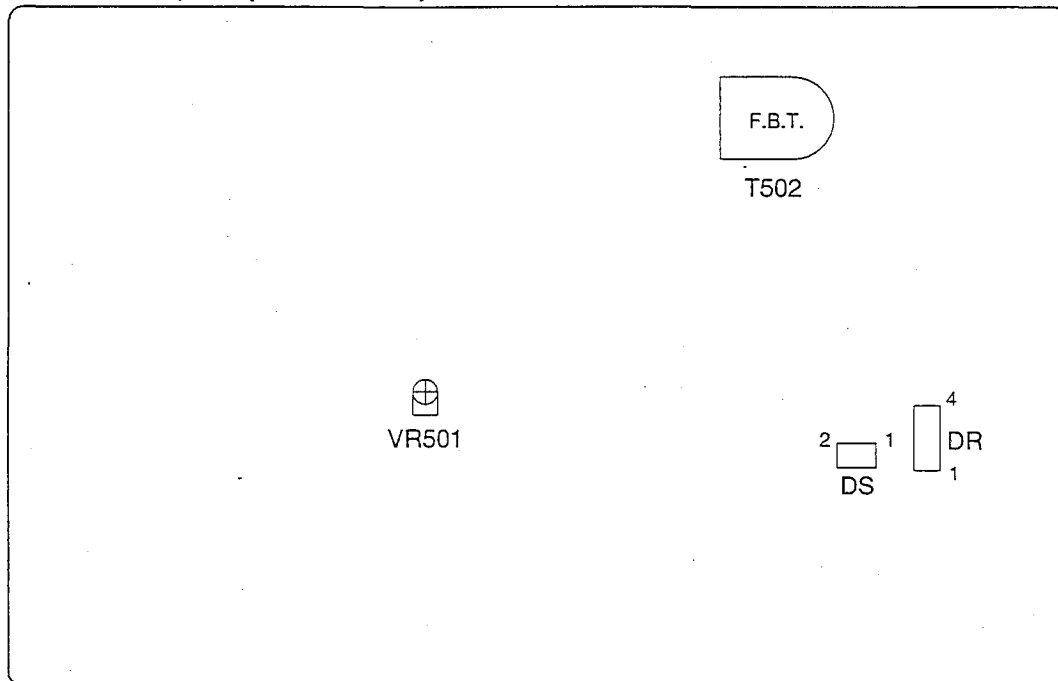
Use the following timing signals :



Program No.	Signal	Pattern	Horizontal Frequency $f_H$ [kHz]	Vertical Frequency $f_V$ [Hz]	Timing (Upper line : Horizontal Time [ $\mu$ s] / Lower line : Vertical line [H])				
					A+B [ $\mu$ s] / [H]	C [ $\mu$ s] / [H]	E [ $\mu$ s] / [H]	B [ $\mu$ s] / [H]	D [ $\mu$ s] / [H]
11	Standard Signal I	OPTION2	24.39	57.52	41.00/424	3.00/4	4.38/26	30.75/381	2.87/13
12	Standard Signal J	Crosshatch with circle	24.39	57.52	41.00/424	3.00/4	4.38/26	30.75/381	2.87/13
13	Standard Signal K	Crosshatch	24.39	57.52	41.00/424	3.00/4	4.38/26	30.75/381	2.87/13
15	Standard Signal M	Full White Raster	24.39	57.52	41.00/424	3.00/4	4.38/26	30.75/381	2.87/13
17	Standard Signal O	Gray Scale	24.39	57.52	41.00/424	3.00/4	4.38/26	30.75/381	2.87/13
18	Standard Signal P	Full Black	24.39	57.52	41.00/424	3.00/4	4.38/26	30.75/381	2.87/13
21	Standard Signal Q	OPTION2	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
22	Standard Signal R	Crosshatch with circle	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
23	Standard Signal S	Crosshatch	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
24	Standard Signal T	CHARA WINDOW	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
25	Standard Signal U	Full White Raster	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
27	Standard Signal W	Gray Scale	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
28	Standard Signal X	Full Black	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25
29	Standard Signal Y	Centering	31.67	60.32	31.58/525	3.58/2	0.49/21	26.94/502	0.57/0
30	Standard Signal Z	Dot	31.67	60.32	31.58/525	3.58/2	1.71/50	25.88/448	0.41/25

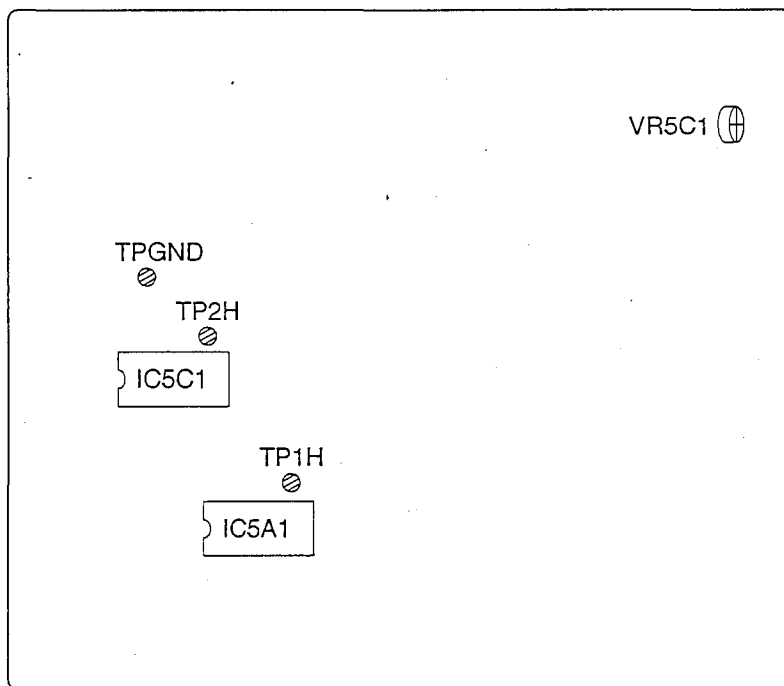
# LOCATION OF TEST POINTS AND ADJUSTMENTS

PCB-DEFL (Component side) :



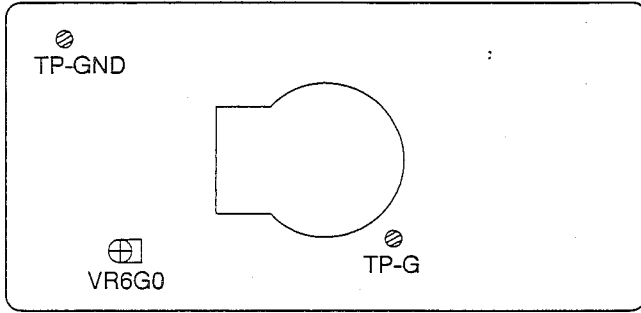
Front View

PCB-AFC (Component side)

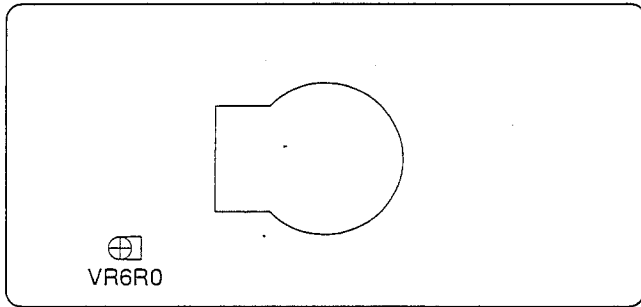


Front View

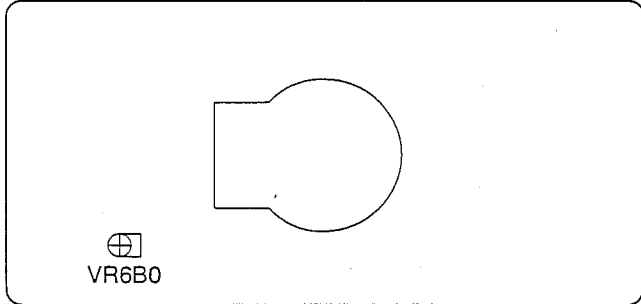
**PCB-CRT (G) (Component side)**



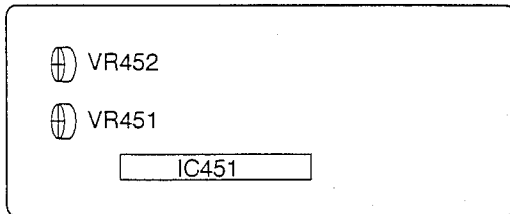
**PCB-CRT (R) (Component side)**



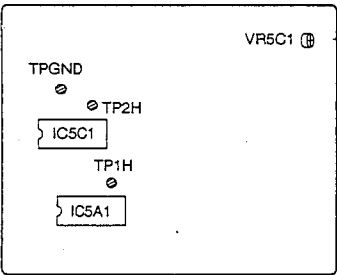
**PCB-CRT (B) (Component side)**

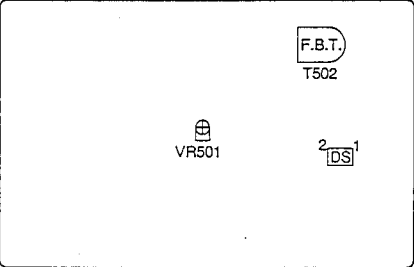


**PCB-DEFL V (Component side)**



# ADJUSTMENT PROCEDURES

<b>[Deflection Circuit]</b> 1. Horizontal Free Run Frequency		<b>Adjustment purpose</b> Set the oscillating frequency in a horizontal synchronizing circuit.  <b>Symptom when incorrectly adjusted</b> Horizontally shifted picture.
<b>Measuring Instrument</b>	Frequency Counter	1. Set VR5C1 to the center position. 2. Supply an OPTION2 signal (No. 11). 3. Connect "+" side on the frequency counter to TP2H. And connect "-" side to TPGND. respectively to turn on the power. 4. Respectively to turn the power on. 5. Adjust VR5C1 with no signal supplied so that the frequency counter is $24.39 \pm 0.01$ kHz.
<b>Test Point</b>	+ Side : TP1H, TP2H - Side : TPGND	
<b>External Trigger</b>	----	
<b>Measurement Range</b>	----	
<b>Input Signal</b>	VG814 (No.11) OPTION2	
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal	
<b>PCB-AFC (Component side)</b> 		

<b>[High-voltage Circuit]</b> 2. High Voltage Control		<b>Adjustment purpose</b> Set high-voltage to be applied to the CRT.  <b>Symptom when incorrectly adjusted</b> Too widened or narrowed picture or too bright or dark picture.
<b>Measuring Instrument</b>	DC Voltmeter	1. Supply a Full Black signal (No.18). 2. Connect "+" side on the DC voltmeter to ① pin of Connector DS. And connect "-" side to ② pin of Connector DS and measure the voltage. 3. Adjust VR501 so that the voltage is $19.85 \pm 0.02$ V. <b>Note ;</b> After adjustment, fix VR501 with hot melt adhesive so as not to be readjusted and fluctuated.
<b>Test Point</b>	+ Side : ① pin of Connector DS - Side : ② pin of Connector DS	
<b>External Trigger</b>	----	
<b>Measurement Range</b>	----	
<b>Input Signal</b>	VG814 (No.18) Full Black	
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal	
<b>PCB-DEFL (Component side)</b> 		

<b>[CRT Circuit]</b> 3. Cut Off	<b>Adjustment purpose</b> Set the point of three CRTs.
	<b>Symptom when incorrectly adjusted</b> Monochrome with color tint, incorrect brightness.

<b>Measuring Instrument</b>	Oscilloscope
<b>Test Point</b>	Test Pin (TP-G)
<b>External Trigger</b>	----
<b>Measurement Range</b>	DIV 5V TIM 10μs
<b>Input Signal</b>	VG-814 (No.18) Full Black
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal

**Note :** Perform this adjustment after adjustment 2 (High Voltage Control).  
**Note :** Perform this adjustment more than 5 minutes after energizing because the brightness changes after turning on the power.

1. Supply a Full Black signal (No.18).
2. Turn the Screen controls of VR-FOCUS counter-clockwise fully.

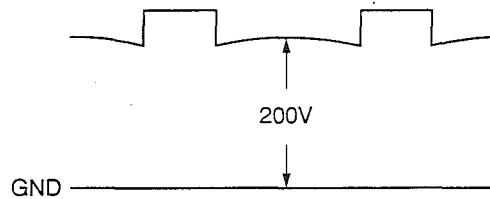
**Note :** VR-FOCUS is installed at the left bottom of the screen from the front view.

3. Adjust the controls so that the Green light is just visible.
4. Set the User Mode.

- Ⓐ Press the "PICTURE" button on the remote hand unit to activate the "CONTRAST" adjustment mode.
- Ⓑ Set the initial data of "CONTRAST" to "+127". ("+" button)  
Unless any effective buttons are pressed within 6 seconds, the picture will return to the normal picture.
- Ⓒ Select the "BRIGHT" adjustment mode in the User Mode.
- Ⓓ Set the initial data of "BRIGHTNESS" to "0" (Center value).  
("+ " or "- " button)

5. Turn the Cut Off controls (VR6R0, VR6G0, VR6B0) clockwise fully while observing from the parts side.
6. Observe the waveform at the test point (TP-G). (Use TP-GND for GND.)
7. Set to the TEST 1.1.8 mode.

- Ⓐ Press the "1", "1", and "8" to activate the TEST 1.1.8 mode immediately after pressing the "TEST" button.
- Ⓑ Keep pressing the "R/B" button to select the "DAC" adjustment mode.
- Ⓒ Select "0 SUB-BRIGHT" ("▲" or "▼" button).
- Ⓓ Adjust "0 SUB-BRIGHT" so that the cathode voltage is 200V.  
("◀" or "▶" button)

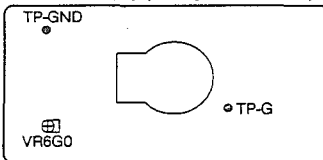


- Ⓔ Supply a Gray Scale signal (No.17).
- Ⓕ Press either of R, G, or B button on VG-814 to make monochrome.
- Ⓖ Roughly adjust the screen controls so that the most bottom portion of 16-gradation and the 1 level upper than that will be visible at about the same luminance or the 1 level upper one will be a little more lit.

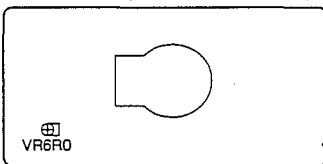
**Note :** In case of having difficulties in adjusting equivalently, turn the Cut Off controls (VR6R0, VR6G0, and VR6B0) counter-clockwise to perform fine control.

- Ⓗ Repeat the step Ⓖ in the same manner with the each color except performed in the step Ⓕ.
- Ⓙ After adjustment, press "ENTER" to write the data into memory.
- Ⓚ Press the "TEST" button to terminate the TEST 1.1.8 mode.

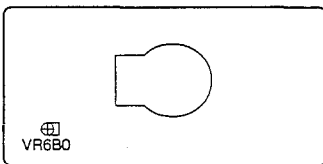
PCB-CRT (G) (Component side)



PCB-CRT (R) (Component side)



PCB-CRT (B) (Component side)



[Deflection Circuit]  
4. Centering

**Adjustment purpose** Set the picture to the screen center.  
**Symptom when incorrectly adjusted** The picture center is not in the right position.

Measuring Instrument	----
Test Point	----
External Trigger	----
Measurement Range	----
Input Signal	VG-814 (No.20) Centering
Input Terminal	RGB Input Terminal

1. Supply a Centering signal (No.20).
- Note :** Set the 2-Pole Magnet in the condition that different catches are placed one upon another on the magnet.
2. Press the "R" and "B" buttons on VG-814 to produce a Green monochrome picture.
  3. Press the "TEST", "1", "1", and "8" buttons on the remote hand unit in that order to set to the TEST 1.1.8 mode.
  4. Press the "R/B" button to select the item "H-WIDTH" and "V-WIDTH" in the "DAC" adjustment mode.
  5. Turn the Centering Magnet for the Deflection Yoke (Green) shown in Fig. 1 to adjust the item "H-WIDTH" and "V-WIDTH" so that the top and bottom of the picture and the middle of left and right edges (C, D, E and F) can be seen in Fig. 2.
- Note :** Confirm that the difference between C and D is 8mm at maximum and 10mm at maximum with the difference between E and F. The position of the screen center is 453mm away from the Top Board of the product and 570mm away from the Side Board.
6. Press the "R/B" button to select the "CONV" adjustment mode.
  7. Set the items "2 HPCC" and "62 VPCC" to the center as shown in Fig. 2.
  8. Set the initial data for "HSTA", "VSTA", "TILT", "SKEW", "HLIN" and "VLIN" to "127" respectively. ("◀" or "▶" button) ("HLIN" adjusts only G (Green).)
  9. Select the item "VBOW" so that Line B in Fig. 2 is straight. (Adjust G (Green) only.)
  10. Keep pressing the "R/B" button to select the "DAC" adjustment mode again.
  11. Adjust the "V-POS1" so that the top and bottom edges of the picture shown in Fig. 2 do not disappear and the picture is positioned almost at the center. ("◀" or "▶" button).
  12. Select the "H-POS1" and adjust so as not to position without returning at the left and right edges in Fig. 2. ("◀" or "▶" button)
  13. After adjustment, press "ENTER" to write the data into memory.
  14. Press the "TEST" button to terminate the TEST 1.1.8 mode.
- Note :** Adjust VR452 (V-WIDTH) when not being able to position the vertical height to optimum.
15. Turn the Deflection Yoke (Green) to adjust so that Line A (a horizontal line at the middle of the picture) is horizontal in Fig. 2.
- Note :** Perform adjustment immediately so as not to change the magnet filed when operating fixed screws for the Deflection Yoke.
16. Perform adjustments with a centering magnet for the Deflection Yoke (Green) shown in Fig. 1 so that the center mark of the picture (intersection point between A line and B line) is positioned at the center of the screen. Also adjust VR451 (V-LIN) alternately so that the clearance of C and D from the center is equal.
  17. Input Red and Blue in sequence. Adjust the Centering Magnet of each Deflection Yoke for R (Red) tube and B (Blue) tube so that the center of the picture and the inclination of A line against Green will be overlapped.
- Note :** The deviation of overlap shall be less than the width of A line and B line.

PCB-DEFL V (Component side)

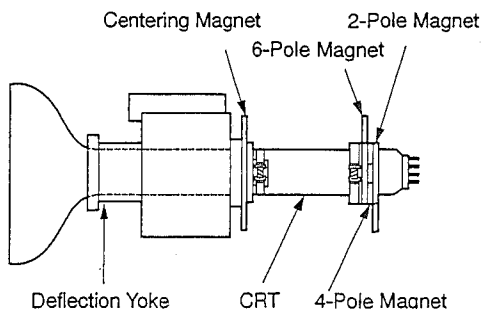
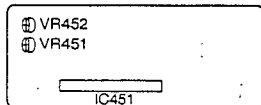


Fig. 1

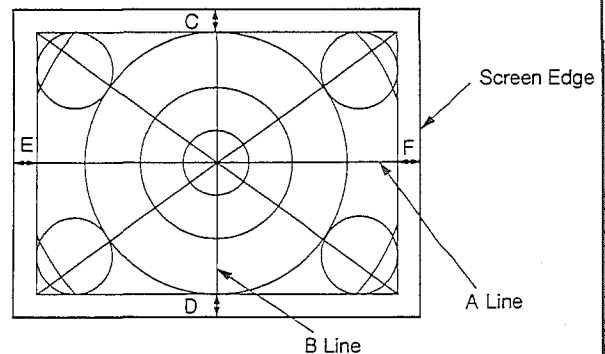


Fig. 2

[Deflection Circuit] 5. Raster Size	Adjustment purpose Symptom when incorrectly adjusted	To set the linearity in horizontal and vertical directions in the picture. Distorted picture in horizontal or vertical direction.
--	---	--

Measuring Instrument	----
Test Point	----
External Trigger	----
Measurement Range	----
Input Signal	VG-814 (No.12) Crosshatch with circle
Input Terminal	Mini D-SUB 15 Pin Input Terminal

1. Supply a crosshatch with circle signal (No.12).
  2. Press the "R" and "B" buttons on VG-814 to produce a Green monochrome picture.
  3. Press the "TEST", "1", "1", and "8" buttons on the remote hand unit in that order to set to the TEST 1.1.8 mode.
  4. Press the "R/B" button to select the item "V-WIDTH" in the "DAC" adjustment mode.
  5. Set the initial data for "V-WIDTH" to "0". ("◀" or "▶" button)
  6. Press the "R/B" button on the remote hand unit to select the "CONV" adjustment mode.
  7. Confirm that each adjustment data of the adjustment items "HWID", "VWID" and "VLIN" is "127".
  8. Press the "R/B" button to select the "H-POS1" and "V-POS1" again in the "DAC" adjustment mode respectively.
  9. Perform adjustments so that the center of the picture is at the screen center. ("◀" or "▶" button)
- Note :** The position of the screen center should be 453mm away from the Top Board of the product and 570mm away from the Side Board.
10. Adjust the "H-WIDTH" and "HLIN" in the "DAC" adjustment mode of the TEST 1.1.8 mode so that A point in Fig. 1 is overlapped with the left and right frame of the screen.
  11. Adjust VR452 (Vertical Height) and VR451 (Vertical Linearity) so that B point shown in Fig. 1 is overlapped with the top and bottom frame of the screen.
  12. Confirm the steps 8 to step 11 again.
  13. Adjust the "H-POS1" and "V-POS1" of the "DAC" adjustment mode in the TEST 1.1.8 mode so that 1 line of 4 sides of the Picture (mark ○) shown in Fig. 2 goes to hide on the Screen Edge without any return.
  14. After adjustment, press "ENTER" to write the data into memory.
  15. Press the "TEST" button to terminate the TEST 1.1.8 mode.
- Note :** If there is a return in the step 13, perform adjustment 4 (Centering) again.

PCB-DEFL V (COMPONENT)

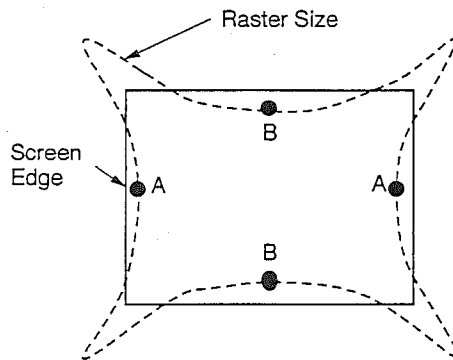
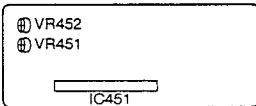


Fig. 1

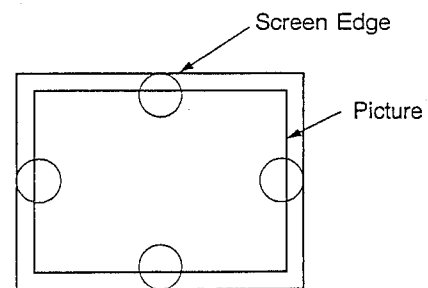


Fig. 2

<b>[CRT Circuit]</b> 6. Focus	<b>Adjustment purpose</b> Sharpness of picture <b>Symptom when incorrectly adjusted</b> Poor sharpness of picture.
----------------------------------	---

<b>Measuring Instrument</b>	----
<b>Test Point</b>	----
<b>External Trigger</b>	----
<b>Measurement Range</b>	----
<b>Input Signal</b>	VG-814 (No.14) CHARA WINDOW
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal

- Note :** This adjustment should be performed after adjustment 3 (Cut Off).
1. Supply a CHARA WINDOW signal (No.14).
  2. Press the "WINDOW" button on VG-814 to produce a crosshatch signal only.
  3. Cover the Red and Blue Lenses with Lens caps to produce a Green monochrome picture.
  4. Adjust G (Green) on FOCUS controls of VR-FOCUS so that a black line and peripheral 4 edges shown in enlarged Fig. 1 are best focused.
- Note :** VR-FOCUS is installed at the left bottom of the screen observing from the front.
5. Cover the G (Green) and B (Blue) tube side (Lens) with Lens caps to produce a Red monochrome picture.
  6. Adjust Red on the FOCUS controls in the same manner as the step 4.
  7. Cover the tube side (Lens) of the Red and Green CRTs to produce a Blue monochrome picture.
  8. Adjust B (Blue) on the FOCUS controls in the same manner as shown in the step 4.
  9. Turn each front Lens of Green, Red, and Blue CRT Assemblies to adjust so that the enlarged figure shown in Fig. 1 is best focused when producing a Green or Red or Blue monochrome picture.
  10. Confirm if the black line is visible in the entire screen in Fig. 1.  
If not, adjust the steps 3 to 8 again.

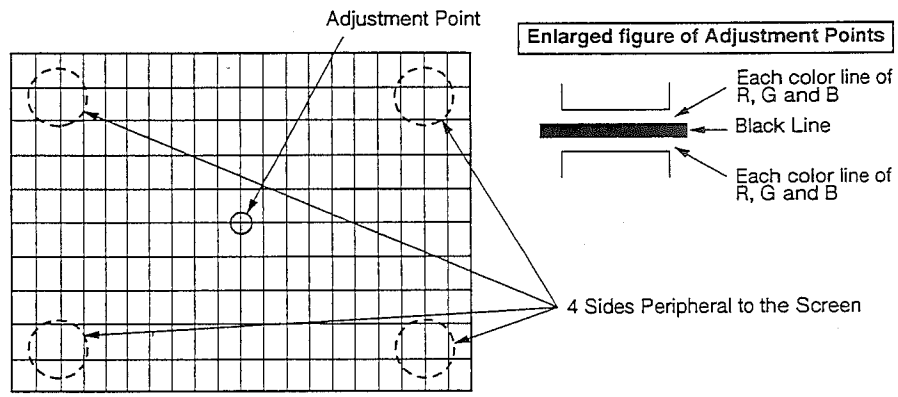


Fig. 1

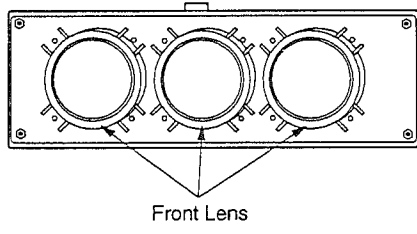


Fig. 2



<b>[CRT Circuit]</b> 7. Ellipticity	<b>Adjustment purpose</b> To correct distorted light projected from CRT.
	<b>Symptom when incorrectly adjusted</b> Poor focus of picture.

<b>Measuring Instrument</b>	----
<b>Test Point</b>	----
<b>External Trigger</b>	----
<b>Measurement Range</b>	----
<b>Input Signal</b>	VG-814 (No.39) Dot
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal

**Note :** This adjustment shall be performed only after replacing the Green CRT.

\* Cover the Red and Blue CRTs with Lens caps when performing this adjustment.

1. Supply a dot signal (No.39).

2. Adjust G (Green) on the Focus controls of VR-FOCUS so that the luminescent spot is in the blooming condition to some extent.

**Note :** VR-FOCUS is installed at the left bottom of the screen observing from the front. 3. Confirm if the luminescent spot is round. If not round, perform adjustments so that it will be round as the guidelines below :

- Ⓐ Regard the luminescent spot as ellipse and judge the ellipse direction.
- Ⓑ Open 2 sheets of 4-Pole Magnets on the Focus Magnet at 90° (Maximum magnetism).
- Ⓒ Rotate the 4-Pole Magnet while retaining the condition in step Ⓑ to rotate ellipse shown in step Ⓐ by 90° . (Refer to A in the chart below.)
- Ⓓ Make catches for 2 sheets of 4-Pole Magnet approach equally (The polarized amount will decrease) to make the ellipse round. (Refer to B in the chart below.)
- Ⓔ Regard the luminescent spot as triangular circle and judge the vertex direction.
- Ⓕ Open the 6-Pole Magnet on 2 sheets of the Focus Magnet at 60° (Maximum magnetism).
- Ⓖ Rotate the 6-Pole Magnet while retaining the condition in step Ⓕ so that the triangular circle in step e is seen to rotate by 180° . (Refer to C shown in the chart below.)
- Ⓗ Make catches for 2 sheets of 6-Pole Magnets approach (The magnetism amount will decrease) so that the triangular circle is seen to be most round. (Refer to D in the chart below.)
- Ⓘ Repeat the steps Ⓐ to Ⓗ, if necessary.

4. Confirm that the position of the picture is correct. If not, readjust the position with a Centering Magnet on the Deflection Yoke.

5. After adjustment, lock the Centering Magnet, 4-Pole Magnet, 6-Pole Magnet, and Alignment Magnet with paint.

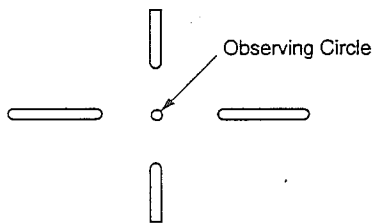
6. Remove the Lens cap covering the CRT.

**[Judgement of Ellipticity]**

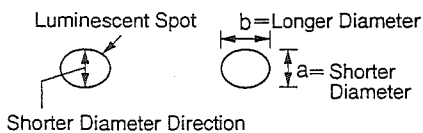
Perform adjustments to satisfy ① and ② below at the same time.

① Ellipticity in Blooming.

$$b/a \geq 0.9$$



**[Ellipticity Adjustments]**



② The round shape of the Halo and Blooming is the same Blooming

	Just	Focus	Halo
OK			
NG			

**Dot Beam Movement by 4-Pole Magnet / 6-Pole Magnet**

		Movement of Magnet	Brightness of Luminescent Spot	
A	Rotation of 4-Pole Magnet			Correction of rotation position of the luminescent spot.
B	Big angle in the opening of 4-Pole Magnet			Correction of the shape of the luminescent spot.
C	Rotation of 6-Pole Magnet			Correction of the rotation position of the luminescent spot.
D	Big angle in the opening of 6-Pole Magnet			Correction of the shape of the luminescent spot.

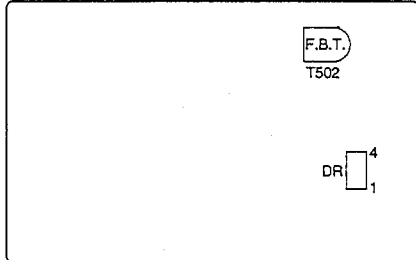
<b>[Deflection Circuit]</b> 8. White, Brightness	<b>Adjustment purpose</b> To set the white balance of the picture to optimum. <b>Symptom when incorrectly adjusted</b> Incorrect brightness of the white portion of the picture.
---	---

<b>Measuring Instrument</b>	DC Voltmeter
<b>Test Point</b>	+ side : ① pin of Connector DR - side : ④ pin of Connector DR
<b>External Trigger</b>	----
<b>Measurement Range</b>	3mA
<b>Input Signal</b>	VG-814 (No.17) Gray Scale
<b>Input Terminal</b>	Mini-D-SUB 15 pin Input Terminal

**Note :** Perform this adjustment more that 5 minutes after energizing.  
**Note :** Perform this adjustment after adjustment 7 (Focus).

1. Supply a Gray Scale signal (No.17).
2. Set up the TEST 1.1.8 mode.
  - Ⓐ Immediately after Pressing the "TEST" button on the remote hand unit, press "1", "1", and "8" to activate the TEST 1.1.8 mode.
  - Ⓑ Keep pressing the "R/B" button to select the "DAC" adjustment mode.
  - Ⓒ Press the "▲" button to select the "1 SUB-CONT", "2R-GAIN" and "3B-GAIN".
  - Ⓓ Set each adjustment data to 0 by pressing "◀" or "▶" button.
  - Ⓔ Press the "R" or "B" button on VG-814 to produce a Green monochrome picture.
  - Ⓕ Connect the "+" on the DC Ampere Meter to the ① pin of Connector DR and "-" side to the ④ pin of Connector DR respectively to measure the current value.

**PCB-DEFL (Component side)**



**Note :** Confirm that the internal resistance of the DC Ampere Meter is 30Ω or less and the length of the lead wire is 30 cm or less.

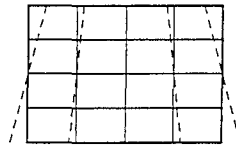
- Ⓖ Adjust the item "1 SUB-CONT" so that the current value is 710 μA. ("◀" or "▶" BUTTON)
- Ⓗ After adjustment, press "ENTER" to write the data into memory.
- Ⓘ Press the "TEST" button to terminate the TEST 1.1.8 mode.
3. Remove the DC Ampere Meter and press the R and B buttons on VG-814.
4. Supply a Full White signal (No.15).
5. Activate the TEST 1.1.8 mode to select the "DAC" adjustment mode.
6. Adjust the "2R-GAIN" and "3B-GAIN" so that the screen center is in pure white.
7. Supply a Gray Scale signal (No.17).
8. Re-connect the "+" side on the DC Ampere Meter to the ① pin of Connector DR and "-" side to the ④ pin of Connector DR respectively.
9. Adjust the "1 SUB-CONT" so that the current value is  $1450 \pm 30 \mu A$ .
10. Confirm that the level of the most bottom of 16-Gradation is the same as that of the 1 level upper (or it may be the condition that the gradation that is 2 level upper from the most bottom begins lighting). If the level is not equal, adjust the "0 SUB-BRIGHT".
11. Press "ENTER" on the remote hand unit to write the data into memory.
12. Press the "TEST" button to terminate the TEST 1.1.8 mode.
13. Repeat the steps 4 to 12.
14. After adjustment, remove the DC Ampere Meter.

[Deflection Circuit] 9. Raster Distortion	<b>Adjustment purpose</b> To set up the horizontal and vertical linearity of the picture. <b>Symptom when incorrectly adjusted</b> Distorted picture in horizontal or vertical direction.
--	--

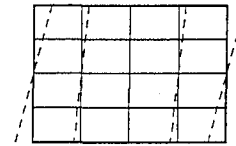
<b>Measuring Instrument</b>	----
<b>Test Point</b>	----
<b>External Trigger</b>	----
<b>Measurement Range</b>	----
<b>Input Signal</b>	VG-814 (No.12) Crosshatch with circle
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal

**Note :** This adjustment shall be performed repeatedly together with adjustment 5 (Raster Size).

1. Supply a Crosshatch with circle signal (No.12).
2. Press the "R" and "B" buttons on VG-814 to produce a Green monochrome picture.
3. Press the "TEST", "1", "1", "8" buttons on the remote hand unit in that order to activate the TEST 1.1.8 mode.
4. Press the "R/B" button to select the "CONV" adjustment mode.
5. Press the R button on VG-814 to display Red overlapped. Select the "0 HSTA" and "1 VSTA" respectively to adjust the center of the screen to be overlapped with the screen center.
6. Select the item "2 HPCC" (SIDE-PCC) and perform adjustments so that the vertical lines on the left and right edges of the crosshatch are straight.
7. Select the item "62 VPCC" (T-B-PCC) and perform adjustments so that the horizontal lines at the top and bottom edges of the crosshatch are straight.
8. Select the item "89 H11" and perform adjustments so that the vertical lines on the left and right edges are perpendicular. Repeat this adjustment and the adjustment item "94 H21" by turns when not perpendicular.

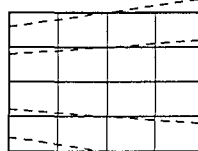


H11

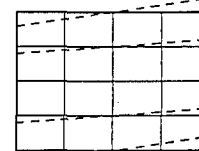


H21

9. Select the adjustment item "102 V11" and perform adjustments so that the horizontal lines on the top and bottom edges are horizontal. If not horizontal simultaneously, repeat this adjustment and the adjustment item "103 V12" by turns.

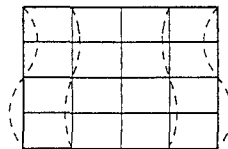


V11

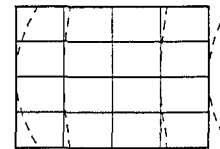


V12

10. Unless the vertical lines on the left and right edges in the step 8 are straight, adjust the adjustment item "91 H13" and "95 H22".



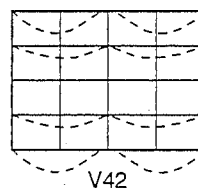
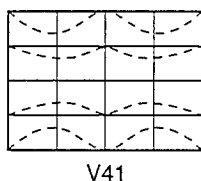
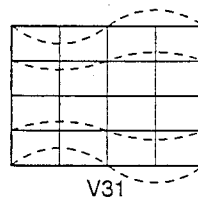
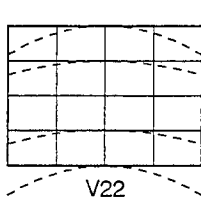
H13



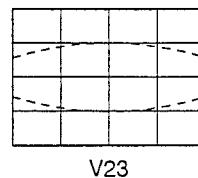
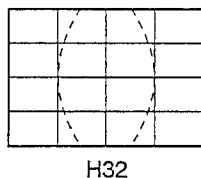
H22

Continued on next page.

11. Unless the horizontal lines on the top and bottom edges are straight in the step 9, adjust the adjustment items "106 V22", "108 V31", "109 V41" and "110 V42".



12. Unless the vertical lines and horizontal lines from the inner side are straight, adjust the adjustment items "98 H32" and "107 V23".

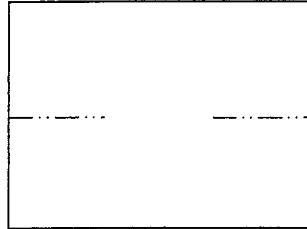


13. Repeat the adjustments in the steps 5 to 12, if necessary.
14. Press "ENTER" to write the data into memory.
15. Press the "TEST" button to terminate the TEST 1.1.8 mode.

<b>[Convergence Circuit]</b> 10. Dynamic Convergence	<b>Adjustment purpose</b> To correct color misconvergence in Red, Green, and Blue.
	<b>Symptom when incorrectly adjusted</b> Color misconvergence.

<b>Measuring Instrument</b>	----
<b>Test Point</b>	----
<b>External Trigger</b>	----
<b>Measurement Range</b>	----
<b>Input Signal</b>	VG-814 (No.15) Full White Raster
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal

1. Supply a Full White signal (No.15).
2. Press the "TEST", "1", "1", "8" buttons on the remote hand unit in that order to activate the TEST 1.1.8 mode.
3. Press the "R/B" button to select the "CONV" adjustment mode.
4. When a black horizontal line or luminescent line appears horizontally on the middle of the picture as shown below, adjust the adjustment data for the item "122 KOFS" so that the line disappears.



5. Supply a Crosshatch signal (No.13).
6. Press the "R" and "B" buttons to produce a Green monochrome picture.
7. Confirm the display concerning the following items. Perform adjustments, if required.

Green	Item	Note (Range of adjustment data)	
63	TILT	Horizontal Tilt	---
64	BOW	Horizontal Bow	---
67	SKEW	Skew	---
68	VBOW	Vertical Bow	---
70	HLIN	Horizontal Linearity	---
73	HISL	Horizontal Inside Linearity 2	---
74	HCNL	Horizontal Left Pin Correction	102~152
75	HCNR	Horizontal Right Pin Correction	102~152
76	VCNL	Vertical Left Pin Correction	102~152
77	VCNR	Vertical Right Pin Correction	102~152
78	HKLT	Horizontal Keystone	---
79	HKLB	Horizontal Keystone	---
80	HKRB	Horizontal Keystone	---
81	HKRT	Horizontal Keystone	---
84	VKRB	Vertical Keystone	---
85	VKRT	Vertical Keystone	---

**Note :** Correct the following signals, if required.  
Horizontal Signal..... "88 H26", "89 H11", "91 H13", "92 H14"  
Vertical signal..... "93 H16", "96 H23", "103 V12"

Continued on next page.

8. Press the R and B buttons on VG-814 to emit full colors. After that, perform adjustments according to the following adjusting methods to converge the green lines.

Red	Blue	Item	Adjusting Method	Note (Range of adjustment data)
3 TILT	123 TILT	Horizontal Tilt	Merge horizontal center line with Green line.	—
4 BOW	124 BOW	Horizontal Bow	Merge horizontal center line with Green line.	—
5 VWID	125 VWID	Vertical Height	Merge horizontal lines with Green lines.	—
6 VLIN	126 VLIN	Vertical Linearity	Merge horizontal lines with Green lines.	—
7 SKEW	127 SKEW	Skew	Merge vertical center line with Green line.	—
8 VBOW	128 VBOW	Vertical Bow	Merge horizontal center line with Green line.	107~147
9 HWID	129 HWID	Horizontal Width	Merge vertical lines with Green lines.	—
10 HLIN	130 HLIN	Horizontal Linearity	Merge vertical lines with Green lines.	—
11 HSDL	131 HSDL	Left Horizontal Side	Merge left vertical line with Green line.	—
12 HSDR	132 HSDR	Right horizontal Side	Merge right vertical line with Green line.	—
13 HISL	133 HISL	Horizontal Inside Linearity	Merge vertical lines with Green lines.	—
14 HCNL	134 HCNL	Horizontal Left Pin Correction	Merge upper and lower left vertical lines with Green lines.	—
15 HCNR	135 HCNR	Horizontal Right Pin Correction	Merge upper and lower right vertical lines with Green lines.	—
16 VCNL	136 VCNL	Vertical Left Pin Correction	Merge upper and lower left horizontal lines with Green lines.	—
17 VCNR	137 VCNR	Vertical Right Pin Correction	Merge upper and lower right horizontal lines with Green lines.	—
18 HKLT	138 HKLT	Horizontal Keystone (Left Top)	Merge upper left vertical line with Green line.	—
19 HKLB	139 HKLB	Horizontal Keystone (Left Bottom)	Merge lower left vertical line with Green line.	—
20 HKRB	140 HKRB	Horizontal Keystone (Right Bottom)	Merge lower right vertical line with Green line.	—
21 HKRT	141 HKRT	Horizontal Keystone (Right Top)	Merge upper right vertical line with Green line.	—
22 VKLT	142 VKLT	Vertical Keystone (Left Top)	Merge upper left horizontal line with Green line.	—
23 VKLB	143 VKLB	Vertical Keystone (Left Bottom)	Merge lower left horizontal line with Green line.	—
24 VKRB	144 VKRB	Vertical Keystone (Right Bottom)	Merge lower right horizontal line with Green line.	—
25 VKRT	145 VKRT	Vertical Keystone (Right Top)	Merge upper right horizontal line with Green line.	—
42 V11	162 V11	Vertical Keystone	Merge upper and lower corner horizontal lines with Green lines.	—
43 V12	163 V12	Vertical Keystone Balance	Merge upper and lower corner horizontal lines with Green lines.	—
45 V21	165 V21	T/B-PCC	Merge upper and lower corner horizontal lines with Green lines.	—
46 V22	166 V22	Vertical PCC Balance	Merge upper and lower corner horizontal lines with Green lines.	—
47 V23	167 V23	Vertical Inside Pin	Merge horizontal center line with Green line.	—

**Note :** Correct the following signals, if required.

Horizontal Signal ..... Merge vertical lines with Green lines.

"26/146 H03", "27/147 H04", "28/148 H06", "31/151 H13",  
 "32/152 H14", "33/153 H16", "36/156 H23", "37/157 H30",  
 "39/159 H42", "40/160 H51"

Vertical Signal ..... Merge horizontal lines with Green lines.

"41/161 V03", "44/164 V13", "51/171 V51"

9. Press "ENTER" to write the data into memory.

10. Press the "TEST" button to terminate the TEST 1.1.8.

Continued on next page.

3 TILT 63 TILT 123 TILT		11 HSDL 71 HSDL 131 HSDL		24 VKRB 84 VKRB 144 VKRB	
4 BOW 64 BOW 124 BOW		12 HSDR 72 HSDR 132 HSDR		25 VKRT 85 VKRT 145 VKRT	
5 VWID 125 VWID		18 HKLT 78 HKLT 138 HKLT		14 HCNL 74 HCNL 134 HCNL	
6 VLIN 126 VLIN		19 HKLB 79 HKLB 139 HKLB		15 HCNR 75 HCNR 135 HCNR	
7 SKEW 67 SKEW 127 SKEW		20 HKRB 80 HKRB 140 HKRB		16 VCNL 76 VCNL 136 VCNL	
8 VBOW 68 VBOW 128 VBOW		21 HKRT 81 HKRT 141 HKRT		17 VCNR 77 VCNR 137 VCNR	
9 HWID 129 HWID		22 VKLT 82 VKLT 142 VKLT		45 V21 105 V21 165 V21	
10 HLIN 70 HLIN 130 HLIN		23 VKLB 83 VKLB 143 VKLB		13 HISL 73 HISL 133 HISL	

Continued on next page.

26 H03 86 H03 146 H03		33 H16 93 H16 153 H16		40 H51 100 H51 160 H51	
27 H04 <hr/> 147 H04		36 H23 96 H23 156 H23		41 V03 101 V03 161 V03	
28 H06 <hr/> 148 H06		37 H30 97 H30 157 H30		44 V13 104 V13 164 V13	
32 H14 92 H14 152 H14		39 H42 99 H42 159 H42		51 V51 111 V51 171 V51	

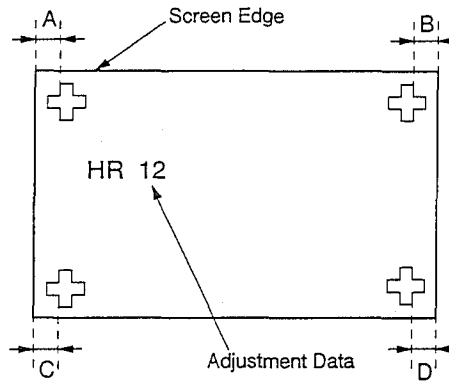
**Note :** Refer to the adjustment 9 (Raster Distortion) as to the adjustments on the display except the above.



<b>[Screen Character Circuit]</b> 11. Screen Character Position	<b>Adjustment purpose</b> To position the character display. <b>Symptom when incorrectly adjusted</b> Incorrect character position.
--	--

<b>Measuring Instrument</b>	----
<b>Test Point</b>	----
<b>External Trigger</b>	----
<b>Measurement Range</b>	----
<b>Input Signal</b>	VG-814 (No.13) Crosshatch
<b>Input Terminal</b>	Mini D-SUB 15 Pin Input Terminal

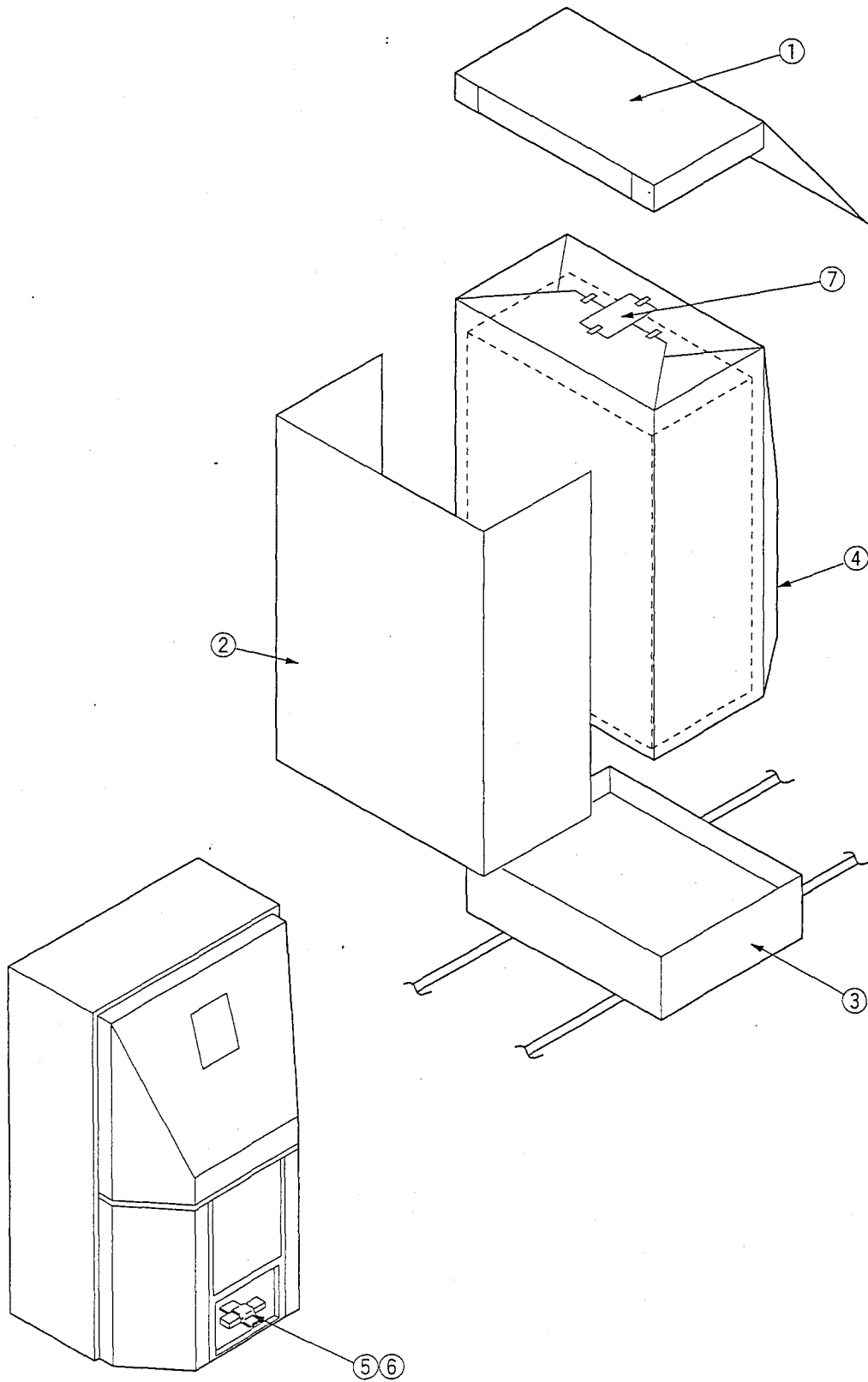
1. Supply a Crosshatch signal (No.13)
2. Immediately after pressing the "TEST" button on the remote hand unit, press the "1", "1", "8" in that order to activate the TEST 1.1.8 mode.
3. Keep pressing the "R/B" button to select the "HR" adjustment mode.
4. Perform adjustments so that A, B, C and D shown in the figure below are equal. ("◀" or "▶" button)
5. Press "ENTER" to write the data into memory.
6. Press the "TEST" button to terminate the TEST 1.1.8 mode.





# PARTS LIST

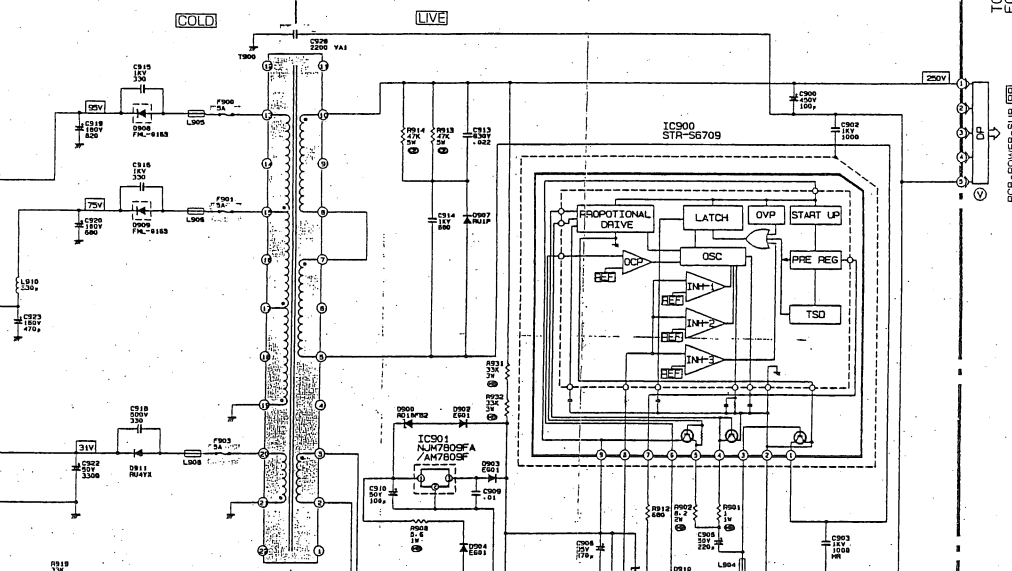
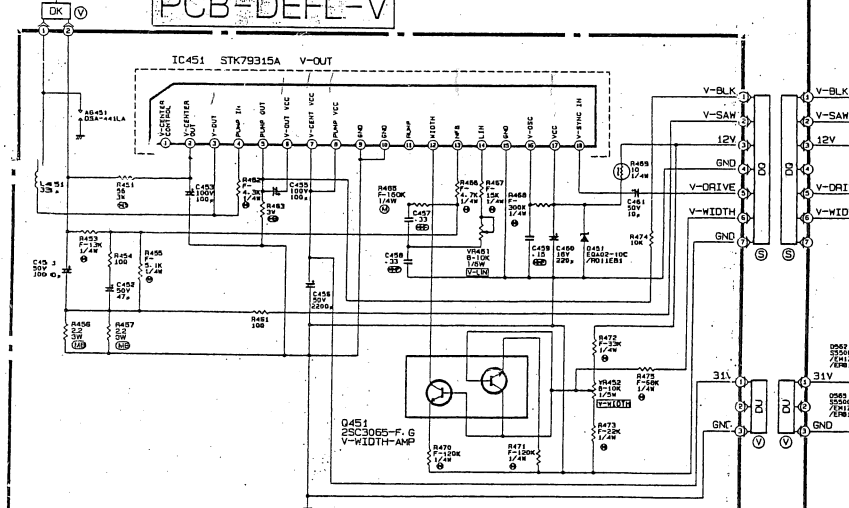
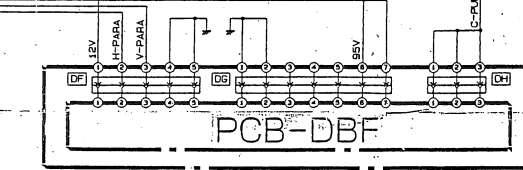
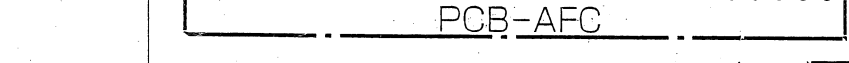
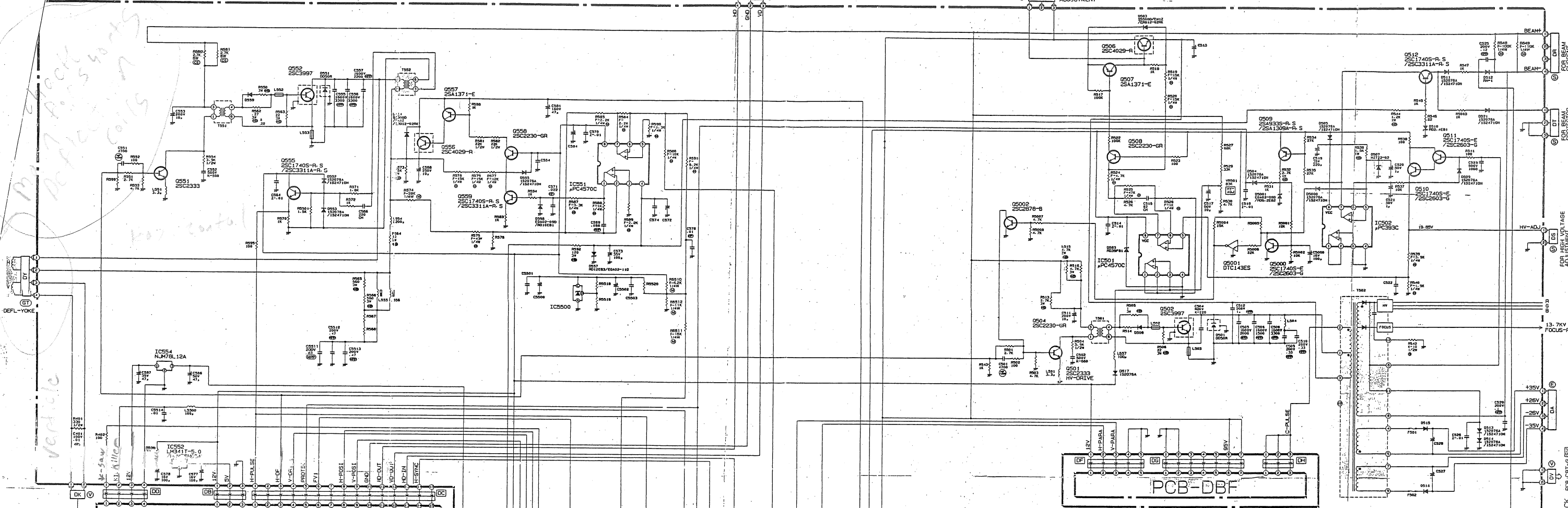
## REPACKING PROCEDURE



PCB-DEFL

UNIT CONVERTER

H.V. PROTECTOR ADJUSTMENT



50P-GHS63 INDEX

BLOCK DIAGRAM	① AFC	①
MAIN(1/2)	② CRT-R.G.B	②
MAIN(2/2)	③ DBF	③
SYSCON	④ POWER-SUB	④
DEFL	⑤ TERMINAL	⑤
DEFL-V	⑥ PREAMP	⑥
CONV-SUB	⑦ SENSOR(TOP)(BOTTOM)	⑦
VIDEO	⑧ SENSOR(RIGHT)(LEFT)	⑧

19.85 VDC

3.7KV FOCUS-PACK

+35V

+26V

-25V

-35V

TO FOCUS-PACK

PCB-POWER-SUB

250V

PCB-MAIN(1/2)

PCB-MAIN(2/2)

PCB-DBF

PCB-AFC

PCB-DEFL

PCB-DEFL-V

PCB-POWER-SUB

PCB-MAIN(1/2)

PCB-MAIN(2/2)

PCB-DBF

PCB-AFC

PCB-DEFL

PCB-DEFL-V

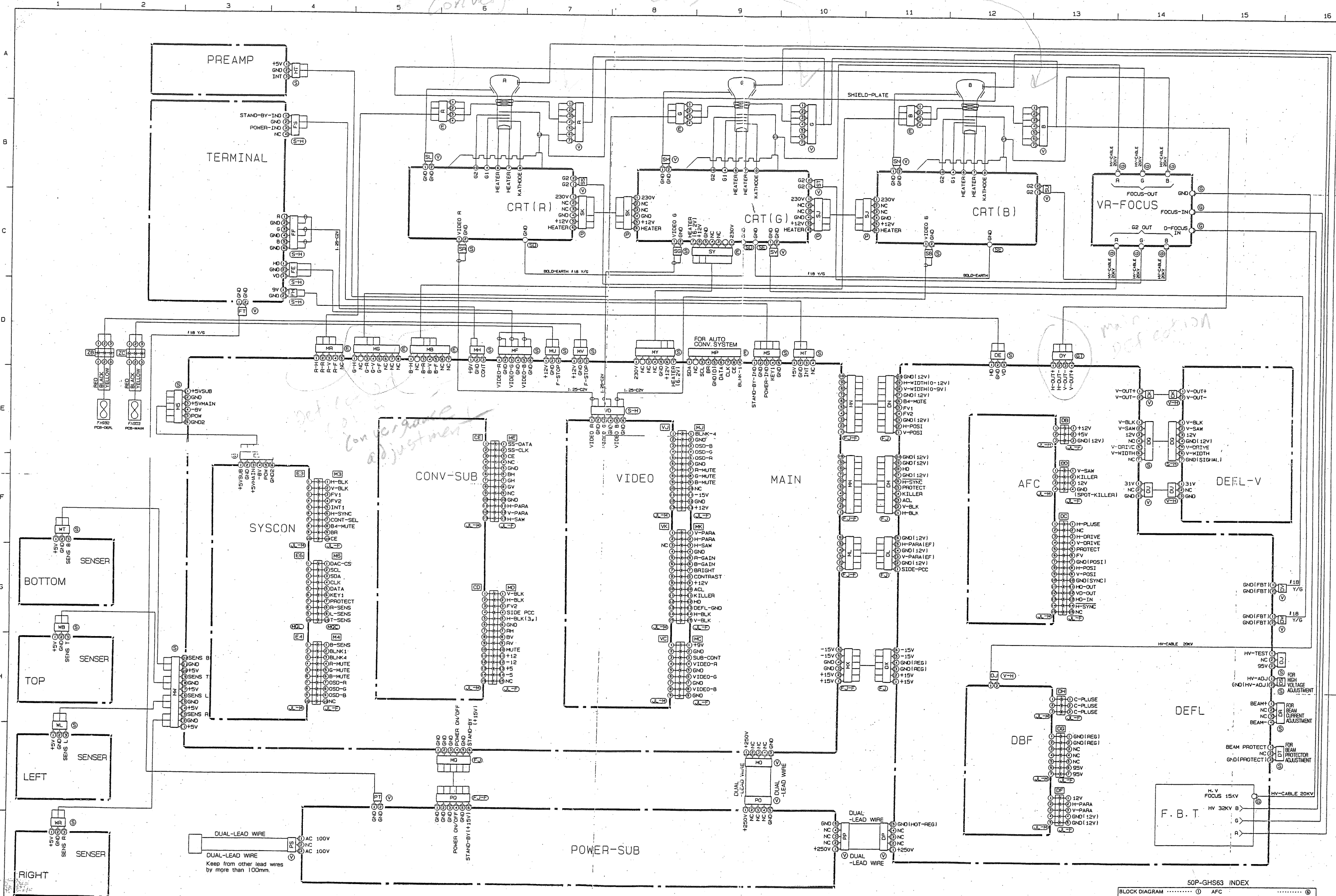
PCB-POWER-SUB

PCB-MAIN(1/2)

PCB-MAIN(2/2)

*Reflected in  
Convergence*

*Main deflection  
coils*



**SCHEMATIC DIAGRAM  
MODEL : 50P-GHS63**

- NOTE**
- DC voltages were measured from points indicated in the circuit ground with a high-Z voltmeter.
  - Waveforms were taken with standard colour bar signal.
  - TP6A, etc. show Test Points.

**4. CAPACITORS**

Value	Not indicated	PF, for numbers more than 1	µF, for numbers less than 1
Dielectric Strength	Not indicated	50V	
Tolerance	Not indicated	±10%	No tolerance is indicated for electrolytic capacitors and 200µF
Short	Not indicated	Capacitor	

G=25% F=100% Q=20% C=±0.25PF  
 J=±5% K=±10% Z=±80% T=±200% F=±1PF  
 M=±20% N=±5% O=±5%

Not indicated: Ceramic capacitor  
 (P) Polyester capacitor  
 (PP) Polypropylene film capacitor  
 (AL) Aluminum electrolytic capacitor  
 (T) Twin film capacitor  
 (S) Semiconductor ceramic capacitor  
 (M) Metallized paper  
 (MP) Metallized polyester capacitor  
 (PAP) Polyester polypropylene film capacitor  
 (C) Chip capacitor  
 (E) Electrolytic capacitor  
 (N) Non polarized electrolytic capacitor

Not indicated: Ceramic capacitor chip  
 (C) Electrolytic capacitor  
 (N) Non polarized electrolytic capacitor etc.

Characteristics (only ceramic capacitor)  
 Not indicated: F or B (high dielectric percentage)  
 CHL: Leak. Temperature compensating type

**5. Resistors**

Value	Not indicated	Ω	k (1000Ω)	M (1000kΩ)
Wattage	Not indicated	1/4W or 1/8W		
Tolerance	Not indicated	±5%		
Short	Not indicated	Resistor		

Not indicated: Carbon resistor  
 (C) Fixed composition resistor  
 (M) Metal oxide film resistor (R)  
 (G) General resistor  
 (W) Wire wound resistor  
 (S) Metal film resistor  
 (L) Metal thin resistor  
 (T) Metal thin resistor

6. This is a basic schematic diagram. Some sets may be subject to modification according to engineering improvement.

**SPECIFIC SYMBOL**

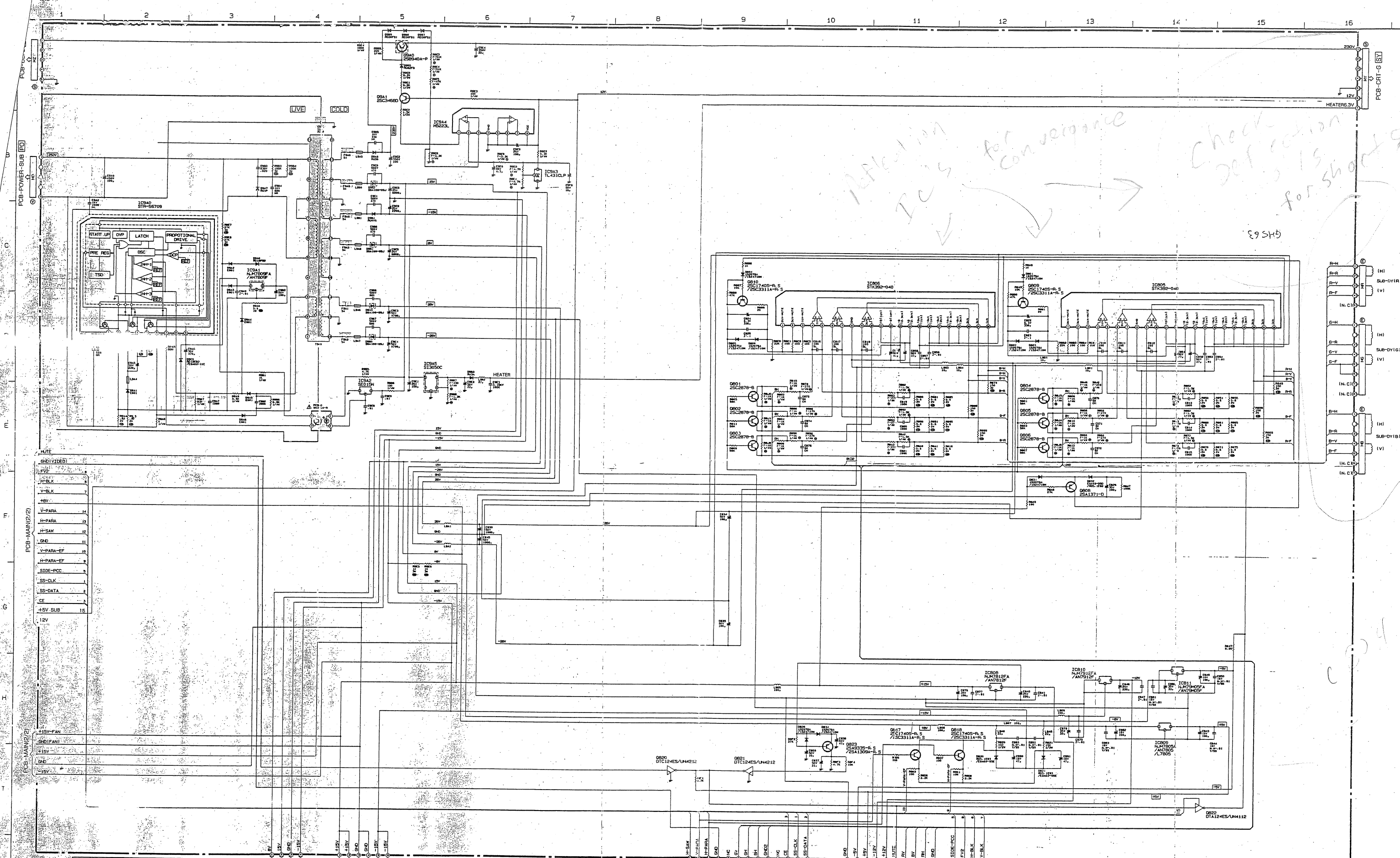
⊕	Zener Diode	⊕	Crystal unit
⊕	Vacuum	⊕	Air Gap
⊕	Posistor	⊕	Part (resistor) attached on the copper-clad side of PCB
⊕	Thermistor	⊕	Ceramic filler
⊕	Fusible Resistor		

**SHADED COMPONENTS HAVE SPECIAL CHARACTERISTICS IMPORTANT TO SAFETY. BEFORE REPLACING ANY OF THESE COMPONENTS READ CAREFULLY THE PRODUCT SAFETY NOTICE IN THE SERVICE MANUAL. DON'T DEGRADE THE SAFETY OF THE RECEIVERS THROUGH IMPROPER SERVICING.**

**SERVICE MAN WARNING**  
 X-RADIATION PRECAUTION  
 THIS PRODUCT INCLUDES CRITICAL ELECTRICAL AND MECHANICAL PARTS ESSENTIAL FOR X-RADIATION PROTECTION.  
 TO AVOID POSSIBLE EXPOSURE TO X-RADIATION TAKE X-RADIATION PROTECTIVE MEASURES FOR PERSONNEL DURING SERVICING.  
 SEE SERVICE INSTRUCTIONS FOR SPECIFIED REPLACEMENT PARTS AND SERVICE ADJUSTMENTS.

**50P-GHS63 INDEX**

BLOCK DIAGRAM	①	AFC	①
MAIN(1/2)	②	CRT-R.G.B	②
MAIN(2/2)	③	DBF	③
SYSCON	④	POWER-SUB	④
DEFL	⑤	TERMINAL	⑤
DEFL-V	⑥	PREAMP	⑥
CONV-SUB	⑦	SENSOR(TOP)(BOTTOM)	⑦
VIDEO	⑧	SENSOR(RIGHT)(LEFT)	⑧



Reflection IC's for convergence  
 Check deflection for shorts  
 E9SH5

PCB-MAIN(1/2)

50P-GHS63 INDEX

BLOCK DIAGRAM	①	AFC	①
MAIN(1/2)	②	CRT-R.G.B	②
MAIN(2/2)	③	DBF	③
SYSCON	④	POWER-SUB	④
DEFL	⑤	TERMINAL	⑤
DEFL-V	⑥	PREAMP	⑥
CONV-SUB	⑦	SENSOR(TOP)(BOTTOM)	⑦

- MUTE
- GEN(V)VIDE
- FVS
- H-BLK
- H-V
- V-PARA
- H-PARA
- H-SAM
- END
- V-PARA-EF
- H-PARA-EF
- SIDE-POC
- SS-CLK
- SS-DATA
- CE
- +5V SUB
- 12V

- B-H (H)
- B-V (V)
- B-F (V)
- IN.CX
- B-H (H)
- B-V (V)
- B-F (V)
- IN.CX
- B-H (H)
- B-V (V)
- B-F (V)
- IN.CX

- PCB-POWER-SUB
- PCB-MAIN(2/2)
- PCB-MAIN(2/2)
- PCB-FILTER
- PCB-DEFL
- PCB-CONV-SUB
- PCB-CONV-SUB

PCB-CRT-G

HEATERS:3V

- H-SAM
- V-PARA
- H-PARA
- END
- V-PARA-EF
- H-PARA-EF
- SIDE-POC
- SS-CLK
- SS-DATA
- CE
- +5V SUB
- 12V

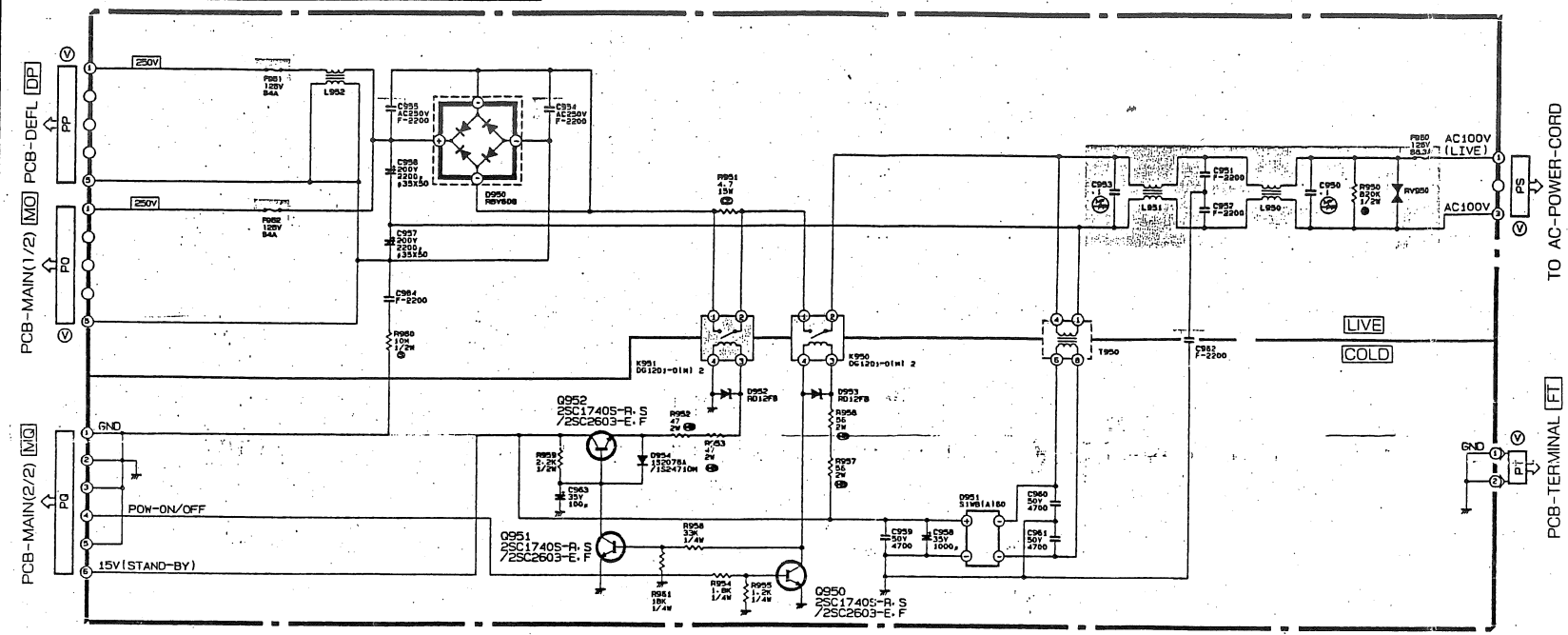
PCB-MAIN(1/2)

- H-SAM
- V-PARA
- H-PARA
- END
- V-PARA-EF
- H-PARA-EF
- SIDE-POC
- SS-CLK
- SS-DATA
- CE
- +5V SUB
- 12V

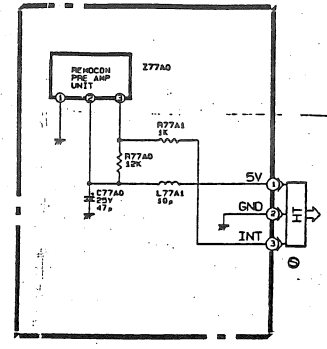
1 2 3 4 5 6 7 8 9 10 11

A  
B  
C  
D  
E  
F  
G

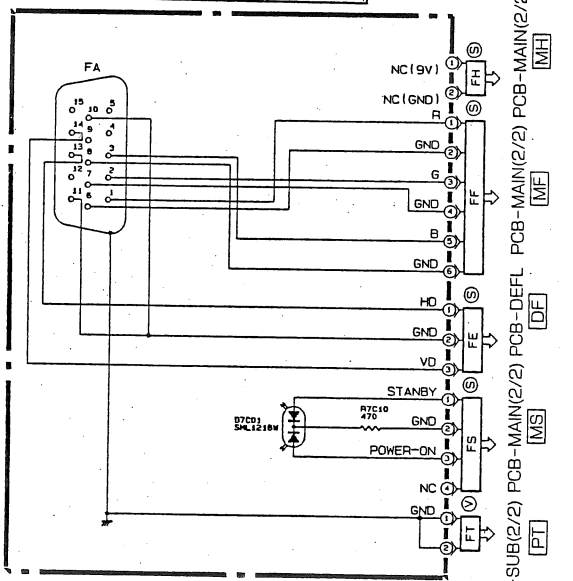
PCB-POWER-SUB



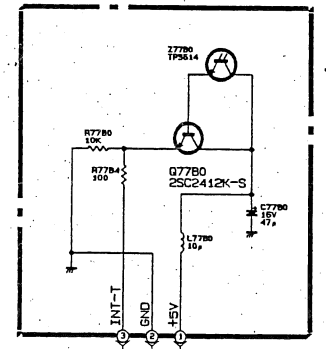
PCB-PREAMP



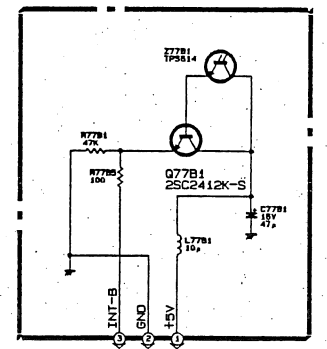
PCB-TERMINAL



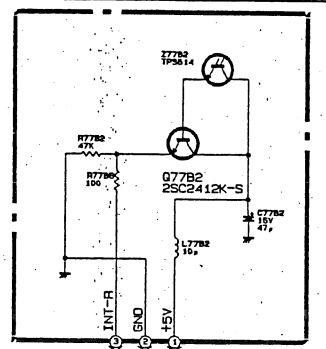
PCB-SENSOR(TOP)



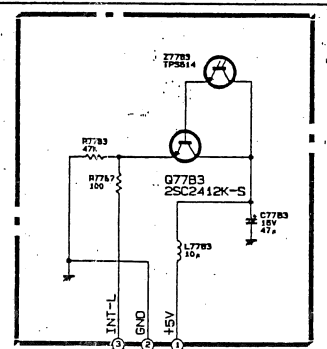
PCB-SENSOR(BOTTOM)



PCB-SENSOR(RIGHT)



PCB-SENSOR(LEFT)

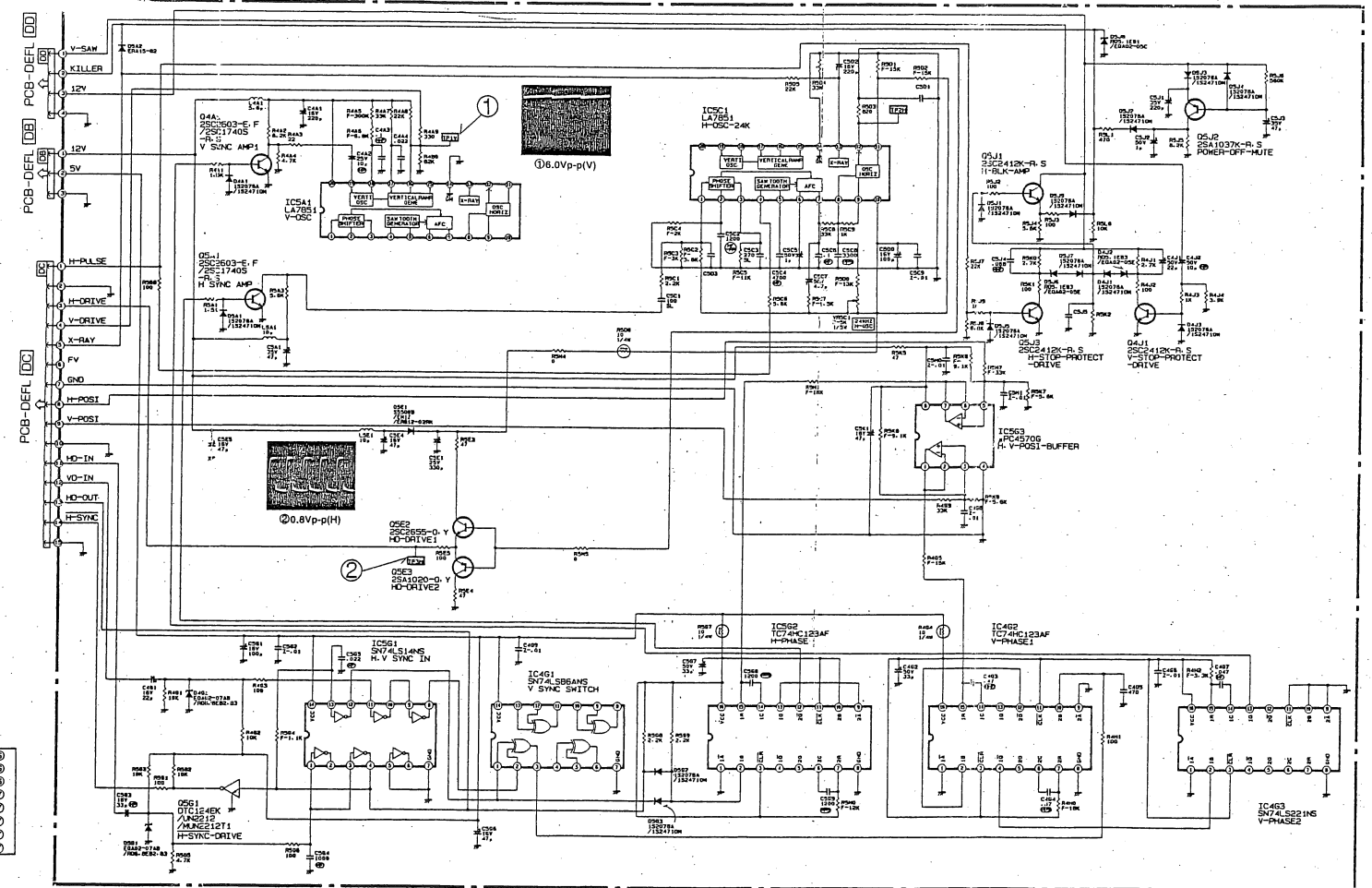
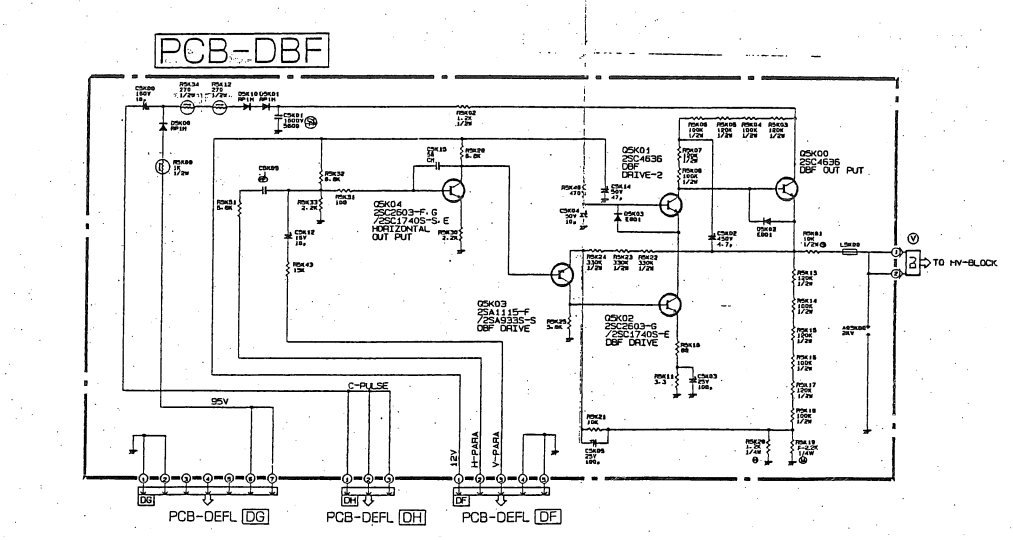
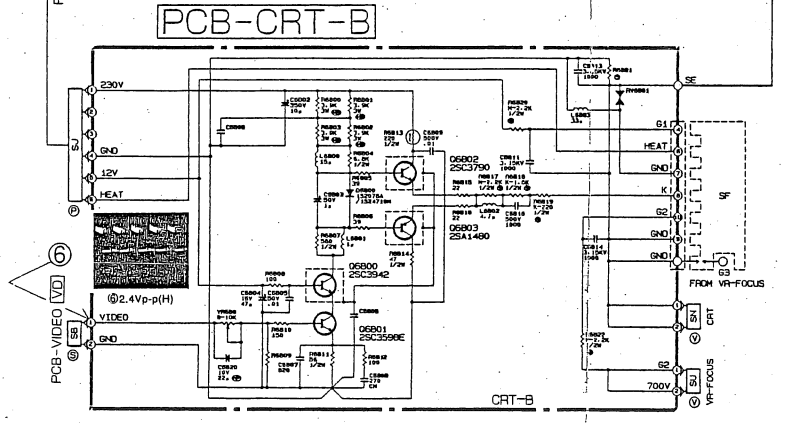
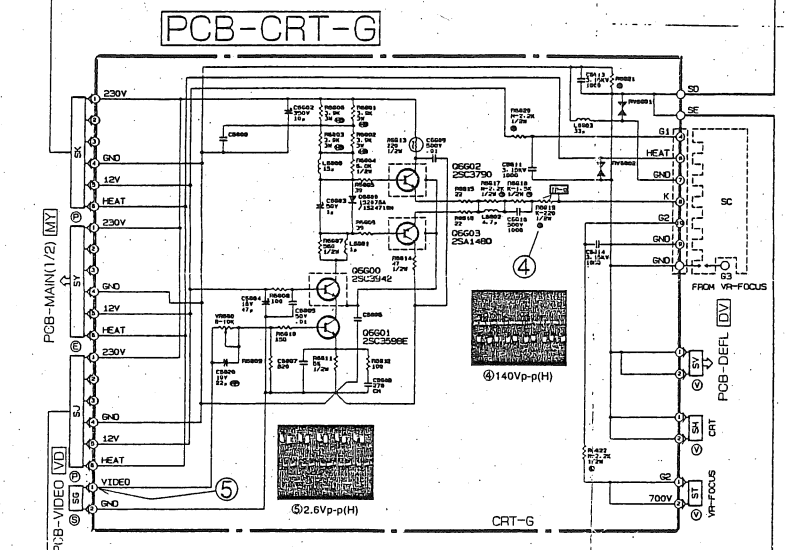
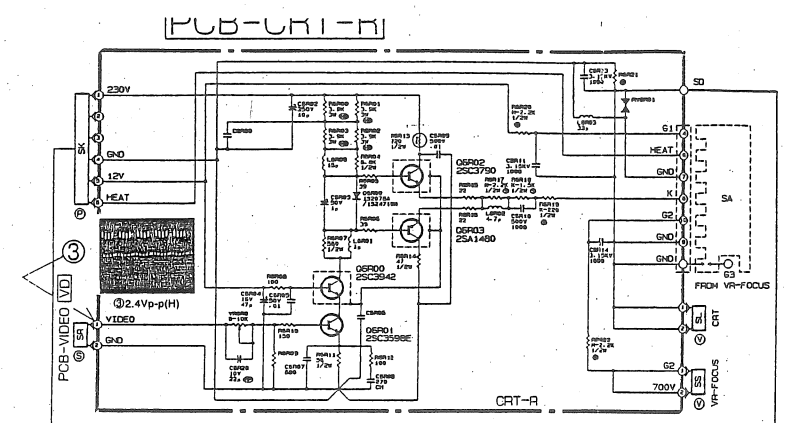
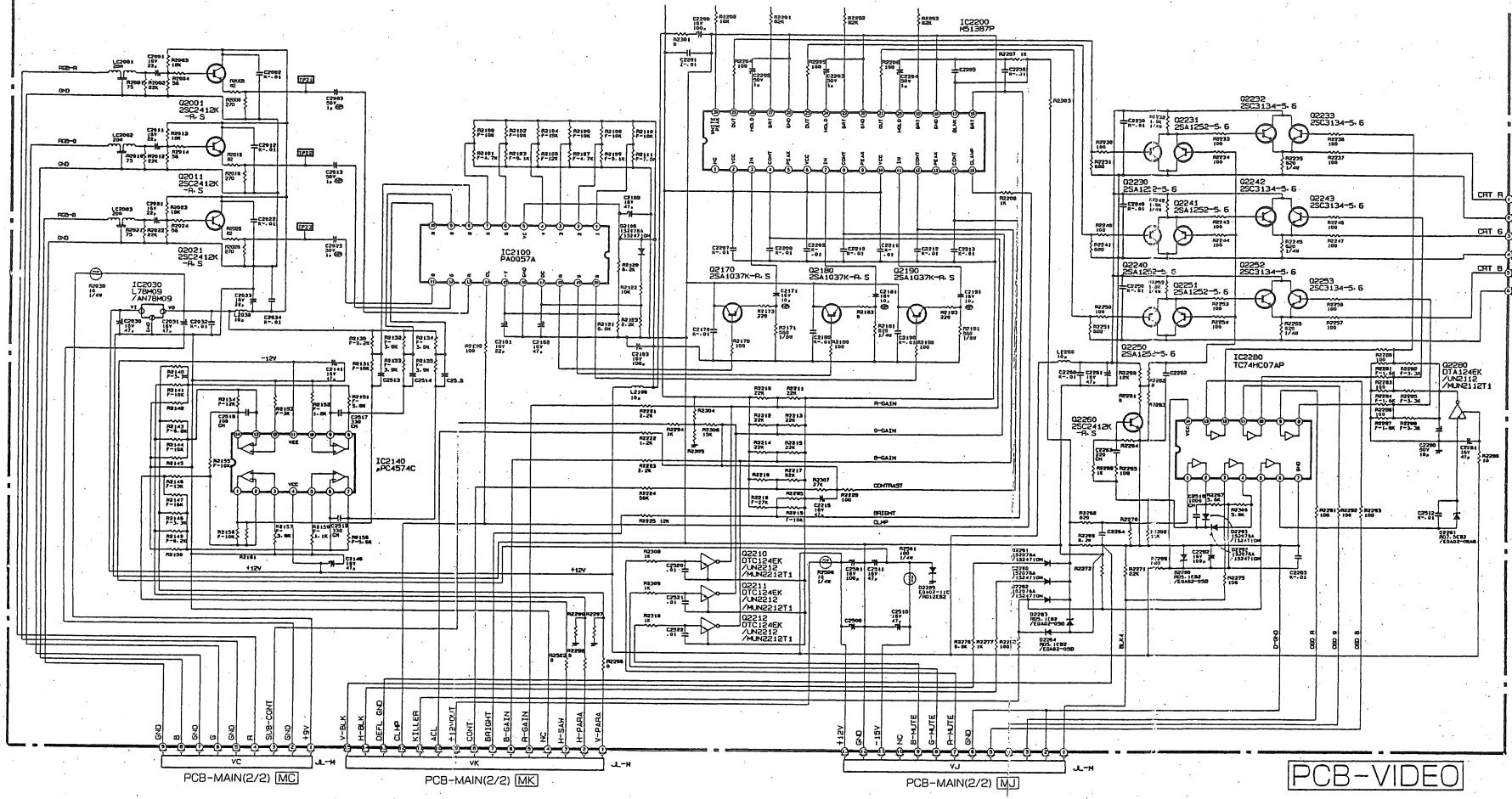


50P-GHS63 INDEX

BLOCK DIAGRAM	①	AFC	⑩
MAIN(1/2)	②	CRT-R,G,B	⑪
MAIN(2/2)	③	DBF	⑫
SYSCON	④	POWER-SUB	⑬
DEFL	⑤	TERMINAL	⑭
DEFL-V	⑥	PREAMP	⑮
CONV-SUB	⑦	SENSOR(TOP)(BOTTOM)	⑯
VIDEO	⑧	SENSOR(RIGHT)(LEFT)	⑰



A  
B  
C  
D  
E  
F  
G  
H  
I  
J

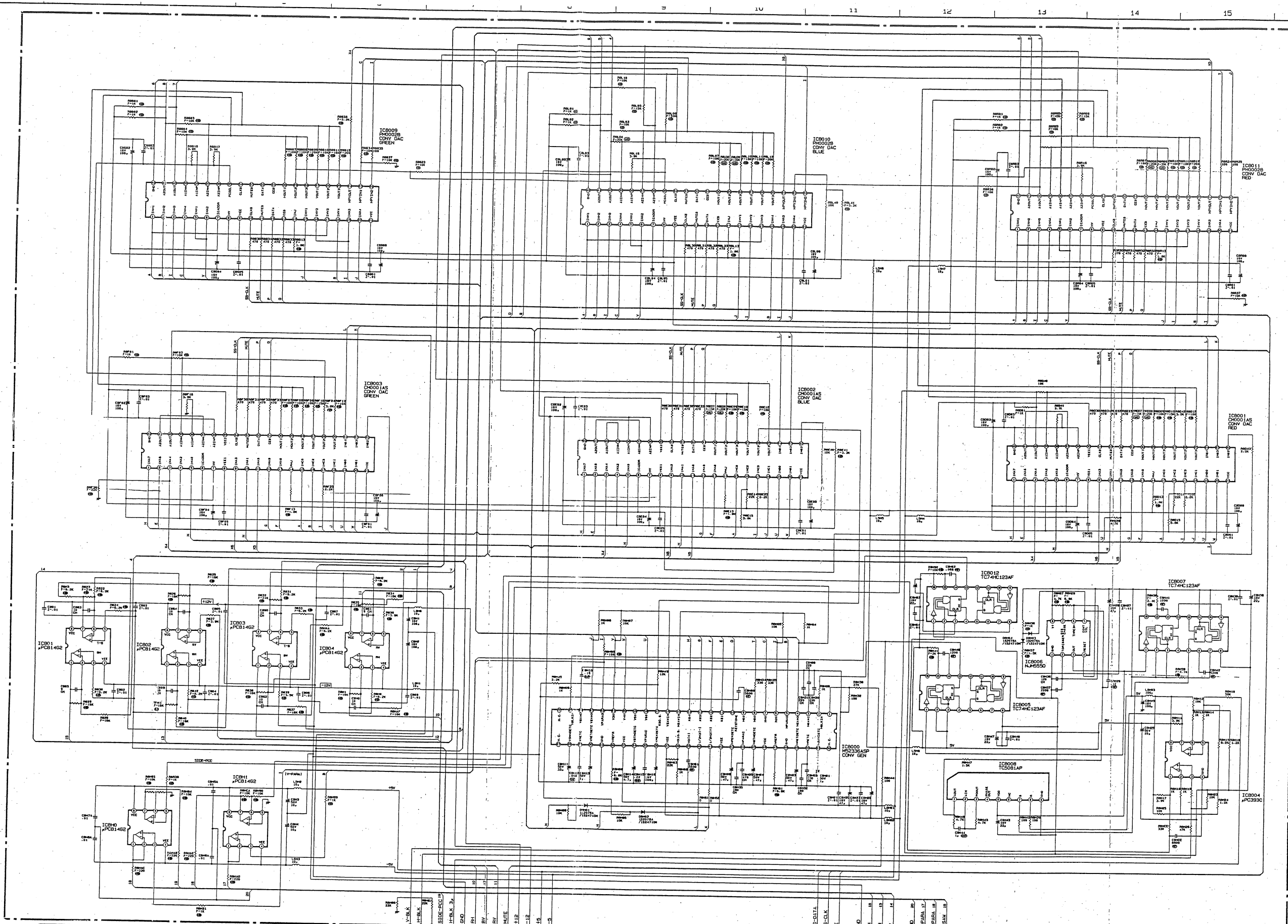


50P-GHS63 INDEX

BLOCK DIAGRAM	①	AFC	⑥
MAIN(1/2)	②	CRT-R,G,B	⑦
MAIN(2/2)	③	DBF	⑧
SYSCON	④	POWER-SUB	⑨
DEFL	⑤	TERMINAL	⑩
DEFL-V	①	PREAMP	⑪
CONV-SUB	②	SENSOR(TOP)(BOTTOM)	⑫
VIDEO	③	SENSOR(RIGHT)(LEFT)	⑬

All resistors 1/10W P-M-CHIP unless otherwise specified.





PCL CONV-SUB

PCB-MAIN(1/2) MD

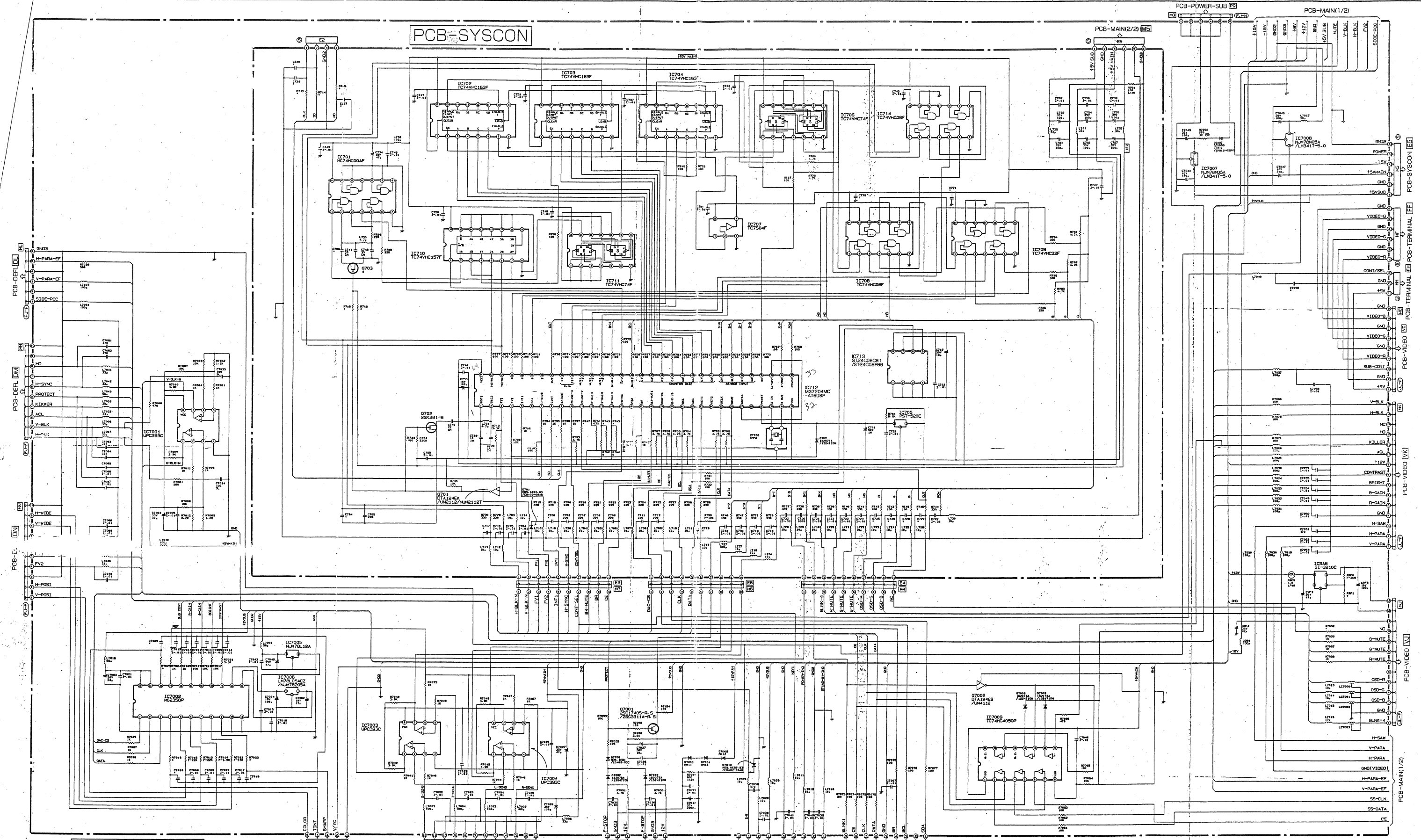
All resistors are 1/10W unless otherwise specified.

PCB-MAIN(1/2) ME

50P-GHS63 INDEX

BLOCK DIAGRAM	① AFC	⑥
MAIN(1/2)	② CRT-R,G,B	⑦
MAIN(2/2)	③ DBF	⑧
SYSCON	④ POWER-SUB	⑨
DEFL-V	⑤ TERMINAL	⑩
CONV-SUB	⑥ PREAMP	⑪
VIDEO	⑦ SENSOR(TOP)(BOTTOM)	⑫
	⑧ SENSOR(RIGHT)(LEFT)	⑬

PCB-SYSCON



PCB-MAIN(2/2)

PCB-SENSOR(TOP)(BOTTOM)(LEFT)(RIGHT)

FAN FAN

PCB-PREAMP PCB-TERMINAL FOR AUTO CONV. SYSTEM

50P-GHS63 INDEX

BLOCK DIAGRAM	①	AFC	⑥
MAIN(1/2)	②	CRT-R,G,B	⑦
MAIN(2/2)	③	DBF	⑧
SYSCON	④	POWER-SUB	⑨
DEFL	⑤	TERMINAL	⑩
DEFL-V	⑥	PREAMP	⑪
CONV-SUB	⑦	SENSOR(TOP)(BOTTOM)	⑫
VIDEO	⑧	SENSOR(RIGHT)(LEFT)	⑬

# SEGA

SEGA ENTERPRISES, INC. (USA)

45133 Industrial Drive  
Fremont, CA 94538  
650-802-1750 phone  
650-802-1754 fax



Happ Controls, Inc. a company of the  
**SUZO-HAPP GROUP**

# INVOICE COPY

106 GARLISCH DRIVE  
ELK GROVE VILLAGE, IL 60007

REMIT TO:  
HAPP CONTROLS, INC.  
BOX 88696  
MILWAUKEE, WI 53288-0696

DATE NUMBER WHS PAGE  
08/04/09 1773324 MN 1

PHONE: 847-593-6130  
FAX: 847-593-6137

Toll Free 888-289-4277  
Phone:  
Toll Free 888-593-4277  
Fax:

**S HAPP (MINNESOTA)**  
**O 9549 PENN AVE S**  
**L**  
**D**  
**T BLOOMINGTON, MN 55431**  
**O USA**

**S HAPP (MINNESOTA)**  
**H 9549 PENN AVE S**  
**I**  
**P**  
**T BLOOMINGTON, MN 55431**  
**O USA**

ORDER NO.	ORDER DATE	CUSTOMER NO.	SLSMN. NO	PURCHASE ORDER NO.	SHIP VIA	SHIP DATE	TERMS
1379952	07/29/09	*8	928	Dave	PICK UP Prepay/Add	08/04/09	C.O.D.

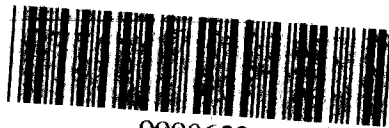
QTY OPEN	QTY SHIPPED	QTY BACK. ORD.	ITEM NO.	ITEM DESCRIPTION	UNIT PRICE	EXTENDED PRICE
1	1	0	999-0623	manual for Mitsubishi 50" TV	60.76	60.76

SALES AMOUNT	60.76
MISC. CHARGES	0.00
SALES TAX	4.42
S & H	0.00
<b>TOTAL =&gt;</b>	<b>65.18</b>

Sega Amusements USA

Item: 999-0623

MANUAL 50PGHS63 (81)W/SCHMTC



9990623

*CAST*