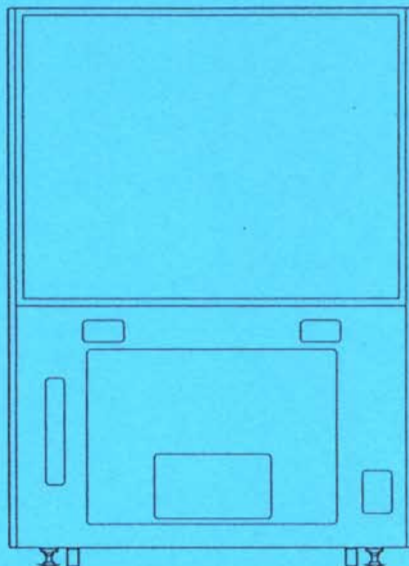




Service Manual

1998

PROJECTION TELEVISION
GM3 CHASSIS



MODEL
50P-GHS91

CAUTION

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

SPECIFICATIONS

- | | | | |
|-------------------|--------------------------------------|--------------|------------------------------------|
| • Chassis | : GM3 | • Operating | : 0°C to 30°C |
| • Power Input | : AC100 ~ 120V ; 50/60Hz | Temperature | |
| • Power | : 230W | • Relative | : 20 % to 80 % |
| Consumption | | Humidity | |
| • Input Terminal | | • Cabinet | : 1140 (W) × 1670 (H) × 584 (D) mm |
| RGB Input | : 0.7Vp-p 75Ω Positive Polarity | Dimensions | |
| HD/VD Input | : TTL level 3.0 ~ 5.0Vp-p 470Ω | • Weight | : 105 kg |
| Negative Polarity | | • Attachment | : Remote Hand Unit |
| • Reception | : Horizontal Frequency 31.5 ± 0.5kHz | Battery | |
| Frequency | : Vertical Frequency 60 ± 5Hz | | |
| (RGB Signal) | | | |

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

MITSUBISHI ELECTRIC

Copyright © 1997 Mitsubishi Electric Corporation All Rights Reserved.

999-0757

CONTENTS

• SAFETY PRECAUTIONS	1
• CLEANING	3
• DEW CONDENSATION	3
• PCB LOCATIONS	4
• DISASSEMBLY METHOD	5
• LEAD WIRE ROUTE	6
• REPLACEMENT OF LENTICULAR SCREEN AND FRESNEL LENS	7
• CRT REPLACEMENT	8
• SELF DIAGNOSIS FUNCTION	10
• ADJUSTMENT MODE	12
TEST 1.1.8 MODE (ADJUSTMENTi)	12
TEST 1.1.10 MODE (CONVERGENCE)	14
TEST 1.1.9 MOCE (RESET)	15
TEST 8.8.► MODE (DIGITAL CONVERGENCE SETTING)	15
TEST 9.9.► MODE (OPTION SETTING)	16
TEST 1.1.► MODE (AUTO ADJUSTOR SETTING)	16
USER ADJUSTMENT MODE	17
TEST CROSS PATTERN MODE	17
• CIRCUIT ADJUSTMENT	18
MEASURING EQUIPMENT AND JIGS	18
TEST SIGNAL	18
LOCATION OF TEST POINTS AND ADJUSTMENTS	19
AFC CIRCUIT	20
HIGH-VOLTAGE CONTROL CIRCUIT	20
CRT CIRCUIT	21
CONVERGENCE CIRCUIT	22
DEFLECTION CIRCUIT	23
FOCUS CIRCUIT	25
CRT CIRCUIT	27
VIDEO CIRCUIT	28
CONVERGENCE CIRCUIT	29
• PARTS LIST	32
• PACKING PROCEDURE	34
• IC BLOCK DIAGRAM	
• SCHEMATIC DIAGRAM	
• PRINTED CIRCUIT BOARD PARTS LAYOUT	

SAFETY PRECAUTIONS

NOTICE: When servicing, observe all cautions and safety-related notes indicated in the labels attached on the cabinet, chassis, and parts, etc. Observe all those cautions and notes, the service manual, and the instruction manual, etc.

WARNING

Turn on the power only when necessary.

Unplug the power plug when not necessary to keep it on. Servicing with the power on may cause more trouble due to the short and an electric city.


Wear the protection groves.

Wear the protection groves when servicing with the power on. The high voltage is applied inside the product and touching the high-voltage part while the product is turned on may cause an electric shock.

Do not shock the CRT.

This product has shrink-banded CRT. It may explode if a shock is given to the neck part or corn part during service from the back of the product or during service with the CRT removed.

Use the designated parts.

When replacing the parts marked with  marks in the circuit diagram and parts table, use the designated parts for sure. Those parts are flame resisting and voltage-proof, which is important for safety. Using the parts other than the designated ones may cause a fire.

Be sure to place the parts in the original positions after the replacement.

Place the parts in the original positions for sure after using the insulation materials (tubes or tapes, etc.), lifting the parts from PCB-PRINT, or replacing the parts fastened on the back of the PCB. Those parts are fastened in a special way for the prevention of heat generation. Therefore, they may cause a fire if not placed back in the right position.

Route and clamp the wires to the original positions for sure.

If the internal wires are close to the heat-generating or high-voltage parts, it may cause a fire.

Do not put a large tension to the anode-lead wires.

If a tension of more than approx. 5kg to the anode-lead wires, the wires may get disconnected from the fly-back trans and discharged, which may cause an electric shock or a fire.

Do not alter the circuit.

The CRT and high-voltage peripheral circuit of this product are designed so that X-ray dose not harm human body. When repairing the high-voltage peripheral circuit, use the designated parts such for CRTs and do not alter the circuit. Altering the circuit may cause the X-ray to harm the human body when the product has a fault.

Perform the safety check.

Check if the screws and parts which are removed for servicing are back in the original positions and if the peripheral part is not deteriorated due to servicing. Perform the following insulation checking method to confirm the safety is secured.


Insulation Checking Method

Unplug the plug from the power outlet and turn on the power switch. Measure with a 500V insulation resistance tester [Note 1]. The insulation resistance value should be 1M Ω or more between each terminal of the plug and external metal part [Note 2]. If the value is lower than that, the product needs to be checked and repaired.

[Note 1] Use a tester, etc. if the 500V insulation resistance tester is not available.

[Note 2] External Metal Part Image Input Terminal

Check the following items when repairing.

Checking Item	Check
(1) Safety Check Before Repairing	
(a) Installation	
Is the product placed in a well-ventilated condition (distance, ventilator) ?	
No bad effect from the direct sun light, humidity, heat (stove, etc.), or dust ?	
Is the power supplied rightly (regular outlet, poly-type wiring) ?	
Is the product placed rightly (stability, height, inclination) ?	
(b) Product	
Are the plug and power code not damaged ?	
Any abnormal sound, smell, or temperature rise ?	
Any abnormality in the catch, handle, or back cover (any rattling, missings) ?	
Other abnormality noticed () ?	
(2) Complete repairing	
(a) Used the right parts ?	
Used the regular fuse (type, shape, weight) ?	
Used the regular insulation (materials, diameter) ?	
Used the regular plug and power code ( mark, type) ?	
Used the regular internal wires, high-voltage lead wires (diameter, covering materials, thickness, indicated pressure-proof value) ?	
Used the regular CRT (shrink band) ?	
Use the regular fly-back trans, deflection yoke ?	
Used the regular power switch, power trans, noise reduction condenser ?	
Used other regular parts for replacement ?	
(b) Installation wiring	
Are the parts-attaching positions, attachment, intervals not altered ?	
Are all wires routed, clamped and located (the distance from the heat-generating parts, the rotating part) same as initially ?	
No defective soldering (excessive solder, air spaces, winding omission, etc.) ?	
Are the insulation materials back in the original place (tubes, tapes, or fibers, etc.) ?	
Are the forming parts not inclined ?	
(3) Safety check after repairing	
(a) No abnormality peripheral to the repaired part (parts inclination, damages, etc.)	
(b) No parts needs immediate repair ? No deterioration ?	
(c) No foreign object entrained (soldering scraps, string scraps or screws, etc.) ?	
(d) No possibility of a danger due to the deterioration (discoloration, damages or leakage, etc.) ?	
(e) Are all dirt and dust removed at the finishing ?	
(f) All installation, fastening completed (back cover) ?	
(g) Checked the insulation with a tester, etc. (antenna terminals, between the external metal part and plug) ?	
(4) Provide sufficient explanation for users	
(a) Explanation of checked points for safety and remedy	
(b) Instruction on the right usage	
Read the instruction manual carefully before use.	
Do not remove the back cover.	
Do not put in any object through the ventilator or crevices.	
Keep the plug off when not using the product for a long period of time.	
Consult the shop, etc. before cleaning dirt or dust inside the product.	
Clean the CRT surface and cabinet, etc. after turning the power switch off.	
If the product has a remote controller, turn off the power switch of the product before going out or sleeping.	
(c) In the case of a trouble, unplug the product and contact the shop immediately.	

CLEANING

Cautions during Cleaning

- Handle the lenticular screen with care because it is made of acrylic resin and easy to be damaged.
- Do not wipe it with benzine or thinner, etc. It may deteriorate of the screen or remove the paint coating. Be sure to follow the instructions relating to the use of chemical cloth if you choose to use one.
- Be sure to unplug the power cord when cleaning the inside of the product because the high voltage is applied to the inside of it.
- Be careful not to touch the lens surface by hand or scratch it.

Cleaning Procedures

- Wipe the dirt lightly with a piece of soft cloth. When the screen has obstinate dirt on it, soak a piece of soft cloth into the diluted detergent and wring it tightly to wipe the dirt with it. Finish with a piece of dry cloth after that.
- Wipe the lenticular screen along the streaks.
- Clean the fresnel lens, mirror, or lens with a cleaner effective for prevention of static electricity.

DEW CONDENSATION

Dew Condensation on Lens

Dew condensation may occur on the optical unit when there is a sudden rise in the room temperature, which may temporarily cause a fuzzy picture.

In this case, leave the unit for 1 to 2 hours with the power on so that the dew condensation will disappear.

PCB LOCATIONS

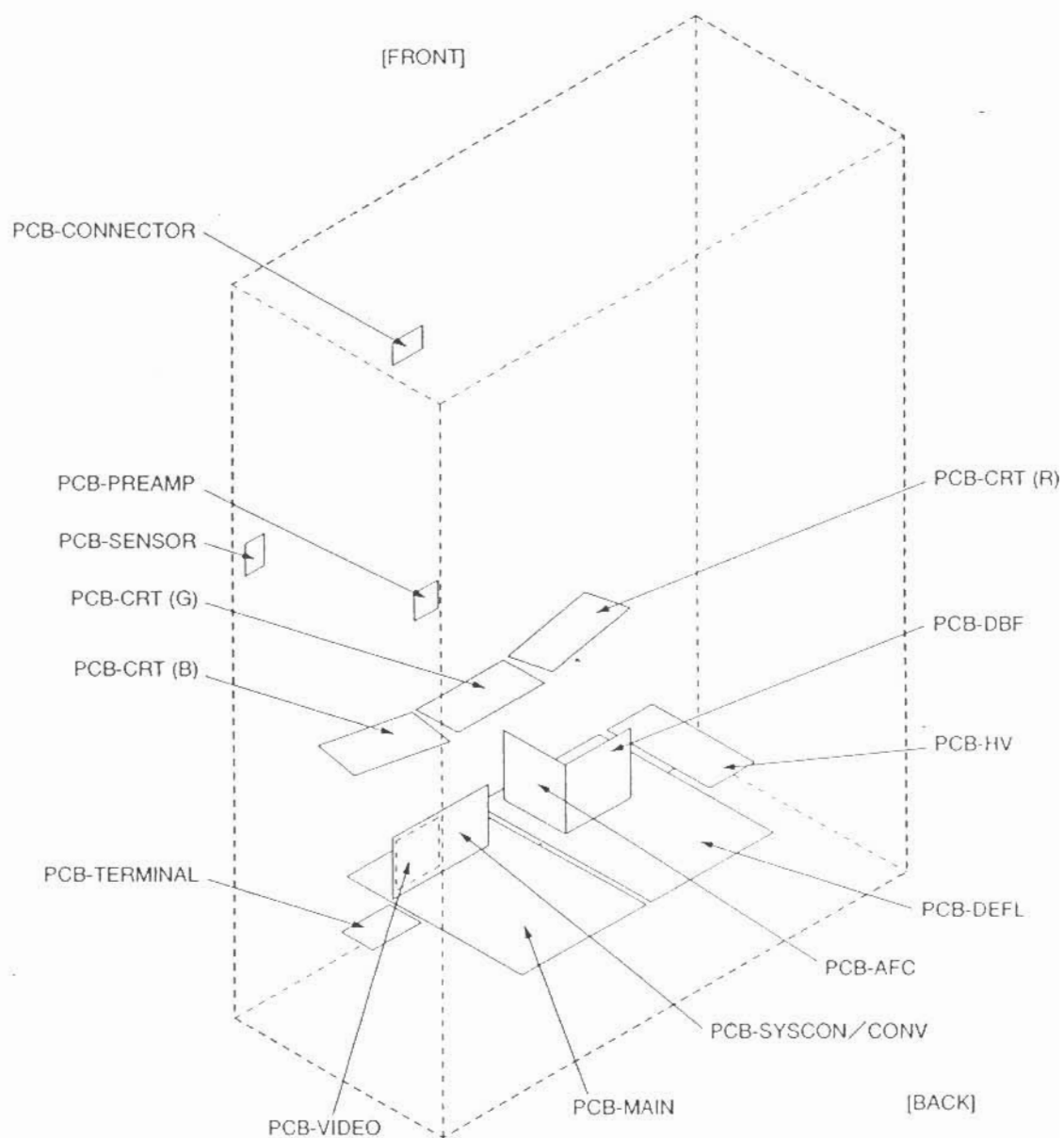


FIG. 1

DISASSEMBLY METHOD

Refer to the parts price table for the parts numbers.

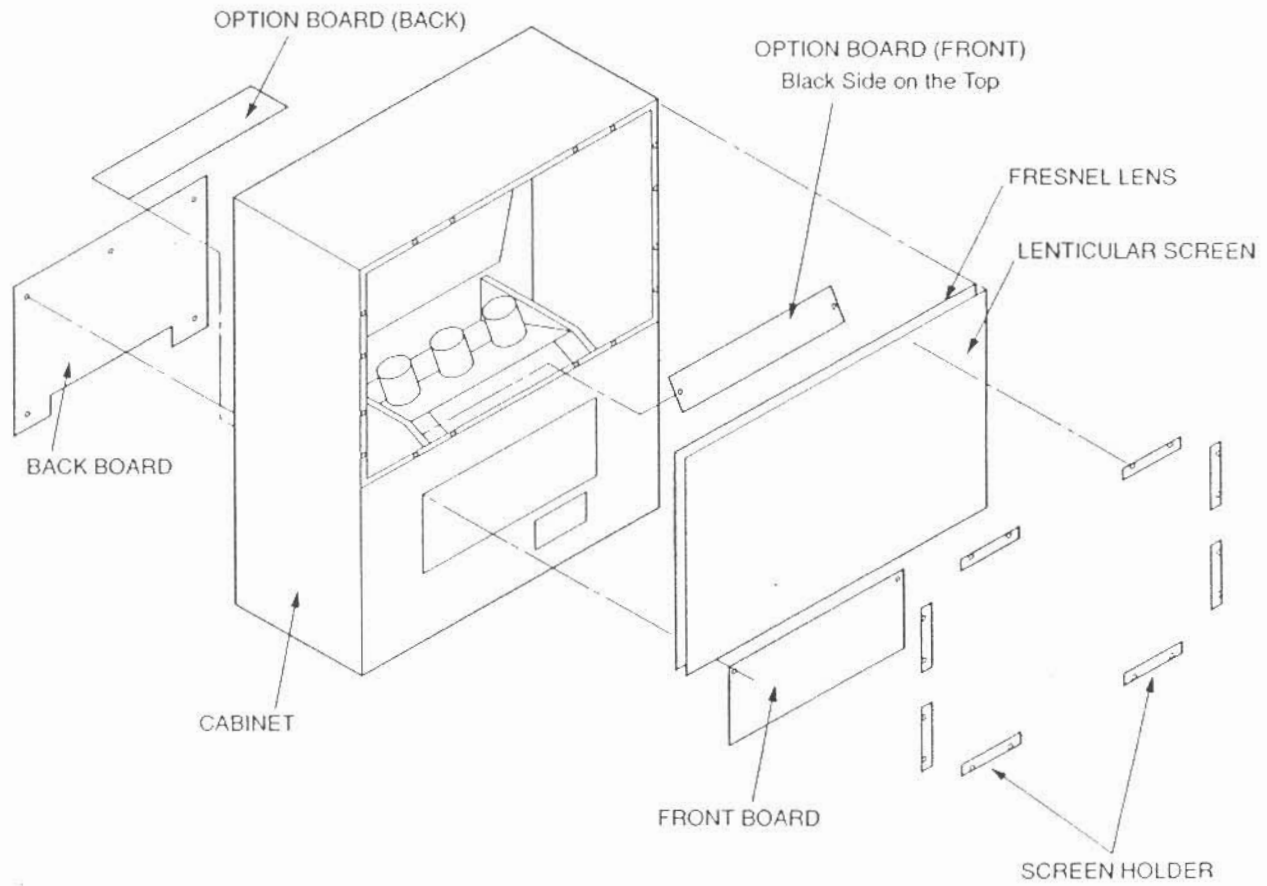


FIG. 2

NAME OF PARTS	SCREW NUMBER
SCREEN HOLDER	2 EACH
FRONT BOARD	2
BACK BOARD	9
OPTION BOARD (F)	2
OPTION BOARD (B)	NONE







LEAD WIRE ROUTE

[CAUTION] The internal wires are routed and clamped so that they will not come close to heat-generating or high-voltage parts. Therefore, all wires should be placed back in the original positions after the service.

Anode lead wires are routed so that the anode cap does not get a tension. Place them back to the initial positions after servicing.

Clamp the lead wires along the clamping zone * shown in the following figure.

Lead wire should not be slack.

	Optical Unit
	Focus control
	High-voltage Block
	Clamping Zone *
	Hidden Clamping Zone *
	Aerial Clamp

* Clamping zone shows the route of the lead wire bundle, high-voltage lead wire and lead wire on the primary side.

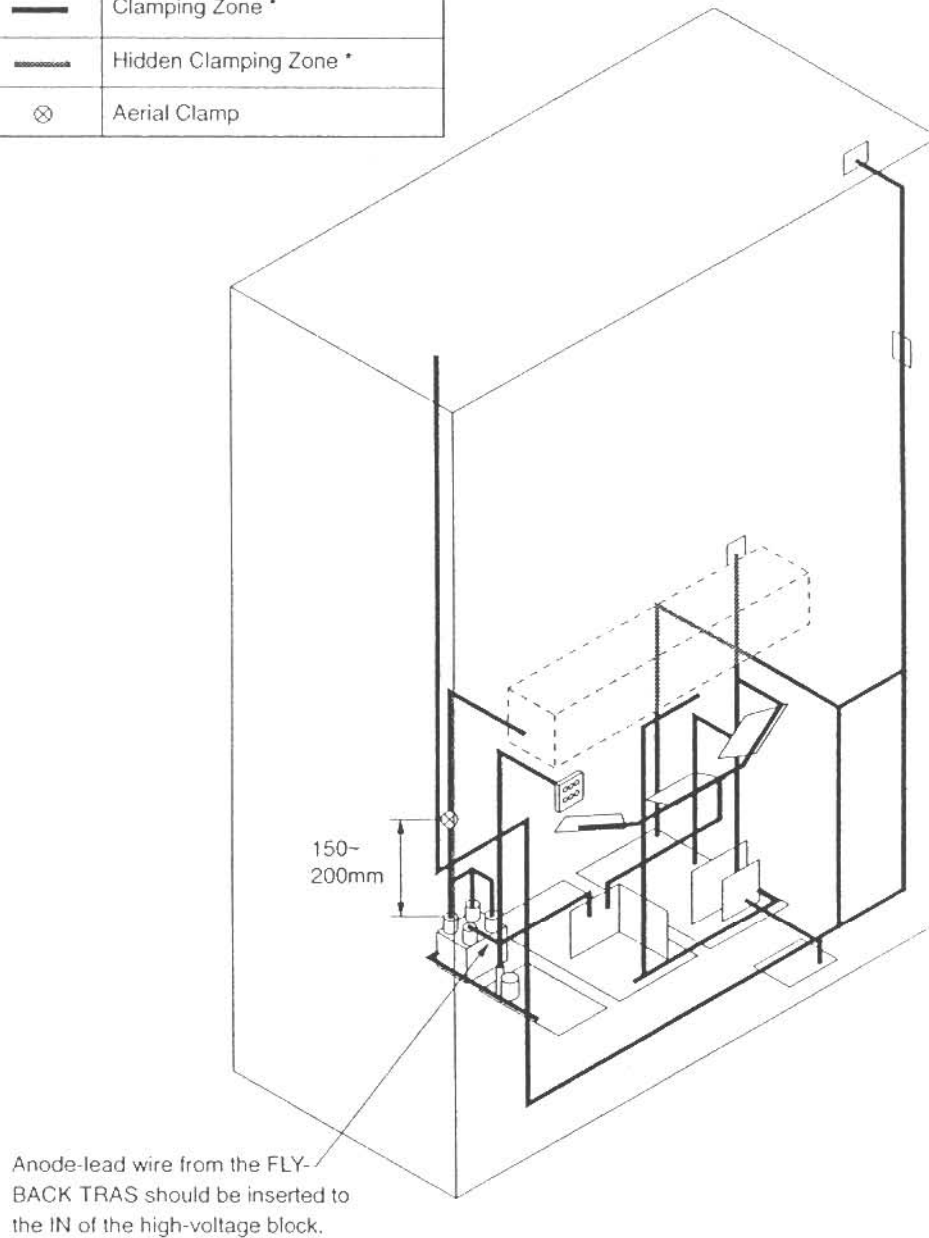


FIG. 3

REPLACEMENT OF LENTICULAR SCREEN AND FRESNEL LENS

Cautions for Handling Lenticular Screen and Fresnel Lens

1. Wear a pair of gloves when handling the lenticular screen and fresnel lens. (for prevention of cutting fingers, finger prints)
2. Do not turn the fresnel lens to the sun. (for prevention of a fire, skin burn)
3. Do not store them in a very humid place. (for prevention of deformation due to moisture absorption)

Removal of Lenticular Screen and Fresnel Lens

1. Remove the 16 screws (a) fastening the screen holder. (FIG. 4-1)
 2. Remove the lenticular screen and fresnel lens. (FIG. 4-2)
- Remove the both-sided tape sticking on the joint of the lenticular screen and fresnel lens by heating with a dryer, etc.

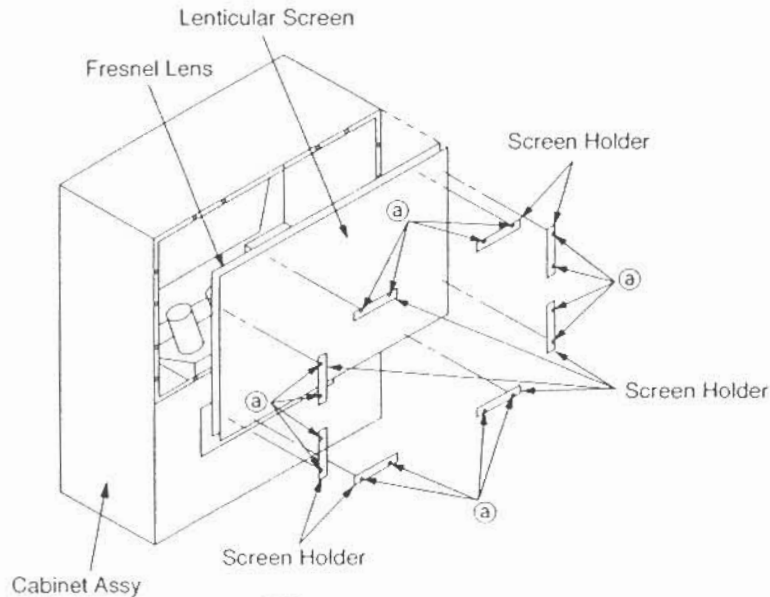


FIG. 4-1

Installation of Lenticular Screen and Fresnel Lens

1. Stick the lenticular screen and fresnel lens with the both-sided tape. (FIG. 4-2)
2. Attach the cushion to the lenticular screen and fresnel lens. (FIG. 4-3)
3. Fasten 16 screws (a) attach the screen holder. (FIG. 4-1)

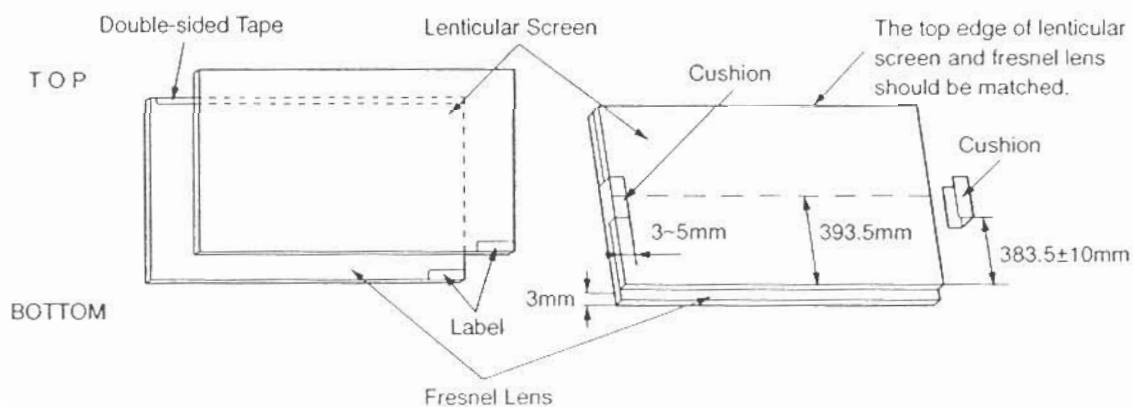


FIG. 4-2

FIG. 4-3

CRT REPLACEMENT

Removal of CRT

When replacing CRTs, replace them one by one. Turn the power on after replacing each CRT. Roughly adjust the focus, screen center, convergence and confirm that the screen is almost correctly adjusted. And replace the next CRT.

1. Remove the back board and front board.
2. Remove the anode-lead wires (3 wires to the optical unit) from the high-voltage block. And bring the disconnected anode-lead wires into contact with the heat-radiating board to discharge the residual electric charge inside the CRT. (FIG. 5-1)
3. Remove the lenticular screen and fresnel lens.
4. Remove the optional board (front).
5. Remove all the lead wires connected to the optical unit and PCB-CRT (R), (G), (B) from the optical unit.
6. Remove the 4 screws (a) fastening the optical unit to remove it from the cabinet assy. (FIG. 5-2)

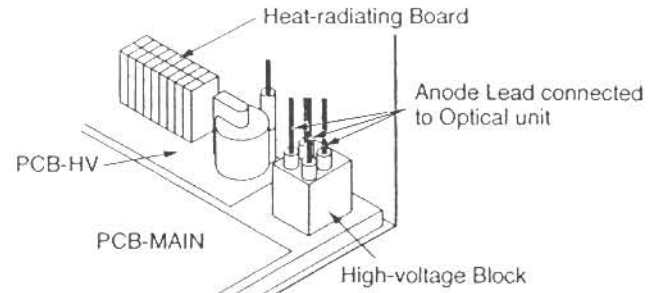


FIG. 5 - 1

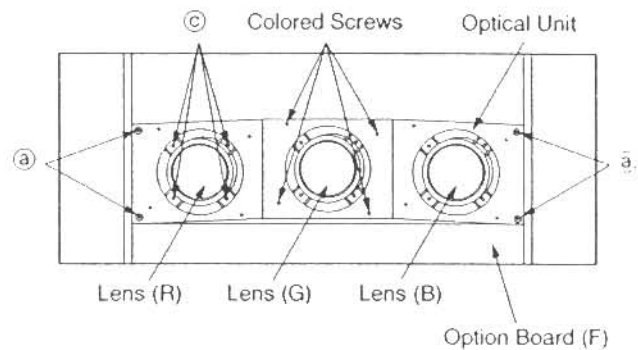


FIG. 5 - 2

7. Remove the 6 screws (b) fastening the shield cover to remove the cover (upper) and (lower) from the optical unit. (FIG. 5-3)

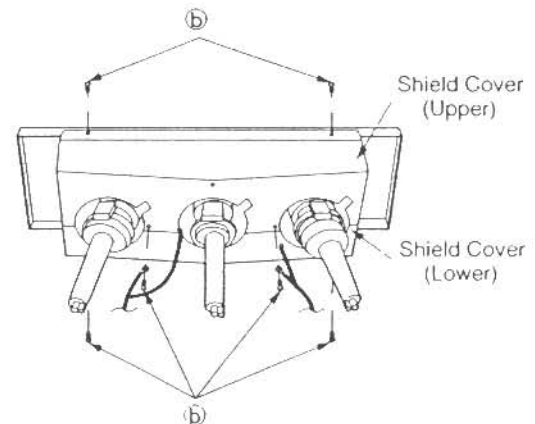


FIG. 5 - 3

9. Remove the 4 screws (d) fastening the CRT, as holding the CRT. (FIG. 5-4)
The CRT can be removed from the optical unit.

[Caution] Never loosen the colored screws. It may cause a leaking of the cooling liquid. If the leaked cooling liquid is sticking to the lens surface, wipe it off with a piece of soft cloth. If the cooling liquid leaked into the lens mirror cylinder, replace the lens mirror cylinder.

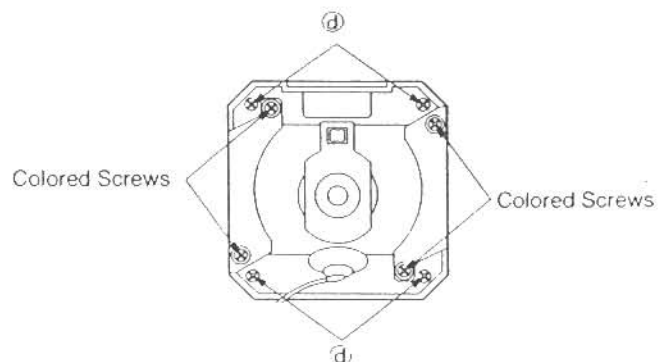


FIG. 5 - 4

CRT Installation

[CAUTION] If the cooling liquid is sticking on the lens, wipe it off with a piece of soft cloth.

If the cooling liquid leaked into the lens mirror cylinder, replace the lens with a new one.

1. Insert the deflection yoke to the CRT neck part and stick them temporarily.
2. Install the CRT to the optical unit. (FIG. 5-4)
3. Install the lens to the optical unit. (FIG. 5-2)
4. Install the deflection yoke to the designated position. (FIG. 5-5)
5. Install the shield cover to the optical unit. (FIG. 5-3)
6. Install the optical unit to the cabinet assy. (FIG. 5-2)
7. Install all the lead wires which were connected to the optical unit and PCB-CRT (R), (G), (B) to the optical unit.
8. Install the anode lead which was disconnected at Item 2 of "CRT REPLACEMENT" to the high-voltage block. (FIG. 5-1)
9. Install the option board (front) to the cabinet assy.
10. Install the lenticular screen, fresnel lens, back board, front board to the cabinet assy.

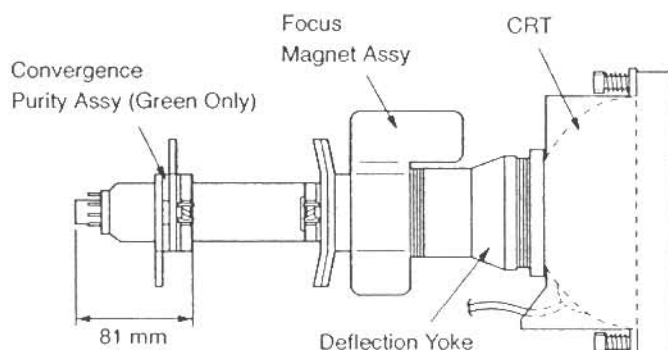


FIG. 5 - 5

Necessary Adjustment After CRT Replacement

Adjust according to the following items after replacing the CRT.

- Adjustment 3 (Cut-off)
- Adjustment 5 (Centering)
- Adjustment 6 (Raster Size)
- Adjustment 7 (Focus)
- Adjustment 8 (Alignment)
- Adjustment 9 (Ellipticity)
- Adjustment 10 (White)
- Adjustment 11 (Raster Distortion)
- Adjustment 12 (Dynamic Convergence)

SELF-DIAGNOSIS FUNCTION

This product has the self-diagnosis function for defect diagnosis. When a trouble occurs during operation, the image disappears and the defect diagnosis LED lights / blinks, located inside the product. Detect a defect, using "Operation of Defect Diagnosis LED" and "Diagnosis Flow Chart".

This diagnosis function operates twice for prevention of wrong detection. During operation, it automatically re-starts operating in five seconds after detecting the defect and stopping temporarily. If no abnormality is detected, it keeps operating and if an abnormality is detected, it stops again.

❑ Operation of Defect Diagnosis LED "When no image is displayed on the screen"

① Defect Diagnosis "For checking whether the product has a defect"

Light-out 1. Only the sync. signal is supplied, not the image signal.
 2. The power is not supplied to the product.
 3. The power of the product has a defect. (Analyze the defect by checking the breaking down of a fuse.)

Red blink The sync. signal is not supplied.

Red light Refer to the defect indication of the following ③, ④, ⑥.

② SIGNAL "Input signal check" (Detection for blue)

Light-out 1. The image signal is not supplied.
 2. The power is not supplied to the product.
 3. The power of the product has a defect. (Analyze the defect by checking the breaking down of a fuse.)

Green light Defect in the PCB-TERMINAL, PCB-VIDEO, PCB-CRT

③ H-STOP "Operation check of horizontal deflection"

Light-out The horizontal deflection circuit is operating normally.

Red light 1. Wrong operation of the high-voltage protector. (Re-turn on the power.)
 2. Defect in the PCB-AFC, PCB-DEFL, PCB-HV.

④ V-STOP "Operation check of vertical deflection"

Light-out The vertical deflection circuit is operating normally.

Red light Defect in the PCB-AFC, PCB-DEFL, PCB-MAIN.

⑤ POWER "Power supply check"

Light-out 1. The power is not supplied to the product.
 2. Defect in the PCB-MAIN, PCB-DEFL, PCB-HV (Analyze the defect by checking the breaking down of a fuse.)

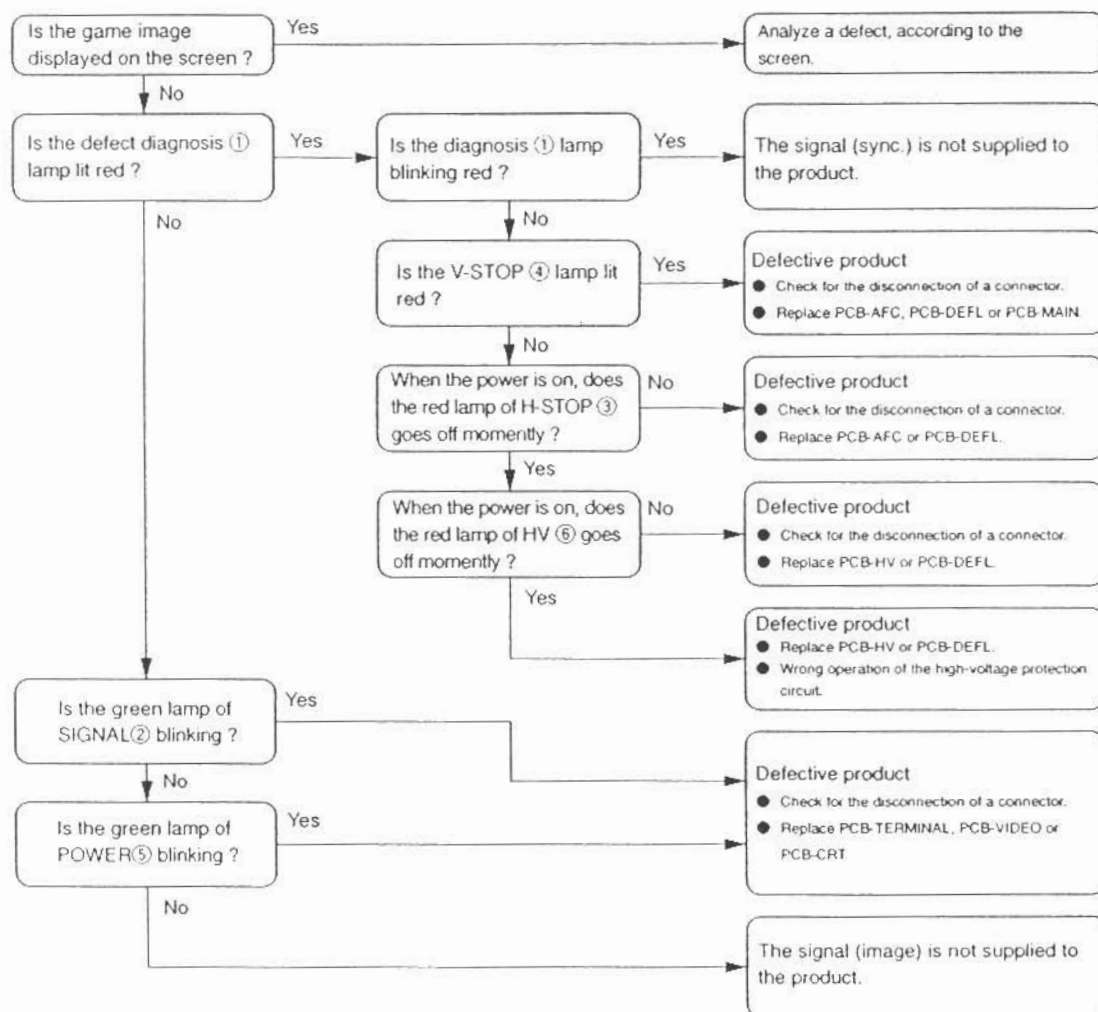
Green light The power circuit is operating normally.

⑥ HV "Operation check of high-voltage circuit"

Light-out The high-voltage circuit is operating normally.

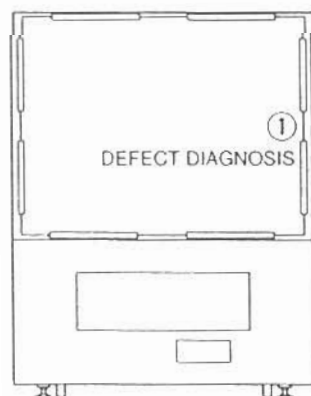
Red light 1. Wrong operation of the high-voltage protector (Re-turn on the power.)
 2. Defect in the PCB-DEFL, PCB-AFC, PCB-HV.

□ DIAGNOSIS FLOW CHART

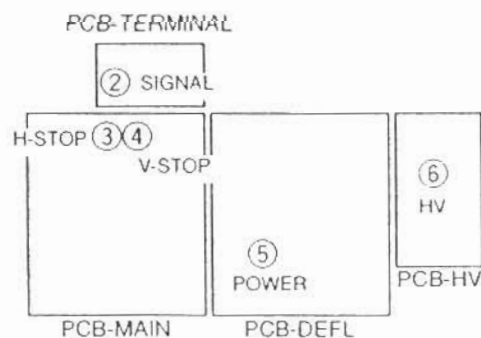


□ LED LOCATION

EXTERNAL DISPLAY



INTERNAL DISPLAY



ADJUSTMENT MODE

This product is provided with the following adjustment modes.

- TEST 1.1.8. mode : Adjustment of Convergence, Point convergence, ATC, Alignment, DAC, and Cumulative energizing time display (See the page 12 ~ 14)
- TEST 1.1.10 mode : Convergence adjustment (To save the changed data of the convergence and the point convergence in the TEST 1.1.8 mode without pressing the "ENTER" button.) (See the page 14)
- TEST 1.1.9 mode : Maintenance menu (See the page 15)
- TEST 8.8.▶ mode : Basic setting of Digital convergence (See the page 15)
- TEST 9.9.▶ mode : Option setting (See the page 16)
- TEST 1.1.▶ mode : Adjustment of the auto adjustor correction coefficient (See the page 16)
- User Adjustment mode : Adjustment performed by users (See the page 17)
- TEST Cross Pattern mode : Adjustment of "HSTA" and "VSTA" of Red and Blue pictures in Convergence adjustment (See the page 17)

TEST 1.1.8 Mode (Adjustment)

Perform adjustments using the remote hand unit.

Take the following steps for adjustments.

To activate

- Press the "TEST", "1" "1" and "8" buttons on the remote hand unit.

To terminate

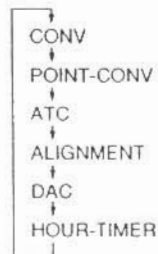
- Press the "TEST" button on the remote hand unit.
- The normal picture is displayed again unless any buttons are pressed within 5 minutes.

To save the data

- Press the "ENTER" button.

Effective buttons and their functions in the TEST 1.1.8 mode

R/B : To switch the adjustment functions in the following order.



R/G/B : To switch Green, Red and Blue on the "CONV", "POINT-CONV (Position)/(Adjustment)" or "DAC" picture.

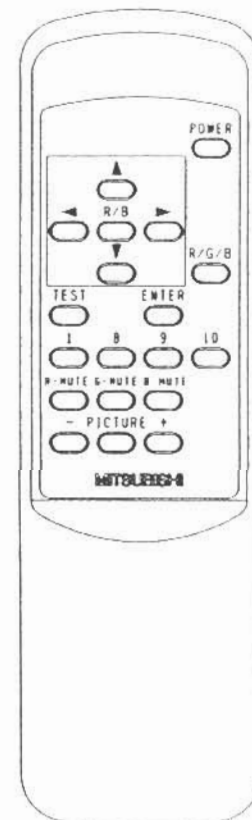
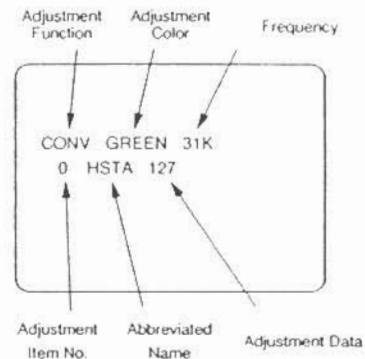
- ▲, ▼ : To switch the adjustment items on the "CONV", "ATC" or "DAC" picture.
- ▲, ▼ : To move the cursor vertically on the "POINT-CONV (Position)" picture.
- ▲, ▼ : To increase or decrease the V data on the "POINT-CONV (Adjustment)" picture.
- ◀, ▶ : To increase or decrease the data on the "CONV", "ATC" or "DAC" picture.
- ◀, ▶ : To move the cursor horizontally on the "POINT-CONV (Position)" picture
- ◀, ▶ : To increase or decrease the H data on the "POINT-CONV (Adjustment)" picture.
- ◀, ▶ : To switch ON and OFF on the "ALIGNMENT" picture.

PICTURE : To switch the "POINT-CONV (Position)" picture and the "POINT-CONV (Adjustment)" picture.

R-MUTE, G-MUTE, B-MUTE : Turn ON or OFF the video mute of R/G/B.

1 : To switch the internal signal (Crosshatch) and the external signal on the "CONV", or "POINT-CONV (Position)/(Adjustment)" picture.

TEST 1.1.8 Mode Display



List of Adjustment Functions and Adjustment Items

The data in () are the initial value. Perform the adjustment items given in the "Note" column.

The data without () are not to be changed.

Function Display				CONV					
No.			Abbreviated Name	Adjustment Name	Range	Data			Note
R	G	B				15k	24k	31k	
0	0	0	HSTA	Horizontal Static	-512 ~ 511	0	0	(0)	※ 1
1	1	1	VSTA	Vertical Static	-512 ~ 511	0	0	(0)	
2	2	2	TILT	Tilt	-512 ~ 511	0	0	(0)	
3	3	3	SKEW	Skew	-512 ~ 511	0	0	(0)	
4	4	4	HWID	Horizontal Width	-512 ~ 511	0	0	(0)	※ 2
5	5	5	HLIN	Horizontal Linearity	-512 ~ 511	0	0	(0)	
—	6	—	HPCC	Side-PCC	-512 ~ 511	0	0	(0)	※ 3
—	7	—	VPCC	Top-Bottom-PCC	-512 ~ 511	0	0	(0)	
6	8	6	VKEY	Vertical Keystone	-512 ~ 511	0	0	(0)	※ 1
7	—	7	HSBW	Horizontal Side Balance Width	-512 ~ 511	0	0	(0)	※ 4

※ 1 Refer to the adjustments 11 (Raster Distortion) and 12 (Dynamic Convergence).

※ 2 Refer to the adjustments 6 (Raster Size), 11 (Raster Distortion) and 12 (Dynamic Convergence).

※ 3 Refer to the adjustments 5 (Centering) and 11 (Raster Distortion).

※ 4 Refer to the adjustment 12 (Dynamic Convergence).

Function Display				POINT-CONV					
No.			Abbreviated Name	Adjustment Name	Range	Data			Note
R	G	B				15k	24k	31k	
0-0	0-0	0-0		Upper left	-512 ~ 511	0, 0	0, 0	(0),(0)	#13 (Point Convergence) Left : H, Right : V
7-7	7-7	7-7		Bottom right	-512 ~ 511	0, 0	0, 0	(0),(0)	

Function Display				ATC					
No.			Abbreviated Name	Adjustment Name	Range	Data			Note
R	G	B				15k	24k	31k	
0	0	0	HSTA	Horizontal Static	-512 ~ 511	0	0	0	
1	1	1	VSTA	Vertical Static	-512 ~ 511	0	0	0	
2	2	2	TILT	Tilt	-512 ~ 511	0	0	0	
3	3	3	SKEW	Skew	-512 ~ 511	0	0	0	

Function Display				ALIGNMENT			
Adjustment Name				Range	Setting	Note	
Alignment Blooming / Just				ON/OFF	OFF		

Function Display		DAC					
Adjustment Item No.	Abbreviated Name	Adjustment Name	Range	Data			Note
				15k	24k	31k	
0	HV-ADJ	HV-ADJ	- 127 ~ + 127	(-127)			#2 (High-Voltage Control)
1	H-POSI	Horizontal Position	- 127 ~ + 127	0	0	(0)	#5 (Centering)
2	V-POSI	Vertical Position	- 127 ~ + 127	0	0	(0)	
3	H-WIDTH	Horizontal Width	- 127 ~ + 127	-127	-127	(-127)	#6 (Raster Size)
4	V-HEIGHT	Vertical Height	- 127 ~ + 127	0	0	(0)	
5	V-C-LIN	V-C-LIN	- 127 ~ + 127	0	0	(0)	※ 5
6	V-S-LIN	V-S-LIN	- 127 ~ + 127	0	0	0	#5 (Centering)
7	H-DUTY	H-DUTY	- 127 ~ + 127	0	0	0	
8	F/V-REF	F/V-REF	- 127 ~ + 127	-95	-17	(+41)	#1 (Horizontal Free Run Frequency)
9	GAIN-R	R Gain	- 127 ~ + 127	0	0	(0)	#10 (White)
10	GAIN-B	B Gain	- 127 ~ + 127	0	0	(0)	
11	SUB-CONT	Sub Contrast	- 127 ~ + 127	(0)			
12	SUB-BRT	Sub Brightness	- 50 ~ + 50	(0)			※ 6
13	OSD-ADJ	OSD-ADJ	- 127 ~ + 127	0			
14	GAMMA-H	GAMMA-H	- 127 ~ + 127	-2			
15	GAMMA-L	GAMMA-L	- 127 ~ + 127	0			

※ 5 Refer to the adjustments 5 (Centering) and 6 (Raster Size).

※ 6 Refer to the adjustments 3 (Cut Off) and 10 (White).

Function Display		HOUR-TIMER		
Adjustment Name		Range	Time	Note
Cumulative operating time		0 ~ 9999	0	Reset in the TEST 1.1.9 mode.

□ TEST 1.1.10 Mode (Convergence)

"CONV" and "POINT-CONV" in the TEST 1.1.8 mode are adjusted in this mode.

The changed data in this mode are saved in EEPROM without pressing the "ENTER" button.

To activate

1. Press the "TEST", "1", "1" and "10" buttons on the remote hand unit.

To operate

2. Same steps as in the TEST 1.1.8 mode.

To terminate

3. Press the "TEST" button on the remote hand unit.

TEST 1.1.10 Mode Display

CONV GREEN 31K
0 HSTA 127

□TEST 1.1.9 Mode (Reset)

Following items are reset in this mode.

TEST 1.1.9 Mode Display

To activate

1. Press the "TEST", "1", "1" and "9" buttons on the remote hand unit.

To operate

2. Select an item using the "▲" or "▼" button on the remote hand unit.
3. Change the data using the "◀" or "▶" button on the remote hand unit.
(For POWER ON DELAY only)

To initialize

4. Press the "ENTER" button on the remote hand unit.

To terminate

5. Press the "TEST" button on the remote hand unit.

▶ INITIAL
E2RESET
HOUR-RESET
POWER ON DELAY : 2SEC

INITIAL : To reset the "CONTRAST" and the "BRIGHTNESS" in the User adjustment mode.
E2RESET : Never select. All the data in EEPROM are reset.
HOUR-RESET : To reset the HOUR-TIMER. Carry out when replacing the CRTs.
POWER ON DELAY : To increase the data of POWER ON DELAY in the range of 2 ~ 20 seconds.

□TEST 8.8.▶ Mode (Digital Convergence Setting)

Basic setting of the Digital convergence is performed in this mode.

Take the following steps for setting.

Supply the input signal of fh : 31kHz.

TEST 8.8.▶ Mode Display

CONV INITIAL 31K
0 LINE 3

To activate

1. Press the "TEST", "8", "8" and "▶" buttons on the remote hand unit.

To operate

2. Select an item using the "▲" or "▼" button on the remote hand unit.
3. Change the data using the "◀" or "▶" button on the remote hand unit.

To save

4. Press the "ENTER" button on the remote hand unit.

To terminate

5. Press the "TEST" button on the remote hand unit.

Item	Data (31kHz)	Note
0 LINE	3	
1 NORP	1	
2 VINT	1	
3 HINT	0	
4 COUT	1	
5 HP LL	1	
6 VSTR	0	
7 VCNT	Automatic detection	
8 STLN	2	
9 FPHS	(197)	#4 (Convergence Horizontal Phase)
10 CPHS	0	
11 DPHS	0	
12 TPHS	70	
13 HDLY	254	
14 PLWD	40	
15 HVOL	0	
16 PWM2	0	

□TEST 9.9.▶ Mode (Option Setting)

Option setting is performed in this mode. Take the following steps for setting.

To activate

1. Press the "TEST" , "1" "1" and "9" buttons on the remote hand unit.
2. Press the "9" "9" and "▶" buttons within 10 seconds after the TEST 1.1.9 mode is activated.

To operate

3. Select an item using the "▲" or "▼" button on the remote hand unit.
4. Switch ON or Off using the "◀" or "▶" button on the remote hand unit.

To terminate

5. Press the "TEST" button on the remote hand unit.

TEST 9.9.▶ Mode Display

▶ AUTO CONV : OFF
AI PICTURE : OFF
AUTO FRAME : OFF
REMOCON : OFF

Item	Data	Note
AUTO CONV	OFF	
AI PICTURE	OFF	
AUTO FRAME	OFF	
REMOCON	OFF	

□TEST 1.1.▶ Mode (Auto Adjustor Setting)

The auto adjustor coefficient is set in this mode. Take the following steps for setting. Supply the input signal of fh : 31kHz.

To activate

1. Press the "TEST" , "1" "1" and "▶" buttons on the remote hand unit.

To operate

2. Select an item using the "▲" or "▼" button on the remote hand unit.
3. Select the color using the R/G/B button on the remote hand unit.
4. Change the data using the "◀" or "▶" button on the remote hand unit.

To save

5. Press the "ENTER" button on the remote hand unit.

To terminate

6. Press the "TEST" button on the remote hand unit.

TEST 1.1.▶ Mode Display

COEFF GREEN 31K
H HSTA

Item	Data (31kHz)			Item	Data (31kHz)		
	R	G	B		R	G	B
H HSTA	0	0	0	V HSTA	0	0	0
H VSTA	0	0	0	V VSTA	0	0	0
H TILT	0	0	0	V TILT	0	0	0
H SKEW	0	0	0	V SKEW	0	0	0
H HWID	-11	---	+16	V HWID	0	---	0
H HLIN	-54	0	+56	V HLIN	0	0	0
H HPCC	---	+8	---	V HPCC	---	-74	---
H VPCC	---	-56	---	V VPCC	---	-24	---
H VKEY	-13	-13	+12	V VKEY	-19	0	+26
H HSBW	0	---	0	V HSBW	0	---	-15

□ User Adjustment Mode

To activate

1. Press the "PICTURE" button on the remote hand unit to display the "CONTRAST".

To operate

2. The items are switched to be displayed in the following order every time the "PICTURE" button is pressed.
3. Change the data using the "+" or "-" button on the remote hand unit.

To terminate

4. Press the "PICTURE" button while the last item is displayed.

CONTRAST
BRIGHTNESS
H-POSI
H-WIDTH
V-POSI
V-WIDTH
AI PICTURE *
AUTO FRAME ADJ *
AUTO CONVERGENCE *

* Displayed when they are ON in the Option setting (TEST 9.9.► mode).

User Adjustment Mode Display



□ TEST Cross Pattern Mode

"HSTA" and "VSTA" of Red and Blue in the convergence adjustment are adjusted in this mode.

To activate

1. Press the "TEST" button on the remote hand unit to display the cross pattern at the screen center.

To operate

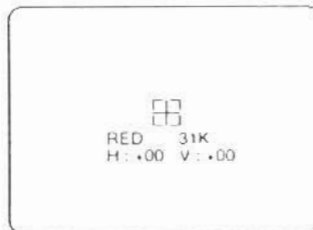
2. Press the "R/B" button on the remote hand unit to switch Red and Blue.
3. Increase or decrease the VSTA data using the "▲" or "▼" button on the remote hand unit.
4. Increase or decrease the HSTA data using the "◀" or "▶" button on the remote hand unit.

The changed data are saved in the EEPROM when the button is released.

To terminate

5. Press the "TEST" button on the remote hand unit.

TEST Cross Pattern Mode Display



CIRCUIT ADJUSTMENTS

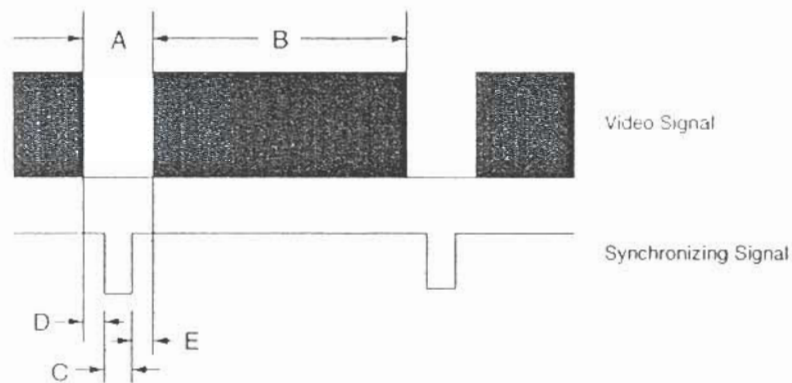
Perform the adjustments required only.

☐ Measuring Equipment and Jigs

- ☐ Oscilloscope (Unless otherwise specified in particular, use 10:1 probes.)
- ☐ RGB Signal Generator [VG-814, Program ROM :50P-GHS91]
- ☐ Frequency Counter
- ☐ DC Voltmeter
- ☐ DC Ampere Meter
- ☐ Electrical Tools

☐ Test Signal

Use the following timing signals :

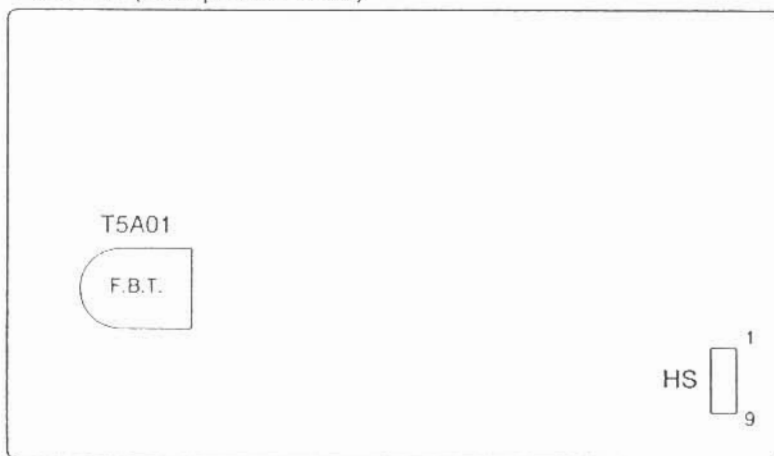


Signal source ROM :50P-GHS91

Program No.	Pattern	Horizontal Frequency f_H [kHz]	Vertical Frequency f_V [Hz]	Timing (Upper line : Horizontal Time [μs] / Lower line : Vertical line [H])				
				A + B [μs] / [H]	G [μs] / [H]	E [μs] / [H]	B [μs] / [H]	D [μs] / [H]
14	CHARA WINDOW	24.39	57.52	41/424	3/4	4.38/26	30.75/38	2.87/13
18	Full Black	∅	∅	∅	∅	∅	1	∅
21	SMPTE	31.69	59.8	31.56/53	3.11/3	3.11/33	∅	1.78/14
22	Crosshatch with circle	∅	∅	0	∅	∅	23.56/48	∅
23	Crosshatch	∅	∅	∅	∅	∅	0	∅
25	2 Gradation Gray Scale	∅	∅	∅	∅	∅	∅	∅
26	Dot	∅	∅	∅	∅	∅	∅	∅
27	Gray Scale	∅	∅	∅	∅	∅	∅	∅
28	Full Black	∅	∅	∅	∅	∅	∅	∅
29	Centering	∅	∅	∅	∅	∅	∅	∅

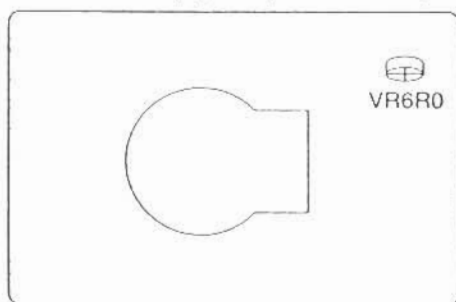
Location of Test Points and Adjustments

PCB-HV (Component side)

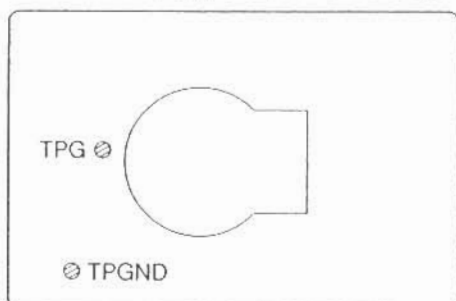


Front View

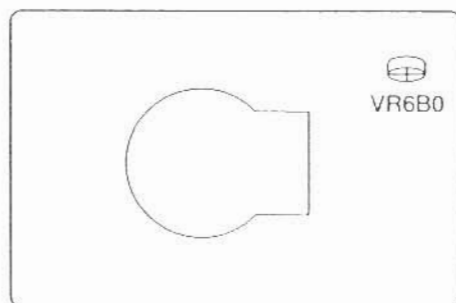
PCB-CRT(R) (Component side)



PCB-CRT(G) (Component side)



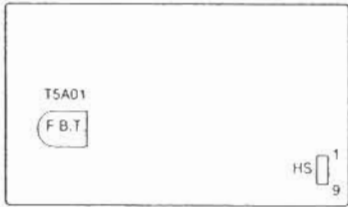
PCB-CRT(B) (Component side)




[AFC Circuit] 1. Horizontal Free Run Frequency		Adjustment purpose: Set the oscillating frequency in the horizontal synchronizing circuit. Symptom when incorrectly adjusted: Horizontally shifted picture.
---	--	--

Measuring Instrument	Frequency Counter	1. Connect +side on the frequency counter to 9pin of Connector HS and -side to 8pin. 2. Supply a SMPTE signal (No.21) and turn the power on. 3. Adjust the "DAC 8 F/V-REF" in the TEST 1.1.8 mode so that the frequency is $31.50 \pm 0.11\text{kHz}$ with no signal input. a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "DAC". c. Press the "▲" or "▼" button to display the "DAC 8 F/V-REF". d. Pull out the input signal terminal so that no signal is input. e. Press the "◀" or "▶" button so that the frequency is $31.50 \pm 0.11\text{kHz}$. 4. Press the "Enter" button to save the data. 5. Press the "TEST" button to terminate the TEST 1.1.8 mode.
Test Point	+ Side : 9pin of Connector HS - Side : 8pin of Connector HS	
External Trigger	-----	
Measurement Range	-----	
Input Signal	SMPTE (No.21)	
Input Terminal	Mini D-SUB 15 Pin Input Terminal	

PCB-HV (Component side)

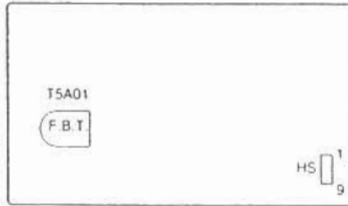





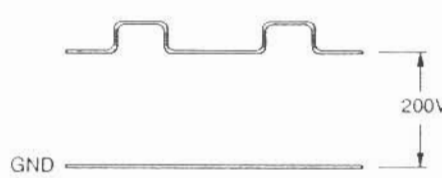
[High-Voltage Circuit] 2. High Voltage Control		Adjustment purpose: Set high-voltage to be applied to the CRT. Symptom when incorrectly adjusted: Too widened or narrowed picture or too bright or dark picture.
---	--	---

Measuring Instrument	DC Voltmeter (Inside impedance 100k Ω or over)	1. Supply a Full Black signal (No.18). 2. Connect +side on the DC voltmeter to 5pin of Connector HS and -side to 8pin. 3. Adjust "DAC 0 HV-ADJ" in the TEST 1.1.8 mode so that the voltage is $19.7 \pm 0.4\text{V}$. a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "DAC". c. Press the "▲" or "▼" button to display the "DAC 0 HV-ADJ". d. Press the "◀" or "▶" button so that the voltage is $19.7 \pm 0.4\text{V}$. 4. Press the "Enter" button to save the data. 5. Press the "TEST" button to terminate the TEST 1.1.8 mode.
Test Point	+ Side : 5pin of Connector HS - Side : 8pin of Connector HS	
External Trigger	-----	
Measurement Range	-----	
Input Signal	Full Black (No.18)	
Input Terminal	Mini D-SUB 15 Pin Input Terminal	

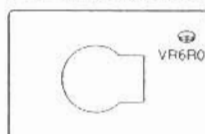
PCB-HV (Component side)



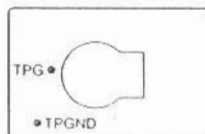


[CRT Circuit] 3. Cut Off		Adjustment purpose Symptom when Incorrectly adjusted	Set the illuminating point of three CRTs. Monochrome with color tint, incorrect brightness.
Measuring Instrument	Oscilloscope	<p>[Note] Perform this adjustment after the adjustment 2 (High Voltage Control).</p> <p>[Note] Perform this adjustment 5 or more minutes after energizing because the brightness changes after turning on the power.</p> <p>Setting</p> <ol style="list-style-type: none"> 1. Supply a Full Black signal (No.28). 2. Turn all the Screen controls of VR-FOCUS counter-clockwise fully. 3. Adjust the Screen control (G) so that the Green raster illuminates faintly. 4. Set the "CONTRAST" to "+127" and the "BRIGHTNESS" to "0" in the User mode. <ol style="list-style-type: none"> a. Press the "PICTURE" button to display the "CONTRAST". b. Press the "+" button on the remote hand unit to set the data of "CONTRAST" to "+127". c. Press the "PICTURE" button to display the "BRIGHTNESS". d. Press the "+" or "-" button to set the data of "BRIGHTNESS" to "0". 5. Set the "DAC 14 GAMMA-H" in the TEST1.1.8 mode to "-2". <ol style="list-style-type: none"> a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "DAC". c. Press the "▲" or "▼" button to display the "DAC 14 GAMMA-H". d. Press the "◀" or "▶" button to set the data of the "DAC 14 GAMMA-H" to "-2". 6. Set the controls for Cut Off adjustment (VR6R0, VR6B0) to the middle. <p>Adjustment</p> <ol style="list-style-type: none"> 7. Observe the waveform at the test point (TP-G). Use TP-GND for GND. 8. Adjust "DAC 12 SUB-BRT" in the TEST1.1.8 mode so that the cathode voltage is 200V. <ol style="list-style-type: none"> a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "DAC". c. Press the "▲" or "▼" button to display the "DAC 12 SUB-BRT". d. Press the "◀" or "▶" button so that the cathode voltage is 200V. <div style="text-align: center;">  </div> <ol style="list-style-type: none"> 9. Supply a Gray Scale signal (No.27). 10. Press any of the "R-MUTE", "G-MUTE", or "B-MUTE" button to produce a monochrome picture. These "MUTE" buttons are effective only in the TEST1.1.8 mode. 11. Roughly adjust the Screen controls of VR-FOCUS so that the most bottom portion of 16 gradation and the 1 level upper and the 2 level upper portion will illuminate at about the same luminance or the 2 level upper portion will illuminate a little. 12. Repeat the steps 10 and 11 with each color except one already adjusted. 13. Press the "Enter" button to save the data. 14. Press the "TEST" button to terminate the TEST 1.1.8 mode. 	
Test Point	TP-G		
External Trigger	----		
Measurement Range	DIV 5V TIM 10μs		
Input Signal	Full Black (No.28)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		

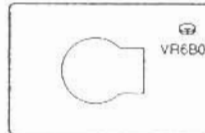
PCB-CRT(R) (Component side)

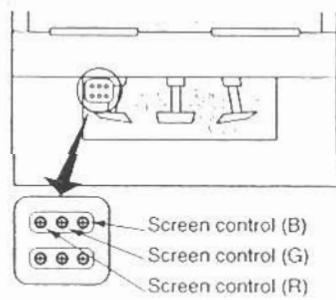


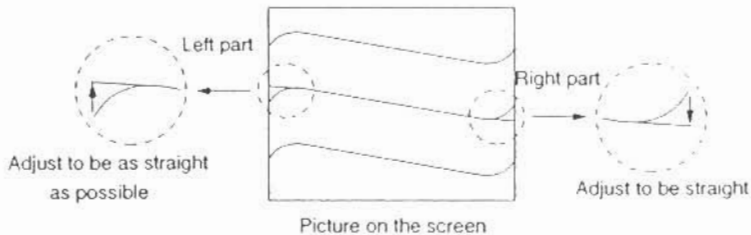
PCB-CRT(G) (Component side)

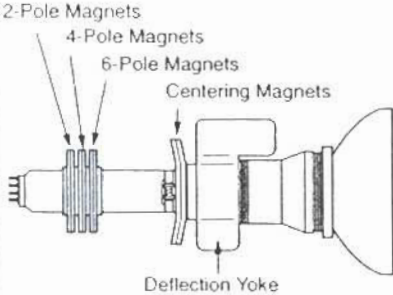
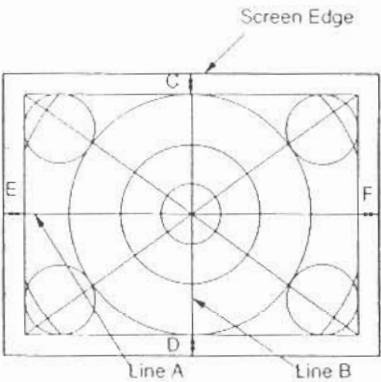


PCB-CRT(B) (Component side)





[Convergence Circuit]		Adjustment purpose	Convergence adjustment at the screen center.
4. Convergence Horizontal Phase		Symptom when incorrectly adjusted	Misconvergence on the right or left side of the picture.
Measuring Instrument	—	[Note] Perform this adjustment before the adjustment 11 (Raster Distortion). 1. Supply a Crosshatch signal (No.23). 2. Set the "CONV 2 TILT RED" to "+100". a Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b Press the "R/B" button on the remote hand unit to display the "CONV". c Press the "▲" or "▼" button to display the "CONV 2 TILT". d Press the "R/G/B" button to display the "CONV 2 TILT RED". e Press the "◀" or "▶" button to set the "CONV 2 TILT RED" to "+100". 3. Press the "ENTER" button to save the data. Then press the "TEST" button to terminate the TEST1.1.8 mode. 4. Adjust the "9 FPHS" in the TEST 8.8.▶ mode so that the right part of the raster is straight and the left part is as straight as possible. This adjustment can be performed on the red monochrome picture produced by the "MUTE" button. a Press the "TEST", "8", "8" and "▶" buttons to activate the "TEST 8.8.▶" mode. The "CONV INITIAL" is displayed on the screen. b Press the "▲" or "▼" button to display the "9 FPHS". c Press the "◀" or "▶" button so that the right part of the raster is straight and the left part is as straight as possible. 5. Press the "ENTER" button to save the data. Then press the "TEST" button to terminate the TEST 8.8.▶ mode. 6. Set the "CONV 2 TILT RED" in the TEST 1.1.8 mode to "0". 7 Press the "ENTER" button to save the data. Then press the "TEST" button to terminate the TEST1.1.8mode.	
Test Point	—		
External Trigger	—		
Measurement Range	—		
Input Signal	Crosshatch (No.23)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		

[Deflection Circuit]		Adjustment purpose	Set the picture to the screen center.
5. Centering		Symptom when Incorrectly adjusted	The picture center is not in the right position.
Measuring Instrument	—	[Note] Perform the adjustment 6 (Raster Size) after this adjustment. Setting 1. Supply a Centering signal (No.29). 2. Match the catches of different shapes on the 2-Pole Magnet in Fig. 1. 3. Press the "R-MUTE" button and the "B-MUTE" button on the remote hand unit to produce a Green monochrome picture. These "MUTE" buttons are effective only in the TEST 1.1.8 mode. 4. Adjust the data of the "DAC 3H-WIDTH" and the "DAC 4V-HEIGHT" in the TEST 1.1.8 mode and turn the Centering Magnet in Fig. 1 so that the outline of the crosshatch picture (C, D, E and F) can be seen as shown in Fig. 2. 5. Adjust the "CONV 6 HPCC" and the "CONV 7 VPCC" in the TEST 1.1.8 mode so that the outline of the crosshatch picture is straight (Fig. 2). a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "CONV". c. Press the "▲" or "▼" button to display the "CONV 6 HPCC". d. Press the "◀" or "▶" button so that the outline of the crosshatch picture is straight (Fig. 2). e. Press the "▲" button to display the "CONV 7 VPCC". f. Press the "◀" or "▶" button so that the outline of the crosshatch picture is straight. 6. Set the following data in the TEST 1.1.8 mode to "0". "CONV 0 HSTA" R/G/B "CONV 1 VSTA" R/G/B "CONV 2 TILT" R/G/B "CONV 5 HLIN" G only	
Test Point	—		
External Trigger	—		
Measurement Range	—		
Input Signal	Centering (No.29)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		
 <p>Fig. 1</p>		 <p>Fig. 2</p>	
		Adjustment 7. Adjust the "DAC 2 V-POSI" in the TEST 1.1.8 mode so that the lowest line of the picture is barely seen at the bottom of the screen. 8. Adjust the "DAC 1 H-POSI" in the TEST 1.1.8 mode so that the picture is almost at the center without the corners folded. [Note] Add 1 or 2 to the "H-POSI" value when right or left squares begin to be closed during the step 8. 9. Adjust the "DAC 5 V-C-LIN" and the "DAC 6 V-S-LIN" in the TEST 1.1.8 mode so that the circles at the four corners are a perfect circle. 10. Turn the Deflection Yoke (G) so that the Line A (across the center of the picture) is horizontal. [Note] Handle the fixed screw on the Deflection Yoke(G) quickly so as not to change the magnetism. 11. Turn the Centering Magnets on the Deflection Yoke (G) so that the center mark of the picture (intersection of the Line A and the Line B) is at the screen center. 12. Perform the "DAC 5V-C-LIN" adjustment and the step 11 alternately so that the length of C and D in Fig. 2 are equal. 13. Press the "ENTER" button to save the data. 14. Press the "TEST" button to terminate the TEST 1.1.8 mode. 15. Produce a Red and a Blue pictures on the screen. Turn the Centering Magnets and the Deflection Yoke(R) and (B) so that each picture center and Line A matches to that of the Green picture. [Note] Shifted amount should be less than the width of the Line A or the Line B. [Note] The length difference of C and D should be less than 8mm, and that of E and F should be less than 10mm. The screen center is at 453mm from the top and 570mm from the right and left edges.	

[Deflection Circuit]		Adjustment purpose	To set the linearity of the picture in horizontal and vertical directions.
6. Raster Size		Symptom when incorrectly adjusted	Distorted picture in horizontal or vertical direction.
Measuring Instrument	—	<ol style="list-style-type: none"> 1. Supply a Crosshatch with circle signal (No.22). 2. Produce a Green monochrome picture on the screen. 3. Adjust the "H-POSI" and the "V-POSI" in the User mode so that the picture center is at the screen center. <ol style="list-style-type: none"> a. Press the "PICTURE" button on the remote hand unit to display the "H-POSI" in the User mode. b. Press the "+" or "-" button to move the picture to the screen center horizontally. c. Press the "PICTURE" button to display the "V-POSI" in the User mode. d. Press the "+" or "-" button to move the picture to the screen center vertically. 4. Adjust the "DAC 3 H-WIDTH" and the "CONV 5 HLIN GREEN" so that the raster edges (part A in Fig. 1) match to the screen edges. <ol style="list-style-type: none"> a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "DAC" c. Press the "▲" or "▼" button to display the "DAC 3H-WIDTH" d. Press the "◀" or "▶" button so that the raster edges (part A in Fig. 1) match to the right and left screen edges. e. Press the "R/B" button to display the "CONV" f. Press the "▲" or "▼" button to display the "CONV 5 HLIN GREEN" g. Repeat the step d. 5. Adjust the "DAC 4 V-HEIGHT" and the "DAC 5 V-POSI" in the TEST 1.1.8 mode so that the raster edges (part B in Fig. 1) match to the top and bottom screen edges. 6. Repeat the steps 3, 4 and 5. 7. Press the "ENTER" button to save the data. 8. Press the "TEST" button to terminate the TEST 1.1.8 mode. 9. Confirm that the 4 edges of the picture(○ parts in Fig. 2) can be approximate to the screen edges using the "H-POSI" and the "V-POSI" in the User mode without any edges folded. <p>If any edges are folded, repeat the adjustment 5 (Centering).</p>	
Test Point	—		
External Trigger	—		
Measurement Range	—		
Input Signal	Crosshatch with circle (No.22)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		

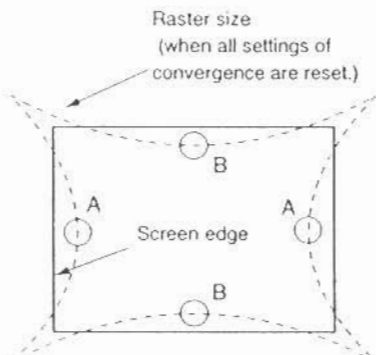


Fig. 1

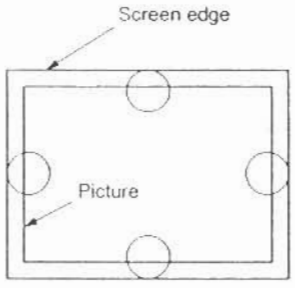


Fig. 2

[Focus Circuit] 7. Focus	Adjustment purpose Sharpness of picture. Symptom when incorrectly adjusted Poor sharpness of picture.
-----------------------------	--

Measuring Instrument	—
Test Point	—
External Trigger	—
Measurement Range	—
Input Signal	CHARA WINDOW (No. 14)
Input Terminal	Mini D-SUB 15 Pin Input Terminal

[Note] Perform this adjustment after the adjustment 3 (Cut Off) and 4 (Convergence Horizontal Phase).

Static focus

1. Supply a CHARA WINDOW signal (No. 14). Erase the window at the screen center.
2. Cover the Red and Blue lenses with lens caps to produce a Green monochrome picture.
3. Adjust the Focus control (G) so that the black line at the Point 1 (Fig. 1) is clearest (heaviest).
4. Cover the Green and Blue lenses with lens caps to produce a Red monochrome picture.
5. Adjust the Focus control (R) as in the step 3.
6. Cover the Green and Red lenses with lens caps to produce a Blue monochrome picture.
7. Adjust the Focus control (B) so that the blue line at the Point 1 (Fig. 1) is clearest (thinnest).

Lens focus

8. Supply a CHARA WINDOW signal (No. 14). Erase the window at the screen center.
9. Produce Green, Red, and Blue monochrome pictures. Turn each front lens of the Green, Red and Blue CRTs so that the Point 2 and the 4 corners of the screen are clearest.
10. Confirm that the black line at the point can be seen on the entire screen. When not, repeat the adjustment 2 ~ 9.

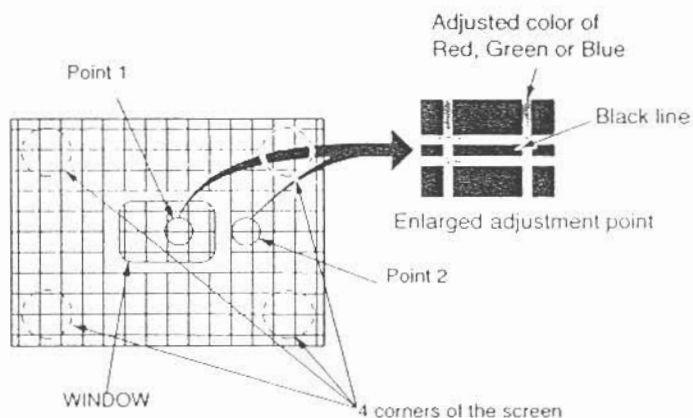
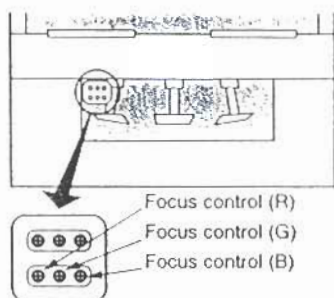


Fig. 1

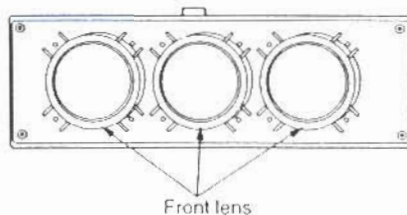
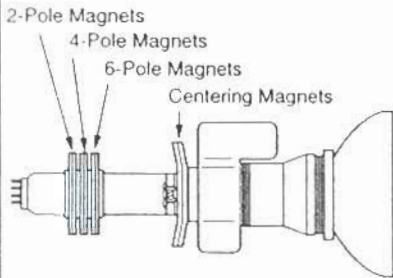



Fig. 2

[Focus Circuit]		Adjustment purpose	To merge the focus point projected form CRT with the center axis of the light.
8. Alignment		Symptom when incorrectly adjusted	Out of focus on a bright or dark picture.
Measuring Instrument	—	<p>[Note] Perform this adjustment before the adjustment 5 (Centering) and 7 (Focus). However, adjust the focus roughly in advance when a picture is out of focus remarkably.</p> <p>[Note] Perform this adjustment only when the Green CRT is replaced.</p> <p>Setting</p> <ol style="list-style-type: none"> 1. Match all the catches of the 2-Pole, 4-Pole and 6-Pole Magnets respectively. Regarding the 2-Pole Magnets, match the catches of different shapes. 2. Supply a Dot signal (No.26). 3. Cover the Red and Blue lenses with lens caps to produce a Green monochrome picture. <p>Adjustment</p> <ol style="list-style-type: none"> 4. Display circles of blooming and just focus. <ol style="list-style-type: none"> a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "ALIGNMENT". c. Press the "◀" or "▶" button to turn the "ALIGNMENT" "ON". Circles of blooming and just focus are displayed. When the displayed circles (blooming/just focus) are too dark to see, adjust the brightness and the focus. 5. Rotate the 2-Pole Magnets and adjust the opening angle by their catches so that the two kinds of circles are a concentric circle. 6. When the picture center is shifted during the step 5, bring it back to the screen center using the Centering Magnets and repeat the step 4. 7. Turn the "ALIGNMENT" in the TEST 1.1.8 mode "OFF" to back to the normal picture. 	
Test Point	----		
External Trigger	----		
Measurement Range	—		
Input Signal	Dot (No.26)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		



2-Pole Magnets
4-Pole Magnets
6-Pole Magnets
Centering Magnets



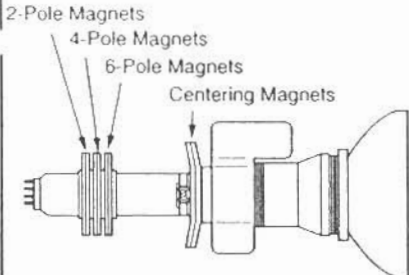
Blooming
Just focus

During Alignment adjustment

NG NG OK

Make the circles concentric.

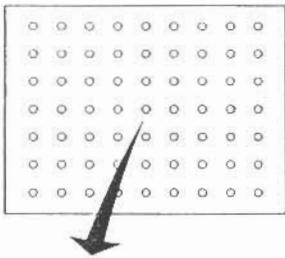
[CRT Circuit] 9. Ellipticity		Adjustment purpose To correct distorted light projected from CRT.
		Symptom when incorrectly adjusted Poor focus of picture.
Measuring Instrument	-----	[Note] Perform this adjustment just prior to or after the adjustment 8 (Alignment). Perform this adjustment only when the Green CRT is replaced. Setting 1. Match all the two catches of the 2-Pole, 4-Pole and 6-Pole Magnets respectively. Regarding the 2-Pole Magnets, match the catches of different shapes. 2. Supply a Dot signal (No.26). 3. Cover the Red and Blue lenses with lens caps to produce a Green monochrome picture. Adjustment 4. Display circles of blooming and just focus. a. Press the "TEST" , "1" , "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "ALIGNMENT" c. Press the "◀" or "▶" button to turn the "ALIGNMENT" "ON" 5. Adjust the Focus controls so that the size of blooming circles is appropriate When the blooming circles are too dark to see, adjust the brightness. 6. Make adjustments according to the following steps so that the luminescent spots are a perfect circle (Shorter diameter / Longer diameter = 0.9 or over). a. Regard the luminescent spots as a ellipse and distinguish the longer diameter b. Make an opening angle at 90° with the catches of the two 4 Pole Magnets (Maximum magnetism) c. Rotate the 4-Pole Magnets while retaining the angle in the step b so that the ellipses in the step a rotate by 90° . (Refer to A in the table below) d. Put the catches of the 4-Pole Magnets close each other (The polarized amount will decrease) to make the ellipses a perfect circle. (Refer to B in the table below) e. Regard the luminescent spots as a triangular circle and judge the vertex direction f. Make an opening angle at 60° with the catches of the two 6-Pole Magnets. (Maximum magnetism) g. Rotate the 6-Pole Magnets while retaining the angle in the step f so that the triangular circles in the step e are seemed to rotate by 180° (Refer to C in the table below) h. Put the catches of the 6-Pole Magnets close each other (The polarized amount will decrease) so that the triangular circles are seemed to be a perfect circle. (Refer to D in the table below) i. Repeat the steps a ~ h until the luminescent spots are seemed to be a perfect circle. (Shorter diameter / Longer diameter = 0.9 or over) 7. When the picture center is shifted during the step 6, bring it back to the screen center using the Centering Magnets and repeat the step 6 8. Turn the "ALIGNMENT" in the TEST 1.1.8 mode "OFF" to back to the normal picture 9. Lock the Centering Magnets, 2-Pole Magnets, 4-Pole Magnets and 6-Pole Magnets with paint after this adjustment. 10. Remove the lens caps on the CRTs.
Test Point	-----	
External Trigger	-----	
Measurement Range	-----	
Input Signal	Dot (No.26)	
Input Terminal	Mini D-SUB 15 Pin Input Terminal	



2-Pole Magnets
4-Pole Magnets
6-Pole Magnets
Centering Magnets

[Judgement of Ellipticity]
Perform the adjustment to satisfy ① and ② below at the same time.

① Ellipticity in Blooming circles



$b = \text{Longer Diameter}$
 $a = \text{Shorter Diameter}$
 $a/b \geq 0.9$

② The round shape of Halo and Blooming should be same.

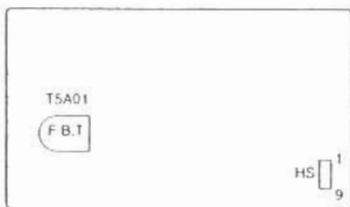
	Blooming	Just focus	Halo
OK			
NG			

Dot Beam Movement by 4-Pole Magnets and 6-Pole Magnets

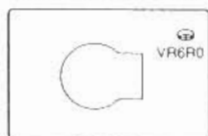
	Movement of Magnet	Brightness of Luminescent Spot	
A	Rotation of 4-pole Magnets 		Correction of luminescent spots' rotation
B	Large angle by 4-Pole Magnets 		Correction of luminescent spots' shape
C	Rotation of 6-pole Magnets 		Correction of luminescent spots' rotation
D	Large angle by 6-Pole Magnets 		Correction of luminescent spots' shape

[Video Circuit] 10. White		Adjustment purpose Symptom when Incorrectly adjusted	To set the white balance of the picture to optimum. Incorrect brightness of the white portion of the picture.
Measuring Instrument	DC Ampere Meter	[Note] Perform this adjustment more than 5 minutes after energizing. [Note] Perform this adjustment after the adjustment 7 (Focus).	
Test Point	+ side : 1pin of Connector HS - side : 3pin of Connector HS	1. Supply a Gray Scale signal (No.27).	
External Trigger	----	2. Set the "DAC 9 GAIN-R", "DAC 10 GAIN-B" and "DAC 11 SUB-CONT" in the TEST 1.1.8 mode to "0".	
Measurement Range	3mA	a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode.	
Input Signal	Gray Scale (No.27)	b. Press the "R/B" button on the remote hand unit to display the "DAC".	
Input Terminal	Mini D-SUB 15 Pin Input Terminal	c. Press the "▲" or "▼" button to display the "DAC 9 GAIN-R".	
		d. Press the "◀" or "▶" button to set the data of the "DAC 9 GAIN-R" to "0".	
		e. Set the "10 GAIN-B" and "11 SUB-CONT" to "0" with the same steps.	
		3. Press the "R-MUTE" and the "B-MUTE" buttons to produce a Green monochrome picture. Those "MUTE" buttons are effective only in the TEST 1.1.8 mode.	
		4. Connect +side on the DC Ampere Meter to 1pin of Connector HS and -side to 3pin, then observe the current value.	
		[Note] The internal resistance of the DC Ampere Meter should be 10Ω or less.	
		5. Adjust the "DAC 11 SUB-CONT" in the TEST 1.1.8 mode so that the current value is $550 \pm 10\mu A$.	
		Confirm that the most bottom portion of 16 gradation and the 1level upper and the 2 level upper portion will illuminate at the same luminance or the 2 level upper portion will illuminate a little. If not, make adjustment with the Screen control (G) of VR-FOCUS.	
		6. Press the "ENTER" button to save the data.	
		7. Disconnect the DC Ampere Meter from Connector HS.	
		8. Release the "R-MUTE" and "B-MUTE" to produce 3 colors picture.	
		These "MUTE" buttons are effective only in the TEST 1.1.8 mode.	
		9. Supply a 2 Gradation Gray Scale signal (No. 25).	
		10. Adjust the Screen control (R) and VR6R0, and the Screen control (B) and VR6B0 so that the middle of the screen (white 30% part) is proper gray. (Dark picture adjustment)	
		11.Reverse the input signal. (Press the "INV" button of VG-814 when the signal resource is VG-814.)	
		12. Adjust the "DAC 9 GAIN-R" and the "DAC 10 GAIN-B" in the TEST 1.1.8 mode so that the above the gray part at the middle of the center (white 100% part) is proper white. (Bright picture adjustment)	
		13. Supply a Gray Scale signal (No. 27).	
		14. Connect +side on the DC Ampere Meter to 1pin of Connector HS and -side to 3pin, then observe the current value.	
		[Note] The internal resistance of the DC Ampere Meter should be 10Ω or less.	
		15. Adjust the "DAC 11 SUB-CONT" in the TEST 1.1.8 mode so that the current value is $1300 \pm 30\mu A$.	
		16. Press the "ENTER" button to save the data.	
		17. Disconnect the DC Ampere Meter from Connector HS.	
		18. Confirm that the most bottom portion of 16 gradation and the 1level upper and the 2 level upper portion will illuminate at the same luminance or the 2 level upper portion will illuminate a little. If not, make adjustment with the "DAC 12 SUB-BRT" in the TEST 1.1.8 mode.	
		19. Repeat the steps 8 ~ 18.	
		20. Press the "ENTER" button to save the data.	
		21. Press the "TEST" button to terminate the TEST 1.1.8 mode.	

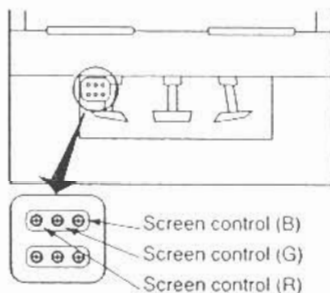
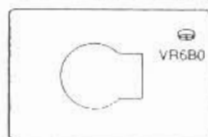
PCB-HV (Component side)



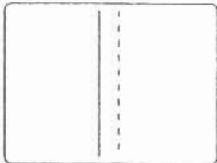
PCB-CRT(R) (Component side)



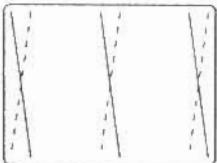
PCB-CRT(B) (Component side)




[Convergence Circuit] 11. Raster Distortion		Adjustment purpose To set up the horizontal and vertical linearity of the picture. Symptom when Incorrectly adjusted Distorted picture in horizontal or vertical direction.
Measuring Instrument	—	[Note] Repeat this adjustment together with the adjustment 6(Raster Size). 1. Supply a Crosshatch with circle signal (No.22). 2. Press the "B-MUTE" button on the remote hand unit to produce a Green and a Red pictures. The "MUTE" buttons are effective only in the TEST 1.1.8 mode. 3. Adjust the "CONV 0 HSTA RED" and the "CONV 1 VSTA RED" in the TEST 1.1.8 mode so that the Red picture is superimposed on the Green picture at the screen center. The adjustment range should be within ± 120 . a. Press the "TEST" , "1" , "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "CONV" . c. Press the "▲" or "▼" button to display the "CONV 0 HSTA" . d. Press the "R/G/B" button to display the "CONV 0 HSTA RED" . e. Make adjustment with the "◀" or "▶" button. f. Make adjustment for "1 VSTA" with the same steps. 4. Press the "MUTE" button on the remote hand unit to produce a Green monochrome picture. 5. Adjust the "CONV 6 HPCC GREEN" in the TEST 1.1.8 mode so that the right and the left vertical lines of the crosshatch picture are straight. 6. Adjust the "CONV 7 VPCC GREEN" in the TEST 1.1.8 mode so that the top and the bottom horizontal lines are straight. 7. Adjust the "CONV 8 VKEY GREEN" in the TEST 1.1.8 mode so that the top and the bottom lines of the crosshatch picture are parallel. 8. Repeat the steps 4, 5 and 6 if necessary. 9. Adjust the following "CONV GREEN" in the TEST 1.1.8 mode so that the horizontal and the vertical lines of the Green picture are straight and parallel as well as their horizontal and vertical linearity is optimum. Fix the "0 HSTA" and "1 VSTA" of Green to "0" . 10. Press the "ENTER" button to save the data. 11. Press the "TEST" button to terminate the TEST 1.1.8 mode. 12. Perform the adjustment 13 (Point Convergence) for Green, if necessary.
Test Point	—	
External Trigger	—	
Measurement Range	—	
Input Signal	Crosshatch with circle (No. 22)	
Input Terminal	Mini D-SUB 15 Pin Input Terminal	



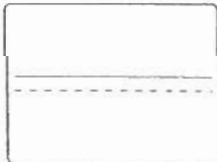
0 HSTA



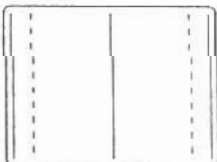
3 SKEW



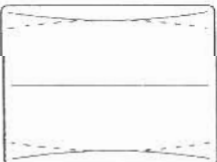
6 HPCC



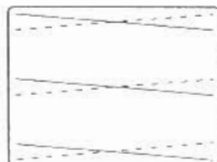
1 VSTA



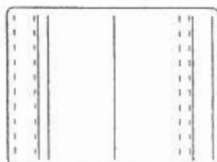
4 HWID



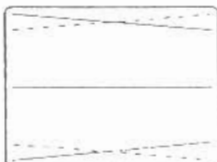
7 VPCC



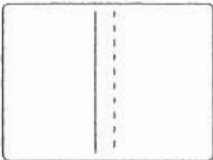

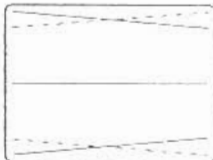
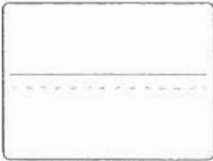




2 TILT



5 HLIN



8 VKEY

[Convergence Circuit] 12. Dynamic Convergence		Adjustment purpose Symptom when Incorrectly adjusted	To correct color misconvergence in Red, Green and Blue. Color misconvergence.
Measuring Instrument	—	[Note] Perform this adjustment after the adjustment 11 (Raster Distortion). 1. Supply a Crosshatch signal (No. 23). 2. Adjust the "CONV RED/BLUE" in the TEST 1.1.8 mode to superpose the Red and the Blue lines on the Green lines. Variable range of the "0 HSTA" and the "1 VSTA" should be within ± 120 . a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode. b. Press the "R/B" button on the remote hand unit to display the "CONV". c. Press the "R/G/B" button to select a color to be corrected (RED or BLUE). d. Press the "▲" or "▼" button to display an item to be corrected. e. Press the "◀" or "▶" button for adjustment. 3. Press the "ENTER" button to save the data. 4. Press the "TEST" button to terminate the TEST 1.1.8 mode. 5. Perform the adjustment 13 (Point Convergence) for RED/BLUE, if necessary.	
Test Point	—		
External Trigger	—		
Measurement Range	—		
Input Signal	Crosshatch (No. 23)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		
		<div style="display: flex; flex-wrap: wrap; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>0 HSTA</p> </div> <div style="text-align: center;">  <p>3 SKEW</p> </div> <div style="text-align: center;">  <p>6 VKEY</p> </div> <div style="text-align: center;">  <p>1 VSTA</p> </div> <div style="text-align: center;">  <p>4 HWID</p> </div> <div style="text-align: center;">  <p>7 HSBW</p> </div> <div style="text-align: center;">  <p>2 TILT</p> </div> <div style="text-align: center;">  <p>5 HLIN</p> </div> </div>	

[Convergence Circuit] 13. Point Convergence		Adjustment purpose Symptom when Incorrectly adjusted	To correct color misconvergence in Red, Green and Blue at points. Color misconvergence.
Measuring Instrument	—	<p>[Note] Perform this adjustment after the adjustment 6 (Raster size) and 12 (Dynamic Convergence).</p> <p>1. Supply a Crosshatch signal (No. 23).</p> <p>2. Perform the Point Convergence adjustment for Green so that all lines are horizontal and vertical as well as their horizontal and vertical linearity is optimum.</p> <p>Perform the Point Convergence adjustment for Red and Blue so that each adjustment point is superimposed on Green.</p> <p>a. Press the "TEST", "1", "1" and "8" buttons on the remote hand unit to activate the TEST 1.1.8 mode.</p> <p>b. Press the "R/B" button on the remote hand unit to display the "POINT-CONV".</p> <p>c. Press the "1" button to switch the internal signal to the external signal.</p> <p>d. Press the "▲", "▼", "◀" or "▶" button to move the cursor to the point to be corrected.</p> <p>The picture edges are sometimes corrected with the cursor out of the screen.</p> <p>e. Press the "PICTURE" button to switch the picture for cursor transfer to the picture for data change. The data of H and V are displayed.</p> <p>f. Press the "R/G/B" button to select the color to be corrected. The data corresponding to the color of the cursor can be changed.</p> <p>g. Press the "▲", "▼", "◀" or "▶" button for adjustment.</p> <p>h. Press the "PICTURE" button to switch the picture for data change to the picture for cursor transfer. Repeat the steps d ~ h.</p> <p>3. Press the "ENTER" button to save the data.</p> <p>4. Press the "TEST" button to terminate the TEST 1.1.8 mode.</p>	
Test Point	—		
External Trigger	—		
Measurement Range	—		
Input Signal	Crosshatch (No. 23)		
Input Terminal	Mini D-SUB 15 Pin Input Terminal		

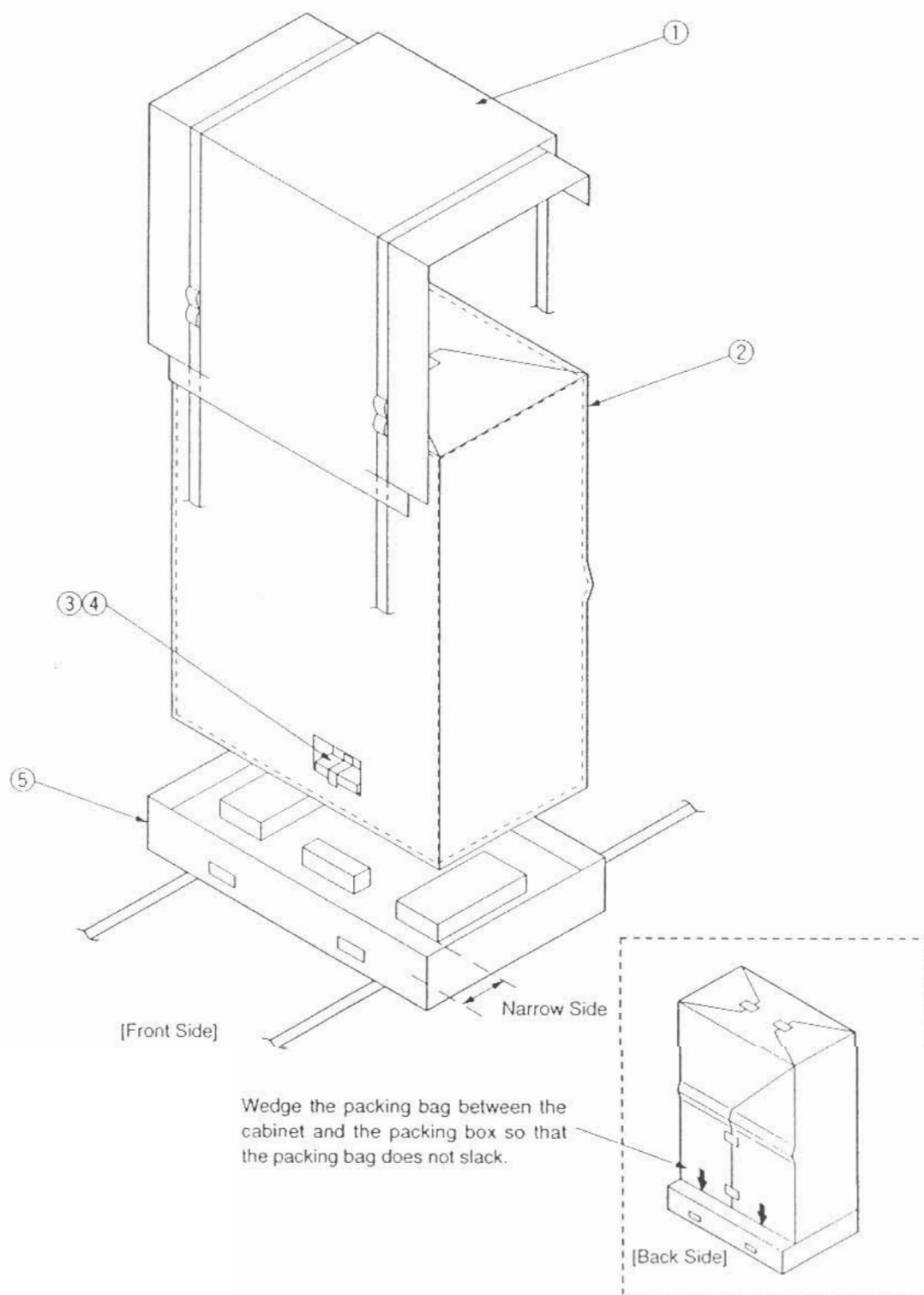
補修部品表

形名: 50P-GHS91

注意事項

- ・新部品欄に○印のあるものは、新規部品です。
- ・性能維持・安全のため、かならず指定部品（△印）をお使いください。
- ・設定部品は回路変更等により、通知なく変更する場合があります。

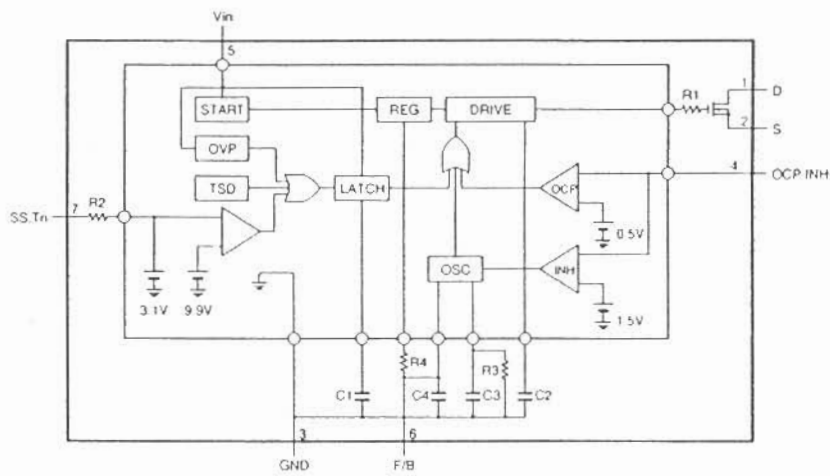
PACKING PROCEDURE



ICBLOCK DIAGRAMS

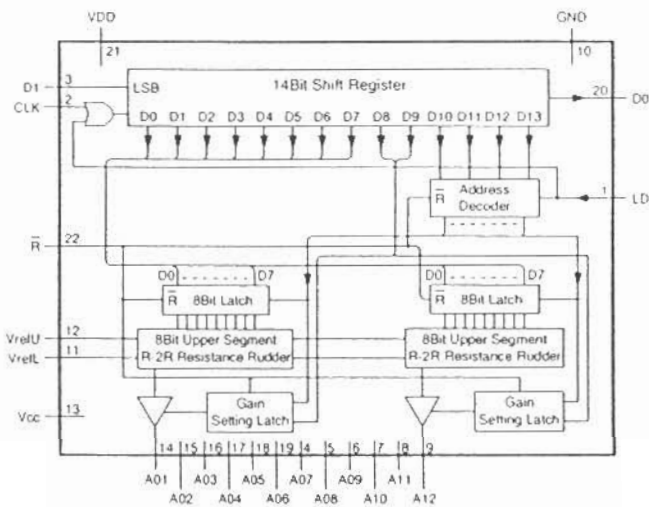
PCB-DEFL

IC900 STR-M6831A

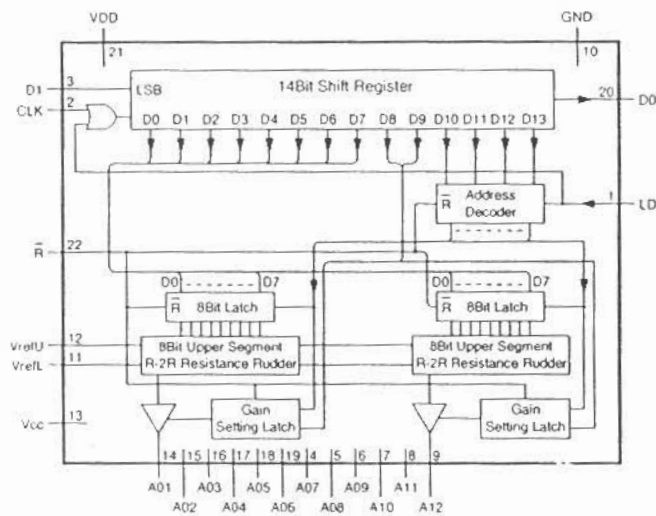


PCB-AFC

IC5A2 M62358P



IC2601 M62358P



PCB-SYSCON/CONV

(1/2)

IC702, IC703, IC704 TC74VHC163F

TRUE TABLE

INPUTS					OUTPUTS				FUNCTION
CLR	LD	ENP	ENT	CK	QA	QB	QC	QD	
L	X	X	X	\downarrow	L	L	L	L	RESET DATA TO "0"
H	L	X	X	\downarrow	A	B	C	D	PRESET DATA
H	H	X	L	\downarrow	NO CHANGE				NOT COUNT
H	H	L	X	\downarrow	NO CHANGE				NOT COUNT
H	H	H	H	\downarrow	COUNT UP				COUNT
X	X	X	X	\downarrow	NO CHANGE				NOT COUNT

(NOTE) X : DONT CARE
A,B,C,D : LOGIC LEVEL FOR DATA INPUT
CARRY : CARRY-ENT : QA : QB : QC : QD

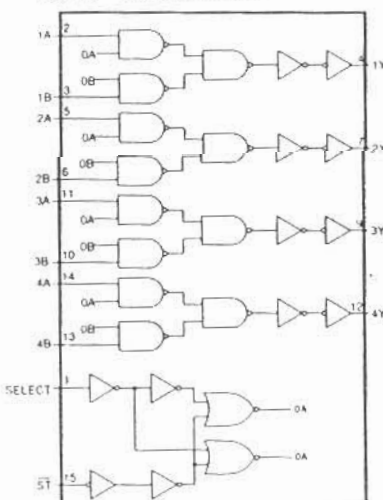
IC706, IC711 TC74VHC74F

TRUE TABLE

INPUTS				OUTPUTS		FUNCTION
CLR	PR	D	CK	Q	\bar{Q}	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	RESET
L	L	X	X	H	H	—
H	H	L	\downarrow	L	H	—
H	H	H	\downarrow	H	L	—
H	H	X	\downarrow	On	On	NO CHANGE

X : DONT CARE

IC710 TC74VHC157F

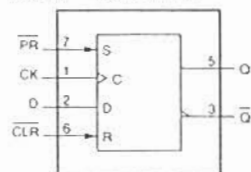


TRUE TABLE

INPUTS				OUTPUTS
ST	SELECT	A	B	
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

X : DONT CARE

IC811 TC7W74FU



TRUE TABLE

INPUTS				OUTPUTS		FUNCTION
CLR	PR	D	CK	Q	Q̄	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	RESET
L	L	X	X	H	H	—
H	H	L	⎓	L	H	—
H	H	H	⎓	H	L	—
H	H	X	⎓	Q _n	Q̄ _n	NO CHANGE

X: DON'T CARE

IC814 TC74VHC163F

TRUE TABLE

INPUTS					OUTPUTS				FUNCTION
CLR	LD	ENP	ENT	CK	QA	QB	QC	QD	
L	X	X	X	⎓	L	L	L	L	RESET DATA TO '0'
H	L	X	X	⎓	A	B	C	D	PRESET DATA
H	H	X	L	⎓	NO CHANGE				NOT COUNT
H	H	L	X	⎓	NO CHANGE				NOT COUNT
H	H	H	H	⎓	COUNT UP				COUNT
X	X	X	X	⎓	NO CHANGE				NOT COUNT

(NOTE) X : DON'T CARE
 A,B,C,D : LOGIC LEVEL FOR DATA INPUT
 CARRY : CARRY = ENT · QA · QB · QC · QD

IC8E01, IC8E02, IC8E03, IC8E04, IC8E05, IC8E06
μPD6376GS