

JVC

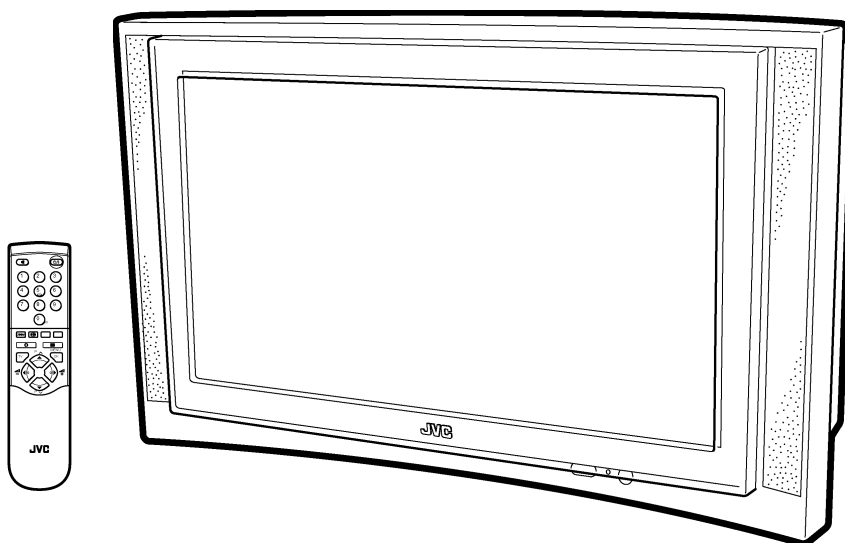
SERVICE MANUAL

COLOUR TELEVISION

AV32L5EKG AV32L5EIG

BASIC CHASSIS

MF



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SPECIFICATIONS

Item	CONTENTS	
	AV32L5EKG	AV32L5EIG
Dimensions (W × H × D)	855mm × 550mm × 568mm	
Mass	54.2kg	
TV RF System	CCIR I	CCIR B/G, I, D/K, L, L'
Colour System	PAL NTSC 3.58 / 4.43 (Play back only)	PAL / SECAM NTSC 3.58 / 4.43 (Play back only)
Sound System	NICAM(I)	A2 (B/G, D/K), NICAM (B/G, I, D/K, L)
Teletext System	Fastext(United Kingdom system) TOP(German system)	Fastext(United Kingdom system) TOP(German system) WST(World standard system)
Receiving Frequency		
	VHF _____	47MHz~ 470MHz
	UHF 470MHz~862MHz	470MHz~862MHz
	French CATV _____	116MHz~172MHz / 220MHz~469MHz
Intermediate Frequency		
	VIF Carrier 38.9MHz(I)	38.9MHz(B/G, D/K, I, L), 33.95MHz(L')
	SIF Carrier 33.5MHz(6.0MHz : I)	33.4MHz(5.5MHz : B/G) / 32.9MHz(6.0MHz : I)
Colour Sub Carrier		
	PAL 4.43MHz	4.43MHz
	SECAM _____	4.40625MHz / 4.25MHz
	NTSC 3.58MHz / 4.43MHz	3.58MHz / 4.43MHz
Power Input	AC 220V~240V , 50Hz	
Power Consumption	189W(Maximum), 140W(Average)	
Picture Tube	Visible size : 76cm, Measured diagonally	
High Voltage	31.0kV ^{+1kV} _{-1.5kV} (at zero beam current)	
Speaker	20 × 4cm Oval × 2	
Audio Output	Rated power output : 7.5W+7.5W	
Input / Output terminals		
	EXT-1	21-pin Euro connector (SCART socket), Video, Audio L/R, RGB signal input are available TV broadcast output (Video and Audio L/R) are available
	EXT-2	21-pin Euro connector (SCART socket), S-Video, Video, Audio L/R, RGB signal input are available AV selector (TV LINK) function is available
	EXT-3	21-pin Euro connector (SCART socket), Video, Audio L/R, RGB signal input are available
	EXT-4	RCA pin type, S-Video, Video, Audio L/R signal input are available
	Audio output	RCA pin type, Variable audio L/R and sub woofer output are available
Aerial socket	75 Ω unbalanced, Coaxial	
Headphone jack	Stereo mini jack (φ 3.5mm)	
Remote Control Unit	RM-C56 (AAA/R03 dry cell battery × 2)	

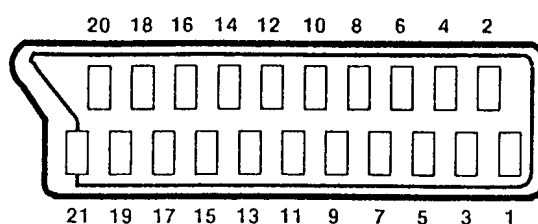
Design & specifications are subject to change without notice.

■ 21-pin Euro connector (SCART socket) : EXT-1 / EXT-2 / EXT-3

(P-P= Peak to Peak, S-W= Sync tip to white peak, B-W= Blanking to white peak)

Pin No.	Signal Designation	Matching Value	EXT-1	EXT-2	EXT-3
1	AUDIO R output	500mVrms(Nominal), Low impedance	○ (TV OUT)	○ (LINE OUT)	NC
2	AUDIO R input	500mVrms(Nominal), High impedance	○	○	○
3	AUDIO L output	500mVrms(Nominal), Low impedance	○ (TV OUT)	○ (LINE OUT)	NC
4	AUDIO GND		○	○	○
5	GND (B)		○	○	○
6	AUDIO L input	500mVrms(Nominal), High impedance	○	○	○
7	B input	700mV _{B-W} , 75Ω	○	○	NC
8	FUNCTION SW (SLOW SW)	Low : 0-3V, High : 8-12V, High impedance	○	○	○
9	GND (G)		○	○	○
10	SCL3		NC	○	NC
11	G input	700mV _{B-W} , 75Ω	○	○	NC
12	SDA3		NC	○	NC
13	GND (R)		○	○	○
14	GND (Y _S)		○	○	NC
15	R / C input	R : 700mV _{B-W} , 75Ω C : 300mV _{P-P} , 75Ω	○ (only R)	○	○ (only C)
16	Ys input	Low : 0 - 0.4, High : 1 - 3V, 75Ω	○	○	NC
17	GND(VIDEO output)		○	○	○
18	GND(VIDEO input)		○	○	○
19	VIDEO output	1V _{P-P} (Negative going sync), 75Ω	○ (TV)	○ (LINE OUT)	NC
20	VIDEO / Y input	1V _{P-P} (Negative going sync), 75Ω	○ (only VIDEO input)	○	○
21	COMMON GND		○	○	○

[Pin assignment]



SAFETY PRECAUTIONS

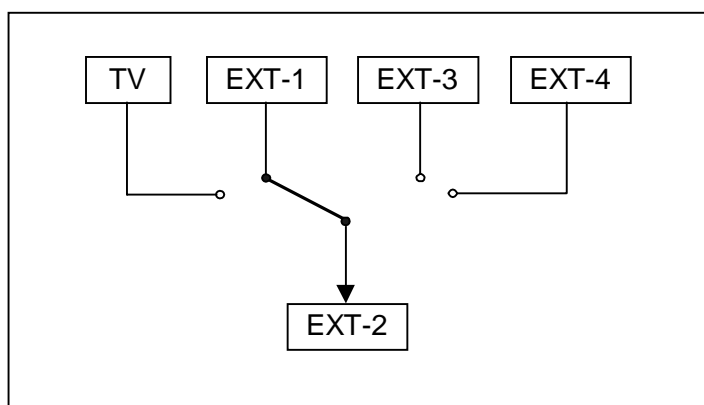
1. The design of this product contains special hardware and many circuits and components specially for safety purposes. For continued protection, no changes should be made to the original design unless authorized in writing by the manufacturer. Replacement parts must be identical to those used in the original circuits. Service should be performed by qualified personnel only.
2. Alterations of the design or circuitry of the product should not be made. Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacturer of responsibility for personal injury or property damage resulting therefrom.
3. Many electrical and mechanical parts in the product have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessary be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in the Parts List of Service Manual. Electrical components having such features are identified by shading on the schematics and by (Δ) on the Parts List in the Service Manual. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the Parts List of Service Manual may cause shock, fire, or other hazards.
4. The leads in the products are routed and dressed with ties, clamps, tubing's, barriers and the like to be separated from live parts, high temperature parts, moving parts and / or sharp edges for the prevention of electric shock and fire hazard. When service is required, the original lead routing and dress should be observed, and it should be confirmed that they have been returned to normal, after re-assembling.

WARNING

1. The equipment has been designed and manufactured to meet international safety standards.
2. It is the legal responsibility of the repairer to ensure that these safety standards are maintained.
3. Repairs must be made in accordance with the relevant safety standards.
4. It is essential that safety critical components are replaced by approved parts.
5. If mains voltage selector is provided, check setting for local voltage.

FEATURES

- New chassis design enable use of an interactive on screen control.
- The TELETEXT SYSTEM has a built-in FASTEXT (UK system), TOP (German system) and WST (world standard system) system.
- Pure FLAT CRT reproduce fine textured.
- Digi Pure pro : Auto digi pure with motion picture compensation.
- Because this TV unit corresponds to multiplex broadcast, users can enjoy music programs and sporting events with live realism. In addition, BILINGUAL programs can be heard in their original language.
- Built-in ECO (ECONOMY, ECOLOGY) MODE.
In accordance with the brightness in a room, the brightness and/or contrast of the picture can be adjusted automatically to make the optimum picture which is easy on the eye.
- Users can make VCR dubbing of picture and sound by controlling the AV selector to select an optional source at the EXT-2 output shown in figure bellow.



MAIN DIFFERENCE LIST

Δ	Model name		AV32L5EKG	AV32L5EIG
	Part name			
	MAIN PWB		SMF-1901A-U2	SMF-1001A-U2
Δ	RATING LABEL		LC20091-024A-U	LC20091-042A-U
	EURO LABEL		AEM1052-021-E	AEM1052-020-E
Δ	INST BOOK		LCT0909-001A-U	LCT0910-001A-U
	REG. SHEET		AEM3148-001-E	×

SPECIFIC SERVICE INSTRUCTIONS

DISASSEMBLY PROCEDURE

REMOVING THE REAR COVER

1. Unplug the power cord.
2. As shown in the Fig. 1, remove the 11 screws marked **A**.
3. Withdraw the rear cover toward you.

REMOVING THE SIDE CONTROL JACK ASSEMBLY

- After removing the rear cover.
1. As shown in the Fig. 1, remove the screw marked **B**.
 2. While slightly raise the side control jack assembly, remove the 2 claws under the side control jack assembly.
 3. As shown in Fig 2, disconnect the connector "SR", "SL", "S", "F" and "K".

REMOVING THE SIDE CONTROL PWB

- After removing the rear cover and side control jack assembly.
1. As shown in Fig.2, remove the 3 claws **C** from back side of the side control jack assembly.
 2. Pull out the SIDE CONTROL PWB.

REMOVING THE CHASSIS

- After removing the rear cover.
1. Slightly raise the both sides of the chassis by hand and remove the two claws under the both sides of the chassis from the front cabinet.
 2. Withdraw the chassis backward.
(If necessary, take off the wire clamp, connectors etc.)

REMOVING THE SPEAKER BOX

- After removing the rear cover.
1. As shown in Fig. 1, remove the 2 screws marked **D**.
- NOTE :** When removing the screws marked **D** of the speaker box assembly, remove the lower side screw first, and then remove the upper one.
2. Remove the 2 screws **E** attaching the speaker box.
 3. Remove the 2 screws **F** attaching the speaker.
 4. Follow the same steps when removing the other hand speaker.

REMOVING THE AV TERMINAL BOARD

- After removing the rear cover.
1. As shown in Fig. 1, remove the 3 screws marked **G**.
 2. As shown in Fig. 3, remove the 2 claws marked **H** under the CHASSIS.
 3. As shown in Fig. 3, remove the AV TERMINAL BOARD slightly in the direction of arrow **I**.

CHECKING THE PW BOARD

To check the back side of the PW Board.

- 1) Pull out the chassis. (Refer to REMOVING THE CHASSIS).
- 2) Erect the chassis vertically so that you can easily check the back side of the PW Board.

[CAUTION]

- When erecting the chassis, be careful so that there will be no contacting with other PW Board.
- Before turning on power, make sure that the wire connector is properly connected.
- When conducting a check with power supplied, be sure to confirm that the CRT EARTH WIRE (BRAIDED ASS'Y) is connected to the CRT SOCKET PW board.

WIRE CLAMPING AND CABLE TYING

1. Be sure to clamp the wire.
2. Never remove the cable tie used for tying the wires together.
Should it be inadvertently removed, be sure to tie the wires with a new cable tie.

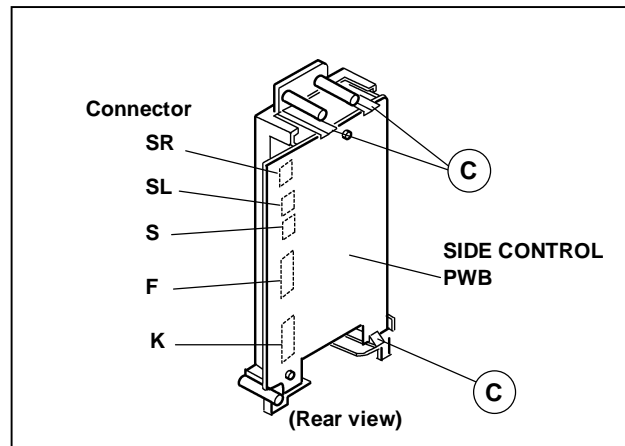


Fig. 2

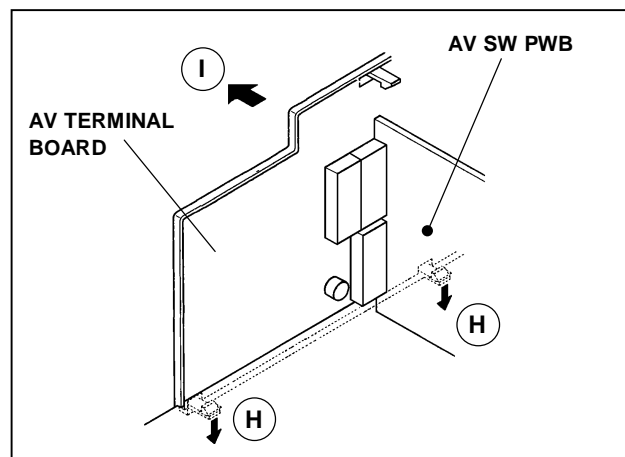


Fig. 3

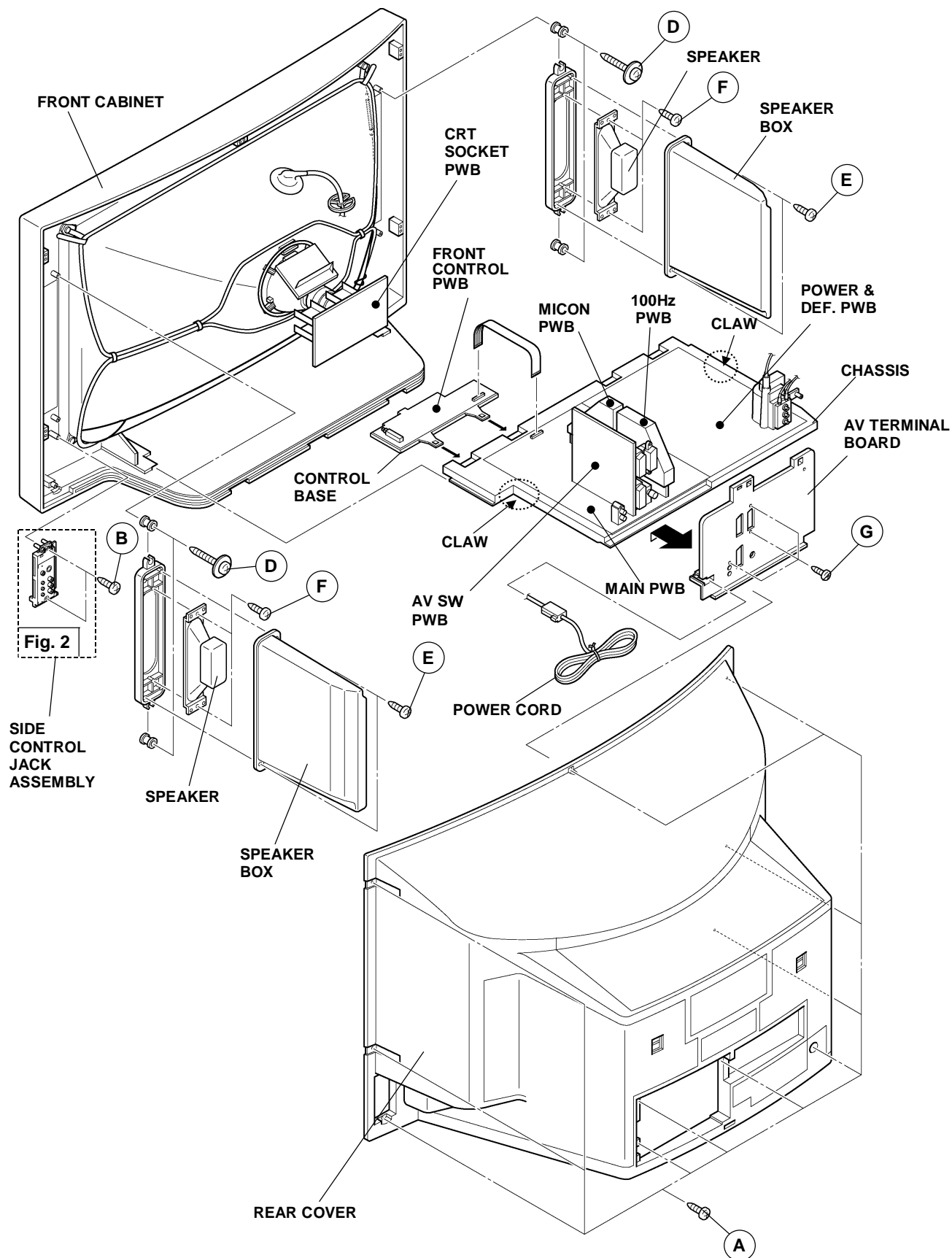


Fig. 1

No.51779

REMOVING THE CRT

- * Replacement of the CRT should be performed by 2 or more persons.
- After removing the cover, chassis etc.,
- 1. Putting the CRT change table on soft cloth, the CRT change table should also be covered with such soft cloth (shown in Fig.4).
- 2. While keeping the surface of CRT down, mount the TV set on the CRT change table balanced will as shown in Fig.5.
- 3. Remove 4 screws marked by arrows with a box type screw driver as shown in Fig.5.
- Since the cabinet will drop when screws have been removed, be sure to support the cabinet with hands.
- 4. After 4 screws have been removed, put the cabinet slowly on cloth (At this time, be carefully so as not to damage the front surface of the cabinet) shown in Fig.6.
- The CRT should be assembled according to the opposite sequence of its dismounting steps.
- * The CRT change table should preferably be smaller than the CRT surface, and its height be about 35cm.
- * About CRT Spacer
An appropriate CRT spacer should be used in the corresponding CRT in accordance with the type of the CRT.
When a CRT is replaced, special attention should be paid to this matter.

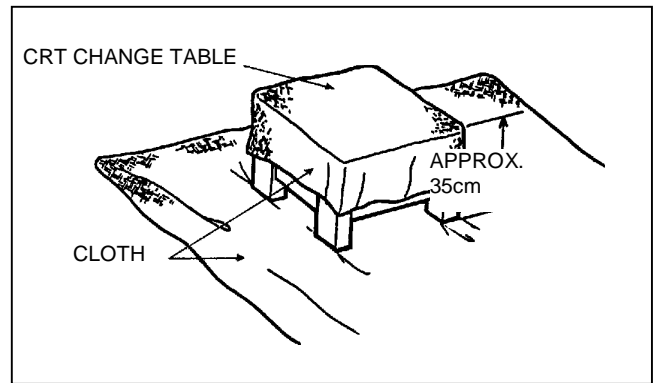


Fig. 4

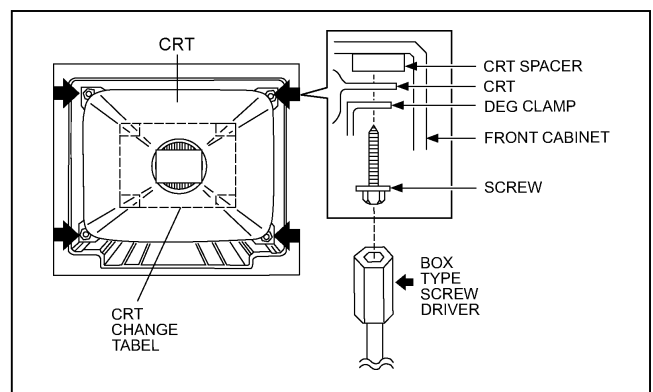


Fig. 5

COATING OF SILICON GREASE FOR ELECTRICAL INSULATION ON THE CRT ANODE CAP SECTION.

- Subsequent to replacement of the CRT and HV transformer or repair of the anode cap, etc. by dismantling them, be sure to coat silicon grease for electrical insulation as shown in Fig.7. Wipe around the anode button with clean and dry cloth. (Fig.7) Coat silicon grease on the section around the anode button. At this time, take care so that any silicon greases dose not stick to the anode button. (Fig.8)

★ Silicon grease product No. KS - 650N

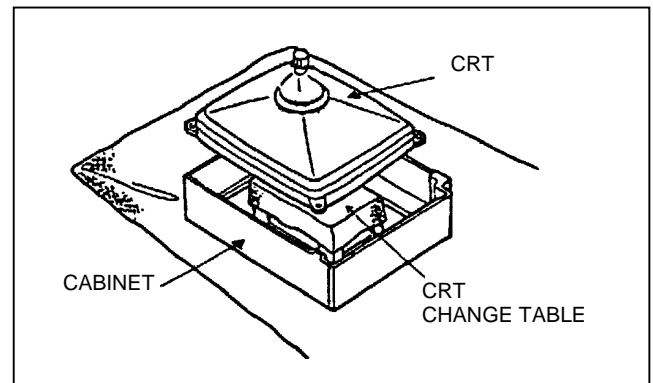


Fig. 6

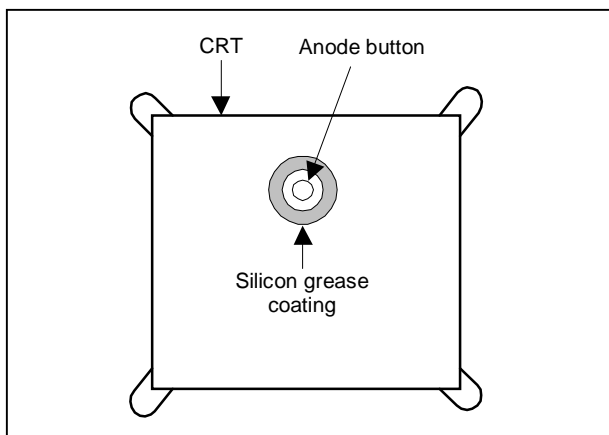


Fig. 7

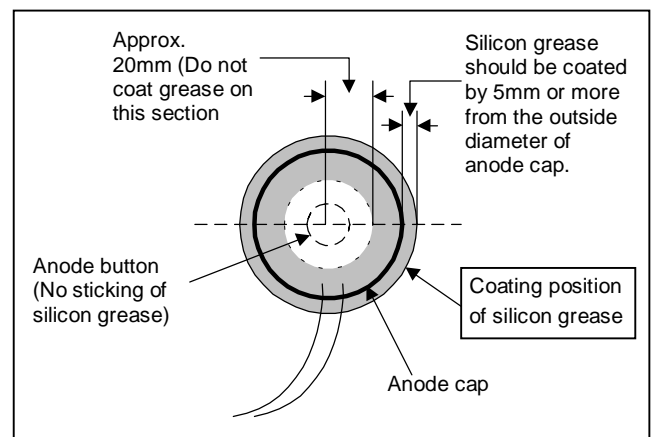


Fig. 8

REPLACEMENT OF MEMORY ICs

1. Memory ICs

This TV use memory ICs. In the memory ICs, there are memorized data for correctly operating the video and deflection circuits. When replacing memory ICs, be sure to use ICs written with the initial values of data.

2. Procedure for replacing memory ICs

PROCEDURE
<p>(1) Power off Switch the power off and unplug the power cord from the wall outlet.</p>
<p>(2) Replace ICs. Be sure to use memory ICs written with the initial data values.</p>
<p>(3) Power on Plug the power cord into the wall outlet and switch the power on.</p>
<p>(4) Check and set SYSTEM CONSTANT SET: It must not adjust without signal.</p> <ol style="list-style-type: none"> 1) Press the INFORMATION key and the MUTING key of the REMOTE CONTROL UNIT simultaneously. 2) The SERVICE MENU screen of Fig. 1 will be displayed. 3) While the SERVICE MENU is displayed, press the INFORMATION key and MUTING key simultaneously, and the SYSTEM CONSTANT SET screen of Fig. 2 will be displayed. 4) Check the setting values of the SYSTEM CONSTANT SET of Table 1. If the value is different, select the setting item with the FUNCTION UP/DOWN key, and set the correct value with the FUNCTION +/- key. 5) Press the MENU(OK) key to memorize the setting value. 6) Press the INFORMATION key twice, and return to the normal screen.
<p>(5) Setting of receive channels Set the receive channel. For setting, refer to the OPERATING INSTRUCTIONS.</p>
<p>(6) Setting of SERVICE MENU Verify the setting items of the SERVICE MENU of Table 2, and reset where necessary. For setting, refer to the SERVICE ADJUSTMENTS.</p>
<p>(7) User settings Check the user setting values of Table 3, and if setting value is different, set the correct value. For setting, refer to the OPERATING INSTRUCTIONS.</p>

SERVICE MENU	
1. IF	2. V/C
3. AUDIO	4. DEF
5. VSM PRESET	6. STATUS
7. PIP	8. ---
9. SHIPPING (OFF)	0. BUS FREE
1-9 : SELECT i : EXIT	

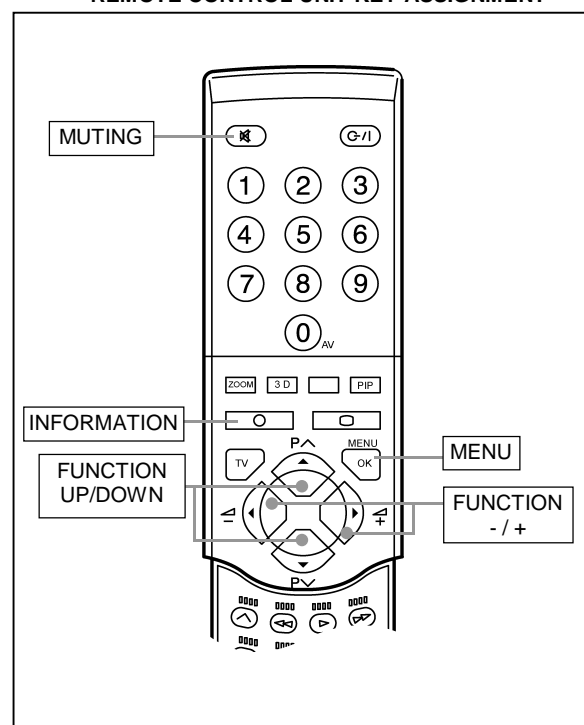
Fig.1

SYSTEM CONSTANT SET	
1. DESTINATION	**
-/+ (M) : STORE i : EXIT	

Fig.2

2. CRT TYPE	16 : 9
3. PURITY	NO
4. PICTURE TILT	YES
5. DIGIPURE PRO	YES
6. PIP	1 TUNER
7. PIC & TEXT	YES
8. DOLBY	NO
9. BBE	YES
10. PROGRESSIVE	YES
11. TDA9178	YES
12. TONE IC	YES
13. FLAT	YES

REMOTE CONTROL UNIT KEY ASSIGNMENT



SETTING VALUES OF SYSTEM CONSTANT SET (TABLE 1)

Setting item	Setting content	AV32L5EKG	AV32L5EIGY
1.DESTINATION	→ EK → EU → EI →	EK	EI
2.CRT TYPE	→ 16:9 → 4:3 →	16:9	16:9
3.PURITY	→ YES → NO →	NO	NO
4.PICTURE TILT	→ YES → NO →	YES	YES
5.DIGIPURE PRO	→ YES → NO →	YES	YES
6.PIP	→ 1 TUNER → 2 TUNER → NO →	1 TUNER	1 TUNER
7.PIC & TEXT	→ YES → NO →	YES	YES
8.DOLBY	→ YES → NO →	NO	NO
9.BBE	→ YES → NO →	YES	YES
10.PROGRESSIVE	→ YES → NO →	YES	YES
11.TDA9178	→ YES → NO →	YES	YES
12.TONE IC	→ YES → NO →	YES	YES
13.FLAT	→ YES → NO →	YES	YES

SERVICE MENU SETTING ITEMS (TABLE 2)

Setting item	Setting value	Setting item	Setting value
1. IF	1. VCO 2. ATT ON/OFF	5. VSM PRESET COOL NORMAL WARM	1. CONT. 2. BRIGHT 3. SHARP 4. COLOUR 5. HUE 6. WDR R 7. WDR G 8. WDR B
2. V / C	1. RGB BLK 2. WDR R 3. WDR G 4. WDR B 5. BRIGHT 6. CONTRAST 7. COLOUR 8. HUE 9. SHARP 10. VCO ADJUSTMENT 11. VIDEO AGC 12. SYNC SLICE		6. STATUS (Do not adjust)
3. AUDIO (Do not adjust)	1. ERR LIMIT 2. A2 ID THR	7. PIP	1. PIP VCO ADJ
4. DEF.	1. V-SHIFT 2. V-SIZE 3. H-CENT 4. H-SIZE 5. TRAPEZ 6. EW-PIN 7. COR-PIN 8. COR-UP 9. COR-LO 10. ANGLE 11. BOW 12. V-S.CR 13. V.LIN	9. SHIPPING (Do not adjust)	OFF
		0. BUS FREE (Do not adjust)	_____

USER SETTING VALUES (TABLE 3)

Setting item	Setting value	Setting item	Setting value
SUB POWER	ON	VOLUME	10
SHIPPING CHANNEL	PR1	DISPLAY	INDICATED
PRESET CHANNEL	See ; OPERATING INSTRUCTIONS.	ZOOM MODE	PANORAMIC
PICTURE SETTING		EXT SETTING	
TINT	COOL	ID	BLANK
CONTRAST	CENTER	DUBBING	EXT-1→EXT-2
BRIGHT	CENTER		
SHARP	CENTER		
COLOUR	CENTER		
ECO MODE	OFF		
PICTURE FEATURES		FEATURES	
DIGITAL VNR	AUTO	SLEEP TIMER	OFF
DIGIPURE PRO	AUTO	BLUE BLACK	ON
COLOUR SYSTEM	TV : According to preset CH	CHILD LOCK	ID : No.0000, All CH : OFF
4:3 AUTO ASPECT	EXT : AUTO	DECODER (EXT-2)	All CH : OFF
	PANORAMIC		
SOUND SETTING		INSTALL	
BASS	CENTER	LANGUAGE	ENGLISH
TREBLE	CENTER	EDIT	PR CHANNEL ONLY
BALANCE	CENTER		OTHERS : BLANK
TV SPEAKER	L / R		
HYPERSOUND	OFF		
BBE	ON		

SERVICE ADJUSTMENTS

BEFORE STARTING SERVICE ADJUSTMENT

1. There are 2 ways of adjusting this TV: One is with the REMOTE CONTROL UNIT and the other is the conventional method using adjustment parts and components.
2. The setting (adjustment) using the REMOTE CONTROL UNIT is made on the basis of the initial setting values. The setting values that adjust the screen to the optimum condition can be different from the initial setting values.
3. Make sure that connection is correctly made to AC power source.
4. Turn on the power of the TV and measuring instrument for warming up for at least 30 minutes before starting adjustment.
5. If the receive or input signal is not specified, use the most appropriate signal for adjustment.
6. Never touch parts (such as variable resistors, transformers and condensers) not shown in the adjustment items of this service adjustment.

7. Preparation for adjustment (presetting):

Unless otherwise specified in the adjustment items, preset the following functions with the REMOTE CONTROL UNIT:

Setting position

PICTURE MODE (VSM)	NORMAL
TINT, CONTRAST, BRIGHT SHARP, COLOUR	CENTER
SLEEP TIMER	OFF
BALANCE	CENTER
ECO	OFF
ZOOM	PANORAMIC

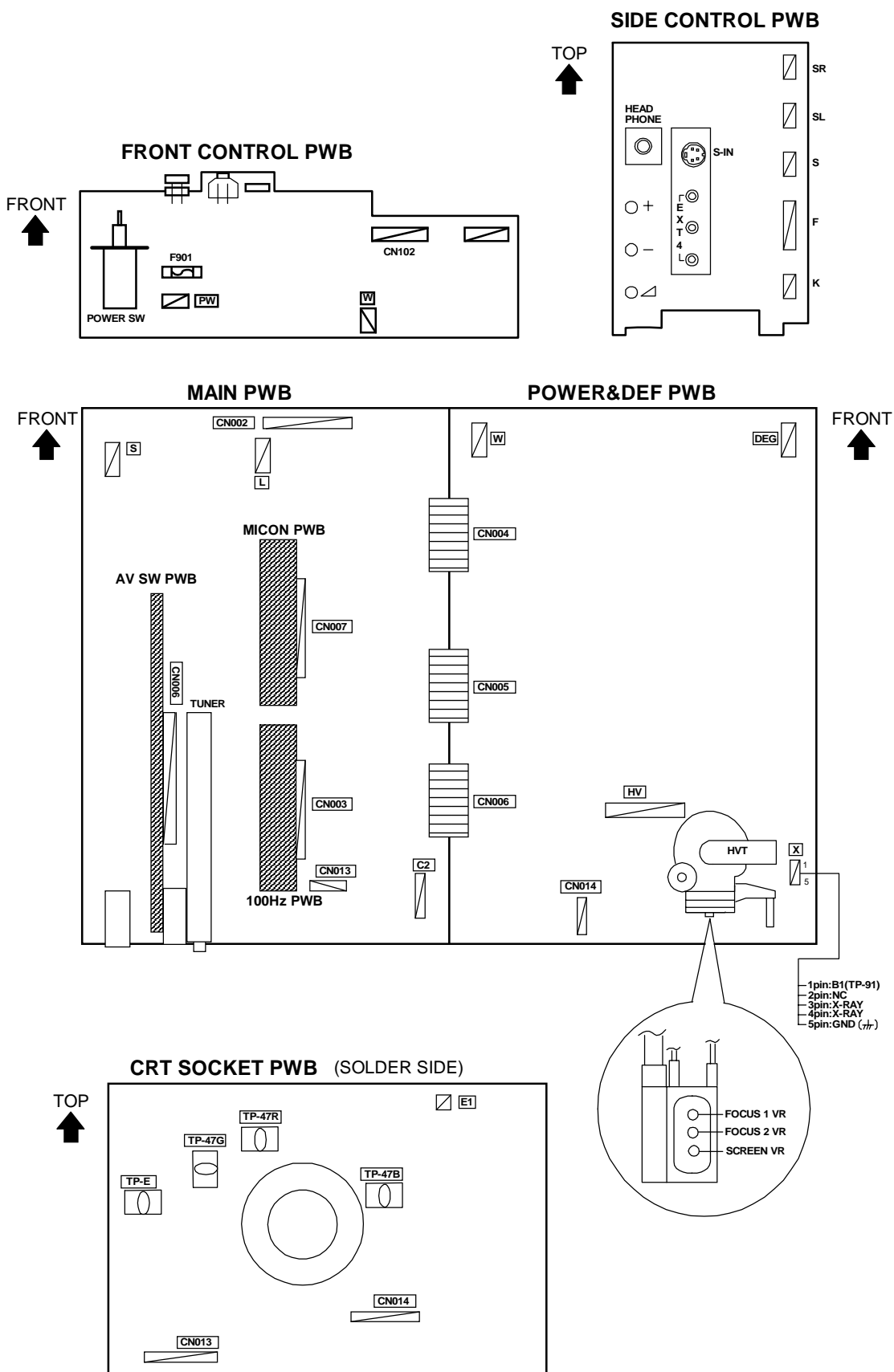
MEASURING INSTRUMENT AND FIXTURES

1. DC voltmeter (or digital voltmeter)
2. Oscilloscope
3. Signal generator (Pattern generator) [PAL / SECAM / NTSC]
4. Remote control unit

ADJUSTMENT ITEMS

- CHECKING ITEMS.
- ADJUSTMENT OF FOCUS AND SCREEN.
- IF CIRCUIT ADJUSTMENT.
- VSM PRESET SETTING.
- VIDEO / CHROMA CIRCUIT ADJUSTMENT.
- PIP CIRCUIT VCO ADJUSTMENT.
- AUDIO CIRCUIT ADJUSTMENT. (DO NOT ADJUST)
- DEFLECTION CIRCUIT ADJUSTMENT.

ADJUSTMENT LOCATIONS



BASIC OPERATION SERVICE MENU

1. TOOL OF SERVICE MENU OPERATION

Operate the SERVICE MENU with the REMOTE CONTROL UNIT.

2. SERVICE MENU ITEMS

With the SERVICE MENU, various settings (adjustments) can be made, and they are broadly classified in the following items of settings (adjustments):

- (1) **1. IF** This mode adjusts the setting values of the IF circuit.
- (2) **2.V/C** This mode adjusts the setting values of the VIDEO / CHROMA circuit.
- (3) **3.AUDIO** This mode adjusts the setting values of the multiplicity SOUND circuit.
- (4) **4.DEF** This mode adjusts the setting values of the DEFLECTION circuit for each aspect mode given below.

ASPECT MODE	Vertical frequency / Scan mode
FULL	100Hz inter-race / 60Hz Progressive
PANORAMIC	100Hz inter-race / 60Hz Progressive
SUBTITLE	100Hz inter-race / 60Hz Progressive

- (5) **5.VSM PRESET** This mode adjusts the initial setting values of COOL,NOMAL and WARM.
(VSM : Video Status Memory)
- (6) **7.PIP** This mode adjusts the setting values of the PIP circuit.

3. BASIC OPERATION OF SERVICE MENU

(1) How to enter SERVICE MENU

Press the **INFORMATION** key and the **MUTING** key of the REMOTE CONTROL UNIT simultaneously (Fig.2), and the SERVICE MENU screen (Fig. 1) will be displayed.

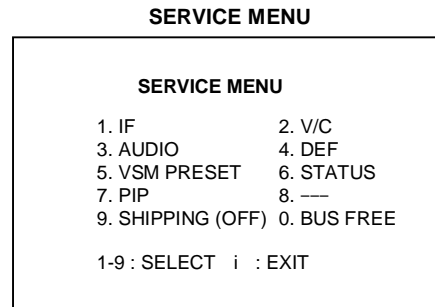


Fig.1

(2) Selection of SUB MENU SCREEN

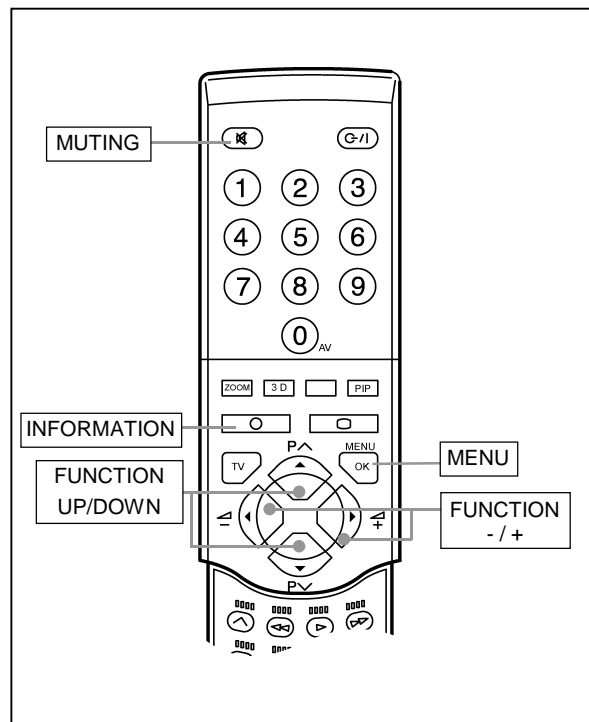
Press one of keys 1~5 of the REMOTE CONTROL UNIT and select the SUB MENU SCREEN (See Fig. 3), form the SERVICE MENU.

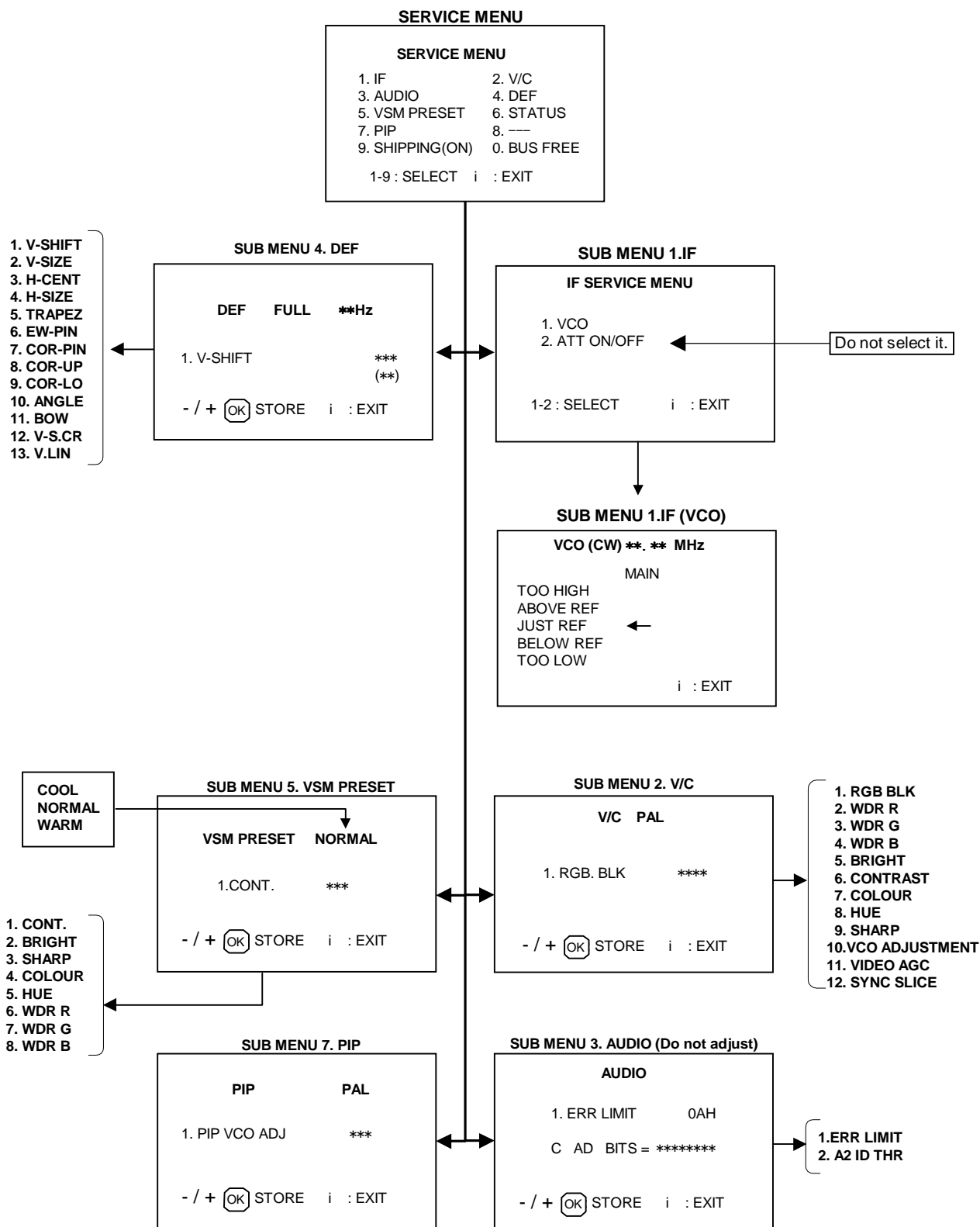
SERVICE MENU → SUB MENU

1. IF
2. V / C
3. AUDIO
4. DEF.
5. VSM PRESET
6. STATUS
7. PIP
8. - - -
9. SHIPPING (OFF)
0. BUS FREE

The item of number 6, 8, 9, and 0 are not to work.

REMOTE CONTROL UNIT KEY ASSIGNMENT





SUB MENU 1.IF (VCO)

VCO (CW) **. ** MHz

MAIN

TOO HIGH ←

ABOVE REF

JUST REF

BELOW REF

TOO LOW

i : EXIT

SUB MENU 1. V-SHIFT

1. V-SHIFT

2. V-SIZE

3. H-CENT

4. H-SIZE

5. TRAPEZ

6. EW-PIN

7. COR-PIN

8. COR-UP

9. COR-LO

10. ANGLE

11. BOW

12. V-S.CR

13. V.LIN

SUB MENU 5. VSM PRESET

COOL

NORMAL

WARM

1. CONT.

2. BRIGHT

3. SHARP

4. COLOUR

5. HUE

6. WDR R

7. WDR G

8. WDR B

SUB MENU 2. V/C

1. RGB BLK

2. WDR R

3. WDR G

4. WDR B

5. BRIGHT

6. CONTRAST

7. COLOUR

8. HUE

9. SHARP

10. VCO ADJUSTMENT

11. VIDEO AGC

12. SYNC SLICE

SUB MENU 3. AUDIO (Do not adjust)

1. ERR LIMIT

2. A2 ID THR

SUB MENU 1.IF (VCO)

Do not select it.

(3) **Setting methods**

- Method of Setting 1.IF as [VCO] : It must not adjust without signal.

- ① 1 Key..... Select 1.IF.
- ② 1 Key Select 1. VCO (CW)
Check the arrow position from the "ABOVE REF." to "BELOW REF."
The receive channel is automatically set by selecting VCO mode.
- ③ INFORMATION Key..... Return to the SERVICE MENU screen.

- Method of setting 2.V/C, 3.AUDIO, 4.DEF, 5.VSM PRESET and 7.PIP.

- ① 2~5, 7 Key Select one from 2. V/C, 3. AUDIO, 4. DEF, 5. VSM PRESET and 7.PIP.
- ② FUNCTION UP/DOWN Key Select setting items.
- ③ FUNCTION +/-..... Set (adjust) the setting values of the setting items.
- ④ MENU (OK) Key Memorize the setting value.
(Before storing the setting values in memory, do not press the CH, TV, POWER ON / OFF key - if you do, the values will not be stored in memory.)
- ⑤ INFORMATION Key..... Return to the **SERVICE MENU** screen.

- Do not adjust 6. STATUS, 8. ---, 9. SHIPPING(OFF) and 0. BUS FREE functions.

(4) **Release of SERVICE MENU**

- 1) After completing the adjustment, return to the SERVICE MENU, then again press the INFORMATION (OK) key to return to the normal screen.

ADJUSTMENT

CHECKING ITEM

Item	Measuring instrument	Test point	Adjustment part	Description
Check of B1 Power Supply	DC voltmeter Remote Control unit	TP-91(B1) TP-E(↗) [X connector on POWER DEF PWB]		<ol style="list-style-type: none"> 1. Receive any broadcast. 2. Press the ZOOM key and select the FULL mode. 3. Select 2. V/C from the SERVICE MENU. 4. Select 1. RGB BLK with function UP / DOWN key. 5. Press the function + (↖) key to turn on the cutoff screen condition (all black screen). 6. Connect a DC voltmeter to TP-91(B1) and TP-E(↗). 7. Make sure that the voltage is DC 139.9 ±2.0V. 8. Press the function - (↗) key to return to service menu.
Check of High Voltage	High voltage meter Remote Control unit	CRT anode Chassis GND		<ol style="list-style-type: none"> 1. Receive any broadcast. 2. Press the ZOOM key and select the FULL mode. 3. Select 2. V/C from the SERVICE MENU. 4. Select 1. RGB BLK with function UP / DOWN key. 5. Press the function + (↖) key to turn on the cutoff screen condition (all black screen). 6. Connect a High voltage meter to CRT ANODE and chassis GND. 7. Make sure that the voltage is DC 31.0kV ^{+1kV} _{-1.5kV}. 8. Press the function - (↖) key to return to service menu.

ADJUSTMENT OF FOCUS AND SCREEN

Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of FOCUS	Signal generator		FOCUS 1 VR FOCUS 2 VR [In HVT]	<ol style="list-style-type: none"> 1. Receive a cross-hatch signal. 2. By turning the FOCUS 2 VR, to make the vertical lines as fine and sharp as possible. 3. By turning the FOCUS 2 VR, adjust the picture so that the 6th vertical line from left side of the cross-hatch picture becomes thinnest. 4. By turning the FOCUS 1 VR, adjust the 4th horizontal line from the upper side may become uniform at the line center and its periphery. 5. Carry out adjustment by repeating the steps 3 and 4 about. 6. Make sure that when the screen is darkened, the lines remain in good focus.

A schematic diagram of the High Voltage Transformer (HVT) section. It shows a vertical cylindrical component with a top terminal. Below it, a rectangular control panel contains three circular potentiometers labeled FOCUS 1 VR, FOCUS 2 VR, and SCREEN VR from top to bottom.

A diagram illustrating the adjustment of focus using a cross-hatch signal. A 10x10 grid is shown. A diagonal line of dots represents the cross-hatch signal. An arrow labeled 'Adjustment point' points to the intersection of the 4th horizontal line from the top and the 6th vertical line from the left. Another arrow labeled 'FOCUS 1 VR' points to the 4th horizontal line. A third arrow labeled 'FOCUS 2 VR' points to the 6th vertical line.

VSM PRESET SETTING

Item	Measuring instrument	Test point	Adjustment part	Description
Setting of VSM PRESET	Remote control unit		1. CONT. 2. BRIGHT 3. SHARP 4. COLOUR 5. HUE 6. WDR R 7. WDR G 8. WDR B	1. Press the MENU key and select COOL mode with the remote control unit. 2. Select 5.VSM PRESET from the SERVICE MENU. 3. Adjust the FUNCTION UP/DOWN and -/+ key to bring the set values of 1.CONT ~ 8. WDR B to the values shown in the table. 4. Press the MENU key and memorize the set value. 5. Respectively select the VSM PRESET mode for NORMAL and WARM, and make similar adjustment as in 3 above. 6. Press the MENU key and memorize the set value. * Refer to OPERATING INSTRUCTIONS for the PICTURE MODE.

Setting item	VSM preset mode		
	COOL	NORMAL	WARM
1. CONT.	+16	-4	-13
2. BRIGHT	0	0	0
3. SHARP	-12	-12	-12
4. COLOUR	0	0	-1
5. HUE	0	0	0
6. WDR R	-25	0	+5
7. WDR G	-12	0	0
8. WDR B	0	0	0

SETTING VALUES OF VSM PRESET

VIDEO/CHROMA CIRCUIT ADJUSTMENT

The setting (adjustment) using the REMOTE CONTROL UNIT is made on the basis of the initial setting values.
The setting values that adjust the screen to the optimum condition can be different from the initial setting values.

Do not adjust

Colour system Setting item	Initial setting value			Colour system Setting item	Initial setting value		
	PAL	SECAM	NTSC		PAL	SECAM	NTSC
1.RGB BLK	—	—	—	7.COLOUR	000	000	000
2.WDR R	000	←	←	8.HUE	—	—	020
3.WDR G	000	←	←	9.SHARP	+007	←	←
4.WDR B	-012	←	←	10.VCO ADJUSTMENT	Automatically optimized after adjustment		
5.BRIGHT	000	←	←	11.VIDEO AGC	000	←	←
6.CONTRAST	000	←	←	12.SYNC SLICE	+007	←	←

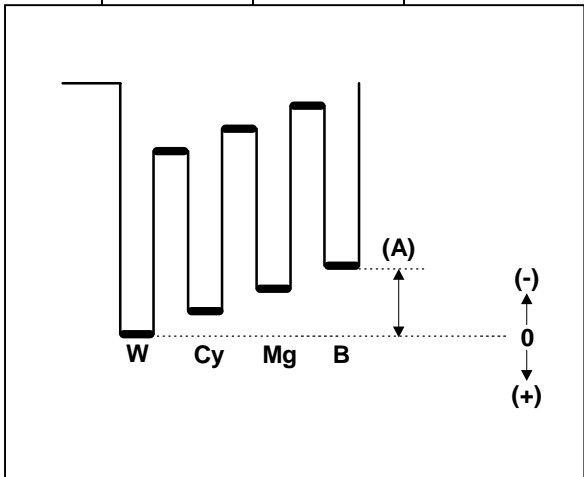
Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of WHITE BALANCE (High-Light)	Signal generator Remote control unit		2.WDR R 3.WDR G	<ul style="list-style-type: none"> ● Set the PICTURE MODE to NORMAL. 1. Receive a black and white signal (colour off). 2. Select 2. V/C from the SERVICE MENU. 3. Modify 2. WDR R and 3.WDR G data to adjust the white balance (high light). 4. Press the MENU key and memorize the set value. 5. Change the contrast and brightness up and down with the remote control from low–light to high–light, and check that the tracking of the white balance is good.
Adjustment of SUB BRIGHT	Remote control unit		5.BRIGHT	<ul style="list-style-type: none"> 1. Receive any broadcast. 2. Select 2.V/C from the SERVICE MENU. 3. Select 5.BRIGHT with the FUNCTION UP/DOWN key. 4. Set the initial setting value with the FUNCTION -/+ key. 5. If the brightness is not the best with the initial setting value, make fine adjustment until you get the best brightness. 6. Press the MENU key and memorize the set value.
Adjustment of SUB CONTRAST	Remote control unit		6.CONTRAST	<ul style="list-style-type: none"> 1. Receive any broadcast. 2. Select 2.V/C from the SERVICE MENU. 3. Select 6.CONTRAST with the FUNCTION UP/DOWN key. 4. Set the initial setting value with the FUNCTION - or + key. 5. If the contrast is not the best with the initial setting value, make fine adjustment until you get the best contrast. 6. Press the MENU key and memorize the set value.

Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of SUB COLOUR I	Remote control unit		7.COLOUR (PAL/SECAM/NTSC)	<p>[Method of adjustment without measuring instrument]</p> <p>PAL COLOUR</p> <ol style="list-style-type: none"> 1. Receive PAL broadcast. 2. Select 2.V/C from the SERVICE MENU. 3. Select 7.COLOUR with the FUNCTION UP/DOWN key. 4. Set the initial setting value for PAL COLOUR with the FUNCTION - or + key. 5. If the colour is not the best with the initial set value, make fine adjustment until you get the best colour. 6. Press the MENU key and memorize the set value. <p>SECAM COLOUR (Only for AV32L5EIGY)</p> <ol style="list-style-type: none"> 1. Receive a SECAM broadcast. 2. Make fine adjustment of SECAM COLOUR in the same manner as for above. <p>NTSC COLOUR (NTSC 3.58 COLOUR)</p> <ol style="list-style-type: none"> 1. Input a NTSC 3.58MHz COMPOSITE VIDEO signal from the EXT terminal. 2. Make similar fine adjustment of NTSC 3.58 COLOUR in the same manner as for above.
				<p>(NTSC 4.43 COLOUR)</p> <ol style="list-style-type: none"> 1. Input a NTSC 4.43MHz COMPOSITE VIDEO signal from the EXT terminal. 2. Make similar fine adjustment of 4.43 COLOUR in the same manner as for above.

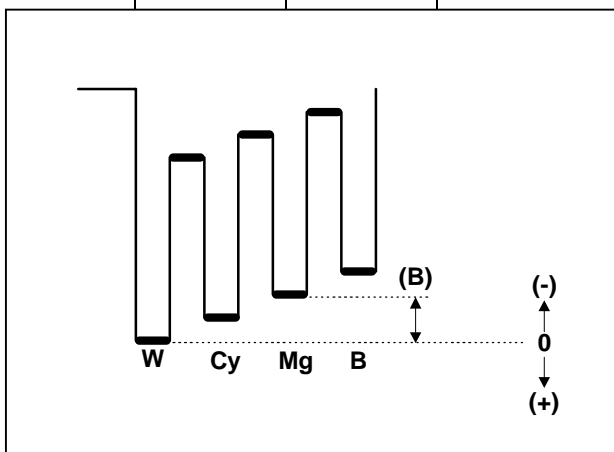
The diagram shows a remote control unit with the following labeled keys:

- CH. key:** A dashed box encloses the numeric keypad (0-9).
- MENU (OK) key:** A key with a square icon containing a circle and a dot.
- FUNCTION key:** A key with a square icon containing a circle and a dot, located below the MENU key.
- i (INFORMATION) key:** A key with a lowercase 'i' in a circle, located at the bottom left.

Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of SUB COLOUR II	Signal generator	TP-47B TP-E(↕) [CRT SOCKET PWB]	7.COLOUR (PAL/SECAM/NTSC)	[Method of adjustment using measuring instrument]
	Oscilloscope		PAL COLOUR	<ol style="list-style-type: none"> 1. Receive a PAL full field colour bar signal(75% white). 2. Select 2.V/C from the SERVICE MENU. 3. Select 7.COLOUR with the FUNCTION UP/DOWN key. 4. Set the initial setting value of PAL COLOUR with the FUNCTION - or + key. 5. Connect the oscilloscope between TP-47B and TP-E 6. Adjust PAL COLOUR and bring the value of (A) in the illustration to +6V (voltage difference between white (w) and blue (B)). 7. Press the MENU key and memorize the setting value.
	Remote control unit		SECAM COLOUR (Only for AV32L5EIGY)	<ol style="list-style-type: none"> 1. Receive a SECAM full field colour bar signal(75% white). 2. Set the initial setting value of SECAM COLOUR with the FUNCTION +/- key. 3. Adjust SECAM COLOUR and bring the value of (A) of the illustration to +7V(W~B). 4. Press the MENU key and memorize the setting value.
			NTSC COLOUR	(NTSC 3.58 COLOUR) <ol style="list-style-type: none"> 1. Input a NTSC 3.58MHz COMPOSITE VIDEO signal (full field colour bar with 75% white) from the EXT terminal. 2. Set the initial setting value of NTSC 3.58 COLOUR with the FUNCTION +/- key. 3. Adjust NTSC 3.58 COLOUR and bring the value of (A) of the illustration to +4V(W~B). 4. Press the MENU key and memorize the setting value.
				(NTSC 4.43 COLOUR) <ol style="list-style-type: none"> 1. Input a NTSC 4.43MHz COMPOSITE VIDEO signal (full field colour bar with 75% white) from the EXT terminal. 2. Set the initial setting value of NTSC 4.43 COLOUR with the FUNCTION +/- key. 3. Adjust NTSC 4.43 COLOUR and bring the value of (A) of the illustration to -7V(W~B). 4. Press the MENU key and memorize the setting value.



Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of SUB HUE I	Remote control unit		8.HUE	[Method of adjustment without measuring instrument]
			NTSC 3.58 HUE	<ol style="list-style-type: none"> 1. Input a NTSC 3.58MHz COMPOSITE VIDEO signal (full field colour bar with 75% white) from the EXT terminal. 2. Select 2.V/C from the SERVICE MENU. 3. Select 8.HUE with the FUNCTION UP/DOWN key. 4. Set the initial setting value of NTSC 3.58 HUE with the FUNCTION +/- key. 5. If you cannot get the best hue with the initial setting value, make fine adjustment until you get the best hue. 6. Press the MENU key and memorize the set value.
			NTSC 4.43 HUE	<ol style="list-style-type: none"> 1. When NTSC 3.58 is set, NTSC 4.43 will be automatically set at the respective values.
Adjustment of SUB HUE II	Signal generator	TP-47B TP-E(↕) [CRT SOCKET PWB]	8.HUE	[Method of adjustment using measuring instrument]
	Oscilloscope Remote control unit		NTSC 3.58 HUE	<ol style="list-style-type: none"> 1. Input a NTSC 3.58MHz COMPOSITE VIDEO signal (full field colour bar with 75% white) from the EXT terminal. 2. Select 2.V/C from the SERVICE MENU. 3. Select 8.HUE with the FUNCTION UP/DOWN key. 4. Set the initial setting value of NTSC 3.58 HUE with the FUNCTION - / + key. 5. Connect the oscilloscope between TP-47B and TP-E 6. Adjust NTSC 3.58 HUE to bring the value of (B) in the illustration to -2V (voltage difference between white (W) and magenta(Mg)). 7. Press the MENU key and memorize the setting value
			NTSC 4.43 HUE	<ol style="list-style-type: none"> 1. When NTSC 3.58 is set, NTSC 4.43 will be automatically set at the respective values.



Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of VCO for colour decoder	Signal generator Remote control unit		10. VCO	<ol style="list-style-type: none"> 1. Input a PAL full field colour bar signal (75% white) from the EXT terminal. 2. Select 2. V/C from the SERVICE MENU. 3. Select 10. VCO adjustment with the FUNCTION UP/DOWN key. 4. Press the OK key then automatically optimized.

PIP CIRCUIT ADJUSTMENT

The setting (adjustment) using the REMOTE CONTROL UNIT is made on the basis of the initial setting values.
The setting values that adjust the screen to the optimum condition can be different from the initial setting values.

	Variable range	Initial setting value
1.PIP VCO ADJ	-001 (Fixed)	-001

Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of PIP VCO for pip colour decoder	Signal generator Remote control unit		1. PIP VCO ADJ	<ol style="list-style-type: none"> 1. Input a PAL full field colour bar signal (75% white) from the EXT terminal. 2. Select 7. PIP from the SERVICE MENU. 3. Select 1. PIP VCO ADJ with the FUNCTION UP/DOWN key. 4. Press the OK key then automatically optimized.

AUDIO CIRCUIT ADJUSTMENT [Do not adjust]

Do not adjust 3. AUDIO of the SERVICE MENU as it requires no adjustment.

If values had changed by the some reason set the initial values in the following table.

Setting item	Variable range	Fixed value
1. ERR LIMIT	00H~FFH	0AH
2. A2 ID THR	00H~FFH	19H

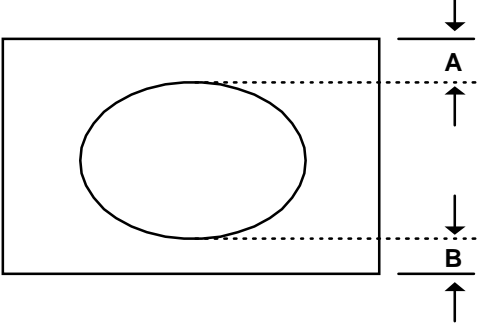
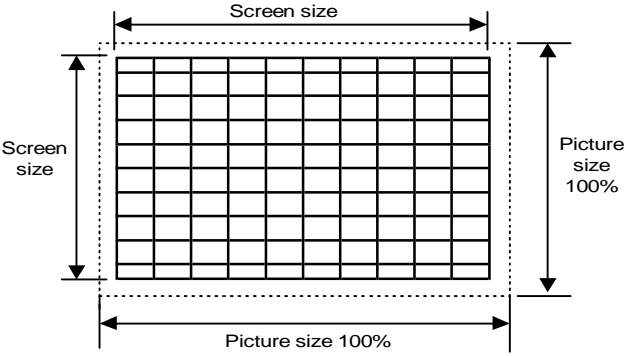
DEFLECTION CIRCUIT ADJUSTMENT

There are 4 aspect modes (①FULL, ②PANORAMIC, ③SUBTITLE, ④COMPRESS) of the adjustment (1) 100Hz i mode, (2) 60Hz p and (3) 120Hz i mode..... depending upon the kind of signals (vertical frequency 100Hz i / 60Hz p / 120Hz i). Character "i" is an omission of "inter lace scan", and character "p" is an omission of "progressive scan".

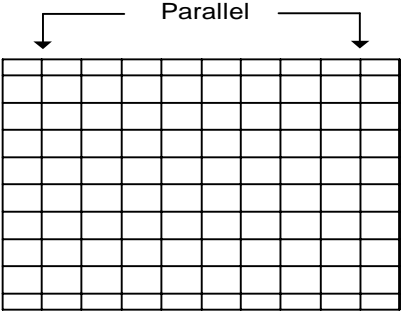
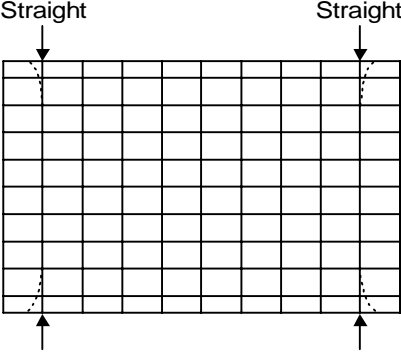
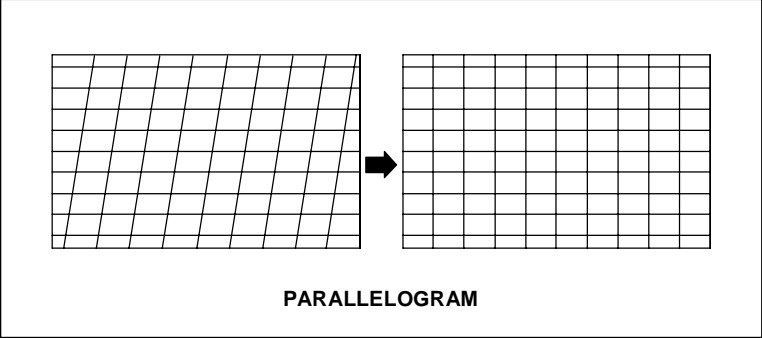
- When the 100Hz FULL mode has been established, the setting of other modes will be done automatically. However, if the picture quality has not been optimized, adjust each mode again, respectively.
- The adjustment using the remote control unit is made on the basis of the initial setting values.
- The setting values that adjust the screen to the optimum condition can be different from the initial setting values.

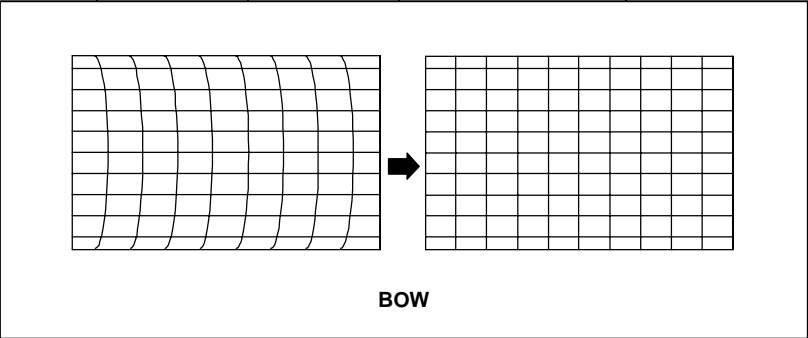
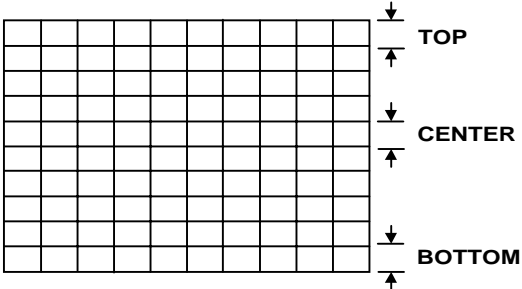
Do not adjust

Setting item	Initial setting value							
	FULL		PANORAMIC		SUBTITLE (16 : 9)		COMPRESS	
	100Hz i	60Hz p	100Hz i	60Hz p	100Hz i	60Hz p	100Hz i	120Hz i
1.V- SHIFT	-3	+10	+1	0	+5	0	0	0
2.V-SIZE	0	+1	0	0	0	0	-15	0
3.H-CENT	-15	+5	-2	0	0	0	0	0
4.H-SIZE	-29	-4	-4	0	0	0	0	0
5.TRAPEZ	-9	+13	0	0	0	0	0	0
6.EW-PIN	-17	0	+1	0	-1	0	0	0
7.COR-PIN	-13	0	-2	0	-2	0	0	0
8.COR-UP	+7	0	-6	0	+5	0	0	0
9.COR-LO	+10	0	+7	0	+4	0	0	0
10.ANGLE	0	0	+10	0	0	0	0	0
11.BOW	0	0	0	0	0	0	0	0
12.V-S.CR	-17	0	+7	0	+11	0	0	0
13.V-LIN	-3	0	-11	0	-18	0	0	0

Item	Measuring instrument	Test point	Adjustment part	Description												
Adjustment of V-SHIFT	Signal generator Remote control unit		1.V- SHIFT	<p>[FULL mode]</p> <ol style="list-style-type: none"> 1. Receive a circle pattern signal of vertical frequency 50Hz. 2. Select 4.DEF from the SERVICE MENU. 3. Select 1.V-SHIFT with the FUNCTION UP/DOWN key. 4. Adjust V-SHIFT to make A = B. 5. Check the adjustment condition in other zoom mode. If it is a wrong condition, re-adjust in "FULL" mode and adjust with 1. V-SHIFT. 6. Press the MENU key and memorize the set value. 												
				 <p>The diagram shows a rectangular screen with a circle inside. Two horizontal dashed lines are drawn across the circle. The vertical distance from the top edge of the screen to the upper dashed line is labeled 'A'. The vertical distance from the lower dashed line to the bottom edge of the screen is labeled 'B'. Arrows indicate the measurement directions.</p>												
Adjustment of V-SIZE	Signal generator Remote control unit		2.V-SIZE	<ol style="list-style-type: none"> 7. Receive a cross-hatch signal. 8. Select 2.V-SIZE and set the initial setting value. 9. Adjust V-SIZE to the vertical screen size of the picture becomes the value given table below. 10. Press the MENU key and memorize the set value. 11. Input a NTSC VIDEO signal (60Hz) from the EXT terminal, and make sure that the vertical screen size is in the table below. 12. Press the MENU key and memorize the set value. 												
				 <p>The diagram shows a rectangular screen with a grid pattern inside. The outer dimensions of the screen are labeled 'Screen size'. The inner dimensions of the grid are labeled 'Picture size 100%'. Arrows indicate the measurement directions.</p>												
				<table border="1"> <thead> <tr> <th>ASPECT</th> <th>FULL</th> <th>PANORAMIC</th> <th>SUB TITLE</th> </tr> </thead> <tbody> <tr> <td>TOP</td> <td>92%</td> <td>87%</td> <td>70%</td> </tr> <tr> <td>BOTTOM</td> <td>92%</td> <td>87%</td> <td>83%</td> </tr> </tbody> </table> <p>[VERTICAL SCREEN SIZE]</p>	ASPECT	FULL	PANORAMIC	SUB TITLE	TOP	92%	87%	70%	BOTTOM	92%	87%	83%
ASPECT	FULL	PANORAMIC	SUB TITLE													
TOP	92%	87%	70%													
BOTTOM	92%	87%	83%													

Item	Measuring instrument	Test point	Adjustment part	Description								
Adjustment of H. CENTER	Signal generator Remote control unit		3.H-CENT.	13. Receive a circle pattern signal. 14. Select 3.H-CENT and set the initial setting value. 15. Adjust H-CENT to make $C=D$. 16. Press the MENU key and memorize the set value.								
Adjustment of H.SIZE	Signal generator Remote control unit		4.H-SIZE	17. Receive a cross-hatch signal. 18. Select 4.H-SIZE and set the initial setting value. 19. Adjust H-SIZE and make sure that the horizontal screen size of the picture is in the bellow table. 20. Press the MENU key and memorize the set value. 21. Press the MENU key and memorize the set value.								
<table border="1"> <thead> <tr> <th>ASPECT MODE</th> <th>FULL</th> <th>PANORAMIC</th> <th>SUBTITLE</th> </tr> </thead> <tbody> <tr> <td>H SIZE</td> <td>92%</td> <td>95%</td> <td>92%</td> </tr> </tbody> </table> <p>[HORIZONTAL SCREEN SIZE]</p>					ASPECT MODE	FULL	PANORAMIC	SUBTITLE	H SIZE	92%	95%	92%
ASPECT MODE	FULL	PANORAMIC	SUBTITLE									
H SIZE	92%	95%	92%									
Adjustment of EW-PIN	Signal generator Remote control unit		6.EW-PIN	22. Select 6.EW-PIN and set the initial setting value 23. Adjust EW-PIN and make the 2nd.vertical lines at the left and right edges of the screen straight. Also make sure that the 3rd vertical lines are straight. 24. Press the MENU key and memorize the set value.								

Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of TRAPEZ	Signal generator Remote control unit		5.TRAPEZ	25. Receive a cross-hatch signal. 26. Select 5.TRAPEZ with the FUNCTION UP/DOWN key. 27. Set the initial setting value of TRAPEZ with the FUNCTION - or + key. 28. Adjust TRAPEZ and bring the VERTICAL lines at the right and left edges of the screen parallel . 29. Press the MENU key and memorize the set value.
				
Adjustment of CORNER UP/ LOW	Signal generator Remote control unit		7.COR-PIN 8.COR-UP 9.COR-LO	30. Select 9.COR-LO with the FUNCTION UP / DOWN key. 31. Set the initial setting value of COR-LO with the FUNCTION - or + key. 32. Adjust COR-LO, and bring the lines at the low corner straight. 33. Select 8.COR-UP with the FUNCTION UP / DOWN key. 34. Set the initial setting value of COR-UP with the FUNCTION - or + key. 35. Adjust COR-UP, and bring the lines at the upper corner straight. 36. If the extreme upper & lower corners have pin or barrel condition a little, chose 7.COR-PIN and adjust it to get the straight. 37. Press the MENU key and memorize the set value.
				
Adjustment of ANGLE	Signal generator Remote control unit		10.ANGLE	<ul style="list-style-type: none"> ● In case which there is a parallelogram distortion of images on the screen. 38. Select 10.ANGLE with the FUNCTION UP / DOWN key. 39. Adjust ANGLE, and bring the VERTICAL lines straight. 40. Press the MENU key and memorize the set value.
				

Item	Measuring instrument	Test point	Adjustment part	Description
Adjustment of BOW	Signal generator Remote control unit		11.BOW	<ul style="list-style-type: none"> In case where there is a bow-shaped distortion of images on the screen. 41. Select 11.BOW with the FUNCTION UP/DOWN key. 42. Adjust BOW, and bring the VERTICAL lines straight. 43. Press the MENU key and memorize the set value.
				
Adjustment of V-S.CR & V.LINE	Signal generator Remote control unit		12.V-S.CR 13.V.LIN.	<ul style="list-style-type: none"> When the vertical linearity has been deteriorated remarkably, perform the following steps. 44. Receive a cross-hatch signal. 45. Select 13. V.LIN with the FUNCTION UP / DOWN key. 46. Set the initial setting value of 13. V.LIN with the FUNCTION - / + key. 47. Select 12. V-S.CR. with the FUNCTION UP / DOWN key. 48. Set the initial setting value of 12. V-S.CR. with the FUNCTION - / + key. 49. Adjust 13. V.LIN and 12. V-S.CR. to the spaces of each lines at TOP, CENTER, and BOTTOM become uniform.
				
				At first the adjustment in 100Hz FULL mode should be done, then the data for the other aspect mode is corrected in the respective value at the same time. And confirm the deflection adjustment initial setting value in 120Hz (NTSC EXT mode) FULL mode. If the adjustment in 100Hz each aspect mode has been done and stored, the data for the same aspect modes in 120Hz is corrected in the respective value. Only the data for the other aspect mode in 120Hz is corrected for itself.

REPLACEMENT OF CHIP COMPONENT

■ CAUTIONS

1. Avoid heating for more than 3 seconds.
2. Do not rub the electrodes and the resist parts of the pattern.
3. When removing a chip part, melt the solder adequately.
4. Do not reuse a chip part after removing it.

■ SOLDERING IRON

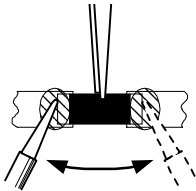
1. Use a high insulation soldering iron with a thin pointed end of it.
2. A 30w soldering iron is recommended for easily removing parts.

■ REPLACEMENT STEPS

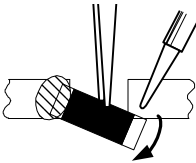
1. How to remove Chip parts

◆ Resistors, capacitors, etc

- (1) As shown in the figure, push the part with tweezers and alternately melt the solder at each end.

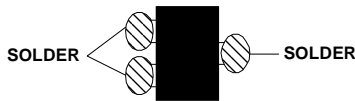


- (2) Shift with tweezers and remove the chip part.

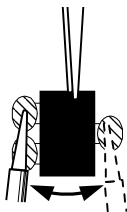


◆ Transistors, diodes, variable resistors, etc

- (1) Apply extra solder to each lead.



- (2) As shown in the figure, push the part with tweezers and alternately melt the solder at each lead. Shift and remove the chip part.

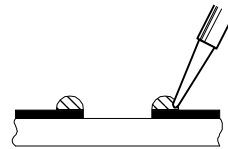


Note : After removing the part, remove remaining solder from the pattern.

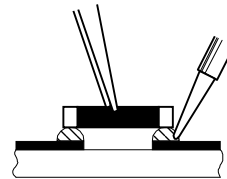
2. How to install Chip parts

◆ Resistors, capacitors, etc

- (1) Apply solder to the pattern as indicated in the figure.

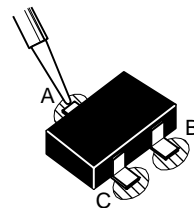


- (2) Grasp the chip part with tweezers and place it on the solder. Then heat and melt the solder at both ends of the chip part.

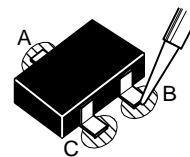


◆ Transistors, diodes, variable resistors, etc

- (1) Apply solder to the pattern as indicated in the figure.
- (2) Grasp the chip part with tweezers and place it on the solder.
- (3) First solder lead **A** as indicated in the figure.



- (4) Then solder leads **B** and **C**.



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