SERVICE MANUAL

HIGH RESOLUTION DISPLAY MONITOR

TFA1105STTUW

MITSUBISHI ELECTRIC CORPORATION
SEP. 1999

CBB-S5678

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1. Specification

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1. Outline

This display monitor is a domestic Mitsubishi brand 21 type (50cm) high resolution display monitor.

1.1 Model

TFA1105STTUW

Designate the above model when placing an order.

1.2 Standards

	Applicable standards
Safety	IEC950
Radio wave interference	VCCI- Class B
Low leakage frequency magnetic field	MPR-II, TCO91
Energy conservation	International Energy Star Program
Ergonomics	ISO 9241-3, ISO9241-7, ISO9241-8 (TÜV-ERGO)
Power harmonic	Guidelines for Measures to Suppress Household and General-Purpose Product Harmonic
Others	TCO95

2. CRT specifications

Model	M50LPR69X41
Type	Saving energy type Diamond Tron (aperture grill)
CRT size	21 type (50cm)
Grill pitch	0.28mm
Deflection angle	90 degrees
Phosphors	B22 medium short persistence
Electron gun	S-NX-DBF gun
Transmittance	Approx. 41.6% (including coating)
Surface treatment	Low reflection antistatic coating
Max. phosphors surface size	398.3mm x 298.7mm
Surface curvature rate radius (reference)	Horizontal: 1170mm, Vertical: 40000mm
Phosphors color coordination	Red: X=0.625, Y=0.340 Green: X=0.290, Y=0.605 (Typical) Blue: X=0.150, Y=0.070

3. Electrical specifications

3.1 Deflection performance

Horizontal deflection	Scanning frequency	30~115kHz
	Back porch	1.1 μ sec or more
	Blanking	2.8 μsec or more (fh≤86kHz)/2.3μsec or more (fh>86kHz)
	Horizontal sync. signal width	0.7 μsec or more
Vertical deflection	Scanning frequency	50~160Hz
	V-sync+V-back Porch	450 μ sec or more
	Vertical sync. signal width	When 2H≦Vs≦10H Fh≦50Hz When 3H≦Vs≦10H Fh>50Hz
	Total No. of scannings	(Vertical sync. signal width + 256H) or more

(*) The display may not extend to the picture edges at a timing where the display time ratio is as follows:

74% or less

Display time ratio = Horizontal display time/horizontal scanning time (%)

3.2 Signal input

Video signal	R. G. B video signal
Sync. signal	Sync on Green (Superimposed on green image signal) Composite sync. signal (Negative polarity TTL) Separate sync. signal (Positive/negative polarity TTL)
Video input impedance	75Ω
Sync. signal input impedance	1kΩ
Signal input level	Video signal: 0.7V/1.0Vp-p±10% Sync on Green: 0.3Vp-p±10% Separate sync. signal: TTL level (>2.5V)

3.3 Video characteristics

Video clock frequency	240MHz
Rise/fall time	3.7nsec (standard) 10 to 90% (video amplitude: 35Vp-p)

- The input video signal rise/fall time is 2nsec or less.
- The video circuit rise/fall time is calculated with the following expression.

$$Ta = \sqrt{Tm^2 - (Ts^2 + Tp^2 + Tsc^2)}$$

Where : Ta = Amplifier rise / fall time
Tm = Measured rise / fall time
Ts = Input signal rise / fall time
Tp = Probe effect on rise / fall time = 2.2 x R1 x Cp
R1 = Amplifier output resistance (ohm)
Cp = Total probe capacitance (F)
Tsc =Scope rise / fall time = 0.35 / Scope bandwidth (MHz)

3.4 Power supply

Power voltage	100~120/220~240VAC±10%
Power frequency	50/60Hz±3Hz
Power consumption (standard)	140W 1.40A@100-120VAC 0.70A@220-240VAC (When USB device is not connected) 155W 1.55A@100-120VAC 0.75A@220-240VAC (When USB device is connected)
Leakage current	3.5mA or less
Rush current (at cold start)	70A 0-p or less

3.5 Power management function (When USB is not connected)

Mode	Sync. signal		Video	Power consumption	Recovery time	Power lamp
	Horizontal	Vertical				
Normal	On	On	Active	140W	—	Green
Standby	Off	On	Blank	10W or less	Approx. 3 sec.	Amber
Temporary stop	On	Off	Blank	10W or less	Approx. 3 sec.	Amber
Complete stop	Off	Off	Blank	3W or less	Approx. 12 sec.	Amber

- When a computer with the VESA DPMS (Display Power Management Signaling Standard) compatible power management function is connected and used, complies with the "International Energy Star Program".

3.6 Degaussing

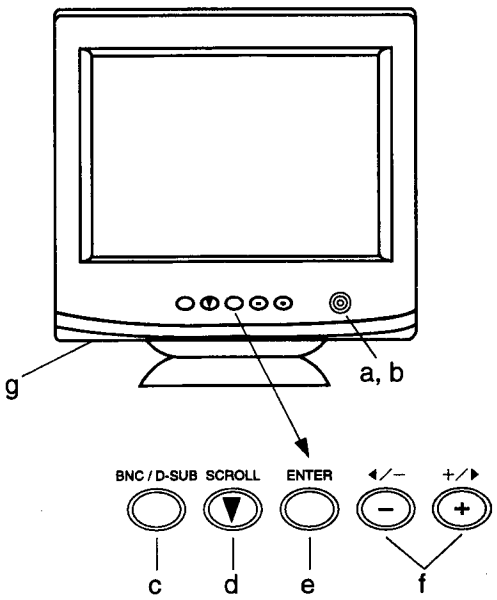
Automatic demagnetizing	Automatically demagnetizes when power is turned ON.
Manual demagnetizing	Demagnetizes when operations are carried out with demagnetizing menu in OSD.

- An interval of 15 minutes or more is required before carrying out degaussing again.

4. Functions

4.1 Front panel adjustment functions

a: Power switch
b: Power lamp
c: Connector select button
d: Main menu select button
e: Enter button
f: Sub-menu select/adjustment button
g: USB downstream



4.2 OSD (On Screen Display) functions

OSD1 group		Default setting
Contrast	0 - 100%	100%
Brightness	0 - 100%	Adjustment value
Color number	1 (9300K)	1 (9300K)
	2 (6500K)	
	3 (5000K)	
R amplitude1,2,3	0 - 100%	Adjustment value
G amplitude1,2,3	0 - 100%	Adjustment value
B amplitude1,2,3	0 - 100%	Adjustment value
Color temperature1,2,3	5000-9300K	9300K
Color reset1,2,3	PROCEED	-
OSD2 group		Default setting
Horizontal width	0 - 100%	Adjustment value
Horizontal phase	0 - 100%	Adjustment value
Horizontal raster position	0 - 100%	Adjustment value
Vertical width	0 - 100%	Adjustment value
Vertical position	0 - 100%	Adjustment value
Pin-cushion distortion	0 - 100%	Adjustment value
Trapezoid distortion	0 - 100%	Adjustment value
Center pincushion distortion	0 - 100%	Adjustment value
Upper pincushion distortion	0 - 100%	Adjustment value
Lower pincushion distortion	0 - 100%	Adjustment value
Pincushion balance	0 - 100%	Adjustment value
Parallelogram distortion	0 - 100%	Adjustment value
Peripheral pincushion distortion balance	0 - 100%	Adjustment value
Center pincushion distortion balance	0 - 100%	Adjustment value
Vertical linearity balance	0 - 100%	Adjustment value
Vertical linearity	0 - 100%	Adjustment value
Rotation	0 - 100%	Adjustment value
Zoom	0 - 100%	Adjustment value
Screen reset	PROCEED	-

OSD3 group		Default setting
TEXT mode	Sharp / Smooth	Sharp
Horizontal convergence	0 - 100%	Adjustment value
Vertical convergence	0 - 100%	Adjustment value
Upper vertical convergence	0 - 100%	Adjustment value
Lower vertical convergence	0 - 100%	Adjustment value
MOIRE clear	Off / On	Off
MOIRE clear level	0 - 100%	0%
Upper left purity	0 - 100%	Adjustment value
Upper right purity	0 - 100%	Adjustment value
Lower left purity	0 - 100%	Adjustment value
Lower right purity	0 - 100%	Adjustment value
Clamp position	Front / Back	Back
Video amplitude	1.0V / 0.7V	0.7V
OSD4 group		Default setting
Degaussing	PROCEED	-
Power save	Off / On	On
Control lock	Off / On	Off
Menu position	<-- -->	Center
All reset	PROCEED	-
GTF automatic size	PROCEED	-
Information	Horizontal Frequency	
	Vertical Frequency	
	Preset Information	
	Connector Information	
Language select	ENG / GER	JAP
	ESP / FRA	
	ITA / JAP	
OSD5 group		
USB upstream select	PORT-A / PORT-B	
USB port combination	A D-SUB / BNC	
	B BNC / D-SUB	

4.3 Rear panel

a: Power input connector (3P IEC plug)

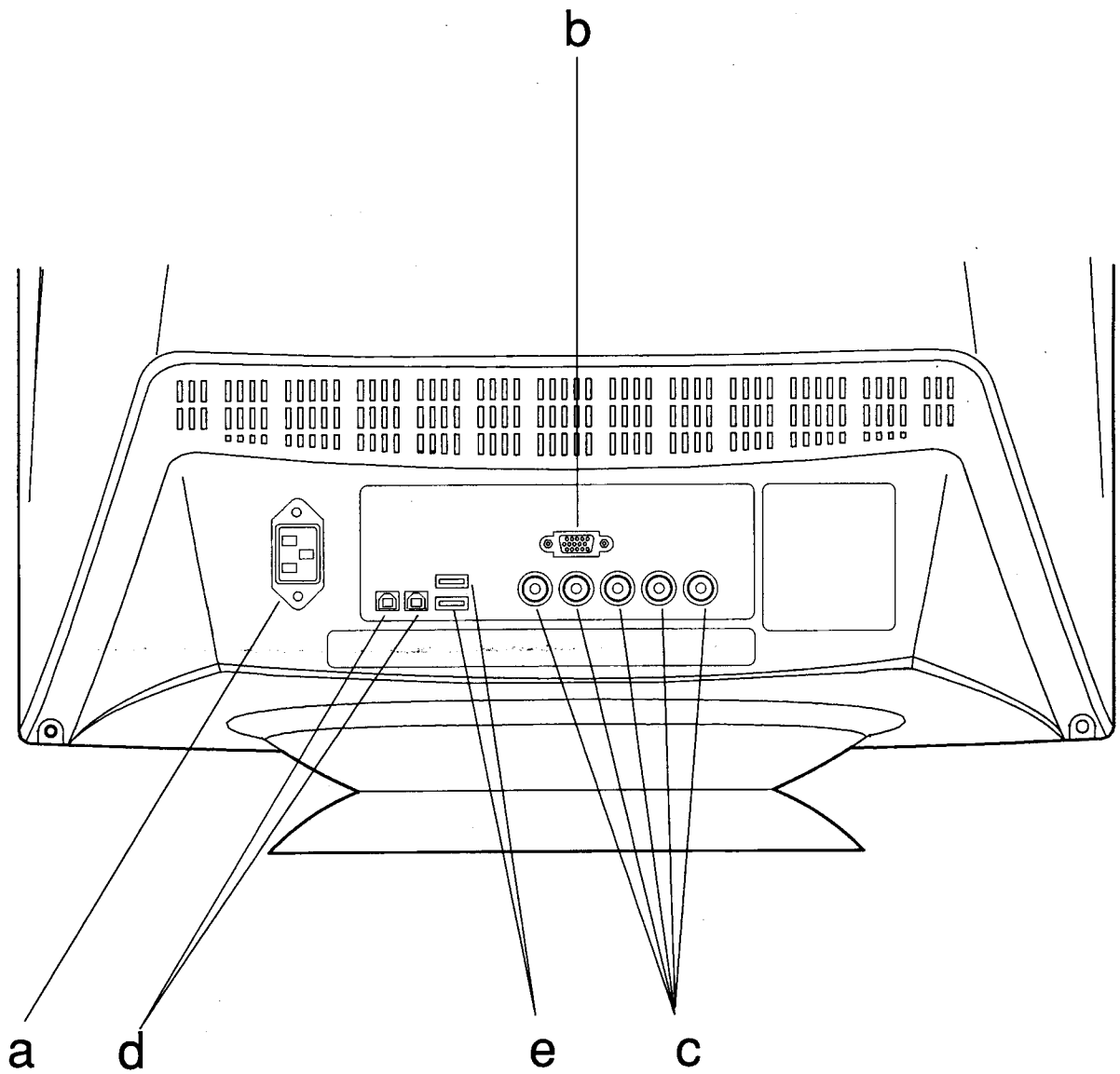
b: Signal input connector (mini D-Sub 15P)

c: Signal input connector (BNC)

Red	Video signal
Green	Video signal or, green Video signal + composite sync. signal (Sync on Green)
Blue	Video signal
Horizontal sync. signal/Composite sync. signal	
Vertical sync.signal	

d: USB upstream (x2)

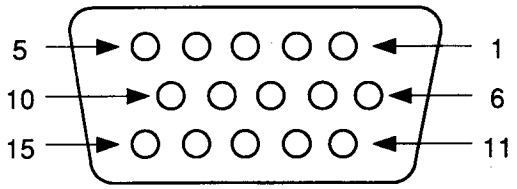
e: USB downstream (x2)



4.4 Connector pin layout

(1) Mini D-Sub 15-pin

Pin	Signal
1	Red video signal
2	Green video signal, or Green video signal+Composite sync. signal
3	Blue video signal
4	Ground
5	Ground
6	Ground (red)
7	Ground (green)
8	Ground (blue)
9	Not used
10	Ground
11	Ground
12	Serial data
13	Horizontal sync. signal / Composite sync. signal
14	Vertical sync. signal
15	Serial clock



Rear panel

4.5 DDC (Display Data Channel) function

Compatible with VESA DDC1 and DDC2B (Only EDID data)

The EDID data is listed in Appendix 2.

4.6 Preset timing

- Factory preset: 10 (Refer to Appendix 1 for the factory-set timing)
- User preset: 15 (Max. No. of set timings)

Timing judgement conditions

Horizontal scanning frequency	Must be separated by 1kHz or more
Vertical scanning frequency	Must be separated by 1Hz or more
Sync. signal polarity	The horizontal or vertical synchronization signal polarity must be different.

- If even one of the above conditions is satisfied for the preregistered factory and user preset timing, the judgement can be made.

4.7 USB (Universal Serial Bus) function

Universal Serial Bus Specification Revision 1.0 compatible

Operates under Windows 98 environment.

SELF POWERED HUB (Up to one downstream port 500mA can be supplied)

3 x downstream port

2 x upstream port

5. Display performance

5.1 Testing conditions

Power supply	100VAC 60Hz or 230VAC 50Hz
Video input signal	1600×1200 (106kHz, 85Hz), 0.7Vp-p
Warm up	30 min. or more with fully white picture
Ambient temperature	20~25℃
Relative humidity	40~80%
Environment magnetic field	BH=0, BV=0.040mT
Contrast, brightness setting	Contrast: max., brightness: factory-set state
Display dimensions	380mm×285mm : 4 : 3 Aspect ratio
Ambient lighting	200±50lx
Luminance meter	Minolta CA-100 or equivalent

• Items with no particular designated are tested at the factory-set state.

5.2 Display dimensions

For aspect ratio 4:3	Width: 380mm±5mm, height: 285mm±5mm
For aspect ratio 5:4	Width: 356mm±5mm, height: 285mm±5mm

5.3 Luminance (brightness)

CRT center luminance (brightness)	Full white: 100cd/m² or more (At color No. 1) 85cd/m² or more (At color No. 2) 70cd/m² or more (At color No. 3)
Luminance (brightness) evenness	Δ Luminance/center luminance: 25% or less
Back raster luminance (brightness)	Approx. 0.3cd/m²: Factory-set state
	No back raster must be visible at minimum brightness.

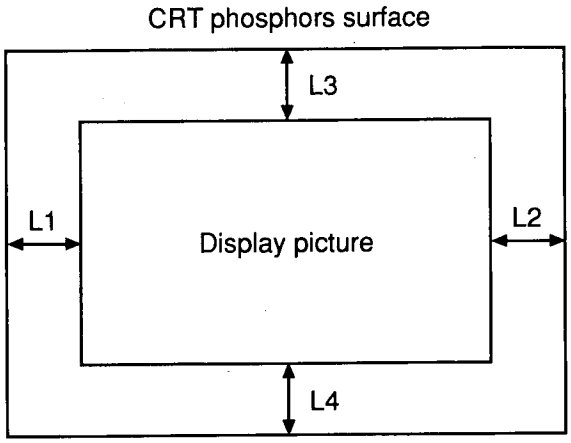
5.4 Color coordination

Color temperature setting value	Color-1: 9300K+8 M.P.C.D. X=0.283±0.020 Y=0.297±0.020
	Color-2: 6500K X=0.313±0.020 Y=0.329±0.020
	Color-3: 5000K+8 M.P.C.D. X=0.345±0.020 Y=0.359±0.020
White color evenness	0.020 or less: Difference of picture center and X or Y of periphery
Color tracking	±0.020 or less: Video input level: 10cd/m² to MAX
	±0.020 or less: Contrast adjustment: 25cd/m² to MAX (Brightness is adjusted at factory-set state)

5.5 Picture position

Picture position	| L1 - L2 | ≦ 4mm, | L3 - L4 | ≦ 4mm

• Display a fully white picture.

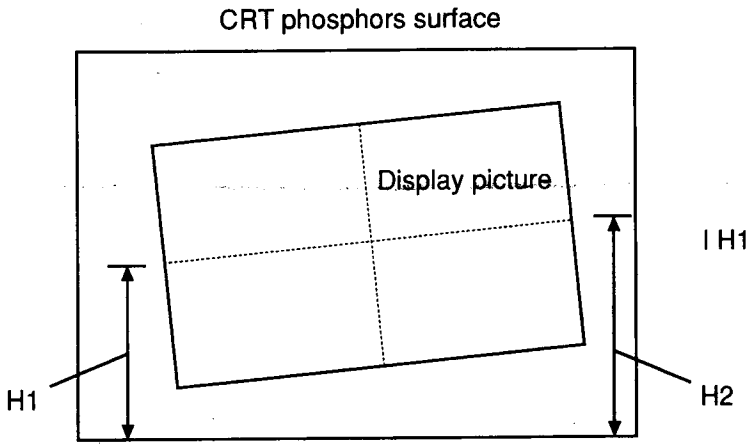


| L1 - L2 | ≦ 4mm
| L3 - L4 | ≦ 4mm

5.6 Picture inclination

Picture inclination	| H1 - H2 | < 3.5mm

• Green monochrome crosshatch display

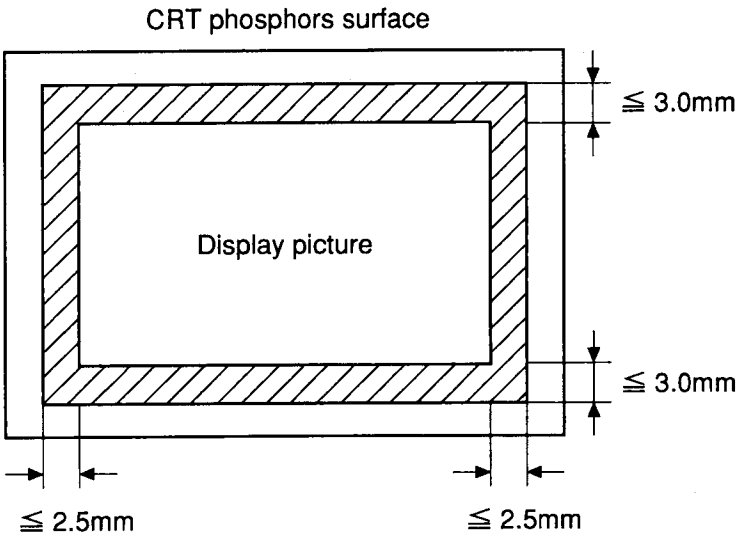


| H1 - H2 | < 3.5mm

5.7 Other distortion

All other distortion excluding picture inclination and picture position	H: ≦ 2.5mm, V: ≦ 3.0mm

- Green monochrome crosshatch display
- The screen inclination and screen position must be in the hatched section after being adjusted to the optimum level.

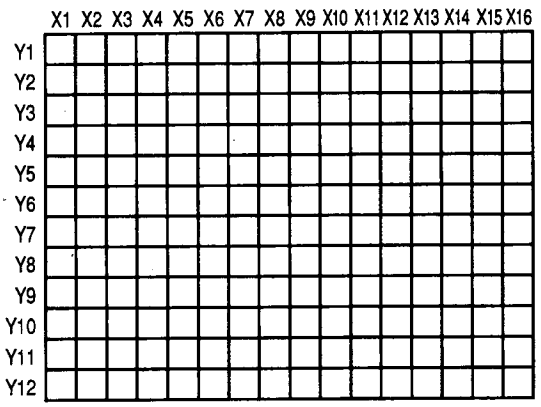


5.8 Linearity

Linearity	Horizontal: 10% or less, adjacent: 7% or less
	Vertical: 10% or less, adjacent: 7% or less

- Specified at the preset timing.
- Display a green monochrome crosshatch (16 x 12 pitch) with 17 vertical and 13 horizontal lines.
- Calculate the max. pitch as Xmax, and the min. pitch as Xmin using the following expression.

$$\frac{Xmax - Xmin}{Xmax} \times 100\%$$

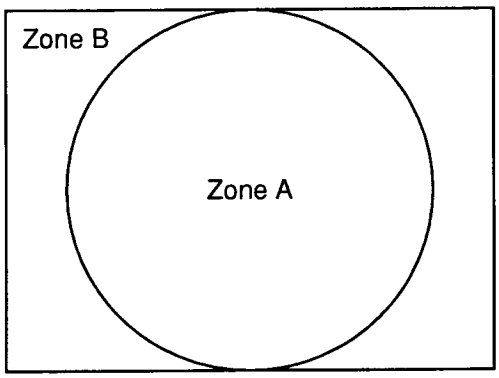


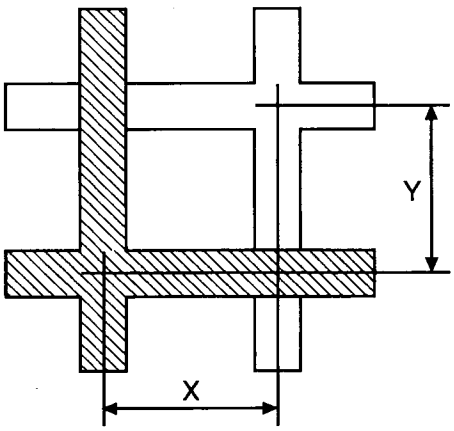
X1 = X2 = X3 =··· = X16
Y1 = Y2 = Y3 =··· = Y12

5.9 Convergence

Convergence	Zone A (In 285mm circle)	: 0.30mm or less
	Zone B (within 380×285mm)	: 0.40mm or less

- Display a white crosshatch (16×12 pitch) with 17 vertical and 13 horizontal lines.
- Use the value between the two colors most separated in the horizontal (X) and vertical (Y) directions of R, G and B
- fH: Horizontal frequency





5.10 Focus

Focus	Display a 7×9 pixel "H". Must be readable on the entire picture.

5.11 Picture width variation

Picture width variation	0.5% or less (in respect to adjusted picture width)

- Picture width variation when full white picture is displayed, and luminance value is changed between 30% and 100%, or the power voltage is changed between 90 and 132VAC.

5.12 Temperature characteristics

Screen size	Width: ±1.5%, height ±1.5%
Luminance (brightness)	Window (80×80mm), fully white:±10%
Color corordination	X、Y: ±0.015 (At picture center)
Display picture position	Horizontal: ±4.0mm, vertical: ±4.0mm

- The difference with the value specified when the ambient temperature is between 5 and 35℃ and the value measured at 25℃ must be within the above values.
  Measure after warming up for at least 30 minutes.

6. Design and mechanism specifications

6.1 Cabinet and tilt stand

Plastic material	Cabinet: PC+HIPS (Flame Class 2.5mm 5VA) Tilting table: ABS (Flame Class HB)
Outer color	Grayish White (Mitsubishi color No.: B-N-C039)
Logo display	Refer to Fig. 2.
Tilt table adjustment angle	Left/right:−90° ～+90° , Up/down: 10° ～−5°
Outline dimensions	500mm (W)×500mm (H)×494mm (D) Refer to Fig. 1

6.2 Rating label

Refer to fig. 2.

6.3 Packing

Packaging box specifications	Material: Class 2 double-sided cardboard Stacking height: Max. five levels
Packaging box printing specifications	Refer to Fig. 5.
Packaging box outline dimensions	Refer to Fig. 4.
Packaging box drawing	Refer to Fig. 6.

6.4 Weight

Main unit	Approx. 31kg
Packaged state	Approx. 35.5kg

6.5 Accessories

Power cord	2-pole power core with grounding lead wire: Refer to Fig. 7.
Signal cable	SC-B102 : Refer to Fig. 8.
USB cable	RC-X301 : Refer to Fig. 9.
User's guide	English
Warranty card	Appended

7. Environment conditions

7.1 Temperature, humidity and altitude

	Working environment conditions	Storage environment conditions
Temperature	5~35℃	-20~60℃
Relative humidity	10~90% (With no dew condensation)	10~95% (With no dew condensation)
Altitude	3000m	15000m

7.2 Vibration test (in packaged state)

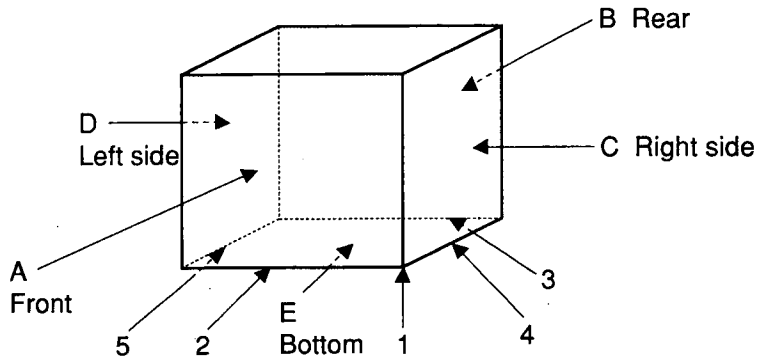
(1) Sine wave vibration (resonance point search)

Test axis	3 axes
Vibration level	5~200Hz
Search time	2 minutes
Acceleration	0.5G (0-P)
Test time	1 resonance point×5 minutes×3 axes
Fixing method	Fixing on vibration table

(2) Random vibration

Test axis	3 axes
Vibration level	5~200Hz
Acceleration	0~1.47Grms
Test time	30 minutes×3axes
Fixing method	Fixing on vibration table

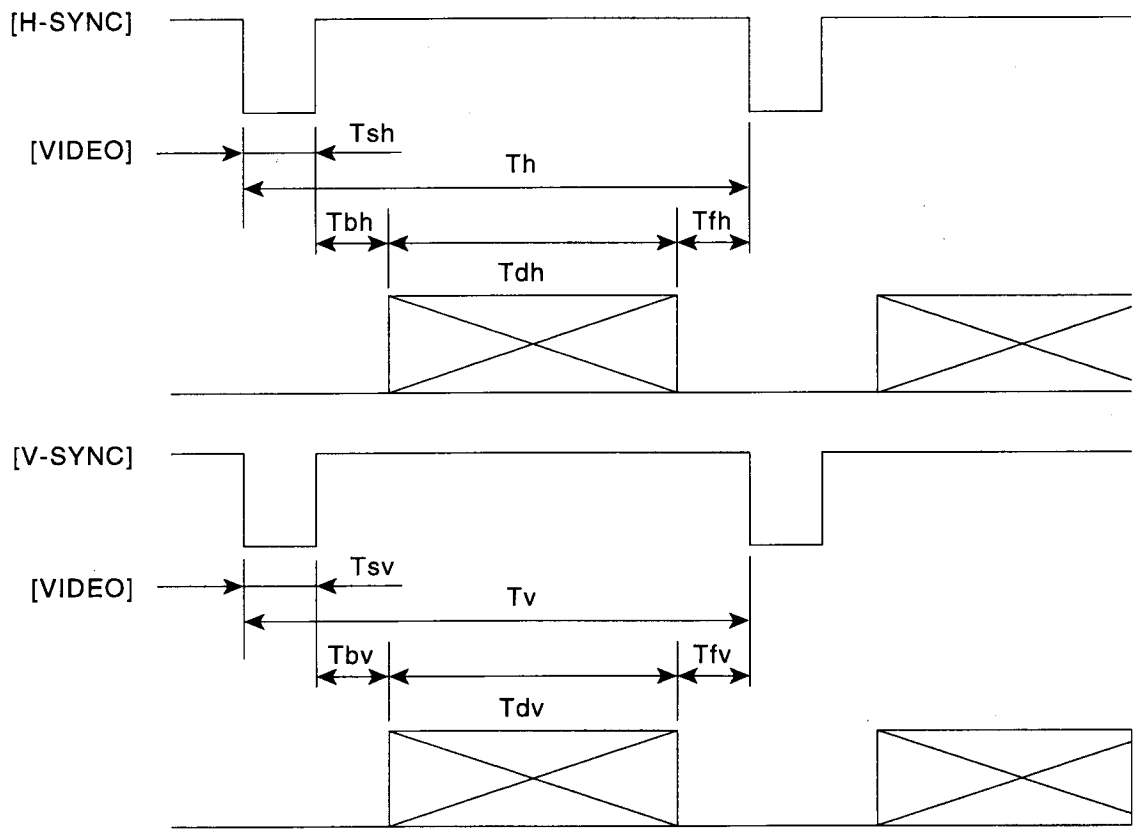
7.3 Dropping test (in packaged state)



- Must be no abnormality when naturally dropped under the following conditions.
- 1 corner, 4 edges, 5 surfaces. Base, and edges including base.

	Position	Height
Angle	1	46cm
Edge	2, 3, 4, 5	46cm
Surface	A, B, C, D, E	46cm

Appendix 1 Preset timing chart



NO.	Clock (MHz)	Th (μsec) (dot)	Tsh (μsec) (dot)	Tfh (μsec) (dot)	Tbh (μsec) (dot)	Tdh (μsec) (dot)	Tv (msec) (line)	Tsv (msec) (line)	Tfv (msec) (line)	Tbv (msec) (line)	Tdv (msec) (line)	Hs	Vs	Fh (kHz)	Fv (Hz)	Remarks
1	25.175	31.778 (800)	3.813 (96)	0.636 (16)	1.907 (48)	25.422 (640)	16.683 (525)	0.064 (2)	0.318 (10)	1.048 (33)	15.253 (480)	-	-	31.47	59.94	640x480
2	56.250	18.631 (1048)	1.138 (64)	0.569 (32)	2.702 (152)	14.222 (800)	11.756 (631)	0.056 (3)	0.019 (1)	0.503 (27)	11.179 (600)	+	+	53.67	85.06	VESA 800x600 / 85Hz
3	78.750	16.661 (1312)	1.219 (96)	0.203 (16)	2.235 (176)	13.004 (1024)	13.328 (800)	0.050 (3)	0.017 (1)	0.466 (28)	12.795 (768)	+	+	60.02	75.03	VESA 1024x768 / 75Hz
4	94.500	14.561 (1376)	1.016 (96)	0.508 (48)	2.201 (208)	10.836 (1024)	11.765 (808)	0.044 (3)	0.015 (1)	0.524 (36)	11.183 (768)	+	+	68.68	85.00	VESA 1024x768 / 85Hz
5	135.000	12.504 (1688)	1.067 (144)	0.119 (16)	1.837 (248)	9.481 (1280)	13.329 (1066)	0.038 (3)	0.013 (1)	0.475 (38)	12.804 (1024)	+	+	79.98	75.03	VESA 1280x1024 / 75Hz
6	157.500	10.971 (1728)	1.016 (160)	0.406 (64)	1.422 (224)	8.127 (1280)	11.761 (1072)	0.033 (3)	0.011 (1)	0.483 (44)	11.234 (1024)	+	+	91.15	85.03	VESA 1280x1024 / 85Hz
7	202.500	10.667 (2160)	0.948 (192)	0.316 (64)	1.501 (304)	7.901 (1600)	13.333 (1250)	0.032 (3)	0.011 (1)	0.491 (46)	12.800 (1200)	+	+	93.75	75.00	VESA 1600x1200 / 75Hz
8	229.500	9.412 (2160)	0.837 (192)	0.279 (64)	1.325 (304)	6.972 (1600)	11.765 (1250)	0.028 (3)	0.009 (1)	0.433 (46)	11.294 (1200)	+	+	106.25	85.00	VESA 1600x1200 / 85Hz
9	100.000	14.56 (1456)	1.280 (128)	0.320 (32)	1.440 (144)	11.520 (1152)	13.322 (915)	0.044 (3)	0.043 (3)	0.568 (39)	12.667 (870)	-	-	68.68	75.06	APPLE21 1152x870
10	252.242	8.754 (2208)	0.698 (176)	0.507 (128)	1.205 (304)	6.343 (1600)	11.765 (1344)	0.026 (3)	0.009 (1)	0.525 (60)	11.204 (1280)	-	-	114.24	85.00	VESA GTF 1600x1280 / 85Hz

Appendix 2 DDC EDID DATA contens

-- EDID DATA DUMP TEXT --
Vendor Name: MEL
Product Code LSB (HEX): f0
Product Code MSB (HEX): 42
Product Code (DEC): 17136
(Microsoft INF ID: MEL42F0)
Serial Number: NNNNNNNNN
Week of Manuf: 30
Year of Manuf: 98

EDID Version: 1
EDID Revision: 1
Extension Flag: 0

Input Singal: ANALOG
Setup: NO
Sync on Green: YES
Composite Sync: YES
Separate Sync: YES
V Sync Serration: NO
V Signal Level: 0.700V/0.300V (1V p-p)

Max Image Size H (cm): 38
Max Image Size V (cm): 28
DPMS Stand By: YES
DPMS Suspend: YES
DPMS Active Off: YES
GTF Support: YES
Display Type: RGB Color

Gamma: 2.05
Red x: 0.625
Red y: 0.340
Green x: 0.290
Green y: 0.605
Blue x: 0.150
Blue y: 0.070
White x: 0.283
White y: 0.297

Established Timings:
720x400@70 720x400@88
640x480@60 640x480@67
640x480@72 640x480@75
800x600@56 800x600@60
800x600@72 800x600@75
832x624@75 1024x768@60
1024x768@70 1024x768@75
1152x870@75 1280x1024@75

Standard Timing #1:
Horizontal Active Pixels: 1800
Aspect Ratio: 4:3
Refresh Rate: 80

Standard Timing #2:
Horizontal Active Pixels: 1600
Aspect Ratio: 5:4
Refresh Rate: 85

EDID EDITOR V1.17 (970612)
(C) Mitsubishi Electric

Standard Timing #3:
Horizontal Active Pixels: 1600
Aspect Ratio: 4:3
Refresh Rate: 85

Standard Timing #4:
Horizontal Active Pixels: 1600
Aspect Ratio: 4:3
Refresh Rate: 75

Standard Timing #5:
Horizontal Active Pixels: 1280
Aspect Ratio: 5:4
Refresh Rate: 85

Standard Timing #6:
Horizontal Active Pixels: 1280
Aspect Ratio: 5:4
Refresh Rate: 75

Standard Timing #7:
Horizontal Active Pixels: 1024
Aspect Ratio: 4:3
Refresh Rate: 85

Standard Timing #8:
Horizontal Active Pixels: 1800
Aspect Ratio: 5:4
Refresh Rate: 75

Detailed Timing (block #1):
Pixel Clock: 252.24
Horizontal Active: 1600
Horizontal Blanking: 608
Vertical Active: 1280
Vertical Blanking: 60
(Horizontal Frequency: 114.24 kHz)
(Vertical Frequency: 85.2 Hz)
Horizontal Sync Offset: 128
Horizontal Sync Width: 176
Vertical Sync Offset: 1
Vertical Sync Width: 3
Horizontal Border: 0
Vertical Border: 0
Horizontal Image Size: 380
Vertical Image Size: 285
Interlaced: NO
Image: Normal Display
Sync: Digital Separate
Bit 1: OFF
Bit 2: OFF

Monitor Range Limits (block #2):
Minimum Vertical Rate: 50 Hz
Maximum Vertical Rate: 160 Hz
Minimum Horizontal Rate: 30 kHz
Maximum Horizontal Rate: 115 kHz
Maximum Pixel Clock: 280 MHz
GTF Data: 00 0a 20 20 20 20 20 20

Monitor Name (block #3): TFA1105U
Monitor Serial Number (block #4): NNNNNNNNN

-- EDID DATA DUMP TEXT --

00 ff ff ff ff ff ff 00
34 ac f0 42 ** ** ** **
W Y 1 01 0e 26 1c 69
e9 04 88 a0 57 4a 9b 26
12 48 4c ff ef 80 c2 54
a9 99 a9 59 a9 4f 81 99
81 8f 61 59 c2 8f 88 62
40 60 62 00 3c 50 80 b0
13 00 7c 1d 11 00 00 18
00 00 00 fd 00 32 a0 1e
73 1c 00 0a 20 20 20 20
20 20 00 00 00 fc 00 54
46 41 31 31 30 35 55 0a
20 20 20 20 00 00 00 ff
00 3N 3N 3N 3N 3N 3N 3N
3N 3N 0a 20 20 20 00 S

W : Week of manufacture
Y : Year of manufacture
S : Check sam
* : Serial number (Hexadecimal)
N : Serial number (ASCII)

2. Circuit description

2.1 Outline

This display monitor is configured of the following eight blocks.

(a) Power block
(b) Deflection circuit block
(c) High-voltage circuit
(d) Video circuit block
(e) Control circuit
(f) Control software
(g) USB circuit
(h) CRT drive circuit

Details of each circuit are given in this section.

2.2 Power circuit

2.2.1 Outline

(1) The power block is compatible with 100 to 120VAC/220 to 240VAC (50/60Hz).

(2) An active filter circuit is incorporated to suppress the higher harmonic current and improve the power factor.

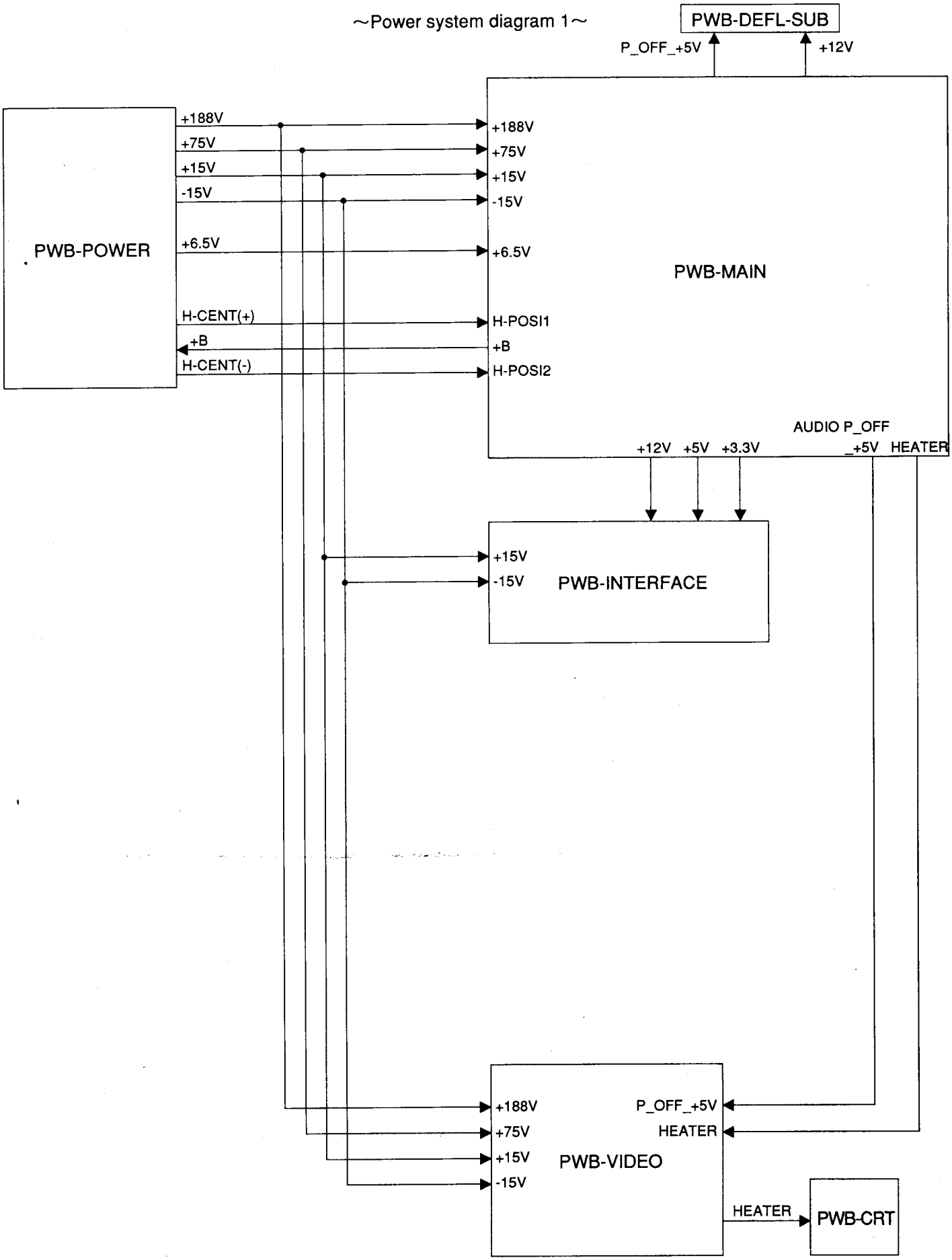
(3) The circuit that supplies to the secondary side is divided into two, with one called the main power and the other called the sub-power.
During normal use, both the main power and sub-power supply power to the secondary side, but during power save, only the sub-power functions.
The main power is configured with a pseudo-resonance operation fly-back converter type switching control IC. The sub-power is configured with a PWM (Pulse Width Modulation) control IC.
Each power circuit suppresses the voltage fluctuation caused by the secondary load fluctuation by feeding back the voltage fluctuation from the secondary side of the transformer via a photo coupler.

(4) The secondary side output is as shown in Table 1.
This power block only generates power to the reference voltage. Thus, the voltage required for each circuit block (i.e., +12V or +5V) is generated in the respective circuit block or by the three-terminal regulator, etc., in the PWB mounted on the circuit block.
(Refer to power system diagram)

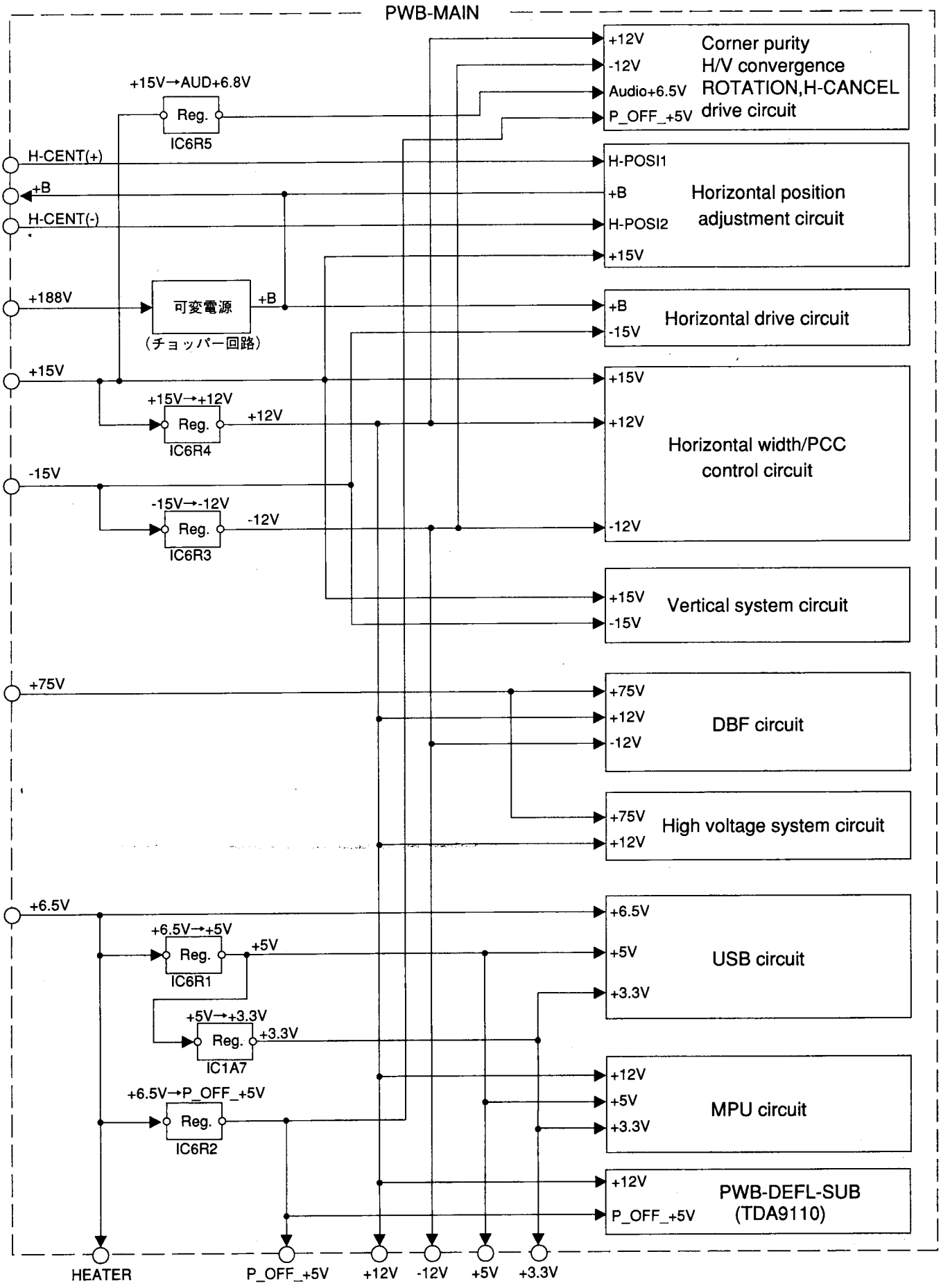
Power block	Circuit name	Output voltage (actual measurement value)	Application
Main power section	+180V	+188V	Horizontal deflection circuit, VIDEO cutoff circuit
	+80V	+75V	
	+15V	+15.3V	DBF circuit, high-voltage circuit
	-15V	-15.4V	+12V Reg, etc.
	H-CENT (+)	4.56V (across +B)	-12V Reg, etc.
	+B	+B	Horizontal position control circuit
	H-CENT (-)	-4.61V (across +B)	
	+6.5V	+6.6V	
Sub-power supply section			Heater, +5V Reg, USB circuit

Table 1

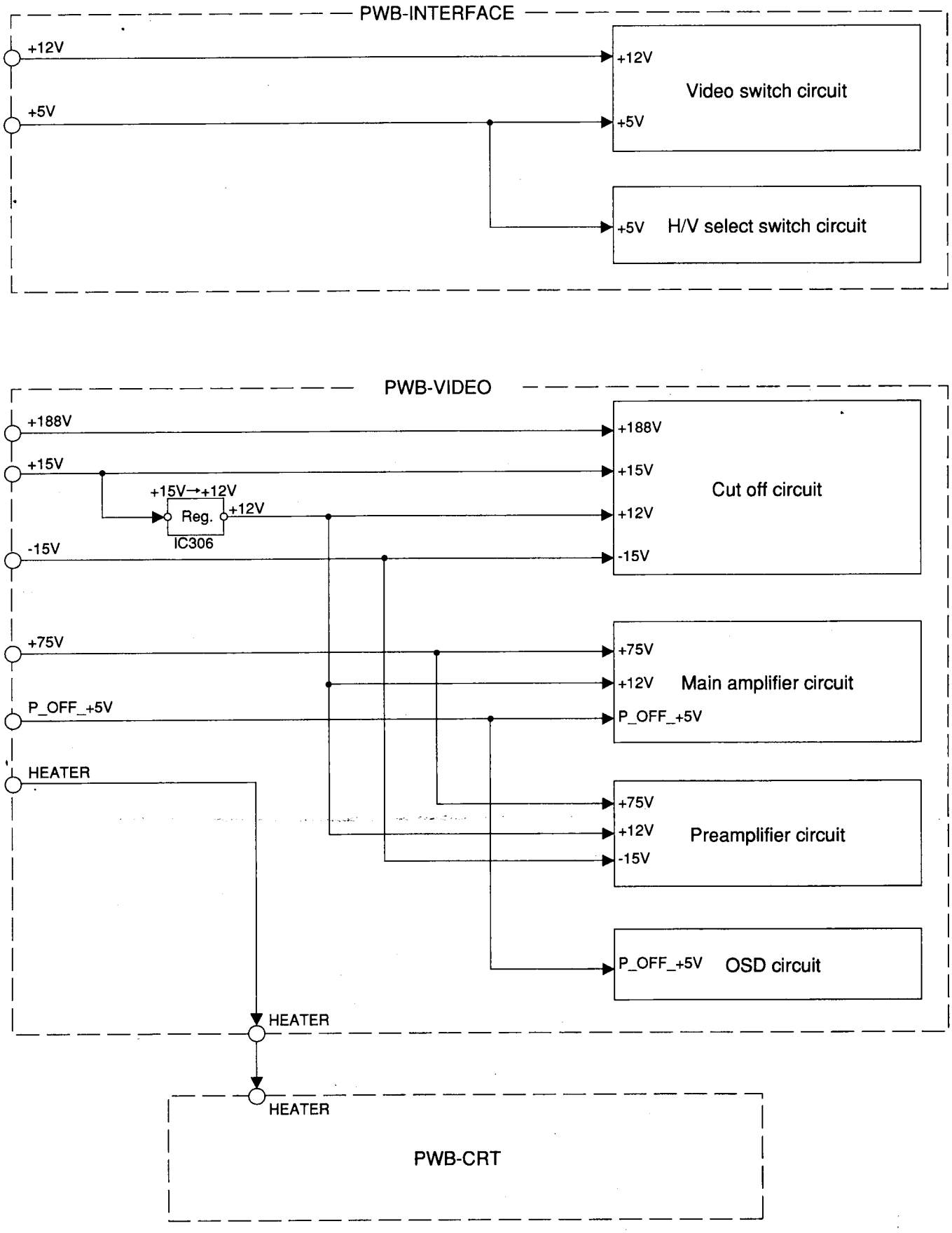
~Power system diagram 1~



～Power system diagram 2～



~Power system diagram 3~



2.2.2 Rectifying smoothing circuit and rush current control

(1) The AC input voltage is rectified by the diode bridge in the IC901 (MJ2400).

(2) The R902 is inserted as a series in the rectifying line to suppress the rush current when the power switch is turned ON.
The same effect can be achieved with the R973, but it is added as a measure against EMI.

(3) The AC input when the power is turned ON charges C908 from D5, D6 via R904/R905. During this time, R902 acts as the current limiting element.

(4) When C908 is charged, the internal thyristor turns ON. R902 is short-circuited to prevent power loss from R902.

(5) When the power is turned OFF, the C908 charge is discharged via R903.
The rectified voltage is supplied to the active filter circuit.

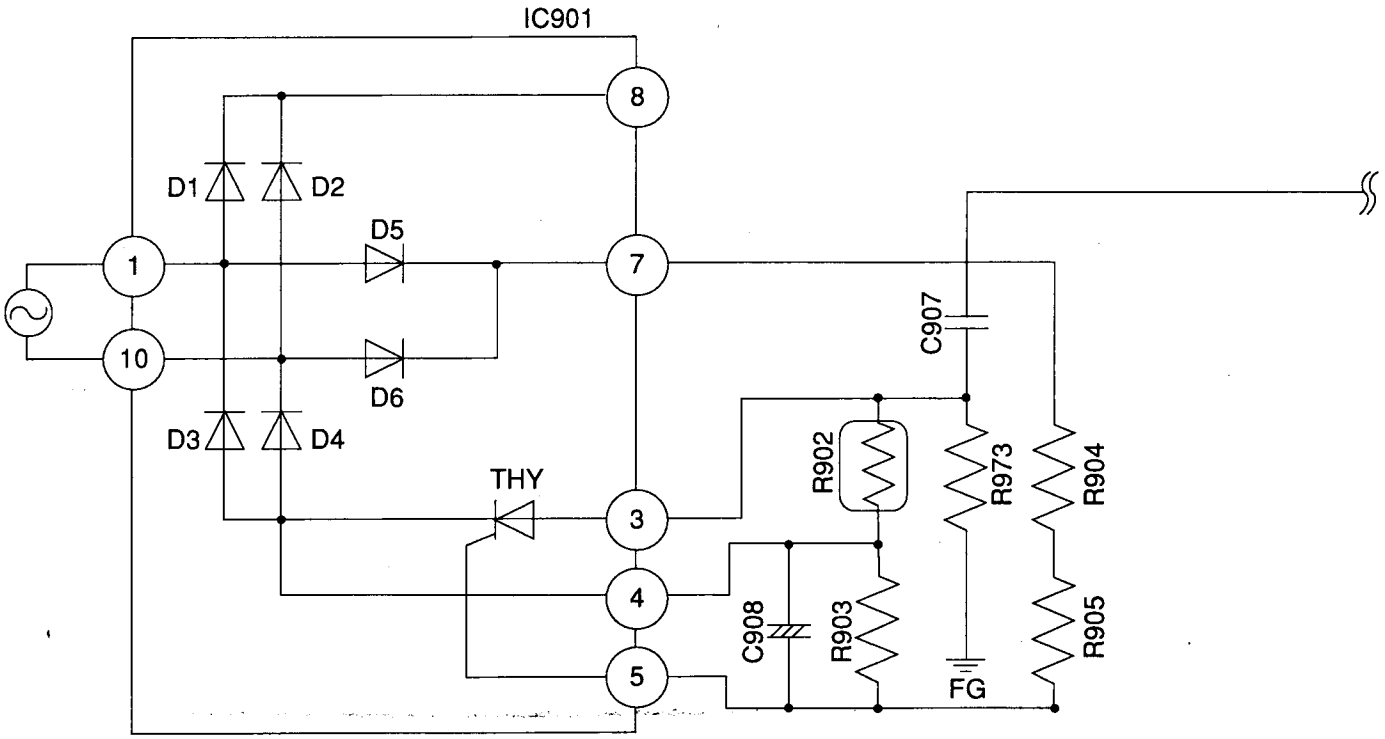


Figure 1. Rectifying smoothing circuit

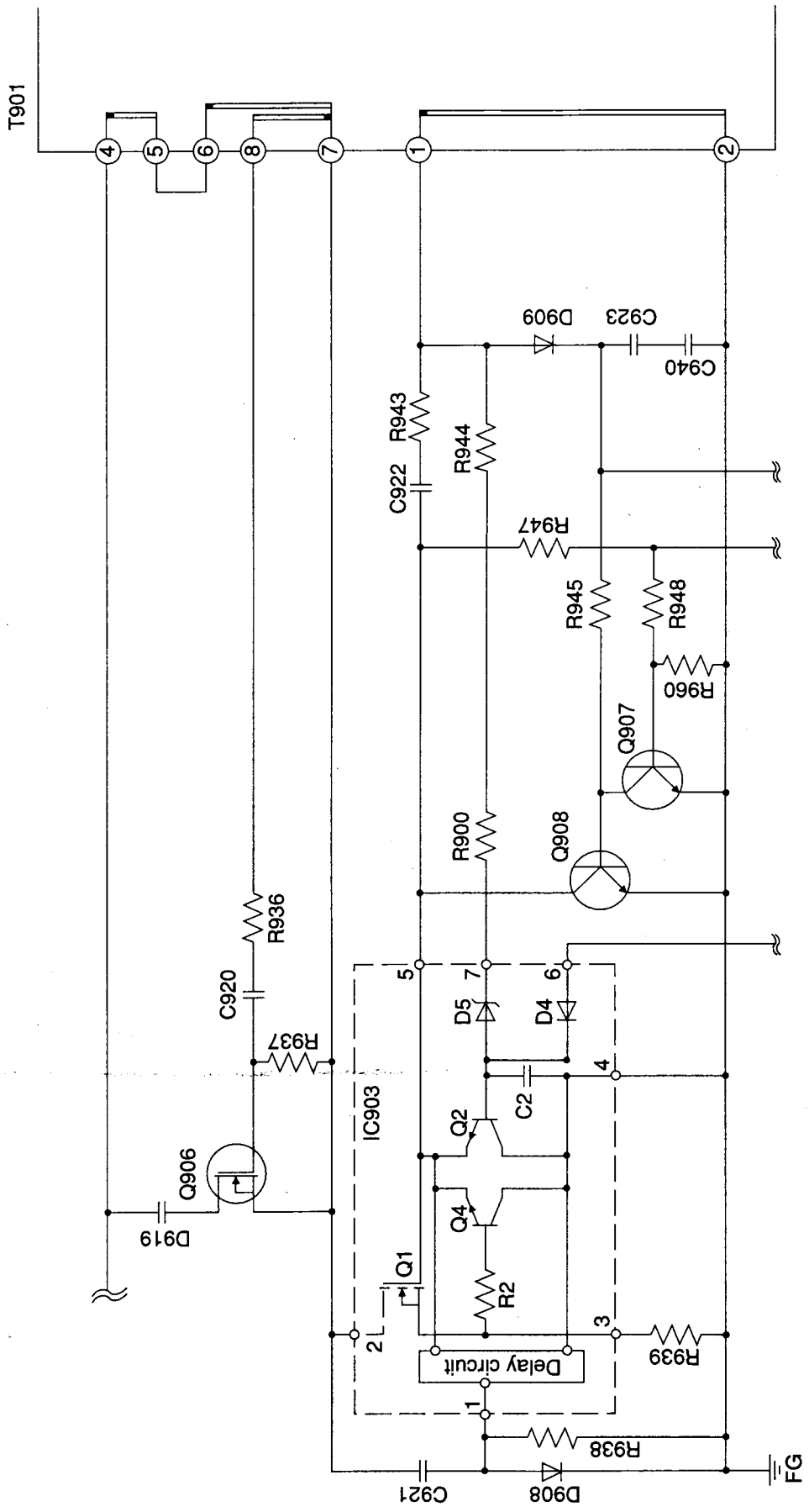

T901
4
5
6
8
7
1
2
D909
C923
C940
R943
R944
C922
R947
R945
R948
R960
Q907
R900
Q908
R936
C920
R937
5
7
6
D5
D4
4
C2
IC903
Q2
Q906
Q4
D919
Q1
R2
2
3
R939
Delay circuit
1
R938
C921
D908
FG

Figure 2

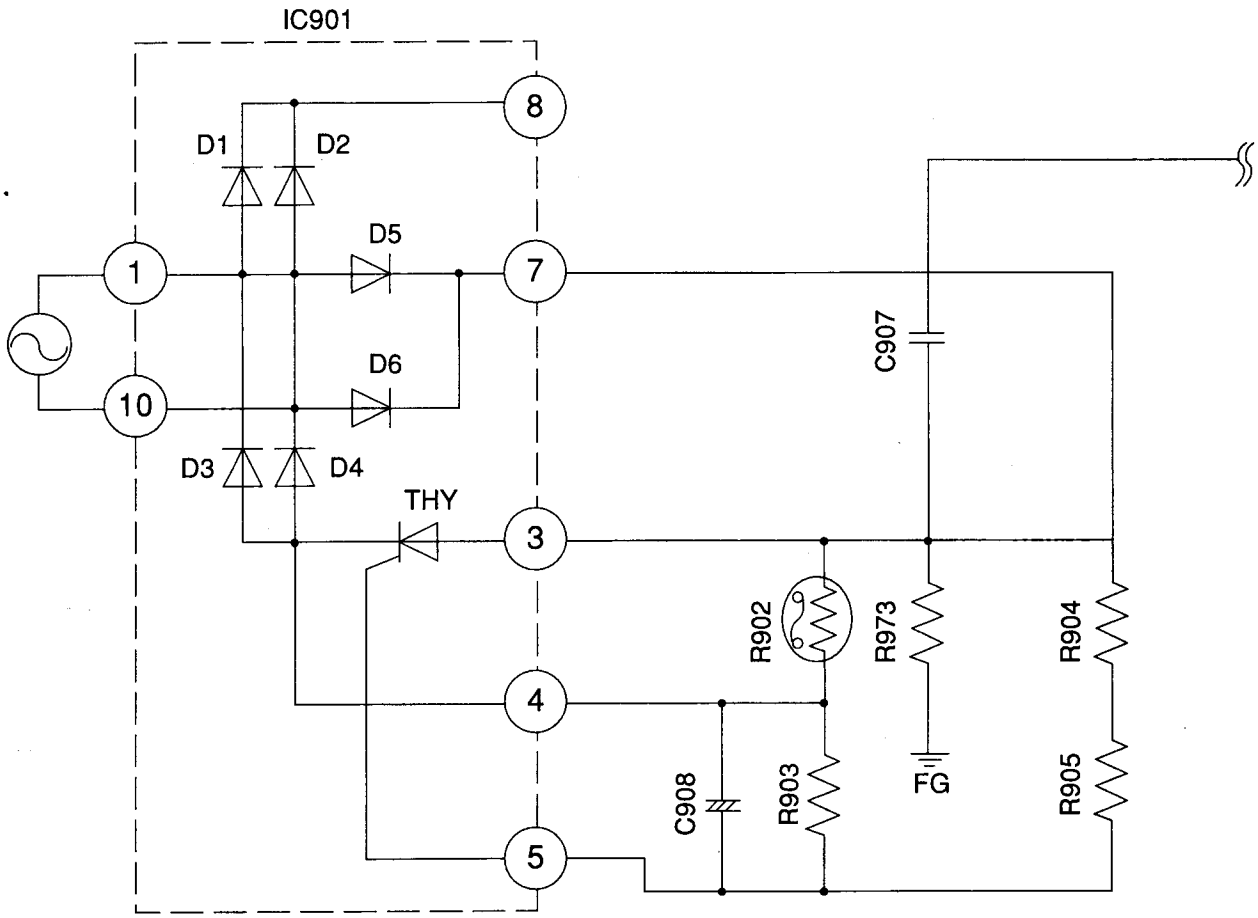

IC901
8
D1
D2
D5
1
7
D6
10
D3
D4
THY
3
4
5
C907
R902
R973
R904
C908
R903
FG
R905

Figure 3

2.2.3 Higher harmonic circuit

(1) This circuit detects the current that continuously flows through L903, and tracks this current voltage to the full-wave rectified voltage.
(Smoothing current mode control).

(2) A Motorola MC33262 is used for control. (Refer to Fig. 4.)

(3) The IC902 pin No. 1 is the voltage feedback input terminal.
When the C917 + side reaches approx. 380V, the voltage is fed back via R931, R929, R955, R930 and R928.

(4) The IC902 pin No. 3 is the multiplier input terminal.
The full-wave rectified voltage waveform is input via R917, R918, R919, R920 and R921.
Both voltages are multiplied in the C902 to achieve the threshold voltage.

(5) The IC902 pin No. 4 is the current sense input terminal.The current that flows through L903 is converted into a voltage at the R923 between the Q905 source FG, and is input into the IC902 pin No. 4.
This voltage and the threshold voltage are compared internally to turn the Q905 gate ON and OFF.
The threshold voltage is created with the full-wave rectified voltage, so the current that flows to L903 is as shown in Fig. 4.

(6) The IC902 pin No. 5 detects the L903 zero current.
Turning ON of the Q905 is started when the IC902 detects this zero current, and ends when the threshold voltage is reached.

(7) The IC902 pin No. 8 is the Vcc terminal with low-voltage detection circuit. The voltage is supplied from the sub-power via Q910 (SW).
As the output voltage rises when pin No. 1 is open, an overvoltage protector is provided on the external circuit.

The energy accumulated in the L903 during the Q905 ON interval is discharged to C917 via D904 by the pulses generated during the OFF interval.
This is smoothed at C917 and changed into a DC voltage.
By repeating the above operation, a DC power is obtained for the output, and even if the input side is a current pulse, there is maximum current of each cycle is above the sine, so by smoothing, a sine wave equivalent to the input voltage waveform is achieved finally.

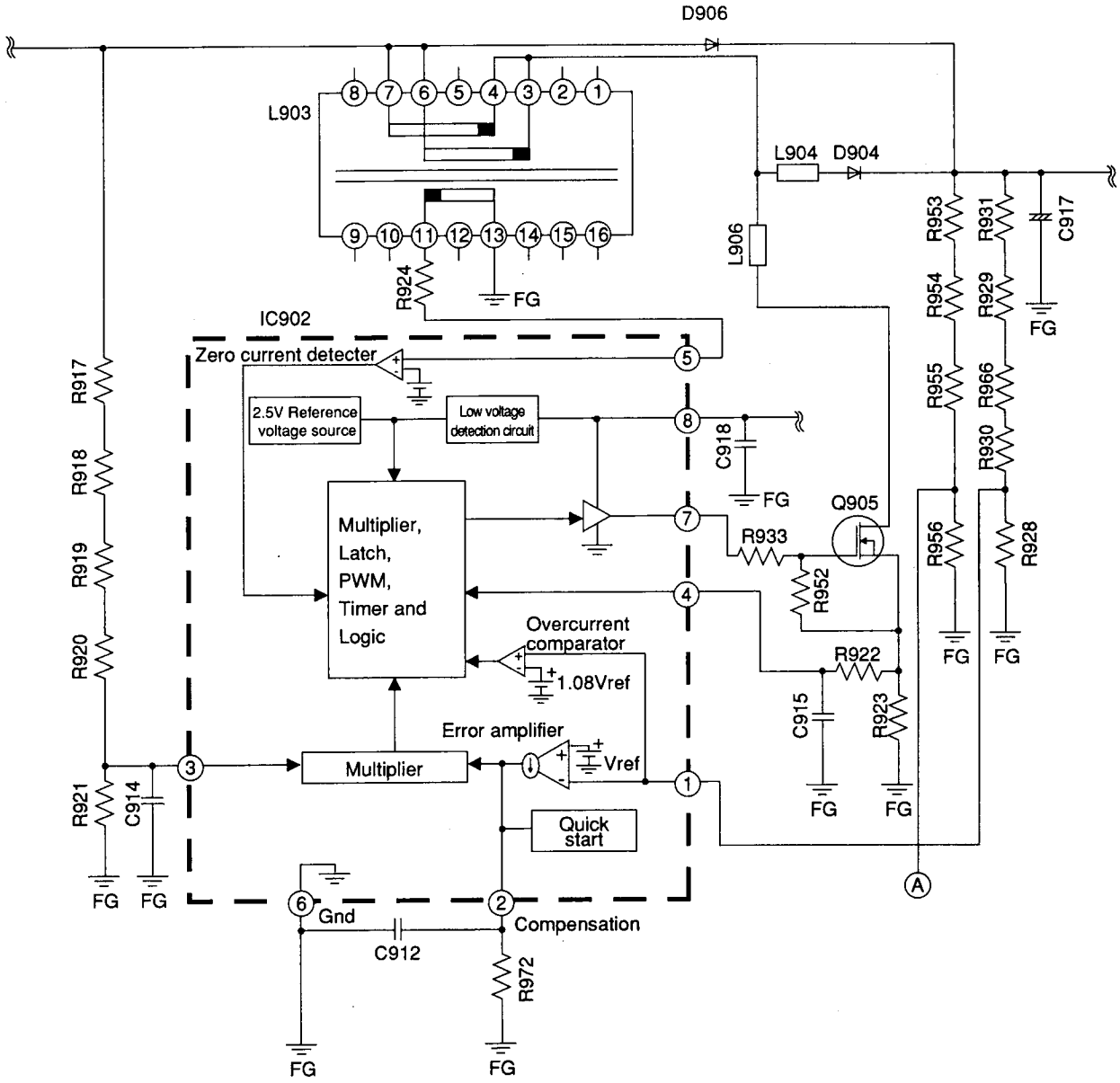
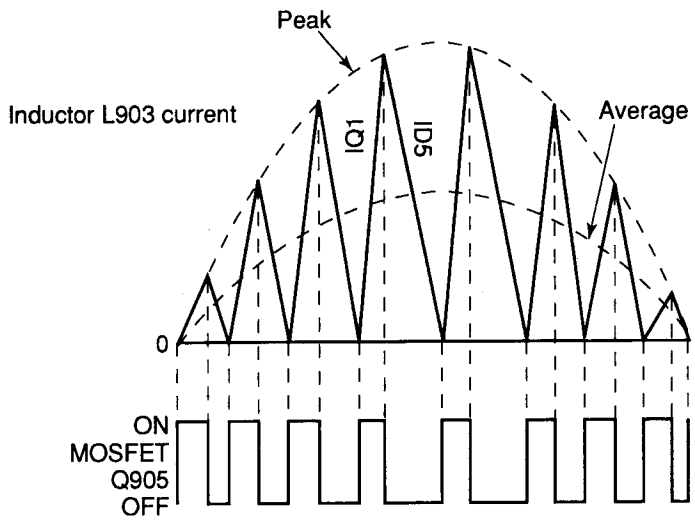


Figure 4. High harmonic wave circuit



Inductor current and MOSFET gate voltage waveform

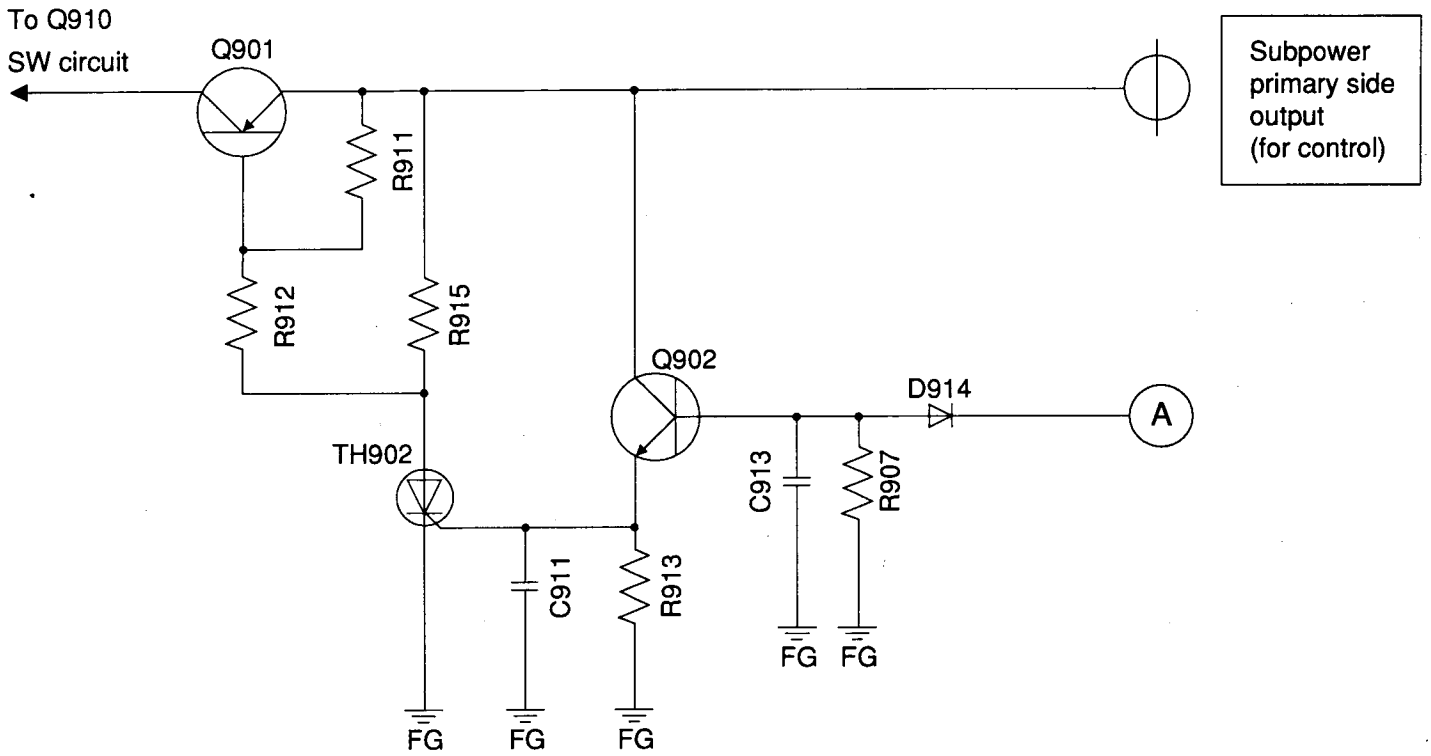


Figure 5. HIgh harmonic wave OVP circuit

2.2.4 Sub-power circuit

(1) An automatic regulator MIP02223SY is used for the sub-power.

(2) When the power switch is turned ON, the rectified and smooth DC voltage (AC voltage x $\sqrt{2}$) is supplied to pin No. 3 of IC904. This passes through pin No. 1 and charges C926. When pin No. 1 reaches 5.7V, the current supply from pin No. 3 is cut off, and the oscillation in the IC904 starts. The output FET operation starts. (As the Q910 is OFF, IC902 and IC903 do not operate.)

(3) With this, the voltage is induced to T902 pin No. 2 and the secondary side. These outputs are each rectified, and are used as the primary side control power and as the power for the MPU, USB and heater.

(4) The voltage induced to the secondary side is fed back from the constant voltage circuit using an IC922 (shunt regulator) to the primary side via IC914 (photo coupler). This circuit supplies and controls the primary control power to the IC904 pin No. 1 via R952, and suppresses the voltage fluctuation on the secondary side.

(5) When the secondary voltage starts, the MPU operation starts, and the P-SUS signal line is set to HIGH.

(6) This information is conveyed to the primary side via IC911 to turn Q910 ON. When Q910 turns ON, the primary side control power is supplied to IC902 and IC903, and the higher harmonic circuit operates. The main power circuit operation then starts. This is approx. 200ms after the sub-power starts.

2.2.5 Main power circuit

(1) The main power uses a pseudo-resonance operation fly-back converter type switching control ICMA5941.

(2) In Fig. 6, when the sub-power starts and Q910 turns ON, Q908 turns OFF and IC903 starts operation. In other words, when potential is generated across the No. 5 and No. 3 pins and VTH = 3V (TPY) is achieved, the drain current flows to the main switching terminal Q1, and the input voltage VDC is applied on the Np coil.
With this, the voltage calculated with the following expression is generated at the NC1 coil, and the voltage is supplied to the gate terminal (pin No. 5) via R943 and C922.

(3) Immediately after the power is turned ON, the constant voltage and dropping control are not sufficiently activated, so an excessive current could flow to the Q1 drain. As the Q1 drain current overcurrent protection, the R939 is connected across the source terminal (pin No. 3) and ground terminal (pin No. 4). When the voltage drops, Q4 turns On, the gate voltage VGS drops below VTH, and Q1 turns OFF.

(4) From the NC1 coil, voltage is supplied to the gate terminal and C2 is charged via D5. When the C2 potential reaches approx. 1V, Q2 turns ON and the gate voltage VGS drops below VTH. Thus, Q1 turns OFF. In other words, the Q1 max. ON time is the value determined by the NC1 coil voltage VCNC1, R900, R944, D5 and C2.

(5) When Q1 turns OFF, the energy accumulated in the transformer T901 is output from the NS coil to the secondary side via D961. At the same time, the voltage generated in the reverse direction passes through D5, R900 and R944 to discharge C2, and charges the NC1 coil with a minus potential.
When the discharge of the transformer energy ends, D961 turns OFF, but a voltage is generated in the NC1 due to the fly-back of the slight residual energy. This turns Q1 ON again, and continues the switching operation.

(6) Constant voltage control
IC921 is connected to the 180V power line, and is fed back to the IC903 F/B terminal (pin No. 6) via IC912 (photo coupler).

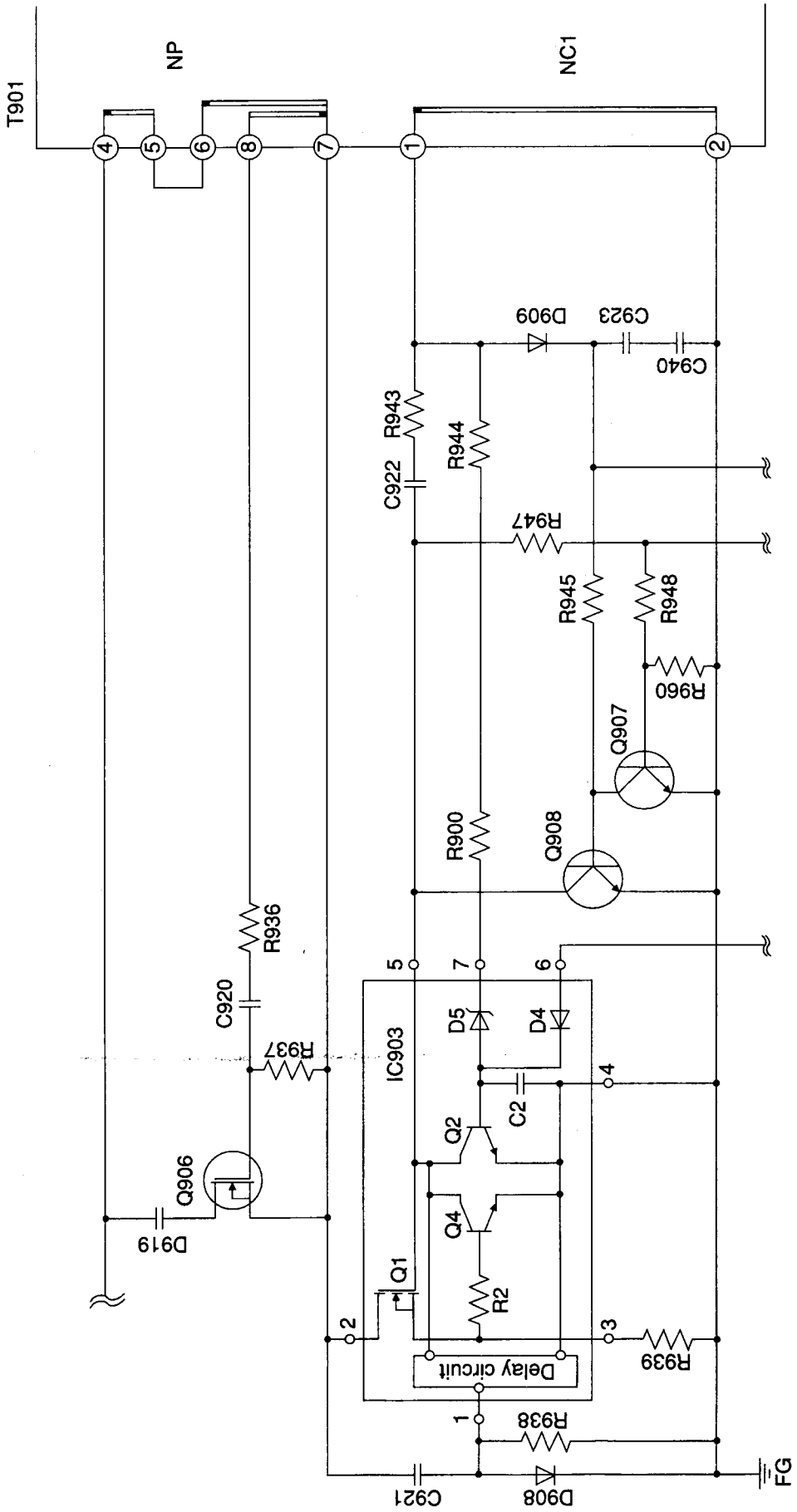


Figure 6. Main power circuit

2.2.6 Degaussing circuit

(1) An automatic and manual degaussing circuit are provided.
These circuits are used to prevent the picture performance from dropping when the CRT is magnetized, and operate as follow.

(2) Q964 is conducted and RY901 operates with the DG signal output from the MPU when the power is turned ON.
With this, a current flows to the degaussing coil, and degaussing is carried out. This degaussing takes approx. 5 sec. Manual degaussing is possible by selecting the degaussing menu from the OSD picture.

2.2.7 Power management circuit

When power management is turned ON on the OSD menu picture, the energy conservation mode will be enabled as shown in Table 2 according to the presence of a horizontal/vertical synchronization signal.

Mode	H-SYNC	V-SYNC	VIDEO
Normal	Present	Present	Active
Standby	Not present	Present	Blank
Temporary stop	Present	Not present	Blank
Complete stop	Not present	Not present	Blank

Table 2

The energy consumption at this time is as shown in Table 3.

Mode	Power consumption	Recovery time	Power LED
Normal	140W	—	Green
Standby	10Wor less	Approx. 3 sec.	Amber
Temporary stop	10W or less	Approx. 3 sec.	Amber
Complete stop	3W or less	Approx. 12 sec.	Amber

Table 3

2.2.8 Protection circuit

(1) Overcurrent protection circuit
The IC903 has an overcurrent protection circuit determined by VNC1, R900, R944, D5 and C2. This activates when the +180V or +80V line is short-circuited.

(2) Overvoltage protection circuit (secondary side)
The +80V line voltage is monitored so that the CRT is not fatally damaged. If the +80V line voltage rises for any cause, TH901 (thyristor) turns ON via D970, and the P-SUS line is set to LOW.
This information passes through the IC911 (photo coupler) and is conveyed to the primary side. Q910 is turned OFF, and the main power operation is stopped.
As this is a thyrister operation, the state is held until the power is turned OFF and ON again.

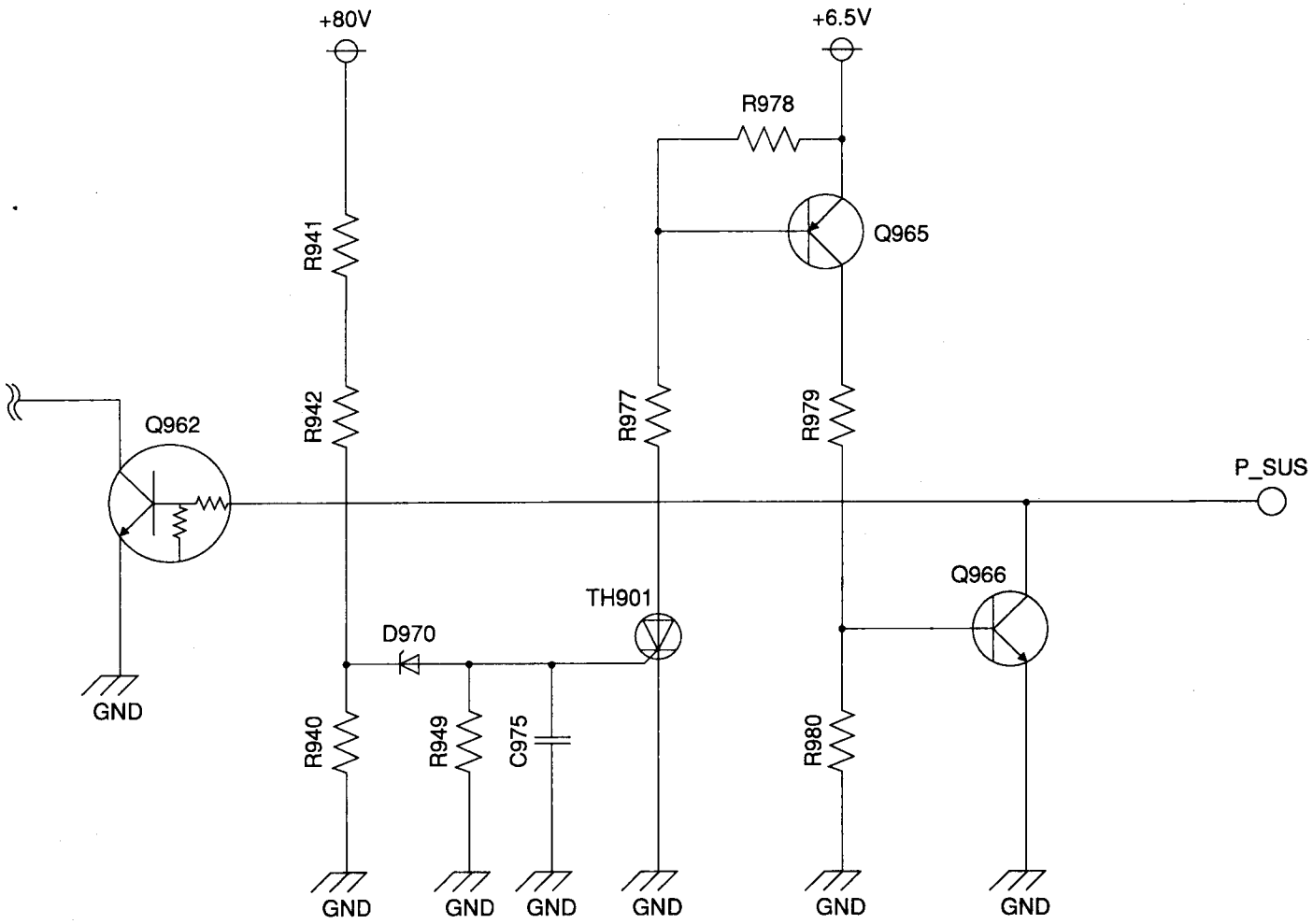


Figure 7. Secondary side overvoltage protection circuit

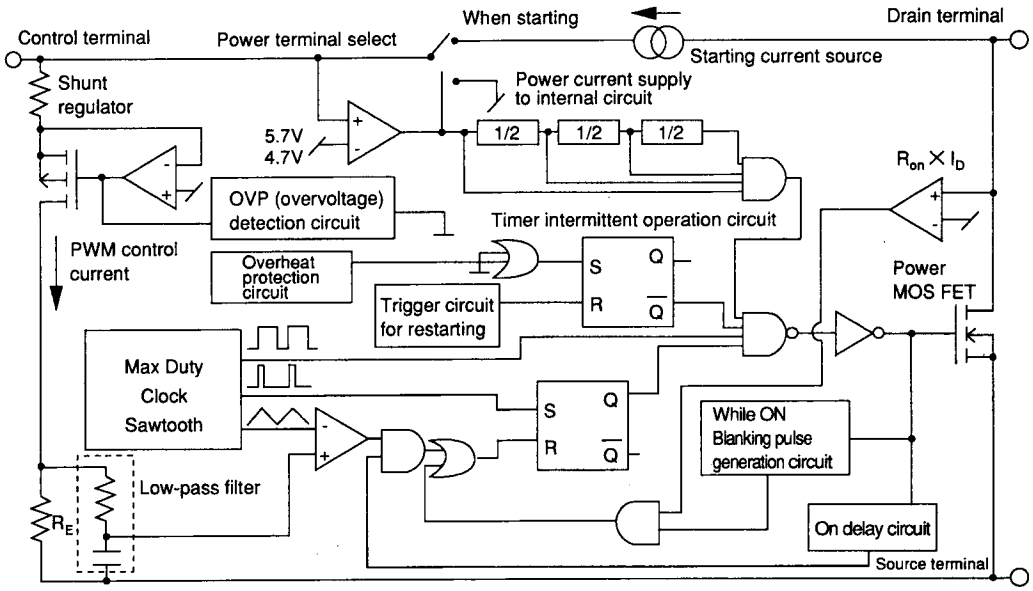


Figure 8. IC904 (MIP0223Y) circuit

2.3 Deflection circuit block

2.3.1 Outline

The deflection block is configured of the horizontal oscillation circuit, vertical oscillation circuit, and blanking circuit, and of the horizontal output circuit, +B control circuit, CS/LIN circuit, H-POSI circuit and vertical output circuit.

2.3.2 Horizontal oscillation circuit, vertical oscillation circuit and blanking circuit

(1) Horizontal oscillation circuit

The horizontal oscillation circuit is configured centering on the IC7A1 on the PWB-DEFL-SUB.

The H-SYNC/G-SYNC signal input from the synchronization separation circuit to the IC100 (MPU) is output from the IC7F1 as the H_S signal. It is then, reversed and rectified at the IC110 (inverter), and input as the H_S signal into the IC7A1 pin No. 1.

IC7A1 oscillates in synchronization with this H-S signal. With the phase control and duty control from the 12C BUS with the MPU, a stabilized horizontal drive output HD2 signal is output from pin No. 26 with the AFC signal fed back from the horizontal output circuit to pin No. 12.

(2) Vertical oscillation circuit

The vertical oscillation circuit is also configured centering on the IC7A1.

IC7A1 oscillates in synchronization with the V-S signal input into pin No. 2, and outputs the VST1 signal and Imid signal from pin Nos. 23 and 21.

(3) Blanking circuit

The blanking circuit is configured of the IC7F1 (inverter) peripheral circuit on the PWB-DEFL-SUB.

The AFC signal from the horizontal output circuit is rectified by Q7F0, Q7F1 and IC7F1, and is added at Q7F2 and Q7F3 with the V-BLK signal rectified at IC7F1. Then it is output as the HV-BLK signal rectified again at the IC7F1 to the image signal amplifying circuit.

2.3.3 Horizontal output circuit

The horizontal output circuit is configured mainly of Q501, T501, Q502 and T503, etc., in the PWB-MAIN as shown in Fig. 9.

The HD signal (= HD2 signal) output from the horizontal oscillation circuit described above, passes through Q501 and T501, and drives and switches the horizontal output transistor Q502 base.

When Q502 turns ON, the deflection current Idy that flows to the horizontal deflection yoke increases from 0 to max. Idyp following the next expression:

$$Idyp = (Vcc/Ldy) \times Ton$$

(Vcc: Power voltage, Ldy: parallel inductance of horizontal output transformer T503 and horizontal deflection yoke, Ton: Q502 ON interval).

When Q502 turns OFF, the deflection current Idy flows to charge C506 and C526 with the energy accumulated in the horizontal deflection yoke. However, when the C506 and C526 voltage (hereinafter Vcp) reaches $\{1 + (\pi/2) \times (Ts/Tr)\} \times Vcc$, the deflection current Idy becomes 0. The charge accumulated in C506 and C526 is discharged, and flows to the horizontal deflection yoke as the negative deflection current.

This charge/discharge time is called the retrace interval or retrace time, and is expressed with the following expression.

$$Tr = \pi \sqrt{Ldy \times Cr}$$ (Cr : Parallel capacity of C506, C526)

When Vcp reaches approx. 0, the negative deflection current reaches the peak.

This charging/discharge interval is the resonance interval by Ldy and Cr. When Vcp oscillates into the negative direction due to the resonance phenomenon, a forward bias is applied on the damper diodes D503. The deflection current Idy flows between the horizontal deflection yoke and damper diode loop, and nears 0.

By repeating the above steps, a sawtooth current is passed to the horizontal deflection yoke, and horizontal scanning is carried out.

2.3.4 +B control circuit

The horizontal picture width is controlled by varying the +B power voltage applied on the horizontal output circuit.

The +B control circuit is a DC-DC converter configured of the IC5J1, IC5J2, Q541 and T502, etc. By comparing the voltage data converted from the horizontal deflection current fed back from the T502 and the H-SIZE-CON signal from the MPU, the IC5J1 carries out PWM control of the Q541, and a stable +B power is supplied.

By superimposing the PCC signal on the H-SIZE-CON signal at IC5J1 and modulating the +B power, the distortion at the left and right sides of the picture is compensated.

2.3.5 CS/LIN circuit

The horizontal linearity is compensated by selecting the S-character compensation capacitor (C518, C513, C514, C515, C516, C517) with the FET switch (Q504, IC501), and by selecting the horizontal linearity coil L502 and S-character compensation capacitor (C528) with relay RY501.

Refer to the following table for the selection of the S-character compensation capacitor and horizontal linearity coil.

H. frequency (kHz)	RY501 LIN	C513 CS6	C514 CS5	C515 CS4	C516 CS3	C517 CS2	C518 CS1	C528
30~34.	OFF	ON	ON	ON	ON	ON	ON	ON
34~36	OFF		ON	ON	ON		ON	ON
36~39	OFF		ON		ON		ON	ON
39~43	OFF			ON			ON	ON
43~46	OFF		ON	ON		ON		ON
46~48	OFF			ON	ON			ON
48~49	OFF			ON	ON			ON
49~53	OFF		ON	ON				ON
53~56	ON	ON	ON			ON		
56~58	ON	ON	ON			ON		
58~60	ON		ON			ON		
60~62	ON		ON			ON		
62~64	ON		ON	ON	ON			
64~66	ON		ON	ON	ON			
66~68	ON	ON	ON		ON			
68~70	ON	ON	ON		ON			
70~73	ON	ON			ON			
73~76	ON	ON			ON			
76~78	ON	ON	ON	ON				
78~80	ON	ON			ON			
80~83	ON	ON	ON	ON				
83~85	ON	ON	ON	ON				
85~88	ON			ON				
88~90	ON			ON				
90~92	ON			ON				
92~94	ON	ON	ON					
94~96	ON	ON	ON					
96~98	ON	ON	ON					
98~100	ON		ON					
100~102	ON		ON					
102~104	ON		ON					
104~107	ON	ON						
107~110	ON	ON						
110~112	ON	ON						
112~114	ON	ON						
114~116	ON	ON						

2.3.6 H-POSI circuit

The H-POSI circuit is configured of Q5A1, IC5A1 and L5A1, etc. The horizontal luster position is controlled by supplying the DC current from the IC5A1 pin No. 4 via the L5A1 to the horizontal deflection yoke.

2.3.7 Vertical output circuit

The vertical deflection circuit controls the vertical width and vertical position with IC7A1 on the PWB-DEFL-SUB. The linearity is controlled with IC5P1 on the PWB-MAIN. Each control signal is added and input into the vertical deflection output IC401 via connector J5P1.

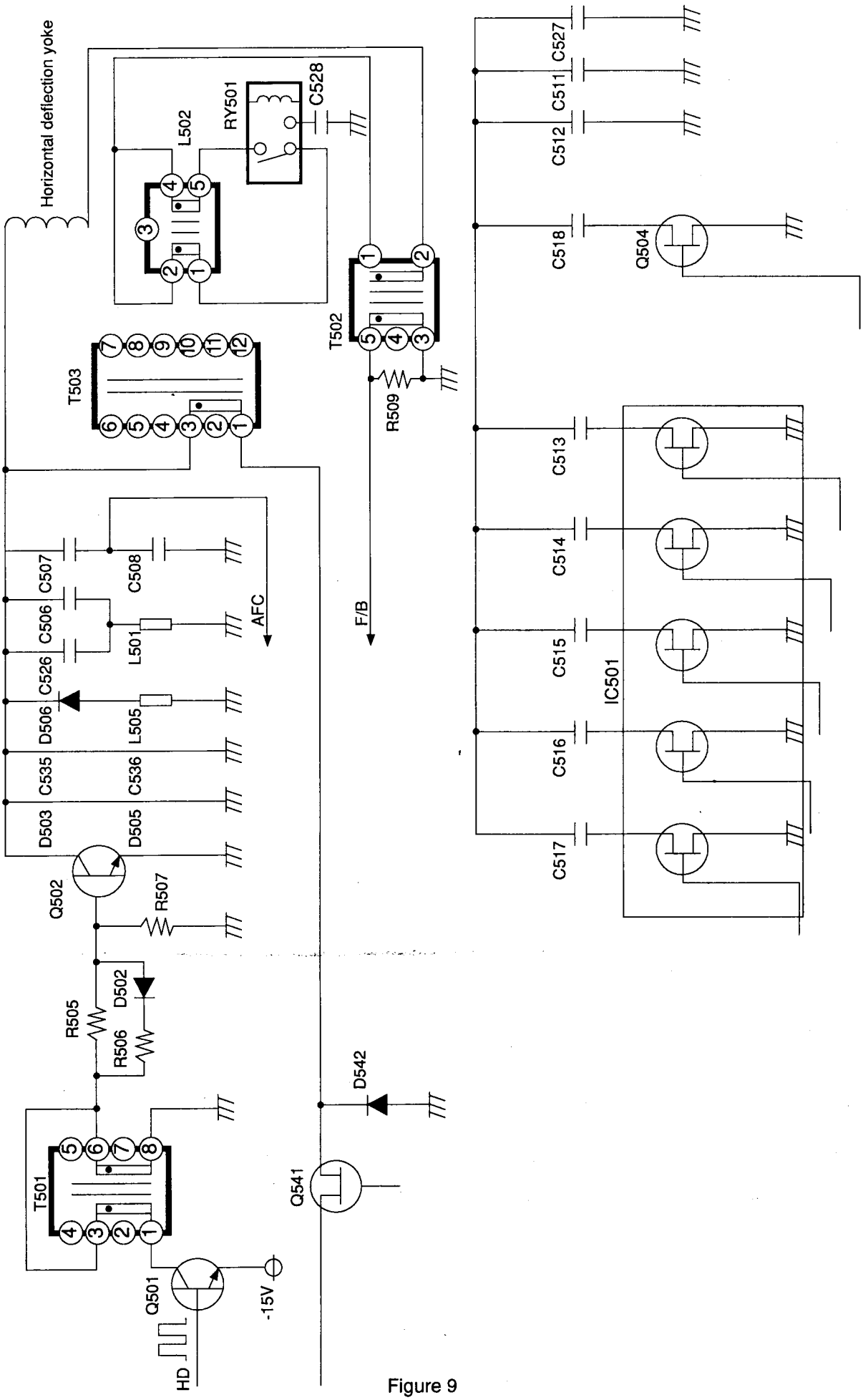

Horizontal deflection yoke
L502
RY501
C528
T502
T503
R509
F/B
AFC
C507
C508
C506
L501
C526
D506
L505
C535
C536
D503
D505
Q502
R507
R505
D502
R506
D542
T501
Q541
Q501
-15V
HD
C527
C511
C512
C518
Q504
C513
C514
C515
C516
C517
IC501

Figure 9

2.4 High-voltage circuit

(1) The horizontal deflection collector pulse is divided into approx. 1/15, and the pulse is input into the IC601 pin No. 4. When Q601 turns ON, energy is supplied to the high-voltage coil to generate a high voltage. To maintain the high voltage at a constant level regardless of the horizontal frequency or beam current amount, the high voltage is divided by the bleeder resistor in the T601. This is applied in the IC601 pin No. 6 and compared with the IC internal reference voltage.
The Q601 gate pulse width is varied by the IC601 pin No. 1 output so that these two voltages have the same potential.
In this manner, feedback control is carried out to keep the high voltage at a constant level.
The high voltage is set with VR601 (HV-ADJ). (24.0kV standard)

(2) The pulses detected from the T601 10 pin of tertiary coil is rectified by D605 and C604. When the high voltage reaches 28.5kV or more, that voltage is changed to 12.5V and is applied in the IC602 pin No. 5. When the voltage exceeds the IC internal reference voltage, the HIGH voltage is output from the IC pin No. 9, and the high voltage control pulse output from the IC601 pin No. 1 is stopped to shut down the high voltage circuit. This state is not cancelled until the power switch is turned OFF.

(3) The beam current that flows to T601 is detected by R613 and input in the IC602 pin No. 6. It is then compared with the IC internal reference voltage. When the beam current exceeds approx. 1400μA, the HIGH voltage is output from the IC pin No. 7, and the high-voltage control pulses output from the IC601 pin No. 1 are stopped to shut down the high-voltage circuit. This state is not cancelled until the power switch is turned OFF.

2.4.1 DBF circuit

The DBF circuit optimizes the focus at the center of the picture and at the periphery. There are two electrodes for the focus electrodes. A voltage having divided anode voltage is applied on both electrodes. The horizontal (approx. 360V) and vertical (approx. 140V) parabola waves are superimposed on the dynamic (F1) via the capacitor. The horizontal and vertical parabola waves are created at IC5P1, and then amplified at Q6E3, Q6E4, Q6E2, Q6E1, Q6E5, Q6E6 and T6E1. Then, these are added to the fly-back transformer T601.

2.5 Video block

2.5.1 Image signal amplifying circuit

The video circuit has the same configuration for R, G and B. The G (Green) video circuit will be explained in this section.
The video signal is input in the input signal select IC200 pins No. 5 (BNC input) and No. 12 (D-SUB input). When the pin No. 15 is LOW, the pin No. 5 is selected, and when the HIGH, the No. 12 pin is selected. The signal is then output from pin No. 23. The output from the IC200 pin No. 23 is input into the IC301 pin No. 2.
With the IC301, the video signal and adjustment picture (OSD) video signal, clamp signal and blanking signal are combined and output from pin No. 35.
The output from the IC301 pin No. 35 is input in the main up IC302 pin No. 1 and amplified.
The output from the IC302 pin No. 3 is AC-coupled at C315, and is then combined with the cutoff voltage (video output bias). After combining, it is supplied to the CRT cathode via the lead wire.

2.5.2 Synchronization separator circuit

The synchronization signal input from the D-SUB connector is input into the synchronization separator IC202 pin No. 3 (horizontal) and pin No. 13 (Vertical). The synchronization signal input from the BNC connector is input into the IC202 pin No. 2 (horizontal) and pin No. 14 (vertical). When the IC202 pin No. 1 is LOW, the BNC input is selected, and when HIGH, the D-SUB input is selected. The signal is then output from the IC202 pin No. 4 (horizontal) and pin No. 12 (vertical). The output from the IC202 pin No. 4 (horizontal) and pin No. 12 (vertical) is input into the IC203 pin No. 3 (horizontal) and pin No. 5 (vertical). The waveform is created and the signal is amplified, before being output from pin No. 4 (horizontal) and pin No. 6 (vertical). The Sync on Green signal is input with IC203 using the control signal from IC200.

2.5.3 On Screen Display circuit

The adjustment picture (OSD) control signal is input to the IC300 pin No. 5 (CLK), pin No. 6 (DATA), pin No. 18 (H-BLK), and pin No. 19 (V-BLK).
The signal output from pin No. 12 (BLKO), pin No. 13 (GOSD), pin No. 15 (ROSD) and pin No. 17 (BOSD) is combined with the video signal at IC301.

2.6 Control circuit

2.6.1 Outline

The control section is configured of the 8-bit single-chip MPU IC100, non-volatile memory IC101, deflection compensation control IC5P1, IC7A1, convergence compensation coil drive IC6J1 and geomagnetism cancel control IC303, etc.

2.6.2 Rotation circuit

The rotation circuit compensates the inclination of the picture caused by geomagnetism. Adjustments are made by passing a DC current to the rotation coil wound on the front side of the DY. Control is carried out by IC100#4 (PWM_DAC) to 0 to 5V (J103#1 to J802#1) using 2.5V as a reference. A DC current is passed to the rotation coil from IC113.

2.6.3 Corner purity circuit

The corner purity circuit compensates the color unevenness or color unmatching at the picture corner. Adjustments are made by passing a DC current to the corner purity coil installed on the four corners of the picture on the back side of the CRT.

- The upper left corner of the picture is controlled by IC106#1 (12C control_DAC) to 0 to 5V using 2.5V as a reference. Then, a +/- DC current is passed to the upper left corner purity coil from IC107#7, #8.
- The upper right corner of the picture is controlled by IC106#2 (12C control_DAC) to 0 to 5V using 2.5V as a reference. Then, a +/- DC current is passed to the upper right corner purity coil from IC107#10, #11.
- The lower left corner of the picture is controlled by IC106#3 (12C control_DAC) to 0 to 5V using 2.5V as a reference. Then, a +/- DC current is passed to the lower left corner purity coil from IC107#7, #8.
- The lower right corner of the picture is controlled by IC106#4 (12C control_DAC) to 0 to 5V using 2.5V as a reference. Then, a +/- DC current is passed to the lower right corner purity coil from IC107#10, #11.

2.6.4 Geomagnetism canceler circuit

The geomagnetism canceler circuit detects the meridional horizontal magnetic field (IC305#5) with the IC303 (geomagnetism sensor unit). That detected voltage is read by IC100#14 (MPU_ADC) and the following cancel function is automatically controlled by the specified control program.

The IC303 (geomagnetism sensor unit) output voltage operates as follows.

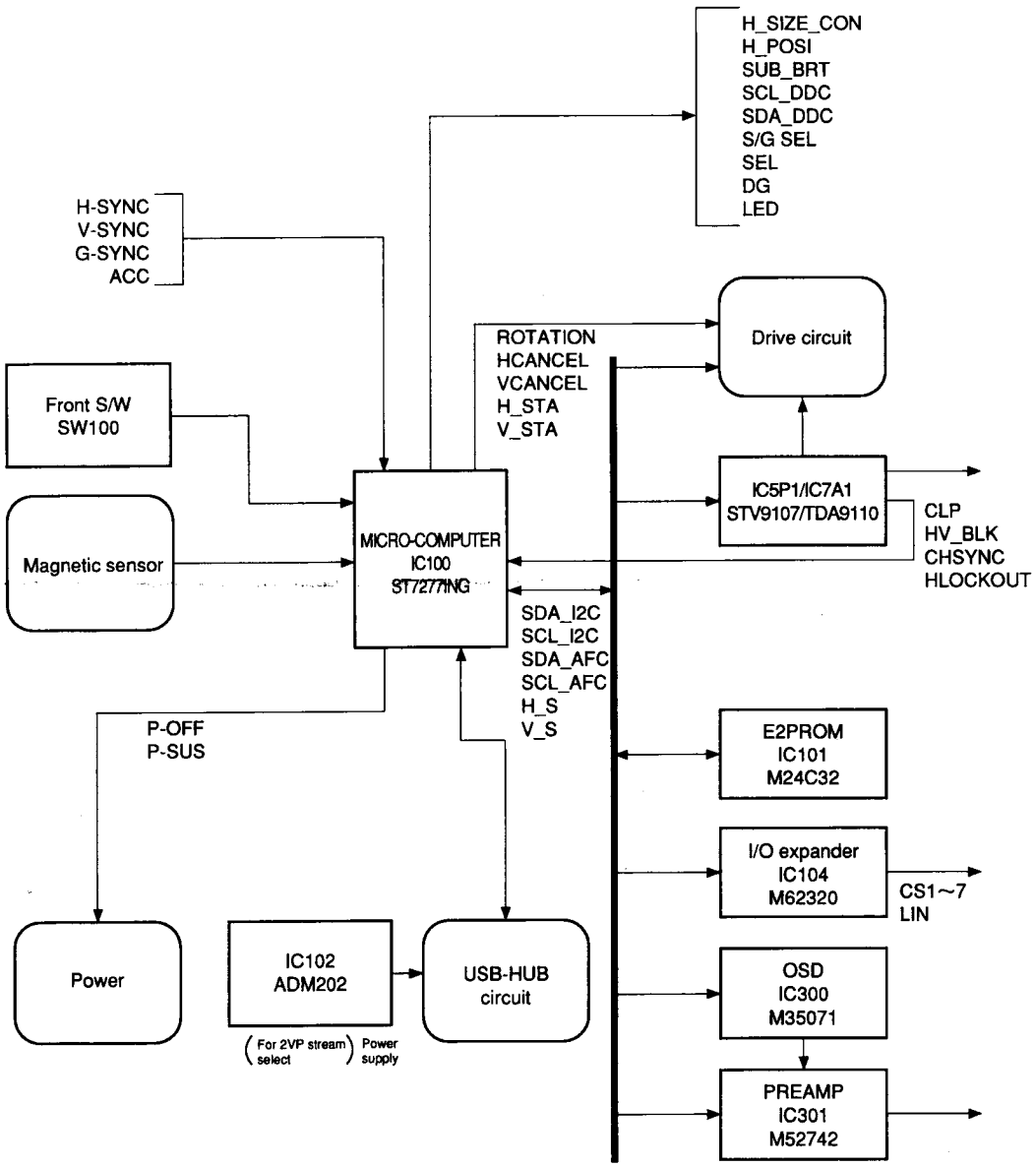
- Meridional horizontal magnetic field (IC305#5): 0.5V (-0.04mT) to 2.5V (±0.00mT) to 4.0V (+0.04mT)

2.6.4.1 Meridional horizontal magnetic field cancel function

2.6.4.1.1 Horizontal magnetic field landing cancel

The horizontal magnetic field landing cancel circuit compensates the color unevenness and color unmatching that occurs in the horizontal direction, which is the reverse direction at the upper edge and bottom edge of the monitor display picture. Automatic adjustments are made by passing a DC current to the purity coil wound around the display picture. The current is controlled to 0 to 5 by IC100#2 (PWM_DAC), using 2.5V as reference, and a DC current is passed to the purity coil from IC112.

next Yhj element is compensated in this state. When compensated with the values added and



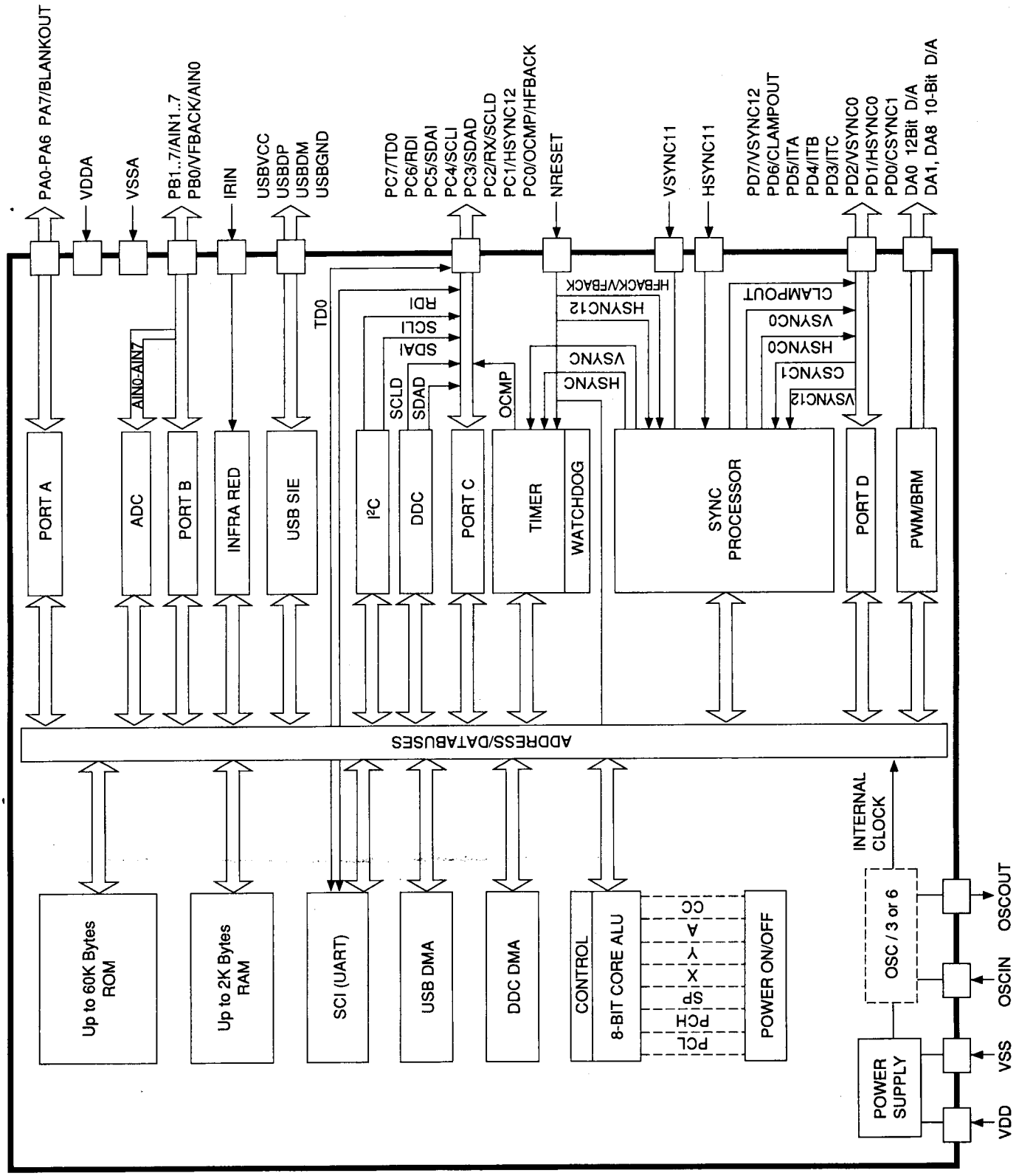
I2C bus line connection IC list

Signal name : SDA_I2C, SCL_I2C

IC sources	IC models	Slave Address	PWB	Remarks
IC300	M35071	7C/7D	VIDEO	
IC301	M52742SP	88/89	VIDEO	
IC5P1	STV9107	8C/8D	MAIN	
IC802	STV9107/M	8E/8F	DY-SUB	Not used for A chassis only for B chassis
IC101	M24C32WMN6T	A0/A1	MAIN	Variable
IC104	M62320FP	70/71	MAIN	Variable
IC106	M62334FP	98/99	MAIN	

Signal name : SDA_AFC, SCL_AFC

IC sources	IC models	Slave Address	PWB	Remarks
IC7A1	TDA9110	8C/8D	DEFL-SUB	


PA0-PA6 PA7/BLANKOUT
VDDA
VSSA
PB1..7/AIN1..7
PB0/VFBACK/AIN0
IRIN
USBVCC
USBDP
USBDM
USBGND
PC7/TD0
PC6/RDI
PC5/SDAI
PC4/SCLI
PC3/SDAD
PC2/RX/SCLD
PC1/HSYNC12
PC0/OCMP/HFBACK
NRESET
VSYNC11
HSYNC11
PD7/VSYNC12
PD6/CLAMPOUT
PD5/ITA
PD4/ITB
PD3/ITC
PD2/VSYNC0
PD1/HSYNC0
PD0/CSYNC1
DA0 12Bit D/A
DA1, DA8 10-Bit D/A
AIN0-AIN7
TD0
RDI
SCLI
SDAI
SCLD
SDAD
OCMP
HFBACK/VFBACK
HSYNC12
VSYNC
HSYNC
CLAMPOUT
VSYNC0
HSYNC0
CSYNC1
VSYNC12
PORT A
ADC
PORT B
INFRA RED
USB SIE
I²C
DDC
PORT C
TIMER
WATCHDOG
SYNC PROCESSOR
PORT D
PWM/BRM
ADDRESS/DATABUSES
Up to 60K Bytes ROM
Up to 2K Bytes RAM
SCI (UART)
USB DMA
DDC DMA
CONTROL
8-BIT CORE ALU
PCL
PCH
SP
X
A
CC
POWER ON/OFF
INTERNAL CLOCK
OSC / 3 or 6
POWER SUPPLY
OSCOUT
OSCIN
VSS
VDD

A Chassis MPU pin assignment

PIN No.	IN/OUT	FUNCTION	ASSIGNMENT	POSI/NEG.	Initial state	Remarks
1	OUT	DA0	SUB BRIGHT(D/A)	POSI		
2	OUT	DA1	HCANCEL(D/A)	POSI		
3	OUT	DA2	NOT USED	POSI		
4	OUT	DA3	ROTATION(D/A)	POSI		
5	OUT	DA4	NOT USED	POSI		
6	OUT	DA5	H-STATIC(D/A)	POSI		
7	OUT	DA6	H-POSI(D/A)	POSI		
8	OUT	DA7	H-SIZE(D/A)	POSI		
9	OUT	DA8	NOT USED	POSI		
10	—	VSSA	GND(A)	—	—	
11	—	VDDA	+5V(A)	—	—	
12	IN	PB7	FRONT BUTTON(A/D)	POSI		
13	IN	PB6		POSI		
14	IN	PB5	XOUT(A/D)	POSI		
15	IN	PB4		POSI		
16	IN	PB3	ACC(A/D)	POSI		
17	IN	PB2	H-DET(A/D)	POSI		
18	IN	PB1		POSI		
19	IN	PB0/VFBACK	USB UPB VCC			
20	IN	VSYNCI1	VSYNC	NEG.		Inverting input
21	IN	PD7/VSYNCI2/ITD	USB UPA VCC			
22	OUT	PD6/CLAMPO	P-OFF			
23	IN	PS5/ITA	CHSYNC	POSI		
24	IN	PD4/ITB	HLOCKOUT			
25	OUT	PD3/ITC	P-SUS			
26	OUT	PD2/VSYNCO	VSYNC	NEG.		
27	OUT	PD1/HSYNCO	HSYNC	NEG.		
28	IN	PD0/CSYNCI	CSYNC			
29	—	VSS	GND(D)	—	—	
30	IN	HSYNCI1	HSYNC			Inverting input
31	—	VDD	+5V(D)	—	—	
32	OUT	PC0/OCMP/HFBACK	DEGAUSS			
33	OUT	PC1HSYNCI2	CONNECTOR			
34	IN	PC2/SCLD(DDC)/RX	SCL(DDC)	POSI		
35	IN/OUT	PC3/SDAD(DDC)	SDA(DDC)	POSI		
36	OUT	PC4/SCLI(I2C)	SCL(12C)	POSI		
37	IN/OUT	PC5/SDAI(I2C)	SDA(12C)	POSI		
38	IN	PC6/RDI(SCI)				
39	OUT	PC7/TDO(SCI)				
40		USBGND	USBGND			
41		USBDM	USBDM			
42		USBDP	USBDP			
43		USBVCC	USBVCC			
44	OUT	OSCOUT	CRYSTAL(OUT)	POSI		
45	IN	OSCIN	CRYSTAL(IN)	POSI		
46	IN	PA7/BLANKO	HUBSUS(IN)			
47	OUT	PA6	UPSEL(OUT)			
48	IN	PA5	SDAIAFC(IN)			
49	OUT	PA4	SDAOAFC(OUT)			
50	OUT	PA3	SCLAFC(OUT)			
51	OUT	PA2	S/GSEL(OUT)	POSI		
52	OUT	PA1	LEDY(OUT)			
53	OUT	PA0	HUB RESET	—	—	
54	IN	NOT(NRESET)	RESET(IN)			
55	—	IRIN	GND	—	—	
56	—	VPP/TEST	GND	—	—	

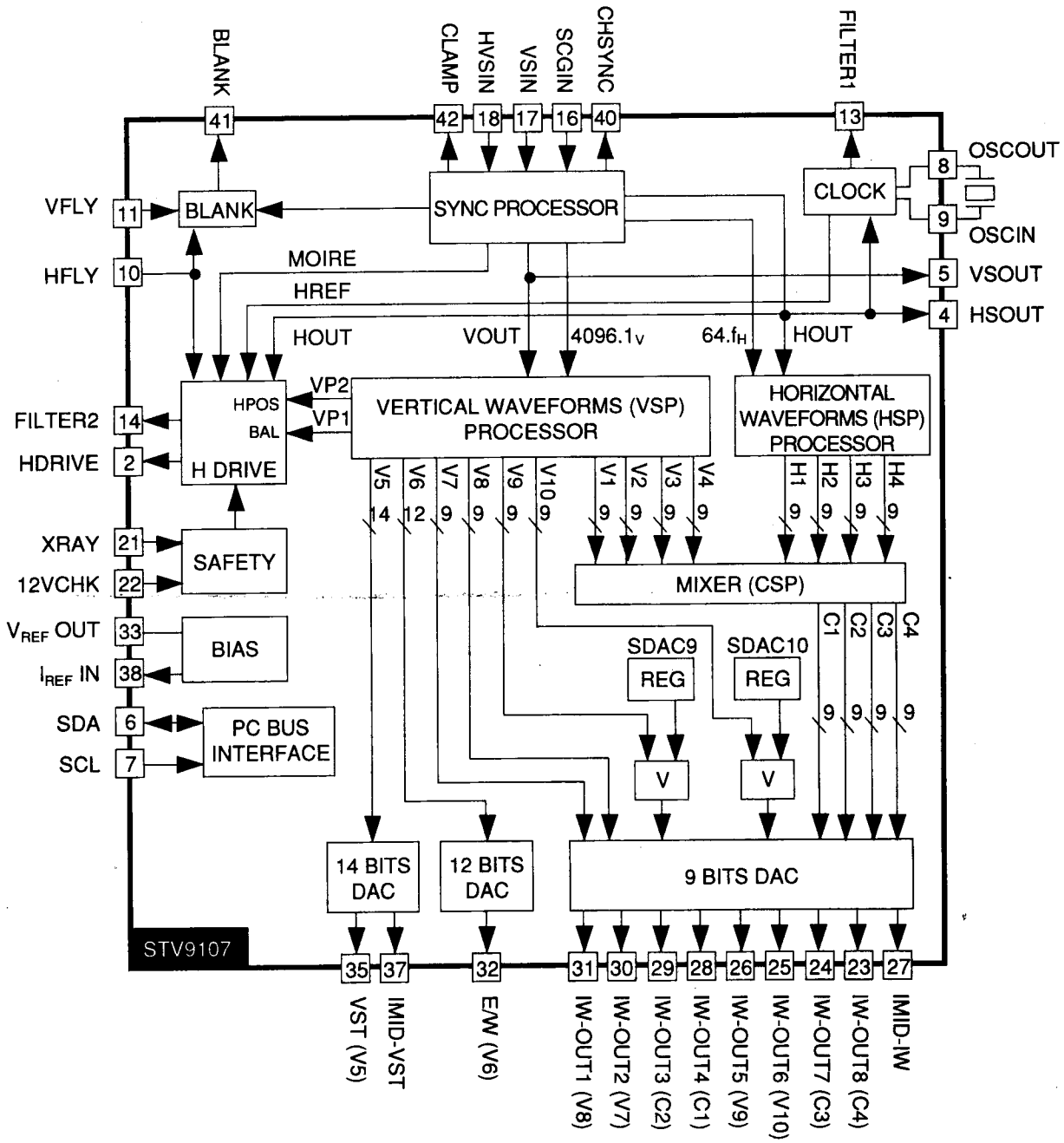
2.6.5 Deflection compensation

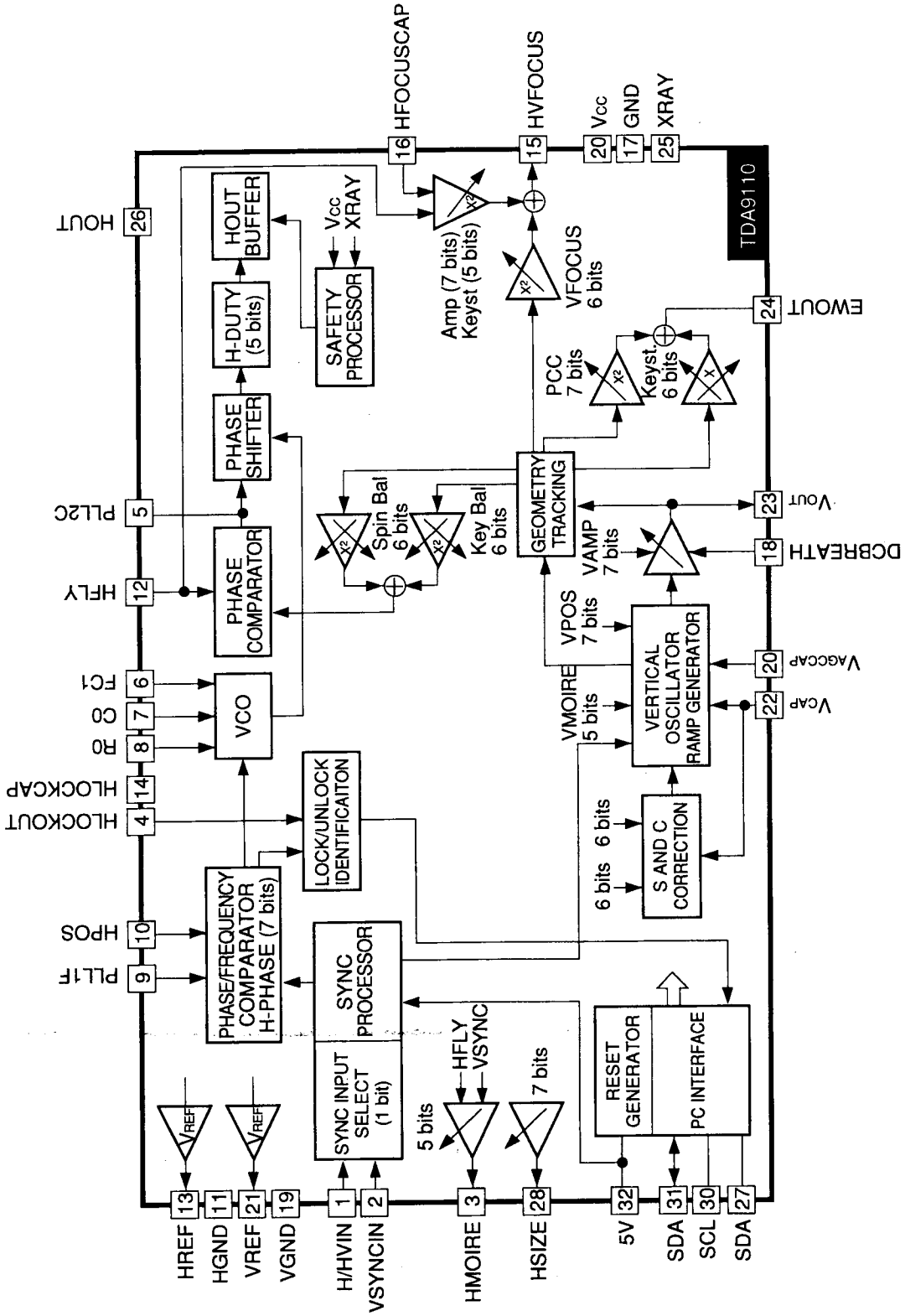
2.6.5.1 PCC

The PCC includes CENTER-PCC, TOP-PCC, BOTTOM-PCC, PCC-PHASE, CORNER-PCC-BALANCE, and CENTER-PCC-BALANCE. These signals send data via the I2C bus to the deflection control IC5P1 (STV9107) from the MPU IC100.
At the IC5P1, the signals are incorporated into the internal calculation expression based on the received data, and are input from pin No. 32 to the +B control IC5J1 (BA9757) on the main PWB.

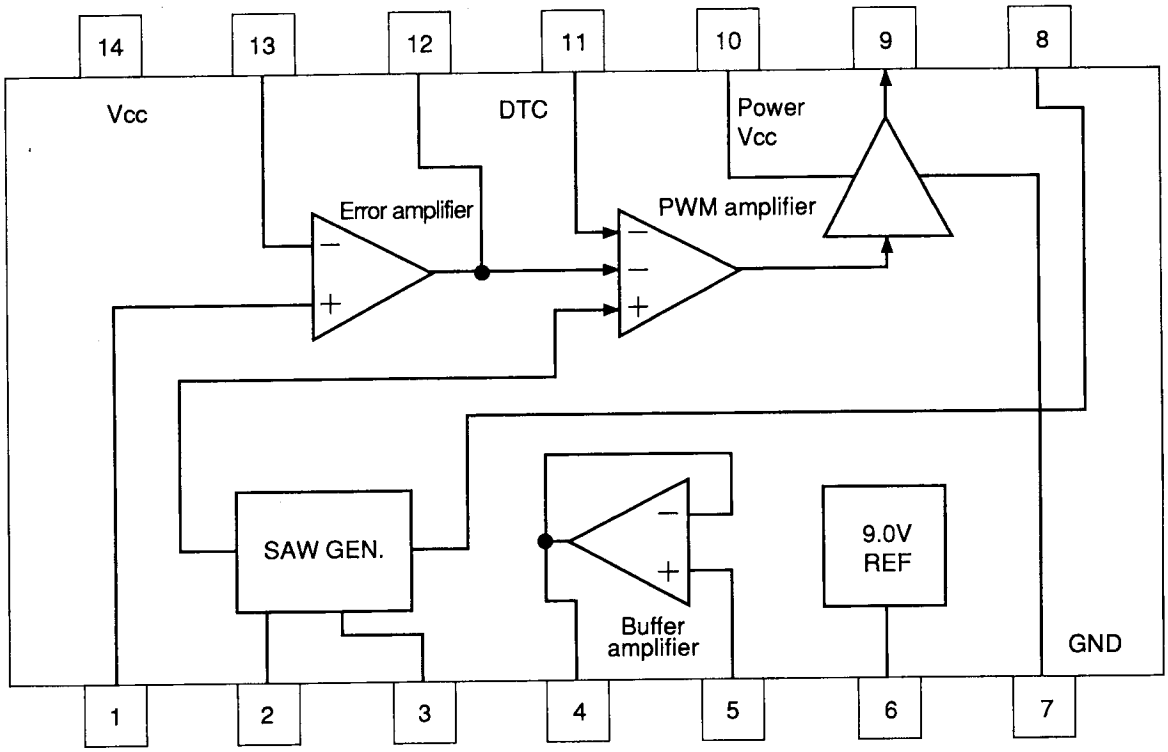
2.6.5.2 PIN-KEY

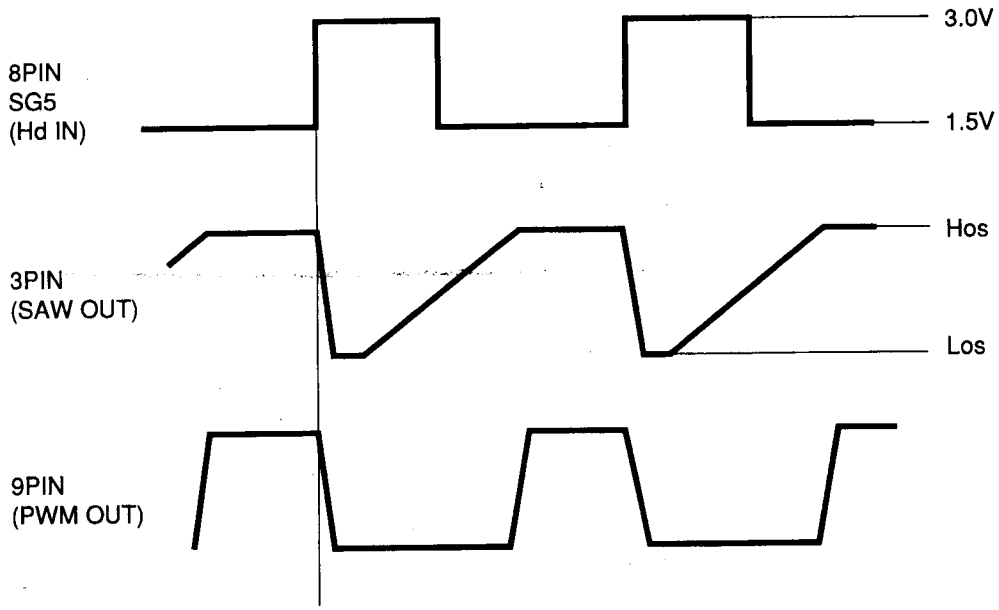
The PIN-KEY includes PIN-BALNACE and KEY-BALANCE. These signals send data via the I2C bus to the deflection control IC5P1 (STV9107) from the MPU IC100. At the IC5P1, the signals are incorporated into the internal calculation expression based on the received data, and are output from pin No. 31. The signals are then input to pin No. 10 of the other deflection control IC7A1 (TDA9110) on the DEFL-SUB PWB via J7A2. At IC7A1, the input PIN-KEY signal is incorporated in the H-DRIVE signal and output from pin No. 26.





IC7A1 TDA9110





IC5J2 BA9757

2.7 Control software

2.7.1 Outline

The outline of the MPU (IC100) process is as follows.

(1) Input SYNC judgment
The frequency counter and polarity of Sync input from the PWB-I/F is judged, and whether the picture adjustment value is the registered timing is judged.

(2) Picture adjustment function
The adjustment value stored in the EEPROM (IC101) is read based on the input Sync frequency, and the picture size/position/distortion and brightness/color coordination, etc., are set.

(3) POWER SAVE function
The suspend mode or complete off mode are entered according to the input Sync and POWER SAVE ON/OFF function.

(4) Input connector select
The BNC/DSUB connector is selected. If the input Sync is not available for either H or V, the other connector is automatically checked, and operation takes place with the connector side for which the input is confirmed.

(5) External communication (DDC)
The DDC1/2B/2Bi functions are provided.

(6) External communication (USB Function)
The communication functions for adjusting the picture in accordance with the USB Monitor Control Class are provided.

2.7.2 Input SYNC judgment

(1) Operation frequency range
- Horizontal frequency: 30kHz to 115kHz
- Vertical frequency: 50Hz to 160Hz

(2) Max. No. of memorized timings
- Preset timings: 22 timings
- User timings: 15 timings

(3) Judgment of memorized timing
The state of the input SYNC and the state of the SYNC saved in the EEPROM are compared. When the following conditions (a), (b) and (c) are all satisfied, it is judged as the memorized timing.
(a) The input SYNC polarity is the same for both H and V
(b) The difference of the horizontal frequency is within 0.5kHz
(c) The difference of the vertical frequency is within 0.5Hz

Order of comparing directories:
The directories are compared in the order of PRESET0→PRESET1→... PRESET21→ USER0→USER1→ ... USER14.

If the same timing is judged midway, the comparison step is stopped, and the corresponding adjustment value is read from the EEPROM.

(4) Order for saving user timing

When a new timing is input and the picture is adjusted, the input SYNC frequency, polarity and adjustment value at that time are saved in the EEPROM.

If 15 (max.) user timings are already saved, the oldest timing will be deleted, and the new timing information will be saved.

2.7.3 Picture adjustment function

The picture adjustment modes include the following:

User mode: Normal monitor adjustment mode.

Factory adjustment mode: Mode dedicated for factory adjustments. The factory dedicated adjustment items can be adjusted.

When the input timing is the preset timing, the adjustment value in this mode will be the adjustment value for reset and center click.

Refer to "Adjustment procedures: 3.8 Adjustment" for details on entering the factory adjustment mode and returning to the user mode.

A list of adjustment items is given on the following pages.

*Center click: If the adjustment item per timing for preset timing or a common adjustment item is selected with the OSD, and the AJD state is entered by pressing the ENTER button, the adjustment value will return to the factory adjustment value when the + and - buttons are pressed simultaneously.

2.7.4 POWER SAVE function

When the OSD adjustment item "POWER SAVE" is "ON", the POWER SAVE mode will be entered when the H or VSYNC input stops.

The input SYNC and POWER SAVE mode correspond as follows.

HSYNC	VSYNC	Mode
×	○	Suspend mode
○	×	Suspend mode
×	×	Complete OFF mode

(1) Suspend mode

By setting P_OFF (IC100#22) to HIGH and P_SUS (IC100#25) to LOW, the power output other than +6.5V, +5V, P-OFF+5V, D3.3V and HEATER will stop.

If the SYNC input from the selected input connector is stopped only for H or V, the suspend mode will be entered.

In this mode, the input connector selection and POWER SAVE mode will be maintained until the H and V are both input into the selected input connector, or until both H and V SYNC are stopped.

(2) Complete OFF mode

By setting P_SUS (IC100#25) to LOW and P_OFF (IC100#22) to LOW, the power output other than +6.5V, +5V and D3.3V will stop.

The complete off mode will be entered when both the H and V SYNC input from the selected input connector is stopped.

In this mode, the connector on the opposite side is checked at a one-second interval, and if there is a SYNC input at that connector, the complete off mode will be cancelled.

(3) Transition to POWER SAVE mode
When the POWER SAVE mode is entered, the OSD and POWER LED will operate as follows.
(Common for suspend and complete off modes.)

(i) When the input SYNC stops, the following yellow background OSD will appear.

ATTENTION NO SIGNAL H : OFF (or ON) V : OFF (or ON) PLEASE CHECK INPUT SIGNAL OR CONNECTION

(ii) After the above state continued for approx. five seconds, the following white back ground OSD will appear.

POWER SAVE

(iii) After the above state continued for approx. one second, the POWER SAVE mode will be entered. After entering the mode, the POWER LED will change to orange.

2.7.5 Input connector select

The B chassis has the two input systems BNC and DSUB, which can be used when selected. The select function operates as follows.

(1) When power is turned ON
The input connector having displayed the previous picture is selected.

(2) Select with BNC/DSUB button
When the BNC/DSUB button is pressed, the connector opposite the currently selected input connector will be selected.

(3) When SYNC is not input correctly
(a) When input SYNC is OUT OF RANGE
That input connector will be held, and the OUT OF RANGE OSD will appear.

(b) When only H or VSYNC is input
That input connector will be held, and the NO SIGNAL OSD will appear, or the POWER SAVE mode will be entered.

(c) When neither H nor VSYNC is input
Input connector will be switched to the other at one-second intervals. If there is a SYNC input, that input connector selection will be held. If there is no SYNC input even at the other input connector, the one-second interval switching will be continued. The NO SIGNAL OSD will appear, or the POWER SAVE mode will be entered.

	User free	Data management		Reset			Center click
		Each timing	Common	All	Color	Screen	
CONTRAST	○		○	○			○
BRIGHT	○		○	○			○
COLO NO	○	○		○			
R-GAIN(COLOR 1, 2, 3)	○		○	○	○		○
G-GAIN(COLOR 1, 2, 3)	○		○	○	○		○
B-GAIN(COLOR 1, 2, 3)	○		○	○	○		○
COLOR TEMPERATURE 1, 2, 3	○		○	○	○		○
COLOR RESET 1, 2, 3	○	–	–	–	–	–	–
H-SIZE	○	○		○		○	○
H-PHASE	○	○		○		○	○
H-POSITION	○	○		○		○	○
V-SIZE	○	○		○		○	○
V-POSITION	○	○		○		○	○
PCC-AMP	○	○		○		○	○
PCC-PHASE	○	○		○		○	○
PCC-CENTER	○	○		○		○	○
TOP-PCC	○	○		○		○	○
BOTTOM-PCC	○	○		○		○	○
PIN-BALANCE	○	○		○		○	○
KEY-BALANCE	○	○		○		○	○
CORNER-BALANCE	○	○		○		○	○
PCC-CENRER-BALANCE	○	○		○		○	○
V-LIN-BALANCE	○	○		○		○	○
V-LIN	○	○		○		○	○
ROTATION	○		○	○			○
ZOOM	○		○	○		○	○
GEOMETRY RESET	○	–	–	–	–	–	–
TEXT MODE	○	○		○			
H-CONVERGENCE	○		○	○			○
V-CONVERGENCE	○		○	○			○
V-CONVERGENCE-TOP	○		○	○			○
V-CONVERGENCE-BOTTOM	○		○	○			○
CORNER PURITY (TL)	○		○	○			○
CORNER PURITY (TR)	○		○	○			○
CORNER PURITY (BL)	○		○	○			○
CORNER PURITY (BR)	○		○	○			○
MOIRE CANCEL	○	○		○			
MOIRE CANCEL LEVEL	○	○		○			○
CLAMP PULSE POSITION	○	○		○			
VIDEO LEVEL	○	○		○			
DEGAUSS	○	–	–	–	–	–	–
POWER SAVE	○		○	○			
CONTROL LOCK	○		○	○			
OSD POSITION	○		○	○			
ALL RESET	○	–	–	–	–	–	–
GTF AUTO ADJUST	○	–	–	–	–	–	–
DIAGNOSIS	○	–	–	–	–	–	–
LANGUAGE	○		○				
USB UP-STREAM	○		○	○			
USB PORT COMBINATION	○		○	○			
DBF H AMP (X2-L)		○		○	–	○	–
DBF H AMP (X2-R)		○		○	–	○	–
DBF H AMP (X4-L)		○		–	–	–	–
DBF H AMP (X4-R)		○		–	–	–	–
DBF H PHASE		○		–	–	–	–
DBF V AMP (X2)		○		–	–	–	–
R BIAS (COLOR 1)			○	○	○	–	–
G BIAS (COLOR 1)			○	○	○	–	–
B BIAS (COLOR 1)			○	○	○	–	–
R BIAS (COLOR 2)			○	○	○	–	–
G BIAS (COLOR 2)			○	○	○	–	–
B BIAS (COLOR 2)			○	○	○	–	–
R BIAS (COLOR 3)			○	○	○	–	–
G BIAS (COLOR 3)			○	○	○	–	–
B BIAS (COLOR 3)			○	○	○	–	–
SUB-BRIGHT			○	–	–	–	–
ABL			○	–	–	–	–
H-PURITY			○	–	–	–	–

2.8 USB circuit

2.8.1 Outline

The A chassis has a function to monitor and control with the 2 upstream/3 downstream USB SELF POWERED HUB and USB.

<USB HUB controller (IC1A0)>

This is mainly configured a regulator (IC1A1) for supplying the Vbus with overcurrent detection.

(1) Data signal

The data signal is connected from the root port connector (J1A4 or J1A5) to the controller (IC1A0) root port. The data signal is connected from the IC1A0 downstream ports 1, 2 and 5 to each downstream port connector (J1A2, J8A7). The controller waits for data communication between the upstream side and downstream side.

(2) 2 upstream

The A chassis has two root port connectors (ROOT A and ROOT B). The data signal from the ROOT A or B is connected from the analog switch (IC1A2) to the controller (IC1A0) root port.

If either ROOT A or B is connected, that root port will be connected to automatically.

If both ROOT A and B are connected, which port to be connected to can be selected with OSD settings.

(3) Power supply to downstream

The B chassis USB HUB is a SELF POWERED HUB. A +5V power is supplied from the regulator (IC1A1) to each downstream port.

An overcurrent detection function is provided, so if an overcurrent is detected at any of the downstream ports, the power supply to the downstream port will stop.

(4) USB monitor control

The controller (IC1A0) downstream 3 (IC1A0 #9, 10) is connected to the MPU (IC100) USB port (#42, 41), and monitoring and control by the USB can be carried out with this.

2.8.2 USB 2 upstream

The MPU (IC100) inputs the UPSEL signal (IC100#47) into the analog switch (IC1A2), and connects either the ROOT A or B data signal to the controller (IC1A0) root port.

The Vbus (#1) of each root port connector is connected to the MPU (IC100), and when the voltage reaches HI, the MPU judges this as an upstream connection.

UPSEL	Selected ROOT
LOW	ROOT B (J1A5)
HIGH	ROOT A (J1A4)

The MPU controls as follows according to the connections.

(1) When both ROOT A and B are not connected.

When both UPA (IC100#21) and UPB (IC100#19) are LOW, the UPSEL setting is held, and the OSD "USB UPSTREAM" display changes to "NO ROOT CONNECTION".

(2) When either ROOT A or B is connected

When either UPA or UPB is HI, the MPU controls with the UPSEL signal so that the data signal of that root port is connected to the controller (IC1A0).

At this time, the OSD "USB UPSTREAM" display changes to blue only for the connected root.

(3) When both ROOT A and B are connected

When either UPA or UPB is HI, ROOT A or B is selected with the OSD setting. At this time, the OSD "USB UPSTREAM" display changes to blue only for the selected root, and to black for all other roots.

(a)When root is selected with +/- buttons at OSD "USB UPSTREAM"

The OSD designation (blue characters) root port is selected.

This selection status is saved in the EEPROM (IC101), and the selection of that route is held regardless of the BNC/DSUB connector selection state. The OSD "USB PORT COMBINATION" display changes to black characters.

(b) When the combination with the input connector is selected with the +/- buttons at OSD "USB PORT COMBINATION", the combination designated with the +/- button is dis played in blue.

The root corresponding to the input connector designated and displayed on the picture is selected with the combination of the OSD designation (blue characters).

2.8.3 USB downstream power supply

The power supply and overcurrent detection to the B chassis downstream is carried out with the 3 downstream together.

(1) Vbus power supply

When the controller (IC1A0) is recognized from the root port direction, the current output signal at the downstream is output from IC1A0 #33. When #1, 5 and 9 are set to HI, the power regulator (IC1A1) supplies a 5V power to each downstream port (J1A2 #1, 5, J8A7 #1).

(2) Overcurrent detection

The regulator (IC1A1) has an overcurrent detection function. When the current output of each port reaches 550mA (min.) or more, the current output from that port is automatically stopped, and the corresponding overcurrent detection flag terminal (IC1A1 #2, #6 or #10) is grounded.

The overcurrent detection flag terminal is an open collector output, which is pulled up to +5V at R1H7. LOW is input into the controller overcurrent detection input terminal (IC1A0 #26).

When the controller (IC1A0) detects this signal, it turns IC1A1 #1, 5, and 9 to LOW to disable the current output.

With this, the current output at all downstream ports is stopped.

The regulator (IC1A1) has a function to stop the overcurrent detection for a set time after current output starts to avoid malfunctioning of the overcurrent detection caused by the rush current. This time is controlled by the external capacitors (C1C1, C1D8, C1D4).

2.8.4 USB monitor control

The USB monitor control is carried out by the MPU (IC100) connected to the downstream port (DOWN3) of the USB HUB controller(IC1A0). A low-speed (1.5Mbps) compatible USB interface circuit is built into the MPU. When the monitor is connected to a PC, the various descriptors saved in the MPU memory are sent from the monitor to the PC. The monitor USB interface is recognized as an HID (Human Interface Device) Class compatible peripheral device, and the required drivers are automatically installed. To adjust the monitor, the monitor adjustment software (Diamond Control) is required. This can be downloaded from the Mitsubishi internet home page. For the HID class driver required for USB monitor control, the driver enclosed as a standard with Windows 98 can be used. The various descriptors of the A chassis are given below.

Descriptor of USB Monitor function

(1) Report descriptor

```
0x05, 0x80,          // USAGE_PAGE (Monitor)  (#10)
0x09, 0x01,          // USAGE (Monitor Control)
0xa1, 0x01,          // COLLECTION (Application)
0x05, 0x82,          // USAGE_PAGE (VESA Virtual Controls)
0x75, 0x08,          // REPORT_SIZE (8)
0x85, 0x04,          // REPORT_ID (4)  (#20)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x25, 0x7f,          // LOGICAL_MAXIMUM (127) changed moto 255
0x95, 0x02,          // REPORT_COUNT (2)
0x09, 0x20,          // USAGE (Horizontal Position )
0x09, 0x30,          // USAGE (Vertical Position )
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x20,          // USAGE (Horizontal Position )
0x09, 0x30,          // USAGE (Vertical Position )
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x1d,          // REPORT_ID (29)  (#17)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x01,          // REPORT_COUNT (1)
0x09, 0x18,          // USAGE (Video Gain Green)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x18,          // USAGE (Video Gain Green)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x06,          // REPORT_ID (6) (#21)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x02,          // REPORT_COUNT (2)
0x09, 0x16,          // USAGE (Video Gain Red)
0x09, 0x1a,          // USAGE (Video Gain Blue)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x16,          // USAGE (Video Gain Red)
0x09, 0x1a,          // USAGE (Video Gain Blue)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x12,          // REPORT_ID (18)  (#25) //added 98.10.20
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x03,          // REPORT_COUNT (3) //debuged 98.11.5 moto 1
0x09, 0x6D,          // USAGE (Video Red Bias)
0x09, 0x6F,          // USAGE (Video Blue Bias)
0x09, 0x71,          // USAGE (Video Green Bias)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x6D,          // USAGE (Mitsubishi Reserved)
0x09, 0x6F,          // USAGE (Mitsubishi Reserved)
0x09, 0x71,          // USAGE (Mitsubishi Reserved)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x03,          // REPORT_ID (3)          (#17)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x01,          // REPORT_COUNT (1)
0x09, 0x10,          // USAGE (Brightness)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x10,          // USAGE (Brightness)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x05,          // REPORT_ID (5)       (#16)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x25, 0x7f,          // LOGICAL_MAXIMUM (127)
```

```
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x32,          //  USAGE (V-SIZE)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x32,          //  USAGE (V-SIZE)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x07,          //  REPORT_ID (7)    (#16) //added 98.10.20
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x25, 0x03,          //  LOGICAL_MAXIMUM (3)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x14,          //  USAGE (Color No.)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x14,          //  USAGE (Color No.)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x09,          //  REPORT_ID (9)    (#17)
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    //  LOGICAL_MAXIMUM (255)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x42,          //  USAGE (PCC-PHASE)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x42,          //  USAGE (PCC-PHASE)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x0A,          //  REPORT_ID (10)   (#16)
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x25, 0x3f,          //  LOGICAL_MAXIMUM (63)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x40,          //  USAGE (KEY-BALANCE)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x40,          //  USAGE (KEY-BALANCE)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x0B,          //  REPORT_ID (11)   (#16)
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x25, 0x7f,          //  LOGICAL_MAXIMUM (127)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x24,          //  USAGE (PCC-AMP)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x24,          //  USAGE (PCC-AMP)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x0C,          //  REPORT_ID (12)   (#16)
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x25, 0x3f,          //  LOGICAL_MAXIMUM (63)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x26,          //  USAGE (PIN-BALANCE)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x26,          //  USAGE (PIN-BALANCE)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x0D,          //  REPORT_ID (13)   (#17)
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    //  LOGICAL_MAXIMUM (255)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0x44,          //  USAGE (ROTATION)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x44,          //  USAGE (ROTATION)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x0E,          //  REPORT_ID (14)   (#17)
0x15, 0x01,          //  LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    //  LOGICAL_MAXIMUM (255)
0x95, 0x01,          //  REPORT_COUNT (1)
0x09, 0xE5,          //  USAGE (CORNER-BALANCE)
0xb1, 0x62,          //  FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0xE5,          //  USAGE (CORNER-BALANCE)
0x81, 0x62,          //  INPUT (Data,Var,Abs,NPrf,Null)
```

```
0x85, 0x0F,          // REPORT_ID (15)    (#17)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x01,          // REPORT_COUNT (1)
0x09, 0xE6,          // USAGE (PCC-CENTER)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0xE6,          // USAGE (PCC-CENTER)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x10,          // REPORT_ID (16)    (#21)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x02,          // REPORT_COUNT (2)
0x09, 0x46,          // USAGE (PCC-TOP-CORNER)
0x09, 0x4a,          // USAGE (PCC-BOTTOM-CORNER)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x46,          // USAGE (PCC-TOP-CORNER)
0x09, 0x4a,          // USAGE (PCC-BOTTOM-CORNER)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x11,          // REPORT_ID (17)    (#21)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x02,          // REPORT_COUNT (2)
0x09, 0x28,          // USAGE (H-STATIC)
0x09, 0x38,          // USAGE (V-STATIC)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x28,          // USAGE (H-STATIC)
0x09, 0x38,          // USAGE (V-STATIC)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x16,          // REPORT_ID (22)    (#28)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x25, 0x7E,          // LOGICAL_MAXIMUM (126)
0x95, 0x04,          // REPORT_COUNT (4)
0x09, 0xE8,          // USAGE (C-PURTITY(TL))
0x09, 0xE9,          // USAGE (C-PURTITY(TR))
0x09, 0xEA,          // USAGE (C-PURTITY(BL))
0x09, 0xEB,          // USAGE (C-PURTITY(BR))
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0xE8,          // USAGE (C-PURTITY(TL))
0x09, 0xE9,          // USAGE (C-PURTITY(TR))
0x09, 0xEA,          // USAGE (C-PURTITY(BL))
0x09, 0xEB,          // USAGE (C-PURTITY(BR))
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x17,          // REPORT_ID (23)    (#21)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x02,          // REPORT_COUNT (2)
0x09, 0xF2,          // USAGE (V-CONV-TOP)
0x09, 0xF3,          // USAGE (V-CONV-BOTTOM)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0xF2,          // USAGE (V-CONV-TOP)
0x09, 0xF3,          // USAGE (V-CONV-BOTTOM)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x1A,          // REPORT_ID (26)    (#17)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x01,          // REPORT_COUNT (1)
0x09, 0xE7,          // USAGE (PCC-CENTER-BALANCE)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0xE7,          // USAGE (PCC-CENTER-BALANCE)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
```

```
0x85, 0x1B,          // REPORT_ID (27) (#17)
0x15, 0x01,          // LOGICAL_MINIMUM (127) //moto 127 98.10.20
0x26, 0xff, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x01,          // REPORT_COUNT (1)
0x09, 0x12,          // USAGE (CONTRAST)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x12,          // USAGE (CONTRAST)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x1C,          // REPORT_ID (28) (#17)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x26, 0xEE, 0x00,    // LOGICAL_MAXIMUM (238)
0x95, 0x01,          // REPORT_COUNT (1)
0x09, 0x22,          // USAGE (H-SIZE)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0x22,          // USAGE (H-SIZE)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
0x85, 0x1F,          // REPORT_ID (31) (#29)
0x15, 0x00,          // LOGICAL_MINIMUM (0)
0x26, 0xFF, 0x00,    // LOGICAL_MAXIMUM (255)
0x95, 0x01,          // REPORT_COUNT (4)
0x09, 0xAC,          // USAGE (fh hi byte)
0x09, 0xAD,          // USAGE (fh lo byte)
0x09, 0xAE,          // USAGE (fv hi byte)
0x09, 0xAF,          // USAGE (fv lo byte)
0xb1, 0x62,          // FEATURE (Data,Var,Abs,NPrf,Null)
0x09, 0xAC,          // USAGE (fh hi byte)
0x09, 0xAD,          // USAGE (fh lo byte)
0x09, 0xAE,          // USAGE (fv hi byte)
0x09, 0xAF,          // USAGE (fv lo byte)
0x81, 0x62,          // INPUT (Data,Var,Abs,NPrf,Null)
//
0x05, 0x82,          // USAGE PAGE(VESA Virtual Controls) (#24)
0x75, 0x08,          // REPORT SIZE (8)
0x15, 0x00,          // LOGICAL_MINIMUM (0)
0x25, 0x01,          // LOGICAL_MAXIMUM (1)
0x85, 0x14,          // REPORT_ID (20)
0x95, 0x01,          // REPORT_COUNT (3)
0x09, 0x01,          // USAGE (Degauss)
0xb1, 0x02,          // FEATURE (Data,Var,Abs)
0x09, 0x08,          // USAGE (COLOR RESET)
0xb1, 0x02,          // FEATURE (Data,Var,Abs)
0x09, 0x06,          // USAGE (Geomotry RESET)
0xb1, 0x02,          // FEATURE (Data,Var,Abs)
//
0x05, 0x82,          // USAGE PAGE(VESA Virtual Controls) (#24)
0x85, 0x15,          // REPORT_ID (21)
0x09, 0xB0,          // USAGE (SETTINGS)
0xa1, 0x02,          // COLLECTION(Logical)
0x05, 0x81,          // USAGE PAGE(Monitor Enumrated Value)
0x09, 0x01,          // USAGE(ENUM 1)(Save current Settings)
0x09, 0x02,          // USAGE(ENUM 2)(Restore Factory Settings)
0x75, 0x08,          // REPORT SIZE (8)
0x15, 0x01,          // LOGICAL_MINIMUM (1)
0x25, 0x02,          // LOGICAL_MAXIMUM (2)
0xb1, 0x40,          // FEATURE (Data,Ary,Abs,Null)
0xc0,                // END_COLLECTION
0xc0                 // END_COLLECTION
```

(2) Device descriptor

```
0x12,   //  bLength
0x01,   //  bDescriptorType
0x00,   //  bcdUSB
0x01,
0x00,   //  bDeviceClass
0x00,   //  bDeviceSubClass
0x00,   //  bDeviceProtocol
0x08,   //  bMaxPacketSize0
0x52,   //  idVendor (0452h)Mistubishi Electronics (MELA)
0x04,
0x71,   //  idProduct 0071;TFA1105U-A
0x00,
0x00,   //  bcdDevice
0x01,
4,      // Index of string descriptor
        // describing manufacturer
44,     // Index of string descriptor
        // describing product
62,     // Index of string descriptor
        // describing the device's
        // serial number
0x01    // bNumConfigurations
```

(3) String descriptor

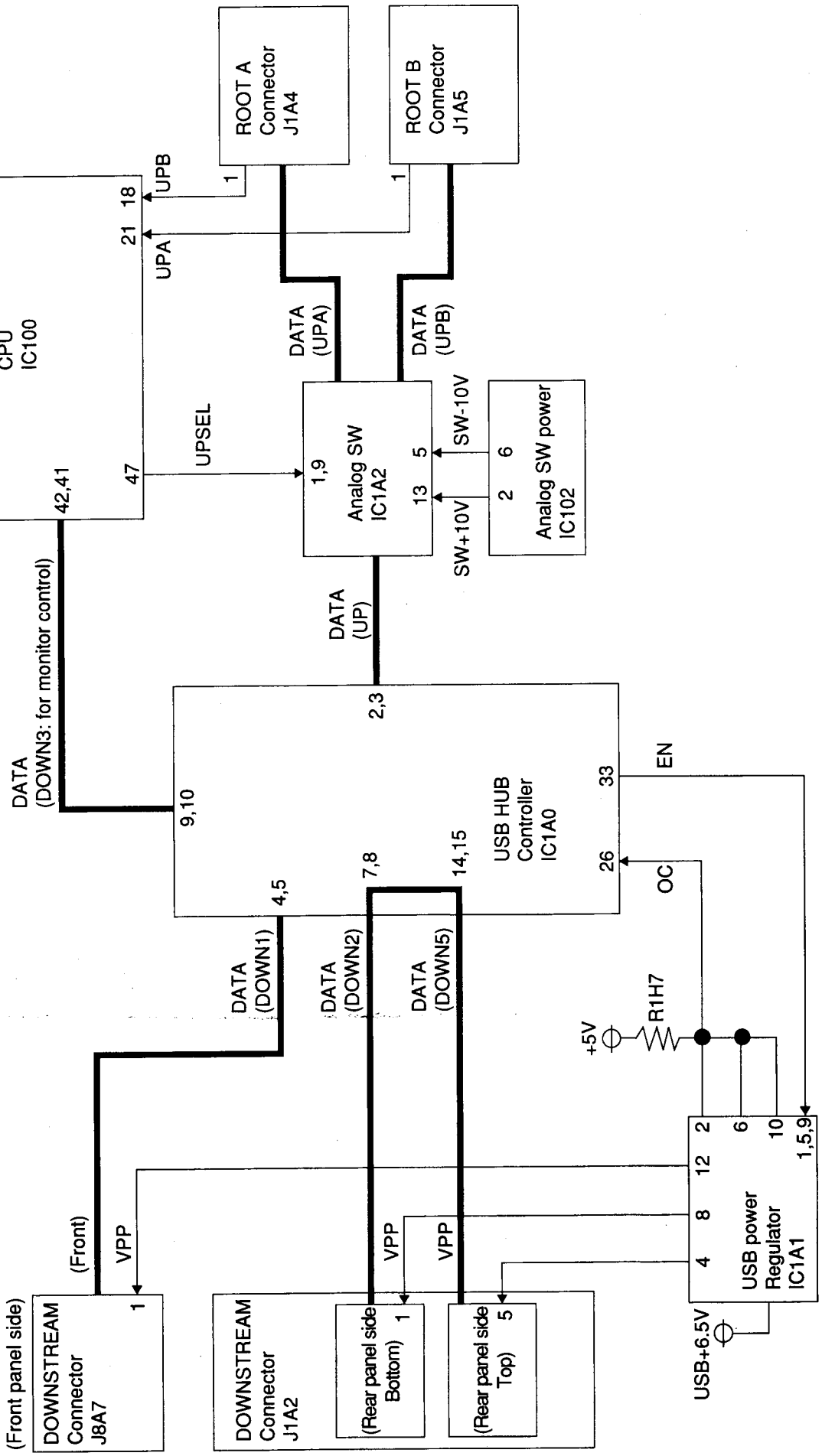
```
0x04,
0x03,
0x09,
0x04,   //  LangID = 0x0409: U.S. English
        //  4
40,     //  Size of manufaturer string
0x03,   //  bDescriptorType = String descriptor
        //  Manufaturer: "MITSUBISHI ELECTRIC"
'M',0, 'I',0, 'T',0, 'S',0, 'U',0, 'B',0, 'I',0, 'S',0, 'H',0, 'I',0,' ',0,'E',0,
'L',0, 'E',0, 'C',0, 'T',0, 'R',0, 'I',0, 'C',0,

        //  44
18,
0x03,   //  Product name: "TFA1105U    "
'T',0, 'F',0, 'A',0, '1',0, '1',0, '0',0, '5',0, 'U',0,

        //  62
22,
0x03,   //  Serial number: "19981234-1"
'1',0, '9',0, '9',0, '8',0, '1',0, '2',0, '3',0, '4',0, '-',0, '1',0
   (The contents are different each manufacture.)
        //  84
```

(4) Configuration descriptor

```
0x09,  //  bLength: Configuation Descriptor size
0x02,  //  bDescriptorType: Configuration
SIZ_CONFIG_DESC,
       //  wTotalLength: 34 Bytes returned
0x00,
0x01,  //  bNumInterfaces: 1 interface
0x01,  //  bConfigurationValue:
       //  Configuration value
0x00   //  iConfiguration:
       //  Index of string descriptor
       //  describing the configuration
0x40,  //  bmAttributes:
       //  Self powered
0x32,  //  MaxPower 100 mA
       //  09
0x09,  //  bLength: Interface Descriptor size
0x04,  //  bDescriptorType:
       //  Interface descriptor type
0x00,  //  bInterfaceNumber: Number of Interface
0x00,  //  bAlternateSetting: Alternate setting
0x01,  //  bNumEndpoints: Two endpoints used
0x03,  //  bInterfaceClass: HID
0x00,  //  bInterfaceSubClass: No subclass
0x00,  //  nInterfaceProtocol: None
0x00,  //  iInterface:
       //  Index of string descriptor
       //  18
0x09,  //  bLength: HID Descriptor size
0x21,  //  bDescriptorType: HID
0x00,  //  bcdHID: HID Class Spec release number
0x01,
0x00,  //  bCountryCode: Hardware target country
0x01,  //  bNumDescriptors:
       //  Number of HID class descriptors
       //          to follow
0x22,  //  bDescriptorType
SIZ_REPORT_DESC_l,
SIZ_REPORT_DESC_h,
       //  wItemLength: Total length of Report descriptor
0x07,  //  bLength: Endpoint Descriptor size
0x05,  //  bDescriptorType:
       //  Endpoint descriptor type
0x81,  //  bEndpointAddress:
       //          Endpoint Address (IN)
0x03,  //  bmAttributes: Interrupt endpoint
0x08,  //  wMaxPacketSize: 8 Byte max
0x00,
0x0A   //  bInterval: Polling Interval (10 ms)
```



USB circuit outline

3. Adjustment procedure

3.1 Scope

These are the specified adjustment and inspection methods for the TFA1105STTUW.

3.2 Application

The applicable models are as follow.

Model	Rating label	Destination	Remarks
1	TFA1105STTUW	For own domestic use	

3.3 Measuring instruments

(1) Signal generator A: Astro Design VG-812 or equivalent
(2) Signal generator B: Astro Design VG-829 or equivalent
(3) DC voltmeter: 150V 0.5 Class or digital voltmeter
(4) High voltage meter: 0.5 Class that can measure 30KV
(5) Luminance meter: Minolta color analyzer CA-100 or equivalent
(6) AC voltmeter: 150V/300V 0.5 Class
(7) Oscilloscope: Scope with band of 100MHz or more
(8) Slidac: Slidac that can be varied to 260VAC or more
(9) Double scale: For width and distortion measurement
(10) Withstand voltage meter: Kikusui Model TOS8650 or equivalent
(11) Grounding conductivity measuring instrument: CLARE U.K. product

3.4 Standard setting state

Unless particularly designated, adjust with the state given in this section.

3.4.1 Power voltage

Assembly	Aging	Adjustment	Remarks
AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	

3.4.2 Adjustment magnetic field

Adjustment magnetic field	Remarks
HORIZ. 0mT VERT. 0.04mT	Northern hemisphere
HORIZ. 0mT VERT. 0.mT	Equator
HORIZ. 0mT VERT. -0.04mT	Southern hemisphere

3.4.3 Signal cable

Unless particularly designated, use a D-SUB 15-PIN signal cable.

3.5 Preparatory inspections

(1) The assembly must be assembled.
(2) There must be no cracks or remarkable contamination on the PWB.
(3) There must be no remarkable lifting or inclination of the parts on the PWB, and the parts must not be touching.
(4) The connectors must be securely inserted without crimping faults.
(5) The CRT socket, anode cap and focus lead must be securely mounted.
(6) The lead wires must not be pressed against the edges of the board.
(7) The lead wires must not touch the high temperature parts such as the R-METAL, R-CEMENT or TR with FIN.
(8) The board must not be bent, remarkably contaminated or scratched.
(9) The CRT has no scratch or chipping.
(10) Each potentiometer must turn smoothly.
(11) Always set each potentiometer to the following positions before turning the power ON.

Potentiometer default settings

PWB name	IC sources	Name (symbol)	Default adjustment position	Remarks
PWB-MAIN	VR601	HV-ADJ	Turn completely to left	
		FOCUS1	Center	FBT
		FOCUS2	Center	FBT
		SCREEN	Turn completely to left	FBT

3.6 Initializing the adjustment data in the EEPROM

(1) Turn the monitor power ON to confirm that the aging raster appears.
(2) Initialize the EEPROM with serial communication. Use the designated file shown below, and initialize the adjustment data in the EEPROM.
(3) Turn the monitor power OFF.

Adjustment data initialization file name

Rating label	Date of revision	Remarks
A_OWN_20.DAT		

The initial data regarding the horizontal linearity is as shown below.

Frequency	LIN	CS6	CS5	CS4	CS3	CS2	CS1
30 -- 34	L	L	L	L	L	L	L
34 -- 36	L		L	L	L		L
36 -- 39	L		L		L		L
39 -- 43	L			L			L
43 -- 46	L		L	L		L	
46 -- 48	L			L	L		
48 -- 49	L			L	L		
49 -- 53	L		L	L			
53 -- 56		L	L			L	
56 -- 58		L	L			L	
58 -- 60			L			L	
60 -- 62			L			L	
62 -- 64			L	L	L		
64 -- 66			L	L	L		
66 -- 68		L	L		L		
68 -- 70		L	L		L		
70 -- 73		L			L		
73 -- 76		L			L		
76 -- 78		L	L	L			
78 -- 80		L			L		
80 -- 83		L	L	L			
83 -- 85		L	L	L			
85 -- 88				L			
88 -- 90				L			
90 -- 92				L			
92 -- 94		L	L				
94 -- 96		L	L				
96 -- 98		L	L				
98 -- 100			L				
100 -- 102			L				
102 -- 104			L				
104 -- 107		L					
107 -- 110		L					
110 -- 112		L					
112 -- 114		L					
114 -- 116		L					

The above is MPU output and blank sections above are H.

※ When CS or LIN-COIL is ON, the corresponding bit is "L".
When OFF, the corresponding bit is "H".

3.7 Names of each monitor part

3.7.1 Configuration of front control panel

a: Power switch
b: Power-on Indicator
c: BNC/D-SUB Select button
d: Scroll button
e: Enter button
f: Adjust Minus button
g: Adjust Pluss button
h: USB Down-Stream Connector

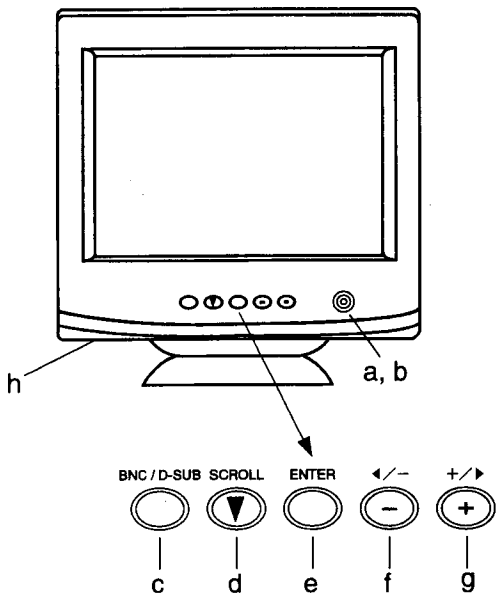


Fig. 1 Front control panel

3.7.2 Configuration of rear input connector

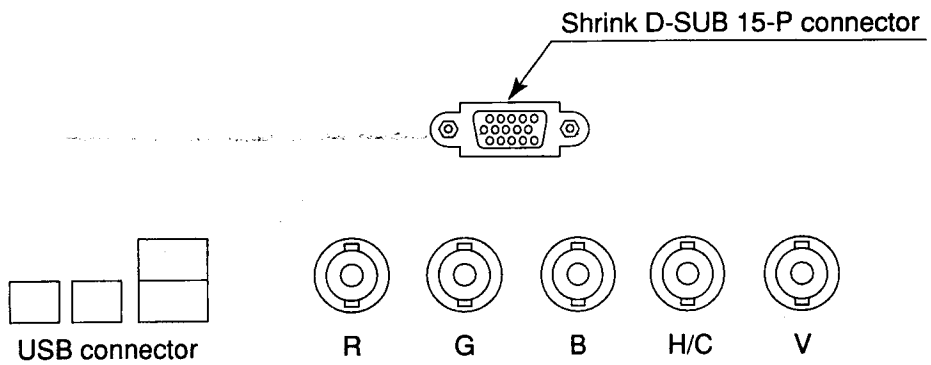


Fig. 2 Rear input connector (standard)

3.7.3 OSD display matrix

3.7.3.1 User mode

Adjustment items	Setting contents	Default setting	Setting classification	
			By timings	Common
OSD group 1				
CONTRAST	0~255	100%		○
BRIGHT	0~255	50%		○
COLOR NO.	1,2,3	COLOR NO.1	○	
R-GAIN 1,2,3	0~255			○
G-GAIN 1,2,3	0~255			○
B-GAIN 1,2,3	0~255			○
COLOR TEMPERATURE 1,2,3	0~86	1. 9300K 2. 6500K 3. 5000K		○
COLOR RESET	PROCEED			
OSD group 2				
H-SIZE	0~*		○	
H-PHASE	0~127		○	
H-POSI	0~255		○	
V-SIZE	0~127		○	
V-POSITION	0~127		○	
PCC-AMP	0~127		○	
PCC-PHASE	0~255		○	
PCC-CENTER	0~255		○	
PCC-TOP-CORNER	0~255		○	
PCC-BOTTOM-CORNER	0~255		○	
PIN-BALANCE	0~63		○	
KEY-BALANCE	0~63		○	
CORNER-BALANCE	0~255		○	
PCC-CENTER-BALANCE	0~255		○	
V-LIN-BALANCE	0~255		○	
V-LIN	0~127		○	
ROTATION	0~255	CENTER		○
ZOOM	0~*		○	
GEOMETRY-RESET	PROCEED			
OSD group 3				
TEXT mode	Sharp/Smooth	SHARP	○	
H-CONVERGENCE	0~255	50%		○
V-CONVERGENCE	0~255	50%		○
V-CONVERGENCE-TOP	0~255	50%		○
V-CONVERGENCE-BOTTOM	0~255	50%		○
CORNER PURITY(TL)	0~126	50%		○
CORNER PURITY(TR)	0~126	50%		○
CORNER PURITY(BL)	0~126	50%		○
CORNER PURITY(BR)	0~126	50%		○
MOIRE CANCEL	OFF / ON	OFF	○	
MOIRE CANCEL LEVEL	0~31	0%	○	
CLAMP PULSE POSITION	FRONT/BACK	BACK	○	
VIDEO LEVEL	1.0/0.7V	0.7V	○	
OSD group 4				
DEGAUSS	PROCEED			○
POWER-SAVE	OFF/ON	ON		○
CONTROL LOCK	OFF/ON	OFF		○
OSD POSITION	<-- -->			○
ALL RESET	PROCEED			
GTF AUTO ADJUST	PROCEED			
DIAGNOSIS				
LANGUAGE	ENG/ESP/ITA/GER/FRA/JAP	ENG		○
OSD group 5				
USB UP STREAM	PORT A / PORT B			○
USB PORT COMBINATION	PORT A : D-SUB BNC PORT B : BNC D-SUB			○

3.7.3.2 Factory mode

The following contents are added section to the user mode.

Adjustment items	Default setting	Setting classification	
		By timings	Common
FACT 00			
DBF H AMP(L)	0~127	○	
DBF H AMP(R)	0~127	○	
DBF H PHASE	0~127	○	
DBF H AMP	0~127	○	
DBF H PHASE	0~127	○	
R BIAS(COLOR1)	0~255		○
G BIAS(COLOR1)	0~255		○
B BIAS(COLOR1)	0~255		○
R BIAS(COLOR2)	0~255		○
G BIAS(COLOR2)	0~255		○
B BIAS(COLOR2)	0~255		○
R BIAS(COLOR3)	0~255		○
G BIAS(COLOR3)	0~255		○
B BIAS(COLOR3)	0~255		○
			○
H-PURITY	0~255		○
ABL	0~255		○
SUB-BRIGHT	0~255		○
B-L	0~238		○
B-H	0~238		○

3.8 Adjustment

3.8.1 How to select the factory adjustment (FACTORY) mode

3.8.1.1 Selecting with automatic adjustment device (Selecting with communication)

Using the communication command (DDC2Bi), issue the command from the automatic adjustment device to the monitor, and set the factory adjustment mode flag in the EEPROM to "FAh" ("00h" for user mode).
(Refer to the A chassis automatic adjustment communication specifications (Protocol of DDC2Bi Enhanced) for details.)

3.8.1.2 Selecting with front panel switches

(1) Turn the power ON while holding down the BNC/D-SUB SELECT button.
(2) After step (1), release the button after one to two seconds.
(3) Confirm that 00 is displayed for the counter on the OSD display, and set to 225 with the ◀/-ADJUST button.
(4) Set to 05 with the +/▶ ADJUST button.
(5) When the ENTER button is pressed, the factory mode will be entered.
This factory adjustment mode is entered with the above steps.

*The factory adjustment mode remains valid even after the power is turned OFF.

<Returning to the user mode from the factory mode>

(1) OSD (for factory, user select) is displayed with the group selection.
(2) Set the counter value to 010.
(3) When the ENTER button is pressed, the mode will return to the user mode.

3.8.2 Adjustments before aging

Status Indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Before aging		The only the sync. signal of
			No. 8 : 106.25K / 85Hz

After powering on the monitor, adjust the "SCREEN" of FBT to the appropriate brightness and adjust the "FOCUS 1, 2" of the focus pack so that the both ends of the picture become vivid.

3.8.2.1 Adjusting the high voltage

Status Indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	High voltage		The only the sync. signal of
			No. 8 : 106.25K / 85Hz

(1) Turn the monitor power OFF, and connect a high voltage meter to the CRT anode. Then, turn the monitor power ON.
(2) Adjust to 24.5kV±0.5kV with VR601 (HV-ADJ) of PWB-MAIN.

3.8.2.2 SCREEN voltage adjustment

Status Indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	SCREEN voltage		The only the sync. signal of
			No. 8 : 106.25K / 85Hz

(1) Connect a high voltage meter to the TP-SC terminal on the PWB-CRT.
(2) Set to 700V±5V with the SCREEN-VR of FBT.

3.8.2.3 Setting the high voltage protector working voltage

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Setting the high voltage protector working voltage		The only the sync. signal of No. 8 : 106.25K / 85Hz

(1) Connect a voltage meter to TP-XPRO on the PWB-MAIN.
(2) Confirm that the TP-XPRO voltage is 10V±1V.
(3) Apply voltage (13±0.5V) from a source outside the monitor onto the TP-XPRO to confirm that the high voltage protector operates.
(4) After confirming, repeatedly turn the power ON and OFF (at five second intervals) to confirm that the high voltage protector does not operate.

3.8.2.4 Shock test

Status Indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Shock test		The color bar pattern signal of No. 8 : 106.25K / 85Hz

(1) Display the "color bar" from the signal generator A.
(2) Confirm that there is no abnormality in the image when shock is applied on the monitor.

3.8.2.5 Preadjustment before aging

Status Indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Before aging		No. 8 : 106.25K / 85Hz
			Full white

(1) Display a "full white" from the signal generator A.
(2) Confirm that the R, G and B channel images are output.
(3) Confirm that the H-CENT, picture position, picture size, PCC and balance can be controlled, and approximately adjust.
(4) Confirm that the OSD power management is turned OFF.
(5) Enter the factory mode (aging mode) beforehand.
(6) Disconnect the signal and confirm that the following display appears on the OSD. Then, adjust the picture to the specified luminance value before ITC adjustment using BRIGHT adjustment, and carry out heat run for 30 minutes or more.
(Specify the working range limit for ITC here.)
The value indicated in the designs is to be used for the "specified landing value".

3.8.3 Adjustments after aging

3.8.3.1 +B adjustment

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	After aging	Factory	

Input the following timings of the sync. signal successively, and adust the picture width to 390mm±4mm.

Timing No.	Timing	OSD adjustment items
A	30.0kHz	+B-L
B	114.24kHz	+B-H

3.8.4 Adjusting the picture size, position and distortion (using automatic adjustment device)

The manual adjustment methods are explained below. The adjustments are executed in the factory adjustment (factory) mode.
Adjust the picture size to the value indicated in the list of adjustment values.
Adjust the distortion to the value indicated in the picture performance inspection item.

3.8.4.1 Adjusting the picture inclination

Set the OSD to ROTATION with the SELECT button on the front panel, and using the (-) (+) ADJUST buttons, set the raster inclination to be horizontal to the CRT face surface.

3.8.4.2 Adjusting the back raster position

(1) Set BRT to 100% to show the back raster. (When using the automatic adjustment device, set RGB-BIAS to MAX also.)
(2) Input each adjustment timing, and set the OSD display to H-POSI. Using the (-) (+) ADJUST buttons, adjust the horizontal back raster position to the center of the bezel.
At this time, the raster width will be 390mm±10mm and $|L1-L2| \leq 3$mm.
(3) For Timing No. 1 (fh=31.47kHz), adjust by adding +30 count to the adjustment value above-mentioned.

3.8.4.3 Adjusting the left/right distortion, picture width, picture position (H-PHASE) and vertical linearity (all modes)

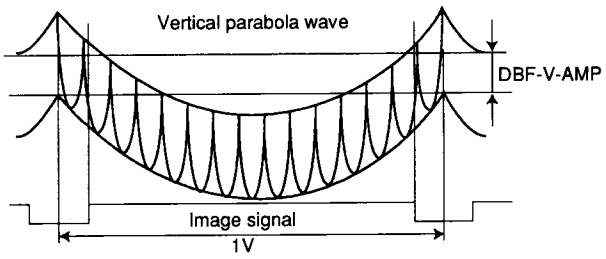
Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Picture size, position, distortion	Factory	See table of3.9.1.12 (P3-25).

(1) Adjust the vertical size to approx. 285mm, and the vertical position to the approximate center.
(2) Select V-LIN and V-LIN-BAL with the OSD, and adjust so that the vertical linearity is equal at the very top of the picture, at the very bottom of the picture, and at the center of the picture.
(3) Select V-SIZE and V-POSI with the OSD, and adjust the vertical width and vertical position to the specified values using the ADJUST buttons.
(4) Select PCC-AMP, PCC-PHASE, CENTER-PCC, CORNER-PCC (TOP/BOTTOM) with the OSD, and adjust the vertical line at both side of the picture to the straight line using the ADJUST buttons.
(5) If the left and right distortions differ, select PIN-BALANCE, KEY-BALANCE, CORNER-BALANCE and CENTER-BALANCE with the OSD, and adjust so that the distortions are visually balanced.
(6) Select H-PHASE with the OSD, and adjust the horizontal raster position to the center of the picture using the ADJUST buttons.
(7) Select H-SIZE with the OSD, and adjust the horizontal raster width to the value given in the adjustment list using the ADJUST buttons.
* Note that the picture position and distortion must be within the ranges given in the picture performance inspection items.

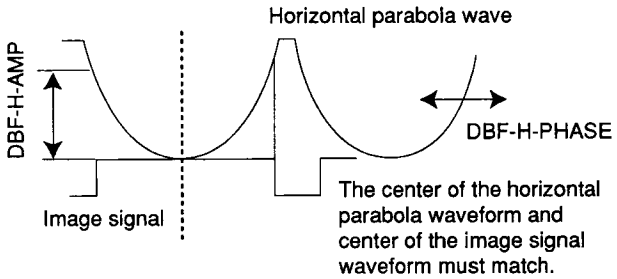
3.8.4.4 Adjusting the DBF amplitude and phase

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	DBF ammplitude and phase	Factory	See table of3.9.1.12 (P3-25).

(1) Connect the oscilloscope to the PWB-MAIN TP6E1 and to the signal sources full R (VIDEO).
(2) Set the adjustment mode Factory mode.
(3) Set the OSD to the DBF-H-AMP (L and R) select picture, and using the (-) (+) ADJUST buttons adjust the horizontal parabola wave amplitude (image area) to the value given in the list of adjustment values.
Note that the difference of the value must be input for L and R.
(4) Set the OSD to the DBF-H-PHASE select picture, and using the (-) (+) ADJUST buttons adjust the horizontal parabola wave phase as shown below in respect to the image signal.
(5) Set the OSD to the DBF-V-AMP select picture, and using the (-) (+) ADJUST buttons adjust the vertical parabola wave amplitude (image area) to the value of 120V±10V.
(6) Set the OSD to the DBF-V-PHASE select picture, and using the (-) (+) ADJUST buttons adjust the vertical parabola wave phase as shown below in respect to the image signal.



DBF-V-AMP/PHASE adjustment



DBF-H-AMP/PHASE adjustment

3.8.5 Adjusting the cut off

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Cut off	Factory	No. 8 : 106.25K / 85Hz

(1) Input the timing No. 8 from the signal source. (R, G, B OFF)
(2) Select BIAS1, and set BRIGHT to 128, SUB-BRIGHT to 200, and the R, G, B-BIAS to 50.
(3) Adjust the back raster luminance to 0.3±0.1cd/m².
(a) If more than 0.3cd/m², change SUB-BRIGHT to adjust.
(b) If less than 0.3cd/m², change R, G, B-BIAS to adjust.
The R, G, B-BIAS data must be the same values at this time.
(4) Using two colors except for the basic colors, adjust the color coordination to the following values.
(5) Change SUB-BRIGHT, and adjust the back raster luminance to 0.3±0.05cd/m².
If adjustments with just SUB-BRIGHT are not possible, change BRIGHT and adjust.
(6) If the back raster color coordination is deviated from the following values, repeat steps (4) and (5).
(If the back raster cannot disappear, set BRIGHT to min., and set to the point where the back raster is eliminated with SUB-BRIGHT. Next, change BRIGHT, and adjust the back raster luminance to 0.3±0.05cd/m², and then adjust again from step (3).)
(7) Confirm that the back raster adisappears when setting the BRIGHT min.
(8) Copy COLOR 1 G-BIAS, to the COLOR 2, 3 G-BIAS.

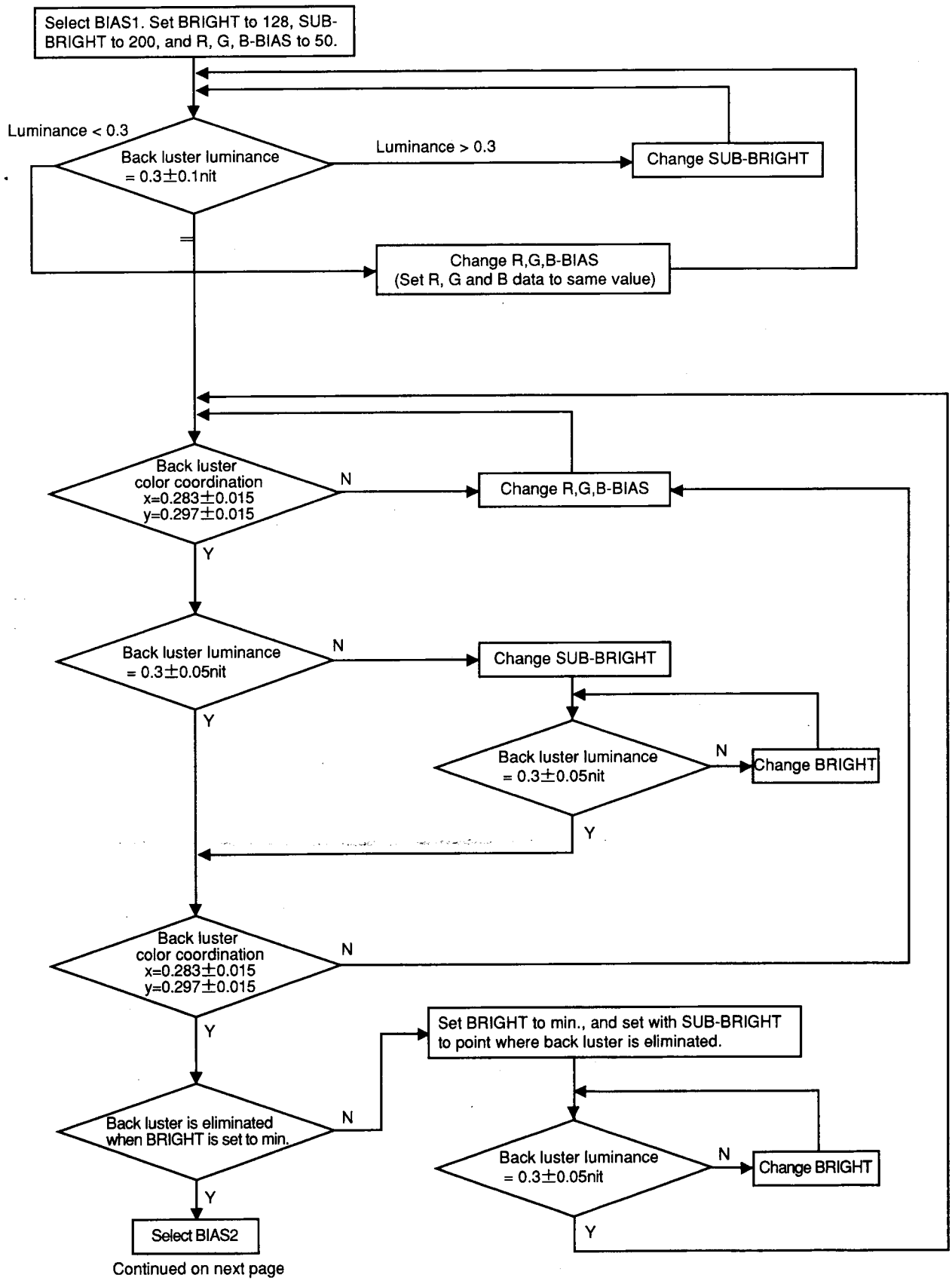
(9) Select BIAS 2, and change the BIAS data for the R and B colors (G-BIAS is fixed). Adjust the back raster color coordination to the following table.

(10) Select BIAS 3, and change the BIAS data for the R and B colors (G-BIAS is fixed). Adjust the back raster color coordination to the following table.

Confirmation item		COLOR 1	COLOR 2	COLOR 3
Color coordination	x	0.283±0.015	0.313±0.015	0.345±0.015
	y	0.297±0.015	0.329±0.015	0.359±0.015

*The flow chart is provided on the next page.

Cutoff adjustment procedures



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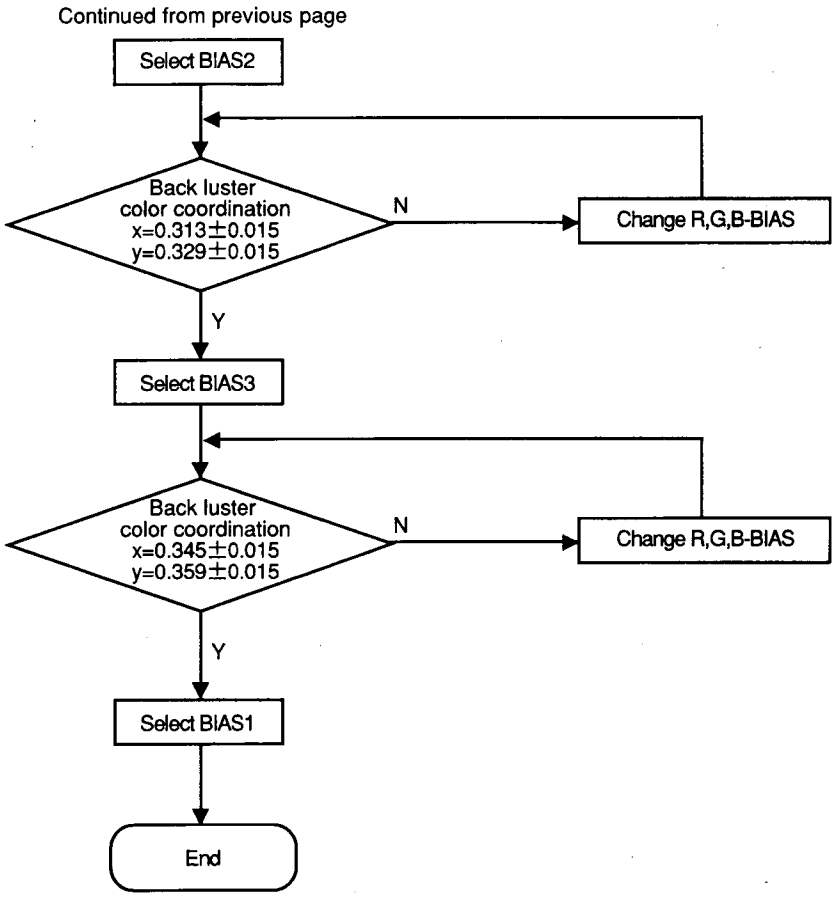

Continued from previous page
Select BIAS2
Back luster
color coordination
x=0.313±0.015
y=0.329±0.015
N
Change R,G,B-BIAS
Y
Select BIAS3
Back luster
color coordination
x=0.345±0.015
y=0.359±0.015
N
Change R,G,B-BIAS
Y
Select BIAS1
End

3.8.6 Adjusting the RGB drive signal

3.8.6.1 Adjusting the R, G, B drive signal (Adjustment of COLOR 1)

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	R, G, B drive signal	Factory	No. 8 : 106.25K / 85Hz
			WINDOW picture

(1) Input the following adjustment timing at the signal source.
WINDOW picture (Input amplitude = 0.7Vp-p)

Adjustment timing
Timing No. 8 (1600 x 1200 106.25K/85)

(2) Select CONTRAST with the OSD, and set to MAX with (+) ADJUST button.
(3) Select BRIGHT with the OSD, and set the data for center value with the (-) (+) ADJUST buttons.
(4) Set the signal generator A output to the WINDOW pattern (approx. 80mm square at center of CRT picture), and input only "GREEN".
(5) Set the COLOR 1 G with the OSD, and adjust the luminance to the following value with the ADJUST button.
(6) Input BLUE, RED and GREEN, appropriately select the COLOR 1 B and R, and adjust the color coordination to the following value with the ADJUST button.
(7) Set CONTRAST to 25cd/m^2 with the OSD to confirm that the change in color coordination is within ±0.015 for both x and y.
*Adjust COLOR 2 and 3 to the following values with the same method.

(Note) After adjusting COLOR, always set to COLOR 1.
(The COLOR preset will be set to the default COLOR 1 with this step.)

COLOR		1	2	3	Remarks
G-WINDOW luminance		78.0	68.0	58.0	(Reference value)
W-WINDOW color coordination	x	0.283	0.313	0.345	±0.005
	y	0.297	0.329	0.359	±0.005
Full white luminance(cd/m^2)		108 or more	90 or more	75 or more	

3.8.6.2 Adjusting ABL

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	ABL	Factory	No. 8 : 106.25K / 85Hz
			Full white

(1) Input timing No. 8 at the signal source.
(Full white picture input amplitude = 0.7Vp-p)
(2) Set contrast to MAX, bright to MAX, and select ABL-ADJUST with OSD. Adjust to 108cd/m^2±3 with COLOR 1.
The picture size must be approximately the H width given in the list of adjustment values at this time.

3.8.7 Adjusting the Purity

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Purity	Factory	C: 85Hz
			RED crosshatch reverse

(1) Input only the red of the timing C : 1600 x 1200/85Hz at the signal source RED crosshatch is displayed in reverse.
(2) Set the chamber adjustment magnetic field to the northern hemisphere magnetic field (HORIZ. = 0mT, VERT. = +0.04mT).
(3) After carefully degaussing the monitor with 100V handy-demagnetizer, demagnetize with a demagnetizer.
(4) Set the monitor to the factory mode from the front panel, select Purity, and adjust the cancel current to 0mA±5mA).
(5) Fully scan the picture size with the normal mode to confirm the below effective magnetic field allowance. (Carry out the 45-degree rotation check only for the tube axis direction magnetic field.)

(a)Turn the cancel switch OFF.
(b)Effective magnetic field (Magnetic field for adjustment magnetic field)
(1) BH: +0.04mT (2) BH: -0.04mT
(3) BV: +0.06mT (Northern hemisphere) (4) BV: -0.06mT (Northern hemisphere)
(5) BV: +0.04mT (Southern hemisphere) (6) BV: -0.04mT (Southern hemisphere)
(Equator) (Equator)
(c) Demagnetize with a demagnetizer.
(d)Turn the cancel switch ON.
(e)Judgment

Repeat the effective magnetic field four times in the following order.
(1) (2) (3) (4) ... (Northern hemisphere)
(1) (2) (5) (6) ... (Southern hemisphere)
(Equator)

* Repeat (a) to (e) four times for each effective magnetic field.
** When another color is hit while checking the 45-degree rotation of the tube axis direction magnetic field, if the level is not a problem in use of the normal mode Corner Purity, the level will be OK.
*** When checking the vertical magnetic field, confirm for both three colors of R/G/B.

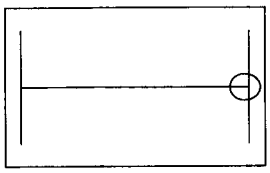
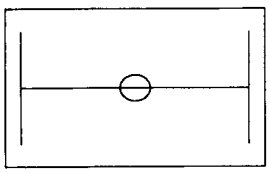
3.8.8 Adjusting the focus

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Focus		No. 8 : 106.25K / 85Hz
			H character, crosshatch

For steps (1) and (2), use the timing No. 8 (1600 x 1200 106.25K/85) H character pattern and crosshatch pattern.
For step (3), use all preset timing H character patterns and crosshatch patterns.

Adjusting the static focus

(1) Display a white crosshatch pattern, and adjust the focus following section "3.8.8 Adjusting the focus".

	Normal or reverse display	Point to align with
Vertical line	Reverse display	 FOCUS JUST at center of right side vertical line (circle section).
Horizontal line	Normal display	 FOCUS JUST at center of screen (circle section).

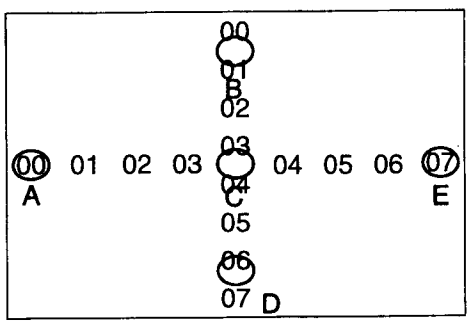
(2) If the DBF voltage is insufficient or excessive, select DBF H-AMP and DBF V-AMP from the OSD, and readjust with the ADJUST button. Then repeat step (1), and adjust so that the following judgement conditions are satisfied.

(3) For all of the other preset timings, if the DBF voltage is insufficient or excessive, select / DBF H-AMP and DBF V-AMP from the OSD, and readjust with the ADJUST button.

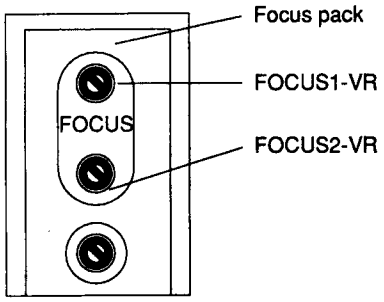
The focus is judged as follows.

Timing	Judgment pattern (Note 1) (Note 2)
Normal display	Crosshatch pattern
Reverse display Timing No. 0~8 timing No. 9, 10	 Judge with pattern A Judge with pattern B

(Note 1) Pattern A: Font 7 ×9, Cell 10×11, e character
(Note 2) Pattern B: Font 7 ×9, Cell 10×11, H character
Core: Judge the ratio of the halo.
To judge the reverse display, do not carry out a relative evaluation with the other point on the screen. Instead, judge whether the H character can be read at that point.



Focus attention point



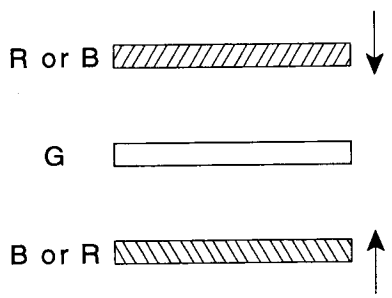
Focus pack

3.8.9 Adjusting the convergence

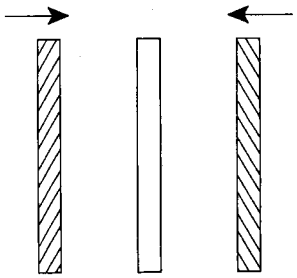
Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Convergence	Normal	No. 8 : 106.25K / 85Hz
			Crosshatch

Adjust the followings in the normal mode.

(1) Select H-CONVERGENCE/V-CONVERGENCE/V-CONVERGENCE-TOP/V-CONVERGENCE-BOTTOM with the OSD using the SELECT buttons on the front panel.
(2) After confirming the CONVERGENCE operating with the ADJUST buttons on the front panel, press the (-) and (+) buttons simultaneously. (Then, confirm the display of each data is 50%.)
(3) Adjust so that the horizontal and vertical convergences are best with CP ring of CRT, etc. and others.



Vertical convergence



Horizontal convergence

3.8.10 Default settings

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Default settings	Factory mode	Each adjustment timing
			Crosshatch

(1) Set for the factory mode and set all of the adjustment timings of the color coordination selection for COLOR 1.
(2) For the adjustment items except the above timings, set with the table below in the factory mode.

Setting items	Setting contents	Setting classification	
		by timing	Common
POWER-SAVE	ON		○
MOIRE-CLEAR	OFF	○	
MOIRE-CLEAR LEVEL	0	○	
CLAMP-PULSE	BACK	○	
TEXT MODE	OFF	○	

(3) Restore to the user mode with the front panel or automatic adjuster.

(4) Execute ALL RESET and confirm the setting of each OSD is as follows.

CONTRAST		100%
BRIGHTNESS		50%
ROTATION		CENTER
H-CONVERGENCE		50%
V-CONVERGENCE		50%
V-CONVERGENCE-TOP		50%
V-CONVERGENCE-BOTTOM		50%
CORNER PURITY	TL	50%
	TR	〃
	BL	〃
	BR	〃

CENTER is the factory adjustment setting value called when pressing (-) (+) ADJUST buttons simultaneously in the NORMAL MODE.

(5) Power off the switch.

3.9 Inspections (In normal mode)

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Inspections	Normal mode	

3.9.1 Electrical performance

Inspect the electrical performance by setting contrast to MAX and bright to center (press the (-) (+) ADJUST buttons simultaneously).

3.9.1.1 Withstand voltage

There must be no abnormality when 1500VAC is applied for two seconds between both ends of the AC input terminal and chassis, and between the DG coil terminal and chassis.

3.9.1.2 Grounding conductivity check

Check that the resistance value is 100mΩ or less when 25A is passed between the AC input terminal grounding GND and chassis GND.

3.9.1.3 Degaussing coil operation

Confirm that when OSD DEGAUSS is executed, the picture vibrates and then stops.

3.9.1.4 POWER SAVE function operation (Set the AC power input to 230V)

Confirmation timing
Timing No. 8 (1600 x 1200 106.25K/85)

Use the full white pattern without R, G, B signals.
Select POWER-SAVE from the OSD, and set the POWER-SAVE function ON.
(Note) For the USB, do not connect a pseudo-USB load. Instead measure the following power consumption.

(1) STANDBY MODE

(a) Confirm that when H-SYNC is removed, the system waits for approx. five seconds, displays POWER SAVE for approx. three seconds, and then the picture darkens. Also confirm that the power LED changes to orange and the power consumption is as follows.

Power consumption	10W or less

(b) Confirm that when H-SYNC is input again, the high voltage is recovered, and the picture appears in four seconds.

(2) SUSPEND MODE

(a) Confirm that when V-SYNC is removed, the system waits for approx. five seconds, displays POWER SAVE for approx. three seconds, and then the high voltage drops. Also confirm that the power LED changes to orange when the high voltage is down. Confirm that the power consumption is as follows.

Power consumption	10W or less

(b) Confirm that when V-SYNC is input again, the high voltage is recovered, and the picture appears in four seconds.

(3) COMPLETE OFF MODE

(a) Confirm that when both H-SYNC and V-SYNC are removed, the system waits for approx. five seconds, displays POWER SAVE for approx. three seconds, and then the high voltage drops.
Also confirm that the power LED changes to orange when the high voltage is down.
Confirm that the power consumption is as follows.

Power consumption	3W or less

(b) Confirm that when H-SYNC and V-SYNC are input again, the high voltage is recovered, and the picture starts to become brighter within 12 seconds.

3.9.1.5 Confirming the MOIRE-CLEAR function

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	MOIRE-CLEAR		No. 9 : 68.7K / 75.1Hz

Input timing No. 9 (1152 x 870 68.7K/75.1), and turn the MOIRE-CLEAR function ON. Confirm that the picture vibrates in the horizontal direction.

3.9.1.6 Confirming the CORNER-PURITY function

Confirmation timing
Timing No. 8 (1600 x 1200 106.25K/85)

Input a (full white display), and press the (-)(+) ADJUST buttons to change the CORNER PURITY (4 points). Confirm that the color coordination around the picture changes. Then, press the (-)(+) ADJUST buttons simultaneously to confirm that the picture purity returns to the CENTER.

3.9.1.7 Focus, picture performance

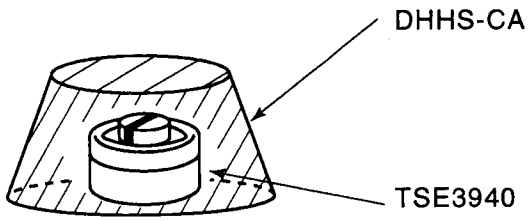
Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Focus		No. 8 : 106.25K / 85Hz
			H character

The picture must be evenly bright with the "H" character normal and reverse displays.

3.9.1.8 Fixing the parts

(1) After the adjustment and inspection are completed, fix FOCUS1, FOCUS2 and SCREEN-VR on the FBT focus pack with a yellow pen or white pen.

(2) Place the DHHS-CAP on the PWB-MAIN VR601. Use TSE3940 adhesive.



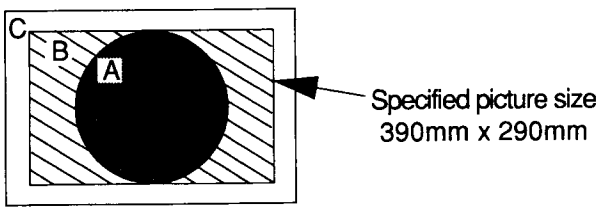
3.9.1.9 Mis-convergence

After heat running for 20 minutes or more, the mis-convergence amount in the horizontal and vertical directions when the set is faced to the East or West must be below the following values.

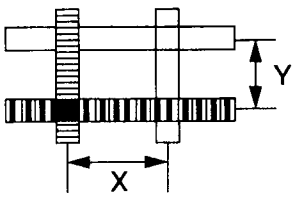
The mis-convergence amount is the value between the two colors of R, G and B separated the most in the horizontal (X) and vertical (Y) directions when a 17 vertical line x 13 horizontal line crosshatch is displayed.

Zone	Mis-convergence amount				
Center	0.2mm or less				
A	0.3mm or less				
B	0.4mm or less				
C	0.4mm or less				
Measurement timing (Timing No.)	7				

<Zone>



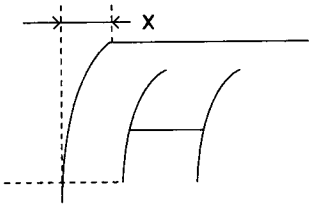
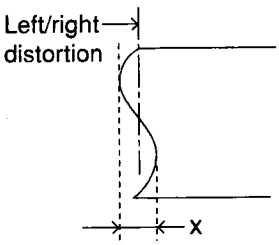
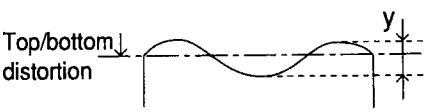
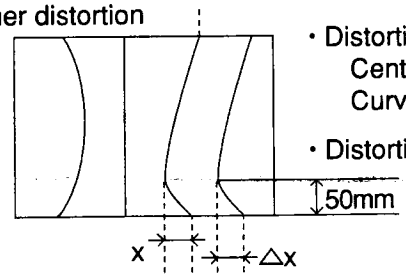
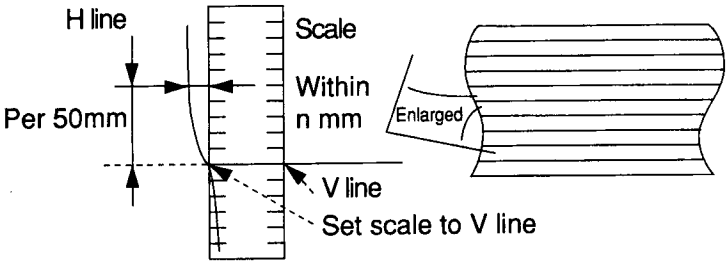
<Mis-convergence amount>

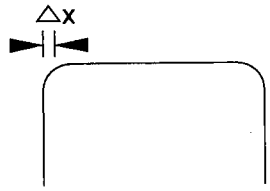
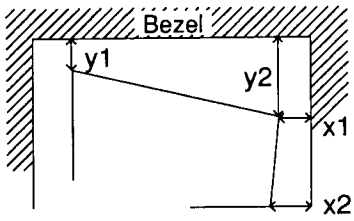
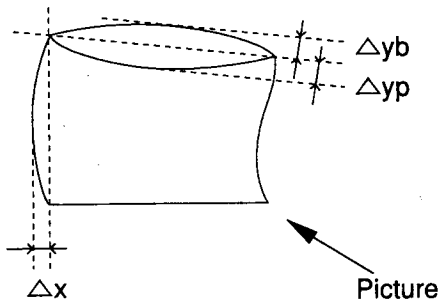
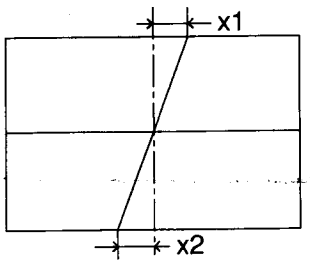
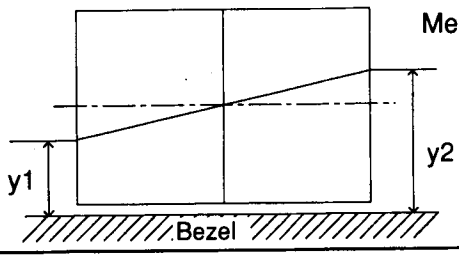


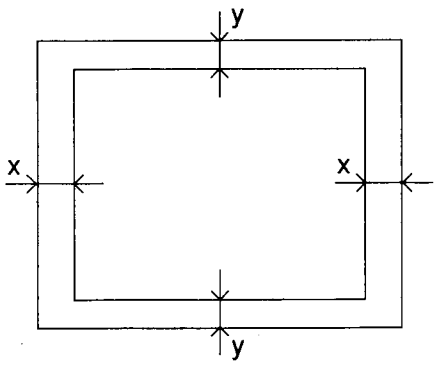
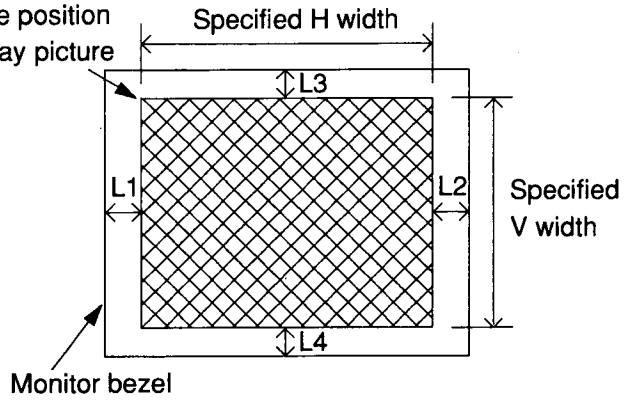
3.9.1.10 Picture distortion

When the picture distortion is measured, each distortion of the preset timing must be less than the following values.

<Picture performance inspection items> Inspect the following items for the picture distortion.

No.	Item	Judgement reference value	Input signal
1.	4-corner section distortion Inspect the distortion at the four corners. • Signal, H character with frame (both normal/reverse)  • Distortion x: Distortion in the range of one H character height. Judge with the white display G. (Judge the distortion amount with a fluorescent material stripe.)	x≦1pitch (=0.3mm)	H character with frame (both normal/ reverse)
2.	4-edge distortion When S-character or seagull type high frequency distortion is visible, check with the following method.  • Distortion x of S-character distortion, etc.: Distortion excluding normal pin, barrel or trapezoid. Note: There must be no sea-gull distortion.  • Distortion y: High frequency distortion excluding trapezoid.	x≦0.6mm * Note y≦1.0mm	Crosshatch pattern
3.	Inner distortion  • Distortion x: Center line Curve of other vertical line • Distortion △x: Curve within 50mm range Vertical line △X measurement method 	x≦1.0mm x≦1.5mm △x≦0.6mm	

No.	Item	Judgement reference value	Input signal
4.	Line curve (crosshatch pattern outer contour)  △x: Curve within 50mm range (horizontal) △y: Curve within 50mm range (vertical)	△x≦1.0mm △y≦1.0mm	Crosshatch pattern
5.	Horizontal trapezoid (top/bottom), vertical trapezoid (left/right)  • △y= | y1-y2 | △x= | x1-x2 | • Control with the above right value for each the top, bottom, left and right.	△y≦2.0mm △x≦1.8mm	
6.	Top/bottom pin and barrel, left/right pin and barrel  	△yb≦1.4mm △yp≦1.8mm △x ≦1.0mm	
7.	Parallelogram distortion  Measure the larger of x1 and x2.	x ≦0.8mm	
8.	Inclination  Measure △y = ly1-y2l.	△y≦2.0mm	

No.	Item	Judgement reference value	Input signal
9.	Distortion Must be within the following frame. ※ (Note, excluding ROTATION) 	y≦2.5mm x≦2.0mm	Crosshatch pattern
10.	Picture position Display picture 	| L1-L2 | ≦ 3.0mm | L3-L4 | ≦ 3.0mm	Full white

3.9.1.11 Linearity

Measure the linearity with a 17 horizontal line x 13 vertical line crosshatch.

Horizontal linearity : 10% or less, adjacent : 5% or less

Vertical linearity : 10% or less, adjacent : 5% or less

Calculation expression : (Xmax x Xmin) / Xmax x 100%

3.9.1.12 Adjustment value list

The horizontal width, vertical width and DBF-H amplitude must be within the following ranges.

Timing	Horizontal width (mm)			Vertical width (mm)			DBF-H amplitude (V)		
No.	Group 1			Group1			Group 1		
1	380±5			285±4			300±10		
2	380±5			285±4			300±10		
3	380±5			285±4			300±10		
4	380±5			285±4			300±10		
5	356±5			285±4			300±10		
6	380±5			285±4			300±10		
7	380±5			285±4			300±10		
8	380±5			285±4			300±10		
9	380±5			285±4			300±10		
10	356±5			285±4			300±10		
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									

3.9.1.13 Confirming the optional timing

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the optional timing		Check 2 : 35KHz/66
			Full white

Criteria:

- The image on the screen must not be cut in the horizontal and vertical display position.
- The horizontal and vertical picture widths are inside the bezel frame.

3.9.1.14 Checking the functions during Sync on Green and Composite Sync input

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Checking the functions during Sync on Green and Composite Sync input		Check 1 : 35K / 66Hz, Check 2 : 35K / 66Hz
			Full white

[Sync on Green]
Timing: Check 1 (35K/66), full white
[Composite Sync]
Timing: Check 2 (35K/66), full white
In the normal mode, input the above timing into the D-SUB or BNC connector to confirm that the operation is normal.

3.9.1.15 Confirming the D-SUB/BNC input (Timing No. 8 1600 x 1200 @85Hz)

Status Indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the D-SUB/BNC input		No. 8 : 85Hz

Confirm the input select function for both D-SUB and BNC with the following procedure.
Confirm one of the following with an independent stage.

(1) After connecting D-SUB, press the front button (D-SUB/BNC) and confirm that after the picture darkens it returns to the normal state.
(2) After connecting BNC, press the front button (D-SUB/BNC) and confirm that after the picture darkens it returns to the normal state.

3.9.1.16 Confirming the reset operation

Confirmation timing
Timing No. 8 (1600 x 1200 106.25K/85)

Carry out the following confirmation in the NORMAL MODE.

(1) After lowering the CONTRAST data somewhat, press the (-)(+) ADJUST buttons simultaneously to confirm that the data changes to 100%.
(2) After lowering the BRIGHT data somewhat, press the (-)(+) ADJUST buttons simultaneously to confirm that the data changes to 50%.
(3) After setting H-SIZE to MAX, start the Geometry Reset function with the OSD to confirm that the data returns to the original value.

(4) After lowering the ROTATION data somewhat, press the (-)(+) ADJUST buttons simultaneously to confirm that the data returns to the original value.
(5) After lowering the H-STATIC data somewhat, press the (-)(+) ADJUST buttons simultaneously to confirm that the data returns to 50%.
(6) After lowering the COLOR-1 GREEN data somewhat, press the reset button to confirm that the GREEN data returns to the original value with COLOR RESET.

3.9.1.17 Confirming the full white luminance

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the full white luminance		No. 8 : 85Hz
			Full white

Timing No. 8 (1600 x 1200 106.25K/85), input amplitude = 0.7Vp-p
Confirm that the full white luminance is the following value.

COLOR 1	COLOR 2	COLOR 3	Remarks
103 or more	90 or more	75 or more	

3.9.1.18 Confirming the back raster luminance

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the back raster luminance		No. 8 : 85Hz、 R, G, B OFF

Input timing No. 8 (1600 x 1200 @85Hz) (R, G, B OFF).
When at the BRIGHT CENTER with COLOR 1, confirm that the back raster luminance is 0.3+/-0.1cd/m^2. Confirm that the back raster luminance is 2.5cd/m^2 or more at BRIGHT MAX.

3.9.1.19 Luminance/color coordination uniformity

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Luminance/color coordination uniformity		No. 8 : 85Hz

The luminance ratio between the center and periphery must be 80% or more with timing No. 8 (1600 x 1200 @85Hz) COLOR 1.
The color coordination difference between the center and periphery must be $\Delta x, y < \pm 0.012$ at COLOR 1/2/3.

3.9.1.20 Confirming the full white color coordination

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the color tracking		No. 8 : 85Hz
			Full white

Confirm that the color coordination at the center of the full white is within the following range at the drive signal adjustment timing.

Confirmation item		COLOR 1	COLOR 2	COLOR 3
Color coordination	x	0.283±0.010	0.313±0.010	0.345±0.010
	y	0.297±0.010	0.329±0.010	0.359±0.010

※ OSD color coordination confirmation
X=0.283±0.04 Y=0.297±0.05
(Confirm at the white section of the OSD.)

3.9.1.21 Confirming the color tracking

Confirm that the color coordination change is within the ±0.015 range when the CONTRAST is set to 25cd/m² with the OSD.

3.9.1.22 Confirming the TEXT MODE operation

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the TEXT MODE operation		No. 8 : 85Hz
			Crosshatch

Using a timing No. 8 (1600 x 1200 @ 85Hz) crosshatch pattern, select the TEXT mode with the OSD. Confirm that the vertical line becomes thicker during the reverse display and ringing and smearing, etc. are not found when changed from SHARP to SMOOTH.

3.9.1.23 CRT installation position

CRT installation position tolerance Within ±3mm in vertical direction Within ±2.5mm in horizontal direction
Inclination: Within ±2.5mm at bezel reference

3.9.1.24 Confirming the geomagnetism tolerance

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the geomagnetism tolerance		No. 8 : 106.25K / 85Hz

There must be no apparent color unevenness with each single color when the magnetic field is changed with the following procedure.

Horizontal magnetic field (B_H) : 0±0.04mT
Vertical magnetic field (B_V) : Magnetic field by destination
Display picture size : 393mm x 295mm

<Confirmation procedure>
Completely demagnetize the entire unit including the monitor plates, CRT, funnel section, along the DG coil and face surface with handy-demagnetizer (100V) at the magnetic fields for BH = 0G. Then, change BH to the above values, and demagnetize again. Then, visually confirm.
Note that when changing Bv, set to the effective magnetic field, and then carry out manual degaussing on the OSD once before confirming.

3.9.1.25 Confirming the cancel function operation

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the cancel function operation		No. 8 : 106.25K / 85Hz

Confirm that the following cancel function operates correctly when the tube axial magnetic field (BH) is moved 0.04mT in the + direction or - direction.

3.9.1.26 Confirming the grill vibration

Status indicator	Adjustment item	Adjustment mode/set	Input signal/pattern
	Confirming the grill vibration		No. 8 : 106.25K / 85Hz
			Full white

Using timing No. 8 (1600 x 1200 106.25K/85) full white pattern.

(1) Tap the top of the monitor with a rubber hammer.
(Strength equivalent to shock test.)
(2) Observe from a position 60cm away from the tube surface.
(3) If the vibration continues for 10 seconds or more, judge as line out.
(4) For the set judged as line out, after carry out normal aging (30 minutes or more), apply an impact on the center of the tube surface with an impact hammer. Impact strength: 0.35Nm
(5) Observe from a position 60cm away from the tube surface.
(6) If the vibration continues for 9.5 seconds or more, replace the CRT. If the vibration is within 9.5 seconds, return to the line.

3.9.1.27 Confirming the USB hub

Test using a USB mouse, etc.

3.9.1.28 Others

(1) When the PUSH button is pressed, the changes must be smooth, and there must be no abnormalities such as noise.
(2) Synchronization must not flow when the power switch is turned ON and OFF.
(3) Confirm that the POWER LED is lit.

3.10 Checking the DDC function (using automatic adjustment device)

This writing operation is carried out in combination with the PC.
Confirm that the PC internal clock is correctly set when preparing for this work.

3.10.1 Writing/checking the DDC and EDID data

(1) Following the PC picture displays, select the target model. (This step is carried out only once when the device is started up or the model is changed.)
(2) Turn the monitor power ON.
(3) Following the PC picture displays, write the data into the EEPROM.
The data contents shall be those designated in the table of section 3.10.3 on the next page.
(4) Following the PC picture displays, check the DDC function.

3.10.2 Setting the serial No.

(1) DDC compatible serial No. setting specifications

[Hexadecimal conversion]
Read the following serial No. with the barcode system, and set the serial No. with the following conversion.

Serial No.
Mitsubishi serial No.
Customer serial No.

Low-order 5 digits of S/N → Hexadecimal conversion → Store data in order from low-order byte
6th and higher digit of S/N → Set as 0 (Follow VESA Standards)

(Example) 512002978 → 00000BA2 → Address0C : A2
Address0D : 0B
Address0E : 00
Address0F : 00
(The above address is the offset from the head address 0C32h in the EEPROM.)

[ASCII conversion]
Read the Mitsubishi serial No. with the barcode system, and set the serial No. with the following conversion.
Low-order 5 digits of S/N → ASCII code conversion → Store data in order from low-order byte (To MONITOR DESCRIPTOR #4)
(Example) 512A02978

↓

35 31 32 41 30 32 39 37 38

↓

Address (H)	Data (H)		
71	35		
72	31		
73	32		
74	41		
75	30		
76	32		
77	39		
78	37		
79	38		
7A	0A	← Indicates end of S/N data	Fixed data (Set according to No. of S/N digits)
7B	20	← Indicates blank	
7C	20	← Indicates blank	
7D	20	← Indicates blank	

(The above address is the offset from the head address 0C32h in the EEPROM.)

(2) USB compatible serial No. setting specifications

Store the serial No. into the following address in the EEPROM with the following procedure.

[UNICODE conversion]
Read the Mitsubishi serial No. with the barcode system, and set the serial No. with the following conversion.

S/N → UNICODE conversion → Store data in order from low-order byte (To STRING DESCRIPTOR)

(Example) 512A02978

↓

0035 0031 0032 0041 0030 0032 0039 0037 0038

↓

Head address; 0F60h

Offset address from head address	Setting data	
00	35	
01	00	
02	31	
03	00	
04	32	
05	00	
06	41	
07	00	
08	30	
09	00	
0A	32	
0B	00	
0C	39	
0D	00	
0E	37	
0F	00	
10	38	
11	00	
12	20	; Insert the space "0020" when there is a blank
13	00	

3.10.3 DDC write data contents

The contents of DDC write data must be as follows.

-- EDID DATA DUMP TEXT --
Vendor Name: MEL
Product Code LSB (HEX): f0
Product Code MSB (HEX): 42
Product Code (DEC): 17136
(Microsoft INF ID: MEL42F0)
Serial Number: NNNNNNNNN
Week of Manuf: 30
Year of Manuf: 98

EDID Version: 1
EDID Revision: 1
Extension Flag: 0

Input Singal: ANALOG
Setup: NO
Sync on Green: YES
Composite Sync: YES
Separate Sync: YES
V Sync Serration: NO
V Signal Level: 0.700V/0.300V (1V p-p)

Max Image Size H (cm): 38
Max Image Size V (cm): 28
DPMS Stand By: YES
DPMS Suspend: YES
DPMS Active Off: YES
GTF Support: YES
Display Type: RGB Color

Gamma: 2.05
Red x: 0.625
Red y: 0.340
Green x: 0.290
Green y: 0.605
Blue x: 0.150
Blue y: 0.070
White x: 0.283
White y: 0.297

Established Timings:
720x400@70 720x400@88
640x480@60 640x480@67
640x480@72 640x480@75
800x600@56 800x600@60
800x600@72 800x600@75
832x624@75 1024x768@60
1024x768@70 1024x768@75
1152x870@75 1280x1024@75

Standard Timing #1:
Horizontal Active Pixels: 1800
Aspect Ratio: 4:3
Refresh Rate: 80

Standard Timing #2:
Horizontal Active Pixels: 1600
Aspect Ratio: 5:4
Refresh Rate: 85

EDID EDITOR V1.17 (970612)
(C) Mitsubishi Electric

Standard Timing #3:
Horizontal Active Pixels: 1600
Aspect Ratio: 4:3
Refresh Rate: 85

Standard Timing #4:
Horizontal Active Pixels: 1600
Aspect Ratio: 4:3
Refresh Rate: 75

Standard Timing #5:
Horizontal Active Pixels: 1280
Aspect Ratio: 5:4
Refresh Rate: 85

Standard Timing #6:
Horizontal Active Pixels: 1280
Aspect Ratio: 5:4
Refresh Rate: 75

Standard Timing #7:
Horizontal Active Pixels: 1024
Aspect Ratio: 4:3
Refresh Rate: 85

Standard Timing #8:
Horizontal Active Pixels: 1800
Aspect Ratio: 5:4
Refresh Rate: 75

Detailed Timing (block #1):
Pixel Clock: 252.24
Horizontal Active: 1600
Horizontal Blanking: 608
Vertical Active: 1280
Vertical Blanking: 60
(Horizontal Frequency: 114.24 kHz)
(Vertical Frequency: 85.2 Hz)
Horizontal Sync Offset: 128
Horizontal Sync Width: 176
Vertical Sync Offset: 1
Vertical Sync Width: 3
Horizontal Border: 0
Vertical Border: 0
Horizontal Image Size: 380
Vertical Image Size: 285
Interlaced: NO
Image: Normal Display
Sync: Digital Separate
Bit 1: OFF
Bit 2: OFF

Monitor Range Limits (block #2):
Minimum Vertical Rate: 50 Hz
Maximum Vertical Rate: 160 Hz
Minimum Horizontal Rate: 30 kHz
Maximum Horizontal Rate: 115 kHz
Maximum Pixel Clock: 280 MHz
GTF Data: 00 0a 20 20 20 20 20 20

Monitor Name (block #3): TFA1105U
Monitor Serial Number (block #4): NNNNNNNNN

-- EDID DATA DUMP TEXT --

00 ff ff ff ff ff ff 00
34 ac f0 42 ** ** ** **
W Y 1 01 0e 26 1c 69
e9 04 88 a0 57 4a 9b 26
12 48 4c ff ef 80 c2 54
a9 99 a9 59 a9 4f 81 99
81 8f 61 59 c2 8f 88 62
40 60 62 00 3c 50 80 b0
13 00 7c 1d 11 00 00 18
00 00 00 fd 00 32 a0 1e
73 1c 00 0a 20 20 20 20
20 20 00 00 00 fc 00 54
46 41 31 31 30 35 55 0a
20 20 20 20 00 00 00 ff
00 3N 3N 3N 3N 3N 3N 3N
3N 3N 0a 20 20 20 00 S

W : Week of manufacture
Y : Year of manufacture
S : Check sam
* : Serial number (Hexadecimal)
N : Serial number (ASCII)

3.11 Default inspection

3.11.1 Default setting of switches

Confirm that the following switch is set as follows.

(1) Power switch: OFF

3.11.2 Default setting of OSD

Execute all reset and onfirm that each OSD setting is as shown in the OSD display.

Setting items	Setting classification		Setting contents	Remarks
	by timing	Common		
CONTRAST		○	100%	
BRIGHT		○	50%	
ROTATION		○	CENTER	
H/V/TOP/BOTTOM-CONV		○	50%	
COLOR	○		COLOR 1	All timings
POWER-SAVE		○	ON	
MOIRE	○		OFF	All timings
MOIRE LEVEL	○		0%	All timings
CLAMP-PULSE	○		BACK (+)	All timings
CORNER PURITY TL/TR/BL/BR		○	50%	
VIDEO LEVEL	○		0.7V (+)	All timings
TEXT MODE	○		Sharp	All timings
LANGUAGE		○	ENG	

* CENTER is the factory adjustment value called when the (-) (+) ADJUST buttons are pressed simultaneously in the normal mode.
Only CONTRAST will be set to MAX when the (-) (+) ADJUST buttons are pressed simultaneously in the normal mode.

3.11.3 Checking the labels

Confirm that the "SERVICEMAN WARNING", "rating label", "manufacturing date stamp", "SERIAL NO. label", and "set sub-No.", etc., are attached to the specified position, and have been checked.

3.11.4 Packaging

(1) There must be no remarkable contamination, tearing or scratches, etc.
(2) The model name must be accurately displayed.
(3) The SERIAL NO. must be attached. (Must be the same No. as the set.)
(4) The package must be accurately sealed.

3.12 Degaussing with handy-demagnetizer

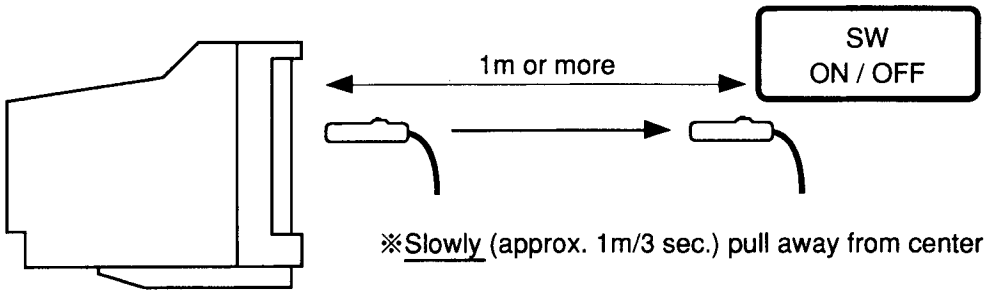
3.12.1 General precautions

(1) Carry this procedure out with the monitor power ON.
(2) When degaussing with handy-demagnetizer, the demagnetizer power must be turned ON and OFF at a position at least 1m away from CRT tube.
(3) Use a bar type demagnetizer instead of a ring type.
Carefully and slowly (1m/3 sec.) demagnetize the CRT tube and bezel side surface.
When separating the degaussing coil at the end, separate as slow as possible with the following procedure.
If separated quickly, stripes could remain at the picture corners.

3.12.2 How to hold and use the handy-demagnetizer

(1) Approach the demagnetizer as carefully and slowly (approx. 1m/3 sec.) as possible, and move around the bezel side periphery two to three times.
(2) Next, gradually (approx. 1m/3 sec.) move to the CRT tube side, and move around the CRT tube four to five times with the following procedure.
(3) Finally, leave the CRT tube as slowly (approx. 1m/3 sec.) as possible, and turn the handy-demagnetizer unit switch OFF at a position 1 to 1.5m away.

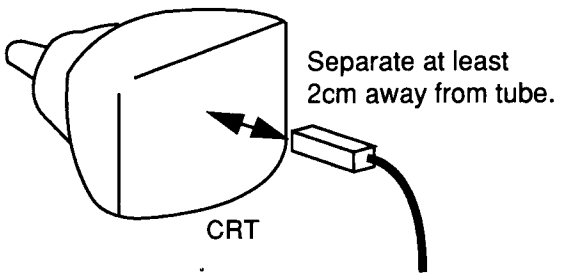
Looking from side of set



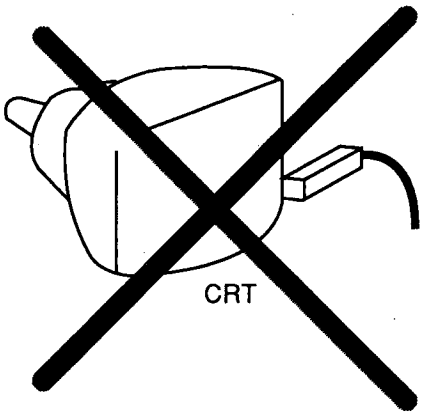
※Slowly (approx. 1m/3 sec.) pull away from center of tube.

<Holding the hand degaussing unit>

Face the hand degaussing unit so that the longitudinal direction is vertical in respect to the CRT.



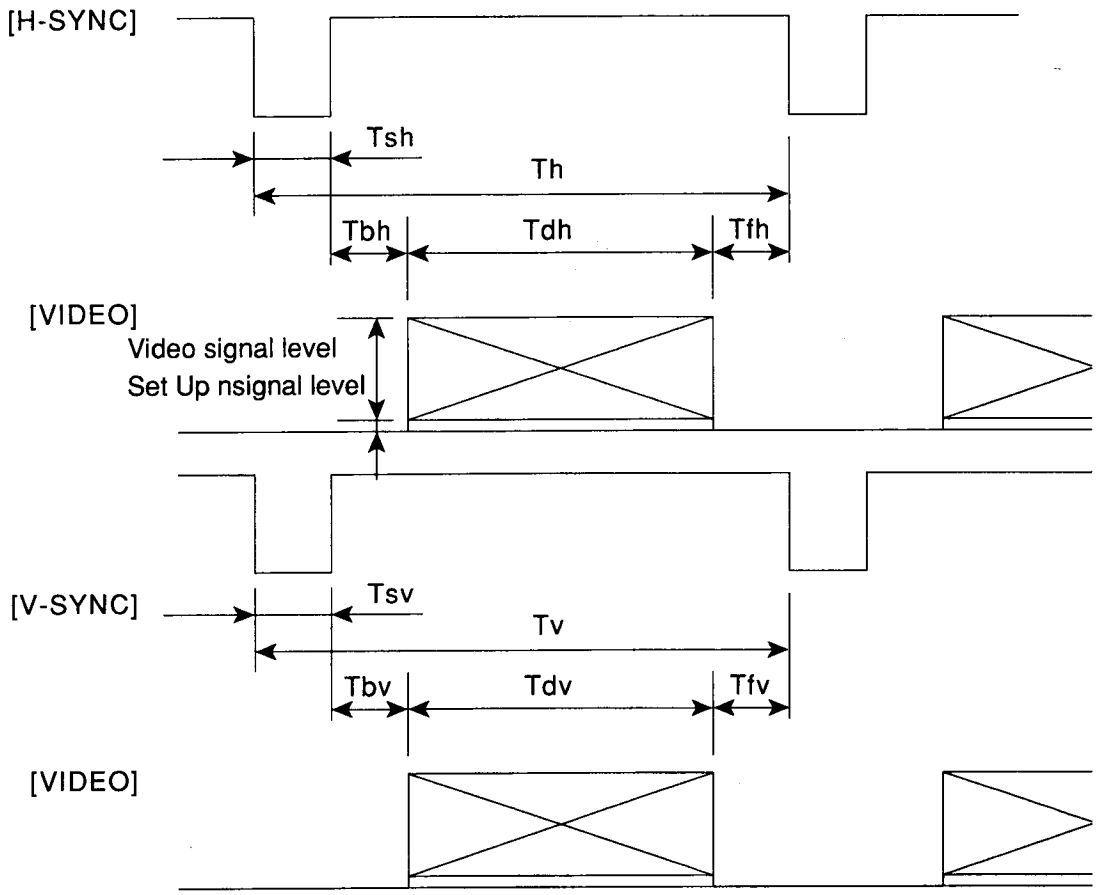
Do not hold the hand degaussing unit so that the longitudinal direction is parallel in respect to the CRT.



3.13 Caution

Do not input the user timing before factory adjustments.
(The automatic tracking of the FOCUS could be adversely affected.)

3.14 Timing chart

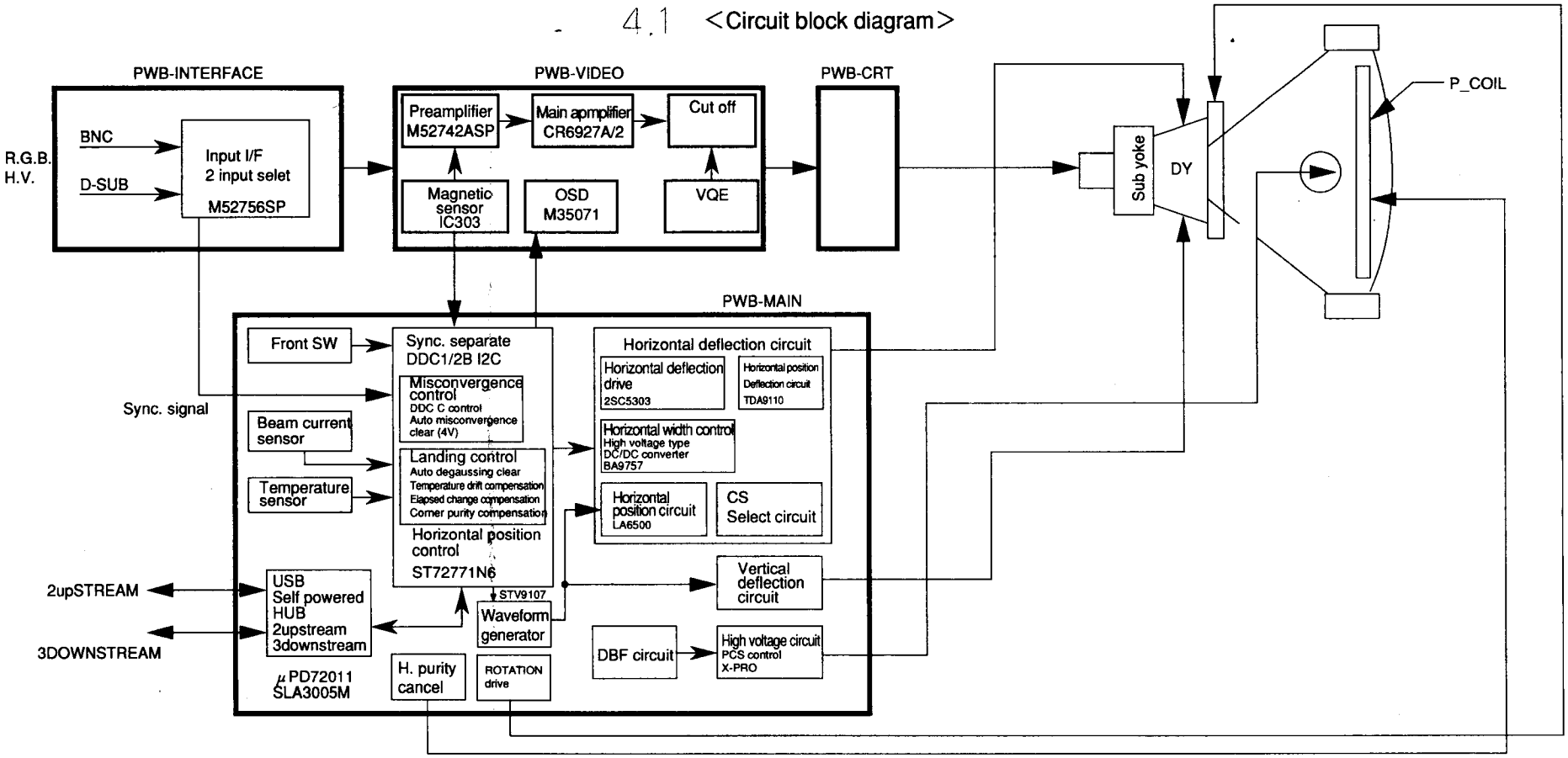


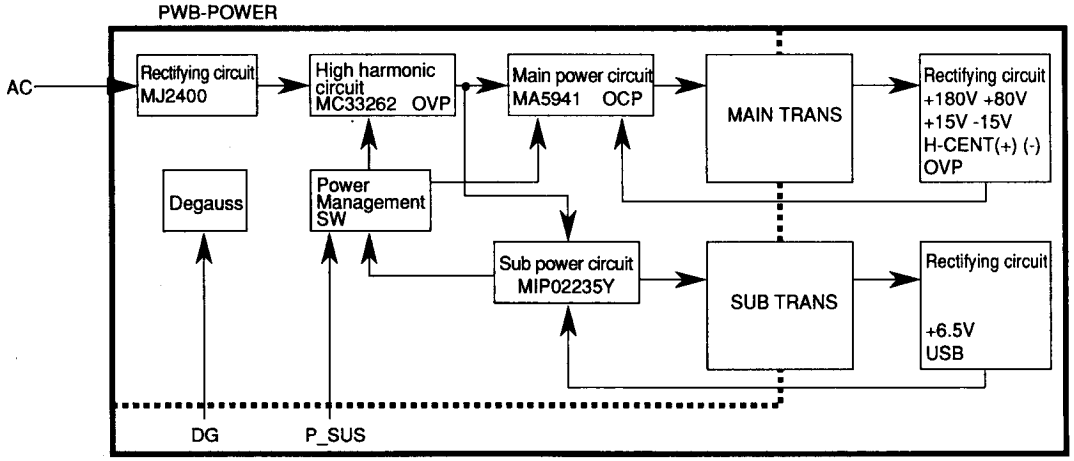
※Refer to after the next page for the preset timing details.

NO	Fh (kHz)	Clock (MHz)	Th (μSEC) (dot)	Tsh (μSEC) (dot)	Tfh (μSEC) (dot)	Tbh (μSEC) (dot)	Tdh (μSEC) (dot)	Fv (Hz)	Tv (mSEC) (line)	Tsv (mSEC) (line)	Tfv (mSEC) (line)	Tbv (mSEC) (line)	Tdv (mSEC) (line)	Hs	Vs	VIDEO level (V)	set up level (V)	Selation	Type 1		Remarks
A	30		33.333 (1684)	4.000 (202)	1.000 (51)	3.000 (152)	25.333 (1280)	70.10	14.268 (1313)	0.064 (6)	1.176 (108)	1.906 (175)	11.122 (1024)	+	—	0.7	—	—			+B adjustment
B	114.24	252.242	8.754 (2208)	0.698 (176)	0.507 (128)	1.205 (304)	6.343 (1600)	85.00	11.765 (1344)	0.026 (3)	0.009 (1)	0.525 (60)	11.204 (1280)	—	—	0.7	—	—	○9		GTF(1600*1280@85)
C	106.25	229.500	9.412 (2160)	0.837 (192)	0.279 (64)	1.325 (304)	6.972 (1600)	85.00	11.765 (1250)	0.028 (3)	0.009 (1)	0.433 (46)	11.294 (1200)	+	—	0.7	—	—			Purity adjustment
Check 1	35		28.571	3.500	1.891	4.000	19.180	66.70	15.000	0.086	1.485	2.000	11.428	S/G		0.7	—	—			Check 1
Check 2	35		28.571	3.500	1.891	4.000	19.180	66.70	15.000	0.086	1.485	2.000	11.428	Compo site		0.7	—	1H			Check 2
Check 3																					Frequency upper limit confirmation
1	31.47	25.175	31.778 (800)	3.813 (96)	0.636 (16)	1.907 (48)	25.422 (640)	59.94	16.683 (525)	0.064 (2)	0.318 (10)	1.048 (33)	15.253 (480)	—	—	0.7	—	—	○0		IBM 480(640*480)
2	53.67	56.250	18.631 (1048)	1.138 (64)	0.569 (32)	2.702 (152)	14.222 (800)	85.06	11.756 (631)	0.056 (3)	0.019 (1)	0.503 (27)	11.179 (600)	+	+	0.7	—	—	○1		VESA(800*600@85)
3	60.02	78.750	16.661 (1312)	1.219 (96)	0.203 (16)	2.235 (176)	13.004 (1024)	75.03	13.328 (800)	0.050 (3)	0.017 (1)	0.466 (28)	12.795 (768)	+	+	0.7	—	—	○2		VESA(1024*768@75)
4	68.68	94.50	14.561 (1376)	1.016 (96)	0.508 (48)	2.201 (208)	10.836 (1024)	85.00	11.765 (808)	0.044 (3)	0.015 (1)	0.524 (36)	11.183 (768)	+	+	0.7	—	—	○3		VESA(1024*768@85)
5	79.98	135.000	12.504 (1688)	1.067 (144)	0.119 (16)	1.837 (248)	9.481 (1280)	75.03	13.329 (1066)	0.038 (3)	0.013 (1)	0.475 (38)	12.804 (1024)	+	+	0.7	—	—	○4		VESA(1280*1024@75)
6	91.15	157.5	10.971 (1728)	1.016 (160)	0.406 (64)	1.422 (224)	8.127 (1280)	85.03	11.761 (1072)	0.033 (3)	0.011 (1)	0.483 (44)	11.234 (1024)	+	+	0.7	—	—	○5		VESA(1280*1024@85)
7	93.75	202.500	10.667 (2160)	0.948 (192)	0.316 (64)	1.501 (304)	7.901 (1600)	75.00	13.333 (1250)	0.032 (3)	0.011 (1)	0.491 (46)	12.800 (1200)	+	+	0.7	—	—	○6		VESA(1600*1200@75)
8	106.25	229.500	9.412 (2160)	0.837 (192)	0.279 (64)	1.325 (304)	6.972 (1600)	85.00	11.765 (1250)	0.028 (3)	0.009 (1)	0.433 (46)	11.294 (1200)	+	+	0.7	—	—	○7		VESA(1600*1200@85)
9	68.68	100.000	14.560 (1456)	1.280 (128)	0.320 (32)	1.440 (144)	11.520 (1152)	75.05	13.322 (915)	0.044 (3)	0.043 (3)	0.568 (39)	12.667 (870)	—	—	0.7	—	—	○8		APPLE21(1152*870)
10	114.24	252.242	8.754 (2208)	0.698 (176)	0.507 (128)	1.205 (304)	6.343 (1600)	85.00	11.765 (1344)	0.026 (3)	0.009 (1)	0.525 (60)	11.204 (1280)	—	—	0.7	—	—	○9		GTF(1600*1280@85)

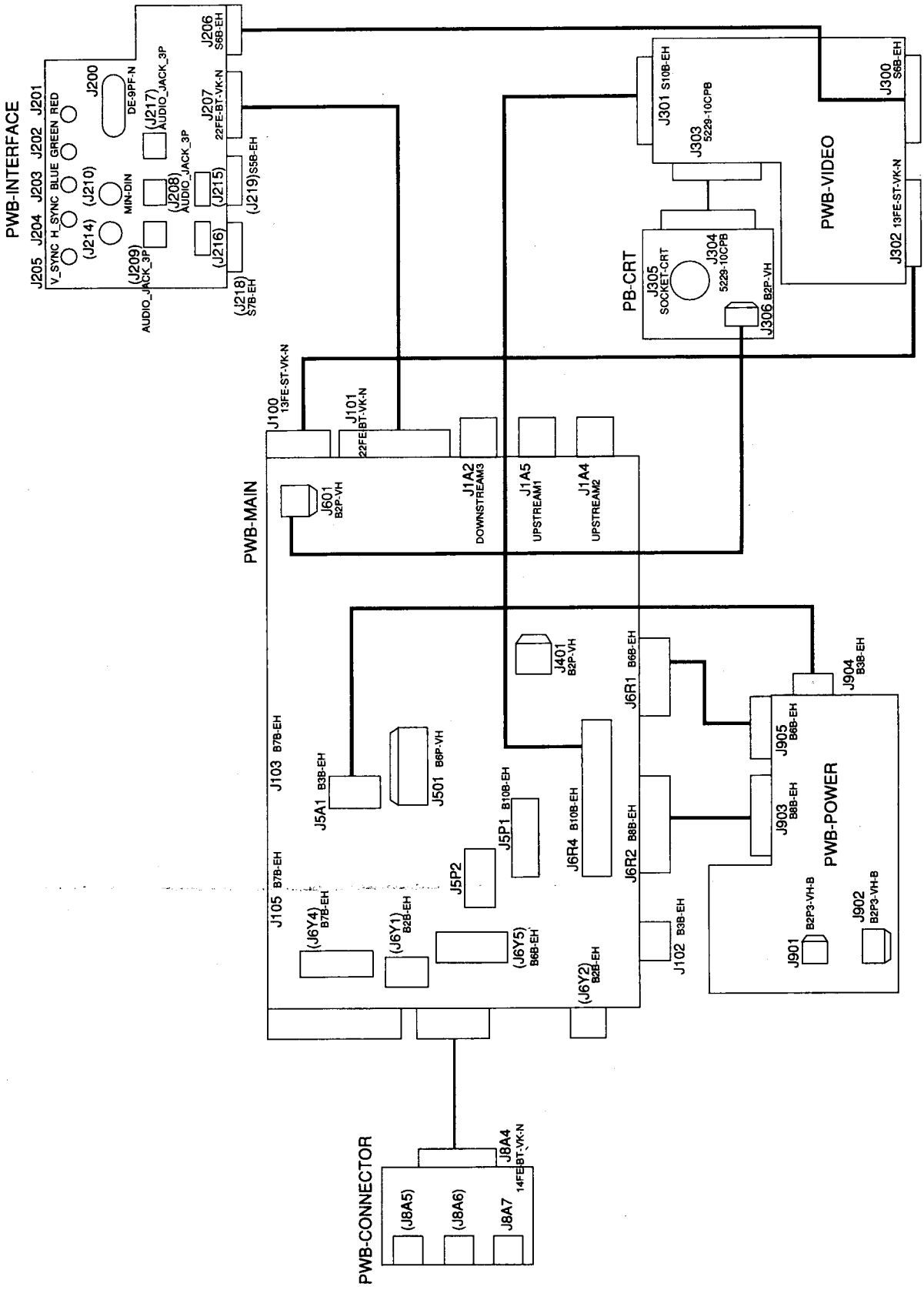
Mark ○ : Factory adjustment
Mark □ : Factory adjustment [Though they are presets, it does not apply to the specification of the picture distortion. The sync. signals are reference to the above. (It is possible to reset with the above timings.))
Mark ▲ : Initial data [So long as initial data, the sync. signals are reference to Hs: + and Vs: -. However, it is necessary to adjust only the H-SIZE, H-PHASE, DBF-H-AMP, DBF-H-PHASE in factory mode.
The numbers after the marks are the number of preset.

4.1 <Circuit block diagram>





5.1 <PWB tangential diagram>



5.2

A Chassis connector connection

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment	PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
MAIN	J100 13FE-BT-VK-N	1	NC	VIDEO	J302 13FE-ST-VK-N	13	NC
		2	Y-OUT			12	Y-OUT
		3	X-OUT			11	X-OUT
		4	GND			10	GND
		5	SUB_BRT			9	SUB_BRT
		6	HV_BLK			8	HV_BLK
		7	GND			7	GND
		8	CLP			6	CLP
		9	V_S			5	V_S
		10	H_OSD			4	H_OSD
		11	GND			3	GND
		12	SCL_I2C			2	SCL_I2C
		13	SDA_I2C			1	SDA_I2C
MAIN	J101 22FE-BT-VK-N	1	+12V	INTERFACE	J207 22FE-BT-VK-N	22	+12V
		2	+12V			21	+12V
		3	GND			20	GND
		4	+5V			19	+5V
		5	GND			18	GND
		6	S/G_SEL			17	S/G_SEL
		7	G_SYNC			16	G_SYNC
		8	H_SYNC			15	H_SYNC
		9	V_SYNC			14	V_SYNC
		10	SEL			13	SEL
		11	GND			12	GND
		12	SDA_DDC			11	SDA_DDC
		13	SCL_DDC			10	SCL_DDC
		14	+3_3V			9	+3_3V
		15	GND			8	GND
		16	USB_D+			7	USB_D+
		17	USB_D-			6	USB_D-
		18	GND			5	GND
		19	GND			4	GND
		20	RXD			3	RXD
		21	DTR			2	DTR
		22	TXD			1	TXD
MAIN	J102 B3B-EH	1	+6_5V	Power LED			
		2	GND				
		3	LED				
MAIN (CONT_USB)	J1A2 DOWNSTREAM3	1	DW_VPP2	USB DOWNSTREAM			
		2	DW_DM2				
		3	DW_DP2				
		4	DW_VSS2				
		5	DW_VPP5				
		6	DW_DM5				
		7	DW_DP5				
		8	DW_VSS5				

A Chassis connector connection

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
MAIN (CONT_USB)	J1A4 UPSTREAM1	1	UP_VPP1
		2	UP_DM1
		3	UP_DP1
		4	UP_VSS1
MAIN (CONT_USB)	J1A5 UPSTREAM2	1	UP_VPP2
		2	UP_DM2
		3	UP_DP2
		4	UP_VSS2
INTERFACE	J200 DE-9PF-N	1	RED
		2	GREEN
		3	BLUE
		4	GND
		5	GND
		6	GND
		7	GND
		8	GND
		9	5V_DDC
		10	GND
		11	GND
		12	SDA_DDC
		13	H-SYNC
		14	V-SYNC
		15	SCL_DDC
INTERFACE	J201 CP450	1	RED
	J202 CP450	1	GREEN
	J203 CP450	1	BLUE
	J204 CP450	1	H_SYNC
	J205 CP450	1	V_SYNC
INTERFACE	J206 S6B-EH	1	GND
		2	B
		3	GND
		4	R
		5	GND
		6	G
INTERFACE	J208 AUDIO_JACK_3P CP452	1	AUDIO COM
		2	AUDIO R+
		3	AUDIO L+
INTERFACE	J209 AUDIO_JACK_3P CP452	1	MIC_COM
		2	MIC_R+_OUT
		3	MIC_L+_OUT
INTERFACE	J210 MIN-DIN PCS688-01-201 CP452	1	DTR
		2	NC
		3	TXD
		4	GND
		5	RXD
		6	GND
		7	NC
		8	NC
INTERFACE	J214 MIN-DIN	1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	
INTERFACE	J207 AUDIO_JACK_3P CP452	1	GND
		2	USB_DAC_R+
		3	USB_DAC_L+

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
VIDEO	J300 S6B-EH	1	GND
		2	B
		3	GND
		4	R
		5	GND
		6	G
INTERFACE	J216 S3B-EH CP452	2	
		1	
		3	
INTERFACE	J215 S5B-EH CP452	2	
		5	
		1	
		3	
		4	

USB UPSTREAM

USB UPSTREAM

D-SUB SIGNAL INPUT

BNC SIGNAL INPUT

SPEAKER INPUT

MIKE INPUT

RS232C

USB_DAC

A Chassis connector connection

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
INTERFACE	J218 S7B-EH CP452	1	GND
		2	MIC_L+_OUT
		3	MIC_R+_OUT
		4	AUDIO_R+
		5	AUDIO_L+
		6	USB_DAC_R+
		7	USB_DAC_L+
INTERFACE	J219 S5B-EH CP452	1	GND
		2	USB_D-
		3	USB_D+
		4	+3_3V
		5	+5V
VIDEO	J301 S10B-EH	1	-15V
		2	GND
		3	GND
		4	P-OFF_+5V
		5	HEATER
		6	+15V
		7	NC
		8	+80V
		9	NC
		10	+200V
CRT	J304 5229-10CPB	1	G
		2	GND
		3	NC
		4	R
		5	GND
		6	NC
		7	B
		8	GND
		9	HEATER
		10	GND
CRT	J305 HPS0720-011002		SOCKET-CRT
CRT	J306 B2P-VH RX452	1	G2
		2	G2
MAIN (DEFL)	J401 B2P-VH RX452	1	VDY+
		2	NC
		3	VDY-
MAIN (DEFL)	J501 B6P-VH RX452	1	HDY-
		2	HDY-
		3	NC
		4	NC
		5	HDY+
		6	HDY+
MAIN (DEFL)	J5A1 B3B-EH CP4520	1	H-POSI1
		2	+B
		3	H-POSI2

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
AUDIO-SUB	J8G2 S7B-EH CP452	1	GND
		2	MIC_L+_OUT
		3	MIC_R+_OUT
		4	AUDIO_R+
		5	AUDIO_L+
		6	USB_DAC_R+
		7	USB_DAC_L+
AUDIO-SUB	J8G1 S5B-EH CP452	1	GND
		2	USB_D-
		3	USB_D+
		4	+3_3V
		5	+5V
MAIN (DEFL)	J6R4 B10B-EH CP452	1	-15V
		2	GND
		3	GND
		4	P-OFF_+5V
		5	HEATER
		6	+15V
		7	NC
		8	+80V
		9	NC
		10	+200V
VIDEO	J303 5229-10CPB	10	G
		9	GND
		8	NC
		7	R
		6	GND
		5	NC
		4	B
		3	GND
		2	HEATER
		1	GND
CRT			
MAIN (DEFL)	J601 B2P-VH RX452	1	G2
		2	G2
DY I/F			
DY I/F			
POWER	J904 B3B-EH CP452	1	H-CENT(+)
		2	+B
		3	H-CENT(-)

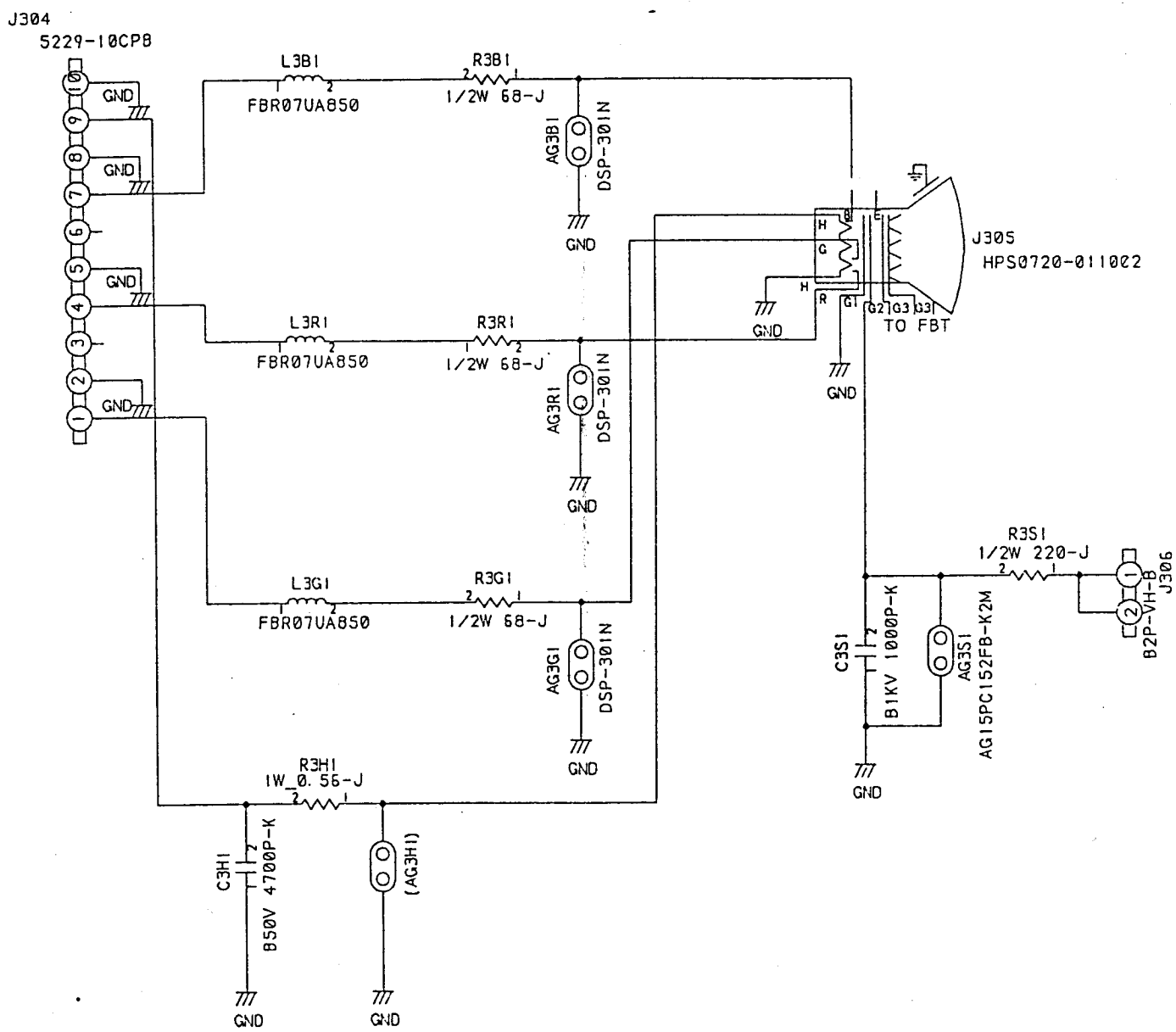
A Chassis connector connection

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment	PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
MAIN (CONT_USB)	J5S1 ANABOKO	1	VST	DEFL-SUB	J7A1 B7PS-TB-2	1	VST
		2	Imid			2	Imid
		3	GND			3	GND
		4	P_OFF_+5V			4	P_OFF_+5V
		5	+12V			5	+12V
		6	SCL_AFC			6	SCL_AFC
		7	SDA_AFC			7	SDA_AFC
MAIN (CONT_USB)	J5U1 ANABOKO	1	H_S	DEFL-SUB	J7A2 B8PS-TB-2	1	H_S
		2	V_S			2	V_S
		3	GND			3	GND
		4	HD2			4	HD2
		5	HLOCKOUT			5	HLOCKOUT
		6	PIN_KEY			6	PIN_KEY
		7	AFC			7	AFC
		8	NC			8	NC
		9	BLK_V_IN			9	BLK_V_IN
		10	BLK_OUT			10	BLK_OUT
MAIN (DEFL)	J6R1 B6B-EH CP452	1	+6_5V	POWER	J905 B6B-EH CP452	1	+6_5V
		2	USB_+6_5V			2	USB
		3	GND			3	GND
		4	GND			4	GND
		5	P-SUS			5	P-SUS
		6	DG			6	DG
MAIN (DEFL)	J6R2 B8B-EH CP452	1	+190V	POWER	J903 B8B-EH CP452	1	+190V
		2	NC			2	NC
		3	+80V			3	+80V
		4	NC			4	NC
		5	+15V			5	+15V
		6	GND			6	GND
		7	GND			7	GND
		8	-15V			8	-15V
MAIN (DEFL)	J6Y1 B2B-EH CP452	1	L-	SPEAKER L			
		2	L2				
		3	NC				
MAIN (DEFL)	J6Y2 B2B-EH CP452	1	R-	SPEAKER R			
		2	R3				
		3	NC				
MAIN (DEFL)	J6Y3 14FE-BT-VK-N	1	L2	CONECT	J8A4 14FE-BT-VK-N	14	L2
		2	L+			13	L+
		3	L1			12	L1
		4	R1			11	R1
		5	R+			10	R+
		6	R1			9	R2
		7	GND			8	GND
		8	GND			7	GND
		9	L+_IN			6	MIC_L
		10	MICR+_IN			5	MIC_R
		11	DW_VSS1			4	DW_VSS3
		12	DW_DM1			3	DW_DM3
		13	DW_DP1			2	DW_DP3
		14	DW_VPP1			1	DW_VPP3

A Chassis connector connection

PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment	PWB name	Sources/ Model name/ Parts No.	Pin No.	Pin assignment
MAIN (CONT)	J104 B2B-EH CP452	1	ROTATION1	ROTATION COIL			
		2	ROTATION2				
MAIN (CONT)	J106 B10B-EH CP452	1	H CANCEL1				
		2	H CANCEL2				
		3	CP-BL1				
		4	CP-BL2				
		5	CP-BR1				
		6	CP-BR2				
		7	CP-TL1				
		8	CP-TL2				
		9	CP-TR1				
		10	CP-TR2				
POWER	J901 B2P3-VH-B	1	L	AC INPUT			
		2	NC				
		3	N				
POWER	J902 B2P3-VH-B	1	N	DG			
		2	NC				
		3	L				
MAIN (DEFL)	J6J1 B2B-XH-A	1	V_STA1	V STATIC COIL			
		2	V_STA2				
MAIN (DEFL)	J6J2 B2B-XH-A	1	H_STA1	H STATIC COIL			
		2	H_STA2				

REF.NO.	CIRCUIT
J4**	V-DEFLECTION
J5**	H-DEFLECTION
J5A*,J5B*	H-POSITION
J5F*	TCO
J5J*,J5K*	+B CONTROL
J5P*,J5R*	CONTROL
J5S*,J5T*	CONTROL
J6**	HV
J6E*,J6F*	DBF
J8**	POWER
J8A*,J8B*	AUDIO
J8E*,J8F*	DDCP
J8G*,J8H*	DDCP



RDG21X -TFA1105STUW-

5.3 SCHEMATIC DIAGRAM

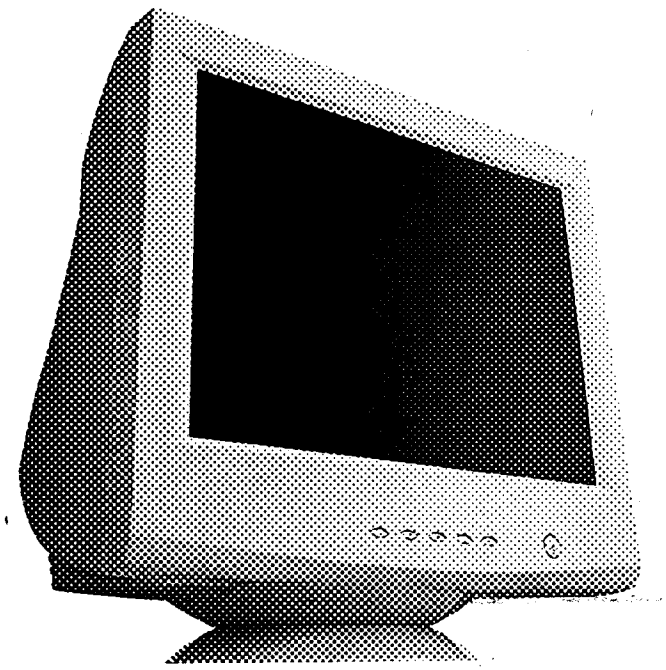
CRT

MITSUBISHI

AUTO-SCANNING WITH DIGITAL CONTROL
COLOR DISPLAY MONITOR

Diamond Plus 120u

MODEL **TFA1105STTUW**
USER'S GUIDE



For future reference, record the serial number of your display monitor in the space below:
SERIAL No. [ ]
The serial number is located on the rear cover of the monitor.

CAUTION

The power cord provided with this monitor is designed for safety and must be used with a properly grounded outlet to avoid possible electrical shock.

Do not remove the monitor cabinet as this can expose you to very high voltages and other hazards.

MANUFACTURER DECLARATION FOR CE-MARKING:

We, Mitsubishi Electric Corp., declare under our sole responsibility, that this product is in conformity with the following standards:

EN60950
EN55022 Class B
EN50082-1
EN61000-3-2
EN61000-3-3

following the provisions of:

73/23/EEC Low Voltage Directive
89/336/EEC EMC Directive

WARNING!

This product is not designed for use in life support devices and Mitsubishi Electric Corporation makes no representations to the contrary. Life support devices are those devices which are used to measure, diagnose, or evaluate the tissue, systems or functions of the human body; or other devices employed to support or sustain life or good health.

Trademark

IBM, PC, PS/2, PS/V, Personal System/2 are registered trademarks of International Business Machines Corp.
Apple Macintosh is a registered trademark of Apple Computer, Inc.
Quadra is a trademark of Apple Computer, Inc.
UNIX is a registered trademark in the United States and other countries, licensed exclusively through X/Open Company Limited.
ENERGY STAR is a U.S. registered mark.

1

Congratulations on your purchase of the high resolution color monitor. We designed this monitor to provide you with years of reliable trouble-free operation.

This guide tells you how to connect, adjust and care for your monitor. This guide also provides technical specifications and instructions for troubleshooting any basic problems you may experience with your monitor.

1.1 Features

The Diamond monitor is a 55cm/21"(50cm/19.7" Diagonal Viewable Image) intelligent, microprocessor-based monitor compatible with most analog RGB (Red, Green, Blue) display standards, including PS/V®, PS/2®, Apple® Macintosh® Centris, Quadra, Macintosh II and Power Macintosh family signals.

It provides crisp text and vivid color graphics with VGA, SVGA, XGA (non-interlaced), and most Macintosh compatible color video cards.

- The monitor's wide auto-scanning compatibility range makes it possible to upgrade video cards or software without purchasing a new monitor.
- Digitally controlled auto-scanning is done using an internal microprocessor, for horizontal scan frequencies between 30kHz and 115kHz, and vertical scan frequencies between 50Hz and 160Hz. The microprocessor-based intelligence allows the monitor to operate in each frequency mode with the precision of a fixed frequency monitor.
- The monitor contains resident memory for pre-programmed screen display standards and is also capable of storing additional user adjustment parameters.
- The monitor is capable of producing a non-interlaced maximum addressable resolution format of 1800 dots x 1440 lines. This display is well suited for windowing environments.
- Because of the analog signal inputs, the monitor can display an unlimited palette of colors that can be manually adjusted to suit your specific needs.
- The monitor has a power management function accorded to VESA™ DPMS™-standard. To save energy, the monitor must be connected to a system compliant with the VESA™ DPMS™-standard. (Refer to your computer and/or video card instructions for proper operation.)
- To ensure ease of installation and ongoing use, the monitor features Moire Clear Function and On-Screen Display (OSD) of all monitor set-up and adjustment functions.
- For use in a variety of applications, the monitor complies with UL 1950, CSA C22.2 No.950 and EN60950 for safety, FCC Class-B, VCCI Class-B and EN55022 Class-B for EMI, MPR-II, ISO 9241-3, ISO9241-7, ISO9241-8 and ZH1/618 ergonomics. The monitor also complies with TCO'99 guideline for environmental safe use.
- Digital Chassis design for lighter, more compact enclosure and increased screen performance.
- The world's standard DIAMONDTRON tube upgraded with improved focus and convergence for supersharp and pure picture images.
- The monitor complies with Video Electronics Standards Association (VESA™) DDC™1/2B(EDID) specification. If your computer provides DDC™1/2B(EDID) function, setup will be done automatically.
- New S-NX gun technology and MSB-DY for lower power consumption with optimum screen performance.
- Fine 0.28mm aparture grille pitch/Maximum addressable resolution of 1800 x 1440.
- USB self-powered hub with 2 upstream ports and 3 downstream ports.

1.2 Internal Preset Memory Capability

To minimize adjustment needs, the factory has preset popular display standards into the monitor, as shown in Table 1. If any of these display standards are detected, the picture size and position are automatically adjusted. All of the factory presets may be overwritten by adjusting the user controls. The monitor is capable of automatically storing up to 15 additional display standards. The new display information must differ from any of the existing display standards by at least 1kHz for the horizontal scan frequency or 1Hz for the vertical scan frequency or the sync signal polarities must be different.

Table 1. Memory Buffer Factory Presets

PRESET TIMING	Fh(kHz)	Fv (Hz)	Polarity H	Polarity V
640 x 480 N.I.	31.5	60.0	–	–
800 x 600 N.I.	53.7	85.1	+	+
1024 x 768 N.I.	60.0	75.0	+	+
1024 x 768 N.I.	68.7	85.0	+	+
1152 x 870 N.I.	68.7	75.1	–	–
1280 x 1024 N.I.	80.0	75.0	+	+
1280 x 1024 N.I.	91.2	85.0	+	+
1600 x 1200 N.I.	93.8	75.0	+	+
1600 x 1200 N.I.	106.3	85.0	+	+
1600 x 1280 N.I.	114.2	85.0	–	–

1.3 Power Management Function

The monitor has the power management function which reduces the power consumption of the monitor when not in use. There are three reduced power level modes.

Mode	Power(with no USB operation)	POWER-ON INDICATOR
Normal	140 W	Green
Stand-By	≦10 W	Amber
Suspend	≦10 W	Amber
Off	≦ 3 W	Amber

1.4 DDC

The monitor includes the DDC™1 and DDC™2B feature. DDC (Display Data Channel) is a communication channel over which the monitor automatically informs the computer system about its capabilities (e.g. each supported resolution with its corresponding timing).
DDC is routed through previously unused pins of the 15-pin VGA connector.
The system will perform "Plug and Play" feature if both, monitor and computer, implement the DDC protocol.

1.5 Location Considerations

When setting up and using the monitor, keep the following in mind:

- For optimum viewing, avoid placing the monitor against a bright background or where sunlight or other light sources may reflect on the display area of the monitor; place the monitor just below eye level.
- Place the monitor away from strong magnetic or electromagnetic fields, such as high capacity transformers, electric motors, large current power lines, steel pillars, etc....
  Magnetism can cause distortion in the picture and/or color purity.
- Avoid covering the slots or openings of the monitor. Allow adequate ventilation around the monitor so the heat from the monitor can properly dissipate. Avoid putting the monitor into any enclosure that does not have adequate ventilation.
- Avoid exposing the monitor to rain, excessive moisture, or dust, as this can cause a fire or shock hazard.
- Avoid placing the monitor, or any other heavy object, on the power cord. Damage to the power cord can cause a fire or electrical shock.
- When transporting the monitor, handle it with care.

1.6 Cleaning Your Monitor

When clean the monitor, please follow these guidelines:

- Always unplug the monitor before cleaning.
- Wipe the screen and cabinet front and sides with a soft cloth.
- If the screen requires more than dusting, apply a household window cleaner to a soft cloth to clean the monitor screen.

CAUTION

Do not use benzene, thinner or any volatile substances to clean the unit as the finish may be permanently marked. Never leave the monitor in contact with rubber or vinyl for an extended time period.

1.7 Unpacking

After you unpack the box you should have all of the items indicated in Figure 1. Save the box and packing materials in case you ship or transport the monitor.

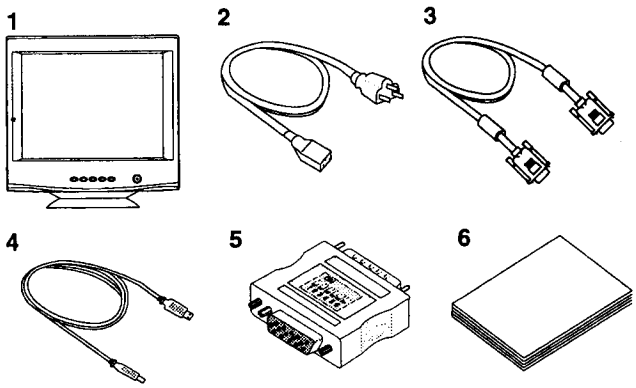


Figure 1.

1. Color Monitor
2. AC Power Cord
3. Signal Cable SC-B102 (or SC-B104)
4. USB Upstream Cable
5. Macintosh Adapter AD-A205
6. User's Guide (this document)

1.8 Tilt/Swivel Base

The monitor comes with a tilt/swivel base. This enables you to position the monitor to the best angle and tilt for maximum viewing comfort.

Screen Position Adjustment

Adjust the tilt and rotation of the monitor by placing your hands at opposite sides of the case. You can adjust the monitor 90 degrees right or left, 10 degrees up or 5 degrees down, as shown below.

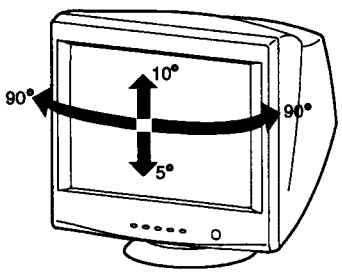


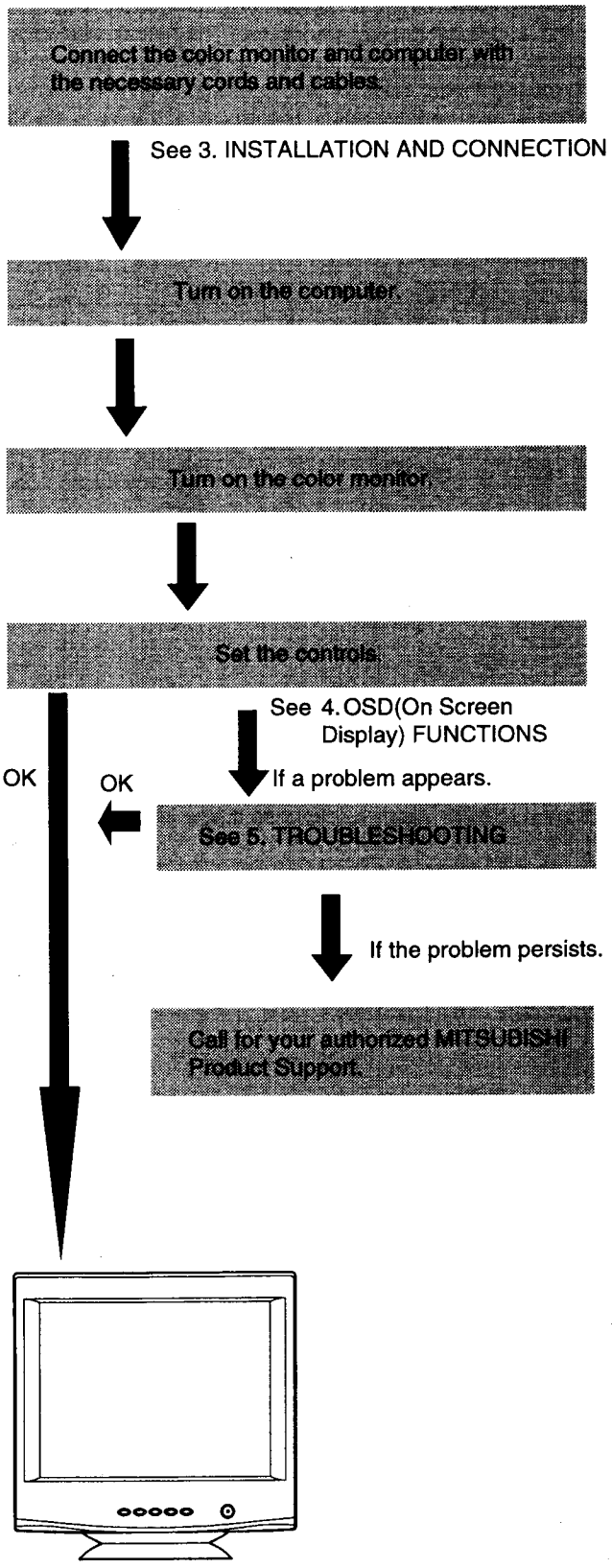
Figure 2.

CAUTION

Keep your fingers away from the pivot area of the tilt/swivel base.

1.9 Quick Operation Chart

To summarize the steps in connecting your computer with the color monitor and setting the necessary controls and switches, refer to the chart below.



2

2.1 Control Names

See Figures 3 and 4 for the location of the user controls, indicator and connectors.
Each part is identified by number and is described individually.

FRONT

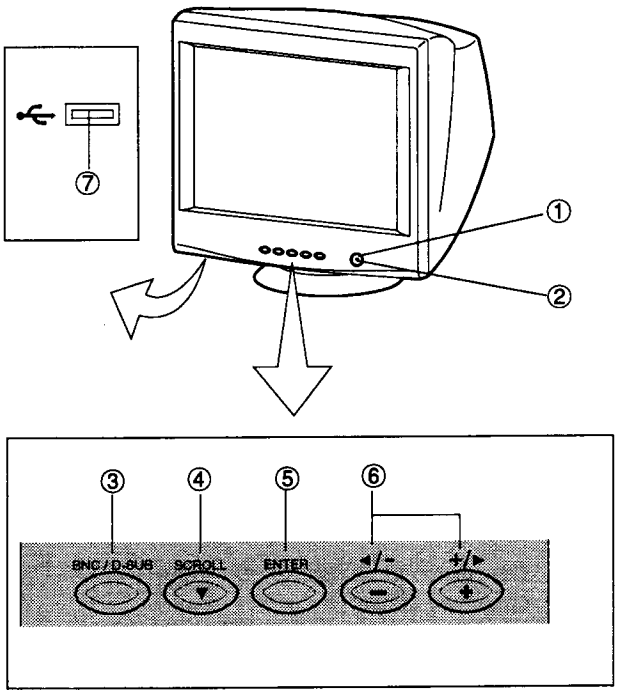


Figure 3

REAR

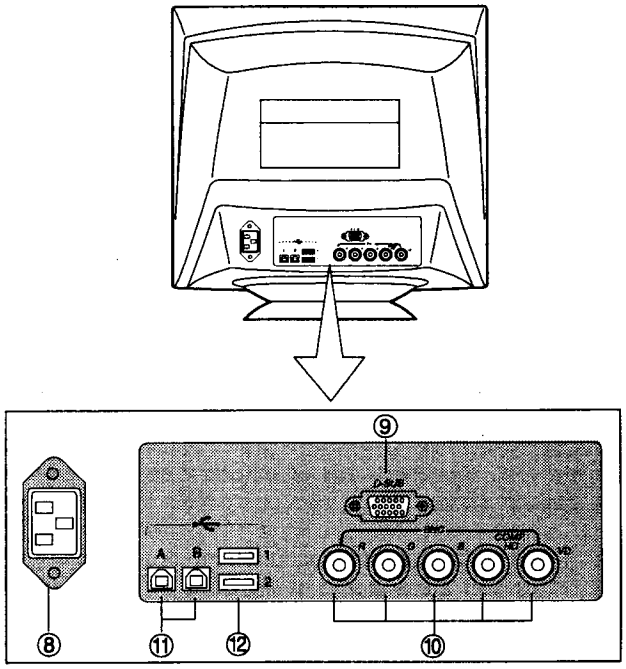


Figure 4

2.2 Function

1. **POWER SWITCH:** A push-on / push-off switch for AC power.
2. **POWER-ON INDICATOR:** This indicator illuminates at green when AC power is on, and illuminates at amber when the monitor is in the power management modes.
3. **INPUT CONNECTOR SELECT BUTTON:** Push to select the signal input connector, BNC or D-SUB.
4. **SCROLL BUTTON:** Push to select group icon.
5. **ENTER BUTTON:** Push to fix/unfix the item icon.
6. **FUNCTION ADJUST BUTTONS:** Push the adjust buttons to select the item icon and to adjust the image on the screen.
7. **DOWNSTREAM PORT:** To connect USB camera, keyboard, mouse, etc.
8. **AC POWER CONNECTOR**
9. **SIGNAL INPUT CONNECTOR (DB9-15P)**
10. **SIGNAL INPUT CONNECTORS (BNC)**
11. **UPSTREAM PORTS:** To connect to USB equipped computer(s).
12. **DOWNSTREAM PORTS:** To connect to USB equipped peripherals, e.g, USB camera, keyboard, printer, etc.

3

On the back of the monitor four kinds of plug-in connections are provided: AC power connector for the AC input, DB9-15P connector and BNC connector for video signal input and USB ports for USB communication.

3.1 AC Power Connection

One end of the AC power cord is connected into the AC power connector on the back of the monitor. The other end is plugged into a properly grounded three-prong AC outlet. The monitor's auto-sensing power supply can automatically detect 100-120V AC or 220-240V AC and 50 or 60Hz.

3.2 Signal Cable Connection

The attached video signal cable provides a DB9-15P connector for the VGA compatible analog RGB outputs on your computer. Apple Macintosh Computers can also be interfaced with using the included Mitsubishi Macintosh adapter AD-A205.

3.2.1 Connecting to Any IBM VGA Compatible System

Figure 5 shows the SC-B102 or SC-B104 cable connection to the Video Graphics Array (VGA) port in an IBM Personal System/2® series, or any VGA compatible system.

1. Power off, both the monitor and the computer.
2. Connect the one end of the SC-B102 or SC-B104 cable to the DB9-15P connector on the VGA controller card.
3. Connect the other end of the SC-B102 or SC-B104 cable to the DB9-15P receptacle on the back of the monitor.
4. Power on the computer, then the monitor.
5. After using the system, power off the monitor, then off the computer.

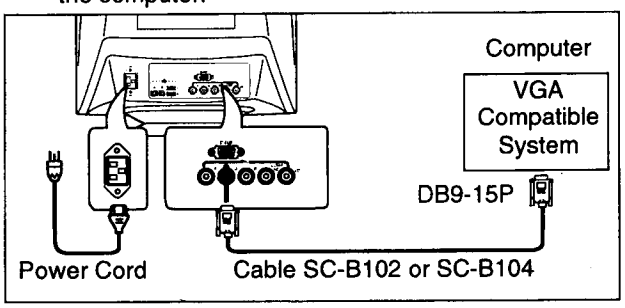


Figure 5.

CAUTION

The socket-outlet shall be installed near the equipment and shall be easily accessible. During servicing, disconnect the plug from the socket-outlet.
Méme si le moniteur est mis hors tension il reste toujours alimenté. La prise secteur devrait ainsi être facilement accssible en cas d'urgence.

3.2.2 Connecting to An Apple Macintosh Computer

Figure 6 shows the SC-B102 or SC-B104 cable and AD-A205 Adapter to the video port in an Apple Macintosh.

1. Power off, both the monitor and the computer.
2. Set the DIP switches of Macintosh Adapter according to the setting chart.
   (See 7.3 Macintosh Adapter AD-A205 settings)
3. Connect the 15-pin (DB-15P) end of the AD-A205 Adapter to the straight 15-pin connector on the Macintosh video port on the computer or on the video board.
4. Connect the sub-miniature 15-pin (DB9-15P) end of AD-A205 Adapter to the SC-B102 or SC-B104 cable.
5. Connect the other end of the SC-B102 or SC-B104 cable to the DB9-15P receptacle on the back of the monitor.
6. Power on the Macintosh, then the monitor.
7. After using the system, power off the monitor, then off the Macintosh.

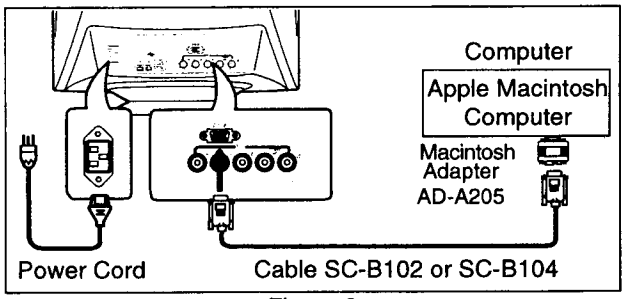


Figure 6.

3.2.3 Connecting to a Unix Workstation & Third Party Graphics Card

Figure 7 shows the SC-B102 (or SC-B104) or "75Ω" coaxial cable (not supplied) connection to the graphics video card (PC-CAD and workstation).

1. Power off, both the monitor and the computer.
2. Connect one end of the SC-B102 (or SC-B104) cable or the "75Ω" coaxial cable to the output connector on the computer, or on the video board.
3. Connect the other end of the SC-B102 (or SC-B104) cable or the "75Ω" coaxial cable to the DB9-15P receptacle or the BNC receptacles on the back of the monitor.
4. Power on the computer, then the monitor.
5. After using the system, power off the monitor, then off the computer.

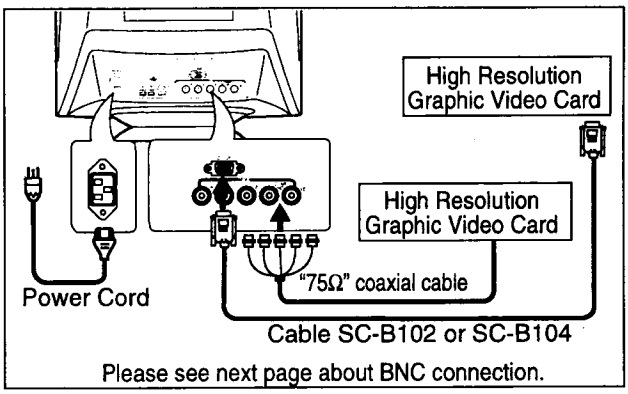
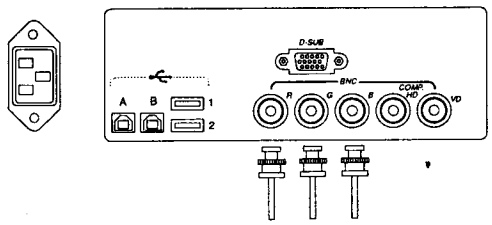


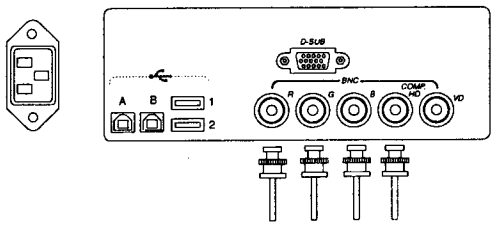
Figure 7.

3.2.4 BNC Connection

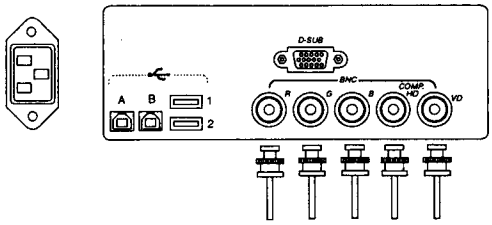
(1) IN CASE OF A COMPOSITE SYNC ON GREEN VIDEO SIGNAL (SYNC ON GREEN):
Connect the R, G and B video signals to the BNC receptacles on the back of the monitor.



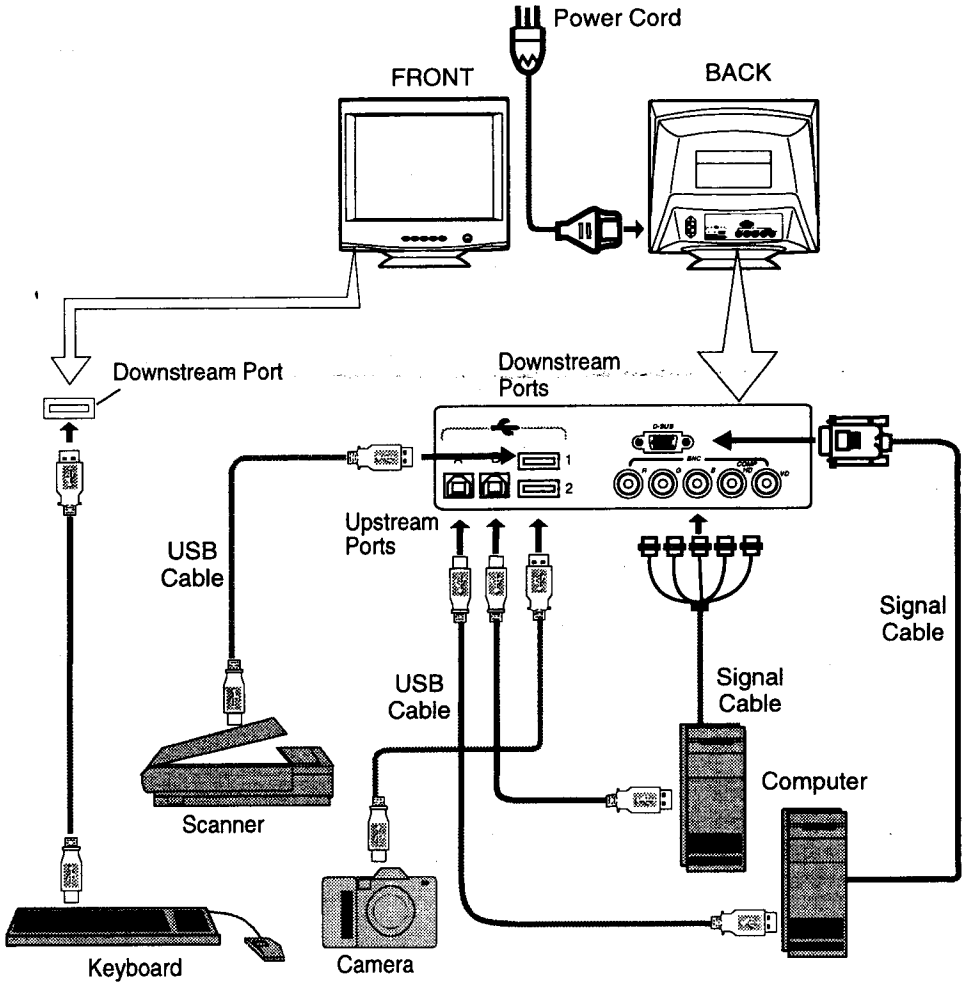
(2) IN CASE OF EXTERNAL COMPOSITE SYNC SIGNAL:
Connect the R, G and B video signals and the Composite sync signal to BNC receptacles on rear panel, respectively.



(3) IN CASE OF SEPARATE HORIZONTAL AND VERTICAL SYNC SIGNALS:
Connect the R, G and B video signals and the horizontal and vertical sync signals to the BNC receptacles on the rear panel.



3.3 USB System Basic Application



NOTE

- The computer is required to have Windows® 98 installed and USB functions.
- When connecting one computer, either Upstream port A or B is available. The Upstream port with that the computer is connected is detected automatically.

3.4 Installation of USB Function

1. Power on the display monitor and computer.
2. Enumerate Mitsubishi USB HUB using the following procedure.

NOTE

- During the enumeration of Mitsubishi USB Hub, connect the keyboard and mouse equipped with USB function, to the computer and not to the downstream ports on the display monitor. After the enumeration, the keyboard and mouse can be used by connecting to the downstream ports.
- Do not unplug the USB cable during the enumerations.

(1) Connect the computer and the display monitor with the included USB upstream cable. Figure 8 will appear.
(2) Click "Next" on Figure 8 to get Figure 9.
(3) Click "Finish" on Figure 9 to complete the enumeration of Mitsubishi USB HUB.

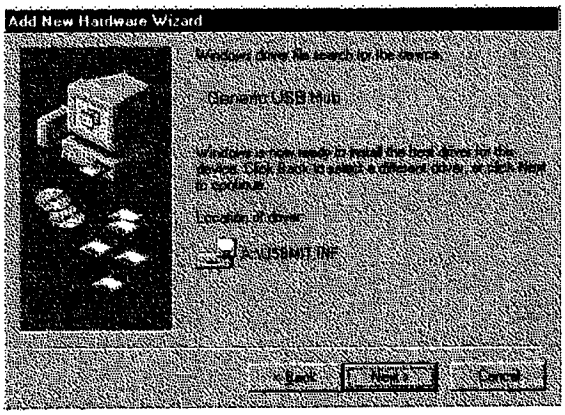


Figure 8

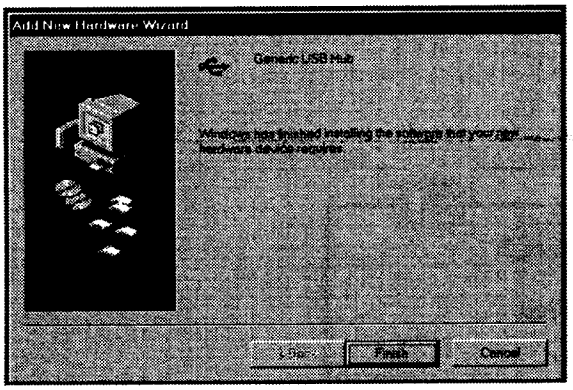


Figure 9

You can confirm that "Mitsubishi USB HUB" is successfully enumerated with the following method.

- Open "Device Manager" tab in "System" property under "Control Panel". Confirm that "Generic USB HUB" is listed in "Universal Serial Bus Controller". If you can't confirm it, re-enumerate "Mitsubishi USB HUB" again by following (a) or (b).

(a) Disconnect and connect the USB cable to the upstream port of the display monitor.
(b) Power Off/On the display monitor.

NOTE

If the mark ⓘ appears with "Generic USB HUB", then enumeration was unsuccessful. Select "Generic USB HUB" marked with ⓘ mark and click "Remove" and "Refresh". After that, the enumeration is automatically started.

NOTE

The enumeration of USB HUB may be necessary for each USB port on the computer.

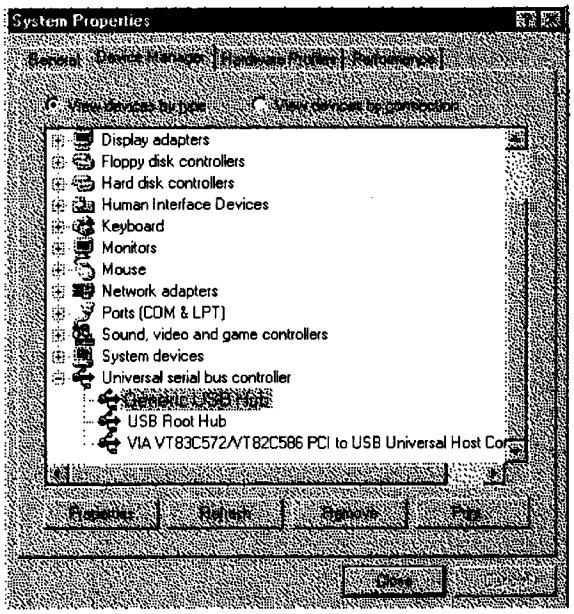


Figure 10

3. Enumerate the Mitsubishi Monitor Function using the following procedure.

(1) Insert Windows® 98 CD-ROM into your computer. Then, Figure 11 will appear.

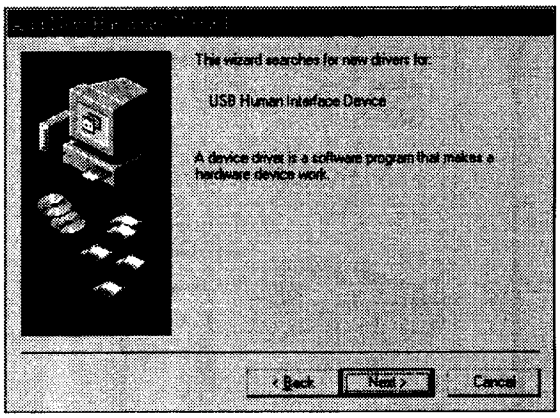


Figure 11

(2) Click "Next" on Figure 11 and Figure 12 will appear.

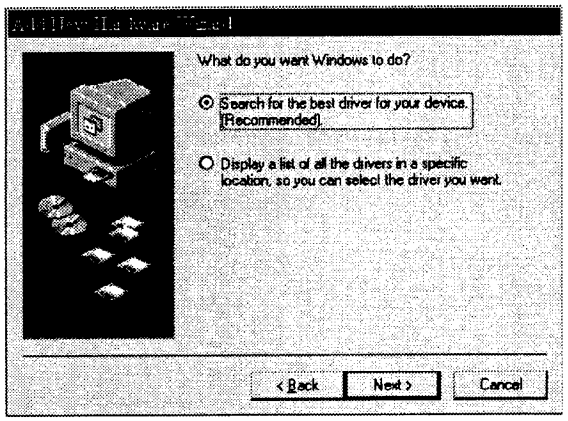


Figure 12

(3) Click "Next" on Figure 12 and Figure 13 will appear.

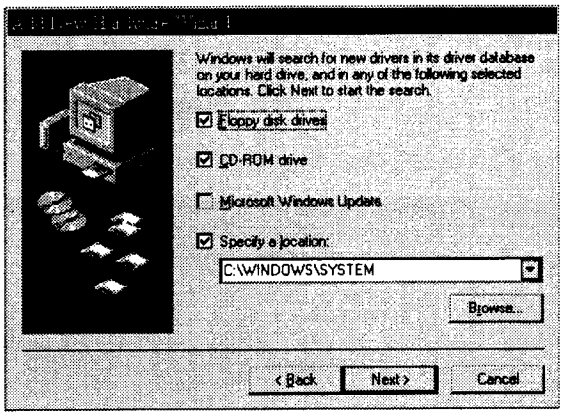


Figure 13

(4) Click "CD-ROM Drive(C)" and "(L)", and click "Next". Figure 14 will appear.

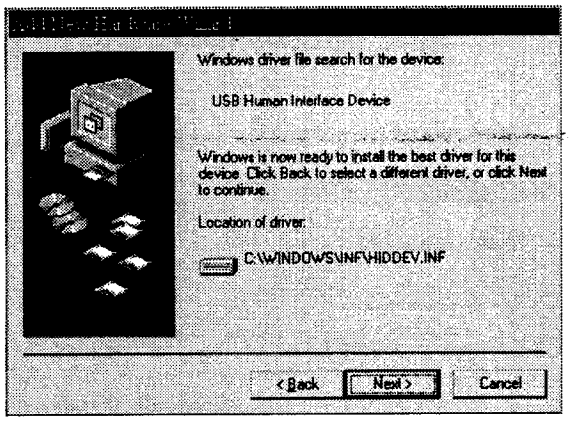


Figure 14

(5) Click "Next" on Figure 14 and Figure 15 will appear. Click "Finish" on Figure 15 to complete Enumeration of Mitsubishi Monitor Function.

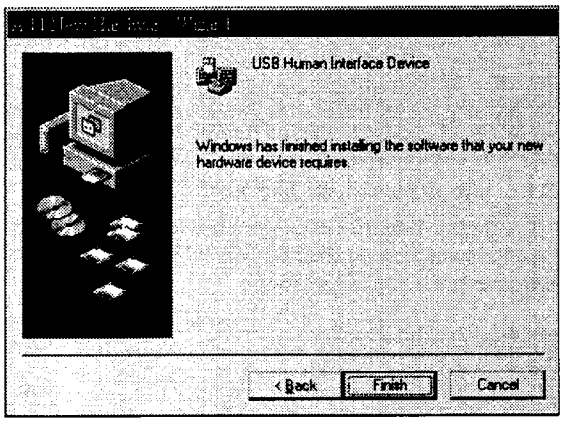


Figure 15

You can confirm that Enumeration of Mitsubishi Monitor Function is successfull with the following method.

- Open "Device Manager" tab in "System" property under "Control Panel". Confirm that "HID-compliant Device" and "USB Human Interface Device" are listed in "Human Interface Device". If you can't confirm it, re-enumerate "Mitsubishi Monitor Function" again by following (a) or (b).

(a) Disconnect and connect the USB cable to the up-stream port of the display monitor.
(b) Power Off/On the display monitor.

NOTE

If the mark ⓘ appears with "HID-Compliant Device" and/or "USB Human Interface Device", the enumeration was unsuccessful. Select "HID-Compliant Device" and/or "USB Human Interface Device" marked with ⓘ mark and click "Remove" and "Refresh". After that, the enumeration is automatically started.

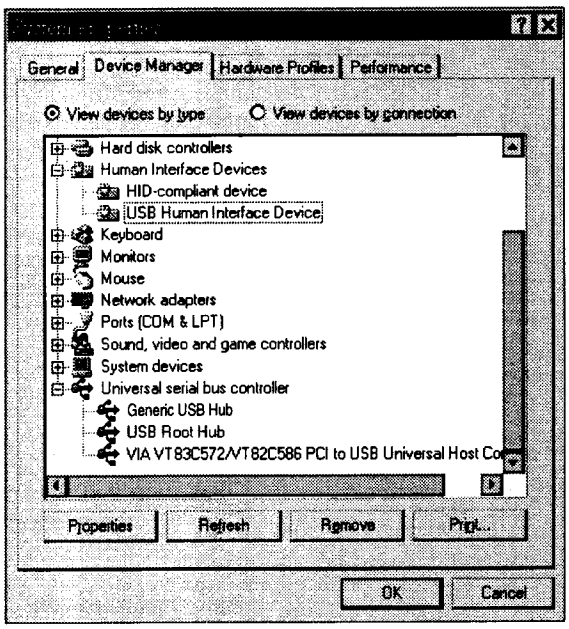


Figure 16

NOTE

The following should be observed in order to use the USB function reliably:

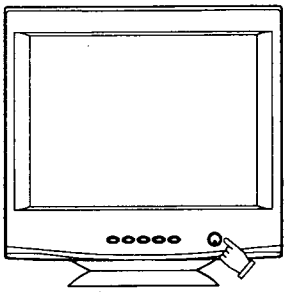
- Make sure all connections are made firmly and correctly.
- Do not change the Upstream port during the recognition of the monitor or other peripherals.
- Close all Windows program before changing the Upstream or disconnecting USB cable.

4

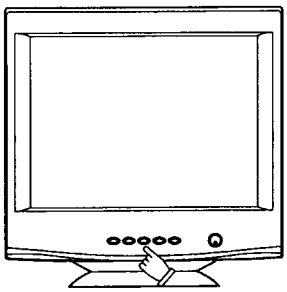
4.1 How to adjust the screen

The monitor has an OSD(On Screen Display) function. The following procedure shows how to adjust the screen with using the OSD function.

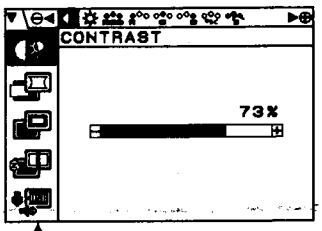
(1) Turn on the monitor.



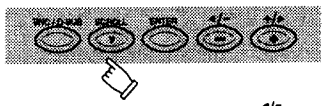
(2) Press any button (SCROLL ENTER −/− +/+) to display the OSD screen.
At the time, ⊖ ◀ ▶⊕ marks are blinking.



(3) Select the group icon on Main Menu by pressing SCROLL.

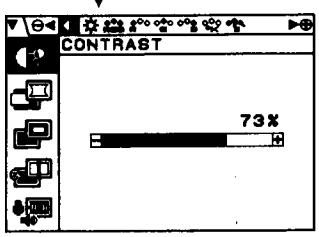


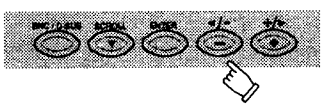
Main Menu



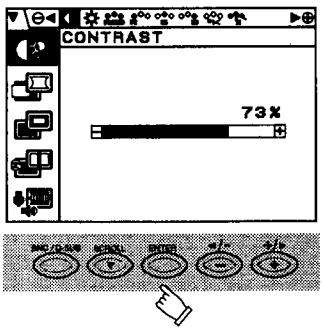
(4) Select the item icon on Sub Menu by pressing −/− or +/+ button.

Sub Menu



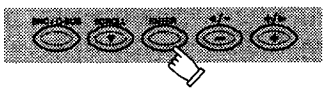


(5) Fix the item icon by pressing the enter button ENTER.
⊟⊞ marks are blinking when fixed.

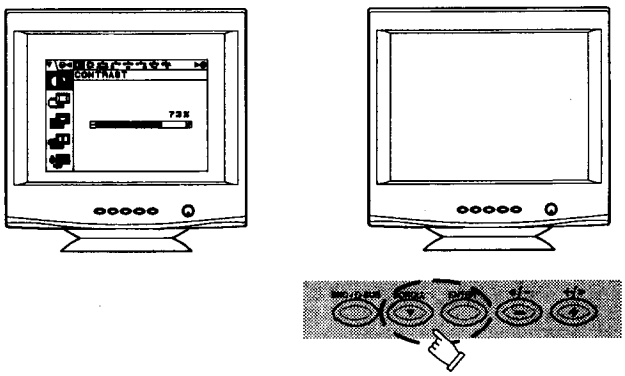


(6) Adjust by pressing −/− or +/+ button.

(7) To select another item, press ENTER button once again.
The fixed condition will be cancelled.
At the time, ⊖ ◀ ▶⊕ marks are blinking.



(8) If you don't press any button for about ten seconds, the OSD screen will disappear.
Or pressing both SCROLL and ENTER buttons simultaneously. The OSD screen will disappear quickly.



NOTE

The condition of the disappeared OSD screen is memorized until turning off the display monitor. In case that the OSD screen is displayed again before turning off the display monitor, the latest OSD screen will appear.

4.2 Adjustment Items

X: Available

Items	Function	A	B	C	D
CONTRAST	Adjusts the contrast level.		X	X	X
BRIGHT	Adjusts the black level of the screen.		X	X	X
COLOR NO	Selects the preferable color from Color 1, Color 2, and Color 3.			X	
R-GAIN	Provides the red-color balances for the display.		X	X	X
G-GAIN	Provides the green-color balances for the display.		X	X	X
B-GAIN	Provides the blue-color balances for the display.		X	X	X
COLOR TEMPERATURE	Adjusts the color temperature of the image on the screen.		X	X	X
COLOR RESET	Restores the each color gain and color temperature to the factory preset.	-	-	-	-
H-SIZE	Adjusts the horizontal size of the image on the screen.	X	X	X	
H-PHASE	Adjusts the horizontal position of the image on the screen.	X	X	X	
H-POSITION	Adjusts the horizontal position of the screen.	X	X	X	
V-SIZE	Adjusts the vertical size of the image on the screen.	X	X	X	
V-POSITION	Adjusts the vertical position of the image on the screen.	X	X	X	
PCC-AMP	Straightens the left and right sides of the image on the screen.	X	X	X	
PCC-PHASE	Adjusts the parallelism of the left and right sides of the image on the screen.	X	X	X	
PCC-CENTER	Adjusts the pincushioning near the vertical center of the screen.	X	X	X	
TOP-PCC	Adjusts the pincushioning at the top corners of the screen.	X	X	X	
BOTTOM-PCC	Adjusts the pincushioning at the bottom corners of the screen.	X	X	X	
PIN-BALANCE	Adjusts the curvature of the left and right sides of the image on the screen.	X	X	X	
KEY-BALANCE	Adjusts the vertical slant or tilt of the image on the screen.	X	X	X	
CORNER-BALANCE	Adjusts the curvature of the left and right sides of the image at the corners of the screen.	X	X	X	
PCC-CENTER-BALANCE	Adjusts the curvature of the both sides of the screen image at the center of the screen.	X	X	X	
V-LIN-BALANCE	Centers the linearity of the vertical axis of the screen.	X	X	X	
V-LIN	Adjusts the linearity of the vertical axis of the screen.	X	X	X	
ROTATION	Adjusts the rotation of the image on the screen.		X	X	X
ZOOM	Zooms the screen to all sides.	X	X	X	
GEOMETRY RESET	Restores to the factory preset level.	-	-	-	-
TEXT MODE	To get preferable image for your work.			X	
H-CONVERGENCE	Adjusts the horizontal alignment of the red, green and blue beams.		X	X	X
V-CONVERGENCE	Adjusts the vertical alignment of the red, green and blue beams.		X	X	X
V-CONVERGENCE-TOP	Adjusts the upper vertical alignment of the red, green, and blue beams.		X	X	X
V-CONVERGENCE-BOTTOM	Adjusts the bottom vertical alignment of the red, green, and blue beams.		X	X	X
CORNER PURITY (TL)	Adjusts the purity of the top-left corners of the screen.		X	X	X
CORNER PURITY (TR)	Adjusts the purity of the top-right corners of the screen.		X	X	X
CORNER PURITY (BL)	Adjusts the purity of the bottom-left corners of the screen.		X	X	X
CORNER PURITY (BR)	Adjusts the purity of the bottom-right of the screen.		X	X	X
MOIRE CANCEL	When setting to ON, the moire level on the screen can decreased by the MOIRE CANCEL LEVEL.			X	
MOIRE CANCEL LEVEL	Adjusts the moire level on the screen.		X	X	
CLAMP PULSE POSITION	Uses this function to eliminate excessive green or white background that may occur when both Sync-On-Green and external sync signals are applied to the monitor.			X	
VIDEO LEVEL	Selects video level 1.0V or 0.7V.			X	
DEGAUSS	Eliminates possible color shading or impurity.	-	-	-	-
POWER SAVE	When setting to ON, the power consumption of the monitor will be reduced when not in use.			X	X
CONTROL LOCK	Locks the OSD function to keep the OSD screen you desired.				X
OSD POSITION	Moves the OSD screen position.			X	X
ALL RESET	Restores all items to the factory preset level.	-	-	-	-
GTF AUTO ADJUST	Adjusts the screen size and distortion automatically.	-	-	-	-
DIAGNOSIS	Indicates the current scanning frequency and factory or user preset timing number.	-	-	-	-
LANGUAGE	Selects the language used on OSD screen.				X
USB UP-STREAM	Selects the Upstream port which you want to use.			X	X
USB PORT COMBINATION	Selects the combination of the Upstream port and signal input connector.			X	X

A. Press "GEOMETRY RESET" to restore to the factory preset level.

B. Press +/▸ (+) and -/◂ (−) buttons together, to restore to the factory preset level.

C. Press "ALL RESET" to restore to the factory preset level.

D. Set data does not change by the change of the signal timing.

Group Icon	Item Icon	Item	Press the Minus Button	Press the Plus Button
		CONTRAST	To decrease the contrast.	To increase the contrast.
		BRIGHT	To decrease the brightness.	To increase the brightness.
	RGB	COLOR NO	To select color 1, color 2, color 3.	
	R	R-GAIN	To decrease red color level of the color mode selected by "COLOR NO".	To increase red color level of the color mode selected by "COLOR NO".
	G	G-GAIN	To decrease green color level of the color mode selected by "COLOR NO.	To increase green color level of the color mode selected by "COLOR NO.
	B	B-GAIN	To decrease blue color level of the color mode selected by "COLOR NO.	To increase blue color level of the color mode selected by "COLOR NO.
	K	COLOR TEMPERATURE	To decrease the color temperature of the color mode selected by "COLOR NO.	To increase the color temperature of the color mode selected by "COLOR NO.
		COLOR RESET	———	To restore the color-gain and color temperature of the color mode selected by "COLOR NO to the factory preset.
		H-SIZE	To narrow the width of the image on the screen.	To expand the width of the image on the screen.
		H-PHASE	To move the image on the screen to the left.	To move the image on the screen to the right.
		H-POSITION	To move the image to the left.	To move the image to the right.
		V-SIZE	To narrow the height of the image on the screen.	To expand the height of the image on the screen.
		V-POSITION	To move the image down.	To move the image up.
		PCC-AMP	To collapse the center of the image.	To expand the center of the image.
		PCC-PHASE	To decrease the width at the top of the image and to increase the width at the bottom.	To increase the width at the top of the image and to decrease the width at the bottom.
		PCC-CENTER	To narrow the center of the image horizontally.	To expand the center of the image horizontally.
		TOP-PCC	To expand the width of the image near the corners of top.	To narrow the width of the image near the corners of top.
		BOTTOM-PCC	To expand the width of the image near the corners of bottom.	To narrow the width of the image near the corners of bottom.
		PIN-BALANCE	To move the top and bottom of the image to the right.	To move the top and bottom of the image to the left.
		KEY-BALANCE	To make the screen slant to the left.	To make the screen slant to the right.
		CORNER-BALANCE	To move the corners of the image to the right.	To move the corners of the image to the left.
		PCC-CENTER-BALANCE	To move the center of the image to the left.	To move the center of the image to the right.
		V-LIN-BALANCE	To vertically expand the bottom of the screen and compress the top.	To vertically compress the bottom of the screen and compress the top.
		V-LIN	To vertically compress the center of the screen and expand the top and bottom.	To vertically expand the center of the screen and compress the top and bottom.
		ROTATION	To rotate the image counterclockwise.	To rotate the image clockwise.
		ZOOM	To narrow the screen to all sides.	To expand the screen to all sides.

Group Icon	Item Icon	Item	Press the Minus Button	Press the Plus Button
		GEOMETRY RESET	———	To restore to factory preset level.
		TEXT MODE	To select "SHARP" mode.	To select "SMOOTH" mode.
		H-CONVERGENCE	To move the red to the left and the blue to the right.	To move the red to the right and the blue to the left.
		V-CONVERGENCE	To move the red to the upper and the blue to the lower.	To move the red to the lower and the blue to the upper.
		V-CONVERGENCE-TOP	To move the red to the upper and the blue to the lower of top screen.	To move the red to the lower and the blue to the upper of top screen.
		V-CONVERGENCE-BOTTOM	To move the red to the upper and the blue to the lower on the bottom screen.	To move the red to the lower and the blue to the upper on the bottom screen.
		CORNER PURITY(TL)	To adjust the purity condition on the top-left corner.	
		CORNER PURITY(TR)	To adjust the purity condition on the top-right corner.	
		CORNER PURITY(BL)	To adjust the purity condition on the bottom-left corner.	
		CORNER PURITY(BR)	To adjust the purity condition on the bottom-right corner.	
		MOIRE CANCEL	To select the Moire Cancel mode off.	To select the Moire Cancel mode on.
		MOIRE CANCEL LEVEL	To decrease the level of the moire-clear wave.	
		CLAMP PULSE POSITION	To eliminate an excessive green or white-back ground that may occur when both Sync-On-Green and external sync signals are applied to the monitor. To clamp the video signal at the front of the H-Sync pulse.	To clamp the video signal at the back of the H-Sync pulse. If you connect to Macintosh, press plus buton.
		VIDEO LEVEL	To select 1.0V of video input.	To select 0.7V of video input.
		DEGAUSS	———	To eliminate possible color shading or impurity.
		POWER SAVE	To select the constant power consumption mode.	To select the power-save mode.
		CONTROL LOCK	To unlock the OSD function.	To lock the OSD function except for "BRIGHTNESS" and "CONTRAST".
		OSD POSITION	To move the OSD screen position to the left.	To move the OSD screen position to the right.
		ALL RESET	———	To restore all items to the factory preset.
		GTF AUTO ADJUST	———	To adjust screen size, position and distortions automatically.
		DIAGNOSIS	It shows the current scanning frequency and Preset No.	
		LANGUAGE	To choose the language used on OSD. ENG.....English, FRA.....French, ESP.....Spanish, ITA.....Italian, GER.....German, JPN.....Japanese	

NOTE

CONTROL LOCK: This is to lock the OSD function to keep the OSD screen image you set.
Press plus button to lock the OSD function. You can adjust only "BRIGHTNESS" and "CONTRAST" at the condition.
Press minus button to unlock the locked condition.

GTF: This function is available when the computer has the GTF™ function according to the VESA®GTF™ standard.

Group Icon	Item Icon	Item	Press the Minus Button	Press the Plus Button
		USB UP-STREAM	The USB functions of the computer connected to Upstream port ROOT-A become active.	The USB functions of the computer connected to Upstream port ROOT-B become active.
			NOTE • The Upstream port in active is colored by blue on the OSD screen. • In case that either the Upstream port ROOT-A or ROOT-B is chosen by this function, the auto-change of the Upstream port is not available. • It may take about 15 seconds until the USB devices have been recognized by the computer after the Upstream port is changed. • Make sure the operation of the devices connected to the downstream ports before changing USB Upstream ports. It may take approximately 15 seconds max. until the devices have been recognized by the computer and start to operate after the Upstream ports are changed. • Do not change the Upstream ports during enumeration to prevent errors of the operation of devices or application software. • Close all Windows programs before changing Upstream ports.	
		USB PORT COMBINATION	The Upstream port ROOT-A is assigned for signal input connector "D-SUB" and ROOT-B is assigned for "BNC"	The Upstream port ROOT-A is assigned for signal input connector "BNC" and ROOT-B is assigned for "D-SUB".
			NOTE • This function is to change the Upstream port automatically in corresponding to the change of signal input connector. • This function is only available in case that both the Upstream ports are connected to the computers. • It may takes 15 seconds until the USB devices have been recognized by the computer after the Upstream port is changed. • In case that the computer chosen enters into a power management mode, the signal input connector and Upstream port are changed to others automatically. • When the Upstream port which is connected to the computer not displays on the screen is selected, the operation of the USB devices connected to the Downstream ports is not shown on the screen of the display monitor.	

NOTE

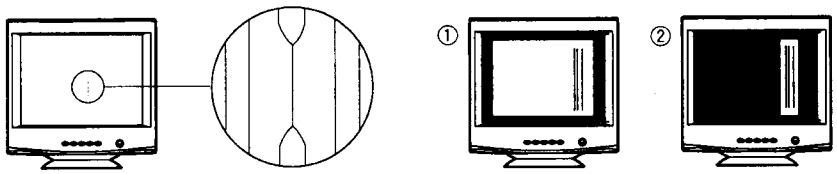
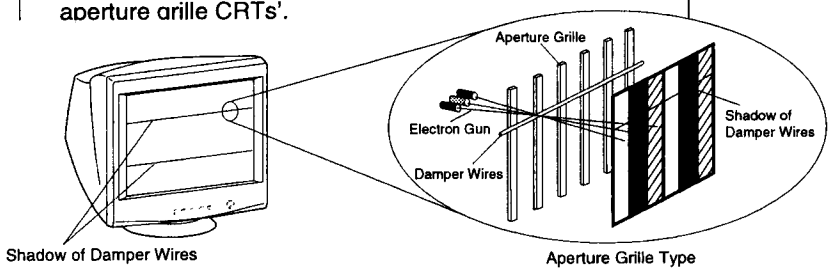
USB Monitor Control will be available when installing "USB Monitor Control Software" into the computer. The "USB Monitor Control Software" can be downloaded from Mitsubishi Internet Home Page:

http://www.mitsubishi-display.com/

5

Before calling your Authorized Product Support, please check that the items below are properly connected or set. In case of using a non-standard signal, please check the pin assignments and the signal timing of your computer with the specification outlined in 6. SPECIFICATIONS and 7. APPENDIX.

PROBLEM		ITEMS TO CHECK	LOCATION
No picture	LED On (Green)	• Contrast and brightness controls.	• Front (Adjust to the maximum brightness or push the reset button)
	LED Off	• Power switch. • AC power cord disconnected.	• Front • Rear
	LED On (Amber)	• Signal cable disconnected. • BNC cables are misconnected or the green cable is disconnected. • Computer power switch. • Power management function is active.	• Rear • Check the graphics adapter and cables • Computer • Press any key on the keyboard or move the mouse
The following message appeared ATTENTION NO SIGNAL H ▷ OFF V ▷ OFF PLEASE CHECK INPUT SIGNAL OR CONNECTION.		• Signal cable disconnected. • BNC cables are misconnected or the green cable is disconnected. • Computer power switch. • Power management function is active.	• Rear • Check the graphics adapter and cables • Computer • Press any key on the keyboard or move the mouse
The following message appeared. ATTENTION SIGNAL FREQUENCY IS OUT OF RANGE. FH ▷ 24.8KHz FV ▷ 43.0Hz PLEASE CHANGE SIGNAL TIMING.		• Input signal frequency range is disagreement. CGA MODE is not available. MDA MODE is not available. EGA MODE is not available.	• Check the specification of graphics adapter and monitor
Abnormal picture	Display is missing, center shifts, or too small or too large of a display size	• Perform "GEOMETRY-RESET" or "ALL RESET" for a standard signal. • Adjust H-SIZE, V-SIZE, H-PHASE, and V-POSITION with non-standard signals. • Monitor may not be able to get full-screen image depend on signal. In this case, please select other resolution, or other vertical refresh timing. • Make sure you wait a few seconds after adjusting the size of the image before changing or disconnecting the signal.	• Front (OSD) • Front (OSD)
	Display is dark or too bright	• "VIDEO LEVEL" is not at the appropriate position for your graphics adapter output.(0.7V or 1.0Vp-p)	• Front (OSD)
	No operation of the USB devices	• [Universal serial bus controller] is not listed in [Device Manager].	• Confirm that Windows98 is installed into the computer.
		• [Generic USB HUB] is not listed in [Device Manager].	• Make sure of the cable connections. • Restart the computer. • Turn off the monitor and then turn on. • Disconnect all the cables connected to theUpstream ports and re-connect then.
		• On the OSD screen, the Upstream port to which the USB device you want to use is connected is not colored by blue.	• Select the Upstream port by using the OSD screen, "Upstream port selection"

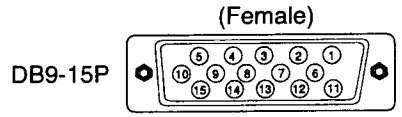
PROBLEM		ITEMS TO CHECK	LOCATION
Abnormal Picture	Black vertical lines are visible on the screen.	• Thin vertical black lines on one or both sides of the screen. This minor condition is caused by grille element overlap which can occur during shipping. We suggest slapping the cabinet sides with an open hand after the monitor is warm. If this fails, position an open white window over the affected area of the screen and maximize the brightness and contrast controls. This will cause localized heating of the overlap which will clear permanently in a few minutes. Be sure to readjust the brightness and contrast controls back to the normal viewing levels after this procedure. 	• –
	Two fine horizontal lines are visible on the screen.	• The 2 very faint thin lines across the screen are normal. They are caused by the aperture grille stabilization filaments (Damper Wires) which are required for all aperture grille CRTs'. 	• –
	A buzzing sound when power on.	• A brief vibration or hum sound that is heard just after power up is normal. This is caused by the automatic degaussing function. This sound will be heard each time the monitor is powered up from a cold start and each time the manual degauss button is used.	• –

6

Model No.		TFA1105STTUW
CRT	Size	55cm/21"(50cm/19.7" Diagonal Viewable Image)
	Mask type	Aperture grille
	Gun	In-line
	Deflection angle	90°
	Phosphors	Red, Green, Blue EBU (medium short persistence)
	Aperture grille pitch	0.28mm (variable)
	Face Plate	Anti-glare, Anti-reflection and Anti-static coating
	Focusing method	Dynamic Beam Forming (DBF)
INPUT SIGNAL	Video	0.7 or 1.0Vp-p analog RGB
	Sync	Sync. on Green or separated H, V sync. or Composite sync
SIGNAL INTERFACE	Input Connector	5BNC, DB9-15P
	Input Impedance	75Ω (video), 1kΩ(sync.)
USB	Function	• Self-powered HUB complying with Universal Serial Bus Specification Rev.1.0
	Interface	• 2 Upstream ports/12Mbps • 3 Downstream ports/12Mbps, 1.5Mbps, possible to supply 500mA max. per each Downstream port
SCANNING FREQUENCY	Horizontal	30 - 115kHz
	Vertical	50 - 160Hz
RESOLUTION (HxV)	1800dots x 1440lines Non-Interlaced maximum addressable resolution format at 85Hz	
WARM-UP TIME	30 minutes to reach optimum performance level	
BRIGHTNESS	100cd/m^2, standard full white video signal at 9300K (+ 8MPCD)	
BLANKING TIME	Horizontal	≧ 2.8 μsec (typ.)
	Vertical	≧ 450 μsec (typ.)
DISPLAY SIZE	380mm x 285mm(typ.)	ratio 4:3
COLOR	5000K~9950K	
POWER SOURCE	AC100-120/220-240V±10% 50/60Hz 140W (typ.) <155W(typ.): with USB operation>	
OPERATING ENVIRONMENT	Temperature	5 - 35°C
	Humidity	10 - 90%RH (without condensation)
DIMENSIONS	(W)19.7inch x (H)19.7inch x (D)19.4inch / (W) 500mm x (H) 500mm x (D) 490.5mm	
WEIGHT	Approx. 31.0kg (68.2lbs.)	
TILT/SWIVEL BASE	Tilt Angle	-5° - +10°
	Swivel Angle	±90°
REGULATIONS	Safety	UL1950 (UL), CSA C22.2 No.950 (C-UL) EN60950 (TÜV-GS)
	EMC	FCC Class-B, DOC Class-B EN55022 Class-B, VCCI Class-B EN50082-1, EN61000-3-2, EN61000-3-3
	X-Ray	DHHS, HWC, Röv vom 8.1, 1987
	Other	CE-Marking, MPR-II/TCO'91 ISO9241-3, ISO9241-7, ISO9241-8 (TÜV-ERGO) TCO '99, ZH1/618 (TÜV-GS) International ENERGY STAR Program Energy 2000 Labeling Award Guidelines for the Suppression of Harmonics in Appliances and General-Use Equipment

7

7.1 Monitor Signal Input Connector (DB9-15P)

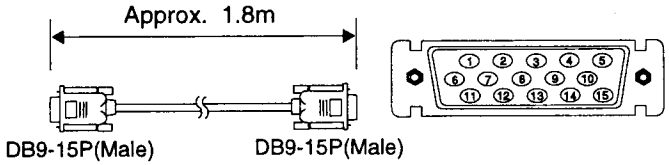


PIN ASSIGNMENTS

Pin No.	Signal
1	RED VIDEO
2	GREEN VIDEO or COMPOSITE SYNC with GREEN VIDEO
3	BLUE VIDEO
4	GROUND
5	DDC GROUND
6	RED GROUND
7	GREEN GROUND
8	BLUE GROUND
9	NC
10	SYNC GROUND
11	GROUND
12	SDA
13	HORIZONTAL SYNC or COMPOSITE SYNC
14	VERTICAL SYNC(VCLK)
15	SCL

DDC ..... DISPLAY DATA CHANNEL
SDA ..... SERIAL DATA
SCL ..... SERIAL CLOCK
NC ..... NO-CONNECTION

7.2 Signal Cable SC-B102 or SC-B104



PIN ASSIGNMENTS

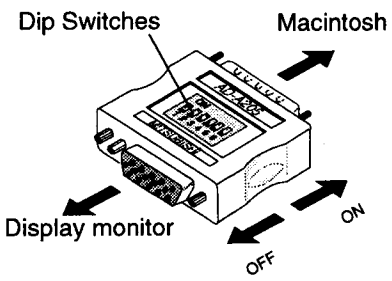
Pin No.	Signal
1	RED
2	GREEN
3	BLUE
4	GROUND
5	DDC GROUND
6	RED GROUND
7	GREEN GROUND
8	BLUE GROUND
9	NC
10	SYNC GROUND
11	GROUND
12	SDA
13	HORIZONTAL SYNC
14	VERTICAL SYNC(VCLK)
15	SCL

DDC ..... DISPLAY DATA CHANNEL
SDA ..... SERIAL DATA
SCL ..... SERIAL CLOCK
NC ..... NO-CONNECTION

7.3 Macintosh Adapter AD-A205 Settings

The AD-A205 Macintosh Adapter allows you to take an advantage of the built in video capabilities of your Macintosh computer with the monitor.

(1) Set the dip switches of the adapter, before connect to the computer.



(2) Set the dip switches according to the following chart. By using the following chart, you can choose a main resolution, quickly.
If you wish to operate by other resolution, refer to next page; "AD-A205 Mac Adapter Setting Chart"

Apple Macintosh	Switch ON	Switch Setting
Macintosh IIsi, IIci, IIvi, IIvx, LC, LC II	1,2	
Macintosh LC III, LC475, LC630	2,4	
Macintosh Quadra 610, 650, 700, 800, 840AV, 900, 950 Macintosh Centris 610, 650, 660AV	1,2,3,4	
Performa 6260, 6310, 6410, 6420 Power Macintosh 6100, 6100AV, 6200, 6300 Power Macintosh 7100AV, 7200, 7300, 7500, 7600 Power Macintosh 8100, 8100AV, 8500, 8600 Power Macintosh 9500, 9600 Workgroup Server 7350, 8150, 9150, 9650	1,2,6	
Power Macintosh 4400, G3	3,4	

<AD-A205 Mac Adapter Setting Chart>

● Set the dip switch "ON" as shown below. (Example : "1,2" )

RESOLUTION	Macintosh								Performa		Power Macintosh									
	IIsi IIci	IIvi IIvx	LC LCII	LCIII LC475	LC630	Quadra 700 900	Quadra 610 650 800 950 Centris 610 650	Quadra 840AV Centris 660AV	6260 6310	6410 6420	Workgroup Server 8150 9150 6100 8100 6100AV 7100AV 8100AV DRAM Video Port (HDI-45)	8100 VRAM Video Card (DB-15) 6100AV 7100AV 8100AV AV Video Card (DB-15)	6200 6300	7200	4400	7300 7500 7600 8500 8600 Workgroup Server 7350	9500	9600/233 Workgroup Server 9650	9600/300 9600/350	G3
640 x480@60Hz		3,4	3,4	3,4	3,4	3,4	3,4	3,4	1,2,6	1,2,6	3,4	3,4	1,2,6	3,4	3,4	3,4	3,4	3,4	3,4	3,4
640 x480@67Hz	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2,6	1,2,6	1,2,6	1,2,6	1,2,6	1,2,6	3,4	1,2,6	1,2,6	1,2,6	1,2,6	3,4
640 x480@72Hz															3,4					3,4
640 x480@75Hz															3,4					3,4
640 x480@85Hz																				3,4
800 x600@60Hz					3,4				1,2,6	1,2,6			1,2,6	3,4	3,4	3,4	3,4	3,4	3,4	3,4
800 x600@72Hz					3,4			3,4	1,2,6	1,2,6		3,4	1,2,6	3,4	3,4	3,4	3,4	3,4	3,4	3,4
800 x600@75Hz														3,4	3,4	3,4	3,4	3,4	3,4	3,4
800 x600@85Hz																			3,4	3,4
832 x624@75Hz				2,4	2,4	2,4	2,4	2,4	1,2,6	1,2,6	1,2,6	1,2,6	1,2,6	1,2,6	3,4	1,2,6	1,2,6	1,2,6	1,2,6	3,4
1024 x768@60Hz								3,4		1,2,6		3,4		3,4	3,4	3,4	3,4	3,4	3,4	3,4
1024 x768@70Hz								3,4				3,4			3,4		3,4		3,4	3,4
1024 x768@72Hz										1,2,6				3,4		3,4		3,4		
1024 x768@75Hz							2,3	2,3				1,2,6		1,2,6	3,4	1,2,6	1,2,6	1,2,6	1,2,6	3,4
1024 x768@85Hz																			3,4	3,4
1152 x870@75Hz						1,2,3,4	1,2,3,4	1,2,3,4				1,2,6		1,2,6	3,4	1,2,6	1,2,6	1,2,6	1,2,6	3,4
1280 x960@60Hz																			3,4	
1280 x960@75Hz															3,4	1,2,6	3,4	1,2,6	1,2,6	3,4
1280 x960@85Hz																			3,4	
1280 x1024@60Hz															3,4		3,4		3,4	3,4
1280 x1024@75Hz															3,4	1,2,6	1,2,6	1,2,6	1,2,6	3,4
1280 x1024@85Hz																			3,4	3,4
1600 x1200@60Hz																		1,2,6	1,2,6	3,4
1600 x1200@65Hz																			1,2,6	3,4
1600 x1200@67Hz																		1,2,6		
1600 x1200@70Hz																				3,4
1600 x1200@75Hz																		1,2,6	1,2,6	3,4

1. The resolution does not change with the computer powered on when you set the dip switches.
   Be sure to power off the computer when you set the dip switches.
2. Set the dip switches by a pointed article like a pencil or ball paint pen to touch end of the switch groove.

(3) "AD-A205 Mac Adapter Setting Chart" shows all available modes for Macintosh systems and all possible combinations with the monitor.
However, we recommend you to use the monitor with a preset timing. (See 1.2 Internal Preset Memory Capability)

(4) Please refer to the instruction book of your computer about the resolution setting.
Resolution may not be changed on some computers.