iiyama

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SERVICE MANUAL

Vision Master™ Pro514 **HM204D/DT**

710-1 Kitaowaribe, Nagano-shi 381-0014 JAPAN

[Revision Record]

Rev.	Section	Contents

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NOTICE

The information in this document is subject to change without notice.

SAFETY PRECAUTION

1. The design of this product contains special hardware, many circuits and components specially for safety purposes. For continued protection, no changes should be made to the original design unless authorized in writing by the manufacturer. Replacement parts must be identical to those used in the original circuits. Service should be performed by qualified personnel only.

2. Alterations of the design or circuitry of the products should not be made. Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacturer of responsibility for personal injury or property damage resulting therefrom.

3. Many electrical and mechanical parts in the products have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in the parts list of Service manual. Electrical components having such features are identified by mark "#" on the schematics and "!" on the parts list in Service manual. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the parts list of Service manual may create shock, fire, or other hazards.

4. Use isolation transformer.
The chassis and any sub-chassis contained in some products are connected to the primary circuit of the AC power line. An isolation transformer of adequate capacity should be inserted between the product and the AC power supply point while performing any service on some products when the primary circuit of the AC power supply is exposed.

5. The high voltage applied to the picture tube must conform with that specified in Service manual. Excessive high voltage conditions should be kept to a minimum, or should be prevented. If severe arcing occurs, remove the AC power immediately and determine the cause by visual inspection (incorrect installation, cracked or melted high voltage harness, poor soldering, etc.) To maintain the proper minimum level of soft X-ray emission, components in the high voltage circuitry including the picture tube must be the exact replacements or alternatives approved by the manufacturer of the complete product.

6. Isolation Check
(Safety for Electrical Shock Hazard)
After reassembling the product always perform an isolation check on the exposed metal parts of the cabinet (video input and output terminals, control knobs, screwheads, control shafts, etc.) to be sure the product is safe to operate without danger of electrical shock.

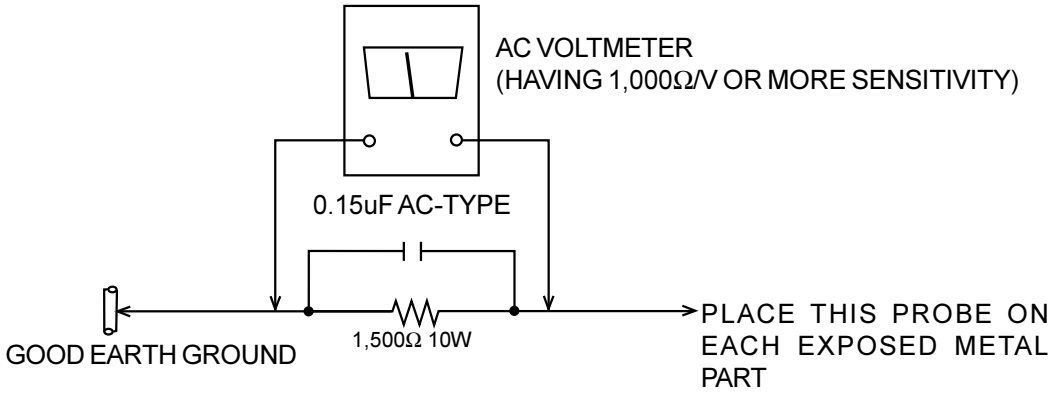
(1) Dielectric Strength Test
The isolation between the AC primary circuit and all metal parts exposed to the user, particularly any exposed metal part having a return path to the chassis should withstand a voltage of 1,500V AC(r.m.s.), 20mA(current sensitivity) for a period of one minute.
This method of test requires a test equipment not generally found in the service trade.

(2) Leakage Current Check
Plug the AC line cord directly into the AC outlet (do not use a line isolation transformer during this check.). Using a "Leakage Current Tester", measure the leakage current from each exposed metal part of the cabinet, particularly any exposed metal part having a return path to the chassis, to a known good earth ground (water pipe etc.). Any leakage current must not exceed 3.5mA AC(r.m.s.).

Alternate Check Method

Plug the AC line cord directly into the AC outlet (do not use a line isolation transformer during this check.). Use an AC voltmeter having 1,000 ohms per volt or more sensitivity in the following manner. Connect a 1,500Ω 10W resistor paralleled by a 0.15uF AC-type capacitor between an exposed metal part and a known good earth ground (water pipe etc.).

Measure the AC voltage across the resistor with the AC voltmeter. Move the resistor connection to each exposed metal part, particularly any exposed metal part having a return path to the chassis, and measure the AC voltage across the resistor. Now, reverse the plug in the AC outlet and repeat each measurement. Any voltage measured must not exceed 2.45V AC(r.m.s.). This corresponds to 0.8mA AC(r.m.s.).



1. SET-UP ADJUSTMENTS

The following adjustments should be made when a complete realignment is required or a new picture tube is installed.

<Required measuring equipment>

Signal generator (Programmable video generator)..... Leader 1604A
DC voltmeter (300V DC range)
Note: Digital multimeter can also be used.
High voltage probe (0-30kV DC)
Color analyzer..... Minolta CA-100
Photometer..... Minolta LS-100
Electric field meter..... Combinova EFM 100
Scale (Two 50cm scales put together so that no visual aberration occurs.)
Frequency counter
Digital wattage meter
Landing meter..... LSS LND-070 or 072
Degausser
Headphones
CD player
Audio-LR confirmation equipment
USB compliant computer
Interface adapter (Iiyama handmade)
Short-connector (Iiyama handmade)

<Preparation>

1. Place the monitor without tilting.
2. Connect the signal cable from the signal generator to the monitor.
3. Face the CRT screen to east so as not to be influenced by magnetic force.
4. Turn ON the Power Switch, and degauss the entire screen with degausser. ➔ **See "EXTERNAL**
5. **DEGAUSS".**
   Perform adjustment by setting the brightness to center and the contrast to maximum, except where
6. specifically indicated.
   Receive MODE 5 and turn ON the Power Switch. Perform adjustment after a warm-up of at least an
7. hour.
   Adjustment data is automatically saved in the memory when the on screen display disappears, when another signal is received.

Note: This monitor should be checked and adjusted by connecting it to a signal generator, then entering and running the timing charts both below and of Chapter 2.

fH (kHz)	Resolution*	Sync polarity			Sync on green	Horizontal (µsec)					Vertical (msec)				
		H	V	Comp		A	B	C	D	E	O	P	Q	R	S
29.2	640×400	P	P	–	–	34.26	2.74	3.43	27.40	0.69	14.285	0.103	0.444	13.704	0.034
30.9	800×600	P	P	–	–	32.36	2.57	3.34	25.68	0.77	20.000	0.097	0.455	19.416	0.032
47.6	1024×720	N	N	O	O	21.00	2.00	2.36	15.76	0.88	16.695	0.084	0.420	15.115	1.076
* 77.8	320×350	P	P	–	–	12.69	1.06	1.64	9.40	0.59	5.000	0.038	0.508	4.442	0.012

The resolutions are only for your reference when using Leader 1604A.

ADJUSTMENT MODE

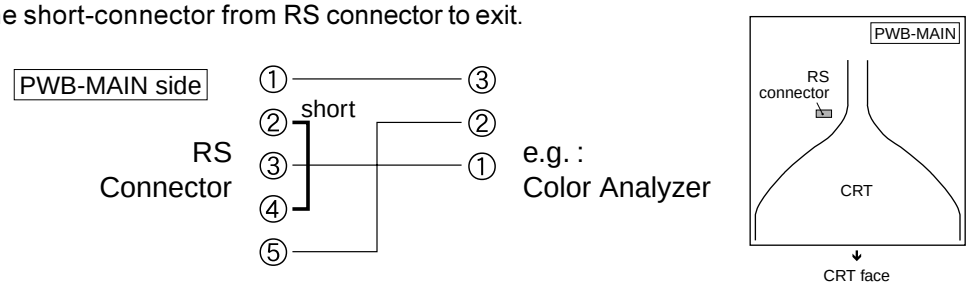
There are two different modes available to adjust the monitor as described below. The adjustment with '☐' in front of the title are only available under User Mode. The adjustments with '■' in front of the title are only available under Factory Mode. You can perform the other adjustments by either User or Factory Mode. Please change the mode as required.

USER MODE:

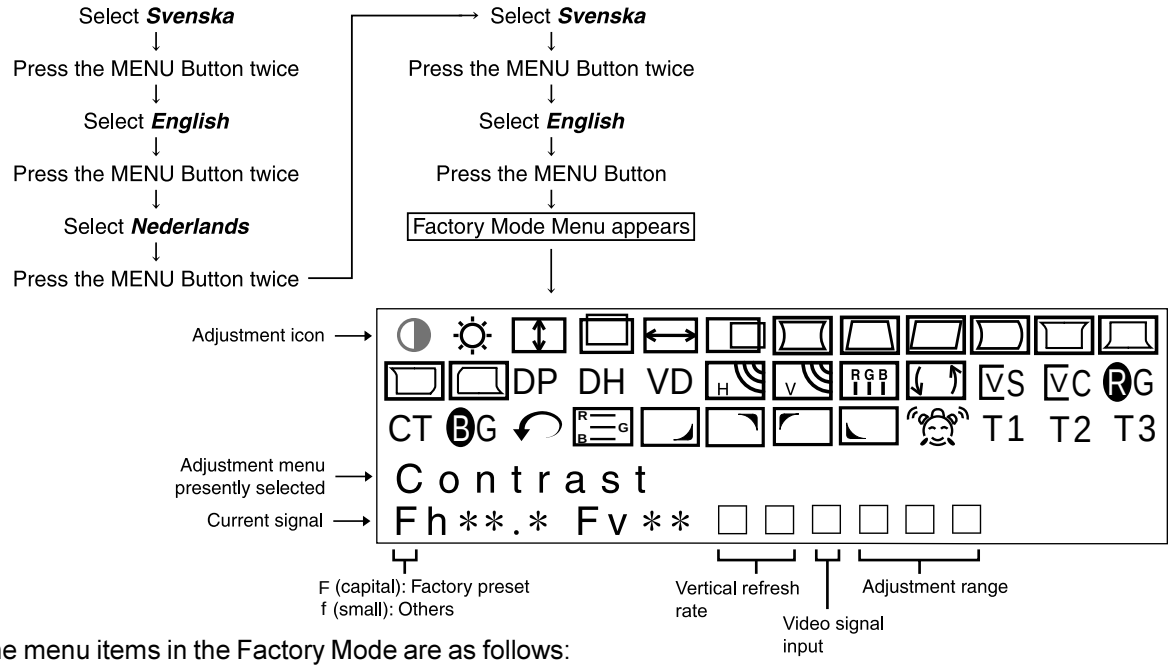
Turn ON the Power Switch and you are in the User Mode.

FACTORY MODE: There are two ways to enter the Factory Mode.

1. Turn OFF the Power Switch. Short between pins 2 and 4 of RS connector on the PWB-MAIN with a short-connector. Turn ON the Power Switch and you are in the Factory Mode. The following Factory Mode Menu appears on the screen when you press the MENU Button. Turn OFF the Power Switch and remove the short-connector from RS connector to exit.



2. In the adjustment menu, select "Function" on the Main Menu and then select "Language" on the Sub-Menu. Follow the flow chart below and you are in the Factory Mode. Turn OFF the Power Switch to exit.



The menu items in the Factory Mode are as follows:

Contrast	Pincushion	Pinbalance Top	V moire	Temp cont	Top-left
Brightness	Trapezoid	Pinbalance Btm	H convergence	Blue gain	Bottom-left
V-size	Parallelogram	DBF Para	Tilt-Dy	rrc	CRT check
V-position	Pinbalance	DBF Phase	V linear side	V-conver	DA TEST 1
H-size	Sidepin Top	V DBF	V linear corner	Bottom-right	DA TEST 2
H-position	Sidepin Bottom	H moire	Red gain	Top-right	DA TEST 3

EXTERNAL DEGAUSS

Make sure you disable the Bottom-right, Top-right, Top-left, Bottom-left, and rrc settings before performing the external degauss. Follow the procedure below depending on the adjustment mode you are in.

PROCEDURE

☐ USER MODE

1) Select Degauss and press the MENU Button so that the Bottom-right, Top-right, Top-left and Bottom-left will be disabled.
2) Degauss the entire screen with degausser while the Degauss is activated (approx. 6 seconds).

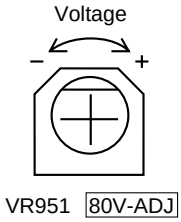
■ FACTORY MODE

1) Select CRT Check and press the MENU Button so that the Bottom-right, Top-right, Top-left, Bottom-left, and rrc will be disabled.
2) Confirm that the OSD stays displayed on the screen.

   Note: If the OSD disappears, restart from 1).
3) Degauss the entire screen with degausser.

1-1. 80V-ADJ adjustment [PWB-MAIN]

1) Receive a cross-hatch inverted signal of MODE 1 when applying the AC voltage of 110±10V.
2) Connect the DC voltmeter between CONNECTOR TP and GND (chassis).
3) Adjust the voltage to DC 83±0.5V with VR951 (80V-ADJ).



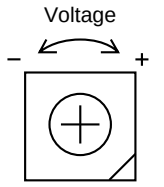
VR951 80V-ADJ

1-2. ANODE VOLTAGE adjustment [PWB-MAIN]

WARNING !

VR501 (HV-ADJ) have been carefully factory-adjusted for each unit in order to satisfy regulations regarding X-radiation.
Further adjustment on VR501 shall not be performed.
In case of adjustment, the adjusted position of VR501must be fixed by a soldering iron to prevent it from rotating.

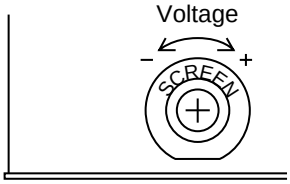
1) Receive a cross-hatch inverted signal of MODE 6.
2) Turn OFF the Power Switch.
3) Connect a high-voltage probe between CRT anode and GND (chassis).
4) Turn ON the Power Switch.
5) Adjust the high-voltage to 27.0±0.1kV with VR501 (HV-ADJ).
6) Confirm the variation of high-voltage is within ±0.2kV when receiving MODE 1 and MODE 8 respectively.
7) Turn OFF the Power Switch and remove the high-voltage probe.



VR501 HV-ADJ

1-3. SCREEN VOLTAGE adjustment [PWB-MAIN]

See 1-15. Automatic COLOR adjustments.



T501(FBT)

1-4. POWER FACTOR CIRCUIT confirmation [PWB-MAIN]

1) Receive a cross-hatch inverted signal of MODE 5.
2) Turn OFF the Power Switch.
3) Connect the DC voltmeter between TP4 and TP0.
4) Turn ON the Power Switch.
5) Confirm that the voltage is DC 345±40V.
6) Remove the DC voltmeter.

■1-5. TEMPERATURE SENSOR confirmation

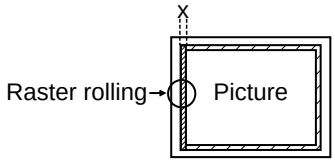
1) Receive a cross-hatch inverted signal of MODE 5.
2) Select CRT Check and press the MENU Button.
3) Confirm that respective temperature of CRT fannel and monitor front displayed on the screen is as follows: actual temperature ±5°C.

■1-6. FH-LIMITER confirmation

1) Receive a cross-hatch inverted signal of fH 29.2kHz.
2) Confirm that the picture disappears. Also, make sure the horizontal oscillation frequency is within the specified range: 58-62kHz.
3) Receive fH 30.9kHz and confirm that the picture is synchronized.
4) Receive fH 77.8kHz and confirm that the picture is synchronized.
5) Turn OFF the power of signal generator and confirm that the picture disappears. Also make sure the horizontal oscillation frequency is within the specified range above.
6) Remove the frequency counter.

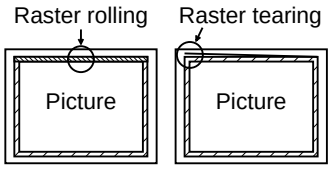
■1-7. H-BLANKING confirmation

1) Receive a cross-hatch inverted signal of MODE 5.
2) Minimize the horizontal size (H-size) with the front buttons.
3) Select DA TEST 2 and press the MENU Button so that the automatic confirmation program starts.
4) Confirm that X of the right hand side figure is as follows: X </= 3.0mm.
5) Adjust the horizontal size roughly with the front buttons.



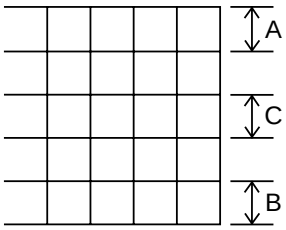
■1-8. V-BLANKING confirmation

1) Receive a cross-hatch inverted signal of MODE 5.
2) Adjust the vertical size and position (V-size and V-position) of the picture roughly with the front buttons.
3) Select DA TEST 2 and press the MENU Button so that the automatic confirmation program starts.
4) Confirm that the back-raster is not rolling or tearing at the top.
5) Confirm that no retrace line is over the picture.



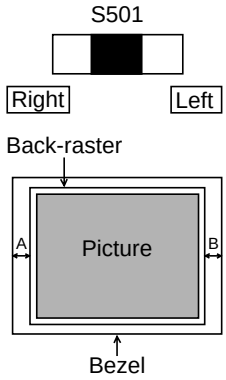
■1-9. V-LIN adjustment

1) Receive a cross-hatch inverted signal of MODE 7.
2) Adjust the vertical size so that the size is 295±4mm.
3) Adjust the vertical linear corner (V linear corner), so that difference between A and B of the right hand side figure is as follows: | A–B | </= 0.5mm
4) Adjust the vertical linear side (V linear side), so that A, B and C are almost equal.



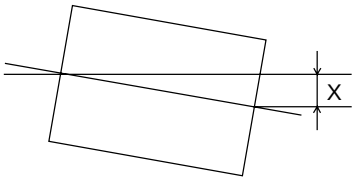
■1-10. H-CENT adjustment [PWB-MAIN]

1) Receive a cross-hatch inverted signal of MODE 8.
2) Adjust the horizontal size and position of the picture roughly with the front buttons.
3) Maximize the brightness so that the back-raster appears on the screen.
4) Set S501 to the right, center or left so that A and B in the right hand side figure are almost equal.
5) Return the brightness to center indication.



■1-11. TILT-DY adjustment

1) Receive a cross-hatch inverted signal of MODE 5.
2) Adjust the tilt deflection yoke (Tilt-Dy) with the ▶ / ◀ Buttons so that X of the right hand side figure is as follows: | X | </= 0.5mm.



■1-12. PICTURE SIZE, POSITION AND DISTORTION adjustment (Criteria)

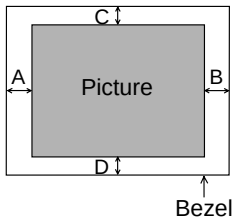
1) Receive a cross-hatch inverted signal of MODE 5.

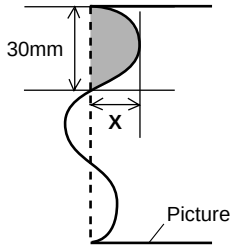
2) Adjust the picture size and position to the specified setting below.

H-size: 395±4mm	H-position: | A–B |<4mm
V-size: 295±4mm	V-position: | C–D |<4mm

3) Correct the side distortion with the front buttons so that X of the right hand side figure is as follows: | X | </= 0.5mm/30mm when selecting the most remarkable distortion with the naked eye.

Pincushion	Parallelogram
Trapezoid	Sidepin Top / Bottom
Pinbalance	Pinbalance Top / Bottom





■1-13. PICTURE SIZE, POSITION AND DISTORTION adjustment

1) Receive a cross-hatch inverted signal of fH MODE 5.

2) Adjust the picture size, position and distortion roughly with the front buttons to the reference settings below.

H-size: 395±10mm	H-position: | A–B |<8mm
V-size: 295±10mm	V-position: | C–D |<8mm

| X \| </= 1.0mm/30mm when selecting the most remarkable distortion with the naked eye.

Note: The picture should be within the bezel.

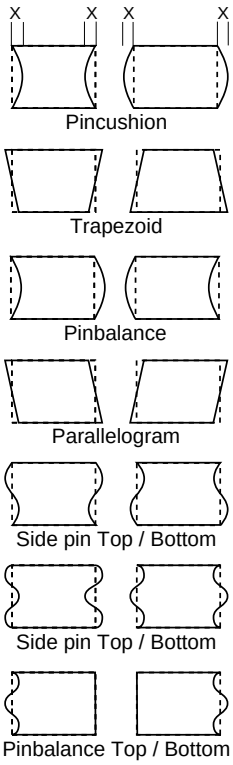
3) Receive a cross-hatch inverted signal of all preset modes respectively.

4) Adjust the picture size and position to the specified setting below.

H-size: 395±10mm	H-position: | A–B |<8mm
V-size: 295±10mm	V-position: | C–D |<8mm

5) Correct the Pincushion and Trapezoid distortion with the front buttons so that X of the right hand side figure is as follows: | X | </= 0.5 mm/30mm when selecting the most remarkable distortion with the naked eye.

Note: No other adjustment items for distortion than the above should be adjusted.



☐1-14. RESET confirmation

1) Receive a cross-hatch inverted signal of MODE 5.

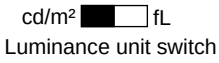
2) Change the horizontal position (H-position) roughly with the front buttons.

3) Perform Reset.

4) Confirm that the adjustment data above is reset to the factory setting.

■1-15. Automatic COLOR adjustments

WARNING: Do not change the horizontal and vertical sync signal or the frequency while the automatic COLOR adjustments are underway.



Luminance unit switch

Color analyzer setting:

- Luminance unit switch: cd/m^2
- B.P.S. DIP switch: 9600 (1000)
- Turn ON the color analyzer switch and press 0-CAL switch before use.

B. P. S. DIP switch

1) Be sure to enter the Factory Mode by using the short-connector.
2) Connect the interface adapter from RS-232C of the color analyzer to the PWB-RS of the short-connector.
3) Receive a white window signal of MODE 5.
4) Turn OFF the R, G and B outputs on the signal generator.
5) Apply a color analyzer probe to the center of the screen.
6) Turn ON the Remote Switch of the color analyzer.
7) Adjust the brightness of back-raster to 0.3-0.4cd/m^2 with T501 (FBT) SCREEN VR so that the automatic CUT-OFF adjustment starts.
8) Turn ON REMORT again to start CUT-OFF adjustment.
9) Turn ON the R, G and B outputs on the signal generator so that the COLOR TEMPERATURE and CONTRAST LIMIT adjustments start automatically.

   <COLOR TEMPERATURE>
   The X and Y specified readings of the color analyzer are as follows:

   CT 1 (9300K)
   X: 0.283±0.008
   Y: 0.297±0.008

   <CONTRAST>
   The specified contrast range is 140±8cd/m^2.

   Note: In case that the contrast is not within the specified range above, repeat 4) to 7).
10) The OSD disappears.
11) Press the MENU Button so that the OSD appears.
12) All adjustment data is stored when the OSD disappears.
13) Turn OFF the Remote Switch of the color analyzer.
14) Turn OFF and ON the Power Switch and you are in the User Mode.
15) Perform Reset and confirm the Brightness ranges are as follows:

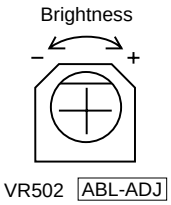
    ONQ ON: 140±8cd/m^2
    OPQ OFF: 100+10, -2cd/m^2

Note: The adjustments above can be repeated by turning OFF and ON the Power Switch.

■1-16. GRAY SCALE confirmation

1) Receive a 16-gradation gray scale signal of MODE 5.
2) Make sure the 15th gradation on the gray scale is barely visible when the 16th gradation (back raster) is not visible at all.

■1-17. BRIGHTNESS adjustment [PWB-MAIN]



1) Receive an entire white raster signal of MODE 5.
2) Apply a photometer to the screen center.
3) Adjust VR502 (ABL-ADJ) so that photometer reads 100+5, -2cd/m^2.

■1-18. SYNC SIGNAL INPUT confirmation

1) Receive a cross-hatch inverted signal of fH 47.6kHz.
2) Select composite and sync on green signal inputs respectively by the signal generator.
3) Confirm that the picture is displayed normally.

□1-19. SIGNAL SELECT confirmation

1) Receive a cross-hatch inverted signal of MODE 5.
2) Switch the signal input to VIDEO IN 1 and VIDEO IN 2 respectively.
3) Press the Input Select Button (VIDEO 1/2) for approx. 5-6 seconds.
4) Confirm that the picture is displayed normally.

□1-20. POWER MANAGEMENT confirmation

1) Turn OFF the Power Switch and connect a digital wattage meter.
2) Turn ON the Power Switch.
3) Receive a cross-hatch inverted signal of MODE 5.
4) Turn OFF the R, G and B outputs on the signal generator.
5) Disconnect the H/HV and V cables.
6) Confirm that the input wattage is 3W or less and the Power Indicator turns to orange.
7) Connect the H/HV and V cables and confirm that the picture appears.
8) Turn OFF the Power Switch and remove the digital wattage meter.
9) Turn ON the Power Switch.

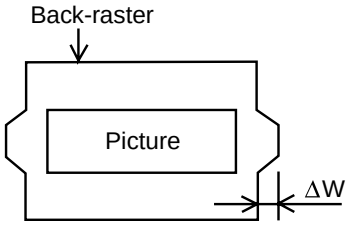
■1-21. H-CONVERGENCE confirmation

1) Receive a cross-hatch inverted signal of MODE 5.
2) Select H-convergence or DA TEST 3, and press the MENU Button so that the automatic confirmation program starts.
3) Confirm that the horizontal line is diverged.

■1-22. V-CONVERGENCE confirmation

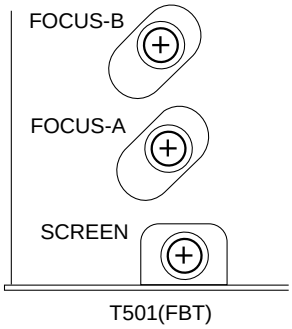
1) Receive a cross-hatch inverted signal of MODE 5.
2) Select V-convergence or DA TEST 3, and press the MENU Button so that the automatic confirmation program starts.
3) Confirm that the vertical line is diverged.

■1-23. RASTER REGULATION (DYNAMIC) confirmation



1) Receive an entire white signal of MODE 5.
2) Set the input signal by the signal generator as follows:
   V-DISP-TIME: 150 V-POSI-TIME: 450
3) Maximize the brightness or set the signal level to 0.9Vp-p by the signal generator.
4) Confirm that <W of the right hand side figure is 1.0mm or less when turning the luminance volume on the signal generator to the maximum and "1" respectively.
5) Return the brightness to center indication.

■1-24. FOCUS [PWB-MAIN]



T501(FBT)

1) Receive a green cross-hatch signal of MODE 6.
2) Adjust FOCUS-B VR of T501 (FBT) to make the vertical lines sharpest at points L, M and R as shown in Fig 1.
3) Adjust FOCUS-A VR of the T501 to make the horizontal center line sharpest at points L, M and R as shown in Fig. 1.
4) If the focus at points T and M is as shown in Fig. 2, adjust V-DBF in the menu with the front buttons to make the horizontal lines have the same thickness at points T, M and B. And adjust the FOCUS-A VR again to make the horizontal lines sharpest at points T, M and B. (V-DBF should not be adjusted when focus at points T and M is optimum.)
5) If the focus at points L and M is as shown in Fig. 3 or vice versa, adjust DBF Para and DBF Phase in the menu with the front buttons to make the horizontal center line have the same thickness at points L, M and R. And adjust the FOCUS-A VR again to make the horizontal center line sharpest at points L, M and R. (DBF Para and DBF Phase should not be adjusted when focus at points L and M is optimum.)
6) Repeat 2) to 5) until the focus is optimum.
7) Confirm no focus variation on the entire screen.
8) Check the focus with red and blue respectively.
9) Receive a H-character signal and repeat 7).
10) Repeat the FOCUS adjustments until the focus with red, green and blue is optimum.

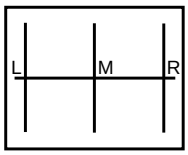


Fig.1

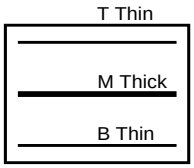


Fig.2

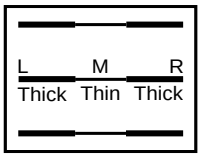
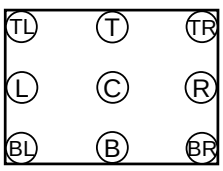


Fig.3

1-25. LUMINANCE DIFFERENCE confirmation



1) Receive an entire white signal of MODE 5.
2) Apply a photometer to the two points where the luminance difference is remarkable with the naked eye.
3) Confirm that the luminance difference is 22.5cd/m^2 or less.

1-26. AUDIO confirmation

1) Turn the Volume Control from 0% to 100% and make sure the sound is normal without hum etc.

2) Set the Volume Control at mechanical center.

3) Connect the output of a CD player to the Audio Connector and make sure the right and left speaker works normally.

4) Turn the Volume Control and make sure the volume varies.

5) Connect Audio-LR confirmation equipment between the Audio Connector and CD player.

6) Turn off left switch of the Audio-LR confirmation equipment and make sure the right speaker works normally.

7) Turn off right switch of the Audio-LR confirmation equipment and make sure the left speaker works normally.

8) Turn the Volume Control to 0% and connect headphones to the Headphone Connector.

9) Confirm that the Headphones don't make noise.

10) Turn the Volume Control from 0% to 100% and make sure the sound from the both headphones is well balanced and normal without hum etc.

1-27. USB Operation Check

1) Connect cables according to the user manual.

2) Turn ON the Power Switch of the monitor and computer.

3) Double-click “Universal serial bus controller” as shown in Fig 1 on next page.

4) Confirm that “Generic USB Hub” or “Iiyama USB Hub” appears as shown in Fig 2.

5) Disconnect the USB Cable from the USB compliant computer.

6) Double-click “Universal serial bus controller”.

7) Confirm that “Generic USB Hub” or “Iiyama USB Hub” disappears as shown in Fig 3.

8) Connect the USB Cable to the stand.

9) Repeat 1) to 5) and confirm that the USB function works normally.

Fig. 1

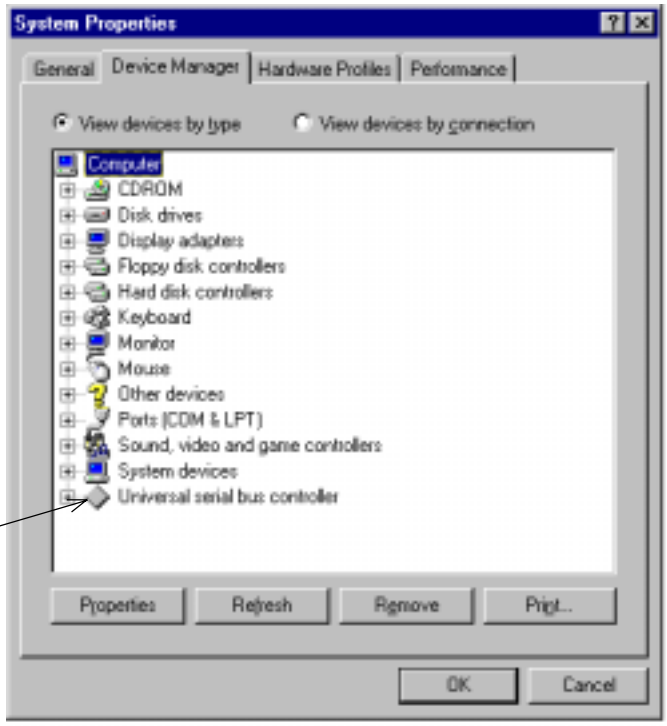


Fig. 2

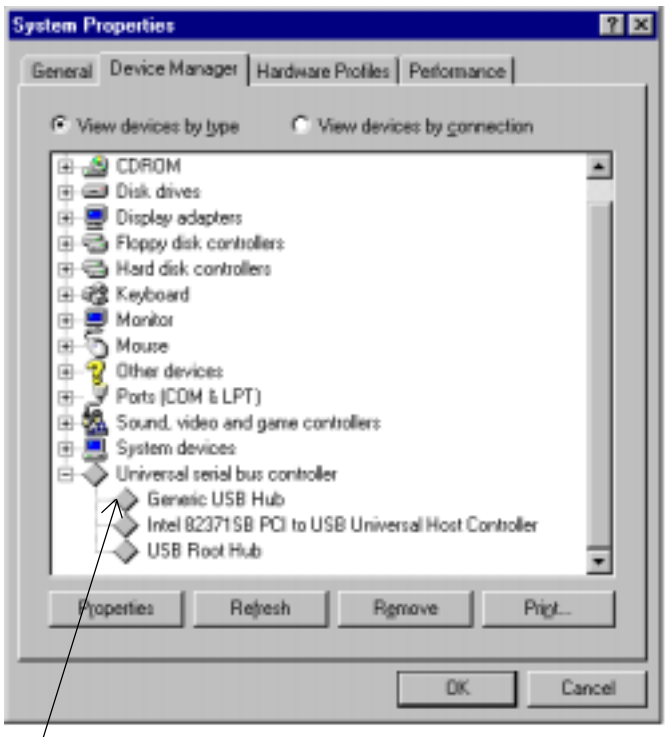


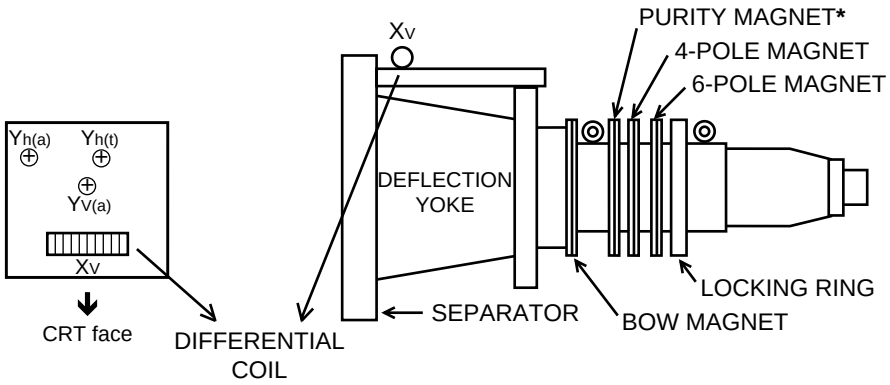
Fig. 3

■ 1-28. ITC (Integrated Tube Component) adjustments

The following ITC adjustments should be made only when a new picture tube is installed, or convergence is poor. All set-up adjustments above-mentioned must be completed before any further ITC adjustment is attempted. Receive an entire white raster signal and turn ON the Power Switch. Perform adjustment after a warm-up of at least an hour.
Perform the following adjustments by setting H-convergence and V-convergence to center indication.

Notes: See Chapter 5 concerning parts list for the ITC adjustments.
* PURITY MAGNET should not be turned during the ITC adjustments.

< Top view > **< Side view >**

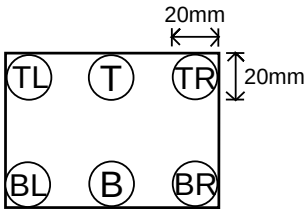


1-28-1. LANDING correction

Landing meter setting:

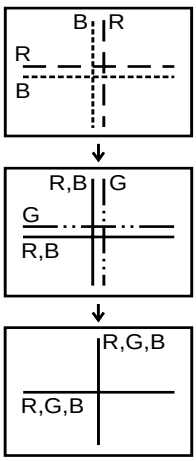
- Mode Select Switch: Monitor Normal
  Note: Mode Select Switch should be set before turning on the power switch of the landing meter.
- Volt: 2V
- Time: 50ms
- Gain: 7
- Unit: % for LND-070, 0.8µm (1%=0.8µm) for LND-072

1) Face the CRT screen to east and set it vertically.
2) Degauss the entire screen with degausser. ➔ **See "EXTERNAL DEGAUSS".**
3) Select DEGAUSS and press the MENU Button.
4) Receive an entire green signal.
5) Adjust the horizontal size to make it full-scan.
6) Apply the landing meter to TL (top-left), TR (top-right), BL (bottom-left) and BR (bottom-right) in the right hand side figure.
7) Confirm that "H" reading of the landing meter is within ±20% at each point.
8) Adjust rrc with the front buttons so that the "H" reading difference between T (top) and B (bottom) in the right hand side figure is as follows: | T-B | = ±3%.
9) Adjust Bottom-right, Top-right, Top-left and Bottom-left respectively with the front buttons so that "H" reading of the landing meter at each point is as follows:



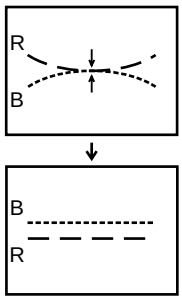
TL: –8 to –2% TR: +2 to +8% BL/BR: –3 to +3%

1-28-2. STATIC CONVERGENCE adjustment



1) Receive a red and blue cross-hatch signal.
2) Adjust the 4-POLE MAGNET so that red and blue beams converge on the center cross lines.
3) Add green to the red and blue cross-hatch signal.
4) Adjust the 6-POLE MAGNET so that red and blue beams converge with green beam on the center cross lines.
5) Repeat the adjustment until red, blue and green beams converge each other.
6) Fix the 4-POLE MAGNET and the 6-POLE MAGNET by turning the LOCKING RING.
7) Mark the 4-POLE MAGNET and the 6-POLE MAGNET with paint marker (090Z029A01) so that adjusted position is understandable.

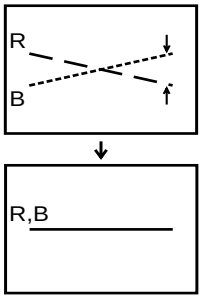
1-28-3. BOW MAGNET adjustment



1) Receive a red and blue cross-hatch signal.
2) Adjust the BOW MAGNET so as to straighten an arched horizontal line.

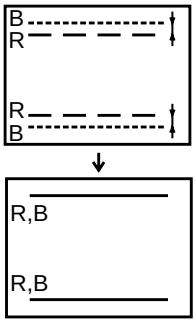
   Note: Must be careful not to misconverge vertical lines by this adjustment.
3) Perform the 1-29-3. STATIC CONVERGENCE adjustment so as to converge the red and blue lines.
4) Fix the BOW MAGNET with paint (090Z020A01).

1-28-4. DIFFERENTIAL COIL adjustment (XV adjustment)



1) Receive a red and blue cross-hatch signal.
2) Adjust the DIFFERENTIAL COIL so that the horizontal cross line converge each other.

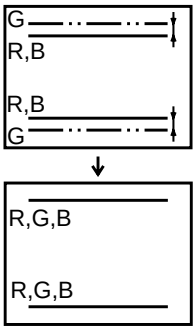
1-28-5. YV (a) adjustment



1) Receive a red and blue cross-hatch signal.
2) Adjust the specified YV (a) volume so that red and blue beams converge each other at the upper and lower edges of the horizontal line.

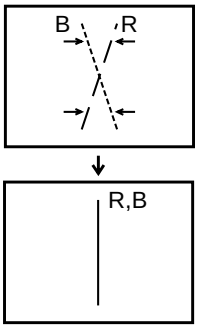
1-28-6. Yh(a) adjustment

1) Receive a white cross-hatch signal.
2) Adjust the specified VCR volume so that red, green and blue beams converge each other at the upper and lower edges of the horizontal line.



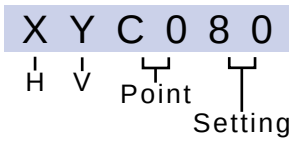
1-28-7. YH (t) adjustment

1) Receive a red and blue cross-hatch signal.
2) Adjust the specified YH (t) volumes so that vertical cross lines converge each.



1-28-8. DIGITAL CONVERGENCE adjustments

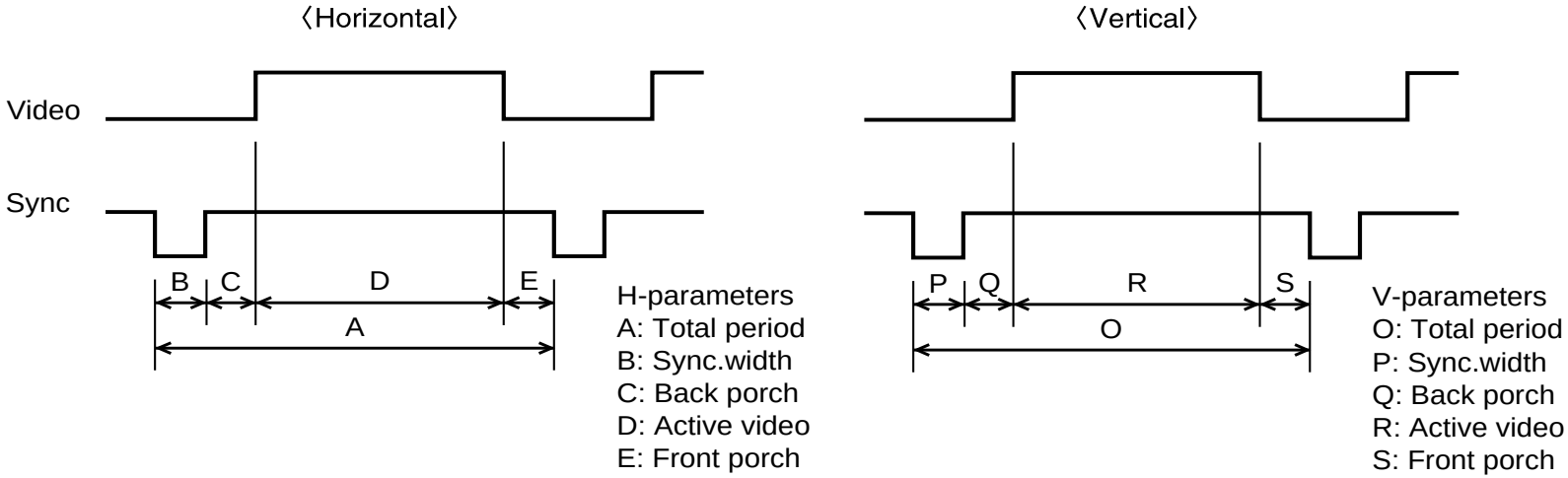
1) Receive a red and blue cross-hatch signal.
2) Adjust the horizontal convergence (H-convergence) and the vertical convergence (V-convergence) with the front buttons so that red and blue beams converge.
3) Press the Input Select Button (VIDEO 1/2) so that the OSD as shown in the right hand side figure appears and the Digital H/V-convergence is enabled.
4) Confirm the horizontal/vertical convergence at the points: C0 to C8, B0 to B8, A0 to A8, D0 to D8, E0 to E8 in the right hand side figure.
5) If the horizontal/vertical line is diverged, select the adjustment point with the +/– Buttons and switch to X (H) or Y (V) with the MENU Button.
6) Press the +/– Buttons while the OSD is displayed to make red and blue beams converged.
7) Press the Input Select Button (VIDEO 1/2) so that the Digital H/V-convergence is disabled.
8) Add green to the red and blue cross-hatch signal.



A0	A1	A2	A3	A4	A5	A6	A7	A8
B0	B1	B2	B3	B4	B5	B6	B7	B8
C0	C1	C2	C3	C4	C5	C6	C7	C8
D0	D1	D2	D3	D4	D5	D6	D7	D8
E0	E1	E2	E3	E4	E5	E6	E7	E8

Points

2. TIMING CHART



Mode	VESA Timing Name	fH (kHz)	fV (Hz)	Sync polarity			Sync on green	Horizontal (μsec)					Vertical (msec)				
				H	V	Comp		A	B	C	D	E	O	P	Q	R	S
1	640×480 @60Hz	31.469	59.940	N	N	–	–	31.778	3.813	1.907	25.422	0.636	16.683	0.064	1.048	15.253	0.318
2	640×480 @85Hz	43.269	85.008	N	N	–	–	23.111	1.556	2.222	17.778	1.556	11.764	0.069	0.578	11.093	0.023
3	800×600 @85Hz	53.674	85.061	P	P	–	–	18.631	1.138	2.702	14.222	0.569	11.756	0.056	0.503	11.179	0.019
4	1024×768 @85Hz	68.677	84.997	P	P	–	–	14.561	1.016	2.201	10.836	0.508	11.765	0.044	0.524	11.183	0.015
5	1280×1024 @85Hz	91.146	85.024	P	P	–	–	10.971	1.016	1.422	8.127	0.406	11.761	0.033	0.483	11.235	0.011
6	1600×1200 @85Hz	106.250	85.000	P	P	–	–	9.412	0.837	1.325	6.972	0.279	11.765	0.028	0.433	11.294	0.009
7	1920×1440 @85Hz	128.520	85.000	P	P	–	–	7.781	0.633	1.078	5.625	0.445	11.765	0.023	0.529	11.204	0.007
8	2048×1536 @85Hz	137.020	85.000	P	P	–	–	7.298	0.577	1.010	5.278	0.433	11.765	0.021	0.525	11.210	0.007

3. IC APPLICATION

Ref No.	Description	Application	Location (PWB)
Deflection circuit			
IC350	UPC1888DCT	H&V oscillator, Distortion / Size / Phase / DBF control, Variable B control	MAIN
IC401	LA7840L	Vertical deflection output	↑
IC501	SLA5058	S-correction switching	↑
Power circuit			
IC901	STR-G6551	Sub power control	STAND
IC921	431	5V output control	↑
IC951	MC33260P	Power factor control	MAIN
IC952	STR-F6676	Main power control	↑
IC953	7712/2412	12V regulator	↑
IC351	7812	12V regulator	↑
IC205	7805	12V regulator	STAND
IC703	29M33	3.3V regulator	CORRECTION
IC704	78M05	5V regulator	↑
IC503	7805	5V regulator	MAIN
Microprocessor circuit			
IC104	TMP47C24N	Sub microprocessor	STAND
IC301	TMP86PP11AN	Main Microprocessor	MAIN
IC302	M51951BSL/KIA7045P	5V watcher	↑
IC303	24C08	E^2PROM (DATA)	↑
IC102	24C21	E^2PROM (DDC)	STAND
IC103	24C21	E^2PROM (DDC)	↑
High voltage circuit			
IC502	MSPAD383	High voltage output control	MAIN
Video & Sync processing circuit			
IC101	M61323SP-600	Video input switch	STAND
IC105	74LS157	H-sync and S.O.G. input switch	↑
IC201	CXA2153S	Video pre-amplifier	↑
IC202	LM2412T	Video output	↑
IC203	M35047-057SP/063SP	On screen display control	↑
IC204	LM240NA	Cut-off control	↑
CRT circuit			
IC701	M62393P	D/A converter	CORRECTION
IC702	UPD61882	Digital signal processor	↑
IC705	LA6510/TA8410AK	POWER-0P-AMP (TILT/NS-RRC control)	↑
IC706	LA6510/TA8410AK	POWER-0P-AMP (BL/BR control)	↑
IC707	LA6510/TA8410AK	POWER-0P-AMP (TL/TR control)	↑
IC708	STK391-110	POWER-0P-AMP (H/V-convergence control)	↑
Additional function circuit			
IC601	AN7522	AUDIO-AMP	STAND
IC701	ISP1122	USB control	↑
IC702	PCF8582C	E^2PROM (USB)	↑
IC304	MIU-231	Terrestrial magnetic sensor	MAIN

Note: Specifications of Microprocessor are on next page.

Main microprocessor specifications

Pin	Name	Function	Pin	Name	Function
1	GND	GND	42	V-IN	V-SYNC signal input
2	X-IN	12MHz X'TAL	41	H-IN	H-COMP / SYNC signal input
3	X-OUT	12MHz X'TAL	40	V-OUT	V-SYNC signal output
4	TEST	GND	39	H-OUT	H-SYNC signal output
5	Vcc	5V	38	CLAMP	Video clamp signal output
6	CS7	Cushion-S switching signal 7 output	37	MODEL-SW	Model no. switching
7	CS1	Cushion-S switching signal 1 output	36	MODEL-SW	Model no. switching
8	RESET	Reset	35	DDC-SDA	DDC SDA
9	CS2	Cushion-S switching signal 2 output	34	DDC-SCL	DDC SCL
10	SIZE-PWM	PWM-H SIZE	33	E^2PROM-SDA	E^2PROM SDA
11	DEG	Degauss control signal output	32	E^2PROM-SCL	E^2PROM SCL
12	CS3	Cushion-S switching signal 3 output	31	SDA	IIC SDA
13	CS4	Cushion-S switching signal 4 output	30	SCL	IIC SCL
14	CS5	Cushion-S switching signal 5 output	29	SUB-SO	Sub microprocessor data-out
15	CS6	Cushion-S switching signal 6 output	28	SUB-SI	Sub microprocessor data-in
16	H-LIN1	H-LIN1 switching signal output	27	SUB-SCK	Sub microprocessor clock
17	DRIVE1	H-DRIVE1 switching signal output	26	H-LIN2	H-LIN2 switching signal output
18	X	Magnetism X detection	25	DRIVE2	H-DRIVE2 switching signal output
19	Y	Magnetism Y detection	24	DIAG	Automatic adjustment clock
20	FUNNEL	CRT funnel temperature detection	23	DATA-OUT	Automatic adjustment data input
21	Vref	5V	22	DATA-IN	Automatic adjustment data output

Sub microprocessor specifications

Pin	Name	Function	Pin	Name	Function
1	Vref	5V	28	VDD	5V
2	KEY1	Front key signal input (MENU/VIDEO)	27	GND	GND
3	KEY2	Front key signal input (UP/DOWN/LEFT/RIGHT)	26	GND	GND
4	TEMP	Surrounding temperature detection	25	GND	GND
5	NC	N.C.	24	GND	GND
6	VOLUME1	Volume control 1	23	GND	GND
7	SOG SW	S.O.G. Switching signal ouput	22	RESET	Reset
8	PS1	Main power on/off control signal ouput	21	X-OUT	4MHz X'TAL
9	SIG-SEL	Video input terminal select signal output	20	X-IN	4MHz X'TAL
10	VOLUME2	Volume control 2	19	TEST	N.C.
11	VOLUME3	Volume control 3	18	SUB-SCK	Main microprocessor clock
12	VOLUME4	Volume control 4	17	SUB-SO	Data output
13	LED	LED signal output	16	SUB-SI	Data input
14	VSS	GND	15	PS2	N.C.

4. CIRCUIT DESCRIPTION

4-1. POWER SUPPLY circuit

Power supply circuit consists of MAIN POWER circuit on PWB-MAIN and SUB POWER circuit on PWB-STAND. MAIN POWER circuit is switching power supply circuit of primary output feedback with using control IC (IC952). SUB POWER circuit is an asynchronous switching power supply circuit of secondary output feedback with using IC901 built-in output FET.

Power supply start procedure is as follows;

① Power switch is turned ON.

② SUB POWER circuit (5V and 8.5V output) is turned on.

③ K901 (RELAY) is turned on.

④ POWER FACTOR circuit is turned on.

⑤ MAIN POWER circuit (83V, 32V, 16V and -12V output) is turned on.

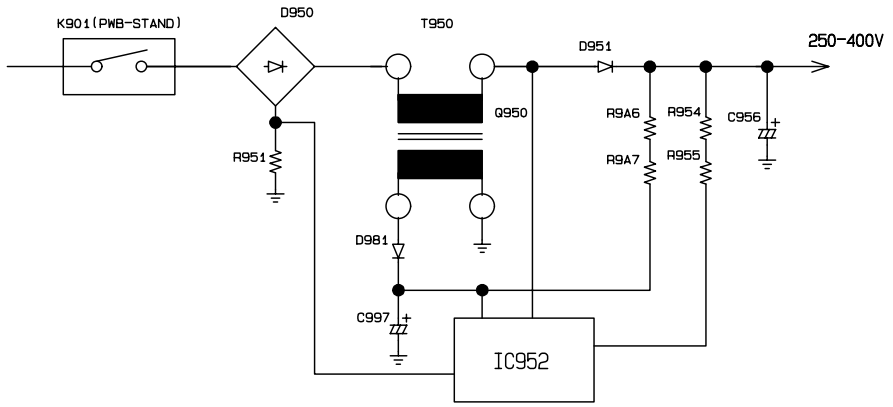
⑥ Monitor is activated.

(1) POWER FACTOR circuit

The voltage waveform from current is controlled to be in proportion with input voltage at pressor chopper circuit. This circuit is prevented from being harmonic by compared with following waveforms.

① The full-wave rectified voltage waveform from D950 via PWB-STAND and smoothed voltage waveform from C956.
② The voltage waveform from R951

① and ② waveforms are compared at IC951. Q950 is turned off when ② exceeds ①, and turned on when ② is 0V. This repetition is to change input current to substantially sinusoidal waveform and it corrects harmonic distortion.
The output voltage vary between 320V and 400V by input AC voltage and load current.
The switching frequency is not constant as Q950 is turned on or off by monitoring input voltage and load current.
The switching frequency is approx. 70-250kHz.



(2) MAIN POWER circuit

After the POWER FACTOR IC is activated, power source is supplied to 4 pin of IC952 (VCC) by start-up resister R958 and R959, and MAIN POWER circuit is activated. MAIN POWER circuit is supplied 25V auxiliary coil (detect coil) voltage between 8 and 9 pin of T951 (main transformer).
The T951 primary auxiliary coil detects the load of 32V output voltage from the T951 secondary and controls the feedback current by fed back to 1 pin of IC952 (FB).

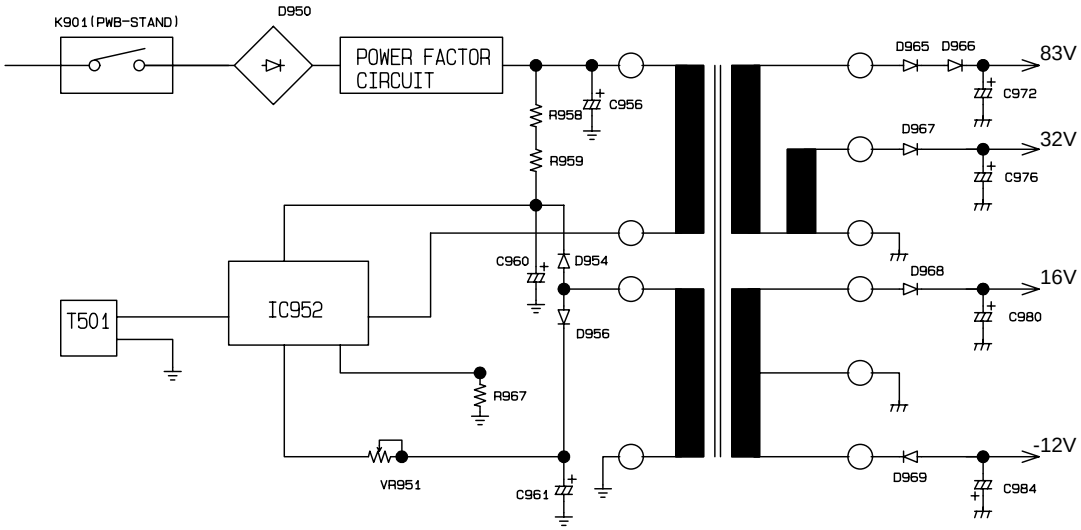
The T951 secondary provides the following DC voltages:

① 83V line: Supplied to the HIGH VOLTAGE OUTPUT (T501) and the VIDEO OUTPUT IC (IC202) and the CUT-OFF IC (IC204) as power source.

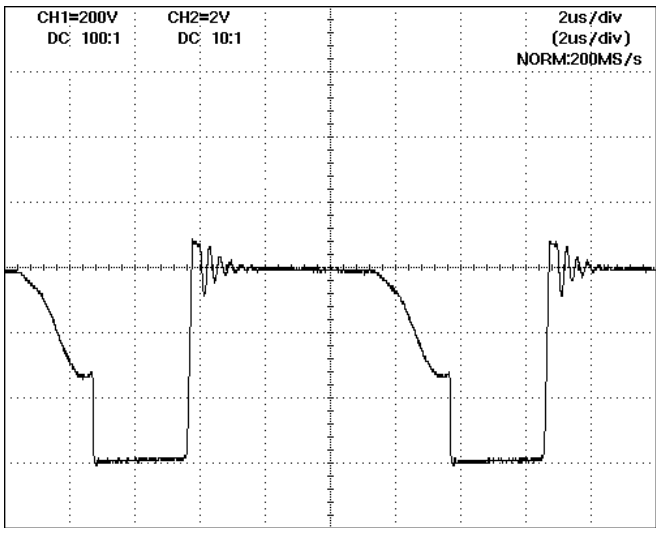
② 32V line: Supplied to the HORIZONTAL DEFLECTION OUTPUT (variable B voltage control) circuit and HORIZONTAL DRIVE circuit as power source.

③ 16V line: Supplied to the each 12V POWER CONTROL circuit, the CRT CORRECTION circuit and the VERTICAL OUTPUT IC (IC104, +) as power source.

④ –12V line: Supplied to the CRT CORRECTION circuit and the VERTICAL OUTPUT IC (IC104, –) as power source.



<Waveform>



IC952 ③ pin Drain output (200V/div)

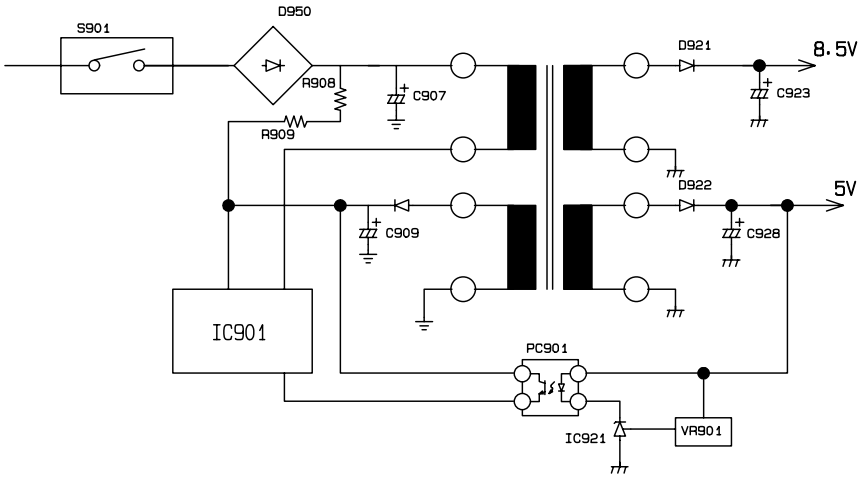
(3) SUB POWER circuit

When AC input is supplied to SUB POWER circuit, start-up resister R908 and R909 detect 4 pin of IC901 voltage (VCC-IN) and activate internal start circuit of IC901. When pin 4 of IC901 voltage turns to 16V, internal control circuit starts operation and auxiliary coil voltage between 2 and 3 pin of T901 (sub transformer) is up to approx.18V, and SUB POWER circuit is activated.
IC921 detects the load of 5V output voltage from the T901 secondary and controls the feedback current in PC901 (photocoupler) by fed back to 5 pin of IC901 (OCP/FB).

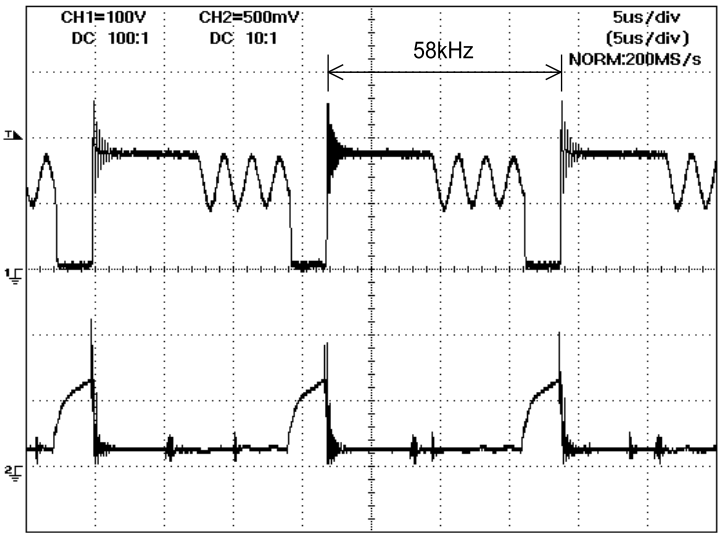
The T901 secondary provides the following DC voltages:

① 8.5V line: Supplied to the Heater voltage IC (IC920) and the Audio-Amp (IC601) as power source.

② 5V line: Supplied to the Microprocessor (IC301 and IC104), USB-IC (IC701), SW-IC (IC101) and 5V CONTROL circuit as power source.



<Waveform>



IC901 pin 1 (Drain output)
(100V/div)

IC901 pin 5 (OCP/FB input)
(0.5V/div)

Note: Above waveform is switching waveform when USB peripherals are not connected.

(4) Power management modes

When IC301 (main microprocessor) detects presence of horizontal and vertical sync signal, control signal is output from IC104 (sub microprocessor). The control signal stops MAIN POWER circuit and decrease heater voltage, and power consumption is reduced.

<Power save control signals>

Mode	Sync signal	PS1	LED	Circuit
		IC104 pin 8	IC104 pin 13	
Normal	H,V-Sync: ON	HIGH	HIGH (Green)	All circuits are activated.
Power Management	H or V-Sync: OFF H and V-Sync: OFF	LOW	LOW (Orange)	Main power stops. (83V/32V/16V/-12V) Heater is off.

The power consumption under the power management mode is 3W or less when USB peripherals or audio equipment are not connected.

4-2. SYNC SIGNAL PROCESSING circuit

The input signal from D-SUB connector is set input condition of VIDEO IN 1 / 2 and sync signal by IC101 (VIDEO-SW-IC) and IC105 (SYNC-SW-IC), and input to pins 41 (H-IN) and 42 (V-IN) of IC301. The input H/V-sync signal is waveform-shaped and output from pins 39 (H-OUT) and 40 (V-OUT) of IC301, and then supplied to pins 26 (H-IN) and 27 (V-IN) of IC350 (H/V oscillation IC) to control the horizontal and vertical deflection.
The setting of signal input condition monitors H/V-sync signal applied to IC301, and output SIGNAL SELECT signal from pin 9 of IC104 and S.O.G. switching signal from pin 7 of IC104.

(1) SIGNAL SELECT signal: Set VIDEO-IN 1/2 by controlling pin 13 of IC101.

D-SUB input	IC104 pin 9
VIDEO-IN 1	LOW
VIDEO-IN 2	HIGH

(2) S.O.G. switching signal: Set SEP/COMP, S.O.G. by controlling pin 1 of IC105.

Sync signal input	IC104 pin 7
SEP/COMP input	LOW
S.O.G. input	HIGH

NOTE: S.O.G. switching signal is switched to LOW level when the H/V-sync signal is off, and switched to HIGH level when COMP signal is input to pin 41 of IC301.

(3) The input sync signal to IC301 is processed by SYNC SIGNAL PROCESSING circuit in IC301 as follows:

① Discriminate the input sync signal type: Separate / Composite

② Discriminate the sync polarity: Positive / Negative

③ Detect the input sync signal presence

④ Count the frequency
Counting criterion: X'TAL 12MHz (X301)

4-3. CONTROL circuits

(1) HORIZONTAL / VERTICAL OSCILLATION circuit

The H/V-sync signal input to IC350 is phase-sifted and converted to the waveform in IC350. The pulse synchronized with the horizontal sync signal is output from pin 17 as horizontal drive pulse. The sawtooth wave synchronized with the vertical sync signal is output from pin 4.

The pulse output from pin 17 generates a frequency locked to the input signal under the following conditions:

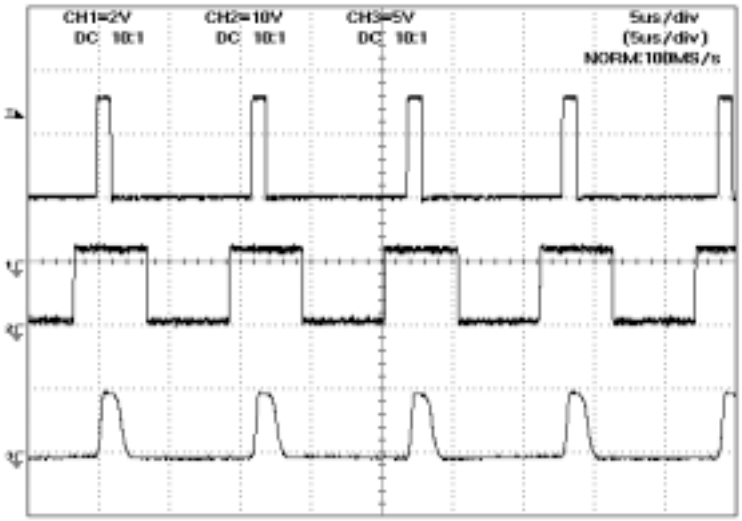
① The horizontal sync signal is input to pin 26.

② The vertical sync signal is input to pin 27.

③ The feedback pulse (AFC pulse) of the HORIZONTAL DEFLECTION OUTPUT circuit is input to pin 18.

IC350 (UPC1888DCT) is auto-sync system and adjusts the horizontal frequency automatically make the vertical sync signal input to pin 27 trigger. In case that the AFC pulse is not input, the output pulse from pin 17 is unlocked and the horizontal picture size changes with keeping it small and picture is not synchronized.

<IC350 Oscillation Waveform>



IC350 pin 26 H-sync input (2V/div)

IC350 pin 17 HD-OUT output (10V/div)

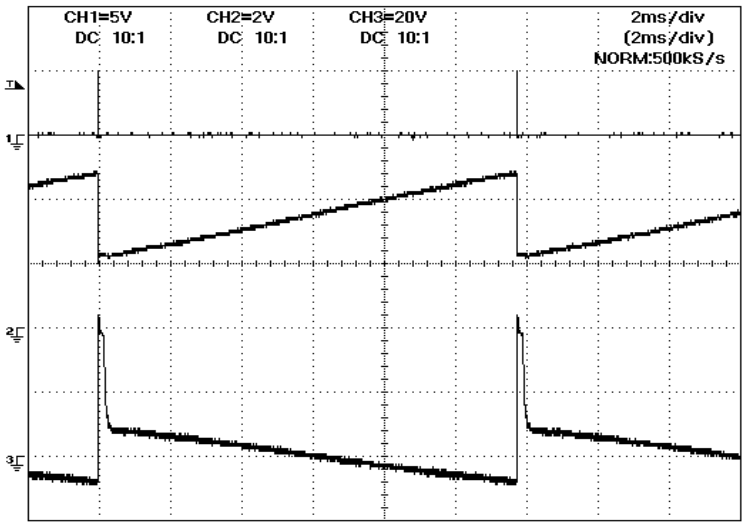
IC350 pin 18 AFC input (5V/div)

(2) VERTICAL DEFLECTION circuit

The sawtooth wave output from pin 4 of IC350 is amplified by IC401 (V-OUT-IC) and then supplied to the deflection yoke as a vertical deflection current to control the vertical deflection.

V-position is controlled by changing the DC component of the sawtooth wave output from pin 4.

<Vertical Waveform>



IC350 pin 27 V-sync input (5V/div)

IC350 pin 4 sawtooth-wave output (2V/div)

IC401 pin 2 V-OUT output (20V/div)

(3) HORIZONTAL SIZE and DISTORTION CONTROL circuits

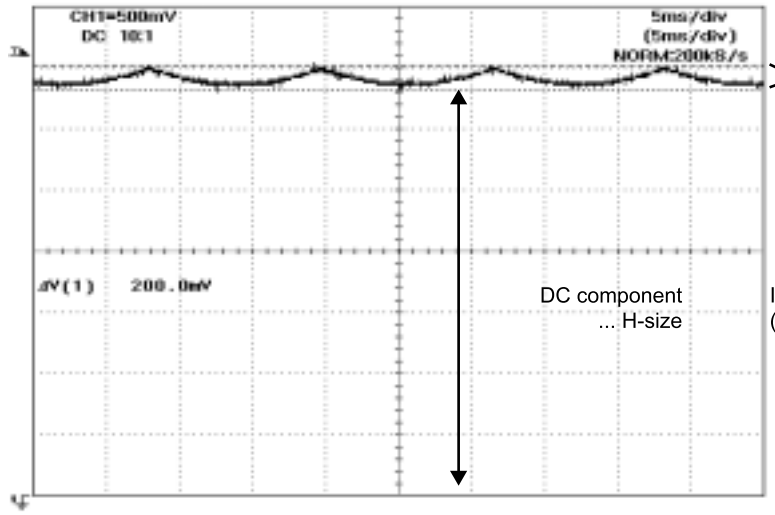
The variable B voltage control pulse synchronized with the horizontal sync signal is output from pin 14 of IC350. The control pulse makes the PRESSOR CHOPPER circuit consisted of L956, Q953 and D970 output the variable B voltage of horizontal deflection output.

The horizontal size control voltage and distortion control parabolic wave output from pin 5 are input to pin 11 and then the output pulse of pin 14 controls the horizontal size and distortion as follows:

① H-size: The output duty of pin 14 is varied by the DC voltage input to pin 11.

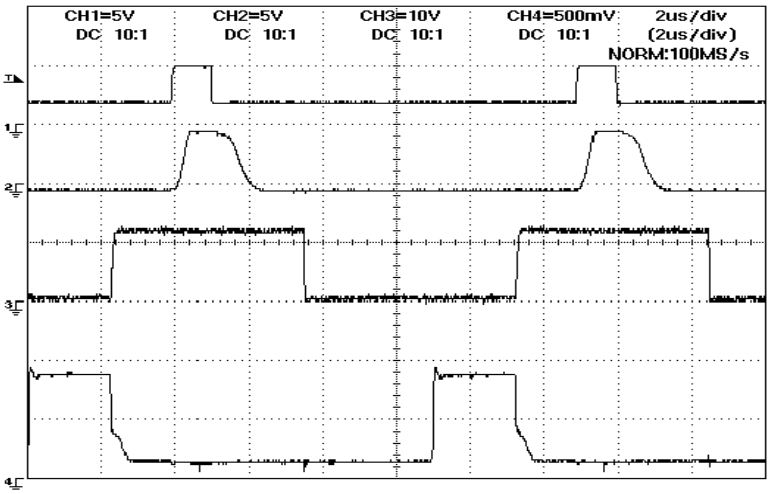
② Distortion: The parabolic wave (AC component) input to pin 11 is synthesized with the output pulse of pin 14.

<Waveform>



AC component ... Distortion

IC350 pin 5 output
(0.5V/div)



IC350 pin 26 H-sync input
(5V/div)

IC350 pin 18 AFC input
(5V/div)

IC350 pin 17 HD-OUT output
(10V/div)

IC350 pin 14 Variable B
control pulse (0.5V/div)

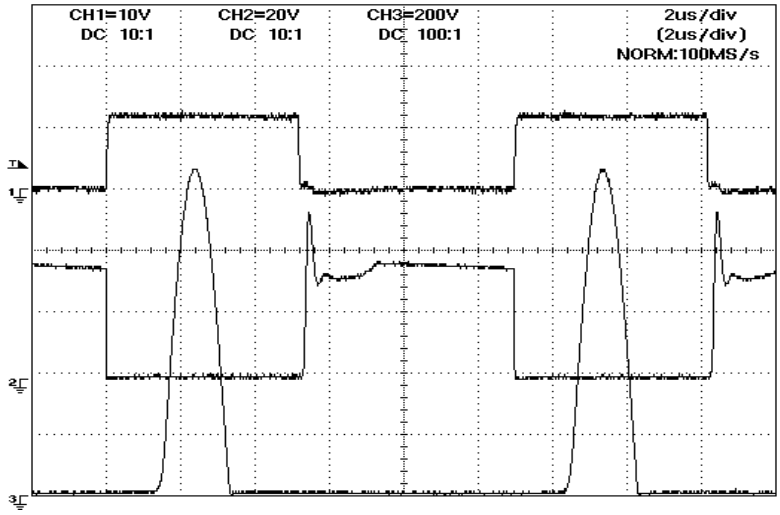
4-4. HORIZONTAL DEFLECTION circuit

(1) HORIZONTAL DRIVE circuit

The horizontal drive pulse output from pin 17 of IC350 is amplified by Q504 and T502 and then supplied to Q503 (H-OUT) base as a current.

The current is amplified by Q503 and then supplied to the deflection yoke as a horizontal deflection current to control the horizontal deflection.

<Vertical Waveform>



Q504 Gate input (10V/div)

Q504 Drain output (20V/div)

Q503 corrector output (200V/div)

(2) HORIZONTAL LINEARITY CORRECTION circuit

The switching signal from IC301 controls H-LIN-COIL (L503, L504 and L507), S-correction capacitor (C510, C511, C512, C513, C514 and C557) and FET-ARRAY (IC501), and then correct linearity every frequency.

Each switching point performs horizontal linear and distortion correction as follows:

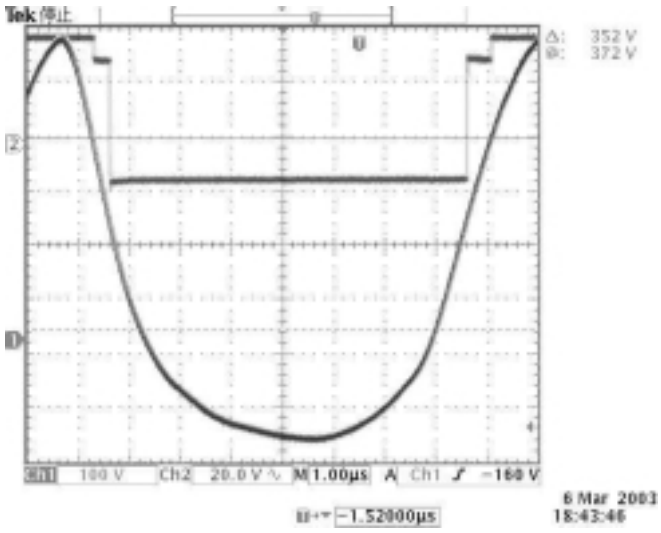
fH (kHz)	IC301 output pin									
	CS1 (Pin 7)	CS2 (Pin 9)	CS3 (Pin 12)	CS4 (Pin 13)	CS5 (Pin 14)	CS6 (Pin 15)	CS7 (Pin 6)	H-LIN1 (Pin 16)	H-LIN2 (Pin 26)	DRIVE (Pin 17)
29.5 - 34.0	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	LOW
34.1 - 41.0	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	LOW
41.1 - 45.0	HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	LOW
45.1 - 49.0	HIGH	LOW	LOW	HIGH	LOW	LOW	HIGH	LOW	HIGH	HIGH
49.1 - 59.0	HIGH	LOW	HIGH	HIGH	LOW	LOW	HIGH	LOW	HIGH	HIGH
59.1 - 66.0	HIGH	HIGH	LOW	LOW	LOW	LOW	HIGH	LOW	HIGH	HIGH
66.1 - 73.0	HIGH	HIGH	LOW	HIGH	LOW	LOW	HIGH	LOW	HIGH	HIGH
73.1 - 84.0	HIGH	HIGH	HIGH	LOW	LOW	LOW	HIGH	LOW	HIGH	HIGH
84.1 - 88.5	HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	HIGH
88.6 - 97.0	HIGH	HIGH	HIGH	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH
97.1 - 115.0	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH
115.1-140.0	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH

4-5. DYNAMIC BEAM FOCUS (DBF) circuit

(1) H-DBF

The parabolic wave of horizontal period is output from pin 9 of IC350 (HDFO) and then amplified by Q516 and Q517. It increases up to approx. 500Vp-p by T503 and synthesized with V-parabolic wave and then applied to pin 12 (DF) of T501 (FBT).

<H-DBF Waveform>



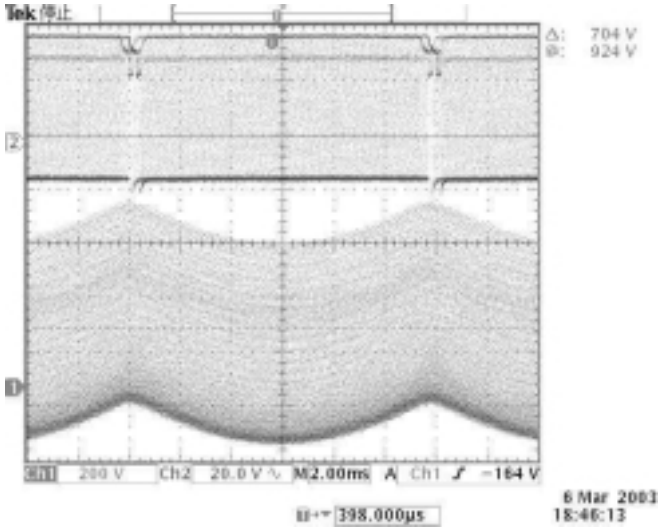
CRT cathode input
(H period)

T501 (FBT) pin 12 input
DBF horizontal element
(100V/div)

(2) V-DBF

The parabolic wave of vertical period is output from pin 8 of IC350 (VDFO) and then amplified by Q520. It is synthesized with H-parabolic wave.

<V-DBF Waveform>



CRT cathode input
(V period)

T501 (FBT) pin 12 input
(200V/div)

4-6. VIDEO circuit

(1) Pre-amp

The video signal from D-SUB connector via IC101 (SW-IC) is input to pins 1 (R-IN), 3 (G-IN) and 6 (B-IN) of IC201 pre-amplifier. This video signal is clamped by clamp signal input to pin 13 of IC201. The blanking signal input to pin 14 is synthesized with the clamped signal and then output from pins 29 (R-OUT), 27 (G-OUT) and 25 (B-OUT) respectively. The blanking signal is synthesized signal of V-BLK and H-BLK signals.

V-BLK signal: Remove the raster retrace line.
H-BLK signal: Remove the side raster rolling.

I^2C-BUS controls D/A converter in IC201 as follows:

① Contrast

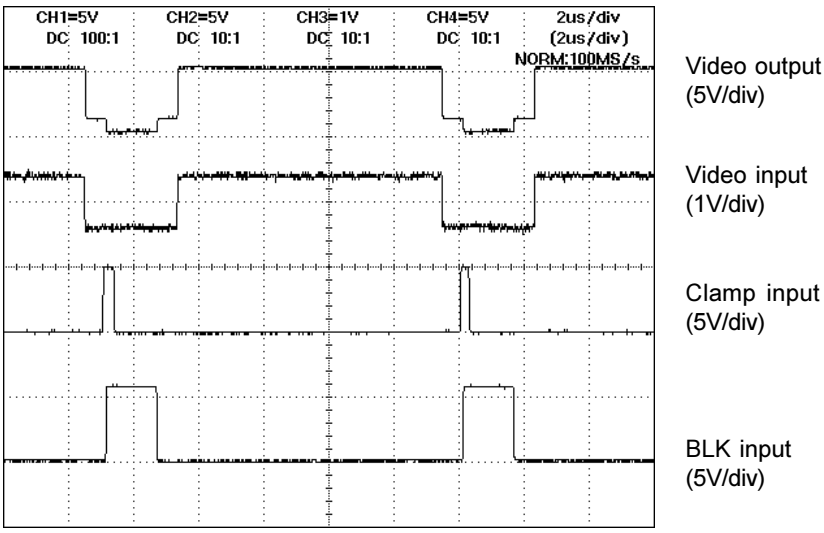
② Sub-brightness

③ R/G/B drive

④ OSD contrast

⑤ D/A output voltage for the CUT-OFF circuit

<IC201 Waveform>



(2) ABL

DC voltage input to pin 7 of IC201 controls the amplitude of the video output signal.

0.5V: The amplitude of the video output signal is 0%.
4.5V: The amplitude of the video output signal is 100%. (ABL is not activated.)

DC voltage is output by detecting the current input to T501 (FBT). This DC voltage controls the amplitude of the video output signal not to input more than specific current into FBT by inputing 7 pin of IC201.

(3) VIDEO-OUT and CUT-OFF circuits

The video signal input to pins 9 (R-IN), 8 (G-IN) and 11 (B-IN) of IC202 (VIDEO-OUTPUT) is amplified reversely and then output from pins 3 (R-OUT), 5 (G-OUT) and 1 (B-OUT) respectively.

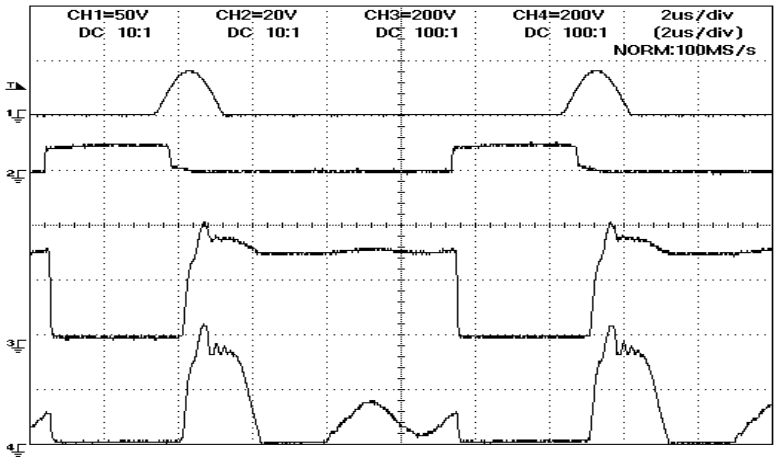
The R/G/B-cut-off and brightness D/A control voltages output from pins 18-21 of IC201 pre-amplifiers are amplified by IC204 (CUT-OFF-IC), and then added to the video signal from IC202 and supplied to the CRT cathode grid.

4-7. HIGH VOLTAGE CONTROL / OUTPUT circuit

The AFC pulse output from the HORIZONTAL DEFLECTION OUTPUT (L501) applied to pin 3 of IC502 (HV-CONT-IC) and then a control pulse synchronized with the frequency of the AFC pulse is output from pin 1 of IC502 and operate Q521 (HV-OUT).

For stabilizing high voltage output control, this circuit is to detect a feedback voltage from pins 10 and 11 of T501 (FBT) and feed back to pin 4 of IC502, change the output duty of pin 1 of IC502, and control the high voltage change due to the brightness changes.

<Waveform>



L501 AFC output (50V/div)

Q521 Gate input (20V/div)

Q521 Drain output (200V/div)

T501 pin 1 output (200V/div)

4-8. PROTECTION circuit

This circuit is composed of the following protection circuits to prevent a damage to the monitor and X-ray radiation when the monitor is inoperative.

When the circuit is in the following cases, pin 19 of IC350 (XRAY) turns to 5V and then the horizontal drive pulse output from pin 17 and the variable B control pulse output from pin 14 turn to “LOW” level (0V). It makes the HORIZONTAL DEFLECTION OUTPUT and the HIGH VOLTAGE OUTPUT circuits stop.

The signal that the X-RAY PROTECTION circuit is activated is sent to IC301 (Main Microprocessor) from IC350 by I^2C-BUS when pin 19 turns to 5V. IC301 receives the signal and then PS1 signal of pin 8 of IC104 turns to “LOW” level so that the MAIN POWER circuit is turned off.

In case that the PROTECTION circuit is activated and the HORIZONTAL DEFLECTION OUTPUT, HIGH VOLTAGE OUTPUT and MAIN POWER circuits are turned off, turn OFF and ON the Power Switch to recover.

The PROTECTION circuit operates in the following cases:

① +B9 line: The voltage is 270V or more.

② X-RAY PROTECTION circuit: The high voltage is 29.0kV or more.

③ ARC LIMIT circuit: The beam current in FBT is 3.0mA or more.

4-9. CRT CORRECTION circuit

Following adjustment and functions are for CRT correction.

① DYNAMIC/STATIC-CONVERGENCE

② TILT-DY

③ NS-RRC

④ LANDING (TR/TL/BR/BL)

(1) DYNAMIC/STATIC-CONVERGENCE

The control voltage (AC) from IC702 is amplified by IC708 and applied to CONVERGENCE-COIL built-in CRT deflection yoke. It makes any points of DYNAMIC-CONVERGENCE change.
The DC voltage from pins 12 and 13 of IC701 is synthesized with the control waveform from IC702 and vary the DC component. It makes whole screen of STATIC-CONVERGENCE change.

(2) TILT-DY

DC voltage from pin 14 of IC701 is amplified by 7 pin of IC705 and applied to TILT-COIL of CRT deflection yoke. It makes CRT and DY tilt change.

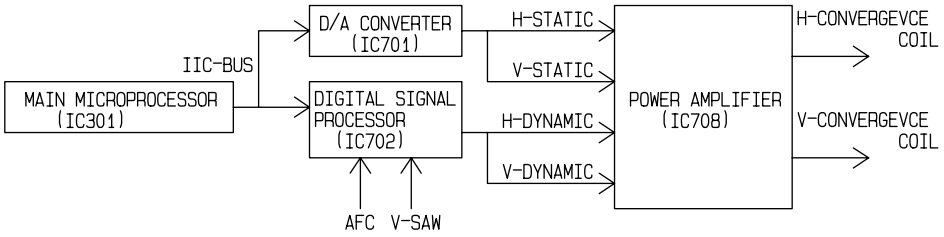
(3) NS-RRC

DC voltage from 15 pin of IC701 is amplified by pin 3 of IC705 and applied to NS-RRC COIL. It makes discoloration caused by vertical direction magnetic field for CRT face detected by IC304 (Terrestrial magnetic sensor) on PWB-MAIN.

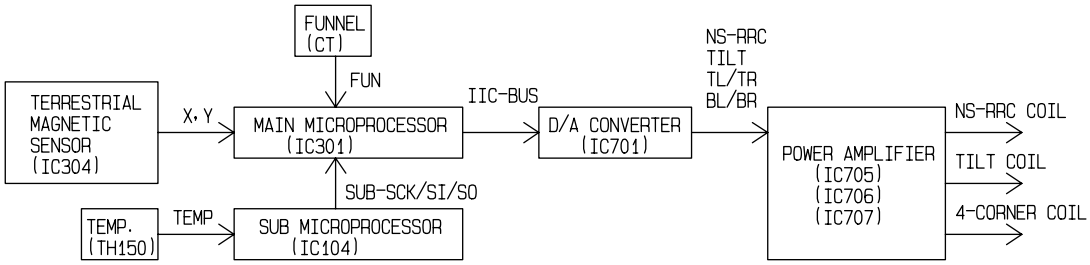
(4) LANDING (4 corner coils)

DC voltage from pins 4-7 of IC701 is amplified by pins 3 and 7 of IC706 and IC707, and applied to 4 corner coils. It makes discoloration caused by horizontal direction magnetic field for CRT face detected by IC304 (Terrestrial magnetic sensor) on PWB-MAIN, and CRT funnel temperature and surrounding temperature detected by temperature sensor.

<BLOCK DIAGRAM for DYNAMIC / STATIC-CONVERGENCE adjustment>



<BLOCK DIAGRAM for TILT-DY / NS-RRC / LANDING adjustment>



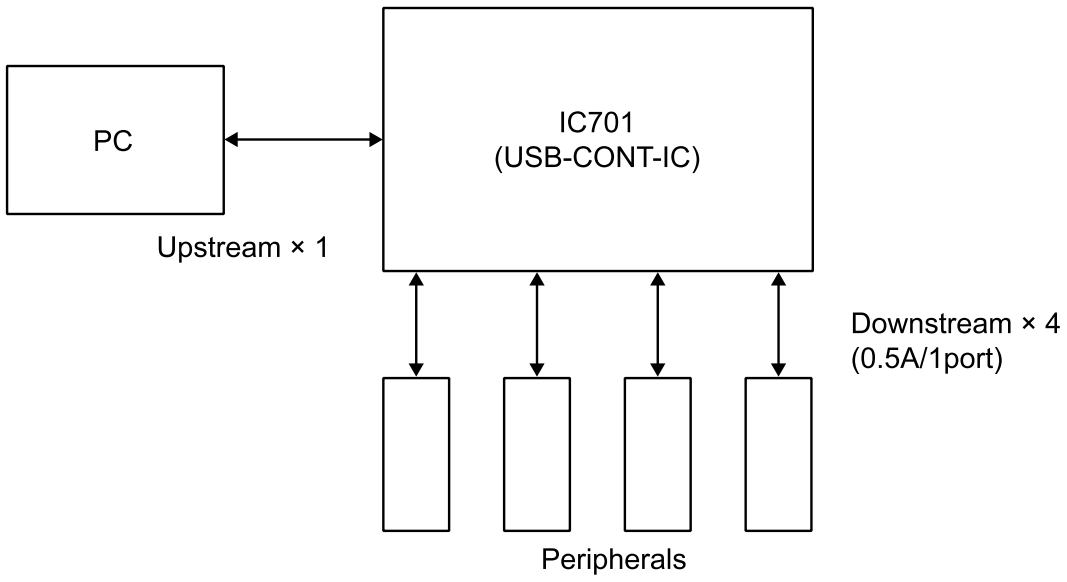
4-10. AUDIO circuit

The audio signal from CN602 (AUDIO-IN) is amplified by IC601 (AUDIO-AMP) and output to Speaker and Headphone jack.
The VR voltage (0-1.2V) from pin 9 of IC601 switch output of pins 6, 10, 11 and 12 of IC104 to HIGH and LOW to control the volume.
IC601 is active under the power management mode.

Level	Input Voltage IC601 pin 9	IC104 output pin			
		Pin 6	Pin 10	Pin 11	Pin 12
0	0.020	LOW	LOW	LOW	LOW
1	0.046	HIGH	LOW	LOW	LOW
2	0.073	LOW	HIGH	LOW	LOW
3	0.104	HIGH	HIGH	LOW	LOW
4	0.135	LOW	LOW	HIGH	LOW
5	0.172	HIGH	LOW	HIGH	LOW
6	0.211	LOW	HIGH	HIGH	LOW
7	0.256	HIGH	HIGH	HIGH	LOW
8	0.292	LOW	LOW	LOW	HIGH
9	0.346	HIGH	LOW	LOW	HIGH
10	0.404	LOW	HIGH	LOW	HIGH
11	0.473	HIGH	HIGH	LOW	HIGH
12	0.546	LOW	LOW	HIGH	HIGH
13	0.636	HIGH	LOW	HIGH	HIGH
14	0.736	LOW	HIGH	HIGH	HIGH
15	0.861	HIGH	HIGH	HIGH	HIGH

4-11. USB circuit

This circuit detects connecting condition of the upstream port (CN701 UP) from PC and the downstream port (CN702 and CN703) from peripherals and communicate with PC. USB cable (series A/B) is composed of V, GND, +D and -D signals. The condition of connection is judged from by detecting data transfer rate of peripherals connected by +D and -D combination at IC701.



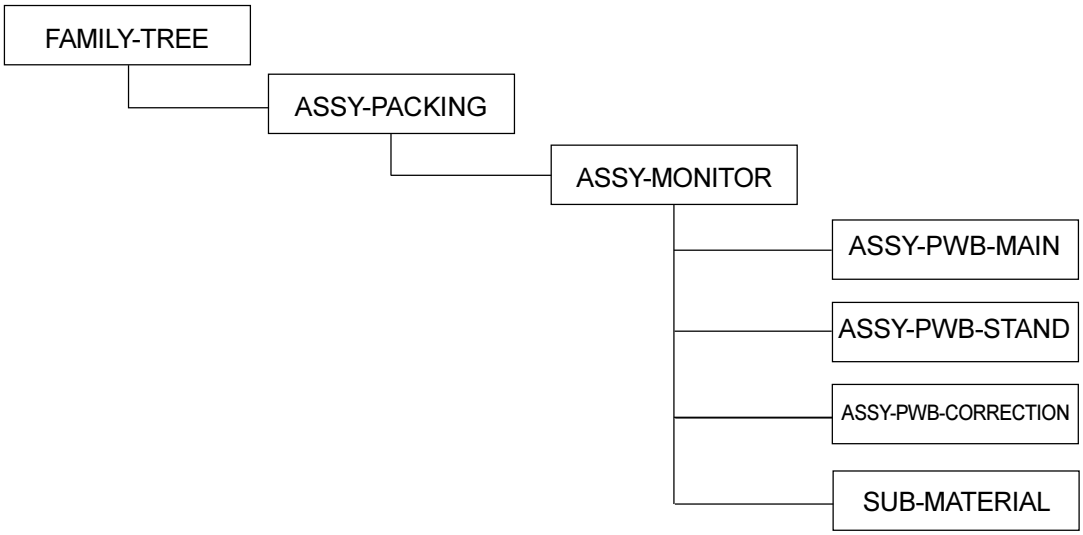
5. SERVICE PARTS LIST

WARNING !

The components identified by " ! " in this manual are critical for safety.
Replace only with part number specified .

< Contents >

< Structure >



ELECTRICAL PARTS LIST

< Abbreviations in PART section >

Abbreviation	Meaning
R-C	Resistor-Carbon
R-MB	Resistor-Metal
R-FUSE	Resistor-Fuse
C-C	Capacitor-Ceramic
C-E	Capacitor-Electrolytic
C-PP	Capacitor-Polypropylene
C-MF	Capacitor-Multilayer Metallized Polyester Film
D	Diode
ZD	Zener Diode
TR	Transistor
PHC	Photo Coupler
PTH	Positive Thermistor
HDT	Horizontal Drive Transformer
FBT	Flyback Transformer
VR	Variable Resistor
SW	Switch
SWT	Switching Transformer

< Marks in DESCRIPTION section >

< Resistor >

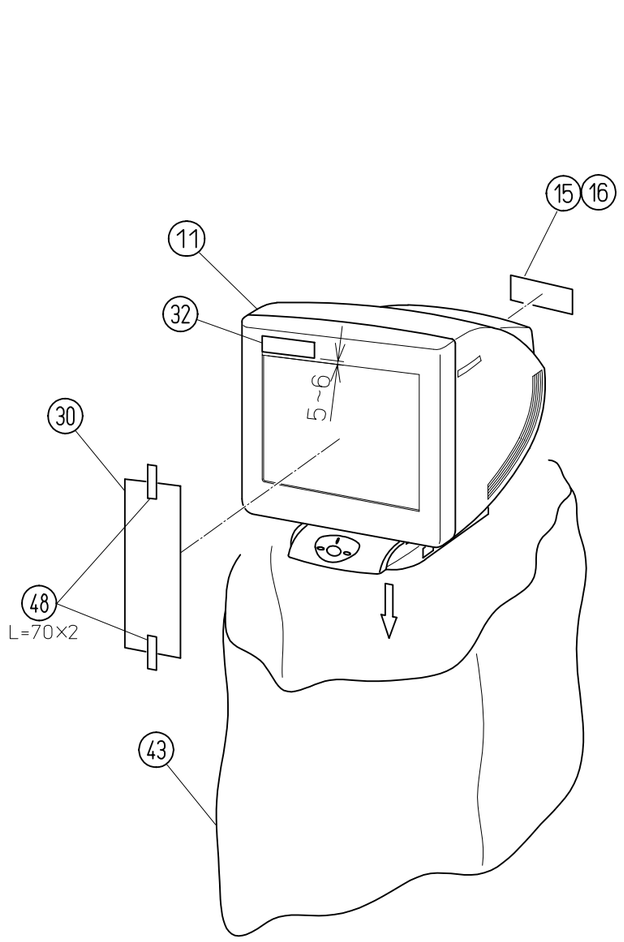
Mark	Tolerance
F	± 1%
J	± 5%
K	±10%

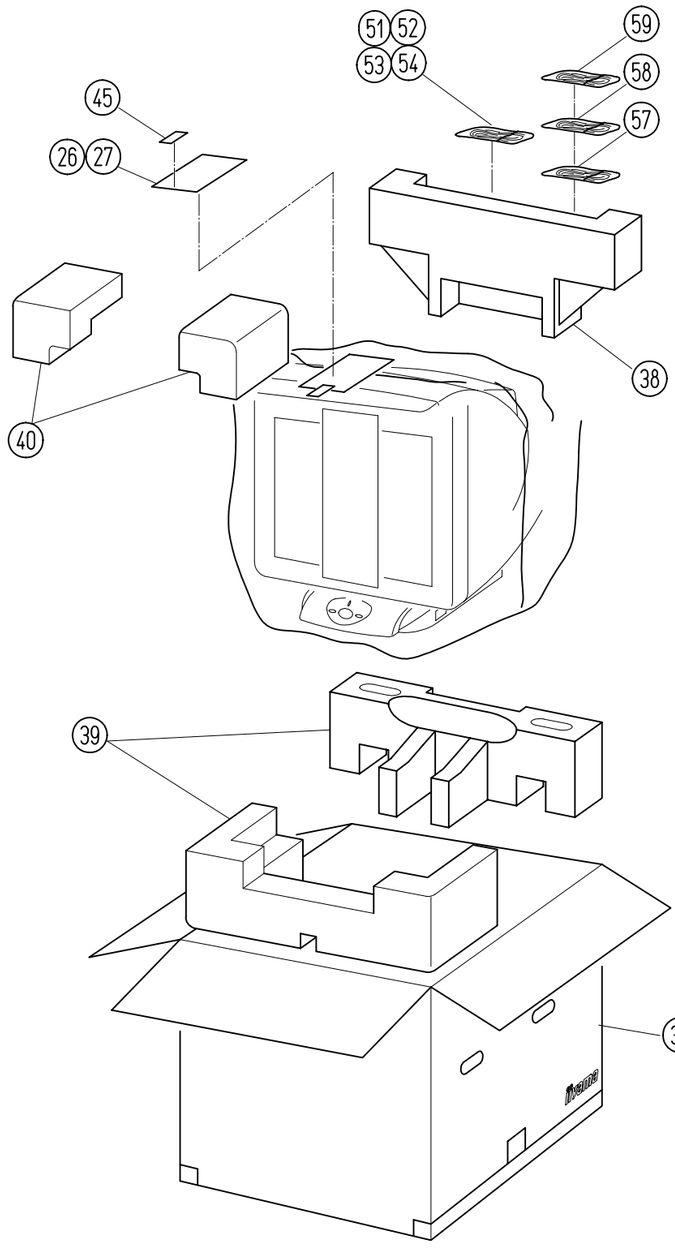
< Capacitor >

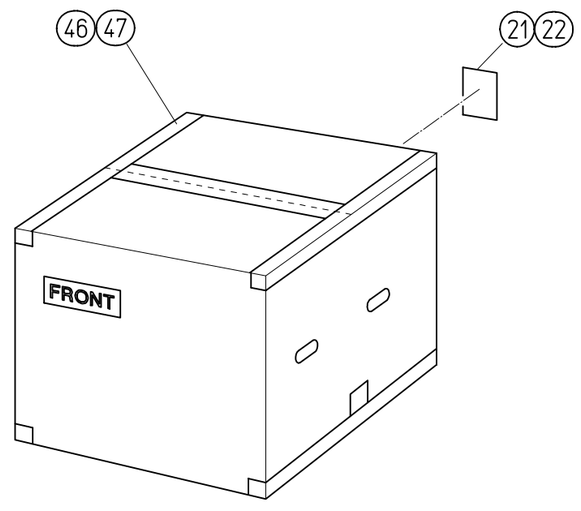
Mark	Tolerance
H	± 3%
J	± 5%
K	± 10%
M	± 20%
P	+100%
	– 0%
Z	+ 80%
	– 20%

6. EXPLODED VIEW

Note: The numbers in this exploded view are the same as the reference numbers in the Chapter 5.

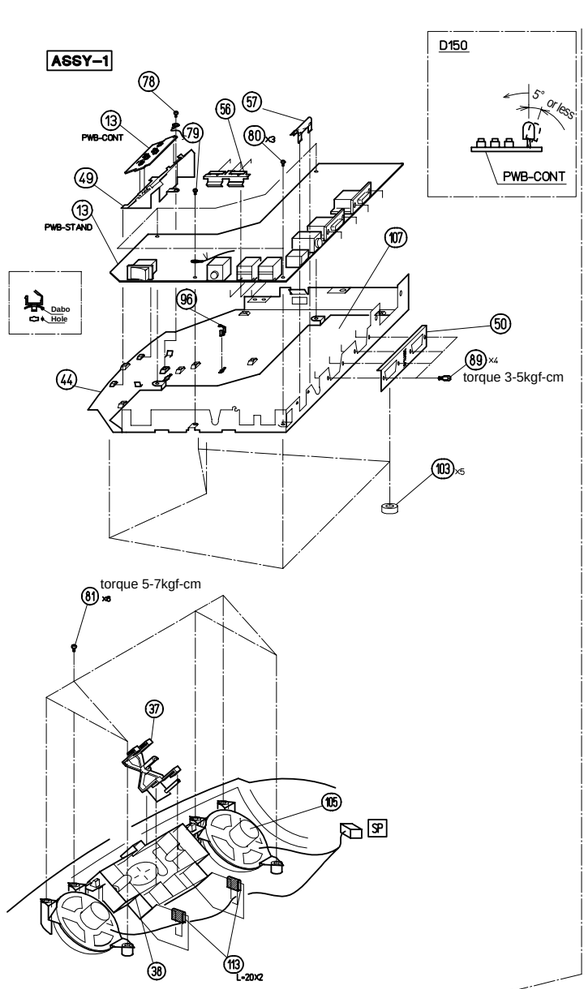


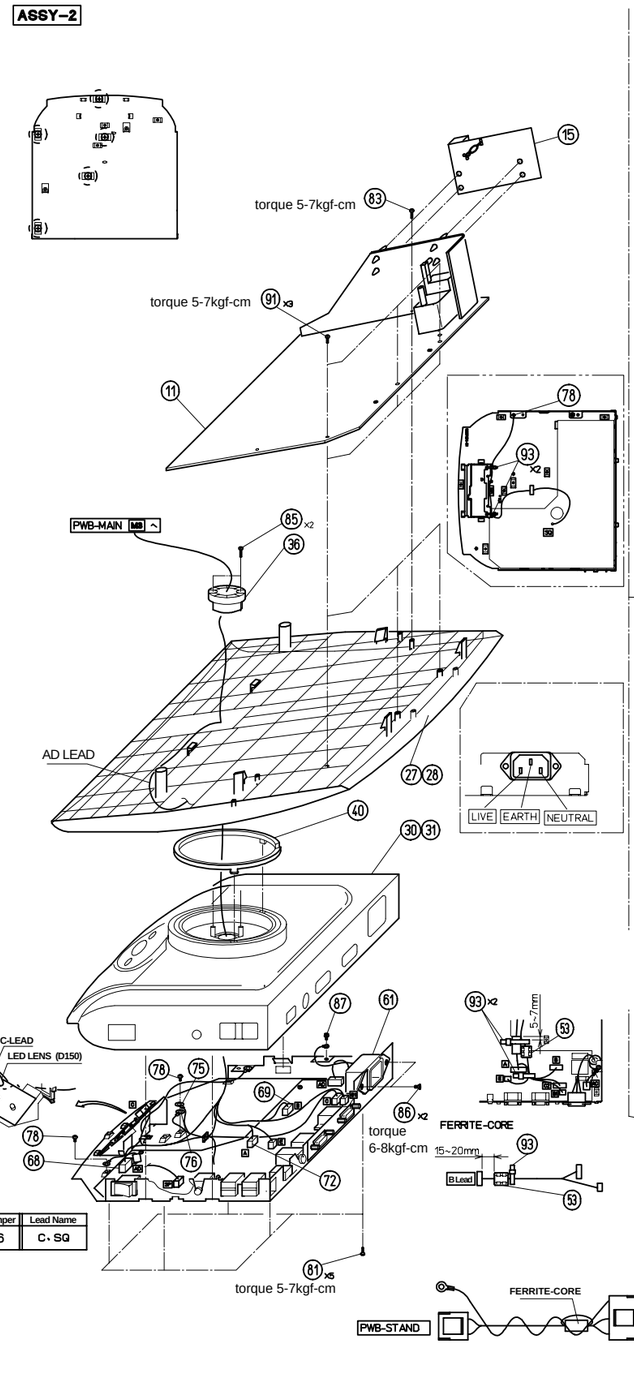




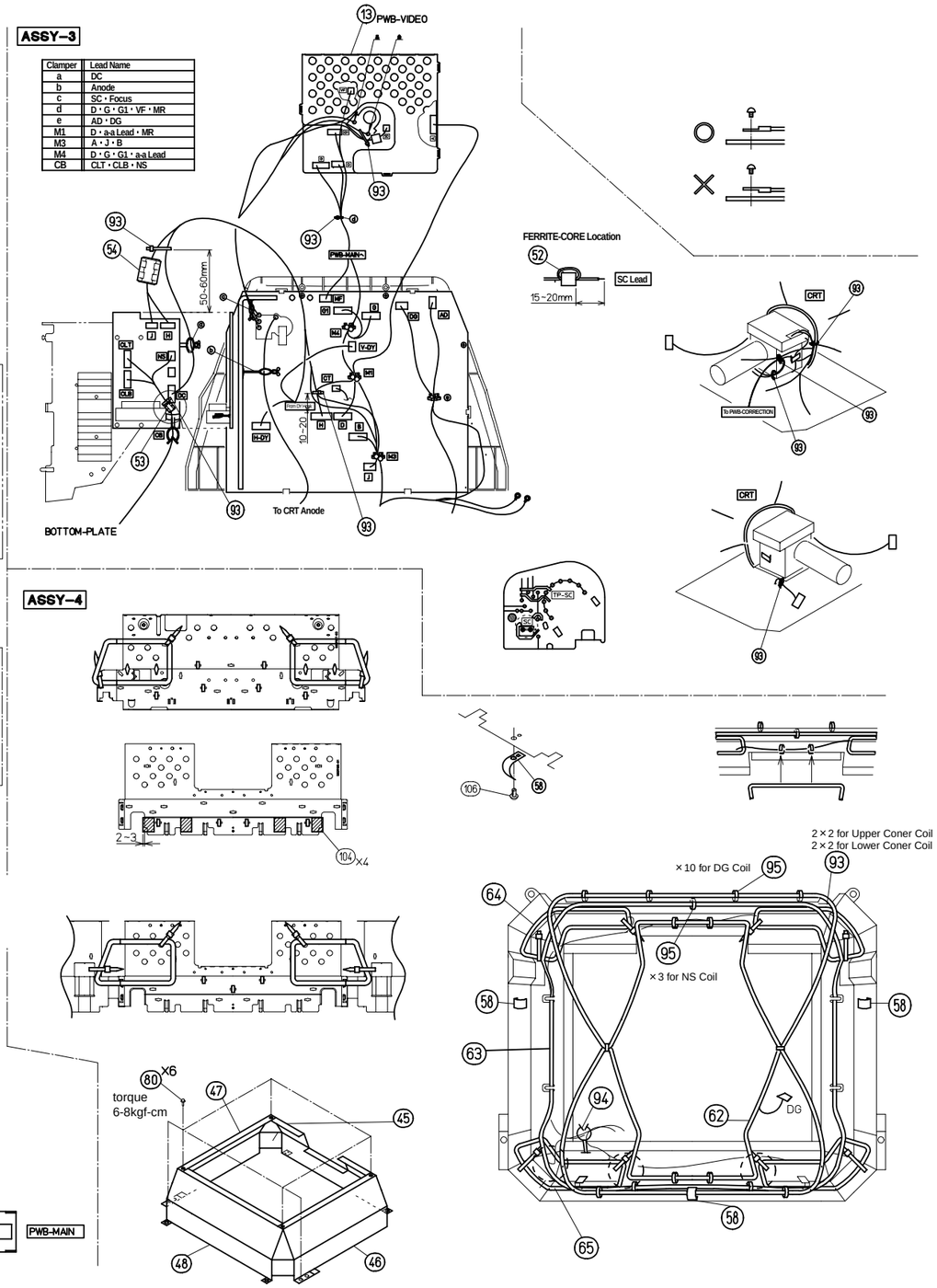
ASSY-PACKING

Note: Except where indicate otherwise, all screw torcue is 9-11kgf-cm in ASSY-MONITOR.





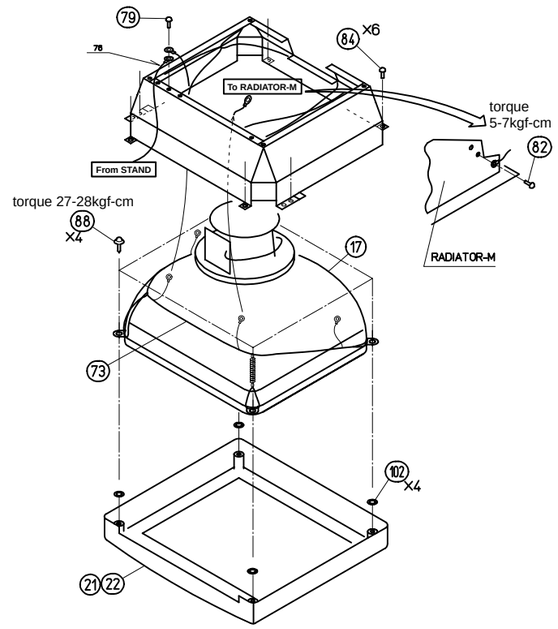
Clamper	Lead Name
96	C・SQ



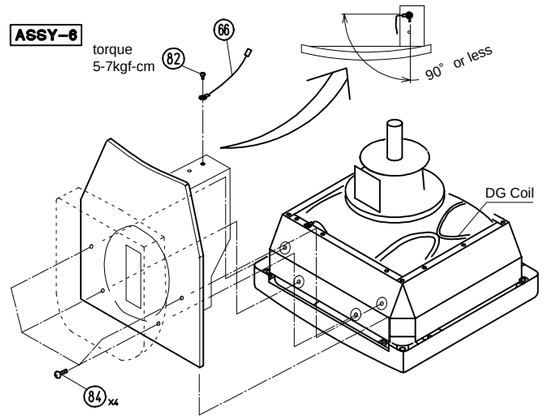
Clamper	Lead Name
a	DC
b	Anode
c	SC・Focus
d	D・G・G1・VF・MR
e	AD・DG
M1	D・a-a Lead・MR
M3	A・J・B
M4	D・G・G1・a-a Lead
CB	CLT・CLB・NS

ASSY-MONITOR

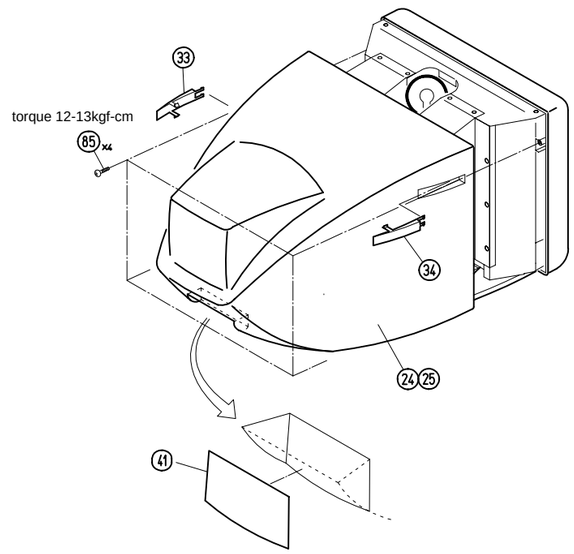
ASSY-5



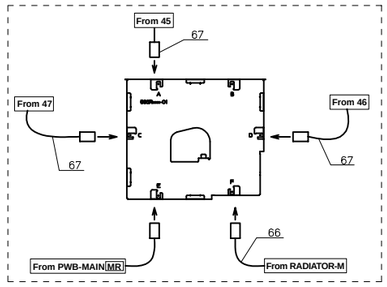
ASSY-6

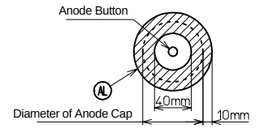


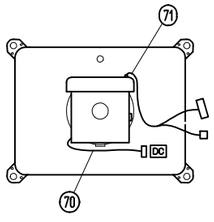
ASSY-8

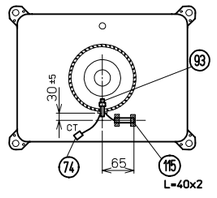


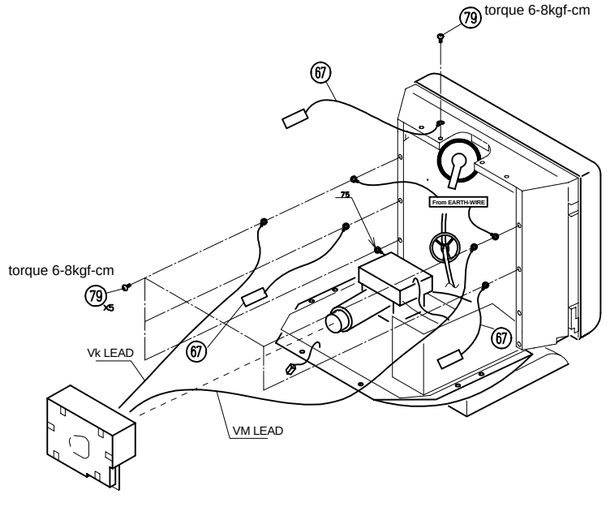
ASSY-7

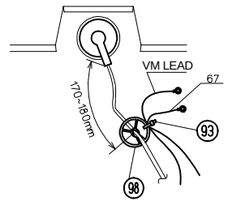


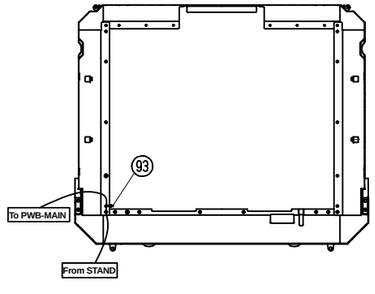






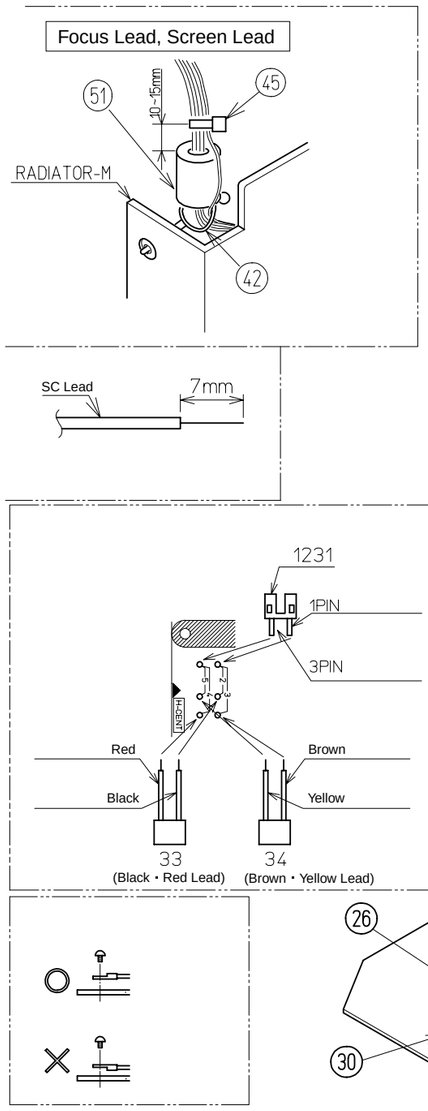


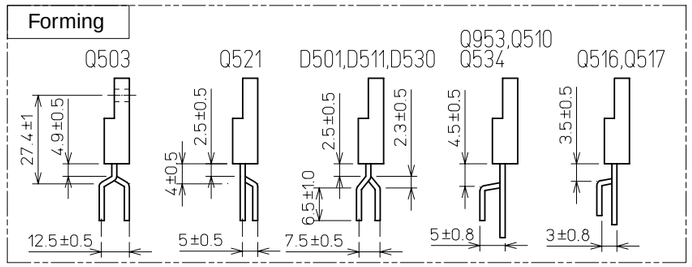


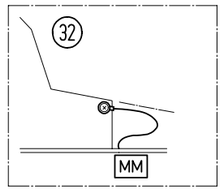


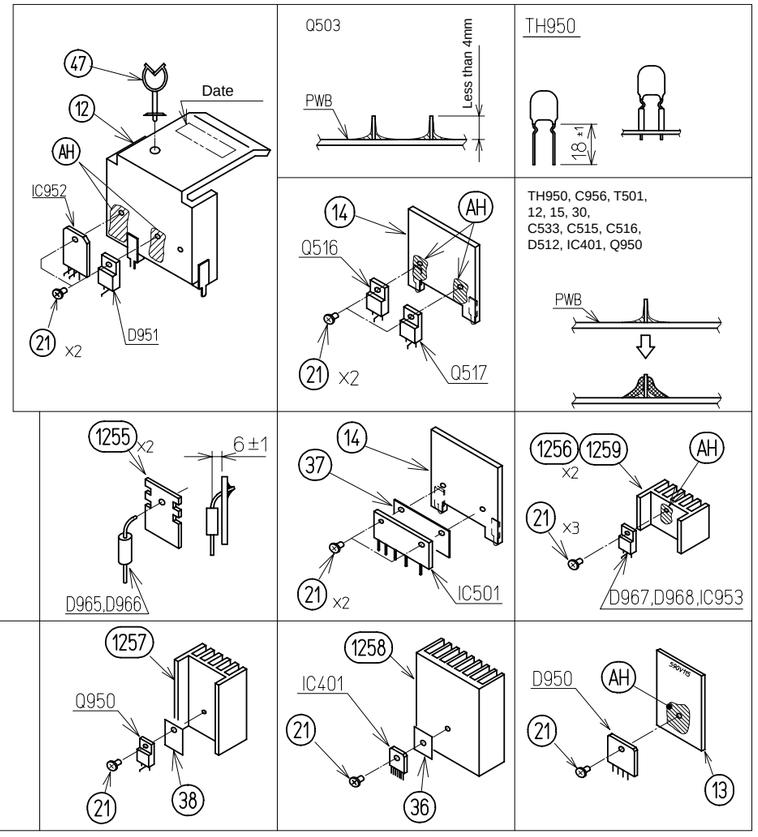
ASSY-MONITOR

Note: Except where indicate otherwise, all screw torcue is 3-5kgf-cm in ASSY-PWB-MAIN.

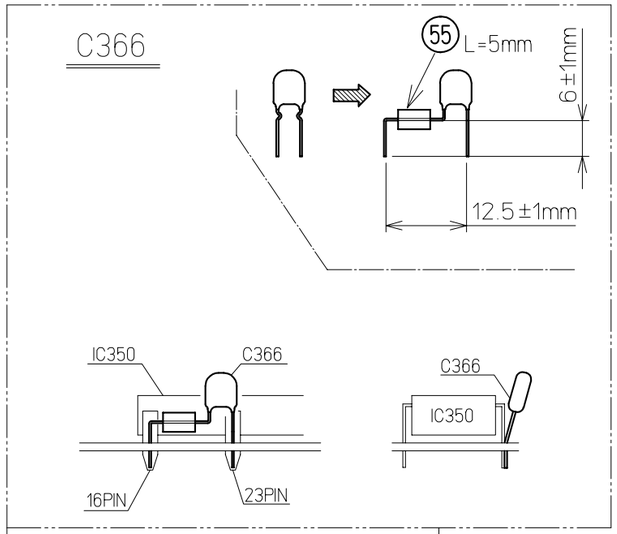


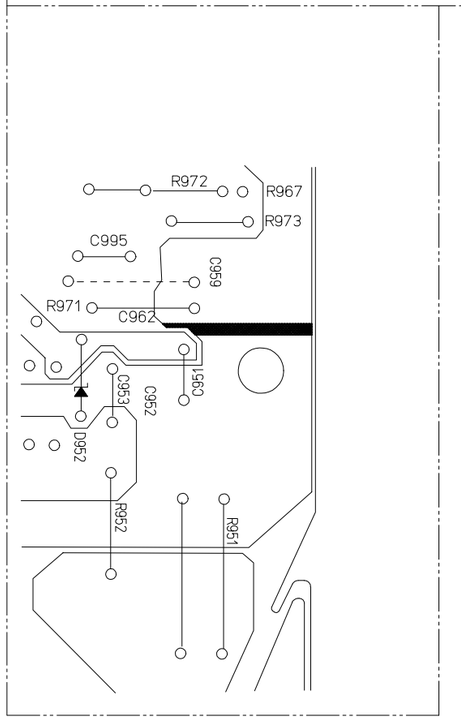


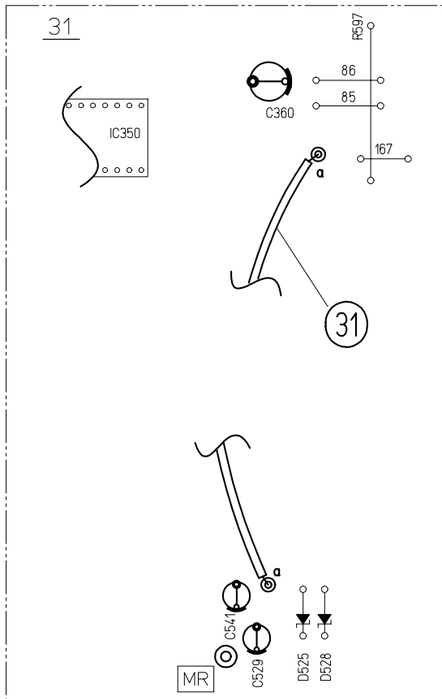


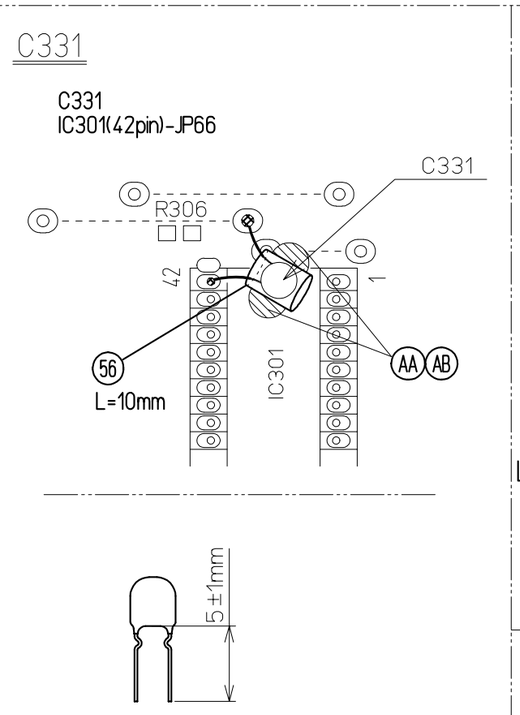


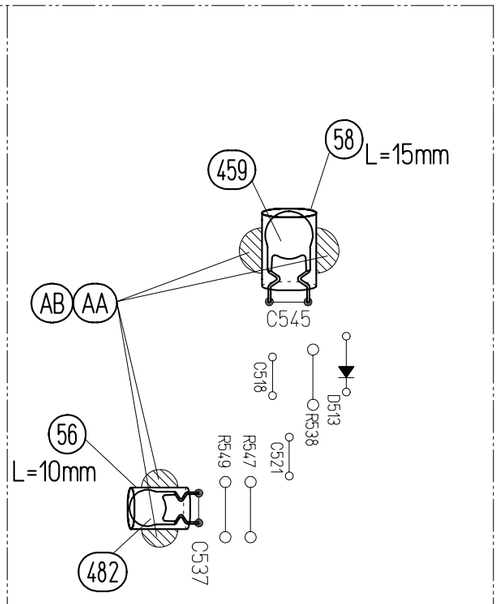
ASSY-PWB-MAIN

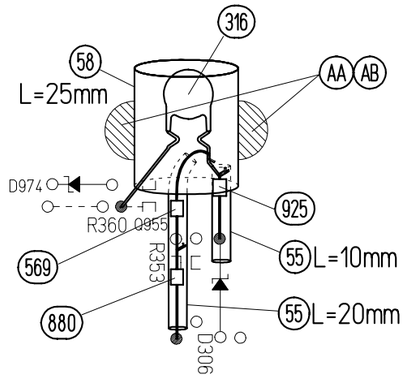


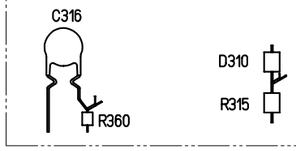






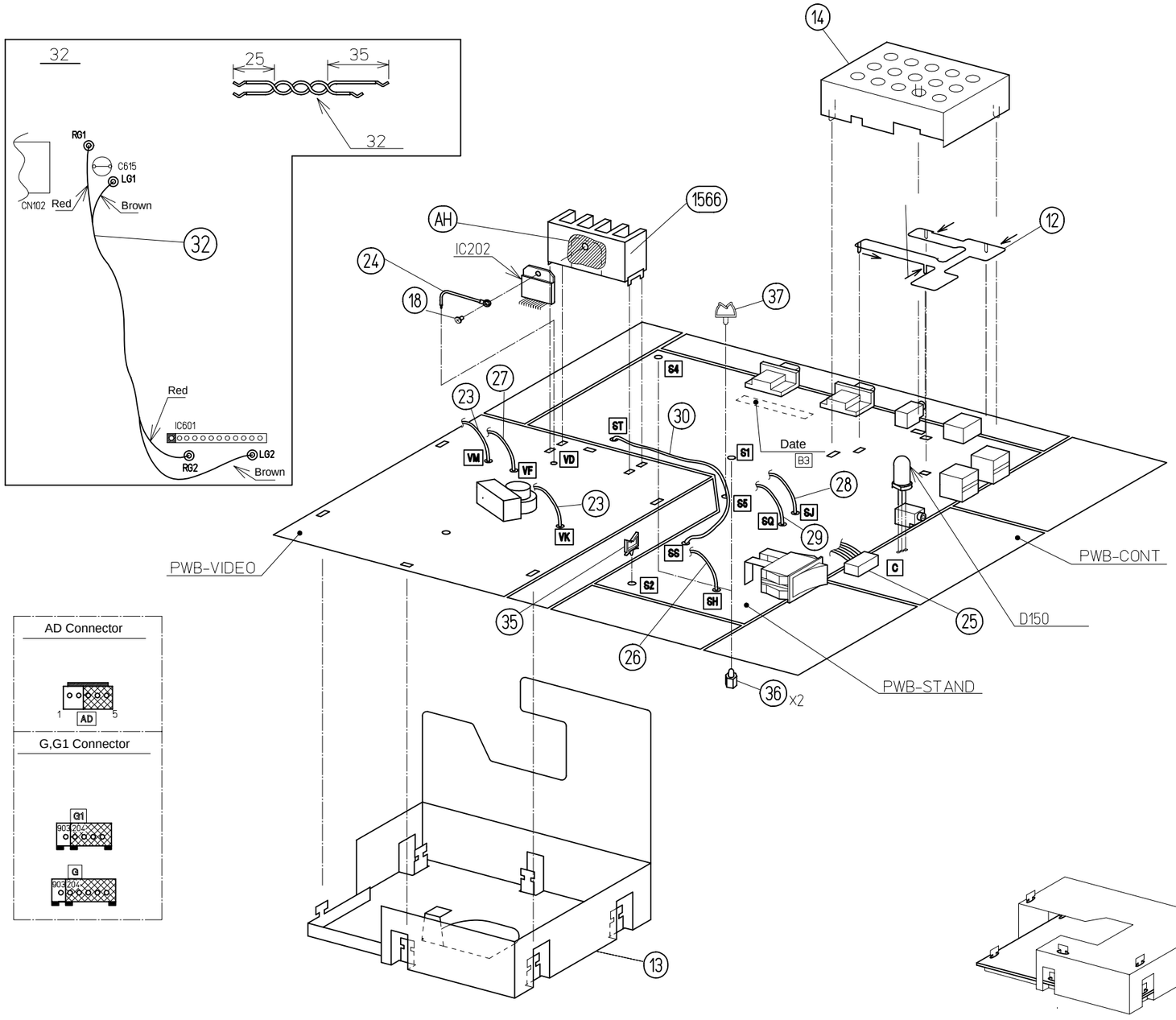


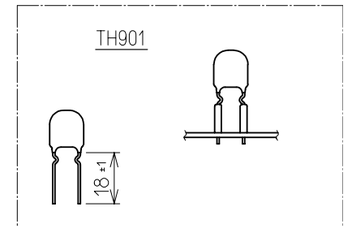


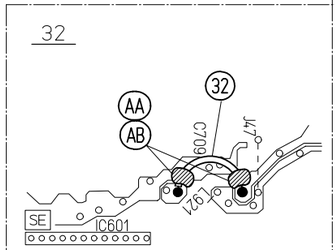


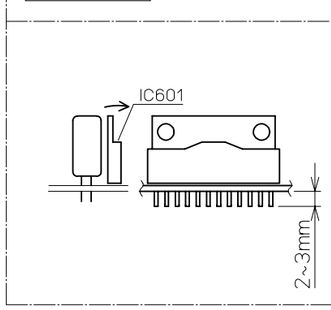
ASSY-PWB-MAIN

Note: Except where indicate otherwise, all screw torcue is 3-5kgf-cm in ASSY-PWB-STAND.



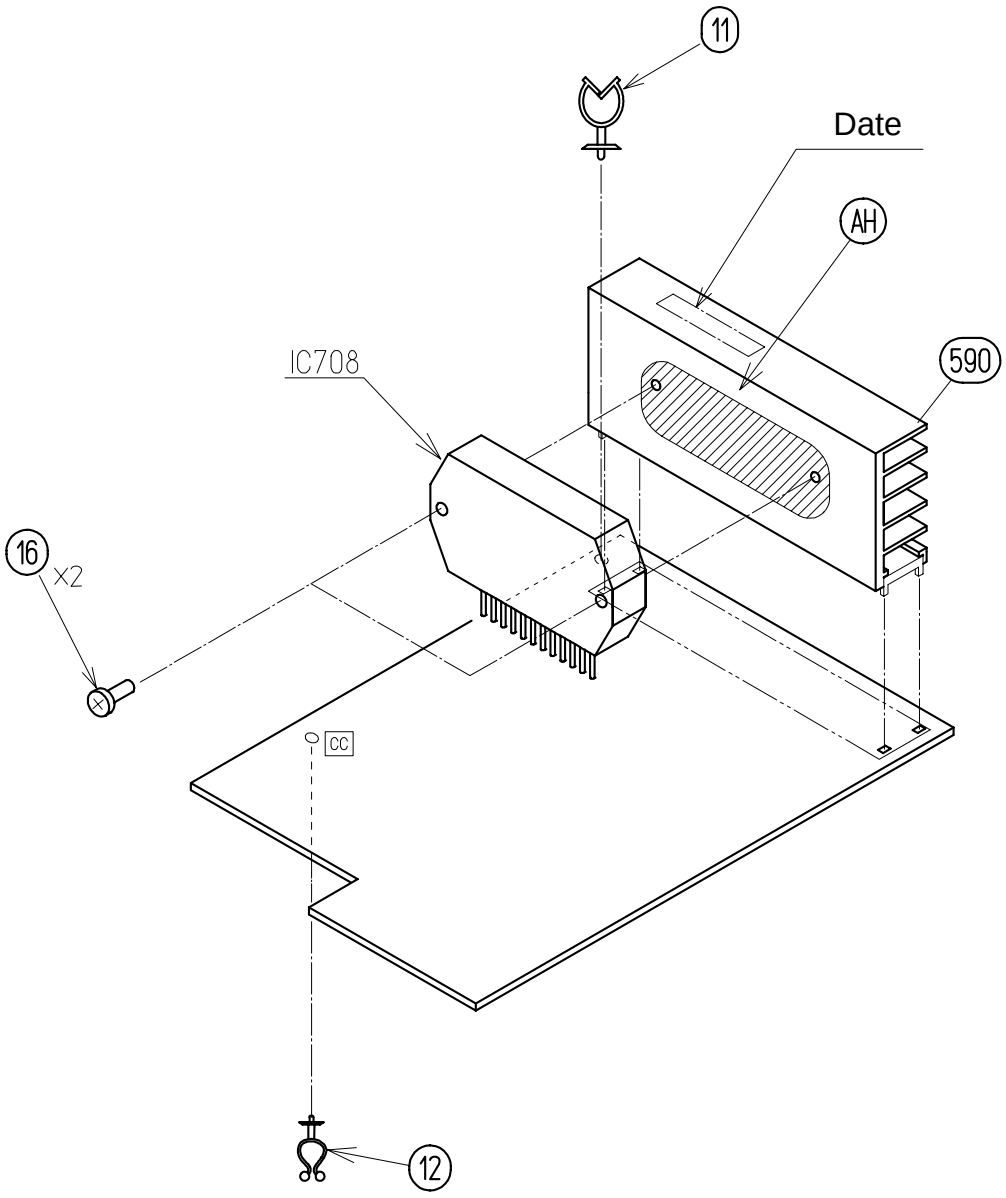


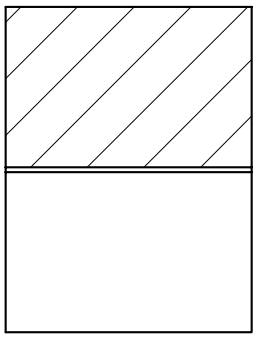




ASSY-PWB-STAND

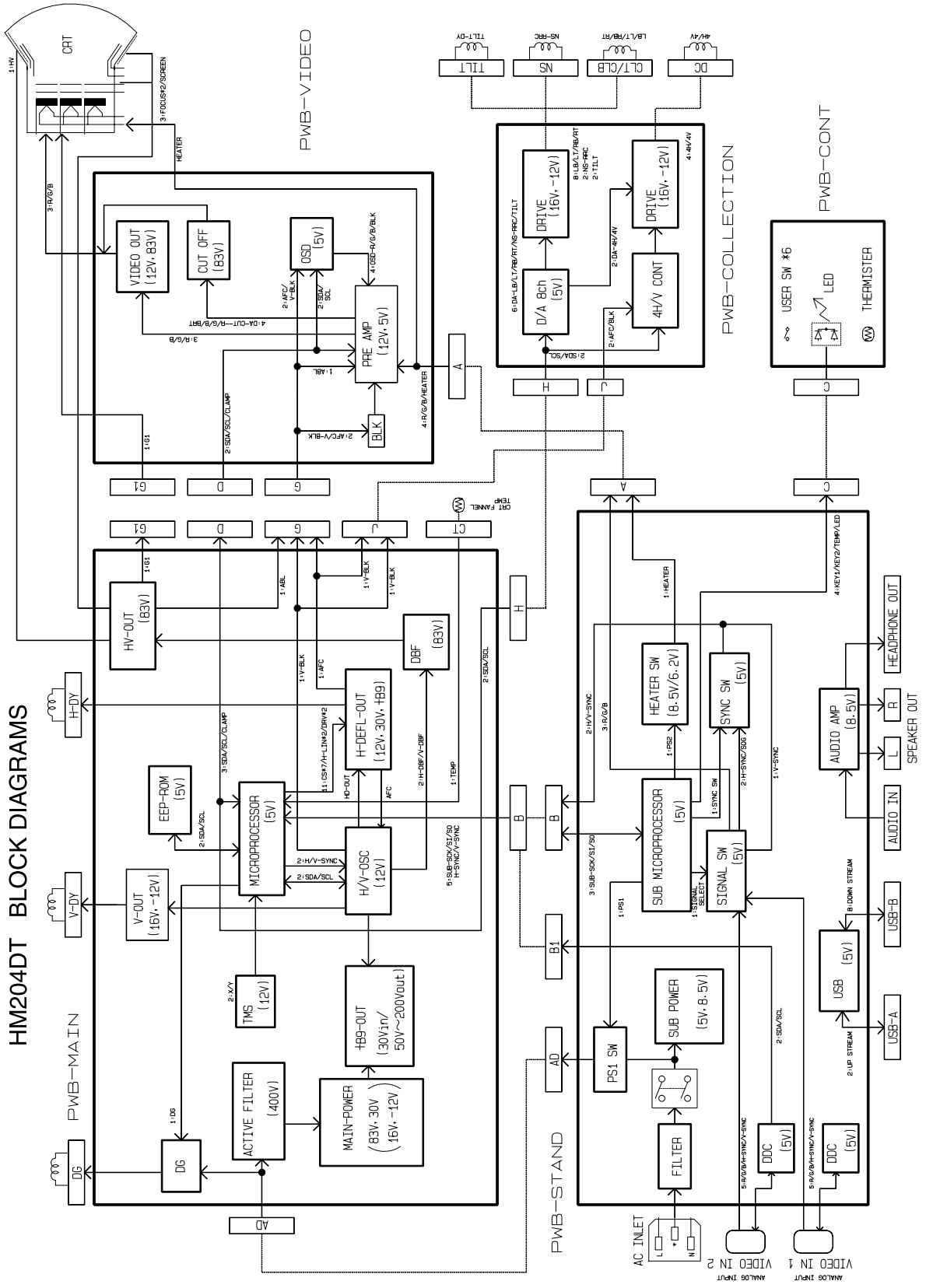
Note: Except where indicate otherwise, all screw torcue is 3-5kgf-cm in ASSY-PWB-CORRECTION.





ASSY-PWB-CORRECTION

7. DIAGRAMS


HM204DT BLOCK DIAGRAMS
PWB-MAIN
PWB-VIDEO
PWB-COLLECTION
PWB-CONT
PWB-STAND
CRT
VIDEO OUT (12V, 83V)
CUT OFF (83V)
OSD (5V)
PRE AMP (12V, 5V)
BLK
D/A 8ch (5V)
DRIVE (16V, -12V)
4H/V CONT
USER SW *6
LED
THERMISTER
HV-OUT (83V)
DBF (83V)
H-DEFL-OUT (12V, 30V, +B9)
EEP-ROM (5V)
MICROPROCESSOR (5V)
H/V-OSC (12V)
V-OUT (16V, -12V)
TMS (12V)
+B9-OUT (30Vin/ 50V~200Vout)
ACTIVE FILTER (400V)
MAIN-POWER (83V, 30V / 16V, -12V)
HEATER SW (8.5V/6.2V)
SYNC SW (5V)
AUDIO AMP (8.5V)
SUB MICROPROCESSOR (5V)
SIGNAL SW (5V)
SUB POWER (5V, 8.5V)
PS1 SW
FILTER
USB (5V)
DDC (5V)
DDC (5V)
AC INLET
VIDEO IN 1
VIDEO IN 2
HEADPHONE OUT
SPEAKER OUT
AUDIO IN
USB-B
USB-A