MITSUBISHI

PART NO. 599910598

SERVICE MANUAL

COLOR MONITOR **Diamond Plus 93SB**

MODEL DPlus 93SB (B)

NEC-MITSUBISHI ELECTRIC VISUAL SYSTEMS CORPORATION

JUNE 2002

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WARNING

The SERVICE PERSONNEL should have the appropriate technical training, knowledge and experience necessary to:

- Be familiar with specialized test equipment, and
- Be careful to follow all safety procedures associated with high voltage CRT circuit designs to minimize danger to themselves and their coworkers.

To avoid electrical shocks, this equipment should be used with an appropriate power code and be connected only to a properly grounded AC outlet.

This equipment utilized a micro-gap power switch. Turn off the set by first pushing the front panel power switch. Next, remove the power cord from the AC outlet.

To prevent fire or shock hazards, do not expose this unit to rain or moisture.


This symbol warns the personnel that un-insulated voltage within the unit may have sufficient magnitude to cause electric shock.


This symbol alerts the personnel that important literature concerning the operation and maintenance of this unit has been included.
Therefore, it should be read carefully in order to avoid any problems.

PRODUCT SAFETY CAUTION

1. When parts replacement is required for servicing, always use the manufacturer's specified replacement.

2. Comply with all caution and safety-related notes on the product display chassis and picture tube.

3. When replacing the component, always be certain that all the components are put back in the place.

4. When servicing display monitor unit, it is required that the provided lead dress is used in the high voltage circuit area.

5. It is also recommended that shatter proof goggles are worn, when removing installing and handling the picture tube. People not equipped with the proper precautionary measures mentioned should keep the picture tube away from body while handling.

6. As for a connector, pick and extract housing with fingers properly since a disconnection and improper contacts may occur, when wires of the connector are led.

7. Use a proper screwdriver. If you use screwdriver that does not fit, you may damage the screws.

8. X-radiation precaution

   This product contains critical electrical and mechanical parts essential for X-ray protection.

   Normal anode voltage is 26.0 kV at zero beam picture tube current under AC 100-120V/220-240V input, and anode voltage must not exceed the voltages shown below under any operation condition.

   To measure anode voltage set brightness for very dim picture, and use a high impedance volt meter between chassis and anode lead and measure high voltage.

   If high voltage exceeds the specifications on the chassis schematic diagram, take the necessary corrective action.

Table MAXIMUM ANODE VOLTAGE

beam current	at 0 mA	at 0.6 mA	at 1.2 mA
A/B Ver.	31.0 kV	30.5 kV	30.5 kV

9. When you degauss the set with an external degaussing coil, you must keep strictly item " * Notes about degaussing method " of ADJUSTMENT Procedures.

CONTENTS

User's Manual

1. B Version

MITSUBISHI

User's Manual

Diamond Pro 750SB
Diamond Plus 93SB

www.nec-mitsubishi.com

Declaration of the Manufacturer

We hereby certify that the colour monitor
Diamond Pro 750^{SB} / Diamond Plus 93^{SB}
is in compliance with
Council Directive 73/23/EEC:
– EN 60950
Council Directive 89/336/EEC:
EN 55022
– EN 61000-3-2
– EN 61000-3-3
– EN 55024
and marked with

CE

NEC-Mitsubishi Electric Visual
Systems Corporation
686-1, Nishioi Oi-Machi
Ashigarakami-gun
Kanagawa 258-8533, Japan

ENERGYSTAR Product

As an ENERGYSTAR Partner, NEC-Mitsubishi Electronics Display of America, Inc. has determined that this product meets the ENERGYSTAR guidelines for energy efficiency. The ENERGYSTAR emblem does not represent EPA endorsement of any product or service.

WARNING

TO PREVENT FIRE OR SHOCK HAZARDS, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE. ALSO, DO NOT USE THIS UNIT'S POLARIZED PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLETS UNLESS THE PRONGS CAN BE FULLY INSERTED.
EFRAIN FROM OPENING THE CABINET AS THERE ARE HIGH VOLTAGE COMPONENTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

CAUTION

RISK OF ELECTRIC SHOCK • DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

This symbol warns user that uninsulated voltage within the unit may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any part inside this unit.

This symbol alerts the user that important literature concerning the operation and maintenance of this unit has been included. Therefore, it should be read carefully in order to avoid any problems.

Canadian Department of Communications Compliance Statement

DOC: This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

C-UL: Bears the C-UL Mark and is in compliance with Canadian Safety Regulations according to C.S.A. C22.2 No. 950.

FCC Information

1. Use the attached specified cables with the Diamond Pro 750^{SB} / Diamond Plus 93^{SB} colour monitor so as not to interfere with radio and television reception.
   (1) Please use the supplied power cord or equivalent to ensure FCC compliance.
   (2) Shielded captive type signal cable.
   Use of other cables and adapters may cause intereference with radio and television reception.
2. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
   - Reorient or relocate the receiving antenna.
   - Increase the separation between the equipment and receiver.
   - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
   - Consult your dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

If necessary, the user should contact the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet, prepared by the Federal Communications Commission, helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

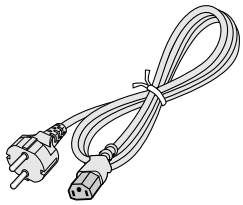
Contents

Your new Diamond Pro 750^{SB} / Diamond Plus 93^{SB} monitor box* should contain the following:

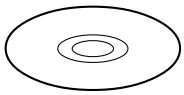
- Diamond Pro 750^{SB} / Diamond Plus 93^{SB} Monitor with tilt/swivel base
- Power Cord
- Captive Signal Cable
- User's Manual
- CD ROM with Setup Software, complete User's Manual and other helpful files.
  To see the User's Manual, Acrobat Reader 4.0 must be installed on your PC.

Captive Signal Cable

User's Manual



Power Cord



CD-ROM

** Remember to save your original box and packing material to transport or ship the monitor.*

Quick Start

To attach the Diamond Pro 750^{SB} / Diamond Plus 93^{SB} monitor to your system, follow these instructions:

1. Turn off the power to your computer.
2. If necessary, install the display card into your system. For more information, refer to the display card manual.
3. For the PC: Connect the 15-pin mini D-SUB of the captive signal cable to the connector of the display card in your system **(Figure A.1).** Tighten all screws.

   For the Mac: Connect the Diamond Pro 750^{SB} / Diamond Plus 93^{SB} Macintosh cable adapter (not included) to the monitor connector on the Macintosh **(Figure B.1).** Attach the 15-pin mini D-SUB end of the captive signal cable to the Diamond Pro 750^{SB} / Diamond Plus 93^{SB} Macintosh cable adapter on the computer **(Figure B.1).** Tighten all screws.
4. Connect one end of the power cord to the Diamond Pro 750^{SB} / Diamond Plus 93^{SB} monitor and the other end to the power outlet **(Figure C.1).**
5. Turn on the monitor **(Figure D.1)** and the computer.

NOTE: If you have any problems, please refer to the **Troubleshooting** section of this User's Manual.

Figure A.1

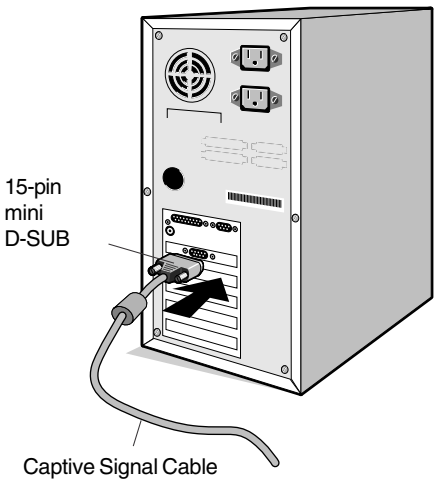


Figure B.1

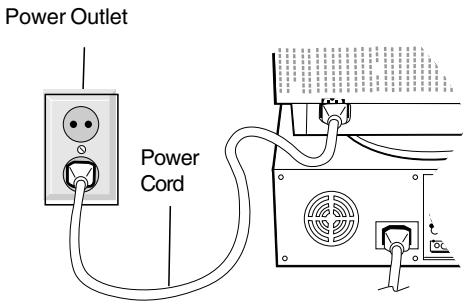


Figure C.1

Figure D.1

Controls

OSM (On-Screen Manager) control buttons on the front of the monitor function as follows:

	Main Menu	Sub-Menu
EXIT	Exits the OSM menu.	Exits to the OSM controls main menu.
CONTROL ◄/►	Moves the highlighted area left/right to select one of the sub-menus.	Moves the highlighted area left/right to select one of the controls.
CONTROL –/+	Has no function.	Moves the bar in the – or + direction to decrease or increase the adjustment.
SELECT/ SBMODE	Without OSD, switches SuperBright Mode ON/OFF With OSD, enters sub menu	Has no function.
RESET	Resets all the controls within the highlighted menu to the factory setting.	Resets the highlighted control to the factory setting.

NOTE: When **RESET** is pressed in the main and sub-menu, a warning window will appear allowing you to cancel the reset function.

NOTE: When the OSM is off, it will act as the SuperBright (SB) function key. User can select between SB MODE OFF, SB MODE1, and SB MODE2. The first time this key is pressed, the current SB Mode is indicated. Within a 3 second window, if this key is selected again, the SB MODE will change to the next SB MODE. For example, the current mode is SB MODE OFF, the key is pressed twice within a 3 second time frame, the SB MODE will change to SB MODE1 and so on. The color temperature at each SB Mode is adjusted by appropriate color control except for the sRGB mode whose color setting cannot be adjusted. When the unit is turned off, it will reset to SB off mode.

Brightness/Contrast Controls

Brightness: Adjusts the overall image and background screen brightness.

Contrast: Adjusts the image brightness in relation to the background.

Degauss: Eliminates the buildup of stray magnetic fields which alter the correct scan of the electron beams and affect the purity of the screen colours, focus and convergence. When activated, your screen image will jump and waver a bit as the screen is demagnetized.

Caution: Please allow a minimum of 20 minutes to elapse between uses of the Degauss Control.

Size and Position Controls

Left/Right: Moves the image horizontally (left or right).

Down/Up: Moves the image vertically (up or down).

Narrow/Wide: Decreases or increases the horizontal size of the image.

Short/Tall: Decreases or increases the vertical size of the image.

Controls *– continued*

Color Control System

Colour presets selects the desired colour setting. The bar is replaced by the colour setting choice. Each colour setting is adjusted at the factory to the stated Kelvin. If a setting is adjusted, the name of the setting will change from Kelvin to Custom except sRGB mode.

Red, Green, Blue: Color Control System decreases or increases the monitor's red, green or blue colour guns depending upon which is selected. The change in colour will appear on screen and the direction (decrease or increase) will be shown by the bars.

sRGB mode: sRGB mode provides the suitable colour managed picture image. You can not change Red, Green and Blue colours, brightness and contrast individually.

Colour Temperature Adjustment: Adjusts the colour temperature of the screen image.

Geometry Controls

Geometry Controls Menu

The **Geometry** controls allow you to adjust the curvature or angle of the sides of your display.

Sides In/Out (pincushion): Decreases or increases the curvature of the sides either inward or outward.

Sides Left/Right (pincushion balance): Decreases or increases the curvature of the sides either to the left or right.

Sides Tilt (parallelogram): Decreases or increases the tilt of the sides either to the left or right.

Sides Align (trapezoidal): Decreases or increases the bottom of the screen to be the same as the top.

Rotate (raster rotation): Rotates the entire display clockwise or counterclockwise.

Corner Correction: Allows you to adjust the geometry of the corners of your display – **Top or Bottom.**

Tools 1

Moiré Canceler: Moiré is a wavy pattern which can sometimes appear on the screen. The pattern is repetitive and superimposed as rippled images. When running certain applications, the wavy pattern is more evident than in others. To reduce moiré, adjust the level by using –/+ CONTROL buttons.

Linearity: This selection allows you to adjust the spacing of the area on the screen. The purpose of this control is to ensure that a one-inch circle is a true one-inch circle wherever it is on the screen. The best way to determine the vertical linearity is as follows:

- Draw equally spaced horizontal lines using a drawing application that has a ruler.
- Use the **Vertical Balance** control to adjust the lines near the top and bottom of your screen.
- Use the **LINEARITY (VER.)** control to adjust the spacing between the lines near the center and top of your screen.

Convergence (Diamond Plus 93^{SB} only): Aligns all three colors (R,G,B) to form a single color (white). The purpose of this control is to ensure that a white line drawn on the screen is as crisp and clear as possible.

- Use the **CONVERGENCE (HOR.)** control to adjust the alignment of the lines in the up/down direction.
- Use the **CONVERGENCE (VER.)** control to adjust the alignment of the lines in the left/right direction.

Controls *– continued*

Tools 2

Language: OSM controls menus are available in 6 languages.

OSM Position: You can choose where you would like the OSM controls menu to appear on your screen. Selecting OSM Position allows you to manually adjust the OSM controls menu position from among Center, Top left, Top right, Bottom left and Bottom right.

OSM Turn Off: The OSM controls menu will stay on as long as it is in use. In the OSM Turn Off sub-menu, you can select how long the monitor waits after the last touch of a button for the OSM controls menu to disappear. The preset choices are 5 thru 120 seconds.

OSM Lock Out: This control completely locks out access to all OSM controls functions except Brightness and Contrast. When attempting to activate OSM controls while in the lock out mode, a screen will appear indicating that OSM controls are locked out. To activate the OSM Lock Out function, press SELECT and hold + down simultaneously. To deactivate the OSM Lock Out, press SELECT and hold + down simultaneously.

IPM System Off Mode:	Enable:	The IPM System works normally and all stages of energy savings are utilized.
	Disable:	The Off Mode of the IPM System is not used.

NOTE: For standard systems and graphics boards, keep the factory setting at ENABLE.

EdgeLock Control: Operating your monitor at a nonstandard timing may cause images to appear darker than normal or have color distortion. Use of the EdgeLock control will adjust images to their normal state.

Hot Key: This selection allows you to use ◄/► as brightness control and –/+ as contrast control.

Factory Preset: Selecting Factory Preset allows you a reset most OSM control settings back to the factory settings. A warning statement will appear to confirm that you do want to reset ALL settings. Individual settings can be reset by highlighting the control to be reset and pressing the **RESET** button.

Information

Display Mode: Indicates the current mode and frequency setting of the monitor.

Monitor Info: Indicates the model and serial numbers of your monitor.

Refresh Notifier: A message will advise you if the refresh rate of the signal being applied to the monitor by the computer is too low. For further information, please refer to your display card or system manual.

Recommended Use

Safety Precautions and Maintenance

FOR OPTIMUM PERFORMANCE, PLEASE NOTE
THE FOLLOWING WHEN SETTING UP AND USING THE
DIAMOND PRO 750[SB] / DIAMOND PLUS 93[SB] COLOUR MONITOR:

- DO NOT OPEN THE MONITOR. There are no user serviceable parts inside and opening or removing covers may expose you to dangerous shock hazards or other risks. Refer all servicing to qualified service personnel.
- Do not spill any liquids into the cabinet or use your monitor near water.
- Do not insert objects of any kind into the cabinet slots, as they may touch dangerous voltage points, which can be harmful or fatal or may cause electric shock, fire or equipment failure.
- Do not place any heavy objects on the power cord. Damage to the cord may cause shock or fire.
- Do not place this product on a sloping or unstable cart, stand or table, as the monitor may fall, causing serious damage to the monitor.
- Keep the monitor away from high capacity transformers, electric motors and other devices such as external speakers or fans, which may create strong magnetic fields.
- If possible, position the monitor so that it is facing the east to minimize the effects of the earth's magnetic field.
- Changing the direction of the monitor while it is powered on may cause image discolouration. To correct this, turn the monitor off for 20 minutes before powering it back on.
- When operating the Diamond Pro 750[SB] / Diamond Plus 93[SB] with its AC 220 - 240 V worldwide power supply, use a power supply cord that matches the power supply voltage of the AC power outlet being used. The power supply cord you use must have been approved by and comply with the safety standards of your country. (Type H05VV-F should be used except in UK)
- In UK, use a BS-approved power cord with molded plug having a black (5A) fuse installed for use with this monitor. If a power cord is not supplied with this monitor, please contact your supplier.

Cleaning Your Monitor

A special coating is provided on the glass (CRT) surface of this monitor to reduce a reflection and static electricity on the glass surface. Due to the delicate coating on the glass surface, use a lint-free, non-abrasive cloth (cotton or equivalent) and a non-alcohol, neutral, non-abrasive cleaning solution to minimize dust. If the screen requires more than a light cleaning, apply a soft neutral detergent and water directly to a soft cloth and use it upon wringing water, to clean the glass surface. Clean your monitor regularly.

CAUTION: The following agents will cause damage to the CRT when cleaning the glass surface:
Benzene, thinner, acid/alkaline detergent, alcohol detergent, detergent with abrasive powder, detergent with anti-static agent, detergent for cleaning.

Immediately unplug your monitor from the wall outlet and refer servicing to qualified service personnel under the following conditions:

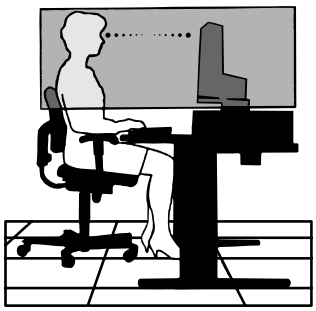
- When the power supply cord or plug is damaged.
- If liquid has been spilled, or objects have fallen into the monitor.
- If the monitor has been exposed to rain or water.
- If the monitor has been dropped or the cabinet damaged.
- If the monitor does not operate normally by following operating instructions.

CAUTION

- Allow adequate ventilation around the monitor so that heat can properly dissipate. Do not block ventilated openings or place the monitor near a radiator or other heat sources. Do not put anything on top of monitor.
- The power cable connector is the primary means of detaching the system from the power supply. The monitor should be installed close to a power outlet which is easily accessible.
- Handle with care when transporting. Save packaging for transporting.

Recommended Use *– continued*

CORRECT PLACEMENT AND ADJUSTMENT OF THE MONITOR CAN REDUCE EYE, SHOULDER AND NECK FATIGUE. CHECK THE FOLLOWING WHEN YOU POSITION THE MONITOR:



- Adjust the monitor height so that the top of the screen is at or slightly below eye level. Your eyes should look slightly downward when viewing the middle of the screen.
- Position your monitor no closer than 40 cm and no further away than 60 cm from your eyes. The optimal distance is 50 cm.
- Rest your eyes periodically by focusing on an object at least 6 meter away. Blink often.
- Position the monitor at a 90° angle to windows and other light sources to minimize glare and reflections. Adjust the monitor tilt so that ceiling lights do not reflect on your screen.
- If reflected light makes it hard for you to see your screen, use an anti-glare filter.
- Clean your monitor regularly. Use a lint-free, non-abrasive cloth and a non-alcohol, neutral, non-abrasive cleaning solution or glass cleaner to minimize dust.
- Adjust the monitor's brightness and contrast controls to enhance readability.
- Use a document holder placed close to the screen.
- Position whatever you are looking at most of the time (the screen or reference material) directly in front of you to minimize turning your head while you are typing.
- Get regular eye checkups.

Ergonomics

To realize the maximum ergonomics benefits, we recommend the following:

- Adjust the Brightness until the background raster disappears
- Do not position the Contrast control to its maximum setting
- Use the preset Size and Position controls with standard signals
- Use the preset Colour Setting and Sides Left/Right controls
- Use non-interlaced signals with a vertical refresh rate between 75 - 120 Hz
- Do not use primary colour blue on a dark background, as it is difficult to see and may produce eye fatigue due to insufficient contrast

Specifications

Monitor Specifications		Diamond Pro 750SB Monitor	Notes
Picture Tube	Diagonal: Viewable Image Size:	43 cm/17 inch 406 mm/16 inch	90° deflection, 0.25 mm grille pitch, medium short persistence phosphor, aperture grille CRT, multi-layered, anti-static screen coating, dark-tint screen and OptiClear screen.
Input Signal	Video: Sync:	ANALOG 0.7 Vp-p/75 Ohms Separate sync. TTL Level Horizontal sync. Positive/Negative Vertical sync. Positive/Negative Composite sync. (Positive/Negative) (TTL Level)	
Display Colours	Analog input:	Unlimited number of Colours	Depends on display card used.
Synchronization Range	Horizontal: Vertical:	30 kHz to 96 kHz 50 Hz to 160 Hz	Automatically Automatically
Resolutions Supported Resolution based on horizontal and vertical frequencies only		640 x 480 @ 60 to 160 Hz 800 x 600 @ 50 to 146 Hz 832 x 624 @ 50 to 141 Hz 1024 x 768 @ 50 to 116 Hz 1152 x 870 @ 50 to 103 Hz 1280 x 1024 @ 50 to 89 Hz 1600 x 1200 @ 50 to 76 Hz	Some systems may not support all modes listed. NEC-Mitsubishi Electronics Display cites recommended resolution at 85 Hz for optimal display performance
Active Display Area (Factory Setting)	Horizontal: Vertical:	315 mm/12.4 inches 236 mm/9.3 inches	Dependent upon signal timing used, and does not include border area.
Active Display Area (Full Scan)		325 mm/12.8 inches 244 mm/9.6 inches	Dependent upon signal timing used, and does not include border area.
Power Supply		AC 100 - 240 V, 50 - 60 Hz	
Current Rating		1.9 A @ 100 - 240 V	
Dimensions		397 mm (W) x 392 mm (H) x 415.5 mm (D) 15.6 inches (W) x 15.4 inches (H) x 16.4 inches (D)	
Weight		17.2 kg 37.9 lbs	
Environmental Considerations			
	Operating Temperature: Humidity: Altitude: Storage Temperature: Humidity: Altitude:	+5 °C to +35 °C 10 % to 90 % 0 to 3,000 m -20 °C to +60 °C 10 % to 90 % 0 to 15,000 m	

NOTE: Technical specifications are subject to change without notice.

Specifications *– continued*

Monitor Specifications		Diamond Plus 93SB Monitor	Notes
Picture Tube	Diagonal:	50 cm/19 inch	90° deflection, 0.25/0.27 mm grille pitch, medium short persistence phosphor, aperture grille CRT, multi-layered, anti-static screen coating, dark-tint screen and OptiClear screen.
	Viewable Image Size:	457 mm/18 inch	
Input Signal	Video:	ANALOG 0.7 Vp-p/75 Ohms	
	Sync:	Separate sync. TTL Level Horizontal sync. Positive/Negative Vertical sync. Positive/Negative Composite sync. (Positive/Negative) (TTL Level)	
Display Colours	Analog input:	Unlimited number of Colours	Depends on display card used.
Synchronization	Horizontal:	30 kHz to 96 kHz	Automatically
Range	Vertical:	50 Hz to 160 Hz	Automatically
Resolutions Supported Resolution based on horizontal and vertical frequencies only		640 x 480 @ 60 to 160 Hz 800 x 600 @ 50 to 146 Hz 832 x 624 @ 50 to 141 Hz 1024 x 768 @ 50 to 116 Hz 1152 x 870 @ 50 to 103 Hz 1280 x 1024 @ 50 to 89 Hz 1600 x 1200 @ 50 to 76 Hz 1792 x 1344 @ 50 to 68 Hz	Some systems may not support all modes listed. NEC-Mitsubishi Electronics Display cites recommended resolution at 85 Hz for optimal display performance
Active Display Area (Factory Setting)	Horizontal: Vertical:	356 mm/14.0 inches 266 mm/10.5 inches	Dependent upon signal timing used, and does not include border area.
Active Display Area (Full Scan)		366 mm/14.4 inches 266 mm/10.5 inches	Dependent upon signal timing used, and does not include border area.
Power Supply		AC 100 - 240 V, 50 - 60 Hz	
Current Rating		2.2 A @ 100 - 240 V	
Dimensions		442 mm (W) x 443 mm (H) x 447.5 mm (D) 17.4 inches (W) x 17.4 inches (H) x 17.6 inches (D)	
Weight		22.7 kg 50.0 lbs	
Environmental Considerations			
	Operating Temperature:	+5 °C to +35 °C	
	Humidity:	10 % to 90 %	
	Altitude:	0 to 3,000 m	
	Storage Temperature:	-20 °C to +60 °C	
	Humidity:	10 % to 90 %	
	Altitude:	0 to 15,000 m	

NOTE: Technical specifications are subject to change without notice.

Features

SuperBright Diamondtron CRT: This patented flat aperture grille CRT delivers an exceptional viewing experience with unprecedented brightness and contrast and a virtually flat image that reduces distortion and glare so that what you see on-screen is what you get on your printed output. The state-of-the-art Mitsubishi PX-DBF electron gun and tight 0.25 mm grille pitch delivers precise focus for crisp, clear text and images.

SuperBright Mode : With the simple touch of a button, the brightness level of the Diamondtron CRT doubles. This function enhances the crispness of images for clarity-conscious applications such as graphics, animation and video.

Super Bright Mode OFF: for text based images (normal use)
Super Bright Mode-1 ON: for images
Super bright Mode-2 ON: for moving image such as DVD movies

OptiClear Screen Surface: Further reduces reflection and glare and increases contrast without sacrificing focus level, clarity or brightness.

Dual Dynamic Beam Focus: Provides precise, continuous focus adjustments of the electron beams and optimum image quality, even to the far edges of the screen.

Color Control System with sRGB: Allows you to change between five colour settings on your display to match your personal preference. The sRGB-enabled colour matching setting found within Color Control helps achieve a consistent colour environment with other sRGB-enabled hardware and software applications.

On Screen Manager (OSM) Controls: Allows you to quickly and easily adjust all elements of your screen image via simple to use on-screen menus.

ErgoDesign Features: Enhances human ergonomics to improve the working environment, protect the health of the user and save money. Examples include OSM controls for quick and easy image adjustments, tilt/swivel base for preferred angle of vision, space-conscious cabinet design and compliance with MPRII guidelines for lower emissions.

Plug and Play: The Microsoft solution with the Windows 95/98/Me/2000/XP operating system facilitates setup and installation by allowing the monitor to send its capabilities (such as screen size and resolutions supported) directly to your computer, automatically optimizing display performance.

Intelligent Power Manager (IPM) System: Provides innovative power-saving methods that allow the monitor to shift to a lower power consumption level when on but not in use, saving two-thirds of your monitor energy costs, reducing emissions and lowering the air conditioning costs of the workplace.

Reduced Magnetic Field Technology: Reduces magnetic and alternating electric field emissions and static electricity, addressing ergonomic concerns regarding potential risks from extended computer monitor use.

Multiple Frequency Technology: Automatically adjusts monitor to the display card's scanning frequency, thus displaying the resolution required.

FullScan Capability: Allows you to use the entire screen area in most resolutions, significantly expanding image size.

Troubleshooting

No picture

- Display card should be completely seated in its slot.
- Power Button and computer power switch should be in the ON position.
- Signal cable should be completely connected to display card/computer.
- Check connector for bent or pushed-in pins.

Image is scrolling or unstable

- Signal cable should be completely attached to the computer.
- Check pin assignments and signal timings of the monitor and your display card with respect to recommended timings and pin assignments.
- If the Macintosh cable adapter is used, check for proper connection or make sure the display card is Macintosh compatible and that the card is properly seated in the computer.

LED on monitor is not lit *(no green, orange colour can be seen)*

- Power Switch should be in the ON position and power cord should be connected.

Picture is fuzzy or colour looks blotchy

- Adjust Brightness and Contrast Controls or adjust the Moiré Canceler control.
- Access the Degauss Control through OSM controls. Activate the Degauss Control.
  CAUTION: A minimum interval of 20 minutes should elapse before the Deguass Control is used a second time when not switching between modes.

Picture bounces or a wavy pattern is present in the picture

- Move electrical devices that may be causing electrical interference away from the monitor.
- See inside cover of User's Manual for FCC information.

Edges of the display image are not square

- Use the OSM Geometry Controls to straighten the edges.
- If possible, position the front of the monitor facing east.

Display image is not centered, too small, or too large

- Use the OSM Size and Position Controls to adjust the image.

Thin lines appear on your screen

- Thin lines are normal for an aperture grille CRT and are not a malfunction.
  These are shadows from the damper wires used to stabilize the aperture grille and are most noticeable when the screen's background is light (usually white).

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.
- 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 in a few minutes. Be sure to readjust the brightness and contrast controls back to the normal viewing level after this procedure.

TCO'99

Diamond Pro 750SB / Diamond Plus 93SB

Congratulations! You have just purchased a TCO'99 approved and labeled product! Your choice has provided you with a product developed for professional use. Your purchase has also contributed to reducing the burden on the environment and also to the further development of environmentally adapted electronics products.

Why do we have environmentally labelled computers?

In many countries, environmental labelling has become an established method for encouraging the adaptation of goods and services to the environment. The main problem, as far as computers and other electronics equipment are concerned, is that environmentally harmful substances are used both in the products and during the manufacturing. Since it has not been possible for the majority of electronics equipment to be recycled in a satisfactory way, most of these potentially damaging substances sooner or later enter Nature.

There are also other characteristics of a computer, such as energy consumption levels, that are important from the viewpoints of both the work (Internal) and natural (external) environments. Since all methods of conventional electricity generation have a negative effect on the environment (acidic and climate-influencing emissions, radioactive waste, etc.), it is vital to conserve energy. Electronics equipment in offices consume an enormous amount of energy since they are often left running continuously.

What does labelling involve?

This product meets the requirements for the TCO'99 scheme which provides for international and environmental labelling of personal computers. The labelling scheme was developed as a joint effort by the TCO (The Swedish Confederation of Professional Employees), Svenska Naturskyddsforeningen (The Swedish Society for Nature Conservation) and Statens Energimyndighet (The Swedish National Energy Administration).

The requirements cover a wide range of issues: environment, ergonomics, usability, emission of electrical and magnetic fields, energy consumption and electrical and fire safety.

The environmental demands concern restrictions on the presence and use of heavy metals, brominated and chlorinated flame retardants, CFCs (freons) and chlorinated solvents, among other things. The product must be prepared for recycling and the manufacturer is obliged to have an environmental plan which must be adhered to in each country where the company implements its operational policy. The energy requirements include a demand that the computer and/or display, after a certain period of inactivity, shall reduce its power consumption to a lower level in one or more stages. The length of time to reactivate the computer shall be reasonable for the user.

Labelled products must meet strict environmental demands, for example, in respect of the reduction of electric and magnetic fields, physical and visual ergonomics and good usability.

Environmental Requirements

Flame retardants

Flame retardants are present in printed circuit boards, cables, wires, casings and housings. In turn, they delay the spread of fire. Up to thirty percent of the plastic in a computer casing can consist of flame retardant substances. Most flame retardants contain bromine or chloride and these are related to another group of environmental toxins, PCBs, which are suspected to give rise to severe health effects, including reproductive damage in fisheating birds and mammals, due to the bioaccumulative* processes. Flame retardants have been found in human blood and researchers fear that disturbances in foetus development may occur.

TCO'99 *– continued*

TCO'99 demand requires that plastic components weighing more than 25 grams must not contain flame retardants with organically bound chlorine and bromine. Flame retardants are allowed in the printed circuit boards since no substitutes are available.

Lead**

Lead can be found in picture tubes, display screens, solders and capacitors. Lead damages the nervous system and in higher doses, causes lead poisoning.

TCO'99 requirement permits the inclusion of lead since no replacement has yet been developed.

Cadmium**

Cadmium is present in rechargeable batteries and in the colourgenerating layers of certain computer displays. Cadmium damages the nervous system and is toxic in high doses.

TCO'99 requirement states that batteries, the colourgenerating layers of display screens and the electrical or electronics components must not contain any cadmium.

Mercury**

Mercury is sometimes found in batteries, relays and switches, Mercury damages the nervous system and is toxic in high doses.

TCO'99 requirement states that batteries may not contain any Mercury. It also demands that no mercury is present in any of the electrical or electronics components associated with the display unit.

CFCs (freons)

CFCs (freons) are sometimes used for washing printed circuit boards. CFCs break down ozone and thereby damage the ozone layer in the stratosphere, causing increased reception on Earth of ultraviolet light with consequent increased risks of skin cancer (malignant melanoma).

The relevant TCO'99 requirement; Neither CFCs nor HCFCs may be used during the manufacturing and assembly of the product or its packaging.

* Bio-accumulative is defined as substances which accumulate within living organisms.
** Lead, Cadmium and Mercury are heavy metals which are Bio-accumulative.

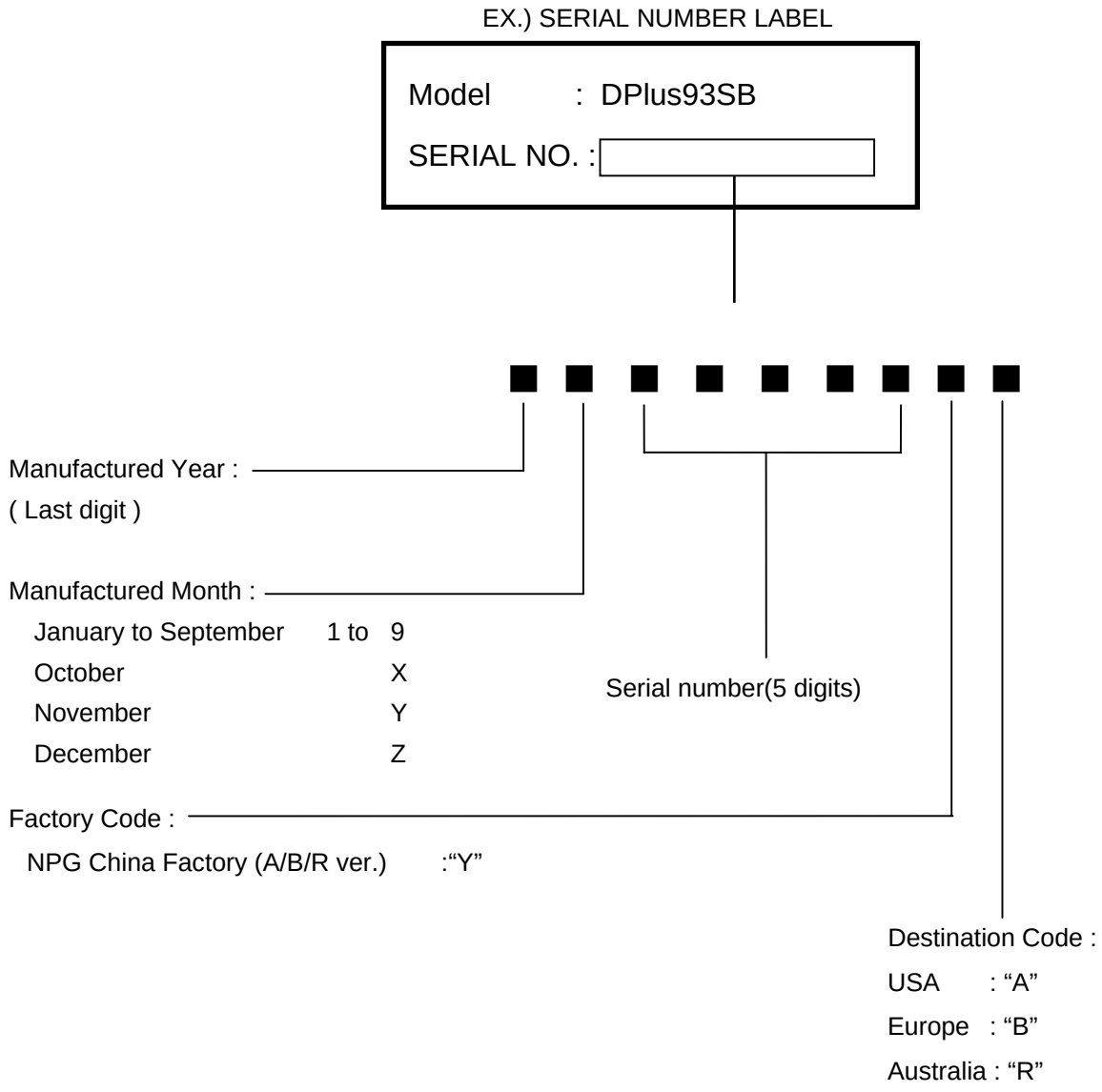
To obtain complete information on the environmental criteria document, order from:

TCO Development Unit
SE-114 94 Stockholm
SWEDEN
FAX Number: +46 8 782 92 07
E-mail (Internet): development@tco.se

You may also obtain current information on TCO'99 approved and labelled products by visiting their website at:
http://www.tco-info.com/

Serial Number Information

Refer to the serial number information shown below.

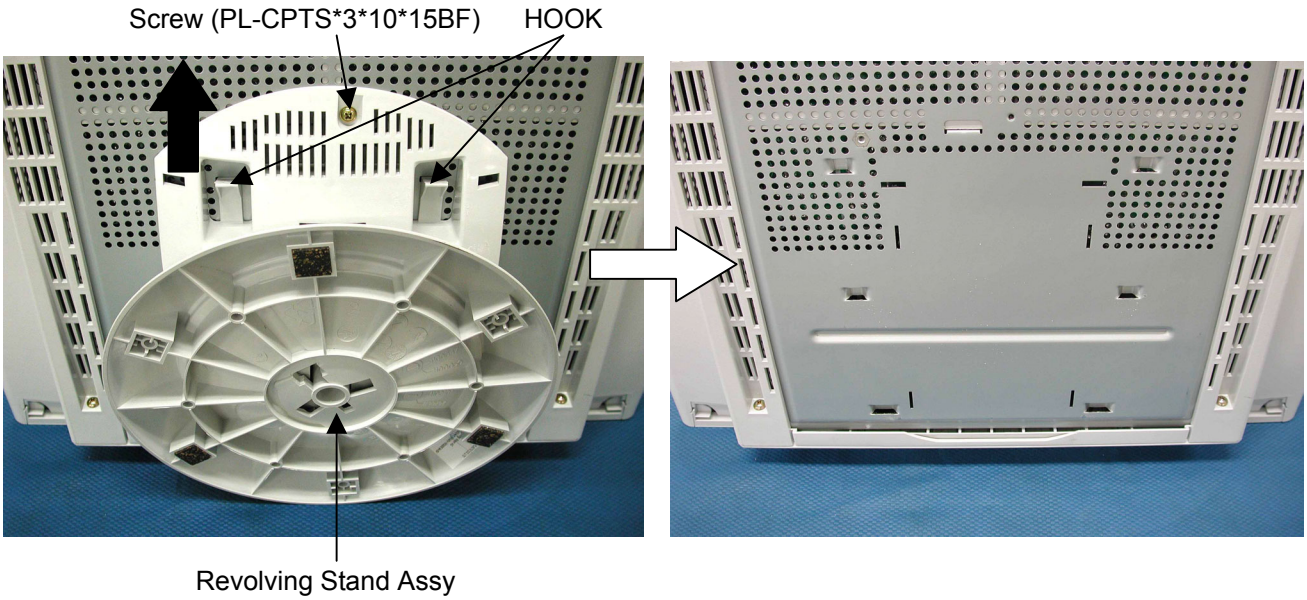


DISASSEMBLY

- Before you disassemble the set, turn off power and pull out the power plug.
- Use the appropriate screwdriver that fits the screw. If you use screwdriver that does not fit, you may break the screws.
- Assembly is the opposite process of Disassembly.
- Carefully discharge the CRT anode by shorting it to ground before removing anode cap.

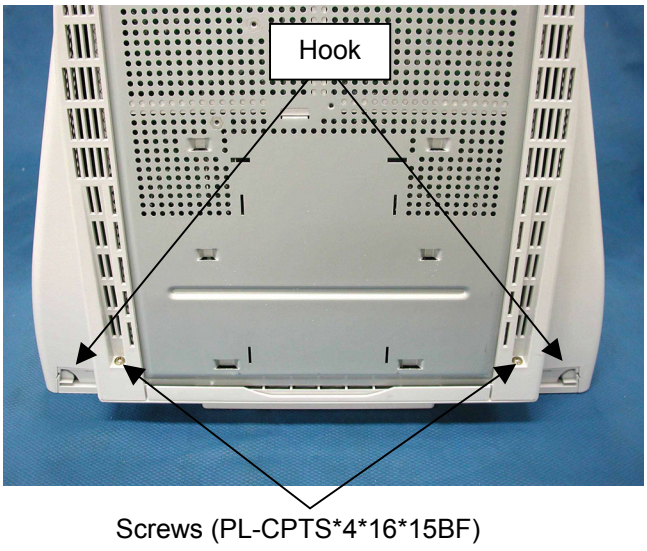
Revolving Stand ASSY

1. Turn the monitor CRT face down on a clean static free surface to prevent scratching CRT face.
2. Remove the screw (PL-CPTS*3*10*15BF) and remove by pulling up the Hooks and lifting the Revolving stand Assy up to the side.



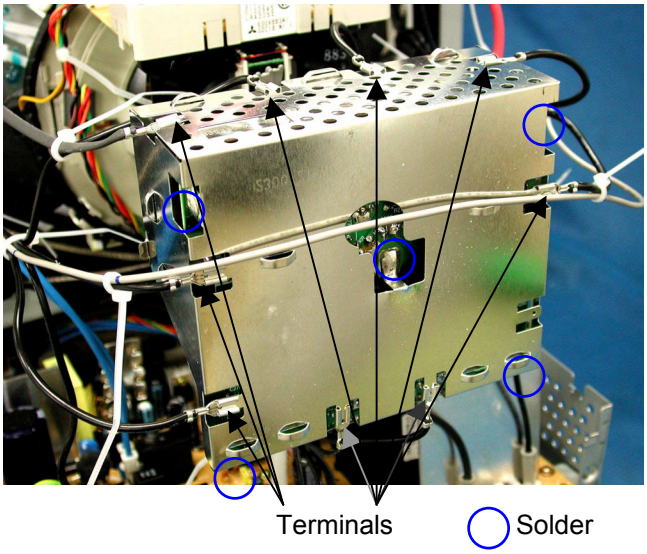
Cabinet Back

1. Remove the two screws (PL-CPTS*4*16*15BF) and unlock the two hooks.

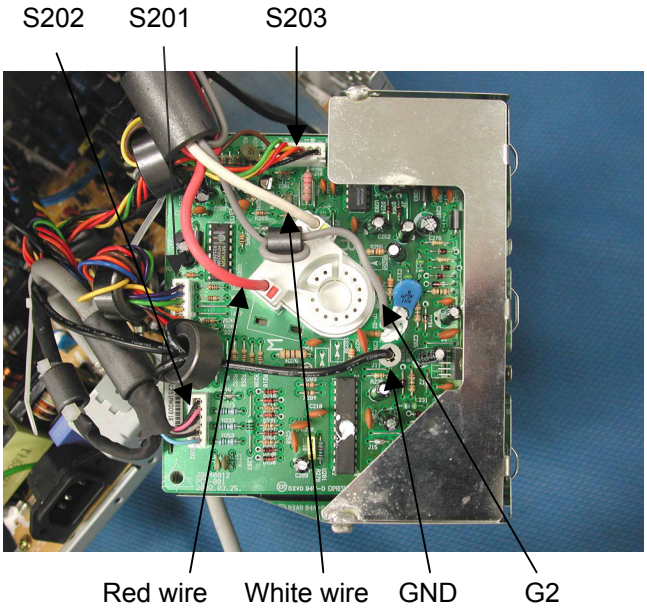


CRT BOARD

1. Remove the nine terminals and desolder the five points as shown.

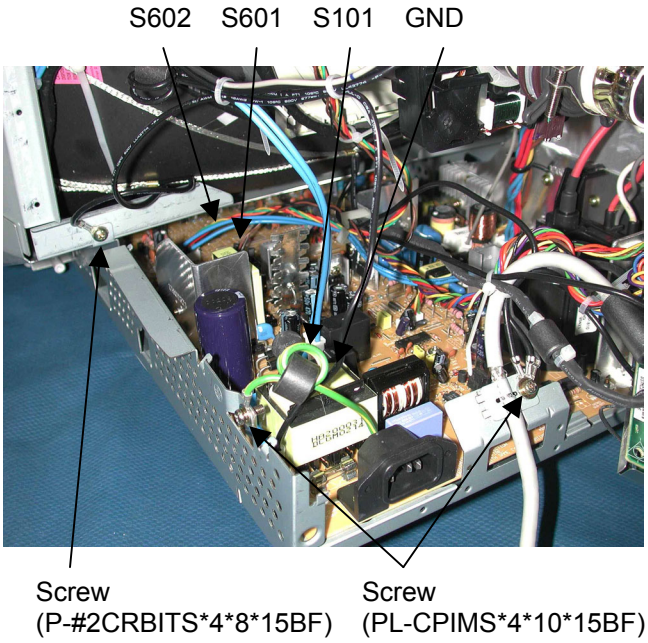


2. Disconnect the connectors “S201”, “S202”, “S203” and “GND”.
3. Desoldor the wires: “White wire”, “Red wire” and “G2”.



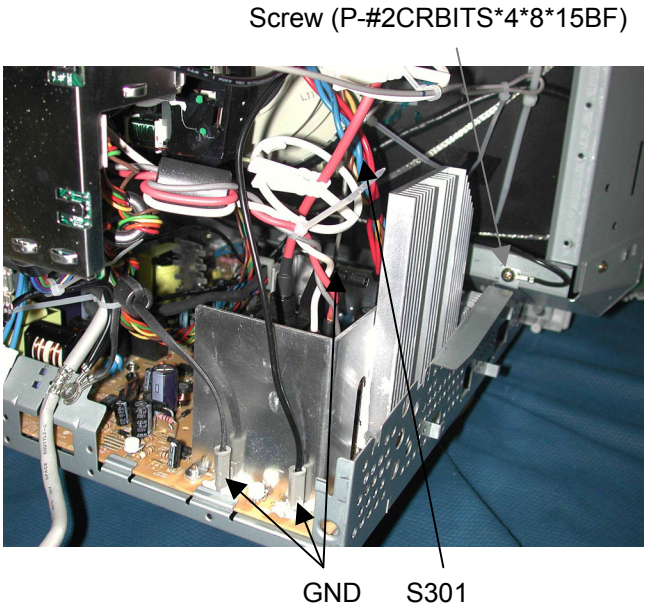
MAIN BOARD

1. Disconnect the connectors “S601”, “S602”, ”S101” and “GND”.
2. Remove the screw (P-#2CRBITS*4*8*15BF) and two screws (PL-CPIMS*4*10*15BF).

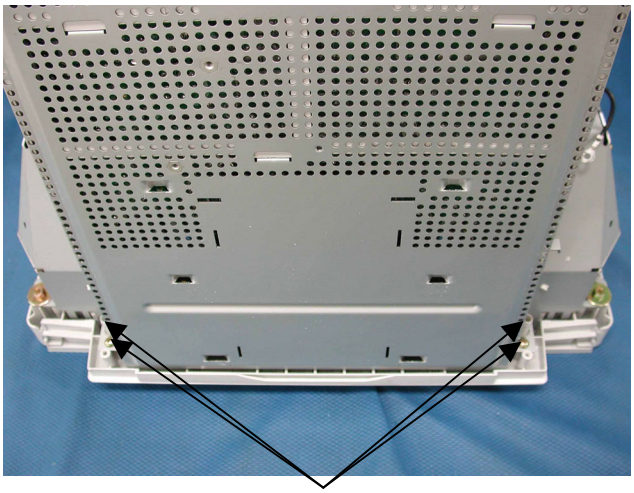


3. Disconnect the connectors “GND” and “S301”.
4. Remove the screw (P-#2CRBITS*4*8*15BF) .
5. Remove the Anode cap from CRT.

   NOTE: Carefully discharge the CRT anode by shorting it to ground before removing anode cap.



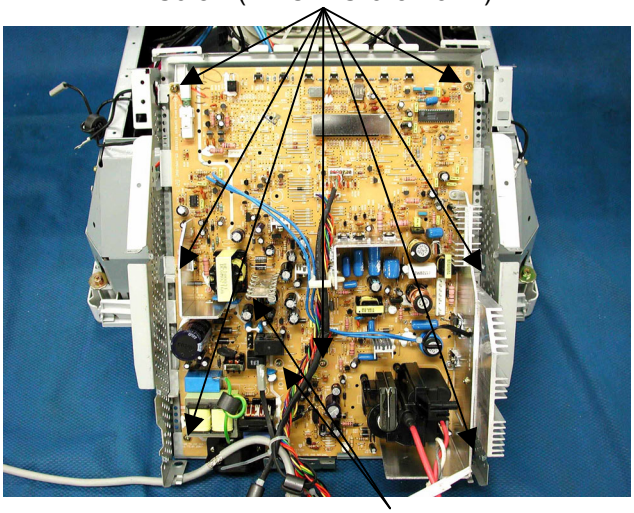
6. Remove the four screws (PL-CPTS*4*16*15BF) and remove the Chassis Base from Cabinet Front ASSY.



Screws (PL-CPTS*4*16*15BF)

7. Remove the seven screws (PL-CPTS*3*8*15BF) and two screws (PL-CPIMS*3*10*15BF).
8. Remove the Main Board from Chassis Base.

Screw (PL-CPTS*3*8*15BF)



Screw (PL-CPIMS*3*10*15BF)

ADJUSTMENT PROCEDURES

TABLE OF CONTENTS

1. Adjustment & Inspection Tools

(A) Color Analyzer (B) Signal Generator CHROMA 2235 or compatible

(C) Multi Meter (D) Hi-Voltage Probe

(E) Convergence Meter (F) Degaussing Probe

(G) Power Meter

2. Timing Table (Factory Mode –18 Modes)

MODE	RESOLUTION	H-SYNC EREQ.	V-SYNC FREQ	H . POLARITY	V . POLARITY
1	VGA400	31.4KHz	70Hz	-	+
2	VGA640*480	31.4KHz	60Hz	-	-
3	640*480(75)	37.5KHz	75Hz	-	-
4	640*480(85)	43.2KHz	85Hz	-	-
5	800*600(75)	46.8KHz	75Hz	+	+
6	MACII 49K	49.7KHz	75Hz	-	-
7	800*600(85)	53.6KHz	85Hz	+	+
8	1024*768(75)	60.0KHz	75Hz	+	+
9	1280*1024(60)	64.0KHz	60Hz	+	+
10	1024*768(85)	68.6KHz	85Hz	+	+
11	1280*1024(75)	79.9KHz	75Hz	+	+
12	1280*1024(85)	91.1KHz	85Hz	+	+
13	1600*1200(75)	93.7KHz	75Hz	+	+
14	1024*768(60)	48.3KHz	60Hz	-	-
15	800*600(60)	37.8KHz	60Hz	+	+
16	MACII 35K	35.0KHz	67Hz	-	+
17	MAC 1152*870	68.7KHz	75Hz	-	-
18	VGA720*400(70)	31.5KHz	70Hz	-	+

3. Normal Condition Definition

(A) Input AC Voltage 110V/60Hz.

(B) Warm up time minimum 30 minutes.

(C) Full White Pattern.

(D) All VR’s adjust to Center Position.

(F) Color temp 9300K

4. Hot Key Operation

(A) Factory Mode: power on + '+' key + '–' key.

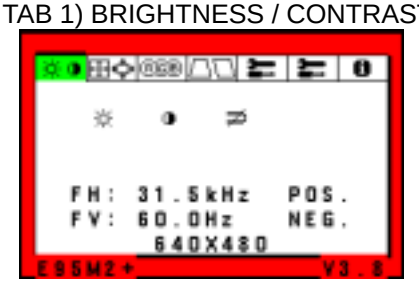
*To hide the Factory menu temporary in Factory mode:

Push "RESET" key once while Menu is displayed, then Menu disappears.

Push "RESET" key once more, then Menu reappears.

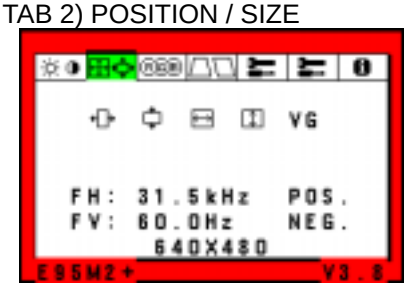
(B) Factory Menu

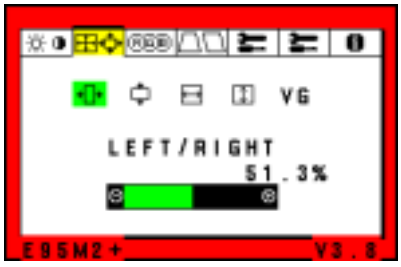
TAB 1) BRIGHTNESS / CONTRAST



☼: Brightness
◑ : Contrast

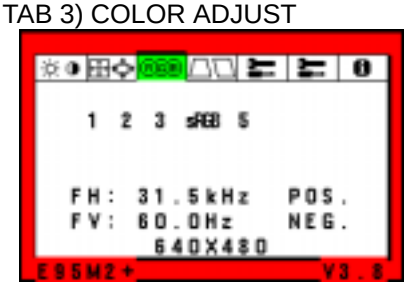
TAB 2) POSITION / SIZE





: Left / Right (H.Position)
: Down / Up (V.Position)
: Narrow / Wide (H.Size)
: Short / Tall (V.Size)
VG: Vertical GAIN(Vertical Sub Size)

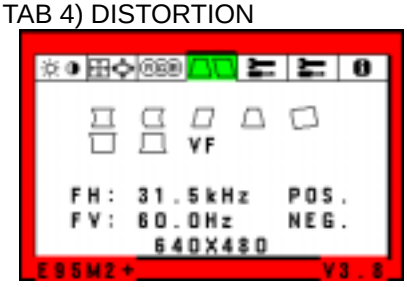
TAB 3) COLOR ADJUST

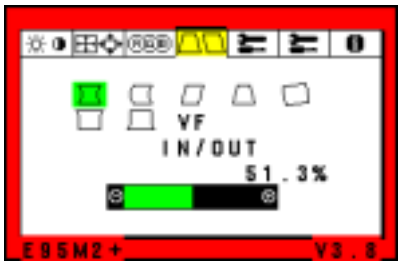


1: 9300K
2: 8200K
3: 7500K
sRGB: sRGB
5: 5000K

: N/A
R : Red Gain
G : Green Gain
B : Blue Gain
RB : Red Bias
GB : Green Bias
BB : Blue Bias
☼ : Brightness
◑ : Contrast

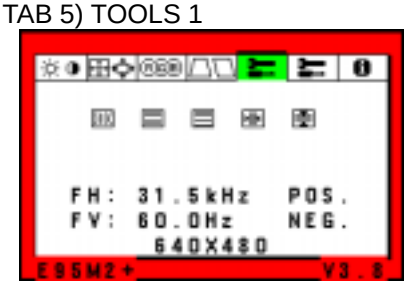
TAB 4) DISTORTION





: In / Out (Side Pincushion)
: Left / Right (Pin Balance)
: Tilt (Parallelogram)
: Align (Trapezoid)
: Rotate
: Top Corner
: Bottom Corner
VF : Vertical Focus

TAB 5) TOOLS 1

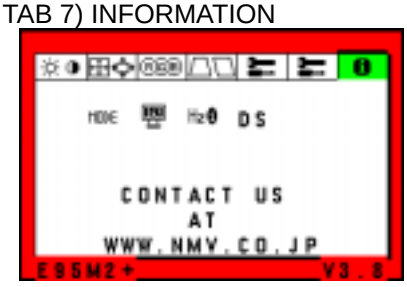


:Moire canceller
:Linearity(VER.)
:Linearity balance
:Convergence(HOR.)
:Convergence(VER.)

TAB 6) TOOLS 2

TOOL 2 is as same as user mode

TAB 7) INFORMATION



DS :Destination

5. B+ Check

(A) Mode: No.12.

(B) Pattern: Full White. (Brightness set to cut off)

(C) Check other power sources are: 83.9V ±1V, 7.05V ±0.3V, 26.5V ±1V, -14.3V ±1V, 14.2V ±0.3V.

6. X-RAY Test

(A) Mode: No.12

(B) Pattern: Normal Crosshatch (Brightness just cut off)

(C) Test

Apply a resistor (4.7K, 1/4W, 1%) between TP1 and TP2 then power on, Monitor should be active in x-ray protector.

7. H. V. Adjustment

(A) Mode: No.12

(B) Pattern: Full Black (Brightness just cut off)

(C) Adjust VR301 to make the high voltage has 26kV ±0.1kV.

8. H-Raster Center Adjustment

(A) Mode: No.13

(B) Pattern: Crosshatch Reverse

(C) Adjust the Brightness Control so that the background is visible.

(D) Adjust VR501 to make the raster mostly near center background position.

9. Preset Adjustment

(A) Mode No.12

(B) Pattern: Cross hatch

(C) Enter to Factory mode. Adjust H-phase, V-center, H-size, V-size, Pincushion, Trapezoid, Bow, Parallelogram Top-corner, Bottom-corner, and rotation to make Picture Position Center and Picture Size 356*267mm.

10. G2 Voltage Adjustment

(A) Mode No. 12

(B) Pattern: Full Black

(C) Adjust: Monitor should be warm up more than 30 minutes.

(D) Adjust screen VR to make G2 voltage 680V±10V.

11. White Balance adjustment

(A) Setting

Enter Factory Mode,

Mode: No.12, Pattern: Full White.

Warm up 60 min.

Make External Degauss.

(B) Cut Off Adjustment

1. Select the color Mode 9300K.
2. Cut Off Adjustment : Video Signal Off(0.Vp-p),Bright Control set to Max., Adjust G. Bias at the Brightness 3.4 ±0.7cd/m^2 (1FL ±0.2FL).
3. 9300K (Select color Mode 9300)
   Adjust R. Bias, B. Bias to make X=0.283, Y=0.297, with readjusting G. Bias to keep the brightness between 3.4 ±0.7cd/m2 (1FL ±0.2FL).

(C) "9300K, 5000K MODE" White Balance Adjustment

1. 9300K (Select color Mode 9300K)

   1) Video Signal off (0.Vp-p), Contrast set to Max, Adjust Brightness to 0.1cd/m^2.

   2) 50*50mm Green block Pattern, Adjust G Gain to Y=86cd/m^2 .

   3) 50*50mm White block Pattern, Adjust R, B Gain to x=0.283, y=0.297.

   4) Adjust R, G, B gain again to meet following spec.

   9300K x=0.283 ±0.010cd/m^2
   y=0.297 ±0.010cd/m^2
   Y=130 ±2cd/m^2

2. 5000K (Select color Mode 5000K)

1) Video Signal off (0.Vp-p), Contrast set to Max, Adjust Brightness to 0.1cd/m^2.

2) 50*50mm Green block Pattern, Adjust G Gain to Y=70cd/m^2 .

3) 50*50mm White block Pattern, Adjust R, B Gain to x=0.345, y=0.359.

4) Adjust R, G, B gain again to meet following spec.

5000K x=0.345 ±0.010cd/m^2
y=0.359 ±0.010cd/m^2
Y>100cd/m^2

(D) “sRGB MODE” White Balance Adjustment (Select color Mode sRGB)

1) Video Signal off (0.Vp-p), Contrast set to Max, Adjust Brightness to 0.1cd/m^2.

2) 50*50mm Green block Pattern, Adjust G Gain to Y=75cd/m^2 .

3) Change Pattern to Full white. Adjust R, B Gain to x=0.313, y=0.329.

4) Adjust contrast to meet following spec.

sRGB x=313 ±0.010cd/m^2
y=329 ±0.010cd/m^2
Y=93 ±2cd/m^2(27FL)

(E) “SB1, 2 MODE” White Balance Adjustment (Select the color Mode SB1, 2 MODE)

1) Select the color mode “SB1 Mode” by “Select” key when OSM is off.

2) Video signal off (0Vp-p), Adjust brightness to Y=0.1cd/m^2.

3) Change pattern to 50*50mm white block, Adjust contrast control to Y=215 ±2cd/m^2.

4) Change pattern to 32/255 gray. Adjust brightness to make 0.8cd/m^2.

5) Select the color mode “SB2 MODE”.

6) Video signal off(0Vp-p), Adjust brightness to Y=0.1cd/m^2.

7) Change pattern to 50*50mm white block, Adjust contrast control to Y=255 ±2cd/m^2.

(F) ABL Adjustment and Brightness Preset

1) SB mode off, Color set to 9300K.Full White Pattern.

2) Brightness, contrast control to max., Adjust VR302 to Y=105 ±2cd/m^2 (30.5FL).

3) Brightness preset: set to Y=0.1 ±2cd/m^2.

12. Focus Adjustment

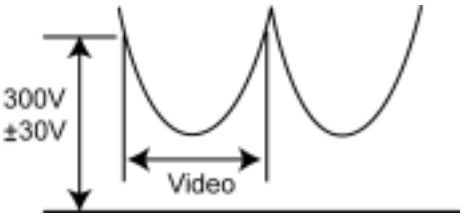
(A) Mode: No.12, 9300K

(B) Pattern: Green Crosshatch, Brightness just cut off, Contrast maximum.

(C) Adjust V- Parabola Vp-p by OSM V-Focus control in Factory Mode. V focus: 73% of control bar.

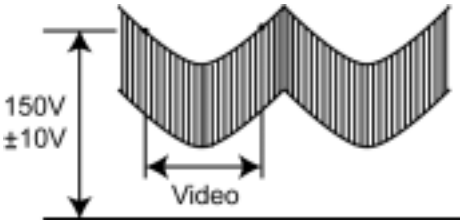
(D) Check T303 output voltage of the video range.

H-para=300V ±30V



Horizontal

V-para=150V ±10V



Vertical

(E) Adjust F1 VR of FBT (lower side VR) for the vertical line to become fine line.

(F) Adjust F2 VR of FBT (higher side VR) for the horizontal line to become fine line.

(G) Receive Focus adjustment pattern.

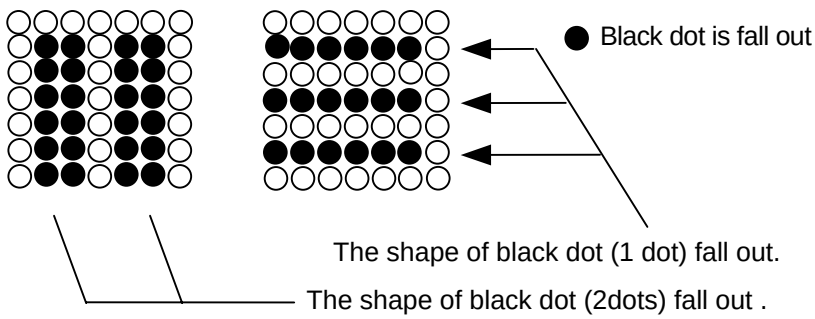
(H) Adjust F1 VR if vertical black line is not falling out.

(I) Adjust F2 VR if horizontal black line is not falling out.

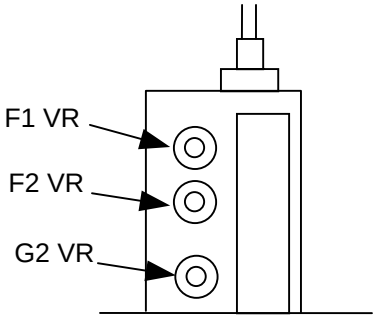
(J) Use the video card “Matrox G550”, and receive Microsoft Excel “Work sheet” (1280*1024(85)).

Make sure that there is no double line for horizontal at the center.

*Note: Focus adjustment must be finished at F1 VR.



FOCUS ADJUSTMENT PATTERN



Focus VR

13. Purity Adjustment

(1) Receive signal 12 (Cross hatch pattern).

(2) The CRT face should be facing east and degauss the entire unit by external degaussing coil.

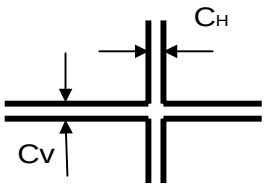
(3) Make sure the single color purity.

If not, readjust CPC magnet and touch up using correction magnets.

14. Convergence Adjustment

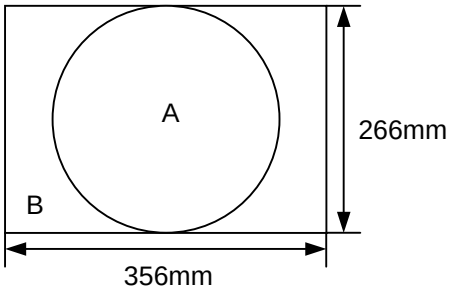
CH : Convergence error of horizontal direction

CV : Convergence error of vertical direction



(1) Receive signal 12 (Cross hatch pattern).

(2) Measure convergence error. If it is out of spec, adjust convergence by 4-pole magnets and 6-pole magnets.



A Zone (A circle 236mm in the center of the CRT face center)

CH, CV : Within 0.25mm

B Zone (Areas outside of zone A within the rectangle of 356mmx266mm)

CH, CV : Within 0.30mm

15. Power Saving Function Inspection

(A) Mode: No.13

(B) Pattern: Full white

(C) Input: Maximum rating voltage

(D) Inspection

1. It should be into power off Mode when the both horizontal sync and vertical sync are disable after 8 seconds. Check the LED color “Orange” and the power consumption must be less than 5W.
2. It should be recovered the normal Mode when the both horizontal sync and vertical sync are enable. Check the picture is normal and LED color “Green”.

16. Distortion Adjustment

Factory mode setting

* After completion of adjustment exit the factory mode and data will be saved.

Signal: All signals Cross hatch

Perform the adjust for signal No.13 in step 1 ~ 3.

Perform the adjust for above all signal in step 4 ~ 5.

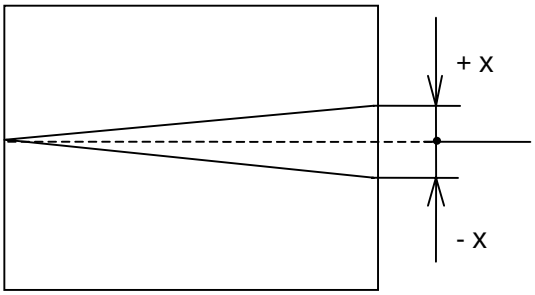
1. Rotation Adjustment

(1) Receive signal 13 (Cross hatch)

(2) Select the “ ▱ “ icon in OSM TAB 4.

(3) Make sure that the picture tilt meets the following standards.

X ≤ 1.0mm

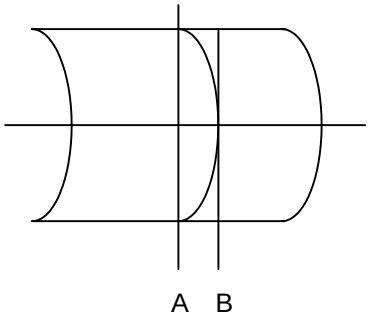


2. Pincushion Balance Adjustment

(1) Select the “ ▱ “ icon in OSM TAB 4.

(2) Make sure that the Pincushion Balance meets the following standards.

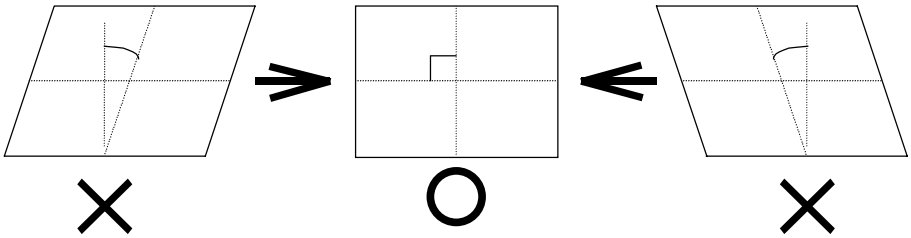
A – B ≤ 0.5mm



3. Parallelogram distortion Adjustment

(1) Select the “ ▱ “ icon in OSM TAB 4.

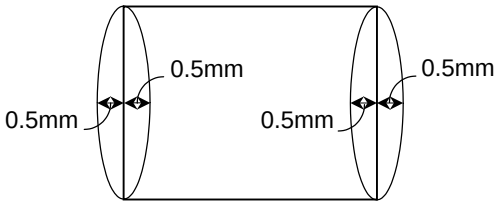
(2) Adjust “+”, “-“ SW so that the vertical line and horizontal line at the screen’s center fall at right angles. (less than 90 ±0.5 degree)



4. Side Pincushion Adjustment

(1) Select the “ ⌷ “ icon in OSM TAB 4.

(2) Make sure that the side pincushion distortion meets the following standards.



5. Trapezoid Distortion Adjustment

(1) Select the “ ⏢ “ icon in OSM TAB 4.

(2) Make sure that the trapezoid distortion meets the following standards.

$|(AB - CD)| \leq 1.0mm$

$|(AC - BD)| \leq 1.0mm$

17. Setting Before Shipment

(A) Color Temp: 9300K(SB mode off).

(B) OSM position: Center of the screen

(C) Brightness: Preset

(D) H moire: Minimum

(E) Refresh Notifier: OFF

(F) OSM turn off time: 45 sec

(G) IPM off mode: Enable

(H) Language: English for A,B,C,R Version, Japanese for J Version.

(I) OSM Lock: OFF

(J) Edge Lock: Back

(K) Hot Key: “OFF” for A,J Version and “ON” for B,R Version.

18. Adjustment Magnetic Field

Vertical: +40uT, Horizontal: ±0uT(Neutral)

* Notes About Degaussing Method

Follow the degaussing procedure as below. (To prevent intertwinement of aperture grille.)

1) Use stick type degaussing probe at demagnetizing CRT.
   Do not use ring type degaussing probe.

2) In order to remove a magnetization from front, top, bottom and side of CRT, and bottom chassis.
   Do not switch off the degaussing probe abruptly. Move the degaussing probe slowly when degaussing.

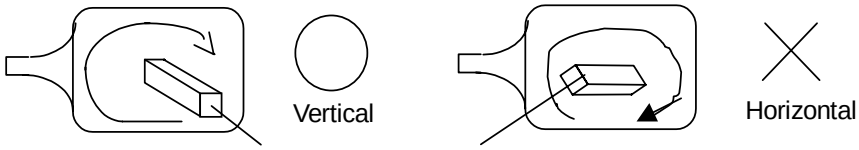
   Note: If switch off the degaussing probe near the set, the set will be magnetized.

3) Degaussing method

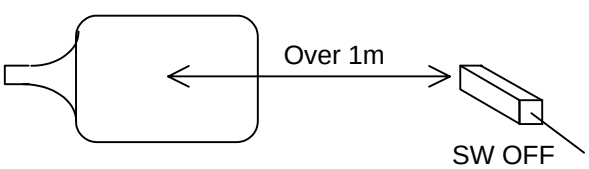
   When switch on the degaussing probe, keep distance between panel surface and degaussing probe more than 50cm. Move the degaussing probe vertically facing to the panel surface.

   Keep distance of panel surface and degaussing probe to more than 15mm.

   Starting from edge of CRT, move the degaussing probe toward CRT center in circular motion, spending 6 to 7 seconds. (Rounding about 4 or 5 times.)



4) After sufficiently degaussing the CRT, move the degaussing probe slowly away from the panel surface while rotating from corner to center, taking more than 3 seconds. Turn off SW more than 1m away from the CRT. Degauss again if the unit is magnetized.



Magnetized Pattern Example

19. TIMING SHEET

Preset Mode No.	1	2	3	4	5	6
	VGA	VGA	VESA	VESA	VESA	(MAC)
Signal Name	640*400	640*480	640*480 (75)	640*480 (85)	800*600 (75)	832*624 (75)
Resolution	640*400	640*480	640*480	640*480	800*600	832*624
Dot Clock (MHz	25.175	25.175	31.500	36.000	49.500	57.283
fh (kHz)	31.47	31.469	37.50	43.269	46.875	49.725
fv (Hz)	70.09	59.940	75.00	85.008	75.00	74.550
Total (dot)	800	800	840	832	1056	1152
(uS)	31.78	31.778	26.667	23.111	21.333	20.111
Disp (dot)	640	640	640	640	800	832
(uS)	25.42	25.422	20.317	17.778	16.162	14.523
Front (dot)	16	16	16	56	16	32
(uS)	0.64	0.636	0.508	1.556	0.323	0.559
Sync Pulse (dot)	96	96	64	56	80	64
(uS)	3.18	3.813	2.032	1.556	1.616	1.117
Back (dot)	48	48	120	80	160	224
(uS)	1.91	1.907	3.810	2.222	3.232	3.910
Total (H)	449	525	500	509	625	667
(mS)	14.268	16.683	13.333	11.764	13.333	13.414
Disp (H)	400	480	480	480	600	624
(mS)	12.711	15.253	12.800	11.093	12.800	12.549
Front (H)	12	10	1	1	1	1
(mS)	0.381	0.318	0.027	0.023	0.021	0.020
Sync Pulse (H)	2	2	3	3	3	3
(mS)	0.064	0.064	0.080	0.069	0.064	0.060
Back (H)	35	33	16	25	21	39
(mS)	1.112	1.049	0.427	0.578	0.448	0.784
Interlace	NON	NON	NON	NON	NON	NON
Polarity (H/V)	NEG/POS	NEG/NEG	NEG/NEG	NEG/NEG	POS/POS	NEG/NEG
Composite Sync						
Composite Video						
Character Font	7*9	7*9	7*9	7*9	7*9	7*9
Serration	OFF	OFF	OFF	OFF	OFF	OFF
EQP	OFF	OFF	OFF	OFF	OFF	OFF

Preset Mode No.		7	8	9	10	11	12
		VESA	VESA	VESA	VESA	VESA	VESA
Signal Name		800*600 (85)	1024*768 (75)	1280*1024 (60)	1024*768 (85)	1280*1024 (75)	1280*1024 (85)
Resolution		800*600	1024*768	1280*1024	1024*768	1280*1024	1280*1024
Dot Clock	(MHz)	56.250	78.750	108.000	94.5	135.0	157.5
fh	(kHz)	53.674	60.023	63.981	68.677	79.976	91.146
fv	(Hz)	85.061	75.029	60.020	85	75.025	85.024
Total	(dot)	1048	1312	1688	1376	1688	1728
	(uS)	18.631	16.660	15.630	14.561	12.504	10.971
Disp	(dot)	800	1024	1280	1024	1280	1280
	(uS)	14.222	13.003	11.852	10.836	9.481	8.127
Front	(dot)	32	16	48	48	16	64
	(uS)	0.569	0.203	0.444	0.508	0.119	0.406
Sync Pulse	(dot)	64	96	112	96	144	160
	(uS)	1.138	1.219	1.037	1.016	1.067	1.016
Back	(dot)	152	176	248	208	248	224
	(uS)	2.702	2.235	2.296	2.201	1.873	1.422
Total	(H)	631	800	1066	808	1066	1072
	(mS)	11.756	13.328	16.661	11.765	13.329	11.761
Disp	(H)	600	768	1024	768	1024	1024
	(mS)	11.179	12.795	16.005	11.183	12.804	11.235
Front	(H)	1	1	1	1	1	1
	(mS)	0.019	0.017	0.016	0.015	0.013	0.011
Sync Pulse	(H)	3	3	3	3	3	3
	(mS)	0.056	0.050	0.047	0.044	0.038	0.033
Back	(H)	27	28	38	36	38	44
	(mS)	0.503	0.466	0.594	0.524	0.475	0.483
Interlace		NON	NON	NON	NON	NON	NON
Polarity	(H/V)	POS/POS	POS/POS	POS/POS	POS/POS	POS/POS	POS/POS
Composite Sync							
Composite Video							
Character Font		7*9	7*9	7*9	7*9	7*9	7*9
Serration		OFF	OFF	OFF	OFF	OFF	OFF
EQP		OFF	OFF	OFF	OFF	OFF	OFF

Preset Mode No.		13	14	15	16	17	18
		VESA	VESA	VESA	MAC	MAC	VGA
Signal Name		1600*1200 (75)	1024*768 (60)	800*600 (60)	640*480 (67)	1152*870 (75)	720*400 (70)
Resolution		1600*1200	1024*768	800*600	640*480	1152*870	720*400
Dot Clock	(MHz)	202.5	65.0	40.0	30.24	100	28.322
Fh	(kHz)	93.75	48.36	37.8	35.0	68.681	31.469
Fv	(Hz)	75	60	60	66.67	75.062	70.087
Total	(dot)	2160	1344	1056	864	1456	900
	(uS)	10.667	20.68	26.40	28.57	14.560	31.777
Disp	(dot)	1600	1024	800	640	1152	720
	(uS)	7.901	15.75	10.0	21.16	11.52	25.422
Front	(dot)	64	24	40	64	32	18
	(uS)	0.316	0.37	1.00	2.12	0.320	0.636
Sync Pulse	(dot)	192	136	128	64	128	108
	(uS)	0.948	2.09	3.20	2.12	1.280	3.813
Back	(dot)	304	160	188	96	144	54
	(uS)	1.501	2.46	2.20	3.17	1.440	1.907
Total	(H)	1250	806	628	525	915	449
	(mS)	13.333	16.667	16.579	15.000	13.322	14.268
Disp	(H)	1200	768	600	480	870	400
	(mS)	12.800	15.880	15.840	13.714	12.667	12.711
Front	(H)	1	3	1	3	3	12
	(mS)	0.011	0.062	0.026	0.086	0.044	0.381
Sync Pulse	(H)	3	6	4	3	3	2
	(mS)	0.032	0.124	0.106	0.086	0.044	0.064
Back	(H)	46	29	23	39	39	35
	(mS)	0.491	0.600	0.607	1.114	0.568	1.112
Interlace		NON	NON	NON	NON	NON	NON
Polarity	(H/V)	POS/POS	NEG/NEG	POS/POS	NEG/NEG	NEG/NEG	NEG/POS
Composite Sync					YES	YES	
Composite Video							
Character Font		7*9	7*9	7*9	7*9	7*9	7*9
Serration		OFF	OFF	OFF	ON	ON	ON
EQP		OFF	OFF	OFF	OFF	OFF	OFF

INSPECTION

TABLE OF CONTENTS

1.Scope

1.1 Introduction

This document defines the design and performance requirements for a 19 inch (18inch Viewable), color display monitor. This monitor uses a 19 inch Flat AG Trio (Aperture Grille) type CRT. This monitor is capable of maximum resolution of 1600 x 1200 pixels at 76 Hz non-interlaced mode, and is capable of horizontal frequencies between 30kHz and 96kHz.

The manufacture assumes the responsibilities for the design and assembly of the power supply and deflection circuits and the integration of these components with the CRT/yoke assembly and all mechanical parts, to meet the requirements of this specification.

The following list shows the model name, Cabinet color, Audio function and market.

MODEL NAME	Cabinet color	Audio Base	MARKET	Ver.
Dplus93SB	DAS/LG	No	Europe	Bver.
Dplus93SB	AS/LG	No	Australia	Rver.
Dplus93SB	AS/LG	No	China	Cver.

* “AS” : Aluminum Silver
  “LG” : Light Gray
  “DAS” : Dark Aluminum Silver

1.2 General Description

NO	Item			Spec.	REMARKS
1	CRT	Vendor / Model No.		Mitsubishi / M46LXH51X31	
		Type		Diamondtron M2+ (Aperture Grille)	
		Size		48cm / 45.7cm Diagnonal Viewable Image (19" / 18" Diagnonal Viewable Image)	
		Grill Speacing (Phosphor Spacing)		Approx. 0.25mm (center) / 0.27mm (edge) (Approx. 0.26mm(center) / 0.28mm (edge)	Aperture Grille
		Phosphor Type		B22	
		Face-plate		Anti-Refection / Anti-Static Film	
		Electron Gun Type		PX-DBF	
		Face-plate Transmission		approx.43.8% (Includidng face-plate coating)	
2	SCANNING	Horizontal Freq		30.0k - 96.0kHz	
		Vertical Freq		50 - 160Hz	
3	SIGNAL INPUT	Video		Analog	0.7Vp-p
		Sync		Composite Sync	TTL Pos / Neg
				Separate Sync	TTL Pos / Neg
		Termination (Impedance)	Video	75 ohm to GND	
			Sync.	2.2K ohm to GND or more	
4	SCREEN CHARACTERISTICS	Display Resolution(Maximum)		1792×1344 68Hz (Maximum) 1280x1024 85Hz (recommend)	
		Display Size	Preset	356 mm(H) * 266 mm(V)	
			Full Scan	366 mm(H) * 274 mm(V)	
		Misconvergence		Center: 0.25 mm , Corner : 0.3 mm	
		Brightness (Full White)		100cd/m^2 at 9300K (Cont:MAX Bri:Preset)	
5	CONTROL (User Controls)	Front		Power SW Exit, Left, Right, -, +, Select, Reset Note: User can change Super Bright Mode by pressing a Select key.	7 control buttons
			OSM	Brightness , Contrast , Degauss H.Size, V.Size, H.Position, V.Position Color Control (9300K, 8200K, 7500K, sRGB, 5000K) Color Temperature Adjust, Color Gain Adjust Geometry : 7ways (Side Pin In/Out , Side Pin Left/Right , Parallelogram, Trapezoid, Rotation, TopPin In/Out, BottomPin In/Out) Moire Canceler (Horizontal), Linearrity(Vertical), Vertical Balance Convergence Adjust(H), Convergence Adjust(V) Language select (6:E/G/F/SP/IT/JA), OSM position, OSM turn off, OSM lock out, IPM System, Clamp Pulse Position, Hot Key, Factory Preset Display mode, Monitor info., Refresh notifire, URL indication Diagnosis indication	
6	CONNECTOR	Power Input		Power Cord (Length:1.8m, Color: Haze Gray)	
		Signal Input		Mini 15pin D-sub (Length:1.8m, Color:Haze Gray)	
7	POWER SUPPLY	Operating Range		AC100-120 / 220-240VAC	
		Power Consumption (Max.)		100W 2.2A@100-120V / 220-240VAC Power save < 5W	
8	ENVIRONMENTAL CONDITION	Operating temperature		5- 35 ^{o}C	
		Relative humidity		10 - 90 % (without condensation)	
9	WEIGHT			Net : 22.7kg / 50.0lbs, Gross : 26.7kg / 58.9lds	
10	DIMENSIONS	Cabinet with Tilt / Swivel stand		Net : W 442mm(17.4"), H 443mm(17.4"), D 447.55mm(17.6")	
		Carton		Gross: W 550mm(21.7"), H 580mm(22.8"), D 585mm(23.0")	
11	REGULATION	Safety		UL1950(UL), CSA C22.2 No.950(C-UL), EN60950(TUV-GS), CCIB, PCBC, GOST, PSB	
		EMC		FCC-B, DOC-B, EN55022-B, EN61000-3-2,-3-3, EN55024(IEC61000-4-2,-4-3,-4-4,-4-5,-4-6,-4-8,-4-11), C-tick, CCIB, VCCI-B, JPHG	
		X-Ray		DHHS, Red Act, PTB	
		VLF / ELF		pr EN50279(MPR-lll), TCO'99, TCO95(for Aver. Black) JEIDA-G15-1996	
		Power Management		International Energy Star Office Equipment Program	
		Ergonomics		TUV-GS (ISO9241-3, ISO9241-7, ISO9241-8), TCO'99, TCO95(for Aver. Black)	
		Miscellaneous		TCO'99, TCO95(for Aver. Black), CE marking, JEIDA-G11-1996	
		Others		WHQL (Win ME, Win 2000, Win XP)	
12	OTHERS	Plug & Play		DDC2B,DDC/CI (Support 9pin-5V)	
13	FEATURE			Self Diagnosis	

1.3 Regulations

GEOGRAPHICAL REGION	REGULATIONS						
	SAFETY	EMC	X-RAY	ELF/VLF*	Power Management*	Ergonomics	Miscellaneous And others
DPlus73SB(B) DPlus73SB (C) DPlus73SB (R)	UL C-UL TUV-GS PCBC Gost PSB CCIB CCEE	EN55022-B EN55024 EN61000-3-2 EN61000-3-3 C-tick	PTB	MPR-III TCO'99	Energy Star TCO'99	TUV-GS (IS9241-3 IS9241-7 IS9241-8) TCO'99	WHQL (Win ME, Win 2000, Win XP)

*****: This model is applied these regulations in case of including the audio base.

1.4 Regulation Information & Marking Location

Marking Location	Regulation	Information
(1)	UL	UL1950 3rd Edition (or UL60950 3rd edition)
(1)	C-UL	CAN/CSA-C22.2 NO.950:1995 (or CAN/CSA-C22.2 No.60950:2000)
(1),(2)	TUV-GS	EN60950 : 1992 & AD1/AD2/AD3/AD4/AD11(or EN60950:2000), EK1-ITB 2000, ISO9241-3: 1992, ISO9241-7: 1998, ISO9241-8: 1997
(1)	PSB	Singapore Safety
(1)	CCIB	Chinese Safety & EMI
(1),(2)	FCC	47 CFR Chapter I Part15 Subpart B, Class B
-	DOC	Interference-Causing Equipment Standard ICES-003 Issue 3,Class B
-	DHHS	21CFR Chapter I Subchapter J
-	Red Act	Radiation Emitting Devices Act
-	PTB	German X-ray
-	MPR-III	prEN50297
-	TCO'95	Requirements for environmental labeling of personal computers
(1),(2),(3)	TCO'99	Requirements and test methods for environmental labeling of display(CRT) and Ecology
(1),(2),(3)	CE-Marking	EN60950: 1992 & AD1/AD2/AD3/AD4/AD11(or EN60950 : 2000) EN55022: 1998 Class B, EN55024: 1998(IEC61000-4-2,-4-3,-4-4,-4-5,-4-6,-4-8,-4-11) EN61000-3-2 : 1995 & AD1/AD2, EN61000-3-3 : 1995
(1),(2),(3)	Energy Star	International Energy Star office Equipment Program
(2)	PCBC	Poland Safety
(1),(2),(3)	Gost	Russian Safety
(1),(2),(3)	C-tick	AS/NZS3548:1995+A1/A2:1997
(1),(2)	JPHG	(Japan Power Harmonics Guidelines) Guidelines for the suppression of Harmonics in Household and General – Use Equipment
-	JEIDA	JEIDA-G-15-1996: Guide Line for Low Frequency electromagnetic field JEIDA-G11-1996: Guide Line for Electrostatic Field Emission.
-	WHQL	Microsoft Windows® Hardware Quality Labs

Note:

(1) This mark is printed on the " Rating Label ".
(2) This mark is printed on the " Carton Box ".
(3) This mark is printed on the " User's Manual ".

2. CRT Specifications

Vendor	Mitsubishi
CRT Model No.	M46LXH51X31
Type	Diamondtron NF (Aperture Grille)
Size	46cm/43cm Diagonal View able Image (19”/18” Diagonal Viewable Image)
Dot pitch	0.25mm / 0.27mm
Phosphor Spacing	0.26mm
Deflection Angle	90 degree
Phosphor Type	B22
Electron Gun Type	PX-DBF type
Light Transmission at Center (Approx.)	Approx.43.5% (Include Face-plate coating)
Face-plate	AR-film (Anti-reflection and Anti-static)
Useful Screen dimensions	366x 274 mm
Face-plate Curvature	H: R=50000 mm , V: R=80000 mm
Phosphor Color Coordinate	R: X=0.626 , Y=0.338 G: X=0.278 , Y=0.601 (Typical) B: X=0.150 , Y=0.068

3. Electric Specifications

3.1 Deflections

Horizontal	Scanning Frequency	30 – 96 kHz
	Back Porch	$\geq$ 1.1 μsec
	Blanking	$\geq$ 2.3 μsec
	H-sync Width	$\geq$ 0.9 μsec
Vertical	Scanning frequency	50 – 160 Hz
	V-sync + V-back Porch	$\geq$ 420 μsec
	V-sync Width	2H $\leq$ Vs $\leq$ 8H or 100 μsec
	V-Total Line	$\geq$ 256H+ V-sync Width

3.2 Signal Input

Video Input Signal	R.G.B analog
Sync. Input Signal	External composite sync. TTL(P or N) External HD/VD separate sync. TTL(P or N)
Video Input Impedance	75 ohm to ground
Sync. Input Impedance	2.2k ohm to grand or more.
Signal Level	Video signal : 0.70V p-p ±5% Composite sync. :TTL level(>2.5V) Separate H/V-sync. :TTL level(>2.5V)

3.3 Video Performance

Video Clock Frequency	235MHz (Input signal)
Pulse Rise and Fall time	6.0nsec (typ.) 10 to 90% at 40Vp-p

The rise and fall time of the input video signal is 2.0nsec or less.

The pulse rise or fall time is determined using the formula :

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

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 Rl x Cp

Rl = Amplifier output resistance (ohm)

Cp = Total probe capacitance (F)

Tsc= Scope rise / fall time = 0.35 / Scope bandwidth (MHz)

3.4 Power Supply

Input Voltage	100 - 240 VAC ± 10%
Frequency	50/60Hz ± 3Hz
Power Consumption (Max.)	100W 100 - 240VAC, 2.2A
Condition (Monitor):	Input voltage:100-240VAC Signal: No.13 (1600x1200 (75Hz), (All white)) Contrast: Max, Brightness: Max, SB Mode: ON H/V size: full scan Others: default position
(Typical)	92W
Condition (Monitor):	Input voltage: 100 - 240VAC Signal: No.12 (1280x1024 (85Hz), (All white)) Contrast: Max, Brightness: Cut off SB Mode: OFF H/V size: Preset Distortion/color: default position
AC leakage current	Except Japan ≤ 3.5mA(259V), Japan ≤ 0.25mA(105V)
Inrush current	≤ 42A 0-peak at 240VAC on cold starting ≤ 100A 0-peak at 240VAC on hot starting

3.5 Power Saving

	H-sync	V-sync	Video	Power Consumption	Recovery Time	LED Indicator
ON Mode	On	On	Active	100W (Max.)	-	Green
Off Mode	Off	On	Blank	≤ 5W	3 - 5 sec	Orange
	On	Off	Blank			
	Off	Off	Blank			

3.6 Degaussing

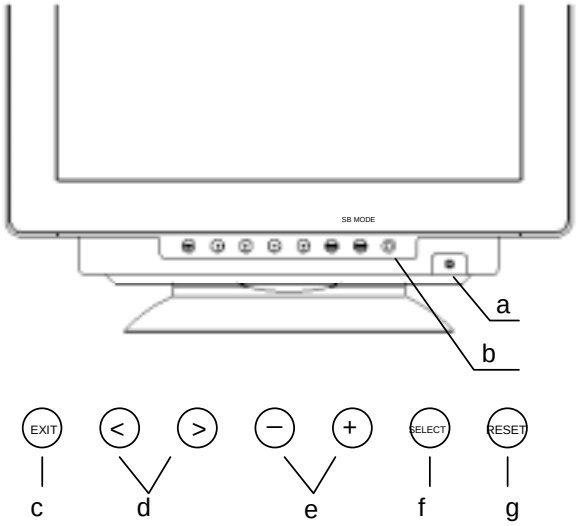
Auto Degaussing	The monitor has an automatic degaussing function which activates when the unit is turned on.
Manual Degaussing	This activates degaussing at the user's discretion after the unit is operating

The Monitor requires minimum of 15 minutes between manual degaussing operations.

4. Functions

4.1 Display Part

4.1.1 Front Controls



a : POWER SWITCH

b : POWER INDICATOR

c : EXIT BUTTON

d : ITEM SELECT BUTTONS

e : FUNCTION ADJUST BUTTONS

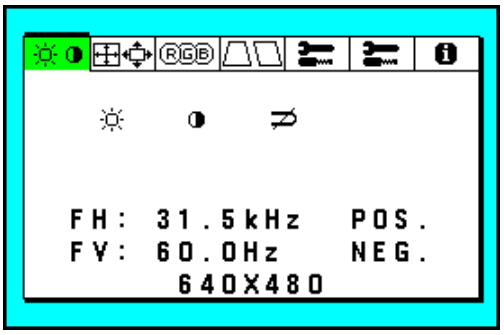
f : SELECT BUTTON

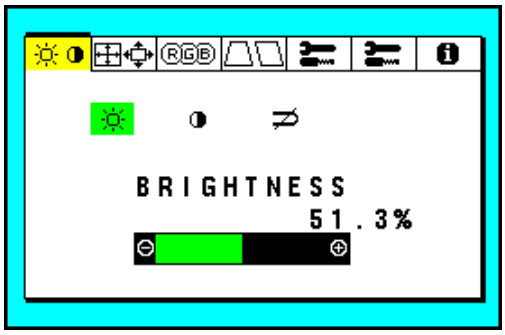
g : RESET BUTTON

4.1.2 OSM (On-Screen Manager) Function

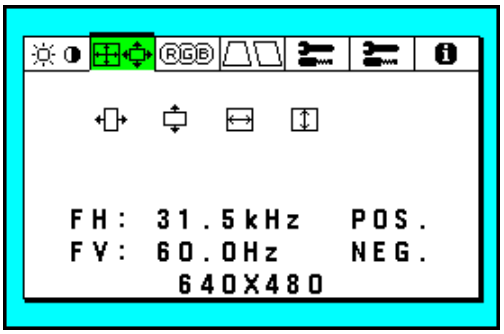
4.1.2.1 OSM Menu

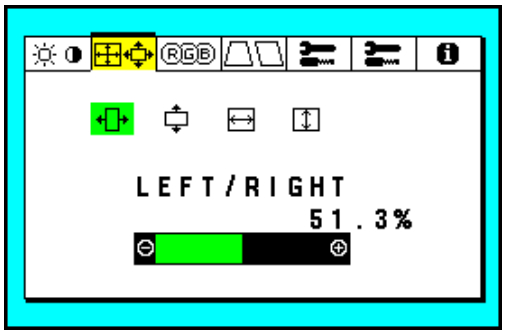
Tab 1



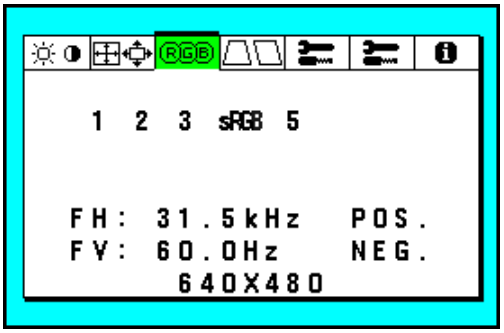


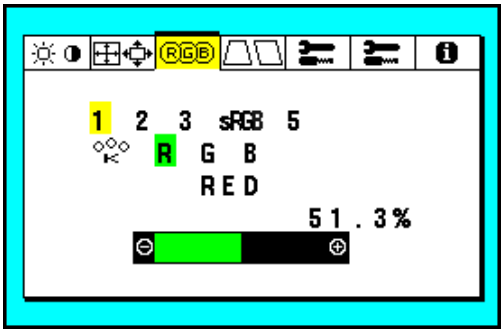
Tab 2



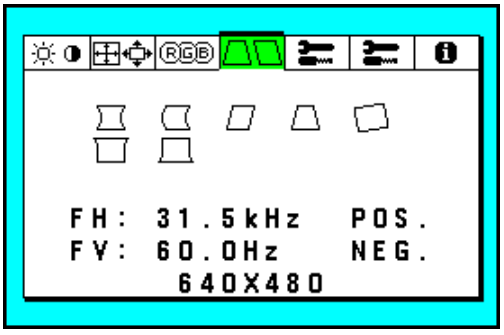


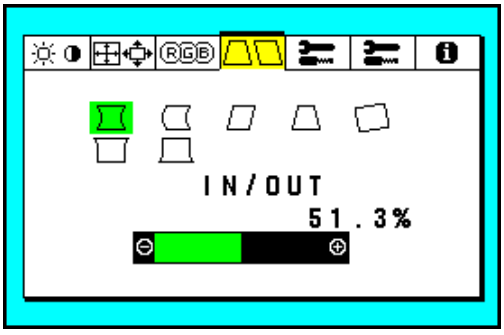
Tab 3



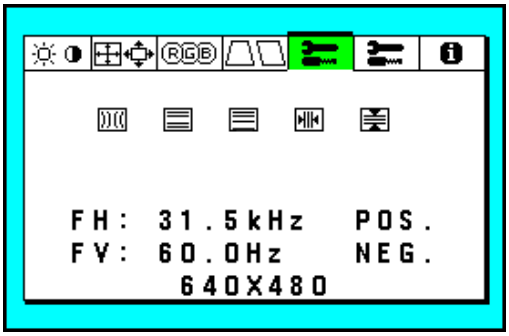


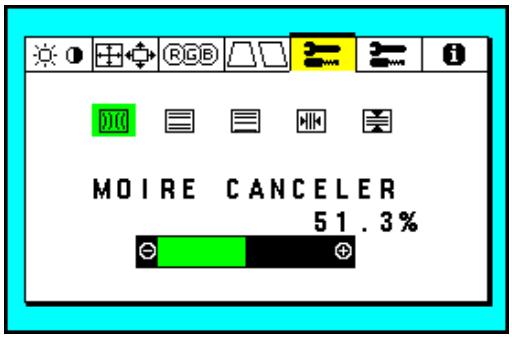
Tab 4



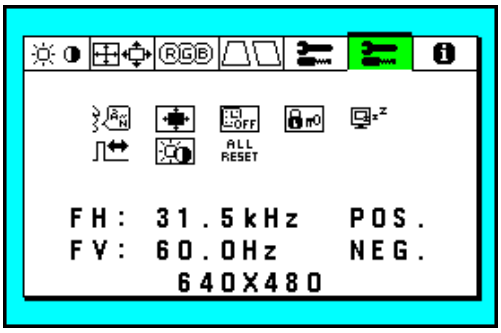


Tab 5

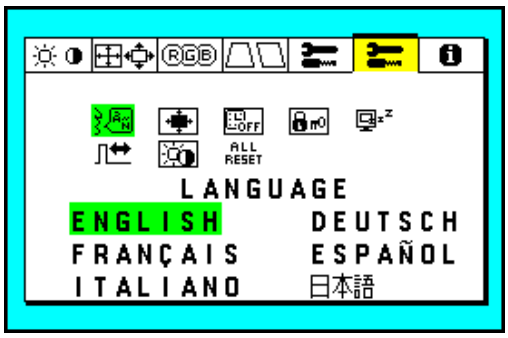




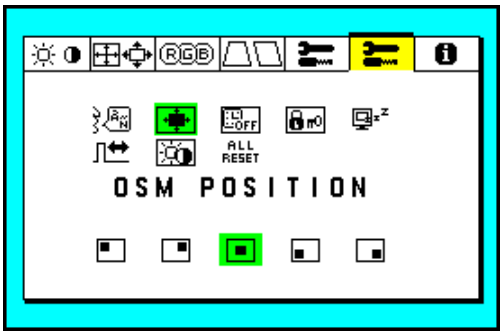
Tab 6



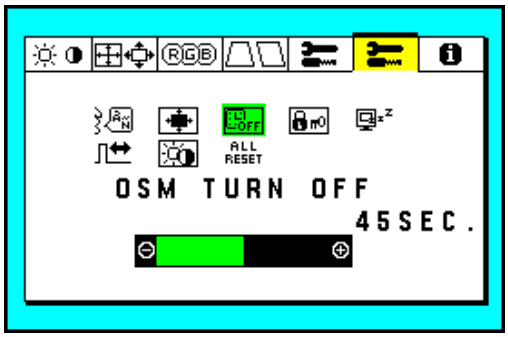
Tab 6 (Language)



Tab 6 (OSM Position)

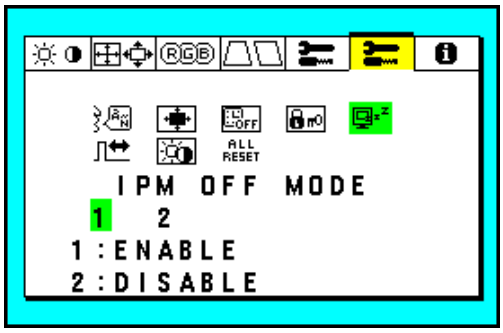


Tab 6 (OSM Turn off)

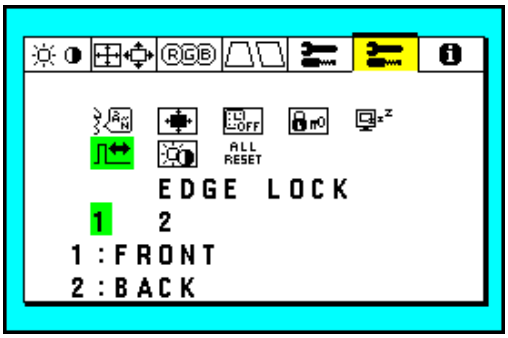


Tab 6 (OSM Lock)

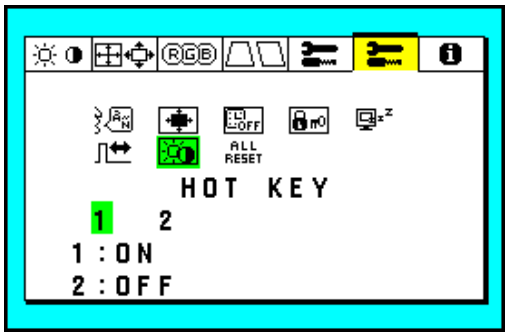
Tab 6 (IPM OFF Mode)



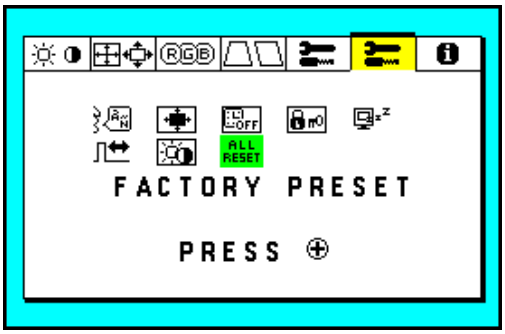
Tag6 (Edge Lock)



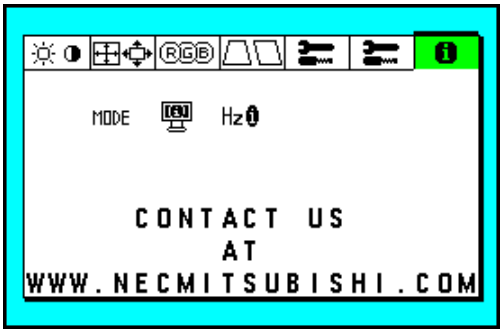
Tag6 (Hot Key)



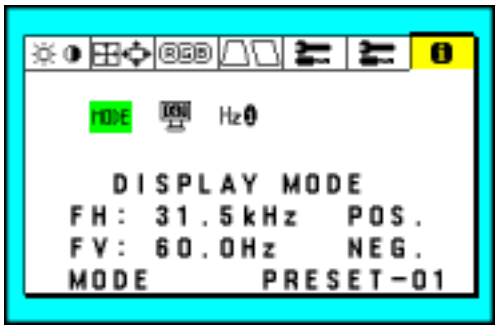
Tab 6 Factory Preset



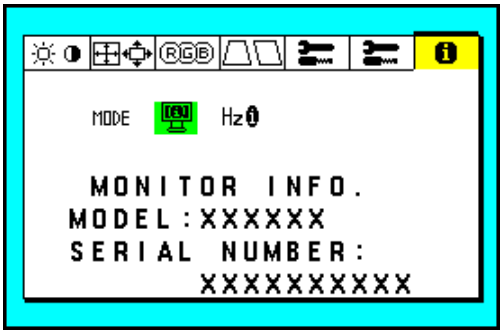
Tab 7 (URL indication)



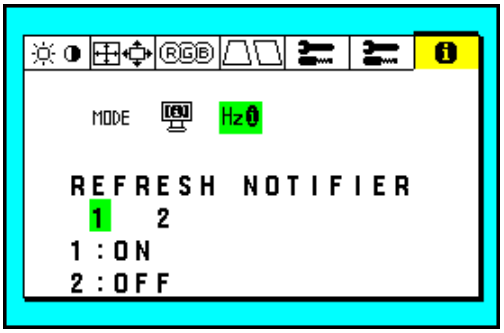
Tab 7 (Display Mode)



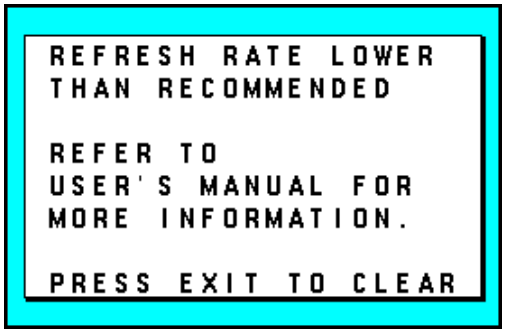
Tab 7 (Monitor info.)



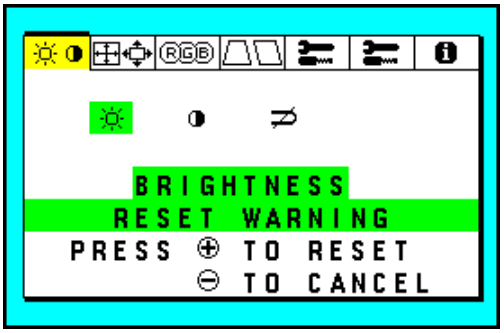
Tab 7 (Refresh Notifier)



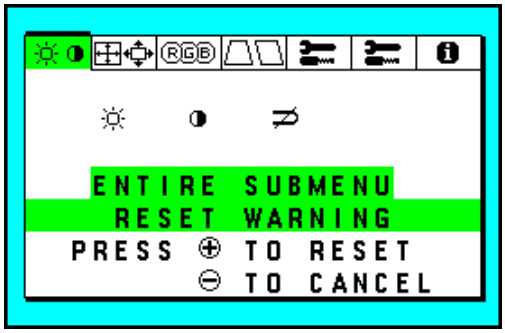
Refresh Notifier



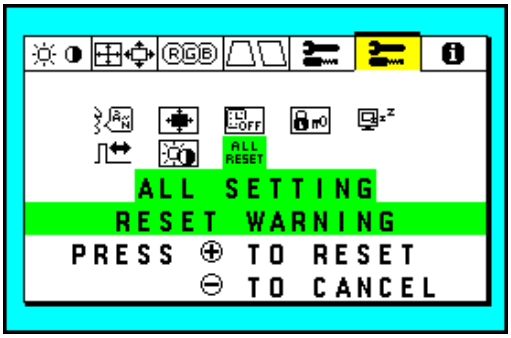
Item Reset



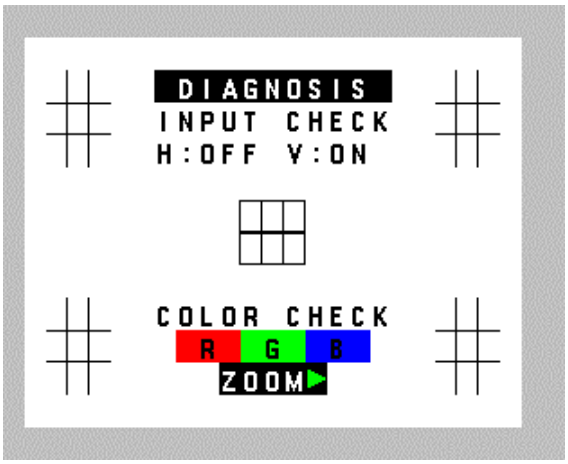
Tab Reset



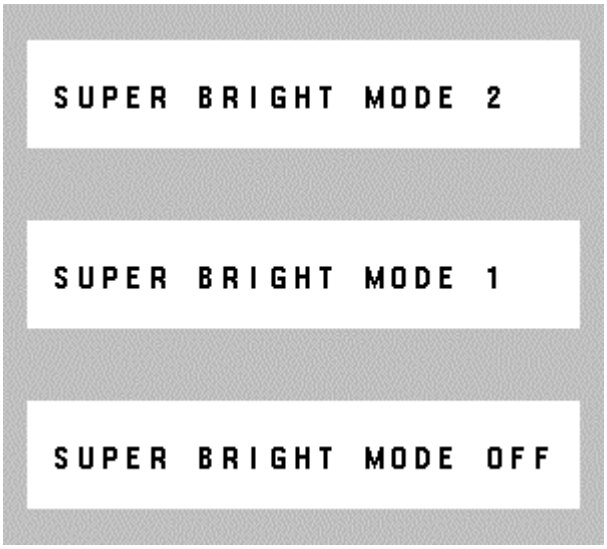
Factory Preset

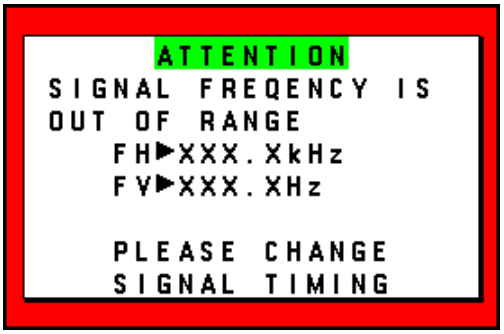


Others


DIAGNOSIS
INPUT CHECK
H:OFF V:ON
COLOR CHECK
R G B
ZOOM▶


POWER SAVE


SUPER BRIGHT MODE 2
SUPER BRIGHT MODE 1
SUPER BRIGHT MODE OFF


ATTENTION
SIGNAL FREQENCY IS
OUT OF RANGE
FH▶XXX.XkHz
FV▶XXX.XHz
PLEASE CHANGE
SIGNAL TIMING

4.1.2.2 OSM Item variability & Default position.

Tab	Item		Default	Item Reset	Push"+"	Push"-"
1	Brightness	0-100%	50% (Normal, SB mode2) Adjusted (SB mode1)	Yes	Up	Down
	Contrast	0-100%	100% (A, J) 85% (B, C, R)	Yes	Up	Down
	Degauss	-	-	-	Operate	-
2	Left/Right (H.Posi)	0-100%	Adjusted	Yes	Right	Left
	Down/Up (V.Posi)	0-100%	Adjusted	Yes	Up	Down
	Narrow/Wide (H.Size)	0-100%	Adjusted	Yes	Big	Small
	Short/Tall(V.Size)	0-100%	Adjusted	Yes	Big	Small
3	Color Number	1(9300K)	1(9300K)	Yes	-	-
		2(8200K)		Yes	-	-
		3(7500K)		Yes	-	-
		4(sRGB)		Yes	-	-
		5(5000K)		Yes	-	-
	Color Temperature	5000K-9300K	1:9300K 2:8200K 3:7500K 5:5000K	Yes	High	Low
	R/G/B gain control	0-100%	Adjusted	Yes	Up	Down
4	In/Out (Side_Pin)	0-100%	Adjusted	Yes		
	Left/Right(SidePinBalance)	0-100%	Adjusted	Yes		
	Tilt (Parallelogram)	0-100%	Adjusted	Yes		
	Align (Trapezoidal)	0-100%	Adjusted	Yes		
	Rotate	0-100%	Adjusted	Yes		
	Top(Top comer)	0-100%	Adjusted	Yes	Big	Small
	Bottom(Bottom comer)	0-100%	Adjusted	Yes	Big	Small
5	Moire Canceler (Hor)	0-100%	0%	Yes	Increase	Decrease
	Moire Canceler (Ver) (SM-CRT model only)	0-100%	0%	Yes	Increase	Decrease
	Linearity	0-100%	Adjusted	Yes		
	Linearity Balance	0-100%	Adjusted	Yes		
	Convergence(Hor.)	0-100%	Adjusted	Yes	Right(Red)	Left(Red)
	Convergence(Ver.)	0-100%	Adjusted	Yes	Up(Red)	Down(Red)
6	Language	English / German / French / Spanish / Italian / Japanese	English (A,B,C,R) Japanese (J)	No	-	-
	OSM Position	5 position	Center	Yes	Cursor move to +/-	
	OSM Turn off	5-120 sec.	45sec	Yes	Turn off Time shorter	Turn off Time longer
	OSM Lock	OFF/ON	OFF	No	Lock on: "Select" + "+"key	
	IPM OFF Mode	Enable/ Disable	1 (Enable)	No	Cursor move to +/-	
	EDGE LOCK	Front/Back	Back	Yes	Cursor move to +/-	
	HOT KEY	OFF/ON	OFF(A,J) ON(B,R)	No	Cursor move to +/-	
	Factory Preset	-	-	-	All Reset	

7	URL indication	Type “W” : WWW.NECMITSUBISHI.COM Type “J” : WWW.NMV.CO.JP			
	Display Mode	FH : Horizontal Frequency & Polarity FV : Vertical Frequency & Polarity			
	Monitor Info.	Model Name & Serial Number			
	Refresh Notifier	OFF/ON	OFF	-	Cursor move to +/-

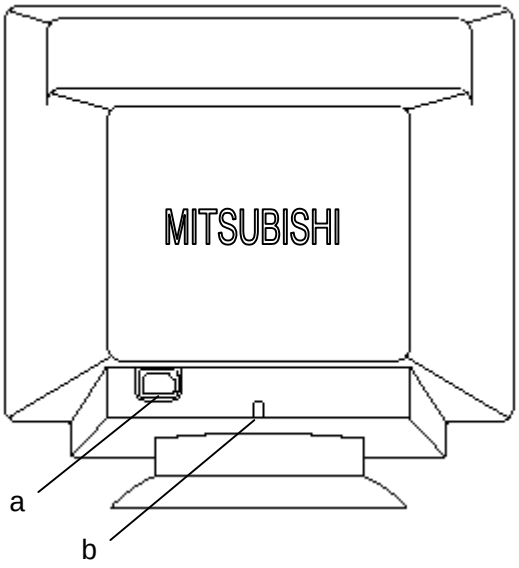
Default show factory shipping condition.

4.1.3 Back Panel

a: AC POWER CONNECTOR (3P IEC Plug)

b: SIGNAL INPUT CONNECTOR pig-tail type (D-SUB 15P)

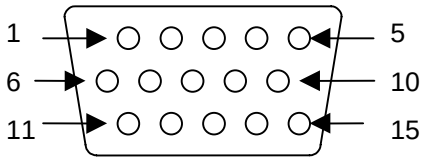
Signal Cable: Length:1800 ±50mm, Color: Hazegray (NEC#8508)



4.1.4 Connector Pin Assignment

1) Signal Input Connector (mini D-sub 15P pig-tail cable)

Pin	Signal
1	Red-video
2	Green-video
3	Blue-video
4	Gnd
5	DDC Gnd
6	Red Gnd
7	Green Gnd
8	Blue Gnd
9	DDC +5V
10	Sync Gnd
11	Gnd
12	Serial data
13	H-sync or Composite sync
14	V-sync(v-clock)
15	Serial clock



Signal Cable Connector

4.1.5 DDC (Display Data Channel) Functions

VESA DDC 2B (EDID data only) , (Support 9pin-5V)

VESA DDC/CI

4.1.6 Preset Timing

Factory-presets: 14 signals (See 19. Timing sheet of ADJUSTMENT PROCEDURES for detail timing parameters.)

(Signal No. 2 to No.8, No.10 to No.13, No.16 to No.18 are adjustment Signals.)

User-presets : 10 (F.I.F.O)

Preset Timing Discrimination

Horizontal Frequency	≥ 1kHz
Vertical Frequency	≥ 1Hz

* The monitor is able to discriminate input signals by at least one of above parameters.

5. Display Quality

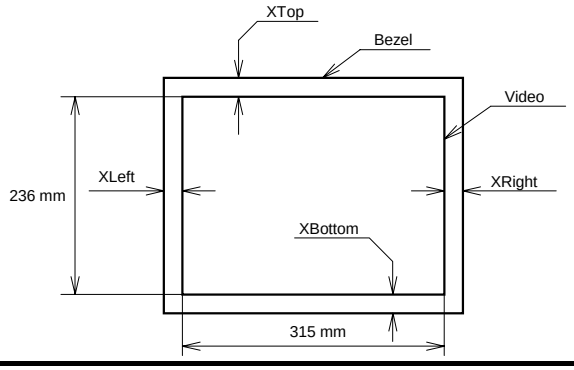
5.1 Basic Test Conditions

AC Voltage	120VAC 60Hz or 230VAC 50Hz
Video Signal	No.12, 1280 x 1024 (85Hz) (fH=91.1kHz fV=85Hz) Video signal 0.70 ±0.01Vp-p
Picture	Reverse cross hatch pattern
Warm Up	More than 30 min. with full white picture
Temperature	20 – 25 degree C
Relative Humidity	40 - 80 %
Magnetic Field	BH=0.000mT, BV=0.040mT (Northern Hemisphere) BH=0.000mT, BV=-0.040mT (Southern Hemisphere)
Contrast & Brightness	Contrast maximum and Brightness default position (Cut off)
Display Size	356 x 266 mm for 4:3 aspect ratio
Ambient light	200 ± 50 lx
Luminance Meter	Minolta CA100 or Equivalent

If no description, the test below are applied under the Basic Test Condition.

Unless specified, the monitor is set at the factory default setting.

5.2 Picture Size and Position

Adjustment Signal: Signal No.1 to 14	Size	Horizontal : 356mm ± 4.0 mm Vertical : 266mm ± 4.0 mm
	Position	Horizontal : | XLef t – Xright | ≤ 4.0mm Vertical : | XTop - XBottom | ≤ 4.0mm The picture should adjust underscan.
Figure		

5.2.1 Size and Position Control Ranges

Signal No.1 to 14 Size Control Ranges	The horizontal and vertical size control should be controllable to “FullScan” at the maximum position.
Signal No.1 to 14 Position Control Ranges	Image position can be controlled to the center position of the bezel opening.

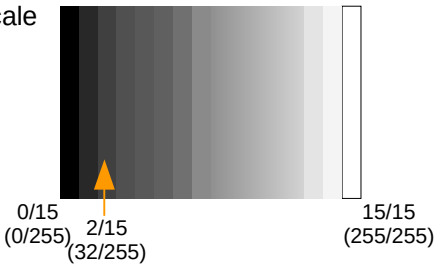
5.3 Luminance (Brightness)

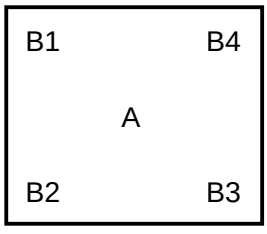
Signal No.13 (VESA1280*1024@85Hz)

<table>
<tr><td>5.3.1 Luminance
at CRT center
(Full white pattern)</td><td>Contrast : Max.
Brightness : default position (Cut off)
95cd/m^2 ≤ Full White ≤ 110 cd/m^2
(at 9300K + 8 M.P.C.D.)</td></tr>
<tr><td>5.3.2 Luminance
at CRT center
(Window pattern)
(H:33%,V:33%)</td><td>SB Mode : OFF
Contrast : Max.
Brightness : default position (Cut off)
120 cd/m^2 ≤ Window pattern ≤ 150 cd/m^2
(at 9300K + 8 M.P.C.D.)

SB Mode 1
Contrast : Max.
Brightness : default position
(Adjust to 0.8 cd/m^2 at 2/15 gray(32/255 gray)*1)
Window pattern = 200 cd/m^2 -0, +30 cd/m^2
(at 9300K + 8 M.P.C.D.)

SB Mode 2
Contrast : Max.
Brightness : default position (Cut off)
Window pattern = 240 cd/m^2 -0, +30 cd/m^2
(at 9300K + 8 M.P.C.D.)

*1 Gray scale
 
</td></tr>
<tr><td>5.3.3
Luminance Variation
(Full white pattern)

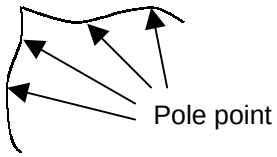
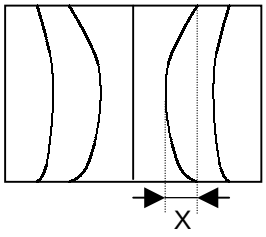
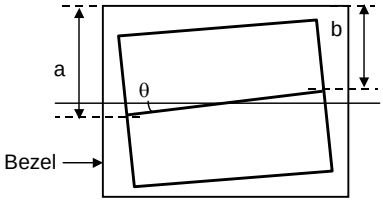
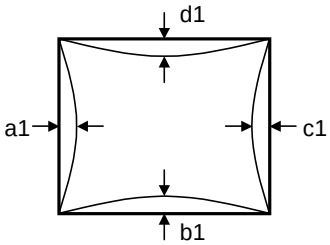
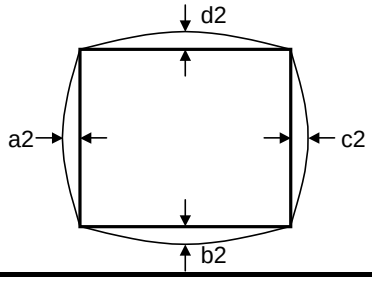
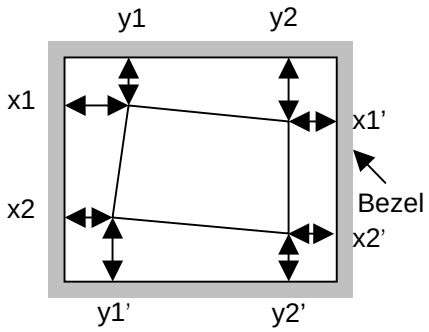
Contrast : MAX
Brightness :
Adjust to 100cd/m^2</td><td>$120\% \geq \frac{Bi}{A} \times 100 \geq 80\%$
 
</td></tr>
<tr><td>5.3.4
Back Raster
Luminance
(Full black pattern)</td><td>Brightness : default position (Cut off)
Raster ≤ 0.20 cd/m^2
Raster must not visible at minimum Brightness control.
Brightness : MAX position
2.0 cd/m^2 ≤ Raster ≤ 6.0 cd/m^2</td></tr>
</table>

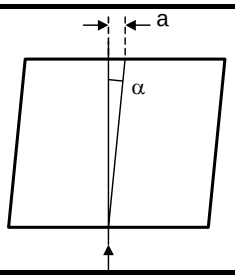
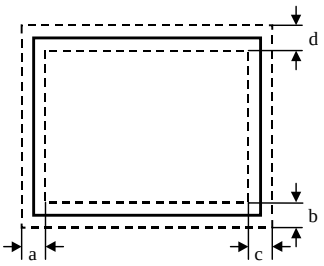
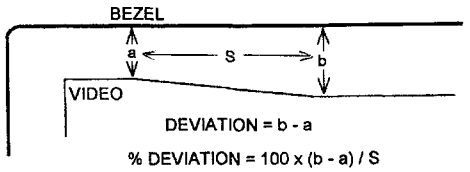
5.4 Color

Signal No.13 (VESA1280*1024@85Hz)

5.4.1Color Temperature (Window pattern) (H:33%,V:33%) Contrast : 100cd/m^2 Brightness : Cut off	Color-1: 9300K + 8 M.P.C.D. Xref=0.283 ± 0.015 Yref=0.297 ± 0.015
	Color-2: 8200K X=0.290 ± 0.015 Y=0.313 ± 0.015
	Color-3: 7500K X=0.300 ± 0.015 Y=0.315 ± 0.015
	Color-4: sRGB (Luminance: 80 +20/-10 cd/m^2) X=0.313 ± 0.015 Y=0.329 ± 0.015
	Color-5: 5000K X=0.345 ± 0.015 Y=0.359 ± 0.015
5.4.2 White Uniformity (Full white pattern) Contrast : 100cd/m^2 Brightness : Cut off	White color temperature (x, y) at B1,B2,B3,B4 is as follows. A(x ref, y ref) x ≤ x ref ± 0.015 y ≤ y ref ± 0.015 B1 B4 A B2 B3
5.4.3 Color Tracking of Contrast control (Window pattern) (H:33%,V:33%)	X = Xref ± 0.015 Y = Yref ± 0.015 Color setting : 9300K Contrast Control: from 20cd/m^2 to MAX Brightness : Cut off
5.4.4 Color Tracking of brightness control (Window pattern) (H:33%,V:33%)	X = Xref ± 0.015 Y = Yref ± 0.015 Color setting : 9300K Contrast Control: 20cd/m^2 Brightness : from Man. to Mix.
5.4.5 sRGB color quality (Full white pattern)	RED : x=0.640 +0.020/-0.035 Y=0.330 +0.030/-0.020 Green: x=0.300 +0.020/-0.035 Y=0.600 +0.020/-0.020 Blue: x=0.150 +0.015/-0.015 Y=0.060 +0.030/-0.015 White: x(sRGB)=0.3127 ± 0.020 y(sRGB)=0.3290 ± 0.020 |x(sRGB)-y(sRGB)|< 0.020 Brightness:Y=80 +20/-10 cd/m^2 Gamma: S-g=2.2 ± 0.2

5.5 Geometric Distortion

5.5.1 Partial Distortion The number of pole point each side All Preset Signals Top and Bottom side: Less than 3 point Left and right side: Less than 2point	
5.5.2 Inner Distortion All Preset Signals With Crosshatch $f_h \geq 38kHz$: $x \leq 0.5$ mm $f_h < 38kHz$: $x \leq 1.0$ mm	
5.5.3 Raster Rotation/Tilt All Preset Signals $\lvert a - b \rvert \leq 1.0$ mm or -0.5 degree $\leq \theta \leq \pm 0.5$ degree	
5.5.4 Pincushion All Preset Signals Top : d1 ≤ 1.5 mm Bottom : b1 ≤ 1.5 mm |d1-b1| ≤ 1.5 mm Left side : a1 ≤ 1.5 mm Right side : c1 ≤ 1.5 mm |a1-c1| ≤ 1.5 mm	
5.5.5 Barrel All Preset Signals Top : d2 ≤ 1.5mm Bottom : b2 ≤ 1.5 mm Left side : a2 ≤ 1.5 mm Right side : c2 ≤ 1.5 mm	
5.5.6 Trapezoid $\Delta y \leq 1.5$ mm $\Delta x \leq 1.5$ mm $\Delta x = \lvert x1 - x2 \rvert$ $\Delta y = \lvert y1 - y2 \rvert$	

5.5.7. Parallelogram All Preset Signals -0.8mm ≤ a ≤ +0.8mm or -0.2 degree ≤ α ≤ +0.2 degree	
5.5.8 Overall Distortion All Preset Signals Top : d ≤ 1.5mm Bottom : b ≤ 1.5mm Left side : a ≤ 1.5mm Right side : c ≤ 1.5mm	
5.5.9 Video Boundary Geometry All Preset Signals S ≤ 50mm : b-a ≤ 0.5 mm S > 50mm : b-a ≤ 0.01 x S mm	

5.6 Linearity

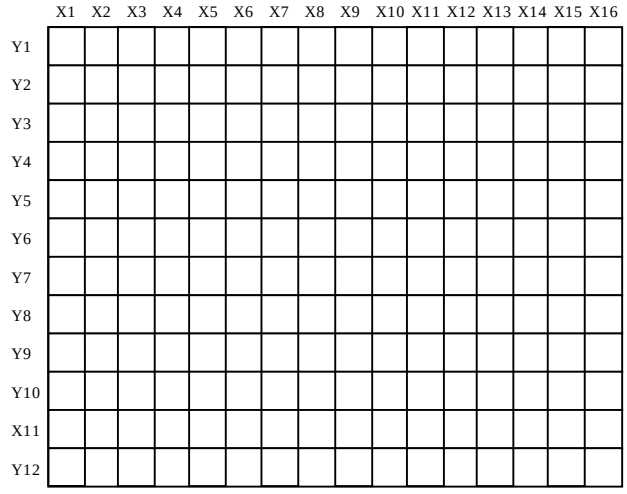
Linearity	H: ≤ 15%(31-43k) , ≤ 12%(43-55k) , ≤ 10%(55k-) , adjacent: ≤ 6%
	V: ≤ 10% , adjacent: ≤ 5%

* at preset timings

* With Green-Crosshatch (17 lines horizontally by 13 lines vertically) applied.

* The formula used to calculate linearity is:

$$\frac{Xmax - Xmin}{(Xmax + Xmin)/2} \times 100\% \qquad \frac{Ymax - Ymin}{(Ymax + Ymin)/2} \times 100\%$$



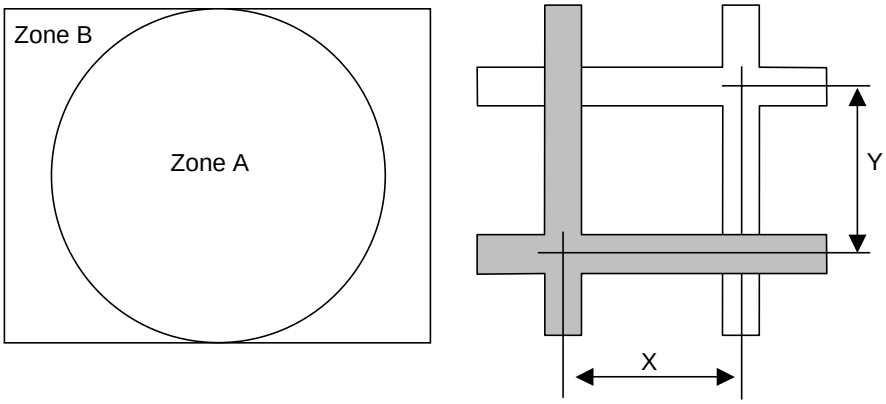
X1=X2=X3=…=X16

Y1=Y2=Y2=…=Y12

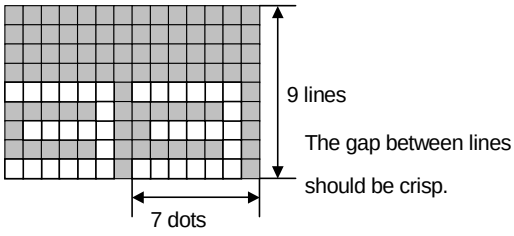
5.7 Misconvergence

Misconvergence	Zone A: X, Y ≤ 0.25 mm within the 236 mm diameter circle
	Zone B: X, Y ≤ 0.3 mm within 315 mm x 236 mm

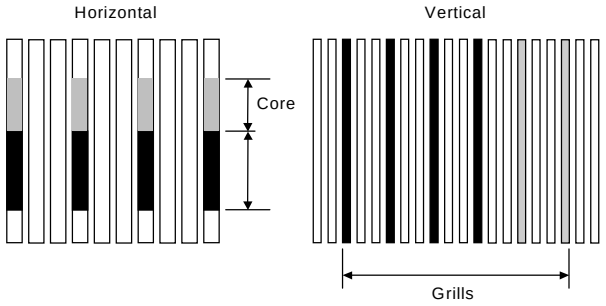
* With White Crosshatch (17 lines horizontally by 13 lines vertically) applied.
* Zone A is a circular area with 236mm diameter at the center.
* Zone B is a rectangular area (315mm x 236mm) outside of the Zone A.
* Use worst case horizontal/vertical misconvergence between any two primary colors.



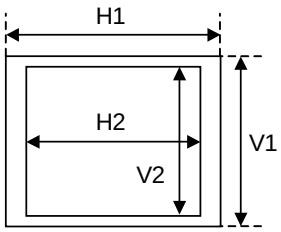
5.8 Focus

Focus Signal No.13 Contrast : Max. Brightness: Cut off	Resolution: 1600 x 1280 (75Hz) Character: 7 x 9 pixel "∃" Color : White Judgment: "∃" character are readable with clearly at the whole screen.  Use the video card "Matrox G550" and receive Microsoft Excel "Work sheet" (1280*1024(85)). Make sure that there is no double line for horizontal.

5.9 Halo

Halo Signal No.13 Contrast : Max. Brightness: Preset	Character: Color: Crosshatch Judgment: Each color (Red, Blue) line do not form halos. Vertical lines : halos + core are less than 7 grills(R), 7 grills(B) Horizontal lines : core : halos = 1 : less than 1.5 

5.10 Raster Regulation

Raster Size Regulation All Preset Signals (Full White pattern)	Judgment: 1.The total horizontal and vertical size of the picture shall not change more than 1.0mm, when displaying a flat field, and adjusting the brightness from 30 to 110 cd/$m^{2.}$ 2. The picture size should not vary 1% in the horizontal and vertical direction by Input voltage change in 90-132VAC and 198-264VAC. Size Change Spec. $\frac{\lvert H1-H2\rvert}{H2} \le 1\%$ $\frac{\lvert V1-V2\rvert}{V2} \le 1\%$ 
Dynamic Raster Regulation All preset signal	Pattern  White window V: 33% H: 100% Judgment $f_h \ge 46kHz$: $\lvert A-B\rvert \le 0.5mm$ $f_h < 46kHz$: $\lvert A-B\rvert \le 1.0mm$

6. CRT Limits of Screen and Faceplate Blemish

6.1 CRT Face plate defect

6.1.1 Inspection condition

1) Adjust each gun to provide approximately 34cd/m2 of 9300K+27M.P.C.D. (or 6550K+727M.P.C.D.) light at the center of the screen. Ambient light level at the tube face should be approximately 10 luxes.

2) When the tube is not operating, the screen should be viewed under high-level source incandescent light of approximately 200 luxes measured at he faceplate surface.

3) The screen should be viewed distance of 60 cm for both cases.

4) View white and R, G, B individual color, and faceplate appearances.

6.1.2 Quality zone

The screen quality area is divided into the following two quality zones.

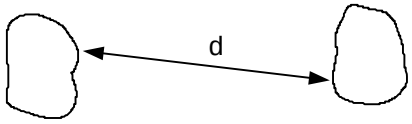
Zone A : Inside of the central rectangle of horizontal 360mm by vertical 270mm on the screen.

Zone B : Outside of this rectangle on the screen.

6.1.3 Screen and Faceplate Blemish Acceptance Criteria

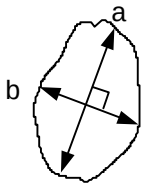
1) Screen blemish

a. Minimum separation of defects : d



b. Average diameter of defects :

Turn of (a + b) / 2 (a: length, b: width)



c. Acceptance criteria for screen blemishes

Black spot, missing aperture

Average diameter (mm)	A	B	A + B	Minimum distance
0.51 ~	0	0	0	-
0.31 ~ 0.50	0	0	0	-
0.15 ~ 0.30	6 (note 1)	6 (note 1)	10 (note 1)	10mm

Discoloration, stain, Missing phosphor, etc.

Average diameter (mm)	A	B	A + B	Minimum distance
0.51 ~ 0.75	0	1	-	20mm
00.15 ~ 0.50	2	3	-	20mm

Note 1: Applied for each color independently.

2) Face plate defect

a. Blisters, opaque spots and elongated closed blisters

Average diameter (*1) (mm)	Allowable number (pcs)			Minimum Separation (mm)
	Zone A	Zone B	Total	
0.76	0	0	0	30
0.51 ~ 0.75	0	1	1	
0.26 ~ 0.50	2	3	5	
0.11 ~ 0.25	-	-	-	(*2)

Note (*1) Mean diameter shall be either one of the following values, which is smaller.

(a+b)/2 or a/20+2b (a: length, b: width)

Note (*2) Less than 5pcs. In area of 10mm diameter.

b. Flaw

Flaw Width (mm)	Specification Length
0.16 ~	Rejected
0.11 ~ 0.15	Less than 13mm
0.06 ~ 0.10	Less than 26mm
~ 0.05	Unlimited

c. Other glass defect

Flaw, crack and chip must be visually noticeable.

See the limitation sample regarding iron rust and striae, etc.

6.2 AR-film Blemishes

6.2.1 Inspection conditions

1) Plate a CRT on the test table and illuminate the CRT screen surface by a fluorescent lamp.

2) The luminance on the CRT surface shall be set between 1000 and 1500 luxes.

3) Those not recognized with the naked eye at the viewing distance of 40cm from the CRT surface are not considered to be defects.

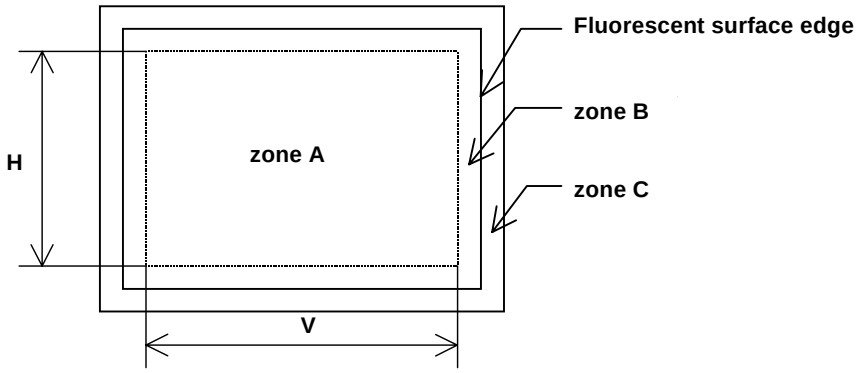
6.2.2 Quality zone

The screen is divided into following 3 zones.

Zone A: Inside of the central rectangle of horizontal 360mm by 270mm on the screen.

Zone B: The area between outside the rectangle and the edge of the phosphor screen.

Zone C: The area outside the edge of the phosphor screen.



6.2.3 Acceptance Criteria for K Coating Blemishes

a. Scratch (Glass and coating)

Width (mm)	Specification Length (Zone A + Zone B)
0.16 ~	Rejected
0.11 ~ 0.15	Maximum length 13mm
0.06 ~ 0.10	Maximum length 26mm
~ 0.05	Unlimited

Note 1: Even though width of scratch is more than 0.16mm, regard scratch whose contrast is weak extremely as stain and apply standard of 6.2.3 a.

Note 2: Do not recognize flaws which injures goods prices though it is not especially stipulated as for zone C.

b. Opaque flaws (ex. Stain) and coating peeling

Do not apply the following standard to zone C.

Classify flaws by contrast and judge it by size every the contrast.

Definition of contrast

High contrast : The foreign substance which shuts off light from fluorescence surface.

Middle contrast : A semitransparent foreign substance and stain.
(ex. coating material which has been changed)

Low contrast : Stain and dust which do not reflect light from fluorescence surface and can be distinguished by its appearance.

Note : Ignore the light spot with no interference color.

(However, Non of them with its size in excess of 3.75 mm is acceptable, that damages the product quality.)

Standards

Average diameter classified by a contrast (Note 1) (mm)			Allowable number		Allowable Length (mm)
High contrast	Middle contrast	Low contrast	Zone A	Zone B	
~ 0.10	~ 0.20	~ 0.50	Ignore	Ignore	-
0.11 ~ 0.25	0.21 ~ 0.50	0.51 ~ 1.25	2 [4]	4 [5]	20
0.26 ~ 0.50	0.51 ~ 1.00	1.26 ~ 2.50	1 [4]	2 [4]	40
0.51 ~ 0.75	1.01 ~ 1.50	2.51 ~ 3.75	0 [4]	1 [4]	80

Values inside [ ] represent acceptable number in low contrast.

See the table in the next page for total defect number, which is acceptable in low contrast.

Note 1: Convert (a+b)/2 or a/20 + 2b small value into average diameter. (a: length, b: width)

total number of a low contrast flaws	Zone A	Zone B
Standard classified by zones	6	8
Total (zone A + zone B)	10	

Note 1: Acceptable interval shall be larger one in the case that defects have different interval.

Note 2: There is no standard regarding zone C. Therefore, no defect is accepted that may deteriorate the value of products. Defect level by consultation. Discuss is necessary.

Note 3: Tolerance of defect size is approx. 10%.

6.2.4 Irregularity of reflected color

Irregularity of reflected color that is easily visible should not be recognized. (K coat)

Irregularity of reflected color that influences Raster easily should not be recognized. (AR Film)

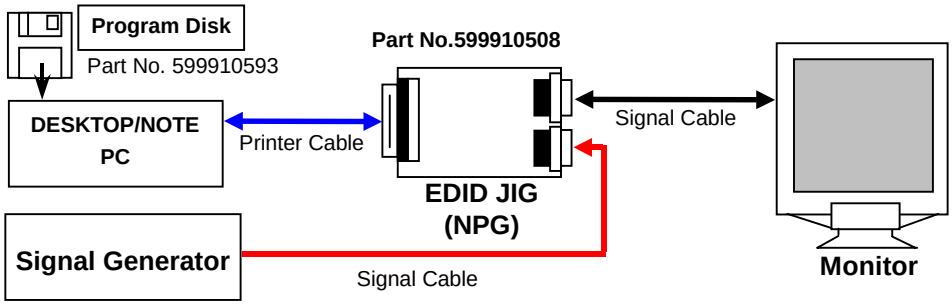
6.2.5 Dirt, cloudiness, no uniformity and other defects

The defects shall not be recognized when the green raster is produced over the screen. If necessary, the limit sample is provided.

7. Inspection of PLUG & PLAY Communication and OSM "MONITOR INFORMATION" for Model Name/ Serial Number

7.1 A System Construction

This system should be connected as shown below.



7.2 Input Signal

Horizontal sync frequency: Not specified.

Vertical sync frequency: Not specified.

7.3 Programs Required

NPGV233.EXE
DP93SB.BAT
DP93SB.TXT

7.4 Inspection Procedures

a. Factory Mode: power on + '+' key + '–' key.

b. Copy the above-mentioned programs in an adequate directory.

c. Set up the MO-DOS mode. (DOS Prompt of Windows95/98 is also acceptable.)

d. Execute the DP93SB.BAT from the command line.

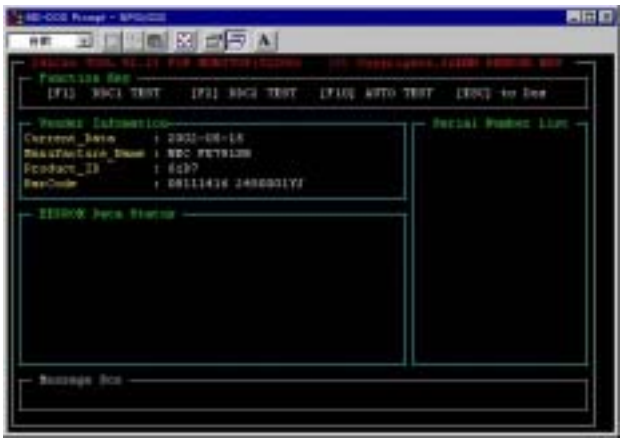
e. "MONITOR INFO." of the OSM is indicated, and a model name and a serial number are confirmed.
When the model name and the serial number are not written in or it differs, h or later is performed.

f. Press the F2 key to start the inspection of DDC2B.
As a result of inspection, when EDID data is not written in or it differs, h or later is performed.

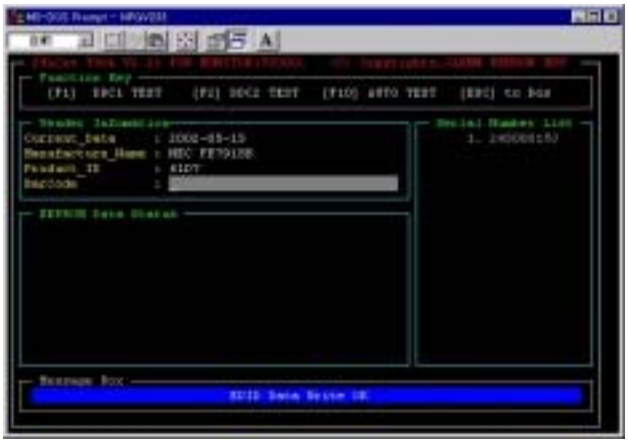
g. Check the serial number of the set and enter an input of the following code from the keyboard.

08109710 Serial Number (Model Code + 1 Space + Serial No.)

Example: 08109716 2450001YB



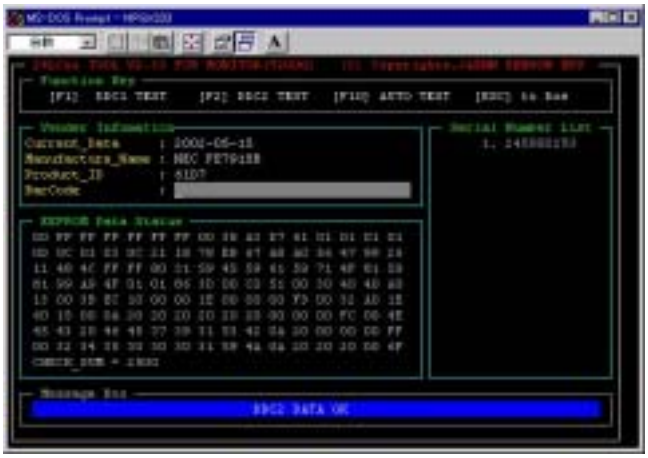
h. Press the Enter key. Then, the EDID data, OSM model name, and the serial number begin to be written in.



i. Display “MONITOR INFO.” of the OSM, and confirm that the model name and serial number have been correctly written.

j. Press the F2 key to start the inspection of DDC2B.

After the completion of inspection, the contents of EDID are displayed. If an error should occur, the related error message will be displayed in the bottom area of the screen. Refer to Paragraph 7.5 in regard to the meaning of this error message.



7.5 Error Messages

- IIC Communication Error

  Communication disabled

- EDID Check Sum Error

  Entry of false EDID

- DDC2 Does Not Find Head Data

  DDC2 Communication disabled

7.6 EDID Data File

The EDID data file text is shown below. When you write or inspect EDID for this monitor, the following table can be used.

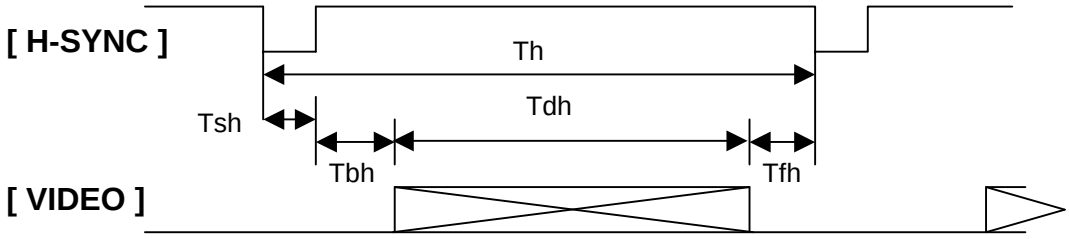
File name : DP93SB.TXT

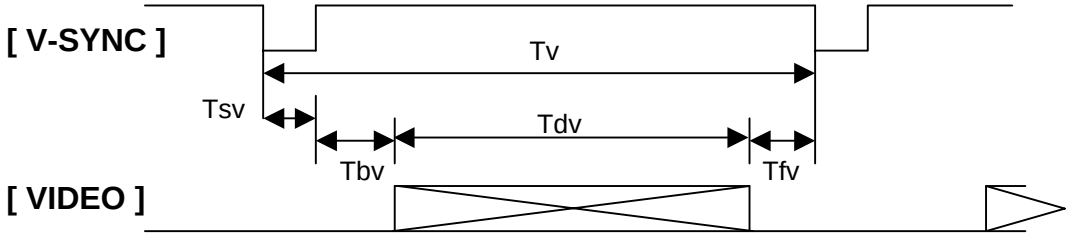
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**A**	**B**	**C**	**D**	**E**	**F**
00	00	FF	FF	FF	FF	FF	FF	00	34	AC	25	46	01	01	01	01
10	04 *1	0C *2	01	03	0C	25	1B	78	EB	7A	68	A0	56	47	99	26
20	12	48	4C	FF	FF	80	31	59	45	59	61	59	71	4F	81	59
30	81	99	A9	4F	C1	45	86	3D	00	C0	51	00	30	40	40	A0
40	13	00	64	0A	11	00	00	1E	00	00	00	FD	00	32	A0	1E
50	60	17	00	0A	20	20	20	20	20	20	00	00	00	FC	00	44
60	50	4C	55	53	39	33	53	42	0A	20	20	20	00	00	00	FF
70	00	32 *3	32 *3	30 *3	30 *3	30 *3	30 *3	31 *3	59 *3	41 *3	0A *3	20 *3	20 *3	20 *3	00	15 *4

Table 7.6 Data list

*1 : address 10h	Manufactured month x 4
*2 : address 11h	Manufactured year - 1990
*3 : address 71h ~ 7Dh	Input serial number (ASCII code)
	Add 0Ah after serial number.
	Add 20th remaining address.
*4 : address 7Fh	Checksum. The sum of entire 128byte shall be equal to 00h.

Appendix 1 Preset Timing Chart





Preset Signal

No	Signal Name	Clock (MHz)	Fh (kHz)	Fv (Hz)	Th (uSec) (dot)	Tsh (uSec) (dot)	Tfh (uSec) (dot)	Tbh (uSec) (dot)	Tdh (uSec) (dot)	Tv (mSec) (line)	Tsv (mSec) (line)	Tfv (mSec) (line)	Tbv (mSec) (line)	Tdv (mSec) (line)	Hs	Vs
1	VGA 720*400(70)	28.322	31.469	70.087	31.777 (900)	3.813 (108)	0.636 (18)	1.907 (54)	25.422 (720)	14.268 (449)	0.064 (2)	0.381 (12)	1.112 (35)	12.711 (400)	-	+
2	VGA 640*480(60)	25.175	31.469	59.940	31.778 (800)	3.813 (96)	0.636 (16)	1.907 (48)	25.422 (640)	16.683 (525)	0.064 (2)	0.318 (10)	1.049 (33)	15.253 (480)	-	-
3	Mac640*480	30.240	35.000	66.667	28.571 (864)	2.116 (64)	2.116 (64)	3.175 (96)	21.164 (640)	15.000 (525)	0.086 (3)	0.086 (3)	1.114 (39)	13.714 (480)	-	-
4	VESA 640*480(75)	31.500	37.500	75.000	26.667 (840)	2.032 (64)	0.508 (16)	3.810 (120)	20.317 (640)	13.333 (500)	0.080 (3)	0.027 (1)	0.427 (16)	12.800 (480)	-	-
5	VESA 800*600(75)	49.500	46.875	75.000	21.333 (1056)	1.616 (80)	0.323 (16)	3.232 (160)	16.162 (800)	13.333 (625)	0.064 (3)	0.021 (1)	0.448 (21)	12.800 (600)	+	+
6	VESA 640*480(85)	36.000	43.269	85.008	23.111 (832)	1.556 (56)	1.556 (56)	2.222 (80)	17.778 (640)	11.764 (509)	0.069 (3)	0.023 (1)	0.578 (25)	11.093 (480)	-	-
7	MAC832*624	57.283	49.725	74.550	20.111 (1152)	1.117 (64)	0.559 (32)	3.910 (224)	14.524 (832)	13.414 (667)	0.060 (3)	0.020 (1)	0.784 (39)	12.549 (624)	-	-
8	VESA 800*600(85)	56.250	53.674	85.061	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)	+	+
9	VESA 1024*768(75)	78.750	60.023	75.029	16.660 (1312)	1.219 (96)	0.203 (16)	2.235 (176)	13.003 (1024)	13.328 (800)	0.050 (3)	0.017 (1)	0.466 (28)	12.795 (768)	+	+
10	Mac1152*870	100.00	68.681	75.062	14.560 (1456)	1.280 (128)	0.320 (32)	1.440 (144)	11.520 (1152)	13.322 (915)	0.044 (3)	0.044 (3)	0.568 (39)	12.667 (870)	-	-
11	VESA 1024*768(85)	94.500	68.677	84.997	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)	+	+
12	VESA 1280*1024(75)	135.00	79.976	75.025	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)	+	+
13	VESA 1280*1024(85)	157.50	91.146	85.024	10.970 (1728)	1.016 (160)	0.406 (64)	1.420 (224)	8.130 (1280)	11.761 (1072)	0.033 (3)	0.011 (1)	0.483 (44)	11.761 (1024)	+	+
14	VESA 1600*1200(75)	202.50	93.750	75.000	10.667 (2160)	0.948 (192)	0.306 (64)	1.501 (304)	7.901 (1600)	13.330 (1250)	0.032 (3)	0.011 (1)	0.491 (46)	12.800 (1200)	+	+

TROUBLE SHOOTING

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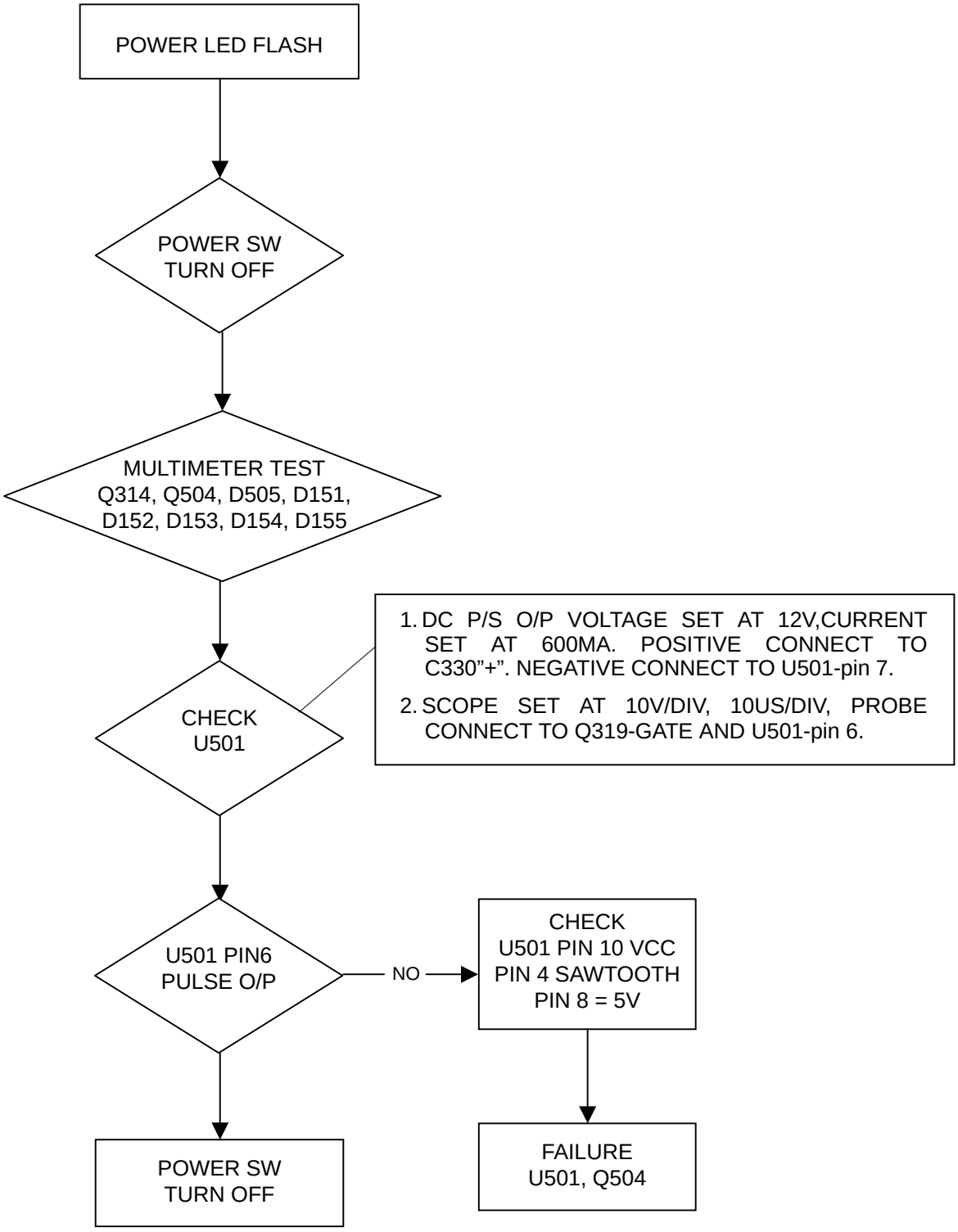
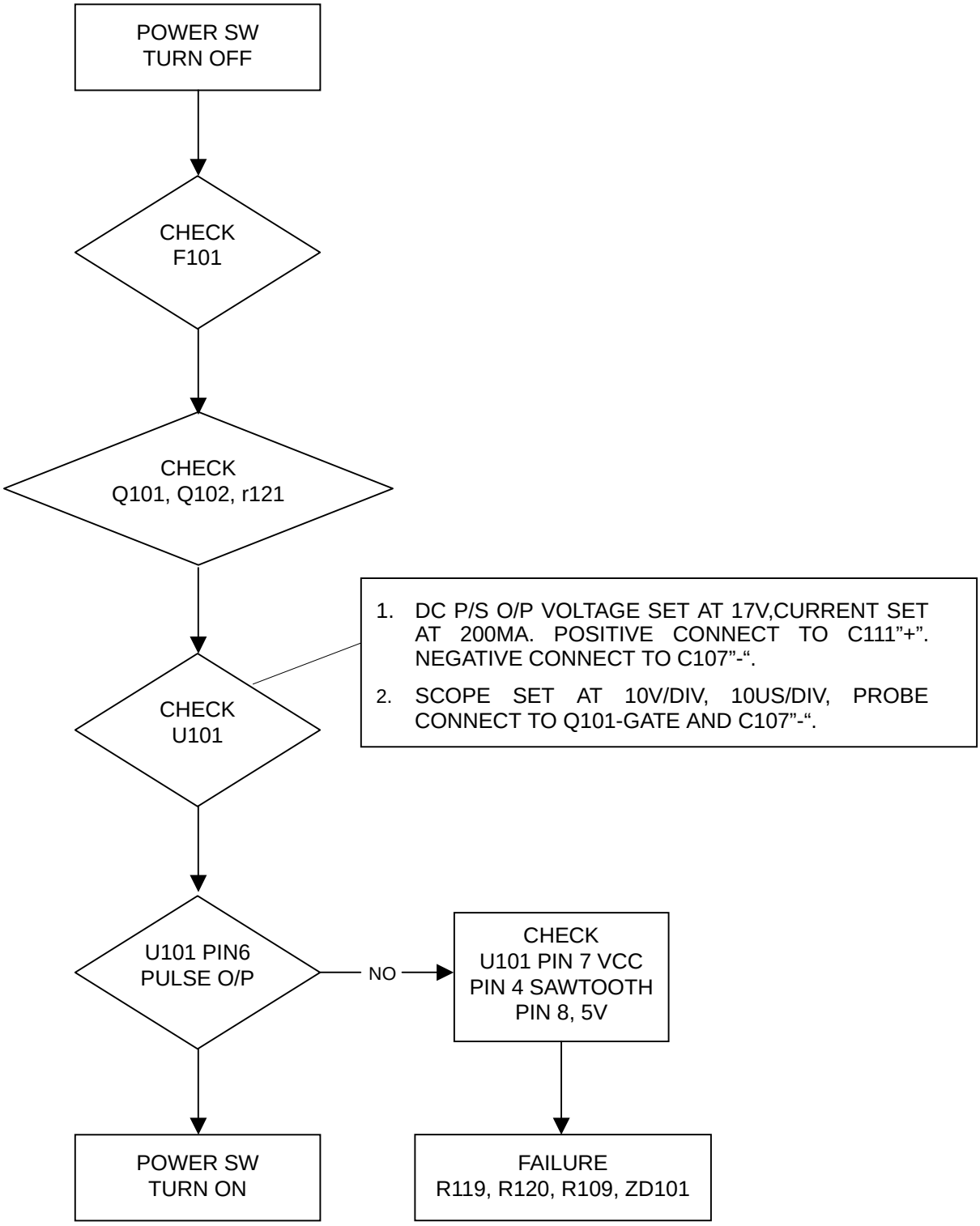
Refer to User's Manual trouble shooting section before using this chart.

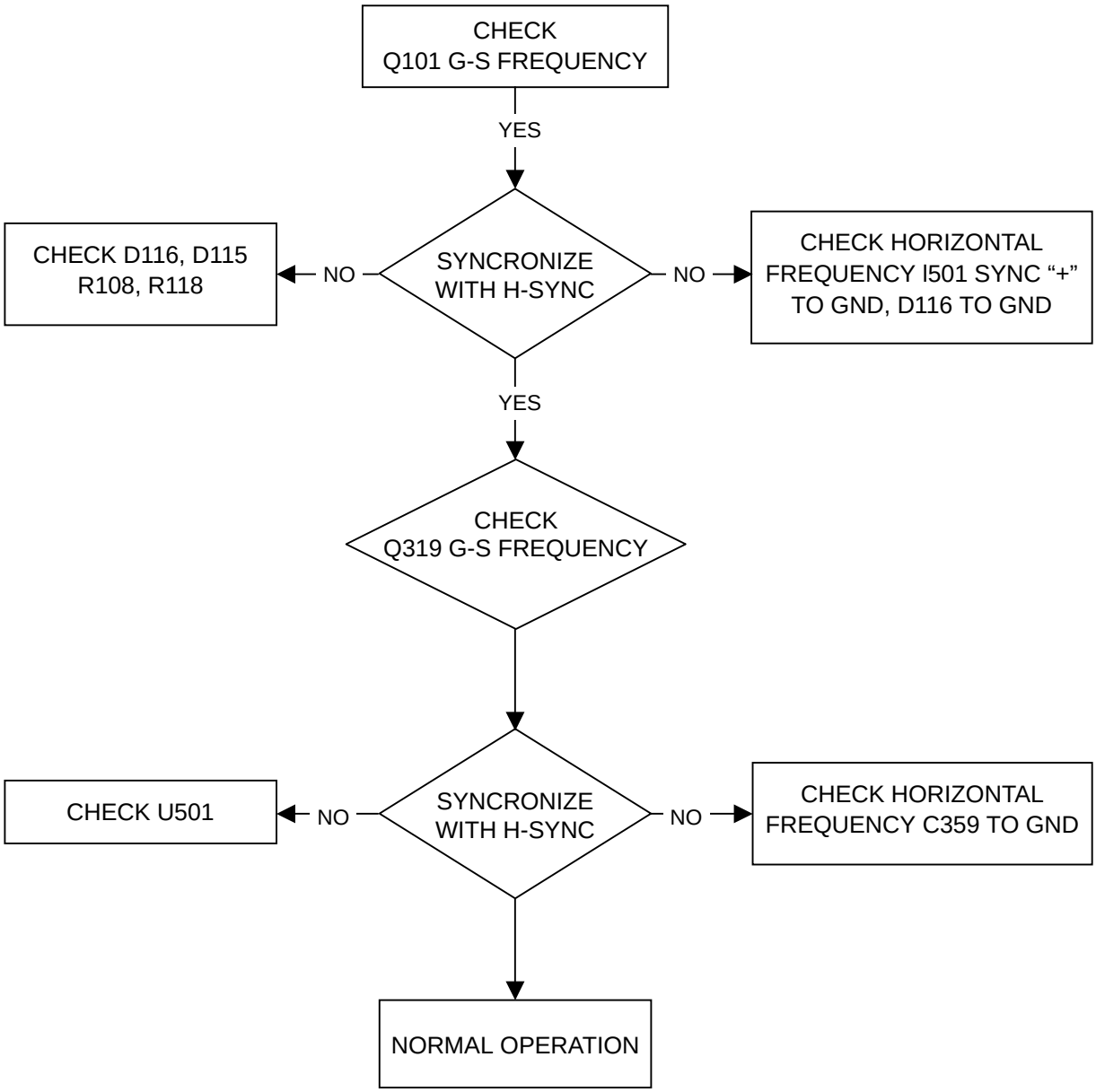
1. NO OPERATION, POWER LED FLASH



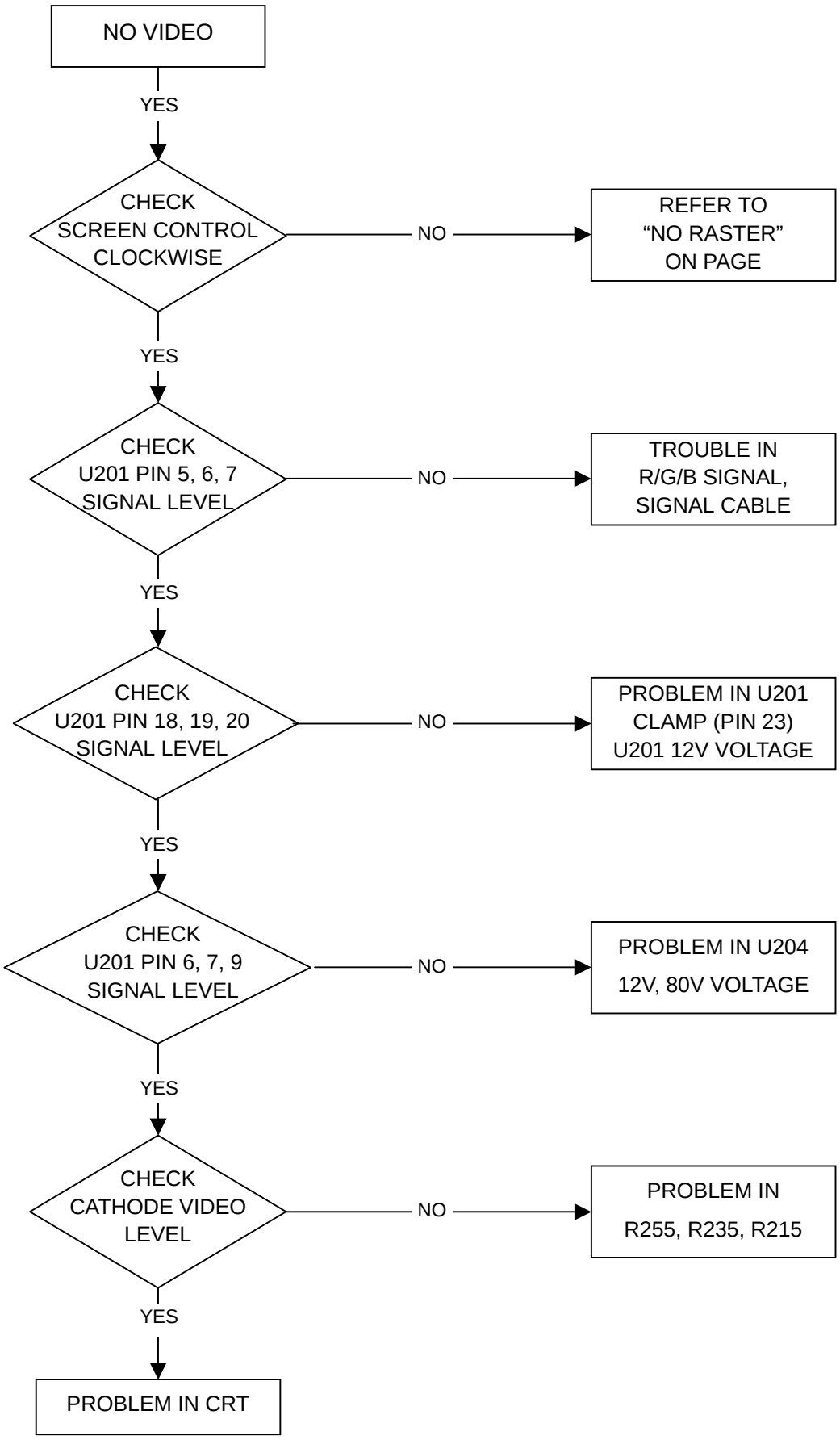
2. NO OPERATION, POWER LED OFF



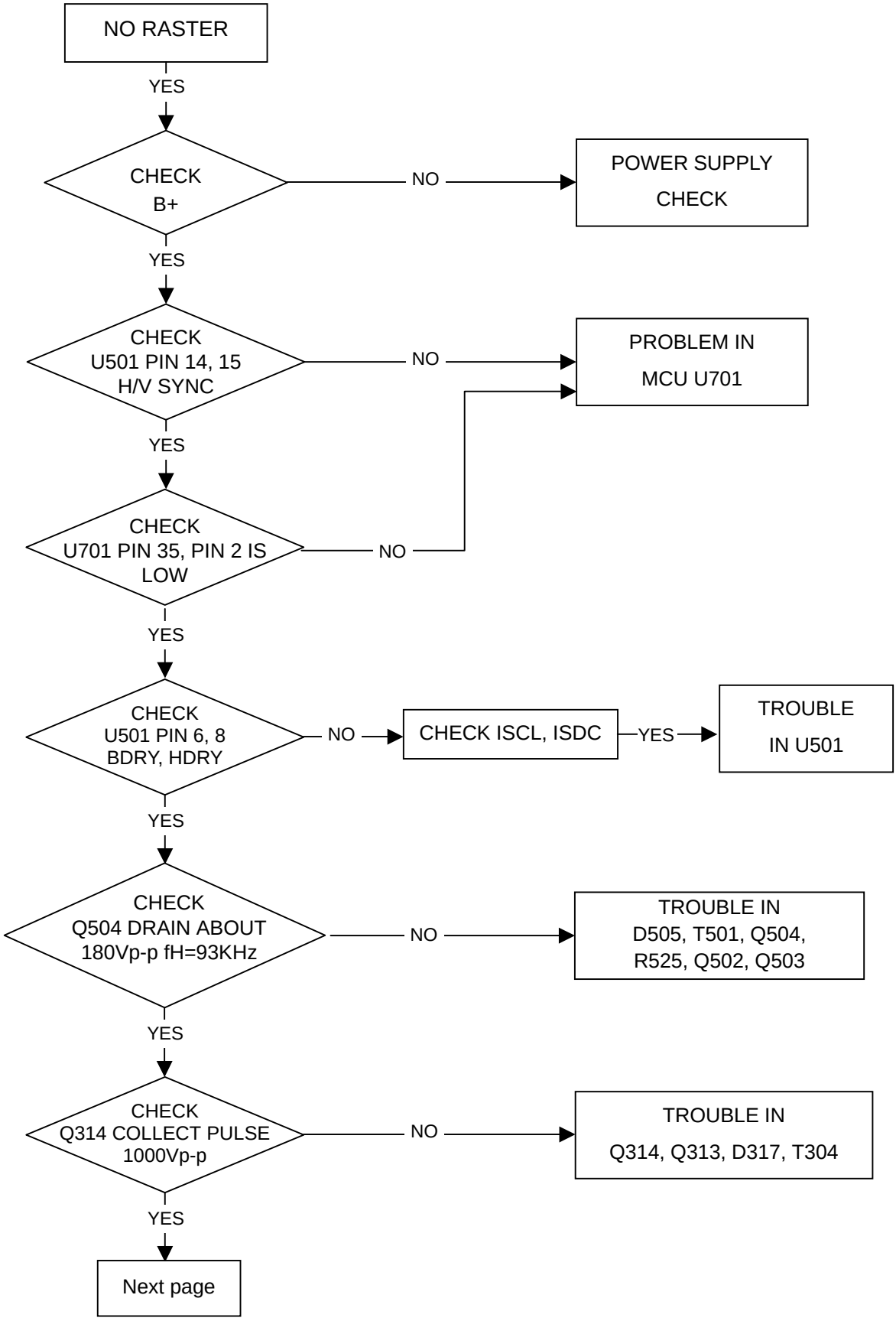
3. VIDEO NOISE, NO SYNCHRONOUS

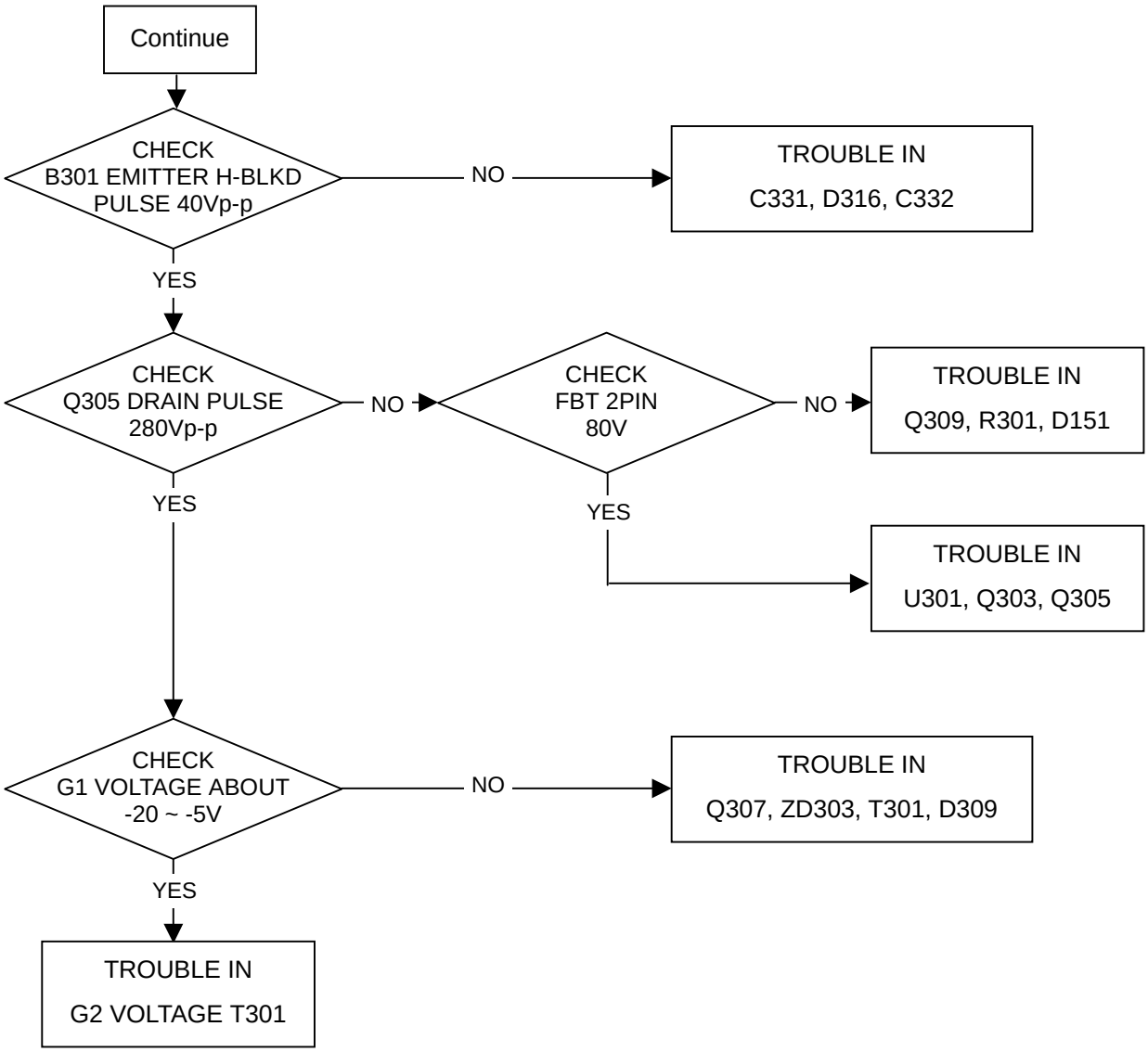


4. NO VIDEO

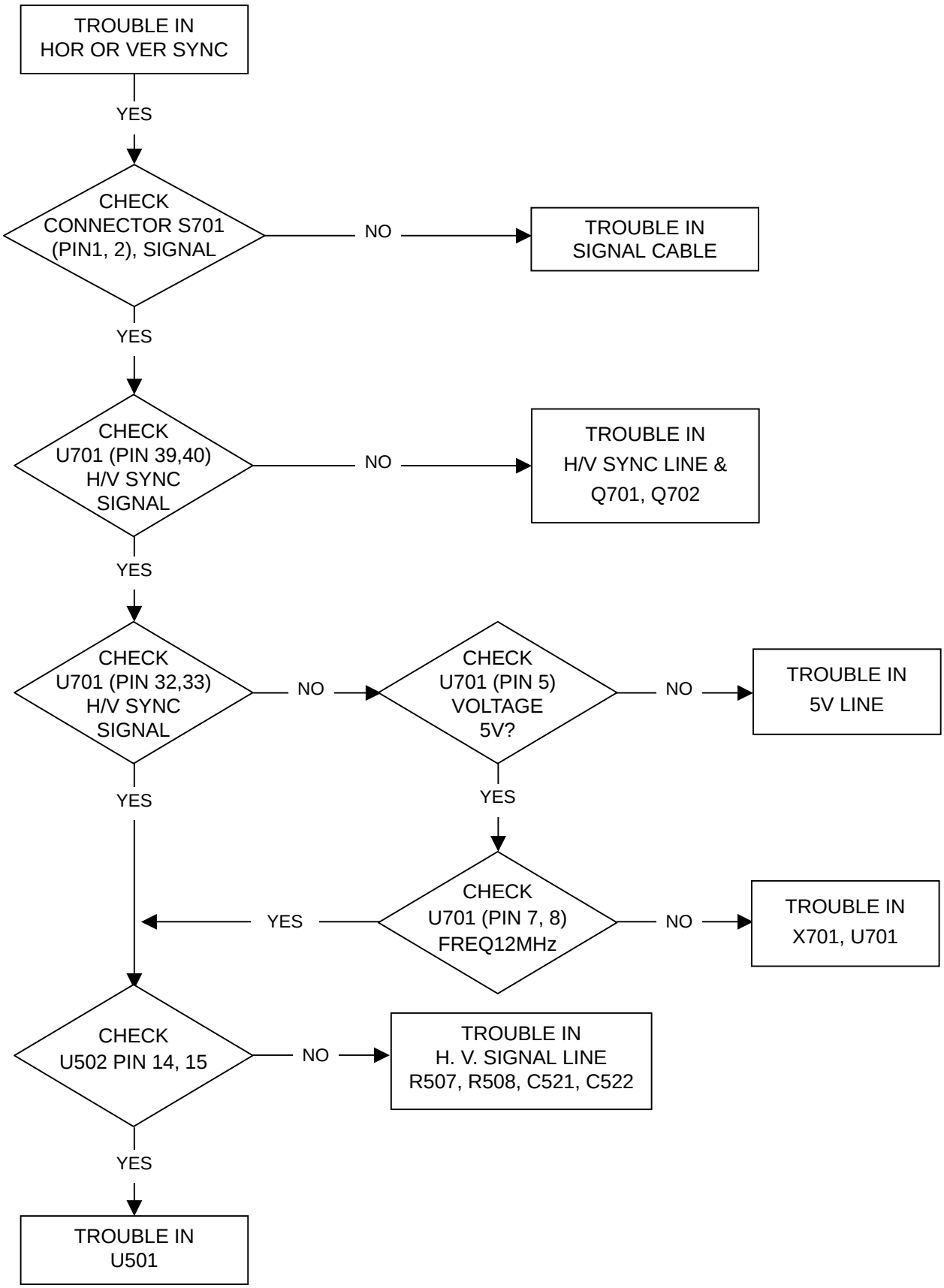

NO VIDEO
YES
CHECK SCREEN CONTROL CLOCKWISE
NO
REFER TO "NO RASTER" ON PAGE
YES
CHECK U201 PIN 5, 6, 7 SIGNAL LEVEL
NO
TROUBLE IN R/G/B SIGNAL, SIGNAL CABLE
YES
CHECK U201 PIN 18, 19, 20 SIGNAL LEVEL
NO
PROBLEM IN U201 CLAMP (PIN 23) U201 12V VOLTAGE
YES
CHECK U201 PIN 6, 7, 9 SIGNAL LEVEL
NO
PROBLEM IN U204 12V, 80V VOLTAGE
YES
CHECK CATHODE VIDEO LEVEL
NO
PROBLEM IN R255, R235, R215
YES
PROBLEM IN CRT

5. NO RASTER

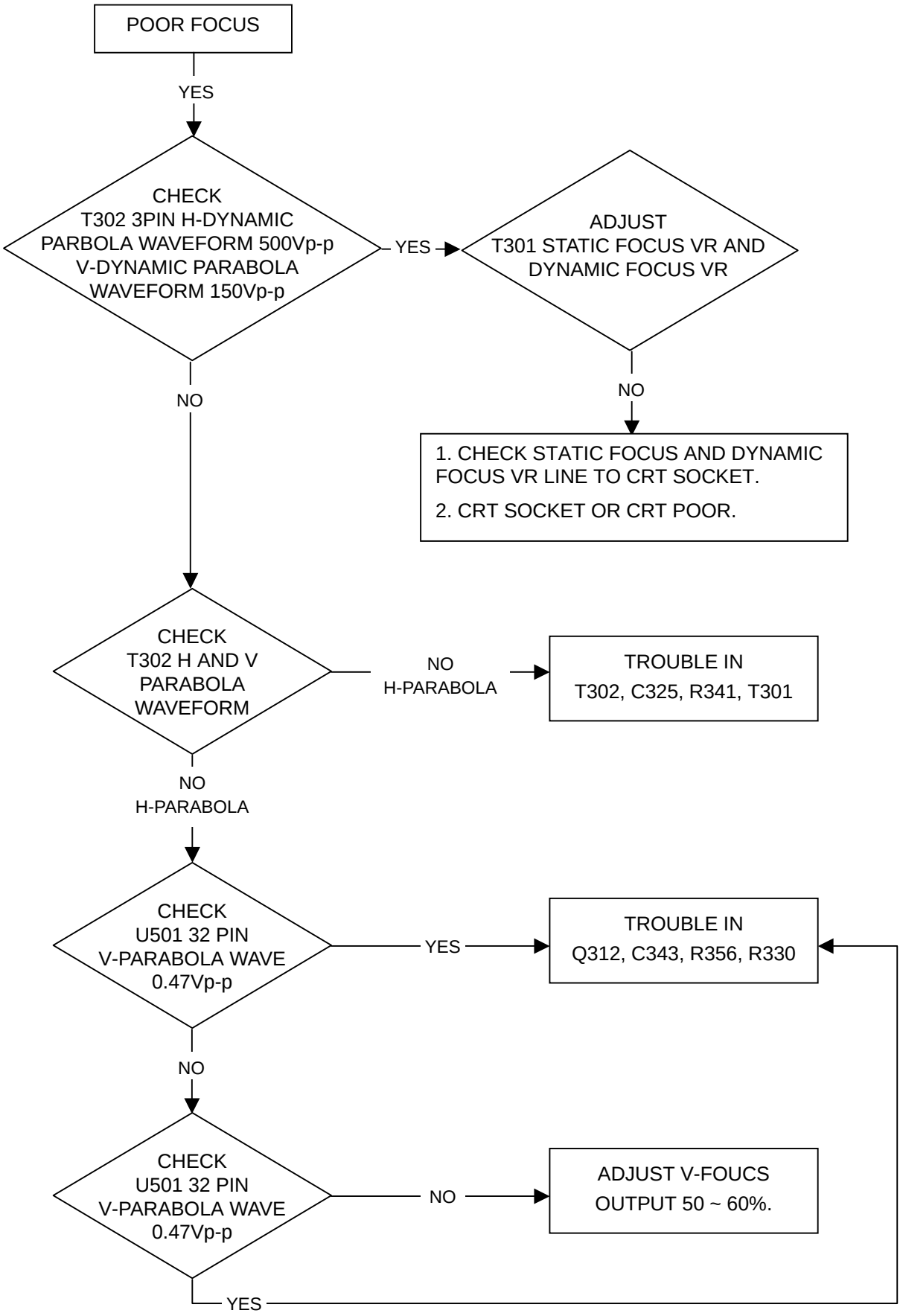

NO RASTER
YES
CHECK
B+
NO
POWER SUPPLY
CHECK
YES
CHECK
U501 PIN 14, 15
H/V SYNC
NO
PROBLEM IN
MCU U701
YES
CHECK
U701 PIN 35, PIN 2 IS
LOW
NO
YES
CHECK
U501 PIN 6, 8
BDRY, HDRY
NO
CHECK ISCL, ISDC
YES
TROUBLE
IN U501
YES
CHECK
Q504 DRAIN ABOUT
180Vp-p fH=93KHz
NO
TROUBLE IN
D505, T501, Q504,
R525, Q502, Q503
YES
CHECK
Q314 COLLECT PULSE
1000Vp-p
NO
TROUBLE IN
Q314, Q313, D317, T304
YES
Next page


Continue
CHECK
B301 EMITTER H-BLKD
PULSE 40Vp-p
NO
TROUBLE IN
C331, D316, C332
YES
CHECK
Q305 DRAIN PULSE
280Vp-p
NO
CHECK
FBT 2PIN
80V
NO
TROUBLE IN
Q309, R301, D151
YES
YES
TROUBLE IN
U301, Q303, Q305
CHECK
G1 VOLTAGE ABOUT
-20 ~ -5V
NO
TROUBLE IN
Q307, ZD303, T301, D309
YES
TROUBLE IN
G2 VOLTAGE T301

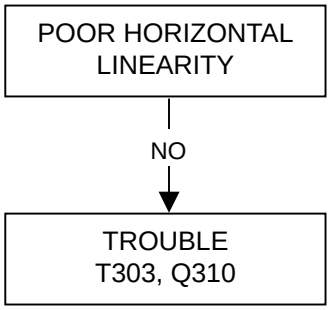
6. H. V. SYNC TROUBLE



7. POOR FOCUS


POOR FOCUS
YES
CHECK
T302 3PIN H-DYNAMIC
PARBOLA WAVEFORM 500Vp-p
V-DYNAMIC PARABOLA
WAVEFORM 150Vp-p
YES
ADJUST
T301 STATIC FOCUS VR AND
DYNAMIC FOCUS VR
NO
1. CHECK STATIC FOCUS AND DYNAMIC FOCUS VR LINE TO CRT SOCKET.
2. CRT SOCKET OR CRT POOR.
NO
CHECK
T302 H AND V
PARABOLA
WAVEFORM
NO
H-PARABOLA
TROUBLE IN
T302, C325, R341, T301
NO
H-PARABOLA
CHECK
U501 32 PIN
V-PARABOLA WAVE
0.47Vp-p
YES
TROUBLE IN
Q312, C343, R356, R330
NO
CHECK
U501 32 PIN
V-PARABOLA WAVE
0.47Vp-p
NO
ADJUST V-FOUCS
OUTPUT 50 ~ 60%.
YES

8. POOR HORIZONTAL LINEARITY



CIRCUIT DESCRIPTION

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1. Power Circuit

1.1 General Description

This power unit uses a switching power supply. The switching frequency is synchronized within the range of the horizontal frequencies (31kHz to 96kHz).

1.2 EMI Circuit

The EMI circuit comes in a two-stage configuration. The first stage is composed of the choke coil in the common mode and the capacitor X. The second stage is composed of the four capacitors Y. R101 is a discharge resistor for the capacitor X. When the power switch is OFF, this resistor is used to discharge the electric charge accumulated in the capacitor C101.

The EMI circuit is the circuit that is used to prevent the outflow of monitor's switching noise toward the outside. Its function is effective in minimizing the adverse influence of switching noise to other electronic devices.

1.3 AC Rectifier and Smoothing Capacitor

The AC input power is rectified by the full bridge type rectifier. This rectifier is composed of the diodes D101 to D104. The AC voltage is converted into a DC voltage by the smoothing capacitor C107.

TH101 is an NTC thermistor intended to reduce the inrush current that is generated when the power switch is turned ON.

1.4 Degaussing Circuit

The degaussing circuit is composed of the PTC thermistor TH102, the degaussing coil and the relay RL181. The relay is controlled by the control signal from the MCU.

1.5 Transformer and Energy

1) When a drive pulse is fed from U101 pin 6 (IC KA3842A) to the gate of Q101, a current flows from the positive side to the negative side of C107 through the primary winding of transformer T101 (Pin 6 and Pin 4) and Q101 D-S. By this operation, energy is stored in T101. When the supply of the driving pulse to the gate of Q101 is suspended, Q101 is turned OFF and all the diodes connected to the secondary winding is reversed biased so that the energy stored in T101 is discharged to the secondary side. Q101 is turned ON and OFF by U101 and this operation is then repeated.

2) The MOS FET Q101 is turned ON and OFF by U101 (KA3842A). KA3842A is a PWM (Pulse Width Modulation) IC with an operation start voltage of 16V and an operation stop voltage of 10V.
The pin assignment of the KA3842A pulse width modulation IC chip is shown below.

Pin 1: Feedback	Pin 5: Ground (GND)
Pin 2: Correction	Pin 6: Pulse output
Pin 3: Current sensor	Pin 7: VCC
Pin 4: Oscillator	Pin 8: VREF (5.1V)

1.6 Overcurrent Protection

If a certain fault occurs and the output power on secondary side becomes too excessive, the peak voltage at U101 Pin 3 raised. When this voltage reaches 1V, U101 operates so that the ON period of Q101 is shortened. As a result, the output voltage on secondary side and the voltage in the auxiliary winding (Pin 1 and Pin 2) on T101's primary side is lowered. When the voltage in the auxiliary winding becomes less than 10V, the oscillation of the U101 is stopped. However, a charging current flows into C111 through R102, R103, Q102, and D105. When the voltage at U101 Pin 7 reaches 16V, U101 begins to oscillate again. As a result, U101 repeats the intermittent oscillation (repetition of oscillation and suspension).

1.7 Starter Circuit

When the power switch is turned ON, Q102 is turned ON and a charging current flows into C111 through R102, R103, Q102, and D105. When the voltage at U101 Pin 7 reaches 16V, the U101 begins to oscillate. When the U101 begins to oscillate, the currents consumed in U101 and Q101 increased. Therefore, current is fed from the auxiliary winding (Pin 1 and Pin 2) on primary side of T101.

1.8 Sync Circuit

When the pulses synchronized with the horizontal frequencies (31kHz to 96kHz), are supplied from the centering choke coil L501 to the sync circuit that is composed of D115, D116, R125, R108, R118, and C119, the oscillation frequency of the U101 is synchronized with the input horizontal frequency.

1.9 Feedback Circuit

The output of the auxiliary winding on the primary side of T101 Pin 1 is converted into a DC voltage by D110 and C112. This DC voltage is divided by R114 and R115, and is then compared with the reference voltage at U101 Pin 8. The error from the reference voltage is input in U101 Pin 2 and the output voltage is controlled until it becomes identical with the reference voltage.

1.10 Snubber Circuit

The snubber circuit consisting of D116, C109, and R122 is intended to reduce the surge voltage that is generated when Q101 is turned OFF.

1.11 Power Management Function

This is the power saving mode: The power of the 14V line is turned OFF by the MPU (U701), in order to stop the operation of the deflection circuit and the video circuit. At that time, LED101 changes its color from green to orange.

1) When the power switch is kept in the ON position, the MPU detects both the horizontal and vertical sync signals. If the either the vertical and horizontal sync signals from the PC main unit is no present from the signal cable, the voltage level at the MPU Pin 29 (PS1) turns HI to cause Q152 to turn ON and Q151 is turned OFF. This causes the power of the 14V line to be turn OFF and this causes Q503 to turn OFF. In addition, the -12V power supply fed by U601 from the 14V line is also turns OFF. As a result, operation of the deflection and the video circuits is suspended.

   At that time, the potential at MPU Pin 28 (PS2) turns LOW with a 50% duty, thus making Q155 to turn ON/OFF. As a result, the heater voltage is lowered and the power consumption is reduced.

2) When the user touches the keyboard of the PC in the OFF mode, the MPU detects the horizontal and vertical sync signals to reset the monitor.

1.12 Harmonic Coil Changeover Circuit

In order to suppress harmonics generated from equipment, this coil is connected in series with the live side of the power line. To comply with the world wide specifications for power supplies, the power voltage is divided by the resistors of R131, R132, and R133 and the resulting voltage is used to cause Q131 and Q132 to turn ON/OFF with the threshold value of ZD131 to drive the coil of RL131. In this fashion, changeover is conducted to choose a series connection when the source voltage is high or a parallel connection when the source voltage is low. The source voltage change over is about 170V AC.

2. MCU

2.1 Frequency Specifications

Horizontal Frequency : 29.5kHz to 96kHz

Vertical Frequency : 43Hz to 160Hz

Support of composite sync signals

2.2 System Architecture

1) MCU - Myson MTV212NM32, 32k-byte ROM size.

2) E^2PROM - 24C08 Series, 8k-bits (initialize enabled by microcomputer).

3) OSD - Myson MTV030N16.

2.3 Inputs

1) Sync input - Two pins for reversal inputs of horizontal sync and vertical sync.

2) Key input - Two pins for A/D key input (EXIT, <, >, -, +, SELECT, RESET).

3) One pin for signaling cable connection sensing (for factory).

4) Reset input - High pulses for MCU reset.

5) Crystal oscillator input - Two pins for using a 12MHz crystal oscillator.

6) Detection of oscillation IC operation - One pin.

7) Detection of protector operation - Three pins for beam current, high voltage, and X rays protector detection.

8) External 5V detection input - One pin.

2.4 Outputs

1) Degaussing - Made to be active for a predetermined time period during degaussing. The MCU executes degaussing even when the power supply is turned ON.

2) CS output - Four pins for CS control (CS4, CS2, CS1, CS0)
CS3 not used.

3) MUTE - When the sync signal is unstable, this output becomes active to protect the relevant circuits. The two circuits of MUTE1 and MUTE2 are available.

4) Convergence - Two PWM outputs for horizontal and vertical (19” only).

5) POWER save - Two circuit control pins for power saving.

6) Sync signal output - Two pins for horizontal sync and vertical sync.

7) Rotation - One PWM output pin for rotation circuit control.

8) DDC communication - Communication port of DDC-DDC2B or DDC/CI. Two circuits of HSCL and HSDA.

9) ISDA/ISCL - Two pins for EEPROM, OSD IC, OSC IC, and PRE-AMP IC.

2.5 Pin Assignments

Pin #	Function	Circuit symbols	Pin #	Function	Circuit symbols
1	UNLOCK supervisory input of OSC IC	DEFL-IN	**21**	Signaling cable detection input	#5(PC)
2	MUTE output	MUTE1	**22**	Key input	AD1
3	Protector input	X/YRAY-IN	**23**	Key input	AD0
4	RESET input	RESET	**24**	DDC communication port	HSDA
5	Power input	VDD	**25**	DDC communication port	HSCL
6	GND	VSS	**26**	Vertical convergence control output	CG-V
7	Crystal oscillator input	X2	**27**	Horizontal convergence control output	CG-H
8	Crystal oscillator input	X1	**28**	POWER SAVE control output	PS2
9	I^2C communication port	ISDA	**29**	POWER SAVE control output	PS1
10	I^2C communication port	ISCL	**30**	Degaussing control output	DEG
11	CS control output	CS0	**31**	Not used	TL
12	Not used	AD-DRIFT	**32**	Vertical sync output	V-OUT
13	Protector input	MEAN-IN	**33**	Horizontal sync output	H-OUT
14	Protector input	HVOLT-IN	**34**	Not used	TR
15	Model changeover input	OPTION1	**35**	MUTE output	MUTE
16	CS control output	CS1	**36**	Rotation control output	ROT
17	CS control output	CS2	**37**	Model changeover input	BL
18	Not used	CS3	**38**	Model changeover input	BR
19	CS control output	CS4	**39**	Horizontal sync input	H-IN
20	External 5V detection input	PC97	**40**	Vertical sync input	V-IN

2.6 CS Table

Horizontal frequencies	RDF193H/FE991SB/DPlus93SB					RDF173H/FE791SB/Dpro750SB				
	CS0 Pin 11	CS1 Pin 16	CS2 Pin 17	CS3 Pin 18	CS4 Pin 19	CS0 Pin 11	CS1 Pin 16	CS2 Pin 17	CS3 Pin 18	CS4 Pin 19
<34K	L	L	L	H	L	L	L	L	H	L
<36.5K	L	L	H	H	H	H	L	H	H	L
<40K	L	L	H	H	H	L	L	H	H	H
<44K	L	H	L	H	L	L	H	L	H	L
<49K	H	H	L	H	L	L	H	L	H	H
<52K	H	H	L	H	H	L	H	L	H	H
<58K	H	H	L	H	H	H	H	L	H	H
<62.5K	L	H	H	H	L	L	H	H	H	L
<67K	L	H	H	H	L	H	H	H	H	L
<74K	H	H	H	H	L	H	H	H	H	L
<83K	L	H	H	H	H	L	H	H	H	H
83K<98K	H	H	H	H	H	H	H	H	H	H
98K<	H	H	H	H	H	H	H	H	H	H

2.7 Model Changeover Table

Model	Pin 15	Pin 37	Pin 38
RDF193H/FE991SB/DPlus93SB	H	L	H
RDF173H/FE791SB/Dpro750SB	H	H	L

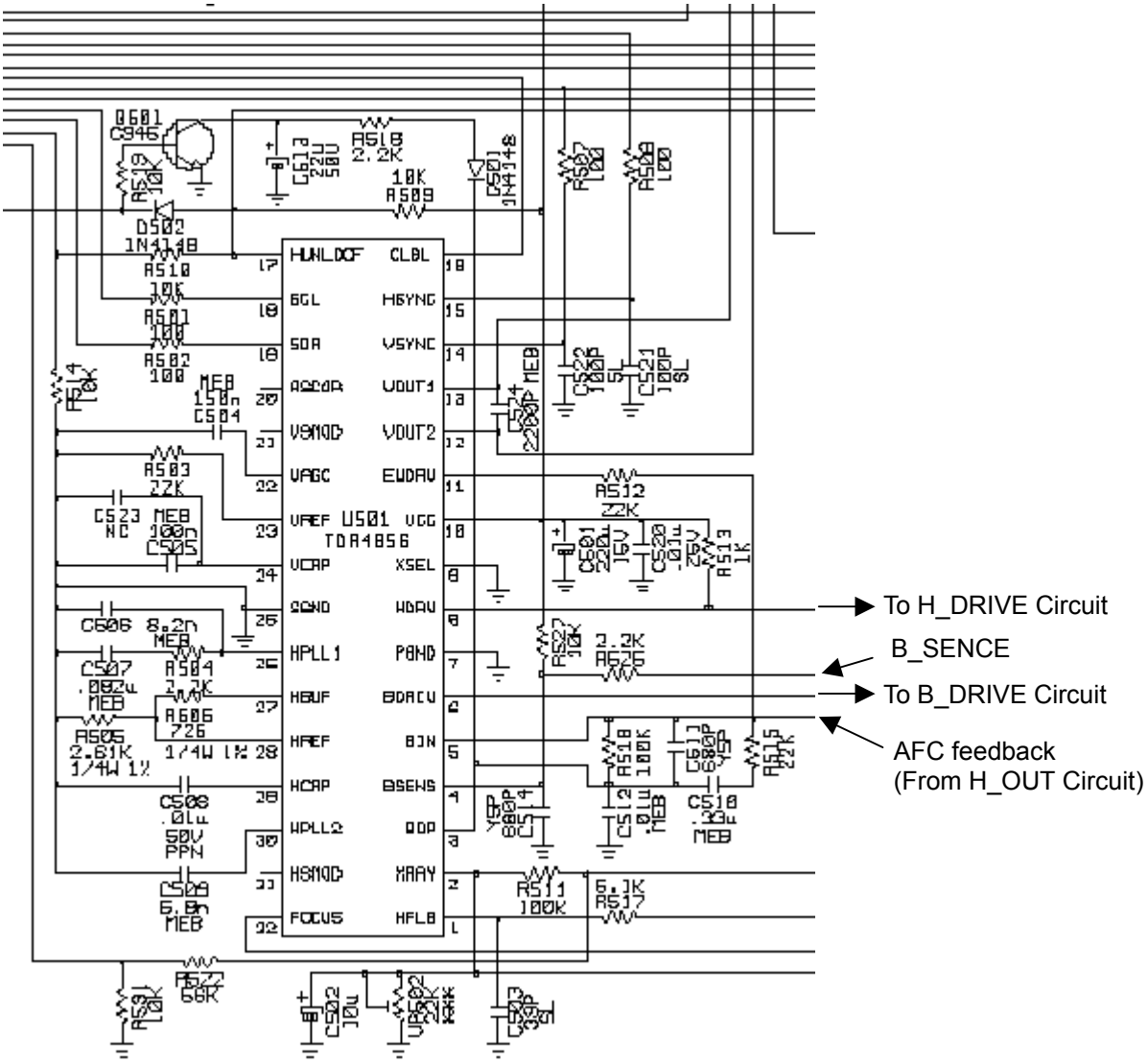
3. Deflection Circuit

3.1 Deflection Control IC (IC501)

IC501 is in charge of the horizontal width control and the generation of vertical pre-amplifier output. This IC follows the frequency and generates a proper output of horizontal drive pulses. For the screen size control, this IC also generates the B+ output drive pulses.

In addition, using the control signals from the microcomputer IC701, this IC is used to control the trapezoidal distortion, the pin balance, and the horizontal position. There are also outputs of horizontal and vertical parabolic waveforms for focusing.

The pre-amplifier functions are available for the vertical screen width, the position, and the vertical linearity.



(Fig. 3.1)Deflection Control IC (IC501)

3.2 Horizontal Deflection Circuit

3.2.1 Horizontal Oscillator Circuit

The outputs of the horizontal oscillator drive pulses (Pin 8 H_DRV) and the Power B drive pulses (Pin 6 B_DRIV) are generated from the U501 (TDA4856).

The horizontal drive pulses of about 10Vp-p are output from Pin 8 (H_DRV) in the open collector mode. The duty cycle is about 50% and its frequency is dependent on the input horizontal sync frequency. Even though the input frequency varies, the duty cycle is kept almost constant (about 50%).

The AFC feedback signal from the horizontal deflection output circuit is input to Pin 5 (B_IN) and an error amplifier of R515, R516, C510, and C511 is established between Pin 5 (B_IN) and Pin 3 (B_OUT).

Based on the error-guaranteed voltage at Pin 3 (B_OUT), a voltage B drive pulse output is generated in the open collector mode from Pin 6 (B_DRIV) with the use of the IC's internal comparator and the flip-flop circuit. These pulses are output in synchronization with the horizontal drive pulses.

3.2.2 Step-up Horizontal Deflection source (+B)

This is a step-up type chopper circuit consisting of Q504, T601, D505, etc.

Based on the input power supply of 26V, an output of about 30 to 40V (horizontal size MIN to MAX) is generated when fh = 31kHz and another output of about 110 to 130V is generated when fh = 93kHz.

To produce this circuit input, the drive pulse output from U501 (TDA4856) Pin 6 (B_DRIV) and the 26V power is stepped up to obtain a B power source according to this pulse duty.

The deflection source B is obtained from the input pulse duty when the power input is assumed to be Vi, using the formula given below.

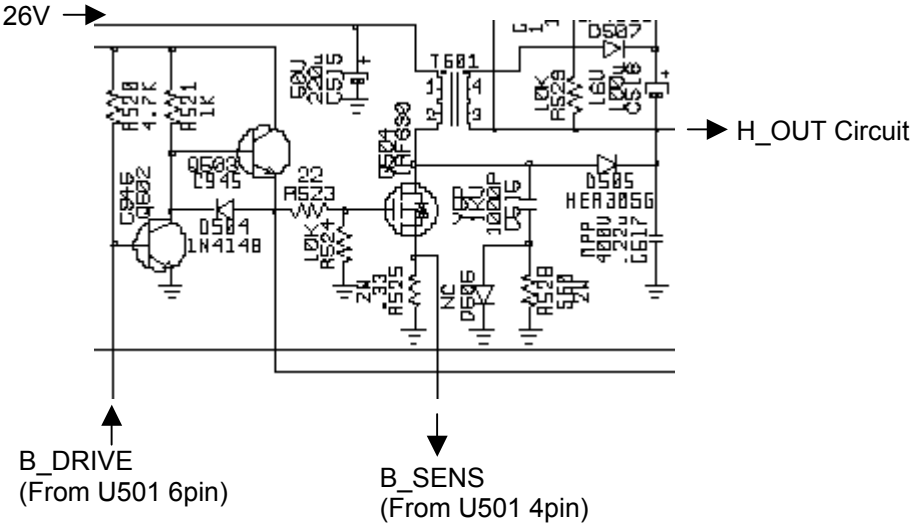
$$D = 1 - (Vi/B)$$

$$B = Vi/(1 - D)$$

For horizontal size and distortion adjustment, a signal is output from U501 Pin 11 (EW_DRV) to Pin 5 (B_IN) which is superposed on the drive pulses output from Pin 6 (B_DRIV).

[B_SENS operation waveform]

When the current of R525 reaches about 3.5A peak (B_SENS voltage at U501 pin 4 = 0.27Ω * 3.5A = 0.945V; TYP 1.0V for IC specifications), the B_DRV signal at U501 Pin 6 turns OFF and the FET Q504 is turned OFF. At that time, the drain voltage of Q504 is raised by the counter electromotive force and the resultant voltage is used as a B power supply for the deflection circuit. The duration of the counter electromotive force pulse for the B power supply is dependent on the load that is required by the deflection circuit. When the required amount of current is flows through D505, the drain voltage of Q504 settles down to the source voltage (approx. 26V) through the inductance of T501.



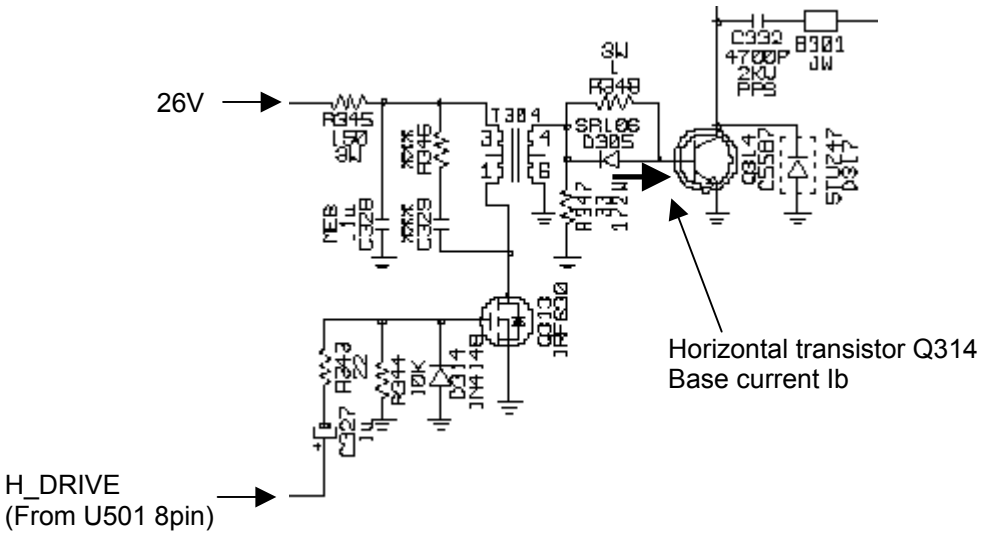
(Fig. 3.2.2) Step-up Horizontal Deflection Source (+B)

3.2.3 Horizontal Width Control Circuit

Q314 is controlled by the horizontal drive pulses from IC501. While Q314 is turned ON, the energy is stored in the horizontal deflection yoke. When it is turned OFF, the stored energy flows into C331 and C332. This operation is repeated to maintain the horizontal deflection. The voltage of collector pulses at Q314 is divided by C331 and C332, and the resultant pulses are used for the switching synchronization of the high voltage control IC301 and the generation of horizontal blanking pulses. The horizontal width is controlled by changing the B+ drive pulse duty of the output at IC501 Pin 6. When the duty is changes, the rectifying voltage of D317 and the “S” correction capacitor changes. Then, the horizontal width also changes. The vertical parabolic waveform is generated within IC501 and the resultant output is generated at IC501 pin 5. This output is then applied to the B+ drive pulse generator circuit through R512. By virtue of this parabolic output, the correction control can be conducted for the pincushion, barrel trapezoidal and upper/lower distortions.

3.2.4 Horizontal Drive Circuit

In the horizontal drive circuit, the horizontal oscillation drive pulses output from IC501 (TDA4856) pin 8 H_DRV of the oscillator are used to convert the power supply of 26V to the base drive current fed to the horizontal transistor through the drive transformer T304 and the switching FET Q313.



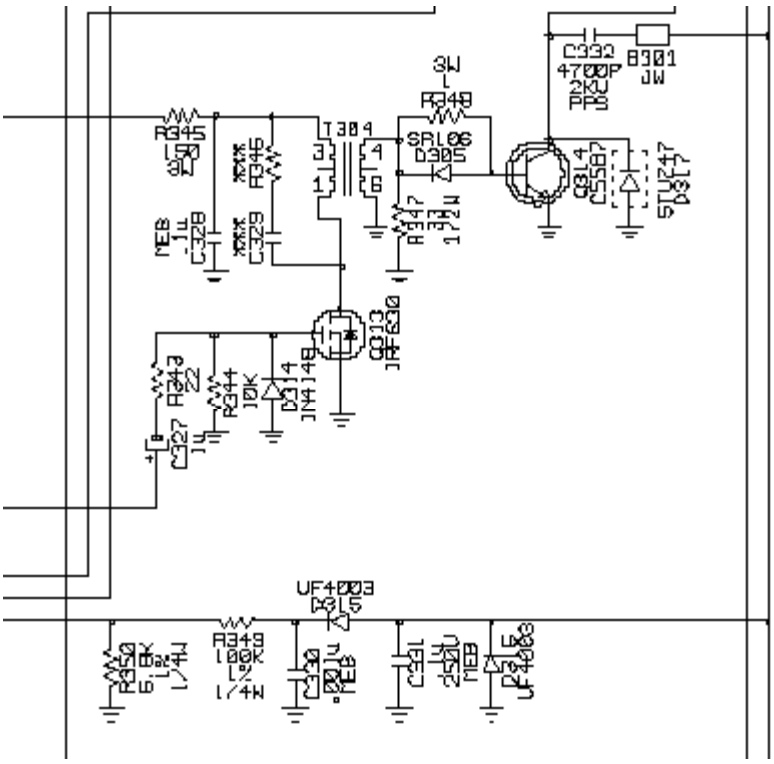
(Fig. 3.2.4) Horizontal Drive Circuit

3.2.5 Horizontal Output Circuit and Horizontal Feedback Circuit

The horizontal output circuit is composed of the horizontal transistor Q314, the damper diode D317, the resonance capacitor C332 and the deflection yoke (H_DY).

When the base current fed from the drive circuit is turned ON, a deflection current flows into the horizontal transistor Q314 for the specified time period. By virtue of the base current drain feature (Ib2), a collector pulse of about 1000V is generated at the collector of Q314 by the resonance circuit consisting of the resonance capacitor C332 and H_DY, the linear coil and the “S” capacitor. The pulse width of this resonance pulse is mainly dependent on the inductance value of the deflection yoke H_DY and the capacitance value of the resonance capacitor.

Using the collector pulse of this output circuit, the presence of an AFC pulse is detected according to the capacitance ratio of the resonance capacitor C332 vs. C331 in the AFC feedback circuit. The AFC feedback circuit is composed of D315, D316, C330, C331, R349, and R350. The detected AFC pulse is DC-rectified by D315 and C330, and fed back to the +B voltage input circuit (U501: Pin 5 of B_IN) of the oscillator circuit.



(Fig. 3.2.5) Horizontal Output Circuit and Horizontal Feedback Circuit

3.2.6 Linear Correction Circuit and “S” Correction capacitor Circuit

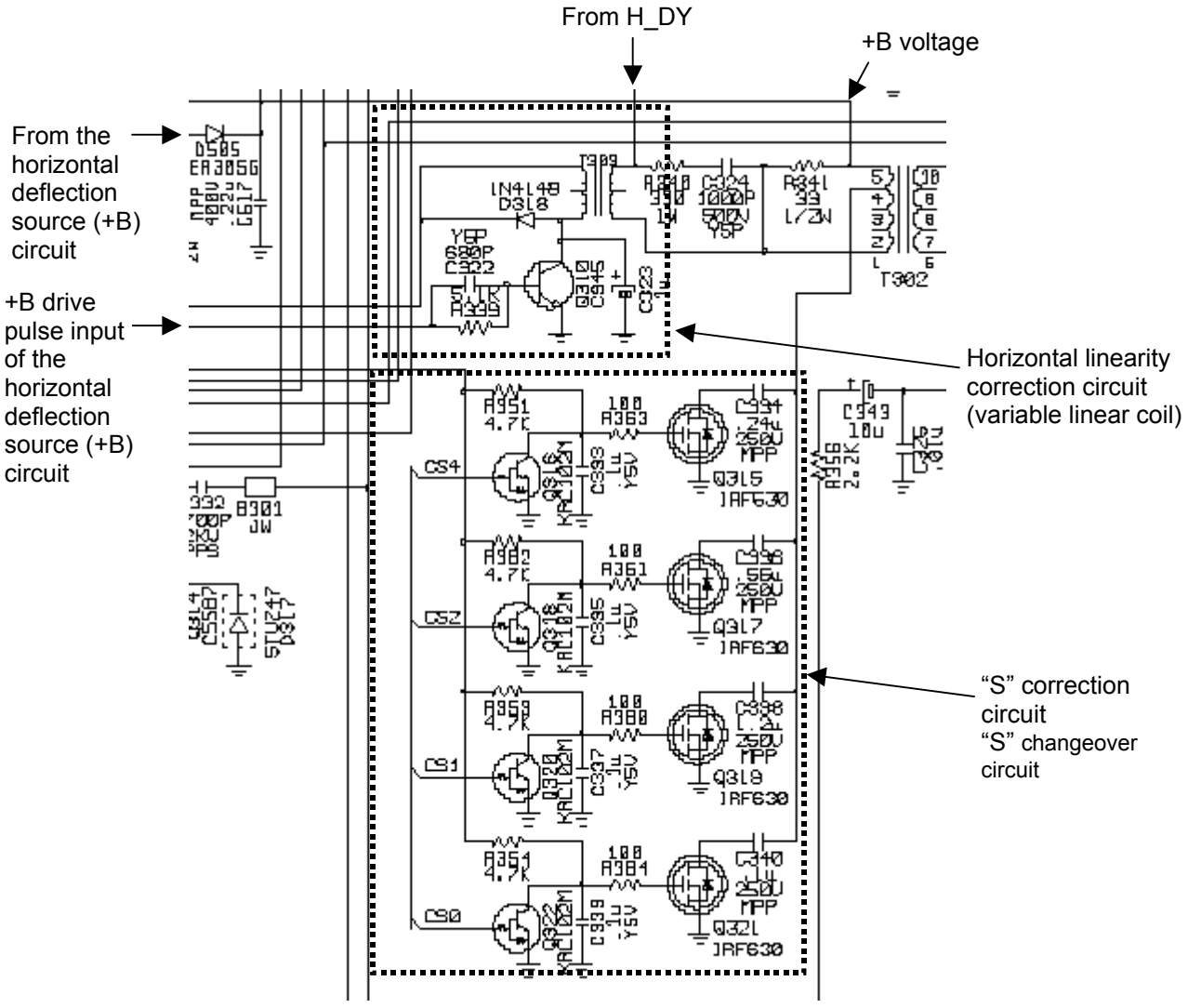
The horizontal linearity correction circuit uses a variable linear coil (T303).

The variable linear coil T303 is used to control the current with the aid of Q310, R339, C322, and C323 which flows on the primary side of the coil.

The control signal input is entered from the drive pulse circuit of the horizontal deflection source (+B power supply) circuit. It is dependent on the variation (input frequency and horizontal size) in the +B voltage of the horizontal deflection circuit, and is used to control the horizontal linearity.

The “S” capacitor C517 correction circuit is enabled when all the signals are received. For the other “S” capacitors C334, C336, C338 and C340 are turned ON and OFF at each frequency by the FETs Q315, Q317, Q319 and Q321, respectively, in order to control the increase or decrease in the capacitance of the “S” capacitors according to the input frequency.

The ON/OFF control of the “S” capacitors is carried out according to the CS signals (CS0, CS1, CS2 and CS4) sent from the MPU.



(Fig. 3.2.6) Linear Correction Circuit and “S” Correction Circuit

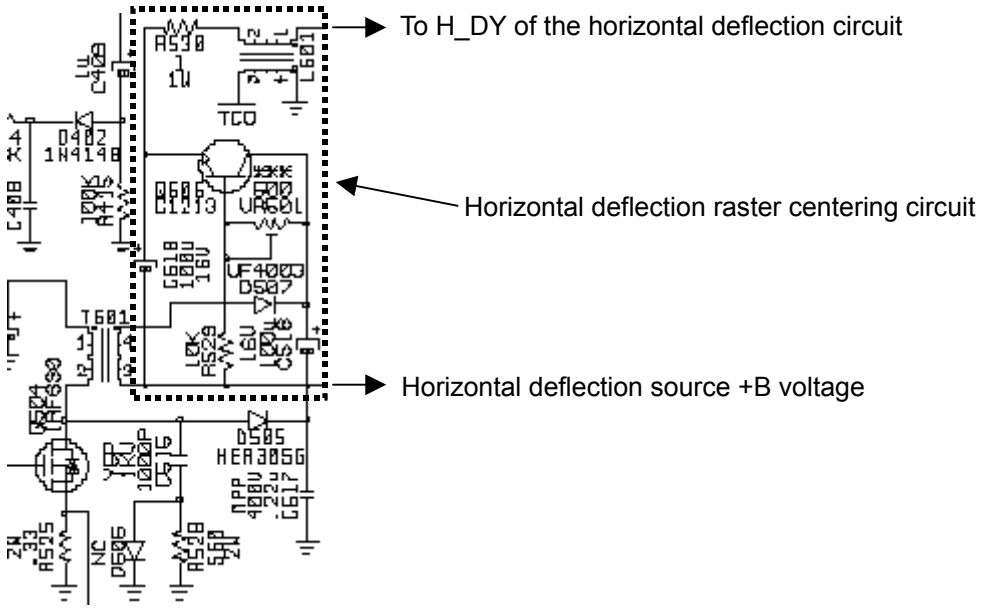
3.2.7 Centering Circuit

The horizontal raster centering circuit is inserted between the horizontal deflection source circuit and the horizontal deflection output circuit (H_DY). This circuit is used to assure a current flow of the DC current bias component in order to shift the deflection current waveform toward the horizontal deflection circuit.

The inflow current is controlled through the adjustment of VR501.

The raster centering circuit uses about 5VDC generated by the rectifier circuit of D507 and C518, using the power from the secondary winding of T501 in the horizontal deflection source circuit. As a result, a raster centering correction current is fed from the current circuit that is composed of Q505, R529, R530, VR501, C519 and L501.

The correction current value is determined by the synthetic impedance (approx. 10Ω) of R530 and L501.



(Fig. 3.2.7) Centering Circuit

3.3 Vertical Deflection Circuit

3.3.1 Introduction

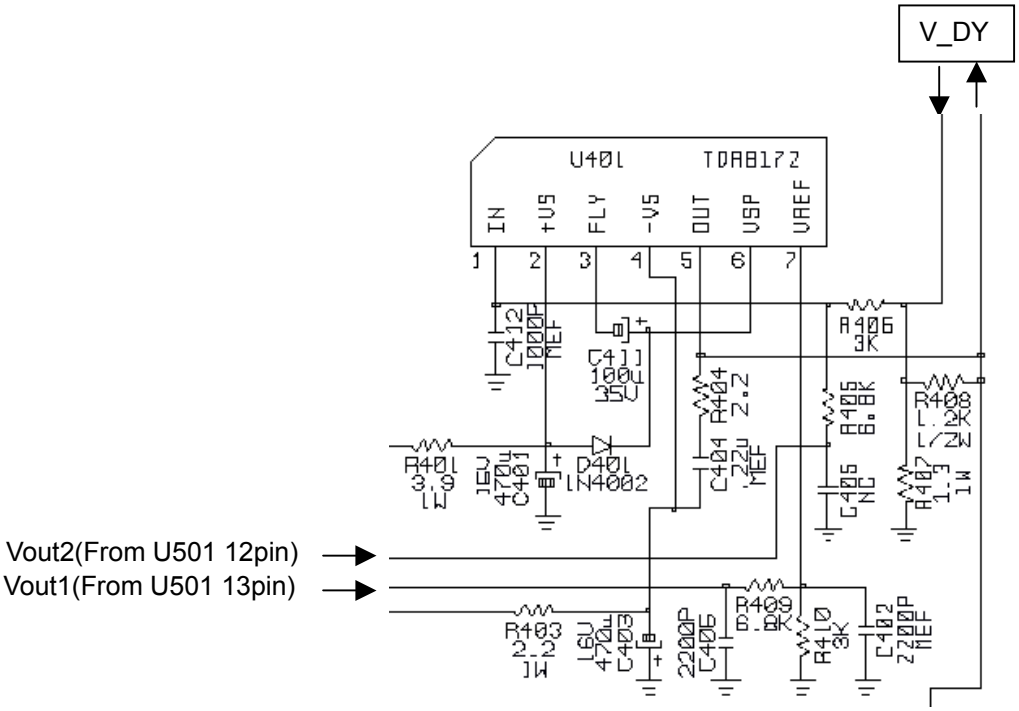
The vertical deflection circuit gains an input of vertical saw-tooth wave signals generated from the oscillator IC501 Pin 13 Vout1 and Pin 12 Vout2. The resultant output signal is converted into a current that drives the DY (V) through the use of the U401 (TDA8172) driven by +14V and -12V of the power supply.

The vertical deflection circuit is composed of the following blocks:

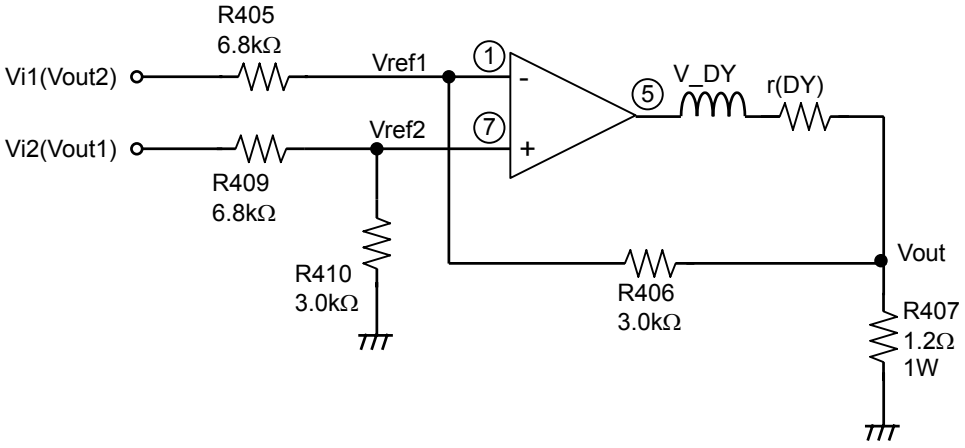
1) Saw-tooth wave generator and waveform correction circuit (U501)

2) Vertical output circuit (U401)

Circuit diagram



Equivalent circuit



(Fig. 3.3.1) Introduction

3.3.2 Saw-tooth Wave Signal and Waveform Correction Circuit (U501)

1) Vertical oscillator
   When a vertical sync signal input is entered into U501 Pin 14, the saw-tooth wave signals are output from U501 Pin 12 and 13. The frequencies of these waveforms are identical with those of the vertical input sync signal. If there is no vertical sync signal input, the frequency of the output waveform is equal to the free-run frequency. This free-run frequency is maintained at approximately 75Hz.

2) Vertical size control circuit
   The saw-tooth wave signal output generated from U501 Pin 12 and Pin 13 is input to U401 of the vertical output amplifier. The vertical screen size is controlled by changing the amplitude of this saw-tooth wave signal.

3) Vertical raster position
   The saw-tooth wave signal output generated from U501 Pin 12 and 13 is input to U401 of the vertical output amplifier. At the same time, the DC component of the waveform applied to U401 Pin 7 changes to control the vertical raster position.

3.3.3 Vertical Output Amplifier Circuit (U401)

The saw-tooth wave signal output generated from U302 Pin 12 is input to U401 Pin 1 of the vertical output amplifier. The amplified current waveform is output from U401 Pin 5. With this current, the vertical deflection coil is operated.

4. High Voltage Circuit

The high voltage circuit uses the PWM control system to regulate the ON/OFF time of the high voltage generator FET. U301 is the IC that performs the PWM control. The pulse voltage generated in Q305 is stepped up at T301 (F.B.T.) to obtain a 26kV potential. The feedback voltage from T301 Pin 11 is divided by a combination of R316 and VR301, and the obtained voltage is then fed back to IC701 Pin 1. A constant high voltage is maintained by controlling the pulse width of the PWM output at Pin 10. For the adjustment of a high voltage the VR301 is adjusted, which is used as a shunt resistor of the feedback voltage. The PWM output is synchronized with the horizontal sync frequency. The trigger pulse signal for synchronization is output from the shunt voltage of the collector pulse obtained from the horizontal deflection output circuit Q314. This output is applied to IC301 Pin 5.

5. Dynamic Focus Circuit

The primary winding of T302 is driven by the parabolic voltage generated by the horizontal source +B circuit. As a result, a step-up horizontal parabolic waveform is generated in the secondary winding of T302. On the other hand, the vertical parabolic waveform output is generated from IC501 Pin 32 and it is then amplified at Q312. The vertical parabolic waveform signal is superposed on the horizontal parabolic waveform signal available on the secondary side of T302. The power supply for Q312 is obtained by using the output voltage at T301 Pin 6 Which is rectified by D307 and C311.

6. Safety Protection Circuit and X-ray Protection Circuit

6.1 X-ray Protection Circuit

This is a protection circuit intended to prevent the radiation of X-ray from exceeding the dangerous level, possibly caused by an unusual high voltage rise.

Please do not modify either the high voltage circuit or the safety protection circuit.

The high voltage upper limit value and the beam current value are defined by the upper limit curves of X-ray radiation in the CRT.

The X-ray protection circuit operates at 27.5kV. The detection and protection circuit comes in the two circuits.

In Circuit 1, the rise of the pulse voltage at T301 Pin 7 is controlled by comparing the reference voltage with the voltage rectified at D308 and C312 in the U302. In an error mode, a high level output from U302 is applied to U701 Pin 3 (X/XRAY-IN). When an error is sensed, U701 suspends the high voltage deflection for protection in the completely stopped mode.

In Circuit 2, the rise of the pulse voltage T301 Pin 7 is controlled by inputing the voltage which is rectified at D308 and C312, at U501 Pin 2 (XRAY). When an error is sensed, U501 suspends the oscillation. At the same time, the HUNLOCK is turned HIGH to send the information of abnormal oscillation to the microcomputer. Q301 is simultaneously turned ON to stop the driving U301 for protection.

Operation of this circuit is maintained until the AC power supply is turned OFF.

6.2 Beam Current protection Circuit

The protection circuit operates when the current flowing in the high voltage generator winding of the FBT exceeds the specified level. The detection of the beam current is conducted in terms of the voltage drop measured by the circuit elements of VR302, R321, and R320, connected in between T301 Pin 8 and 12V. When the inrush current flowing in Pin 8 exceeds the specified level, the voltage is lowered at T301 Pin 8. This voltage input to U302 via R236 and is compared with the reference voltage. In any error mode, the output is turned LOW and this output is input to U701 Pin 13 (MEAN-IN). At this stage, high voltage deflection is suspended in the completely stopped mode.

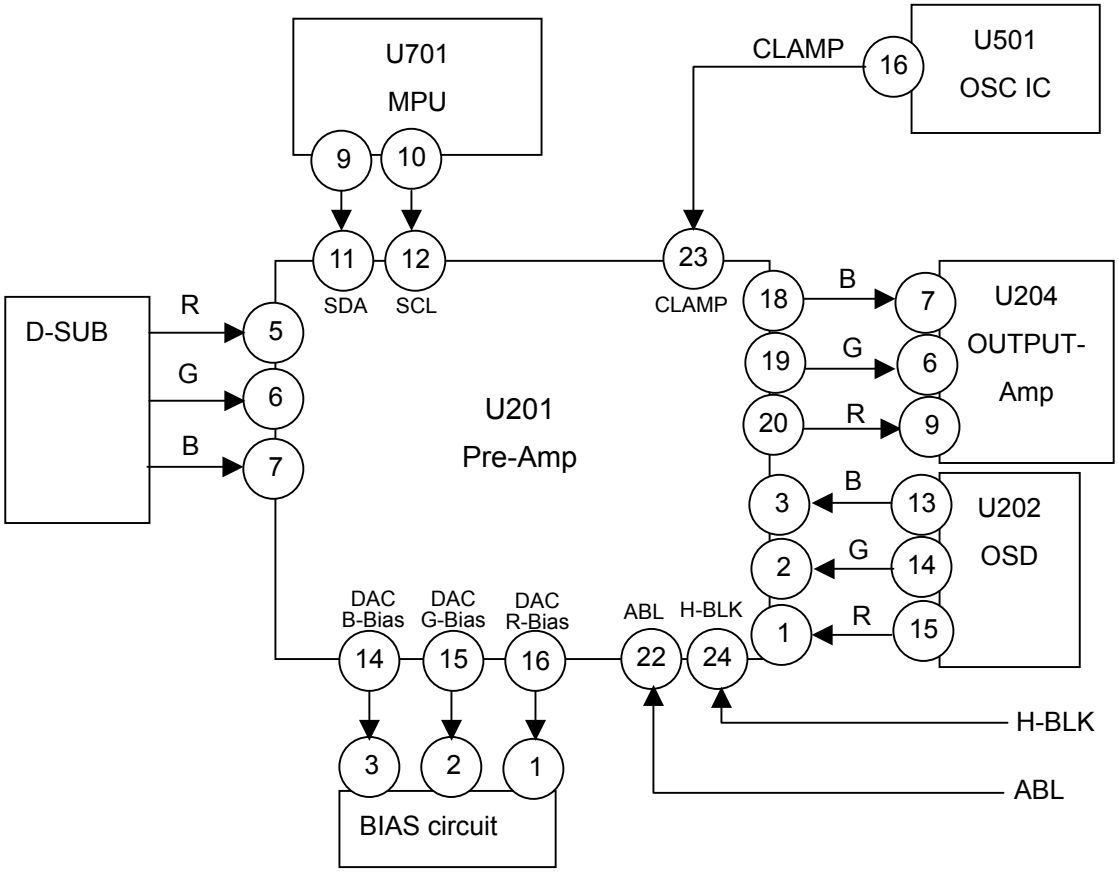
6.3 Primary Leakage Current Protection Circuit

The protection circuit operates when the current flowing into the primary winding of the FBT exceeds the specified level. The detection of the primary leakage current is conducted in terms of the voltage drop measured at R301 that is connected in between the 83V power supply and T301 Pin 2. When the inrush current flowing into Pin 2 exceeds the specified level, the voltage of R301 is lowered at T301 Pin 2. Q309 is then turned ON and the potential at U501 Pin 2 is turned HIGH via R318. When an error is sensed, U501 suspends oscillation. At the same time, the HUNLOCK is turned HIGH to send the information of abnormal oscillation to the microcomputer. Q301 is simultaneously turned ON to stop driving U301 for protection.

7. Video Circuit

7.1 Video Pre-amplifier

The U201 is a video pre-amplifier. It is used to control the following functions.



(Fig. 7.1) Video Pre-amplifier

7.1.1 Video Signal Mixing

In U201, the video signal is mixed with the OSD signal (3, 2, 1 for B, G, R respectively). Then, the resultant signal is mixed with the horizontal blanking waveform signal. Outputs for B, G, R are generated from Pins 18, 19, and 20, respectively.

7.1.2 Video Clamp

The clamp waveform signal with a polarity is output from the oscillator IC (U501) and is input to U201 Pin 23.

7.1.3 Horizontal Blanking

The collector pulses of Q314 are divided by the combination of C331 and C332. The obtained pulses are used as the horizontal blanking pulses and is input to U201 pin 24 with a positive polarity. The potential at Pin 24 is HIGH during the horizontal flyback period and the video output voltage of U201 is dropped to perform the blanking operation.

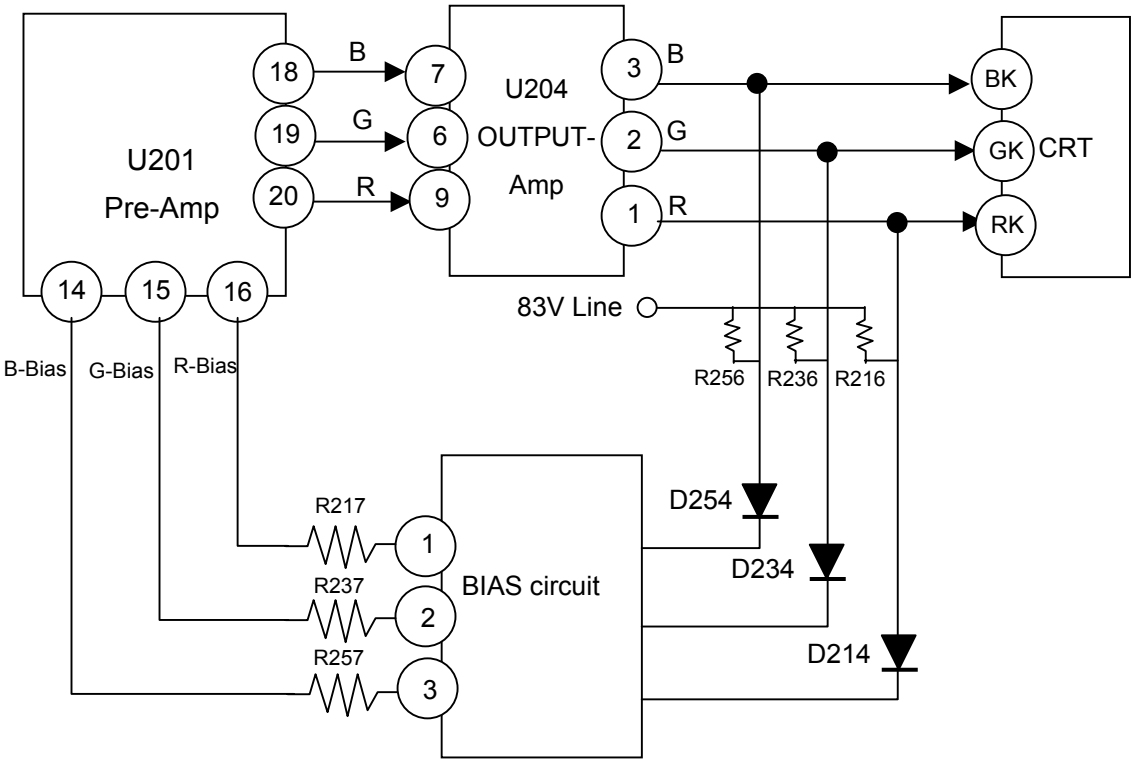
7.1.4 Contrast, White Balance, and Brightness Control

The MPU (U701) sends an 8-bit control data of contrast, white balance, and brightness to the U201 through the I^2C bus (SCL, SDA line). The contrast data is used for the simultaneous control of the R, G, B cathode voltages for the three channels. The white balance data is used to control R, G, B, gains respectively. The brightness data is used for the simultaneous control of the R, G, B bias levels. Then, the brightness data are converted from digital to analog (DC voltage 0 to 5V) in the U201. The data from the D/A output pins (14, 15, 16) are respectively output to the bias circuits (B_BIAS, G_BIAS, R_BIAS).

7.2 Video Bias Control

The video signals are amplified at the U204. The bias voltages output from U201 are amplified in the bias circuit to control the Brightness.

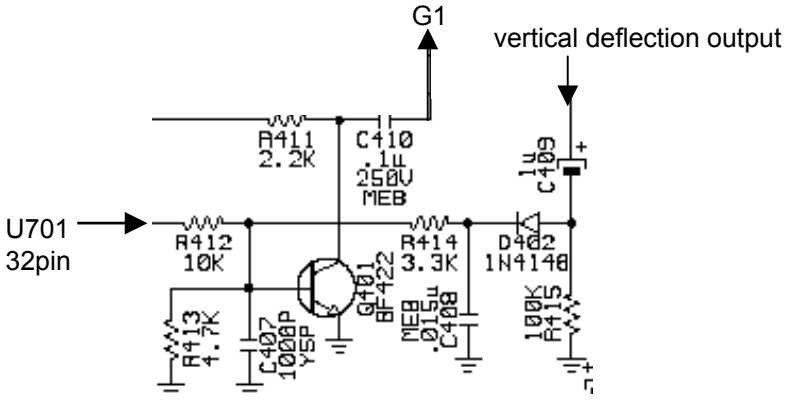
The brightness of the back raster is adjusted by controlling the black level of the CRT cathode, which is the DC clamp level of the output for the bias circuit. The brightness of this back raster is adjusted by the brightness. The output from the bias circuit is dependent on the R/G/B bias and brightness. The R/G/B bias is individually adjusted by controlling the D/A outputs from U201 Pins 14, 15, and 16 through the I^2C bus extended from U701.



(Fig. 7.2) Video Bias Control

7.3 Vertical Flyback Blanking Circuit

The V-OUT output from the MPU U701 Pin 32 is synthesized with the vertical deflection output that has been shaped by the circuit of C409, D402, R415, R414, and C408. The synthesized output is used for the blanking operation of the vertical flyback period, by switching Q401 that is connected to G1.

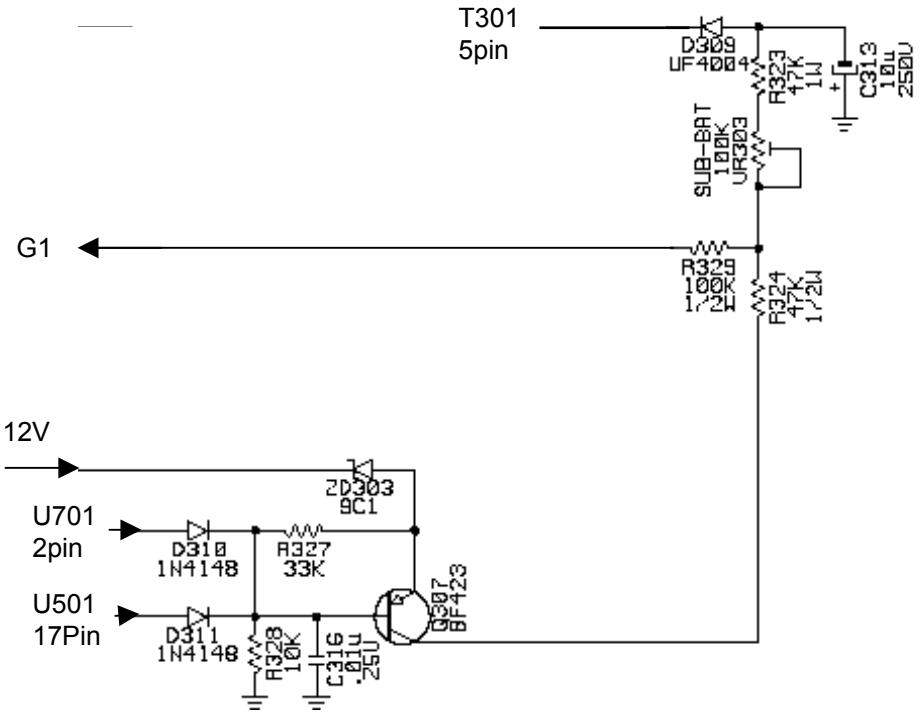


(Fig. 7.3)Vertical Flyback Blanking Circuit

7.4 Blanking Operation: Signal Mode Changeover, Power ON/OFF and Unstate Sync signals

The image blanking operation at the time of signal mode changeover and power ON/OFF is carried out by controlling the G1 voltage. This voltage control is actually effected by Q307 that makes the switching of the blanking pulse output sent from the MUTE1 circuit of the U701 Pin 2 through D310.

When the sync signals become unstable, the blanking operation is carried out by controlling the G1 voltage, whose operation is actually effected by Q307 that makes the switching of the blanking pulse output sent from the HUNLOCK circuit of the U501 through D311.



(Fig. 7.4) Blanking Operation: Signal Mode Changeover, Power ON/OFF and Unstable Sync signals

7.5 ABL Circuit

The ABL circuit performs the adjustment of the ABL level with the use of VR302.

7.6 SB MODE (Super Bright Mode)

The Super Bright Mode (SB MODE hereafter) is a function to achieve the effective display of images by emphasizing their intonation. This feature is enabled by controlling the brightness level and the contrast.

The SB MODE makes the best use of the features of the high brightness CRT. In this mode, the video amplitude is increased so that the maximum brightness is raised higher than that in the normal mode.

In the case of this model two kinds of the SB MODE are available, chosen by changing the setting according to the application.

In the SB MODE1 that is intended to achieve a sharp display of photos or the like, the black level is lowered than usual to strain the black tone so that the brightness can be raised by increasing the video amplitude.

In the SB MODE2 that is intended to achieve the reproduction of motion pictures like DVD, etc., the black level is cut off and the maximum brightness is raised higher than that in the SB MODE1. This mode is effective in attaining the maximum brightness almost equivalent to the brightness of a TV screen, useful for the expression of details in a dark scene. As a matter of course, the maximum brightness of the SB MODE1 is lower than that of the SB MODE2.

In the SB MODE, U201 is controlled by the microcomputer through the I^2C bus to realize this mode. At that time, the video amplitude (maximum brightness) and the image bias point (black level) are controlled.

REPLACEMENT PARTS LIST

The components specified for Model DPlus 93SB(B)

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
*** ICS ***			
U201	80016621	79PQ2544	IC LM1267
U202	80016761	79PQ2546	OSD IC MTV030N-046 FOR P7
U203	80010891	79PQ1731	IC LM2480
U204	80016611	79PQ2543	IC LM2465
U301	80016141	79PQ2534	IC TL494
U302	80010251	79PQ2205	IC LM358N/KIA358P
U401	80001041	79PQ0793	IC TDA8172 (N.S,SGS)
U501	80007131	79PQ2525	IC TDA4856
U601	80010641	79PQ2527	IC KA7812 CT(TO-220)
U701	80016951	79PQ2550	FLASH MCU MTV212MN32 N170
U702	80009941	79PQ2277	IC ATMEL EEPROM AT24C08B
*** TRANSISTORS ***			
Q101	EF100113	79PQ2812	FET N 2SK2843(SC) 600V/10
Q102	80005251	79PQ2524	TR NPN KSP44 TO-92(T)
Q103	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q104	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q105	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q131	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q132	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q151	EB307720	79PQ1246	TR PNP KSB772 TO-126
Q152	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q153	EA306691	79PQ1522	TR NPN HSD669AC TO-126
Q155	EB307720	79PQ1246	TR PNP KSB772 TO-126
Q156	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q157	80016661	79PQ2545	TR 2SD882
Q181	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q201	EAA18157	79PQ0734	TR NPN 2SC1815GR TO-92(T)
Q271	EBA07336	79PQ0062	TR PNP 2SA733P TO-92(T)
Q301	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q302	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q303	EBA07336	79PQ0062	TR PNP 2SA733P TO-92(T)
Q304	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q305	80008081	79PQ2526	TR N 2SK2996
Q306	EF206300	79PQ1525	FET N IRF630 TO-220 3P
Q307	EBA04230	79PQ0061	TR PNP BF423 TO-92(T)
Q309	EBA04230	79PQ0061	TR PNP BF423 TO-92(T)
Q310	EA306691	79PQ1522	TR NPN HSD669AC TO-126
Q312	80005251	79PQ2524	TR NPN KSP44 TO-92(T)
Q313	EF206300	79PQ1525	FET N IRF630 TO-220 3P
Q315	EF206301	79PQ0064	FET N YTAF630 TO-220F

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
Q316	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q317	EF206301	79PQ0064	FET N YTAF630 TO-220F
Q318	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q319	80003311	79PQ1168	FET N YTAF640 TO-220F
Q320	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q321	EF206301	79PQ0064	FET N YTAF630 TO-220F
Q322	80014321	79PQ2529	TR NPN KRC102M TO-92(T)
Q401	EAA04220	79PQ0811	TR NPN BF422 TO-92(T)
Q501	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q502	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q503	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q504	80003311	79PQ1168	FET N YTAF640 TO-220F
Q505	EA306691	79PQ1522	TR NPN HSD669AC TO-126
Q601	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q602	EAA12133	79PQ0057	TR NPN 2SC1213AC TO-92(T)
Q603	EBA06733	79PQ1524	TR PNP 2SA673AC TO-92(T)
Q613	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q614	EAA12133	79PQ0057	TR NPN 2SC1213AC TO-92(T)
Q615	EBA06733	79PQ1524	TR PNP 2SA673AC TO-92(T)
Q616	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q617	EAA12133	79PQ0057	TR NPN 2SC1213AC TO-92(T)
Q618	EBA06733	79PQ1524	TR PNP 2SA673AC TO-92(T)
Q701	EAA23690	79PQ0059	TR NPN PH2369 TO-92(T)
Q702	EAA09456	79PQ0056	TR NPN 2SC945 TO-92(T)
Q703	EBA07336	79PQ0062	TR PNP 2SA733P TO-92(T)

*** DIODES ***

D101	EJB20001	79PQ0318	DIODE/A 3A 1N5406 (FAGOR)
D102	EJB20001	79PQ0318	DIODE/A 3A 1N5406 (FAGOR)
D103	EJB20001	79PQ0318	DIODE/A 3A 1N5406 (FAGOR)
D104	EJB20001	79PQ0318	DIODE/A 3A 1N5406 (FAGOR)
D105	EJ044148	79PQ0065	DIODE T" 1N4148"
D106	EJ044148	79PQ0065	DIODE T" 1N4148"
D107	EJ044148	79PQ0065	DIODE T" 1N4148"
D108	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D109	EJ044148	79PQ0065	DIODE T" 1N4148"
D110	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D111	EJ044148	79PQ0065	DIODE T" 1N4148"
D112	EJ044148	79PQ0065	DIODE T" 1N4148"
D113	EJ044148	79PQ0065	DIODE T" 1N4148"
D115	EJ044148	79PQ0065	DIODE T" 1N4148"
D116	EJ044148	79PQ0065	DIODE T" 1N4148"
D117	EJ044148	79PQ0065	DIODE T" 1N4148"
D118	80003821	79PQ1487	DIODE 1A/1KV UF4007 D041
D119	EJ044148	79PQ0065	DIODE T" 1N4148"
D120	EJ044148	79PQ0065	DIODE T" 1N4148"
D131	EJAC0010	79PQ2552	DIODE/T 1A 1N4007
D132	EJ044148	79PQ0065	DIODE T" 1N4148"

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
D150	EJA05819	79PQ1644	DIODE STKY/T 1A/40V 1N581
D151	80016531	79PQ2541	DIODE 3A/600V RL4A (SANKE
D152	80016961	79PQ2551	DIODE/A 3.5A/200V RL4Z(SA
D153	80012371	79PQ2528	DIODE 3A/200V SF33(CHENMK
D154	80003571	79PQ2522	DIODE 200V/2A UF003 (CHEN
D155	80010341	79PQ2063	DIODE SR260 2A/60V(CHENMK
D181	EJ044148	79PQ0065	DIODE T" 1N4148"
D203	EJAC0018	79PQ1251	DIODE/T 1A 1N4937
D210	EJ044148	79PQ0065	DIODE T" 1N4148"
D211	EJ044148	79PQ0065	DIODE T" 1N4148"
D212	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D213	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D214	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D230	EJ044148	79PQ0065	DIODE T" 1N4148"
D231	EJ044148	79PQ0065	DIODE T" 1N4148"
D232	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D233	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D234	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D250	EJ044148	79PQ0065	DIODE T" 1N4148"
D251	EJ044148	79PQ0065	DIODE T" 1N4148"
D252	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D253	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D254	80000451	79PQ0043	DIODE/T 1/2W 1SS83
D271	EJ044148	79PQ0065	DIODE T" 1N4148"
D301	EJ044148	79PQ0065	DIODE T" 1N4148"
D302	EJ044148	79PQ0065	DIODE T" 1N4148"
D303	EJ044148	79PQ0065	DIODE T" 1N4148"
D304	EJ044148	79PQ0065	DIODE T" 1N4148"
D305	80011421	79PQ2809	DIODE 2A/600V RK36(SANKEN
D306	80001121	79PQ2521	DIODE 3A/400V HER305G
D307	80009741	79PQ1784	DIODE/T UF4005
D308	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D309	80009761	79PQ1786	DIODE/T UF4004
D310	EJ044148	79PQ0065	DIODE T" 1N4148"
D311	EJ044148	79PQ0065	DIODE T" 1N4148"
D312	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D313	EJ044148	79PQ0065	DIODE T" 1N4148"
D314	EJ044148	79PQ0065	DIODE T" 1N4148"
D315	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D316	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D317	EJB00004	79PQ0070	DIODE/A 5TUZ47
D318	EJ044148	79PQ0065	DIODE T" 1N4148"
D319	EJA00018	79PQ1526	DIODE/T 1A UF4006
D401	EJAC0005	79PQ0067	DIODE/T 1A 1N4002
D402	EJ044148	79PQ0065	DIODE T" 1N4148"
D501	EJ044148	79PQ0065	DIODE T" 1N4148"
D502	EJ044148	79PQ0065	DIODE T" 1N4148"
D503	EJ044148	79PQ0065	DIODE T" 1N4148"

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
D504	EJ044148	79PQ0065	DIODE T" 1N4148"
D505	80001121	79PQ2521	DIODE 3A/400V HER305G
D507	80003841	79PQ1489	DIODE 1A/20V UF4003 DG41
D601	EJ044148	79PQ0065	DIODE T" 1N4148"
D602	EJ044148	79PQ0065	DIODE T" 1N4148"
D605	EJ044148	79PQ0065	DIODE T" 1N4148"
D606	EJ044148	79PQ0065	DIODE T" 1N4148"
D704	EJ044148	79PQ0065	DIODE T" 1N4148"
D709	EJ044148	79PQ0065	DIODE T" 1N4148"
LED101	80000131	79PQ0021	LED L-59GH/1GYC
ZD101	EKA0200B	79PQ1252	ZEN DIODE 1/2W(T) HZS20.2
ZD102	EKA0180B	79PQ0078	ZEN DIODE 1/2W(T) 18V
ZD131	EKA01201	79PQ0077	ZEN DIODE 1/2W(T) 12A2
ZD151	EKA00604	79PQ1441	ZEN DIODE 1/2W(T) HZS6B2
ZD303	EKA00906	79PQ0076	ZEN DIODE 1/2W(T) 9C1
ZD701	EKA00607	79PQ0292	ZEN DIODE 1/2W(T) 6C2
ZD702	EKA00607	79PQ0292	ZEN DIODE 1/2W(T) 6C2
ZD703	EKA00607	79PQ0292	ZEN DIODE 1/2W(T) 6C2
ZD704	EKA00607	79PQ0292	ZEN DIODE 1/2W(T) 6C2
ZD705	EKA00607	79PQ0292	ZEN DIODE 1/2W(T) 6C2
ZD706	EKA00607	79PQ0292	ZEN DIODE 1/2W(T) 6C2
ZD712	EKA0150B	79PQ2553	ZEN DIODE 1/2W(T) 15-2
ZD713	EKA0150B	79PQ2553	ZEN DIODE 1/2W(T) 15-2

*** TRANSFORMERS ***

T101	HE100031	79PQ2815	POWER XFMR ERL35 200UH E9
T301	HH910011	79PQ2816	FBT E95 (MERITRON)
T302	80016811	79PQ2549	DF X'FM N1901
T304	80012261	79PQ2817	DRIVE X'FM 6MH(EI-19) HR1

*** VARIABLE RESISTORS ***

VR301	FF310223	79PQ2573	VR CARBON 6MM 22K
VR302	FF310223	79PQ2573	VR CARBON 6MM 22K
VR501	FF310501	79PQ2231	VR CARBON 6MM 500H

*** RELAYS & SWITCHES ***

SW101	JC800121	79PQ2453	SW POWER DC 30V 0.1A SPUN
SW701	80000251	79PQ0028	TACT SW 1P 100G+-50
SW702	80000251	79PQ0028	TACT SW 1P 100G+-50
SW703	80000251	79PQ0028	TACT SW 1P 100G+-50
SW704	80000251	79PQ0028	TACT SW 1P 100G+-50
SW705	80000251	79PQ0028	TACT SW 1P 100G+-50
SW706	80000251	79PQ0028	TACT SW 1P 100G+-50
SW707	80000251	79PQ0028	TACT SW 1P 100G+-50

*** PWB ASSYS ***

CRTBD	AC0M22MM	79PQ2788	CRT INSERT ASSY
MAINBD	AM0M22MM	79PQ2596	MAIN INSERT ASSY(FE991SB)

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
*** COILS & FILTERS ***			
B201	HC006002	79PQ1104	BEAD 3.5X4.7/T
B203	80000561	79PQ1232	BEAD 3.5*6*0.8/T
B204	80000561	79PQ1232	BEAD 3.5*6*0.8/T
L101	HA100041	79PQ2810	CORE EMI COMMON CHOKE25MH
L131	HA200031	79PQ2811	HARMONIC CHOKE EE42 60MH
L151	HB000008	79PQ0276	CHOKE COIL 100UH 8X10
L201	HB000008	79PQ0276	CHOKE COIL 100UH 8X10
L202	HB000008	79PQ0276	CHOKE COIL 100UH 8X10
L203	HB013100	79PQ1277	PACKING COIL T 10UH K
L210	HB013278	79PQ1752	PACKING COIL /T 0.27UH K
L211	HB013338	79PQ2590	PACKING COIL /T 0.33UH K(
L230	HB013278	79PQ1752	PACKING COIL /T 0.27UH K
L231	HB013338	79PQ2590	PACKING COIL /T 0.33UH K(
L250	HB013278	79PQ1752	PACKING COIL /T 0.27UH K
L251	HB013338	79PQ2590	PACKING COIL /T 0.33UH K(
L301	80016071	79PQ2531	CHOCK COIL 14UH P75
L501	80016081	79PQ2532	CHOCK COIL 8.0MH (DRWW16*
RL181	80003761	79PQ2523	REPLY 12V 6P OSA-SS-212DM
T501	80016801	79PQ2548	CHOKE COIL 45UH N1901
*** ELECTRICAL PARTS & MISCELLANEOUS PARTS ***			
B101	HC006003	79PQ1595	BEAD 3.5X8/T
B102	HC005003	79PQ1594	BEAD 3.5X8/T(WBRH-2.5X8X0
B103	HC005003	79PQ1594	BEAD 3.5X8/T(WBRH-2.5X8X0
B301	HC006003	79PQ1595	BEAD 3.5X8/T
B302	HC006003	79PQ1595	BEAD 3.5X8/T
B303	HC006003	79PQ1595	BEAD 3.5X8/T
B304	HC006003	79PQ1595	BEAD 3.5X8/T
CABLE	80016301	79PQ2536	SIGNAL CABLE P75
CRTS	80005711	79PQ1363	ISDW02S41 CRT SOCKET
DEG	HA690011	79PQ2785	DEGAUSSING COIL E95 UN-PU
F101	80001521	79PQ0799	FUSE 3.15A/250V 50T
J70	HC006003	79PQ1595	BEAD 3.5X8/T
J79	HC006003	79PQ1595	BEAD 3.5X8/T
J80	HC006003	79PQ1595	BEAD 3.5X8/T
L102	HA100051	79PQ2737	CORE EMI COMMON CHOKE UU1
P101	JD512001	79PQ0290	AC SOCKET 3P
P-CORD	80001651	79PQ0869	POWER CORD 3P 1.8M EUROPE
Q314	80008151	79PQ2739	TR NPN 2SC5587 TO-3P
R102	FA360333	79PQ2710	CARBON 1/2W M(T) 5% 33K
RL131	80005831	79PQ1722	RELAY 12V 8 P MI-SS-212D
TH101	80004371	79PQ1499	THERMISTOR NTCR N15SP006L
TH102	80015731	79PQ2530	THERMISTOR PTCR 4.5H(9H13
X701	EM012004	79PQ1735	X'TAL 49U 12MHZ

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
*** APPEARANCE PARTS ***			
CABB	10102221	79PQ2672	CABINET BACK
CABF	10102031	79PQ2513	CABINET FRONT ASSY
CHASS	12000631	79PQ2515	CHASSIS BASE
PANEL	11700431	79PQ2676	PANEL(DP93SB)
REVS	11000991	79PQ2466	REVOLVING STAND ASSY
SPONGE	17000301	79PQ1359	CUSHION PIECE(BACK)
*** PRINTED & PACKING MATERIALS ***			
BAGP1	13700031	79PQ2252	BAG POLYETHYLENE(150*370)
BAGP2	13700021	79PQ0958	BAG POLYETHYLENE
CART	13201821	79PQ2680	CARTON BOX DP93 SB(B)
CDROM	19700082	79PQ2797	INSTRUCTION CO-ROM DPLUS/
LABELC	15201621	79PQ2486	LABEL CARTON (NE)
LA-WA1	15201541	79PQ2632	LABEL WARNING(28KV)
LA-WA2	15201561	79PQ2670	LABEL WARNING(28KV,1100UA
MANU	15501241	79PQ2687	OWNERS MANUAL DP93SB(B)
NAV	15900251	79PQ2790	NAVISET CARTON BOX FLYER
NP	15001551	79PQ2683	NAME PLATE DP93SB(B)
PEBAG	13700231	79PQ2792	PE BAG(500*480*850+WARNIN
POLB	13400771	79PQ2518	POLYLON(B)
POLT	13400761	79PQ2517	POLYLON(T)
*** RESISTORS ***			
R101	FA330684	79PQ0156	CARBON 1/2W(T) 5% 680K
R103	FA330333	79PQ1039	CARBON 1/2W(T) 5% 33K
R104	FA240564	79PQ0328	CARBON 1/4W(T) 5% 560K
R105	FA240564	79PQ0328	CARBON 1/4W(T) 5% 560K
R106	FB244708	79PQ2561	METAL 1/4W(T) 1% 4.7H
R107	FB910010	79PQ0345	METAL 1/4W(T) 5% 1OHM
R108	FA040390	79PQ0108	CARBON 1/8W(T) 5% 39OHM
R109	FA240470	79PQ0136	CARBON 1/4W 5% 47OHM
R110	FA240103	79PQ0126	CARBON 1/4W(T) 5% 10K
R111	FA240103	79PQ0126	CARBON 1/4W(T) 5% 10K
R112	FA240563	79PQ1646	CARBON 1/4W(T) 5% 56K
R113	FA240242	79PQ1032	CARBON 1/4W(T) 5% 2.4K
R114	FB242702	79PQ1052	METAL 1/4W(T) 1% 27K
R115	FA240222	79PQ0129	CARBON 1/4W(T) 5% 2.2K
R116	FB244531	79PQ2560	METAL 1/4W(T) 1% 4.53K
R117	FA240203	79PQ0128	CARBON 1/4W(T) 5% 20K
R118	FA330330	79PQ2556	CARBON 1/2W(T) 5% 33H
R119	FA330102	79PQ0146	CARBON 1/2W(T) 5% 1K
R120	FC240158	79PQ2572	WOUND RES 3W/M(A)5% 0.15H
R121	FB560338	79PQ1183	MOF 2W/M(A) 5% 0.33H
R122	FB570683	79PQ2570	MOF 2W/M(B) 5% 68K
R123	FA240104	79PQ0822	CARBON 1/4W(T) 5% 100K
R124	FA240222	79PQ0129	CARBON 1/4W(T) 5% 2.2K
R125	FA330102	79PQ0146	CARBON 1/2W(T) 5% 1K

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
R126	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R127	FA330470	79PQ2266	CARBON 1/2W(T) 5% 47H
R128	FA330564	79PQ1544	CARBON 1/2(T) 5% 560K
R129	FA330564	79PQ1544	CARBON 1/2(T) 5% 560K
R131	FA330434	79PQ2558	CARBON 1/2W(T) 5% 430K
R132	FA330434	79PQ2558	CARBON 1/2W(T) 5% 430K
R133	FA330513	79PQ2559	CARBON 1/2W(T) 5% 51K
R135	FA330433	79PQ2557	CARBON 1/2W(T) 5% 43K
R137	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R138	FA240681	79PQ0140	CARBON 1/4W(T) 5% 680OHM
R139	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R148	FA040162	79PQ2211	CARBON 1/8W(T) 5% 1.6K
R151	FA330224	79PQ0828	CARBON 1/2W (T) 5% 220K
R153	FA330104	79PQ0826	CARBON 1/2W(T)5%100K
R154	FA240103	79PQ0126	CARBON 1/4W(T) 5% 10K
R155	FA330751	79PQ2215	CARBON 1/2W(T) 5% 750H
R156	FA240103	79PQ0126	CARBON 1/4W(T) 5% 10K
R157	FA240103	79PQ0126	CARBON 1/4W(T) 5% 10K
R158	FA330751	79PQ2215	CARBON 1/2W(T) 5% 750H
R161	FA240102	79PQ0125	CARBON 1/4W 5% 1KOHM
R162	FA240122	79PQ1030	CARBON 1/4W(T) 5% 1.2KH
R164	FA330109	79PQ0147	CARBON 1/2W (T) 5% 1OHM
R165	FA330102	79PQ0146	CARBON 1/2W(T) 5% 1K
R181	FA240103	79PQ0126	CARBON 1/4W(T) 5% 10K
R182	FA240473	79PQ0138	CARBON 1/4W 5% 47KOHM
R201	FA040562	79PQ0739	CARBON 1/8W(T) 5% 5.6K
R202	FA040105	79PQ0085	CARBON 1/8W(T) 5% 1M
R203	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R204	FA040562	79PQ0739	CARBON 1/8W(T) 5% 5.6K
R205	FA040221	79PQ1255	R,CARBON 1/8W(T) 5% 220H
R206	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R207	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R208	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R209	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R210	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R211	FA040330	79PQ0105	CARBON 1/8W(T) 5% 33OHM
R213	FB247509	79PQ0168	METAL 1/4W(T) 1% 75OHM
R215	FA240330	79PQ1645	CARBON 1/4W(T) 5% 33H
R216	FA040105	79PQ0085	CARBON 1/8W(T) 5% 1M
R217	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R218	FA240750	79PQ0141	CARBON 1/4W(T) 5% 75OHM
R230	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R231	FA040330	79PQ0105	CARBON 1/8W(T) 5% 33OHM
R233	FB247509	79PQ0168	METAL 1/4W(T) 1% 75OHM
R235	FA240330	79PQ1645	CARBON 1/4W(T) 5% 33H
R236	FA040105	79PQ0085	CARBON 1/8W(T) 5% 1M
R237	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R238	FA240750	79PQ0141	CARBON 1/4W(T) 5% 75OHM

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
R250	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R251	FA040330	79PQ0105	CARBON 1/8W(T) 5% 33OHM
R253	FB247509	79PQ0168	METAL 1/4W(T) 1% 75OHM
R255	FA240330	79PQ1645	CARBON 1/4W(T) 5% 33H
R256	FA040105	79PQ0085	CARBON 1/8W(T) 5% 1M
R257	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R258	FA240750	79PQ0141	CARBON 1/4W(T) 5% 75OHM
R270	FA240472	79PQ0137	CARBON 1/4W(T) 5% 4.7K
R271	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R272	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R273	FA040681	79PQ0120	CARBON 1/8W(T) 5% 680OHM
R274	FA040681	79PQ0120	CARBON 1/8W(T) 5% 680OHM
R275	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R276	FA330101	79PQ0145	CARBON 1/2W(T) 5% 100OHM
R277	FA240334	79PQ1034	CARBON 1/4W(T) 5% 330K
R278	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R279	FB241002	79PQ0161	METAL 1/4W(T) 1% 10K
R280	FB470229	79PQ1471	MOF 1W/M(A) 5% 2.2OHM
R282	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R283	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R284	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R285	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R286	FA040123	79PQ0087	CARBON 1/8W(T) 5% 12K
R287	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R289	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R301	FB470338	79PQ1712	MOF 1W/M(A) 5% 0.33H
R302	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R303	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R304	FA040563	79PQ0820	CARBON 1/8W(T) 5% 56K
R305	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R306	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R307	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R308	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R309	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R310	FA040220	79PQ1528	CARBON 1/8W(T) 5% 22H
R311	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R312	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R313	FA040511	79PQ0117	CARBON 1/8W(T) 5% 510OHM
R314	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R315	FA330100	79PQ0144	CARBON 1/2W(T) 5% 10OHM
R316	FA040753	79PQ1619	CARBON 1/8W(T) 5% 75K
R317	FA040512	79PQ1531	CARBON 1/8W(T) 5% 5.1K
R318	FA040104	79PQ0084	CARBON 1/8W(T) 5% 100K
R319	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R320	FA330102	79PQ0146	CARBON 1/2W(T) 5% 1K
R321	FA330103	79PQ0825	CARBON 1/2W(T) 5% 10K
R322	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R323	FA330274	79PQ1038	CARBON 1/2W(T) 5% 270KH

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
R324	FA330223	79PQ2554	CARBON 1/2W(T) 5% 22K
R325	FA040821	79PQ1025	CARBON 1/8W(T) 5% 820
R326	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R327	FA040333	79PQ0106	CARBON 1/8W(T) 5% 33K
R328	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R329	FA330104	79PQ0826	CARBON 1/2W(T)5%100K
R330	FA330102	79PQ0146	CARBON 1/2W(T) 5% 1K
R331	FB560104	79PQ2568	MOF 2W/M(A) 5% 100K
R333	FA040105	79PQ0085	CARBON 1/8W(T) 5% 1M
R334	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R335	FB470101	79PQ0169	MOF 1W/M(A) 5% 100OHM
R336	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R337	FB470100	79PQ0340	MOF 1W/M(A) 5% 10OHM
R338	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R339	FA040562	79PQ0739	CARBON 1/8W(T) 5% 5.6K
R340	FB470331	79PQ0743	RES MOF 1W/M(A) 5% 330H
R341	FA330330	79PQ2556	CARBON 1/2W(T) 5% 33H
R342	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R343	FA040220	79PQ1528	CARBON 1/8W(T) 5% 22H
R344	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R345	FB710121	79PQ1555	MOF 2W/M(A) 5% 120H
R347	FA330270	79PQ2555	CARBON 1/2W(T) 5% 27H
R348	FB710518	79PQ2571	MOF 3W/M(A) 5% 0.51H
R349	FB241003	79PQ1047	METAL 1/4W(T) 1% 100K
R350	FB245601	79PQ1058	METAL 1/4W(T) 1% 5.6K
R351	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R352	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R353	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R354	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R355	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R356	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R357	FA040513	79PQ0118	CARBON 1/8W(T) 5% 51K
R358	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R359	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R360	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R361	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R362	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R363	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R364	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R365	FB710161	79PQ2805	MOF 3W/M(A) 5% 160 OHM
R401	FB560339	79PQ0180	MOF 2W/M(A) 5% 3.3OHM
R403	FB470109	79PQ0742	RES MOF 1W/M(A) 5% 1H
R404	FA240229	79PQ1031	CARBON 1/4W(T) 5% 2.2H
R405	FA040682	79PQ0121	CARBON 1/8W(T) 5% 6.8K
R406	FA040302	79PQ1529	CARBON 1/8W(T) 5% 3K
R407	FB470139	79PQ1648	MOF 1W/M(A) 5% 1.3H
R408	FA330122	79PQ1539	CARBON 1/2W (T) 5% 1.2K
R409	FA040682	79PQ0121	CARBON 1/8W(T) 5% 6.8K

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
R410	FA040302	79PQ1529	CARBON 1/8W(T) 5% 3K
R411	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R412	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R413	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R414	FA040332	79PQ0321	CARBON 1/8W(T) 5% 3.3K
R415	FA040104	79PQ0084	CARBON 1/8W(T) 5% 100K
R501	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R502	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R503	FA040223	79PQ0096	CARBON 1/8W(T) 5% 22K
R504	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R505	FB242611	79PQ0165	METAL 1/4W(T) 1% 2.61K
R506	FB247250	79PQ2562	METAL 1/4W(T) 1% 725H
R507	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R508	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R509	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R510	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R511	FB245102	79PQ2268	METAL 1/4W(T) 1% 51K
R512	FA040153	79PQ0090	CARBON 1/8W(T) 5% 15K
R513	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R514	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R515	FA040223	79PQ0096	CARBON 1/8W(T) 5% 22K
R516	FA040333	79PQ0106	CARBON 1/8W(T) 5% 33K
R517	FA040512	79PQ1531	CARBON 1/8W(T) 5% 5.1K
R518	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R519	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R520	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R521	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R522	FA040563	79PQ0820	CARBON 1/8W(T) 5% 56K
R523	FA040220	79PQ1528	CARBON 1/8W(T) 5% 22H
R524	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R525	FC2D0278	79PQ2813	R WOUND 3W/M(A) 5% 0.27K
R526	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R527	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R528	FB710561	79PQ2814	MOF 3W/M(A) 5% 560OHM
R529	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R530	FB440010	79PQ2566	MOF 1W/M(A) 5% 1H
R531	FB274702	79PQ1872	METAL 1/4W/M(T) 1% 47K
R533	FB271742	79PQ2563	METAL 1/4W/M(T) 1% 17.4K
R601	FA040333	79PQ0106	CARBON 1/8W(T) 5% 33K
R602	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R603	FA040184	79PQ0092	CARBON 1/8W(T) 5% 180K
R604	FA040220	79PQ1528	CARBON 1/8W(T) 5% 22H
R614	FB470242	79PQ2567	MOF 1W/M(A) 5% 2.4K
R615	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R616	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R617	FB470242	79PQ2567	MOF 1W/M(A) 5% 2.4K
R618	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R619	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
R627	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R628	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R629	FB560201	79PQ1474	MOF 2W/M(A) 5% 200OHM
R630	FB560201	79PQ1474	MOF 2W/M(A) 5% 200OHM
R635	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R701	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R702	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R703	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R704	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R705	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R706	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R707	FA040105	79PQ0085	CARBON 1/8W(T) 5% 1M
R708	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R710	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R711	FB277500	79PQ2565	METAL 1/4W/M(T) 1% 750H
R713	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R714	FA040102	79PQ0082	CARBON 1/8W(T) 5% 1K
R715	FB272701	79PQ2564	METAL 1/4W/M(T) 1%2.7K
R716	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R717	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R719	FB275601	79PQ1967	METAL 1/4W/M(T) 1% 5.6K
R721	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R722	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R723	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R724	FB271002	79PQ1862	METAL 1/4W/M(T) 1% 10K
R725	FB277500	79PQ2565	METAL 1/4W/M(T) 1% 750H
R726	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R727	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R728	FB272701	79PQ2564	METAL 1/4W/M(T) 1%2.7K
R729	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R730	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R731	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R732	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R733	FA040101	79PQ0081	CARBON 1/8W(T) 5% 100OHM
R734	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R735	FA040471	79PQ0113	CARBON 1/8W(T) 5% 470OHM
R736	FA040222	79PQ0095	CARBON 1/8W(T) 5% 2.2K
R737	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R738	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R739	FB275601	79PQ1967	METAL 1/4W/M(T) 1% 5.6K
R746	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R747	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R748	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R749	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R751	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K
R752	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R754	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R756	FA040103	79PQ0083	CARBON 1/8W(T) 5% 10K

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
R757	FA040472	79PQ0114	CARBON 1/8W(T) 5% 4.7K
R760	FA040392	79PQ0110	CARBON 1/8W(T) 5% 3.9K
R762	FA040272	79PQ0100	CARBON 1/8W(T) 5% 2.7K

*** CAPACITORS ***

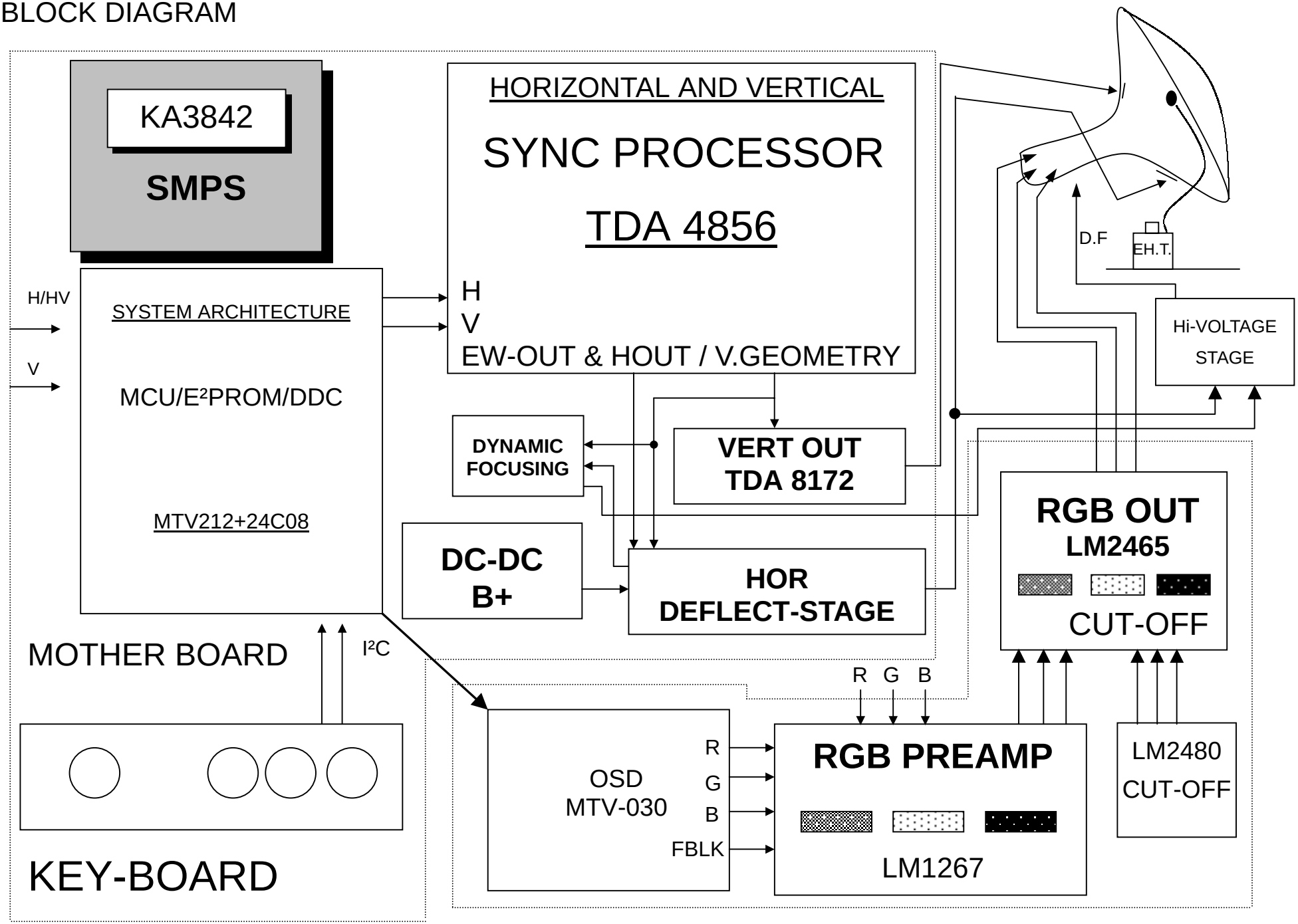
C101	GJ047400	79PQ0272	SAFETY X-CAP 0.47U/275V M
C102	GJH102E5	79PQ0274	SAFE Y-CAP/S 1000P/400V M
C103	GJH102E5	79PQ0274	SAFE Y-CAP/S 1000P/400V M
C105	GJH102E5	79PQ0274	SAFE Y-CAP/S 1000P/400V M
C106	GJH102E5	79PQ0274	SAFE Y-CAP/S 1000P/400V M
C107	GKA337E5	79PQ0382	POWER ELECT 85C 330U/400V
C108	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C109	GB7103H3	79PQ1746	CERAMIC Y5P(B)/T0.01U/1KV
C110	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C111	GA322745	79PQ1082	ELECT 85°C/T 220U/35V M
C112	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C113	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C114	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C115	GF222252	79PQ0754	MEF CAP BOX 0.0022U/50V J
C116	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C117	GB715153	79PQ2582	CERAMIC Y5P(B)/T 150P/50V
C118	GB747153	79PQ0238	CC Y5P(B)/T 470P/50V K
C119	GF233262	79PQ0256	MEF CAP BOX 0.0033U/63VJ
C120	GA347755	79PQ2578	ELECT 85OC/T 470U/50V M
C121	GF210452	79PQ0752	MEF CAP BOX 0.1U/50V J
C131	GA3105E5	79PQ2576	ELECT 85OC/T 1U/400V M
C132	GA310555	79PQ0196	ELECT 85°C/T 1U/50V M
C135	GJC222E5	79PQ0273	SAFE Y-CAP/D 2200P/400V M
C151	GAI10775	79PQ1984	ELECT 105 C/T 100U/100V M
C152	GAH47755	79PQ2806	ELECT 105OC/A 470U/50V M
C153	GAB10835	79PQ0223	ELECT 105°C/A1000U/25V M
C154	GAH22735	79PQ2807	ELECT 105OC/A 220U/25V M
C155	GAA10825	79PQ0218	ELECT 85°C/A 1000U/16V M
C157	GAA10775	79PQ1576	ELECT 85C/ A 100U/100V M
C158	GAA47735	79PQ1577	ELECT 85C/A 470U/25V M
C159	GA322635	79PQ1743	ELECT 85C/T 22U/25V M
C160	GA322735	79PQ1266	C,ELEC 220UF 25V M
C161	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C162	GA315725	79PQ2577	ELECT 85OC/T 150U/16V M
C181	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C182	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C202	GE210352	79PQ0245	CQ PEI/T 0.01U/50V J
C203	GE210352	79PQ0245	CQ PEI/T 0.01U/50V J
C205	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C206	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C207	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C209	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C210	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
C211	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C212	GA410575	79PQ0213	ELECT NP/T 1U/100V M
C213	GA210575	79PQ1265	C,ELEC 1UF 100V M
C230	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C231	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C232	GA410575	79PQ0213	ELECT NP/T 1U/100V M
C233	GA210575	79PQ1265	C,ELEC 1UF 100V M
C250	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C251	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C252	GA410575	79PQ0213	ELECT NP/T 1U/100V M
C253	GA310575	79PQ0197	ELECT 85°C/T 1U/100VM
C270	GB656052	79PQ1087	CERAMIC SL/T 56P/50V
C272	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C273	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C274	GB7102F3	79PQ0234	CC Y5P(B)/T 1000P/500V K
C275	GB7222F3	79PQ1717	CERAMIC Y5P(B) 2200P/500V
C276	GA222675	79PQ1078	ELECT 105°C/T 22U/100V M
C277	GAA10575	79PQ1744	ELECT 85C/A 1U/100V M
C278	GB7102F3	79PQ0234	CC Y5P(B)/T 1000P/500V K
C279	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C27A	GB618152	79PQ2233	CERAMIC SL/T 180P/50V J
C27E	GB618152	79PQ2233	CERAMIC SL/T 180P/50V J
C280	GB7102F3	79PQ0234	CC Y5P(B)/T 1000P/500V K
C282	GA310555	79PQ0196	ELECT 85°C/T 1U/50V M
C283	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C284	GB7102F3	79PQ0234	CC Y5P(B)/T 1000P/500V K
C285	GB9332H3	79PQ0243	CC Z5V(F)/T 3300P/1KV Z
C286	GB9472H3	79PQ2235	CERAMIC Z5V(F)/T 4700P/1K
C287	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C288	GF210462	79PQ0253	MEF CAP BOX 0.1U/63V J
C289	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C290	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C293	GA322555	79PQ0202	ELECT 85°C/T 2.2U/50V M
C294	GB647152	79PQ1930	CERAMIC SL/T 470P/50V J
C295	GA210675	79PQ2574	ELECT 105OC/T 10U/100V M
C296	GA210675	79PQ2574	ELECT 105OC/T 10U/100V M
C301	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C302	GA310725	79PQ0199	ELECT 85°C/T 100U/16V M
C303	GB768153	79PQ1582	CERAMIC Y5P(B)/T 680P/50V
C304	GF210452	79PQ0752	MEF CAP BOX 0.1U/50V J
C305	GB768153	79PQ1582	CERAMIC Y5P(B)/T 680P/50V
C306	GF222352	79PQ0857	MEF CAP BOX 0.022U/50V J
C307	GB710153	79PQ2580	CERAMIC Y5P(B)/T 100P/50V
C308	GFE102H2	79PQ2589	PLASTIC PMS/A 1000P/1KV J
C309	GF233452	79PQ0760	MEF CAP BOX 0.33U/50V J
C310	GA310555	79PQ0196	ELECT 85°C/T 1U/50V M
C311	GA2105D5	79PQ2808	ELECT 105OC/T 1U/350V M
C312	GA347655	79PQ1267	C,ELEC 47UF 50V M

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
C313	GA310685	79PQ1081	ELECT 85°C/T 10U/250V M
C314	GA322555	79PQ0202	ELECT 85°C/T 2.2U/50V M
C315	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C316	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C317	GBE332F5	79PQ2583	CC Z5U(E)/A 3300P/500V M
C318	GA310555	79PQ0196	ELECT 85°C/T 1U/50V M
C320	GAA22775	79PQ2579	ELECT 85OC/A 220U/100V M
C321	GA347625	79PQ0210	ELECT 85°C/T 47U/16V M
C322	GB768153	79PQ1582	CERAMIC Y5P(B)/T 680P/50V
C323	GA322725	79PQ0204	ELECT 85°C/T 220U/16V M
C325	GB7101H3	79PQ1089	CERAMIC 100P/1KV
C326	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C327	GF210452	79PQ0752	MEF CAP BOX 0.1U/50V J
C328	GA322585	79PQ0203	ELECT 85°C/T 2.2U/250V M
C330	GF210272	79PQ0750	MEF CAP BOX 0.001U/100V J
C331	GFB10482	79PQ1209	PLASTIC MPP/A 0.10U/250VJ
C332	GFE622J2	79PQ1749	PLASTIC PMS/A 6200P/2KV J
C333	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C334	GFB22482	79PQ0889	PLASTIC MPP/A 0.22U/250V
C335	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C336	GFB56482	79PQ0380	PLASTIC MPP/A 0.56U/250V
C337	GA347555	79PQ0208	ELECT 85°C/T 4.7U/50V M
C338	GFB15582	79PQ2588	PLASTIC MPP/A 1.5U/250V J
C339	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C340	GFB10482	79PQ1209	PLASTIC MPP/A 0.10U/250VJ
C343	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C401	GA347725	79PQ0851	ELECT 85C/T 470U/16VM
C403	GA347725	79PQ0851	ELECT 85C/T 470U/16VM
C404	GF222452	79PQ0756	MEF CAP BOX 0.22U/50V J
C406	GF222252	79PQ0754	MEF CAP BOX 0.0022U/50V J
C407	GB710253	79PQ0233	CC Y5P(B)/T 1000P/50V K
C408	GF215352	79PQ2585	MEF CAP BOX 0.015U/50V J
C409	GA310555	79PQ0196	ELECT 85°C/T 1U/50V M
C410	GF210482	79PQ1586	MEF CAP BOX 0.1U/250V J
C411	GA310745	79PQ0848	ELECT 85C/T 100U/35VM
C501	GA310725	79PQ0199	ELECT 85°C/T 100U/16V M
C502	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C503	GB639052	79PQ1928	CERAMIC SL/T 39P/50V J
C504	GF215452	79PQ1098	MEF CAP BOX 0.15U/50V J
C505	GF210452	79PQ0752	MEF CAP BOX 0.1U/50V J
C506	GF282252	79PQ2312	MEF CAP BOX 0.0082U/50V J
C507	GF282352	79PQ2587	MEF CAP BOX 0.082U/50V J
C508	GE410351	79PQ2584	PLASTIC PPN/T 0.01UF/50V
C509	GF268252	79PQ2586	MEF CAP BOX 0.0068U/50V J
C510	GF210352	79PQ0751	MEF CAP BOX 0.01U/50V J
C511	GB768153	79PQ1582	CERAMIC Y5P(B)/T 680P/50V
C512	GF210352	79PQ0751	MEF CAP BOX 0.01U/50V J
C513	GA322655	79PQ1122	ELECT 85°C/T 22U/50V M

SYMBOL	Part No for NPG	Part No for NMV	DESCRIPTION
C514	GF210252	79PQ0748	MEF CAP BOX 0.001U/50V J
C515	GA347755	79PQ2578	ELECT 85OC/T 470U/50V M
C516	GB7471H3	79PQ0239	CC Y5P(B)/T 470P/1KV K
C517	GFD304E2	79PQ1624	PLASTIC PMM/T 0.3U/400V J
C518	GA310725	79PQ0199	ELECT 85°C/T 100U/16V M
C519	GA310725	79PQ0199	ELECT 85°C/T 100U/16V M
C520	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C521	GB610153	79PQ1578	CERAMIC SL/T 100P/50V K
C522	GB610153	79PQ1578	CERAMIC SL/T 100P/50V K
C523	GB639052	79PQ1928	CERAMIC SL/T 39P/50V J
C524	GB639052	79PQ1928	CERAMIC SL/T 39P/50V J
C601	GA322725	79PQ0204	ELECT 85°C/T 220U/16V M
C602	GA322725	79PQ0204	ELECT 85°C/T 220U/16V M
C603	GA322555	79PQ0202	ELECT 85°C/T 2.2U/50V M
C611	GB733153	79PQ1580	CERAMIC Y5P(B)/T 330P/50V
C612	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C613	GB733153	79PQ1580	CERAMIC Y5P(B)/T 330P/50V
C614	GA310655	79PQ0198	ELECT 85°C/T 10U/50V M
C615	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C616	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C701	GE210352	79PQ0245	CQ PEI/T 0.01U/50V J
C702	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C703	GA310715	79PQ1570	ELECT 85O C/T 100U/10V M
C704	GB633052	79PQ0231	CERAMIC SL/T 33P/50V J
C705	GB633052	79PQ0231	CERAMIC SL/T 33P/50V J
C706	GB710153	79PQ2580	CERAMIC Y5P(B)/T 100P/50V
C709	GB710153	79PQ2580	CERAMIC Y5P(B)/T 100P/50V
C710	GB710153	79PQ2580	CERAMIC Y5P(B)/T 100P/50V
C716	GB710253	79PQ0233	CC Y5P(B)/T 1000P/50V K
C717	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C718	GB210458	79PQ0228	CERAMIC Y5V/T 0.1U/50V Z
C719	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z
C720	GB910358	79PQ0242	CC Z5V(F)/T 0.01U/50V Z

9. BLOCK DIAGRAM

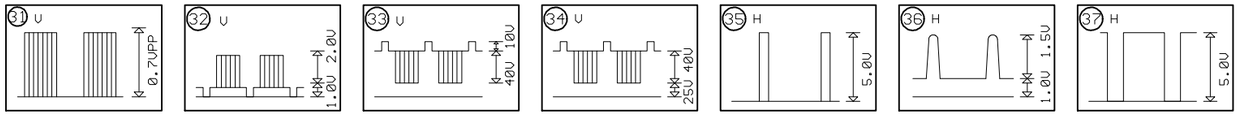


10. SCHEMATIC DIAGRAM MAIN PWB ASSY (FE991SB/DPlus93SB)

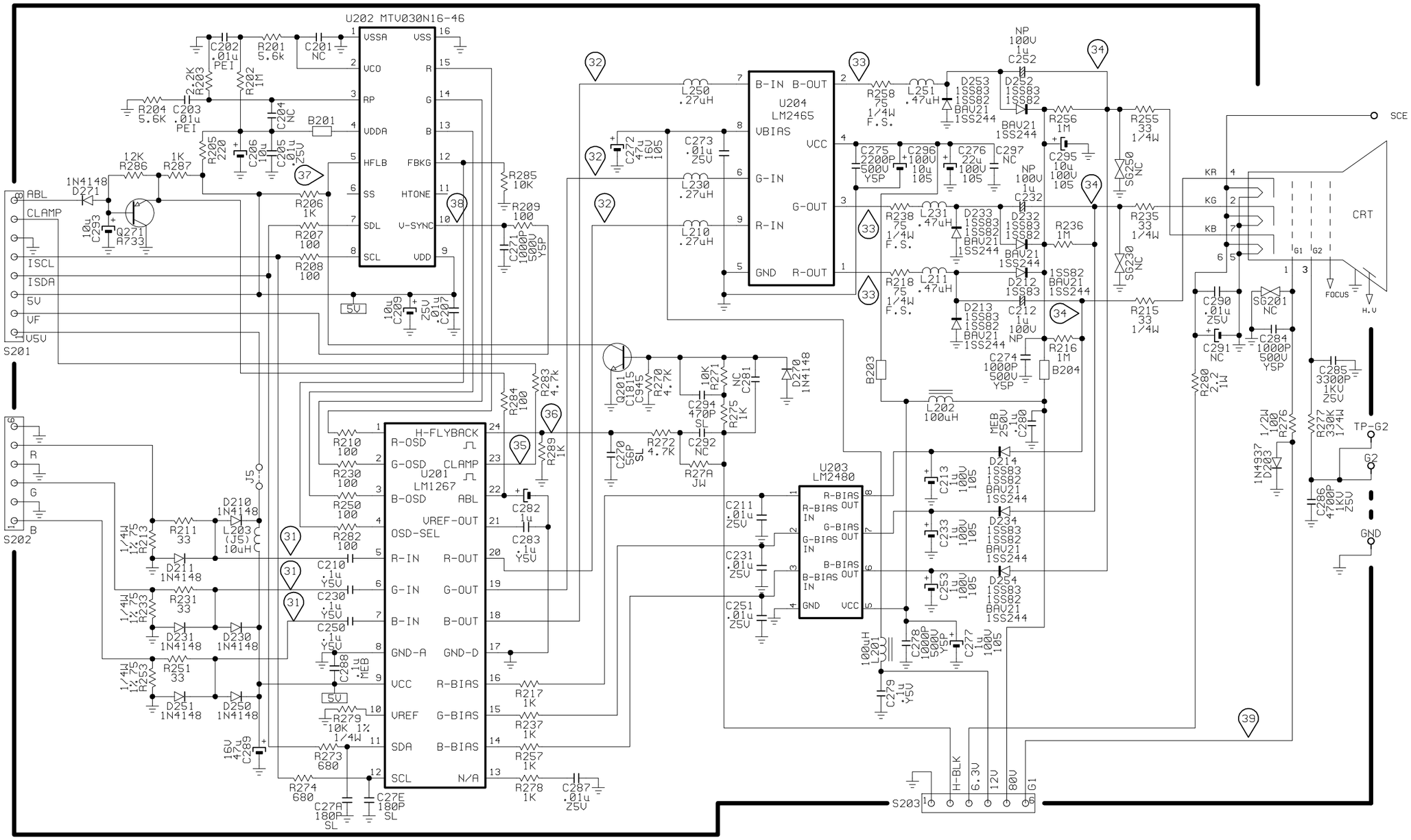
ITEAM	SAMAUNG/LG	MITSUBISHI
CRT	S.M46QCK761X123	M.M46LXH51X31
	L.M46QEF903X01	M.M46LXH51X31R
CRT SOCKET	17" 29D NECK	DHE-A92-700D
		A
C308	1500P/1KV PMS	1000P/1KV PMS
C325	47P/2KV SL	100P/2KV SL
C332	4300P/2KV PMS	6200P/2KV PMS
C334	0.27u/250V MPP	0.27u/250V MPP
C336	0.47u/250V MPP	0.75u/250V MPP
C338	1.5u/250V MPP	1.6u/250V MPP
C340	0.15u/250V MPP	0.15u/250V MPP
C517	0.24u/400V MPP	0.27u/400V MPP
JP2	JW	OPEN
R315	10 1W	22 1W
R323	47K 1W	270K 1/2W
R324	47K 1/2W	22K 1/2W
R339	5.6K 1/8W	10K 1/8W
R340	120 1W	330 1W
R345	100 7W	82 7W
R348	1.1 3W	1 3W
R358	7.68K 1/4W 1%	5.49K 1/4W 1%
R706	NC	4.7K 1/8W
R729	NC	4.7K 1/8W
S301	BASE-PIN 4P	CONNECTOR VH-8P
S601	BASE-PIN 3P	WIRE 6P-4P-2P
S602	NC	
TH102	9(18/3P)	4.5(9/3P)
VR303	100K	JW
ZD712	NC	15-2
ZD713	NC	15-2

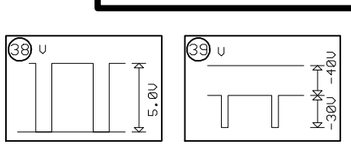
NOTE:
1.THE UNIT OF RESISTANCE " OHM " IS OMITTED (K-1000 OHMS AND M-1MEG OHMS)
2.ALL RESISTORS ARE " 1/4 WATT , 5 % " UNLESS OTHERWISE NOTED.
3.ALL CAPACITANCE RATTING " 50V " IS OMITTED UNLESS OTHERWISE NOTED.

10. SCHEMATIC DIAGRAM CRT PWB ASSY (FE991SB/DPlus93SB)

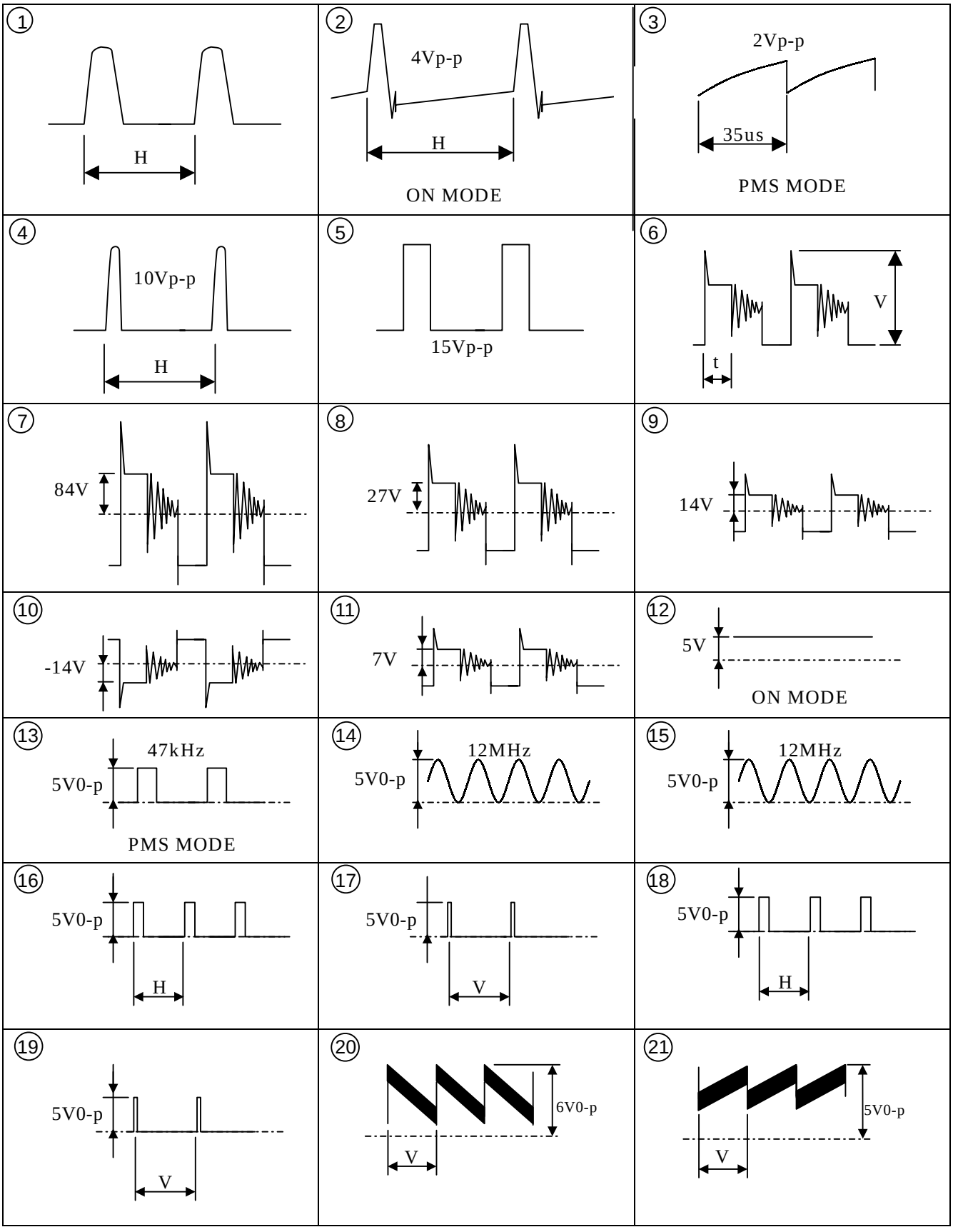


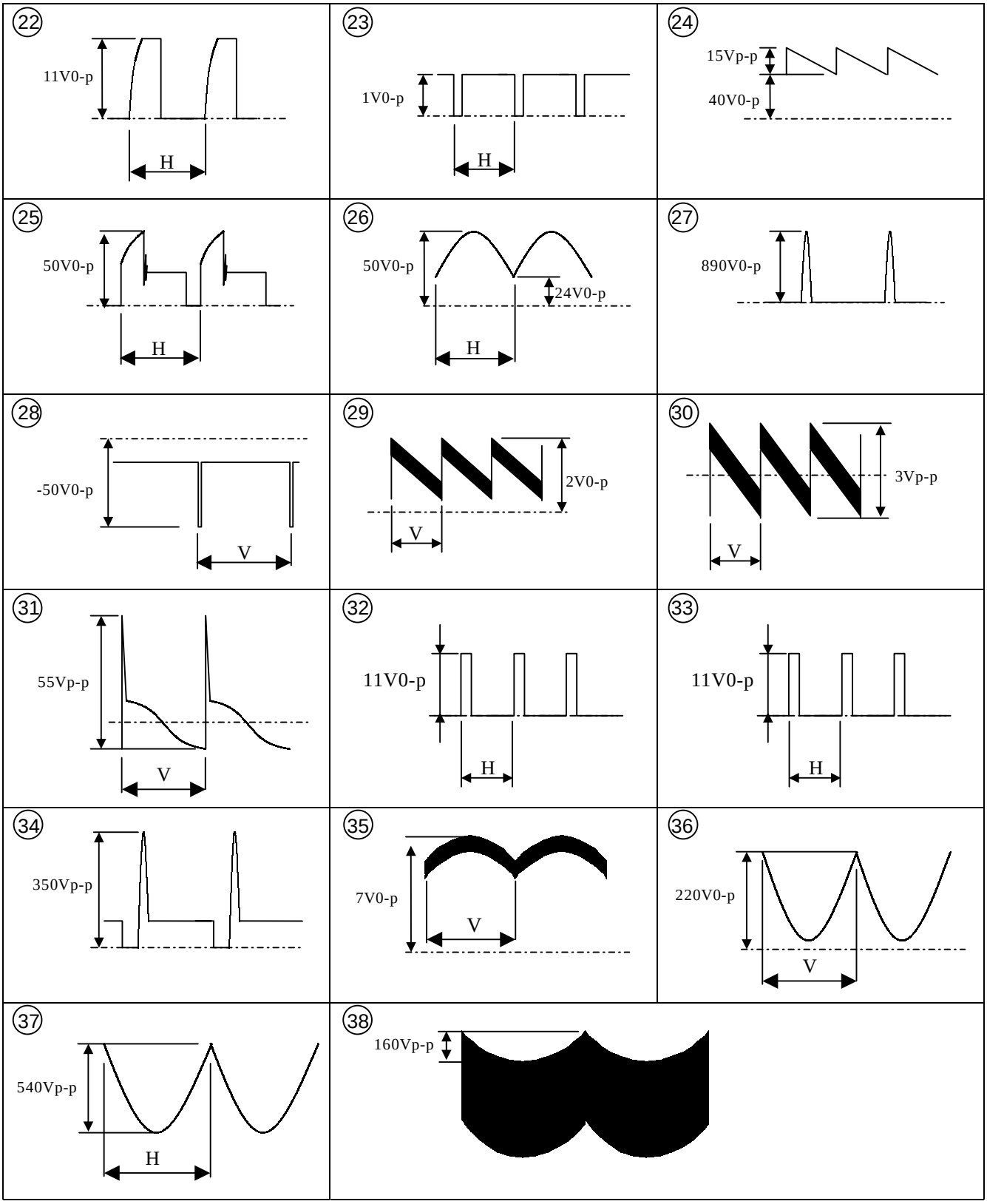
NOTE:
1.THE UNIT OF RESISTANCE " OHM " IS OMITTED (K-1000 OHMS AND M-1MEG OHMS)
2.ALL RESISTORS ARE " 1/8 WATT , 5 % " UNLESS OTHERWISE NOTED.
3.ALL CAPACITANCE RATTING " 50V " IS OMITTED UNLESS OTHERWISE NOTED.
4.CAPACITOR VALUES ARE IN F(FARAD).u=uF(10-(-6)F) p=pF(10-(-12)F)
5.VOLTAGES AND WAVEFORMS ARE MEASURED UNDER THE "H" CHARACTOR SIGNALS IN THE CONDITIONS OF THE CONTRAST CONTROL IS MAXIMUM, THE BRIGHTNESS CONTROL IS CUT OFF AND ALL OTHER CONTROLS ARE NORMAL OPERATION.
6.H---HORIZONTAL RATE, V---VERTICAL RATE.
7.VOLTAGES AND WAVEFORMS ARE MEASURED UNDER THE FOLLOWING SYNC. AND VIDEO EXCEPT WHERE OTHERWISE INDICATED.
AC INPUT : 100V
SYNC. :HORIZONTAL RATE 31.5KHz TTL LEVEL NEGATIVE
VERTICAL RATE 60Hz TTL LEVEL NEGATIVE
VIDEO :ANALOG 0.7Vpp POSITIVE





WAVE FORM MAIN PWB ASSY (FE991SB/DPlus93SB)




22
11V0-p
H
23
1V0-p
H
24
15Vp-p
40V0-p
25
50V0-p
H
26
50V0-p
24V0-p
H
27
890V0-p
28
-50V0-p
V
29
2V0-p
V
30
3Vp-p
V
31
55Vp-p
V
32
11V0-p
H
33
11V0-p
H
34
350Vp-p
35
7V0-p
V
36
220V0-p
V
37
540Vp-p
H
38
160Vp-p