

Service Manual

ViewSonic PT813-2

Model No. PT813-2

***21" Digital Controlled Color Monitor
Professional Series***



(Rev. 1 - September 1997)

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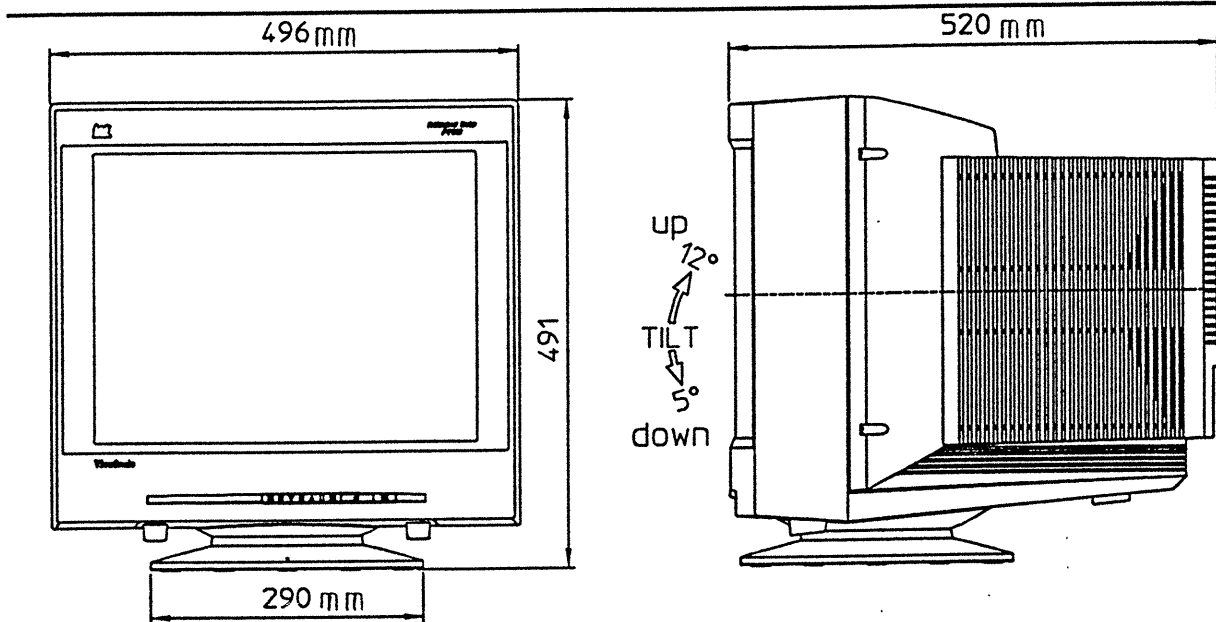
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PT813-2

GENERAL INFORMATION



High brilliancy, high-definition display resulting from the adoption of an aperture-grille CRT.

Color-control function based on an installed high-performance microprocessor.

Completely MPR-II & TCO compatible.
Multi-scan equipment compatible---capable of working with IBM® PC-compatible machines, Apple Macintosh® series, and SUN® workstations.

Uses an aperture-grille CRT

A high-performance microprocessor.

OSD (on-screen display) function.

Equipped with power-management capability as a standard function.

VESA DDC1 & DDC2B and 2B+ applicable

Preset-mode of 32 channels.

Specifications

CRT	Size: 21inch Phosphor: Short persistence (P22) AG pitch: 0.28mm Face treatment: K-Coat / TCO Coat
Resolution	1600 dots (H) x 1200 lines (V) max.
Display size	380mm (H) x 285mm (V)
Number of preset channels	32 channels max.
Frequency	30 to 106(107)kHz (Horizontal), 50 to 160Hz (Vertical)
Video signal	R,G,B analogue, 0.714Vp-p positive Input impedance: 75 Ω Sync. signal: 1.0Vp-p to 5.5Vp-p
Connector	BNC or 15 pins mini D-sub type
Power requirement	AC90 to 132V or AC180 to 264V
Power consumption	150W typ.
Dimensions	496mm (W) x 491mm (H) x 520mm (D)
Weight	34 kg (Approx.)
Tilt / Swivel stand	Tilted: 12° (up) 5° (down), Swiveled: 90° (left) 90° (right)
Ambience	Temperature: 0°C to 40°C, Humidity: 20% to 80%

SECTION 1 : SAFETY WARNING

CAUTION: No work should be attempt on an exposed monitor chassis by anyone not familiar with servicing procedures and precautions.

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SPECIFIED PARTS WHOSE PART NUMBERS APPEARS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY ViewSonic. CIRCUIT ADJUSTMENTS THAT ARE CRITICAL TO SAFE OPERATION ARE IDENTIFIED IN THIS MANUAL. FOLLOW THESE PROCEDURES WHENEVER CRITICAL COMPONENTS ARE REPLACED OR IMPROPER OPERATION IS SUSPECTED.

1.1 SAFETY CHECK-OUT:

After correcting the original service problem, perform the following safety checks before releasing the set to the customer:

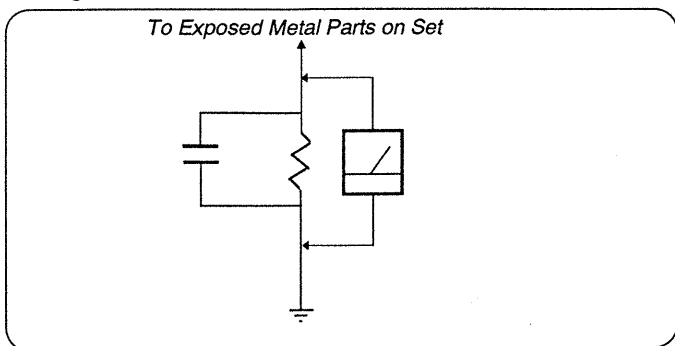
1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the interboard wiring to ensure that no wires are "pinched" or contact high-wattage resistors.
3. Check that all control knobs, shields, covers, ground straps, and mounding hardware have been replaced. Be absolutely certain that you have replaced all the insulators.
4. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Pint them out to the customer and recommend their replacement.
5. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
6. Check the line cord for cracks and abrasion. Recommend the replacement of any suck line cord to the customer.
7. Check the +B and HV to see they are at the values specified. Make sure your instruments are accurate; be suspicious of your HV meter if sets always have low HV.

1.2 LEAKAGE TEST

The AC leakage from any exposed metal parts to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5mA (500 microamperes). Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as **Simpson 229** or **RCA WT-540A**. Follow the manufacturers' instructions to use these instruments.

2. A battery-operates AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.



1.3 HOW TO FIND A GOOD EARTH GROUND

A cold-water pipe is guaranteed earth ground ; the cover-plate retaining screw on most AC outlet boxes is also at earth ground. If the retaining screw is to be used as your earth-ground, verify that it is at ground by measuring the resistance between it and a cold-water pipe with an ohmmeter. The reading should be zero ohms. If a cold-water pipe is not accessible, connect a 60-100 watts trouble light (not a neon lamp) between the hot side of the receptacle and the retaining screw. Try both slots, if necessary, to locate the hot side of the line, the lamp should light at normal brilliance if the screw is at ground potential.

1.4 PRECAUTIONS

1.4.1 CRT REPLACEMENT

Extreme care should be used in handling the CRT as rough handling may cause it to imploded due to high vacuum pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection. Be sure to disconnect the monitor from all external power sources. Discharge the CRT by shorting the anode connection to chassis ground (Not cabinet or other parts) before CRT removing. The CRT must be replace with the same type of the CRT for implosion protection and X-ray protection. Do not remove the deflection yoke and /or convergence / purity rings. The new CRT and deflection yoke are matched at the factory, which includes all required convergence / purity adjustment.

1.4.2 Power Transistor Replacement

When replacing a power transistor with heatsink. Silicone grease should be applied evenly to the transistor nuts heatsink. The transistor mounting nuts must be tight before soldering the transistor leads. These insure proper cooling and electrical connections and mechanical security. Non-compliance these instructions can result in failure of the transistor and / or relates components.

1.4.3 Component Removal

When removing a component from a circuit board, care should be taken to prevent lifting of the coil from a circuit board. An iron temperature should be controlled to the proper temperature. Apply the iron only long enough to melt the solder and draw it away.

1.4.4 X-radiation

Warning: The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level 26.75 KV. NOTE: It is important to use an accurate periodically calibrated high voltage meter.

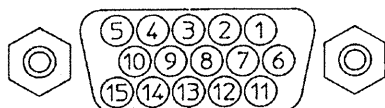
SECTION 2 SPECIFICATIONS

CRT	Size: 21inch	Phosphor: Short persistence (p22)
	AG pitch: 0.28mm	face treatment: K-Coat / TCO Coat
	Total Faceplate Transmission:	K-Coat: 39%, TCO-Coat: 36%
Resolution	640dot x 350line to 1600dot x 1200 line	
Scanning frequency	Horizontal: 30kHz - 106kHz -up 107kHz as functionally	
	vertical: 50 - 160Hz	
Display size	380mm (H) x 285mm (V)	
Number of preset channels	32 channels max.	
Preset signal	Channel 1 to 13 are original preset at the factory settings.	
Preset at the factory settings		

ch.	resolution	fH(kHz)	fV(Hz)	Remarks	ch.	resolution	fH(kHz)	fV(Hz)	Remarks
1	1280x1024	79.976	75.025	VESA 1024/75Hz	9	832x624	49.72	74.55	MAC 624/75Hz
2	1280x1024	91.146	85.024	VESA 1024/85Hz	10	1024x768	60.24	74.93	MAC 768/75Hz
3	1024x768	60.023	75.02	VESA 768/75Hz	11	1024x768	68.67	84.99	VESA 768/85Hz
4	640x350	31.47	70.09	VGA 350L Ind.	12	1152x870	68.68	75.06	MAC 870/75Hz
5	640x400	31.47	70.09	VGA 400L Ind.	13	1600x1200	93.75	75.00	VESA1200L/75Hz
6	640x480	31.47	59.94	VGA 480L Ind.					
7	800x600	46.87	75.00	VESA 600/75Hz					
8	1600x1200	106.25	85.00	VESA 1200/85Hz					

Signal input	Types of signal:	Sync. on Green, Composite Sync., Separated Sync.
	Frequency:	30 to 107 kHz (Horizontal), 50 to 160Hz (Vertical)
	Video signal:	R,G,B analogue, 0.714Vp-p positive, Input impedance: 75 Ω
	Sync. signal:	1.0Vp-p to 5.5Vp-p positive or negative
	Connector:	BNC or 15 pins mini D-sub type (by Inch screw)

Pin assignment (15pins mini D-sub type)



1: R	2: G	3: B	4: GND	5: GND
6: R-GND	7: G-GND	8: B-GND	9: NC	10: HS-GND
11: VS-GND	12: DDC	13: HS/VS	14: VS	15: DDC

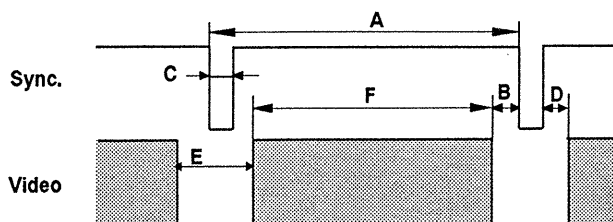
Rear view of connector

Power	Input voltage:	AC90 to 132V or AC180 to 264V
	Frequency:	50/60Hz
	Power consumption:	150W typ.
Maximum Luminance output	120cd/m ²	
Screen Distortion	Within 2mm	
Screen Linearity	Maximum 7%	
Misconvergence	Within 0.3mm (Circular area with a diameter of equal to the vertical size)	
	Within 0.4mm (Overall specified screen size)	
video bandwidth	120MHz	
Video Input connectors	15pin D-Type connector and BNC connector (R,G,B,HS,VS) (Automatic selection at power on and able to change by front panel)	
National Agency Approvals	Safety:	IEC950 (TÜV Rheinland, (GS mark, TÜV ergonomics),UL1950, CSA C22,2 N0.950 Nordic Regulations (SEMKO)
	EMI:	FCC Class B, TÜV CE/EMC,
	ELF/VLF:	MPR-II, TCO
USER Controls	Luminance:	Contrast, Brightness
	Screen Size/Position:	Horizontal Screen Size and Position, Vertical Screen size and Position.
	Screen Distortion:	Pincushion, trapezoid, Parallel, Bow, HourGlass, Hooking)
	Screen Tilt:	Screen Tilt Adjustment
	Degauss:	Manual and Automatic Degaussing
	Color control:	Selectable of 3 colour balance (9300K, 6500K, 5500K)and adjustable
	Image Control:	Moire reduction, H/V Static Convergence
	Focus Control:	Horizontal Focus, Vertical Focus
Power Saving	suspend mode:	Max 15W
	off mode:	Max 8W
Servicing Control	External communication connector on the rear panel (RS-232C Compatible) Control software will be provided.	
Dimensions	496mm (W) x 491mm (H) x 520mm (D)	
Weight	34 kg (Approx.)	
Tilt / Swivel stand	Tilted: 12 ° (up) 5 ° (down), Swiveled: 90 ° (left) 90 ° (right)	
Ambience	Temperature: 0°C to 40°C, Humidity: 20% to 80% (No dew condensation)	
Accessories	Power Cord, VGA signal cable, User's Manual, Mac Adapter, Warranty Card	

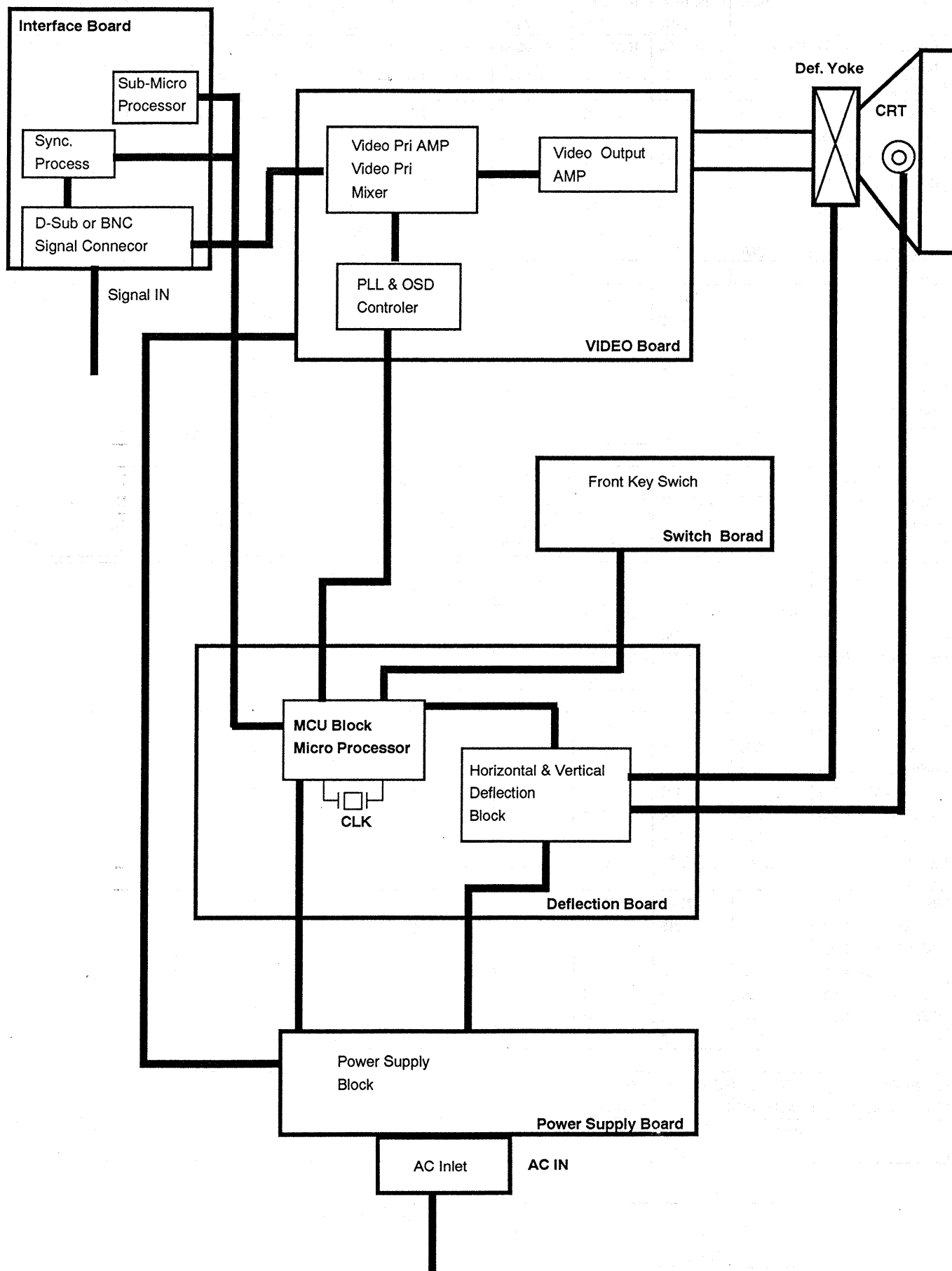
2.2 Detailed Timing specifications of preset

Preset CH Number	1	2	3	4	5	6	7	8	9	10
Preset Name	1280x1024 75Hz	1280x1024 85Hz	1024x768 75Hz	640x350 70Hz	640x400 70Hz	640x480 60Hz	800x600 75Hz	1600x1200 85Hz	832x624 75Hz	1024x768 75Hz
Resolution (HxV)	1280x1024	1280x1024	1024x768	640x350	640x400	640x480	800x600	1600x1200	832x624	1024x768
Dot Clock (MHz)	135.000	157.500	78.750	25.175	25.175	25.175	49.5	229.50	57.283	80.00
Horizontal										
H-Freq. (kHz)	79.976	91.146	60.023	31.47	31.47	31.47	46.875	106.25	49.724	60.24
H-Total (Dots)	1688	1728	1312	800	800	800	1056	2160	1152	1328
H-Front porch (Dots)	16	48	16	16	16	16	16	64	32	32
H-Sync width (Dots)	144	160	96	96	96	96	80	192	64	96
H-Back porch (Dots)	248	240	176	48	48	48	160	304	224	176
H-blanking (Dots)	408	448	288	160	160	160	256	560	320	304
H-Active (Dots)	1280	1280	1024	640	640	640	800	1600	832	1024
Vertical										
Vertical Freq (Hz)	75.025	85.024	75.029	70.09	70.09	59.94	75.00	85.00	74.55	74.93
V-Total (Line)	1066	1072	800	449	449	525	625	1250	667	804
V-Front porch (Line)	1	1	1	37	12	10	1	1	1	3
V-Sync. width (Line)	3	3	3	2	2	2	3	3	3	3
V-Back porch (Line)	38	44	28	60	35	33	21	46	39	30
V-Blanking (Line)	42	48	32	99	49	45	25	50	43	36
V-Active (Line)	1024	1024	768	350	400	480	600	1200	624	768
Sync.										
H-polarity/V-polarity	POS/POS	POS/POS	POS/POS	POS/NEG	NEG/NEG	NEG/NEG	POS/POS	POS/POS	NEG/NEG	NEG/NEG
Scanning mode	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER	NON INTER
Comment	VESA 1024/75Hz	VESA 1024/85Hz	VESA 768/75Hz	VGA 350L IND	VGA 400L IND	VGA 480L IND	VESA	VESA 1200/85Hz	MAC 624L 75Hz	MAC 768/75Hz

Preset CH Number	11	12	13	14	15	16	17	18	19	20
Preset Name	1024x768 85Hz	1152x870 75Hz	1600x1200 75Hz							
Resolution (HxV)	1024x768	1152x870	1600x1200							
Dot Clock (MHz)	94.50	100.00	202.50							
Horizontal										
H-Freq. (kHz)	68.677	68.68	93.750							
H-Total (Dots)	1376	1456	2160							
H-Front porch (Dots)	48	32	64							
H-Sync width (Dots)	96	128	192							
H-Back porch (Dots)	208	144	304							
H-blanking (Dots)	352	304	560							
H-Active (Dots)	1024	1152	1600							
Vertical										
Vertical Freq (Hz)	84.997	75.06	75.00							
V-Total (Line)	808	915	1250							
V-Front porch (Line)	1	3	1							
V-Sync. width (Line)	3	3	3							
V-Back porch (Line)	36	39	46							
V-Blanking (Line)	40	45	50							
V-Active (Line)	768	870	1200							
Sync.										
H-polarity/V-polarity	POS/POS	NEG/NEG	POS/POS							
Scanning mode	NON INTER	NON INTER	NON INTER							
	VESA 768/85Hz	MAC 870/75Hz	VESA 1200/70Hz							



SECTION 3 : BLOCK DIAGRAMS



SECTION 4 : CIRCUIT DESCRIPTIONS

4.1 Deflection Board (D Board) Operations

Deflection Board consists of horizontal drive and output, Cs (S-Cap) Selection, +B (DC-DC Converter), high voltage output, vertical output circuit and focus bias circuit.

4.1.1 Horizontal and Vertical Drive Control

Horizontal & Vertical oscillation is controlled by IC610(μ PC1883) on MCU Board (M Board). The horizontal control section is consists of Sync polarity detection, Phase shifter, H-width, H-OSC, AFC, F/V control and horizontal duty control. The vertical section is consists of Sync polarity detection, V-OSC, V-Ramp generator, the V-sweep correction of a vertical linearity, and E-W distortion, such as side-pin, trapezoid, pin-balance, parallelogram.

The horizontal drive pulse comes from pin 18 of IC610 and applied to pin 14 of P201 on D-Board as HDP. And this pulse is applied to gate of Q304 of H-Drive FET and amplified to output stage through the horizontal drive transformer T301. Horizontal output transistor Q356 operates simply as a switch and this switching operation generates a saw-tooth current through the H-deflection coil.

The vertical drive ramp wave pulse comes from pin 9 of IC610 and applied to pin 17 of P202 on D-Board as VS-OUT. And this pulse is applied to pin 5 of IC201. IC201 is a monolithic integrated circuit. It is a full performance and very efficient vertical deflection which intended for direct drive of vertical deflection coil, and pin 2 of this IC generates output saw-tooth current through the V-deflection coil.

4.1.2 High Voltage Output and Focus Bias

The high voltage power supply +B1 (+160V) applies to pin 6 of FBT, then applied to source of Q402 (HV-Output FET). The gate of Q402 is controlled by PWM pulse which generated by PWM Board, and regulate the high voltage.

Focus correction is applicable to both of Horizontal and Vertical. The horizontal one consists of Q452/Q453 and Q451, and the control parabolic wave form is applied from pin 13 of P202 on MCU. The vertical one consists of Q450, and the control parabolic wave form is applied from pin 14 of P202 on MCU. And the mixed parabolic wave of horizontal and vertical is applied to FBT.

4.1.3 Cs (S-Cap. Change) circuit

To optimize horizontal linearity, MCU controls horizontal S-Wave form correction capacitor (Cs). Q305 through Q308 (MOS FETs) are Cs change. MCU decides appropriate capacitor and output Cs select signal.

4.1.4 +B Converter (Chopper) circuit

Horizontal size adjusting is controlled by +B Chopper circuit consist of Q350 and T350 etc. This control voltage is generated by H-control section on MCU Board. Modulated voltage is applied to gate of Q350 (Chopper FET), and +B (DC voltage) is chopped and applied to primary winding of T350, then applied to Q356 (H-Output Transistor).

4.1.5 AEF Reduction circuit

AEF Reduction circuit consists of T451 and its surrounding devices. This circuit is used for alternate electric field emission from CRT face. This is a TCO's countermeasure circuit.

4.2 Video Board (V Board) Operations

Video Board (V Board) consists of video output , video clamp , screen voltage control , horizontal static convergence control , and CRT electrode circuit.

4.2.1 Video output, clamp and OSD circuit

Each video signal R,G,B from Interface board (I board) are

applied to preamp of IC801. OSD signal is mixed to each video output which are coming from IC801(M52320SP), then these mixed video signals are applied to Output amp of IC805 (VP553) and amplified 15 times (about 23 dB). Amplified signals (output of pin 4, 8, 14 of IC805) are cut DC by capacitor of C833, 835, 837 applied to R,G, B CRT electrode. The bias level (Background level) of video signals are adjusted by the diode clamp circuit consist of D811 through D813 and Q811 through Q816. This circuit adjust the white balance of back raster level.

The OSD control circuit consists of IC802 (M35045) as a OSD control chip. This chip is controlled by the serial data from MCU. The IC802 consists of OSD video memory and its control circuit.

4.2.2 D/A convertor

The MCU controls video bias level (back ground level) ,video drive level , and contrast. The D/A control signals are sent from the MCU by the 3 signals (clock data load), and controlled signals are output to the each circuit. The D/A control data is periodically refreshed.

4.2.3 Screen voltage control circuit

The screen voltage (G_2) of CRT electrode is generated by pin 10 of FBT and applied directory as a constant value.

4.3 Interface Board (I Board) Operations

Interface Board (I Board) consists of video input selector, sync-processor, and sub-micro computer.

4.3.1 Video input selector circuit

This monitor has two inputs, D-type subminiature connector and BNC type connector. These inputs are selected by IC101(M52348SP). Input selection signal is controlled by MCU.

4.3.2 Sync Processing circuit

Input separate sync signals or composite sync signal or green sync signals are shaped by the sync precessing circuit, consist of IC102 etc. Separated or shaped signals (HD and VD) are applied to the MCU board and clamp pulse generating circuit.

4.4 Switching Power Supply (SR Board) Operations

4.4.1 Switching circuit

This Switching Power Supply (SR Board) consists of EMI filter circuit, AC rectifier and primary control, secondary rectifier, and power saving control circuit.

AC input from P901 is rectified by D901 through the EMI filter and smoothed by C907. Inrush current is protected by the R902 (Fusing resistor) and R903 which are shorted by the relay of K901 about 2 seconds after power on . IC902 is main switching controller integrated circuit. Pin 5 and Pin 9 of T903 are switching driver windings that control the switching frequency and its pulse duty. T902 is countermeasure device for high harmonic current.

Pin 18,17,12 and 10, are the secondary output taps, each voltages are shown as follows.

Pin No.	Output voltages	Remarks
10	-15V	MCU Board control circuit
12	15V	MCU, Video preamp, D board control
17	75V	Video output, H Def drive
18	160V	Horizontal output, HV output

IC901 is sub-power supply control IC. This power is only applied to a secondary of micro computer circuit (MCU) through separate transformer T901. Each output voltages are shown as follows.

Pin No.	Output voltages	Remarks
10 of T901	7V	PS, MCU Board control circuit
3 of IC951	6.3V	H1 (Heater voltage)

+B line is sensed by the IC952 (error amp) and this device drives photo coupler PH901. If output voltage of +B line is increased, this delta voltage is increasing and switching ON duty becomes small so that each secondary output voltage is controlled to be low.

4.4.2 Power saving circuit

The Power saving signals which are sent from the MCU, control the three mode of standby, suspend (less 15W), off (less 8w) and shutdown. Previous 2 modes are return automatically, but shutdown mode doesn't recover, which recovers only power SW operation.

The difference between suspend mode and off mode is a heater voltage active or not, the first one is active but the second is non-active. Therefore the recovery time of power off mode is equal to the normal powering on time.

-Suspend mode-

When the PS-CTL1 signal is active (low active), then the Q952 is off, and primary photo-coupler PH902 becomes off, then Q902 is on state, and the emitter current of Q902 applies to pin 8 of IC902. Since pin 8 is trigger sensing point for the oscillation stop of IC902, all main switching power supply which generates through T903 become off state. After all, when PS-CTL1 is active, monitor becomes suspend mode.

-Off mode-

When both of PS-CTL1 & PS-CTL2 are active (low active), pin 2 of IC951 is low, then heater voltage which generates from IC951 becomes off. So that, off mode is only supply for +7V which is used for MCU control circuit.

-Standby mode-

Video is off

4.4.3 Protection circuit

-Shut Down Mode-

The monitor is protected against internal circuit failure and is designed to shut down when abnormal circumstances occur. If an internal circuit is damaged or broken, the monitor detects this and the Power LED turns Red. The signals that enable the Shut Down Mode are: 1 - OCP (over current protection), 2 - OVP (over voltage protection), 3 - HV-PRO (High Voltage protection), and 4 - Beam PRO (Beam Current Protection). When in this mode, PS-CTL1, 2, and 3 are active.

-CAUTION-

F901 and F902 are AC line fuses for this monitor. If replacement is necessary, replace only with the same type and rating as the original fuses, as follows:

Type:	215
Rating:	T5AH 250V
Mfr.:	Littel inc.

4.5 MCU Board (M Board) Operations

MCU (Micro Computer Unit) board controls all the monitor's operation state, that are horizontal frequency, picture adjustment, white balance control, OSD control and MCU protection.

MCU consists of MCU block circuit (MCU chip, clock, EEPROM, D/A converter and their communication ports), horizontal and vertical oscillation block, horizontal distortion and size control circuit, HV control, screen Tilt control circuit and etc..

4.5.1 MCU block circuit

The MCU is 16 Bit microcontroller which has 32kB of ROM and 1kB of RAM and operates 20MHz clock speed. IC604 (MB3773) is a reset generator which generates a reset signal when power on and the MCU runs away. IC606((S-2864A) is a EEPROM which has 8k Bytes (64k bits) capacity. This chip contains adjustment data, MCU operation data and OSD data. IC605(HC574) is a data latch. IC607 and IC608 (M62352) are D/A converter -Digital to Analogue which bit width is 8 bits of adjust screen rates.

By the input of H-sync and V-sync from I Board, the MCU detects the input signal timing mode and outputs the stored data in EEPROM to the D/A converter and several control data (i.e. Cs, horizontal frequency control, OSD control etc.) to external ports or internal control section.

When the adjustment mode, the MCU control the picture screen data and store these data to EEPROM.

This MCU has a external serial communication port which based on RS-232C (but signal level is 0 to 5V). Using this port, MCU communicates external host computer and controls several functions. The port is used for automatic picture screen adjustments and the other service adjustments.

4.5.2 Horizontal size and Distortion control circuit

The circuit around IC612 are horizontal size & distortion control circuit. This circuit generates PWM pulse which synchronized horizontal frequency, and this controls +B chopper circuit which are shown in item 4.1.4. Final this control PWM pulse generates from Q628 and applied to Q350 Chopper FET of D-Board.

This monitor provides several distortion adjust functions, such as pincushion, trapezoid, parallel, bow and Sine (Hourglass) & Cosine(Hooking). These original correction wave forms are generated from pin 10 of IC610 as a E/W parabolic wave which is shown in item 4.1.1., and this parabolic wave is applied & mixed to IC612, then controls the gate of Q350 with H-Size modulated pulse and adjust the each distortions.

4.5.3 H and V Focus control circuit

The circuit around, IC615, IC617 are horizontal and vertical focus control section. The horizontal one uses AFC and H-DF signals, and this original rectangular pulse are integrated two times, then generates parabolic wave and this wave applied to Horizontal Dynamic focus amp on D-Board. The vertical one uses VFV and V-Size signal, and generates V-rate parabolic wave by same method of horizontal ones, then applied to Vertical Dynamic focus amp on D-Board.

4.5.4 High voltage control circuit -PWM Board

The actual anode voltage (HV) sensed by the resistors divided voltage in the FBT breeder and R410 & RV401 on the D Board, and this voltage is applied to pin 11 of P603 on MCU Board. This voltage is buffered by the IC751 and applied to IC752 on PWM Board as a HV control circuit.

The circuit around IC751 and 752 are the PWM control circuit, that convert the HV control voltage to pulse width synchronized horizontal frequency. Here Q752 and Q753 are buffer stage of the PWM circuit and this pulse applied to Q402 - Chopper switching MOSFET -on the D Board.

4.5.5 Vertical Static convergence control circuit

The ramp wave synchronized vertical deflection is generated by pin 3,4 of IC616 (analogue switch), and this wave is split off the part of positive and negative. The positive part of this wave is attenuated by the pot. of RV601, also negative part is attenuated by the pot. RV602. These pots are control the misconvergence of top part (RV601:BOTTOM) and bottom part (RV602:TOP) of the screen. The signal named VSTAT is vertical static convergence control signal and applied to IC 622. Buffered by Q656 and Q657, vertical convergence control signal drives the Vertical Convergence Coil mounted on the Deflection Yoke.

4.5.6 Horizontal Static convergence control circuit

The circuit around IC621 and Q654,655 is horizontal convergence circuit. The voltage from D/A converter is applied to IC621, and buffered by Q654, Q655, and the horizontal convergence control signal drives the Horizontal Convergence Coil mounted on the Deflection Yoke.

4.5.7 Rotation control circuit

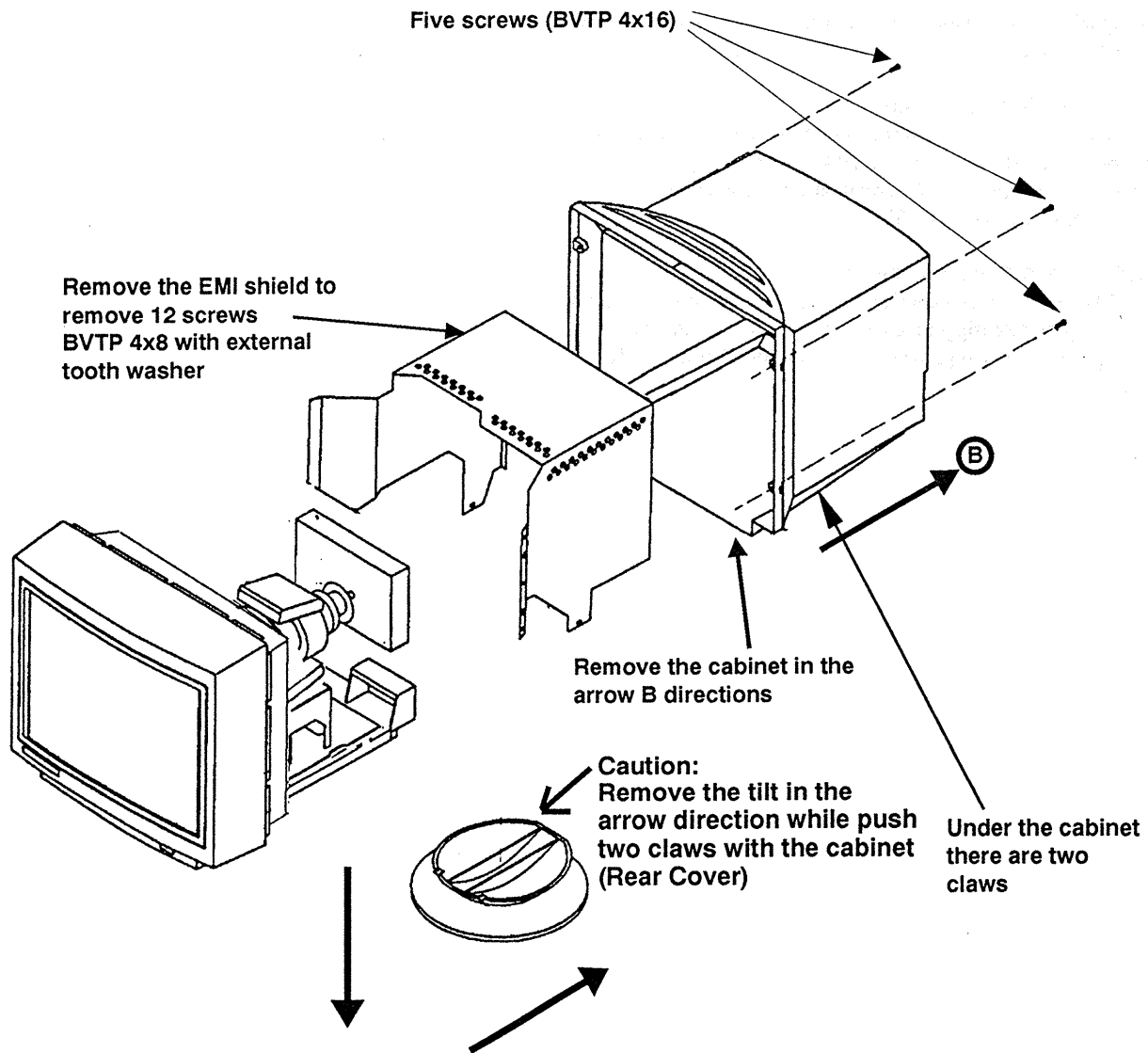
The circuit around IC621 and Q652,653 is the rotation (Tilt) control circuit. The voltage from D/A converter is applied to IC621, and buffered by Q652, Q653, rotation control signal drives the rotation coil mounted on the CRT.

4.5.8 Protector control circuit

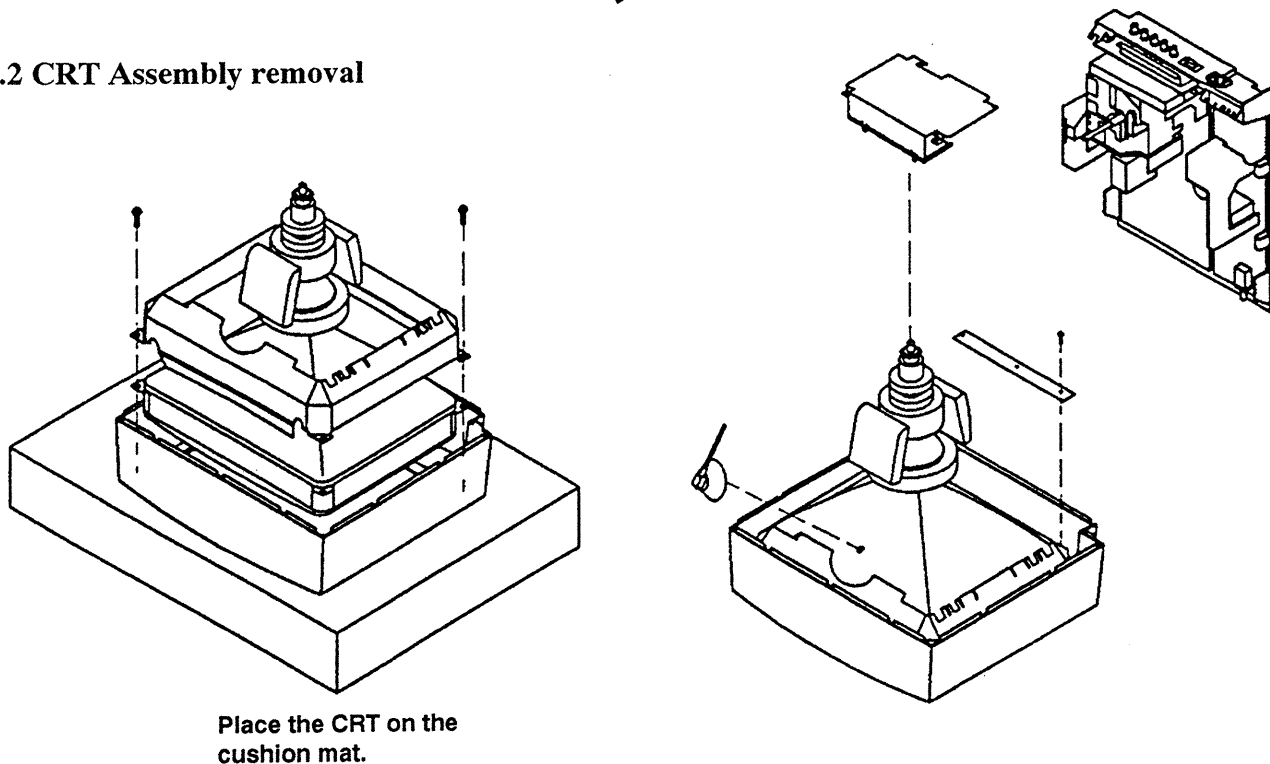
The circuit around Q640, 642 is the protector control circuit. The each protector trigger signals generates MCU chip and these drives power save and protector circuit on SR (Power Supply) Board.

SECTION 5: DISASSEMBLY

5.1 Tilt and cabinet removal



5.2 CRT Assembly removal



SECTION 6 SERVICE SOFTWARE

6.1 Operating environment

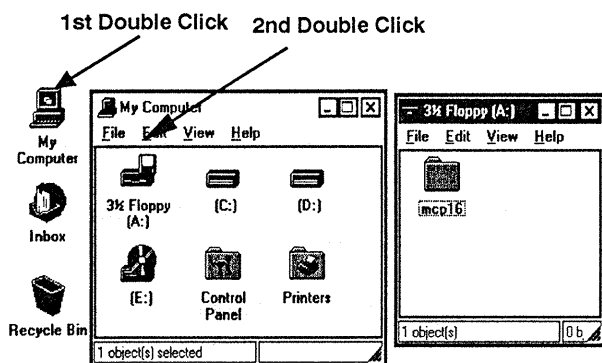
To operate this servicing software, following environment is needed.

- *HV METER
- *IBM-PC or compatible machines.
- *Windows® 95 or later.
- *RS-232C (CH1, or CH2).
- *Communication unit (Monitor to Host PC).
- *Signal generator (With clock of at least 135MHz).
- *MCP16 (Monitor Control Program 16) version 1.10 or later.
- *Power supply +2.5V~6V
- *DigitalVOLT METER.

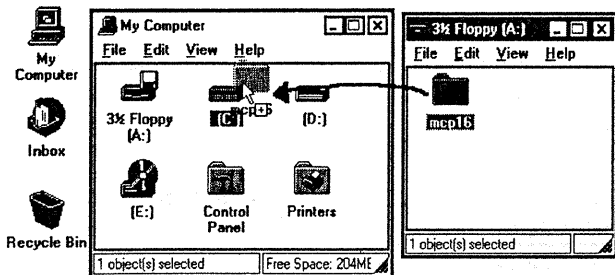
6.2 installation

Caution: Before installing the program, please make a back-up copy of the diskette. All installation instructions assume that you are working with a back-up copy of the diskette.

- When operation Windows environment, insert the MCP16 diskette in the A drive .
- Open the MyComputer Icon and the 3.5Floppy Icon



- Drag the folder named MCP16 onto the Harddisk drive to copy the files.



- Insert the next diskette and copy the file as was mentioned above.
- After finished the copying. Click the Icon named MCP16

*When the correct password is not input, the MCP16 has only minimum level of menu.
You will have this password from the authorized dealer.*

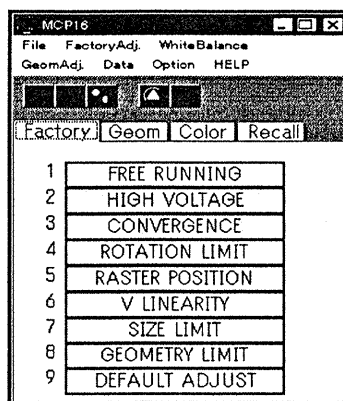
6.3 Operations

6.3.1 SQC menu

The SQC (sequence) menu operates sequential adjustment of the monitor. This command calls the adjustment items sequentially and should be used when the whole adjustment of the monitor are needed. (i.e. MCU board is changed: Most of the monitor adjustment data are stored on the EEPROM of the MCU board.)

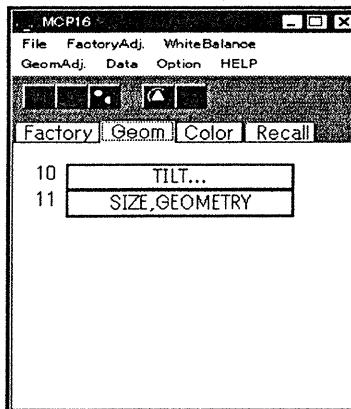
6.3.2 Factory Adjustment screen

This menu includes the items which can not adjust by front panel. This menu should be used when factory preset timings have changed, or FBT, MCU board changed.



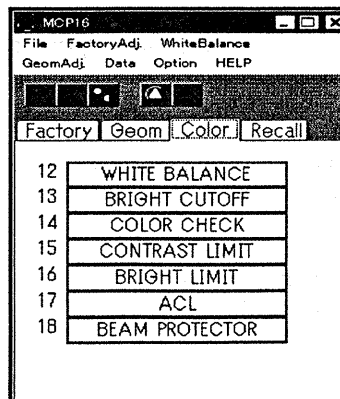
6.3.4 Geometry Adj menu

This menu consists of general adjustment which can adjust by front panel. This menu can adjust factory preset CH, but front panel can only adjust user CH.



6.3.3 Color screen

This menu includes the white balance and luminance adjustment items. When the CRT or CRT board is changed, then readjust the white balance and luminance by this commands.



6.3.5 DATA menu

This menu has only **Last Protect** command. This command uses when the MCU protection has operated. About MCU protection, please refer to section 7.1 (Appendix)



Fig 6.3.6 Data menu

6.3.6 Option menu

This menu are the utilities of this program. The **Test Pattern** command displays the test pattern which is selected by check-box. This command is convenient when the monitor adjustment is operated by the Host machine signal.

The **Password** command changes the menu of MCP16 when the correct password is input.

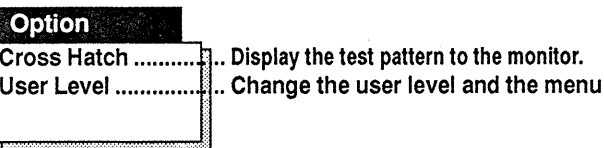
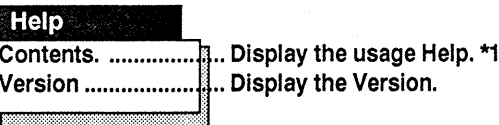


Fig 6.3.7 Option menu

6.3.7 Help

This command displays the usage help of each command.



*1 Help File is needed

Fig 6.3.8 Help menu

EEPROM ADDRESS	Contentment
0000H ~ 0160H	Fundamental monitor operating data area (user can not access)
0180H ~ 01BFH	White balance and color data area. (white balance, user color) only user color can access.
01C0H ~ 0200H	Common adjustment data area and back up area. (Rotation, convergence, brightness, contrast, etc.)
0280H ~ 06A0H	Independent CH adjustment data area. (Signal name, size, position, distortion, H/V ch frequency data) user can access area.
0BC0H ~ 1FFFH	OSD data area

————— User access area
 - - - - - Partially user access area
 - - - - - Can not access area

Fig 6.4.1 EEPROM data location map

6.4.3 EEPROM data location

The PT813-2 has 8kbyte of data memory on the MCU board. This service software accessed only adjustment element.

6.4.4 Communications Unit

The communications unit for service connects an IBM PC or compatibles and the PT813-2. The computer side is a D-sub 25-pin male connector.

6.4 Others

6.4.1 Monitor Reset

If the adjustment has been made, it is necessary to confirm the adjustment. To confirm the adjustment, the monitor reset should be done. There are two ways to reset the monitor, one way is power switch on again, other way is using the **RESET** command on the File menu. The **RESET** command is attached the command short cut button. Instead of opening the **Data - RESET** command, click the short cut button, then **RESET** command is operated. (please refer to section 6.7: Appendix)

6.4.2 Error

If the connector of communications unit is not connected properly, or the monitor power is not on, following error message is displayed.

There are no response from the monitor
Please check the connection, monitor power

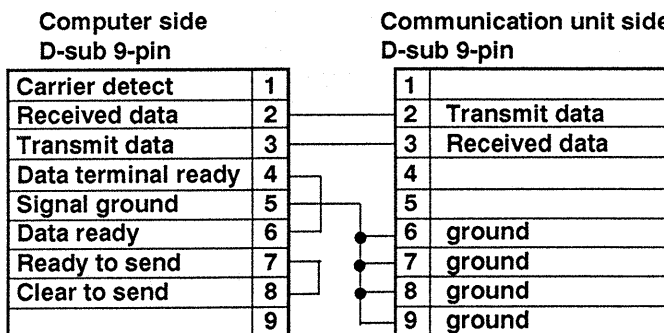


Fig 6.4.2 Communication unit connection diagram (9-pin)

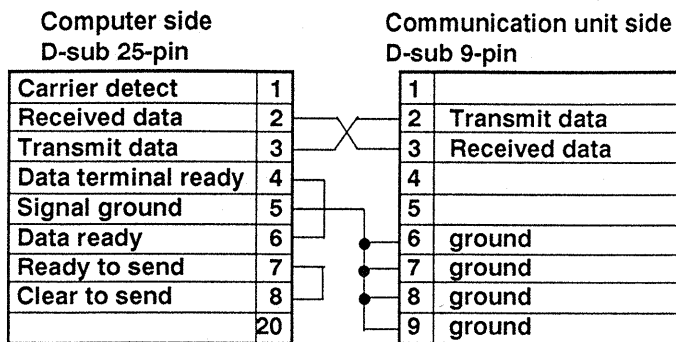


Fig 6.4.3 Communication unit connection diagram (25-pin)

Depending on the computer connected, the RS-232C connector is either a D-sub 25-pin female connector or D-sub 9-pin female connector. Fig 6.4.2 and 6.4.3 show the pin layout for each connector. Please use the connector appropriate to your computer.

6.4.5 Communication Unit connection

How to connect the communication Unit
(Monitor side)

Remove the cover of communication connector of the monitor which is located rear panel, and connect the 8-pin mini-DIN connector.

(Computer side)

Connect the 9-P or 25-P D-sub connector to the RS-232C port.
(if the port exists more than two, then connect RS232C-1 port.)

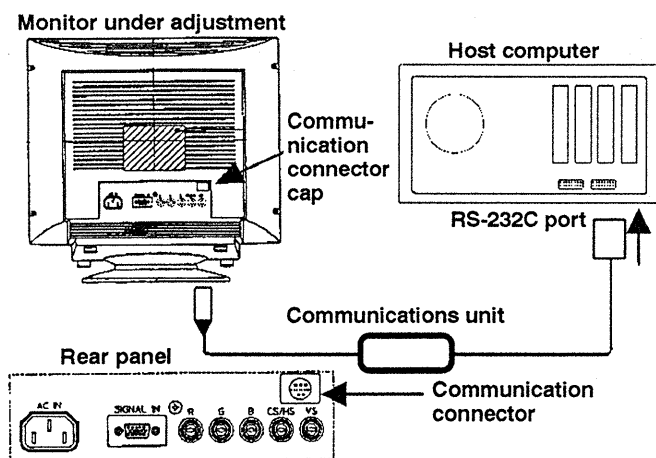


Fig 6.4.4 Communication unit connection

6.5 Safety Related Adjustment

When replacing the following components, you must make this adjustment and conformation.

FBT (PCF71-04:T401) (all adjustment is needed)
MCU Board (HV,HD,BL adjustment is needed)
R410,R409 (BL adjustment is needed)

Where HV is High Voltage, HD is HOLD-DOWN, BL is Beam Limiter.

All adjustment and confirmation should be done under following condition.

1280x1024 75Hz mode
No video (No screen image)

6.5.1 HV Regulator circuit adjustment and confirmation

When replacing the FBT, confirm from first step (from a. to j.).
When replacing the MCU board, confirm from step f to j.

- Remove the sealing cap and the RV401 of the D board.
- Resoldering the new parts of the RV401.
- Receive specified signal.
- Set the BRIGHTNESS and CONTRAST controls to minimum condition. (Cut-Off condition).
- Connect the digital multimeter to pin 7 of P603 (HVS-OUT) on the MCU board.
- Adjust this voltage for $2.50 \pm 0.01V$ DC by using the MCP16-service software (High Voltage menu), and after finished, click OK.
- When displayed <HV Protect Point() >, then click OK.
- After power off, connect the High Voltage meter to the CRT anode, then power on again.
- Adjust the High Voltage for $27.0KV \pm 0.1KV$ by the RV401, and after finished this adjustment, seal the RV401 by the specified sealing cap and silicone.
- Repeat from step f and h.
- After RESET the monitor, confirm the voltage is set upper value.

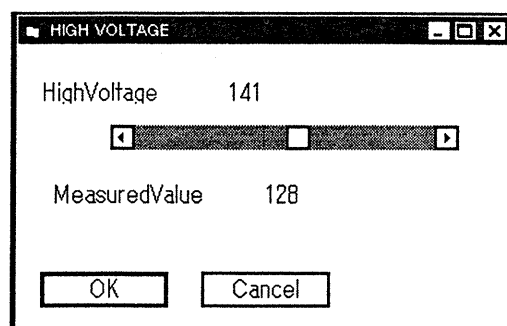


Fig 6.5.1 High Voltage Adjustment menu

6.5.2 HV HOLD-DOWN Circuit confirmation

- Receive the specified signal.
- Set the **BRIGHTNESS** and **CONTRAST** controls to minimum condition. (Cut-Off condition).
- Apply an external DC voltage gradually to **pin 11 of P603 (HV-sense)** on the MCU board, and confirm that the minimum voltage is less than **2.76V DC** where by the HOLD-DOWN circuit operates immediately and raster disappears. And also when apply 2.57VDC, then confirm that HOLD-DOWN circuit does not operate

6.5.3 BEAM PROTECTOR Adjustment and confirmation

When replacing the MCU board or the components of **R410** or **R409**, Beam Protector adjustment is needed.

- Receive the specified signal.
 - Open the Beam Protector menu of **MCP16 (Beam Protector)**, and apply an external DC voltage **-4.75V DC** to **pin 8 of P603 (ACL)** on the MCU board.
- If the voltage is set, then click **COPY** Button and **OK** Button.

Note: Do not click "OK", when no apply specified voltage to pin 8 of P603.

- RESET** the monitor.
- Apply an external DC voltage gradually to **pin 8 of P603 (ACL)** on the MCU board, and confirm that the minimum voltage is less than **-5.0V DC** where by the Beam Limiter circuit operates immediately and raster disappears.

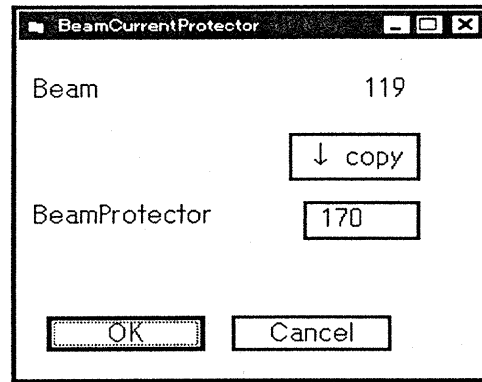


Fig 6.5.2 Beam Limit Adjustment menu

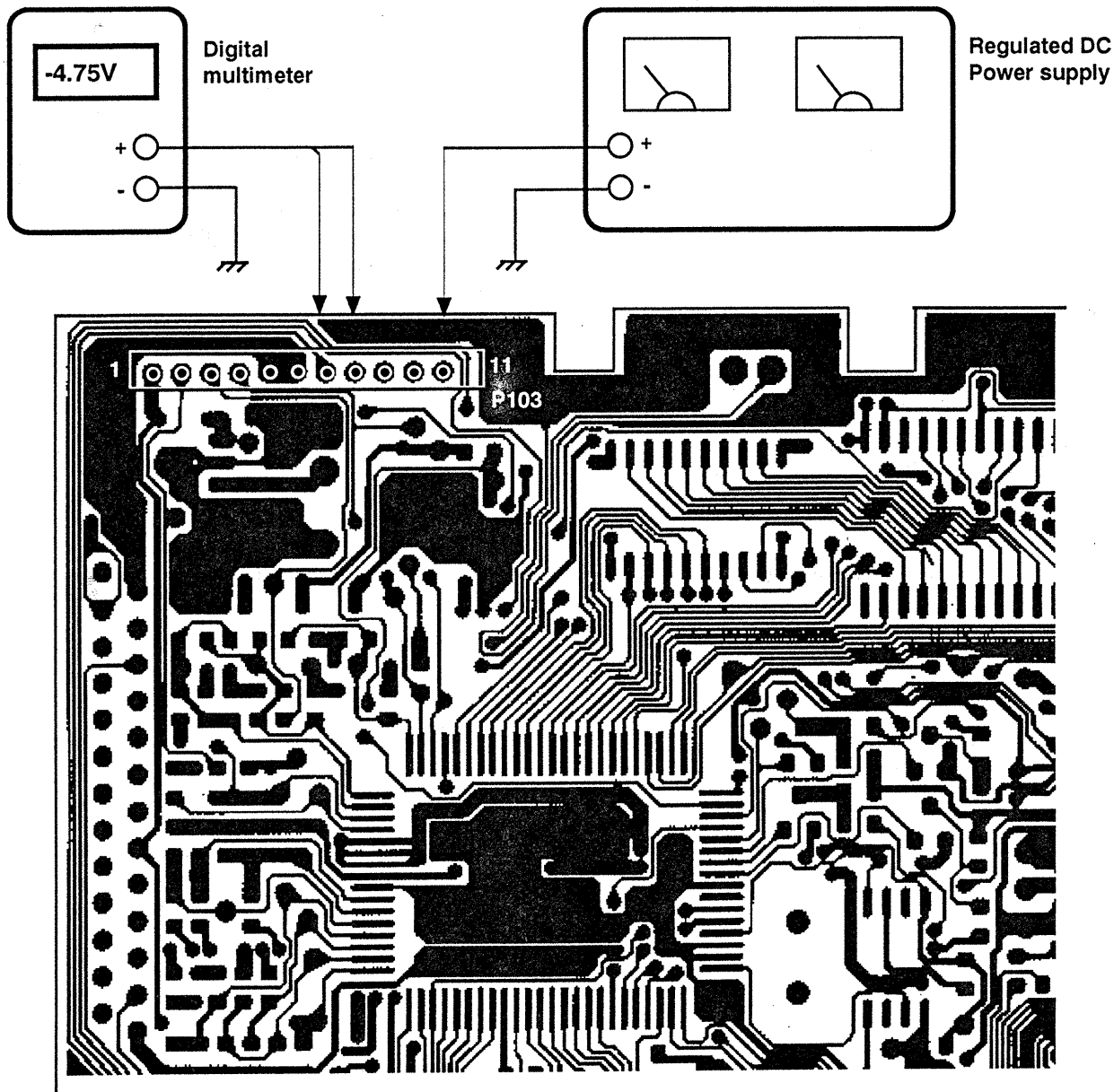


Fig 6.5.3 HOLD DOWN and BEAM LIMITER check point

6.6 Adjustment Procedure

6.6.1 Necessary adjustment for several change

If units or components on the unit has changed, following adjustments are needed.

Adjustment Item	Changed components or bloc							PWM	:PWM
	PWM Board	D Board	V Board	PS Board	I Board	MCU Board	CRT		
(1) Fh adjustment						X			
(2) High voltage	X	X ³				X	X ¹		
(3) Convergence	X	X ^{1,3}	X ¹			X	X		
(4) Rotation (Tilt)						X	X		
(5) Raster Position		X				X	X		
(6) V Linearity		X				X	X ¹		
(7) H-Size V-Size Limit	X	X				X			
(8) Distortion Limit	X	X				X	X ¹		
(9) Default adjustment		X				X	X ¹		
(10) Tilt etc	X ¹	X ¹				X	X ¹		
(11) Size, Position and Distortion	X	X		X ¹		X	X		
(12) White balance			X ¹		X ¹	X ²	X		
(13) Brightness cut off point			X ¹		X ¹	X ²	X		
(14) Contrast			X ¹		X ¹	X ²	X		
(15) Bright Limit			X ¹		X ¹	X ²	X		
(16) ACL			X ¹		X ¹	X	X		
(17) Colour data									
(18) Beam Limit		X ³	X		X ¹	X			
(19) Focus	X	X ³					X		
*Safety Related adjustment		X ³				X	X		

Comments

X means that adjustment is needed.

*1 Only confirmation is needed, but readjust if adjustment is out of range.

*2 When changing the MCU board, the data from the old MCU board can be transferred to the new MCU board if it's readable. Normally, confirmation of correct adjustment is necessary. Readjust only if settings are out of range (white balance data are transmitted to the I board as digital data).

*3 If the FBT is replaced, these adjustments are required.

6.6.3 Adjustment items

Adjustment should be done by following procedure.

6.6.2 Adjustment Order

It is very important that adjustments be made in a specific order as shown in the above menu, Adjustment Items (1) - (19).

When an adjustment is made, make sure that all other necessary adjustments are also made, as shown in the "Changed Components" columns above.

(1) Fh Adjustment (Horizontal Free running frequency)

(Adjustment condition)

31.5kHz, 95kHz, 60kHz Timing

- Input the 31.5kHz timing, and select <HFree running Low>. When select this point, the screen horizontal synchronization has out, then adjust the screen is almost standstill by right or left arrow key.
- Input the 95kHz timing, and select <HFree running High>, then adjust the screen is almost standstill by right or left arrow key.

c. After finished above a. to c. adjustment, click the **<OK>** button, the horizontal synchronization data is stored to EEPROM immediately and the screen becomes normal condition.

***Caution:** When making this adjustment, horizontal synchronization is out, so another monitor is required as a signal source.

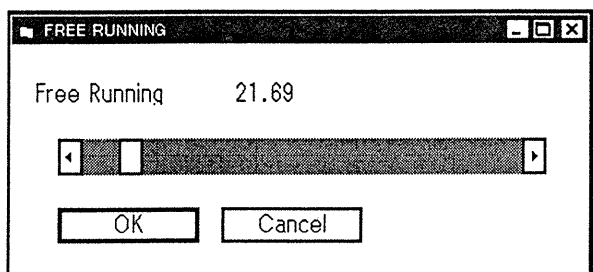


Fig 6.6.1 Fh Adjustment menu

(2) High Voltage adjustment

Please refer to Safety Related adjustment on section 6.5

(3) Convergence adjustment

(Adjustment condition)

fh 80kHz

Cross Hatch pattern

Non reverse (black background) Green

video off

a. Adjust the all **Red** and **Blue** vertical line to almost overlap each other in all of the screen by **<H Conver>** cursor.

b. Adjust the all **Red** and **Blue** horizontal line to almost overlap each other in all of the screen by **<V Conver>** cursor. After finished above a. to b. , then click **<OK>** button.

When click **<OK>** button ,the convergence data is stored immediately to user area.

*** To make further adjustment, please refer to appendix 1 -- Mis convergence correction -- on page 26**

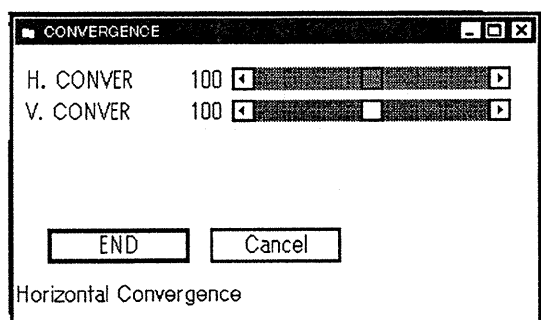


Fig 6.6.2 Convergence Adjustment menu

(4) Rotation (Tilt) adjustment

(Adjustment condition)

fh 80kHz

Cross Hatch pattern

a. Adjust the upper and lower line of screen image to have parallel with bezel frame line by **<Rotation>** cursor.

b. After finished this adjustment, click **<OK>** , then the data of **Rotation limit** is stored to **EEPROM** immediately.

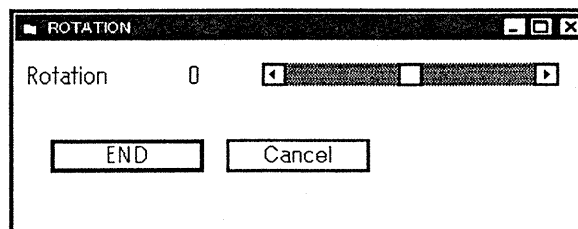


Fig 6.6.3 Rotation limit adjustment menu

(5) Raster Position

(Adjustment condition)

VGA 480L (Low),

fh 95kHz / fv 160Hz) (High)

Cross Hatch pattern

a. Input the **VGA 480** line signal timing, then adjust the raster for the center position of the screen by **<Low HF >** cursor.

***NOTE1**

b. Input the **95kHz / 160Hz** mode, then adjust the raster for the center position of the screen by **<High HF>** cursor.

***Note 1** When having **<RESET>**, horizontal raster position may shift right, than pre-adjusted position.

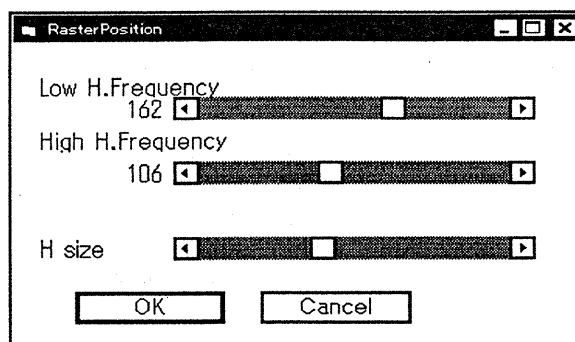


Fig 6.6.4 Raster Position Adjustment menu

(6) Vertical Linearity adjustment

(Adjustment condition)

VGA480L timing (Low)
and 95kHz / 160Hz timing (High)
Cross Hatch pattern

**This adjustment requires only vertical VGA480L and 95kHz /160Hz timings. Horizontal timing is not specified (Horizontal timing is not concerned for this adjustment.)*

- Input the vertical frequency **VGA480L** timing, then adjust the upper half and lower half of screen for becoming to same size by **<Fv=60Hz>** cursor.
- Input the vertical frequency **95KHz/160Hz** timing, then adjust the upper half and lower half of screen for becoming to same size by **<Fv=160Hz>** cursor. (similar to step a.)
- After finished above a. to b. step, click **<OK>** button. When click **<OK>** button, the vertical linearity data is stored immediately to factory data area.

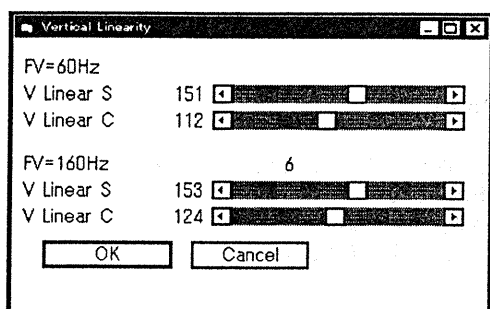


Fig 6.6.5 V Linearity Adjustment menu

(7) Size Limit adjustment

Horizontal Size Limit adjustment

(Adjustment condition)

95kHz/160Hz, MAC 480L
Cross Hatch pattern

- Input the **MAC 480** Line timing, then adjust the horizontal size for almost bezel frame line by **< H SIZE MAX 0 >** cursor.
- Input the **95kHz/160Hz** timing, then adjust the horizontal size for **355mm** by **< H SIZE MIN >** cursor.

V-size Limit adjustment

(Adjustment condition)

VGA400L
and 95kHz/160Hz timing
Cross Hatch pattern

**V-size min adjustment requires only vertical 160Hz timings. Horizontal timing is not specified (Horizontal timing is not concerned for this adjustment.)*

- Input the **VGA 400** Line timing, then adjust the vertical size for **almost over +10mm** on bezel frame line by **<V SIZE MAX 1 >** cursor.
- Input the **160Hz** timing, then adjust the vertical size for **250mm** by **<V SIZE MIN >** cursor.
- After finished above a. to c. adjustment , then click **<OK>**

button. When click **<OK>** button, the data of this adjustment is stored immediately to factory data area.

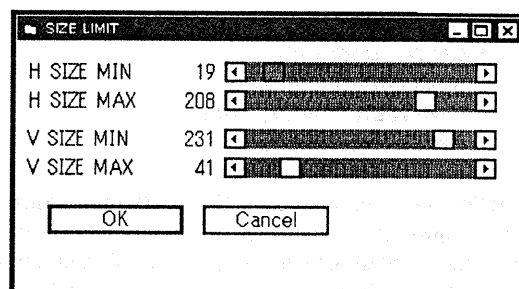


Fig 6.6.6 H Size Limit Adjustment menu

(8) Geometry Limit adjustment

(Adjustment condition)

80kHz timing (1280x1024 75Hz)
Cross Hatch pattern

- Adjust the **H-SIZE**, **H-POSITION**, **V-SIZE**, and **V-POSITION** by operational keys on the front panel (adjustment using OSD) for specified horizontal and vertical size and position.
- | | |
|------------------------|--------------|
| <u>Horizontal size</u> | 380mm |
| <u>Vertical size</u> | 285mm |
- After finished upper adjustment, then make best adjustment of the **<PIN PHASE>** - parallelogram adjustment, **<PIN CUSHION>**, **<SIN>**, and **<COS>** by each cursor.
 - After finished above a. to b. adjustment, then click **<OK>** button. When click **<OK>** button, the data of this adjustment is stored immediately to factory data area.

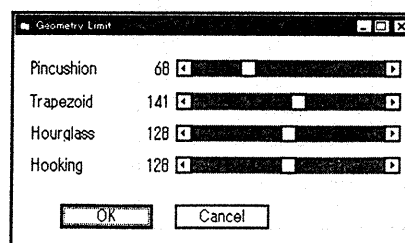


Fig 6.6.7 Geometry limit adjustment menu

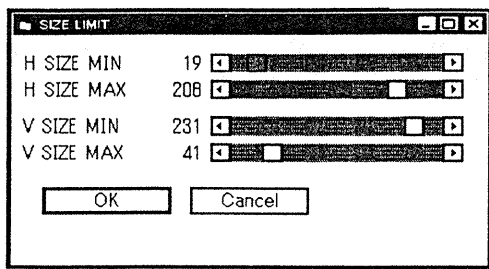


Fig 6.6.8 V Size Limit Adjustment menu

(10) Default adjustment

(Adjustment condition)

VGA 480L(Low) and
95K-160Hz timing (High)
Cross Hatch pattern

- Input the VGA480L timing and Select <Default adjust Low>. Adjust the horizontal size and position, vertical size and position, and distortions for specified value. (specified value -- please refer to specification section :page 4)
- After finished above adjustment, then click <OK>. When click <OK> button, the data of this adjustment are stored to specified data area .
- Input the 95KHz-160Hz timing. and adjust same above.

**This is adjustment for No Preset Timings.*

Before adjusting this item, size limit and pin limit must be completed.

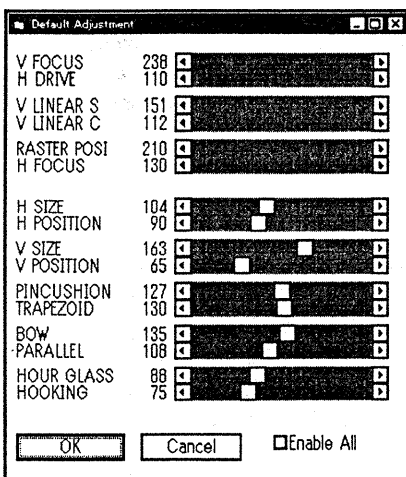
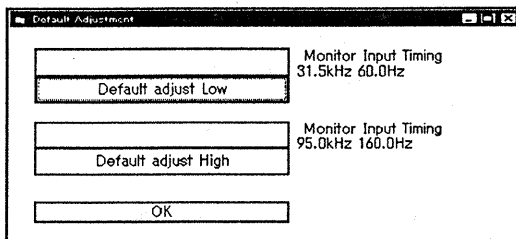
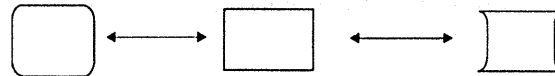


Fig 6.6.9 Default Size Position and Distortion Adjustment menu

* Hour glass distortion adjustment corrects the right and left vertical line like a S curve.



* Hooking distortion adjustment corrects the right and left vertical line like a U curve. The difference between pincushion correction and U shape correction is the width of correction range. (Pincushion corrects from upper line to bottom line but cosine corrects around center of the screen.)



(10)Tilt etc. adjustment

(11) Size , Position, and Distortion adjustment (Adjustment condition)

All preset timing
Cross Hatch pattern

- Input the specified timings described on section 2.2 (page 5). , and adjust the horizontal size and position, vertical size and position, and distortions for specified value. (specified value - please refer to specification section :page 4)
- After finished above adjustment, then click <OK>. When click <OK> button, the data of this adjustment are stored to specified ch data area (same as user adjustment area) If Back up box is checked, the adjustment data are transferred to back up area simultaneously.
- Change next preset timing and make same adjustment.

Before adjusting this item size limit and pin limit must be completed.

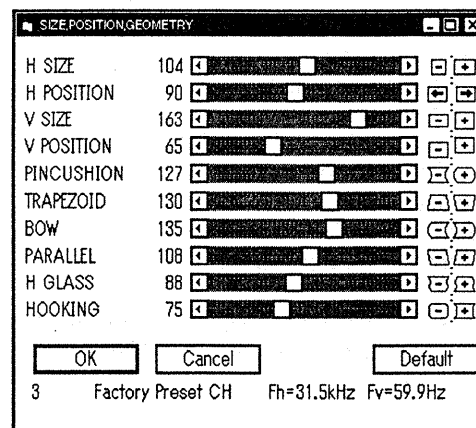
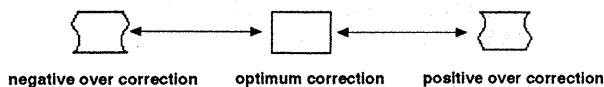


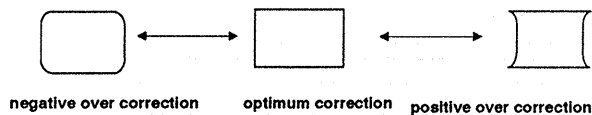
Fig 6.6.10 Default Size Position and Distortion Adjustment menu

Fig 6.6.9 Size Position and Distortion Adjustment menu

* Hourglass distortion adjustment corrects the right and left vertical line like a S curve.



* Hooking distortion adjustment corrects the right and left vertical line. The difference between pincushion correction and Hooking correction is the width of correction range.



(12) White balance

(Adjustment condition)

1280x1024 75Hz (80kHz) timing

No video (No screen image)

and 20% white window screen image.

- a. Adjust the back raster (back ground level) brightness and white balance to be following value under no video condition by <BIAS MAX R>, <BIAS MAX G> and <BIAS MAX B> cursor. The BIAS MAX data should be started with 200D, and VIDEO +B data should be started with 120D.

Back raster brightness: $4.5 \pm 0.3 \text{ cd/m}^2$
 White balance $X = 0.281 \pm 0.01$
 $Y = 0.311 \pm 0.01$

- b. Adjust the video brightness and white balance for following value under 20% window screen condition by <DRIVE R>, <DRIVE G>, <DRIVE B> and <CONTRAST> cursor.

Video brightness: $120 \pm 3 \text{ cd/m}^2$
 White balance $X = 0.281 \pm 0.01$
 $Y = 0.311 \pm 0.01$

In above adjustment, it should be fix the least colour data at **230D**.

- c. Adjust the video brightness and white balance to be following value under 20% white window screen image pattern by <BIAS MIN R>, <BIAS MIN G> and <BIAS MIN B> cursor. The BIAS MIN data should be started with 100D.

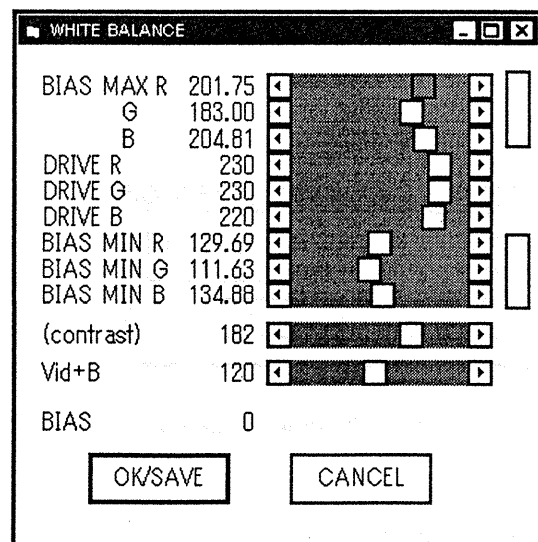


Fig 6.6.11 White balance Adjustment menu

Video brightness: $30 \pm 3 \text{ cd/m}^2$
 White balance $X = 0.281 \pm 0.01$
 $Y = 0.311 \pm 0.01$

- d. After finished above a. to c. adjustment click <OK> button. When click <OK> button, the data of this adjustment are stored to factory colour adjustment data area. (This area can not access from the front control panel)

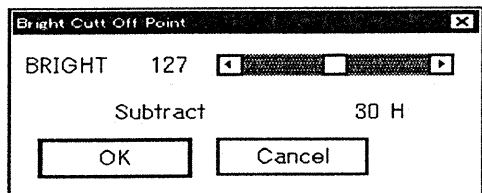


Fig 6.6.12 Brightness Cutoff Point Adjustment menu

(13) Brightness Cut off Point adjustment
 (Adjustment condition)

1280x1024 75Hz (79.97kHz) timing
 No video (No screen image)

- a. Adjust the back raster brightness level from 0.2 cd/m^2 to 0.25 cd/m^2 under no video condition by <Bright> cursor.
- b. After finished above adjustment, click <OK> button. When click <OK> button, the data of this adjustment is subtracted specified value and stored to factory data area.

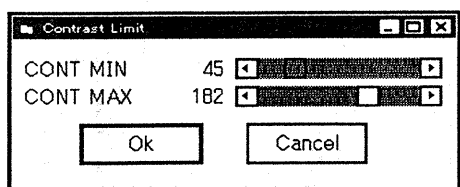


Fig 6.6.13 Contrast Adjustment menu

(14) Contrast adjustment

(Adjustment condition)

1280x1024 75Hz (79.97kHz) timing
 20% Window screen image

- a. Adjust the maximum video contrast level for $120 \pm 2 \text{ cd/m}^2$ by <CONT MAX> cursor.
- b. Adjust the minimum video contrast level for $1 \pm 0.5 \text{ cd/m}^2$ by <CONT MIN> cursor.
- c. After finished above adjustment, click <OK> button. When click <OK> button, then the data of this adjustment is stored to factory data area.

**Before adjusting this item (Contrast), No.13 item (Brightness Cut Off Point) must be completed.*

(15) Bright Limit adjustment
 (Adjustment condition)

1280x1024 75Hz (80kHz) timing
 20% Window screen image

- a. Under 20% window screen, adjust the video brightness for $160 \pm 2 \text{ cd/m}^2$ by <ATTENUATION> cursor.
- b. After finished this adjustment, click <OK>. When click <OK> button, then the data of this adjustment is stored to factory data area.

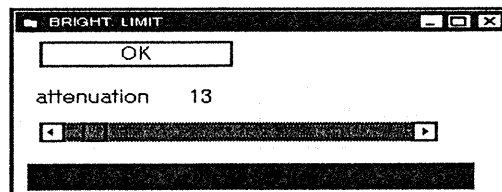


Fig 6.6.14 Brightness Limit Adjustment menu

(16) ACL (Automatic Contrast Limiter) adjustment
 (Adjustment condition)

1280x1024 75Hz (80kHz) timing
 All white screen image

- a. When select this menu, ACL level of the monitor is diminished and contrast and brightness are set to maximum level automatically.
- b. Adjust the ACL level for 90 cd/m^2 by <ACL> cursor.
- c. After finished this adjustment, click <OK> button. When click <OK> button, then the data is stored to factory data area.

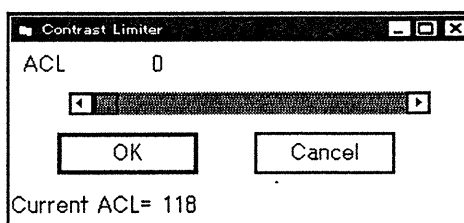


Fig 6.6.15 ACL Adjustment menu

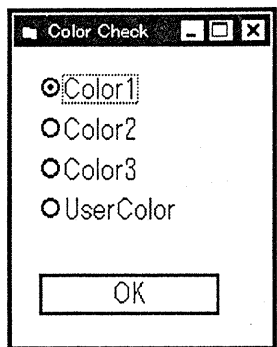


Fig 6.6.16 Colour check menu

(17) Color confirmation

**The color data of No.2 and No.3 are set automatically to specified value when making adjustment of No.11 (White balance), then this adjustment is not needed on normal adjustment.*

(condition)

1280x1024 75Hz (80kHz) timing
20% Window screen image

Color 1: All of <R>, <G>, and color data are FFH
Color 2: X=0.313±0.01, Y=0.329±0.01
Color 3: X=0.323±0.01, Y=0.348±0.01

(18) Beam Limit adjustment

Please refer to the safety related adjustment on section 6.5

(19) End

When quit this sequence menu, click the <OK> button.

(20) Focus

(Adjustment condition)

1280x1024 75Hz (80kHz) timing
Cross Hatch pattern or other specified special pattern
Contrast: MAX
Brightness Just cut off

Adjust the screen focus to be fine in all area by using the two pots located on the FBT. (Upper located pot is for horizontal line adjustment, and other one is for vertical line adjustment)

When making this adjustment, **Brightness** and **Contrast** must be set above specified condition by front operational keys.

Displayed pattern should be better to use following pattern. (meme pattern).This pattern can display using **option - closshatch** command and check the box of focus pattern.

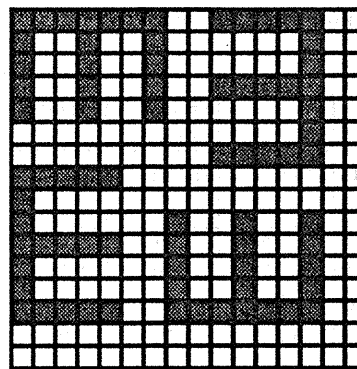


Fig 6.6.17 Focus adjustment pattern

At first using vertical line adjustment pot, adjust the vertical line focus and next using horizontal line adjustment pot, adjust the horizontal line focus.

For making good focus on entire screen, adjust the point specified fig 6.6.8 best.

**It is not necessary to use Service software in this adjustment.*

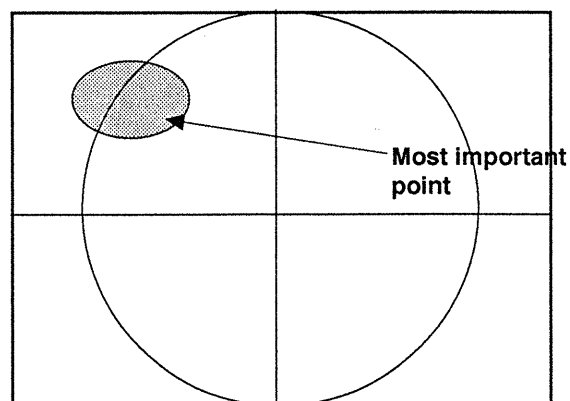


Fig 6.6.18 Most important point of focus adjustment

6.6.4 ViewSonic PT813 Service TIMING

Name	CH 1 80K	FH MIN 31.5K	FH MAX 95K	MAC480L	57K70Hz VESA70Hz	V-SIZE LIMIT				
Dot Clock (MHz)	135.0	25.175	164.10	30.24	75.00	25.175				
Horizontal										
H-Freq. (kHz)	79.97	31.47	94.97	35.00	56.47	31.47				
H-Total (Dots)	1688	800	1728	864	1328	800				
H-Front porch (Dots)	16	16		64	24	16				
H-Sync width (Dots)	144	96	164	64	136	96				
H-Back porch (Dots)	248	48	228	96	144	48				
H-blanking (Dots)	408			224	304					
H-Active (Dots)	1280	640	1280	640	1024	640				
Vertical										
Vertical Freq (Hz)	75.03	59.94	159.88	66.67	70.06	70.09				
V-Total (Line)	1066	525	594	525	806	449				
V-Front porch (Line)	1	10		3	3	12				
V-Sync. width (Line)	3	2	3	3	6	2				
V-Back porch (Line)	38	33	46	39	29	35				
V-Blanking (Line)	42	45		45	38					
V-Active (Line)	1024	480	525	480	768	400				
Sync.										
H-polarity/V-polarity Scanning mode	P/P	N/N	P/P	N/N	N/N	N/P				
Comment		VGA480				VGA400				

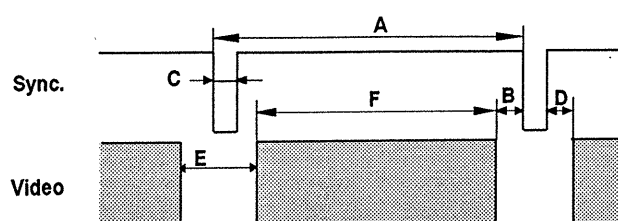


CHART DETAIL

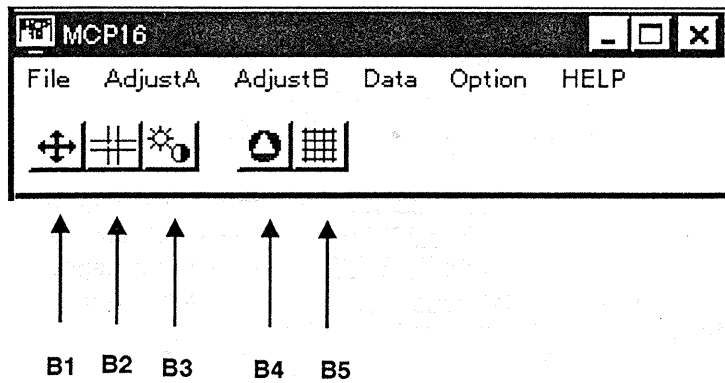
A: TOTAL(LINE or DOTS) D: Back porch
 B: Front porch E: Blanking time
 C: Sync pulses width F: Active(LINE or DOTS)

6.7 APPENDIX

6.7.1 MENU Short cut ICONs (Tool bar)

It is convenient to use Menu Short cut ICONs (Tool bar).

When you open the MCP16 software, the tool bar is displayed. If you push this ICON button, then specified Item appears without selection from menu line. Each button calls the following items.



B1 button Size Position Adjustment item equivalent to User - Size, Distortion menu.

B2 button Convergence / Rotation Adjustment item equivalent to User - Convergence menu.

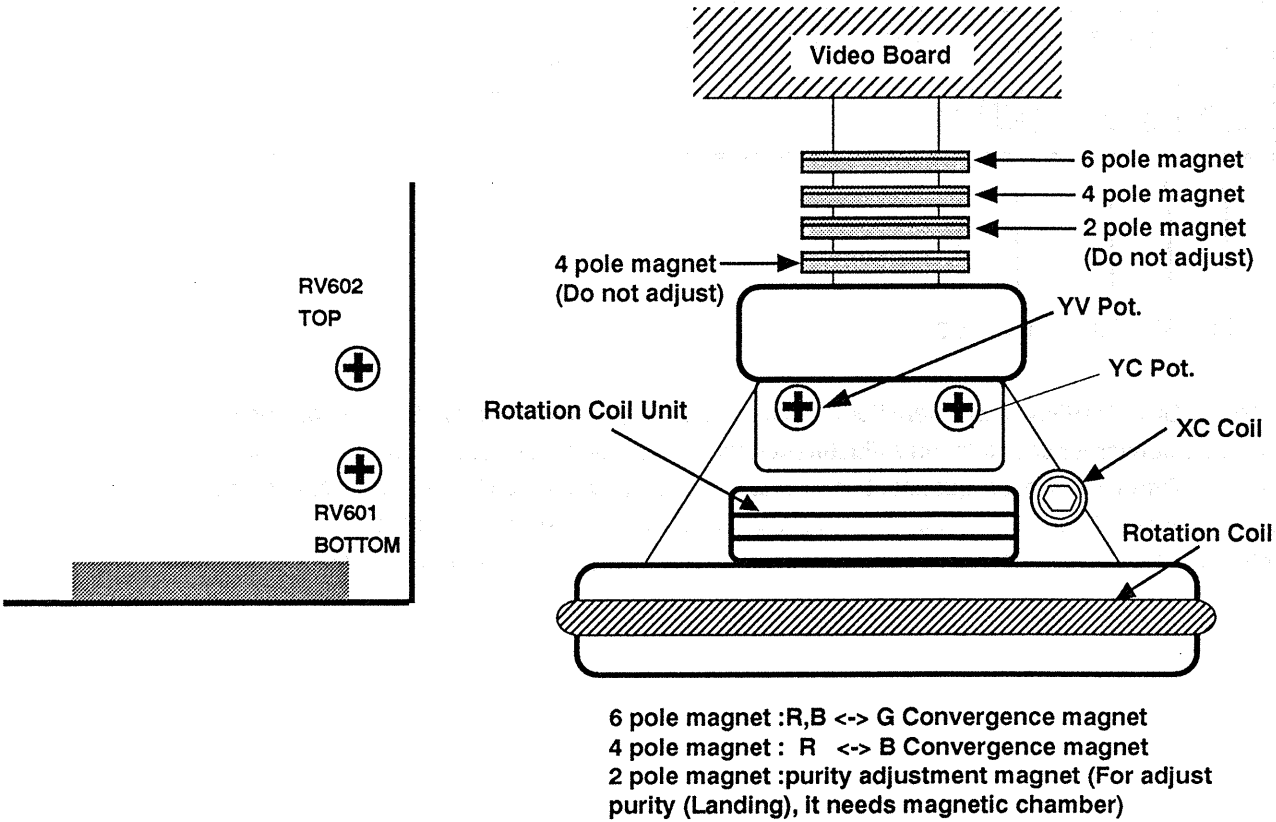
B3 button Bright/Contrast Adjustment item equivalent to User - Bright, Cont menu.

B4 button Reset item equivalent to Data - MCU Reset menu.

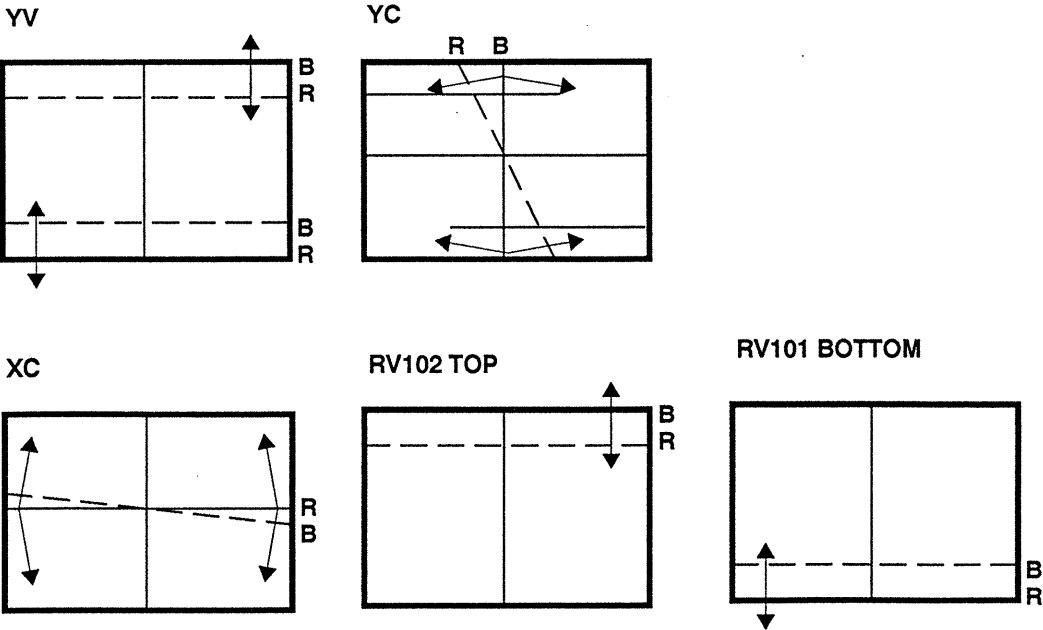
B5 button CROSS HATCH item equivalent to Option - CROSS Hatch menu.

6.7.4 MIS CONVERGENCE CORRECTION

For adjust mis convergence exactly, it is needed to make adjustment around the deflection yoke.
Adjustment procedure in as follows.



YV Pot.alignment should be adjustde with RV101and RV102 on MCU Bord to reduce the trapezoidal distortion.



SECTION 7 TROUBLE SHOOTING

7.1 Trouble Shoot

-- SYMPTOM --

-- CHECK --

--POSSIBLE CAUSE--

-- ACTION --

1.
No image appears
on the screen

1. Absence of HV charging
sound.

1. 1
(When power supply is normal)
a. Fail of horizontal deflection
circuit

1. 1
a. Check horizontal deflection circuit
components and replace if needed.
(possible components)
Q350 (horizontal chopper)
Q356 (horizontal output)
D357 (damper diode)
Q304 (horizontal drive)
*If Q356 has failed, it should be better to
replace Q350 simultaneously.
b. check high voltage circuit components
and replace if needed.
(possible components)
Q402 (HV output)

b. Fail of high voltage circuit

c. Fail of horizontal oscillation
circuit. (M)

c. Check horizontal oscillation circuit on
(M)
IC610 (M) and around circuit.

1.2
(when power supply is abnormal)

a. Lose of line connector.
b. Lose of internal connector.
c. Blow of fuse, F901,902 and
fusing resistor R903
d. Failure of switching control
component.

1.2
a. Check a connection.
b. Check a connection of J901 through
J904 and J951,952,953.
c. Replace fuse or fusing resistor.
*caution when upper, case other
parts may be broken.
d. Replace IC902 (switching controller
and primary switch.)

2.Check of power Indicator

(When power on, indicator LED
light green about one second and
a moment LED light red and power
down.)

After searching the problem, change
component if needed.

*In this case, MCU detect the failure of circuit
and shutdown power supply.*

This protector operates following case.

a. High voltage is over or under.
b. +B1 voltage is over or under.
c. +B1 current is over.
d. Anode current is over.
e. Horizontal size is too large or too small.

*To confirm which case the protector operates,
need the service software.*

See appendix1 the end of this section.

2.Check of CRT electrodes

Heater electrode

Failure of Heater electrode.

Replace CRT

G2 electrode

a. G₂ (Screen voltage drop.)

a. Check G2 control circuit. (V)

b. Failure of MV rectifier
circuit.

b. Check 10pin of T401 (FBT), R403 and
D406

R,G,B cathode
electrode

c. Failure of video circuit.

c. Check video circuit components and
check the following connection
especially.
P801 (video signal)
P802 (video control signal)
P804 (power supply of video)

-- SYMPTOM --	-- CHECK --	--POSSIBLE CAUSE--	-- ACTION --
2. Poor Focus		a. Adjustment error. b. Failure of CRT (<i>Can not improve focus.</i>) Reduction of beam emission. c. Failure of FBT (<i>Can not improve focus.</i>) Failure of focus pot. d. Anode voltage drop. Failure of high voltage circuit.	a. Readjust focus by the pot. of FBT and using MCP16, adjust v-focus. b. Replace CRT. c. Replace FBT. d. Check High voltage control circuit, and replace (M)
3. Convergence			Readjust convergence by the adjustment section.
4. Dirt of colour	Check of environment of monitor	a. Magnetization of chases and CRT b. Abnormal environmental magnetic field. c. Failure of degaussing circuit. d. Short interval power ON-OFF e. CRT face direction change while power on.	a. Degauss the monitor. (automatic or manual degaussing.) b. Apart the monitor from the abnormal place and degaussing. c. Check degaussing circuit. TH901, Q951, P902 d. Power on again after several minute past. e. same as d.
5. Low luminance		a. G ₂ (screen)voltage drop. b. Failure of video circuit. (V) c. Failure of (I) . (video control block.) d. High voltage drop. e. failure of CRT (reduction of beam emission)	a. Check G ₂ voltage. b. Check video circuit. IC801, IC805 (video pre/out amp) c. Check (I) . IC101 (analogue SW) connection of P109 (control signal from M Board.) d. Check high voltage control circuit. (refer to 1-b.) e. Change CRT.
6. Poor white balance		White balance adjustment error.	Readjust white balance using MCP16.
7. Loss of colour		a. Failure of video circuit. b. Lose of connection. c. Failure of (I) .	a. Check video circuit. (refer to 1-2-c.) b. Check of connection. P801 (video signal) P802 (video control signal) P804 (power supply of video) c. Check of (I) (refer to 5-c)
8. failure of horizontal synchronization		8.1 (When OSD message "NO H SYNC" is appeared.) a. Mis connection of video cable.	8.1 a. Confirm connection of input video signal.

-- SYMPTOM --

-- CHECK --

--POSSIBLE CAUSE--

-- ACTION --

8. Failure of horizontal synchronization

- b. Failure of sync. precessing circuit.
- c. Failure of sync detection circuit on MCU Board.

8.2 (When OSD message is not appear.)

- a. Failure of horizontal oscillation circuit on MCU Board.
- b. Adjustment error of horizontal free running frequency.

- b. Check sync. processing circuit.
IC101,102 on (I)
P110 (I) and P109 (I)
- c. Check 4 pin of IC601 (M)

8.2

- a. Check horizontal oscillation circuit.
IC610 (H/V oscilation)
- b. Readjust horizontal frequency following the adjustment procedure.

9. Failure of vertical synchro.

9.1 (When OSD message "NO V SYNC" is appeared.)

- a. Mis connection of video cable.
- b. Failure of sync. processing circuit.
- c. Failure of sync detection circuit on MCU Board.

9.2 (When OSD message is not appear.)

- a. Failure of vertical oscillation circuit on MCU Board.

9.1

- a. Confirm connection of input video signal.
- b. Check sync. processing circuit.
IC101,102 on (I)
P109 (I) and P601 (M)
- c. Check 4 pin of IC601 (M)

9.2

- a. Check vertical oscillation circuit.
IC610 (H/V oscilation)

10. Failure of OSD

- a. Failure of SW701 to SW708 (S)

- b. Failure of MCU Board.
(around sw search circuit.)

- c. Failure of OSD control circuit.

- a. Check of SW701 to SW704 (S) and connection
P602 (M)

- b. Check of sw search circuit. (M)
RB622 to RB625 (series resistor)

- c. Check of OSD control circuit.

IC802 (OSD controller)
P110 (especially 6 to 10pin)

11. Failure of horizontal size
(horizontal size is too small or too large)

- a. Failure of horizontal size control circuit.

- b. Failure of horizontal chopper circuit.

- c. Failure of connection of horizontal DY

- d. Adjustment error

- a. Check of horizontal size control circuit.
Q622 to Q628 (M)
J201 18pin(HS-OUT)

- b. Check of horizontal chopper circuit.
Q350 (H Chopper) (D) and around circuit.

- c. Check of horizontal DY connection
P350 (horizontal DY) (D)
- d. Readjust horizontal size using MCP16 or front panel.

12. Failure of vertical size
(vertical size is too small or too large)

- a. Failure of vertical size control circuit.

- a. Check of vertical size control circuit.
(M)
IC610 (vertical size control)
17 pin of J202

-- SYMPTOM --	-- CHECK --	--POSSIBLE CAUSE--	-- ACTION --
12. Vertical size is too small or too large		b. Failure of vertical size output. c. Failure of connection of vertical DY d. Adjustment error	b. Check of V output (D) IC201 (vertical output) D201 (V pumping up) L202 (V power filter) c. Check of connection of vertical P203 (vertical DY) d. Readjust vertical size
13. Horizontal position is not center		13.1 (When failure of horizontal raster position.) a. Failure of horizontal raster position control circuit. b. Failure of horizontal raster position drive circuit. c. Adjustment error 13.2 (When failure of horizontal phase (video position) sifter) a. Failure of phase sift control circuit. b. Adjustment error	13.1 a. Check of control circuit (M) IC608 (D/A converter) (M) 7 pin of P202 (M) b. Check of h position out Q354 through Q355 (h posi out) D355, D356 (h posi rectifier) R354, R355 (fusing resistor) T350 (H output transformer) c. Readjust using MCP16 <i>(This item can only adjust by MCP16)</i> 13.2 a. Check of phase sift circuit. (M) b. Readjust using MCP16 or front panel.
14. Vertical position is not center.		a. Failure of vertical position control circuit. b. Failure of vertical position output circuit. c. Adjustment error	a. Check of position control circuit. (M) IC607 (D/A converter) 15 pin of J202 b. Check of position output circuit. (D) pin 4 of IC201 (V-amp) c. Readjust using MCP16 or front panel.

7.2 Appendix

Check of MCU protection

When the monitor is power on, if power indicate LED lights green about 1 second and next it lights red a moment and power down , then MCU controlled protector has operated and shutdown the power supply.

As explain on circuit description section, the MCU of this monitor is searching several circuit information of monitor. These information is as follows.

1. Horizontal size information. (under or over)
2. High Voltage information. (under or over)
3. Anode beam current information. (over)
4. +B current information. (over)
5. +B voltage information. (over)
6. EEPROM failure or data error

If the sensing voltage of information has been over (or under) than setting value by something cause (ex failure of component), the MCU triggers the PS3 signal (SWR shutdown signal) and shutdown power supply. Before shutting down, the MCU writes the code of protection in the EEPROM.

To resolve the cause of shutdown , it is needed to read this code. But in normal mode , power of the monitor is down , there is special mode .

How to know the shutdown cause.

1. Remove back cabinet of the monitor.
2. Jumper the test pads shown fig 7.2.1 by soldering.
3. Power the monitor on , then power indicate LED will light red. (Under this state, the monitor operate PS2 mode.)
4. Connect the communication unit and run MCP16
5. Select <Check - LastProtect> menu.
6. The window of LastProtect will appear and you can know the cause of shutdown on the Data 2. (Data 1 has already written when the factory protection check.)
7. When the cause has known, repair or readjust the monitor.
8. After repairing the monitor , never forget to remove the jumper of test pads.

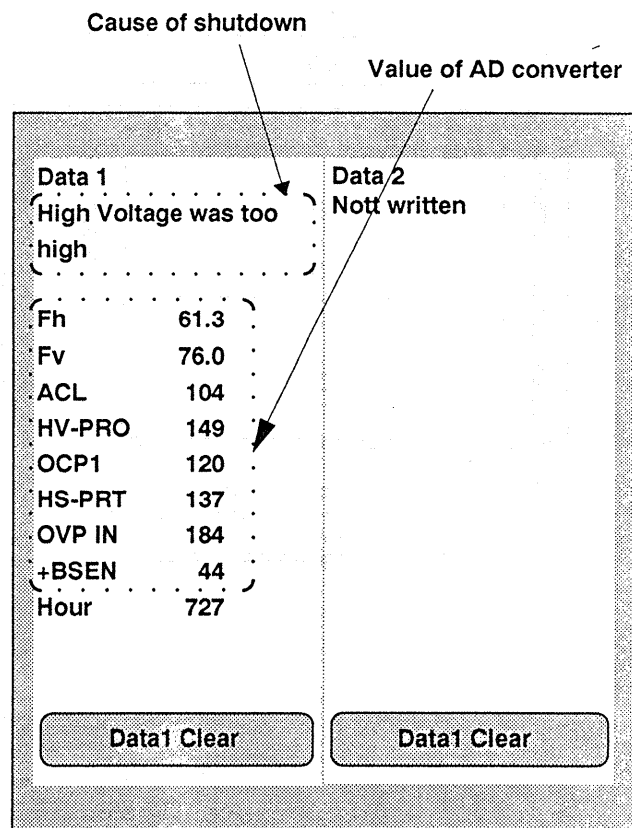


Fig 7.2.2 LastProtect window

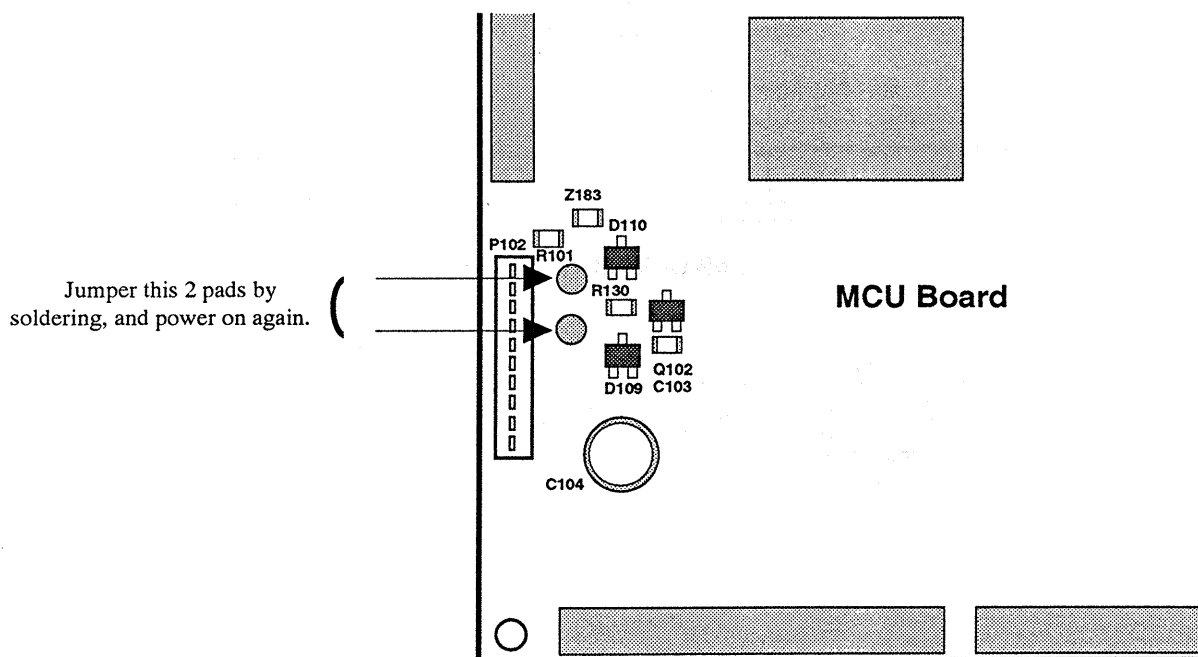
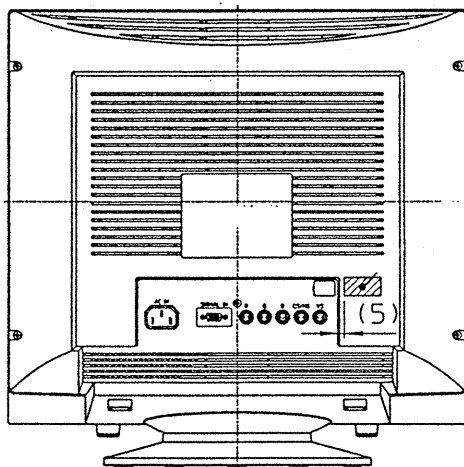
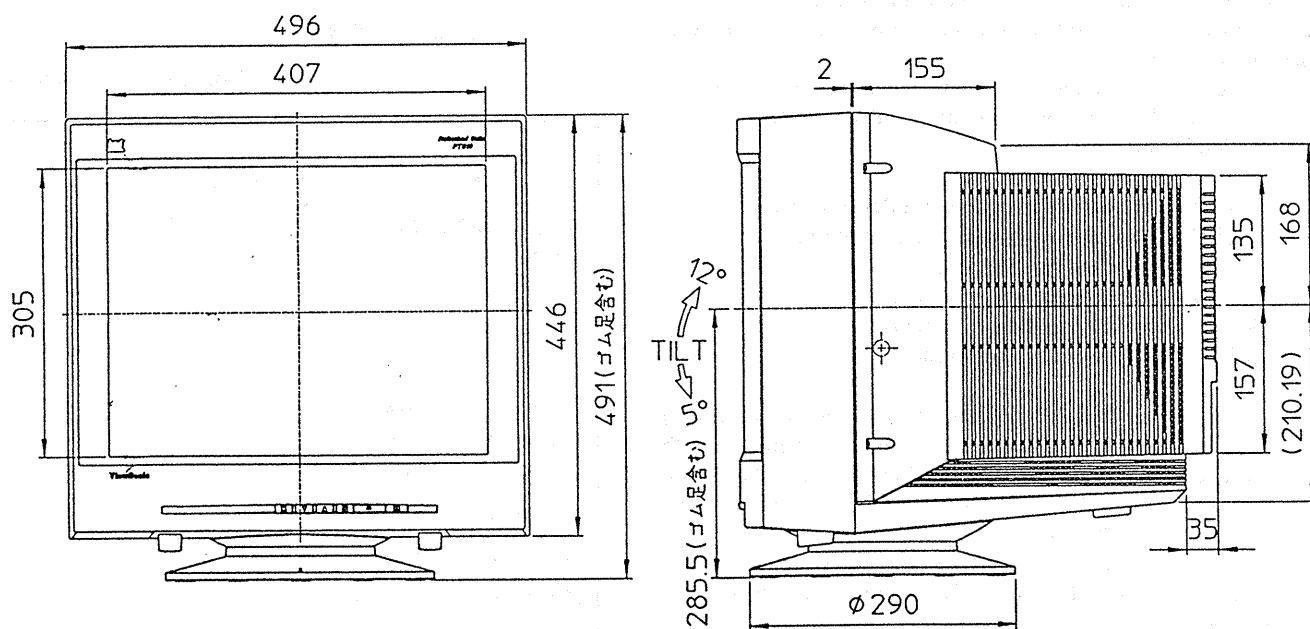
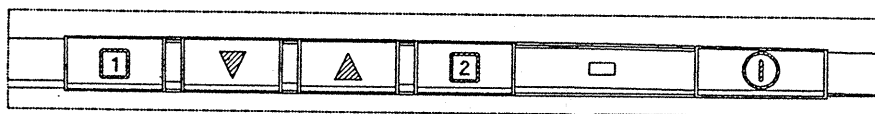


Fig 7.2.1 Jumpering point

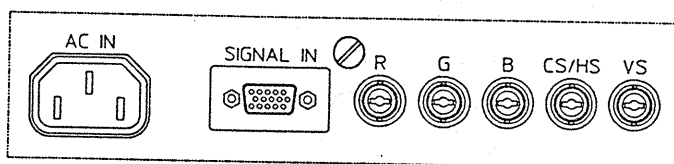
SECTION 8 OUTLINE DRAWING



DETAIL OF FRONT PANEL



DETAIL OF REAR CONNECTOR PANEL



SECTION 9 WAVE FORMS

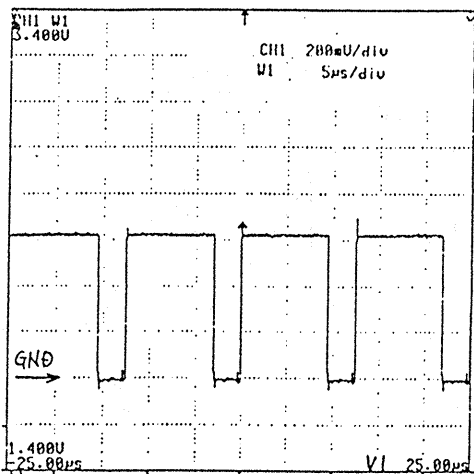
The waveforms are measured following condition.

Horizontal frequency: 80.0kHz
Vertical frequency 75Hz

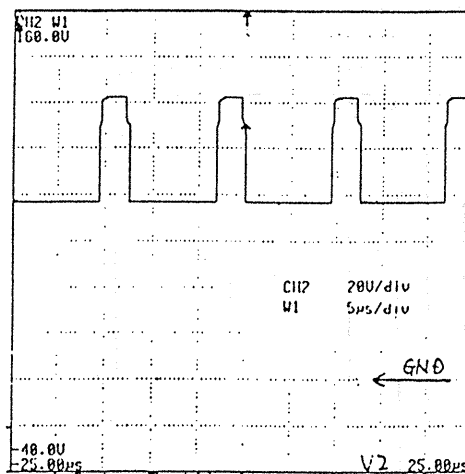
Video mode All White pattern for wave forms are V1,V2 and D12, others are cross hatch non-revers pattern.
Luminance MAX
Line input 100V AC

WAVE FORM 1: DEFLECTION BLOCK

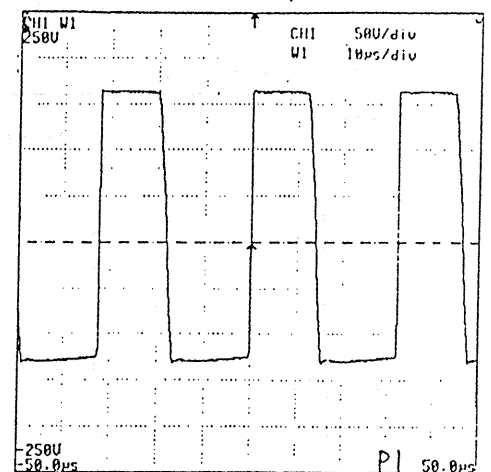
V1:R Video input



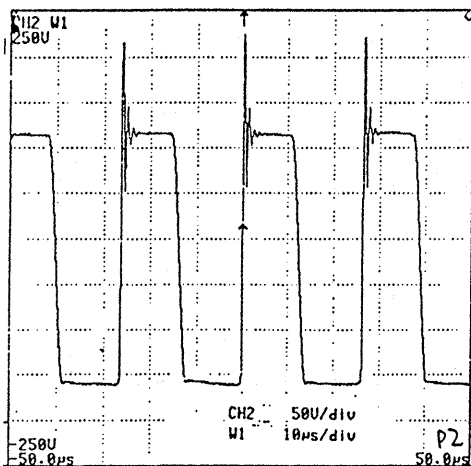
V2:Cathode of R Electrode



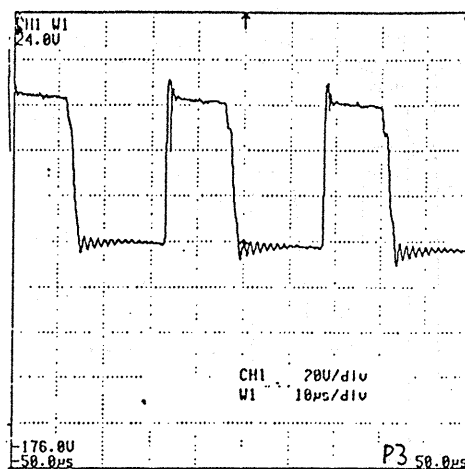
P1:4B1 SW transformer output



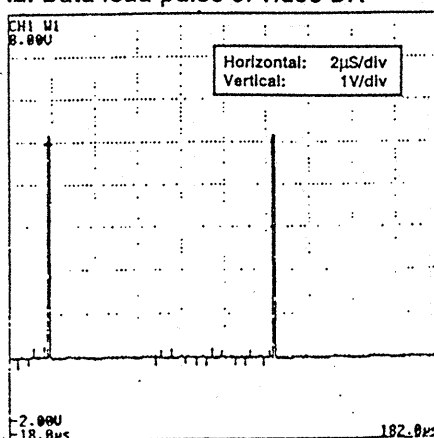
P2:SW control IC output



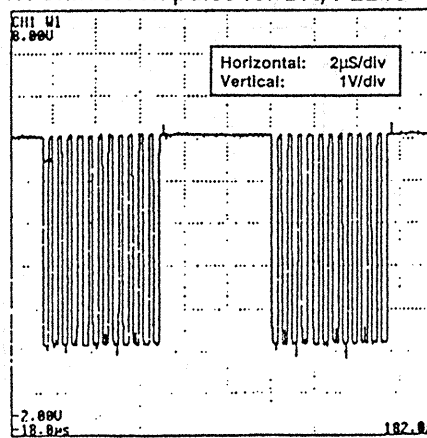
P3:SW drive winding output



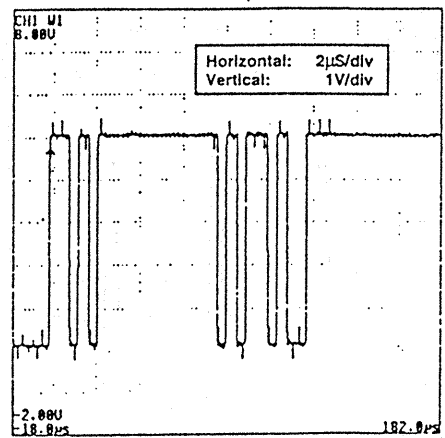
I2: Data load pulse of video DA



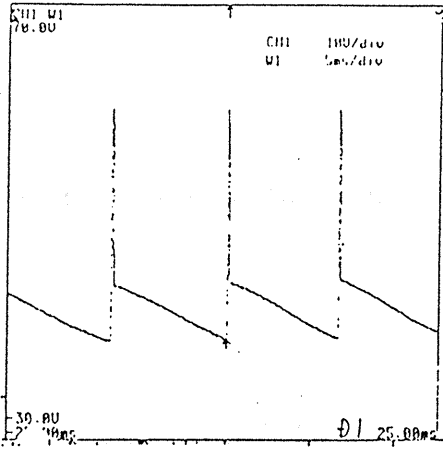
I3: Shift clock pulse for DA, PLL IC



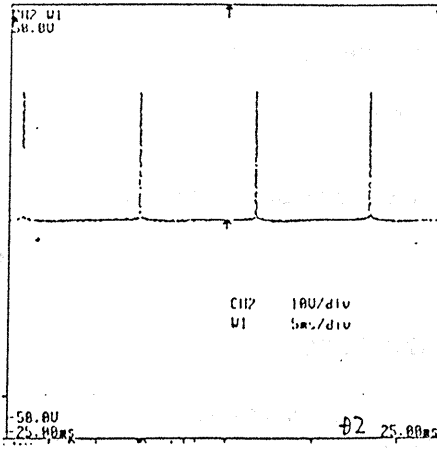
I4: Serial data of DA, PLL IC



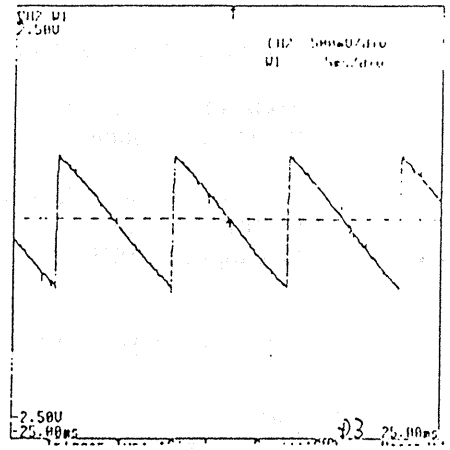
D1:Vertical Deflection output



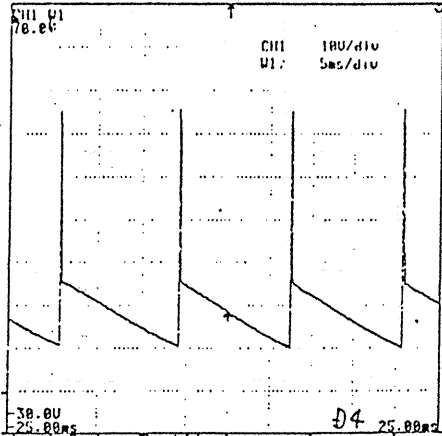
D2:Vertical Deflection pump up



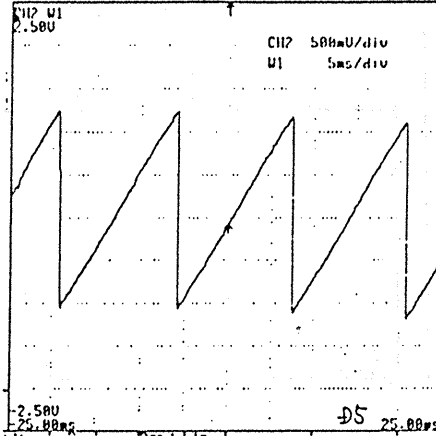
D3:Vertical DY return line



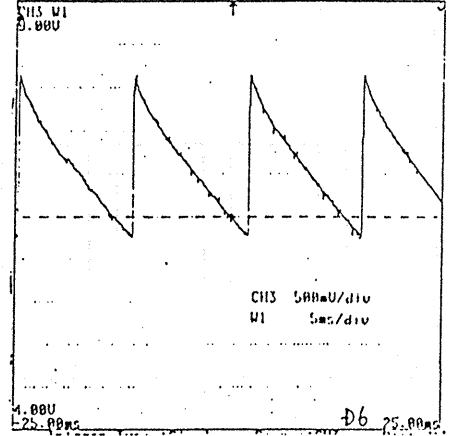
D4:Vertical DY hot line



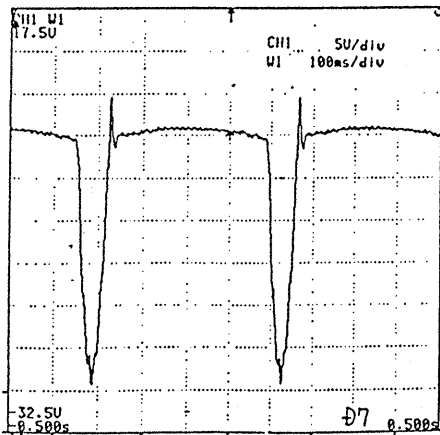
D5:Vertical linear correction



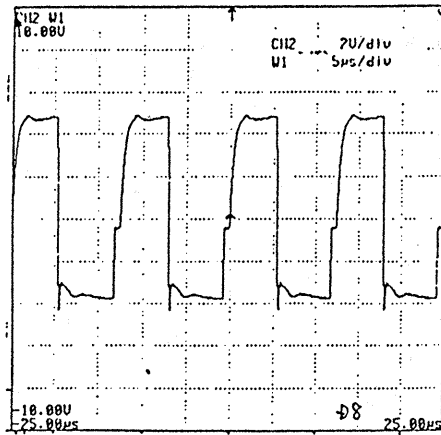
D6:AEF(VLF) cancel pulse



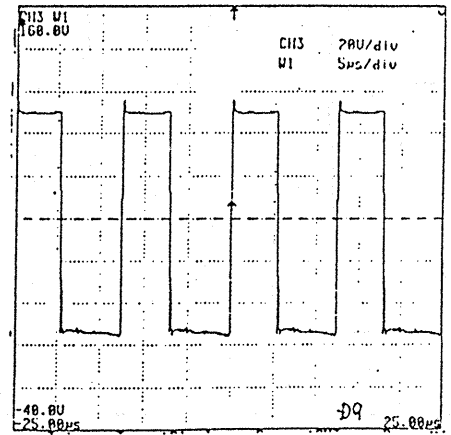
D7:Vertical protect blanking pulse



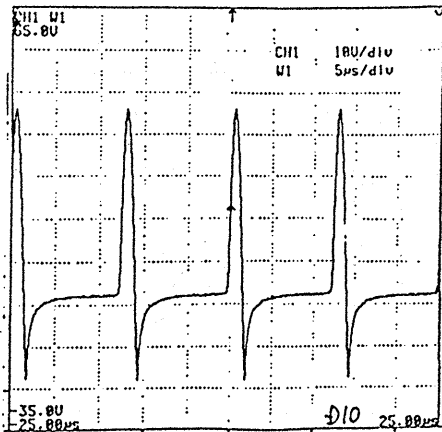
D8:Horizontal deflection drive pulse



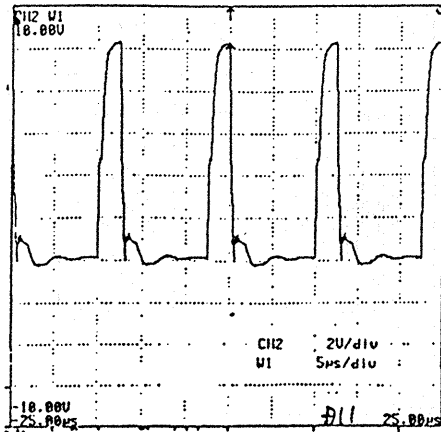
D9:Horizontal size control pulse (to chopper)



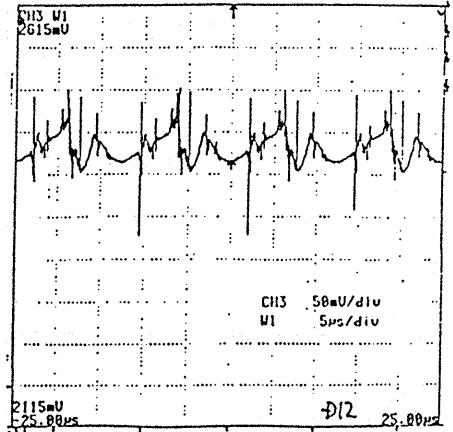
D10:Horizontal AFC pulse



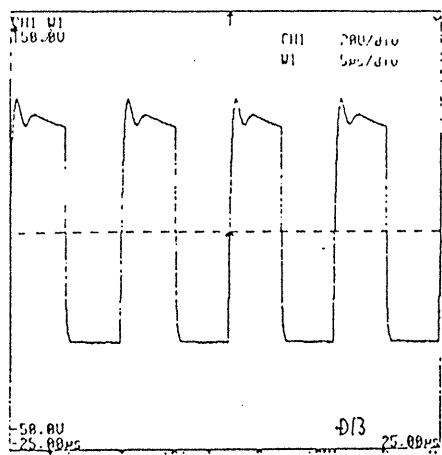
D11:HV drive pulse



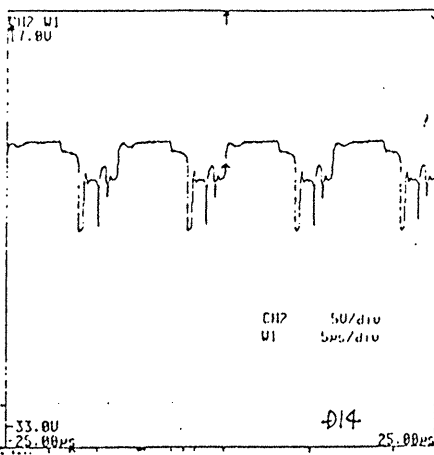
D12:HV sensing voltage



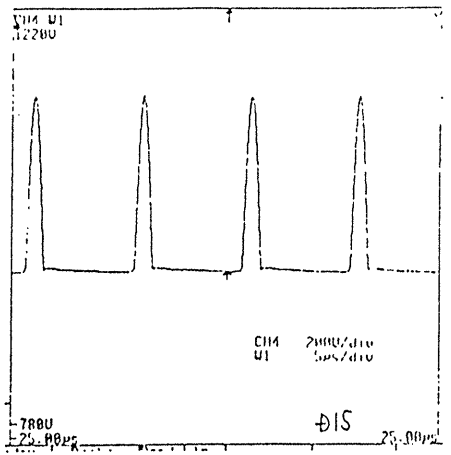
D13:Horizontal drive drain pulse



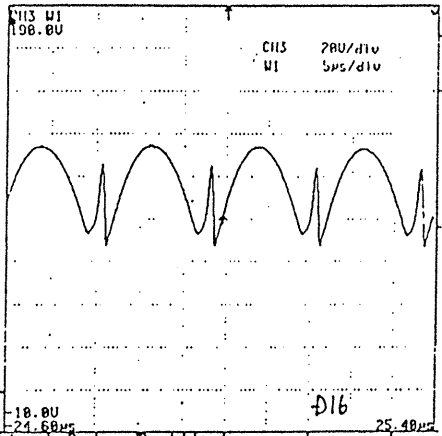
D14:Horizontal drive base pulse



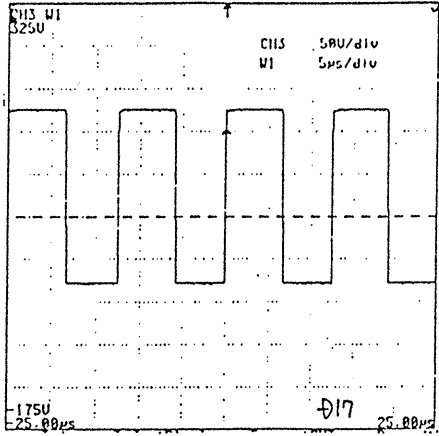
D15:Horizontal output collector pulse



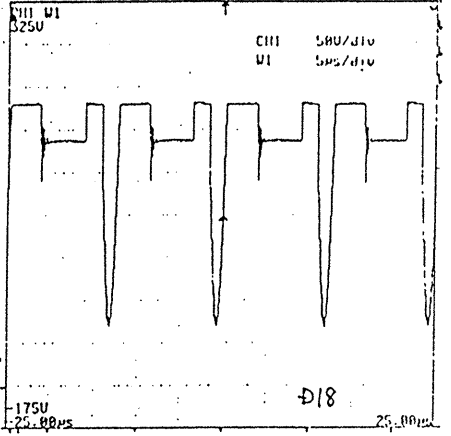
D16:Horizontal DY return line



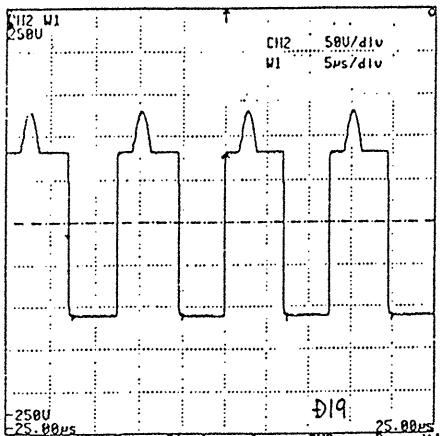
D17:Horizontal chopper output pulse



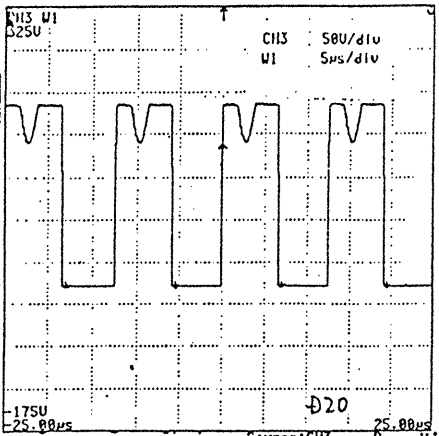
D18:Horizontal output trans output



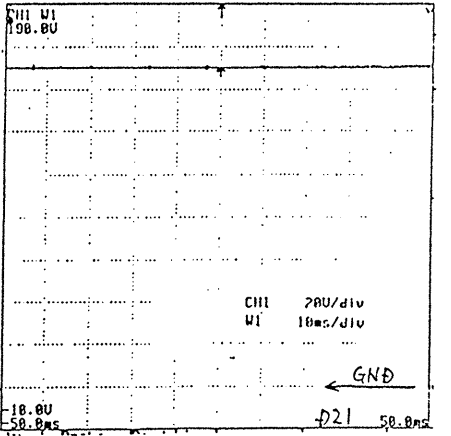
D19:Horizontal position winding



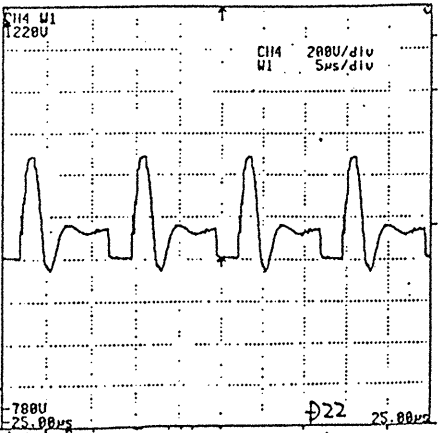
D20:Horizontal position winding



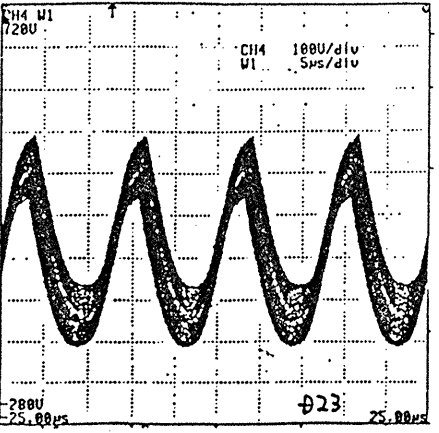
D21:HV +B voltage

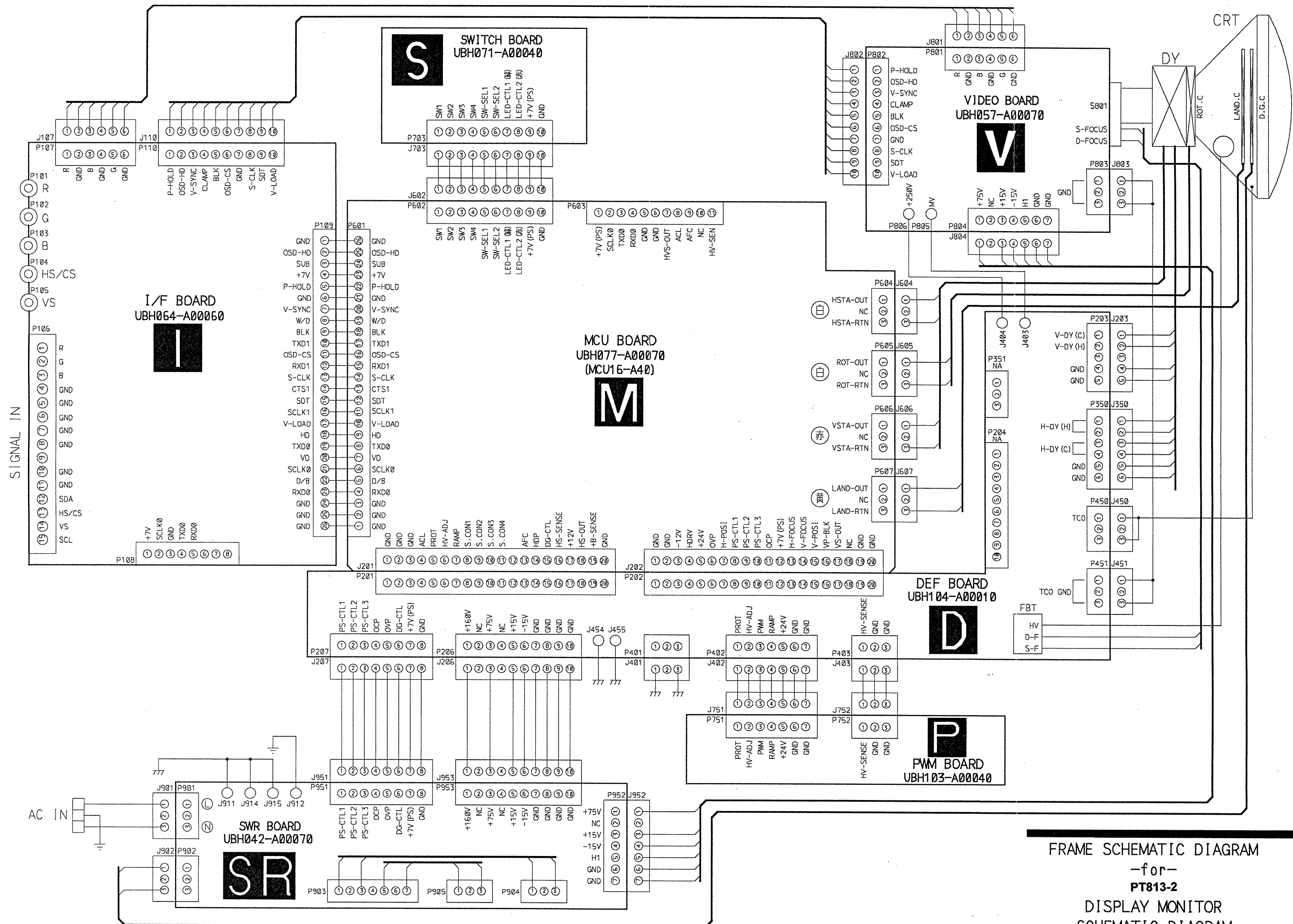


D22:HV output drain pulse

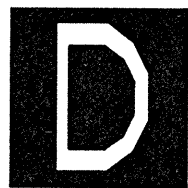
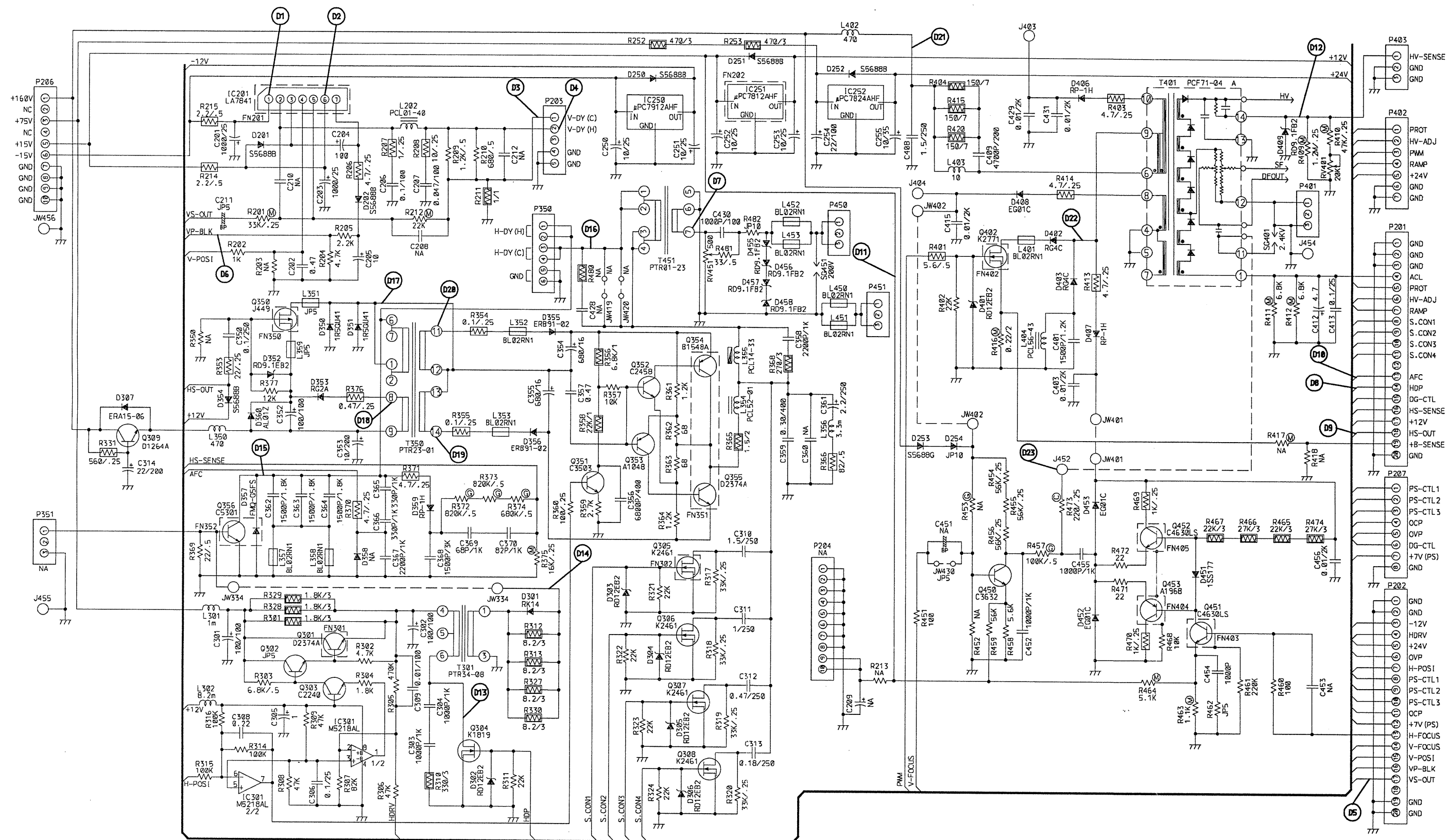


D23:Dynamic focus output(H rate)





Circuit Diagrams (DEFLECTION CIRCUIT BOARD)



RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	

GENERAL SCHEMATIC NOTES:

- UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(M)FARADS
50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5% FOR COMPLETE DESCRIPTION
OF COMPONENTS, REFER TO PARTS LIST.
WHERE K:1000 OHMS. M:1000k OHMS
P:μF FARADS
- UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(M)HENRY
10% FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
- DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

Deflection CIRCUIT BOARD
-for-
PT813-2
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	

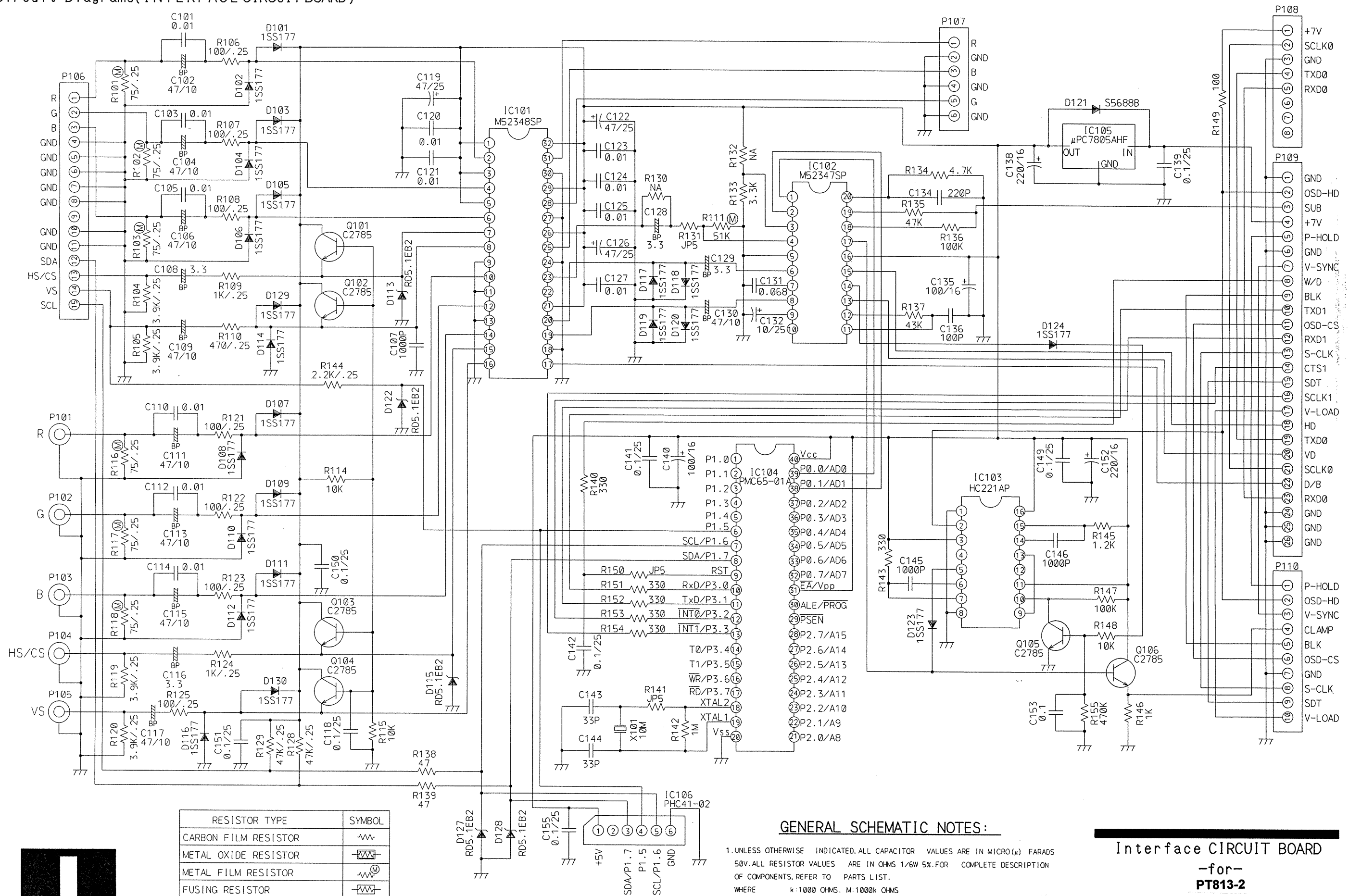
1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO(μ) FARADS
50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5%. FOR COMPLETE DESCRIPTION
OF COMPONENTS, REFER TO PARTS LIST.
WHERE K: 1000 OHMS, M: 1000K OHMS
P: μ FARADS

2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO(μ) HENRY
10%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.

3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

[illegible]

Circuit Diagrams(INTERFACE CIRCUIT BOARD)



RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO (μ) FARADS
50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W 5% FOR COMPLETE DESCRIPTION
OF COMPONENTS, REFER TO PARTS LIST.
WHERE K: 1000 OHMS. M: 1000k OHMS
P: μ FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO (μ) HENRY
10%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

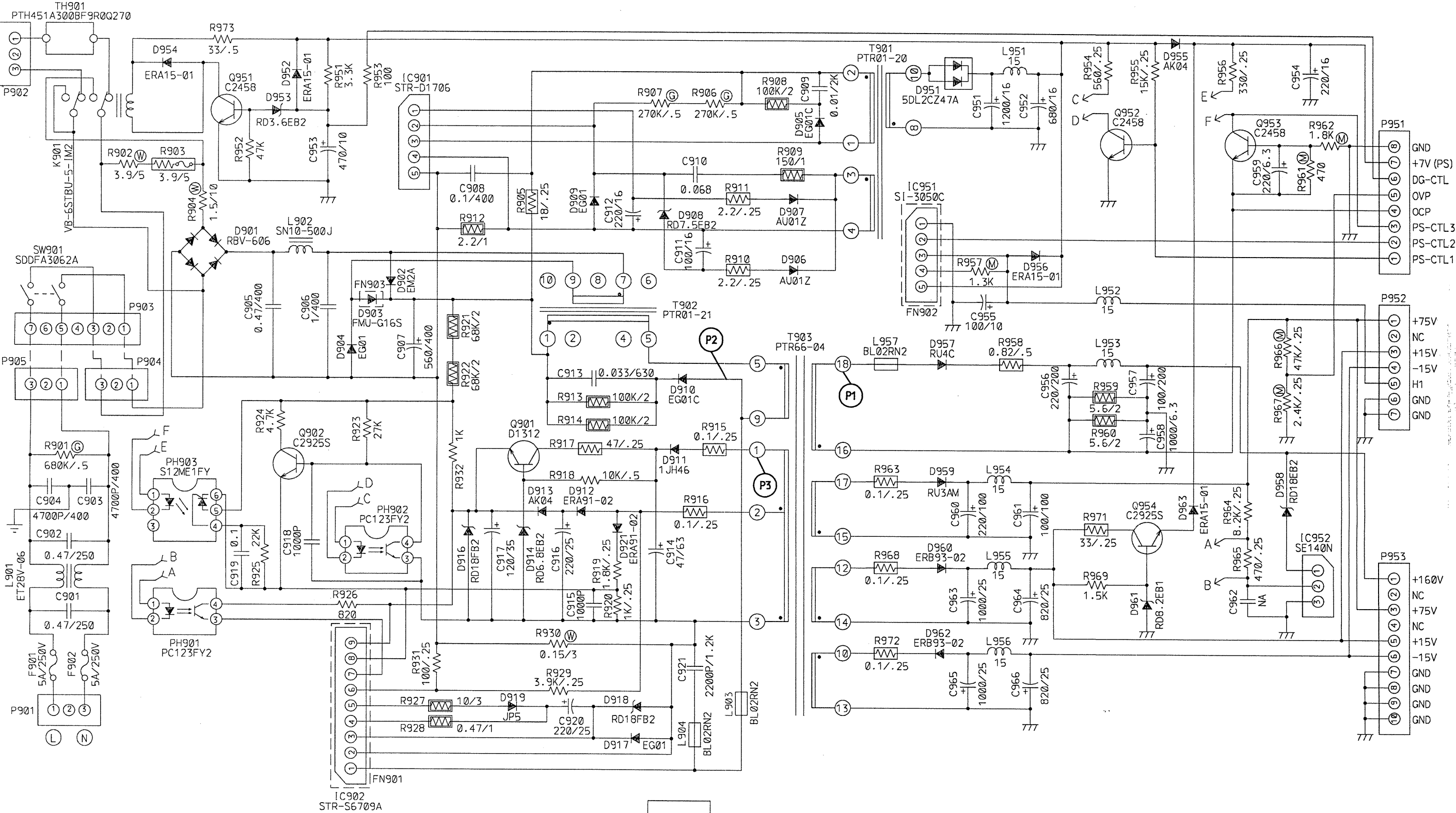
Interface CIRCUIT BOARD

-for-
PT813-2

DISPLAY MONITOR SCHEMATIC DIAGRAM

ViewSonic Corporation

Circuit Diagrams (SW Regurator CIRCUIT BOARD)

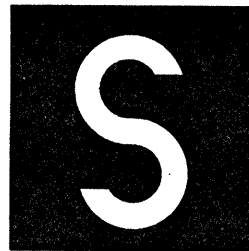
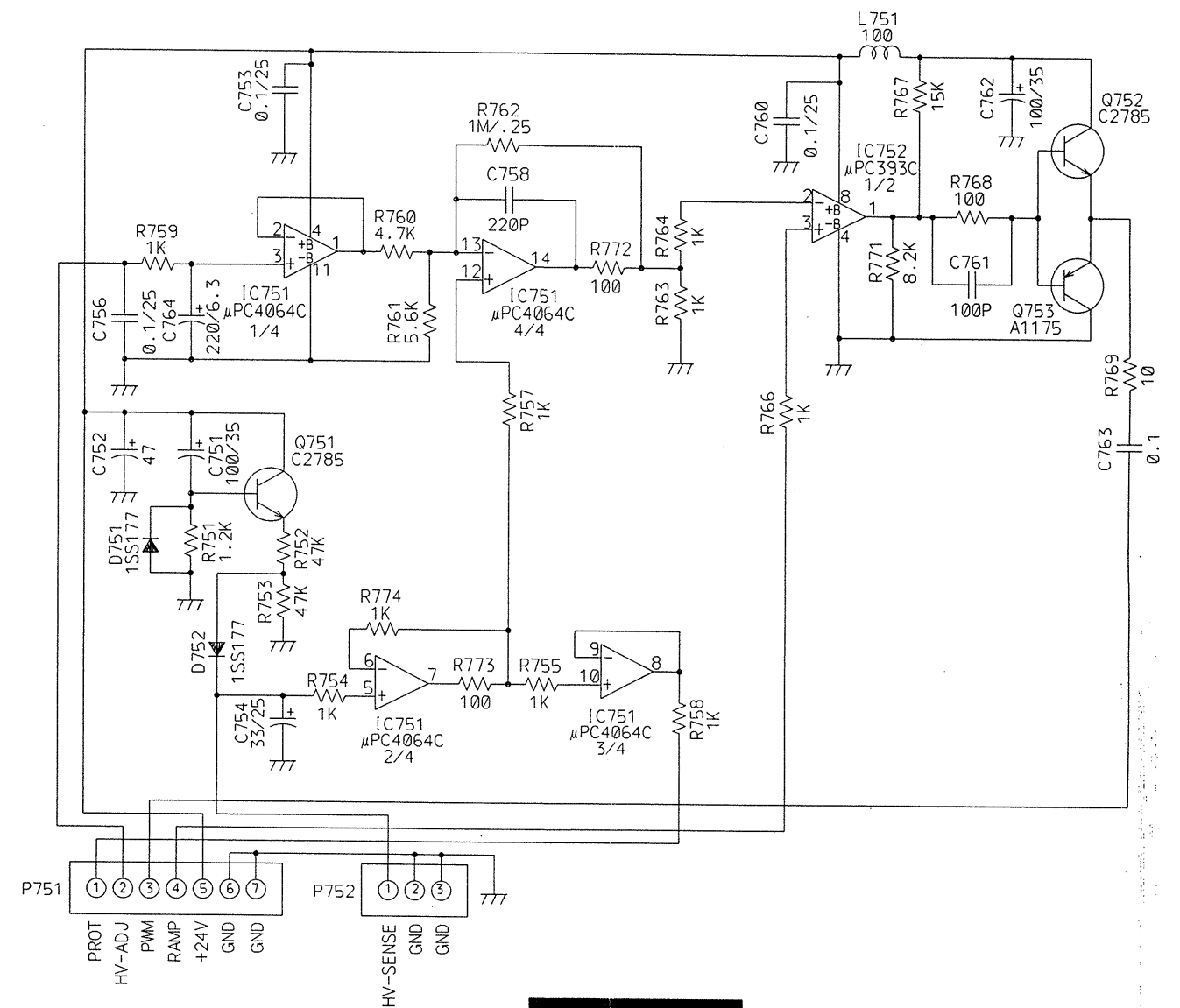
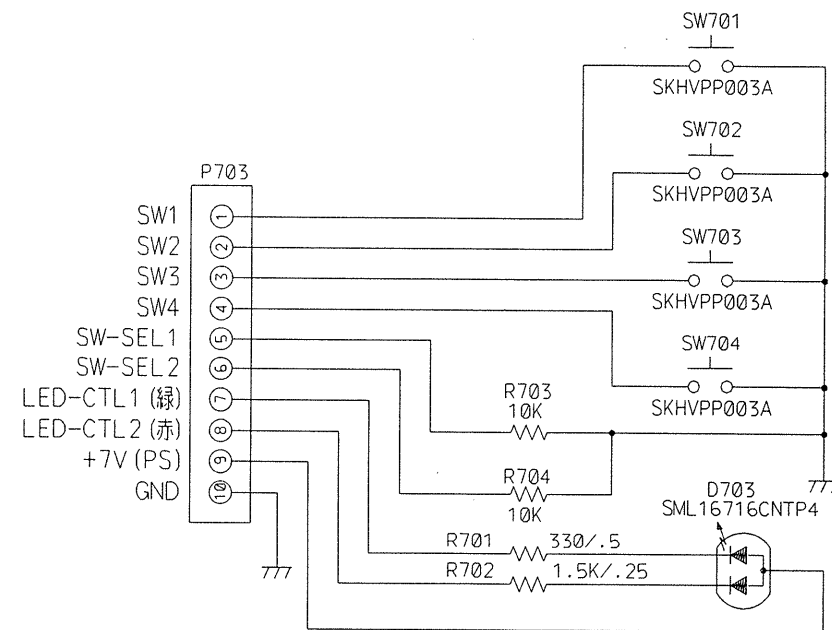


RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	

GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO (μ) FARADS
50V. ALL RESISTOR VALUES ARE IN OHMS 1/6W SX. FOR COMPLETE DESCRIPTION
OF COMPONENTS, REFER TO PARTS LIST.
WHERE k: 1000 OHMS. M: 1000k OHMS
p: μμ FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO (μ) HENRY
10%. FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

SW Regurator CIRCUIT BOARD
-for-
PT813-2
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation



RESISTOR TYPE	SYMBOL
CARBON FILM RESISTOR	
METAL OXIDE RESISTOR	
METAL FILM RESISTOR	
FUSING RESISTOR	
CARBON COMPOSITION RESISTOR	
FILM PROOF CARBON RESISTOR	
WIRE WOUND RESISTOR	
METAL GLAZE RESISTOR	

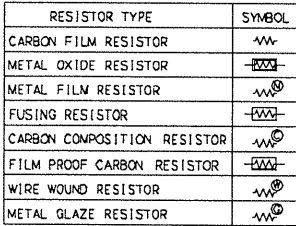
GENERAL SCHEMATIC NOTES:

1. UNLESS OTHERWISE INDICATED, ALL CAPACITOR VALUES ARE IN MICRO (μ) FARADS
50% ALL RESISTOR VALUES ARE IN OHMS 1/6W 5% FOR COMPLETE DESCRIPTION
OF COMPONENTS, REFER TO PARTS LIST.
WHERE K: 1000 OHMS. M: 1000K OHMS
P: μ K FARADS
2. UNLESS OTHERWISE INDICATED, ALL INDUCTOR VALUES ARE IN MICRO (μ) HENRY
10% FOR COMPLETE DESCRIPTION OF COMPONENTS, REFER TO PARTS LIST.
3. DASHED LINE BOX ENCLOSES HEAT SINK MOUNTED DEVICE.

SWITCH&PWM CIRCUIT BOARD
-for-
PT813-2

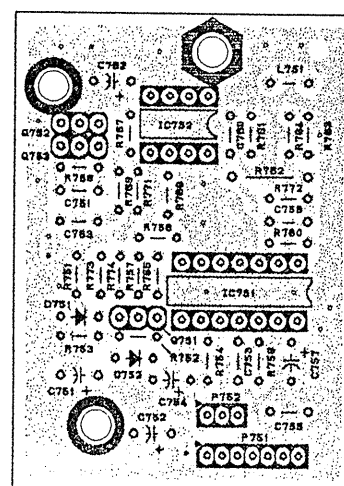
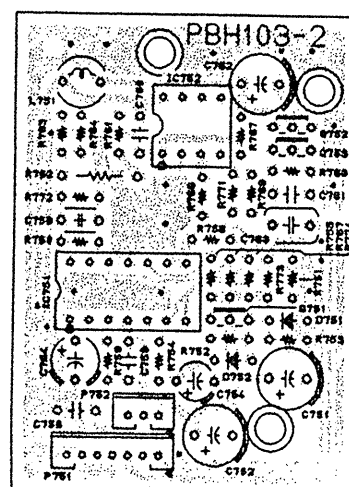
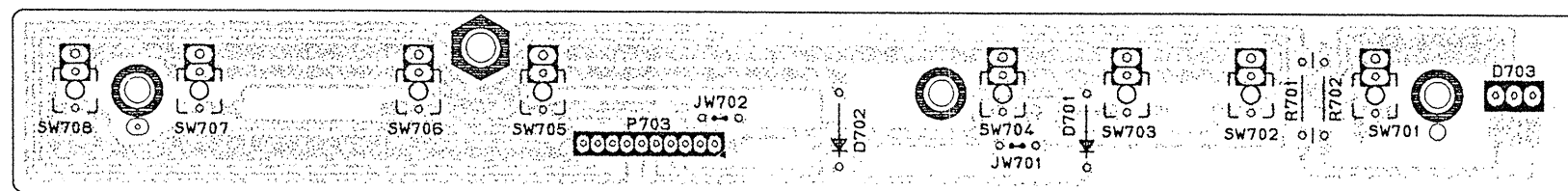
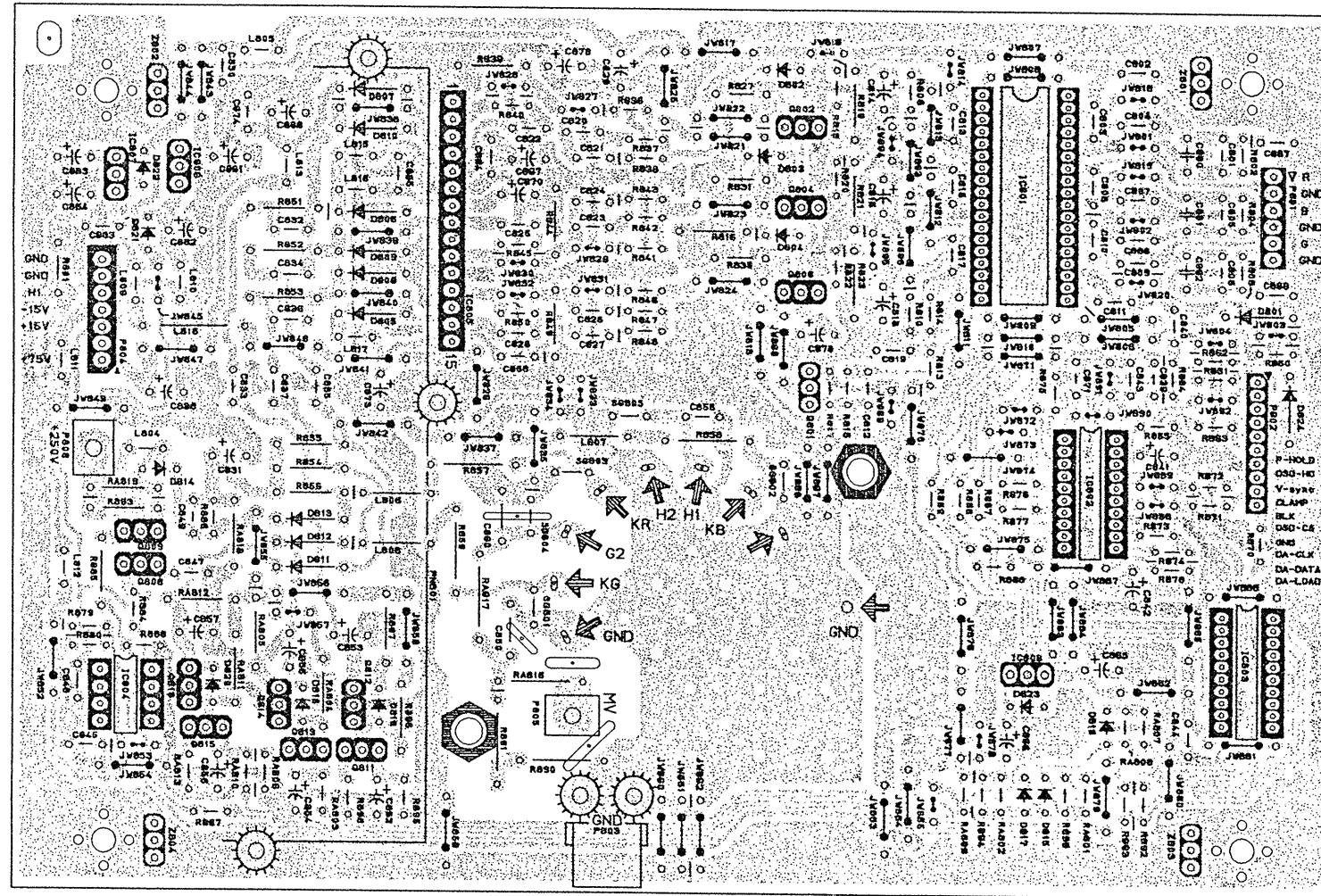
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

M

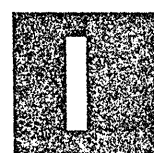
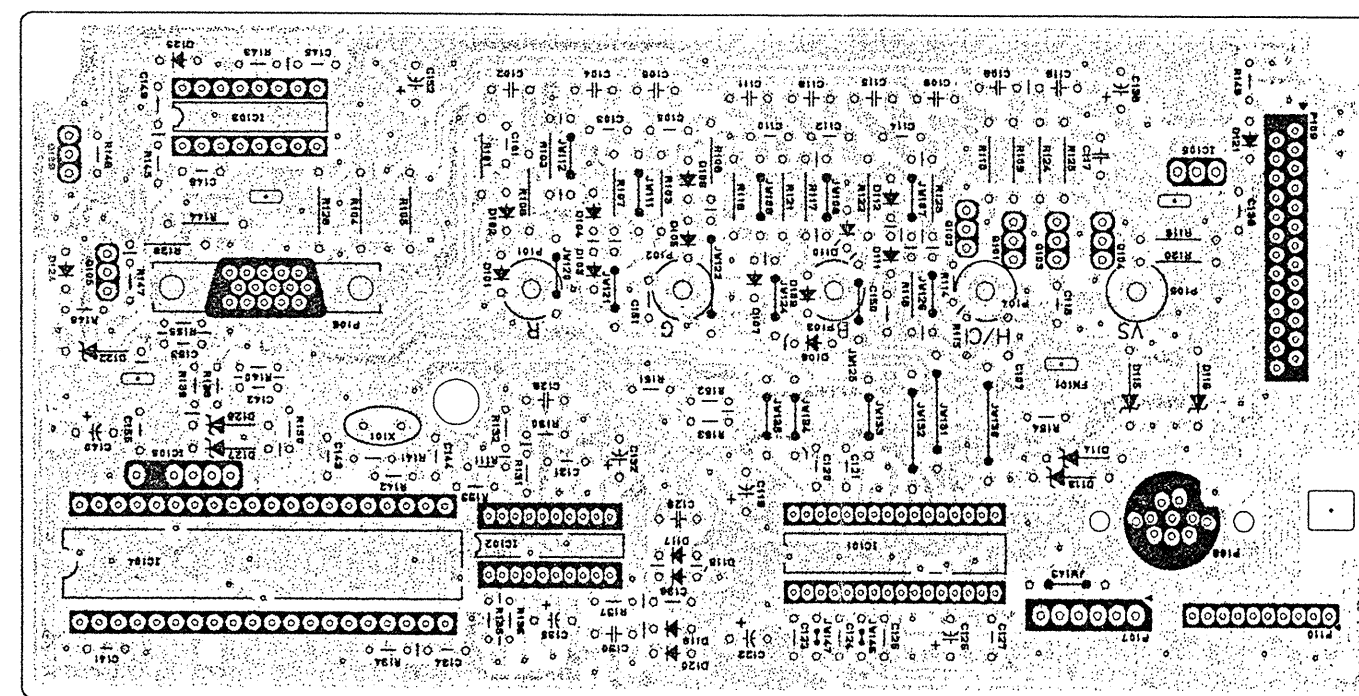
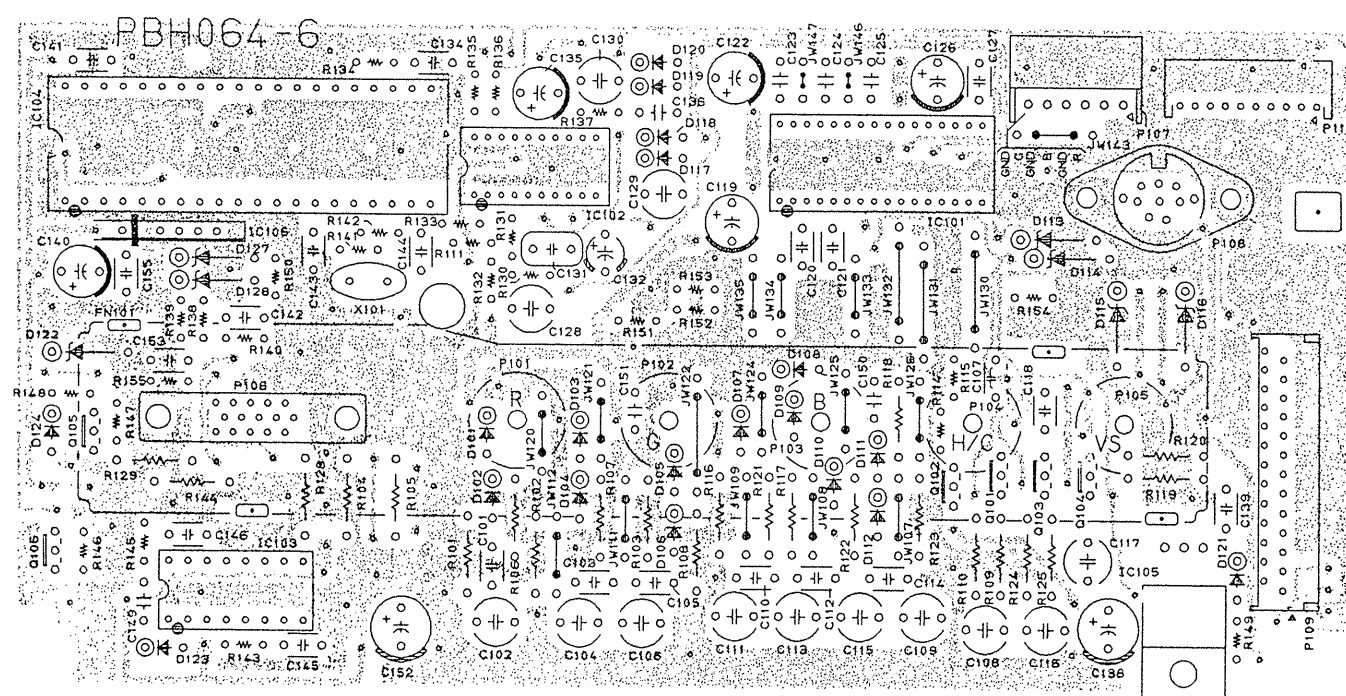
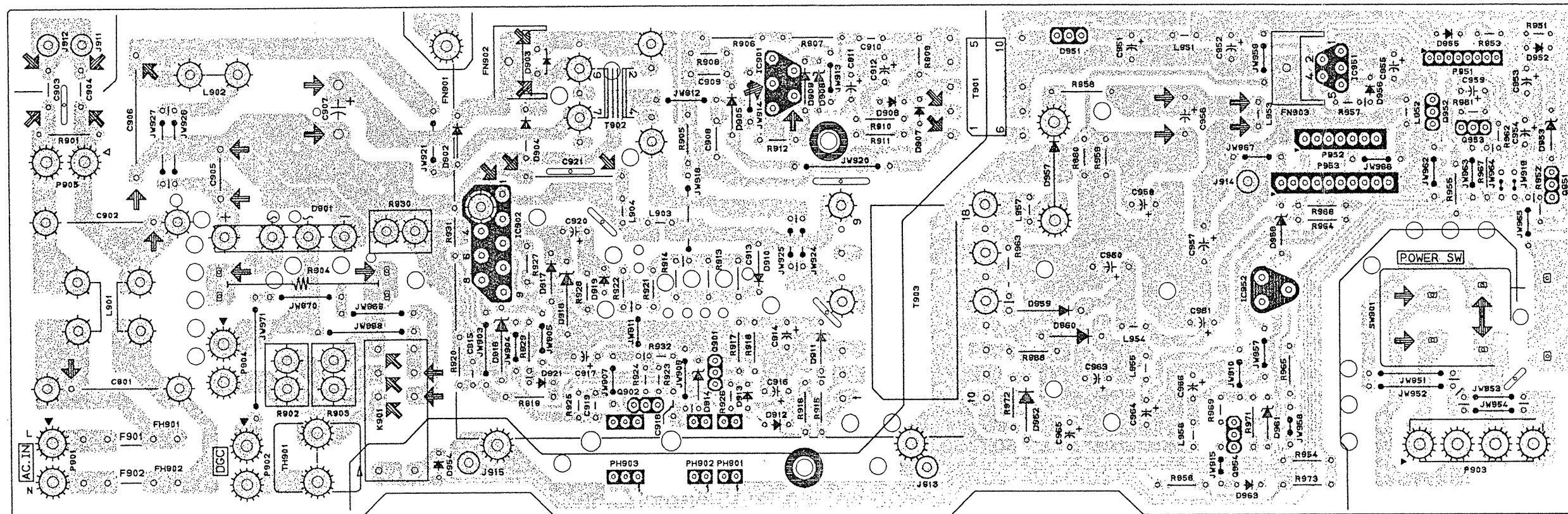


MCU CIRCUIT BOARD
-for-
PT813-2
DISPLAY MONITOR
SCHEMATIC DIAGRAM
ViewSonic Corporation

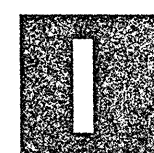
- 40 -



SR



PARTS SIDE



SOLDERNG SIDE

I & SR CIRCUIT BOARD

- for -

PT813-2

COLOR CRT

DISPLAY MONITOR

Printed wiring Board

ViewSonic Corporation

SECTION 11 EXPLODED VIEW and PARTS LIST

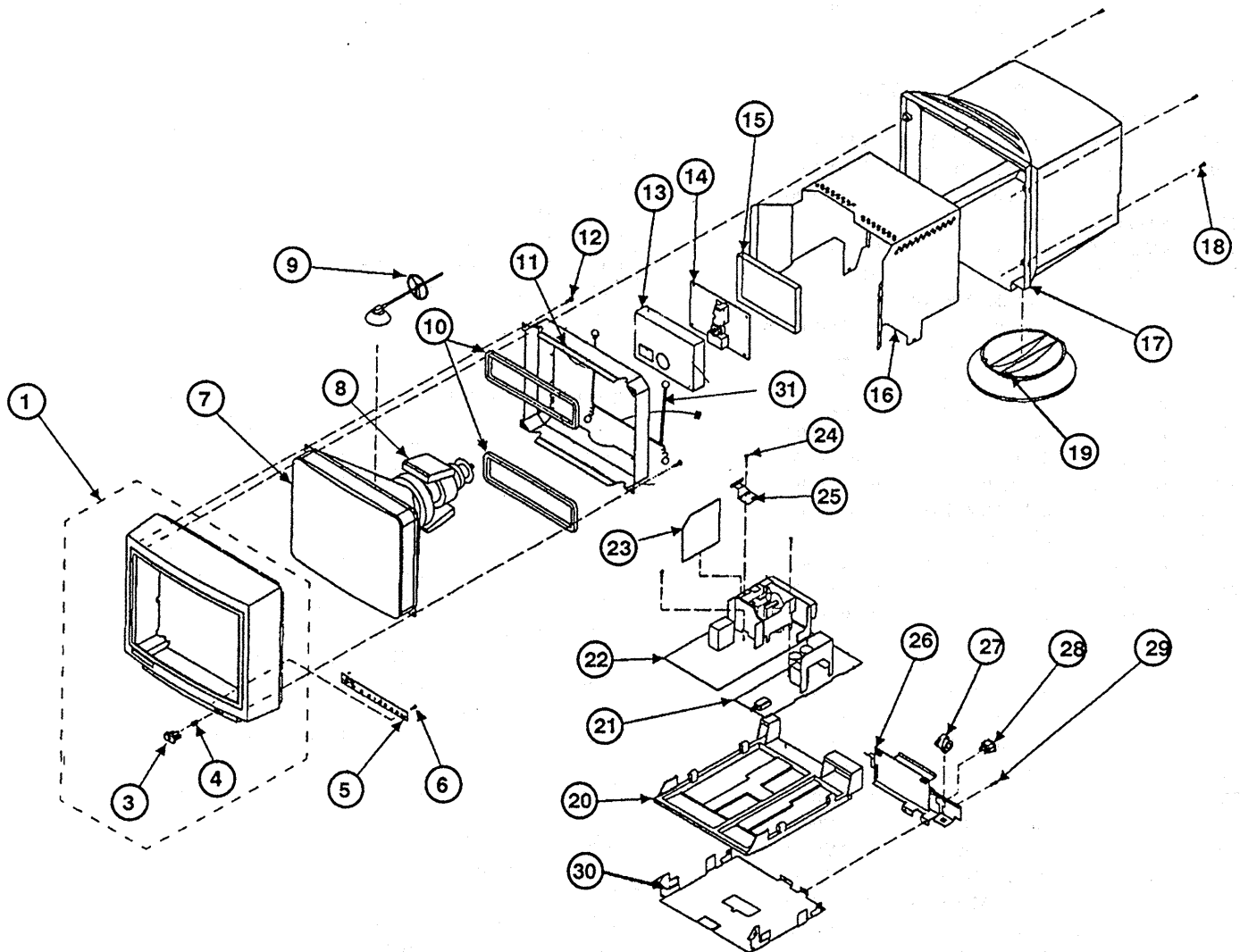
The components identified by Δ are critical for safety.
Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
1	bezel assembly	PBE21-22	9U62062-00	
3	include bezel assembly		9U69127-00	
4	include bezel assembly		9U59309-00	
5	SW board assembly		7S80129-65	
6	tapping screw (BV)	3.0dia x 8	9Z03607-00	
7	CRT	M50LJG39X28	9T03755-00	Δ #
8	Deflection Yoke (integrated in CRT)			
9	HV cable holder	3-704-372-01	9W70404-00	
10	Degauss coil	PCL63-11	8F81440-00	
11	CRT shield assembly		9U70398-04	
12	frange tapping screw		9W36503-00	
13	shield VFA		9U70396-02	
14	Video board assembly		7S80129-50	#
15	shield VB		9U70391-00	
16	shield cover		9U70394-03	
17	cover		9U61017-00	
18	tapping screw (BV)	4x16 F-NI	9Z03682-00	
19	stand assembly	PMM20-19	9U69062-00	
20	bracket D		9U69055-00	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
21	SW regulator board assembly		7S80129-40	#
22	Deflection board assembly		7S80129-45	#
23	MCU board	MCU16-A40	9T19240-04	Δ #
24	tapping screw (BV)	3.0dia x 8	9Z03607-00	
25	bracket MCU		9U70392-00	
26	I/F assembly		7S80129-35	#
27	holder core		9U69056-00	
28	AC inlet	AC-P03C505	9T89119-00	
29	tapping screw +ext.tooth washer		9Z03677-01	
		4.0dia x8		
30	shield D		9U70393-02	
31	CRT GND ASSY		6C88830-00	
32	PWM Board assemble		7S80129-25	#

NOTE

The construction parts of an assembled parts are indicated with a collation number in the remark column.



SECTION 12 Electrical Parts List

NOTE

All variable and adjustable resistors have characteristic curve B, unless otherwise noted.

RESISTORS

All resistors are in ohms

The components identified by Δ in this manual have been carefully factory selected for each set in order to satisfy regulations regarding X-ray radiation. Should replacement be required, replace only with the value originally used.

The components identified by Δ are critical for safety.
Replace only with code number specified

There are some cases the reference number on one board overlaps on the other board, therefore, when ordering parts by the reference number, please include the board name.

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
----------	------------	--------------	----------	---------

DEFLECTION BOARD

<PWB>				
PB001	PWB1	PBH104-3	9T13104-03	
<INTEGRATED CIRCUIT>				
IC201	IC	LA7841	9T34429-00	#
IC250	IC	μ PC7912AHF	9T30052-00	
IC251	IC	μ PC7812AHF	9T30036-00	
IC252	IC	μ PC7824AHF	9T30055-00	
IC301	IC	M5218AL	9T34501-00	
<TRANSISTOR&FET>				
Q301	Transistor	2SD2374A	9T44259-00	#
Q303	Transistor	2SC2240-GR-TPE2	9T42361-50	
Q304	MOS FET	2SK1819-01MR	9T45091-00	#
Q305	MOS FET	2SK2461	9T45014-00	#
Q306	MOS FET	2SK2461	9T45014-00	#
Q307	MOS FET	2SK2461	9T45014-00	#
Q308	MOS FET	2SK2461	9T45014-00	#
Q309	Transistor	2SD1264A-P(SB)	9T44231-00	
Q350	MOS FET	2SJ449	9T45106-00	#
Q351	Transistor	2SC3503-E/F	9T42531-00	
Q352	Transistor	2SC2458-Y-TPE4	9T42396-50	
Q353	Transistor	2SA1048-Y-TPE4	9T40209-50	
Q354	Transistor	2SB1548A	9T41110-00	
Q355	Transistor	2SD2374A	9T44259-00	
Q356	Transistor	2SC5301-YB	9T42701-00	#
Q402	MOS FET	2SK2771-01R-F172R9T	9T45092-00	#
Q450	Transistor	2SC3632	9T42500-00	
Q451	Transistor	2SC4630LS-CB	9T42630-00	
Q452	Transistor	2SC4630LS-CB	9T42630-00	
Q453	Transistor	2SA1968-CB	9T40368-00	
<DIODE>				
D201	Diode	S5688B-TPA3	9T47050-50	
D202	Diode	S5688B-TPA3	9T47050-50	
D250	Diode	S5688B-TPA3	9T47050-50	
D251	Diode	S5688B-TPA3	9T47050-50	
D252	Diode	S5688B-TPA3	9T47050-50	
D253	Diode	S5688G-TPA3	9T47049-50	
D301	Diode	RK14 LF-A1	9T47250-00	
D302	Diode Zener	RD12EB2-TA11R	9V46072-50	
D303	Diode Zener	RD12EB2-TA11R	9V46072-50	
D304	Diode Zener	RD12EB2-TA11R	9V46072-50	
D305	Diode Zener	RD12EB2-TA11R	9V46072-50	
D306	Diode Zener	RD12EB2-TA11R	9V46072-50	
D307	Diode	ERA15-06V3	9T47087-50	
D350	Diode	1R5GU41 LC7-15A	9T47265-00	#
D351	Diode	1R5GU41 LC7-15A	9T47265-00	#
D352	Diode Zener	RD9.1EB2-TA11R	9V46059-50	#

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
----------	------------	--------------	----------	---------

D353	Diode	RG2A LF-A1	9T47232-01	
D354	Diode	S5688B-TPA3	9T47050-50	
D355	Diode	ERB91-02-L6	9T47292-01	
D356	Diode	ERB91-02-L6	9T47292-01	
D357	Diode	FMQ-G5FS	9T47144-00	
D358	N/A			
D359	Diode	RP-1H	9T47105-00	
D360	Diode	AL01Z-V0	9T47267-50	
D401	Diode Zener	RD12EB2-TA11R	9V46072-50	
D402	Diode	RG4C LF015-308	9T47187-03	
D403	Diode	RG4C LF015-308	9T47187-03	
D406	Diode	RP-1H	9T47105-00	
D407	Diode	RP-1H	9T47105-00	
D408	Diode	EG01C-V0	9T47164-50	
D409	Diode Zener	RD9.1FB2	9T46359-01	
D451	Diode	1SS177-TPA7	9T47221-50	
D452	Diode	EG01C-V0	9T47164-50	
D453	Diode	EG01C-V0	9T47164-50	
D455	Diode Zener	RD9.1FB2	9T46359-00	
D456	Diode Zener	RD9.1FB2	9T46359-00	
D457	Diode Zener	RD9.1FB2	9T46359-00	
D458	Diode Zener	RD9.1FB2	9T46359-00	

<RESISTOR>

RV401	Variable Resistor	20K	9T50289-00	Δ
RV451	Variable Resistor	500 0.3W B	9T50239-53	
R201	Metal	33K Ω 1/4W	9T52015-63	
R202	Carbon	1.0K Ω 1/6W	9V51014-51	
R203	N/A			
R204	Carbon	4.7K Ω 1/6W	9V51014-67	
R205	Carbon	2.2K Ω 1/6W	9V51014-59	
R206	Fusible	4.7 1/4W	9T52951-67	
R207	Fusible	1.0 1/4W	9T52951-51	
R208	Fusible	10 1/4W	9T52952-51	
R209	Carbon	1.2K 1/2W	9T51054-53	
R210	Carbon	680 1/2W	9T51053-71	
R211	Metal Oxide	1.0 1W	9T51661-51	
R212	Metal	22K Ω 1/6W	9T52005-59	
R213	N/A			
R214	Fusible	2.2 1/2W	9T52956-59	
R215	Fusible	2.2 1/2W	9T52956-59	
R252	Metal Oxide	470 3W	9T51703-67	
R253	Metal Oxide	470 3W	9T51703-67	
R301	Metal Oxide	1.8K 3W	9T51704-57	
R302	Carbon	4.7K Ω 1/6W	9V51014-67	
R303	Carbon	6.8K Ω 1/2W	9V51054-71	
R304	Carbon	1.8K Ω 1/6W	9V51014-57	
R305	Carbon	470K Ω 1/6W	9V51016-67	
R306	Carbon	47K Ω 1/6W	9V51015-67	
R307	Carbon	82K Ω 1/6W	9V51015-73	
R308	Carbon	47K Ω 1/6W	9V51015-67	

The components identified by Δ are critical for safety.
Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
R309	Carbon	47K Ω 1/6W	9V51015-67	
R310	Metal Oxide	330 3W	9T51683-63	
R311	Carbon	22K Ω 1/6W	9V51015-59	
R312	Metal Oxide	8.2 3W	9T51701-73	
R313	Metal Oxide	8.2 3W	9T51701-73	
R314	Carbon	100K Ω 1/6W	9V51016-51	
R315	Carbon	100K Ω 1/6W	9V51016-51	
R316	Carbon	100K Ω 1/6W	9V51016-51	
R317	Carbon	33K Ω 1/4W	9V51025-63	
R318	Carbon	33K Ω 1/4W	9V51025-63	
R319	Carbon	33K Ω 1/4W	9V51025-63	
R320	Carbon	33K Ω 1/4W	9V51025-63	
R321	Carbon	22K Ω 1/6W	9V51015-59	
R322	Carbon	22K Ω 1/6W	9V51015-59	
R323	Carbon	22K Ω 1/6W	9V51015-59	
R324	Carbon	22K Ω 1/6W	9V51015-59	
R327	Metal Oxide	8.2 3W	9T51701-73	
R328	Metal Oxide	1.8K 3W	9T51704-57	
R329	Metal Oxide	1.8K 3W	9T51704-57	
R330	Metal Oxide	8.2 3W	9T51701-73	
R350	N/A			
R353	Fusible	22 1/4W	9T52952-59	
R354	Fusible	0.1 1/4W	9T59710-50	
R355	Fusible	0.1 1/4W	9T59710-50	
R356	Metal Oxide	6.8K 1W	9T51664-71	
R357	Carbon	10K Ω 1/6W	9V51015-51	
R358	Metal Oxide	22K 1W	9T51665-59	
R359	Carbon	2.7K Ω 1/6W	9V51014-61	
R360	Carbon	100 Ω 1/4W	9V51023-51	
R361	Carbon	1.2K Ω 1/6W	9V51014-53	
R362	Carbon	68 Ω 1/6W	9V51012-71	
R363	Carbon	68 Ω 1/6W	9V51012-71	
R364	Carbon	1.2K Ω 1/6W	9V51014-53	
R365	Metal Oxide	1.5 2W	9T51671-55	
R366	Fusible	82 1/2W	9T52957-73	
R368	Metal Oxide	270 3W	9T51683-61	
R369	Carbon	22 Ω 1/2W	9V51052-59	
R370	Fusible	4.7 1/4W	9T52951-67	
R371	Fusible	4.7 1/4W	9T52951-67	
R372	Metal Glaze	820K 1/2W	9T53604-73	
R373	Metal Glaze	820K 1/2W	9T53604-73	
R374	Metal Glaze	680K 1/2W	9T53604-71	
R375	Metal	16K 1/4W	9T52015-56	
R376	Fusible	0.47 1/4W	9T59710-51	
R377	Carbon	12K 1/6W	9T51015-53	
R401	Fusible	5.6 1/2W	9T52956-69	
R402	Carbon	22K Ω 1/6W	9V51015-59	
R403	Fusible	4.7 1/4W	9T52951-67	
R404	Metal Oxide	150 7W	9T59265-00	
R409	Metal	1.2M 1/4W	9T52017-53	Δ
R410	Metal	47K Ω 1/4W	9V52015-67	Δ
R411	Metal	6.8K Ω 1/6W	9V52004-71	Δ
R412	Metal	6.8K Ω 1/6W	9V52004-71	Δ
R413	Fusible	4.7 1/4W	9T52951-67	
R414	Fusible	4.7 1/4W	9T52951-67	
R415	Metal Oxide	150 7W	9T59265-00	
R416	Metal Oxide	0.22 2W	9T51670-59	
R417	N/A			
R418	N/A			
R420	Metal Oxide	150 7W	9T59265-00	
R451	Carbon	100 Ω 1/6W	9V51013-51	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
R452	N/A			
R453	N/A			
R454	Carbon	56K 1/4W	9T51025-69	
R455	Carbon	56K 1/4W	9T51025-69	
R456	Carbon	56K 1/4W	9T51025-69	
R457	Metal Glaze	100K 1/2W	9T53604-51	
R458	Carbon	5.6K Ω 1/6W	9V51014-69	
R459	Carbon	56K Ω 1/6W	9V51015-69	
R460	Carbon	100 Ω 1/6W	9V51013-51	
R461	Carbon	220K 1/6W	9T51016-59	
R463	Metal	1.1K 1/6W	9T52004-52	
R464	Metal	5.1K 1/6W	9T52004-68	
R465	Metal Oxide	22K 3W	9T51705-59	
R466	Metal Oxide	27K 3W	9T51705-61	
R467	Metal Oxide	22K 3W	9T51705-59	
R468	Carbon	10K Ω 1/6W	9V51015-51	
R469	Fusible	1.0K 1/4W	9T59739-00	
R470	Fusible	1.0K 1/4W	9T59739-00	
R471	Carbon	22 Ω 1/6W	9V51012-59	
R472	Carbon	22 Ω 1/6W	9V51012-59	
R473	Solid	220 1/4W	9T59113-09	
R474	Metal Oxide	27K 3W	9T51705-61	
R480	N/A			
R481	Carbon	33 1/2W	9T51052-63	

<CAPACITOR>

C201	Elect	1000 μ F 25V	9T65909-50
C202	Polyester	0.47 μ F 50V	9V77436-50
C203	Elect	1000 μ F 25V	9T65909-50
C204	Elect	100 μ F 50V	9T62110-56
C205	Elect	10 μ F 50V	9V62106-65
C206	Polyester	0.1 μ F 100V	9T77513-50
C207	Polyester	0.047 μ F 100V	9T7037150
C208	N/A		
C209	N/A		
C210	N/A		
C212	N/A		
C250	Elect	10 μ F 25V	9V62066-65
C251	Elect	10 μ F 25V	9V62066-65
C252	Elect	10 μ F 25V	9V62066-65
C253	Elect	10 μ F 25V	9V62066-65
C254	Elect	22 μ F 100	9T62147-56
C255	Elect	10 μ F 35V	9T62086-56
C301	Elect	100 μ F 100V	9T65885-50
C302	Elect	100 μ F 100V	9T62150-56
C303	Ceramic	1000PF 1KV	9V68720-51
C304	Ceramic	1000PF 1KV	9V68720-51
C305	Elect	1.0 μ F 50V	9V62102-65
C306	Elect	0.1 μ F 25V	9V69998-50
C308	Polyester	0.22 μ F 50V	9V77432-50
C309	Polyester	0.01 μ F 100V	9V70363-50
C310	Polyester	1.5 μ F 250V	9T70817-00
C311	Polyester	1.0 μ F 250V	9T70815-00
C312	Polyester	0.47 μ F 250V	9T70811-00
C313	Polyester	0.18 μ F 250V	9T70806-00
C314	Elect	22 μ F 200V	9T64072-50
C350	Polyester	0.1 μ F 250V	9V77550-50
C352	Elect	100 μ F 100V	9T65885-50
C353	Elect	10 μ F 200V	9T65908-01
C354	Elect	680 μ F 16V	9T65875-51
C355	Elect	680 μ F 16V	9T65875-51

The components identified by **Δ** are critical for safety.
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REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
C356	Polyester	6800PF 400V	9V70161-50	
C357	Polyester	0.47 μ F 50V	9V77436-50	
C358	Ceramic	2200PF 1KV	9T67747-51	
C359	Polypropylene	0.3 μ F 400V	9T73516-00	
C360	N/A			
C361	Elect	2.2 μ F 250V	9T62205-55	
C362	Polypropylene	1500PF 1.8KV	9T73805-00	
C363	Polypropylene	1500PF 1.8KV	9T73805-00	
C364	Polypropylene	1500PF 1.8KV	9T73805-00	
C365	Ceramic	330PF 1KV	9V68779-51	
C366	Ceramic	330PF 1KV	9V68779-51	
C367	Ceramic	2200PF 1KV	9V68722-51	
C368	Ceramic	1500PF 3KV	9T67766-51	
C369	Ceramic	68PF 1KV	9V67711-51	
C370	Ceramic	82PF 1KV	9T67712-51	
C401	Polypropylene	1500PF 1.2KV	9T73207-00	
C408	Polyester	1.5 μ F 250V	9T77564-02	
C409	Polyester	4700PF 200V	9V70409-50	
C412	Elect	4.7 μ F 50V	9V62105-65	
C413	Ceramic	0.1 μ F 25V	9V69998-50	
C415	Ceramic	0.01 μ F 2KV	9T67773-51	
C424	N/A			
C428	N/A			
C429	Ceramic	0.01 μ F 2KV	9T67773-51	
C430	Polyester	1000PF 100V	9T70351-50	
C431	Ceramic	0.01 μ F 2KV	9T67773-51	
C451	N/A			
C452	Ceramic	1000PF 1KV	9T67745-51	
C453	N/A			
C454	Polyester	1000PF 50V	9V70301-50	
C455	Ceramic	1000PF 1KV	9T67745-51	
C456	Ceramic	0.01 μ F 2KV	9T67773-51	

<COIL>

L202	Choke Coil		9U04640-00	
L301	Micro Inductor	1.0mH	9U05443-00	
L302	Micro Inductor	8.2mH	9U15454-50	
L350	Micro Inductor	470 μ H	9U05439-00	
L352	InductorBead		9U16521-50	
L353	InductorBead		9U16521-50	
L354	Choke Coil	PCL52-01	9U12231-00	
L355	Linearity Coil	PCL14-33	9U10223-00	
L356	Micro Inductor	3.3mH	9U15449-50	
L357	InductorBead		9U16521-50	
L358	InductorBead		9U16521-50	
L401	InductorBead		9U16521-50	
L402	Micro Inductor	470 μ H	9U15439-50	
L403	Micro Inductor	10 μ H	9U15486-50	
L404	Choke Coil	PCL56-43	9U12443-00	
L450	InductorBead	BL02RN1-R62T4	9U16521-50	
L451	InductorBead	BL02RN1-R62T4	9U16521-50	
L452	InductorBead	BL02RN1-R62T4	9U16521-50	
L453	InductorBead	BL02RN1-R62T4	9U16521-50	

<OTHERS>

T301	Drive Transf	PTR34-08	9T93638-00	
T350	H-Output Transf	PTR23-01	9T94341-00	
T401	FBT	PCF71-04 A	9T95264-01	# Δ

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
T451	Pulse	PTR01-23	9T94723-00	
SG401	Spark Gap	DSA-242MA-06	9T92023-00	
SG451	Surge Protector	DSP-201M-C04F	9T92019-50	
P201	Connector	IL-SDD-20P-S2T2	9T82115-00	
P202	Connector	IL-SDD-20P-S2T2	9T82115-00	
P203	Connector	W-P3005-02	9T81015-00	
P204	N/A			
P206	Connector	B10B-XH-2	9T86644-00	
P207	Connector	B8B-PH-K	9T86607-00	
P350	Connector	CMI6506-0101	9T87282-00	
P351	N/A			
P401	Connector	B2P3-VH-B-C	9T86652-01	
P402	Connector	B7B-PH-K	9T86606-00	
P403	Connector	B3B-PH-K	9T86602-00	
P450	Connector	B2P3-VH-B	9T86652-00	
P451	Connector	B2P3-VH-B-C	9T86652-01	

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REF. NO. PARTS NAME DESCRIPTIONS CODE NO. REMARKS

VIDEO BOARD

<PWB>

PB002 PWB PBH057-4 9T13057-04

<IC>

IC801	IC	M52320SP	9T20008-00	#
IC802	IC	M35045-057SP-01	9T20033-00	
IC803	D/A Converter	M62352P	9T39102-00	
IC804	IC	μ PC358C	9T30037-00	
IC805	IC	VP553	9T34444-00	#
IC806	IC	μ PC7812AHF	9T30036-00	
IC807	IC	μ PC7905AHF	9T30054-00	
IC808	IC	μ PC7805AHF	9T30053-00	

<TRANSISTOR>

Q801	Transistor	2SC3732-K/L-T	9V42505-50
Q802	Transistor	2SA1433-E/F-AE	9T40326-50
Q804	Transistor	2SA1433-E/F-AE	9T40326-50
Q806	Transistor	2SA1433-E/F-AE	9T40326-50
Q808	Transistor	2SC4218-E/F-AA	9T42558-50
Q809	Transistor	2SC4218-E/F-AA	9T42558-50
Q811	Transistor	2SC4218-E/F-AA	9T42558-50
Q812	Transistor	2SA1624-E/F-AA	9T40341-50
Q813	Transistor	2SC4218-E/F-AA	9T42558-50
Q814	Transistor	2SA1624-E/F-AA	9T40341-50
Q815	Transistor	2SC4218-E/F-AA	9T42558-50
Q816	Transistor	2SA1624-E/F-AA	9T40341-50

<DIODE>

D801	N/A		
D802	Diode	1SS177-TPA7	9T47221-50
D803	Diode	1SS177-TPA7	9T47221-50
D804	Diode	1SS177-TPA7	9T47221-50
D805	Diode	1SS83-TD	9T47202-50
D806	Diode	1SS83-TD	9T47202-50
D807	Diode	1SS83-TD	9T47202-50
D808	Diode	1SS83-TD	9T47202-50
D809	Diode	1SS83-TD	9T47202-50
D810	Diode	1SS83-TD	9T47202-50
D811	Diode	1SS83-TD	9T47202-50
D812	Diode	1SS83-TD	9T47202-50
D813	Diode	1SS83-TD	9T47202-50
D814	Diode	S5688G-TPA3	9T47049-50
D815	Diode	1SS177-TPA7	9T47221-50
D816	Diode	1SS177-TPA7	9T47221-50
D817	Diode	1SS177-TPA7	9T47221-50
D818	Diode	1SS177-TPA7	9T47221-50
D819	Diode	1SS177-TPA7	9T47221-50
D820	Diode	1SS177-TPA7	9T47221-50
D821	Diode	S5688B-TPA3	9T47050-50
D822	Diode	S5688B-TPA3	9T47050-50
D823	Diode	S5688B-TPA3	9T47050-50
D824	Diode Zener		9V46039-50

<RESISTOR>

R801	Metal Oxide	68	2W	9T51672-71
R802	Corbon	10 Ω	1/6W	9V51012-51
R804	Corbon	10 Ω	1/6W	9V51012-51
R806	Corbon	10 Ω	1/6W	9V51012-51
R808	Corbon	56K	1/6W	9T51015-69
R810	Corbon	5.6K Ω	1/6W	9V51014-69

REF. NO. PARTS NAME DESCRIPTIONS CODE NO. REMARKS

R813	Metal	100K Ω	1/6W	9V52006-51
R814	Metal	13K	1/6W	9T52005-54
R815	Corbon	270	1/6W	9T51013-61
R816	Corbon	2.2K Ω	1/2W	9V51054-59
R817	Corbon	100 Ω	1/6W	9V51013-51
R818	Corbon	330 Ω	1/6W	9V51013-63
R819	Corbon	820 Ω	1/4W	9V51023-73
R820	Corbon	330 Ω	1/6W	9V51013-63
R821	Corbon	820 Ω	1/4W	9V51023-73
R822	Corbon	330 Ω	1/6W	9V51013-63
R823	Corbon	820 Ω	1/4W	9V51023-73
R827	Metal Oxide	270	1W	9T51663-61
R831	Metal Oxide	270	1W	9T51663-61
R835	Metal Oxide	270	1W	9T51663-61
R836	Corbon	820 Ω	1/6W	9V51013-73
R837	Metal	120	1/6W	9T52003-53
R838	Metal	22K	1/6W	9T52005-59
R839	Metal	750 Ω	1/4W	9T52013-72
R840	Metal	150K	1/6W	9T52006-55
R841	Corbon	820 Ω	1/6W	9V51013-73
R842	Metal	110	1/6W	9T52003-52
R843	Metal	22K	1/6W	9T52005-59
R844	Metal	750 Ω	1/4W	9T52013-72
R845	Metal	150K Ω	1/6W	9V52006-55
R846	Corbon	820 Ω	1/6W	9V51013-73
R847	Metal	110	1/6W	9T52003-52
R848	Metal	22K	1/6W	9T52005-59
R849	Metal	750 Ω	1/4W	9T52013-72
R850	Metal	150K Ω	1/6W	9V52006-55
R851	N/A			
R852	N/A			
R853	N/A			
R854	Metal Glaze	330K	1/4W	9T53601-63
R855	Metal Glaze	330K	1/4W	9T53601-63
R856	Metal Glaze	330K	1/4W	9T53601-63
R857	Solid	100	1/4W	9T59113-01
R858	Solid	100	1/4W	9T59113-01
R859	Solid	100	1/4W	9T59113-01
R860	N/A			
R861	Corbon	470 Ω	1/6W	9V51013-67
R862	Corbon	100 Ω	1/6W	9V51013-51
R863	Corbon	1.0K Ω	1/6W	9V51014-51
R864	Metal	2.4K	1/6W	9T52004-60
R866	Corbon	1.0K Ω	1/6W	9V51014-51
R867	Corbon	1.0K Ω	1/6W	9V51014-51
R868	Corbon	1.0K Ω	1/6W	9V51014-51
R869	Corbon	1.0K Ω	1/6W	9V51014-51
R870	Corbon	1.0K Ω	1/6W	9V51014-51
R871	Corbon	1.0K Ω	1/6W	9V51014-51
R872	Corbon	1.0K Ω	1/6W	9V51014-51
R873	Corbon	10K Ω	1/6W	9V51015-51
R874	Corbon	10K Ω	1/6W	9V51015-51
R875	N/A			
R876	N/A			
R877	N/A			
R878	Corbon	10K Ω	1/6W	9V51015-51
R879	Corbon	39K Ω	1/6W	9V51015-65
R880	Corbon	10K Ω	1/6W	9V51015-51
R883	Metal Glaze	1.0M	1/4W	9T53602-51
R884	Corbon	47K Ω	1/6W	9V51015-67
R885	Metal Glaze	1.0M	1/4W	9T53602-51
R887	Metal	68K	1/6W	9T52005-71

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REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
R888	Metal	16K 1/6W	9T52005-56	
R890	Metal Glaze	2.2M 1/2W	9T53605-59	
R891	Metal Glaze	2.2M 1/2W	9T53605-59	
R892	Corbon	1.5KΩ 1/6W	9V51014-55	
R893	Corbon	90K 1/6W	9T51016-65	
R894	Corbon	68KΩ 1/6W	9V51015-71	
R895	Corbon	1.0KΩ 1/6W	9V51014-51	
R896	Metal Glaze	100K 1/4W	9T53601-51	
R897	Metal Glaze	100K 1/4W	9T53601-51	
R898	Corbon	8.2KΩ 1/6W	9V51014-73	
R899	Corbon	1.5KΩ 1/6W	9V51014-55	
RA801	Corbon	390K 1/6W	9T51016-65	
RA802	Corbon	68KΩ 1/6W	9V51015-71	
RA803	Corbon	1.0KΩ 1/6W	9V51014-51	
RA804	Metal Glaze	100K 1/4W	9T53601-51	
RA805	Metal Glaze	100K 1/4W	9T53601-51	
RA806	Corbon	8.2KΩ 1/6W	9V51014-73	
RA807	Corbon	1.5KΩ 1/6W	9V51014-55	
RA808	Corbon	390K 1/6W	9T51016-65	
RA809	Corbon	68KΩ 1/6W	9V51015-71	
RA810	Corbon	1.0KΩ 1/6W	9V51014-51	
RA811	Metal Glaze	100K 1/4W	9T53601-51	
RA812	Metal Glaze	100K 1/4W	9T53601-51	
RA813	Corbon	8.2KΩ 1/6W	9V51014-73	
RA816	Metal Glaze	820K 1/2W	9T53604-73	
RA817	Metal Glaze	100K 1/2W	9T53604-51	
RA818	N/A			
RA819	Corbon	5.6K 1/4W	9T51024-69	

<CAPACITOR>

C801	Plyester	0.01 μ F 50V	9V70313-50	
C802	Ceramic	0.1 μ F 25V	9V69998-50	
C803	Ceramic	0.1 μ F 25V	9V69998-50	
C804	Ceramic	0.1 μ F 25V	9V69998-50	
C805	Plyester	0.01 μ F 50V	9V70313-50	
C806	Ceramic	0.1 μ F 25V	9V69998-50	
C807	Ceramic	0.1 μ F 25V	9V69998-50	
C808	Plyester	0.01 μ F 50V	9V70313-50	
C809	Ceramic	0.1 μ F 25V	9V69998-50	
C810	Ceramic	0.1 μ F 25V	9V69998-50	
C811	Ceramic	0.1 μ F 25V	9V69998-50	
C812	N/A			
C813	Ceramic	0.1 μ F 25V	9V69998-50	
C814	Elect	10 μ F 25V	9V62066-65	
C815	Ceramic	0.1 μ F 25V	9V69998-50	
C816	Elect	10 μ F 25V	9V62066-65	
C817	Ceramic	0.1 μ F 25V	9V69998-50	
C818	Elect	10 μ F 25V	9V62066-65	
C819	Ceramic	0.1 μ F 25V	9V69998-50	
C820	Ceramic	47PF 50V	9T67220-50	
C821	Ceramic	22PF 50V	9T67216-50	
C822	Polyester	1000PF 100V	9T70351-50	
C823	Ceramic	47PF 50V	9T67220-50	
C824	Ceramic	22PF 50V	9T67216-50	
C825	Polyester	1000PF 100V	9T70351-50	
C826	Ceramic	47PF 50V	9T67220-50	
C827	Ceramic	22PF 50V	9T67216-50	
C828	Polyester	1000PF 100V	9T70351-50	
C829	Elect	220 μ F 25V	9V62071-65	
C830	Ceramic	0.1 μ F 25V	9V69998-50	
C831	Elect	22 μ F 200V	9T64068-50	

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
C833	Plyester	0.1 μ F 250V	9V77550-50	
C835	Plyester	0.1 μ F 250V	9V77550-50	
C837	Plyester	0.1 μ F 250V	9V77550-50	
C838	Elect	47 μ F 100V	9T62149-56	
C839	Ceramic	4700PF 50V	9T69975-50	
C840	Ceramic	0.1 μ F 50V	9T69976-50	
C841	Elect	1.0 μ F 50V	9T62102-56	
C842	Elect	100 μ F 10V	9V62030-65	
C843	Ceramic	0.1 μ F 50V	9T69976-50	
C844	Ceramic	0.1 μ F 25V	9V69998-50	
C845	Ceramic	0.1 μ F 25V	9V69998-50	
C846	Ceramic	0.1 μ F 25V	9V69998-50	
C847	Ceramic	0.1 μ F 25V	9V69998-50	
C849	N/A			
C850	Ceramic	0.01 μ F 2KV	9T67773-51	
C852	Elect	10 μ F 25V	9V62066-65	
C853	Elect	1.0 μ F 250V	9T62204-55	
C854	Elect	10 μ F 25V	9V62066-65	
C855	Elect	1.0 μ F 250V	9T62204-55	
C856	Elect	10 μ F 25V	9V62066-65	
C857	Elect	1.0 μ F 250V	9T62204-55	
C858	Ceramic	4700PF 1KV	9T67768-51	
C860	Ceramic	0.01 μ F 2KV	9T67773-51	
C861	Elect	47 μ F 16V	9T62049-56	
C862	Elect	47 μ F 25V	9V62069-65	
C863	Elect	47 μ F 16V	9T62049-56	
C864	Elect	47 μ F 25V	9T62069-56	
C865	Elect	47 μ F 16V	9T62049-56	
C866	Elect	47 μ F 25V	9T62069-56	
C867	Elect	4.7 μ F 100V	9T62145-56	
C868	Elect	2.2 μ F 100V	9T62143-56	
C870	Elect	4.7 μ F 100V	9T62145-56	
C871	Plyester	1000PF 50V	9V70301-50	
C873	Elect	4.7 μ F 100V	9T62145-56	
C874	Polyester	0.1 μ F 100V	9T77513-50	
C878	Elect	220 μ F 6.3V	9V62011-65	
C879	Elect	220 μ F 6.3V	9V62011-65	
C880	Elect(BP)	4.7 μ F 50V	9T65196-51	
C881	Elect(BP)	4.7 μ F 50V	9T65196-51	
C882	Elect(BP)	4.7 μ F 50V	9T65196-51	
C883	Ceramic	0.1 μ F 50V	9T69976-50	
C884	N/A			
C885	N/A			
C886	N/A			
C887	Ceramic	22PF 50V	9T67216-00	
C888	Ceramic	22PF 50V	9T67216-00	
C889	Ceramic	22PF 50V	9T67216-00	

<COIL>

L804	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L805	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L809	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L810	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L811	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L812	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L813	Micro Inductor	LHL08TB471K	9U15439-50	
L815	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L816	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L817	Inductor Bead	BL02RN2-R62T4	9U16523-50	
L818	Micro Inductor	LAL04TB100K	9U15321-51	

The components identified by **Δ** are critical for safety.
Replace only with code number specified

REF. NO. PARTS NAME DESCRIPTIONS CODE NO. REMARKS

<SURGE PROTECTOR>

SG801	Surge Protector	DSP-301N-C04F	9T92020-50
SG802	Surge Protector	DSP-301N-C04F	9T92020-50
SG803	Surge Protector	DSP-301N-C04F	9T92020-50
SG804	Spark Gap	AG15PC152FB-K2M9T92016-50	
SG805	Surge Protector	DSP-201M-C04F	9T92019-50

<OTHERS>

P801	Connector	B6B-XH-2	9T86649-00
P802	Connector	B10B-PH-K	9T86609-00
P803	Connector	B2P3S-VH	9T86654-00
P804	Connector	B7B-XH-2	9T86643-00
P805	Base Pin	005P-3200	9T87311-00
P806	Base Pin	005P-3200	9T87311-00

REF. NO. PARTS NAME DESCRIPTIONS CODE NO. REMARKS

INTERFACE BOARD

<PWB>

PB003	PWB	PBH064-6	9T13064-06
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<INTEGRATED CIRCUIT>

IC101	IC	M52348SP	9T34509-00
IC102	IC	M52347SP	9T34508-00
IC103	IC	TC74HC221AP	9T22031-00
IC104	IC	PMC65-01A	9T36650-01
IC105	IC	μ PC7805AHF	9T30053-00
IC106	HIC	PHC41-02	9T37401-00

<TRANSISTOR>

Q101	Transistor	2SC2785-JL/HL-T	9V42449-50
Q102	Transistor	2SC2785-JL/HL-T	9V42449-50
Q103	Transistor	2SC2785-JL/HL-T	9V42449-50
Q104	Transistor	2SC2785-JL/HL-T	9V42449-50
Q105	Transistor	2SC2785-JL/HL-T	9V42449-50
Q106	Transistor	2SC2785-JL/HL-T	9V42449-50

<DIODE>

D101	Diode	1SS177-TPA7	9T47221-50
D102	Diode	1SS177-TPA7	9T47221-50
D103	Diode	1SS177-TPA7	9T47221-50
D104	Diode	1SS177-TPA7	9T47221-50
D105	Diode	1SS177-TPA7	9T47221-50
D106	Diode	1SS177-TPA7	9T47221-50
D107	Diode	1SS177-TPA7	9T47221-50
D108	Diode	1SS177-TPA7	9T47221-50
D109	Diode	1SS177-TPA7	9T47221-50
D110	Diode	1SS177-TPA7	9T47221-50
D111	Diode	1SS177-TPA7	9T47221-50
D112	Diode	1SS177-TPA7	9T47221-50
D113	Diode Zener	RD5.1EB2-TA11R	9V46035-50
D114	Diode	1SS177-TPA7	9V47221-50
D115	Diode Zener	RD5.1EB2-TA11R	9V46035-50
D116	Diode	1SS177-TPA7	9V47221-50
D117	Diode	1SS177-TPA7	9T47221-50
D118	Diode	1SS177-TPA7	9T47221-50
D119	Diode	1SS177-TPA7	9T47221-50
D120	Diode	1SS177-TPA7	9T47221-50
D121	Diode	SS688B-TPA3	9T47050-50
D122	Diode Zener	RD5.1EB2-TA11R	9V46035-50
D123	Diode	1SS177-TPA7	9T47221-50
D124	Diode	1SS177-TPA7	9T47221-50
D127	Diode Zener	RD5.1EB2-TA11R	9V4603550
D128	Diode Zener	RD5.1EB2-TA11R	9V4603550
D129	Diode	1SS177-TPA7	9T47221-50
D130	Diode	1SS177-TPA7	9T47221-50

<RESISTOR>

R101	Metal	75Ω	1/4W	9V5201272
R102	Metal	75Ω	1/4W	9V5201272
R103	Metal	75Ω	1/4W	9V5201272
R104	Carbon	3.9KΩ	1/4W	9V5102465
R105	Carbon	3.9KΩ	1/4W	9V5102465
R106	Carbon	100Ω	1/4W	9V5102351
R107	Carbon	100Ω	1/4W	9V5102351

The components identified by Δ are critical for safety.
Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
R108	Carbon	100 Ω 1/4W	9V51023-51	
R109	Carbon	1.0K Ω 1/4W	9V51024-51	
R110	Carbon	470 Ω 1/4W	9V51023-67	
R111	Metal	51K 1/6W	9T52005-68	
R114	Carbon	10K Ω 1/6W	9V51015-51	
R115	Carbon	10K Ω 1/6W	9V51015-51	
R116	Metal	75 Ω 1/4W	9V52012-72	
R117	Metal	75 Ω 1/4W	9V52012-72	
R118	Metal	75 Ω 1/4W	9V52012-72	
R119	Carbon	3.9K Ω 1/4W	9V51024-65	
R120	Carbon	3.9K Ω 1/4W	9V51024-65	
R121	Carbon	100 Ω 1/4W	9V51023-51	
R122	Carbon	100 Ω 1/4W	9V51023-51	
R123	Carbon	100 Ω 1/4W	9V51023-51	
R124	Carbon	1.0K Ω 1/4W	9V51024-51	
R125	Carbon	100 Ω 1/4W	9V51023-51	
R128	Carbon	47K Ω 1/4W	9V51025-67	
R129	Carbon	47K Ω 1/4W	9V51025-67	
R130	N/A			
R132	N/A			
R133	Carbon	3.3K Ω 1/6W	9V51014-63	
R134	Carbon	4.7K Ω 1/6W	9V51014-67	
R135	Carbon	47K Ω 1/6W	9V51015-67	
R136	Carbon	100K Ω 1/6W	9V51016-51	
R137	Carbon	43K 1/6W	9T51015-66	
R138	Carbon	47 Ω 1/6W	9V51012-67	
R139	Carbon	47 Ω 1/6W	9V51012-67	
R140	Carbon	330 Ω 1/6W	9V51013-63	
R143	Carbon	1.0M Ω 1/6W	9V51017-51	
R142	Carbon	330 Ω 1/6W	9V51013-63	
R144	Carbon	2.2K Ω 1/4W	9V51024-59	
R145	Carbon	1.2K Ω 1/6W	9V51014-53	
R146	Carbon	1.0K Ω 1/6W	9V51014-51	
R147	Carbon	100K Ω 1/6W	9V51016-51	
R148	Carbon	10K 1/6W	9T51015-01	
R149	Carbon	100 Ω 1/6W	9V51013-51	
R151	Carbon	330 Ω 1/6W	9V51013-63	
R152	Carbon	330 Ω 1/6W	9V51013-63	
R153	Carbon	330 Ω 1/6W	9V51013-63	
R154	Carbon	330 Ω 1/6W	9V51013-63	
R155	Carbon	470K 1/6W	9T51016-67	

<CAPACITOR>

C101	Plyester	0.01 μ F 50V	9V70313-50
C102	Elect(BP)	47 μ F 10V	9T64059-50
C103	Plyester	0.01 μ F 50V	9V70313-50
C104	Elect(BP)	47 μ F 10V	9T64059-50
C105	Plyester	0.01 μ F 50V	9V70313-50
C106	Elect(BP)	47 μ F 10V	9T64059-50
C107	Plyester	1000PF 50V	9V70301-50
C108	Elect(BP)	3.3 μ F 50V	9T64060-50
C109	Elect(BP)	47 μ F 10V	9T64059-50
C110	Plyester	0.01 μ F 50V	9V70313-50
C111	Elect(BP)	47 μ F 10V	9T64059-50
C112	Plyester	0.01 μ F 50V	9V70313-50
C113	Elect(BP)	47 μ F 10V	9T64059-50
C114	Plyester	0.01 μ F 50V	9V70313-50
C115	Elect(BP)	47 μ F 10V	9T64059-50
C116	Elect(BP)	3.3 μ F 50V	9T64060-50
C117	Elect(BP)	47 μ F 10V	9T64059-50
C118	Ceramic	0.1 μ F 25V	9V69998-50

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
C119	Elect	47 μ F 25V	9T64063-50	
C120	Plyester	0.01 μ F 50V	9V70313-50	
C121	Plyester	0.01 μ F 50V	9V70313-50	
C122	Elect	47 μ F 25V	9T64063-50	
C123	Plyester	0.01 μ F 50V	9V70313-50	
C124	Plyester	0.01 μ F 50V	9V70313-50	
C125	Plyester	0.01 μ F 50V	9V70313-50	
C126	Elect	47 μ F 25V	9T64063-50	
C127	Plyester	0.01 μ F 50V	9V70313-50	
C128	Elect(BP)	3.3 μ F 50V	9T64060-50	
C129	Elect(BP)	3.3 μ F 50V	9T64060-50	
C130	Elect(BP)	47 μ F 10V	9T64059-50	
C131	Polyester	0.068 μ F 50V	9T70323-50	
C132	Elect	10 μ F 25V	9T64062-50	
C134	Ceramic	220PF 50V	9T67268-50	
C135	Elect	100 μ F 16V	9T64064-50	
C136	Ceramic	100PF 50V	9V67224-50	
C138	Elect	220 μ F 16V	9T64061-50	
C139	Ceramic	0.1 μ F 25V	9V69998-50	
C140	Elect	100 μ F 16V	9T64064-50	
C141	Ceramic	0.1 μ F 25V	9V69998-50	
C142	Ceramic	0.1 μ F 25V	9V69998-50	
C143	Ceramic	33pF 50V	9V67218-50	
C144	Ceramic	33pF 50V	9V67218-50	
C145	Plyester	1000PF 50V	9V70301-50	
C146	Plyester	1000PF 50V	9V70301-50	
C149	Ceramic	0.1 μ F 25V	9V69998-50	
C150	Ceramic	0.1 μ F 25V	9V69998-50	
C151	Ceramic	0.1 μ F 25V	9V69998-50	
C152	Elect	220 μ F 16V	9T64061-50	
C153	Polyester	0.1 μ F 50V	9T77428-00	
C155	Ceramic	0.1 μ F 25V	9V69998-50	

<CONNECTOR>

P101	BNC CONNECTOR	YKF31-0008	9T88502-00
P102	BNC CONNECTOR	YKF31-0008	9T88502-00
P103	BNC CONNECTOR	YKF31-0008	9T88502-00
P104	BNC CONNECTOR	YKF31-0008	9T88502-00
P105	BNC CONNECTOR	YKF31-0008	9T88502-00
P106	Connector	D02-M15STF-26L9-2	9T88734-00
P107	Connector	S6B-XH-A	9T86676-00
P108	Connector	TCS7689-01-201	9T87711-00
P109	Connector	IL-FPC-26SL-N	9T82127-00
P110	Connector	S10B-PH-K	9T86623-00

The components identified by Δ are critical for safety.
Replace only with code number specified

REF. NO. PARTS NAME DESCRIPTIONS CODE NO. REMARKS

SW REGULATOR SUPPLY BOARD

<PWB>

PB004 PWB PBH042-8 9T13042-08

<INTEGRATED CIRCUIT>

IC901 IC STR-D1706(LF904) 9T33222-00 Δ #

IC902 IC STR-S6709A(LF953) 9T33223-00 Δ #

IC951 IC SI-3050C 9T33243-00

IC952 IC SE140N-LF4 9T33202-00

<TRANSISTOR>

Q901 Transistor 2SD1312-L-T 9T44251-50

Q902 Transistor 2SC2925S-TA 9T42461-50

Q951 Transistor 2SC2458-Y-TPE4 9T42396-50

Q952 Transistor 2SC2458-Y-TPE4 9T42396-50

Q953 Transistor 2SC2458-Y-TPE4 9T42396-50

Q954 Transistor 2SC2925S-TA 9T42461-50

<DIODE>

D901 Diode Bridge RBV-606 LF-B 9T47369-00

D902 Diode EM2A LF-F4 9T47055-00

D903 Diode FMU-G16S 9T47143-00

D904 Diode EG01-V0 9T47246-50

D905 Diode EG01C-V0 9T47164-50

D906 Diode AU01Z-V0 9T47160-50

D907 Diode AU01Z-V0 9T47160-50

D908 Diode Zener RD7.5EB2-TA11R 9V46051-50

D909 Diode EG01-V0 9T47246-50

D910 Diode EG01C-V0 9T47164-50

D911 Diode 1JH46-TPA3 9T47174-50

D912 Diode ERA91-02 V3 9T47093-50

D913 Diode AK04 V0 9T47229-50

D914 Diode Zener RD6.8EB2-TA11R 9V46047-50

D916 Diode Zener RD18FB2 9V46388-00

D917 Diode EG01-V0 9T47246-50

D918 Diode Zener RD18FB2 9V46388-00

D921 Diode ERA91-02 V3 9T47093-50

D951 Diode 5DL2CZ47A 9T47264-00

D952 Diode ERA15-01 V3 9T47086-50

D953 Diode Zener RD3.6EB2-TA11R 9V46021-50

D954 Diode ERA15-01 V3 9T47086-50

D955 Diode AK04 V0 9T47229-50

D956 Diode ERA15-01 V3 9T47086-50

D957 Diode RU4C LF015-308 9T47192-04

D958 Diode Zener RD18EB2-TA11R 9T46088-50

D959 Diode RU3AM LF-C4 9T47173-01

D960 Diode ERB93-02 L6 9T47089-00

D961 Diode Zener RD8.2EB1-TA11R 9V46054-50

D962 Diode ERB93-02 L6 9T47089-00

D963 Diode ERA15-01 V3 9T47086-50

<PHOTO COUPLER>

PH901 Photo Coupler PC123FY2 9T49152-00

PH902 Photo Coupler PC123FY2 9T49152-00

PH903 Photo Coupler S12ME1FY 9T49200-00

<RESISTOR>

R901 Metal Glaze 680K 1/2W 9T53604-71

R902 Cement 3.9 5W 9T52559-15

R903 Cement Resistor with Fuse 3.9 5W 9T59579-00

R904 Cement 1.5 10W 9T59575-01

REF. NO. PARTS NAME DESCRIPTIONS CODE NO. REMARKS

R905 Fusible 18 1/4W 9T52952-57

R906 Metal Glaze 270K 1/2W 9T53604-61

R907 Metal Glaze 270K 1/2W 9T53604-61

R908 Metal 100K 2W 9T51676-51

R909 Metal 150 1W 9T51663-55

R910 Fusible 2.2 1/4W 9T52951-59

R911 Fusible 2.2 1/4W 9T52951-59

R912 Metal 2.2 1W 9T51661-59

R913 Metal 100K 2W 9T51676-51

R914 Metal 100K 2W 9T51676-51

R915 Fusible 0.1 1/4W 9T59710-50

R916 Fusible 0.1 1/4W 9T59710-50

R917 Fusible 47 1/4W 9T52952-67

R918 Carbon 10K 1/2W 9T51055-51

R919 Carbon 1.8K Ω 1/4W 9V51024-57

R920 Carbon 1.0K Ω 1/4W 9V51024-51

R921 Metal 68K 2W 9T51675-71

R922 Metal 68K 2W 9T51675-71

R923 Carbon 27K Ω 1/6W 9V51015-61

R924 Carbon 4.7K Ω 1/6W 9V51014-67

R925 Carbon 22K Ω 1/6W 9V51015-59

R926 Carbon 820 Ω 1/6W 9V51013-73

R927 Metal 10 3W 9T51682-51

R928 Metal 0.47 1W 9T51660-67

R929 Carbon 3.9K Ω 1/4W 9V51024-65

R930 Cement 0.15 3W 9T52555-05

R931 Carbon 100 Ω 1/4W 9V51023-51

R932 Carbon 1.0K Ω 1/6W 9V51014-51

R951 Carbon 3.3K Ω 1/6W 9V51014-63

R952 Carbon 47K Ω 1/6W 9V51015-67

R953 Carbon 100 Ω 1/6W 9V51013-51

R954 Carbon 560 Ω 1/4W 9V51023-69

R955 Carbon 15K Ω 1/4W 9V51025-55

R956 Carbon 330 Ω 1/4W 9V51023-63

R957 Metal 1.3K 1/6W 9T52004-54

R958 Fusible 0.82 1/2W 9T59713-51

R959 Metal 5.6 2W 9T51671-69

R960 Metal 5.6 2W 9T51671-69

R961 Metal 470 Ω 1/6W 9V52003-67

R962 Metal 1.8K Ω 1/6W 9V52004-57

R963 Fusible 0.1 1/4W 9T59710-50

R964 Carbon 8.2K 1/4W 9T51024-73

R965 Carbon 470 Ω 1/4W 9V51023-67

R966 Metal 47K Ω 1/4W 9V52015-67

R967 Metal 2.4K Ω 1/4W 9V52014-60

R968 Fusible 0.1 1/4W 9T59710-50

R969 Carbon 1.5K Ω 1/6W 9V51014-55

R971 Fusible 3 1/4W 9T52952-63

R972 Fusible 0.1 1/4W 9T59710-50

R973 Carbon 33 1/2W 9T51052-63

<THERMISTOR>

TH901 Posistor 9 Ω 270V 9T48816-00

<CAPACITOR>

C901 Polyester 0.47 μ F 250V 9T79129-00

C902 Polyester 0.47 μ F 250V 9T79129-00

C903 Ceramic 4700PF 400V 9T69949-50

C904 Ceramic 4700PF 400V 9T69949-50

C905 Polypropylene 0.47 μ F 400V 9T77595-02

C906 Polypropylene 1.0 μ F 400V 9T79132-00

The components identified by Δ are critical for safety.
Replace only with code number specified

REF.NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
C907	Elect	560 μ F	400V 9T64057-00	
C908	Polyester	0.1 μ F	400V 9T77587-50	
C909	Ceramic	0.01 μ F	2KV 9T67773-51	
C910	Polyester	0.068 μ F	50V 9T70323-50	
C911	Elect	100 μ F	16V 9T64042-50	
C912	Elect	220 μ F	16V 9T64043-50	
C913	Polyester	0.033 μ F	630V 9T77610-50	
C914	Elect	47 μ F	63V 9T62129-56	
C915	Plyester	1000PF	50V 9V70301-50	
C916	Elect	220 μ F	25V 9T64044-50	
C917	Elect	120 μ F	35V 9T64069-50	
C918	Plyester	1000PF	50V 9V70301-50	
C919	Plyester	0.1 μ F	50V 9V70325-50	
C920	Elect	220 μ F	25V 9T64023-50	
C921	Polypropylene	2200PF 1.2KV	9T73209-00	
C951	Elect	1200 μ F	16V 9T64045-51	
C952	Elect	680 μ F	16V 9T65875-51	
C953	Elect	470 μ F	10V 9T62033-56	
C954	Elect	220 μ F	16V 9T64043-50	
C955	Elect	100 μ F	10V 9T64048-50	
C956	Elect	220 μ F	200V 9T64071-00	
C957	Elect	100 μ F	200V 9T64012-00	
C958	Elect	1000 μ F	6.3V 9V62014-65	
C959	Elect	220 μ F	6.3V 9V62011-65	
C960	Elect	220 μ F	100V 9T65928-00	
C961	Elect	100 μ F	100V 9T65885-50	
C962	N/A			
C963	Elect	1000 μ F	25V 9T64049-01	
C964	Elect	820 μ F	25V 9T64006-51	
C965	Elect	1000 μ F	25V 9T64049-01	
C966	Elect	820 μ F	25V 9T64006-51	

<COIL>

L901	Choke Coil	ET28V-06	9U16108-00
L902	Coil	SN10-500J	9U14672-00
L903	Inductor Bead	BL02RN2-R62T4	9U16523-50
L904	Inductor Bead	BL02RN2-R62T4	9U16523-50
L951	Micro Inductor	EL0607RA-150K	9U05409-50
L952	Micro Inductor	EL0607RA-150K	9U05409-50
L953	Micro Inductor	EL0607RA-150K	9U05409-50
L954	Micro Inductor	EL0607RA-150K	9U05409-50
L955	Micro Inductor	EL0607RA-150K	9U05409-50
L956	Micro Inductor	EL0607RA-150K	9U05409-50
L957	Inductor Bead	BL02RN2-R62T4	9U16523-50

T901	Switching Transf	PTR01-20	9T94720-00	Δ
T902	Switching Transf	PTR01-21	9T94721-00	
T903	Switching Transf	PTR66-04	9T94934-00	Δ

<RELAY>

K901	Relay	DC6V	9T91508-00
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<FUSE>

F901	Fuse	5A 250V	9V91198-00
F902	Fuse	5A 250V	9V91198-00

<FUSE HOLDER>

FH901	Fuse Holder	PFC5000-0202	9T90986-50
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REF.NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
FH902	Fuse Holder	PFC5000-0202	9T90986-50	
<OTHERS>				
P901	Connector	B2P3-VH-B-R	9T86652-02	
P902	Connector	B2P3-VH-B	9T86652-00	
P903	Connector	B4P7-VH-B	9T86657-00	
P904	Connector	B2P3-VH-B-C	9T86652-01	
P905	Connector	B2P3-VH-B-C	9T86652-01	
P951	Connector	B8B-PH-K	9T86607-00	
P952	Connector	B7B-XH-2	9T86643-00	
P953	Connector	B10B-XH-2	9T86644-00	

SWITCH BOARD

<PWB>

PB005	PWB	PBH071-0	9T13071-00
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<DIODE>

D703	Diode	SML16716CNTF4-D1,D3	9T48435-50
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<RESISTOR>

R701	Carbon	330 Ω 1/2W	9V51053-63
R702	Carbon	1.5K 1/4W	9T51024-55
R703	Carbon	10K Ω 1/6W	9V51015-51
R704	Carbon	10K Ω 1/6W	9V51015-51

<CONNECTOR>

P703	Connector	S10B-PH-K	9T86623-00
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PWM BOARD

<PWB>

PB006	PWB	PBH103-2	9T13103-02
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<INTEGRATED CIRCUIT>

IC751	IC	μ PC4064C	9T30056-00
IC752	IC	μ PC393C	9T30057-00

<TRANSISITOR>

Q751	Transistor	2SC2785-JL/HL-T	9V42449-50
Q752	Transistor	2SC2785-JL/HL-T	9V42449-50
Q753	Transistor	2SA1175-JL/HL-T	9V40251-50

<DIODE>

D751	Diode	1SS177-TPA7	9T47221-50
D752	Diode	1SS177-TPA7	9T47221-50

<RESISTOR>

R751	Carbon	1.2K Ω 1/6W	9V51014-53
R752	Carbon	47K Ω 1/6W	9V51015-67
R753	Carbon	47K Ω 1/6W	9V51015-67
R754	Carbon	1.0K Ω 1/6W	9V51014-51
R755	Carbon	1.0K Ω 1/6W	9V51014-51
R757	Carbon	1.0K Ω 1/6W	9V51014-51
R758	Carbon	1.0K Ω 1/6W	9V51014-51
R759	Carbon	1.0K Ω 1/6W	9V51014-51
R760	Carbon	4.7K Ω 1/6W	9V51014-67
R761	Carbon	5.6K Ω 1/6W	9V51014-69
R762	Carbon	1.0M Ω 1/4W	9V51027-51
R763	Carbon	1.0K Ω 1/6W	9V51014-51
R764	Carbon	1.0K Ω 1/6W	9V51014-51

The components identified by **△** are critical for safety.
Replace only with code number specified

REF. NO.	PARTS NAME	DESCRIPTIONS	CODE NO.	REMARKS
R765	N/A			
R766	Carbon	1.0K Ω 1/6W	9V51014-51	
R767	Carbon	15K Ω 1/6W	9V51015-55	
R768	Carbon	100 Ω 1/6W	9V51013-51	
R769	Carbon	10 Ω 1/6W	9V51012-51	
R771	Carbon	8.2K Ω 1/6W	9V51014-73	
R772	Carbon	100 Ω 1/6W	9V51013-51	
R773	Carbon	100 Ω 1/6W	9V51013-51	
R774	Carbon	1.0K Ω 1/6W	9V51014-51	

<CAPACITOR>

C751	Elect	100 μ F 35V	9V62090-65	
C752	Elect	47 μ F 50V	9V62109-65	
C753	Ceramic	0.1 μ F 25V	9V69998-50	
C754	Elect	33 μ F 25V	9V62068-65	
C756	Ceramic	0.1 μ F 25V	9V69998-50	
C757	N/A			
C758	Ceramic	220PF 50V	9T67268-50	
C759	N/A			
C760	Ceramic	0.1 μ F 25V	9V69998-50	
C761	Ceramic	100PF 50V	9T67224-50	
C762	Elect	100 μ F 35V	9V62090-65	
C763	TFJ γ π^* γ π^*	0.1 μ F 50V	9T77428-50	
C764	Elect	220 μ F 6.3V	9V62011-65	

<OTHERS>

L751	Micro Inductor	100 μ H	9U15419-50	
P751	Connector	B7B-PH-K	9T86606-00	
P752	Connector	B3B-PH-K	9T86602-00	

MCU

U001	MCU Unit	MCU16-A40	9T19240-04	△
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BODY

L001	Rotation Coil	PCL01-68	8F81447-00	
CA001	AC Inlet ASSY	PZE32-13	6C88966-00	
CA003	CRT-GND ASSY	PZE41-17	6C88930-00	
CA004	GND ASSY 2	PZE42-13C	6C88810-00	
CA005	GND ASSY 1	PZE42-13B	6C88806-00	
CA006	GND ASSY 2	PZE42-13B	6C88806-00	
CA007	GND ASSY	PZE42-50	6C88974-00	
CA008	Cable ASSY	PZE52-112	6C88976-00	
CA009	GND-ASSY	PZE42-56	9U29135-00	
CA011	GND-ASSY	PZE42-46	6C88954-00	
CA012	GND-ASSY	PZE42-46	6C88954-00	
CA013	AC Cord Set	SVT3 $\times$ 18AWG(105 $^{\circ}$ C) YP-39	9U23443-00	
CA014	AC Cord	PZE11-125	9U23436-00	
CA015	Signal cable ASSY	PZE21-57	9U00203-00	
W001	Leafcon	TFL-125K-26-200	3A85262-00	
V001	CRT	M50LJG39X28	9T03755-00	△
DG001	Degauss Coil	PCL63-11	8F81440-00	
Z001	HV CableHolder	3-704-372-01	9W70404-00	
Z002	Core	BF30B16 $\times$ 28 $\times$ 9	9T97902-00	
Z003	SK Binder	SKB-100	9U21180-00	
Z004	Cable Clip	NO.2047	9U21230-00	
Z005	Parts Lock	NO.61	9U21242-00	
Z006	Clip	NO.166	9U20436-00	