The reason why photocoupler is used for transfering output voltage variation is for insulation between primary circuit and secondary circuit.

6. Synchronization

At switching power supply, there are some cases display screen is interfared by switching noise, because of high frequency. To get rid of this interfarance, switching circuit is synchronized by horizontal scanning rate.

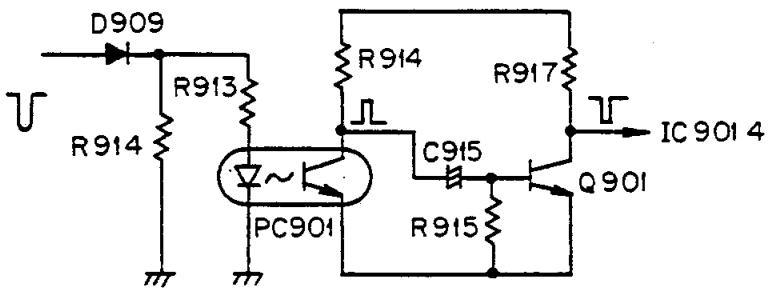


Fig. 3-23 Synchronization

Horizontal pulse of deflection circuit is used as synchronization signal. Another photo coupler is used for isolation between primary circuit and secondary circuit and horizontal sync signal is supplied to Q901 base through PC901, C915 and this signal wave form is shaped, inverted to feed to feed to IC901 terminal 4.

Therefore IC901 ramp oscillator frequency is locked to horizontal scanning frequency.

3.8.2 Automatic Degaussing Circuit

Positors RP901, RP902 and degaussing coil L991 composed a automatic degaussing (ADG) circuit to demagnetic the shadow mask and internal shield in the CRT.
Positor shows low resistance value in normal temperature, for example, eight ohm at 25°C.
When apply AC line voltage, about 16 Ap-p current flows three in degaussing coil. After seconds, resistance of positor increase rapidly by itself heating and degaussing current decrease less than 160 mAp-p.

The ADG circuit does a better job of degaussing the internal shield and shadow mask in the CRT than is possible with an external degaussing coil.

However, an external hand-held coil is more effective for degaussing chassis parts which may have become strongly magnetized during handling or transportation. Therefore, we recommend external degaussing at the time of installation of the monitor.

No routine external degaussing is needed.

For this initial degaussing, the HOZAN, Model HC-21 or similar degaussing coil is recommended. Connect the degaussing coil to a 120-volt AC line and hold the coil about one inch away from the CRT and chassis. More the coil slowly in a circular motion parallel to the front of the monitor for a few seconds. Then slowly back away several feet from the monitor and turn off the degaussing coil.

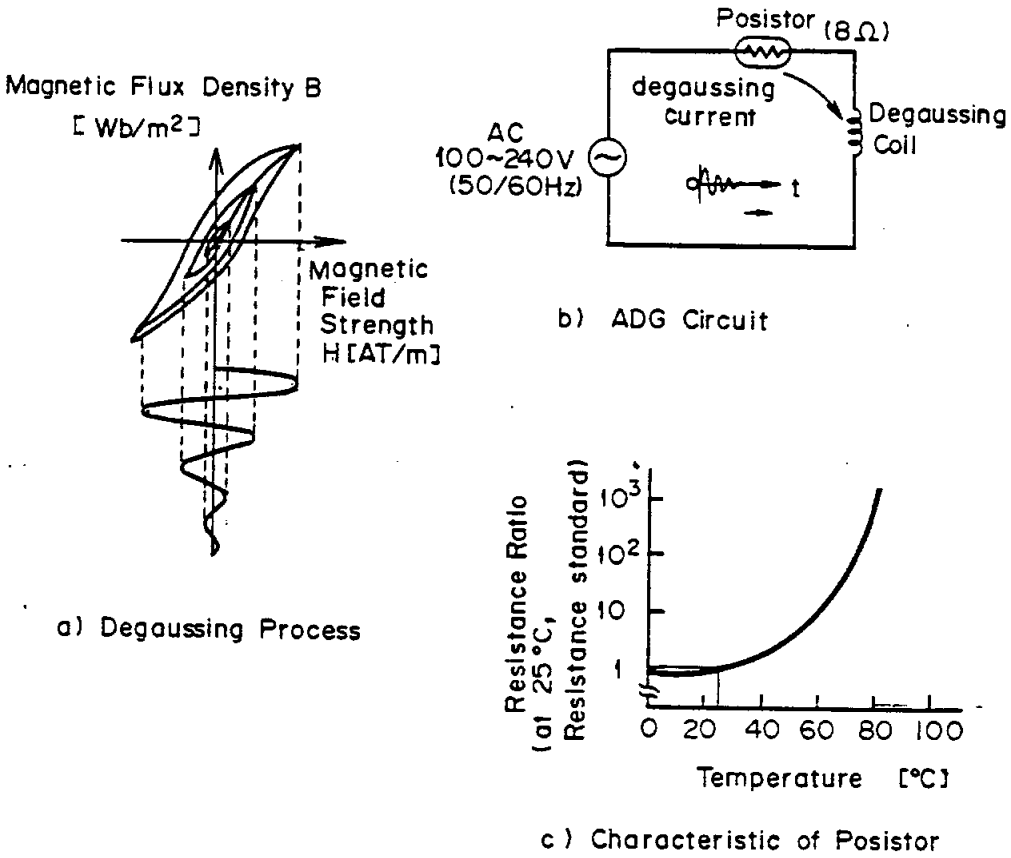


Fig. 3-24 Automatic Degaussing Circuit

3.9 LOW VOLTAGE DC POWER SUPPLIES

The primary dc power source is +B1 (+80V) switching regulator on the PCB-POWER. Other power sources (+16V dc, CRT Heater (6.3V), H-CENT, +B2 (+170V)) are shown in Fig. 3-9.

These power sources obtained from horizontal output transformer T502 by pulse rectification.

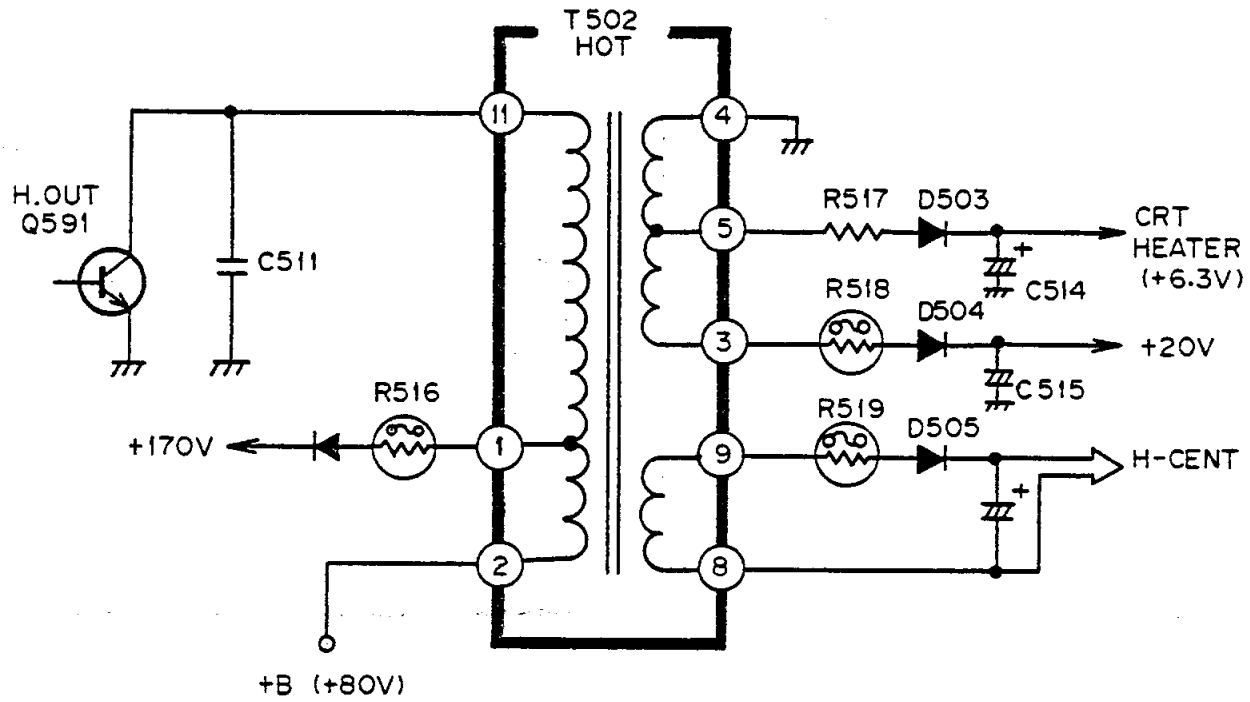


Fig. 3-25 Low Voltage Power Supply Circuits

SECTION 4
MAINTENANCE

SAFETY PRECAUTIONS

(NOTICE) Observe all cautions and safety related notes located inside the monitor cabinet and on the monitor chassis.

WARNING

1. Operation of these monitors outside the cabinet or with the cover removed, involves a shock hazard from the monitor power supplies. Work on the monitor should not be attempted by anyone who is not throughly familiar with precautions necessary when working on high voltage equipment.

2. Do not install, remove or handle the picture tube in any manner unless shatter-proof goggles are worn.
People not so equipped should be kept away while handling picture tube. Keep picture tube away from the body while handling.

X-RADIATION WARNING

The surface of picture tube may X-Radiation. Precaution during servicing and if it possible use of a lead apron of metal for shielding is recommended.
To avoid possible exposure to X-Radiation and electrical shock hazard, the high voltage compartment must be kept in place whenever the chassis is in operation. When replacing picture tube, use only designated replacement part since it is a critical component with regard to X-Radiation at noted above.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in color display monitor have special safety related characteristics.
These characteristics are often not evident form visual inspection not can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc.

Replacement parts which have these special safety characteristics are identified in this service manual.

Electrical components having such features are identified by shading on the schematic diagram and the parts list of this service manual and by marking on the supplementary sheet for this chassis to be issued subsequently, therefore replacement of any safety parts should be identical invalue and characteristics.

ALIGNMENT PROCEDURE

Monitor alignment procedures contained in this section should be follow whenever a major component is replaced: such as a CRT, deflection yoke, or circuit board.
Some alignment may also be required periodically to correct for component ageing. Degaussing should be performed periodically whenever it is suspected that degaussing is required. These alignment procedures should be performed in the order given herein. Due to interaction, some portions of the alignment procedures may require repeating.

For quick reference, all maintenance adjustments are listed in Table 4-1, together with the location, circuit designator and related paragraph for each control. Figure 4-1 through 4-3 shows the location of all adjustments.

In the following alignemnt procedures it is assumed that proper line voltage and frequency are available. A video source with proper line rate is required for application to the red, green, and blue inputs. The green video must contain composite sync or a proper signal supplied to the external sync input. After all inputs have been connected, the Horizontal Hold (VR502) and the Vertical Hold (VR401) must be adjusted for a stable picture. Approximately 30 minutes should be allowed for warm-up before proceeding.

4.1 RECOMMENDED ALIGNMENT/MAINTENANCE EQUIPMENT

The following test equipment items, or equivalent substitutions are recommended to alignment or maintenance the monitor.

1.	Signal Generator	
2.	High Voltage Meter	- SINGER Type-ESH Electrostatic volt-meter, Class 1.0 30 kV or High voltage Probe to 30 kV
3.	AC Voltmeter	YOKOGAWA Type 2013 Class 0.5
4.	DC Voltmeter	YOKOGAWA Type 2011 Class 0.5
5.	Volt-Ohm-Ammeter	AC, DC, ohms 1% on DC
6.	Degaussing Coil	HOZAN Type HC-21

7.	Variac	Swing line voltage ± 10%
8.	Convergence Error Gaugw	RCA Type PIX503G
9.	Luminescence Meter	Minolta Type nt-1°
10.	Magnifying Glass	8-10 Power
11.	Alignment Tools	

4.2 SETTING

4.2.1 Set the Control VRs as following.

a. Center position

PCB-MAIN	VR401	VR402
	VR403	VR404
	VR405	VR406
	VR501	VR502
	VR503	VR530
	VR532	FOCUS
	SCREEN	
PCB-CRT	VR201	VR231
	VR261	
PCB-POWER	VR901	
MISSELANEOUS	VR591 (CONT)	

b. Full counter clockwise position

PCB-MAIN	VR531 (HV-LIMIT)	
PCB-CRT	VR202	VR232
	VR262	

4.2.2 Insert a connector (PE) on the PCB-POWER to the AC line input voltage (100 ∿ 120 V or 220 ∿ 240 V AC)

4.3 DEGAUSSING

The display monitor should be degaussed before set-up and adjustment procedure are performed. The display monitor is equipped with Automatic Degaussing Circuit.

Other parts of the monitor may also require degaussing. This would be indicated by poor color purity or convergence which cannot be corrected by normal alignment. Degaussing of the monitor chassis is performed manually by using a commercial degaussing coil. The following procedure should be adhered to when using a degaussing coil:

a. With the coil switch in the OFF position and perpendicular to the screen, turn the switch to the ON position.

b. Turn the coil parallel to the screen and, with a circular motion, slowly bring the coil to the monitor.

c. Continuing the circular motion, pass the coil over the front, top, and sides of the monitor for approximately two minutes.

d. Then, moving in a circular motion and with the coil perpendicular to the monitor, slowly back away 6 to 8 feet and turn the coil switch OFF.

NOTE: Degaussing Coil - HOZAN, Type HC-21

4.4 HORIZONTAL AND VERTICAL HOLD CONTROLS

Set Hor. Hold (VR502) and Vert. Hold (VR403) on the PCB-MAIN for stable picture.

4.5 DC SOURCE VOLTAGE ADJUSTMENT

a. Check the AC input line voltage is within 100 ∿ 120 V AC or 220 ∿ 240 V AC.

b. Supply a line voltage to the PCB-POWER through the connector (PA).

c. Connect the DC voltmeter to the collector of Q593 on the RADIATOR-D and the chassis. Adjust +B1 Control (VR901) on the PCB-POWER at DC V.

4.6 HIGH VOLTAGE AND HV LIMITER ADJUSTMENT

a. Remove a line voltage.

b. Connect a high voltage meter between the anode cap of CRT and the chassis.

c. Supply a line voltage.

d. Turn High Voltage Control (VR532) on the PCB-MAIN gradually clockwise until a reading of 25.8 ± 0.3 kV is achieved.

If High Voltage value cannot be obtained, adjust the +B1 Control (VR901) to get 25.8 ± 0.3 kV.

e. Turn High Voltage Limiter Control (VR531) gradually clockwise to operate the High Voltage Safety Circuit and goes out the raster.

f. Remove a line voltage.

g. Reset the High Voltage Control (VR532) to the center position and supply a line voltage.

h. Adjust High Voltage Control (VR532) for 22 ± 0.3 kV at anode cap of CRT.

NOTICE

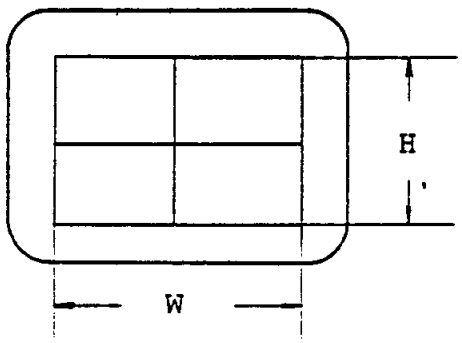
High Voltage Control (VR532) and HV Limiter Control (VR531) are critical components and never adjust or replace these components in the field servicing.

4.7 WIDTH AND HEIGHT ADJUSTMENT

a. Select a OUT-LINE test pattern.

b. Adjust Hor. Width Control (L503) and Vert. Height Control (VR401) for a OUT-LINE pattern size.

WIDTH x HEIGHT : 250 ± 5 x 180 ± 5



4.8 VERTICAL LINEARITY ADJUSTMENT

a. Select a cross-hatch test pattern.

b. Adjust Vert. Linearity Control (VR402) for uniform spacing of cross-hatch at top/bottom and center of viewing area.

4.9 SIDE PCC ADJUSTMENT

a. Select a cross-hatch test pattern.

b. Observe the vertial lines at the left and right sides, adjust PCC Phase Control (VR404) and PCC Amp Control (VR405) on the PCB-MAIN to obtain straight vertical edges at the right and left sides of the screen.

4.10 HORIZONTAL CENTERING ADJUSTMENT

a. Select a OUT-LINE test pattern.

b. Adjust Hor. Centering Control (VR503) to center the raster on the screen.

4.11 VERTICAL CENTERING ADJUSTMENT

a. Select a OUT-LINE test pattern.

b. Vertical centering correction is selected by the position of connector (DH).

Three selections of vertical centering are provided. To select no vertical centering correction, the connector (DH) is plugged into connector (DH) receptacle pin 2. Plugging the connector (DH)

into pin 1 or pin 3 will deflect the entire raster vertically.

The direction of raster movement may be reversed by selecting the connector (DH) when plugged into pin 1 or pin 3.

c. Adjust Vert. Centering Control (VR406) to center the raster on the screen.

4.12 VIDEO PHASE ADJUSTMENT

a. Select a OUT-LINE test pattern.

b. Ensure Hor. Hold Control (VR502) has been adjusted.

c. Adjust Brightness Control (VR530) and Contrast Control (VR591) for a picture of suitable contrast with the dim raster.

d. Adjust Hor. Phase Control (VR501) to center the OUT-LINE picture on the raster.

4.13 GRAY SCALE TRACKING ADJUSTMENT

4.13.1 Cathode Bias and Screen Bias adjustment

a. Select a WHITE-FIELD test pattern.

b. Turn the Contrast Control (VR591) fully counter-clockwise.

c. Connect the DC voltmeter to the cathode of D202, D232 or D262 on the PCB-CRT. Set the R, G, B-Bias Controls (VR202, VR232 and VR262) on the PCB-CRT at DC + 150 $\pm$ 3 V.

d. Connect the DC voltmeter to the connector (DC), pin 3 on the PCB-MAIN. Set the Brightness Control (VR530) at DC + 30 ± 0.5 V.

e. Turn Screen Bias Control (R591) located High Voltage resistor block
Observe the raster color to determine which CRT beams are visible.

f. Adjust the R, G, B - Bias Controls (VR202, VR232 and VR262) as required to equalize the three beam intensities resulting a grey raster.

4.13.2 Video Drive adjustment

a. Prior to performing the video drive adjustment, the cathode bias and screen bias adjustment must be proper.

b. Select a WHITE-FIELD test pattern.

c. Set the Contrast Control (VR591) to the center of the range.

d. Set the three Contrast Controls (VR201, VR231 and VR261) on the PCB-CRT fully clockwise position.

e. Observe the highlight color and adjust the three Contrast Controls (VR201, VR231 and VR261) to obtain white highlights.

4.14 FOCUS ADJUSTEMNT

a. Select a DOT test pattern.

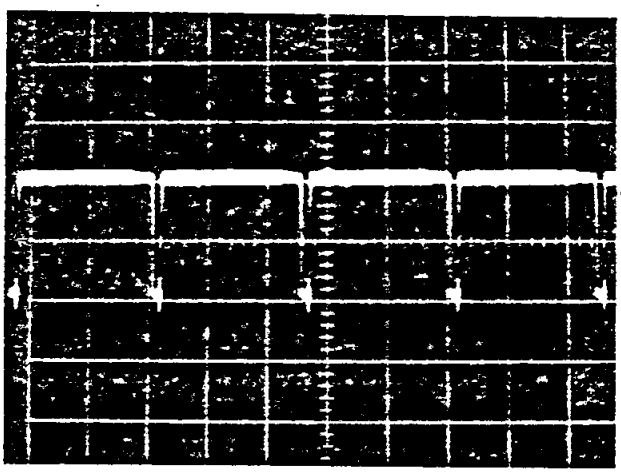
b. Adjust the Contrast Control (VR591) for a normal display

c. Adjust the Focus Control (R591) located High voltage resistor block (Fig.) for best overall focus, observating both the center and corners of the screen.

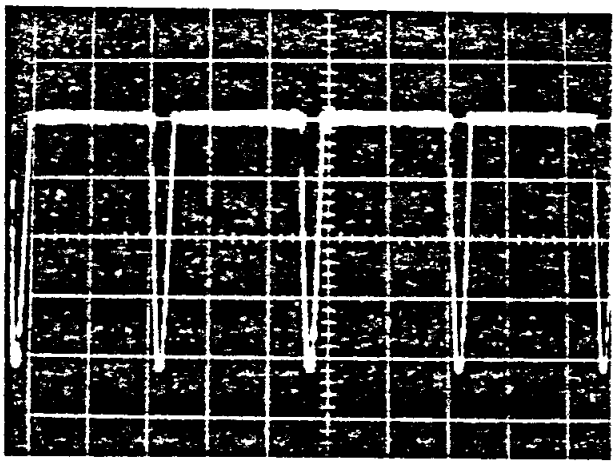
4.15 WAVEFORM DATA

Each waveform, in Fig. 4-4a through 4-4q, is labeled with the waveform number, the vertical scaling in volts per division and the horizontal scaling in time per division. The waveforms are ferenced by waveform number in the schematic diagram contained in Fig. 5-1. when measuring waveforms proper line voltage and video, HD and VD inputs must be applied to the monitor. Connect the vertical sync pulse to the oscilloscope external-trigger-imput and adjust the time base to that specified on the waveform label. The vertical sync pulse may be obtained from the video source or from vertical circuit in the monitor at R410/R411 on the PCB-MAIN. When observing horizontal circuit waveforms, sync may be obtained from horizontal pulse at CONNECTOR-PB #2 on the PCB-MAIN.

Note: When madsuring waveforms of primary power circuit, Oscilloscope GND terminal must be connected to primary GND point, for example, emitter of Q901.

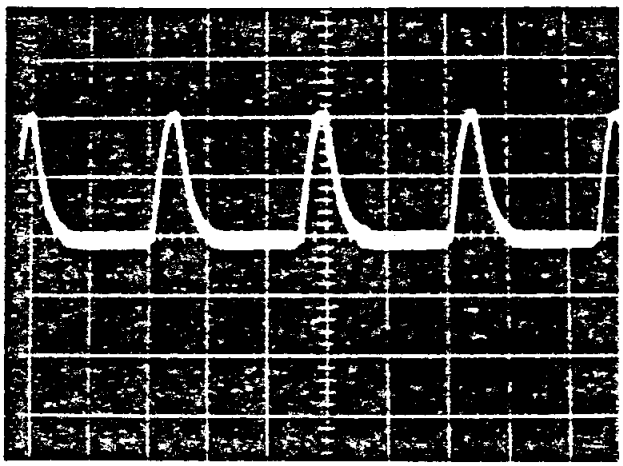


(1) Q901 COLL, 5V, 20μs

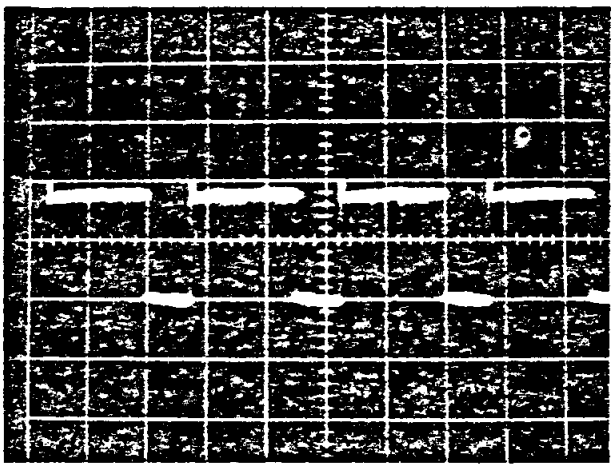


(2) CONNECTOR (PB) #2, 20V, 20μs

Fig. 4-4 a. Waveforms (PCB-POWER)

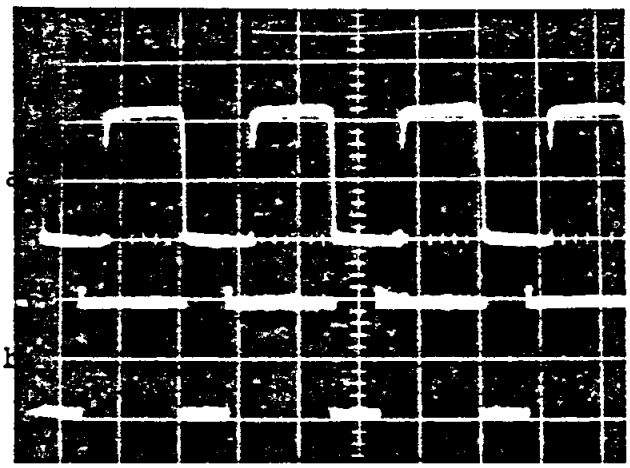


(3) Q901 BASE, 1V, 20μs

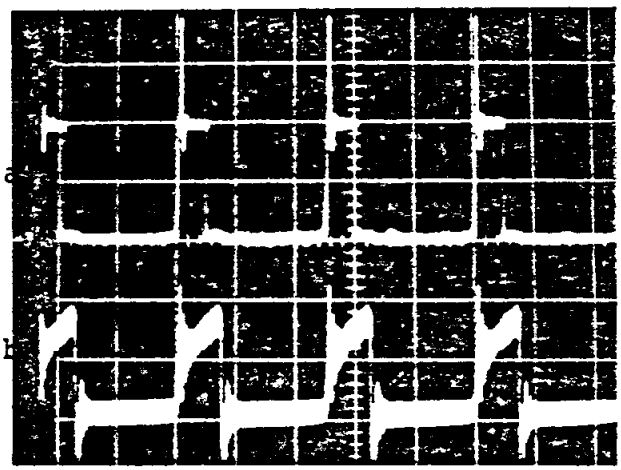


(4) IC901 #3, 5V, 20μs

Fig. 4-4 b. Waveforms (PCB-POWER)

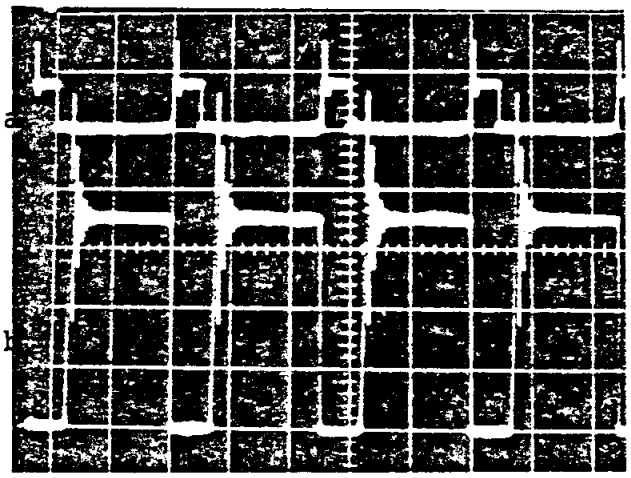


(5) a. Q903 COLL, 2V, 20μs
b. IC901 #3, 5V

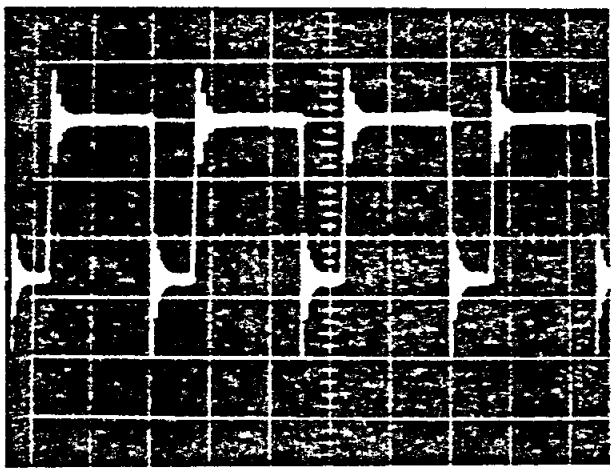


(6) a. Q904 COLL, 20V, 20μs
b. Q991 BASE, 2V

Fig. 4-4 c. Waveforms (PCB-POWER)

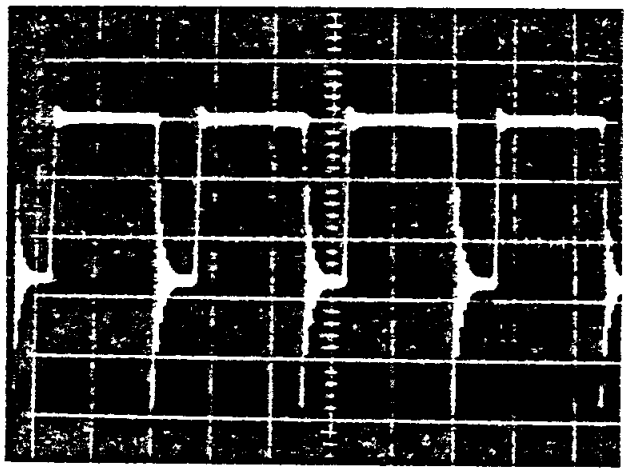


(7) a. Q904 COLL, 50V, 20μs
b. Q991 COLL, 100V



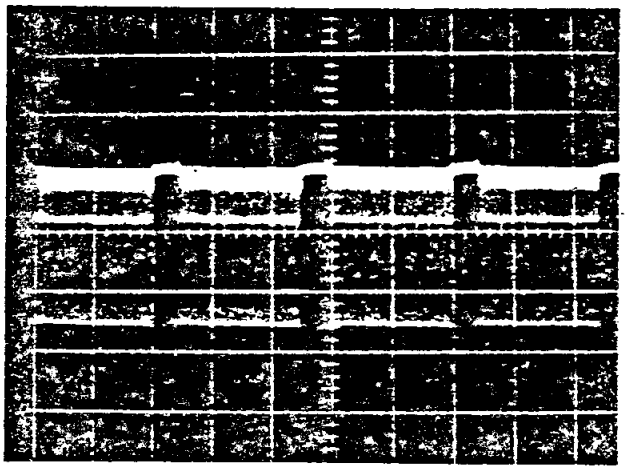
(8) T902 #1, 50V, 20μs

Fig. 4-4 d. Waveforms (PCB-POWER)

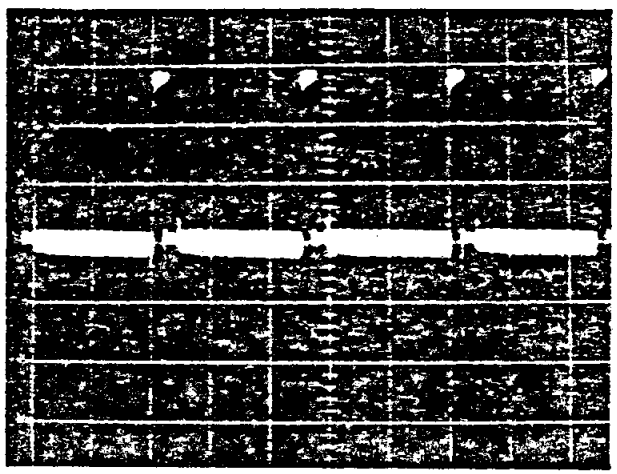


(9) T902 #7, 100V, 20μs

Fig. 4-4 e. Waveforms (PCB-POWER)

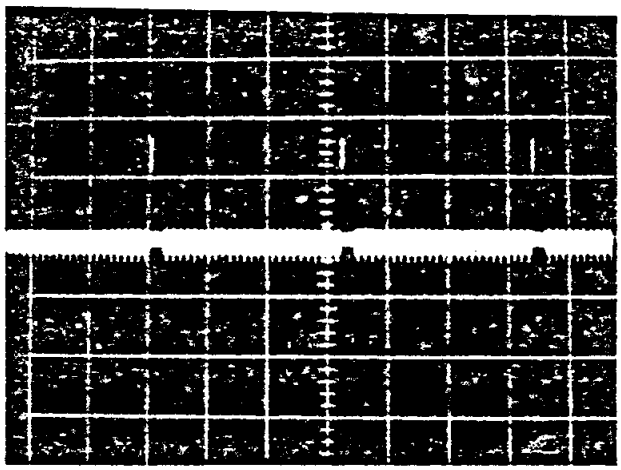


(10) CONNECTOR-VA #1, 2V, 20μs

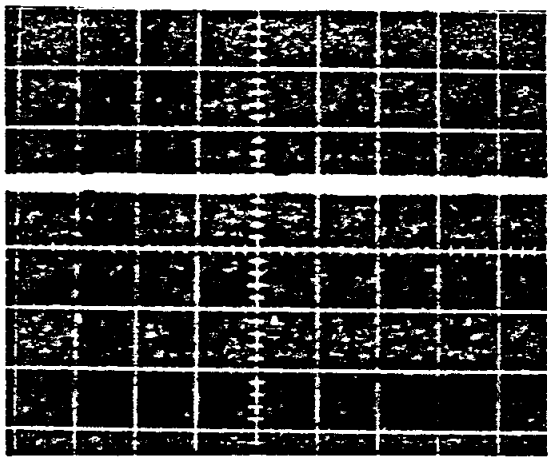


(11) CONNECTOR-VA #7, HD, 1V, 20μs

Fig. 4-4 f. Waveforms (PCB-MAIN)

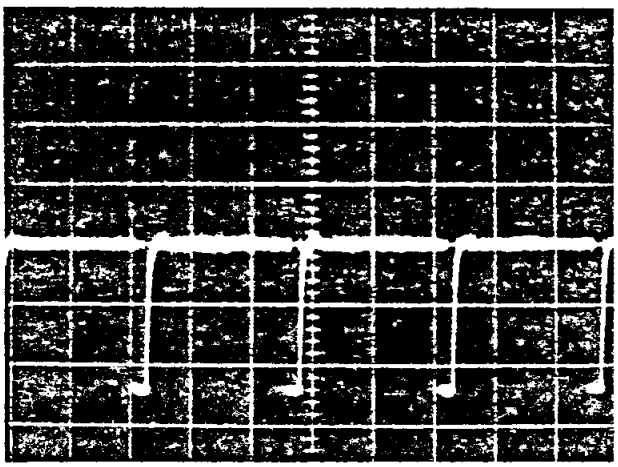


(12) CONNECTOR-VA #9, VD, 1V, 5ms

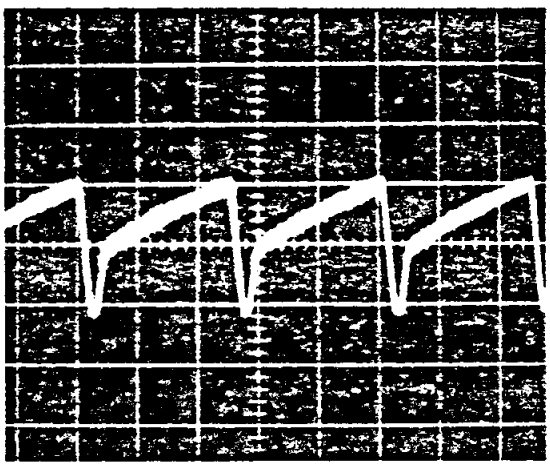


(13) Q401 COLL, 1V; 5ms

Fig. 4-4 g. Waveforms (PCB-MAIN)

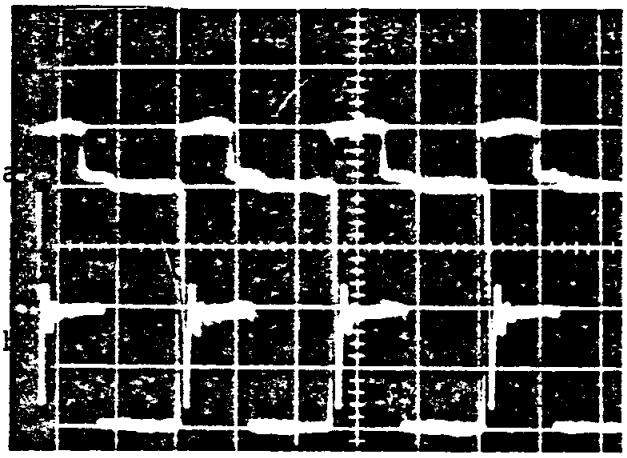


(14) Q501 COLL, 5V, 20μs

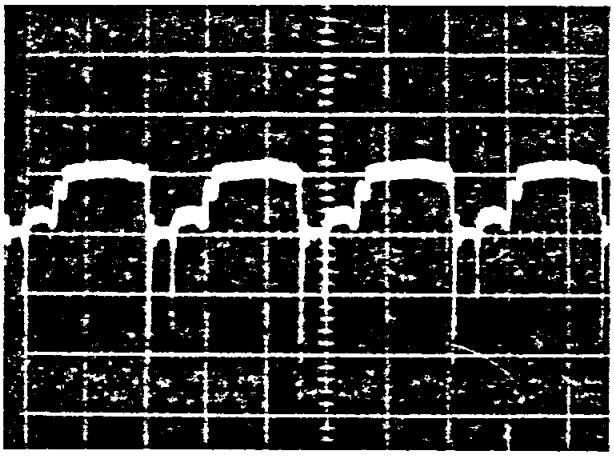


(15) IC401 #14, 2V, 20μs

Fig. 4-4 h. Waveforms (PCB-MAIN)

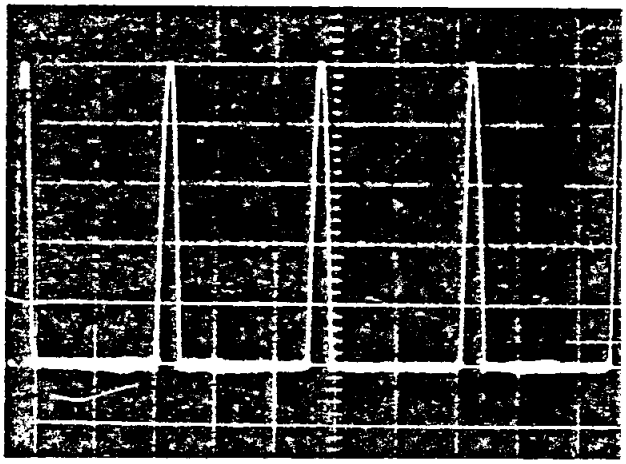


(16) a. IC401 #10, 5V, 20μs
b. Q502 COLL, 50V

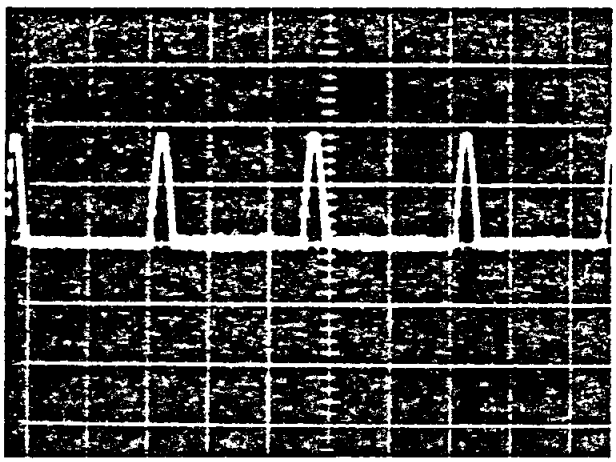


(17) Q591 BASE, 2V, 20μs

Fig 4-4 i. Waveforms (PCB-MAIN)

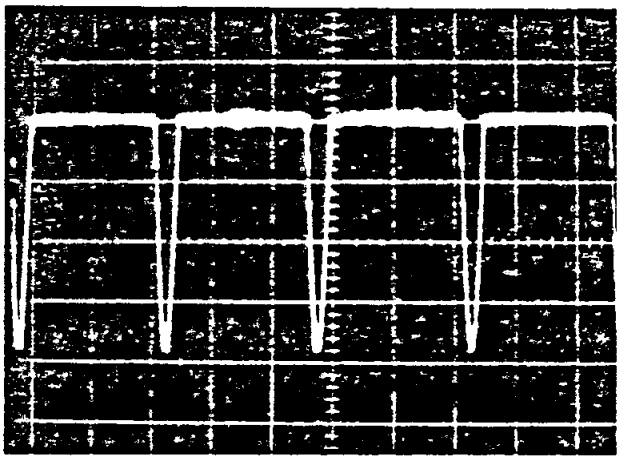


(18) Q591 COLL, 800 Vp-p, 20μs

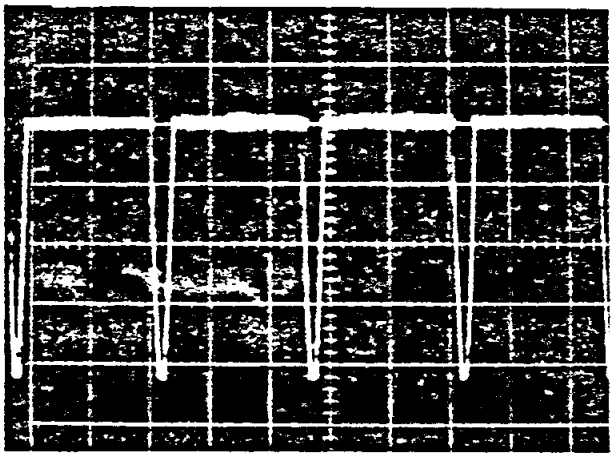


(19) T502 #1, 50V, 20μs

Fig 4-4 j. Waveforms (PCB-MAIN)

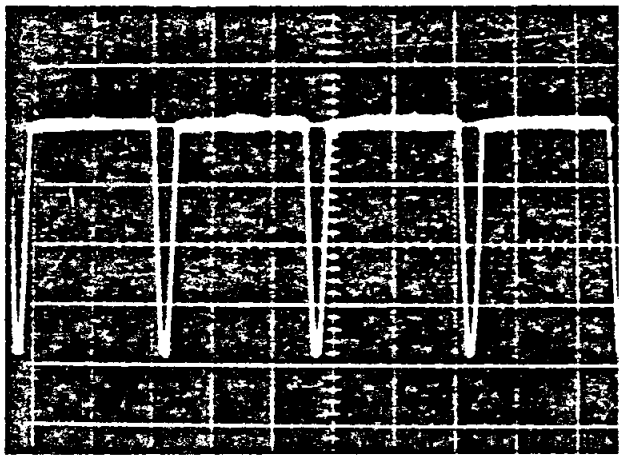


(20) T502 #3, 50V, 20μs

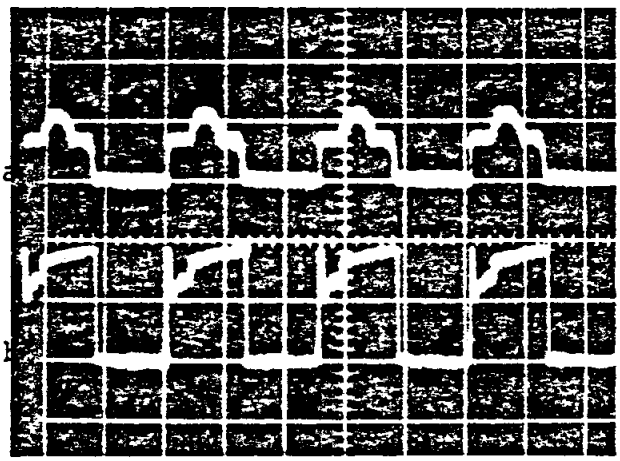


(21) T502 #5, 20V, 20μs

Fig 4-4 k. Waveforms (PCB-MAIN)

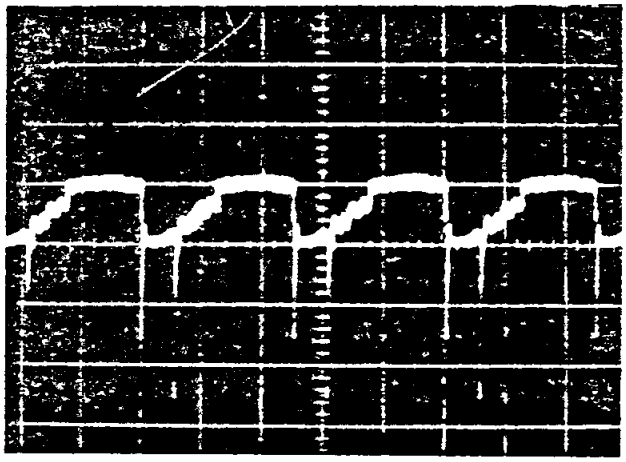


(22) T502 #8(GND)-#9, 5V, 20μs

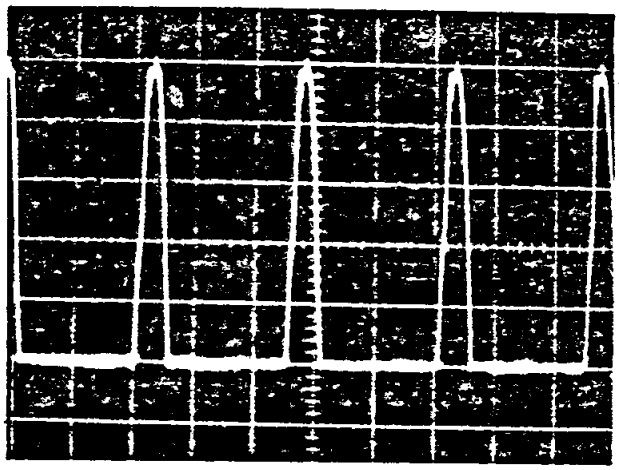


(23) a. Q531 BASE, 1V, 20μs
b. Q531 COLL, 50V

Fig. 4-4 l. Waveforms (PCB-MAIN)

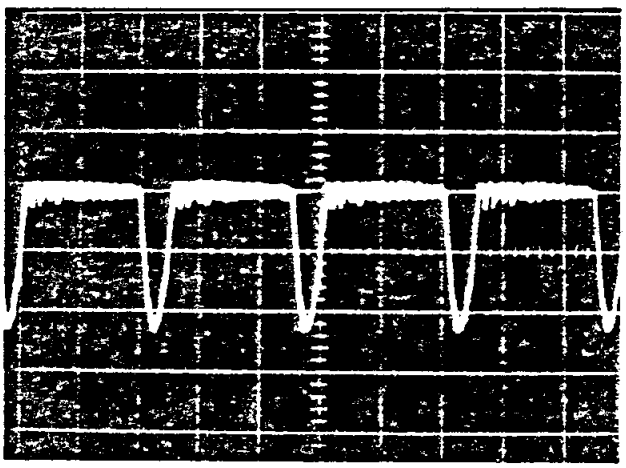


(24) Q592 BASE, 2V, 20μs

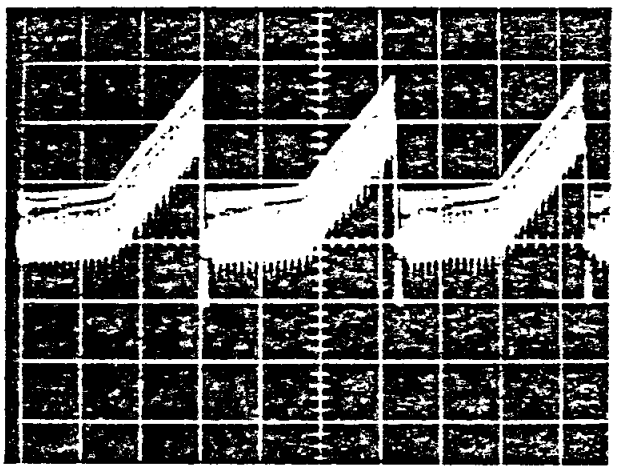


(25) Q592 COLL, 100V, 20μs

Fig. 4-4 m. Waveforms (PCB-MAIN)

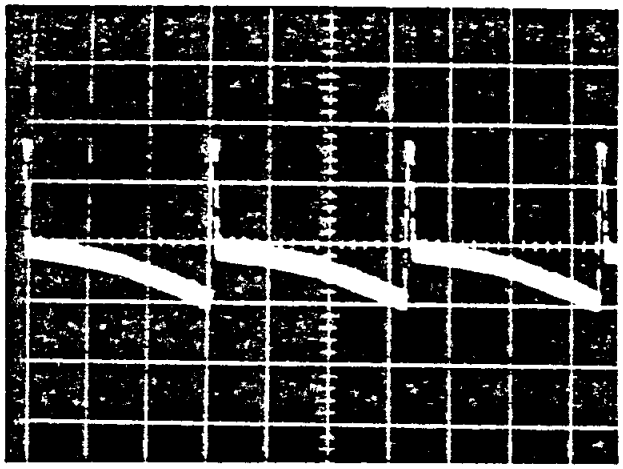


(26) T531 #3, 50V, 20μs

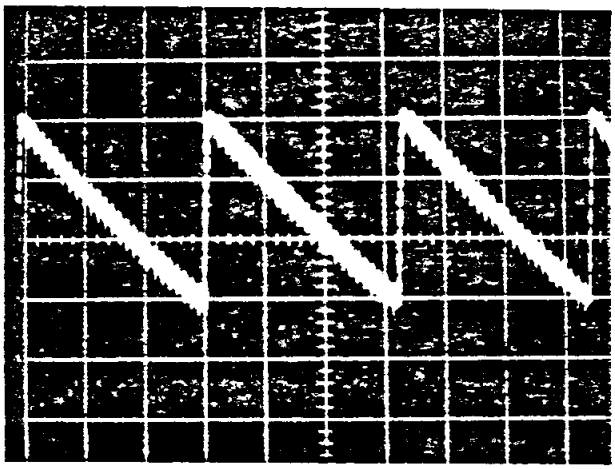


(27) IC401 #2, 0.5V, 5ms

Fig. 4-4 n. Waveforms (PCB-MAIN)

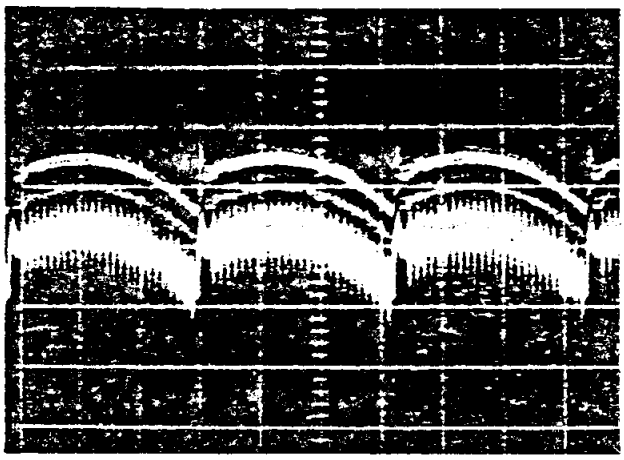


(28) Q492 COLL, 20V, 5ms

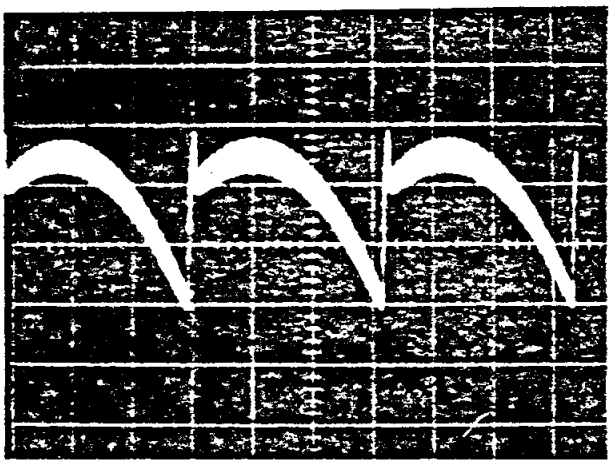


(29) R410/R411, 1V, 5ms

Fig. 4-4 o. Waveforms (PCB-MAIN)

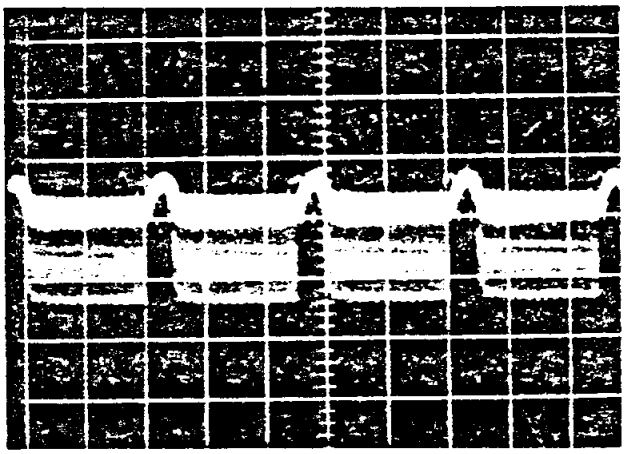


(30) Q402 BASE, 0.2V, 5ms

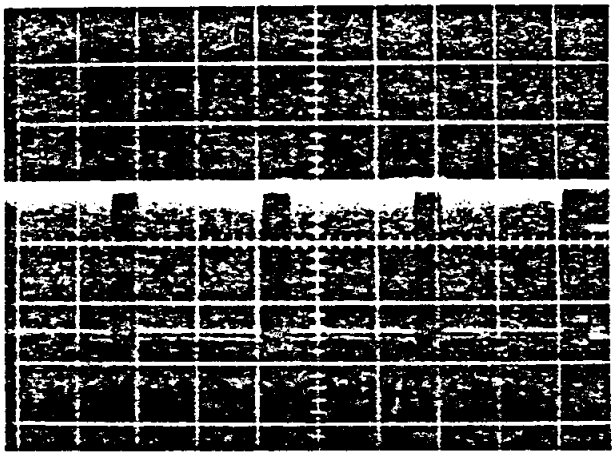


(31) Q403, COLL, 2V, 5ms

Fig 4-4 p. Waveforms (PCB-MAIN)



(32) Q201 EMIT, 0.5V, 20μs



(33) Q202 EMIT, 20V, 20μs

Fig. 4-4 q. Waveforms (PCB-CRT)

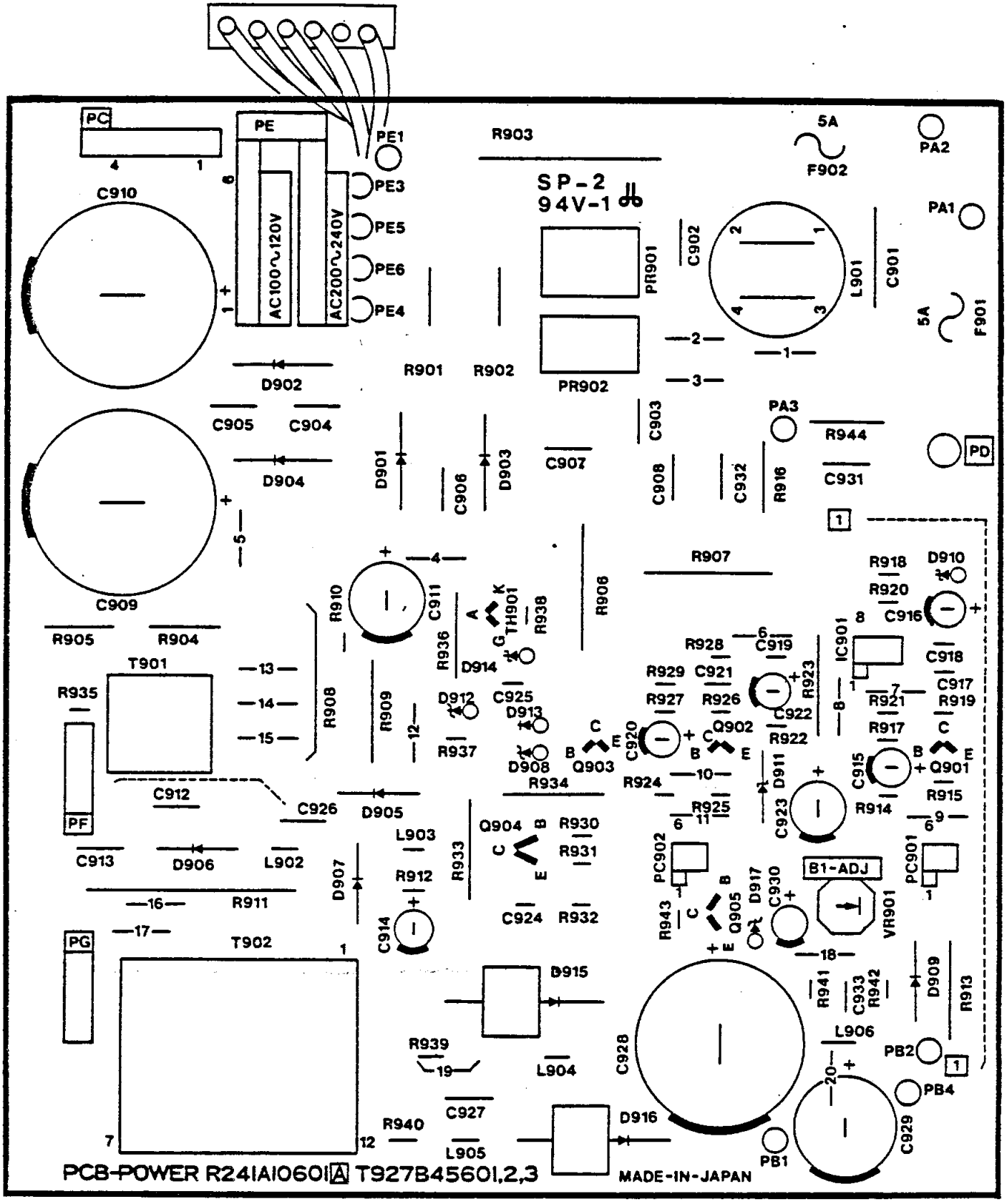


Fig. 4-1 PCB-POWER Location

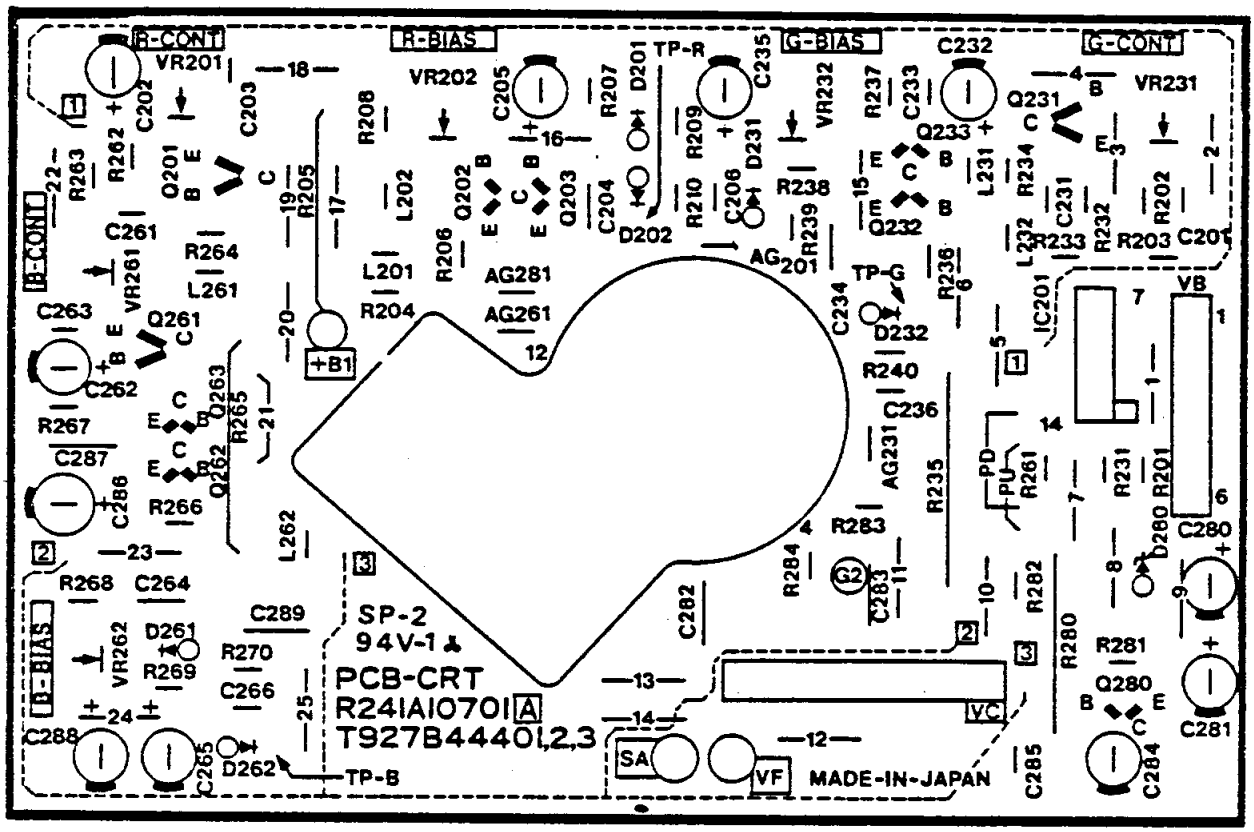


Fig. 4-3 PCB-CRT Location

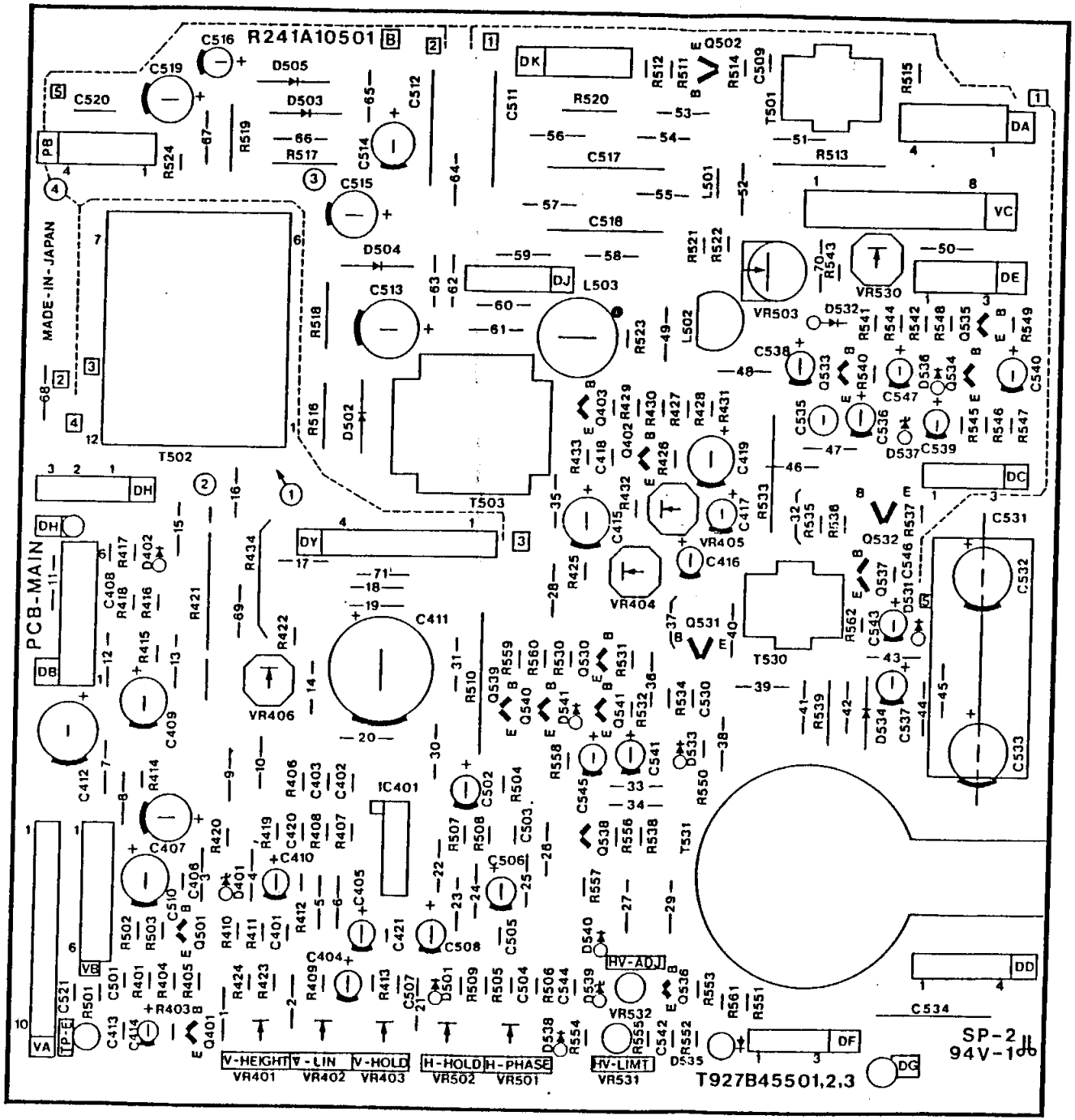


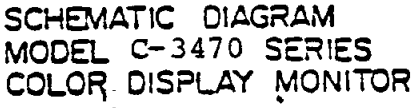
Fig. 4-2 PCB-MAIN Location

SECTION 5
SCHEMATIC DIAGRAMS

MODEL: C-3470

The complete schematic diagram for the monitor is contained in four sections.

Fig.5-1



The numbered references on the schematic diagrams are the waveform designators for the waveforms contained in Fig. through Fig.

NOTE 1:

1. The unit of resistance "ohm" entirely omitted.
   Accordingly, K=1000 ohms,
   M=1000K ohms
2. The wattage of resistor, not specifically designated, is 1/4 Watt.
3. Resistors, not specifically designated, are: Fixed carbon film resistor.
4. The marks of resistor are as follow:
   - S : Composition (Solid type) resistor
   - CE : Cemented resistor
   - MB : Metal oxide film resistor (type B)
   - W : Wire wound resistor
5. The tolerance of resistor value, not specifically designated, is ±5%, K = ±10%, M = ±20%
6. The unit of capacitance, not specifically designated,
   a) μF, for numbers less than 1
   b) pF, for numbers great than 1

7. Capacitors, not specifically designated are: ceramic Capacitors except electrolytic capacitors.

8. The marks of capacitors are as follow:

   (MF) : Polyester film capacitor

   (PC) : Paper capacitor (type C)

   (PP) : Polypropylene film capacitor

   (PL) : Plastic film capacitor

   (TAN) : Tantalum capacitor

   : Electrolytic capacitor

9. The PC work voltage of capacitor, not specifically designed is 50V.

10. The tolerance of capacitor value, not specifically designated,
    is: ±10% for polyester capacitor
        ±5% for ceramic capacitor
    and J=±5%, K=±10%, M=±20%, $P=\pm^{100}_{0}\%$
        C=±0.25pF, D=±0.5pF, F=±1pF, $Z=^{+80}_{-20}\%$

11. Specific Symbol

    Zener Diode, SCR (Thyristor)

    Triac, Air Gap

    Posistor

NOTE 2:

1. DC voltage were measured from points indicated to the circuit ground with a VTVM. Line voltage at 100V AC on signal applied.

2. This is a basic schematic diagram. Some sets may be subject to modification according to engineering improvement.

SECTION 6
PARTS LIST

MODEL: C-3470

The following table contains a list of replaceable sub-assemblies, and Chassis piece parts. In order to expedite delivery of replacement part orders.

Specify: 1. Model Number
2. Part Number and Description
3. Quantity

Unless full information is supplies, delay in execution of orders will result.

RESISTOR

MARK	TOLERANCE
J	±5%
K	±10%
M	±20%
F	±1%

CAPACITOR

MARK	TOLERANCE	MARK	TOLERANCE
J	±5%	Z	+80% -20%
K	±10%	C	±0.25pF
M	±20%	P	±0.5pF
P	+100% -0%	F	±1pF

* R100 : Critical component

Table 6-1 PARTS LIST C-3470

SYMBOL NO.	PART NO.	DESCRIPTION	
	TUBE		
V291	254P47301	Picture Tube	AT1429LB22-TC05
	ICs		
IC201	271P03801	IC	SN74S38N
IC401	262P50101	"	HA11414
IC901	266P71902	"	M51841P
	TRANSISTORS		
Q201Q231Q261	270P51401/ 270P51406	TRANSISTOR	2SC1507(1)/2SC1505L
Q202Q232Q262	270P51102	"	2SC2229-Y
Q203Q233Q263	270P51002	"	2SA949-Y
Q270	260P04003	"	2SC620-D
Q401	260P17105	"	2SC710-D
Q402	260P17706	"	2SC711A-EF
Q403	260P18603	"	2SB647A-B
Q491	270P50701	"	2SC2168
Q492	270P50701	"	2SC2168
Q501	260P17105	"	2SC710-D
Q502	270P51401/ 270P51406	"	2SC1507(1)/2SC1505L
Q530	260P04003	"	2SC620-D
Q531	270P51401/ 270P51406	"	2SC1507(1)/2SC1505L
Q532	270P51201	"	2SC2317
Q533	260P35301	"	2SC1515K
Q534	270P16504	"	2SA628-F
Q535	260P17105	"	2SC710-D