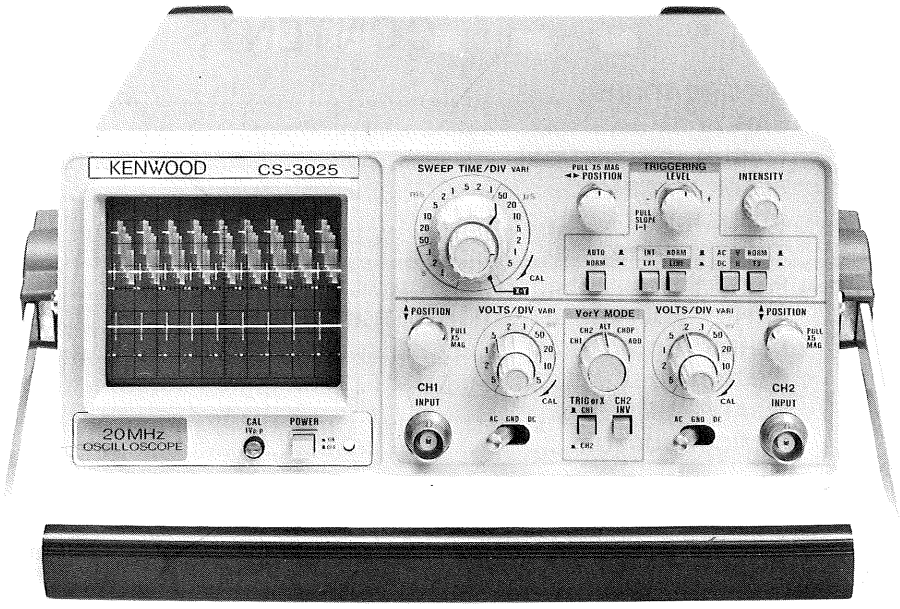
KENWOOD

20MHz OSCILLOSCOPE

CS-3025

SERVICE MANUAL

KENWOOD CORPORATION



WARNING

The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

CONTENTS

SPECIFICATIONS

CRT

Type	Rectangular high luminance CRT (with internal graticule)
Acceleration Voltage	Approx. 1.8 kV
Display Area	8 × 10 div flat-face (1 div = 6.35 mm)

VERTICAL AXIS

Operating Modes	CH1, CH2, ALT, CHOP, ADD
Sensitivity	5 mV/div to 5 V/div, +/− 3%
Sensitivity Magnification	5 times +/− 5% (× 5 MAG used)
Attenuator	1-2-5 step sequence, 10 ranges, adjustable between ranges
Frequency Response	
5 mV/div to 5 V/div	DC: DC to 20 MHz, − 3 dB AC: 5 Hz to 20 MHz, − 3 dB
× 5 MAG used	DC: DC to 4 MHz, − 3 dB AC: 5 Hz to 4 MHz, − 3 dB
Input Impedance	1 Mohm, approx. 40 pF
Rise Time	17.5 ns or less (20 MHz)
Crosstalk	− 40 dB minimum
Polarity Inversion	CH2 only
Chop Frequency	Approx. 50 kHz
⚠ Maximum Input Voltage	800 Vp-p or 400 V (DC + AC peak)

HORIZONTAL AXIS

Operating Modes	X-Y operation selectable with sweep knob X axis selectable with TRIG or X Y axis selectable with V or Y MODE
Sensitivity	Same as vertical axis
Input Impedance	Same as vertical axis
Frequency Response	DC: DC to 200 kHz, − 3 dB AC: 5 Hz to 200 kHz, − 3 dB
X-Y Phase Difference	3° or less at 10 kHz
⚠ Maximum Input Voltage	Same as vertical axis

SWEEP

Sweep Type	NORM: Triggering sweep AUTO: Sweep free runs in absence of trigger
Sweep Time	0.2 μs/div to 1 s/div +/− 3% in 21 ranges, 1-2-5 sequence, adjustable between ranges
Sweep Magnification	5 times +/− 5%

SPECIFICATION

TRIGGERING

Internal Sync .....INT, LINE
External Sync .....EXT
External Sync Input
Impedance .....1 Mohm, Approx. 90 pF
⚠ Maximum External Trigger
Voltage.....50 V (DC + AC_{peak})
Sync Coupling .....AC, DC, TV-V, TV-H
Polarity ..... +/−
Trigger Sensitivity .....

Coupling	Frequency	Amplitude (Voltage)	
		INT	EXT
DC	DC ~ 2 MHz	0.5 div	0.1 Vp-p
	~ 20 MHz	1 div	0.2 Vp-p
AC	10 Hz ~ 2 MHz	0.5 div	0.1 Vp-p
	~ 20 MHz	1 div	0.2 Vp-p
TV-H, V		2 div	0.4 Vp-p

AUTO: Same as above specification for above 50 Hz.

CALIBRATION VOLTAGE .....Square wave (positive polarity)
1 Vp-p ± 3%, 1 kHz ± 3%

POWER REQUIREMENTS

Power Supply Voltage .....AC100/120/220/240 V ±10% 50/60 Hz
Power Consumption .....Approx. 22 W (at 100 V AC)

DIMENSIONS AND WEIGHT

Dimensions.....216 (width) × 89 (height) × 298 (depth) mm
Weight.....Approx. 4 kg

OPERATING TEMPERATURE AND HUMIDITY FOR GUARANTEED SPECIFICATIONS
5 to 35°C, 85% maximum RH

ACCESSORIES.....Probe (PC-30) 2 pcs.
Instruction Manual 1 pc.
Panel Cover 1 pc.

SAFETY

SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. If the power cord is not applied for specified voltage, there is always a certain amount of danger from electric shock.

Line voltage

This instrument operates using ac-power input voltages that 100/120/220/240 V at frequencies from 50 Hz to 60 Hz.

Power cord

The ground wire of the 3-wire ac power plug places the chassis and housing of the oscilloscope at earth ground. Do not attempt to defeat the ground wire connection or float the oscilloscope; to do so may pose a great safety hazard. The appropriate power cord is supplied that is specified when the instrument is ordered.

The power cords are shown as follows in Fig. 1.

Line fuse

The fuse holder is located on the rear panel and contains the line fuse. Verify that the proper fuse is installed by replacing the line fuse.

Voltage conversion

This oscilloscope may be operated from either a 100 V to 240 V, 50/60 Hz power source. Use the following procedure to change from 100 to 240 volt operation or vice versa.

1. Remove the fuse holder.
2. Replace fuse F 1 with a fuse of appropriate value, 0.5 amp for 100 VAC to 120 VAC operation, 0.3 amp for 220 VAC to 240 VAC operation.
3. When performing the reinsertion of fuse holder for the voltage conversion, the appropriate power cord should be used. (See Fig. 1.)
4. For the method of wiring selection in the primary side of the power transformer, refer to page 21.

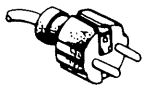
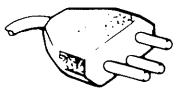
Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord and plate
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.5 A, 250 V Fast blow 6×30 mm	None	Cord: E30-0027-35
	Universal Europe 220 volt/50 Hz Rated 16 amp	North Europe 0.3 A, 250 V Fast blow 5×20 mm Other Europe 0.3 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1815-05
	U.K. 240 volt/50 Hz Rated 13 amp	0.3 A, 250 V Fast blow 6×30 mm	0.8 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	0.3 A, 250 V Fast blow 6×30 mm	None	Cord: E30-0571-15
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.3 A, 250 V Fast blow 6×30 mm	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	0.3 A, 250 V Fast blow 6×30 mm	None	—

Fig. 1 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

1. VERTICAL SECTION

The vertical section has two input channels and consists of an amp system for attenuation and amplification of the signals input to it, trig amp for feeding the signal to the horizontal section for use as the trig signal, and circuit for controlling these.

Attenuator Circuit

The signal applied to the input terminal is applied to the attenuator after passing through the input selection switch. The attenuator consists of 1/10 and 1/100 attenuators and a rotary switch for changing the amp gain in 1-2-5 steps. These 1/10 and 1/100 attenuators are adjusted to the required performance by a trimmer capacitor for square wave adjustment and a trimmer capacitor for input capacitance adjustment. The sensitivity is not attenuated in the ranges from 5 mV to 50 mV, attenuated to 1/10 in the ranges from 0.1 V to 0.5 V, and attenuated to 1/100 in the ranges from 1 V to 5 V.

Vertical Amplifier

The vertical amplifier amplifies the signal output from the attenuator, applies the required control, and applies the signal to the CRT deflecting plate.

The signals for both channel 1 and channel 2 are input to the preamp, and amp gain, variable, mag, pos, etc., control are performed there. The INV operation is also performed for channel 2.

The signal is then input to buffer FET from the attenuator, and the output is input to the base of Q103. The signal is converted from single to dual at the Q103 and Q104 stage, and the amp gain is also altered by using the rotary switch of the attenuator section to change the resistance between the emitters. The signal is then split by VR103, R115, and VR102 (VARIABLE) and is fed to the emitters of Q105 and 106. The collector impedance for MAG is increased at the collectors for switching between MAG (X5) and NORM. VR104 adjusts the MAG REG and VR111 adjusts the MAG-NORM gain ratio. Q107 and 108 in the next stage calibrate the amp gain by adjusting the resistance (VR105) between the emitters, and fed the signal to the trig amp.

This collector is connected to the emitter in the next stage, and the POSITION (VR107) is inserted here and controlled. The emitter grounding is switched for channel 2 to perform inversion.

When the level at the bases of Q109B and Q110B is lower than that at the bases of Q111B and Q112B, the signal is normal. The signal is inverted when higher. In the above description, different circuits were used for channels 1 and 2. From this point, however, the signals are switched by diodes D103 and D104, and one of the two signals is fed to the main amp. Both D103 and D104 are double diodes with a common anode, and the cathode of one of the diodes is connected to the cathode of the other diode. The signal of the channel which is up is fed to the V main amp. The potential at this point is controlled by the V-MODE switch. In the ADD mode, both channels 1 and 2 are up, and the signals from both channels are fed to the main amp. The main amp amplifies the signal from the preamp and applies it to the CRT deflecting plate. The level of this signal is approximately 10V/div. at the deflecting plate. To obtain this signal level, a feedback amp with high throughput is used in the final stage.

Trigger Amplifier

As described above, the trigger amp amplifies the signal fed from the emitters of Q107 and Q108, passes it through the same diode switch used for V MODE switching, and feeds the trigger signal to the horizontal section. VR108 adjusts the DC level of this signal. In the X-Y mode, this signal becomes the X signal and the gain is adjusted by VR110.

2. HORIZONTAL SECTION

The horizontal section consists of a trigger circuit section for generating the trigger pulse from the trigger signal, a sweep generator for generating the sweep signal and unblanking signal from this pulse, and a horizontal output amp for feeding the horizontal signal to the CRT.

Trigger Circuit

The internal trigger signal supplied from the V amp is input to Pins 1 and 4 of J303.

The signal is then amplified by Q304 and Q305, and enters the TRIG SOURCE selection switch S302 from the collector of Q304. This output passes through the COUPLE switch S303 and enters the gate of the Q301 amp for trigger slope switching. The amp formed from Q302 and Q303 converts the signal from single to differential, and switches the slope by selecting the phase. In addition, the DC level of the output is also altered by changing the difference voltage of the differential amp using the TRIG LEVEL knob. This alters the trigger point by the hysteresis comparator described below. This output passes through the Q306 buffer, is split to the Q307 to Q309 sync separate circuit, and this signal and the signal after separation after selected and input to the hysteresis comparator formed by Q310 and Q311.

This hysteresis comparator changes the trigger point because the base potential of Q311 is fixed and the DC level of the trigger signal is altered as described above. The sweep starts from the rising edge of this output pulse.

Sweep Generator

The sweep generator creates the sweep signal from the trigger pulse described above, and also generates a GATE signal synchronized to this sweep signal. The trigger pulse is input to IC303 and IC302. IC302 is a retriggerable one-shot multivibrator, and determines the presence of a trigger pulse within a set period for auto sweep in the AUTO mode. IC301 is a D-type flip-flop which changes the output at the rising edge of the pulse input to the clock input. This Q output is connected to the gate of a Miller circuit for sweep signal generation. This Miller circuit consisting of Q313, Q314,

and a time switch section, etc., cuts off D306 when the input goes to H. The output of the Miller circuit goes to the collector of Q325. This output can be checked at the collector of Q314 or TP301. The slope of the Miller circuit rising edge is determined by capacitors C317 to C321 and R352 to R359 selected by time switch S307. In addition, VARIABLE changes the voltage applied to R352 to R359 to change the sweep speed.
The comparator circuit formed by Q315 and Q316 determines the sweep starting point. The circuit formed by Q317 and Q319 is for hold off. Q of IC303 is used as the gate signal for unblanking.

Output Amplifier

The X signal or sweep signal is selected and input to the horizontal output amp. The amp amplifies this signal to form the differential signal applied to the horizontal deflecting plate of the CRT.
The X signal is output from the collector of Q304 which is the output of the internal trigger amp, and enters the base of Q319. This output is combined with the sweep signal at the emitter of Q320. The sweep is stopped in the X-Y mode and the horizontal axis operates by the X signal. During sweeping, Q319 is cutoff and the axis operates by the sweep signal.
The signal from the collector of Q320 is input to the base of Q322, and creates the differential signal with the H-POS level input to the base of Q321. The final stage is a feedback amp using a push-pull amplifier for high frequencies.

3. POWER & Z AXIS AMPLIFIER SECTION

The power-Z section includes a power supply section for generating the DC voltage needed for the circuits, high voltage section for generating the high voltage needed for the CRT, and a Z amp for creating the unblanking signal.

Power Supply Circuit

The power supply section creates the DC voltage needed for the circuit from the secondary output of the power transformer. All of the regulators are series regulators, and power of +240 V, +110 V, +12 V, and −12 V are produced. +240 V power is used mainly for the horizontal output amp. +100 V is used mainly as the power supply for the vertical output amp. Unregulated voltage of approximately +22 V is used for high voltage.

High Voltage

The high voltage section produces high voltage of approximately −1800 V which is applied to the CRT from the +22 V unregulated power supplied from the power supply section. The main section is the DC-DC convertor formed around T802, and the high voltage rectification section uses a P-P rectification circuit to reduce the load on the transformer. The high voltage level is stabilized by detecting the cathode of the CRT and controlling the DC drive voltage for converter oscillation.

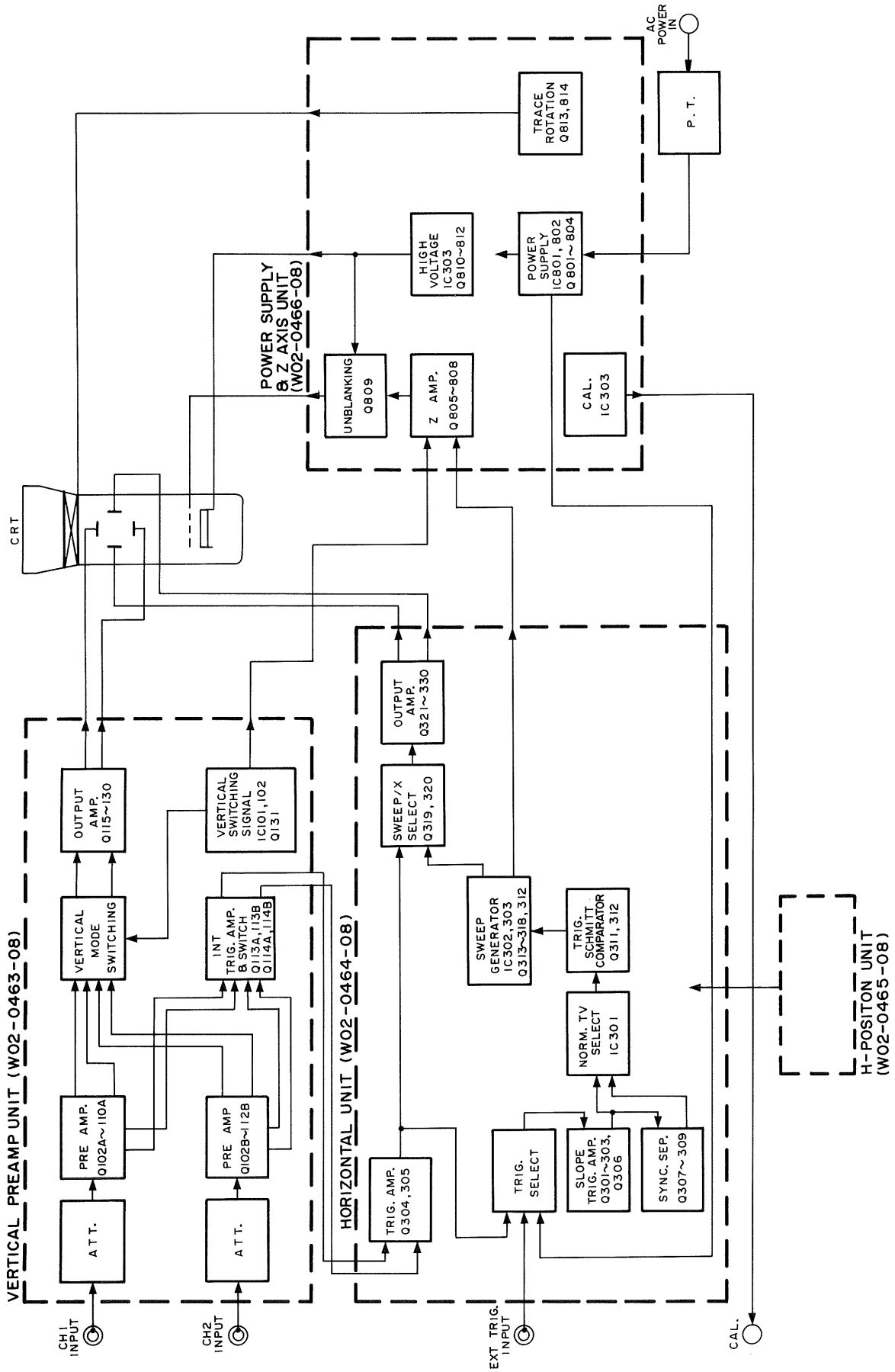
Z Axis Amplifier

The Z- amp amplifies the gate signal created by the sweep generator and the chop blk signal generated by the vertical switching signal generator. The above signals and INTEN level are input to the emitter of Q805. The signal is the applied to the high voltage circuit after amplification by the push-pull amp similar to that in the final stage of the horizontal stage. At this time, the signal passes through C821 after the AC component has been chopped by C822 and the DC component by Q809, and is then rectified by D810 and D811.

4. CALIBRATION AND TRACE ROTATION

There are also calibration and trace rotation circuits in the power-Z section. Calibration oscillation is by positive feedback to the IC803 op amp. Trace rotation is uses an emitter matching driver.

BLOCK DAIGRAM



ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.
The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the scope sufficiently (more than 30 minutes) before starting.
Before calibrating the scope, check the power supply voltage.

TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Minimum Specification
Digital Multi-Meter	DL-706 (KENWOOD)	Impedance: More than 10 MΩ, Measuring range: 0.01 V to 199 V
Sine-Wave Generator	651 B (YHP)	Frequency: 10 Hz to 10 MHz, constant voltage over tuning range
Sine-Wave Generator	SG-503 (Tektronix)	Frequency: 50 kHz to 100 MHz, Output impedance: 50 Ω, constant voltage over tuning range.
Square-Wave Generator	PG-506 (Tektronix)	Output signal: 1 kHz, Amplitude: 10 mVp-p to 10 Vp-p, Accuracy: within ±1%, Rise time: 35 ns or less 100 kHz, Rise time: 1 ns or less
Q Meter	4343B (YHP)	—
Color Pattern Generator	CG-911A (KENWOOD)	—
Oscilloscope	CS-6010 (KENWOOD)	Sensitivity: more than 5 mV Frequency response: More than 100 MHz
Time-Marker Generator	TG-501 (Tektronix)	Time mark: 0.5 s to 0.1μs repetive waveform
High-Voltage Probe	—	Input Impedance: 1000 MΩ
Termination	—	Impedance: 50 Ω Accuracy: within 3%
Termination	—	3 watts type impedance: 50 Ω
Attenuator	—	−20 dB attenuation (50 Ω)

Table 1

PREPARATION FOR ADJUSTMENT

Control Settings

The control settings listed below must be used for each adjustment procedure.
Exceptions to these settings will be noted as they occur.
After completing a adjustment, return the controls to the following settings.

NAME OF KNOBS	POSITION
INTENSITY	12 o'clock
CH1, CH2, ▲▼ POSITION, PULL×5 MAG	Mechanical center, push
CH1, CH2, VOLTS/DIV	10 mV/DIV
CH1, CH2, VARIABLE	CAL
CH1, CH2, AC-GND-DC	GND
MODE	CH1
TRIG or X	CH1
CH2 INV	NORM
◄► POSITION, PULL×5 MAG	Mechanical center, push
▟ AUTO, ▁ NORM	AUTO
INT, EXT	INT
NORM, LINE	NORM
AC, DC	AC
NORM, TV	NORM
TRIG LEVEL	Mechanical center

Table 2

ADJUSTMENT

Item	Adjustment VR (C)	P.C.B.	Setting	Procedure
1. POWER SUPPLY & CRT SECTION ADJUSTMENT				
INTENSITY	VR801	W02-0466-08	SWEEP TIME/DIV; X-Y AC-GND-DC; GND	Adjust the luminescent spot erase control between 8-o'clock position and 10-o'clock position.
FOCUS	VR803	W02-0466-08	SWEEP TIME/DIV; X-Y AC-GND-DC; GND	Adjust the FOCUS control between 9-o'clock position and 15-o'clock position so that the spot is rounded with the luminescent spot just focused.
ASTIG	VR309	W02-0464-08	SWEEP TIME/DIV; X-Y AC-GND-DC; GND	
TRACE ROTATION	VR804	W02-0466-08	AC-GND-DC; GND	Adjust so that the luminescent line goes parallel with the horizontal line of the scale.
2. VERTICAL SECTION ADJUSTMENTS				
CH1 STEP BAL	VR101A	W02-0463-08	AC-GND-DC; GND VOLTS/DIV; 5 mV	Adjust so that the position of the luminescent line does not change even when the VOLTS/DIV control is rotated.
CH1 DC BAL	VR103A	W02-0463-08	AC-GND-DC; GND VOLTS/DIV; 5 mV	Adjust so that the position of the luminescent line does not change even when the VARIABLE control is rotated.
CH1 MAG BAL	VR104A	W02-0463-08	AC-GND-DC; GND	Adjust so that the position of the luminescent lines does not change even with the ×5 MAG knob is set to "PULL".
CH1 GAIN	VR105A	W02-0463-08	VOLTS/DIV; 5 mV	Input a square wave of 1 kHz, 20 mVp-p and adjust so that its amplitude is of 4 divisions.
CH1 MAG GAIN	VR111A	W02-0463-08	VOLTS/DIV; 5 mV	Input a square wave of 1 kHz, 5 mVp-p and adjust so that its amplitude is of 5 divisions. After adjustment, check the CH1 gain. If a deviation occurs, readjust the CH1 gain. After readjustment, also readjust the MAG gain. Then, recheck the gain.
CH2 STEP BAL	VR101B	W02-0463-08	AC-GND-DC; GND VOLTS/DIV; 5 mV	Adjust so that the position of the luminescent line does not change even when the VOLTS/DIV control is rotated.
CH2 DC BAL	VR103B	W02-0463-08	AC-GND-DC; GND VOLTS/DIV; 5 mV	Adjust so that the position of the luminescent line does not change even when the VARIABLE control is rotated.
CH2 MAG BAL	VR104B	W02-0463-08	AC-GND-DC; GND	Adjust so that the position of the luminescent line does not change even when the ×5 MAG knob is set to "PULL".
CH2 GAIN	VR105B	W02-0463-08	VOLTS/DIV; 5 mV	Input a square wave of 1 kHz, 20 mVp-p and adjust so that its amplitude is of 4 divisions.
CH2 MAG GAIN	VR111B	W02-0463-08	VOLTS/DIV; 5 mV	Input a square wave of 1 kHz, 5 mVp-p and adjust so that its amplitude is of 5 divisions. After adjustment, check the CH2 gain. If a deviation occurs, readjust the CH2 gain. After readjustment, also readjust the MAG gain. Then, recheck the gain.
CH1 Input Capacity	C103A	W02-0463-08	VOLTS/DIV; 10 mV	Adjust the input capacity to 39 pF ±1 pF.

ADJUSTMENT

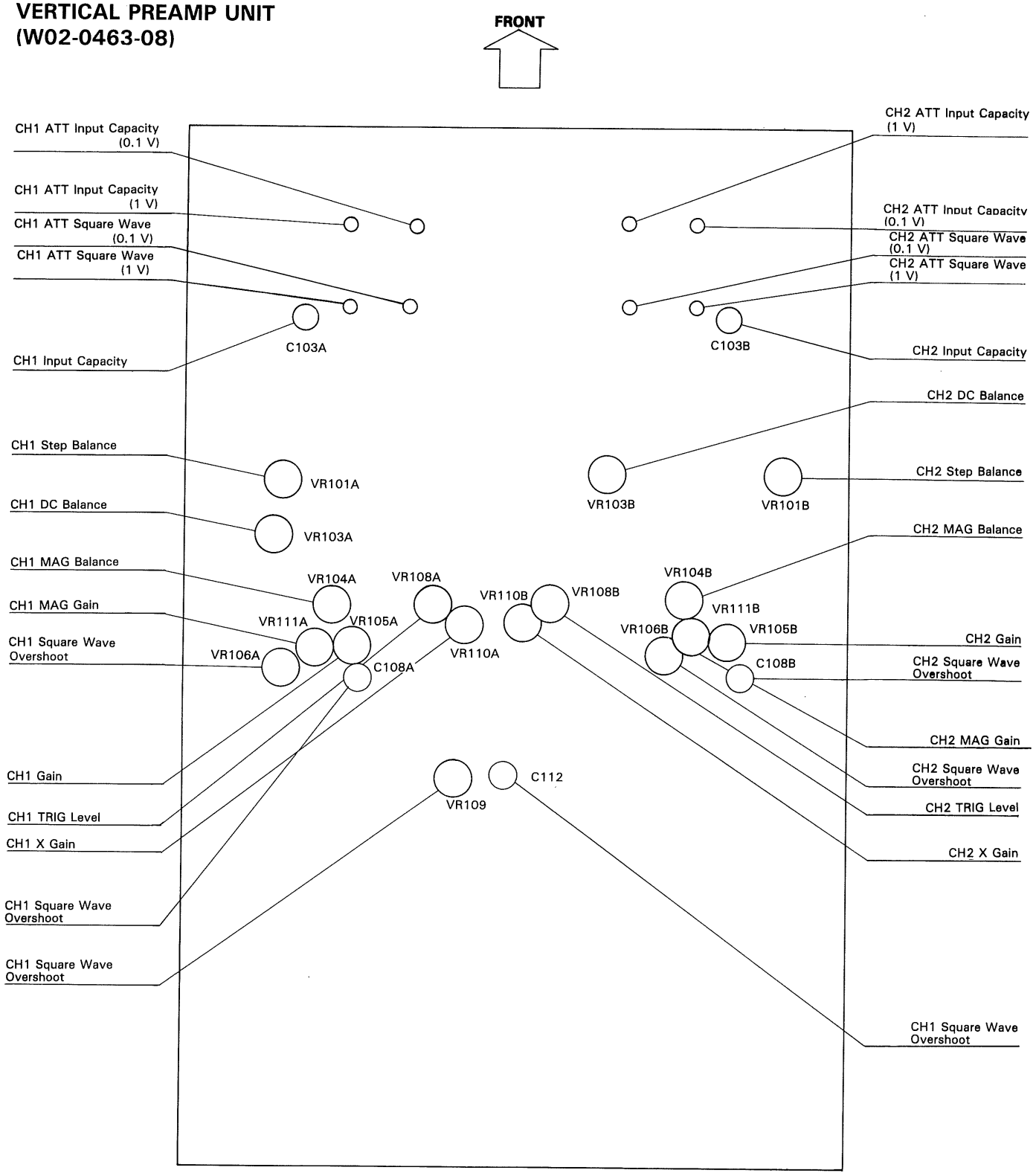
Item	Adjustment VR (C)	P.C.B.	Setting	Procedure
CH1 Square Wave Overshoot	C108A VR106A C112 VR109	W02-0463-08	VOLTS/DIV; 10 mV	
CH1 ATT Input Capacity		W02-0463-08	VOLTS/DIV; 0.1 V ; 1 V	Adjust the input capacity to 39 pF ±1 pF.
CH1 ATT Square Wave		W02-0463-08	VOLTS/DIV; 0.1 V ; 1 V	Input a square wave of 1 kHz, 5 divisions and adjust so that its waveform is flat.
CH2 Input Capacity	C103B	W02-0463-08	VOLTS/DIV; 10 mV	Adjust the input capacity to 39 pF ±1 pF.
CH2 Square Wave Overshoot	C108B VR106B	W02-0463-08	VOLTS/DIV; 10 mV	
CH2 ATT Input Capacity		W02-0463-08	VOLTS/DIV; 0.1 V ; 1 V	Adjust the input capacity to 39 pF ±1 pF.
CH2 ATT Square Wave		W02-0463-08	VOLTS/DIV; 0.1 V ; 1 V	Input a square wave of 1 kHz, 5 divisions and adjust so that its waveform is flat.
3. HORIZONTAL SECTION ADJUSTMENTS				
1 ms SWEEP TIME	VR302 VR307	W02-0464-08	SWEEP TIME/DIV; 1 ms	Adjust VR302 so that the sweep length is of 11 waves for 1 ms marker. After that, adjust VR307 so that the top of each wave is put on a graduation of the scale.
SWEEP Start point	VR313	W02-0464-08	SWEEP TIME/DIV; 1 ms	Adjust so that with VR313 set to the mechanical center position the start of the sweep is put on the left end of the scale.
MAG GAIN	VR306	W02-0464-08	SWEEP TIME/DIV; 1 ms ×5 MAG; PULL	Adjust so that with an input of 1 ms marker signal its amplitude is of 5 divisions.
MAG Center	VR308	W02-0464-08	SWEEP TIME/DIV; 1 ms ×5 MAG; PULL	Set the left end of the 1 ms marker signal to the center of the scale, then adjust so that with the setting of "×5 MAG" the left end comes to the center of the scale.
10 ms SWEEP TIME	VR301	W02-0464-08	SWEEP TIME/DIV; 10 ms	Adjust so that 10 ms marker signal is put on each graduation of the scale.
5 μs SWEEP TIME	VR303	W02-0464-08	SWEEP TIME/DIV; 5 μs	Adjust so that 5 μs maker signal is put on each graduation of the scale.
0.5 μs SWEEP TIME	VR304	W02-0464-08	SWEEP TIME/DIV; 0.5 μs	Adjust so that 0.5 μs marker signal is put on each graduation of the scale.
CH1 TRIG LEVEL	VR108A	W02-0463-08		Adjust so that with a 1 1 kHz sinewave input of 4 divisions the trigger point does not change even when selection is made between trigger coupling AC and DC.
CH2 TRIG LEVEL	VR108B	W02-0463-08		Adjust so that with a 1 kHz sinewave input of 4 divisions the trigger point does not change even when selection is made between trigger coupling AC and DC.
X-GAIN CH1	VR110A	W02-0463-08	SWEEP TIME/DIV; X-Y CH1 VOLTS/DIV; 10 mV V MODE or Y; CH2 TRIG or X; CH1	Adjust so that with a 1 kHz square wave input of 50 mV its amplitude is of 5 divisions.

ADJUSTMENT

Item	Adjustment VR (C)	P.C.B.	Setting	Procedure
X-GAIN CH2	VR110B	W02-0463-08	SWEEP TIME/DIV; X-Y CH2 VOLTS/DIV; 10 mV V MODE or Y; CH1 TRIG or X; CH2	Adjust so that with a 1 kHz square wave input of 50 mV its amplitude is of 5 divisions.
4. CAL ADJUSTMENT				
CAL Voltage frequency	VR805 VR806	W02-0466-08		Adjust VR805 so that the voltage at the CAL pin is 1 V ±3%. Adjust VR806 so that its frequency is 1 kHz ±3%.

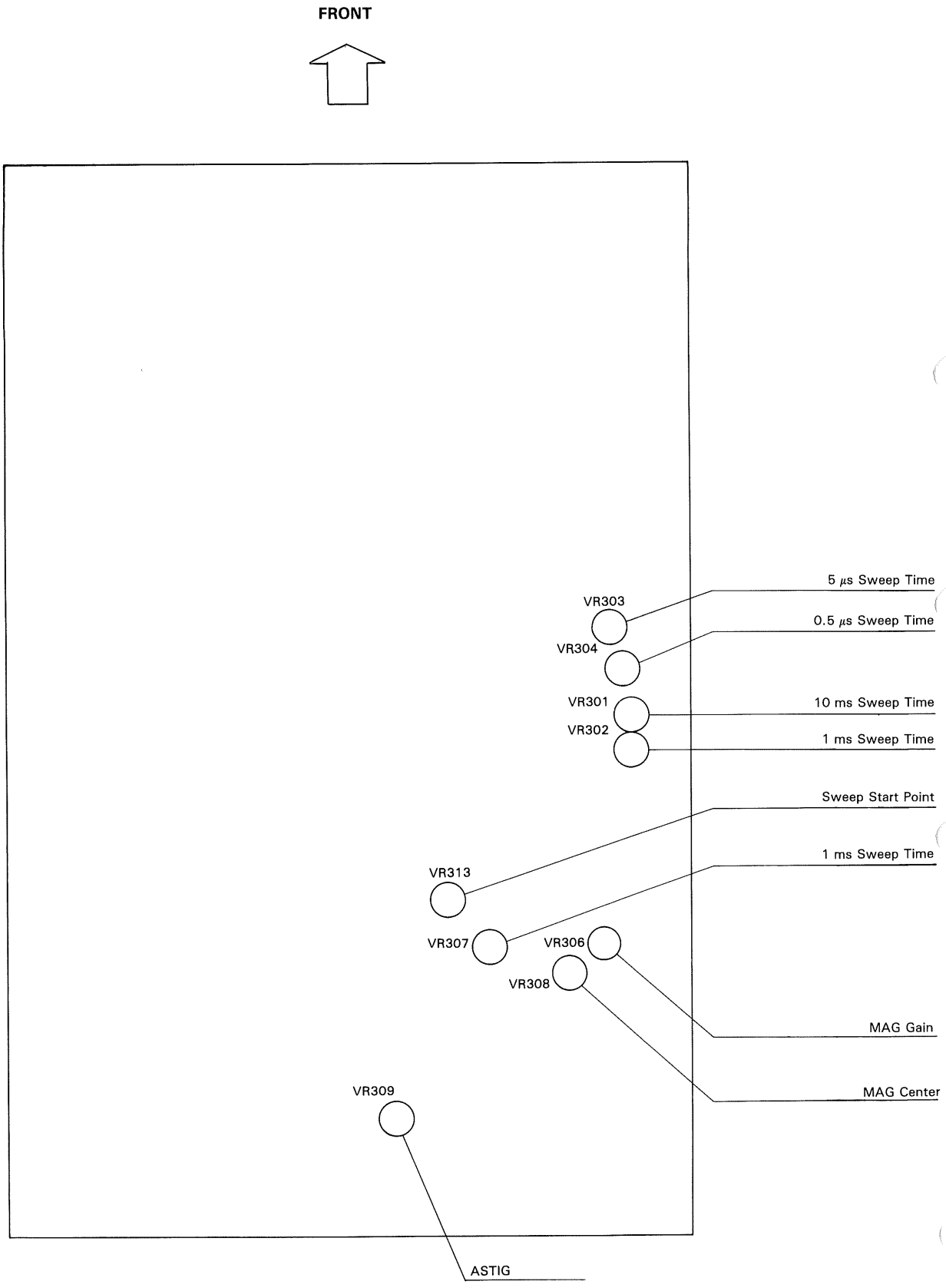
ADJUSTMENT

VERTICAL PREAMP UNIT (W02-0463-08)



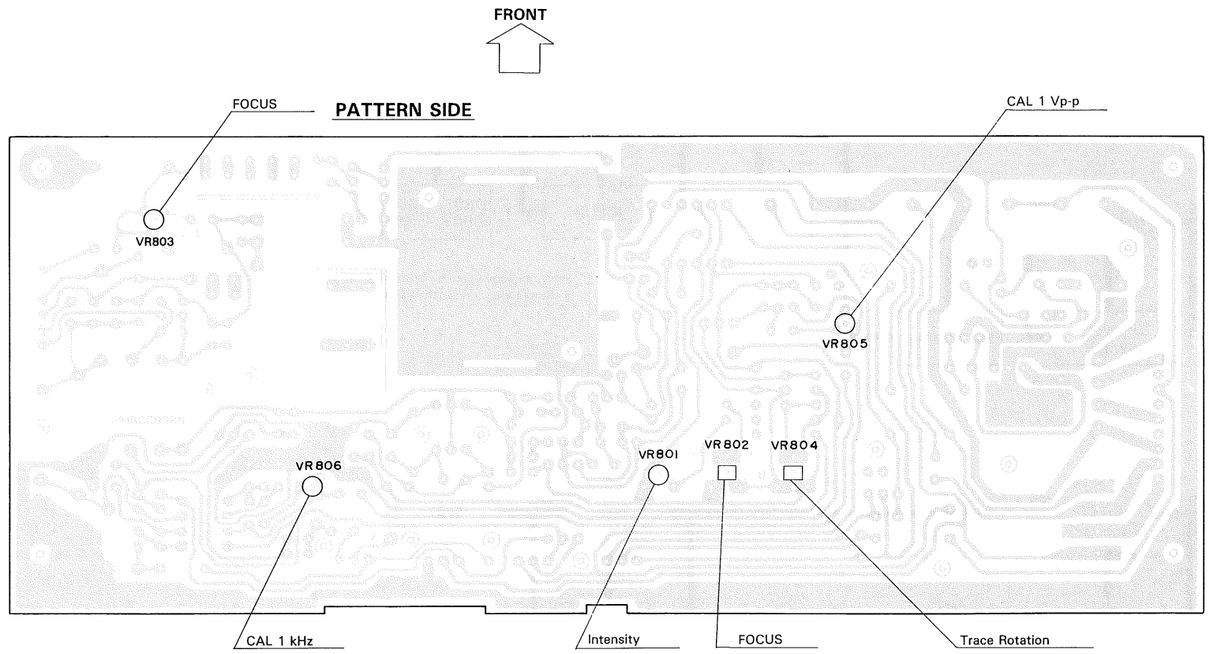
ADJUSTMENT

HORIZONTAL UNIT (W02-0464-08)

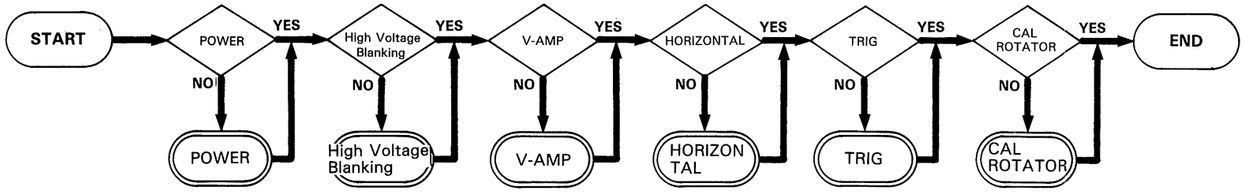


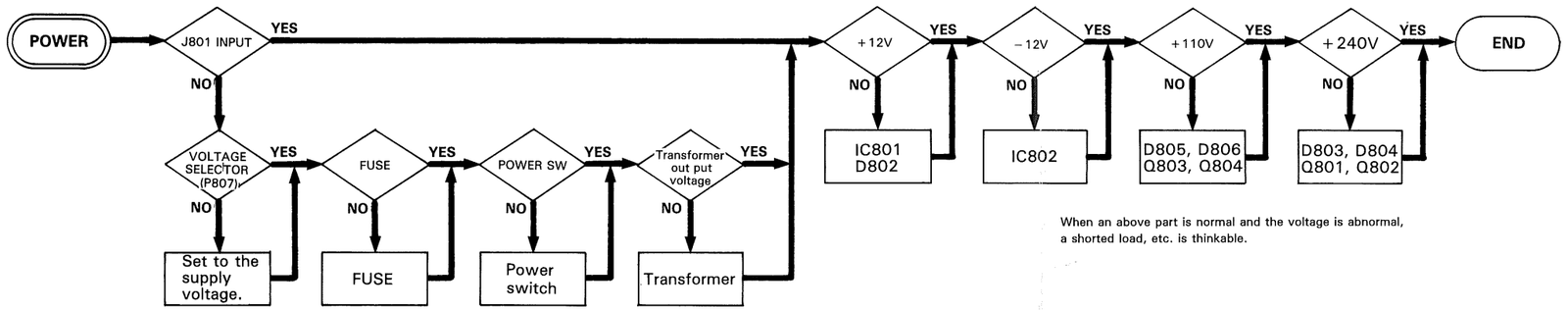
ADJUSTMENT

POWER SUPPLY & Z AXIS UNIT
(W02-0466-08)

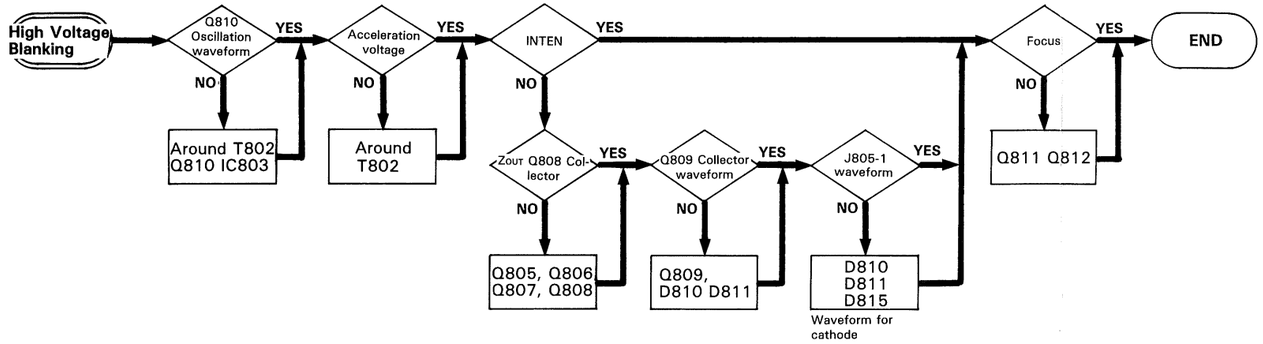


TROUBLESHOOTING

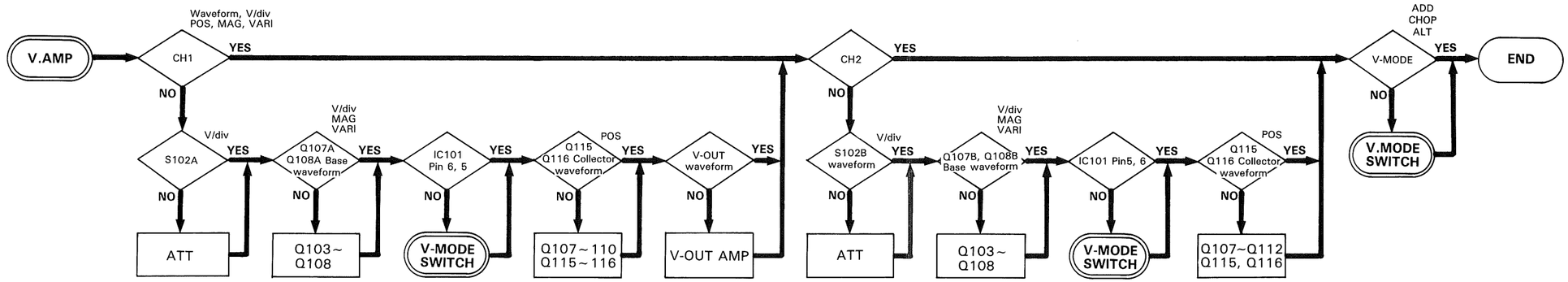


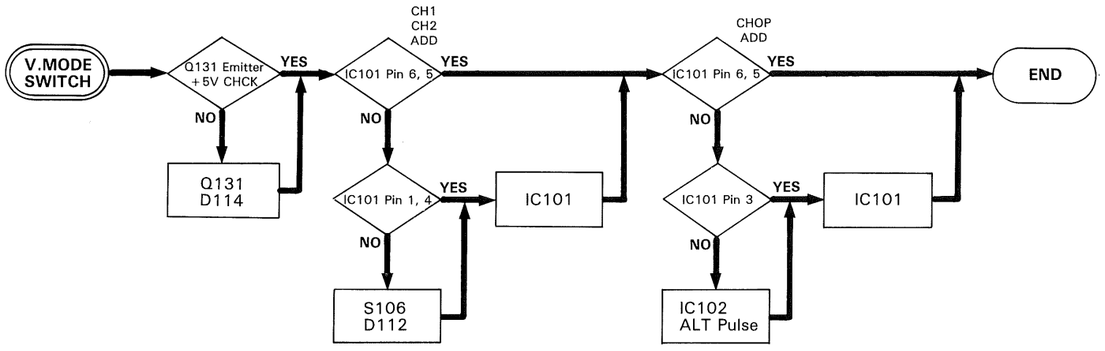


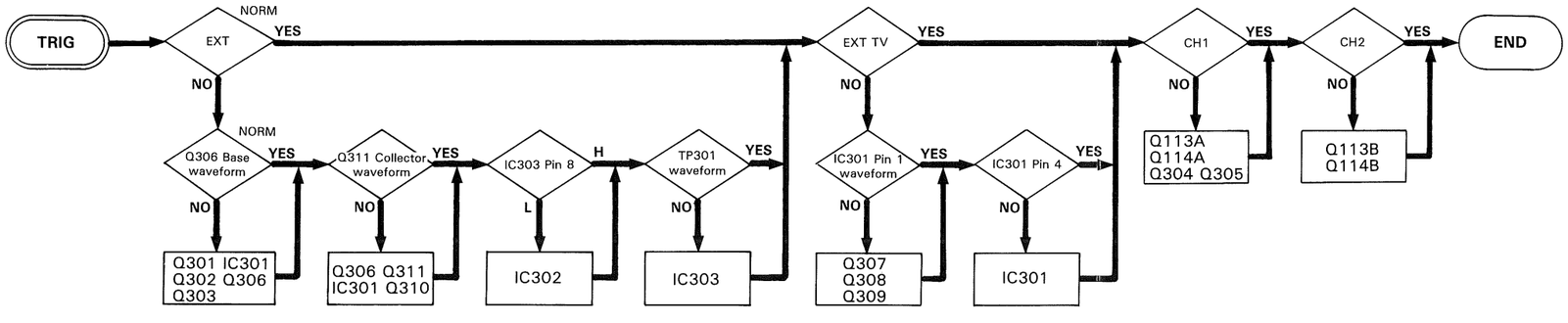
When an above part is normal and the voltage is abnormal, a shorted load, etc. is thinkable.

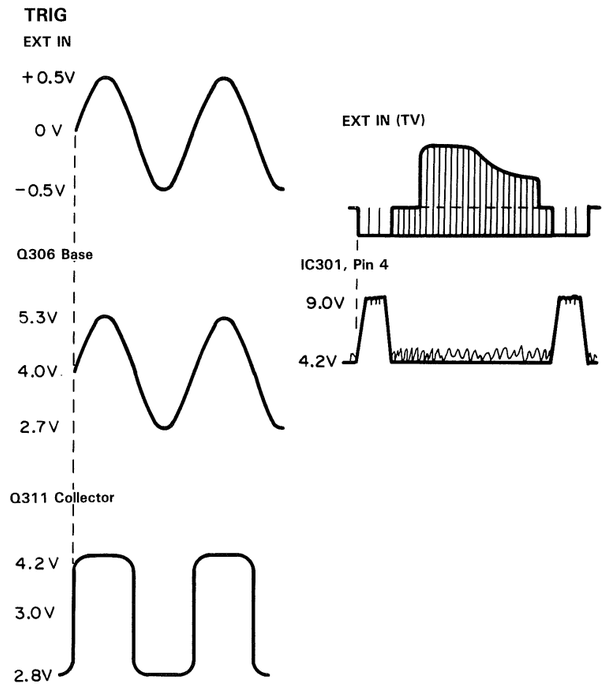


TROUBLESHOOTING

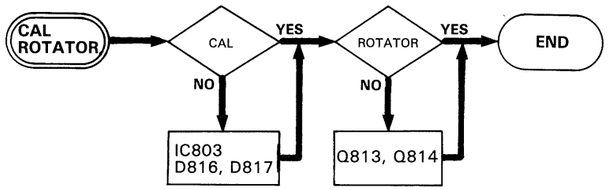


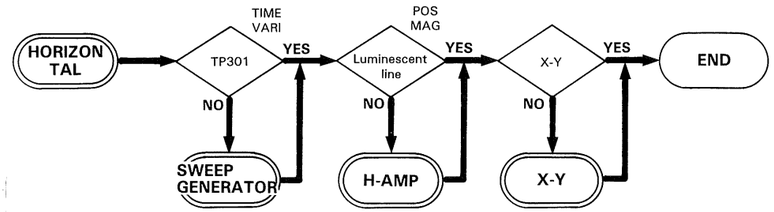


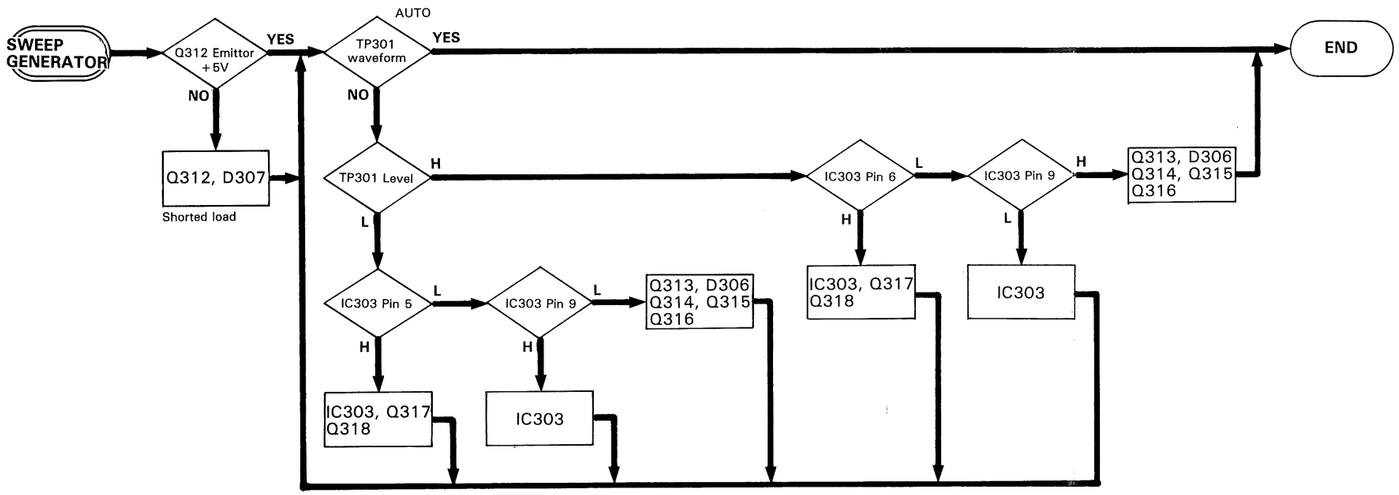


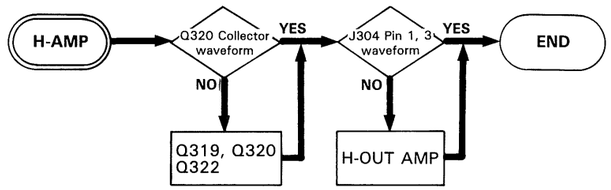


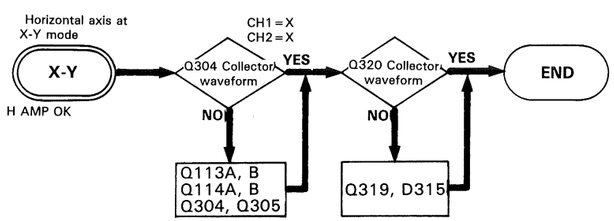
TROUBLESHOOTING





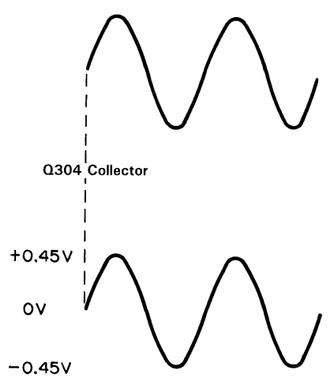






X-Y

Vin: Amplitude 6 div



CS-3025 UNIT

Y70-1660-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	B30-0967-08	LED;REF NO.D311
	B50-7682-00	INSTRUCTION MANUAL,JAPANESE
	B50-7683-00	INSTRUCTION MANUAL,ENGLISH
	E31-5592-08	WIRE ASS'Y;4P,J104-303
	E31-5593-08	WIRE ASS'Y;5P,J105-803
	E31-5594-08	WIRE ASS'Y;2P,J106-308
	E31-5595-08	WIRE ASS'Y;2P,J302-301
	E31-5596-08	WIRE ASS'Y;3P,J804-CAL,L801
	E31-5597-08	WIRE ASS'Y;7P,J305-802
	E31-5598-08	WIRE ASS'Y;7P,J306-307
	E31-5599-08	WIRE ASS'Y;2P,J309
	E31-5602-08	WIRE ASS'Y;6P,J805-806
	F05-3011-05	FUSE(6X30MM) 0.3A
	F05-3019-08	FUSE(5X20MM) 0.3A
	F05-5013-05	FUSE(6X30MM) 0.5A
	H01-5899-08	CARTON BOX
	H12-0577-08	PAD,TOP
	H12-0578-08	PAD,BOTTOM
	H12-0579-08	PAD,PLATE
	H20-1730-08	VINYL COVER
	J21-4647-08	BRACKET
	W03-2308-05	PROBE (PC-30)
P807A	E23-0569-08	CONNECTOR PIN WITH WIRE
P807B	E31-5604-08	CONNECTOR
1	A01-1208-08	CASE,TOP
2	A01-1209-08	CASE,BOTTOM
3	A20-2836-08	MOLDED PANEL
4	A21-1147-08	DECORATIVE PANEL
5	A21-1148-08	DECORATIVE PANEL
6	A22-0874-08	SUB PANEL
7	A23-1694-08	REAR PANEL
8	A50-0510-08	FRAME,RIGHT
9	A50-0511-08	FRAME,LEFT
10	B07-0719-08	ESCUTCHEON
11	B11-0508-08	FILTER
12	B40-2921-08	NAME PLATE,MODEL
13	D21-0920-08	SHAFT
14	D22-0505-08	COUPLING
15	E01-0107-08	CRT SOCKET
16	E04-0259-05	BNC RECEPTACLE
17	E21-0668-08	CAL TERMINAL
18	E23-0570-08	TERMINAL
19A	E30-1815-05	CEE POWER CORD
19B	E30-0571-15	SAA POWER CORD
19C	E30-0027-35	UL/CSA POWER CORD
19D	E30-1870-05	BS POWER CORD
19E	E30-1888-08	JIS POWER CORD
20	F07-0947-08	BRACKET,POWER SWITCH
21	F07-0953-08	COVER
22	F10-1608-08	FRAME,CENTER
23	F11-1219-08	SHIELD CASE
24	F11-1220-08	SHIELD CASE
25	F19-0718-08	BRACKET
26	F19-0721-08	BRACKET
27	F20-0678-08	ADHESIVE TAPE
28	G13-0726-08	CUSHION
29	G13-0727-08	CUSHION
30	J02-0522-08	RUBBER FOOT
31A	J13-0508-08	FUSE HOLDER,FOR 6X30MM FUSE
31B	J13-0509-08	FUSE HOLDER,ROR 5X20MM FUSE
32	J21-4643-08	BRACKET;CRT
33	J21-4644-08	BRACKET;CRT
34	J21-4645-08	HANDLE STEPPER
35	J21-4647-08	BRACKET
36A	J42-0547-08	BUSHING,FOR 2-WIRE CORD
36B	J42-0549-08	BUSHING,FOR 3-WIRE CORD
37	K01-0530-08	HANDLE
38	K21-0900-08	KNOB;SWEEP VARI
39	K21-0901-08	KNOB;SWEEP TIME/DIV
40	K21-0902-08	KNOB;POSITION,TRIG.LEVEL
41	K21-0903-08	KNOB;INTEN,VOLTS VARI
42	K21-0904-08	KNOB;VOLTS/DIV
43	K21-0905-08	KNOB;V OR Y MODE
44	K27-0528-14	KNOB,FOR PUSH SW
45	K27-0544-08	KNOB;POWER
46	L01-9806-08	POWER TRANSFORMER
47	L39-0529-08	ROTATOR COIL(REF NO.L801)
48	N09-0763-08	SCREW
49	S40-1527-08	POWER SWITCH
50	W01-0503-04	REAR RUBBER FOOT/CORD WRAP
51	W02-0463-08	VERTICAL PREAMP UNIT
52	W02-0464-08	HORIZONTAL UNIT
53	W02-0465-08	H-POSITION UNIT
54	W02-0466-08	POWER SUPPLY & Z AXIS UNIT
55	9S2TM31	CRT

VERTICAL PREAMP UNIT

W02-0463-08

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F01-0869-08	HEAT SINK			
	F10-1610-08	SHIELD PLATE			
	F10-1611-08	SHIELD PLATE			
	J25-5316-08	PCB (UNMOUNTED)			
C101A	C91-1289-08	CAP. POLYESTER	0.047	10%	400V
C101B	C91-1289-08	CAP. POLYESTER	0.047	10%	400V
C102A	CK45E2H103P	CAP. CERAMIC	0.01		500V
C102B	CK45E2H103P	CAP. CERAMIC	0.01		500V
C103A	C05-0066-05	CAP. TRIMMER	10P		
C103B	C05-0066-05	CAP. TRIMMER	10P		
C108A	C05-0401-05	CAP. TRIMMER	20P		
C108B	C05-0401-05	CAP. TRIMMER	20P		
C110A	CM93BD2A220J	CAP. MICA	22P	5%	100V
C110B	CM93BD2A220J	CAP. MICA	22P	5%	100V
C111A	CM93BD2A030D	CAP. MICA	3P	0.5P	100V
C111B	CM93BD2A030D	CAP. MICA	3P	0.5P	100V
C112	C05-0467-08	CAP. TRIMMER	40P		
C113	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C114A	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C114B	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C115A	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C115B	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C116	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C117A	CK45E2H103P	CAP. CERAMIC	0.01		500V
C117B	CK45E2H103P	CAP. CERAMIC	0.01		500V
C118A	CK45E2H103P	CAP. CERAMIC	0.01		500V
C118B	CK45E2H103P	CAP. CERAMIC	0.01		500V
C119	CF93AN2D332K	CAP. POLYESTER	3300P	10%	200V
C120	CK45E2H103P	CAP. CERAMIC	0.01		500V
C122	CF93AN2A472K	CAP. POLYESTER	4700P	10%	100V
C123	CF93AN2A472K	CAP. POLYESTER	4700P	10%	100V
C124	CF93AN2A472K	CAP. POLYESTER	4700P	10%	100V
C125	C91-1290-08	CAP. CERAMIC	100P	10%	50V
C126A	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C126B	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C127A	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C127B	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C128A	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C128B	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C129A	CF93AN2A102K	CAP. POLYESTER	1000P	10%	100V
C129B	CF93AN2A102K	CAP. POLYESTER	1000P	10%	100V
C130A	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C130B	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C131A	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C131B	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C132	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C133	CK45E2H103P	CAP. CERAMIC	0.01		500V
C134	C91-1291-08	CAP. CERAMIC	1000P	10%	50V
C135	C91-1291-08	CAP. CERAMIC	1000P	10%	50V
C136	C91-1291-08	CAP. CERAMIC	1000P	10%	50V
C137	C91-1291-08	CAP. CERAMIC	1000P	10%	50V
C138	C91-1291-08	CAP. CERAMIC	1000P	10%	50V
C139	C91-1291-08	CAP. CERAMIC	1000P	10%	50V
C140	CM93BD2A100D	CAP. MICA	10P	0.5P	100V
C141	CM93BD2A100D	CAP. MICA	10P	0.5P	100V
C142	CE04W1A101MR	CAP. ELECTRO	100	20%	10V
C143	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C144	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C145A	CM93BD2A220J	CAP. MICA	22P	5%	100V
D101A	1S2472	DIODE			
D101B	1S2472	DIODE			
D102A	1SS200	DIODE			
D102B	1SS200	DIODE			
D103A	1SS200	DIODE			
D103B	1SS200	DIODE			
D104A	1SS200	DIODE			
D104B	1SS200	DIODE			
D105A	1SS200	DIODE			
D105B	1SS200	DIODE			
D106A	1SS200	DIODE			
D106B	1SS200	DIODE			
D107	05Z5.1Y	DIODE, ZENER	5.1V		

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
D108	05Z5.1Y	DIODE, ZENER	5.1V		
D109	05Z5.1Y	DIODE, ZENER	5.1V		
D110A	05AZ2.2Z	DIODE, ZENER	2.2V		
D110B	05AZ2.2Z	DIODE, ZENER	2.2V		
D111	05Z5.1Y	DIODE, ZENER	5.1V		
D112	1SS201	DIODE			
D114	05Z5.6Y	DIODE, ZENER	5.6V		
D115	1S2472	DIODE			
IC101	SN74LS74AN	IC, D-FLIP FLOP			
IC102	SN74LS02N	IC, QUAD 2-INPUT NOR GATE			
J102A	E23-0571-08	PIN TERMINAL			
J102B	E23-0571-08	PIN TERMINAL			
J103A	E23-0571-08	PIN TERMINAL			
J103B	E23-0571-08	PIN TERMINAL			
J104	E40-7051-08	PIN CONNECTOR	4 P		
J105	E40-7046-08	PIN CONNECTOR	7 P		
J106	E40-7050-08	PIN CONNECTOR	2 P		
L101A	L37-0048-08	COIL	2.7UH	20%	
L101B	L37-0048-08	COIL	2.7UH	20%	
Q101A	2SK105(H)	FET, N-CHANNEL			
Q101B	2SK105(H)	FET, N-CHANNEL			
Q102A	2SK240(BL)	FET, N-CHANNEL			
Q102B	2SK240(BL)	FET, N-CHANNEL			
Q103A	2SC1809(P)	TR. SI, NPN			
Q103B	2SC1809(P)	TR. SI, NPN			
Q104A	2SC1809(P)	TR. SI, NPN			
Q104B	2SC1809(P)	TR. SI, NPN			
Q105A	2SC1809(P)	TR. SI, NPN			
Q105B	2SC1809(P)	TR. SI, NPN			
Q106A	2SC1809(P)	TR. SI, NPN			
Q106B	2SC1809(P)	TR. SI, NPN			
Q107A	2SA1005(K)	TR. SI, PNP			
Q107B	2SA1005(K)	TR. SI, PNP			
Q108A	2SA1005(K)	TR. SI, PNP			
Q108B	2SA1005(K)	TR. SI, PNP			
Q109A	2SA1005(L)	TR. SI, PNP			
Q109B	2SA1005(L)	TR. SI, PNP			
Q110A	2SA1005(L)	TR. SI, PNP			
Q110B	2SA1005(L)	TR. SI, PNP			
Q111B	2SA1005(L)	TR. SI, PNP			
Q112B	2SA1005(L)	TR. SI, PNP			
Q113A	2SA1005(L)	TR. SI, PNP			
Q113B	2SA1005(L)	TR. SI, PNP			
Q114A	2SA1005(L)	TR. SI, PNP			
Q114B	2SA1005(L)	TR. SI, PNP			
Q115	2SA1005(L)	TR. SI, PNP			
Q116	2SA1005(L)	TR. SI, PNP			
Q117	2SC1809(P)	TR. SI, NPN			
Q118	2SC1809(P)	TR. SI, NPN			
Q119	2SC1730	TR. SI, NPN			
Q120	2SC1730	TR. SI, NPN			
Q121	2SC3423	TR. SI, NPN			
Q122	2SC3423	TR. SI, NPN			
Q123	2SA1360(Y)	TR. SI, PNP			
Q124	2SA1360(Y)	TR. SI, PNP			
Q125	2SA1005(L)	TR. SI, PNP			
Q126	2SA1005(L)	TR. SI, PNP			
Q127	2SC3423	TR. SI, NPN			
Q128	2SC3423	TR. SI, NPN			
Q129	2SA1360(Y)	TR. SI, PNP			
Q130	2SA1360(Y)	TR. SI, PNP			
Q131	2SC1740(Q)	TR. SI, NPN			
R101A	RN14BK2E1004F	RES. METAL FILM	1M	1%	1/4W
R101B	RN14BK2E1004F	RES. METAL FILM	1M	1%	1/4W
R102A	RD14BB2E334J	RES. CARBON	330K	5%	1/4W
R102B	RD14BB2E334J	RES. CARBON	330K	5%	1/4W
R103A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R103B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R104A	RD14BB2E510J	RES. CARBON	51	5%	1/4W
R104B	RD14BB2E510J	RES. CARBON	51	5%	1/4W
R105A	RN14BK2E8200F	RES. METAL FILM	820	1%	1/4W
R105B	RN14BK2E8200F	RES. METAL FILM	820	1%	1/4W
R106A	RN14BK2E61R2D	RES. METAL FILM	61.2	0.5%	1/4W
R106B	RN14BK2E61R2D	RES. METAL FILM	61.2	0.5%	1/4W
R107A	RN14BK2E1600F	RES. METAL FILM	160	1%	1/4W
R107B	RN14BK2E1600F	RES. METAL FILM	160	1%	1/4W
R108A	RN14BK2E4502F	RES. METAL FILM	45K	1%	1/4W
R108B	RN14BK2E4502F	RES. METAL FILM	45K	1%	1/4W
R109A	RD14BB2E121J	RES. CARBON	120	5%	1/4W
R109B	RD14BB2E121J	RES. CARBON	120	5%	1/4W
R110A	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R110B	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R111A	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R111B	RN14BK2E3001F	RES. METAL FILM	3K	1%	1/4W
R112A	RN14BK2E5601F	RES. METAL FILM	5.6K	1%	1/4W
R112B	RN14BK2E5601F	RES. METAL FILM	5.6K	1%	1/4W
R113A	RN14BK2E5601F	RES. METAL FILM	5.6K	1%	1/4W
R113B	RN14BK2E5601F	RES. METAL FILM	5.6K	1%	1/4W
R114A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R114B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R115A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R115B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R116A	RD14BB2E163J	RES. CARBON	16K	5%	1/4W
R116B	RD14BB2E163J	RES. CARBON	16K	5%	1/4W
R117A	RD14BB2E752J	RES. CARBON	7.5K	5%	1/4W
R117B	RD14BB2E752J	RES. CARBON	7.5K	5%	1/4W
R118A	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R118B	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R119A	RN14BK2E4700F	RES. METAL FILM	470	1%	1/4W
R119B	RN14BK2E4700F	RES. METAL FILM	470	1%	1/4W
R120A	RN14BK2E4700F	RES. METAL FILM	470	1%	1/4W
R120B	RN14BK2E4700F	RES. METAL FILM	470	1%	1/4W
R121A	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R121B	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R122A	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R122B	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R123A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R123B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R125A	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R125B	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R126A	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R126B	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R128A	RD14BB2E362J	RES. CARBON	3.6K	5%	1/4W
R128B	RD14BB2E362J	RES. CARBON	3.6K	5%	1/4W
R129A	RD14BB2E362J	RES. CARBON	3.6K	5%	1/4W
R129B	RD14BB2E362J	RES. CARBON	3.6K	5%	1/4W
R130	R90-0666-08	RES. ARRAY	4X8.2K		
R132A	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R132B	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R133A	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R133B	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R134B	RD14BB2E912J	RES. CARBON	9.1K	5%	1/4W
R135B	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R137A	RD14BB2E912J	RES. CARBON	9.1K	5%	1/4W
R137B	RD14BB2E822J	RES. CARBON	8.2K	5%	1/4W
R138A	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R138B	RD14BB2E162J	RES. CARBON	1.6K	5%	1/4W
R139	RD14BB2E301J	RES. CARBON	300	5%	1/4W
R140	RD14BB2E301J	RES. CARBON	300	5%	1/4W
R141	RD14BB2E301J	RES. CARBON	300	5%	1/4W
R142	RD14BB2E301J	RES. CARBON	300	5%	1/4W
R143	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R144	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R145	RD14BB2E431J	RES. CARBON	430	5%	1/4W
R146	RD14BB2E751J	RES. CARBON	750	5%	1/4W
R147	RD14BB2E751J	RES. CARBON	750	5%	1/4W
R148	RD14BB2E431J	RES. CARBON	430	5%	1/4W
R149	RD14BB2E431J	RES. CARBON	430	5%	1/4W
R150	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R151	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R153A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R153B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R156	RD14BB2E622J	RES. CARBON	6.2K	5%	1/4W
R157	RD14BB2E622J	RES. CARBON	6.2K	5%	1/4W
R158	RN14BK2H2702F	RES. METAL FILM	27K	1%	1/2W
R159	RN14BK2H2702F	RES. METAL FILM	27K	1%	1/2W
R160	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R161	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R162	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R163	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R164	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R165	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R166	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R167	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R168	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R169	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R170	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R171	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R172	RD14BB2E913J	RES. CARBON	91K	5%	1/4W
R173	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R174	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R175	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R176	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R177	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R178	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R179	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R180	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R181	RD14BB2E101J	RES. CARBON	100	5%	1/4W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R182	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R183	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R184	RD14BB2E222J	RES. CARBON	2.2K	5%	1/4W
R185	RD14BB2E512J	RES. CARBON	5.1K	5%	1/4W
R186	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R187	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R188	RD14BB2E242J	RES. CARBON	2.4K	5%	1/4W
R189A	RD14BB2E203J	RES. CARBON	20K	5%	1/4W
R189B	RD14BB2E203J	RES. CARBON	20K	5%	1/4W
R190	RD14BB2E471J	RES. CARBON	470	5%	1/4W
R191	RD14BB2E471J	RES. CARBON	470	5%	1/4W
R192	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R194A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R194B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R195A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R195B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R196A	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R196B	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R197A	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R197B	RD14BB2E511J	RES. CARBON	510	5%	1/4W
S101A	S33-2507-08	LEVER SWITCH			
S101B	S33-2507-08	LEVER SWITCH			
S102A	S02-3503-08	ATTENUATOR			
S102B	S02-3503-08	ATTENUATOR			
S104	S42-2516-08	PUSH SWITCH			
S106	S03-4503-08	ROTARY SWITCH			
TP1	E23-0571-08	PIN TERMINAL			
VR101A	R12-0586-08	RES. SEMI FIXED	100 B		
VR101B	R12-0586-08	RES. SEMI FIXED	100 B		
VR103A	R12-0588-08	RES. SEMI FIXED	220 B		
VR103B	R12-0588-08	RES. SEMI FIXED	220 B		
VR104A	R12-0587-08	RES. SEMI FIXED	330 B		
VR104B	R12-0587-08	RES. SEMI FIXED	330 B		
VR105A	R12-0416-05	RES. SEMI FIXED			
VR105B	R12-0416-05	RES. SEMI FIXED			
VR106A	R12-1553-08	RES. SEMI FIXED	2.2KB		
VR106B	R12-1553-08	RES. SEMI FIXED	2.2KB		
VR107A	R05-3517-08	V.R.	10KB		
VR107B	R05-3517-08	V.R.	10KB		
VR108A	R12-1412-05	RES. SEMI FIXED			
VR108B	R12-1412-05	RES. SEMI FIXED			
VR109	R12-1412-05	RES. SEMI FIXED			
VR110A	R12-1412-05	RES. SEMI FIXED			
VR110B	R12-1412-05	RES. SEMI FIXED			
VR111A	R12-3428-05	RES. SEMI FIXED			
VR111B	R12-3428-05	RES. SEMI FIXED			

HORIZONTAL UNIT

W02-0464-08

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J25-5315-08	PCB (UNMOUNTED)			
C301	C91-1292-08	CAP. CERAMIC	0.1		
C302	CF93AN2D103K	CAP. POLYESTER	0.01	10%	200V
C303	CM93BF2A221J	CAP. MICA	220P	5%	100V
C304	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C305	NO USE				
C306	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C307	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C308	CE04W1HOR1MR	CAP. ELECTRO	0.1	20%	50V
C309	CE04W1H100MR	CAP. ELECTRO	10	20%	50V
C310	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C311	CF93AN2D332K	CAP. POLYESTER	3300P	10%	200V
C312	CM93BF2A121J	CAP. MICA	120P	5%	100V
C313	CM93BF2A151J	CAP. MICA	150P	5%	100V
C314	CF92V1H102J	CAP. POLYESTER	1000P	5%	50V
C315	CM93BF2A270J	CAP. MICA	27P	5%	100V
C316	NO USE				
C317	CM93BD2A150J	CAP. MICA	15P	5%	100V
C318	C91-1301-08	CAP. POLYESTER	2.2	10%	100V
C319	CF92V1H223J	CAP. POLYESTER	0.022	5%	50V
C320	CM93BF2A221J	CAP. MICA	220P	5%	100V
C321	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C322	CE04W1E220MR	CAP. ELECTRO	22	20%	25V
C323	CE04W1E220MR	CAP. ELECTRO	22	20%	25V
C324	CF92V1H104K	CAP. POLYESTER	0.1	10%	50V
C325	CF92V1H222K	CAP. POLYESTER	2200P	10%	50V
C326	C91-1288-08	CAP. CERAMIC	330	10%	50V
C327	CM93BD2A030D	CAP. MICA	3P	0.5P	100V
C328	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C329	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C330	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C331	CM93BD2A010D	CAP. MICA	1P	0.5P	100V

REF.NO	PARTS NO	NAME & DESCRIPTION			
C332	CK45E2H103P	CAP. CERAMIC	0.01		500V
C333	C91-1286-08	CAP. POLYESTER	0.047	10%	2KV
C334	CK45E2H103P	CAP. CERAMIC	0.01		500V
C335	CK45E2H103P	CAP. CERAMIC	0.01		500V
C336	CK45E2H103P	CAP. CERAMIC	0.01		500V
C337	CF92V1H333J	CAP. PLASTIC FILM	0.033	5%	50V
C338	CK45E2H103P	CAP. CERAMIC	0.01		500V
C339	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C340	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C341	NO USE				
C342	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C345	CF92V1H102K	CAP. POLYESTER	1000P	10%	50V
C346	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C347	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C348	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C349	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C350	CM93BF2A390J	CAP. MICA	39P	5%	100V
C351	CE04W2V010MR	CAP. ELECTRO	1	20%	350V
C352	CE04W1E101MR	CAP. ELECTRO	100	20%	25V
C353	CE04W1C330MR	CAP. ELECTRO	33	20%	16V
C354	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C355	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C356	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C357	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C358	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C359	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C360	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C361	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C362	CF92V1H152J	CAP. POLYESTER	1500P	5%	50V
C363	C91-1287-08	CAP. CERAMIC	390	10%	50V
C364	CM93BF2A470J	CAP. MICA	47P	5%	100V
C365	CM93BD2A200J	CAP. MICA	20P	5%	100V
C366	CF92V1H103K	CAP. POLYESTER	0.01	10%	50V
C367	CM93BD2A220J	CAP. MICA	22P	5%	100V
C368	CF93AN2D332K	CAP. POLYESTER	3300P	10%	200V
C369	CM93BF2A151J	CAP. MICA	150P	5%	100V
D301	1S1587	DIODE			
D302	1SS201	DIODE			
D303	1SS201	DIODE			
D304	1SS201	DIODE			
D305	1S2472	DIODE			
D306	1S1587	DIODE			
D307	05Z5.6Y	DIODE, ZENER	5.6V		
D308	1SS200	DIODE			
D309	1SS200	DIODE			
D312	1S2472	DIODE			
D313	05Z6.2Y	DIODE, ZENER	6.2V		
D314	05Z5.1Y	DIODE, ZENER	5.1V		
D315	1S2472	DIODE			
D316	05Z8.2Y	DIODE, ZENER	8.2V		
IC301	TC4053BP	IC, 2-CH ANALOG MULTIPLEXER			
IC302	SN74LS122N	IC, RETRIGG. MONO. MULTIVIB.			
IC303	SN74LS74AN	IC, D-FLIP FLOP			
J302	E40-7050-08	PIN CONNECTOR	2 P		
J303	E40-7051-08	PIN CONNECTOR	4 P		
J304	E40-7046-08	PIN CONNECTOR	7 P		
J305	E40-7048-08	PIN CONNECTOR	7 P		
J306	E40-7048-08	PIN CONNECTOR	7 P		
J307	NO USE				
J308	E40-7050-08	PIN CONNECTOR	2 P		
Q301	2SK240(BL)	FET, N-CHANNEL			
Q302	2SC1809(Q)	TR. SI, NPN			
Q303	2SC1809(Q)	TR. SI, NPN			
Q304	2SA1005(L)	TR. SI, PNP			
Q305	2SA1005(L)	TR. SI, PNP			
Q306	2SA933(Q)	TR. SI, PNP			
Q307	2SC1740(Q)	TR. SI, NPN			
Q308	2SA1005(L)	TR. SI, PNP			
Q309	2SA1005(L)	TR. SI, PNP			
Q310	2SA1005(L)	TR. SI, PNP			
Q311	2SA1005(L)	TR. SI, PNP			
Q312	2SC1740(Q)	TR. SI, NPN			
Q313	2SK117(GR)	FET. N-CHANNEL			
Q314	2SC1740(Q)	TR. SI, NPN			
Q315	2SA1005(L)	TR. SI, PNP			
Q316	2SA1005(L)	TR. SI, PNP			
Q317	2SC1809(Q)	TR. SI, NPN			
Q318	2SA1005(L)	TR. SI, PNP			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q319	2SA933(Q)	TR. SI, PNP			
Q320	2SC1740(Q)	TR. SI, NPN			
Q321	2SA1005(K)	TR. SI, PNP			
Q322	2SA1005(K)	TR. SI, PNP			
Q323	2SK583	FET, N-CHANNEL			
Q324	2SA933(Q)	TR. SI, PNP			
Q325	2SA933(Q)	TR. SI, PNP			
Q326	2SC3503	TR. SI, NPN			
Q327	2SC3503	TR. SI, NPN			
Q328	2SA1381	TR. SI, PNP			
Q329	2SA1381	TR. SI, PNP			
Q330	2SK583	FET, N-CHANNEL			
R3A0	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R3A1	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R3A3	RD14BB2E683J	RES. CARBON	68K	5%	1/4W
R3A4	RD14BB2E363J	RES. CARBON	36K	5%	1/4W
R3A5	RD14BB2E514J	RES. CARBON	510K	5%	1/4W
R3A7	RD14BB2E203J	RES. CARBON	20K	5%	1/4W
R3A8	RD14BB2E123J	RES. CARBON	12K	5%	1/4W
R3A9	RD14BB2E153J	RES. CARBON	15K	5%	1/4W
R3B0	RD14BB2E912J	RES. CARBON	9.1K	5%	1/4W
R3B1	RD14BB2E393J	RES. CARBON	39K	5%	1/4W
R3B2	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R3B7	RD14BB2E244J	RES. CARBON	240K	5%	1/4W
R3B8	RD14BB2E510J	RES. CARBON	51	5%	1/4W
R3B9	RD14BB2E510J	RES. CARBON	51	5%	1/4W
R3C1	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R3C2	RD14BB2E560J	RES. CARBON	56	5%	1/4W
R301	RD14BB2E201J	RES. CARBON	200	5%	1/4W
R302	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R303	RD14BB2E304J	RES. CARBON	300K	5%	1/4W
R304	RD14BB2E512J	RES. CARBON	5.1K	5%	1/4W
R305	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R306	RD14BB2E510J	RES. CARBON	51	5%	1/4W
R307	RD14BB2E362J	RES. CARBON	3.6K	5%	1/4W
R308	RD14BB2E362J	RES. CARBON	3.6K	5%	1/4W
R309	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R310	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R311	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R312	NO USE				
R313	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R314	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R315	RD14BB2E182J	RES. CARBON	1.8K	5%	1/4W
R316	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R317	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R318	RD14BB2E821J	RES. CARBON	820	5%	1/4W
R319	RD14BB2E821J	RES. CARBON	820	5%	1/4W
R320	RD14BB2E512J	RES. CARBON	5.1K	5%	1/4W
R321	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R322	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R323	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R324	RD14BB2E242J	RES. CARBON	2.4K	5%	1/4W
R325	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R326	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R327	RD14BB2E302J	RES. CARBON	3K	5%	1/4W
R328	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R329	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R330	RD14BB2E392J	RES. CARBON	3.9K	5%	1/4W
R331	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R332	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R333	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R334	RD14BB2E223J	RES. CARBON	22K	5%	1/4W
R335	RD14BB2E512J	RES. CARBON	5.1K	5%	1/4W
R336	NO USE				
R337	RD14BB2E152J	RES. CARBON	1.5K	5%	1/4W
R338	RD14BB2E243J	RES. CARBON	24K	5%	1/4W
R339	RD14BB2E151J	RES. CARBON	150	5%	1/4W
R340	RD14BB2E393J	RES. CARBON	39K	5%	1/4W
R341	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R342	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R343	RD14BB2E133J	RES. CARBON	13K	5%	1/4W
R344	RD14BB2E163J	RES. CARBON	16K	5%	1/4W
R345	RD14BB2E153J	RES. CARBON	15K	5%	1/4W
R346	RD14BB2E822J	RES. CARBON	8.2K	5%	1/4W
R347	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R348	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R349	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R350	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R351	RD14BB2E432J	RES. CARBON	4.3K	5%	1/4W
R352	RN14BK2H4994F	RES. METAL FILM	4.99M	1%	1/2W
R353	RN14BK2H4994F	RES. METAL FILM	4.99M	1%	1/2W
R354	RN14BK2E2004F	RES. METAL FILM	2M	1%	1/4W
R355	RN14BK2E1004F	RES. METAL FILM	1M	1%	1/4W
R356	RN14BK2E5003F	RES. METAL FILM	500K	1%	1/4W
R357	RN14BK2E2003F	RES. METAL FILM	200K	1%	1/4W
R358	RN14BK2E1003F	RES. METAL FILM	100K	1%	1/4W
R359	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R360	RD14BB2E751J	RES. CARBON	750	5%	1/4W
R361	RD14BB2E512J	RES. CARBON	5.1K	5%	1/4W
R362	RD14BB2E132J	RES. CARBON	1.3K	5%	1/4W
R363	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R364	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R365	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R366	NO USE				
R367	RD14BB2E472J	RES. CARBON	4.7K	5%	1/4W
R368	NO USE				
R369	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
R370	RD14BB2E153J	RES. CARBON	15K	5%	1/4W
R371	RD14BB2E363J	RES. CARBON	36K	5%	1/4W
R372	RD14BB2E203J	RES. CARBON	20K	5%	1/4W
R373	RD14BB2E822J	RES. CARBON	8.2K	5%	1/4W
R374	RD14BB2E221J	RES. CARBON	220	5%	1/4W
R375	RD14BB2E132J	RES. CARBON	1.3K	5%	1/4W
R376	RD14BB2E134J	RES. CARBON	130K	5%	1/4W
R377	RD14BB2E134J	RES. CARBON	130K	5%	1/4W
R378	RN14BK2E8872F	RES. METAL FILM	88.7K	1%	1/4W
R379	RN14BK2E7371F	RES. METAL FILM	7.37K	1%	1/4W
R380	RN14BK2E7371F	RES. METAL FILM	7.37K	1%	1/4W
R381	RN14BK2H1203F	RES. METAL FILM	120K	1%	1/2W
R382	RN14BK2H1203F	RES. METAL FILM	120K	1%	1/2W
R383	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R384	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R385	RD14BB2E273J	RES. CARBON	27K	5%	1/4W
R386	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R387	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R388	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R389	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R390	RD14BB2E304J	RES. CARBON	300K	5%	1/4W
R391	RD14BB2E304J	RES. CARBON	300K	5%	1/4W
R392	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R393	NO USE				
R394	RD14BB2E273J	RES. CARBON	27K	5%	1/4W
R395	NO USE				
R396	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R397	RD14BB2E123J	RES. CARBON	12K	5%	1/4W
R398	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R399	RD14BB2E101J	RES. CARBON	100	5%	1/4W
S301	S40-1525-08	PUSH SWITCH			
S307	S29-3504-08	ROTARY SWITCH			
TP301	E23-0571-08	PIN TERMINAL			
TP302	E23-0571-08	PIN TERMINAL			
TP303	E23-0571-08	PIN TERMINAL			
VR301	R12-1408-05	RES. SEMI FIXED	4.7KB		
VR302	R12-1408-05	RES. SEMI FIXED	4.7KB		
VR303	R12-1408-05	RES. SEMI FIXED	4.7KB		
VR304	R12-1408-05	RES. SEMI FIXED	4.7KB		
VR305	R05-3516-08	V.R.	500 B		
VR306	R12-0585-08	RES. SEMI FIXED	470 B		
VR307	R12-1553-08	RES. SEMI FIXED	2.2KB		
VR308	R12-5406-05	RES. SEMI FIXED	100KB		
VR309	R12-5404-05	RES. SEMI FIXED	220KB		
VR313	R12-3427-05	RES. SEMI FIXED	10KB		

PARTS LIST

H-POSITION UNIT

W02-0465-08

REF.NO	PARTS NO	NAME & DESCRIPTION		
	J25-5317-08	PCB (UNMOUNTED)		
J307	E40-7046-08	PIN CONNECTOR	7 P	
J308	NO USE			
J309	E40-7050-08	PIN CONNECTOR	2 P	
R393	RD14BB2E392J	RES. CARBON	3.9K 5%	1/4W
VR310	R29-3502-08	V.R.	10K	
VR311	R05-3518-08	V.R.	2X10KB	
VR312	R05-3518-08	V.R.	2X10KB	

POWER SUPPLY & Z AXIS UNIT

W02-0466-08

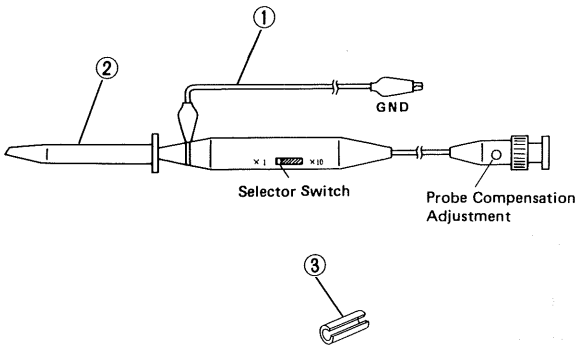
REF.NO	PARTS NO	NAME & DESCRIPTION			
	F01-0870-08	HEAT SINK			
	F11-1222-08	SHIELD CASE			
	F20-0682-08	SPACER(IC801B/802B,Q801B/803B)			
	F29-0513-08	SPACER(IC801A/802A,Q801A/803A)			
	J25-5318-08	PCB (UNMOUNTED)			
	J39-0524-08	SPACER			
C801	C90-0989-08	CAP. ELECTRO	47	20%	200V
C802	C90-0989-08	CAP. ELECTRO	47	20%	200V
C803	C90-0990-08	CAP. ELECTRO	1	20%	315V
C804	C90-0988-08	CAP. ELECTRO	1000	20%	35V
C805	C90-0988-08	CAP. ELECTRO	1000	20%	35V
C806	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C807	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C808	CE04W1H470MR	CAP. ELECTRO	47	20%	50V
C809	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C810	CF92V1H224J	CAP. POLYESTER	0.22	5%	50V
C811	C91-1284-08	CAP. CERAMIC	470		2KV
C812	C91-1285-08	CAP. CERAMIC	6800		2KV
C813	C91-1285-08	CAP. CERAMIC	6800		2KV
C814	C91-1285-08	CAP. CERAMIC	6800		2KV
C815	C91-1285-08	CAP. CERAMIC	6800		2KV
C816	CE04W1E101MR	CAP. ELECTRO	100	20%	25V
C817	CF92AN2A223K	CAP. POLYESTER	0.022	10%	100V
C818	NO USE				
C819	C91-1283-08	CAP. POLYESTER	0.022	10%	
C820	NO USE				
C821	C91-1285-08	CAP. CERAMIC	6800		2KV
C822	C91-1285-08	CAP. CERAMIC	6800		2KV
C823	NO USE				
C824	CM93BD2A010D	CAP. MICA	1P	0.5P	100V
C825	CM93BD2A020D	CAP. MICA	2P	0.5P	100V
C826	CK45E2H103P	CAP. CERAMIC	0.01		500V
C827	CK45E2H103P	CAP. CERAMIC	0.01		500V
C828	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C829	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C830	CF92AN2D103K	CAP. POLYESTER	0.01	10%	200V
C831	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C832	CF92V1H102J	CAP. POLYESTER	1000P	5%	50V
C833	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C834	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C835	CF92V1H103J	CAP. POLYESTER	0.01	5%	50V
C836	NO USE				
C837	CM93BF2A151J	CAP. MICA	150P	5%	100V
C838	CF92V1H332J	CAP. POLYESTER	3300P	5%	50V
D801	1G4B41	DIODE,STACK			
D802	1G4B41	DIODE,STACK			
D803	05Z62	DIODE, ZENER	62V		
D804	05Z62	DIODE, ZENER	62V		
D805	05Z51Y	DIODE, ZENER	51V		
D806	05Z62	DIODE, ZENER	62V		
D807	1SS201	DIODE			
D808	1S2472	DIODE			
D809	1S2091	DIODE			
D810	05Z82	DIODE, ZENER	82V		
D811	05Z82	DIODE, ZENER	82V		
D812	ESJA52-12	DIODE, HIGH VOLTAGE			
D813	ESJA52-12	DIODE, HIGH VOLTAGE			
D814	1SR124-400A	DIODE,HIGH VOLTAGE			
D815	05Z82	DIODE, ZENER	82V		
D816	1S2472	DIODE			
D817	05Z6.8Y	DIODE, ZENER	6.8V		

REF.NO	PARTS NO	NAME & DESCRIPTION			
IC801	UA78M12UC	IC, POSITIVE VOLTAGE REGULATOR			
IC802	UA79M12AUC	IC, NEGATIVE VOLTAGE REGULATOR			
IC803	TL082CP	IC, OP AMP			
J801	E40-7049-08	PIN CONNECTOR	9 P		
J802	E40-7048-08	PIN CONNECTOR	7 P		
J803	E40-7046-08	PIN CONNECTOR	7 P		
J804	E40-7045-08	PIN CONNECTOR	3 P		
J805	E40-7047-08	PIN CONNECTOR	6 P		
Q801	2SC3503	TR. SI, NPN			
Q802	2SC2240	TR. SI, NPN			
Q803	2SC3503	TR. SI, NPN			
Q804	2SC2240	TR. SI, NPN			
Q805	2SC1740(Q)	TR. SI, NPN			
Q806	2SC1740(Q)	TR. SI, NPN			
Q807	2SA1381	TR. SI, PNP			
Q808	2SC3503	TR. SI, NPN			
Q809	2SC3503	TR. SI, NPN			
Q810	2SD880(GR)	TR. SI, NPN			
Q811	2SA1091(O)	TR. SI, PNP			
Q812	2SA1091(O)	TR. SI, PNP			
Q813	2SC1740(Q)	TR. SI, NPN			
Q814	2SA933(Q)	TR. SI, PNP			
R801	RD14BB2E512J	RES. CARBON	5.1K	5%	1/4W
R802	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R803	RD14BB2E513J	RES. CARBON	51K	5%	1/4W
R804	RD14BB2E510J	RES. CARBON	51	5%	1/4W
R805	RD14BB2E100J	RES. CARBON	10	5%	1/4W
R806	RD14BB2E335J	RES. CARBON	3.3M	5%	1/4W
R807	RD14BB2E393J	RES. CARBON	39K	5%	1/4W
R808	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R809	RD14BB2E113J	RES. CARBON	11K	5%	1/4W
R810	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R811	RD14BB2E821J	RES. CARBON	820	5%	1/4W
R812	RD14BB2E202J	RES. CARBON	2K	5%	1/4W
R813	RD14BB2E623J	RES. CARBON	62K	5%	1/4W
R814	RD14BB2E683J	RES. CARBON	68K	5%	1/4W
R815	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R816	RD14BB2E272J	RES. CARBON	2.7K	5%	1/4W
R817	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R818	RD14BB2E333J	RES. CARBON	33K	5%	1/4W
R819	RD14BB2E475J	RES. CARBON	4.7M	5%	1/4W
R820	RD14BB2E203J	RES. CARBON	20K	5%	1/4W
R821	RD14BB2E754J	RES. CARBON	750K	5%	1/4W
R822	RD14BB2E103J	RES. CARBON	10K	5%	1/4W
R823	RD14BB2E120J	RES. CARBON	12	5%	1/4W
R824	RD14BB2E101J	RES. CARBON	100	5%	1/4W
R825	R92-1438-08	RES. FUSE	5.1	5%	1/2W
R826	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R827	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R828	RD14BB2E511J	RES. CARBON	510	5%	1/4W
R829	RN14BK2E3303F	RES. METAL FILM	330K	1%	1/4W
R830	R92-1437-08	RES. CARBON	47M	2%	
R831	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R832	RD14BB2E104J	RES. CARBON	100K	5%	1/4W
R833	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R834	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R835	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R836	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R837	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R838	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R839	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R840	RD14BB2E155J	RES. CARBON	1.5M	5%	1/4W
R841	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R842	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R843	RD14BB2E391J	RES. CARBON	390	5%	1/4W
R844	RD14BB2E393J	RES. CARBON	39K	5%	1/4W
R845	RD14BB2E204J	RES. CARBON	200K	5%	1/4W
R846	RD14BB2E184J	RES. CARBON	180K	5%	1/4W
R847	RD14BB2E122J	RES. CARBON	1.2K	5%	1/4W
R848	RD14BB2E332J	RES. CARBON	3.3K	5%	1/4W
R849	RD14BB2E102J	RES. CARBON	1K	5%	1/4W
R850	RD14BB2E683J	RES. CARBON	68K	5%	1/4W
R851	RD14BB2E753J	RES. CARBON	75K	5%	1/4W
R852	RD14BB2E474J	RES. CARBON	470K	5%	1/4W
R853	RD14BB2E513J	RES. CARBON	51K	5%	1/4W
T802	L19-0423-08	CONVERTOR TRANSFORMER			
VR801	R12-3428-05	RES. SEMI FIXED			
VR802	R12-8516-08	RES. SEMI FIXED 50KB			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
VR803	R12-8514-08	RES. SEMI FIXED 2.2MB
VR804	R12-8515-08	RES. SEMI FIXED 20KB
VR805	R12-1408-05	RES. SEMI FIXED 4.7KB
VR806	R12-3427-05	RES. SEMI FIXED 10KB
W001	R92-1061-05	JUMPING RES. ZERO OHM (5MM)

MODEL PC-30 (LOW CAPACITY PROBE)

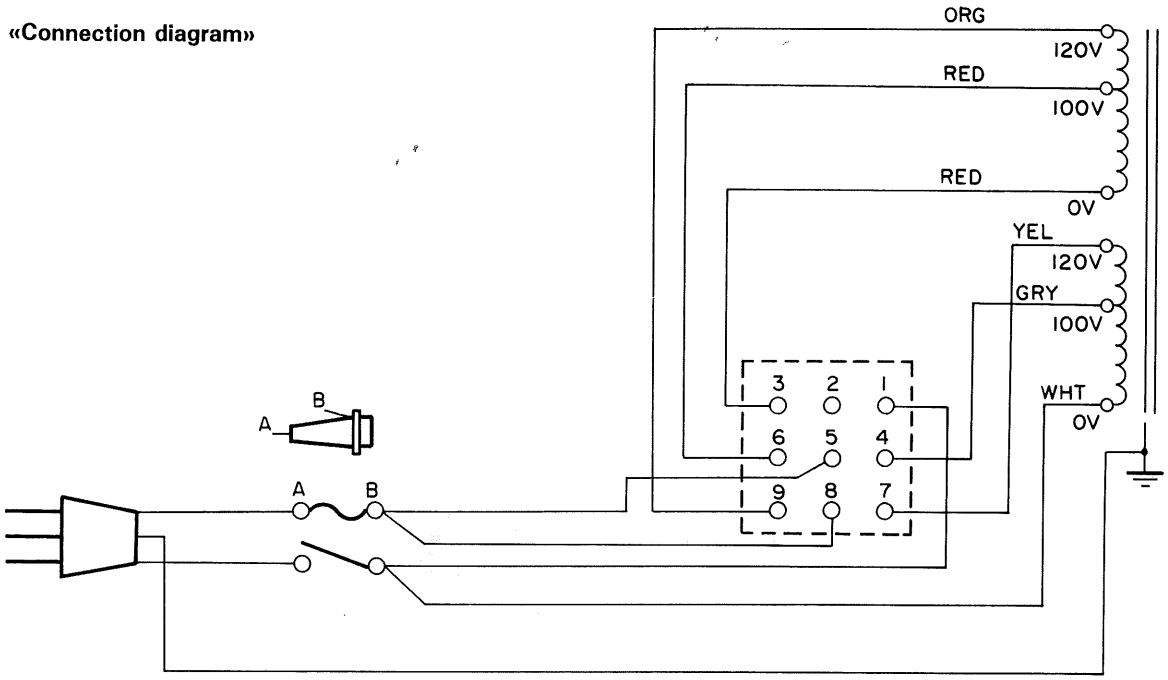


ITEM	DESCRIPTION	PARTS NO.
①	Ground Wire Assembly	E30-1883-08
②	Retractable Hook Tip	E29-0540-08
③	Marker (Orange)	B42-1950-08

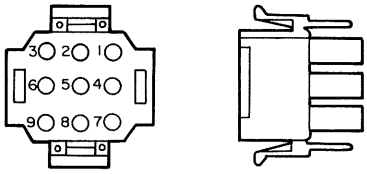
W03-2308-05

SUPPLY VOLTAGE SELECTION METHOD

«Connection diagram»



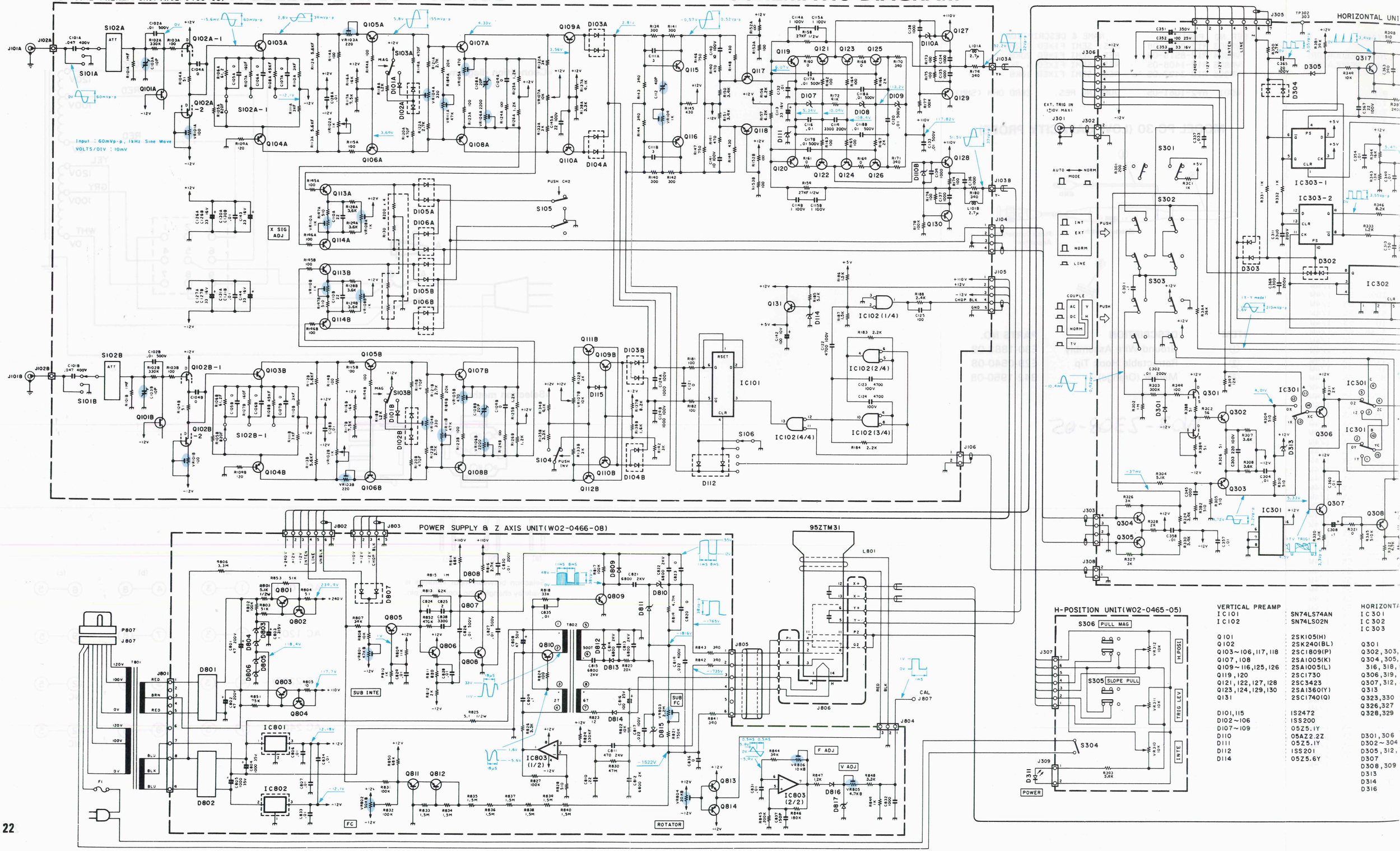
«Selection method»



Selection between input voltages is made by changing the connection pin.

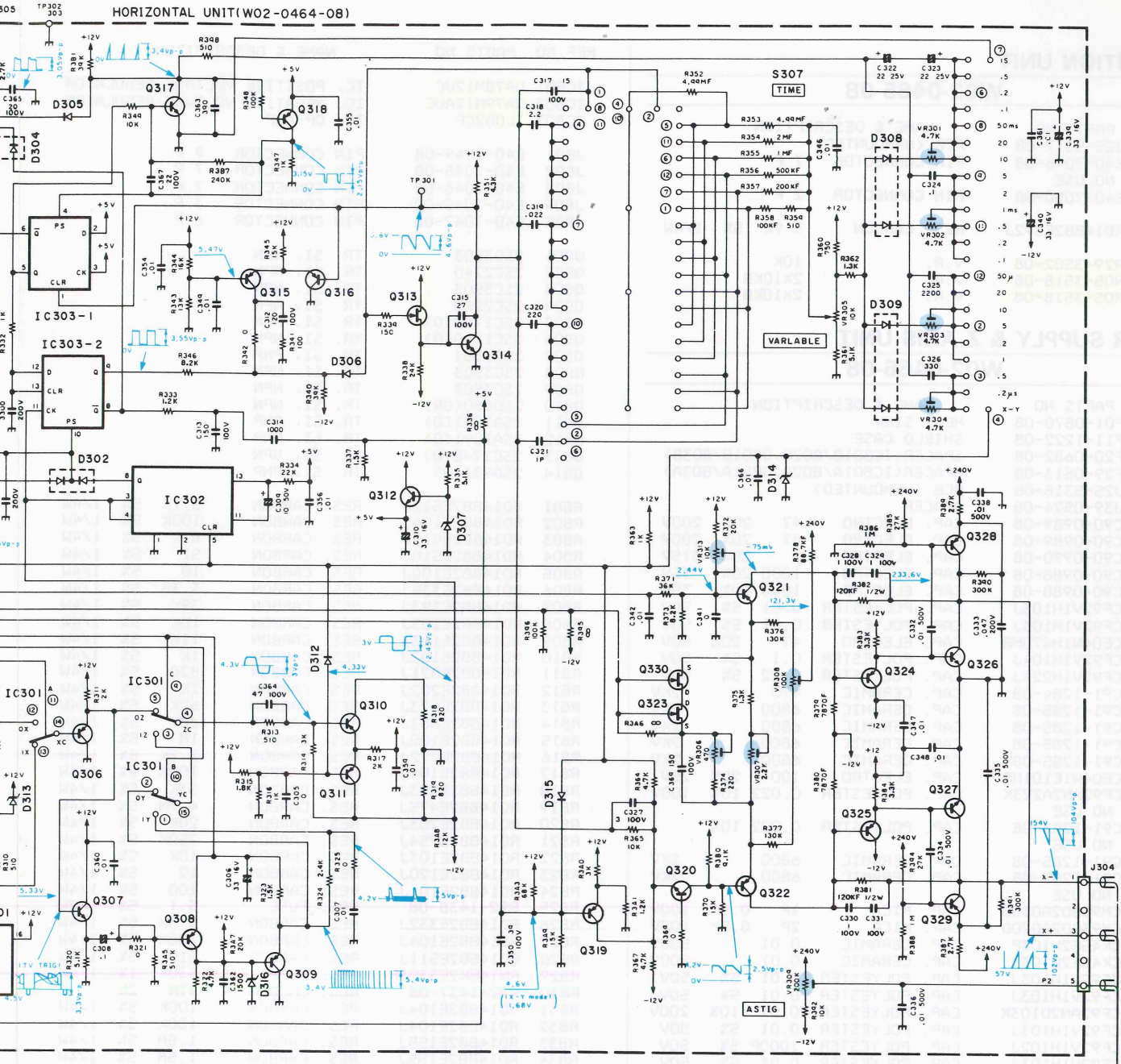
	(a)	(b)	(c)
AC 100 V~	1—3	4—8	6—5
AC 120 V~	1—3	7—8	9—5
AC 220 V~	4—3	9—8	2—5 NC
AC 240 V~	7—3	9—8	2—5 NC

SCHEMATIC DIAGRAM



VERTICAL PREAMP		HORIZONTAL	
IC101	: SN74LS74AN	IC301	
IC102	: SN74LS02N	IC302	
		IC303	
Q101	: 2SK105(H)	Q301	
Q102	: 2SK240(BL)	Q302, 303,	
Q103~106, 117, 118	: 2SC1809(P)	Q304, 305,	
Q107, 108	: 2SA1005(K)	316, 318,	
Q109~116, 125, 126	: 2SA1005(L)	Q306, 319,	
Q119, 120	: 2SC1730	Q307, 312,	
Q121, 122, 127, 128	: 2SC3423	Q313	
Q123, 124, 129, 130	: 2SA1360(Y)	Q323, 330	
Q131	: 2SC1740(Q)	Q326, 327	
		Q328, 329	
D101, 115	: IS2472		
D102~106	: ISS200		
D107~109	: 05Z5.1Y	D301, 306	
D110	: 05AZ2.2Z	D302~304	
D111	: 05Z5.1Y	D305, 312,	
D112	: ISS201	D307	
D114	: 05Z5.6Y	D308, 309	
		D313	
		D314	
		D316	

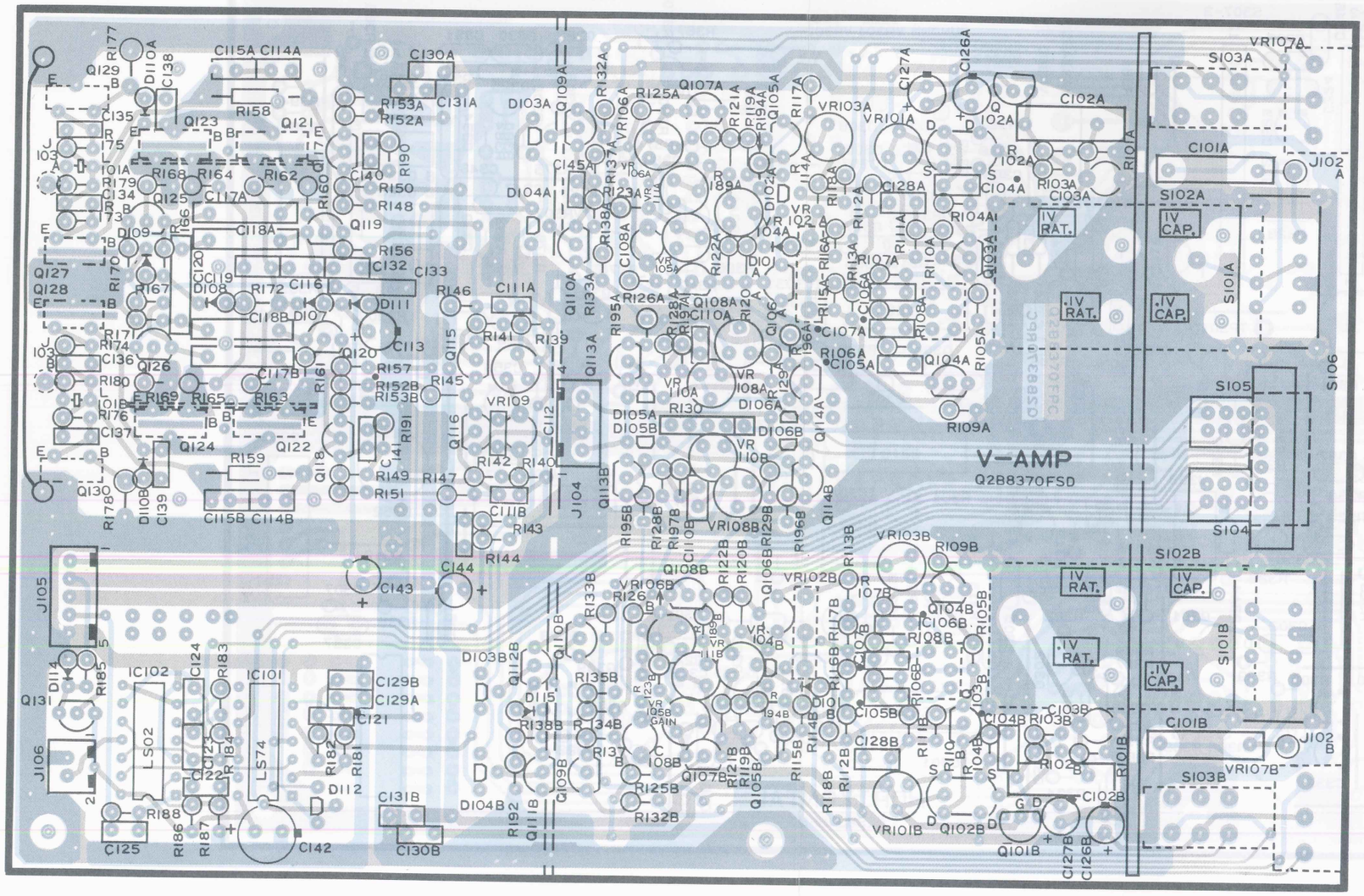
HORIZONTAL UNIT(W02-0464-08)



	HORIZONTAL			POWER SUPPLY	
SN74LS74AN	IC301	TC4053BP	IC801	UA78M12UC
SN74LS02N	IC302	SN74LS122N	IC802	UA79M12AUC
	IC303	SN74LS74AN	IC803	TL082CP
2SK105(H)				
2SK240(BL)	Q301	2SK240(BL)	Q801,803,808,809	2SC3503
2SC1809(P)	Q302,303,317	2SC1809(Q)	Q802,804	2SC2240
2SA1005(K)	Q304,305,308~311,315		Q805,806,813	2SC1740(Q)
2SA1005(L)	316,318,321,322	2SA1005(L)	Q807	2SA1381
2SC1730	Q306,319,324,325	2SA933(Q)	Q810	2SD880(GR)
2SC3423	Q307,312,314,320	2SC1740(Q)	Q811,812	2SA1091(O)
2SA1360(Y)	Q313	2SK117(GR)	Q814	2SA933(Q)
2SC1740(Q)	Q323,330	2SK583		
	Q326,327	2SC3503	D801,802	1G4B41
IS2472	Q328,329	2SA1381	D803,804,806	05Z62
ISS200			D805	05Z5.1Y
05Z5.1Y			D807	ISS201
05AZ2.2Z	D301,306	IS1587	D808,816	IS2472
05Z5.1Y	D302~304	ISS201	D809	IS2091
ISS201	D305,312,315	IS2472	D810,811,815	05Z82
05Z5.6Y	D307	05Z5.6Y	D812,813	ESJA5S-12
	D308,309	ISS200	D814	ISR124-400A
	D313	05Z6.2Y	D817	05Z6.8Y
	D314	05Z5.1Y		
	D316	05Z8.2Y		

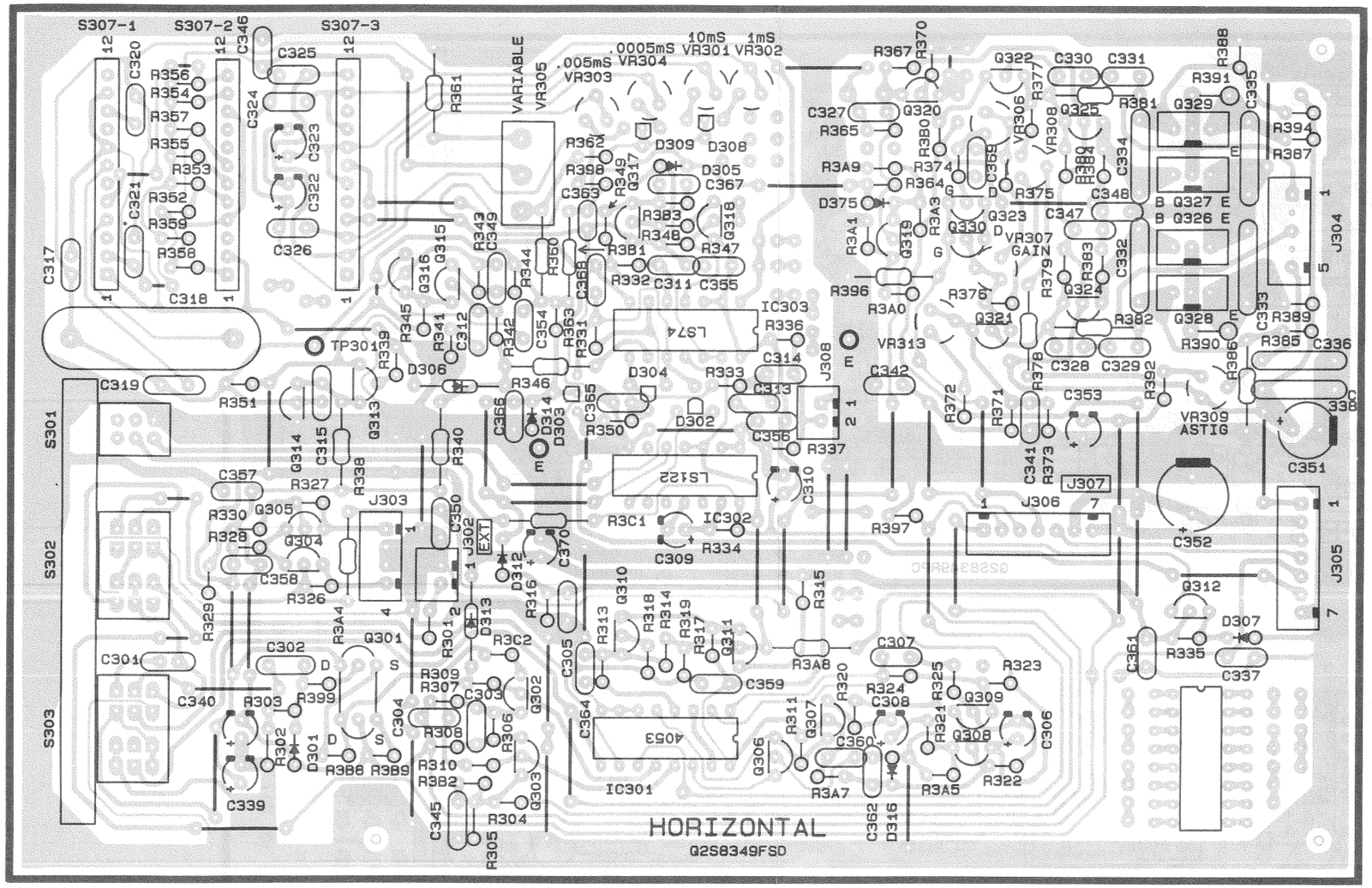
P.C. BOARD

VERTICAL PREAMP UNIT (W02-0463-08)



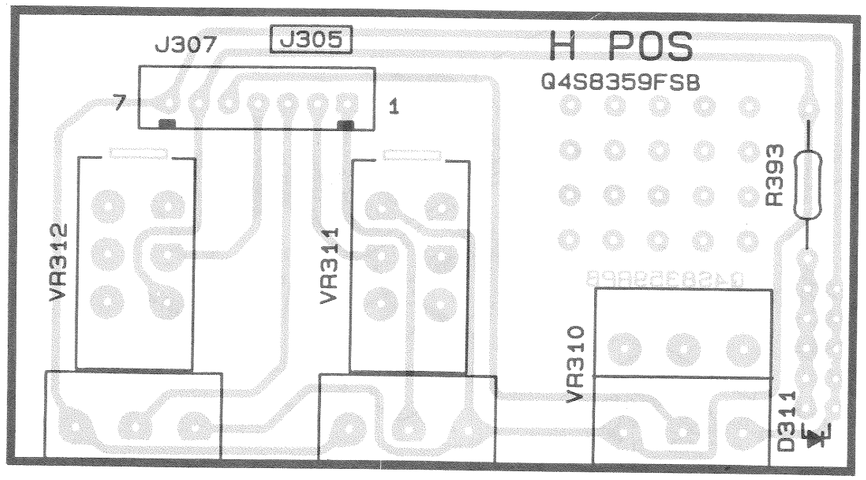
P.C. BOARD

HORIZONTAL UNIT (W02-0464-08)

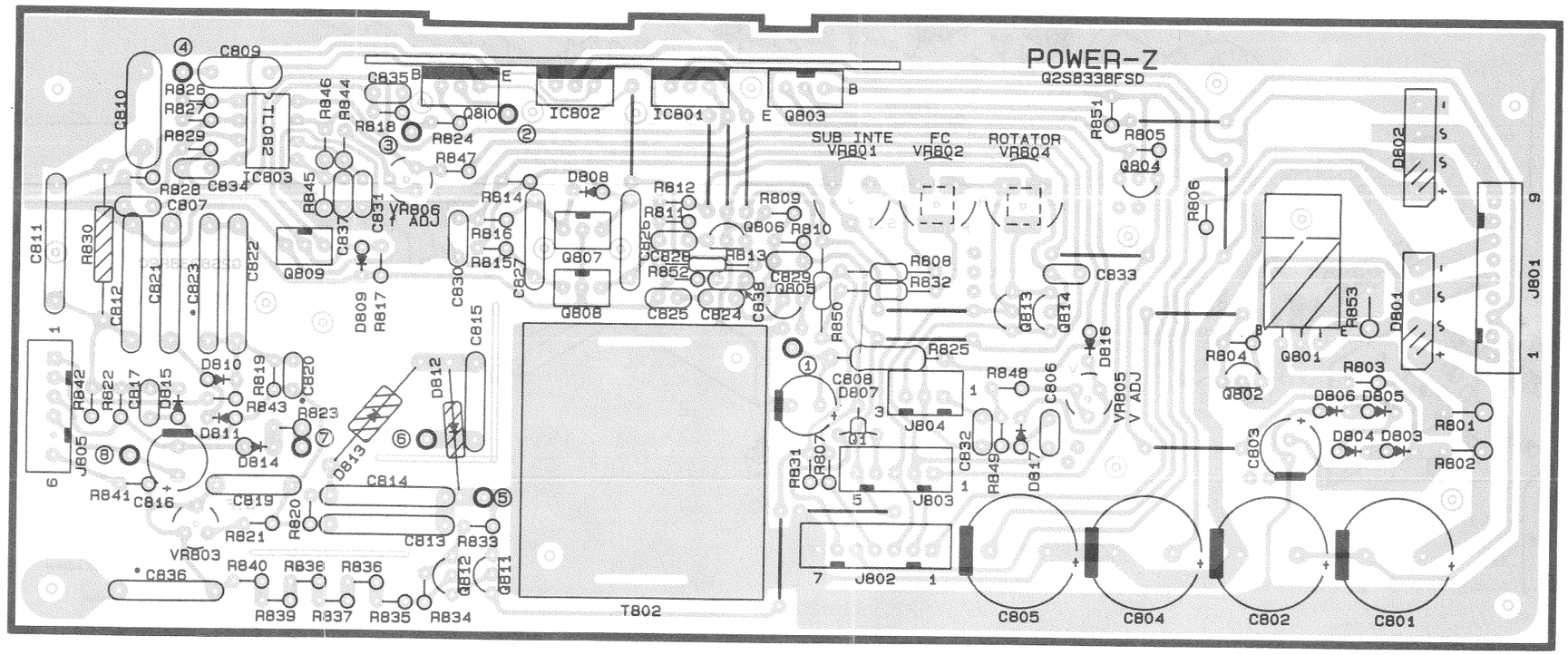


P.C. BOARD

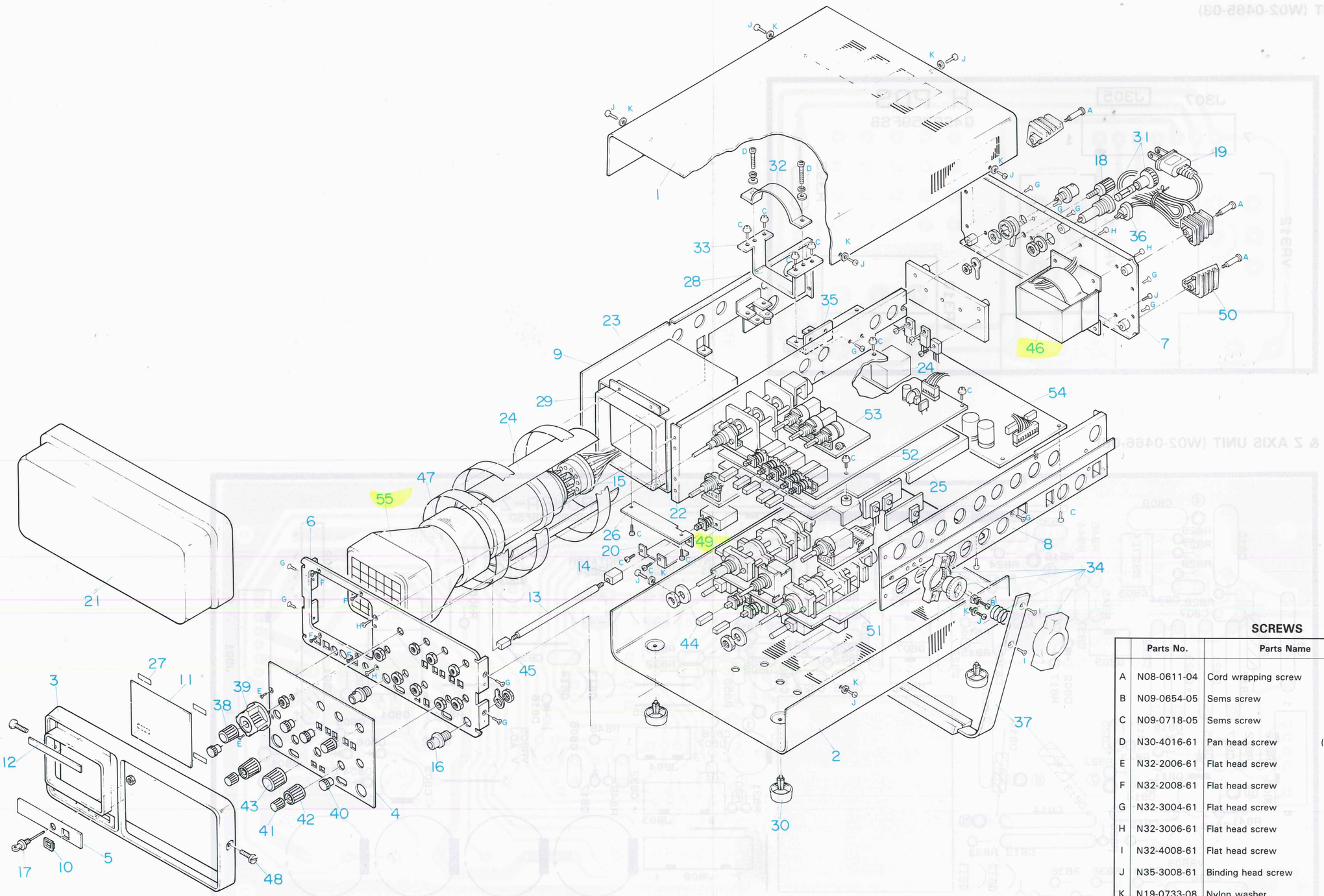
H-POSITION UNIT (W02-0465-08)



POWER SUPPLY & Z AXIS UNIT (W02-0466-08)



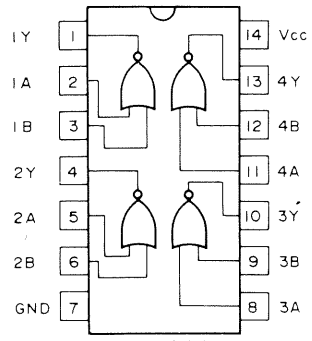
DISASSEMBLY



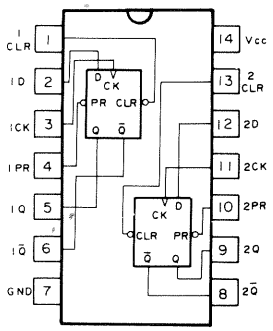
SCREWS

	Parts No.	Parts Name		Figure
A	N08-0611-04	Cord wrapping screw		
B	N09-0654-05	Sems screw	(M4×8)	
C	N09-0718-05	Sems screw	(M3×6)	
D	N30-4016-61	Pan head screw	(M4×16)	
E	N32-2006-61	Flat head screw	(M2×6)	
F	N32-2008-61	Flat head screw	(M2×8)	
G	N32-3004-61	Flat head screw	(M3×4)	
H	N32-3006-61	Flat head screw	(M3×6)	
I	N32-4008-61	Flat head screw	(M4×8)	
J	N35-3008-61	Binding head screw	(M3×8)	
K	N19-0733-08	Nylon washer	(φ3)	

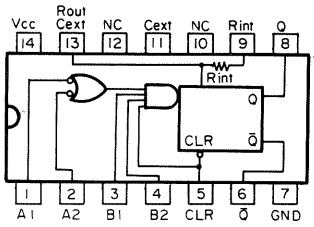
SEMICONDUCTORS



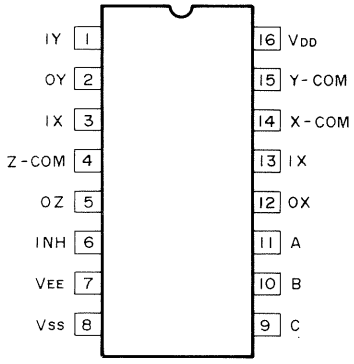
SN74LS02N



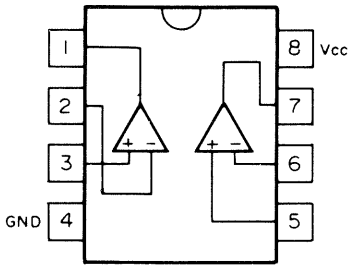
SN74LS74AN



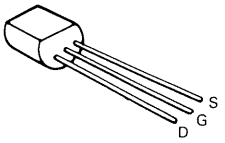
SN74LS122N



TC4053BP



TL082CP



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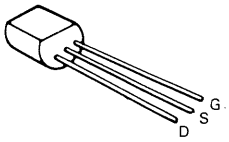

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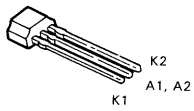
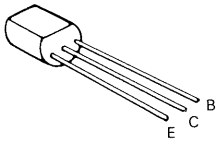
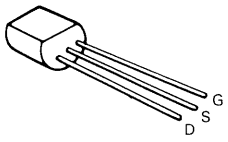


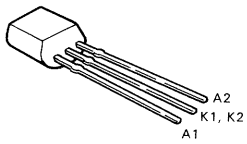
1SS200



2SA1005 (K, L) 2SC1730
2SA1091 (O) 2SC1740 (Q)
2SA933 (Q) 2SC1809 (P)
2SC2240



2SK583



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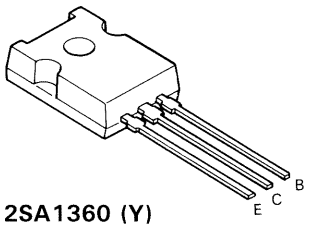

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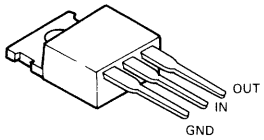
2SC3423 (Y)



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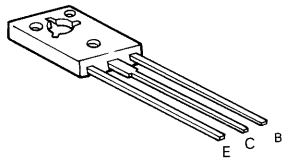

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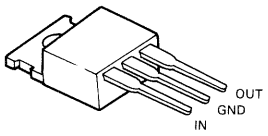

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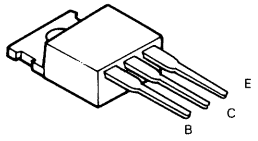

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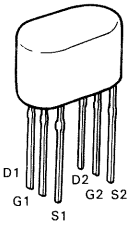

2SK240 (BL)

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