CIRCUIT DISCRIPTION

Vertical Amplifier

The vertical signal input via the BNC connector is applied to the first ATT via the AC-GND-DC switch when it is set properly. The ATT output signal is applied to the dual FETs (Q228), which has a high input impedance. (Use of dual FETs ensures stable DC balance under varying temperature conditions.) The signal is then applied to emitter followers Q204 and Q205, which have a low output impedance and are connected to the second ATT. The second ATT varies the degree of amplification by changing the emitter resistances of Q206 and Q207. DC balance of the source follower at the first stage of the second ATT is obtained with VR201, so the trace is prevented from moving when the attenuation is changed. The vertical signal is then applied to the variable amplifier consisting of Q208 and Q209, where the signal level is adjusted. VR203 adjusts the DC balance of the variable amplifier so that the trace does not move when the VR is turned. VR1a varies the DC level balance between the collectors of Q208 and Q209 to adjust vertical positioning of the input waveform. The vertical signal is then applied to both the mode selection circuit and the A/D buffer amplifier.

The mode selection circuit consists of IC202, IC204 and IC205. IC202 operates as a mode selection switch, IC204 passes the input signal and IC205 passes the memory signal. Q216 and Q217 form a cascode amplifier which amplifies the signal to a sufficient level. The signal is then amplified by the output amplifier consisting of Q220 through Q227. Finally, the vertical signal is applied to the vertical deflection electrodes of the CRT.

VR205 and VR206, connected to pins 1 and 13 of IC204 and 206, respectively, adjust their gain.

The memory signal is amplified by IC203 after it is subjected to D/A conversion, and is then applied to IC205. Vertical positioning of the memory signal waveform is adjusted with VR1b, which is connected to IC203.

The A/D buffer amplifier output signal applied to the cascode amplifier consisting of Q210 through Q213, the its level is shifted by Zener diodes D204 and D205. The signal is then applied to IC201, which has single end output. The IC201 output signal is applied to the input terminal of the A/D input terminal of the control section. The signal from the emitter of Q215 is transmitted to the horizontal circuits and is used as the sync. signal.

Synchronizing Voltage

The trigger signal selected with the SOURCE switch (INT/LINE/EXT) is applied to differential amplifier IC401. The rising or falling edge of the waveform is used to determine the sweep starting point. The edge used is selected with the SLOPE switch. Variable resistor VR4 varies the DC level of the trigger signal to shift the sweep starting point. The trigger signal, after selection with the SLOPE switch, is applied to a Schmitt trigger consisting of gate circuits in IC403 through emitter follower Q402. The waveform of the trigger signal is shaped into a square wave which is used as the clock pulse signal for sweep control flip-flop IC404. The flip-flop inverts its state according to the clock pulse signal to turn Q403 OFF, then the Miller integrator starts charging.

The Miller integrator determines the sweep time according to the time constant of C and R, which is selected with the SWEEP TIME/DIV selector. It outputs a saw-tooth wave with good linearity. The state of hold-off timer IC405 is inverted when the Miller integrator output level at Q413 rises. Therefore, sweep is stopped for the time determined by the hold-off time constant. After the hold-off time has been passed, the next clock pulse is awaited.

When the TRIG AUTO switch is ON, the trigger signal output from the Schmitt trigger drives the automatic sweep circuit, which consists of Q406 through Q408. The collector level of Q408 is LOW and the flip-flop is in the free running state when no trigger signal is input. The flip-flop is synchronized with the clock signal when the trigger signal is input.

The saw-tooth wave generated with the Miller integrator is applied to the horizontal amplifier, which consists of Q416 through Q421, via the SWEEP/EXT H selector, and its signal level is amplified to the desired level. Then, the saw-tooth wave signal is applied to the horizontal deflection electrodes of the CRT.

When the DISPLAY MODE switch is set to the EXT H position, the SWEEP/EXT H selector is automatically switched to separate the Miller integrator and the horizontal amplifier so that the output of the EXT H buffer amplifier is applied to the horizontal amplifier.

Digital Memory

The vertical input signal applied to the A/D converter from the A/D buffer amplifier is converted into a digital signal. The A/D converter circuit consists of the following circuits: analog comparator IC530, which compares the A/D converter input signal with the D/A converter output signal; sequential comparison register IC529, which compares and latches MSB through LSB of the analog comparator output in that order, and D/A converter consisting of Q507 - Q514. The A/D converter output is latched by register IC578 each time one word is converted. The sampling speed is determined by the A/D start signal supplied by the time base unit.

The time base unit consists of a crystal controlled oscillator (IC541), which generates 10 MHz, and a frequency divider (IC553, IC564, IC563, IC552, IC551, IC540 and IC539). The frequency dividing ratio is determined by the SWEEP TIME/DIV switch. When the CLOCK switch is set in the INT position in the SCOPE mode, a clock signal with a period of 1/100 of the period specified by the SWEEP TIME/DIV switch is output from pin 8 of IC538. When the CLOCK switch is in the INT position in the PEN mode, a clock signal with a period of 10, 20 or 50 ms (according to the setting of the SWEEP TIME/DIV switch) is output from pin 11 of IC538. When the CLOCK switch is in the EXT position, the clock signal input to the EXT CLOCK terminal is output from pin 12 of IC549. However, when the SWEEP TIME/DIV switch is set in the range from 1 through 50 μs, the frequency divider stops operation so that the A/D converter does not operate.

The clock signal generated by the time base unit is applied to the address counter (IC526, IC519 and IC511) and the delay counter (IC533, IC532 and IC531) to write the data into memory (IC574 and IC575) in sequency when the WRITE START switch is set to ON. When a trigger pulse is generated, the delay counter starts counting by the number which is the complement of the number set by the digital switch of TRIGGER POINT to stop writing into memory. A latch circuit (IC503 and IC502) stores the initial point data.

Memory read starts in synchronization with the SWEEP GATE signal after memory write has been completed. Memory output data is latched by IC573, then applied to a D/A converter consisting of Q215 through Q522 so that it is converted into an analog signal. The analog signal is applied to a voltage follower consisting of IC501 and IC580, then is applied to the memory amplifier in the vertical amplifier for output to the MEMORY OUT terminal.

CRT Power Supply Circuit

The CRT (Cathode Ray Tube) requires a voltage of about 2 KV. This high voltage is generated using a DC-DC converter, and is regulated by a feedback-type voltage regulator. A negative feedback amplifier and a DC reproducing circuit are used to prevent the high voltage from varying when the brightness is increased and to improve the unblanking characteristics during high speed sweep.

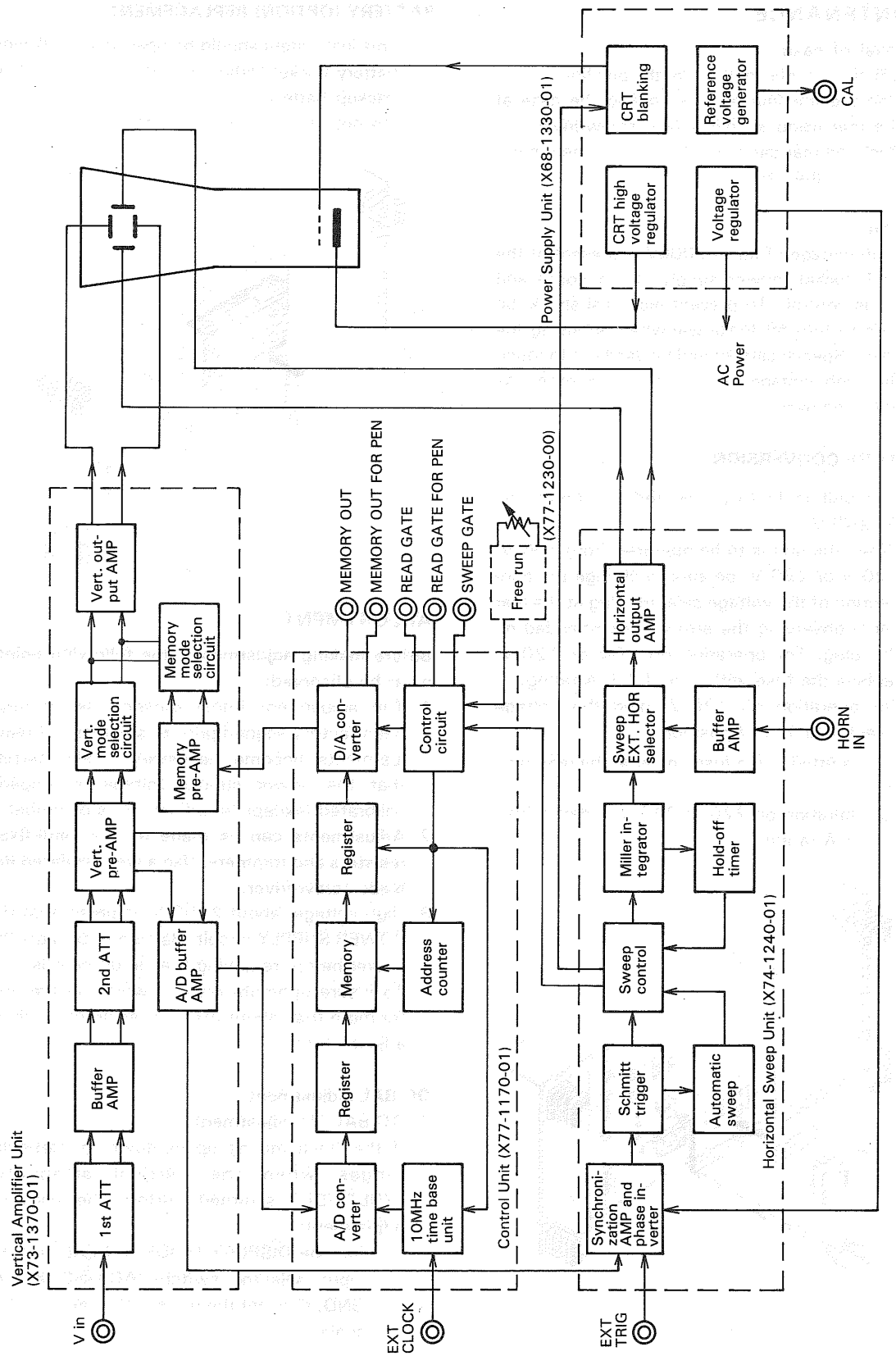
All the power supply circuits use voltage regulators; the main power supply circuit uses a tracking generator, so it is particularly stable.

FREE RUN

S1a,b (X-77-1230-00) switches between the normal and free run modes.

The free run mode is selected by pulling the S1a,b knob out. In the free run mode, the ground level is applied to one input terminal of IC2 via diode D1 and the R/W C signal is applied to the other input terminal of IC2. When the R/W C signal becomes low during its READ period, the gate output level also becomes low; therefore, the timer (IC1) is triggered. This ground level signal from the gate circuit is applied to pin 2 (the clear terminal) of IC203 in the vertical amplifier and pin 2 (the clear terminal) of IC404 in the horizontal amplifier through diodes D2 and D3, respectively. The timer (IC1) holds pin 2 at the high level for the time determined by VR1. When pin 2 of IC1 drops to the low level, pin 6 of IC55 in the control unit is set to the low level through diode D1 so that the write state is entered (i.e., the R/W C signal level is high). After memory write has been finished, the gate of IC2 described above outputs a GND level signal again to trigger the timer. The above process is repeated automatically.

BLOCK DIAGRAM



MAINTENANCE AND ADJUSTMENT

MAINTENANCE

Removal of case

1. Lift the handle to the upright position.
2. Remove the four screws holding the case at the rear using a Philips type screwdriver.
3. Push the rear panel and the unit can be removed from the case.

Caution

High voltage of up to 2000V is present at the CRT socket, power supply circuit board and focus control. To prevent electrical shock, be sure to turn off the power when removing the case. Special care should be used not to touch the high voltage circuits after the case has been removed.

VOLTAGE CONVERSION

(1) The unit is factory adjusted to operate on AC240 V.
When the unit is to be operated from 100 V, 120 V or 220 V, be sure to change the connection of the voltage selector plug at the rear panel observing the arrow mark provided on the plug. For operation on 100 or 120 V, replace the fuse with one of 1.5 A rating.
For operation on 120 V, plug the voltage selector to 117 V position.

(2) Fuse is fitted in the fuse holder at the rear panel.
For operation on 220 or 240 V, insert a fuse of 0.7 A rating.

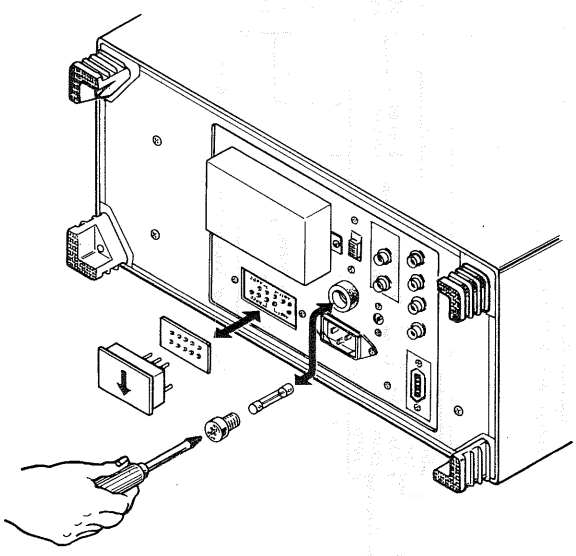


Fig. 23

BATTERY (OPTION) REPLACEMENT

This instrument should be operated on alkaline battery (nickel cadmium battery) for operating backup battery.
Do not use manganese battery.

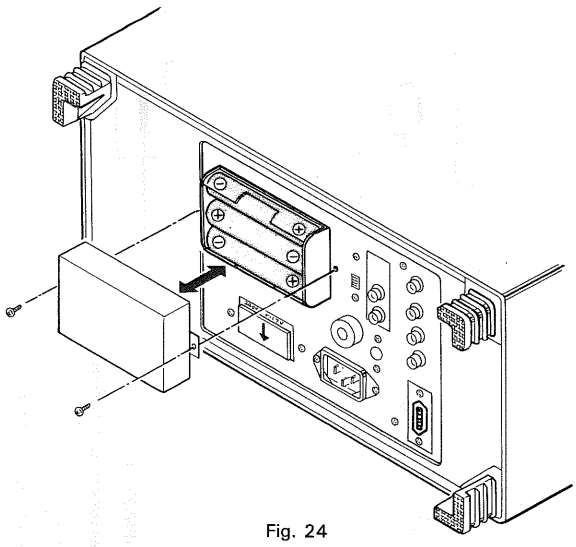


Fig. 24

ADJUSTMENT

Before making adjustments, the following points must be observed:

1. The adjustment items outlined below have been factory aligned prior to shipment. If readjustments become necessary, make certain that the power supply voltage is properly calibrated (except for adjustments of probe).
2. **Adjustments can be made by the semi-fixed resistors and trimmers. Use a well insulated flat blade screwdriver.**
3. High voltage (about 2000 V) is present on the POWER SUPPLY circuit. Be sure to turn off the power before removing the circuit boards.
4. To insure optimum results, warm up the unit for more than about 30 minutes before making adjustments.

DC BAL Adjustment

1. DC BAL (1) adjustment
If the trace moves up or down at particular ranges when the vertical attenuator (VOLTS/DIV) is turned, perform the following adjustment.
(1) Set the DISPLAY MODE to REAL and the input selector switch (AC-GND-DC) to GND, then set the trace in the center of the scale.

(2) Turn the vertical attenuator VARIABLE fully counterclockwise and adjust the STEP BAL VR so that the trace is stationary at all ranges when the VOLTS/DIV is turned.

2. DC BAL (2) adjustment

If the trace moves up or down at particular ranges when the vertical attenuator VARIABLE is turned, perform the following adjustment.

(1) With the VARIABLE turned fully counterclockwise, set the trace in the center of the scale. Next, turn the VARIABLE fully clockwise. If, at this time, the trace moves up or down, adjust the VAR BAL VR until it is centered.

(2) Repeat the above steps so that the trace stays still when the VARIABLE is turned.

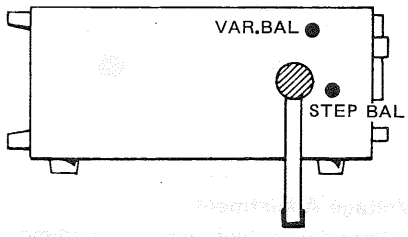


Fig. 25 DC BAL adjustment

Vertical Attenuator Adjustment (VOLTS/DIV)

(1) Using a square wave generator, apply 1kHz 0.5-100Vp-p signal to the vertical input terminal.

(2) Set the VOLTS/DIV to 0.1V and adjust the trimmer TC202 until high quality of square wave is obtained.

(3) Similarly, adjust the TC204 for the 1V range and the TC206 for the 10V range.

Probe and Input Capacity Adjustments

(1) Set the VOLTS/DIV to 0.01V.

(2) Set the probe to 10:1 and connect it to the INPUT terminal. Apply 1kHz square wave signal to the probe and adjust the trimmer of the probe until high quality of wave is obtained. During the adjustment, the input voltage is attenuated to 1/10, while the input impedance is 10MΩ and the input capacity is less than 18pF.

(3) Next, set the VOLTS/DIV to 0.1V. Adjust the TC201 until high quality of square wave is obtained.

(4) Similarly, adjust the TC203 for the 1V range and the TC205 for the 10V range.

Vertical Sensitivity Adjustment

(1) With the VOLTS/DIV set to 0.01V, turn the VARIABLE fully clockwise to the CAL position.

(2) Apply 0.05Vp-p square wave signal to the vertical input.

(3) Adjust the VR205 (GAIN ADJ) so that the vertical amplitude reaches 5 div.

CRT Center Adjustment

(1) Short the base of Q218 to the base of Q219.

(2) Adjust the V208 until the horizontal trace comes to the vertical center.

Frequency Response and Overshoot Adjustments

(1) Apply 100kHz square wave signal of good rising characteristic to the input.

(2) Adjust the trimmer TC207 for optimum mid-range waveform (after the rising portion).

(3) Adjust the VR207 for optimum high range waveform (rising portion).

Adjustments of Sweep Time (horizontal sensitivity) and Trace Length

(1) Set the SWEEP TIME/DIV to 0.1 ms range and turn the VARIABLE fully clockwise to the CAL position.

(2) Apply a calibrated 1kHz sine wave signal to the input. Adjust each POSITION control so that the waveform is in the vertical center and the start point is extreme left of the scale.

(3) Adjust the VR407 so that one wave length of the 1kHz signal is 10 div on the scale. Also, adjust the length of the horizontal trace with the VR406 (LENGTH ADJ). Since the VR406 adjusts only the end point of the waveform, the length of the waveform can be adjusted without affecting the start point and sweep time. During this adjustment, manipulate the ◄► POSITION and TRIG LEVEL to retain the start point in the center at the left end of the scale.

(4) Adjust 1 μs range with TC401.

X5 MAG Adjustment

(1) Set the SWEEP TIME/DIV switch to 1 ms range. Apply about 1kHz sine wave signal to the vertical input.

(2) Adjust the oscillation frequency and ◄► POSITION so that 11 peaks of waveform appear and each peak is on the vertical line of the scale.

(3) Adjust the VR408 (MAG ADJ) so that the peak-to-peak space is 5 div when the MAG switch is pulled.

MAG Center Adjustment

(1) Set the SWEEP TIME/DIV to 0.1 ms. Apply 1kHz square wave to the vertical input. Adjust so that one wave covers the entire scale.
(2) Set the ◄► POSITION to the mechanical center position (the waveform may deflect in horizontal direction).
(3) Pull the MAG switch and adjust the VR404 (MAG CENT) so that the rising (or falling) portion in the center of the waveform comes to the position of "X1" (MAG switch is depressed).
(4) Repeat the above adjustment until the rising (or falling) portion of the waveform remains in the same position regardless of the position of the MAG switch.

Adjustments of EXT-H, Horizontal Position and Sensitivity

(1) Set the DISPLAY MODE to EXT. H and the ◄► POSITION to the mechanical center position.
(2) Turn the VARIABLE fully clockwise to the CAL position.
(3) Adjust the VR405 until the spot comes to the center of the horizontal axis.
(4) Apply 1kHz 1.5Vp-p sine wave signal to the HOR. INPUT terminal.
(5) Adjust the VR404 so that the trace reaches 10 div on the scale.

Sync Level Adjustment

(1) Apply 1 kHz sine wave signal to the vertical input and set the SOURCE switch to INT.
(2) Adjust the VR401 so that the waveform starts at the same position on the opposite slope when the SLOPE polarity ("+" and "−") is changed.

Calibration Voltage Adjustment

(1) Connect the calibration voltage output to the vertical input. Set the VOLTS/DIV to 0.2 V and SWEEP TIME/DIV to 0.2 ms.
(2) Adjust the frequency to 1kHz with the VR102, and the duty ratio to 50:50 with the VR106.
(3) Adjust the VR101 to obtain output voltage of 1Vp-p.

ASTIG Adjustment

Adjust the ASTIG VR until the trace is even in thickness. This adjustment should be made in conjunction with the FOCUS control. Since the ASTIG is stabilized, no readjustment is required.

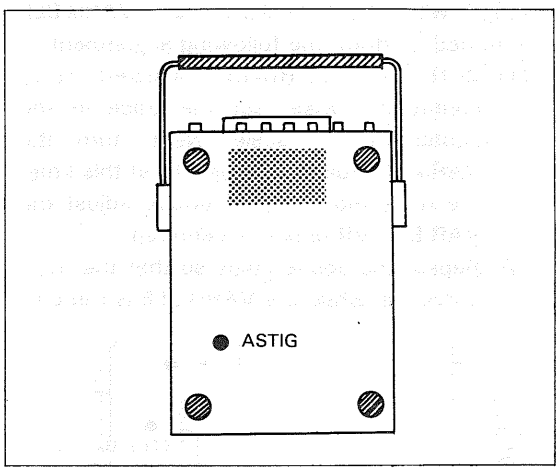


Fig. 26

High Voltage Adjustment

(1) Connect a high input impedance (more than 100MΩ) DC voltmeter for high voltage measurement to the No. 1 pin of P103.
Connect the other side to the chassis.
(2) Adjust the VR103 to obtain −18.5kV.

Blanking Voltage Adjustment

(1) Set the LEVEL to PULL AUTO to display a trace.
(2) Adjust the VR104 so that the trace disappears at 9-11 o'clock position of the INTENSITY knob.

Memory Circuit

Adjustments of Memory Position and Memory Output Voltage

(1) Set the VOLTS/DIV to 0.1V and SWEEP TIME/DIV to 1 ms. Write 200 Hz 1 Vp-p sine wave signal in the memory (both the "+" and "−" sides of memory wave on the scope are saturated).
(2) Adjust the VR2 (semi-fixed resistor on MEMORY POSITION switch) until the center level of the memory wave becomes 0V. Next, adjust the VR206 (VERTICAL circuit) so that the amplitude between the "+" and "−" saturation points becomes 8 div on the scope.

(3) Repeat the above adjustments a few times.

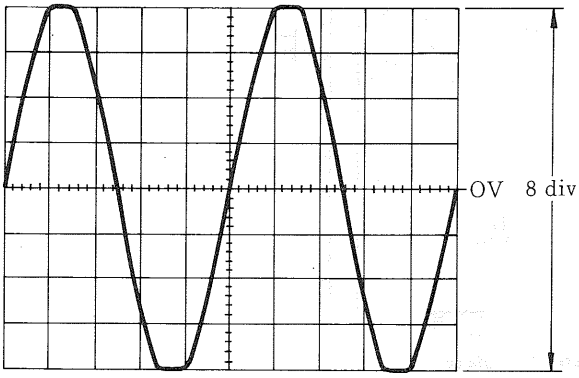


Fig. 27

(4) Adjust the VR505 so that the MEMORY output center level is 0V. Next, adjust the VR506 until the amplitude between the output voltage saturation points reaches 1.6Vp-p.

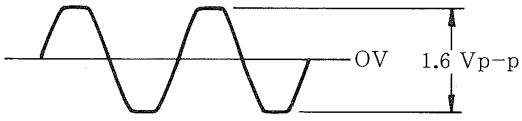
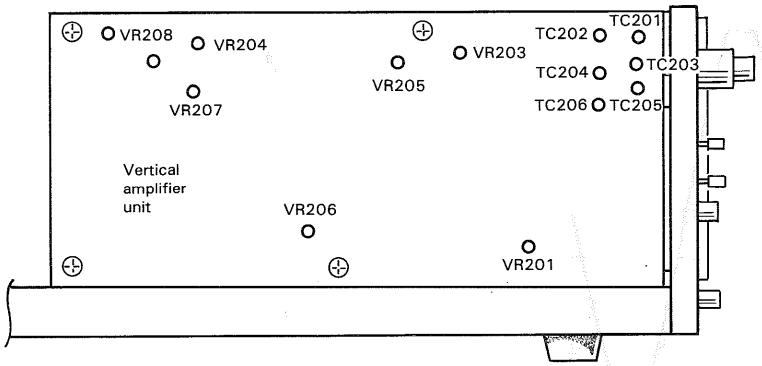


Fig. 28

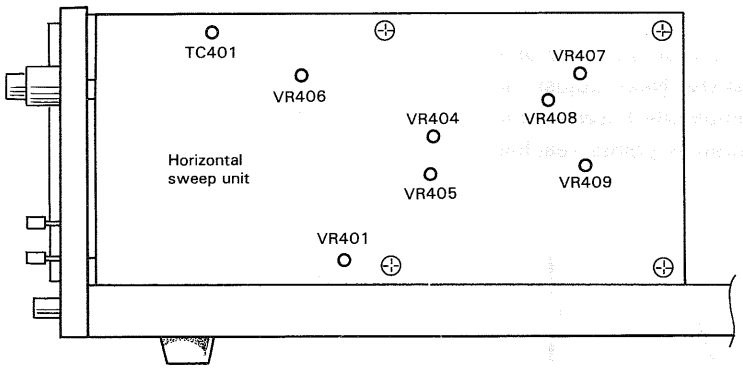
Deviations of Real Wave and Memory Wave

(1) Set the DISPLAY MODE to DUAL, the VOLTS/DIV to 0.1V, and the SWEEP TIME/DIV to 1 ms. Write 0.6 Vp-p sine wave signal in the memory (6 div amplitude).

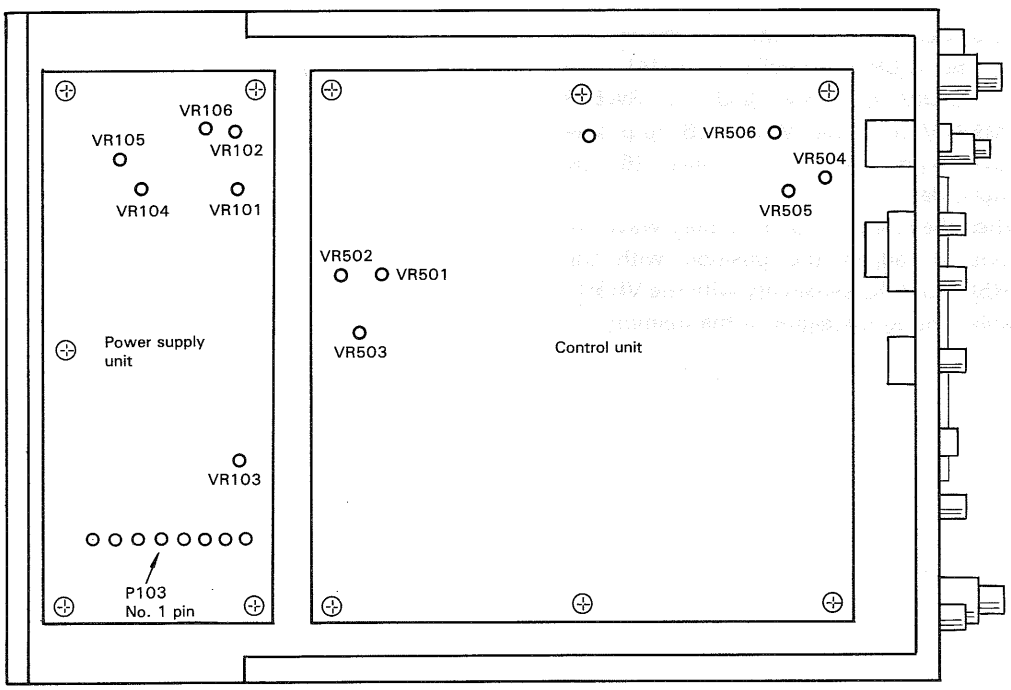
(2) When the real wave and memory wave are deviated, adjust the position with the VR502 and the sensitivity with the VR501 while writing the signal in the memory.



Location of Adjustments (Left side view)



Location of Adjustments (Right side view)



Location of Adjustment (Bottom view)

PARTS LIST

MAIN CHASSIS

Ref. No.	Parts No.	Name & Description
	A20-2753-25	Diecasting panel
	A21-0899-04	Decorative panel (1)
	A21-0871-04	Decorative panel (2)
	A21-0871-04	Decorative panel (3)
	A22-0819-03	Sub panel (1)
	A22-0820-03	Sub panel (2)
	B07-0122-04	Push escutcheon
	B07-0706-04	Push escutcheon
	B07-0710-02	Rear escutcheon
	B19-0716-03	Filter
	B19-0710-04	Acryl (for light focus)
	B20-0916-04	Graticule
	B30-0920-05	Lamp
	B09-0011-04	Hole bushing
	B40-2765-04	Name plate
	B41-0726-04	Voltage indication plate
	B50-2950-00	Instruction manual
DN1-4	B30-0920-05	Lamp ass'y
M-1	B31-0722-08	Meter (round type)
	D23-0061-04	Bearing
	D22-0402-05	Coupling
	E01-1404-05	CRT socket
	E03-0005-05	Power jack (EXT)
	E03-0201-05	Power connector
	E08-1081-05	Voltage selector (receptacle)
	E09-0681-05	Voltage selector (plug)
	E21-0654-04	CAL terminal
	E21-0657-04	Terminal (GND)
	E30-1818-05	Power cord (JIS)
	E30-1819-05	Power cord (CEE)
	E30-1821-05	Power cord (SAA)
	E22-0781-08	Lug terminal

Ref. No.	Parts No.	Name & Description
	E04-0251-05	BNC receptacle
	E29-0526-08	Plug
	E29-0527-08	Cap
	E29-0528-08	Plug
	E29-0529-08	Cap
	E40-1064-05	Pin connector
	F01-0231-14	Heat sink
	F07-0908-14	Handle cover
	F11-0950-02	CRT shield (1)
	F11-0954-04	CRT shield (2)
	F11-0960-04	CRT shield (3)
	F15-0701-04	Felt
	F15-0712-04	Reflector
	F19-0703-04	Voltage selector (plate)
	F05-1521-05	Fuse 1.5A
	F05-7011-05	Fuse 0.7A
	G02-0606-14	Handle spring
	G13-0705-04	CRT mounting rubber
	G13-0710-14	CRT mounting rubber
	G13-0712-14	CRT mounting rubber
	J02-0507-05	Cord wrap
	J21-2906-05	Gear
	J21-2907-05	Ring
	J21-2912-05	LED holder
	J13-0033-15	Fuse holder
	J19-1625-08	Battery case
	K01-0512-05	Handle
	K21-0293-14	Push knob
	K21-0819-03	Knob
	K21-0822-14	Knob
	K21-0825-04	Knob

Ref. No.	Parts No.	Name & Description
	K21-0831-24	Knob
	K21-0832-14	Knob
	K21-0833-14	Knob
	K27-0502-04	Lever knob (gray)
	K27-0504-04	Knob (square, light gray)
	K27-0505-04	Knob (square, blue)
	L01-9286-08	Power transformer
	L19-0019-05	Converter transformer
	L77-1002-05	Crystal oscillator
	L79-0501-08	Noise filter
	H01-2946-04	Carton box
	H10-2812-12	Pad, formed styrene
	H12-0531-04	Pad, carton
	H20-1713-14	Protective cover
	S31-2007-05	Slide switch
	S37-2005-05	Lever switch
	S32-2013-05	Lever switch
	S32-4007-05	Lever switch
	S02-1501-05	Rotary switch
	S42-3509-08	Key switch
	S29-1501-08	Thumb wheel switch
	W01-0503-04	Cord wrap
	002-0006-05	Shield gascket
		FET 2SK228T-2&3
		Transistor 2N5771
		IC NE529N
		IC AN606
		IC AN904
		CRT E2713B31A

Ref. No.	Parts No.	Name & Description
	RN14BK2H9003F	Metal film resistor 900kΩ ±1% 1/2W
	RN14BK2H9903F	Metal film resistor 990kΩ ±1% 1/2W
	RN14BK2H9993F	Metal film resistor 999kΩ ±1% 1/2W
R1	RW98A3H201J	Winding resistor 200Ω ±5% 5W
R2	RC05GF3A185K	Carbon resistor 1.8MΩ ±10% 1W
VR1	R19-9504-08	Variable resistor (V.POSITION) A=500Ω, B=10kΩ
VR2	R06-9503-08	Variable resistor (MEMORY POS.) A=500Ω, B=10kΩ
VR3	R19-9505-08	Variable resistor (H.POSITION) A=5kΩ, B=10kΩ
VR4	R01-4507-08	Variable resistor (TRIG.) 50kΩ
VR5,6	R23-9501-05	Variable resistor (INTEN) A=1kΩ, B=5kΩ
VR7	R05-8503-08	Variable resistor (FOCUS) 3MΩ
VR8	R03-2504-08	Variable resistor (POWER) 5kΩ
	R01-8503-05	Variable resistor (FREE RUN) 2MΩ
	R12-1029-05	Semi-fixed resistor 1kΩB
	R12-0502-05	Semi-fixed resistor 100ΩB
	R12-6005-05	Semi-fixed resistor 330kΩB
C1	CE62W2V470	Electrolytic capacitor 47μF 350WV
C2	CK45B3D102K	Ceramic capacitor 1000pF ±10% 2000WV
	CK45E3D103P	Ceramic capacitor 0.01μF +100%, −0% 2000WV
	CK45E3D102P	Ceramic capacitor 1000pF +100%, −0% 2000WV
	C05-0403-05	Ceramic trimmer 6pF
	C05-0404-05	Ceramic trimmer 10pF
	C05-0405-05	Ceramic trimmer 20pF
		Transistor 2SD288
		Transistor 2SB630
		IC ES7812M
		IC FS7912M
D1,2		LED AR4133S
D3		LED PG4133SX

Ref. No.	Parts No.	Name & Description
D4		LED AR4133S
D5		Rectifier S2VB20
	Y87-1330-00	Probe PC-22
	X67-1080-00	Digital output cord

VERTICAL AMPLIFIER UNIT (X73-1370-01)

Ref. No.	Parts No.	Name & Description			
R201,202	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R203	RN14BK2H9003F	Metal film res.	900kΩ	±1%	1/2W
R204	RN14BK2E1113F	Metal film res.	111kΩ	±1%	1/4W
R205	RN14BK2H9903F	Metal film res.	990kΩ	±1%	1/2W
R206	RN14BK2E1012F	Metal film res.	10.1kΩ	±1%	1/4W
R207	RN14BK2H9993F	Metal film res.	999KΩ	±1%	1/2W
R208	RN14BK2E1001F	Metal film res.	1kΩ	±1%	1/4W
R209	RN14BK2E1004F	Metal film res.	1MΩ	±1%	1/4W
R210	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R211,212	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R213,214	RN14BK2E4991F	Metal film res.	4.99kΩ	±1%	1/4W
R215	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R216	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R217,218	RD14BB2E153J	Carbon res.	15kΩ	±5%	1/4W
R219-221	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R222,223	RN14BK2E4301F	Metal film res.	4.3kΩ	±1%	1/4W
R224	RN14BK2E7410F	Metal film res.	741Ω	±1%	1/4W
R225	RN14BK2E3830F	Metal film res.	383Ω	±1%	1/4W
R226	RD14BB2E4R7J	Carbon res.	4.7Ω	±5%	1/4W
R227	RN14BK2E1050F	Metal film res.	105Ω	±1%	1/4W
R228	RD14BB2E100J	Carbon res.	10Ω	±5%	1/4W
R229	RD14BB2E181J	Carbon res.	180Ω	±5%	1/4W
R230	RN14BK2E1820F	Metal film res.	182Ω	±1%	1/4W
R231	RD14BB2E100J	Carbon res.	10Ω	±5%	1/4W
R232	RN14BK2E1820F	Metal film res.	182Ω	±1%	1/4W
R233	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R234,235	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R236	RN14BK2E6800F	Metal film res.	680Ω	±1%	1/4W
R237	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R238	RN14BK2E6800F	Metal film res.	680Ω	±1%	1/4W
R239,240	RD14BB2E682J	Carbon res.	6.8kΩ	±5%	1/4W
R241,242	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R243	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R244	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R245	RD14BB2E331J	Carbon res.	330Ω	±5%	1/4W
R246,247	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R248	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W

Ref. No.	Parts No.	Name & Description			
R249	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R250,251	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R252-255	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R256	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R257	RN14BK2E5101F	Metal film res.	5.1kΩ	±1%	1/4W
R258	RN14BK2E1002F	Metal film res.	10kΩ	±1%	1/4W
R259	RN14BK2E5101F	Metal film res.	5.1kΩ	±1%	1/4W
R260	RN14BK2E1002F	Metal film res.	10kΩ	±1%	1/4W
R261,262	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R263,264	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R265,266	RN14BK2E3001F	Metal film res.	3kΩ	±1%	1/4W
R267	RN14BK2E2202F	Metal film res.	22kΩ	±1%	1/4W
R268	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R269	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R270	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R271	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R272,273	RD14BB2E682J	Carbon res.	6.8kΩ	±5%	1/4W
R274	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R275,276	RN14BK2E3001F	Metal film res.	3kΩ	±1%	1/4W
R277,278	RN14BK2E6800F	Metal film res.	680Ω	±1%	1/4W
R279-282	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R283,284	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R285	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R286	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R287	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R288	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R289-292	RD14BB2E562J	Carbon res.	5.6kΩ	±5%	1/4W
R293	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R294	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R295	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R296	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R297-300	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R301	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R302	RD14BB2E474J	Carbon res.	470kΩ	±5%	1/4W
R303	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R304,305	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R306,307	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W

Ref. No.	Parts No.	Name & Description			
R308	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R309,310	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R311,312	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R313,314	RD14BB2E333J	Carbon res.	33kΩ	±5%	1/4W
R315	RD14BB2E331J	Carbon	330Ω	±5%	1/4W
R316	RD14BB2E822J	Carbon res.	8.2kΩ	±5%	1/4W
R317	RD14BB2E331J	Carbon res.	330Ω	±5%	1/4W
R318,319	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R320	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R321	RD14BB2H683J	Carbon res.	68kΩ	±5%	1/2W
R322	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R323,324	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R325	RD14BB2E331J	Carbon res.	330Ω	±5%	1/4W
R326	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R327	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R328,329	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R330	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R331	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R332	RD14BB2E681J	Carbon res.	680Ω	±5%	1/4W
R333	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R334	RD14BB2E333J	Carbon res.	33kΩ	±5%	1/4W
R335,336	RD14BB2E221J	Carbon res.	220Ω	±5%	1/4W
VR201	R12-1002-05	Semifixed res.	1kΩB		
VR202	R02-2508-05	Semifixed res.	5kΩB		
VR203	R12-0401-05	Semifixed res.	100ΩB		
VR204	R12-3002-05	Semifixed res.	10kΩB		
VR205,206	R12-0505-05	Semifixed res.	200ΩB		
VR207	R12-1002-05	Semifixed res.	1kΩB		
VR208	R12-4503-05	Semifixed res.	50kΩB		
VR209	R12-5401-05	Semifixed res.	100kΩB		
C201	C91-0561-08	Ceramic cap.	0.1μF		600WV
C202	CC45CH2H470J	Ceramic cap.	47pF	±5%	500WV
C203	CK45B2H471J	Ceramic cap.	470pF	±5%	500WV
C204	CC45CH1H050D	Ceramic cap.	5pF	±0.5pF	
C205	CK45B2H332K	Ceramic cap.	3300pF	±10%	500WV

Ref. No.	Parts No.	Name & Description			
C206	C90-0261-05	Ceramic cap.	0.047μF		
C207,208	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C209	CEO4W1A470M	Electrolytic cap.	47μF		10WV
C210	C90-0261-05	Ceramic cap.	0.047μF		
C211,212	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C213	CEO4W1A470M	Electrolytic cap.	47μF		10WV
C214	CK45B2H332K	Ceramic cap.	3300pF	±10%	500WV
C215	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C216	CC45CH1H100D	Ceramic cap.	10pF	±0.5%	
C217	CC45SL1H330J	Ceramic cap.	33pF	±5%	
C218	CEO4W1A101M	Electrolytic cap.	100μF		10WV
C219,220	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C221	CC45SL1H560J	Ceramic cap.	56pF	±5%	
C222	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C223	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C224	C90-0261-05	Ceramic cap.	0.047μF		
C225	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C226	CC45CH1H050D	Ceramic cap.	5pF	±0.5pF	
C227,228	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C229	C90-0261-05	Ceramic cap.	0.047μF		
C230	CC45SL1H330J	Ceramic cap.	33pF	±5%	
C231	CK45B1H103K	Ceramic cap.	0.01μF	±10%	
C232	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C233	C90-0261-05	Ceramic cap.	0.047μF		
C234	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C235	C90-0261-05	Ceramic cap.	0.047μF		
C236-239	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C240	CEO4W1A470M	Electrolytic cap.	47μF		10WV
C241,242	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C243	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C244	C90-0262-05	Ceramic cap.	0.047μF		
C245	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C246	CC45CH1H220J	Ceramic cap.	22pF	±5%	
C247	CC45SL1H221J	Ceramic cap.	220pF	±5%	
C248	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C249	C90-0261-05	Ceramic cap.	0.047μF		
C250	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV

Ref. No.	Parts No.	Name & Description			
C251	CEO4W1A470M	Electrolytic cap.	47μF		10WV
C252	CEO4W1C470M	Electrolytic ceramic cap.	47μF		16WV
C253	C90-0261-05	Ceramic cap.	0.047μF		
C254	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C255	CEO4W1A470M	Electrolytic cap.	47μF		10WV
C256	No use				
C257	CC45SL1H221J	Ceramic cap.	220pF	±5%	
C258	CEO4W1C470M	Electrolytic cap.	47μF		16WV
C259,260	C90-0261-05	Ceramic cap.	0.047μF		
C261	CC45CH1H130J	Ceramic cap.	13pF	±5%	
C262	CK45F1H103Z	Ceramic cap.	0.01μF	+80%−20%	
C263,264	CC45CH1HO10C	Ceramic cap.	1pF	±0.25pF	
C265	CK45E2H103P	Ceramic cap.	0.01μF	+100%−0%	500WV
C266,267	CC45CH1HO10C	Ceramic cap.	1pF	±0.25pF	
C268	CK45B2H332K	Ceramic cap.	3300pF	±10%	500WV
C269	CK45B1H471K	Ceramic cap.	470pF	±10%	
C270	CK45B2H332K	Ceramic cap.	3300pF	±10%	500WV
C271	CK45B1H471K	Ceramic cap.	470pF	±10%	
C272	CK45B2H103P	Ceramic cap.	0.01μF	+100%,−10%	500WV
C273	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C274	CEO4W1A470M	Electrolytic cap.	47μF		10WV
C275	CEO4W2E330M	Electrolytic cap.	33μF		250WV
C276	CK45B2H103P	Ceramic cap.	0.01μF	+100%,−0%	500WV
C277,278	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C279	C90-0261-05	Ceramic cap.	0.047μF		
C280,281	CK45B1H102K	Ceramic cap.	1000pF	±10%	
C282,283	C90-0261-05	Ceramic cap.	0.047μF		
TC201	C05-0404-05	Ceramic trimmer	10pF		
TC202	C05-0403-05	Ceramic trimmer	6pF		
TC203	C05-0404-05	Ceramic trimmer	10pF		
TC204	C05-0403-05	Ceramic trimmer	6pF		
TC205	C05-0404-05	Ceramic trimmer	10pF		
TC206	C05-0403-05	Ceramic trimmer	6pF		

Ref. No.	Parts No.	Name & Description	
TC207	C05-0404-05	Ceramic trimmer	10pF
IC201		IC	μPC159A
IC202		IC	SN7472
IC203		IC	μPA15
IC204,205		Transistor array	AN904
IC206		IC	SN7400
Q201		Transistor	2SC273 or 2SC1815
Q202		Transistor	2SA495 or 2SC1015
Q203		FET	2SK30(0)
Q204,205		Transistor	2SC373 or 2SC1815
Q206,207		Transistor	2SC1215
Q208,209		Transistor	2SC373 or 2SC1815
Q210,211		Transistor	2SC495 or 2SC1015
Q212-219		Transistor	2SC373 or 2SC1815
Q220,221		Transistor	2SC1215
Q222,223		Transistor	2SC1628
Q224,225		Transistor	2SA818
Q226,227		Transistor	2SC373 or 2SC1815
Q228		Dual FET	2SK228-1-2or-1-3
D201,202		Diode	RD6, 8E
D203		Diode	1S953
D204,205		Diode	RD6, 8E
D206-208		Diode	1N34
D209,210		Diode	1S953
D211		Diode	RD10E
D212,213		Diode	1N34
D214,215		Diode	1S953
L201-204	L40-4701-03	Ferri inductor	47μH
L205,206	L40-6801-03	Ferri inductor	68μH
S201	S32-4007-05	Lever switch	
S202	S01-2509-08	Rotary switch	
P210,202	E40-1064-05	Pin connector	10P
P203	E19-0861-08	Pin plug	8P

HORIZONTAL SWEEP UNIT (X74-1240-01)

Ref. No	Parts No.	Name & Description			
R401	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R402	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R403	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R404	RD14BB2E154J	Carbon res.	150kΩ	±5%	1/4W
R405	RD14BB2E153J	Carbon res.	15kΩ	±5%	1/4W
R406	RD14BB2E511J	Carbon res.	510Ω	±5%	1/4W
R407	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R408	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R409	RD14BB2E682J	Carbon res.	6.8kΩ	±5%	1/4W
R410	RD14BB2E333J	Carbon res.	33kΩ	±5%	1/4W
R411	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R412	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R413,414	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R415	RD14BB2E822J	Carbon res.	8.2kΩ	±5%	1/4W
R416,417	RN14BK2E1003F	Metal film res.	100kΩ	±1%	1/4W
R418	RD14BB2E122J	Carbon res.	1.2kΩ	±5%	1/4W
R419	RN14BK2E1503F	Metal film res.	150kΩ	±1%	1/4W
R420	RN14BK2E2493F	Metal film res.	249kΩ	±1%	1/4W
R421	RN14BK2E4993F	Metal film res.	499kΩ	±1%	1/4W
R422	R92-1015-08	Carbon res.	1.5MΩ		
R423	R92-1016-08	Carbon res.	2.5MΩ		
R424	RD14BB2E391J	Carbon res.	390Ω	±5%	1/4W
R425	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R426	RD14BB2E682J	Carbon res.	6.8kΩ	±5%	1/4W
R427	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R428	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R429	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R430	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R431	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R432-434	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R435	RD14BB2E511J	Carbon res.	510Ω	±5%	1/4W
R436	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R437	RD14BB2E683J	Carbon res.	68kΩ	±1%	1/4W
R438	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R439	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R440	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R441,442	RD14BB2E182J	Carbon res.	1.8kΩ	±5%	1/4W

Ref. No	Parts No.	Name & Description			
R443	RD14BB2E221J	Carbon res.	220Ω	±5%	1/4W
R444,445	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R446	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R447	RD14BB2E682J	Carbon res.	6.8kΩ	±5%	1/4W
R448	RD14BB2E183J	Carbon res.	18kΩ	±5%	1/4W
R449	RD14BB2E123J	Carbon res.	12kΩ	±5%	1/4W
R450	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R451	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R452	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R453	RS14AB1A823J	Metal oxide film res.	82kΩ	±5%	1W
R454,455	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R456	RD14BB2E153J	Carbon res.	15kΩ	±5%	1/4W
R457	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R458	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R459-461	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R462	RD14BB2E272J	Carbon res.	2.7kΩ	±5%	1/4W
R463	RD14BB2E473J	Carbon res.	47kΩ	±5%	1/4W
R464	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R465	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R466	RD14BB2E682J	Carbon res.	6.8k	±5%	1/4W
R467,468	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R469	R92-1017-08	Carbon res.	13kΩ		7W
R470	RD14BB2E331J	Carbon res.	330Ω	±5%	1/4W
R471	R92-1017-08	Carbon res.	13kΩ	±5%	7W
R472	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R473	RD14BB2E822J	Carbon res.	8.2kΩ	±5%	1/4W
R474	RD14BB2E392J	Carbon res.	3.9kΩ	±5%	1/4W
R475,476	RD14BB2E821J	Carbon res.	820Ω	±5%	1/4W
R477-479	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R480	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R481	RD14BB2E151J	Carbon res.	150Ω	±5%	1/4W
VR401	R12-1002-05	Semifixed res.	1kΩB		
VR402,403	R19-9506-08	Semifixed res.	A=3k,B=100kΩB		
VR404	R12-0003-05	Semifixed res.	470ΩB		
VR405	R12-1003-05	Semifixed res.	2.2kΩB		
VR406	R12-2502-05	Semifixed res.	5kΩB		

Ref. No	Parts No.	Name & Description			
VR407	R12-1002-05	Semifixed res.	1kΩB		
VR408	R12-0505-05	Semifixed res.	200ΩB		
VR409	R12-0003-05	Semifixed res.	470ΩB		
VR410	R12-1002-05	Semifixed res.	1kΩB		
C401,402	CE04W1H010M	Electrolytic cap.	1μF		
C403	CC45SL1H050C	Ceramic cap.	5pF	±0.25pF	
C404	C90-0261-05	Ceramic cap.	0.047μF		
C405	CC45SL1H100D	Ceramic cap.	10pF	±0.5pF	
C406,407	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C408	CE04W1A470M	Electrolytic cap.	47μF		10WV
C409	C90-0261-05	Ceramic cap.	0.047μF		
C410	CC45CH1H101J	Ceramic cap.	100pF	±5%	
C411,412	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C413,414	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C415	CE04W1A470M	Electrolytic cap.	47μF		10WV
C416	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C417	CE04W1C100M	Electrolytic cap.	10μF		16WV
C418-420	CE04W1H010M	Electrolytic cap.	1μF		50WV
C421	CK45B1H102K	Ceramic cap.	1000pF	±10%	
C422	CK45F1H103Z	Ceramic cap.	0.01μF	+80%−20%	
C423	CC45SL1H101J	Ceramic cap.	100pF	±5%	
C424	CK45B1H471K	Ceramic cap.	470pF	±10%	
C425	C90-0261-05	Ceramic cap.	0.047μF		
C426	CE04W1C470M	Electrolytic cap.	47μF		16WV
C427	CC45SL1H221J	Ceramic cap.	220pF	±5%	
C428	CE04W1A470M	Electrolytic cap.	47μF		10WV
C429	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C430	C91-0562-08	Ceramic cap.	1μF		
C431	C91-0556-08	Ceramic cap.	0.01μF	±2%	
C432	CC45CH1H910J	Ceramic cap.	91pF	±5%	
C433	CC45CH1H390J	Ceramic cap.	39pF	±5%	
C434,435	CS15E1A4R7K	Tantalum cap.	0.47μF		10WV
C436	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C437	CC45CH1H100D	Ceramic cap.	10pF	±0.5pF	
C438	CE04W1C470M	Electrolytic cap.	47μF		16WV
C439,440	C90-0261-05	Ceramic cap.	0.047μF		

Ref. No	Parts No.	Name & Description		
C441,442	CE04W1C470M	Electrolytic cap.	47μF	16WV
C443	C90-0261-05	Ceramic cap.	0.047μF	
C444	C90-0298-05	Semiconductor ceramic cap.	0.1μF	12WV
C445	CK45B1H102K	Ceramic cap.	1000pF ±10%	
C446	CC45SL1H331J	Ceramic cap.	330pF ±5%	
C447	CK45B1H472K	Ceramic cap.	4700pF ±10%	
C448	C90-0298-05	Semiconductor ceramic cap.	0.1μF	12WV
C449,450	CE04W1A470M	Electrolytic cap.	47μF	10WV
C451,452	C90-0298-05	Semiconductor ceramic cap.	0.1μF	12WV
C453	C90-0261-05	Ceramic cap.	0.047μF	
C454	CE04W1C101M	Electrolytic cap.	100μF	16WV
C455	C90-0261-05	Ceramic cap.	0.047μF	
C456	CE04W1C101M	Electrolytic cap.	100μF	16WV
C457	CE04W2E470M	Electrolytic cap.	47μF	250WV
C458	CK45B1H472K	Ceramic cap.	4700pF ±10%	
C459,460	CE04W1A470M	Electrolytic cap.	47μF	10WV
C461	CK45B1H471K	Ceramic cap.	470pF ±10%	
C462	CC45SL1H020C	Ceramic cap.	2pF ±0.25%	
C463	CE04W1C101M	Electrolytic cap.	100μF	16WV
C464	C90-0298-05	Semiconductor ceramic cap.	0.1μ	12WV
C465	CK45F1H103Z	Ceramic cap.	0.01pF +80% −20%	
C466	CC45SL1H331J	Ceramic cap.	330pF ±5%	
TC401,402	C05-0405-05	Ceramic trimmer	20pF	
IC401		IC	AN606	
IC402		IC	SN74123	
IC403		IC	SN74S00	
IC404		IC	SN7472N	
IC405		IC	LM555CN or MC1455	
IC406		IC	SN75453BP	
IC407		IC	CD4016AE	
Q401,402		Transistor	2SC373 or 2SC1815	
Q403		Transistor	2SA495 or 2AS1015	
Q404-408		Transistor	2SC373 or 2SC1815	

Ref. No.	Parts No.	Name & Description	
Q409		FET	2SK30(0)
Q410,411		Tansistor	2SC373 or 2SC1815
Q412		FET	2SK30(0)
Q413-417		Transistor	2SC373 or 2SC1815
Q418-420		Transistor	2SC373 or 2SC1505
D401		Diode	RD3, 9E
D402		Diode	1S953
D403,404		Diode	1N34
D405		Diode	1S953
D406-408		Diode	1N34
D409,410		Diode	1S953
L401-405	L40-4701-03	Ferri inductor	47μH
S401	S32-4007-05	Lever switch	
S402	S32-2013-05	Lever switch	
S403	S01-3503-08	Rotary switch	
P401	E19-1261-08	Pin plug	12P
P402	E40-1064-05	Pin connector	10P
P403	E40-1264-05	Pin connector	12P

CONTROL UNIT (X77-1170-01)

Ref. No.	Parts No.	Name & Description			
R501	No use				
R502	No use				
R503-515	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R516-522	RD14BB2B221J	Carbon res.	220Ω	±5%	1/8W
R523-525	RD14BB2B102J	Carbon res.	1kΩ	±5%	1/8W
R526	RD14BB2B103J	Carbon res.	10kΩ	±5%	1/8W
R527	RD14BB2B102J	Carbon res.	1kΩ	±5%	1/8W
R530,531	RD14BB2B222J	Carbon res.	2.2kΩ	±5%	1/8W
R532	RD14BB2B331J	Carbon res.	330Ω	±5%	1/8W
R533	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R534,535	RD14BB2B222J	Carbon res.	2.2kΩ	±5%	1/8W
R536	RD14BB2B391J	Carbon res.	390Ω	±5%	1/8W
R537	RD14BB2B333J	Carbon res.	33kΩ	±5%	1/8W
R538	RD14BB2B103J	Carbon res.	10kΩ	±5%	1/8W
R539	RD14BB2B222J	Carbon res.	2.2kΩ	±5%	1/8W
R540	RD14BB2B102J	Carbon res.	1kΩ	±5%	1/8W
R541	RD14BB2B471J	Carbon res.	470Ω	±5%	1/8W
R542	RD14BB2B104J	Carbon res.	100kΩ	±5%	1/8W
R543	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R544	RD14BB2B103J	Carbon res.	10kΩ	±5%	1/8W
R545	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R546	No use				
R547,548	RD14BB2B222J	Carbon res.	2.2kΩ	±5%	1/8W
R549	RD14BB2B101J	Carbon res.	100Ω	±5%	1/8W
R550	RD14BB2B561J	Carbon res.	560Ω	±5%	1/8W
R551	RD14BB2B102J	Carbon res.	1kΩ	±5%	1/8W
R552	RD14BB2B104J	Carbon res.	100kΩ	±5%	1/8W
R553,554	RD14BB2B152J	Carbon res.	1.5kΩ	±5%	1/8W
R555	RD14BB2B221J	Carbon res.	220Ω	±5%	1/8W
R556	RD14BB2B103J	Carbon res.	10kΩ	±5%	1/8W
R557	RD14BB2B680J	Carbon res.	68Ω	±5%	1/8W
R558	RS14AB3A220J	Metal oxide film res.	22Ω	±5%	1W
R559	RD14BB2B222J	Carbon res.	2.2kΩ	±5%	1/8W
R560	RD14BB2B821J	Carbon res.	820Ω	±5%	1/8W
R561-567	RN14BK2E9100F	Metal film res.	910Ω	±1%	1/4W
R568-575	RN14BK2E1800F	Metal film res.	180Ω	±1%	1/4W

Ref. No.	Parts No.	Name & Description			
R576-582	RN14BK2E3600F	Metal film res.	360Ω	±1%	1/4W
R583-585	RD14BB2B222J	Carbon res.	2.2kΩ	±5%	1/8W
R586	RD14BB2B682J	Carbon res.	6.8kΩ	±5%	1/8W
R587	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R588	RD14BB2B102J	Carbon res.	1kΩ	±5%	1/8W
R589	RD14BB2B821J	Carbon res.	820Ω	±5%	1/8W
R590-596	RN14BK2E9100F	Metal film res.	910Ω	±1%	1/4W
R597-603	RN14BK2E1800F	Metal film res.	180Ω	±1%	1/4W
R604-611	RN14BK2E3600F	Metal film res.	360Ω	±1%	1/4W
R612	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R613	RD14BB2B221J	Carbon res.	220Ω	±5%	1/8W
R614	RD14BB2B331J	Carbon res.	330Ω	±5%	1/8W
R615	RD14BB2B391J	Carbon res.	390Ω	±5%	1/8W
R616,617	RD14BB2B221J	Carbon res.	220Ω	±5%	1/8W
R618	RD14BB2B103J	Carbon res.	10kΩ	±5%	1/8W
R619	RD14BB2B471J	Carbon res.	470Ω	±5%	1/8W
R620-629	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R630	No use				
R631	RD14BB2B332J	Carbon res.	3.3kΩ	±5%	1/8W
R632	RD14BB2B223J	Carbon res.	22kΩ	±5%	1/8W
R633	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R634	RD14BB2B221J	Carbon res.	220Ω	±5%	1/8W
R635	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R636	No use				
R637,638	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R639	RD14BB2B103J	Carbon res.	10kΩ	±5%	1/8W
R640	RD14BB2B473J	Carbon res.	47kΩ	±5%	1/8W
R641	RD14BB2B471J	Carbon res.	470Ω	±5%	1/8W
R642	RD14BB2B223J	Carbon res.	22kΩ	±5%	1/8W
R643	RD14BB2B363J	Carbon res.	36kΩ	±5%	1/8W
R644	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
R646	RD14BB2B333J	Carbon res.	33kΩ	±5%	1/8W
R647,648	RD14BB2B471J	Carbon res.	470Ω	±5%	1/8W
R649-651	RD14BB2B472J	Carbon res.	4.7kΩ	±5%	1/8W
VR501	R12-0505-05	Semifixed res.	200Ω		
VR502	R12-1026-05	Semifixed res.	3.3kΩ		

Ref. No.	Parts No.	Name & Description			
VR503,504	R12-0505-05	Semifixed res.	200Ω		
VR505	R12-1026-05	Semifixed res.	3.3kΩ		
VR506,507	R12-3002-05	Semifixed res.	10kΩ		
C501-504	No use				
C505	CK45B1H221K	Ceramic cap.	220pF	±10%	
C506	CK45B1H101K	Ceramic cap.	100pF	±10%	
C508,509	CK45B1H101K	Ceramic cap.	100pF	±10%	
C510	CK45B1H102K	Ceramic cap.	1000pF	±10%	
C511	CK45B1H331K	Ceramic cap.	330pF	±10%	
C512	No use				
C513	CK45B1H101K	Ceramic cap.	100pF	±10%	
C514	CC45CH1H220J	Ceramic cap.	22pF	±5%	
C515	CK45B1E103K	Ceramic cap.	0.01μF	±10%	25WV
C516	CE04W1A470M	Electrolytic cap.	47μF		10WV
C517	CE04W1A150M	Electrolytic cap.	15μF		10WV
C518	CK45B1H221K	Ceramic cap.	220pF	±10%	
C519	CK45CH1H100D	Ceramic cap.	10pF	±0.5pF	
C520	CE04W1C470M	Electrolytic cap.	47μF		16WV
C521	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C522	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C523	CE04W1A470M	Electrolytic cap.	47μF		10WV
C524,525	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C526,527	CK45B1H221K	Ceramic cap.	220pF	±10%	
C528	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C529	CE04W1C101M	Electrolytic cap.	100μF		16WV
C530	CE04W1A101M	Electrolytic cap.	100μF		10WV
C531,532	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C533	CE04W1C101M	Electrolytic cap.	100μF		16WV
C534	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C535	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C536	CE04W1A101M	Electrolytic cap.	100μF		10WV
C537	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C538	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C539	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C540	CE04W1C101M	Electrolytic cap.	100μF		16WV
C541	CE04W1A101M	Electrolytic cap.	100μF		10WV

Ref. No.	Parts No.	Name & Description			
C542	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C543	CE04W1A101M	Electrolytic cap.	100μF		10WV
C544	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C545	CE04W1C101M	Electrolytic cap.	100μF		16WV
C546	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C547	CE04W1C470M	Electrolytic cap.	47μF		16WV
C548	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C549	CK45B1H102K	Ceramic cap.	1000pF	±10%	
C550	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C551	CE04W1C101M	Electrolytic cap.	100μF		16WV
C552	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C553	CE04W1A101M	Electrolytic cap.	100μF		10WV
C554-588	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C589	CE04W1A101M	Electrolytic cap.	100μF		10WV
C590-595	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C596	CK45B1H221K	Ceramic cap.	220pF	±10%	
C597	CC45CH1H330J	Ceramic cap.	33pF	±5%	
C598	CK45B1H221K	Ceramic cap.	220pF	±10%	
C599,600	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C601	C91-0558-08	Ceramic cap.	0.2μF		12WV
C602-605	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C606	CK45B1H102K	Ceramic cap.	1000pF	±10%	
C607	CK45B1H101K	Ceramic cap.	100pF	±10%	
C608	CK45B1H102K	Ceramic cap.	1000pF	±10%	
C609,610	CK45B1H473K	Ceramic cap.	0.047μF	±10%	
C611,612	C91-0559-08	Ceramic cap.	0.2μF		12WV
C613	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C614	CC45SL1H220J	Ceramic cap.	22pF	±5%	
C615	CK45B1H472K	Ceramic cap.	4700pF	±10%	
C616	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C617,618	C91-0559-08	Ceramic cap.	0.2μF		12WV
C619	CC45SL1H470J	Ceramic cap.	47pF	±5%	
IC501		IC	LM310		
IC502		IC	MC14174		
IC503		IC	MC14175		
IC504,505		No use			

Ref. No.	Parts No.	Name & Description	
IC506		IC	MC1741
IC507-509		IC	SN7406
IC510		IC	SN74LS85
IC511		IC	SN74LS193
IC512-514		No use	
IC515,516		IC	SN7406
IC517		No use	
IC518		IC	SN74LS85
IC519		IC	SN74LS193
IC520-522		No use	
IC523		IC	SN7406
IC524		No use	
IC525		IC	SN74LS85
IC526		IC	SN74LS193
IC527,528		No use	
IC529		IC	AM2503
IC530		IC	NE529
IC531-533		IC	SN74LS192
IC534		IC	SN7400
IC535		IC	SN74123
IC536		IC	SN74LS107
IC537		IC	SN7400
IC538		IC	SN7403
IC539,540		IC	SN74LS90
IC541,542		IC	SN7404
IC543		IC	SN7410
IC544		IC	SN7404
IC545		IC	SN7410
IC546		IC	SN7404
IC547		IC	SN74LS107
IC548,549		IC	SN7410
IC550		IC	SN7403
IC551-553		IC	SN74LS90
IC554		IC	SN74LS107
IC555		IC	SN74279
IC556		IC	SN7400
IC557		IC	SN7404

Ref. No.	Parts No.	Name & Description	
IC558		IC	SN74LS107
IC559		IC	SN7400
IC560		IC	SN7404
IC561		IC	SN7402
IC562		IC	SN7403
IC563,564		IC	SN74LS90
IC565		IC	SN74123
IC566		IC	SN74121
IC567,568		IC	SN74LS174
IC569		IC	SN7408
IC570		IC	SN74S00
IC571		IC	CD4011BE
IC572		IC	CD4013BE
IC573		IC	SN74LS273
IC574,575		IC	μPD444C
IC576,577		IC	SN74367
IC578		IC	SN74LS273
IC579		IC	SN7474
IC580		IC	LM310
IC581		IC	SN74158
Q501		Transistor	2SA495 or 2SA1015
Q502-506		Transistor	2SC373 or 2SC1815
Q507-522		Transistor	2N5771
Q523		Transistor	E175
D501-515		Diode	1N34
D516-523		Diode	1S953
D524,525		Diode	1N34
D526-528		Diode	1S953
D529		Diode	RD6.2E
L501-508	L40-4701-03	Ferri inductor	47μH
X501	L77-1002-05	Crystal	10MHz

Ref. No.	Parts No.	Name & Description
P501	E40-1266-05	Pin connector 12P
P502	E19-0461-08	Pin connector 4P
P503,504	E40-1266-05	Pin connector 12P
P505	E40-0461-08	Pin connector 4P
P506,507	E40-1066-05	Pin connector 10P
P508	E19-0362-08	Pin connector 3P
P509	E19-0461-08	Pin connector 4P

FREE RUN UNIT (X77-1230-00)

Ref. No	Parts No.	Name & Description			
R1	RD14BB2B472J	Carbon res.	4.7 kΩ		
R2,3	RD14BB2B222J	Carbon res.	2.2kΩ		
R4	RD14BB2B183J	Carbon res.	18kΩ		
VR1	R01-8503-05	Variable res.	2MΩB		
C1	C90−0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C2	CK45B1H471K	Ceramic cap.	470pF	±10%	
C3	CS15E1A100M	Tantalum cap.	10μF		10WV
C4	CK45B1H103K	Ceramic cap.	0.01μF	±10%	
IC1		IC	NE555		
IC2		IC	SN7432		
D1-4		Diode	1N34		
P601	E19-1061-08	Pin connector	10P		

POWER SUPPLY UNIT (X68-1330-01)

Ref. No.	Parts No.	Name & Description			
R101	R92-1010-08	Winding res.	0.39Ω	±5%	2W
R102	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R103	RN14BK2E4991F	Metal film res.	4.99kΩ	±1%	1/4W
R104	RN14BK2E1182F	Metal film res.	11.8kΩ	±1%	1/4W
R105	RD14BB2E391J	Carbon res.	390Ω	±5%	1/4W
R106	RS14AB3A220J	Metal oxide film res.	22Ω	±5%	1W
R107	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R108	RD14BB2E220J	Carbon res.	22Ω	±5%	1/4W
R109	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R110	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R111	RD14BB2B220J	Carbon res.	22Ω	±5%	1/4W
R112	RN14BK2E1502F	Metal film res.	15kΩ	±1%	1/4W
R113	RN14BK2E3013F	Metal film res.	301kΩ	±1%	1/4W
R114	RD14BB2E473J	Carbon res.	47kΩ	±5%	1/4W
R115	RD14BB2E683J	Carbon res.	68kΩ	±5%	1/4W
R116,117	RD14BB2E222J	Carbon res.	2.2kΩ	±5%	1/4W
R118	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R119,120	RS14AB3A101J	Metal oxide film res.	100Ω	±5%	1W
R121	RD14BB2E164J	Carbon res.	160kΩ	±5%	1/4W
R122	RD14BB2E473J	Carbon res.	47kΩ	±5%	1/4W
R123	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R124	RD14BB2E471J	Carbon res.	470Ω	±5%	1/4W
R125	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R126	RD14BB2E470J	Carbon res.	47Ω	±5%	1/4W
R127	R92-1011-08	Winding res.	3.6MΩ	±5%	
R128	R92-0146-25	Winding res.	2.2MΩ	±5%	
R129	R92-1012-08	Carbon res.	2MΩ	±5%	
R130	R92-0146-25	Winding res.	2.2MΩ	±5%	
R131	R92-1013-08	Carbon res.	1.8MΩ	±5%	
R132	RD14BK2H473J	Carbon res.	47kΩ	±5%	1/2W
R133,134	R92-1014-08	Carbon res.	22MΩ	±5%	
R135	RD14BB2E473J	Carbon res.	47kΩ	±5%	1/4W
R136	RD14BB2E153J	Carbon res.	15kΩ	±5%	1/4W
R137	RD14BB2E224J	Carbon res.	220kΩ	±5%	1/4W
R138	RD14BB2E223J	Carbon res.	22kΩ	±5%	1/4W
R139	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R140	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W

Ref. No.	Parts No.	Name & Description			
R141	RD14BB2E154J	Carbon res.	150kΩ	±5%	1/4W
R142,143	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R144	RD14BB2E683J	Carbon res.	68kΩ	±5%	1/4W
R145	RD14BB2E123J	Carbon res.	12kΩ	±5%	1/4W
R146	RD14BB2E332J	Carbon res.	3.3kΩ	±5%	1/4W
R147,148	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
R149	RD14BB2E822J	Carbon res.	8.2kΩ	±5%	1/4W
R150	RD14BB2E682J	Carbon res.	6.8kΩ	±5%	1/4W
R151	RD14BB2E101J	Carbon res.	100Ω	±5%	1/4W
R152	RD14BB2E472J	Carbon res.	4.7kΩ	±5%	1/4W
R153	RD14BB2E221J	Carbon res.	220Ω	±5%	1/4W
R154	RD14BB2E103J	Carbon res.	10kΩ	±5%	1/4W
R155	RD14BB2E224J	Carbon res.	220kΩ	±5%	1/4W
R156	RD14BB2E104J	Carbon res.	100kΩ	±5%	1/4W
R157	RD14BB2E152J	Carbon res.	1.5kΩ	±5%	1/4W
R158	RD14BB2B152J	Carbon res.	1.5kΩ	±5%	1/8W
R159	RD14BB2B102J	Carbon res.	1kΩ	±5%	1/8W
R160	RD14BB2E102J	Carbon res.	1kΩ	±5%	1/4W
VR101	R12-1002-05	Semifixed	1kΩB		
VR102-104	R12-4503-05	Semifixed	50kΩB		
VR105	R12-6005-05	Semifixed	330kΩB		
VR106	R12-4503-05	Semifixed	50kΩB		
C101	CE04W1C222M	Electrolytic cap.	2200μF		16WV
C102	CE04W1A101M	Electrolytic cap.	100μF		10WV
C103	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C104,105	CE04W1E102M	Electrolytic cap.	1000μF		25WV
C106	CE04W1C101M	Electrolytic cap.	100μF		16WV
C107	C90-0261-05	Ceramic cap.	0.047μF		25WV
C108	CE04W1C101M	Electrolytic cap.	100μF		16WV
C109	C90-0261-05	Ceramic cap.	0.047μF		25WV
C110	CK45E2H103P	Ceramic cap.	0.01μF	+100% −0%	500WV
C111	C91-0556-08	Ceramic cap.	0.01μF	±2%	
C112	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C113	No use				
C114	CK45F1H223Z	Ceramic cap.	0.022μF	+80% −20%	
C115	CE04W1H471M	Electrolytic cap.	470μF		50WV

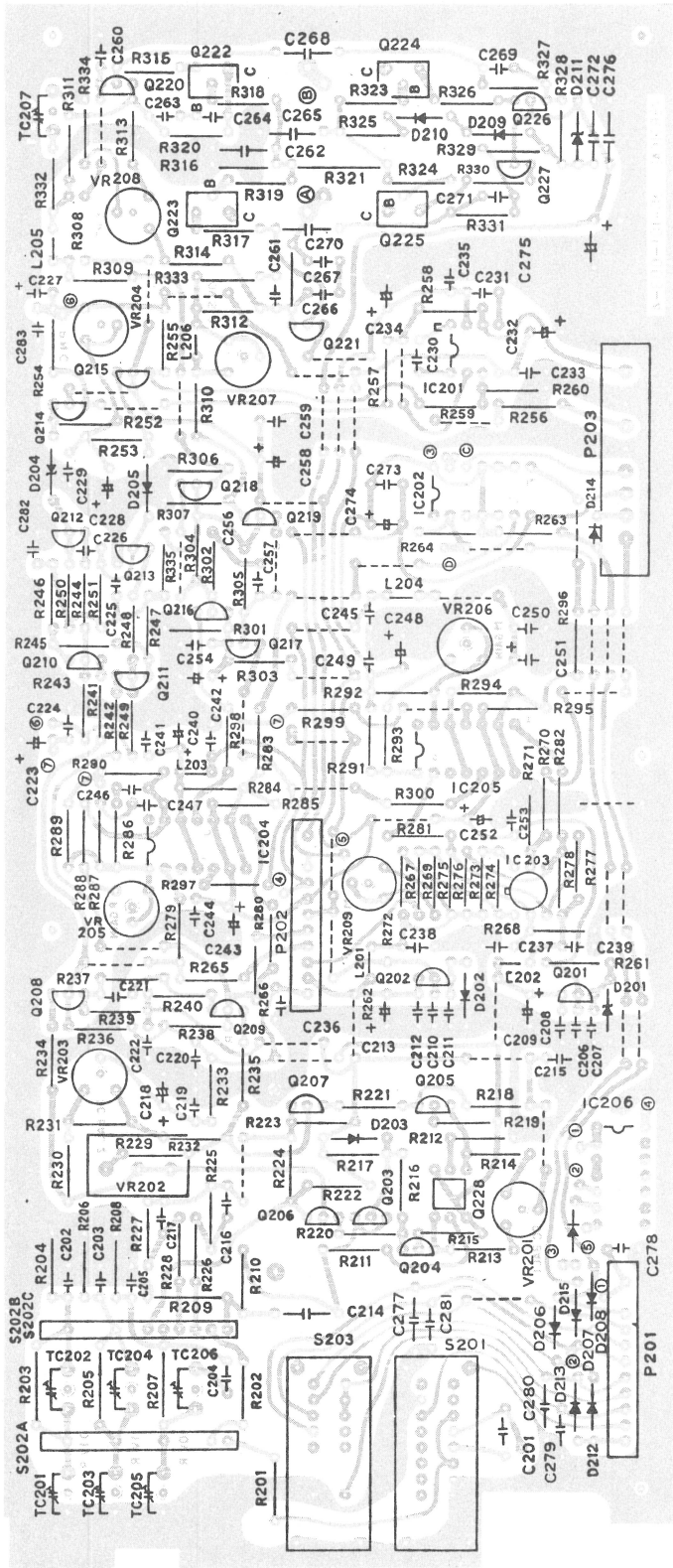
Ref. No.	Parts No.	Name & Description			
C116	CK45F1H103Z	Ceramic cap.	0.01μF	+80% −20%	
C117-122	CK45E3D103P	Ceramic cap.	0.01μF	+100% −0%	2000WV
C123	CE04W2E330M	Electrolytic cap.	33μF		250WV
C124	CE04W2E010M	Electrolytic cap.	1μF		250WV
C125	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C126,127	CC45CH1H010C	Ceramic cap.	1pF	±0.25pF	
C128	CC45SL1H050C	Ceramic cap.	5pF	±0.25pF	
C129	CK45E1H222P	Ceramic cap.	2200pF	+100% −0%	
C130	CC45SL1H050C	Ceramic cap.	5pF	±0.25pF	
C131-134	C90-0261-05	Ceramic cap.	0.047μF		25WV
C135,136	C90-0298-05	Semiconductor ceramic cap.	0.1μF		12WV
C137	C91-0560-08	Film cap.	0.47μF		50WV
C138	C91-0557-08	Ceramic cap.	0.1μF		50WV
IC101,102		IC	μA741CN		
IC103		IC	LM555CN		
Q101		Transistor	2SC1509		
Q102		Transistor	2SC373 or 2SC1815		
Q103		Transistor	2SA777		
Q104		Transistor	2SC1509		
Q105		Transistor	2SA777		
Q106		Transistor	2SC373 or 2SC1815		
Q107		Transistor	2SA495 or 2SA1015		
Q108		Transistor	2SD401		
Q109		Transistor	2SC983		
Q110		Transistor	2SC1566		
Q111,112		Transistor	2SC983		
Q113		Transistor	2SC1215		
Q114		Transistor	2SC373 or 2SC1815		
D101		Rectifier	S1QB10		
D102		Rectifier	S1QB60		
D103,104		Diode	1S953		
D105		Diode	LA80		
D106,107		Diode	W06C		

Ref. No.	Parts No.	Name & Description	
D108		Rectifier	RD30ER
D109		Diode	W06C
D110		Diode	1S953
D111		Diode	1S955
D112		Diode	RD5.1E-C
L101,102	L40-4701-03	Ferri inductor	47μH
T1	L19-0019-05	Converter transformer	
N101-103		Neon lamp	NE-2
P101	E19-0361-08	Pin connector	3P
P102	E40-1064-05	Pin connector	10P
P103	E19-0861-08	Pin connector	8P
P104	E19-0561-08	Pin connector	5P
P105,106	E40-1064-05	Pin connector	10P

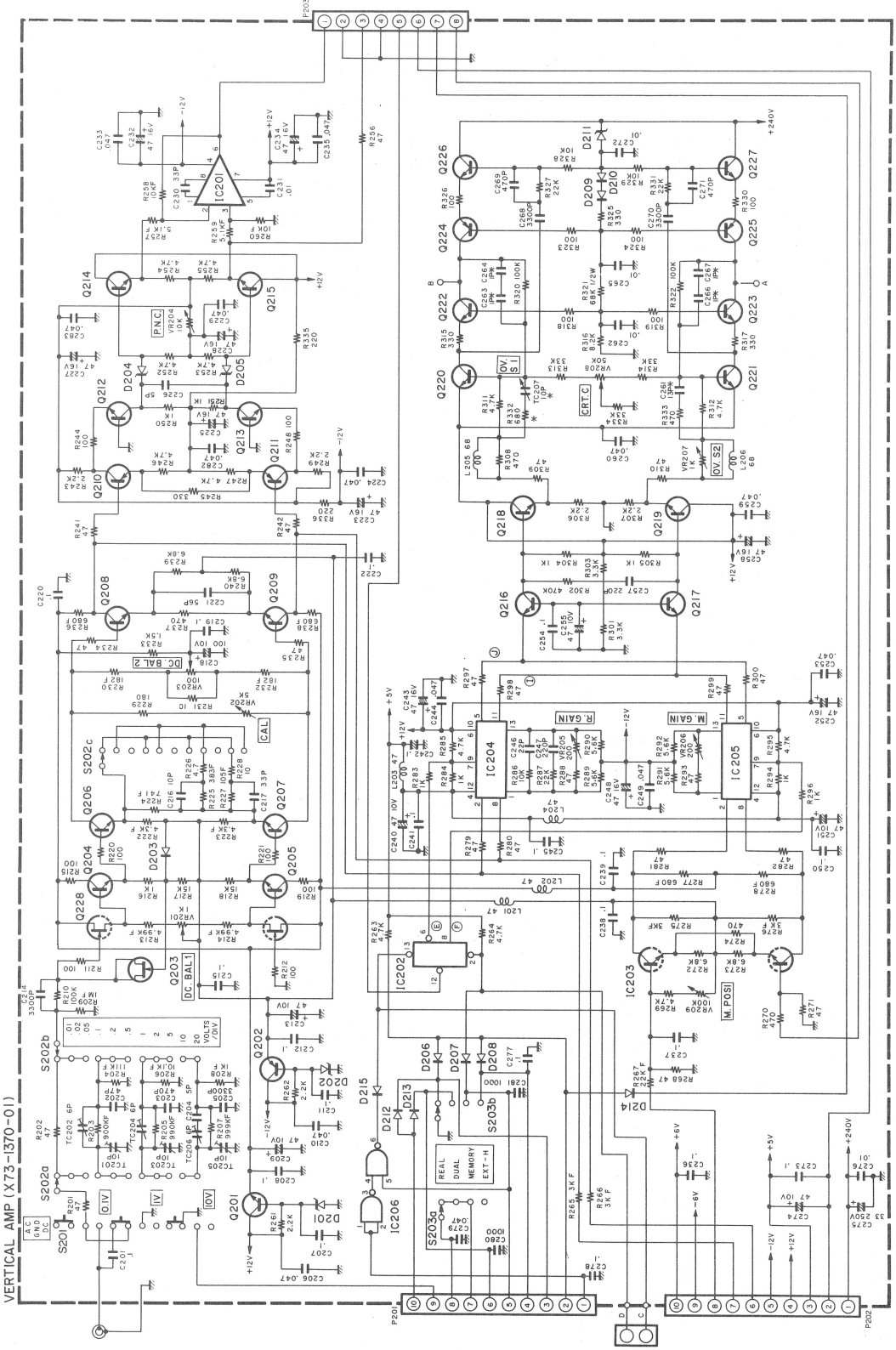
MEMO

PC BOARD

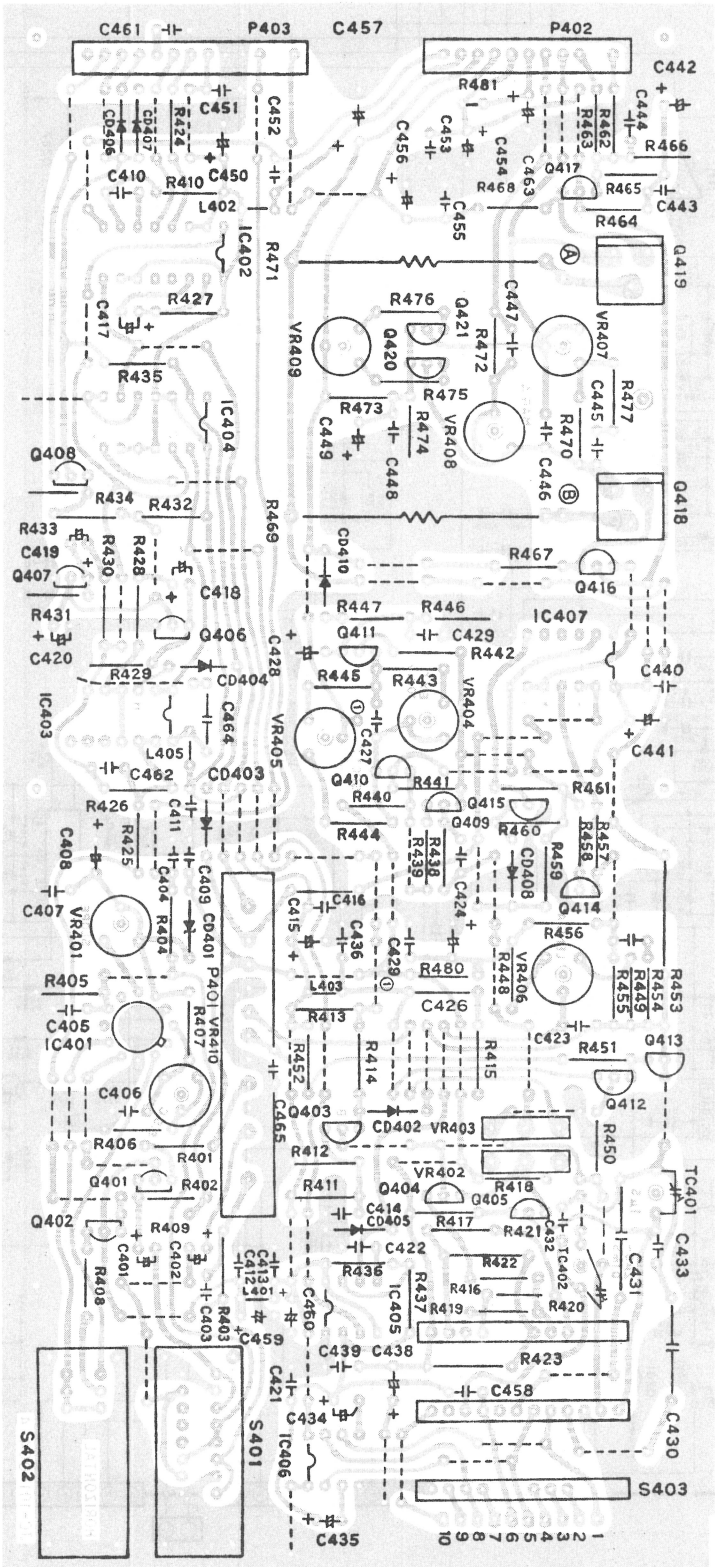
VERTICAL AMPLIFIER UNIT (X73-1370-01)



CIRCUIT DIAGRAM

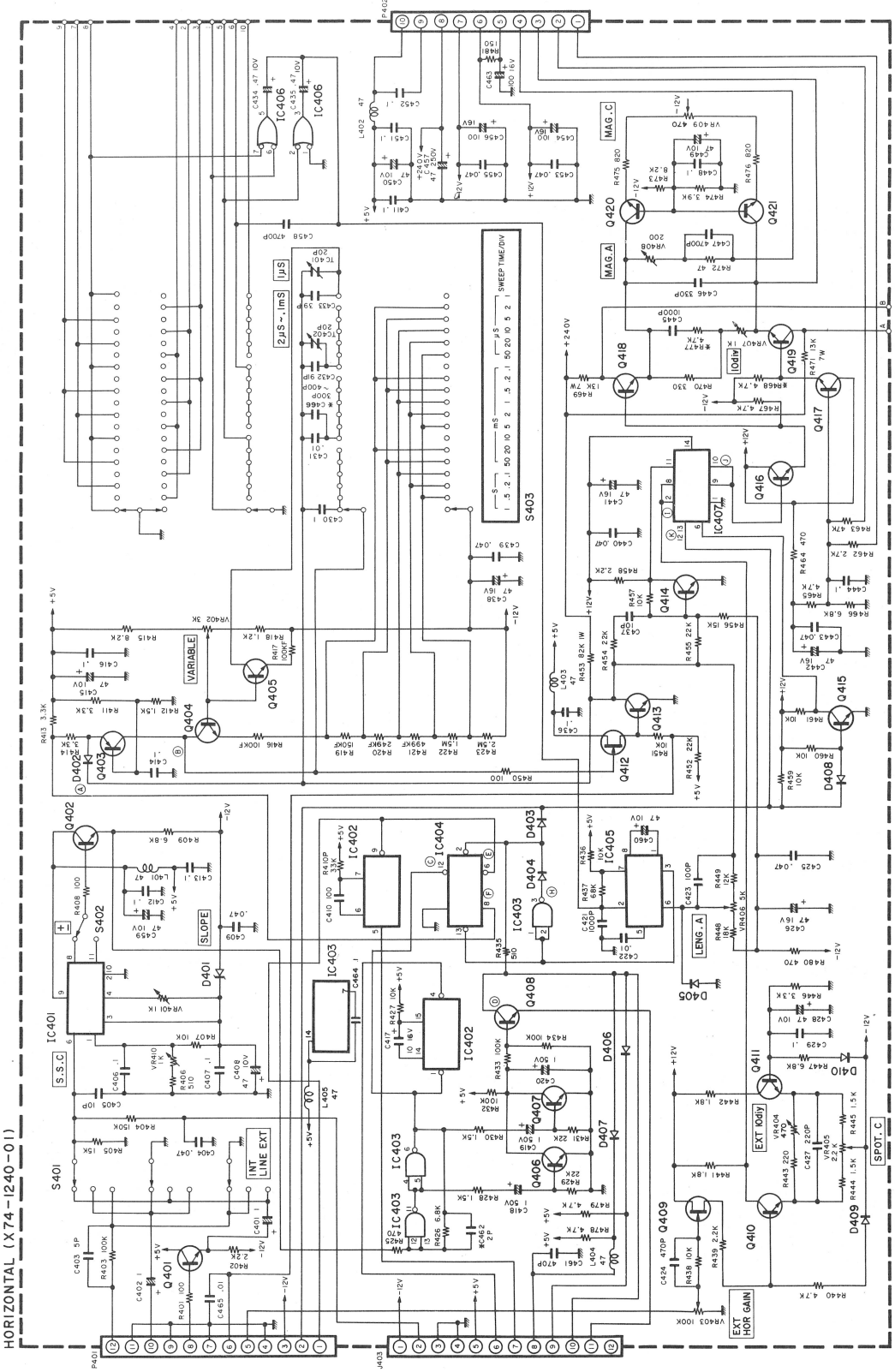


PC BOARD



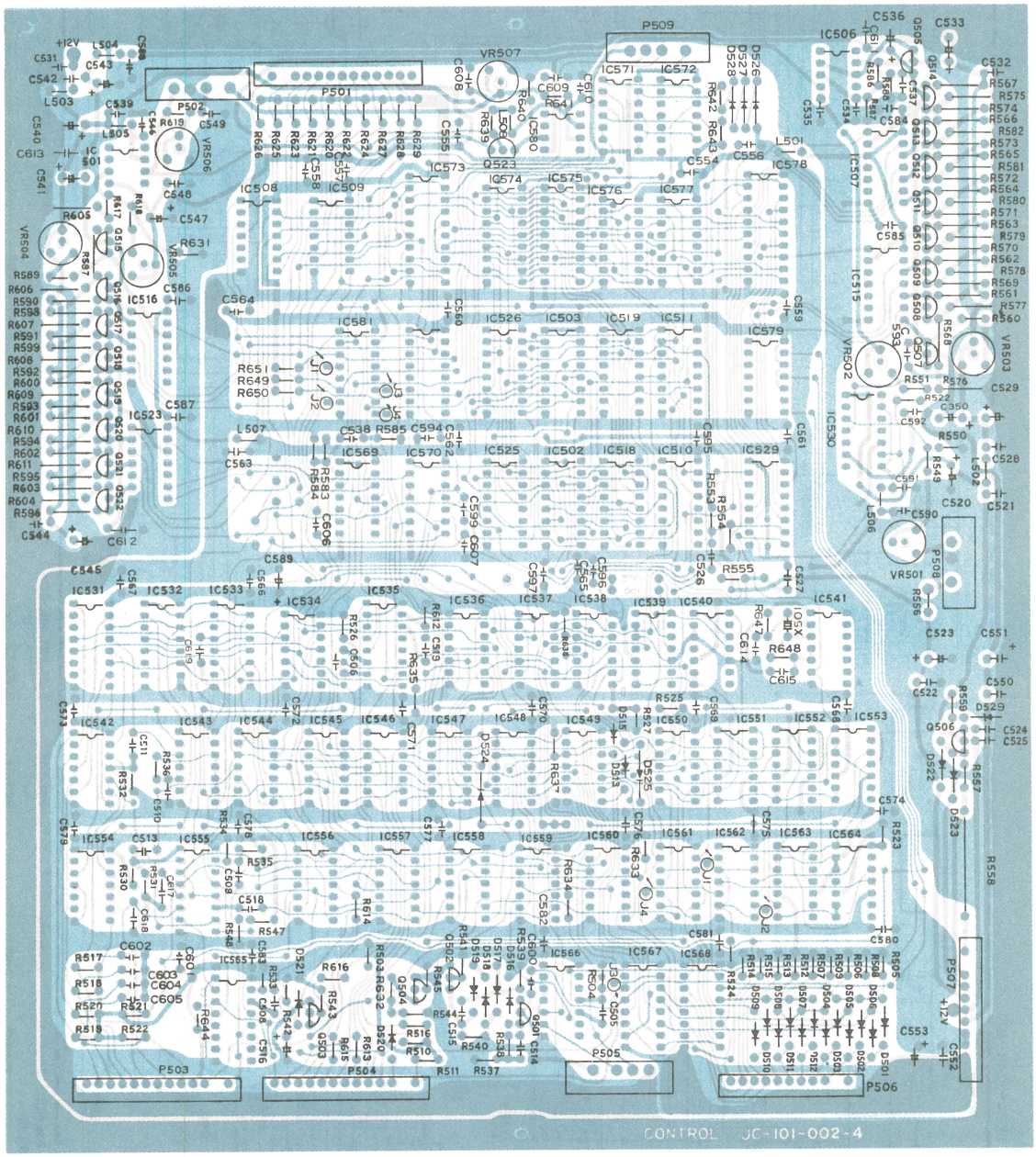
HORIZONTAL SWEEP UNIT (X74-1240-01)

CIRCUIT DIAGRAM

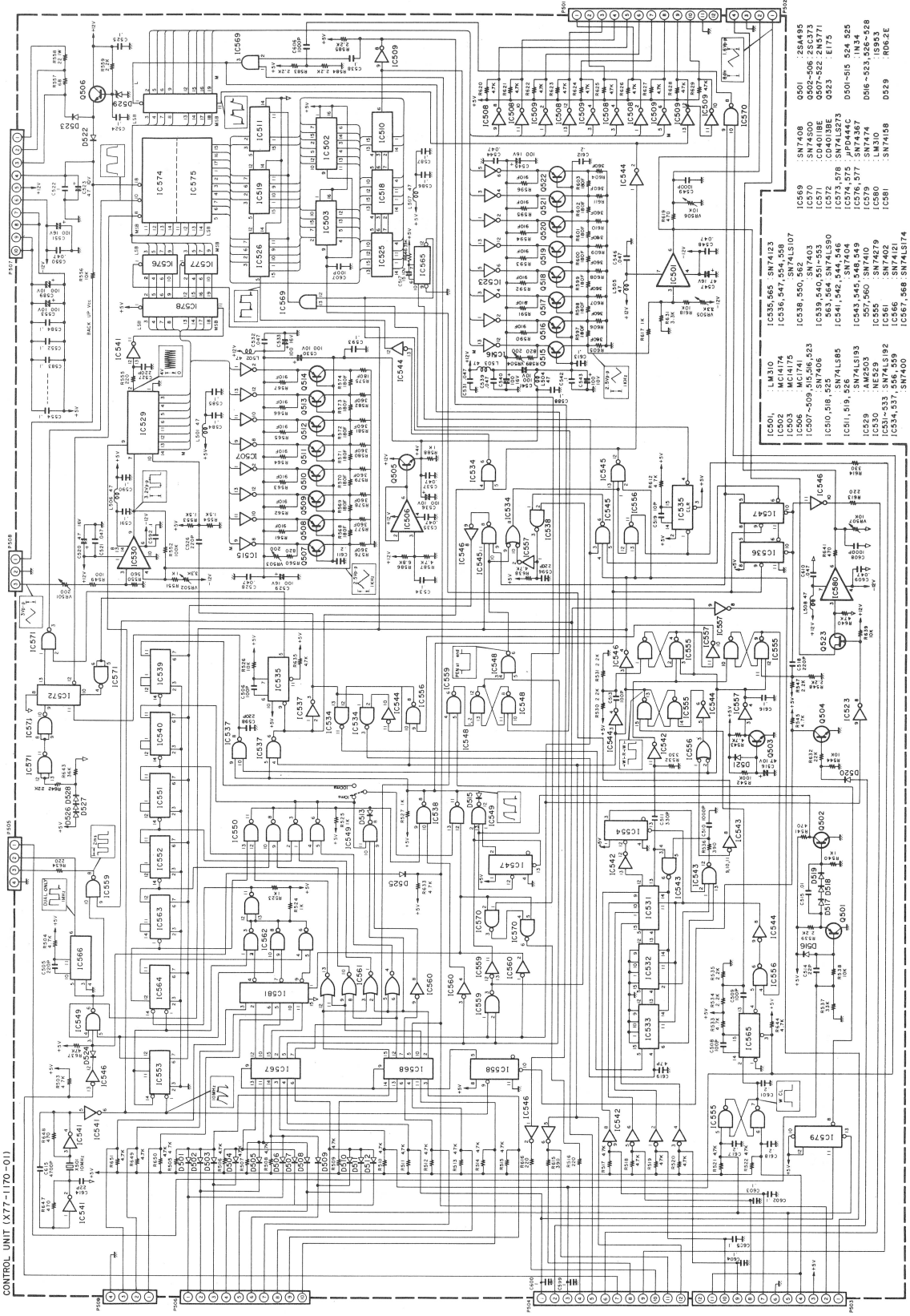


PC BOARD

CONTROL UNIT (X77-1170-01)

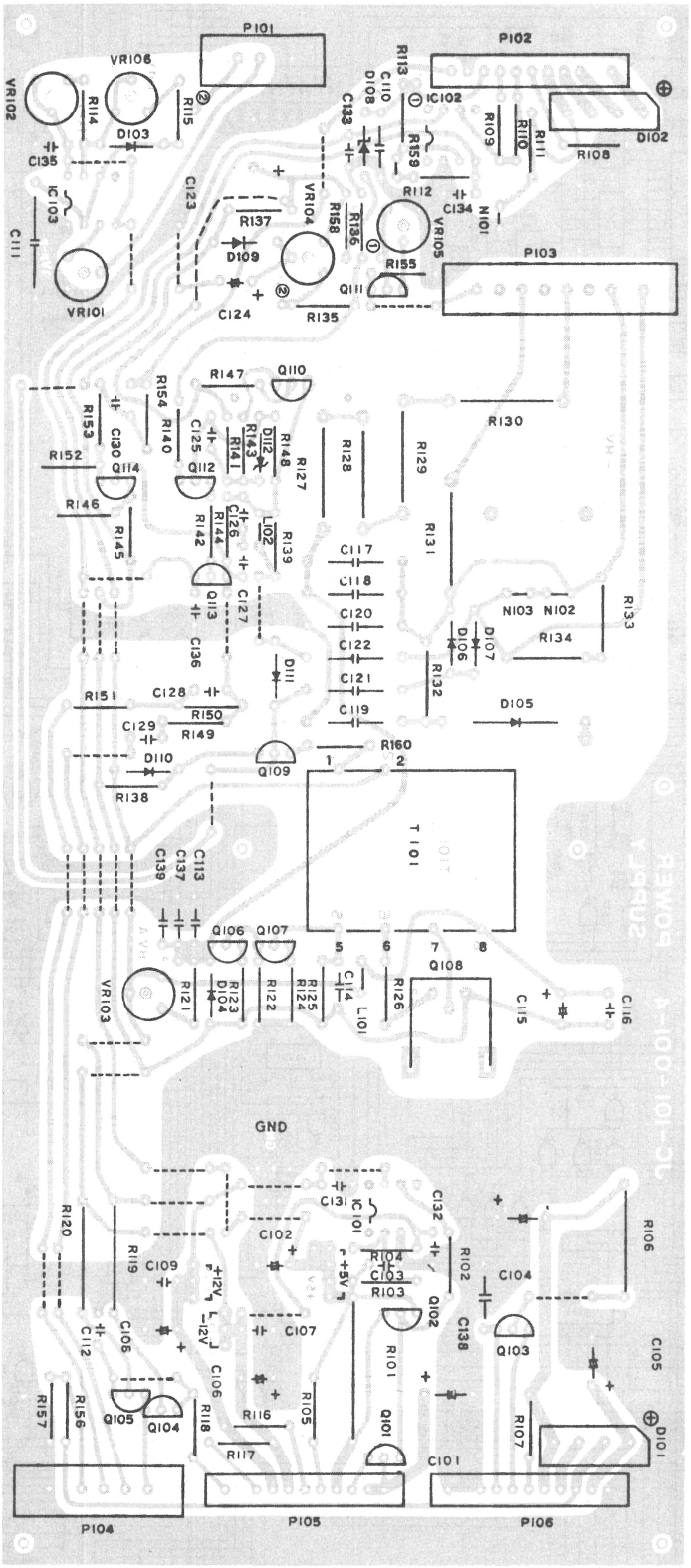


CIRCUIT DIAGRAM

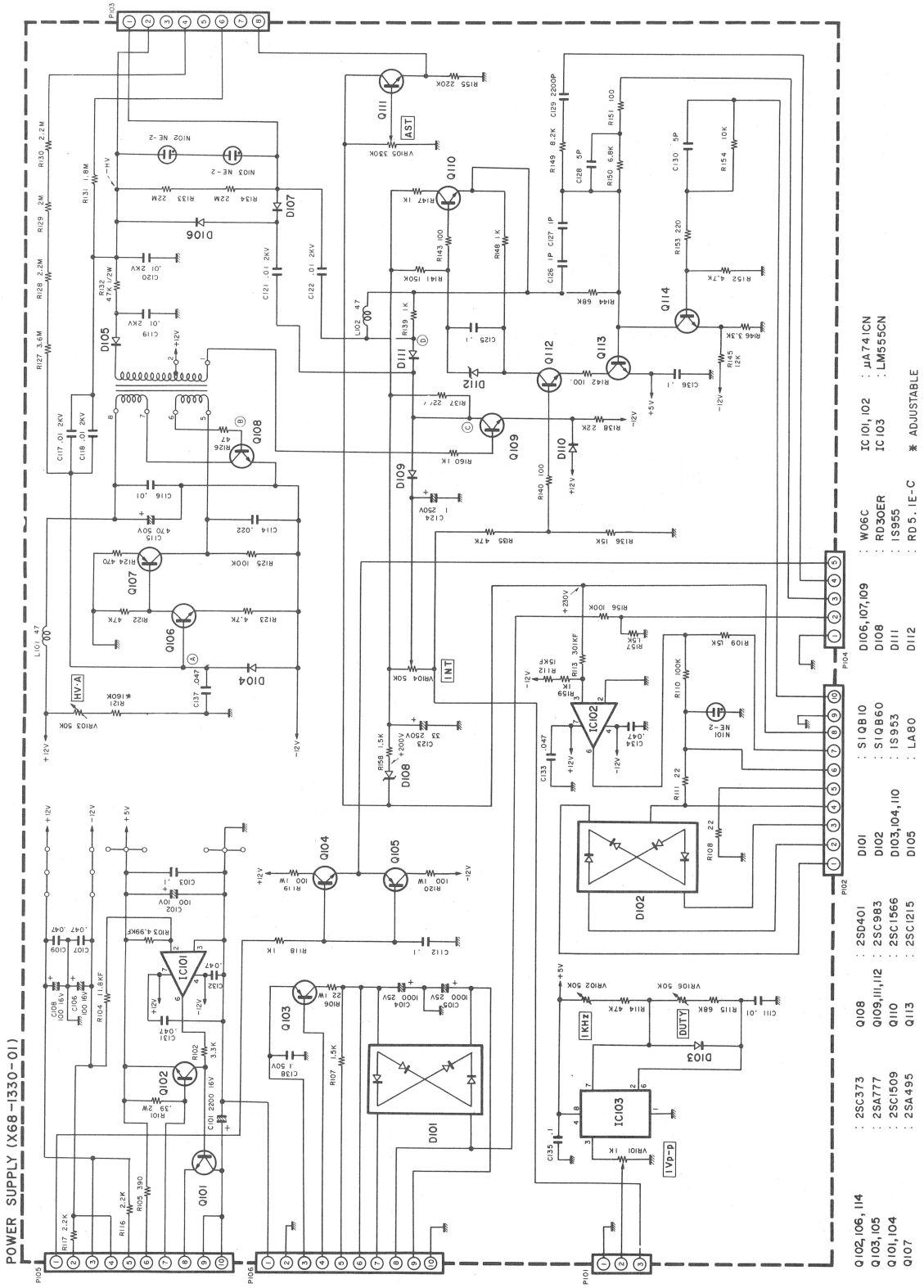


PC BOARD

POWER SUPPLY UNIT (X68-1330-01)

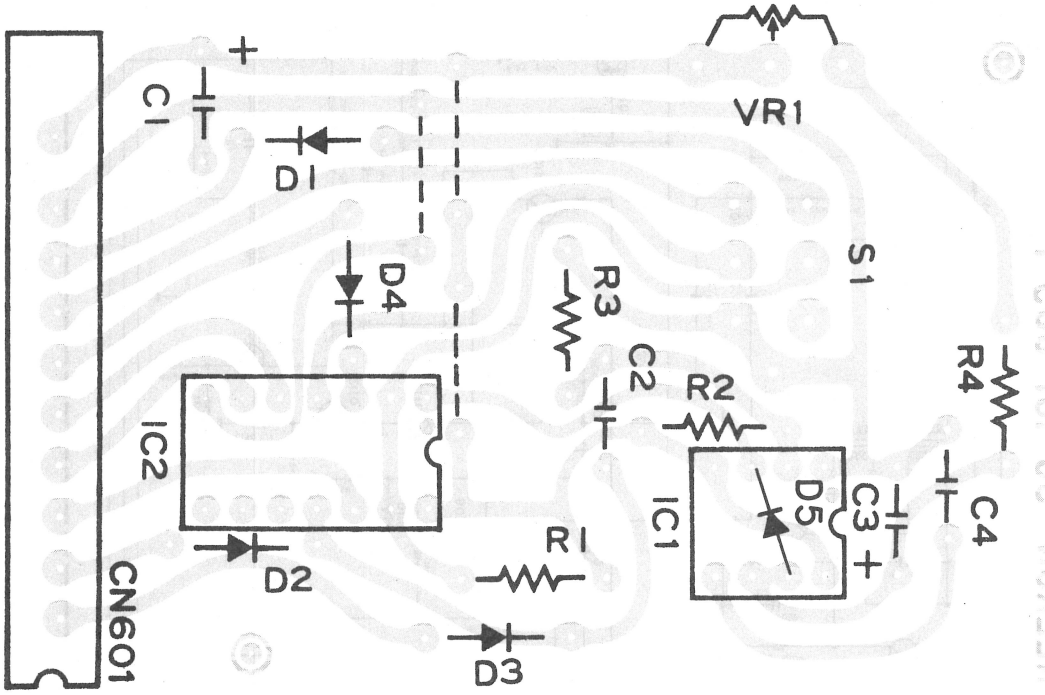


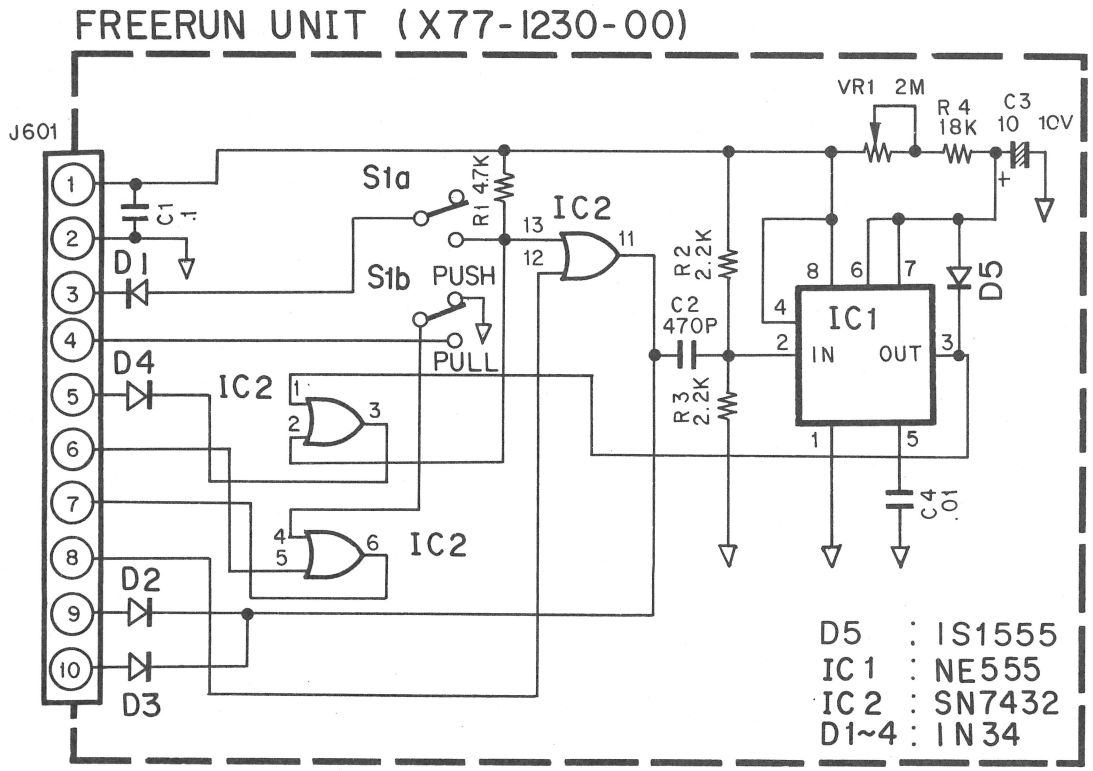
CIRCUIT DIAGRAM



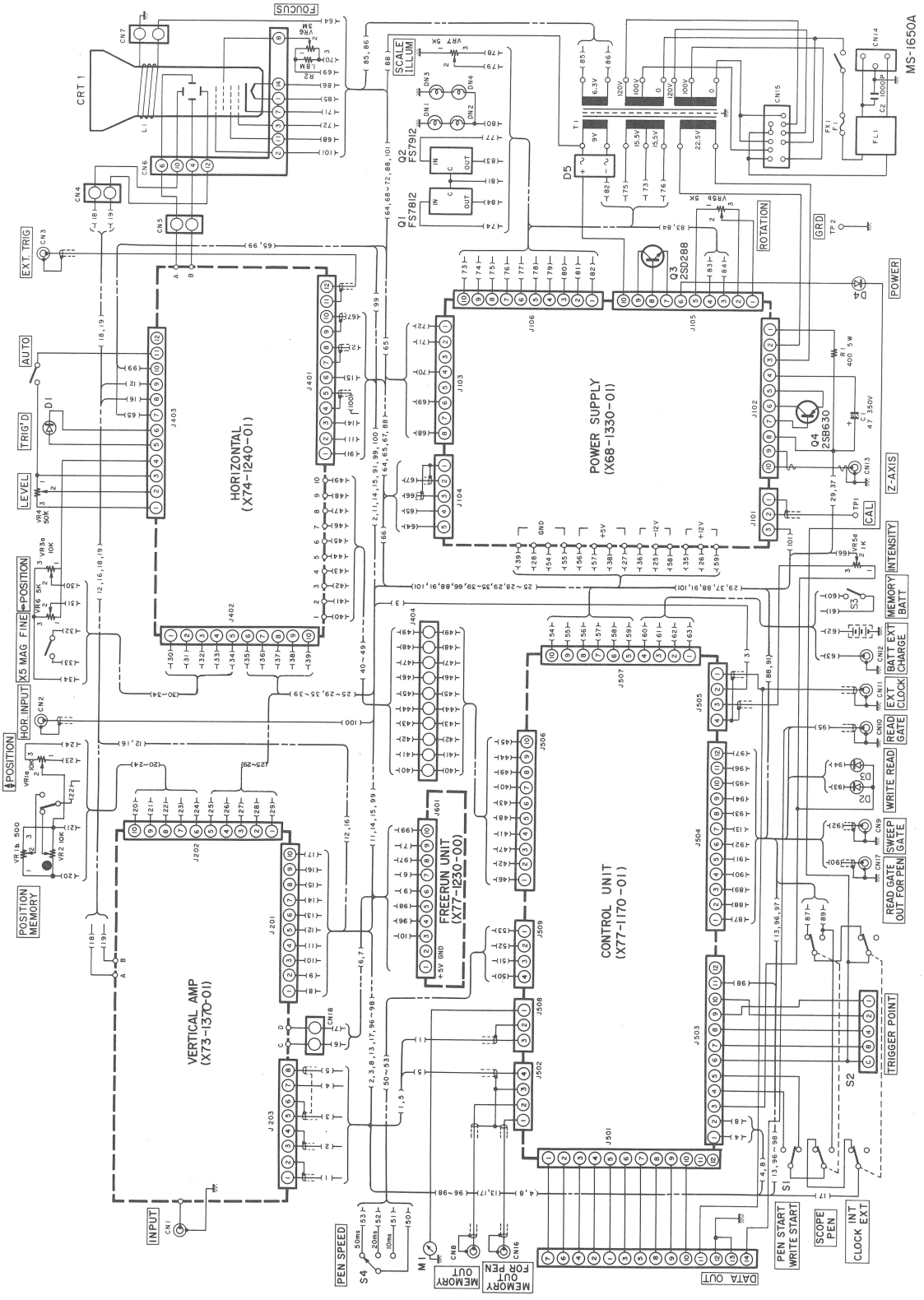
PC BOARD / CIRCUIT DIAGRAM

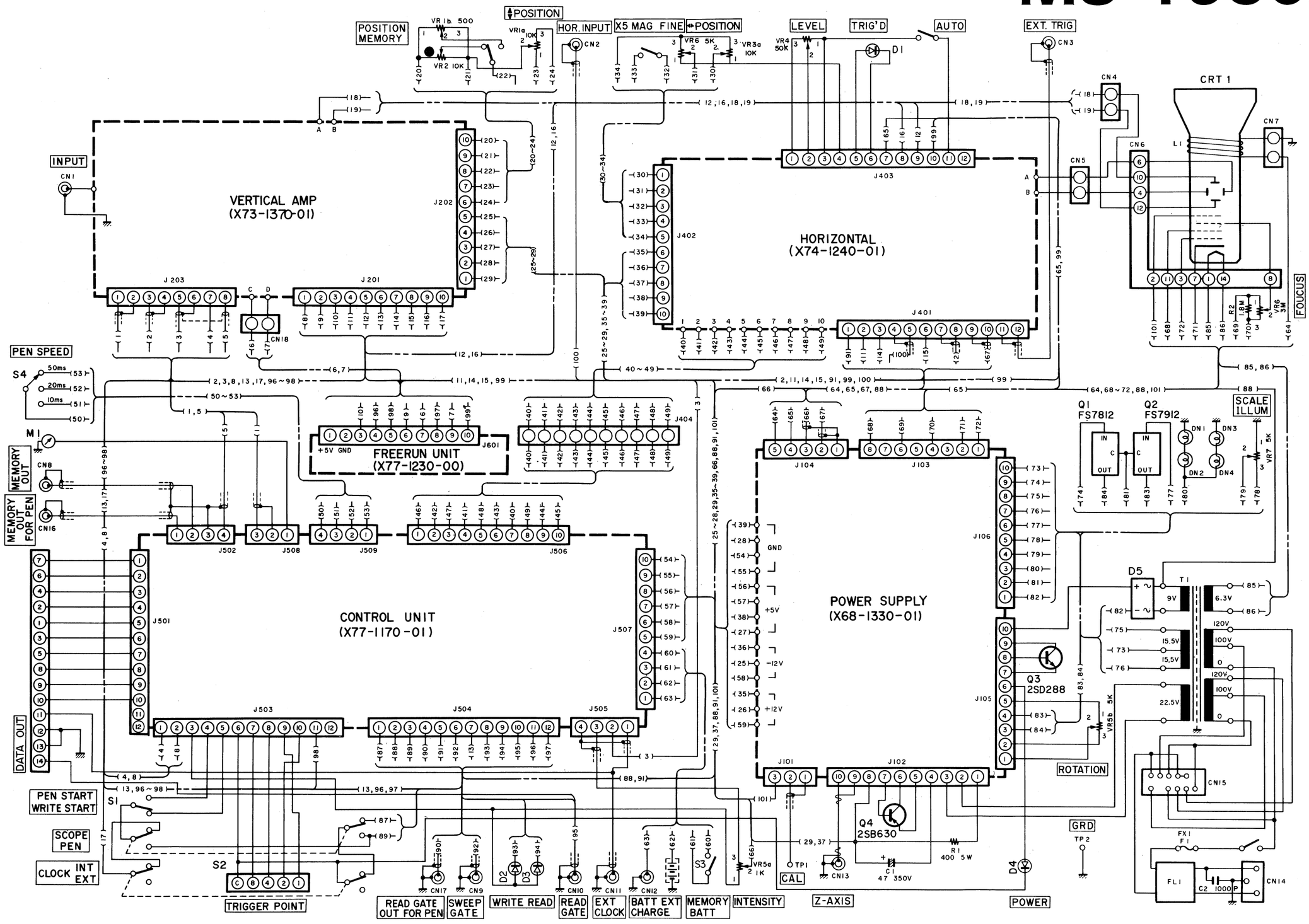
FREE RUN UNIT (X77-1230-00)



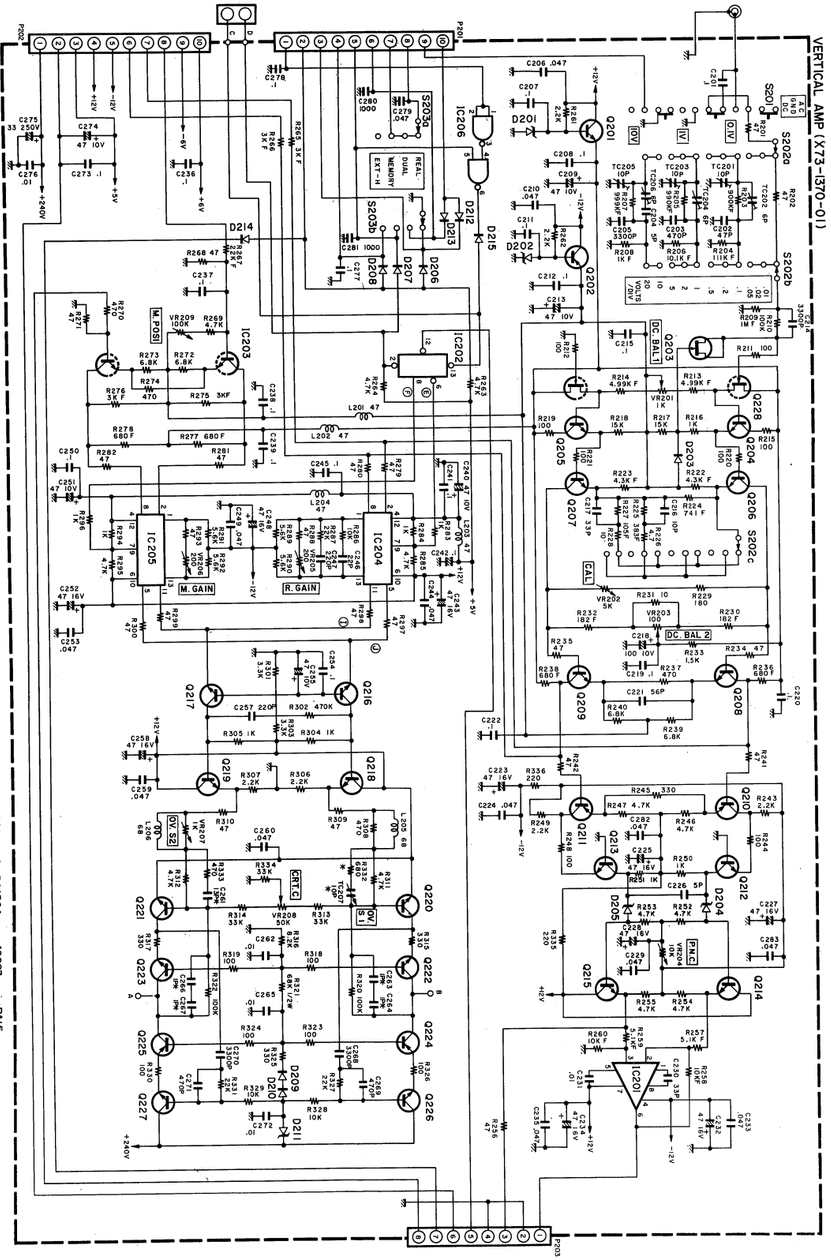


CIRCUIT DIAGRAM




POSITION
POSITION MEMORY
VR1b 500
VR1a 10K
VR2 10K
HOR. INPUT
CN2
X5 MAG FINE
POSITION
VR6 5K
VR3a 10K
LEVEL
VR4 50K
TRIG'D
D1
AUTO
EXT. TRIG
CN3
CN4
CRT 1
CN7
CN6
L1
CN5
INPUT
CN1
VERTICAL AMP
(X73-1370-01)
J202
J203
J201
CN18
J403
J402
HORIZONTAL
(X74-1240-01)
J401
FOUCUS
R2 1.8M
VR6 3M
PEN SPEED
S4
50ms
20ms
10ms
M1
MEMORY OUT
CN8
MEMORY OUT FOR PEN
CN16
+5V GND
FREERUN UNIT
(X77-1230-00)
J601
J404
J502
J508
J509
J506
J501
CONTROL UNIT
(X77-1170-01)
J503
J504
J505
J507
DATA OUT
PEN START WRITE START
S1
SCOPE PEN
CLOCK INT EXT
S2
TRIGGER POINT
READ GATE OUT FOR PEN
SWEEP GATE
CN17
CN9
D2
D3
WRITE READ
CN10
READ GATE
CN11
EXT CLOCK
CN12
BATT EXT CHARGE
S3
MEMORY BATT
VR5a 2 1K
INTENSITY
J104
J103
J106
J105
J101
J102
POWER SUPPLY
(X68-1330-01)
GND
+5V
-12V
+12V
Q3 2SD288
Q4 2SB630
R1 400 5W
C1 47 350V
TP1
CAL
CN13
Z-AXIS
D4
POWER
Q1 FS7812
Q2 FS7912
SCALE ILLUM
DN1
DN2
DN3
DN4
VR7 5K
D5
T1
9V
6.3V
120V
100V
15.5V
22.5V
VR5b 5K
ROTATION
CN15
GRD
TP2
FX1
F1
FL1
C2 1000P
CN14

VERTICAL AMP (X73-1370-01)



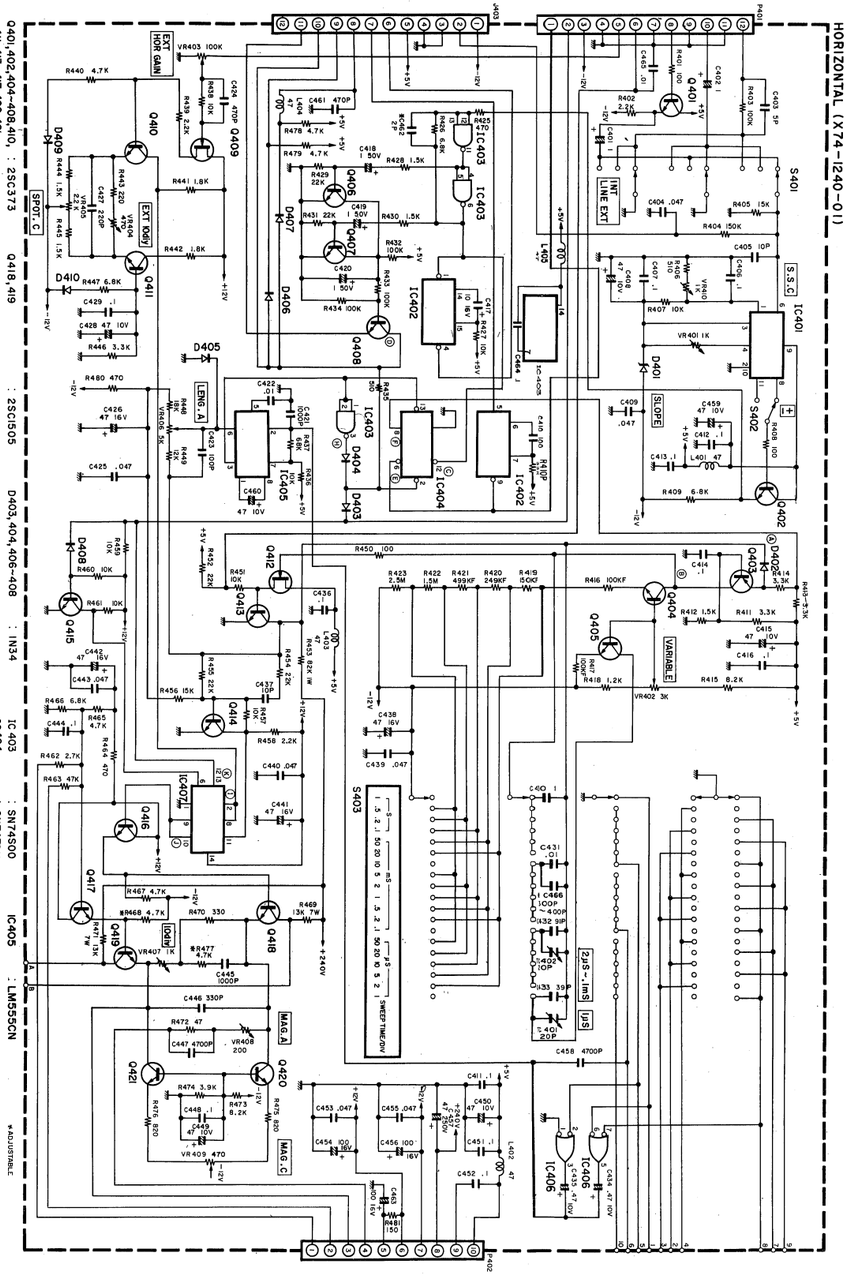
Q201,204,205,208,209 : 2SC1215
212~219,226,227 : 2SC373
Q202,210,211 : 2SA495
Q203 : 2SK30(O)

Q206,207,220,221 : 2SC1215
Q222,223 : 2SC1628
Q224,225 : 2SA968
Q228 : 2SK228-1-2 or1-3

D201,202,204,205 : RD6.8E
D203,209,210,213 : 1S953
D206~208,212,213 : 1N34
D211 : RD10E

IC201 : μPC159A
IC202 : SN7472
IC204,205 : AN904
IC206 : SN7400
IC203 : μPA15

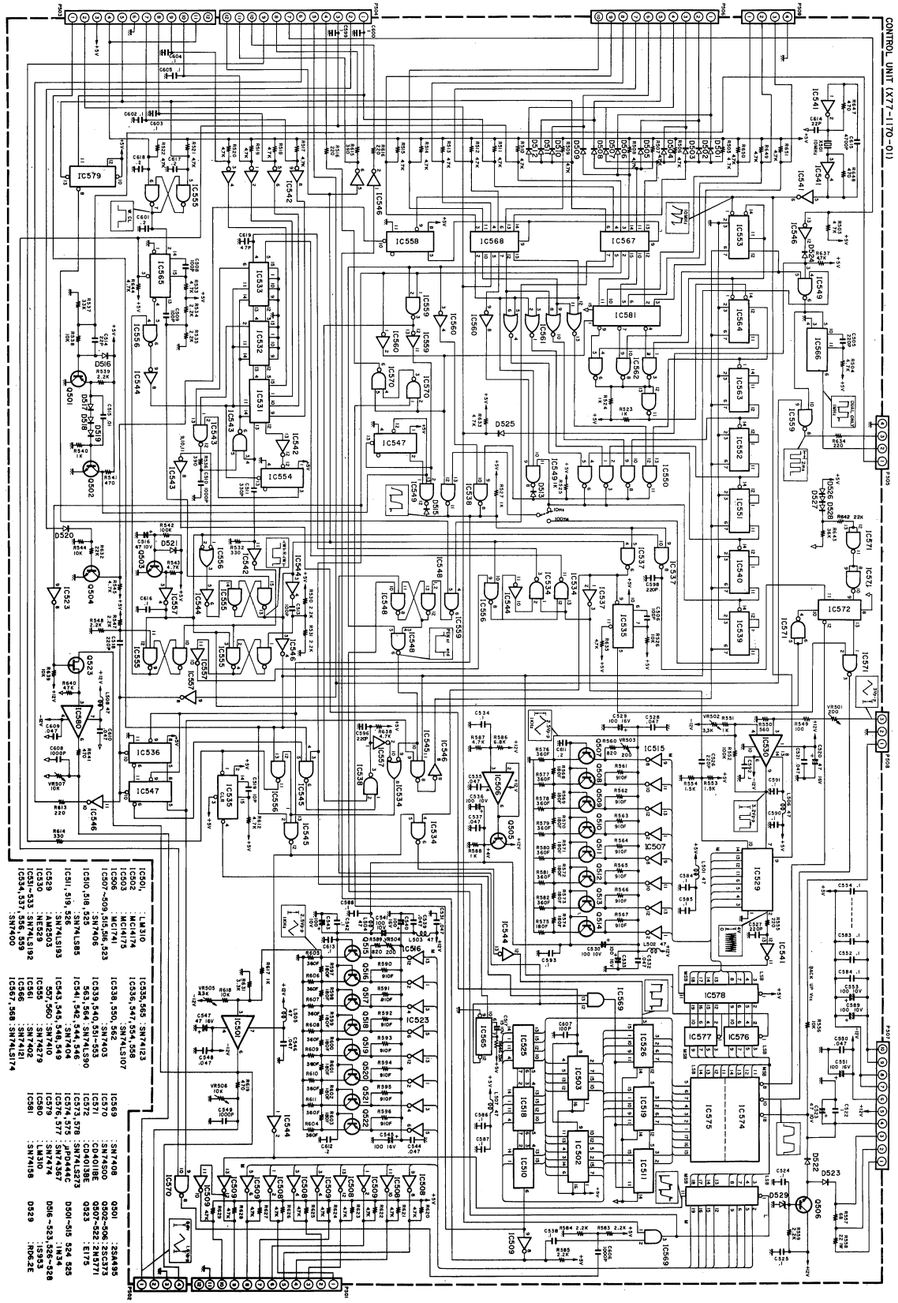
HORIZONTAL (X74-1240-01)



Q401,402,404~408,410,411,413~417,420,421 : 2SC373
Q403,409,412 : 2SA945
Q418,419 : 2SC1505
D401,402,405,409,410 : 1S953
D403,404,406~408 : 1N34
D409,411~414 : RD3.9E
IC401 : SN74S00
IC402 : SN7472N
IC403 : SN754153BP
IC404 : C0406AE
IC405 : LM555CN
IC406 : AN606
IC407 : SN74123

*ADJUSTABLE

CONTROL UNIT (X77-1170-01)



POWER SUPPLY (X68-1330-01)