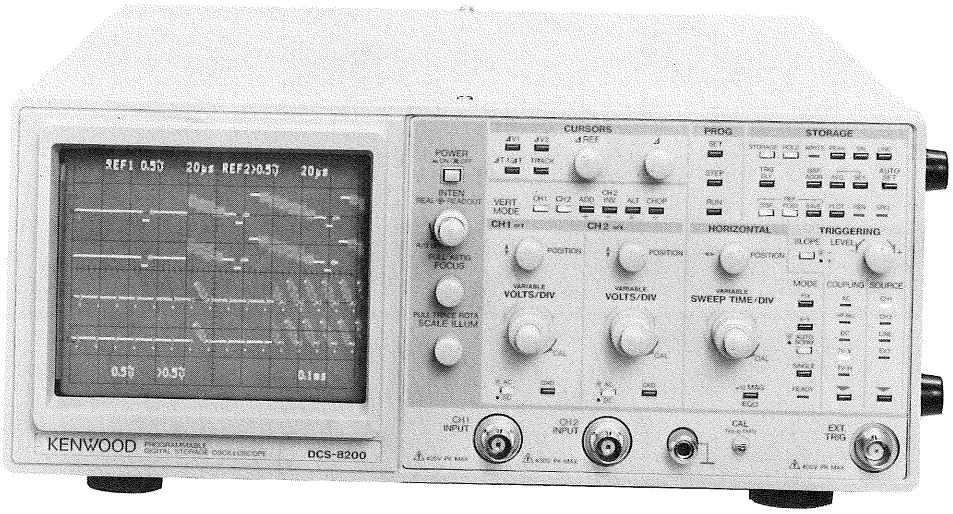
KENWOOD

PROGRAMMABLE DIGITAL STRAGE OSCILLOSCOPE

DCS-8200

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

【Real-Time section】

CRT

Type : 150 mm rectanguler with internal graticule
Acceleration voltage : 12 kV
Effective Surface : 8×10 div (1 div = 10 mm)

Vertical Axis (CH1 and CH2)

Sensitivity : 1 to 5 mV/div ±3 %
Attenuator : 1 to 5 mV/div 1-2-5 step, 5 ranges
Input impedance : 1 MΩ±1 %, 22pF ± 3pF
Freq. responce : DC: DC to 50 MHz -3dB (5mV to 5V/div)
DC to 5 MHz -3dB (1 to 2mV/div)
AC: 5 Hz to 50 MHz -3dB (5mV to 5V/div)
5 Hz to 5 MHz -3dB (1 to 2mV/div)
Rise time : 7 ns or less (50MHz)
Operation modes : CH1, CH2, ALT, CHOP, ADD (CH1+CH2)
CHOP frequency : Approx. 250 kHz
Channel polarity : Possible only with CH2
⚠Max. input voltage : 800Vp-p, or 400V (DC+AC peak)

Horizontal axis (CH2 input, except for ×10 magnification)

Operation modes : Switchable to X-Y mode with horizontal mode,
CH1: Y-axis CH2: X-axis
Sensitivity : Same as vertical axis (CH2)
Input impedance : Same as vertical axis (CH2)
Freq. responce : DC: DC to 1 MHz (-3dB)
AC: AC to 1MHz (-3dB)
X-Y phase difference : 3° or less at 100 kHz
⚠Max. input voltage : Same as vertical axis (CH2)

Sweep

Sweep system : NORM, AUTO, SINGLE
Sweep time : 0.5s/div to 0.1μs/div ±3 %, 1-2-5 step, 21 ranges
Sweep magnification : 10 times ±5 % (real-time only)
Linearity : ±3 % (×10MAG : ±5 %)

Triggering

Internal trigger : CH1, CH2, LINE
External trigger : EXT
External trigger input impedance : 1 MΩ
⚠Max. external trigger input voltage : 800Vp-p, or 400V (DC+AC peak)
Trigger coupling : AC, $HF_{REJ.}$, DC, TV-FRAME, TV-LINE
Trigger sensitivity :

	Frequency Range	Internal	External
DC	DC to 10 MHz	1 div	0.1 Vp-p
	DC to 50 MHz	2 div	0.2 Vp-p
AC	10 Hz to 10 MHz	1 div	0.1 Vp-p
	10 Hz to 50 MHz	2 div	0.2 Vp-p
HFrej	Increased minimum sync amplitude for above 10kHz.		
TV	FRAME, LINE	1 div	0.1 Vp-p

AUTO : Same as above specification for above 50Hz.
FIX : Same as above specification for above 40Hz.

Calibration voltage : Square wave, positive polarity, 1 Vp-p ±2 %, 1 kHz ±3 %

SPECIFICATIONS

【Storage section】

Vertical resolution

Data length : 8-bit (25 dot/div)
Dynamic range : Approx. 10 div

Freq. responce

Effective storage frequency : DC: DC to 8 MHz, (sin interpolation)
AC: 5 Hz to 8 MHz, (sin interpolation)
Equivalent sampling : DC: DC to 50 MHz
AC: 5Hz to 50 MHz

Rise time

Effective rise time : 80 ns or less

Memory capacity

NORM	:	Display memory (including REF memory)	2KW × 2/CH (200 dot/div)
		Acquisition memory	16KW/CH
		REF memory	16KW/CH
Equivalent sampling	:	Display memory (including REF memory)	2KW × 2/CH (200 dot/div)
		Acquisition memory	2KW/CH
		REF memory	2KW/CH
Roll	:	Display memory (including REF memory)	2KW × 2/CH (200 dot/div)
		Acquisition memory	16KW/CH
		REF memory	16KW/CH
Averaging	:	Display memory (including REF memory)	2KW/CH (200 dot/div)
		Acquisition memory	5KW/CH
X-Y	:	Display memory (including REF memory)	2KW/CH (200 dot/div)
		Acquisition memory	2KW/CH
		REF memory	2KW/CH

REF memory data backup (32KW) :
System : Capacitance system
Life : 7 days or more

Sweep time

Equivalent sampling : 20 ns/div to 5μs/div
NORM : 0.1 μs/div to 100 ms/div (0.1 μs/div to 5μs/div is magnification range).
Roll : 0.2s/div to 500s/div
* Max. sampling speed is 20 MS/s, 2-channel sync.

Storage system

NORM : Data updated for every trigger input
SINGLE : Single sweep write
AVERAGE : 2 to 256 times, average of adding (2, 4, 8...256)
PEAK DETECTOR : 100 ns glitch detection
Effective sweep range (500s/div to 0.1ms/div)
ROLL : Data is recorded on screen continuously and updated.
Equivalent sampling : Sequential sampling system

Magnification and reduction

Magnification and reduction are performed centered on the CRT with SWEEP TIME/DIV control (when the starting point is set at the left edge of the screen.).
Magnification : Max. 100×
Reduction : Max. ×1/10

Interpolation

Systems : Linear interpolation, sin interpolation

Trigger delay

Pre-trigger : Up to -80 times of SWEEP TIME/DIV setting (integer times setting)
Post-trigger : Up to +10,000 times of SWEEP TIME/DIV setting (integer times setting)

X-Y

NORM : DC to 800 kHz
Equivalent Sampling : DC to 50 MHz

SPECIFICATIONS

PEN OUT

Output : CRT display and hard copy (25 KW)
- Y axis: Output voltage, 0.5V/div
  Output impedance, approx. 2kΩ
  Readout speed, 10ms/word and 50ms/word
- X axis: Output voltage, 0.5v/div
  Output impedance, approx. 2kΩ
  Readout speed, 10ms/word and 50ms/word

PEN DOWN

Output level : TTL level ("L" during operation)

Waveform operation

CH1 + CH2, CH1 − CH2, CH1 × CH2, CH1 ÷ CH2

Plotter output

Output : RS-232C, HP-GL command (made by Muto Industries, for HP-GL plotter), for CRT hard copy, data transmission only.

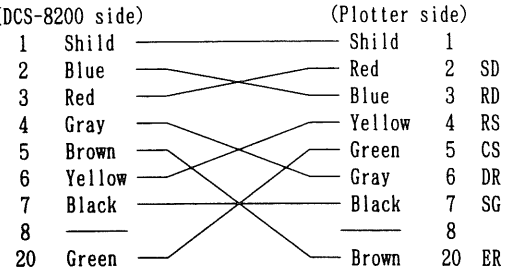
Baud rate : 9600, 4800, 2400 and 1200 bps.

Transfer system : Data length 8-bit, no parity, stop bit is 2-bit fixed, hardware-hand shake.

Signals :

FG (Frame Ground)	
SD (Send Data)	→ plotter
RD (Receive data)	← plotter
RS (Request to send)	→ plotter
CS (Clear to Send)	← plotter
DR (Data Set Ready) Request to send from plotter	← plotter
ER (Data Terminal Ready) Permission to send from plotter	→ plotter
SG (Signal Ground)	

Connections :



【Readout section】

Calendar

Calendar display : Year, month, day, O'clock and minute (set with panel switch)

Clock accuracy : ±2 min./month

Battery life : approx. 30,000 hours

Setting values

Displays ●CH1/CH2 Scale Factor (with probe detector) ●GND ●V-UNCAL ●CH2 INVERT ●Sweep Scale Factor (MAG conversion) ●H-UNCAL ●Four operations (+, −, ×, ÷) ●Scroll Address ●AVG times setting ●Trigger Point (Post-trigger, Pre-trigger) ●EQU ●ROLL ●AUTO SET setting ●Program Steps ●REF Memory Condition Setting ●Trigger Time ●PEAK DETECTOR Setting

Cursor

Cursor mode

- ΔV1 : Voltage difference between ΔREF and ΔCURSOR due to CH1 scale factor
- ΔV2 : Voltage difference between ΔREF and ΔCURSOR due to CH2 scale factor
- ΔT : Time difference between ΔREF and ΔCURSOR due to sweep scale factor
- 1/ΔT : Frequency between ΔREF and ΔCURSOR due to sweep scale factor
- RATIO : Voltage ratio and time ratio between ΔREF and Δcursors, supposing 5-division on the CRT as 100%
- PHASE : Phase difference between ΔREF and Δcursors, supposing 5-division on the CRT as 360°
- TRACKING : Move ΔREF CURSOR and ΔCURSOR in parallel.

SPECIFICATIONS

Cursor measurment

Measurment accuracy ±2 %

Measuring range Vertical direction : ±3.6 div or more from center of CRT

Horizontal direction : ±4.6 div or more from center of CRT

【Other functions】

Program

Program range :

CURSORS, VERT MODE, VOLTS/DIV, ▲▼ POSITION, AC/DC, GND, ◀▶ POSITION, SWEEP TIME/DIV, ×10MAG/EQU, HORIZONTAL MODE, TRIGGERING SLOP, TRIGGERING SOURCE, STORAGE, HOLD, PEAK, SINE, LINEAR, TRIG DLY, DISP.ADDR, AVG, REF DISP

No. of steps : Max. 20 steps

Auto Range

Vertical axis : 2, 4 and 6 divisions

Horizontal axis : 2 and 5 cycles

PEAK DETECTOR

MAX value display

MIN value display

MAX/MIN value display

【General specifications】

Power supply : AC 100, 120, 220, 240V ±10 % (Max. 250V) 50/60 Hz, approx. 75W

Dimensions : 319 mm wide ×132 mm high ×380 mm deep

Max. dimensions : 341 mm wide ×132 mm high ×442 mm deep

Weight : Approx. 11 kg

Specifications temperature and humidity:

10 to 35℃, not more than 85% humidity

Operation temperature and humidity:

0 to 40℃, not more than 85% humidity

Accessories : 1 instruction manual, 2 PC-33 probes, 1 power cord, 2 Replacement fuses.

【Interface unit】

GP-IB (Complies with IEEE Standard 488-1978).

Subsets SH1 : (Transmission handshake) all functions

AH1 : (Reception handshake) all functions

T5 : (Talker) Basic talker, serial pole, and talker only mode. Has talker release function with MLA.

TE0 : (Talker address extension) Does not have function.

L4 : (Listener) Basic listener. Has listener release function with MTA.

LE0 : (Listener address extension) Does not have function.

SR1 : (Service request) Has all functions

RL2 : (Remote/local) Has remote/local function. Does not have local lock out (LLO) function.

PP0 : (Parallel pole) Does not have function.

DC1 : (Device clear) Has all functions.

DT0 : (Device trigger) Does not have function

C0 : (Controller) Has no functions.

Delimiter : CR/LF and EOI

Data code : ASCII code and binary code

Status bytes

b8	b7	b6	b5	b4	b3	b2	b1
Extension Status	SRQ	Error	BUSY	Status Code			

(41H) Waveform write complete

(42H) Output finished

(61H) Command error

(62H) Command parameter error

(64H) Data error

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. The specified voltage is shown at the fuse holder of the AC inlet. 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 by an option that is specified when the instrument is ordered.
The optional 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, 1.6 amp for 100 VAC to 120 VAC operation, 1 amp for 220 VAC to 240 VAC operation.
3. Reinsert it for appropriate voltage range.
4. When performing the reinsertion of fuse holder for the voltage conversion, the appropriate power cord should be used. (See Fig. 1.)

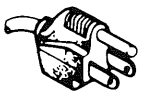
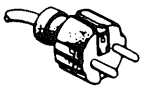
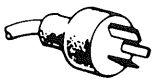
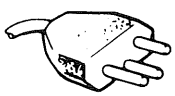
Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	1.6 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1820-05
	Universal Europe 220 volt/50 Hz Rated 16 amp	North Europe 1 A, 250 V Slow blow 5×20 mm Other Europe 1 A, 250 VV Fast blow 6×30 mm	None	Cord: E30-1819-15
	U.K. 240 volt/50 Hz Rated 13 amp	1 A, 250 V Fast blow 6×30 mm	0.8 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	1 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1821-15
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	1 A, 250 V Fast blow 6×30 mm	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	1 A, 250 V Fast blow 6×30 mm	None	—

Fig. 1 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

Vertical Attenuator Circuit (X75-1200-00)

The attenuator rotary switches for channel 1 and channel 2 include the attenuator circuits built into the switches themselves. The vertical input signal from the BNC input connector is switched by the AC/DC/GND switch and input to the first stage attenuator circuit. This attenuator input signal is attenuated by a factor of 1/1, 1/10, or 1/100 (selected by the vertical rotary switch) and input to the first stage buffer amplifier, which is formed by Q1, Q2, Q3, Q4, Q5, and U1 in channel 1 and by Q101, Q102, Q103, Q104, Q105, and U101 in channel 2. The buffer amplifier first divides the input signal into high and low frequency components and impedance converts the high frequency components with Q1 (Q101) and the low frequency components with U1 (U101). These signals are combined at the base of Q5 (Q105) and output from the emitter.

Since OP amps with a small DC offset drift are used for U1 and U101, the outputs from Q5 and Q105 have good temperature stability.

This output signal is input to the second stage attenuator, which has a selectable attenuation of 1/1, 1/2, 1/4, or 1/10, and then output to the second amplifier. The second stage attenuator has a low input impedance, and thus provides attenuated output with excellent frequency characteristics. Also, a switch is provided that sets the second amplifier to a factor of 5 amplification when a 1 mV or 2 mV sensitivity is selected. Q4 (Q104) is a fixed current source load for Q3 (Q103), while Q1, Q2, and D1 (Q101, Q102, and D102) are input protection elements.

Vertical Preamp Circuit (X73-1930-00)

The signal output from the attenuator circuits is input to the second amplifier, which consists of the dual transistor's Q1 and Q2 (Q201 and Q202 in channel 2). The 1 mV/2 mV amplifier is a switchable gain amplifier, and either Q1 or Q2 (Q201 or Q202) can be driven by switching between the transistor Q151 and Q152 (Q351 and Q352) current sources.

When the oscilloscope is set to ranges other than 1 mV or 2 mV per division, Q151 (Q351) is selected and the Q1 (Q201) amplifier operates, and when either a 1 mV or 2 mV per division range is set, Q152 (Q352) is selected and the Q2 (Q202) amplifier operates at the normal factor of five gain. TH1 (TH201) is connected at the Q2 (Q202) emitter to compensate for gain drift at the 1 mV and 2 mV per division settings. Transistor's Q6 and Q2 (Q206 and Q202) are attached at the second amplifier output to form the variable circuit associated with the attenuator.

A GaAsFET transistor is used for Q6 (Q206), and since these transistors are selected for good linearity, they form continuously variable attenuators with good frequency characteristics.

The output signal from the second amplifier is input to the collectors of transistor's Q7 and Q8 (Q207 and Q208), passed through transistor's Q121 and Q122 (Q321 and Q322), and output as the trigger signal. The output on the opposite side of the trigger signal in channel 2 is output as the X signal.

The signal passes through the emitter-follower formed by Q7 and Q8 (Q207 and Q208) and is input to the third amplifier of Q9 and Q10 (Q209 and Q210). At this stage, a differential transistor emitter load is used as a fixed current supply to realize a high CMRR, and transistor's Q12 and Q13 (Q212 and Q213) are used as a grounded base cascode amplifier in the output stage to minimize the influence of transistor feedback capacitance at high frequencies. Also, reverse phase output can be acquired from channel 2 by switching, with U301, the base potentials of the collector cross-connected transistor pairs Q212/Q213 and Q232/Q233. The vertical position circuit formed by transistor's Q14 and Q15 (Q214 and Q215) is connected to the cascode amplifier transistor Q12 and Q13 (Q212 and Q213) collectors, and forms the vertical position adjustment circuit.

The third amplifier output signal is passed through the emitter follower of transistor's Q16 and Q17 (Q216 and Q217) and input to the A/D amplifier circuit and the real-time mode circuit. First the A/D amplifier circuit input signal is input to transistor's Q143 and Q144 (Q343 and Q344). Here the signal is converted by a single sided differential amplifier and output to the A/D board A/D preamplifier through the Q145 (Q345) drive transistor.

The signal input to the real-time mode circuit enters the fourth amplifier. The fourth amplifier is a cascode amplifier formed by transistor's Q27, Q28, Q20, and Q21 (Q218, Q219, Q222, and Q223), and is provided with a vertical position fine adjustment circuit on the emitters of transistor's Q27 and Q28 (Q218 and Q219).

Note that switching between the digital mode circuit and the real-time mode circuit is only provided for channel 1, and that this function is formed by transistor's Q382 and Q381.

Transistor's Q20 and Q21 are used as the fourth amplifier (a cascode amplifier) base grounding transistors for both the digital mode and real-time mode circuits. The collectors of the channel 1 output transistor's Q20 and Q21 are connected, as are the collectors of the channel 2 output transistor's Q222 and Q223. The emitters of transistor's Q20, Q21, Q222, and Q2231are connected to the emitters of transistor's Q18, Q19, Q220, and Q221, whose bases are connected to the channel switching signals. This structure provides the vertical mode switching operation, in which the output transistors of this stage (Q20, Q21, Q222, and Q223) are turned on or off by the channel switching signals. Also, fluctuation in the operating points of ADD and other modes are suppressed by transistor Q224. Transistor's Q650 and Q630 are connected to the collectors of transistor's Q20, Q21, Q222, and Q223 as a digital mode frequency characteristics compensation circuit.

The signal is then passed through the emitter-follower formed by transistor's Q22 and Q23 and output to the bases of transistor's Q24 and Q25 to generate the fourth amplifier output, which is then input to the final amplifier (X80-1090-00). Since Q24 and Q25 are the emitter ground for the cascade amplifier, the output to the final amplifier (X80-1090-02) is a current output.

CIRCUIT DESCRIPTION

Trigger Signal Switching Circuit (X73-1930-00)

The trigger signal, which is output from the operation of each channel, passes through the trigger output amplifier formed by Q121 and Q122 (Q321 and Q322), and is input to the trigger switching circuit formed by transistor's Q401 to Q408.
A line trigger signal from external circuits and the power supply circuit is also input here. The four trigger signals are output to the horizontal sweep unit.
The trigger enable signals are connected to the bases of Q401 to Q404, whose emitters are connected to the emitters of transistor's Q405 to Q408. Thus trigger signals can be selected by turning Q405 to Q408 on or off appropriately.

Vertical Final Amplifier (X80-1090-02)

The signal sent from the vertical preamplifier is amplified at the base ground stage of the cascode amplifier formed by transistor's Q1 and Q2, and sent to the next stage through the emitter-follower formed by transistor's Q3 and Q4.
Transistor's Q5, Q6, Q7 and Q8 also have a cascode structure. The thermistor TH1 is inserted between the emitters of Q5 and Q6 to compensate for gain temperature drift, and R16, R17, C50, and C51 are used for ultra low frequency compensation. The output of this stage is passed through the emitter-follower formed by transistor's Q9 and Q10, and is then input to the final amplifier formed by transistor's Q11, Q13, Q15, and Q16 where it is amplified to a level of 2.5 V/div (single-sided). VR1 is a gain adjustment variable resistor, VR2 is the CRT centering adjustment, VR5 is the operating point adjustment, and P42 is adjusted to +37 V.
The read-out Y signal (R/O Y signal) is input to transistor's Q17 and Q18. The REAL signal and the R/O signal are switched by transistor's Q19 and Q20. D1 and D2 are inserted to improve isolation. The cursor gain and cursor Y position are adjusted with VR3 and VR4 respectively.

Power Supply Circuit (X68-1480-01)

The power supply consists of 5 regulated systems, 2 unregulated systems, and a scale illumination system.
When the power supply switch is turned on, first the −10 V provided by Q2, U1 and D8 is brought up. This −10 V is stabilized using D8 as a reference. The other voltages, i.e., +10 V, +5 V, +65 V, and +120 V use emitter outputs since the currents supplied are small.
The scale illumination voltage is rectified by D1 and controlled by Q8.

Trace Rotation and Calibration Circuits (X68-1480-01)

The trace rotation circuit drives the rotator coil located in the CRT cone from the emitter-follower formed by the Q17 and Q18 complementary transistor pair.
The calibration circuit (CAL) generates a 1 kHz square wave with a multi-vibrator oscillator circuit based on U2, and generates the 1 Vp-p CAL signal by switching that square wave with D12 and D27. The frequency is adjusted with VR5, and the level is adjusted with VR6.

Blanking Circuit and High Voltage Circuit (X68-1480-01)

The unblanking signal from P26 is inverted and amplified by the blanking amplifier formed by Q11 to Q13, and is combined with the cathode voltage by the direct-current regeneration circuit formed by D18 to D20.
Transistor's Q9 and Q10 form the autofocus inverting amplifier, and produce the focusing voltage from the blanking signal. The focus voltage is combined with the high voltage by the direct-current regeneration circuit formed by D14 to D16, and drives the focus electrode.
The −1.5 kV required for the cathode is produced by the Q15 transistor oscillator and the high voltage converter block (W02-0431-05). Negative feedback from the cathode is applied to the U4/Q14 error amplifier to acquire a stabilized high voltage from the converter oscillator circuit.

Trigger Circuit (X74-1550-00)

The trigger signal selected in the vertical preamplifier is passed through P402 and input to the trigger amplifier formed by Q1 and Q2. The Q2 output is switched between AC and DC by the trigger coupling relay K1, and input to Q51 through Q54 in TV synchronous operation, and to Q3 to Q9 in other modes, where it is amplified to ECL logic levels. Q51, D2, and D3 form a TV synchronization polarity switching circuit, and synchronization pulses are extracted by Q54 with the sync chip clamped by Q53 and D6. Of these synchronization pulses, the vertical synchronization pulses are acquired by passing through the differentiator formed by R64, C62, and C64.
The FIX circuit detects the input signal using D12, D13, C7, C8, R84, and R85, and inputs it to the gate of Q5 after passing it through the U114 analog switch and the U203 buffer amplifier.
The signal output from the trigger amplifier is wave-shaped by the Schmitt circuit formed by U112a and U112b and then the trigger slope is switched by U112c. The following horizontal sweep circuit is driven by these signal synchronization pulses.
The trigger pulses are passed through a detection circuit formed by D101, D102, Q101, and U105b and are input to U102c. When there are trigger pulses, the base of transistor Q101 will become high, and trigger pulses are received by setting U105b high, passing them through U102c, and setting the U103b reset terminal low. When there are no trigger pulses, the U103b reset terminal goes high, the system goes to the reset state, and auto-freerun begins.

CIRCUIT DESCRIPTION

Horizontal Sweep Circuit (X74-1550-00)

When a trigger pulse triggers the U103b flip-flop, the output is inverted and passed through Q114 to control Q120, and a sweep signal corresponding to the CR time constant switched by U121 to U124 and Q121 to Q123. This sweep signal is output, through U141 and U142, to the horizontal output switching circuit. Also, this sweep output is input to the comparator formed by Q171 and Q172 where the illuminated line length is determined. The hold off time is determined by C178 to C181, which are switched by U104a, R181, and Q178 to Q180.

Blanking Circuit (X74-1550-00)

The U103b flip-flop sweep gate signal is passed through the ECL to TTL converter consisting of transistor's Q187 and Q189, and the Q187 output is input to the CPU board as the equivalent sampling circuit TRIG signal trigger pulse in digital mode. The output from Q189 is input to Q201 through the gates U107a, U107c, U105c, and U107d.

U106c and U106d form a chop oscillator circuit that oscillates at about 500 kHz. This signal is mixed with the sweep gate by U107a. This signal is divided by 2 by U109a, and output to the vertical board (X73-1930-00) by P402 as the vertical switching signal after passing through U108a and U108b.

The R/O BLK signal is mixed with the sweep gate signal by U107d, the DSO-BLK signal is mixed with the sweep gate signal by U105c, and the R/O UNBLK signal is input to Q205. The BLK and UNBLK signals are mixed by Q202 and Q204 and output by Q203. U202b is a comparator that generates the R/O OFF signal.

Horizontal Output Switching Circuit (X74-1550-00)

The real-time sweep signal, the XY signal, and the digital sweep signal are switched by transistor's Q143 to Q146, Q149, and Q150. The selected signal is output to the horizontal final amplifier by P406 after passing through Q147 and Q148.

Horizontal Final Circuit (X80-1090-02)

The horizontal signal input from P24 is input to transistor's Q25 and Q26 or Q27 and Q28 (MAG × 10) from the emitters of transistor's Q23 and Q24. Q44 and Q45 perform the switching between the Q25/Q26 and Q27/Q28 pairs. Q29 and Q30 form the grounded base stage of a cascode amplifier, and the D13 to D20 limiters are inserted at the output collectors. The impedance is converted by the emitter-follower formed by Q31 and Q32, and the signal is amplified to 6 V/div (single-sided) by the final amplifier, which consists of Q33 to Q40 and Q50. The thermistor TH3 is inserted between the emitters of Q25 and Q26 to compensate for thermal drift in the gain, and the thermistor TH4 is inserted between the emitters of Q27 and Q28 to compensate for thermal drift in the gain.

On the other hand, the read-out signal is input to Q47 and Q48. The R/O REQ signal switches between Q47/Q48 and Q25/Q26 (or Q27/Q28). D5 and D6 are inserted to improve the isolation between Q47/Q48 and Q25/Q26 (or Q27/Q28).

Readout Overview

The R/O unit (X77-1720-00) is functionally constructed from 3 blocks.

1) Input Port Block

This block acquires switch information and clock data for CRT readout display.

(This block is implemented by the U1, U4 to U16, U18, U19, U23, and U50 ICs.)

2) Display Block

This block generates the X and Y axis signals for CRT readout display.

(This block is implemented by the U32, U33, U39, U40 to U42, U48, U49, and RA1 ICs and resistors.)

3) Cursor Block

This block consists of the cursor measurement A/D converter and arithmetic blocks.

(This block is implemented by the U33 to U38, U43 to U45, U47, and U51 to U53 ICs.)

Input Port Block (X77-1720-00)

This block acquires switch state data and clock data, and also transfers that data to the character generator (U32) under the control of the U1 microprocessor. The reference clock is given by a clock formed from an external 10 MHz clock and U30. The switch data required for CRT display is acquired for the microprocessor every 20 ms by an input board consisting of U5 to U13 and U50. U4 is the decoder for the input board, and its output signals G1 to G3 are output with a period of 20 ms.

Clock data is output once a minute from the U23 clock IC pin 1. The microprocessor is interrupted by a pulse signal, and accesses U23 to acquire the clock data on this interrupt.

U23 is backed up by the lithium battery B1 even when the power is off, and operates with a reference clock of 32.768 kHz provided by the quarts oscillator X2. As a result, when the battery is close to being exhausted and its voltage falls under 2 V when the power is off, the 32.768 reference clock will no longer operate. The display will indicate a clock delay and "BATT.DOWN."

Clock data maintenance is performed at power on and off by the +5 V power supply detection IC U24, which has a typical detection level of + 4.4 V.

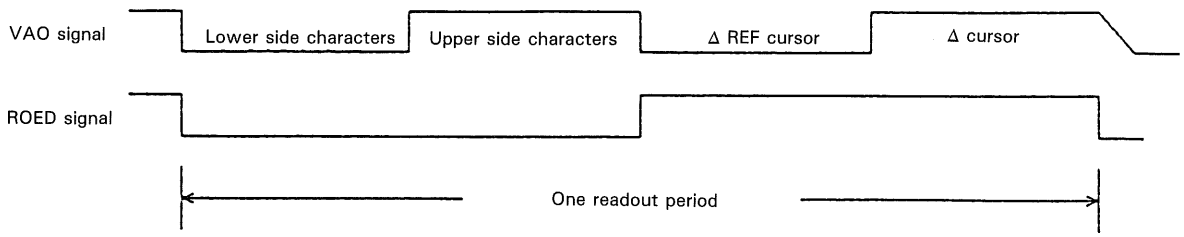
Display Block (X77-1720-00)

The random scan method (X/Y display) is used for character display, and the character generator U32 is controlled by the R/O controller U33 character counter (U33; CD1 to CD7) and the dot counter (U33; DC0 to DC4).

In real-time mode, readout display is performed with a 13.5 ms period. In storage mode, readout display and storage display are timeshared, with both readout display and storage display having periods of about 10 ms. The control signals used in this case are the ROED (R/O end) signal, and the RSTR (R/O start) signal from the A/D unit (X78-1080-00). (The storage display period is defined by the RETR signal going high, and the completion of the readout operation.)

A single readout display period is divided into four parts, consisting of the lower side characters, the upper side characters, the Δ REF cursor, and the Δ cursor. The timing is switched by the U33-89 ROED signal and the U33-46 VAO signal.

CIRCUIT DESCRIPTION



The character generator U32 holds 5 × 7 dot matrix characters, the 3 bits 1 to 3 output the X-axis data, D03 to D06 output the 4-bit Y-axis data, and D07 is the character start/end control bit. The digital signals output from U32 are converted to analog signals by the U48 X axis signal D/A converter and by the Y axis D/A converter formed by U41 and RA1. These signals are passed though the analog switches U39 and U40, and then the buffer amplifier U42. The X-axis signal is then sent to the final unit (X80-1090-02).
The character dot display is controlled by the ROUB, ROB, and ROQ signals from U33 to U86, U87, and U88. The ROB signal removes the real-time waveform display, the ROQ signal switches between the real-time waveform and readout displays, and the ROUB signal performs readout dot display.
Also, the above three signals are controlled by the ROSP signal (readout off signal (READ OFF)) from U33 pin 83.

Cursor Block (X77-1720-00)

The cursor mode resolution is 12 bits, corresponding to the full scale voltage of the cursor knob.
The cursor knob voltage is directly input to the analog switch U36, and the switched output is input to the A/D converter formed by U33, U35, U47, and U1. The analog values of the Δ REF and Δ cursor knob are converted by this A/D converter to 12-bit digital values, and the required cursor calculations are performed by the microprocessor U1. This A/D conversion is performed by comparing the cursor knob voltage to an analog voltage produced by converting the 12-bit data output by the microprocessor U1 to analog with the U35 D/A converter using the comparator U47. The conversion time for this A/D conversion is 10 ms.
The analog voltage output from the U35 D/A converter is switched between Δ REF and Δ cursor, and is held by the hold circuits as the cursor display voltage every 10 ms.
Also, the analog control system operates in a similar manner, with the input time multiplexed by the analog switches U36 and U38. The analog voltage output from the U35 D/A converter is switched by the analog switches U37 and U51 and sent to the other circuits after passing through hold circuits and the buffer amplifiers U43 to U45, U52 and U53.

CIRCUIT DESCRIPTION

Storage Display Overview

The DSC-8200 employs an equivalent sampling function that uses an A/D converter with a 20 ms per sample sampling time. In the equivalent sampling mode, time ranges from 20 ns/div to 5 μs/div are possible, and a channel 1/channel 2 simultaneous sampling method is used.

The peak hold function and the memory control function do not use the microprocessor, but are controlled completely in hardware. Since this would require an enormous number of parts if implemented in discrete components the DTM6010 gate array was developed for these functions.

The memory system consists of 16 kbytes per channel of data memory (implemented as two 8 kbyte memories), 16 kbytes per channel of REF memory, and 8 kbytes of display memory (including REF) at 2 kbytes per channel.

Note that the display method in storage mode and readout mode is not a chop method but an ALT relationship.

ALT operation control is performed by the RO-ACK signal from the R/O side and the RO-REQ signal from the storage side. That is, RO-ACK rises on the fall of the DI-STAT signal, and a storage display period starts. An R/O display period begins when the RO-REQ signal falls in response to the storage side DISP-END signal. If the DI-STAT signal is not output, storage display will not begin, and if RO-REQ is not in the low state, readout display will not begin.

A/D Preamp Block (X78-1080-00)

The signal input from P140 (P301) is input to the differential amplifier formed by Q1 and Q2 (Q13 and Q14). Here, the differential amplifier is converted to single-end, and the signal is sent to the sample and hold circuit through the Q5 (Q19) drive amplifier.

Q3 and Q4 (Q15 and Q16) are connected to the differential amplifier and the drive amplifier as a constant-current supply.

Switching in the sample and hold circuit is performed by the diode switch D11 and D12 (D22 and D23), and the diode switching circuit is driven by the Q6 and Q7 (Q18 and Q19) drive transistors.

The diode switch is in the on state during normal sampling, and during equivalent sampling is only off during hold periods.

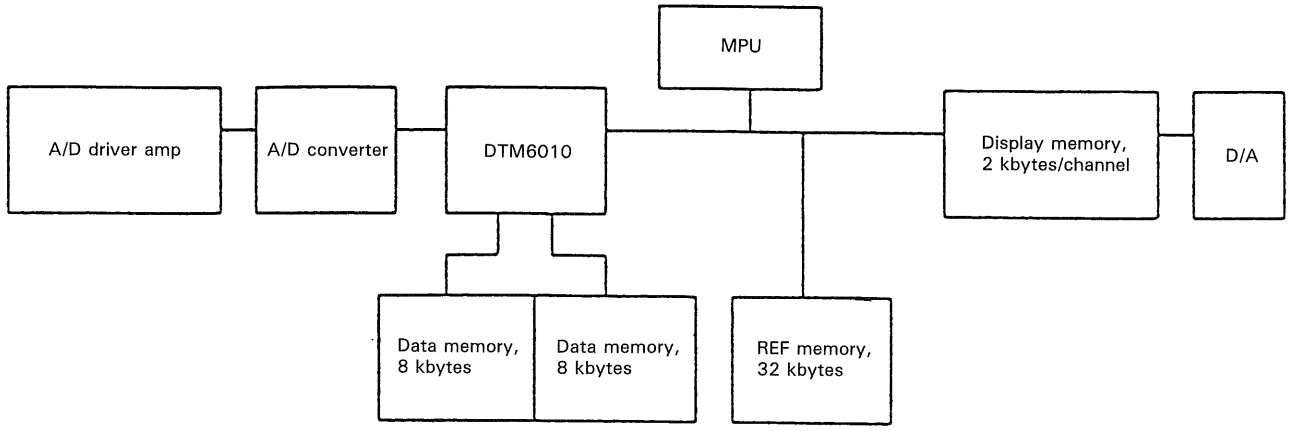
The signal output from the hold capacitor C21 (C54) is impedance converted by the Q8 (Q20) FET transistor, and Q9 (Q21) is attached as a constant-current supply for Q8.

The signal from the FET transistor is input to the differential amplifier formed by Q11 and Q12 (Q23 and Q24), and is output to the A/D converter from the Q10 (Q24) drive transistor. Q601 and Q602 (Q701 and Q702) are attached to the base of Q12 (Q24) to compensate for gain and position fluctuations in equivalent sampling mode.

A/D Converter

U1 (U10) is a 20 Mpsps CMOS video 8-bit A/D converter that operates using a two step parallel conversion method. The reference circuit is a 2 Vp-p circuit with a range from +0.6 to +2.6 V that uses a built-in A/D circuit.

Analog sampling is performed on the falling edge of the clock signal, and digital data output is delayed 2.5 clock cycles (about 18 ns) from the analog sampling point.



CIRCUIT DESCRIPTION

Data Memory Circuits

The data memory circuits U6 and U7 (U15 and U16) adopt a 2-phase ring method, and consist of two 35 ns 16-kbyte memories per channel.

Data memory control and buffering for output to the microprocessor are performed by the U2 (U20) gate array. Thus it is possible to connect the data memory directly to the microprocessor data bus.

Since there is also a peak hold function built into the U2 (U20) gate array, it also handles the input of external control signals.

Data memory address control, sample and hold pulses, and the A/D clock are acquired by the timing control circuit formed by U21, U22, and U17, and input to the address counter formed by U24 to U26. The address counter adopts a ring counter method, and therefore operates from the start of sampling until the end of sampling. When operation completes, the microprocessor reads data out of data memory by reading from the end address read port formed by U48 and U49, and switching the U12 to U14 address selector.

Display Memory Block

The U55 display memory addresses are allocated into 4 equal sections, an allocation that is performed by dividing the memory starting at the first address into CH1, CH2, REF1, and REF2 data.

The display method adopted is to sweep one line while counting with the U60 memory address counter, and U56 handles display channel control.

Illuminated line length control operates using the timing and control systems formed by U64, U53, U69, U52, and U68 and counting with the blanking counter formed by U62 and U63.

X-Y display in digital mode is performed by controlling the memory address and data latch timing to the U71 and U75 D/A converters by switching with the U59 selector and the U73 and U74 data latches. In display screen blanking control, channel switching is performed by U67, phase control is performed by U69, and address noise is removed from the D/A analog data with U52. This allows a signal formed from the address clock to be mixed with the blanking signal and sent to the DSO-BL input of the trigger/sweep unit (X74-1550-00).

D/A Converter Block

The 8-bit digital signal input from the U55 display memory is converted to analog and output by the U71 and U75 D/A converters.

In NORM mode and REF display mode, the D/A converter U71 outputs the Y axis analog data, and the 12-bit X axis analog data is output from U75. The X axis data is formed by the D/A conversion of the memory address, and this data is output to the D/A converter by U73 and U74.

In X-Y mode, the U71 D/A converter is used for the Y axis (channel 1), and U75 is used for the X axis (channel 2). For the X axis (channel 2) signal, U71 is switched to function as an 8-bit D/A converter.

D/A Amplifier Block

The signals output from the U71 and U75 D/A converters are buffered by the U77 and U78 buffer amplifiers. The U77 DSO-Y signal is sent to the PRAMP unit (X73-1930-00), and the U78 DSO-X signal is sent to the TRIG/SWEEP unit (X74-1550-00).

There is also a circuit that adds the vertical hold-position DC level for CH1, CH2, REF1, and REF2 to the U77 DSO-Y signal. The DC addition is sent from the R/O board (X77-1720-00) and a DC level corresponding to each channel in the U67 display channel switch is sent to U77 trough the U80 buffer amplifier.

Analog Plotting Block

Control of the back panel analog plotting signals is handled completely in software.

Output channel control and the internal operating clock are output from the U81 microprocessor output port, and PL1 to PL4 are used as channel settings, e.g. when PL1 is low, channel 1 is output. PL2 to PL4 are used for switching in the same manner.

The named U81 port signals are defined as follows: PL-CLK is the internal operating clock, P-LIFT is pen lift, START is plot start, and PLOT is plot mode selection.

Analog plot signals are handled as follows: when the START signal goes high, the signals output from U77a and U78a are switched by the analog switch U110, and output from the back panel BNC connector through U151.

During plotting operations, the CRT scan is stopped, and the waveform is displayed as illuminated points from the START time. When the plotting operation has completed, the waveform displayed prior to plotting is redisplayed.

Microprocessor Block (X77-1730-00)

The microprocessor is driven by the X3 clock at 12.288 MHz, and controls the following memories: 32 kbytes of ROM, 8 kbytes of RAM (U90) used as a working area, 32 kbytes of buffer memory (U89), and 32 kbytes of REF memory (U105). The U92, U106, and U107 address selectors perform port enabling.

Since a battery backup is provided for the REF memory, the contents of REF memory is maintained even when the main power is off.

CIRCUIT DESCRIPTION

Clock Divider Block

The 40 MHz output of the X4 oscillator is taken as the base signal and divided to provided several different clock signals. The 40 MHz signal is divide by 2 by U131a to generate a 20 MHz clock, and this clock is divided by 2 by U131b to form a 10 MHz clock.

The 40 MHz signal is divide by 10 by U130 to form a 4 MHz clock, and this clock is divided by 2 by U132 to form a 2 MHz clock. This signal is passed though the U134 divider and then the U137 phase compensation circuit, and is then switched by U133 to form the sampling clock and the trigger clock. Also, the 20 MHz signal prior to the U133 selector is passed through the U114 EQU gate, and sent to the A/D unit (X78-1080-00) as a 20 MHZ clock. A 10 MHz clock is sent to the R/O unit (X77-1720-00) and a 4 MHz clock (a 0.25 μs period) is sent to the X78-1080-00 A/D converter for display use.

The sampling clock is selected under microprocessor U81 control at the U138 OUT port.

The sampling frequencies are shown in the table below.

EQU mode		NORM mode		ROLL mode	
Range	Frequency	Range	Frequency	Range	Frequency
20 ns	20 MHz	10 μs	20 MHz	0.5 s	400 Hz
50 ns		20 μs	10	1 s	200 Hz
0.1 μs		50 μs	4	2 s	100 Hz
0.2 μs		0.1 ms	2	5 s	40 Hz
0.5 μs		0.2 ms	1	10 s	20 Hz
1 μs		0.5 ms	400 kHz	20 s	10 Hz
2 μs		1 ms	200	50 s	4 Hz
5 μs	20 MHz	2 ms	100	100 s	2 Hz
		5 ms	40	200 s	1 Hz
		10 ms	20	500 s	0.4 Hz
		20 ms	10		
		50 ms	4		
		0.1 s	2		
		0.2 s	1		

Trigger Block

The trigger block consists of an auto-trigger circuit, an equivalent sampling circuit and a trigger counter circuit.

The auto-trigger circuit takes its inputs from the TRIG/SWEEP unit (X74-1550-00) at ECL levels.

Transistor Q120 converts ECL to TTL levels, and its output is input to the U123 and U124 auto-trigger counters. The auto-trigger counter can operate when the auto-set mode pin (U127, pin 16) is high. In digital mode NORM sampling is performed once, and the number of times the TRIG signal is input in a SWEEP-G period is counted with the U123 and U124 counters. This value is read in by the microprocessor from the U120 read port, and the range is set based on microprocessor calculations. When an error is generated on a U81 microprocessor read of the U91 read port due to the U135 error bit being set to high in response to over 256 counter events, the upper range is reset, NORM sampling is performed, and the microprocessor calculates an optimal range by reading in the counter value.

The trigger counter block consists of a pre-trigger counter circuit, a post-trigger counter circuit, and trigger synchronization circuit.

The trigger signal is generated by inputting the real-time SWEEP-G signal with U152, synchronizing that signal with the sampling clock with the U121 synchronization circuit, and outputting it as the post-trigger load pin, equivalent sampling, and TRIG-G signals.

In the pre-trigger counter block, which consists of U139 and U140, the time between the start of sampling and the point when the trigger signal is enabled is counted. The setting can be set to any integer multiple up to −80 times the sweep time per division.

In the post-trigger counter block, which consists of U141 to U143, the time between the trigger signal input and the output of the sampling end signal is counted. This time can be set to any integer multiple up to + 10,000 times the sweep time per division.

The U137 start gate is set to low by the sampling start pulse, which is generated in software, and the pre-trigger counter (U139 and U140) is counted up to the set value. The synchronization circuit is enabled by the RCO output and the TRIG-DEL gate U128, and the SWEEP-G signal is input.
When the SWEEP-G signal is input the post-trigger counter operates and the sampling end signal is output. Note that the sampling end signal generates an interrupt to the microprocessor U81.
In equivalent sampling mode, a single cycle of the real-time RTO-SWEEP signal is converted to a pulse signal by the U129 comparator and is used as a sampling clock with a period of one pulse per sweep.
The RTO-SWEEP input is impedance converted by Q162 and input to the U129 comparator. The digital value resulting from counting the SWEEP-G signal by U149 is converted to an analog value by the U148 2-bit D/A converter and sent to the U129 comparator though the U150 D/A buffer.
The comparator output pulses are output through the U155 selector as the clock signal for the counters.

R/O Interface Block

The R/O interface block is described in the section describing the R/O block. Refer to that section for details.
R/O output data is output to the R/O bus by U108, and R/O input data is input by U109.
Control interface is implemented by U91, U114, and U113.

GP-IB Interface Block

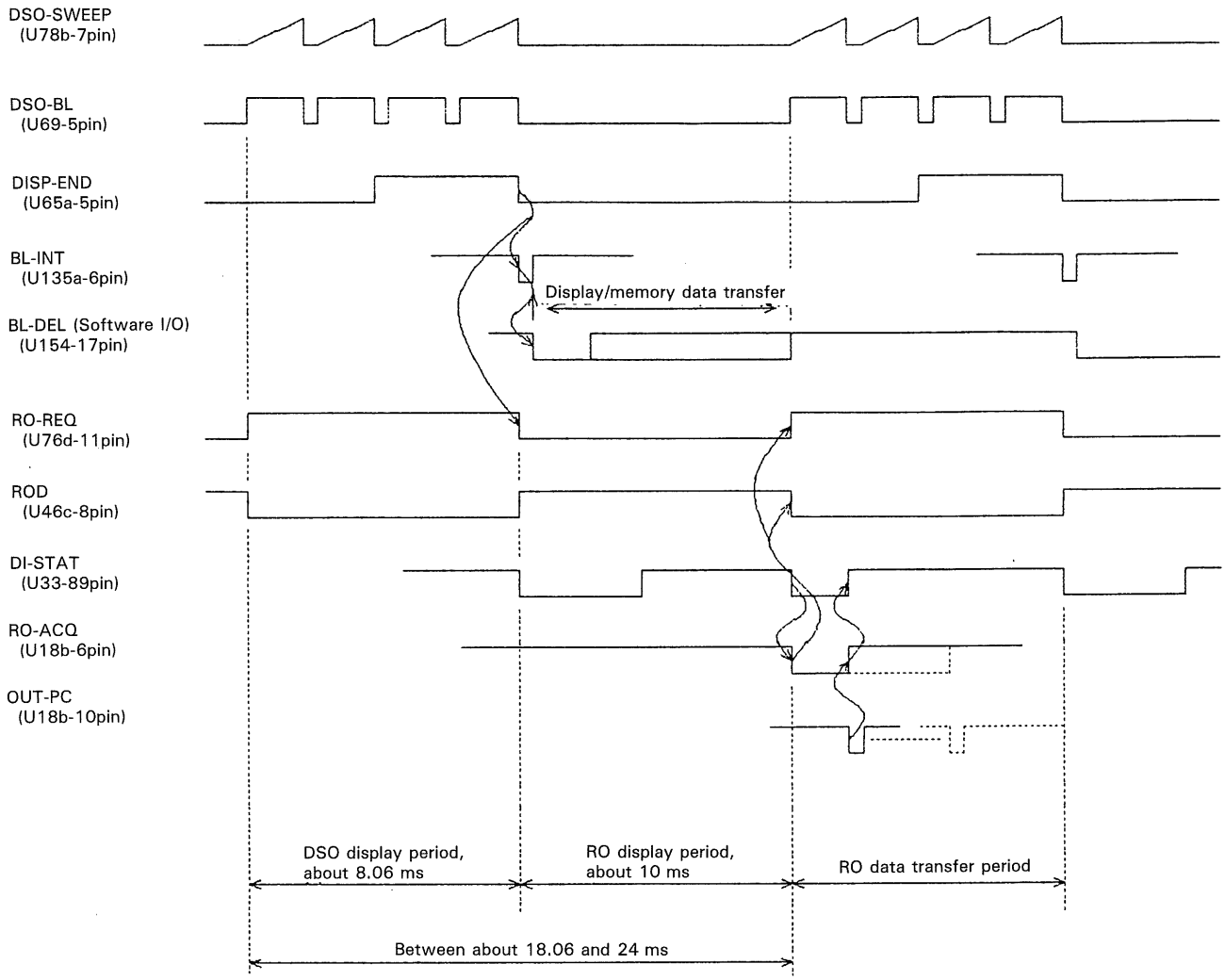
GP-IB implements an IEEE 488 standard interface using the U88 special-purpose LSI.
The GP-IB driver and receiver are implemented by U86 and U87, and the address data is read in from the switch data by the U156 input port.

RS-232C Interface

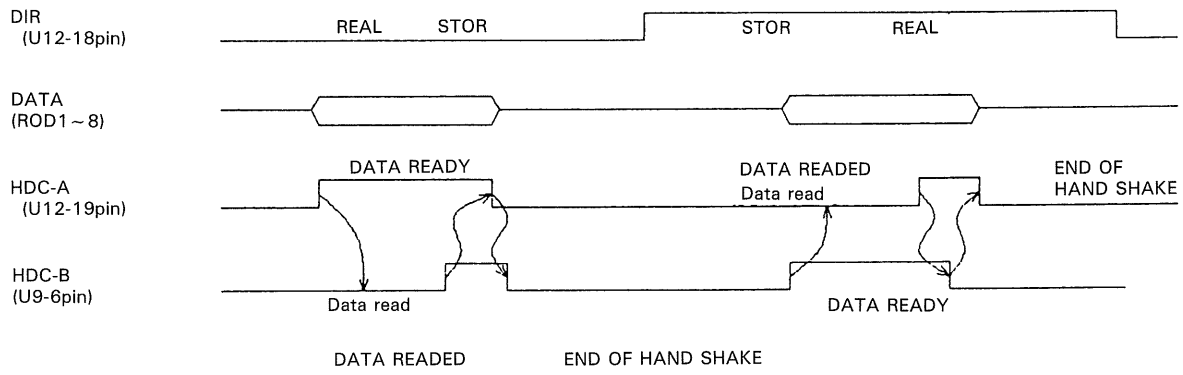
The RS-232C port is used as a dedicated digital plotter port, and is implemented by using the U81 microprocessor internal serial port through the U80 driver/receiver.
Note that the speed setting and analog/digital output switching are specified by reading in switch data through the U157 input port.

CIRCUIT DESCRIPTION

RO and DSO Dual Operating Timing Chart

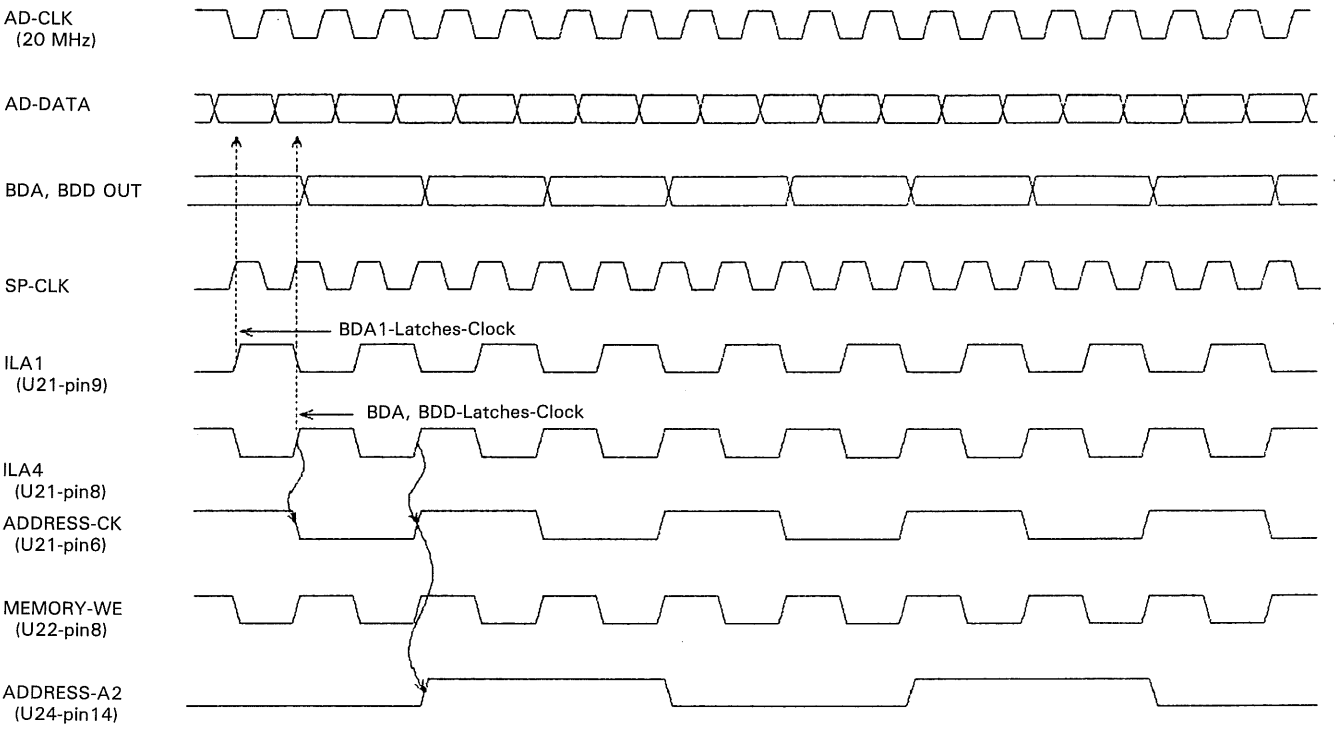


RO/STOR Communications Timing Chart



CIRCUIT DESCRIPTION

NORM Sampling Timing Chart



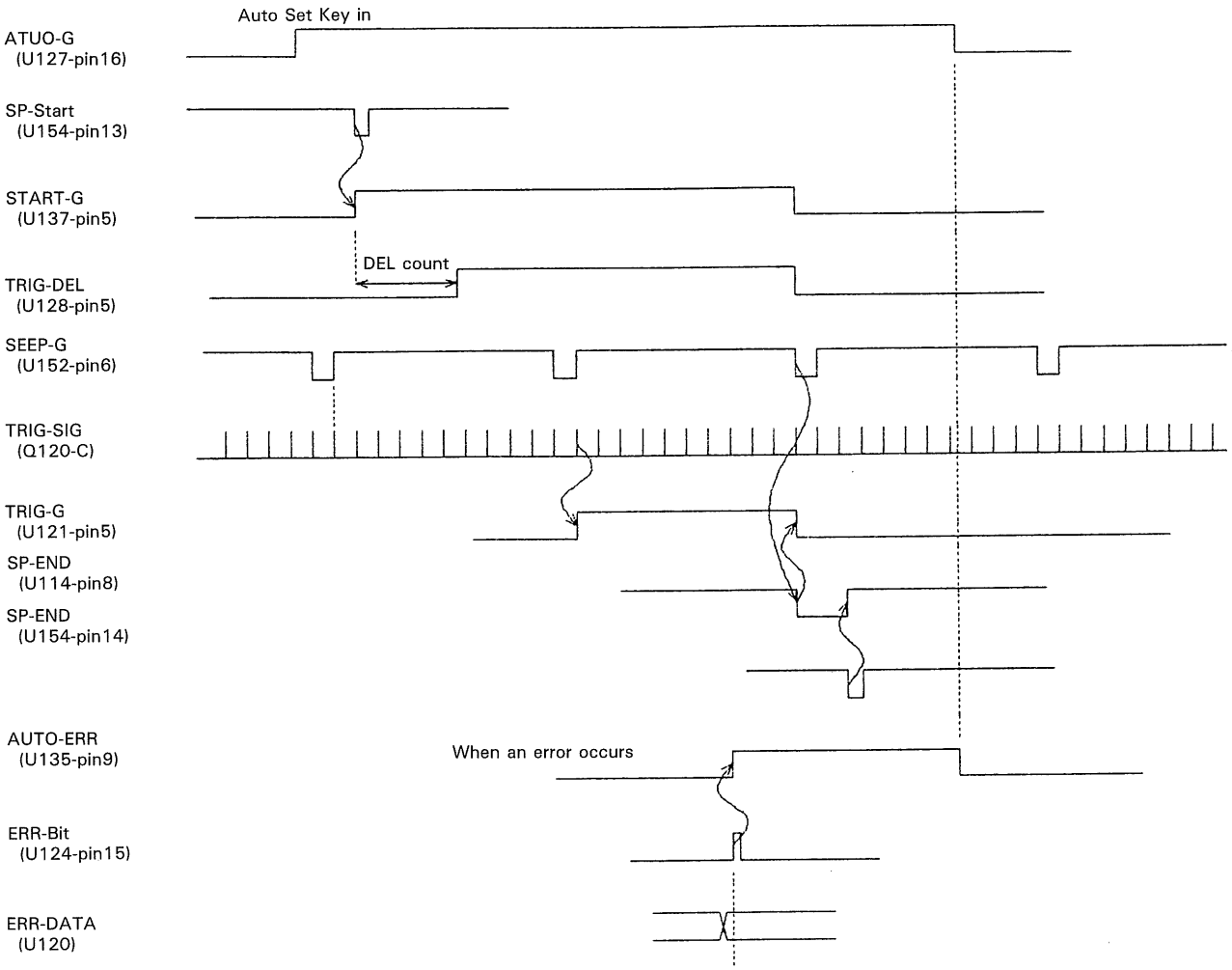
The figure above is the timing chart for the highest sampling rate (50 ns) at 10 μs/div.
Since peak operation is performed using U2 and U20, the timing must fulfill the above conditions.
Roll operation is similar.

CIRCUIT DESCRIPTION

Auto-Set Timing Chart

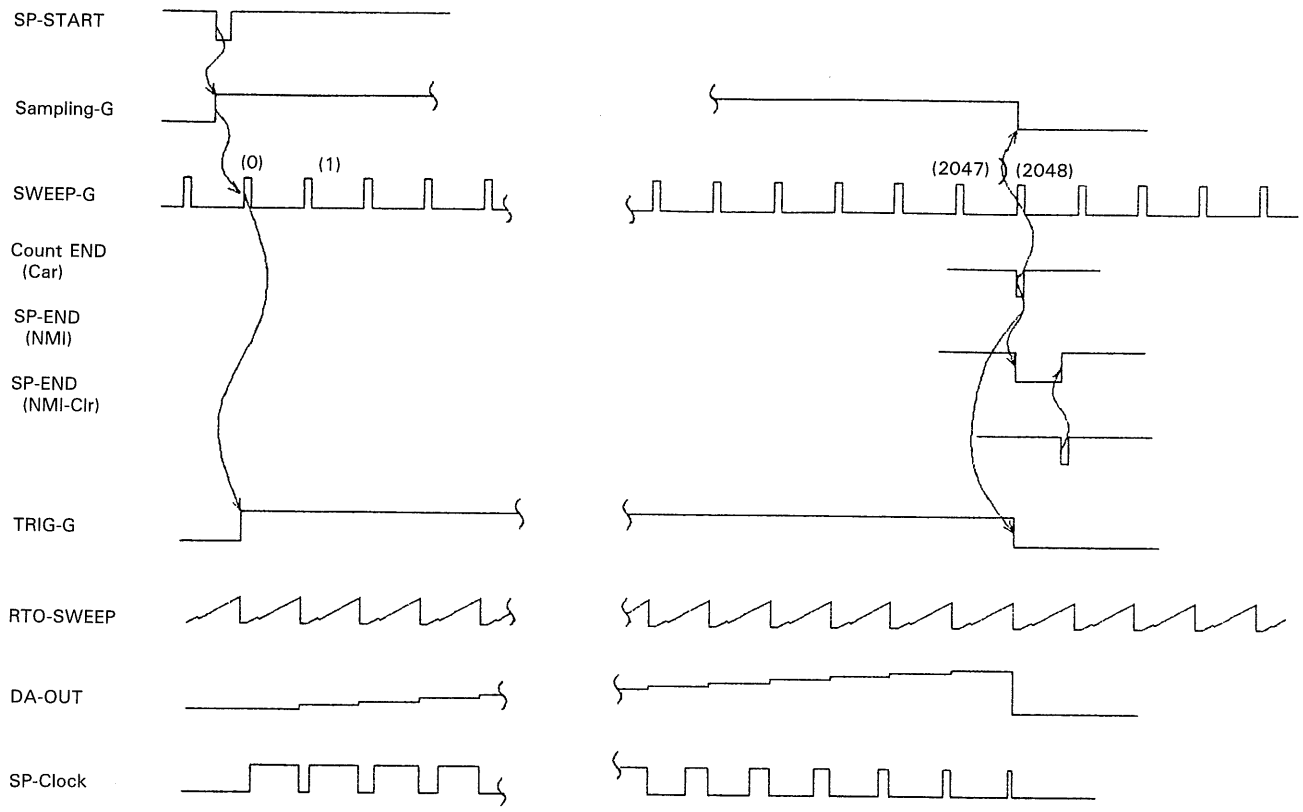
The auto-set operation for the vertical axis sets the volts/div setting in software by processing the A/D sampling data. Sampling is performed in 2-kword units.

The following is the timing chart for the horizontal axis auto-set operation.

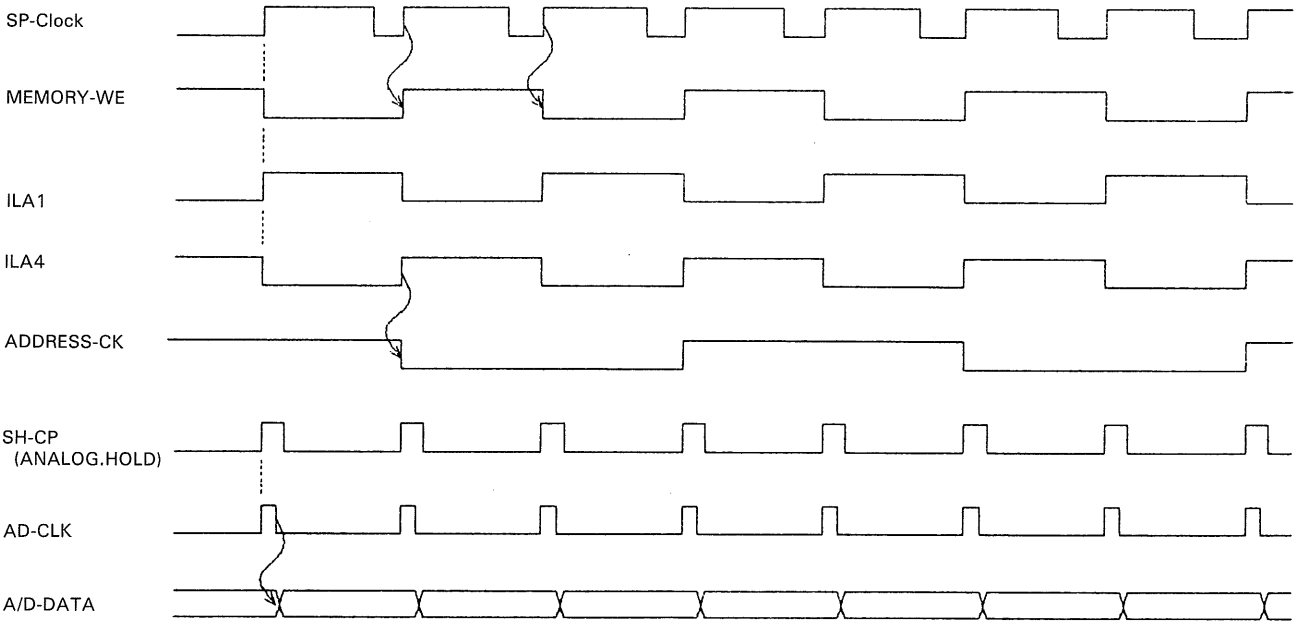


CIRCUIT DESCRIPTION

Equivalent Sampling Timing Chart

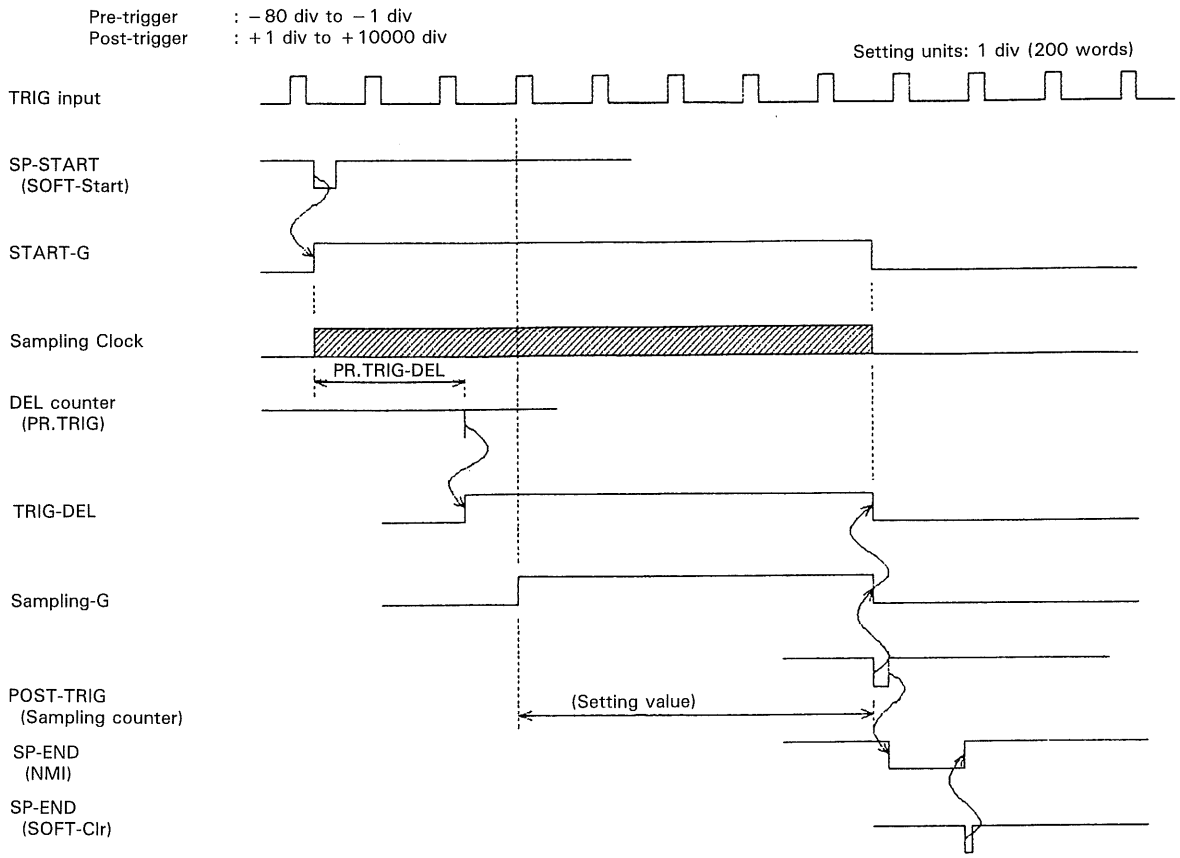


Equivalent sampling is implemented by iterating the timing shown above.
Although the sampling time also depends on the input signal, a single sampling cycle is completed in SWEEP-G times 2048 units.

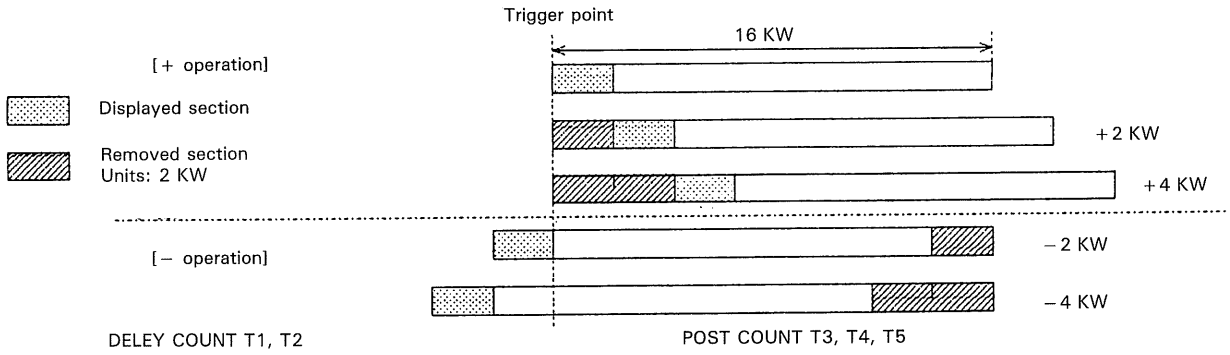


CIRCUIT DESCRIPTION

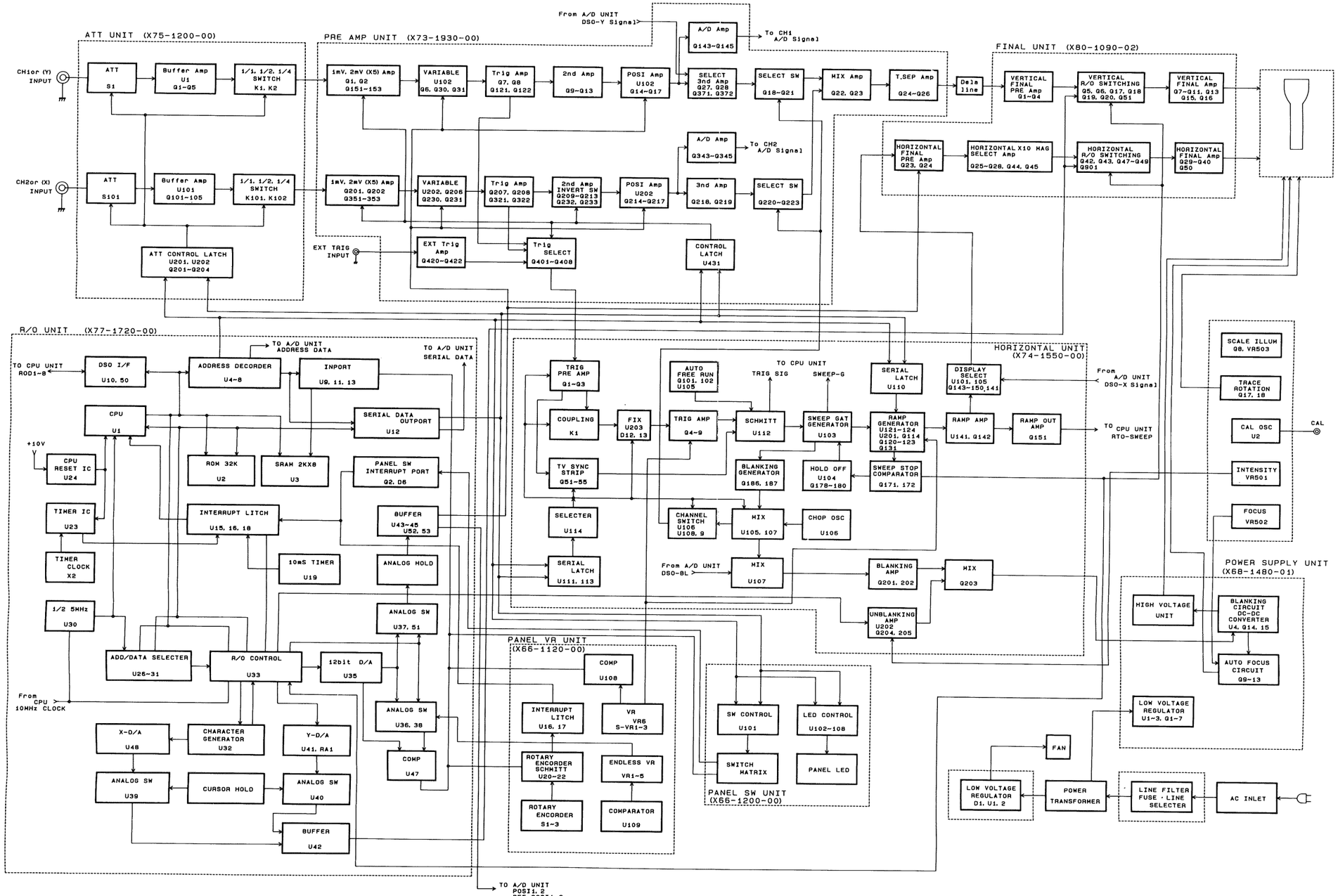
Trigger Operation Timing Chart



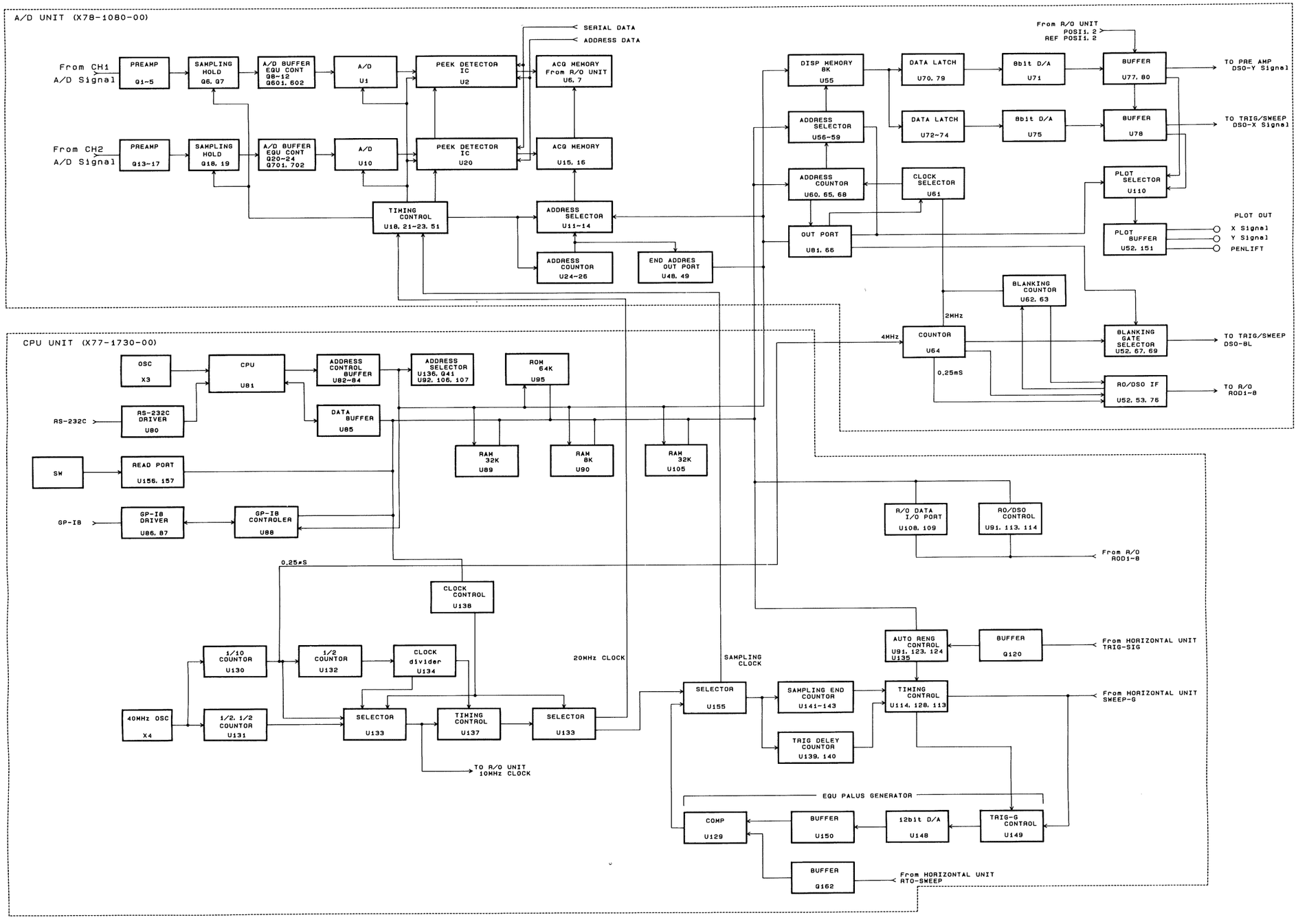
TRIG Counter Operation



BLOCK DIAGRAM



BLOCK DIAGRAM



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-711 (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: 35ns or less 100 kHz, Rise time: 1 ns or less
Q Meter	4343B (YHP)	—
Color Pattern Generator	CG-911A (KENWOOD)	—
Oscilloscope	CS-6020 (KENWOOD)	Sensitivity: more than 1 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
INTEN	12 o'clock
READOUT INTEN	Fully counterwise
FOCUS, ASTIG	Optimum position
CH1, CH2 ▲▼ POSITION	Mechanical center
◄ ► POSITION	Mechanical center
×10 MAG/EQU	LED OFF
VARIABLE, H.VARIABLE (VOLTS/DIV, SWEEP TIME/DIV)	CAL
AC-GND-DC (CH1 and CH2)	DC (GND at no signal)
VERTICAL MODE	CH1
HORIZONTAL MODE	AUTO
TRIGGERING COUPLING	AC
TRIGGERING SOURCE	CH1
TRIGGERING LEVEL	Mechanical center
VOLTS/DIV (CH1 and CH2)	10 mV/DIV
SWEEP TIME/DIV	1 ms/DIV
PROG SET	Press twice to set to initial setting (the indicator goes off).

Table 2

ADJUSTMENT

1. Power Supply and CRT Section Adjustments

Item	Adjustment	PCB	Procedure
−10 V	VR1	X68-1480	Adjust VR1 so that the terminal voltage at pin No. 2 of the connector P41 is −10 V.
Focus Center	VR4	X68-1480	Push the FOCUS knob in (for the FOCUS operation) and then set it to the mechanical center position. Pull the knob out (for the ASTIG operation), display a luminescent spot in the center of the screen and adjust the ASTIG control and VR4 to minimize the size of the spot.
Intensity	VR2	X68-1480	Display the luminescent spot in the center of the screen and turn the REAL-INTEN knob to a 10 o'clock position. Then adjust VR2 so that the spot is dimly visible.
CRT Center	VR2	X80-1090	With Q1-collector and Q2-collector short-circuited, adjust VR2 so that the luminescent line comes to the center of the screen.
Vertical Center Voltage	VR5	X80-1090	With Q1-collector and Q2-collector short-circuited, adjust VR5 to give 37 V at pin No. 1 of the connector P42 so that the luminescent line comes to the center of the screen.
Horizontal Center Voltage	VR9	X80-1090	In X-Y mode, adjust HORIZONTAL POSITION so that the luminescent spot comes to the center of the screen. Adjust VR9 to give 60 V at pin No. 1 of the connector P43.

2. Vertical Section Adjustments

Item	Adjustment	PCB	Procedure
CH1 100 Hz Sag	VR2	X75-1200	CH1 VOLTS/DIV: 10 mV Apply square waves using a square-wave oscillator so that the amplitude extends over 6 divisions on the screen. Adjust VR2 so that the square waves are parallel to each other.
CH2 100 Hz Sag	VR102	X75-1200	Adjust in the same way as for CH1.
CH1 1 kHz Waveform Shaping	TC903 TC904	X75-1200	AC-GND-DC: DC Apply 1 kHz square waves to CH1 INPUT with the amplitude extending over 4 to 6 divisions, then adjust in each range so that leading edges are parallel to each other. TC903 for 0.1 V/div, TC904 for 1 V/div
CH2 1 kHz Waveform Shaping	TC913 TC914	X75-1200	Adjust in the same way as for CH1.
CH1 Input Capacity	TC901 TC902	X75-1200	AC-GND-DC: DC CH1 VOLTS/DIV: 10 mV Connect a capacity meter to CH1 INPUT and measure the capacity in the 10 mV range. Adjust so that the capacities in each range are the same as for the 10 mV range. TC 901 for 0.1 V/div, TC902 for 1 V/div Input capacity: 22 pF ±3 pF
CH2 Input Capacity	TC911 TC912	X75-1200	Adjust in the same way as for CH1.
CH1 Step ATT Balance	VR1 VR1	X75-1200 X73-1930	SWEEP TIME/DIV: 1 ms AC-GND-DC: GND Adjust VR1 (X75-1200) so that the luminescent line does not vary even when the range is switched between 1 mV and 2 mV. Adjust VR1 (X75-1930) so that the luminescent line does not vary even when the range is switched between 2 mV and 5 mV.

ADJUSTMENT

Item	Adjustment	PCB	Procedure
CH1 Variable Balance	VR5	X73-1930	VOLTS/DIV: 10 mV SWEEP TIME/DIV: 1 ms Adjust VR5 so that the luminescent line does not move even when the VARIABLE knob is rotated.
CH2 Step ATT Balance	VR101 VR201	X75-1200 X73-1930	Adjust in the same way as for CH1.
CH2 Variable Balance	VR215	X73-1930	Adjust in the same way as for CH1.
CH2 INV Balance	VR216	X73-1930	CH2 POSITION: Display in the center of the screen. CH2 VOLTS/DIV: 1 mV SWEEP TIME/DIV: 1 ms Adjust VR216 so that the luminescent line does not move even when the CH2 INV switch is turned ON/OFF.
CH2 Position Center	VR205	X73-1930	AC-GND-DC: AC CH2 VOLTS/DIV: 10 mV SWEEP TIME/DIV: 1 ms CH2 INPUT: Sine wave with the amplitude extending over approx. 10 divisions on the screen Display CH2 after pressing SET, then adjust VR205 so that it comes to the center.
CH1 Position Center	VR4	X73-1930	Adjust in the same way as for CH2.
CH1 Gain	VR1	X80-1090	AC-GND-DC: DC VOLTS/DIV: 10 mV Apply a 50 mV square wave, and adjust so that the amplitude extends over 5 divisions on the screen.
CH1 1 mV Gain	VR2	X73-1930	AC-GND-DC: DC VOLTS/DIV: 1 mV Apply a 5 mV square wave, and adjust so that the amplitude extends over 5 divisions on the screen.
CH2 Gain	VR206	X73-1930	AC-GND-DC: DC VOLTS/DIV: 10 mV Apply a 50 mV square wave, and adjust so that the amplitude extends over 5 divisions on the screen.
CH2 1 mV Gain	VR202	X73-1930	AC-GND-DC: DC VOLTS/DIV: 1 mV Apply a 5 mV square wave, and adjust so that the amplitude extends over 5 divisions on the screen.
X Gain	VR324	X73-1930	AC-GND-DC: DC CH2 VOLTS/DIV: 10 mV HORIZONTAL MODE: X-Y Apply a 50 mV square wave, and adjust so that the amplitude extends over 5 divisions on the horizontal axis on the screen.

ADJUSTMENT

3. TRIG Section Adjustments

Item	Adjustment	PCB	Procedure
FIX Level Center	VR1	X74-1550	HORIZONTAL MODE : FIX, AUTO TRIGGERING SOURCE : CH1 COUPLING : DC INPUT : Sine wave with the amplitude extending over 4 divisions on the screen Adjust VR1 so that the starting point of the waveform on the screen has the same amplitude in the center of the waveform when switching SLOPE between + (plus) and − (minus).
TRIG Level Center	VR123 VR323 VR428	X73-1930	HORIZONTAL MODE : AUTO TRIGGERING SOURCE : CH1/CH2/EXT (switching) COUPLING : AC/DC (switching) INPUT : Sine wave with the amplitude extending over 4 divisions on the screen Adjust VR1 so that the starting point of the waveform on the screen does not vary when switching COUPLING between AC and DC. (Align the point for DC with that for AC.) VR123 for CH1, VR323 for CH2, VR428 for EXT

4. Horizontal Section Adjustments

Item	Adjustment	PCB	Procedure
1 ms range	VR143	X74-1550	SWEEP TIME/DIV : 1 ms CH1 INPUT : Input 1 ms Time Marker. Adjust VR143 to align the input signal with the scale on the screen.
10 ms range	VR138	X74-1550	SWEEP TIME/DIV : 10 ms CH1 INPUT : Input 10 ms Time Marker. Adjust VR138 to align the input signal with the scale on the screen.
0.2 μs range	TC128	X74-1550	SWEEP TIME/DIV : 0.2 μs CH1 INPUT : Input 0.2 μs Time Marker. Adjust TC128 to align the input signal with the scale on the screen.
1 μs range	TC127	X74-1550	SWEEP TIME/DIV : 1 μs CH1 INPUT : Input 1 μs Time Marker. Adjust TC127 to align the input signal with the scale on the screen.
× 10MAG Gain	VR8	X80-1090	SWEEP TIME/DIV : 1 ms CH1 INPUT : 10 μs Time Marker With × 10MAG KEY on (with the LED lit up), adjust VR8 to align the input signal with the scale on the screen.
× 10MAG Center	VR7	X80-1090	SWEEP TIME/DIV : 1 ms CH1 INPUT : 5 ms Time Marker With × 10MAG KEY on (with the LED lit up), align the second Time Marker on the screen with the scale in the center using Horizontal Position. With × 10MAG KEY off (with the LED unlit), adjust VR7 to align the second Time Marker with the scale in the center.
Horizontal Position Center	VR6	X80-1090	SWEEP TIME/DIV : 1 ms CH1 INPUT : 10 ms Time Marker Adjust VR6 so that the Marker on the screen displays in the same range when the Position volume is fully turned clockwise and counterclockwise (with 10 divisions for each side).
X Position Center	VR145	X74-1550	SWEEP TIME/DIV : 1 ms Using Horizontal Position, align the starting point of the luminescent line with the scale at the left end on the screen. With Horizontal Mode X-Y Key on (with the LED lit up), adjust VR145 so that the luminescent spot on the screen comes to the center of the screen.

ADJUSTMENT

5. Display System

Item	Adjustment	PCB	Procedure
Y Gain and Position	VR5 VR6	X78-1080	* Adjust using a test pattern (stepped-wave) How to output a test pattern 1. Turn the power switch off. (Power off) 2. Turn the power switch on while pressing the AUTO SET switch. (Restart) 3. Release the AUTO SET switch. * Adjust VR5 to align with each division of the Y axis scale on the screen. Move the test pattern in Y direction using VR6 so that VR5 can be adjusted easily. * Adjust VR6 to align the test pattern (stepped-wave) with the Y axis scale on the screen at intervals of 8 divisions.
X Gain and Position	VR7 VR8	X78-1080	* Adjust using a test pattern (stepped-wave) * Adjust VR7 to align with each division of the X axis scale on the screen. Move the test pattern in X direction using VR8 so that VR7 can be adjusted easily. * Adjust VR8 to align the test pattern (stepped-wave) with the X axis scale on the screen at intervals of 10 divisions.
X Position	VR8	X78-1080	Stopping the test pattern output Turn the power on again. TIME/DIV : 1 ms * Using Horizontal Position, align the starting point of the luminescent line in REAL mode with the scale at the left end on the screen. Adjust VR8 so that the luminescent line starts from the same point even when the mode is changed to STORAGE.

6. AD system

Item	Adjustment	PCB	Procedure
CH1 AD Gain and Position	VR63 VR142	X78-1080 X73-1930	VOLTS/DIV : 10 mV SWEEP TIME/DIV : 0.2 ms CH1 INPUT : 50 mV square wave TRIGGERING MODE : AUTO * In REAL mode, display in a position on the screen where adjustment can be performed easily. * Change the mode from REAL to STORAGE, then adjust VRs 63 and 142 so that the gain and the position are the same as for REAL. (Adjust precisely repeating this procedure several times.) VR142 for gain and VR63 for position adjustment.
CH2 AD Gain and Position	VR69 VR342	X78-1080 X73-1930	VOLTS/DIV : 10 mV SWEEP TIME/DIV : 0.2 ms CH1 INPUT : 50 mV square wave TRIGGERING MODE : AUTO * In REAL mode, display in a position on the screen where adjustment can be performed easily. * Change the mode from REAL to STORAGE, then adjust VRs 69 and 342 so that the gain and the position are the same as for REAL. (Adjust precisely repeating this procedure several times.) VR342 for gain and VR69 for position adjustment.

ADJUSTMENT

Item	Adjustment	PCB	Procedure
CH1 EQU Mode Gain and Position	VR601 VR602	X78-1080	VOLTS/DIV : 10 mV SWEEP TIME/DIV : 5 μs CH1 INPUT : 50 kHz sine wave with the amplitude extending over 5 divisions on the screen AC-GND-DC : AC TRIGGERING MODE : AUTO * In STORAGE NORM mode, display in a position on the screen where adjustment can be performed easily. * Switching between NORM and EQU (×10 MAG), adjust VRs 601 and 602 so that the gain and the position are the same as for REAL. (Adjust precisely repeating this procedure several times.) VR602 for gain and VR601 for position adjustment.
CH2 EQU Mode Gain and Position	VR701 VR702	X78-1080	VOLTS/DIV : 10 mV SWEEP TIME/DIV : 5 μs CH2 INPUT : 50 kHz sine wave with the amplitude extending over 5 divisions on the screen AC-GND-DC : AC TRIGGERING MODE : AUTO * In STORAGE NORM mode, display in a position on the screen where adjustment can be performed easily. * Switching between NORM and EQU (×10 MAG), adjust VRs 701 and 702 so that the gain and the position are the same as for REAL. (Adjust precisely repeating this procedure several times.) VR702 for gain and VR701 for position adjustment.
TIME/DIV Gain and Position	VR11 VR12	X77-1730	VOLTS/DIV : 10 mV SWEEP TIME/DIV : 0.1 μs CH2 INPUT : TIME Marker 0.1 μs with the amplitude extending over approx. 4 divisions on the screen AC-GND-DC : AC TRIGGERING MODE : AUTO * Display in a position on the screen where adjustment can be performed easily. * Adjust VR11 to align with each division of the X axis scale on the screen. Move in horizontal direction using Horizontal Position so that VR11 can be adjusted easily. (Perform the adjustment operation with the marker signal of F 2% for the purposes of (1) preventing the error due to temperature drift and (2) satisfying the specifications also in the 20 μs range.) * Adjust VR12 so that the waveform is displayed without any breaks. * Check to make sure that there is no break in the displayed waveform switching the range between TIME/DIV 5 μs and 20 ns.

ADJUSTMENT

7. Overshoot and CAL Adjustments

Item	Adjustment	PCB	Procedure
Overshoot	TC1 TC2 <for CH1> TC2 VR3 TC3 VR97 TC97 <for CH2> TC202 VR203 TC203 TC280	X80-1090 X73-1930	CH1, 2 VOLTS/DIV : 10 mV CH1, 2 AC-GND-DC : DC SWEEP TIME/DIV : 0.1 μs, 0.2 μs • Apply a 1 MHz square wave to CH1 INPUT. * In STORAGE EQU mode, adjust TC2, TC3 and VR3 so that both overshoot and ringing extend over 0.3 divisions. * In REAL mode, adjust TC1 and TC2 so that the waveform is flat in the intermediate-frequency band. * In REAL mode, adjust TC97 and VR97 so that both overshoot and ringing extend over 0.3 divisions. • Apply a 1 MHz square wave to CH2 INPUT. * In STORAGE EQU mode, adjust TC202, TC203 and VR203 so that both overshoot and ringing extend over 0.3 divisions. * In REAL mode, adjust TC280 so that the waveform is flat in the high-frequency band. (At this point of time, both overshoot and ringing should extend over 0.3 divisions.) Confirmation after adjustments The frequency characteristics in the 10 mV range should be 55 MHz (−3 dB) or more for each channel. The channel signal difference (between CH1 and CH2 INV ADD) should be 0.5 divisions or less (when applying a 50 MHz square wave with the amplitude extending over 8 divisions).
CAL	VR5 VR6	X68-1480	Connect an oscilloscope calibrated for 100 MHz band to the CAL terminal and set VOLTS/DIV to 0.2 V and TIME/DIV to 0.1 ms. Adjust VR5 so that one cycle is 1 ms (i.e. 10 divisions). Adjust VR6 so that the amplitude is 1 V (i.e. 5 divisions).

8. Cursor Section Adjustments

Item	Adjustment	PCB	Procedure
Cursor Y Gain	VR3	X80-1090	CURSORS : ΔY1 Δ : Turn clockwise until the cursor stops at the top of the screen. ΔREF : Turn counterclockwise until the cursor stops at the bottom of the screen. CH1 VOLTS/DIV : 10 mV * Adjust VR3 so that the interval between the cursors is 8 divisions. Move the cursor in Y direction using VR4 so that VR3 can be adjusted easily.
Cursor Y Position	VR4	X80-1090	CURSORS : ΔV1 Δ : Turn clockwise until the cursor stops at the top of the screen. ΔREF : Turn counterclockwise until the cursor stops at the bottom of the screen. * Adjust VR4 to align two horizontal cursors with the uppermost and lowest scales on the screen respectively.
Cursor X Gain and Position	VR10 VR11	X80-1090	CURSORS : ΔV1 Δ : Turn clockwise until the cursor stops at the right end of the screen. ΔREF : Turn counterclockwise until the cursor stops at the left end of the screen. * Adjust VR11 so that the interval between the cursors is 10 divisions. Move the cursor in X direction using VR10 so that VR10 can be adjusted easily. * Adjust VR10 to align two vertical cursors with the right end and left end scales on the screen respectively.

ADJUSTMENT

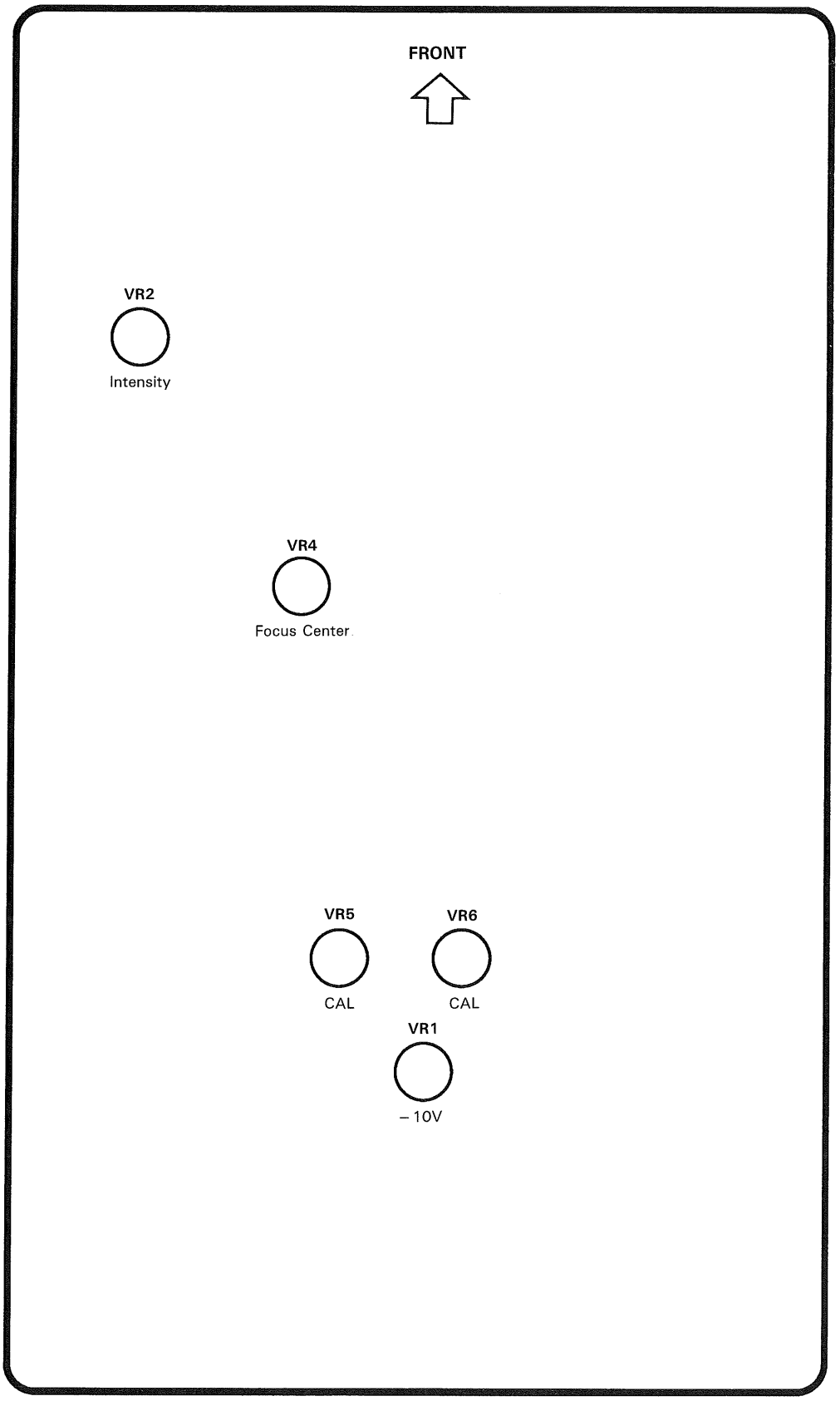
9. PLOT system

Item	Adjustment	PCB	Procedure
X Gain	VR14	X78-1080	AC-GND-DC : GND SWEEP TIME/DIV : 10 μs * In NORM mode, turn CH1 POSITION fully clockwise. Then change the mode to HOLD mode, press the PLOT KEY and adjust VR14 to give +5 V at terminal X of PEN OUT in the rear side.
Y Gain	VR16	X78-1080	AC-GND-DC : GND SWEEP TIME/DIV : 10 μs * In NORM mode, turn CH2 POSITION fully clockwise. Then change the mode to HOLD. X-Y mode, press the PLOT KEY and adjust VR16 to give +5 V at terminal Y of PEN OUT in the rear side.

ADJUSTMENT

POWER SUPPLY UNIT (X68-1480-01)

Pattern side view

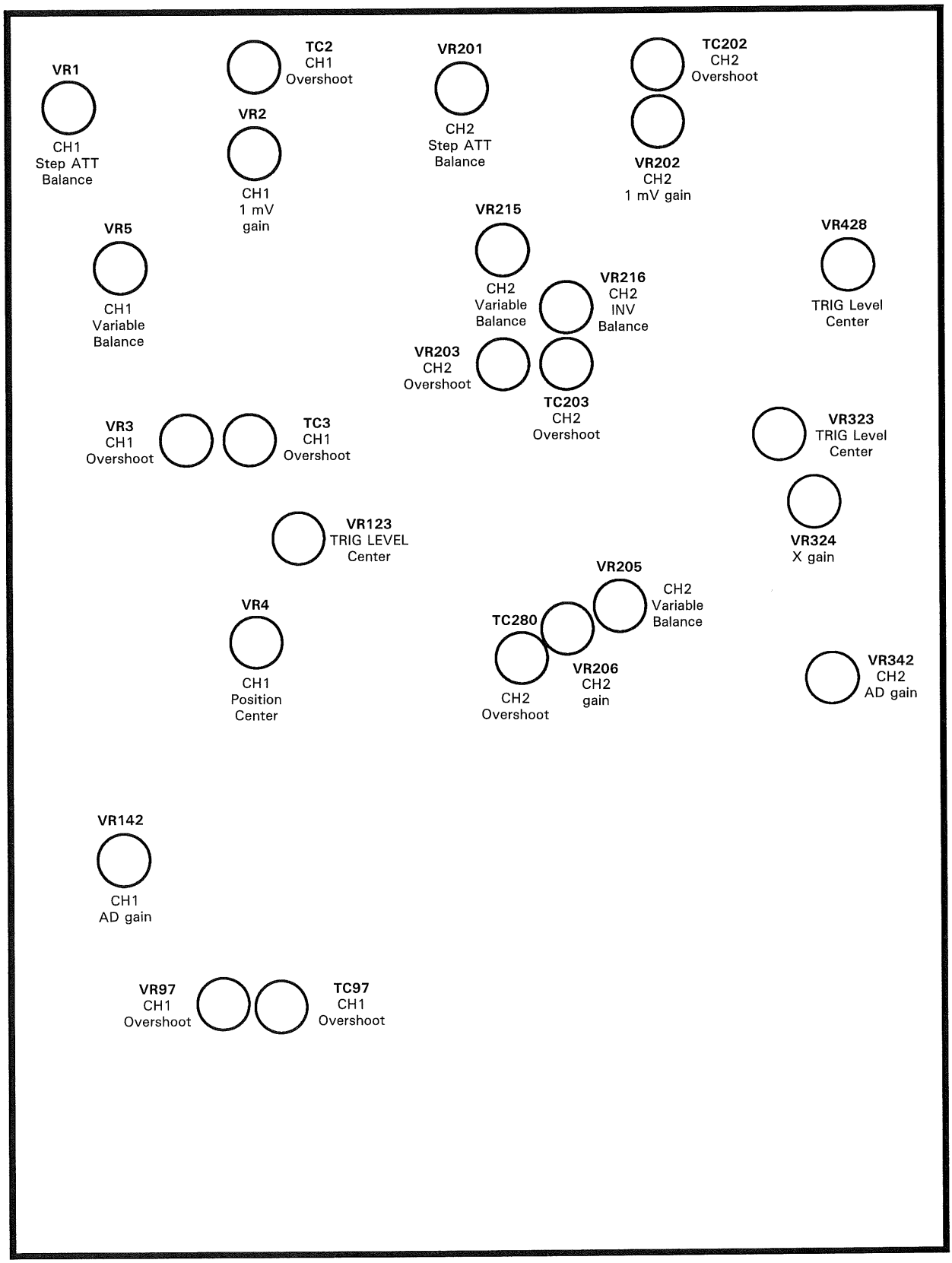


ADJUSTMENT

PRE AMP UNIT (X73-1930-00)

FRONT

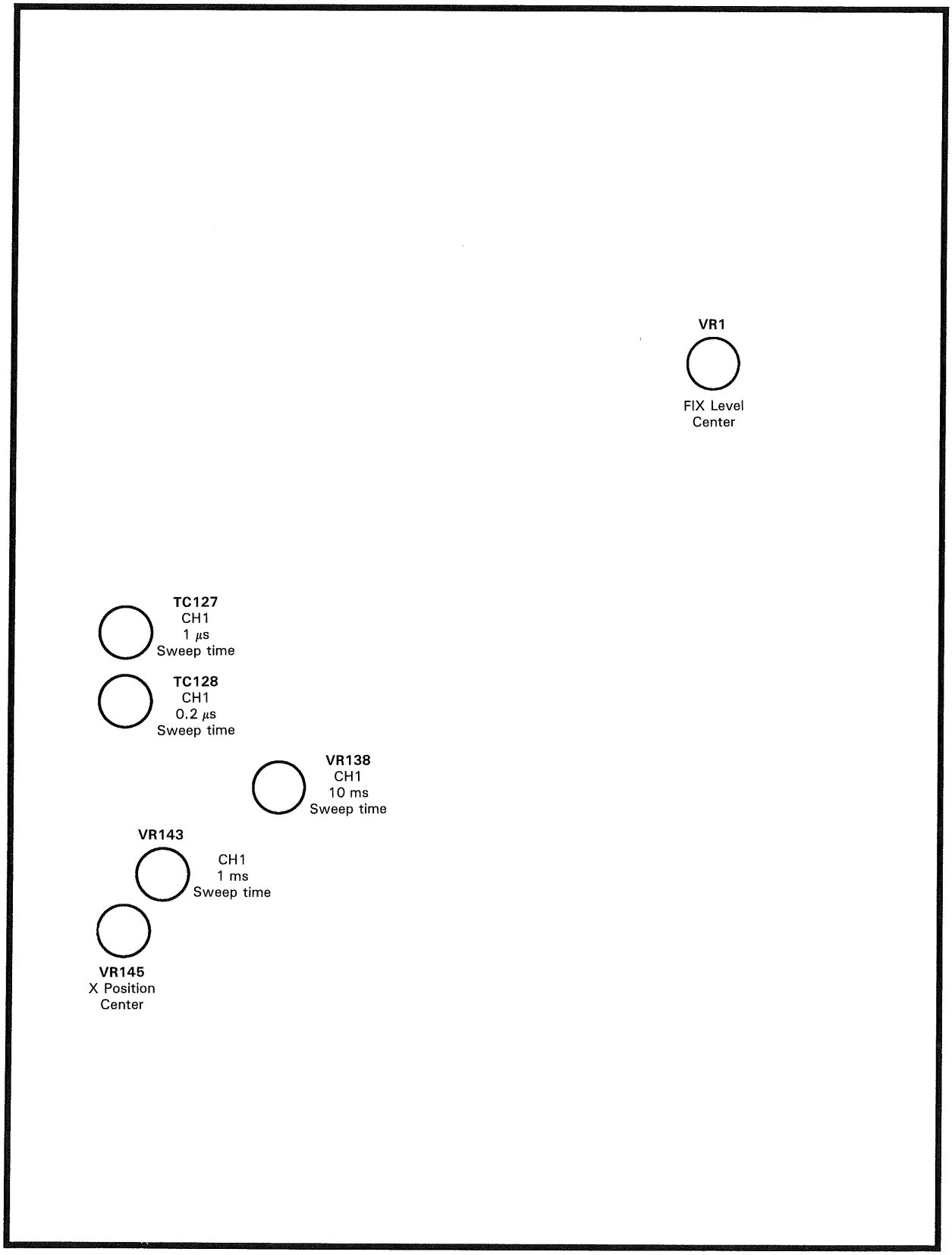
Pattern side view



ADJUSTMENT

HORIZONTAL UNIT (X74-1550-00)

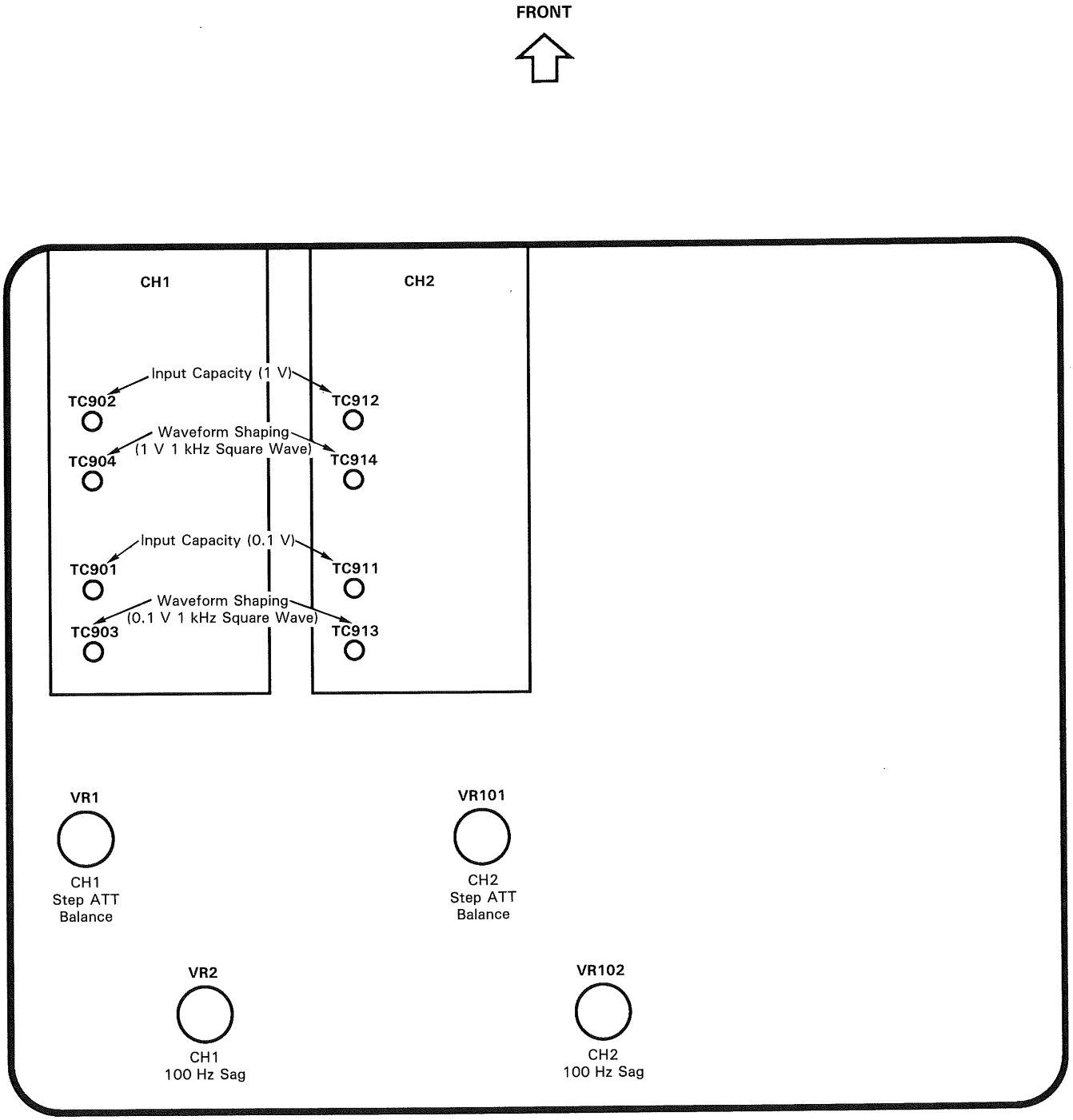
Pattern side view



FRONT

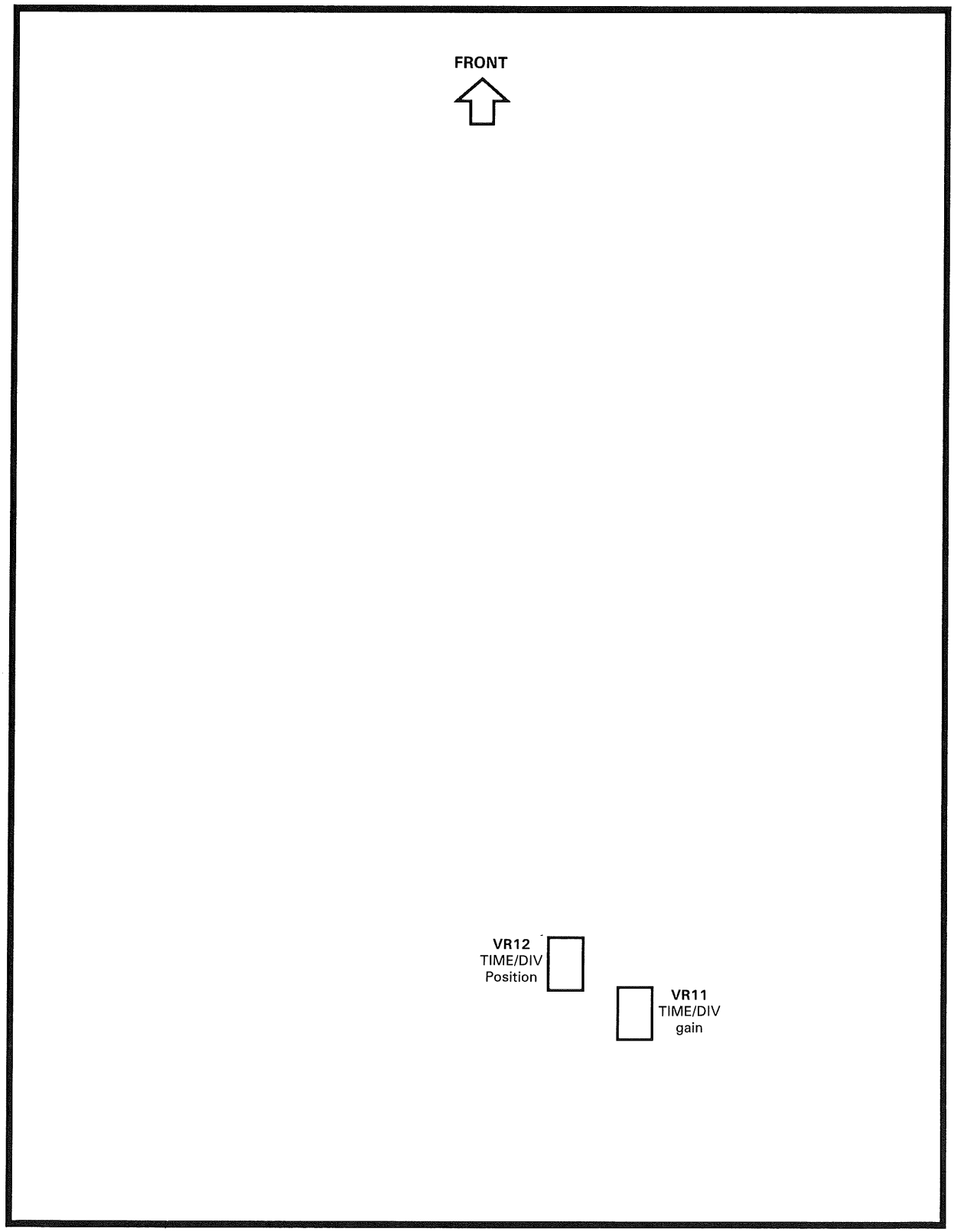
ADJUSTMENT

ATT UNIT (X75-1200-00)



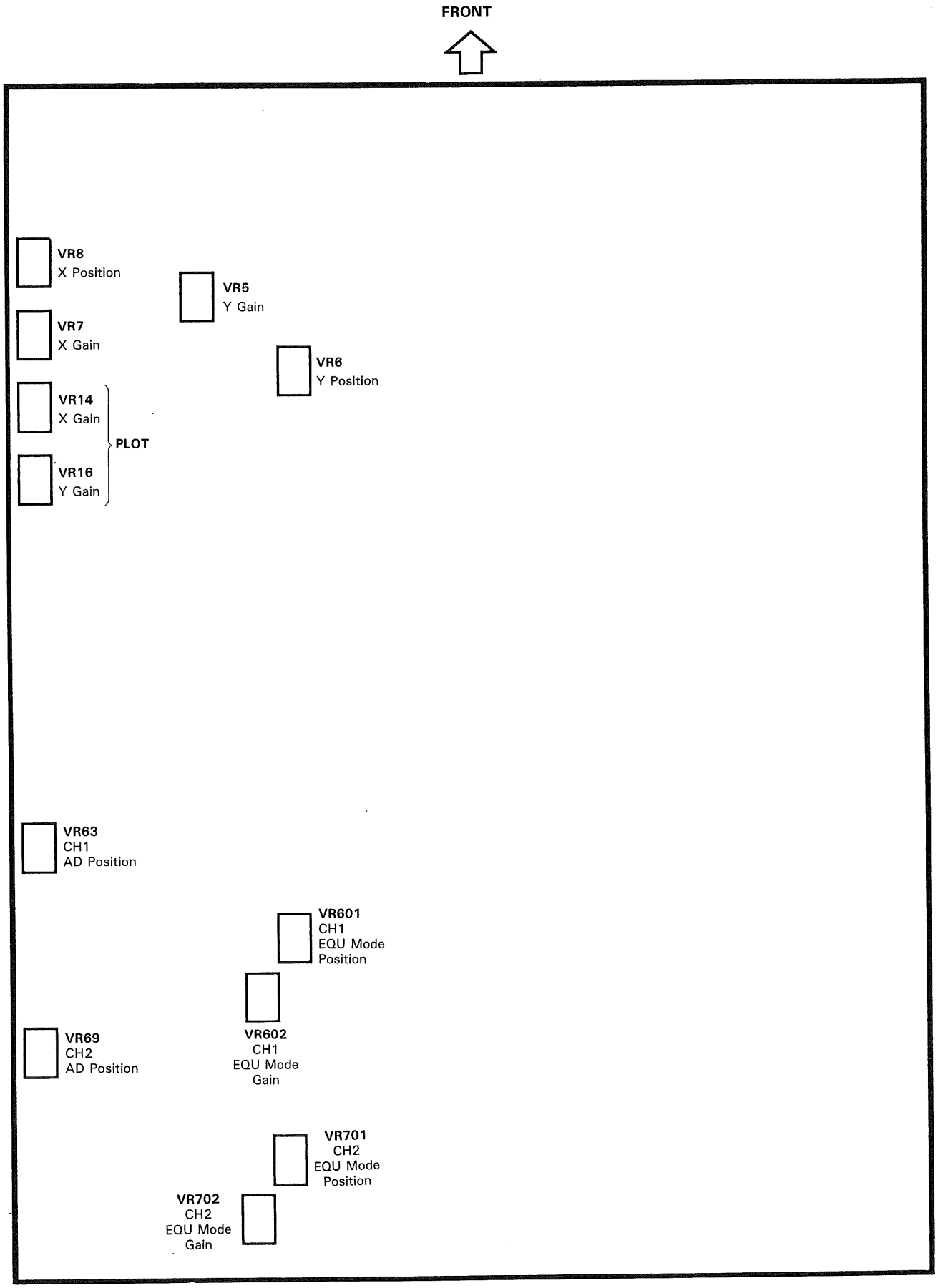
ADJUSTMENT

STORAGE UNIT (X77-1730-00)



ADJUSTMENT

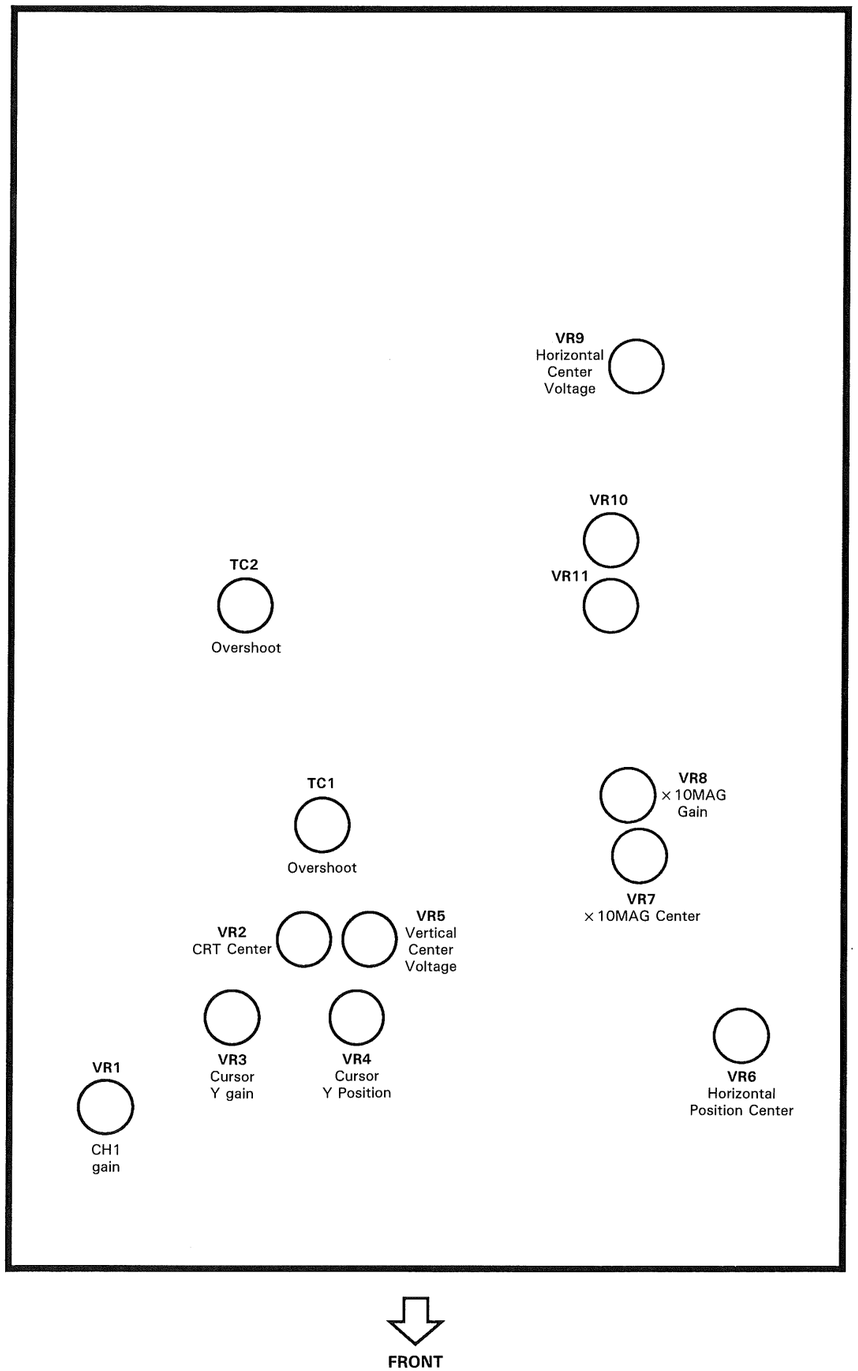
A/D CONVERTER UNIT (X78-1080-00)



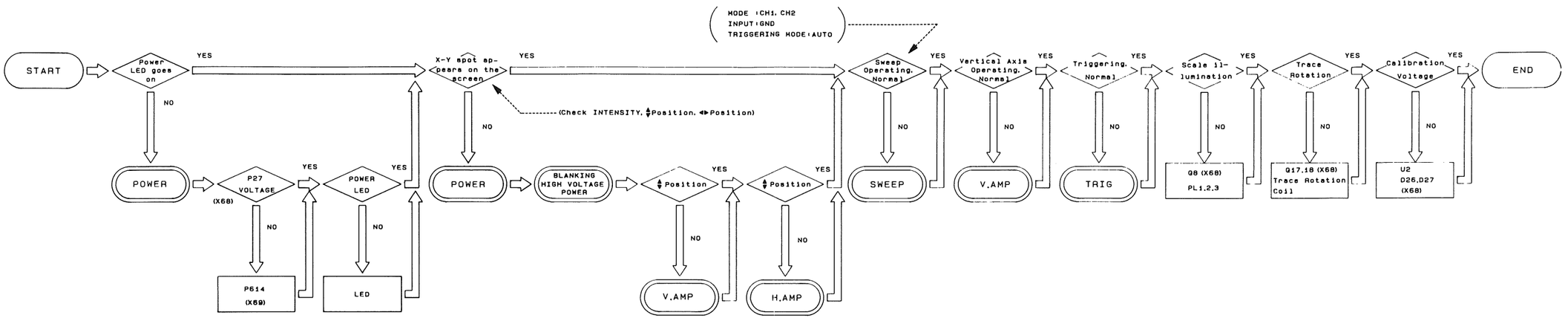
ADJUSTMENT

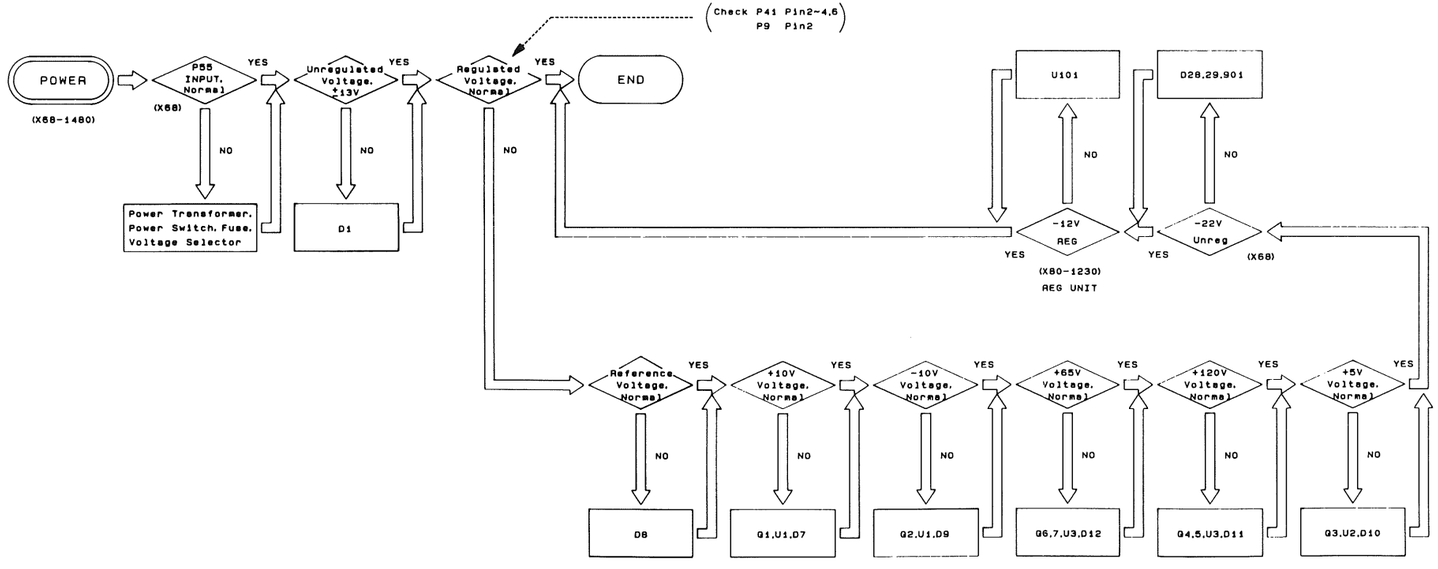
FINAL UNIT (X80-1090-02)

Pattern side view



TROUBLESHOOTING





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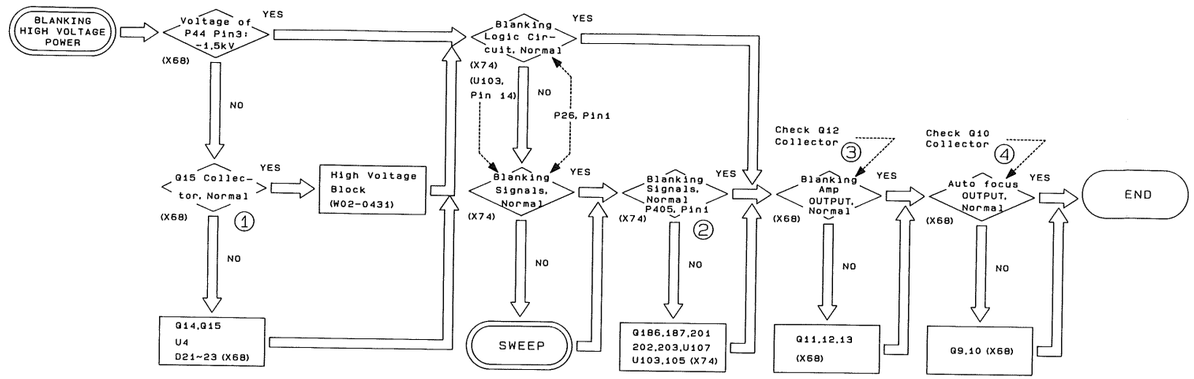

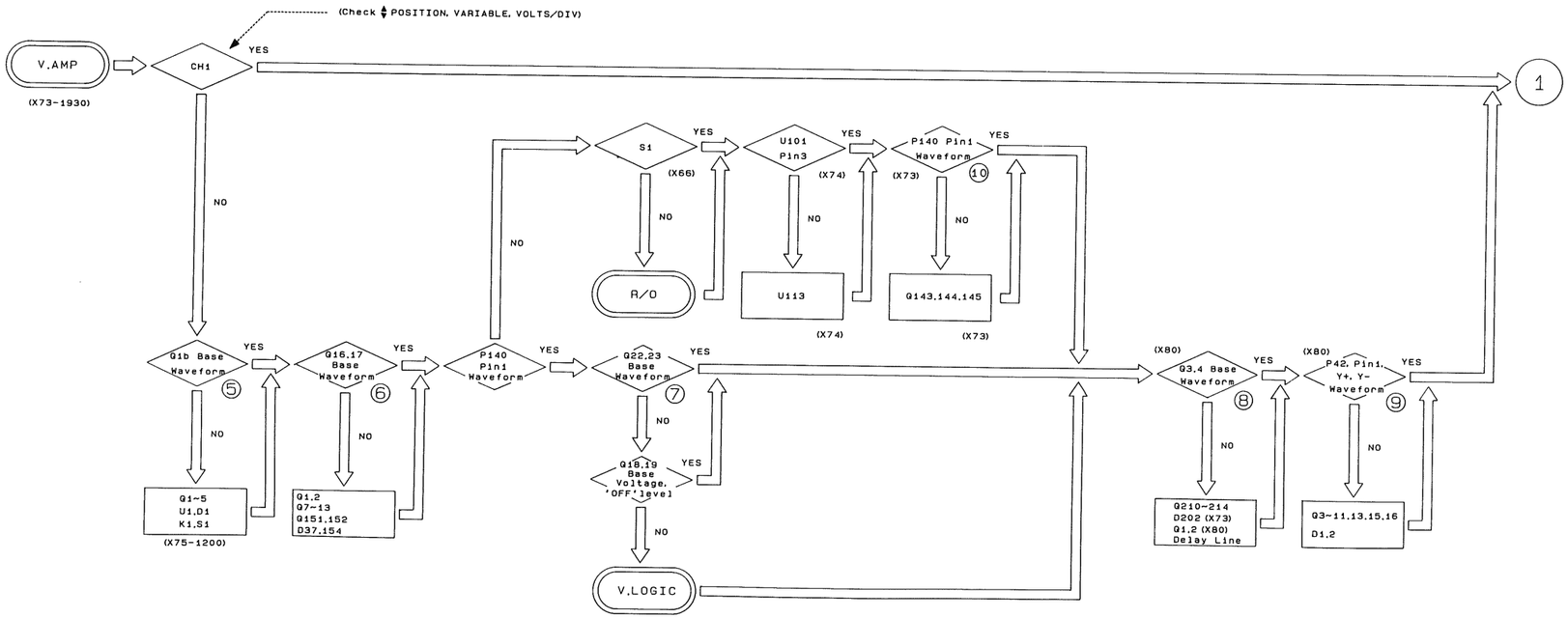

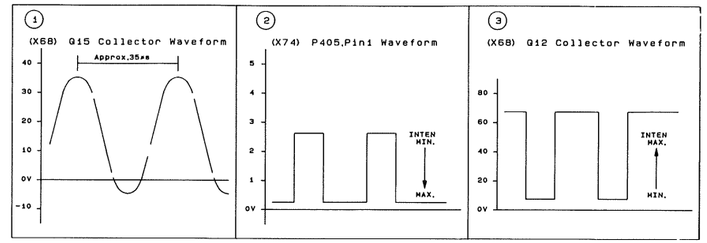

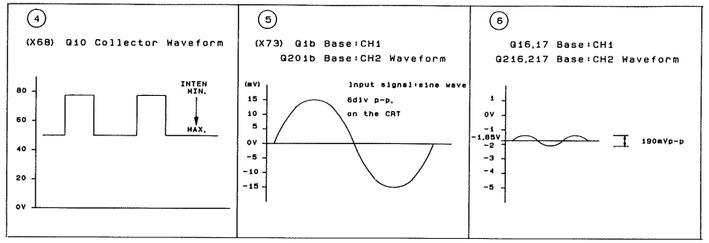

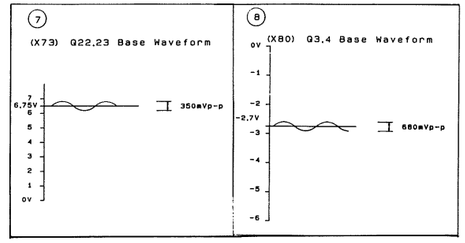

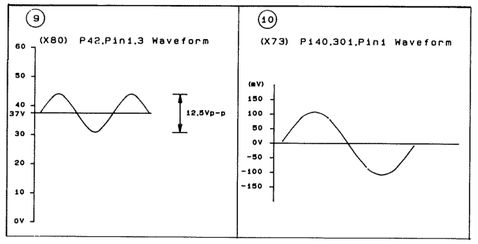

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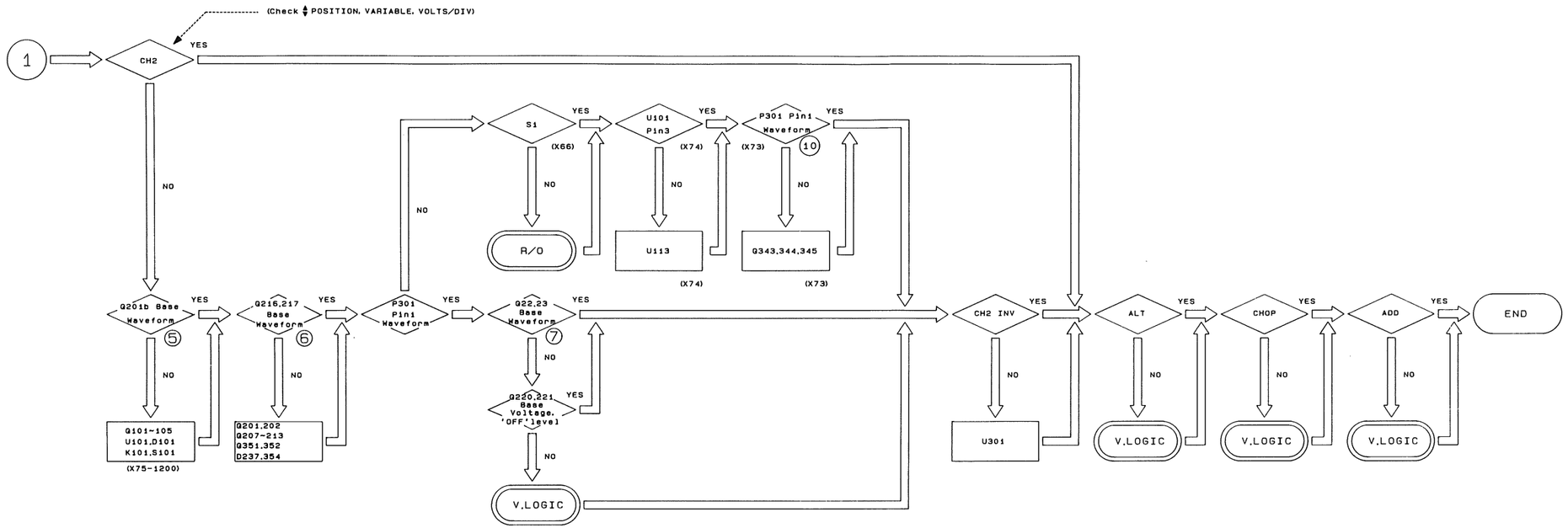

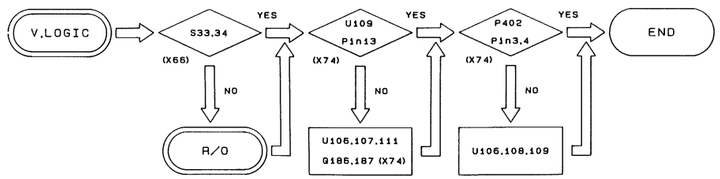

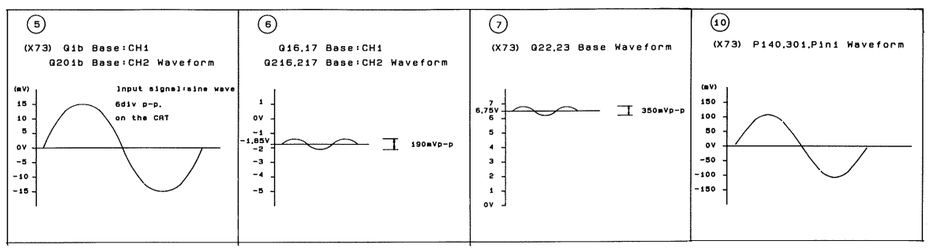

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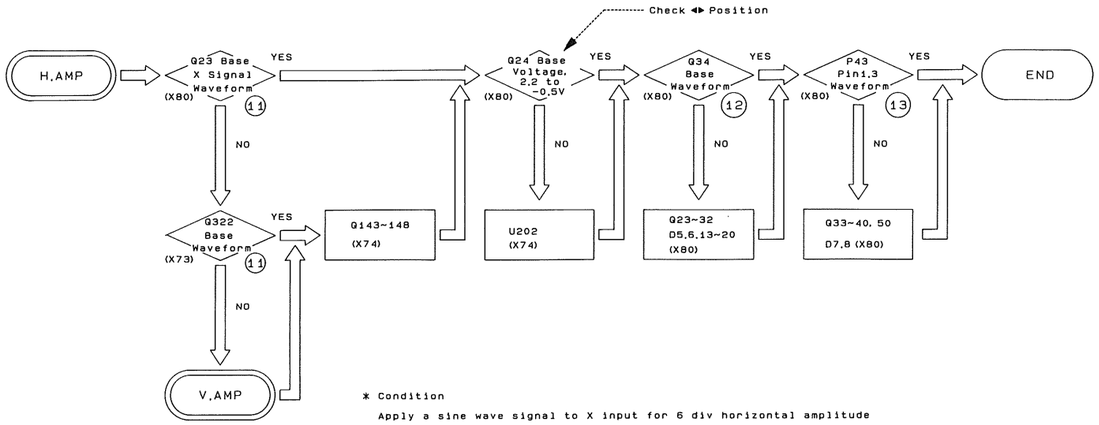

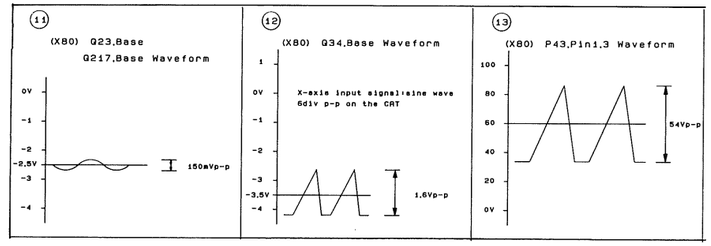

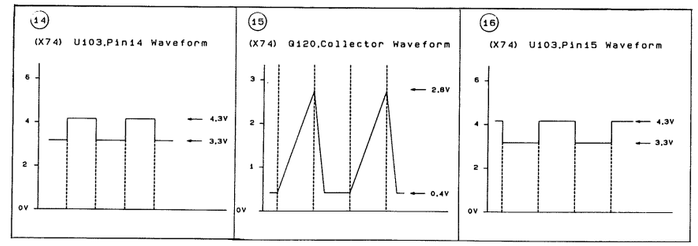

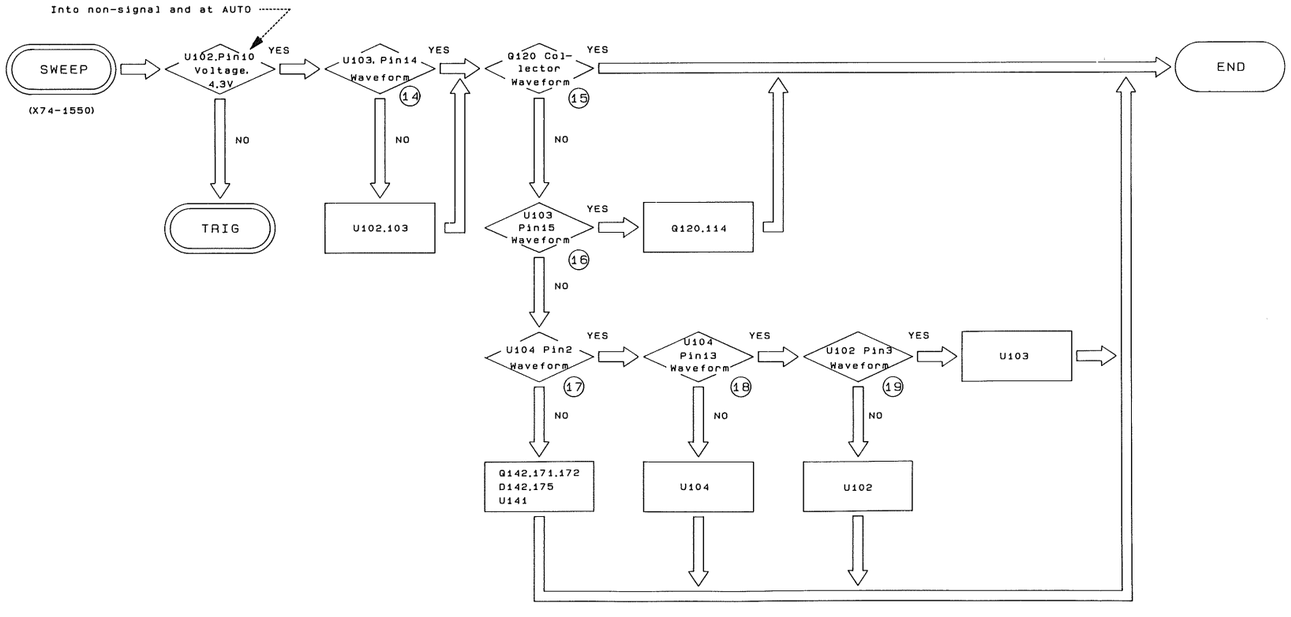

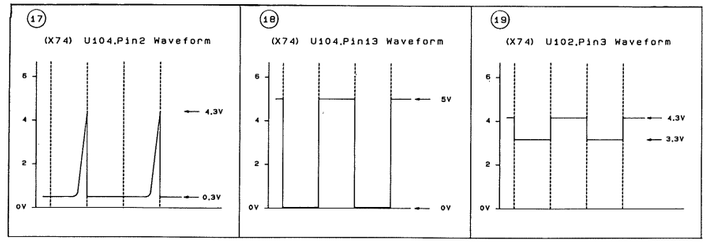

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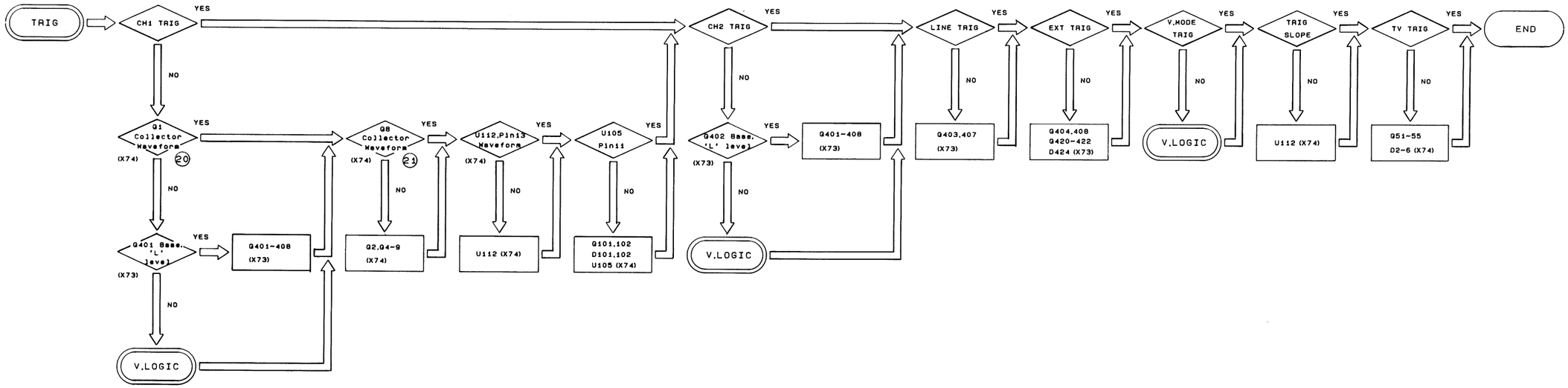

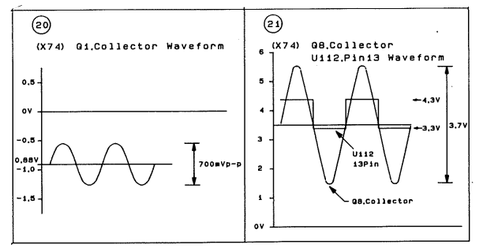

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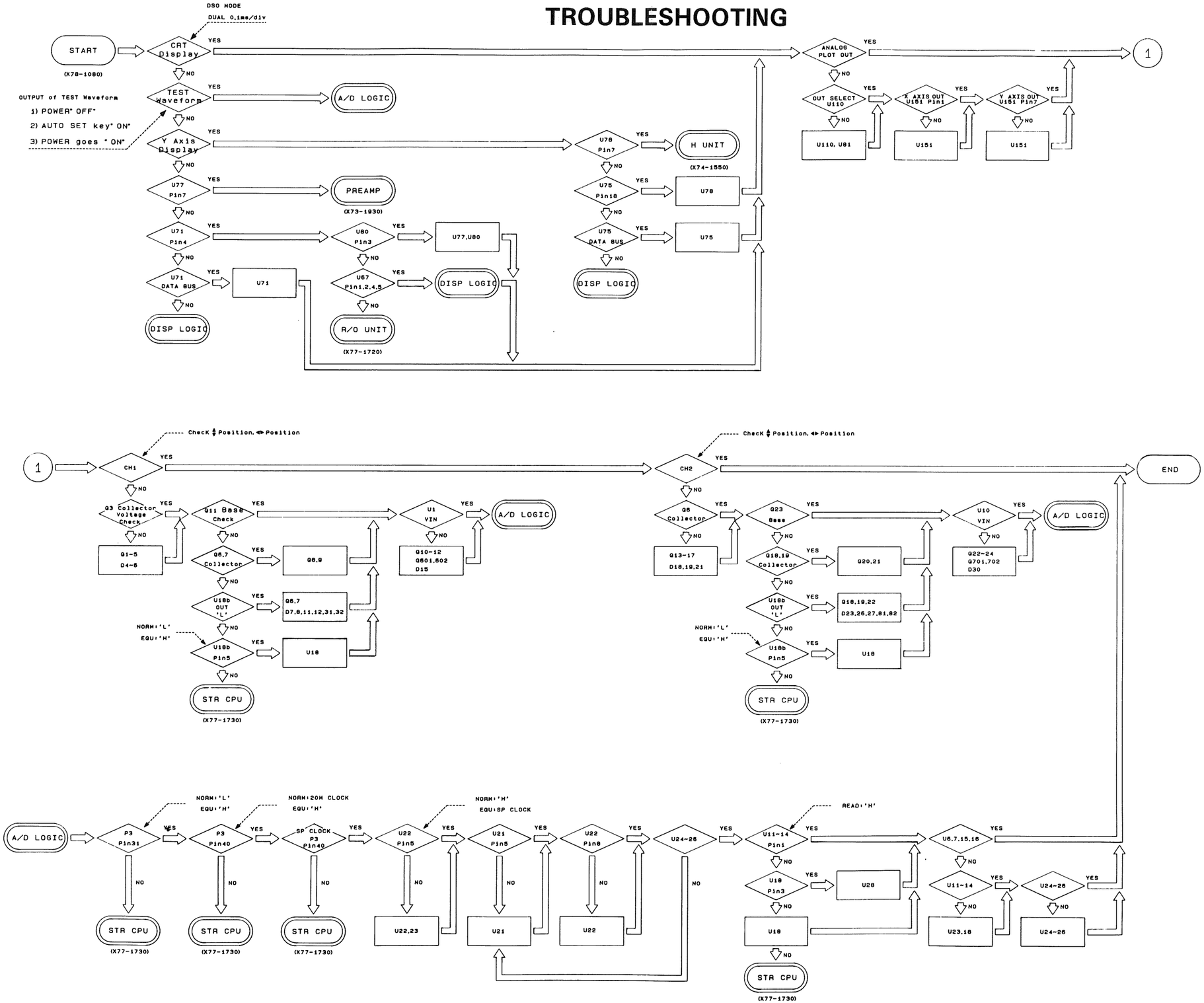

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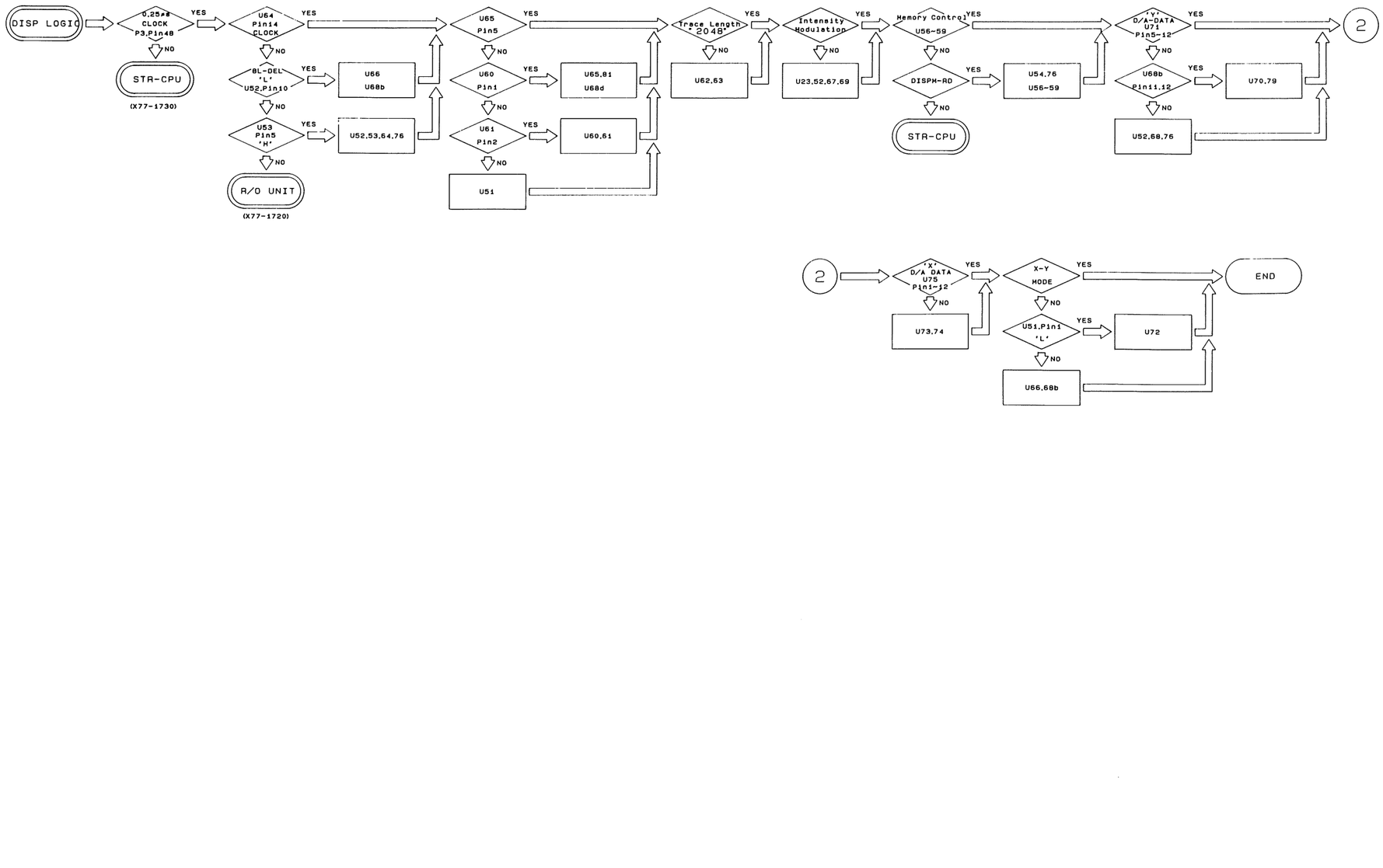

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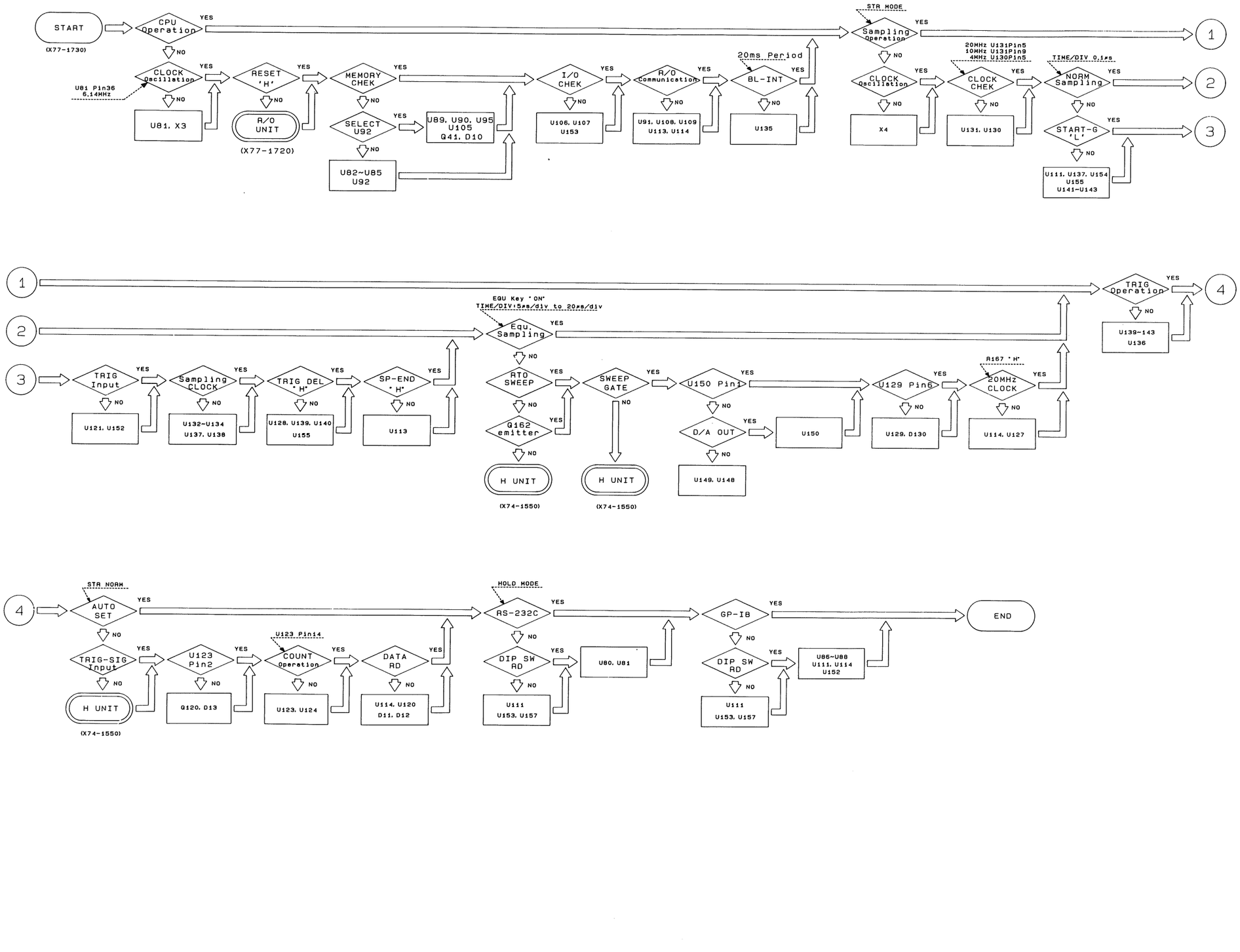

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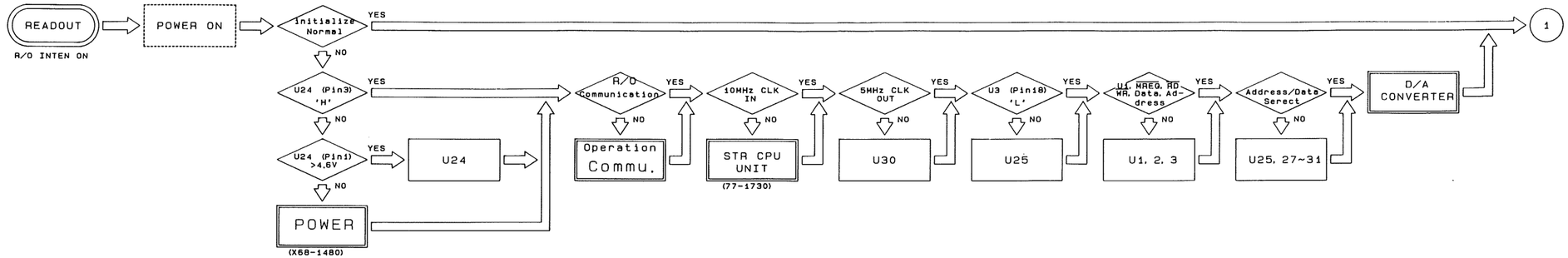
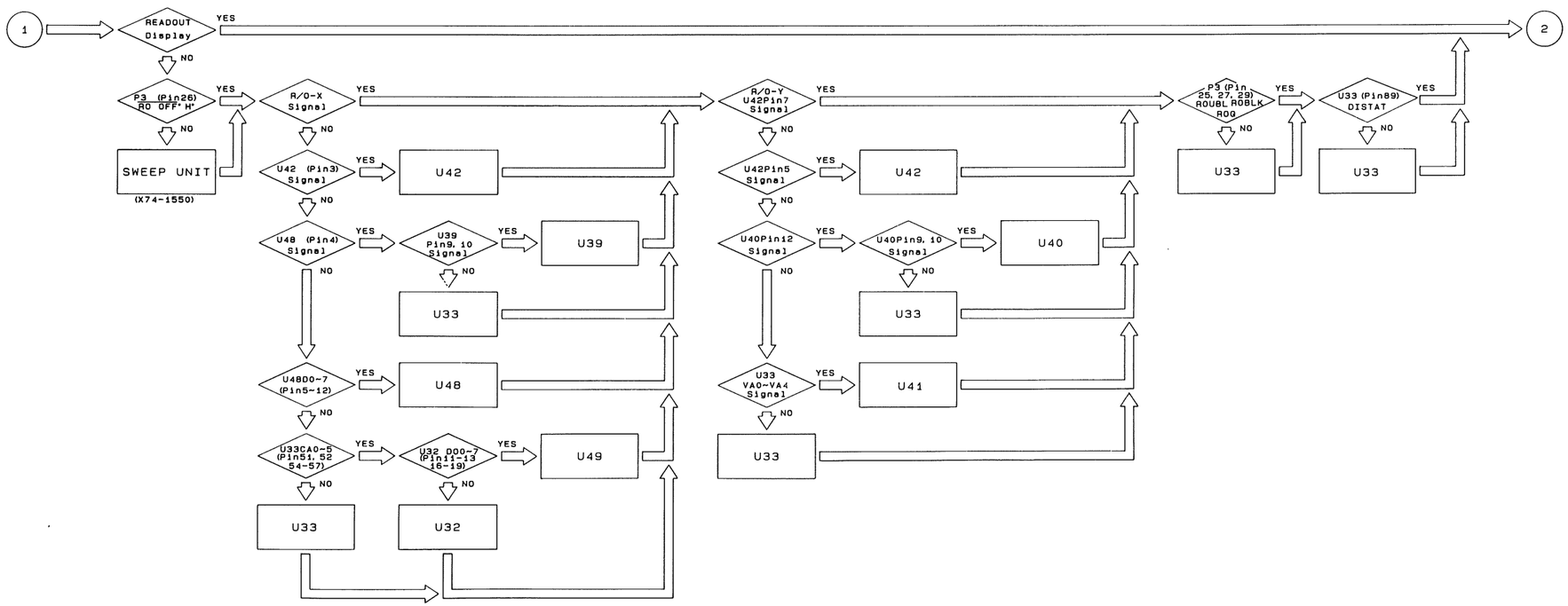
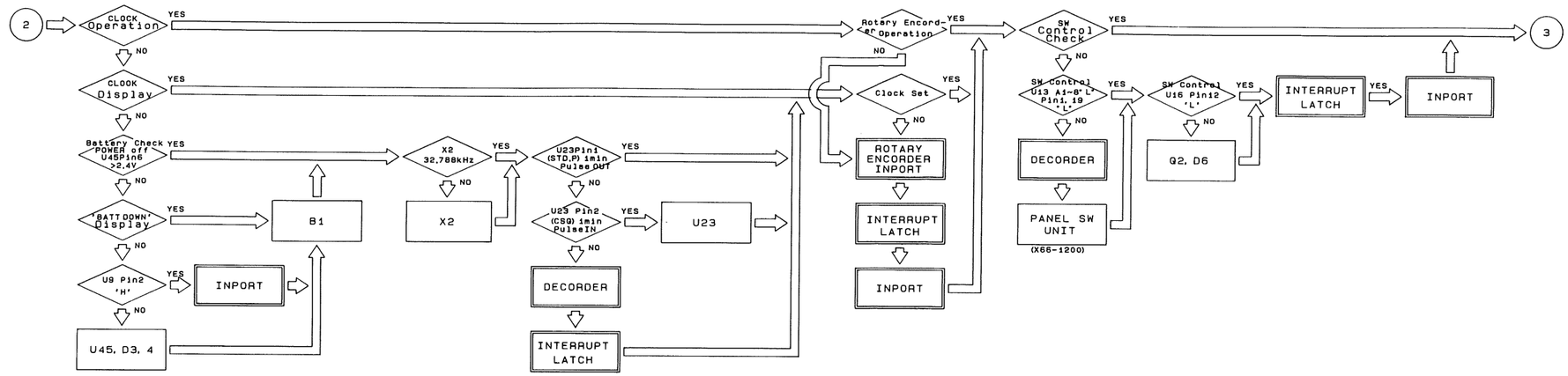
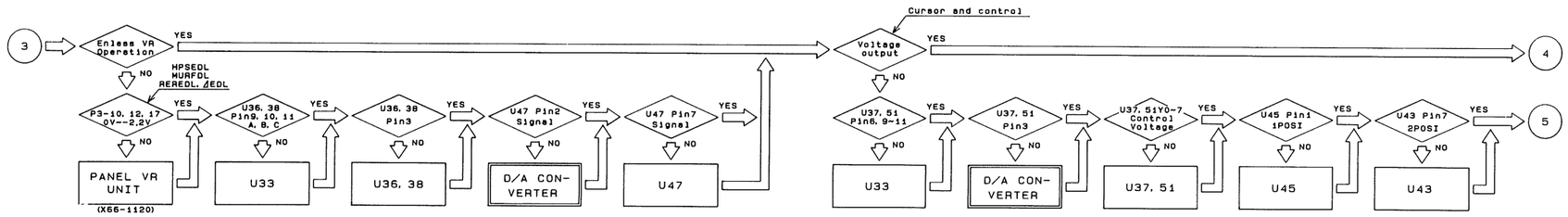
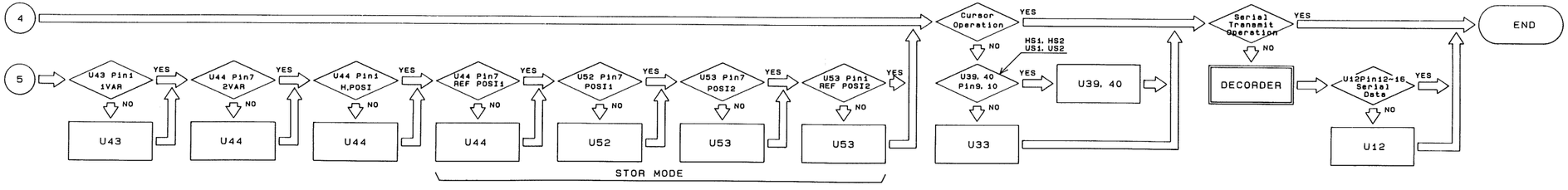


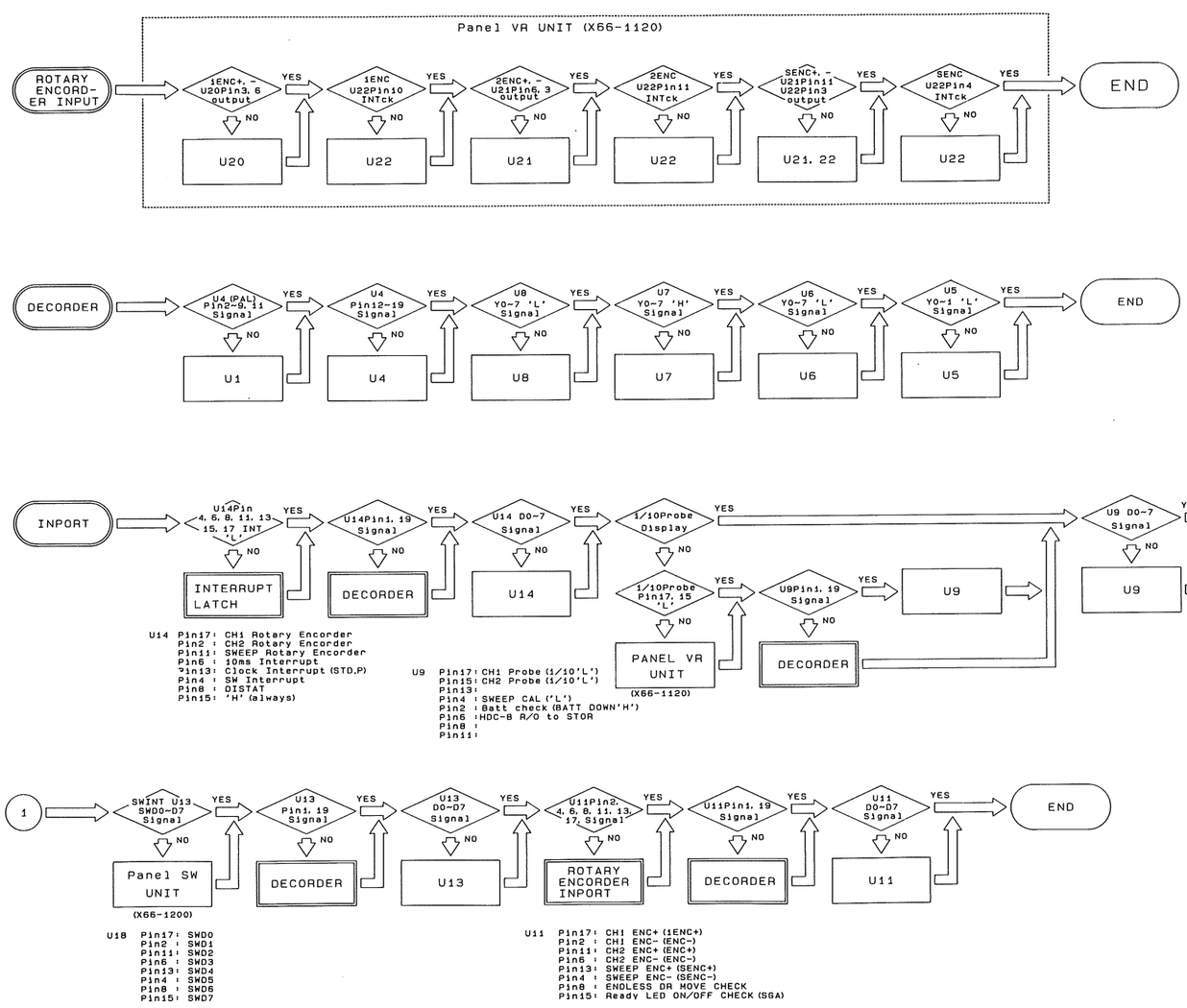



2
CLOCK Operation
YES
NO
CLOCK Display
Battery Check POWER off U45Pin6 >2.4V
'BATT DOWN' Display
U9 Pin2 'H'
INPORT
B1
U45, D3, 4
X2 32.768kHz
X2
U23Pin1 (STD.P) 1min Pulse OUT
U23 Pin2 (CSO) 1min PulseIN
U23
DECORDER
INTERRUPT LATCH
Rotary Encoder Operation
Clock Set
ROTARY ENCODER INPORT
INTERRUPT LATCH
INPORT
SW Control Check
SW Control U13 A1-8' L' Pin1, 19 'L'
DECORDER
PANEL SW UNIT
(X66-1200)
SW Control U16 Pin12 'L'
Q2, D6
INTERRUPT LATCH
INPORT
3

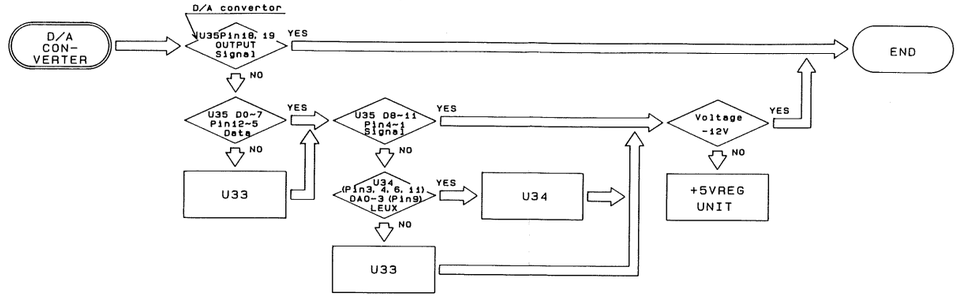

3
Enless VR Operation
HPSEDL HURFDL REREDL, ZEDL
P3-10, 12, 17 0V--2.2V
PANEL VR UNIT
(X66-1120)
U36, 38 Pin9, 10, 11 A, B, C
U33
U36, 38 Pin3
U36, 38
U47 Pin2 Signal
D/A CONVERTER
U47 Pin7 Signal
U47
Cursor and control
Voltage output
4
U37, 51 Pin6, 9-11
U33
U37, 51 Pin3
D/A CONVERTER
U37, 51Y0-7 Control Voltage
U37, 51
U45 Pin1 1POSI
U45
U43 Pin7 2POSI
U43
5

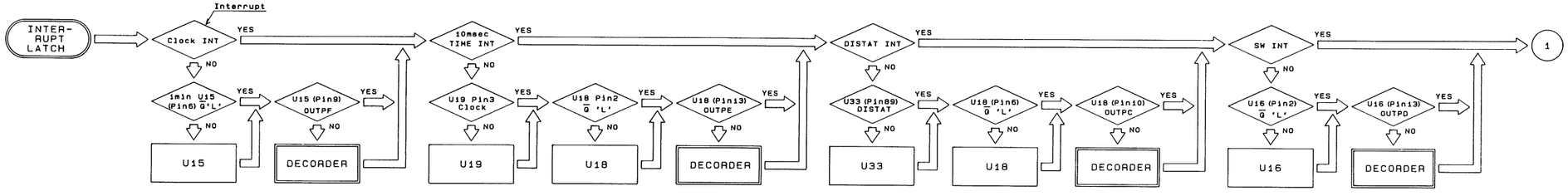

4
5
U43 Pin1 1VAR
U43
U44 Pin7 2VAR
U44
U44 Pin1 H.POSI
U44
U44 Pin7 REF POSI1
U44
U52 Pin7 POSI1
U52
U53 Pin7 POSI2
U53
U53 Pin1 REF POSI2
U53
STOR MODE
Cursor Operation
HS1, HS2 US1, US2
U39, 40 Pin9, 10
U33
U39, 40
Serial Transmit Operation
DECORDER
U12Pin12-16 Serial Data
U12
END

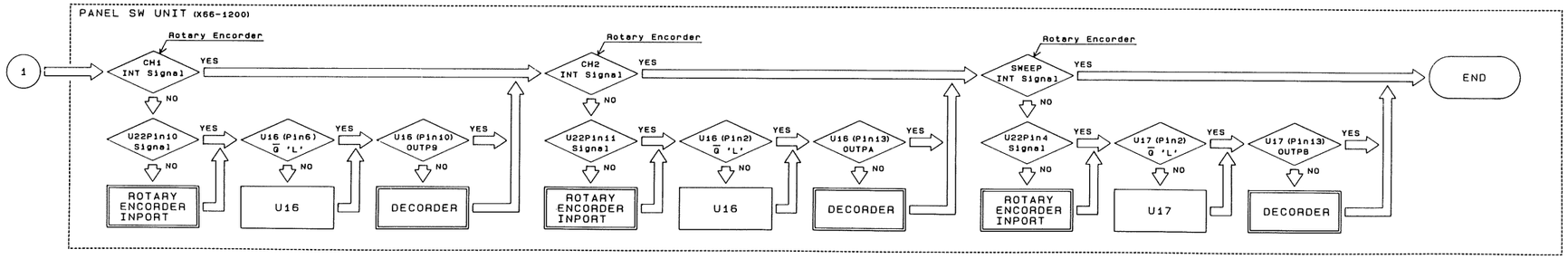
TROUBLESHOOTING



TROUBLESHOOTING







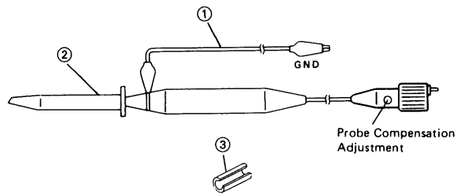
PARTS LIST

DCS-8200 UNIT

Y70-1720-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	B30-0952-05	LAMP (T4.2 8V 0.15A)
	B41-0710-04	CAUTION LABEL;「HIGH VOLTAGE」
	B42-3819-05	SERIAL NO.PLATE
	B63-0058-10	INSTRUCTION MANUAL;JAPANESE
	B63-0059-10	INSTRUCTION MANUAL;ENGLISH
	E30-1644-15	BS POWER CORD
	E30-1818-05	JIS POWER CORD SET
	E30-1819-15	IEC POWER CORD SET
	E30-1820-05	UL/CSA POWER CORD SET
	E30-1821-05	SAA POWER CORD SET
	E31-0564-15	WIRE ASS'Y;PROTECTIVE EARTH
	E38-0331-05	WIRE ASS'Y;EXT. TRIG TO P401
	E38-0335-05	WIRE ASS'Y;P202 TO P201
	E38-0336-05	WIRE ASS'Y;P140 TO P2
	E38-0337-05	WIRE ASS'Y;P301 TO P1
	E38-0344-15	WIRE ASS'Y;PEN OUT TO P6
	E38-0346-05	WIRE ASS'Y;P403 TO P402
	E38-0347-05	WIRE ASS'Y;P604 TO P202
	E38-0348-05	WIRE ASS'Y;P611 TO P2
	E38-0361-15	WIRE ASS'Y;P82 TO TRANS.
	E38-0363-05	WIRE ASS'Y;P402 TO P6
	E38-0364-05	WIRE ASS'Y;P401 TO P7
	E38-0488-05	WIRE ASS'Y;P246 TO P101
	E38-0563-05	WIRE ASS'Y;P501/502/503 TO
	F05-1023-05	FUSE(6.4X32) 1A/250V
	F06-1022-05	FUSE(5.2X20) T1A/250V
	F51-0012-05	FUSE(6.4X30) 1.6A/250V
	H10-2828-22	FOAMED STYRENE PAD (FRONT)
	H10-2829-12	FOAMED STYRENE PAD (REAR)
	H20-1727-04	VINYL COVER
	H53-0042-04	CARTON BOX
	W03-2307-05	R/O PROBE (PC-33)
1	A01-1246-02	CASE,TOP
2	A01-1247-12	CASE,BOTTOM
3	A11-0505-12	CHASSIS,FOR UNIT
4	A11-0504-12	CHASSIS,FOR UNIT
5	A13-0914-02	FRAME,LEFT
6	A13-0964-02	FRAME,CENTER
7	A13-0965-02	FRAME,TOP
8	A13-0966-02	FRAME,BOTTOM
9	A13-0967-02	FRAME,FRONT & TOP
10	A13-0968-02	FRAME,FRONT & BOTTOM
11	A21-1181-12	DECORATIVE PANEL
12	A63-0035-33	PANEL ASS'Y
13	A83-0024-02	REAR PANEL
14	B11-0518-04	FILTER
15	B30-0997-05	LAMP ASS'Y;SCALE ILLUMINATION
16	B39-0407-04	SPACER
17	B73-0004-13	NAME PLATE;MODEL NO.
18	D21-0915-04	EXTENSION SHAFT
19	D22-0501-04	JOINT & COUPLING
20	E04-0259-05	BNC RECEPTACLE
21	E18-0365-05	AC SELECTOR WITH 6X30MM FUSE
22	E18-0366-15	AC SELECTOR WITH 5X20MM FUSE
23	E21-0660-04	TERMINAL,CAL
24	E21-0667-05	METAL TERMINAL
25	E23-0513-05	EARTH LUG,BNC
26	E23-0552-04	EARTH TERMINAL
27	E38-0349-05	WIRE ASS'Y;RS-232C TO P602
28	E38-0350-15	WIRE ASS'Y;GP-IB TO P2
29	F09-0512-04	EDGING
30	F10-1643-13	SHIELD PLATE
31	F10-1644-04	SHIELD PLATE
32	F10-1647-03	SHIELD PLATE;FOR PRE AMP UNIT
33	F10-1648-03	SHIELD PLATE;FOR ATT UNIT
34	F11-1206-13	SHIELD CASE,CRT
35	F15-0733-04	FELT (CRT SHIELD)
36	F20-0639-04	INSULATOR
37	F20-0695-04	INSULATED SHEET
38	F29-0519-03	INSULATED SHEET
39	F31-0607-04	BRACKET,FOR HANDLE
40	J02-0089-05	RUBBER FOOT
41	J02-0512-05	FOOT(SMALL)
42	J02-0515-04	TILT STAND
43	J11-0046-05	CABLE CLAMP
44	J19-1651-14	BRACKET
45	J19-1652-04	BRACKET FOR P.C.B.
46	J19-1653-23	HOLDER FOR CRT
47	J21-2573-04	HOLDER FOR LEG
48	J21-4594-33	BRACKET,FOR CRT
49	J21-4753-04	BRACKET
50	J21-4754-04	BRACKET
51	J21-4756-04	BRACKET
52	J21-4757-04	BRACKET
53	J21-4762-14	BRACKET
54	J30-0623-04	SPACER
55	J31-0604-04	SPACER
56	J39-0536-05	SPACER
57	J42-0533-04	BUSHING (FREE)
58	J59-0403-05	NYLON RIVET (ILLUMI)
59	J61-0516-05	SUPPORT
60	K01-0545-05	HANDLE
61	K21-0919-04	KNOB
62	K21-0920-04	KNOB
63	K21-0921-04	KNOB
64	K23-0814-04	KNOB
65	K27-0538-04	BUTTON;POWER SWITCH
66	K27-0543-04	BUTTON(39 USED)
67	L01-9968-25	POWER TRANSFORMER
68	L39-0531-05	ROTATION COIL
69	L76-0120-05	DELAY LINE
70	T40-0417-15	FAN
71	W01-0503-04	REAR RUBBER FOOT/CORD WRAP
72	X66-1120-00	PANEL VR UNIT
73	X66-1200-00	PANEL SW UNIT
74	X68-1480-01	POWER SUPPLY UNIT
75	X69-1220-00	CONNECTION UNIT
76	X73-1930-00	PREAMP UNIT
77	X74-1550-00	HORIZONTAL UNIT
78	X75-1200-00	ATT UNIT
79	X77-1720-00	READOUT UNIT
80	X77-1730-00	STORAGE UNIT
81	X78-1080-00	A/D CONVERTER UNIT
82	X80-1090-02	FINAL UNIT
83	X80-1230-00	AC FILTER UNIT
84	150VTM31	CRT

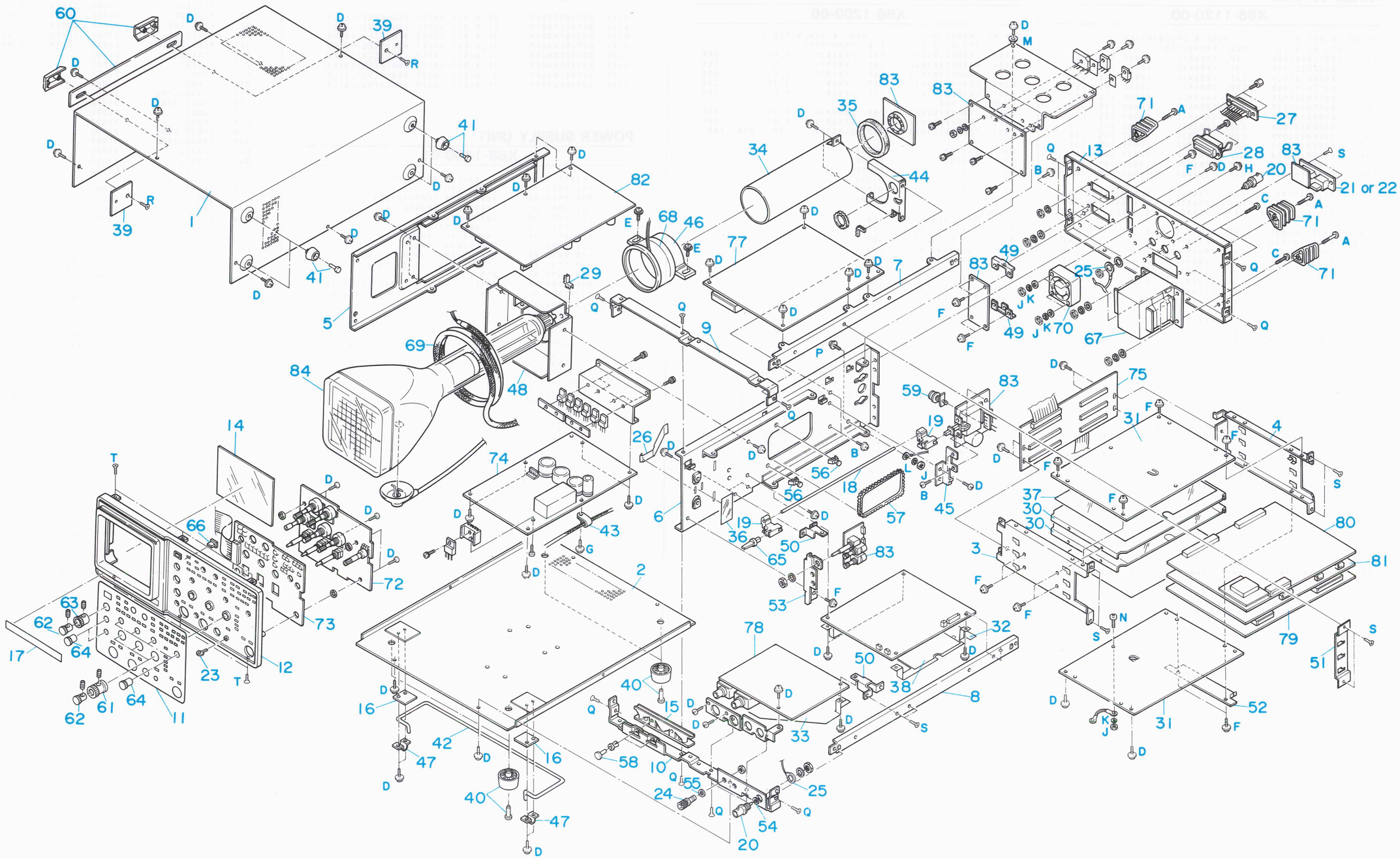
MODEL PC-31 (LOW CAPACITY PROBE)



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

	Parts No.	Parts Name	Figure
A	N08-0611-04	SCREW (For CORD WRAP)	
B	N09-0623-04	SCREW, SEMS PAN HD (M3×8)	
C	N09-0654-05	SCREW, SEMS PAN HD (M4×8)	
D	N09-0739-05	SCREW, SEMS BINDING TAPTITE (3×8)	
E	N09-0748-04	SCREW, SEMS PAN HD (M4×12)	
F	N09-0757-05	SCREW, SEMS BINDING TAPTITE (3×6)	
G	N09-0799-05	SCREW, SEMS BINDING TAPTITE (3×12)	
H	N09-0800-05	SCREW, SEMS PAN HD (M3×14)	
J	N10-2030-41	NUT, HEX (M3)	
K	N16-0030-41	SPRING WASHER (ϕ3)	
L	N17-1030-41	TOOTHED LOCK WASHER (ϕ3)	
M	N19-0191-05	WASHER, NONMETAL	
N	N30-3006-41	SCREW, PAN HD (M3×6)	
P	N30-3010-41	SCREW, PAN HD (M3×10)	
Q	N32-3006-41	SCREW, FLAT HD (M3×6)	
R	N32-4006-41	SCREW, FLAT HD (M4×6)	
S	N88-3008-41	SCREW, FLAT HD TAPTITE (3×8)	
T	N89-3006-41	SCREW, BINDING TAPTITE (3×6)	

DISASSEMBLY



PARTS LIST

PANEL VR UNIT

X66-1120-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0114-12	PCB (UNMOUNTED)			
C1	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C2	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C3	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C4	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C5	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C6	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C7	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C8	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C9	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C10	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C11	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C12	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C13	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C31	C91-1315-05	CAP. CERAMIC	0.1	80/-10%	50V
C32	C91-1315-05	CAP. CERAMIC	0.1	80/-10%	50V
C33	C91-1315-05	CAP. CERAMIC	0.1	80/-10%	50V
C101	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C102	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C103	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C104	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C105	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C106	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C107	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C108	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C109	NO USE				
C110	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C111	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C112	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
D32	1SS132	DIODE			
JL901	E38-0446-05	WIRE ASS'Y			
JW1	E38-0357-05	WIRE ASS'Y			
R1	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R2	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R3	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R11	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R12	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R13	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R14	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R15	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R16	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R34	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R35	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R36	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R37	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R38	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R39	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R80	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R81	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R82	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R83	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R84	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R85	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R86	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R87	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R88	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
RA2	R90-0652-05	RES. NETWORK	6X10K	5%	
S1	W02-0498-05	ENCORDER SWITCH			
S2	W02-0498-05	ENCORDER SWITCH			
S3	W02-0498-05	ENCORDER SWITCH			
U16	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U17	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U20	HD74HC08FP	IC,QUAD 2-INPUT AND GATE			
U21	HD74HC08FP	IC,QUAD 2-INPUT AND GATE			
U22	HD74HC7266FP	IC,QUAD 2-INPUT NOR GATE			
U108	NJM4558M	IC,DUAL OP-AMP			
U109	NJM4558M	IC,DUAL OP-AMP			
VR1	R10-3504-15	ENDLESS VOLUME	2X10K	B	
VR2	R10-3504-15	ENDLESS VOLUME	2X10K	B	
VR3	R10-3504-15	ENDLESS VOLUME	2X10K	B	
VR4	R10-3504-15	ENDLESS VOLUME	2X10K	B	
VR5	R10-3504-15	ENDLESS VOLUME	2X10K	B	
VR6	R05-3514-05	VOLUME	20K	B	

PANEL SW UNIT

X66-1200-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0113-12	PCB (UNMOUNTED)			
C103	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C104	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C105	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C106	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C107	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C108	NO USE				
C109	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C110	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C111	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	1SS132	DIODE			
D4	1SS132	DIODE			
D5	1SS132	DIODE			
D6	1SS132	DIODE			
D11	B30-0964-05	LED			
D12	B30-0964-05	LED			
D13	B30-0964-05	LED			
D14	B30-0964-05	LED			
D15	B30-0964-05	LED			
D16	B30-0964-05	LED			
D17	B30-0964-05	LED			
D18	B30-0964-05	LED			
D19	B30-0964-05	LED			
D20	B30-0964-05	LED			
D21	B30-0964-05	LED			
D22	B30-0964-05	LED			
D23	B30-0964-05	LED			
JW1	E38-0356-05	WIRE ASS'Y			
R1	R90-0653-05	RES. NETWORK	8X10K	5%	
R2	NO USE				
R3	R90-0614-05	RES. NETWORK	8X390	5%	
R4	R90-0614-05	RES. NETWORK	8X390	5%	
R5	R90-0639-05	RES. NETWORK	6X390	5%	
R6	R90-0639-05	RES. NETWORK	6X390	5%	
R7	R90-0614-05	RES. NETWORK	8X390	5%	
R8	R90-0614-05	RES. NETWORK	8X390	5%	
R9	R90-0614-05	RES. NETWORK	8X390	5%	
S1	S40-2525-05	SWITCH			
S2	S40-2525-05	SWITCH			
S3	S40-2525-05	SWITCH			
S4	S40-2525-05	SWITCH			
S5	S40-2525-05	SWITCH			
S9	S40-2525-05	SWITCH			
S10	NO USE				
S11	S40-2525-05	SWITCH			
S12	S40-2525-05	SWITCH			
S13	S40-2525-05	SWITCH			
S14	S40-2525-05	SWITCH			
S17	S40-2525-05	SWITCH			
S18	S40-2525-05	SWITCH			
S19	S40-2525-05	SWITCH			
S20	S40-2525-05	SWITCH			
S21	S40-2525-05	SWITCH			
S22	S40-2525-05	SWITCH			
S23	S40-2525-05	SWITCH			
S24	NO USE				
S25	S40-2525-05	SWITCH			
S26	S40-2525-05	SWITCH			
S27	S40-2525-05	SWITCH			
S28	S40-2525-05	SWITCH			
S29	S40-2525-05	SWITCH			
S30	S40-2525-05	SWITCH			
S31	S40-2525-05	SWITCH			
S32	S40-2525-05	SWITCH			
S33	S40-2525-05	SWITCH			
S34	S40-2525-05	SWITCH			
S35	S40-2525-05	SWITCH			
S36	S40-2525-05	SWITCH			
S37	S40-2525-05	SWITCH			
S38	S40-2525-05	SWITCH			
S39	NO USE				
S40	S40-2525-05	SWITCH			
S41	S40-2525-05	SWITCH			
S42	S40-2525-05	SWITCH			
S43	S40-2525-05	SWITCH			
S44	S40-2525-05	SWITCH			
S45	NO USE				
S46	S40-2525-05	SWITCH			
S47	S40-2525-05	SWITCH			
S48	S40-2525-05	SWITCH			
U101	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U102	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U103	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U104	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U105	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U106	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U107	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U108	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			

POWER SUPPLY UNIT

X68-1480-01

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E23-0557-14	EARTH LUG			
	F01-0813-05	HEAT SINK (CONVERTER)			
	F01-0858-03	HEAT SINK (POWER TR)			
	F10-1601-04	SHIELD PLATE			
	F15-0727-04	HOLDER (NEON LAMP)			
	F29-0521-04	INSULATED SHEET			
	J25-5182-32	PCB (UNMOUNTED)			
	N09-0623-04	SCREW,SEMS PAN HD M3X8			
	N09-0731-05	SCREW,SEMS PAN HD M3X12			
	N14-0626-04	NUT			
	R92-0150-05	JUMPING RES.	ZERO OHM(10MM)		
	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
	W02-0431-05	HIGH VOLTAGE BLOCK			
C1	C90-0970-05	CAP. ELECTRO	3900	20%	25V
C2	C90-0970-05	CAP. ELECTRO	3900	20%	25V
C3	NO USE				
C4	CE04W2E470M	CAP. ELECTRO	47	20%	250V
C5	C90-0969-05	CAP. ELECTRO	560	20%	100V
C6	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C7	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C8	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C9	CE04EW1A221M	CAP. ELECTRO	220	20%	10V
C10	CE04W2C010M	CAP. ELECTRO	1	20%	160V
C11	CE04EW2A100M	CAP. ELECTRO	10	20%	100V
C12	CE04EW1V221M	CAP. ELECTRO	220	20%	35V
C13	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C14	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C15	CC45FCH2H010C	CAP. CERAMIC	1P	0.25P	500V
C16	CC45FCH2H020C	CAP. CERAMIC	2P	0.25P	500V
C17	CE04W2C2R2M	CAP. ELECTRO	2.2	20%	160V
C18	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C19	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C20	CC45FCH2H010C	CAP. CERAMIC	1P	0.25P	500V
C21	CC45FCH2H010C	CAP. CERAMIC	1P	0.25P	500V
C22	C91-0571-05	CAP. CERAMIC	0.01		2KV
C23	C91-0571-05	CAP. CERAMIC	0.01		2KV
C24	CK45FB2H102K	CAP. CERAMIC	1000P	10%	500V
C25	C91-0571-05	CAP. CERAMIC	0.01		2KV
C26	CK45FB2H102K	CAP. CERAMIC	1000P	10%	500V
C27	C91-0571-05	CAP. CERAMIC	0.01		2KV
C28	C91-0571-05	CAP. CERAMIC	0.01		2KV
C29	C91-0571-05	CAP. CERAMIC	0.01		2KV
C30	C91-0571-05	CAP. CERAMIC	0.01		2KV
C31	CK45E3D102P	CAP. CERAMIC	1000P		2KV
C32	CQ92FM1H154K	CAP. MYLAR	0.15	10%	50V
C33	CQ92FM1H154K	CAP. MYLAR	0.15	10%	50V
C34	CK45FB1H222K	CAP. CERAMIC	2200P	10%	50V
C35	CK45FB1H472K	CAP. CERAMIC	4700P	10%	50V
C36	CE04EW1E102M	CAP. ELECTRO	1000	20%	25V
C37	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C38	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C41	CQ92FM1H103J	CAP. MYLAR	0.01	5%	50V
C42	CE04W2C2R2M	CAP. ELECTRO	2.2	20%	160V
C43	CE04W2C2R2M	CAP. ELECTRO	2.2	20%	160V
C44	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C45	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C46	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C47	C91-0571-05	CAP. CERAMIC	0.01		2KV
C48	C91-0571-05	CAP. CERAMIC	0.01		2KV
C51	CE04EW1E102M	CAP. ELECTRO	1000	20%	25V
C52	NO USE				
C53	CK45FB2H101K	CAP. CERAMIC	100P	10%	500V
C54	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C57	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C937	CE04EW1E102M	CAP. ELECTRO	1000	20%	25V
D1	S4VB40F1	DIODE, BRIDGE			
D2	NO USE				
D3	S1VB40	DIODE, BRIDGE			
D6	MTZ24JC	DIODE, ZENER	23.72V		
D7	MTZ10JC	DIODE, ZENER	9.95V		
D8	MTZ5.1JB	DIODE, ZENER	5.07V		
D9	MTZ10JC	DIODE, ZENER	9.95V		
D10	MTZ5.1JB	DIODE, ZENER	5.07V		
D11	1SS132	DIODE			
D12	1SS132	DIODE			
D13	1SS83	DIODE			
D14	1SS83	DIODE			
D15	1SR35-200A	DIODE			
D16	1SR35-200A	DIODE			
D17	1SS83	DIODE			
D18	1SS83	DIODE			
D19	1SR35-200A	DIODE			
D20	1SR35-200A	DIODE			
D21	1SS132	DIODE			
D22	1SS132	DIODE			
D23	1SS132	DIODE			
D26	1SS132	DIODE			
D27	1SS132	DIODE			
D28	W06C	DIODE			
D29	W06C	DIODE			
D901	1SS132	DIODE			
L1	L40-1011-13	FERRI INDUCTOR	100UH	10%	
L2	L40-1011-13	FERRI INDUCTOR	100UH	10%	
L3	L40-1021-03	FERRI INDUCTOR	1MH	10%	
L901	L40-1545-06	FERRI INDUCTOR	150MH	5%	
NL1	NE-2B	NEON LAMP			
NL2	NE-2B	NEON LAMP			
NL3	NE-2B	NEON LAMP			
NL4	NE-2B	NEON LAMP			
P9	E40-3241-05	PIN CONNECTOR	6P		
P26	E40-3237-05	PIN CONNECTOR	2P		
P27	E40-3239-05	PIN CONNECTOR	4P		
P41	E40-3241-05	PIN CONNECTOR	6P		
P44	E40-0503-05	PIN CONNECTOR	5P		
P45	NO USE				
P46	E40-3237-05	PIN CONNECTOR	2P		
P47	E40-3237-05	PIN CONNECTOR	2P		
P48	E40-3237-05	PIN CONNECTOR	2P		
P49	E40-3237-05	PIN CONNECTOR	2P		
P50	E40-3239-05	PIN CONNECTOR	4P		
P51	NO USE				
P52	E40-3239-05	PIN CONNECTOR	4P		
P55	E40-5068-05	PIN CONNECTOR	11P		
Q1	2SB1133(S)	TR. SI, PNP			
Q2	2SD1666(S)	TR. SI, NPN			
Q3	2SB1133(S)	TR. SI, PNP			
Q4	2SC3749(N)	TR. SI, NPN			
Q5	2SC2271(D)	TR. SI, NPN			
Q6	2SC3749(N)	TR. SI, NPN			
Q7	2SC2271(D)	TR. SI, NPN			
Q8	2SD1666(S)	TR. SI, NPN			
Q9	2SA1208(S)	TR. SI, PNP			
Q10	2SC2910(S)	TR. SI, NPN			
Q11	2SA1210(S)	TR. SI, PNP			
Q12	2SC2912(S)	TR. SI, NPN			
Q13	2SA1005(K)	TR. SI, PNP			
Q14	2SA1175(F)	TR. SI, PNP			
Q15	2SD613(E)	TR. SI, NPN			
Q16	2SC2271(D)	TR. SI, NPN			
Q17	2SC1384(R)	TR. SI, NPN			
Q18	2SA684(R)	TR. SI, PNP			
R1	RD14KB3D390J	RES. CARBON ALLOY	39	5%	2W
R2	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R3	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R4	RD14KB3D390J	RES. CARBON ALLOY	39	5%	2W
R5	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R6	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R7	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R8	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R9	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R10	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R11	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R12	NO USE				
R13	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R14	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R15	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R16	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R17	RD14KB3D682J	RES. CARBON ALLOY	6.8K	5%	2W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R18	R92-1405-05	RES. CARBON ALLOY	18K	5%	1/2W
R19	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R20	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R21	RN14BK2C2403F	RES. METAL FILM	240K	1%	1/6W
R22	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R23	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R24	RD14KB3D182J	RES. CARBON ALLOY	1.8K	5%	2W
R25	R92-1406-05	RES. CARBON ALLOY	13K	5%	1/2W
R26	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R27	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R28	RN14BK2C1303F	RES. METAL FILM	130K	1%	1/6W
R29	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R30	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R33	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R34	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R35	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R36	RD14BB2C124J	RES. CARBON	120K	5%	1/6W
R37	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R38	RD14BB2C683J	RES. CARBON	68K	5%	1/6W
R39	RD14BB2C114J	RES. CARBON	110K	5%	1/6W
R40	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R41	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R42	RD14BB2C334J	RES. CARBON	330K	5%	1/6W
R43	RD14BB2C823J	RES. CARBON	82K	5%	1/6W
R44	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R45	RD14BB2C124J	RES. CARBON	120K	5%	1/6W
R46	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R47	RD14BB2C334J	RES. CARBON	330K	5%	1/6W
R48	RD14BB2C683J	RES. CARBON	68K	5%	1/6W
R49	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R50	RD14BB2C113J	RES. CARBON	11K	5%	1/6W
R51	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R52	R92-1034-05	RES. METAL FILM	47M	5%	1/2W
R53	R92-1034-05	RES. METAL FILM	47M	5%	1/2W
R54	R92-1125-05	RES. METAL FILM	7.5M	1%	1W
R55	R92-1125-05	RES. METAL FILM	7.5M	1%	1W
R56	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R57	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R58	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R59	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R60	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R61	NO USE				
R62	R92-1153-05	RES. METAL FILM	5.1M	5%	1W
R63	R92-1193-05	RES. METAL FILM	8.2M	5%	1W
R64	RD14BB2C753J	RES. CARBON	75K	5%	1/6W
R65	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R66	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R67	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R68	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R69	RD14BB2C433J	RES. CARBON	43K	5%	1/6W
R70	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R71	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R72	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R73	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R74	NO USE				
R75	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R76	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R77	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R80	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R81	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R82	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R83	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R84	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R85	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R86	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R87	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R901	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
U1	NJM4558D	IC,DUAL OP AMP			
U2	NJM4558D	IC,DUAL OP AMP			
U3	NJM4558D	IC,DUAL OP AMP			
U4	NJM4558D	IC,DUAL OP AMP			
VR1	R12-1538-05	RES. SEMI FIXED	1KB		
VR2	R12-5526-05	RES. SEMI FIXED	100KB		
VR3	NO USE				
VR4	R12-8001-05	RES. SEMI FIXED	2.2MB		
VR5	R12-4416-05	RES. SEMI FIXED	50KB		
VR6	R12-1538-05	RES. SEMI FIXED	1KB		

CONNECTION UNIT

X69-1220-00

REF.NO	PARTS NO	NAME & DESCRIPTION	
	E38-0448-05	WIRE ASS'Y;P608 TO P602	
	J73-0121-12	PCB (UNMOUNTED)	
P601	E38-0358-05	WIRE ASS'Y	20P
P602	E38-0359-05	WIRE ASS'Y	34P
P603	E40-3241-05	PIN CONNECTOR	6P
P604	E40-3305-05	PIN CONNECTOR	8P
P605	E40-7214-05	PIN CONNECTOR	50P
P606	E40-7034-05	PIN CONNECTOR	40P
P607	E40-7214-05	PIN CONNECTOR	50P
P608	E40-7034-05	PIN CONNECTOR	40P
P609	E40-7034-05	PIN CONNECTOR	40P
P610	E40-7214-05	PIN CONNECTOR	50P
P611	E40-3307-05	PIN CONNECTOR	10P
P612	E40-7213-05	PIN CONNECTOR	26P
P613	E40-3239-05	PIN CONNECTOR	4P
P614	E40-3239-05	PIN CONNECTOR	4P

PREAMP UNIT

X73-1930-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0116-12	PCB (UNMOUNTED)			
C4	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C10	CC45FCH1H680J	CAP. CERAMIC	68P	5%	50V
C16	CC45FSL1H681J	CAP. CERAMIC	680P	5%	50V
C34	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C42	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C50	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C78	CC45FSL1H331J	CAP. CERAMIC	330P	5%	50V
C79	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C108	CC45FCH1H180J	CAP. CERAMIC	18P	5%	50V
C125	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C137	CC45FCH1H120J	CAP. CERAMIC	12P	5%	50V
C145	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C166	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C167	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C168	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C204	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C210	CC45FCH1H680J	CAP. CERAMIC	68P	5%	50V
C216	CC45FSL1H681J	CAP. CERAMIC	680P	5%	50V
C234	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C242	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C279	CC45FSL1H331J	CAP. CERAMIC	330P	5%	50V
C293	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C301	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C308	CC45FCH1H180J	CAP. CERAMIC	18P	5%	50V
C325	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C328	CE04EW1E220M	CAP. ELECTRO	22	20%	25V
C340	CC45FCH1H150J	CAP. CERAMIC	15P	5%	50V
C345	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C366	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C367	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C368	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C372	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C377	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C401	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C402	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C403	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C404	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C405	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C406	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C411	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C423	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C424	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C427	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C430	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C501	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C502	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C503	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C504	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C505	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C506	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C507	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C508	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C509	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C510	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C511	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C512	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C513	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C514	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C515	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C516	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C517	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C518	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C519	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C520	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C521	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C522	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C601	CQ92FM1H102K	CAP. MYLAR	1000P	10%	50V
C602	NO USE				
C603	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C611	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C612	NO USE				
C613	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C614	NO USE				
C615	CC45FCH1H151J	CAP. CERAMIC	150P	5%	50V
C616	C91-1315-05	CAP. CERAMIC	0.1	80/-10%	50V
C617	C91-1315-05	CAP. CERAMIC	0.1	80/-10%	50V
C623	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C624	NO USE				
C625	CC45FCH1H151J	CAP. CERAMIC	150P	5%	50V
C630	CC45FCH1H330J	CAP. CERAMIC	33P	5%	50V
C650	CC45FCH1H330J	CAP. CERAMIC	33P	5%	50V
C672	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C701	CC45CH1H020C	CAP. CERAMIC	2P	0.25P	50V
C702	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C712	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
D80	MA700	DIODE			
D81	MA700	DIODE			
D82	MA700	DIODE			
D83	MA700	DIODE			
D102	1SS132	DIODE			
D154	1SS132	DIODE			
D292	MTZ6.2JB	DIODE, ZENER	6.1V		
D293	MA700	DIODE			
D294	MA700	DIODE			
D354	1SS132	DIODE			
D385	1SS132	DIODE			
D424	MTZ6.2JB	DIODE, ZENER	6.1V		
D801	1SS132	DIODE			
D811	1SS132	DIODE			
JW2	E38-0333-15	WIRE ASS'Y			

REF.NO	PARTS NO	NAME & DESCRIPTION	
JW102	E38-0333-15	WIRE ASS'Y	
P140	E40-3238-05	PIN CONNECTOR	3P
P202	E40-3238-05	PIN CONNECTOR	3P
P220	E40-3238-05	PIN CONNECTOR	3P
P301	E40-3238-05	PIN CONNECTOR	3P
P401	E40-3237-05	PIN CONNECTOR	2P
P402	NO USE		
P403	E40-3243-05	PIN CONNECTOR	8P
P404	E40-7215-05	PIN CONNECTOR	20P
Q1	2SC4072	TR. SI, NPN	
Q2	2SC3381(GR)	TR. SI, NPN	
Q6	3SK121(GR)	FET,N-CHANNEL,DUAL GATE	
Q7	2SA1005(K)	TR. SI, PNP	
Q8	2SA1005(K)	TR. SI, PNP	
Q9	2SC2671(H)	TR. SI, NPN	
Q10	2SC2671(H)	TR. SI, NPN	
Q11	2SC3354(S)	TR. SI, NPN	
Q12	2SA1206(K)	TR. SI, PNP	
Q13	2SA1206(K)	TR. SI, PNP	
Q14	2SA1206(K)	TR. SI, PNP	
Q15	2SA1206(K)	TR. SI, PNP	
Q16	2SC3779(D)	TR. SI, NPN	
Q17	2SC3779(D)	TR. SI, NPN	
Q18	2SC2785(F)	TR. SI, NPN	
Q19	2SC2785(F)	TR. SI, NPN	
Q20	2SC3354(S)	TR. SI, NPN	
Q21	NO USE		
Q22	2SC3354(S)	TR. SI, NPN	
Q23	2SC3354(S)	TR. SI, NPN	
Q24	2SA1206(K)	TR. SI, PNP	
Q25	2SA1206(K)	TR. SI, PNP	
Q26	2SA1005(K)	TR. SI, PNP	
Q27	2SC3354(S)	TR. SI, NPN	
Q28	2SC3354(S)	TR. SI, NPN	
Q29	NO USE		
Q30	2SA1005(K)	TR. SI, PNP	
Q31	2SA1005(K)	TR. SI, PNP	
Q121	2SC3354(S)	TR. SI, NPN	
Q122	2SC3354(S)	TR. SI, NPN	
Q143	2SC3354(S)	TR. SI, NPN	
Q144	2SC3354(S)	TR. SI, NPN	
Q145	2SC3354(S)	TR. SI, NPN	
Q151	2SC3354(S)	TR. SI, NPN	
Q152	2SC2910(S)	TR. SI, NPN	
Q153	2SA1175(F)	TR. SI, PNP	
Q201	2SC4072	TR. SI, NPN	
Q202	2SC3381(GR)	TR. SI, NPN	
Q206	3SK121(GR)	FET,N-CHANNEL,DUAL GATE	
Q207	2SA1005(K)	TR. SI, PNP	
Q208	2SA1005(K)	TR. SI, PNP	
Q209	2SC2671(H)	TR. SI, NPN	
Q210	2SC2671(H)	TR. SI, NPN	
Q211	2SC3354(S)	TR. SI, NPN	
Q212	2SA1206(K)	TR. SI, PNP	
Q213	2SA1206(K)	TR. SI, PNP	
Q214	2SA1206(K)	TR. SI, PNP	
Q215	2SA1206(K)	TR. SI, PNP	
Q216	2SC3779(D)	TR. SI, NPN	
Q217	2SC3779(D)	TR. SI, NPN	
Q218	2SC3354(S)	TR. SI, NPN	
Q219	2SC3354(S)	TR. SI, NPN	
Q220	2SC2785(F)	TR. SI, NPN	
Q221	2SC2785(F)	TR. SI, NPN	
Q222	NO USE		
Q223	2SC3354(S)	TR. SI, NPN	
Q224	2SA1005(K)	TR. SI, PNP	
Q230	2SA1005(K)	TR. SI, PNP	
Q231	2SA1005(K)	TR. SI, PNP	
Q232	2SA1206(K)	TR. SI, PNP	
Q233	2SA1206(K)	TR. SI, PNP	
Q321	2SC3354(S)	TR. SI, NPN	
Q322	2SC3354(S)	TR. SI, NPN	
Q343	2SC3354(S)	TR. SI, NPN	
Q344	2SC3354(S)	TR. SI, NPN	
Q345	2SC3354(S)	TR. SI, NPN	
Q351	2SC3354(S)	TR. SI, NPN	

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q352	2SC2910(S)	TR. SI, NPN			
Q353	2SA1175(F)	TR. SI, PNP			
Q371	2SC3354(S)	TR. SI, NPN			
Q372	2SC3354(S)	TR. SI, NPN			
Q381	2SC2785(F)	TR. SI, NPN			
Q382	2SC2785(F)	TR. SI, NPN			
Q383	2SA1175(F)	TR. SI, PNP			
Q401	2SC2785(F)	TR. SI, NPN			
Q402	2SC2785(F)	TR. SI, NPN			
Q403	2SC2785(F)	TR. SI, NPN			
Q404	2SC2785(F)	TR. SI, NPN			
Q405	2SC3354(S)	TR. SI, NPN			
Q406	2SC3354(S)	TR. SI, NPN			
Q407	2SC3354(S)	TR. SI, NPN			
Q408	2SC3354(S)	TR. SI, NPN			
Q420	2SC3354(S)	TR. SI, NPN			
Q421	2SK404(F)	FET, N-CHANNEL			
Q422	2SC3354(S)	TR. SI, NPN			
Q630	2SC3315(C)	TR. SI, NPN			
Q650	2SC3315(C)	TR. SI, NPN			
R2	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R3	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R4	RD14BB2C433J	RES. CARBON	43K	5%	1/6W
R5	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R6	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R7	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R8	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R9	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R10	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R11	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R12	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R13	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R14	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R15	RD14BB2C560J	RES. CARBON	56	5%	1/6W
R16	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R17	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R18	NO USE				
R19	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R22	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R23	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R26	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R27	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R28	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R29	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R30	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R31	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R32	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R33	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R34	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R35	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R36	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R37	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R38	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R39	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R40	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R41	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R42	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R43	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R44	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R45	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R46	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R47	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R48	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R49	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R50	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R51	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R54	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R55	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R56	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R57	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R61	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R62	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R63	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R64	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R65	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R66	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R67	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R68	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R69	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R70	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R71	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R72	RD14BB2C220J	RES. CARBON	22	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R73	NO USE				
R74	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R75	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R76	NO USE				
R77	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R78	RD14BB2C184J	RES. CARBON	180K	5%	1/6W
R79	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R80	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R81	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R82	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R83	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R84	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R85	RD14BB2C752J	RES. CARBON	7.5K	5%	1/6W
R86	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R87	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R88	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R89	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R90	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R91	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R92	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R93	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R94	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R95	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R96	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R97	NO USE				
R98	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R99	RN14BK2C1800F	RES. METAL FILM	180	1%	1/6W
R100	RN14BK2C1800F	RES. METAL FILM	180	1%	1/6W
R101	RN14BK2C1500F	RES. METAL FILM	150	1%	1/6W
R102	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R103	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R104	RN14BK2C1800F	RES. METAL FILM	180	1%	1/6W
R105	NO USE				
R106	RD14BB2C183J	RES. CARBON	18K	5%	1/6W
R107	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R108	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R121	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R122	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R123	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R124	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R125	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R130	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R131	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R132	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R133	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R134	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R135	NO USE				
R136	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R137	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R141	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R142	NO USE				
R143	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R147	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R148	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R149	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R150	NO USE				
R151	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R152	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R153	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R154	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R155	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R156	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R157	NO USE				
R158	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R159	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R160	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R161	RN14BK2C9101F	RES. METAL FILM	9.1K	1%	1/6W
R162	RN14BK2C1603F	RES. METAL FILM	160K	1%	1/6W
R163	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R164	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R165	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R166	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R167	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R168	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R169	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R202	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R203	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R204	RD14BB2C433J	RES. CARBON	43K	5%	1/6W
R205	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R206	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R207	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R208	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R209	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R210	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R211	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R212	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R213	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R214	RD14BB2C470J	RES. CARBON	47	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R215	RD14BB2C560J	RES. CARBON	56	5%	1/6W
R216	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R217	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R218	NO USE				
R219	RN14BK2C1603F	RES. METAL FILM	160K	1%	1/6W
R220	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R221	NO USE				
R222	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R223	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R226	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R227	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R228	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R229	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R230	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R231	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R232	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R233	NO USE				
R234	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R235	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R236	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R237	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R238	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R239	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R240	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R241	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R242	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R243	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R244	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R245	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R246	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R247	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R248	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R249	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R250	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R251	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R252	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R253	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R254	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R255	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R256	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R257	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R258	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R259	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R260	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R261	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R262	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R263	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R264	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R265	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R266	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R267	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R268	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R269	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R270	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R271	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R272	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R273	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R274	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R275	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R276	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R277	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R278	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R279	RD14BB2C184J	RES. CARBON	180K	5%	1/6W
R280	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R281	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R282	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R283	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R284	RD14BB2C183J	RES. CARBON	18K	5%	1/6W
R285	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R286	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R287	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R288	RD14BB2C752J	RES. CARBON	7.5K	5%	1/6W
R289	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R290	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R291	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R292	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R293	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R308	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R321	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R322	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R323	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R324	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R325	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R326	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R327	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R328	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R329	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R330	NO USE				
R331	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R332	RD14BB2C470J	RES. CARBON	47	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R333	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R338	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R339	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R340	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R341	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R342	RD14BB2C750J	RES. CARBON	75	5%	1/6W
R343	NO USE				
R344	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R345	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R346	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R351	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R352	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R353	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R354	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R355	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R356	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R357	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R358	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R359	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R360	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R361	RN14BK2C9101F	RES. METAL FILM	9.1K	1%	1/6W
R362	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R363	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R364	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R365	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R366	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R367	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R368	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R371	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R372	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R373	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R374	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R375	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R376	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R381	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R382	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R383	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R384	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R385	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R386	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R387	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R401	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R402	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R403	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R404	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R405	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R406	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R407	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R408	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R409	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R410	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R411	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R412	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R413	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R421	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R422	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R423	RD14BB2C684J	RES. CARBON	680K	5%	1/6W
R424	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R425	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R426	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R427	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R428	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R431	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R432	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R501	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R502	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R503	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R504	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R505	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R506	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R507	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R508	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R509	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R510	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R511	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R512	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R513	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R514	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R520	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R601	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R602	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R607	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R608	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R621	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R622	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R630	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R650	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R701	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R702	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R703	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R704	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R801	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R802	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R803	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R804	RD14BB2C124J	RES. CARBON	120K	5%	1/6W
R811	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R812	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R813	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R814	RD14BB2C124J	RES. CARBON	120K	5%	1/6W
TC2	C05-0446-05	CAP. TRIMMER	30P		
TC3	C05-0444-05	CAP. TRIMMER	10P		
TC97	C05-0448-05	CAP. TRIMMER	70P		
TC202	C05-0446-05	CAP. TRIMMER	30P		
TC203	C05-0444-05	CAP. TRIMMER	10P		
TC280	C05-0443-05	CAP. TRIMMER	6P		
TH1	SDT-20	THERMISTOR			
TH201	SDT-20	THERMISTOR			
TH301	SDT-1000	THERMISTOR			
U102	NJM4558D	IC,DUAL OP AMP			
U202	NJM4558D	IC,DUAL OP AMP			
U301	HD74HC04FP	IC,HEX INVERTER			
U431	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
VR1	R12-4516-05	RES. SEMI FIXED 50KB			
VR2	R12-0575-05	RES. SEMI FIXED 100 B			
VR3	R12-0575-05	RES. SEMI FIXED 100 B			
VR4	R12-0575-05	RES. SEMI FIXED 100 B			
VR5	R12-3549-05	RES. SEMI FIXED 10KB			
VR97	R12-0576-05	RES. SEMI FIXED 200 B			
VR123	R12-1545-05	RES. SEMI FIXED 1KB			
VR142	R12-0577-05	RES. SEMI FIXED 500 B			
VR201	R12-4516-05	RES. SEMI FIXED 50KB			
VR202	R12-0575-05	RES. SEMI FIXED 100 B			
VR203	R12-0575-05	RES. SEMI FIXED 100 B			
VR204	NO USE				
VR205	R12-0575-05	RES. SEMI FIXED 100 B			
VR206	R12-2522-05	RES. SEMI FIXED 5KB			
VR215	R12-3549-05	RES. SEMI FIXED 10KB			
VR216	R12-0576-05	RES. SEMI FIXED 200 B			
VR323	R12-3550-05	RES. SEMI FIXED 20KB			
VR324	R12-0575-05	RES. SEMI FIXED 100 B			
VR342	R12-0577-05	RES. SEMI FIXED 500 B			
VR428	R12-2522-05	RES. SEMI FIXED 5KB			

HORIZONTAL UNIT

X74-1550-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F10-1651-04	SHIELD PLATE			
	F29-0522-04	INSULATION SHEET			
	J73-0117-12	PCB (UNMOUNTED)			
C1	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C2	CF92FV1H333J	CAP. POLYESTER	0.033	5%	50V
C3	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C6	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C7	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C8	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C12	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C13	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C14	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C19	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C27	CC45FSL1H331J	CAP. CERAMIC	330P	5%	50V
C28	NO USE				
C29	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C33	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C39	CC45FCH1H050D	CAP. CERAMIC	.5P	0.5P	50V
C40	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C41	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C42	NO USE				
C43	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C51	CE04BW1E220M	CAP. ELECTRO	22	20%	25V
C54	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C59	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C60	NO USE				
C61	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C62	CQ92FM1H102K	CAP. MYLAR	1000P	10%	50V
C63	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C64	CQ92FM1H222K	CAP. MYLAR	2200P	10%	50V
C69	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C70	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C71	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C72	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C73	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C74	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C101	CK45FB1H222K	CAP. CERAMIC	2200P	10%	50V
C102	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C103	CE04EW1H010M	CAP. ELECTRO	1	20%	50V
C119	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C120	NO USE				
C121	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C122	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C123	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C124	C91-1246-05	CAP. PLASTIC	4.7	5%	100V
C125	CQ93AP2A392J	CAP. MYLAR	3900P	5%	100V
C126	C91-1247-05	CAP. PLASTIC	0.047	2%	100V
C127	CM93BD2A391J	CAP. MICA	390P	5%	100V
C131	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C132	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C133	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C134	NO USE				
C135	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C136	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C137	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C138	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C139	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C140	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C141	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C142	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C143	CC45CH1H270J	CAP. CERAMIC	27P	5%	50V
C144	NO USE				
C145	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C148	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C151	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C152	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C153	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C154	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C163	CC45CH1H151J	CAP. CERAMIC	150P	5%	50V
C171	CE04EW1C470M	CAP. ELECTRO	47	20%	16V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C176	CC45CH1H270J	CAP. CERAMIC	27P	5%	50V
C177	NO USE				
C178	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C179	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C180	CQ92FM1H152K	CAP. MYLAR	1500P	10%	50V
C181	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C188	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C196	CC45FCH1H680J	CAP. CERAMIC	68P	5%	50V
C204	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C219	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C220	NO USE				
C221	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C230	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C249	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C250	NO USE				
C251	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C254	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C255	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C256	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C257	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C258	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C259	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C260	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C261	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C262	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C263	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C264	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C265	NO USE				
C266	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C267	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C268	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C290	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C291	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C301	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C302	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C303	CC45CH1H270J	CAP. CERAMIC	27P	5%	50V
C313	CQ92M1H102K	CAP. MYLAR	1000P	10%	50V
C317	CC45SL1H121J	CAP. CERAMIC	120P	5%	50V
C328	CC45SL1H101J	CAP. CERAMIC	100P	5%	50V
C401	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C402	CQ92M1H102K	CAP. MYLAR	1000P	10%	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	1SS132	DIODE			
D4	1SS132	DIODE			
D5	1SS132	DIODE			
D6	1SS132	DIODE			
D7	1SS132	DIODE			
D8	1SS132	DIODE			
D9	1SS132	DIODE			
D10	1SS132	DIODE			
D11	NO USE				
D12	MA700	DIODE			
D13	MA700	DIODE			
D14	MTZ4.7JC	DIODE, ZENER	9.6V		
D21	1SS132	DIODE			
D101	MA700	DIODE			
D102	MA700	DIODE			
D109	MA700	DIODE			
D110	MA700	DIODE			
D111	MA700	DIODE			
D112	MA700	DIODE			
D119	1SS132	DIODE			
D142	MA700	DIODE			
D151	1SS132	DIODE			
D152	1SS132	DIODE			
D162	1SS132	DIODE			
D170	MA700	DIODE			
D175	1SS132	DIODE			

REF.NO	PARTS NO	NAME & DESCRIPTION	
D178	1SS132	DIODE	
D179	1SS132	DIODE	
D180	1SS132	DIODE	
D187	1SS132	DIODE	
D221	MA700	DIODE	
D236	1SS132	DIODE	
D237	1SS132	DIODE	
D301	MA700	DIODE	
D901	1SS132	DIODE	
JW402	E38-0451-15	WIRE ASS'Y	
JW403	E38-0452-15	WIRE ASS'Y	
JW404	E38-0474-15	WIRE ASS'Y	
K1	S51-1527-05	RELAY	
P246	E40-3238-05	PIN CONNECTOR	3P
P401	E40-7216-05	PIN CONNECTOR	40P
P402	E40-3243-05	PIN CONNECTOR	8P
P403	NO USE		
P404	E40-3243-05	PIN CONNECTOR	8P
P405	E40-3238-05	PIN CONNECTOR	3P
P406	E40-3238-05	PIN CONNECTOR	3P
Q1	2SA1206(K)	TR. SI, PNP	
Q2	2SA1005(K)	TR. SI, PNP	
Q3	2SC2671(H)	TR. SI, NPN	
Q4	2SK241(Y)	FET, N-CHANNEL	
Q5	2SK241(Y)	FET, N-CHANNEL	
Q6	2SC2671(H)	TR. SI, NPN	
Q7	2SC2671(H)	TR. SI, NPN	
Q8	2SA1005(K)	TR. SI, PNP	
Q9	2SA1005(K)	TR. SI, PNP	
Q10	2SC2785(F)	TR. SI, NPN	
Q11	2SA1175(F)	TR. SI, PNP	
Q21	2SC4049	TR. SI, NPN	
Q51	2SC2785(F)	TR. SI, NPN	
Q52	2SC2785(F)	TR. SI, NPN	
Q53	2SC2785(F)	TR. SI, NPN	
Q54	2SC2785(F)	TR. SI, NPN	
Q55	2SC2785(F)	TR. SI, NPN	
Q56	2SC2785(F)	TR. SI, NPN	
Q101	2SC2785(F)	TR. SI, NPN	
Q102	2SA1206(K)	TR. SI, PNP	
Q114	2SA1005(K)	TR. SI, PNP	
Q120	2SC3732(L)	TR. SI, NPN	
Q121	2SC2786(K)	TR. SI, NPN	
Q122	2SC2786(K)	TR. SI, NPN	
Q123	2SC2786(K)	TR. SI, NPN	
Q131	2SA1005(K)	TR. SI, PNP	
Q132	2SC2785(F)	TR. SI, NPN	
Q141	2SC3354(S)	TR. SI, NPN	
Q142	2SC3354(S)	TR. SI, NPN	
Q143	2SA1175(F)	TR. SI, PNP	
Q144	2SA1175(F)	TR. SI, PNP	
Q145	2SA1175(F)	TR. SI, PNP	
Q146	2SA1175(F)	TR. SI, PNP	
Q147	2SC2785(F)	TR. SI, NPN	
Q148	2SC2785(F)	TR. SI, NPN	
Q149	2SA1175(F)	TR. SI, PNP	
Q150	2SA1175(F)	TR. SI, PNP	
Q151	2SC3354(S)	TR. SI, NPN	
Q171	2SC2786(K)	TR. SI, NPN	
Q172	2SC2786(K)	TR. SI, NPN	
Q178	2SC2785(F)	TR. SI, NPN	
Q179	2SC2785(F)	TR. SI, NPN	
Q180	2SC2785(F)	TR. SI, NPN	
Q183	2SA1175(F)	TR. SI, PNP	
Q184	2SA1175(F)	TR. SI, PNP	
Q185	NO USE		
Q186	2SA1175(F)	TR. SI, PNP	
Q187	2SA1175(F)	TR. SI, PNP	
Q201	2SC2785(F)	TR. SI, NPN	
Q202	2SC2786(K)	TR. SI, NPN	
Q203	2SC2786(K)	TR. SI, NPN	

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q204	2SC2786(K)	TR. SI, NPN			
Q205	2SC2785(F)	TR. SI, NPN			
Q401	2SC2785(F)	TR. SI, NPN			
R1	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R2	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R3	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R4	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R5	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R6	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R7	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R8	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R9	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R10	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R11	NO USE				
R12	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R13	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R14	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R15	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R16	NO USE				
R17	RN14BK2C1803F	RES. METAL FILM	180K	1%	1/6W
R18	NO USE				
R19	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R20	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R21	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R22	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R23	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R24	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R25	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R26	RN14BK2C82R0F	RES. METAL FILM	82.0	1%	1/6W
R27	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R28	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R29	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R30	NO USE				
R31	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R32	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R33	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R34	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R35	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R36	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R37	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R38	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R39	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R40	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R41	RN14BK2C1602F	RES. METAL FILM	16K	1%	1/6W
R42	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R43	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R44	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R45	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R51	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R52	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R53	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R54	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R55	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R56	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R57	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R58	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R59	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R60	RD14BB2C754J	RES. CARBON	750K	5%	1/6W
R61	RD14BB2C244J	RES. CARBON	240K	5%	1/6W
R62	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R63	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R64	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R65	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R66	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R67	RD14BB2C161J	RES. CARBON	160	5%	1/6W
R68	RD14BB2C183J	RES. CARBON	18K	5%	1/6W
R69	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R70	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R71	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R72	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R73	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R74	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R75	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R76	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R77	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R78	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R79	NO USE				
R80	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R81	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R84	RD14BB2C224J	RES. CARBON	220K	5%	1/6W
R85	RD14BB2C224J	RES. CARBON	220K	5%	1/6W
R86	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R87	RN14BK2C1802F	RES. METAL FILM	18K	1%	1/6W
R88	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R89	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R90	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R101	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R102	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R105	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R106	RD14BB2C134J	RES. CARBON	130K	5%	1/6W
R107	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R108	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R109	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R110	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R111	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R112	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R113	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R114	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R115	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R116	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R117	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R118	NO USE				
R119	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R120	RD14BB2C274J	RES. CARBON	270K	5%	1/6W
R121	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R122	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R123	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R127	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R131	RN14BK2C2402F	RES. METAL FILM	24K	1%	1/6W
R132	RN14BK2C2703F	RES. METAL FILM	270K	1%	1/6W
R133	RN14BK2C1503F	RES. METAL FILM	150K	1%	1/6W
R134	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R135	NO USE				
R136	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R137	NO USE				
R138	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R141	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R142	NO USE				
R143	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R144	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R145	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R146	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R147	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R148	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R149	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R150	NO USE				
R151	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R152	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R153	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R154	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R155	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R156	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R157	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R158	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R159	RD14BB2C113J	RES. CARBON	11K	5%	1/6W
R160	NO USE				
R161	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R162	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R163	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R164	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R165	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R166	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R170	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R171	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R172	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R173	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R174	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R175	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R176	RN14BK2C2402F	RES. METAL FILM	24K	1%	1/6W
R177	NO USE				
R178	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R179	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R180	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R181	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R182	NO USE				
R183	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R184	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R185	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R186	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R187	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R188	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R189	NO USE				
R190	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R191	NO USE				
R192	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R193	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R196	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R201	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R202	RD14BB2C101J	RES. CARBON	100	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R203	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R204	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R205	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R206	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R207	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R208	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R209	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R210	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R211	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R212	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R213	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R214	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R215	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R216	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R217	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R218	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R219	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R220	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R221	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R225	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R226	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R227	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R228	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R229	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R230	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R231	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R232	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R233	RD14BB2C683J	RES. CARBON	68K	5%	1/6W
R234	RD14BB2C303J	RES. CARBON	30K	5%	1/6W
R235	RD14BB2C474J	RES. CARBON	470K	5%	1/6W
R236	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R237	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R238	RN14BK2C7502F	RES. METAL FILM	75K	1%	1/6W
R239	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R240	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R246	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R247	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R248	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R249	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R250	NO USE				
R251	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R252	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R253	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R301	R90-0647-05	RES. NETWORK(SWEEP 1)			
R302	R90-0651-05	RES. NETWORK(SWEEP 2)			
R310	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R311	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R312	NO USE				
R313	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R343	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R401	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
TC127	C05-0449-05	CAP. TRIMMER	100P		
TC128	C05-0445-05	CAP. TRIMMER	20P		
U101	HD74HC00FP	IC,QUAD 2 INPUT NAND GATE			
U102	MC10102L	IC,QUAD 2-INPUT NOR GATE			
U103	MC10H131L	IC,DUAL D-FILP FLOP			
U104	HD74HC123AFP	IC,DUAL RETRIGG. SINGLE SHOT			
U105	HD74HC08FP	IC,QUAD 2-INPUT AND GATE			
U106	HD74HC00FP	IC,QUAD 2 INPUT NAND GATE			
U107	SN74ALS00N	IC,QUAD 2-INPUT NAND GATE			
U108	HD74HC00FP	IC,QUAD 2 INPUT NAND GATE			
U109	HD74HC112FP	IC,DUAL J-K F.F. (WITH PR&CLR)			
U110	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U111	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U112	MC10107L	IC,TRIPLE 2 INPUT EXC OR/NOR			
U113	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U114	HD14053BFP	IC,TRIPLE 2CH ANALOG MPX/DE-MP			
U121	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U122	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U123	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U124	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U141	2SK332(F)	FET, N-CHANNEL			
U201	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U202	NJM4558M	IC,DUAL OP-AMP			
U203	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
VR1	R12-3549-05	RES. SEMI FIXED 10KB			
VR138	R12-2522-05	RES. SEMI FIXED 5KB			
VR143	R12-1545-05	RES. SEMI FIXED 1KB			
VR144	NO USE				
VR145	R12-2522-05	RES. SEMI FIXED 5KB			

ATT UNIT

X75-1200-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J21-4755-04	BRACKET;FOR ATT			
	J73-0115-12	PCB (UNMOUNTED)			
	N09-0739-05	SCREW,SEMS BINDING TAPTITE 3X8			
	N32-3006-41	SCREW,FLAT HD M3X6			
	R92-1061-05	JUMPING RES. ZERO OHM (5MM)			
C1	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C2	CE04BW1E220M	CAP. ELECTRO	22	20%	25V
C3	CQ92FM1H102K	CAP. MYLAR	1000P	10%	50V
C4	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C5	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C6	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C9	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C10	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C14	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C15	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C16	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C17	CC45FCH1H620J	CAP. CERAMIC	62P	5%	50V
C24	CC45FCH1H050C	CAP. CERAMIC	5P	0.25P	50V
C101	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C102	CE04BW1E220M	CAP. ELECTRO	22	20%	25V
C103	CQ92FM1H102K	CAP. MYLAR	1000P	10%	50V
C104	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C105	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C106	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C109	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C110	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C114	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C115	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C116	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C117	CC45FCH1H620J	CAP. CERAMIC	62P	5%	50V
C124	CC45FCH1H050C	CAP. CERAMIC	5P	0.25P	50V
C201	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C202	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C210	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C211	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C212	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C213	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C214	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C215	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
D1	1SS132	DIODE			
D2	MTZ5.1JB	DIODE, ZENER	5.07V		
D101	1SS132	DIODE			
D102	MTZ5.1JB	DIODE, ZENER	5.07V		
D201	1SS132	DIODE			
D202	1SS132	DIODE			
D203	1SS132	DIODE			
D204	1SS132	DIODE			
K1	S51-2508-05	RELAY			
K2	S51-2508-05	RELAY			
K101	S51-2508-05	RELAY			
K102	S51-2508-05	RELAY			
L210	L40-1011-03	FERRI INDUCTOR	100UH	10%	
P1	E40-3238-05	PIN CONNECTOR	3P		
P101	E40-3238-05	PIN CONNECTOR	3P		
P202	E40-3243-05	PIN CONNECTOR	8P		
P211	E40-3238-05	PIN CONNECTOR	3P		
Q1	2SK404(F)	FET, N-CHANNEL			
Q2	2SC3354(S)	TR, SI, NPN			
Q3	2SC3354(S)	TR, SI, NPN			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q4	2SC3354(S)	TR. SI, NPN			
Q5	2SC3354(S)	TR. SI, NPN			
Q101	2SK404(F)	FET, N-CHANNEL			
Q102	2SC3354(S)	TR. SI, NPN			
Q103	2SC3354(S)	TR. SI, NPN			
Q104	2SC3354(S)	TR. SI, NPN			
Q105	2SC3354(S)	TR. SI, NPN			
Q201	2SC4049	TR. SI, NPN			
Q202	2SC4049	TR. SI, NPN			
Q203	2SC4049	TR. SI, NPN			
Q204	2SC4049	TR. SI, NPN			
R1	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R2	RN14BK2E1803D	RES. METAL FILM	180K	0.5%	1/4W
R3	RN14BK2E8203D	RES. METAL FILM	820K	0.5%	1/4W
R4	RD14BB2C684J	RES. CARBON	680K	5%	1/6W
R5	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R6	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R7	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R8	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R9	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R10	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R11	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R12	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R13	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R14	RN14BK2C1004F	RES. METAL FILM	1M	1%	1/6W
R15	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R16	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R17	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R18	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R19	RN14BK2C1500F	RES. METAL FILM	150	1%	1/6W
R20	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R21	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R22	RN14BK2C6000D	RES. METAL FILM	600	0.5%	1/6W
R23	RN14BK2C2000D	RES. METAL FILM	200	0.5%	1/6W
R24	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R31	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R101	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R102	RN14BK2E1803D	RES. METAL FILM	180K	0.5%	1/4W
R103	RN14BK2E8203D	RES. METAL FILM	820K	0.5%	1/4W
R104	RD14BB2C684J	RES. CARBON	680K	5%	1/6W
R105	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R106	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R107	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R108	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R109	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R110	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R111	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R112	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R113	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R114	RN14BK2C1004F	RES. METAL FILM	1M	1%	1/6W
R115	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R116	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R117	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R118	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R119	RN14BK2C1500F	RES. METAL FILM	150	1%	1/6W
R120	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R121	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R122	RN14BK2C6000D	RES. METAL FILM	600	0.5%	1/6W
R123	RN14BK2C2000D	RES. METAL FILM	200	0.5%	1/6W
R124	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R131	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R201	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R202	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R203	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R204	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R205	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R206	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R207	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R208	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R209	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R210	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R211	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
S1	S02-4511-15	ATTENUATOR UNIT			
S101	S02-4511-15	ATTENUATOR UNIT			
U1	LF411CN	IC,DUAL JFET INPUT OP AMP			
U101	LF411CN	IC,DUAL JFET INPUT OP AMP			
U201	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			
U202	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH			

REF.NO	PARTS NO	NAME & DESCRIPTION
VR1	R12-4516-05	RES. SEMI FIXED 50KB
VR2	R12-0577-05	RES. SEMI FIXED 500 B
VR101	R12-4516-05	RES. SEMI FIXED 50KB
VR102	R12-0577-05	RES. SEMI FIXED 500 B

READOUT UNIT

X77-1720-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F10-1649-03	SHIELD PLATE			
	F29-0520-04	INSULATION SHEET			
	J73-0118-02	PCB (UNMOUNTED)			
B1	W09-0408-05	BATTERY,CR2354-1HF			
C1	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C2	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C3	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C24	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C25	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C26	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C27	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C28	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C29	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C30	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C31	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C32	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C33	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C34	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C35	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C36	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C37	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C38	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C39	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C40	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C41	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C52	CE04EW1H010M	CAP. ELECTRO	1	20%	50V
C60	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C61	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C62	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C63	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C64	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C65	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C66	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C67	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C68	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C69	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C70	CE04EW1H010M	CAP. ELECTRO	1	20%	50V
C71	CE04EW1H010M	CAP. ELECTRO	1	20%	50V
C72	CE04EW1H010M	CAP. ELECTRO	1	20%	50V
C73	CE04EW1H010M	CAP. ELECTRO	1	20%	50V
C102	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C103	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C104	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C105	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C106	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C107	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C108	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C109	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C110	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C111	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C112	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C113	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C114	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C115	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C116	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C117	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C118	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C119	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C120	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C121	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C122	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C123	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C124	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C125	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C126	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C127	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C128	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C129	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C130	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C131	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C132	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C133	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C134	NO USE				
C135	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C136	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C137	NO USE				
C138	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C139	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C140	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C141	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C142	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C143	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C144	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C145	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C146	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C147	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C148	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C149	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C150	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C151	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C152	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C153	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C161	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C162	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C163	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C164	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C165	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C166	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C167	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C168	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C169	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C170	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	1SS132	DIODE			
D4	1SS132	DIODE			
D5	DAP803	DIODE ARRAY			
D6	DAP803	DIODE ARRAY			
D7	1SS132	DIODE			
D8	MTZ5.1JB	DIODE, ZENER	5.07V		
L1	L40-1011-03	FERRI INDUCTOR	100UH	10%	
L2	L40-1011-03	FERRI INDUCTOR	100UH	10%	
P1	E40-7212-05	PIN CONNECTOR	34P		
P2	E40-7211-05	PIN CONNECTOR	20P		
P3	E40-7209-05	PIN CONNECTOR	50P		
P4	E40-7035-05	PIN CONNECTOR	40P		
Q1	2SC3354(S)	TR. SI, NPN			
Q2	2SC3354(S)	TR. SI, NPN			
R1	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R2	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R3	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R4	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R5	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R6	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R7	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R8	NO USE				
R9	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R10	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R24	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R25	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R28	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R29	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R30	RN14BK2C1303F	RES. METAL FILM	130K	1%	1/6W
R31	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R32	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R33	NO USE				
R34	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R35	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R36	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R37	RN14BK2C3302F	RES. METAL FILM	33K	1%	1/6W
R38	RN14BK2C9090F	RES. METAL FILM	909	1%	1/6W
R39	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R40	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R41	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R42	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R43	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R44	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R45	NO USE				
R46	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R47	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R48	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R49	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R50	RD14BB2C103J	RES. CARBON	10K	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R51	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R52	NO USE				
R53	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R54	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R58	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R59	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R60	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R61	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R62	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R63	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R64	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R65	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R66	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R67	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R70	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R71	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R72	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R73	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R74	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R75	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R76	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R77	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R78	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R79	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R91	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R92	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R93	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R94	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R95	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R96	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R97	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R98	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R99	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R100	NO USE				
R101	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R102	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R103	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R104	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R105	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R106	RN14BK2C3602F	RES. METAL FILM	36K	1%	1/6W
RA1	R90-0662-05	RES. NETWORK			
RA2	R90-0663-05	RES. NETWORK	8X1M		
U1	LH0080BF	IC,Z80B CPU			
U2	T93-0751-74	PROGRAM ROM (MBM27128-25)			
U3	MB8464-10LL-FP	IC,S-RAM			
U4	CTM5110	IC,GATE ARRAY			
U5	HD74HC138FP	IC,3-8 DECOD./DE-MPX			
U6	HD74LS138FP	IC,3-TO-8 DEMULTIPLEXER			
U7	HD74HC238FP	IC,3-TO-8 LINE DECODER			
U8	HD74HC138FP	IC,3-8 DECOD./DE-MPX			
U9	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U10	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U11	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U12	HD74HC574FP	IC,OCTAL D-F.F. (3-S)			
U13	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U14	HD74HC244FP	IC,OCTAL BUS BUFFER			
U15	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U16	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U17	NO USE				
U18	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U19	HA17555PS	IC,TIMER			
U23	MSM6242BGS-VK	IC,REAL TIME CLOCK			
U24	PST518B	IC,RESET			
U25	HD14066BP	IC, QUAD ANALOG SW/QUAD MPX			
U26	HD74HC08FP	IC,QUAD 2-INPUT AND GATE			
U27	HD74HC04FP	IC,HEX INVERTER			
U28	HD74LS157FP	IC,2 TO 1 DATA SELECTORS			
U29	HD74LS157FP	IC,2 TO 1 DATA SELECTORS			
U30	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U31	HD74LS11FP	IC,TRIPLE 3-INPUT AND			
U32	T93-0752-04	PROGRAMMED ROM			
U33	CTM5020	IC,GATE ARRAY OP			0V
U34	HD74HC174FP	IC,HEX D-TYPE FLIP-FLOP			
U35	AM6012DC	IC,12-BIT D/A CONVERTER			
U36	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U37	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U38	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U39	HD14052BFP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U40	HD14052BFP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U41	HD74HC244FP	IC,OCTAL BUS BUFFER			
U42	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U43	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U44	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U45	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U46	HD74HC00FP	IC,QUAD 2 INPUT NAND GATE			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
U47	NJM311M	IC,VOLTAGE COMPARATOR
U48	DAC0808LCN	IC,8-BIT D/A CONVERTER
U49	HD74HC564FP	IC,OCTAL D-TYPE FLIP-FLOP
U50	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U51	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX
U52	NJM072M	IC,DUAL J-FET INPUT OP-AMP
U53	NJM072M	IC,DUAL J-FET INPUT OP-AMP
X2	L77-1229-05	CRYSTAL RESONATOR

STORAGE UNIT

X77-1730-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0120-12	PCB (UNMOUNTED)			
C1	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C2	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C3	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C4	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C5	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C6	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C7	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C8	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C9	NO USE				
C10	C90-3049-05	CAP. METAL FILM	1	1%	100V
C11	CC45FCH1H100D	CAP. CERAMIC	10P	0.5P	50V
C12	CC45FCH1H100D	CAP. CERAMIC	10P	0.5P	50V
C13	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C61	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C62	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C63	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C64	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C65	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C66	NO USE				
C67	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C71	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C72	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C73	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C74	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C81	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C120	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C121	NO USE				
C122	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C130	CE04EW1E220M	CAP. ELECTRO	22	20%	25V
C140	CC45FSL1H101J	CAP. CERAMIC	100P	5%	50V
C143	CC45FSL1H101J	CAP. CERAMIC	100P	5%	50V
C150	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C171	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C172	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C173	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C174	NO USE				
C175	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C176	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C180	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C181	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C186	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C187	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C188	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C189	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C190	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C201	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C202	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C203	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C204	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C205	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C206	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C207	NO USE				
C208	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C209	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C210	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C211	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C212	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C213	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C214	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C215	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C216	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C221	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C222	CE04EW1E470M	CAP. ELECTRO	47	20%	25V
C223	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C224	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C225	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C228	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C229	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C230	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C231	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
D10	1SS132	DIODE			
D11	1SS132	DIODE			
D12	1SS132	DIODE			
D13	MA700	DIODE			
D130	MTZ4.7JC	DIODE, ZENER	9.6V		
L1	L40-1011-03	FERRI INDUCTOR	100UH	10%	
L5	L40-1011-03	FERRI INDUCTOR.	100UH	10%	
L6	L40-1011-03	FERRI INDUCTOR	100UH	10%	
P2	E40-7208-05	PIN CONNECTOR	26P		
P3	E40-7209-05	PIN CONNECTOR	50P		
P4	E40-7035-05	PIN CONNECTOR	40P		
P5	NO USE				
P6	E40-3243-05	PIN CONNECTOR	8P		
P7	E40-5066-05	PIN CONNECTOR	9P		
P101	E40-3238-05	PIN CONNECTOR	3P		
Q41	2SK583	FET, N-CHANNEL			
Q120	2SA1175(F)	TR. SI, PNP			
Q162	2SA1175(F)	TR. SI, PNP			
R111	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R112	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R113	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R114	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R115	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R116	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R117	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R118	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R119	NO USE				
R120	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R121	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R122	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R123	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R124	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R125	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R126	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R127	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R128	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R129	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R130	NO USE				
R131	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R132	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R133	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R134	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R135	RD14BB2C823J	RES. CARBON	82K	5%	1/6W
R136	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R137	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R138	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R139	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R140	NO USE				
R141	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R142	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R157	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R158	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R159	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R160	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R161	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R162	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R163	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R164	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R165	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R166	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R167	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R168	RD14BB2C470J	RES. CARBON	47	5%	1/6W
RA1	R90-0612-05	RES. NETWORK	8X4.7K		
RA2	R90-0612-05	RES. NETWORK	8X4.7K		
RA3	R90-0612-05	RES. NETWORK	8X4.7K		
RA4	R90-1122-05	RES. NETWORK	8X150		
RA5	R90-1123-05	RES. NETWORK	8X220		
RA6	R90-1123-05	RES. NETWORK	8X220		

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
RA7	R90-1123-05	RES. NETWORK 8X220
RA8	R90-1122-05	RES. NETWORK 8X150
U80	MAX232CPE	IC,RS-232C DRIVERS/RECEIVERS
U81	HD64180R1CP8X	IC,CPU
U82	HD74HC244FP	IC,OCTAL BUS BUFFER
U83	HD74HC244FP	IC,OCTAL BUS BUFFER
U84	HD74HC244FP	IC,OCTAL BUS BUFFER
U85	HD74HC245FP	IC,OCTAL 3-S BUS TRANSCEIVER
U86	SN75160BN	IC,OCTAL GP-IB TRANSCEIVER
U87	SN75161BN	IC,OCTAL GP-IB TRANSCEIVER
U88	UPD7210C	IC,GP-IB CONTROLLER
U89	MB84256-10LL-FP	IC,S-RAM
U90	MB8464-10LL-FP	IC,S-RAM
U91	HD74HC125FP	IC,QUAD BUS BUFFER (3-S)
U92	CTM5120	IC,GATE ARRAY
U95	T93-0753-04	IC,PROGRAMMED ROM
U105	MB84256-10LL-FP	IC,S-RAM
U106	HD74HC238FP	IC,3-TO-8 LINE DECODER
U107	HD74HC138FP	IC,3-8 DECOD./DE-MPX
U108	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U109	HD74HC541FP	IC,OCTAL 3-S BUFFER/LINE DRIVE
U110	NO USE	
U111	HD74HC08FP	IC,QUAD 2-INPUT AND GATE
U112	NO USE	
U113	HD74HC74FP	IC,DUAL D-F.F.
U114	HD74HC00FP	IC,QUAD 2 INPUT NAND GATE
U120	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U121	HD74LS74FP	IC,DUAL D-F.F. (WITH PR&CLR)
U122	NO USE	
U123	HD74LS161FP	IC,STNC. 4-BIT BINARY COUNTER
U124	HD74LS161FP	IC,STNC. 4-BIT BINARY COUNTER
U127	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U128	SN74ALS74AN	IC,DUAL D-F.F. (WITH PR&CLR)
U129	NJM360M	IC,DIFFERENTIAL COMPARATOR
U130	SN74S196N	IC,LATCH
U131	SN74F74N	IC,DUAL D-FLIP FLOP
U132	HD74HC161FP	IC,SYNC. 4-BIT COUNTER
U133	SN74AS153N	IC,DUAL 4-1 DATA SELECTOR/MPX
U134	SPG-8650-0	IC,PROGRAMMABLE DEMULTIPLIER
U135	HD74HC74FP	IC,DUAL D-F.F.
U136	HD74HC238FP	IC,3-TO-8 LINE DECODER
U137	SN74ALS74AN	IC,DUAL D-F.F. (WITH PR&CLR)
U138	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U139	HD74HC592FP	IC,8-BIT REGISTER BINARY COUNT
U140	HD74HC592FP	IC,8-BIT REGISTER BINARY COUNT
U141	HD74HC592FP	IC,8-BIT REGISTER BINARY COUNT
U142	HD74HC592FP	IC,8-BIT REGISTER BINARY COUNT
U143	HD74HC592FP	IC,8-BIT REGISTER BINARY COUNT
U148	AM6012DC	IC,12-BIT D/A CONVERTER
U149	HD74HC4040FP	IC,12-BIT BINARY COUNTER
U150	NJM072M	IC,DUAL J-FET INPUT OP-AMP
U151	NO USE	
U152	SN74ALS04AN	IC,HEX INVERTER
U153	HD74HC245FP	IC,OCTAL 3-S BUS TRANSCEIVER
U154	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U155	HD74LS153FP	IC,DUAL 4-1 DATA SELECT./MPX
U156	HD74HC244FP	IC,OCTAL BUS BUFFER
U157	HD74HC244FP	IC,OCTAL BUS BUFFER
VR11	R12-2523-05	RES. SEMI FIXED 5KB
VR12	R12-3551-05	RES. SEMI FIXED 10KB
X3	L77-1071-05	CRYSTAL RESONATOR
X4	L77-1069-05	CRYSTAL RESONATOR

A/D CONVERTER UNIT

X78-1080-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0119-12	PCB (UNMOUNTED)			
C3	CC45FCH1H080D	CAP. CERAMIC	8P	0.5P	50V
C4	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C5	NO USE				
C6	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C12	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C13	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C16	CC45FCH1H080D	CAP. CERAMIC	8P	0.5P	50V
C19	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C20	NO USE				
C21	CC45FCH1H270J	CAP. CERAMIC	27P	5%	50V
C22	NO USE				
C23	CC45FCH1H270J	CAP. CERAMIC	27P	5%	50V
C24	NO USE				
C25	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C26	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C27	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C28	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C29	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C30	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C31	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C32	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C33	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C34	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C35	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C36	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C37	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C38	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C39	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C40	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C41	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C42	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C43	NO USE				
C44	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C45	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C46	CC45FCH1H121J	CAP. CERAMIC	120P	5%	50V
C47	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C48	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C49	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C50	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C51	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C52	NO USE				
C53	CC45FCH1H270J	CAP. CERAMIC	27P	5%	50V
C54	CC45FCH1H270J	CAP. CERAMIC	27P	5%	50V
C61	CC45FCH1H150J	CAP. CERAMIC	15P	5%	50V
C62	CC45FCH1H180J	CAP. CERAMIC	18P	5%	50V
C63	CC45FCH1H100D	CAP. CERAMIC	10P	0.5P	50V
C64	CK45FB1H222K	CAP. CERAMIC	2200P	10%	50V
C71	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C72	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C77	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C82	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C101	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C102	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C106	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C110	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C111	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C112	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C113	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C120	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C142	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C145	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C146	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C149	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C150	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C151	CC45FSL1H331J	CAP. CERAMIC	330P	5%	50V
C155	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C156	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C157	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C158	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C159	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C160	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C161	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C162	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C163	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C180	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C226	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C227	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C301	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C302	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C303	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C304	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C305	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C306	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C307	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C308	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C309	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C310	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C311	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C312	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C313	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C314	CK45FF1H103Z	CAP. CERAMIC	0.01	10%	50V
C320	CC45FCH1H151J	CAP. CERAMIC	150P	5%	50V
C321	CC45FCH1H100D	CAP. CERAMIC	10P	0.5P	50V
C325	CC45FCH1H330J	CAP. CERAMIC	33P	5%	50V
C329	CC45FCH1H150J	CAP. CERAMIC	15P	5%	50V
C330	NO USE				
C331	CC45FCH1H030C	CAP. CERAMIC	3P	0.25P	50V
C332	NO USE				
C333	CC45FCH1H030C	CAP. CERAMIC	3P	0.25P	50V
C355	CC45FCH1H330J	CAP. CERAMIC	33P	5%	50V
C359	CC45FCH1H150J	CAP. CERAMIC	15P	5%	50V
C360	NO USE				
C361	CC45FCH1H390J	CAP. CERAMIC	39P	5%	50V
C367	CC45FCH1H390J	CAP. CERAMIC	39P	5%	50V
C372	CC45CH1H220J	CAP. CERAMIC	22P	5%	50V
C373	NO USE				
C374	CC45CH1H220J	CAP. CERAMIC	22P	5%	50V
C382	CC45FCH1H040C	CAP. CERAMIC	4P	0.25P	50V
C383	NO USE				
C384	CC45FCH1H040C	CAP. CERAMIC	4P	0.25P	50V
C601	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C602	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C701	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C702	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C703	CC45FSL1H101J	CAP. CERAMIC	100P	5%	50V
C801	CC45CH1H080D	CAP. CERAMIC	8P	0.5P	50V
C802	CC45CH1H080D	CAP. CERAMIC	8P	0.5P	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	NO USE				
D4	1SS132	DIODE			
D5	1SS132	DIODE			
D6	1SS132	DIODE			
D7	MA700	DIODE			
D8	MA700	DIODE			
D11	HSM88AS	DIODE			
D12	HSM88AS	DIODE			
D15	1SS132	DIODE			
D16	1SS132	DIODE			
D17	1SS132	DIODE			
D18	1SS132	DIODE			
D19	1SS132	DIODE			
D20	NO USE				
D21	1SS132	DIODE			
D22	HSM88AS	DIODE			
D23	HSM88AS	DIODE			
D26	MA700	DIODE			
D27	MA700	DIODE			
D30	1SS132	DIODE			
D31	MA700	DIODE			
D32	MA700	DIODE			

REF.NO	PARTS NO	NAME & DESCRIPTION			
D81	MA700	DIODE			
D82	MA700	DIODE			
D152	MA700	DIODE			
D301	1SS132	DIODE			
JW1	E38-0449-05	WIRE ASS'Y			
L2	L40-1011-03	FERRI INDUCTOR	100UH	10%	
P1	E40-3238-05	PIN CONNECTOR	3P		
P2	E40-3238-05	PIN CONNECTOR	3P		
P3	E40-7209-05	PIN CONNECTOR	50P		
P4	E40-7035-05	PIN CONNECTOR	40P		
P5	NO USE				
P6	E40-3241-05	PIN CONNECTOR	6P		
Q1	2SC3354(S)	TR. SI, NPN			
Q2	2SC3354(S)	TR. SI, NPN			
Q3	2SC3779(D)	TR. SI, NPN			
Q4	2SC3354(S)	TR. SI, NPN			
Q5	2SC3779(D)	TR. SI, NPN			
Q6	2SA1206(K)	TR. SI, PNP			
Q7	2SA1206(K)	TR. SI, PNP			
Q8	2SK241(Y)	FET, N-CHANNEL			
Q9	2SK241(Y)	FET, N-CHANNEL			
Q10	2SC3354(S)	TR. SI, NPN			
Q11	2SC2785(F)	TR. SI, NPN			
Q12	2SC2785(F)	TR. SI, NPN			
Q13	2SC3354(S)	TR. SI, NPN			
Q14	2SC3354(S)	TR. SI, NPN			
Q15	2SC3354(S)	TR. SI, NPN			
Q16	2SC3779(D)	TR. SI, NPN			
Q17	2SC3779(D)	TR. SI, NPN			
Q18	2SA1206(K)	TR. SI, PNP			
Q19	2SA1206(K)	TR. SI, PNP			
Q20	2SK241(Y)	FET, N-CHANNEL			
Q21	2SK241(Y)	FET, N-CHANNEL			
Q22	2SC3354(S)	TR. SI, NPN			
Q23	2SC2785(F)	TR. SI, NPN			
Q24	2SC2785(F)	TR. SI, NPN			
Q52	2SC3354(S)	TR. SI, NPN			
Q303	2SA1565	TR. SI, PNP			
Q601	2SK583	FET, N-CHANNEL			
Q602	2SK583	FET, N-CHANNEL			
Q701	2SK583	FET, N-CHANNEL			
Q702	2SK583	FET, N-CHANNEL			
R1	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R2	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R3	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R4	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R5	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R6	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R7	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R8	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R9	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R10	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R11	NO USE				
R12	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R13	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R14	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R15	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R16	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R17	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R18	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R19	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R20	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R21	NO USE				
R22	RD14BB2C560J	RES. CARBON	56	5%	1/6W
R23	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R24	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R25	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R26	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R27	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R28	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R31	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R32	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R33	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R34	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R35	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R36	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R37	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R38	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R39	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R40	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R41	NO USE				
R42	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R43	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R44	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R45	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R46	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R47	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R48	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R49	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R50	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R51	NO USE				
R52	RD14BB2C560J	RES. CARBON	56	5%	1/6W
R53	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R54	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R55	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R56	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R57	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R58	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R59	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R60	NO USE				
R61	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R62	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R63	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R64	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R65	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R66	NO USE				
R67	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R68	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R69	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R70	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R71	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R72	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R73	NO USE				
R74	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R75	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R76	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R77	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R78	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R81	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R82	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R152	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R171	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R172	NO USE				
R173	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R174	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R175	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R176	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R177	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R178	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R179	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R180	NO USE				
R181	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R182	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R183	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R184	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R185	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R186	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R187	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R188	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R189	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R190	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R191	RD14BB2C183J	RES. CARBON	18K	5%	1/6W
R192	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R193	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R194	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R195	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R196	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R197	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R198	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R199	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R200	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R201	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R202	NO USE				
R203	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R204	NO USE				
R205	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R206	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R207	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R208	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R209	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R210	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R243	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R244	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R245	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R246	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R247	RD14BB2C103J	RES. CARBON	10K	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R248	NO USE				
R249	RD14BB2C183J	RES. CARBON	18K	5%	1/6W
R250	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R251	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R254	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R255	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R258	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R259	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R301	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R302	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R303	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R331	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R332	NO USE				
R333	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R372	RD14BB2C683J	RES. CARBON	68K	5%	1/6W
R373	NO USE				
R374	RD14BB2C683J	RES. CARBON	68K	5%	1/6W
R601	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R602	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R603	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R604	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R701	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R702	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R703	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R704	RD14BB2C102J	RES. CARBON	1K	5%	1/6W

U1	CXD1175AP	IC,A/D CONVERTER
U2	DTM6010	IC,GATE ARRAY
U6	CXK5863P-35	IC,S-RAM
U7	CXK5863P-35	IC,S-RAM
U10	CXD1175AP	IC,A/D CONVERTER
U11	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U12	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U13	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U14	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U15	CXK5863P-35	IC,S-RAM
U16	CXK5863P-35	IC,S-RAM
U17	HD74HC138FP	IC,3-8 DECOD./DE-MPX
U18	SN74AS08N	IC,QUAD 2-INPUT AND GATE
U19	NO USE	
U20	DTM6010	IC,GATE ARRAY
U21	SN74AS74N	IC, DUAL D-F.F.(WITH PR & CLR)
U22	SN74AS74N	IC, DUAL D-F.F.(WITH PR & CLR)
U23	SN74AS04N	IC,HEX INVERTERS
U24	HD74HC161FP	IC,SYNC. 4-BIT COUNTER
U25	HD74HC161FP	IC,SYNC. 4-BIT COUNTER
U26	HD74HC161FP	IC,SYNC. 4-BIT COUNTER
U48	HD74HC244FP	IC,OCTAL BUS BUFFER
U49	HD74HC244FP	IC,OCTAL BUS BUFFER
U50	NO USE	
U51	SN74AS04N	IC,HEX INVERTERS
U52	HD74HC08FP	IC,QUAD 2-INPUT AND GATE
U53	HD74HC112FP	IC,DUAL J-K F.F. (WITH PR&CLR)
U54	HD74HC245FP	IC,OCTAL 3-S BUS TRANSCEIVER
U55	MB8464-10LL-FP	IC,S-RAM
U56	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U57	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U58	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U59	HD74HC153FP	IC,DUAL 4-1 DATA SELECT./MPX
U60	HD74HC4040FP	IC,12-BIT BINARY COUNTER
U61	HD74HC157FP	IC,QUAD. 2-1 DATA SELECT./MPX
U62	HD74HC592FP	IC,8-BIT REGISTER BINARY COUNT
U63	HD74HC592FP	IC;8-BIT REGISTER BINARY COUNT
U64	HD74HC161FP	IC,SYNC. 4-BIT COUNTER
U65	HD74HC112FP	IC,DUAL J-K F.F. (WITH PR&CLR)
U66	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U67	HD14052BFP	IC,DUAL 4-CH ANALOG MPX/DE-MPX
U68	HD74HC139FP	IC,DUAL 2-4 DECOD./DE-MPX
U69	HD74HC112FP	IC,DUAL J-K F.F. (WITH PR&CLR)
U70	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U71	DAC0800LCN	IC,8-BIT D/A CONVERTER
U72	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U73	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U74	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U75	AM6012DC	IC,12-BIT D/A CONVERTER
U76	HD74HC32FP	IC,QUAD. 2-OR
U77	NJM072M	IC,DUAL J-FET INPUT OP-AMP
U78	NJM072M	IC,DUAL J-FET INPUT OP-AMP
U79	HD74HC574FP	IC,OCTAL D-F.F. (3-S)
U80	NJM4558M	IC,DUAL OP-AMP
U81	HD74HC574FP	IC,OCTAL D-F.F. (3-S)

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
U110	HD14053BFP	IC,TRIPLE 2CH ANALOG MPX/DE-MP
U151	NJM4558M	IC,DUAL OP-AMP
VR5	R12-0580-05	RES. SEMI FIXED 500 B
VR6	R12-2523-05	RES. SEMI FIXED 5KB
VR7	R12-2523-05	RES. SEMI FIXED 5KB
VR8	R12-3551-05	RES. SEMI FIXED 10KB
VR14	R12-2523-05	RES. SEMI FIXED 5KB
VR15	NO USE	
VR16	R12-2523-05	RES. SEMI FIXED 5KB
VR63	R12-4517-05	RES. SEMI FIXED 50K
VR69	R12-4517-05	RES. SEMI FIXED 50K
VR601	R12-3552-05	RES. SEMI FIXED 20KB
VR602	R12-4518-05	RES. SEMI FIXED 50KB
VR701	R12-3552-05	RES. SEMI FIXED 20KB
VR702	R12-4518-05	RES. SEMI FIXED 50KB

FINAL UNIT

X80-1090-02

REF.NO	PARTS NO	NAME & DESCRIPTION
	F01-0859-14	HEAT SINK
	F01-0860-04	HEAT SINK
	J25-5183-22	PCB (UNMOUNTED)
	N09-0626-04	SCREW,SEMS PAN HD M3X10
	R92-0150-05	JUMPING RES. ZERO OHM(10MM)
C1	CK45F1H103Z	CAP. CERAMIC 0.01 +80-20% 50
C2	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C3	CC45FSL1H221J	CAP. CERAMIC 220P 5% 50V
C4	CC45FCH1H030C	CAP. CERAMIC 3P 0.25P 50V
C5	NO USE	
C6	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C7	CE04EW1C330M	CAP. ELECTRO 33 20% 16V
C13	CK45FE2H472P	CAP. CERAMIC 4700P 500V
C14	CK45FE2H472P	CAP. CERAMIC 4700P 500V
C19	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C20	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C21	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C22	CK45F1H103Z	CAP. CERAMIC 0.01 +80-20% 50
C23	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C28	C91-1232-05	CAP. CERAMIC 5.6P 10% 50V
C29	CC45FCH2H010C	CAP. CERAMIC 1P 0.25P 500V
C30	CC45FCH2H010C	CAP. CERAMIC 1P 0.25P 500V
C31	CK45B2H472K	CAP. CERAMIC 4700P 10% 500V
C32	CK45B2H472K	CAP. CERAMIC 4700P 10% 500V
C33	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C34	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C35	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C39	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C40	NO USE	
C41	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C45	CE04EW1C471M	CAP. ELECTRO 470 20% 16V
C46	CE04EW1C471M	CAP. ELECTRO 470 20% 16V
C47	CE04EW2A470M	CAP. ELECTRO 47 20% 100V
C48	CE04W2C100M	CAP. ELECTRO 10 20% 160V
C49	CK45FE2H472P	CAP. CERAMIC 4700P 500V
C50	CE04EW0J682M	CAP. ELECTRO 6800 20% 6.3V
C51	CE04EW0J682M	CAP. ELECTRO 6800 20% 6.3V
C52	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C53	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C54	NO USE	
C55	CC45SL1H471J	CAP. CERAMIC 470P 5% 50V
C58	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C59	CC45FCH1H470J	CAP. CERAMIC 47P 5% 50V
C60	NO USE	
C61	CC45FCH1H220J	CAP. CERAMIC 22P 5% 50V
C901	CC45FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C902	CC45FCH1H150J	CAP. CERAMIC 15P 5% 50V
C903	CQ92M1H104K	CAP. MYLAR 0.1 10% 50V
C904	CC45SL1H471J	CAP. CERAMIC 470P 5% 50V
C910	CC45CH1H220J	CAP. CERAMIC 22P 5% 50V
C911	CE04EW1C220M	CAP. ELECTRO 22 20% 16V
C912	CE04EW1C220M	CAP. ELECTRO 22 20% 16V
C913	CK45B1H472K	CAP. CERAMIC 4700P 10% 50V
C914	CC45CH1H020C	CAP. CERAMIC 2P 0.25P 50V
C923	CK45B1H472K	CAP. CERAMIC 4700P 10% 50V
D1	MA700	DIODE
D2	MA700	DIODE
D3	MA700	DIODE
D4	1SS132	DIODE
D5	MA700	DIODE
D6	MA700	DIODE
D7	1SS132	DIODE
D8	1SS132	DIODE
D9	NO USE	
D10	1SS132	DIODE
D11	MA700	DIODE
D12	NO USE	
D13	1SS132	DIODE
D14	1SS132	DIODE
D15	1SS132	DIODE
D16	1SS132	DIODE
D17	1SS132	DIODE
D18	1SS132	DIODE
D19	1SS132	DIODE
D20	1SS132	DIODE
D901	1SS132	DIODE
D902	1SS132	DIODE
D903	MA700	DIODE
D904	1SS132	DIODE
J250	E40-0318-05	PIN CONNECTOR 3P
J260	E40-0318-05	PIN CONNECTOR 3P
L1	L40-1292-70	FERRI INDUCTOR 1.2UH 10%
L2	L40-6882-70	FERRI INDUCTOR 0.68UH 20%
L3	L40-6882-70	FERRI INDUCTOR 0.68UH 20%
L4	L40-1292-70	FERRI INDUCTOR 1.2UH 10%
P8	E40-3238-05	PIN CONNECTOR 3P
P24	E40-3243-05	PIN CONNECTOR 8P
P41	E40-3241-05	PIN CONNECTOR 6P
P42	E40-3238-05	PIN CONNECTOR 3P
P43	E40-3238-05	PIN CONNECTOR 3P
P250	E40-0311-05	PIN CONNECTOR 3P
P260	E40-0311-05	PIN CONNECTOR 3P
Q1	2SA1206(K)	TR. SI, PNP
Q2	2SA1206(K)	TR. SI, PNP
Q3	2SC3354(S)	TR. SI, NPN
Q4	2SC3354(S)	TR. SI, NPN
Q5	2SC3354(S)	TR. SI, NPN
Q6	2SC3354(S)	TR. SI, NPN
Q7	2SC3354(S)	TR. SI, NPN
Q8	2SC3354(S)	TR. SI, NPN
Q9	2SC3354(S)	TR. SI, NPN
Q10	2SC3354(S)	TR. SI, NPN
Q11	2SC3779(D)	TR. SI, NPN
Q12	NO USE	
Q13	2SC3779(D)	TR. SI, NPN
Q14	NO USE	
Q15	2SC3596(E)	TR. SI, NPN
Q16	2SC3596(E)	TR. SI, NPN
Q17	2SC3315(D)	TR. SI, NPN
Q18	2SC3315(D)	TR. SI, NPN
Q19	2SA1005(K)	TR. SI, PNP
Q20	2SA1005(K)	TR. SI, PNP
Q23	2SC2785(F)	TR. SI, NPN
Q24	2SC2785(F)	TR. SI, NPN
Q25	2SC3354(S)	TR. SI, NPN
Q26	2SC3354(S)	TR. SI, NPN
Q27	2SC3354(S)	TR. SI, NPN
Q28	2SC3354(S)	TR. SI, NPN
Q29	2SA1175(F)	TR. SI, PNP
Q30	2SA1175(F)	TR. SI, PNP
Q31	2SC2785(F)	TR. SI, NPN
Q32	2SC2785(F)	TR. SI, NPN
Q33	2SC3354(S)	TR. SI, NPN
Q34	2SC3354(S)	TR. SI, NPN
Q35	2SC3354(S)	TR. SI, NPN
Q36	2SC3354(S)	TR. SI, NPN
Q37	2SC2911(S)	TR. SI, NPN
Q38	2SA1209(S)	TR. SI, PNP
Q39	2SC2911(S)	TR. SI, NPN

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q40	2SA1209(S)	TR. SI, PNP			
Q41	NO USE				
Q42	2SA1005(K)	TR. SI, PNP			
Q43	2SA1005(K)	TR. SI, PNP			
Q44	2SC2786(K)	TR. SI, NPN			
Q45	2SC2786(K)	TR. SI, NPN			
Q46	NO USE				
Q47	2SC3315(D)	TR. SI, NPN			
Q48	2SC3315(D)	TR. SI, NPN			
Q49	2SC2785(F)	TR. SI, NPN			
Q50	2SA1005(K)	TR. SI, PNP			
Q51	2SC2785(F)	TR. SI, NPN			
Q901	2SC2785(F)	TR. SI, NPN			
R1	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R2	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R3	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R4	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R5	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R6	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R7	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R8	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R9	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R10	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R11	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R12	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R13	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R14	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R15	RD14BB2E470J	RES. CARBON	47	5%	1/4W
R16	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R17	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R18	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R19	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R20	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R21	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R22	RD14BB2C623J	RES. CARBON	62K	5%	1/6W
R23	NO USE				
R24	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R25	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R26	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R27	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R28	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R29	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R30	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R31	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R32	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R33	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R34	NO USE				
R35	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R36	NO USE				
R37	RN14BK2E62R0F	RES. METAL FILM	62.0	1%	1/4W
R38	RN14BK2E62R0F	RES. METAL FILM	62.0	1%	1/4W
R39	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R42	RD14BB2C430J	RES. CARBON	43	5%	1/6W
R48	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R49	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R50	NO USE				
R51	R92-1411-05	RES. SPR5L30	1.2K	5%	5W
R52	R92-1412-05	RES. SPR5L30	1.8K	5%	5W
R53	R92-1412-05	RES. SPR5L30	1.8K	5%	5W
R54	R92-1411-05	RES. SPR5L30	1.2K	5%	5W
R60	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R78	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R79	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R80	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R81	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R82	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R83	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R84	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R87	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R88	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R89	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R90	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R91	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R92	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R93	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R94	NO USE				
R95	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R96	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R97	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R98	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R99	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R100	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R101	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R102	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R103	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R104	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R105	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R106	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R107	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R108	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R109	NO USE				
R110	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R111	RD14BB2C364J	RES. CARBON	360K	5%	1/6W
R112	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R113	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R114	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R115	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R116	RN14BK2H3902F	RES. METAL FILM	39K	1%	1/2W
R117	RN14BK2H3902F	RES. METAL FILM	39K	1%	1/2W
R118	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R119	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R120	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R121	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R122	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R123	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R124	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R125	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R126	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R127	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R128	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R129	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R130	NO USE				
R131	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R132	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R150	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R156	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R157	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R160	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R161	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R162	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R163	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R164	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R165	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R166	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R167	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R168	RD14BB2C201J	RES. CARBON	200	5%	1/6W
R169	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R170	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R171	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R172	NO USE				
R173	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R174	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R175	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R176	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R177	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R178	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R179	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R180	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R181	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R182	RD14BB2C112J	RES. CARBON	1.1K	5%	1/6W
R183	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R184	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R185	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R186	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R187	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R188	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R189	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R190	NO USE				
R191	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R192	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R193	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R194	NO USE				
R195	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R196	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R197	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R198	RN14BK2C1300F	RES. METAL FILM	130	1%	1/6W
R199	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R200	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R201	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R202	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R203	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R206	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R207	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R208	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R209	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R210	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R211	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R212	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R213	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R901	RD14BB2C101J	RES. CARBON	100	5%	1/6W

PARTS LIST

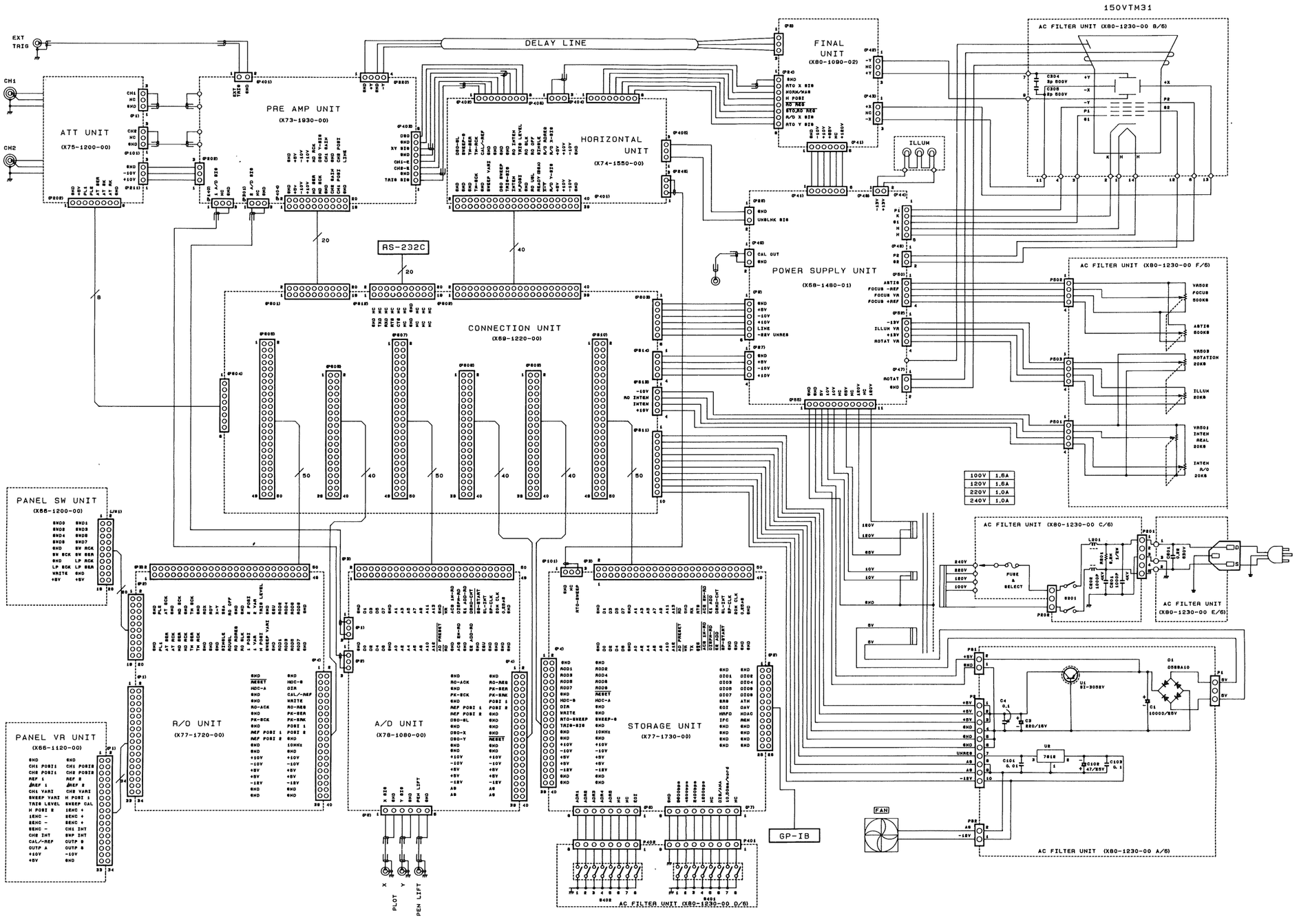
REF.NO	PARTS NO	NAME & DESCRIPTION			
R902	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R903	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R904	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R905	RD14BB2C113J	RES. CARBON	11K	5%	1/6W
R906	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R910	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R911	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R912	RD14BB2C240J	RES. CARBON	24	5%	1/6W
R913	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R922	RD14BB2C240J	RES. CARBON	24	5%	1/6W
R923	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R930	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R931	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R932	RN14BK2C8201F	RES. METAL FILM	8.2K	1%	1/6W
TC1	C05-0445-05	CAP. TRIMMER	20P		
TC2	C05-0449-05	CAP. TRIMMER	100P		
TH3	SDT1000	THERMISTOR			
TH4	SDT100	THERMISTOR			
VR1	R12-1539-05	RES. SEMI FIXED	2KB		
VR2	R12-0569-05	RES. SEMI FIXED	100 B		
VR3	R12-0571-05	RES. SEMI FIXED	500 B		
VR4	R12-1538-05	RES. SEMI FIXED	1KB		
VR5	R12-0569-05	RES. SEMI FIXED	100 B		
VR6	R12-4416-05	RES. SEMI FIXED	50KB		
VR7	R12-0570-05	RES. SEMI FIXED	200 B		
VR8	R12-0569-05	RES. SEMI FIXED	100 B		
VR9	R12-0570-05	RES. SEMI FIXED	200 B		
VR10	R12-1538-05	RES. SEMI FIXED	1KB		
VR11	R12-0571-05	RES. SEMI FIXED	500 B		

AC FILTER UNIT

X80-1230-00

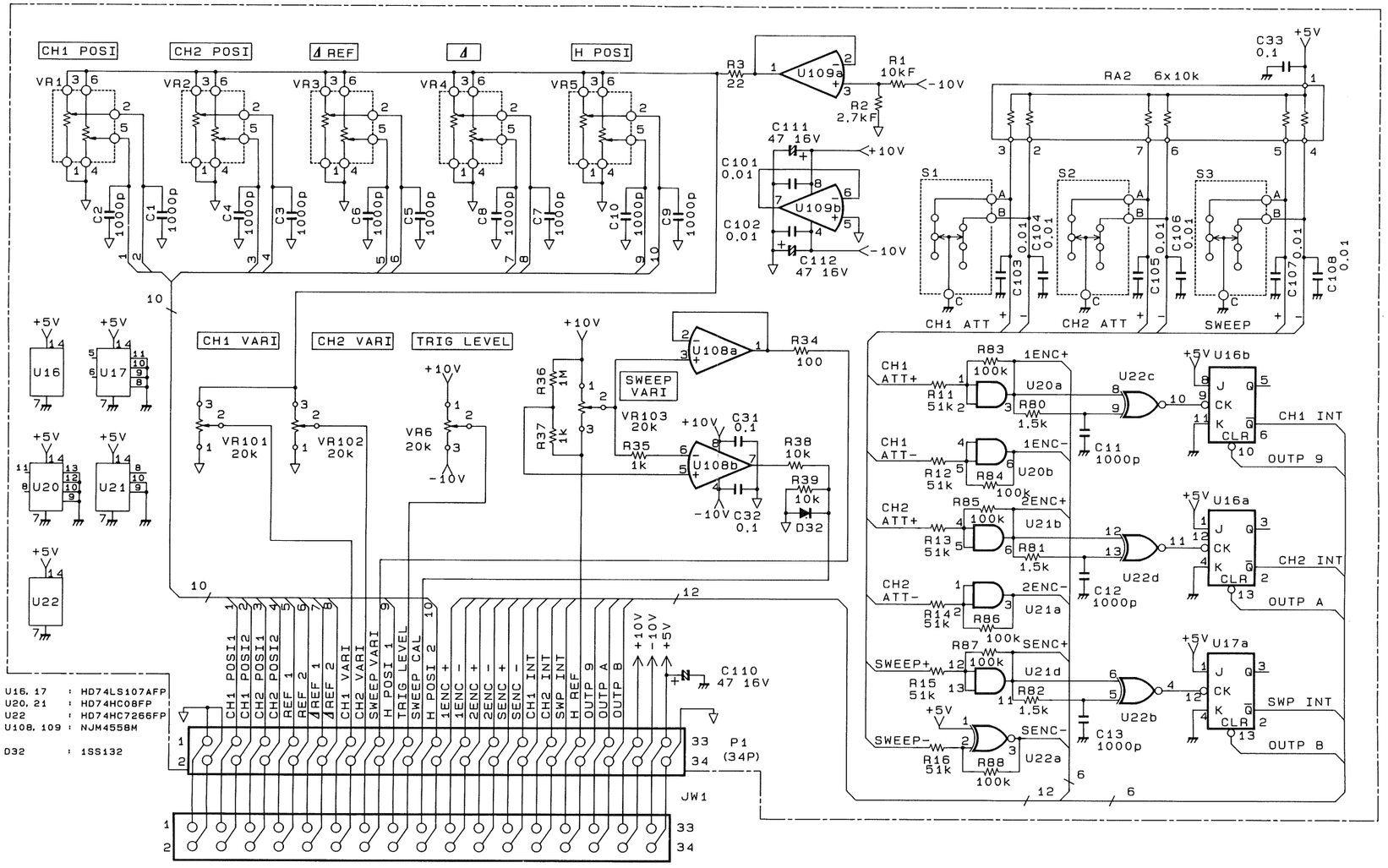
REF.NO	PARTS NO	NAME & DESCRIPTION			
	E38-0354-05	WIRE ASS'Y			
	E38-0355-05	WIRE ASS'Y			
	F02-0521-03	HEAT SINK			
	J73-0122-12	PCB (UNMOUNTED)			
	N09-0626-04	SCREW,SEMS PAN HD M3X10			
	R92-0150-05	JUMPING RES.	ZERO OHM(10MM)		
	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
C1	C90-3050-05	CAP. ELECTRO	10000	20%	25V
C2	NO USE				
C3	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C4	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C101	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C102	CE04EW1E470M	CAP. ELECTRO	47	20%	25V
C103	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C201	C91-0575-05	CAP. CERAMIC	1000P	20%	4KV
C202	C91-0575-05	CAP. CERAMIC	1000P	20%	4KV
C304	CC45CH2H030C	CAP. CERAMIC	3P	0.25P	500V
C305	CC45CH2H020C	CAP. CERAMIC	2P	0.25P	500V
C601	C91-0551-05	CAP. POLYESTER	0.22	10%	630V
D1	D5SBA10	DIODE,BRIDGE			
JW303	E38-0352-25	WIRE ASS'Y			
JW304	E38-0353-05	WIRE ASS'Y			
JW601	E38-0360-25	WIRE ASS'Y			
L201	L33-0808-05	CHOKE COIL			
P1	E40-0305-05	PIN CONNECTOR	3P		
P2	E40-5067-05	PIN CONNECTOR	10P		
P81	E40-3237-05	PIN CONNECTOR	2P		
P82	E40-3237-05	PIN CONNECTOR	2P		
P201	E40-7104-05	PIN CONNECTOR	4P		
P202	E40-7103-05	PIN CONNECTOR	3P		
P401	E40-3306-05	PIN CONNECTOR	9P		
P402	E40-3305-05	PIN CONNECTOR	8P		
P501	E40-3239-05	PIN CONNECTOR	4P		
P502	E40-3239-05	PIN CONNECTOR	4P		
P503	E40-3239-05	PIN CONNECTOR	4P		
R201	RD14BY2H225J	RES. CARBON	2.2M	5%	1/2W
S201	S40-2524-05	PUSH SWITCH;POWER			
S401	S62-0608-05	DIP SWITCH			
S402	S62-0608-05	DIP SWITCH			
U1	SI-3052V	IC,3-TERMINAL REGULATOR			
U2	NJM7912FA	IC,3-TERMINAL REGULATOR			
VR501	R23-3506-05	V.R.	1K B		
VR502	R23-7501-05	V.R. (FOCUS,ASTIG)	500KB X 2		
VR503	R23-3503-05	V.R. (ILLUM,ROTAT)	20KB X 2		
Z302	E01-0103-05	CRT SOCKET			

SCHEMATIC DIAGRAM



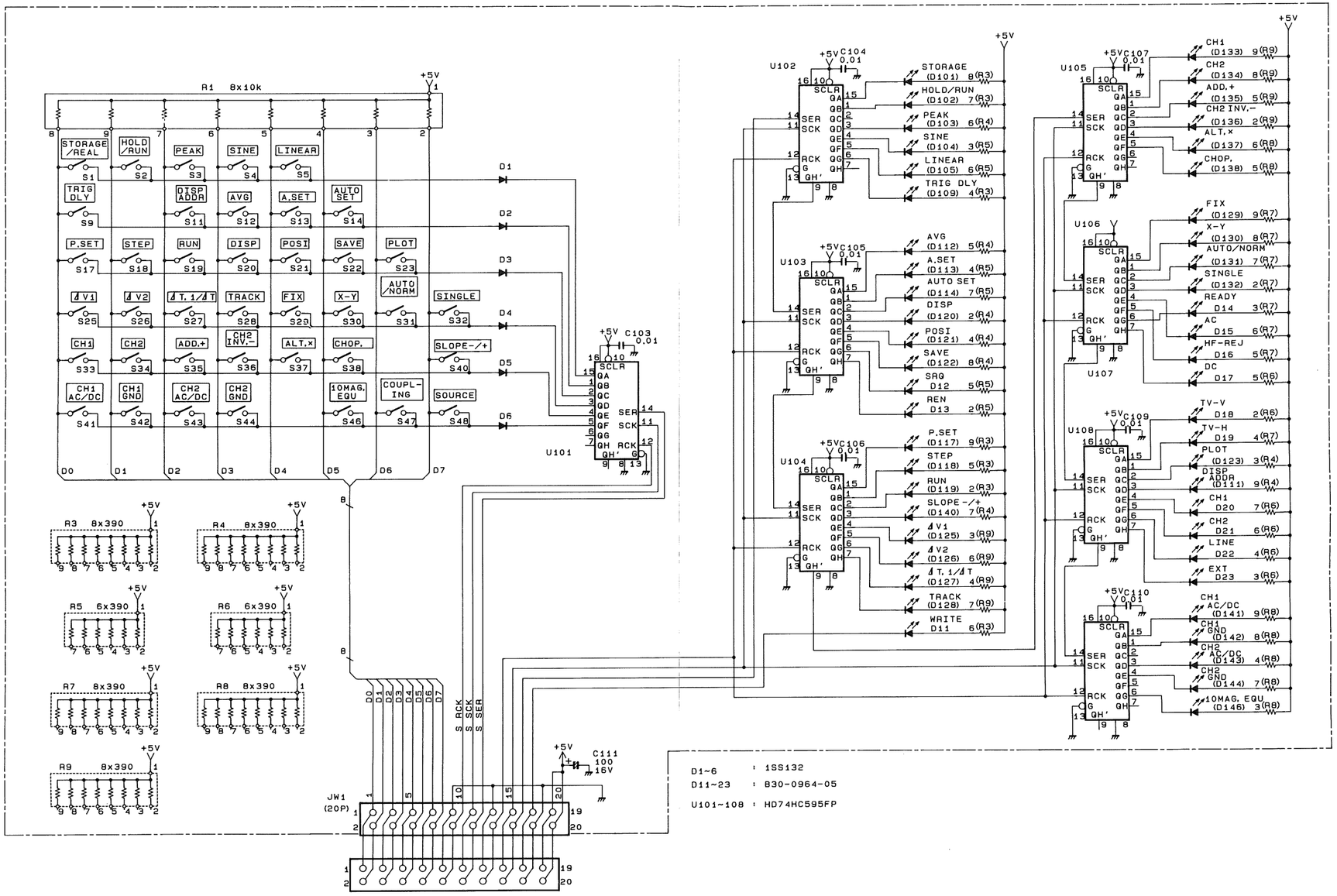
SCHEMATIC DIAGRAM

PANEL VR UNIT (X66-1120-00)

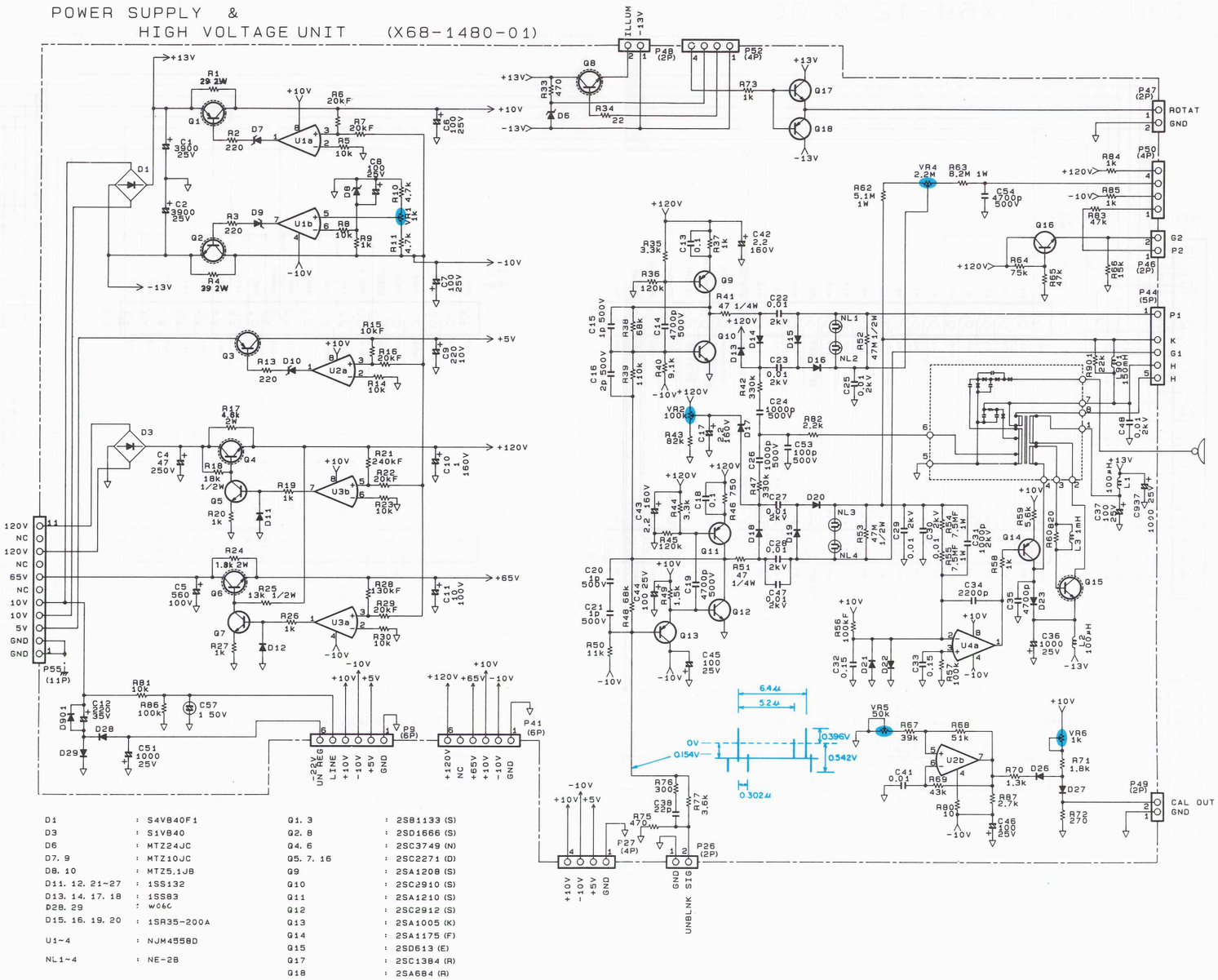


SCHEMATIC DIAGRAM

PANEL SWITCH UNIT (X66-1200-00)



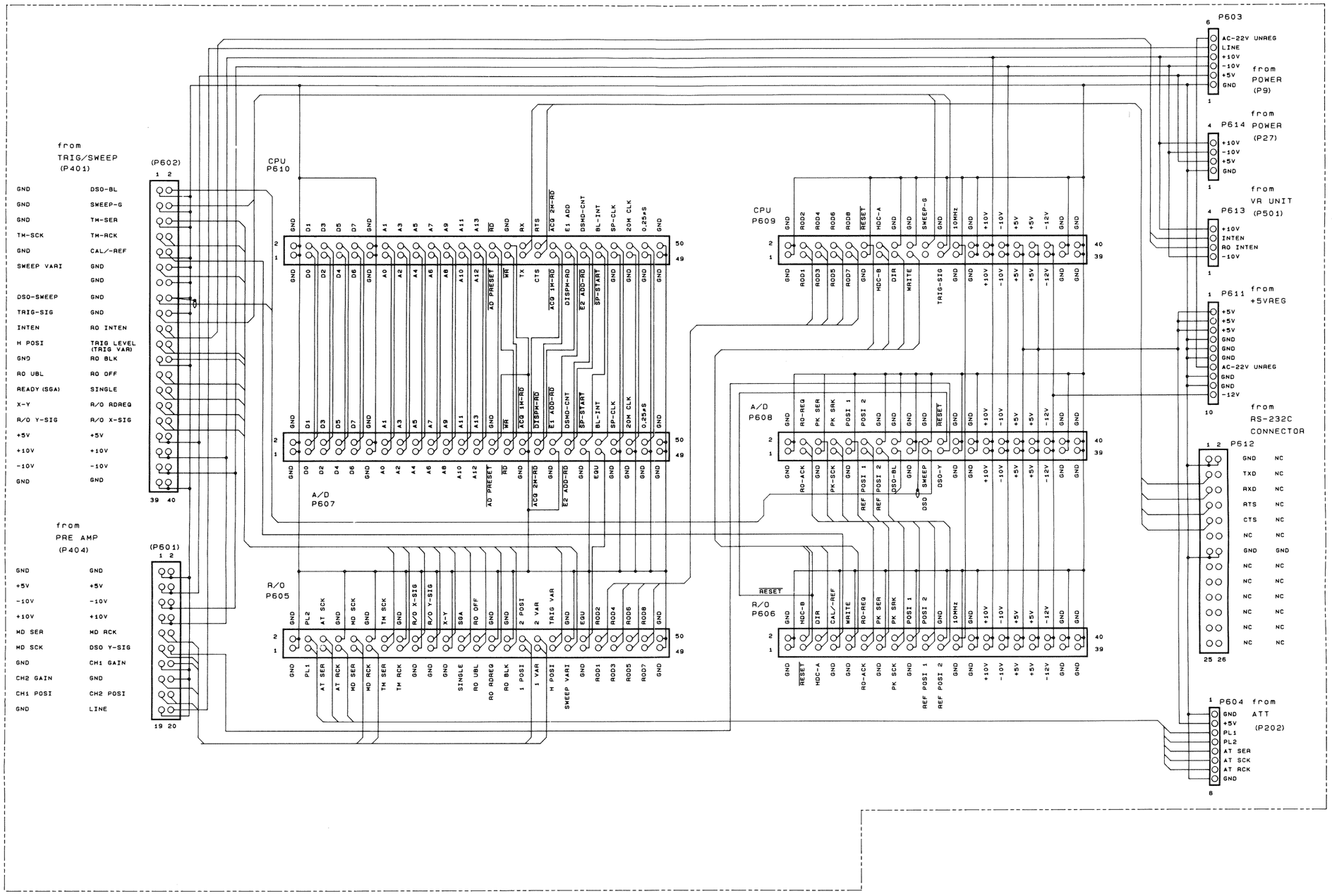
SCHEMATIC DIAGRAM



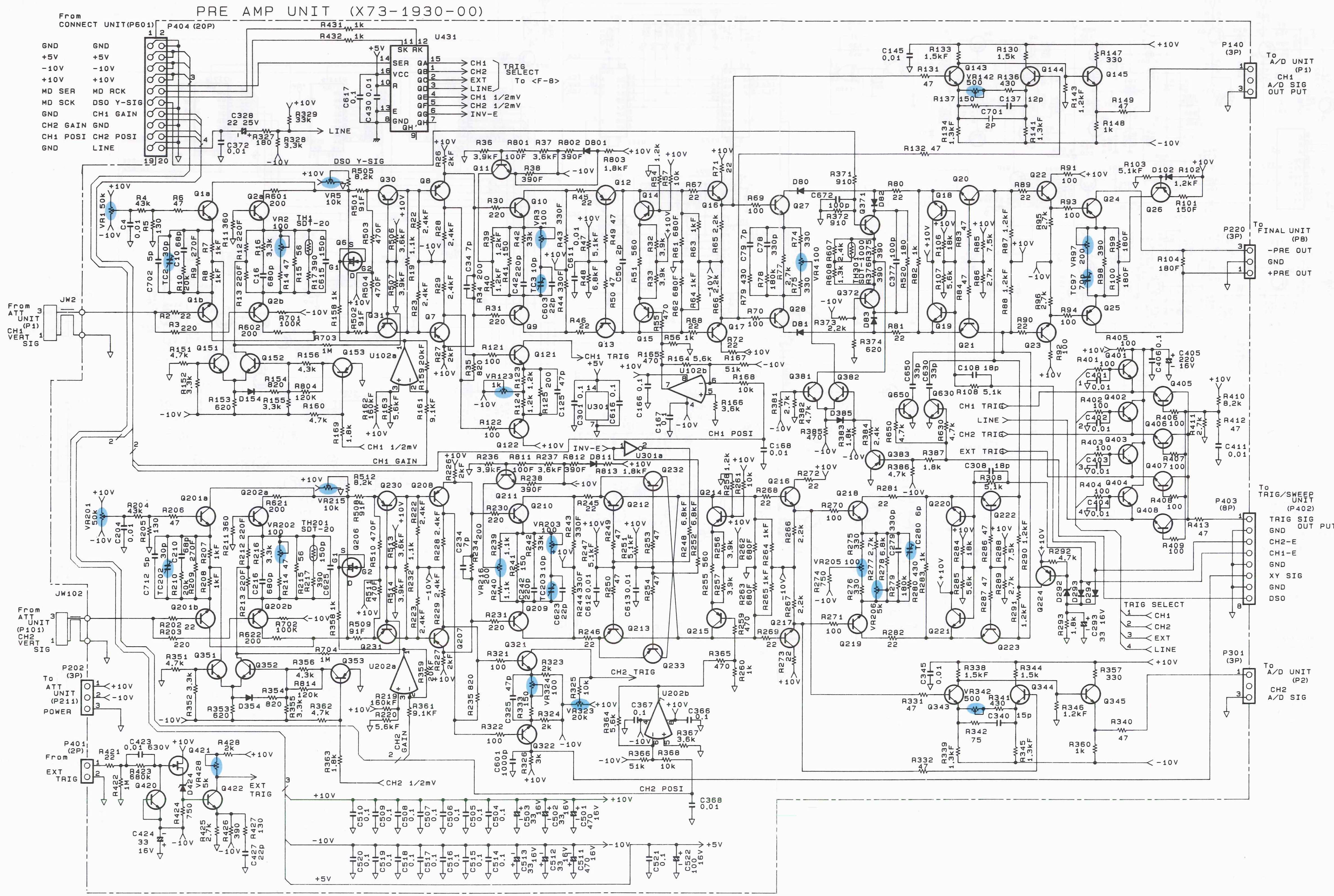
D1	: S4VB40F1	Q1, 3	: 2SB1133 (S)
D3	: S1VB40	Q2, 8	: 2SD1666 (S)
D6	: MTZ24JC	Q4, 6	: 2SC3749 (N)
D7, 9	: MTZ10JC	Q5, 7, 16	: 2SC2271 (D)
D8, 10	: MTZ5.1JB	Q9	: 2SA1208 (S)
D11, 12, 21~27	: 1SS132	Q10	: 2SC2910 (S)
D13, 14, 17, 18	: 1SS83	Q11	: 2SA1210 (S)
D28, 29	: W06C	Q12	: 2SC2912 (S)
D15, 16, 19, 20	: 1SR35-200A	Q13	: 2SA1005 (K)
U1~4	: NJM4558D	Q14	: 2SA1175 (F)
NL1~4	: NE-28	Q15	: 2SD613 (E)
		Q17	: 2SC1384 (R)
		Q18	: 2SA684 (R)

SCHEMATIC DIAGRAM

CONNECTION UNIT (X69-1220-00)



SCHEMATIC DIAGRAM



U102, 202	: NJM4558D
U301	: HD74HC04FP
U431	: HD74HC595FP
D102, 154, 354, 384, 801, 811	: 1SS132
D80~83, 293, 294	: MA700
D292, 424	: MTZ6.2JB
Q1, 201	: 2SC4072
Q2, 202	: 2SC3381 (GR)
Q6, 206	: 3SK121 (GR)
Q7, 8, 26, 30, 31, 207, 208, 224, 230, 231	: 2SA1005 (K)
Q9, 10, 209, 210	: 2SC2671 (H)
Q11, 20~23, 27, 28, 121, 122, 143~145, 151, 211, 218, 219, 222, 223, 321, 322, 343~345, 351, 371, 372, 405~408, 420, 422	: 2SC3354 (S)
Q12~15, 24, 25, 212~215, 232, 233	: 2SA1206 (K)
Q16, 17, 216, 217	: 2SC3779 (D)
Q18, 19, 220, 221, 381, 382, 401~404	: 2SC2785 (F)
Q152, 352	: 2SC2910 (S)
Q153, 353, 383	: 2SA1175 (F)
Q421	: 2SK404 (F)
Q630, 650	: 2SC3315 (C)

SCHEMATIC DIAGRAM

HORIZONTAL UNIT (X74-1550-00)

Q1. 102	: 2SA1206 (K)
Q2. 8. 9. 114. 131	: 2SA1005 (K)
Q3. 6. 7	: 2SC2671 (H)
Q4. 5	: 2SK241 (Y)
Q10. 51~56. 101. 132. 147. 148. 178~180 201. 205. 401	: 2SC2785 (F)
Q11. 143~146. 149. 150. 183. 184. 186. 187	: 2SA1175 (F)
Q21	: 2SC4049
Q120	: 2SC3732 (L)
Q121~123. 171. 172. 202~204	: 2SC2786 (K)
Q141. 142. 151	: 2SC3354 (S)
U101. 105. 108	: HD74HC00FP
U102	: MC10102L
U103	: MC10H131L
U104	: HD74HC123AFP
U105	: HD74HC08FP
U107	: SN74ALS00N
U109	: HD74HC112FP
U110. 111. 113	: HD74HC595FP
U112	: MC10107L
U114	: HD14053BFP
U121~124	: HD14051BFP
U141	: 2SK332 (F)
U201. 203	: NJM072M
U202	: NJM4558M
D1~10. 21. 119. 162. 175. 178~180. 187 236. 237. 119	: 1SS132
D12. 13. 101. 102. 109~112. 142. 151. 152 170. 221. 301	: MA700
D14	: MTZ4.7JC
D901	: 1SS132

ATT UNIT (X75-1200-00) SCHEMATIC DIAGRAM

Q1, Q101	:	2SK404 (F)
Q2, Q3, Q4, Q5, Q102, Q103, Q104, Q105	:	2SC3354 (S)
Q201, Q202, Q203, Q204	:	2SC4049
U1, U101	:	LF411CN
U201, U202	:	HD74HC595FP
D1, D101, D201, D202, D203, D204	:	1SS132
D2, D102	:	MTZ5, 1JB

SCHEMATIC DIAGRAM

READOUT UNIT (X77-1720-00)

U1	: LH0080BF
U2	: T93-0751-74
U3	: M88464-10LL-FP
U4	: CTM5110
U5,U8	: HD74HC138FP
U6	: HD74LS138FP
U7	: HD74HC238FP
U9,U10,U11,U13,U15	: HD74LS244FP
U12,U50	: HD74HC574FP
U14,U41	: HD74HC244FP
U15,U16,U18,U30	: HD74LS107AFP
U19	: HA17555PS
U23	: MSM62428GS-VK
U24	: PST5188
U25	: HD14066BP
U26	: HD74HC08FP
U27	: HD74HC04FP
U28,U29	: HD74LS157FP
U31	: HD74LS11FP
U32	: T93-0752-04
U33	: CTM5020
U34	: HD74HC174FP
U35	: AM6012DC
U36,U37,U38,U51	: HD14051BFP
U39,U40	: HD14052BFP
U42,U43,U44,U45,U52,U53	: NJM4558M
U46	: HD74HC00FP
U47	: NJM311M
U48	: DAC0808LCN
U49	: HD74HC564FP
Q1,Q2	: 2SC3354 (S)
D8	: MTZ5.1JB
D5,D6	: DAP803
D1,D2,D3,D4,D7	: 1SS132

From PANEL VR UNIT (P1)

GND	CH1 POSI1	GND
CH1 POSI2	CH2 POSI1	CH2 POSI2
REF 1	REF 2	
∠REF 1	∠REF 2	
CH1 VARI	CH2 VARI	
SWEEP VARI	H POSI 1	
TRIG LEVEL	SWEEP CAL	
H POSI 2	1ENC +	
1ENC −	2ENC +	
2ENC −	SENC +	
SENC −	CH1 INT	
CH2 INT	SWP INT	
CAL/−REF	OUTP 9	
OUTP A	OUTP B	
+10	−10V	
+5V	GND	

From CONNECTION UNIT (605)

GND	GND
PL1	PL2
AT SER	AT SCK
AT RCK	GND
MD SER	MD SCK
MD RCK	GND
TM SER	TM SCK
TM RCK	GND
GND	ROX
GND	ROY
GND	X-Y
SINGLE	SGA
RQUBL	RQ OFF
RQ RDREQ	GND
RQ BLK	GND
1 POSI	2 POSI
1 VAR	2 VAR
H POSI	TRIG LEVEL
SWEEP VARI	GND
GND	EQU
ROD1	ROD2
ROD3	ROD4
ROD5	ROD6
ROD7	ROD8
GND	GND

From CONNECTION UNIT (P606)

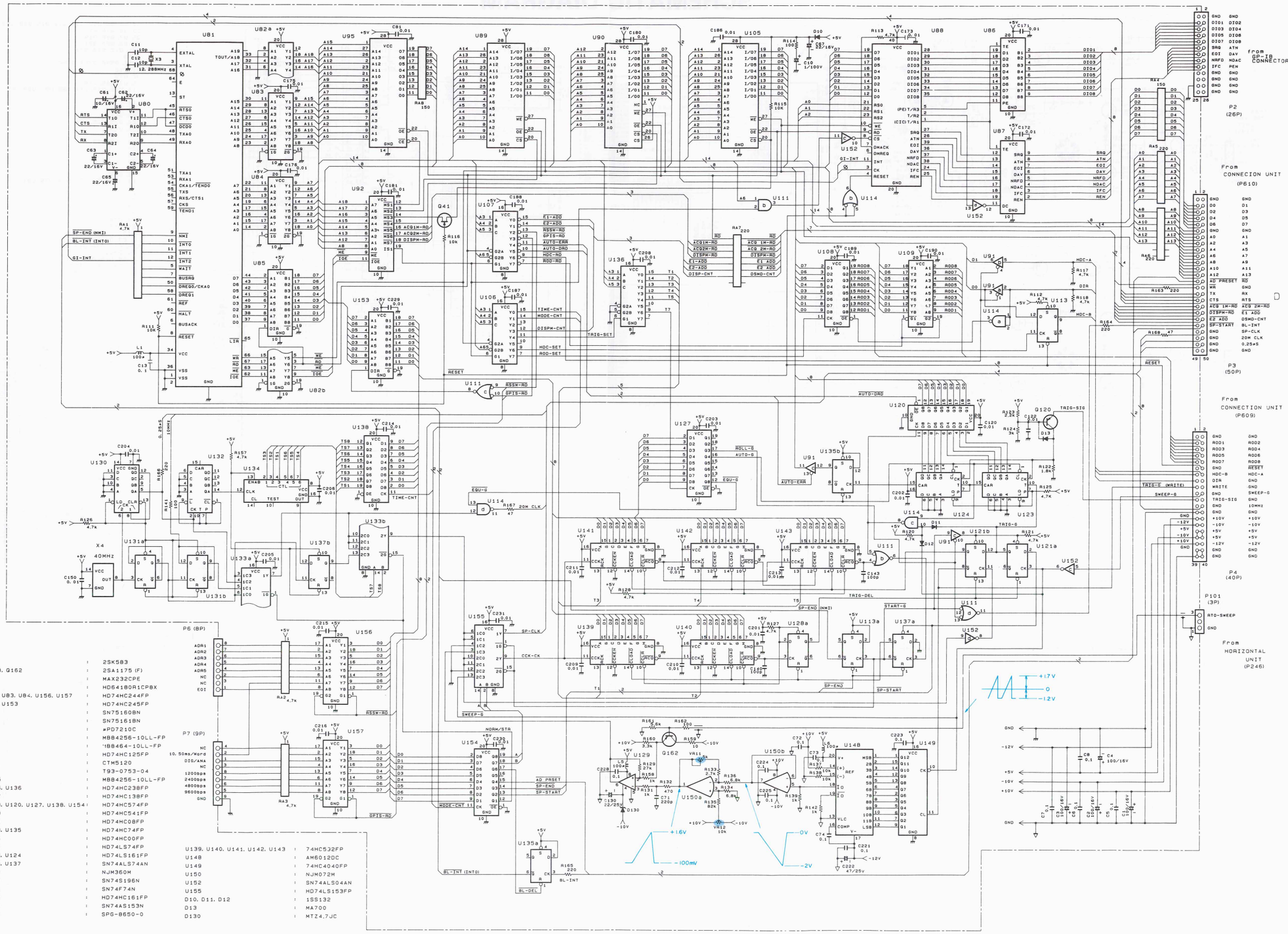
GND	GND
RESET	HDC-B
HDC-A	DIR
GND	CAL/−REF
GND	WRITE
RQ-ACK	RQ-REQ
GND	PK-SER
PK-SCK	PK-SRK
GND	POSI 1
REF POSI 1	POSI 2
REF POSI 2	GND
GND	10MHz
GND	GND
+10V	+10V
−10V	−10V
+5V	+5V
+5V	+5V
−12V	−12V
GND	GND
GND	GND

From PANEL SW UNIT (P2)

SWD0	SWD1
SWD2	SWD3
SWD4	SWD5
SWD6	SWD7
GND	SW RCK
SW SCK	SW SER
GND	LP RCK
LP SCK	LP SER
WRITE	GND
+5V	+5V

STORAGE UNIT (X77-1730-00)

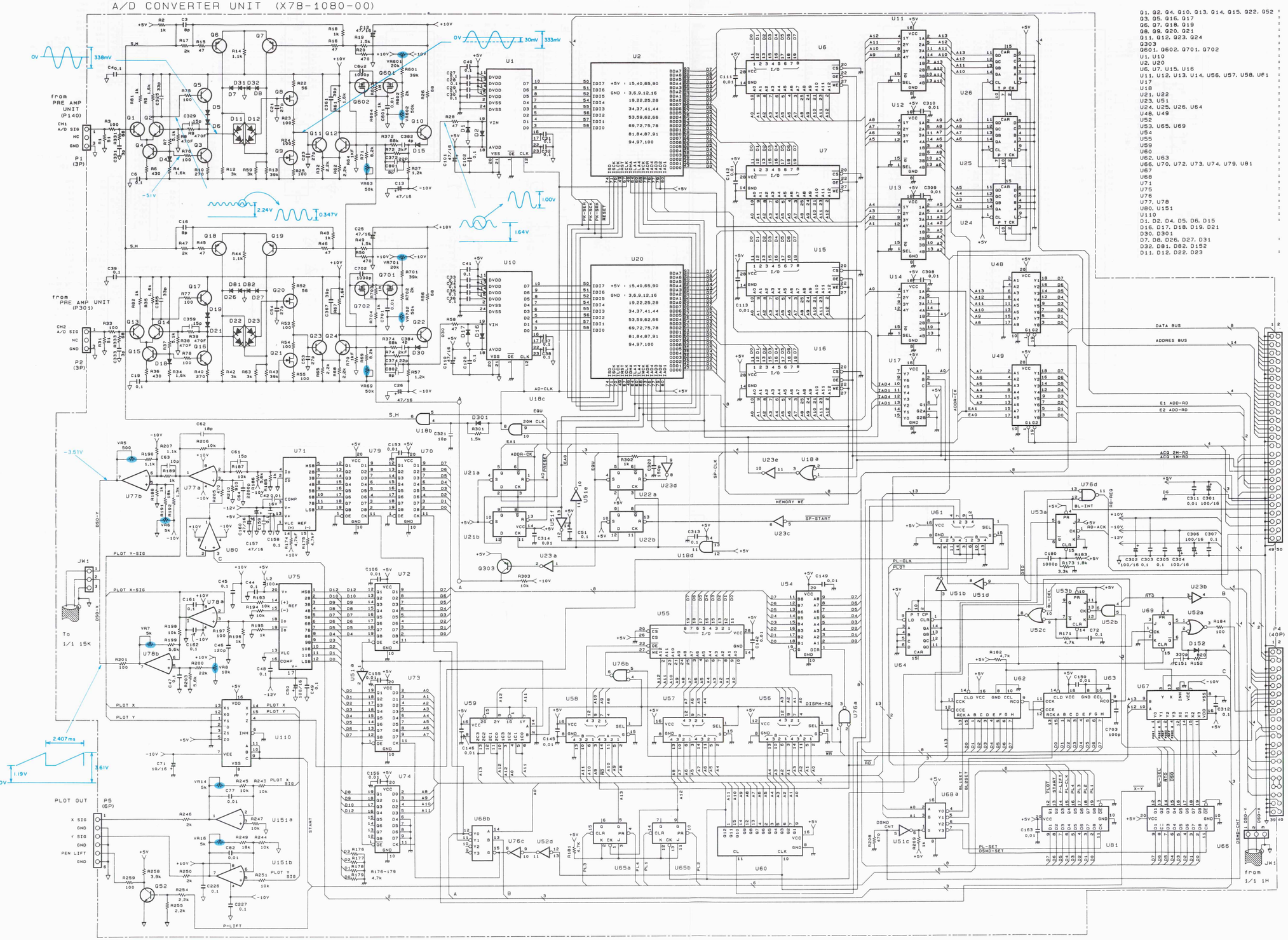
SCHEMATIC DIAGRAM



Q41	:	2SK583
Q120, Q162	:	2SA1175 (F)
U80	:	MAX232CPE
U81	:	HD64180R1CP8X
U82, U83, U84, U156, U157	:	HD74HC244FP
U85, U153	:	HD74HC245FP
U86	:	SN75160BN
U87	:	SN75161BN
U88	:	#PD7210C
U89	:	MB84256-10LL-FP
U90	:	'1B8464-10LL-FP
U91	:	HD74HC125FP
U92	:	CTM5120
U95	:	T93-0753-04
U105	:	MB84256-10LL-FP
U106, U136	:	HD74HC238FP
U107	:	HD74HC138FP
U108, U120, U127, U138, U154	:	HD74HC574FP
U109	:	HD74HC541FP
U111	:	HD74HC08FP
U113, U135	:	HD74HC74FP
U114	:	HD74HC00FP
U121	:	HD74LS74FP
U123, U124	:	HD74LS161FP
U128, U137	:	SN74ALS74AN
U129	:	NJM360M
U130	:	SN74S196N
U131	:	SN74F74N
U132	:	HD74HC161FP
U133	:	SN74AS153N
U134	:	SPG-8650-0

U139, U140, U141, U142, U143	:	74HC532FP
U148	:	AM6012DC
U149	:	74HC4040FP
U150	:	NJM072M
U152	:	SN74ALS04AN
U155	:	HD74LS153FP
D10, D11, D12	:	1SS132
D13	:	MA700
D130	:	MTZ4.7JC

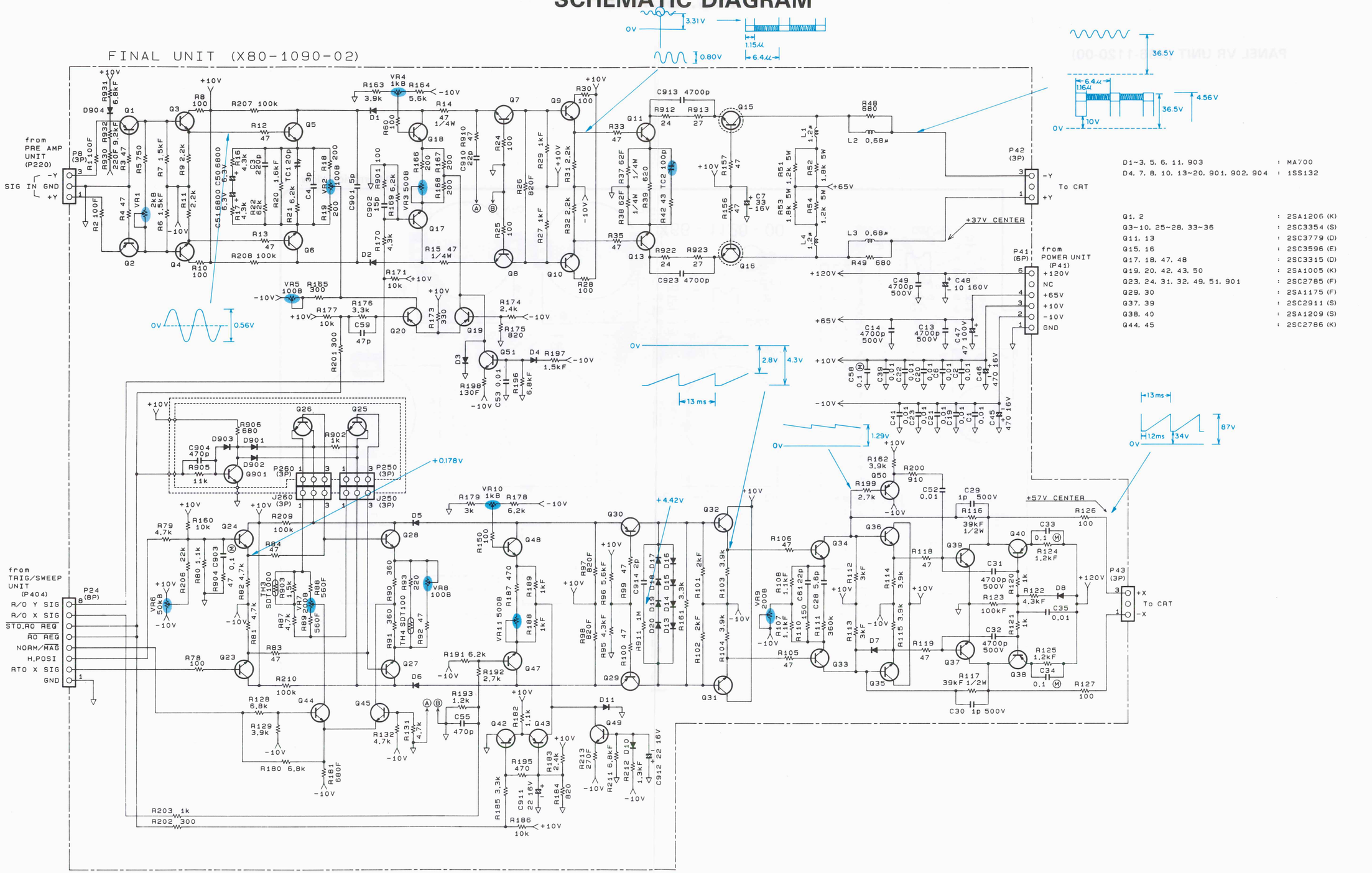
SCHEMATIC DIAGRAM



Q1, Q2, Q4, Q10, Q13, Q14, Q15, Q22, Q52	2SC3354 (S)
Q3, Q5, Q16, Q17	2SC3779 (D)
Q6, Q7, Q18, Q19	2SA1206 (K)
Q8, Q9, Q20, Q21	2SK241 (Y)
Q11, Q12, Q23, Q24	2SC2785 (F)
Q303	2SA1565
Q601, Q602, Q701, Q702	2SK583
U1, U10	CXD1175AP
U2, U20	DTM6010
U6, U7, U15, U16	CXK5863P-35
U11, U12, U13, U14, U56, U57, U58, U61	HD74HC157FP
U17	HD74HC138FP
U18	SN74AS08N
U21, U22	SN74AS74N
U23, U51	SN74AS04N
U24, U25, U26, U64	HD74HC161FP
U48, U49	HD74HC244FP
U52	HD74HC08FP
U53, U65, U69	HD74HC112FP
U54	HD74HC245FP
U55	M88464-10LL-FP
U59	HD74HC153FP
U60	HD74HC4040FP
U62, U63	HD74HC592FP
U66, U70, U72, U73, U74, U79, U81	HD74HC574FP
U67	HD14052BFP
U68	HD74HC139FP
U71	DAC0800LCN
U75	AM6012DC
U76	HD74HC32FP
U77, U78	NJM072M
U80, U151	NJM4558M
U110	HD140538FP
D1, D2, D4, D5, D6, D15 D16, D17, D18, D19, D21 D30, D301	1SS132
D7, D8, D26, D27, D31 D32, D81, D82, D152	MA700
D11, D12, D22, D23	HSM88AS

SCHEMATIC DIAGRAM

FINAL UNIT (X80-1090-02)



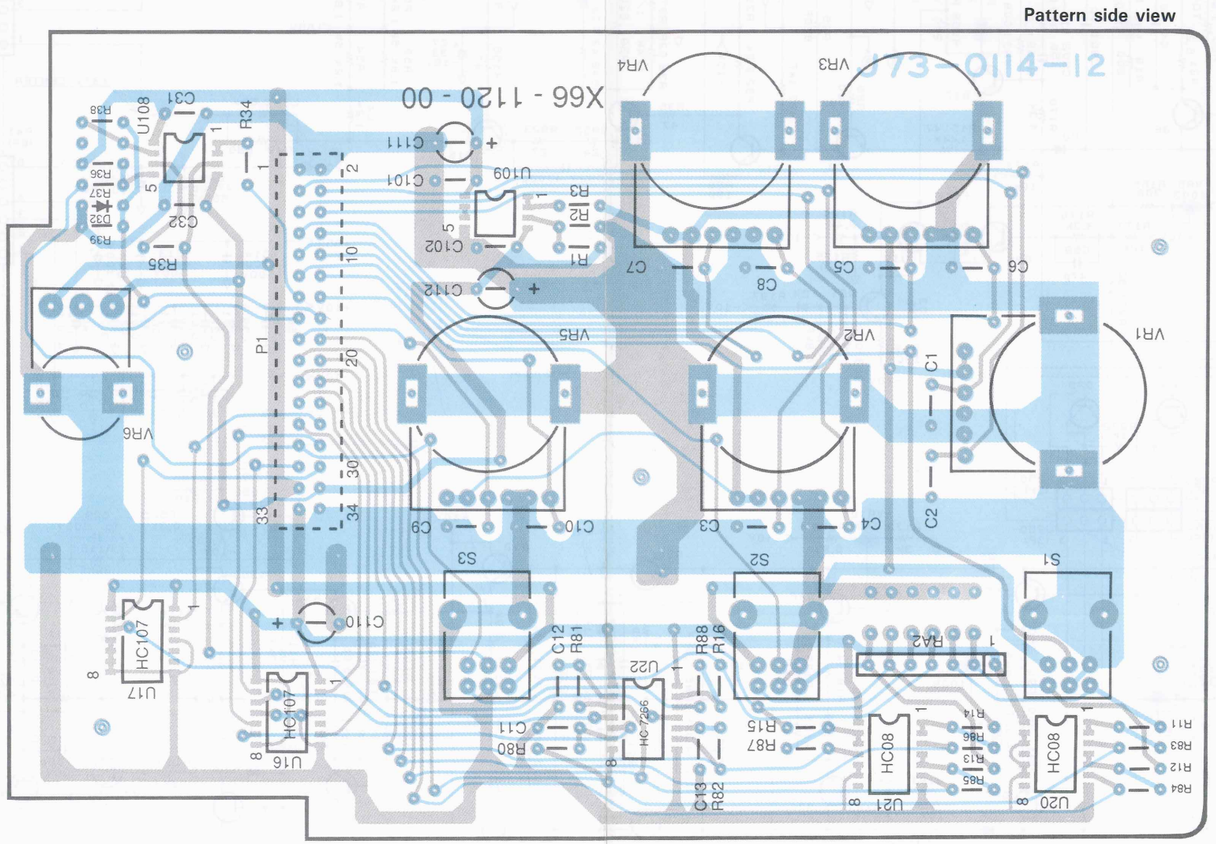
D1~3. 5. 6. 11. 903	: MA700
D4. 7. 8. 10. 13~20. 901. 902. 904	: 1SS132

Q1. 2	: 2SA1206 (K)
Q3~10. 25~28. 33~36	: 2SC3354 (S)
Q11. 13	: 2SC3779 (D)
Q15. 16	: 2SC3596 (E)
Q17. 18. 47. 48	: 2SC3315 (D)
Q19. 20. 42. 43. 50	: 2SA1005 (K)
Q23. 24. 31. 32. 49. 51. 901	: 2SC2785 (F)
Q29. 30	: 2SA1175 (F)
Q37. 39	: 2SC2911 (S)
Q38. 40	: 2SA1209 (S)
Q44. 45	: 2SC2786 (K)

P.C. BOARD

PANEL VR UNIT (X66-1120-00)

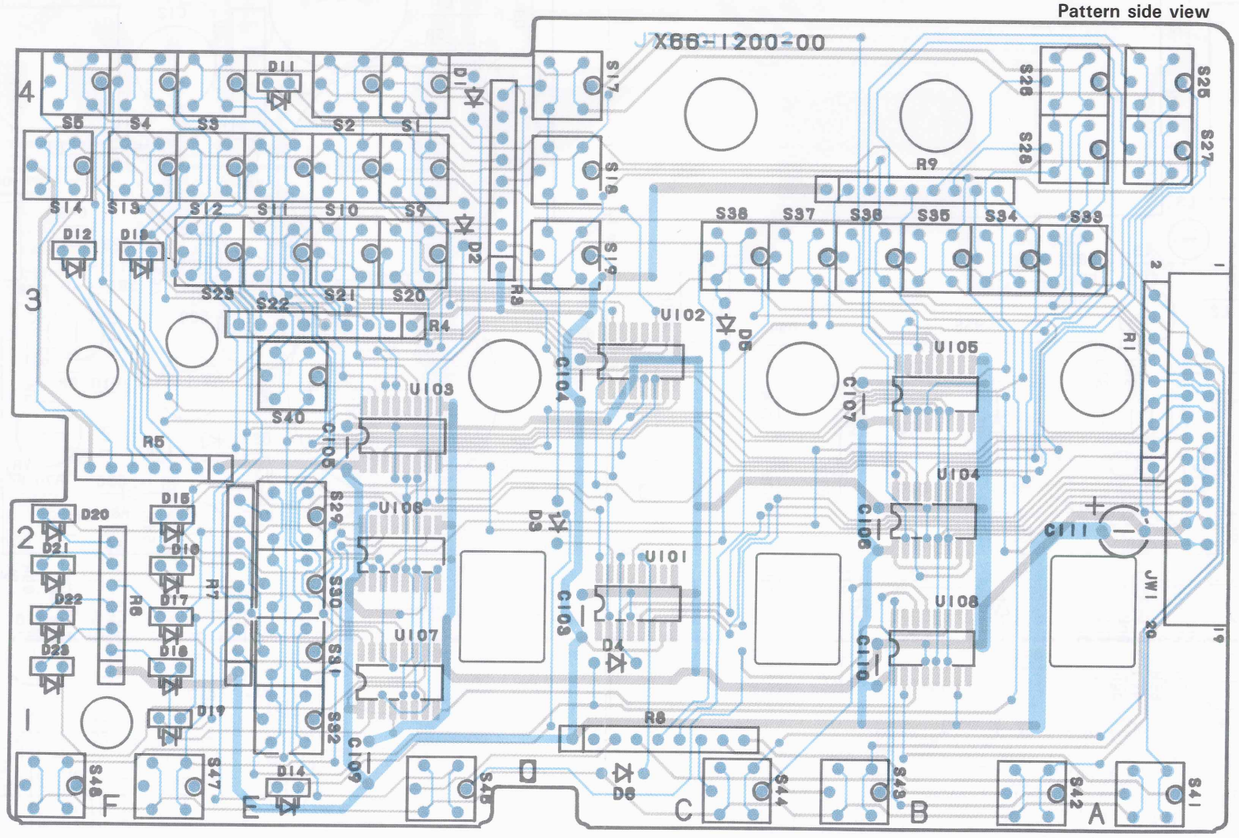
Pattern side view



P.C. BOARD

PANEL SW UNIT (X66-1200-00)

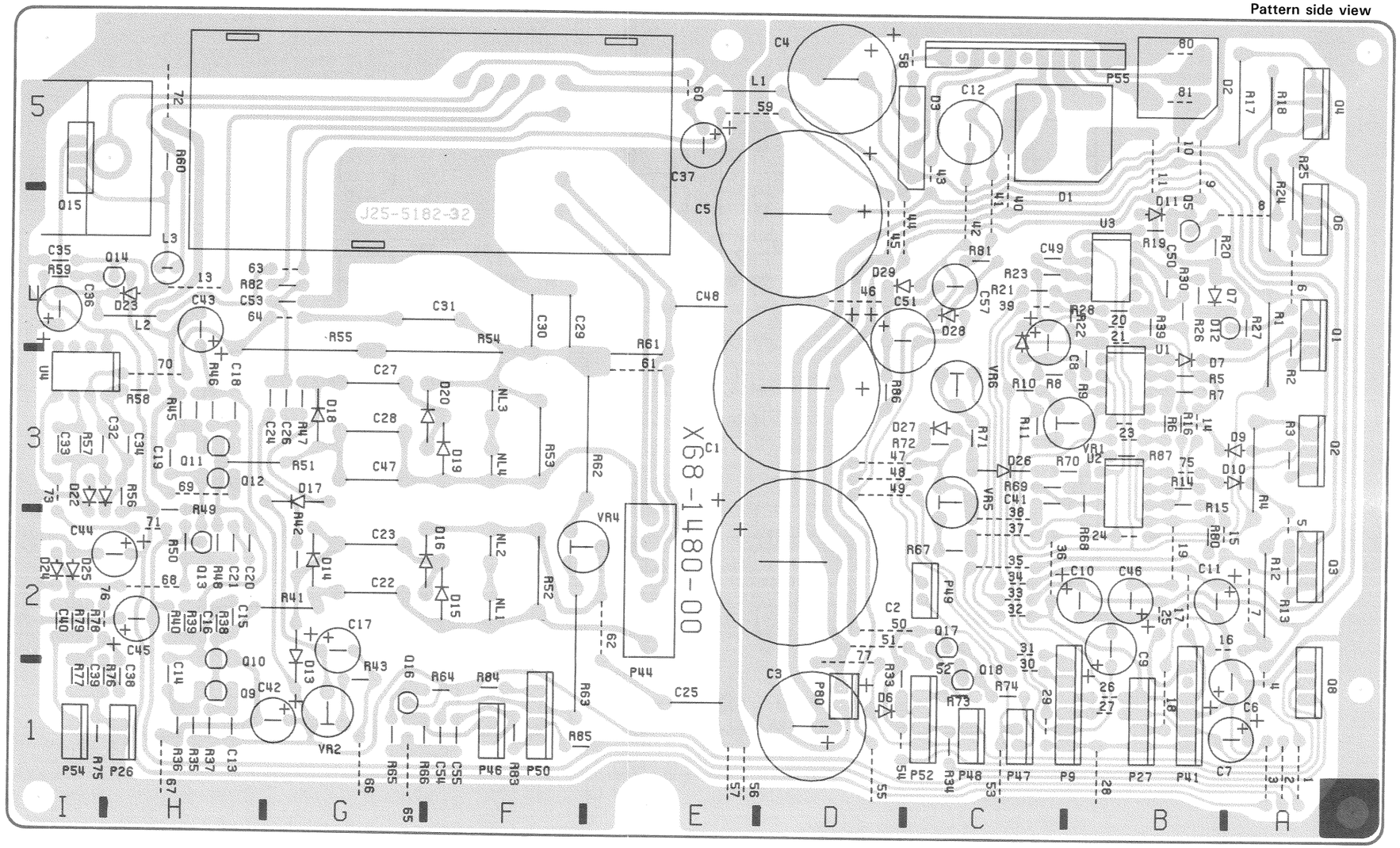
Pattern side view



P.C. BOARD

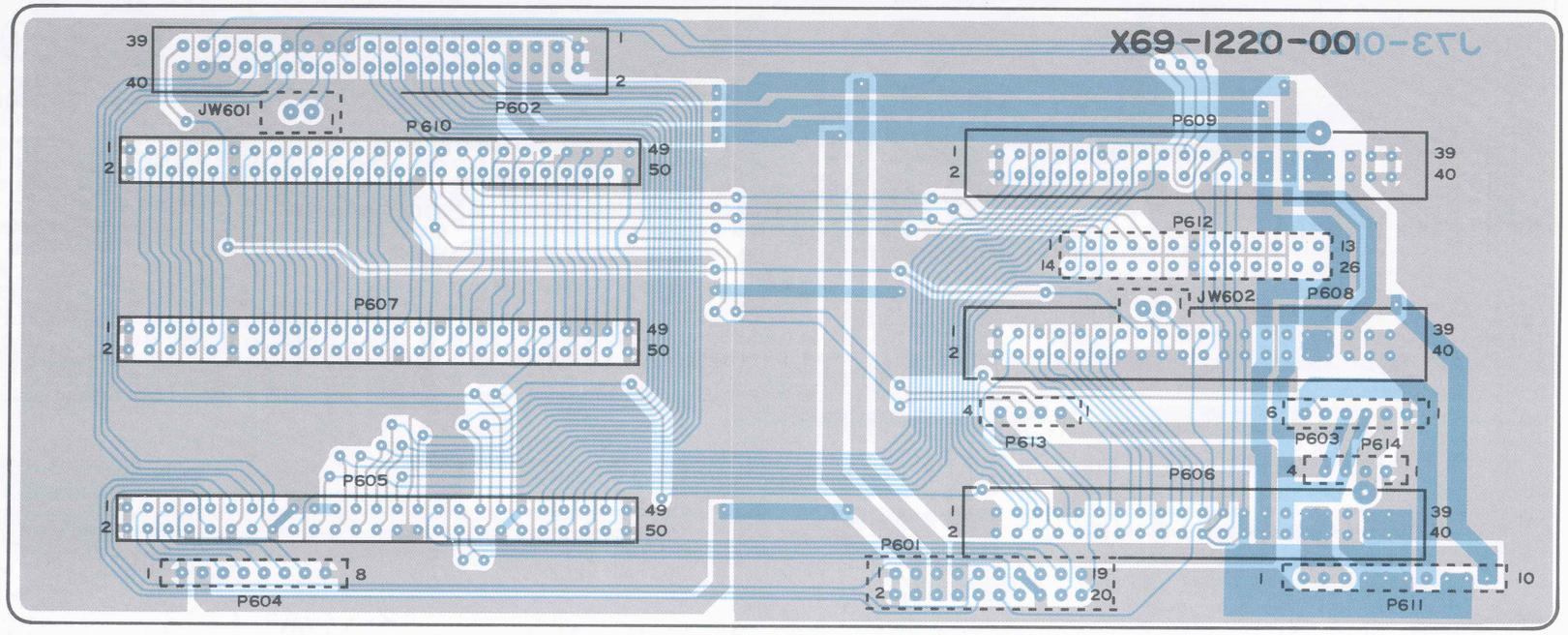
POWER SUPPLY UNIT (X68-1480-01)

Pattern side view



P.C. BOARD

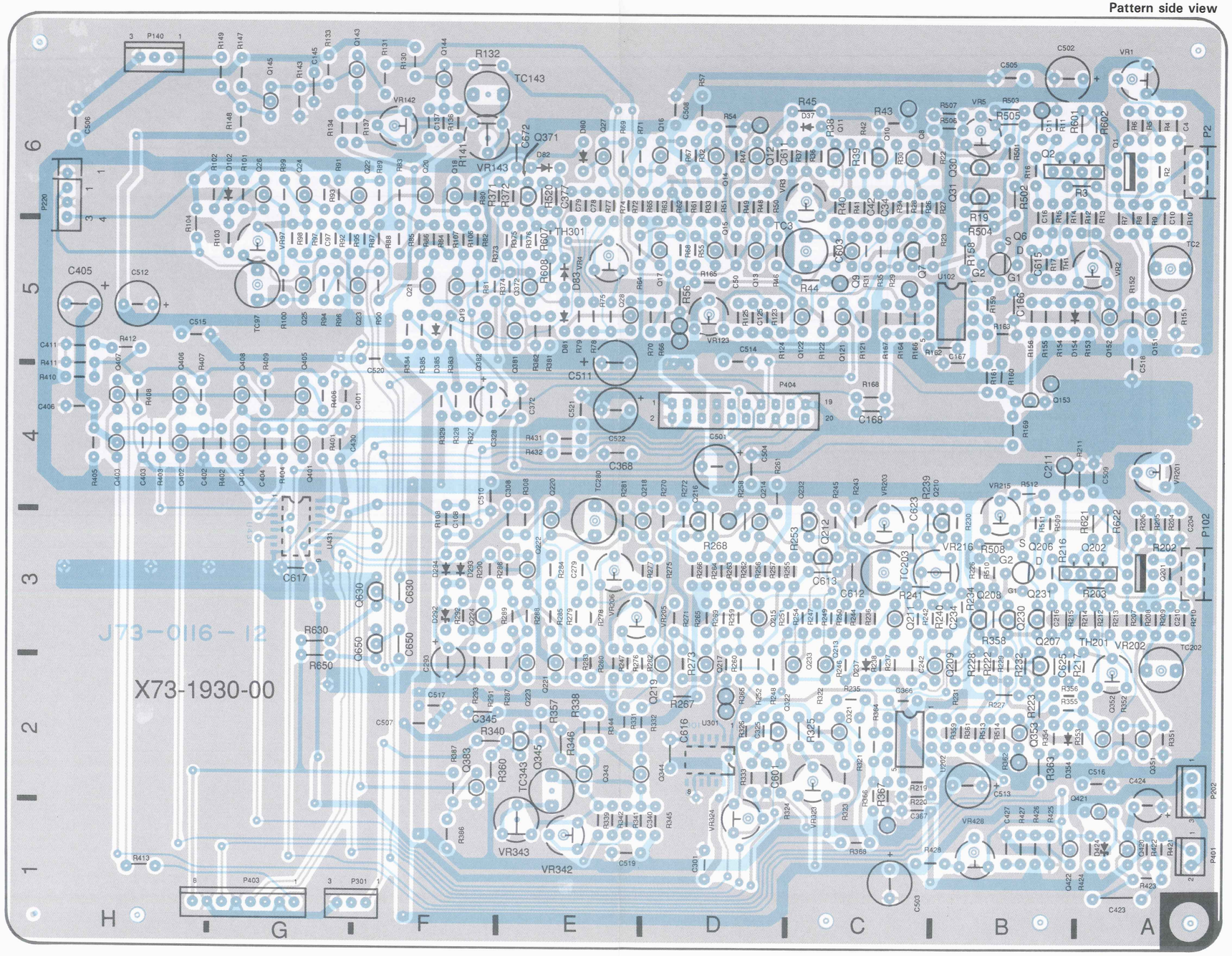
CONNECTION UNIT (X69-1220-00)



P.C. BOARD

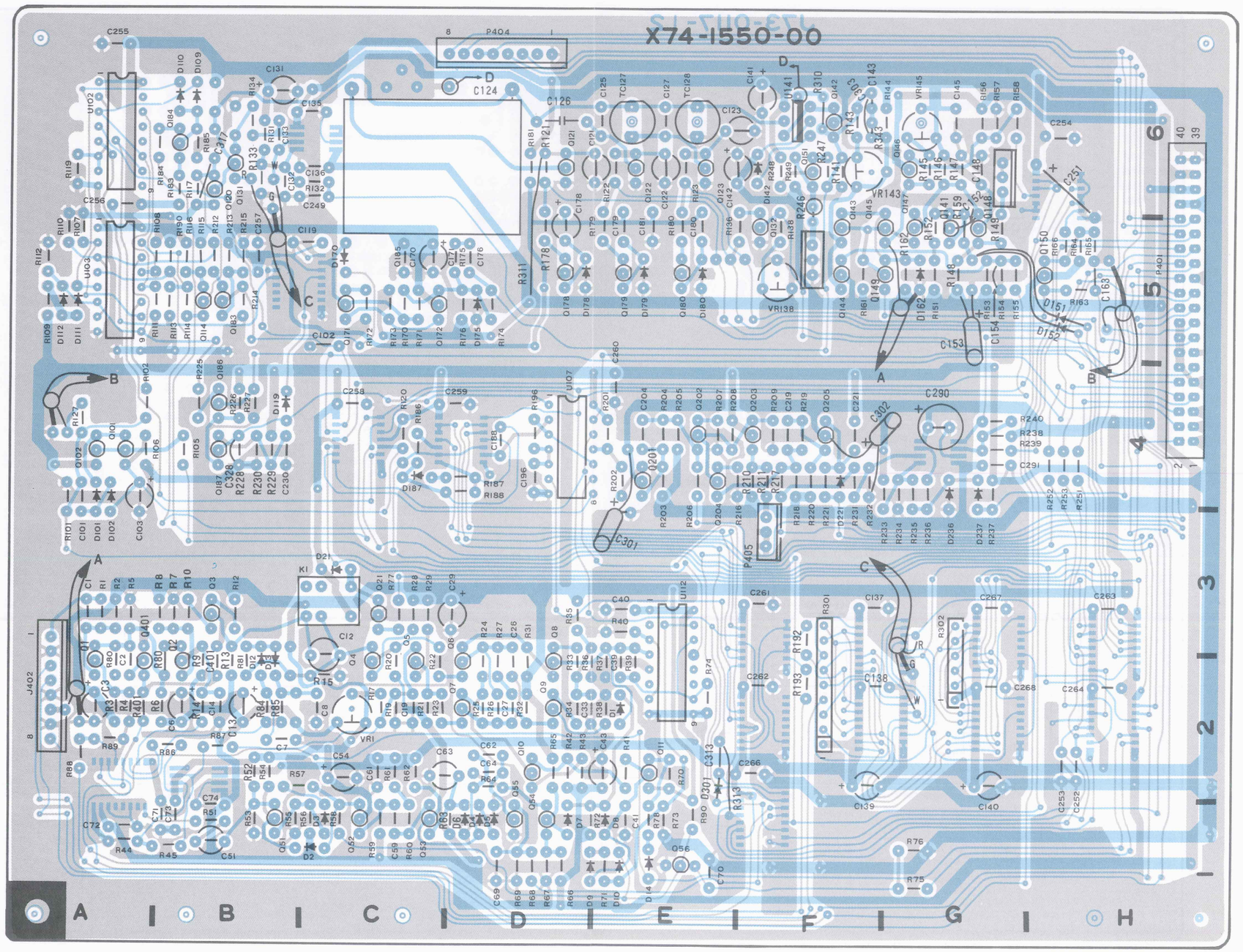
PRE AMP UNIT (X73-1930-00)

Pattern side view



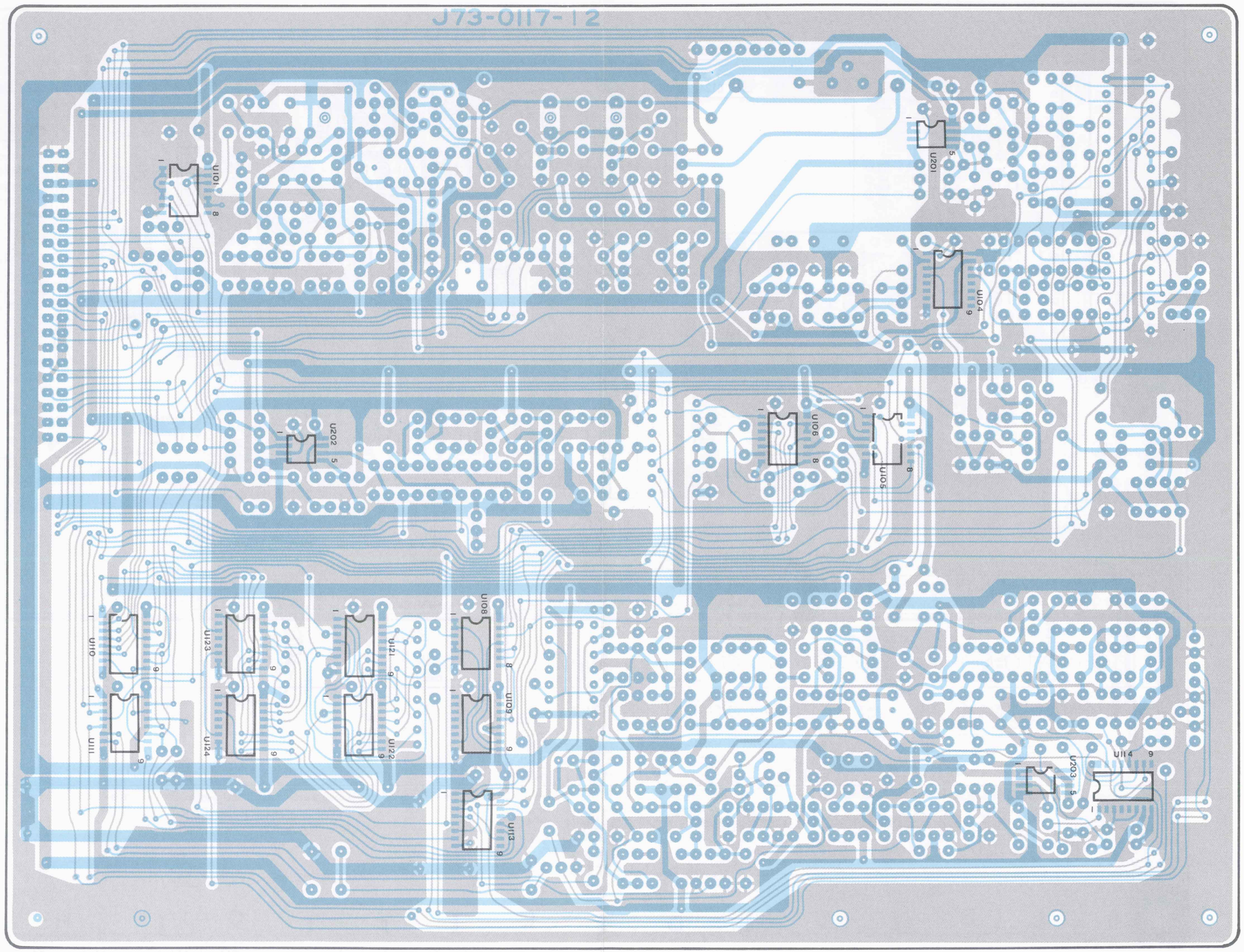
P.C. BOARD

HORIZONTAL UNIT (X74-1550-00) A



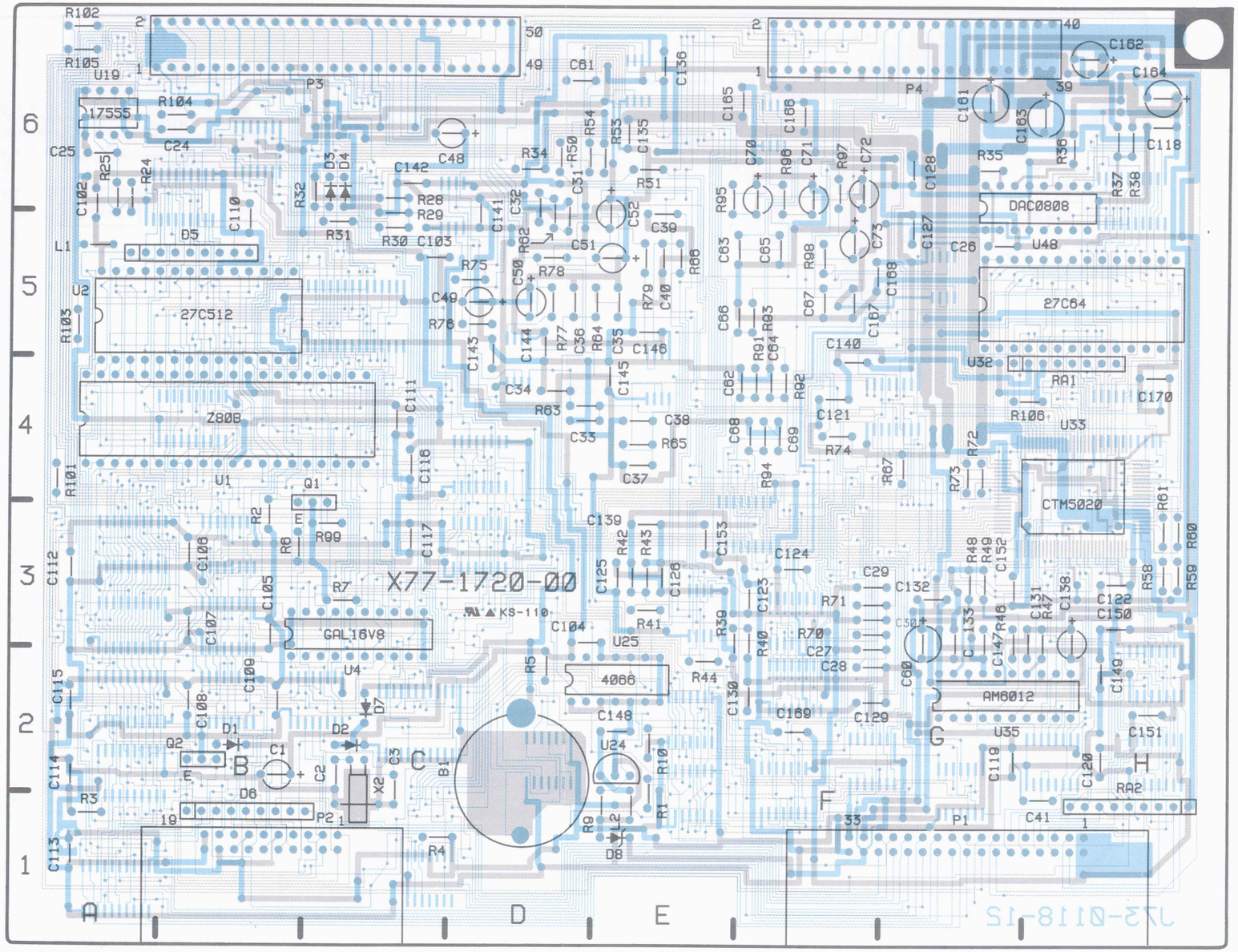
P.C. BOARD

HORIZONTAL UNIT (X74-1550-00) B



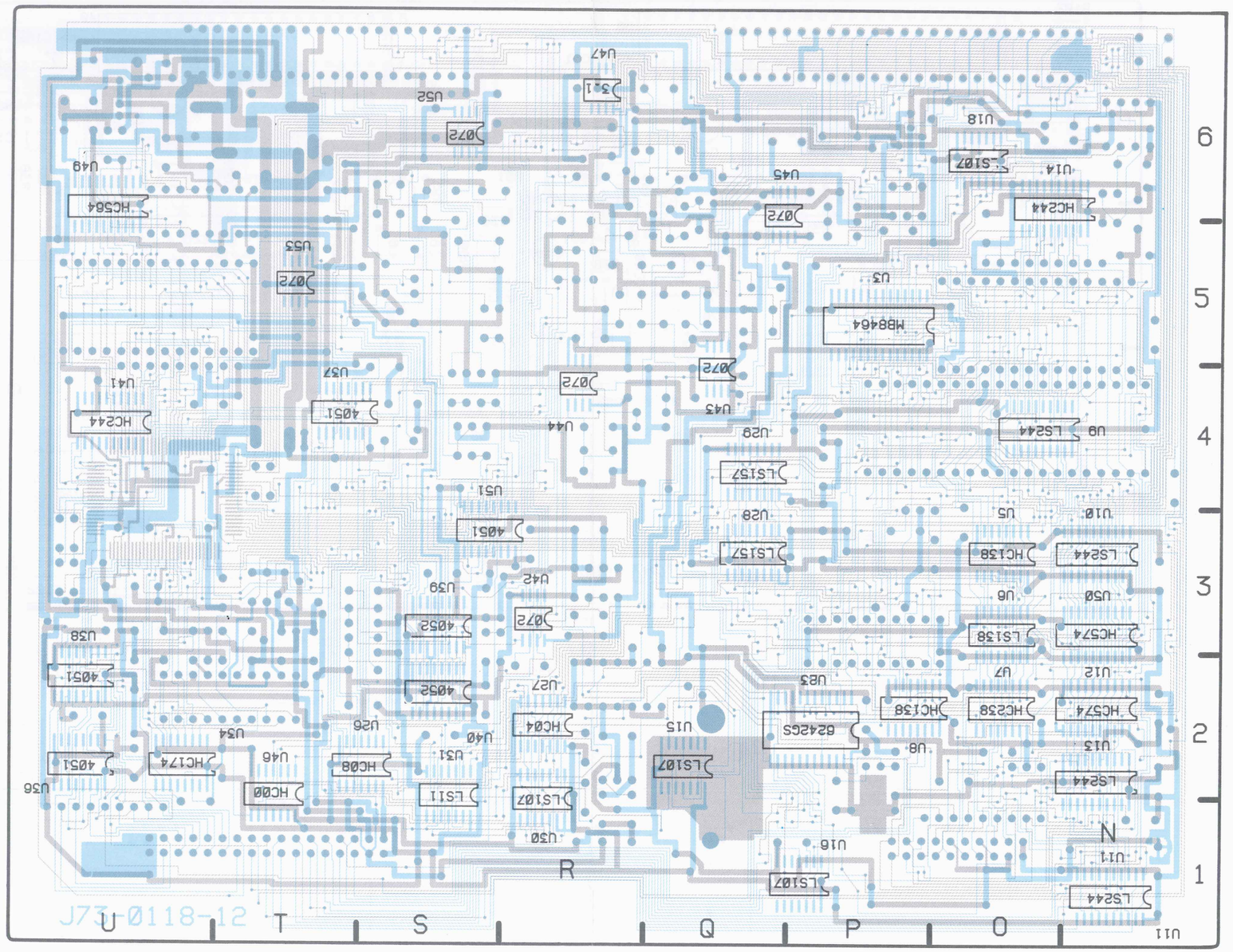
P.C. BOARD

READOUT UNIT (X77-1720-00) A



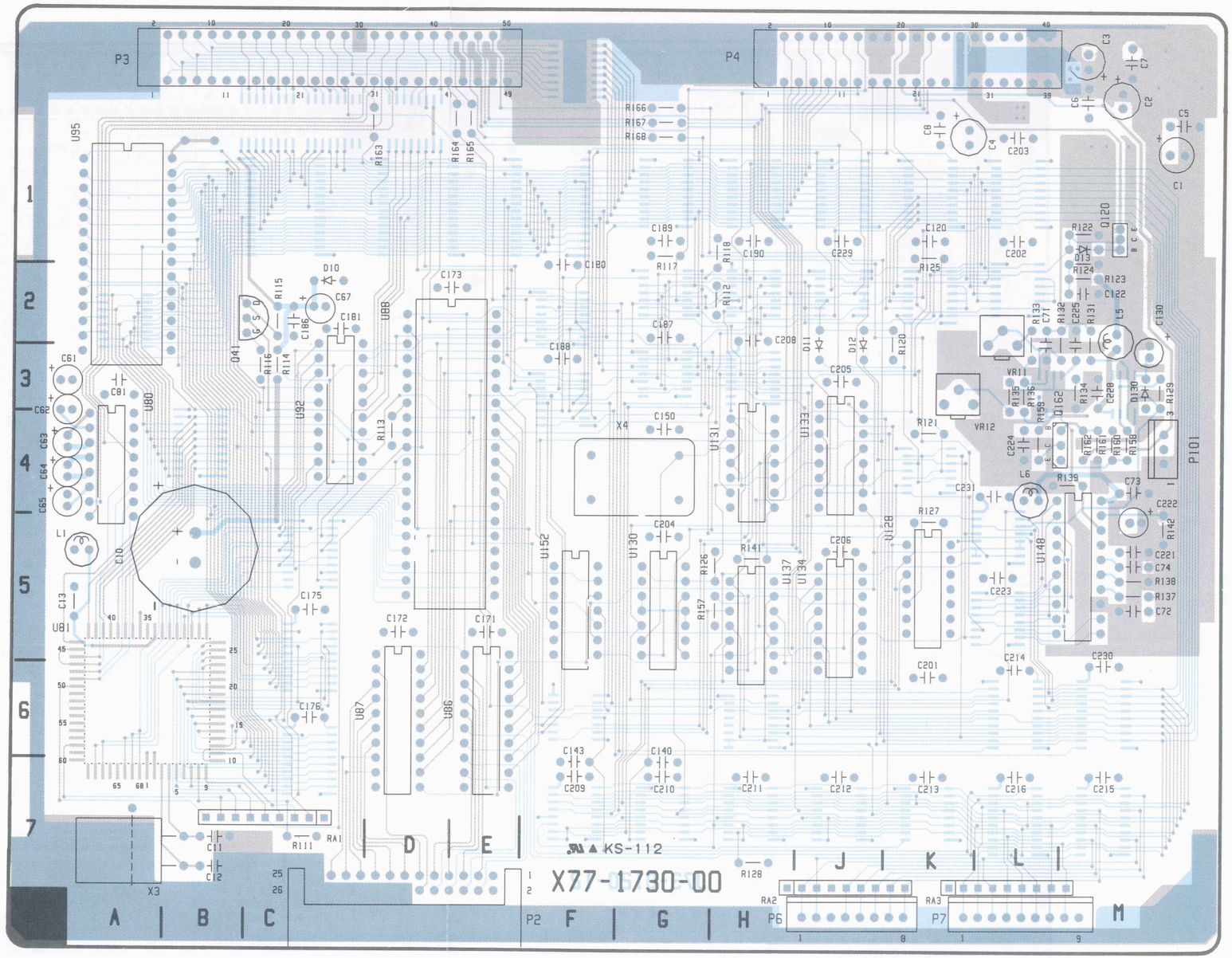
P.C. BOARD

READOUT UNIT (X77-1720-00) B



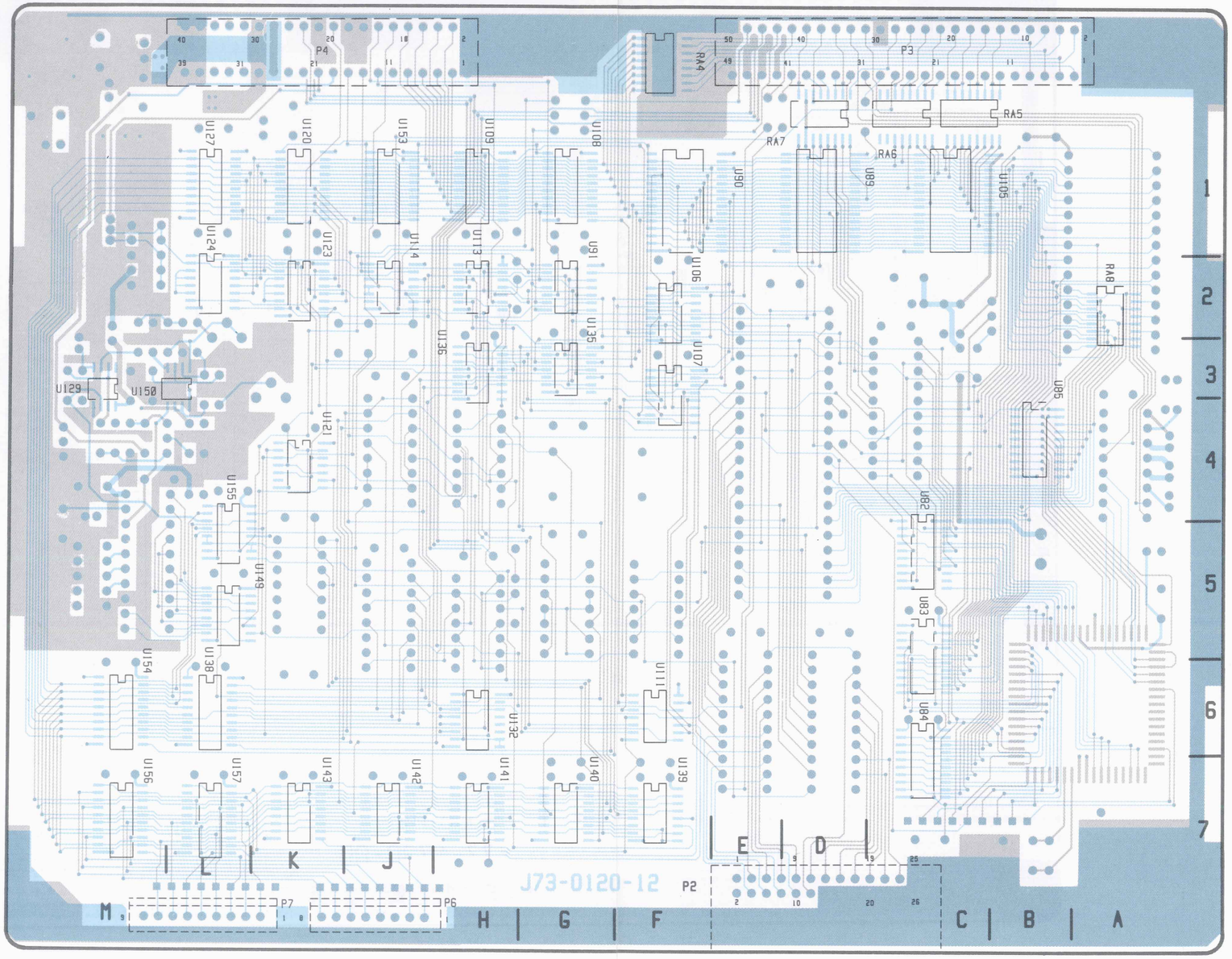
P.C. BOARD

STORAGE UNIT (X77-1730-00) A



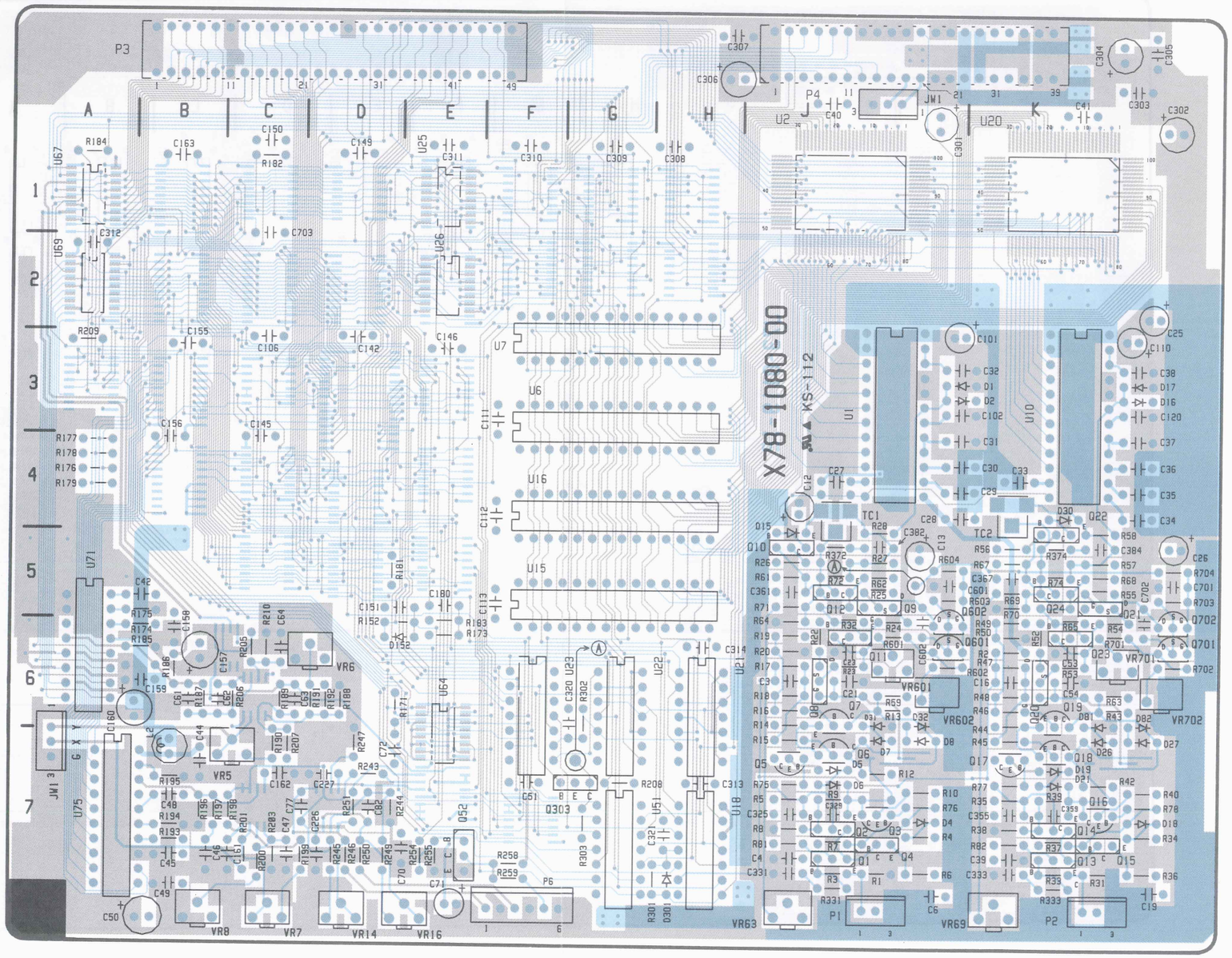
P.C. BOARD

STORAGE UNIT (X77-1730-00) B



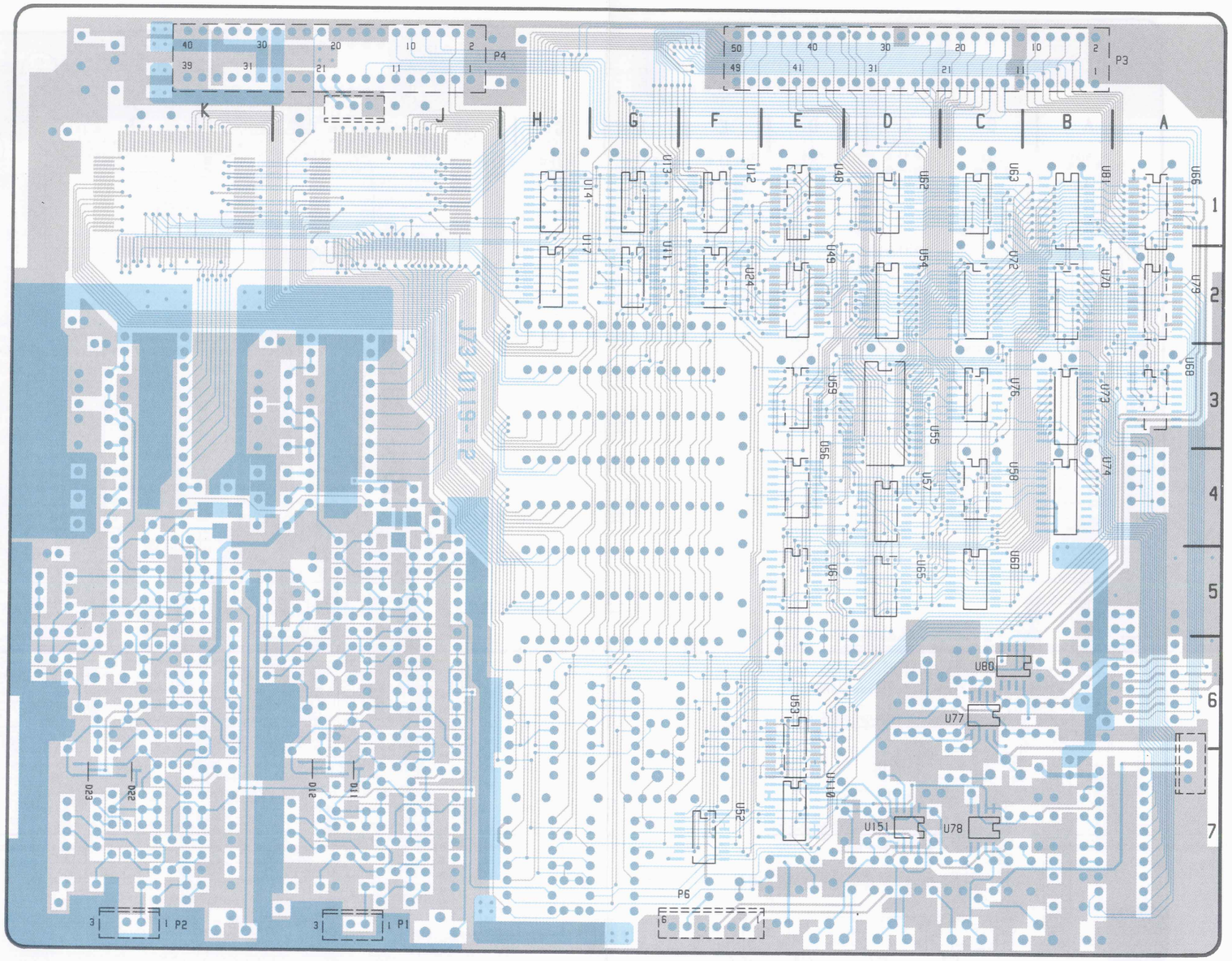
P.C. BOARD

A/D CONVERTER UNIT (X78-1080-00) A



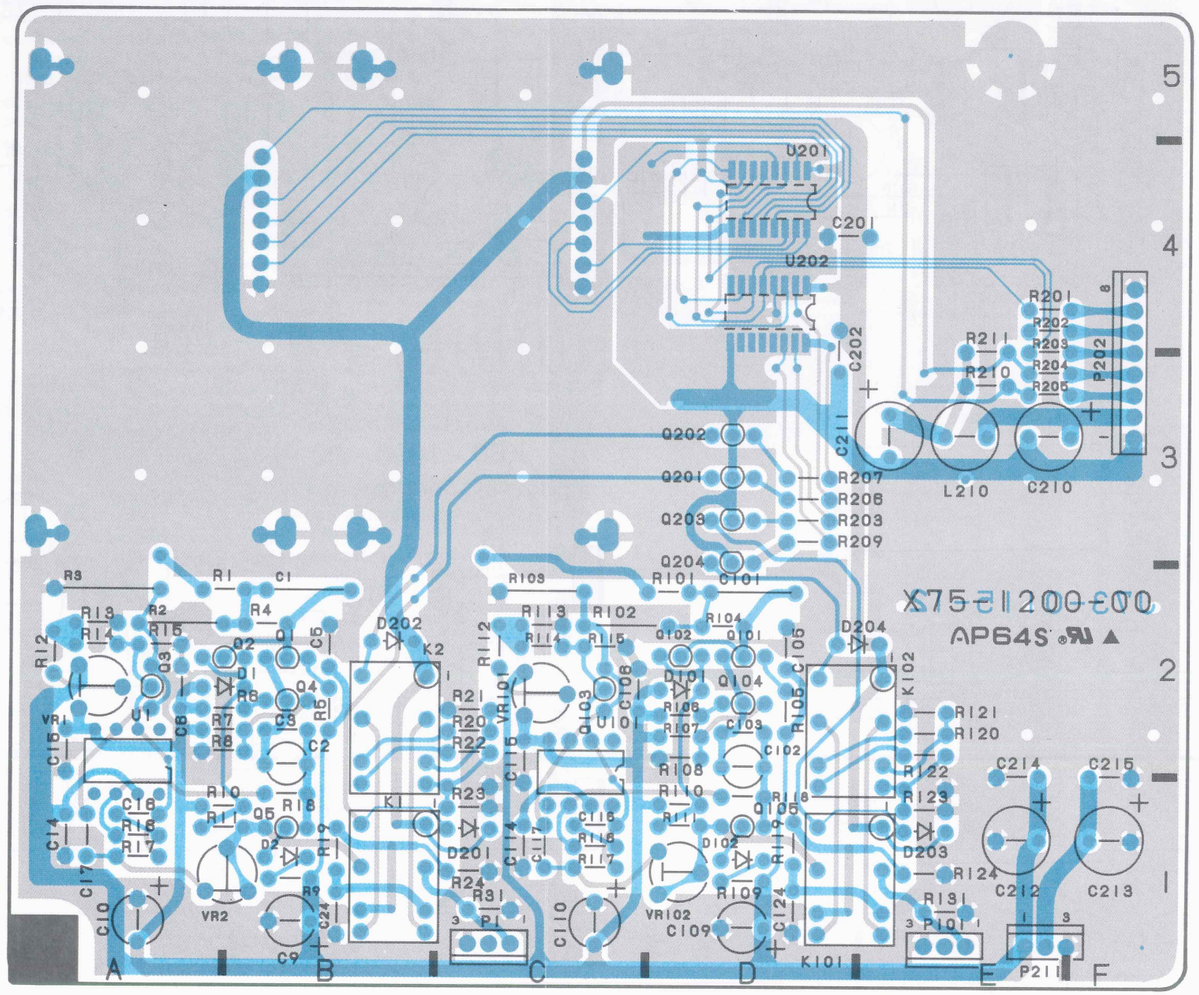
P.C. BOARD

A/D CONVERTER UNIT (X78-1080-00) B



P.C. BOARD

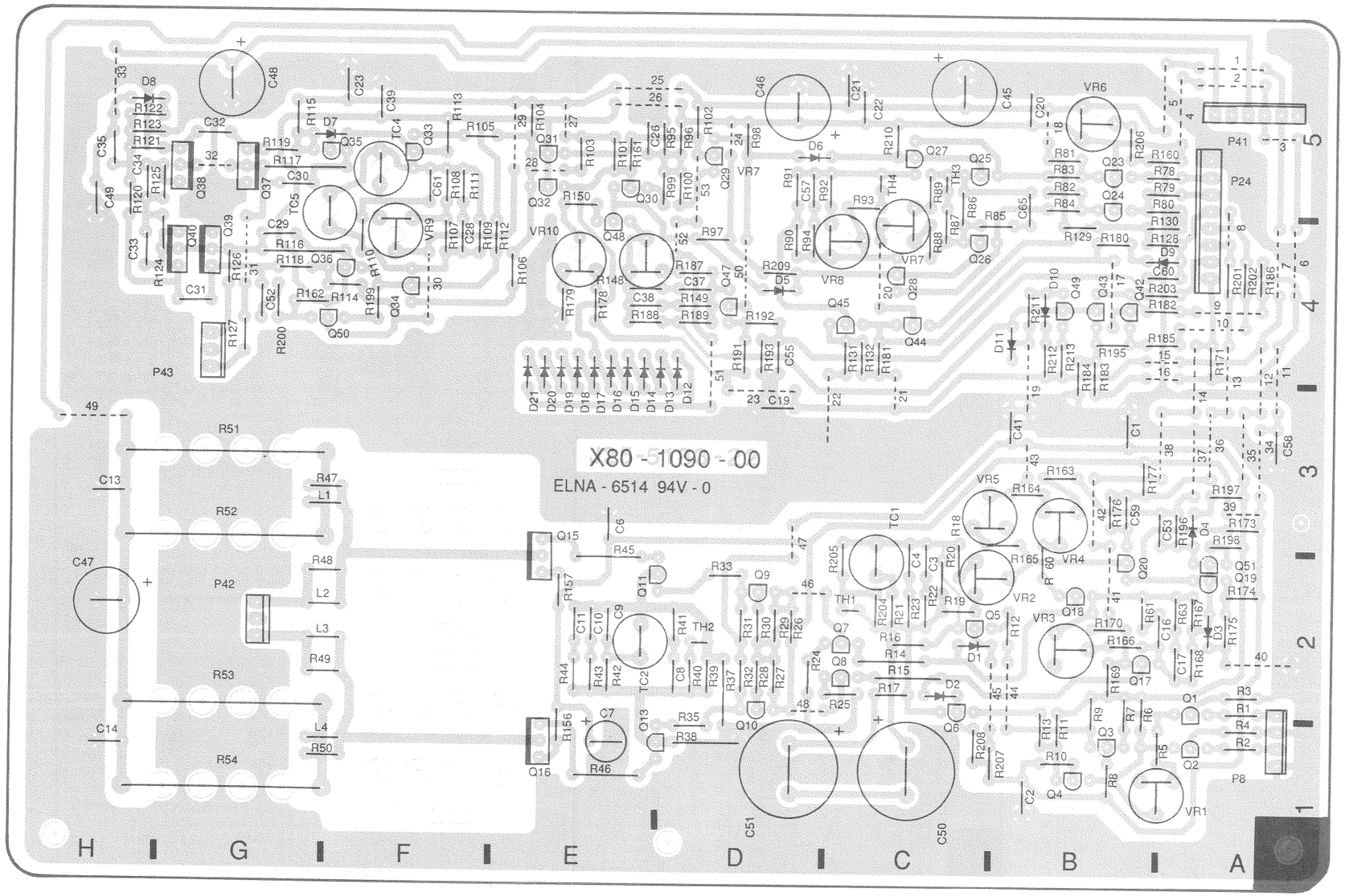
ATT UNIT (X75-1200-00)



P.C. BOARD

FINAL UNIT (X80-1090-02)

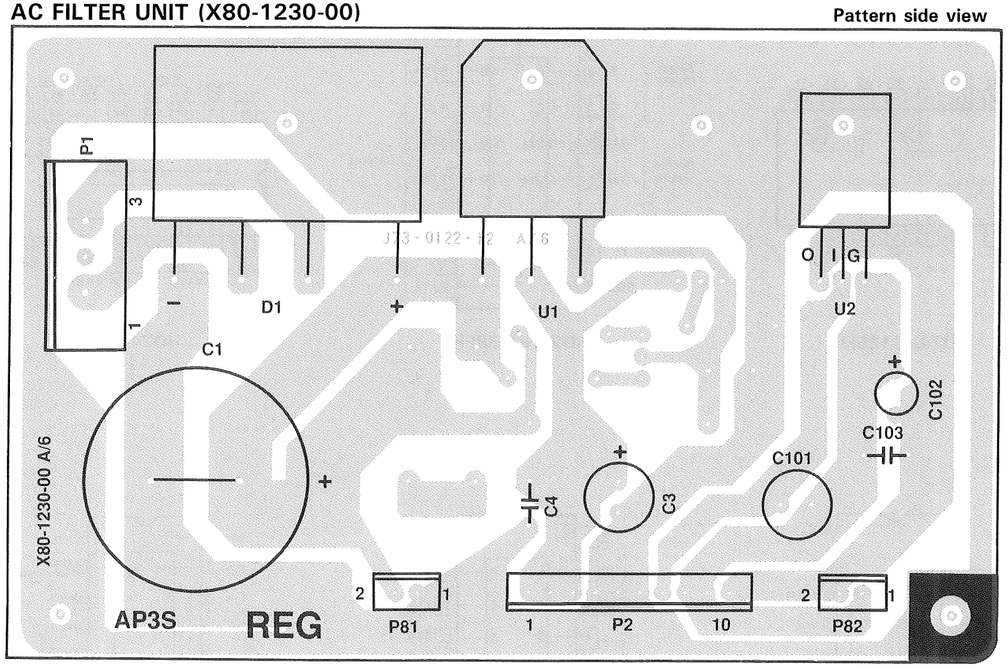
Pattern side view



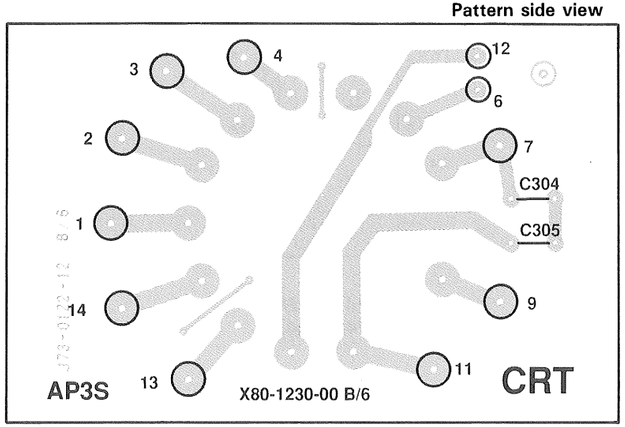
P.C. BOARD

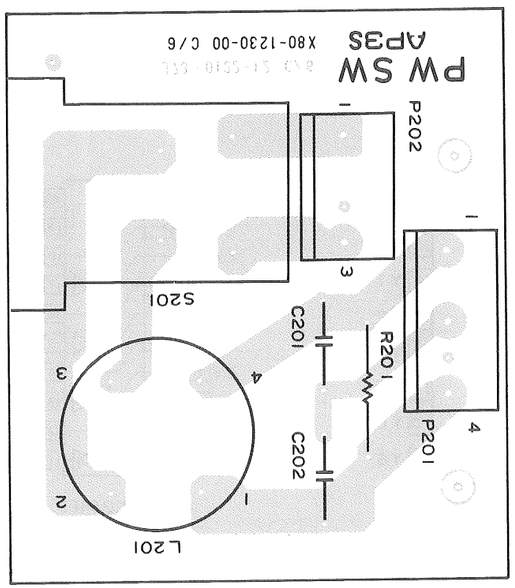
AC FILTER UNIT (X80-1230-00)

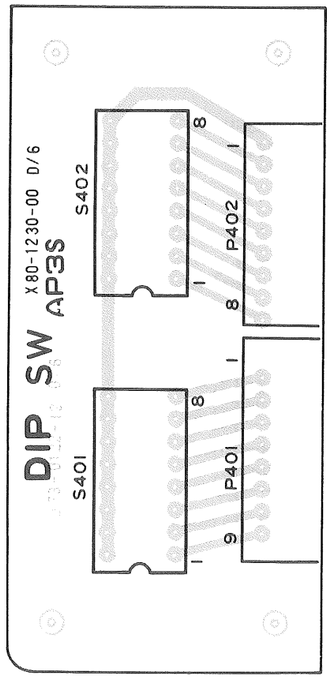
Pattern side view



Pattern side view







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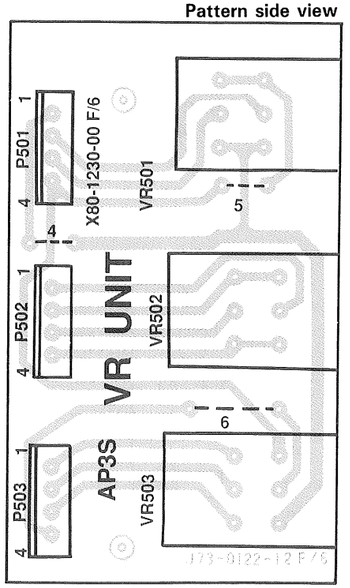
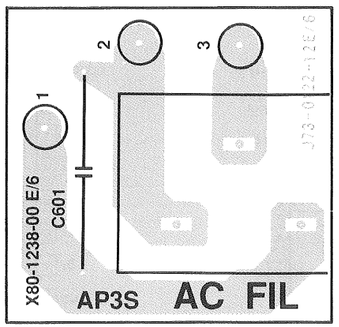
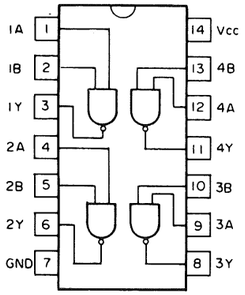


Pattern side view



SEMICONDUCTORS



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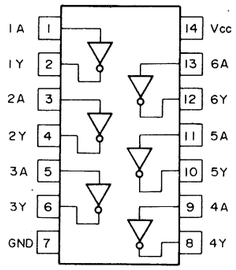

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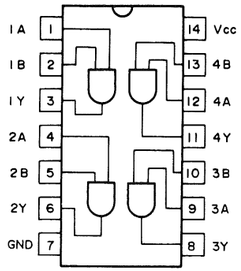

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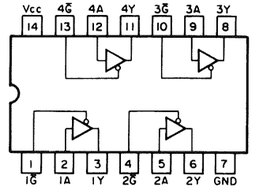

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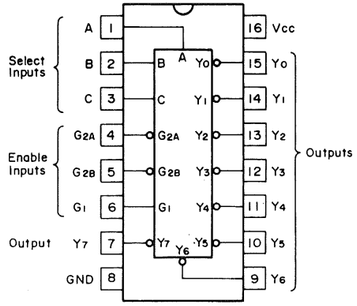

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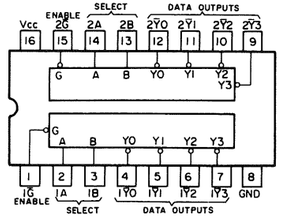

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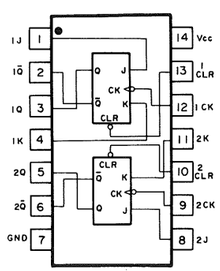

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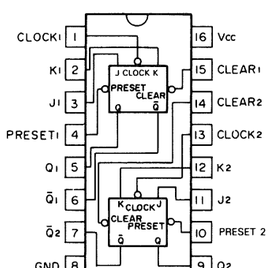

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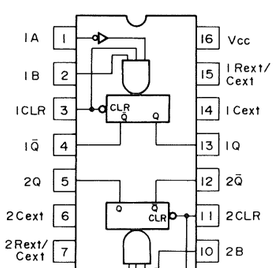

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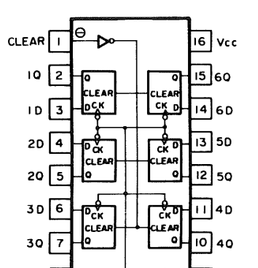

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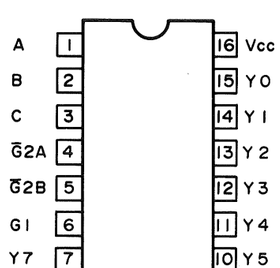

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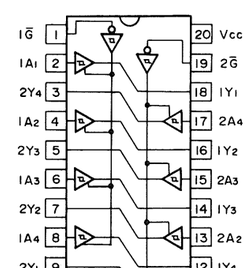

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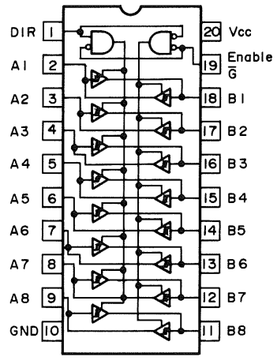

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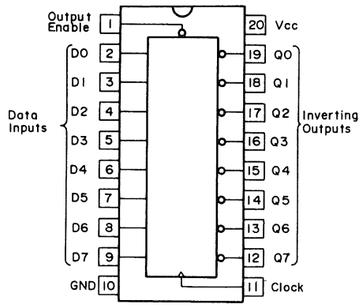

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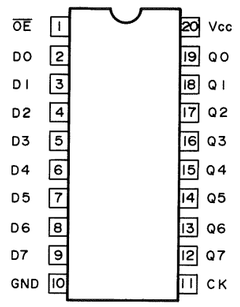

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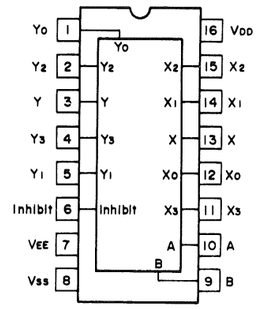

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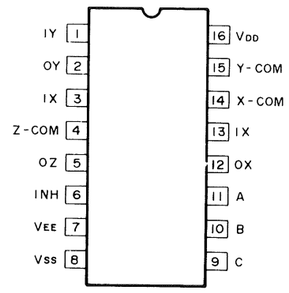

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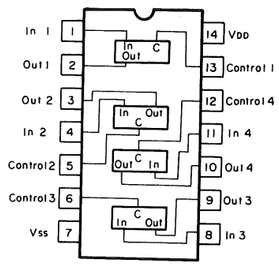

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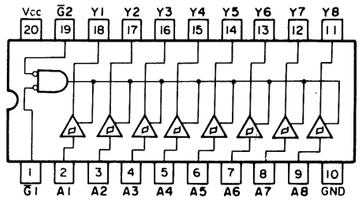

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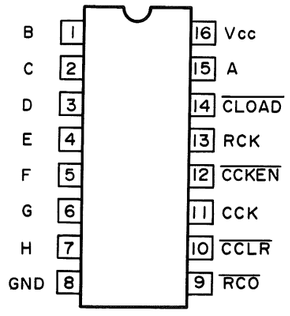

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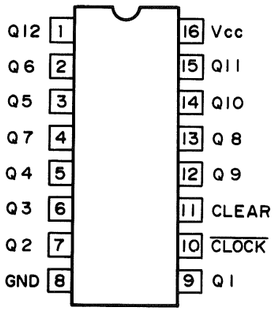

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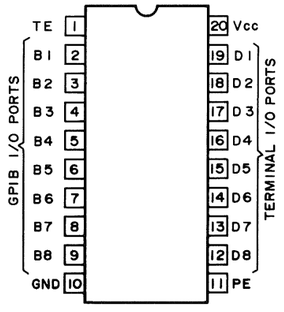

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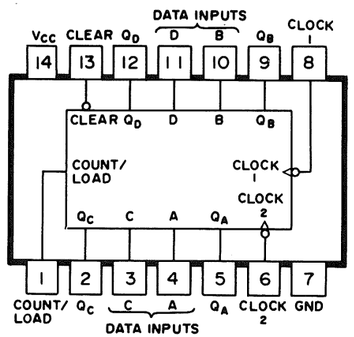

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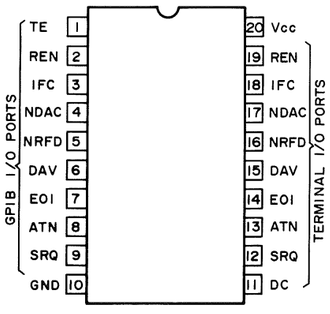

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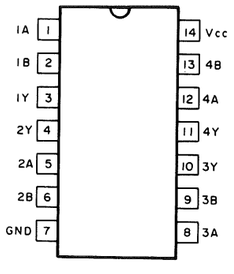

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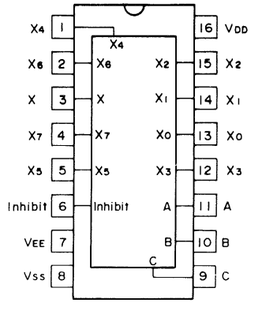

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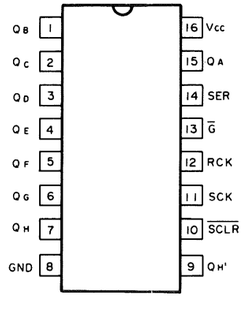

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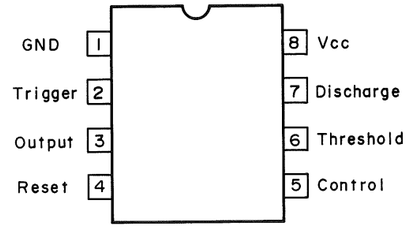

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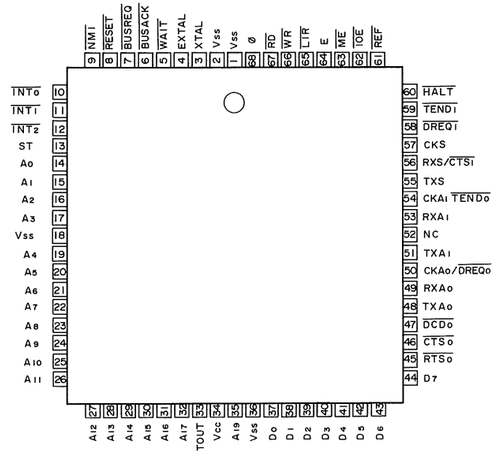

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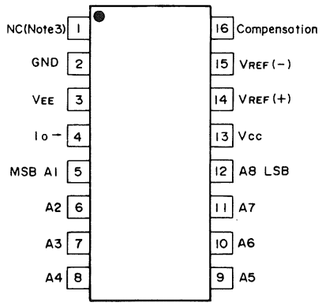
SEMICONDUCTORS



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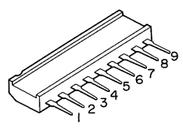

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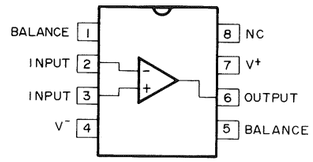

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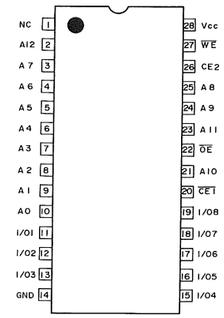

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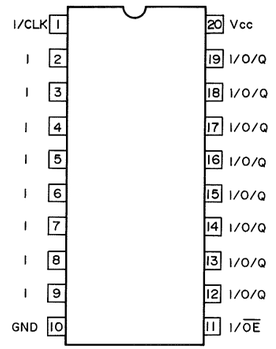

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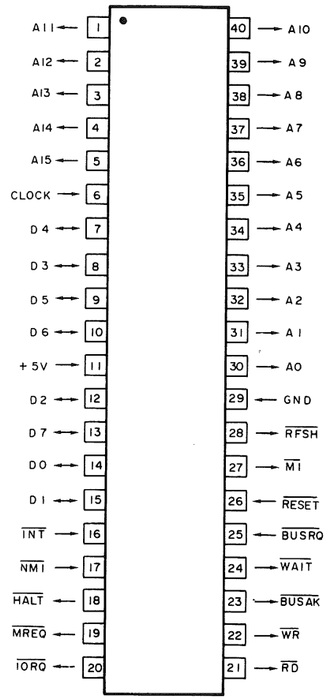

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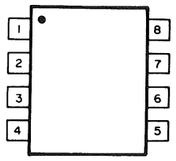
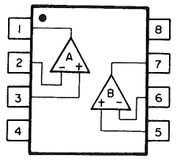


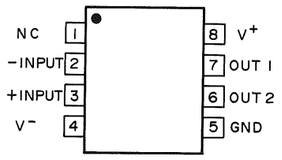
Pin name
1. GROUND
2. + INPUT
3. − INPUT
4. V⁻
5. BAL
6. BAL/STROBE
7. OUTPUT
8. V⁺

NJM311M



Pin name
1. A OUTPUT
2. A (−) INPUT
3. A (+) INPUT
4. V⁻
5. B (+) INPUT
6. B (−) INPUT
7. B OUTPUT
8. V⁺

NJM072M



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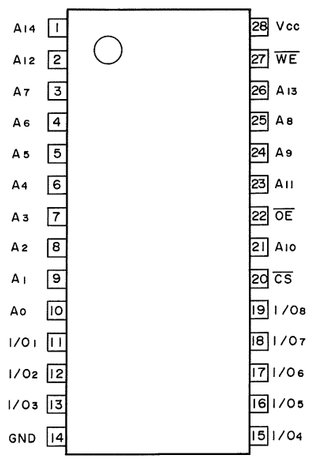

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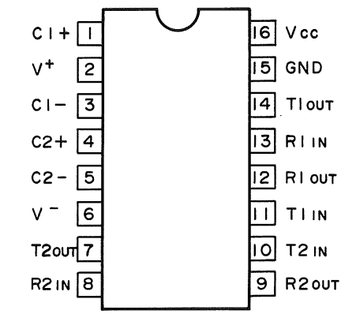

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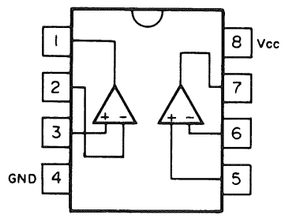

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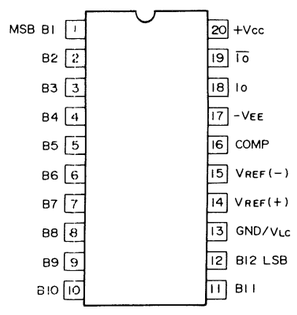

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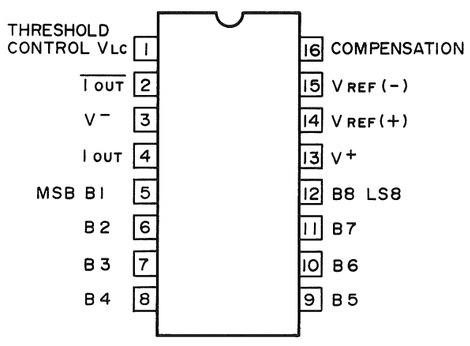

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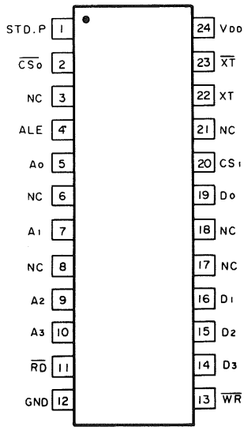

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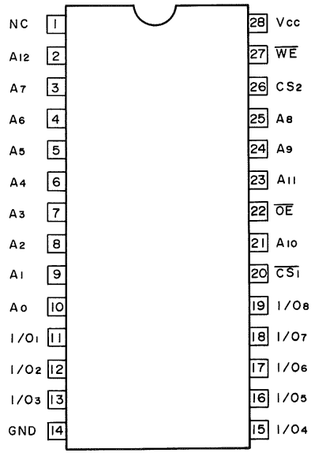

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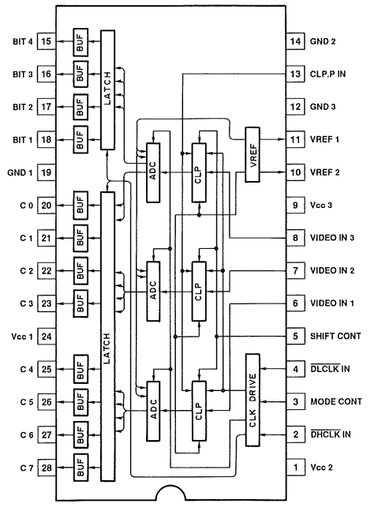
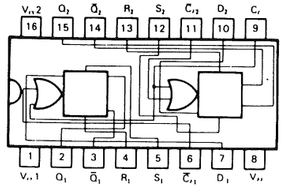


CXD1175AB

SEMICONDUCTORS



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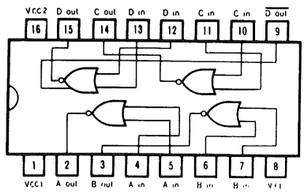

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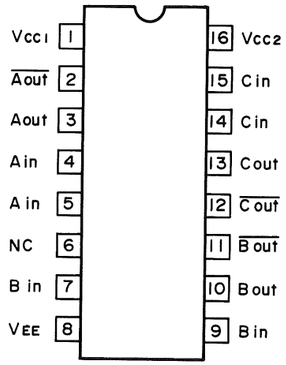

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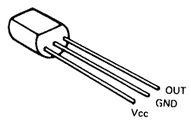

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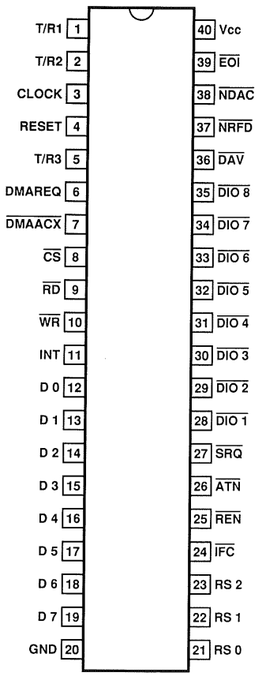

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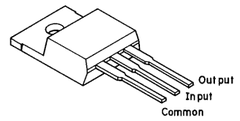

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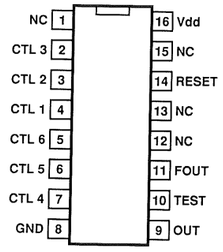

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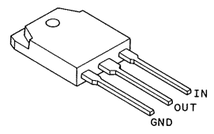

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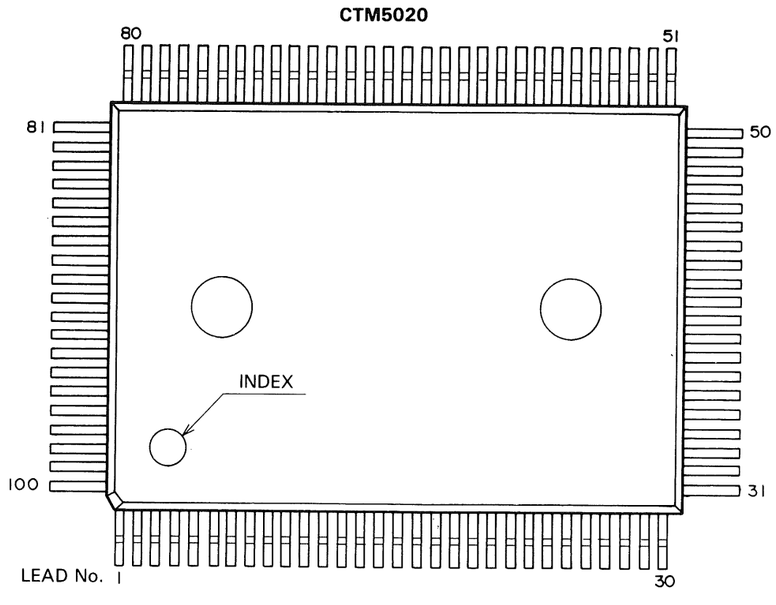
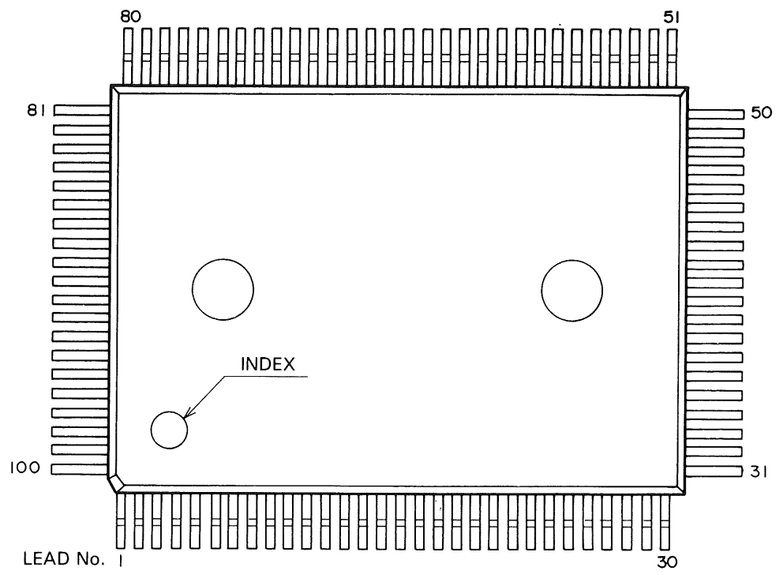


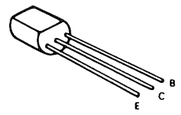
Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	CONT	26	TSD0	51	GETD	76	DD3
2	A13	27	TSD1	52	CA0	77	SING
3	VDD	28	VDD	53	VDD	78	VDD
4	A14	29	TSD2	54	CA4	79	R10M
5	A15	30	AX2	55	CA3	80	10M
6	INT0	31	AX1	56	CA2	81	HLDF
7	VX3	32	AX0	57	CA1	82	SGA
8	VX2	33	AX3	58	CD3	83	ROSP
9	VX1	34	HS2	59	CD2	84	ROD
10	VX0	35	HS1	60	CD4	85	HLDL
11	DA0	36	TDIO	61	CD1	86	ROUB
12	DA1	37	TWE	62	CD5	87	ROB
13	DA2	38	TCK1	63	DC4	88	ROQ
14	DA3	39	TST1	64	CD7	89	ROED
15	VSS	40	VSS	65	VSS	90	VSS
16	DA4	41	TST2	66	DC3	91	D7
17	DA5	42	TADD	67	DC2	92	D5
18	DA6	43	TCK2	68	CD6	93	D3
19	DA7	44	VS2	69	DC1	94	D1
20	DA8	45	VS1	70	DC0	95	ALE
21	DA9	46	VA0	71	CD0	96	D6
22	ROR	47	VA4	72	DD7	97	D4
23	ROA	48	VA3	73	DD6	98	D2
24	LEVX	49	VA2	74	DD5	99	D0
25	TCL	50	VA1	75	DD4	100	WR

SEMICONDUCTORS

DTM6010



Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	BDB4	26	BDD4	51	IDI6	76	IAD4
2	BDB5	27	BDD5	52	IDI5	77	IAD3
3	GND	28	GND	53	GND	78	GND
4	BDB6	29	BDD6	54	IDI4	79	IAD2
5	BDB7	30	BDD7	55	IDI3	80	IAD1
6	GBW0	31	OSQH	56	IDI2	81	GBWE
7	BDC0	32	ODO7	57	IDI1	82	BDA0
8	BDC1	33	ODO6	58	IDI0	83	BDA1
9	GBW1	34	GBW6	59	GBW9	84	GBWF
10	BDC2	35	ODO5	60	ILA4	85	BDA2
11	BDC3	36	ODO4	61	ILA3	86	BDA3
12	GBW2	37	GBW7	62	GBWA	87	GBWG
13	BDC4	38	ODO3	63	ILA2	88	BDA4
14	BDC5	39	ODO2	64	ILA1	89	BDA5
15	VCC	40	VCC	65	VCC	90	VCC
16	GND	41	GND	66	GND	91	GND
17	BDC6	42	ODO1	67	ICLK	92	BDA6
18	BDC7	43	ODO0	68	IWCK	93	BDA7
19	GBW3	44	GBW8	69	GBWB	94	GBWH
20	BDD0	45	OLCK	70	ILCK	95	BDB0
21	BDD1	46	IDMA	71	ISCK	96	BDB1
22	GBW4	47	OLTH	72	GBWC	97	GBWI
23	BDD2	48	OLSB	73	IADR	98	BDB2
24	BDD3	49	IRST	74	ISD	99	BDB3
25	GBW5	50	IDI7	75	GBWD	100	GBWJ



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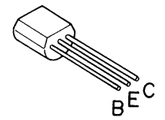
2SA1208 (S)
2SC1384 (R)
2SC2271 (D)
2SC2910 (S)
2SA1005 (K)



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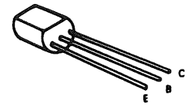

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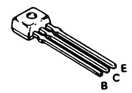

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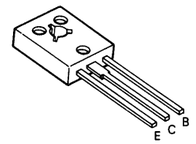

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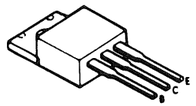
1210 (S)
2SC2911 (S)
2912 (S)



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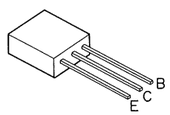
2SD1666 (S)
2SC3749 (N)



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2SC3315 (D)
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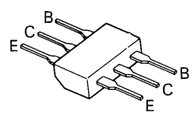
2SC3315



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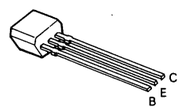

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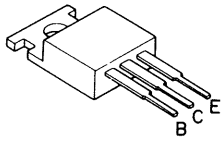
SEMICONDUCTORS



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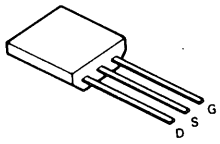

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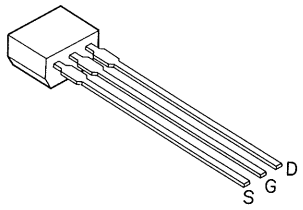

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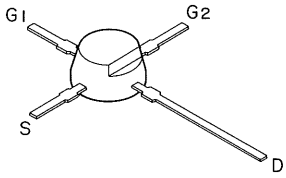

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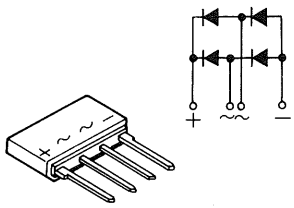

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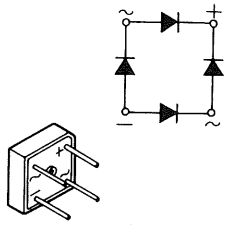

S4VB40F1

A product of
KENWOOD CORPORATION
2-5, 1-chome, Shibuya, Shibuya-ku, Tokyo 150, Japan

PRINTED IN JAPAN B51-1106-00 (MC)