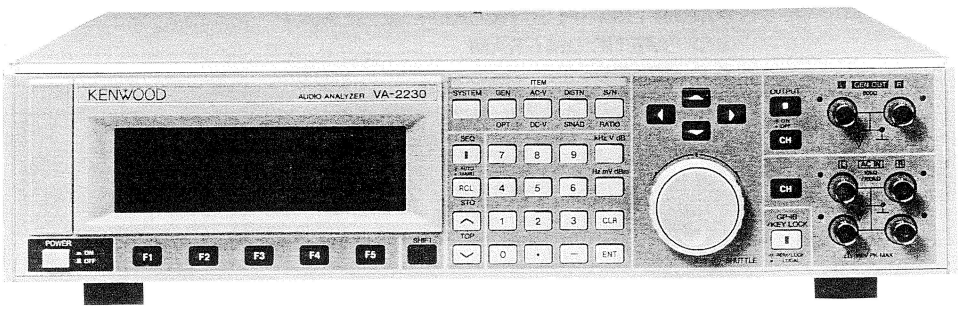
KENWOOD

AUDIO ANALYZER

VA-2230

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

Signal Generator (Common to L and R channel outputs)

Items	Specifications	Conditions & remarks
Frequency		
Frequency band Ranges	5Hz to 110kHz Range 1: 5Hz to 20.09kHz Range 2: 20.1kHz to 110.0kHz	 DDS oscillation RC oscillation
Set resolutions	1Hz (5Hz to 2009Hz) 10Hz (2.01kHz to 20.09kHz) 100Hz (20.1kHz to 110.0kHz)	
Accuracy	$\pm 5 \times 10^{-5}$ ±3% of set value	DDS oscillation RC oscillation
Display	4 digits max.	
Spot freq.	Spot 1: 20Hz ($\pm 5 \times 10^{-5}$) Spot 2: 1kHz ($\pm 5 \times 10^{-5}$) Spot 3: 20kHz ($\pm 5 \times 10^{-5}$)	
Output		
Output ranges	14.0dBV to −85.9dBV 16.2dBm to −83.7dBm	0dBV=1Vrms 600Ω 0dBm=1mW 600Ω
Set resolution	0.1dB resolution	
Display	3 digits with − sign	
Accuracy	Set value ±0.5dB≧−40dBV Set value ±0.8dB<−40dBV	At 1kHz as standard, 600Ω load
Flatness	±0.05dB (20Hz to 20.09kHz) ±0.5dB (5Hz to 110kHz)	At 1kHz as standard, 600Ω load
Output impedance	Approx. 600Ω	
Power off noises	≦10μVrms	
Distortion rates	≦0.001% (−100dB) (THD+N) 80kHzBW ≦0.001% (−100dB) (THD) 80kHzBW ≦0.005% (−86dB) (THD+N) 80kHzBW ≦0.01% (−80dB) (THD+N)	Spots 1 & 2 Spot 3 20Hz to 20kHz All ranges

SPECIFICATIONS

Measuring Circuit Function

Items	Specifications	Conditions & remarks
Measurement functions	Frequency measurement AC level measurement W display Relative display Total distortion rate measurement (THD+N) Harmonic analysis (THD) S/N ratio measurement SINAD measurement Ratio measurement (R/L & L/R) DC level measurement	Select second to tenth harmonics.

Frequency Measurement

Items	Specifications	Conditions & remarks
Frequency band	5 Hz to 210kHz	In AC level measurement
Display	5 digits max.	
Resolutions	100kHz ≦ freq. ····· 10Hz 10kHz ≦ freq. <100kHz ··· 1Hz 1kHz ≦ freq. <10kHz ···· 0.1Hz Freq. < 1kHz ····· 0.01Hz	
Input signal level	1mVrms to 100Vrms	AC level measurement 1/3 of full scale or more in each range
Accuracy	$\pm 5 \times 10^{-4} \pm 1$ digit	
Measurement method	Basic frequency is found from sampling data through FFT processing.	
AC measurement Lch Rch L- & R-ch	 L channel input signal is measured. R channel input signal is measured. L channel input signal is measured.	
Ratio measurement R/L measurement L/R measurement	 L channel input signal is measured. R channel input signal is measured.	

SPECIFICATIONS

AC Level Measurement (Common to L and R channel inputs)

Items	Specifications	Conditions & remarks
Input level measuring ranges	In V(Resolution) In dBV In dBm(Resolution) 100V (10mV) 40.0dBV 42.2dBm(0.1dB) 30V (1mV) 29.5dBV 31.7dBm(0.1dB) 10V (1mV) 20.0dBV 22.2dBm(0.1dB) 3V (100μV) 9.5dBV 11.7dBm(0.1dB) 1V (100μV) 0dBV 2.2dBm(0.1dB) 300mV (10μV) −10.5dBV −8.3dBm(0.1dB) 100mV (10μV) −20.0dBV −17.8dBm(0.1dB) 30mV (1μV) −30.5dBV −28.3dBm(0.1dB) 10mV (1μV) −40.0dBV −37.8dBm(0.1dB) 3mV(0.1μV) −50.5dBV −48.3dBm(0.1dB) 1mV(0.1μV) −60.0dBV −57.8dBm(0.1dB) 300μV(0.1μV) −70.5dBV −68.3dBm(0.1dB) Over-range: Approx. 20%	12 ranges Auto meas.: 1mv to 100V vange Except 100V range
Level accuraty	±2% of full scale	1kHz
Frequency response	±5% (20Hz to 20kHz) ±10% (5Hz to 110kHz) ±20% (5Hz to 210kHz)	At 1kHz, full scale as standard
Residual noises	≦4μVrms	80kHzBW
Indicative response	Root mean square value	
Relative measurement range	±130dB 0.0001% to 999.9%	Measurement range is restricted by reference level.
Wattage display Wattage display R_L setting range	Wattage is found from measured AC level and virtual load resistor (R_L). No actual load built in. 5 digits max. 2 to 500Ω	

SPECIFICATIONS

Total Distortion Rate Measurement (Common to L and R channel inputs)

Items	Specifications	Conditions & remarks
Measurement mode	Total distortion rate (THD+N)	
Fundamental wave measurement freq.	10Hz to 110kHz	Restricted by input level measurement ranges.
Distortion meas. ranges	In % (Resolution) In dB (Resolution) 100% (0.01%) 0 dB (0.1dB) 30% (0.001%) −10.5dB (0.1dB) 10% (0.001%) −20dB (0.1dB) 3% (0.0001%) −30.5dB (0.1dB) 1% (0.0001%) −40dB (0.1dB) 0.3% (0.0001%) −50.5dB (0.1dB) 0.1% (0.0001%) −60dB (0.1dB) 0.03% (0.0001%) −70.5dB (0.1dB) 0.01% (0.0001%) −80dB (0.1dB)	9 ranges
Display units Input signal level Distortion rate	 V, dBV & dBm % & dB	
Indicative response Input signal level Distortion rate	 Root mean square value Root mean square value	
Fundamental wave reduction rate	Fundamental waves are reduced with notch filter (approx. −60dB) and FFT processing. (110 dB reduction)	
2nd harmonics deviation	±1dB ±3dB	20Hz to 20kHz All ranges
Residual noises & distortion rate	Unbalanced input	
Input ranges 100V, 30V, 10V, 3V 1/3 or more of 1V	 ≦−94dB (≦0.002%) 10Hz to 20kHz 80kHzBW ≦−80dB (≦0.01%) 10Hz to 110kHz 500kHzBW	
1/3 or more of 300mV	≦−86dB (≦0.005%) 10Hz to 20kHz 80kHzBW ≦−66dB (≦0.05%) 10Hz to 110kHz 500kHzBW	
1/3 of more of 100mV	≦−74dB (≦0.02%) 10Hz to 20kHz 80kHzBW ≦−60dB (≦0.1%) 10Hz to 110kHz 500kHzBW	
20mV of 30mV	≦−65dB (≦0.056%) 1kHz 20kHzBW	
7mV of 10mV	≦−55dB (≦0.18%) 1kHz 20kHzBW	
2mV of 3mV	≦−45dB (≦0.56%) 20Hz to 10kHz 20kHzBW	

SPECIFICATIONS

Items	Specifications	Conditions & remarks
Residual noises & distortion rate	Balanced input	
Input ranges 100V, 30V, 10V, 3V 1/3 or more of 1V	≦−86dB (≦0.005%) 10Hz to 20kHz 80kHzBW ≦−80dB (≦0.01%) 10Hz to 110kHz 500kHzBW	
1/3 or more of 300mV	≦−80dB (≦0.01%) 10Hz to 20kHz 80kHzBW ≦−66dB (≦0.05%) 10Hz to 110kHz 500kHzBW	
1/3 or more of 100mV	≦−74dB (≦0.02%) 10Hz to 20kHz 80kHzBW ≦−60dB (≦0.1%) 10Hz to 110kHz 500kHzBW	
Input level range	1mV to 100Vrms	Distortion rate measurement range is restricted by input signal level.
Input level meas. ranges	In V(Resolution) In dBV In dBm(Resolution) 100V (10mV) 40.0dBV 42.2dBm(0.1dB) 30V (1mV) 29.5dBV 31.7dBm(0.1dB) 10V (1mV) 20.0dBV 22.2dBm(0.1dB) 3V (100μV) 9.5dBV 11.7dBm(0.1dB) 1V (100μV) 0dBV 2.2dBm(0.1dB) 300mV (10μV) −10.5dBV −8.3dBm(0.1dB) 100mV (10μV) −20.0dBV −17.8dBm(0.1dB) 30mV (1μV) −30.5dBV −28.3dBm(0.1dB) 10mV (1μV) −40.0dBV −37.8dBm(0.1dB) 3mV(0.1μV) −50.5dBV −48.3dBm(0.1dB)	Auto meas. : 100mV to 100V range Distortion rate meas. band of 3 to 30mV input level meas. range is 10Hz to 20kHz.
Input signal level accuracy	±2% of full scale	1kHz
Input signal level freq. response	±5% ±10%	20Hz to 20kHz ALL ranges

SPECIFICATIONS

Harmonic Distortion Rate Measurement (Common to L and R channel inputs)

Items	Specifications	Conditions & remarks
Measurement mode	Harmonic distortion rate (THD) measurement 2nd to 10th harmonics are selectively detected and measured.	
Residual noises & distortion rate	Unbalanced input	
Input ranges 100V, 30V, 10V, 3V 1/3 or more of 1V	≦−100dB(≦0.001%) 10Hz to 20kHz 80kHzBW ≦−80dB (≦0.01%) 10Hz to 110kHz 500kHzBW	
1/3 or more of 300mV	≦−94dB (≦0.002%) 10Hz to 20kHz 80kHzBW ≦−74dB (≦0.02%) 10Hz to 110kHz 500kHzBW	
1/3 or more of 100mV	≦−86dB (≦0.005%) 10Hz to 20kHz 80kHzBW ≦−74dB (≦0.02%) 10Hz to 110kHz 500kHzBW	
Residual noises & distortion rate	Balanced input (+ & − to inputs at equal level) distortion rate	
Input ranges 100V, 30V, 10V, 3V 1/3 or more of 1V	≦−94dB (≦0.002%) 10Hz to 20kHz 80kHzBW ≦−80dB (≦0.01%)) 10Hz to 110kHz 500kHzBW	
1/3 or more of 300mV	≦−86dB (≦0.005%) 10Hz to 20kHz 80kHzBW ≦−74dB (≦0.02%) 10Hz to 110kHz 500kHzBW	
1/3 or more of 100mV	≦−86dB (≦0.005%) 10Hz to 20kHz 80kHzBW ≦−74dB (≦0.02%) 10Hz to 110kHz 500kHzBW	
	Other specifications are the same as in total distortion rate measurement.	

Harmonic Analysis (Common to L and R channel inputs)

Items	Specifications	Conditions & remarks
Measurement mode	Total distortion rate of specified harmonics (2nd to 10th) is measured.	
	Other specifications are the same as in total distortion rate measurement.	

SPECIFICATIONS

SINAD Measurement (Common to L and R channel inputs)

Items	Specifications	Conditions & remarks
SINAD measurement range	0 to 40dB	1 range
Display units S component level SINAD	 V, dBV, dBm dB	
Other items	Some as in total distortion rate measurement, except that D-RNG is fixed to 100 %.	

S/N Ratio Measurement (Common to L and R channel inputs)

Items	Specifications	Conditions & remarks
Input level range	Approx. 30μVrms to 100Vrms for both signal (S) and noise (N) components	N level must be lower than S level.
S/N ratio meas. range	0 to 130dB	
S/N ratio meas. limit Unbalanced input	S/N ratio measurement range is restricted by S component level in input signals as shown below. S level (≦10kHz) S/N meas. limit ≧30dBV >130dB ≧20dBV >120dB ≧10dBV >110dB ≧ 0 dBV >100dB ≧−10dBV >90dB ≧−20dBV >80dB ≧−30dBV >70dB ≧−40dBV >60dB ≧−50dBV >50dB ≧−60dBV >40dB ≧−70dBV >30dB	 80kHzBW
Display unit S component level S/N ratio	 V, dB, dBm dB	
S component level accuracy	±2% of full scale	1kHz
S/N ratio accuracy	±1.2dB	1kHz

SPECIFICATIONS

Items	Specifications	Conditions & remarks
Indicative response	Root mean square value	
Delay time in S/N ratio meas.	1.5 sec. + meas. time 2 sec. + meas. time 3 sec. + meas. time 5 sec. + meas. time 7 sec. + meas. time 10 sec. + meas. time	SS=1.5s SS=2 s SS=3 s SS=5 s SS=7 s SS=10s

Ratio Measurement (L/R & R/L)

Items	Specifications	Conditions & remarks
Input level range	Approx. 30μVrms to 100Vrms for both L and R input signals	
Relative level meas. range	0 to ±130dB 0.0001% to 999.9%	Measurement range is restricted by reference level.
Ratio meas. range denominator signal level 40dBV 30dBV 20dBV 10dBV 0 dBV −10dBV −20dBV −30dBV −40dBV −50dBV −60dBV −70dBV −80dBV −90dBV	Ratio measurement range is restricted by denominator level as shown below. 0 to −130dB 10 to −120dB 20 to −110dB 30 to −100dB 40 to −90dB 50 to −80dB 60 to −70dB 70 to −60dB 80 to −50dB 90 to −40dB 100 to −30dB 110 to −20dB 120 to −10dB 130 to 0dB	80kHzBW f ≦20kHz
Display unit L & R level ratio	V, dBV, dBm dB, %	
Ratio accuracy	±1.2dB	1kHz
Indicative response	Root mean square value	
Measurement switching time	1.5 sec. + meas. time 2 sec. + meas. time 3 sec. + meas. time 5 sec. + meas. time 7 sec. + meas. time 10 sec. + meas. time	SS=1.5s SS=2 s SS=3 s SS=5 s SS=7 s SS=10s

SPECIFICATIONS

DC Level Measurement

Items	Specifications	Conditions & remarks
Input channel	For DC input: 1 channel	
Input impedance	For DC input: Approx. 1MΩ	
Input level display unit	V	
Input level meas. range	Display in V (Resolution) 100V (100mV) 30V (10mV) 3V (1mV) 300mV (0.1mV) 30mV (0.01mV) Over-range: Approx. 20%	 5 ranges Except 100 range
Level meas. accuracy	±0.3% of full scale +0.75% of measured value ±3% of full scale +0.75% of measured value	Over 300mV range 30mV range

SPECIFICATIONS

Common Matters to Measurement Functions

Items	Specifications	Conditions & remarks
Input channel	For AC input: 2 channels (Balanced and unbalanced switchable)	
Input impedance	For AC input: Approx. 10kΩ/100kΩ	
Max. allowable input	150VDC+ACpeak (AC input impedance: 10kΩ, preset level : 30Vrms	1kHz
Ground	Floating and non-floating switchable (DC, AC & GEN)	
Filters	<Characteristics in the fixed input range>	
100Hz HPF	−3dB cut-off freq. 75±15Hz Roll-off characteristics: ≦−40dB at 25Hz	Analog filter
200Hz HPF	−3dB cut-off freq. 180±25Hz Roll-off characteristics: 60dB/decade	Analog filter
15kHz LPF	Pass band characteristics: ±1dB below 15kHz Attenuation band char: ≦−30dB over 19kHz	Digital filter
20kHz LPF	Pass band characteristics: ±1.5dB below 20kHz ±1.0dB below 19.8kHz Attenuation band char: ≦−30dB over 24.1kHz	Analog filter
80kHz LPF	−3dB cut-off freq. 80±10Hz Roll-off characteristics: 60dB/decade	Analog filter
PSOPHO A	A characteristics compliant with IEC standard	Digital filter
PSOPHO CCIR ARM	CCIR ARM characteristics	Digital filter
PSOPHO AUDIO	Audio characteristics compliant with DIN 45405	Digital filter
Monitor output	Output impedance: Approx. 600Ω	ACV monitor
Averaging function	N=OFF, 2, 4, 8 & 16	Additive averaging

* The above-shown specifications are applicable to non-floating operation in GEN, AC or DC mode.

SPECIFICATIONS

Memory Function

Items	Specifications	Conditions & remarks
Points Settings	100 points (May be divided into 10 groups.) ① Panel setting ② EXT CONTROL I/O ③ Batch storage of limit data into memory	

Sequence Function

Items	Specifications	Conditions & remarks
Auto sequence functions	① Single up ② Single down ③ Repetitive up ④ Repetitive down	

GP-IB Interface

Items	Specifications	Conditions & remarks
Functions	① Panel status ② Measured value output ③ Memory dump ④ Memory synchronization	

EXT I/O Interface function

Items	Specifications	Conditions & remarks
Functions	① Remote sequential recalling ② Remote modification ③ Remote direct recalling ④ Limit judgment output ⑤ Control output ⑥ Memory list print-out ⑦ 8-bit data reading ⑧ Measured data print-out	

SPECIFICATIONS

Items	Specifications	Conditions & remarks
Dimensions	Frame : 426(W)×400(D)×99(H) mm Max. dimensions: 426(W)×449(D)×113(H) mm	
Weight	Approx. 9.7kg	
Line voltage	100V/120V/220V/240VAC±10%, 50/60Hz	
Power consumption	Approx. 48W	On 100VAC
Fuse capacity	100V, 120V area : 630mA (Time lag fuse) 220V, 240V area : 315mA (Time lag fuse)	
Guarantee temp. & humid	10℃ to 35℃, 85% or less (No dew condensation)	
Operating temp. & humid	10℃ to 35℃, 85% or less (No dew condensation) * Max. humidity at operating temperature over 30℃ is restricted according to LCD environmental condition graph. Use in allowable range.	
Insulation resistance	Between source and case : 500VDC, 30MΩ Between AC GND and case : 500VDC, 30MΩ Between DC GND and case : 500VDC, 30MΩ Between GEN GND and case: 500VDC, 30MΩ	
Dielectric strength	Between AC input and case: 1500VAC, 50/60Hz, 1 minute	

SAFETY

SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. 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 instrument at earth ground. Do not attempt to defeat the ground wire connection or float the instrument 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, 630 m amp for 100 VAC to 120 VAC operation, 315 m 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.)

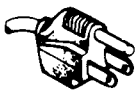
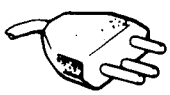
Plug configuration	Power cord and plug type	Factory installed instrument fuse	Parts No. for power cord
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	630 mA, 250 V Slow blow 5 × 20 mm	E30-1951-05
	Universal Europe 230 volt/50 Hz Rated 16 amp	315 mA, 250 V Slow blow 5 × 20 mm	E30-1952-05
	U.K. 240 volt/50 Hz Rated 13 amp	315 mA, 250 V Slow blow 5 × 20 mm	E30-1963-05
	Australian 240 volt/50 Hz Rated 10 amp	315 mA, 250 V Slow blow 5 × 20 mm	E30-1821-15
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	315 mA, 250 V Slow blow 5 × 20 mm	–
	Switzerland 240 volt/50 Hz Rated 10 amp	315 mA, 250 V Slow blow 5 × 20 mm	–

Fig. 1 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

Panel Unit (X66-1410-00)

The Panel Unit controls the key inputs and LED display on the panel.

Lower / Higher	CC 0	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7
RR 0	J CW	J CCW			S CCW-full	S CCW	S CW	S CW-full
RR 1	F 1	F 2	F 3	F 4	F 5			SHIFT
RR 2	SEQ	RCL	∧	∨	7	4	1	0
RR 3	8	5	2	•	9	6	3	—
RR 4	kHz	Hz	CLR	ENT	△	◁	▷	▽
RR 5	MEVV	GEN	AC-V	DIST	S/N			
RR 6								
RR 7	OUT	CH(GEN)	CH(AC)		GPIB			

Notes: J CCW (CW) indicates the rotation of the jog/shuttle dial in the counterclockwise (clockwise) direction.

S CCW-full (CW-full) indicates the rotation of the shuttle dial in the fully counterclockwise (fully clockwise) position.

S CCW (CW) indicates the rotation of the shuttle dial in the counterclockwise (clockwise) direction.

V14 is the ROM for use in decoding the key matrix signals. When a key or jog/shuttle dial is operated, an address is selected according to the table above and the data written in that address is output at DD0 to DD7. The output at U15 pin ⑧ is the CPU interrupt signal *REM0_KRQ, which turns from L → H when a key is pressed or the jog/shuttle dial is operated. Upon detection of the interrupt, the CPU sets *REM0_KEN at V16E pin ⑪ to L level top open the gate of U13, and read the key matrix signal to read the key press or jog/shuttle dial status.

Signal name	LD 00	LD 01	LD 03	LD 04	LD 06	LD 07	LD 10	LD 14	LD 15	LD 17
LED	GEN L	GEN R	AC 2 (UNB)	ACR (UNB)	ACL (BAL)	ACR (BAL)	OUT	GPIB	SHIFT	SEQ

U10 and U2 are ports for lighting the LEDs. The signal names and the LEDs corresponding to each of them are shown in the above table. These ports are controlled by the CPU.

Signal name	LD 02	LD 05
LED	GEN GND	AC GND

The GEN GND and AC GND LEDs shown above are lighted by the Slight SWs on the Switch Unit (X69-1350-00) located on the rear of the set.

CPU Unit (X77-1940-00)

The CPU Unit is the system controller managing the audio analyzer system. The main functions include the key input processing, LCD display, EXT I/O control, DSP control, GP-IB control and control of the ports of various units.

Key processing

The data exchange with panel keys is performed using PD0 to PD7 of I/O port U12, REM0_A/*D, REM0_STB, REM0_KEN and key or rotary encoder interrupt signal *REM0_KRQ.

LCD display

The LCD display is controlled by LCD controller U18 and VRAM U19. The CPU transfers necessary data for display to U18 at the timing of interrupt signal *INTP1.

EXT I/O control

The data exchange inside the I/O Unit (X72-1200-00) is performed using AB00 to AB15, DB0 to DB7, *STBB and R/*WB. The external key interrupt signal is *INT4.

The data exchange with the external rotary encoder is performed using PD0 to PD7 of I/O port U12, *REM1_KEN and rotary encoder interrupt signal *REM1_KRQ.

GP-IB control

The GP-IB is controlled by GP-IB controller U14 and drives U15 and U16.

The GP-IB interrupt signal is INT7.

DSP control

From the viewpoint of the CPU, the DSP is an I/O port.

The data exchange with DSP is performed using AB15 to AB00, DB0 to DB7, R/*WB, *STBB, PS5, PS3, PS2 and *INTE0 which is the interrupt signal from DSP (DSP interrupt signal *DAK1 is not used).

Unit port control

The ports of the Control Unit (X77-1930-00), DSP Unit (X79-1230-00) and Oscillator Unit (X71-1230-00) are set using signals *SCKB. SDTB. SSTB and SR/WB.

Back-up

The notch filter calibration constants are stored in EEPROM U34.

The contents of RAM U11 are backed up by BT1. Reset IC U2 controls signal MWE so that the contents of RAM U11 are not destroyed at the time the power is switched on or off. MWE is a signal which becomes +5 V before the CPU starts when the power is turned on, and 0 V before the CPU is shut off when the power is turned off. VRAM U19 is not backed up.

CIRCUIT DESCRIPTION

I/O Unit (X72-1200-00)

The I/O unit is used to control the EXT I/O.
Signals EB085 to 089 and EB091 to 093 are connected with the EXT I/O pins as shown in the following table.

Signal name	EB 085	EB 086	EB 087	EB 088	EB 089	EB 091	EB 092	EB 093
EXT I/O	UP	DOWN	CLR	FREQ	AMPL	K 5	K 6	K 7

These signals are sent through buffer U7 and 8-to-3 priority encoder U6 and input to input port U5. When any of the above signals turns from H to L, signal GS at U6 pin ⑭ goes L level to generate interrupt EB004 (INT4) to the CPU, which then reads the pin data through U5.

Signal name	EB 039	EB 040
EXT I/O	EXTRE 1	EXTRE 2

Signals EB039 and EB040 are connected with the EXT I/O pins as shown in the above table. As the external rotary encode is connected to these pine, interrupt EB097 (*REM1_KRW) to the CPU is generated at U8B, U8D, U8A, U8C, U3D, U9A and U9B. The CPU reads the rotation direction of the rotary encode by opening the gate of U10 using EB098 (*REM1_KEN).

Signal name	EB 036	EB 037	EB 038
EXT I/O	UNDER	PASS	OVER

Signals EB036, EB037 and EB038 are connected to the EXT I/O as shown in the above table. These pins are connected with external LEDs and used in GO/NO-GO judgment. The CPU latches these signals at U4.

Signal name	EB 084	EB 083	EB 082	EB 081	EB 080	EB 079	EB 078	EB 077
EXT I/O	$P2_7$	$P2_6$	$P2_5$	$P2_4$	$P2_3$	$P2_2$	$P2_1$	$P2_0$

Signal name	EB 034	EB 033	EB 032	EB 031	EB 030	EB 029	EB 028	EB 027
EXT I/O	$P1_7$	$P1_6$	$P1_5$	$P1_4$	$P1_3$	$P1_2$	$P1_1$	$P1_0$

Signal name	EB 026	EB 035
EXT I/O	STB	BUSY

As shown in table above, I/O ports P00 to P17 of U5 are used in the data I/O with port 1 and port 2 of the EXT I/O.

Control Unit (X77-1930-00)

The Control Unit is used to control the contrast and brightens of the LCD.
The output from pin ② of D/A converter U3 is the DC output for the LCD contrast adjustment, while the output from its pin ① is the DC output for the LCD brightness adjustment. This D/A converter is set using serial data SSTB, *SCKB and SDTB from the CPU.
The output from U5A pin ① is designed to be about -6 V when the contrast setting made on the panel is 0 and about -8.5 V when the panel setting is 9, provided that the ambient temperature is 23 deg.C. (The voltage is adjusted with V1, but as the actual voltage is variable due to variance n LCD products, it is recommended to set the panel setting to 5 and adjust visually to the easiest-to-seen contrast).
TH1 is the thermister for compensating for change in the LCD contrast due to temperatures.
U4A and U4B form a CR oscillator with oscillating frequency of about 280 Hz. Based on the brightness adjustment DC signal output from U3 pin ①. With the brightness adjustment, the 150 V AC voltage supplied to the LCD lamp is controlled by switching the input to DC/AC converter U6 ON/OFF by varying the duty of the 280 Hz clock at the output of U4D using the oscillator.

DSP Unit (X79-1230-00)

This unit is used to process the analog signals from the AC or DC input to signals which are easy to be A/D converted by the DSP Unit (X79-1250-00).
The unit can be divided roughly into the AC signal processor and DC signal processor blocks. The blocks are isolated between each other.

AC measurements (including distortion measurement)

The AC input circuitry is compatible with BAL and UNBAL input modes, and equipped with two lines for the R CH and L CH of stereo.
The signal input through R is supplied to K4A or K4B (in case of BAL input) to have the input impedance converted from 100k to 10k. The signal input through L is supplied to K7A or K7B (BAL input) to have the input impedance converted from 100k to 10k. The L/R inputs are switched over with K5A, K6A, K5B (BAL input) and K6B (BAL input) and with K8A, K9A, K8B (BAL input) and K9B (BAL input). The input from the CH which is not used for single-CH measurement or CH which is not being measured in L&R measurement is terminated by R5. 17 (BAL input), R29 and 34 (BAL input).
K10A and K10 B (BAL input) are used to switch over the input signal gain between 0 dB/-20 dB, and K11A and K1B (BAL input) are used to switch over the input signal gain between 0 dB/-10 dB. The gain can be switched according to ranges.
TC1, TC2, TC3 and TC4 are used for high-frequency compensation when the above attenuation is inserted. D1, Q13, D4, Q14, D5, Q15, D8 and Q16 are used to protect the input of preamp U1 in case a signal with an excessive level is input by mistake.
U1 is a preamplifier (X73-2080-00). The relationship between its gain and the logic of pins ⑭, ⑮ and ⑯ is as shown below.

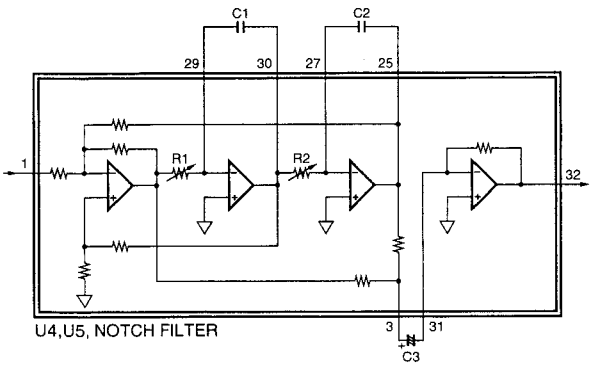
Gain	U1 ⑭	U1 ⑮	U ⑯
+30 dB	H	H	H
+20 dB	L	H	H
+10 dB	L	L	H
0 dB	L	L	L

The gain above can be switched according to the ranges.

CIRCUIT DESCRIPTION

As the preamp is required to have a distortion below 0.001%, The preamp used in gain switching reduces the ON resistance by using two parallel transistors for FETs Q5, Q11, Q10 and Q26. In addition, to control the offset in the preamp output to no more than 300 mV when the gain is 30 dB, first-stage FETs Q1 to Q4 are selected with VGS (so that the difference in the FETs forming the pair is no more than 3 mV).
When the input mode is BAL, U2A is combined with K12A and K12B to convert the BAL signal into UNBAL signal.

U3A is a +40 dB amp which is combined with K14A and K14B. This amp is operated with distortion measurement input ranges of 3 mV, 10 mV and 30 mV.
K15B is used to switch between the 0/-40 dB attenuators, and operated when the input range in AC-V measurement is between 100 mV and 100 V o when the distortion range in distortion measurement is between 3% and 100%. VR2 is the -40 dB adjustment VR.
This input outputs the RANGE ONITO signal, which is used as the input signal measuring signal in distortion measurements.
U4 and U5 are notch filters, which are combined in AC-V measurements to act as a +40 dB amp. Each of these filters is composed of the state-variable filters as shown below.



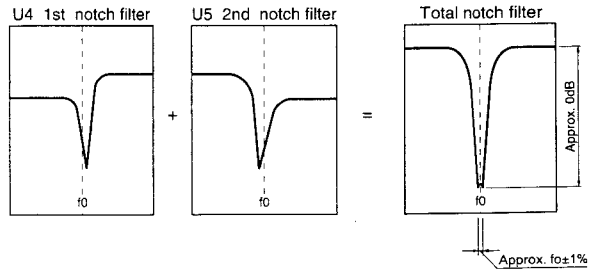
In the following, the filter shown in the figure above will be described taking U4 as example.
In the actual circuit diagram, C1 and C2 in the figure above are composed respectively of C24, 25, 27 and 29 and of C31, 33, 35 and 37. They are switched over by a relay according to the frequency ranges as shown in the following table.

ITEM	Frequency range	C24, C31,	C25, C33,	C27, C35,	C29, C37,
ACV	All ranges	Shorted	OFF	OFF	OFF
THD+N	10 Hz to 200 Hz	ON	OFF	OFF	OFF
or THD	200 Hz to 2k	OFF	ON	OFF	OFF
or HD	2 k to 20 k	OFF	OFF	ON	OFF
	20 k to 110 k	OFF	OFF	OFF	ON

In the actual circuit diagram, VRs R1 and R2 in the figure above are composed of R100, R101 and a discrete ladder resistance. The resistance value can be switched with the FET SWs of U4 to U7 and U8 to U11. The relationship between the notch frequency and U10 port settings is as shown below though there are slight difference in bits depending on sets (depending on the notch filter calibration conditions).

Signal name \ f	2 k	5 k	9 k	10 k
N 11	H	H	H	H
N 10	H	H	L	L
N 09	H	L	L	L
N 08	L	L	H	L
N 07	H	L	L	H
N 06	L	H	L	H
N 05	H	L	H	L
N 04	H	H	L	L
N 03	H	H	L	H
N 02	H	L	H	L
N 01	H	L	L	L
N 00	H	H	H	L

The settings of U5 are identical to U4.
The attenuation characteristics differ between U4 and U5 as shown below. As for the characteristics when U4 and U5 are connected in series, the attenuation is about -60 dB and attenuation width is about ±1% of fo.



U16B is used for HPF filtering. C78, C79, R98 and R99 form the 5 Hz two-stage Butterworth HPF, C80, C81, R110 and R101 form the 30 Hz two-stage Butterworth HPF, C2, C83, C84, R103, 104 and R105 form the 200 three-stage Butterworth HPF, and C87, C88,
C(9, 108, 109, R110, V16A, C85, C86, R106 and R107 form 100 Hz five-stage Butterworth HPF. An optional HPF can be connected to P8.
VR9 is the VR for offset adjustment of U16B.

CIRCUIT DESCRIPTION

V17A is used for LPF filtering of 800 kHz and 80 kHz.
R114, R115, R116, C92, C93 and C94 from the 500 kHz three-stage Butterworth LPF, and R117, R118, R119, C95, C96 and C97 from the 80 kHz three-stage Butterworth LPF. An optional LPF can be connected through connector P8; The optional PSO PHO filter can be connected between the U17A output and the next stage through connector P8.
U20 is a 20 kHz nine-stage Chebyshev LPF manufactured by Murata. This filter is usable even when the 20 kHz LPF in the menu is set to OFF. If TP11 is observed, it may be seen that analog SW U15G is switched at a certain interval (which differs depending on the FAST and SLOW modes). This is because the 20k LPF should be switched OFF for the 500 kHz sampling measurements and ON fo the 44 kHz sampling adjustment.
VR10 is the VR for use in gain adjustment when the 20k LPF is ON.
The filter composed of U33 and U33B is used to provide the filtering characteristics of 20 kHz or more for the DIN-AUDIO filter among the PSO PHO filters. The filter characteristics below 20 kHz of the DIN-AUDIO filter, those of other PSO PHO filters and those of the 15 kHz LPF are provided by digital processing after A/D conversion.
Although the combination of U21F and U22A allow switching the input signal gain between +10 dB/-10 dB, the gain is currently fixed at -10 dB with both AC-V and distortion measurements.
VR11 is the VR for use in offset adjustment of U22A.
The combination of U21E and U22B allow switching the input signal gain between 0 dB/+10 dB/+20 dB. With the AC-V measurement, the gain is +20 dB only in the 300 mV range and +10 dB in other ranges. With distortion measurement, the gain is variable depending on the distortion ranges.
VR12 is the VR for use in offset adjustment of U22B. VR5 is used to adjust the gain of U22B. U23A, C113, C114, R147 and R148 from the 3 Hz HPF.
U24A and U24B are permanently ON during AC-V measurement. In distortion measurement, they are switched alternately with V24C and C24D to measure the input level and distortion signal level and the distortion rate is calculated with the DSP.
U23B is a buffer amp.
VR6 and VR13 are the gain adjustment VR and offset adjustment VR, which allow gain and offset adjustments when combined with U17 in the DSP Unit (X79-1250-00). Care is required in the gain adjustment because varying VR6 also affects the gain in DC-V measurement.

DC measurements

The DD measuring circuit is composed of the input attenuator and DC amp
The signal input from DC IN is supplied to K1A, where the input signal gain is switched between 0 dB/-20 dB. With K2A, the input signal gain can be switched between 0 dB/-10 dB. VR3 and VR4 are used to adjust the -20 dB and -10 dB attenuators respectively. These attenuators are used in the 100 V and 30 V ranges.
K3A is used to short-circuit the U12A Input to the measuring circuitry GND during AC-V measurement.
K3B is used to connect the measuring circuitry GND to the DC input GND during DC measurement or to AC input GND during AC measurement.

> Note: The AC input GND and DC input GND can be connected to the chassis GND independently through the Switch Unit (X69-1350-00) on the rear panel.

Q17 and Q18 are used to protect the input of U12A in case a signal with an excessive level is input by mistake.
V12A is the DC amp. The relationship between its gain and the logic of U6A pins ⑦ and ⑭ is as shown below.

Amp gain	U 6A⑦	U 6A⑭	U 13A	U 13B	U13C	U13D
0 dB	H	H	ON	OFF	ON	OFF
20 dB	H	L	ON	OFF	OFF	ON
40 dB	L	L	OFF	ON	OFF	ON

The gain above can be switched according to the ranges.
VR14 is the VR used for offset adjustment of U12A.
R75 and R300 are used to adjust the DC level in order to align the sensitivity in DC measurement and the input signal level sensitivity in distortion measurement.
During DC measurement, V25D is turned ON and connected to buffer amp U23B.

AC-V monitor circuit

To monitor the input signal during AC-V measurement, the AC-V monitor outputs signal with an output impedance of 600-ohm and output level of 1 Vrms (at full-scale input of each range with 600-ohm termination) from the BNC connector on the rear panel. The output from pin ㉜ of 2nd notch filter U5 is used for monitoring. The level is adjusted with VR100.

Port setting

The ports are set by supplying serial data (SDT), clock (SCK) and latch pulse (SST) to U30A, U15A, U21A, U6A, U7A, U8A, U9A, U10A and U11A.
To pass the data above, the gate of U18B opens in case the setting is made from the DSP Unit, and the gate of U18A in case it is made from the CPU Unit.
PH1A, PH1B and PH2A are the photocouplers for use in isolation between the CPU and DSP GND and the measuring circuitry GND.

CIRCUIT DESCRIPTION

±12.5 V regulator

The ±12.5 V regulator use opamps U27A and U27B. Q11 and Q12 are attached onto the chassis for use in heat radiation.

Gain distribution table

The following tables show the gain distribution in each of the stages from input to output in the DC-V, AC-V and distortion measurements. (The gain is expressed in dB, where 0 dB = 1 Vrms.)

DSP Unit (X79-1230-00): Gain Distribution Table

DC measuring ranges

Input range	Input level	ATT (K1A K2A)	AMP (U12A)	OUTPUT (TP14)
100 V	40	-30	0	10
30 V	30	-20	0	10
3 V	10	0	0	10
300 mV	-10	0	20	10
30 mV	-30	0	40	10

AC measuring ranges

Input range	Input level	ATT (K 10A K 10B K 11A K 11B)	AMP (X73-2080-00)	+40 dB GAIN (K14A K 14B) U 3A	-40 dB ATT (K15B)	1 st & 2 nd Notch filter (X69-1330-00, X69-1340-00)	+10 dB -10 dB GAIN (U22B) U21E	+ 0 dB + 10dB + 20 dB GAIN (U22B) U21E	OUTPUT (TP14)
100 V	40	-30	0	0	-40	40	-10	10	10
30 V	30	-20	0	0	-40	40	-10	10	10
10 V	20	-10	0	0	-40	40	-10	10	10
3 V	10	0	0	0	-40	40	-10	10	10
1 V	0	0	10	0	-40	40	-10	10	10
300 mV	-10	0	20	0	-40	40	-10	10	10
100 mV	-20	0	30	0	-40	40	-10	10	10
30 mV	-30	0	0	0	0	40	-10	10	10
10 mV	-40	0	10	0	0	40	-10	10	10
3 mV	-50	0	20	0	0	40	-10	10	10
1 mV	-60	0	30	0	0	40	-10	10	10
300 µV	-70	0	30	0	0	40	-10	20	10

CIRCUIT DESCRIPTION

Distortion measuring input ranges

Input range	Input level	ATT (K 10A K 10B K 10B K 11A K 11B)	AMP (X73-2080-00)	+40 dB GAIN (K14A K 14B) U 3A	OUTPUT (TP14)
100 V	40	-30	0	0	10
30 V	30	-20	0	0	10
10 V	20	-10	0	0	10
3 V	10	0	0	0	10
1 V	0	0	10	0	10
300 mV	-10	0	20	0	10
100 mV	-20	0	30	0	10
30 mV	-30	0	0	40	10
10 mV	-40	0	10	40	10
3 mV	-50	0	20	40	10

Distortion ranges

Distortion range	-40 dB ATT (K15B) distortion input	-40 dB ATT (K15B)	1 st & 2 nd Notch filter (X69-1330-00 X69-1340-00)	+10 dB -10 dB GAIN (U22A) U21E	+ 0 dB + 10dB + 20 dB GAIN (U22B) U21E	OUTPUT (TP14)
100 %	10	-40	40	-10	0	0
30 %	0	-40	40	-10	+10	0
10 %	-10	-40	40	-10	+20	0
3 %	-20	-40	40	+10	+10	0
1 %	-30	0	40	-10	0	0
0.3 %	-40	0	40	-10	+10	0
0.1 %	-50	0	40	-10	+20	0
0.03 %	-60	0	40	-10	+20	-10
0.01 %	-70	0	40	-10	+20	-20

CIRCUIT DESCRIPTION

DSP Unit 2 (X79-1240-00)

This unit is used to analyze the measured signal data, generate the DDS signal, generate the monitor signal and control the ports.

Measured signal data analysis

The measured signal which has been converted into serial data by the DSP Unit (X79-1250-00) is converted into parallel signal by U14 and U15, and loaded in FIFO memory U16 and U17 at the timing of ADWCK. ADWCK is generated by using DSP Unit (X79-1250-00) U27 which decodes the signal generated by the A/D PLL of the DSP Unit (X79-1250-00). Every time counter of U21 indicates that 1k word of data has been loaded in the memory, interrupt $\overline{INT2}$ to the DSP is generated, so the DSP reads and analyzes the data. When the data has been analyzed, the DSP generates interrupt $\overline{OINT}$ to the Main Cpu (X77-1940-00) to inform it that the measured value has been set.

DDS signal generation

The DDS signal generated by the DSP is written in FIFO memory U22 and U23. This write operation is performed when the DSP receives interrupt $\overline{INT1}$ which is generated when the counter formed with U19B, U19B, U18C and U20A has read data from the 128-word FIFO memory. Clock $\overline{DDSRCK}$ which is used to read data from the FIFO memory is generated by using U30 which decodes the signal generated by the DDS PPL of the DSP Unit (X79-1250-00).

The data read from FIFO memory U22 and U23 is converted from parallel into serial by U24 and U25, oversampled by digital filter U26, sent through selector U27 (which is fixed on the input of the digital filter side) and buffer U28, and supplied to the Oscillator Unit (X71-1230-00).

Monitor signal generation

The THD monitoring signal generated by the DSP is written in FIFO memory U32. The written data is read at the timing of the about 60 Hz clock generated by U31A and U31B, converted into analog signal by D/A converter U33 and I-V converter amp U34, and output externally. (This circuit is omitted from the term of February '95.)

Response of DSP at the time of CPU booting

When the CPU (X77-1940-00) is booted after the power is switched ON, the CPU sets the $\overline{IORES}$ and HLD lines to L levels to request the DSP (U1) to open the data bus and address bus. The DSP monitors these lines and, when the L level is detected, the DSP sets signal $\overline{HLDA}$ to L level to inform the CPU that the buses are open. After being informed of the opening of the buses, the CPU transfers the program (initialize program) to AM U3 and U4 though ports U8, U9, U10 and U11. After the transfer, the CPU sets $\overline{IORES}$ and HLD to H level. When the DSP detects it, the DSP start execution of the transferred initialize program and interrupts the CPU with signal $\overline{OINT}$ and loads the main program in RAM U3 and U4 using $\overline{HLDA}$, HLD and the buses. After loading, the main program starts and DSP starts execution of data analysis, DDS signal generation, etc. Hereafter, the DSP interrupts the CPU with $\overline{OINT}$ every time measured data is analyzed, and data transfer between the CPU and DSP is performed using HLD, $\overline{HLDA}$ and the buses.

Port control

In addition to read, write and computation processing of the data in the A/D FIFO memory, DDS FIFO memory and MONITOR FIFO memory, the DSP also generates signals MDT, MCK, $\overline{MLE1}$, $\overline{MLE2}$ and $\overline{MLE4}$ which are used to set the I/O ports of the DSP Unit (X79-1230-00) and DSP Unit (X79-1250-00).

DSP Unit (X79-1250-00)

This unit is used to convert the signal after analog processing by the DSP Unit (X79-1250-00) from A to D, generate the timing signal fo the A/D conversion (A/D PLL) and generates the timing signal for use in generation of the digital signal.

A/D conversion

The signal output from connector P12 of the DSP Unit (X79-1230-00) is input into connector P1 of the DSP Unit (X79-1240-00). To optimize the signal which is input into A/D converter V21 through amp V17A, the input resistance of V17B is switched with analog SW V18A. The gain is managed by the DSP.

The signal input to pin ④ of 12-bit A/D converter U21 is converted from A to D using the pulse supplied to U21 pin ⑳ as the sampling frequency.

After A/D conversion, the digital signal is converted by U22 and U23 from parallel to serial and the serial data is transferred using the clock (which is adjusted to 8.3 MHz with V1) generated by U20C, U20A and C20D. The transfer timing signals of data signal SDAT are the 8 MHz and $\overline{LOAD}$ signals. After passing through buffer U5A, the above signal is isolated by photocouplers PH1 and PH3 (isolation between CPU. DSP and GND and the measuring circuitry GND), sent through selector U26 (which is used as the buffer) and supplied to the DSP Unit (X79-1250-00).

CIRCUIT DESCRIPTION

DDS PLL

The DDS PLL is composed of loop filter U1, a VCO (an LC oscillator with the oscillation frequency determined by coil L1 and varicaps D1 to D5), RF amp V3 which amplifies the CO output, frequency divider and phase detector U6. The dividing ratio of U6 is set by the DSP so that the VCO output is constant at 100.66 MHz. The reference clock for the input at U6 pin ① is 10 MHz (which is generated by the X'tal oscillator in the DSP).

The VCO oscillation output is amplified by RF amp U2 and divided by U4 into 12.582 MHz. This clock is used as the reference for the timing signal supplied to the DDS oscillator (5 Hz to 20.09 kHz).
Timing signals required for the DDS oscillator, such as VCO0, VCOA, CLK, $\overline{\text{CLK}}$ and RCY, are generated by U9D, U9C, U9A, U9B, U8B, U7A and U8A.

A/D PLL

The A/D PLL is composed of loop filter U11, a VCO (an LC oscillator with the oscillation frequency determined by coil L8 and varicap D150, amp U12B which amplifies the VCO output, frequency divide and phase detector U10. The VCO output frequencies are switched over at the intervals determined in AC-V measurement and distortion measurement as well as according to the FAST or SLOW mode. Therefore, the dividing ratio of U10 is also determined dynamically by the DSP according to this interval. The reference clock for the input at U10 pin ① is 10 MHz (which is generated by the X'tal oscillator in the DSP). Timing signals such as FS500, FS125 and FS31 are used in D/A conversions and generated by U13A and U13B.

Oscillator Unit (X71-1230-00)

The Oscillator Unit is composed of the 5 Hz to 20.09 kHz variable oscillator using a digital oscillator, three spot oscillators including SPOT1 (20 Hz), SPOT2 (1 kHz) and SPOT3 (20 kHz) and the 10.1 Hz to 110 kHz variable oscillator using a CR oscillator.

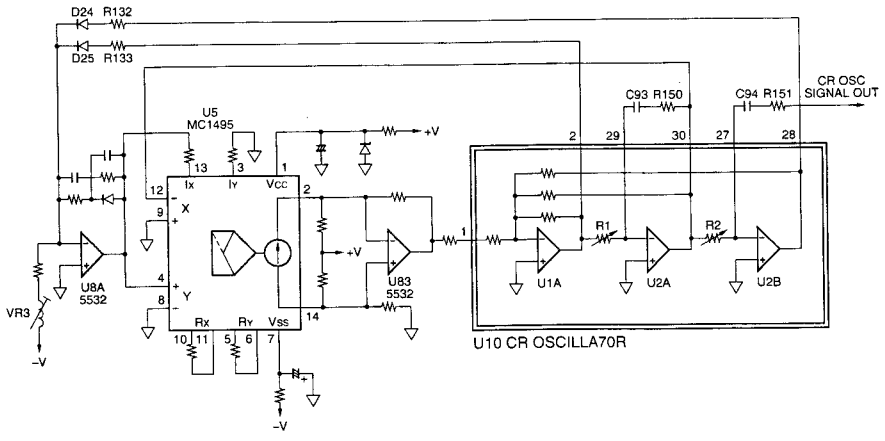
DDS oscillator

The digital sine wave generated by the DSP Unit (X79-1240-00) is input through connector P1. This sine wave uses 3 signal lines which are data (serial data), data transfer clock (12.582 MHz) and latch signal for use in converting serial data into parallel.
These signals are input to photocouplers PH1 and PH2 in order to isolate between the GEN GND circuitry and the CPU, DSP and GND circuitry. The signals output from the photocouplers are sent through Schmitt buffer of U3A and U3B o U3C and U3D and input to D/A converter U4. The level of he output at pin ⑨ is variable with R78. U6A, U6B and U7A from a six-stage Butterworth LPF with fc = 28 kHz. For the output from U7A pin ⑦, it is required to guarantee a flatness o ±0.05 dB a 20 Hz to 20.09 kHz, and the adjustment of trimmer TC1 is necessary for this purpose.

U7B is the 20 kHz LPF fo SPOT3 (20 kHz).
The LPF has a high Q in order to reduce the distortion in the output at U7B pin ①.
VR4 is used in the level adjustment of SPOT3.
R19, VR5, R152, R17, R18, C95, C90, V11A and V3A in U10 (X71-1220-00) form the 20 Hz LPF for SPOT1 (20 Hz). This LPF also has a high Q to reduce distortion.
R27, VR6, R114, R28, 33, C96, C91, V11B and V3A in U10 form the 1 kHz LPF for SPOT2 (1 kHz). This LPF also has a high Q to reduce distortion.

RC oscillator

The RC oscillator uses a state-variable filter and is used in the range from 20.1 kHz to 110 kHz.
It has a circuit configuration as shown below.



CIRCUIT DESCRIPTION

The state-variable filter is composed of three opamps of U1A, U2A and U2B. In the actual circuit diagram, VRs R1 and R2 in the figure above are composed of R100, R101 and a discrete ladder resistance. The resistance value can be switched with the FET SWs of U4 to U7 and U8 to U11.
U5 is the multiplier IC for use in controlling the feedback amount. The sine wave output at U10 pin ㉚ is input to U5 pin ⑫. The amplitude and phase of this sine wave are controlled by the DC level to U5 pin ④, and they are fed back to U10 pin ① via U8B. This feedback is intended to make the oscillation amplitude level constant (AGC).

The sine wave oscillation output at U10 pin ② and the sine wave oscillation output with 180-degree opposite phase at U10 pin ㉘ are half-wave rectified by R113 and D25 and by 132 and D24, and supplied to integrator U8A. On the other hand, from VR3, a constant current flows in the opposite direction which allows to make the oscillation amplitude constant. The oscillation amplitude is determined by the value of this current (which can be adjusted with VR3).

The relationship between the frequency set for the C oscillator and U10 ports is as shown below.

H= 5 V
L= 0 V

Signal name \ f	25 k	50 k	75 k	100 k	110 k
D 27	H	H	H	H	L
D 26	H	H	L	L	H
D 25	H	L	H	L	H
D 24	L	L	L	L	H
D 23	L	H	H	H	H
D 22	H	L	L	L	H
D 21	H	L	L	H	H
D 20	L	L	H	L	L
D 19	H	L	H	H	H
D 18	H	L	L	H	L
D 17	H	H	L	H	H
D 16	L	H	H	L	L

Output stage

The DDS o CR oscillated signal is input to the amp formed by Q1, Q2, U24A and U24B. Vr2 is used to adjust the gain of this amp. This amp functions as an inverter amp. With the input resistance switchable by switching ladder resistance R200 using ET SWs U25, U26 and U27 and the gain variable up to 3 dB in 0.1 dB steps. the amp is used as a part of the output attenuator circuit. At the output of this amp, 48 dB, 24 dB, 12 dB, 6 dB, 3 dB and 24 dB attenuators are provided in the order mentioned. They can be switched ON and OFF using relays.

GEN set level [dB]	Attenuator condition [dB] and port setting					
	48	24	12	6	3	24
	(E 08)	(E 09)	(E 10)	(E 11)	(E 12)	(E 13)
14	H	H	H	H	H	H
10.9	H	H	H	H	L	H
7.9	H	H	H	L	H	H
4.9	H	H	H	L	L	H
1.9	H	H	L	H	H	H
-1.1	H	H	L	H	L	H
-4.1	H	H	L	L	H	H
-10.1	H	L	H	H	H	H
-34.1	L	H	H	H	H	H
-82.1	L	L	H	H	L	L

GEN level [dB]	U28 port settings of 0.1 dB step attenuator							
	E 07	E 06	E 05	E 04	E 03	E 02	E 01	E 00
14.0	L	L	H	H	H	L	L	H
13.9	L	H	L	L	L	L	L	L
13.8	L	H	L	L	L	H	H	H
13.7	L	H	L	L	H	H	H	L
13.6	L	H	L	H	L	H	L	L
13.5	L	H	L	H	H	L	H	H
13.0	L	H	H	H	H	H	L	L
12.0	H	L	H	H	L	H	H	H
11.0	H	H	H	L	H	L	H	H
10.9	L	H	L	L	L	L	L	L

When the GEN output is switched OFF, the GEN output is connected to 600-ohm resistors R76 and R77 by means of relays K7A and K7B.

Port setting

The ports are set by supplying serial data (SDT), clock (SCK) and latch pulse (SST) to U15, U16, U17, U18, U19, U25, U26 and U27.
PH3 and PH4 are the photocouplers for use in isolation between the CPU and DPS GND and the GEN GND.

±12.5 V and ±17.5 V regulators

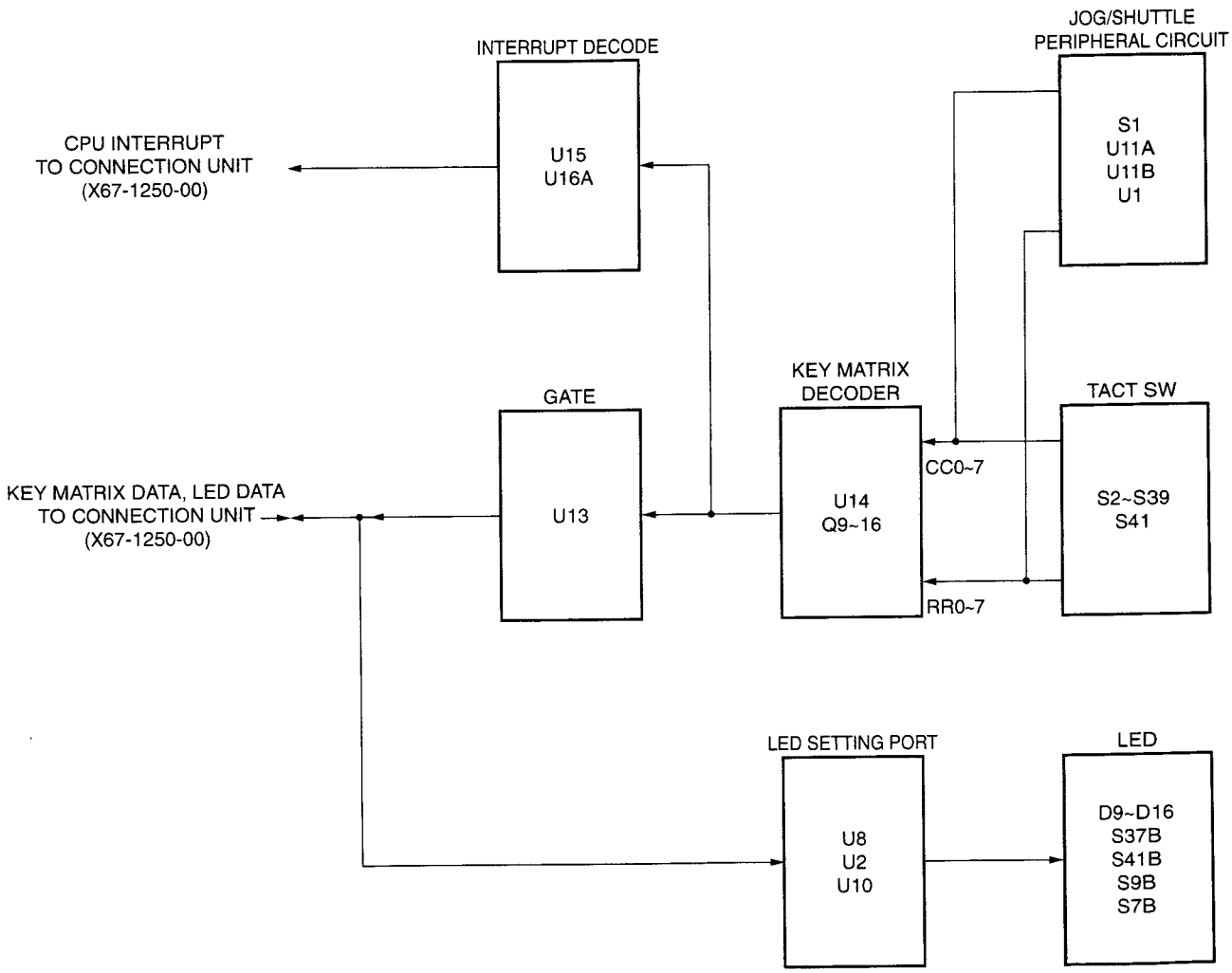
These ±12.5 and ±17.5 V regulators use opamps U36A and U36B. For heat radiation, transistors Q4 and Q3 are attached onto the PCB with screws.

Power Supply Unit (X68-1760-00)

The power is supplied in 3 lines for the measurement circuitry, GEN circuitry and CPU/DSP circuitry.
As shown in the block diagram, the DSP Unit (X79-1230-00) is supplied with the +5 V regulating voltage and +16 V and -16 V non-regulating voltages. The Oscillator Unit (X71-1230-00) is supplied with the +5 V regulating voltage and the +20 V and -20 V non-regulating voltages. The Connection Unit (X67-1250-00) is supplied with the +5 V, +15 V and -15 V regulating voltages.

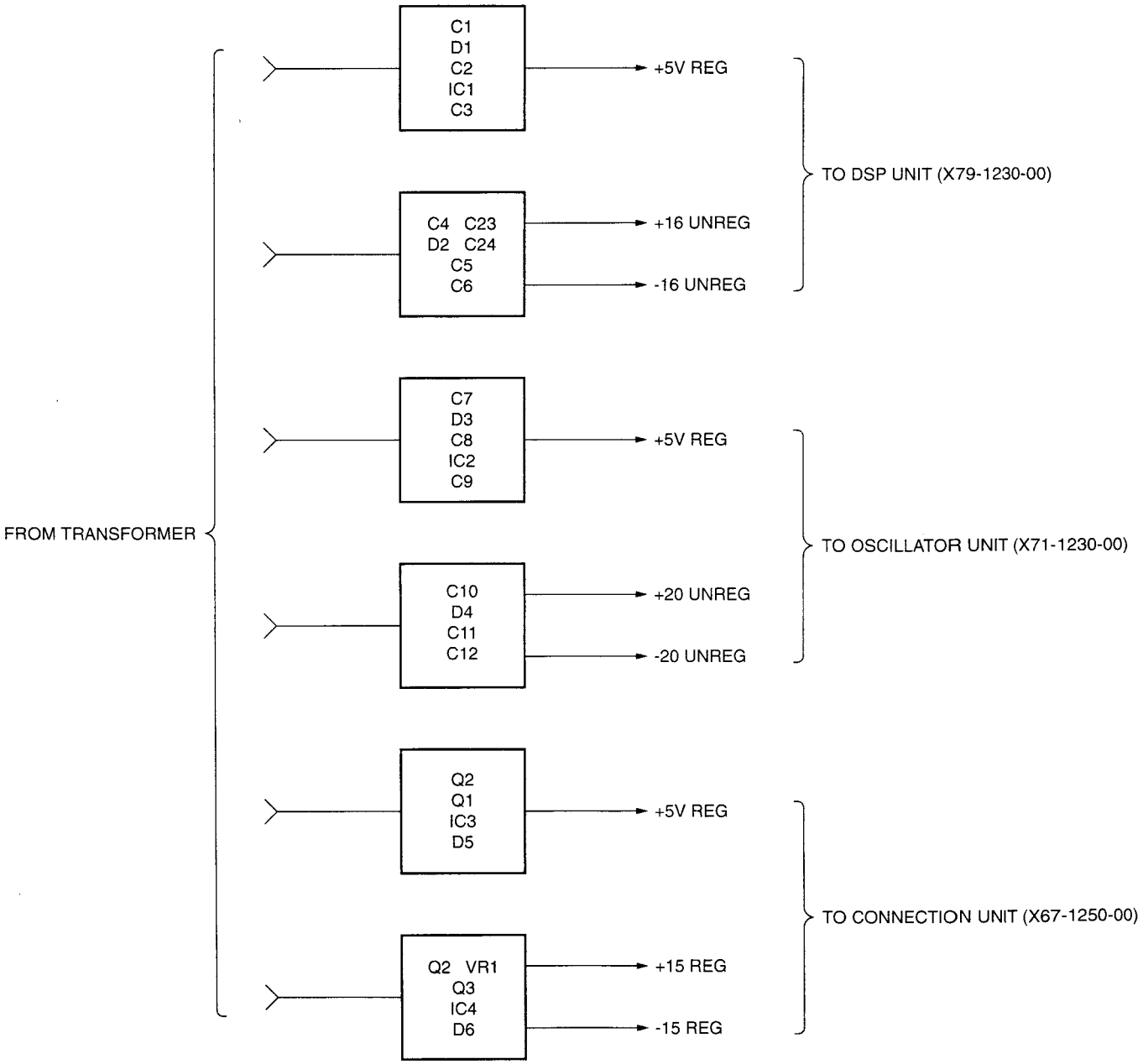
BLOCK DIAGRAM

PANEL UNIT (X66-1410-00)



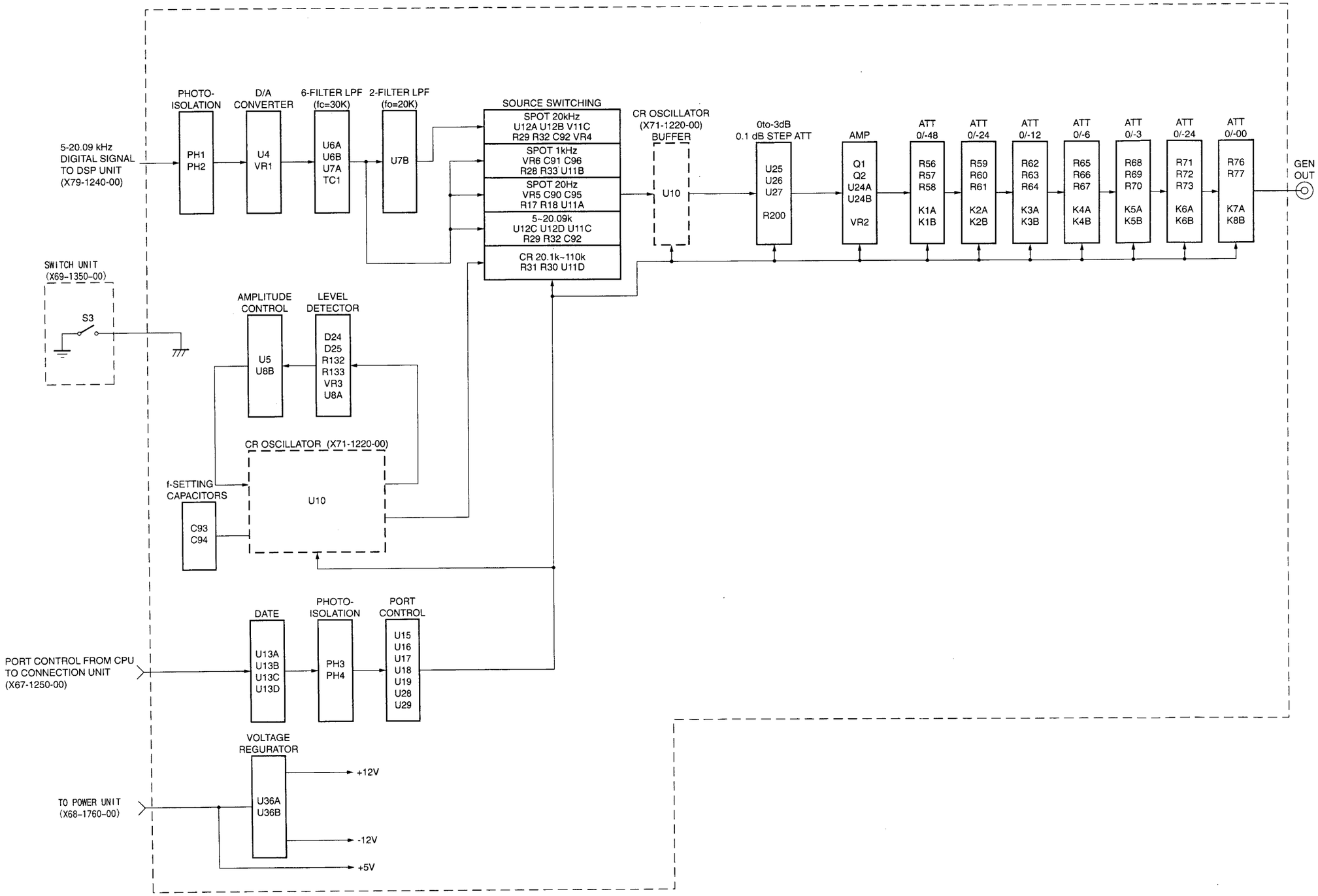
BLOCK DIAGRAM

POWER UNIT (X68-1760-00)



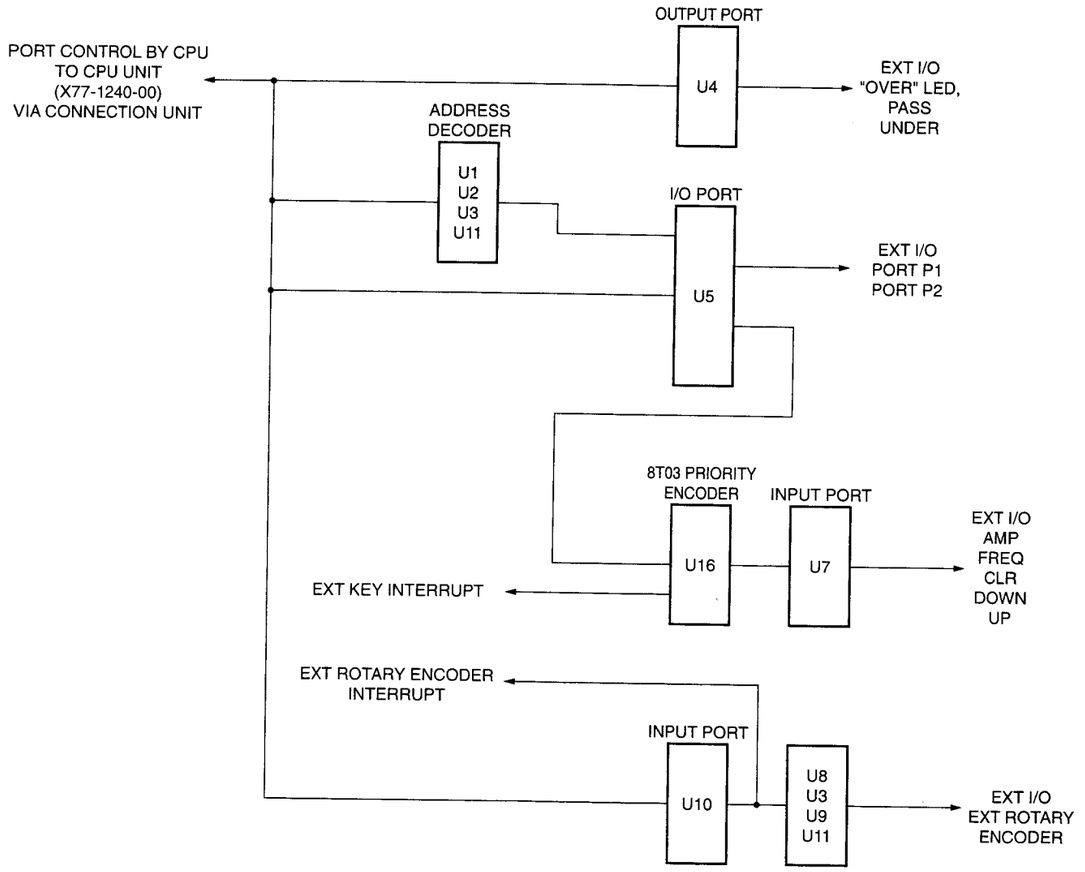
BLOCK DIAGRAM

OSCILLATOR UNIT (X71-1230-00)

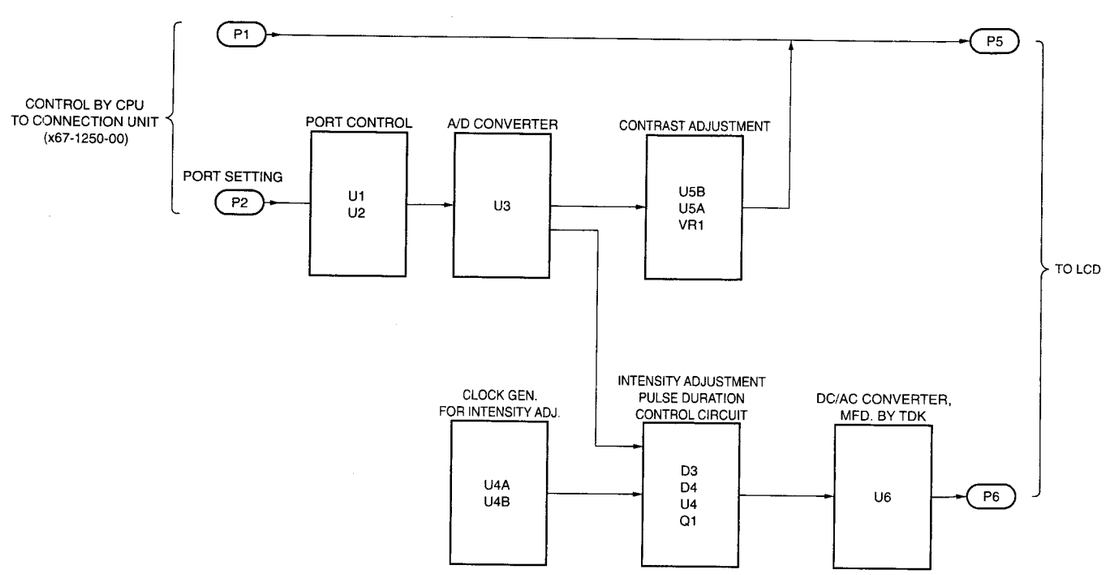


BLOCK DIAGRAM

I/O UNIT (X72-1200-00)



CONTROL UNIT (X77-1930-00)



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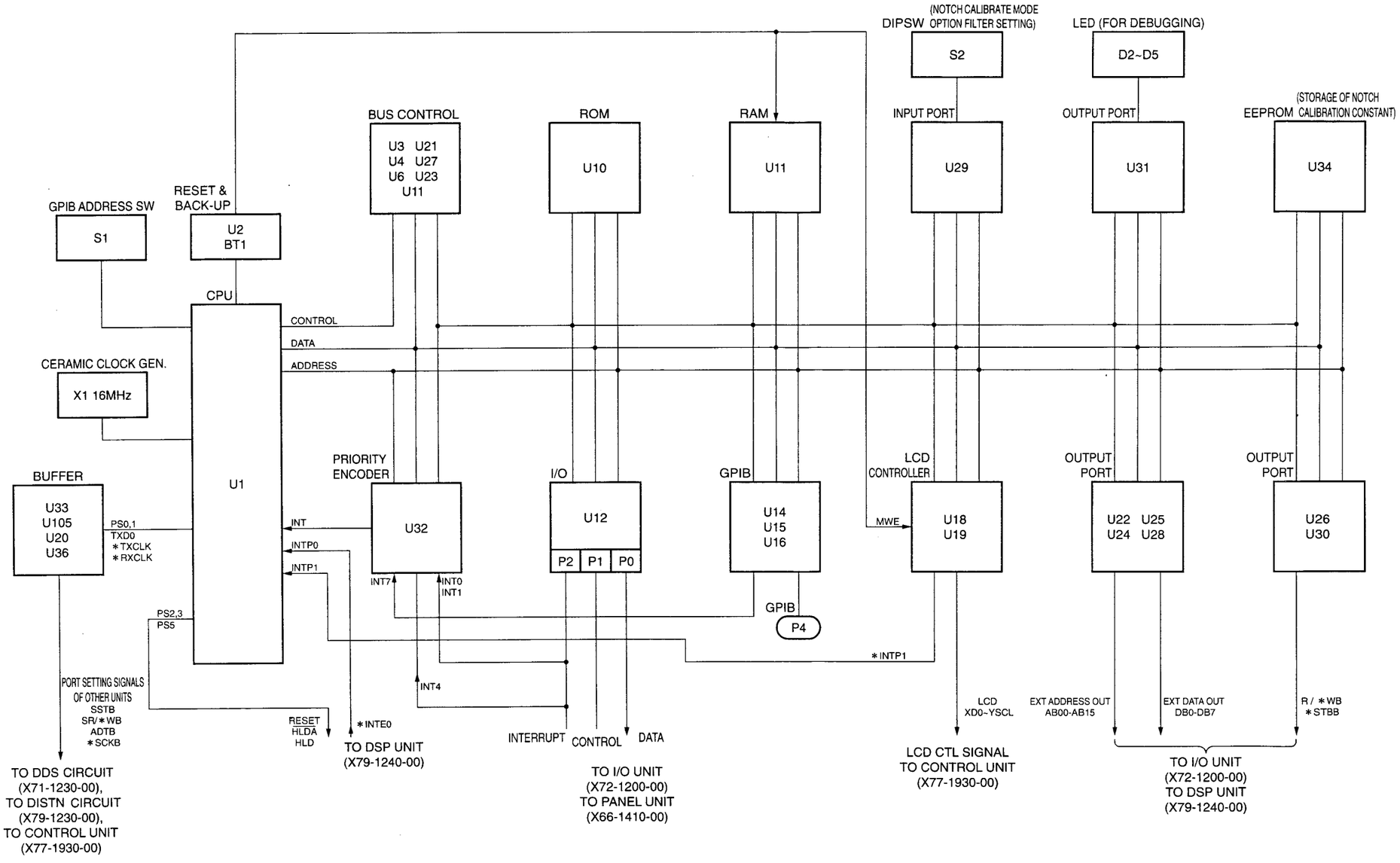
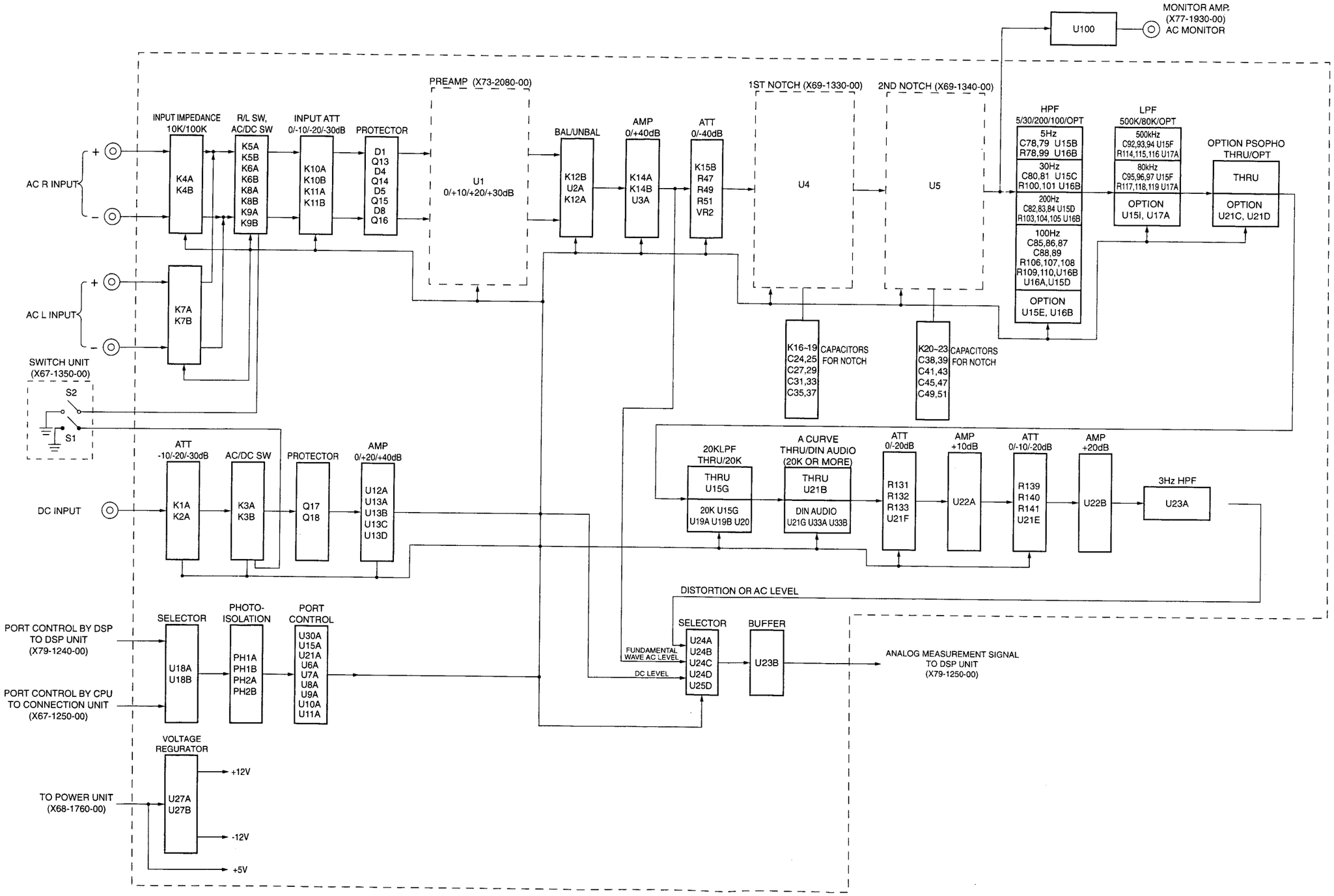
CPU UNIT (X77-1940-00)



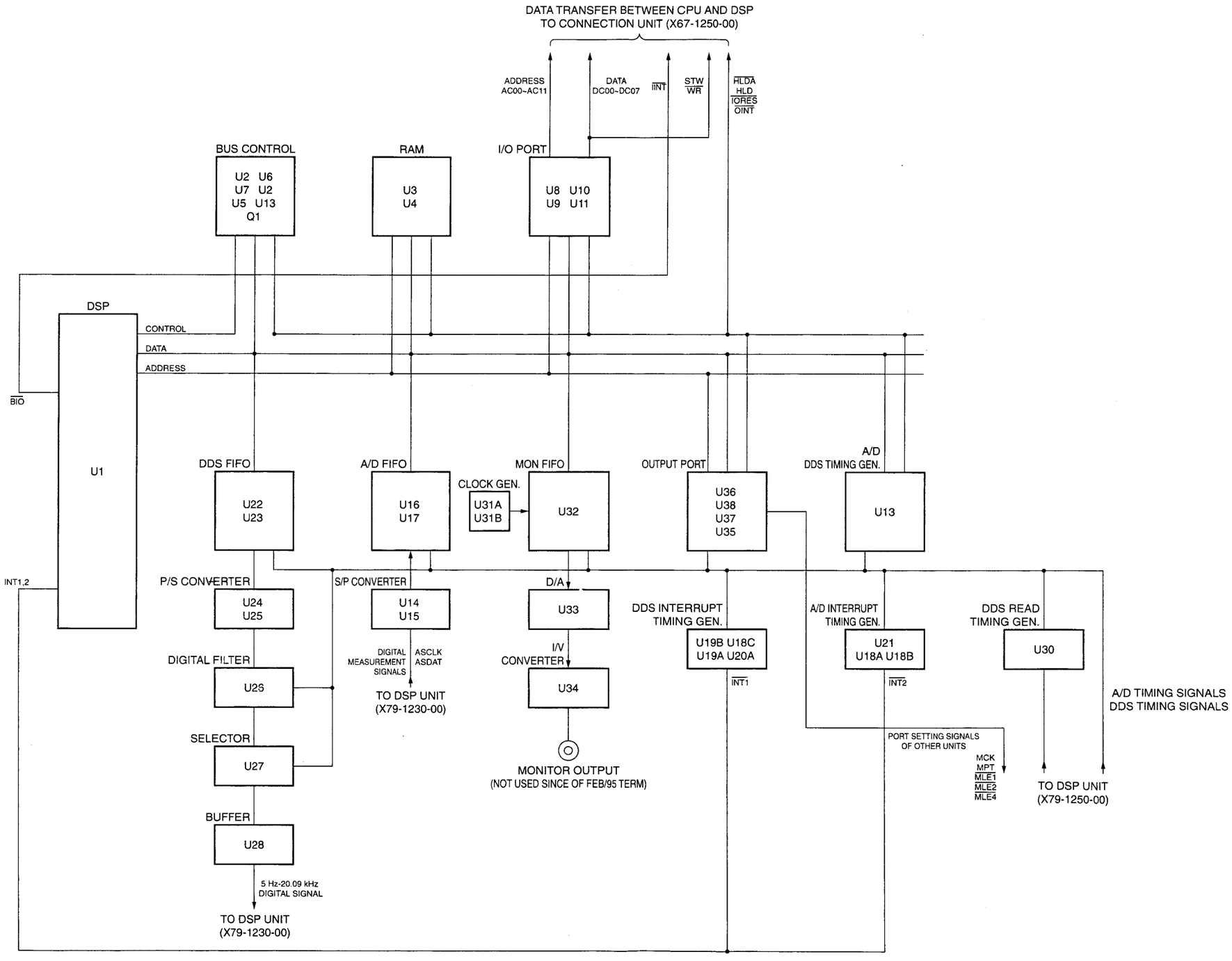
BLOCK DIAGRAM

DPS UNIT (X79-1230-00)



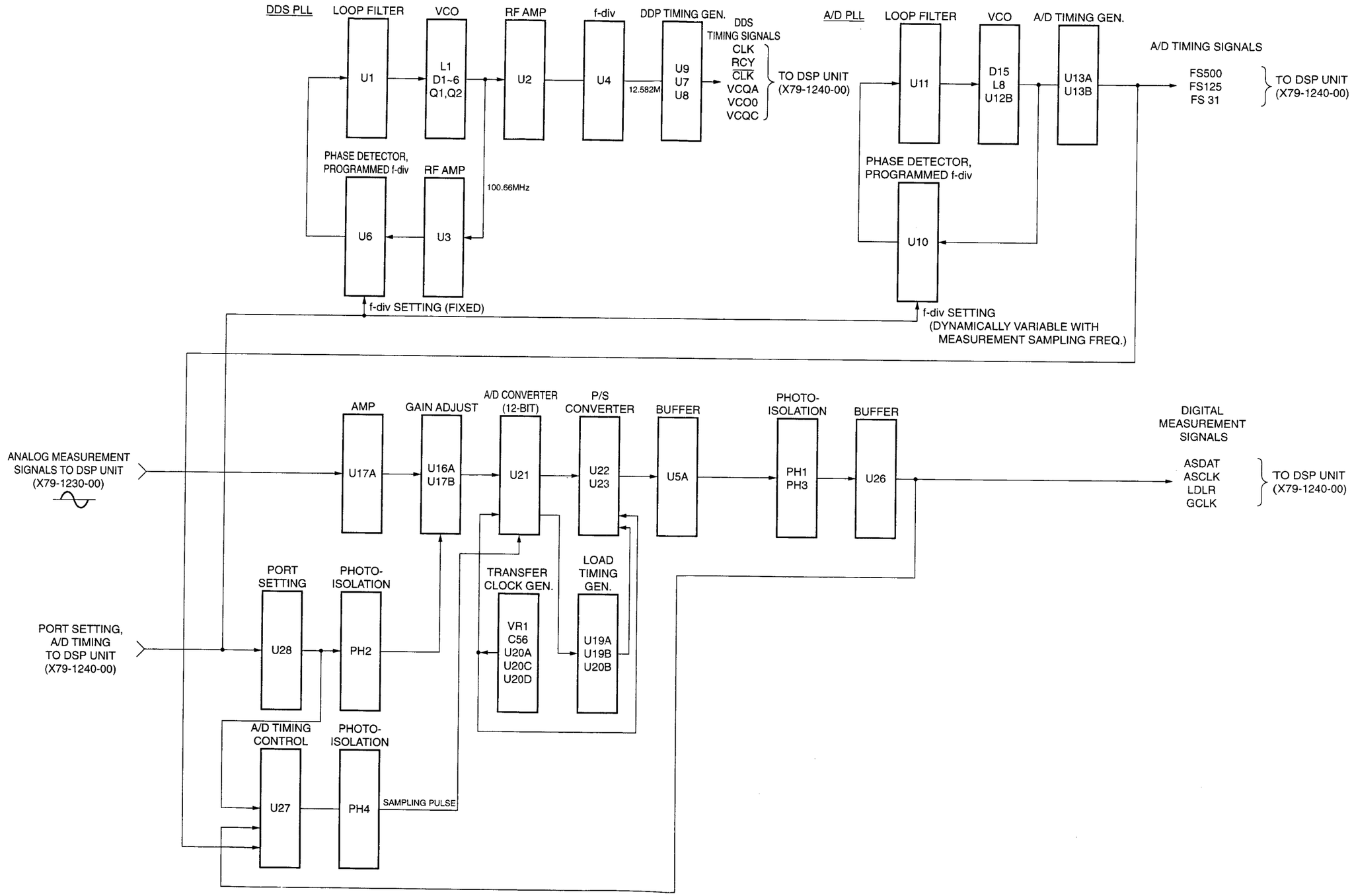
BLOCK DIAGRAM

DPS UNIT (X79-1240-00)



BLOCK DIAGRAM

DPS UNIT (X79-1250-00)



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	Maker
Calibrator	5700A	Fluke
Thermal RMS Digital Multimeter	8506A	Fluke
Universal Counter	5335A	H.P.
Low Distortion Oscillator	AG15B	Shibasoku

PREPARATION FOR ADJUSTMENT

Set the GEN, AC, DC and GND knobs located on the rear panel to the non-floating state before making adjustments.

ADJUSTMENT

Power voltage adjustment & check

Adjust V1 so that the voltage at TP1 of the Power Unit (X68-1760-00) is +15 V (between +14.95 and +15.05 V).
The supply voltage is adjusted only on the point specified above.
However, it is also necessary to check the voltages of the following units;
+5 V, +15 V and -15 V of Connection Unit (X67-1250-00),
+5 V, +12.5 V, -12.5 V, +17.5 V and -17.5 V of Oscillator Unit (X71-1230-00).
+5 V, +12.5 V and -12.5 V of DSP Unit (X79-1230-00).

Voltage	Permissible Range
+5 V	+4.75 to +5.25 V
+15 V	+14.75 to +15.25 V
-15 V	-14.75 to -15.25 V
+12.5 V	+12.0 to +13.0 V
-12.5 V	-12.0 to -13.0 V
+17.5 V	+17.0 to +18.0 V
-17.5 V	-17.0 to -18.0 V

LCD contrast adjustment

After setting the item system menu CTR5 to 5, adjust VR1 of the Control Unit (X77-1930-00) to a position making the contrast easiest to see (VR1 can be adjusted through the hold on the shield).

VR 1	LCD contrast adjustment	Use this VR for LCD contrast adjustment.

A/D offset adjustment

The A/D offset adjustment sets the DC offset generated by the opamp inside the DSP Unit (X79-1250-00) to 0. The DSP Unit (X79-1250-00) can be adjusted from the rear of the shield case but, before the adjustment, it is first required to set slide switch S1 to the position with which pins ② and ③ are shorted (to the opposite side to TP7).
Set ITEM to DC-V measurement and the input range to 30 mV. After these settings, adjust V2 so that the displayed value is 0 V.
After adjustment, return S1 to the position with which pins ① and ② are shorted.

Data transfer clock frequency adjustment

The clock for use in transfer of A/D converted data is adjusted by connecting a counter to TP5 and turning VR1 so that the clock frequency is 8.3 MHz.

For this adjustment, it is necessary to take the DSP Unit (X79-1250-00) out of the shield case.

VR 2	A/D offset adjustment	Use this VR for set DC offset to measurement A/D converter to 0.
VR 1	Data transfer clock frequency adjustment	Use this VR to adjust data transfer clock to 8.3 MHz.

Oscillator adjustments

Set ITEM to GEN. The following adjustments are performed on the Oscillator Unit (X71-1230-00). Use the following procedures for the adjustments.

(1) D/A converter 1 kHz output level adjustment
Set GEN to VARI of 1 kHz and level of 0 dBV, and adjust 78 so that voltage at V4 (PCM56P-K) pin ⑨ is 5.9 to 6.1 Vp-p.

(2) Digital oscillator VARI output level adjustment
Set GEN to VARI of 1 kHz and level of 0 dBV, and adjust VR2 so that the GEN output read on the calibration voltmeter is 0 dBV ±0.1 dB when the GEN output is terminated with 600 ohms.

(3) D/A converter distortion adjustment
Set GEN to VARI of 5 kHz and level of 0 dBV, and adjust VR1 so that the GEN output read on the calibration voltmeter is minimized (below 0.0048 V) when the GEN output is terminated with 600 ohms.

(4) SPOT 1 output level adjustment
Switch GEN to SPOT 1, set level to 0 dBV and adjust VR5 so that the GEN output read on the calibration voltmeter is 0 dBV ±0.1 dB when the GEN output is terminated with 600 ohms.

(5) SPOT 2 output level adjustment
Switch GEN to SPOT 2, set level to 0 dBV and adjust VR5 so that the GEN output read on the calibration voltmeter is 0 dBV ±0.1 dB when the GEN output is terminated with 600 ohms.

(6) SPOT 3 output level adjustment
Switch GEN to SPOT 3, set level to 0 dBV and adjust VR4 so that the GEN output read on the calibration voltmeter is 0 dBV ±0.1 dB when the GEN output is terminated with 600 ohms.

(7) CR oscillator output level adjustment
Set GEN to VARI of 25 kHz and level of 0 dBV, and adjust VR3 so that the GEN output read on the calibration voltmeter is 0 dBV ±0.1 dB when the GEN output is terminated with 600 ohms.

(8) DDS frequency response adjustment
Set the GEN level to 0 dBV, and adjust TC1 so that the level read on the calibration voltmeter when the frequency is 20 kHz is identical to the level when the frequency is 1 kHz. Check that the level deviation in the range from 20 Hz to 20 kHz is within the specification of ±0.05 dB (reference: 1 kHz).

(9) CR oscillator frequency response check
Set the GEN level to 0 dBV and, on the calibration voltmeter, check that the frequency level deviations in the range from 20.09 kHz to 110 kHz are within the specification of ±0.5 dB (reference: 1 kHz).

(10) Attenuator level check
Set the GEN frequency to 1 kHz, vary the level as described below and check that the output accuracy is within the specification (±0.5 dB at no less than -40 dBV, ±0.8 dB at below 40 dBV).

Between 14.0 and 11.0 dB, check at all levels in 0.1 dB steps.
Below 11.0 dB, check at levels of 10.9 dB, 7.9 dB, 1.9 dB, -10.1 dB, -34.1 dB and -81.2 dB.

(11) Distortion check
Set the GEN level to 14 dBV and, on the calibration voltmeter, check that distortions at different frequencies meet the specifications below.

Between 5 Hz and 110 kHz, THD+N should be no more than 0.01% with 600-ohm termination.
Between 20 Hz and 20 kHz, THD+N should be no more than 0.005% with 600-ohm termination and 80k LPF switched ON.
With SPOT 1 and SPOT 2, THD+N should be no more than 0.001% with 600-ohm termination and 80k LPF switched ON.
With SPOT 3, THD should be no more than 0.001% with 600-ohm termination and 80k LPF switched ON.

Oscillator adjustment points

R 78	D/A converter 1 kHz output level	Make output at U4 pin ⑨ stable (at f = 1 kHz). This influences distortion at f = 110 kHz, distortion of SPOT 3, etc. This influences all levels of digital oscillator.
VR 2	Digital oscillator VARI output level	Use this VR to adjust output level of digital oscillator VARI.
VR 1	D/A converter output distortion adjustment	Use this VR to minimize output distortion of D/A converter U4.
VR 5	SPOT 1 output level	Use this VR to adjust output level of SPOT 1. Re-adjustment is required after adjustments of R78 and/or VR2.
VR 6	SPOT 2 output level	Use this VR to adjust output level of SPOT 2. Re-adjustment is required after adjustments of R78 and/or VR2.
VR 4	SPOT 3 output level	Use this VR to adjust output level of SPOT 3. Re-adjustment is required after adjustments of R78 and/or VR2.
VR 3	CR oscillator output level	Use this V to adjust output level of CR oscillator. Re-adjustment is required after adjustment of VR2.
TC 1	DDS frequency response adjustment	Use this trimmer to adjust digital oscillator so that it meets frequency response specification in frequency range from 5 Hz to 20 kHz.

Adjustments for DC-V measurement
Switch ITEM to DC-V. The following adjustments are performed on the DSP Unit (X79-1230-00). Use the following procedures for the adjustments.

(1) DC offset adjustment of output amp U23B
Set the range to 30 mV, connect TP3 to GND (TP20) and adjust V13 so that the displayed value is in the range of (between -0.01 and +0.01 mV).

(2) DC offset adjustment of DC preamp U12A
Set the range to 30 mV and shot- the DC inputs on the rear panel. Then adjust VR14 so that the displayed value is in the range of (between -0.03 and +0.03 mV).

(3) 3 V range adjustment (Gain adjustment of output amp U23B)
Set the range to 3 V, set the DC calibrator output to 3.00 V and apply it to the DC input. Then adjust VR6 so that the displayed value is between 2.997 and 3.003 V.

(4) 300 mV range adjustment
Set the range to 300 mV, set the DC calibrator output to 300 mV and apply it to the DC input. Then adjust VR7 so that the displayed value is between 299.7 and 300.3 mV.

(5) 30 mV range adjustment
Set the range to 30 mV, set the DC calibrator output to 30.0 mV and apply it to the DC input. Then adjust VR8 so that the displayed value is between 29.97 and 30.03 mV.

(6) 30 V range adjustment
Set the range to 30 V, set the DC calibrator output to 30.0 V and apply it to the DC input. Then adjust VR3 so that the displayed value is between 29.97 and 30.03 V.

(7) 100 V range adjustment
Set the range to 100 mV, set the DC calibrator output to 100.0 V and apply it to the DC input. Then adjust VR4 so that the displayed value is between 99.9 and 100.1 V.

Adjustment points in DC-V measurement

VR 13	DC offset adjustment of output amp U23B	Use this VR to adjust DC offset produced in U23B to 0. This adjustment affects AC measurement as well as DC measurement.
VR 14	DC offset adjustment of DC preamp U12A	Use this VR to adjust DC offset produced in U12B to 0.
VR 6	3 V range adjustment (Gain adjustment of output amp U23B)	Use this VR to adjust gain of DC-V 3 V range. This adjustment affects other ranges in DC-V measurement as well as all gains in all ranges in AC-V measurement and distortion measurement.
VR 7	300 mV range adjustment	Use this VR to adjust gain of DC-V 300 mV range. After adjusting VR7, it is necessary to re-adjust 30 mV range gain using V8.
VR 8	30 mV range adjustment	Use this VR to adjust gain of DC-V 30 mV range.
VR 3	30 V range adjustment	Use this VR to adjust -20 dB attenuator of DC-V 30 V range. After adjusting VR3, it is necessary to re-adjust 100 V range using VR4.
VR 4	100 V range adjustment	Use this VR to adjust -10 dB attenuator of DC-V 100 V range.

ADJUSTMENT

Adjustments for AC-V measurement

Switch ITEM to AC-V. The following adjustments are performed on the DSP Unit (X79-1230-00). (The adjustments for DC-V measurement should be completed before proceeding to the following.)

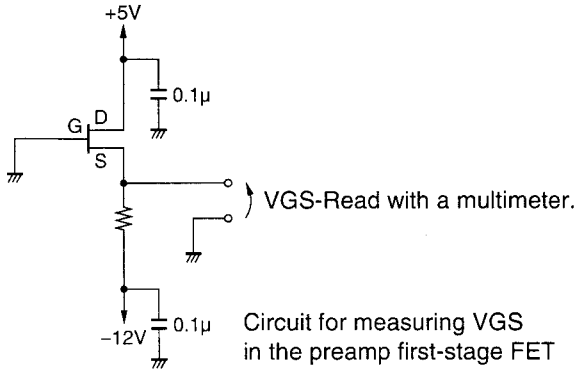
(1) First, check the DC offset in the preamp output.

Set the input mode to L CH UNBAL and short-circuit the input.

Set the range to 100 mV fixed and check that the DC offset in the output from preamp U1 pin ㉜ is no more than 0.3 V.

Then set input mode to BAL, short-circuit the BAL input and check that the DC offset in the output from preamp U1 pin ㉙ is no more than 0.3 V.

If the voltage is larger, hunting or delay in response may occur in AC measurements. In this case, adjust the pair of Q1 and Q2 (UNBAL input) or Q3 and Q4 (BAL input) in preamp U1 (X73-2080-00). (The difference in VGS of the pair should be no more than 3 mV.)



Circuit for measuring VGS in the preamp first-stage FET

(2) Set the input impedance to 100-kilohms, switch all filters OFF and switch the input mode to UNBAL, L CH.

(3) AC-V gain adjustment

Set the range to 3 V, AC calibrator output to 3.0 Vrms and its frequency to 25 kHz, and apply the output to the L CH input. Then adjust VR5 so that the displayed value is between 2.998 and 3.002 V.

(4) 1 kHz gain adjustment

Use the same 3 V range but switch the 20k LPF ON. Set the CA calibrator output to 3.0 Vrms and the frequency to 1 kHz. Then adjust VR10 so that the displayed value is between 2.998 and 3.002 V. After adjustment, switch the 20k LPF OFF.

(5) 30 mV range adjustment

Set the range to 30 nV, AC calibrator output to 30.0 mV and its frequency to 1 kHz. Then adjust VR5 again so that the displayed value is between 29.98 and 30.02 mV.

(6) -40 dB attenuator gain adjustment

Set the range to 3 V, AC calibrator output to 3.0 Vrms and its frequency to 1 kHz. Then adjust VR2 so that the displayed value is between 2.998 and 3.002 V.

(7) AC amp DC offset adjustment

Short-circuit the L CH input, set the range to 300 μV, and connect TP1 to TP18 (GND). Then, while observing TP10 with the oscilloscope, adjust VR9 so that the DC level becomes 0 V. After adjustment, disconnect TP1 from TP18.

Then, while observing TP12 with the oscilloscope, adjust V11 so that the DC level is 0 V.

Then, while observing TP13 with the oscilloscope, adjust VR12 so that the DC level is 0 V.

(8) -10 dB attenuator frequency response adjustment

Set the range to 3 V, AC calibrator output to 3.0 Vrms and its frequency to 210 kHz, and record the level measured under this condition.

Next, switch the range to 10 V and adjust TC2 so that the current level is equal to the level measured above. Then vary the frequency between 5 Hz and 210 kHz and check that the frequency response at 110 kHz or more is within ±10% of that at 1 kHz.

(9) -20 dB attenuator frequency response adjustment

Set the range to 10 V, AC calibrator output to 10.0 Vrms and its frequency to 210 kHz, and record the level measured under this condition.

Next, switch the range to 30 V and adjust TC1 so that the current level is equal to the level measured above. Then vary the frequency between 5 Hz and 210 kHz and check that the frequency response at 110 kHz or more is within ±10% of that at 1 kHz.

(10) -30 dB attenuator frequency response check

Set the range to 100 V and AC calibrator output to 10.0 Vrms. Then vary the frequency between 5 Hz and 210 kHz and check that the frequency response at 110 kHz or more is within ±15% of that at 1 kHz.

(11) Adjustment with BAL input

Switch the input mode to BAL, set the range to 100 mV, and short-circuit the UNBAL input (upper connector). Apply the AC calibrator output with a level of 100 mVms and frequency of 1 kHz to the BAL input (lower connector). Then adjust VR1 so that the displayed value is between 99.93 and 100.70 mV.

(12) BAL attenuator frequency response adjustment

With the same input set-up us (11) above, adjust the -10 dB attenuator with TC4 and the -20 dB attenuator with -20 dB using the same procedures as (8) to (10) above.

ADJUSTMENT

(13) Range accuracy check

Set the input mode to UNBAL and check that the measuring accuracy at the full-scale input is within specification in each of the ranges from 300 mV to 100 V.

(14) HPF frequency response check

Set the range to 1 V and the AC calibrator output to 1 Vrms. Then check the frequency response of each HPF based on REL measurement with respect to 1 kHz. (Check by referring to the specifications of the built-in filters in the test result report.)

(15) LPF frequency response check

Set the range to 1 V and the AC calibrator output to 1 Vrms. Then check the frequency response of each LPF based on REL measurement with respect to 1 kHz. (Check by referring to the specifications of the built-in filters in the test result report.)

(16) PSOPHO frequency response check

Set the range to 1 V and the AC calibrator output to 1 Vrms. Then check the frequency response of each PSOPHO based on REL measurement with respect to 1 kHz. (Check by referring to the specifications of the built-in filters in the test result report.)

AC-V monitor output adjustment

Proceed to this adjustment after having completed all adjustments of the DSP Unit (X79-1230-00).
Set the ITEM to AC-V measurement, the range to 1 V fixed and the input mode to UNBAL. Set the AC calibrator output to 1 Vrms and 1 kHz and apply it to AC IN. Then adjust V100 of the Control Unit (X77-1930-00) from the rear of the PCB so that the monitor output on the rear panel outputs 1 Vrms (between 995 and 1005 mV) with 600-ohm termination.

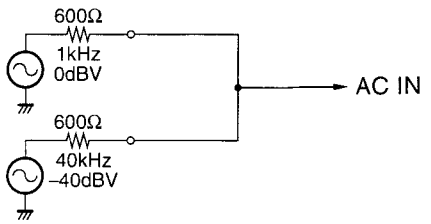
VR 100	Monitor output level	Use this VR to adjust monitor output level in AC-V measurements.

(17) Residual distortion check

At each frequency in each frequency range, check that the residual distortions (THD+N, THD0 are within specifications.

(18) Distortion check

Mix 1 kHz, 0 dB signal and 40 kHz, -40 dBV signal externally (use two oscillators. The distortions should be no more than 0.1%.). Apply the mixed signal and check that the distortions are between -39 and -41 dB with both THD+N and THD.



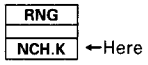
Adjustment points for AC-V measurement

VR 5	AC-V gain adjustment	Use this VR to align screen display with actual input level by adjusting gain of amp U22B.
VR 10	1 kHz gain adjustment	Use this VR to align screen display when 20k LPF is ON with actual input level by adjusting gain of amp U19B.
VR 2	-40 dB attenuator gain adjustment	Use this VR to align screen display in ranges which use -40 dB attenuator with actual input level.
VR 9	DC offset adjustment	Use this VR to set DC offset of amp U16B to 0.
VR 11	DC offset adjustment	Use this VR to set DC offset of amp U22A to 0.
VR 12	DC offset adjustment	Use this VR to set DC offset of amp U22A to 0.
TC 2 TC 4	-10 dB attenuator frequency response adjustment	Use these trimmers to adjust frequency response of -10 dB input attenuator (10 V and 100 V ranges). TC2: UNBAL. TC4: BAL.
TC 1 TC 3	-20 dB attenuator frequency response adjustment	Use these trimmers to adjust frequency response of -20 dB input attenuator (30 V and 100 V ranges). TC1: UNBAL. TC3: BAL.
VR 1	BAL amp gain adjustment	Use this VR to align screen display with BAL input and that with UNBAL input.

ADJUSTMENT

Notch filter calibration

Set S1 bit ⑧ on the CPU Unit (X77-1940-00). When power is switched ON with this condition, the calibration menu will be displayed on AC-V measurement menu 7-3.



Fix the range at 1 V, then select the calibration menu. Fist select F4=1st to calibrate the frequency of the 1st notch filter, then select F3=100 Hz as the calibration frequency range. Apply 1 Vrms, 100 Hz sine wave externally and vary the frequency linearly in the range of 100 Hz ±10% to find the point where dipping (decease in level) occurs. When F5=ENTER is pressed once at the point with must noticeable dipping, the frequency is displayed on the screen; press F5= ENTER again now. The frequency displayed on the screen is captured in the bottom left of the screen and the value is written in the EEPROM of the CPU Unit. (This value will not be cleared by reset operations.) Similarly to above, by selecting the calibration frequency range with F3 and notch filter with F4, calibrate frequencies in order of 100 Hz/2nd, 1 kHz/1st, 1 kHz/2nd, 10 Hz/1st, 10 kHz/2nd, 100 kHz/1st and 100 kHz/2nd. The 100 kHz calibrations are to be performed with 30 mV input level in the 30 mV range.

After the notch filter calibration, set S1 bit ⑧ back to ON and turn power ON again.

"NCH.K" will disappear from AC-V measurement menu 7-3.

Reset operations

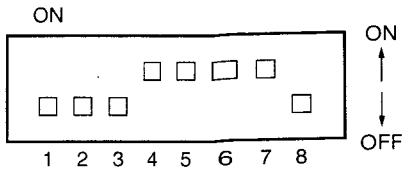
Product reset

After setting bit ⑧ of S1 on the CPU Unit (X77-1940-00) to OFF, turn power ON while holding the SHIFT key depressed; the system will boot while changing screens. This is the product reset operation. Use care in this operation for it clears the sequence memory contents set by the user (but the notch filter calibration frequencies are not cleared). After servicing of a unit, etc., this reset operation should be performed always after obtaining approval of the user. Also do not forget to set S1 bit ⑧back to ON again.

SHIFT-reset

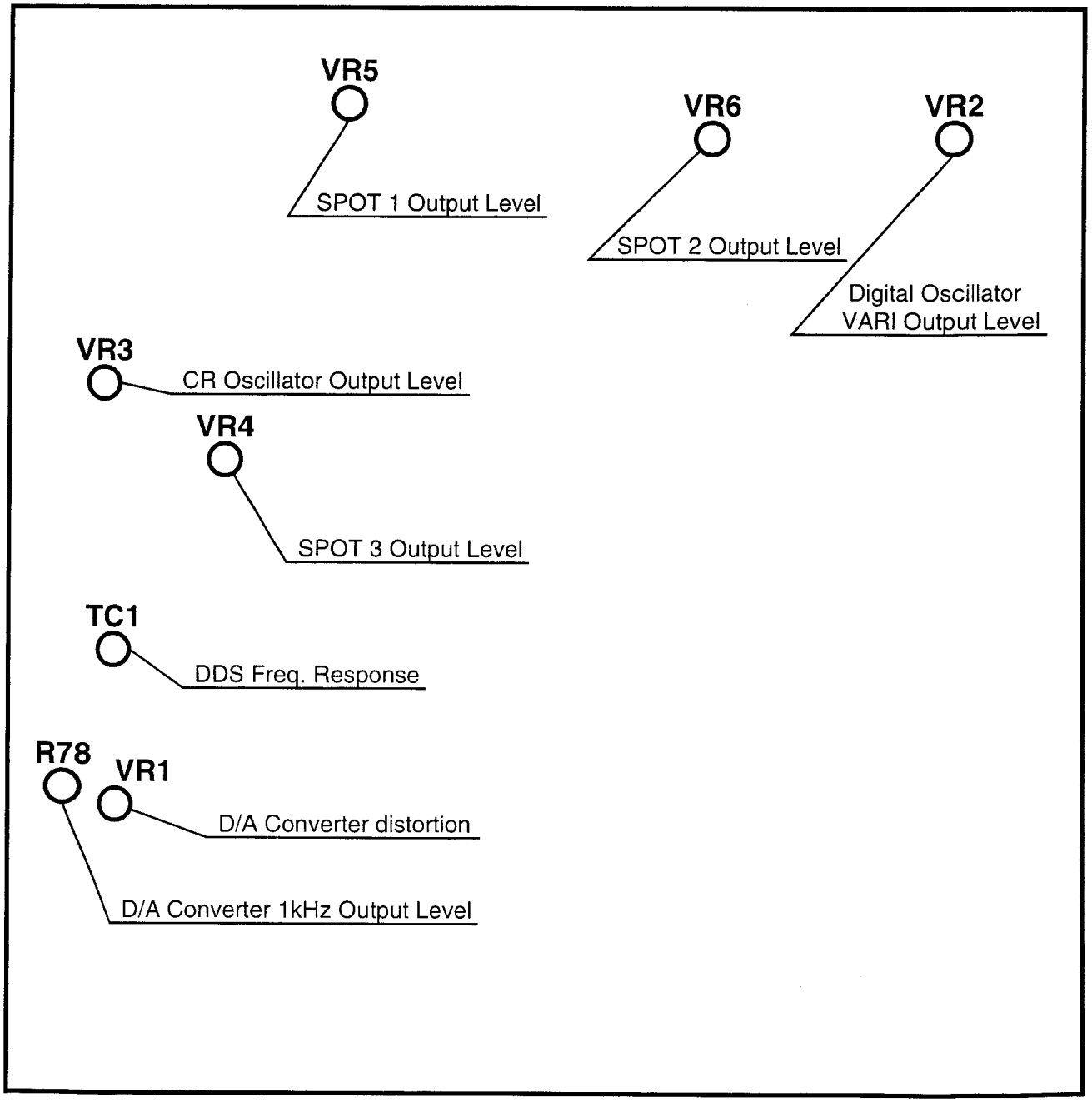
If power is turned on while holding the SHIFT key depressed by leaving bit ⑧ of S1 on the CPU Unit (X77-1940-00) to ON (factory setup before shipment), the system will also boot while changing screens. This operation is the SHIFT-reset operation. This operation does not clear the sequence memory contents but it simply resets the ITEM setup to the initial condition.

CPU S1

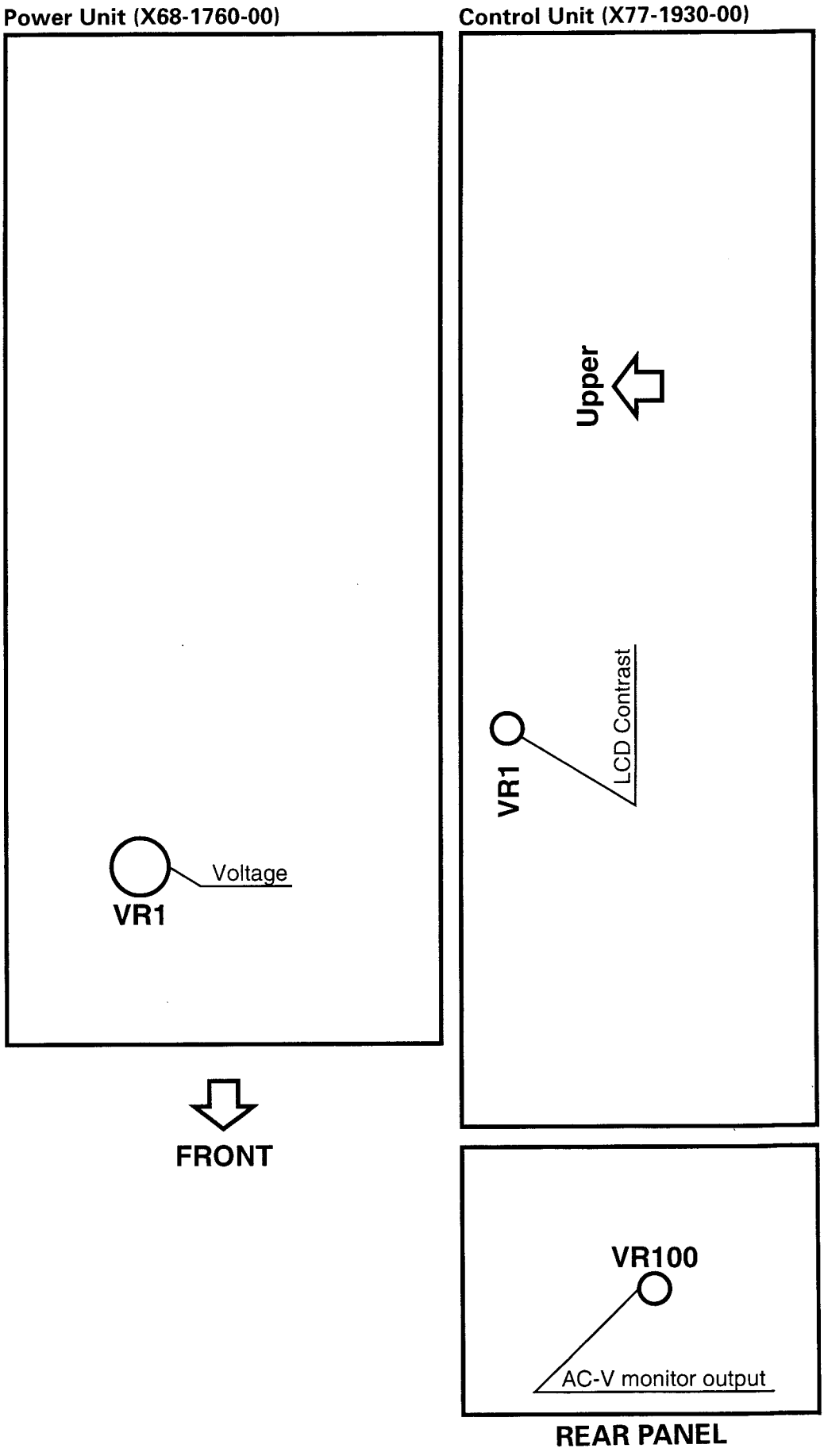


ADJUSTMENT

Oscillator Unit (X71-1230-00)



ADJUSTMENT


Power Unit (X68-1760-00)
Control Unit (X77-1930-00)
Upper
VR1
LCD Contrast
Voltage
VR1
FRONT
VR100
AC-V monitor output
REAR PANEL

TROUBLE SHOOTING

	Symptom	Possible Cause	Check Items
1	LCD display or LEDs do not light.	Fuse is blown. Transformer is abnormal. Power Unit failure.	• Check fuse. • Check output from secondary side of transformer. • Check output voltage from Power Unit.
2	After SHIFT-reset operation, LCD screen remains white or LEDs light abnormally, key operations do not occur and GEN output is not output.	CPU Unit (X77-1990-00) is abnormal.	• CPU may not be functioning. (Check operations of CPU clock, data bus and address bus.)
3	Key operations, LED lighting and GEN output are normal, but LCD screen is abnormal.	CPU Unit (X77-1990-00) is abnormal.	• Check LCD controller V18 for abnormality.
		Control Unit (X77-1930-00) is abnormal.	• Perform SHIFT-reset and check voltages at D/A converter V3 pins ② or ① and after.
4	After SHIFT-reset, LCD screen shows a menu but key operations are not accepted. GEN output is also abnormal.	DSP Unit (X79-1240-00) is abnormal.	• DSP may not be functioning. (Check operations of DSP clock, data bus and address bus.) • Check if data transfer between CPU ↔ DSP is normal. (Check operations of $\overline{\text{TORES}}$, $\overline{\text{HLDA}}$, HLD, $\overline{\text{OINT}}$ and $\overline{\text{IINT}}$ as well as those of V3, V4 and U8 to U12.) • If U1, U2, U13 and U30 use sockets, check contact failure.
		DSP Unit (X79-1250-00)	• If U27 uses a socket, check contact failure.
		Panel Unit (X66-1410-00) is abnormal.	• Check if V16A pin ② outputs key interrupt signal.
5	LCD display shows a menu, but responses to key operations such as ITEM switching are poor. Measurement value display does not show neither "---" or figures.	DSP Unit (X79-1250-00) is abnormal.	• Same as 4 above. • Check if A/D PLL is normal. (In Fast mode of AC-V measurement, check voltage at output TP4 of U11 with oscilloscope. Check 10 MHz clock at U10 pin ①. Check operations of MCK, $\overline{\text{MLE3}}$ and MDT.) • Check signals ADSTART at U27 pin ⑲ → U14C → PH4 → U21 pin ⑳ and $\overline{\text{CONSVST}}$. (Specially, I level of pulse input to U21 pin ⑳ should be 0 V. Also check sampling frequency.) • Check 8.3 MHz clock at TP5 of U20D pin ⑪. • Check $\overline{\text{LOAD}}$ signals from V21 pin ㉒ → V19 → V20B pin ⑥. (Check operations of A/D converter U21.) • Check signals from U22 and U23 → U5A → PH1 and PH3 → V26, as well as ASDAT, ASCLK, LDL and GCLK. (Check serial transfer.)
		DSP Unit (X79-1240-00)	• Same as 4 above. • Check ASDAT, ASCLK and $\overline{\text{ADWCK}}$ to U14 and U15. (Check loading in FIFO memory U16 and U17.) • Check ADRCK. (Check data read from DSP FIFO memory U16 and U17.) • Check $\overline{\text{INT2}}$ at V18A pin ③. (Check fetch instruction and interrupt in data for DSP.)

TROUBLE SHOOTING

6	"– – –" is displayed on measurement value display position.	DSP Unit (X79-1250-00) is abnormal.	• Set S1 of DSP Unit (X79-1250-00) to DC offset adjustment position, and check if V17B pin ⑦ is 0 V and if DC-V measurement value display also 0 V. If it is not 0 V, check U18 and U17B. If it is 0 V, U17A o DSP Unit (X79-1230-00) is abnormal.
		DSP Unit (X79-1230-00) is abnormal.	• Identify whether AC-V measurement or DC-V measurement is abnormal. If both are abnormal. supply voltage or port set-up may be abnormal; check ports in order of U18A, U18B, PH1 then PH2 to see that DSP outputs signals SST, SDT and SCK. (Note that SST, SDT and SCK from CPU are valid only during ITEM switching.) • If port set-up does not seem to be abnormal, refer to gain distribution table, fix the range and check signals at each node in order of input → output.
7	In distortion measurement, residual distortion is not within the spec.	DSP Unit (X79-1250-00) is abnormal.	• 9.4 MHz data transfer clock (TP5) is below 9 MHz. In such a case, distortion increases as measured frequency is increased.
		DSP Unit (X79-1230-00) is abnormal.	• Check operation of opamps used in 1st notch and 2 notch filters (X69-1330-00, X69-1340-00). • Check operation of preamp (X73-2080-00). Specifically, switch range to 100 mV, 300 mV, 1 V and 3 V to find which range is abnormal. Also check gain switching FET.
		CPU Unit (X77-1940-00) is abnormal.	• Check if there is any problem with notch calibration coefficient of EEPROM U34. (Notch calibration is always required after replacement of CPU BD.)
8	In auto measurement of AC-V, it takes long time until measurement result is focused. (Similar phenomena also occurs in L/R measurement.)	DSP Unit (X79-1230-00)	• Check DC offset error between U16B, U22A, U22B and U23B. (Shot AC IN, adjust preamps below then adjust DC offset with VR9, VR11, VR12 and VR13 in this order.)
		Preamp Unit (X73-2080-00)	• Check if the pair of fist-stage FET Q1 and Q2 or that of Q3 and Q4 (in case of BAL input) is matched. (Short AC IN and measure DC offset at pin ㉜ or pin ㉙ (in case of BAL input) in AC V measurement; DC offset should be within 300 mV.)
		DSP Unit (X79-1250-00)	• Check DC offset error in V17B. (Switch S1 to offset adjustment and adjust VR2 in DC 30 mV range.)
9	Digital oscillator oscillation is abnormal or oscillation frequency is unstable.	DSP Unit (X79-1250-00) is abnormal.	• DDS PLL is abnormal. (+12.582 MHz, +5 V clock is not output at TP6.) If PLL is not locked, the balance of U1 pin ② = U1 pin ③ = approx. 2.5 V is lost and output frequency becomes unstable.
		DSP Unit (X79-1240-00) is abnormal.	• Check operations of DDS FIFO U22 and U23 ($\overline{\text{DDSCK}}$ timing). • Check operations of parallel/serial converter U24 and U25 ($\overline{\text{SLD}}$ and CLK timings). • Check operations of digital filter U26 (BCK0, WCK0 and DOL timings).
		DSP Unit (X79-1230-00) is abnormal.	• Check operations of U27 and U28 output signals. • Check clock, data and latch operations from P1 up to D/A converter U4. (Particularly, if duty of 12.582 MHz clock to U4 pin ⑤ is spoiled, it becomes impossible to assure L level. Adjust this with 113.) • If sine wave is output at D/A converter U4 pin ⑨, check signals of U6A, U6B then U7A in this order.

TROUBLE SHOOTING

10	CR oscillator oscillates abnormally.	Oscillator Unit (X71-1230-00) is abnormal.	• Check operations of U8A, U5 and U8B.
		Oscillator Unit (X71-1220-00) is abnormal.	• Check operations of U1A, U1B, U2A and U2B.
11	Attenuator operation is abnormal.	Oscillator Unit (X71-1230-00) is abnormal.	• If 0.1 dB step is abnormal, check operations of U25, U26 and U27. • If 1 dB or higher step is abnormal, check relay operations of K1 to K8.
12	Both digital oscillator and CR oscillator are abnormal.	Oscillator Unit (X71-1230-00) is abnormal.	• In order of U13 to U13D then PH3 and PH4, check if serial data, clock, latch pulse and selector signals for port-setup are supplied from CPU Unit through P2 by varying GEN frequency level.
		CPU Unit (X77-1940-00) is abnormal.	• Check if serial data (SDTB9, clock (*SCKB), latch (SR/*WB) and selector (SSTB) signals for set-up above are output.

PARTS LIST

VA-2230

Y88-1800-00

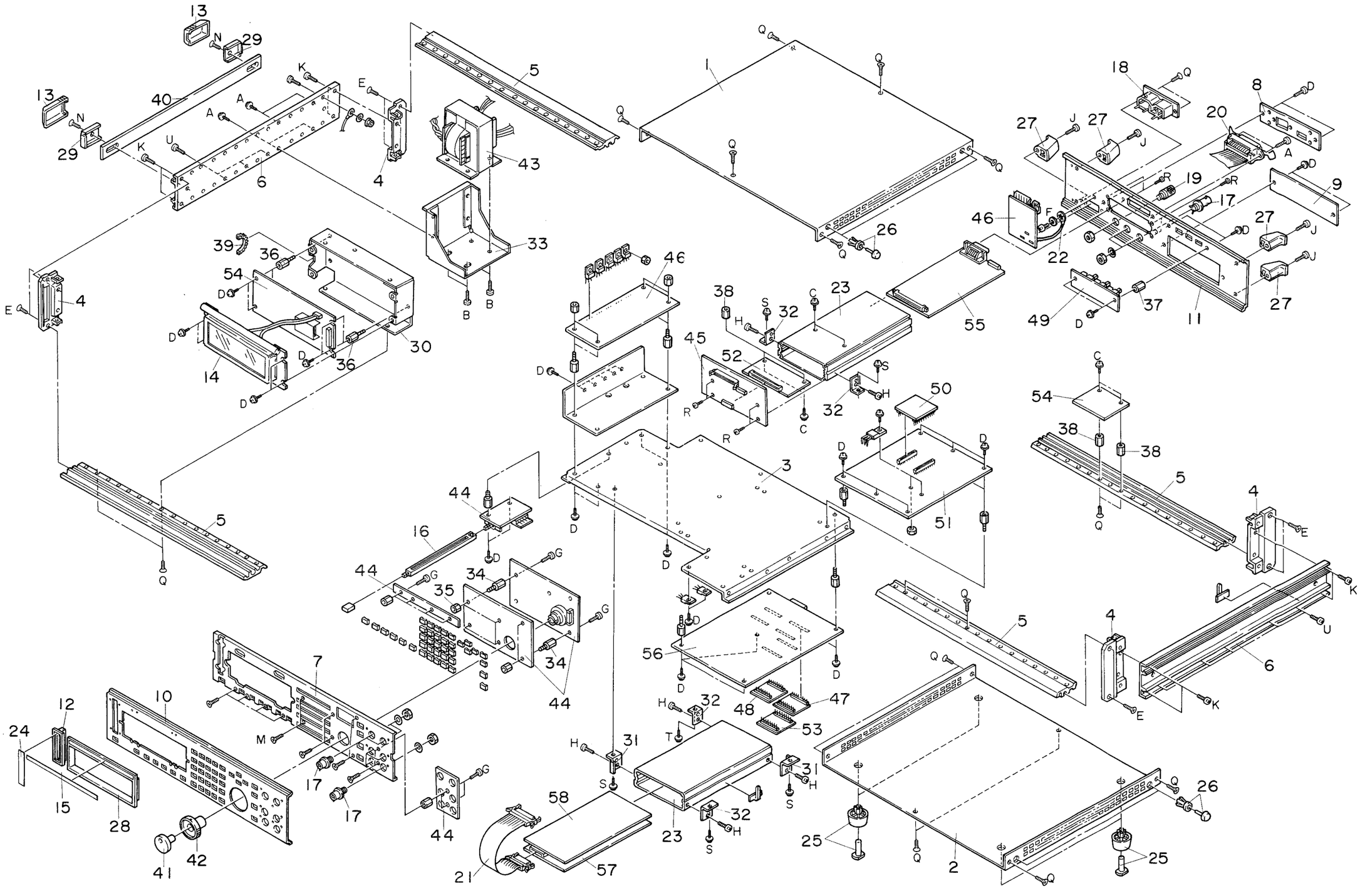
REF.NO	PARTS NO	NAME & DESCRIPTION
	B42-3819-05	SERIAL NO. PLATE
	B42-3820-05	LABEL;CARTON BOX
	B63-0232-10	INSTRUCTION MANUAL;JAPANESE
	B63-0233-10	INSTRUCTION MANUAL;ENGLISH
	D4SBS6	DIODE,BRIDGE
	E30-1929-05	BS POWER CORD
	E30-1950-05	JIS POWER CORD
	E30-1951-05	UL/CSA POWER CORD
	E30-1952-05	CEE POWER CORD
	E30-1953-05	SAA POWER CORD
	E38-1097-05	WIRE ASS'Y;SUB P TO CONNECTION
	E38-1099-05	WIRE ASS'Y;CONNE. TO LCD.CN
	E38-1100-05	WIRE ASS'Y;CONNE. TO LCD.CN
	E38-1102-15	WIRE ASS'Y;P.SW TO P.AC
	E38-1103-05	WIRE ASS'Y;CONNECTION TO DDS
	E38-1104-05	WIRE ASS'Y;LSD. CN TO LCD
	E38-1105-05	WIRE ASS'Y;CONNECTION TO DISTN
	E38-1106-15	WIRE ASS'Y;PW TO CONNE. DSP
	E38-1107-05	WIRE ASS'Y;SUB P TO PANEL F
	E38-1108-15	WIRE ASS'Y;DDS TO DSP MAIN
	E38-1109-05	WIRE ASS'Y;DSP SUB TO DISTN
	E38-1110-15	WIRE ASS'Y;DSP SUB TO DISTN
	E38-1111-15	WIRE ASS'Y;PW TO DDS. DISTN
	E38-1112-15	WIRE ASS'Y;DDS TO BNC
	E38-1113-05	WIRE ASS'Y;SUB P TO PANEL F
	E38-1114-05	WIRE ASS'Y;SW TO DDS. BNC
	E38-1115-05	WIRE ASS'Y;DISTN TO SW
	E38-1116-05	WIRE ASS'Y;BNC TO SUB P
	E38-1117-05	WIRE ASS'Y;BNCD
	E38-1118-15	WIRE ASS'Y;BNC TO DISTN
	E38-1119-05	WIRE ASS'Y;DSP MAIN TO MONITOR
	E38-1120-15	WIRE ASS'Y;DISTN TO BNC
	E38-1122-05	WIRE ASS'Y;DSP MAIN TO DSP SUB
	E38-1149-05	WIRE ASS'Y;POWER TO STACK
	E38-1150-15	WIRE ASS'Y;DISTN TO Q11
	E38-1151-15	WIRE ASS'Y;DISTN TO Q12
	E38-1196-05	WIRE ASS'Y;MONITOR TO DISTN
	F05-3112-05	FUSE(5X20MM) T315MA/250V
	F05-6313-05	FUSE(5X20MM) T630MA/250V
	H10-2885-12	FOAMED STYRENE PAD
	H20-1721-04	VINYL COVER
	H53-0167-04	CARTON BOX
	K27-0567-04	BUTTON;WITHOUT WINDOW,WHITE
	K27-0594-04	BUTTON;「F1」
	K27-0595-04	BUTTON;「F2」
	K27-0596-04	BUTTON;「F3」
	K27-0597-04	BUTTON;「F4」
	K27-0598-04	BUTTON;「F5」
	K27-3619-04	BUTTON;WHITE/HOLE
	K27-3620-04	BUTTON;BLUE/HOLE
	K27-3622-04	BUTTON;「ENT」,WHITE
	K27-3623-04	BUTTON;「CLR」,WHITE
	K27-3628-04	BUTTON;GRAY/HOLE
	K27-3629-04	BUTTON;「POWER」,GRAY
	K27-3630-04	BUTTON;「1」,WHITE
	K27-3631-04	BUTTON;「2」,WHITE
	K27-3632-04	BUTTON;「3」,WHITE
	K27-3633-04	BUTTON;「4」,WHITE
	K27-3634-04	BUTTON;「5」,WHITE
	K27-3635-04	BUTTON;「6」,WHITE
	K27-3636-04	BUTTON;「7」,WHITE
	K27-3637-04	BUTTON;「8」,WHITE
	K27-3638-04	BUTTON;「9」,WHITE
	K27-3639-04	BUTTON;「0」,WHITE
	K27-3640-04	BUTTON;「.」,WHITE
	K27-3643-04	BUTTON SET
	K27-3644-04	BUTTON;「RCL」,WHITE
	K27-3645-04	BUTTON;「-」,WHITE
	K27-3646-04	BUTTON;「CH」,GRAY
	K27-3647-04	BUTTON;「^」,WHITE
	K27-3648-04	BUTTON;「▶」,BLUE
	K27-3649-04	BUTTON;「▲」,BLUE
	L92-0213-05	FERRITE CORE
	L92-0214-05	FERRITE CORE
	N14-0404-04	FLANGE NUT M3
Q11	2SB1015(Y)	TR. SI, PNP
Q12	2SD1406(Y)	TR. SI, NPN
1	A01-4024-02	CASE;TOP
2	A01-4025-02	CASE;BOTTOM
3	A10-1499-22	CHASSIS
4	A13-2204-05	FRAME;SIDE ESCUTCHEON
5	A13-2208-02	FRAME;TOP,BOTTOM
6	A13-2209-02	FRAME;SIDE
7	A22-1312-22	SUB PANEL
8	A29-0515-04	PANEL;GP-IB
9	A29-0516-04	BLIND PANEL
10	A63-0191-02	FRONT PANEL
11	A83-0074-12	REAR PANEL
12	B01-0707-03	ESCUTCHEON
13	B09-0409-03	CAP;HANDLE
14	B38-0417-05	LCD
15	B73-0110-04	NAME PLATE;MODEL NO.
16	D21-0935-04	EXTENSION SHAFT

REF.NO	PARTS NO	NAME & DESCRIPTION
17	E04-0253-15	BNC RECEPTACLE
18	E18-0366-25	AC INLET
19	E21-0667-05	METAL TERMINAL
20	E38-1098-05	WIRE ASS'Y;EXT I/O TO CONNE.
21	E38-1101-05	WIRE ASS'Y;CONNE. TO DSP MAIN
22	E38-1121-05	WIRE ASS'Y;SW TO GND
23	F11-1279-03	SHIELD CASE
24	F15-0768-04	BLIND PLATE
25	J02-0089-05	RUBBER FOOT
26	J02-0519-05	RUBBER FOOT;UNDER
27	J02-0535-03	RUBBER FOOT;REAR
28	J10-0434-02	BEZEL
29	J21-4843-04	BRACKET;HANDLE
30	J21-4915-02	BRACKET;LCD
31	J21-4916-04	BRACKET;SHIELD CASE
32	J21-4917-04	BRACKET;SHIELD CASE
33	J21-4926-23	BRACKET;POWER TRANSFORMER
34	J32-1220-04	BOSS L=10MM/M2.6
35	J32-1221-14	BOSS L=6MM/M2.6
36	J32-1230-04	BOSS L=6MM/M3
37	J32-1232-04	BOSS L=12MM/M3
38	J32-1237-04	BOSS L=7MM/M3
39	J42-0557-04	BUSHING
40	K01-0558-05	HANDLE
41	K29-0879-03	DIAL;JOG
42	K29-0880-03	DIAL;SHUTTLE
43	L07-1530-05	POWER TRANSFORMER
44	X66-1410-00	PANEL UNIT
45	X67-1250-00	CONNECTION UNIT
46	X68-1760-00	POWER UNIT
47	X69-1330-00	FILTER UNIT
48	X69-1340-00	FILTER UNIT
49	X69-1350-00	SWITCH UNIT
50	X71-1220-00	OSCILLATOR UNIT
51	X71-1230-00	OSCILLATOR UNIT
52	X72-1200-00	I/O UNIT
53	X73-2080-00	PRE AMP UNIT
54	X77-1930-00	CONTROL UNIT
55	X77-1940-00	CPU UNIT
56	X79-1230-00	DSP UNIT
57	X79-1240-00	DSP UNIT
58	X79-1250-00	DSP UNIT

SCREWS

	Parts No.	Parts Name		Figure
A	N09-0626-04	SCREW, SEMS PAN HD	(M3 × 10)	
B	N09-0654-05	SCREW, SEMS PAN HD	(M4 × 8)	
C	N09-0741-04	SCREW, SEMS PAN HD	(M3 × 6)	
D	N09-0742-04	SCREW, SEMS PAN HD	(M3 × 8)	
E	N09-4515-05	SCREW, FLAT HD	(M4 × 12)	
F	N14-0622-05	NUT, WITH TOOTH	(M4)	
G	N30-2604-41	SCREW, PAN HD	(M2.6 × 4)	
H	N30-3004-41	SCREW, PAN HD	(M3 × 4)	
J	N30-3012-41	SCREW, PAN HD	(M3 × 12)	
K	N30-4008-41	SCREW, PAN HD	(M4 × 8)	
L	N30-4010-41	SCREW, PAN HD	(M4 × 10)	
M	N32-2604-41	SCREW, FLAT HD	(M2.6 × 4)	
N	N32-4012-41	SCREW, FLAT HD	(M4 × 12)	
P	N33-3006-41	SCREW, OVAL HD	(M3 × 6)	
Q	N33-3008-41	SCREW, OVAL HD	(M3 × 8)	
R	N67-2608-41	SCREW, SEMS PAN HD	(M2.6 × 8)	
S	N67-3008-41	SCREW, SEMS PAN HD	(M3 × 8)	
T	N67-3014-41	SCREW, SEMS PAN HD	(M3 × 14)	
J	N89-3008-41	SCREW, BINDING TAPTITE	(3 × 8)	

DISASSEMBLY FOR REPAIR



VA-2230

PARTS LIST

PANEL UNIT

X66-1410-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E02-0143-05	IC SOCKET	28P		
	J39-0544-05	SPACER			
	J73-0354-02	PCB (UNMOUNTED)			
C1	CQ92FM1H104K	CAP. PLASTIC	0.1	10%	50V
C2	CQ92FM1H104K	CAP. PLASTIC	0.1	10%	50V
C3	CQ92FM1H473K	CAP. PLASTIC	0.047	10%	50V
C4	CE04EW1H2R2M	CAP. ELECTRO	2.2	20%	50V
C5	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C6	NO USE				
C7	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C8	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C9	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C10	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C11	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C12	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C13	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C14	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C15	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C16	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C17	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
D9	B30-3017-05	LED			
D10	B30-3017-05	LED			
D11	B30-3017-05	LED			
D12	B30-3017-05	LED			
D13	B30-3017-05	LED			
D14	B30-3017-05	LED			
D15	B30-3017-05	LED			
D16	B30-3017-05	LED			
L1	L33-0828-05	CHOKE COIL			
P1	E40-7471-05	PIN CONNECTOR	50P		
P2	E40-3250-05	PIN CONNECTOR	6P		
P3	E40-3249-05	PIN CONNECTOR	5P		
P4	E40-7472-05	PIN CONNECTOR	14P		
P5	E40-3254-05	PIN CONNECTOR	10P		
P6	E40-3254-05	PIN CONNECTOR	10P		
P7	E40-3250-05	PIN CONNECTOR	6P		
P8	E40-3249-05	PIN CONNECTOR	5P		
P9	NO USE				
P10	E40-3247-05	PIN CONNECTOR	3P		
P14	E40-7470-05	PIN CONNECTOR	50P		
P100	E40-7420-05	PIN CONNECTOR	4P		
Q9	2SA1346	TR. SI, PNP			
Q10	2SA1346	TR. SI, PNP			
Q11	2SA1346	TR. SI, PNP			
Q12	2SA1346	TR. SI, PNP			
Q13	2SA1346	TR. SI, PNP			
Q14	2SA1346	TR. SI, PNP			
Q15	2SA1346	TR. SI, PNP			
Q16	2SA1346	TR. SI, PNP			
R1	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R2	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R3	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R4	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R5	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R9	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R10	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R11	NO USE				
R12	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R13	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R14	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R15	NO USE				
R16	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R17	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R18	NO USE				
R19	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R20	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R21	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R22	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R40	RN14BK2C10R0F	RES. METAL FILM	10.0	1%	1/6W
R100	R90-0628-05	RES. NETWORK	8X10K		
R101	R90-0628-05	RES. NETWORK	8X10K		
R102	R90-1186-05	RES. NETWORK	22K		
S1	S79-0608-05	JOG SHUTTLE			
S2	S70-0601-05	SWITCH			
S3	S70-0601-05	SWITCH			
S4	S70-0601-05	SWITCH			
S5	S70-0601-05	SWITCH			
S6	S70-0601-05	SWITCH			
S7	S70-0602-05	SWITCH			
S8	S70-0601-05	SWITCH			
S9	S70-0602-05	SWITCH			
S10	S70-0601-05	SWITCH			
S11	S70-0601-05	SWITCH			
S12	S70-0601-05	SWITCH			
S13	S70-0601-05	SWITCH			
S14	S70-0601-05	SWITCH			
S15	S70-0601-05	SWITCH			
S16	S70-0601-05	SWITCH			
S17	S70-0601-05	SWITCH			
S18	S70-0601-05	SWITCH			
S19	S70-0601-05	SWITCH			
S20	S70-0601-05	SWITCH			
S21	S70-0601-05	SWITCH			
S22	S70-0601-05	SWITCH			
S23	S70-0601-05	SWITCH			
S24	S70-0601-05	SWITCH			
S25	S70-0601-05	SWITCH			
S26	S70-0601-05	SWITCH			
S27	S70-0601-05	SWITCH			
S28	S70-0601-05	SWITCH			
S29	S70-0601-05	SWITCH			
S30	S70-0601-05	SWITCH			
S31	S70-0601-05	SWITCH			
S32	S70-0601-05	SWITCH			
S33	S70-0601-05	SWITCH			
S34	S70-0601-05	SWITCH			
S35	S70-0601-05	SWITCH			
S36	S70-0601-05	SWITCH			
S37	S70-0602-05	SWITCH			
S38	S70-0601-05	SWITCH			
S39	S70-0601-05	SWITCH			
S40	NO USE				
S41	S70-0602-05	SWITCH			
S100	S68-0628-05	PUSH SWITCH			
U1	TC4053BP	IC,TRIPLE 2-CH MPX/DE-MPX			
U2	TC74HC259AP	IC,8-BIT ADDRESSABLE LATCH			
U8	TC74HC138AP	IC,3 TO 8 LINE DECODER			
U9	NO USE				
U10	TC74HC259AP	IC,8-BIT ADDRESSABLE LATCH			
U11	TC74HC74AP	IC,DUAL D-FLIP FLOP			
U12	NO USE				
U13	TC74HC541AP	IC,OCTAL BUS BUFFER (3-STATE)			
U14	T93-0866-04	IC,PROGRAMMED ROM			
U15	TC74HC30AP	IC,8-INPUT NAND GATE			
U16	TC74HC14AP	IC,HEX SCHMITT INVERTER			
U17	TC74HC00AP	IC,QUAD 2-INPUT NAND GATE			

CONNECTION UNIT

X67-1250-00

REF.NO	PARTS NO	NAME & DESCRIPTION	
	J73-0351-12	PCB (UNMOUNTED)	
P1	E40-7472-05	PIN CONNECTOR	14P
P2	E40-7472-05	PIN CONNECTOR	14P
P3	E40-3255-05	PIN CONNECTOR	11P
P4	E40-7475-05	PIN CONNECTOR	50P
P5	E40-7472-05	PIN CONNECTOR	14P
P6	E40-3257-05	PIN CONNECTOR	13P
P7	E40-7474-05	PIN CONNECTOR	40P
P8	E40-3256-05	PIN CONNECTOR	12P
P9	E40-3254-05	PIN CONNECTOR	10P
P10	E40-3250-05	PIN CONNECTOR	6P
P11	E40-7476-05	PIN CONNECTOR	100P
P12	E40-7476-05	PIN CONNECTOR	100P

PARTS LIST

POWER UNIT

X68-1760-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F01-2330-03	HEAT SINK			
	J21-4927-04	BRACKET			
	J73-0350-22	PCB (UNMOUNTED)			
	N09-0742-04	SCREW,SEMS PAN HD M3X8			
	N32-3010-41	SCREW,FLAT HD M3X10			
C1	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C2	C90-2689-05	CAP. ELECTRO	3300	20%	16V
C3	C90-2671-05	CAP. ELECTRO	47	20%	10V
C4	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C5	C90-2712-05	CAP. ELECTRO	3300	20%	35V
C6	C90-2712-05	CAP. ELECTRO	3300	20%	35V
C7	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C8	C90-1404-05	CAP. ELECTRO	2200	20%	16V
C9	C90-2671-05	CAP. ELECTRO	47	20%	10V
C10	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C11	C90-2711-05	CAP. ELECTRO	2200	20%	35V
C12	C90-2711-05	CAP. ELECTRO	2200	20%	35V
C13	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C14	C90-4521-05	CAP. ELECTRO	10000	20%	16V
C15	CF92V1H105J	CAP. POLYESTER	1P	5%	50V
C16	C90-2673-05	CAP. ELECTRO	220	20%	10V
C17	CF92V1H104J	CAP. POLYESTER	0.1	5%	50V
C18	C90-2712-05	CAP. ELECTRO	3300	20%	35V
C19	C90-2710-05	CAP. ELECTRO	1000	20%	35V
C20	C90-2721-05	CAP. ELECTRO	10	20%	50V
C21	C90-2692-05	CAP. ELECTRO	47	20%	25V
C22	C90-2763-05	CAP. ELECTRO	22	20%	25V
C23	C90-2711-05	CAP. ELECTRO	2200	20%	35V
C24	C90-2711-05	CAP. ELECTRO	2200	20%	35V
C201	C91-2659-05	CAP. CERAMIC	0.1	20%	250V
C202	C91-2584-05	CAP. CERAMIC	1000P	10%	250V
C203	C91-2584-05	CAP. CERAMIC	1000P	10%	250V
CN1	E40-5067-05	PIN CONNECTOR	10P		
CN2	E40-3240-05	PIN CONNECTOR	5P		
CN3	E40-3254-05	PIN CONNECTOR	10P		
CN4	E40-3255-05	PIN CONNECTOR	11P		
CN5	E40-3239-05	PIN CONNECTOR	4P		
D1	S1VB20	DIODE,BRIDGE			
D2	S1VB20	DIODE,BRIDGE			
D3	S1VB20	DIODE,BRIDGE			
D4	S1VB20	DIODE,BRIDGE			
D5	S1VB20	DIODE,BRIDGE			
D6	NO USE				
D7	MTZ13JB	DIODE,ZENER			
D8	1SS132	DIODE			
D9	MTZ5.6JB	DIODE,ZENER			
D10	MTZ13JB	DIODE,ZENER			
IC1	TA7805S	IC,3-TERMINAL REGULATOR			
IC2	TA7805S	IC,3-TERMINAL REGULATOR			
IC3	UPC1093J	IC,VARIABLE SHUNT REGULATOR			
IC4	NJM4558D	IC,DUAL OP-AMP			
L201	L33-0808-05	CHOKE COIL	1000UH		
P21	E40-7412-05	PIN CONNECTOR	2P		
P22	E40-7413-05	PIN CONNECTOR	6P		
Q1	2SC1384(R)	TR. SI, NPN			
Q2	2SB1015(Y)	TR. SI, PNP			
Q3	2SD1406(Y)	TR. SI, NPN			
Q4	2SB1015(Y)	TR. SI, PNP			
R1	RD14DB2H102J	RES. CARBON	1K	5%	1/2W
R2	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R3	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R4	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R5	RD14DB2HR47J	RES. METAL FILM	0.47	5%	1/2W
R6	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R7	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R8	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R9	RN14BK2C8201F	RES. METAL FILM	8.2K	1%	1/6W
R10	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R11	RD14DB2H2R2J	RES. CARBON	2.2	5%	1/2W
R12	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R13	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R14	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R15	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R16	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R17	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R201	R92-0173-05	RES. FIXED	2.2M	20%	350V
TP1	E23-0401-05	PIN TERMINAL			
TP2	E23-0401-05	PIN TERMINAL			
VR1	R32-0835-05	RES. SEMI FIXED	500		

FILTER UNIT

X69-1330-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0349-12	PCB (UNMOUNTED)			
C2	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C3	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C4	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C5	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C6	NO USE				
C7	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C8	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C9	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C10	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C13	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C14	CK73FR1H103K	CAP. CERAMIC	0.01	10%	50V
C17	CC73FCH1H050C	CAP. CERAMIC	5P	0.25P	50V
J1	E40-7480-05	PIN CONNECTOR	20P		
J2	E40-7480-05	PIN CONNECTOR	20P		
J17	E40-7480-05	PIN CONNECTOR	20P		
J32	E40-7480-05	PIN CONNECTOR	20P		
Q1	2SK426(X26)	FET, N-CHANNEL			
Q2	2SK426(X26)	FET, N-CHANNEL			
Q3	2SK426(X26)	FET, N-CHANNEL			
Q4	2SK426(X26)	FET, N-CHANNEL			
R1	RN73FH2A332D	RES. METAL FILM	3.3K	0.5%	1/10W
R2	RN73FH2A182D	RES. METAL FILM	1.8K	0.5%	1/10W
R3	RN73FH2A332D	RES. METAL FILM	3.3K	0.5%	1/10W
R4	RN73FH2A622D	RES. METAL FILM	6.2K	0.5%	1/10W
R5	RN73FH2A332D	RES. METAL FILM	3.3K	0.5%	1/10W
R6	RN73FH2A562D	RES. METAL FILM	5.6K	0.5%	1/10W
R7	RN73FH2A362D	RES. METAL FILM	3.6K	0.5%	1/10W
R8	RN73FH2A202D	RES. METAL FILM	2K	0.5%	1/10W
R9	RN73FH2A202D	RES. METAL FILM	2K	0.5%	1/10W
R10	RN73FH2A623D	RES. METAL FILM	62K	0.5%	1/10W
R11	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R12	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R13	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R14	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R15	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R16	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R17	RN73FH2A821D	RES. METAL FILM	820	0.5%	1/10W
R18	RN73FH2A203D	RES. METAL FILM	20K	0.5%	1/10W
R19	RN73FH2A103D	RES. METAL FILM	10K	0.5%	1/10W
R20	RN73FH2A561D	RES. METAL FILM	560	0.5%	1/10W
R21	RN73FH2A202D	RES. METAL FILM	2K	0.5%	1/10W
R22	NO USE				
R23	RN73FH2A623D	RES. METAL FILM	62K	0.5%	1/10W
R24	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R25	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R26	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R27	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R28	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R29	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R30	RN73FH2A821D	RES. METAL FILM	820	0.5%	1/10W
R31	RN73FH2A203D	RES. METAL FILM	20K	0.5%	1/10W
R32	RN73FH2A103D	RES. METAL FILM	10K	0.5%	1/10W
R33	RN73FH2A202D	RES. METAL FILM	2K	0.5%	1/10W
R34	RN73FH2A333D	RES. METAL FILM	33K	0.5%	1/10W
R35	RN73FH2A432D	RES. METAL FILM	4.3K	0.5%	1/10W
R36	RN73FH2A823D	RES. METAL FILM	82K	0.5%	1/10W
R37	NO USE				
R38	RN73FH2A100D	RES. METAL FILM	10	0.5%	1/10W
R39	RN73FH2A332D	RES. METAL FILM	3.3K	0.5%	1/10W
R40	RN73FH2A102D	RES. METAL FILM	1K	0.5%	1/10W
R41	RN73FH2A332D	RES. METAL FILM	3.3K	0.5%	1/10W
R42	RN73FH2A103D	RES. METAL FILM	10K	0.5%	1/10W
R43	RN73FH2A332D	RES. METAL FILM	3.3K	0.5%	1/10W
R44	RN73FH2A103D	RES. METAL FILM	10K	0.5%	1/10W
R45	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R46	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R47	RN73FH2A303D	RES. METAL FILM	30K	0.5%	1/10W
R48	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R49	RN73FH2A272D	RES. METAL FILM	2.7K	0.5%	1/10W
R50	RN73FH2A303D	RES. METAL FILM	30K	0.5%	1/10W
R51	RN73FH2A513D	RES. METAL FILM	51K	0.5%	1/10W
R100	R90-1189-05	RES. NETWORK	10K,20K		
R101	R90-1189-05	RES. NETWORK	10K,20K		
U1	NJM5532M	IC,DUAL LOW NOISE OP-AMP			
U2	NJM5532M	IC,DUAL LOW NOISE OP-AMP			
U3	NJM5532M	IC,DUAL LOW NOISE OP-AMP			
U4	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U5	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U6	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U7	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U8	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U9	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U10	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			
U11	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX			

PARTS LIST

FILTER UNIT

X69-1340-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0349-12	PCB (UNMOUNTED)
C2	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C3	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C4	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C5	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C6	NO USE	
C7	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C8	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C9	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C10	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C13	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C14	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C15	CC73FCH1H470J	CAP. CERAMIC 47P 5% 50V
C16	NO USE	
C17	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
J1	E40-7480-05	PIN CONNECTOR 20P
J2	E40-7480-05	PIN CONNECTOR 20P
J17	E40-7480-05	PIN CONNECTOR 20P
J32	E40-7480-05	PIN CONNECTOR 20P
Q1	2SK426(X26)	FET, N-CHANNEL
Q2	2SK426(X26)	FET, N-CHANNEL
Q3	2SK426(X26)	FET, N-CHANNEL
Q4	2SK426(X26)	FET, N-CHANNEL
R1	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R2	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R3	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R4	RN73FH2A622D	RES. METAL FILM 6.2K 0.5% 1/10W
R5	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R6	RN73FH2A512D	RES. METAL FILM 5.1K 0.5% 1/10W
R7	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R8	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R9	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R10	RN73FH2A623D	RES. METAL FILM 62K 0.5% 1/10W
R11	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R12	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R13	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R14	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R15	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R16	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R17	RN73FH2A821D	RES. METAL FILM 820 0.5% 1/10W
R18	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R19	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R20	RN73FH2A561D	RES. METAL FILM 560 0.5% 1/10W
R21	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R22	NO USE	
R23	RN73FH2A623D	RES. METAL FILM 62K 0.5% 1/10W
R24	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R25	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R26	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R27	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R28	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R29	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R30	RN73FH2A821D	RES. METAL FILM 820 0.5% 1/10W
R31	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R32	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R33	RN73FH2A432D	RES. METAL FILM 4.3K 0.5% 1/10W
R34	RN73FH2A823D	RES. METAL FILM 82K 0.5% 1/10W
R35	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R36	RN73FH2A333D	RES. METAL FILM 33K 0.5% 1/10W
R37	RN73FH2A474D	RES. METAL FILM 470K 0.5% 1/10W
R38	RN73FH2A100D	RES. METAL FILM 10 0.5% 1/10W
R39	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R40	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R41	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R42	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R43	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R44	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R45	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R46	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R47	RN73FH2A303D	RES. METAL FILM 30K 0.5% 1/10W
R48	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R49	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R50	RN73FH2A303D	RES. METAL FILM 30K 0.5% 1/10W
R51	RN73FH2A303D	RES. METAL FILM 30K 0.5% 1/10W
R100	R90-1189-05	RES. NETWORK 10K,20K
R101	R90-1189-05	RES. NETWORK 10K,20K
U1	NJM4580E	IC,DUAL OP-AMP
U2	NJM4580E	IC,DUAL OP-AMP
U3	NJM5532M	IC,DUAL LOW NOISE OP-AMP
U4	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U5	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U6	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U7	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U8	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U9	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U10	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U11	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX

SWITCH UNIT

X69-1350-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0353-02	PCB (UNMOUNTED)
P1	E40-3247-05	PIN CONNECTOR 3P
P2	E40-3246-05	PIN CONNECTOR 2P
P3	E40-3249-05	PIN CONNECTOR 5P
R1	RN14BK2C3600F	RES. METAL FILM 360 1% 1/6W
R2	RN14BK2C3600F	RES. METAL FILM 360 1% 1/6W
R3	RN14BK2C3600F	RES. METAL FILM 360 1% 1/6W
S1	S62-0625-05	SLIDE SWITCH
S2	S62-0625-05	SLIDE SWITCH
S3	S62-0625-05	SLIDE SWITCH

OSCILLATOR UNIT

X71-1220-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	E23-1511-05	TERMINAL
	J73-0349-12	PCB (UNMOUNTED)
C1	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C2	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C3	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C4	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C5	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C6	CC73FCH1H101J	CAP. CERAMIC 100P 5% 50V
C7	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C8	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C9	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C10	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C11	CC73FCH1H820J	CAP. CERAMIC 82P 5% 50V
C12	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C13	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C14	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C15	CC73FCH1H220J	CAP. CERAMIC 22P 5% 50V
C16	NO USE	
C17	CC73FCH1H030C	CAP. CERAMIC 3P 0.25P 50V
C18	CK73FR1H222K	CAP. CERAMIC 2200P 10% 50V
C19	CC73FCH1H121J	CAP. CERAMIC 120P 5% 50V
C51	CC73FCH1H820J	CAP. CERAMIC 82P 5% 50V
J1	E40-7480-05	PIN CONNECTOR 20P
J2	E40-7480-05	PIN CONNECTOR 20P
J17	E40-7480-05	PIN CONNECTOR 20P
J32	E40-7480-05	PIN CONNECTOR 20P
Q1	2SK426(X26)	FET, N-CHANNEL
Q2	2SK426(X26)	FET, N-CHANNEL
Q3	2SK426(X26)	FET, N-CHANNEL
Q4	2SK426(X26)	FET, N-CHANNEL
R1	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R2	NO USE	
R3	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R4	RN73FH2A622D	RES. METAL FILM 6.2K 0.5% 1/10W
R5	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R6	RN73FH2A512D	RES. METAL FILM 5.1K 0.5% 1/10W
R7	RN73FH2A392D	RES. METAL FILM 3.9K 0.5% 1/10W
R8	RN73FH2A512D	RES. METAL FILM 5.1K 0.5% 1/10W
R9	RN73FH2A512D	RES. METAL FILM 5.1K 0.5% 1/10W
R10	RN73FH2A623D	RES. METAL FILM 62K 0.5% 1/10W
R11	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R12	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R13	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R14	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R15	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R16	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R17	RN73FH2A821D	RES. METAL FILM 820 0.5% 1/10W
R18	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R19	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R20	R92-0670-05	JUMPING RES. ZERO OHM
R23	RN73FH2A623D	RES. METAL FILM 62K 0.5% 1/10W
R24	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R25	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R26	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R27	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R28	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R29	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R30	RN73FH2A821D	RES. METAL FILM 820 0.5% 1/10W
R31	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R32	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R38	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R39	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R40	NO USE	
R41	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R42	RN73FH2A182D	RES. METAL FILM 1.8K 0.5% 1/10W
R43	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
R44	RN73FH2A182D	RES. METAL FILM 1.8K 0.5% 1/10W
R45	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R46	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R47	RN73FH2A303D	RES. METAL FILM 30K 0.5% 1/10W
R48	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R49	RN73FH2A272D	RES. METAL FILM 2.7K 0.5% 1/10W
R50	RN73FH2A303D	RES. METAL FILM 30K 0.5% 1/10W
R100	R90-1189-05	RES. NETWORK 10K,20K
R101	R90-1189-05	RES. NETWORK 10K,20K
U1	NJM5532M	IC,DUAL LOW NOISE OP-AMP
U2	NJM5532M	IC,DUAL LOW NOISE OP-AMP
U3	NJM5532M	IC,DUAL LOW NOISE OP-AMP
U4	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U5	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U6	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U7	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U8	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U9	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U10	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX
U11	TC4053BFS	IC,TRIPLE 2-CH MPX/DE-MPX

OSCILLATOR UNIT

X71-1230-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0351-12	PCB (UNMOUNTED)
	N09-0743-04	SCREW,SEMS PAN HD M3X10
	N14-0404-04	FLANGE NUT M3
C1	C91-1315-05	CAP. CERAMIC 0.1 80/-20% 50V
C2	C91-1315-05	CAP. CERAMIC 0.1 80/-20% 50V
C3	CE04EW1C101M	CAP. ELECTRO 100 20% 16V
C4	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C5	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C6	CE04HW1V100M	CAP. ELECTRO 10 20% 35V
C7	CQ92HP2A471F	CAP. PLASTIC 470P 1% 100V
C8	CQ92HP2A101F	CAP. PLASTIC 100P 1% 100V
C9	CQ93HPG1H333F	CAP. PLASTIC 0.033 1% 50V
C10	CQ92HP2A101F	CAP. PLASTIC 100P 1% 100V
C11	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C12	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C13	NO USE	
C14	CC45FSL1H121J	CAP. CERAMIC 120P 5% 50V
C15	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C16	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C19	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C20	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C21	NO USE	
C22	CQ92FM1H104J	CAP. PLASTIC 0.1 5% 50V
C26	CK45FB1H221K	CAP. CERAMIC 220P 10% 50V
C34	C91-1315-05	CAP. CERAMIC 0.1 80/-20% 50V
C35	CE04BW1C221M	CAP. ELECTRO 220 20% 16V
C36	CE04EW1C221M	CAP. ELECTRO 220 20% 16V
C37	CE04EW1H101M	CAP. ELECTRO 100 20% 50V
C48	CE04EW1H100M	CAP. ELECTRO 10 20% 50V
C50	NO USE	
C51	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C52	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C53	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C54	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C55	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C56	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C64	C91-1315-05	CAP. CERAMIC 0.1 80/-20% 50V
C65	NO USE	
C66	CE04EW1C101M	CAP. ELECTRO 100 20% 16V
C67	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C68	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C72	C91-1315-05	CAP. CERAMIC 0.1 80/-20% 50V
C73	CQ93HPG1H122F	CAP. PLASTIC 1200P 1% 50V
C74	CQ93HPG1H122F	CAP. PLASTIC 1200P 1% 50V
C75	CQ92HP2A221F	CAP. PLASTIC 220P 1% 100V
C76	NO USE	
C77	CQ93HPG1H102F	CAP. PLASTIC 1000P 1% 50V
C78	CQ92HP2A331F	CAP. PLASTIC 330P 1% 100V
C79	NO USE	
C80	CC45FCH1H330J	CAP. CERAMIC 33P 5% 50V
C81	CQ93HPG1H392F	CAP. PLASTIC 3900P 1% 50V
C85	CC45FCH1H220J	CAP. CERAMIC 22P 5% 50V
C90	CQ93HPG1H223F	CAP. PLASTIC 0.022 1% 50V
C91	CQ93HPG1H102F	CAP. PLASTIC 1000P 1% 50V
C92	CQ92HP2A391F	CAP. PLASTIC 390P 1% 100V
C93	CQ92HP2A471F	CAP. PLASTIC 470P 1% 100V
C94	CQ92HP2A471F	CAP. PLASTIC 470P 1% 100V
C95	C91-2645-05	CAP. FILM 0.82 2% 50V
C96	C91-2644-05	CAP. FILM 0.22 2% 50V
C97	CK45FB1H102K	CAP. CERAMIC 1000P 10% 50V
C98	CK45FB1H102K	CAP. CERAMIC 1000P 10% 50V
C99	CC45FCH1H330J	CAP. CERAMIC 33P 5% 50V
C202	CE04EW1H100M	CAP. ELECTRO 10 20% 50V
C205	CK45B2H222K	CAP. CERAMIC 2200P 10% 500V
D1	1SS132	DIODE
D2	1SS132	DIODE
D3	RD5.6JS	DIODE,ZENER
D4	RD5.6JS	DIODE,ZENER
D5	1SS132	DIODE
D6	1SS132	DIODE
D7	1SS132	DIODE
D8	1SS132	DIODE
D9	1SS132	DIODE
D10	1SS132	DIODE
D11	1SS132	DIODE
D12	1SS132	DIODE
D15	RD5.6F	DIODE,ZENER
D16	MTZ16JA	DIODE,ZENER
D17	MTZ16JA	DIODE,ZENER
D18	1SS132	DIODE
D19	RD5.6JS	DIODE,ZENER
D20	1SS132	DIODE
D21	RD5.6JS	DIODE,ZENER
D22	1SS132	DIODE
D23	RD5.6JS	DIODE,ZENER
D24	1SS132	DIODE
D25	1SS132	DIODE
D26	RD5.6F	DIODE,ZENER
D50	1SS132	DIODE
K1	S76-0627-05	RELAY
K2	S76-0627-05	RELAY
K3	S76-0627-05	RELAY
K4	S76-0627-05	RELAY
K5	S76-0627-05	RELAY
K6	S76-0627-05	RELAY
K7	S76-0627-05	RELAY
K8	S76-0627-05	RELAY
L1	L33-0832-05	CHOKE COIL
P1	E40-3259-05	PIN CONNECTOR 15P
P2	E40-3254-05	PIN CONNECTOR 10P
P3	E40-3249-05	PIN CONNECTOR 5P
P4	E40-3250-05	PIN CONNECTOR 6P
P5	E40-7486-05	PIN CONNECTOR 20P
P6	E40-7486-05	PIN CONNECTOR 20P
P7	E40-7486-05	PIN CONNECTOR 20P
P8	E40-7486-05	PIN CONNECTOR 20P
P9	E40-3246-05	PIN CONNECTOR 2P
PH1	TLP2630	IC,PHOTO COUPLER
PH2	TLP2630	IC,PHOTO COUPLER
PH3	TLP2630	IC,PHOTO COUPLER
PH4	TLP2630	IC,PHOTO COUPLER
Q1	2SK190H	FET, N-CHANNEL
Q2	2SK190H	FET, N-CHANNEL
Q3	2SD1406(Y)	TR. SI, NPN
Q4	2SB1015(Y)	TR. SI, PNP
R1	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R2	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R3	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R4	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R5	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R6	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R7	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R8	RN14BK2C2200F	RES. METAL FILM 220 1% 1/6W
R9	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R10	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R11	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R12	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R13	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R14	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R15	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R16	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R17	RN14BK2C5602F	RES. METAL FILM 56K 1% 1/6W
R18	RN14BK2C5602F	RES. METAL FILM 56K 1% 1/6W
R19	RN14BK2C4302F	RES. METAL FILM 43K 1% 1/6W
R20	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R21	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R22	RN14BK2C5101F	RES. METAL FILM 5.1K 1% 1/6W
R23	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R24	RN14BK2C4703F	RES. METAL FILM 470K 1% 1/6W
R25	RN14BK2C2003F	RES. METAL FILM 200K 1% 1/6W
R26	RN14BK2C10R0F	RES. METAL FILM 10.0 1% 1/6W
R27	RN14BK2C2002F	RES. METAL FILM 20K 1% 1/6W
R28	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R29	RN14BK2C2000F	RES. METAL FILM 200 1% 1/6W
R30	RN14BK2C5101F	RES. METAL FILM 5.1K 1% 1/6W
R31	RN14BK2C4701F	RES. METAL FILM 4.7K 1% 1/6W
R32	RN14BK2C4301F	RES. METAL FILM 4.3K 1% 1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION		
R33	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R34	RN14BK2C2201F	RES. METAL FILM 2.2K	1%	1/6W
R35	RN14BK2C1004F	RES. METAL FILM 1M	1%	1/6W
R36	RN14BK2C3301F	RES. METAL FILM 3.3K	1%	1/6W
R37	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R38	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R39	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R40	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R41	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R42	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R43	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R44	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R45	RN14BK2C7501F	RES. METAL FILM 7.5K	1%	1/6W
R46	NO USE			
R47	RN14BK2C3902F	RES. METAL FILM 39K	1%	1/6W
R48	RN14BK2C7501F	RES. METAL FILM 7.5K	1%	1/6W
R49	NO USE			
R50	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R51	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R52	RN14BK2C3301F	RES. METAL FILM 3.3K	1%	1/6W
R53	RN14BK2C3301F	RES. METAL FILM 3.3K	1%	1/6W
R54	RN14BK2C2201F	RES. METAL FILM 2.2K	1%	1/6W
R55	RN14BK2C6000D	RES. METAL FILM 600	0.5%	1/6W
R56	RN14BK2C6040D	RES. METAL FILM 604	0.5%	1/6W
R57	RN14BK2C7502F	RES. METAL FILM 75K	1%	1/6W
R58	RN14BK2C6040D	RES. METAL FILM 604	0.5%	1/6W
R59	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R60	RN14BK2C4701F	RES. METAL FILM 4.7K	1%	1/6W
R61	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R62	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R63	RN14BK2C1101F	RES. METAL FILM 1.1K	1%	1/6W
R64	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R65	RN14BK2C1801F	RES. METAL FILM 1.8K	1%	1/6W
R66	RN14BK2C4480D	RES. METAL FILM 448	0.5%	1/6W
R67	RN14BK2C1801F	RES. METAL FILM 1.8K	1%	1/6W
R68	RN14BK2C3521D	RES. METAL FILM 3.52K	0.5%	1/6W
R69	RN14BK2C2100D	RES. METAL FILM 210	0.5%	1/6W
R70	RN14BK2C3521D	RES. METAL FILM 3.52K	0.5%	1/6W
R71	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R72	RN14BK2C4701F	RES. METAL FILM 4.7K	1%	1/6W
R73	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R74	RN14BK2C10R0F	RES. METAL FILM 10.0	1%	1/6W
R75	NO USE			
R76	RN14BK2C6000D	RES. METAL FILM 600	0.5%	1/6W
R77	RN14BK2C6000D	RES. METAL FILM 600	0.5%	1/6W
R78	R12-2521-05	RES. SEMI FIXED 5KB		
R99	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R100	RN14BK2H1R00F	RES. METAL FILM 1.00	1%	1/2W
R101	RN14BK2C1500F	RES. METAL FILM 150	1%	1/6W
R102	RN14BK2C1500F	RES. METAL FILM 150	1%	1/6W
R103	RN14BK2H1R00F	RES. METAL FILM 1.00	1%	1/2W
R104	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R105	RN14BK2C5601F	RES. METAL FILM 5.6K	1%	1/6W
R106	RN14BK2C1502F	RES. METAL FILM 15K	1%	1/6W
R107	RN14BK2C5601F	RES. METAL FILM 5.6K	1%	1/6W
R108	RN14BK2C5601F	RES. METAL FILM 5.6K	1%	1/6W
R109	RN14BK2C1502F	RES. METAL FILM 15K	1%	1/6W
R110	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R111	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R112	RN14BK2C6800F	RES. METAL FILM 680	1%	1/6W
R113	RN14BK2C3300F	RES. METAL FILM 330	1%	1/6W
R114	RN14BK2C1202F	RES. METAL FILM 12K	1%	1/6W
R115	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R116	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R117	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R118	NO USE			
R119	RN14BK2C3001F	RES. METAL FILM 3K	1%	1/6W
R120	RN14BK2C4301F	RES. METAL FILM 4.3K	1%	1/6W
R121	RN14BK2C1001F	RES. METAL FILM 1K	1%	1/6W
R122	RN14BK2C2201F	RES. METAL FILM 2.2K	1%	1/6W
R123	RN14BK2C2201F	RES. METAL FILM 2.2K	1%	1/6W
R124	RN14BK2C3901F	RES. METAL FILM 3.9K	1%	1/6W
R125	RN14BK2C3901F	RES. METAL FILM 3.9K	1%	1/6W
R126	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R127	RN14BK2C5101F	RES. METAL FILM 5.1K	1%	1/6W
R128	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R129	RN14BK2C1602F	RES. METAL FILM 16K	1%	1/6W
R130	RN14BK2C6801F	RES. METAL FILM 6.8K	1%	1/6W
R131	RN14BK2C20R0F	RES. METAL FILM 20.0	1%	1/6W
R132	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R133	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R134	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R135	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R136	RN14BK2C1002F	RES. METAL FILM 10K	1%	1/6W
R137	RN14BK2C9101F	RES. METAL FILM 9.1K	1%	1/6W
R138	RN14BK2C9101F	RES. METAL FILM 9.1K	1%	1/6W
R139	RN14BK2C9101F	RES. METAL FILM 9.1K	1%	1/6W
R140	RN14BK2C9101F	RES. METAL FILM 9.1K	1%	1/6W
R141	RN14BK2C9101F	RES. METAL FILM 9.1K	1%	1/6W
R142	RN14BK2C9101F	RES. METAL FILM 9.1K	1%	1/6W
R143	RN14BK2C6801F	RES. METAL FILM 6.8K	1%	1/6W
R144	RN14BK2C3001F	RES. METAL FILM 3K	1%	1/6W
R145	RN14BK2C5601F	RES. METAL FILM 5.6K	1%	1/6W
R146	RN14BK2C4701F	RES. METAL FILM 4.7K	1%	1/6W
R149	RN14BK2C2001F	RES. METAL FILM 2K	1%	1/6W
R150	RN14BK2C75R0F	RES. METAL FILM 75.0	1%	1/6W
R151	RN14BK2C68R0F	RES. METAL FILM 68.0	1%	1/6W
R152	RN14BK2C1603F	RES. METAL FILM 160K	1%	1/6W
R200	R90-1190-05	RES. NETWORK 10K,20K		
R201	RN14BK2C1501F	RES. METAL FILM 1.5K	1%	1/6W
TC1	C05-0449-05	CAP. TRIMMER 100P		
TC2	NO USE			
U3	TC74HC14AP	IC,HEX SCHMITT INVERTER		
U4	E02-0149-05	IC SOCKET		
U4	PCM56P-K	IC,16-BIT D/A CONVERTER		
U5	MC1495M	IC,FOUR QUADRANT MULTIPLIER		
U6	NJM4580D	IC,DUAL OP-AMP		
U7	NJM5532DD	IC,DUAL LOW NOISE MULTIPLIER		
U8	NJM5532DD	IC,DUAL LOW NOISE MULTIPLIER		
U11	NJU201AD	IC,QUAD SPST CMOS ANALOG SW		
U12	NJU201AD	IC,QUAD SPST CMOS ANALOG SW		
U13	SN74LS32N	IC,QUAD 2-INPUT OR GATE		
U14	NO USE			
U15	TC74HC4094AP	IC,8-BIT SHIFT REGISTER/LATCH		
U16	TC74HC4094AP	IC,8-BIT SHIFT REGISTER/LATCH		
U17	TC74HC4094AP	IC,8-BIT SHIFT REGISTER/LATCH		
U18	TC74HC4094AP	IC,8-BIT SHIFT REGISTER/LATCH		
U19	TC74HC4094AP	IC,8-BIT SHIFT REGISTER/LATCH		
U24	UPC814C	IC,JFET INPUT OP-AMP		
U25	TC4053BP	IC,TRIPLE 2-CH MPX/DE-MPX		
U26	TC4053BP	IC,TRIPLE 2-CH MPX/DE-MPX		
U27	TC4053BP	IC,TRIPLE 2-CH MPX/DE-MPX		
U28	TC74HC4094AP	IC,8-BIT SHIFT REGISTER/LATCH		
U29	TD62801P	IC,8-BIT REGISTER/LATCH/DRIVER		
U36	NJM4558D	IC,DUAL OP-AMP		
VR1	R32-0836-05	RES. SEMI FIXED 100K		
VR2	R32-0850-05	RES. SEMI FIXED 10K		
VR3	R32-0838-05	RES. SEMI FIXED 20K		
VR4	R32-0837-05	RES. SEMI FIXED 2K		
VR5	R32-0838-05	RES. SEMI FIXED 20K		
VR6	R32-0839-05	RES. SEMI FIXED 5K		

I/O UNIT

X72-1200-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0353-02	PCB (UNMOUNTED)			
C1	CK73FR1H102K	CAP. CERAMIC	1000P	10%	50V
C2	CK73FR1H102K	CAP. CERAMIC	1000P	10%	50V
C3	CK73FR1H102K	CAP. CERAMIC	1000P	10%	50V
C4	CK73FR1H223K	CAP. CERAMIC	0.022	10%	50V
C5	CK73FR1H223K	CAP. CERAMIC	0.022	10%	50V
C6	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C7	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C8	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C9	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C10	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C11	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C12	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C13	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C14	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C15	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C16	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
D1	1SS181	DIODE			
D2	1SS181	DIODE			
P1	E40-7479-05	PIN CONNECTOR 100P			
R1	R92-0670-05	JUMPING RES. ZERO OHM			
R2	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R3	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R4	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R5	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R6	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R7	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R8	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R9	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R10	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R11	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R12	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R13	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R14	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R15	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R16	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R17	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R18	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R19	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R20	RN73FH2A471D	RES. METAL FILM	470	0.5%	1/10W
R21	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R22	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R23	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R24	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W
R25	RN73FH2A473D	RES. METAL FILM	47K	0.5%	1/10W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
R26	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R27	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R28	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R29	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R30	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R31	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R32	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R33	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R34	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R35	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R36	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R37	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R38	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R39	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R40	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R41	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R42	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R43	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R44	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R45	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R46	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R47	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R48	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R49	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R50	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R51	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R52	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R53	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R54	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R55	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R56	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R57	NO USE	
R58	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R59	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R60	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R61	RN73FH2A333D	RES. METAL FILM 33K 0.5% 1/10W
R62	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R63	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R64	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R65	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R66	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R67	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
U1	TC74HC30AF	IC,8-INPUT NAND GATE
U2	TC74HC138AF	IC,3 TO 8 LINE DECODER
U3	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U4	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U5	UPD71055L	IC,PRO. PERIPHERAL INTERFACE
U6	TC74HC148AF	IC,8 TO 3 LINE PRIORITY ENCO.
U7	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U8	TC4093BF	IC,QUAD 2-INPUT SCHMITT TRIG.
U9	UPD4528BG	IC,DUAL MONO. MULTIVIBRATOR
U10	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U11	TC74HC32AF	IC,QUAD 2-INPUT OR GATE

PREAMP UNIT

X73-2080-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0349-12	PCB (UNMOUNTED)
C3	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C4	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C5	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C6	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C7	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C8	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C9	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C10	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C13	CC73FCH1H150J	CAP. CERAMIC 15P 5% 50V
C14	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C15	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C16	CC73FCH1H150J	CAP. CERAMIC 15P 5% 50V
C17	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C20	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C21	CC73FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
D1	1SS184	DIODE
D2	1SS184	DIODE
D3	1SS184	DIODE
J1	E40-7480-05	PIN CONNECTOR 20P
J2	E40-7480-05	PIN CONNECTOR 20P
J17	E40-7480-05	PIN CONNECTOR 20P
J32	E40-7480-05	PIN CONNECTOR 20P
Q1	2SK426(X26)	FET, N-CHANNEL
Q2	2SK426(X26)	FET, N-CHANNEL
Q3	2SK426(X26)	FET, N-CHANNEL
Q4	2SK426(X26)	FET, N-CHANNEL
Q5	2SK1577(P2)	FET, N-CHANNEL
Q6	2SK426(X26)	FET, N-CHANNEL
Q7	2SK426(X26)	FET, N-CHANNEL
Q8	2SK1577(P2)	FET, N-CHANNEL
Q9	2SK426(X26)	FET, N-CHANNEL
Q10	2SK1577(P2)	FET, N-CHANNEL
Q11	2SK1577(P2)	FET, N-CHANNEL
Q12	2SK426(X26)	FET, N-CHANNEL
Q13	2SK426(X26)	FET, N-CHANNEL
Q14	2SK1577(P2)	FET, N-CHANNEL
Q15	2SK426(X26)	FET, N-CHANNEL
Q16	2SK1577(P2)	FET, N-CHANNEL
Q17	2SC2712	TR. SI, NPN
Q18	2SC2712	TR. SI, NPN
Q19	2SC2712	TR. SI, NPN
Q20	2SC2712	TR. SI, NPN
Q21	2SC2712	TR. SI, NPN
Q22	2SC2712	TR. SI, NPN
Q23	2SC3356	TR. SI, NPN
Q24	2SC3356	TR. SI, NPN
Q25	2SC3356	TR. SI, NPN
Q26	2SC3356	TR. SI, NPN
Q27	2SC3356	TR. SI, NPN
Q28	2SC3356	TR. SI, NPN
Q901	2SK1577(P1)	FET, N-CHANNEL
Q902	2SK1577(P1)	FET, N-CHANNEL
Q903	2SK1577(P1)	FET, N-CHANNEL
Q904	2SK1577(P1)	FET, N-CHANNEL
R1	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R2	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R3	RN73FH2A153D	RES. METAL FILM 15K 0.5% 1/10W
R4	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R5	RN73FH2A273D	RES. METAL FILM 27K 0.5% 1/10W
R6	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R7	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R8	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R9	RN73FH2A153D	RES. METAL FILM 15K 0.5% 1/10W
R10	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R11	RN73FH2A273D	RES. METAL FILM 27K 0.5% 1/10W
R12	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R13	RN73FH2A152D	RES. METAL FILM 1.5K 0.5% 1/10W
R14	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R15	RN73FH2A622D	RES. METAL FILM 6.2K 0.5% 1/10W
R16	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R17	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R18	RN73FH2A433D	RES. METAL FILM 43K 0.5% 1/10W
R19	RN73FH2A471D	RES. METAL FILM 470 0.5% 1/10W
R20	RN73FH2A152D	RES. METAL FILM 1.5K 0.5% 1/10W
R21	RN73FH2A622D	RES. METAL FILM 6.2K 0.5% 1/10W
R22	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R23	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R24	RN73FH2A433D	RES. METAL FILM 43K 0.5% 1/10W
R25	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R26	R92-1647-05	RES. CHIP 2.2M 10% 1/10W
R27	R92-1647-05	RES. CHIP 2.2M 10% 1/10W
R28	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R29	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R30	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R31	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R32	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R33	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R34	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R35	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R36	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R37	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R38	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R39	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R40	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R41	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R42	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R43	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R44	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R45	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R46	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R47	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R48	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R49	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R50	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R51	R92-0670-05	JUMPING RES. ZERO OHM
R52	RN73FH2A271D	RES. METAL FILM 270 0.5% 1/10W
R53	R92-0670-05	JUMPING RES. ZERO OHM
R54	RN73FH2A271D	RES. METAL FILM 270 0.5% 1/10W
U1	NJM5532M	IC,DUAL LOW NOISE OP-AMP
U2	NJM5532M	IC,DUAL LOW NOISE OP-AMP
U3	TC4053BF	IC,TRIPLE 2-CH MPX/DE-MPX

PARTS LIST

CONTROL UNIT

X77-1930-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F10-1694-14	SHIELD COVER			
	F10-1695-04	SHIELD COVER			
	J73-0350-22	PCB (UNMOUNTED)			
C1	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C2	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C3	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C4	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C5	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C6	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C7	C91-2643-05	CAP. CERAMIC	0.022	10%	25V
C8	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C9	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C10	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C11	NO USE				
C12	C91-2642-05	CAP. CERAMIC	1000P	10%	25V
C13	CE04EW1E221M	CAP. ELECTRO	220	20%	25V
C100	CE04HW1C331M	CAP. ELECTRO	330	20%	16V
C101	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C102	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
D1	RD5.6JS	DIODE,ZENER			
D2	1SS132	DIODE			
D3	1SS132	DIODE			
D4	1SS132	DIODE			
D5	1SS132	DIODE			
D100	1SS132	DIODE			
D101	1SS132	DIODE			
D200	MTZ18JB	DIODE,ZENER	9.6V		
P1	E40-3257-05	PIN CONNECTOR	13P		
P2	E40-3254-05	PIN CONNECTOR	10P		
P5	E40-7477-05	PIN CONNECTOR	15P		
P6	E40-7478-05	PIN CONNECTOR	5P		
P100	E40-3249-05	PIN CONNECTOR	5P		
P101	E40-3246-05	PIN CONNECTOR	2P		
Q1	2SC1384(R)	TR. SI, NPN			
R1	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R2	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R3	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R4	RN14BK2C1802F	RES. METAL FILM	18K	1%	1/6W
R5	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R6	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R7	RN14BK2C1004F	RES. METAL FILM	1M	1%	1/6W
R8	RN14BK2C1004F	RES. METAL FILM	1M	1%	1/6W
R9	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R10	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R11	RN14BK2C1004F	RES. METAL FILM	1M	1%	1/6W
R12	RN14BK2C22R0F	RES. METAL FILM	22.0	1%	1/6W
R13	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R14	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R15	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R16	RN14BK2C3003F	RES. METAL FILM	300K	1%	1/6W
R17	NO USE				
R18	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R19	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R100	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R101	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R102	RN14BK2C33R0F	RES. METAL FILM	33.0	1%	1/6W
R200	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R801	RN14BK2C2703F	RES. METAL FILM	270K	1%	1/6W
TH1	112-302-2	THERMISTOR			
U1	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.			
U2	TC74HC04AP	IC,HEX INVERTER			
U3	MAX500BCPE	IC,8-BIT D/A CONVERTOR			
U4	TC74HC00AP	IC,QUAD 2-INPUT NAND GATE			
U5	NJM082BD	IC,DUAL JFET INPUT OP-AMP			
U6	W02-2305-05	IC,DC-AC CONVERTER			
U100	NJM5532D	IC,DUAL LOW NOISE OP-AMP			
VR1	R32-0840-05	RES. SEMI FIXED 10K			
VR100	R12-2521-05	RES. SEMI FIXED 5KB			

CPU UNIT

X77-1940-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E02-0154-05	IC SOCKET	14 PIN		
	J73-0352-02	PCB (UNMOUNTED)			
BT1	W09-2380-05	BATTERY			
C1	CC73FCH1H270J	CAP. CERAMIC	27P	5%	50V
C2	CC73FCH1H270J	CAP. CERAMIC	27P	5%	50V
C3	CE04CW1C470M	CAP. ELECTRO	47	20%	16V
C4	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C5	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C6	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C7	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C8	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C9	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C10	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C11	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C12	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C13	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C14	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C15	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C16	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C17	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C18	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C19	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C20	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C21	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C22	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C23	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C24	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C25	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C26	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C27	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C28	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C29	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C30	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C31	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C32	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C33	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C34	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C35	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C36	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C37	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C38	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C39	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C40	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C41	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C42	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C43	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C44	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C45	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C46	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C47	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C48	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C49	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C50	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C51	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C52	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C53	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C54	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C55	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C56	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C57	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C58	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C59	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C60	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C61	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C62	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C63	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C64	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C65	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C66	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C67	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C68	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C69	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C70	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C71	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C72	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C73	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C74	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C75	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C76	CC73FCH1H331J	CAP. CERAMIC	330P	5%	50V
C77	CE04CW1C101M	CAP. ELECTRO	100	20%	16V
C78	CE04CW1C101M	CAP. ELECTRO	100	20%	16V
C79	CE04CW1C101M	CAP. ELECTRO	100	20%	16V
C80	CE04CW1C101M	CAP. ELECTRO	100	20%	16V
C83	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C84	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C85	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C86	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C87	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C88	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C89	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C90	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V
C91	CK73FF1H104Z	CAP. CERAMIC	0.1	20/-80%	50V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
C92	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C93	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C94	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C95	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C96	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C97	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C98	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C99	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C100	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C101	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C102	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C103	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C104	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C105	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C106	CC73FCH1H101J	CAP. CERAMIC 100P 5% 50V
C107	CC73FCH1H331J	CAP. CERAMIC 330P 5% 50V
C108	CC73FCH1H331J	CAP. CERAMIC 330P 5% 50V
D1	1SS181	DIODE
D2	B30-3022-05	LED,RED
D3	B30-3023-05	LED,YELLOW
D4	B30-3021-05	LED,GREEN
D5	B30-3022-05	LED,RED
D6	B30-3022-05	LED,RED
P1	E40-7479-05	PIN CONNECTOR 100P
P4	E08-2484-05	CONNECTOR 24P
R1	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R2	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R3	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R4	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R5	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R6	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R7	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R8	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R9	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R10	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R11	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R12	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R13	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R14	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R15	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R16	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R17	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R18	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R19	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R20	RN73FH2A332D	RES. METAL FILM 3.3K 0.5% 1/10W
R21	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R22	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R23	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R24	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R25	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R26	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R27	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R28	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R29	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R30	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R31	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R32	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R33	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R34	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R35	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R36	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R37	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R38	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R39	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R40	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R41	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R42	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R43	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R44	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R45	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R46	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R47	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R48	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R49	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R50	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R51	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R52	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R53	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R54	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R55	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R56	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R57	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R58	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R59	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R60	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R61	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R62	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R63	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R64	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R65	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R66	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R67	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R68	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R69	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W

REF.NO	PARTS NO	NAME & DESCRIPTION
R70	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R71	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R72	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R73	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R74	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R75	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R76	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R77	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R78	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R79	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R80	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R81	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R82	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R83	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R84	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R85	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R86	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R87	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R88	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R89	RN73FH2A473D	RES. METAL FILM 47K 0.5% 1/10W
R90	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R91	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R92	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R93	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R94	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R95	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R96	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R97	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R98	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R99	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R100	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R101	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R102	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R103	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R104	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R105	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R106	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R107	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R108	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R109	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R110	RN73FH2A104D	RES. METAL FILM 100K 0.5% 1/10W
R111	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R112	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R113	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R114	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R115	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R116	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R117	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R118	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R119	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R120	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R121	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
S1	S79-0609-05	DIP SWITCH
S2	S79-0607-05	DIP SEITDH
S3	S68-0639-05	PUSH SWITCH
S4	S68-0640-05	PUSH SWITCH
U1	UPD70320L-8	IC,1CHIP 16/8-BIT MICRO COMPU.
U2	PST531A	IC,RESET
U3	TC74HC138AF	IC,3 TO 8 LINE DECODER
U4	TC74HC138AF	IC,3 TO 8 LINE DECODER
U5	TC74HC20AF	IC,DUAL 4-INPUT NAND GATE
U6	TC74HC32AF	IC,QUAD 2-INPUT OR GATE
U7	TC74HC04AF	IC,HEX INVERTER
U8	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U9	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U10	T93-0865-14	IC,PROGRAMMED ROM
U11	D431000AGW10L	IC,1M-BIT STATIC RAM
U12	UPD71055L	IC,PRO. PERIPHERAL INTERFACE
U13	MAX202CSE	IC,DUAL RS-232 TRANSCEIVER
U14	TNS8914A	IC,GP-IB ADAPTOR
U15	SN75160BN	IC,OCTAL GP-IB TRANSCEIVER
U16	SN75162BN	IC,BUS TRANSCEIVER
U17	TC74HC32AF	IC,QUAD 2-INPUT OR GATE
U18	SED1330FBA	IC,CMOS GRAPHIC LCD CONTROLLER
U19	D431000AGW10L	IC,1M-BIT STATIC RAM
U20	TC74HC08AF	IC,QUAD 2-INPUT AND GATE
U21	TC74HC138AF	IC,3 TO 8 LINE DECODER
U22	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U23	TC74HC138AF	IC,3 TO 8 LINE DECODER
U24	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U25	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U26	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U27	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U28	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U29	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U30	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U31	TC74HC574AF	IC,OCTAL D-TYPE F.F.
U32	UPD71059L-10	IC,PRO. INTERRUPT CONTROLLER
U33	TC74HC126AF	IC,QUAD BUS BUFFER
U34	S-2913AIF10	IC,CMOS 1K-BIT SERIAL EPROM
U35	NO USE	
U36	TC74HC126AF	IC,QUAD BUS BUFFER
U101	TC74HC14AF	IC,HEX SCHMITT INVERTERE
U105	TC74HC14AF	IC,HEX SCHMITT INVERTERE
X1	L78-0117-05	CERAMIC OSCILLATOR

PARTS LIST

DSP UNIT

X79-1230-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F10-1696-04	SHIELD PLATE			
	F10-1697-04	SHIELD PLATE			
	J73-0350-22	PCB (UNMOUNTED)			
C1	C91-2648-05	CAP. CERAMIC	1	5%	250V
C2	CC45FCH2H100D	CAP. CERAMIC	10P	0.5P	500V
C5	CC45FCH2H220J	CAP. CERAMIC	22P	5%	500V
C6	NO USE				
C7	CC45FCH2H330J	CAP. CERAMIC	33P	5%	500V
C8	C91-2647-05	CAP. FILM	0.01	5%	250V
C9	C91-2648-05	CAP. CERAMIC	1	5%	250V
C12	CC45FCH2H100D	CAP. CERAMIC	10P	0.5P	500V
C13	CC45FCH2H330J	CAP. CERAMIC	33P	5%	500V
C14	NO USE				
C15	CC45FCH2H220J	CAP. CERAMIC	22P	5%	500V
C16	C91-2647-05	CAP. FILM	0.01	5%	250V
C17	C91-2648-05	CAP. CERAMIC	1	5%	250V
C18	C91-2648-05	CAP. CERAMIC	1	5%	250V
C19	CC45FCH1H390J	CAP. CERAMIC	39P	5%	50V
C22	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C23	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C24	CQ93HPG1H391J	CAP. PLASTIC	390P	5%	50V
C25	C91-2646-05	CAP. FILM	0.39	2%	50V
C26	NO USE				
C27	CQ93HPG1H393J	CAP. PLASTIC	0.039	5%	50V
C28	NO USE				
C29	CQ93HPG1H392F	CAP. PLASTIC	3900P	1%	50V
C30	NO USE				
C31	CQ93HPG1H391J	CAP. PLASTIC	390P	5%	50V
C32	NO USE				
C33	C91-2646-05	CAP. FILM	0.39	2%	50V
C34	NO USE				
C35	CQ93HPG1H393J	CAP. PLASTIC	0.039	5%	50V
C36	NO USE				
C37	CQ93HPG1H392F	CAP. PLASTIC	3900P	1%	50V
C38	CQ93HPG1H821J	CAP. PLASTIC	820P	5%	50V
C39	C91-2645-05	CAP. FILM	0.82	2%	50V
C40	NO USE				
C41	CQ93HPG1H823F	CAP. PLASTIC	0.082	1%	50V
C42	NO USE				
C43	CQ93HPG1H822F	CAP. PLASTIC	8200P	1%	50V
C44	NO USE				
C45	CQ93HPG1H821J	CAP. PLASTIC	820P	5%	50V
C46	NO USE				
C47	C91-2645-05	CAP. FILM	0.82	2%	50V
C48	NO USE				
C49	CQ93HPG1H823F	CAP. PLASTIC	0.082	1%	50V
C50	NO USE				
C51	CQ93HPG1H822F	CAP. PLASTIC	8200P	1%	50V
C52	C91-2584-05	CAP. CERAMIC	1000P	10%	250V
C53	C91-2642-05	CAP. CERAMIC	1000P	10%	25V
C54	CE04EW1H470M	CAP. ELECTRO	47	20%	50V
C55	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C56	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C57	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C58	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C59	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C60	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C61	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C62	C91-2584-05	CAP. CERAMIC	1000P	10%	250V
C63	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C64	CE04EW1H470M	CAP. ELECTRO	47	20%	50V
C65	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C66	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C67	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C68	CE04EW1H470M	CAP. ELECTRO	47	20%	50V
C69	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C70	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C71	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C72	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C73	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C74	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C75	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C76	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C77	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C78	CQ93HPG1H224F	CAP. PLASTIC	0.22	1%	50V
C79	CQ93HPG1H224F	CAP. PLASTIC	0.22	1%	50V
C80	CQ93HPG1H683F	CAP. PLASTIC	0.068	1%	50V
C81	CQ93HPG1H683F	CAP. PLASTIC	0.068	1%	50V
C82	CQ93HPG1H103F	CAP. PLASTIC	0.01	1%	50V
C83	CQ93HPG1H103F	CAP. PLASTIC	0.01	1%	50V
C84	CQ93HPG1H103F	CAP. PLASTIC	0.01	1%	50V
C85	CQ93HPG1H473F	CAP. PLASTIC	0.047	1%	50V
C86	CQ93HPG1H473F	CAP. PLASTIC	0.047	1%	50V
C87	CQ93HPG1H473F	CAP. PLASTIC	0.047	1%	50V
C88	CQ93HPG1H473F	CAP. PLASTIC	0.047	1%	50V
C89	CQ93HPG1H473F	CAP. PLASTIC	0.047	1%	50V
C90	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C91	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C92	CQ93HPG1H331J	CAP. PLASTIC	330P	5%	50V
C93	CQ93HPG1H471J	CAP. PLASTIC	470P	5%	50V
C94	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C95	CQ93HPG1H471J	CAP. PLASTIC	470P	5%	50V
C96	CQ93HPG1H102F	CAP. PLASTIC	1000P	1%	50V
C97	CC45FCH1H560J	CAP. CERAMIC	56P	5%	50V
C98	C91-2642-05	CAP. CERAMIC	1000P	10%	25V
C99	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C100	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C101	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C102	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C103	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C104	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C105	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C106	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C107	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C108	CE04HW1V100M	CAP. ELECTRO	10	20%	35V
C109	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C110	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C113	CQ93HPG1H224F	CAP. PLASTIC	0.22	1%	50V
C114	CQ93HPG1H224F	CAP. PLASTIC	0.22	1%	50V
C115	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C116	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C117	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C118	NO USE				
C119	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C120	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C121	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C122	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C123	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C124	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C125	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C126	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C127	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C128	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C129	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C130	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C131	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C132	NO USE				
C133	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C134	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C135	CC45FCH2H101J	CAP. CERAMIC	100P	5%	500V
C136	CC45FCH2H101J	CAP. CERAMIC	100P	5%	500V
C137	CC45FCH2H330J	CAP. CERAMIC	33P	5%	500V
C138	CC45FCH2H330J	CAP. CERAMIC	33P	5%	500V
C139	CE04HW1C330M	CAP. ELECTRO	33	20%	16V
C140	NO USE				
C141	CE04EW1C221M	CAP. ELECTRO	220	20%	16V
C142	C91-2642-05	CAP. CERAMIC	1000P	10%	25V
C143	C91-2642-05	CAP. CERAMIC	1000P	10%	25V
C144	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C145	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C146	CQ93HPG1H471J	CAP. PLASTIC	470P	5%	50V
C147	CQ93HPG1H331J	CAP. PLASTIC	330P	5%	50V
C148	CQ93HPG1H822F	CAP. PLASTIC	8200P	1%	50V
C149	CQ93HPG1H102F	CAP. PLASTIC	1000P	1%	50V
C150	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C151	C91-2649-05	CAP. CERAMIC	0.01	10%	25V
C152	NO USE				
C153	C91-1315-05	CAP. CERAMIC	0.1	80/-20%	50V
C154	CE04HW1A221M	CAP. ELECTRO	220	20%	10V
C155	R92-0150-05	JUMPING RES.	ZERO OHM(10MM)		
C156	CE04BW1C221M	CAP. ELECTRO	220	20%	16V
C164	CC45FCH1H390J	CAP. CERAMIC	39P	5%	50V
C201	CC45FCH1H221J	CAP. CERAMIC	220P	5%	50V
C202	CE04EW1H101M	CAP. ELECTRO	100	20%	50V
C203	CE04HW1C330M	CAP. ELECTRO	33	20%	16V
C204	NO USE				
C205	CK45B2H222K	CAP. CERAMIC	2200P	10%	500V
C206	CK45B2H222K	CAP. CERAMIC	2200P	10%	500V
D1	1SS132	DIODE			
D4	1SS132	DIODE			
D5	1SS132	DIODE			
D8	1SS132	DIODE			
D11	1SS132	DIODE			
D12	1SS132	DIODE			
D13	1SS132	DIODE			
D14	1SS132	DIODE			
D15	1SS132	DIODE			
D16	1SS132	DIODE			
D17	1SS132	DIODE			
D18	1SS132	DIODE			
D19	1SS132	DIODE			
D20	1SS132	DIODE			
D21	1SS132	DIODE			
D22	1SS132	DIODE			
D23	1SS132	DIODE			
D24	1SS132	DIODE			
D25	1SS132	DIODE			
D26	1SS132	DIODE			
D27	RD13JS	DIODE,ZENER			
D28	1SS132	DIODE			
D29	RD5.6JS	DIODE,ZENER			
D30	RD13JS	DIODE,ZENER			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
D31	1SS132	DIODE
D32	1SS132	DIODE
D33	1SS132	DIODE
JP1	R92-1061-05	JUMPING RES. ZERO OHM (5MM)
K1	S76-0627-05	RELAY
K2	S76-0627-05	RELAY
K3	S76-0627-05	RELAY
K4	S76-0627-05	RELAY
K5	S76-0627-05	RELAY
K6	S76-0627-05	RELAY
K7	S76-0627-05	RELAY
K8	S76-0627-05	RELAY
K9	S76-0627-05	RELAY
K10	S76-0627-05	RELAY
K11	S76-0627-05	RELAY
K12	S76-0627-05	RELAY
K13	NO USE	
K14	S76-0627-05	RELAY
K15	S76-0627-05	RELAY
K16	S76-0627-05	RELAY
K17	S76-0627-05	RELAY
K18	S76-0627-05	RELAY
K19	S76-0627-05	RELAY
K20	S76-0627-05	RELAY
K21	S76-0627-05	RELAY
K22	S76-0627-05	RELAY
K23	S76-0627-05	RELAY
P1	E40-3249-05	PIN CONNECTOR 5P
P2	E40-3248-05	PIN CONNECTOR 4P
P3	E40-3249-05	PIN CONNECTOR 5P
P4	E40-3246-05	PIN CONNECTOR 2P
P5	NO USE	
P6	E40-3254-05	PIN CONNECTOR 10P
P7	E40-3254-05	PIN CONNECTOR 10P
P8	E40-7487-05	PIN CONNECTOR 20P
P9	NO USE	
P10	E40-3249-05	PIN CONNECTOR 5P
P11	NO USE	
P12	E40-3246-05	PIN CONNECTOR 2P
P13	E40-7486-05	PIN CONNECTOR 20P
P14	E40-7486-05	PIN CONNECTOR 20P
P15	E40-7486-05	PIN CONNECTOR 20P
P16	E40-7486-05	PIN CONNECTOR 20P
P17	E40-7486-05	PIN CONNECTOR 20P
P18	E40-7486-05	PIN CONNECTOR 20P
P19	E40-7486-05	PIN CONNECTOR 20P
P20	E40-7486-05	PIN CONNECTOR 20P
P21	E40-7486-05	PIN CONNECTOR 20P
P22	E40-7486-05	PIN CONNECTOR 20P
P23	E40-7486-05	PIN CONNECTOR 20P
P24	E40-7486-05	PIN CONNECTOR 20P
P100	E40-3249-05	PIN CONNECTOR 5P
P111	E40-3238-05	PIN CONNECTOR 3P
P112	E40-3238-05	PIN CONNECTOR 3P
PH1	TLP2630	IC,PHOTO COUPLER
PH2	TLP2630	IC,PHOTO COUPLER
Q1	RN1006	TR. SI, NPN
Q2	RN1006	TR. SI, NPN
Q3	RN1006	TR. SI, NPN
Q4	2SC3402	TR. SI, NPN
Q5	2SC3402	TR. SI, NPN
Q6	2SC3402	TR. SI, NPN
Q7	RN1006	TR. SI, NPN
Q8	RN1006	TR. SI, NPN
Q9	RN1006	TR. SI, NPN
Q10	RN1006	TR. SI, NPN
Q13	2SC1907	TR. SI, NPN
Q14	2SC1907	TR. SI, NPN
Q15	2SC1907	TR. SI, NPN
Q16	2SC1907	TR. SI, NPN
Q17	2SC1907	TR. SI, NPN
Q18	2SC1907	TR. SI, NPN
R1	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R2	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R3	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R4	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R5	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R6	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R7	RN14BK2C8982D	RES. METAL FILM 89.8K 0.5% 1/6W
R8	RN14BK2C1112D	RES. METAL FILM 11.1K 0.5% 1/6W
R9	RN14BK2C6812D	RES. METAL FILM 68.1K 0.5% 1/6W
R10	RN14BK2C4642D	RES. METAL FILM 46.4K 0.5% 1/6W
R11	RN14BK2C1003D	RES. METAL FILM 100K 0.5% 1/6W
R12	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R13	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R14	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R15	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R16	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R17	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R18	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R19	RN14BK2C1112D	RES. METAL FILM 11.1K 0.5% 1/6W
R20	RN14BK2C8982D	RES. METAL FILM 89.8K 0.5% 1/6W
R21	RN14BK2C4642D	RES. METAL FILM 46.4K 0.5% 1/6W
R22	RN14BK2C6812D	RES. METAL FILM 68.1K 0.5% 1/6W
R23	RN14BK2C1003D	RES. METAL FILM 100K 0.5% 1/6W
R24	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R25	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R26	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R27	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R28	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R29	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R30	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R31	RN14BK2C1212F	RES. METAL FILM 12.1K 1% 1/6W
R32	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R33	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R34	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R35	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R36	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R37	RN14BK2C2001F	RES. METAL FILM 2K 1% 1/6W
R38	NO USE	
R39	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R40	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R41	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R42	RN14BK2C1003D	RES. METAL FILM 100K 0.5% 1/6W
R43	RN14BK2C1001D	RES. METAL FILM 1K 0.5% 1/6W
R44	RN14BK2C10R0F	RES. METAL FILM 10.0 1% 1/6W
R45	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R46	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R47	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R48	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R49	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R50	NO USE	
R51	RN14BK2C1100D	RES. METAL FILM 110 0.5% 1/6W
R52	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R53	RN14BK2C8983D	RES. METAL FILM 898K 0.5% 1/6W
R54	RN14BK2C1003D	RES. METAL FILM 100K 0.5% 1/6W
R55	NO USE	
R56	RN14BK2C6813D	RES. METAL FILM 681K 0.5% 1/6W
R57	RN14BK2C4323D	RES. METAL FILM 432K 0.5% 1/6W
R58	NO USE	
R59	RN14BK2C1004F	RES. METAL FILM 1M 1% 1/6W
R60	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R61	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R62	RN14BK2C9093D	RES. METAL FILM 909K 0.5% 1/6W
R63	RN14BK2C1004F	RES. METAL FILM 1M 1% 1/6W
R64	RN14BK2C1103D	RES. METAL FILM 110K 0.5% 1/6W
R65	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R66	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R67	RN14BK2C4701F	RES. METAL FILM 4.7K 1% 1/6W
R68	RN14BK2C4701F	RES. METAL FILM 4.7K 1% 1/6W
R69	RN14BK2C4701F	RES. METAL FILM 4.7K 1% 1/6W
R72	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R73	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R74	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R75	RN14BK2C1001D	RES. METAL FILM 1K 0.5% 1/6W
R76	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R77	RN14BK2C1004F	RES. METAL FILM 1M 1% 1/6W
R78	NO USE	
R79	RN14BK2C1501F	RES. METAL FILM 1.5K 1% 1/6W
R80	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R81	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R82	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R85	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R91	RN14BK2C4700F	RES. METAL FILM 470 1% 1/6W
R92	RN14BK2C4700F	RES. METAL FILM 470 1% 1/6W
R93	RN14BK2C4700F	RES. METAL FILM 470 1% 1/6W
R98	RN14BK2C2003F	RES. METAL FILM 200K 1% 1/6W
R99	RN14BK2C8203F	RES. METAL FILM 820K 1% 1/6W
R100	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R101	RN14BK2C2003F	RES. METAL FILM 200K 1% 1/6W
R102	RN14BK2C1500F	RES. METAL FILM 150 1% 1/6W
R103	RN14BK2C6342F	RES. METAL FILM 63.4K 1% 1/6W
R104	RN14BK2C2492F	RES. METAL FILM 24.9K 1% 1/6W
R105	RN14BK2C4323D	RES. METAL FILM 432K 0.5% 1/6W
R106	RN14BK2C1402F	RES. METAL FILM 14K 1% 1/6W
R107	RN14BK2C1473F	RES. METAL FILM 147K 1% 1/6W
R108	RN14BK2C3322F	RES. METAL FILM 33.2K 1% 1/6W
R109	RN14BK2C2552F	RES. METAL FILM 25.5K 1% 1/6W
R110	RN14BK2C1073F	RES. METAL FILM 107K 1% 1/6W
R111	NO USE	
R112	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R113	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R114	RN14BK2C6800F	RES. METAL FILM 680 1% 1/6W
R115	RN14BK2C6800F	RES. METAL FILM 680 1% 1/6W
R116	RN14BK2C6800F	RES. METAL FILM 680 1% 1/6W
R117	RN14BK2C4991F	RES. METAL FILM 4.99K 1% 1/6W
R118	RN14BK2C4991F	RES. METAL FILM 4.99K 1% 1/6W
R119	RN14BK2C4991F	RES. METAL FILM 4.99K 1% 1/6W
R125	RN14BK2C3901F	RES. METAL FILM 3.9K 1% 1/6W
R126	RN14BK2C2402F	RES. METAL FILM 24K 1% 1/6W
R127	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
R128	RN14BK2C2002F	RES. METAL FILM 20K 1% 1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
R129	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R130	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R131	RN14BK2C9101D	RES. METAL FILM 9.1K 0.5% 1/6W
R132	RN14BK2C1001D	RES. METAL FILM 1K 0.5% 1/6W
R133	RN14BK2C11R0F	RES. METAL FILM 11.0 1% 1/6W
R134	RN14BK2C22R0F	RES. METAL FILM 22.0 1% 1/6W
R135	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R136	NO USE	
R137	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R138	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R139	RN14BK2C1002D	RES. METAL FILM 10K 0.5% 1/6W
R140	RN14BK2C3161D	RES. METAL FILM 3.16K 0.5% 1/6W
R141	RN14BK2C1501D	RES. METAL FILM 1.5K 0.5% 1/6W
R142	NO USE	
R143	RN14BK2C1001D	RES. METAL FILM 1K 0.5% 1/6W
R144	NO USE	
R145	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R146	RN14BK2C8201F	RES. METAL FILM 8.2K 1% 1/6W
R147	RN14BK2C2003F	RES. METAL FILM 200K 1% 1/6W
R148	RN14BK2C4303F	RES. METAL FILM 430K 1% 1/6W
R149	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R153	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R158	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R159	RN14BK2H1R00F	RES. METAL FILM 1.00 1% 1/2W
R160	RN14BK2C1500F	RES. METAL FILM 150 1% 1/6W
R161	RN14BK2C1500F	RES. METAL FILM 150 1% 1/6W
R162	RN14BK2H1R00F	RES. METAL FILM 1.00 1% 1/2W
R163	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R164	RN14BK2C1502F	RES. METAL FILM 15K 1% 1/6W
R165	RN14BK2C1502F	RES. METAL FILM 15K 1% 1/6W
R166	RN14BK2C1102F	RES. METAL FILM 11K 1% 1/6W
R167	RN14BK2C1102F	RES. METAL FILM 11K 1% 1/6W
R168	RN14BK2C5601F	RES. METAL FILM 5.6K 1% 1/6W
R169	RN14BK2C6800F	RES. METAL FILM 680 1% 1/6W
R170	RN14BK2C6800F	RES. METAL FILM 680 1% 1/6W
R171	RN14BK2C6800F	RES. METAL FILM 680 1% 1/6W
R172	RN14BK2C3301F	RES. METAL FILM 3.3K 1% 1/6W
R173	RN14BK2C3301F	RES. METAL FILM 3.3K 1% 1/6W
R174	RN14BK2C3301F	RES. METAL FILM 3.3K 1% 1/6W
R185	RN14BK2C1802F	RES. METAL FILM 18K 1% 1/6W
R186	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R187	RN14BK2C2201F	RES. METAL FILM 2.2K 1% 1/6W
R188	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R189	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R300	RN14BK2C1802F	RES. METAL FILM 18K 1% 1/6W
R301	RN14BK2C1004F	RES. METAL FILM 1M 1% 1/6W
R901	R92-0150-05	JUMPING RES. ZERO OHM(10MM)
R902	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R903	RN14BK2C2001F	RES. METAL FILM 2K 1% 1/6W
TC1	C05-0030-15	CAP. TRIMMER 20P
TC2	C05-0030-15	CAP. TRIMMER 20P
TC3	C05-0030-15	CAP. TRIMMER 20P
TC4	C05-0030-15	CAP. TRIMMER 20P
TP1	E23-0401-05	PIN TERMINAL
TP2	NO USE	
TP3	E23-0401-05	PIN TERMINAL
TP4	E23-0401-05	PIN TERMINAL
TP5	E23-0401-05	PIN TERMINAL
TP6	E23-0401-05	PIN TERMINAL
TP7	E23-0401-05	PIN TERMINAL
TP8	E23-0401-05	PIN TERMINAL
TP9	E23-0401-05	PIN TERMINAL
TP10	E23-0401-05	PIN TERMINAL
TP11	E23-0401-05	PIN TERMINAL
TP12	E23-0401-05	PIN TERMINAL
TP13	E23-0401-05	PIN TERMINAL
TP14	E23-0401-05	PIN TERMINAL
TP15	NO USE	
TP16	E23-0401-05	PIN TERMINAL
TP17	E23-0401-05	PIN TERMINAL
TP18	E23-0401-05	PIN TERMINAL
TP19	E23-0401-05	PIN TERMINAL
TP20	E23-0401-05	PIN TERMINAL
TP21	E23-0401-05	PIN TERMINAL
TP22	E23-0401-05	PIN TERMINAL
U2	NJM5534D	IC,OP AMP
U3	NJM5534D	IC,OP AMP
U6	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.
U7	TD62801P	IC,8-BIT REGISTER/LATCH/DRIVER
U8	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.
U9	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.
U10	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.
U11	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.
U12	UPC811C	IC,DUAL JFET OP-AMP
U13	NJU201AD	IC,QUAD SPST CMOS ANALOG SW
U14	TC74HC04AP	IC,HEX INVERTER
U15	NJU7311AL	IC,ANALOG FUNCTION SW
U16	NJM072BD	IC,JFET INPUT OP AMP
U17	NJM072BD	IC,JFET INPUT OP AMP
U18	TC74HC244AP	IC,OCTAL BUS BUFFER (3-STATE)
U19	NJM072BD	IC,JFET INPUT OP AMP
U20	AFL89F20000D1	IC,ACTIVE FILTER
U21	NJU7313AL	IC,ANALOG FUNCTION SW
U22	NJM072BD	IC,JFET INPUT OP AMP
U23	NJM072BD	IC,JFET INPUT OP AMP
U24	NJU201AD	IC,QUAD SPST CMOS ANALOG SW
U25	NJU201AD	IC,QUAD SPST CMOS ANALOG SW
U26	TC74HC138AP	IC,3 TO 8 LINE DECODER
U27	NJM4558D	IC,DUAL OP-AMP
U28	NO USE	
U29	TC74HC00AP	IC,QUAD 2-INPUT NAND GATE
U30	TC4094BP	IC,8-BIT SHIFT/STORE BUS REGI.
U33	NJM072BD	IC,JFET INPUT OP AMP
VR1	R32-0835-05	RES. SEMI FIXED 500
VR2	R32-0835-05	RES. SEMI FIXED 500
VR3	R32-0838-05	RES. SEMI FIXED 20K
VR4	R32-0842-05	RES. SEMI FIXED 50K
VR5	R32-0837-05	RES. SEMI FIXED 2K
VR6	R32-0841-05	RES. SEMI FIXED 1K
VR7	R32-0837-05	RES. SEMI FIXED 2K
VR8	R32-0838-05	RES. SEMI FIXED 20K
VR9	R32-0836-05	RES. SEMI FIXED 100K
VR10	R32-0837-05	RES. SEMI FIXED 2K
VR11	R32-0836-05	RES. SEMI FIXED 100K
VR12	R32-0836-05	RES. SEMI FIXED 100K
VR13	R32-0836-05	RES. SEMI FIXED 100K
VR14	R12-3546-05	RES. SEMI FIXED 10K

DSP UNIT

X79-1240-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0352-02	PCB (UNMOUNTED)
C1	CC73FCH1H470J	CAP. CERAMIC 47P 5% 50V
C2	CC73FCH1H470J	CAP. CERAMIC 47P 5% 50V
C3	NO USE	
C4	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C5	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C6	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C7	C92-1513-05	CAP. ELECTRO 47 20% 16V
C8	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C9	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C10	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C11	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C12	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C13	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C14	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C15	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C16	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C17	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C18	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C19	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C20	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C21	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C22	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C23	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C24	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C25	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C26	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C27	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C28	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C29	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C30	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C31	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C32	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C33	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C34	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C35	CC73FCH1H471J	CAP. CERAMIC 470P 5% 50V
C36	CC73FCH1H471J	CAP. CERAMIC 470P 5% 50V
C37	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C38	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C39	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C40	C92-1513-05	CAP. ELECTRO 47 20% 16V
C41	C92-1513-05	CAP. ELECTRO 47 20% 16V
C42	C92-1513-05	CAP. ELECTRO 47 20% 16V
C43	C92-1514-05	CAP. ELECTRO 10 20% 35V
C44	NO USE	
C45	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C46	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C47	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C48	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C49	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C50	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C51	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C52	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C53	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C54	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C55	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C56	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
D1	1SS226	DIODE
D2	1SS226	DIODE
D3	1SS226	DIODE
D4	1SS226	DIODE
D5	1SS226	DIODE
D6	1SS226	DIODE
JP1	R92-1061-05	JUMPING RES. ZERO OHM (5MM)
P1	E40-7482-05	PIN CONNECTOR 50P
P2	E40-3273-05	PIN CONNECTOR 15P
P3	E40-3263-05	PIN CONNECTOR 5P
P4	E40-3260-05	PIN CONNECTOR 2P
P5	E40-3853-05	PIN CONNECTOR 25P
P6	E40-3853-05	PIN CONNECTOR 25P
Q1	2SC3398	TR. SI, NPN
R1	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R2	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R3	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R4	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R5	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R6	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R7	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R8	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R9	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R10	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R11	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R12	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R13	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R14	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R15	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R16	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R17	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R18	NO USE	
R19	RN73FH2A822D	RES. METAL FILM 8.2K 0.5% 1/10W
R20	RN73FH2A822D	RES. METAL FILM 8.2K 0.5% 1/10W
R21	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R22	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R23	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R24	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R27	RN73FH2A752D	RES. METAL FILM 7.5K 0.5% 1/10W
R28	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R29	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R30	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R31	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R32	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R33	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R34	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R35	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R36	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R37	RN73FH2A621D	RES. METAL FILM 620 0.5% 1/10W
R38	RN73FH2A621D	RES. METAL FILM 620 0.5% 1/10W
R41	R92-0670-05	JUMPING RES. ZERO OHM
TP1	E23-0401-05	PIN TERMINAL
TP2	E23-0401-05	PIN TERMINAL
TP3	E23-0401-05	PIN TERMINAL
U1	TMS320C25FNL	IC,DIGITAL PROCESSOR
U2	CTM6050	IC,GATE ARRAY
U3	CY7C199-25VC	IC,CMOS STATIC RAM
U4	CY7C199-25VC	IC,CMOS STATIC RAM
U5	TC74HC04AF	IC,HEX INVERTER
U6	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U7	TC74HC32AF	IC,QUAD 2-INPUT OR GATE
U8	TC74HC245AF	IC,OCTAL BUS TRANSCEIVER
U9	TC74HC245AF	IC,OCTAL BUS TRANSCEIVER
U10	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U11	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U12	TC74HC374AF	IC,OCTAL D-TYPE F.F. (3-STATE)
U13	CTM6060	IC,GATE ARRAY
U14	TC74HC164AF	IC,8-BIT SIPO SHIFT REGISTER
U15	TC74HC164AF	IC,8-BIT SIPO SHIFT REGISTER
U16	HM63021FP-28	IC,STATIC RAM
U17	HM63021FP-28	IC,STATIC RAM
U18	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U19	TC74HC393AF	IC,DUAL BINARY COUNTER
U20	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U21	TC4040BF	IC,12-BIT BINARY CONVERTER
U22	HM63021FP-28	IC,STATIC RAM
U23	HM63021FP-28	IC,STATIC RAM
U24	TC74HC166AF	IC,8-BIT SIPO SHIFT REGISTER
U25	TC74HC166AF	IC,8-BIT SIPO SHIFT REGISTER
U26	SM5840DS	IC,DIGITAL FILTER
U27	TC74HC4053AF	IC,TRIPLE 2-CH ANALOG MPX
U28	SN75ALS192NS	IC,QUAD DIFFERENTIAL LINE DRI.
U29	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U30	CTM6070	IC,GATE ARRAY
U31	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U32	HM63021FP-28	IC,STATIC RAM
U33	DAC08ED	IC,8-BIT D/A CONVERTER
U34	UPC4071G2	IC,LOW NOISE JFET INPUT OP-AMP
U35	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U36	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
U37	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
U38	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
U42	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
X1	L77-2502-15	CRYSTAL RESONATOR (10MHZ)

DSP UNIT

X79-1250-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0353-02	PCB (UNMOUNTED)
C1	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C2	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C3	CQ92HP2A333F	CAP. PLASTIC 0.033 1% 100V
C4	CQ92HP2A104F	CAP. PLASTIC 0.1 1% 100V
C5	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C6	CK73FR1H472K	CAP. CERAMIC 4700P 10% 50V
C7	CC73FCH1H020C	CAP. CERAMIC 2P 0.25P 50V
C8	CC73FCH1H020C	CAP. CERAMIC 2P 0.25P 50V
C9	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C10	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C11	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C12	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C13	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C14	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C15	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C16	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C17	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C18	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C19	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C20	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C21	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C22	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C23	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C24	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C25	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C26	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C27	NO USE	
C28	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C29	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C30	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C31	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C32	CE04CW1C220M	CAP. ELECTRO 22 20% 16V
C33	CQ93HPG1H823F	CAP. PLASTIC 0.082 1% 50V
C34	CQ93HPG1H103F	CAP. PLASTIC 0.01 1% 50V
C35	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C36	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C37	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C38	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C45	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C46	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C47	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C48	CC73FCH1H221J	CAP. CERAMIC 220P 5% 50V
C49	NO USE	
C50	CE04CW1E100M	CAP. ELECTRO 10 20% 25V
C51	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C52	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C53	CE04CW1C220M	CAP. ELECTRO 22 20% 16V
C54	CE04CW1E100M	CAP. ELECTRO 10 20% 25V
C55	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C56	CC73FCH1H330J	CAP. CERAMIC 33P 5% 50V
C57	CC73FCH1H330J	CAP. CERAMIC 33P 5% 50V
C58	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C59	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C60	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C61	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C62	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C63	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C64	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C65	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C66	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C67	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C68	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C69	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C70	NO USE	
C71	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C72	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C73	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C74	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C75	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C76	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C77	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C78	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C79	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C80	CQ93HPG1H103F	CAP. PLASTIC 0.01 1% 50V
C500	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
D1	1SV215	DIODE
D2	1SV215	DIODE
D3	1SV215	DIODE
D4	1SV215	DIODE
D5	1SV215	DIODE
D6	1SV215	DIODE

PARTS LIST

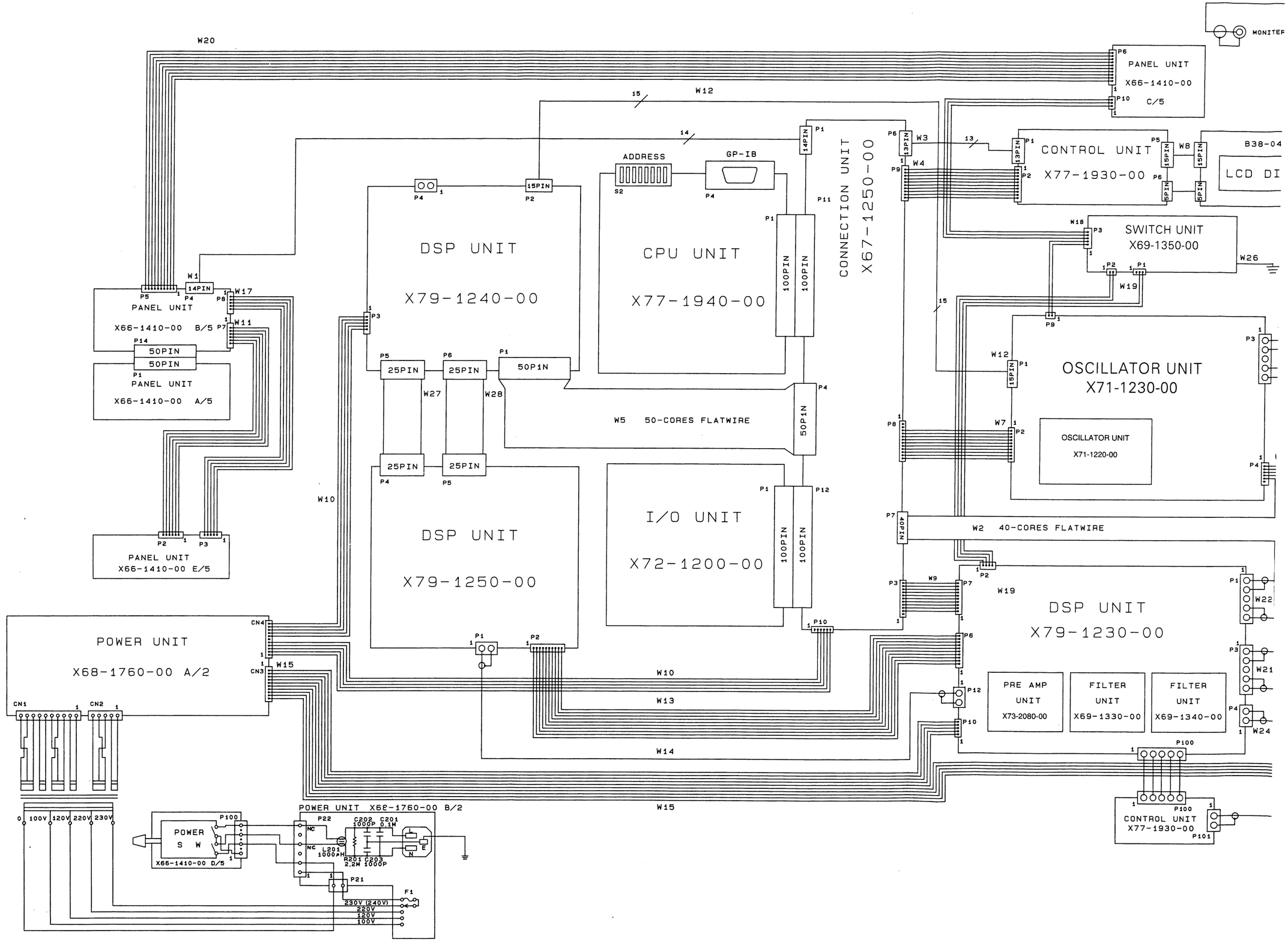
REF.NO	PARTS NO	NAME & DESCRIPTION
D2	1SS226	DIODE
D3	1SS226	DIODE
D4	1SS226	DIODE
D5	1SS226	DIODE
D6	1SS226	DIODE
JP1	R92-1061-05	JUMPING RES. ZERO OHM (5MM)
P1	E40-7482-05	PIN CONNECTOR 50P
P2	E40-3273-05	PIN CONNECTOR 15P
P3	E40-3263-05	PIN CONNECTOR 5P
P4	E40-3260-05	PIN CONNECTOR 2P
P5	E40-3853-05	PIN CONNECTOR 25P
P6	E40-3853-05	PIN CONNECTOR 25P
Q1	2SC3398	TR. SI, NPN
R1	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R2	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R3	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R4	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R5	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R6	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R7	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R8	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R9	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R10	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R11	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R12	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R13	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R14	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R15	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R16	RN73FH2A223D	RES. METAL FILM 22K 0.5% 1/10W
R17	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R18	NO USE	
R19	RN73FH2A822D	RES. METAL FILM 8.2K 0.5% 1/10W
R20	RN73FH2A822D	RES. METAL FILM 8.2K 0.5% 1/10W
R21	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R22	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R23	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R24	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R27	RN73FH2A752D	RES. METAL FILM 7.5K 0.5% 1/10W
R28	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R29	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R30	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R31	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R32	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R33	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R34	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R35	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R36	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R37	RN73FH2A621D	RES. METAL FILM 620 0.5% 1/10W
R38	RN73FH2A621D	RES. METAL FILM 620 0.5% 1/10W
R41	R92-0670-05	JUMPING RES. ZERO OHM
TP1	E23-0401-05	PIN TERMINAL
TP2	E23-0401-05	PIN TERMINAL
TP3	E23-0401-05	PIN TERMINAL
U1	TMS320C25FNL	IC,DIGITAL PROCESSOR
U2	CTM6050	IC,GATE ARRAY
U3	CY7C199-25VC	IC,CMOS STATIC RAM
U4	CY7C199-25VC	IC,CMOS STATIC RAM
U5	TC74HC04AF	IC,HEX INVERTER
U6	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U7	TC74HC32AF	IC,QUAD 2-INPUT OR GATE
U8	TC74HC245AF	IC,OCTAL BUS TRANSCEIVER
U9	TC74HC245AF	IC,OCTAL BUS TRANSCEIVER
U10	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U11	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U12	TC74HC374AF	IC,OCTAL D-TYPE F.F. (3-STATE)
U13	CTM6060	IC,GATE ARRAY
U14	TC74HC164AF	IC,8-BIT SIPO SHIFT REGISTER
U15	TC74HC164AF	IC,8-BIT SIPO SHIFT REGISTER
U16	HM63021FP-28	IC,STATIC RAM
U17	HM63021FP-28	IC,STATIC RAM
U18	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U19	TC74HC393AF	IC,DUAL BINARY COUNTER
U20	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U21	TC4040BF	IC,12-BIT BINARY CONVERTER
U22	HM63021FP-28	IC,STATIC RAM
U23	HM63021FP-28	IC,STATIC RAM
U24	TC74HC166AF	IC,8-BIT SIPO SHIFT REGISTER
U25	TC74HC166AF	IC,8-BIT SIPO SHIFT REGISTER
U26	SM5840DS	IC,DIGITAL FILTER
U27	TC74HC4053AF	IC,TRIPLE 2-CH ANALOG MPX
U28	SN75ALS192NS	IC,QUAD DIFFERENTIAL LINE DRI.
U29	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
U30	CTM6070	IC,GATE ARRAY
U31	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U32	HM63021FP-28	IC,STATIC RAM
U33	DAC08ED	IC,8-BIT D/A CONVERTER
U34	UPC4071G2	IC,LOW NOISE JFET INPUT OP-AMP
U35	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U36	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
U37	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
U38	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
U42	TC74HC541AF	IC,OCTAL BUS BUFFER (3-STATE)
X1	L77-2502-15	CRYSTAL RESONATOR (10MHZ)

DSP UNIT

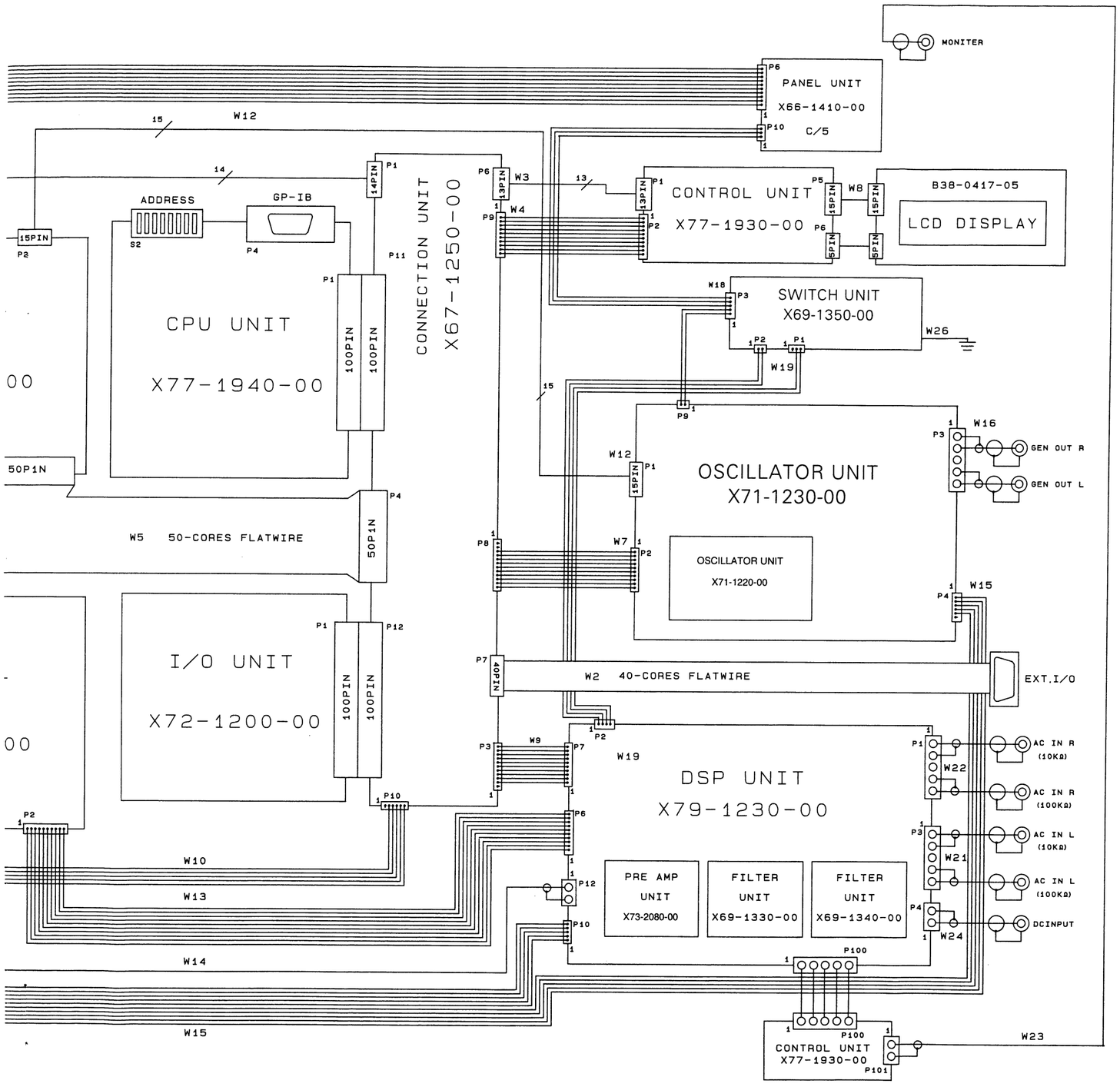
X79-1250-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0353-02	PCB (UNMOUNTED)
C1	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C2	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C3	CQ92HP2A333F	CAP. PLASTIC 0.033 1% 100V
C4	CQ92HP2A104F	CAP. PLASTIC 0.1 1% 100V
C5	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C6	CK73FR1H472K	CAP. CERAMIC 4700P 10% 50V
C7	CC73FCH1H020C	CAP. CERAMIC 2P 0.25P 50V
C8	CC73FCH1H020C	CAP. CERAMIC 2P 0.25P 50V
C9	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C10	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C11	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C12	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C13	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C14	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C15	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C16	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C17	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C18	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C19	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C20	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C21	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C22	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C23	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C24	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C25	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C26	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C27	NO USE	
C28	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C29	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C30	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C31	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C32	CE04CW1C220M	CAP. ELECTRO 22 20% 16V
C33	CQ93HPG1H823F	CAP. PLASTIC 0.082 1% 50V
C34	CQ93HPG1H103F	CAP. PLASTIC 0.01 1% 50V
C35	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C36	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C37	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C38	CE04CW1C101M	CAP. ELECTRO 100 20% 16V
C45	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C46	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C47	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C48	CC73FCH1H221J	CAP. CERAMIC 220P 5% 50V
C49	NO USE	
C50	CE04CW1E100M	CAP. ELECTRO 10 20% 25V
C51	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C52	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C53	CE04CW1C220M	CAP. ELECTRO 22 20% 16V
C54	CE04CW1E100M	CAP. ELECTRO 10 20% 25V
C55	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C56	CC73FCH1H330J	CAP. CERAMIC 33P 5% 50V
C57	CC73FCH1H330J	CAP. CERAMIC 33P 5% 50V
C58	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C59	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C60	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C61	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C62	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C63	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C64	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C65	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C66	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C67	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C68	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C69	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C70	NO USE	
C71	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C72	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
C73	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C74	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C75	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C76	CK73FR1H102K	CAP. CERAMIC 1000P 10% 50V
C77	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C78	CK73FR1H103K	CAP. CERAMIC 0.01 10% 50V
C79	CE04CW1C470M	CAP. ELECTRO 47 20% 16V
C80	CQ93HPG1H103F	CAP. PLASTIC 0.01 1% 50V
C500	CK73FF1H104Z	CAP. CERAMIC 0.1 20/-80% 50V
D1	1SV215	DIODE
D2	1SV215	DIODE
D3	1SV215	DIODE
D4	1SV215	DIODE
D5	1SV215	DIODE
D6	1SV215	DIODE
D7	NO USE	
D8	1SS226	DIODE
D9	RD5.1M	DIODE,ZENER
D15	HVR100	DIODE
D801	MTZ5.1JB	DIODE,ZENER
L1	L40-1281-80	FERRI INDUCTOR 120NH 10%
L2	L40-1001-81	FERRI INDUCTOR 10UH 10%
L3	L40-1011-81	FERRI INDUCTOR 100UH 10%
L4	L33-0839-05	FERRI INDUCTOR 10UH 20%
L5	L33-0839-05	FERRI INDUCTOR 10UH 20%
L6	L40-1011-81	FERRI INDUCTOR 100UH 10%
L7	NO USE	
L8	L40-1011-81	FERRI INDUCTOR 100UH 10%
P1	E40-3260-05	PIN CONNECTOR 2P
P2	E40-3268-05	PIN CONNECTOR 10P
P3	NO USE	
P4	E40-3853-05	PIN CONNECTOR 25P
P5	E40-3853-05	PIN CONNECTOR 25P
PH1	TLP2630	IC,PHOTO COUPLER
PH2	TLP521-4	IC,PHOTO COUPLER
PH3	TLP2630	IC,PHOTO COUPLER
PH4	TLP2630	IC,PHOTO COUPLER
Q1	2SC3099	TR. SI, NPN
Q2	2SC3099	TR. SI, NPN
R1	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R2	RN73FH2A513D	RES. METAL FILM 51K 0.5% 1/10W
R3	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R4	RN73FH2A302D	RES. METAL FILM 3K 0.5% 1/10W
R5	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R6	RN73FH2A302D	RES. METAL FILM 3K 0.5% 1/10W
R7	RN73FH2A330D	RES. METAL FILM 33 0.5% 1/10W
R8	RN73FH2A330D	RES. METAL FILM 33 0.5% 1/10W
R9	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R10	RN73FH2A682D	RES. METAL FILM 6.8K 0.5% 1/10W
R11	RN73FH2A682D	RES. METAL FILM 6.8K 0.5% 1/10W
R12	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R13	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R14	RN73FH2A392D	RES. METAL FILM 3.9K 0.5% 1/10W
R15	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R16	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R17	RN73FH2A470D	RES. METAL FILM 47 0.5% 1/10W
R18	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R19	R92-0670-05	JUMPING RES. ZERO OHM
R20	R92-0670-05	JUMPING RES. ZERO OHM
R21	NO USE	
R22	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R23	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R24	NO USE	
R25	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R26	RN73FH2A513D	RES. METAL FILM 51K 0.5% 1/10W
R27	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R28	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R29	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R30	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R31	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R32	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R33	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R34	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R35	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R36	RN73FH2A222D	RES. METAL FILM 2.2K 0.5% 1/10W
R37	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R38	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R39	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R40	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R41	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R42	RN73FH2A222D	RES. METAL FILM 2.2K 0.5% 1/10W
R43	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R44	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R45	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R46	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R47	RN73FH2A201D	RES. METAL FILM 200 0.5% 1/10W
R48	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R49	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R50	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R51	RN73FH2A564D	RES. METAL FILM 560K 0.5% 1/10W
R52	RN73FH2A433D	RES. METAL FILM 43K 0.5% 1/10W
R53	RN73FH2A203D	RES. METAL FILM 20K 0.5% 1/10W
R54	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R55	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R56	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R57	RN73FH2A152D	RES. METAL FILM 1.5K 0.5% 1/10W
R58	NO USE	
R59	RN73FH2A123D	RES. METAL FILM 12K 0.5% 1/10W
R60	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R61	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R62	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R63	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R64	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R65	RN73FH2A221D	RES. METAL FILM 220 0.5% 1/10W
R66	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R67	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R68	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R69	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R70	NO USE	
R71	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R72	RN73FH2A202D	RES. METAL FILM 2K 0.5% 1/10W
R73	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R74	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R75	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R76	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R77	RN73FH2A102D	RES. METAL FILM 1K 0.5% 1/10W
R78	RN73FH2A222D	RES. METAL FILM 2.2K 0.5% 1/10W
R79	RN73FH2A105D	RES. METAL FILM 1M 0.5% 1/10W
R80	NO USE	
R81	RN73FH2A273D	RES. METAL FILM 27K 0.5% 1/10W
R82	RN73FH2A511D	RES. METAL FILM 510 0.5% 1/10W
R83	RN73FH2A472D	RES. METAL FILM 4.7K 0.5% 1/10W
R84	RN73FH2A103D	RES. METAL FILM 10K 0.5% 1/10W
R85	RN73FH2A101D	RES. METAL FILM 100 0.5% 1/10W
R86	RN73FH2A132D	RES. METAL FILM 1.3K 0.5% 1/10W
R87	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R88	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R89	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R90	RN73FH2A331D	RES. METAL FILM 330 0.5% 1/10W
R801	R92-0150-05	JUMPING RES. ZERO OHM(10MM)
R802	RN14BK2C1002F	RES. METAL FILM 10K 1% 1/6W
S1	S31-1503-05	SLIDE SWITCH
TP1	E23-0401-05	PIN TERMINAL
TP2	E23-0401-05	PIN TERMINAL
TP3	E23-0401-05	PIN TERMINAL
TP4	E23-0401-05	PIN TERMINAL
TP5	E23-0401-05	PIN TERMINAL
TP6	E23-0401-05	PIN TERMINAL
TP7	E23-0401-05	PIN TERMINAL
TP8	E23-0401-05	PIN TERMINAL
U1	UPC4071G2	IC,LOW NOISE JFET INPUT OP-AMP
U2	UPC2711T-E3	IC,LOW NOISE AMP
U3	UPC2711T-E3	IC,LOW NOISE AMP
U4	TD7104F	IC,RECEPTION PRESCALER
U5	SN75ALS192NS	IC,QUAD DIFFERENTIAL LINE DRI.
U6	MB1507PF	IC,PLL FREQUENCY SYNTHESIZER
U7	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U8	TC74HC393AF	IC,DUAL BINARY COUNTER
U9	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U10	MB87086APF	IC,CMOS FREQUENCY SYNTHESIZER
U11	UPC4071G2	IC,LOW NOISE JFET INPUT OP-AMP
U12	TC74HC14AF	IC,HEX SCHMITT INVERTERE
U13	TC74HC393AF	IC,DUAL BINARY COUNTER
U14	TC74HC04AF	IC,HEX INVERTER
U17	UPC4072G2	IC,LOW NOISE JFET INPUT OP-AMP
U18	TC4053BF	IC,TRIPLE 2-CH MPX/DE-MPX
U19	TC74HC74AF	IC,DUAL D-F.F. PR & CLR
U20	TC74HC00AF	IC,QUAD 2-INPUT NAND GATE
U21	MAX120CWG	IC,12BIT SAMPLING A/D CONVERT.
U22	TC74HC166AF	IC,8-BIT SIPO SHIFT REGISTER
U23	TC74HC166AF	IC,8-BIT SIPO SHIFT REGISTER
U26	TC74HC257AF	IC,QUAD 2-CH MULTIPLEXER
U27	CTM6080	IC,GATE ARRAY
U28	TC74HC259AF	IC,8-BIT ADDRESSABLE LATCH
VR1	R32-0839-05	RES. SEMI FIXED 5K
VR2	R32-0848-05	RES. SEMI FIXED 20K

PARTS LIST

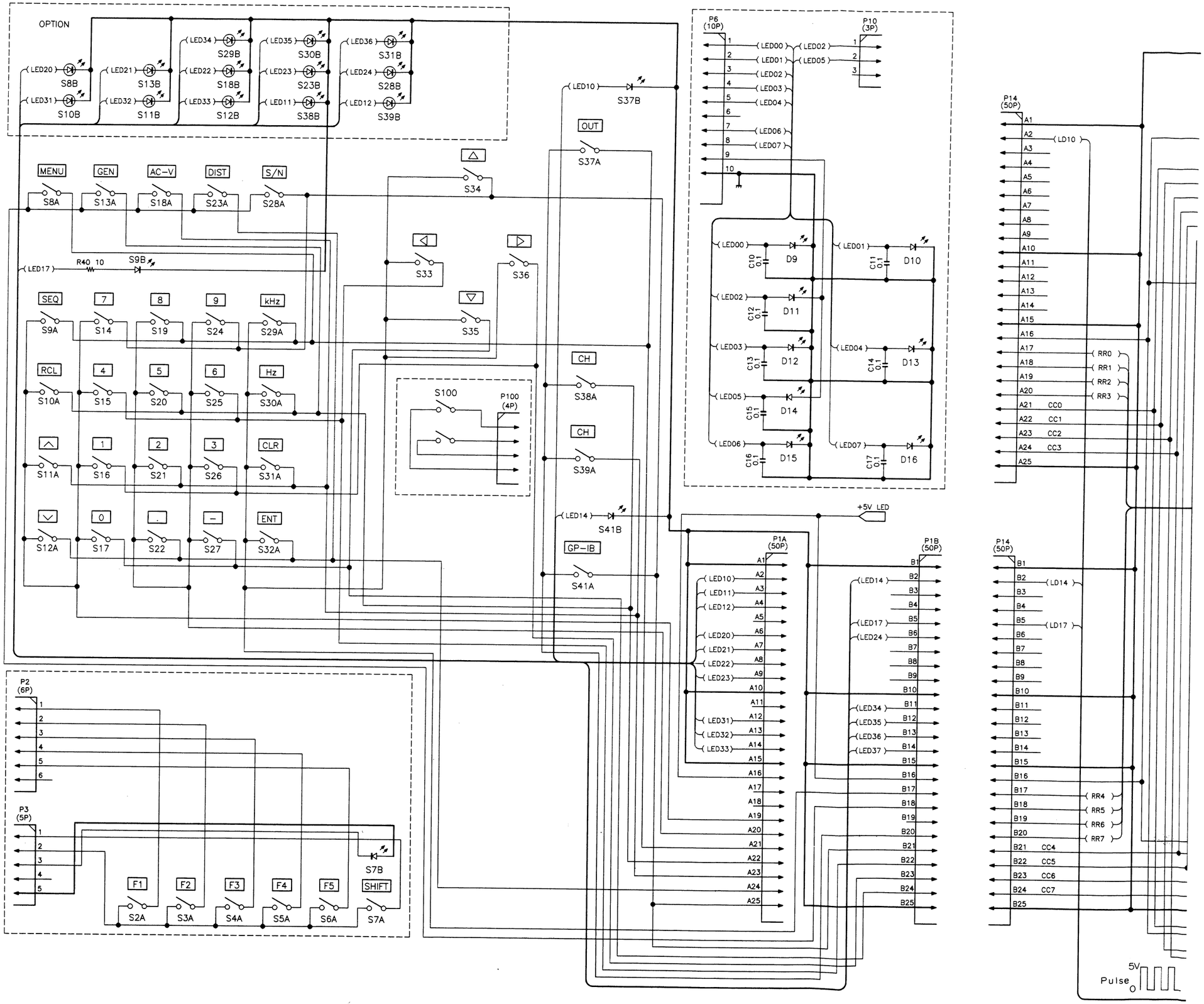

W20
W12
W1
14PIN
PANEL UNIT
X66-1410-00 B/5
W17
W11
50PIN
50PIN
PANEL UNIT
X66-1410-00 A/5
PANEL UNIT
X66-1410-00 E/5
DSP UNIT
X79-1240-00
15PIN
ADDRESS
GP-IB
S2
CPU UNIT
X77-1940-00
100PIN
100PIN
CONNECTION UNIT
X67-1250-00
14PIN
25PIN
25PIN
50P1N
W27
W28
W5 50-CORES FLATWIRE
W10
DSP UNIT
X79-1250-00
I/O UNIT
X72-1200-00
100PIN
100PIN
PANEL UNIT
X66-1410-00
C/5
MONITEF
13PIN
W3
W4
CONTROL UNIT
X77-1930-00
W8
15PIN
6PIN
B38-04
LCD DI
W18
SWITCH UNIT
X69-1350-00
W26
W19
OSCILLATOR UNIT
X71-1230-00
OSCILLATOR UNIT
X71-1220-00
W7
40PIN
W2 40-CORES FLATWIRE
W9
DSP UNIT
X79-1230-00
W22
W21
W24
PRE AMP
UNIT
X73-2080-00
FILTER
UNIT
X69-1330-00
FILTER
UNIT
X69-1340-00
P100
CONTROL UNIT
X77-1930-00
P101
POWER UNIT
X68-1760-00 A/2
CN4
CN3
W15
CN1
CN2
W10
W13
W14
W15
POWER UNIT X68-1760-00 B/2
0 100V 120V 220V 230V
POWER
S W
X66-1410-00 D/5
P22
C202 1000P
C201 0.1M
L202 1000μH
R201 2.2M
C203 1000P
P21
F1
230V (240V)
220V
120V
100V

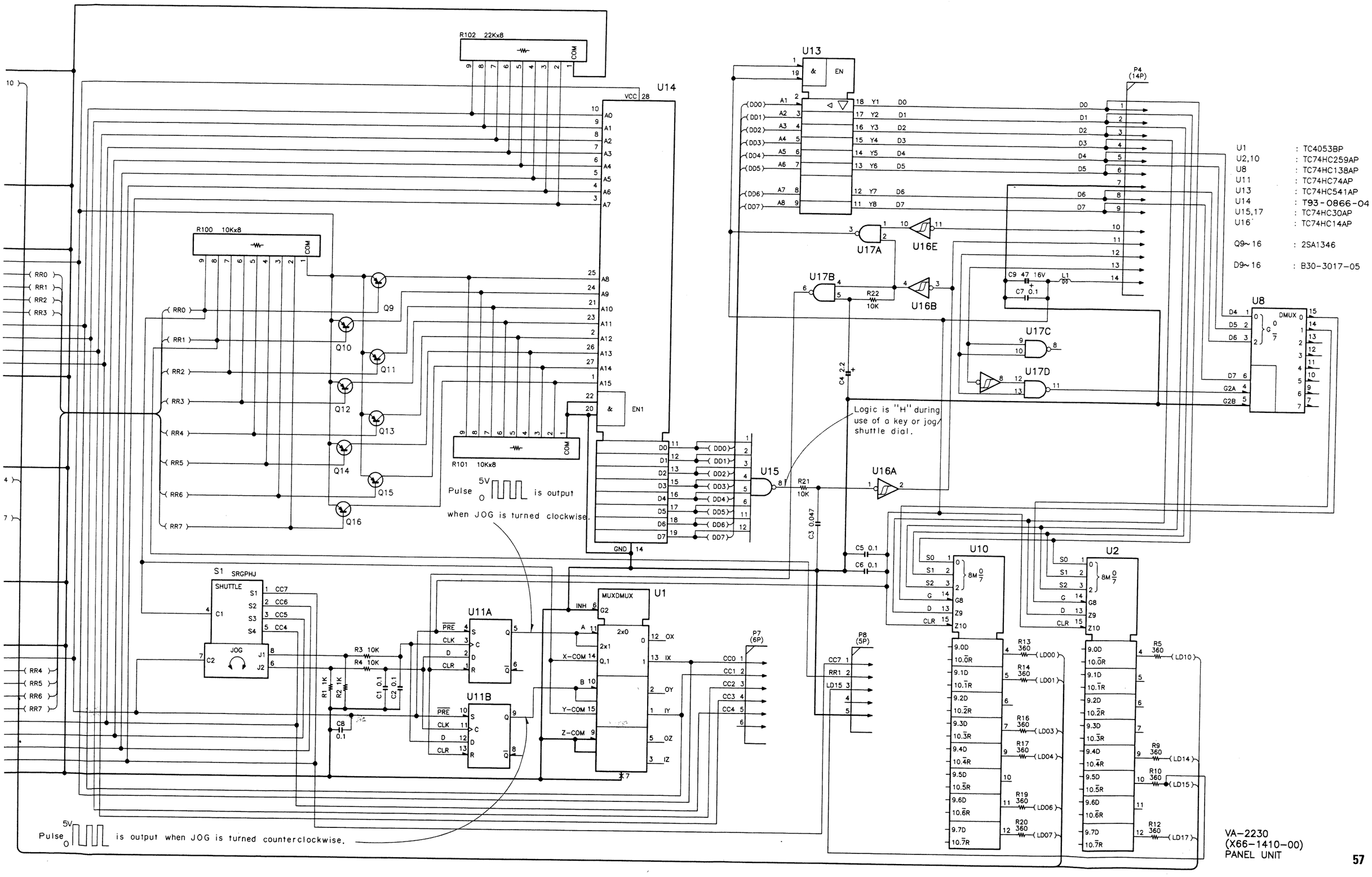
SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM

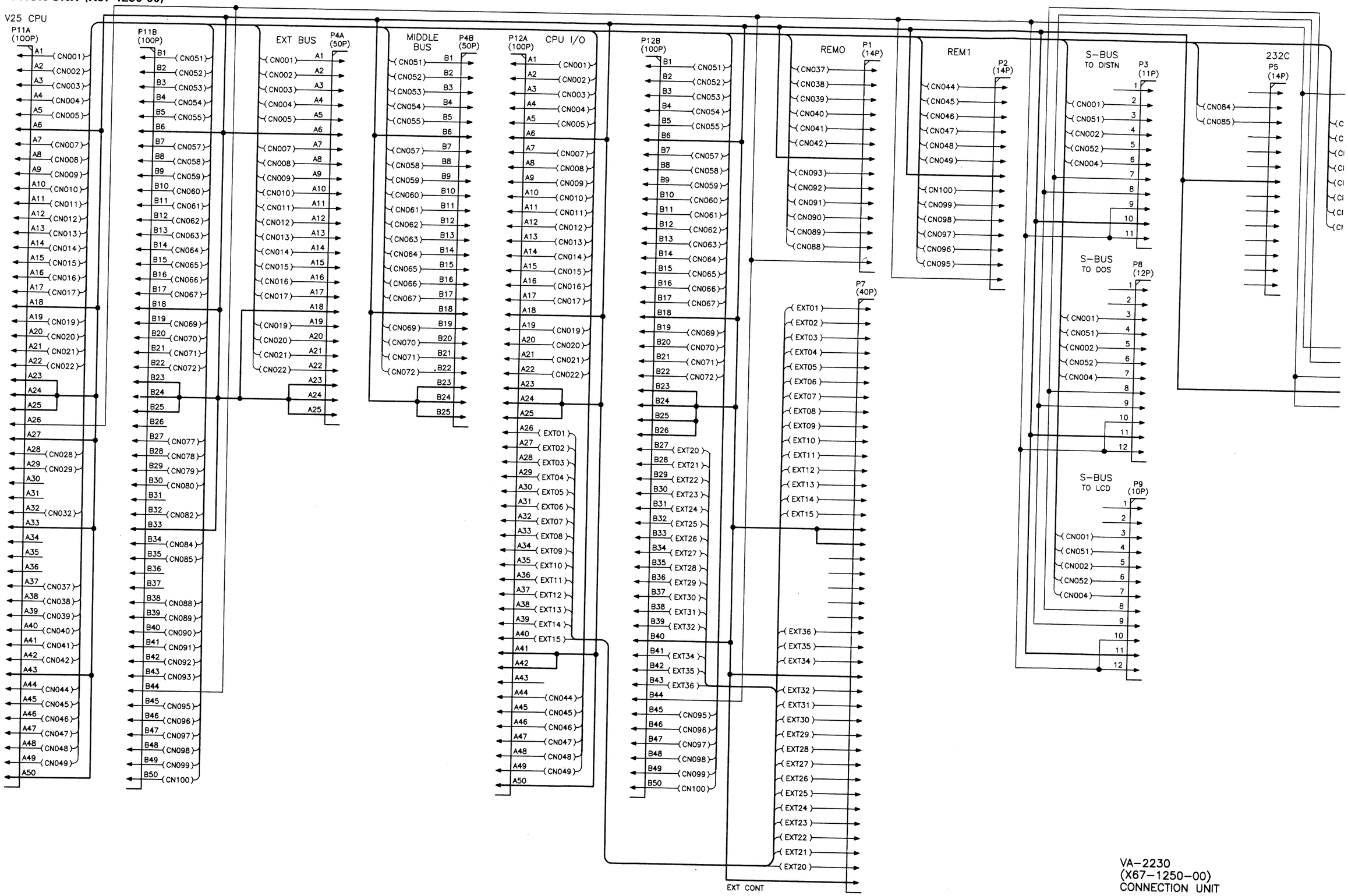
PANEL UNIT (X66-1410-00)





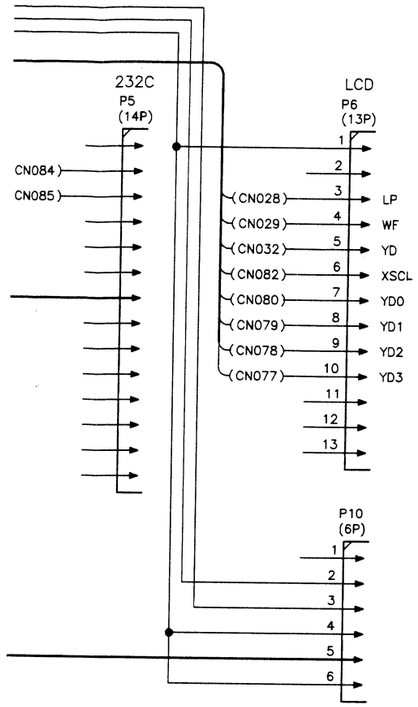
VA-2230
(X66-1410-00)
PANEL UNIT

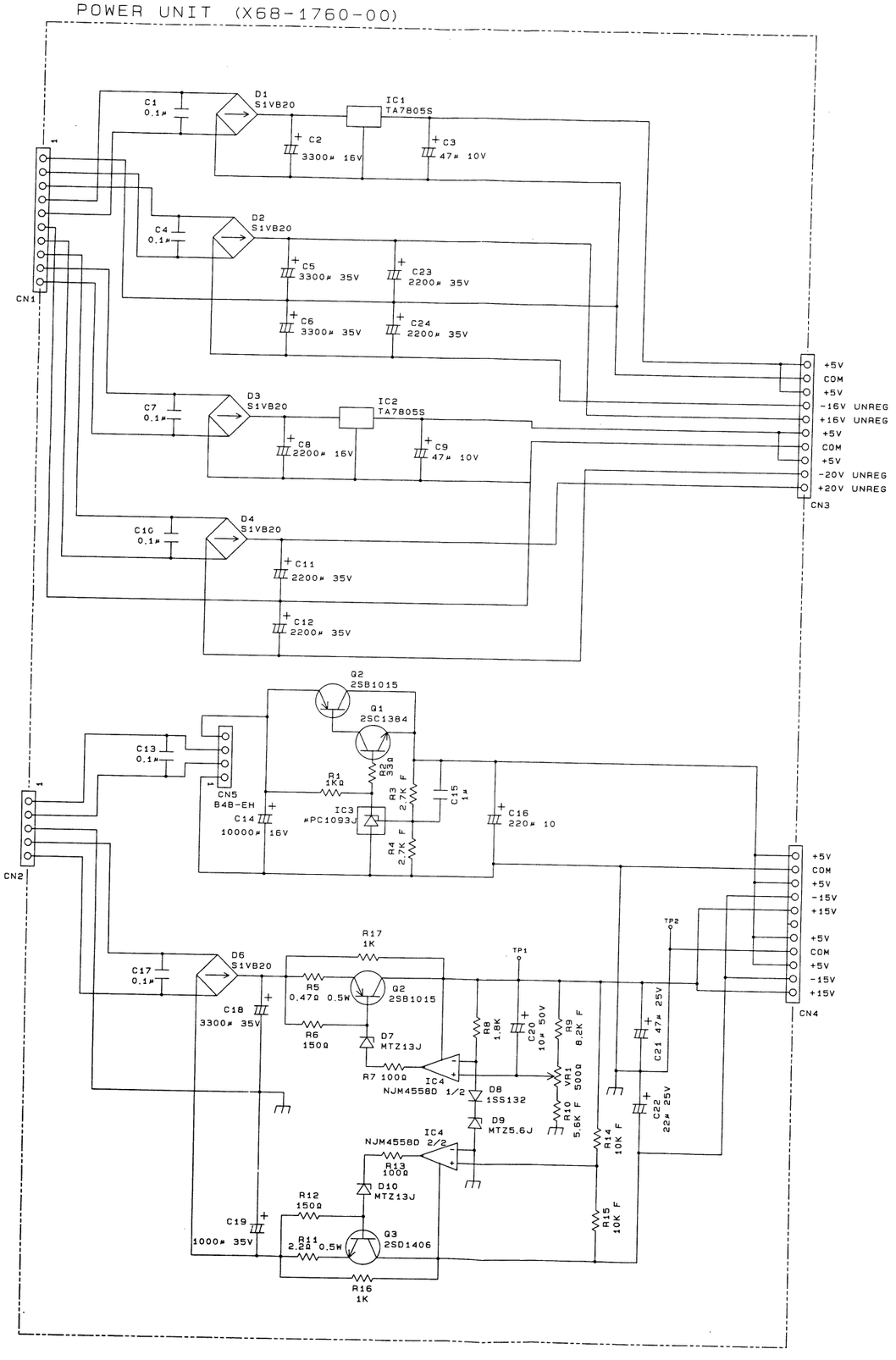
CONNECTION UNIT (X67-1250-00)



VA-2230
(X67-1250-00)
CONNECTION UNIT

SCHEMATIC DIAGRAM

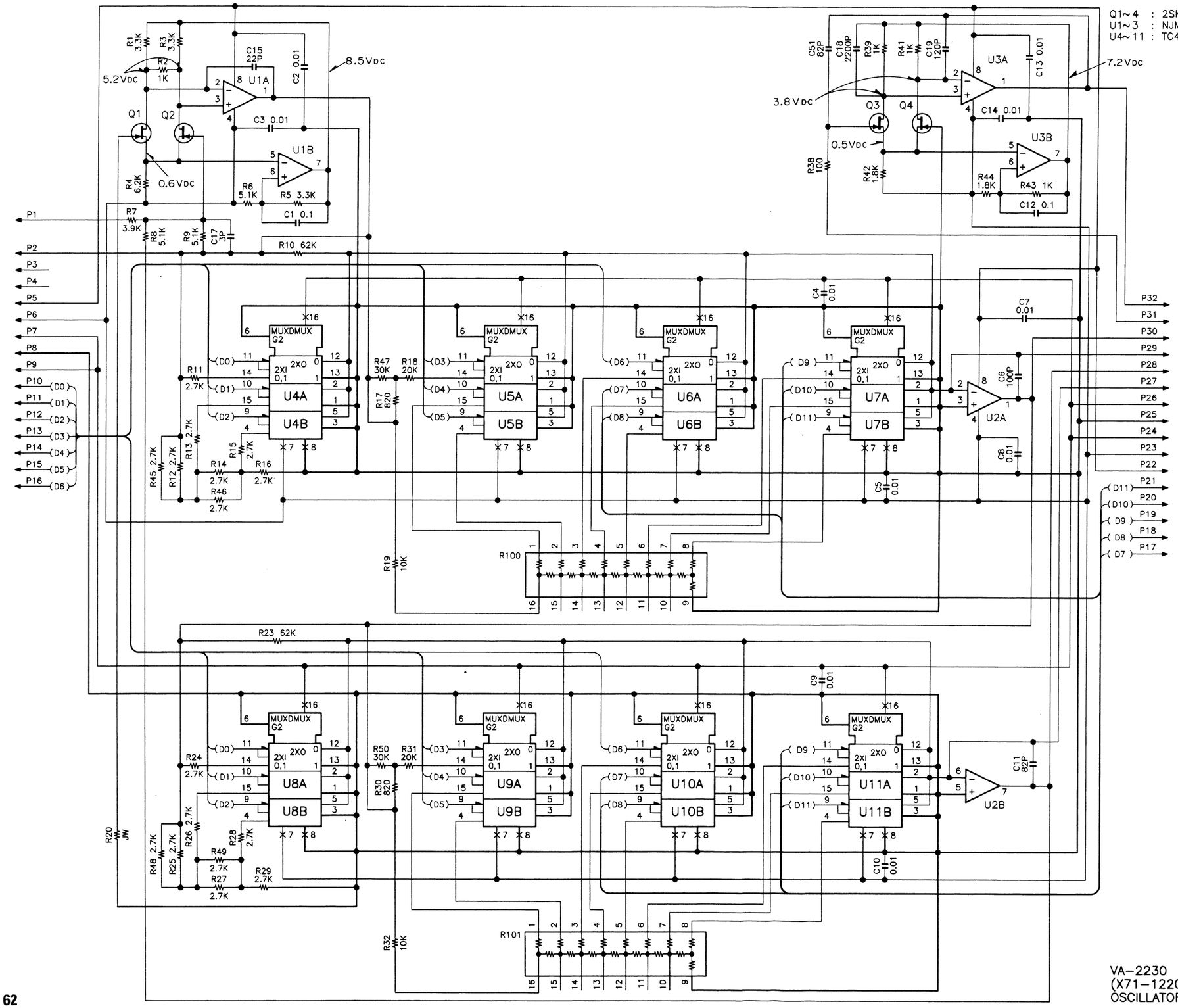




OSCILLATOR UNIT (X71-1220-00)

SCHEMATIC DIAGRAM

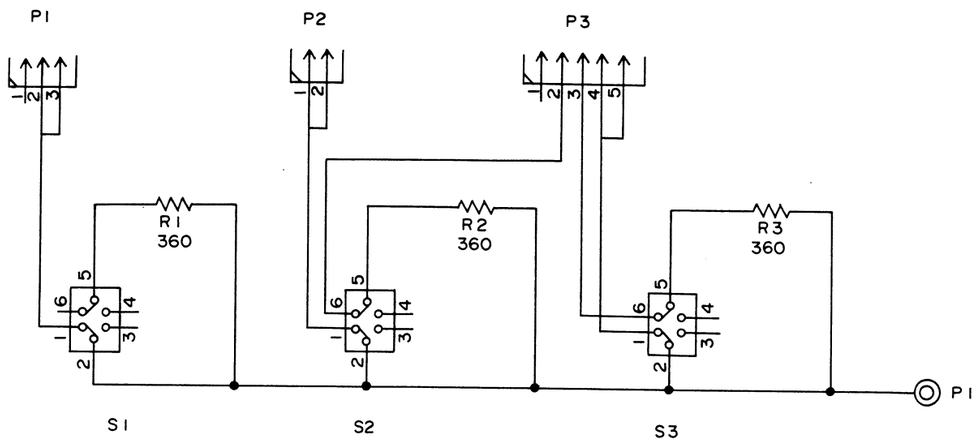
Q1~4 : 2SK426 (X26)
U1~3 : NJM5532M
U4~11 : TC4053BFS



VA-2230
(X71-1220-00)
OSCILLATOR UNIT

SCHEMATIC DIAGRAM

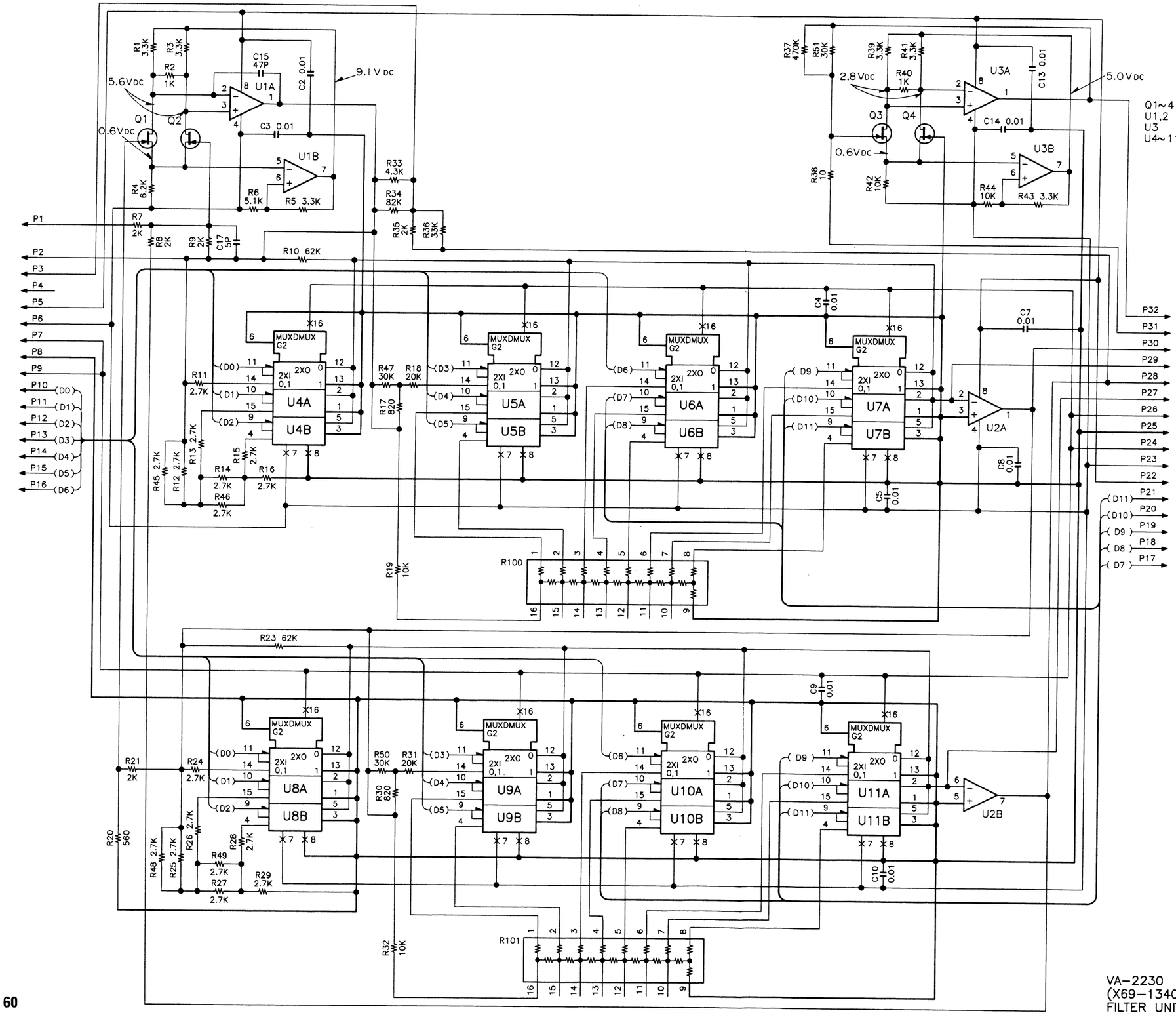
SWITCH UNIT (X69-1350-00)



VA-2230
(X69-1350-00)
Switch unit

SCHEMATIC DIAGRAM

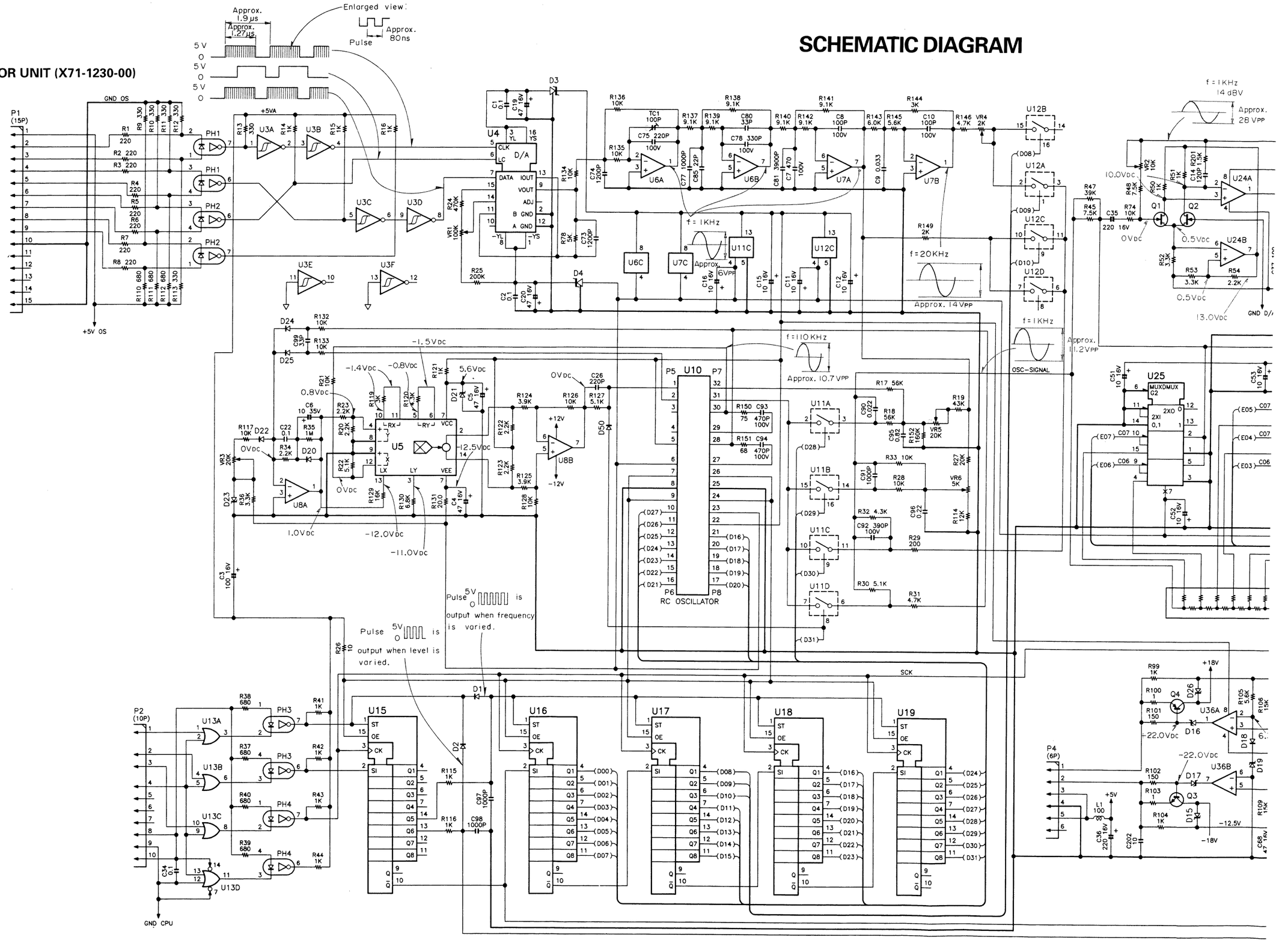
Q1~4 : 2SK426 (X26)
U1,2 : NJM4580E
U3 : NJM5532M
U4~11 : TC4053BFS



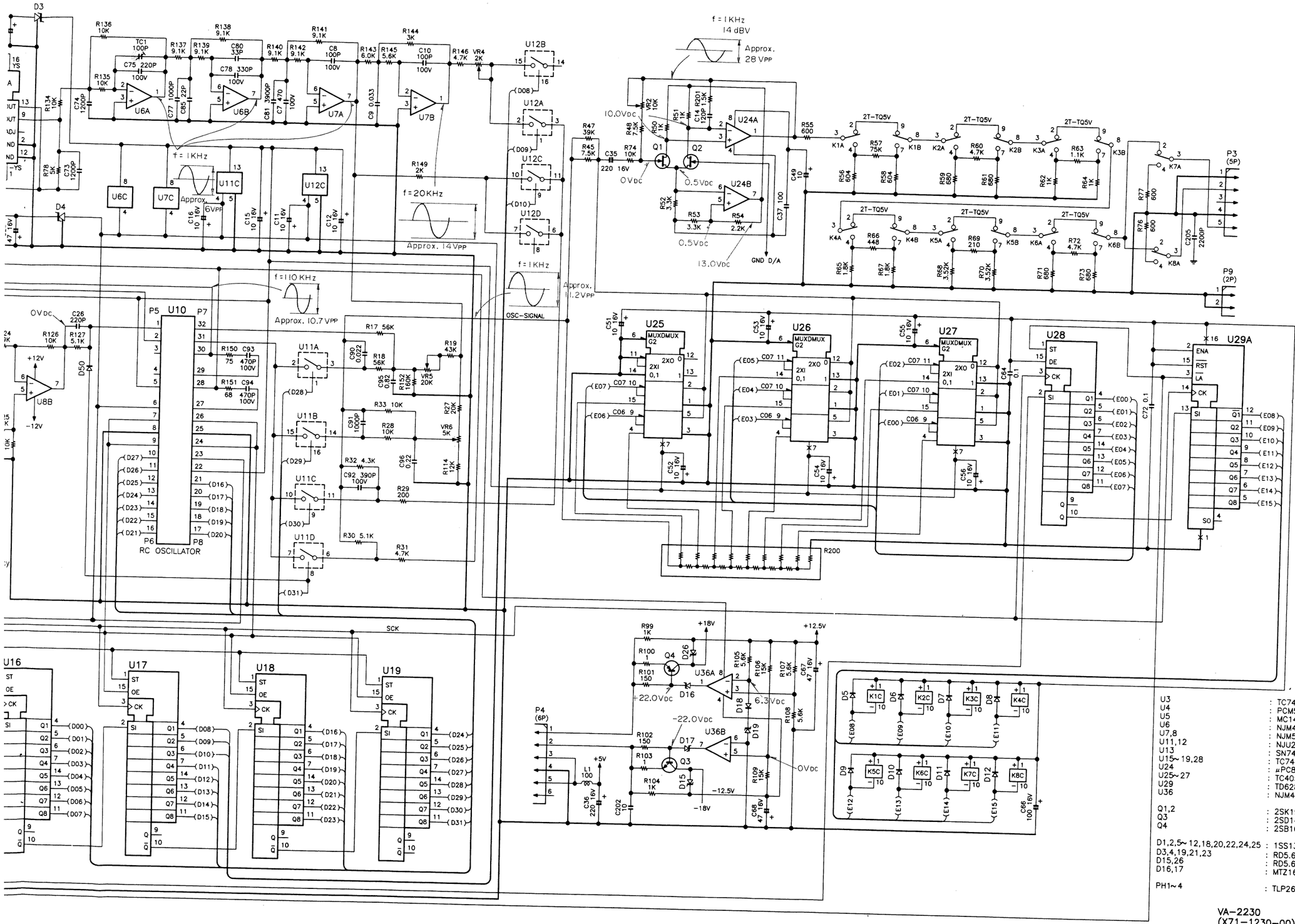
VA-2230
(X69-1340-00)
FILTER UNIT

SCHEMATIC DIAGRAM

OSCILLATOR UNIT (X71-1230-00)

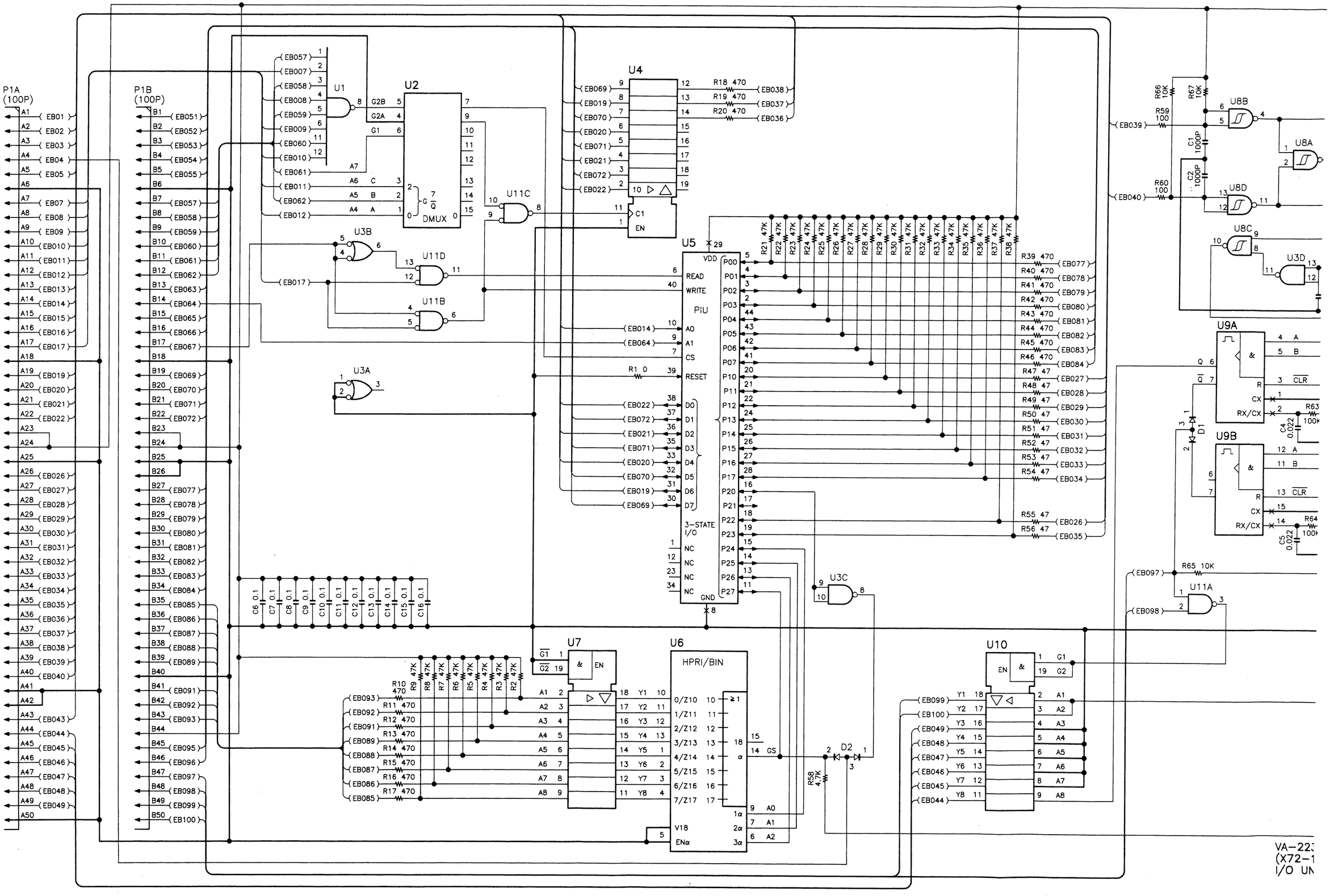


SCHEMATIC DIAGRAM



U3	: TC74HC14AP
U4	: PCM56P-K
U5	: MC1495M
U6	: NJM4580D
U7,8	: NJM5532DD
U11,12	: NJU201AD
U13	: SN74LS32N
U15~19,28	: TC74HC4094AP
U24	: μPC814C
U25~27	: TC4053BP
U29	: TD62801P
U36	: NJM4558D
Q1,2	: 2SK190H
Q3	: 2SD1406(Y)
Q4	: 2SB1015(Y)
D1,2,5~12,18,20,22,24,25	: 1SS132
D3,4,19,21,23	: RD5.6JS
D15,26	: RD5.6F
D16,17	: MTZ16JA
PH1~4	: TLP2630

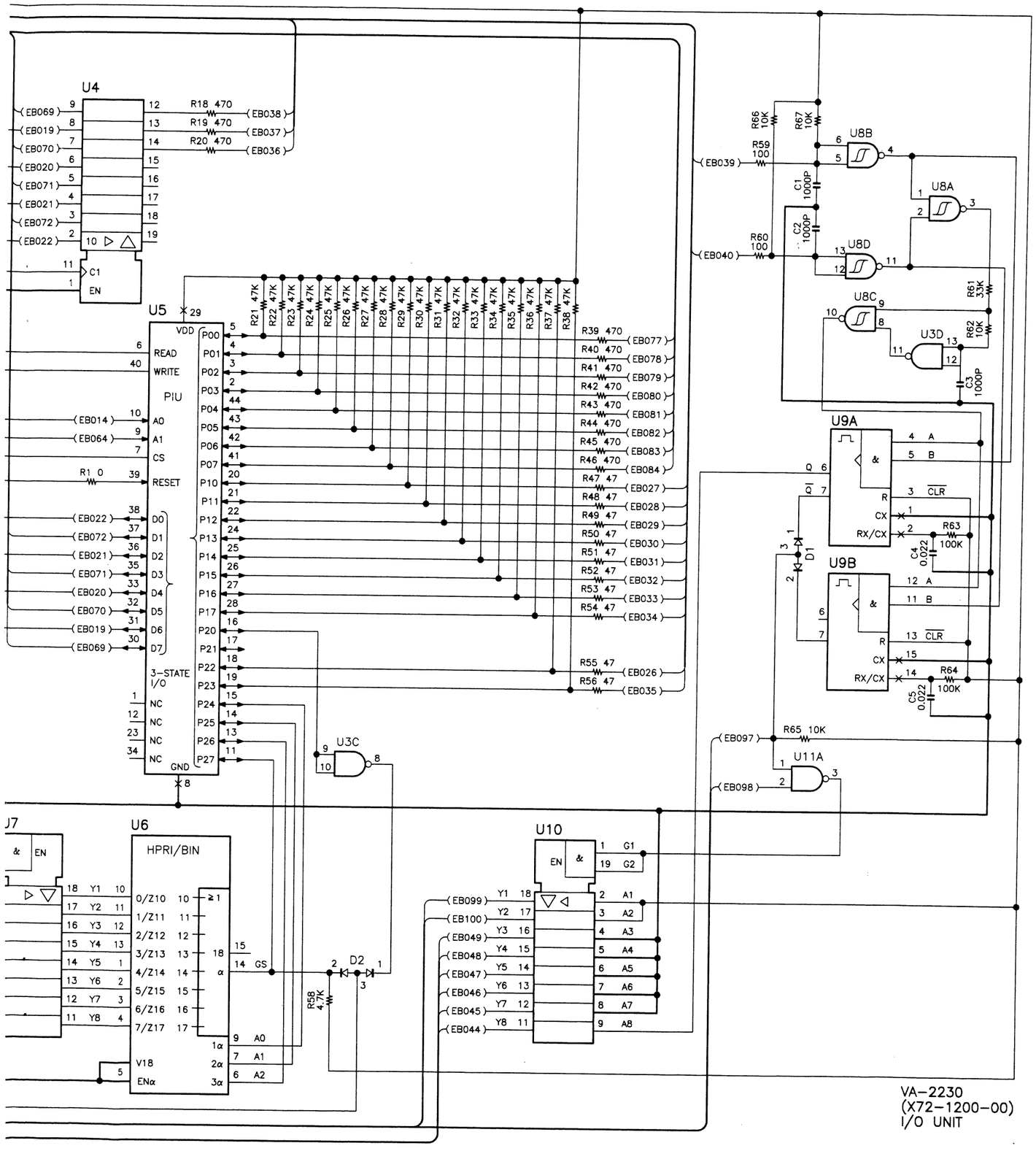
VA-2230
(X71-1230-00)
OSCILLATOR UNIT


P1A (100P)
P1B (100P)
U1
U2
DMUX
U3A
U3B
U3C
U3D
U4
U5
PIU
U6
HPRI/BIN
U7
U8A
U8B
U8C
U8D
U9A
U9B
U10
U11A
U11B
U11C
U11D
D1
D2
C1 1000P
C2 1000P
C4 0.022
C5 0.022
R58 4.7K
R63 100K
R64 100K
R65 10K
R66 10K
R67 10K
R59 100
R60 100
READ
WRITE
RESET
3-STATE I/O
VDD
GND
EB039
EB040
EB097
EB098

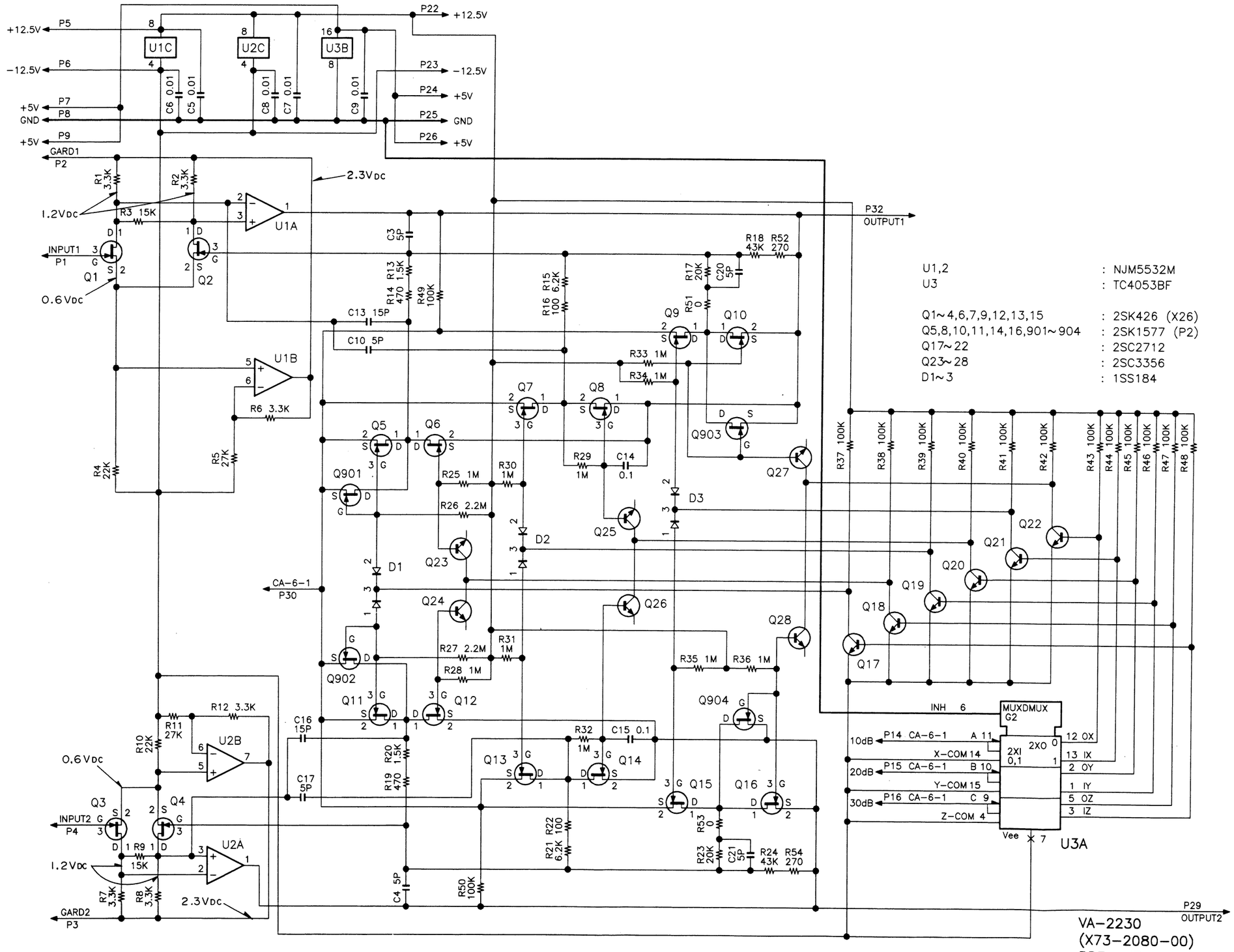
SCHEMATIC DIAGRAM

I/O UNIT (X72-1200-00)

U1	:	TC74HC30AF
U2	:	TC74HC138AF
U3	:	TC74HC00AF
U4	:	TC74HC574AF
U5	:	μPD71055L
U6	:	TC74HC148AF
U7,10	:	TC74HC541AF
U8	:	TC4093BF
U9	:	μPD4528BG
U11	:	TC74HC32AF
D1,2	:	1SS181



SCHEMATIC DIAGRAM

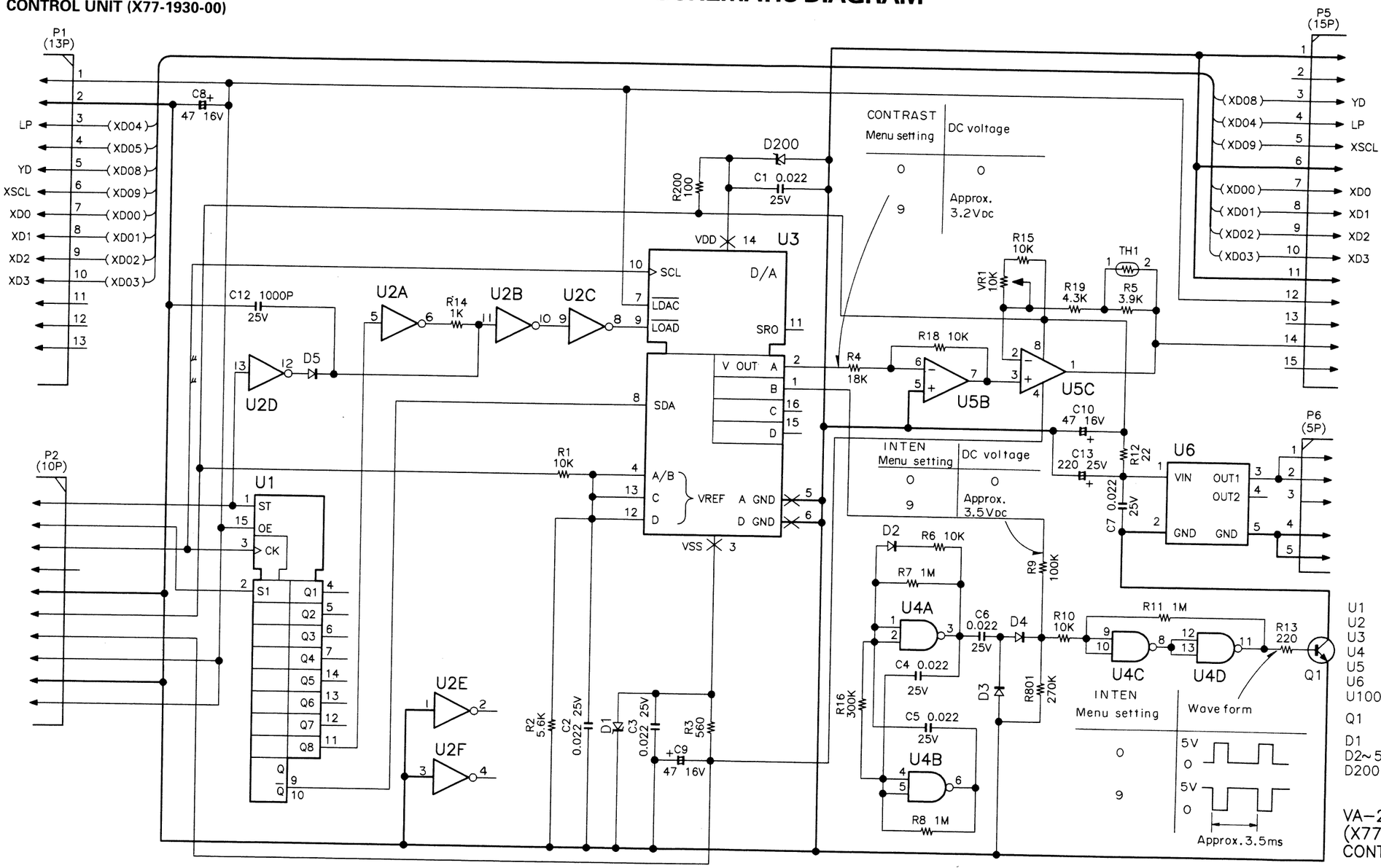


U1,2	: NJM5532M
U3	: TC4053BF
Q1~4,6,7,9,12,13,15	: 2SK426 (X26)
Q5,8,10,11,14,16,901~904	: 2SK1577 (P2)
Q17~22	: 2SC2712
Q23~28	: 2SC3356
D1~3	: 1SS184

VA-2230
(X73-2080-00)
PRE AMP

SCHEMATIC DIAGRAM

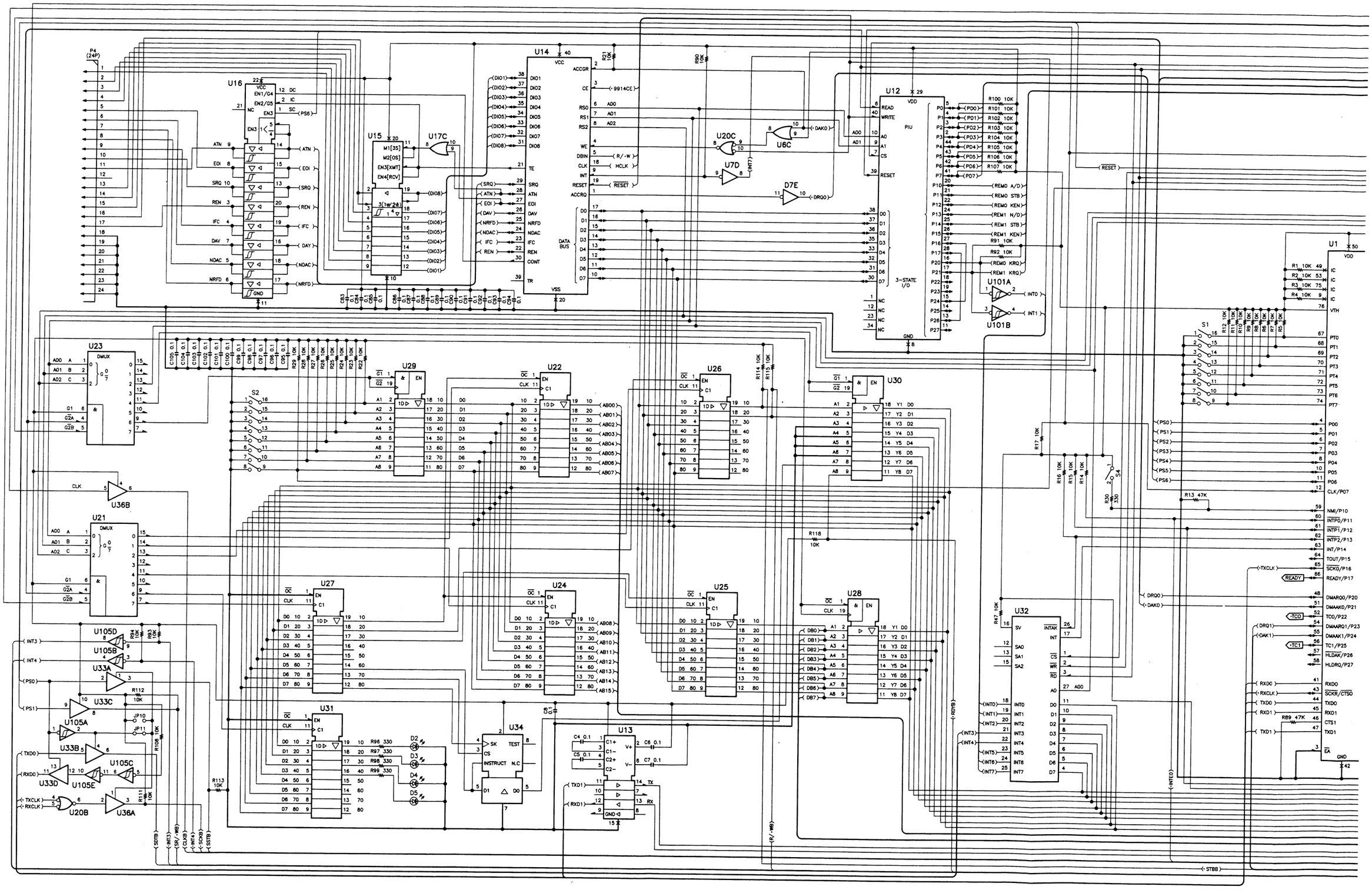
CONTROL UNIT (X77-1930-00)



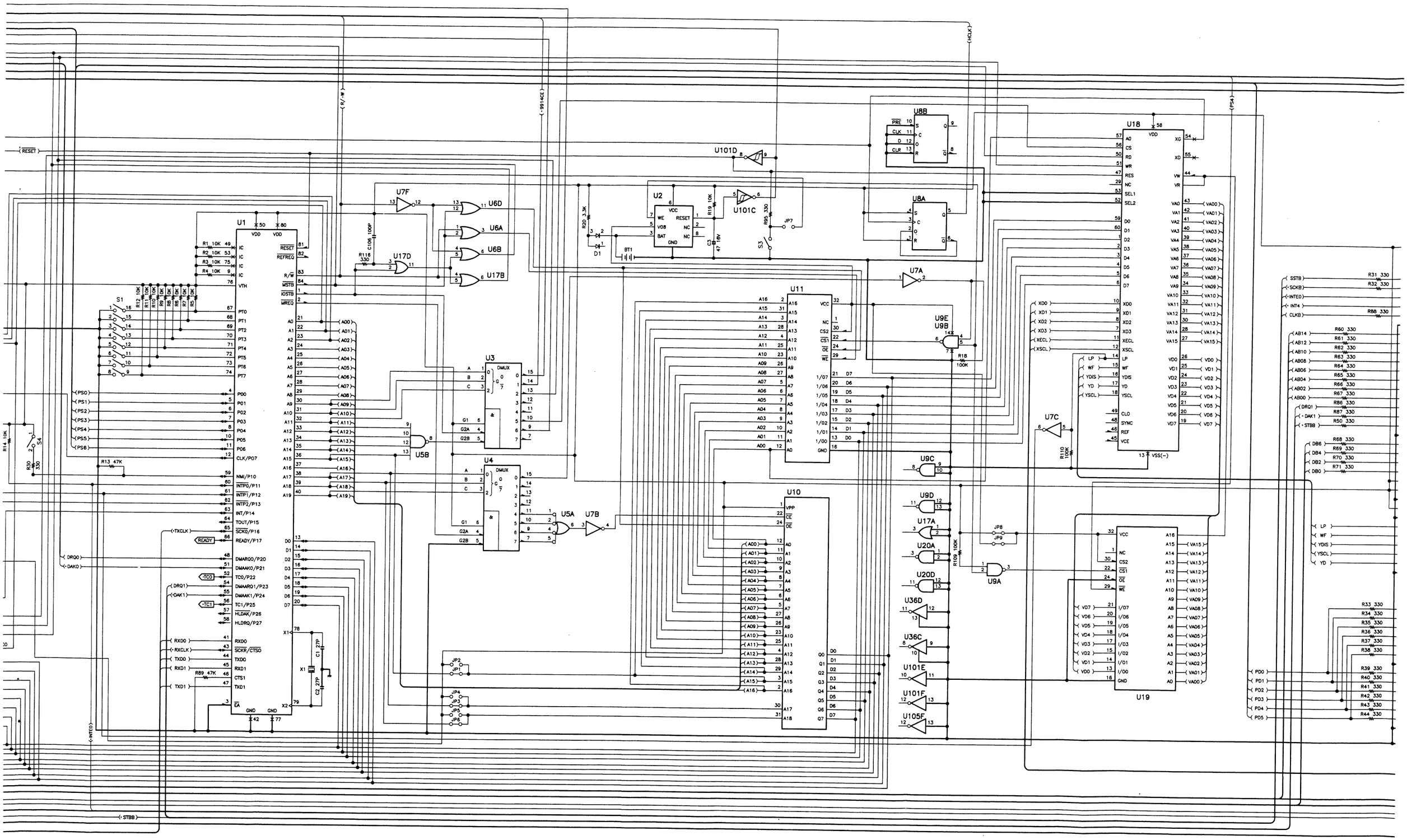
U1	:	TC4094BP
U2	:	TC74HC04AP
U3	:	MAX500BCPE
U4	:	TC74HC00AP
U5	:	NJM082BD
U6	:	W02-2305-05
U100	:	NJM5532D
Q1	:	2SC1384(R)
D1	:	RD5.6JS
D2~5,100,101	:	1SS132
D200	:	MTZ18JB

VA-2230
(X77-1930-00)
CONTROL UNIT

CPU UNIT (X77-1940-00)



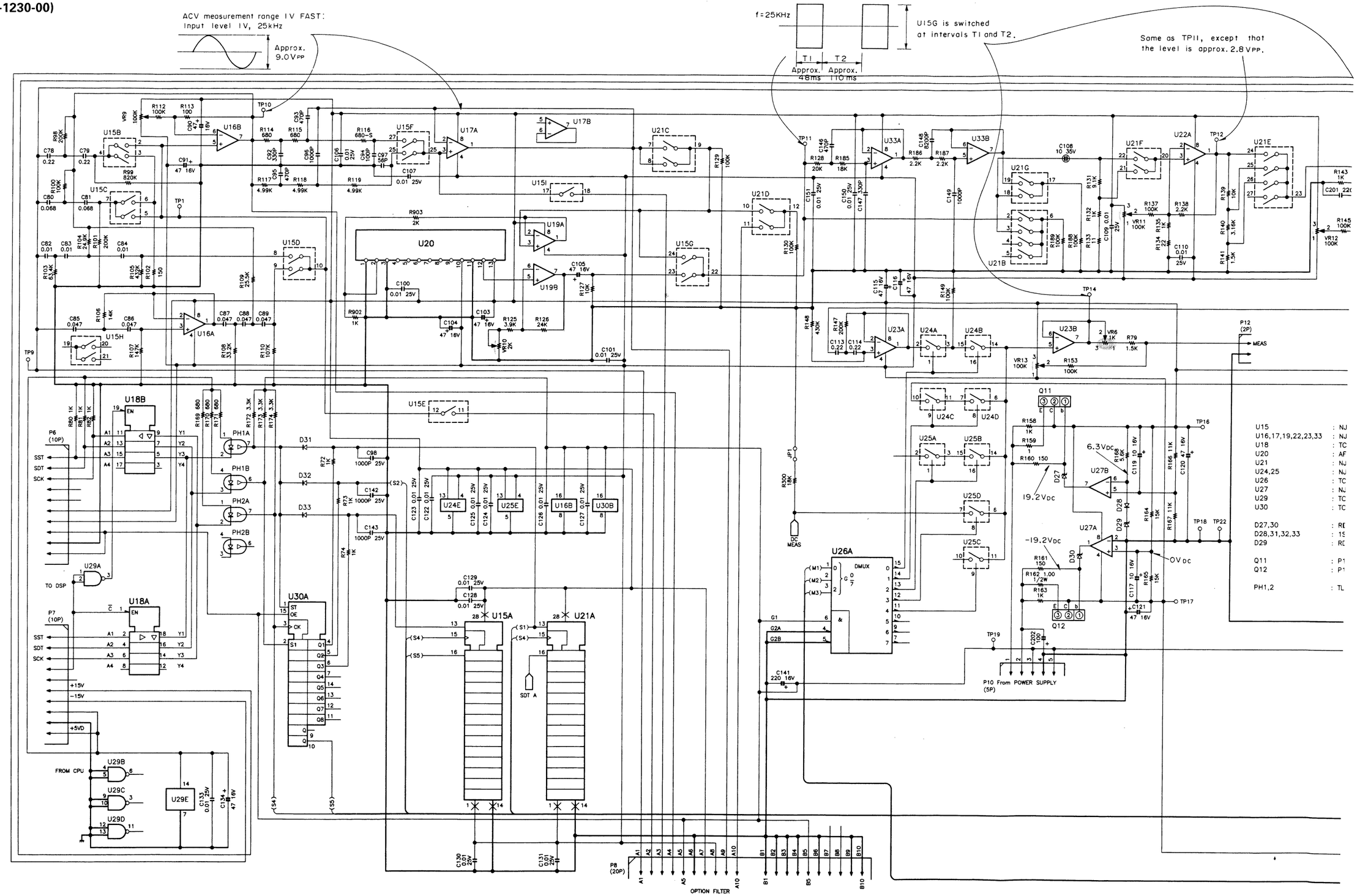
SCHEMATIC DIAGRAM



U1	: μPD70320L-8	U20	: TC74HC08AF
U2	: PST531A	U22,24~27,31	: TC74HC574AF
U3,4,21,23	: TC74HC138AF	U28~30	: TC74HC541AF
U5	: TC74HC20AF	U32	: μPD71059L-10
U6,17	: TC74HC32AF	U33,36	: TC74HC126AF
U7	: TC74HC04AF	U34	: S-2913AIF10
U8	: TC74HC74AF	U101,105	: TC74HC14AF
U9	: TC74HC00AF		
U10	: T93-0865-14	D1	: 1SS181
U11,19	: D431000AGW10L	D2,5,6	: B30-3022-05
U12	: μPD71055L	D3	: B30-3023-05
U13	: MAX202CSE	D4	: B30-3021-05
U14	: TMS9914A		
U15	: SN75160BN		
U16	: SN75162BN		
U18	: SED1330FBA		

VA-2230
(X77-1940-00)
CPU UNIT

DSP UNIT (X79-1230-00)



SCHEMATIC DIAGRAM

easurement range 1V FAST:
evel 1V, 25KHz

U15G is switched at intervals T1 and T2.

T2
Approx. 1TOms

Same as TP11, except that the level is approx. 2.8VPP.

ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 2.8VPP

ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 9.0VPP

U15	:	NJU7311AL
U16,17,19,22,23,33	:	NJM072BD
U18	:	TC74HC244AP
U20	:	AFL89F20000D1
U21	:	NJU7313AL
U24,25	:	NJU201AD
U26	:	TC74HC138AP
U27	:	NJM4558D
U29	:	TC74HC00AP
U30	:	TC4094BP
D27,30	:	RD13JS
D28,31,32,33	:	1SS132
D29	:	RD5.6JS
Q11	:	P111
Q12	:	P112
PH1,2	:	TLP2630

P10 From POWER SUPPLY (5P)

P12 (2P) → MEAS

R INPUT P1 (5P)

L INPUT P3 (5P)

DC INPUT P4 (2P)

FLOWING P2 (4P)

P13 U1 P15 — PRE. AMP — P14

P17 U4 P19 — P18 P20

SDT A

ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 2.8VPP

ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 9.0VPP

ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 90mVPP

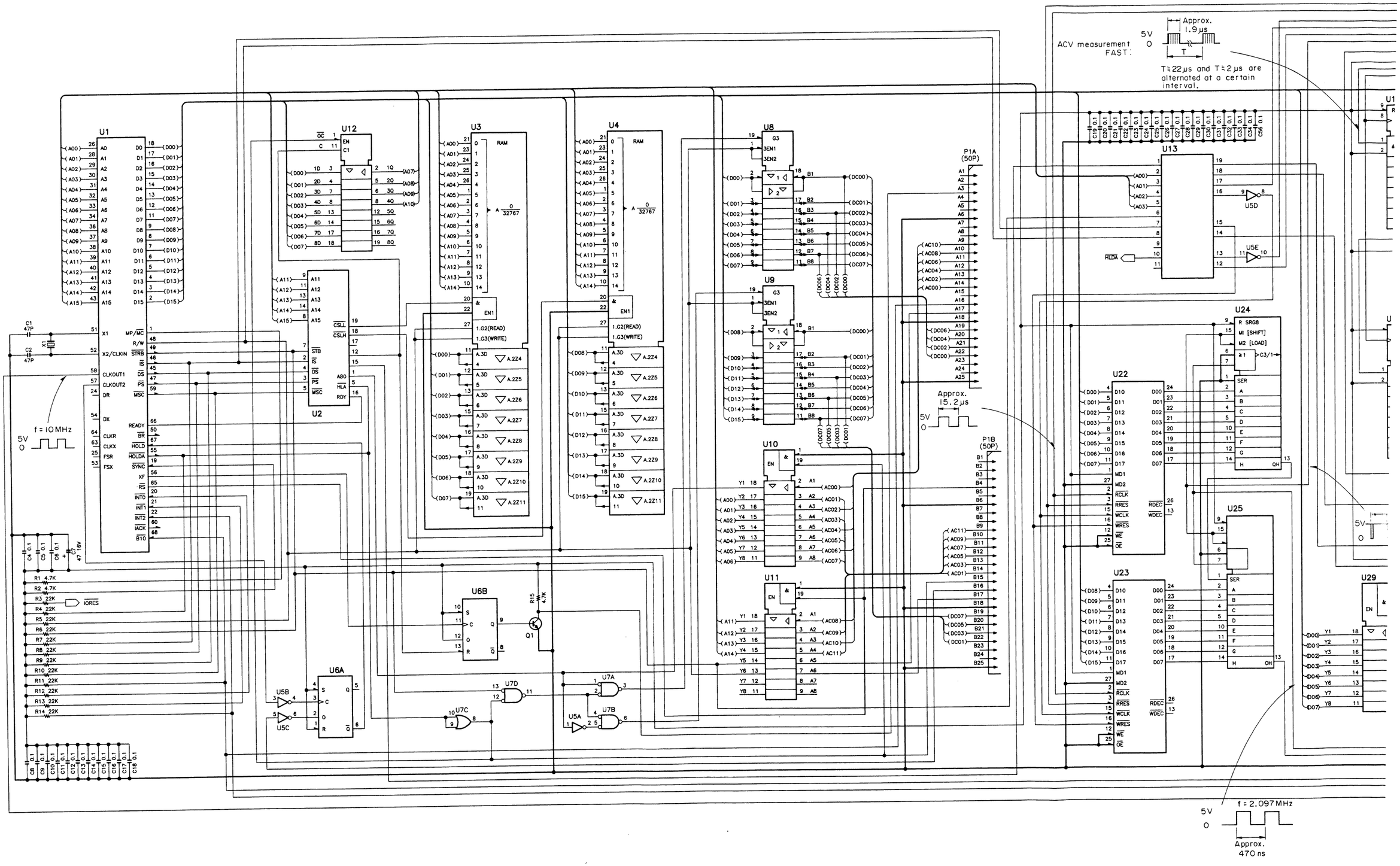
ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 9.0VPP

ACV measurement range 1V FAST:
Input level 1V, 25KHz
Approx. 1.3VPP

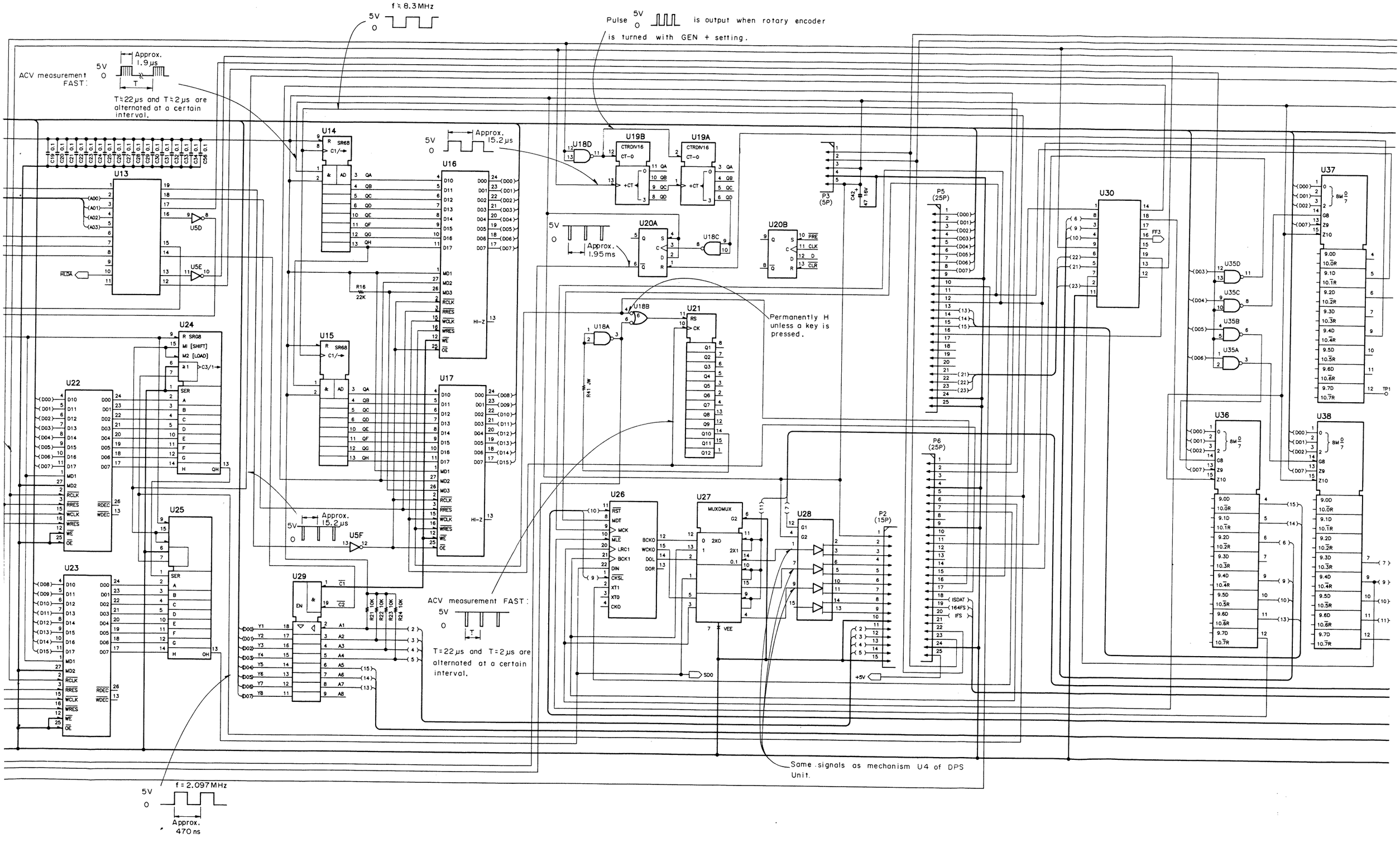
U2,3	: NJM5534D
U6,8~11	: TC4094BP
U7	: TD62801P
U12	: μPC811C
U13	: NJU201AD
U14	: TC74HC04AP
D1,4,5,8,11~26	: 1SS132
Q1~3,7~10	: RN1006
Q4~6	: 2SC3402
Q13~18	: 2SC1907

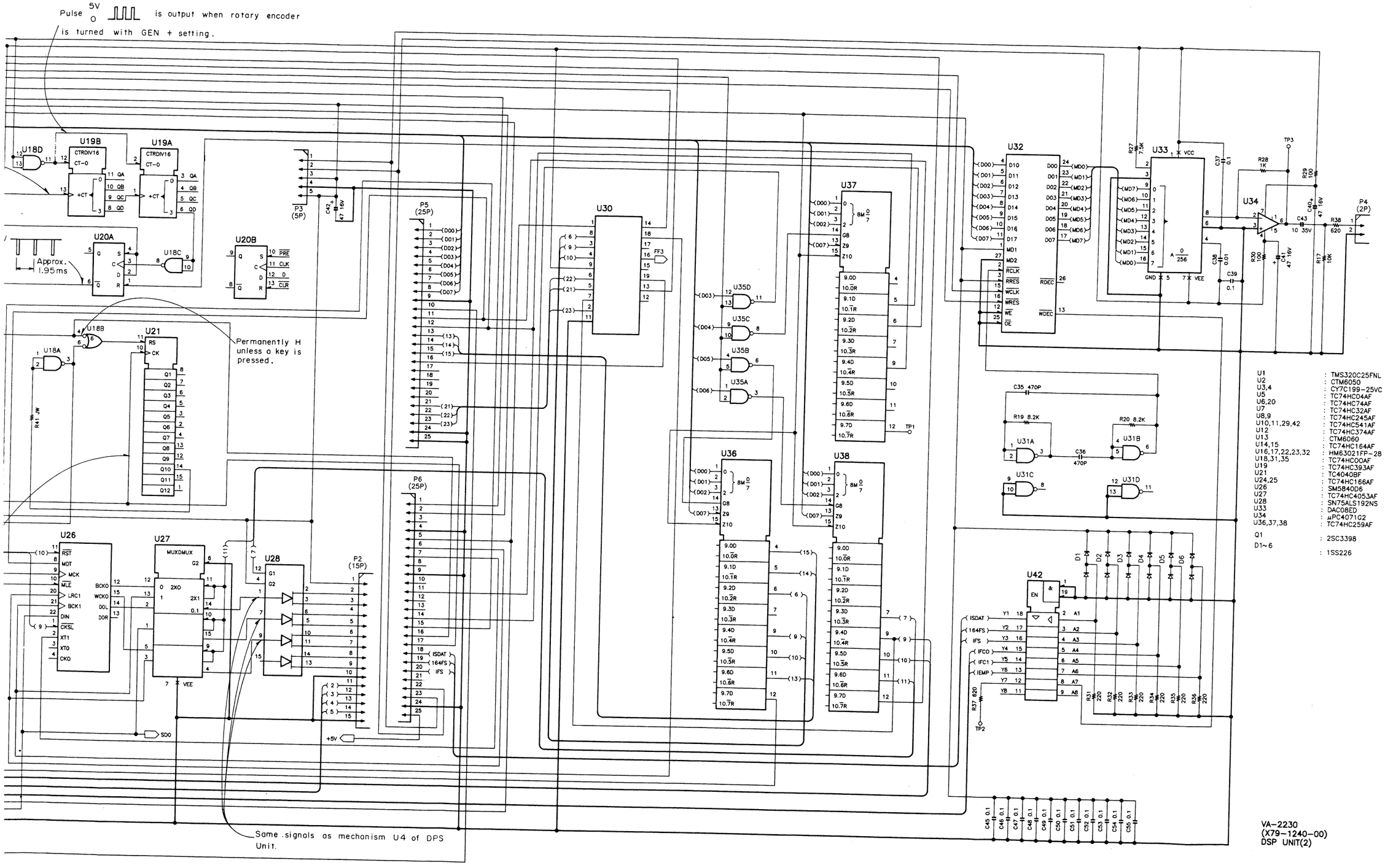
VA-2230
(X79-1230-00)
DSP UNIT

DSP UNIT (X79-1240-00)



SCHEMATIC DIAGRAM

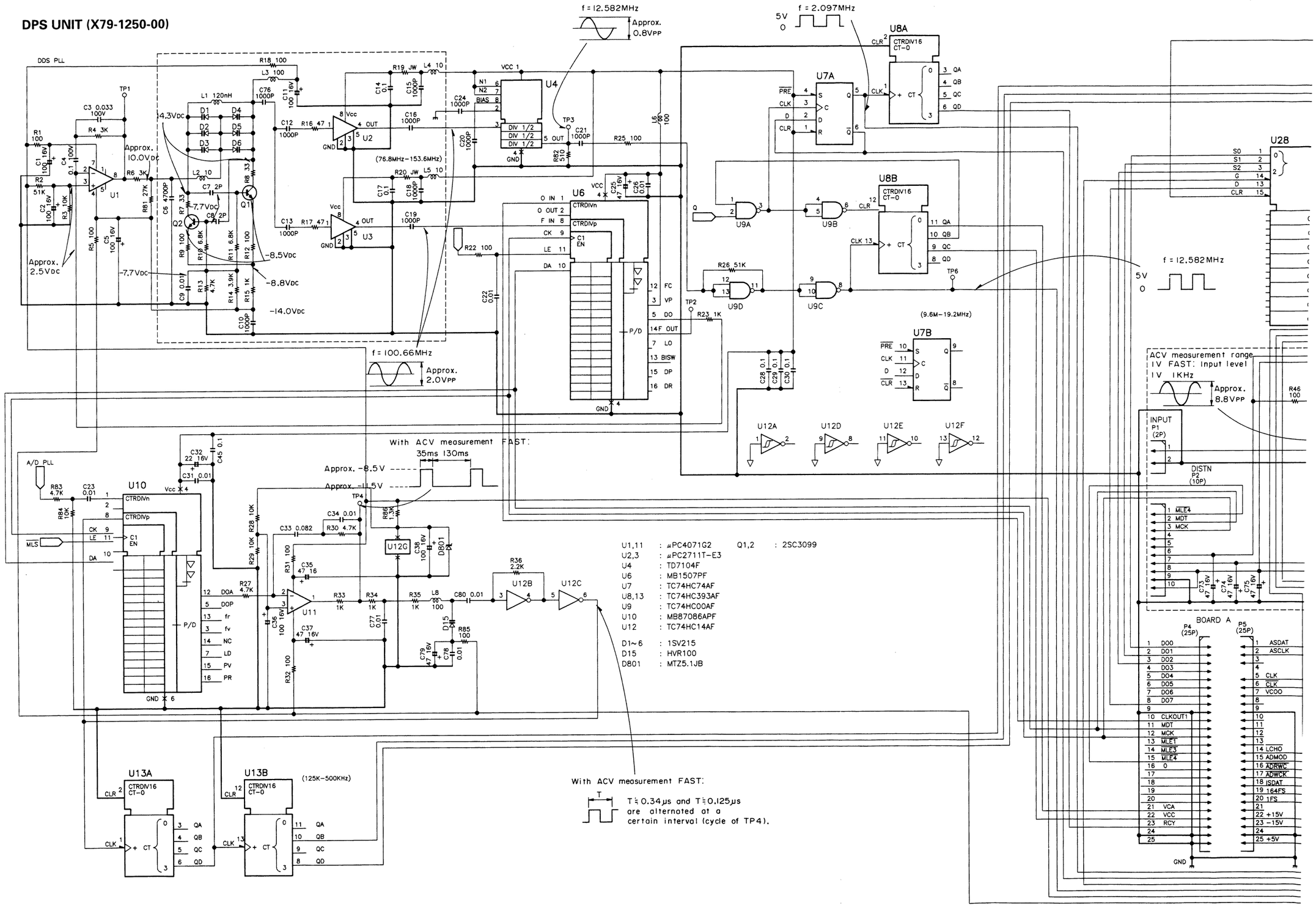




U1	: TMS320C25FNL
U2	: CTM6050
U3,4	: CY7C199-25VC
U5	: TC74HC04AF
U6,20	: TC74HC74AF
U7	: TC74HC32AF
U8,9	: TC74HC245AF
U10,11,29,42	: TC74HC541AF
U12	: TC74HC374AF
U13	: CTM6060
U14,15	: TC74HC164AF
U16,17,22,23,32	: HM63021FP-28
U18,31,35	: TC74HC00AF
U19	: TC74HC393AF
U21	: TC4040BF
U24,25	: TC74HC166AF
U26	: SM5840D6
U27	: TC74HC4053AF
U28	: SN75ALS192NS
U33	: DAC08ED
U34	: μPC4071G2
U36,37,38	: TC74HC259AF
Q1	: 2SC3398
D1~6	: 1SS226

VA-2230
(X79-1240-00)
DSP UNIT(2)

DPS UNIT (X79-1250-00)



U1,11 : μPC4071G2 Q1,2 : 2SC3099
U2,3 : μPC2711T-E3
U4 : TD7104F
U6 : MB1507PF
U7 : TC74HC74AF
U8,13 : TC74HC393AF
U9 : TC74HC00AF
U10 : MB87086APF
U12 : TC74HC14AF

D1~6 : 1SV215
D15 : HVR100
D801 : MTZ5.1JB

: 2SC3099

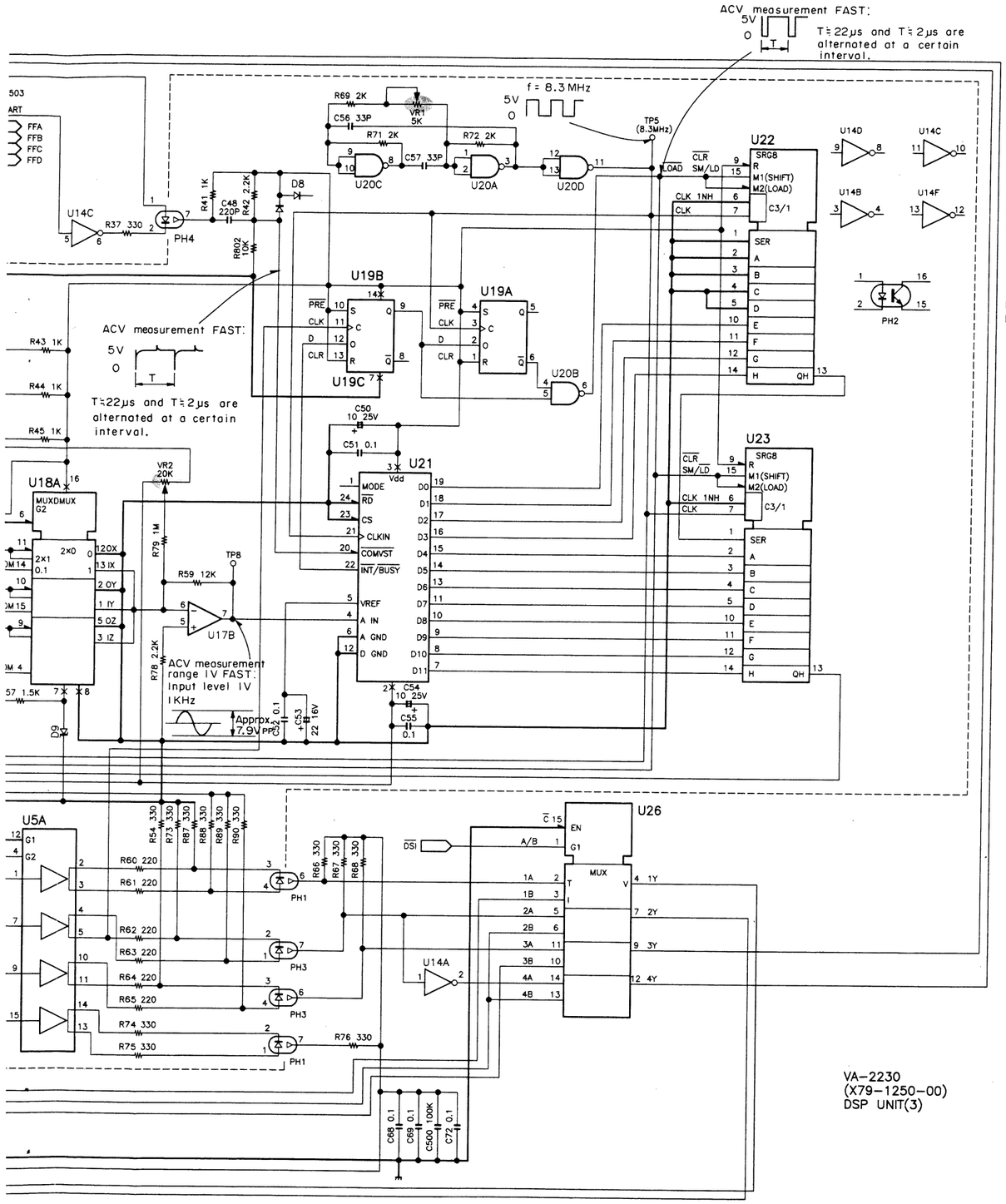
U5
U14
U17
U18
U19
U20
U21
U22,23
U26
U27
U28

D8
D9

PH1,3,4
PH2

VA-2230
(X79-1250-00)
DSP UNIT(3)

SCHEMATIC DIAGRAM

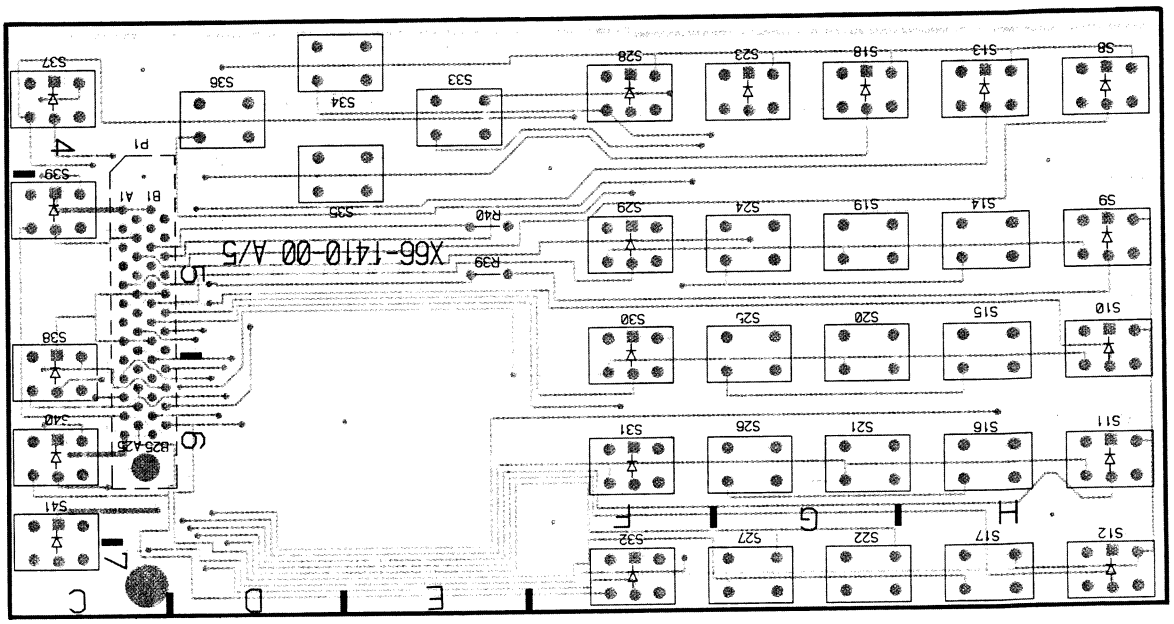


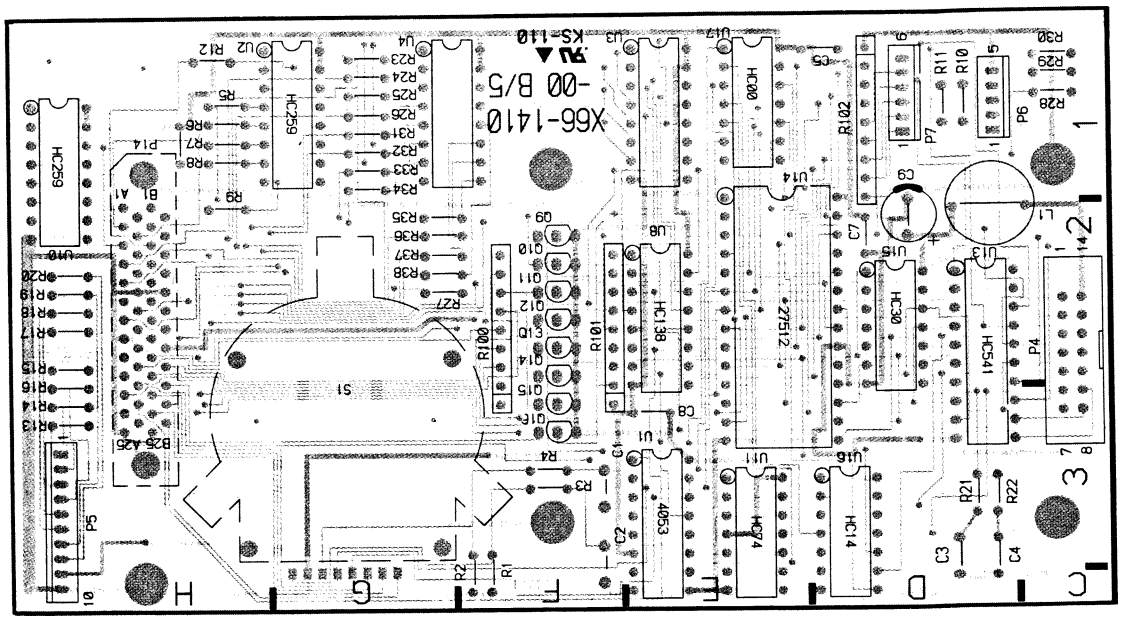
U5	: SN75ALS192NS
U14	: TC74HC04AF
U17	: μPC4072G2
U18	: TC4053BF
U19	: TC74HC74AF
U20	: TC74HC00AF
U21	: MAX120CWG
U22,23	: TC74HC166AF
U26	: TC74HC257AF
U27	: CTM6080
U28	: TC74HC259AF
D8	: 1SS226
D9	: RD5.1M
PH1,3,4	: TLP2630
PH2	: TLP521-4

P. C. BOARD

PANEL UNIT (X66-1410-00)

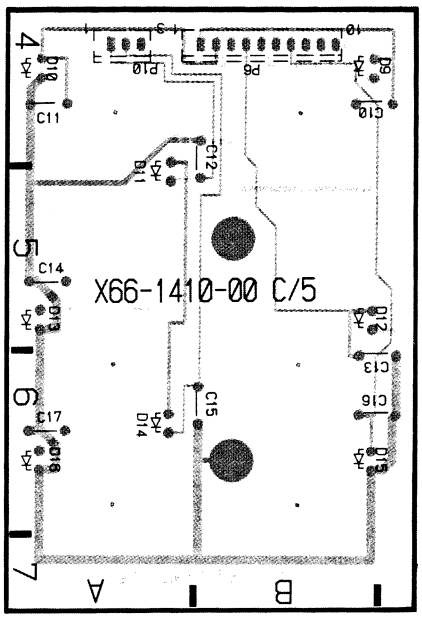
Pattern side view

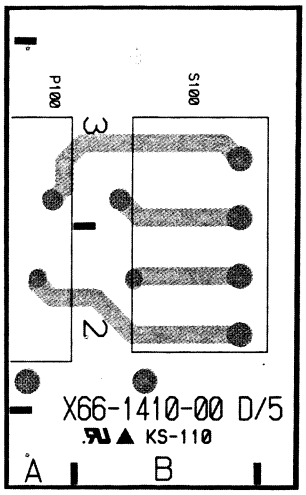




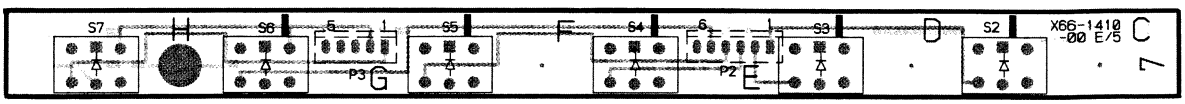
P. C. BOARD

Pattern side view



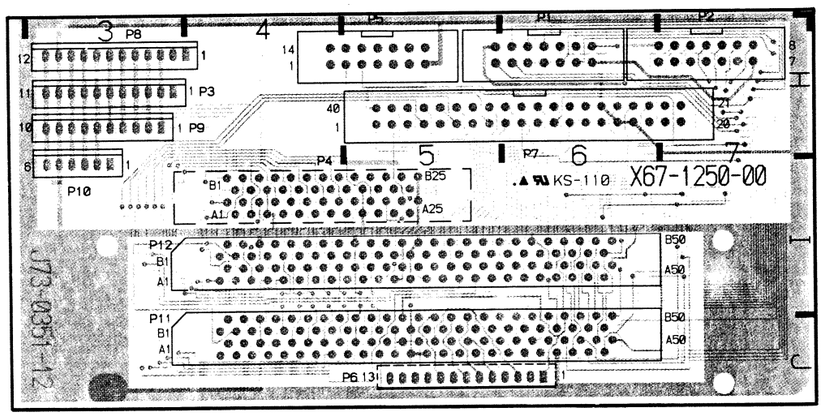


Pattern side view

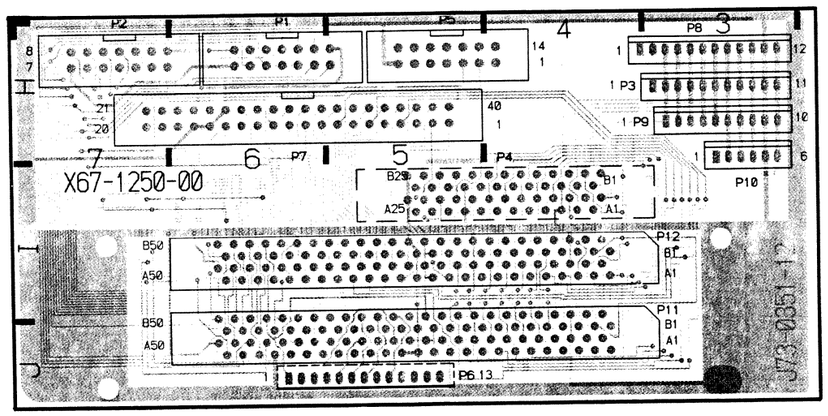


P. C. BOARD

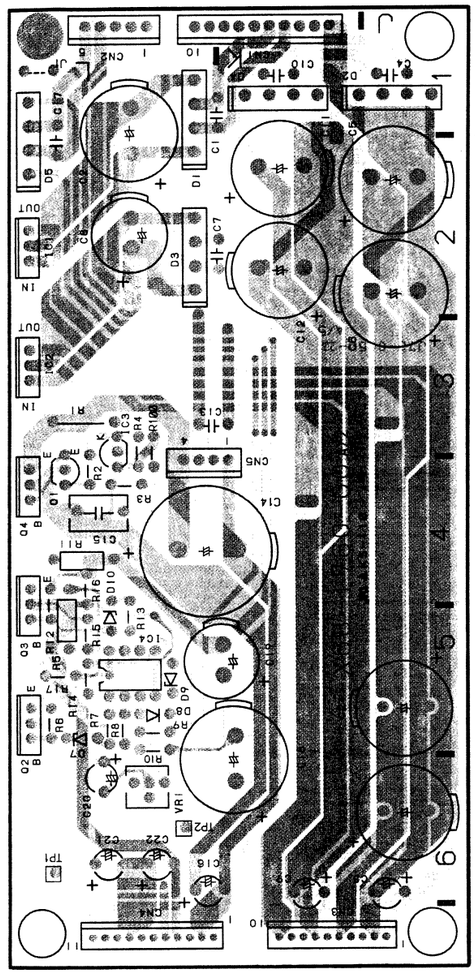
CONNECTION UNIT (X67-1250-00)



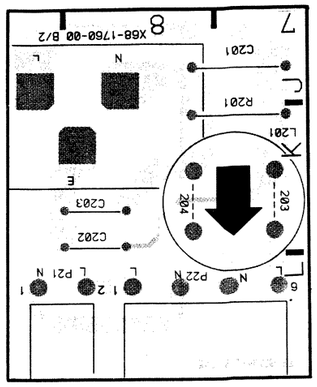
Pattern side view



POWER UNIT (X68-1760-00)

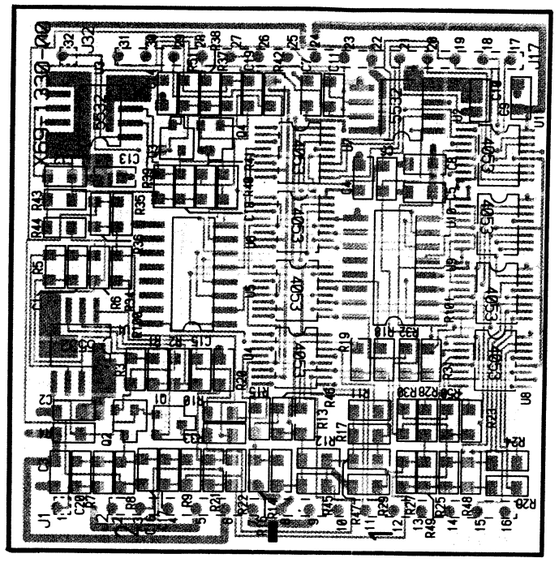


Pattern side view

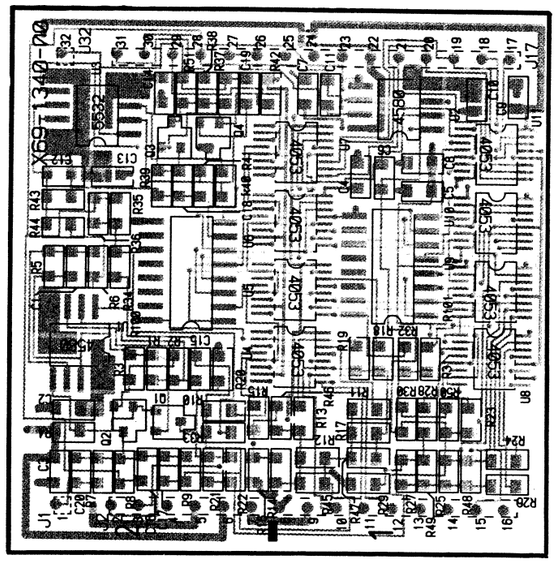


P. C. BOARD

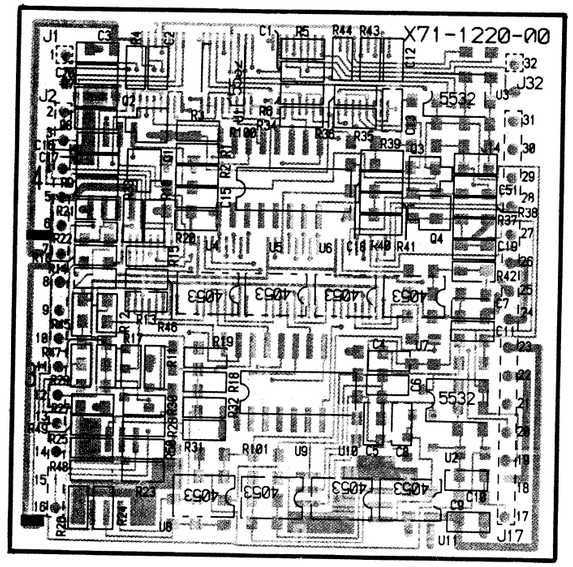
FILTER UNIT (X69-1330-00)



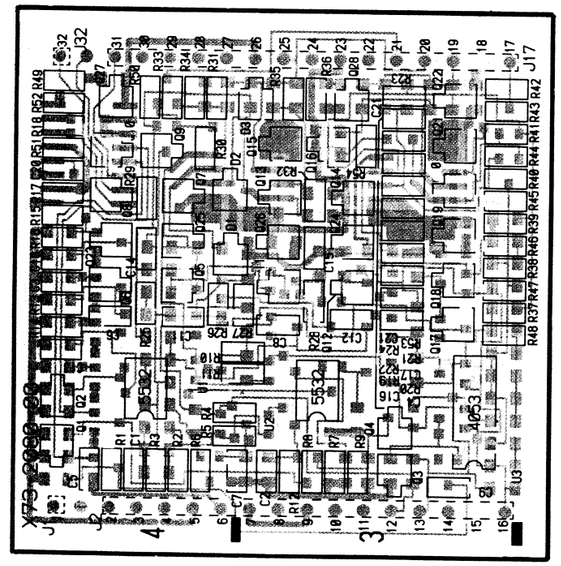
FILTER UNIT (X69-1340-00)



OSCILLATOR UNIT (X71-1220-00)

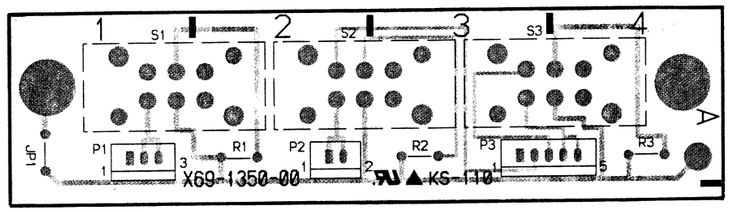


PRE AMP UNIT (X73-2080-00)

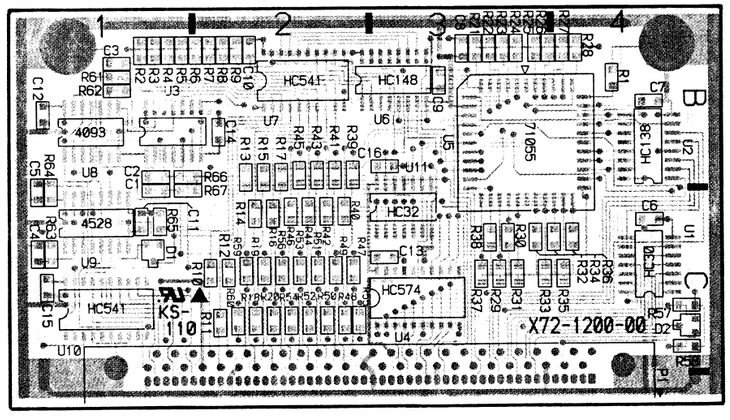


P. C. BOARD

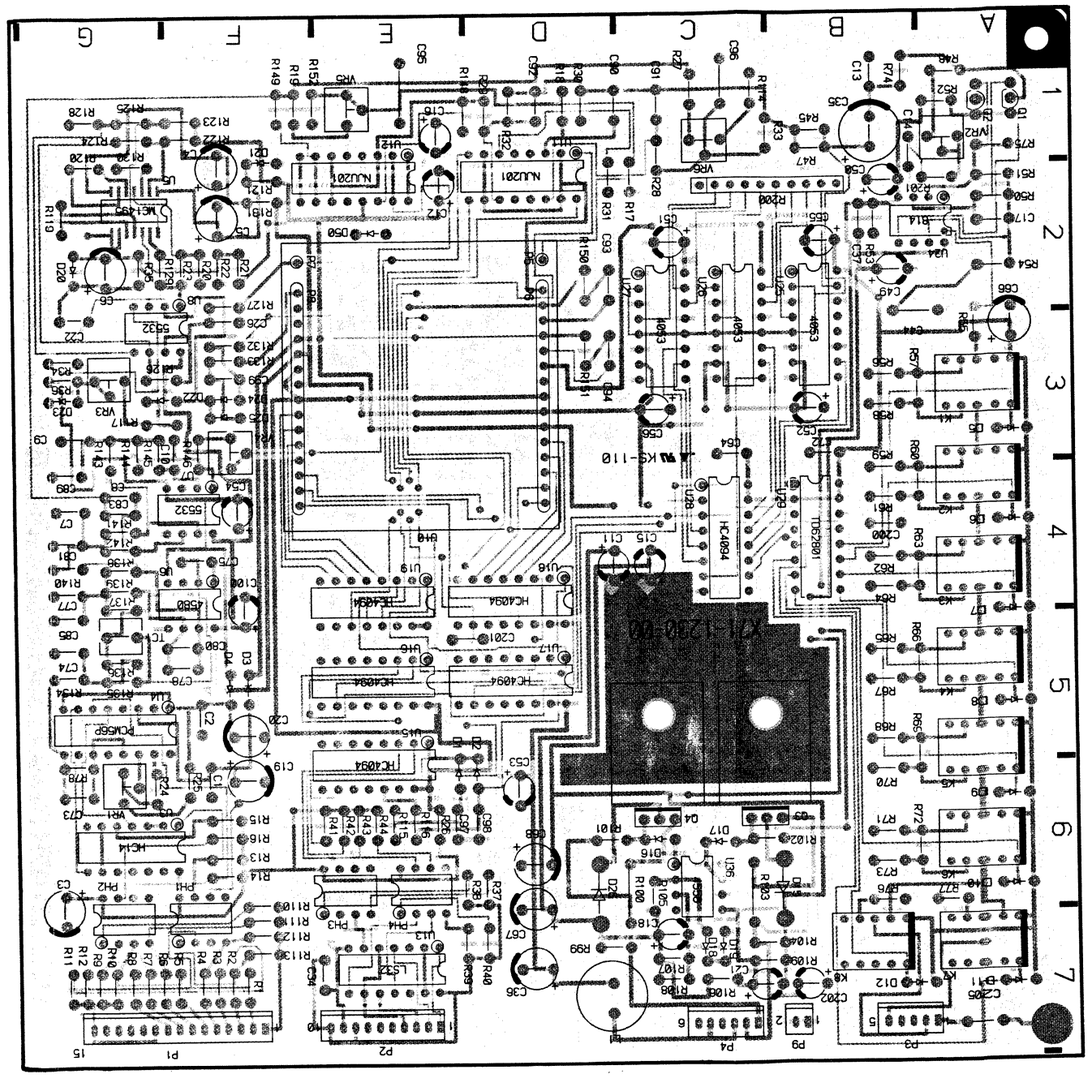
SWITCH UNIT (X69-1350-00)



I/O UNIT (X72-1200-00)

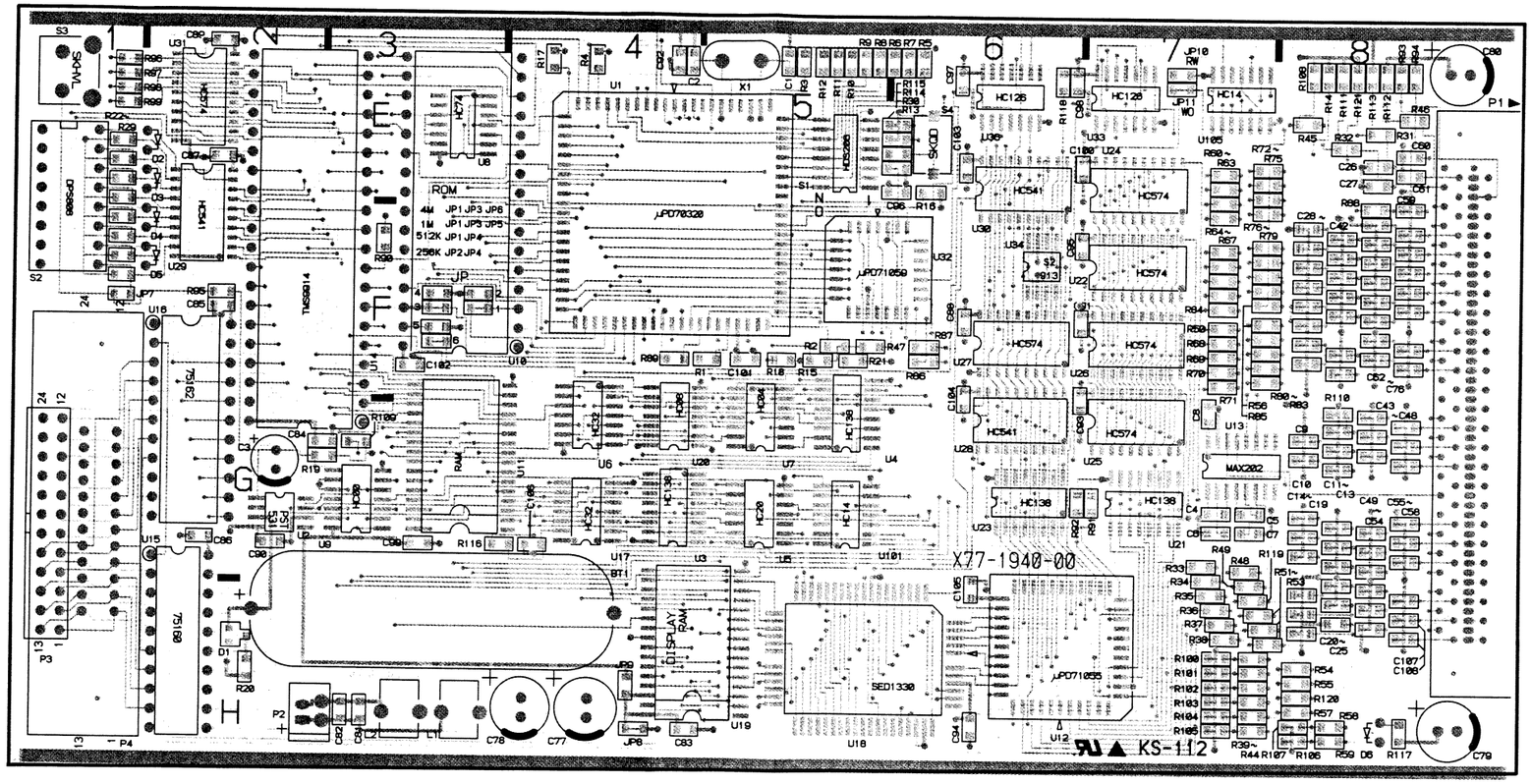


OSCILLATOR UNIT (X71-1230-00)



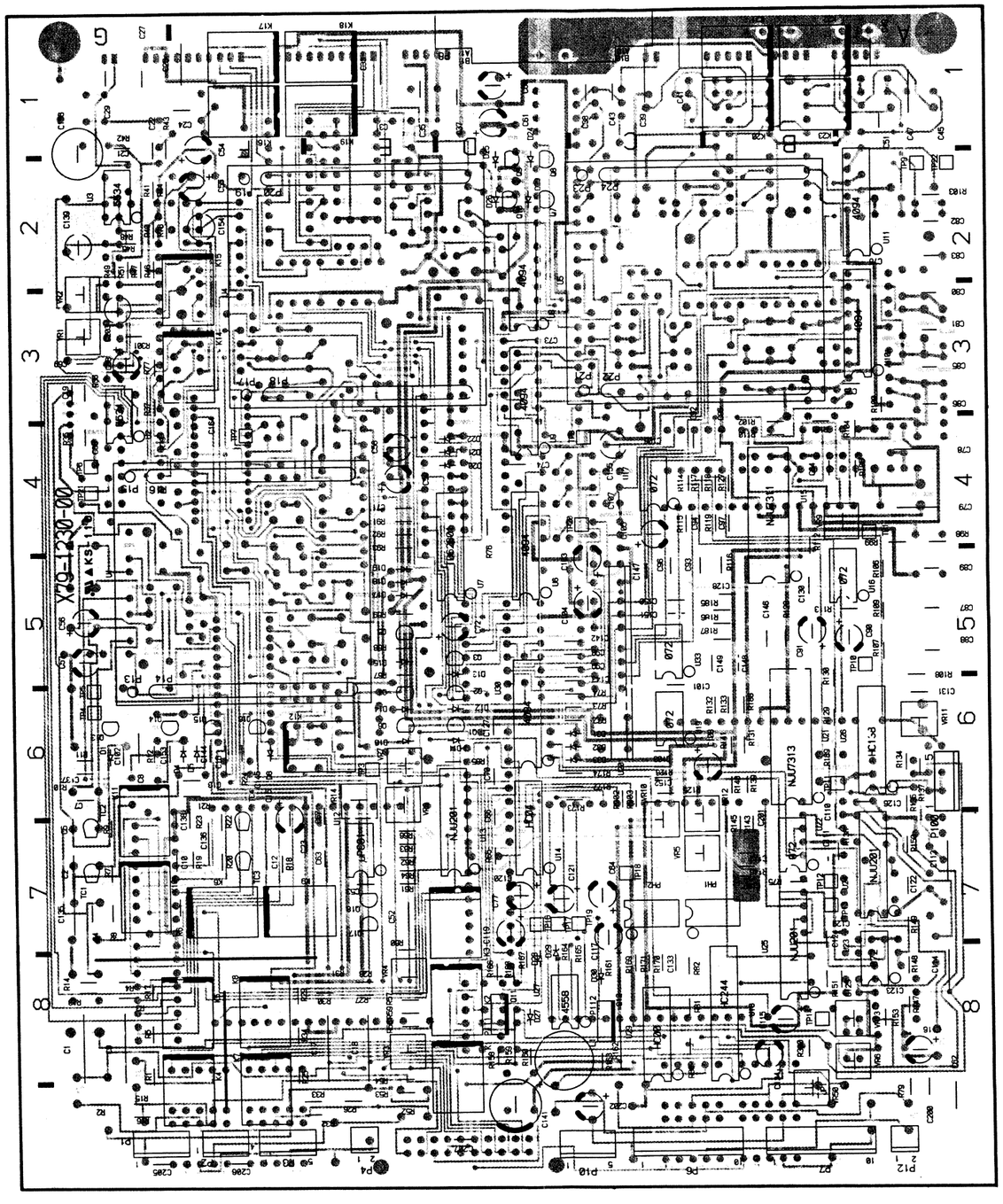
P. C. BOARD

CPU UNIT (X77-1940-00)



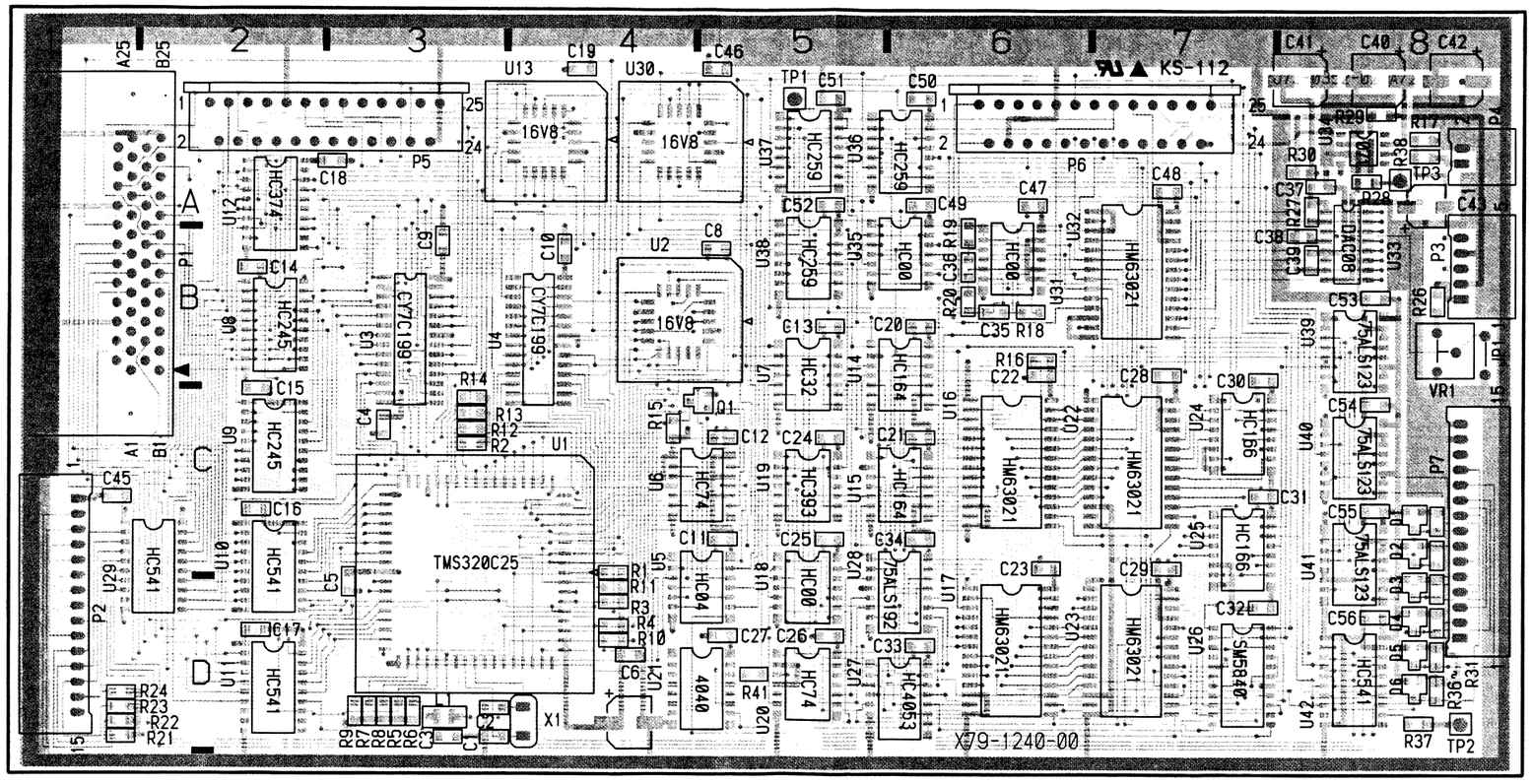
P. C. BOARD

DSP UNIT (X79-1230-00)



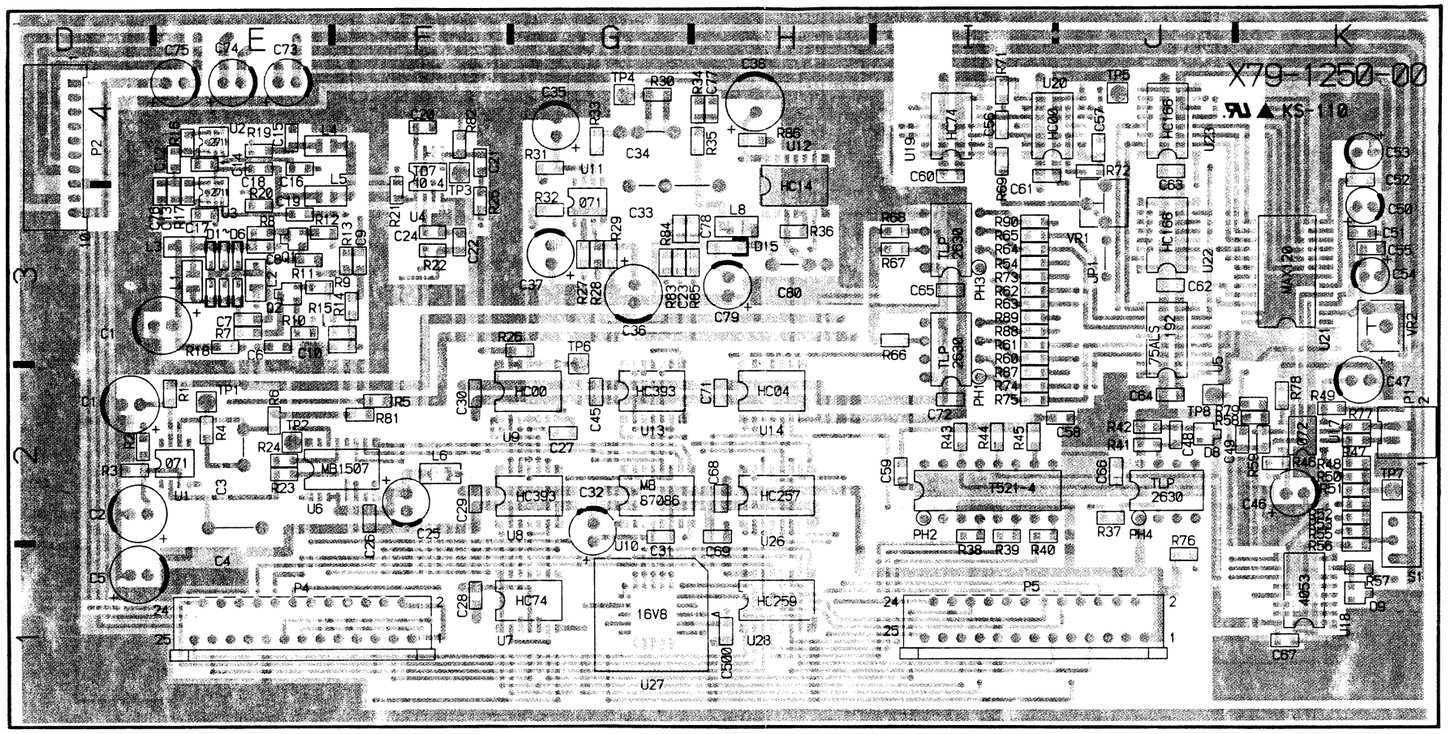
P. C. BOARD

DSP UNIT (X79-1240-00)

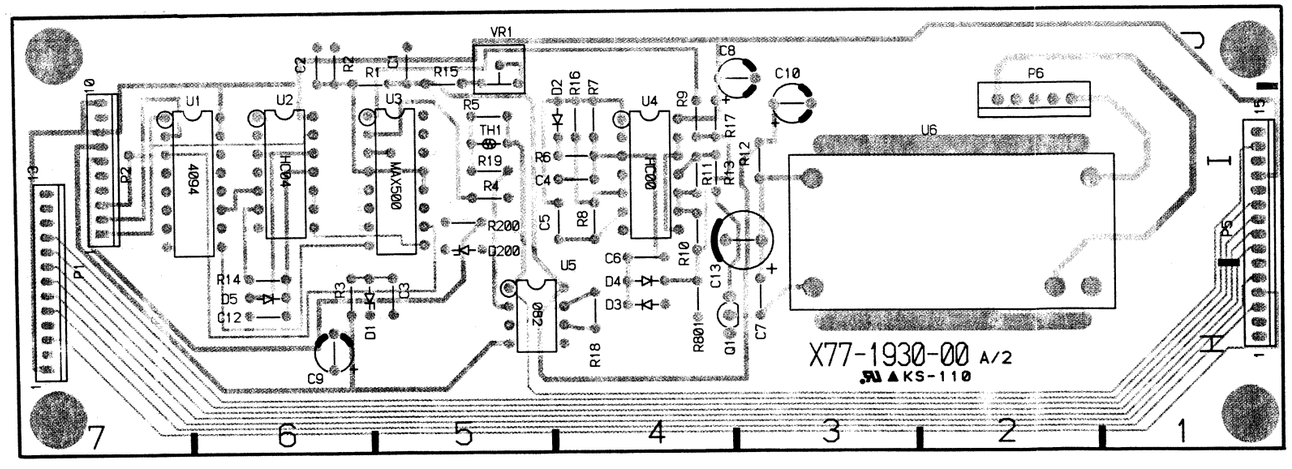


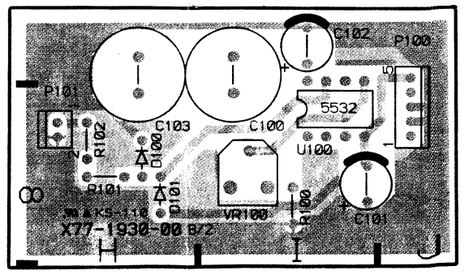
P. C. BOARD

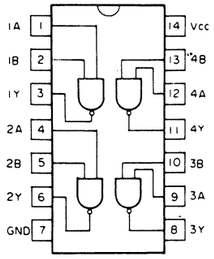
DSP UNIT (X79-1250-00)



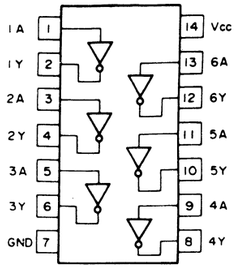
CONTROL UNIT (X77-1930-00)







TC74HC00AF
TC74HC00AP



TC74HC04AF
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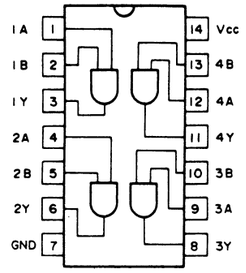
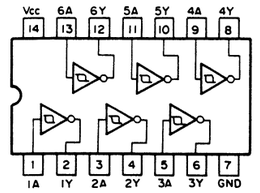


TC74HC08AF



TC74HC14AF
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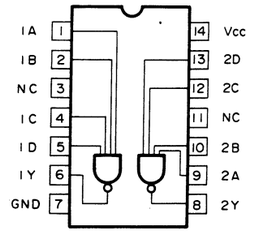
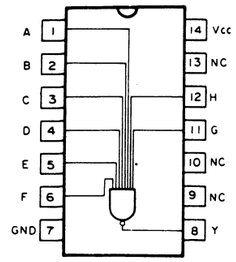


TC74HC20AF



TC74HC30AF
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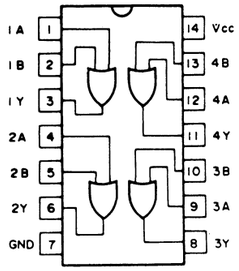

TC74HC32AF
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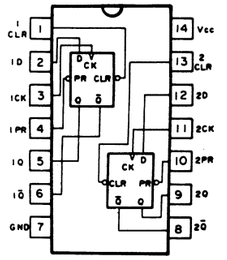

TC74HC74AF
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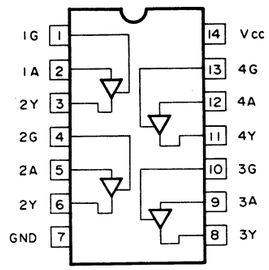
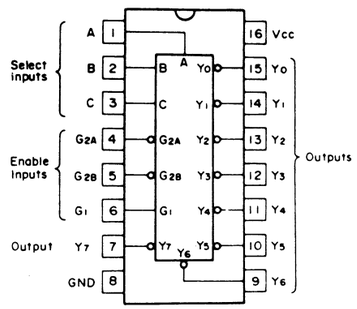


TC74HC126AF



TC74HC138AF
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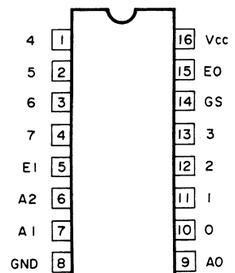

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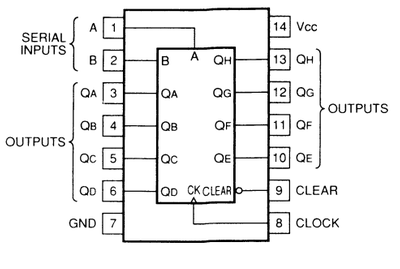

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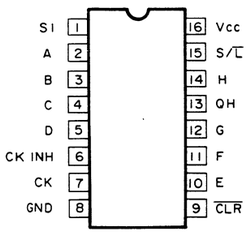

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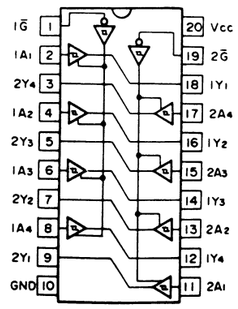
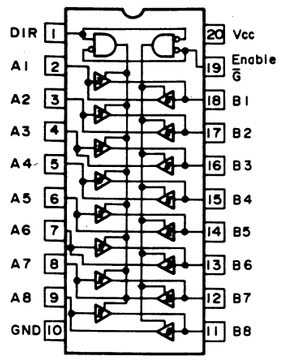


TC74HC244AP



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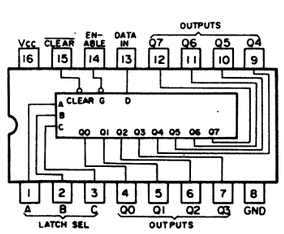

TC74HC259AF
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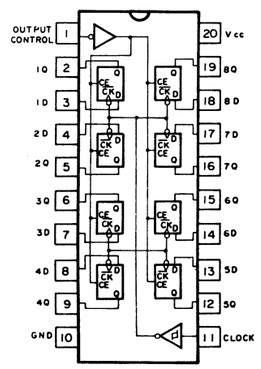

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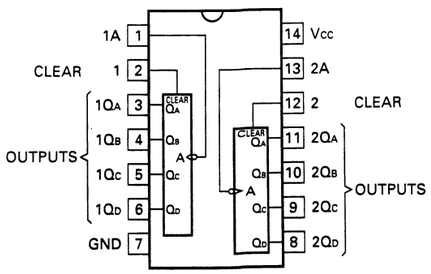

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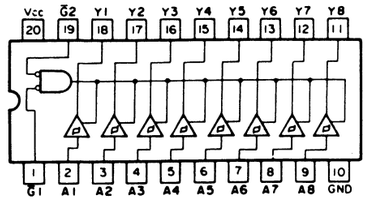

TC74HC541AF
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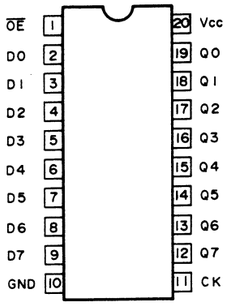

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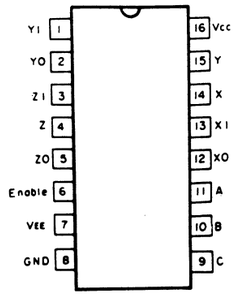

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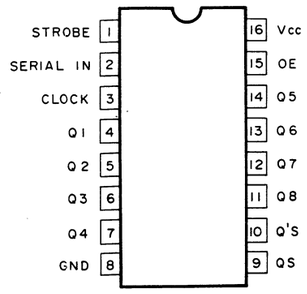

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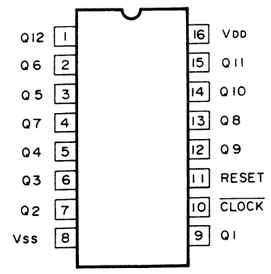

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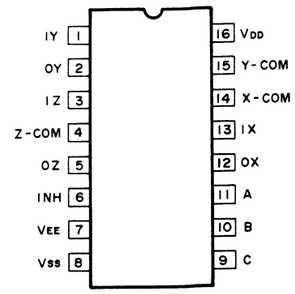
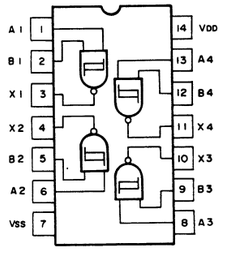


TC4053BF
TC4053BFS
TC4053BP



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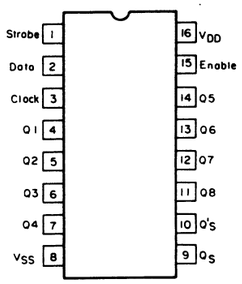

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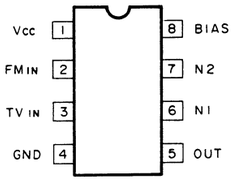

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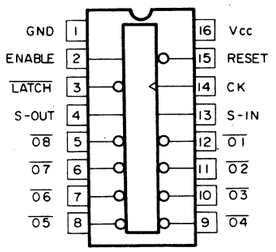

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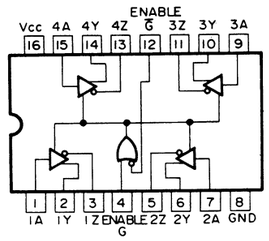

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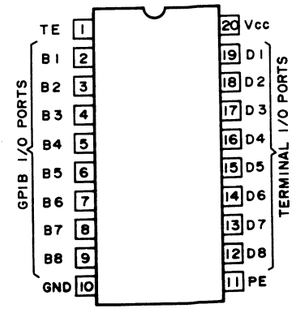

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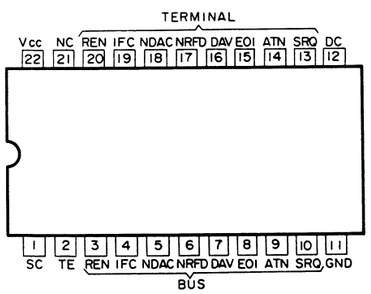

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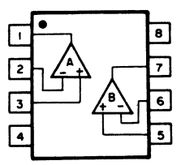
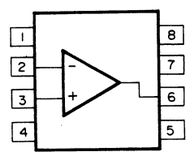


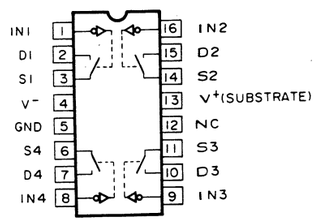
Pin name
1. A OUTPUT
2. A (−) INPUT
3. A (+) INPUT
4. V⁻
5. B (+) INPUT
6. B (−) INPUT
7. B OUTPUT
8. V⁺

NJM072BD
NJM082BD
NJM4558D
NJM4580D
NJM4580E
NJM5532D
NJM5532DD
NJM5532M

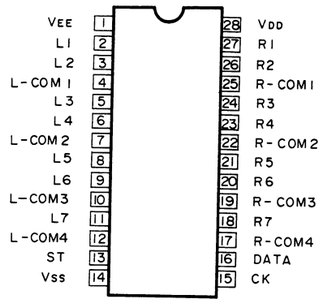


1. V_{IO} Trim
2. − INPUT
3. + INPUT
4. V⁻
5. COMPENSATION
6. OUTPUT
7. V⁺
8. V_{IO} Trim/COMPENSATION

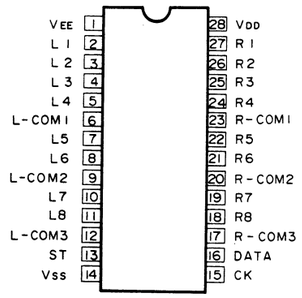
NJM5534D



NJMU201AD



NJU7311AL



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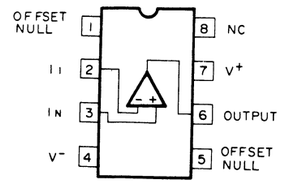
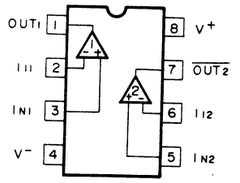
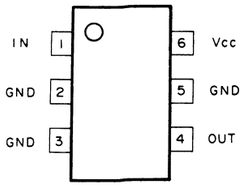


μPC811C



μPC814C



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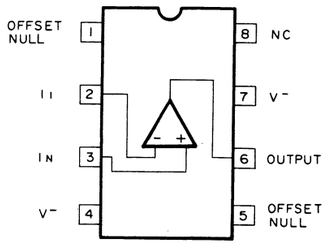
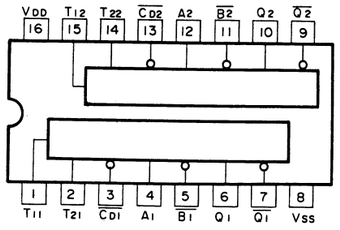
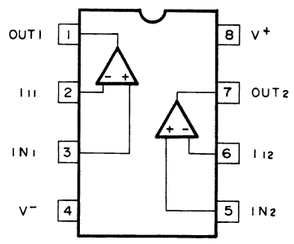


μPC4071G2



μPB4528BG



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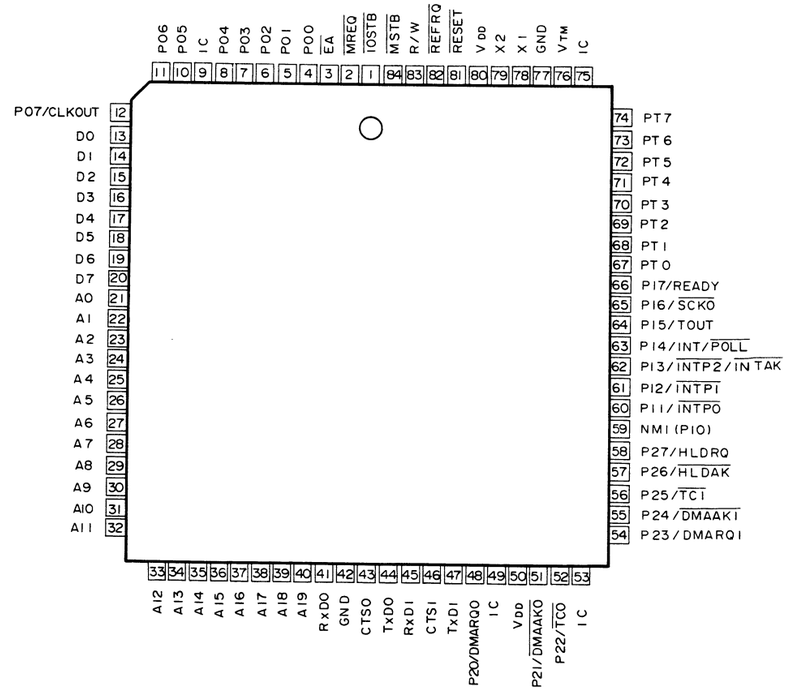
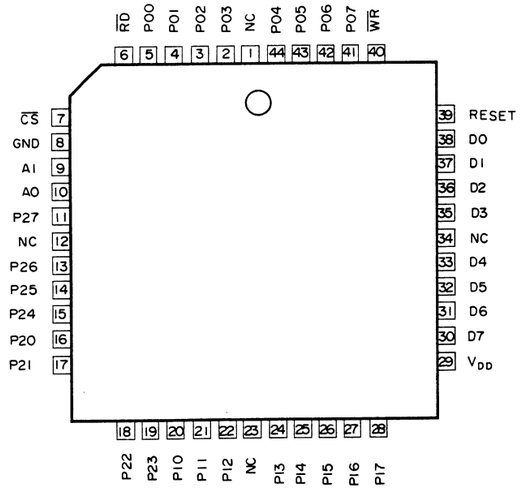


μPD70320L-8



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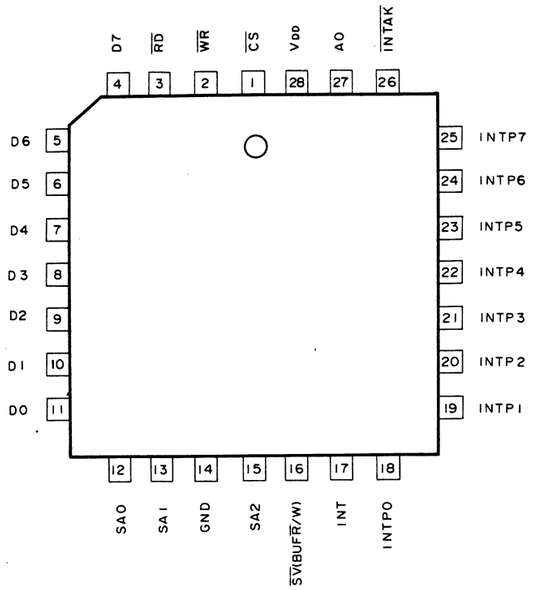

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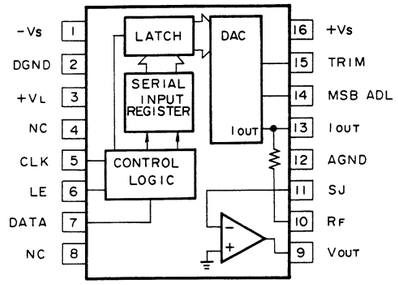
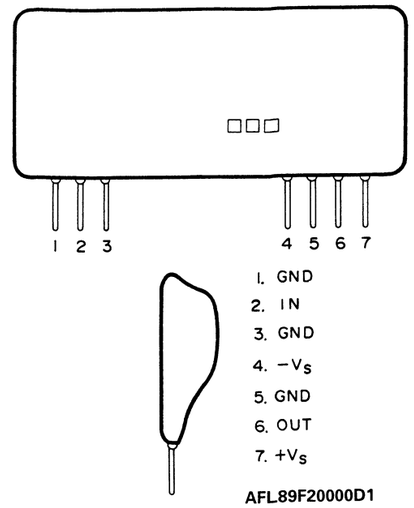


AD185IN-J



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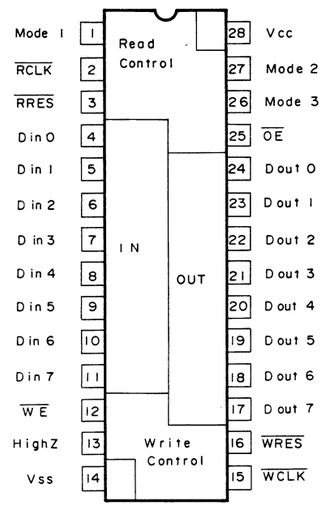

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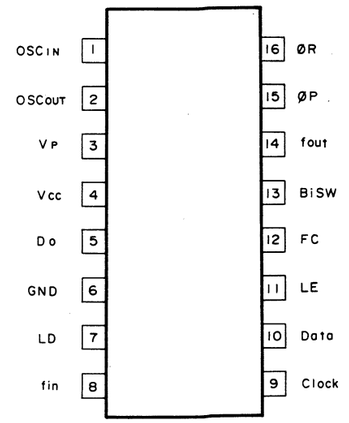

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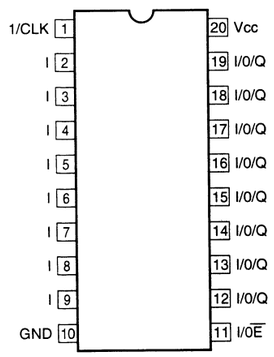

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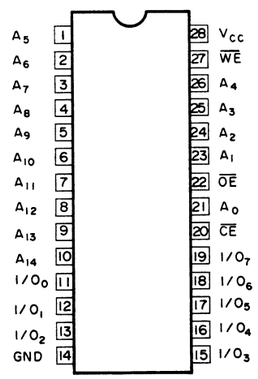

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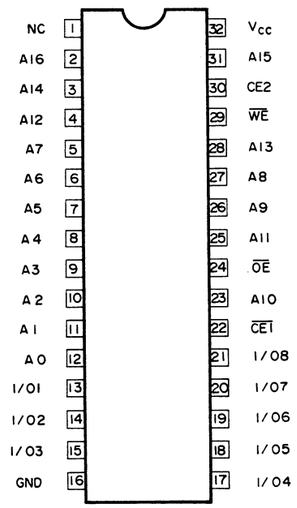

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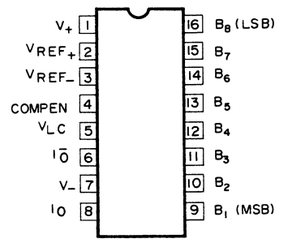

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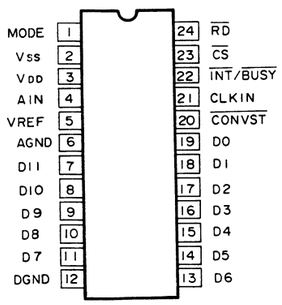

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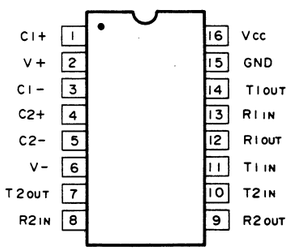

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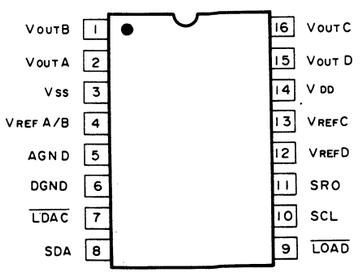

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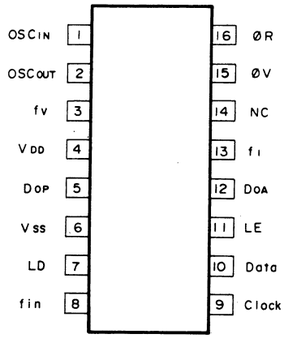

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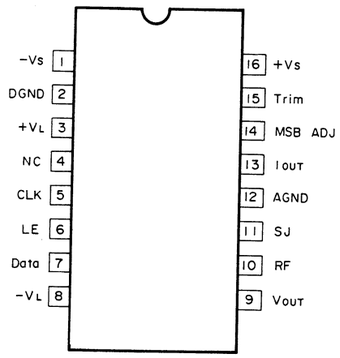

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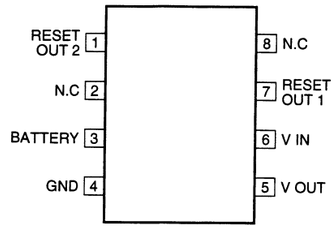

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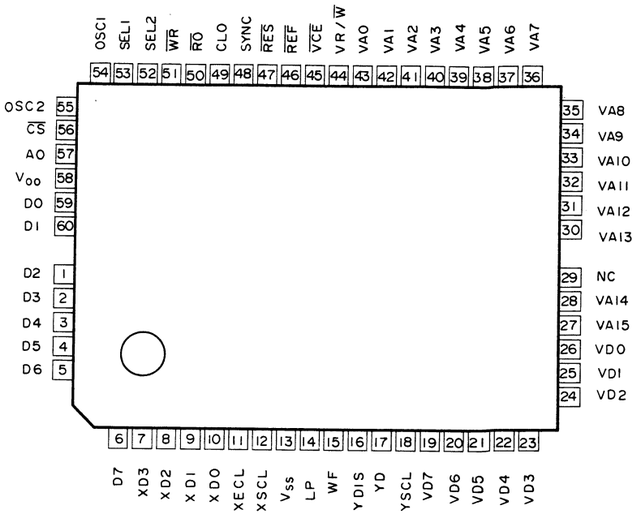

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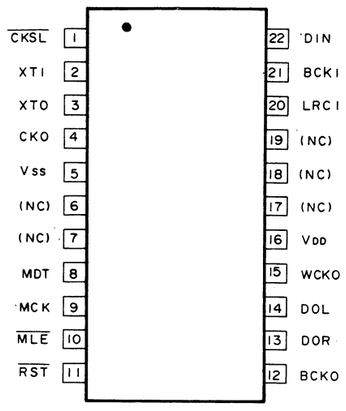

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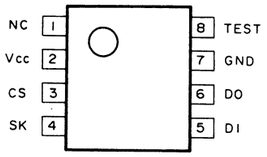

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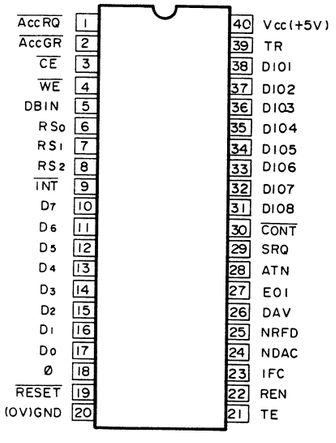

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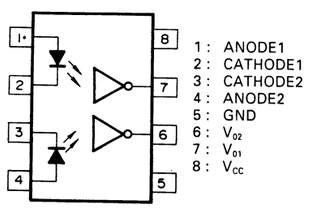

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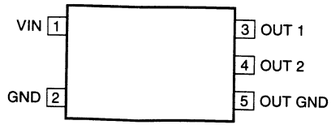

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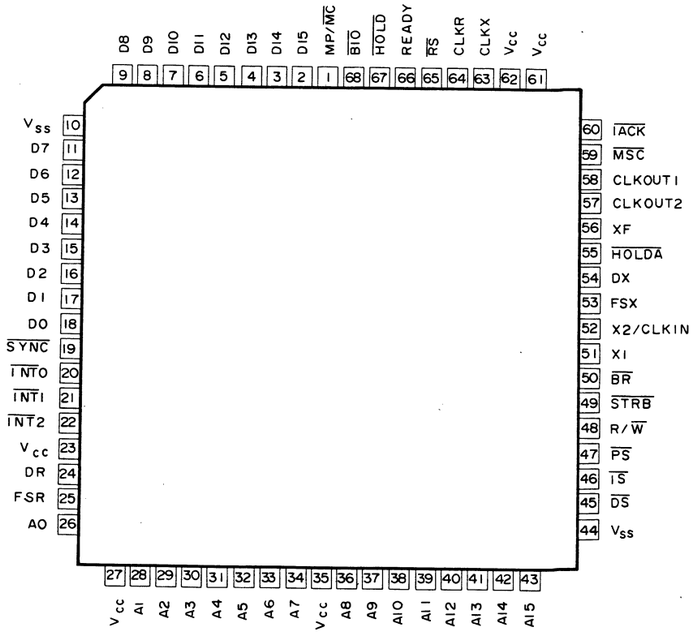

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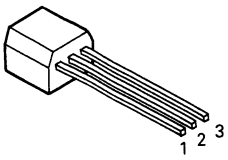

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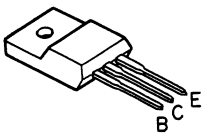
1. REFERENCE
2. ANODE
3. CATHODE



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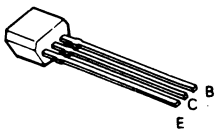

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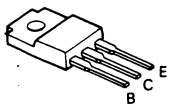

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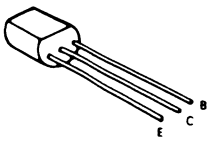

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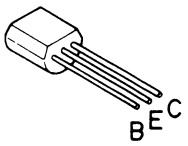

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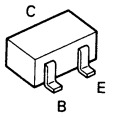

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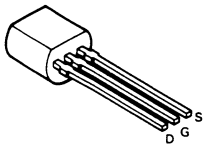

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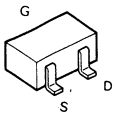

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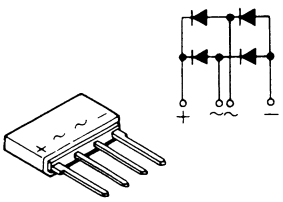

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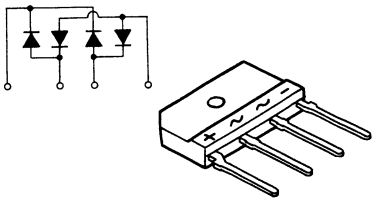

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