

JX-3P (PG-200) SERVICE NOTES

First Edition

SPECIFICATIONS

JX-3P

Keyboard:

61 keys, 5 octaves, C scale

Power consumption:

20 W

Dimensions:

912(W) x 325(D) x 115(H)mm

37-7/8(W) x 12-13/16(D) x 4-1/2(H)in.

Weight:

1.4 kg, 3 lb. 9 oz.

PG-200

Dimensions:

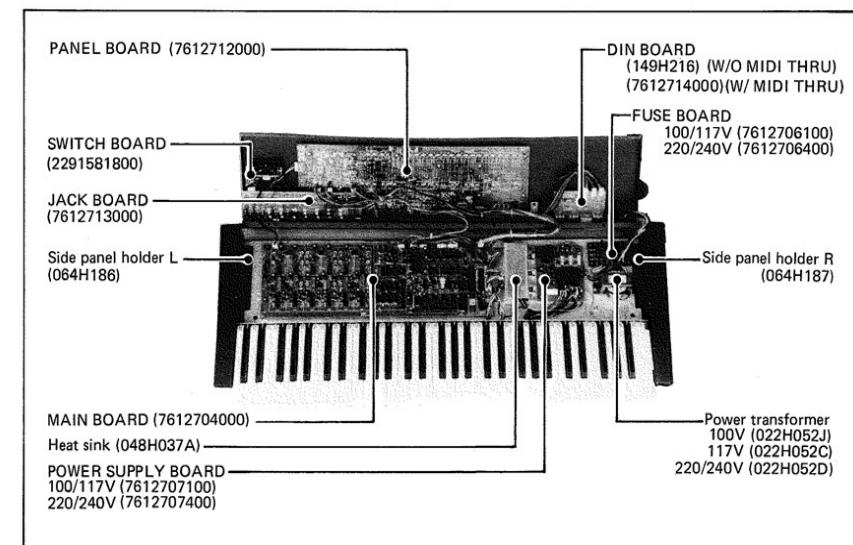
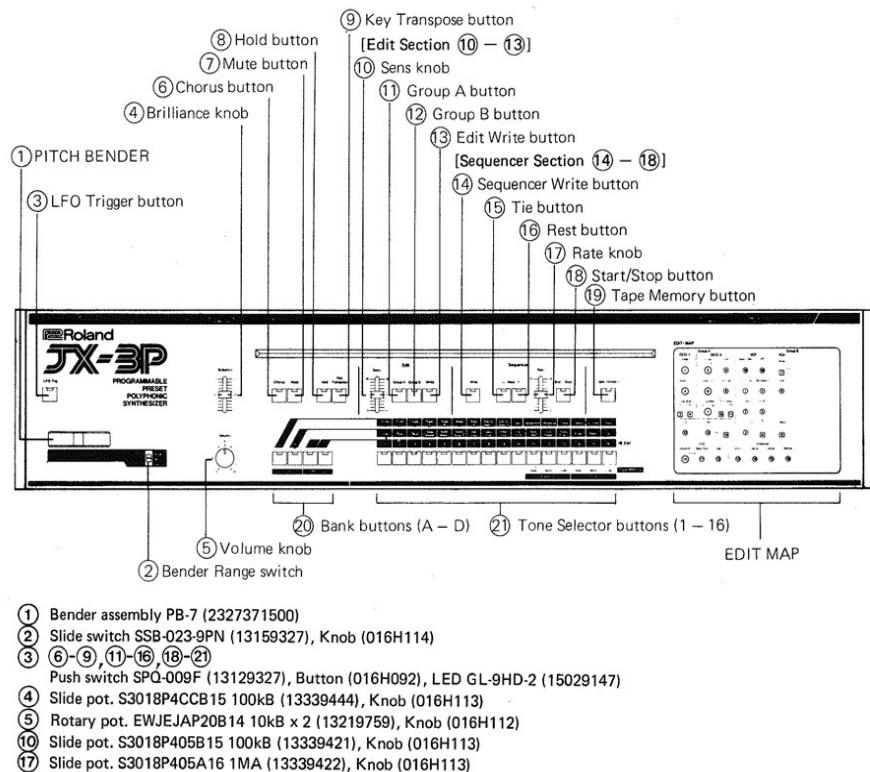
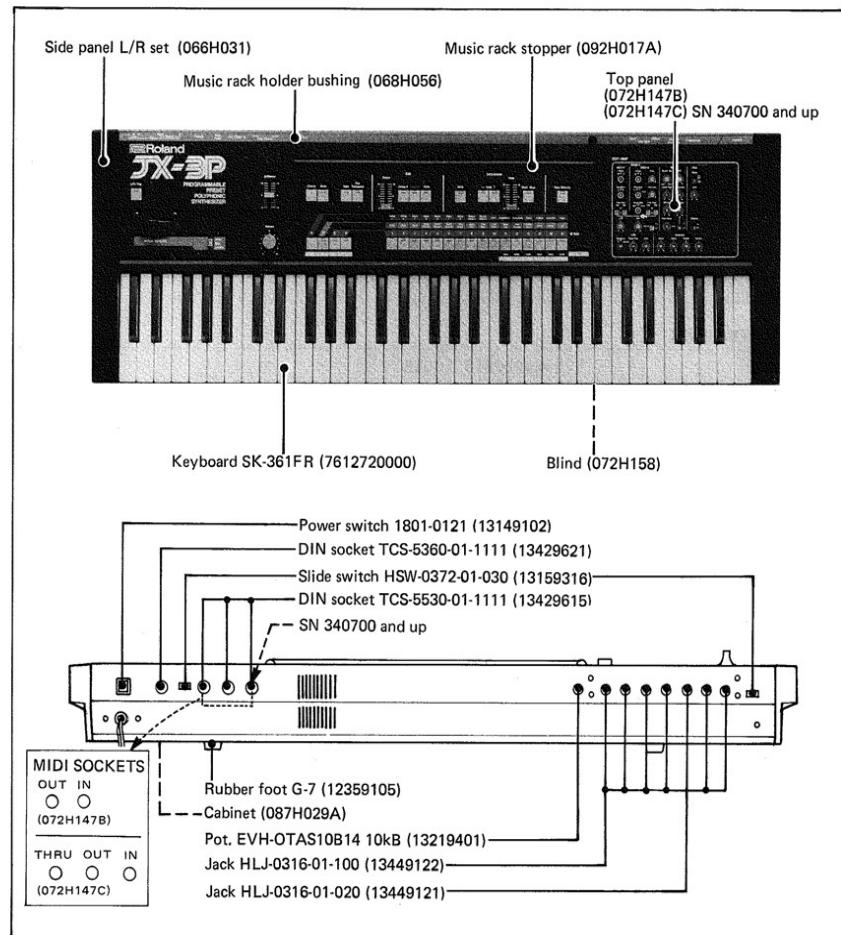
244(W) x 172(D) x 1-3/4(H)mm.

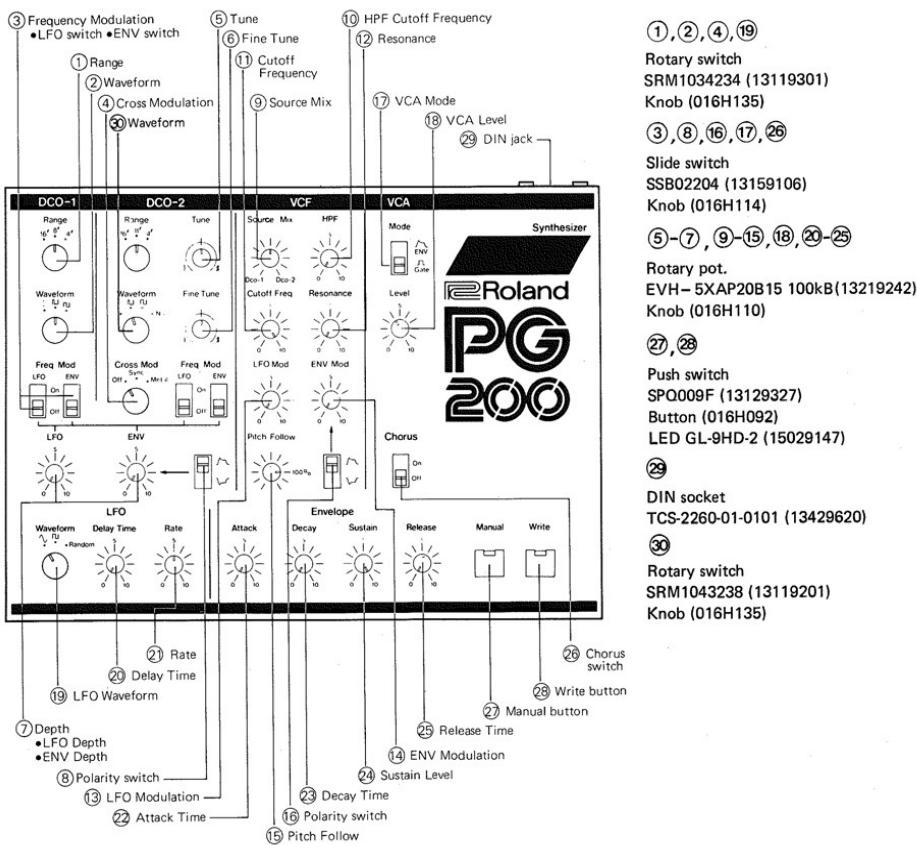
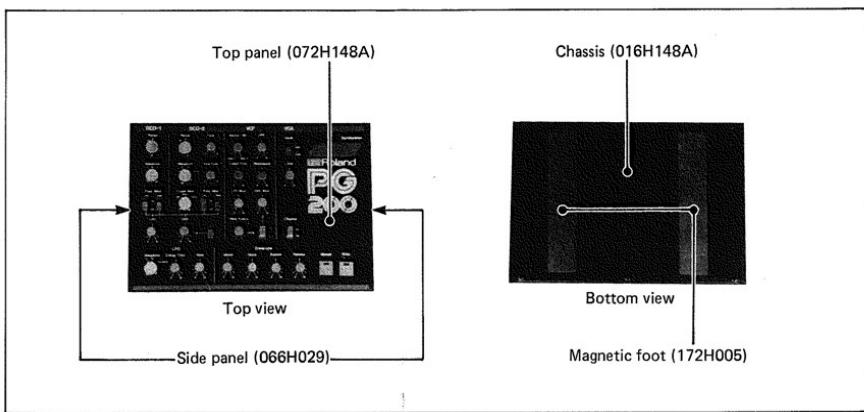
9-5/8(W) x 6-3/4(D) x 1-3/4(H)in.

Weight:

1.4 kg, 3 lb. 9 oz.

JX-3P



PG-200**PARTS LIST****■ PG-200****CASE**

072H148A	Top panel
016H148A	Chassis
066H029	Side panel
172H005	Magnetic foot
066H032	Hard case

KNOB, BUTTON

016H110	Knob	Rotary pot
016H135	Knob	Rotary switch
016H114	Knob	Slide switch
016H092	Button	Push switch

SWITCH

13159106	SSB02204	Slide
13119201	SRM1043238	Rotary, DCO-2
13119301	SRM1034234	Waveform
13129327	SPQ009F	Rotary Push

DIN SOCKET

13429620	TCS-2260-01-0101	6p
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DIN CORD

053H192	6p, 650mm
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PCB

7932803000	CONTROL BOARD (legend 149H217) (pcb 052H444B)
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POTENTIOMETER

13219242	EVH5XAP20B15 100kB
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IC

15179150	M5L8048P-67	CPU WITH PROGRAMMABLE ROM
15159112H0	HD14049UBP	HEX BUFFER
15159113H0	HD14051BP	ANALOG MULTIPLEXER/
		DEMULTIPLEXER
15189118	TL082 BiFET	OP AMP

15189111	NJM311	COMPARATOR
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TRANSISTOR

15119106	2SA733-Q
15129108	2SC945-Q
15129816	2SD880-Y

DIODE

15019103	1S2473
15019613	05Z5.6
15029147	GL-9HD-2

Zener
LED**RESONATOR**

12389800	KMFC1005T1 6MHz	Ceramic
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RESISTOR ARRAY

13919310	RM-8-103 10k x 8
13919118	RK600601611

R-2R,D/A

JX-3P**KEYBOARD**

7612720000 SK-361FR

CASE

072H147B	Top panel
072H147C	Top panel (SN340700-up with MIDI THRU socket hole)
072H158	Blind
066H031	Side panel (L/R set)
064H186	Side panel holder L
064H187	Side panel holder R
087H029A	Cabinet
12359105	Rubber foot G-7
092H011	Music rack
092H017A	Music rack stopper
068H056	Music rack holder bushing
064H188	Music rack holder

KNOB BUTTON

016H112	Knob	Rotary pot
016H113	Knob	Slide pot
016H114	Knob	Slide switch
016H092	Button	Push switch

SWITCH

13149102	1801-0121	Power
13159316	HSW-0372-01-030	Slide, Output, Ext select
13159327	SSB-023-9PN	Slide, Bender
13129327	SPQ-009F	Push

JACK

13449121	HLJ-0316-01-020	Stereo, Phones
13449122	HLJ-0316-01-100	Mono

DIN SOCKET

13429615	TCS-5350-01-1111	5p, MIDI
13429621	TCS-5360-01-1111	6p, PG-200

BENDER ASSEMBLY

2327371500 PB-7

POWER TRANSFORMER

022H052J	100V
022H052C	117V
022H052D	220/240V

COIL

12449221 40M-067-018 10μH

RESONATOR

12389719 KMFC1007T31 12MHz Ceramic

FUSE

(100/117V) GGS 2A/250V UL, CSA

(220/240V)

12559513 CEE T1A 1A/250V timelag
12559514 CEE T2A 2A/250V timelagPrim.
Sec.

15159104HO HD14011BP

QUAD 2-INPUT NAND GATE

15159128HO HD14050BP

HEX BUFFER

15159113HO HD14051BP

ANALOG MULTIPLEXER/

DEMULTIPLEXER

COMPARATOR

OP AMP

15189111 NJM311

VCA

15189103 NJM4558BP

VCF

15189162 NJM072SP BifET

OP AMP (SINGLE INLINE)

15189144 NJM072DP (DUAL INLINE)

Refer to MAIN BOARD Circuit diagram for change.

BBD DRIVER

TRACKING REGULATOR

VREF REGULATOR

5V 3-TERMINAL REGULATOR

HEAD PHONE AMP

FUSE HOLDER

12199515 TF-758

PCB7612704000 MAIN BOARD (legend 149H213) (pcb 052H440C)
7612712000 PANEL BOARD (legend 149H214) (pcb 052H441C)
7612713000 JACK BOARD (legend 149H215) (pcb 052H442B)
149H216 DIN BOARD (pcb 052H451A)
7612714000 DIN BOARD (legend 149H216) (pcb 2291581501)
with MIDI THRU socket
SN340700-up
Though electrically compatible, both PCBs
require different top panel.

(No P. No.) SWITCH BOARD (less parts)

(pcb 052H463 or 2291581800)

7612706100 FUSE BOARD 100/117V (pcb 052H414A)

7612706400 FUSE BOARD 220/240V (pcb 052H414A)

7612707100 POWER SUPPLY BOARD 100/117V

(legend 146H107) (pcb 052H443B)

7612707400 POWER SUPPLY BOARD 220/240V

(legend 146H108) (pcb 052H443B)

POTENTIOMETER

(Rotary)

13219759 EWJEJAP20B14 10kB x 2 Volume

13219401 EVHOTAS10B14 10kB Tune

(Slide)

13339421 S3018P405B15 100kB Edit Sens

13339422 S3018P405A16 1mA Sequencer Rate

13339444 S3018P4CCB15 100kB Brilliance

(Trimmer)

13299134 RVF8P01502 5kB

13299135 RVF8P01103 10kB

13299136 RVF8P01503 50kB

IC

15179142 i8031 or i8051 CPU

15179110 M5L8253P-5 PROGRAMMABLE COUNTER

15179624 MBM2764-30 (EPROM) or 8K BYTE PROM
TMM2365P-624 (MASK ROM) Compatible

15179317 TC5517APL 2K BYTE CMOS RAM

15159503 TC40H000P QUAD 2-INPUT NAND GATE

15159511 TC40H174P HEX D-TYPE FLIP-FLOP

15159524 TC40H245P 8 BIDIRECT BUS BUFFER

15169301HO HD74LS00P NONINVERT 3-STATE

15169304HO HD74LS04P QUAD 2-INPUT OR GATE

15169339HO HD74LS32P BCD TO DECIMAL DECODER

15169310HO HD74LS42P 3 TO 8 DEMULTIPLEXER

15169318HO HD74LS138P 4-BIT BINARY COUNTER

15169321HO HD74LS161P HEX D FLIP-FLOP

15169322HO HD74LS174P OCTAL 3-STATE D-LATCH

15169358 HO74LS373P

15189111 NJM311

OP AMP

15189103 NJM4558BP

VCA

15189162 NJM072SP BifET

OP AMP (SINGLE INLINE)

15189144 NJM072DP (DUAL INLINE)

Refer to MAIN BOARD Circuit diagram for change.

VCF

15229803 BA662B

BBD DRIVER

15229801 IR3109

TRACKING REGULATOR

15219203 MN3009

VREF REGULATOR

15169504 MN3101

5V 3-TERMINAL REGULATOR

15119117 M5230L

HEAD PHONE AMP

15199123 M5231L

LI battery

15199106 μPC7805

28pin IC socket

M5218L

15189136 M5218L

HEAD PHONE AMP

PHOTO COUPLER

15229712 PC-900

TRANSISTOR

15119106 2SA733-Q

use one

15129108 2SC945-Q

color in

15129108A 2SC945-Q selected for noise

151291070G 2SC945-Q

a unit

151291070H 2SC945-Q }

RED

151291070I 2SC945-Q }

ORN

15129136 2SC2878A

YEL

15119802 2SB596-Y

GRN

15129816 2SD880-Y

15139103 2SK30A-GR FET

DIODE

15029147 GL-9HD-2 LED

15019103 1S2473

Rectifier bridge

15019201 1N4002

Rectifier bridge

15019236 W-02 Zener

Zener

15019612 05Z-5.1

POSISTOR

15229909 ERSB33G561

CAPACITOR (polystyrene)

13569901 CQ09S2B47R00J05 47pF

13569167 CQ09S1H100R0J05 100pF

RESISTOR ARRAY

13919301 RM-8-472 4.7k x 8

13919310 RM-8-103 10k x 8

13919311 RM-8-223 22k x 8

R-2R , D/A

13919118 RK600601611

OTHERS

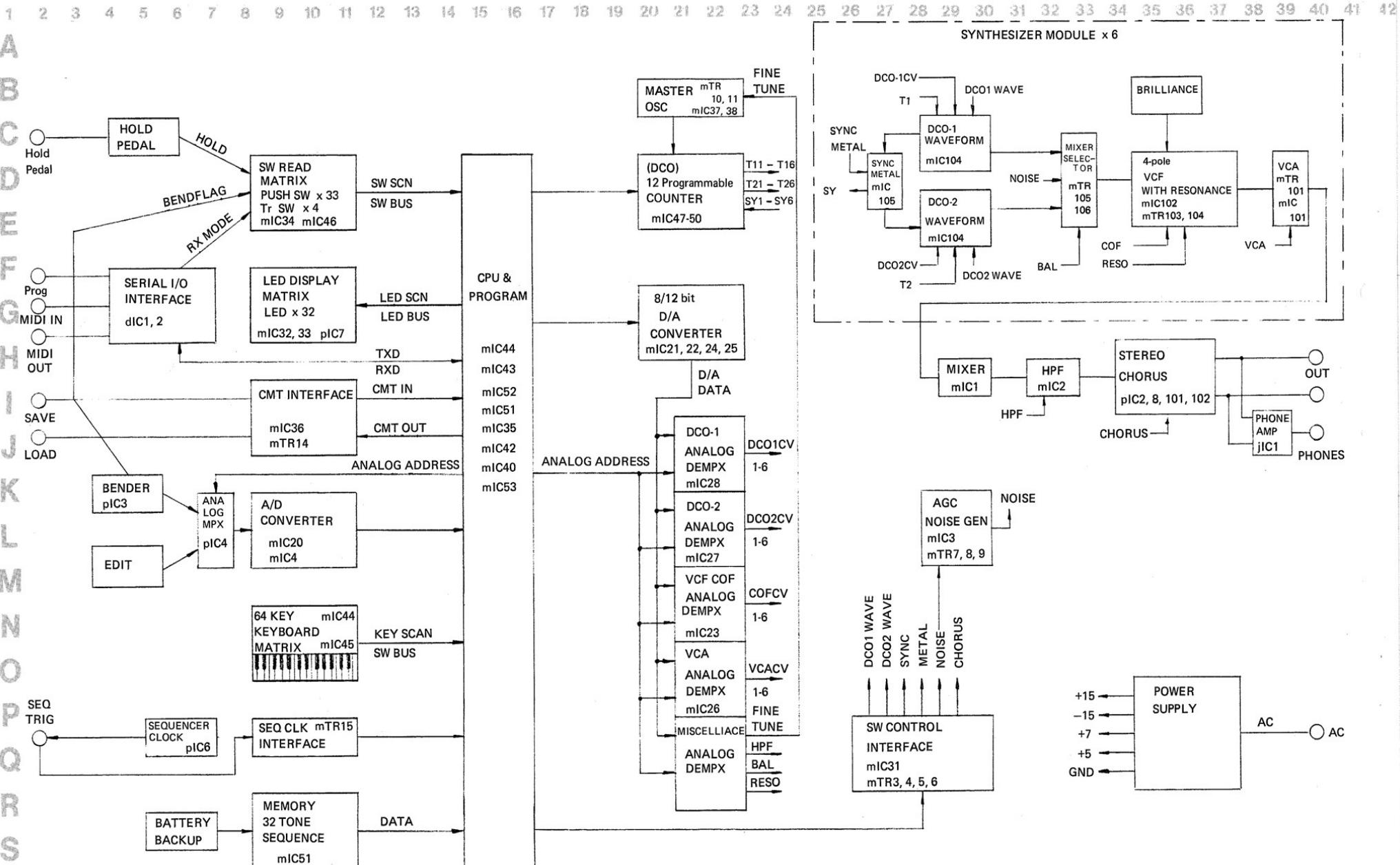
048H037A Heat sink

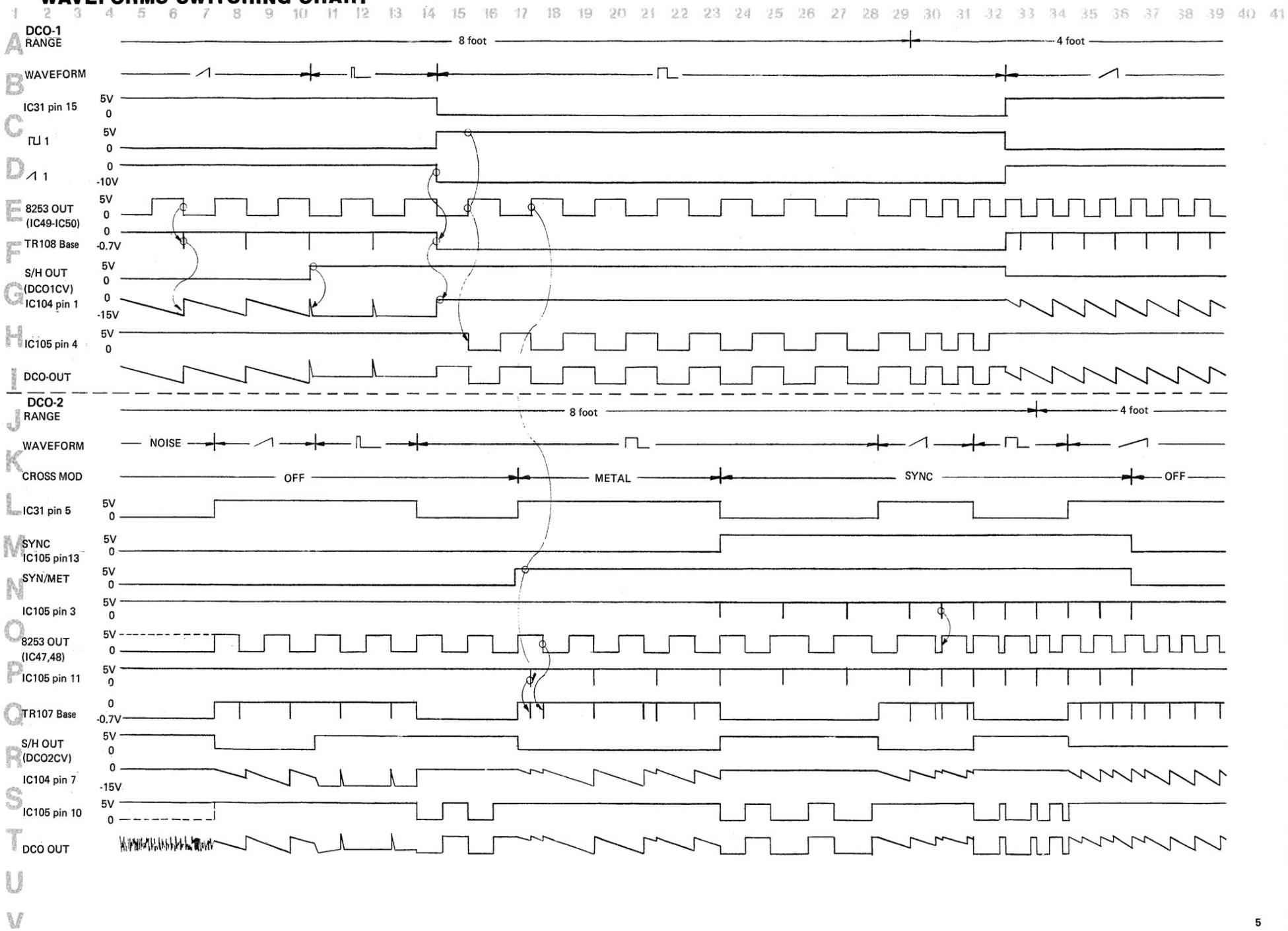
12569111 CR-1/3N

Li battery

13429520 IC-99-24#2

JX-3P BLOCK DIAGRAM



WAVEFORMS SWITCHING CHART

JX-3P CIRCUIT DESCRIPTIONS

CPU

The JX-3P is a 6-voice (12 VCOs) polyphonic synthesizer consisting of devices centering around the CPU.

In the following description, each part will have a number with a letter prefix as an identification to show the board on which it is installed:

m = Main Board, p = Panel Board, j = Jack Board, d = DIN Board, and s = Power Board.

CPU and its peripherals

CPU (mIC44) is either 8031 or 8051. Though 8051 has an internal programmable ROM, JX-3P makes no use of it at all, making both CPUs compatible with each other. Programs are all stored in mIC52 (2764), P-ROM. As an external RAM, mIC51 (TC5517APL) is employed.

Since the data of different timbres and sequence patterns are all stored in the RAM, it is accompanied with a lithium battery as back-up. Memory protection is achieved by gating the line WR. Some of the RAM memories are outside the protection coverage since they are used for data scratch-pad. mIC43 (LS373) is the device for address latching off the data bus.

Program Steps

The CPU cycles steps 1 to 6 within approx. 10mS in consecutive order in time as follows:

1. Read the current state of the keyboard.
2. Refresh the Envelope and LFO data.
3. Read the current state of the panel switches.
4. Read the voltages from Bender and EDIT.
5. Write the control voltage data into DCO, VCF, VCA.
6. Write the note data into the programmable counter in DCO section.

The program interrupts itself to perform extra steps as needed:

7. Access to TAPE for saving or loading a memory.
8. Read Serial Input (MIDI or Programmer PG-200).
9. Drive LED.

READING THE KEYBOARD AND THE SWITCHES

Reading of the keyboard and the panel switches are conducted through the matrixes.

Reading the Keyboard

The keyboard bus is divided into 8 sections with 8 notes per bus section (except the highest bus -- only 5 notes).

The CPU puts one of the buses low through decoder mIC45. On/off of the notes are read by the CPU through mIC46 buffer. This is repeated 8 times, one for each bus section in turn. Once the CPU has accepted and understood a keypress, it immediately scans over 6 modules (channels) to find out the most suitable module to be assigned to that key. Assigned module is not disengaged from the key even the key has been released. The module is kept assigned until it is stolen by a new key.

Reading the Panel Controls

The same as with the Keyboard. The state of Panel switches can be read through the matrix of 5 x 8 and through mIC34 Decoder and mIC46. Some switches are connected to the matrix through transistor (mTR10, 12, 13, 14, 23) and diode. Of these, TR13 informs the CPU the position of Bender lever, that is, polarity of bender control voltage. (Detailed under Bender Interface.)

Bender and EDIT

On the Panel Board, Bender and EDIT signals undergo selection through pIC4 multiplexer, then the signal selected is fed to the A/D converter. A/D conversion is achieved through software in the form of successive-approximation using a D/A converter mIC22, 24, 25 and a comparator mIC20 (D/A and comparator will be discussed later).

Bender Interface

Bender output can vary from negative to positive, exceeding the coverage range of A/D converter -- 0 to +5V. Thus the Bender voltage is read in two ways:

Polarity - through pD50, pTR13 and switch matrix.
Absolute value (positive) - negative voltage is inverted at pIC3 whose pin 3 being shorted to ground through conducting FET switch pTR11. pIC3 output is voltage divided to fall within 0 to 5V.

DATA OUTPUT

Data Distribution

Having obtained various data concerning a note being or to be generated, from RAM, Keyboard, CMT, Panel Controls, Serial Input, Bender, EDIT, HOLD, etc., the CPU delivers processed data, in digital format, through three routes, to JX-3P sound processing stages.

- * To Programmable Counters -- note information
- * To D/A Converter (DCO, VCF, VCA, etc.) -- tone parameters
- * To switch Control Interface (DCO, VCF, NOISE, CHORUS) -- function selection information

DCO (Digital Controlled Oscillator)

Master Oscillator

mTR10(11) generate a frequency of approx. 6MHz. Master Tune (DCO-1 and DCO-2) and Fine Tune(DCO-2) are achieved by changing the bias at these transistors. The master oscillation is divided by either 1/2, 1/4 or 1/8 at mIC37(IC38) which in turn receives footage selection data from the CPU through mIC39. This will give the programmable counters the greater frequency resolution capabilities (16 bits + 2 bits).

Programmable Counters

Programmable counter 8253 containing three 16-bit counters is capable of dividing high frequency signals. Assume that the master oscillator runs at 6MHz and divisor is 6000, the counter develops 1kHz rectangular signals.

Besides keyboard note information, divisor signal contains the following:

- For DCO-1 -- LFO, ADSR and BENDER
For DCO-2 -- Above plus TUNING

This is a feature distinguishable from the conventional design using this type of generator.

In SYNC mode, pulses from DCO-1 are applied to the gate of mated counter in DCO-2 section as RESET pulses.

D/A & S/H

Parameters that determine the timbre of audio signal flowing from Programmable Counter to Synthesizer module are converted into analog equivalent (0 to 4.7V) through D/A Converter consisting of mIC21, 22, 25, R-2R ladder resistors RA1 and RA2 and mIC24. Buffers (mIC21) in MSB 2 bit lines significantly reduce the effects of output impedances of mIC22, 25.

The D/Aed parameters are then applied commonly to Demultiplexers mIC23,

26, 27 and 28 are sampled into correct channel in individual stages. Detailed parameters not shown in the Block Diagram are as follows:

DCO CV - KCV, LFO, ADSR, BENDER
VCF CV -- KCV, ADSR, CUTOFF, LFO
VCA CV -- ADSR, LEVEL, MUTE

NOTES:

To accomodate negative going VCF CV (inverted at mIC24), -5V bias is applied to pin 7 of mIC23 as well as the remaining DMUX (having no ill affection to them). They can swing $\pm 5V$.

ADSR and LFO are software-generated in the computer.

D/A system is introduced into A/D conversion when BENDER or EDIT control is applied to comparator mIC20.

Switch Control Interface

ON or OFF and selection between circuit functions in the Modules and successive stages are performed by electronic switches named as DCO WAVEFORM, SYNC, METAL, NOISE and CHORUS. Switch Control signals from Latch mIC31 are fed to switch gears either directly or through Level controllers. NOISE ON signal is also routed to pin 1 of mIC37 to block DCO-2 master frequency.

Waveform Conversion

Output from Programmable Counter 8253 is a rectangular. So there is a need to convert it to sawtooth when mTR4 is ON. The conversion is carried out on the constant-current integrating-circuit (C115) making use of mIC104. Current flowing into C115 is determined by the output from the S/H circuit of DCO CV. Pulse at mTR108 base (differentiated mIC50 output) discharges C115 at the rectangular rate.

As already mentioned, DCO CV contains amounts of ADSR, LFO, RANGE etc. controls whatever relating to note pitch, which keeps the sawtooth amplitude constant over the frequency range.

The CPU will add a bias to DCO CV to excessively increase charging current when the program needs a pulse-like sawtooth.

When rectangular is selected, it is allowed to pass NAND gate mIC105, while mTR108 is kept conducting by Switch Interface to bypass charging current into C115.

NOTE: with sawtooth selected pin 4 of NAND mIC105 stays high (+5V).

SYNC

With positive voltages at pins 1 and 13, mIC105 develops and applies reset pulses to DCO-2 programmable counter and to TR107 base at a DCO-1 rate.

METAL

METAL being selected, DCO-2 programmable counter does not sync to DCO-1 and its output cannot gate through mIC105. Then mTR107 is clocked on every negative edge of both DCO-1 and 2 rectangualars. This gives DCO-2 sawtooth waveform a quite interesting tone characteristics -- something like what ring modulation offers.

VCF

This is a 4-pole LPF composed of mIC102 and associated components. Feedback amount and the amplitude of resonance is controlled by mTR103, 104 which can transfer signal in both directions. Width control seems to be unnecessary and is omitted in this application. Control voltage at pin 9 of mIC102 is a negative going (inverted at mIC24) and a combination of KCV, CUTOFF, LFO and ADSR controls.

VCA

mTR101 serves as voltage controlled resistor. The internal resistance varies according to VCA CV - a sum of LEVEL, ADSR, LFO and MUTE amounts - with the minimum forward bias voltage maintained by the CPU.

CHORUS

BBD driver pIC102, pTR101, 102, 103 and associated components make up VCO. The VCO sweeps its frequency between 40K-200kHz as the triangular generating in CHORUS SWEEP (pIC1, 2) changes in amplitude.

CHORUS SWEEP also modulates the BBD in the other channel with the LFO of 180 degrees out-of-phase. Audio signal going into and out of BBD has its higher components rolled off through the 1st (pTR1, 2) and the 2nd (pTR105, 106) filters, both have cutoff frequency at 10kHz. Chorus effect will be disabled when negative voltage is present at D40, pTR5 gate.

CASSETTE INTERFACE

When TAPE button on the panel board is detected as has been pushed down, all routine processes come to be suspended except those data transferring to/from TAPE. Interfacing with the Tape memory is achieved through mIC36 which transmits digital data by FSK method, (1 = approx. 1kHz and 0 = approx. 4kHz) and restores them to digital on reception.

SERIAL I/O INTERFACE

Serial input sources are two: Programmer PG-200 and MIDI. Since only one channel is provided for the CPU, selection between two signals should be made at the change-over switch on the rear panel. By specification, MIDI circuit is a current loop type. In TX mode, current is driven by pTR16. In RX mode, input current is converted into a voltage by dIC2 (PC900), photo-coupler. Signals are then led to the Serial Input selector dIC1.

Input from Programmer is the TTL level. Only step required, in this stage, to process this signal is the voltage inversion by dQ1.

LED

Panel LEDs compose an 8 x 4 matrix with 12 lines connected to either mIC32 or 33.

The program periodically interrupts the CPU routine loop to refresh LED data for dynamic lighting.

SEQUENCER CLOCK GENERATOR

mIC6 is a free running multivibrator and is reset on negative going edge of INT0 from the CPU when START is pressed. At the same time, the CPU also resets the internal sequencer program to the start point and begins the program on the first negative edge of the restarted clock.

JX-3P ADJUSTMENT**Test Mode**

The JX-3P has the built-in test program. When evoked while the unit is in the TEST mode, the program will offer various facilities as listed in the table below.

- While pressing one of 7 TONE SELECTORs (see the table below), turn the power ON.
- (During the user's mode) Depress TAPE MEMORY. While holding down one of the 7 TONE SELECTORs depress TAPE MEMORY again.

When in TEST mode, particular LED(s) stays blinking until further buttons are pressed. (Except TONE 9)

TONE SELECTOR NO. (TEST MODE NO.)	KEY ASSIGN	TONE COLOR	REMARKS
1	Same as in user's mode		Activated channel (s) (module) is indicated by a lighting LED on TONE SELECTOR button:
2	Rotary	Same as in user's mode	
3	Rotary, but from a specified channel	Same as in user's mode	CH-1, 11, CH-2, 12, etc.
4	Same as in 1 except test tone		Two kinds of Test Tones are available: BANK A, TONE 1-8' sawtooth from DCO-1
5	Same as in 2 except test tone		BANK A, TONE 2- resonated 1kHz from VCF
6	Same as in 3 except test tone		
9	Same as in user's mode		BANK and TONE LEDs indicate Program Version.

NOTES:

In TEST mode 3, pressing Sequencer-Note-Rest button will advance a number of channel which is the first to be assigned. Other key assignments are self-explanatory when viewing TONE LEDs. BANK and TONE can freely selected even in the TEST mode.

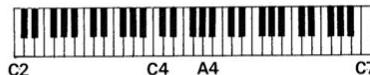
EDIT feature is as effective in the TEST mode as it is in the User's mode.

In the following paragraphs TEST mode, TONE buttons and EDIT often appear as adjustment steps, like below.

- TEST MODE 3** Turn the JX-3P ON while holding down TONE SELECTOR button 3.
- A-2** Select a TONE through BANK A and TONE 2 buttons.
- Group A-15** Depress Group A button, then TONE(EDIT) 15.

Key Designation

In this manual A4 refers to the A key above middle C. i.e. A4 = 442Hz.

**1. Reference Voltage**

- Connect the digital voltmeter between TP9(VREF) and GND on Main board.
- Adjust VR1(VREF) for 4.70V.

2. Master Oscillators

- Connect the tuner or frequency counter to OUTPUT (mono JACK).
- TEST MODE 5**, (A-1) will be set automatically.
- Confirm that TUNE on the rear panel is centered.
- Depress A4 key, and adjust L1 on Main board until the output becomes 442Hz.
- Unplug the meter and plug in the amplifier with speaker or headphones.
- GROUP A-15** (Source Mix) Set Sense to 5 for equal DCO-1 and 2 sounds in level.
- Listening to the two voices, adjust L2 on Main board for zero-beat.
- A-6** (BRASS 1)
- Press SEQUENCER-WRITE. Depress C4 key. Raise Rate to 10.
- Press START/STOP. (C4 note should be heard).
- Set Bend Range to wide.
- Press HOLD. Depress F3 key.
- Move BENDER lever fully to the right, and adjust VR-7 (+BEND) on Panel board so that the two pitches are as in tune as possible.
- Press HOLD, and press it again.
- Depress G4 key.
- Move BENDER lever fully to the left, and adjust VR-8 (-BEND) so that the two pitches are as in tune as possible.

3. D/A Offset

- Connect the scope between TP-7(POLY OUT) and GND on Main board.
- TEST MODE 5**, (A-1) will be set automatically.
- Depress C3 key several times, and find the sawtooth waveform with the lowest amplitude.
- Displaying the waveform on the screen, adjust VR2(DAC OFFSET) on Main board for the maximum amplitude without clip. Waveforms of other channels may be clipped, but this is a sacrifice for stabilizing tone generation in the low end.

4. VCF TUNE

- Connect the scope to TP-7(POLY OUT) on Main board.
(H = 0.1ms/div)
- TEST MODE 8**, (A-2)
- Depress a key (call this key X), and adjust VR1-2(VCF TUNE) on Main board for 1kHz. (One full cycle over the scale).
- Holding down X, depress a key (call this key Y). Waveforms of CH-1 and new channel appear at the same time. Adjust VCF TUNE (VR202-VR606) of the latter channel so that the second waveform is in phase with that of CH-1.
- Repeat the step 4-4 for the remaining channels.

5. VCF RESONANCE

- Connect the scope to TP-7(POLY OUT) on Main board.
- TEST MODE 5**, (A-2)
- Depress a key, and adjust VR-103(RESO) so that the sine wave is 60mVp-p.
- Repeat the step 5-3 for the remaining channels by adjusting RESO (VR203-VR604) of the assigned channel.
- Repeat (4) with other channels, and every time adjust RESO for 60mVp-p.

6. VCA DC BALANCE

- Connect the scope or amplifier with speaker to OUTPUT jack.
- TEST MODE 8**, (A-2 GROUP B-4) (Resonance).
- Set Sense to 0.
- Adjust VR101(DC BAL) on Main board for the minimum transient or thump when a key is depressed.
- Press SEQUENCER-NOTE- to select CH-2, and adjust VR201 for the same as in the step 6-4.
- Repeat for CH-3 to CH-6 (VR301-VR601).

7. BBD BIAS

- TEST MODE 3**, (A-1) will be set automatically.
- Connect the scope to TP-1 on Panel board.
- Press CHORUS.
- Depress 3 keys with HOLD ON.
- Adjust VR-8(BBD BIAS) on Panel board so that the positive and negative peaks of the 3 waveforms are almost equally clipped.
- Reconnect the scope to TP-2, and adjust VR-9 in the same manner as in 7-5.

8. Bender

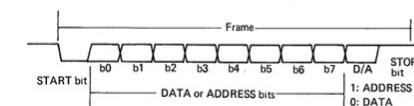
This adjustment can be done in User's mode with audio method.

PG-200**CIRCUIT DESCRIPTIONS****DATA TRANSMISSION**

The CPU IC1 continuously reads the controls (pots and switches) on the PG-200 Programmer. The CPU compares the reading data with the previous ones and transmits the latest data immediately only after a discrepancy occurs.

The CPU transmits the data stream in serial format with an Asynchronous method called Start-Stop system which is handled through software rather than UART.

The unit of information is transmitted either as two frame chain (Pot information) or three chain (Switch information).

**Pot Information**

First frame -- Pot designation (address)

Second frame - Control voltage data from the pot

Switch Information

Since each switch requires only 1 or 2 bits to represent the state, the switches in a CPU port line such as P10 are grouped and sent together with the same address assigned. To distinguish a particular switch to be transferred, a second frame is interleaved with Address and Data frames.

First frame -- Switch group designation (address)

Second frame - MASK (logical): Bits except for the switch to be transmitted are blanked out (0).

Third frame -- Switches status data in the group. The JX-3P recognizes only the bit that has not been masked in the seond frame.

B	I	T	S
7	6	5	4
1	0	0	1
1	0	0	1

The previous scan data
Scan data

* --- Bit 2 changed from 0 to 1, transmission starts.

1st frame (address)	0	0	0	0	0	0	x	x
2nd frame (mask)	0	0	0	0	0	0	1	0
3rd frame (data)	1	0	0	1	1	0	1	1

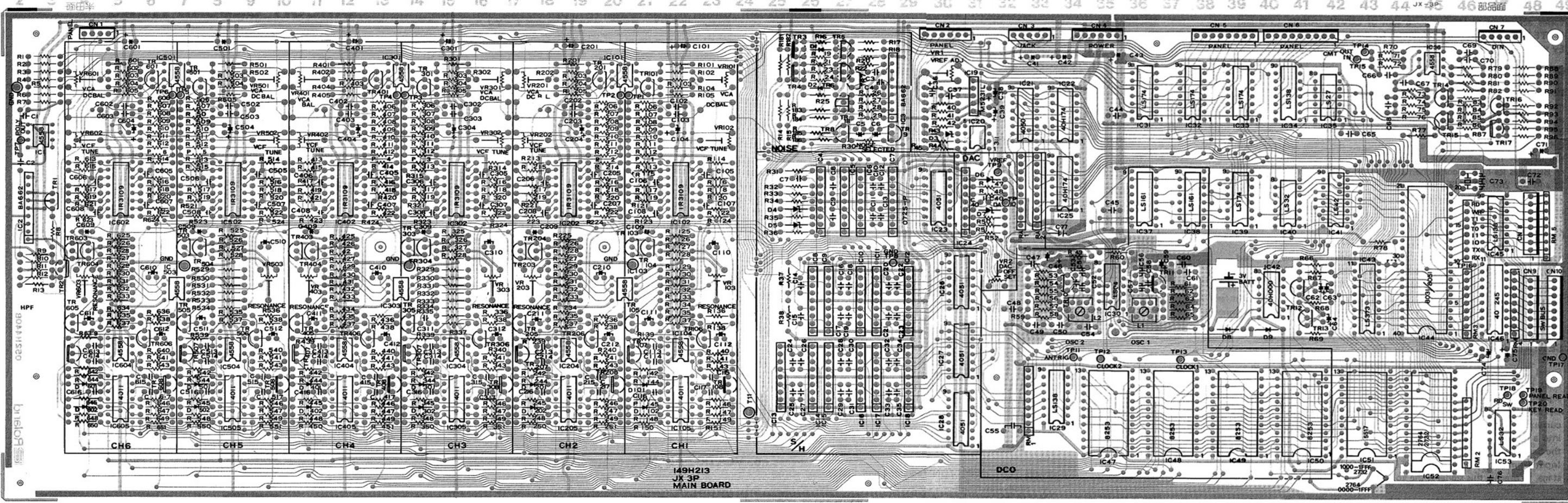
The next scan data change	0	0	0	1	1	0	1	1
*	*	*	*	*	*	*	*	*

* --- Bit 7 changed from 1 to 0, transmission starts.

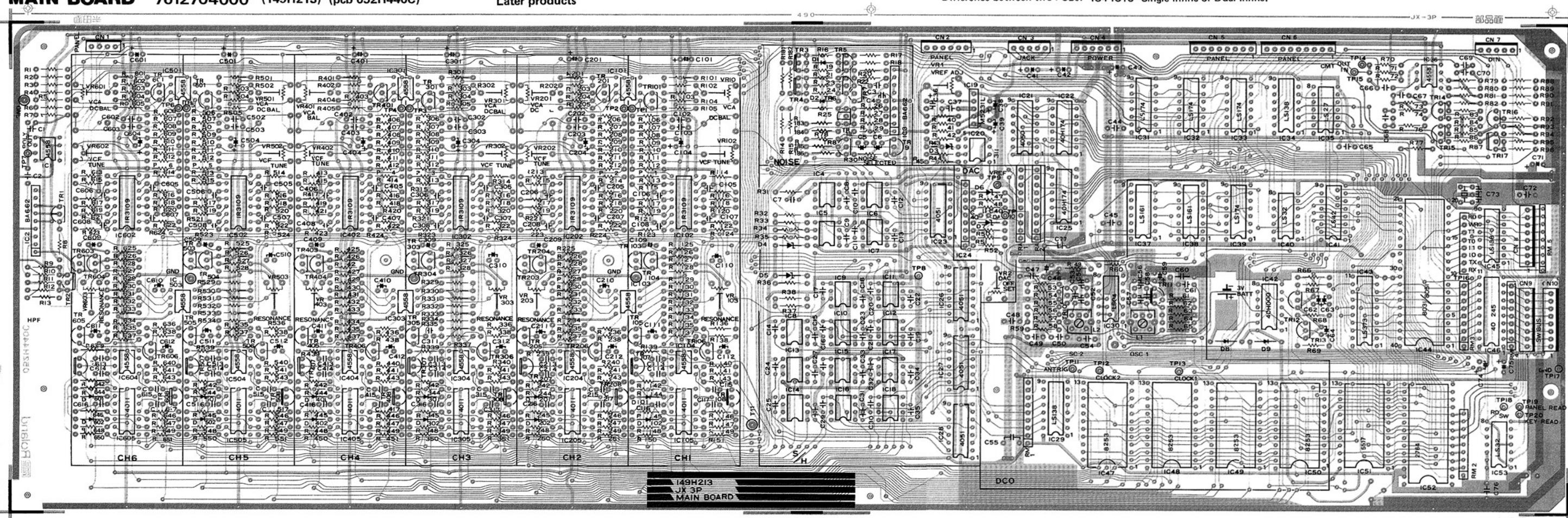
1st frame (address, unchanged)	0	0	0	0	0	0	x	x
2nd frame	1	0	0	0	0	0	0	0
3rd frame	0	0	0	1	1	0	1	1

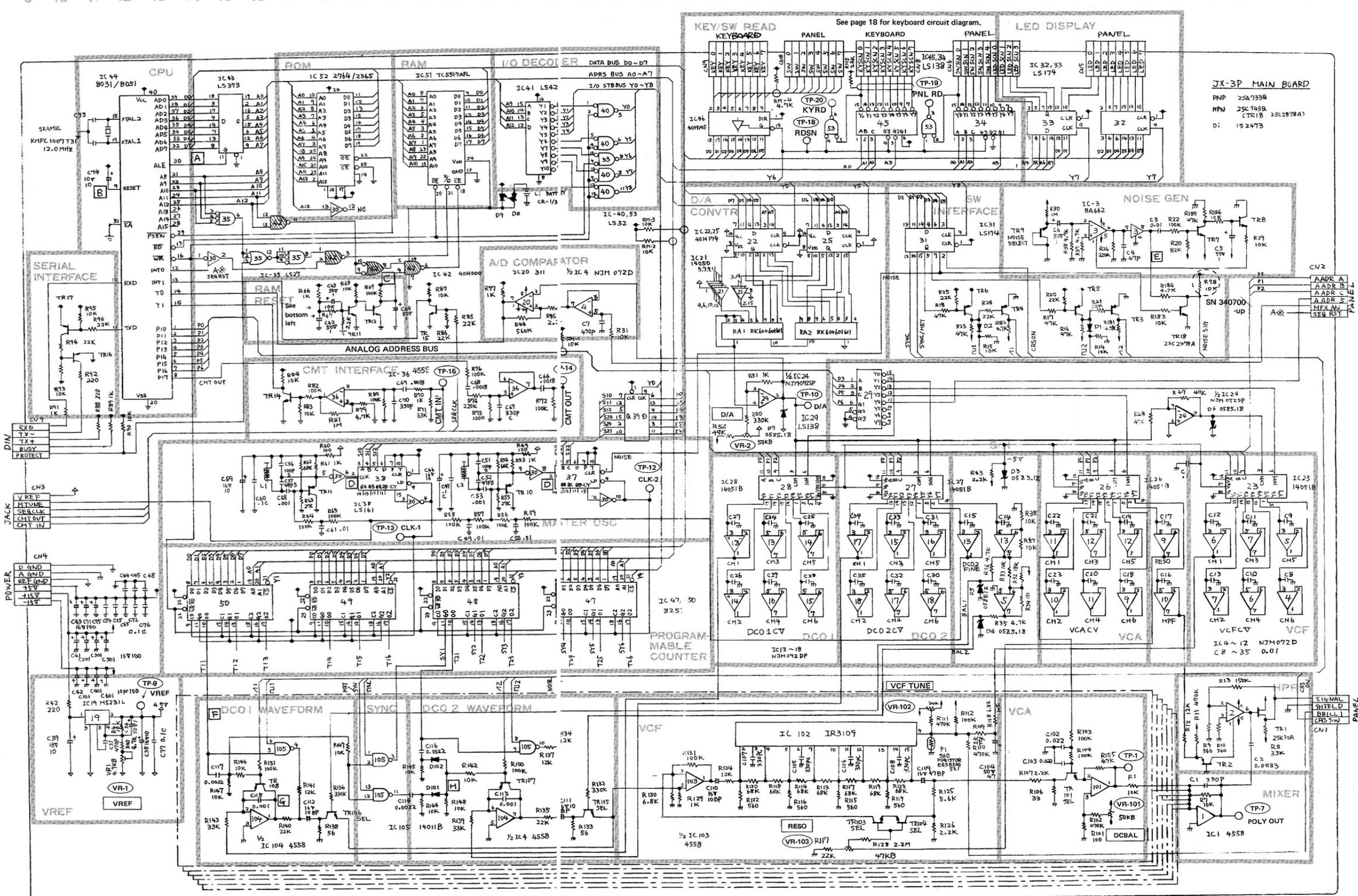
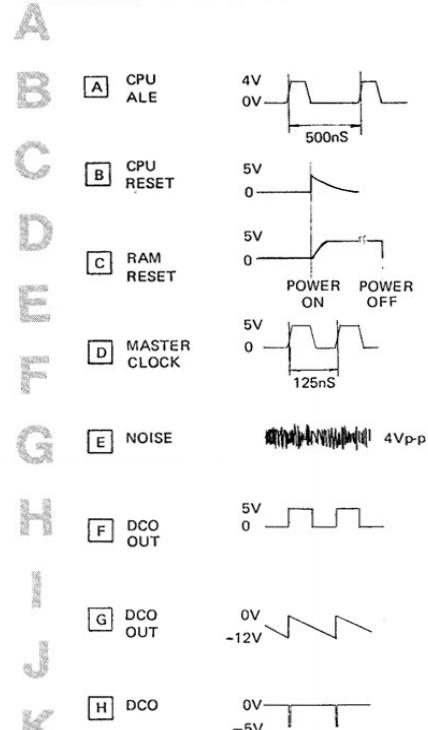
MAIN BOARD (149H213) (pcb 052H440B)

Early products

**MAIN BOARD 7612704000 (149H213) (pcb 052H440C)**

Later products



MAIN BOARD**IC CHANGES**

IC procure problems force the factory to employ equivalent on Main board:

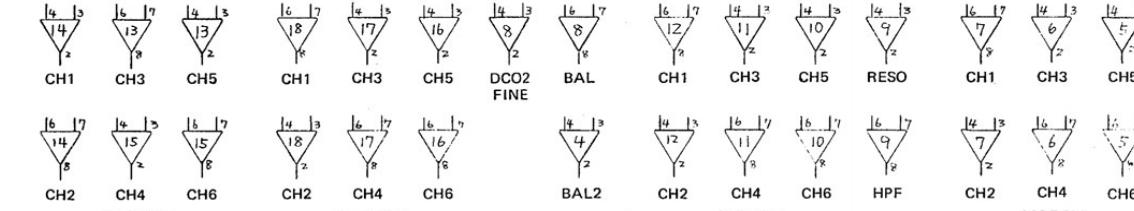
IC4-IC18 - from single inline to dual inline with affected PCB foil patterns relaid out.

Single inline	Dual inline	Remark
NJM072S	NJM072D	As produced
NJM072SP	NJM072DP	Selected, low offset

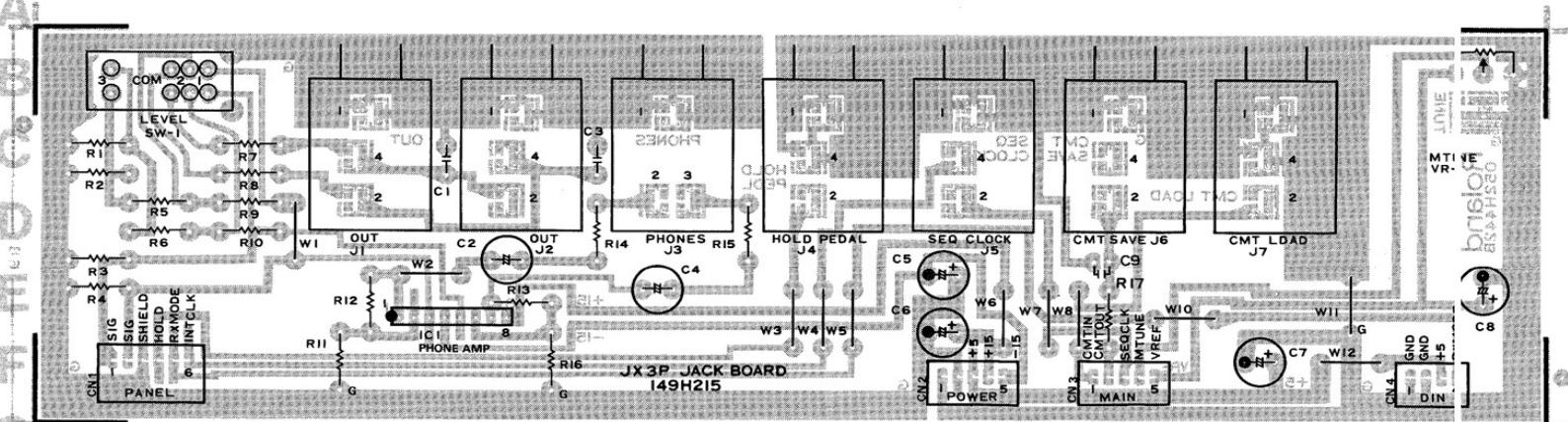
NOTE:
Low offset ICs can replace non-selected ones, single, dual, respectively.

Other brands or makes can be mounted at the factory. In ordering ICs not mentioned above, fill the order sheet with IC number, full name and mark (color), if any, whatever considered useful to identify the IC.

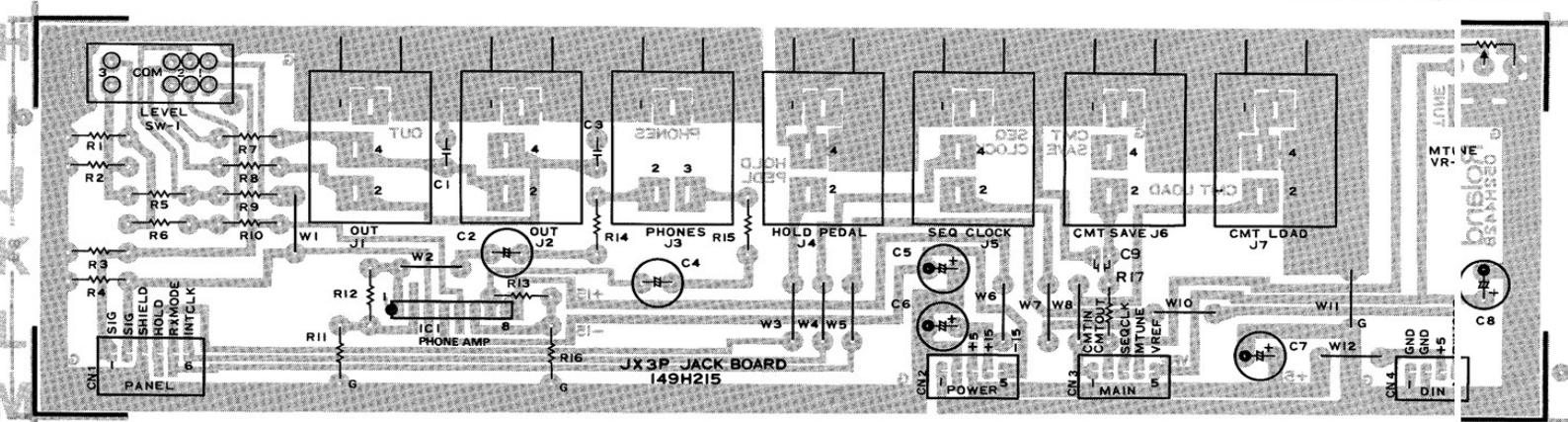
RIGHT
Single inline
ICs Arrangement



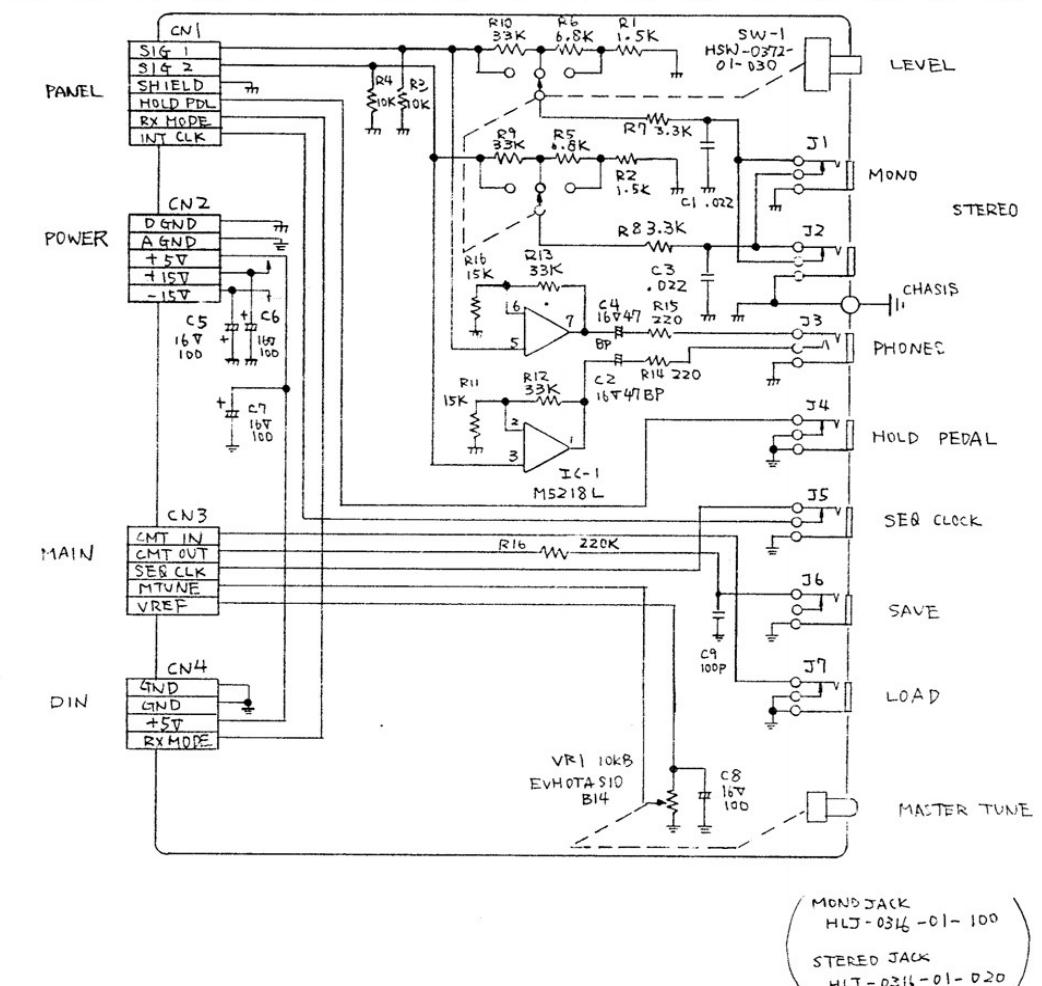
IC4-IC12
NJM072S

JACK BOARD 7612713000 (149H215) (pcb 052H442B)

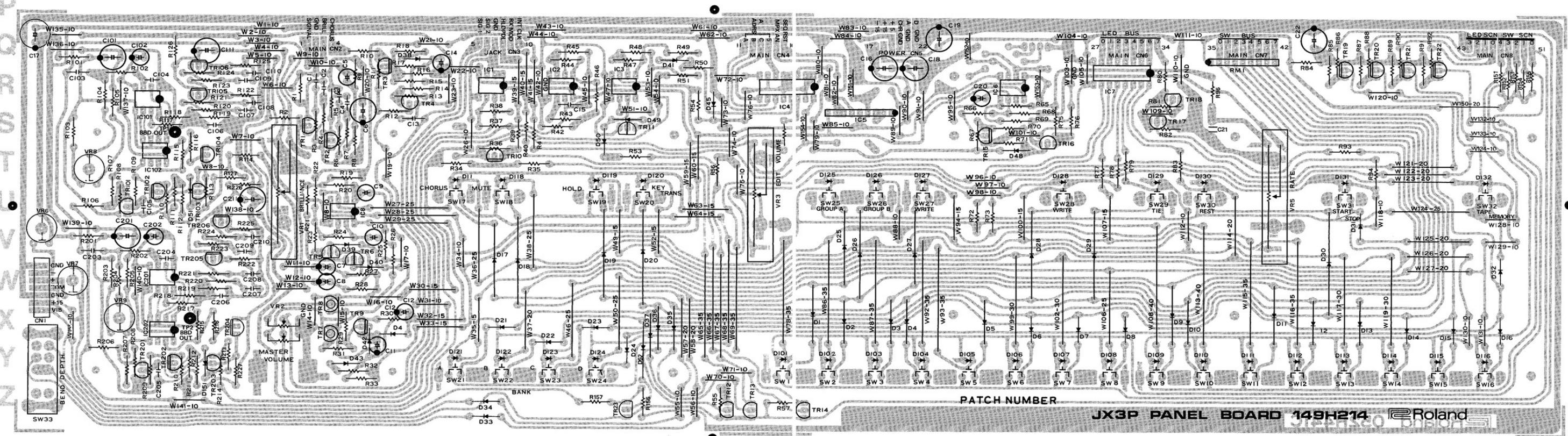
View from component side



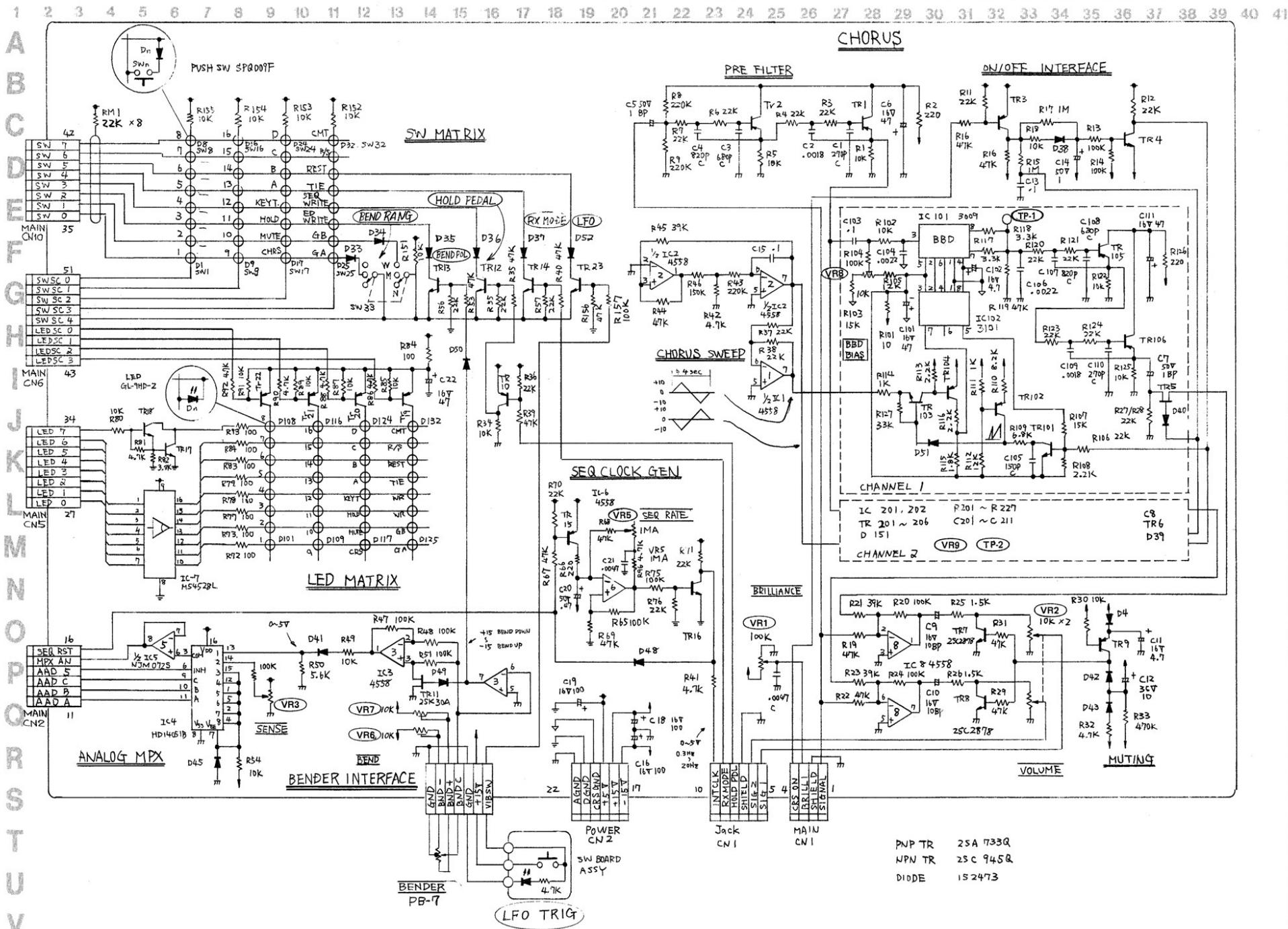
View from foil side



(MONO JACK
HLJ-034-01-100
STEREO JACK
HLJ-034-01-020)

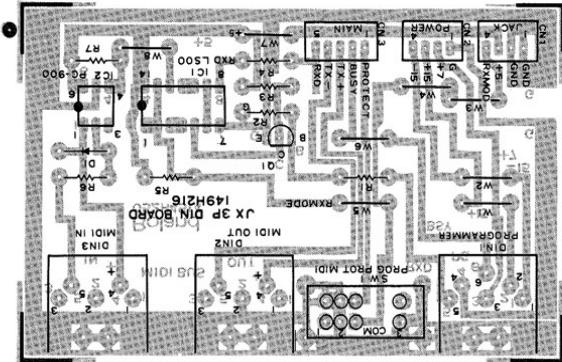
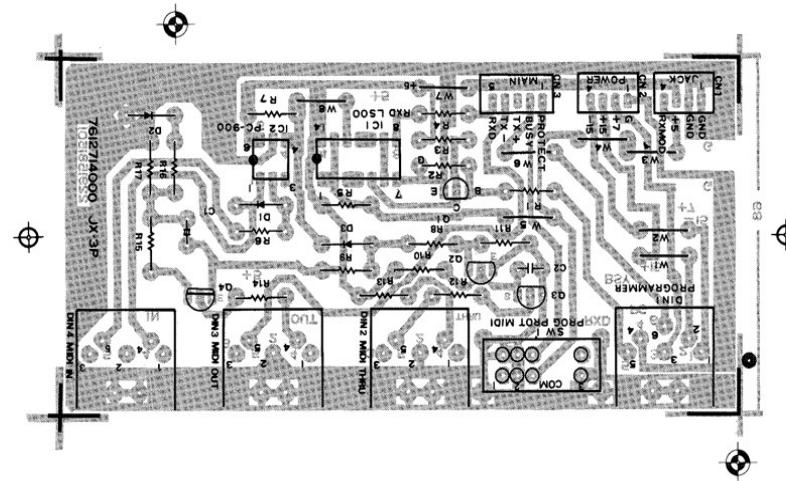
PANEL BOARD 7612712000 (149H214) (pcb 052H441C)

JX3P PANEL BOARD 149H214 Roland

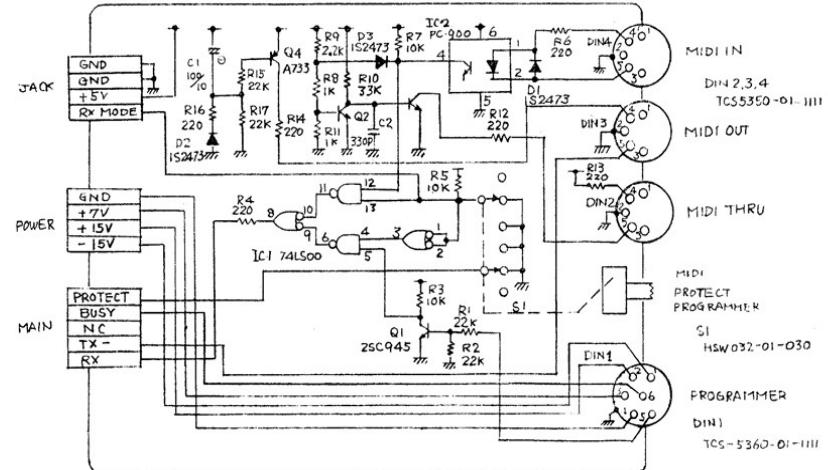
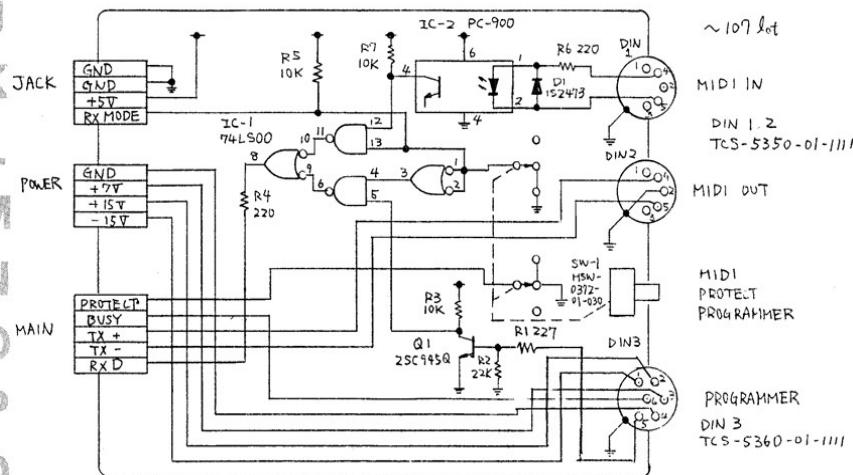


DIN BOARD (149H216) (pcb 052H451A)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U**SN 340700 and up**
DIN BOARD 7612714000 (pcb 2291581501)

Although both PCBs are compatible, substituting new PCB to old one needs Top panel replacement.



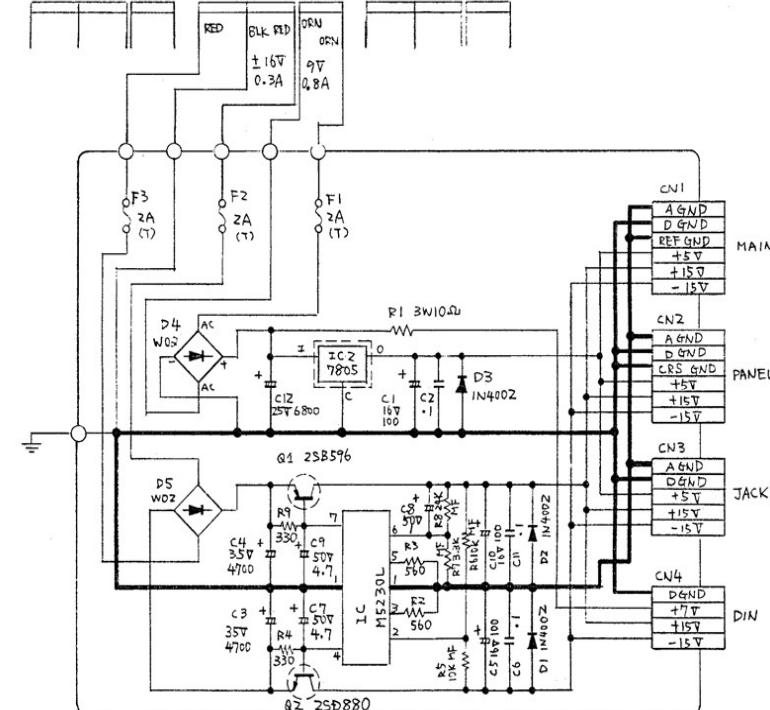
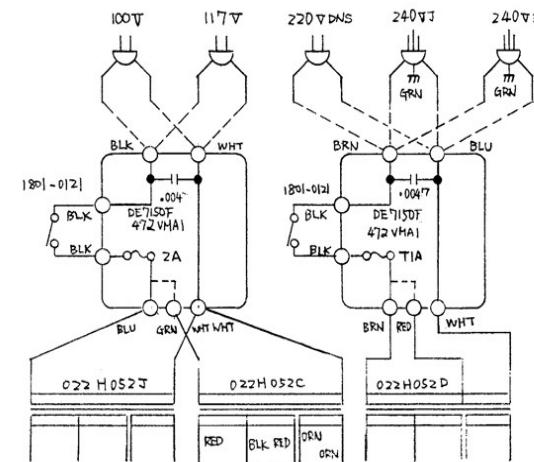
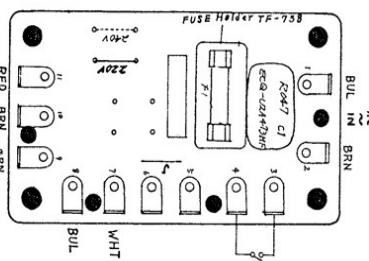
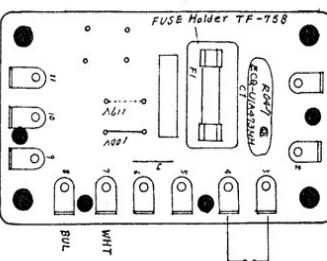
JULY 27, 1983

JX-3P (PG-200)

FUSE BOARD

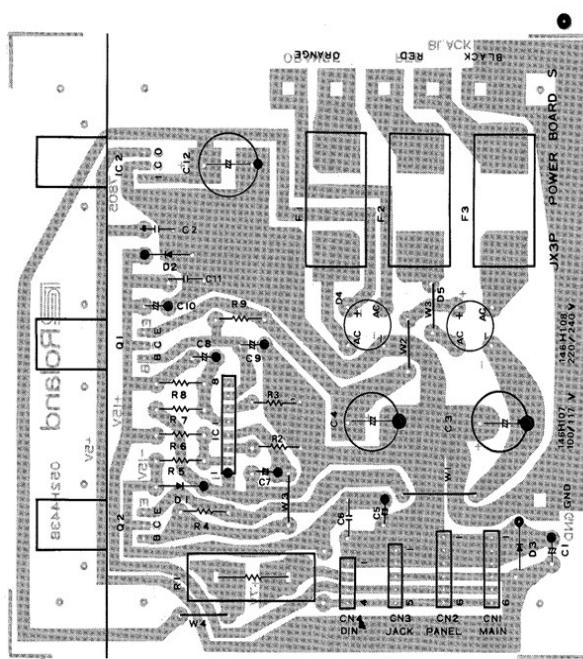
A

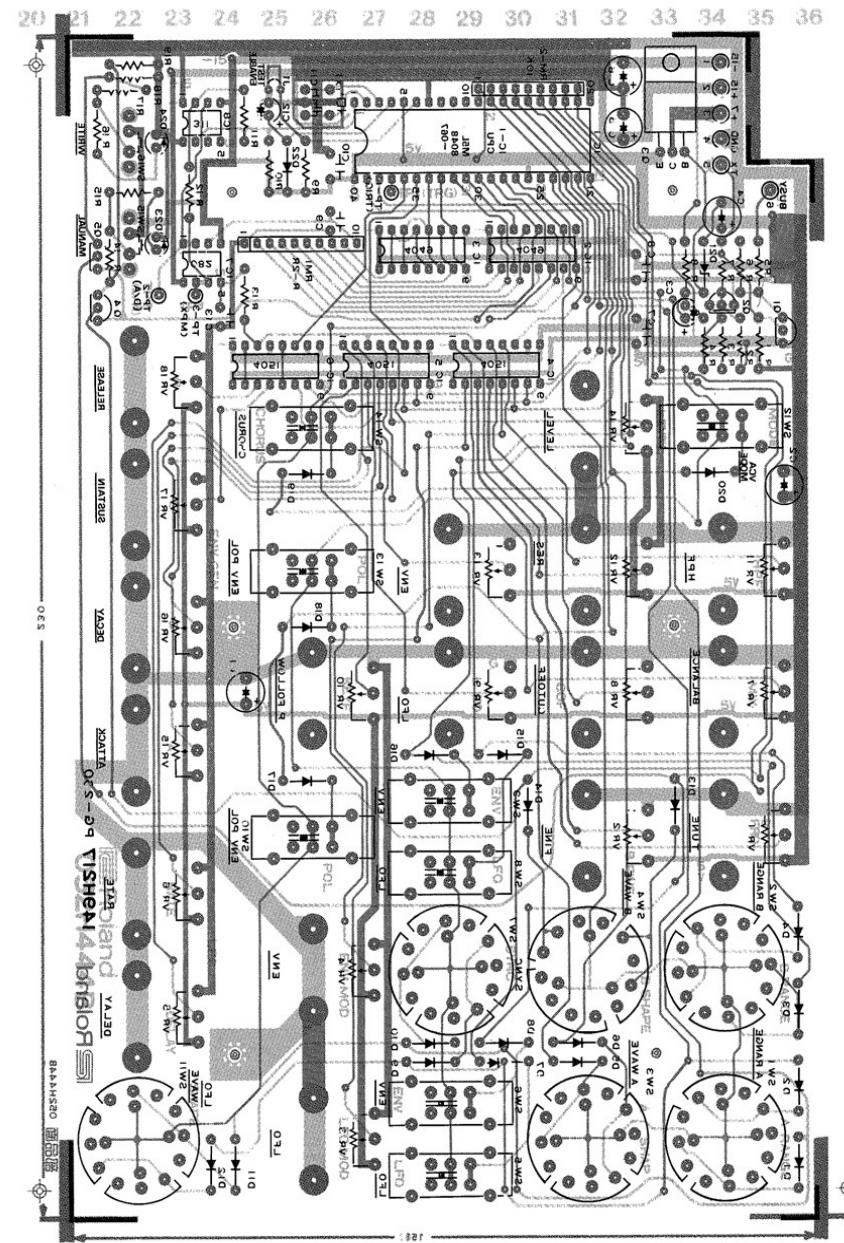
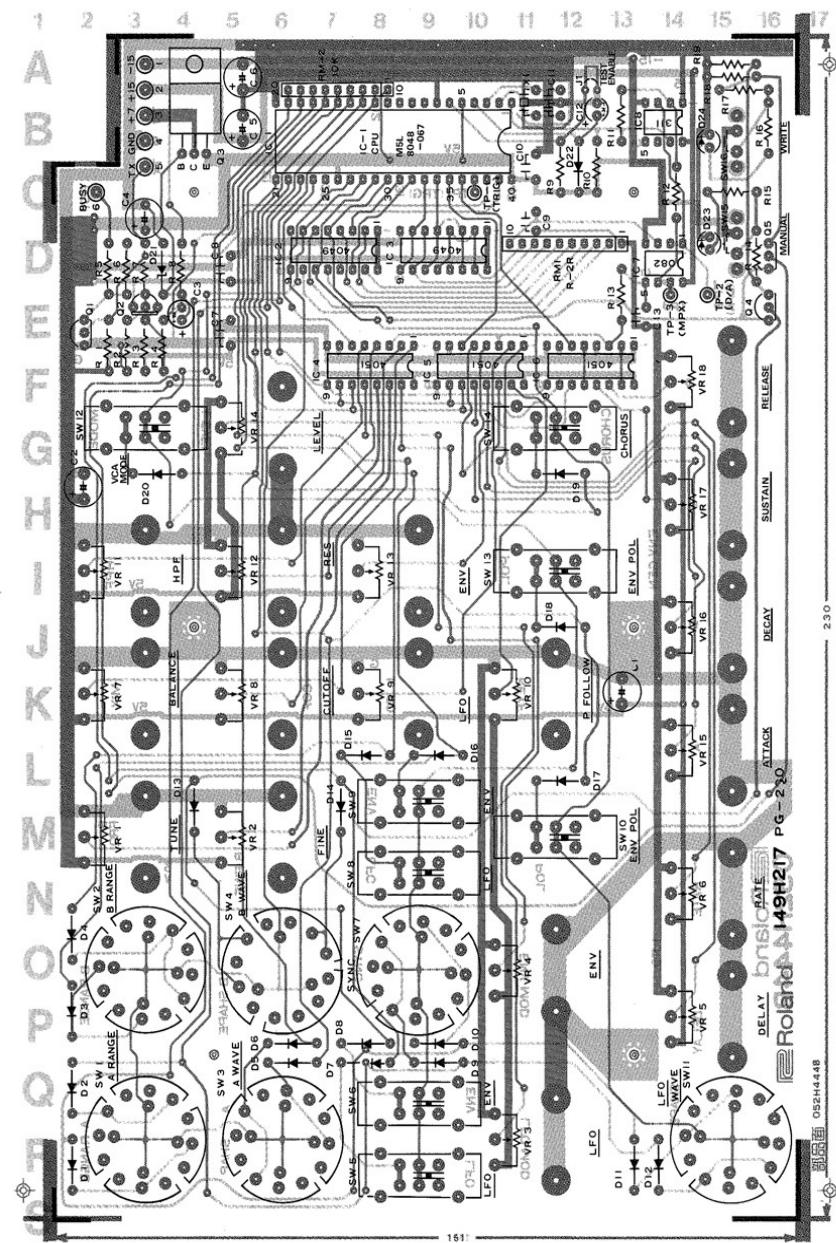
100/117V 7612706100 (pcb 052H414A)
220/240V 7612706400 (pcb 052H414A)



POWER SUPPLY BOARD

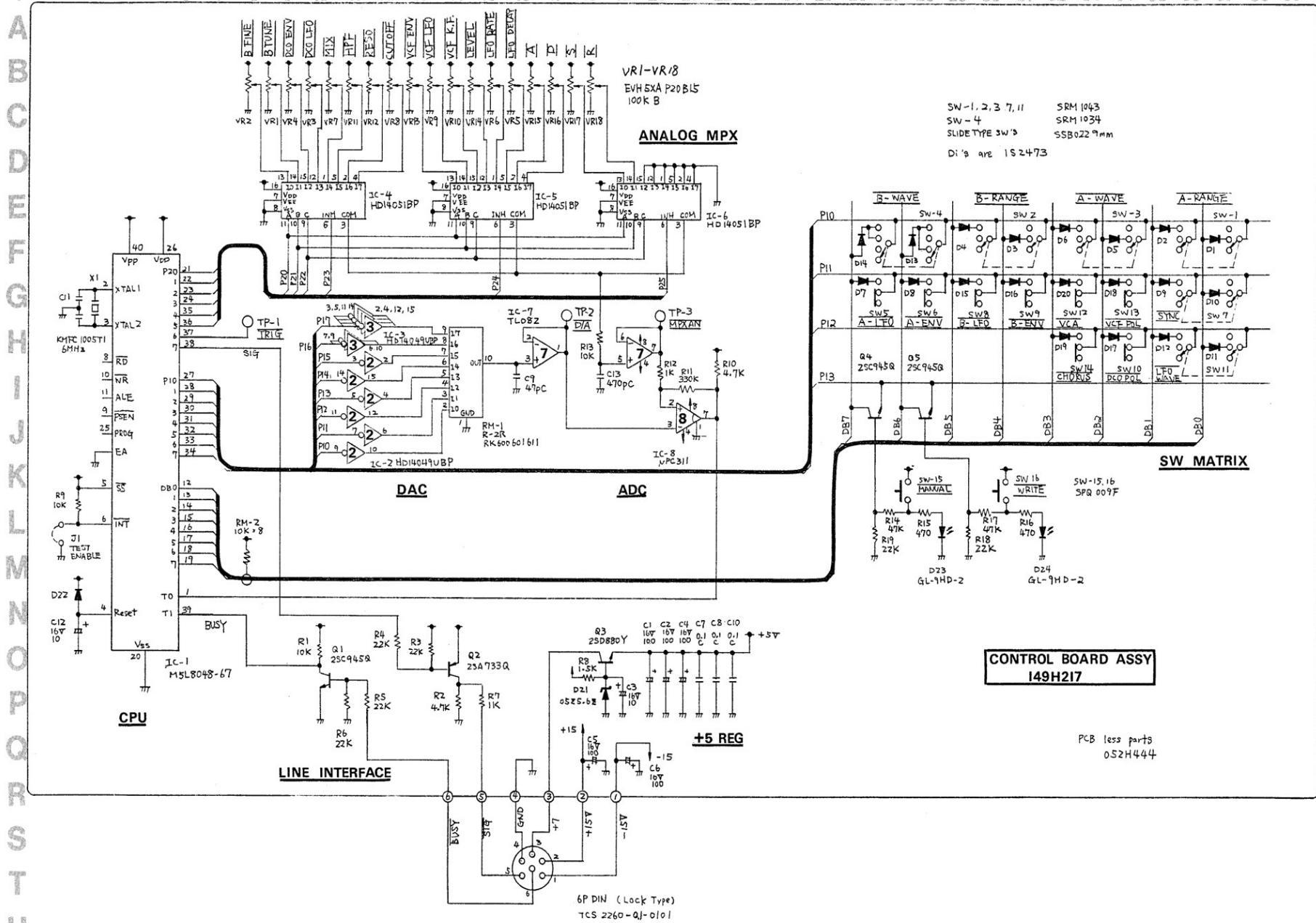
100/117V 7612707100 (146H107) (pcb 052H443B)
220/240V 7612707400 (146H108) (pcb 052H443B)



PG-200**CONTROL BOARD** 7932803000 (149H217) (pcb 052H444B)

PG-200 CIRCUIT DIAGRAM

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41



THE MIDI

MIDI stands for Musical Instrument Digital Interface designed to enable interconnecting synthesizers, sequencers, rhythm machines, home computers, etc. Copies of publications concerning MIDI hardware and data format will be obtained from MIDI committee or through Roland distributors.

In the following listed are data formats and data handling capabilities of MIDI systems of the JX-3P and other Roland models now on the market for reference.

NOTE: Availability of MIDI effects at slave equipment depends on its MIDI operation scheme.

JX-3P MIDI IMPLEMENTATION

TRANSMITTED DATA

Status	Second	Third	Description
1001 0000	0kkk kkkk	0vvv vvv	Note On (v=40H) / (v=0)
1011 0000	0100 0000	0	Hold Off from rear panel jack, if enabled.
1011 0000	0100 0000	7FH	Hold On from rear panel jack, if enabled.
1011 0000	0111 1111	0	POLY Mode Select (All notes off)
1100 0000	00pp pppp		Program Change from front panel, if enabled.
1110 0000	0bbb 0000	0bbb bbbb	Bank A-1 (0) → Bank D-16 (63) Pitch Bender if enabled. MSB LSB MAX (high) 127 96 CENTER 64 0 MIN (low) 0 0

Notes:

1. HOLD switch on the front panel does not send the signal to MIDI OUT.
2. Pitch Range (0kkk kkkk) is 36(C0) - 96(C5).
3. The transmitter sends All Notes Off (POLY Select) when all of the keys are released.

RECOGNIZED RECEIVE DATA

Status	Second	Third	Description
1001 0000	0kkk kkkk	0vvv vvv	Note On (v > 0) / off (v=0) Velocity ignored.
1000 0000	0kkk kkkk	0vvv vvv	Note Off. Velocity ignored.
1011 0000	0100 0000	0	Hold Off, if enabled.
1011 0000	0100 0000	7FH	Hold On, if enabled. v=1 - 126 ignored.
1011 0000	125 (7DH)	0	OMNI Select (All notes off).
1011 0000	127 (7FH)	0	POLY Select (All notes off).
1100 0000	00pp pppp		Program Change if enabled. p=0 - 63
1110 0000	0bbb 0000	0bbb bbbb	Pitch Bender if enabled. MSB LSB MAX 127 96 CENTER 64 0 MIN 0 0 LS 5 bits ignored.

Notes:

1. The JX-3P does not respond to MONO Mode Select.
2. Internal sequencer is not connected to MIDI out.
3. In OMNI mode, any channel will be accepted.
4. Sensitivity of the Pitch Bender is selected by the receiver.

	Wide	Middle	Narrow
MAX (MSB - 127 LSB - 96)	+7	+4	+2 semitone
MIN (MSB - 0 LSB - 0)	-7	-4	-2 semitone

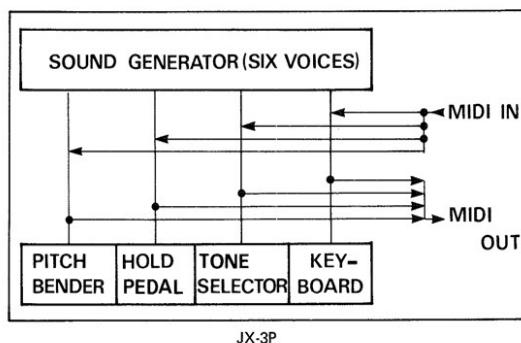
FRONT PANEL CODED FUNCTION

When power on, pressing a Program Select switch will disable the following functions.

Switch	Function
14	Hold On/Off, both transmit and receive.
15	Pitch Bender Change, both transmit and receive.
16	Program Change, both transmit and receive.

Note:

1. On power up, not pressing any switches, these MIDI functions are enabled.
2. The notes outside the JX-3P keyboard range will be shifted by octave(s) to fall within the range.



JX-3P

JP-6 MIDI IMPLEMENTATION

TRANSMITTED DATA

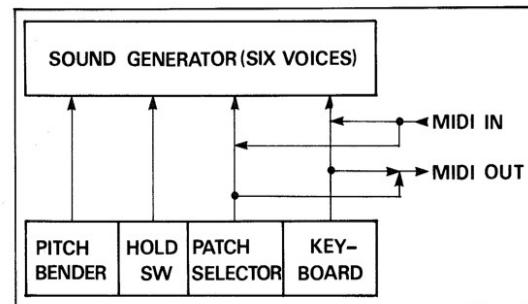
Status	Second	Third	Description
1001 000*	0kkk kkkk	0vvv vvv	Note On (v=40H) / off (v=0)
1011 000*	127 (7FH)	0	POLY Mode Select (All notes off)
1100 0000	000p pppp		Program Change p=0 - 31 (1FH)
1111 0110			Tune

RECOGNIZED RECEIVE DATA

Status	Second	Third	Description
1001 000	0kkk kkkk	0vvv vvv	Note On (v > 0) / off (v=0) Velocity ignored
1000 000	0kkk kkkk	0vvv vvv	Note Off. Velocity ignored
1011 000*	125 - 127	0	Mode Select
1100 000*	000p pppp		Program Change
1111 110			Tune

Notes:

1. In WHOLE KEY mode, the JP-6 sends and receives on Channel 1 only. In SPLIT KEY mode, channels 1 and 2 are allocated to the upper half and the lower half of the keyboard respectively. In OMNI mode, any channel will be accepted.
2. The receiver accepts both OMNI and POLY Select. When MONO Select is received, the receiver switches to OMNI mode.
3. The key signal received from MIDI IN is mixed with self contained key signal.
4. The JP-6 accepts Program Changes not as the number of the tone program but as the number of a combination of Key Mode (WHOLE/SPLIT) and a tone Program Number. The receiver reads Program Changes when PATCH PRESET on the control panel is turned on.
5. The notes outside the JP-6 keyboard range will be shifted by octave(s) to fall within the range.



JP-6

HP-300/400 MIDI IMPLEMENTATION**TRANSMITTED DATA**

Status	Second	Third	Description
1001 0000	0kkk kkkk	0vvv vvvv 0000 0000	Note On Note Off kkk kkkk = 29 - 103 (HP-300) 21 - 108 (HP-400) vvv vvvv = 1 - 127
1011 0000	0100 0000	0111 1111 0000 0000	Damper On Damper Off
1011 0000	0100 0001	0111 1111 0000 0000	Soft On Soft Off
1011 0000	0111 1111	0000 0000	All Notes Off POLY Mode Select

RECOGNIZED RECEIVE DATA IN OMNI MODE

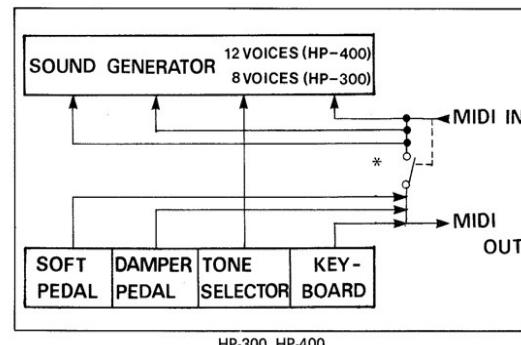
Status	Second	Third	Description
1000 xxxx	0kkk kkkk	0vvv vvvv	Note Off kkk kkkk = 0 - 127 vvv vvvv = 0 - 127 xxxx = 0 - 15
1001 xxxx	0kkk kkkk	0vvv vvvv 0000 0000	Note On Note Off kkk kkkk = 0 - 127 vvv vvvv = 1 - 127
1011 xxxx	0100 0000	0111 1111 0000 0000	Damper On Damper Off
1011 xxxx	0100 0001	0111 1111 0000 0000	Soft On Soft Off
1011 0000	0111 1111	0xxx xxxx	All Notes Off POLY Mode Select xxx xxxx any value
0111 1110	0xxx xxxx		All Notes Off MONO Mode Select (as OMNI)
0111 1101	0xxx xxxx		All Notes Off OMNI Mode Select

RECOGNIZED RECEIVE DATA IN POLY MODE

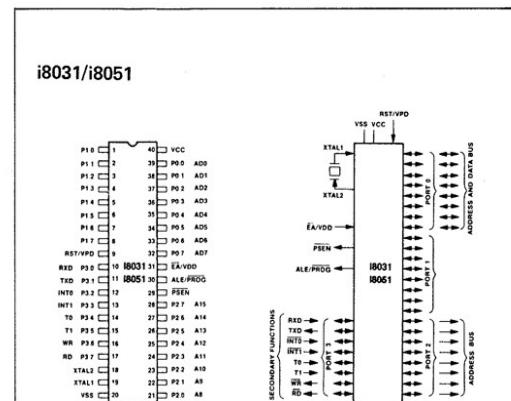
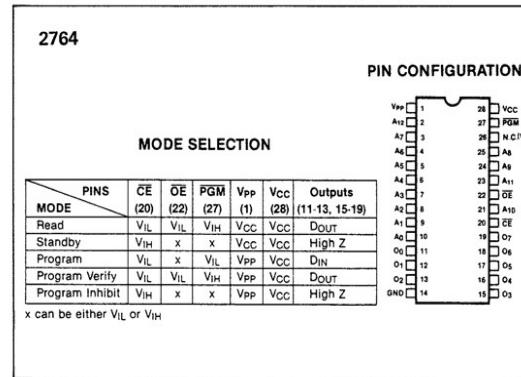
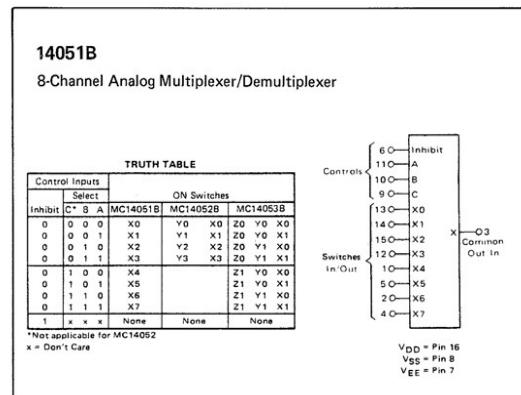
Status	Second	Third	Description
1000 0000	0kkk kkkk	0vvv vvvv	Note Off kkk kkkk = 0 - 127 vvv vvvv = 0 - 127
1001 0000	0kkk kkkk	0vvv vvvv	Note On Note Off kkk kkkk = 0 - 127 vvv vvvv = 1 - 127
1011 0000	0100 0000	0111 1111 0000 0000	Damper On Damper Off
1011 0000	0100 0001	0111 1111 0000 0000	Soft On Soft Off
1011 0000	0111 1111	0xxx xxxx	All Notes Off POLY Mode Select All Notes Off
0111 1110	0xxx xxxx		MONO Mode Select (as OMNI)
0111 1101	0xxx xxxx		All Notes Off OMNI Mode Select

Notes:

1. The transmitter sends All Notes Off code when all the keys are released.
2. The received notes outside the HP-300 (400) keyboard range will be shifted by octave(s) to fall within the range.

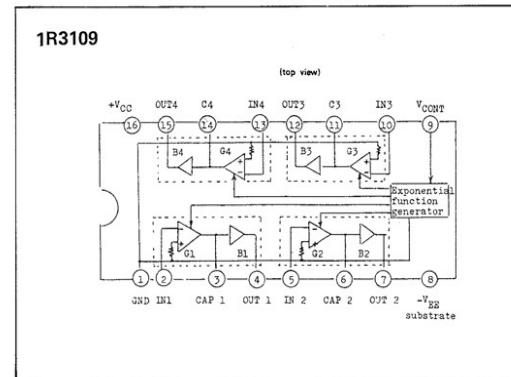
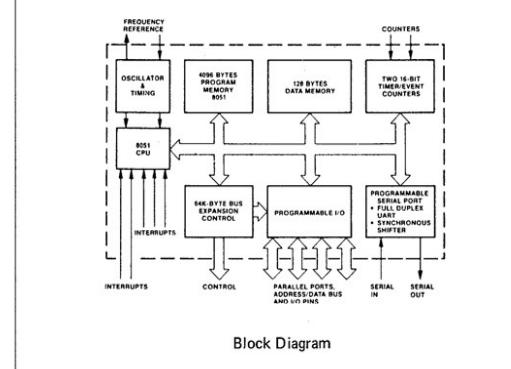


* Engaging MIDI IN disconnects some of the intraconnections for optimum operation when linking sequencer.

IC DATA

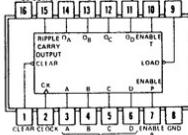
Pin Configuration

Logic Symbol



74LS161

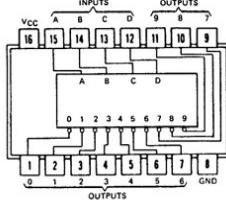
Synchronous Presettable 4-Bit Counter with Clear



INPUT			OUTPUT			ACTION
Clear	Load	CK	Enable P	Q0-Q3	Ripple Carry	
H	H	-	H	H	—	COUNT
H	L	X	X	D, D ₀ , D ₁ , D ₂ , D ₃	—	data set
L	X	X	X	L L L L L	—	clear
H	X	X	X	H H H H H	H	—

74LS42

BCD to DECIMAL Decoder



NO	INPUTS				OUTPUTS									
	D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	L	L	L	L	0	1	2	3	4	5	6	7	8	9
1	L	L	H	L	0	1	2	3	4	5	6	7	8	9
2	L	H	L	L	0	1	2	3	4	5	6	7	8	9
3	L	H	H	L	0	1	2	3	4	5	6	7	8	9
4	L	H	L	L	0	1	2	3	4	5	6	7	8	9
5	L	H	L	H	0	1	2	3	4	5	6	7	8	9
6	L	H	L	H	0	1	2	3	4	5	6	7	8	9
7	L	H	H	H	0	1	2	3	4	5	6	7	8	9
8	H	L	L	H	0	1	2	3	4	5	6	7	8	9
9	H	L	H	H	0	1	2	3	4	5	6	7	8	9
10	H	H	L	H	0	1	2	3	4	5	6	7	8	9
11	H	H	H	H	0	1	2	3	4	5	6	7	8	9
12	H	H	H	H	0	1	2	3	4	5	6	7	8	9

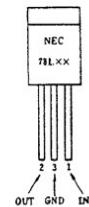
TC5517APL

(μPC78L05, μPC78L15)

(TOP VIEW)	
A ₇	1
A ₆	2
A ₅	3
A ₄	4
A ₃	5
A ₂	6
A ₁	7
A ₀	8
I/O ₁	9
I/O ₂	10
I/O ₃	11
GND	12
V _{DD}	24

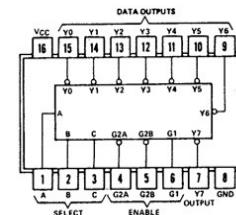
μPC78L

(μPC78L05, μPC78L15)

**74LS138**

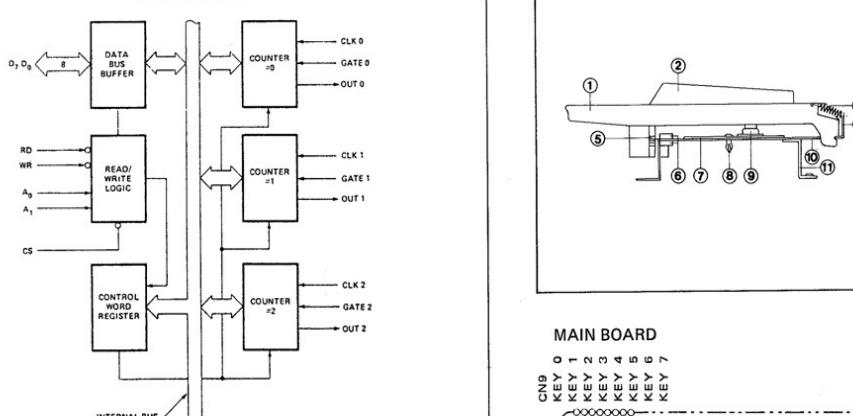
3 to 8 Demultiplexer

ENABLE	SELECT	OUTPUT												
		G ₁	G ₂	C	B	A	Y ₀	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆	Y ₇
X	X	X	X	X	H	H	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H	H	H
H	L	L	L	L	H	H	H	H	H	H	H	H	H	H
H	L	L	L	L	H	H	H	H	H	H	H	H	H	H
H	L	L	L	L	H	H	H	H	H	H	H	H	H	H
H	L	L	L	L	H	H	H	H	H	H	H	H	H	H
H	L	L	L	L	H	H	H	H	H	H	H	H	H	H
H	L	L	L	L	H	H	H	H	H	H	H	H	H	H

**8253/8253-5**

PROGRAMMABLE INTERVAL TIMER

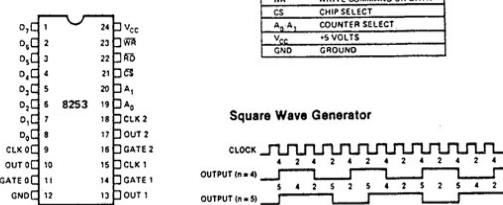
BLOCK DIAGRAM



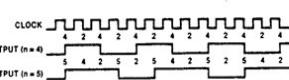
PIN NAMES

D ₀ -D ₉	DATA BUS (8-BIT)
CLK N	COUNTER CLOCK INPUTS
GATE N	COUNTER GATE INPUTS
OUT N	COUNTER OUTPUTS
RD	READ/REGISTER
WR	WRITE/COMMAND OR DATA
CS	CHIP SELECT
A ₀ , A ₁	COUNTER SELECT
V _{CC}	+5 VOLTS
GND	GROUND

PIN CONFIGURATION



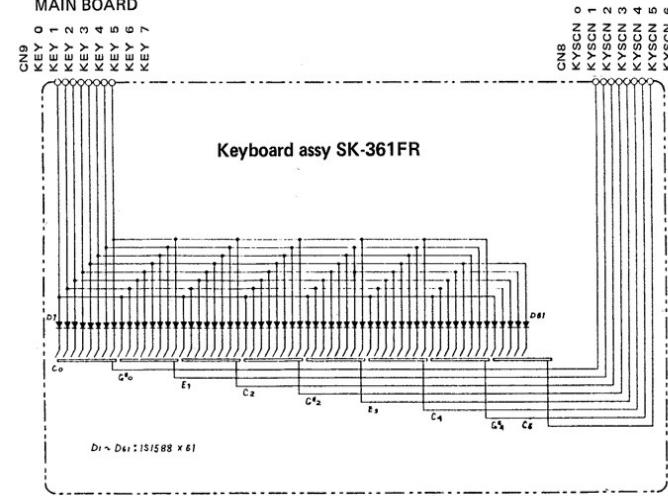
Square Wave Generator



SK361FR Parts List

1	106H026	Natural Key	C,F
1	106H027	Natural Key	D
1	106H028	Natural Key	E,B
1	106H029	Natural Key	G
1	106H030	Natural Key	A
1	106H031	Natural Key	C'
2	106H032	Sharp Key	—
3	070H029	Key Spring	H29
4	061H140	Chassis	H140
5	068H004	Guide Bushing	—
6	101H143	Level Felt	H143
7	149H221	OPH221 (pcb 052H462-1)	—
7	149H222	OPH222 (pcb 052H462-2)	—
8		Nylon Rivet (NRP-345)	—
9	102H010	Contact Rubber	—
9	102H011	Contact Rubber	—
10	098H006	Key Stopper H6	—
11	026	Chassis Bracket	—

MAIN BOARD



Keyboard assy SK-361FR

Di ~ Ds = 1:15 (588 x 6)