

# JX-3P (PG-200) SERVICE NOTES

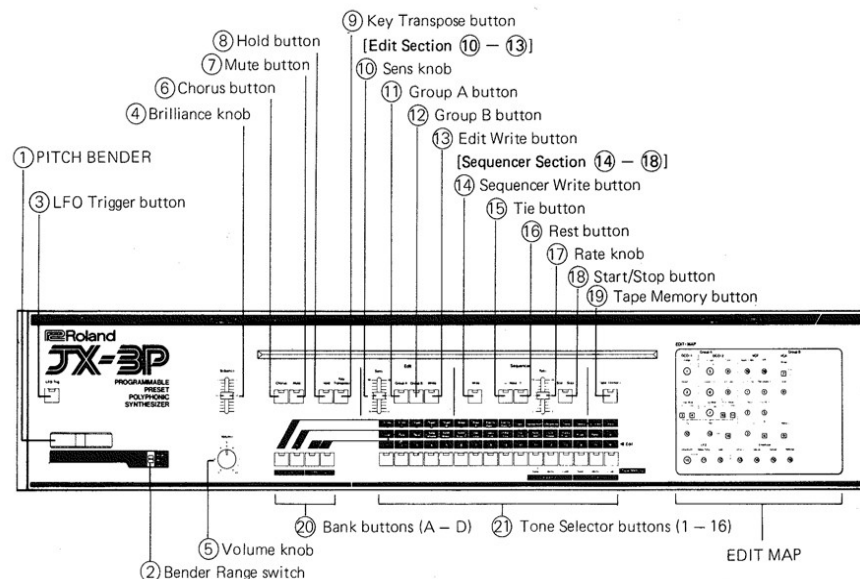
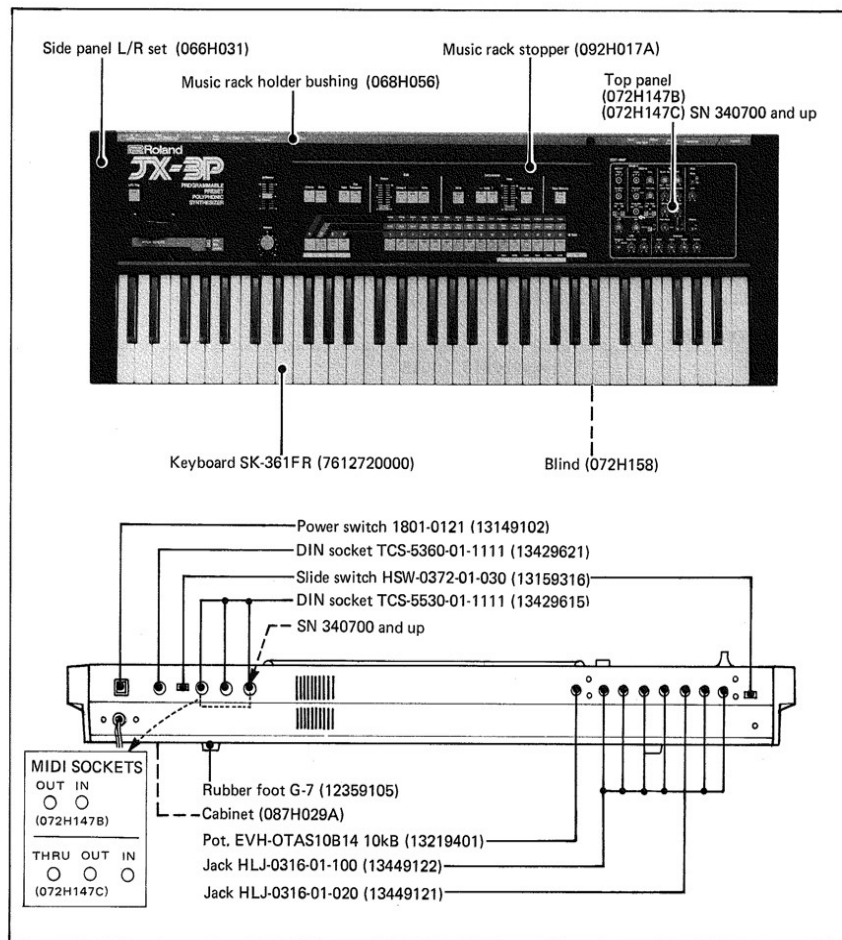
First Edition

## SPECIFICATIONS

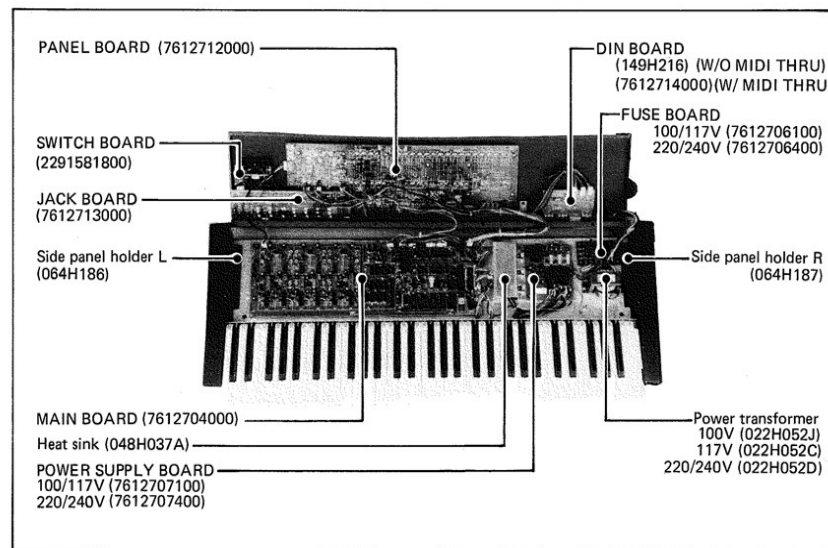
**JX-3P**  
 Keyboard:  
 61 keys, 5 octaves, C scale  
 Power consumption:  
 20 W  
 Dimensions:  
 912(W) x 325(D) x 115(H)mm  
 37-7/8(W) x 12-13/16(D) x 4-1/2(H)in.  
 Weight:  
 9.8 kg, 21 lb. 9 oz.

**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.

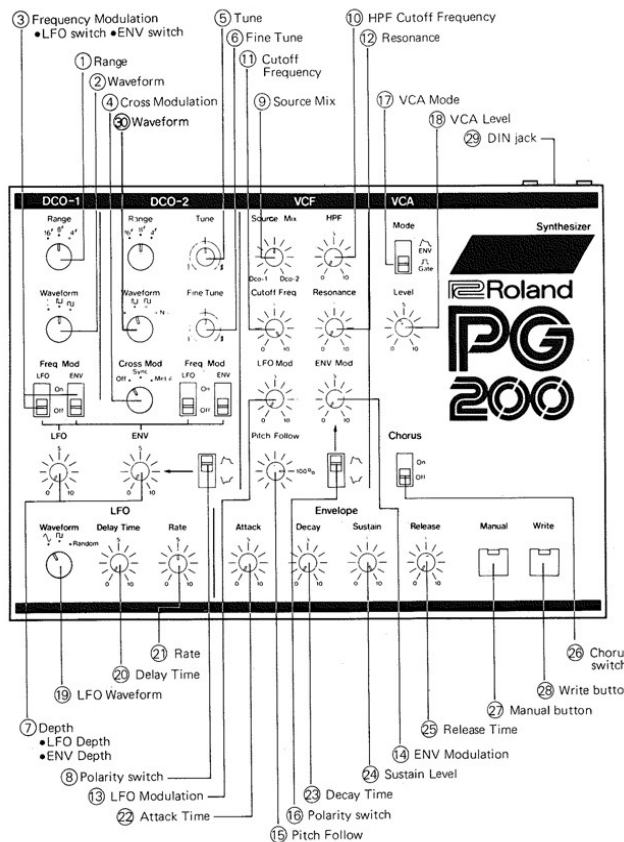
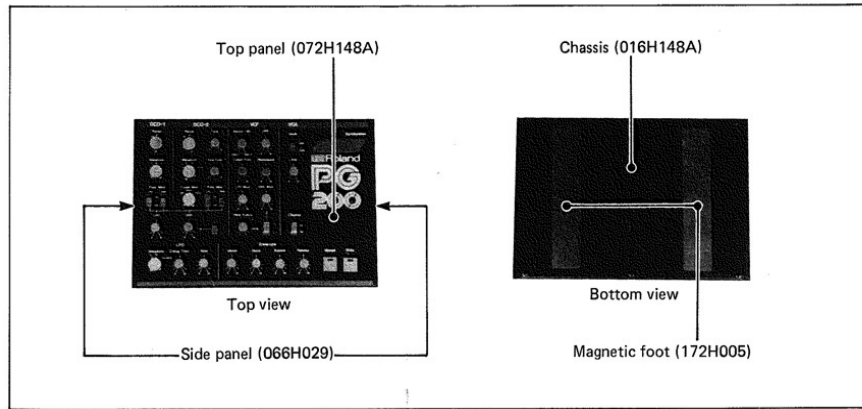
## JX-3P



- ① Bender assembly PB-7 (2327371500)
- ② Slide switch SSB-023-9PN (13159327), Knob (016H114)
- ③ ⑥-⑨, ⑪-⑬, ⑱-⑲  
 Push switch SPQ-009F (13129327), Button (016H092), LED GL-9HD-2 (15029147)
- ④ Slide pot. S3018P4CCB15 100kΩ (13339444), Knob (016H113)
- ⑤ Rotary pot. EWJEJAP20B14 10kΩ x 2 (13219759), Knob (016H112)
- ⑩ Slide pot. S3018P405B15 100kΩ (13339421), Knob (016H113)
- ⑰ Slide pot. S3018P405A16 1MA (13339422), Knob (016H113)



**PG-200**



- ①, ②, ④, ⑩  
Rotary switch  
SRM1034234 (13119301)  
Knob (016H135)
- ③, ⑧, ⑬, ⑰, ⑳, ㉔  
Slide switch  
SSB02204 (13159106)  
Knob (016H114)
- ⑤-⑦, ⑨-⑮, ⑱, ㉑-㉓  
Rotary pot.  
EVH-5XAP20B15 100kΩ (13219242)  
Knob (016H110)
- ㉒, ㉖  
Push switch  
SPQ009F (13129327)  
Button (016H092)  
LED GL-9HD-2 (15029147)
- ㉘  
DIN socket  
TCS-2260-01-0101 (13429620)
- ㉙  
Rotary switch  
SRM1043238 (13119201)  
Knob (016H135)

**PARTS LIST**

■ PG-200

CASE		
072H148A	Top panel	
016H148A	Chassis	
066H029	Side panel	Rubber
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 Waveform
13119301	SRM1034234	Rotary
13129327	SPQ009F	Push

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

DIN CORD		
053H192		6p, 650mm

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

POTENTIOMETER		
13219242	EVH5XAP20B15 100kΩ	

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

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

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

RESONATOR		
12389800	KMFC1005T1 6MHz	Ceramic

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 10 $\mu$ H

**RESONATOR**

12389719 KMFC1007T31 12MHz Ceramic

**FUSE**

(100/117V)  
 12559336 GGS 2A/250V UL, CSA

(220/240V)

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

**FUSE HOLDER**

12199515 TF-758

**PCB**

7612704000 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 10k $\Omega$  x 2 Volume  
 13219401 EVHOTAS10B14 10k $\Omega$  Tune  
 (Slide)  
 13339421 S3018P405B15 100k $\Omega$  Edit Sens  
 13339422 S3018P405A16 1M $\Omega$  Sequencer Rate  
 13339444 S3018P4CCB15 100k $\Omega$  Brilliance

(Trimmer)

13299134 RVF8P01502 5k $\Omega$   
 13299135 RVF8P01103 10k $\Omega$   
 13299136 RVF8P01503 50k $\Omega$

**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  
 NONINVERT 3-STATE  
 15169301HO HD74LS00P QUAD 2-INPUT NAND GATE  
 15169304HO HD74LS04P HEX INVERTER  
 15169339HO HD74LS32P QUAD 2-INPUT OR GATE  
 15169310HO HD74LS42P BCD TO DECIMAL DECODER  
 15169318HO HD74LS138P 3 TO 8 DEMULTIPLEXER  
 15169321HO HD74LS161P 4-BIT BINARY COUNTER  
 15169322HO HD74LS174P HEX D FLIP-FLOP  
 15169358 HD74LS373P OCTAL 3-STATE D-LATCH

15159104HO HD14011BP QUAD 2-INPUT NAND GATE  
 15159128HO HD14050BP HEX BUFFER  
 15159113HO HD14051BP ANALOG MULTIPLEXER/  
 DEMULTIPLEXER

15189111 NJM311 COMPARATOR  
 15189103 NJM4558BP OP AMP

15189162 NJM072SP BiFET OP AMP (SINGLE INLINE)  
 15189144 NJM072DP (DUAL INLINE)  
 Refer to MAIN BOARD Circuit diagram for change.

15229803 BA662B VCA  
 15229801 IR3109 VCF  
 15219203 MN3009 BBD  
 15169504 MN3101 BBD DRIVER  
 15119117 M5230L TRACKING REGULATOR  
 15199123 M5231L VREF REGULATOR  
 15199106  $\mu$ PC7805 5V 3-TERMINAL REGULATOR  
 15189136 M5218L HEAD PHONE AMP

**PHOTO COUPLER**

15229712 PC-900

**TRANSISTOR**

15119106 2SA733-Q  
 15129108 2SC945-Q  
 151291080A 2SC945-Q selected for noise  
 151291070G 2SC945-Q } selected RED } use one  
 151291070H 2SC945-Q } for VCA ORN } color in  
 151291070I 2SC945-Q } YEL } a unit  
 151291070J 2SC945-Q } GRN }  
 15129136 2SC2878A  
 15119802 2SB596-Y  
 15129816 2SD880-Y  
 15139103 2SK30A-GR FET

**DIODE**

15029147 GL-9HD-2 LED  
 15019103 1S2473  
 15019201 1N4002 Rectifier bridge  
 15019236 W-02 Rectifier bridge  
 15019612 05Z-5.1 Zener

**PONISTOR**

15229909 ERSB33G561

**CAPACITOR (polystyrene)**

13569901 CQ09S2B47R00J05 47pF  
 13569167 CQ09S1H100R0J05 100pF

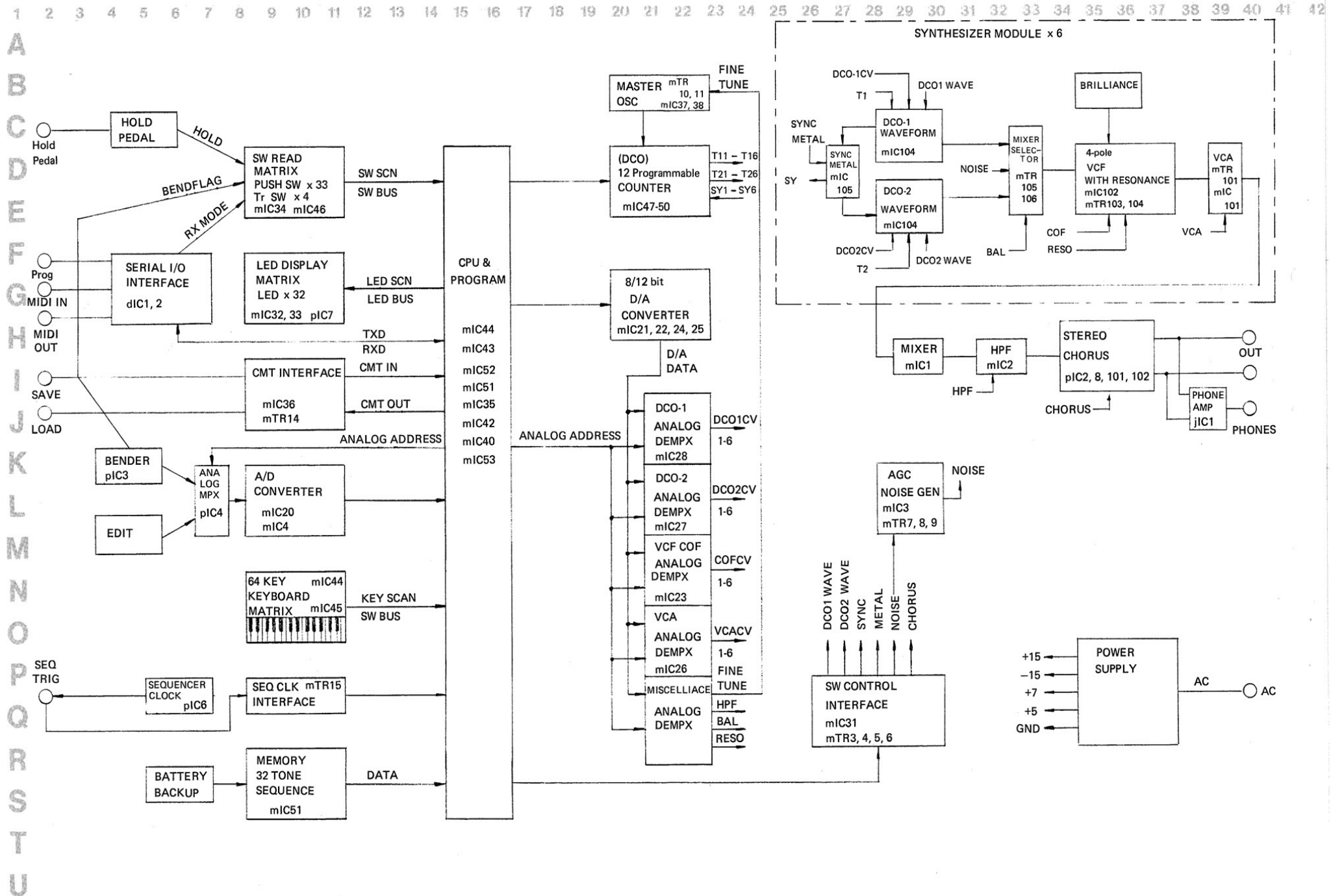
**RESISTOR ARRAY**

13919301 RM-8-472 4.7k x 8  
 13919310 RM-8-103 10k x 8  
 13919311 RM-8-223 22k x 8  
 13919118 RK600601611 R-2R, D/A

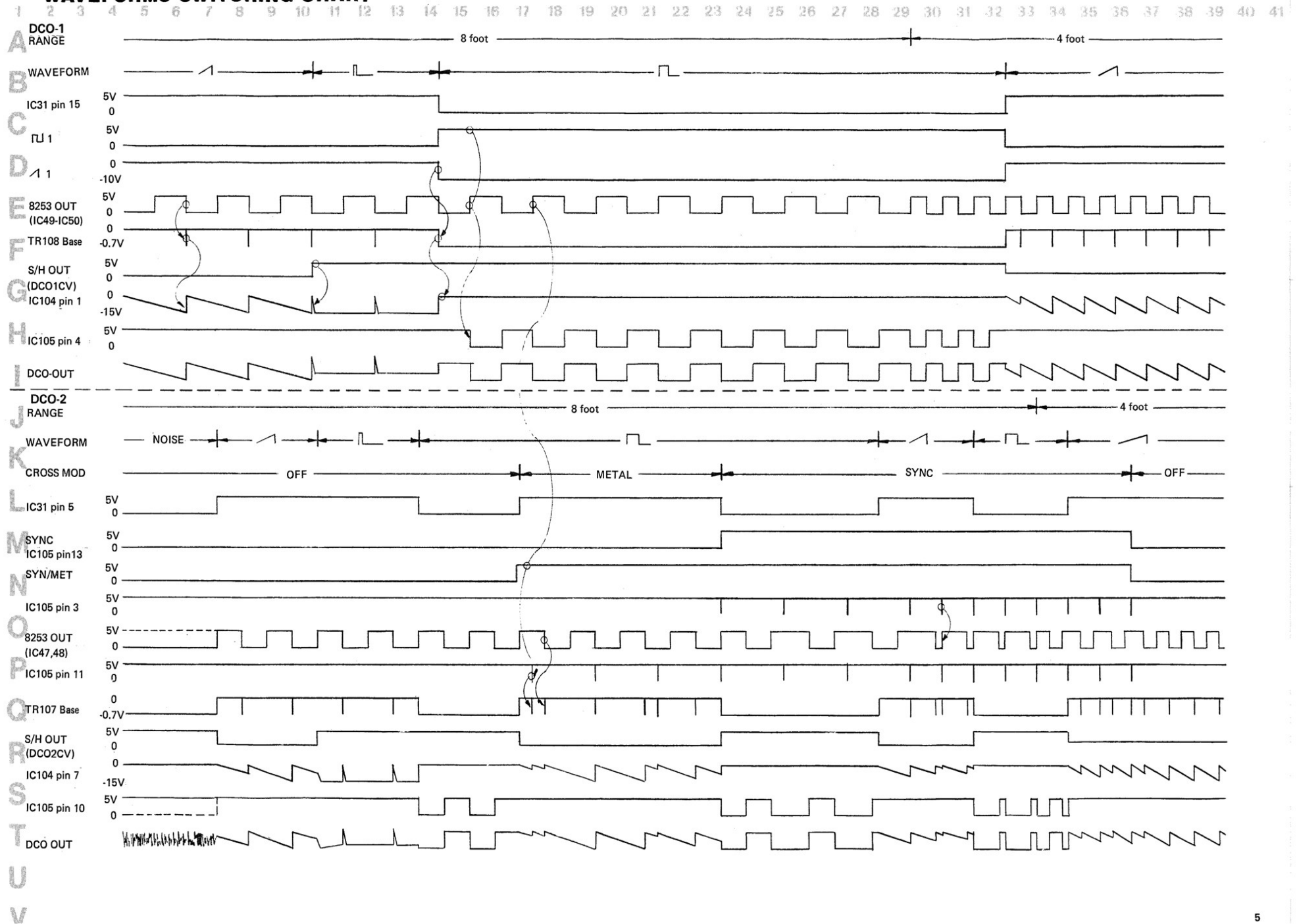
**OTHERS**

048H037A Heat sink  
 12569111 CR-1/3N Li battery  
 13429520 IC-99-24#2 28pin IC socket

# 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 sequencer 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 matrices.

#### 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 grants 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 accommodate 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 rectangulars. 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 dC1.

LED

Panel LEDs compose an 8 x 4 matrix with 12 lines conncted 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 INTO 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 restart-ed 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.

To have the JX-3P enter the TEST mode, two ways are provided:

1. While pressing one of 7 TONE SELECTORS (see the table below), turn the power ON.
2. (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 SELECT button:
2	Rotary	Same as in user's mode	CH-1 -11, CH-2 -12, etc.
3	Rotary, but from a specified channel	Same as in user's mode	Two kinds of Test Tones are available: BANK A, TONE 1-8' sawtooth from DCO-1 BANK A, TONE 2-resonated 1kHz from VCF
4	Same as in 1 except test tone		BANK and TONE LEDs indicate Program Version.
5	Same as in 2 except test tone		
6	Same as in 3 except test tone		
9	Same as in user's mode		

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

- 1-1. Connect the digital voltmeter between TP9(VREF) and GND on Main board.
- 1-2. Adjust VR1(VREF) for 4.70V.

2. Master Oscillators

- 2-1. Connect the tuner or frequency counter to OUTPUT (mono) JACK.
- 2-2. [TEST MODE 5], [A-1] will be set automatically.)
- 2-3. Confirm that TUNE on the rear panel is centered.
- 2-4. Depress A4 key, and adjust L1 on Main board until the output becomes 442Hz.
- 2-5. Unplug the meter and plug in the amplifier with speaker or headphones.
- 2-6. [GROUP A-15] (Source Mix) Set Sense to 5 for equal DCO-1 and 2 sounds in level.
- 2-7. Listening to the two voices, adjust L2 on Main board for zero-beat.

3. D/A Offset

- 3-1. Connect the scope between TP-7(POLY OUT) and GND on Main board.
- 3-2. [TEST MODE 5], [A-1] will be set automatically.)
- 3-3. Depress C3 key several times, and find the sawtooth waveform with the lowest amplitude.
- 3-4. 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

- 4-1. Connect the scope to TP-7(POLY OUT) on Main board. (H = 0.1ms/div)
- 4-2. [TEST MODE 6], [A-2]
- 4-3. Depress a key (call this key X), and adjust VR1-2(VCF TUNE) on Main board for 1kHz. (One full cycle over the scale).
- 4-4. 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 (VR203-VR606) of the latter channel so that the second waveform is in phase with that of CH-1.
- 4-5. Repeat the step 4-4 for the remaining channels.

5. VCF RESONANCE

- 5-1. Connect the scope to TP-7(POLY OUT) on Main board.
- 5-2. [TEST MODE 5], [A-2]
- 5-3. Depress a key, and adjust VR-103(RESO) so that the sine wave is 600mVp-p.
- 5-4. Repeat the step 5-3 for the remaining channels by adjusting RESO (VR203-VR604) of the assigned channel.
- 5-5. Repeat (4) with other channels, and every time adjust RESO for 600mVp-p.

6. VCA DC BALANCE

- 6-1. Connect the scope or amplifier with speaker to OUTPUT jack.
- 6-2. [TEST MODE 6], [A-2 GROUP B-4] (Resonance).
- 6-3. Set Sense to 0.
- 6-4. Adjust VR101(DC BAL) on Main board for the minimum transient or thump when a key is depressed.
- 6-5. Press SEQUENCER-NOTE- to select CH-2, and adjust VR201 for the same as in the step 6-4.
- 6-6. Repeat for CH-3 to CH-6 (VR301-VR601).

7. BBD BIAS

- 7-1. [TEST MODE 3], [A-1] will be set automatically.)
- 7-2. Connect the scope to TP-1 on Panel board.
- 7-3. Press CHORUS.
- 7-4. Depress 3 keys with HOLD ON.
- 7-5. Adjust VR-8(BBD BIAS) on Panel board so that the positive and negative peaks of the 3 waveforms are almost equally clipped.
- 7-6. 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.

- 8-1. [A-6] (BRASS 1)
- 8-2. Press SEQUENCER-WRITE. Depress C4 key. Raise Rate to 10.
- 8-3. Press START/STOP. (C4 note should be heard).
- 8-4. Set Bend Range to wide.
- 8-5. Press HOLD. Depress F3 key.
- 8-6. 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.
- 8-7. Press HOLD, and press it again.
- 8-8. Depress G4 key.
- 8-9. Move BENDER lever fully to the left, and adjust VR-8 (-BEND) so that the two pitches are as in tune as possible.

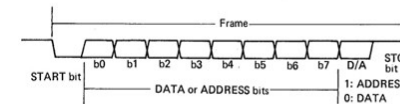
PG-200  
CIRCUIT DESCRIPTIONS

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 second frame.

	B	I	T	S
The previous scan data	1	0	0	1
Scan data	1	0	0	1

\* -- 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

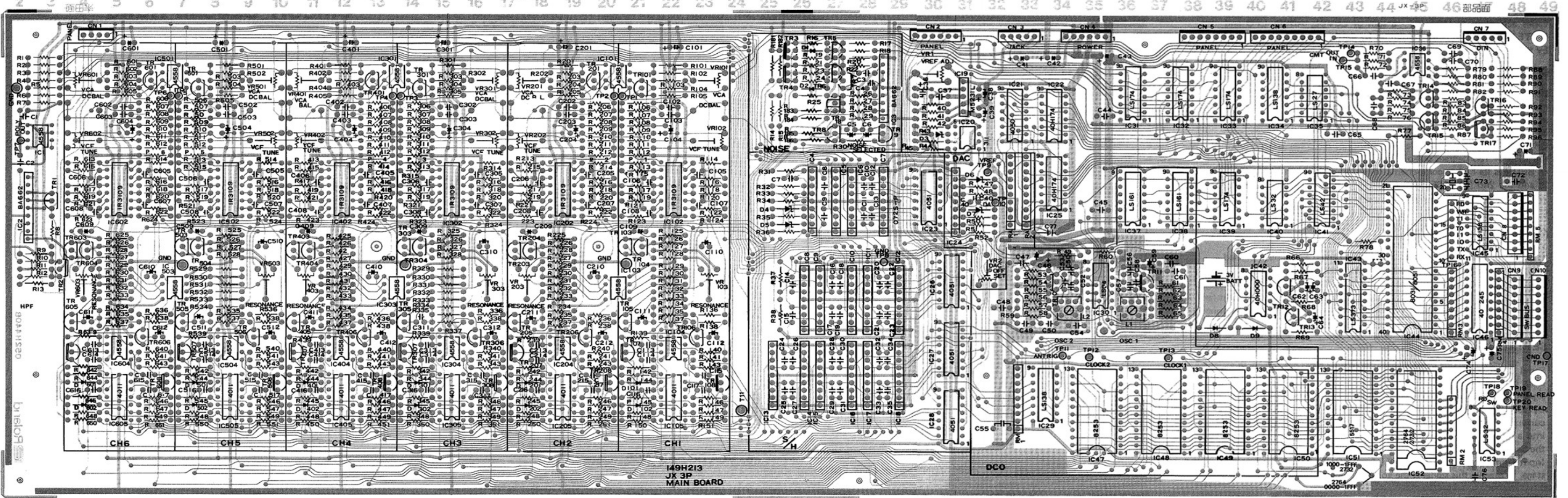
The next scan data change	0	0	0	1	1	0	1	1
				*				

\* -- 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

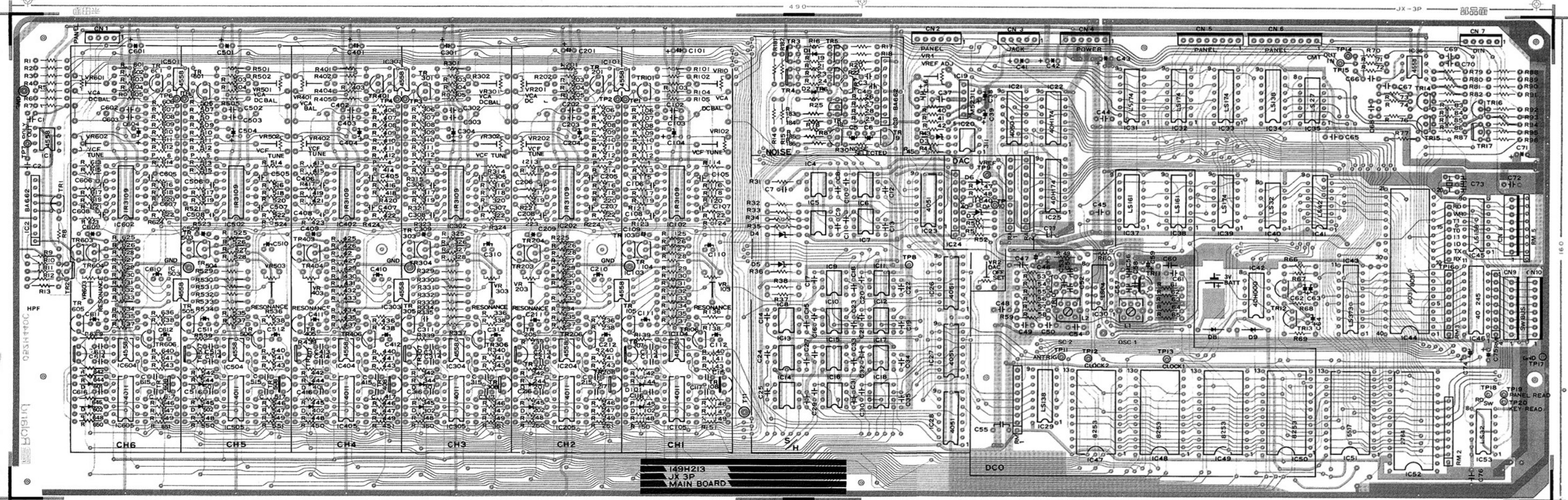


149H213  
JK 3P  
MAIN BOARD

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

Later products

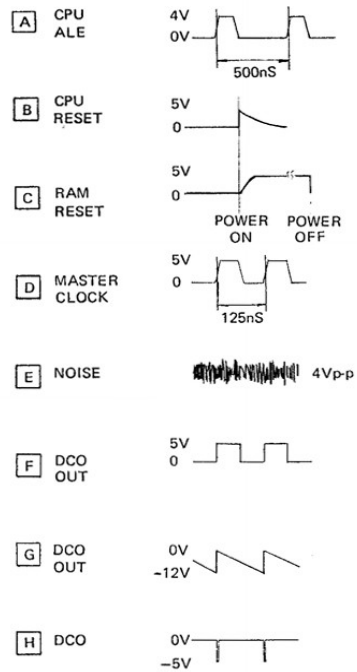
Difference between two PCBs: IC4-IC18—Single inline or Dual inline.



149H213  
JK 3P  
MAIN BOARD



**MAIN BOARD**

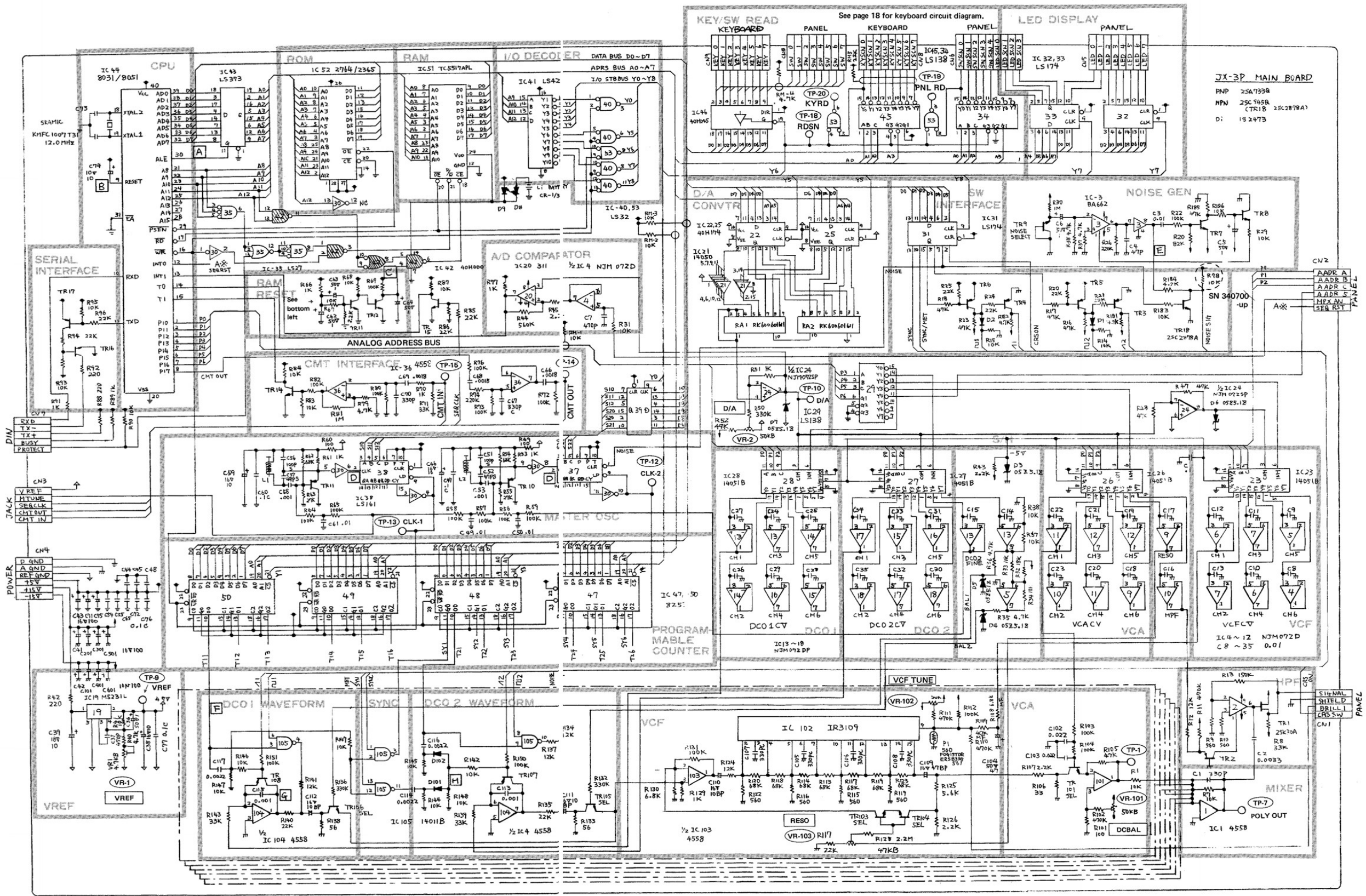
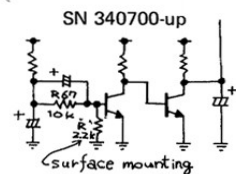
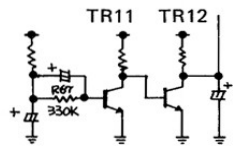


**CHANGES ON IC52**

**ROM**  
From EPROM (2764) to MASK ROM (2365) ..... Compatible.  
Debugged Program  
To cure the problem described below, use the EPROM or MASK ROM of versions A-4 and up for early products, as necessary. Refer to Test Mode in ADJUSTMENT section for identification of existing ROM version.  
When the JX-3P is used as a master in MIDI connection, unwanted note may be heard on the slave having more than six voices.

**RAM RESET CIRCUIT CHANGE**

**Reason**  
To make the JX-3P invulnerable against power line transients.  
This minor reconnection is effective to cure the problem, "program overrun", when the JX-3P is operating from a greatly fluctuating power line.



**JX-3P MAIN BOARD**  
PNP 25A793B  
NPN 25C745B (TR18 25C2878A)  
D: 15 2473

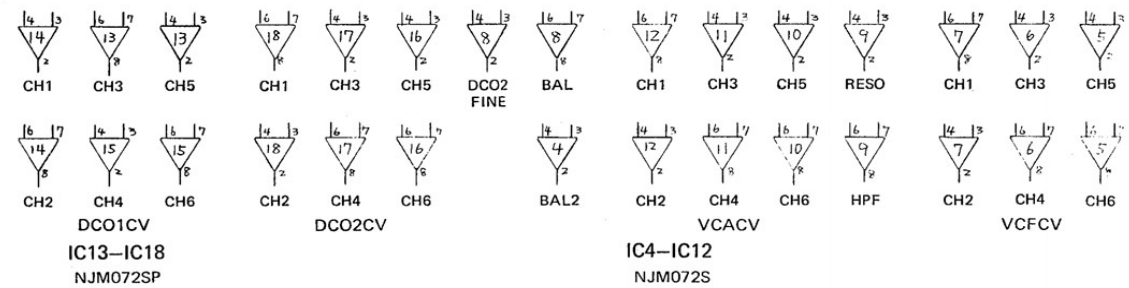
**IC CHANGES**

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.

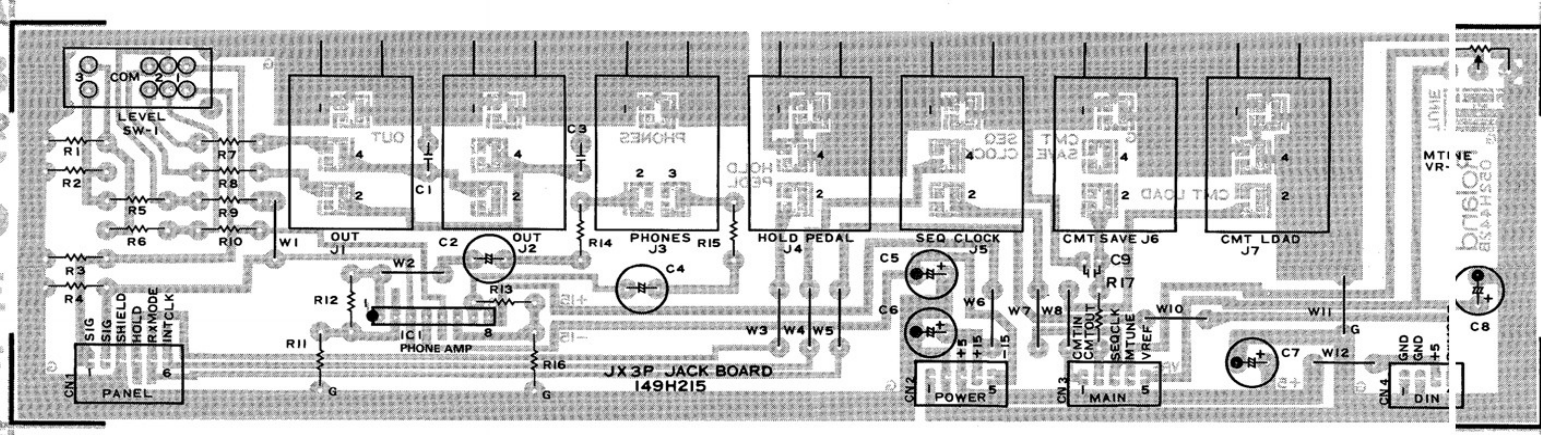
Single inline	Dual inline	Remark
NJM072S	NJM072D	As produced
NJM072SP	NJM072DP	Selected, low offset

**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.

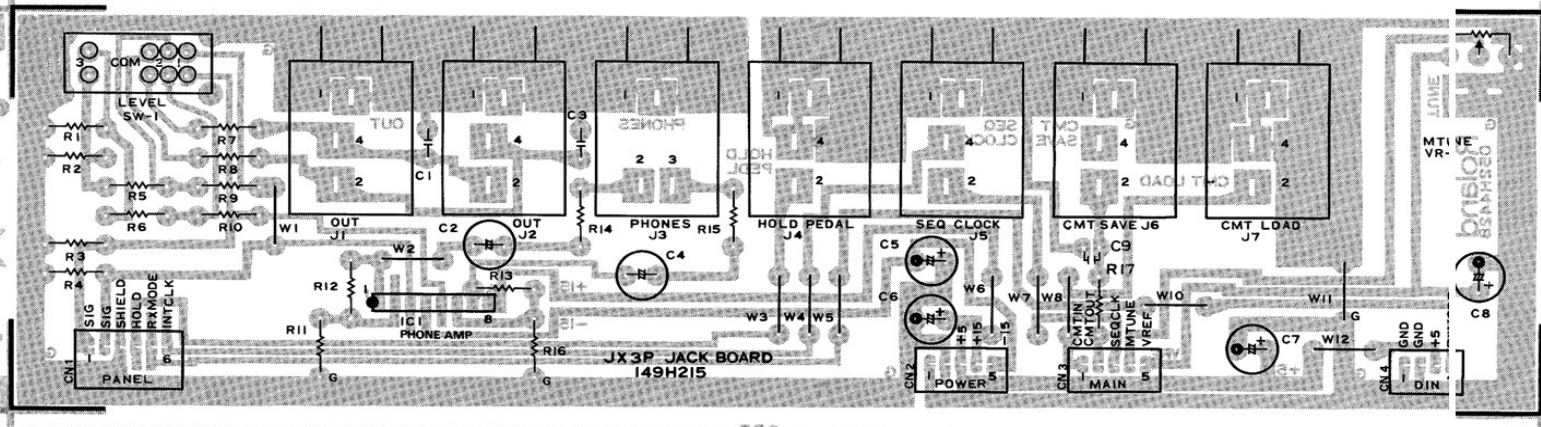
**RIGHT Single inline ICs Arrangement**



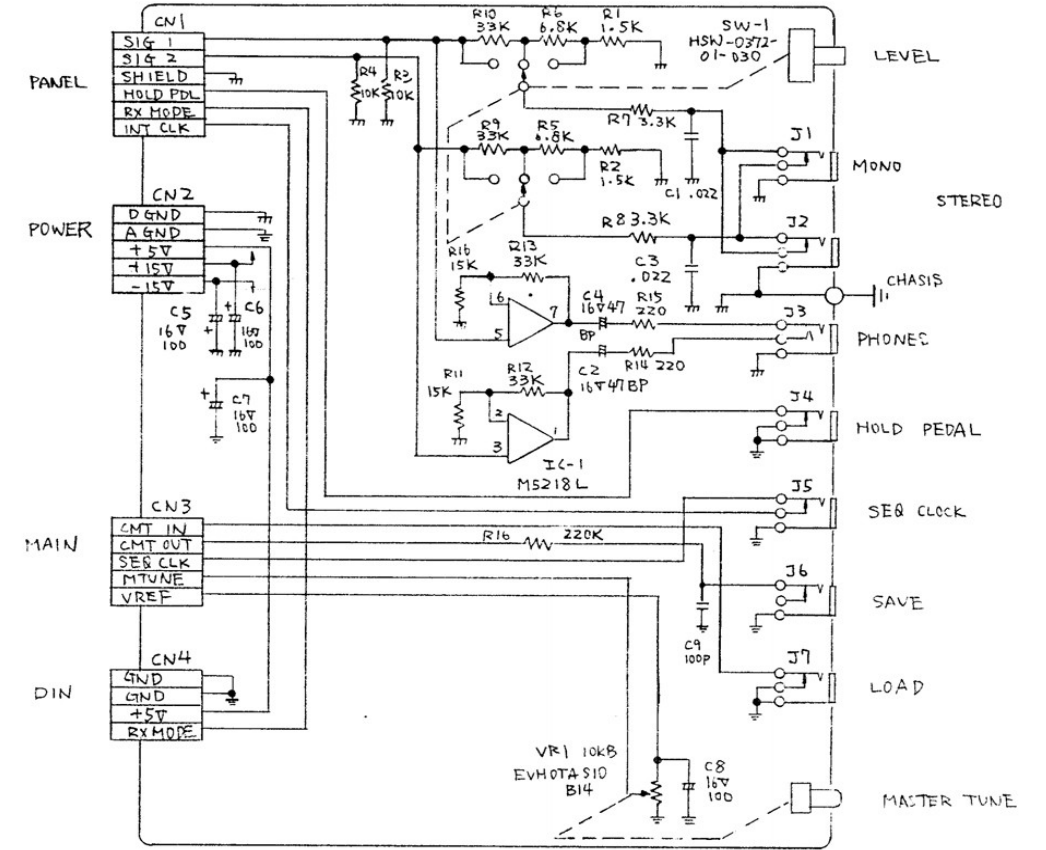
**JACK BOARD** 7612713000 (149H215) (pcb 052H442B)



View from component side

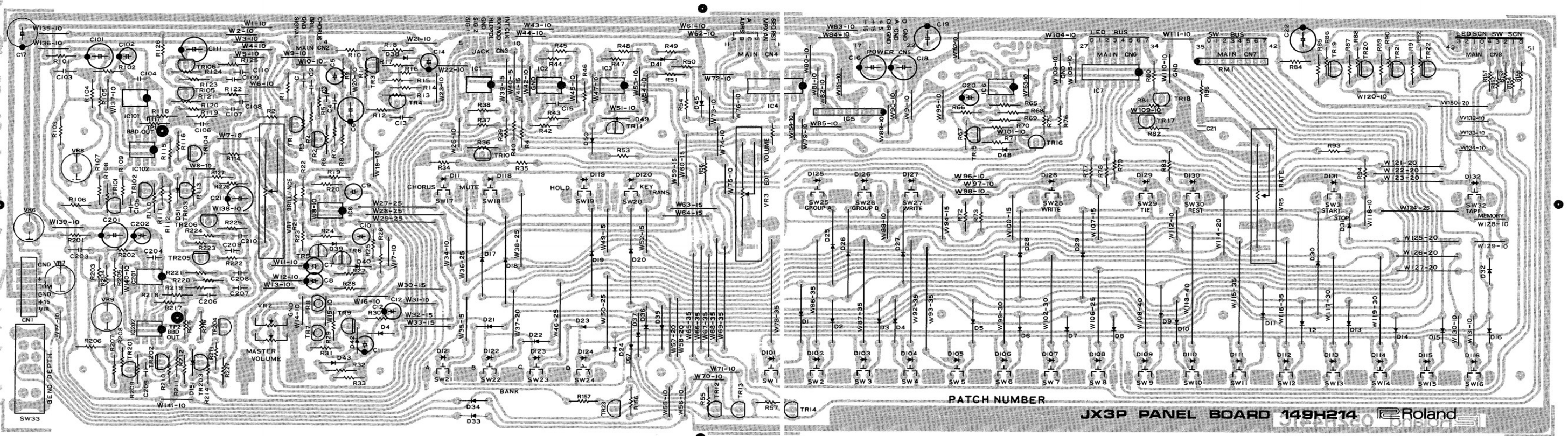


View from foil side

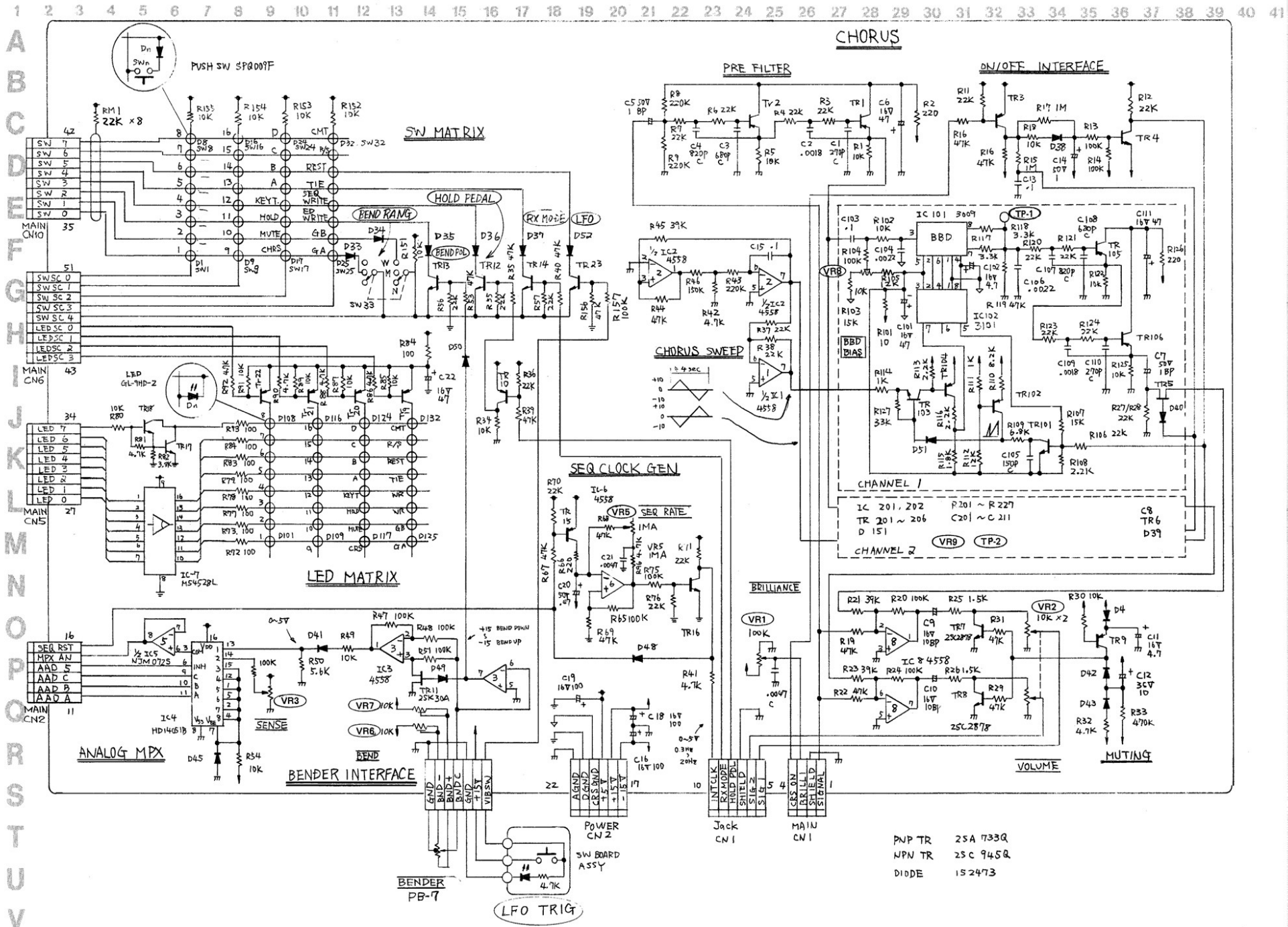


(MONO JACK  
HLJ-0316-01-100)  
(STEREO JACK  
HLJ-0314-01-020)

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



PATCH NUMBER JX3P PANEL BOARD 149H214 Roland



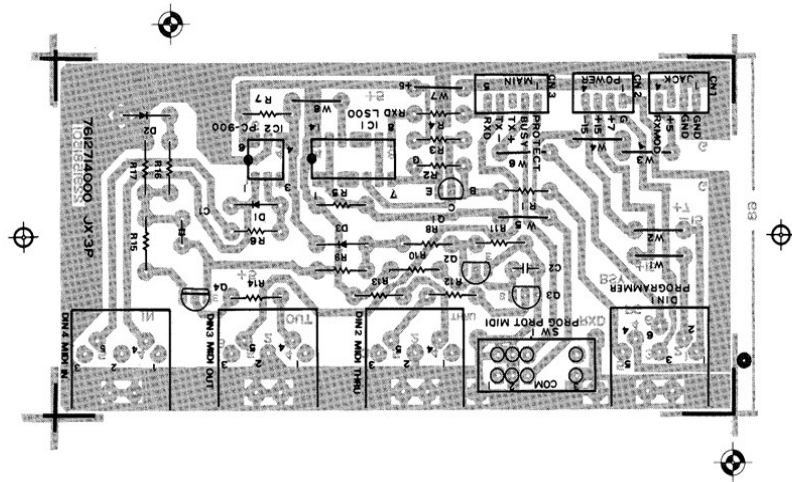
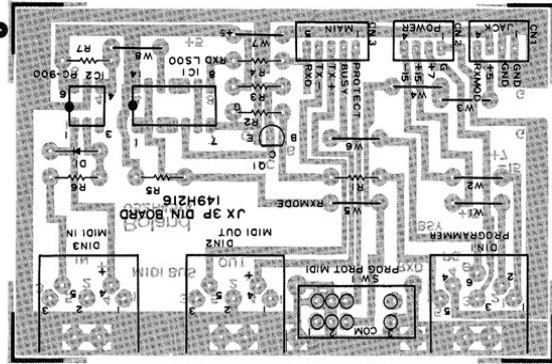
PNP TR 2SA 1733Q  
 NPN TR 2SC 945QR  
 DIODE 1S2473

**DIN BOARD (149H216)** (pcb 052H451A)

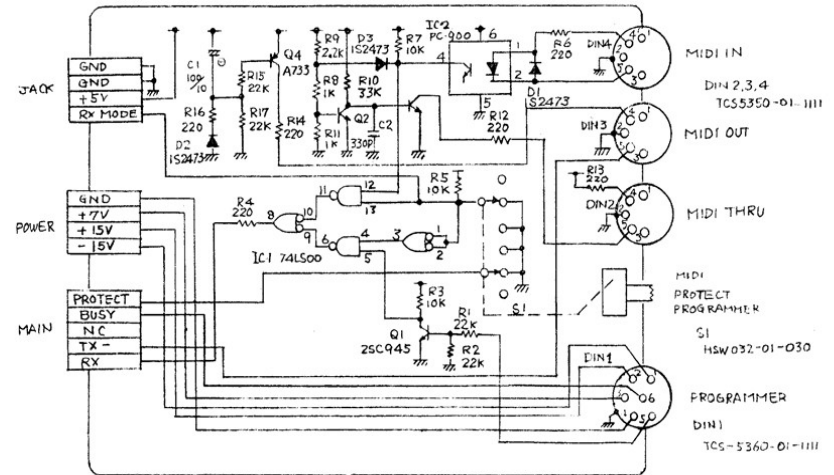
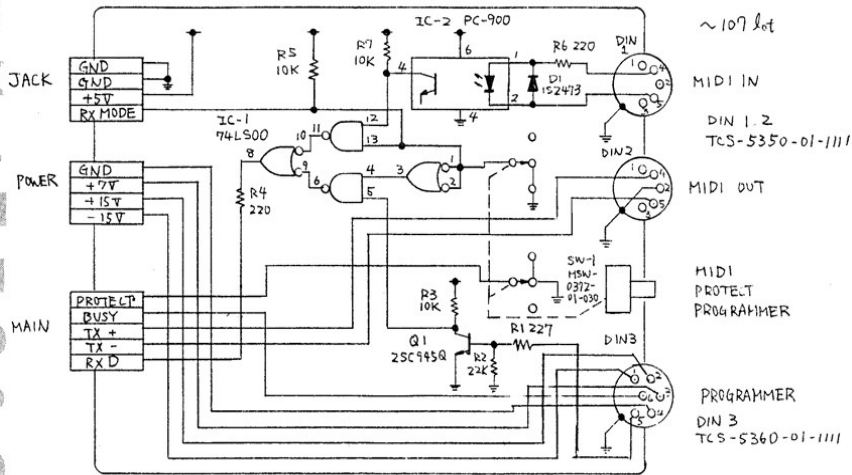
SN 340700 and up  
**DIN BOARD 7612714000** (pcb 2291581501)

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  
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G  
H  
I  
J  
K  
L  
M  
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O  
P  
Q  
R  
S  
T  
U

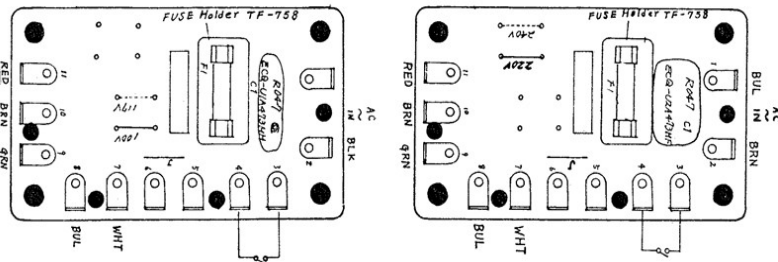


Although both PCBs are compatible, substituting new PCB to old one needs Top panel replacement.



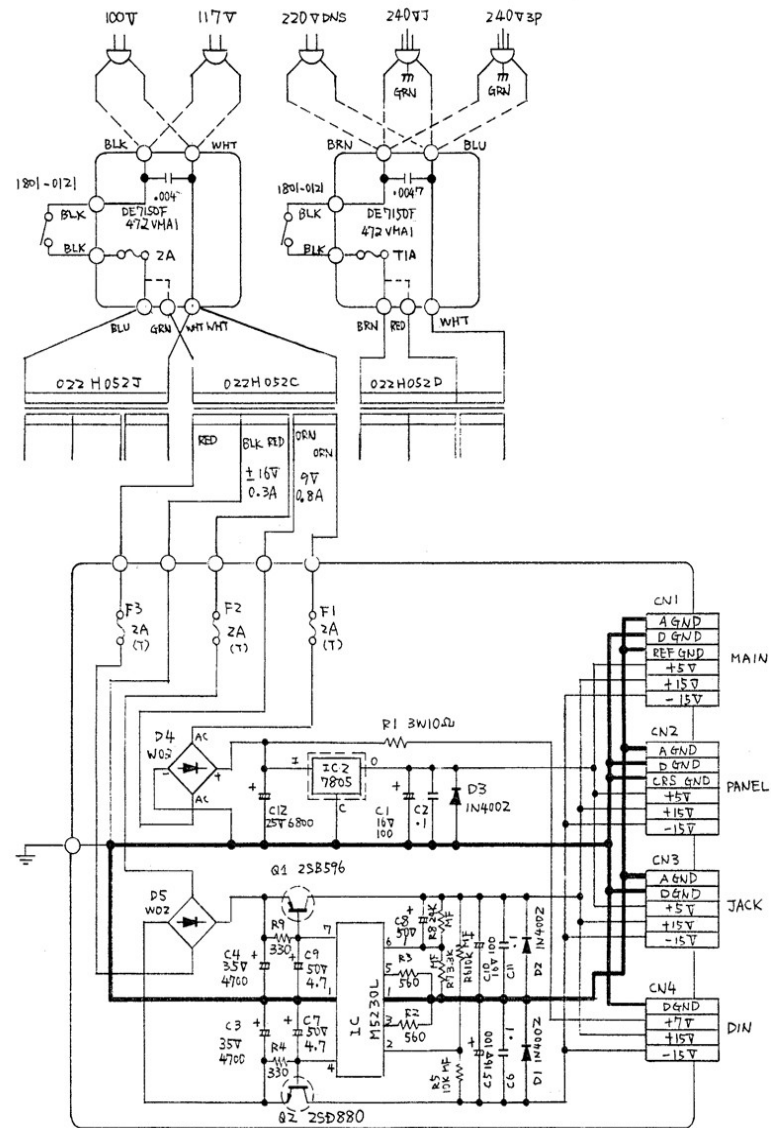
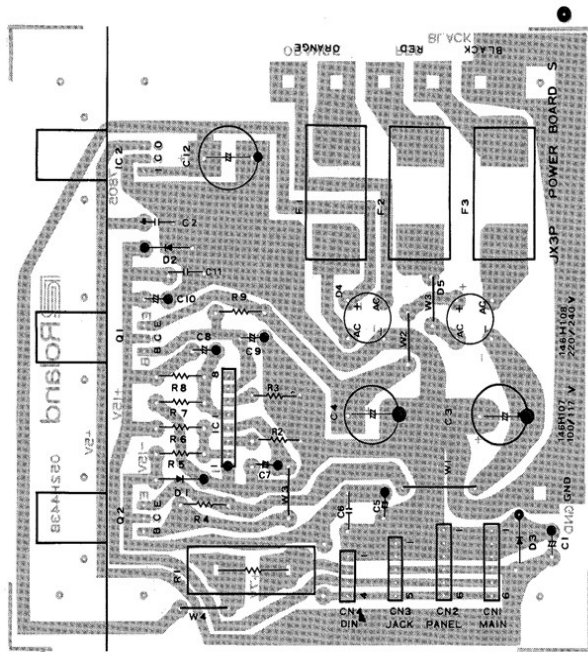
**FUSE BOARD**

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



**POWER SUPPLY BOARD**

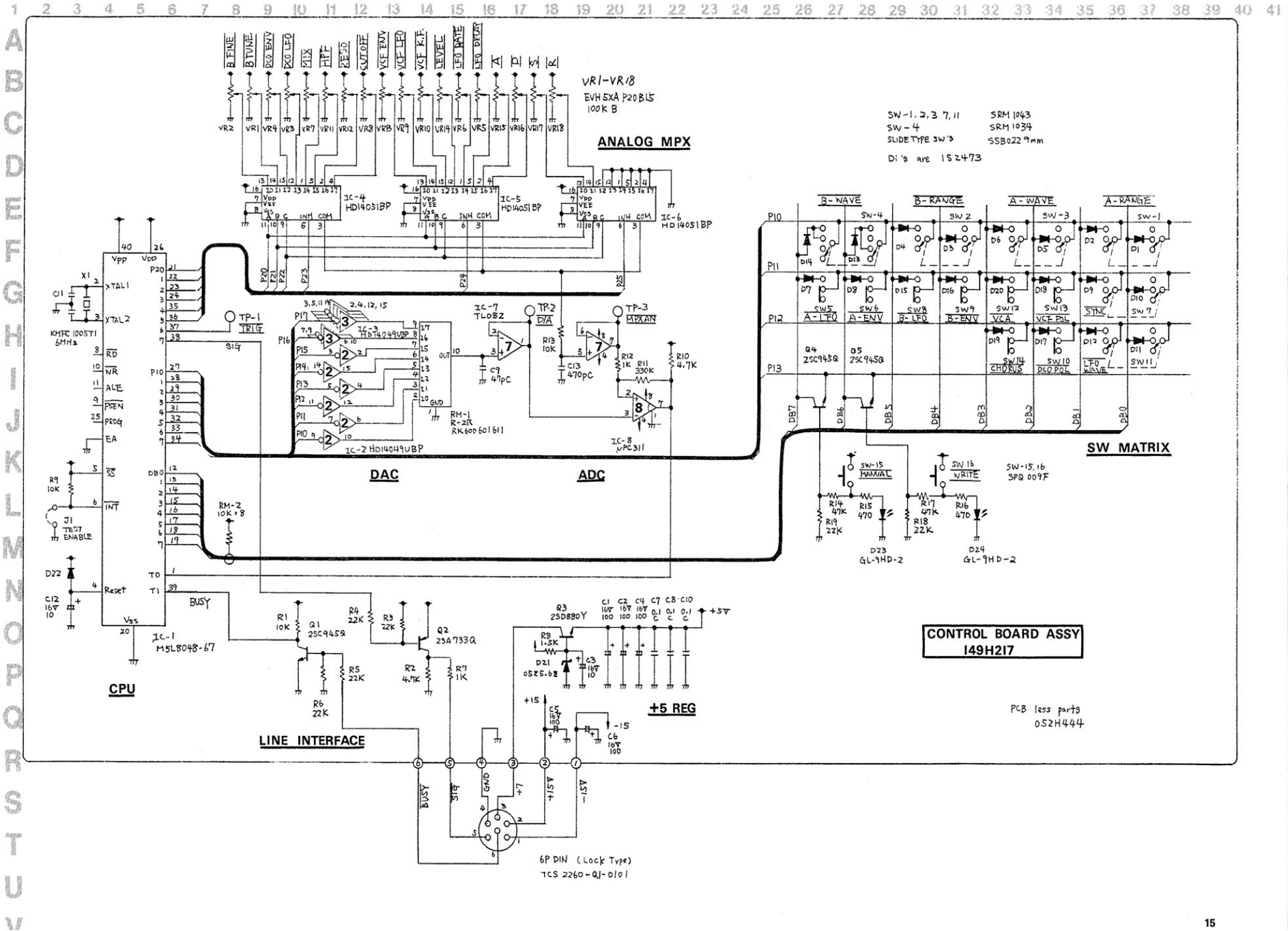
100/117V 7612707100 (146H107) (pcb 052H443B)  
 220/240V 7612707400 (146H108) (pcb 052H443B)



A  
B  
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V



# PG-200 CIRCUIT DIAGRAM



## THE MIDI

MIDI stands for Musical Instrument Digital Interface designed to enable inter-connecting 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 vvvv	Note On (v=40H) / (v=0) Velocity ignored.
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	0bb0 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 vvvv	Note On (v > 0) / off (v=0) Velocity ignored.
1000 0000	0kkk kkkk	0vvv vvvv	Note Off. Velocity ignored.
1011 0000	0100 0000	0	Hold Off, if enabled.
1011 0000	0100 0000	7FH	Hold On, if enabled.
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	0bb0 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

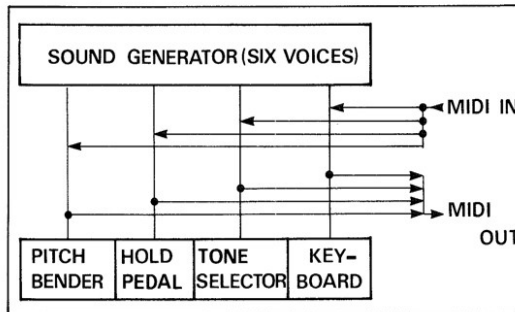
#### FRONT PANEL CODED FUNCTION

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

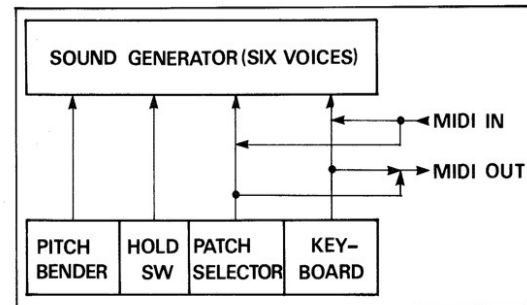
Status	Second	Third	Description
1001 000*	0kkk kkkk	0vvv vvvv	Note On (v=40H) / off (v=0) Velocity ignored
1011 000*	127 (7FH)	0	POLY Mode Select (All notes off)
1100 0000	000p pppp		Program Change p=0 - 31 (1FH)
1111 0110			Tune

#### RECOGNIZED RECEIVE DATA

Status	Second	Third	Description
1001 000*	0kkk kkkk	0vvv vvvv	Note On (v > 0) / off (v=0) Velocity ignored
1000 000*	0kkk kkkk	0vvv vvvv	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	Note On
		0000 0000	Note Off
	kkk kkkk = 29 - 103 (HP-300)		
	21 - 108 (HP-400)		
	vvv vvvv = 1 - 127		
1011 0000	0100 0000	0111 1111	Damper On
		0000 0000	Damper Off
1011 0000	0100 0001	0111 1111	Soft On
		0000 0000	Soft Off
1011 0000	0111 1111	0000 0000	All Notes Off
			POLY Mode Select

**RECOGNIZED RECEIVE DATA IN OMNI MODE**

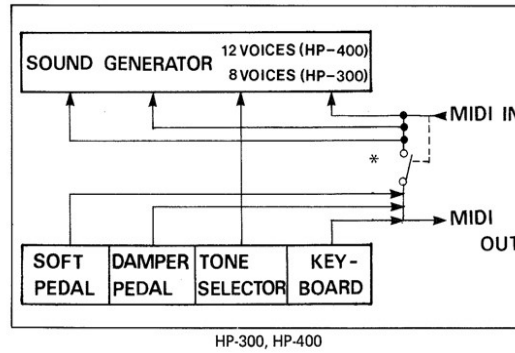
Status	Second	Third	Description
1000 xxxx	0kkk kkkk	0vvv vvvv	Note Off
		vvv vvvv = 0 - 127	
		xxxx = 0 - 15	
1001 xxxx	0kkk kkkk	0vvv vvvv	Note On
		0000 0000	Note Off
		kkk kkkk = 0 - 127	
		vvv vvvv = 1 - 127	
1011 xxxx	0100 0000	0111 1111	Damper On
		0000 0000	Damper Off
1011 xxxx	0100 0001	0111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

**Notes:**

- The transmitter sends All Notes Off code when all the keys are released.
- 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**

**14051B**  
8-Channel Analog Multiplexer/Demultiplexer

Control Inputs		ON Switches	
Inhibit	Select	MC14051B	MC14052B
0	0	X0	Y0
0	0	1	X1
0	0	1	0
0	1	0	X2
0	1	0	1
0	1	1	X3
0	1	1	0
1	0	0	X4
1	0	0	1
1	0	1	X5
1	0	1	0
1	1	0	X6
1	1	0	1
1	1	1	X7
1	1	1	0

None None

\*Not applicable for MC14052  
x = Don't Care

Controls: 6 Inhibit, 11 A, 10 B, 9 C, 13 C, 14 C, 15 C, 12 C, 10 C, 4 X7

Switches: in-0, 1, 2, 3, 4, 5, 6, 7

VDD = Pin 16  
VSS = Pin 8  
VEE = Pin 7

**2764**

**PIN CONFIGURATION**

**MODE SELECTION**

MODE	PINS	CE (20)	OE (22)	PGM (27)	Vpp (1)	Vcc (28)	Outputs (11-13, 15-19)
Read		V <sub>IL</sub>	V <sub>IH</sub>	V <sub>IL</sub>	V <sub>CC</sub>	V <sub>CC</sub>	DOUT
Standby		V <sub>IH</sub>	x	x	V <sub>CC</sub>	V <sub>CC</sub>	High Z
Program		V <sub>IL</sub>	x	V <sub>IL</sub>	V <sub>PP</sub>	V <sub>CC</sub>	DIN
Program Verify		V <sub>IL</sub>	V <sub>IL</sub>	V <sub>IH</sub>	V <sub>PP</sub>	V <sub>CC</sub>	DOUT
Program Inhibit		V <sub>IH</sub>	x	x	V <sub>PP</sub>	V <sub>CC</sub>	High Z

x can be either V<sub>IL</sub> or V<sub>IH</sub>

**i8031/i8051**

**Pin Configuration**

**Logic Symbol**

**Block Diagram**

**1R3109**

(top view)

