

MPU-101

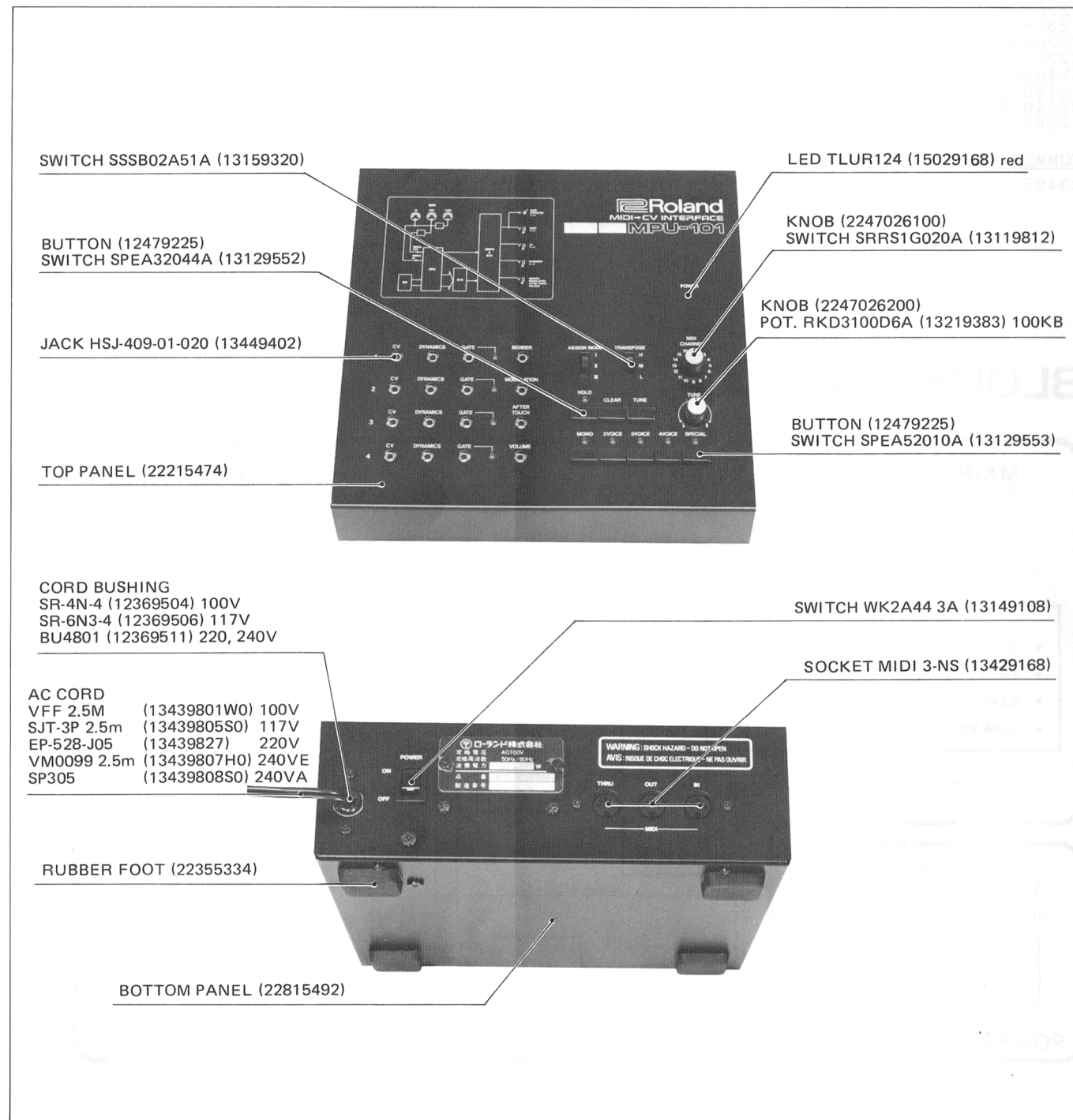
SERVICE NOTES

First Edition

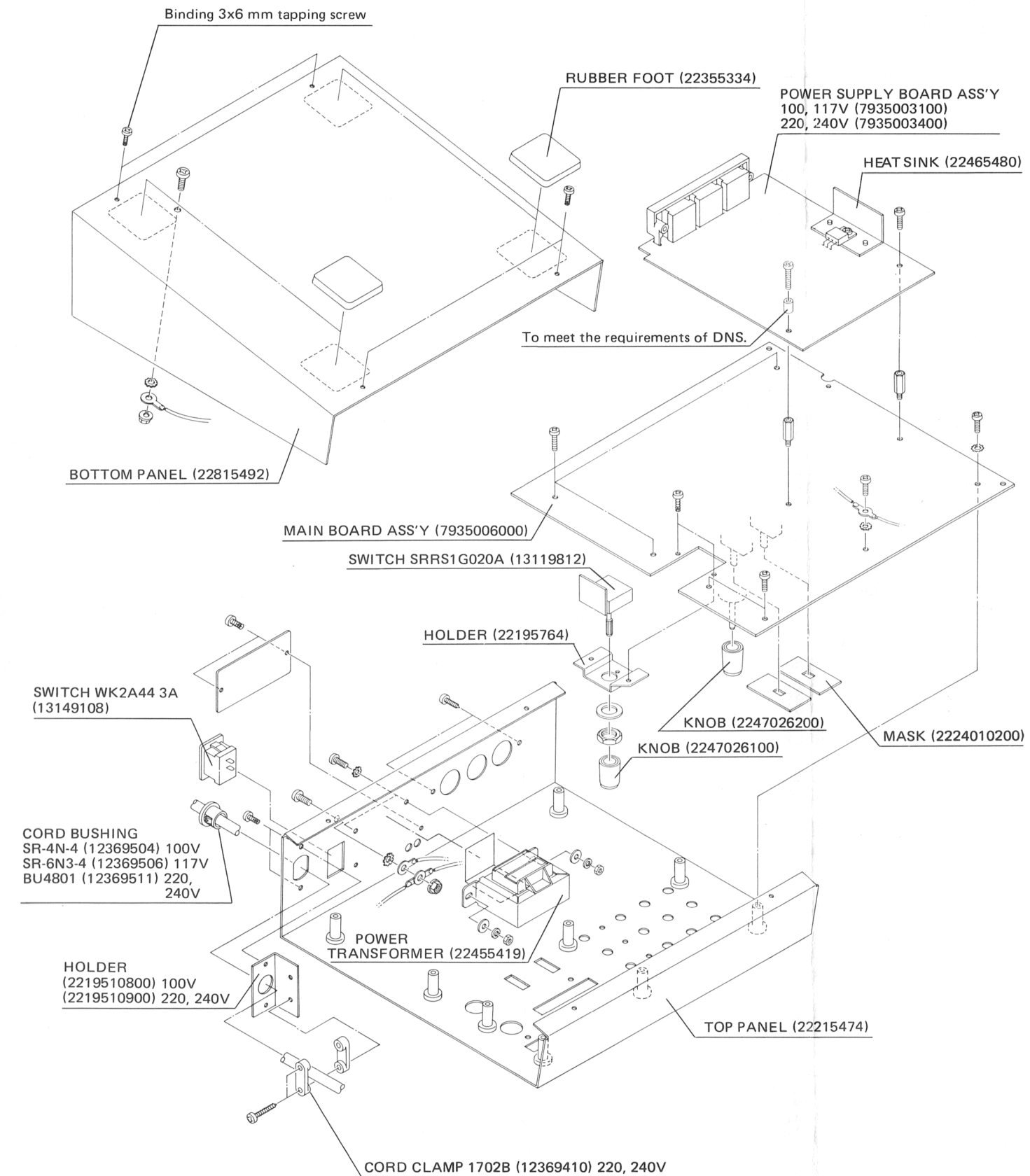
SPECIFICATIONS

CV output 1 V/oct. (-3V - +7.58V)
DYNAMICS output 0V - +10V
GATE output High: +13V Low: 0V
BENDER output -1V - +1V
MODULATION output 0V - +10V
AFTER TOUCH output 0V - +10V
VOLUME output 0V - +10V
TUNABLE RANGE ±100 cent (±83mV)

Power consumption 7W
Dimensions 226 (W) x 81 (H) x 226 (D) mm
 8-7/8 x 3-3/16 x 8-7/8 inch
Weight 2.1 kg 4lb. 10 oz.
OPTION MIDI/SYNC cable MSC-25 (2.5m)
 MSC-50 (5.0m)



DISASSEMBLY

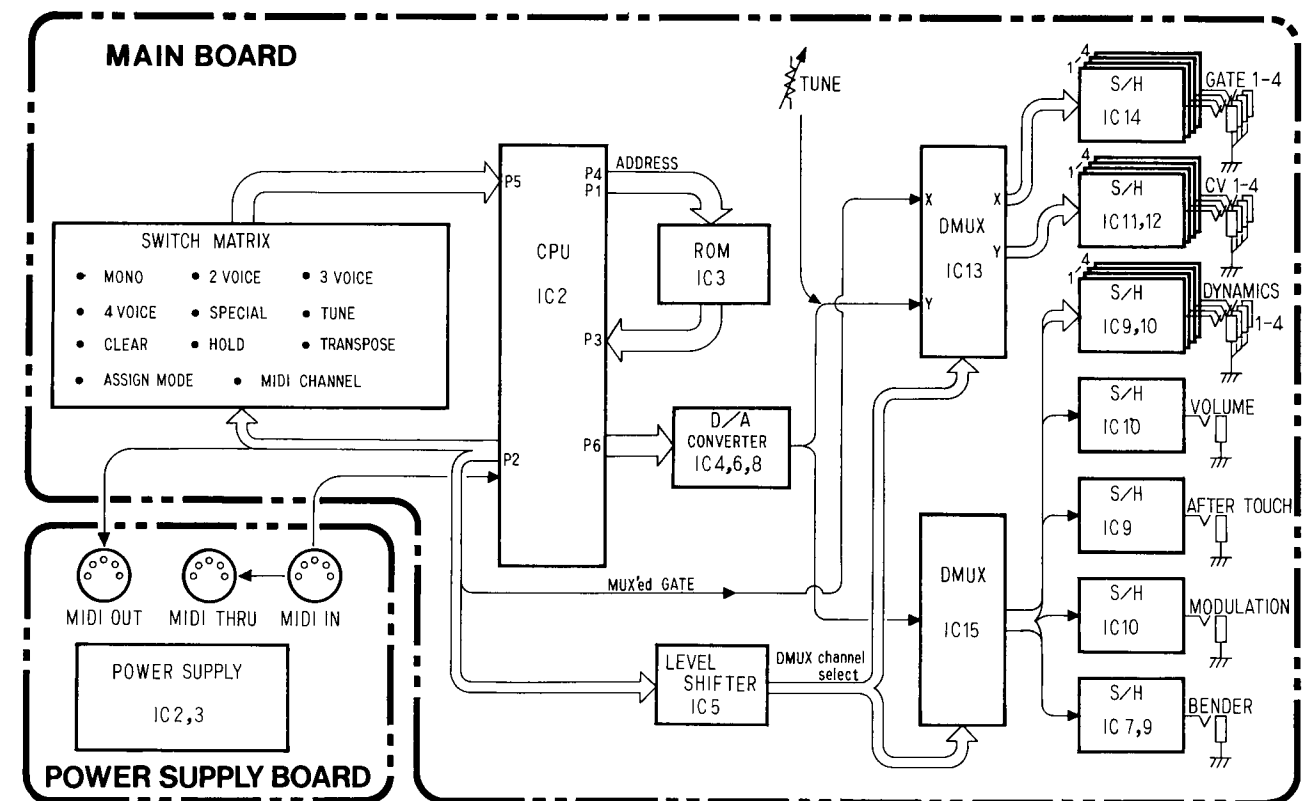


PARTS LIST

PANEL			
22215474		Top	
22815492		Bottom	
HOLDER			
22195764			MIDI CHANNEL switch
2219510800			AC cord (100V)
2219510900			AC cord (220, 240V)
KNOB, BUTTON			
12479225		Button	
2247026100		Knob	MIDI CHANNEL
2247026200		Knob	TUNE
SWITCH			
13129552	SPEA32044A		HOLD/CLEAR/TUNE
13129553	SPEA52010A		MONO/2VOICE/3VOICE/4VOICE/SPECIAL
13159320	SSSB02A51A		ASSIGN MODE/TRANSPOSE
13119812	SRRS1G020A		MIDI CHANNEL (BINARY SWITCH)
13149108	WK2A44 3A		POWER (6A 240V AC)
PCB ASS'Y			
7935006000			Main board (PCB 22925169)
7935003100			Power supply board (PCB 22925170) 100, 117V
7935003400			Power supply board (PCB 22925170) 220, 240V
JACK			
13449402	HSJ-409-01-020		
SOCKET			
13429523	SMD-28-S6T	28P	IC socket
13429168	MIDI3-NS	5P triplet	DIN
FUSE			
12559334	CGS 0.25A	250mA250V	(100, 117V)
12559505	CEE125MAT	T125mA250V	(220, 240V)
RESISTOR ARRAY			
13919117	RCSD8X333K	33kx8	
POTENTIOMETER			
(ROTARY)			
13219383	RKD3100D6A	100k Ω	TUNE
(TRIMMER)			
13299566	RJ6P501 500	500BMF	
13299307	RJ-6S 1K	1kBMF	
13299554	RVS0707V101-3-502	5kBMF	
13299563	RVG0707V101-10-103M	10kBMF	
13299178	RHE0A150RA	100k Ω	
13299607	RHL0N150LA	100kBMF	
FILTER			
13529105	DSS310-55D223S		EMI filter
POWER TRANSFORMER			
22455419	universal	100/117/220/240V	
DIODE			
15019103	1S2473		
15019101	1S1555		
15019208	1SR35-200		
15019624	1SZ52		
15029168	TLUR124	1.ED (red)	
15019245SN	S1VB10	1A 100V rectifier	
PHOTO COUPLER			
15229706	TLP552		
IC			
15179208	HD6303XP		CPU
15179702	TMM2764D		EP-ROM
15159112T0	TC4049BP		Hex buffer/converter inverting type
15159113H0	HD14051BP		Single 8-ch. multiplexer/demultiplexer
15159114H0	HD14052BP		Differential 4-ch. multiplexer/demultiplexer
15159311	MC14504B		Hex level shifter
15159503	TC40H000P		Quad 2-input NAND gate
15189158	μ PC4082C		JFET-input OP Amp
15189154J0	TL064CN		Low-power JFET-input OP Amp
15189146	IR9022		Low-power OP Amp
15199110T0	TA7179P		+15V, -15V voltage regulator
15199106NH	μ PC7805H		+5V voltage regulator

CAPACITOR			
13529104	DE7150F472MVA1	0.0047 μ F	Line bypass
TRANSISTOR			
15119113	2SA1015-GR		
15119112	2SA1015-Y		
15119601	2SB605-L		
15129114	2SC1815-GR		
15129115	2SC1815-Y		
15129600	2SD571-L		
AC CORD			
13439801W0	VFF2.5M	(100V)	
13439805S0	SJT-3P 2.5m	(117V)	
13439827	EP-528-J05	(220V)	
13439807H0	VM0099 2.5m	(240VE)	England
13439808S0	SP305	(240VA)	Australian
OTHERS			
12389715	KMFC1002T	4MHz Xtal (ceramic resonator)	
12369504	SR-4N-4	Cord bushing (100V)	
12369506	SR-6N3-4	Cord bushing (117V)	
12369511	BU4801	Cord bushing (220, 240V)	
22355334		Rubber foot	
22465480		Heat sink	
12199550		Fuse clip	
22240102		Switch mask	
12369410	1702B	Cord clamp (220, 240V)	
COMMERCIALLY AVAILABLE			
23485155	1.5M348-155	MIDI/SYNC cable (1.5m)	
	MSC-25	MIDI/SYNC cable (2.5m)	
	MSC-50	MIDI/SYNC cable (5.0m)	

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

CPU Pin Designation

Pin #	Notation	Function	Pin #	Notation	Function
1	Vss	GND	33	Vcc	+5V
2	XTAL	4MHz clock input	34	P47	ROM chip enable
3	EXTAL		35	P46	NC
4	MP0		36	P45	NC
5	MP1	external ROM, internal RAM	37	P44	ROM address upper 5 bits
6	RES		Reset pulse input	38	
7	STBY	Pulled up to Vcc. (+5V)	39	P42	
8	NMI		40	P41	
9	P20		41	P40	
10	P21	DMUX channel select	42	Vss	GND
11	P22		43	P17	ROM address lower 8 bits
12	P23	Serial input	44	P16	
13	P24	Serial output	45	P15	
14	P25	DMUX INH (IC15)	46	P14	
15	P26	DMUX INH (IC13)	47	P13	
16	P27	MUX'ed GATE output	48	P12	
17	P50	Switch read	49	P11	
18	P51		50	P10	
19	P52		51	P37	Data bus program read (EXT. ROM)
20	P53		52	P36	
21	P54		53	P35	
22	P55		54	P34	
23	P56		55	P33	
24	P57		56	P32	
25	P60	D/A conversion data output	57	P31	
26	P61		58	P30	
27	P62		59	BA	NC
28	P63		60	LIR	NC
29	P64		61	R/W	NC
30	P65		62	WR	NC
31	P66		63	RD	ROM read pulse
32	P67		64	E	System clock (1MHz)

SWITCH READING

All control switches on the top panel are connected to the matrix composed of 8 columns x 2 rows. CPU IC2 alternately sets P20 and P21 to low and reads the state of the switches through P50 - P57.

PORT	PORT								
	57	56	55	54	53	52	51	50	
PORT 20	0	1	Assign I	Clear	Mono	2 Voice	3 Voice	4 Voice	Special
	1	0	Assign II						
	1	1	Assign III						
PORT 21	0	1	Trans- pose H	Tune	Hold	MIDI CHANNEL (4-bit binary format) 0000 to 1111			
	1	0	Trans- pose M						
	1	1	Trans- pose L						

Table 1 SWITCH MATRIX

MIDI IN/OUT

CPU IC2 converts MIDI messages in the selected MIDI channel(s) to Analog Voltages and sends them to JK1 - JK18 respectively. See Table 2.

MIDI	MPU-101 output
NOTE NO. (00H to 7FH)	CV (-3.00V to +7.58V TRANS-POSE: M)
VELOCITY (01H to 7FH)	DYNAMICS (0V to +10V, approx.)
NOTE ON/OFF	GATE ON/OFF
MODULATION CHANNEL PRESSURE VOLUME (00H to 7FH)	MODULATION AFTER TOUCH VOLUME (0 to +9.920V)
PITCH BENDER (00H to 7FH)	BENDER (-1.000V to +1.000V)

Table 2 MIDI to CV conversion

CPU IC2 sends MIDI messages to MIDI OUT when in the Operation Modes except MONO.

SAMPLE AND HOLD

CPU IC2 sends out to P60 - P67 a train of 8-bit parallel data obtained by processing MIDI messages from MIDI IN. The data are fed to R-2R Ladder Network through CMOS buffers IC4 and IC6.

These data become a train of multiplexed analog voltages between 0V and -4.9725V at TP3. (In normal operation mode.)

The voltages in a train are, with corresponding channel select code applied at either of two DMUXs (IC13 or IC15) through Level Shifter IC5, sampled into designated Hold Amps - each consisting of a hold capacitor and a high impedance buffer. See Table 3.

PORT					IC15 (4051)	IC13 (4052)
26	25	22	21	20		
1	0		0	0	DYNAMICS 1	X
1	0		0	1	DYNAMICS 2	
1	0		0	1	DYNAMICS 3	
1	0		0	1	DYNAMICS 4	
1	0		1	0	BENDER	
1	0		1	0	MODULATION	
1	0		1	1	AFTER TOUCH	
1	0		1	1	VOLUME	
0	1		X	0	CV1, GATE 1	
0	1		X	0	CV2, GATE 2	
0	1		X	1	CV3, GATE 3	
0	1		X	1	CV4, GATE 4	

Table 3 DMUX channel select

As can be seen from Fig. 1, some voltages are sampled twice a loop, while the remainder only once.

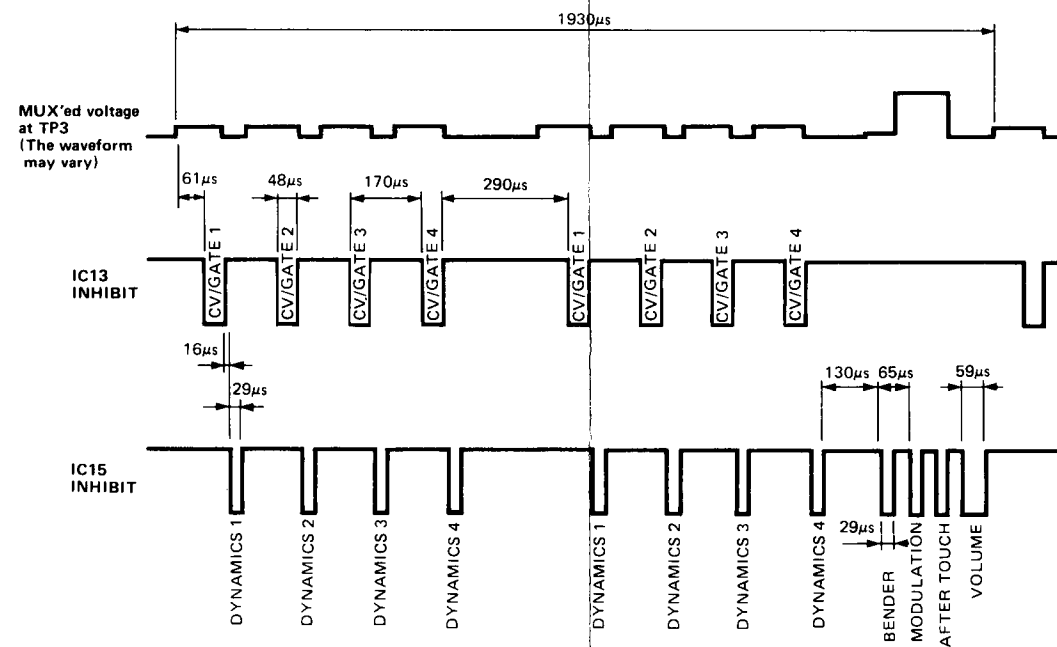


Fig. 1 Timing chart of sampling pulse train

OUTPUTS

OUTPUTS 1 DEFAULT (TUNE knob: center, TRANSPOSE SW: M)

CV outputs 1-4	+2.000V (C ₄)
DYNAMICS outputs 1-4	+5V (Velocity = 64)
GATE outputs 1-4	OFF
BENDER output	0.000V (Center)
MODULATION output	0V (Value = 0)
AFTER TOUCH output	0V (Value = 0)
VOLUME output	+5V (Value = 64)

Table 4

OUTPUTS 2 TUNE button is pressed (TUNE knob: center)

CV outputs 1-4	+2.75V (A ₄)
DYNAMICS outputs 1-4	+5V (Velocity = 64)
GATE outputs 1-4	ON
BENDER output	0.000V (Center)
MODULATION output	0V (Value = 0)
AFTER TOUCH output	0V (Value = 0)
VOLUME output	+5V (Value = 64)

Table 5

OUTPUTS 3 CLEAR button is pressed

CV outputs 1-4	Unchanged
DYNAMICS outputs 1-4	Unchanged
GATE outputs 1-4	OFF
BENDER output	0.000V (Center)
MODULATION output	0V (Value = 0)
AFTER TOUCH output	0V (Value = 0)
VOLUME output	+5V (Value = 0)

Table 6

Received Data vs Output Voltage (Note Number vs CV Output)

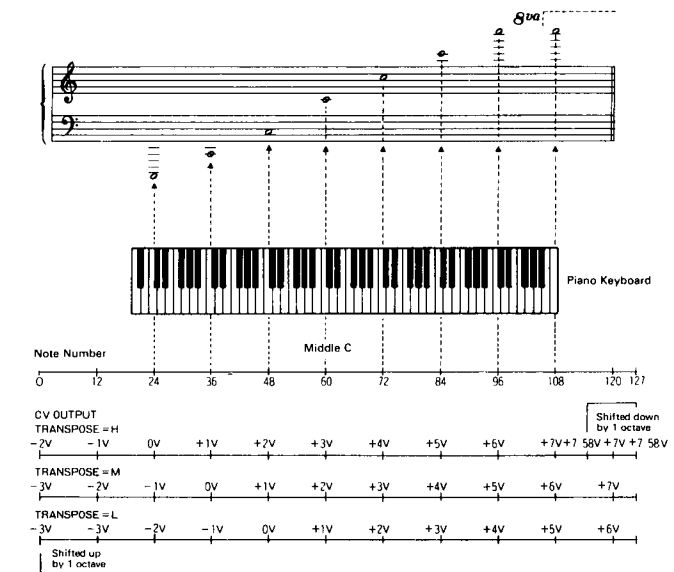
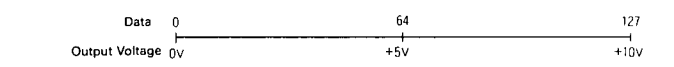


Fig. 2

Dynamics Modulation, After touch and Volume



★ The minimum voltage of Dynamics is 0.078V (DATA = 1)

Fig. 3

Pitch Bender

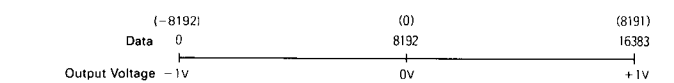
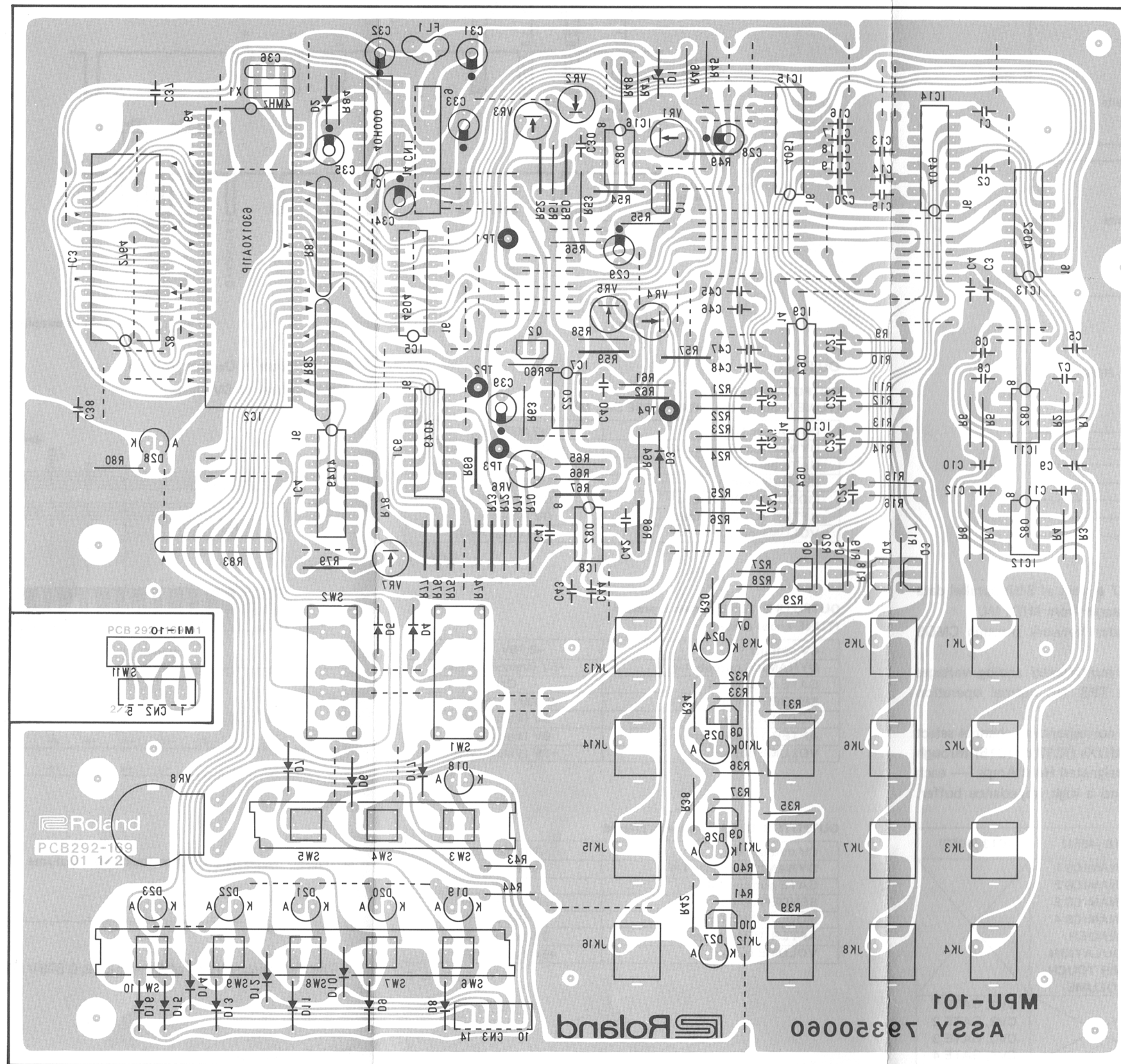


Fig. 4

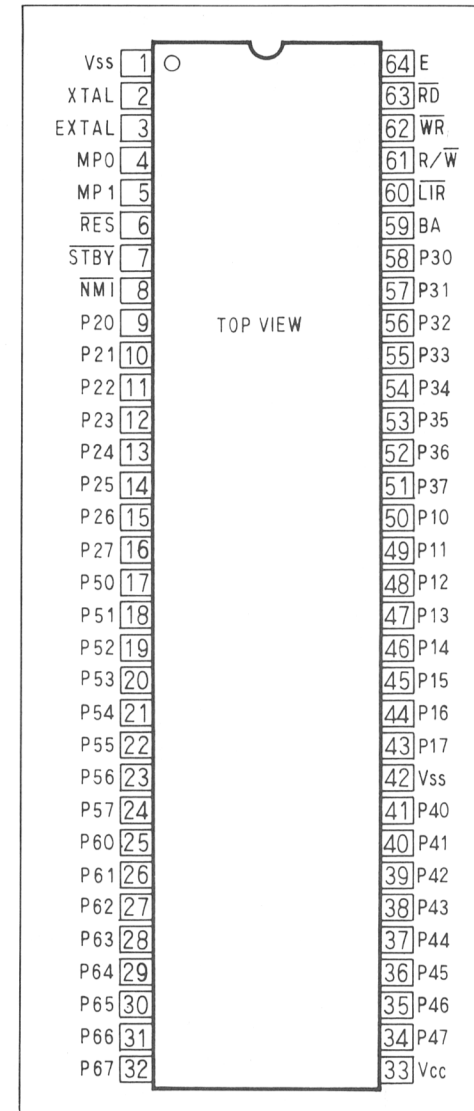
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T

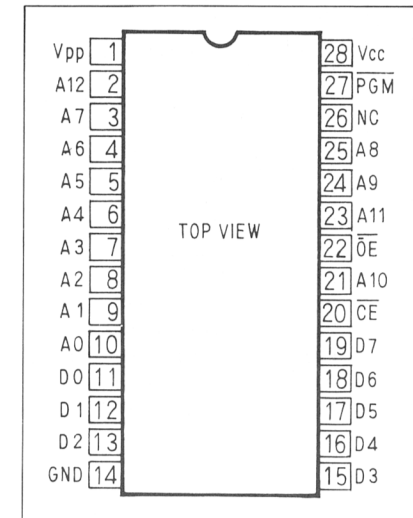
MAIN BOARD 7935006000(pcb 22925169)



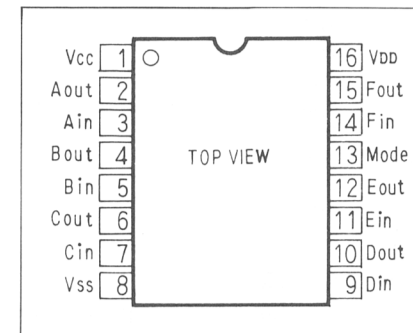
HD6303XP



2764



MC14504B



PARTS CHANGE INFORMATION

MAIN BOARD

R65, R66 220kΩ → 100kΩ (SN561400-up)

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

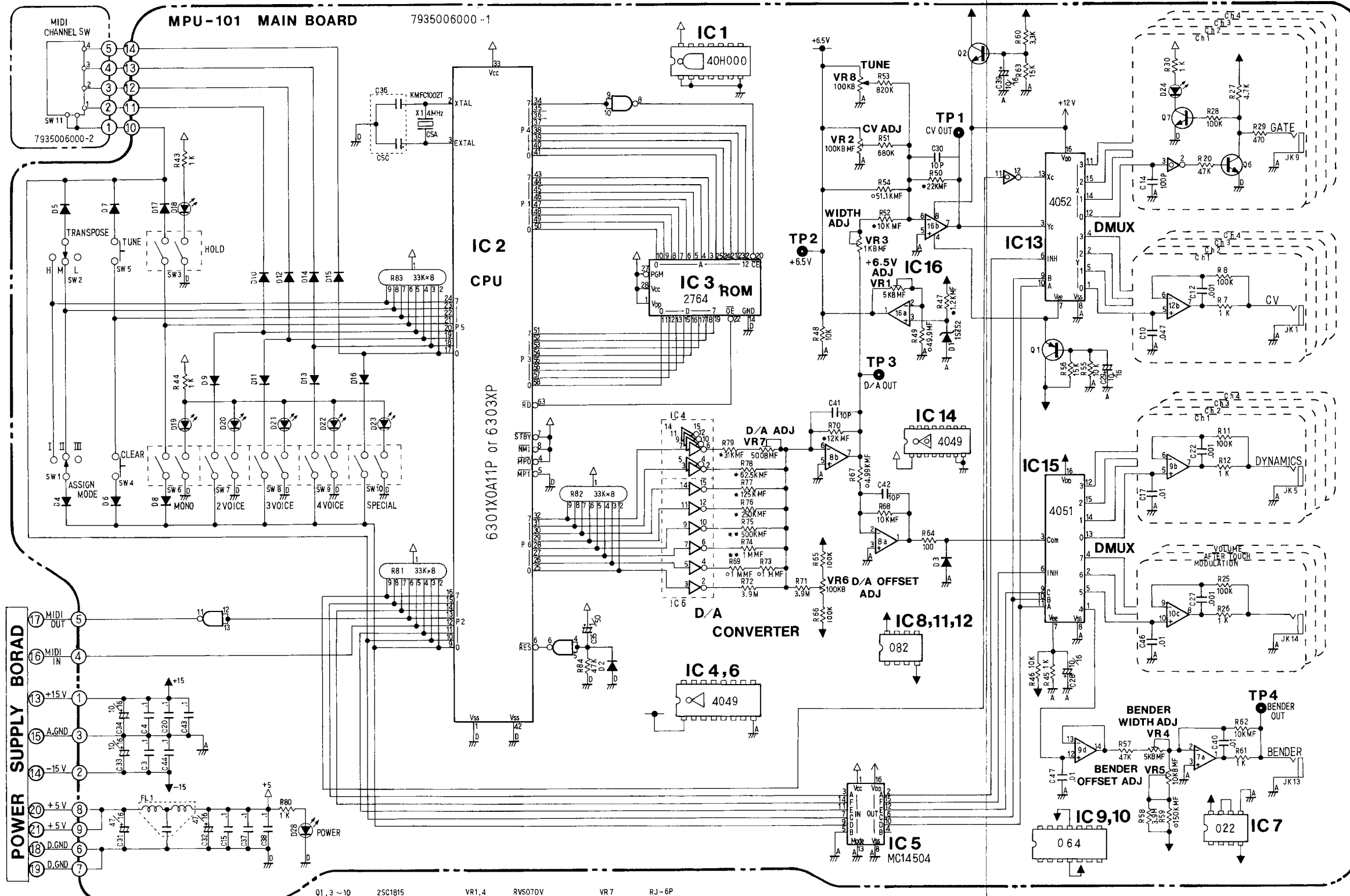
MAIN BOARD

* Do not leave MAIN BOARD disconnected from POWER SUPPLY BOARD while power is ON.
 Unloading PS BOARD will affect IC2 TA7179P on PS BOARD.

BINARY SWITCH SRRS1G020A

ON : 1 OFF : 0

SELECT	OUTPUT			
	4	3	2	1
1	0	0	0	0
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1
16	1	1	1	1



Q1, 3 ~ 10	25C1815	VR1, 4	RVS070V	VR7	RJ - 6P	**	CRB25DY 0.5%
Q2	25A1015	VR2	H0622A	VR8	K161B002Y	*	CRB25BY 0.1%
D1	1S252	VR3	RJ-65	FL1	D55310-5SD2235	*	HR25M 1% 50ppm
D2 ~ 17	1S2473	VR5	RV6070	o	MR25 1% 100ppm	.	
D18 ~ 28	TLUR-124	VR6	H0615C119				

PARTS DESIGNATION (in Dotted line, Schematic Diagram)

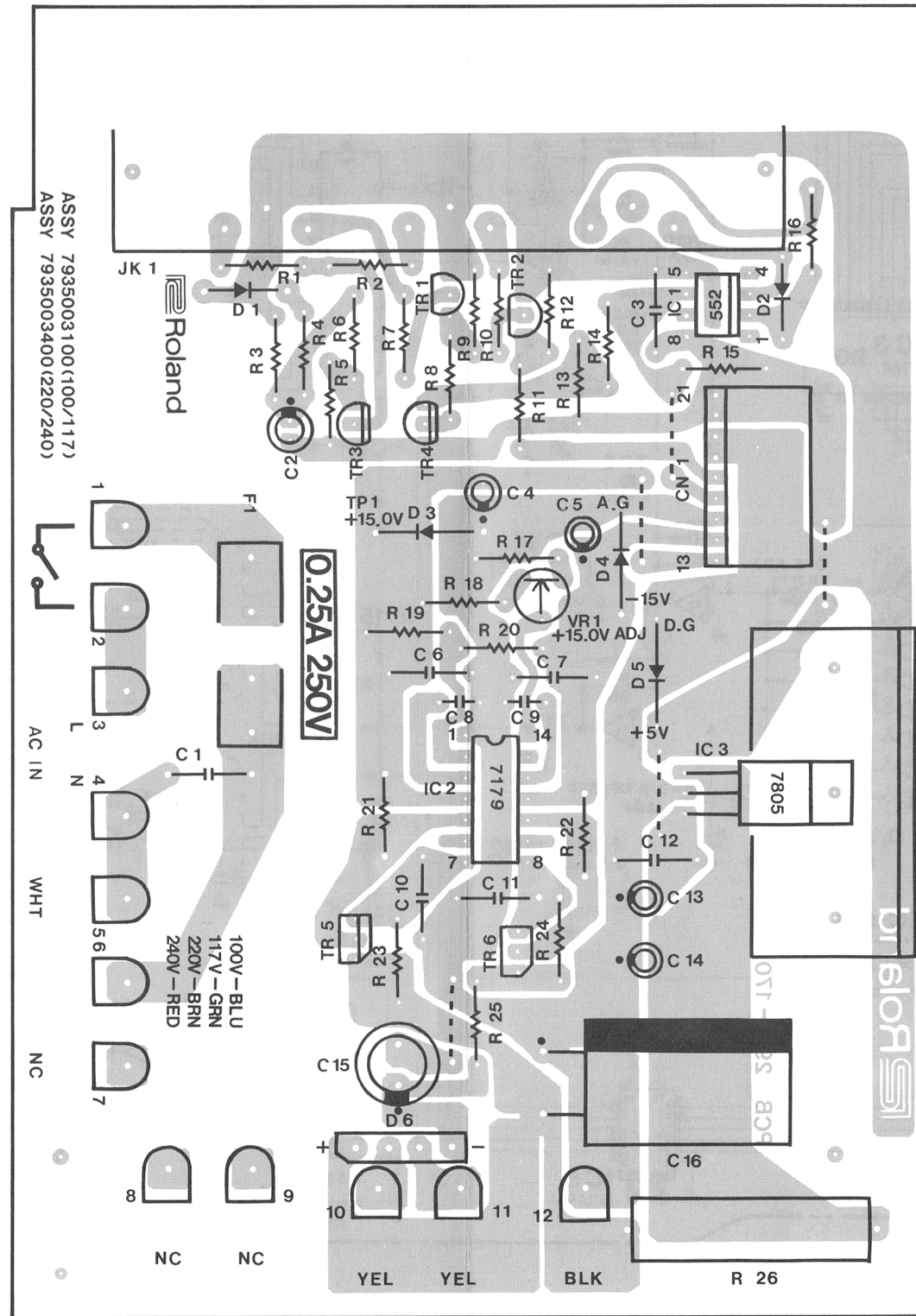
GATE										CV					DYNAMICS							
CH1	IC14a	Q6	Q7	R20	R27	R28	R29	R30	C14	JK9	IC12b	R7	R8	C10	C12	JK1	IC9b	R11	R12	C17	C22	JK5
CH2	IC14f	Q3	Q8	R17	R32	R33	R31	R34	C2	JK10	IC12a	R4	R3	C9	C11	JK2	IC10a	R14	R13	C18	C23	JK6
CH3	IC14b	Q4	Q9	R18	R36	R37	R35	R38	C13	JK11	IC11b	R5	R6	C6	C8	JK3	IC10b	R15	R16	C19	C24	JK7
CH4	IC14d	Q5	Q10	R19	R40	R41	R39	R42	C1	JK12	IC11a	R2	R1	C5	C7	JK4	IC9a	R10	R9	C16	C21	JK8

MODULATION	IC10c	R25	R26	C46	C27	JK14
AFTER TOUCH	IC9c	R21	R22	C48	C25	JK15
VOLUME	IC10d	R24	R23	C45	C26	JK16

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

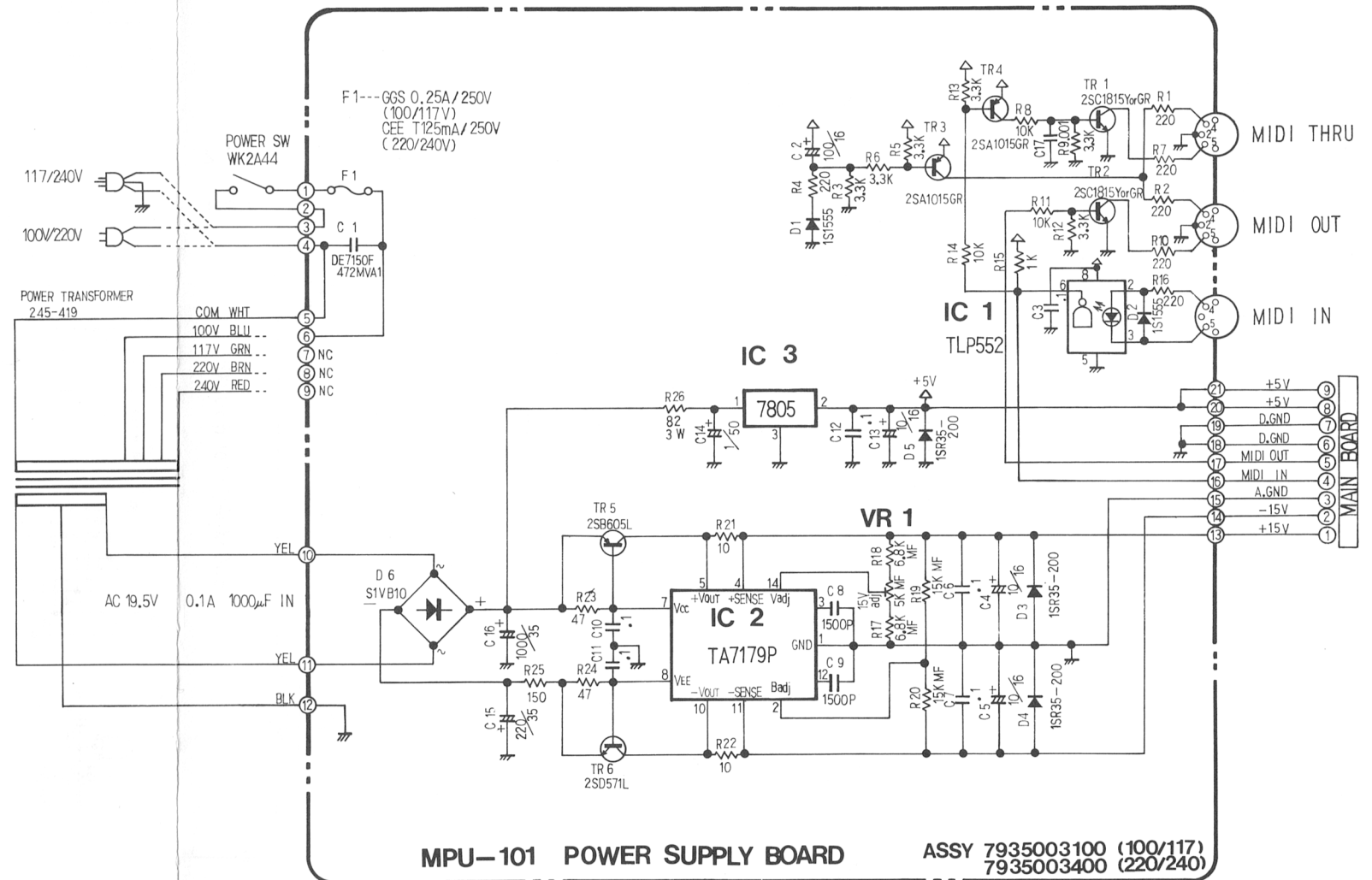
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T

POWER SUPPLY BOARD 7935003100 100/117V(pcb 22925170)
7935003400 220/240V(pcb 22925170)

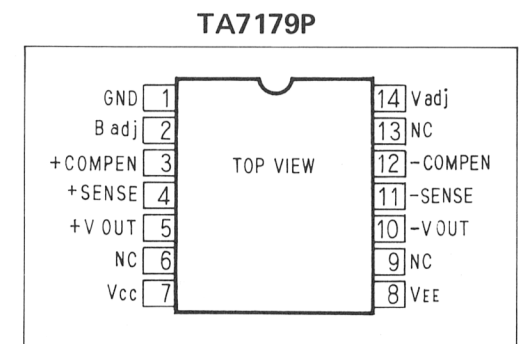


View from component side.

* Do not leave POWER SUPPLY BOARD disconnected from MAIN BOARD while power is ON. Unloading will affect IC2 TA7179P.



MPU-101 POWER SUPPLY BOARD ASSY 7935003100 (100/117)
7935003400 (220/240)



ADJUSTMENT/CHECK PROGRAM

The MPU-101 is provided with the built-in test program for use in adjusting and checking.
The program runs only in the TEST MODE.

Entering TEST MODE

1. With Power OFF set Panel Controls — HOLD: OFF MIDI CH: 1 SPECIAL: ON TUNE: center
2. While holding both CLEAR and TUNE buttons, switch the Power ON.

CAUTION: Allow at least five minutes for warm-up.

In the TEST MODE each function switch serves as a Test Program Selector switch.

Run the program in numerical sequence.

Controls set in an item can be left unchanged unless specified.

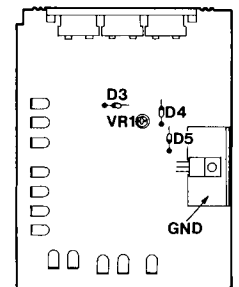
Measuring instrument: Digital Voltmeter (input impedance 1M ohm Min.)

ITEM	MODE/CONTROL	TEST POINT (GROUND)	ADJUST/CHECK for	READING
1	+15V INITIAL TEST MODE	POWER SUPPLY BOARD (PSBD) D3 cathode (Heat sink)	VR1	+15.000V ±10mV
			check	-15.000V ±200mV
			check	+5.000V ±250mV
			VR1	+6.500V ±2mV
			VR6	0.0000V ±0.2mV
2	-15V	MAIN BOARD (MABD) TP2 (JK13 GND)	VR1	+6.500V ±2mV
			check	-3.000V ±1mV
			check	-3.085V ±15mV
			check	-2.915V ±15mV
3	+5V	MAIN BOARD (MABD) TP2 (JK13 GND)	VR1	+6.500V ±2mV
			check	-3.000V ±1mV
			check	-3.085V ±15mV
4	+6.5V	MAIN BOARD (MABD) TP2 (JK13 GND)	VR1	+6.500V ±2mV
			check	-3.000V ±1mV
			check	-3.085V ±15mV
5	D/A OFFSET	(MABD) TP3	VR6	0.0000V ±0.2mV
			check	-3.000V ±1mV
			check	-3.085V ±15mV
			check	-2.915V ±15mV
6	CV	(MABD) TP1	VR2	-3.000V ±1mV
			check	-3.085V ±15mV
			check	-2.915V ±15mV
			TUNE	-3.000V ±1mV
7	WIDTH	Push 4VOICE	VR3	+2.250V ±1mV
			VR7	+2.333V ±1mV
8	D/A	Push 3VOICE	check	-2.958V ±8mV
			check	-2.917V ±2mV
			check	-2.833V ±3mV
9	LSB	Push 2VOICE	check	-2.958V ±8mV
			check	-2.917V ±2mV
			check	-2.833V ±3mV
10	D/A	Push MONO	check	-3.000V ±2mV
			check	0.000V ±2mV
			check	0.0000V ±0.5mV
			check	+1.000V ±3mV
			check	+2.000V ±3mV
			check	+3.000V ±3mV
			check	+4.000V ±3mV
			check	+5.000V ±3mV
			check	+6.000V ±4mV
			check	+7.000V ±4mV
			check	-3.000V ±4mV
			check	-2.000V ±4mV
check	-1.000V ±4mV			

If some of the readings are not satisfactory, repeat items 7-10.

ITEM	MODE/CONTROL	TEST POINT (GROUND)	ADJUST/CHECK for	READING
11	BENDER OFFSET	(MABD) TP4 (JK13 GND)	VR5	+1.000V ±2mV
			VR4	-1.000V ±2mV
			check	0.000V ±2mV
12	BENDER WIDTH	(MABD) TP4 (JK13 GND)	VR5	+1.000V ±2mV
			VR4	-1.000V ±2mV
			check	0.000V ±2mV
13	BENDER OV	(MABD) TP4 (JK13 GND)	VR5	+1.000V ±2mV
			VR4	-1.000V ±2mV
			check	0.000V ±2mV
If some of the readings are not satisfactory, repeat items 11-13.				
14	CV OFFSET	(MABD) JK1 JK2 JK3 JK4 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
15	CV MAX	(MABD) JK1 JK2 JK3 JK4 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
16	DYNAMICS	(MABD) JK5 JK6 JK7 JK8 JK9 JK10 JK11 JK12 JK13 JK14 JK15 JK16 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
17	GATE	(MABD) JK9 JK10 JK11 JK12 JK13 JK14 JK15 JK16 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
			check	0.000V ±10mV
18	MODULATION	(MABD) JK14 JK15 JK16 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV
19	AFTER TOUCH	(MABD) JK14 JK15 JK16 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV
20	VOLUME	(MABD) JK14 JK15 JK16 (JK13 GND)	check	0.000V ±10mV
			check	0.000V ±10mV

POWER SUPPLY BOARD



MAIN BOARD

