

AXIS-1

SERVICE NOTES

First Edition

SPECIFICATIONS

CONTROL UNIT

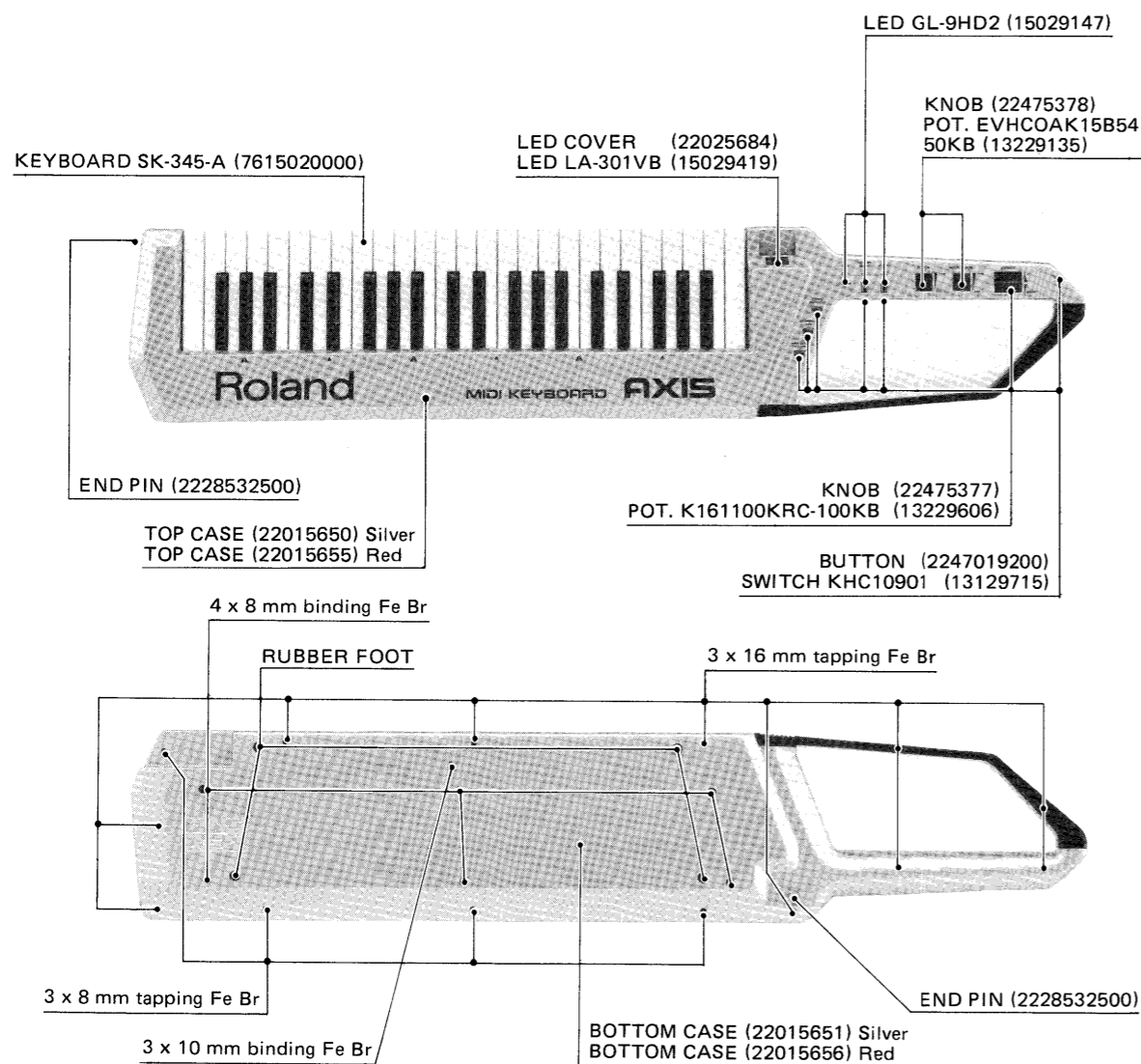
KEYBOARD 45 keys, E scale
 DIMENSIONS 1,075 (W) x 220 (D) x 63 (H) mm
 42-5/16" x 8-11/16" x 2-1/2"
 WEIGHT 3.5 kg 7 lb. 11 oz

POWER SUPPLY UNIT

DIMENSIONS 211 (W) x 141 (D) x 61 (H) mm
 8-5/16" x 5-9/16" x 2-3/8"
 WEIGHT 1 kg 2lb. 3 oz
 POWER CONSUMPTION 6W

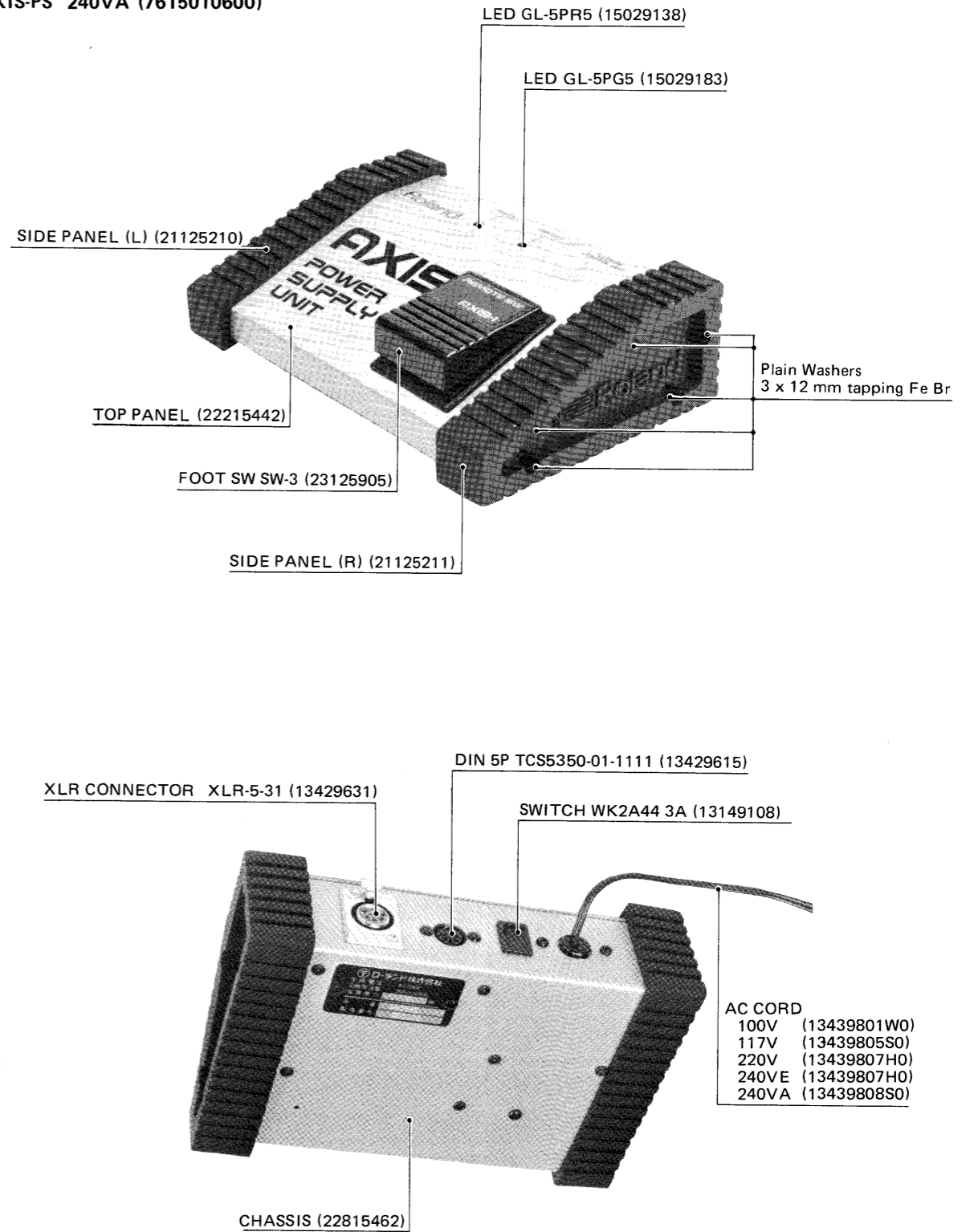
CONTROL UNIT

AXIS-1SV (7615002000) Silver
 AXIS-1RD (7615102000) Red



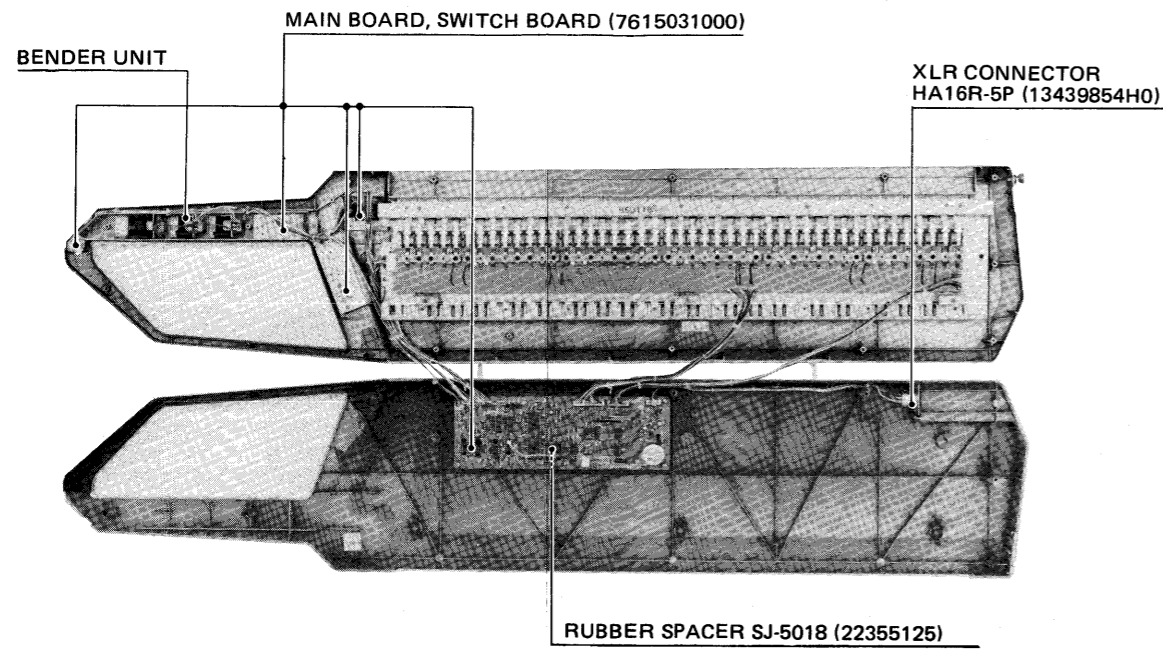
POWER SUPPLY UNIT

AXIS-PS 100V (7615010100)
 AXIS-PS 117V (7615010300)
 AXIS-PS 220V (7615010400)
 AXIS-PS 240VE (7615010500)
 AXIS-PS 240VA (7615010600)

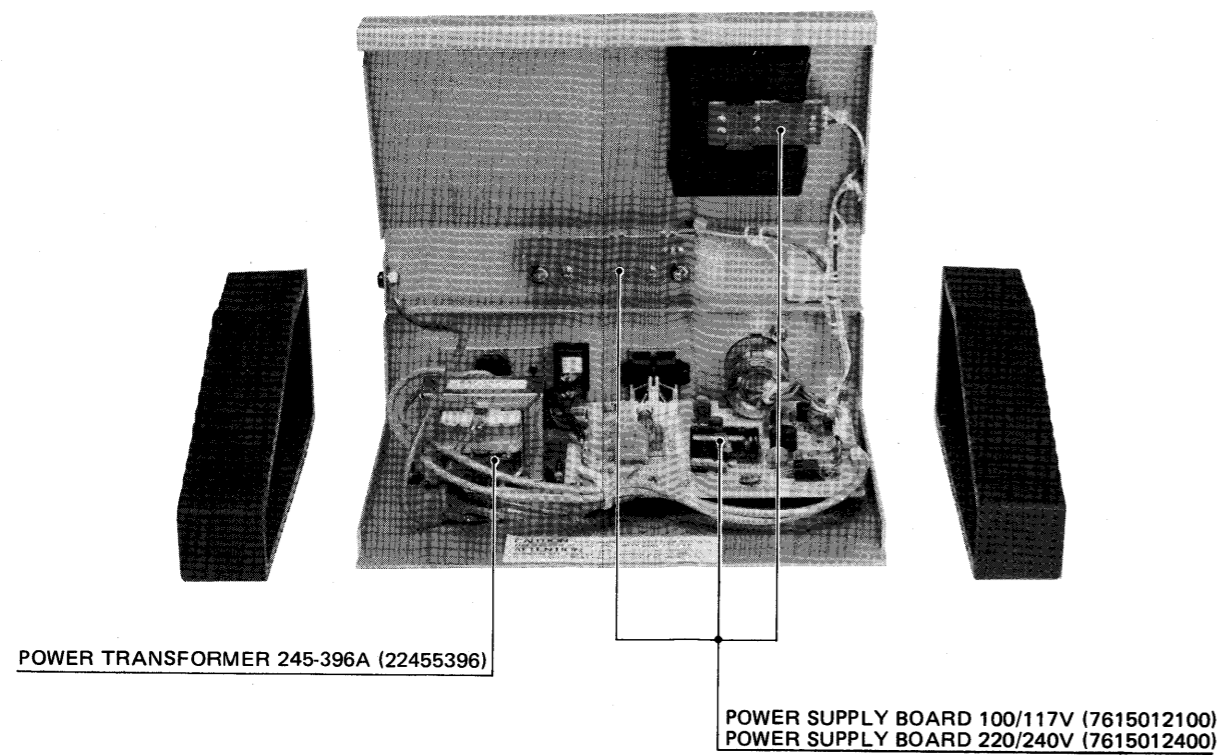


DISASSEMBLY

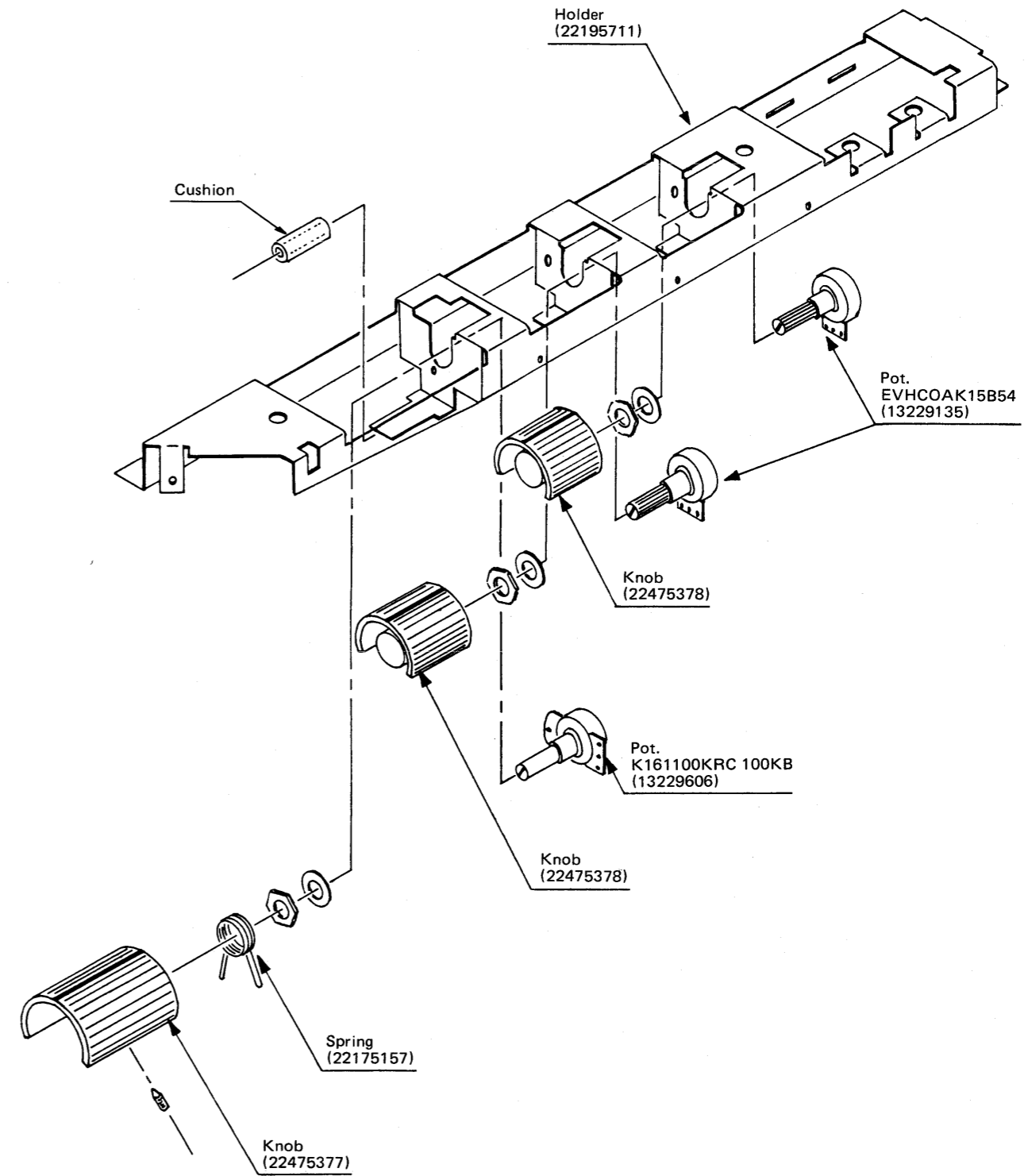
CONTROL UNIT



POWER SUPPLY UNIT



BENDER UNIT



PARTS LIST

CONTROL UNIT

7615002000 AXIS-1SV (silver)
7615102000 AXIS-1RD (red)

CASE

22015655 Top case (red)
22015650 Top case (silver)
22015656 Bottom case (red)
22015651 Bottom case (silver)

PCB ASS'Y

7615031000 Main board (inclusive 7615034000 Switch board)
(PCB 2292511700)

KNOB/BUTTON

22475378 Knob Modulation/Volume
22475377 Knob Bender
2247019200 Button

SWITCH

13129715 KHC10901

POTENTIOMETER

13229606 K161100KRC-100KB 100kB Bender
13229135 EVHCOAK15B54 50kB Modulation/Volume

IC

15179204 HD63B01V1P- CPU
15229824 MB63H130 Dynamic key assigner
15179343 HM6116ASP-12 RAM
15169304 74LS04P Hex inverter
15159503 TC40H000P Quad 2-input NAND gate
15159528 TC40H008P Quad 2-input AND gate
15159511 TC40H174P Hex D-type flip-flop
15159128H0 HD14050BP Hex buffer
15159114H0 HD14052BP Differential 4-ch multiplexer/demultiplexer
15189178 NJM3403AD OP amp
15219125 M54528P Transistor array

TRANSISTOR

15119113 2SA1015-GR
15129114 2SC1815-GR (or 15129115 2SC1815-Y)
15129600 2SD571-L (or 15129610 2SD571-K)

DIODE

15019209T0 S-5500G
15019126 1SS-133
15019668 05Z-6.2ZT Zenner (Taping) 6.2V
15029419 LA-301VB 7segment LED display
15029147 GL-9HD2 LED (red)

RESISTOR ARRAY

13919151 RM12-153J 15k x 12
13919150 RM10-473J 47k x 10
13919118 RGS16L104G 8bit R-2R

CONNECTOR

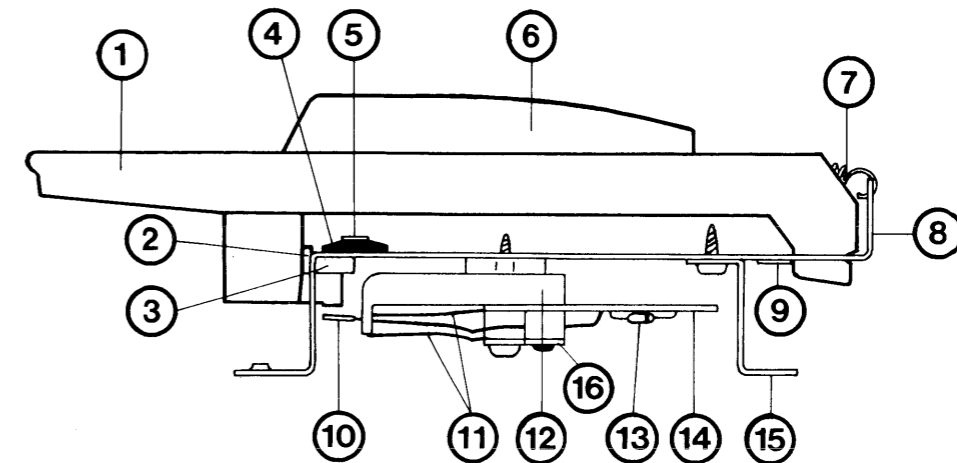
13439854H0 HA16R-5P XLR (male)

OTHERS

12389737 HC18/U 16MHz Xtal
13529113 B7ZC0724-32N Capacitor array
13529115 EXFP8101MW Capacitor block
12449243 ELE-A120KA Coil 12µH
12569149 BR2325-1HC Li-battery 160mA/h
22175157 Spring
23485164 Cable XLR (8m)
23485168 MIDI cable DIN (5m)
22025684 LED cover Violet
22355125 SJ-5018 Rubber spacer

KEYBOARD

7615020000 SK-345-A



1	2257513400	Natural key A	6	2257514000	Sharp key
1	2257513500	Natural key E, B	7	2217513200	Spring SUS-304 WPB
1	2257513600	Natural key C, F	8	2281546600	Chassis
1	2257513700	Natural key D	9	2213540600	Key stopper
1	2257513800	Natural key G	10	2316563900	Contact leaf 1P
1	2257513900	Natural key C', F'	11	2316563400	Contact leaf 8P
1	2257519100	Natural key E'	12	2235533000	Switch base 8P
2	2215571600	Guide bushing	13	1501910300	Diode 1S2473
3	2226544000	SK-3 level felt	14	2292512200	Gate matrix board
4	2222531200	Cushion rail	15	2203511500	Stand
5	2226543300	AXIS-1 felt	16	2212530400	Plate

POWER SUPPLY UNIT

7615010100	AXIS-PS	Power supply unit	(100V)	
7615010300	AXIS-PS	Power supply unit	(117V)	
7615010400	AXIS-PS	Power supply unit	(220V)	
7615010500	AXIS-PS	Power supply unit	(240V E)	England
7615010600	AXIS-PS	Power supply unit	(240V A)	Australian

CASE

22815462	Chassis
22215442	Top panel
21125210	Side panel (L)
21125211	Side panel (R)

PCB ASS'Y

7615012100	Power supply board 100/117V	(PCB 2292511600)
7615012400	Power supply board 220/240V	(PCB 2292511600)

SWITCH

13149108	WK2A44 3A	Power switch
23125905	SW-3	Foot switch

IC

15199127	μPC78M10H	+10V 500mA regulator
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TRANSISTOR

15119113	2SA1015-GR
15129114	2SC1815-GR
15129128	2SC752-Y

DIODE

15019236	W-02	1.5A Rectifier bridge
15019101	1S1555	
15029138	GL-5PR5	LED (red)
15029183	GL-5EG5	LED (green)

CONNECTOR

13429615	TCS5350-01-1111	DIN 5P
13429631	XLR-5-31	XLR (female)

FUSE

12559334	GG5-0.25A	(100/117V)
12559505	CEE-T125mA	(220/240V)

POWER TRANSFORMER

22455396	245-396A
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AC CORD

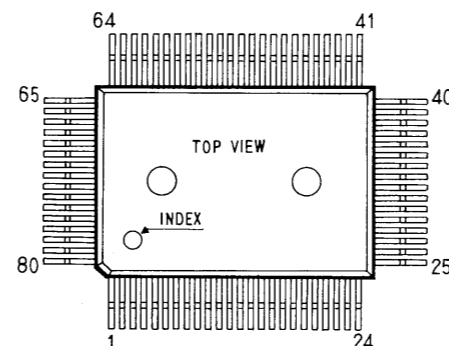
13439801W0	100V	(12369504	SR-4N-4	Cord bushing)	
13439805S0	117V	(12369506	SR6N3-4	Cord bushing)	
13439807H0	220V	(12369511	BU4801	Cord bushing)	
13439807H0	240V E	(12369511	BU4801	Cord bushing)	England
13439808S0	240V A	(12369511	BU4801	Cord bushing)	Australian

OTHERS

13529104	DE7150F472MVA1	Line bypass
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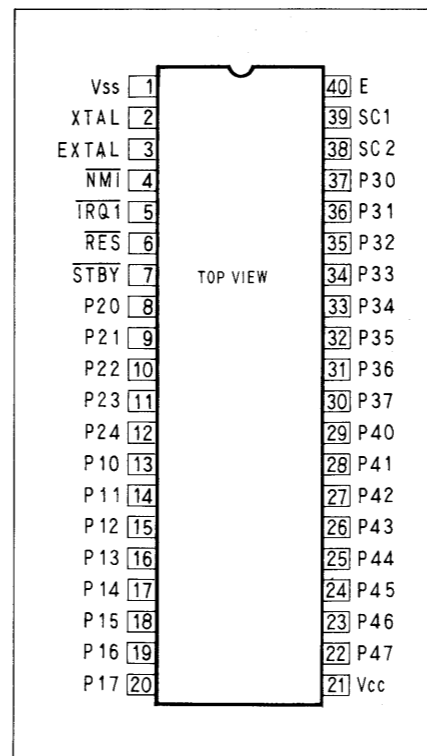
IC DATA

MB63H130

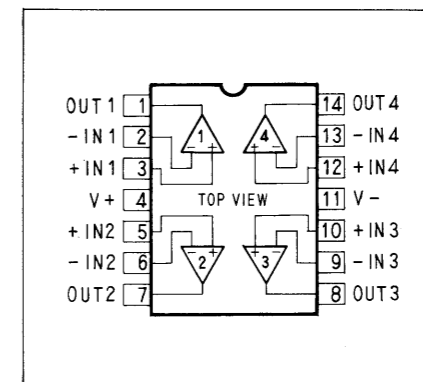


No.	I/O	Name	No.	I/O	Name	No.	I/O	Name	No.	I/O	Name
1	O	T7	21	I	BR9	41	I	CD7	61	O	RA1
2	I	BR0	22	I	MK9	42	I	CA8	62	O	RA10
3	I	MK0	23	I	BR10	43	I	CA9	63	O	RA2
4	I	BR1	24	I	MK10	44	I	CA10	64	I/O	ROE
5	I	MK1	25	I	RES	45	I	CS	65	O	RA3
6	I	BR2	26	I	E	46	I	XT1	66	O	RWE
7	I	MK2	27	O	EXCK	47	O	XT2	67	O	RA4
8	I	BR3	28	I	AS	48	O	ASEL	68	O	RA9
9	I	MK3	29	O	CRES	49	I	MOD1	69	O	RA5
10	I	BR4	30	I	CRNW	50	I	MOD2	70	O	RA8
11	I	MK4	31	O	SRCK	51	I/O	RD3	71	O	RA6
12	-	VSS	32	-	NC	52	-	VSS	72	O	RA7
13	I	BR5	33	-	VDD	53	I/O	RD4	73	-	VDD
14	I	MK5	34	I/O	CD0	54	I/O	RD2	74	O	T0
15	I	BR6	35	I/O	CD1	55	I/O	RD5	75	O	T1
16	I	MK6	36	I/O	CD2	56	I/O	RD1	76	O	T2
17	I	BR7	37	I/O	CD3	57	I/O	RD6	77	O	T3
18	I	MK7	38	I/O	CD4	58	I/O	RD0	78	O	T4
19	I	BR8	39	I/O	CD5	59	I/O	RD7	79	O	T5
20	I	MK8	40	I/O	CD6	60	O	RA0	80	O	T6

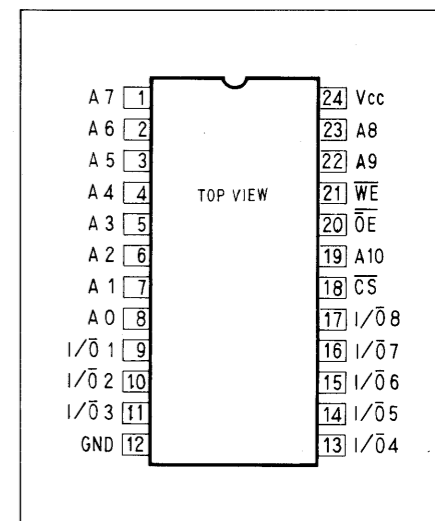
HD6301VIP



NJM3403AD



HM6116ASP-12



CONTROL UNIT

DISASSEMBLY

1. Place the unit on its top face.
2. Remove all the screws on the bottom case.

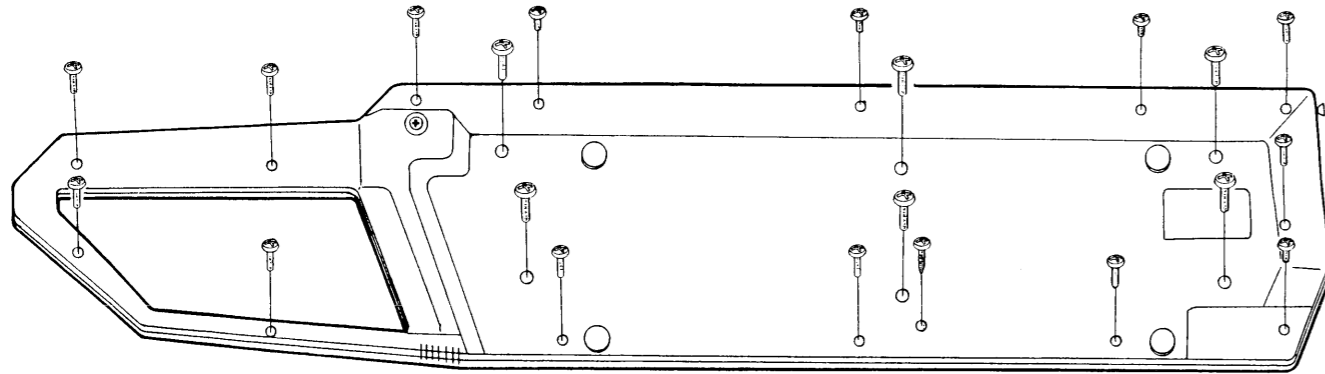


Fig. 1

3. While holding both top and bottom cases tight, turn over the unit. Don't open by lifting up the bottom case as some washers will fall down from the grip.
4. Lift the top case up together with the keyboard. When resting the top case, take care not to scratch the cases since their movements are rather limited by shorter wirings. Both cases have conductive coating inside. Don't short-circuit the backup battery by touching a PCB and the coating.

CAUTION ON REPLACEMENT AND REASSEMBLY

Switch Board (Modulation)

Shift the board in the direction arrowheaded, as possible; then secure it.

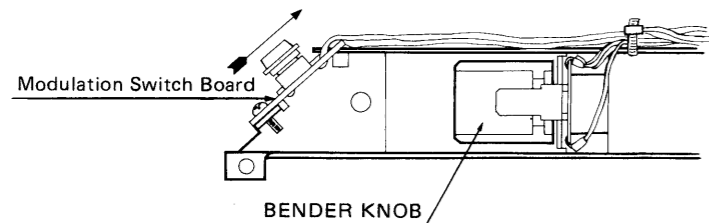


Fig. 2

Switch Board (Octave up/Chord memory)

Be sure to bond the polycarbonate pipe under the LED in its place. If left unfixed, it would be rattling when the unit is swung.

Grip

Don't add or remove washers in the grip boss: they are for height adjustment and differ between units in number.

General Reassembly

Neatly dressed wirings will surely protect themselves from being pinched in the case. Refer to the figures below.

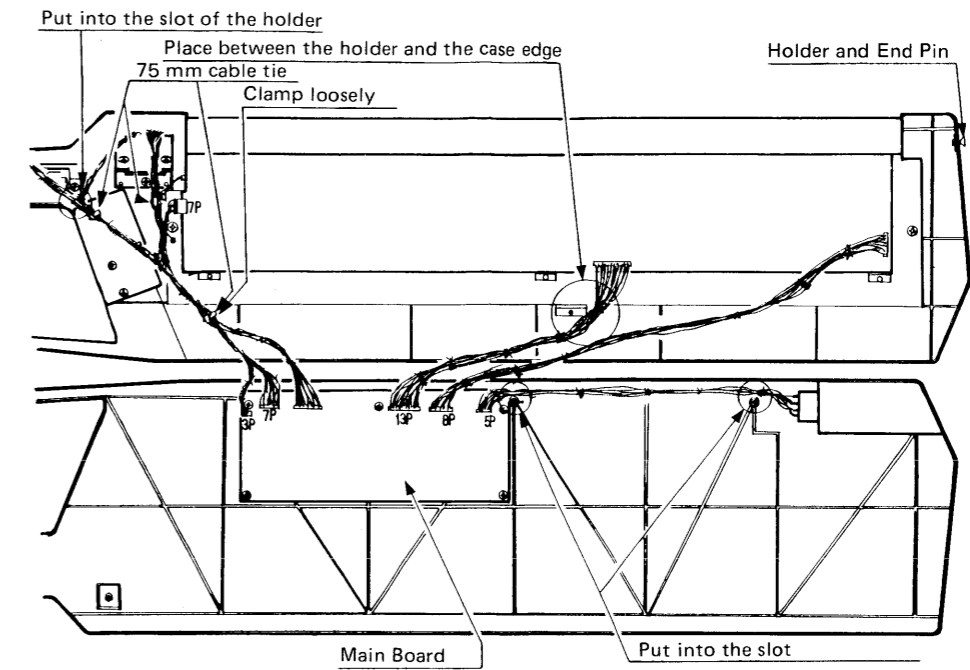


Fig. 3

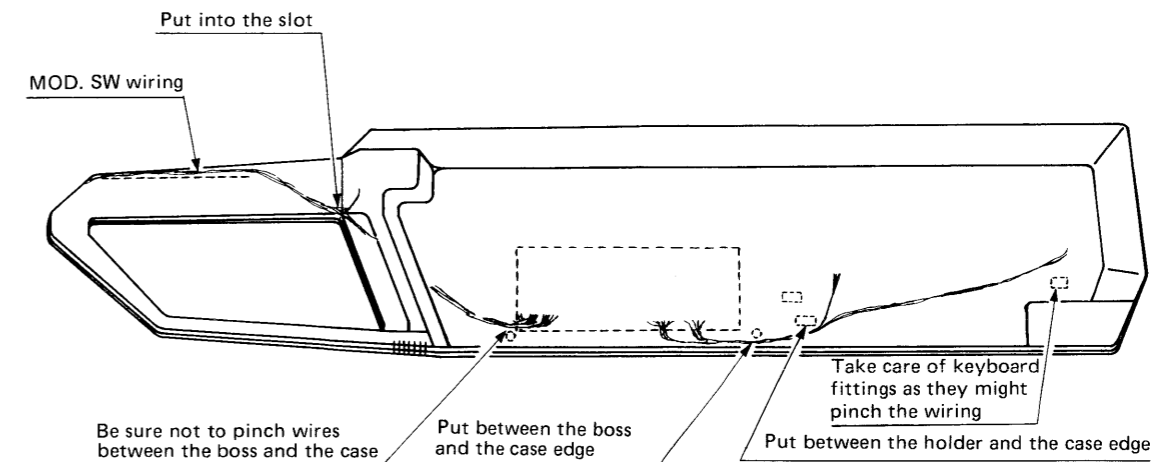


Fig. 4

For final assembly, first place the top case over the bottom case while checking the wirings for pinch, align the both case ends, then turn over the unit. Secure the unit with the 21 screws.

PARTS CHANGE INFORMATION

Power Supply Unit

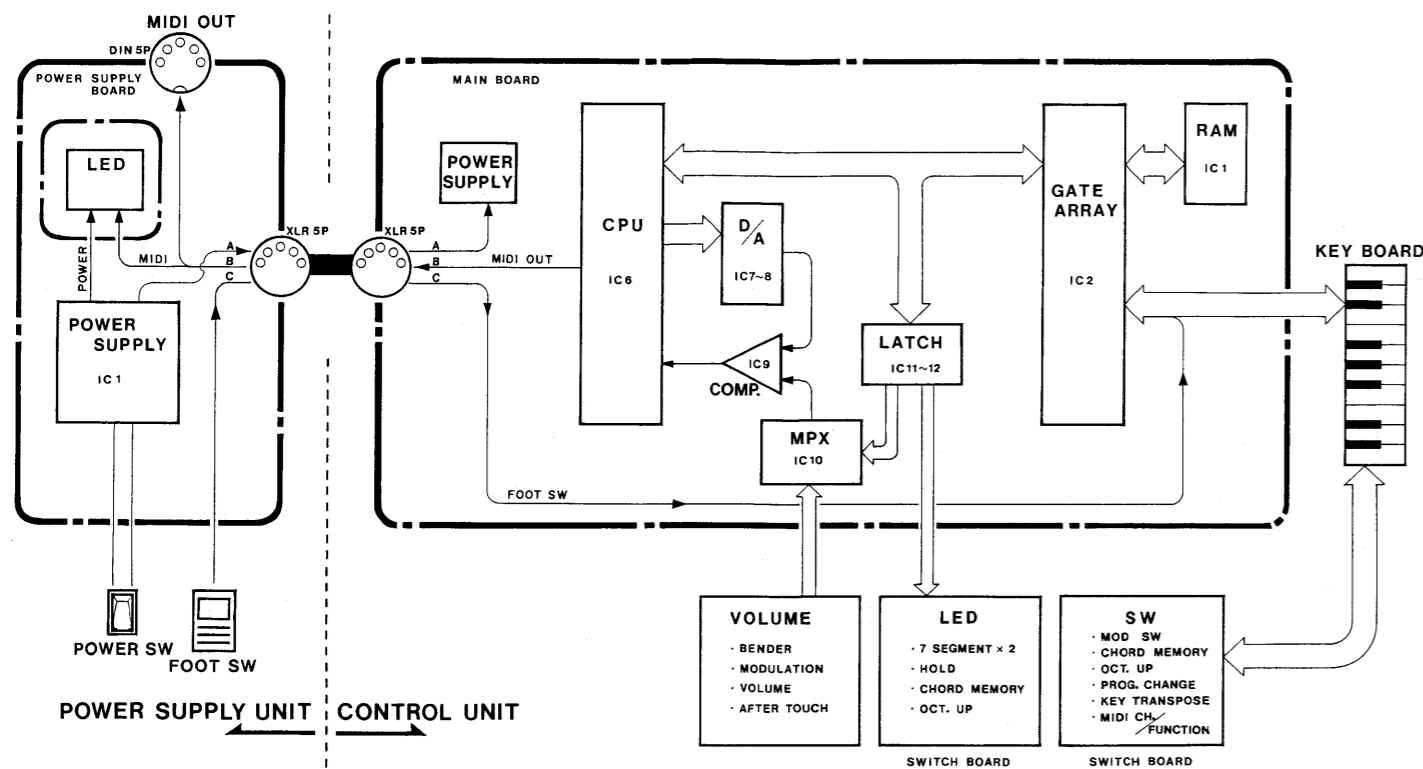
Two kinds of Power Transformer are used.

1. 245-396 Used on the units with serial numbers:

- 490100-490398
- 490430-500666
- 500788-500840
- 500861-500871
- 500877-500884
- 500900-501039
- 501100-501120
- 501245-501269
- 501289-501294

2. 245-396A (Improved version of 245-396) On the rest of the units. Replacement power transformer even for 245-396 will be 245-396A only.

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

KEYBOARD AND SWITCH READING

Gate array (IC2) sends a low scan signal one by one to each row of keyboard matrix through T0-T7. In time with the scanning, IC2 reads MK2-MK7 and BK2-BK7 to know the status of keyboard switches.

T0-T5 are also connected to the panel switches which are this time, read into IC2 through BK10 as a common line.

A foot switch, when connected to TR3, is read through T6, TR4 and BK10 loop.

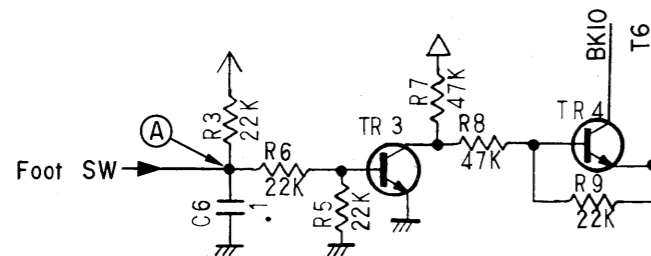


Fig. 5

IC2 stores these data into the RAM (IC1), and in the next output routine places the RAM data on the CPU data bus.

LED LIGHTING

Two digit numerical display and three other LEDs are divided into three groups (D10-12 & dp x 2 in one group, two digit numerical display in two groups). Each group is connected to TR7, 8 and 9 respectively. These TRs are alternately latched and forward biased by IC11 and develops a drive current of about 1/3 duty cycle. On the other hand, IC13 provides LEDs selected by IC11 and IC12 with a return path. An LED, when given simultaneous drive current and return path repeatedly, will light in dynamic method.

VOLUME, BENDER, MODULATION, AFTER TOUCH

Multiplexer IC10 sequentially connects each pot wiper and the after touch sensor to the pin 13 of IC9d comparator (see table 1).

IC11		CONTROL
A	B	
L	L	BENDER
H	L	VOLUME
L	H	MODULATION
H	H	AFTER TOUCH

Table 1

CPU IC6 sends a reference voltage through D/A converter (IC9c, RA3) to the pin 12 of IC9d. In response to the comparator output the CPU updates the data for the next reference voltage, and repeats the sequence, then finally acquires the digital data for that input analog voltage. This is called successive approximation method.

Each analog voltage at pin 13 of IC9d is as follows; some undergo particular process before reaching the comparator for accurate A/D conversion.

VOLUME AND MODULATION

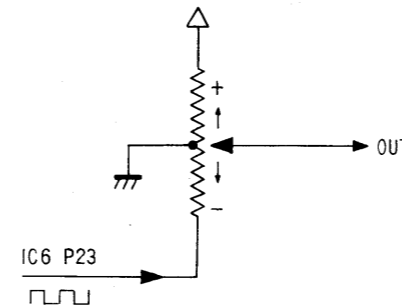
When selected, amplified about 3.7 times at IC9b output.

AFTER TOUCH

About +5V when none of keys are pressed on the keyboard and approx. 0V when any key is pressed hardest.

BENDER

When selected, its amplitude is nearly doubled by IC9b. Since the BENDER output is bilateral, the polarity must be defined. As can be seen from the table below, the positive voltage is kept effective over the P23 cycle, while the negative only during a high half period.



	When traveling in positive direction	When traveling in negative direction
IC6 P23		
IC10 X COM		

Table 2

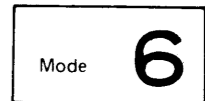
CPU MODE

With AXIS the operational mode of IC6 CPU is mode 6 which is set on the low to high transition of \overline{RESET} with the provision for the related pins designed as follows.

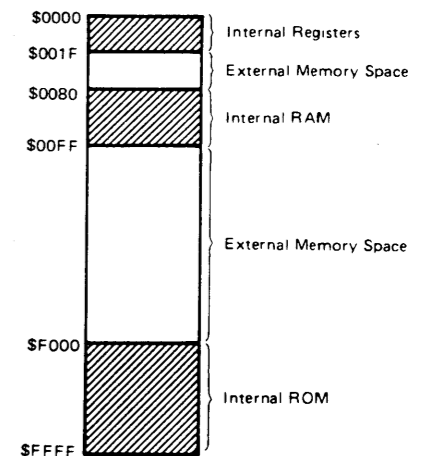
P20 low: hardware-grounded

P21 high: kept high from low \overline{RESET} to high \overline{RESET} and subsequent time determined by the R25, C14 time constant (approx. 50 μ s).

P22 high: kept high by the IC2 until the mode is set. SRCK (IC2) outputs high during a period of mode set by pulling up \overline{ROE} (IC2) with R11.



Multiplexed/Partial Decode



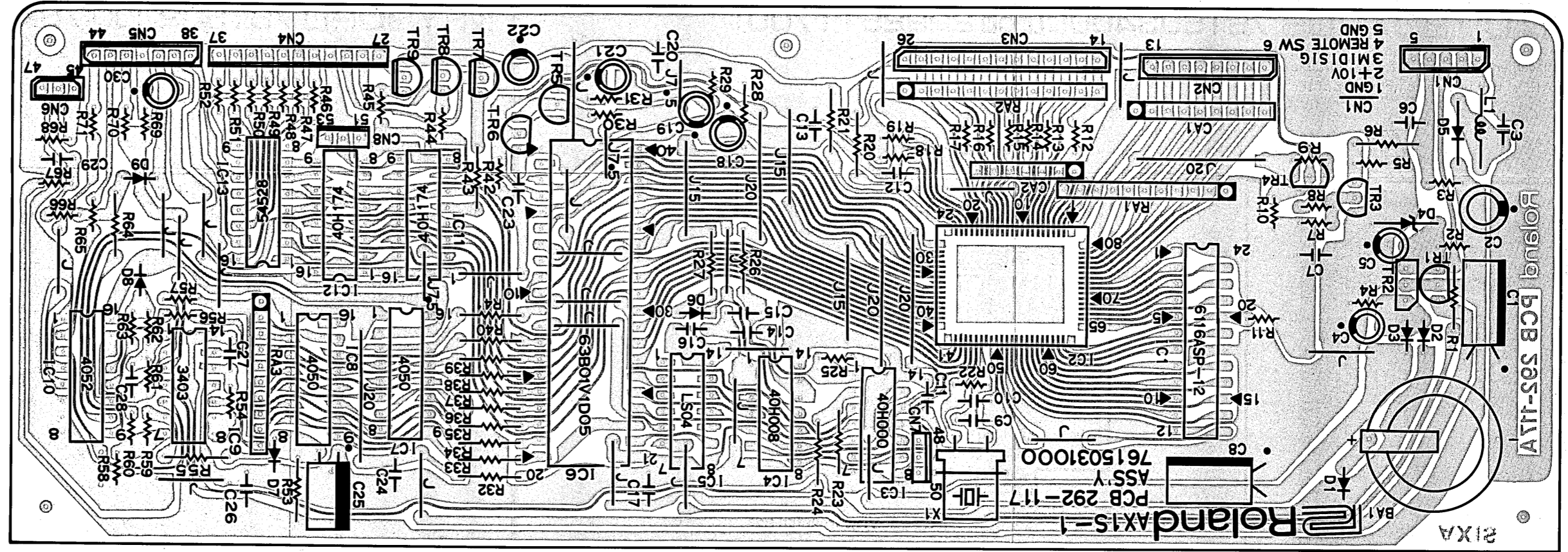
DATA BACK-UP

The CPU can rely on the battery to keep its Vcc high enough to maintain the data in the internal RAM while power switch is off. This is called standby mode and the current drawn from the battery is as low as 2 μ A, assuring the life expectancy of the battery for about 5 years.

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

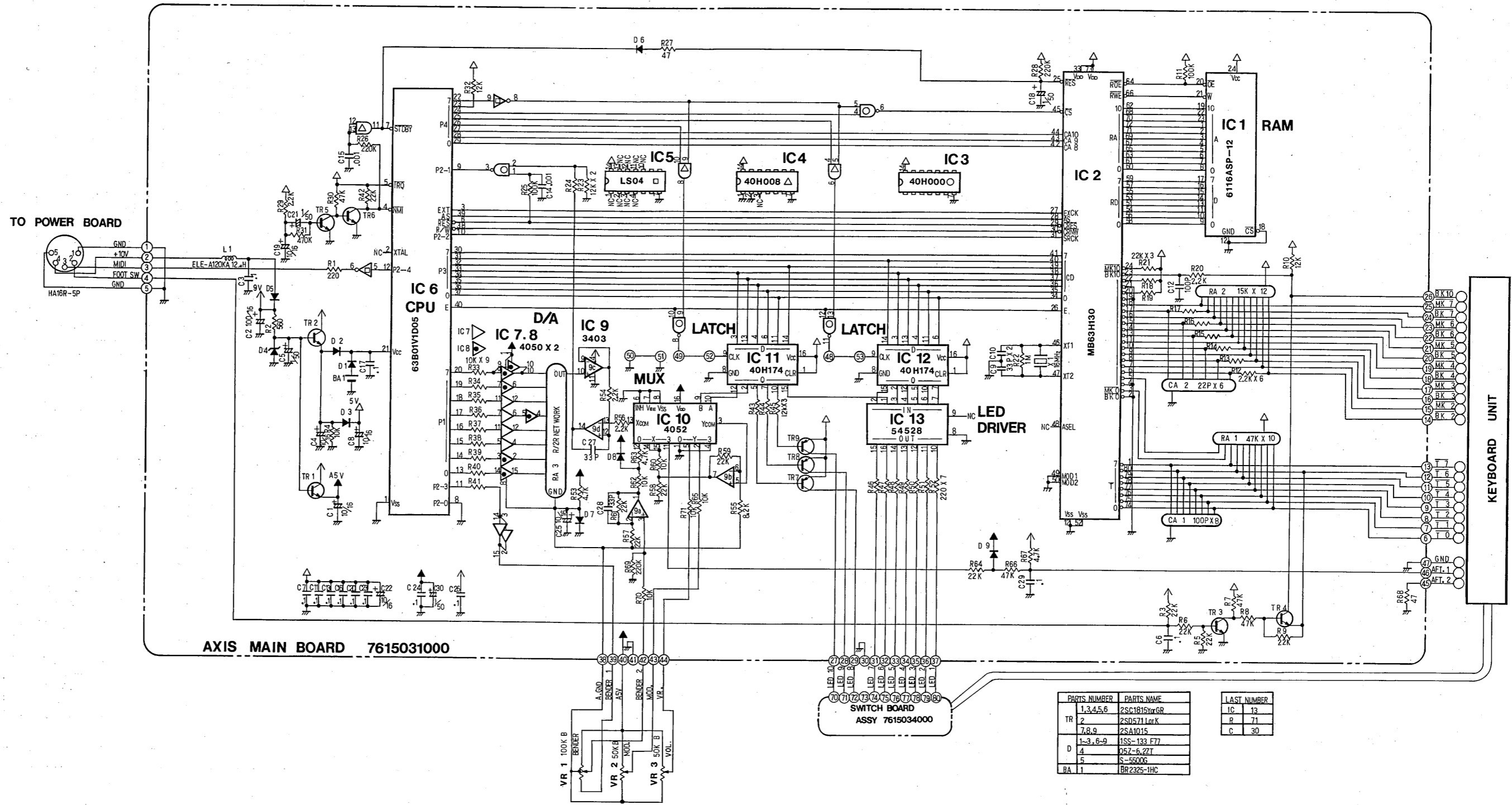
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

**CONTROL UNIT
MAIN BOARD
7615031000
(pcb 2292511700)**



View from component side

*Replacement for one of the splittable PCBs (MAIN, SWITCH BOARDS) will be in a complete set of the five.



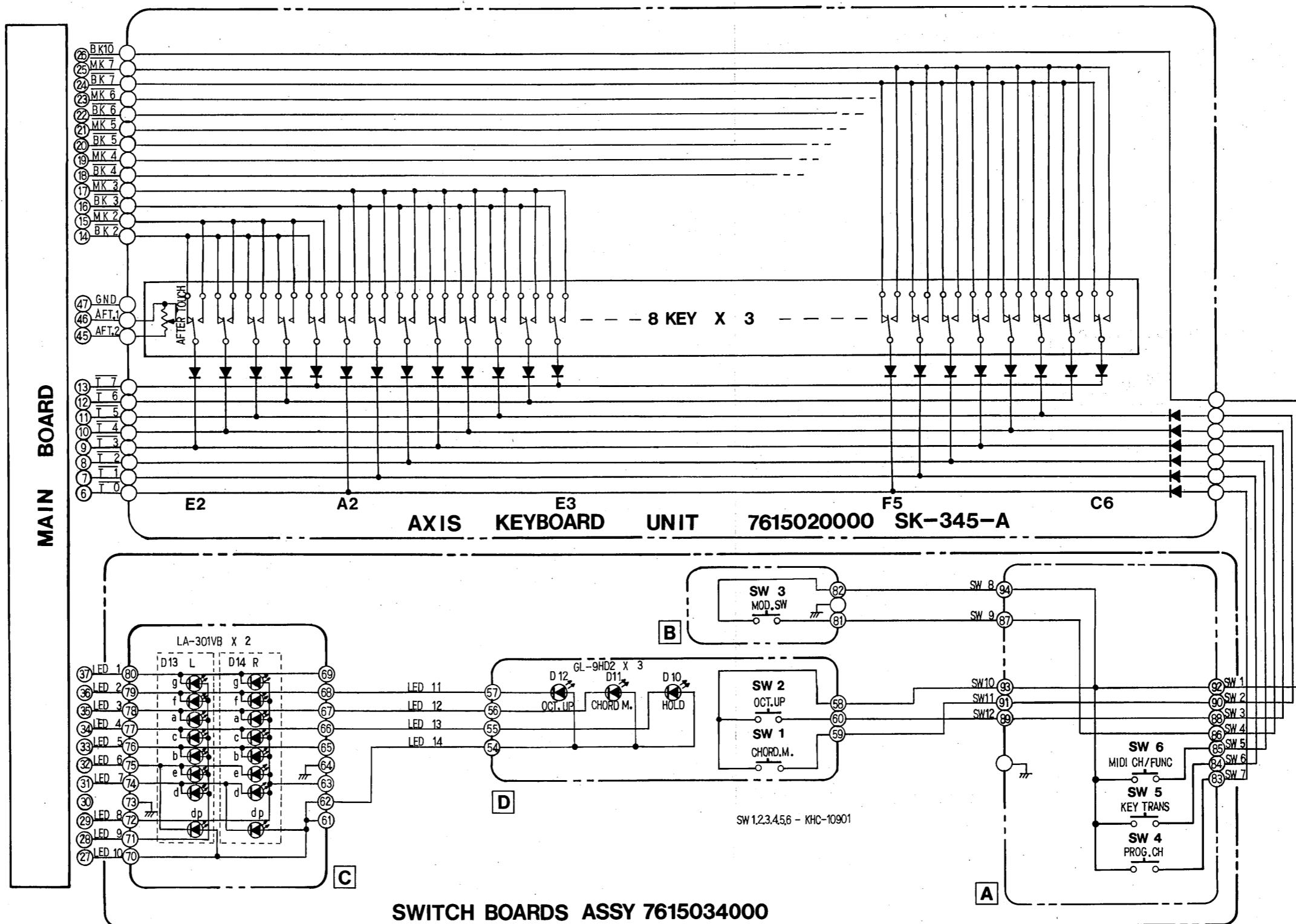
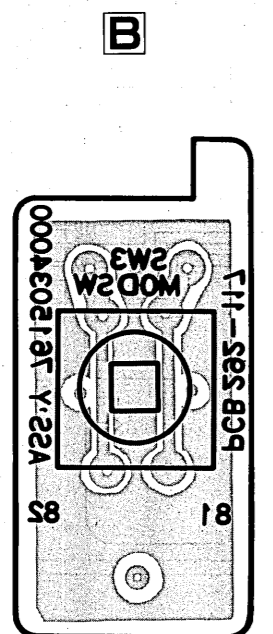
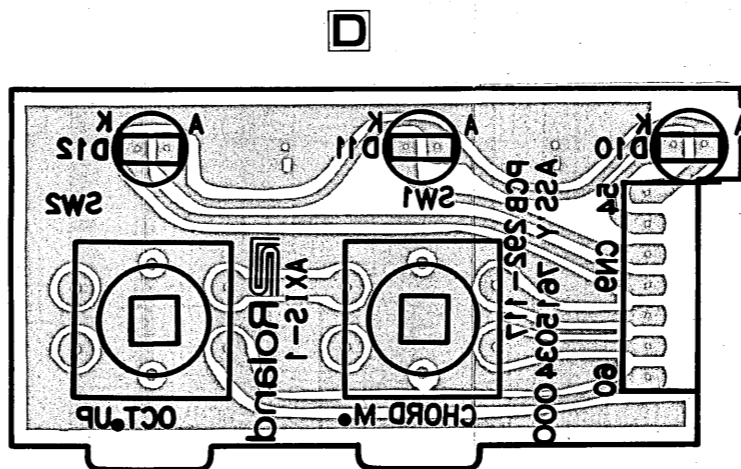
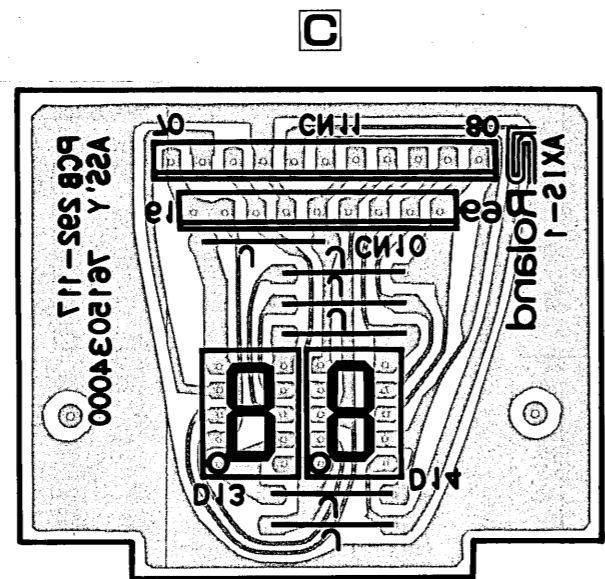
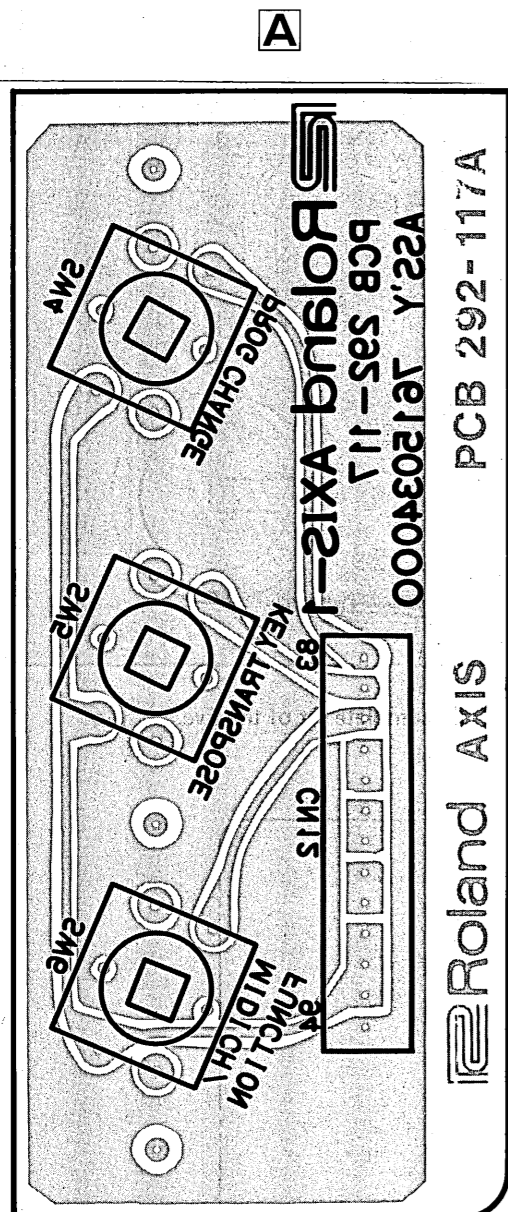
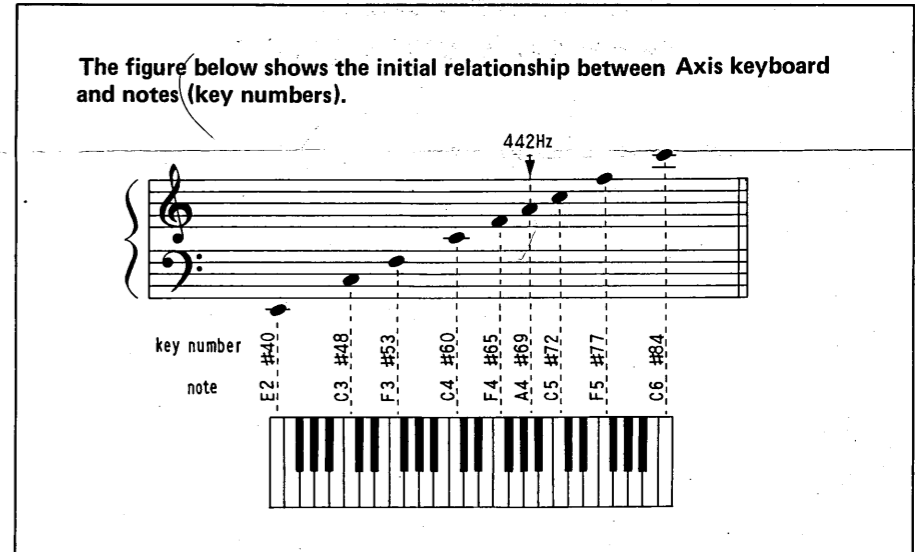
PARTS NUMBER	PARTS NAME	LAST NUMBER
1,3,4,5,6	2SC1815GR	IC 13
7	2SD5711orX	R 71
7.8,9	2SA1015	C 30
1-3, 8-9	15C-133 F77	
4	62-5.52T	
5	62-5500	
BA 1	BR2325-1HC	

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

CONTROL UNIT SWITCH BOARDS 7615034000 (pcb 2292511700)

*Replacement for one of the splittable PCBs (MAIN, SWITCH BOARDS) will be in a complete set of the five.

KEYBOARD 7615020000 SK-354-A



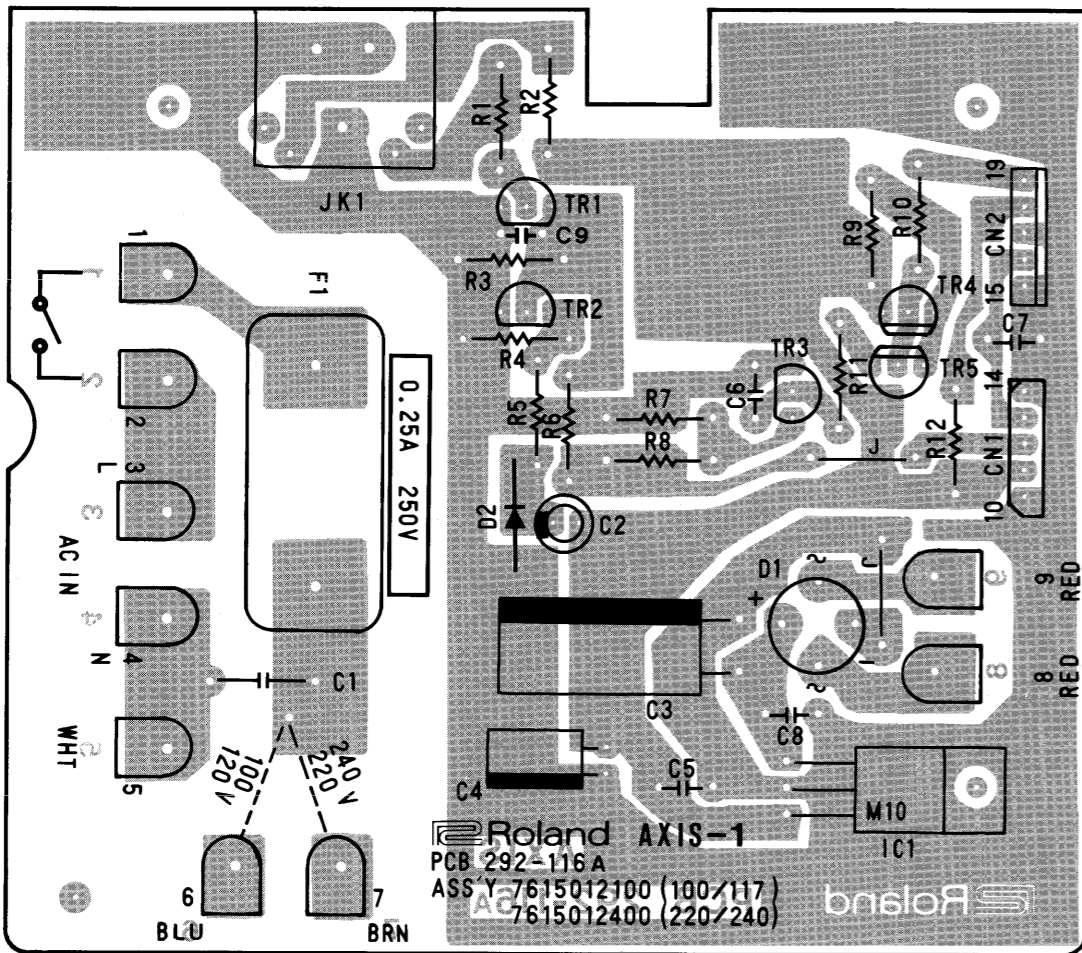
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

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

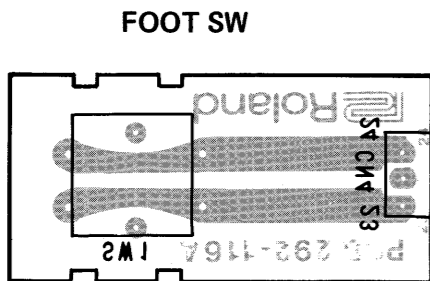
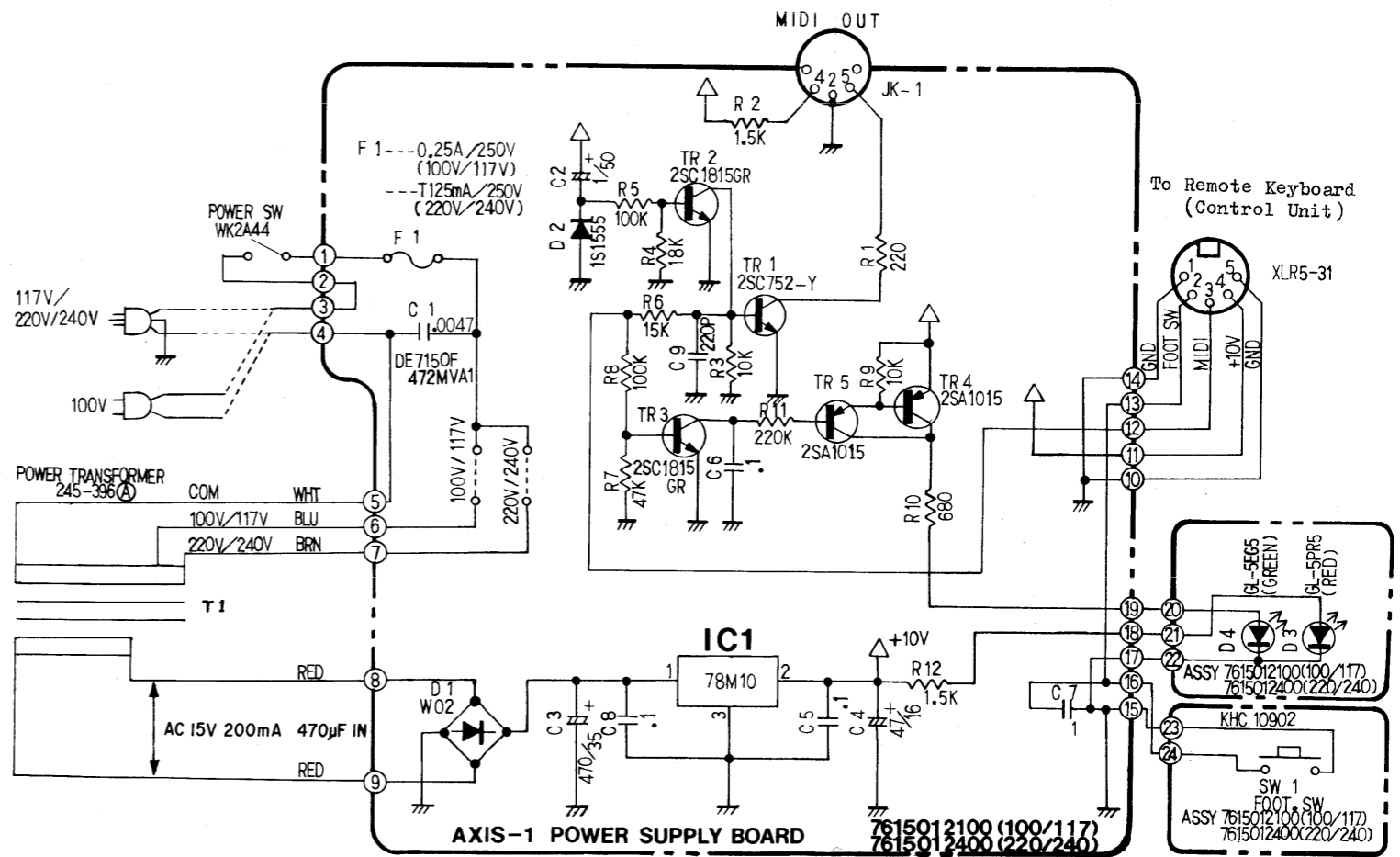
POWER SUPPLY UNIT

POWER SUPPLY BOARD 7615012100 100/117V(pcb 2292511600)
7615012400 220/240V(pcb 2292511600)

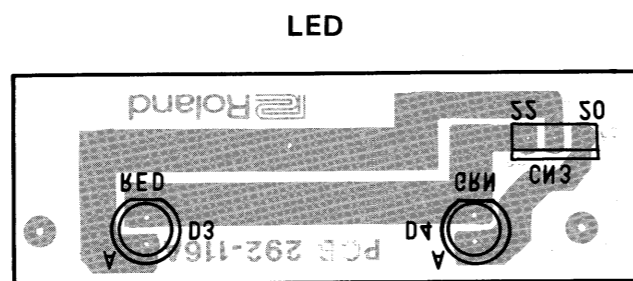
*Replacement for one of the splittable PCBs below will be in a complete set of the three.



View from component side



View from foil side



View from foil side

MIDI Keyboard

MODEL **AXIS-1** MIDI Implementation Chart

Function.....	Transmitted			Recognized	Remarks	
	1	2	3			
Basic Channel	Default	1 - 16			×	Memorized
	Changed	1 - 16			×	
Mode	Default	1 - 4			×	Memorized
	Messages	OMNI on/off, POLY/MONO			×	
	Altered	*****			×	
Note Number	True voice	0 - 127			×	
Velocity	Note ON	○ 9n, v=1-127			×	
	Note OFF	× 9n, v=0			×	
After Touch	Key's	×	×	×	×	
	Ch's	×	○	×	×	
Pitch Bender		○	○	○	×	
Control Change	1- 31	○	○	○	×	
	32- 63	×	×	×	×	
	64- 95	○	○	○	×	
	96-121	×	×	×	×	
Prog Change	True #	○	○	○	×	0 - 119
		*****			×	
System Exclusive		×	×	○	×	\$F0, 43, F7 for old MIDI
System Common	Song Pos	×	×	×	×	
	Song Sel	×	×	×	×	
System Real Time	Tune	○	○	○	×	
	Clock	×	×	×	×	
Aux	Commands	×	×	×	×	
	Local ON/OFF	×	×	×	×	
Mes-sages	All Notes OFF	○	○	○	×	
	Active Sense	○	○	×	×	
		×	×	×	×	
Reset		×	×	×	×	
Notes		Function : After Touch Function On power-up : Transmit memorized mode to memorized ch.				

Mode 1 : OMNI ON, POLY
Mode 3 : OMNI OFF, POLY

Mode 2 : OMNI ON, MONO
Mode 4 : OMNI OFF, MONO

○ : Yes
× : No

MIDI Keyboard

MODEL **AXIS-1** MIDI Implementation

1. TRANSMITTED DATA

Status	Second	Third	Description	
1001 nnnn	0kkk kkkk	0000 0000	Note OFF	*1
1001 nnnn	0kkk kkkk	0vvv vvvv	Note ON	*1
1011 nnnn	0ccc cccc	0vvv vvvv	Control Change	*2
1011 nnnn	0111 1011	0000 0000	ALL NOTE OFF	
1011 nnnn	0111 1100	0000 0000	OMNI OFF	
1011 nnnn	0111 1101	0000 0000	OMNI ON	
1011 nnnn	0111 1110	0000 0001	MONO ON	
1011 nnnn	0111 1111	0000 0000	POLY ON	
1100 nnnn	0ppp pppp		Program Change	*3
1110 nnnn	0vvv vvvv	0vvv vvvv	Pitch Bender Change	
1111 0110			Tune Request	
1101 nnnn	0vvv vvvv		Channel Pressure	*4
1011 nnnn	0000 0001	0vvv vvvv		*5
1011 nnnn	0000 0011	0vvv vvvv		*6
1111 0000	0100 0011		Exclusive Message	*7
	1111 0111 (EOX)		(Active Sensing)	
1111 1110			Active Sensing	*8

Notes : *1 kkkkkk = 0 through 127
*2 ccccccc = 0 through 31
vvvvvvv = 0 through 127
ccccccc = 64 through 95
vvvvvvv = 0 or 127

0 : OFF
127 : ON

*3 ppppppp = 0 through 119

*4,*5,*6,*7,*8

Data format of "After Touch(*4,*5,*6)" and "Active Sensing(*7,*8)" are chosen by "After Touch Function".

After Touch Function	After Touch	Active Sensing
1	*5	*8
2	*4	*8
3	*6	*7