

CASIO®

Service Manual

(without price)

AP-21

MAY 1999



AP-21

ELECTRONIC KEYBOARD

CONTENTS

Safety Notice	1
Specifications	2
Block Diagram	3
PCB Layout	4
Disassembly Instructions	5
Circuit Description	8
Major Waveforms	10
Troubleshooting	11
Wiring Diagram	14
Exploded View	15
Parts List	16
Schematic Diagrams	19

SAFETY NOTICE

CAUTION!

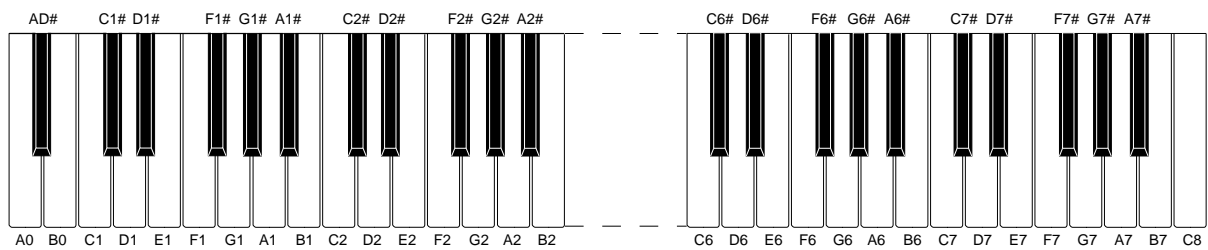
Danger of explosion if battery is incorrectly replaced.
Replace only with the same or equivalent type recommended
by the appliance manufacturer. Discard used batteries
according to manufacturer's instructions.

SPECIFICATIONS

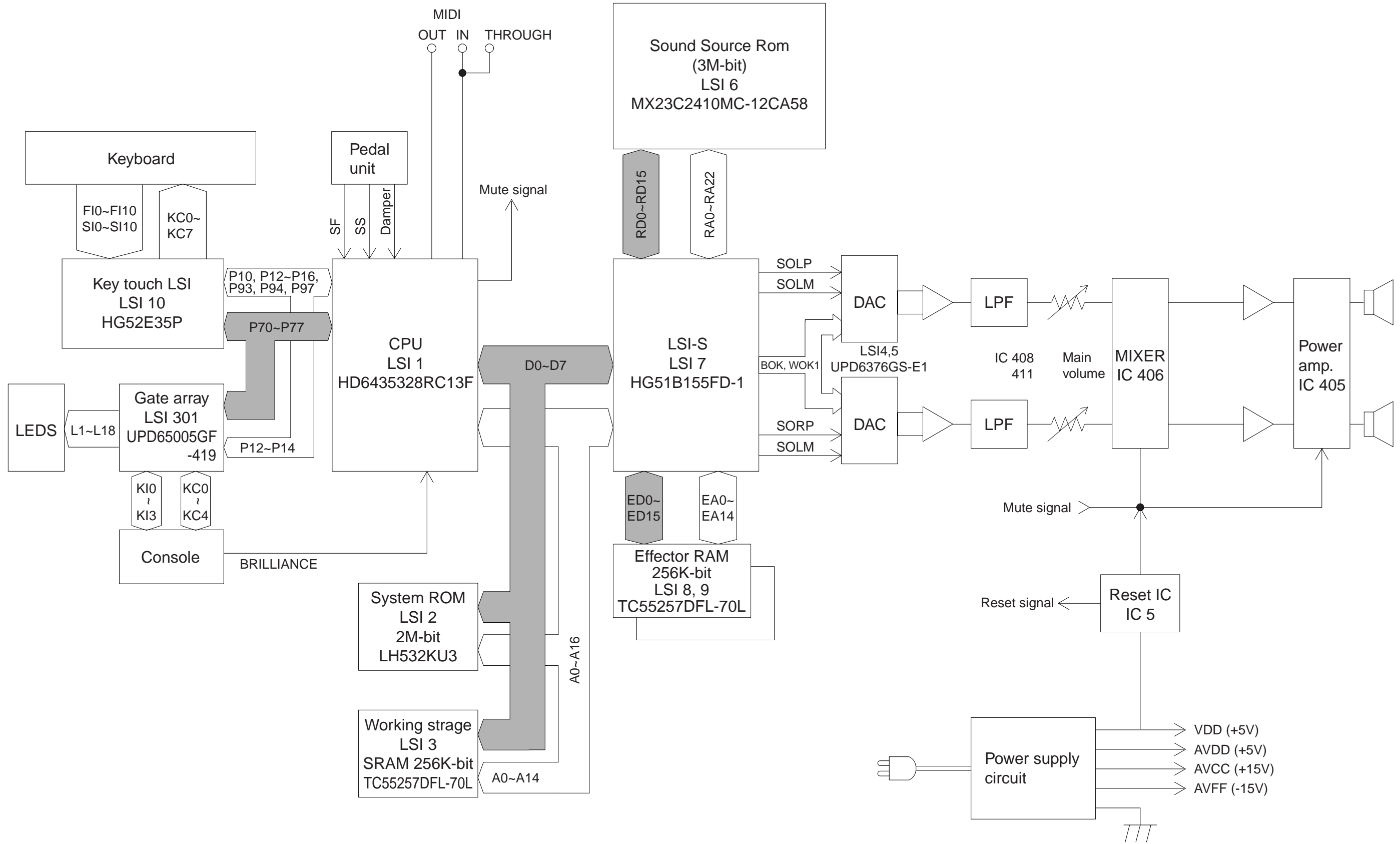
GENERAL

Number of keys:	88
Polyphonic:	32-note
Preset tones:	Piano-1, Piano-2, Electric Piano, Harpsichord, Vibraphone, Pipe Organ, Strings, Choir.
Keyboard Controls:	Touch sensitivity (Initial touch: Light/Middle/Heavy), Tuning curve (Standard/Electric piano/Flat), Baroque pitch (On/Off)
Pedals:	Soft/Sostenuto, Damper
Effects:	Reverb (Room, Stage, Hall-1, Hall-2), Chorus, Tremolo, Brilliance
Transpose:	F# - C - F
Tuning control:	A4 = 440Hz ± 50 cents
Demonstration tunes:	1: Polonais "Héroïque" (F.F. Chopin) 5: CASIO original 2: Frühlingslied Op. 62-6 (F. Mendelssohn) 6: Jesus, Bleibet Meine Freude (J.S. Bach) 3: CASIO original 7: CASIO original 4: Harmonious blacksmith (G.F. Händel) 8: CASIO original
Memory:	Real-time recording [Number of Songs: (A and B), Capacity: Approx. 3,000 notes total] Backup Battery [Built-in lithium battery: BR2330, Battery life: Approx. 5years]
Terminals:	LINE IN Jack [Input impedance: 30KΩ, Sensitivity: 200mV] LINE OUT Jack [Output impedance: 22KΩ, Output voltage: 2.0V (rms) MAX], Phone Jack [6.3ø, stereo], MIDI jack (IN, OUT, THROUGH)
Speakers:	16cm dia. Approx. 20W input Rating: 2 pcs.
Power source:	AC source (120V, 230/240V)
Power consumption:	48W (120V AC), 62W (230/240V AC)
Dimensions:	7-3/4" (H) × 54 (W) × 18 - 1/2" (D) 198mm (H) × 1370mm (W) × 470mm (D)
Weight:	36.4kg (80.3 lbs) /45.5kg (100.3 lbs) with stand

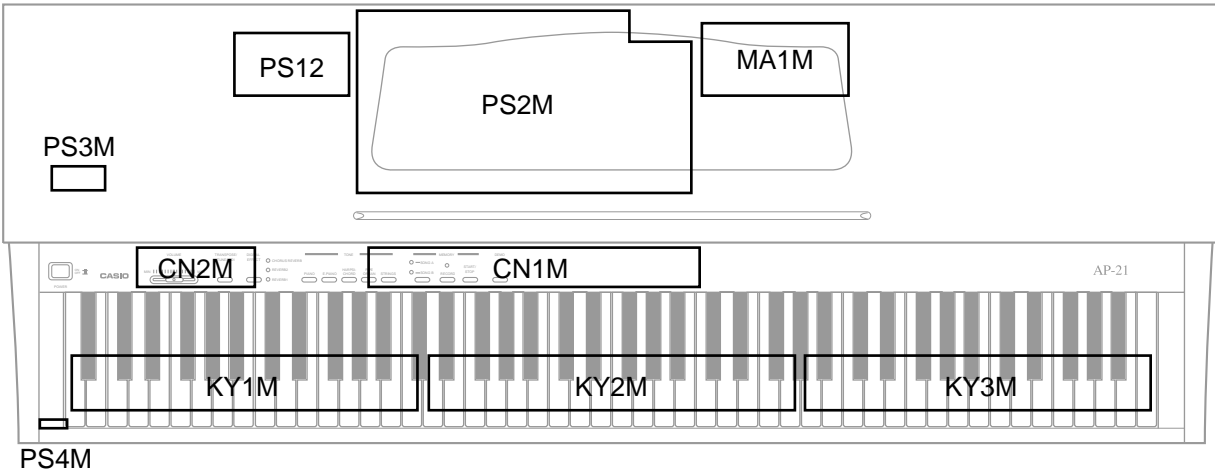
Nomenclature of keys



BLOCK DIAGRAM



PCB LAYOUT



PCB	JCM358-	Components
Main PCB	MA1M	CPU, LSI-S, Sound Source ROM Working storage RAM, Effect RAM Reset IC, DAC, Key Controller
Sub PCB	PS2M	Filter, Lineout Amp., Power Amp. Power supply circuit. MIDI input/output.
Console PCB	CN1M	LEDs, Buttons, Gate array
	CN2M	Main Volume
Other PCBs	PS12	Fuse
	PS3M	Head phone Jack
	PS4M	Power lamp

DISASSEMBLY INSTRUCTIONS

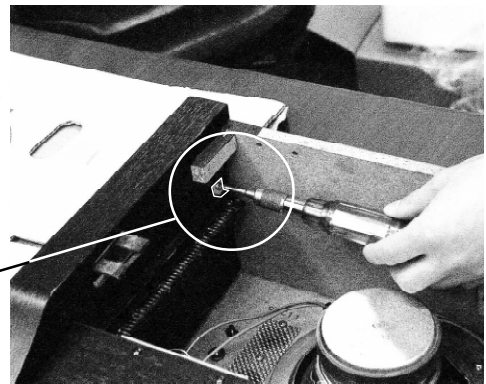
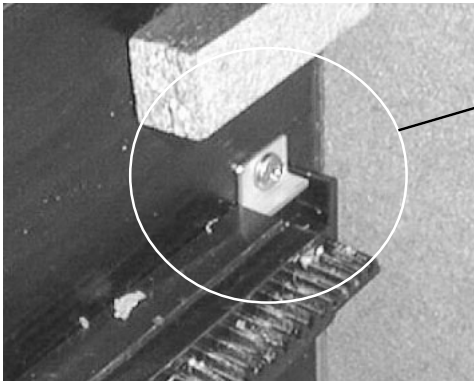
1. Removal of top board

- 1-1. Remove 6 screws affixing the top board on the back.
- 1-2. Slide the top board forward and remove it from the main unit.

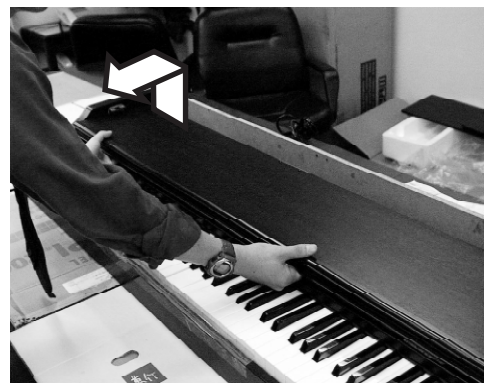


2. Removal of keyboard cover

- 2-1. Lift up the keyboard cover full open position.
- 2-2. Unscrew the L-shaped stopper metal located on the inner left corner.



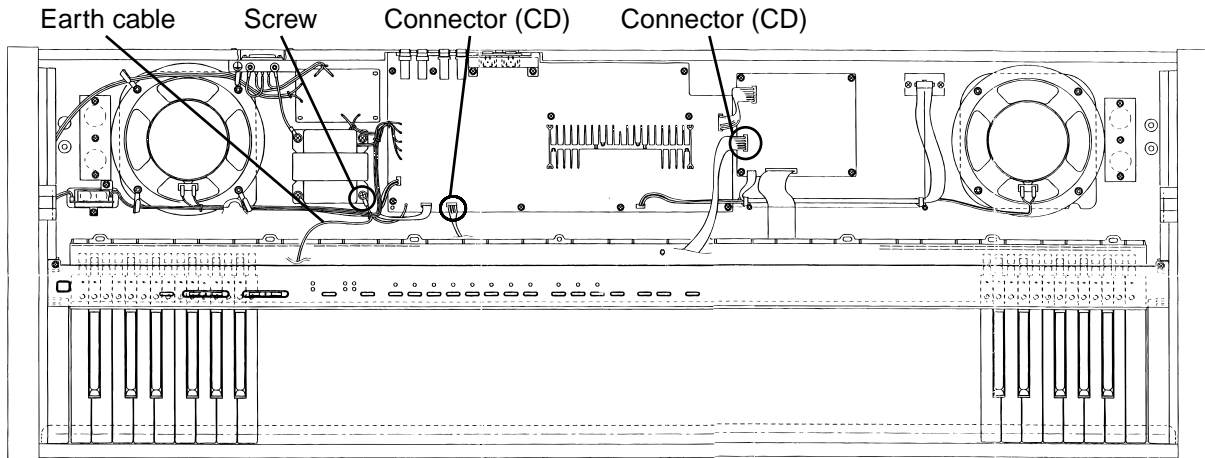
- 2-3. Lift up the keyboard cover gear from the opening where stopper metal is fixed then remove the keyboard cover.



3. Removal of console panel

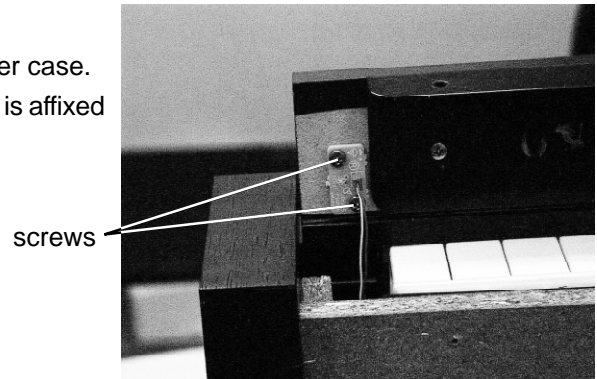
- 3-1. Remove screws affixing both ends of the console panel.
- 3-2. Disconnect connector CD on PCB MA1M, connector CF on PCB PS2M, and transformer grounding wire.
- 3-3. Lift the console panel and turn it over and remove the power switch, which is affixed by 2 screws. Then remove the side panel.

Caution: Be careful not to scratch the side panels.



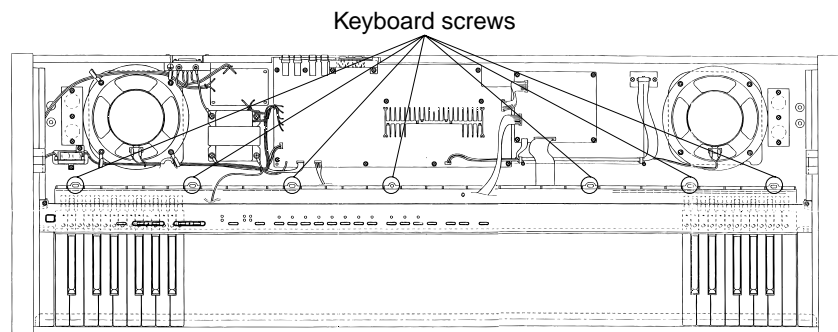
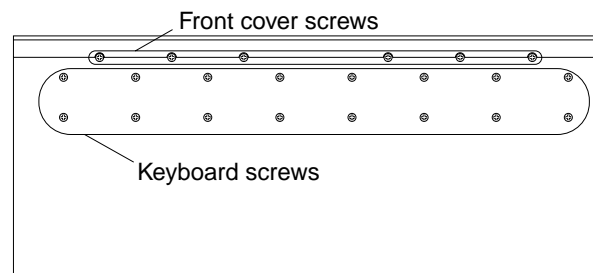
4. Removal of front cover

- 4-1. Remove 6 screws from the front end of the lower case.
- 4-2. Lift the front cover and remove the pilot lamp that is affixed by 2 screws. Then remove the front cover.



5. Removal of keyboard unit

- 5-1. Disconnect connector CA on the PCB MA1M.
- 5-2. Remove 23 screws that affix the keyboard unit (16 on the bottom of the case and 7 on the keyboard unit).
- 5-3. Lift and remove the keyboard unit.



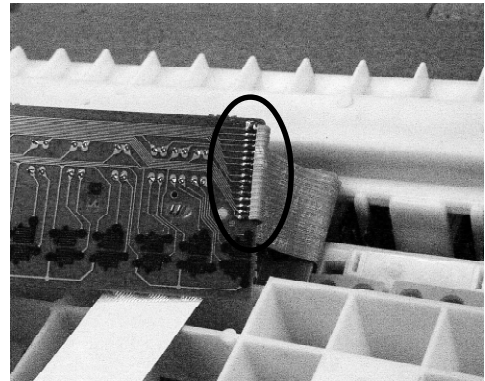
6. Removal of keys

6-1. While prying the side partition plastics with tweezers, lift the edge of the key toward front.



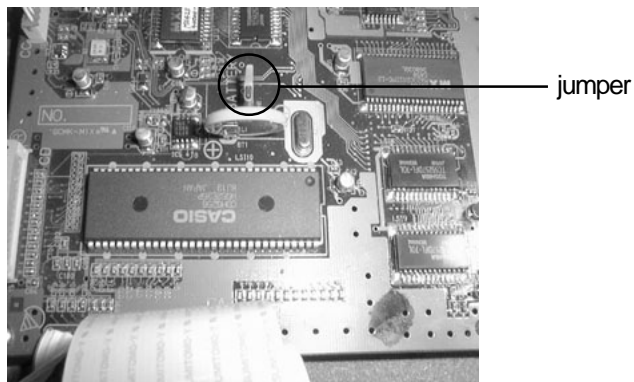
7. Removal of keyboard PCB

7-1. Lay the keyboard so that keyboard PCBs face upward.
7-2. Remove screws on keyboard PCBs (10 screws on PCBs KY1M and KY3M, 12 screws on KY2M).
7-3. Unsolder the cable.



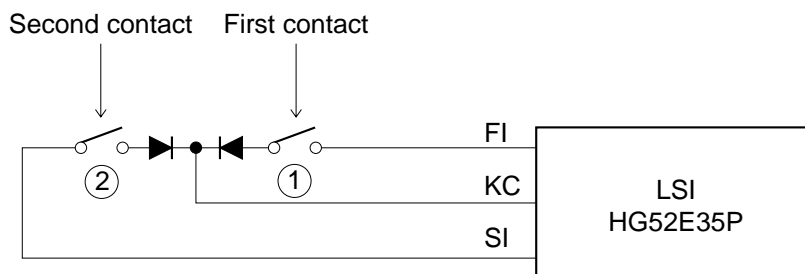
8. Notes on replacing the main PCB.

A lithium battery is set on the main PCB for memory protection.
When you replace the main PCB, disconnect the jumper to open battery circuit.
Since there is no jumper on a new main PCB, be sure to set a jumper.



CIRCUIT DESCRIPTION

KEYMATRIX



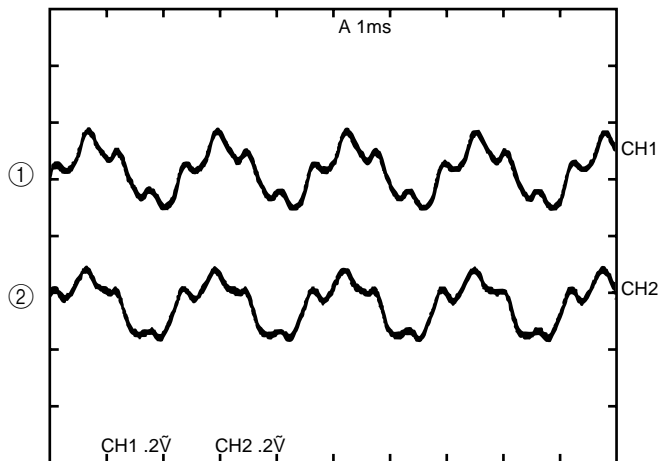
	KC0	KC1	KC2	KC3	KC4	KC5	KC6	KC7
FI0	A0 ①	A0 # ①	B0 ①	C1 ①	C1 # ①	D1 ①	D1 # ①	E1 ①
SI0	A0 ②	A0 # ②	B0 ②	C1 ②	C1 # ②	D1 ②	D1 # ②	E1 ②
EI1	F1 ①	F1 # ①	G1 ①	G1 # ①	A1 ①	A1 # ①	B1 ①	C2 ①
SI1	F1 ②	F1 # ②	G1 ②	G1 # ②	A1 ②	A1 # ②	B1 ②	C2 ②
FI2	C2 # ①	D2 ①	D2 # ①	E2 ①	F2 ①	F2 # ①	G2 ①	G2 # ①
SI2	C2 # ②	D2 ②	D2 # ②	E2 ②	F2 ②	F2 # ②	G2 ②	G2 # ②
FI3	A2 ①	A2 # ①	B2 ①	C3 ①	C3 # ①	D3 ①	D3 # ①	E3 ①
SI3	A2 ②	A2 # ②	B2 ②	C3 ②	C3 # ②	D3 ②	D3 # ②	E3 ②
FI4	F3 ①	F3 # ①	G3 ①	G3 # ①	A3 ①	A3 # ①	B3 ①	C4 ①
SI4	F3 ②	F3 # ②	G3 ②	G3 # ②	A3 ②	A3 # ②	B3 ②	C4 ②
FI5	C4 # ①	D4 ①	D4 # ①	E4 ①	F4 ①	F4 # ①	G4 ①	G4 # ①
SI5	C4 # ②	D4 ②	D4 # ②	E4 ②	F4 ②	F4 # ②	G4 ②	G4 # ②
FI6	A4 ①	A4 # ①	B4 ①	C5 ①	C5 # ①	D5 ①	D5 # ①	E5 ①
SI6	A4 ②	A4 # ②	B4 ②	C5 ②	C5 # ②	D5 ②	D5 # ②	E5 ②
FI7	F5 ①	F5 # ①	G5 ①	G5 # ①	A5 ①	A5 # ①	B5 ①	C6 ①
SI7	F5 ②	F5 # ②	G5 ②	G5 # ②	A5 ②	A5 # ②	B5 ②	C6 ②
FI8	C6 # ①	D6 ①	D6 # ①	E6 ①	F6 ①	F6 # ①	G6 ①	G6 # ①
SI8	C6 # ②	D6 ②	D6 # ②	E6 ②	F6 ②	F6 # ②	G6 ②	G6 # ②
FI9	A6 ①	A6 # ①	B6 ①	C7 ①	C7 # ①	D7 ①	D7 # ①	E7 ①
SI9	A6 ②	A6 # ②	B6 ②	C7 ②	C7 # ②	D7 ②	D7 # ②	E7 ②
FI10	F7 ①	F7 # ①	G7 ①	G7 # ①	A7 ①	A7 # ①	B7 ①	C8 ①
SI10	F7 ②	F7 # ②	G7 ②	G7 # ②	A7 ②	A7 # ②	B7 ②	C8 ②

POWER SUPPLY CIRCUIT

The power supply circuit generates five voltages as shown in the following table.

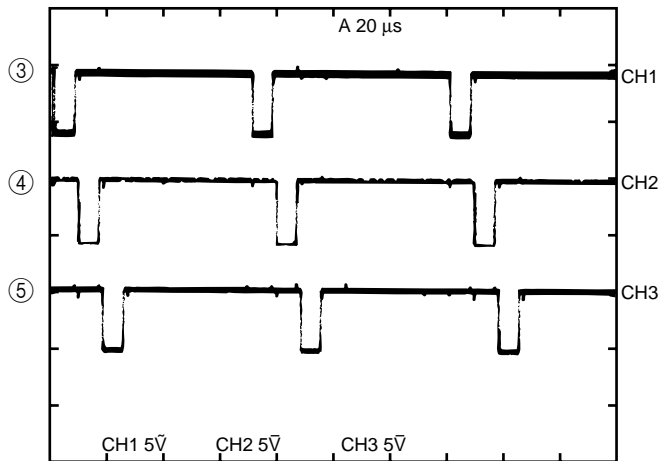
Name	Voltage	For operation of
VDD	+5 V	CPU, Reset IC, DSP, Sound source ROM, Working storage RAM, Effect RAM, Key touch LSI, Gute array, LEDs
AVDD	+5 V	DAC
AVCC	+15 V	Filter, Mixer
AVFF	-15 V	Filter, Mixer

MAJOR WAVEFORMS

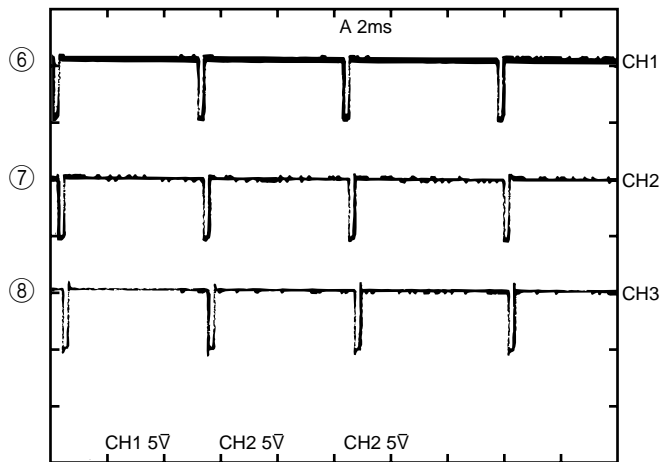


- ① Filter output L-ch CF connector pin 2
- ② Filter output R-ch CF connector pin 1

Tone : Piano 1
Key : A4



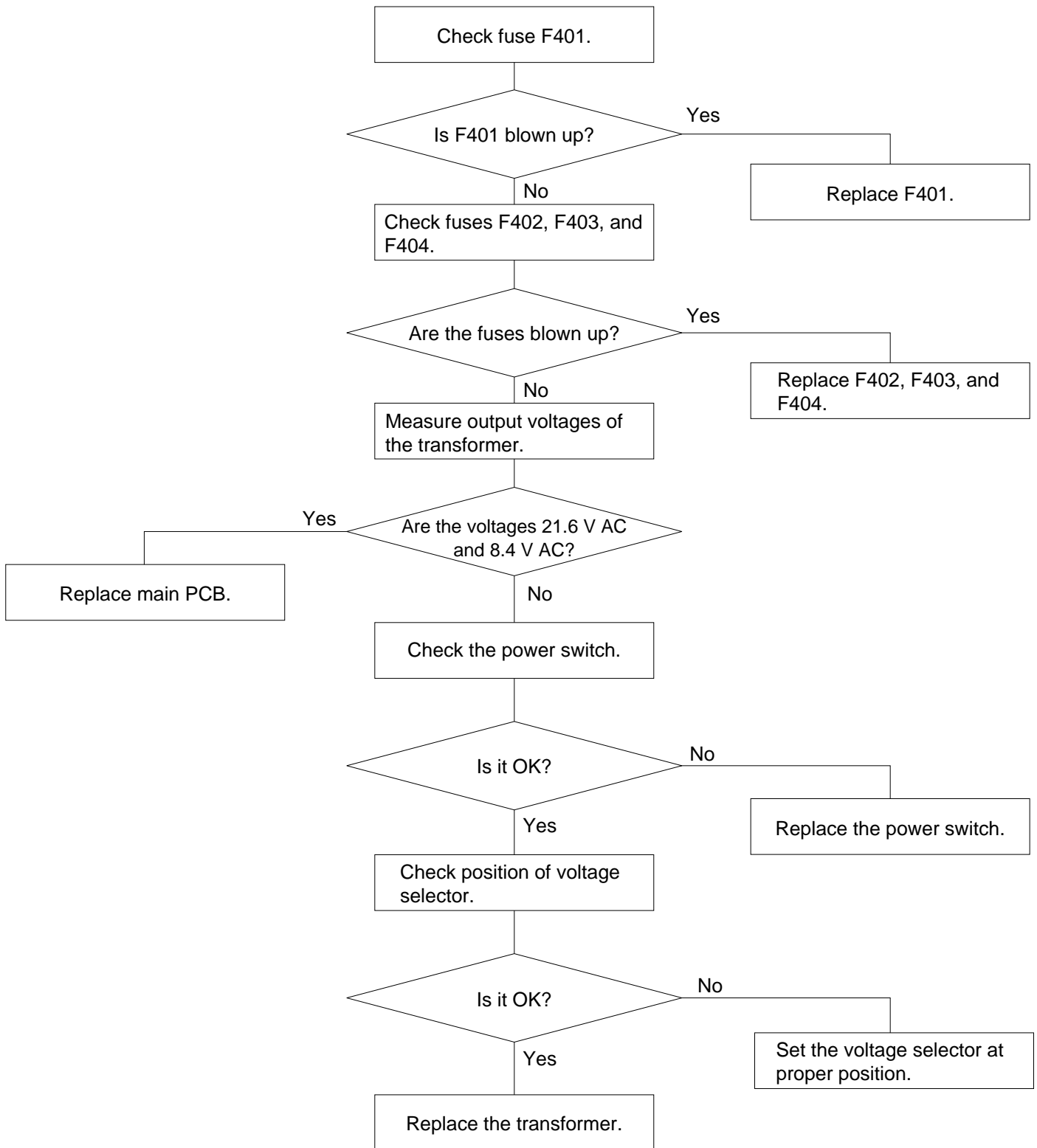
- ③ Key scan signal KC0 CA connector pin 20
- ④ Key scan signal KC1 CA connector pin 19
- ⑤ Key scan signal KC2 CA connector pin 18



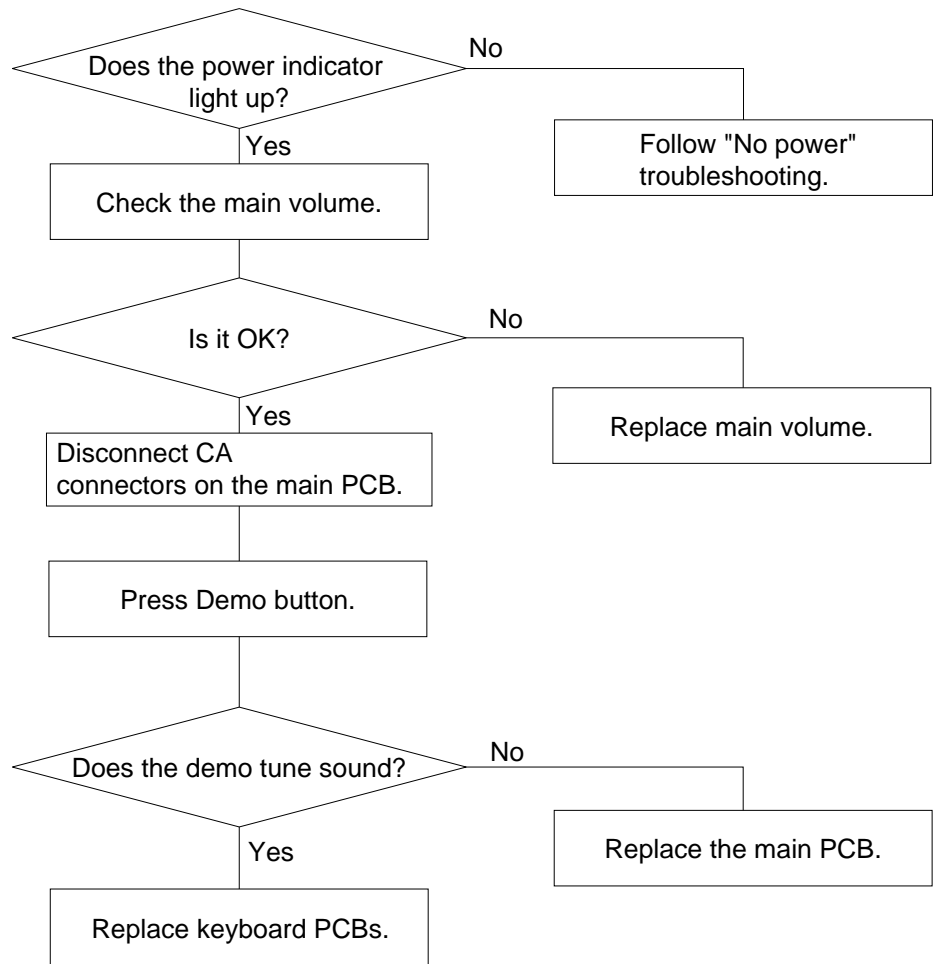
- ⑥ Button scan signal L24 UPD65005GF-419 pin 53
- ⑦ Button scan signal L25 UPD65005GF-419 pin 54
- ⑧ Button scan signal L26 UPD65005GF-419 pin 55

TROUBLESHOOTING

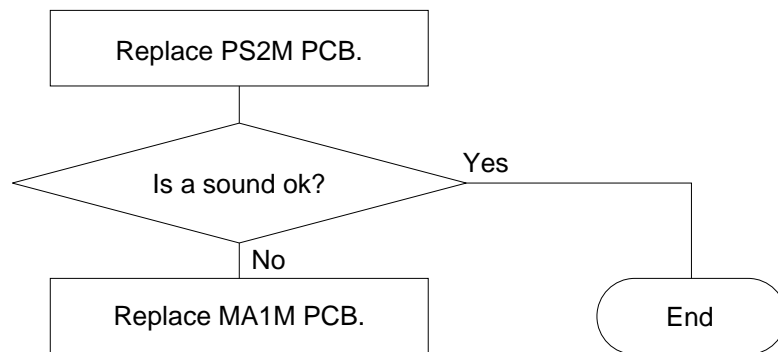
1. No power



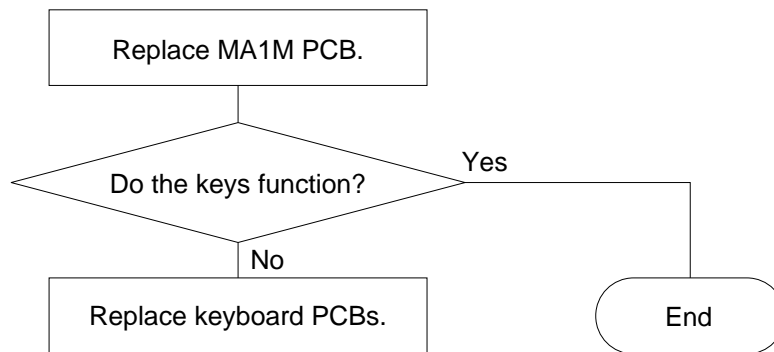
2. No sound



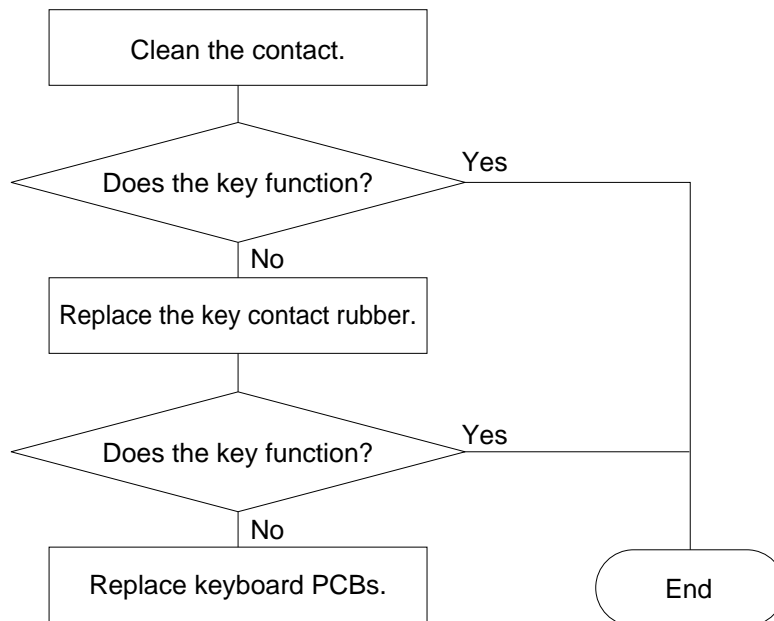
3. Distorted sound



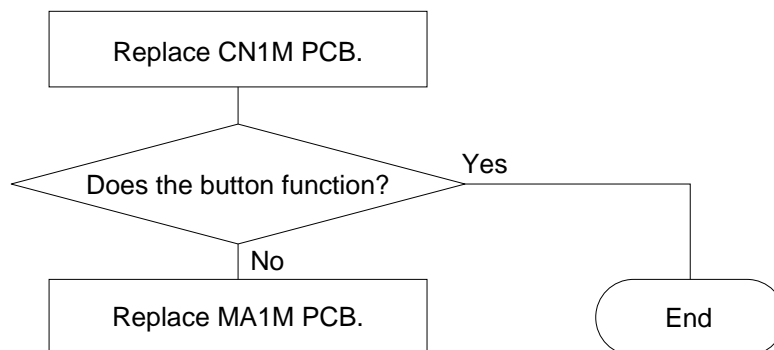
4. Certain keys do not function



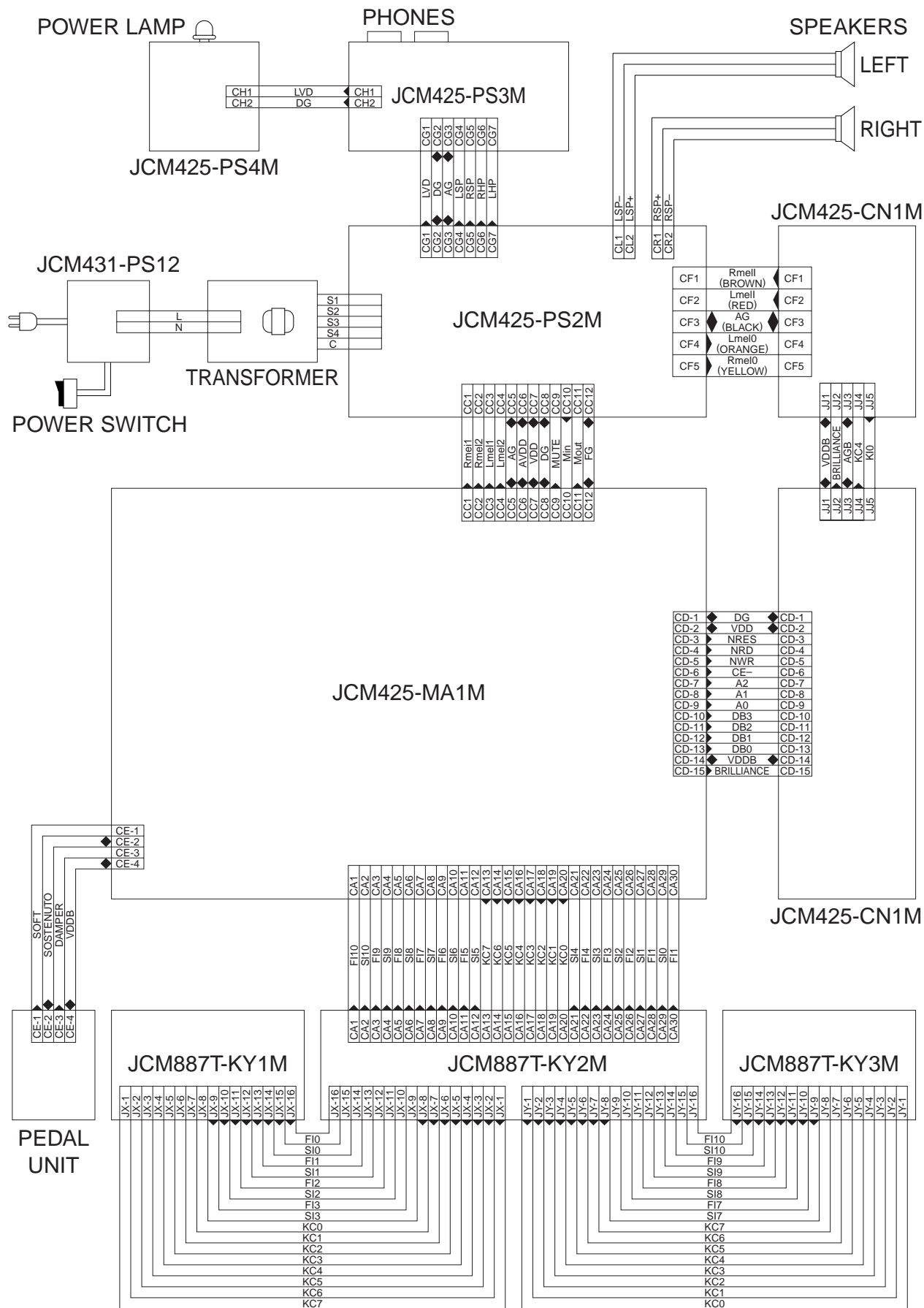
5. A certain key does not function



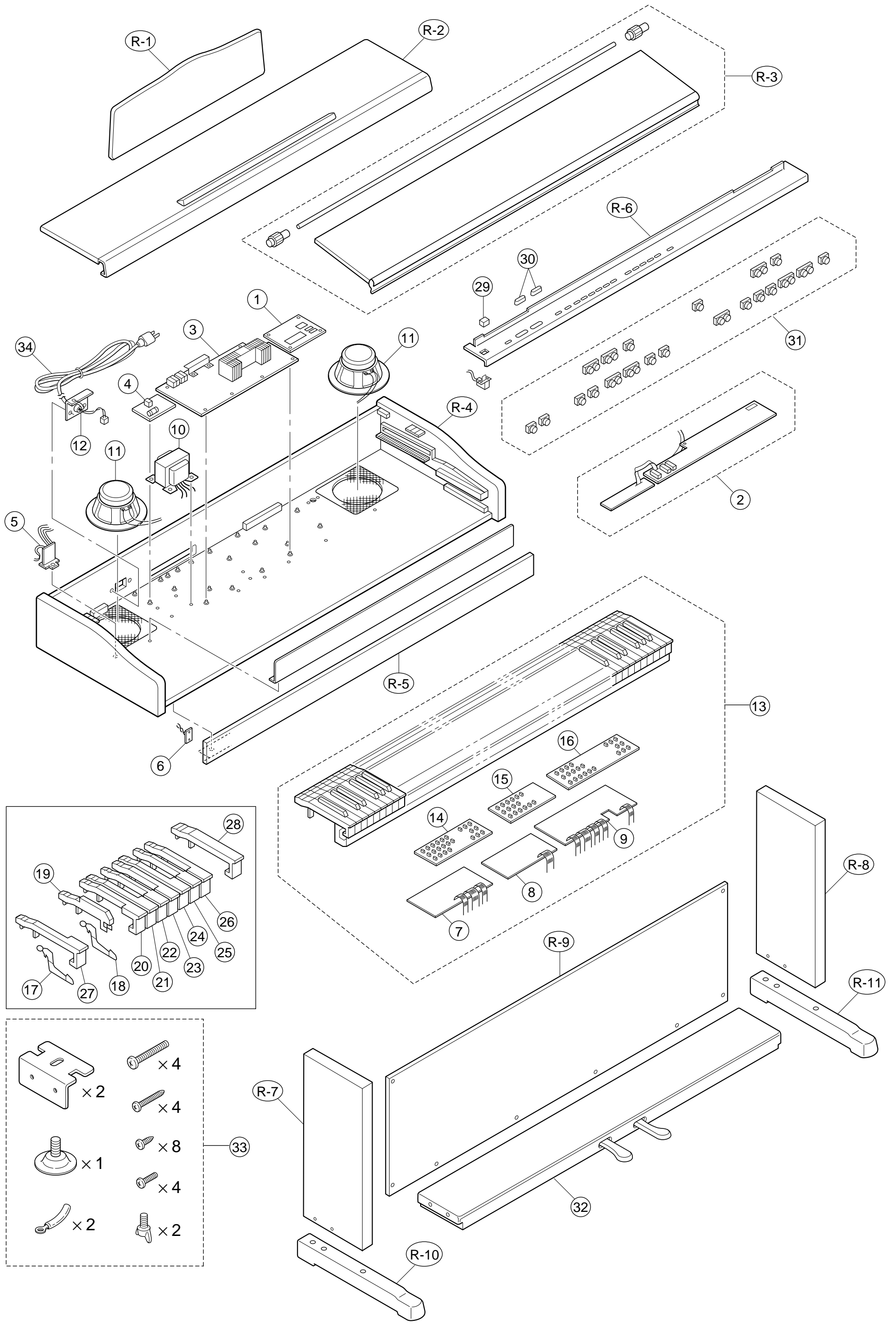
6. A certain button does not function



WIRING DIAGRAM



EXPLODED VIEW



PARTS LIST

AP-21

Notes: This parts list does not include the cosmetic parts, which parts are marked with item No. "R-X" in the exploded view.

Contact our spare parts department if you need these parts for refurbish.

1. Prices and specifications are subject to change without prior notice.
2. As for spare parts order and supply, refer to the "GUIDEBOOK for Spare parts Supply", published separately.
3. The numbers in item column correspond to the same numbers in drawing.

PARTS PRICE LIST

AP-21

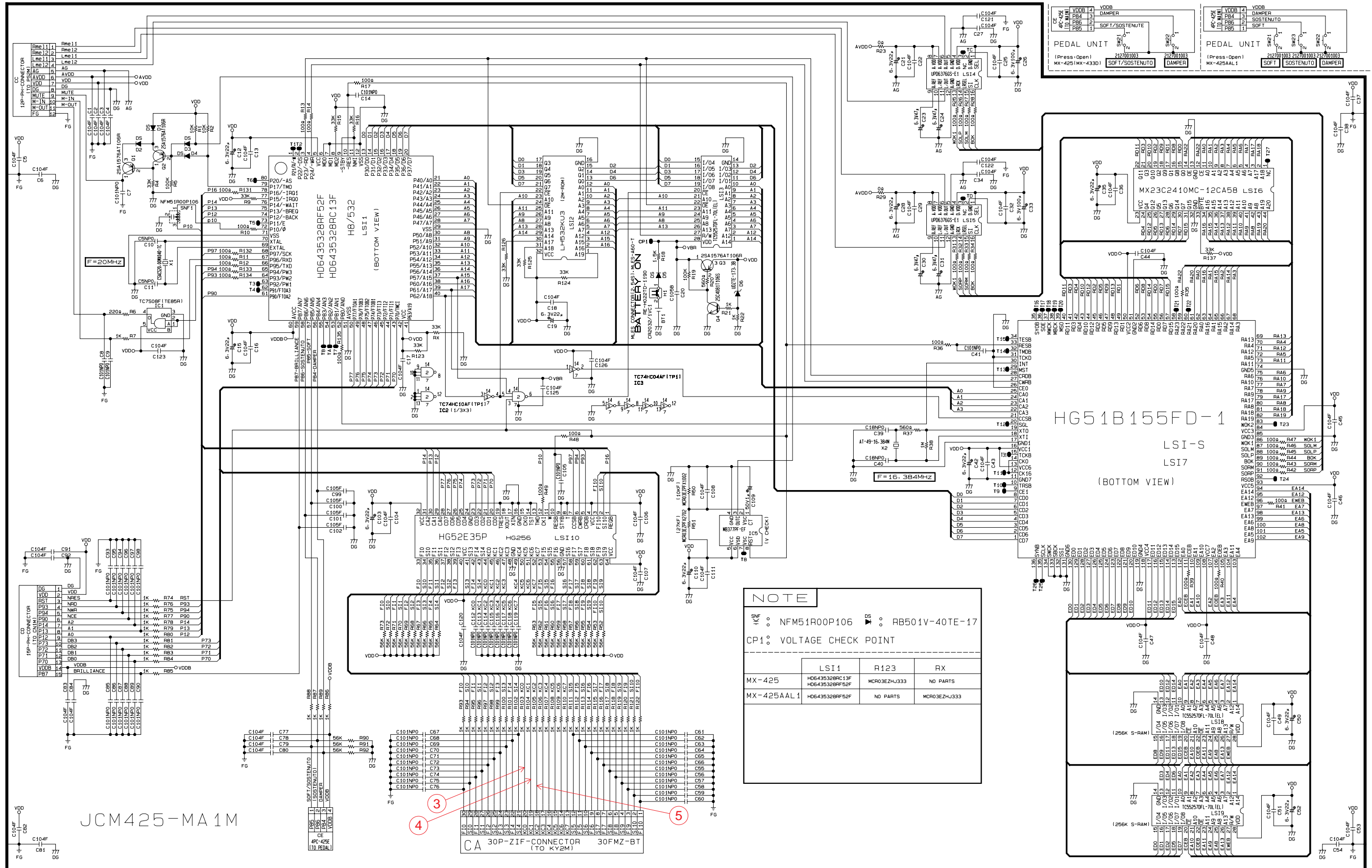
N	Item	Code No.	Part Name	Specification	Q	Price Code	R	Remarks
Main PCB								
N	BT1	3815 0794	BATTERY / LITHIUM	CR2032/1VC1	1	AI	B	
	D1 - D4	2390 2576	DIODE / SCHOTTKY	RB501V-40TE-17	4	AB	B	
	D5	2390 2576	DIODE / SCHOTTKY	RB501V-40TE-17	1	AB	B	
	D6	2360 3057	DIODE / ZENER	UDZTE-173.3B	1	AA	B	
	IC1	2105 1120	IC / L-MOS	TC7S08F(TE85R)	1	AB	B	
	IC2	2105 6657	IC / C-MOS	TC74HC10AF(TP1)	1	AB	B	
	IC3	2011 8806	IC / C-MOS	TC74HC04AF(TP1)	1	AC	B	
	IC5	2114 4060	IC / MONOLITHIC	MB3771PF-EF	1	AK	B	
	LSI1	2011 5222	LSI	HD6435328RC13F	1	CB	A	
	LSI10	2011 5194	LSI	HG52E35P	1	BJ	A	
	LSI2	2012 6404	LSI	LH532KU3	1	AT	A	
	LSI3, LSI8 - LSI9	2012 5572	LSI	TC55257DFL-70L(EL)	3	AS	A	
	LSI4 - LSI5	2114 4221	LSI	UPD6376GS-E1	2	AS	A	
	LSI6	2012 5707	LSI	MX23C2410MC-12CA58	1	BO	A	
	LSI7	2012 1316	LSI	HG51B155FD-1	1	BU	A	
	Q1 - Q2	2250 1162	TRANSISTOR	2SA1576AT106R	2	AA	B	
	Q3	2250 1162	TRANSISTOR	2SA1576AT106R	1	AA	B	
	Q4	2252 0637	TRANSISTOR	2SC4081T106R	1	AA	B	
	SNF1	3025 1505	FILTER / EMI	NFM51R00P106	1	AC	B	
	X1	2590 2100	OSCILLATOR	CSACS20.00MX040-TC	1	AG	B	
X2	2590 1043	OSCILLATOR	AT-49-16.384M	1	AK	B		
1	6927 5470	PCB ASSY / M425-MA1M	M241032*1	1	EM	A		
Console PCB								
N	D301 - D318	2390 1344	DIODE	1SS133T-77	18	AA	B	
	LED301 - LED317	2370 1416	LED	SLZ-190B-03-T2	17	AA	B	
	LSI301	2011 0812	LSI	UPD65005GF-419	1	AT	A	
	SW301 - SW318	3412 0903	SWITCH / TACT	EVQ-21405R	18	AA	A	
	VR301	2765 0280	VOLUME	EWA-NAXCH1B14	1	AI	A	
	VR302	2765 2187	VOLUME	EWA-NFECH1B54	1	AG	A	
	2	6927 5560	PCB ASSY / M425-CN1,2M	M241033*1	1	DD	A	
Power supply PCB								
N	D401 - D404, D415	2390 2996	DIODE	1SR139-400T-32	5	AA	B	
	D405 - D408	2390 3022	DIODE	3BZ41(LC6-15)	4	AD	B	
	D409 - D414	2390 1344	DIODE	1SS133T-77	11	AA	B	
	D417 - D421							
	D416	2390 1323	DIODE	RB100A-T32-T	1	AC	B	
	D422 - D423	2360 1729	DIODE / ZENER	MTZJ5.1AT-77-T	2	AA	B	
	F402	3632 0719	FUSE / UL TIME-LAG	UL-TSC-1A-N1	1	AF	A	For 110 - 127V area
	F402	3631 1037	FUSE / TIME-LAG	(S)T-1A	1	AE	A	For 220 - 240V area
	F403 - F404	3632 0301	FUSE / UL TIME-LAG	UL-TSC-4A-N1	2	AF	A	For 110 - 127V area
	F403 - F404	3632 0049	FUSE / TIME-LAG	(S)T-4A	2	AF	A	For 220 - 240V area
	IC401	2114 5794	IC / MONOLITHIC	NJM78M15FA	1	AE	B	
	IC402	2114 5795	IC / MONOLITHIC	NJM79M15FA	1	AG	B	
	IC403	2114 5797	IC / MONOLITHIC	NJM78L05A(T3)	1	AE	B	
	IC404	2114 5796	IC / MONOLITHIC	NJM78M05FA	1	AE	B	
	IC405	2114 1106	IC / HYBRID	STK4132MK2	1	BL	B	
	IC406, IC408	2114 1799	IC / MONOLITHIC	M5218APR	4	AC	B	
	IC410, IC411							
	IC409	2114 1421	IC / PHOTO COUPLER	PC900V	1	AK	B	
	J401 - J402	3612 0584	JACK	YKB21-5012	2	AD	A	
	J403 - J404	3612 0789	JACK	YKB21-5010	2	AC	A	
	J405	3501 4816	JACK / DIN	YKF51-5051	1	AH	B	
	Q401 - Q404	2254 0551	FET	2SK365-BL(TPE4)	4	AC	A	
	3	6927 5520	PCB ASSY / M425-PS2M	M241035*2		DN	A	For 110 - 127V area
	3	6927 5530	PCB ASSY / M425-PS2M	M241035*3		DN	A	For 220 - 240V area

N	Item	Code No.	Part Name	Specification	Q	Price Code	R	Remarks
PS12,PS3,PS4M PCB's								
N	F401	3632 0294	FUSE / UL TIME-LAG	MT4-2A-N1	1	AF	A	For 110 - 127V area
	F401	3631 1037	FUSE / TIME-LAG	(S)T-1A	1	AE	A	For 220 - 240V area
N	J406 - J407	3502 2657	JACK / PHONE	YKB22-5006	2	AF	A	
	L401	3013 2577	COIL / CHOKE	PLAC1522R0R01B1	1	AM	C	
N	LED401	2370 1417	LED	SLP-135B-51	1	AA	B	
	4	6927 5490	PCB ASSY / M425-PS12	M341012*2	1	BS	B	For 110 - 127V area
	4	6927 5500	PCB ASSY / M425-PS12	M341012*3	1	BR	B	For 220 - 240V area
	5	6927 5540	PCB ASSY / M425-PS3M	M341013*1	1	CO	B	
	6	6927 5580	PCB ASSY / M425-PS4M	M341014*1	1	BJ	B	
Keyboard PCB's								
N	D701 - D876	2390 3043	DIODE	1S2076TE	176	AA	B	
N	7	6927 3270	PCB ASSY / M887T-KY1M	M240951*1	1	BO	C	
N	8	6927 3280	PCB ASSY / M887T-KY2M	M240952*1	1	BT	C	
N	9	6927 5610	PCB ASSY / M887T-KY3M	M241019*1	1	BM	C	
Other electrical parts								
N	10	3012 1614	TRANSFORMER	TE-425-1M1	1	CA	B	For 110 - 127V area
N	10	3012 1615	TRANSFORMER	TE-425-2M1	1	CA	B	For 220 - 240V area
	11	3831 1077	SPEAKER	SG16G51BFA	2	BS	B	
	12	3613 0217	RECEPTACLE	NC-174-10-C	1	AJ	C	
Keyboard unit								
N	13	6927 3230	KY ASSY	M140830*1	1	EO	B	
N	14	6927 3980	RUBBER / CONTACT AB	M240957-1	1	AE	A	
N	15	6927 3990	RUBBER / CONTACT CB	M240958-1	6	AH	A	
N	16	6927 4000	RUBBER / CONTACT CS	M240959-1	1	AH	A	
N	17	6927 3250	HAMMER ASSY / WHITE KEY	M340962*1	52	BF	B	
N	18	6927 3260	HAMMER ASSY / BLACK KEY	M340963*1	36	BF	B	
N	19	6927 4030	BLACK KEY	M140784-1	36	AG	A	
N	20	6927 4040	WHITE KEY / C	M140783-1	7	AH	A	
N	21	6927 4050	WHITE KEY / D	M140785-1	7	AI	A	
N	22	6927 4060	WHITE KEY / E	M140786-1	7	AH	A	
N	23	6927 4070	WHITE KEY / F	M140787-1	7	AI	A	
N	24	6927 4080	WHITE KEY / G	M140788-1	7	AH	A	
N	25	6927 4090	WHITE KEY / A.	M140789-1	7	AH	A	
N	26	6927 4100	WHITE KEY / B	M140790-1	8	AI	A	
N	27	6927 4110	WHITE KEY / SA	M140792-1	1	AM	A	
N	28	6927 4120	WHITE KEY / SC	M140791-1	1	AN	A	
Mechanical parts								
	29	6924 5260	BUTTON / POWER	M340318-1	1	AA	B	
	30	6919 3241	KNOB /SLIDE	M311405-1	2	AB	B	
N	31	6927 5730	SWITCH ASSY / POWER	M341019*1	1	BN	B	
Stand								
N	32	6927 5680	PEDAL-BOX	M241018*1	1	CX	B	
N	33	1004 3475	SCREW SET -415MM	M341366C-1	1	BL	B	
AC cord								
	34	3701 1142	AC cord	5-989660	1	AZ	C	120V, USA
	34	3701 0595	AC cord	EC-654-E06	1	BP	C	230V, Europe 240V, Other countries
	34	3701 1008	AC cord	SP22-17022A	1	CD	C	230V, UK

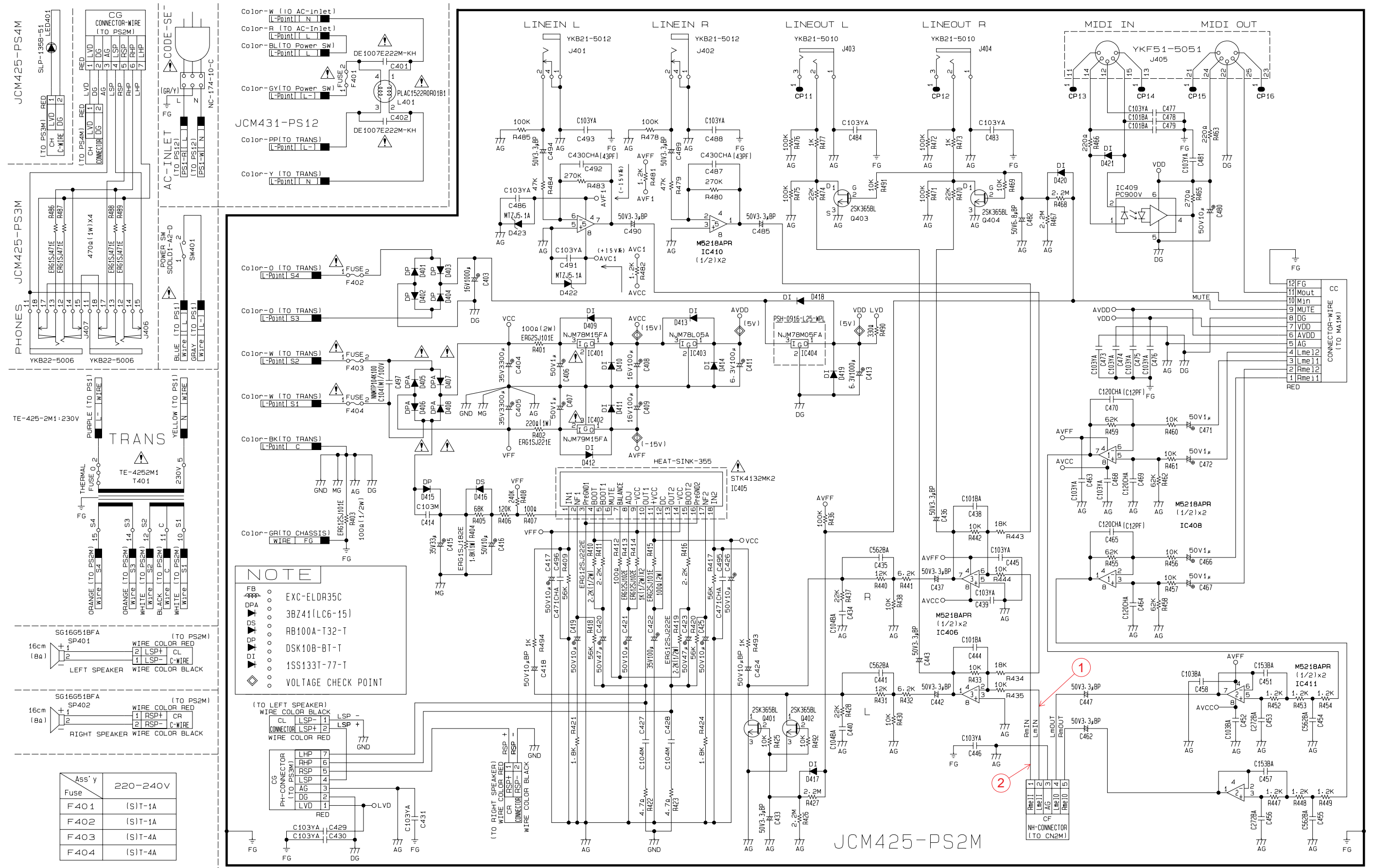
Notes: N- New parts
Q-Quantity used per unit
R-Rank

SCHEMATIC DIAGRAMS

MAIN PCB JCM425-MA1M



MAIN (B) & POWER SUPPLY PCBs JCM425-PS12/PS2M/PS3M/PS4M (AC : 220 - 240V AREA)



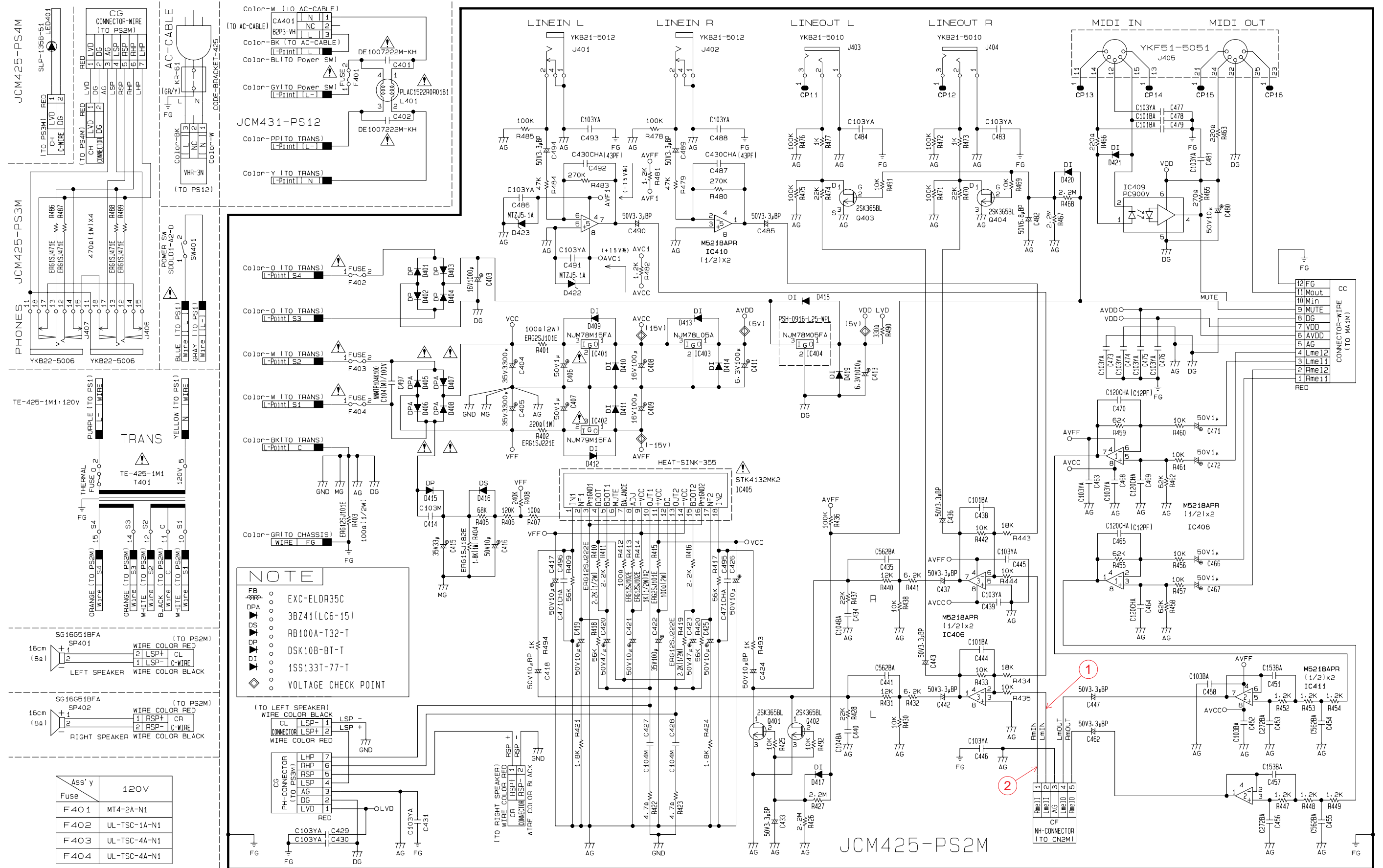
NOTE

- EXC-ELDR35C
- 3BZ41(LC6-15)
- RB100A-T32-T
- DSK10B-BT-T
- 1SS133T-77-T
- ◇ VOLTAGE CHECK POINT

Ass'y	Fuse	220-240V
F401	(S)T-1A	
F402	(S)T-1A	
F403	(S)T-4A	
F404	(S)T-4A	

JCM425-PS2M

MAIN (B) & POWER SUPPLY PCBs JCM425-PS12/PS2M/PS3M/PS4M (AC: 110 - 127V AREA)

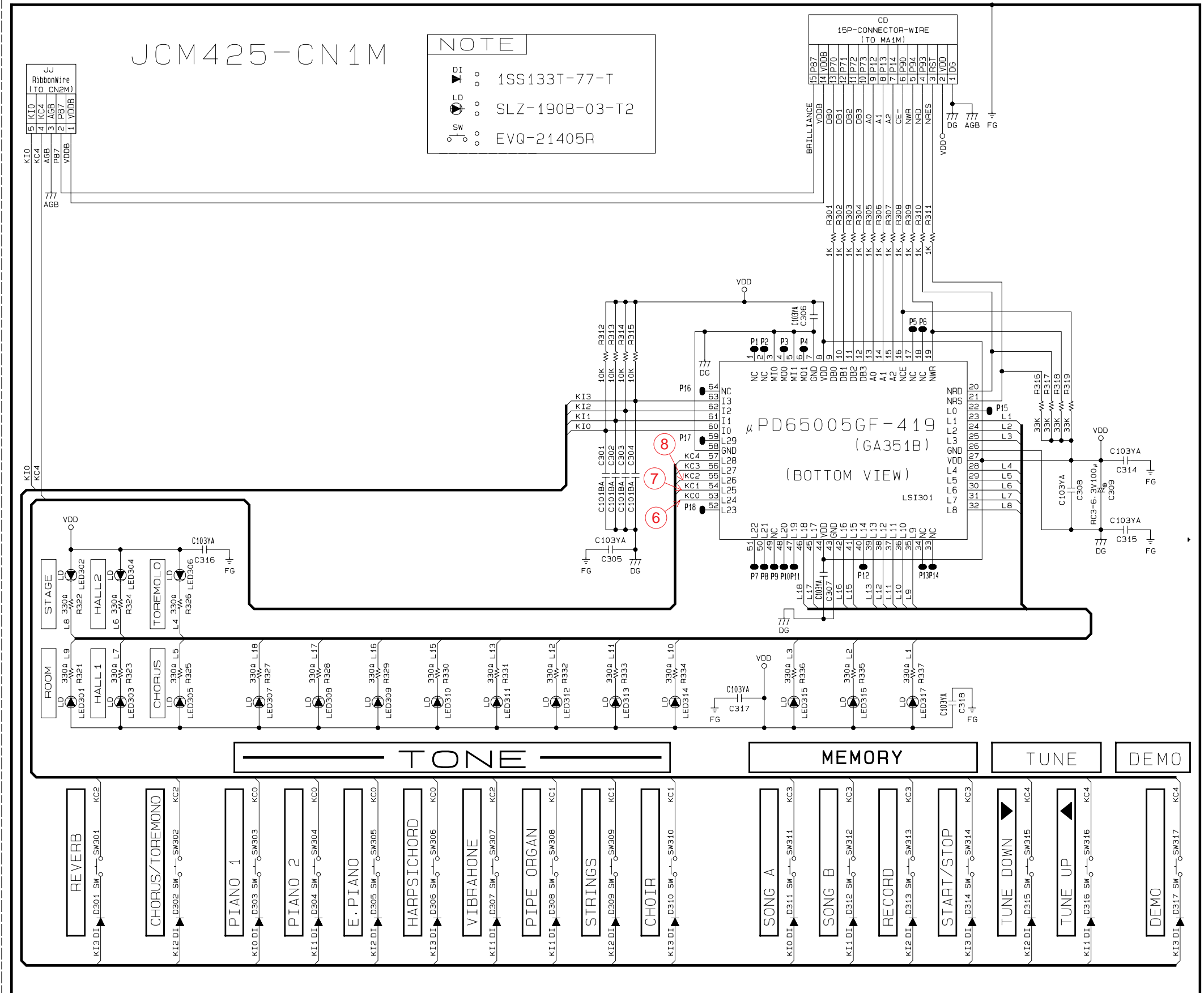
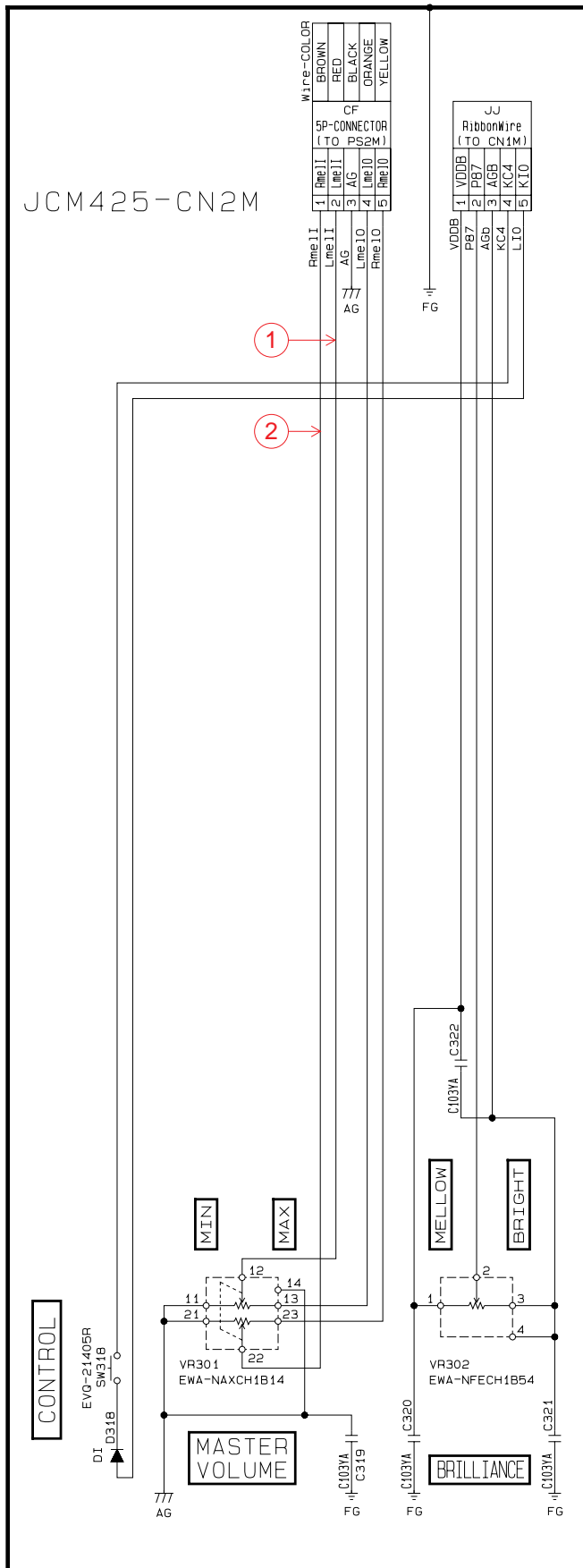


NOTE

- EXC-ELDR35C
- 3BZ41(LC6-15)
- RB100A-T32-T
- DSK10B-BT-T
- 1SS133T-77-T
- ◇ VOLTAGE CHECK POINT

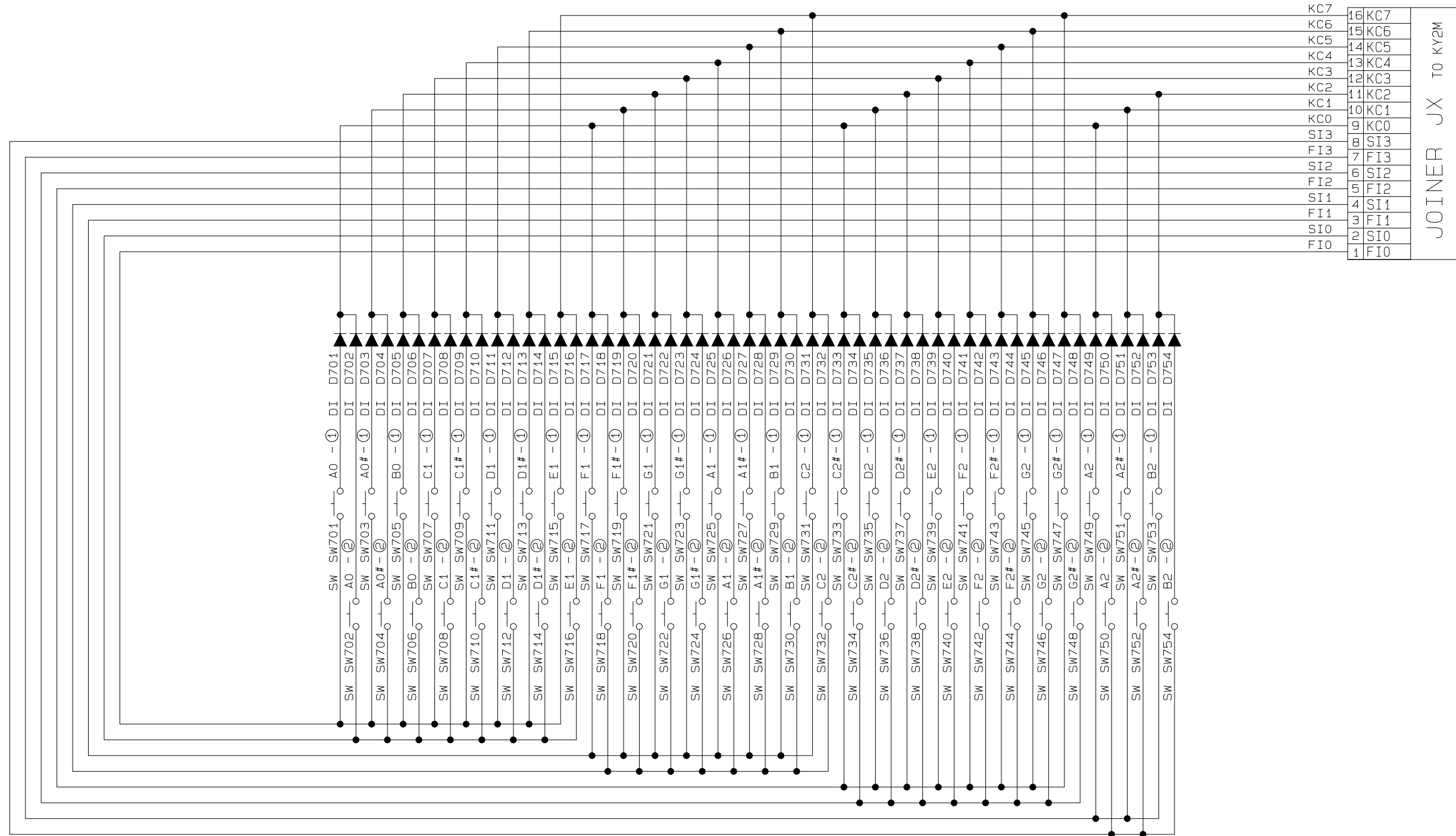
Ass'y	120V
Fuse	F401 MT4-2A-N1
	F402 UL-TSC-1A-N1
	F403 UL-TSC-4A-N1
	F404 UL-TSC-4A-N1

CONSOLE PCB JCM425-CN1M, CN2M



JCM887T-KY1M

NOTE
 DI ◀ : 1S2076TE



KC7	16	KC7
KC6	15	KC6
KC5	14	KC5
KC4	13	KC4
KC3	12	KC3
KC2	11	KC2
KC1	10	KC1
KC0	9	KC0
SI3	8	SI3
FI3	7	FI3
SI2	6	SI2
FI2	5	FI2
SI1	4	SI1
FI1	3	FI1
SIO	2	SIO
FIO	1	FIO

JOINER JX TO KY2M

KEYBOARD PCB JCM887T-KT2M

NOTE

DI ◀ : 1S2076TE

JCM887T-KY2M

CONNECTOR CA701 TO MA1M

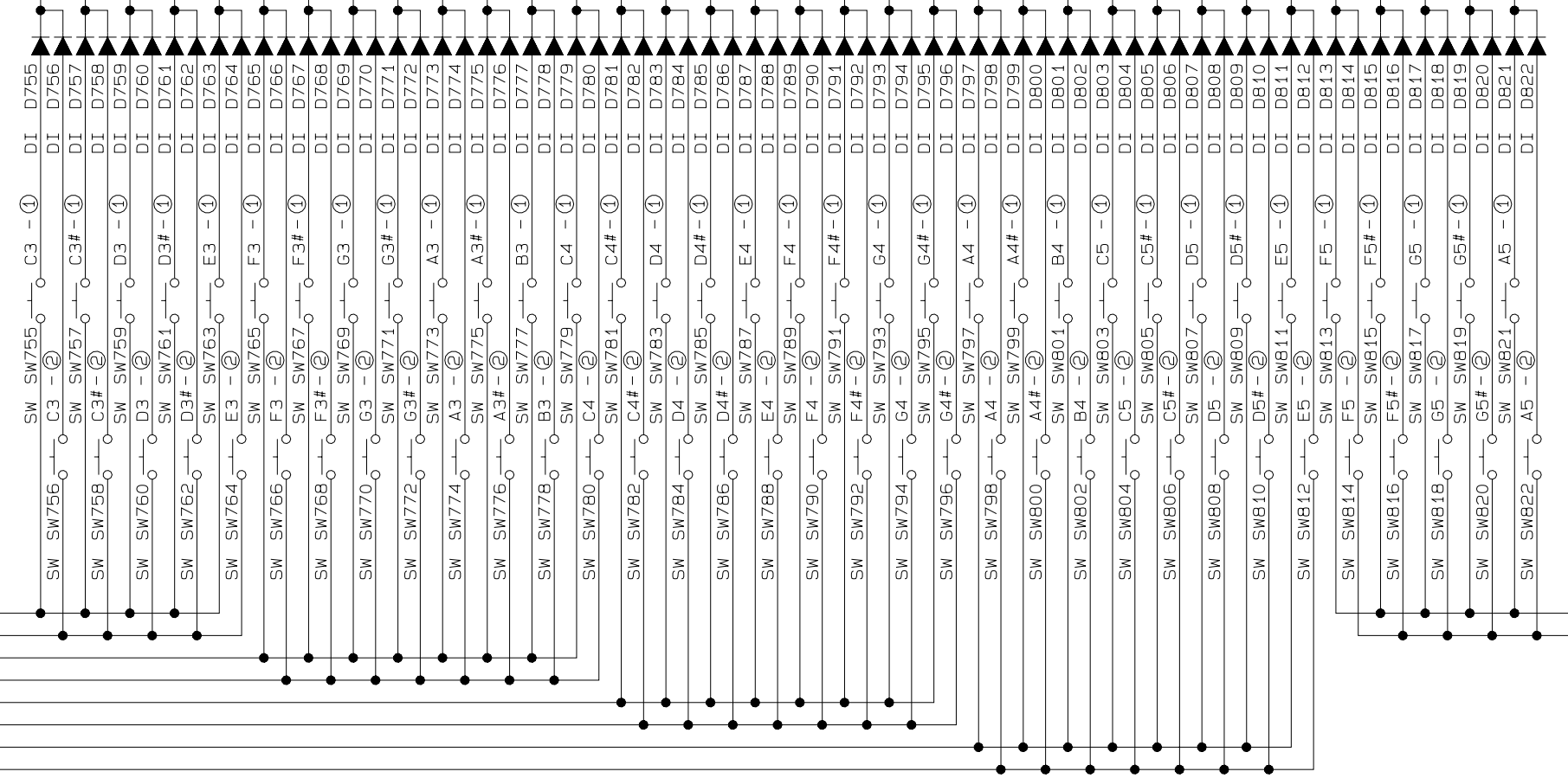
30	FI0
29	SI0
28	FI1
27	SI1
26	FI2
25	SI2
24	FI3
23	SI3
22	FI4
21	SI4
20	KI0
19	KC1
18	KI2
17	KC3
16	KI4
15	KC5
14	KI6
13	KC7
12	SI5
11	FI5
10	SI6
9	FI6
8	SI7
7	FI7
6	SI8
5	FI8
4	SI9
3	FI9
2	SI10
1	FI10

JOINER JX TO KY1M

1	FI0
2	SI0
3	FI1
4	SI1
5	FI2
6	SI2
7	FI3
8	SI3
9	KC0
10	KC1
11	KC2
12	KC3
13	KC4
14	KC5
15	KC6
16	KC7

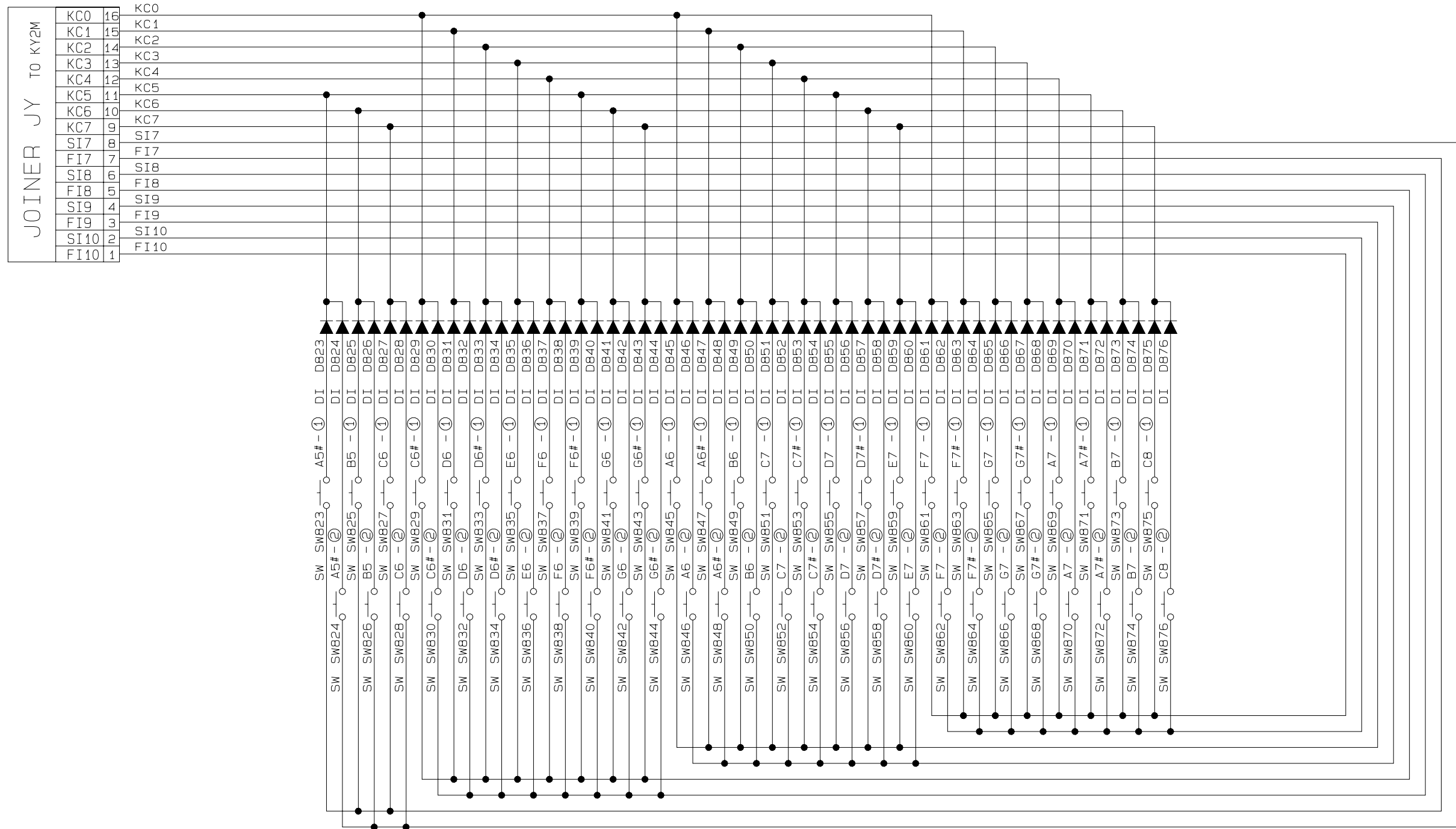
JOINER JY TO KY3M

1	FI10
2	SI10
3	FI9
4	SI9
5	FI8
6	SI8
7	FI7
8	SI7
9	KC7
10	KC6
11	KC5
12	KC4
13	KC3
14	KC2
15	KC1
16	KC0



JCM887T-KY3M

NOTE
 DI ◯ : 1S2076TE



Ver. 1 : Correction of page 18.

CASIO TECHNO CO.,LTD.
Overseas Service Division

Nishi-Shinjuku Kimuraya Bldg. 1F
5-25, Nishi-Shinjuku 7-Chome
Shinjuku-ku, Tokyo 160-0023, Japan