

EM-20/EM-10

CREATIVE KEYBOARD

SERVICE NOTES

Issued by RES

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Specifications

EM-20

GENERAL

61-KEY
TOUCH SENSITIVE KEYBOARD
TOUCH CONTROLLER (Ribbon Controller)
TWO TRACK RECORDER (2nd Track)
BACKLIT CUSTOM DISPLAY
2 x 5 W RMS OUTPUT POWER
8 USER PROGRAM
4 BALANCES
REVERB & CHORUS switches
MELODY INTELLIGENT, LAYER (Upper 1/2)
BASS INVERSION

GENERATION & SOUNDS

24 VOICES POLYPHONY
16 MULTITIMBRAL PARTS
354 TONES AND 12 DRUM KITS
(New Tones - 8 MB PCM Samples)
GM-GS COMPATIBLE

STYLES

64 STYLES ON ROM
STYLE MANIPULATOR (Style Morphing+Style Progression)

MODE

Arranger, Organ, M. Drums

8 ONE TOUCH for each style

CONTROLLERS

PITCH BENDER - MODULATION SWITCHES
DIGITAL VOLUME

CONNECTIONS

REAR POWER SWITCH
JACK OUTPUT (L/mono - R)
SUSTAIN FOOT SWITCH
2 x REAR HEADPHONES
MIDI IN-OUT
POWER SUPPLY 12V 1A ACO Adaptor (230V)
For the other voltages see on page. 7

DIMENSIONS

960 (W) X 380 (D) X 128 (H) mm

WEIGHT

7.10 Kg

ACCESSORIES

See details on page 7

EM-10

GENERAL

61-KEY
TOUCH SENSITIVE KEYBOARD

TWO TRACK RECORDER (2nd Track)

BACKLIT CUSTOM DISPLAY
2 x 3 W RMS OUTPUT POWER
8 USER PROGRAM
2 BALANCES
CHORUS/REVERB switch
MELODY INTELLIGENT

GENERATION & SOUNDS

24 VOICES POLYPHONY
16 MULTITIMBRAL PARTS
226 TONES AND 9 DRUM KITS
(1 MB PCM Samples)
GM-GS COMPATIBLE

STYLES

64 STYLES ON ROM
STYLE MANIPULATOR (Style Morphing+Style Progression)

MODE

Arranger / M. Drums

8 ONE TOUCH for each style

CONTROLLERS

DIGITAL VOLUME

CONNECTIONS

REAR POWER SWITCH
SUSTAIN FOOT SWITCH
REAR HEADPHONES 1/OUT
REAR HEADPHONES 2
MIDI IN-OUT
POWER SUPPLY 12V 500mA ACN Adaptor (230V)
For the other voltages see on page. 7

DIMENSIONS

960 (W) X 380 (D) X 128 (H) mm

WEIGHT

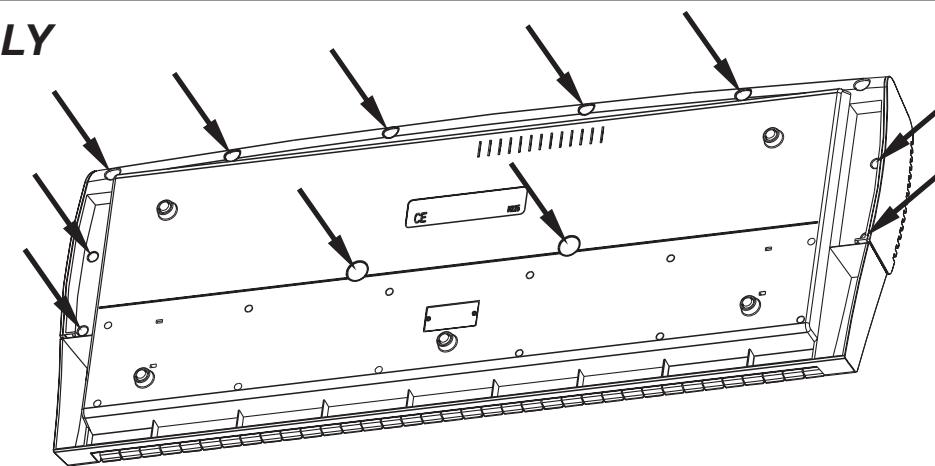
7.00 Kg

ACCESSORIES

See details on page 7

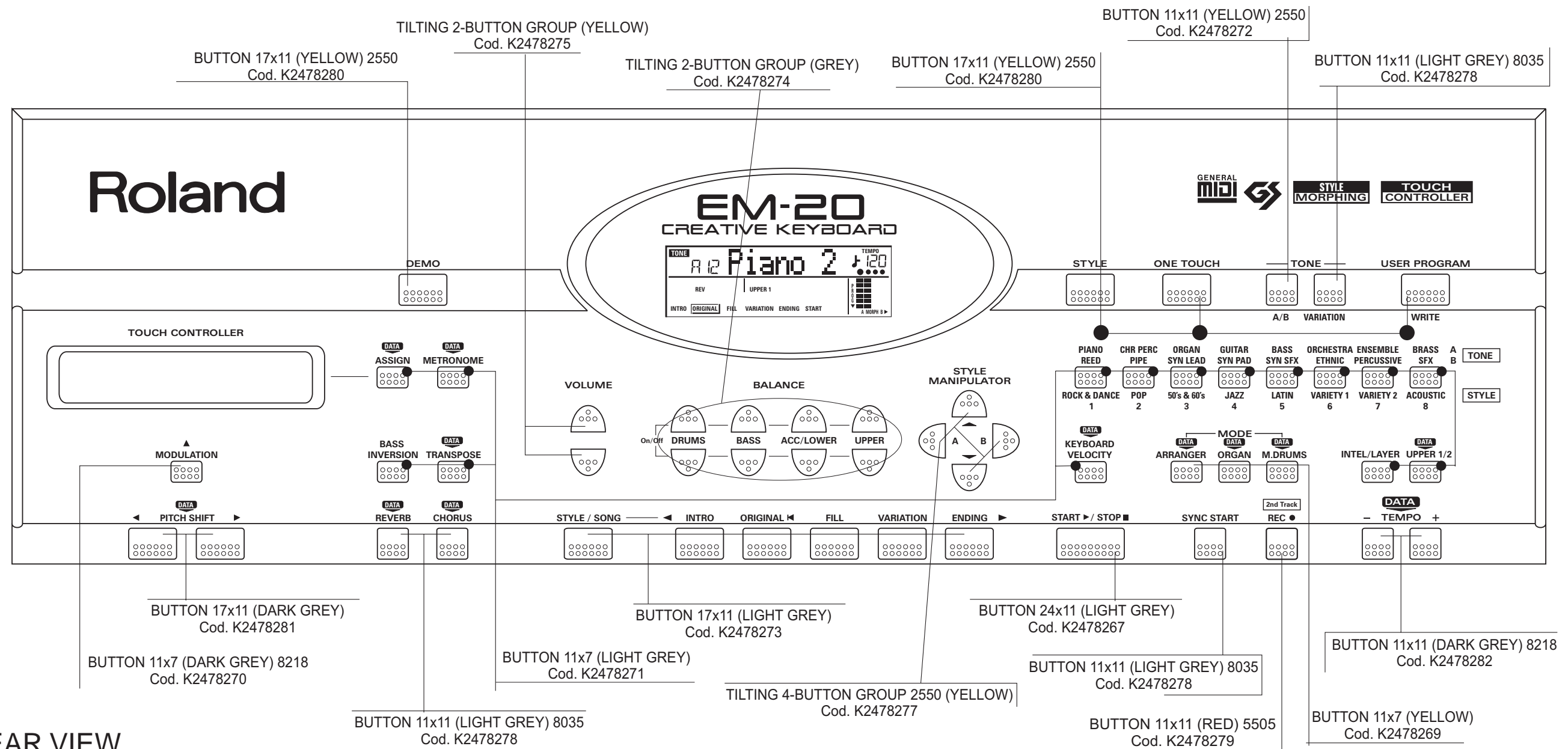


DISASSEMBLY

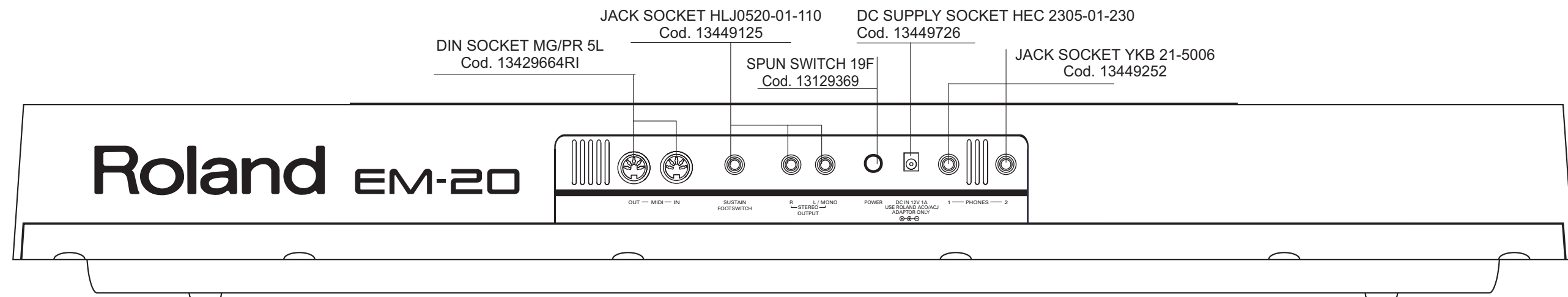


SCREW 2,9 X13 TC TC PR TROP COD. J2289130

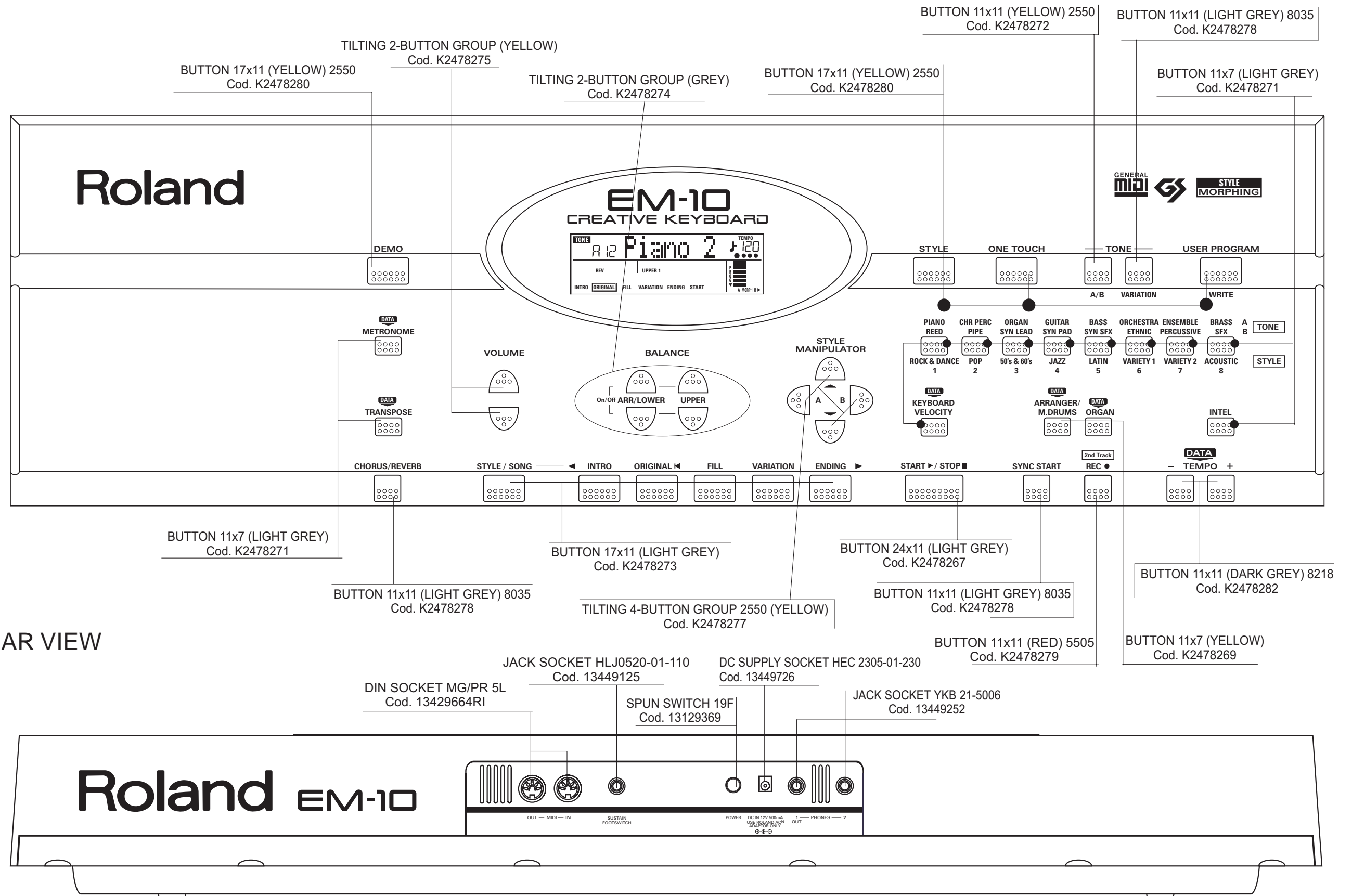
LOCATION OF CONTROLS EM-20



REAR VIEW

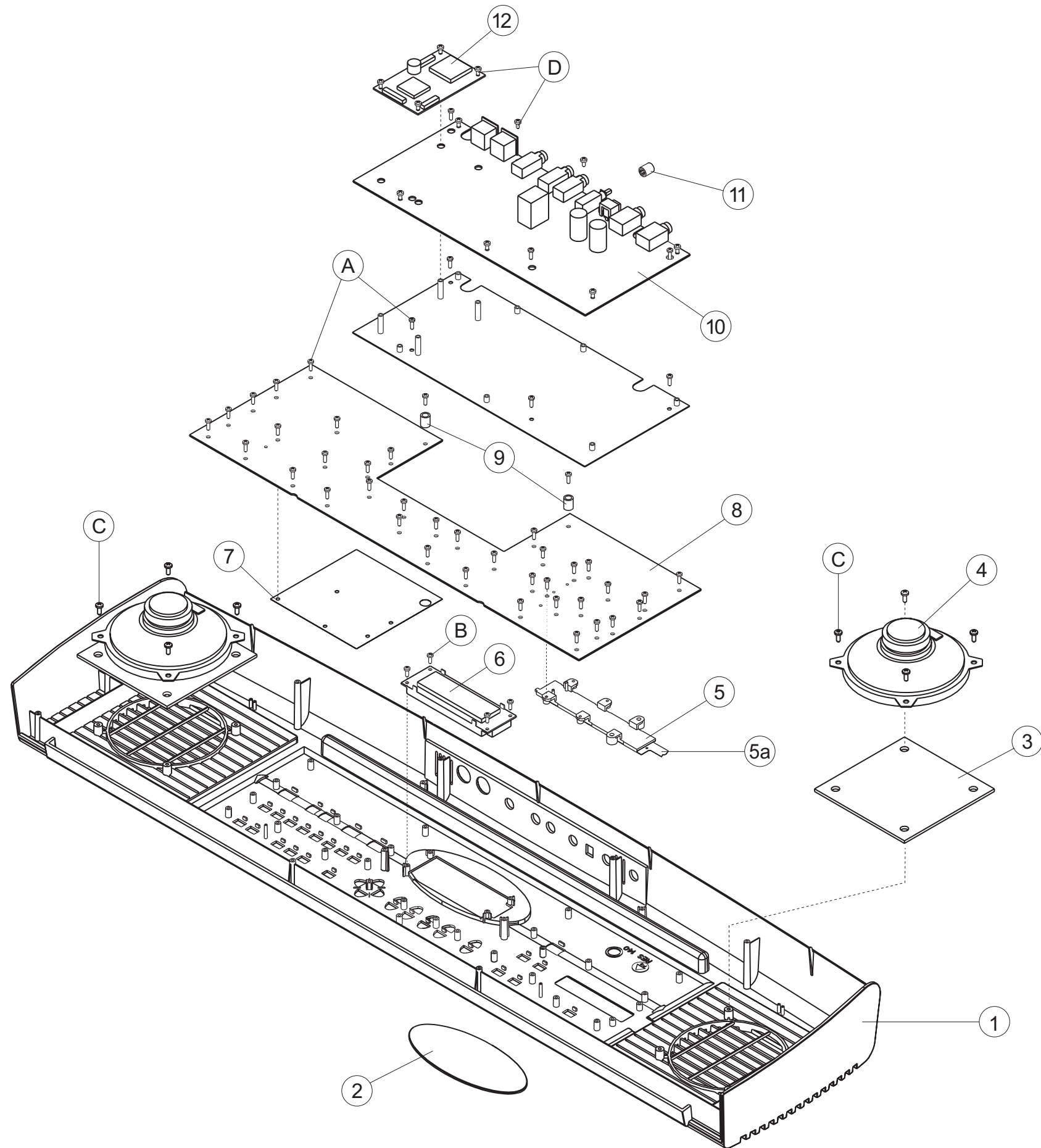


LOCATION OF CONTROLS EM-10

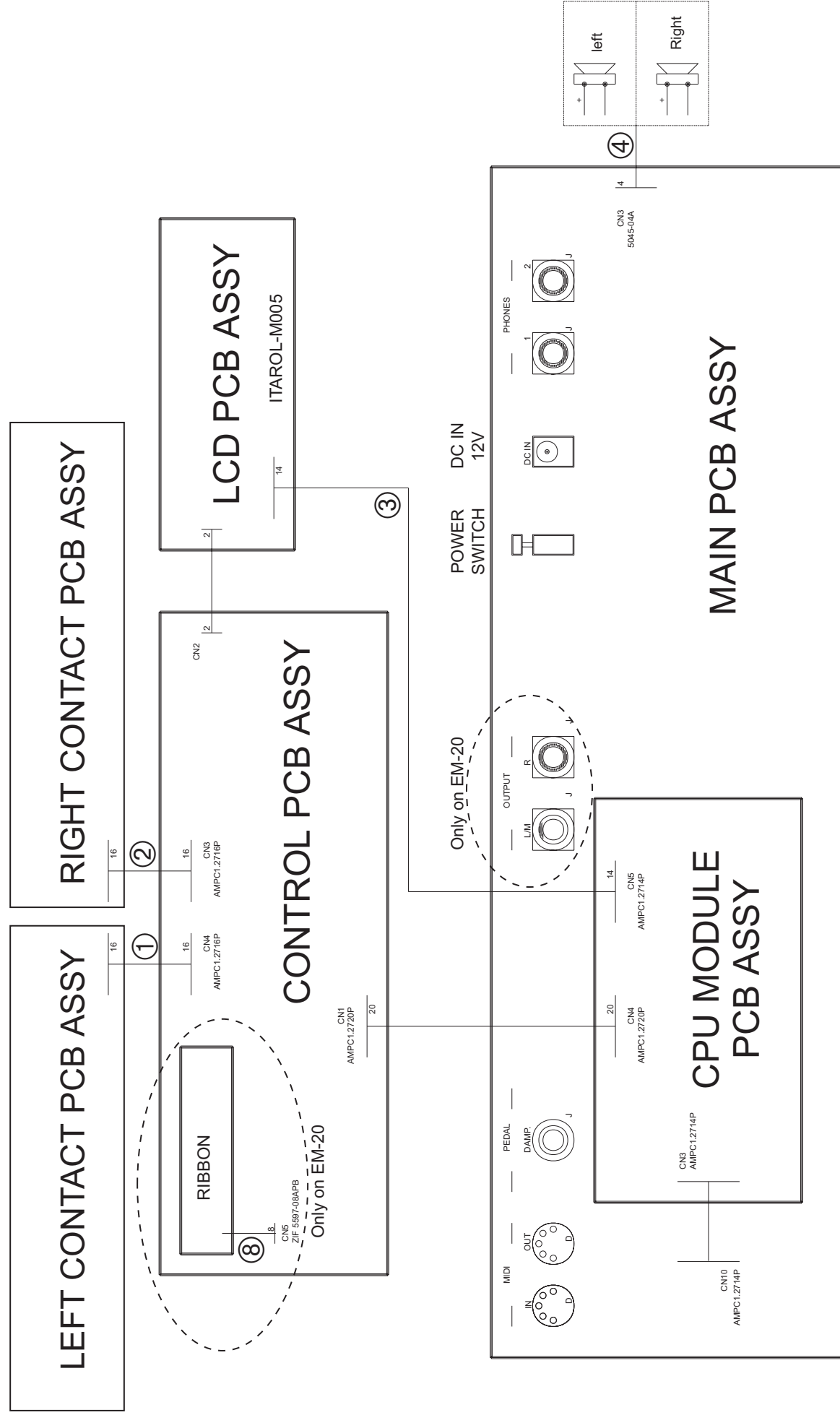


EXPLODED VIEW EM-20/EM-10

No	PARTS NAMES	PARTS NUMBERS
1	SILKSCREENED TOP CABINET for EM-20 SILKSCREENED TOP CABINET for EM-10	7711004000 7711104000
2	SILKSCREENED PLEXIGLASS for EM-20 SILKSCREENED PLEXIGLASS for EM-10	7711005000 7711105000
3	SPEAKER PROTECTION	K2248149
4	LOUDSPEAKER CF120078-01	K2418107
5	SENSOR SUPPORT for EM-20	K2198105
5a	RIBBON SENSOR for EM-20	01121790
6	LCD + CONNECTIONS ASSY	7711006000
7	MYLAR SHIELD MM 115x115 for EM-20	K2258119
8	CONTROLS PCB ASSY for EM-20 CONTROLS PCB ASSY for EM-10	7711003000 7711101000
9	BUSHING H 11,5 I/D 6 E/D 8	K2158107
10	MAIN BOARD PCB ASSY for EM-20 MAIN BOARD PCB ASSY for EM-10	7711001000 7711102000
11	POWER SWITCH CAP (BLACK) 1420	K2478266
12	CPU MODULE ASSY for EM-20 CPU MODULE ASSY for EM-10	7711002000 7711103000
A	SCREW 2,9 x 10 TC TC PR TROP	J2289125
B	SELF TAP SCREW 2,9 x 8 TC TC PR BZ	J2289126
C	SCREW 3,5 x 9,5 TC PR TFR H.8	J2289115
D	SELF LOCK SCREW M3 x 6 H.6	J2289193



WIRING DIAGRAM EM-20/EM-10

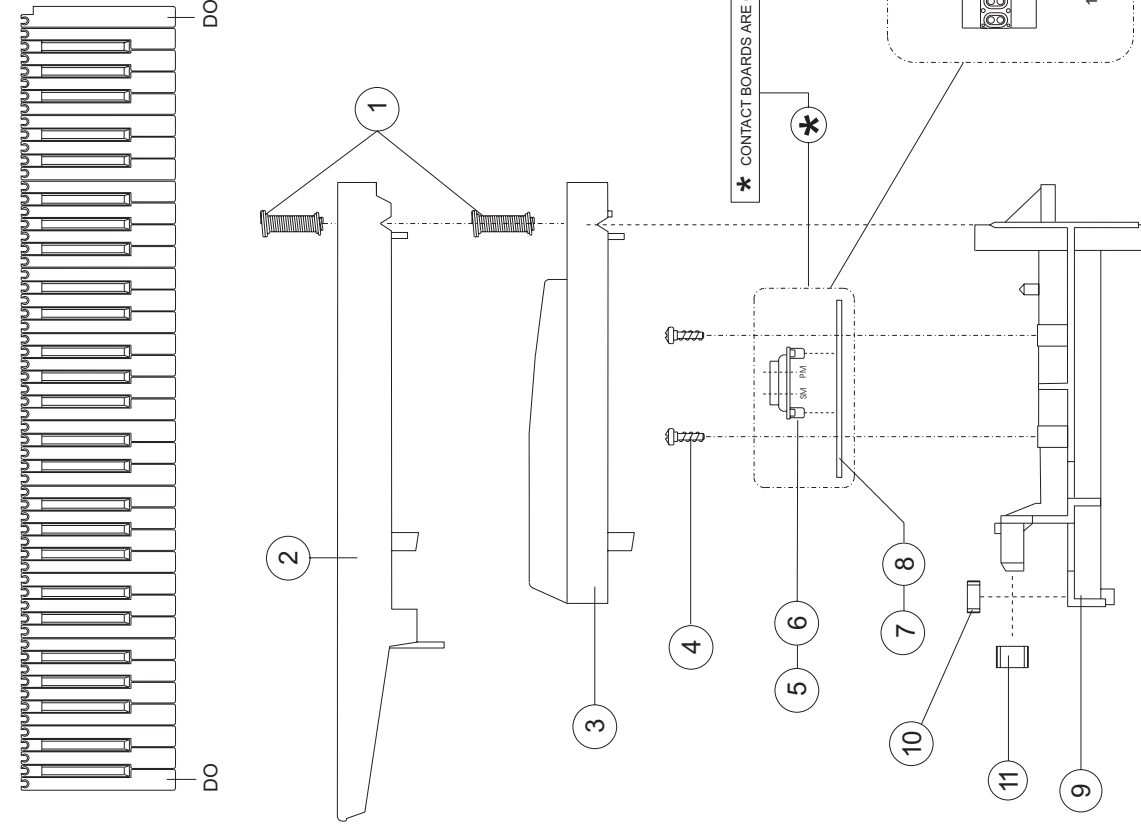


- 1** K3468159 16P FLAT CABLE ASSY (72) -2C
 - 2** K3468209 16P FLAT CABLE ASSY (82) -2C
 - K3468158 16P FLAT CABLE ASSY (62) -2C
 - 3** 7700612000 14P CABLE ASSY (30) -C1A+1H
 - 4** K3468208 4P CABLE (30/74) (W-4PC)
- for EM-10
for EM-20

KEYBOARD PARTS LIST

No.	PARTS NAME	CODE RJA	Num.
1	DOUBLE HEADED SPRING	22178226	61
	NATURAL KEY C5 DO	J2579123	5
	NATURAL KEY D6 RE	J2579124	5
	NATURAL KEY E7 MI	J2579125	5
	NATURAL KEY F1 FA	J2579126	5
	NATURAL KEY G2 SOL	J2579127	5
	NATURAL KEY A3 LA	J2579128	5
	NATURAL KEY B4 SI	J2579129	5
	NATURAL KEY C8 DO (F)	J2579130	1
3	SHARP KEY	22578318	25
4	SCREW 2.9x10 TCTCPR TROP	J2289125	34
5	12P RUBBER CONTACT	2218523802	4
6	13P RUBBER CONTACT	2218523902	1
7	LEFT CONTACT PCB ASSY+RUBBER C. CH.	7624505001	1
8	RIGHT CONTACT PCB ASSY+RUBBER C. CH.	7624504001	1
9	KEYBOARD SUPPORT 61 KEYS	22818746	1
10	ADHESIVE RUBBER 8 x 2.5 x 848	22358151	1
11	RUBBER END STROKE	22158789	61

61-KEY KEYBOARD TP/7BA 2° code 7626921001



CRYSTAL, RESONATOR

00894023	QUARTZ 20000 MHZ	MA-406		X1 on CPU
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CONNECTOR

13419677RI	16P FEM. CONNECTOR AMP 1.27			CN3, 4 on CB / CN3 on RCB / CN4 on LCB
13369689RI	20P FEM. CONNECTOR AMP 1.27			CN4 on CPU
# J3429122	14P FEM. CONNECTOR AMP 1.27			CN3, 5 on CPU
# J3429123	8P FEM. CONNECTOR IL-404-08S-LW	only for EM-20		CN5 on CB
13369688RI	4P MALE CONN. P 2.5 M			CN3 on MB

WIRING, CABLE

# K3468208	4P CABLE	(30/74)	(W-4PC)	CN3 on MB to SPEAKERS
# K3468209	16P FLAT CABLE ASSY	(82)	2C	CN3 on CB to CN3 on RCB only for EM-10
K3468158	16P FLAT CABLE ASSY	(62)	2C	CN3 on CB to CN3 on RCB only for EM-20
K3468159	16P FLAT CABLE ASSY	(72)	2C	CN4 on CB to CN4 on LCB
# J3469158	AWG18-CBL	(7)+FASTON		on LCD ASSY
# 7700612000	14P CABLE ASSY	(30)	-C1A+1H	CN5 on CPU to LCD ASSY

SCREW

J2289122	SCREW	2.2X6 TC TC	BRUN
J2289126	SELF TAP.SCREW	2.9X 8 TCTCPRBZ	
J2289125	SCREW	2.9X10 TC TC PR TROP	
J2289130	SCREW	2.9X13 TC TC PR TROP	
J2289108	SELF LOCK.SCREW	M3X10 TCTC	H.6
J2289193	SELF LOCK.SCREW	M3X6 TC TC	H.6
J2289115	SCREW	3.5X9.5 TC PR TFR	H.8
# K2158107	BUSHING	H.11.5 I/D	6 E/D 8

PACKING

# K2638217	RIGHT POLYST. END-SIDE	EM-20/EM-10	
# K2638218	LEFT POLYST. END-SIDE	EM-20/EM-10	
K2678105	CARTENE ENVELOPE HD	140X57	
K2678106	POLYETH.ENVELOPE	40X55	
# K2618209	OUTER PACKING	EM-20	only for EM-20
# K2618210	OUTER PACKING	EM-10	only for EM-10

MISCELLANEOUS

J2359101	SPACER 3M ART. SJ5012		
# K2258119	MYLAR SHIELD MM 115X115	EM-20	only for EM-20
# 01121790	RIBBON SENSOR		only for EM-20
1342982301	POWER SUPPLY SOCKET HOLDER N°2		
# K2198105	SENSOR SUPPORT	EM-20	only for EM-20

ACCESSORIES

# K6018344	OWNER'S MANUAL (E/D/F)*	EM-20	only for EM-20
# K6018345	MIDI IMPLEMENT. MANUAL	EM-10/20/30/50	
# K6018354	OWNER'S MANUAL (IT/SP/OL)*	EM-20	only for EM-20
# K6018355	OWNER'S MANUAL (E/D/F)*	EM-10	only for EM-10
# K6018356	OWNER'S MANUAL (IT/SP/OL)*	EM-10	only for EM-10
△ K2448106	POWER ADAPTOR ACO 230V 12V 1A	(230V)	only for EM-20)
△ K244810101	P. ADAPTOR ACN 230V 12V 500MA	(230V)	only for EM-10
△ K2448107	POWER ADAPTOR ACO 230VE 12V 1A	(230VE)	
△ K2448108	POWER ADAPTOR ACO 240VA 12V 1A	(240VA)	
△ K2448109	POWER ADAPTOR ACO 120V 12V 1A	(117V)	

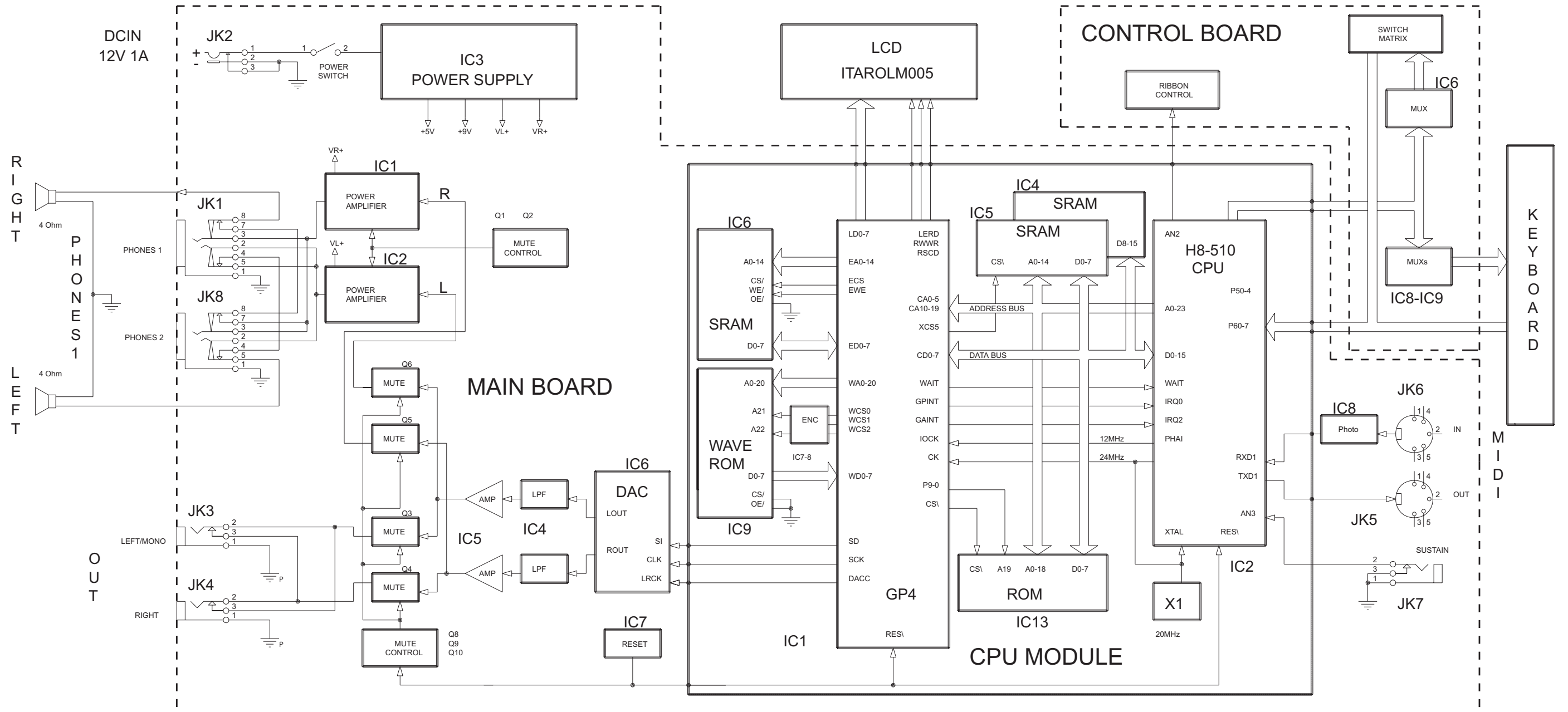
(E/D/F)* = English/ German/ French

(IT/SP/OL)* = Italian/ Spanish/ Dutch

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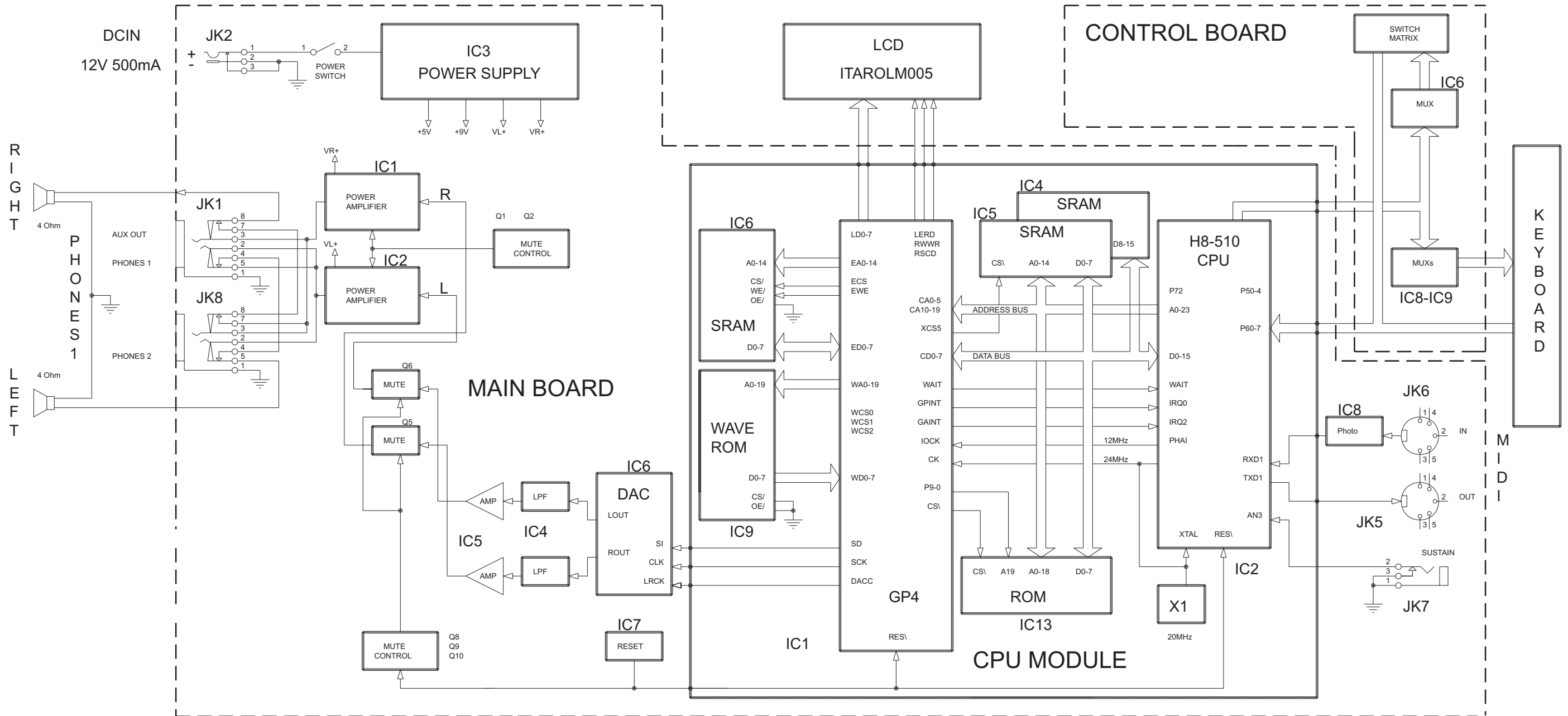
BLOCK DIAGRAM EM-20



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BLOCK DIAGRAM EM-10



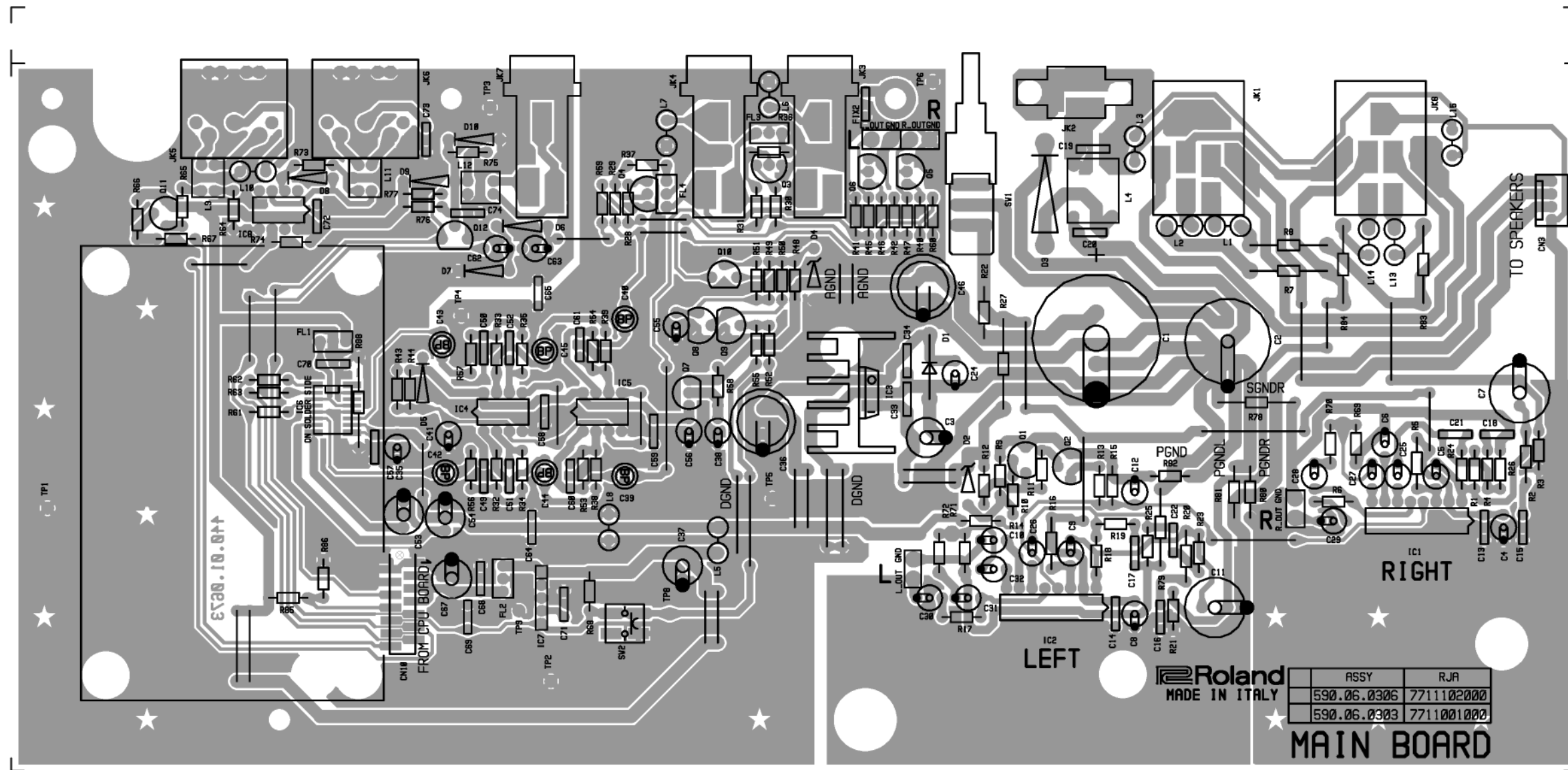
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MAIN PCB ASSY

ASSY 7711001000 for EM-20

ASSY 7711102000 for EM-10

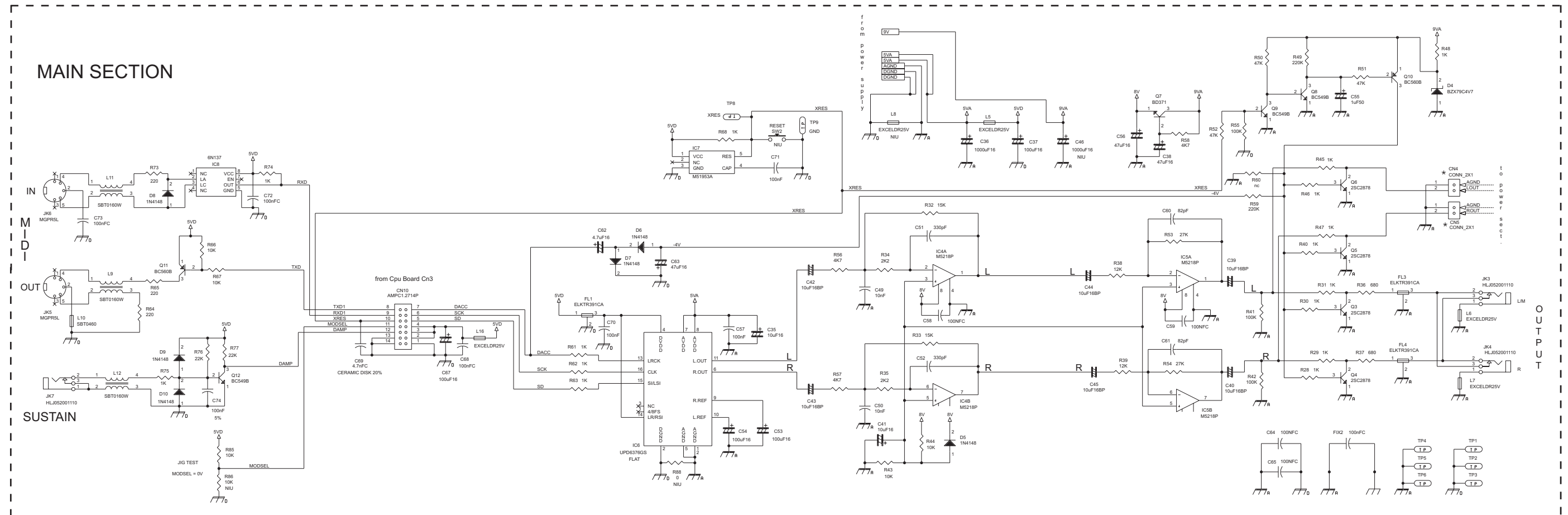
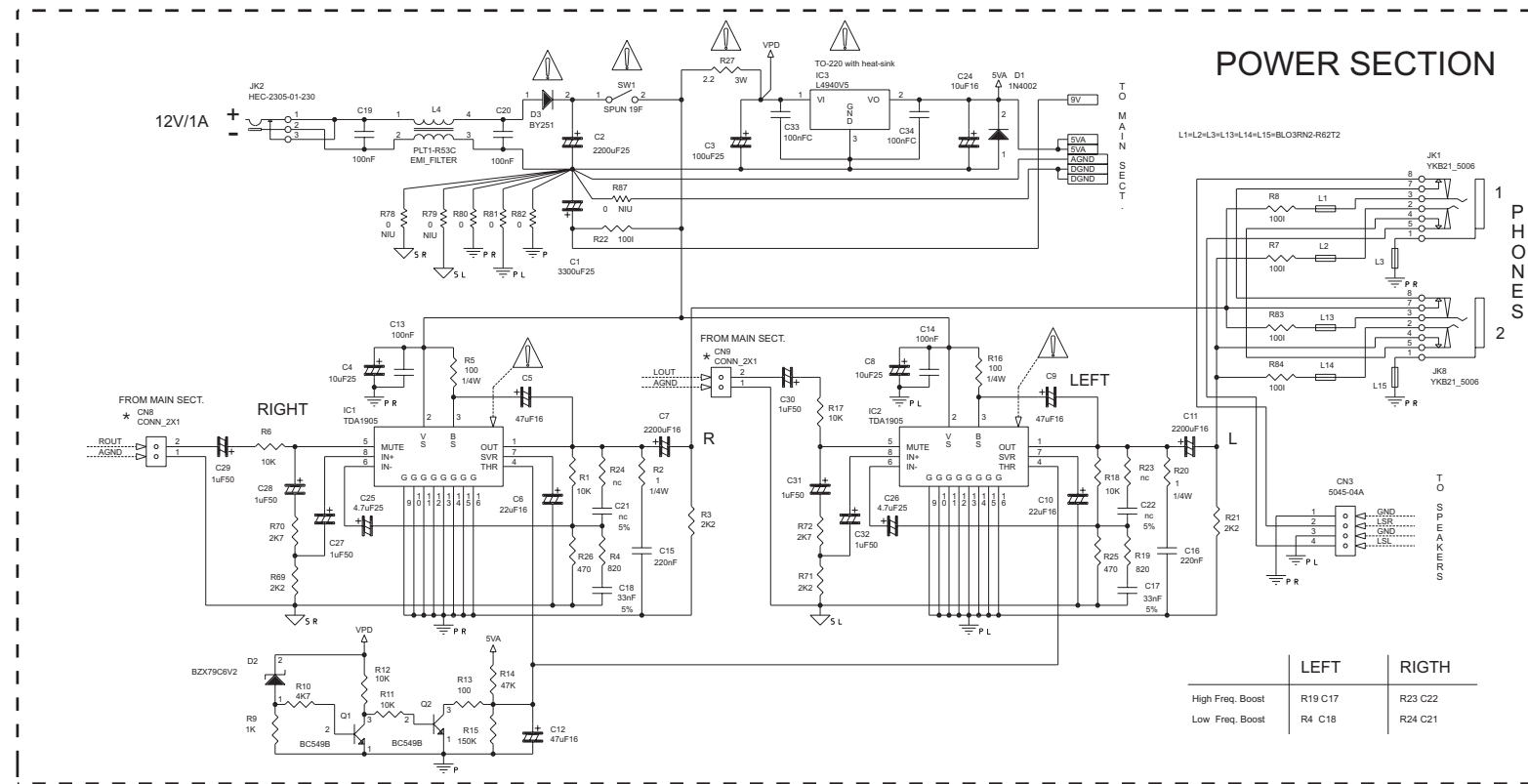


View from component side

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

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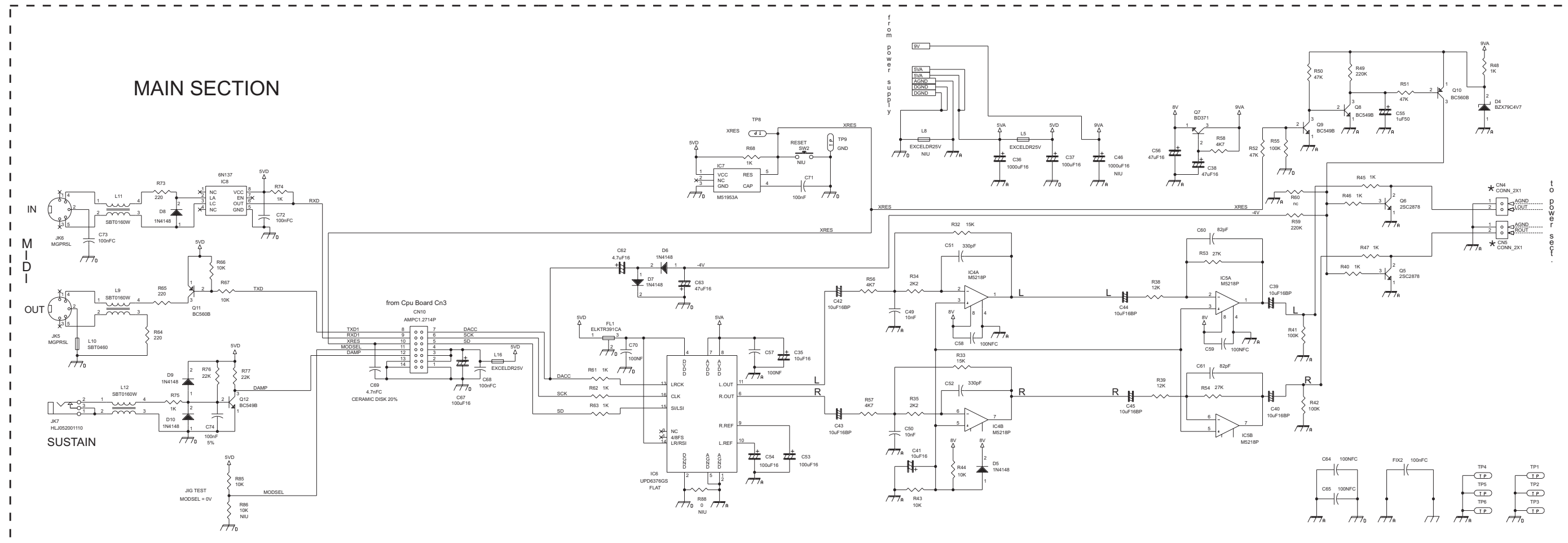
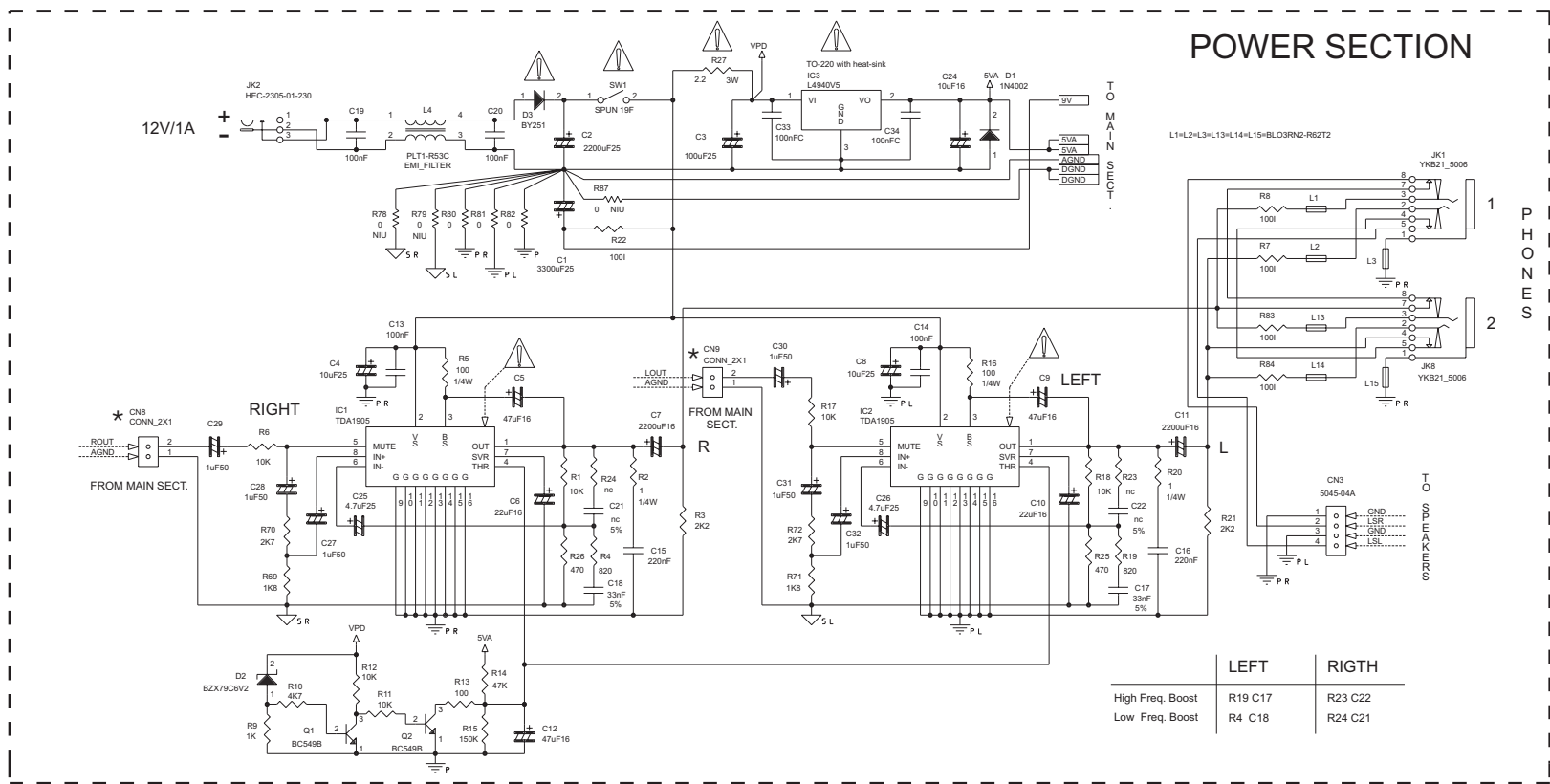
CIRCUIT DIAGRAM (MAIN PCB ASSY EM-20)



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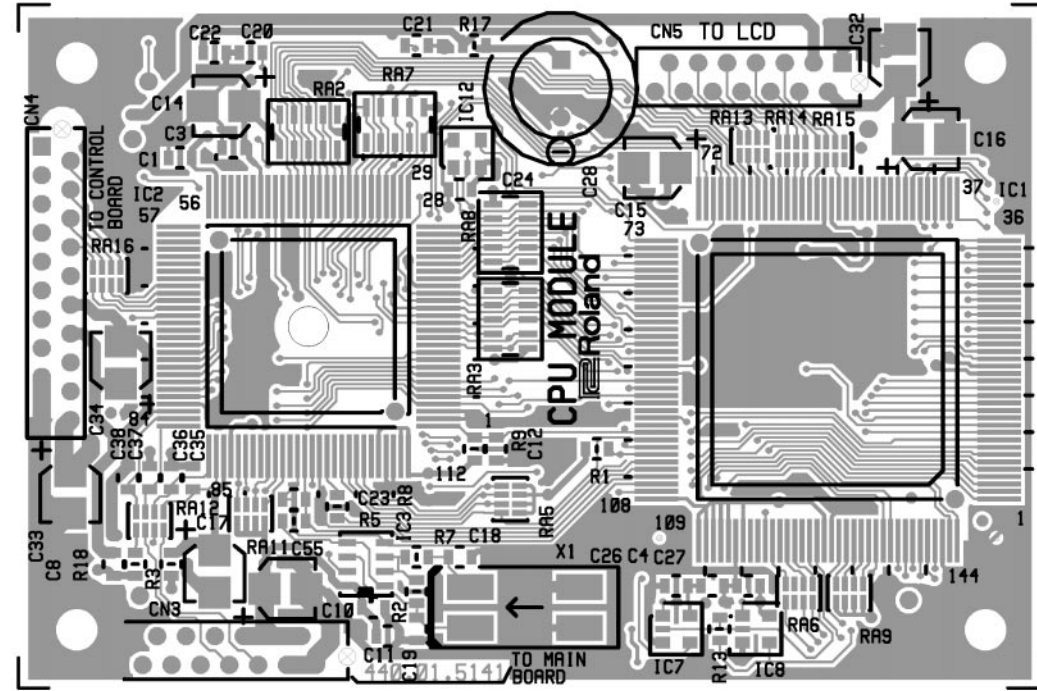
CIRCUIT DIAGRAM (MAIN PCB ASSY EM-10)



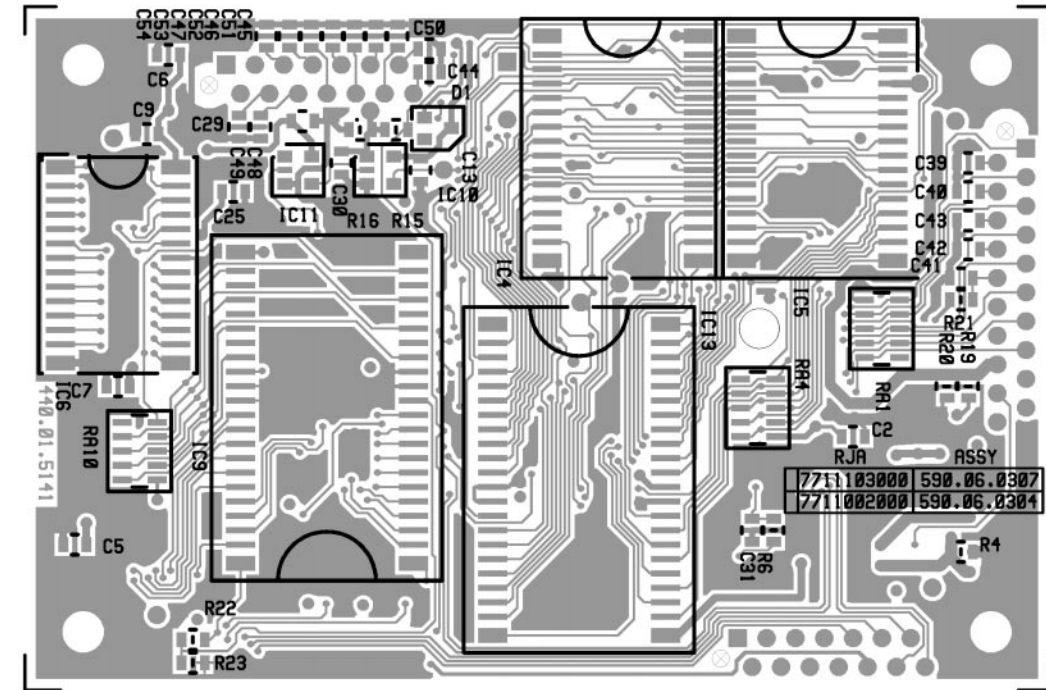
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E CPU PCB ASSY ASSY 7711002000 for EM-20
 ASSY 7711103000 for EM-10



View from component side

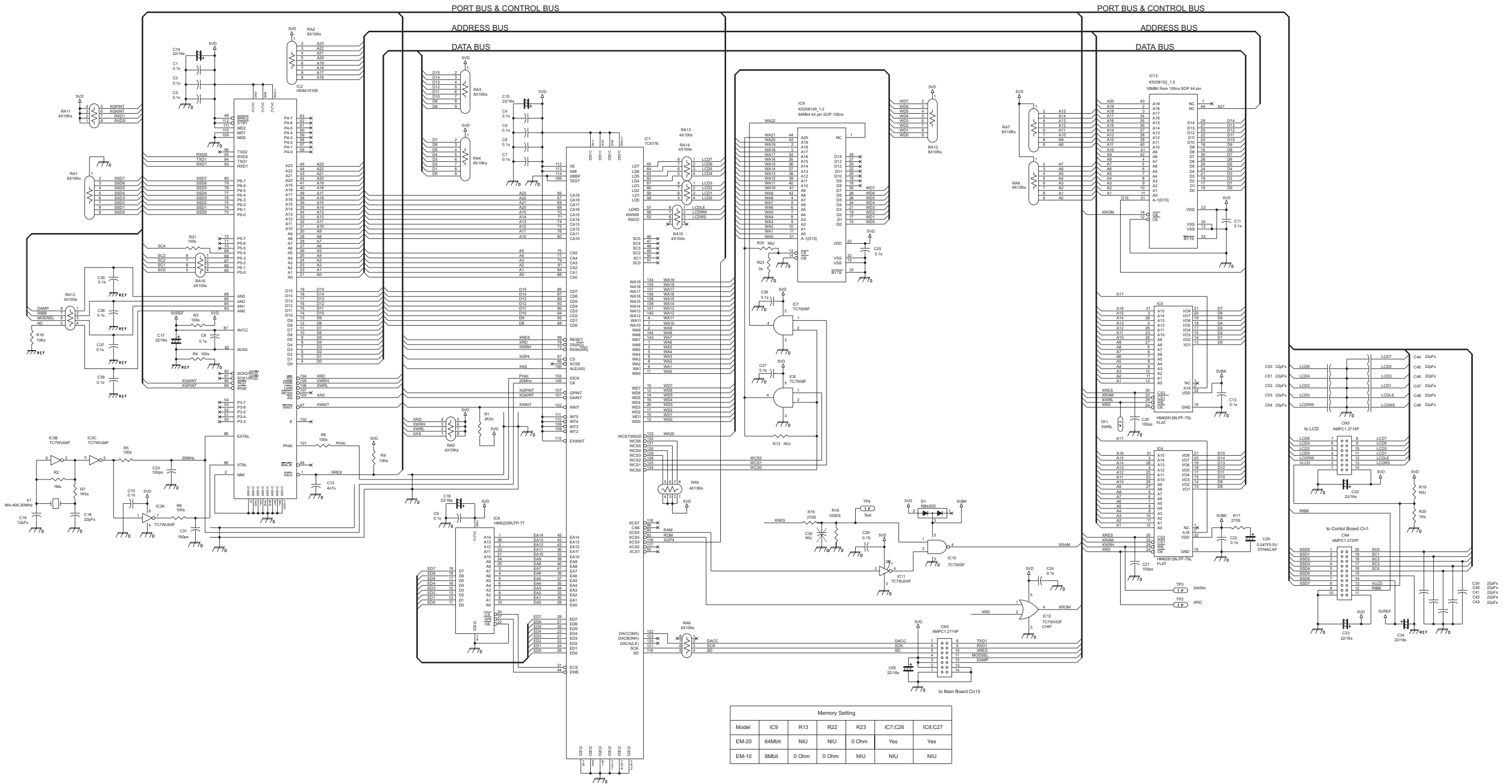


View from solder side

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

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CIRCUIT DIAGRAM (CPU PCB ASSY EM-20)

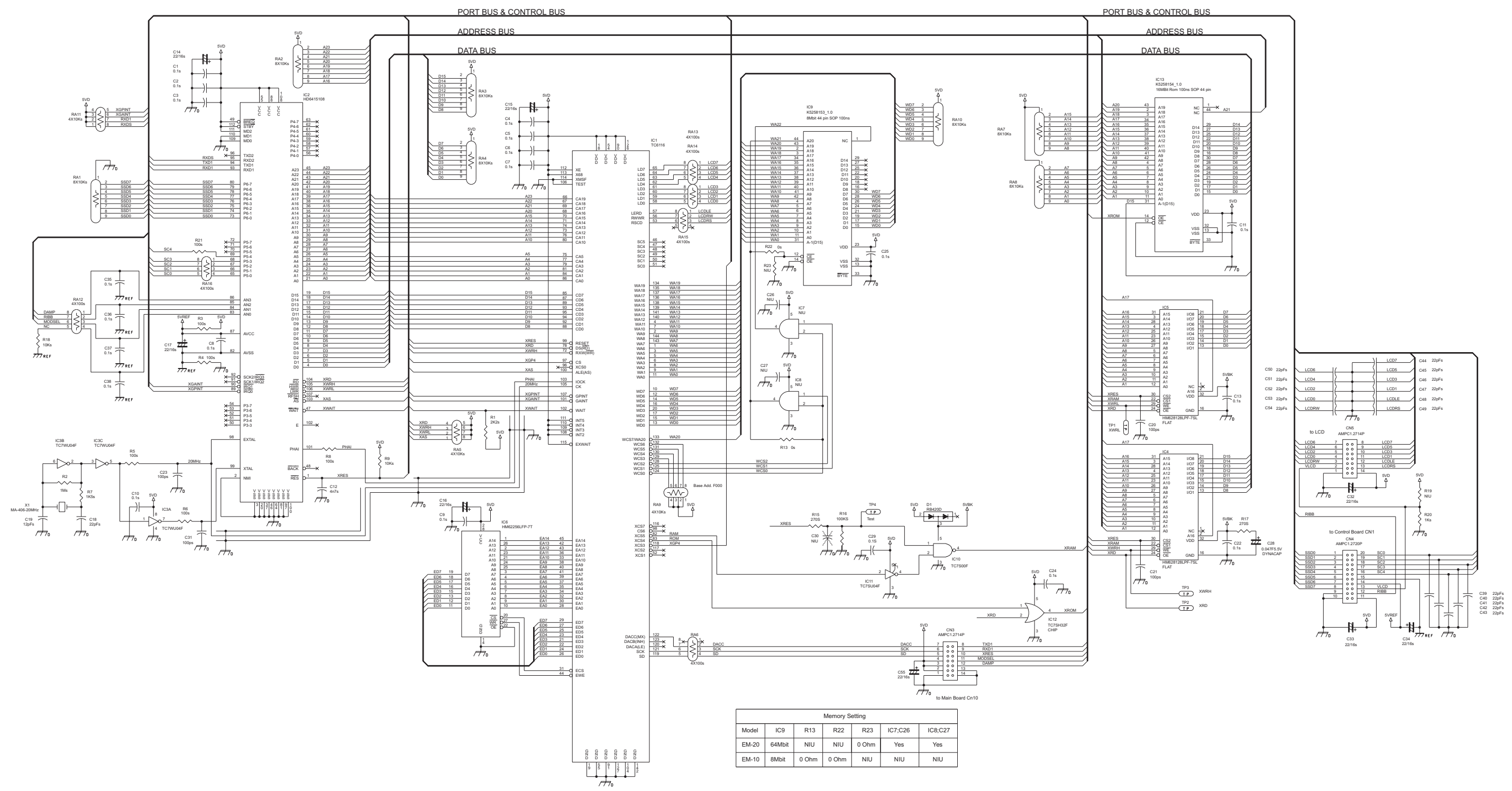


Memory Setting						
Model	IC9	R13	R22	R23	IC7,C26	IC8,C27
EM-20	64Mbit	NIU	NIU	0 Ohm	Yes	Yes
EM-10	8Mbit	0 Ohm	0 Ohm	NIU	NIU	NIU

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CIRCUIT DIAGRAM (CPU PCB ASSY EM-10)

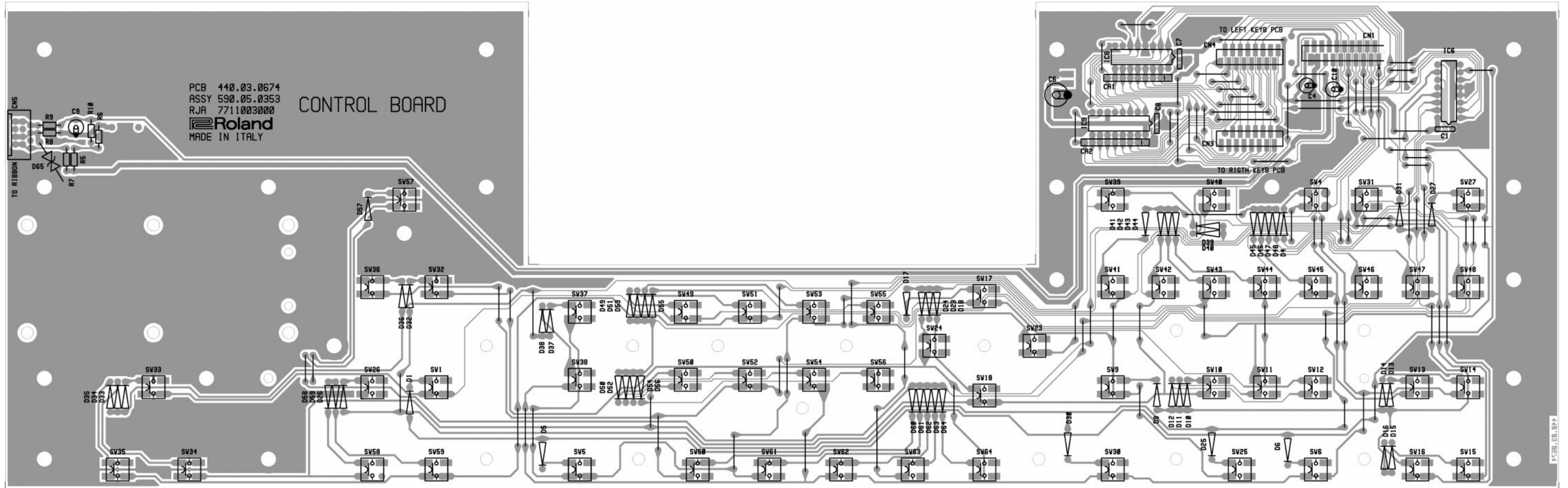


	Model	IC9	R13	R22	R23	IC7,C26	IC8,C27
EM-20	64Mbit	NIU	NIU	0 Ohm	Yes	Yes	Yes
EM-10	8Mbit	0 Ohm	0 Ohm	NIU	NIU	NIU	NIU

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A CONTROL PCB ASSY ASSY 7711003000 for EM-20

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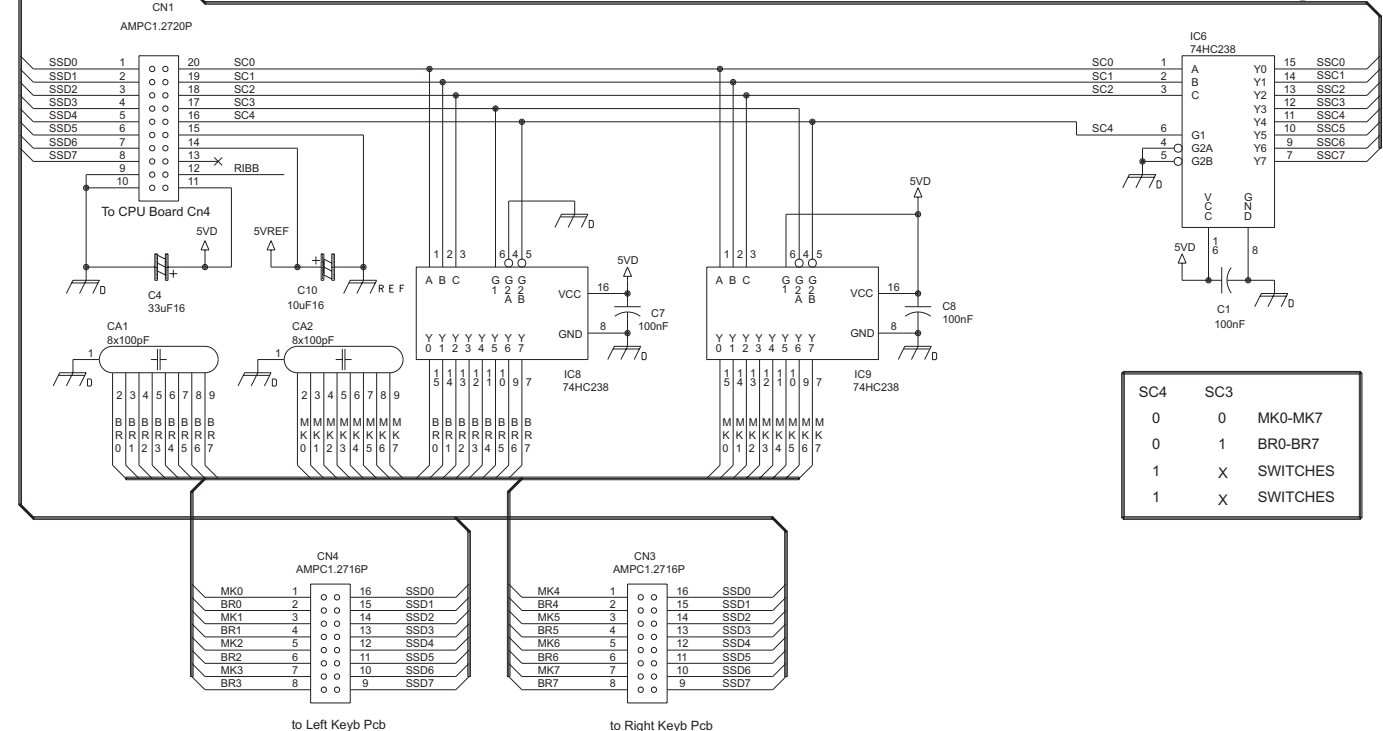
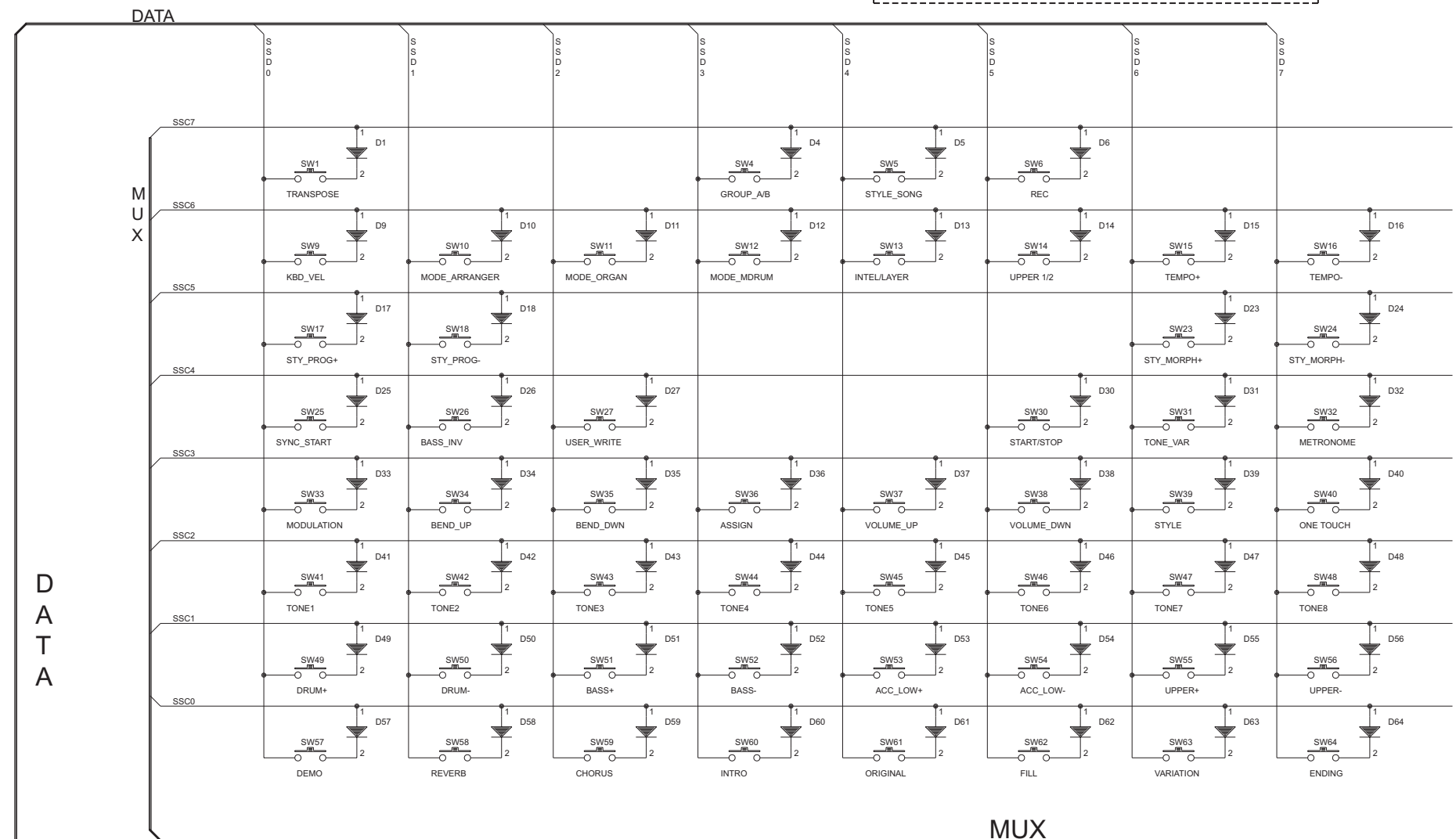
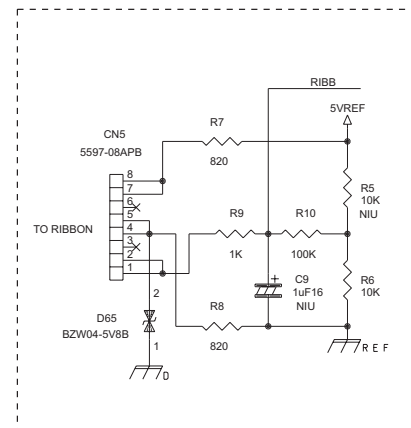
View from component side

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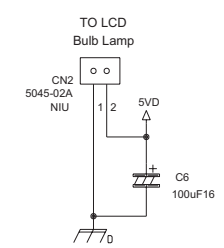
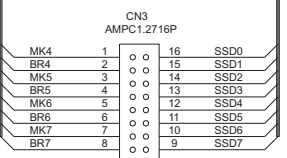
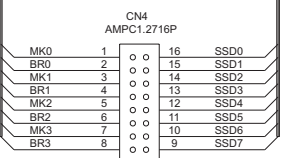
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CIRCUIT DIAGRAM (CONTROL PCB ASSY EM-20)

ALL DIODES D1..D64 IN THIS SHEET ARE 1N4148



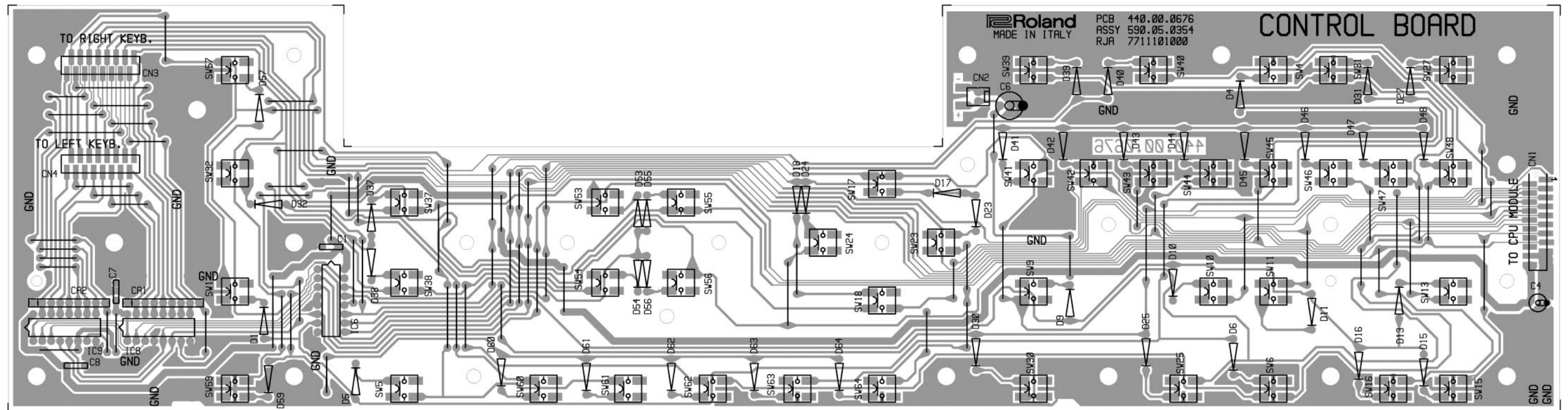
SC4	SC3	
0	0	MK0-MK7
0	1	BR0-BR7
1	X	SWITCHES
1	X	SWITCHES



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A CONTROL PCB ASSY ASSY 7711101000 for EM-10

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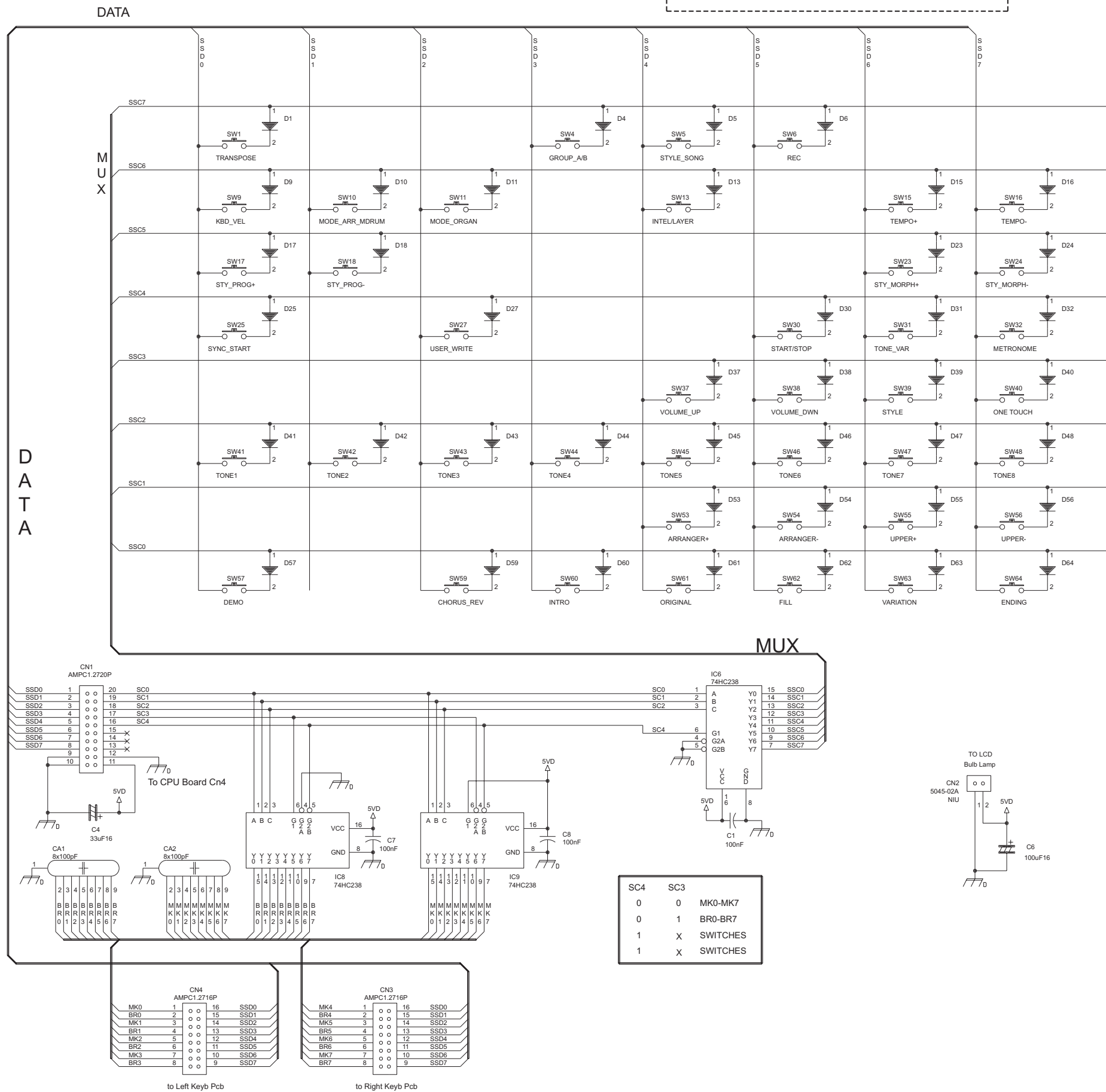
View from component side

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

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CIRCUIT DIAGRAM (CONTROL PCB ASSY EM-10)

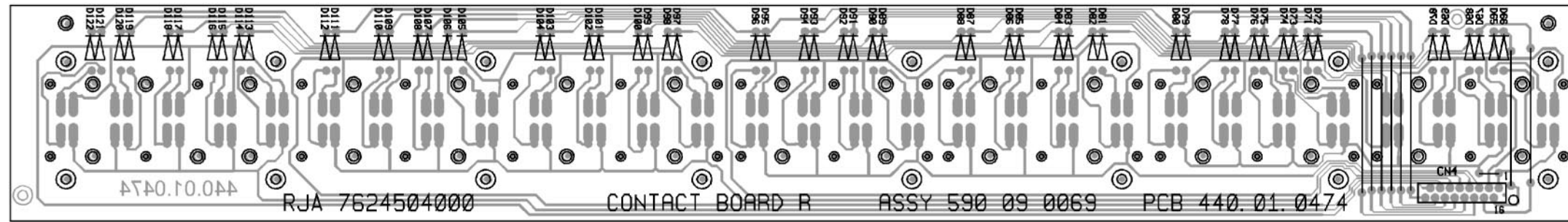
ALL DIODES D1..D64 IN THIS SHEET ARE 1N4148



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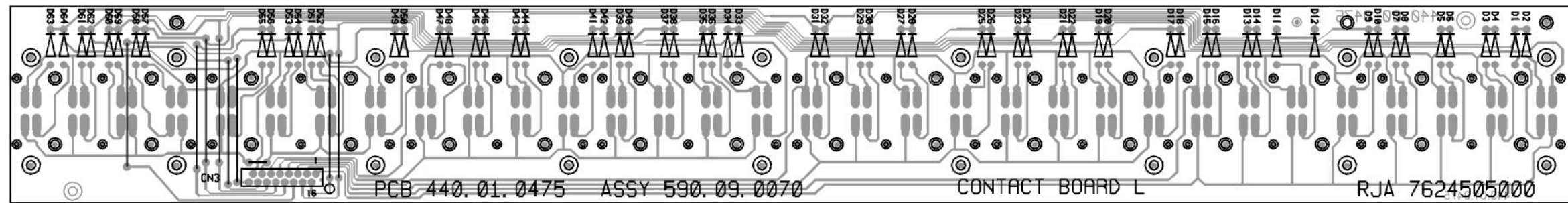
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RIGHT CONTACT PCB ASSY w/RUBBER ASSY 7624504001



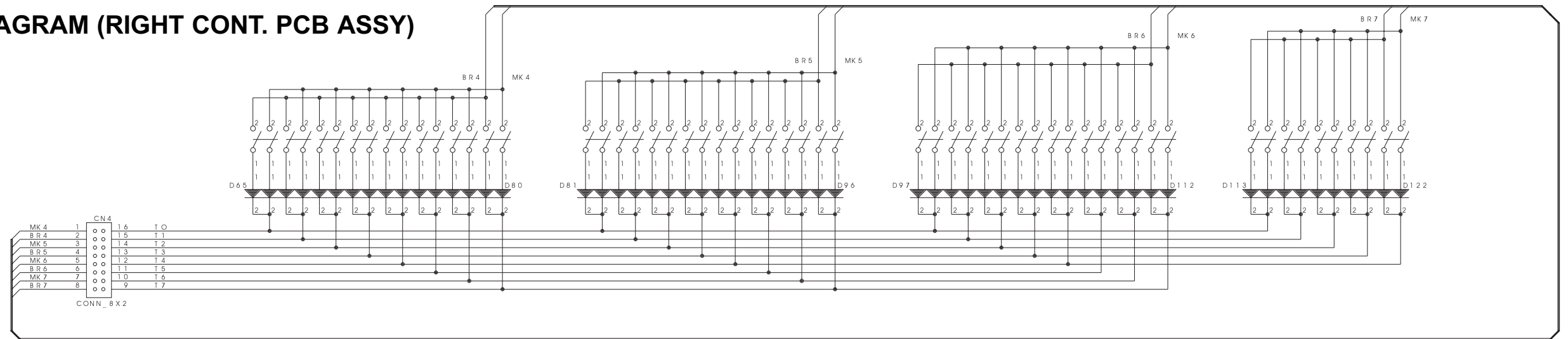
View from component side

LEFT CONTACT PCB ASSY w/RUBBER ASSY 7624505001

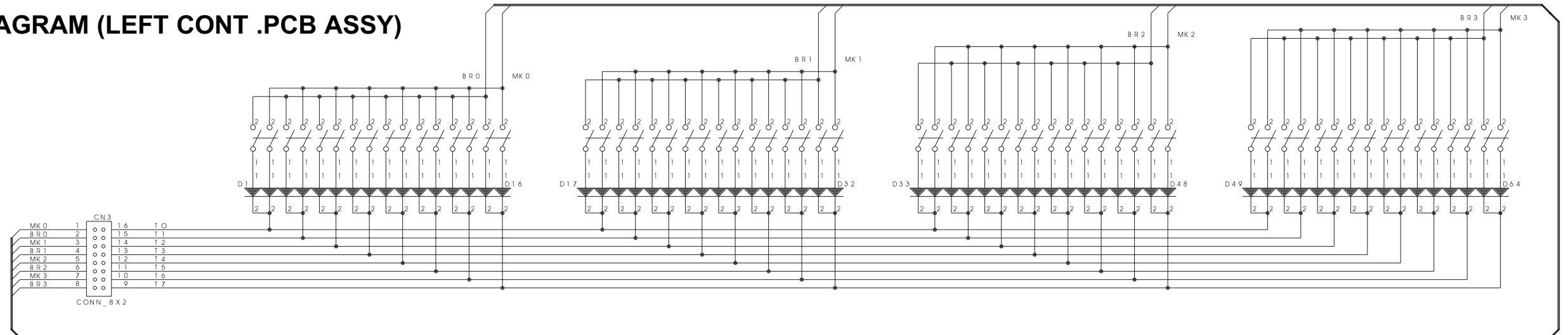


View from component side

CIRCUIT DIAGRAM (RIGHT CONT. PCB ASSY)



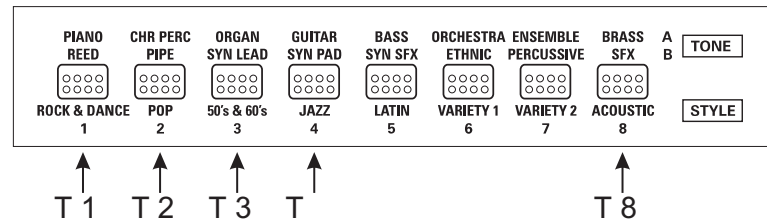
CIRCUIT DIAGRAM (LEFT CONT. PCB ASSY)



TEST MODE EM-20, EM-10

Button description

- Tn1 : Tone 1
- Tn2 : Tone 2
- Tn3 : Tone 3
- Tn4 : Tone 4
- Tn8 : Exit



Displaying messages

When a check implies messages to be visualized, they will be shown on the display in the following manner:

Display: EM-20 (or EM-10) XXX XXXXXXXX

Test structure

The general test menu has a hierarchical structure. You can get back to each previous menu page up to the "Main Menu" page. The **Tone 8** button ("Tn8 = Exit") allows you to interrupt any test except for:

- Ro Test Rom
- Ra Test Ram
- Wr Test Wave Rom
- Tc Touch Control Test (Only for EM-20)

How to enter the Test Mode

Turn the instrument on while keeping the button **tn1** pressed.

The Display shows:

Display : Test

After a few seconds, it shows:

Display : Ver X.XX

After a few seconds, it shows:

Display : P K A M

By pressing the following buttons, you'll start the corresponding following checks:

- ✧ **tn1** * **P** Control panel check
- ✧ **tn2** * **K** Keyboard Check
- ✧ **tn3** * **A** Audio check
- ✧ **tn4** * **M** Memory check

✧ **tn1** * **P** Control panel check

By pressing the **tn1** button, the display shows the following test list:

Display : P1 P2

- P1 = tn1 Panel 1 Control Panel check (1st part)
- P2 = tn2 Panel 2 Control Panel check (2nd part)

● Control Panel check (1st part) [tn1]:

By pressing the Tn1 button, the display shows the following possible check:

Display : Sus Midi

- Sus = tn1 Sustain Footswitch test
- Midi = tn2 Midi Midi Test

● Sus [tn1]

By pressing the **tn1** button, the display shows:

Display : Sus OFF

Action: after inserting the connection pin into its socket, press and release the Sustain footswitch: the message "ON/OFF" will be shown on the display regardless of the whether the footswitch is being pressed or released.

To exit, press the **tn8** Exit button. To get back to the Main Menu press **tn8** Exit again.

● Midi [tn2]

By pressing the **tn2** button, you'll start the Midi test:

The display shows:

Display : OUT < = > IN

Action: If the message "Out < = > In" is shown, the transmission and/or receipt of data has failed. After connecting the MIDI cable (you have to shortcircuit the IN/OUT sockets), the display will show either OK or Er, if there is some error.

To exit, press the **tn8** Exit button. To get back to the Main Menu press **tn8** Exit again.

● Control Panel check (2nd part) [tn2]:

By pressing the **tn2** button, you'll enter the 2nd check part:

The display shows:

Display : Sw Tc Lc

By pressing the following buttons, you'll start the corresponding following tests:

- Sw = tn1 Switch Test
- Tc = tn2 Touch Controller Test (**Attention: ONLY FOR EM-20**)
- Lc = tn3 LCD Test

● Sw [tn1]

By pressing the **tn1** button, the display shows:

Display : XX ZZ

Display: **XX** = (number of the button pressed)
 ZZ = (name of the button pressed)

Action: press the switches on the control panel. The display shows the number of the switch pressed its name and its status. When the switch is ON you'll hear a sound, no sound can be heard when it's off. You may not exit the switch test, unless all switches have been pressed. Otherwise the switch test stops if some fault has been detected; in this event the last switch pressed is shown on the display. To exit press the "Tone 8" and "Start/Stop" buttons. If some switches have not been pressed, their corresponding names will appear successively on the display.

To exit, press the **tn8** Exit button. To get back to the Main Menu press **tn8** Exit again.

● **Tc [tn2] (Only for EM-20)**

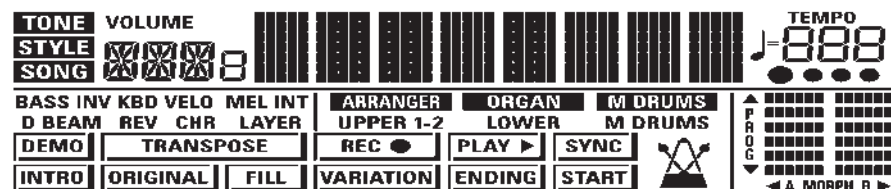
Press the **tn2** button and the Display will show:

Display :	Tch	0/127
-----------	-----	-------

Action: make sure that the value of the Touch controller ranges from 0 to 127 and changes accordingly when moving your finger towards right (0/127) and towards left (127/0) When standing still, the value shown must be 0.
To exit, press the tn8 Exit button.

● **Lc [tn3]**

Press the **tn3** button and the Display will show:



Action: all the symbols and characters existing in the LCD display of EM-20/EM-10 will be shown.
To exit, press the tn8 Exit button.

✧ **tn2 * K Keyboard check**

Press the **tn2** button and the display will show:

Display :	YYYY	XXXX
-----------	------	------

Key **yy** Velocity **zzz** **yy** = {0, C# }
 zzz = {Off,1,...,127}

Action: Press some keys of the keyboard, you'll hear a piano sound. The display will show the number of the pressed key, its name and velocity value.
To exit, press the tn8 Exit button.

✧ **tn3 * A Audio check**

Press the **tn2** button and the display will show:

Display :	Si	Ft	Ef
-----------	----	----	----

● **Si [tn1]:**

If you press the **tn1** button, you'll enter the Audio test.

Display :	Sin	Wave
-----------	-----	------

Before carrying out the audio check, make sure that the AC/DC adaptor is the ACO 12V 1A (230V) type for the mod. EM-20, and that it is the ACN 500mA 12V (230V) type for the mod. EM-10.

Action: A sine wave sound having a 440 Hz frequency will be heard from the right speaker while a sine wave sound having a 1760 Hz frequency will be heard from the left speaker.
Check the signal width and make sure that it is 5 Vpp on the right channel and that it is 5.2 Vpp on the left channel for the mod. EM-10; whereas it should be 6 Vpp on the right channel and 6.2 Vpp on the left channel for the mod. EM-20. Consider a 5% tolerance value for both models as the above values are determined by a resistor divider.
To exit, press the tn8 Exit button.

NOTE The Audio test can be carried out also when turning the instrument on.
This procedure is described further on. page 23 [* Audio Test tn2 on "power on"].

● **Ft [tn2]:**

Press the **tn2** button and the display will show:

Display :	W1	W2	W3
-----------	----	----	----

● **W1 [tn1]:**

Then press **tn1** "W1", and the display will show:

Display :	100Hz
-----------	-------

Action: A sine wave sound having a 100 Hz frequency will be heard from both, the right and the left speakers.
To exit, press the tn8 Exit button.

● **W2 [tn2]:**

Then press **tn2** "W2", and the display will show:

Display :	1000Hz
-----------	--------

Action: A sine wave sound having a 1000Hz frequency will be heard from both, the right and the left speakers.
To exit, press the tn8 Exit button.

● **W3 [tn3]:**

Then press **tn3** "W3", and the display will show:

Display :	10000Hz
-----------	---------

Action: A sine wave sound having a 10000Hz frequency will be heard from both, the right and the left speakers.
To exit, press the tn8 Exit button. To get back to the Main Menu press tn8 Exit again

● **Ef [tn3]:**

By pressing the **tn3** button, the display will show:

Display :	Rev	Cho
-----------	-----	-----

Rev = tn1 REVERB Reverb Test
Cho = tn2 CHORUS Chorus Test

● **Rev [tn1]:**

By pressing the **tn1** button, the display will show:

Display :	Reverber
-----------	----------

Action: A drum sound with a marked reverb effect will be heard from both speakers. The quality level of the reverb effect has to be assessed by ear.

NOTE: Due to a multitasking problem, the first drum sound may result to have a less marked reverb effect than the following ones.
To exit, press the tn8 Exit button. To get back to the Main Menu press tn8 Exit again

● **Cho [tn2]:**

By pressing the **tn2** button, the display will show:

Display :	Chorus
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Action: A square wave sound enriched with the chorus effect will be heard from both speakers. The quality level of the chorus effect has to be assessed by ear.
To exit, press the tn8 Exit button. To get back to the Main Menu press tn8 Exit again

✧ **tn4 * M Memory check**

By pressing the **tn4** button, the display will show:

Display :	Ro	Ra	Wr
-----------	----	----	----

Memory checklist:

Ro = tn1 Rom Test
 Ra = tn2 Ram Test
 Wr = tn3 Wrom Test

● **Ro [tn1]:**

By pressing the tn1 button, the display will show:

Display :	Wait	XX
-----------	------	----

Action : By pressing the tn1 button, the ROM test result xx = {Ok,Er} will appear on the display
 To exit, press the tn8 Exit button.

● **Ra [tn2]:**

By pressing the tn2 button, the display will show:

Display :	Wait	XX
-----------	------	----

Action : By pressing the tn2 button, the RAM test result xx = {Ok,Er} will appear on the display
 To exit, press the tn8 Exit button.

● **Wr [tn3]:**

By pressing the tn3 button, the display will show:

Display :	Wait	XX
-----------	------	----

Action : By pressing the tn3 button, the Wave Rom test result xx = {Ok,Er} will appear on the display
 To exit, press the tn8 Exit button. To get back to the Main Menu press tn8 Exit again

*** Audio Test tn2 on "power on"**

Before checking the audio output, make sure that the AC/DC adaptor is the ACO 12V 1A (230V) type for EM20 and the ACN 12V 500mA (230V) type for EM-10.

The display will show:

Display :	Audio Test
-----------	------------

Action : A sine wave sound having a 440 Hz frequency will be heard from the right speaker while a sine wave sound having a 1760 Hz frequency will be heard from the left speaker.
 Check that the amplitude of the signal relative to the right channel is 5 Vpp and that of the signal relative to the left channel is 5.2 Vpp for the mod. EM-10; whereas for the mod. EM-20 it has to be 6 Vpp for the right channel and 6.2 Vpp for the left channel. Consider a 5% tolerance value for both models as the above values are determined by a resistor divider.

To exit, turn the instrument off.

Initialization of EM-20/10 ("Factory Setup") .

Warning!!!

When the "Factory Setup" is carried out, all the setting saved in the instrument by the user will be lost and replaced by the factory settings.

PROCEDURE :

Turn the instrument on while keeping the "Write" button pressed.

In the middle of the display, the following message will be displayed:

Display :	FACTORY !
-----------	-----------

Identifying the software version.

To identify the current software version of the instrument, turn it on while keeping the Tn5 button pressed.

The display will show:

Display :	VER .XXX ZZZ YYY VV UUUUUU HHHH
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X = Software Version
 Z = Day (example: Thu)
 Y = Month (example: May)
 V = Day (example: 25)
 U = Hour /Min/Sec
 H = Year (example: 1999)

Action : The display will show in sequence: the software version and the date.
 To exit, turn the instrument off.