

CONTROL SYNTHESIZER

S80

SERVICE MANUAL



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IMPORTANT NOTICE

This manual has been provided for the use of authorized Yamaha Retailers and their service personnel. It has been assumed that basic service procedures inherent to the industry, and more specifically Yamaha Products, are already known and understood by the users, and have therefore not been restated.

WARNING : Failure to follow appropriate service and safety procedures when servicing this product may result in personal injury, destruction of expensive components and failure of the product to perform as specified. For these reasons, we advise all Yamaha product owners that all service required should be performed by an authorized Yamaha Retailer or the appointed service representative.

IMPORTANT : This presentation or sale of this manual to any individual or firm does not constitute authorization certification, recognition of any applicable technical capabilities, or establish a principal-agent relationship of any form.

The data provided is believed to be accurate and applicable to the unit(s) indicated on the cover. The research engineering, and service departments of Yamaha are continually striving to improve Yamaha products. Modifications are, therefore, inevitable and changes in specification are subject to change without notice or obligation to retrofit. Should any discrepancy appear to exist, please contact the distributor's Service Division.

WARNING : Static discharges can destroy expensive components. Discharge any static electricity your body may have accumulated by grounding yourself to the ground bus in the unit (heavy gauge black wires connect to this bus.)

IMPORTANT : Turn the unit OFF during disassembly and parts replacement. Recheck all work before you apply power to the unit.

LITHIUM BATTERY HANDLING

This product uses a lithium battery for memory back-up.

WARNING : Lithium batteries are dangerous because they can be exploded by improper handling. Observe the following precautions when handling or replacing lithium batteries.

- Leave lithium battery replacement to qualified service personnel.
- Always replace with batteries of the same type.
- When installing on the PC board by soldering, solder using the connection terminals provided on the battery cells.
- Never solder directly to the cells. Perform the soldering as quickly as possible.
- Never reverse the battery polarities when installing.
- Do not short the batteries.
- Do not attempt to recharge these batteries.
- Do not disassemble the batteries.
- Never heat batteries or throw them into fire.

ADVARSEL!

Lithiumbatteri-Eksplosionsfare ved fejlagtig handling. Udskiftning ma kun ske med batteri af samme fabrikat og type. lever det brugte batteri tilbage til leverandren.

VARNING

Explosionsfara vid felaktigt batteribyte.
Anvand samma batterityp eller en ekvivalent typ som rekommenderas av apparatillverkaren.
Kassera anvant batteri enligt fabrikantens instruktion.

VAROITUS

Paristo voi rajahtaa, jos se on virheellisesti asennettu.
Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin.
Havita kaytetty paristo valmistajan ohjeiden mukaisesti.

The following information complies with Dutch official Gazette 1995. 45; ESSENTIALS OF ORDER ON THE COLLECTION OF BATTERIES.

- Please refer to the disassembly procedure for the removal of Back-up Battery.
- Leest u voor het verwijderen van de backup batterij deze beschrijving.

WARNING: CHEMICAL CONTENT NOTICE!


The solder used in the production of this product contains LEAD. In addition, other electrical/electronic and/or plastic (Where applicable) components may also contain traces of chemicals found by the California Health and Welfare Agency (and possibly other entities) to cause cancer and/or birth defects or other reproductive harm.

DO NOT PLACE SOLDER, ELECTRICAL/ELECTRONIC OR PLASTIC COMPONENTS IN YOUR MOUTH FOR ANY REASON WHATSOEVER EVER!

Avoid prolonged, unprotected contact between solder and your skin! When soldering, do not inhale solder fumes or expose eyes to solder/flux vapor!

If you come in contact with solder or components located inside the enclosure of this product, wash your hands before handling food.

WARNING

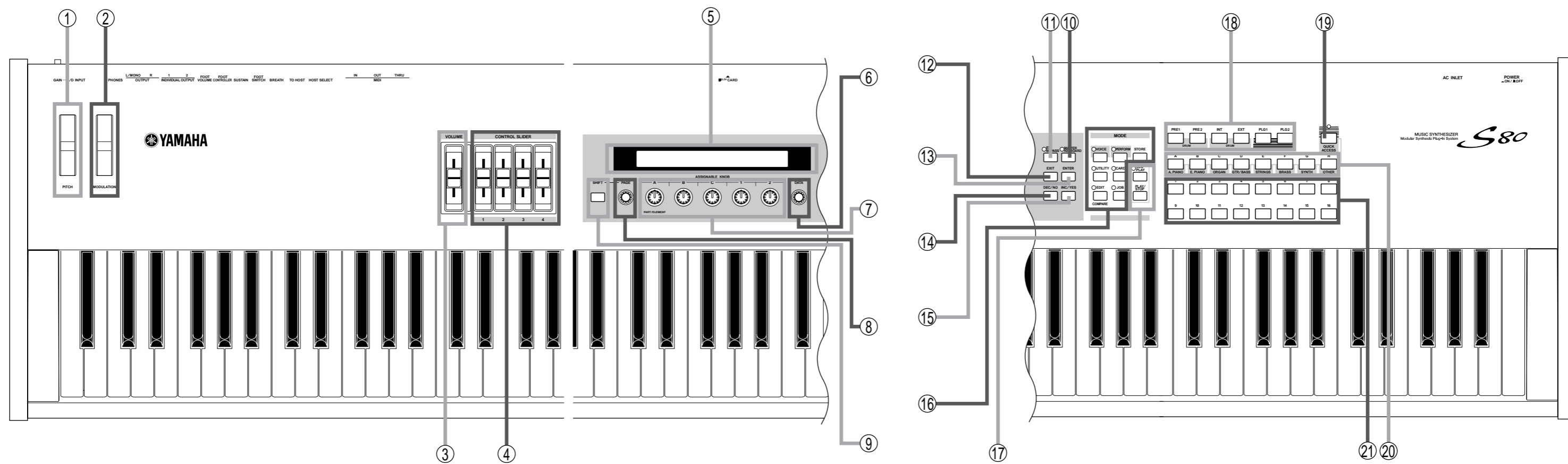
Components having special characteristics are marked  and must be replaced with parts having specification equal to those originally installed.

■ SPECIFICATIONS

KEYBOARD	Number of Keys	88
	Touch	Initial touch, After touch
TONE GENERATION SYSTEM	Tone Generators	AWM2, Modular Synthesis Plug-in System
	Polyphony	64
VOICE	Number of Voice	Normal voices (256 Presets, 128 Internals [Users], 128 Externals [Memory Cards]), Drum voices (8 presets, 2 Internals [Users], 2 Externals [Memory Cards]), Plug-in voices (64 x 2 Plug-in Boards [If installed])
	Wave ROM	24 MByte
PERFORMANCE	Multi-Timbres	19 (16 Voice Parts, A/D Input Part, Plug-in 1/2 Parts)
	Number of Performance	128 Internals, 64 Externals
	Master Keyboard Mode	4 Zones
EFFECT	Reverb	12
	Chorus	23
	Insertion	24 (Insertion 1), 92 (Insertion 2), 24 (Insertion for Plug-in Voices)
	Master EQ	4
SEQUENCE PLAY	Format	SMF Format 0 (Direct Play only), Sequence Chain (Load/Save)
	Number of Sequence Chains	100 Steps (100 Songs)
ARPEGGIATOR	Number of Arpeggios	128
Card	File Type	All Data, All Voice, Plug-in, Sequence Chain, SMF
	Functions	Save, Load, Rename, Delete, Make Directory, Format
CONTROLS	Volume Slider, 4 Control Sliders, Pitch, Modulation, Shift, Page, Knob A/B/C/1/2, Data, Effect Bypass, Master Keyboard, Exit, Enter, Dec/No, Inc/Yes, 7 Mode Keys, Sequence Play, Sequence PLAY/STOP, 6 Memory Keys, Quick Access, 8 Bank Keys, 16 Program/Part Keys, Power, Card Slot, Gain, Host Select	
CONNECTORS & TERMINALS	MIDI In, Out, Thru, To Host, Breath, Footswitch, Sustain, Foot Controller, Foot Volume, Individual Output 1, 2, Output L/Mono R, Phones, A/D Input, AC Inlet, 2 Connectors for Plug-in Boards	
DISPLAY	40 x 2 (Backlit)	
INCLUDED ACCESSORIES	Owner's Manual, Data List, CD-ROM, AC Power Cord	
OPTIONAL ACCESSORIES	PLG150 Plug-in Boards Series, PLG100 Plug-in Boards Series, FC4/5 Footswitch, FC7 Foot Controller, BC3 Breath Controller	
POWER CONSUMPTION	16W	
OUTPUT IMPEDANCE	Output: +18.1 ±2dbm (10k ohms), Phones: +17.2 ±2dbm (33 ohms)	
DIMENSIONS	1329(W) x 371(D) x 157(H) mm	
WEIGHT	24.3 kg	

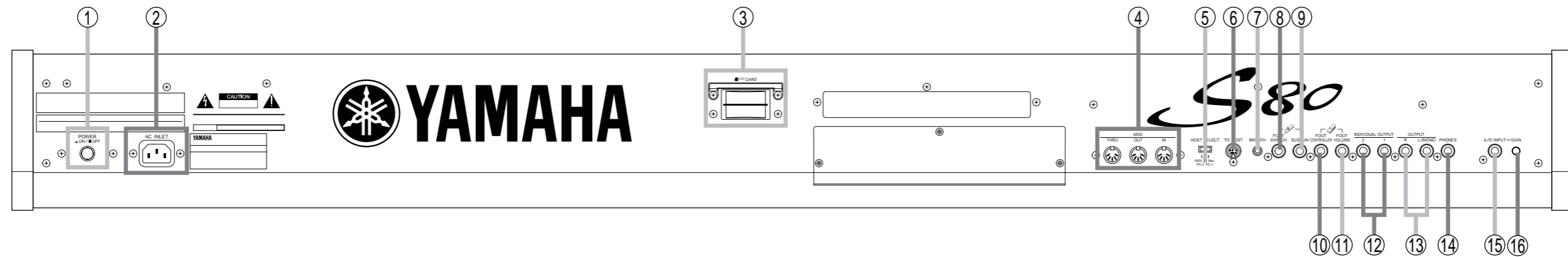
■ PANEL LAYOUT

• Front panel



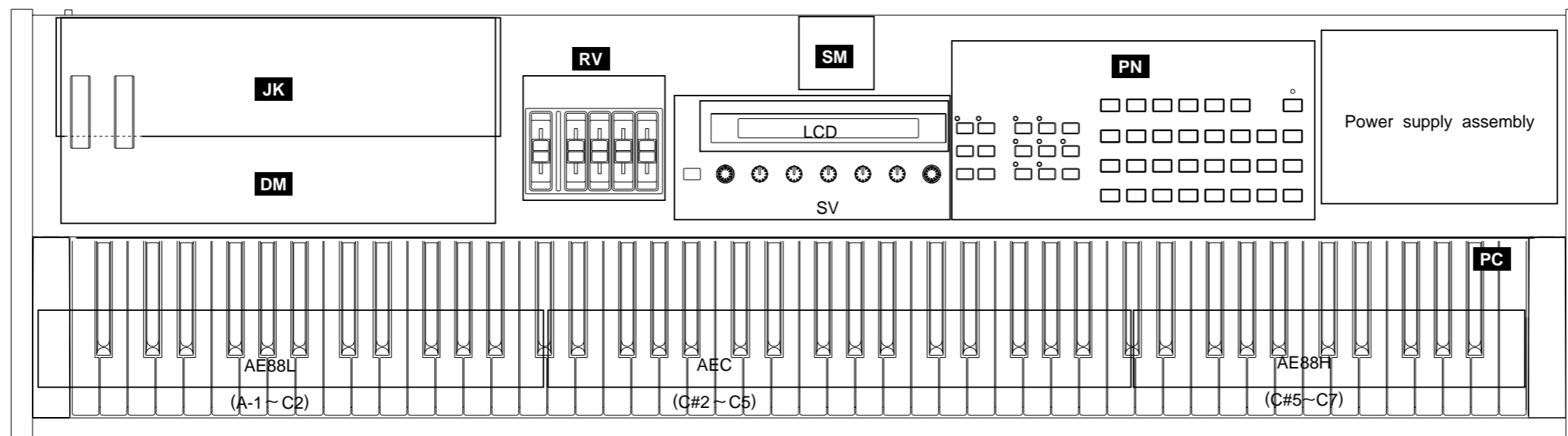
- | | |
|------------------------------------|---------------------------------|
| ① PITCH bend wheel | ⑪ [EF BYPASS] key |
| ② MODULATION wheel | ⑫ [EXIT] key |
| ③ [VOLUME] Slider | ⑬ [ENTER] key |
| ④ Control Sliders | ⑭ [DEC/NO] key |
| ⑤ LCD (Liquid Crystal Display) | ⑮ [INC/YES] key |
| ⑥ [DATA] knob | ⑯ MODE keys |
| ⑦ Knobs [A], [B], [C], [1] and [2] | ⑰ SEQ controls |
| ⑧ [PAGE] knob | ⑱ MEMORY keys |
| ⑨ [SHIFT] key | ⑲ [QUICK ACCESS] key |
| ⑩ [MASTER KEYBOARD] key | ⑳ BANK [A] to [H] keys |
| | ㉑ PROGRAM/PART [1] to [16] keys |

• Rear panel

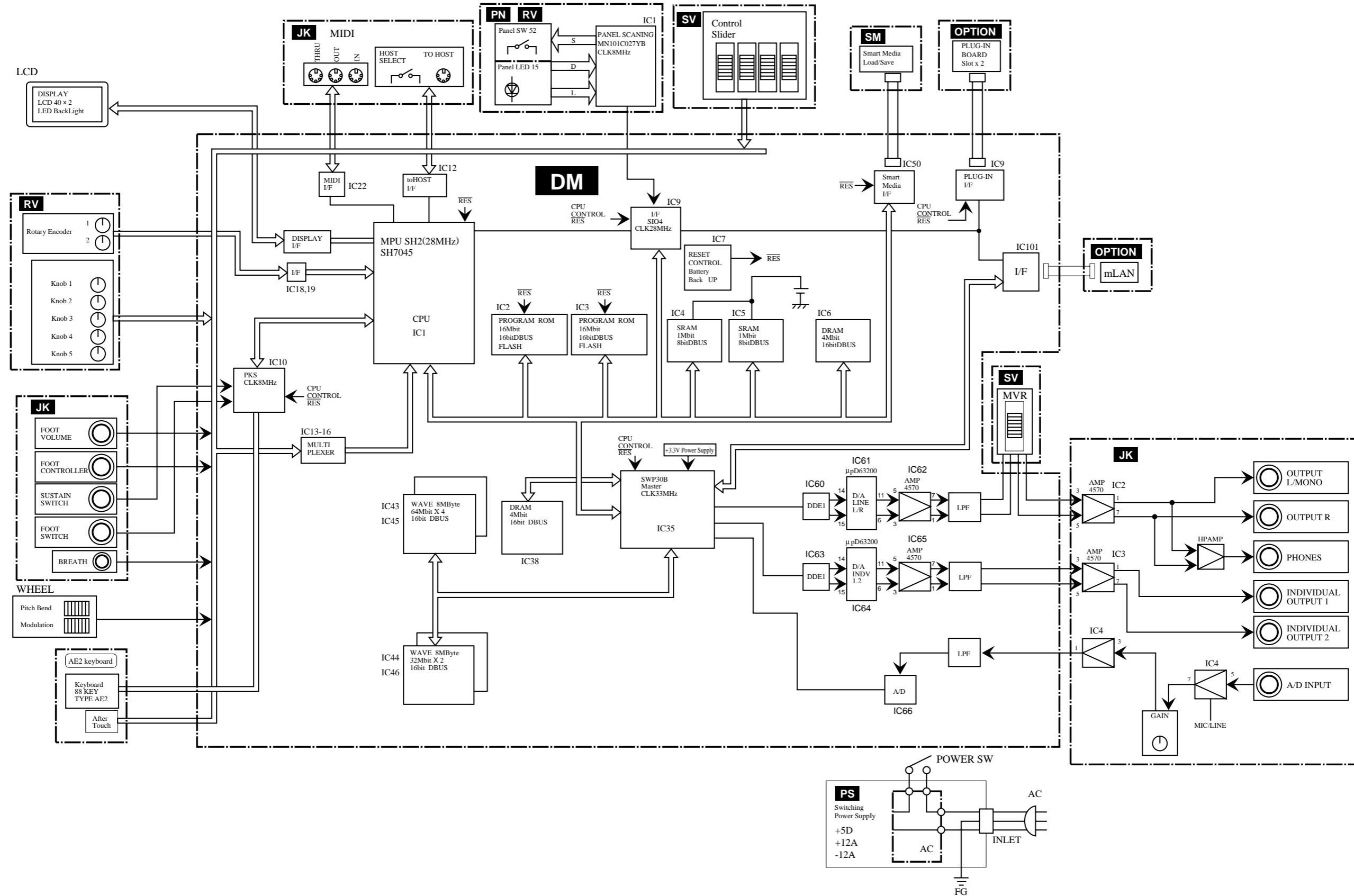


- ① POWER switch
- ② AC INLET terminal
- ③ CARD slot
- ④ MIDI IN, OUT, and THRU connectors
- ⑤ HOST SELECT switch
- ⑥ TO HOST terminal
- ⑦ BREATH jack
- ⑧ FOOT SWITCH jack
- ⑨ SUSTAIN jack
- ⑩ FOOT CONTROLLER jack
- ⑪ FOOT VOLUME jack
- ⑫ INDIVIDUAL OUTPUT 1 and 2 jacks
- ⑬ OUTPUT L/MONO and R jack
- ⑭ PHONES jack
- ⑮ A/D INPUT jack
- ⑯ GAIN knob

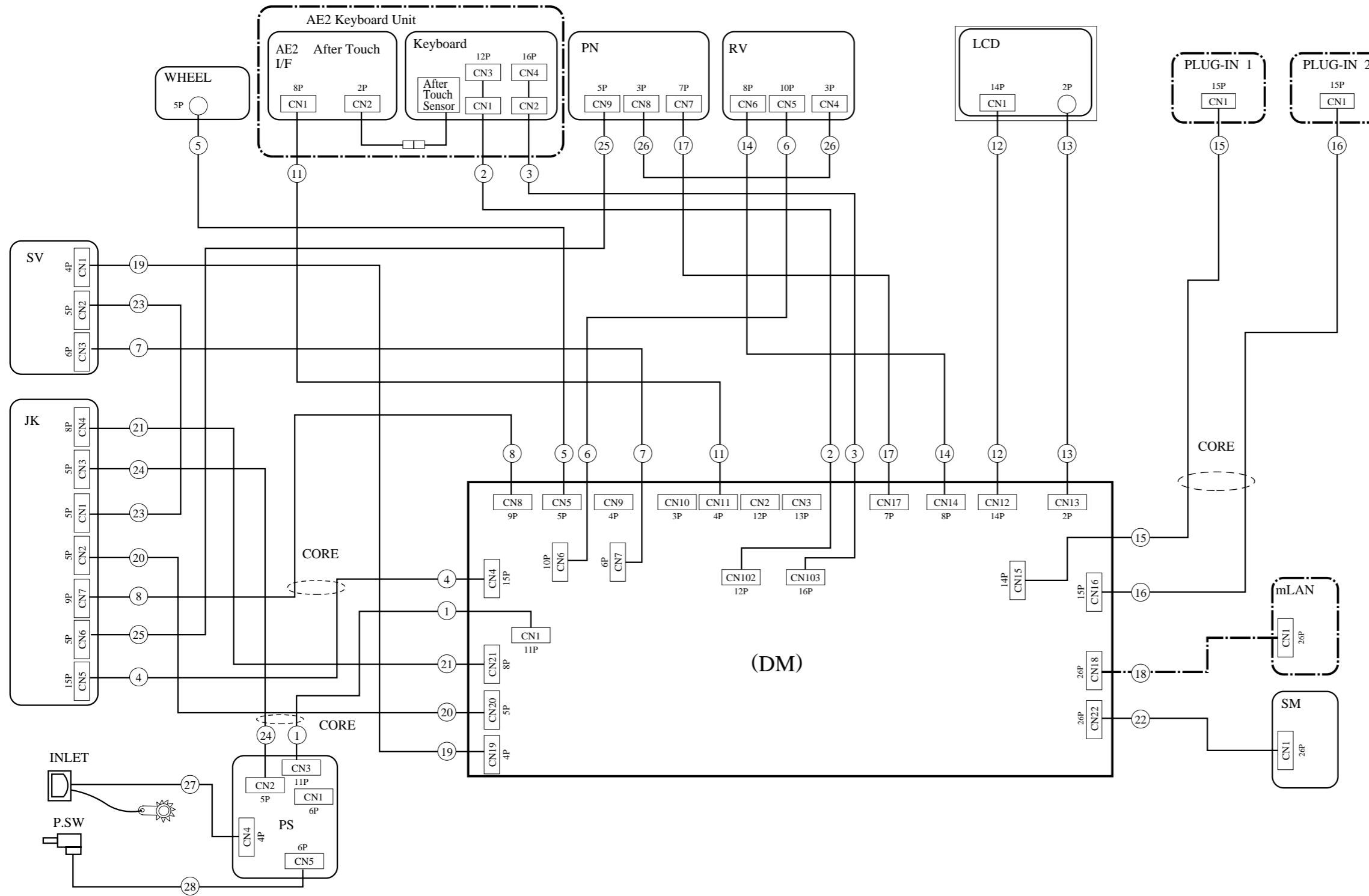
■ CIRCUIT BOARD LAYOUT



BLOCK DIAGRAM



WIRING



Location	Connector Assembly	Remarks	Parts List Ref. No.
* 1 ①	DM-PS	11P/L1450	OVERALL 370
②	MK2	12P	OVERALL 380
③	MK1	16P	OVERALL 390
* 2 ④	KRD-KRD	15P/L600	OVERALL 450
⑤	WHEEL	5P/L300	WHEEL 80
⑥	KRD-KRD	10P/L650	CONTROLPANEL 110
⑦	KRD-KRD	6P/L400	CONTROLPANEL 120
* 2 ⑧	KRD-KRD	9P/L450	OVERALL 400
⑪	AFTER	4P-8P/L1350	OVERALL 420
⑫	DM-LCD	14P/L300	—
⑬	DM-LCD	2P/L500	—
⑭	KRD-KRD	8P/L450	CONTROLPANEL 130
* 3 { ⑮	DM-PLUG IN1	14P-15P/L400	OVERALL 450
⑯	DM-PLUG IN2	15P-15P/L400	
⑰	KRD-KRD	7P/L700	CONTROLPANEL 140
⑱	DM-mLAN	26P	OPTION
⑲	DM-MVR	4P/L450	CONTROLPANEL 150
⑳	DM-IND	5P/L500	OVERALL 470
㉑	DM-JK	4P/L350	OVERALL 480
㉒	DM-SM	26P/L430	CONTROLPANEL 181
㉓	JK-MVR	5P/L650	CONTROLPANEL 160
* 1 ㉔	JK-PS	5P	OVERALL 370
㉕	JK-PN	5P/L800	CONTROLPANEL 170
㉖	KRD-KRD	3P/L300	CONTROLPANEL 180
㉗	PS-AC INLET	4P	POWER SUPPLY 40
㉘	PS-P.SW	3P/L100	POWER SUPPLY 30a

- * 1 Connector Assembly (PS Core)
- * 2 Connector Assembly (DMJK Core)
- * 3 Connector Assembly (PLUG Core)

DISASSEMBLY PROCEDURE

1. Remove the six (6) screws marked [300] from the bottom of the main unit and open the control panel assembly by lifting it up. (Fig. 1)

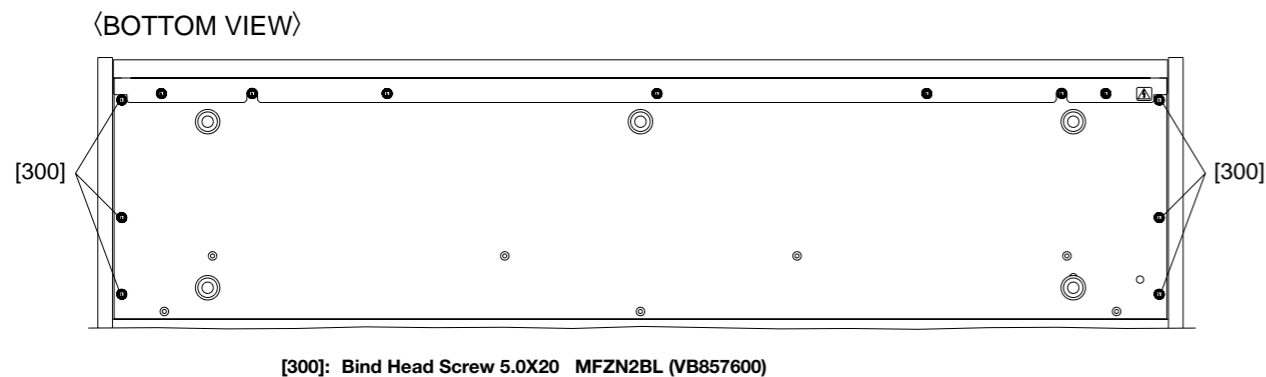


Fig.1

2. PN Circuit Board

- 2-1 Open the control panel assembly. (See procedure 1.)
- 2-2 Remove the twelve (12) screws marked [42]. The PN circuit board can then be removed. (Fig. 2)

3. RV Circuit Board

- 3-1 Open the control panel assembly. (See procedure 1.)
- 3-2 Remove the five (5) knobs marked [200] and the two (2) knobs marked [210] from the panel surface.
- 3-3 Remove the ten (10) screws marked [96]. The RV circuit board can then be removed. (Fig. 2)

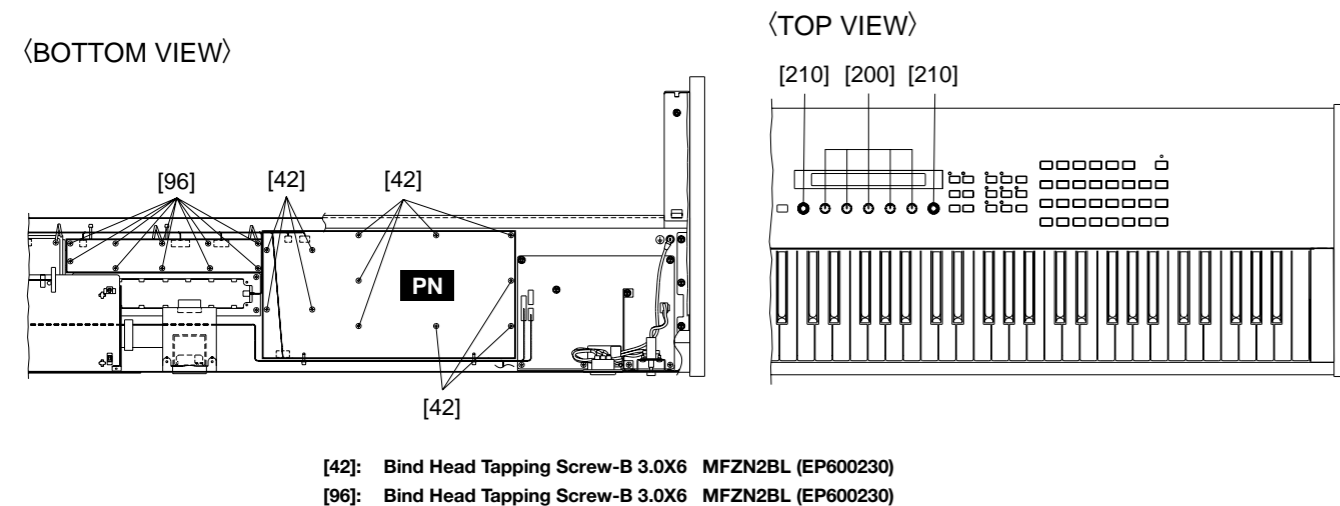


Fig.2

4. Power Supply Unit

- 4-1 Open the control panel assembly. (See procedure 1.)
- 4-2 Remove the two (2) screws marked [30] and the five (5) screws marked [31]. (Fig. 3)
- 4-3 Remove the four (4) screws marked [22] from the power assembly. (Fig. 3) Power supply unit can then be removed.

5. SM Circuit Board

- 5-1 Open the control panel assembly. (See procedure 1.)
- 5-2 Remove the two (2) screws marked [96]. The SM circuit board can then be removed. (Fig. 4)

6. SV Circuit Board

- 6-1 Open the control panel assembly. (See procedure 1.)
- 6-2 Remove the three (3) screws marked [130]. The PLG angle can then be removed. (Fig. 4)
- 6-3 Remove the five (5) knobs marked [220] from the panel surface. (Fig. 4)
- 6-4 Remove the six (6) screws marked [82]. The SV circuit board can then be removed. (Fig. 3)

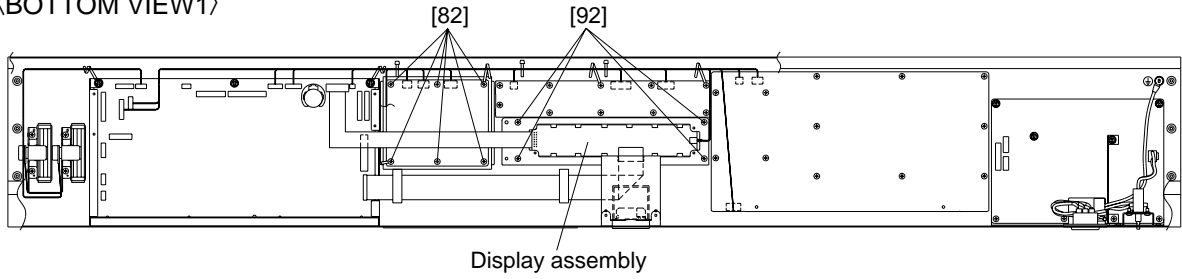
7. Display Assembly

- 7-1 Open the control panel assembly. (See procedure 1.)
- 7-2 Remove the PLG angle. (See procedure 6-2.)
- 7-3 Remove the four (4) screws marked [92]. The display assembly can then be removed. (Fig. 3)

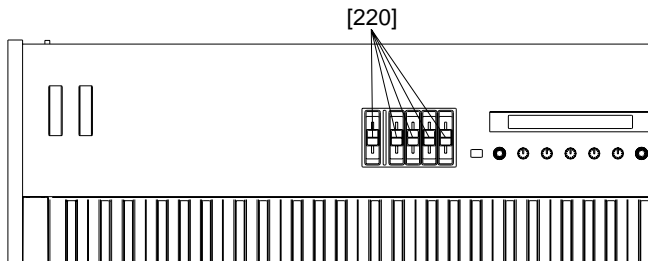
8. JK Circuit Board

- 8-1 Open the control panel assembly. (See procedure 1.)
- 8-2 Remove the nine (9) screws marked [81]. The JK circuit board can then be removed. (Fig. 3)

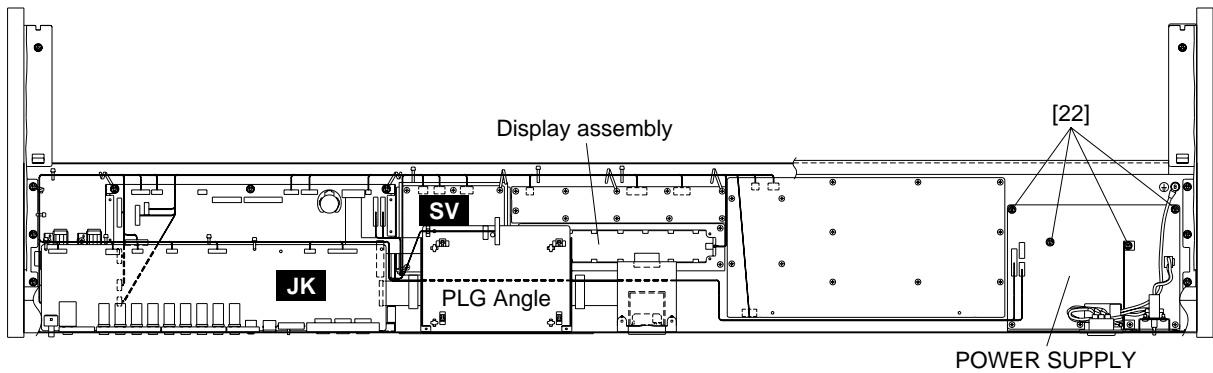
<BOTTOM VIEW1>



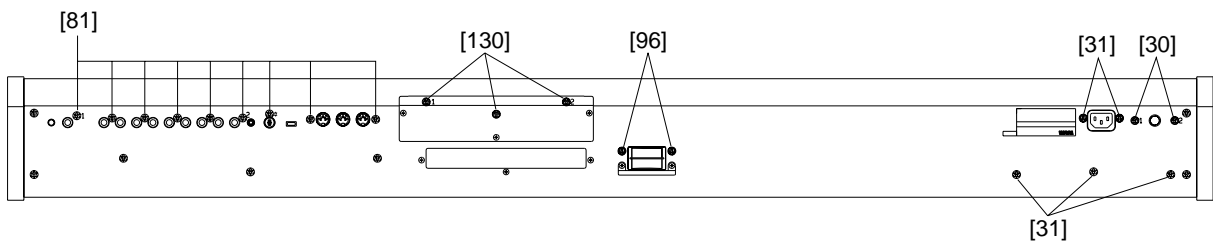
<TOP VIEW>



<BOTTOM VIEW2>



<REAR VIEW>



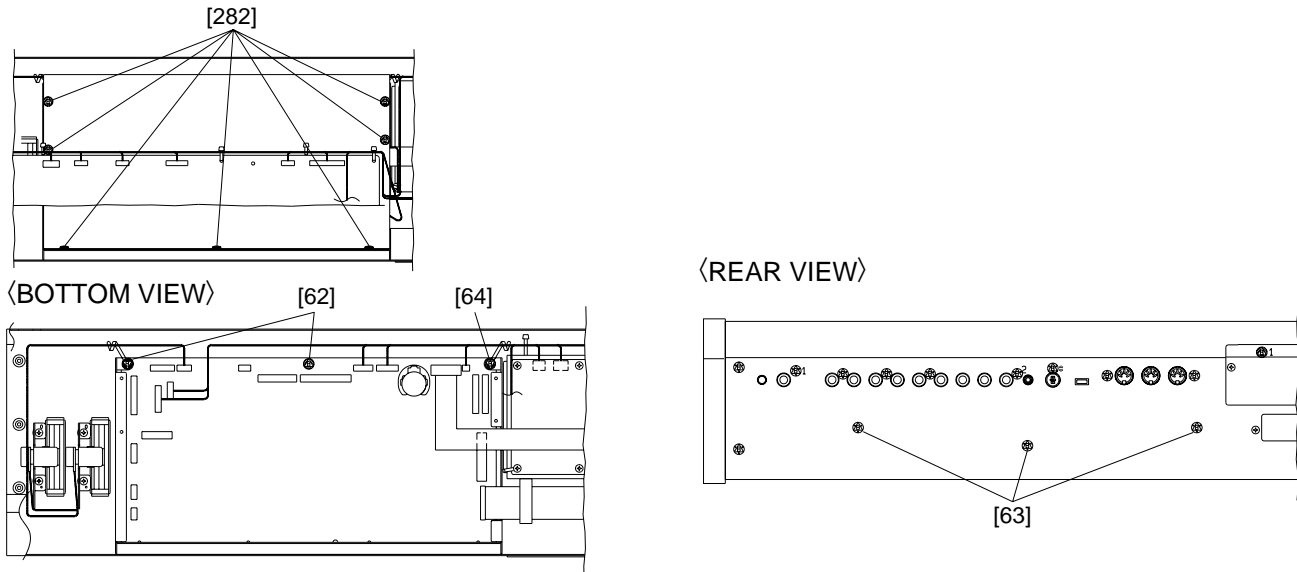
- [22]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)
- [30]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)
- [31]: Bonding Tapping Screw-B 3.0X10 MFZN2BL (VQ049800)
- [81]: Bonding Tapping Screw-B 3.0X10 MFZN2BL (VQ049800)

- [82]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)
- [92]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)
- [96]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)
- [130]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)

Fig.3

9. DM Circuit Board

- 9-1 Open the control panel assembly. (See procedure 1.)
- 9-2 Remove the JK circuit board. (See procedure 8.)
- 9-3 Remove the seven (7) screws marked [282]. The DM shield cover can then be removed. (Fig. 4)
- 9-4 Remove the three (3) screws marked [63]. (Fig. 4)
- 9-5 Remove the two (2) screws marked [62] and the screw marked [64] from the DM circuit board.
Be careful of the harness clamp, which is also installed there. (Fig. 5)

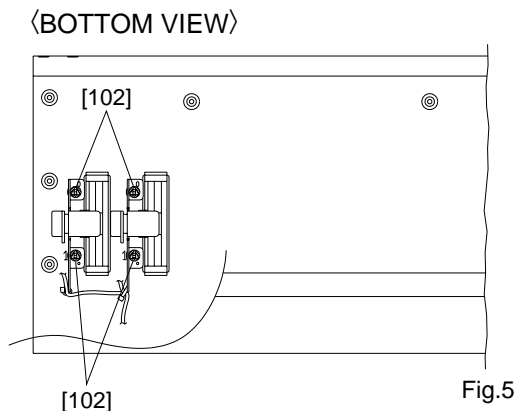


- [62]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)
- [63]: Bonding Tapping Screw-B 3.0X10 MFZN2BL (VQ049800)
- [64]: Bind Head Tapping Screw-B 3.0X8 MFZN2BL (EP600190)
- [282]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)

Fig.4

10. Wheel Assembly

- 10-1 Open the control panel assembly. (See procedure 1.)
- 10-2 Remove the JK circuit board. (See procedure 8.)
- 10-3 Remove the four (4) screws marked [102]. The wheel assembly can then be removed. (Fig. 5)



- [102]: Bind Head Tapping Screw-B 3.0X6 MFZN2BL (EP600230)

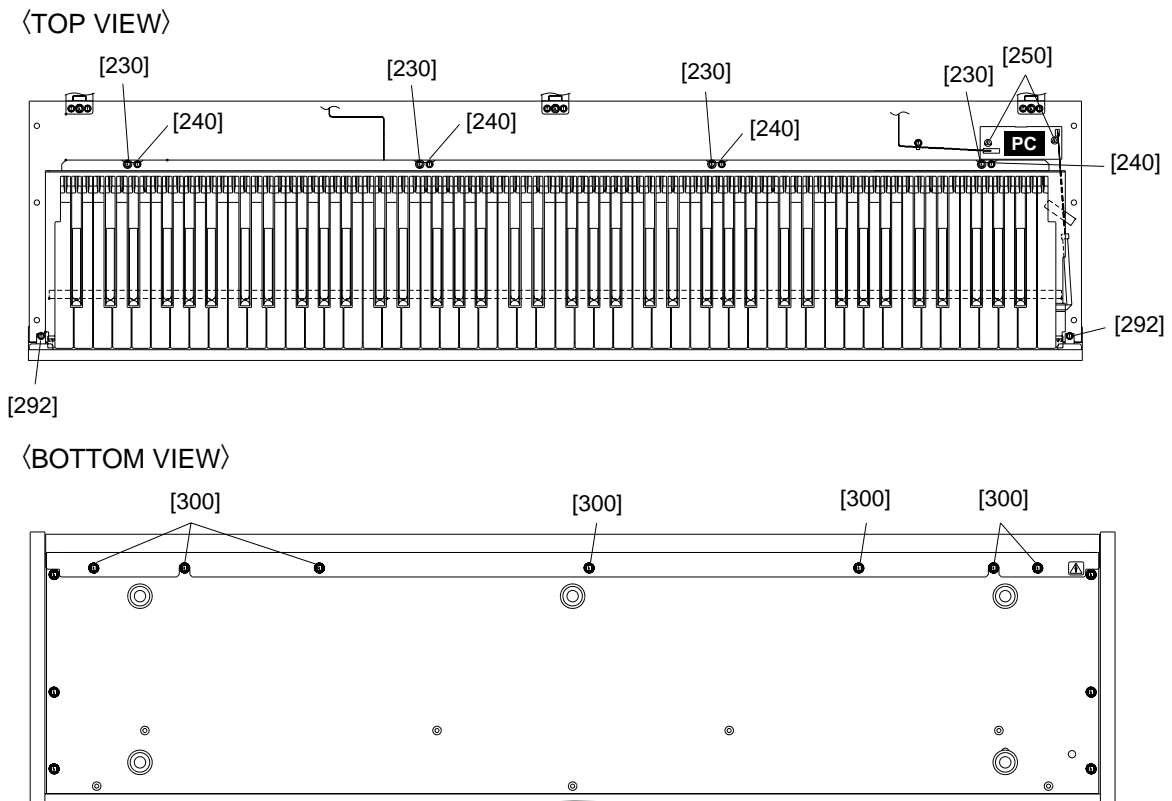
Fig.5

11. PC Circuit Board

- 11-1 Open the control panel assembly. (See procedure 1.)
- 11-2 Remove the two (2) screws marked [250]. The PC circuit board can then be removed. (Fig. 6)

12. Keyboard Assembly

- 12-1 Open the control panel assembly. (See procedure 1.)
- 12-2 Remove the four (4) screws marked [230] and the four (4) screws marked [240]. (Fig. 6)
- 12-3 Loosen the two (2) screws marked [292], which are securing the front rail. (Fig. 6)
- 12-4 Remove the seven (7) screws marked [300], which are securing the front rail at the bottom of the main unit to the keyboard assembly. The keyboard assembly can then be removed. (Fig. 6)



- [230]: Bind Head Screw 4.0X14 MFZN2Y (EG340210)
- [240]: Bind Head Tapping Screw-1 3.5X12 MFZN2Y (EP030240)
- [250]: Bind Head Screw-B 3.0X6 MFZN2BL (EG330360)
- [292]: Bind Head Tapping Screw-1 3.5X12 MFZN2Y (EP030240)
- [300]: Bind Head Screw 5.0X20 MFZN2BL (VB857600)

Fig.6

13. Keyboard Disassembly Procedure

- 13-1 Remove the circuit board marked [A], and then remove the key spring marked [B]. (Fig. 7)
- 13-2 Press the part marked [D] in the direction shown in figure 9, then remove the key marked [D] and the hammer assembly marked [C]. (Fig. 8, Fig. 9)
- 13-3 The black keys can be disassembled by following the same procedure.

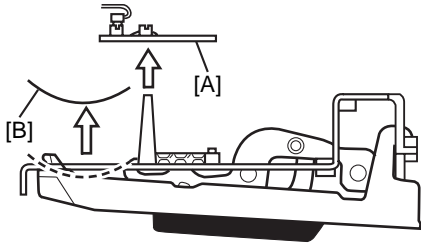


Fig.7

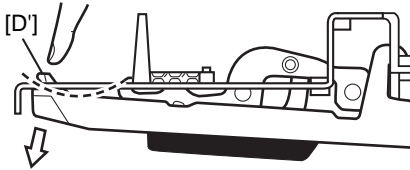


Fig.8

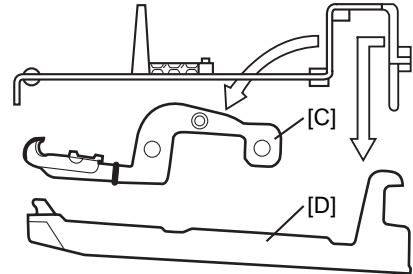


Fig.9

14. Keyboard Assembly Procedure

- 14-1 Insert the hammer assembly marked [C] in the frame in the direction marked [1]. (Fig. 10)
- 14-2 Place the hammer assembly as shown in figures 10 and 11.
- 14-3 Place the white key in the order of [4] and [5]. (Fig. 12)
- 14-4 Place down on the white key in the direction marked [6] shown in figure 13.
- 14-5 Attach the key spring marked [B], and then place the circuit board marked [A]. (Fig. 14)
- 14-6 The black keys can be disassembled by following the same procedure.

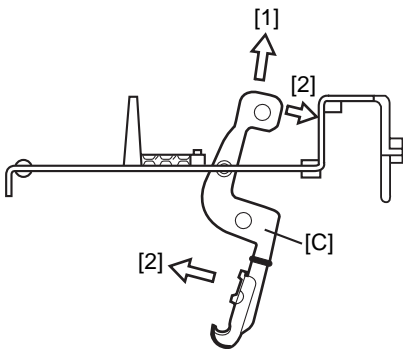


Fig.10

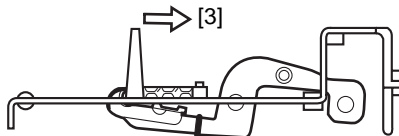


Fig.11

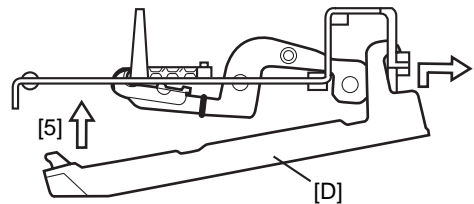


Fig.12

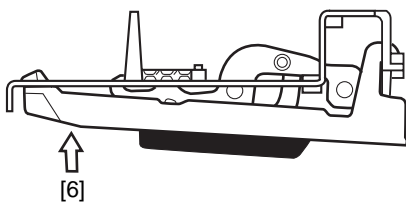


Fig.13

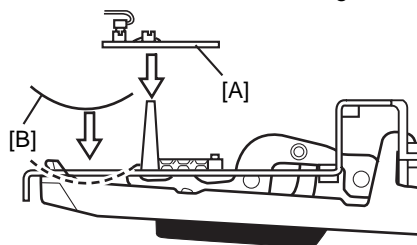


Fig.14

LSI PIN DESCRIPTION

● HD64F7045F28 (XW419A00) CPU

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION		
1	/WRHH	O	HH write	73	D15	I/O	Data bus		
2	PE14	I/O	LCD data 6 input / output	74	D14	I/O			
3	/WRHL	O		75	D13	I/O			
4	PA21	I	MLAN insert detect	76	D12	I/O	Power supply		
5	PE15	I/O	LCD data 7 input / output	77	VCC77	-			
6	VSS6	-	Ground	78	D11	I/O			
7	A0	O	Address bus	79	VSS79	-	Ground		
8	A1	O			80	D10	I/O	Data bus	
9	A2	O			81	D9	I/O		
10	A3	O			82	D8	I/O		
11	A4	O			83	D7	I/O	Power supply	
12	VCC12	-		Power supply	84	D6	I/O		
13	A5	O		Address bus	85	VCC85	-		
14	VSS14	-		Ground	86	D5	I/O	Data bus	
15	A6	O		Address bus	87	VSS87	-	Ground	
16	A7	O				88	D4	I/O	Data bus
17	A8	O				89	D3	I/O	
18	A9	O			90	D2	I/O		
19	A10	O			91	D1	I/O	Power supply	
20	A11	O			92	D0	I/O		
21	A12	O			93	VSS93	-		
22	A13	O			94	XTAL	I	Crystal oscillator	
23	A14	O			95	MD3	I	Mode select	
24	A15	O			96	EXTAL	I	Crystal oscillator	
25	A16	O			97	MD2	I	Mode select	
26	VCC26	-	Power supply	98	NMI	-	Non-maskable interrupt		
27	A17	O	Address bus	99	VCC99/FWP99	-	Power supply		
28	VSS28	-	Ground	100	PA16	I	Encoder 1B input		
29	PA20	I	Encoder 2A input	101	PA17	I	Encoder 1A input		
30	PA19	I	Encoder 2B input	102	MD1	I	Mode select		
31	PB2	O	Row address strobe	103	MD0	I	Mode select		
32	PB3	O	Column address strobe (low)	104	PLLVCC	-	PLL power supply		
33	PA18	I	Host off line detect input	105	PLLCAP	-	PLL capacitor		
34	PB4	O	Column address strobe (high)	106	PLLVSS	-	PLL ground		
35	VSS35	-	Ground	107	PA15	O	CPU clock out		
36	PB5	O	DRAM read/write	108	/RES	-	Reset		
37	A18	O	Address bus	109	TIOCOA	I	A/D jack insert detect interrupt request input		
38	A19	O			110	PE1	I	Smart MINS	
39	A20	O			111	PE2	I	Model detection	
40	VCC40	-		Power supply	112	VCC112	-	Power supply	
41	A21	O		Address bus	113	PE3	I	Smart busy input	
42	VSS42	-		Ground	114	PE4	I	MLAN reset interrupt request input	
43	/RD	O		Read	115	PE5	O	1M clock out	
44	/WDTOVF	-		Not used	116	PE6	I	Model detection	
45	D31	I/O		Data bus	117	VSS117	-	Ground	
46	D30	I/O			118	AN0	I	Analog input	
47	/WRH	O		High write	119	AN1	I		
48	WRL	O	Low write	120	AN2	I			
49	/CS1	O	Chip Select 1	121	AN3	I			
50	CS0	O	Chip Select 0	122	AN4	I			
51	PA9	I	MLAN MIDI interrupt request	123	AN5	I			
52	PA8	I	Interrupt request	124	AVSS	-	Analog ground		
53	/CS3	O	Chip select 3	125	AN6	I	Analog input		
54	/CS2	O	Chip select 2	126	AN7	I			
55	VSS55	-	Ground	127	AVREF	-	Analog reference voltage		
56	D29	I/O	Data bus	128	AVCC	-	Analog power supply		
57	D28	I/O			129	VSS129	-	Ground	
58	D27	I/O			130	RXD0	I	MIDI input	
59	D26	I/O			131	TXD0	O	MIDI output	
60	D25	I/O			132	/IRQ0	I	Plug in sereal interrupt request input	
61	VSS61	-		Ground	133	RXD1	I	HOST input	
62	D24	I/O		Data bus	134	TXD1	O	HOST output	
63	VCC63	-		Power supply	135	VCC135	-	Power supply	
64	D23	I/O			136	/IRQ1	I	MLAN MIDI interrupt input	
65	D22	I/O			137	PE7	I	Smart Vprt Input	
66	D21	I/O			138	PE8	I/O	LCD data 0 input / output	
67	D20	I/O	Data bus	139	PE9	I/O	LCD data 1 input / output		
68	D19	I/O		140	PE10	I/O	LCD data 2 input / output		
69	D18	I/O		141	VSS141	-	Ground		
70	D17	I/O		142	PE11	I/O	LCD data 3 input / output		
71	VSS71	-	Ground	143	PE12	I/O	LCD data 4 input / output		
72	D16	I/O	Data bus	144	PE13	I/O	LCD data 5 input / output		

● HD63B01Y0RCE0F (XM234A00) CPU (PKS)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	/NMI	I	Non-maskable interrupt	33	M1/S8	I	Make contact of key receive/ Switch receive
2	E	O	Key scan drive	34	M0/S7	I	
3	D#	O		35	Vss		
4	D	O		36	F	O	Key scan drive
5	C#	O		37	F#	O	
6	CL	O		38	G	O	
7	PULL 1			39	G#	O	
8	PULL 2		40	A	O	connected to +5V	
9	LC.AE//FS	I	connected to ground	41	A#		O
10	/REPEAT	I	Auto repeat (L:on, H:off)	42	B		O
11	/KOF-REQ	I	Key off request	43	C		O
12	SW1	I	Switch 1 (L: on, H: off)	44	LC//AE	I	Break contact of key receive/ Switch receive
13	SW2	I	Switch 2 (L: on, H: off)	45	B6/S6	I	
14	/IS	I	Input strobe	46	B5/S5	I	
15	/OS	I	Output strobe	47	B4/S4	I	
16	SW3	I	Switch 3 (L: on, H: off)	48	B3/S3	I	Switch drive
17	SW4	I	Switch 4 (L: on, H: off)	49	B2/S2	I	
18	DOUT0	O	Data output	50	B1/S1	I	
19	DOUT1	O		51	B0/S0	I	
20	DOUT2	O		52	Se	O	
21	DOUT3	O		53	Sd	O	
22	DOUT4	O		54	Sc	O	
23	DOUT5	O		55	Sb	O	
24	DOUT6	O		56	Sa	O	
25	DOUT7	O	Power supply (+5V)	57	E		Not used
26	Vcc			58	Vss		Ground
27	Sf	O	Switch drive	59	XTAL		Not used
28	M5/S13	I	Make contact of key receive/ Switch receive	60	EXTAL	I	8 MHz clock
29	M4/S12	I		61	MP0	I	Mode program 0
30	M3/S10	I		62	MP1	I	Mode program 1
31	M2/S9	I		63	/RES	I	Initial clear
32	M1/S8	I		64	/STBY	I	Standby-mode signal

● μ PD63200GS (XM145A00) DAC (Digital to Analog Converter)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	4/8F	I	4/8 Fs selection	9	R. REF		Channel R voltage reference
2	D. GND		Digital ground	10	L. REF		Channel L voltage reference
3	16 BIT	I	16 bit/18 bit selection	11	L. OUT	O	Channel L output
4	D. VDD		Digital power supply	12	A. GND		Analog ground
5	A. GND		Analog ground	13	WDCK	I	Word clock
6	R. OUT	O	Channel R output	14	RSI	I	Channel R series input
7	A. VDD		Analog power supply	15	SI/LSI	I	Series input/Channel L series input
8	A. VDD			16	CLK	I	Clock

● JG710069 (XM326B00) DDE1 (DAC Dynamic Range Enhancer)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	CLK	I	Master clock	9	SH 0	O	N.C.
2	SYW	I	Sync signal	10	SH 1	O	N.C.
3	MIN 1	I	Signal input	11	LE	O	Latch enable for DAC
4	MIN 0	I	Signal input	12	V _{DD}		Power supply
5	Vss		Ground	13	DACO 0	O	Output (DAC)
6	SEL 1	I	Mode select	14	DACO 1	O	Output (DAC)
7	SEL 0	I	Mode select	15	DCLK	O	Clock for DAC
8	SUP	I	1 bit shift up input	16	ICN	I	Initial clear

● TC203C760HF-002 (XS725A00) SWP30B AWM Tone Generator coped with MEG) Standard Wave Processor

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION	
1	VSS	I	(Ground)	121	VSS	I	(Ground)	
2	CA0	I	Address bus of internal register	122	HMD0	I/O	Wave memory data bus (Upper 16 bits)	
3	CA1	I		123	HMD1	I/O		
4	CA2	I		124	HMD2	I/O		
5	CA3	I		125	HMD3	I/O		
6	CA4	I		126	HMD4	I/O		
7	CA5	I		127	HMD5	I/O		
8	CA6	I		128	HMD6	I/O		
9	CA7	I		129	HMD7	I/O		
10	CA8	I		130	HMD8	I/O		
11	CA9	I		131	HMD9	I/O		
12	CA10	I		132	HMD10	I/O		
13	CA11	I	133	HMD11	I/O			
14	VSS	I	(Ground)	134	HMD12	I/O		
15	CD0	I/O	Data bus of internal register	135	HMD13	I/O		
16	CD1	I/O		136	HMD14	I/O		
17	CD2	I/O		137	HMD15	I/O		
18	CD3	I/O		138	VSS	I	(Ground)	
19	CD4	I/O		139	HMA0	O	Wave memory address bus	
20	CD5	I/O		140	HMA1	O		
21	CD6	I/O		141	HMA2	O		
22	CD7	I/O		142	HMA3	O		
23	CD8	I/O		143	HMA4	O		
24	CD9	I/O		144	HMA5	O		
25	CD10	I/O		145	HMA6	O		
26	CD11	I/O	146	HMA7	O			
27	CD12	I/O	147	HMA8	O			
28	CD13	I/O	148	HMA9	O			
29	CD14	I/O	149	HMA10	O			
30	VDD	I	(Power supply)	150	VDD	I		(Power supply)
31	VSS	I	(Ground)	151	VSS	I		(Ground)
32	CD15	I/O	Chip select	152	HMA11	O		Wave memory address bus
33	CSN	I		153	HMA12	O		
34	WRN	I		154	HMA13	O		
35	RDN	I	Read strobe	155	HMA14	O		
36	VDD	I	(Power supply)	156	HMA15	O		
37	SYSH0	O	NSYS/LNSYS upper 16 bits output	157	HMA16	O		
38	SYSH1	O		158	HMA17	O		
39	SYSH2	O		159	HMA18	O		
40	SYSH3	O		160	HMA19	O		
41	SYSH4	O		161	HMA20	O		
42	SYSH5	O		162	HMA21	O		
43	SYSH6	O		163	HMA22	O		
44	SYSH7	O		164	HMA23	O		
45	KONO0	O		Key on data	165	HMA24	O	
46	KONO1	O			166	VSS	I	
47	KONO2	O			167	MRASN	O	RAS when DRAM(s) is connected to wave memory
48	KONO3	O	NSYS input/LNSYS output lower 8 bits	168	MCASN	O	CAS when DRAM(s) is connected to wave memory	
49	VSS	I		(Ground)	169	MOEN	O	Wave memory output enable
50	SYSL0	I/O		170	MWEN	O	Wave memory write enable	
51	SYSL1	I/O		171	VSS	I	(Ground)	
52	SYSL2	I/O		172	LMD0	I/O	Wave memory data bus (Lower 16 bits)	
53	SYSL3	I/O		173	LMD1	I/O		
54	SYSL4	I/O		174	LMD2	I/O		
55	SYSL5	I/O		175	LMD3	I/O		
56	SYSL6	I/O		176	LMD4	I/O		
57	SYSL7	I/O		177	LMD5	I/O		
58	KONI0	I		Key on data input	178	LMD6		I/O
59	KONI1	I	179		LMD7	I/O		
60	VDD	I	(Power supply)		180	VDD		I
61	VSS	I	(Ground)	181	VSS	I		(Ground)
62	KONI2	I	DAC output	182	LMD8	I/O		
63	KONI3	I		183	LMD9	I/O		
64	DAC0	O		184	LMD10	I/O		
65	DAC1	O	DAC0/DAC1 word clock	185	LMD11	I/O		
66	WCLK	O		186	LMD12	I/O		
67	MELO0	O		187	LMD13	I/O		
68	MELO1	O	MEL wave data output	188	LMD14	I/O		
69	MELO2	O		189	LMD15	I/O		
70	MELO3	O		190	VSS	I	(Ground)	
71	MELO4	O	ADC word clock	191	LMA0	O	Wave memory address bus (Lower data memory)	
72	MELO5	O		192	LMA1	O		
73	MELO6	O		193	LMA2	O		
74	MELO7	O	MEL wave data input	194	LMA3	O		
75	VDD	I		(Power supply)	195	LMA4		O
76	ADLR	O		196	LMA5	O		
77	MELI0	I		197	LMA6	O		
78	MELI1	I		198	LMA7	O		
79	MELI2	I		199	LMA8	O		
80	MELI3	I		200	LMA9	O		
81	MELI4	I		201	LMA10	O		
82	MELI5	I		202	LMA11	O		
83	MELI6	I		203	VSS	I		(Ground)
84	MELI7	I		204	LMA12	O		
85	VSS	I	(Ground)	205	LMA13	O		
86	RCASN	O	DRAM column address strobe (RAS signal)	206	LMA14	O		
87	RA8	O	DRAM address bus	207	LMA15	O		
88	RA7	O		208	LMA16	O		
89	RA6	O		209	LMA17	O		
90	VDD	I		(Power supply)	210	VDD	I	(Power supply)
91	VSS	I		(Ground)	211	VSS	I	(Ground)
92	RA5	O		212	LMA18	O		
93	RA4	O		213	LMA19	O		
94	RA3	O		214	LMA20	O		
95	RA2	O		215	LMA21	O		
96	RA1	O		216	LMA22	O		
97	RA0	O		217	LMA23	O		
98	RRASN	O	DRAM row address strobe (RAS signal)	218	LMA24	O		
99	RWEN	O	DARM write enable	219	VSS	I	(Ground)	
100	VSS	I	(Ground)	220	SYO	O	Sync. signal for master clock	
101	RD7	I/O	DRAM data bus	221	VDD	I	Sync. signal for HCLK/OCLK	
102	RD6	I/O		222	QCLK	O	1/12 master clock (64Fs)	
103	RD5	I/O		223	HCLK	O	1/6 master clock (128Fs)	
104	RD4	I/O		224	CK256	O	1/3 master clock (256Fs)	
105	RD3	I/O		225	SYSCCLK	O	1/2 master clock (384Fs)	
106	RD2	I/O		226	VDD	I	(Power supply)	
107	RD1	I/O		227	SY1	I	Sync. clock	
108	RD0	I/O		228	MCLKI	I	Master clock input	
109	VSS	I		(Ground)	229	MCLKO	O	Master clock output
110	RD17	I/O		230	VDD	I	(Power supply)	
111	RD16	I/O		231	XIN	I	Crystal osc. input	
112	RD15	I/O	232	XOUT	O	Crystal osc. output		
113	RD14	I/O	233	VSS	I	(Ground)		
114	RD13	I/O	234	ICN	I	Initial clear		
115	RD12	I/O	235	CHIP2	I	2 chips mode enable		
116	RD11	I/O	236	SLAVE	I	Master/Slave select when 2 chips mode		
117	RD10	I/O	237	TESTON	I	Test pin		
118	RD9	I/O	238	ACIN	I			
119	RD8	I/O	239	DCTEST	I			
120	VDD	I	(Power supply)	240	VDD	I	(Power supply)	

● **MN101C027YB (XS711200) CPU**

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION	
1	S1	I	Switch matrix data	33	S12	I	Switch matrix data	
2	S2	I		34	S13	I		
3	S3	I		35	S14	I		
4	S4	I		36	TXD	O		MIDI transmit data
5	S5	I		37	S15	I		Switch matrix data
6	VREF+	-	38	S16	I			
7	VDD	-	39	S17	I			
8	OSC2	O	Crystal oscillator (8MHz)	40	S18	I	Switch matrix data	
9	OSC1	I	Crystal oscillator (8MHz)	41	L16	O		
10	VSS	-	Ground	42	L17	O		
11	XI	I	Not used	43	L18	O		
12	XO	O	Not used	44	L19	O		
13	MMOD	I	Memory mode select (Grounded)	45	L8	O	LED drive data	
14	RD0	O	Rotary encoder data	46	L9	O		
15	RXD	I	MIDI receive data	47	L10	O		
16	D0	O	LED and switch drive data	48	L11	O		
17	D1	O		49	L12	O		
18	D2	O		50	L13	O		
19	D3	O		51	L14	O		
20	D4	O		52	L15	O		
21	/RST	I	Reset	53	L7	O	LED and switch drive data	
22	D5	O	LED and switch drive data	54	L6	O		
23	D6	O		55	L5	O		
24	D7	O		56	L4	O		
25	D8	O		57	L3	O		
26	D9	O		58	L2	O		
27	S6	I	Switch matrix data	59	L1	O	LED and switch drive data	
28	S7	I		60	L0	O		
29	S8	I		61	VREF	-		Grounded
30	S9	I		62	AD0	I		Analog input
31	S10	I		63	AD1	I		Analog input
32	S11	I		64	S0	I	Switch matrix data	

● **MBCG46183-129 (XV833A00) Gate Array**

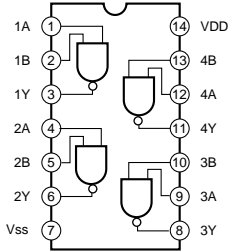
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION	
1	D5	I/O	Data Bus	25	TX31	O	Transmit Data 31	
2	D6	I/O		26	RX32	I	Receive Data 32	
3	D7	I/O		27	TX32	O	Transmit Data 32	
4	/IRQ0	I/O	Interrupt Request Port 0	28	RX33	I	Receive Data 33	
5	/IRQ1	I/O	Interrupt Request Port 1	29	TX33	I/O	Transmit Data 33	
6	VSS	-	Ground	30	/IC	I	Initial Clear	
7	/IRQ2	I/O	Interrupt Request Port 2	31	VSS	-	Ground	
8	/IRQ3	I/O	Interrupt Request Port 3	32	XI	I	Quartz Crystal Input	
9	/RD	I	Read Signal Input	33	VSS	-	Ground	
10	/WR	I	Write Signal Input	34	XO	I/O	Quartz Crystal Output	
11	/CE	I	Chip Enable Input	35	A0	I	Address Bus	
12	/ASTB	I	Address Strobe (Not used: to ground)	36	A1	I		
13	TESTSIO	I	Input with Pull-down Resistor (50k)	37	A2	I		
14	RX0	I	Receive Data 0	38	A3	I		
15	TX0	O	Transmit Data 0	39	A4	I		
16	RX1	I	Receive Data 1	40	A5	I	CPU Clock	
17	TX1	O	Transmit Data 1	41	CPUCLK	I		
18	VSS	-	Ground	42	VSS	-		Ground
19	VDD	-	Power Supply	43	VDD	-		Power Supply
20	RX2	I	Receive Data 2	44	D0	I/O		Data Bus
21	TX2/BO2	O	Transmit Data 2	45	D1	I/O		
22	RX30	I	Receive Data 30	46	D2	I/O		
23	TX30	O	Transmit Data 30	47	D3	I/O		
24	RX31	I	Receive Data 31	48	D4	I/O		

● **PCM1800 (XU770A00) A/D Converter**

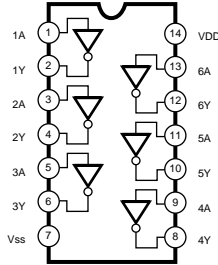
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	VINL	I	Analog input (L ch.)	13	LRCK	I/O	Sampling clock input/output
2	VREF1	-	Reference 1 decoupling cap.	14	BCK	I/O	Bit clock input/output
3	REFCOM	-	Reference decoupling common	15	DOUT	O	Audio data output
4	VREF2	-	Reference 2 decoupling cap.	16	SYSCK	I	System clock input
5	VINR	I	Analog input (R ch.)	17	DGND	-	Digital ground
6	RSTB	I	Reset input active "L"	18	VDD	-	Power supply +5V
7	BYPAS	I	LCF bypass control	19	CINNR	-	Anti-aliasing filter cap. (-) R ch.
8	FMT0	I	Audio data format 0	20	CINPR	-	Anti-aliasing filter cap. (+) R ch.
9	FMT1	I	Audio data format 1	21	CINNL	-	Anti-aliasing filter cap. (-) L ch.
10	MODE0	I	Master/Slave mode selection 0	22	CINPL	-	Anti-aliasing filter cap. (+) L ch.
11	MODE1	I	Master/Slave mode selection 1	23	VCC	-	Analog power supply
12	FSYNC	I/O	Frame sync. input/output	24	AGND	-	Analog ground

IC BLOCK DIAGRAM

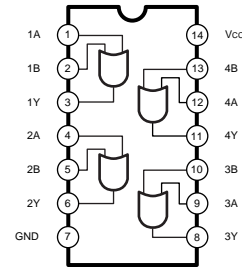
- **TC74VHC00F(XT229A00)**
IC73
MAND



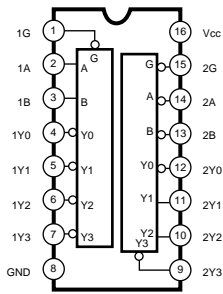
- **TC74VH04F (XM332A00)**
Inverter



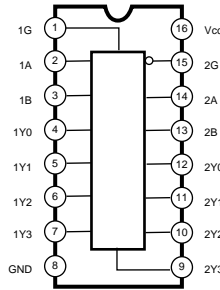
- **TC74VH32F(XN963A00)**
IC29, IC55
OR



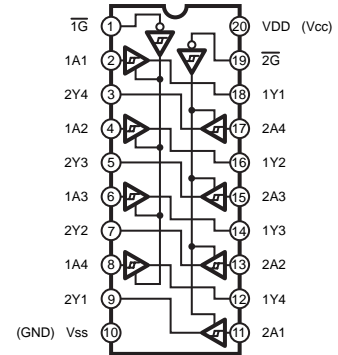
- **TC74LVC139FPEL(XS048A00)**
IC26, IC42
Demultiplexer



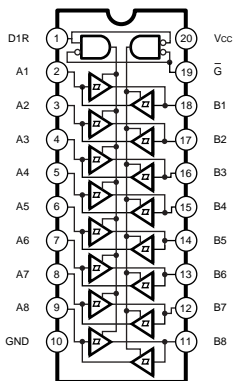
- **TC74VHC157FF(XN966A00)**
IC103
Multiplexer



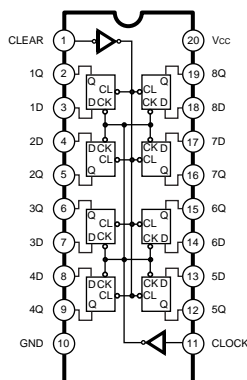
- **TC74VHC244F(XN969A00)**
IC51
Bus Buffer



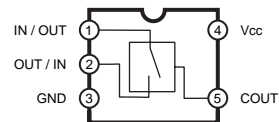
- **TC74VHC245F(XT487A00)**
IC11
Trabsceiver



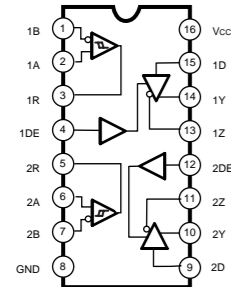
- **TC74VHC273F(XN971A00)IC52**
SN74HC273NSR(XH223A00)
IC27, IC28
D-FF



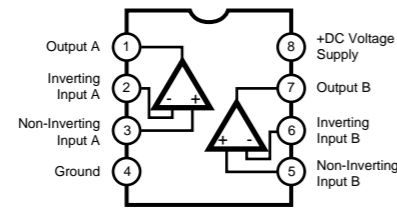
- **TC7S66FF(XR682A00)**
IC30
Analog Switch



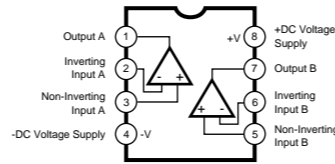
- **M5M34051FP**(XV103A00)
IC12
Line Transceiver



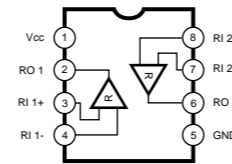
- **NJM4556AMT1**(XQ138A00)
IC23
Operation Amplifier



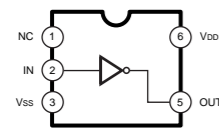
- **NJM4556AD** (XQ824A00)
- **μPC4570G2** (XF291A00)
- **μPC4570C** (XC520A00)
IC62,IC65,IC73
Dual Operational Amplifier



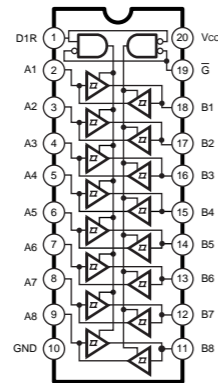
- **DS90C402M** (XW357A00)
IC102
Line Receiver



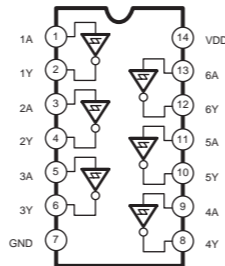
- **SC7SU04FEL** (XI348A00)
IC21
Inverter



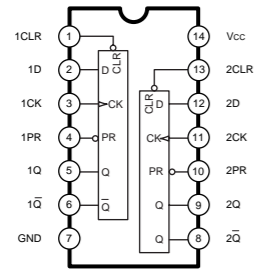
- **TC74VHCT245AF**(XV242A00)
- **TC74VHCT245AFT**(XT744A00)
- **SN74HC245NSR**(XD838A00)
IC31
Buffer
Octo1 3-state Bus Transceiver



- **TC74HC14AF-TP1** (XD657A00)
IC8,IC17,IC20,IC22,IC32,IC100
Hex Inverter

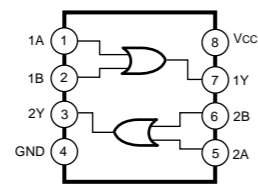


- **TC74HC74AF** (XP003A00)
IC18,IC19
Dual D-Type Flip-Flop

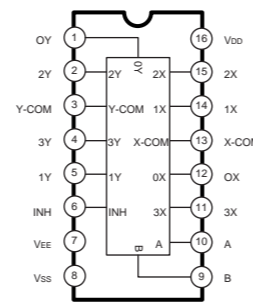


INPUTS				OUTPUTS	
PR	CLR	CLK	D	Q	Q-bar
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	f	H	H	L
H	H	f	L	L	H
H	H	L	X	Q ₀	Q ₀

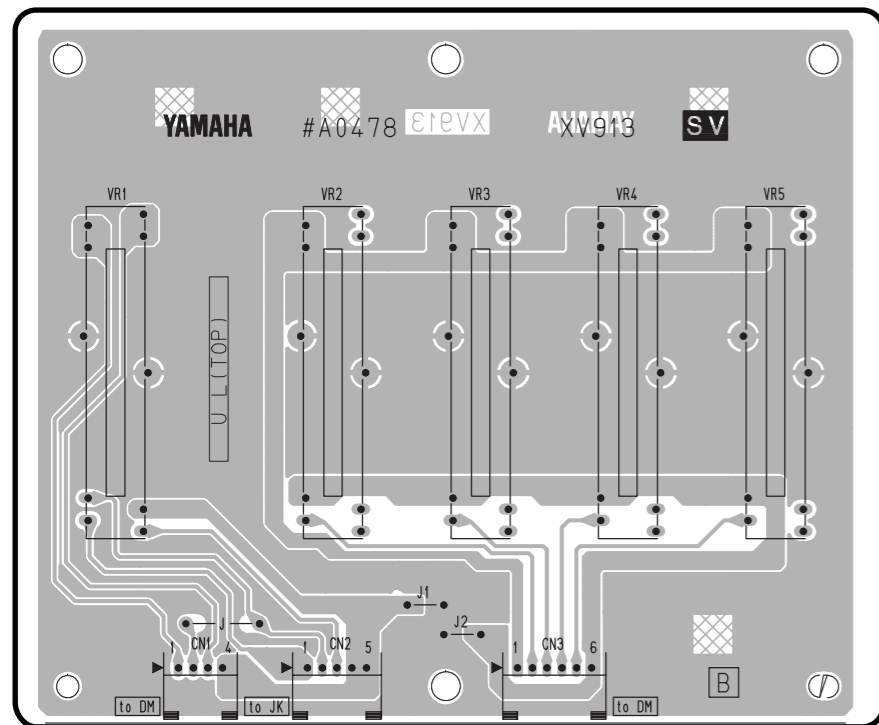
- **TC7W32FU(TE12L)** (XQ173A00)
IC75
OR



- **TC74HC4052AF** (XS790A00)
IC13,IC14,IC15,IC16
Multiplexer



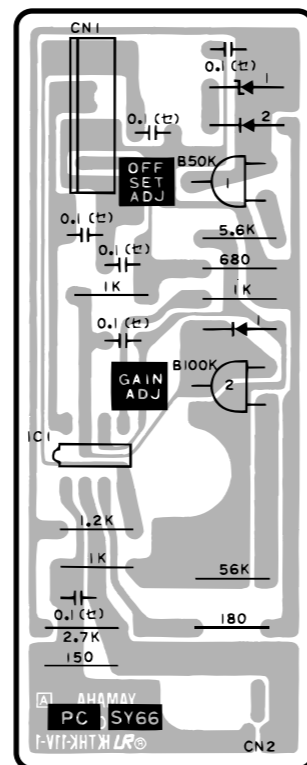
• SV Circuit Board



CN1: to DM-CN19 CN2: to JK-CN1 CN3: to DM-CN7

Component side

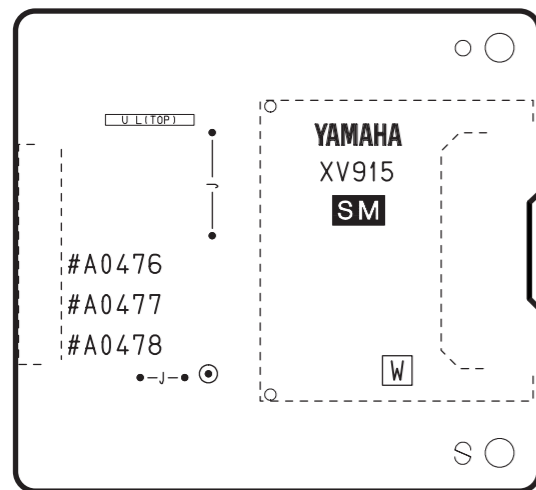
• PC Circuit Board



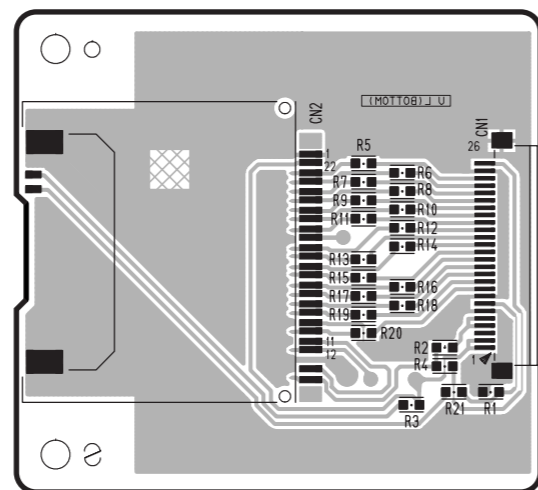
Component side

• SM Circuit Board

CN1: to DM-CN22



Component side



Pattern side

SV: 2NA-V357680
SM: 2NA-V357710

■ TEST PROGRAM

Test No.	Test Item	Test Conditions, Judgment Criteria, etc.
T1	RAM READ/WRITE	OK/NG, (MAIN SRAM/WAVE DRAM)
T2	RAM BATTERY	OK/NG, 2.7V or more, Less than 3.5V
T3	WAVE ROM	OK/NG
T4	LCD	ON/OFF blinking alternately
T5	PANEL SWITCH/LED	OK/NG
T6	ENCODER	OK; 0 to +127(0) to -127
T7	KEYBOARD	OK, KEY CODE/KEY TOUCH
T8	KNOB A-2	OK/NG, 64-127-0-64
T9	SLIDER 1-4	OK/NG, 0-127-0
T12	CONTROLLER	OK/NG, 64-127-0-64 (PB), 0-127-0 (MW), 0-107-0 (AT)
T13	FOOT CONTROL SWITCH	OK, 0-127-0
T14	BREATH CONTROLLER	OK/NG, 127-0-127
T15	CARD	OK/NG
T16	MIDI IN/OUT/THRU	OK/NG THRU Confirmation
T17	HOST SELECT	OK/NG
T18	TO HOST	OK/NG
T19	1 kHz OUTPUT L	OUTPUT(L): +6.0 ± 2 dBm; OUTPUT(R): Less than -72.0 dBm (10 kohm load) INDIV(1): +6.0 ± 2 dBm; INDIV(2): Less than -72.0 dBm (10 kohm load) PHONES(L): +5.0 ± 2 dBm; PHONES(R): Less than -64.0 dBm (33 ohm load)
T20	1 kHz OUTPUT R	OUTPUT(L): Less than -72.0 dBm (10 kohm load); OUTPUT(R): +6.0 ± 2 dBm INDIV(1): Less than -72.0 dBm (10 kohm load); INDIV(2): +6.0 ± 2 dBm PHONES(L): Less than -64.0 dBm (33 ohm load); PHONES(R): +5.0 ± 2 dBm
T21	A/D LEVEL, JACK	OK
T22	A/D -> D/A	OUTPUT (L, R): +15.0 ± 2 dBm (Line) (10 kohm)
T23	PLUG- IN1	OUTPUT (L, R): +11.5 ± 2 dBm (10 kohm)
T24	PLUG- IN2	OUTPUT (L, R): +11.5 ± 2 dBm (10 kohm)
T25	mLAN	OK/NG
T26	FACTORY SET	OK/NG Initialized state
T27	SWP CH	1 kHz, sine wave
T28	EXIT (NOISE LEVEL)	OUTPUT (L, R): Less than -82.0 dBm (10 kohm load) PHONES (L, R): Less than -85.0 dBm (33 ohm load)

Measuring instruments: frequency counter, oscilloscope, AC voltmeter (JIS-C curve type), distortion meter (with flat filter), keyboard amplifier, etc.
Jigs: MIDI cable, specially designed expansion board, etc.

A. HOW TO ENTER THE TEST PROGRAM

While pressing the [VOICE], [PERFORM] and [STORE] switches, turn on the [POWER ON/OFF] switch. The following message will then appear.

```
[EDIT]:AUTO [JOB]:MANUAL [EXIT]:Exit
TEST 478) IntV#. ## ExtV#. ## [CARD]:F. SET
```

In this state, pressing the [EXIT] switch will cancel the test mode and restore the normal state.

B. PROCEEDING THROUGH THE TEST PROGRAM

AUTO MODE:

When the test program is started, the following display will appear.

```
01: RAM R/W [EXIT]:Exit
TEST 478) IntV#. ## ExtV#. ## AUTO MODE
```

Select the test number using the [DEC/NO] and [INC/YES] switches.

Press the [ENTER] switch to execute the tests one after another starting from the currently selected number.

If the test result is "OK", the next test will be selected and executed sequentially.

If an error occurs, an error message will appear and the test will be discontinued.

After pressing the [EXIT] switch, choose an appropriate measure to deal with the error by using the [ENTER], [INC/YES] or [EXIT] switch.

Pressing the [ENTER] switch, will automatically execute the test from where the error occurred.

Pressing the [INC/YES] switch, the test will automatically restart at the test following the one where the error occurred.

Pressing the [EXIT] switch, will execute "T28 EXIT" and the testing will come to an end.

MANUAL MODE:

When the test program is started, the following display will appear.

```
01: RAM R/W [EXIT]:Exit
TEST 478) IntV#. ## ExtV#. ## MANUAL MODE
```

Select the test number using the [DEC/NO] and [INC/YES] switches.

Press the [ENTER] switch to execute the currently selected test.

After the test, press the [EXIT] switch to set to standby mode. When the [EXIT] switch is pressed again, "T28 EXIT" will be executed.

C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED

When the test result has been judged as "NG" in each of the following tests, choose whether to execute the same test or to proceed to the next test.

AUTO MODE:

Press the [EXIT] switch to set to the error processing state.

MANUAL MODE:

Press the [EXIT] switch to set to the next test number. This procedure, however, is not applicable to the "T5 PANEL SWITCH" test.

T1. RAM READ/WRITE

```
01: RAM R/W
```

This test is used to check the write/read/verify functions of the main CPU SRAM.

DISPLAY OF RESULTS

```
OK 01: RAM R/W SRAM OK
```

```
NG 01: RAM R/W SRAM NG
```

TEST END

The test ends after the result is displayed.

OTHER

All RAM data are stored in the memory.

T2. RAM BATTERY

```
02: RAM Battery
```

This test checks if the RAM backup battery voltage is within the range of 2.7 V to 3.5 V.

DISPLAY OF RESULTS

```
OK 02: RAM Battery OK
```

```
OK 02: RAM Battery OK
```

```
OK 02: RAM Battery High NG
#.#V
```

TEST END

The test ends after the result is displayed.

T3. WAVE ROM

```
03: Wave ROM
```

This test compares each wave ROM data.

DISPLAY OF RESULTS

```
OK  03: Wave ROM  IC45  IC43  IC46  IC44  OK
      OK      OK      OK      OK
```

```
NG  03: Wave ROM  IC45  IC43  IC46  IC44  NG
      OK      OK      NG      OK
```

If any IC is NG, the test result will be NG.

TEST END

The test ends after the result is displayed.

T4. LCD

```
04: LCD Blink
```

This test is used to check that all dots on the LCD blink on and off alternately at approximately 1 second intervals and that the back light of the LCD lights up.

TEST END**AUTO MODE:**

Press the [+1] switch to end the test and proceed to the next test.

MANUAL MODE:

Press the [EXIT] switch to end the test, the initial display will appear and the next test number will be set.

T5. PANEL SWITCH/LED

```
05: Panel Switch/LED
```

This test checks that all switches function properly when the panel switches are turned on and off according to the instructions displayed. If the switch is connected to the LED, it also checks that the corresponding LED lights up.

```
05: Panel Switch/LED
Push [xxxxxxxxx]
```

xxxxxxxxx: SWITCH NAME

If the test result is satisfactory, the sine wave is output while the switch is on and the test will proceed to checking the next switch.

If the wrong switch is pressed, "NG" will appear and no sine wave will be output.

If the correct switch is pressed after that, testing will proceed to the next switch.

If the test results for all switches are satisfactory, "OK" will appear.

The switches are checked in the following order.

```
[VOICE]>[PERFORM]>[STORE]>[UTILITY]>[CARD]>
[SEQ]>[EDIT]>[JOB]>[PLAY/STP]>[SHIFT]>[EF.BYPS]>
[MASTER]>[EXIT].[ENTER]>[DEC/NO]>[INC/YES]>
[PRE1]>[PRE2]>[INT]>[EXT]>[PLG1]>[PLG2]>[Q.ACCESS]>
[A]>[B]>[C]>[D]>[E]>[F]>[G]>[H]>[1]>[2]>[3]>[4]>[5]>
[6]>[7]>[8]>[9]>[10]>[11]>[12]>[13]>[14]>[15]>[16]
```

DISPLAY OF RESULTS

```
OK  05: Panel Switch/LED  OK
```

```
NG  05: Panel Switch/LED  NG
Push [xxxxxxxxx]
```

TEST END

If the test results of all switches are satisfactory, "OK" will appear and testing will end.

T6. ENCODER

```
06: Encoder
```

While turning the JOG first clockwise and then counterclockwise (-32), according to the LCD instruction as shown below, check that the number increases and decreases sequentially and that "OK" appears as the result.

```
06: Encoder      Page:yyyy  Data:yyyy
      xxxxx      xxxxx
```

yyyyy: target value ("OK" appears after checking.)

xxxxx: current value

DISPLAY OF RESULTS

```
OK  06: Encoder      Page:OK  Data:OK  OK
      xxxxx      xxxxx
```

NG (No change in the message on the display)

TEST END

The test ends after the result is displayed.

When the test result is "NG", refer to "C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED".

T7. KEYBOARD

```
07: Keyboard
```

This test is used to check that the keyboard functions properly by scaling 88 keys from A1 to C7.

```
07: Keyboard
Push C 1 Velocity =xxxx
```

(The above shows the C1 check.)

xxxx: velocity value of the key being pressed

When the key on the LCD display works at a velocity of 0X10 to 0X6F, it is considered normal and that keys note is output. The test will then proceed to the next key test. If a wrong key is played, “NG” will appear and that note’s sound will not be output. If a correct key is played after that, however, the test will proceed to the next key test. If the test results of all the keys are satisfactory, “OK” will appear on the LCD display.

DISPLAY OF RESULTS

```
OK 07: Keyboard OK
Push C 1 Velocity =xxx
```

```
NG 07: Keyboard NG
Push C 1 Velocity =xxx
```

TEST END

If the test results of all the keys are satisfactory, “OK” will appear and testing will end.

When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T8. A. KNOB A-2

```
08: KnobA-2
```

Move each knob gradually in the following order: Center 64 (63-65); Left 127 (126-127); Right 0 (0-1); Center 64 (63-65), according to the instruction on the LCD as shown below. Check that the numbers change sequentially and that “OK” appears as the result.

Begin the check from the specified knob. The mark [>] will appear to the left of the value of the knob being checked.

```
08: KnobA-2 >A >B >C >1 >2 yyy
>yyy yyy>yyy yyy yyy
```

xxx: current knob value

yyy: next target value

DISPLAY OF RESULTS

```
OK 08: KnobA-2 >A >B >C >1 >2 OK
OK OK OK OK OK
```

NG (No change in the message on the display)

TEST END

The test ends after the results have been displayed. When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T9. SLIDER 1-4

```
09: Slider1-4
```

Move each slider in the following order: Down 0 (0-1); Up 127 (126-127); Down 0 (0-1), according to the instruction on the LCD. Check that the numbers change sequentially and that “OK” appears as the result. Begin the check from the specified slider. The mark [>] will appear to the left of the value of the slider being checked.

```
09: Slider1-4 CS1 CS2 CS3 CS4 yyy
xxx xxx>xxx xxx
```

xxx: current slider value

yyy: next target value

DISPLAY OF RESULTS

```
OK 09: Slider1-4 CS1 CS2 CS3 CS4 OK
OK OK OK OK
```

NG (No change in the message on the display)

TEST END

The test ends after the result is displayed. When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T12. CONTROLLER

```
12: Controller
```

xxx: current knob value

Move the PITCH BENDER, MODULATION WHEEL, RIBBON and AFTER TOUCH controllers according to the instructions on the LCD as described below. Check that the numbers change sequentially and that “OK” appears as the result.

PITCH BENDER: move this controller in the following order: Center (63-65); Up (126-127); Down (0-1); Center (63-65).

RIBBON: move this controller in the following order: Left (6-11); Right (103-108); Left(6-11); and then release it at (122-127).

MODULATION WHEEL: move this controller in the following order: Right (0-1); Up (126-127); Down (0-1).

AFTER TOUCH: operate this controller in the following order: Release (0-5); Push (104-109); and Release (0-5).

```
12: Controller      PB  MW> RB  AT  yyy
      >xxx xxx xxx xxx
```

xxx: current controller value
yyy: next target value

DISPLAY OF RESULTS

```
OK 12: Controller      PB  MW> RB  AT  OK
      xxx xxx xxx xxx
```

NG (No change in the message on the display)

TEST END

The test ends after the result is displayed. When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T13. FOOT CONT, SW

```
13: Foot Cont, SW
```

Operate the FOOT VOLUME, FOOT CONTROLLER, SUSTAIN SWITCH and FOOT SWITCH according to the instruction on the LCD as described below. Check that the numbers change and that “OK” appears as the result.

Release 0 (0-2); Push In 127 (125-127); and Release 0 (0-2). Turn On (0) and Off (1) the SUSTAIN SWITCH and FOOT SWITCH.

FOOT VOLUME: Release (0-2); Push In (125-127); Release (0-2)

FOOT CONTROLLER: same as the above

SUSTAIN SWITCH: On (0); Off (1)

FOOT SWITCH: same as the above

```
13: Foot Cont, SW      FV  FC  SUS  FS  0
      xxx xxx x  x
```

xxx: current controller value
yyy: next target value

DISPLAY OF RESULTS

```
OK 13: Foot Cont, SW      FV  FC  SUS  FS  OK
      OK  OK  OK  OK
```

NG (No change in the message on the display)

TEST END

The test ends after the result is displayed. When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T14. BREATH CONTROLLER

```
14: Breath Controller
```

xxx: current value of the breath controller

Operate the breath controller in the following order: Not blowing (122-127) - Blowing (0-5) - Not blowing (122-127) - Not blowing - Blowing - Not blowing, remove the jack when “EXTRACT PLUG!” appears on the LCD. At this time, check that the plug is not plugged in, the numbers change sequentially and that “OK” appears on the LCD. (The test is “OK” when the value is 34 or less.)

```
14: Breath Controller      yyy
      xxx
```

xxx: current controller value
yyy: next target value

DISPLAY OF RESULTS

OK

14: Breath Controller	OK xxx
-----------------------	-----------

NG (No change in the message on the display)

TEST END

The test ends after the result is displayed.

When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T15. CARD

15: CARD

Load SMART MEDIA, with its protect function turned off, and then execute the test.

If SMART MEDIA is loaded with its protect function turned on the WRPRT error message will appear.

Perform the FORMAT/WRITE/READ/VERIFY check on SMART MEDIA and check that “OK” appears as the result.

Unload SMART MEDIA and check that “NO-CARD” appears on the LCD.

DISPLAY OF RESULTS

OK

15: CARD	OK
----------	----

NG

15: CARD	NG xxxxxxx
----------	---------------

xxxxxxx: Error code

ERROR CODE

RD/WR: read/write error

NO-CARD: no card loaded

WRPRT: write protect

TEST END

The test ends after the result is displayed.

When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T16. MIDI IN/OUT/THRU

16: MIDI (IN/OUT)

Connect a MIDI cable to MID IN and OUT, and then begin testing.

If the IN and OUT check results are “OK”, connect the MIDI monitor with THRU and check that the test pattern (AA•FF•00•55) is output.

DISPLAY OF THE RESULTS

OK

16: MIDI (IN/OUT)	OK
-------------------	----

NG

16: MIDI (IN/OUT)	NG
-------------------	----

(When different data has been received)

NG

16: MIDI (IN/OUT)	NG TIMEOUT
-------------------	---------------

(When reception is not completed within the specified time)

TEST END

The test ends after the result is displayed.

When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T17. HOST SELECT

17: Host Select

Move the HOST SELECT switch according to the instructions on the LCD, and check that “OK” appears as the result.

17: Host Select Select [MIDI]

When the switch activates properly, a sine wave will be output.

If the switch is initially at the MIDI position, move it to any other position and then return it to the MIDI position.

DISPLAY OF RESULTS

OK

17: Host Select	OK
-----------------	----

NG (No change in the message on the display)

TEST END

When the test results of all switches are satisfactory, “OK” will appear on the LCD and the testing will end.

When the test result is “NG”, refer to “C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED”.

T18. TO HOST

```
18: To Host
```

Connect pin No.3 to pin No.5, and connect pin No.6 to No.8, and then execute testing.

Operate the HOST SELECT switch according to the instruction on the LCD and check that "OK" appears when [MIDI] is reached at the end.

When the HOST SELECT switch is set to the MIDI position, the "SET HOST Sw [MAC]" message will appear. Next set the HOST SELECT switch of the main unit to MAC to begin testing.

DISPLAY OF RESULTS

OK

```
18: To Host
```

 OK

NG

```
18: To Host
```

 NG

(When unexpected data is received)

NG

```
18: To Host
```

 NG
TIMEOUT

(When reception is not completed within the specified time)

TEST END

The test ends after the result is displayed.

When the test result is "NG", refer to "C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED".

T19. 1kHz OUTPUT-L

```
19: PCM SIN 1kHz L
```

Insert plugs into OUTPUT-L, OUTPUT-R, INDIV-1, INDIV-2, PHONES (L), and PHONES (R), and then connect the frequency counter, oscilloscope and AC voltmeter (with a JIS-C filter).

Set the master volume to Max and check that the following signals are output from OUTPUT-L, INDIV-1 and 2, and PHONES (L).

OUTPUT-L: 1 kHz \pm 1.5 Hz, sine wave, +6.0 \pm 2 dBm (10k ohm load)

OUTPUT-R: -72 dBm or less (10 kohm load)

INDIV-1: 1 kHz \pm 1.5 Hz, sine wave, +6.0 \pm 2 dBm (10 kohm load)

INDIV-2: -72 dBm or less (10 kohm load)

PHONES (L): 1 kHz, sine wave, +5.0 \pm 2 dBm (33 ohm load)

PHONES (R): -64 dBm or less (33 ohm load)

While sound is being output, the following message appears on the LCD.

```
19: PCM SIN 1kHz L
```

 ON
DISPLAY OF RESULTS**TEST END**

AUTO: when the [INC] switch is pressed, the sound output will stop and the next test will be executed.

MANUAL: when the [EXIT] switch is pressed, testing will end, the initial display will be restored and the next test number will be set.

T20. 1kHz OUTPUT-R

```
20: PCM SIN 1kHz R
```

Insert plugs into OUTPUT-L, OUTPUT-R, PHONES (L), and PHONES (R), and then connect the oscilloscope and AC voltmeter (with a JIS-C filter).

Set the master volume to the Max position.

Check that signals are output at OUTPUT-L, OUTPUT-R, PHONES (L), and PHONES (R) as described below. At this time, signals are output at MEL for mLAN as well.

OUTPUT-L: -72 dBm or less (10k ohm load)

OUTPUT-R: 1 KHZ \pm 1.5 Hz, sine wave, +6.0 \pm 2 dBm (10k ohm load)

INDIV-1: -72 dBm or less (10k ohm load)

INDIV-2: 1 kHz \pm 1.5 Hz, sine wave, +6.0 \pm 2 dBm (10k ohm load)

PHONES (L): -64 dBm or less (33 ohm load)

PHONES (R): 1 kHz, sine wave, +5.0 \pm 2 dBm (33 ohm load)

While sound is output, the following message appears on the LCD.

```
20: PCM SIN 1kHz R
```

 ON
DISPLAY OF RESULTS**TEST END**

AUTO: when the [INC] switch is pressed, the sound output will stop and the next test will be executed.

MANUAL: when the [EXIT] switch is pressed, testing will end, the initial display will be restored and the next test number will be set.

T21. A-D LEVEL, JACK

```
21: A/D Level
```

Set the A/D GAIN volume to the maximum level.

Input a 1 kHz sine wave of the following level through the A/D input port according to the instructions on the LCD.

MIC: -40 dBm \pm 0 dBm LINE: -6 dBm \pm 0 dBm

When a plug is connected to the jack, both "EXTRACT PLUG" appears and the A/D level appear.

When a plug is not connected and the level is 2 or lower, "INSERT PLUG" appears and when a plug is inserted, the A/D level will be indicated.

"OK" will appear when the AD level is within the following range.

MIC: 75 or greater and 85 or less

LINE: 75 or greater and 85 or less

When MIC is OK, the LINE check will be executed automatically.

```
21: A/D Level
LINE xxx
```

xxx,yyy display

DISPLAY OF RESULTS

OK 21: A/D Level OK

NG 21: A/D Level NG
MIN_LEVEL

TEST END

When the [EXIT] switch is pressed, the sound output will stop and the next test number will be set.

For the procedure to take when the test result is "NG", refer to "C. TEST SELECTION WHEN AN ERROR HAS BEEN DETECTED".

T22. A/D -> D/A

```
A/D -> D/A Gain
```

This test is used to check the signal passage from the A/D input to the D/A output.

(GAIN is set to LINE 1 in the initial settings.)

Input a 1 kHz ±5 Hz, -6.0 dBm ±0 dBm sine wave signal to each signal passage through the A/D input in the order described below. Check that the output level specified below is obtained at the output L and R respectively.

Set the A/D INPUT VOLUME knob to the Max position.

```
A/D -> D/A Gain
LINE1
```

LINE 1, LINE 2, MIC 1 and MIC 2 can be selected by using [DEC] and [INC].

With LINE 1, GAIN = LINE applies and the signal input through the A/D will be output at the D/A as is.

With LINE 2, GAIN = LINE applies and the level of the signal input through the A/D will be lowered to the specification of the main unit (-12dB) and then output at the D/A.

With MIC 1, GAIN = MIC applies and the signal input through the A/D will be output at the D/A as is.

With MIC 2, GAIN = MIC applies and the level of the signal input through the A/D will be lowered to the specification of the main unit (-12dB) and then output at the D/A.

When GAIN = Line 1, move the A/D INPUT VOLUME knob and check that the sound volume varies.

OUTPUT-L: 1 kHz ±5 Hz, sine wave, +15.0 ±2 dBm (10k ohm load) (Distortion: 1.00% or less)

OUTPUT-R: 1 kHz ±5 Hz, sine wave, +15.0 ±2 dBm (10k ohm load) (Distortion: 1.00% or less)

TEST END

When the [EXIT] switch is pressed, the sound output will stop and the next test number will be set.

T23. PLUG-IN1

T24. PLUG-IN2

```
23: Plug-In1
```

Connect the HARMONY PLUG-ON boarding into the PLUG-IN 1 slot.

After checking the connection of the PLG-IN 1 slot, the signal transmission and reception of the CONTROL LINE, and the IN/OUT of the MIDI LINE and MEL LINE, check to ensure that the output level specified below is obtained at output L and R respectively.

Set the MASTER VOLUME knob to the Max position.

OUTPUT-L: 1 kHz ±5 Hz, sine wave, +11.5 ±2 dBm (10k ohm load) (Distortion: 1.50% or less)

OUTPUT-R: 1 kHz ±5 Hz, sine wave, +11.5 ±2 dBm (10k ohm load) (Distortion: 1.50% or less)

DISPLAY OF RESULTS

OK (No change in the message on display)

NG 23: Plug-In1 NO_BOARD

xxxxxxx: Error code

Error code

NG-BOARD: a board other than the VH board is loaded.

NO-BOARD: board is not loaded.

CONTROL: CONTROL line failure

TEST END

When the [EXIT] switch is pressed, the sound output will stop and the next test number will be set.

T25. mLAN

```
25: mLAN
```

Connect the mLAN board to the mLAN slot and execute testing.

After checking the connection of the mLAN board, the signal transmission and reception of the MIDI line, the RESET request signal, and the operation of OUT + SWP30 of the MEL line by the external clock, check that "OK" appears. Also, confirm that a 900 Hz sine wave output is obtained as the final signal at OUTPUT L and R.

DISPLAY OF RESULTS

```
OK 25: mLAN OK
```

```
NG 25: mLAN NG
      x x x x x x x x
```

x x x x x x: Error code

Error code

NO-BOARD: board is not loaded.

RESET: error in the reset request signal check

MIDI: MIDI line failure

MEL: MEL OUT line failure

TEST END

When the [EXIT] switch is pressed, the sound output will stop and the next test number will be set.

T26. FACTORY SET

```
26: Factory Set
```

This test is used to restore the factory settings.

When the test is executed, the following message will appear on the LCD.

```
26: Factory Set
      [NO] or [YES] ?
```

Pressing [YES] will restore the factory settings.

Pressing [NO] will not restore the factory settings.

When the test ends properly, the sine wave sound is output momentarily.

DISPLAY OF RESULTS

When the factory settings are restored

```
OK 26: Factory Set OK
```

When the factory settings are not restored

```
NG 26: Factory Set NO SET
```

TEST END

The test ends after the result is displayed.

FACTORY SETTING DATA

After the factory settings are restored, the following data will be set.

T27. SWP Ch

```
27: SWP Ch
```

From OUTPUT-L, the sound output is repeated until the EXIT switch is pressed via the SWP64Ch on the Master side to the L channel and via the SWP64Ch on the Slave side to the R channel.

Connect the plugs to OUTPUT-L and R. Observe the output waveform using the oscilloscope to check that the level of all channels is within the below specified range.

Set the master volume to the Max position.

OUTPUT-L: 1 kHz ±1.5 Hz, sine wave

OUTPUT-R: 2 kHz ±1.5 Hz, sine wave

Also, the following message appears on the LCD during sound output.

```
27: SWP Ch Mode Ch x x x
      64
```

x x x: Sound outputting channel no.

Either 64 or 128 can be selected for the mode.

TEST END

AUTO: when the [EXIT] switch is pressed, the sound output will stop.

MANUAL: when the [EXIT] switch is pressed, the sound output will stop and the mode select standby state will be set. When the EXIT switch is pressed twice more, testing will end.

T28. EXIT

```
28: Exit
```

When testing is executed, the following message will appear on the LCD.

```
28: Exit
    [NO] or [YES] ?
```

When [YES] is pressed, testing will end.
When [NO] is pressed, the entry screen for the AUTO and MANUAL modes will be restored.

D. OTHERS

When the test mode is cancelled, the same sequence that occurred when turning on the power will be executed. Check that the on/off clicking noises of the main unit power switch is as described below.

- OUTPUT-L, R: Less than 500 mV
- INDIV-1, 2: Less than 500 mV
- PHONES-L, R: Less than 500 mV

Also, with testing cancelled check the noise level when the voice play mode is set according to the factory settings and no note has been played to confirm that it satisfies the following conditions.

Take measurements with the voltmeter (with JIS-C filter) connected.

- OUTPUT-L: Less than -82 dBm (10k ohm load)
- OUTPUT-R: Less than -82 dBm (10k ohm load)
- INDIV-1: Less than -82 dBm (10k ohm load)
- INDIV-2: Less than -82 dBm (10k ohm load)
- PHONES-L: Less than -82 dBm (33k ohm load)
- PHONES-R: Less than -82 dBm (33k ohm load)

E. Short-cut Functions

- (1) Turn on the power while pressing [PRE1] and [PRE2], and forced initialization will be executed.

```
FACTORY SET)
<<           Executing           >>
```

- (2) Turn on the power while pressing [INT] and [EXT], the version will then appear and the operating power will be restored about 5 seconds later.

```
>>>> VERSION = Int:#.## , ExtV#.## <<<<
```

- (3) Turn on the power while pressing [EXIT] and [ENTER], and the system program will be loaded from SMART MEDIA and the operating power will be restored.

```
PROGRAM LOAD)
<<           Executing           >>
```

- (4) Turn on the power while pressing [DEC] and [INC], and the wave data will be loaded from SMART MEDIA, and the operating power will be restored.

```
WAVE LOAD)
<<           Executing           >>
```


MIDI DATA FORMAT

Many MIDI messages listed in the MIDI Data Format section are expressed in hexadecimal or binary numbers. Hexadecimal numbers may include the letter "H" as a suffix. The letter "n" indicates a certain whole number. The chart below lists the corresponding decimal number for each hexadecimal/binary number.

Decimal	Hexadecimal	Binary
0	00	0000 0000
1	01	0000 0001
2	02	0000 0010
3	03	0000 0011
4	04	0000 0100
5	05	0000 0101
6	06	0000 0110
7	07	0000 0111
8	08	0000 1000
9	09	0000 1001
10	0A	0000 1010
11	0B	0000 1011
12	0C	0000 1100
13	0D	0000 1101
14	0E	0000 1110
15	0F	0000 1111
16	10	0001 0000
17	11	0001 0001
18	12	0001 0010
19	13	0001 0011
20	14	0001 0100
21	15	0001 0101
22	16	0001 0110
23	17	0001 0111
24	18	0001 1000
25	19	0001 1001
26	1A	0001 1010
27	1B	0001 1011
28	1C	0001 1100
29	1D	0001 1101
30	1E	0001 1110
31	1F	0001 1111
32	20	0010 0000
33	21	0010 0001
34	22	0010 0010
35	23	0010 0011
36	24	0010 0100
37	25	0010 0101
38	26	0010 0110
39	27	0010 0111
40	28	0010 1000
41	29	0010 1001
42	2A	0010 1010
43	2B	0010 1011
44	2C	0010 1100
45	2D	0010 1101
46	2E	0010 1110
47	2F	0010 1111
48	30	0011 0000
49	31	0011 0001
50	32	0011 0010
51	33	0011 0011
52	34	0011 0100
53	35	0011 0101
54	36	0011 0110
55	37	0011 0111
56	38	0011 1000
57	39	0011 1001
58	3A	0011 1010
59	3B	0011 1011
60	3C	0011 1100
61	3D	0011 1101
62	3E	0011 1110
63	3F	0011 1111

Decimal	Hexadecimal	Binary
64	40	0100 0000
65	41	0100 0001
66	42	0100 0010
67	43	0100 0011
68	44	0100 0100
69	45	0100 0101
70	46	0100 0110
71	47	0100 0111
72	48	0100 1000
73	49	0100 1001
74	4A	0100 1010
75	4B	0100 1011
76	4C	0100 1100
77	4D	0100 1101
78	4E	0100 1110
79	4F	0100 1111
80	50	0101 0000
81	51	0101 0001
82	52	0101 0010
83	53	0101 0011
84	54	0101 0100
85	55	0101 0101
86	56	0101 0110
87	57	0101 0111
88	58	0101 1000
89	59	0101 1001
90	5A	0101 1010
91	5B	0101 1011
92	5C	0101 1100
93	5D	0101 1101
94	5E	0101 1110
95	5F	0101 1111
96	60	0110 0000
97	61	0110 0001
98	62	0110 0010
99	63	0110 0011
100	64	0110 0100
101	65	0110 0101
102	66	0110 0110
103	67	0110 0111
104	68	0110 1000
105	69	0110 1001
106	6A	0110 1010
107	6B	0110 1011
108	6C	0110 1100
109	6D	0110 1101
110	6E	0110 1110
111	6F	0110 1111
112	70	0111 0000
113	71	0111 0001
114	72	0111 0010
115	73	0111 0011
116	74	0111 0100
117	75	0111 0101
118	76	0111 0110
119	77	0111 0111
120	78	0111 1000
121	79	0111 1001
122	7A	0111 1010
123	7B	0111 1011
124	7C	0111 1100
125	7D	0111 1101
126	7E	0111 1110
127	7F	0111 1111

Additional Notes

For example, 144 - 159(Decimal)/9nH/1001 0000 - 1001 1111(Binary) indicate the note-on messages for the channels 1 through 16 respectively. 176 - 191/BnH/1011 0000 - 1011 1111 indicate the control change messages for the channels 1 through 16 respectively. 192 - 207/CnH/1100 0000 - 1100 1111 indicate the program change messages for the channels 1 through 16 respectively. 240/F0H/1111 0000 is positioned at the beginning of data to indicate a system exclusive message. 247/F7H/1111 0111 is positioned at the end of the system exclusive message.

aaH(Hexadecimal)/0aaaaaaA(Binary) indicates the data addresses. The data address consists of High, Mid and Low.

bbH/0bbbbbbb indicates byte counts.

ccH/0ccccccc indicates tcheck sums.

ddH/0ddddddd indicates data/value.

SYNTHESIZER/SEQUENCER PART

1) TRANSMIT FLOW

MIDI	<-[SW1]	-----	NOTE ON/OFF	9nH
OUT				
			---- CONTROL CHANGE	
			MODULATION	BnH,01H
			PORTAMENTO TIME	BnH,05H (CS6x only)
			PAN	BnH,0AH (CS6x only)
			SUSTAIN SWITCH	BnH,40H
			PORTAMENTO SWITCH	BnH,41H (CS6x only)
			FILTER RESONANCE	BnH,47H (CS6x only)
			EG RELEASE TIME	BnH,48H (CS6x only)
			EG ATTACK TIME	BnH,49H (CS6x only)
			FILTER CUTOFF FREQ	BnH,4AH (CS6x only)
			EG DECAY TIME	BnH,4BH (CS6x only)
			REVERB SEND	BnH,5BH (CS6x only)
			CHORUS SEND	BnH,5DH (CS6x only)
			ASSIGNABLE CONTROLLER	BnH,(00H .. 5FH)
			FOOT VOLUME	BnH,(07H or 0BH)
			--[SW8]--BANK SEL MSB	BnH,00H
			BANK SEL LSB	BnH,20H
			--[SW2]--EG SUSTAIN LEVEL	BnH,1FH (CS6x only)
			---- PROGRAM CHANGE	CnH
			---- CHANNEL AFTER TOUCH	DnH
			---- PITCH BEND CHANGE	EnH
			--[SW3,4]--SYSTEM REALTIME MESSAGE	
			TIMING CLOCK	F8H
			--[SW4]--SYSTEM REALTIME MESSAGE	
			START	FAH
			CONTINUE	FBH
			STOP	FCH
			--[SW5]--SYSTEM EXCLUSIVE MESSAGE	
			--[SW6]--SAMPLE DUMP STANDARD	
			DUMP REQUEST	FOH 7EH nnH 03H ssH ssH F7H
			ACK	FOH 7EH nnH 7FH ppH F7H
			NK	FOH 7EH nnH 7EH ppH F7H
			CANCEL	FOH 7EH nnH 7DH ppH F7H
			WAIT	FOH 7EH nnH 7CH ppH F7H
			--[SW7]--<BULK DUMP>	FOH 43H 0nH 64H bhH blH ahH amH alH ddH....ddH ccH F7H
			--[SW7]--<PARAMETER CHANGE>	FOH 43H 1nH 64H ahH amH alH ddH....ddH F7H
			----- SYSTEM EXCLUSIVE MESSAGE	
			IDENTITY REPLY	FOH 7EH 7FH 06H 02H 43H 00H 41H 2DH 02H 00H 00H 00H 01H F7H
			----- ACTIVE SENSING	FEH
[SW1]	MIDI Transmit Channel			
	Master Keyboard Mode = on: complies with Zone Transmit Channel.			
	Master Keyboard Mode = off: complies with Keyboard Transmit Channel.			
	The data played back using Sequencer Part will be output through the channels set for the sequence data, ignoring [SW1] settings.			
	CS6R transmits BC and A-C/1-2 of ASSIGNABLE CONTROLLER, and the data from the Sequencer Part. [SW2] MIDI Control Mode			
[SW3]	MIDI Sysx			
[SW4]	MIDI Control			
[SW5]	MIDI Device Number			
	When set to all, data will be output through the channel 1.			
[SW6]	PHRASE CLIP MODE JOB only. Not available on S80.			
[SW7]	In the VOICE MODE, VOICE related data only. In the PERFORMANCE MODE, PERFORMANCE related data only.			
	SYSTEM data will be transmitted/received in all modes.			
[SW8]	SYSTEM Bank Select Switch			

2) RECEIVE FLOW

```

MIDI >-[SW11]---- NOTE OFF          8nH
      |
      |---- NOTE ON/OFF              9nH
      |
      |---- CONTROL CHANGE
      |
      |---- MODULATION                BnH,01H
      |---- PORTAMENTO TIME            BnH,05H
      |---- DATA ENTRY MSB           BnH,06
      |---- DATA ENTRY LSB           BnH,26H
      |---- MAIN VOLUME               BnH,07H
      |---- PAN                       BnH,0AH
      |---- EXPRESSION                 BnH,0BH
      |---- SUSTAIN SWITCH             BnH,40H
      |---- PORTAMENTO SWITCH          BnH,41H
      |---- SOSTENUTO                 BnH,42H
      |---- HARMONIC CONTENT           BnH,47H
      |---- EG RELEASE TIME            BnH,48H
      |---- EG ATTACK TIME            BnH,49H
      |---- BRIGHTNESS                 BnH,4AH
      |---- EG DECAY TIME              BnH,4BH
      |---- PORTAMENTO CONTROL         BnH,54H
      |---- EFFECT1 DEPTH              BnH,5BH
      |---- EFFECT3 DEPTH              BnH,5DH
      |---- DATA ENTRY INC            BnH,60H
      |---- DATA ENTRY DEC            BnH,61H
      |---- ASSIGNABLE CONTROLLER     BnH,(00H..5FH)
      |
      |---- RPN
      |
      |---- PITCH BEND SENS            BnH,64H,00H,65H,00H,06H,mmH
      |---- FINE TUNING                BnH,64H,01H,65H,00H,06H,mmH,26H,11H *1
      |---- COARSE TUNING              BnH,64H,02H,65H,00H,06H,mmH *1
      |---- RPN RESET                 BnH,64H,7FH,65H,7FH
      |---- ALL SOUND OFF              BnH,78H
      |---- RESET ALL CONTROLLERS     BnH,79H
      |---- ALL NOTE OFF              BnH,7BH
      |---- OMNI MODE OFF              BnH,7CH
      |---- OMNI MODE ON               BnH,7DH
      |---- MONO MODE                  BnH,7EH
      |---- POLY MODE                  BnH,7FH
      |
      |----[SW2]--EG SUSTAIN LEVEL     BnH,1FH
      |
      |----[SW8]--BANK SEL MSB         BnH,00H
      |---- BANK SEL LSB               BnH,20H
      |
      |----[SW9]--PROGRAM CHANGE      CnH
      |
      |----CHANEL AFTER TOUCH         DnH
      |
      |----PITCH BEND CHANGE          EnH
      |
      |---- SYSTEM EXCLUSIVE MESSAGE
      |---- IDENTITY REQUEST           FOH 7EH 0nH 06H 01H F7H
      |---- REMOTE SWITCH              FOH 43H 10H 64H 0AH 00H a1H ddH F7H
      |
      |----[SW12]- GM MODE ON          FOH 7EH 7FH 09H 01H F7H
      |
      |----[SW5]+ SYSTEM EXCLUSIVE MESSAGE
      |---- MIDI MASTER VOLUME        FOH 7FH 7FH 04H 01H 11H mmH F7H
      |
      |----[SW6]--SAMPLE DUMP STANDARD
      |---- DUMP HEADER                FOH 7EH nnH 01H esH ssH ddH...ddH F7H
      |---- DATA PACKET                FOH 7EH nnH 02H kKH ddH...ddH cCH F7H
      |---- CANCEL                      FOH 7EH nnH 7DH pPH F7H
      |
      |----[SW10]-<BULK DUMP>          FOH 43H 0nH 64H bhH b1H ahH amH a1H ddH...ddH cCH F7H
      |
      |----[SW7]--<PARAMETER CHANGE> FOH 43H 1nH 64H ahH amH a1H ddH...ddH F7H
      |
      |----[SW7]--<BULK DUMP REQUEST> FOH 43H 2nH 64H ahH amH a1H ddH...ddH F7H
      |
      |----[SW7]--<PARAMETER REQUEST> FOH 43H 3nH 64H ahH amH a1H F7H
      |
      |----[SW12]-XG SYSTEM ON         FOH 43H 1nH 4CH 00H 00H 7EH 00H F7H
      |
      |----[SW3]----- SYSTEM REALTIME MESSAGE
      |---- TIMING CLOCK               F8H
      |
      |----[SW4]----- SYSTEM REALTIME MESSAGE
      |---- START                       FAH
      |---- CONTINUE                     FBH
      |---- STOP                         FCH
      |
      |----ACTIVE SENSING              FEH
  
```

```

[SW2] MIDI Control Mode
[SW3] MIDI Sync
[SW4] MIDI Control
[SW5] MIDI Device Number
When set to the number other than off, MIDI MASTER VOLUME will be received.
[SW6] PHRASE CLIP MODE JOB only. Not available on S80.
[SW7] In the VOICE MODE, VOICE related data only. In the PERFORMANCE MODE, PERFORMANCE
related data only.
SYSTEM data will be transmitted/received in all modes.
[SW8] SYSTEM Bank Select Switch
[SW9] SYSTEM Program Change Switch (Received only in the Play Mode when Voice Mode or
Phrase Clip Mode is selected.)
[SW10] SYSTEM Bulk Protect and the conditions mentioned in SW7 above.
[SW11] MIDI Receive Channel and Receive Filter.
In Performance Mode, complies with Part Receive Channel and Part Receive Switch.
In the modes other than Performance Mode, complies with Basic Receive Channel.
[SW12] SYSTEM Receive GM/XG On
*1 Performance Mode only.
  
```

3) TRANSMIT/RECEIVE DATA

(3-1) CHANNEL VOICE MESSAGES

CS6R transmits BC and A-C/1-2 of ASSIGNABLE CONTROLLER, and the data from the Sequencer Part.

(3-1-1) NOTE OFF

```

STATUS      1000nnnn(8nH)  n = 0 ~ 15 CHANNEL NUMBER
NOTE NUMBER 0kkkkkkk      k = 0 (C-2) ~ 127 (G8)
VELOCITY    0vvvvvvv      ignores *v*
Receive only.
  
```

(3-1-2) NOTE ON/OFF

```

STATUS      1001nnnn(9nH)  n = 0 ~ 15 CHANNEL NUMBER
NOTE NUMBER 0kkkkkkk      k = 0 (C-2) ~ 127 (G8)
VELOCITY    0vvvvvvv(v#0)  NOTE ON
              0vvvvvvv(v=0)  NOTE OFF
  
```

(3-1-3) CONTROL CHANGE

```

STATUS      1011nnnn(BnH)  n = 0 ~ 15 CHANNEL NUMBER
CONTROL NUMBER 0ccccccc
CONTROL VALUE 0vvvvvvv
  
```

```

* TRANSMITTED CONTROL NUMBER
c = 0 BANK SEL MSB           ; v = 0,63,127
c = 32 BANK SEL LSB         ; v = 0,1,8,9,24,25,32,40,41,64,65 *3
c = 1 MODULATION            ; v = 0 - 127
c = 5 PORTAMENTO TIME        ; v = 0 - 127 *4
c = 7 MAIN VOLUME           ; v = 0 - 127
c = 10 PAN                   ; v = 0 - 127 *4
c = 11 EXPRESSION            ; v = 0 - 127
c = 31 EG SUSTAIN LEVEL      ; v = 01-64 - 64:0 - 127:+63 *4,*5
c = 64 SUSTAIN SWITCH        ; v = 0, 127
c = 65 PORTAMENTO SWITCH     ; v = 0-63:OFF , 64-127:ON *4
c = 71 FILTER RESONANCE     ; v = 01-64 - 64:0 - 127:+63 *4
c = 72 EG RELEASE TIME      ; v = 01-64 - 64:0 - 127:+63 *4
c = 73 EG ATTACK TIME       ; v = 01-64 - 64:0 - 127:+63 *4
c = 74 FILTER CUTOFF FREQ   ; v = 01-64 - 64:0 - 127:+63 *4
c = 75 EG DECAY TIME        ; v = 01-64 - 64:0 - 127:+63 *4
c = 91 REVERB SEND           ; v = 0 - 127 *4
c = 93 CHORUS SEND          ; v = 0 - 127 *4
c = 0..95 ASSIGNABLE CONTROLLER ; v = 0 - 127 *6
The Sequencer Part will play back all the recorded control change messages.
  
```

```

* RECEIVED CONTROL NUMBER
c = 0 BANK SEL MSB           ; v = 0 - 127 *3
c = 32 BANK SEL LSB         ; v = 0 - 127 *3
c = 1 MODULATION            ; v = 0 - 127
c = 5 PORTAMENTO TIME        ; v = 0 - 127 *2
c = 6 DATA ENTRY MSB       ; v = 0 - 127 *1
c = 38 DATA ENTRY LSB      ; v = 0 - 127 *1
c = 7 MAIN VOLUME           ; v = 0 - 127
c = 10 PAN                   ; v = 0 - 127
c = 11 EXPRESSION            ; v = 0 - 127
c = 31 EG SUSTAIN LEVEL      ; v = 01-64 - 64:0 - 127:+63 *2,*5
c = 64 SUSTAIN SWITCH        ; v = 0-63:OFF , 64-127:ON *2
c = 65 PORTAMENTO SWITCH     ; v = 0-63:OFF , 64-127:ON *2
c = 66 SOSTENUTO            ; v = 0-63:OFF , 64-127:ON *2
c = 71 HARMONIC CONTENT      ; v = 01-64 - 64:0 - 127:+63
c = 72 EG RELEASE TIME      ; v = 01-64 - 64:0 - 127:+63
c = 73 EG ATTACK TIME       ; v = 01-64 - 64:0 - 127:+63
c = 74 BRIGHTNESS           ; v = 01-64 - 64:0 - 127:+63
c = 75 EG DECAY TIME        ; v = 01-64 - 64:0 - 127:+63 *2
c = 84 PORTAMENTO CONTROL    ; v = 0 - 127 *2
c = 81 EFFECT1 DEPTH        ; v = 0 - 127
c = 93 EFFECT3 DEPTH        ; v = 0 - 127
c = 96 DATA ENTRY INC      ; v = 127 *1
c = 97 DATA ENTRY DEC      ; v = 127 *1
c = 0..95 ASSIGNABLE CONTROLLER ; v = 0 - 127 *6
c = 0..95 ARPEGGIO SW       ; v = 0-63:OFF , 64-127:ON *6
c = 0..95 ARPEGGIO HOLD     ; v = 0-63:OFF , 64-127:ON *6
  
```

*1 Used only when a value is set using RPN.
*2 Invalid with Drum Voices.
*3 Relation between BANK CHANGE and PROGRAM is as follows:

CATEGORY	MSB	LSB	PROGRAM No	Displayed on LCD
Normal Voice	Internal	0	0	0..127 (1..128)
Drum Voice	Internal	127	0	0..1 (1..2)
Normal Voice	Preset 1	63	0	0..127 (1..128)
Normal Voice	Preset 2	63	1	0..127 (1..128)
Plug-in Voice	Internal	63	8	0..127 (1..128)
	External	63	9	0..127 (1..128)
Drum Voice	Plug-in 1	63	24	0..63 (1..64)
	Plug-in 2	63	25	0..63 (1..64)
Performance	Preset	63	32	0..7 (1..8)
	Internal	63	40	0..1 (1..2)
	External	63	41	0..1 (1..2)
Phrase Clip	Internal	63	64	0..127 (1..128)
	External	63	65	0..63 (1..64)
	Internal	63	104	0..3 (1..4)

```

*4 CS6x only.
*5 Transmitted/received only when MODE2 is selected in CONTROL CHANGE MODE.
*6 The default CONTROL NUMBERS of ASSIGNABLE CONTROLLER are as follows:
BREATH CONTROLLER      2
FOOT CONTROLLER        4 (Transmit: CS6x and S80 only)
SCENE CONTROL          14 (Transmit/Receive: CS6x only)
KNOB 1                 16
KNOB 2                 17
KNOB A                 18
KNOB B                 19
KNOB C                 20
RIBBON CONTROLLER     22 (Transmit: CS6x only)
CONTROL SLIDER        7 (Transmit/Receive: S80 only)
FOOT SWITCH           88 (Transmit: CS6x, S80 only)
ARPEGGIO HOLD        89 (Transmit: CS6x only)
ARPEGGIO SWITCH      90 (Transmit: CS6x only)
  
```

PORTAMENTO TIME sets the time it takes for the pitch to reach the next note played when PORTAMENTO SWITCH is set to on.
PAN position relatively changes according to the preset value for each voice.
In PORTAMENTO CONTROL, PORTAMENTO TIME is fixed to 0.
EFFECT1 DEPTH controls reverb send level.
EFFECT3 DEPTH controls chorus send level.
HARMONIC CONTENT adjusts the resonance preset for each voice.
Setting a value adds to or subtracts from the center value, 64, since it is an offset parameter.
The larger the value more resonant sound will be produced. The effective range may be narrower than the range you can designate depending on the selected voice.
The parameters, EG ATTACK TIME, EG DECAY TIME, EG SUSTAIN LEVEL, EG RELEASE TIME adjust the envelopes preset for each voice.
Setting these values add to or subtract from the center value, 64, since these are offset parameters.
BRIGHTNESS adjusts the cutoff frequency preset for each voice.
Setting a value adds to or subtracts from the center value, 64, since it is an offset parameter.
The smaller the value the cutoff frequency will be lowered. The effective range may be narrower than the range you can designate depending on the selected voice.

nk Select will be actually executed when the Program Change message is received.
nk Select and Program Change numbers that are not supported by Yamaha will be nored.

PROGRAM CHANGE
STATUS 1100nnnn(CnH) n = 0 ~ 15 CHANNEL NUMBER
PROGRAM NUMBER 0pppppppp p = 0 ~ 127

CHANNEL AFTER TOUCH
STATUS 1101nnnn(DnH) n = 0 ~ 15 CHANNEL NUMBER
VALUE 0vvvvvvvv v = 0 ~ 127 AFTER TOUCH VALUE

PITCH BEND CHANGE
STATUS 1110nnnn(EnH) n = 0 ~ 15 CHANNEL NUMBER
LSB 0vvvvvvvv PITCH BEND CHANGE LSB
MSB 0vvvvvvvv PITCH BEND CHANGE MSB
Transmitted with a resolution of 7 bits.

ANNEL MODE MESSAGES
STATUS 1011nnnn(BnH) n = 0 ~ 15 CHANNEL NUMBER
CONTROL NUMBER 0ccccccc c = CONTROL NUMBER
CONTROL VALUE 0vvvvvvvv v = DATA VALUE

LL SOUNDS OFF (CONTROL NUMBER = 78H, DATA VALUE = 0)
All the sounds currently played including the channel messages such as note-on and hold-on in a certain channel are muted when receiving this message.

RESET ALL CONTROLLERS (CONTROL NUMBER = 79H, DATA VALUE = 0)
Resets the values set for the following controllers.
PITCH BEND CHANGE 0 (center)
CHANNEL AFTER TOUCH 0 (minimum)
MODULATION 0 (minimum)
EXPRESSION 127 (maximum)
BREATH CONTROLLER 127 (maximum)
FOOT CONTROLLER 127 (maximum)
RIBBON CONTROLLER 0 (center)
KNOB 1 0 (center)
KNOB 2 0 (center)
SUSTAIN SWITCH 0 (off)
SOSTENUTO SWITCH 0 (off)
RPN Not assigned; No change
PORTAMENT CONTROL Resets the source note number

Doesn't reset the following data:
PROGRAM CHANGE, BANK SELECT MSB/LSB, VOLUME, PAN.
HARMONIC CONTENT, SUSTAIN LEVEL, RELEASE TIME, ATTACK TIME, DECAY TIME, BRIGHTNESS
EFFECT SEND LEVEL 1, EFFECT SEND LEVEL 3, PORTAMENTO SWITCH
PITCH BEND SENSITIVITY, FINE TUNING, COARSE TUNING
ASSIGNABLE CONTROLLER

LL NOTES OFF (CONTROL NUMBER = 7BH, DATA VALUE = 0)
All the notes currently set to on in certain channel(s) are muted when receiving this message. However, if Sustain or Sostenuto is on, notes will continue sounding until these are turned off.

MMNI MODE OFF (CONTROL NUMBER = 7CH, DATA VALUE = 0)
Performs the same function as when receiving ALL NOTES OFF.
Sets VOICE RECEIVE CHANNEL to *OWNI OFF,* channel 1.

MMNI MODE ON (CONTROL NUMBER = 7DH, DATA VALUE = 0)
Performs the same function as when receiving ALL NOTES OFF.
Sets VOICE RECEIVE CHANNEL to *OWNI ON.*

MONO (CONTROL NUMBER = 7EH, DATA VALUE = 0..16)
Performs the same function as when receiving ALL SOUNDS OFF. If the 3rd byte (mono) is within 0 through 16, the channel will be Mode4(m = 1).
In VOICE MODE, the mode can be Mode2(m=1) according to VOICE RECEIVE CHANNEL.

OLY (CONTROL NUMBER = 7FH, DATA VALUE = 0)
Performs the same function as when receiving ALL SOUNDS OFF. The channel will be Mode3.
In VOICE MODE, the mode can be Model according to VOICE RECEIVE CHANNEL.

SISTERED PARAMETER NUMBER
STATUS 1011nnnn(EnH) n = 0 ~ 15 CHANNEL NUMBER
LSB 01100100(64H)
RPN LSB 0pppppppp p = RPN LSB(Refer to the table as shown below)
MSB 01100101(65H)
RPN MSB 0qqqqqqqq q = RPN MSB(Refer to the table as shown below)
DATA ENTRY MSB 0000110(06H)
DATA VALUE 0mmmmmmm m = Data Value
DATA ENTRY LSB 00100110(26H)
DATA VALUE 01111111 1 = Data Value

First, designate the parameter using RPN MSB/LSB numbers. Then, set its value with data entry MSB/LSB.

RPN D.ENTRY
LSB MSB MSB LSB PARAMETER NAME DATA RANGE

00H 00H mmH --- PITCH BEND SENSITIVITY 00H - 18H (0 - 24 semitones)
01H 00H mmH 11H MASTER FINE TUNE (mmH,11H)={00H,00H}-{40H,00H}-{7FH,7FH}
(-8192/100/8192) - 0 - (+8192/100/8192)
02H 00H mmH --- MASTER COARSE TUNE 28H - 40H - 58H (-24 - 0 - +24 semitones)
7FH 7FH --- RPN RESET RPN numbers will be left not designated.
The internal values are not affected.

I-REGISTERED PARAMETER NUMBER

There are no applicable parameters.

TEM REAL TIME MESSAGES

CTIVE SENSING

STATUS 11111110(FEH)

Transmitted at every 200 msec.
Once this code is received, the instrument starts sensing. When no status nor data is received for over approximately 350 ms, MIDI receiving buffer will be cleared, and the sounds currently played and the sustain are forcibly turned off. In this case, each control data will be reset to a certain value.

TEM EXCLUSIVE MESSAGE

IVERSAL NON REALTIME MESSAGE

-6-1-1)GENERAL MIDI MODE ON

FOH 7EH 7FH 09H 01H F7H

Received only when SYSTEM Receive GM/XG on is set to on in PERFORMANCE MODE. The Part values will be reset according to the SYSTEM Internal Part settings.

(3-6-1-2)IDENTITY REQUEST(Receive only)

FOH 7EH 0nH 06H 01H F7H ("n" = Device No.However, this instrument receives under "omni.")

(3-6-1-3)IDENTITY REPLY (Transmit only)

FOH 7EH 7FH 06H 02H 43H 00H 41H ddH ddH 00H 00H 01H F7H

dd:Device Number Code
CSEx: 5C 03
CSGR: 5D 03
S80: 5E 03

(3-6-2)UNIVERSAL REALTIME MESSAGE

(3-6-2-1) MIDI MASTER VOLUME

FOH 7FH 7FH 04H 01H 11H mmH F7H

Sets the MASTER VOLUME value.
The value "mm" is used to set the master volume (the value "11" should be ignored).

(3-6-3)PARAMETER CHANGE

(3-6-3-1) XG SYSTEM ON

11110000	F0	Exclusive status
1000011	43	YAMAHA ID
0001nnnn	1n	device Number
1001100	4C	Model ID
0aaaaaaa	0	Address High
0aaaaaaa	0	Address Mid
0aaaaaaa	7E	Address Low
0	0	Data
11110111	F7	End of Exclusive

Received only when SYSTEM Receive GM/XG on is set to on in PERFORMANCE MODE. The Part values will be reset according to the SYSTEM Internal Part settings.
Be aware that executing this message takes ca. 170ms and that, therefore, a certain interval before executing the following message is needed.

(3-6-3-2) NATIVE PARAMETER CHANGE, REMOTE SWITCH

11110000	F0	Exclusive status
1000011	43	YAMAHA ID
0001nnnn	1n	device Number
01100100	64	Model ID
0aaaaaaa	aaaaaa	Address High
0aaaaaaa	aaaaaa	Address Mid
0aaaaaaa	aaaaaa	Address Low
0ddddd	ddddd	Data
11110111	F7	End of Exclusive

For parameters with data size of 2 or more, the appropriate number of data bytes will be transmitted.
See the following MIDI Data Table for Address and Byte Count.
Always received no matter which device number is selected, in the case of REMOTE SWITCH.

(3-6-4)BULK DUMP

11110000	F0	Exclusive status
1000011	43	YAMAHA ID
0000nnnn	0n	device Number
01100100	64	Model ID
0bbbbbbb	bbbbbbb	Byte Count
0bbbbbbb	bbbbbbb	Byte Count
0aaaaaaa	aaaaaaa	Address High
0aaaaaaa	aaaaaaa	Address Mid
0aaaaaaa	aaaaaaa	Address Low
0	0	Data
0ccccccc	ccccccc	Check-sum
11110111	F7	End of Exclusive

See the following MIDI Data Table for Address and Byte Count.
The Check sum is the value that results in a value of 0 for the lower 7 bits when the Byte Count, Start Address, Data and Check sum itself are added.

(3-6-5) DUMP REQUEST

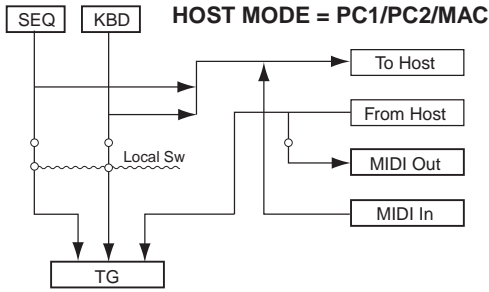
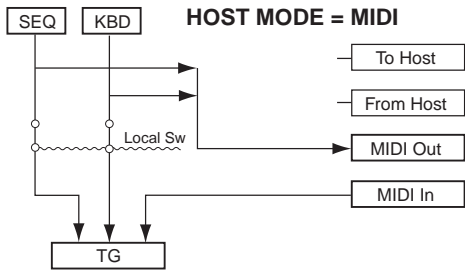
11110000	F0	Exclusive status
01000011	43	YAMAHA ID
0010nnnn	2n	device Number
01100100	64	Model ID
0aaaaaaa	aaaaaaa	Address High
0aaaaaaa	aaaaaaa	Address Mid
0aaaaaaa	aaaaaaa	Address Low
11110111	F7	End of Exclusive

See the following MIDI Data Table for Address and Byte Count.

(3-6-6) PARAMETER REQUEST

11110000	F0	Exclusive status
01000011	43	YAMAHA ID
0011nnnn	3n	device Number
01100100	64	Model ID
0aaaaaaa	aaaaaaa	Address Hig
0aaaaaaa	aaaaaaa	Address Mid
0aaaaaaa	aaaaaaa	Address Low
11110111	F7	End of Exclusive

See the following MIDI Data Table for Address and Byte Count.



Although three types of note on/note off data, received via MIDI, played by the internal sequencer and played on the keyboard will be distinguished, the other controllers (channel messages) equally affect the entire notes.

ALL SOUNDS OFF clears all the sounds in the specific channel(s) played by both the keyboard and the data via MIDI.
ALL NOTES OFF received via MIDI clears the sounds in the specific channel(s) played via MIDI.

Function...	Transmitted	Recognized	Remarks
Basic Channel Default Changed	1 - 16 1 - 16	1 - 16 1 - 16	Memorised
Mode Default Messages Altered	3 X *****	1 1 - 4 (m=1) *2 X	Memorised
Note Number : True voice	0 - 127 *****	0 - 127 0 - 127	Transpose
Velocity Note ON Note OFF	O 9nH, v=1-127 X 9nH, v=0	O v=1-127 X	
After Touch Key's Ch's	X O	X O *1	
Pitch Bend	O	O *1	
Control Change 0,32 1,7,11 5,10 6,38 64 65 66 71-75 91,93 96-97 100-101 1-95	O O X X O X X X X X X X O	O O O O O O O O O O O O O O	*1 *1 *1 *1 *1 *1 *1 *1 *1 *1 *1 *1 *1 *1 Bank Select Data Entry Sustain Sw Portamento Sw Sostenuto Sound Controller Effect Depth RPN Inc,Dec RPN LSB,MSB Assignable Cntrl
Prog Change : True #	O 0 - 127 *1 *****	O 0 - 127 0 - 127	
System Exclusive	O	O	
Common : Song Pos. : Song Sel. : Tune	X X X	X X X	
System : Clock Real Time : Commands	X X	O X	
Aux : All Sound Off : Reset All Cntrls : Local ON/OFF Mes- : All Notes OFF sages: Active Sense : Reset	X X X X O X	O (120,126,127) O (121) X O (123-125) O X	
Notes:	*1 receive if switch is on. *2 m is always treated as "1" regardless of its value.		

Mode 1 : OMNI ON , POLY
Mode 3 : OMNI OFF, POLYMode 2 : OMNI ON , MONO
Mode 4 : OMNI OFF, MONOO : Yes
X : No

YAMAHA [Music Synthesizer --- seq. part]
 Model S80 MIDI Implementation Chart

Date :13-JUL-1999
 Version : 1.0

Function...	Transmitted	Recognized	Remarks
Basic Channel Default Changed	1 - 16 X	X X	Memorised
Mode Default Messages Altered	X X *****	X X X	
Note Number : True voice	0 - 127 *****	X X	
Velocity Note ON Note OFF	O 9nH,v=1-127 X 9nH,v=0	X X	
After Touch Key's Ch's	O O	X X	
Pitch Bend	O	X	
Control Change 0-121	O	X	
Prog Change : True #	O 0 - 127 *****	X	
System Exclusive	O	X	
Common : Song Pos. : Song Sel. : Tune	X X X	X X X	
System : Clock Real Time : Commands	O *2 O *2	O *1 *2 O *2	
Aux : All Sound Off : Reset All Cntrls : Local ON/OFF Mes- : All Notes OFF sages: Active Sense : Reset	O O O O O X	X X X X X X	
Notes: *1 if MIDI sync is midi *2 if MIDI control in is on			

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

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

O : Yes
 X : No