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1. DISASSEMBLY

WHOLE ASS' Y (1/3)

POWER SW KNOB (X1)

LCD WINDOW

ROTARY VR KNOB (X10)

FADER KNOB (X13)
POWER SUPPLY PCB ASS'Y

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-117V</td>
<td>220/230,240V</td>
</tr>
<tr>
<td>FU1 250V 200mA</td>
<td>250V T125mA</td>
</tr>
<tr>
<td>FU2 125V 1.6A</td>
<td>250V T1.0A</td>
</tr>
<tr>
<td>FU3 125V 1.6A</td>
<td>250V T1.0A</td>
</tr>
<tr>
<td>FU4 125V 4A</td>
<td>250V T3.15A</td>
</tr>
<tr>
<td>FU5 125V 2.5A</td>
<td>250V T1.25A</td>
</tr>
</tbody>
</table>
2. BLOCK DIAGRAM
3. TEST MODE

NOTICE: This test mode uses the SRAM area which is originally used as the user program area. Before entering the TEST MODE, please save all the data via MIDI. Otherwise, all the users' data would be lost.

To start TEST MODE

Connect a MIDI cable from MIDI OUT to MIDI IN.
Power on while pressing [MISC] and [SAVE] simultaneously. Keep pressing these switches on till "168RC" appears on the LCD.

To skip NG Process

When "NG" appears, pressing [Master Mute] can skip the NG process.

MIDI: Loop back TEST.
When the circuit and cable are O.K., the test proceeds to the next item.

<table>
<thead>
<tr>
<th>MIDI IN</th>
<th>PC1-IC35(CPU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIDI OUT</td>
<td>IC35-IC36-DT1</td>
</tr>
<tr>
<td>MIDI THRU</td>
<td>PC1-IC36-DT2</td>
</tr>
</tbody>
</table>

ROM: Check sum TEST.
When the result is O.K., the test proceeds to the next item.

IC35(CPU)-all devices connected CPU address and data BUS*
ROM:IC46

RAM: RAM Verify TEST.
When the result is O.K., the test proceeds to the next item.

IC35(CPU)-all devices connected the CPU address and data BUS*
RAM:IC51 and IC52

MSP1: Read back TEST. This only checks the CPU I/F part of the LSI.
When the result is O.K., the test proceeds to the next item.
IC10

MSP2: Read back TEST. This only checks the CPU I/F part of the LSI.
When the result is O.K., the test proceeds to the next item.
IC7

MSP3: Read back TEST. This only checks the CPU I/F part of the LSI.
When the result is O.K., the test proceeds to the next item.
IC8
DSP: Read back TEST. This only checks the CPU I/F part of the LSI.
When the result is O.K., the test proceeds to the next item.
Because of the unstable power condition, some displays NG.
Then, please enter the TEST MODE again without powering off.
When you finish the TEST MODE, the system proceeds to the ordinary mode automatically. Here you can enter the TEST MODE again by pressing [MISC] and [SAVE] simultaneously.
IC38 and DRAM IC39,43

Back up Battery: Check the voltage.
When the result is O.K., the test proceeds to the next item.
BATT1

All the devices tested here are located on KLM-1901 [Main PCB]

- Devices connected CPU BUS
  - ROM: IC46
  - RAM: IC51,52
  - MSP: IC10,7,8
  - CPU BUS GLUE: IC29 Generate chip select and control dynamic wait
  - LCD controller: IC53
  - Optical I/F: IC4 & 6

- Devices controlled via serial line by CPU
  - DSP: IC38
  - SPDI/F Out: IC3

- Sampling clock Devices
  - Xtal: X1 For Internal clock
  - AUSY VCO: XM1 Generate clock from Xtal/Dig In B
  - XM2 Generate clock from Dig In B to read B data
  - XM3 Generate clock from Wclk In/Dig In A
  - XM4 Generate clock from Dig In A to read A data

- Selector: IC11
- Top VCO: IC12 Generate from 256Fs to 1024Fs
- Divider: IC16 For top VCO Div by 4

LED & SW
Step1: All LED On
Press [Master MUTE] or [\(^\)] to skip the LCD test.

Step2: SW Follow the message on the LCD to test each switch.

LCD black all
Press [Master MUTE].

LCD white all
Press [Master MUTE] or [\(^\)] to skip the VOLUME test.
VOLUME TEST
At first, set the level to center (64), then max (127) and min(00).
Press [Master MUTE] or [^] to finish the test mode.

MSP

STEP1
Every outputs sin-like wave generated by MSP1

STEP2
Every outputs sin-like wave generated by MSP2

STEP3
Every outputs sin-like wave generated by MSP3

STEP4
Every outputs saw-like wave generated by DSP
Because of the unstable power condition, some cannot sound.
Then, please enter the TEST MODE again without powering off.
When you finish the TEST MODE, the system proceeds to the ordinary
mode automatically. Here you can enter the TEST MODE again
by pressing [MISC] and [SAVE] simultaneously.

System architecture

*CD# means Circuit Diagram number

[CPUs] KLM-1901 CD#1/12, KLM-1903 CD#3/3

There are two CPUs. One works as the controller for the panel devices [LEDs,
switches,and Faders] and Changed condition of faders and switches are reported to
the main CPU via serial lines. This is the same chip as it is used on the Trinity.
The other is, called the main CPU, which works for DSPs, LCDs and MIDI.
This works with an EPROM and two SRAMs. They are saved with the back-up battery.

[System Program] KLM-1901 CD#1/12, KLMI903 CD#3/3

The main CPU uses 4MB EPROM 40pins DIP 256k x 16bit type
The sub CPU has its own ROM inside and it should be version NKS2.5.

[System Clock]

CPU’s system clock is provided from the clock of crystal oscillator.
The main CPU has 16MHz crystal and the sub CPU has 20MHz crystal.
16MHz of the main CPU’s clock is used for the LCD controller.

[DSPs] MSPs KLM-1901 CD#8/12, DAADs CD#7/12, DSP for effect CD#5/12

168RC has four DSPs. Three of them are functions for the mixer section
and the other one is functions for the effect section.
Three DSPs named MSP, developed by the KORG R&D, has its original I/O architecture,
so they need I/P LSI to connect the ordinary digital audio devices, which is called
DAAD. A DSP for effects is a standard device MN19412, which is used
on the Trinity.
This selected MISC MODE one from [INT, Dig In A, Dig In B, WCLK In].

INT : Source is 24MHz Xtal of AUSY2's block.
Dig IN A,B : The clock is extracted from Adat optical signal by each AUSY2.
WCLK IN : AUSY2 receive the WCLK source via BNC connector.
Selector : Every clocks are fed to the selector[IC11] then are transmitted to the top VCO[IC12] to generate 1024Fs which locked to a selected source. MSPs, DAADs, D/As, A/Ds and SPDI/F are all locked to this top clock.
DSP : MN19412 also locks this but needs another system clock.
This is generated by a 40MHz Xtal[X3] with this chip.
KLM-1901 CD#5/12

This is controlled by the main CPU and Controller Chip[IC53]. The drive voltage is regulated from analog -15V by IC54 on KLM-1901 main board.
It is required for the contrast adjustment. The wires of CN9A are all for the LCD module. CN6A is for the LCD contrast volume.

PCB description

KLM-1901 : Main Board placed lower case 4 layered PCB

Includes Main CPU, ROM, RAM, LCD Controller
Sampling clock VCOs,Selector
MSPs, DAADs, DSP, A/Ds, D/As, SPDI/F, adat I/Fs

KLM-1907 : Power supply placed lower case single sided PCB

Traditional dolopper style circuit is used.
Supplying : Digital +5V
            Analog +5V
            VCO +5V
            Analog +15/-15V
            Phantom +48V

KLM-1980 : Diode block only. This is for all +5V. Single sided.

KLM-1904 Analog Board Double sided PCB

Mic amp, Line amp for inputs and line amp, headphone amp LCD contrast volume are located.

KLM-1903: Sub CPU, SWs and LEDs. Double sided PCB

Including NIGEL: panel control sub CPU. This controls the KLM-1902's devices. The sub CPU is controlled by main CPU via serial lines.

KLM-1902: Faders, SWs and LEDs Single sided PCB

Control matrix lines come from KLM-1903

KLM-1905: Eight volumes with SWs. No active devices. Double sided PCB

Directly connected to the main CPU's A/D ports. SWs go to the sub CPU on KLM-1903

Main parts and functions

Main PCB KLM-1901

CPU    H8/3002 CD#1/12
       IC35

ROM    256k x 16bit EPROM CD#1/12
       IC46

SRAM   128k x 8bit CD#1/12
       IC51,52 battery back-uped

LCDC   M66270FP CD#12/12
       IC53

GLUE   CG24123-4195 CD#9/12
       IC29 Control chip which functions to select for MSPs and AUSYs and adjust timing between DAAD and other digital audio devices.

A/D    SAA7366T CD#3/12
       IC17 Analog A,B
       IC21 Analog C,D
       IC31 Analog E,F
       IC34 Analog H,G

D/A    TDA1305T CD#4/12
       IC44 Monitor L/R
       IC48 Master L/R
       IC55 AUX 1/2

SPDI/F TC9271F CD#4/12
       IC3 Master L/R
adatIF AUSY2 CD#6/12

AUSY#1 IC6 Dig A In/Out with XM3,4 VCOs
AUSY#2 IC4 Dig B In/Out with XM1,2 VCOs

DAAD MM9378-V4 CD#7/12
IC24 Digital audio interface to AUSY#1 Dig A
IC25 Digital audio interface to AUSY#1 Dig A
IC22 Digital audio interface to SPDI/F and Master L/R Out and A,B,C,D input
IC23 Digital audio interface to DSP for Fx
IC13 Digital audio interface to AUSY#2 Dig B
IC14 Digital audio interface to AUSY#2 Dig B
IC9 Digital audio interface to Aux1/2 out, monitor L/R out and E,F,G,H input

MSP MM9427-VUY CD#8/12
IC10 Processor for Ch1-6 channel strip functions including EQs
IC8 Processor for Ch7-12 channel strip functions including EQs
IC7 Processor for Bus, monitor functions
* all In/Out of the digital audio signal are routed via the seven DAADs.

Sampling clock Devices CD#2/12, 6/12

Xtal X1 : For Internal clock
AUSY VCOXM1 Generate clock from Xtal/Dig In B
XM2 : Generate clock from Dig In B to read B data
XM3 : Generate clock from Wclk In/Dig In A
XM4 : Generate clock from Dig In A to read A data
Selector 74AC153
IC11 : Select a source for system sampling frequency
Top VCO T2932
IC12 : Generate from 256Fs to 1024Fs
Divider 74AC161
IC16 : For top VCO Div by 4

Connectors on KLM-1901 Main board

<table>
<thead>
<tr>
<th>Number</th>
<th>Destination</th>
<th># of pins</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN2A</td>
<td>KLM-1907</td>
<td>6</td>
<td>Receive POWER for Digital</td>
</tr>
<tr>
<td>CN3A</td>
<td>KLM-1907</td>
<td>7</td>
<td>Receive POWER for Analog</td>
</tr>
<tr>
<td>CN2</td>
<td>KLM-1903</td>
<td>12</td>
<td>I/F to NIGEL(sub cpu) send power</td>
</tr>
<tr>
<td>CN4A</td>
<td>KLM-1904</td>
<td>16</td>
<td>Analog signal input</td>
</tr>
<tr>
<td>CN5A</td>
<td>KLM-1904</td>
<td>13</td>
<td>Analog signal output</td>
</tr>
<tr>
<td>CN6A</td>
<td>KLM-1904</td>
<td>3</td>
<td>LCD contrast control</td>
</tr>
<tr>
<td>CN9A</td>
<td>LCD Module</td>
<td>14</td>
<td>LCD display control</td>
</tr>
<tr>
<td>CN7A</td>
<td>KLM-1905</td>
<td>10</td>
<td>Analog input of eight nobs position</td>
</tr>
</tbody>
</table>
Connectors on KLM-1907 Power Supply board

<table>
<thead>
<tr>
<th>Number</th>
<th>Destination</th>
<th># of pins</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN15A</td>
<td>AC Inlet</td>
<td>2</td>
<td>AC LINE Input</td>
</tr>
<tr>
<td>CN16A</td>
<td>AC SW</td>
<td>2</td>
<td>AC POWER SW</td>
</tr>
<tr>
<td>CN5</td>
<td>Transformer</td>
<td>5</td>
<td>To Transformer</td>
</tr>
<tr>
<td>CN4</td>
<td>Transformer</td>
<td>8</td>
<td>From Transformer</td>
</tr>
<tr>
<td>CN2A</td>
<td>KLM-1901</td>
<td>6</td>
<td>POWER for Digital</td>
</tr>
<tr>
<td>CN3A</td>
<td>KLM-1901</td>
<td>7</td>
<td>POWER for Analog</td>
</tr>
<tr>
<td>CN17B</td>
<td>KLM-1904</td>
<td>6</td>
<td>POWER for Analog</td>
</tr>
</tbody>
</table>

Connectors on KLM-1904 Analog board

<table>
<thead>
<tr>
<th>Number</th>
<th>Destination</th>
<th># of pins</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN4B</td>
<td>KLM-1901</td>
<td>16</td>
<td>Analog output after D/A</td>
</tr>
<tr>
<td>CN17A</td>
<td>KLM-1907</td>
<td>6</td>
<td>Power supply lines</td>
</tr>
<tr>
<td>CN5B</td>
<td>KLM-1901</td>
<td>13</td>
<td>Analog signal to A/D</td>
</tr>
<tr>
<td>CN14A</td>
<td>KLM-1906</td>
<td>4</td>
<td>Head phone signal</td>
</tr>
<tr>
<td>CN6A</td>
<td>KLM-1901</td>
<td>3</td>
<td>LCD contrast</td>
</tr>
</tbody>
</table>

Connectors on KLM-1903 Sub CPU board

<table>
<thead>
<tr>
<th>Number</th>
<th>Destination</th>
<th># of pins</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN13A</td>
<td>KLM-1905</td>
<td>9</td>
<td>Switch matrix lines for the eight nobs</td>
</tr>
<tr>
<td>CN2</td>
<td>KLM-1902</td>
<td>24</td>
<td>Switch and LED matrix for the Fader PCB</td>
</tr>
<tr>
<td>CN11B</td>
<td>KLM-1902</td>
<td>14</td>
<td>Switch and LED matrix for the Fader PCB</td>
</tr>
<tr>
<td>CN12B</td>
<td>KLM-1902</td>
<td>12</td>
<td>Faders position to the sub CPU's A/D port</td>
</tr>
<tr>
<td>CN1B</td>
<td>KLM-1901</td>
<td>12</td>
<td>Power supply and serial lines to the main CPU</td>
</tr>
</tbody>
</table>
How to exchange the system ROM

Official ROM Version is 960702 "Ver.1.1" or later
Do not use 960701 "Ver.1.0". This causes EQ noise.

Sometimes the user data will disappear by accident. All data dump keeps the process more safety.

1. remove 12 screws
   3 pcs. each of the rear, right, left and front bottom side.
2. Open upper case
   First, pull the upper case horizontally till it does not touch the lower case. Then, put the upper case vertically on the rear side.
3. Change a ROM
   ROM is placed on a socket. Do not touch the back-up battery circuit, otherwise, RAM [user] data would disappear.
4. Close upper case
   Note the edge of upper case is easy to hurt the painted surface of the lower case.
5. Fasten the removed 12 screws

* TEST MODE use user data area and the memory will be initialized.
Before entering the TEST MODE, please save all the data via MIDI.
VAROITUS

ADVARSEL!
Lithiumbatteri — Eksplosionsfare ved fejlagtig handtering.
Udskiftning må kun ske med batteri af samme fabrikat og type.
Levér det brugte batteri tilbage til leverandør.

ADVERSEL
Eksplosjonsfare ved feilaktig skifte av batteri.
Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten.
Brukte batterier kasseres i henhold til fabrikantens instruksjoner.

WARNING
Explosionsfara vid felaktigt batteribyte.
Använd samma batterityp eller en äkvivalent typ som rekommenderas av apparatförsörjaren.
Kassera använt batteri enligt fabrikantens instruktion.

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