SERVICE MANUAL

05R/W

AI^2 SYNTHESIS MODULE

CONTENTS

KORG

1. SPECIFICATIONS

Tone generation method : AI square synthesis system
(full digital processing)

Tone generator : 32 voices 32 oscillators (Single Mode)
16 voices 32 oscillators (Double Mode)

Waveform memory : 16M bit Mask ROM x 3
340 MULTI sounds & 164 Drum sounds

Quantization : 16 bit, 12 bit & 8 bit

Sampling frequency : 31.25kHz

Programs : RAM ... 100 programs
ROM ... 136 programs (for General MIDI)

Combinations : RAM ... 100 combinations

Effects : 47 multi digital effects

Demonstration songs : 1 song

Outputs : L/MONO, R & PHONES

MIDI : IN, OUT & THRU

TO HOST : MINI DIN 8pin(31.25KBPS & 39.1KBPS)

Indicators : 16 x 2 LCD indicator with LED backlight

Switches : POWER switch & 10 keys

Dimensions : 218(W) x 241.5(D) x 45(H)mm

Weight : 1.1kg

Power supply : DC12V 400mA

2. STRUCTURAL DIAGRAM
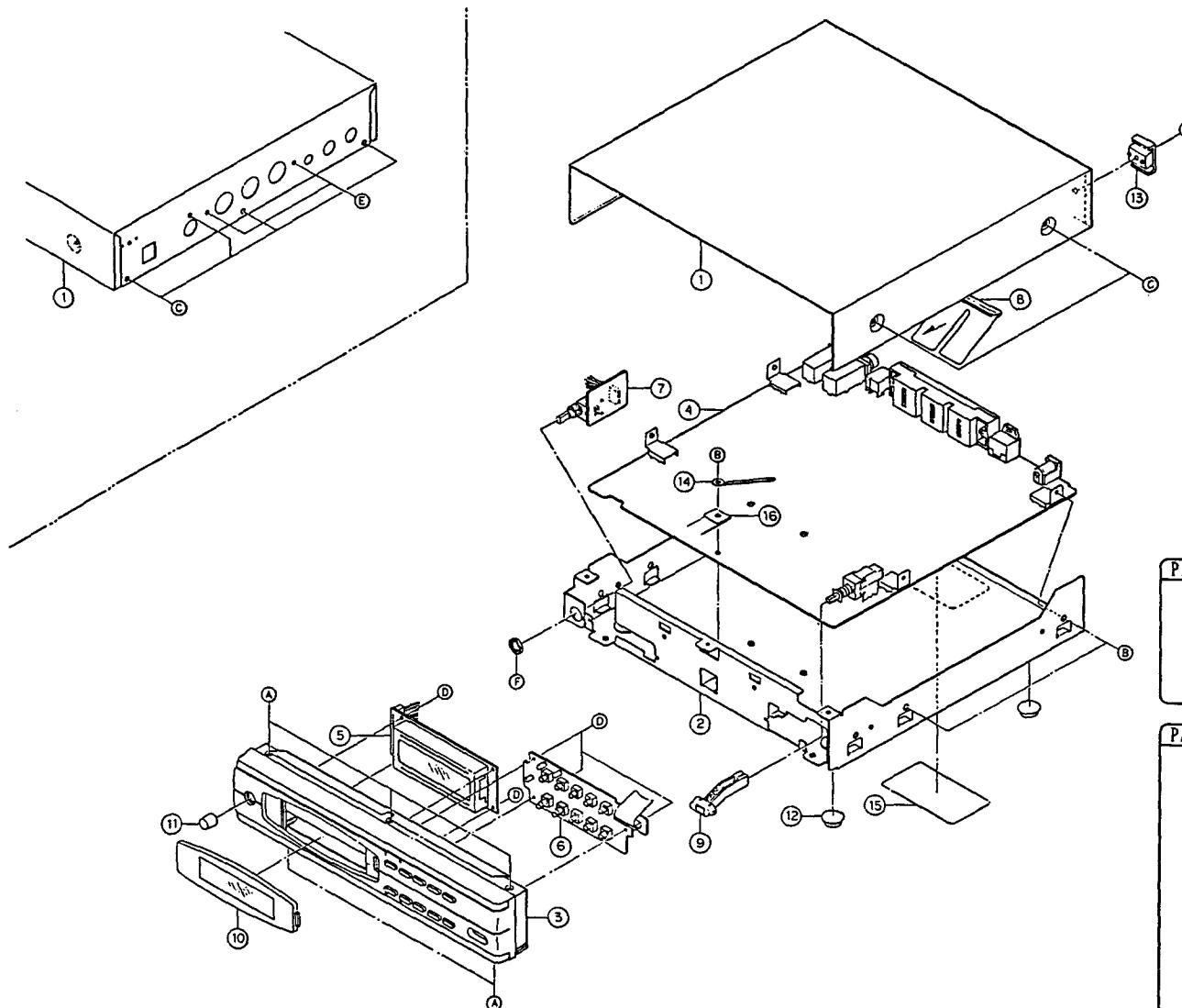
PART NO	SCREWS	PART CODE
A	TS F BZMC 3X6	791060306
B	CT B ZMC 3X6	715230306
C	CT B BZMC 3X6	715260306
D	PLAX B ZMC 2X6	745030206
E	PLAX B BZMC 3X12	745060312
F	VN ZMC 9	773030900

| PART NO	PART NAME		PART CODE
1	X-145 UPPER CASE	KOC-C28049-2	641037400
2	X-145 LOWER CASE	KOC-C28050-2	641037500
3	X-145 FRONT PANEL ASSY	H38006	646044400
4	PCB ASSEMBLY KLM-924		001092400
5	LCD DMC16205NYU-LY-B7 (WITH HARNESS)		313002700
6	PCB ASSEMBLY KLM-925		001092400
7	PCB ASSEMBLY KLM-926		001092400
8	X-507 GND SPRING		644003000
9	X-145 PSW KNOB	KOC-E48039	620025800
10	X-145 LCD WINDOW	KOC-E48043	630018800
11	X-145 VR KNOB	KOC-E48042	620025700
12	RUBBER FOOT SJ-5012 BLACK		500020400
13	X-150 CORD HOOK		646043000
14	SPIRAL CLIP CS-8		540008600
15	NAME SEAL	KOC-F40598	----------
16	X-145 SHIELD SHEET	KOC-C38020	----------

3. DISASSEMBLY

1) Remove 3pcs. of the screws on the back side of the upper case.
[PLAX B BZMC 3×12] ×2
[CT B BZMC 3×6] ×1

CT B BZMC 3x6   PLAX B BZMC 3x12

CORD HOOK
646043000
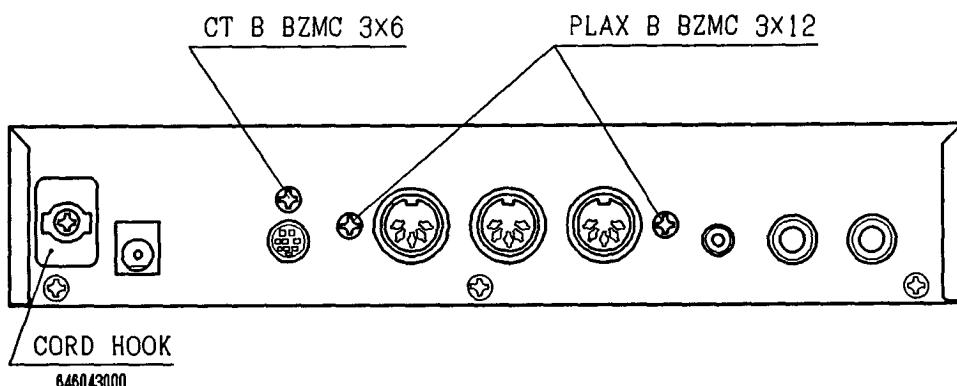
2) Remove 7pcs. of the screws on the upper case and remove the upper case.
[CT B BZMC 3×6] ×7

UPPER CASE
641037400

CT B BZMC 3x6

4
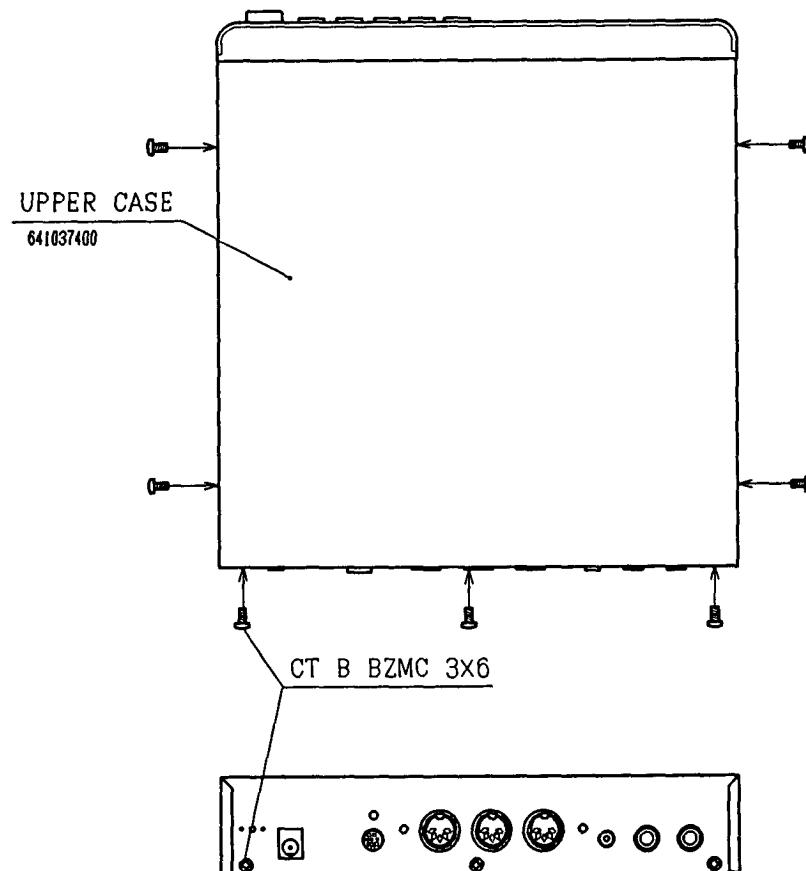
2.Remove the Main Board(KLM-924) and the Front Panel Assembly

1) Unplug 3pcs. of the harnesses on the KLM-924 board.
2) Remove a screw on the KLM-924 board.
   [CT B ZMC 3×6] ×1

KLM-924
001092400

HARNESS(from KLM-926)
470196500
LITHUM BATTERY
520001700
HARNESS(from LCD)

SMCD(from KLM-925)
470196600

SPIRAL CLIP(CS-8)

SHIELD SHEET
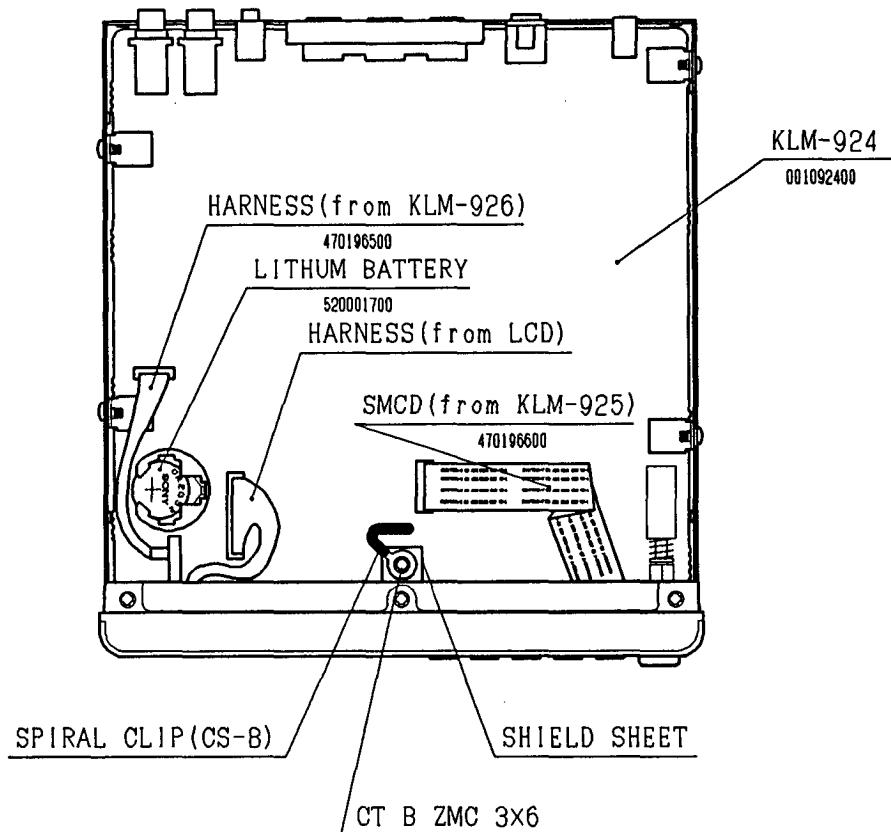
CT B ZMC 3X6

3) Remove the VR knob on the front panel.

FRONT PANEL ASSEMBLY
646044400

POWER SW KNOB
620025800

VR KNOB
620025700

LCD WINDOW
630018800
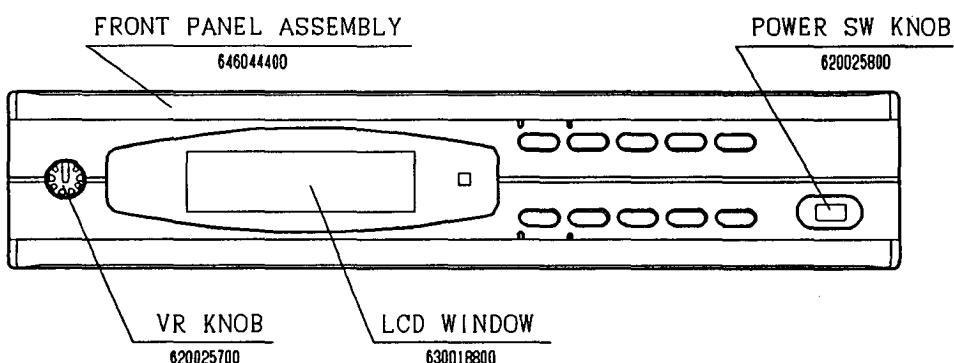
4) Remove 5pcs. of the screws on the front panel.
   [TS F BZMC 3×6] ×5
5) Remove the front panel assembly.
6) Remove the PSW knob.

KLM-924
001092400

POWER SW
375011600

PSW KNOB
620025800

FRONT PANEL ASSY
646044400

TS F BZMC 3X6

PSW KNOB
620025800

<LOWER SIDE>
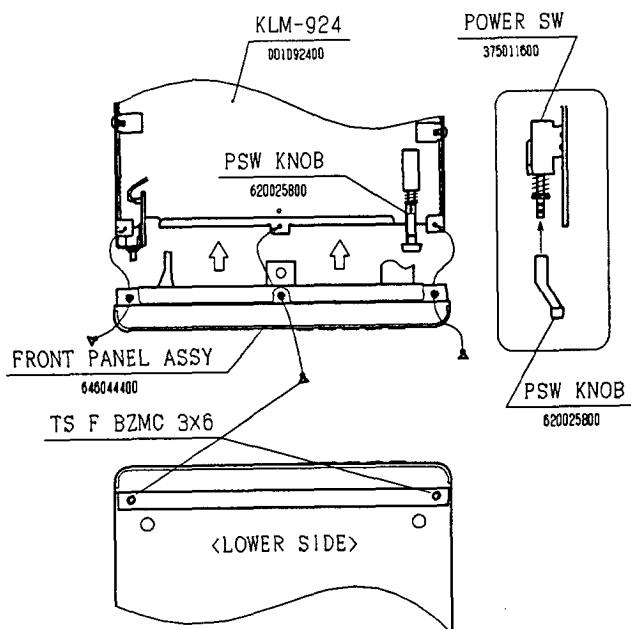
7) Remove 4pcs. of the screws on the side of the lower case.
   [CT B ZMC 3×6] ×4
8) Remove the KLM-924 board.

CT B ZMC 3X6

LOWER CASE
641037500

KLM-924
001092400

KLM-926
001092400

VN ZMC 9

6

KLM-925   LCD   FRONT PANEL ASSEMBLY
001092400   313002700   646044400

SHIELD SHEET   PLAX B ZMC 2X6   PLAX B ZMC 2X6

LCD WINDOW
630018800

FRONT PANEL ASSEMBLY
646044400

GND SPRING   KLM-924   GND SPRING
644003000   001092400   644003000

ROM 9302xx

KLM-924
001092400

RUBBER FOOT
500020400

LOWER CASE
641035700

7

4. BLOCK DIAGRAM
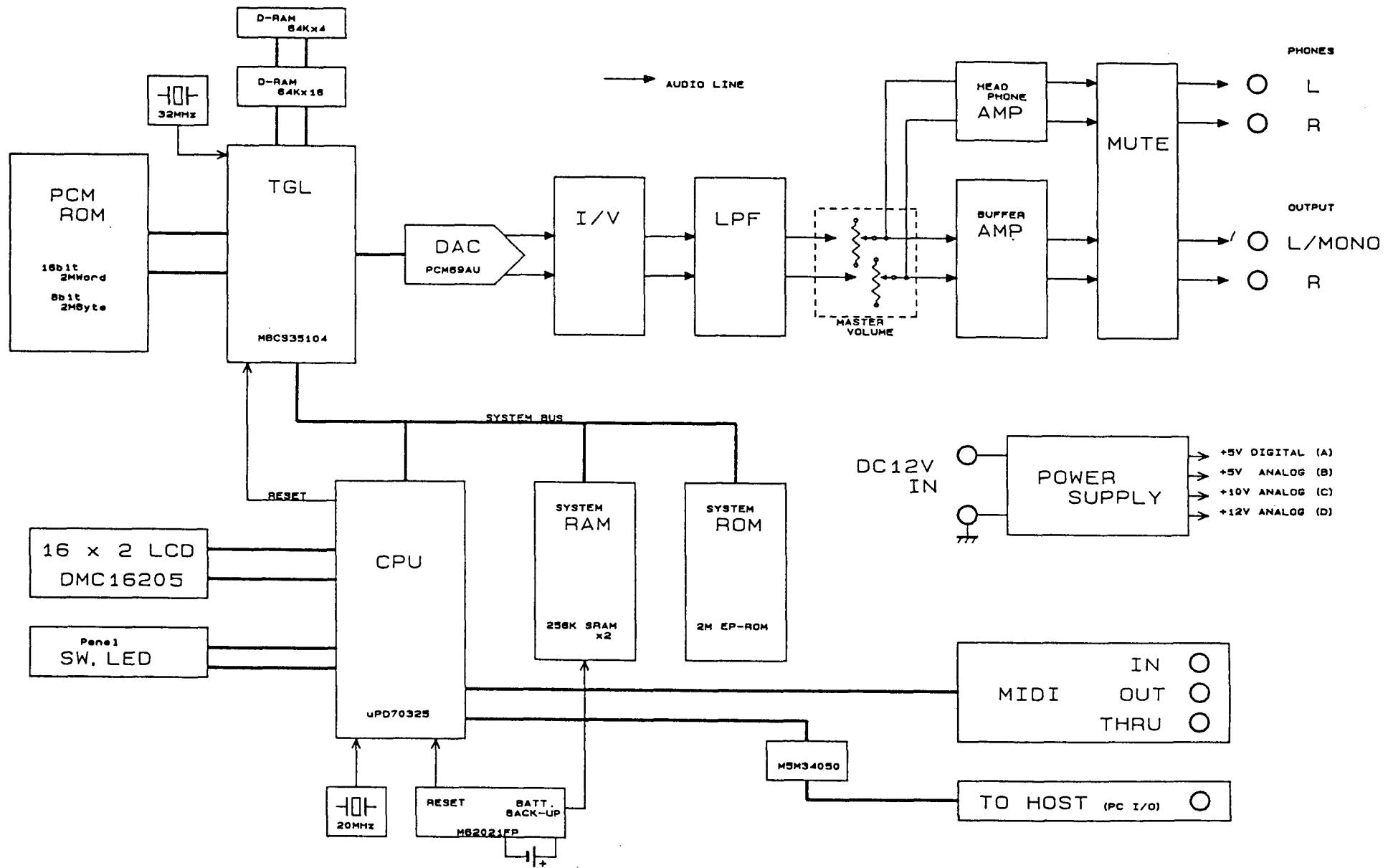
5. CIRCUIT DIAGRAM

KLM-1727   D-RAM Board
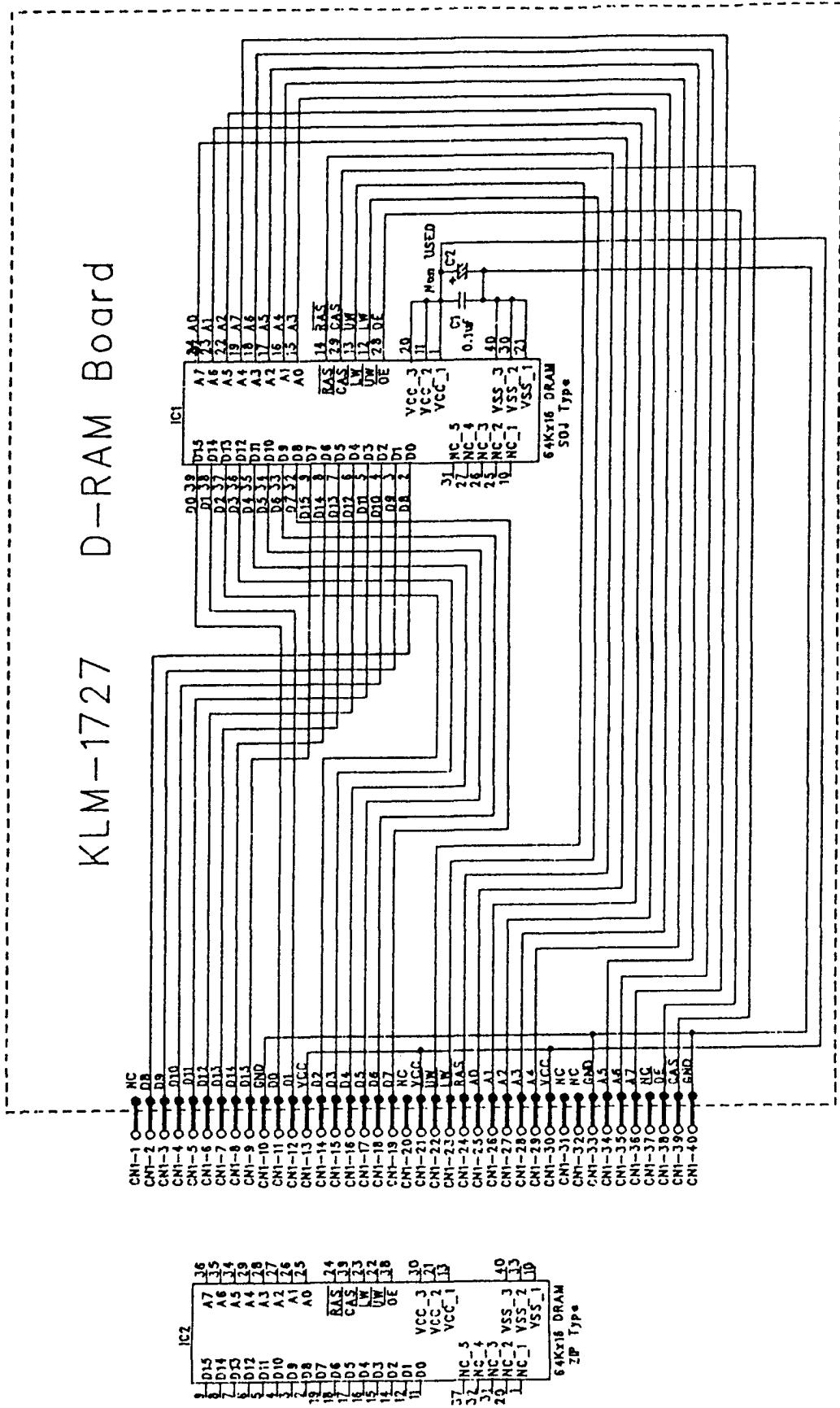
KLM-1727

6. P.C. BOARD

KLM-924, 925, 926 (Non-component Side)
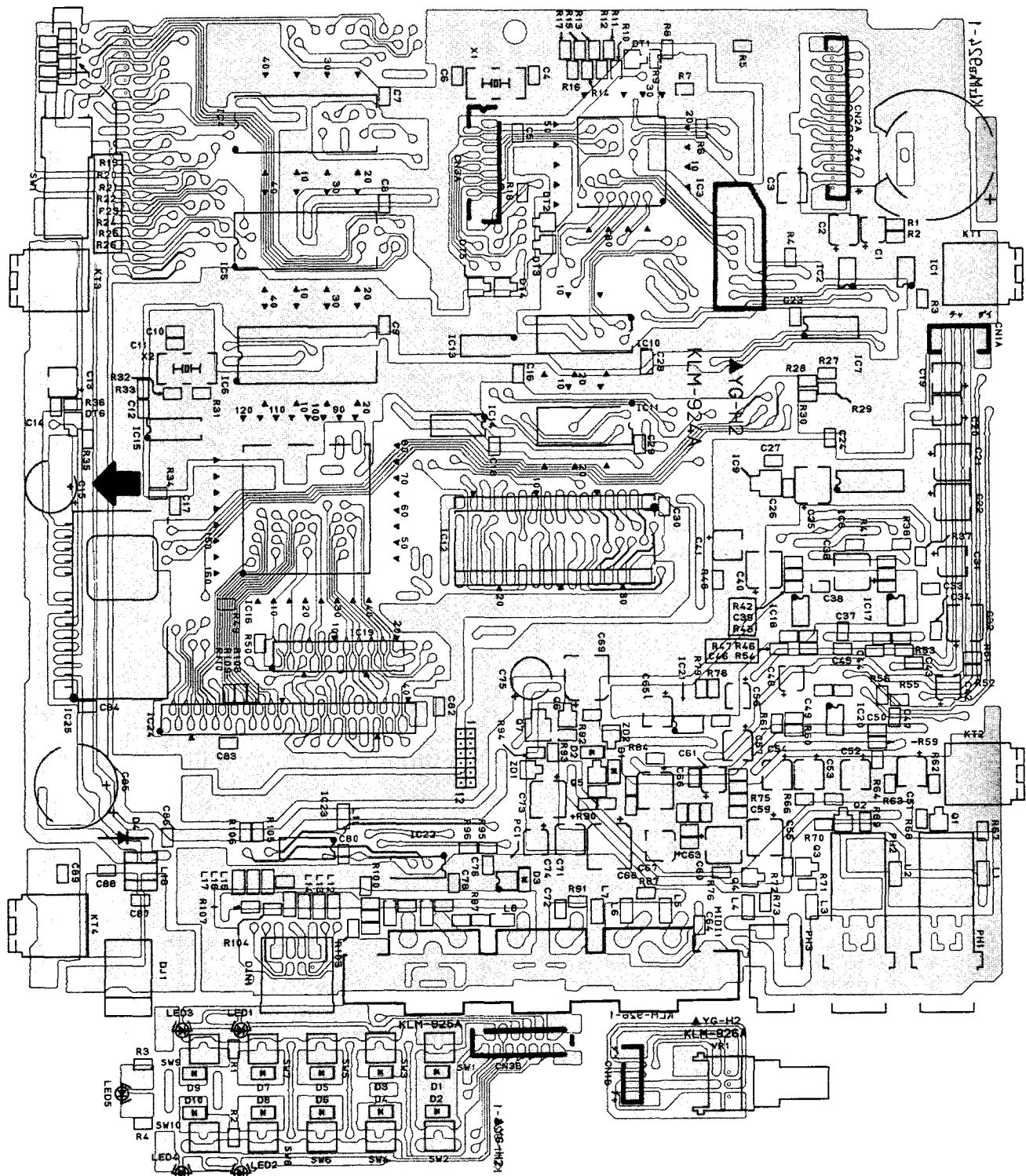
KLM-924, 925, 926 (Component Side)
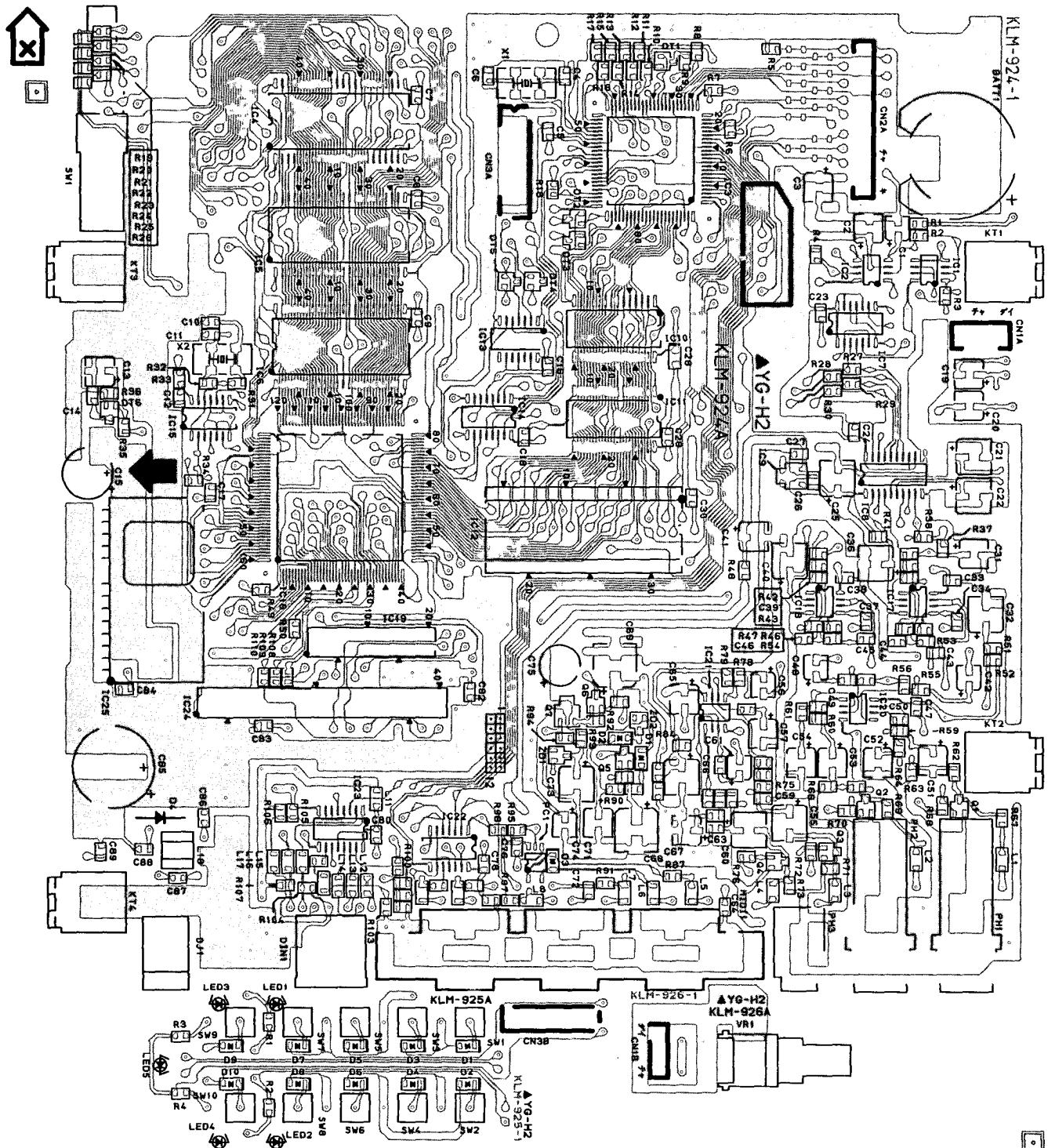
7. DIAGNOSTIC TEST

The O5R/W has a test mode for checking numerous functions. When the test
mode is activated, the O5R/W internal data is initialized. Hence, if it
contains any necessary data, save this data beforehand in a MIDI data
filer or other memory device.
The figure below shows the equipment and settings required for carrying
out tests.

<Settings for Tests>

```
┌──────────┐   ┌──────────┐   ┌────────────────┐
│ MONITOR  │   │ OSCILLO- │   │ AUDIO ANALYZER │
│ AMP.     │   │ SCOPE    │   │                │
└──────────┘   └──────────┘   └────────────────┘

        ┌─────────────────────────────┐
        │      SIGNAL SELECTOR         │
        └─────────────────────────────┘
                                         ┌───────────┐
                                         │ AC ADAPTOR│
                                         └───────────┘
   ┌──────────────────────────────────┐
   │  OUT      MIDI   HOST    DC       │
   │  ①        ②      ③                │       ① OUTPUT L, R & HEADPHONE
   │                                   │       ② MIDI IN - MIDI OUT
   │               O5R/W               │       ③ RS422 SHORT PLUG
   └──────────────────────────────────┘
```
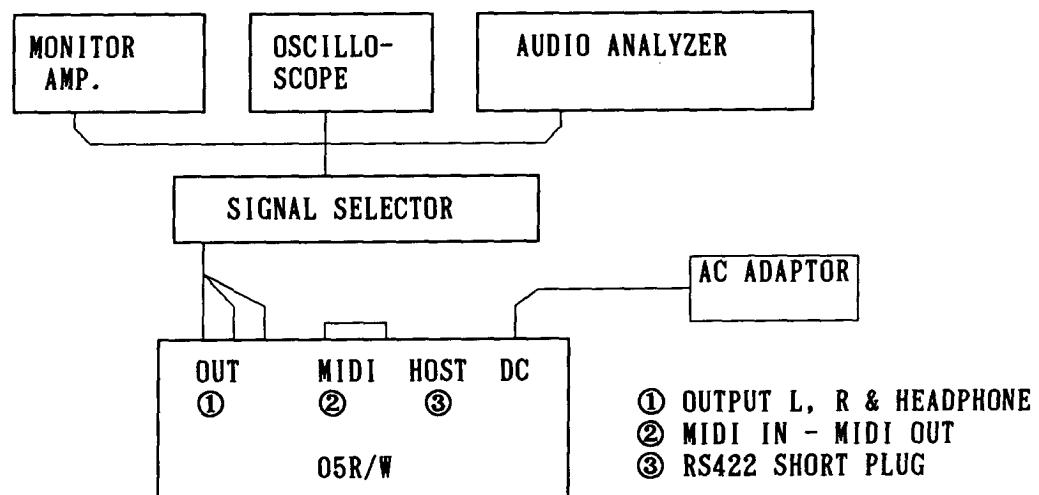
<0. Activating Test Mode>

To activate the test mode, turn on the power while pressing both
the [PROG] and [+10] switches. When the test mode is activated,
the internal test is done automatically. When all the tests are normal,
the system proceeds to check the switches and LEDs. When an error is
found, its details are displayed on the LCD and the test stops.
Also, to activate the test mode that skips checking the MIDI and RS422
(TO HOST) circuitry, turn the power on while pressing both the [+1]
and [-1] switches.

0.1) System ROM checksum

(1) The system ROM checksum is done.
(2) When an error is found, its details are displayed on the LCD.

```
┌─────────────────┐
│ SystemROM ChkSum│
│ Error: Verify   │
└─────────────────┘
```

0.2) SRAM 1 Test

    (1) The SRAM 1 Test is done.
    (2) When an error is found, its details are displayed on the LCD.

```
SRAM Write/Read
Error: Verify
```

0.3) SRAM 2 Test

    (1) The SRAM 2 Test is done.
    (2) When an error is found, its details are displayed on the LCD.

```
SRAM Write/Read
Error: Verify
```

0.4) LCD Module RAM Test

    (1) The LCD module RAM is tested.
    (2) When an error is found, its details are displayed on the LCD.

```
LCD RAM W/R
Error: Verify
```

0.5) LSI (TG part) Initialization Test

    (1) LSI (TGL) initialization is tested.
    (2) When an error is found, its details are displayed on the LCD.

    - When an error is found in the TG part of the TGL

```
TG-CPU I/F
Error: VoiceFlag
```

0.6) LSI (VDFA part) Initialization Test

    - When an error is found in the VDFA part of the TGL

```
VDFA-CPU I/F
Error: Verify
```

0.7) SRAM Backup Battery Test

      (1) The voltage of the SRAM backup battery is tested.
      (2) When an error is found, its details are displayed on the LCD.

     - When the measured voltage is low

```
Internal Battery
Error: Low
```

     - When the measured voltage is high

```
Internal Battery
Error: High
```

0.8) MIDI Circuit Test

      (1) Connect the MIDI OUT and IN jacks on the rear panel to the MIDI
          cables and check that the MIDI data is being received correctly.
      (2) When an error is found, its details are displayed on the LCD.

     - When the data sent and the data received are different

```
MIDI
Error:  OUT-->IN
```

     - When the MIDI cables are not connected to the MIDI OUT and IN jacks

```
MIDI
Warning:OUT X IN
```

0.9) RS422 (TO HOST jack) Circuit Test

      (1) Connect the short plug to the RS422 (TO HOST) jack and check that
          the data sent is being received correctly.
      (2) When an error is found, its details are displayed on the LCD.

     - When the sent data and received data are different

```
PCIF
Error:  OUT-->IN
```

- When the short plug is not connected to the TO HOST jack
  on the rear panel

```
PCIF
Warning:OUT X IN
```

0.10) PCM ROM Test

(1) The PCM ROM is tested.
(2) When an error is found, its details are displayed on the LCD.

```
PCMInt☆ A:******
P:####  R:0000
```

※ "☆": The PCM ROM bank where the error was found is displayed here.

※ "********": The PCM ROM address where the error was found is
              displayed here.

※ "####": The data that should be written at this address is
           displayed here.

※ "0000": The data read from the indicated address is displayed here.

1. Manual Tests

When all the internal tests described above end normally, this test
proceeds to the manual tests. You can move back and forth among the test
items by pressing [+10] and [-10], and among the test steps by pressing
[+1] and [-1].

1.1) Panel Switches and LEDs Test

(1) The front panel switches and LEDs are tested.
(2) The front panel LCD displays the message below.
    Check that all the LEDs are lit.

```
TO:SW/LED
```

(3) Press [+1] and check that the following message is displayed.

```
TO:SW/LED
      COMBI
```

(4) The name of the next switch to be pressed is displayed on the front
    panel LCD. Press the switches as shown on the LCD and check that
    the display changes. Further, when you press the [COMBI], [EDIT],
    [PROG] and [GLOBAL/MULTI] switches, also check that their LEDs
    light up.
    The order for checking the switches is shown below.

    (1) [COMBI]
    (2) [EDIT]
    (3) [PROG]
    (4) [GLOBAL·MULTI]
    (5) [BANK·PAGE+]
    (6) [PAGE-]
    (7) [+10·▶]
    (8) [◀·-10]
    (9) [+1·▲]
    (10)[▼·-1]

1.2) LCD Test

    (1) The LCD is tested.
    (2) Check that the LCD on the front panel displays the message shown
        below.

```
T1:LCD
```

(3) Press [+1] and check that the LCD displays the pattern shown below.

(4) Press [+1] and check that the nothing is displayed on the LCD.

```
```

(5) If the test result is normal, press [+1] to proceed to the next check.

1.3) MDE Test

(1) The MDE is tested. Connect the output L/MONO to the oscilloscope and turn the master volume knob on the panel to 0.

(2) Confirm that the LCD on the front panel displays the message shown below.

```
T2:MDE
```

(3) Press [+1] and turn the master volume knob to MAX.
Check that the oscilloscope measures the same waveform as shown in Fig. MDE-1 below.

(4) Turn the master volume knob to the point where the MDE waveform is not clipping (see Fig. MDE-2) and check that the output waveform is within the voltage range below.

$$5.5 \text{ V} \sim 7.4 \text{ V pp}$$

(5) If the test result is normal, press [+1] to proceed to the next check.

Fig. MDE-1
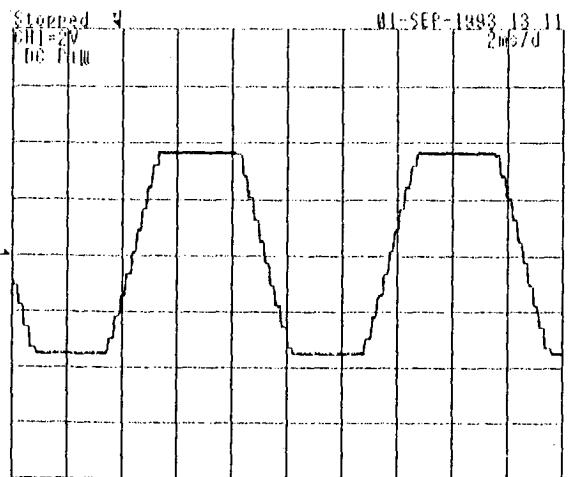
Fig. MDE-2
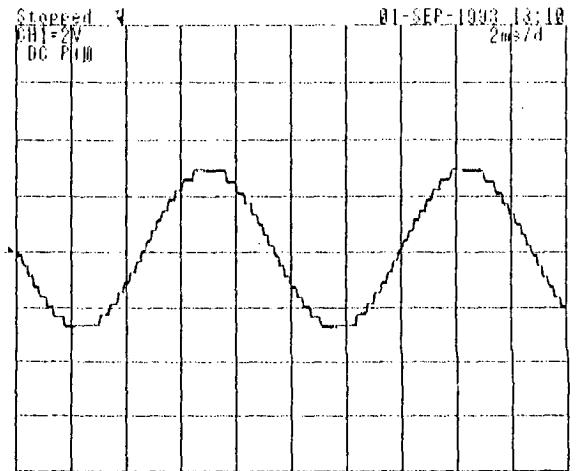
1.4) Measuring residual noise

(1) Turn the master volume knob to MAX, and measure the residual noise for OUT 1, OUT 2, PH/L, and PH/R.

(2) Check that the LCD on the front panel displays the message shown below.

```
T3:NOISE
```

(3) Connect the audio analyzer to output L/MONO and press [+1].
Check that the LCD on the front panel displays the message shown below.

```
T3:NOISE
OUT 1  OFF
```

(4) Check that the value measured by the audio analyzer is as below.

-92.0 dBu max.

(5) Connect the audio analyzer to OUTPUT R and press [+1].
Check that the LCD on the front panel displays the message shown below.

```
T3:NOISE
OUT 2  OFF
```

(6) Check that the value measured by the audio analyzer is as below.

-92.0 dBu max.

(7) Connect the audio analyzer to PHONES and press [+1].
Check that the LCD on the front panel displays the message shown below.

```
T3:NOISE
PH/L   OFF
```

(8) Check that the value measured by the audio analyzer is as below.

-92.0 dBu max.

(9) Press [+1]. Check that the LCD on the front panel displays
the message shown below.

```
T3:NOISE
PH/R    OFF
```

(10) Check that the value measured by the audio analyzer is as below.

-92.0 dBu max.

(11) If the test result is normal, press [+1] to proceed to the next test.

The above measurement values are based on the following setting
conditions:

- Audio analyzer setting: Value arrived at by weighing
- Headphone: At 33 ohms

1.5) Measuring output level

(1) Turn the master volume knob to MAX, and measure the output level
for OUT 1, OUT 2, PH/L and PH/R.

(2) Check that the LCD on the front panel displays the message shown
below.

```
T4:LEVEL

```

(3) Connect the audio analyzer to OUTPUT L/MONO and press [+1].
Check that the LCD displays the message shown below.

```
T4:LEVEL
OUT 1   MAX
```

(4) Check that the value measured by the audio analyzer is as below.

488 Hz
2.00 dBu ~ 3.50 dBu

Also, connect the output to the oscilloscope, and check that
it measures the waveform shown below.

(5) Check that the waveform changes smoothly when the master volume knob
    is turned, and that the level of the waveform goes to 0 when the knob
    is turned to MIN. After these checks are confirmed, turn the master
    volume knob back up to MAX.

Fig. Output level test waveform
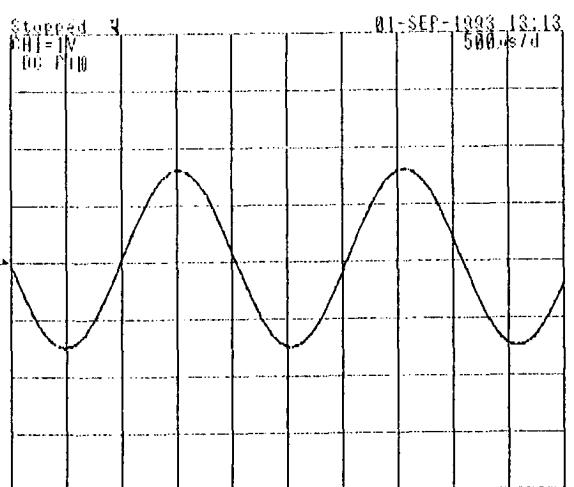
(6) Connect the audio analyzer to OUTPUT R and press [+1].
    Check that the LCD on the front panel displays the message shown
    below.

```
T4:LEVEL
OUT 2  MAX
```

(7) Check that the value measured by the audio analyzer is as below.

    412 Hz
    2.00 dBu ～ 4.50 dBu

    Also, connect the output to the oscilloscope, and check that
    it measures the waveform shown below.

(8) Check that the waveform changes smoothly when the master volume knob
    is turned, and that the level of the waveform goes to 0 when the knob
    is turned to MIN. After these checks are confirmed, turn the master
    volume knob back up to MAX.

(9) Connect the audio analyzer to PHONES and press [+1].
Check that the LCD on the front panel displays the message shown
below.

```
T4:LEVEL
PH/L   MAX
```

(10) Check that the value measured by the audio analyzer is as below.

549 Hz
-1.50 dBu ～ 1.00 dBu

Also, connect the output to the oscilloscope, and check that
it measures the waveform shown below.

(11) Press [+1]. Check that the LCD on the front panel displays
the message shown below.

```
T4:LEVEL
PH/R   MAX
```

(12) Check that the value measured by the audio analyzer is as below.

610 Hz
-1.50 dBu ～ 1.00 dBu

Also, connect the output to the oscilloscope, and check that
it measures the waveform shown below.

The above measurement values are based on the following setting
conditions:

- Headphone: At 33 ohms

<Ending Test Mode>

(1) When all the tests are completed, press [+1]. The preload data will
be loaded automatically and the test mode will end.
(2) Confirm that the LCD on the front panel displays the message
shown below, as this indicates that the preload data has been loaded
correctly.

```
00:Star*Burst
A20 A89 A90 A80
```

(3) Finally, turn off the power.

<How to Initialize RAM Data>

To initialize RAM data in the O5R/W, turn on the power while pressing
both [EDIT] and [▼·-1].

8. CHECK POINTS

1. Clock Generator - TGL

From 2pin of IC15
  To 159pin(MCK) of IC16

  f=32MHz

Stopped
CH1=2V
DC
01-SEP-1993 11:01
50ns/d

P-P	5.04V	RISE	8.5ns
MAX	5.28V	FALL	8.0ns
MIN	240mV	+FREQ	32.25MHz
RMS	3.32V	PERIOD	31.0ns
AVG	2.72V	+WIDTH	15.0ns
UNDSHT	2%	-WIDTH	16.0ns
OVRSHT	2%		
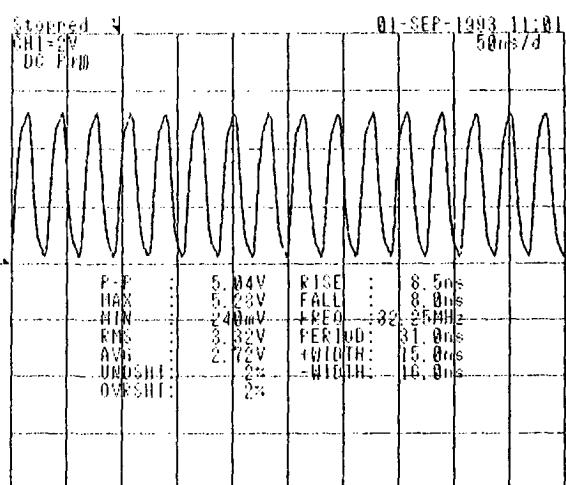
2. TGL - DAC

From 151pin(CKOO) of IC16
  To 15pin(SYS CK) of IC8

Stopped
CH1=2V
DC
01-SEP-1993 16:46
50ns/d

P-P	3.60V	RISE	8.5ns
MAX	4.80V	FALL	8.0ns
MIN	1.20V	+FREQ	16.12MHz
RMS	3.36V	PERIOD	62.5ns
AVG	2.96V	+WIDTH	33.0ns
UNDSHT	5%	-WIDTH	29.5ns
OVRSHT	8%		
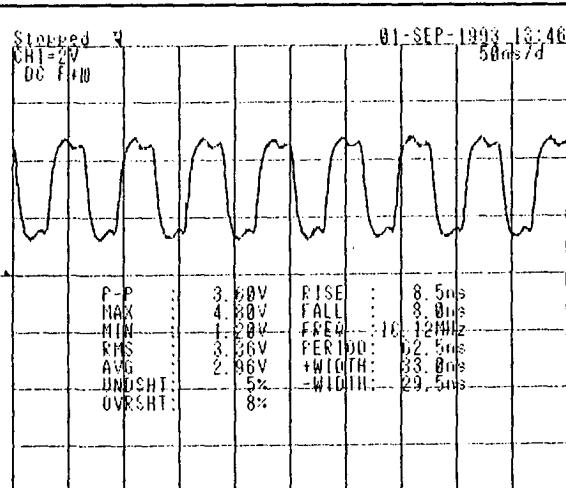
3. TGL - DAC

From 152pin(LRCKO) of IC16
  To 16pin(WDCK) of IC8

Stopped
CH1=2V
DC
01-SEP-1993 11:11
5us/d

P-P	5.04V	RISE	50ns
MAX	5.04V	FALL	15.95us
MIN	0mV	FREQ	
RMS	3.32V	PERIOD	
AVG	2.32V	+WIDTH	16.00us
UNDSHT	8%	-WIDTH	
OVRSHT	10%		
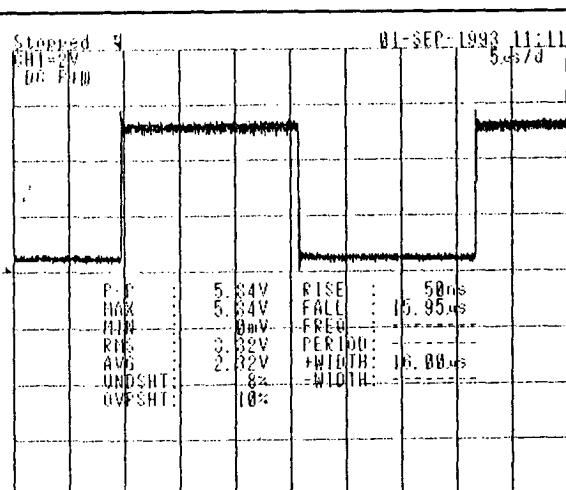
4.TGL - DAC - Clock Generator

From 153pin(BCKO) of IC16
To 14pin(BCK) of IC8
and 3pin(CLK) of IC7


```
Stopped  ⅃                          01-SEP-1993 11:12
CH1=2V                                        200ns/d
DC F 10

P-P      :   5.76V    RISE  :      26ns
MAX      :   5.84V    FALL  :      82ns
MIN      :   40mV     FREQ  :   2.000MHz
RMS      :   3.02V    PERIOD:     500ns
AVG      :   3.12V    +WIDTH:     252ns
UNDSHT:      3%       -WIDTH:     243ns
OVRSHT:      4%
```
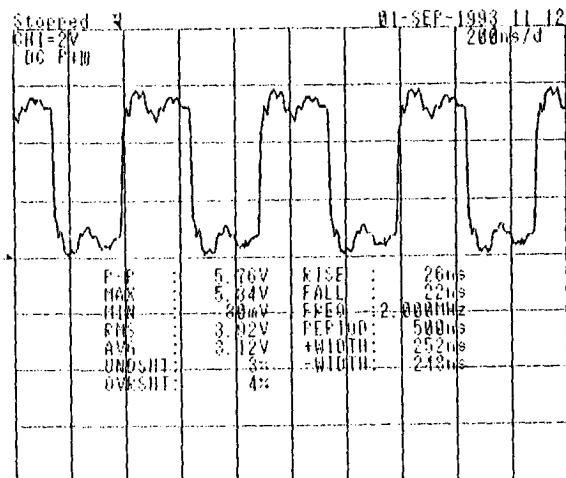
5.Reset - CPU

From 7pin(RES) of IC2
To 57pin(RESET) of IC57

※ when turn the power on


```
Stopped  ⅃                          01-SEP-1993 12:53
CH1=2V                                        20ms/d
DC F 10

P-P      :   5.12V    RISE  :     200µs
MAX      :   5.60V    FALL  :
MIN      :   480mV    FREQ  :
RMS      :   4.84V    PERIOD:
AVG      :   4.32V    +WIDTH:
UNDSHT:      0%       -WIDTH:
OVRSHT:      2%
```
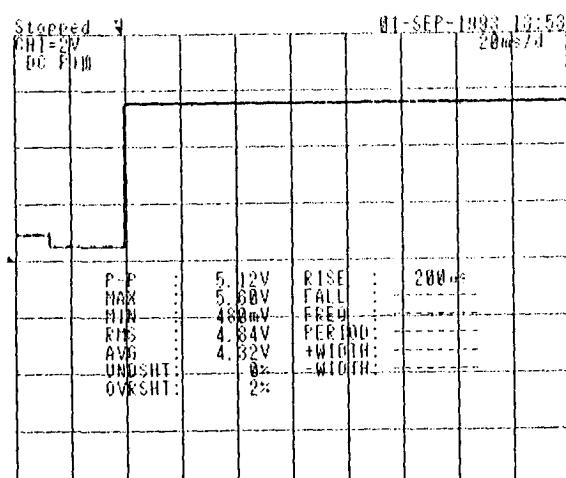
6.CPU - TGL

From 37pin(P17) of IC3
To 2pin(RESET) of IC16

※ when turn the power on


```
Stopped  ⅃                          01-SEP-1993 13:58
CH1=2V                                        200µs/d
DC F 10

P-P      :   5.28V    RISE  :       2µs
MAX      :   5.68V    FALL  :       2µs
MIN      :   400mV    FREQ  :   4.385kHz
RMS      :   4.56V    PERIOD:     228µs
AVG      :   3.84V    +WIDTH:     112µs
UNDSHT:      2%       -WIDTH:     116µs
OVRSHT:      3%
```
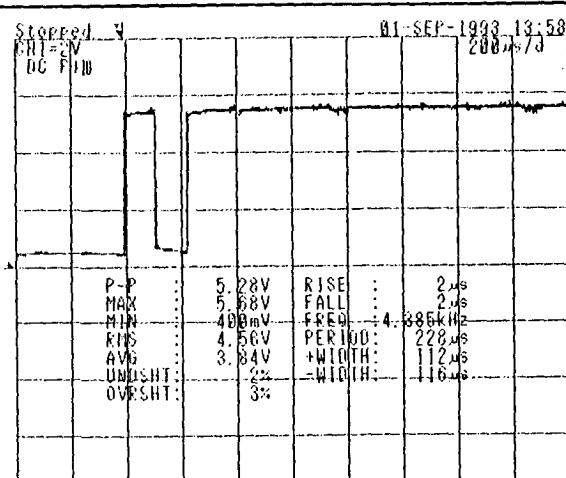
7.Clock Generator - PC I/F

From 5pin(Q) of IC7
To 9pin(2DI) of IC23

f=1MHz


```
Stopped                           01-SEP-1993 14:01
CH1=2V                                   500ns/d
DC f110

        P-P    :  6.80V    RISE  :      45ns
        MAX    :  6.32V    FALL  :      45ns
        MIN    : -480mV    FREQ  : 1.000MHz
        RMS    :  3.72V    PERIOD: 1.000µs
        AVG    :  2.88V    +WIDTH:    500ns
        UNDSHT :    10%    -WIDTH:    500µs
        OVRSHT :     8%
```
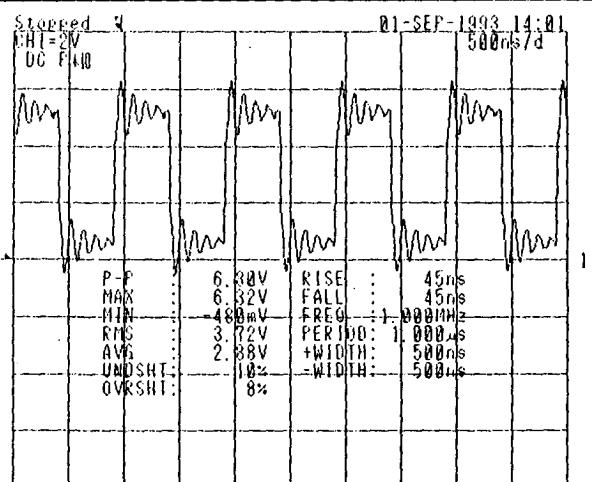
9. REFERENCE DATA

MAIN ICs

CPU:	UPD70325GJ-10-5BG	IC3
SYSTEM ROM:	MBM27C2001-12Z-G(2M EPROM)	IC12
SYSTEM RAM:	MB84256A-10LPF(256K SRAM)	IC10, IC11
TONE GENERATOR:	MBCS35104(TGL)	IC16
WAVE ROMs:	MB8316200A-15PF-G-402(for GM1)	IC4
	UPD23C16000BGX-385(for GM2)	IC5
	LH537FFS	IC6
DRAMs:	MB81464-10PSZ(for multi digital effect)	IC19
	HM511664LZ-8(for multi digital effect)	IC24
D/A CONVERTOR:	PCM69AU	IC8

UPD70325GJ-10-5BG(CPU) PIN ASSIGNMENT

NEC JAPAN
D70325GJ-10
V25
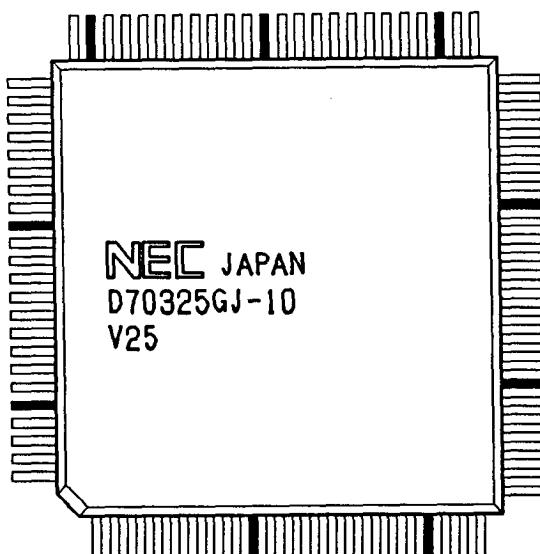
UPD70325GJ-10-5BG(CPU) PIN FUNCTION

PIN NAME	I/O	FUNCTION
P00-P06	I/O	I/O port for SW SCAN
P07	I/O	I/O port (NC)
NMI	I	Non maskable interrupt request
INTP0	I	Interrupt request
P12	I	MODE
P13	I	MODE
P14	O	Output port for MUTE
P15	O	Output port for sub CPU
P16	O	Output port for
P17	I/O	I/O port (NC)
P20-27	I/O	I/O port for
PT0-PT7	I	Input port
IOSTB	O	I/O strobe
MREQ	O	Memory request
D0-D7	I/O	8_bit data bus
A0-A19	O	20_bit address bus
RXD0	I	Serial data input for
RXD1	I	Serial data input for
CTS0	I/O	CTS input
CTS1	I	CST input
TXD0	O	Serial data output
TXD1	O	Serial data output
SCKO	O	Serial clock output
X1,X2	---	System clock terminal
RESET	I	Reset signal input
REFRQ	O	Refresh pulse output
R/W	O	Read/Write strobe
MSTB	O	Memory strobe
VTH	I	Reference voltage input
VDD	---	Power supply (+)
GND	---	Ground
IC	---	Internal connecter
EA	---	External memory access

MBCS35104 (TGL) PIN ASSIGNMENT

Top pins (left to right):
VDDB, MCK, CPUSL, DMODE, SYNC1, SDO0, SDO1, BCKO, LRCKO, CKO0, GND14, SFT2, SFT1, SFT0, WMODE, SMDD1, SMODO, XMM, XMS0, XMS1, VDD7, GND13, XTRE, XTMCK, XMCLK, MD16, XTWE, MD17, MD23, MD18, MD22, MD21, GND12, MD20, MD10, BNK2, BNK3, BNK0, BNK1, GND11, MA19

Left pins (top to bottom):
GND1, CKCL, ED12, ED14, ED16, ED17, ED19, ED5, ED7, ED9, ED10, ED2, ED3, ED0, EWE, RAS, EA5, EA7, EA2, EA0
RESET, CKO2, ED13, ED15, GND2, ED18, ED4, ED6, ED8, VDD1, ED11, CAS, EOE, ED1, GND3, EA6, EA4, EA3, EA1, VDD2

Center: KORG MBCS35104 TGL

Numbers: 160, 150, 140, 130, 120, 10, 110, 20, 100, 30, 90, 40, 50, 60, 70, 80

Right pins (top to bottom):
VDD6, MA8, MA9, MA10, MA11, GND10, MA4, MA3, MA2, MA1, VDD5, MD15, MD0, MD8, MD1, GND9, MD5, MD12, MD4, MD11
MA18, MA17, MA7, MA6, MA5, MA12, MA13, MA14, MA15, MA16, MA0, MD7, MD14, MD6, MD13, MD9, MD2, MD10, MD3, GND8

Bottom pins (left to right):
GND4, CKO, CKSEL, SDIO, BCK1, GND5, A7, A6, A5, A3, VDD3, A1, A0, D0, D1, GND7, D3, R0, P0, P2, VDD4
CKO1, SYNC0, SDI1, LRCK1, NC, A8, A9, A4, A2, GND6, D7, D6, D5, D4, D2, WR, CS, P1, P3

MBCS35104 (TGL) PIN FUNCTION

PIN NAME	I/O	FUNCTION
VDD	---	+5V
VSS	---	Ground
Rest	I	System Rest
MCK	I	Master Clock
CKO	O	32MHz
CKO0-1	O	CLK/2 duty 50% output
CKO2	O	CLK/4 duty 50% output
CKSEL	I	Phase Analog Select for CKO0
CKCL	I	CKO0 Reset input
XMM	I	for Test mode
XMS2-0	I	for Test mode
XTMCK	I	for Test mode
XTRE	I	for Test mode
XTWE	I	for Test mode

26

```
--------- for CPU ----------------------------------------------------
        CPUSL          I        CPU select V25/H8
        CS             I        Chip select
        WR             I        CPU WRITE pulse
        RD             I        CPU READ pulse
        A0-9           I        CPU Address Bus
        D0-9           I/O      CPU Data Bus
        P0-3           0        Output Port


--------- for PCM ROM -------------------------------------------------
        MD0-15         I/O      PCM Memory Data Bus 0-15
        MD16-23        I        PCM Memory Data Bus 16-23 (for 2TGs mode)
        MA0-19         0        PCM Memory Address Bus
        BNK0-3         0        PCM Memory Bank Select
        DMODE          I        DECODE Mode Select
                                        H: Decode BNK#
                                        L: Thru BNK#
        WMODE          I        PCM Memory -word Select
                                        H: 64 osc. , 2TGs Mode
                                        L: 32 osc. , 1TG Mode
        SYNCO          0        Counter Synchro Output (only 2TGs Mode)
        SYNCI          I        Counter Synchro Input (only 2TGs Mode)


--------- for Serial Interface ----------------------------------------
        SDO0-1         0        Serial Data Outout 0,1
                                        SDO0: C ch & D ch
                                        SDO1: A ch & B ch
        BCKO           0        Bit Clock Output (2MHz, 500nsec.)
        LRCKO          0        LR Clock Output
                                        L: R ch
                                        H: L ch
        SDIO-1         I        Serial Data Input 0,1
                                        SDIO: C ch & D ch
                                        SDI1: A ch & B ch
        BCKI           I        Bit Clock Input (2MHz, 500nsce.)
        LRCKI          I        LR Clock Input
                                        L: R ch
                                        H: L ch
        SMOD0-3        I        Serial I/F Format Select


--------- for DRAM ----------------------------------------------------
        EA0-7          0        DRAM Address
        ED0-19         I/O      DRAM Data
        EWE            0        DRAM WE
        EOE            0        DRAM OE
        RAS            0        DRAM RAS
        CAS            0        DRAM CAS
```

1. Voltage check of power supply

       Check that a voltage of +5V (±5%) is input at the VDD pin.

               4.75V ≦ VDD ≦ 5.25V

2. Check of input/output pins, regardless of the CPU interface setting

PIN NAME	FUNCTION
BCKO	2.0 MHz bit clock signal outputs to the D/A converter.
LRCKO	31.25 KHz L/R clock signal output to the D/A converter.

If the voltage level of these pins is +3V or less, check the soldering of peripheral pins and the voltage of the connected device.
Also, if any of these pins is 0V or +5V, check to see whether RESET(TGRES) or the master clock(32.0MHz) has been input. If RESET and MCK are normal and the test mode setting pins have been set as below, check the soldering and the pattern on the circuit board.


3. Check of input/output pins, when the key on

| PIN NAME	FUNCTION
XCS, XWE	Control signal from the CPU

During KEY ON or PROG. CHANGE, check that a low level pulse signal is input from the CPU to the above pins(XSC, XWE). If these signals cannot be observed with the oscilloscope, check the CPU and its peripheral circuits.

PIN NAME	FUNCTION
SDO0, SDO1	serial data output to the D/A converter

In case of observing the waveform with the oscilloscope, it is best to input the LRCKO clock signal to the external trigger input of the oscilloscope. If the serial data cannot be output, check the PCM address bus. To find whether normal serial data is output or not, check whether there is a different bit from the code bit at the left side of the leading and the trailing edge of LRCKO on the oscilloscope screen.

```
LRCKO  ┌──────────────────────────────┐ ┌─────────────
       ┘                              └─┘
SDO    ──────────┌──────────────┐┌┐┌┐┌┐┌┐┌┐┌┐┌──────────
                 ┘              └┘└┘└┘└┘└┘└┘└┘
           ←─ sign ─→
                            ←──────────→
                             swing level
                 M                        L
                 S                        S
                 B                        B
```

HARNESS

CN1A

5

1

PHR-5
(JST)

80

CN1B

5

1

No.1 Pin ORG   Others BRN
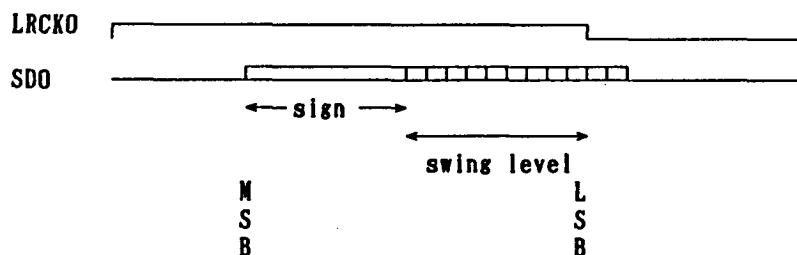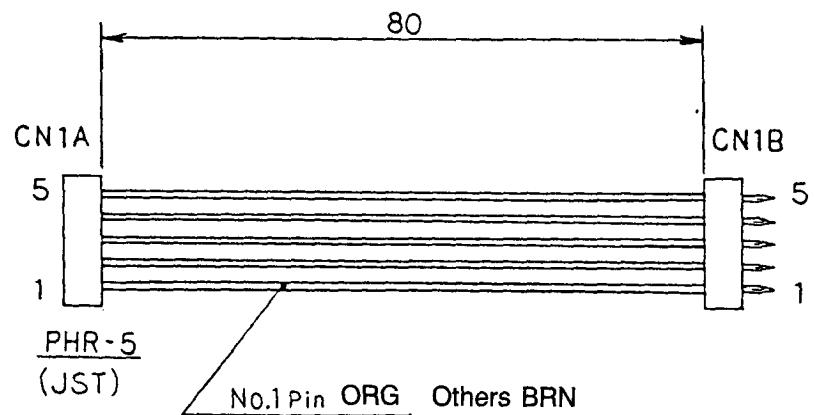
10. PARTS LIST

PART CODE	PART NAME/SPECIFICATION	P.C.BOARD	NOTE	Q'TY
001092400	P.C.BOARD ASSEMBLY KLM-924/5/6	M.PARTS		1
304000070	TR 2SA812-T1 (M5-7)	924		1
304020150	TR 2SC1623-T1B (L7)	924		1
304020170	TR 2SD596-T1 (DV2-4)	924		2
304020230	TR 2SC3661-TA/TB(3K)	924		2
304020290	TR 2SC3618-T1	924		1
304030130	TR FA1A4M-T1B	924		3
304030140	TR FN1A4M-T1B	924		3
310002100	DIODE SR1M-2	924		1
312007800	LED GL3HD8	925		5
313002700	LCD DMC16205NYU-LY-B7 (WITH HARNESS	M.PART		1
314001400	DIODE RLS-73 TE-11	924		3
		925		10
314027100	ZENER DIODE RD10MB3-T1B	924		1
314027300	ZENER DIODE RD3.9MB-T1B	924		1
320001294	IC UPD27C2001C-12/15	924	EP_ROM	1
320001343	IC UPD23C16000BGX-385	924	WAVE_ROM	1
320001350	IC UPD70325GJ-10-5BG (94P QFP)	924	CPU	1
320004357	IC HM511664LZ-8	924	D_RAM	1
320012066	IC MB81464-10PSZ-G-BB-RS2	924	D_RAM	1
320012141	IC MBCS35104-001PF-G-BND	924	TGL	1
320012148	IC MB8316200A-15PF-G-402-HT	924	WAVE_ROM	1
320013052	IC LH537FFS	924	WAVE_ROM	1
324001006	IC UPD74HCU04GS-E2 (SOP)	924	HC_MOS	1
324001015	IC UPC4570G2-E2 (SOP)	924	OP_AMP	4
324004011	IC HD74HC04FPER	924	HC_MOS	1
324004024	IC HD74HC74FPER	924	HC_MOS	1
324004050	IC HD74HC138FPER	924	HC_MOS	2
324004176	IC HD74HC05FPER	924	HC_MOS	1
324009004	IC NJM78L05UA-TE2	924	REGULATER	1
324011002	IC M5223FP-600C (8P SOP)	924	OP_AMP	1
324011004	IC M5216FP-600C-TP3	924	OP_AMP	1
324011013	IC M62021FP-600C	924	RESET	1
324011021	IC M5M34050FP-42A	924	TRANSCEIVER	1
324012006	IC MB84256A-10LPF-G-BND-EF	924	S_RAM	2
324036002	IC PCM69AU-T1 (SELECTED)	924	DAC	1
333000400	DC-DC CONVERTOR MODULE HLD050R6M	924		1
334000600	PHOTO COUPLER PC-410K-TP	924		1
335400080	CRYSTAL OSC SX-1 32.000MHZ	924		1
335400090	CRYSTAL OSC SX-1 20.000MHZ	924		1
362006600	VR RK09L12B0 10KBX2	926		1
375010900	CHIP SW EVQPAC07K	925		10
375011600	PUSH SW SPUL19-2N-W1.5H≈12.5MM	924		1
402005100	SB COIL SBT-0180W	924		1
405008700	AC ADAPTOR KAC-1241 100JP	M.PART	100JP	1

PART CODE	PART NAME/SPECIFICATION	P.C.BOARD	NOTE	Q'TY
405008800	AC ADAPTOR KAC-1253A 117US/CN	M.PART	117US	1
		M.PART	117CN	1
405008900	AC ADAPTOR KAC-1245 240AU	M.PART	240AU	1
405009000	AC ADAPTOR KAC-1246 240UK	M.PART	240UK	1
405009100	AC ADAPTOR KAC-1247 240GE/AF	M.PART	240GE	1
		M.PART	240AF	1
405009200	AC ADAPTOR KAC-1248 220GE	M.PART	220GE	1
405009300	AC ADAPTOR KAC-1259 VDE	M.PART	230GE	1
		M.PART	230FR	1
		M.PART	230SE	1
		M.PART	230WG	1
405009700	AC ADAPTOR KAC-1243A 117EX	M.PART	117EX	1
450002400	PHONE JACK LGR4501-5000 (MONO)	924		2
454006200	HEC-0470-01-630	924		1
454008300	PHONE JACK YKB21-5130	924		1
454009300	MINI DIN CONNECTOR D8-177J-201	924		1
470196500	HARNESS HNS-965 BOARD IN 5P	926	VOLUME	1
471070500	CONNECTOR TOP B5B-PH-K-S	924	VOLUME	1
471071500	CONNECTOR TOP B15B-PH	924	LCD	1
474012600	CARD CONNECTOR FC-13(1.6)	925		1
474019100	FPC CONNECTOR 5597-13CPB	924		1
480001324	IC SOCKET 32P DICF-32CS-E	924		1
480010200	DIN SOCKET YKF51-5046	924		1
500020400	RUBBER FOOT SJ-5012 BLACK	M.PART		4
520001700	LITHIUM BATTERY CR2032VPX	924		1
545020480	SMCD-13X170-ESX10BL-P1.25-S6-K	925		1
575016700	LED SPACER LH-3-2	925		5
620025700	X-145 VR KNOB KOC-E48042	M.PART		1
620025800	X-145 PSW KNOB KOC-E48039-2	M.PART		1
630018800	X-145 LCD WINDOW KOC-E48043	M.PART		1
641037300	X-145/146 METAL FITTING OF PCB	924		4
641037400	X-145 UPPER CASE KOC-C28049-2	M.PART		1
641037500	X-145 LOWER CASE KOC-C28050-2	M.PART		1
644003000	X-507 GND SPRING	M.PART		1
646043000	X-150 CORD HOOK	M.PART		1
646044400	X-145 FRONT PANEL ASSY H38006	M.PART		1
649007400	BATTERY HOLDER	924		1

KLM-925

KLM-924

No value "C" is 0.1uF

MIDI