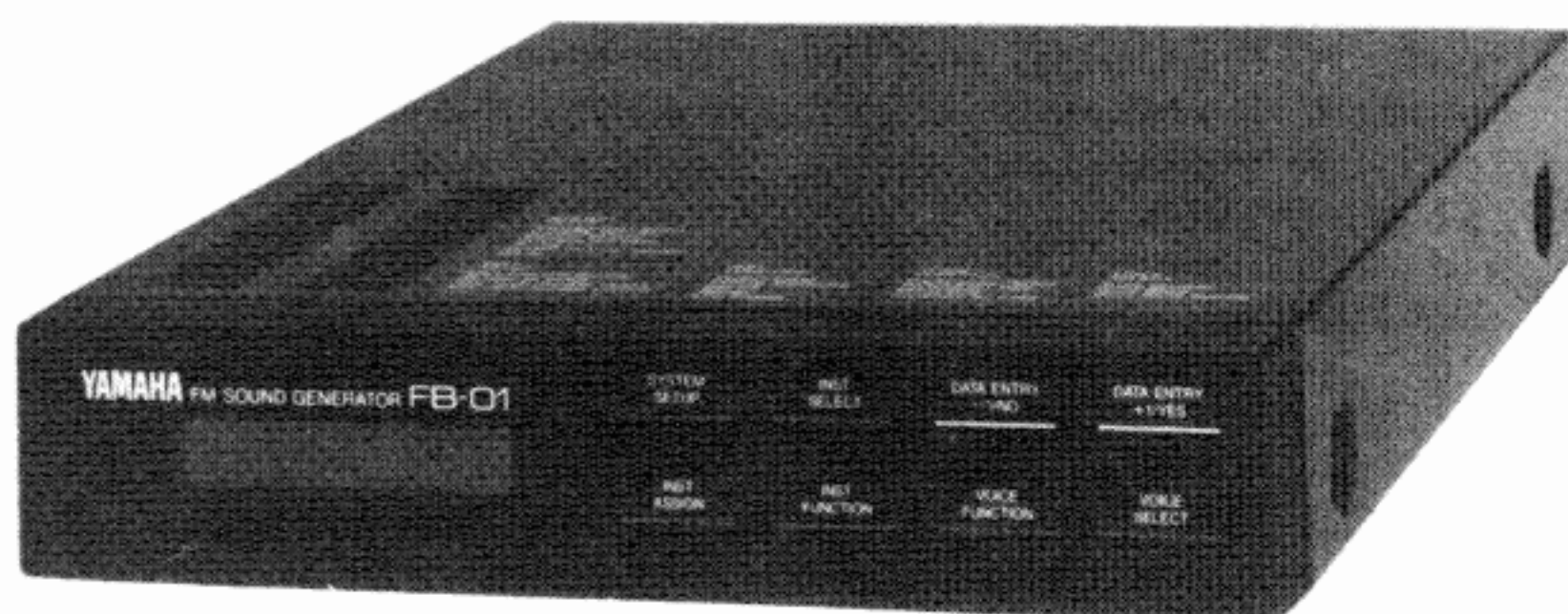


# YAMAHA FM SOUND GENERATOR FB-01

## 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:** The 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 principle-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 buss in the unit (heavy gauge black wires connect to this buss).

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

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, 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.

# SPECIFICATIONS

## CPU

|               |                                                                   |
|---------------|-------------------------------------------------------------------|
| $\mu$ pD70008 | AC-6 (equivalent of the Z-80B C-MOS)                              |
| CLOCK         | 6MHz ( $\pm 0.5\%$ )                                              |
| WAIT          | 3 or 4 WAIT cycles are inserted when accessing the LCD            |
| INTERRUPT     | Only MODE 1 used (NMI unused)                                     |
|               | INTERRUPT is generated from USART ( $\mu$ pD71051) & OPP (YM2164) |
| RESET         | POWER ON RESET only                                               |

## MEMORY

|                                                                               |                   |
|-------------------------------------------------------------------------------|-------------------|
| $8 \times 8$ KBIT S-RAM $\times 2$                                            | 16 KBYTES (150ns) |
| All provided with battery-backup                                              |                   |
| 32 KBYTES Program ROM                                                         | (150ns)           |
| Be sure to use 150ns speed MEMORY to be compatible with the CPU access speed. |                   |

## SOUND SOURCE

|                                                                |                                                   |
|----------------------------------------------------------------|---------------------------------------------------|
| FM sound source utilizes the OPP (YM2164) and the DAC (YM3012) |                                                   |
| CLOCK                                                          | 4MHz ( $\pm 0.2\%$ )                              |
| Amp.                                                           | L-R 2ch                                           |
| Amplification                                                  | 9.2dB (1kHz)                                      |
| Frequency response                                             | 10Hz ~ 16kHz ( $-3$ dB)                           |
| Q                                                              | 0.72                                              |
| Residual noise                                                 | 0.4mV or less<br>(RMS AC voltmeter 4Hz to 500kHz) |
| Power ON/OFF noise                                             | 10mV/3mV<br>(RMS AC voltmeter 4Hz to 500kHz)      |
| L/R gain difference                                            | Within 0.6dB                                      |
| Output level                                                   | $-1.7$ dBm/1kHz<br>(Sine wave 1 tone/ATT 0dB)     |
| Output impedance                                               | 1k $\Omega$ /1kHz                                 |
| D/A conversion sample frequency                                | 62.5kHz                                           |

## MIDI

|                    |                                                    |
|--------------------|----------------------------------------------------|
| USART              | $\mu$ pD71051C                                     |
| PHOTO COUPLER      | PC910                                              |
| MIDI transfer rate | 31.25kHz $\pm 0.1\%$                               |
| MIDI THRU DELAY    | Leading 200ns (TYP)<br>Trailing 150ns (TYP)        |
| CONNECTOR          | DIN5P $\times$ 3<br>(MIDI-IN, MIDI-THRU, MIDI-OUT) |

## DISPLAY

|                       |                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------|
| LCD                   | 16 characters per 1 line<br>(5 $\times$ 7 dots/1 char)                                                         |
| NEGATIVE TYPE         | 1/16 DUTY                                                                                                      |
| Optimum visual angle: | Vertical direction 20° against horizontal plane<br>Horizontal direction 0° against vertical plane              |
| Visual angle range    | : Optimum vision $\pm 20^\circ$ in vertical direction<br>Optimum vision $\pm 30^\circ$ in horizontal direction |
| BACK LIGHT            | 24 chip LED (Working current 180mA)                                                                            |
| Color                 | ORANGE                                                                                                         |
| LCD CONTROLLER        | HD44780A or equivalent                                                                                         |

## INPUT SWITCH

|                                 |          |
|---------------------------------|----------|
| Tact SW (Stroke 1mm) $\times$ 8 |          |
| SW name                         | DATA BUS |
| SYSTEM-SETUP                    | (D0)     |
| INST-SELECT                     | (D1)     |
| INST-ASSIGN                     | (D2)     |
| INST-FUNCTION                   | (D3)     |
| VOICE-FUNCTION                  | (D4)     |
| VOICE-SEL                       | (D5)     |
| - 1/No                          | (D6)     |
| + 1/Yes                         | (D7)     |

|             |           |            |           |
|-------------|-----------|------------|-----------|
| SYSTEM      | INSTSEL   | - 1/NO     | + 1/Yes   |
| INST ASSIGN | INST FUNC | VOICE FUNC | VOICE SEL |

## BATTERY BACKUP

|                  |                            |
|------------------|----------------------------|
| Backup battery   | lithium battery (160Ah)    |
| Backup period    | 5 years after Backup SW ON |
| Backup ON-OFF SW |                            |

## POWER SUPPLY

|                               |                                                                |
|-------------------------------|----------------------------------------------------------------|
| Type                          |                                                                |
| Series type                   | + 3-terminal regulator                                         |
| Primary side specifications   |                                                                |
| $\pm 10\%$ of rated input     | 50Hz/60Hz                                                      |
| Electricity consumption       | 9W                                                             |
| Secondary side specifications |                                                                |
| + 5V (for Digital)            |                                                                |
| Accuracy                      | $\pm 5\%$                                                      |
| Electric current              | 400mA                                                          |
| $\pm 5$ V (for Analog)        |                                                                |
| Accuracy                      | $\pm 5\%$                                                      |
| Electric current              | 100mA                                                          |
| GND                           | + 5V (for Digital)<br>$\pm 5$ V (for Analog)<br>FLOAT mutually |

## GENERAL SPECIFICATIONS

### Conditions for use

|             | Product specifications | Catalogue specifications |
|-------------|------------------------|--------------------------|
| Temperature | 0°C ~ 40°C             | 0°C ~ 35°C               |
| Humidity    | 20% ~ 90%              |                          |

### Temperature for storage

|             | Product specifications                   | Catalogue specifications                 |
|-------------|------------------------------------------|------------------------------------------|
| Temperature | $-20^\circ\text{C}$ ~ $60^\circ\text{C}$ | $-15^\circ\text{C}$ ~ $60^\circ\text{C}$ |
| Humidity    | 10% ~ 90%                                | 10% ~ 90%                                |

|            |                                             |
|------------|---------------------------------------------|
| Dimensions | 218mm(W) $\times$ 48mm(H) $\times$ 274mm(D) |
| Weight     |                                             |

Accessory List: (2) RCA to 1/4 Phone adaptors  
(1) MIDI Cable (1m) ~ 3.2 feet  
(1) Instruction manual  
(1) Warranty Card

## ■ FUNCTIONS & FEATURES

(Refer to the instruction manual for handling.)

### Instrument

|                        |                                                                                                                                                                                                                                                                         |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. of Instruments     | Up to 8 instruments can be specified (No.0 to No.7)                                                                                                                                                                                                                     |
| No. of tones generated | The FB-01 can generate a maximum of 8 tones or notes. If only one instrument is selected, it can be assigned to have a maximum of 8 notes. However, if two or more instruments are selected, then the total 8 note capability is split between the various instruments. |
| MIDI channel           | For each part, one MIDI channel number from # 0 to # 15 can be assigned.                                                                                                                                                                                                |
| System No.             | Separate from MIDI channels, each FB-01 can be assigned system numbers from 1 to 16. Thus, each FB-01 can be controlled independently, even though several FB-01 units are used in the total system.                                                                    |
| Note range             | Acceptable Note Range C2 ~ G8<br>Nominal Note Range 8 octaves.                                                                                                                                                                                                          |

### Voice

Number of preset voices : 240  
 Number of voices which can be defined by the user: 96  
 (Backed up by battery)  
 Basic voice data is interchangeable with SFG01 and SFG05.  
 The notes can be assigned to any instrument (part).  
 A controller and special software (with MIDI capability) are necessary to produce voices.

### Configuration Data Listing

Listed in the table below is the data of configuration No.17 which is one of the preset.  
 The FB-01 has a total of 20 types of configuration data, namely, 4 types which are preset (in ROM) and 16 types (with battery backup) for the user (in RAM).

|                        |                         |    |                              |        |       |       |       |       |       |       |
|------------------------|-------------------------|----|------------------------------|--------|-------|-------|-------|-------|-------|-------|
| CONFIGURATION NUMBER   |                         | 17 | NAME                         | single |       |       |       |       |       |       |
| VOICE FUNCTION COMBINE |                         | ON | KEY-CODE NUMBER RECEIVE MODE |        |       |       | ALL   |       |       |       |
| INSTRUMENT NUMBER      |                         |    | 1                            | 2      | 3     | 4     | 5     | 6     | 7     | 8     |
| INST<br>ASSIGN         | MIDI CHANNEL            |    | 1                            | 2      | 3     | 4     | 5     | 6     | 7     | 8     |
|                        | NUMBER OF NOTES         |    | 8                            | 0      | 0     | 0     | 0     | 0     | 0     | 0     |
|                        | KEY-CODE NUMBER LIMIT/L |    | C-2                          | C-2    | C-2   | C-2   | C-2   | C-2   | C-2   | C-2   |
|                        | KEY-CODE NUMBER LIMIT/H |    | G8                           | G8     | G8    | G8    | G8    | G8    | G8    | G8    |
| VOICE<br>SELECT        | VOICE NUMBER            |    | 1                            | 1      | 1     | 1     | 1     | 1     | 1     | 1     |
|                        | VOICE BANK NUMBER       |    | 3                            | 3      | 3     | 3     | 3     | 3     | 3     | 3     |
| INST<br>FUNCTION       | OUTPUT LEVEL            |    | 127                          | 127    | 127   | 127   | 127   | 127   | 127   | 127   |
|                        | OCTAVE TRANSPOSE        |    | 0                            | 0      | 0     | 0     | 0     | 0     | 0     | 0     |
|                        | DETUNE                  |    | 0                            | 0      | 0     | 0     | 0     | 0     | 0     | 0     |
|                        | STEREO                  |    | L+R                          | L+R    | L+R   | L+R   | L+R   | L+R   | L+R   | L+R   |
|                        | LFO ENABLE              |    | ON                           | ON     | ON    | ON    | ON    | ON    | ON    | ON    |
| VOICE<br>FUNCTION      | PITCHBENDER RANGE       |    | 2                            | 2      | 2     | 2     | 2     | 2     | 2     | 2     |
|                        | PORTAMENTO TIME         |    | 0                            | 0      | 0     | 0     | 0     | 0     | 0     | 0     |
|                        | POLY/MONO               |    | POLY                         | POLY   | POLY  | POLY  | POLY  | POLY  | POLY  | POLY  |
|                        | INPUT CONTROLLER (PMD)  |    | WHEEL                        | WHEEL  | WHEEL | WHEEL | WHEEL | WHEEL | WHEEL | WHEEL |

### Effects

[Effects settings are possible for each instrument (part).]

|              |                  |
|--------------|------------------|
| Sound volume | 128 steps        |
| PAN          | L, LR, R         |
| Detune       | ± 100 cent Max.  |
| Transpose    | ± 2 octaves Max. |

### Special Effects

|                                    |                                                                                |
|------------------------------------|--------------------------------------------------------------------------------|
| Portamento time                    | 128 steps                                                                      |
| Pitch bender range                 | 1 octave Max.                                                                  |
| Poly/mono mode switching possible. |                                                                                |
| AMD control                        | After touch, modulation wheel, breath control or foot control can be selected. |
| PMD control                        | After touch, modulation wheel, breath control or foot control can be selected. |

\*These special effects can be set either for each voice or for each part.

### Configurations

Configurations included 4 types  
 Configurations so that the USER can define 16 types  
 (backed up by battery)  
 "Configuration" is a general term for a series of parameters such as various modes and numerical values which the FB-01 utilizes to generate tones.

### Combine Function

When the combine mode is ON, all voice function data such as bender amount and portamento time are recalled when a voice is loaded. When the combine mode is OFF, the voice function data is NOT recalled with the loaded voice.

## ■ CIRCUIT OPERATION

### 1. CPU Clock Circuit

A 12MHz crystal is utilized in the clock generation circuit to provide the clock signal for the CPU and sound source. A 6MHz clock signal is applied to the clock terminal (pin 6) of the CPU via IC14, a divide by 2 circuit.

### 2. Sub-clock Circuit

A 4MHz crystal is utilized in the clock generation circuit to provide the clock signal for the OPP, DAC, and MIDI circuitry. It is divided down to 500KHz by IC9 (74HC161) and applied to the USART ( $\mu$ PD71051) and OPP (YM2164).

### 3. Reset Circuit

POWER ON RESET is generated by means of the reset circuit consisting of C87, R37, R72 and ZD1. The circuit is also connected to the Chip Enable (CE) signal generation circuit for the RAM battery backup function so that the RAM data is protected at power OFF.

### 4. CPU, ROM, and RAM

The CPU operates on the basis that the system clock is about 6MHz. For this reason, the access time of the bus connecting elements such as ROM and RAM must be faster than 150nS.

The ROM, from 0000H to 7FFFH, is for the voice data and program area as well as for configuration data area.

The RAM, from 8000H to BFFFH, is used as the area for storing various types of register and stack information.

The RAM memory is also utilized for storing the Configuration Data, and the User Memory Data. This RAM area is battery backed-up in order to save or hold the saved data.

### 5. The Sound Source Circuit

This circuit consists of a 4-operator, 8-voices FM sound source (OPP YM2164) and the YM3012 DAC. The FM sound source circuit operates according to the data from the CPU. There are two channels for the audio output and they can produce different voices.

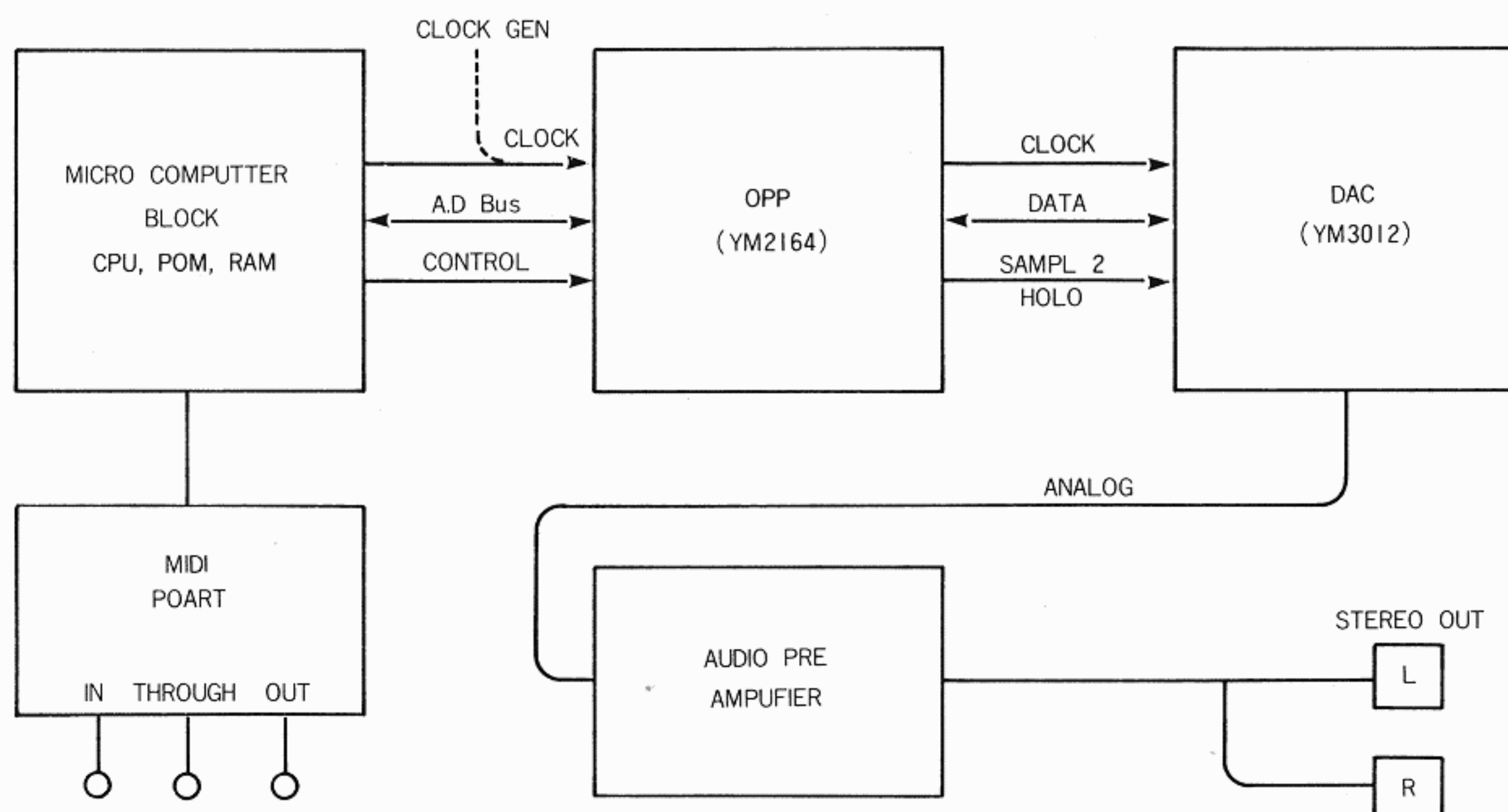
### 6. Switch Scan Circuit

This circuit scans the ON/OFF states of the 8 switches by means of IC18 (74HC244) which is directly connected to the CPU data bus.

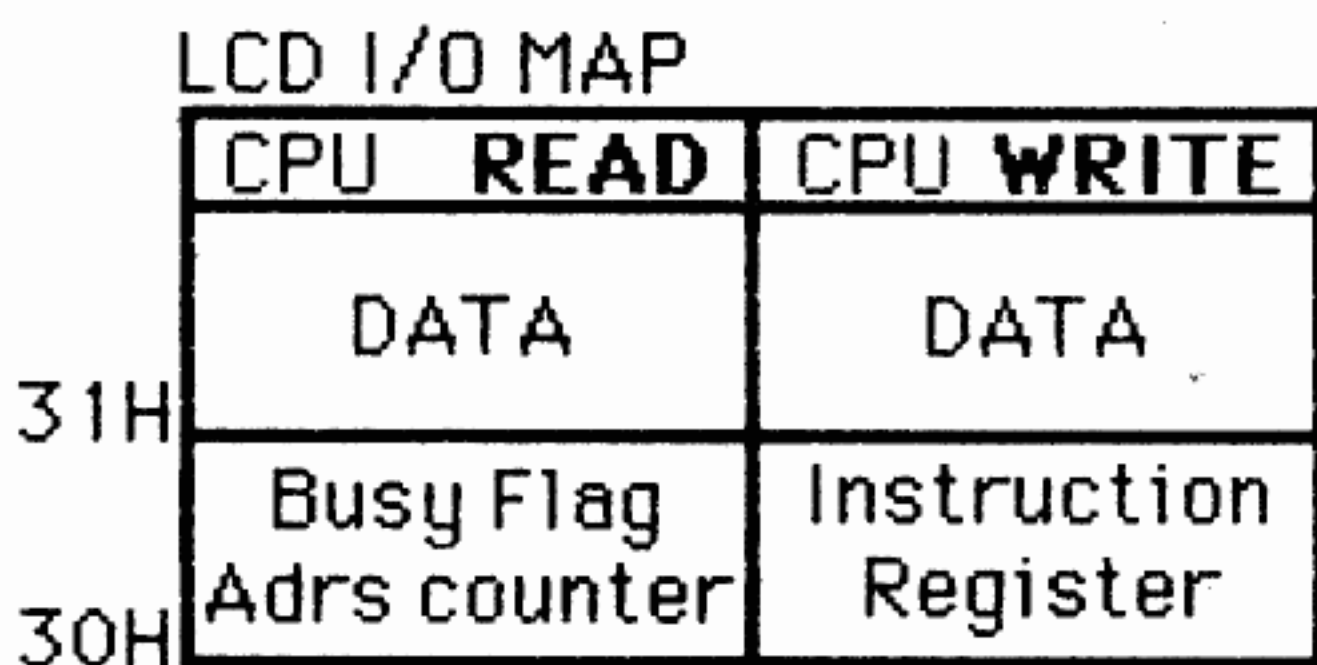
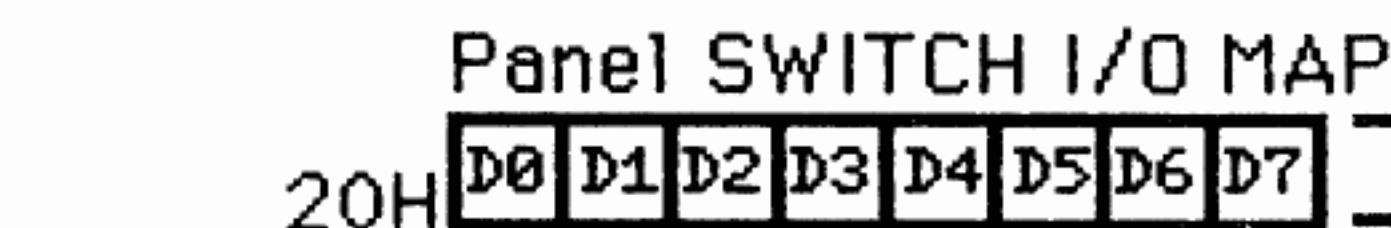
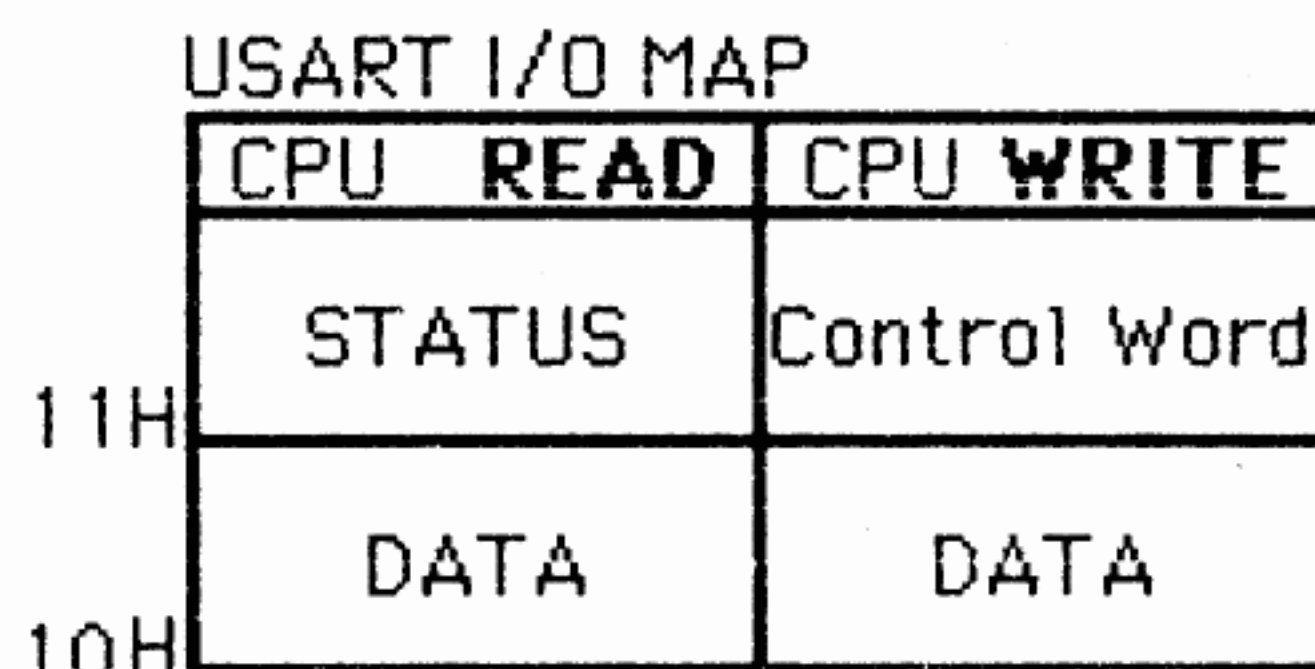
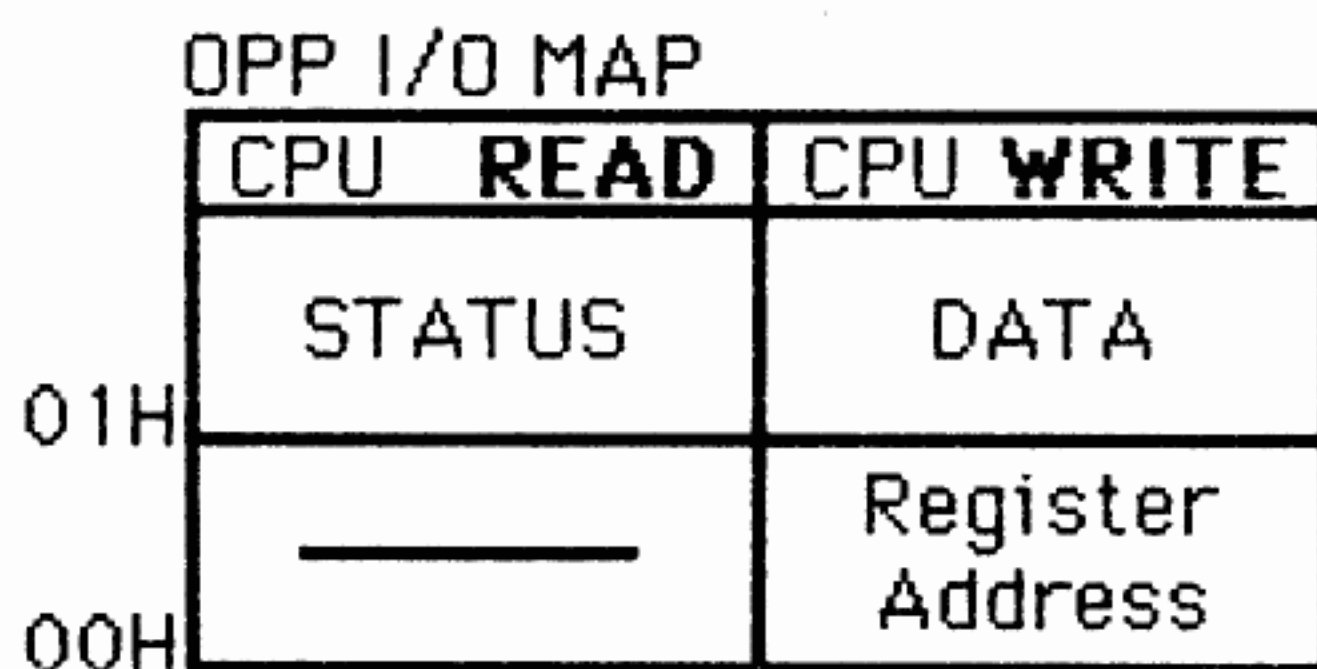
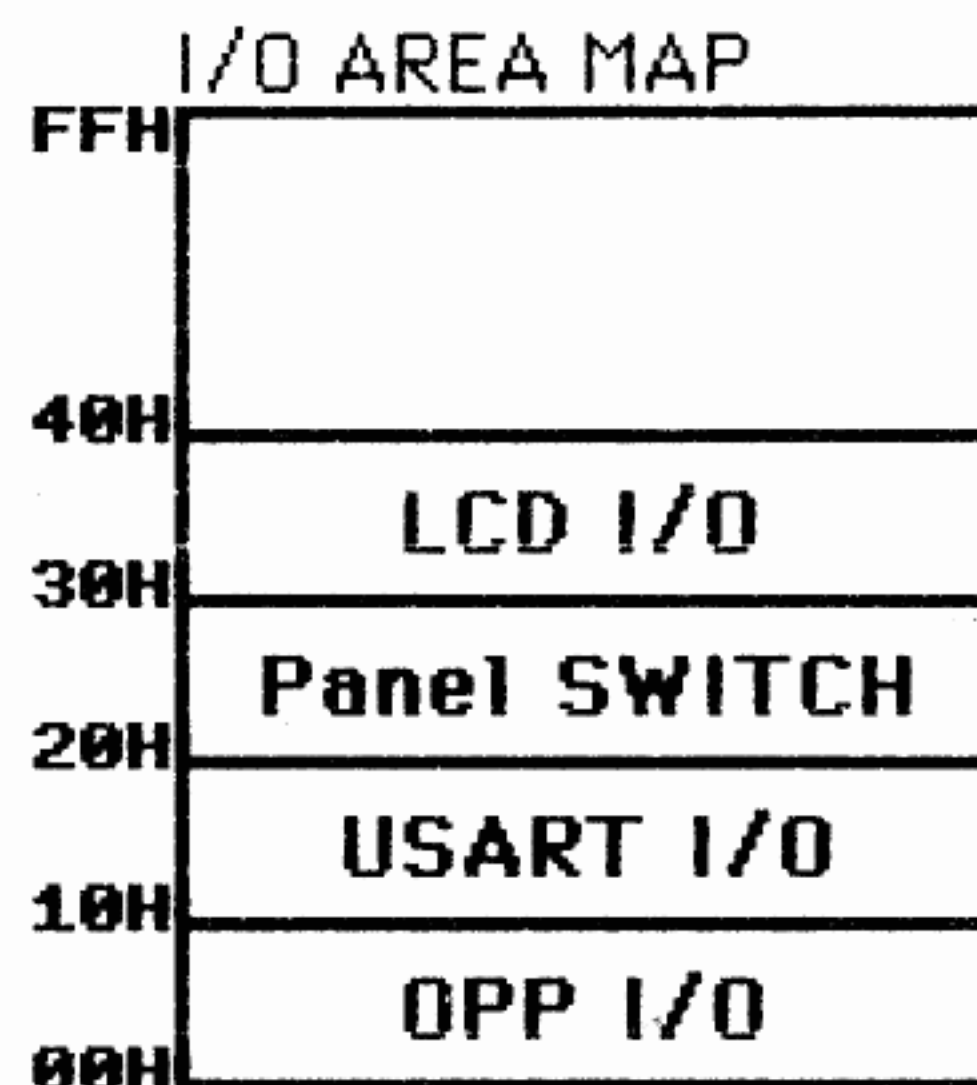
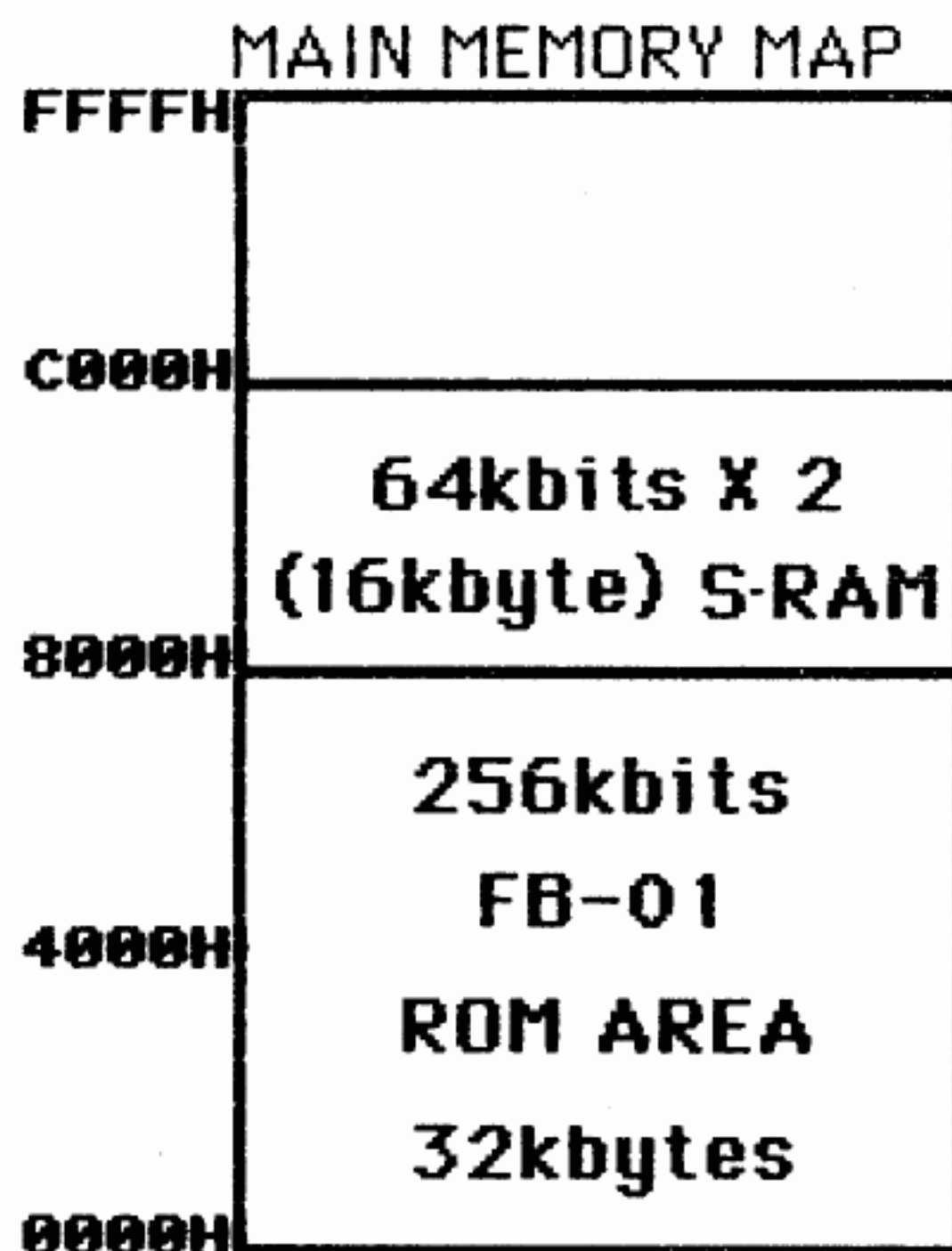
### 7. MIDI Circuit

The USART ( $\mu$ PD71051: 8251 compatible) is used as the Transmitting and Receiving device of the MIDI circuit. It conforms to the MIDI standard V1.0.

## ■ SYSTEM BLOCK DIAGRAM



# ■ **FB-01 MEMORY MAP & I/O PORT MAP**



| BIT | Switch Name    |
|-----|----------------|
| D7  | +1/Yes         |
| D6  | -1/ No         |
| D5  | Voice Select   |
| D4  | Voice Function |
| D3  | Inst Function  |
| D2  | Inst Assign    |
| D1  | Inst Select    |
| D0  | System set up  |

# ■ OPERATIONAL CHECK BY UTILIZING THE TEST PROGRAM

## Test Mode Entry

Before executing the Test Mode or a repair save the user information, all data stored in the S-RAM will be erased when the Test Mode is activated.

Depress and hold the "SYSTEM SET UP", "INST SELECT" and "DATA ENTRY - 1/NO". Switches on the front panel while turn ON the POWER switch, and the test program, starts operating. Test data is written in the S-RAM memory area which is from 8000 to BFFFH (indicated as FFFFH). When this process is complete "S-RAM WRITE END" is displayed, which means that the data for the backup circuit check has been written in the S-RAM.

## TEST MENU MODE

Pressing the "VOICE SELECT" switch after the "S-RAM WRITE END" message is displayed sets the TEST menu mode. The "VOICE SELECT" switch is also used when setting the mode back to the TEST menu mode from other TEST mode routines. Once the mode is set to the TEST menu, the message " = = IFB TEST = =" will be displayed on LCD.

## Battery-backup function & S-RAM check

1. Turn ON the battery backup switch.
  2. Press the proper switch to set to TEST MODE.
  3. If the S-RAM doesn't have the test data written in, writing of the prescribed data starts automatically.
  4. Upon completion of writing the message "S-RAM WRITE END" is displayed. (Press the "VOICE SELECT" key to return to the menu.)
  5. Turn OFF the power and wait for two hours.
  6. Turn ON the power again, set to the TEST mode and check that "S-RAM CHECK OK!" message is displayed. When turning ON the power, be sure to start in the TEST mode. If having started in the NORMAL mode, repeat this process from above step 2.
- If the data in S-RAM has been erased, the prescribed data is automatically written in. However, if "S-RAM WRITE END" is not displayed after the comparative check, it means that the S-RAM related part is defective and the check after this will become ineffective.

## LCD Check

1. Press the proper switches to enter the TEST mode.
2. Press the "VOICE-SEL" switch to select the TEST menu mode the following message should be displayed " = = IFS TEST = =".
3. Press the "SYSTEM" switch to select the LCD TEST mode.
4. Check to make sure that LCD displayed characters as shown in Table 1 which will increment from COH to FFH. During each increment 16 characters are displayed at a time.
5. To stop the sequence and display routine of 16 characters press the VOICE FUNC switch, and the display will stop temporarily.
6. To exit the LCD display routine, press the SYSTEM switch.
7. As a final step, check to make sure that the CHARACTER GENERATE RAM display appears as shown in the figure.
8. Also, check that the color, contrast, visual angle and visual angle range are appropriate.

## CPP TIMER Test

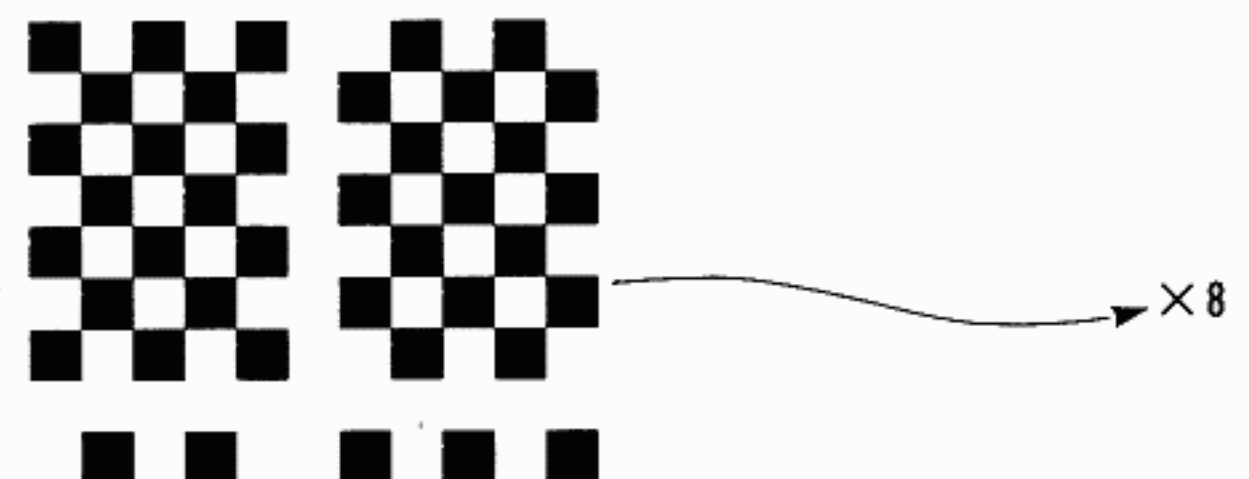
1. Press the specified switch to increment to the TEST menu mode.
2. Press " - 1/NO" switch to advance to the TIMER TEST PROGRAM.
3. Check to make sure that the "TIMER OK!" message is displayed.

## MIDI Function

1. Prepare two FB-01 standard units (Standard unit is a FB-01 unit that is known to be functioning correctly).
2. Connect them as shown in Fig.2 by using the MIDI cable included in the package.
3. Press the specified switch to increment to the TEST menu mode.
4. Press the INST SEL switches of the standard units ① and ② in Fig.2 to advance to the MIDI TEST mode. (UART MIDI CHECK)
5. Press the INST SEL switch of the unit being tested to advance to the MIDI TEST mode.
6. Check to make sure that after a few seconds, the "MIDI OK!" message is displayed on all three units.

## AMP Characteristics

1. Terminate both L and R terminals with 47K $\Omega$  resistors.
2. Press the specified switch to advance to the TEST menu mode.
3. Press the + 1/Yes switch to run the OPP SOUND CHECK PROGRAM.
4. Press the - 1/No switch to initiate the output of a 1kHz TEST signal.
5. Connect a frequency counter to either L or R terminal and check that frequency is within 1000Hz  $\pm$  1Hz.
6. Using an AC voltmeter (level meter Model M-174A of NF make or equivalent), check to make sure that the FLAT characteristic is within  $\pm$  0.3dB of the specified value and that the level difference between L and R is within 0.6dB.
7. Using an oscilloscope, check to make sure that the waveform is not distorted or clipped from.
8. Using a distortion meter, check to make sure that the distortion factor is within 0.5%.
9. Press SYSTEM, INST SEL, - 1/NO, + 1/YES, INST ASSIGN and INST FUNC switches one by one continuously and check that the reading of the AC voltmeter is within  $\pm$  0.3% of the specified value.
10. Turn the power ON and OFF, and check that the AC voltmeter reading is less than 10mV then.
11. Check to make sure that the residual noise is less than 0.5mV in the TEST menu mode.
12. With the same settings as specified in step No.6, add a 1k $\Omega$  to the load resistor and check that the output level changes to one half the original level.



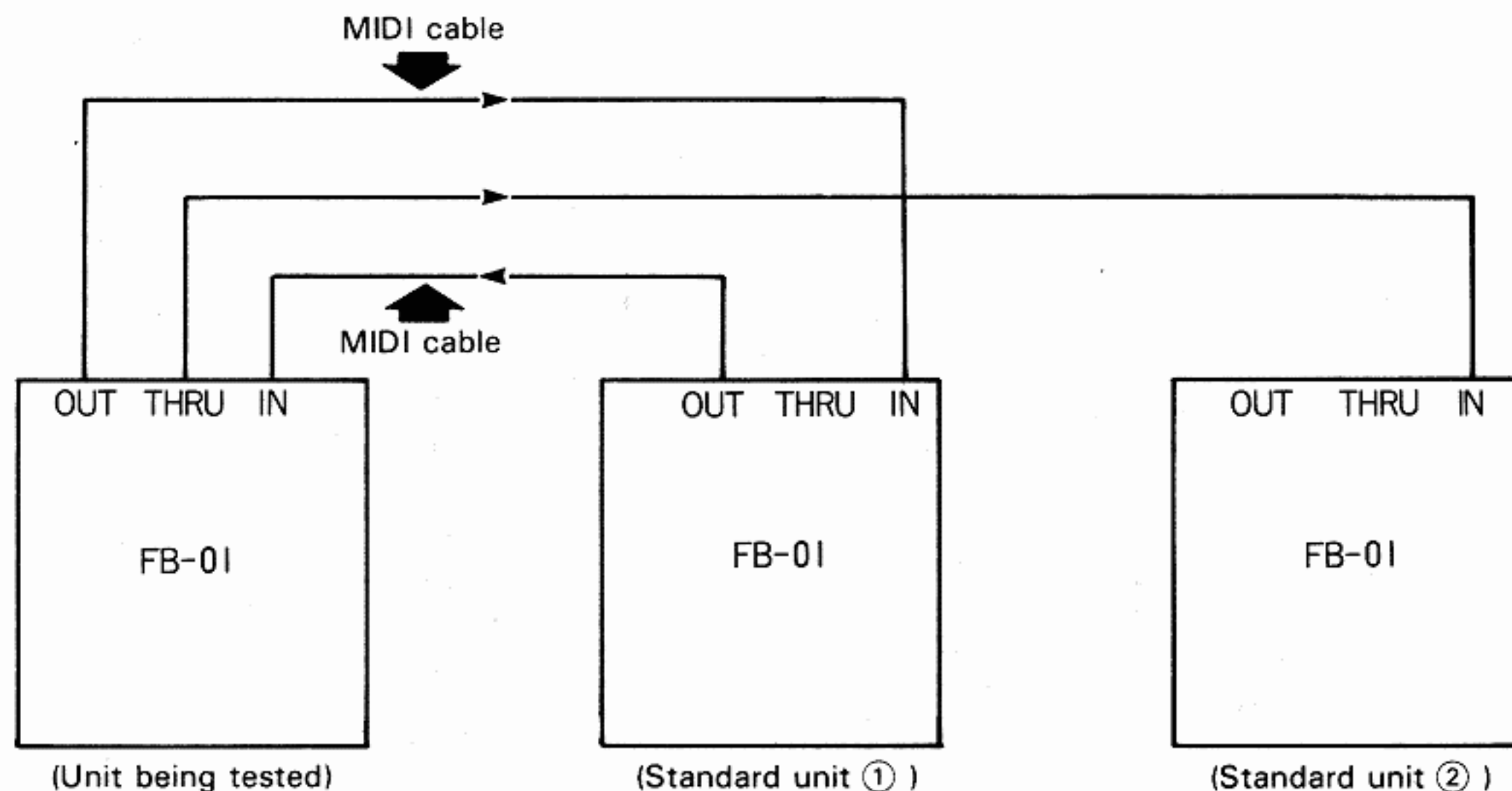
〈Fig. 1〉

# LCD Pattern Display

Character Pattern Table (Table 1)

| High order<br>Low<br>order 4 bit | 4 bit            | 0000 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|----------------------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| XXXX0000                         | CG<br>RAM<br>(1) |      | 0    | a    | P    | ˘    | P    |      | —    | 9    | E    | o    | o    |      |
| XXXX0001                         | (2)              | !    | 1    | 9    | 0    | 2    | 9    | a    | 7    | +    | 4    | 9    | 9    |      |
| XXXX0010                         | (3)              | "    | 2    | E    | R    | b    | r    | "    | 4    | 9    | x    | e    | e    |      |
| XXXX0011                         | (4)              | #    | 3    | C    | S    | c    | s    | ,    | 9    | +    | E    | e    | e    |      |
| XXXX0100                         | (5)              | \$   | 4    | D    | T    | d    | t    | \    | 7    | +    | +    | u    | u    |      |
| XXXX0101                         | (6)              | %    | 5    | E    | U    | e    | u    | .    | +    | +    | 7    | e    | e    |      |
| XXXX0110                         | (7)              | 6    | 6    | F    | V    | f    | v    | 9    | +    | +    | 9    | o    | z    |      |
| XXXX0111                         | (8)              | 7    | 7    | G    | W    | g    | w    | 7    | +    | +    | 7    | q    | π    |      |
| XXXX1000                         | (1)              | 8    | 8    | H    | X    | h    | x    | 4    | 9    | +    | +    | 7    | x    |      |
| XXXX1001                         | (2)              | 9    | 9    | I    | Y    | i    | y    | 9    | 7    | +    | +    | 7    | u    |      |
| XXXX1010                         | (3)              | +    | +    | J    | Z    | j    | z    | 7    | +    | +    | +    | 7    | +    |      |
| XXXX1011                         | (4)              | +    | +    | K    | L    | k    | l    | +    | +    | +    | +    | +    | +    |      |
| XXXX1100                         | (5)              | .    | .    | L    | +    | l    | l    | +    | +    | +    | +    | +    | +    |      |
| XXXX1101                         | (6)              | —    | —    | M    | J    | m    | j    | +    | +    | +    | +    | +    | +    |      |
| XXXX1110                         | (7)              | .    | .    | N    | +    | n    | +    | +    | +    | +    | +    | +    | +    |      |
| XXXX1111                         | (8)              | /    | ?    | O    |      | o    | +    | +    | +    | +    | +    | +    | +    |      |

### Connection for MIDI Function Test

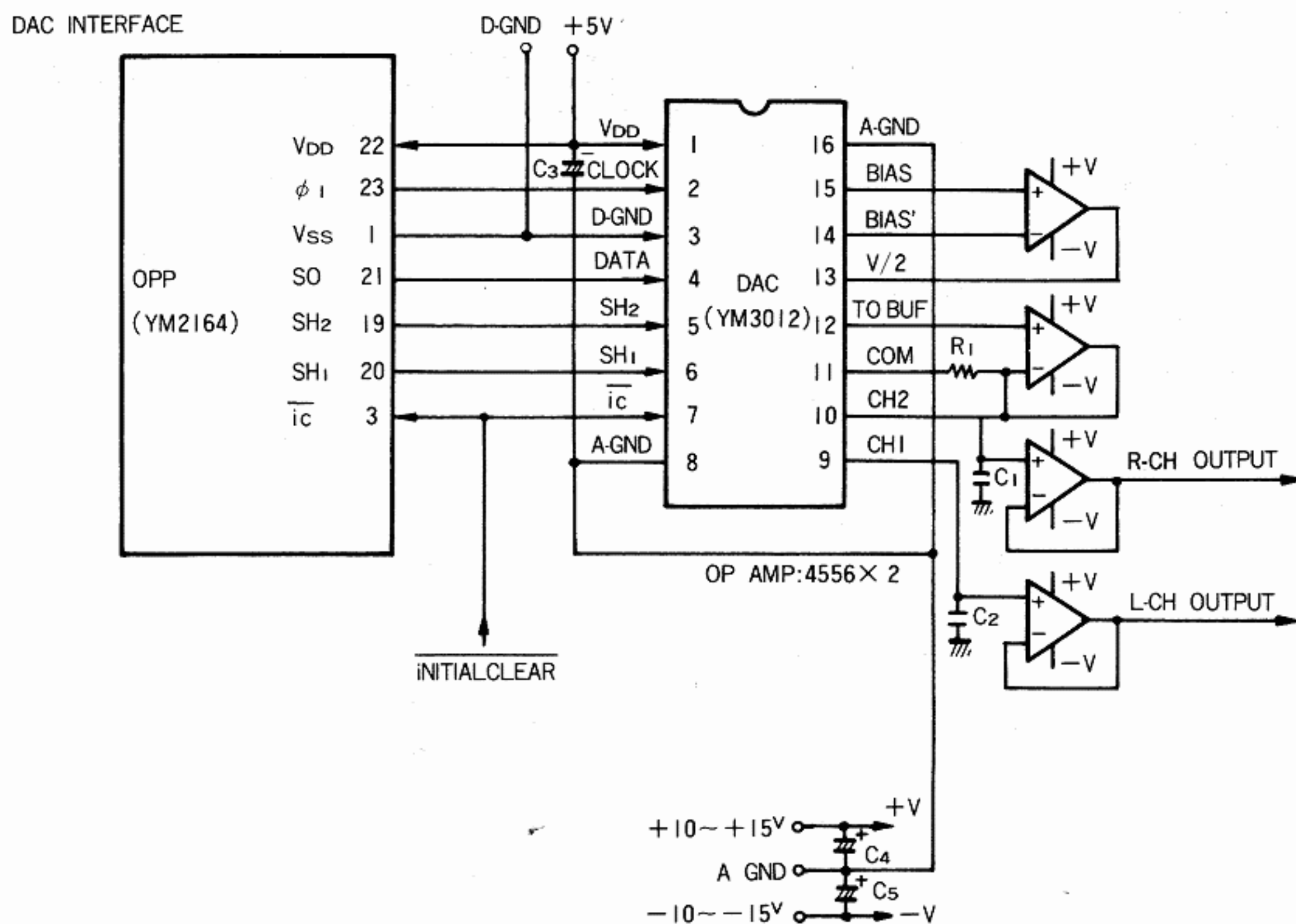


Connection diagram for MIDI Function Test (Fig.2)

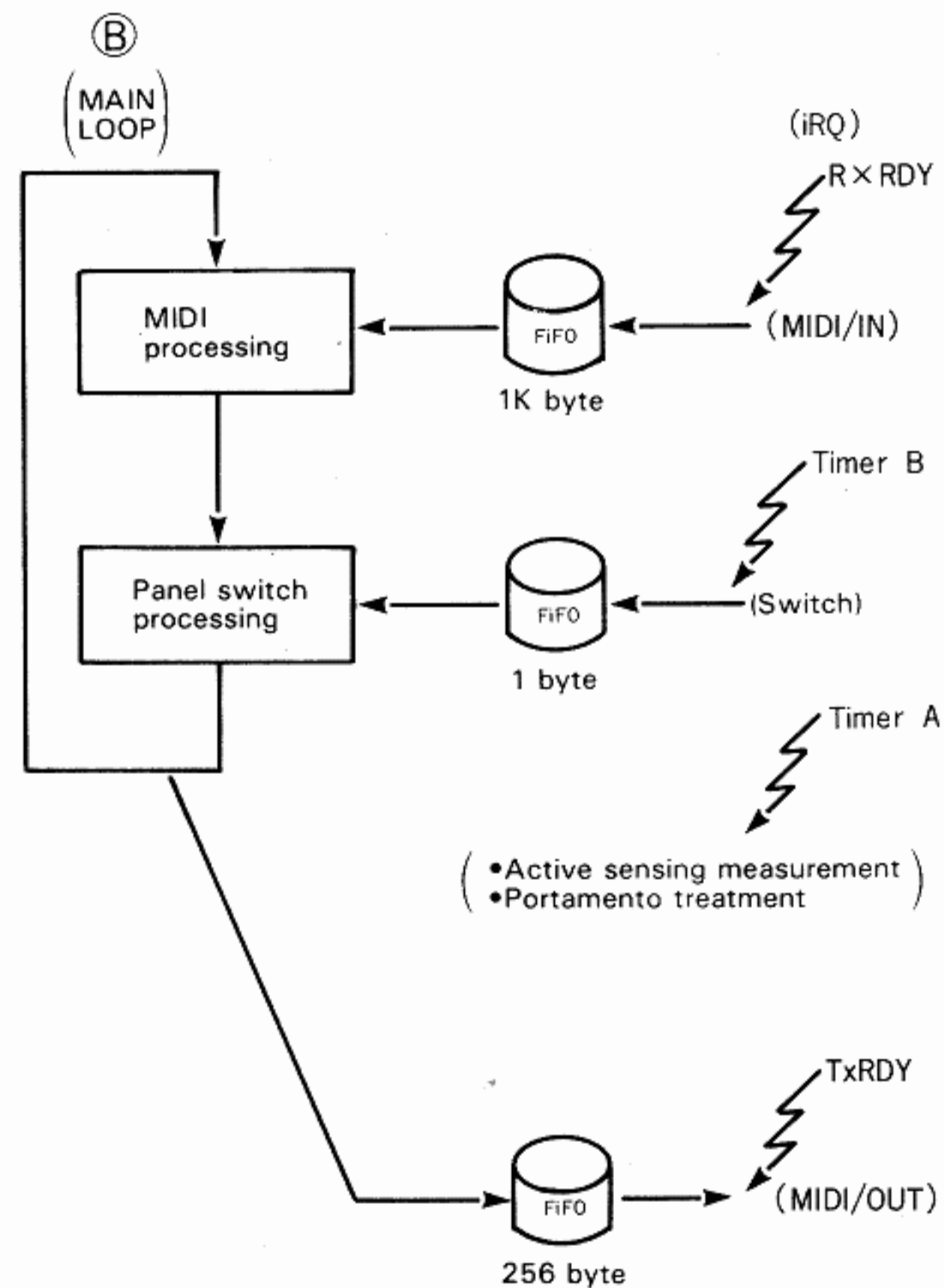
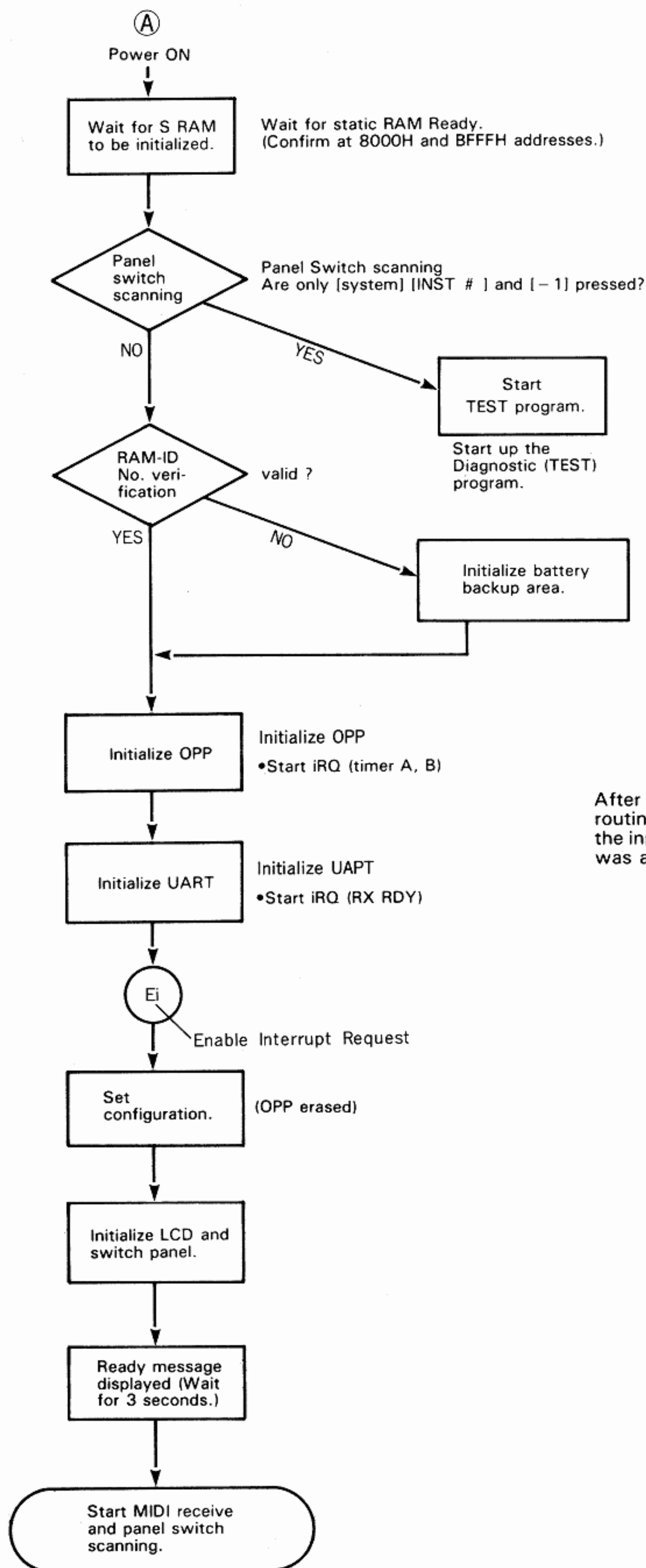
A "Standard unit" is defined as a properly functioning FB-01.

Three FB-01 units are required if the system channel test is to be performed.

### FM Power Source (OPP: YM2164) and D/A (YM3012) Block Diagram



# Boot procedure



After the power is turned ON, the FB-01 is initialized by the (A) routine, and then the MAIN LOOP which is the (B) routine waits for the input and executes each command according to the function that was activated.

## ■ DESCRIPTION ON MIDI

The MIDI signals which the FB-01 can use are classified as follows.

### Channel Message

- Channel voice message  
This is a signal to transmit and receive the information which is directly related to playing. However, for the FB-01, this type of message can only be received, but it can not be transmitted.

The main messages are as follows.

Key note number  
Key ON/OFF signal  
Key velocity  
Change of voice number  
Pitch bender  
Various control information

- Channel mode message  
This message is a signal to indicate the mode which will dictate the processing of the transmitted MIDI data. One example of this type of message is a polyphonic/monophonic switching message.

### System Message

- System common message  
This message executes the total system setup and performs such jobs as locating the beginning of the sequence data. However, this function is not used for the FB-01.

- System real time message  
This message synchronizes sequencer and rhythm units when the automatic play function is used. These messages include commands such as "play start", "play stop" and "synchronous clock".

- System exclusive message  
With the FB-01, the system exclusive messages are classified into three groups as described below.

#### ① Instrument message

This message specifies what is to be controlled with the system number and instrument number. It controls the instrument by changing (parameter change) the voice data, instrument function data, voice function data, etc.. It also dumps the voice data set for each instrument.

#### ② System message

This message specifies what is to be controlled with the system number (system channel number). It changes the parameter common to the system (parameter change) and dumps the voice data for 48 voices and the configuration data.

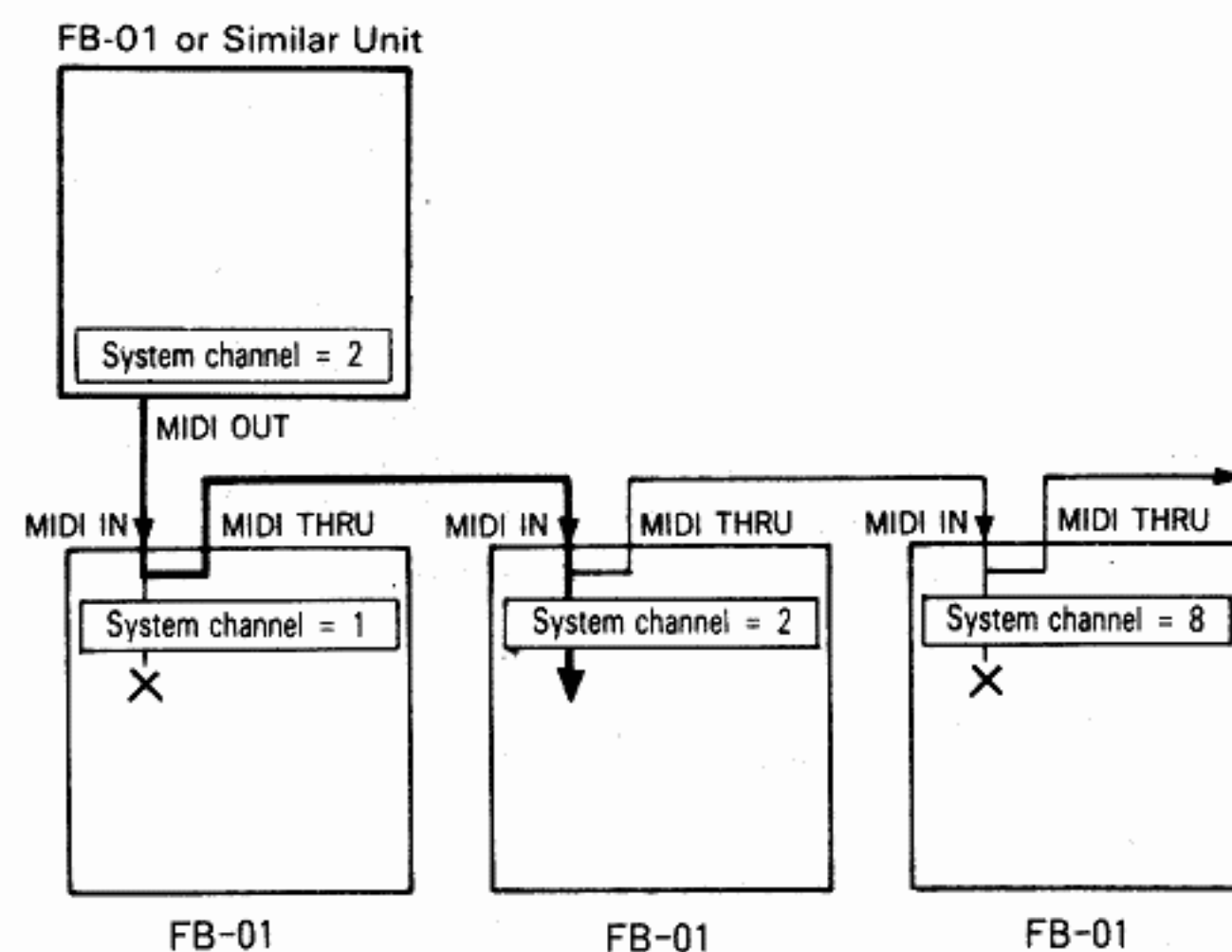
#### ③ Channel message

This message specifies what is to be controlled with the MIDI channel number. The FB-01 operates only when the receiving channel coincides. The information that it controls is the same as the parameter change data of the instrument message, however, the data to be controlled can be specified with the channel number and not with the instrument number.

### System Channel Number

The system channel number is the channel number which is necessary to transmit and receive the system message or instrument message included in the system exclusive data. The number can be set within the range from 1 to 16 by using the SYSTEM SETUP, +1 and -1 switches. The system channel number is entirely different from the MIDI channel number.

When a number of FB-01 units are used in a system setup and, if a different system channel number is assigned for each FB-01, it is possible to control a particular FB-01.



# ■ MIDI RECEIVE DATA FORMAT 1 (CHANNEL MESSAGE, SYSTEM MESSAGE)

## Channel voice message

### ① Key OFF

Status 1000nnnn (8nH:n=Channel No.)  
 Note No. 0kkkkkkk (k=0:C-2~127:G8)  
 Velocity 0vvvvvvv (v: ignored)  
 n=0~15 (0H~FH)

### ② Key ON/OFF

Status 1001nnnn (9nH:n=Channel No.)  
 Note No. 0kkkkkkk (k=0:C-2~127:G8)  
 Velocity 0vvvvvvv (v=1~127:Key ON)  
 (v=0:Key OFF)

\* The output level of each operator varies according to the velocity at the time of reception. How much it varies depends on the velocity sensitivity set by the parameters (data) of each voice. Also, with a voice whose attack rate velocity sensitivity is set, the attack rate varies as well.

\* The note range of this unit is from D#-1 to D7, it produces D7 at the highest and D#-1 at the lowest even when a higher note information or lower note information than the range is received. For example, when D#-7 to D8 information is transmitted, D#-6 to D7 tones are produced.

### ③ Control change

Status 1011nnnn (BnH:n=Channel No.)  
 Control No. 0ccccccc  
 Control value 0vvvvvvv

| Control No.            | Control value                   |
|------------------------|---------------------------------|
| c=1 Modulation wheel   | v=0~127                         |
| c=2 Breath controller  | v=0~127                         |
| c=4 Foot controller    | v=0~127                         |
| c=5 Portamento time    | v=0~127                         |
| c=7 Volume             | v=0~127                         |
| c=10 Pan               | v=0: L<br>v=64: L+R<br>v=127: R |
| c=64 Sustain switch    | v=0:OFF, 127:ON                 |
| c=65 Portamento switch | v=0:OFF, 127:ON                 |
| c=66 Sostenuto switch  | v=0:OFF, 127:ON                 |

\* The control No. 1 receives a signal when the "WHEEL" controller is specified for the pitch modulation controller. Likewise, No.2 and No.4 receive a signal when "BREATH" and "FOOT" controllers are specified, respectively.

### ④ Program change

Status 1100nnnn (CnH:n=Channel No.)  
 Program No. 0ppppppp (p=0:47)

### ⑤ After touch

Status 1101nnnn (DnH:n=Channel No.)  
 Control value 0vvvvvvv

\* Signal is received when the "TOUCH" control is specified for the pitch modulation controller.

### ⑥ Pitch bend

Status 1110nnnn (EnH:n=Channel No.)  
 Value (LSB) 0uuuuuuu  
 Value (MSB) 0vvvvvvv

## Channel mode message

### ① All note OFF

### ② MONO mode ON

### ③ POLY mode ON

Status 1011nnnn (BnH:n=Channel No.)  
 Control No. 0ccccccc  
 Control value 0vvvvvvv

|                              |     |              |
|------------------------------|-----|--------------|
| c=123                        | v=0 | All note OFF |
| c=126                        | v=1 | MONO MODE ON |
| * Operates only in POLY mode |     |              |
| c=127                        | v=0 | POLY MODE ON |
| * Operates only in MONO mode |     |              |

\* When the MONO ON/POLY ON mode is switched, the sound being generated is stopped and sostenuto is turned OFF.

## System real time message

### ① Active sensing (FEH)

\* Once this code is received, sensing is started. If no status or data is received within 300msec, the MIDI receive buffer is cleared and the sound being generated is stopped.

### ② Real time clock (F8H)

\* This clock for system timing and is sent at a rate of 24 clicks per quarter note.

### ③ Start (FAH)

### ④ Continue (FBH)

### ⑤ Stop (FCH)

\* Counting is started by the start or continue signal and stopped by the stop signal.

# ■ MIDI RECEIVE DATA FORMAT 2 (SYSTEM EXCLUSIVE MESSAGE)

## Instrument message

- ① Parameter change (1 byte)
- |               |                              |
|---------------|------------------------------|
| Status        | 11110000(F0H)                |
| ID No.        | 01000011(43H)                |
| Sub-status    | 01110101(75H)                |
| System No.    | 0000ssss(s = system No.)     |
| Message No.   | 00011iii(i = instrument No.) |
| Parameter No. | 0ppppppp(p = 0 ~ 3FH)        |
| Data          | 0ddddddd                     |
| EOX           | 11110111(F7H)                |

This message changes the parameter related to the configuration data and LFO.

\* Refer to Parameter list 1.

- ② Parameter change (2 byte)
- |               |                                           |
|---------------|-------------------------------------------|
| Status        | 11110000(F0H)                             |
| ID No.        | 01000011(43H)                             |
| Sub-status    | 01110101(75H)                             |
| System No.    | 0000ssss(s = system No.)                  |
| Message No.   | 00011iii(i = instrument No.)              |
| Parameter No. | 0ppppppp(p = 40H ~ 7FHH)                  |
| Data          | 0000dddd(Data Low)<br>0000dddd(Data High) |
| EOX           | 11110111(F7H)                             |

This message changes the parameter related to each voice. The data is sent in the order of a Low 4 bit code and a High 4 bit code of the source data.

\* Refer to Parameter list 6 (voice parameter list) for the parameter No.

- ③ Voice bulk data dump
- |               |                                |
|---------------|--------------------------------|
| Status        | 11110000(F0H)                  |
| ID No.        | 01000011(43H)                  |
| Sub-status    | 01110101(75H)                  |
| System No.    | 0000ssss(s = system No.)       |
| Message No.   | 00101iii(i = instrument No.)   |
| Operation No. | 01000000(40H)<br>00000000(00H) |
| EOX           | 11110111(F7H)                  |

This message dumps the data for one voice which is set in the voice buffer of the instrument specified by the system channel and instrument number.

- ④ Store into voice RAM (voice RAM 1 ~ 96) of current voice data
- |               |                              |
|---------------|------------------------------|
| Status        | 11110000(F0H)                |
| ID No.        | 01000011(43H)                |
| Sub-status    | 01110101(75H)                |
| System No.    | 0000ssss(s = system No.)     |
| Message No.   | 00101iii(i = instrument No.) |
| Operation No. | 00000000(00H)                |
| Data          | 00dddddd(d = voice No.)      |
| EOX           | 11110111(F7H)                |

This message stores the currently selected instrument voice data in the voice RAM (voice RAM No.1 ~ 96).

## System message

- ① System parameter change
- |               |                           |
|---------------|---------------------------|
| Status        | 11110000 (F0H)            |
| ID No.        | 01000011 (43H)            |
| Sub-status    | 01110101 (75H)            |
| System No.    | 0000ssss (s = system No.) |
| Message No.   | 00010000 (10H)            |
| Parameter No. | 0ppppppp                  |
| Data          | 0ddddddd                  |
| EOX           | 11110111 (F7H)            |

This message changes the parameter common to the system. It can also change the configuration No.

\* Refer to Parameter list 2 for the parameter No.

- ② Voice RAM 1 (for 48 voices) bulk data dump
- |            |                            |
|------------|----------------------------|
| Status     | 11110000 (F0H)             |
| ID No.     | 01000011 (43H)             |
| Sub-status | 0010ssss (s = channel No.) |
| Format No. | 00001100 (0CH)             |
| EOX        | 11110111 (F7H)             |

This message dumps the voice RAM 1 contents (voice data).

- ③ Each voice bank (for 48 voices) bulk data dump
- |               |                            |
|---------------|----------------------------|
| Status        | 11110000 (F0H)             |
| ID No.        | 01000011 (43H)             |
| Sub-status    | 01110101 (75H)             |
| System No.    | 0000ssss (s = channel No.) |
| Message No.   | 00100000 (20H)             |
| Operation No. | 00000000 (00H)             |
| Bank No.      | 00000xxx (x = 1 ~ 7)       |
| EOX           | 11110111 (F7H)             |

This message dumps the voice data for 48 voices in the voice bank specified by the bank No.

- ④ Current configuration data dump
- |               |                                  |
|---------------|----------------------------------|
| Status        | 11110000 (F0H)                   |
| ID No.        | 01000011 (43H)                   |
| Sub-status    | 01110101 (75H)                   |
| System No.    | 0000ssss (s = channel No.)       |
| Message No.   | 00100000 (20H)<br>00000000 (00H) |
| Operation No. | 00000001 (01H)                   |
| EOX           | 11110111 (F7H)                   |

This message dumps the configuration data which is currently selected.

} Instrument voice data

⑤ Configuration data dump  
 Status 11110000 (F0H)  
 ID No. 01000011 (43H)  
 Sub-status 01110101 (75H)  
 System No. 0000ssss (s = channel No.)  
 Message No. 00100000 (20H)  
 Operation No. 00000010 (02H)  
 000xxxxx (x = configuration No.)  
 EOX 11110111 (F7H)

This message dumps the configuration data specified by the configuration No.

⑥ 16 configuration data dump  
 Status 11110000 (F0H)  
 ID No. 01000011 (43H)  
 Sub-status 01110101 (75H)  
 System No. 0000ssss (s = channel No.)  
 Message No. 00100000 (20H)  
 Operation No. 00000011 (03H)  
 00000000 (00H)  
 EOX 11110111 (F7H)

This message dumps all configuration RAM data. (This configuration data is programmed by the user and stored in the configuration RAM area).

⑦ Unit ID number dump  
 Status 11110000 (F0H)  
 ID No. 01000011 (43H)  
 Sub-status 01110101 (75H)  
 System No. 0000ssss (s = channel No.)  
 Message No. 00100000 (20H)  
 Operation No. 00000100 (04H)  
 00000000 (00H)  
 EOX 11110111 (F7H)

Table 1

| Parameter No. | Parameter Name            | Value         |
|---------------|---------------------------|---------------|
| 00~0F         | Refer to Parameter list 5 |               |
| 10            | L F O Speed               | 0 ~ 127 (Max) |
| 11            | AMD                       | 0 ~ 127       |
| 12            | PMD                       | 0 ~ 127       |
| 13            | Wave Form                 | 0 ~ 3         |
| 14            | L F O Load enable         | 0, 1(on)      |
| 15            | L F O Sync                | 0, 1(on)      |
| 16            | AMS                       | 0 ~ 3         |
| 17            | PMS                       | 0 ~ 7         |
| 18~3F         | Reserved area             |               |

< Parameter list 1 >

⑧ Configuration data store  
 Status 11110000 (F0H)  
 ID No. 01000011 (43H)  
 Sub-status 01110101 (75H)  
 System No. 0000ssss (s = system No.)  
 Message No. 00100000 (20H)  
 Operation No. 01000000 (40H)  
 Data 000ddddd (d = configuration No.)  
 EOX 11110111 (F7H)

This message restores the current configuration in the area whose number is specified (configuration RAM area).

Table 2

| Parameter No. | Parameter Name         | Data      |
|---------------|------------------------|-----------|
| 00~07         | Reserved area          |           |
| 08            | Voice function combine | 0, 1(on)  |
| 09            | L F O Speed            | 0 ~ 127   |
| 0A            | AMD                    | 0 ~ 127   |
| 0B            | PMD                    | 0 ~ 127   |
| 0C            | L F O Wave Form        | 0 ~ 3     |
| 0D            | KC# Receive Mode       | 0 ~ 2※1   |
| 0E~1F         | Reserved area          |           |
| 20            | System channel number  | 0 ~ 15    |
| 21            | Memory protect         | 0, 1(on)  |
| 22            | Configuration number   | 0 ~ 19    |
| 23            | Master tune            | 0 ~ 127※2 |
| 24            | Master output level    | 0 ~ 127   |
| 25~7F         | Reserved area          |           |

※1 : 0 = ALL, 1 = EVEN, 2 = ODD

※2 : 2's Complement

< Parameter list 2 >

## ■ OTHER SYSTEM MESSAGES

### Bulk data

This message transmits multiple data such as voice data and configuration data together, at one time. A byte count to indicate the data size is added at the beginning of the data and a check sum is sent at the end to verify the data transmission.

\* There are two format types for this type of data.

One transmits the source data as it is and the other divides the source data into a Low 4 bit code and a High 4 bit code, it then transmits this data in the order of Low and High codes.

\* The check sum is the low order 7 bits of the 2's complement of the added data byte value.

#### ① 48 voice bulk data

Voice data for the 48 voices in the voice RAM 1.

```
Status      11110000 (F0H)
ID No.      01000011 (43H)
Sub-status  0000ssss (s = channel No.)
Format No.  00001100 (0CH)
Byte count  00100000 (20H)
            00000000 (00H)
Data        0000dddd (Data Low)
            0000dddd (Data High)
            |
            0000dddd (Data Low)
            0000dddd (Data High)
Check sum   00000000 (00H)
Byte count  00010000 (10H)
            01000000 (40H)
Data        0000dddd (Data Low)
            0000dddd (Data High)
            |
            0000dddd (Data Low)
            0000dddd (Data High)
Check sum   00000000 (00H)
EOX         11110111 (F7H)
```

| Address  | Parameter                        | Data  |
|----------|----------------------------------|-------|
| 000 ~007 | Name                             | ASCII |
| 008 ~01F |                                  | 00    |
| 020 ~C20 | Voice data<br>64Bytes × 48Voices |       |

\* Voice data includes 48 voices, each voice requires 64 bytes of data. Refer to Voice parameter list.

< Parameter list 3 >

#### ② 48 voices bulk data

This bulk data for 48 voices is transmitted to the bank specified by the bank No.

```
Status      11110000 (F0H)
ID No.      01000011 (43H)
Sub-status  01110101 (75H)
System No.  0000ssss
Message No. 00000000 (00H)
Operation No. 00000000 (00H)
Bank No.    00000xxx
Byte count  00100000 (20H)
            00000000 (00H)
Data        0000dddd (Data Low)
            0000dddd (Data High)
            |
            0000dddd (Data Low)
            0000dddd (Data High)
Check sum   00000000 (00H)
Byte count  00100000 (10H)
            00000000 (40H)
Data        0000dddd (Data Low)
            0000dddd (Data High)
            |
            0000dddd (Data Low)
            0000dddd (Data High)
EOX         11110111 (F7H)
```

#### ③ Current configuration

This message is transferred to the configuration buffer.

```
Status      11110000 (F0H)
ID No.      01000011 (43H)
Sub-status  01110101 (75H)
System No.  0000ssss
Message No. 00000000 (00H)
Operation No. 00000001 (01H)
            00000000 (00H)
Byte count  00000001 (01H)
            00100000 (20H)
Data        0ddddddd
            |
            0ddddddd
Check sum   00000000 (00H)
EOX         11110111 (F7H)
```

#### ④ Configuration memory

This message is transferred directly to the configuration RAM specified by the memory No.

|               |                                  |
|---------------|----------------------------------|
| Status        | 11110000 (F0H)                   |
| ID No.        | 01000011 (43H)                   |
| Sub-status    | 01110101 (75H)                   |
| System No.    | 0000ssss                         |
| Message No.   | 00000000 (00H)                   |
| Operation No. | 00000010 (02H)                   |
| Memory No.    | 000xxxxx                         |
| Byte count    | 00000001 (01H)<br>00100000 (20H) |
| Data          | 0ddddddd<br>}                    |
|               | 0ddddddd                         |
| Check sum     | 0eeeeeee                         |
| EOX           | 11110111 (F7H)                   |

#### ⑤ 16 configuration memory

All data of the configuration RAM.

|               |                                  |
|---------------|----------------------------------|
| Status        | 11110000 (F0H)                   |
| ID No.        | 01000011 (43H)                   |
| Sub-status    | 01110101 (75H)                   |
| System No.    | 0000ssss                         |
| Message No.   | 00000000 (00H)                   |
| Operation No. | 00000011 (03H)                   |
| Memory No.    | 00000000 (00H)                   |
| Byte count    | 00010100 (14H)<br>00000000 (00H) |
| Data          | 0ddddddd<br>}                    |
|               | 0ddddddd                         |
| Check sum     | 0eeeeeee                         |
| EOX           | 11110111 (F7H)                   |

#### ⑥ 1 voice bulk data

The voice data for one voice is set in the voice buffer of the instrument specified by the instrument No.

|               |                                                |
|---------------|------------------------------------------------|
| Status        | 11110000(F0H)                                  |
| ID No.        | 01000011(43H)                                  |
| Sub-status    | 01110101(75H)                                  |
| System No.    | 0000ssss                                       |
| Message No.   | 00001 i i i (i=instrument No.)                 |
| Operation No. | 00000000(00H)<br>00000000(00H)                 |
| Byte count    | 00000001(01H)<br>00000000(00H)                 |
| Data          | 0000dddd(Data Low)<br>0000dddd(Data High)<br>} |
|               | 0000dddd (Data Low)<br>0000dddd (Data High)    |
| Check sum     | 0eeeeeee                                       |
| EOX           | 11110111 (F7H)                                 |

#### Channel message

##### ① MIDI channel specification (1 byte)

|                 |                            |
|-----------------|----------------------------|
| Status          | 11110000 (F0H)             |
| ID No.          | 01000011 (43H)             |
| Sub-status      | 0001nnnn (n = channel No.) |
| Parameter group | 00010101 (15H)             |
| Parameter No.   | 0ppppppp (p = 0 ~ 3FH)     |
| Data            | 0ddddddd                   |
| EOX             | 11110111 (F7H)             |

This message specifies MIDI channel and changes the parameter. It also executes change of configuration data and LFO related changes.

\* Refer to Table 1 for the parameter No.

##### ② MIDI channel specification

|                 |                                             |
|-----------------|---------------------------------------------|
| Status          | 11110000 (F0H)                              |
| ID No.          | 01000011 (43H)                              |
| Sub-status      | 0001nnnn (n = channel No.)                  |
| Parameter group | 00010101 (15H)                              |
| Parameter No.   | 0ppppppp (p = 40H ~ 7FH)                    |
| Data            | 0ddddddd (Data Low)<br>0000dddd (Data High) |
| EOX             | 11110111 (F7H)                              |

This message specifies MIDI channel and changes the voice data.

\* Refer to voice parameter list.

## Event list

The FB-01 is capable of specifying a halftone higher or lower for subtle tone changes which cannot be specified with ordinary key code data. This function can be used by means of the system exclusive message. When the unit receives system exclusive messages, F0, 43, 75, 70, it is setup to receive the following messages, so that the fraction data can be added to the key ON message. These messages are received continuously until the unit receives F7 (end of exclusive) or the normal status byte of MIDI except the real time message.

```
Status      11110000 (F0H)
ID No.      01000011 (43H)
Sub-status  01110101 (75H)
            01110000 (70H)
Event data  0eeeeeee
            /
            0eeeeeee
EOX         11110111 (F7H)
```

Each data event starts with the event status byte. The length of one data event 2 to 6 bytes, is specified for each type of event. The term 'event status byte' indicates the status section in the event data. From now on it is referred to as 'status byte' but note that it is different from the normal status byte of MIDI.

| Event status | Meaning          |
|--------------|------------------|
| 0nH          | Key OFF          |
| 1nH          | Key ON/OFF       |
| 2nH          | Key ON/OFF       |
| 3nH          | Control change   |
| 4nH          | Program change   |
| 5nH          | After touch      |
| 6nH          | Pitch bender     |
| 7nH          | Parameter change |

< Parameter list 4 >

## Event data format

### ① Key OFF

```
Status      0000nnnn(0nH: n = channel No.)
Note No.    0kkkkkkk
Fraction    0ffffff(f = 0 ~ 127: + 100 cent)
```

### ② Key ON/OFF

```
Status      0001nnnn(1nH: n = channel No.)
Note No.    0kkkkkkk(k = 0: C-2 ~ 127: G8)
Fraction    0ffffff(f = 0 ~ 127: + 100 cent)
Velocity    0vvvvvvv(v = 1 ~ 127: Key ON)
            (v = 1: Key OFF)
```

### ③ Key ON/OFF

```
Status      0010nnnn(2nH: n = channel No.)
Note No.    0kkkkkkk(k = 0: C-2 ~ 127: G8)
Fraction    0ffffff(f = 0 ~ 127: + 100 cent)
Velocity    0vvvvvvv(v = 1 ~ 127: Key ON)
            (v = 1: Key OFF)
Duration    0ddddd(Number of clocks LSB)
(Number of 0ddddd(Number of clocks MSB)
clocks)     (d = 0: Key ON only)
```

- \* When other than 0 is specified in the duration section, the clock is counted by means of the MIDI F8 signal (MIDI clock) which is transmitted from the device on the transmitting side, sound is generated for the specified clock and Key OFF takes place automatically. Thus the device on the transmitting side needs not send the Key OFF message.
- \* When the MIDI start (FA) or continue (FB) signal is received, the MIDI clock starts counting.
- \* When the start or continue signal is received, the # mark at the left end of the display keeps flashing till the stop signal is received.

### ④ Parameter change (1 byte)

This message changes the configuration data and voice data of each instrument.

```
Status      0111nnnn (7nH: n = channel No.)
Parameter No. 00pppppp
Data         0ddddd
```

### ⑤ Parameter change (2 byte)

This message changes the voice data of each instrument.

```
Status      0111nnnn (7nH: n = channel No.)
Parameter No. 00pppppp
Data         0000dddd (Data Low)
            0000dddd (Data High)
```

- \* The data section divides the source data into a Low 4 bit code and a High 4 bit code (2 bytes) and transmits them in the order of Low and High codes.
- \* The data from the control change to pitch bender uses the same format as the channel message except the status byte.

# ■ PARAMETER LIST

## Configuration parameter list

| Parameter No. | Parameter Name                                                                                                                                                                      | Data                                                                         |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|               | CONFIGURATION NAME<br>VOICE FUNCTION COMBINE MODE<br>LFO SPEED<br>AMPLITUDE MODULATION DEPTH<br>PITCH MODULATION DEPTH<br>LFO WAVE FORM<br>KEY-CODE NUMBER RECEIVE MODE<br>RESERVED | ASCII<br>0, 1 (1=COMBINE ON)<br>0~127<br>0~127<br>0~127<br>0~3<br>0~2※1<br>0 |
| 00            | NUMBER OF NOTES                                                                                                                                                                     | 0~8                                                                          |
| 01            | MIDI CHANNEL NUMBER                                                                                                                                                                 | 0~15                                                                         |
| 02            | KEY-CODE NUMBER LIMIT/HIGH                                                                                                                                                          | 0~127                                                                        |
| 03            | KEY-CODE NUMBER LIMIT/LOW                                                                                                                                                           | 0~127                                                                        |
| 04            | VOICE BANK NUMBER                                                                                                                                                                   | 0~6                                                                          |
| 05            | VOICE NUMBER                                                                                                                                                                        | 0~47                                                                         |
| 06            | DETUNE                                                                                                                                                                              | 0~127 (2's complement)                                                       |
| 07            | OCTAVE TRANSPOSE                                                                                                                                                                    | 0~4 (2=CENTER)                                                               |
| 08            | OUTPUT LEVEL                                                                                                                                                                        | 0~127                                                                        |
| 09            | PAN                                                                                                                                                                                 | 0~127 (0=L, 64=L+R, 127=R)                                                   |
| 0A            | LFO ENABLE                                                                                                                                                                          | 0, 1 (1=ON)                                                                  |
| 0B            | PORTAMENTO TIME                                                                                                                                                                     | 0~127                                                                        |
| 0C            | PITCHBENDER RANGE                                                                                                                                                                   | 0~12                                                                         |
| 0D            | MONO/POLY                                                                                                                                                                           | 0, 1 (1=MONO MODE)                                                           |
| 0E            | INPUT CONTROLLER (PMD)                                                                                                                                                              | 0~4※2                                                                        |
| 0F            | RESERVED                                                                                                                                                                            |                                                                              |
|               | Same as INST 1                                                                                                                                                                      | INST 2                                                                       |
|               | do. INST 1                                                                                                                                                                          | INST 3                                                                       |
|               | do. INST 1                                                                                                                                                                          | INST 4                                                                       |
|               | do. INST 1                                                                                                                                                                          | INST 5                                                                       |
|               | do. INST 1                                                                                                                                                                          | INST 6                                                                       |
|               | do. INST 1                                                                                                                                                                          | INST 7                                                                       |
|               | do. INST 1                                                                                                                                                                          | INST 8                                                                       |

※1 : 0=ALL, 1=EVEN, 2=ODD

※2 : 0=OFF, 1=TOUCH, 2=WHEEL, 3=BREATH, 4=FOOT

# Voice parameter list

| Parameter No. | Parameter Name |     |                                    | Data                          |
|---------------|----------------|-----|------------------------------------|-------------------------------|
| 40 ~ 46       |                |     | VOICE NAME                         | ASCII                         |
| 47            | [*****]        |     | USER'S CODE                        | 0 ~ 255                       |
| 48            | [*****]        |     | LFO SPEED                          | 0 ~ 255                       |
| 49            | [a*****]       | [a] | ENABLE TO LOAD LFO DATA            | 0, 1 (1=ENABLE)               |
|               |                | [*] | AMPLITUDE MODULATION DEPTH         | 0 ~ 127                       |
| 4A            | [a*****]       | [a] | LFO SYNC                           | 0, 1 (1=SYNC ON)              |
|               |                | [*] | PITCH MODULATION DEPTH             | 0 ~ 127                       |
| 4B            | [0****000]     | [*] | ENABLE OPERATOR                    | 0, 1 (1=ON) BIT MAP OP4 ⇒ OP1 |
| 4C            | [LRccdd]       | [L] | LEFT OUTPUT ENABLE                 | 0, 1 (1=ON) FB-01 Ignored     |
|               |                | [R] | RIGHT OUTPUT ENABLE                | 0, 1 (1=ON) FB-01 Ignored     |
|               |                | [c] | FEED BACK LEVEL                    | 0 ~ 6                         |
|               |                | [d] | ALGORITHM                          | 0 ~ 7                         |
| 4D            | [0aaa00bb]     | [a] | PITCH MODULATION SENSITIVITY       | 0 ~ 7                         |
|               |                | [b] | AMPLITUDE MODULATION SENSITIVITY   | 0 ~ 3                         |
| 4E            | [0**00000]     | [*] | LFO WAVE FORM                      | 0 ~ 3                         |
| 4F            | [*****]        |     | TRANSPOSE                          | 0 ~ 255 (2's complement)      |
| 50            | [0*****]       |     | TOTAL LEVEL                        | 0 ~ 127 (0=Max. level)        |
| 51            | [a***0000]     | [a] | KEYBOARD SCALING (LEVEL) TYPE BIT0 | 0, 1                          |
|               |                | [*] | VELOCITY SENSITIVITY FOR TL        | 0 ~ 7                         |
| 52            | [aaaabbbb]     | [a] | KEYBOARD SCALING (LEVEL) DEPTH     | 0 ~ 15                        |
|               |                | [b] | ADJUST FOR TL                      | 0 ~ 15                        |
| 53            | [abbbcccc]     | [a] | KEYBOARD SCALING (LEVEL) TYPE BIT1 | 0, 1                          |
|               |                | [b] | DETUNE                             | 0 ~ 7                         |
|               |                | [c] | FREQUENCY                          | 0 ~ 15                        |
| 54            | [aa0*****]     | [a] | KEYBOARD SCALING (RATE) DEPTH      | 0 ~ 3                         |
|               |                | [*] | ATTACK RATE                        | 0 ~ 31                        |
| 55            | [abb*****]     | [a] | MODULATOR/CARRIER FLAG             | 0, 1 (1=carrier)              |
|               |                | [b] | VELOCITY SENSITIVITY FOR AR        | 0 ~ 3                         |
|               |                | [*] | DECAY 1 RATE                       | 0 ~ 31                        |
| 56            | [aa0*****]     | [a] | INHARMONIC FREQUENCY               | 0 ~ 3                         |
|               |                | [*] | DECAY 2 RATE                       | 0 ~ 31                        |
| 57            | [aaaabbbb]     | [a] | SUSTAIN LEVEL                      | 0 ~ 15                        |
|               |                | [b] | RELEASE RATE                       | 0 ~ 15 (0=Max. level)         |
| 58 ~ 5F       |                |     | Same as OP1                        | OP2                           |
| 60 ~ 67       |                |     | do.                                | OP3                           |
| 68 ~ 6F       |                |     | do.                                | OP4                           |
| 70 ~ 79       |                |     | RESERVED                           | 0                             |
| 7A            | [a*****]       | [a] | POLY/MONO                          | 0, 1 (1=MONO MODE)            |
|               |                | [*] | PORTAMENTO SPEED                   | 0 ~ 127                       |
| 7B            | [0aaa*****]    | [a] | INPUT CONTROLLER (PMD)             | 0 ~ 4※                        |
|               |                | [*] | PITCHBENDER RANGE                  | 0 ~ 12                        |
| 7C ~ 7F       |                |     | RESERVED                           | 0                             |

※ 0=OFF, 1=TOUCH, 2=WHEEL, 3=BREATH, 4=FOOT

## ■ MIDI TRANSMIT DATA FORMAT

Normally the transmit function is not executed. When operation information such as dump request is received from the external source, or when the panel is so operated, the system exclusive message as described below is transmitted.

There are two main types of system exclusives that the FB-01 will transmit: data dumps and communication message.

### Communication handshake message

There are three handshake messages that the FB-01 may transmit: ACK, NAK, and cancel. ACK indicates success. NAK indicates a check sum error, a data short error, a framing error, or an overrun error. Cancel indicates a memory protection error, and invalid number error (out of range or ROM area for save).

\* Please see the Communication Message Table for details.

|             |                           |
|-------------|---------------------------|
| Status      | 11110000(F0H)             |
| ID No.      | 01000011(43H)             |
| Sub-status  | 0110nnnn(n = channel No.) |
| Message No. | 0mmmmmm                   |
| EOX         | 11110111(F7H)             |

Communication handshake Message Tables

| Message No.          | Meaning |                                                                                                                |
|----------------------|---------|----------------------------------------------------------------------------------------------------------------|
| m = 2<br>(0000 0010) | ACK     | Completed                                                                                                      |
| m = 3<br>(0000 0011) | NAK     | An error occurred when data is received.                                                                       |
| m = 4<br>(0000 0100) | Cancel  | Impossible to execute for the following reason.<br>a. Memory protect is ON.<br>b. Memory No. is inappropriate. |

### Bulk data

This message dumps following 7 types of data according to the dump request or panel operation.

- ① Voice bank  $\phi$  bulks data  
Dumps the contents of the voice RAM 1.
- ② Voice bank x bulk data (x = 1 ~ 7)  
Dumps the voice data for 48 voices of the bank specified by the bank No.
- ③ Current configuration  
Dumps the contents of the configuration buffer.
- ④ Configuration memory  
Dumps the contents of the configuration memory specified by the memory No.
- ⑤ 16 configuration memory  
Dumps the contents of the configuraion RAM.

- ⑥ Unit ID number  
Dumps the unit ID number.

|               |               |
|---------------|---------------|
| Status        | 11110000(F0H) |
| ID No.        | 01000011(43H) |
| Sub-status    | 01110101(75H) |
| System No.    | 0000ssss      |
| Message No.   | 00000000(00H) |
| Operation No. | 00000100(04H) |
|               | 00000000(00H) |
| Byte count    | 00000000(00H) |
|               | 00010000(10H) |
| Data          | 0ddddddd      |
|               | 0ddddddd      |
| Check sum     | 0eeeeeee      |
| EOX           | 11110111(F7H) |

\* The data section is 16 bytes and the ASC II code of "YAMAHA COM FB-01" is sent.

- ⑦ One voice bulk data  
This message dumps the data for one voice which is set in the voice buffer of the instrument specified by the instrument No.

\* The data can be sent in the maximum length of 4096 bytes in which the 48 voices of bulk data is divided into 49 and the configuration RAM is divided into 16 before transmission. Each data transfer after the division has a byte count at its forefront and a check sum data at the end. These divided data blocks are transferred with a longer than 100msec. interval between them. (This interval is necessary when sending the data to the FB-01.)

# ■ NEW LSI DATA TABLE

## μPD70008AC-6 (XA278001)

| PIN NO. | NAME | I/O | FUNCTION               | PIN NO. | NAME  | I/O | FUNCTION          |
|---------|------|-----|------------------------|---------|-------|-----|-------------------|
| 1       | A11  | O   | Address bus            | 40      | A10   | O   | Address bus       |
| 2       | A12  | O   |                        | 39      | A9    | O   |                   |
| 3       | A13  | O   |                        | 38      | A8    | O   |                   |
| 4       | A14  | O   |                        | 37      | A7    | O   |                   |
| 5       | A15  | O   |                        | 36      | A6    | O   |                   |
| 6       | φ    | I   | Clock                  | 35      | A5    | O   |                   |
| 7       | D4   | I/O | Data bus               | 34      | A4    | O   |                   |
| 8       | D3   | I/O |                        | 33      | A3    | O   |                   |
| 9       | D5   | I/O |                        | 32      | A2    | O   |                   |
| 10      | D6   | I/O |                        | 31      | A1    | O   |                   |
| 11      | +5   |     | DC Supply (+5V)        | 30      | A0    | O   |                   |
| 12      | D2   | I/O | Data bus               | 29      | GND   |     | DC Supply (0V)    |
| 13      | D7   | I/O |                        | 28      | RFSH  | O   | Refresh           |
| 14      | D0   | I/O |                        | 27      | M1    | O   | Machine Cycle one |
| 15      | D1   | I/O |                        | 26      | RESET | I   | Reset             |
| 16      | INT  | I   | Interrupt Request      | 25      | BUSRQ | I   | Bus Request       |
| 17      | NMI  | I   | Non Maskable Interrupt | 24      | WAIT  | I   | Wait              |
| 18      | HALT | O   | Halt State             | 23      | BUSAK | O   | Bus Acknowledge   |
| 19      | MREQ | O   | Memory Request         | 22      | WR    | O   | Write control     |
| 20      | IORQ | O   | Input/Output Request   | 21      | RD    | O   | Read control      |

## YM3012DAC (2-Channel serial input Floating D/A converter) iT301200

| PIN NO. | NAME  | I/O | FUNCTION              | PIN NO. | NAME  | I/O | FUNCTION                               |
|---------|-------|-----|-----------------------|---------|-------|-----|----------------------------------------|
| 1       | VDD   | I   | DC supply (+5V)       | 16      | A.GND | I   | Analog ground                          |
| 2       | CLOCK | I   | Timing clock          | 15      | RB    | O   | Bias-R                                 |
| 3       | D.GND | I   | Digital Ground        | 14      | BC    | I   | Bias compensation                      |
| 4       | SD    | I   | Serial data input     | 13      | MP    | I   | Middle point 1/2 VDD Bias              |
| 5       | SAM2  | I   | Sample and hold (ch2) | 12      | A.OUT | O   | Analog output to Buffer AMP            |
| 6       | SAM1  | I   | Sample and hold (ch1) | 11      | COM   | I   | Ch1 ch2 analog SW common input         |
| 7       | ICL   | I   | Initial clear         | 10      | CH2   | O   | Sample and hold analog SW output (ch2) |
| 8       | A.GND | I   | Analog Ground         | 9       | CH1   | O   | Sample and hold analog SW output (ch1) |

**μPD71051C USART (Universal—Synchronous Asynchronous Receiver—Transmitter) XA996001**

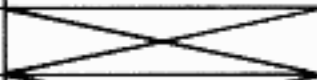
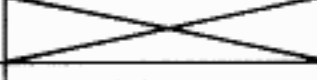
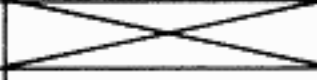
| PIN NO. | NAME  | I/O | FUNCTION                                      | PIN NO. | NAME            | I/O | FUNCTION                 |
|---------|-------|-----|-----------------------------------------------|---------|-----------------|-----|--------------------------|
| 1       | D2    | I/O | } Data bus                                    | 28      | D1              | I/O | } Data bus               |
| 2       | D3    | I/O |                                               | 27      | D0              | I/O |                          |
| 3       | RxD   | I   | Serial data in                                | 26      | V <sub>cc</sub> |     | DC Voltage (+5V)         |
| 4       | GND   |     | Ground                                        | 25      | RxC             | I   | Receiver clock           |
| 5       | D4    | I/O | } Data bus (A <sub>0</sub> ~ A <sub>3</sub> ) | 24      | DTR             | O   | Data terminal ready      |
| 6       | D5    | I/O |                                               | 23      | RTS             | O   | Request to Send          |
| 7       | D6    | I/O |                                               | 22      | DSR             | I   | Data set ready           |
| 8       | D7    | I/O |                                               | 21      | RST             | I   | Reset                    |
| 9       | TxC   | I   | Transmitter clock                             | 20      | CLK             | I   | Clock                    |
| 10      | WR    | I   | Write Control                                 | 19      | TxD             | O   | Serial data out          |
| 11      | CS    | I   | Chip select                                   | 18      | TEMP            | O   | Transmitter empty        |
|         |       |     | Control/Data                                  | 17      | CTS             | I   | Clear to Send            |
| 12      | C/D   | I   | "H": Control/Status "L": Data                 | 16      | SYND            | I/O | SYNC Detect/Break Detect |
| 13      | RD    | I   | Read Control                                  | 15      | TxRDY           | O   | Transmitter ready        |
| 14      | RxRDY | O   | Receiver ready                                |         |                 |     |                          |

**YM2164 OPP Operator (iT216400)**

| PIN NO. | NAME            | I/O | FUNCTION           | PIN NO. | NAME | I/O | FUNCTION              |
|---------|-----------------|-----|--------------------|---------|------|-----|-----------------------|
| 1       | V <sub>ss</sub> |     | GND                | 24      | φM   | I   | Clock 3.58 MHz        |
| 2       | IRQ             | O   | Interrupt data     | 23      | φ1   | I   | Synchro pulse for DAC |
| 3       | IC              | I   | Initial clear      | 22      | VDD  | I   | DC Supply (+5V)       |
| 4       | AO              | I   | Address bus        | 21      | S0   | O   | Tone signal data      |
| 5       | WR              | I   | Write control      | 20      | SH1  | O   | Sample and hold (Ch1) |
| 6       | RD              | I   | Read control       | 19      | SH2  | O   | Sample and hold (Ch2) |
| 7       | CS              | I   | Chip Select        | 18      | D7   | I/O | } Data bus            |
| 8       | CT1             | O   | Control data out 1 | 17      | D6   | I/O |                       |
| 9       | CT2             | O   | Control data out 2 | 16      | D5   | I/O |                       |
| 10      | D0              | I/O | Data bus           | 15      | D4   | I/O |                       |
| 11      | V <sub>ss</sub> |     | GND                | 14      | D3   | I/O |                       |
| 12      | D1              | I/O | Data bus           | 13      | D2   | I/O |                       |

# PARTS LIST

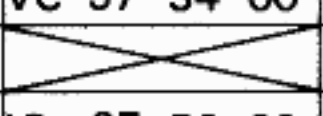
## FB-01 ELECTRONIC COMPONENTS

| Ref. No. | Part No.                                                                          | Description               |                    | 品 名         | Remarks   | ランク |
|----------|-----------------------------------------------------------------------------------|---------------------------|--------------------|-------------|-----------|-----|
| *        |  | Cricuit Board             | MAIN               | MAINシート     |           | 60  |
| *        |  | Circuit Board             | POWER              | ROWERシート    |           | 11  |
| *        | VB 39 75 00                                                                       | Circuit Board             | FRONT-SW           | FRONT-SWシート |           | 07  |
|          |                                                                                   |                           |                    |             |           |     |
| *        |  | Circuit Board             | MAIN               | MAINシート     |           | 60  |
| *        | IC10 XA 27 80 01                                                                  | IC                        | $\mu$ PD70008AC-6  | IC          | CPU       | 09  |
|          | IC7 IT 21 64 00                                                                   | IC                        | YM-2164            | IC          | OPP       | 16  |
| *        | IC8 XA 99 60 01                                                                   | IC                        | $\mu$ PD71051C     | IC          | USART     | 09  |
|          | IC6 IT 30 12 00                                                                   | IC                        | YM-3012            | IC          | SUX DAC   | 08  |
|          | IC19 IG 05 10 00                                                                  | IC                        | TC40H004P          | IC          | INV       | 03  |
|          | IC2 IG 05 26 00                                                                   | IC                        | HD74LS05P          | IC          | INV       | 03  |
|          | IC3 IG 14 22 00                                                                   | IC                        | TC74HCU04P         | IC          | INV       | 03  |
|          | IC20 IR 00 04 00                                                                  | IC                        | TC74HC04P          | IC          | INV       | 03  |
|          | IC16 IR 00 32 00                                                                  | IC                        | TC74HC32P          | IC          | OR        | 03  |
|          | IC22 IR 00 02 00                                                                  | IC                        | TC74HC02P          | IC          | NOR       | 03  |
|          | IC14 IR 00 74 00                                                                  | IC                        | TC74HC74           | IC          | DFF       | 04  |
|          | IC21 IR 01 74 00                                                                  | IC                        | TC74HC174          | IC          | D. FF     | 05  |
|          | IC18 IR 02 44 00                                                                  | IC                        | TC74HC244          | IC          | BUS. BUF  | 07  |
|          | IC15 IR 01 38 00                                                                  | IC                        | TC74HC138          | IC          | DECO-8    | 05  |
| *        | IC9 IR 01 61 20                                                                   | IC                        | $\mu$ PD74HC161C   | IC          | CNT       | 04  |
| *        | IC1,4 IG 04 25 00                                                                 | IC                        | NJM4556            | IC          | OP AMP.   | 04  |
|          | IC5 IG 07 66 00                                                                   | IC                        | TL072CP            | IC          | OP AMP.   | 04  |
| *        | IC12 XA 99 50 01                                                                  | IC                        | $\mu$ PD4464C-15L  | IC          | 64K SRAM  | 20  |
| *        | IC11 XB 46 00 01                                                                  | IC                        | 150NS              | IC          | EPROM     | 12  |
|          | TR4 IA 09 33 00                                                                   | Transistor                | 2SA933S Q,R        | トランジスタ      |           | 03  |
|          | TR3 IA 09 99 00                                                                   | Transistor                | 2SA999 D,E,F       | トランジスタ      |           | 03  |
|          | TR5 IC 18 15 30                                                                   | Transistor                | 2SC1815 Y,GR       | トランジスタ      |           | 03  |
|          | → IC 28 78 00                                                                     | Transistor                | 2SC2878 A,B        | トランジスタ      | TR1,2,6,7 | 03  |
|          | → IF 00 34 50                                                                     | Diode                     | 1SS133             | ダイオード       | D1~7      | 01  |
| *        | ZD2 VB 60 69 00                                                                   | Zener Diode               | HZ4.2              | ツェナーダイオード   |           | 01  |
| *        | ZD1 VB 61 83 00                                                                   | Zener Diode               | HZ3.6              | ツェナーダイオード   |           | 01  |
|          | FZ 00 41 70                                                                       | Semiconductive Cera. Cap. | 0.1 $\mu$ 16V      | 半導体セラコン     |           | 01  |
|          | FG 21 11 80                                                                       | Ceramic Cap.              | 18P 50V            | セラコン        |           | 01  |
|          | FG 21 13 30                                                                       | Ceramic Cap.              | 33P 50V            | セラコン        |           | 01  |
|          | FG 21 13 90                                                                       | Ceramic Cap.              | 39P 50V            | セラコン        |           | 01  |
|          | FG 21 15 60                                                                       | Ceramic Cap.              | 56P 50V            | セラコン        |           | 01  |
|          | FG 21 18 20                                                                       | Ceramic Cap.              | 82P 50V            | セラコン        |           | 01  |
|          | FG 21 21 20                                                                       | Ceramic Cap.              | 120P 50V           | セラコン        |           | 01  |
|          | FG 21 21 80                                                                       | Ceramic Cap.              | 180P 50V           | セラコン        |           | 01  |
|          | FG 44 41 00                                                                       | Ceramic Cap.              | 0.01 $\mu$ 50V     | セラコン        |           | 01  |
|          | FJ 23 71 00                                                                       | Electrolytic Cap.         | 10 $\mu$ 16V       | ケミコン        |           | 01  |
|          | FJ 23 81 00                                                                       | Electrolytic Cap.         | 100 $\mu$ 16V      | ケミコン        |           | 01  |
|          | FJ 23 82 20                                                                       | Electrolytic Cap.         | 220 $\mu$ 16V      | ケミコン        |           | 01  |
|          | FA 51 41 00                                                                       | Mylar Cap.                | 0.01 $\mu$ 50V     | マイラーコン      |           | 02  |
|          | FA 15 31 00                                                                       | Mylar Cap.                | 0.001 $\mu$ 50V    | マイラーコン      |           | 02  |
|          | FA 15 32 20                                                                       | Mylar Cap.                | 0.0022 $\mu$ 50V   | マイラーコン      |           | 02  |
|          | FM 15 41 80                                                                       | Mylar Cap.                | 0.018 $\mu$ 50V    | マイラーコン      |           | 02  |
|          | FM 54 71 00                                                                       | Electrolytic Cap.         | 10 $\mu$ 16V       | BPケミコン      |           | 02  |
|          | FM 09 74 70                                                                       | Electrolytic Cap.         | 47 $\mu$ 16V       | BPケミコン      |           | 02  |
|          | CA2 VB 00 66 80                                                                   | Capacitor Array           | 100P 50V           | コンデンサーアレイ   |           | 02  |
| *        | CA1 VB 44 04 00                                                                   | Capacitor Array           | 1000P 50V          | コンデンサーアレイ   |           | 02  |
|          | HA 15 36 80                                                                       | Carbon Resistor           | 6.8 $\Omega$ 1/4 J | カーボン抵抗      |           | 01  |

\* : New Parts (NR)

ランク: Japan only

**FB-01 ELECTRONIC COMPONENTS**

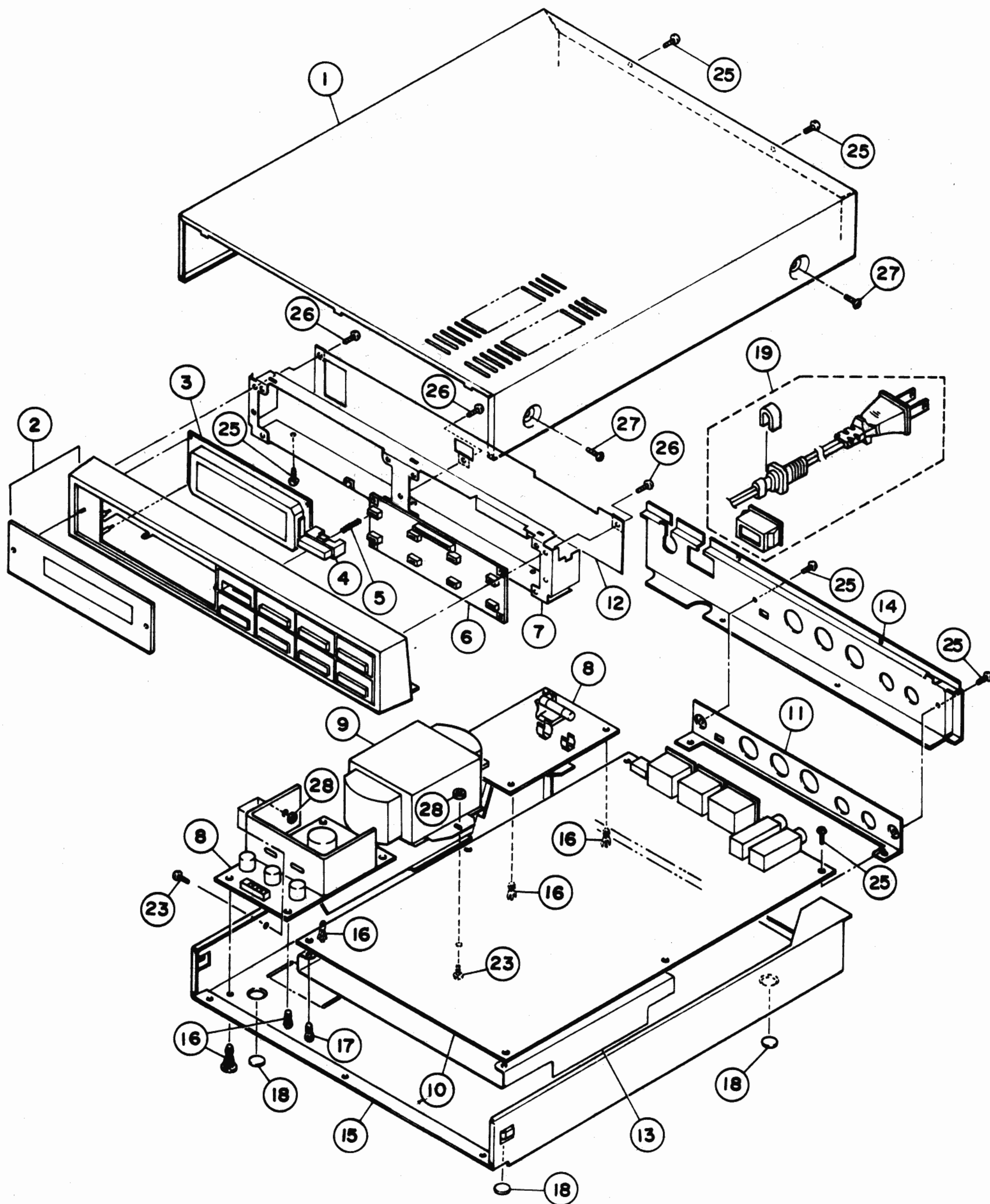
| Ref. No. | Part No.                                                                            | Description               | 品 名             | Remarks                | ランク         |
|----------|-------------------------------------------------------------------------------------|---------------------------|-----------------|------------------------|-------------|
|          | HF 85 44 70                                                                         | Carbon Resistor           | 47Ω 1/6 J       | カーボン抵抗                 | 01          |
|          | HF 85 45 60                                                                         | Carbon Resistor           | 56Ω 1/6 J       | カーボン抵抗                 | 01          |
|          | HF 85 51 00                                                                         | Carbon Resistor           | 100Ω 1/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 52 20                                                                         | Carbon Resistor           | 220Ω 1/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 52 70                                                                         | Carbon Resistor           | 270Ω 1/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 53 30                                                                         | Carbon Resistor           | 330Ω 1/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 54 70                                                                         | Carbon Resistor           | 470Ω 1/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 55 60                                                                         | Carbon Resistor           | 560Ω 1/6 J      | カーボン抵抗                 | 01          |
|          | HJ 35 61 00                                                                         | Carbon Resistor           | 1kΩ 1/4 J       | カーボン抵抗                 | 01          |
|          | HF 85 61 00                                                                         | Carbon Resistor           | 1kΩ 1/6 J       | カーボン抵抗                 | 01          |
|          | HF 85 61 20                                                                         | Carbon Resistor           | 1.2kΩ 1/6 J     | カーボン抵抗                 | 01          |
|          | HF 85 62 20                                                                         | Carbon Resistor           | 2.2kΩ 1/6 J     | カーボン抵抗                 | 01          |
|          | HF 85 63 30                                                                         | Carbon Resistor           | 3.3kΩ 1/6 J     | カーボン抵抗                 | 01          |
|          | HF 85 64 70                                                                         | Carbon Resistor           | 4.7kΩ 1/6 J     | カーボン抵抗                 | 01          |
|          | HF 85 68 20                                                                         | Carbon Resistor           | 8.2kΩ 1/6 J     | カーボン抵抗                 | 01          |
|          | HF 85 71 00                                                                         | Carbon Resistor           | 10kΩ 1/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 72 20                                                                         | Carbon Resistor           | 22kΩ J/6 J      | カーボン抵抗                 | 01          |
|          | HF 85 81 00                                                                         | Carbon Resistor           | 100kΩ 1/6 J     | カーボン抵抗                 | 01          |
|          | HF 85 91 00                                                                         | Carbon Resistor           | 1MΩ 1/6 J       | カーボン抵抗                 | 01          |
|          | VB 60 79 00                                                                         | Metal Film Resistor       | 330Ω 1/6 F      | 金属皮膜抵抗                 |             |
|          | HU 57 53 90                                                                         | Metal Film Resistor       | 390Ω 1/6 F      | 金属皮膜抵抗                 | 02          |
|          | HU 57 62 40                                                                         | Metal Film Resistor       | 2.4kΩ 1/6 F     | 金属皮膜抵抗                 | 02          |
|          | HU 57 64 70                                                                         | Metal Film Resistor       | 4.7kΩ 1/6 F     | 金属皮膜抵抗                 | 02          |
| →        | HZ 00 47 30                                                                         | Resistor Array            | RML8            | 抵抗アレイ RA1~4            | 02          |
| RA5      | VA 09 22 00                                                                         | Resistor Array            | RMLS8-223J      | 抵抗アレイ                  | 01          |
| X1       | QU 00 05 00                                                                         | Quartz Crystal Unit       | 4MHz            | 水晶振動子                  | 05          |
| X2       | QU 00 77 00                                                                         | Ceramic Resonator         | 12MHz           | セラミック振動子               | 03          |
| PC1      | VA 92 86 00                                                                         | Photo Coupler             | PC910           | フォトカブラ                 | 06          |
| BATT     | PC 90 00 30                                                                         | Lithium Battery           | CR2032T         | リチウム電池                 | 04          |
| LF6      | FZ 00 69 70                                                                         | EMI Filter                | Y223NB          | EMIフィルター               | 02          |
| →        | GE 30 06 70                                                                         | Ferrite Bead              | BL02RN2 R62T2   | フェライトビーズ LF4,7,8,10,11 | 02          |
| →        | VC 54 27 00                                                                         | EMI Coil                  | HFN0051         | EMIコイル(LF1,12,13)      | FB-01G only |
| →        | VC 54 32 00                                                                         | EMI Coil                  | HFN0071         | EMIコイル(LF14)           | FB-01G only |
| SW1      | VA 10 16 00                                                                         | Slide Switch              | SSS522          | スライドSW                 | 02          |
| →        | LB 20 23 30                                                                         | Phone Jack                | HLJ0521         | ホーンジャック                | 02          |
| →        | VC 57 40 00                                                                         | Connector                 | 5P TCS4450-01   | DINコネクタ JK3,4,5        | 02          |
| LED      | LB 91 80 30                                                                         | Base Post Connector       | 3P I-TYPE       | ベースツキポスト               | 01          |
| PW       | LB 91 80 60                                                                         | Base Post Connector       | 6P I-TYPE       | ベースツキポスト               | 01          |
| SW       | LB 91 81 00                                                                         | Base Post Connector       | 10P I-TYPE      | ベースツキポスト               | 02          |
| LF5      | VB 41 52 00                                                                         | Cable                     | ESD-R-14A       | 束線キット                  | 06          |
| S1       | VC 57 34 00                                                                         | Earth Cord                |                 | アースコード                 |             |
|          |  | Circuit Board             | POWER           | POWERシート               | 11          |
| TR2      | IG 07 56 00                                                                         | IC                        | NJM78M05A 5V    | IC                     | 03          |
| TR1      | IG 14 76 00                                                                         | IC                        | NJM7805A 5V     | IC                     | 04          |
| TR3      | XB 11 60 01                                                                         | IC                        | MJM79M05A -5V   | IC                     | 04          |
| D1,2     | IH 00 05 90                                                                         | Diode                     | 10E-1           | ダイオード                  | 01          |
| D3       | IH 00 08 80                                                                         | Diode Stack               | STWB20          | ダイオードスタック              | 03          |
|          | FZ 00 41 10                                                                         | Semiconductive Cera. Cap. | 0.1μ 16V        | 半導体セラコン                | 01          |
|          | FJ 23 81 00                                                                         | Electrolytic Cap.         | 100μ 16V        | ケミコン                   | 01          |
|          | FJ 14 84 70                                                                         | Electrolytic Cap.         | 470μ 16V        | ケミコン                   | 02          |
|          | FZ 00 42 80                                                                         | Electrolytic Cap.         | 4700μ 16V       | ケミコン                   | 05          |
|          | Fi 38 32 20                                                                         | Cap Special Ppec          | DE7100/2200-400 | 2200P/400V FB-01G only |             |

※ : New Parts (NR)

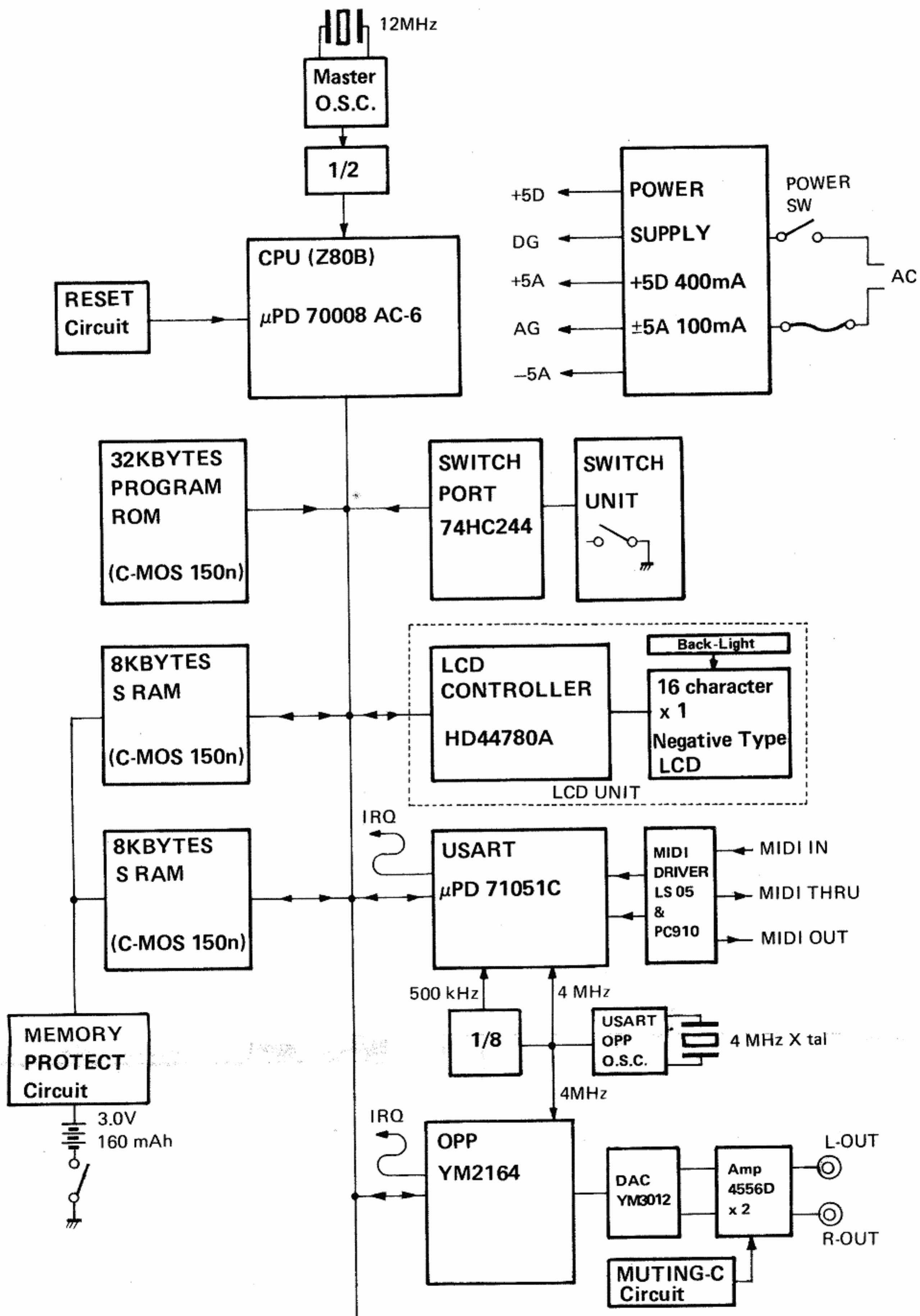
ランク: Japan only



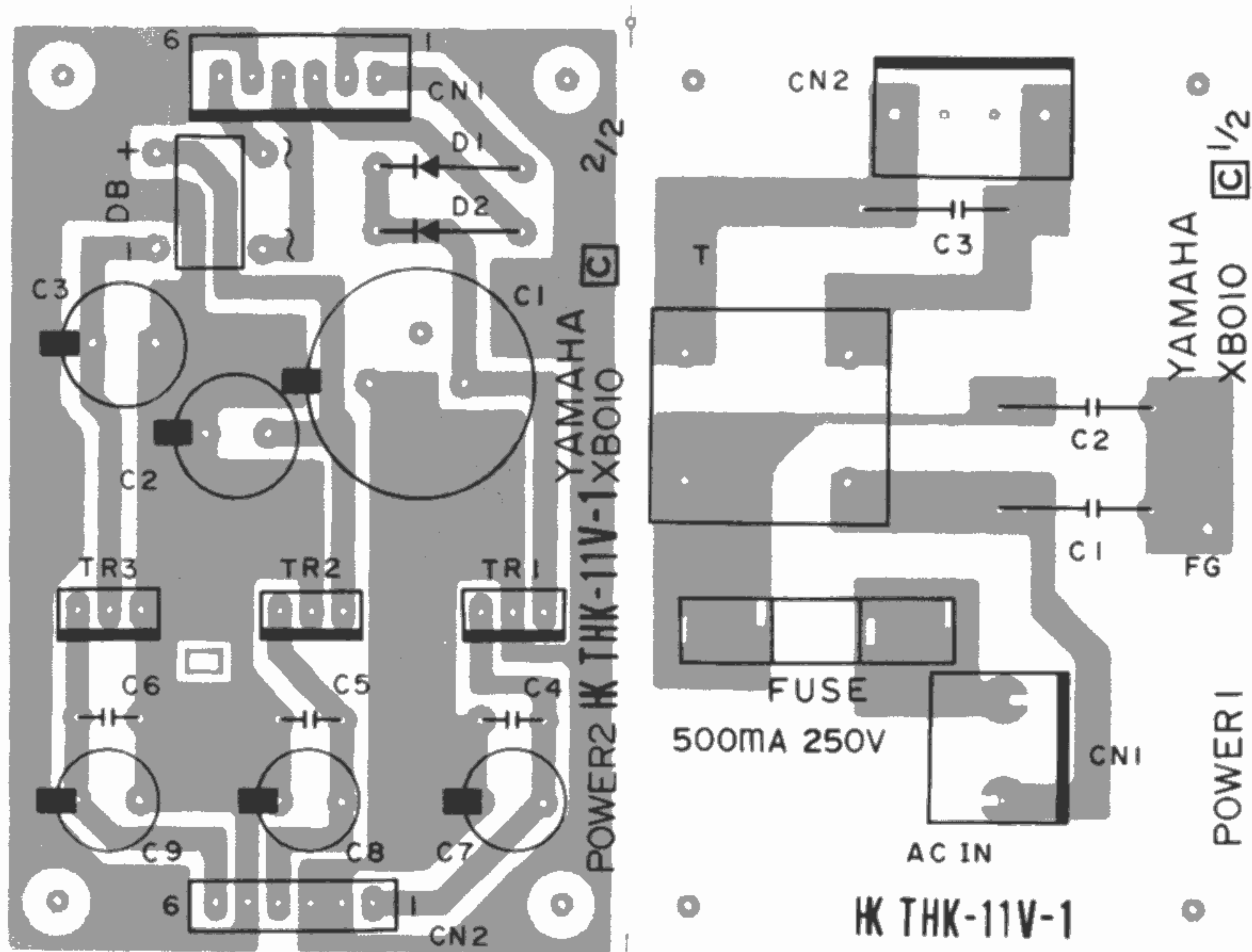
# FB-01 EXTERNAL COMPONENTS



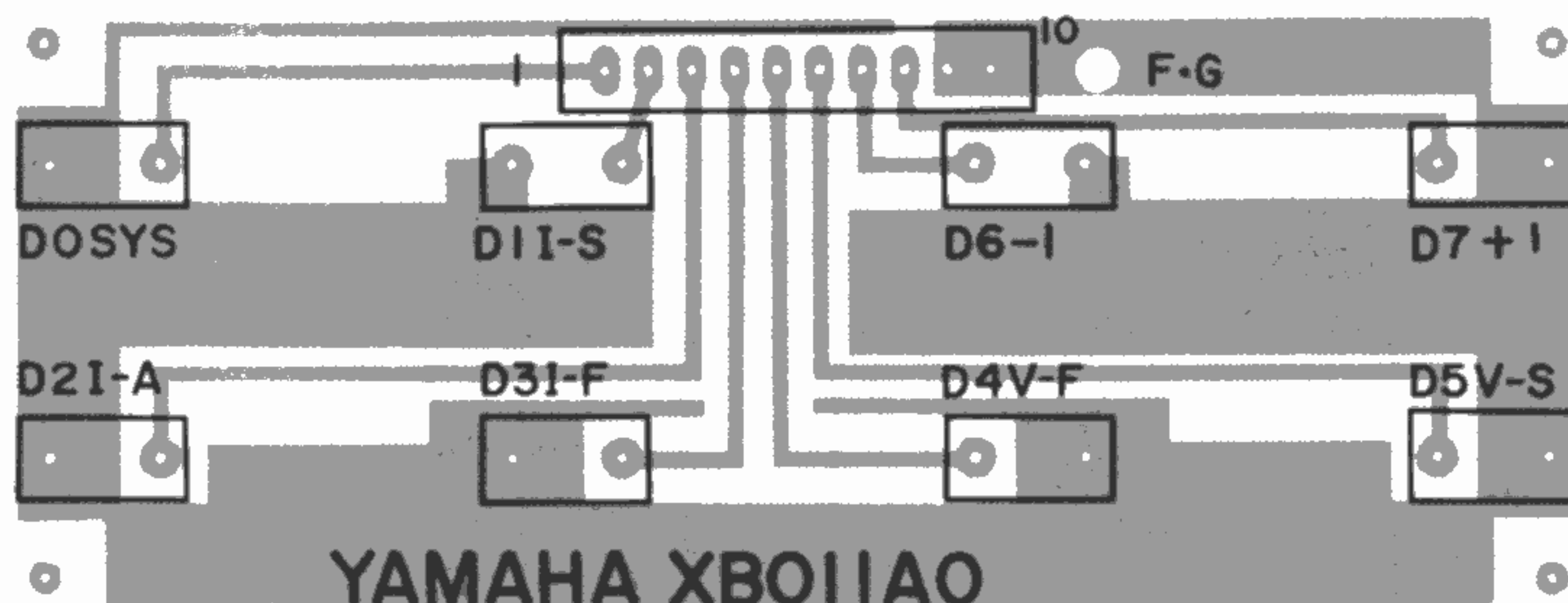
| Ref. No. | Part No.    | Description          | 品 名          | Remarks      | ランク     |
|----------|-------------|----------------------|--------------|--------------|---------|
| * 1      | VB 44 96 00 | Top Case             | トップケース       |              |         |
| * 2      | VB 51 98 00 | Front Panel Assembly | フロントパネルAss'y | J, F, G      |         |
| * 2      | VB 98 45 00 | Front Panel Assembly | フロントパネルAss'y | U, C         |         |
| * 3      | VB 44 81 00 | LCD Assembly         | LCD Ass'y    |              |         |
| * 4      | VB 45 06 00 | Switch Button        | スイッチボタン      | J, F, G      |         |
| * 4      | VB 80 75 00 | Switch Button        | スイッチボタン      | U, C         |         |
| * 5      | VB 45 11 00 | Switch Spring        | スイッチスプリング    |              |         |
| * 6      | VB 39 75 00 | Circuit Board        | FRONT-SW     | FRONT-SWシート  |         |
| * 7      | VB 45 02 00 | Sub Panel            | サブパネル        |              |         |
| * 8      | VB 37 99 00 | Circuit Board        | POWER        | POWERシート     | J       |
| * 8      | VB 38 00 00 | Circuit Board        | POWER        | POWERシート     | U       |
| * 8      | VC 54 14 00 | Circuit Board        | POWER        | POWERシート     | C       |
| * 8      | VB 38 01 00 | Circuit Board        | POWER        | POWERシート     | F       |
| * 8      | VC 54 36 00 | Circuit Board        | POWER        | POWERシート     | G       |
| * 9      | XB 07 50 01 | Power Transformer    |              | 電源トランス       | J       |
| * 9      | XB 49 50 01 | Power Transformer    |              | 電源トランス       | U       |
| * 9      | XB 97 50 01 | Power Transformer    |              | 電源トランス       | C       |
| * 9      | XB 49 20 01 | Power Transformer    |              | 電源トランス       | F, G    |
| * 10     | VB 34 87 00 | Circuit Board        | Main         | Mainシート      | J       |
| * 10     | VC 57 23 00 | Circuit Board        | Main         | Mainシート      | U, C, F |
| * 10     | VC 57 24 00 | Circuit Board        | Main         | Mainシート      | G       |
| * 11     | VB 45 03 00 | Main Board Stay      |              | メインボードステー    |         |
| * 12     | VB 49 27 00 | LCD Shield           |              | LCDシールド      | J, F, G |
| * 12     | VC 68 45 00 | LCD Shield           |              | LCDシールド      | U, C    |
| * 13     | VB 49 28 00 | Main Board Earth     |              | メインボードアース    | U, C, G |
| * 14     | VB 44 97 00 | Rear Panel           |              | リアパネル        | J       |
| * 14     | VB 98 40 00 | Rear Panel           |              | リアパネル        | U       |
| * 14     | VC 35 23 00 | Rear Panel           |              | リアパネル        | C       |
| * 14     | VB 98 42 00 | Rear Panel           |              | リアパネル        | F       |
| * 14     | VC 11 54 00 | Rear Panel           |              | リアパネル        | G       |
| * 15     | VB 45 00 00 | Bottom Case          |              | ボトムケース       | J, F, G |
| * 15     | VC 46 09 00 | Bottom Case          |              | ボトムケース       | U, C    |
| * 16     | VB 45 14 00 | Spacer 6R            |              | ロッキングカードスパーサ |         |
| * 17     | VB 45 13 00 | Spacer 8R            |              | ロッキングカードスパーサ | J, F    |
| * 18     | CB 04 37 50 | Leg Foot             | BL           | ゴム脚          |         |
| * 19     | VB 44 94 00 | AC Inlet Assembly    |              | 電源コードAss'y   | J       |
| * 19     | VC 29 66 00 | AC Inlet Assembly    |              | 電源コードAss'y   | U       |
| * 19     | VC 35 37 00 | AC Inlet Assembly    |              | 電源コードAss'y   | C       |
| * 19     | VB 98 29 00 | AC Inlet Assembly    |              | 電源コードAss'y   | F, G    |
| * 20     | VC 36 08 00 | Polypropylene Film   | ポリエステルフィルム   | インシュレータ0.35t | F, G    |
| * 21     | VC 46 10 00 | Fuse Protector       |              | ヒューズプロテクタ    | F, G    |
| * 22     | VC 36 07 00 | Fuse Label Plate     |              | ヒューズラベルプレート  | U, C    |
| 23       | EA 33 00 66 | Pan Head Screw       | 3.0×6 FCM3BL | ナベ小ネジ        | PACK 01 |
| 24       | ED 03 01 26 | Bind Screw           | 3.0×12       | バインドコネジ      |         |
| 25       | EI 33 00 66 | Bind Tapping Screw   | 3.0×6 ZMC2BL | バインドタッピングネジ  | PACK    |
| 26       | EI 03 00 86 | Bind Tapping Screw   | 3.0×8 ZMC2Y  | バインドタッピングネジ  | PACK 01 |
| 27       | EI 34 00 66 | Bind Tapping Screw   | 4.0×6 ZMC2BL | バインドタッピングネジ  | PACK 01 |
| 28       | EV 10 30 36 | Hexagonal Nut        | φ3 ZMC2BL    | 六角ナット        | 01      |
|          |             |                      |              |              |         |
|          |             |                      |              |              |         |
|          |             |                      |              |              |         |
|          |             |                      |              |              |         |



# ■ FB-01 POWER CIRCUIT BOARD

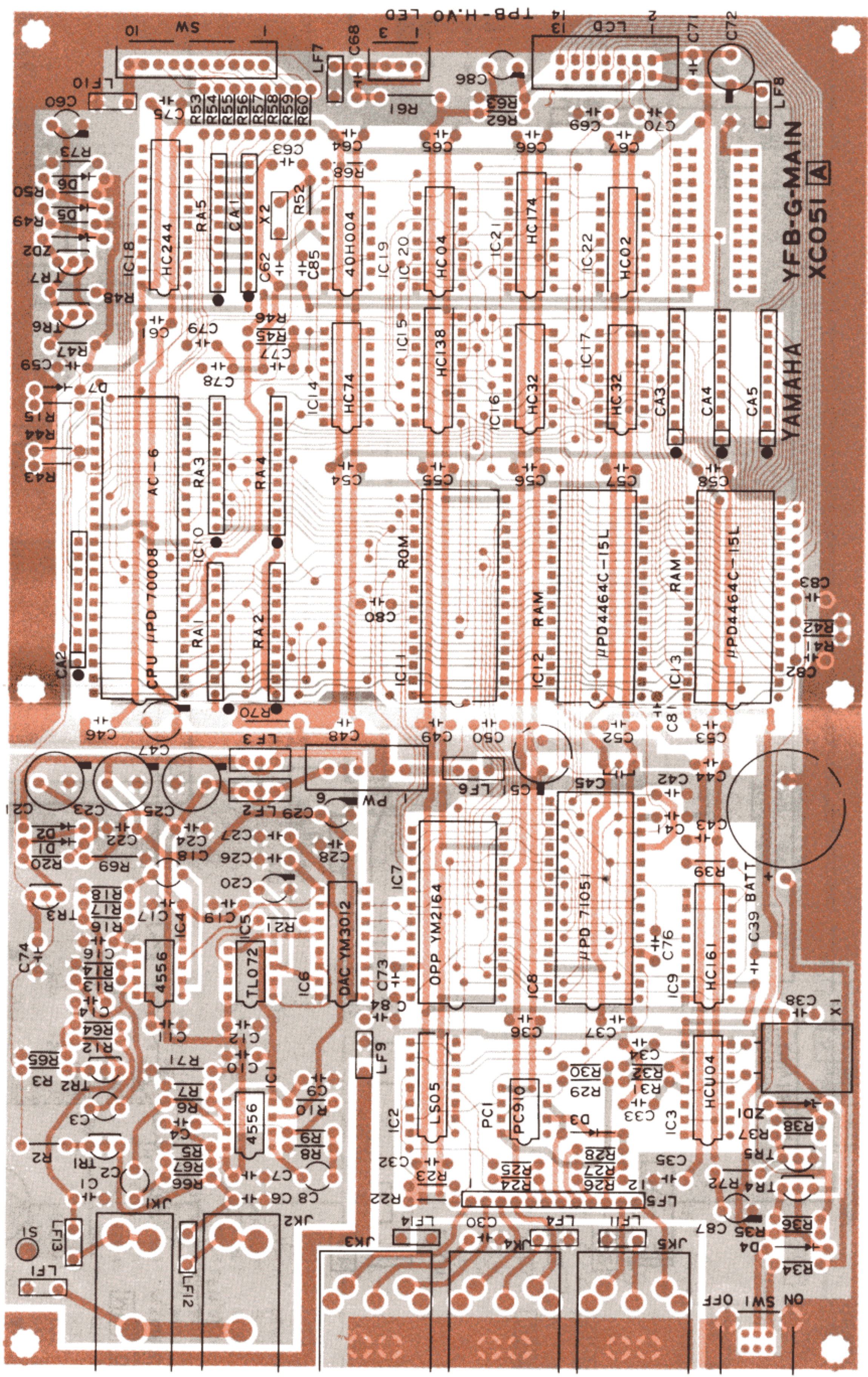


# ■ FB-01 SWITCH CIRCUIT BOARD



# ■ FB-01 MAIN CIRCUIT BOARD

VC572400(G)



## ■FB-01 OVERALL CIRCUIT DIAGRAM

| SW FUNCTION TABLE |            |
|-------------------|------------|
| SW1               | SYSTEM     |
| SW2               | Ins-Sel    |
| SW3               | Ins-Assign |
| SW4               | Ins-Func   |
| SW5               | Voice-Func |
| SW6               | Voice-Sel  |
| SW7               | -1/NO      |
| SW8               | +1/YES     |

