SERVICE MANUAL
& PARTS LIST (with price)

Digital Sampling Keyboard

FZ-1

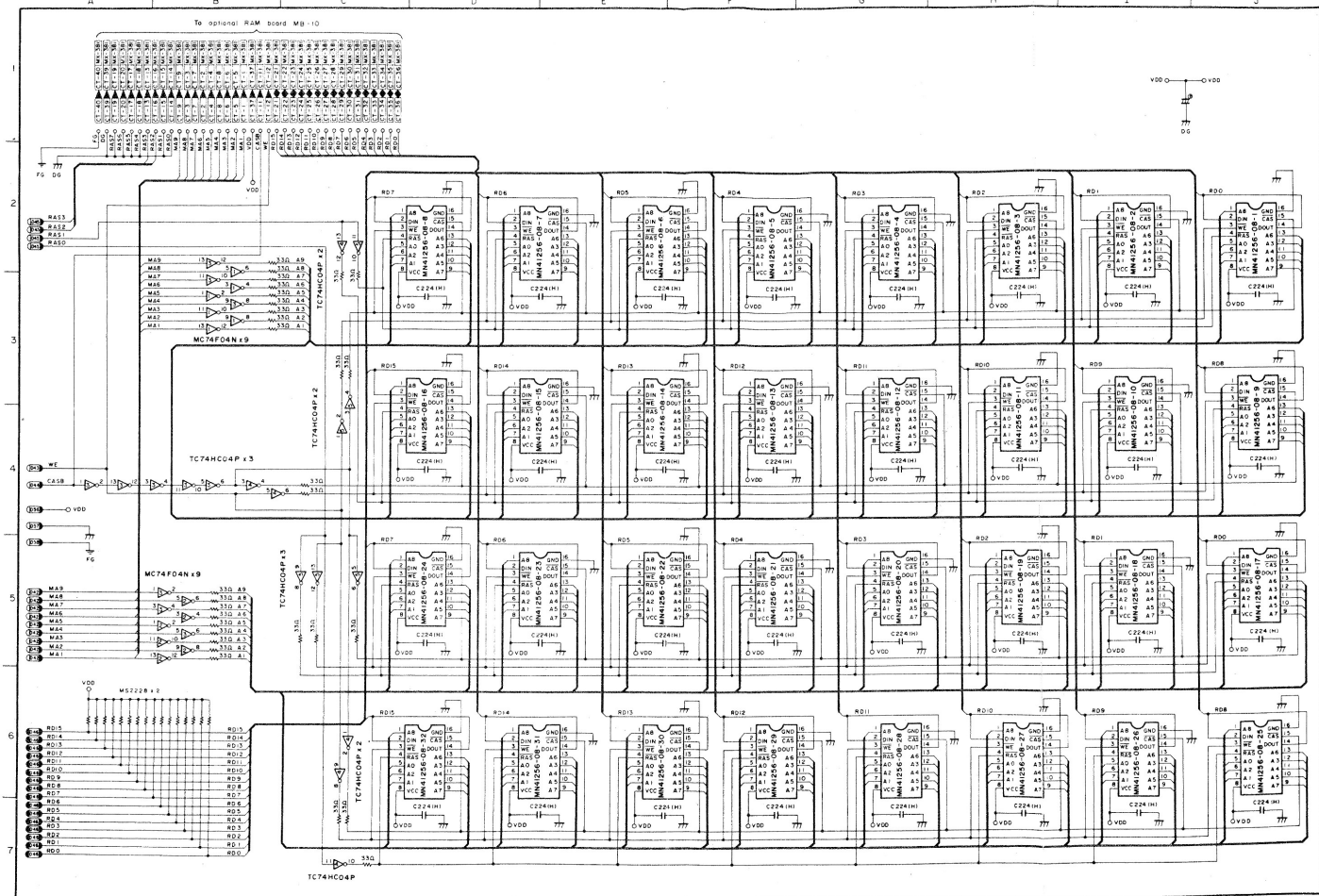
APR. 1987

FZ-1

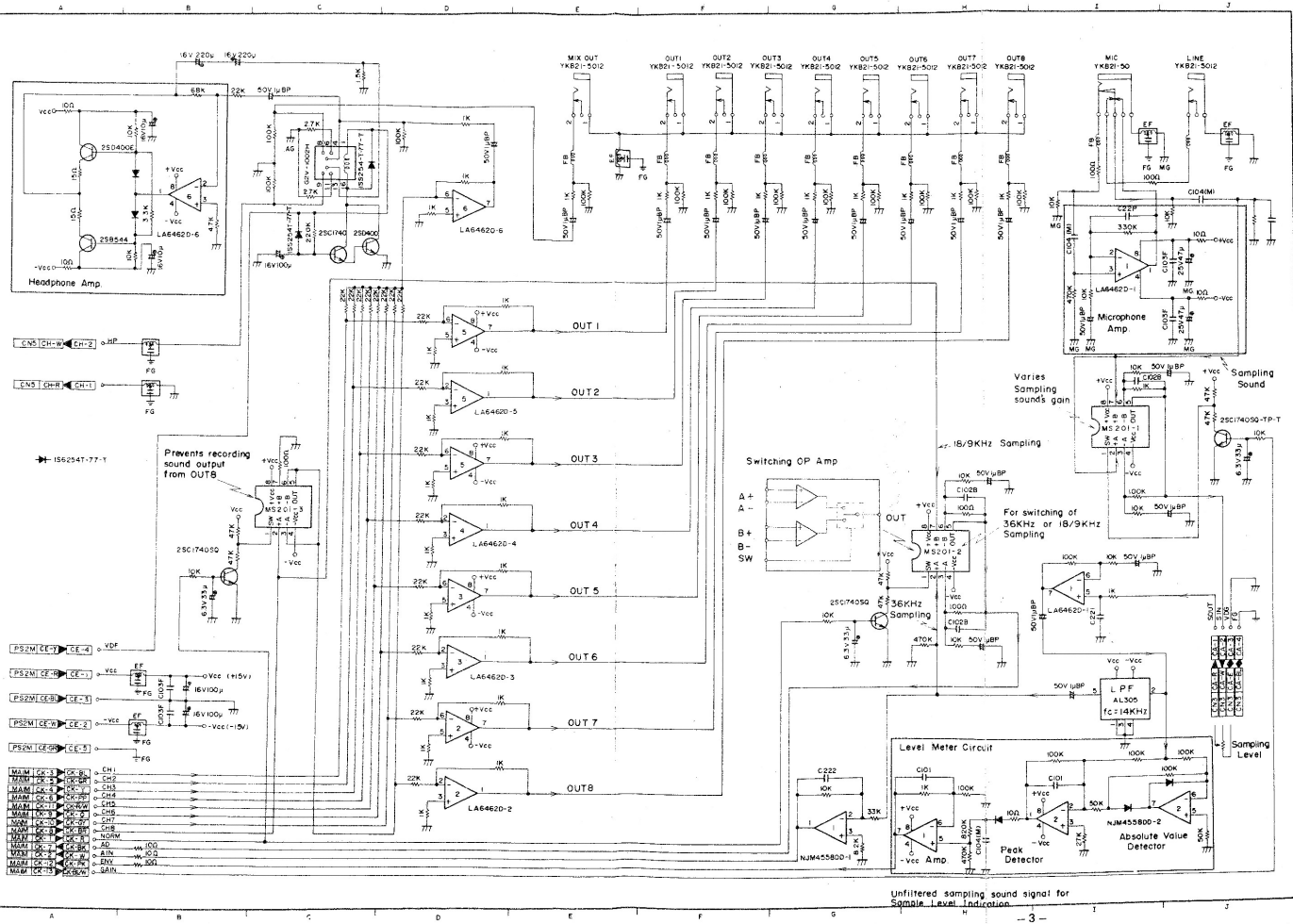
CASIO

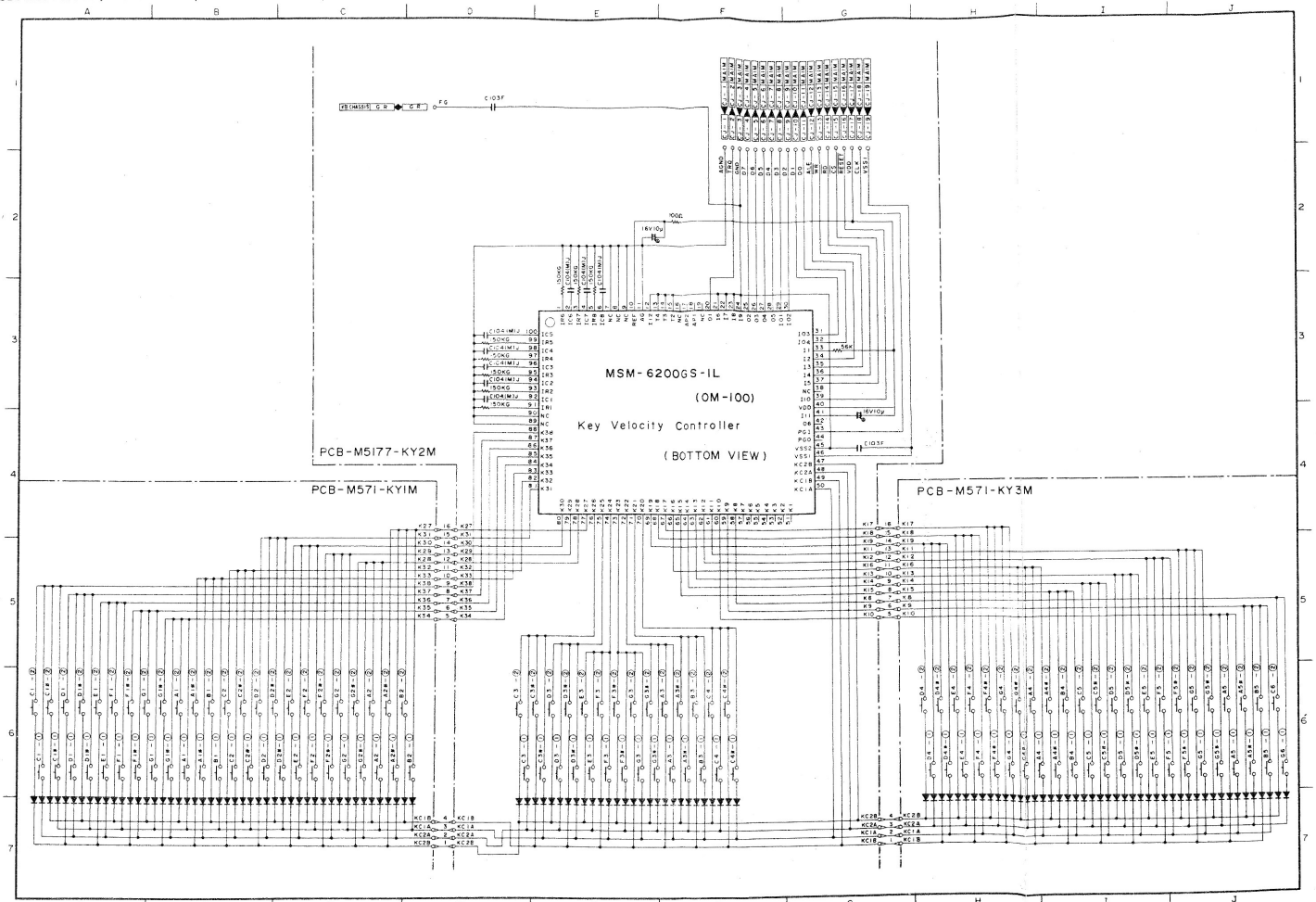
SELF DIAGNOSTIC PROGRAM

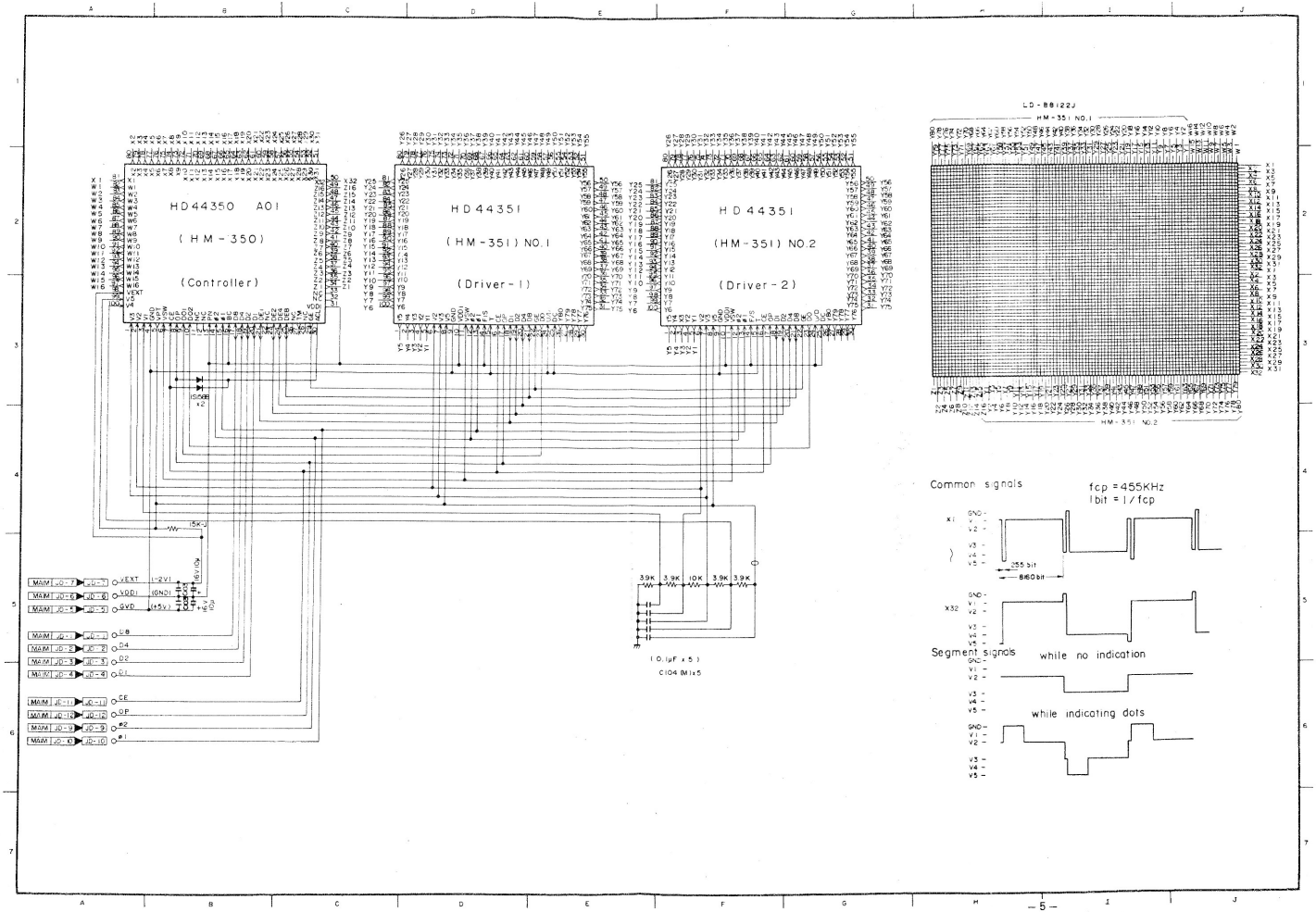
2. PCB M5336-MA1M (2/2)

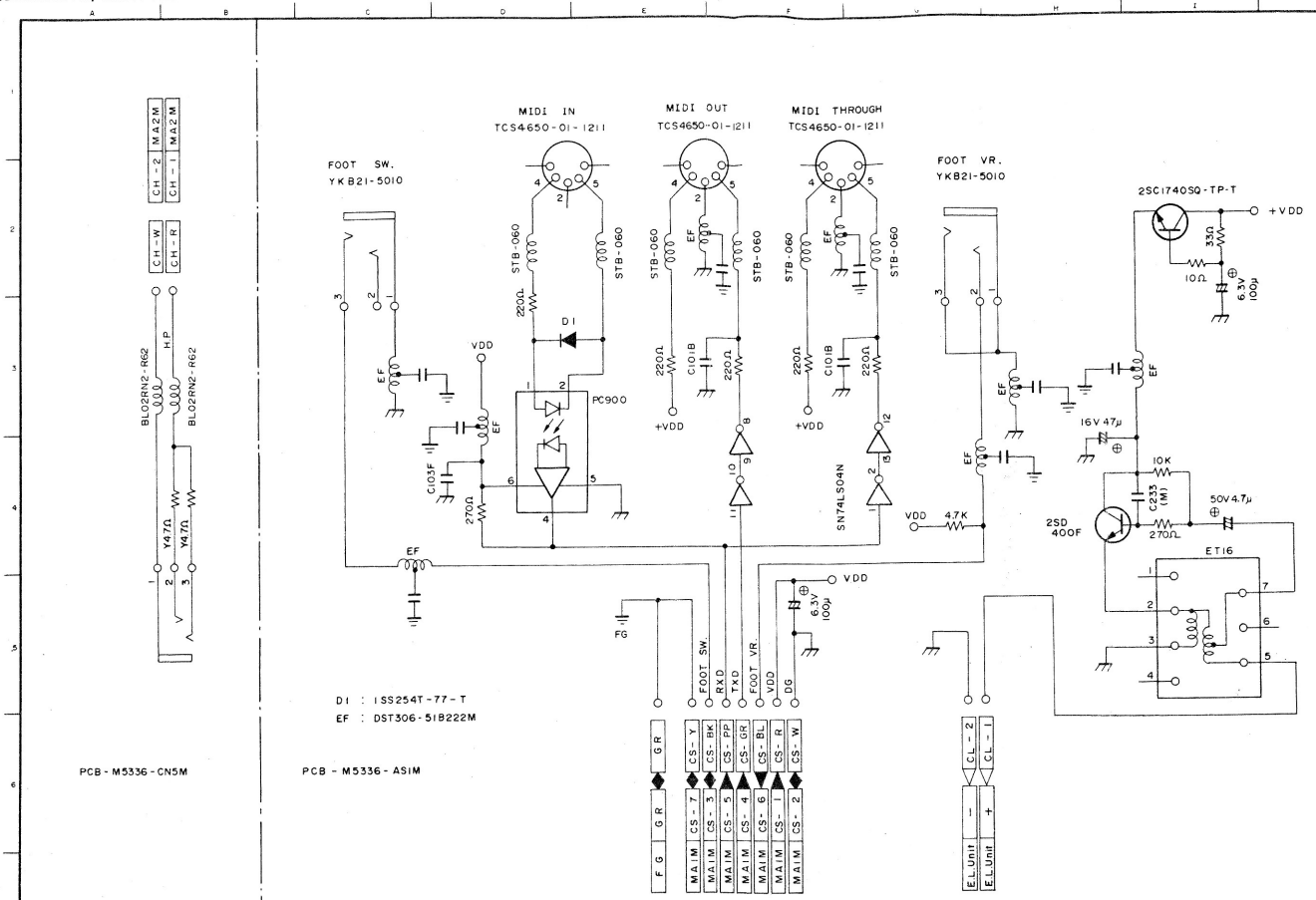


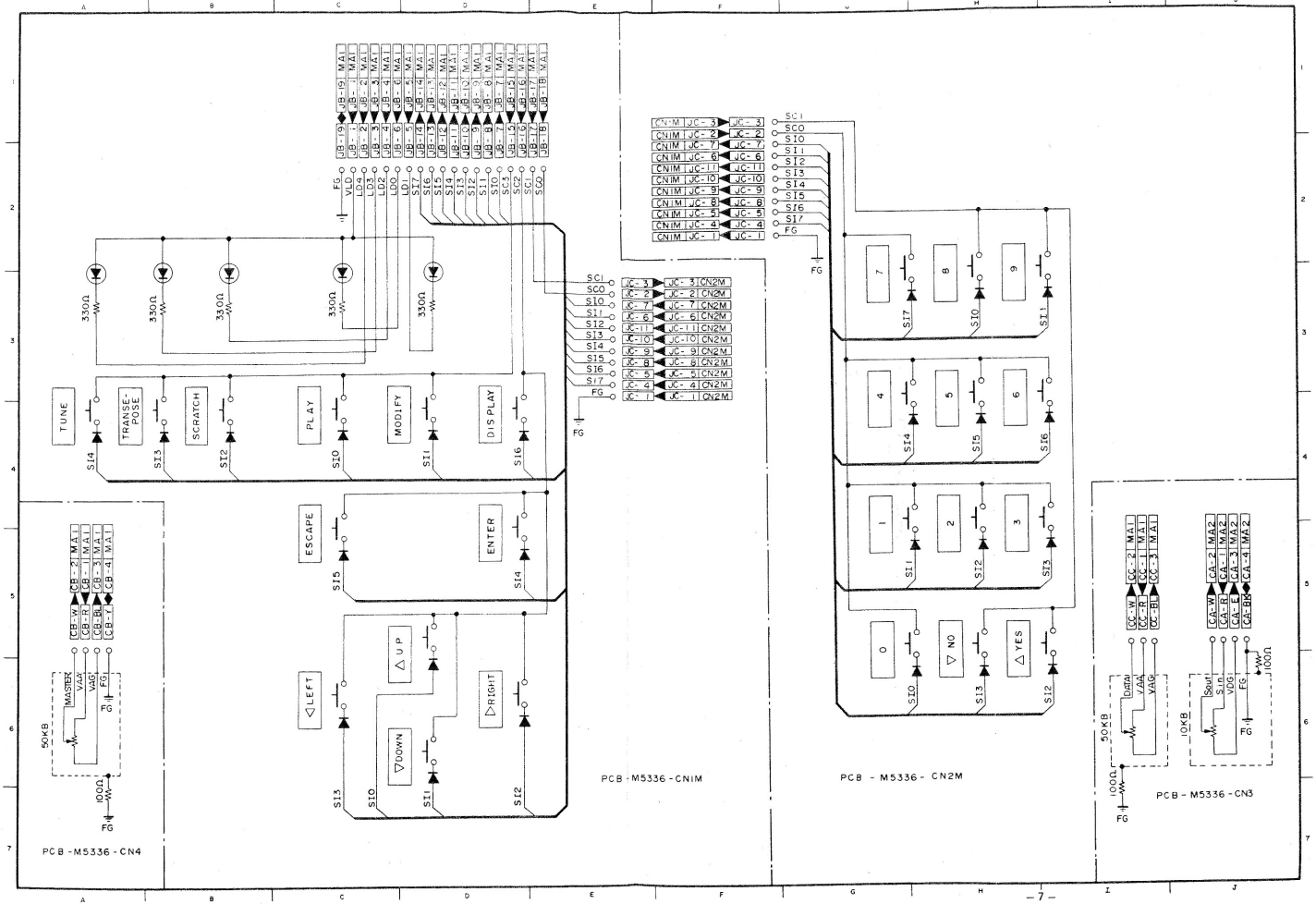
3. PCB M5336-MA2M

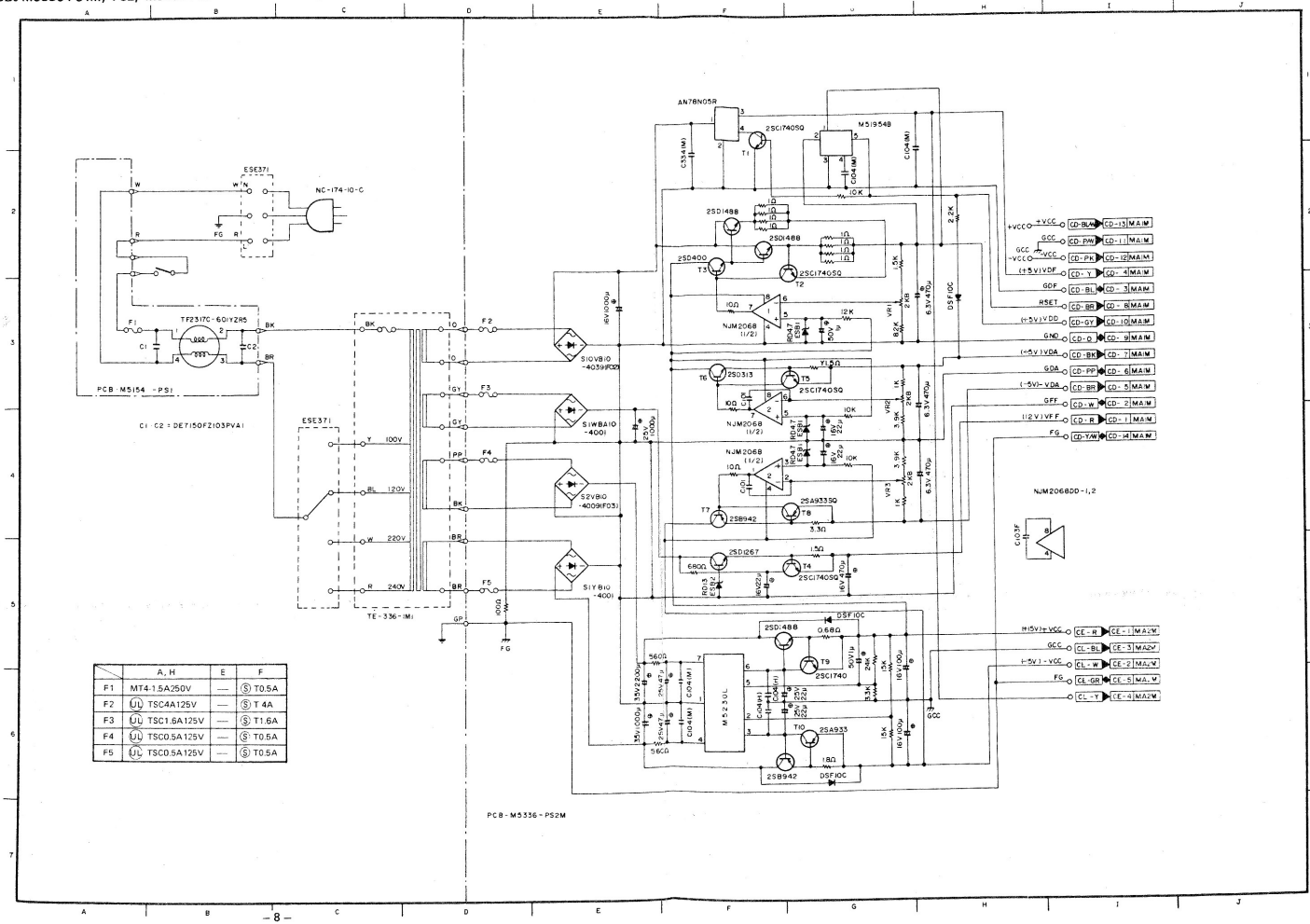



MSM-6200GS-IL
(0M-100)
Key Velocity Controller
(BOTTOM VIEW)
PCB-M5177-KY2M
PCB-M571-KY1M
PCB-M571-KY3M


HD44350 A01
(H M - 350)
(Controller)
HD44351
(HM-351) NO.1
(Driver-1)
HD44351
(HM-351) NO.2
(Driver-2)
LD-88122J
HM-351 NO.1
HM-351 NO.2
15K-Ω
3.9K 3.9K 10K 3.9K 3.9K
(0.1μF x 5)
C104 (M) x5
Common signals
fcp = 455KHz
1bit = 1/fcp
255 bit
860bit
Segment signals
while no indication
while indicating dots

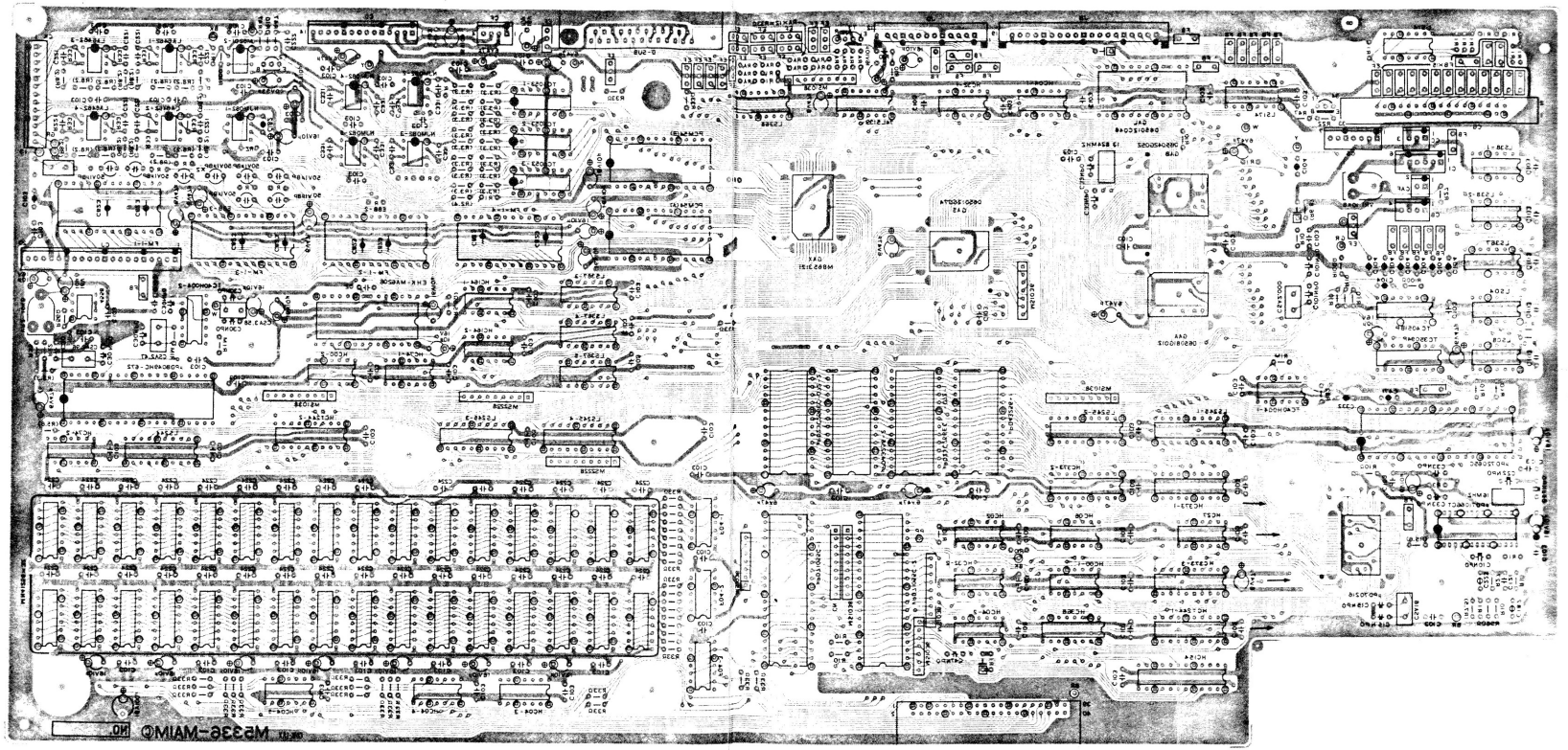

MIDI IN
TCS4650-01-1211
MIDI OUT
TCS4650-01-1211
MIDI THROUGH
TCS4650-01-1211
FOOT SW.
YKB21-5010
FOOT VR.
YKB21-5010
2SC1740SQ-TP-T
+VDD
PC900
SN74LS04N
2SD 400F
ET16
DI : 1SS254T-77-T
EF : DST306-518222M
PCB - M5336-CN5M
PCB - M5336-ASIM
CH-2 MA2M
CH-1 MA2M
CH-W
CH-R
BLO2RN2-R62
H.P
Y4.7Ω
Y4.7Π
FOOT SW.
RXD
TXD
FOOT VR.
VDD
DG
FG
CS-Y
CS-BK
CS-PP
CS-GR
CS-BL
CS-R
CS-W
MAIM CS-7
MAIM CS-3
MAIM CS-5
MAIM CS-4
MAIM CS-6
MAIM CS-1
MAIM CS-2
EL Unit
CL-2
CL-1

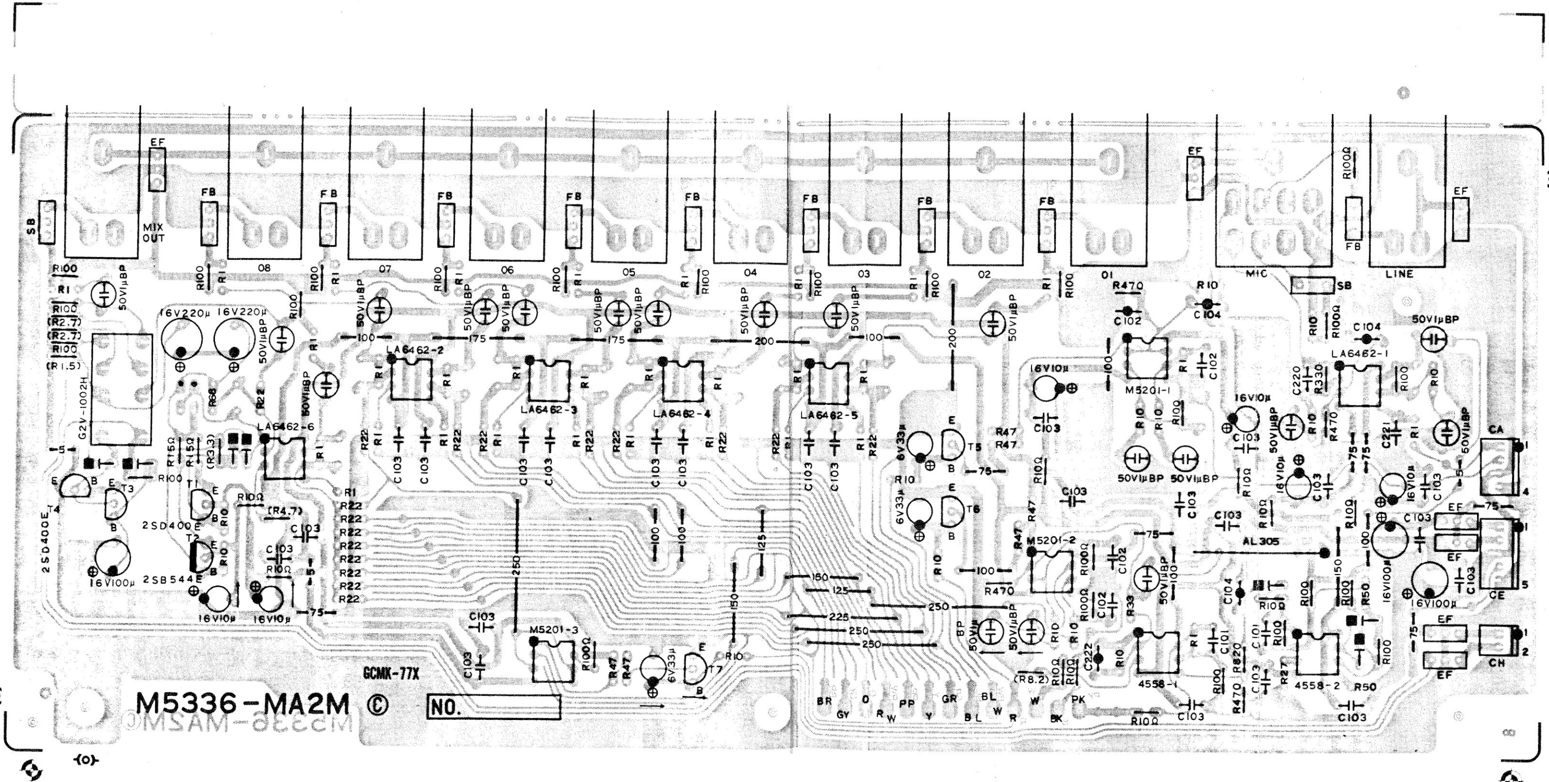

TUNE
TRANSE POSE
SCRATCH
PLAY
MODIFY
DISPLAY
ESCAPE
ENTER
LEFT
UP
DOWN
RIGHT
330Ω
PCB - M5336 - CN1M
PCB - M5336 - CN2M
PCB - M5336 - CN3
PCB - M5336 - CN4
0
NO
YES
50KB
10KB
100Ω
FG

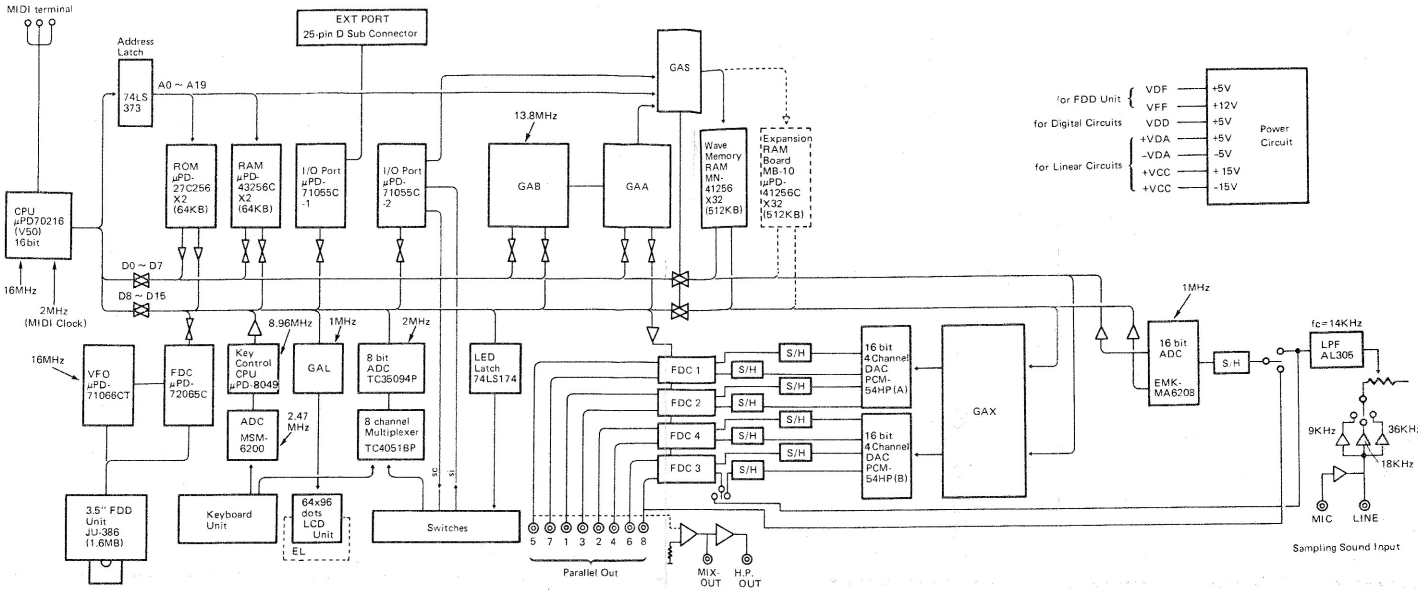


	A, H	E	F
F1	MT4-1.5A250V	—	(S) T0.5A
F2	(UL) TSC4A125V	—	(S) T 4A
F3	(UL) TSC1.6A125V	—	(S) T1.6A
F4	(UL) TSC0.5A125V	—	(S) T0.5A
F5	(UL) TSC0.5A125V	—	(S) T0.5A

PCB VIEW




M5336-MA2M ©
GCMK-77X
NO.
MIX OUT
08
07
06
05
04
03
02
01
MIC
LINE
SB
EF
FB
LA6462-1
LA6462-2
LA6462-3
LA6462-4
LA6462-5
LA6462-6
M5201-1
M5201-2
M5201-3
4558-1
4558-2
G2V-1002H
2SD400E
2SB544E
AL305
CA
CE
CH
16V220μ
16V100μ
16V10μ
6V33μ
50V1μBP
BR
GY
O
R
W
PP
Y
GR
BL
PK
BK



The FZ-1 is a 16-bit sampling keyboard whose sampling frequency is 36KHz and sampled sound is saved or loaded in a floppy disc.

CPU μPD70216 is a 16-bit microprocessor and controls all the devices.
System ROMs contain the FZ-1's system program whereas System RAMs are for the work area of the program.

Recorded sound's waveform is transformed in 16-bit x 512K steps digital data (1,024K steps when optional RAM board is equipped) by a 16-bit ADC (Analog to Digital Converter) EMK-MA6208 and stored in Wave Memory of 32 pieces of 256K-bit dynamic RAMs.

The gate arrays GAA and GAB are for accessing of Wave Memory RAMs.

When Playbacking, data from Wave Memory pass through gate array GAS which controls the Cross Fading.

The outputs of GAS are transformed in analog waveforms by two DACs PCM-54HP (A) and (B).

By means of time sharing, S/H (Sample and Hold) circuits separate the eight DAC outputs one by one and send them to FDCs which is a digital controlled filter and gain controller.

Together with Key Velocity Controller MSM6200, Key CPU μPD8049 controls the key scanning. According to a key pressure strength, after touch detector in Keyboard unit output a voltage which is converted in a digital data in 8-bit ADC TC35094P and sent to the CPU.
TC35094P also converts analog inputs from Pitch Bender, Modulator, Data Entry, and sampling sound level into digital data.

Gate array GAL is a interface between CPU and 64x96 dots graphic LCD Unit.

μPD71055Cs are I/O Ports and performs switch scanning, upper address designation of Wave Memory RAMs, and interface between the CPU and External device.

μPD72065 and μPD71066CT control the FDD (Floppy Disc Drive) JU-386.

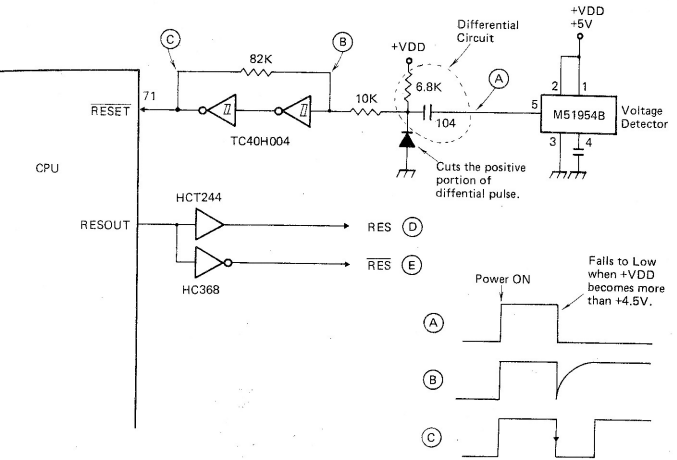
2. CPU (μPD70216)

μPD70216 is a 16-bit C-MOS LSI and controls all the peripheral devices.
The following is pin functions of the CPU.

Pin No.	Terminal	In/Out	Function
78~80, 1	A19 (PS3) ~ A16 (PS0)	Out	Upper address bus
3 ~ 10	AD15 (A15) ~ AD8 (A8)	In/Out	Upper address or data bus
13	GND	–	Ground (0V) source
14 ~ 21	AD7 ~ AD0	In/Out	Lower address or data bus
31	DMARQ3 (RXD)	In	MIDI data input
32	DMAAK3 (TXD)	Out	MIDI data output
33	VDD	–	VDD (+5V) source
37	INT2	In	Interrupt from gate array GAS
40	INT5	In	Interrupt from I/O Port
41	INT6	In	Key entry interrupt
44	TCLK	In	2MHz clock pulse for built-in timer
45	TOUT2	Out	Built-in timer output
50	ASTB	Out	Address latch enable signal. When High, signal AD0 ~ AD15 becomes address bus.
51	$\overline{\text{UBE}}$	Out	Upper Bass Enable. When Low, upper address signals (AD8 ~ AD15) become data bus.
52, 54	GND	–	Ground (0V) source
55, 56	X2, X1	In	16MHz clock pulse inputs
57	CLK OUT	Out	8MHz (a half of 16MHz) clock pulse for gate array GAS
58	$\overline{\text{BUF EN}}$	Out	Data bus buffer enable signal. When Low, Bidirectional Bus Buffers LS245's become functional.
59	BUF R/W	Out	Data bus read/write signal. When High, data is transferred from CPU to other devises whereas the data transfer direction is from devices to CPU when this terminal is Low.
61	$\overline{\text{IO WR}}$	Out	I/O devices write signal. When Low, CPU is able to write data in the I/O devices.
62	$\overline{\text{M WR}}$	Out	Memory devices write signal. When Low, CPU is able to write data in the memory devices.
64	$\overline{\text{IO RD}}$	Out	I/O devices read signal. When Low, CPU is able to read data from the I/O devices.
65	$\overline{\text{M RD}}$	Out	Memory device read signal. When Low, CPU is able to read data from the memory devices.
70	READY	In	Receiving High level signal from this terminal, CPU acknowledges that gate array GAS is not busy.

Pin No.	Terminal	In/Out	Function
71	$\overline{\text{RESET}}$	In	At Power ON, the terminal receives a Low level pulse which resets the CPU.
72	VDD	–	+5V source
74	RES OUT	Out	Power ON reset signal for I/O devices
77	$\overline{\text{REF RQ}}$	Out	Refresh request signal. Falls to Low level when CPU requests Dynamic RAMs to reflesh.

3. CPU RESET CIRCUIT



Circuit Operation

(1) When power switch is turned on, +VDD rises toward +5V.

(2) Voltage Detector M51954B outputs High level voltage from pin 5 (Ⓐ) while +VDD is less than +4.5 volts.

(3) When +VDD becomes higher than +4.5 volts, pin 5 of M51954B (Ⓐ) falls to Low.

(4) At the falling edge of pin 5, a differential pulse is generated in the differential circuit (Ⓑ).

(5) The differential pulse is shaped in a square pulse by the two inverters (Ⓒ).

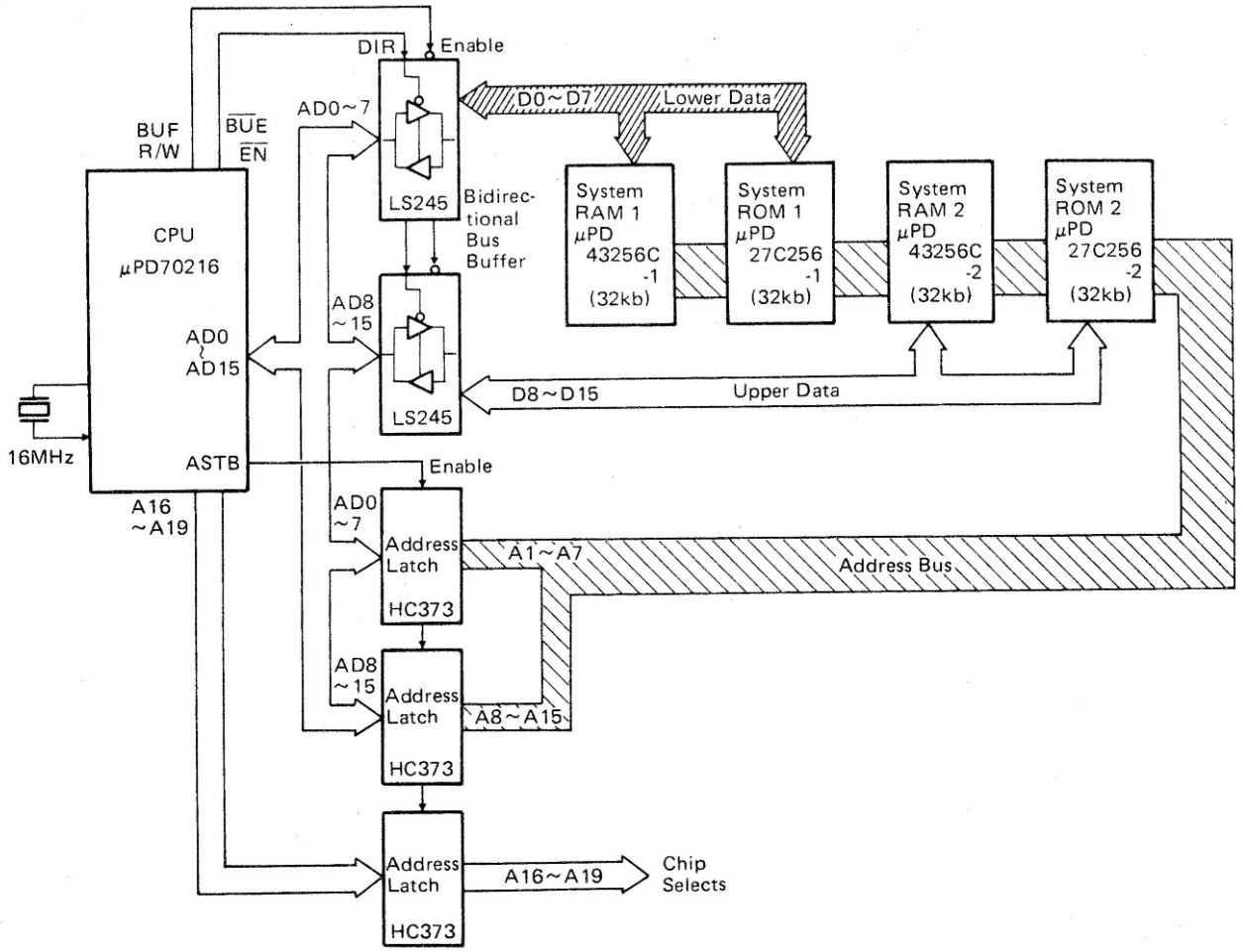
(6) CPU initialize the internal circuits at the falling edge of Reset signal (Ⓒ).

(7) After the initialization of the internal circuits, CPU resets all the devices by signal RES OUT (Ⓓ and Ⓔ).

4. SYSTEM ROM/RAM

4-1. System ROM/RAM Access

System ROMs contain the FZ-1's system program whereas System RAMs are for the work area of the program.



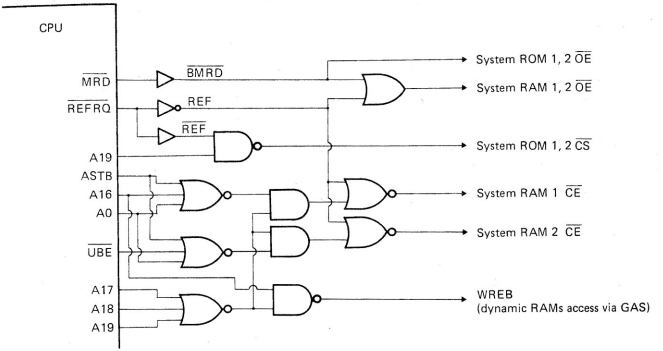
Signals AD0 ~ AD15 function as either data bus or address bus.
When the bus carries an address, CPU raises signal ASTB so that Address Latches (HC373s) are able to take in the signals and send them to the address terminals of the ROMs and the RAMs.

LS245 is a bidirectional buffer which determines the direction of data flow by signal BUF R/W of the CPU.

Signal BUF R/W	Data Flow
High	CPU ← - - - - ROM/RAM
Low	CPU - - - - → ROM/RAM

Since the data bus is 16-bit and data terminals of the ROMs and RAMs are 8-bit, the data is divided in half and stored in each ROM or RAM.

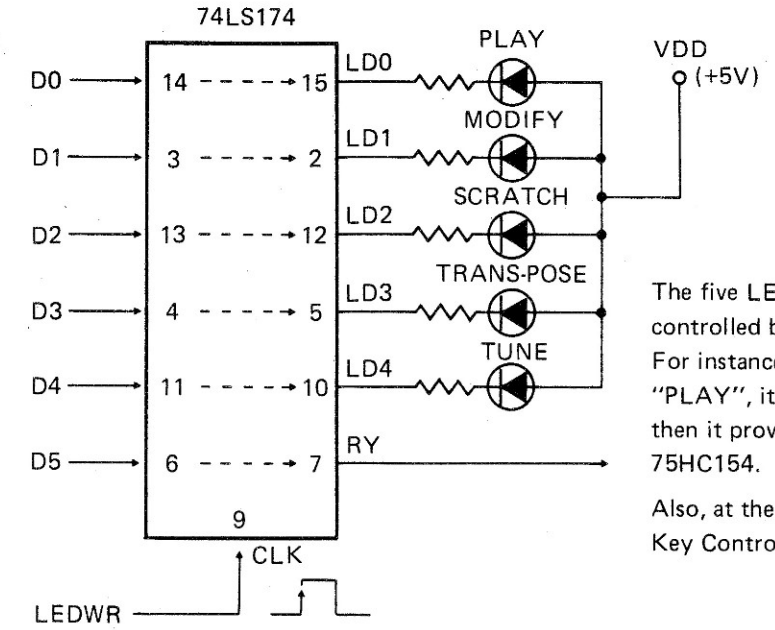
4-2. System ROM/RAM Chip Selection



System ROMs and RAMs are designated when both $\overline{OE}$ and $\overline{CE}$ terminals are Low level. When CPU falls $\overline{MRD}$ terminal, $\overline{CE}$ of System ROM 1, 2 and $\overline{OE}$ and $\overline{CE}$ of System RAM 1, 2 falls Low level selecting the System RAMs. At this time, if signal A19 rises to High, $\overline{CS}$ of System ROM 1, 2 become Low level and the ROMs are selected.

While CPU is generating refresh signals for the dynamic RAMs (Wave Memory RAMs), signal $\overline{REF\ RQ}$ falls to Low level raising $\overline{OE}$ and $\overline{CE}$ of System RAMs so that System RAM 1 and 2 cannot be designated.

5. LED LATCH (74LS174)



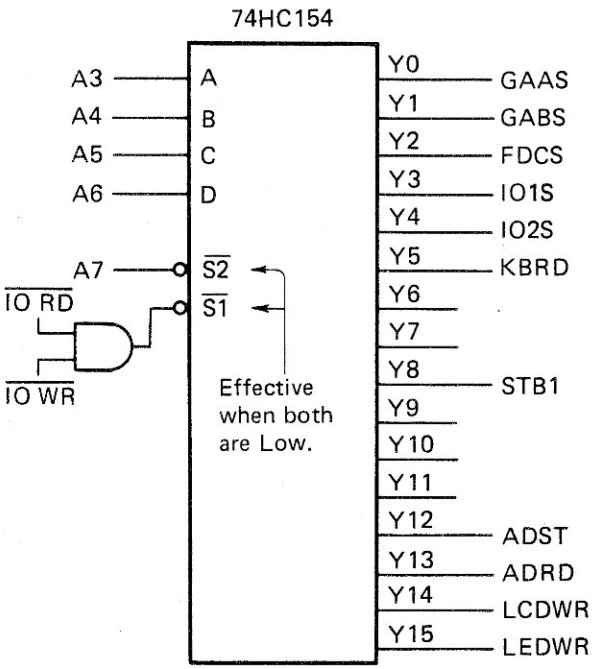
The five LEDs on the operation panel is controlled by LED Latch.
For instance, when CPU lights LED "PLAY", it drops signal D0 of data bus then it provides signal LED WR via 75HC154.

Also, at the falling edge of output RY, Key Controller μPD8049 is initialized.

The contents of data bus D0 ~ D5 is latched and kept until 74LS174 receives next CLK pulse.

6. CHIP SELECTOR

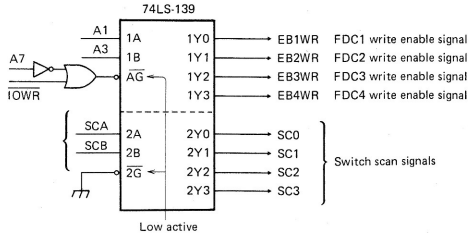
By the combinations of signals A3 ~ A6, one of the outputs falls to Low level and becomes a chip selection signal.



GAAS	Gate array GAA chip selection signal
GABS	Gate array GAB chip selection signal
FDCS	FDC (μPD72065C) chip selection signal
IO1S	I/O Port 1 (μPD72065C) chip selection signal
IO2S	I/O Port 2 (μPD72065C-2) chip selection signal
KBRD	Key Controller (μPD8049HC) data bus gate control
STB1	Enable signal for EXTERNAL PORT
ADST	When Low, 8-bit DAC (TC35094P) starts D/A conversion
ADRD	8-bit DAC (TC35094) chip selection signal
LCDWR	LCD controller GAL write enable signal
LEDWR	LED Latch (74LS174) clock pulse

7. DECODER (74LS139)

By the combination of signals A1, A3, SCA, and SCB, Decoder outputs write enable signal of the FDCs and switch scan signals.

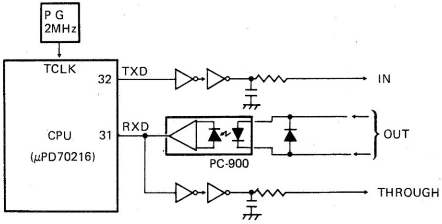


Switch Matrix

	SI0	SI1	SI2	SI3	SI4	SI5	SI6	SI7
SC0	0	1	2	3	4	5	6	7
SC1	8	9	YES	NO				
SC2	UP	DOWN	RIGHT	LEFT	ENTER	ESCAPE	DISPLAY	
SC3	PLAY	MODIFY	SCRATCH	TRANS-POSE	TUNE			

To I/O Port 2

8. MIDI CIRCUITS



9. I/O PORT 1 (μPD71055-1)

I/O Port 1 controls External Port, FDC (Floppy Disc Controller), gate arrays GAA and GAB.

Pin No.	Terminal	Signal	In/Out	Function
1	PO3	IF3	In/Out	Data bus for External Port
2	PO2	IF2	In/Out	
3	PO1	IF1	In/Out	
4	PO0	IF0	In/Out	
5	$\overline{RD}$	$\overline{BIO\ RD}$	In	Read signal. CPU falls this terminal Low when it reads data from I/O Port 1
6	$\overline{CS}$	$\overline{IO1S}$	In	Chip select signal from CPU. I/O Port 1 is designated when this terminal is Low.
7	GND	GND	—	Ground (0V) source
8	A1	A2	In	Address signals
9	A0	A1	In	
10	P27	OBF	Out	Control signals for External Port
11	P26	ACKE	In	
12	P25	IBF	Out	
13	P24	—	In	
14	P20	ACKO	Out	
15	P21	STBO	Out	
16	P22	IFOUT	Out	
17	P23	IF INT	Out	Interrupt signal to CPU when using External Port
18	P10	GAAR	In	Gate array GAA ready signal
19	P11	GABR	In	Gate array GAB ready signal
20	P12	LCR	In	Gate array GAL ready signal
21	P13	ADR	In	8-bit DAC (TC35094P) ready signal. Receives High level signal when the DAC is ready to receive data.
22	P14	CONT	Out	Control signal for Key Controller
23	P15	SYNC	In	Interrupt signal from FDC
24	P16	IF IN	In	Control signal from External Port
25	P17	FD INT	In	Interrupt signal from FDC. When FDC require new data, this terminal receives High level signal.
26	VDD	VDD	—	VDD (+5V) source
27~34	D7 ~ D0	D7 ~ D0	In/Out	Data bus between CPU
35	RESET	RES	In	Power ON reset signal
36	$\overline{WR}$	$\overline{BIO\ WR}$	In	Falls to Low when CPU output data via this I/O Port
37	PO7	IF7	In/Out	Data bus for External Port
38	PO6	IF6	In/Out	
39	PO5	IF5	In/Out	
40	PO4	IF4	In/Out	

10. I/O PORT 2 (μPE71055-2)

I/O Port 2 performs switch scanning, gain control of sample sound, gate array GAS controlling and FDC controlling.

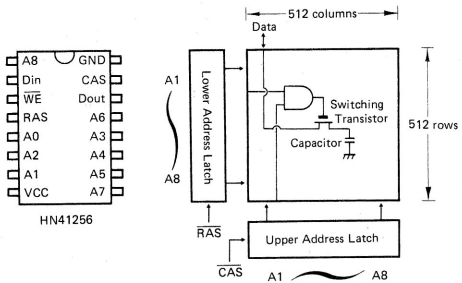
Pin No.	Terminal	Signal	In/Out	Function
40	PO4	ADS2	Out	8-bit DAC input selection signals. By the combinations of these signals, input of 8-bit DAC is varied.
1	PO3	ADS1	Out	
2	PO2	ADS0	Out	
3	PO1	SCB	Out	Switch scanning signals
4	PO0	SCA	Out	
5	$\overline{RD}$	$\overline{BIO\ RD}$	In	Read signal from CPU. CPU falls this terminal Low when it reads data from I/O Port 2.
6	$\overline{CS}$	IO2S	In	I/O Port 2 chip select signal.
7	GND	GND	–	Ground (0V) source
8	A1	A2	In	Address bus
9	A0	A1	In	
10~17	P27 ~ P23	SI7~SI3	In	Switch input signals
18~23	P10 ~ P15	16B~21B	Out	Upper 6 bits of Wave Memory RAM address
24	P16	GAIN	Out	Gain control signal for sampling sounds. Normally High level and falls to Low when sampling level is set at L.
25	P17	NORM	Out	Sampling frequency switching signal. High level when sampling frequency is 36KHz and Low when 18KHz or 9KHz.
26	VDD	VDD	–	VDD (+5V) source
27~34	D7 ~ D0	D7~D0	In/Out	Data bus between I/O Port 2 and CPU
35	RESET	RES	In	Power ON reset signal (High active)
36	$\overline{WR}$	$\overline{BIO\ WR}$	In	Write signal. CPU falls this terminal when it sends data via I/O Port 2.
37	PO7	INUSE	Out	Being Low, this signal selects the FDD Unit and lights the FDD BUSY lamp.
38	PO6	$\overline{MO\ ON}$	Out	FDD Unit's motor drive signal.
39	PO5	TC	Out	High level when data transfer to FDC is completed

11. WAVE MEMORY RAM (HN41256)

11-1. Dynamic RAM

Hitherto, static RAMs have been employed in Casiotone as memory devices.
Static RAMs use six transistors per one bit and turning these transistors on or off, digital signals of High or Low levels are stored.
Since stored data are kept as long as power sources are provided, controlling of static RAMs are made simple but, as the cost per one bit is rather high, static RAMs are unsuitable for a large memory area.

The FZ-1 employs dynamic RAM HN41256s whose capacity is 256K bit for storing sample sound data.
Dynamic RAM contains capacitors which store digital data by being charged or discharged. Since a capacitor does not hold the electric charge for a long time, the stored data must be rewritten periodically. This rewriting is called **refresh.** Also, due to reducing number of pin terminals, addressing is made twice for raws and columns.
As the access of a dynamic RAM is thus complicated, the control circuits become intricate.



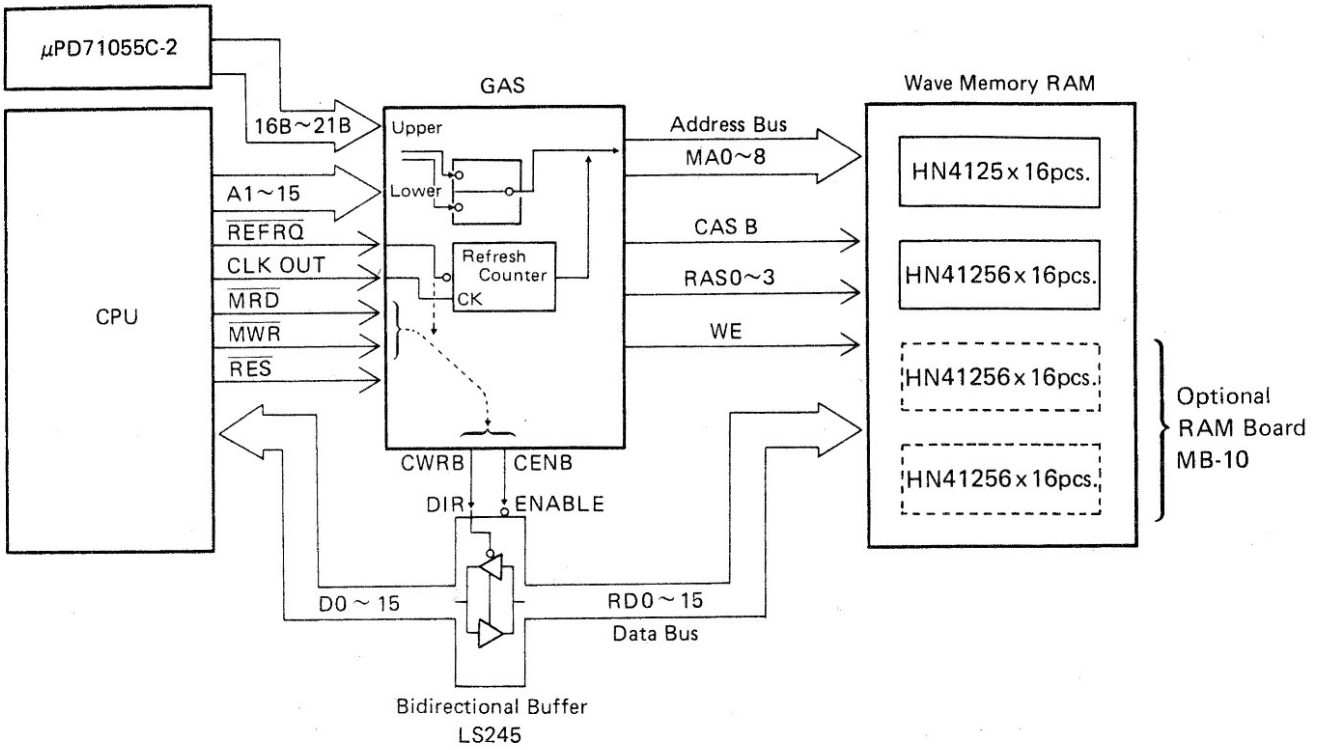
Addressing is made by selecting a column (upper address) first, then a row (lower address). The address signals A1 ~ A8 are put into the upper or lower address latches when enable signals $\overline{CAS}$ (Column Address Strobe) or $\overline{RAS}$ (Row Address Strobe) fall to Low level.

Since dynamic RAMs do not have CE (Chip Enable) or OE (Out Enable) terminals, chip selection is made when $\overline{RAS}$ terminal falls and stored data emerges while $\overline{CAS}$ is Low.

Via a refresh counter in gate array GAS, CPU designates all the addresses periodically for re-charging the capacitors in dynamic RAM.

11-2. Wave Memory RAM Access

Wave Memory RAMs are controlled by CPU via gate array GAS.

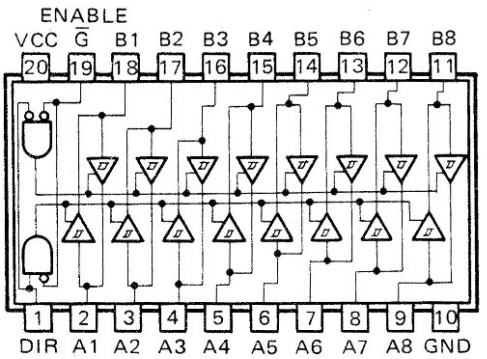


Address bus A1 ~ A15 from CPU and 16B ~ 21B from I/O Port 2 are separated in upper and lower addresses in gate array GAS. The upper and lower addresses are output alternately from MA0 ~ MA8 terminals of GAS.
Wave Memory RAMs descriminate MA0 ~ MA8 as upper or lower addresses by signals RAS0 ~ RAS3 or CAS which are generated in GAS.

In order to recharge the memory cell capacitors of Wave Memory RAMs, CPU periodically send signal $\overline{\text{REF RQ}}$ to GAS.
By $\overline{\text{REF RQ}}$ and 8MHz clock pulse of CLK OUT, refresh counter in GAS starts counting and designates all the addresses of Wave Memory RAMs in turn.

The direction of data flow between CPU and Wave Memory RAMs is controlled by signal $\overline{\text{MRD}}$ and $\overline{\text{MWR}}$ and the bidirectional buffer.

The followings are logic diagram and truth table of bidirectional buffer LS245.

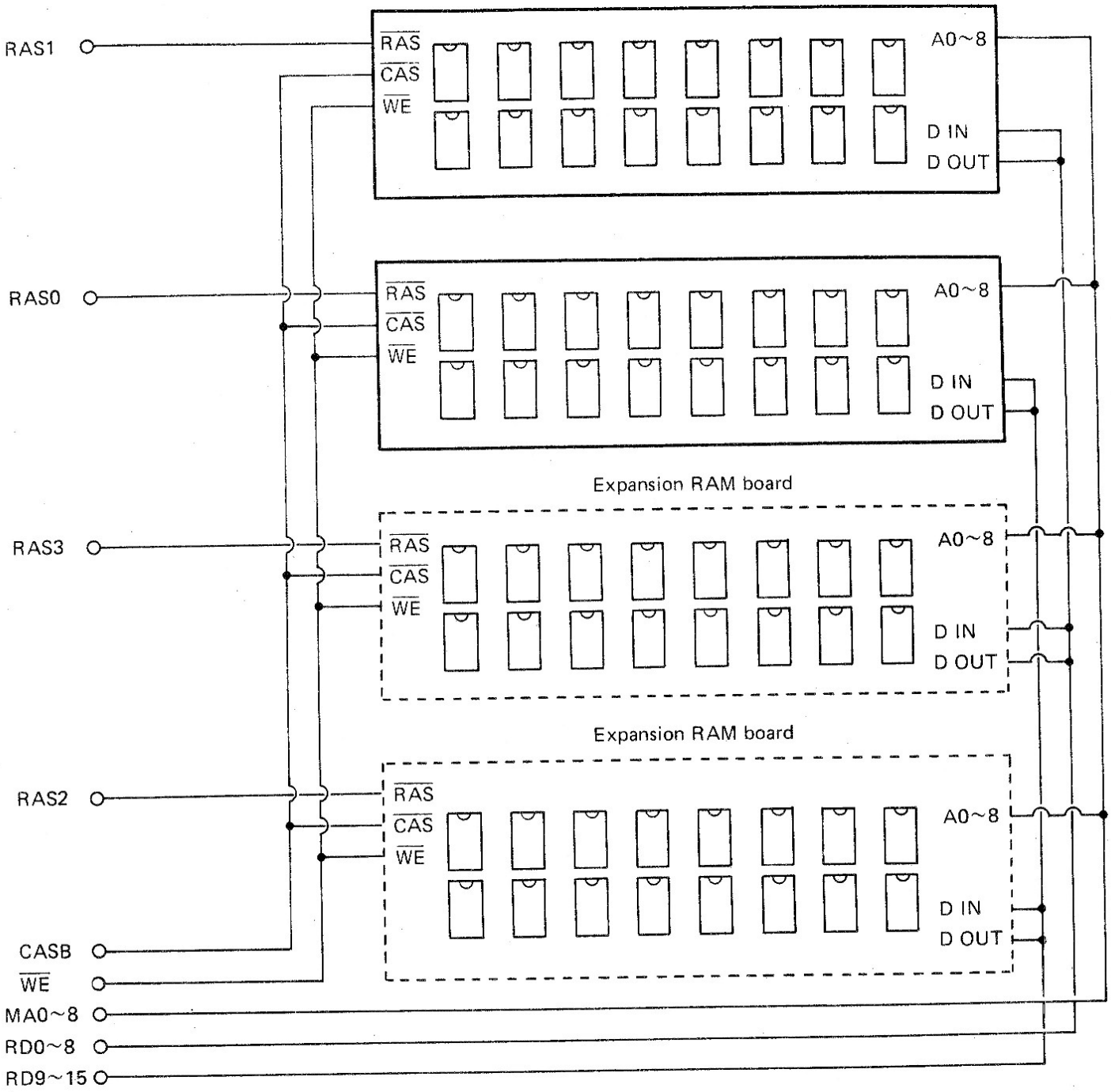


FUNCTION TABLE

ENABLE $\overline{G}$	DIRECTION CONTROL DIR	OPERATION
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H= high level, L= Low level, X= irrelevant

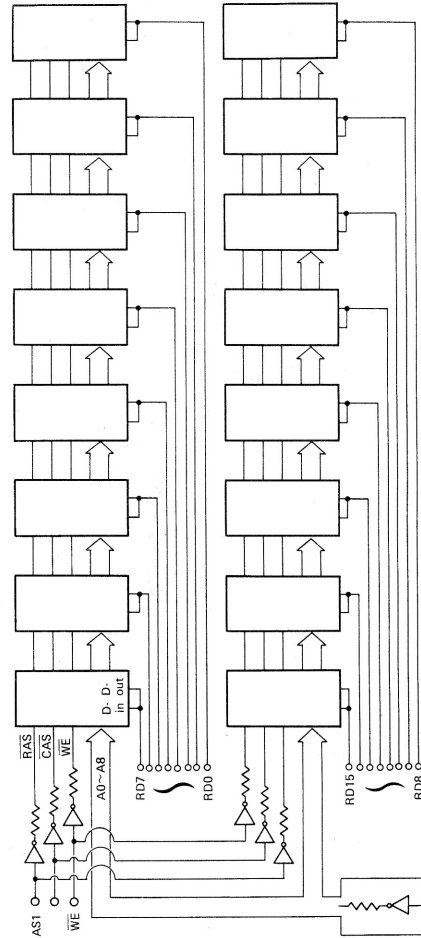
The FZ-1 is equipped with 32 pieces of 256K-bit dynamic RAMs (total capacity of 1 megabyte) for storing sound data and the capacity is doubled when optional RAM board is equipped.



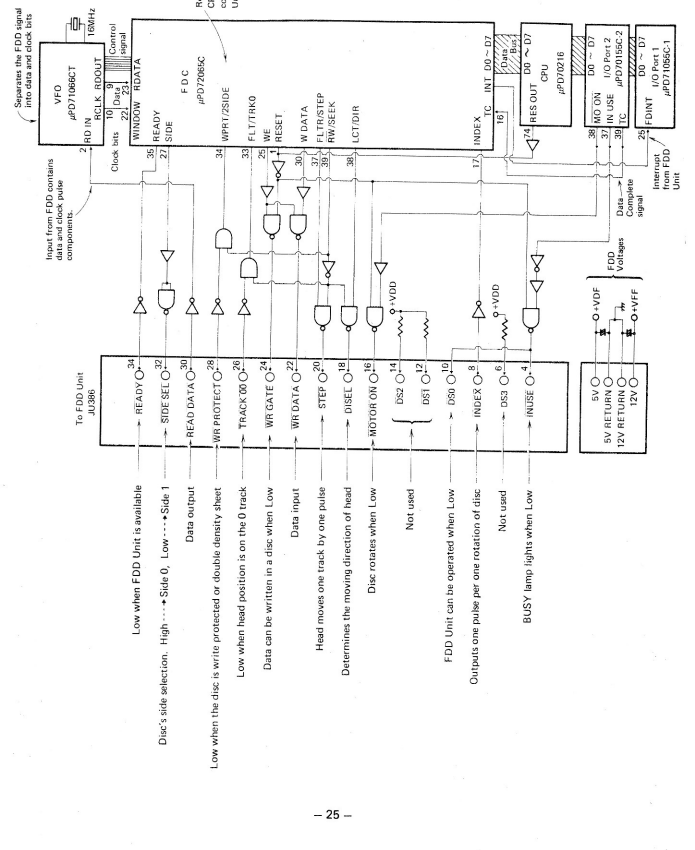
On the above block diagram, one block (circuit in ☐) consists of 16 RAMs and outputs of the RAMs become 16-bit data bus (refer to the next page).

Signals RAS0 ~ RAS3 assign row addresses in each block whereas column address strobe signal CAS B is common to all the RAMs.

Circuit Diagram in 1 Block



12. FDD (Floppy Disc Drive) INTERFACE



13. FDC (Floppy Disc Controller) μPD72065C

Receiving data from CPU, the FDC sends commands such as read data, write data, seek, etc. to the FDD Unit.

Pin Functions of FDC

Pin No.	Terminal	In/Out	Function
1	RESET	In	Power ON reset signal (High active)
2	$\overline{RD}$	In	Receives Low level signal when CPU reads data from FDC
3	$\overline{WR}$	In	Receives Low level signal when CPU writes data in FDC
4	$\overline{CS}$	In	While Low, data transfer between FDC and CPU is possible
5	A0	In	FDC contains two registers. Status register stores commands whereas data register keeps data. When this terminal is Low, the status register is assigned while High level selects data register.
6 ~ 13	DB0 ~ DB7	In/Out	Data bus
14, 15	$\overline{DRQ}$, $\overline{DACK}$		Not used
16	TC	In	Data transfer complete signal
17	INDEX	In	Receives a signal from FDD Unit when read/write head is at the starting position
18	INT	Out	Interrupt signal to CPU
19	ϕ	In	4MHz clock pulse from VFO
20	GND	–	Ground (0V) source
21	WCLK	In	Timing clock signal for reading or writing data in a disc
22	WINDOW	In	Disc's clock bit which is separated in VFO
23	R DATA	In	Disc's data which is separated from clock bit in VFO
24	SYNC	Out	FDC outputs High level when it is reading data from FDD Unit
25	WE	Out	Write command to FDD Unit
26	MFM	Out	Mode selection signal to VFO. Outputs High level at MFM mode (data writing mode for double density disc) and Low at FM mode (data writing mode for single density disc)
27	SIDE	Out	As FDD Unit has two driving heads (Head 0 for top side of disc and Head 1 for bottom side of disc), this terminal selects either head. When Low, Head 0 is selected and Head 1 is assigned when this terminal is High.
28, 29	US1, US0	–	Not used
30	W DATA	Out	Data output for FDD Unit
31, 32	PS1, PS0	–	Not used

Pin No.	Terminal	In/Out	Function
33	FLT/TRK 0	In	Fault/Track 0 discrimination signal. In accordance with voltage level of $\overline{RW}$/SEEK terminal (pin 39), this terminal discriminates FDD error or driving head's Track 0 position. If this terminal receives a signal from FDD Unit when terminal $\overline{RW}$/SEEK is Low, FDC discriminates that the FDD Unit is mulfanctioning. When there is an input at this terminal while $\overline{RW}$/SEEK is High, FDC acknowledges that the driving head in FDD Unit is at track 0 position.
34	WPRT/2 SIDE	In	Write Protect/2-sided disc discrimination terminal. If this terminal receives a signal from FDD Unit while terminal $\overline{RW}$/SEEK is Low, FDC discriminates that loaded disc is write protected. If there is an input at this terminal while $\overline{RW}$/SEEK is High, FDC acknowledges that loaded disc is 2-sided sheet.
35	READY	In	FDC acknowledges that FDD Unit is available when the terminal receives an input
36	HOLD	–	Not used
37	FLTR/STEP	Out	FDC outputs FDD error release signal when $\overline{RW}$/SEEK terminal is Low. The output from this terminal becomes seek pulse (a signal which moves the driving head) while $\overline{RW}$/SEEK is High.
38	LCT/DIR	Out	White $\overline{RW}$/SEEK is Low, the output from this terminal acknowledges FDD Unit that the driving head is designated over track 43. When $\overline{RW}$/SEEK is High, the voltage level of this terminal determines the moving direction of the driving head. High —— To outward Low —— To inward
39	$\overline{WR}$/SEEK	Out	Discrimination terminal of Read/Write or Seek. High —— Read or Write Low —— Seek (moving the driving head)
40	VDD	–	VDD (+5V) source

14. VFO (Voltage-controlled Frequency Oscillator) μPD71066CT

In order to synchronize the data read timing, data is written in a floppy disc together with timing clock bits.

When the written data is read from the disc, the clock bits and data enter to VFO. The VFO separates the clock bits from the data.

Pin No.	Terminal	In/Out	Function
1	AOSR	–	Connected to external resistor for the built-in Analog One Shot circuit
2	RD IN	In	Data input from FDD Unit
3	MIN/CTD	In	Disc size selection terminal Low level ——— 3.5 or 5 inch disc High level ——— 8 inch disc Connected to GND (Low) as FZ-1 uses 3.5" disc.
4	R GATE	In	Together with terminal FDC SW2 (pin 28), this terminal discriminates that data reading is allowed or prohibited. FDC SW2 / R GATE / Data Reading High / High / Possible High / Low / Prohibited Low / High / Prohibited Low / Low / Possible
5	MFM/FM	In	Together with terminal FDC SW2, input voltage of this terminal selects the disc's density.
6	SYNC SW	–	Not used
7	SYNC	In	Built-in PLL's gain change signal
8	GND	–	Ground (0V) source
9	RD OUT	Out	Data output which is synchronized with read clock signal R CLK
10	R CLK	Out	Read clock signal which is separated from floppy disc data
11	FDC CLK	Out	Primary clock pulse for FDC
12	W CLK	Out	Writing clock pulse for FDC
13, 14	X1, X2	In	16MHz clock pulse inputs
15	A GND	–	GND (0V) for built-in linear circuits
16~18		–	Not used
19	TCC	–	Built-in timer's time constant is determined by capacitor and resistor connected to this terminal
20	$\overline{\text{RESET}}$	In	Power ON reset signal input (Low active)
21	CVC	–	Connected to a external capacitor for the built-in VCO (Voltage Controlled Oscillator)
22	FDD SW	–	Not used
23	VCO IN	–	Input from external low-pass filter for the built-in VCO
24, 28	FDC SW1, FDC SW2	–	FDC type selection terminal. Both terminals are opened (internally High level as this LSI contains pull-up resistor) to select μPD72065C as FDC.
25	VDD	–	VDD (+5V) source
26, 27	LPF2, LPF1	Out	VCO signal output to the external low-pass filter

Pin No.	Terminal	In/Out	Function
29	AOSC	–	Connected to external capacitor for the built-in Analog One Shot circuit
30	AVDD	–	+5V source for the built-in linear circuits

15. FDD (Floppy Disc Drive) UNIT JU-386/384

JU-386/384 is a 3.5 inch double density micro floppy disc drive unit featuring 1.6 Megabyte maximum capacity.

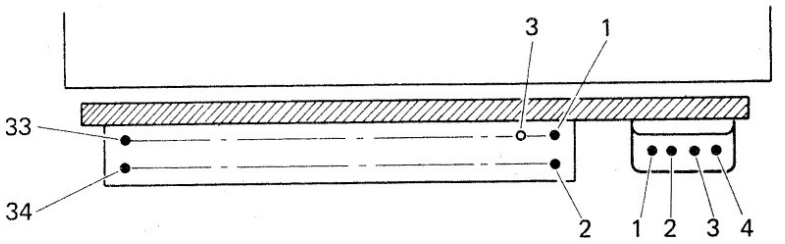
Signal functions of FDD Unit's connector

Terminal Pin No.	Signal	In/Out	Function
4	$\overline{\text{IN USE}}$	In	Low level of this terminal lights the "BUSY" lamp of the FDD Unit
6	$\overline{\text{DB3}}$	In	Not used
8	$\overline{\text{INDEX}}$	Out	Outputs a Low level signal per one rotation of a floppy disc
10	$\overline{\text{DS0}}$	In	Drive 0 selection signal. Connected to $\overline{\text{IN USE}}$ terminal.
12, 14	$\overline{\text{DS1}}$, $\overline{\text{DS2}}$	In	Drive 1 and 2 selection terminals. As JU-386 drives only one disc, these terminals are not used.
16	$\overline{\text{MOTOR ON}}$	In	Motor rotates if this terminal becomes Low while a floppy disc is loaded
18	$\overline{\text{DI SEL}}$	In	Driving head's moving direction select signal input. High ---- To outward Low ---- To inward
20	$\overline{\text{STEP}}$	In	Driving head seeks one track in the direction selected by $\overline{\text{DI SEL}}$ terminal. Head moves at the rising edge of this signal.
22	$\overline{\text{WR DATA}}$	In	Write data timing signal input. Writes data at the falling edge of this terminal.
24	$\overline{\text{WR GATE}}$	In	Data can be written in a floppy disc while this terminal is Low.
26	$\overline{\text{TRACK 00}}$	In	Falls to Low when track 00 is detected
28	$\overline{\text{WR PROTECT}}$	Out	Falls to Low when the loaded disc is write protected or double density sheet
30	$\overline{\text{READ DATA}}$	Out	Outputs data written on the floppy disc
32	$\overline{\text{SIDE SEL}}$	In	Driving head's side selection terminal. High ---- Side 0 (Top) Low ---- Side 1 (Bottom)
34	$\overline{\text{READY}}$	Out	Falls to Low if the following conditions are satisfied. (1) All the voltages are supplied (2) Floppy disc's rotation is over 84 percent of the normal rotation speed (3) A floppy disc is loaded (4) $\overline{\text{DI SEL}}$ terminal is Low (5) Driving head is on track 00 at Power ON

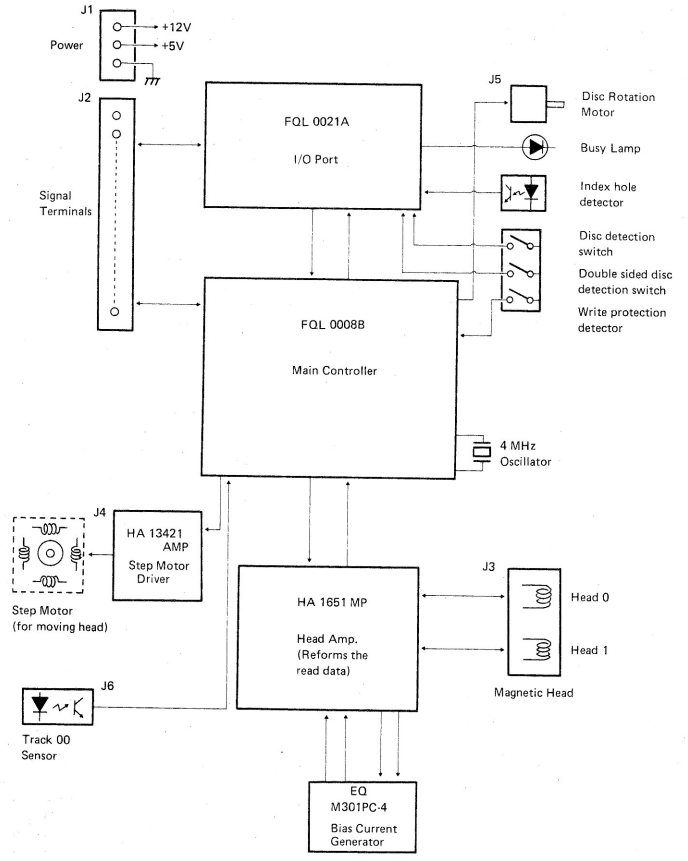
Power Supply Connector

Pin No.	Terminal	Purpose
1	+5V	+5V for FDD Unit circuits
2	5V RETURN	GND for FDD Unit circuits
3	+12V	+12V for FDD Unit motor
4	12V RETURN	GND for FDD Unit motor

Pin arrangements of the connectors

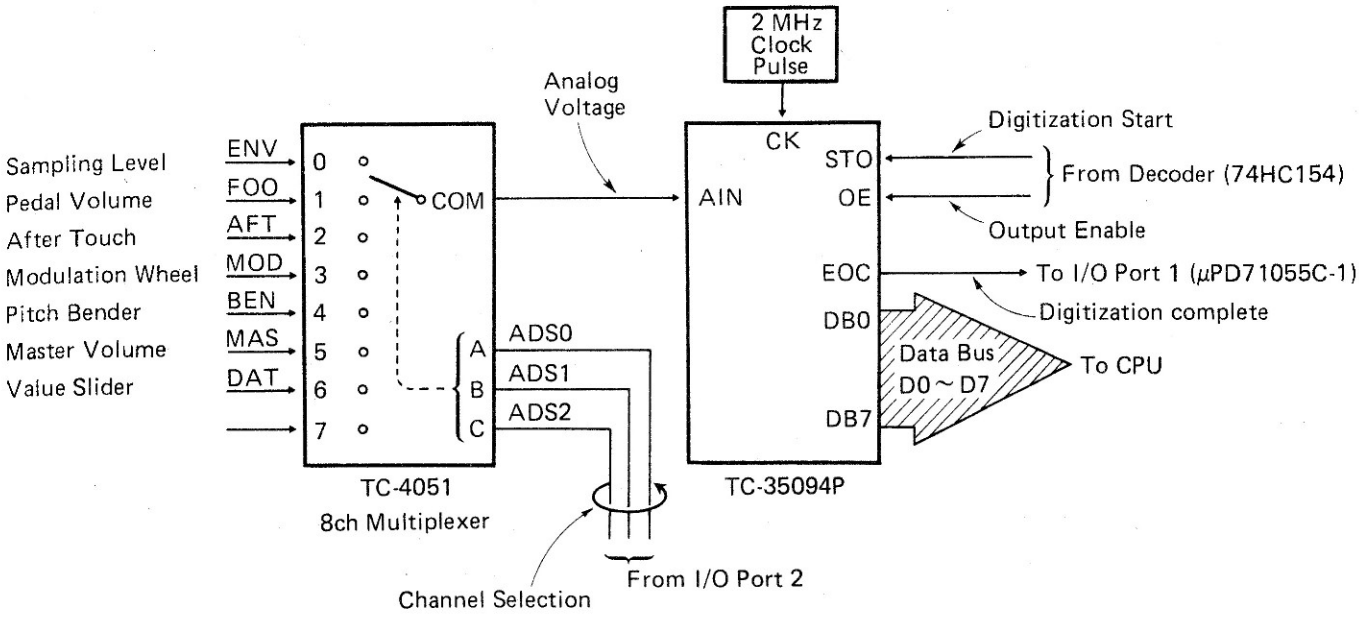


FDD Unit JU-386 Block Diagram



16. 8-BIT ADC (TC-35094)

The AC (Analog to Digital Converter) varies the voltage levels from Pitch Bender, Modulation Wheel, Pedal Volume Control etc. into digital values.



As one ADC receives inputs from several devices, an 8-channel multiplexer selects one input. Input channel is assigned by voltage combinations of terminal A, B, and C and outputs from terminal COM.

A	B	C	ON Channel	Input Signal
Low	Low	Low	0	From Sampling Level
High	Low	Low	1	From Pedal Volume Control
Low	High	Low	2	From After Touch Detector
High	High	Low	3	From Modulation Wheel
Low	Low	High	4	From Pitch Bender
High	Low	High	5	From Master Volume Control
Low	High	High	6	From VALUE Slider
High	High	High	7	Not used

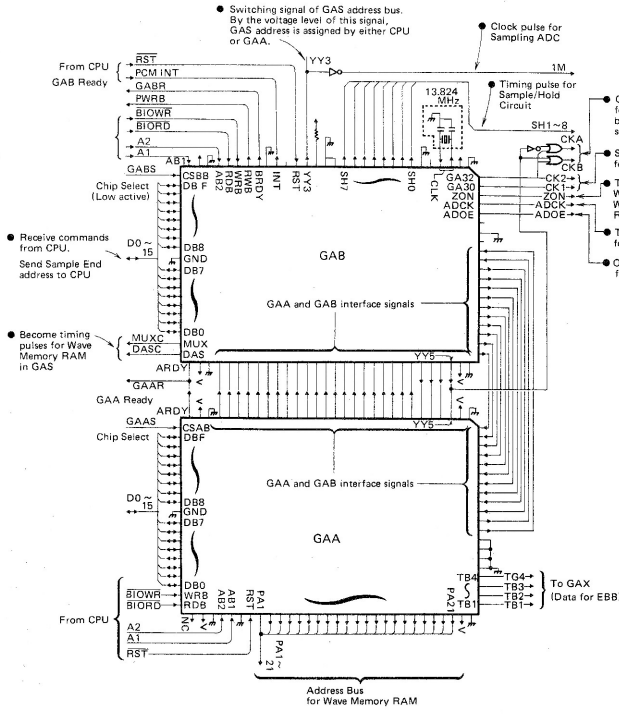
When terminal STO rises to High level, the DAC digitizes the input voltage from terminal A IN and if the digitization is completed, it provides High level signal to I/O Port 1 from terminal EOC. The digitized data are output to CPU via data bus DB0 ~ DB7 when terminal OE is High.

17. GAA & GAB

Receiving commands from CPU data bus, gate arrays GAA and GAB access the address (start address, end address, loop start address, loop end address etc. . . .) of the Memory RAM via gate array GAS for recording and playbacking of sample sounds.

By means of varing the reading speed of Memory RAM data, those gate arrays vary the pitch of the sounds.

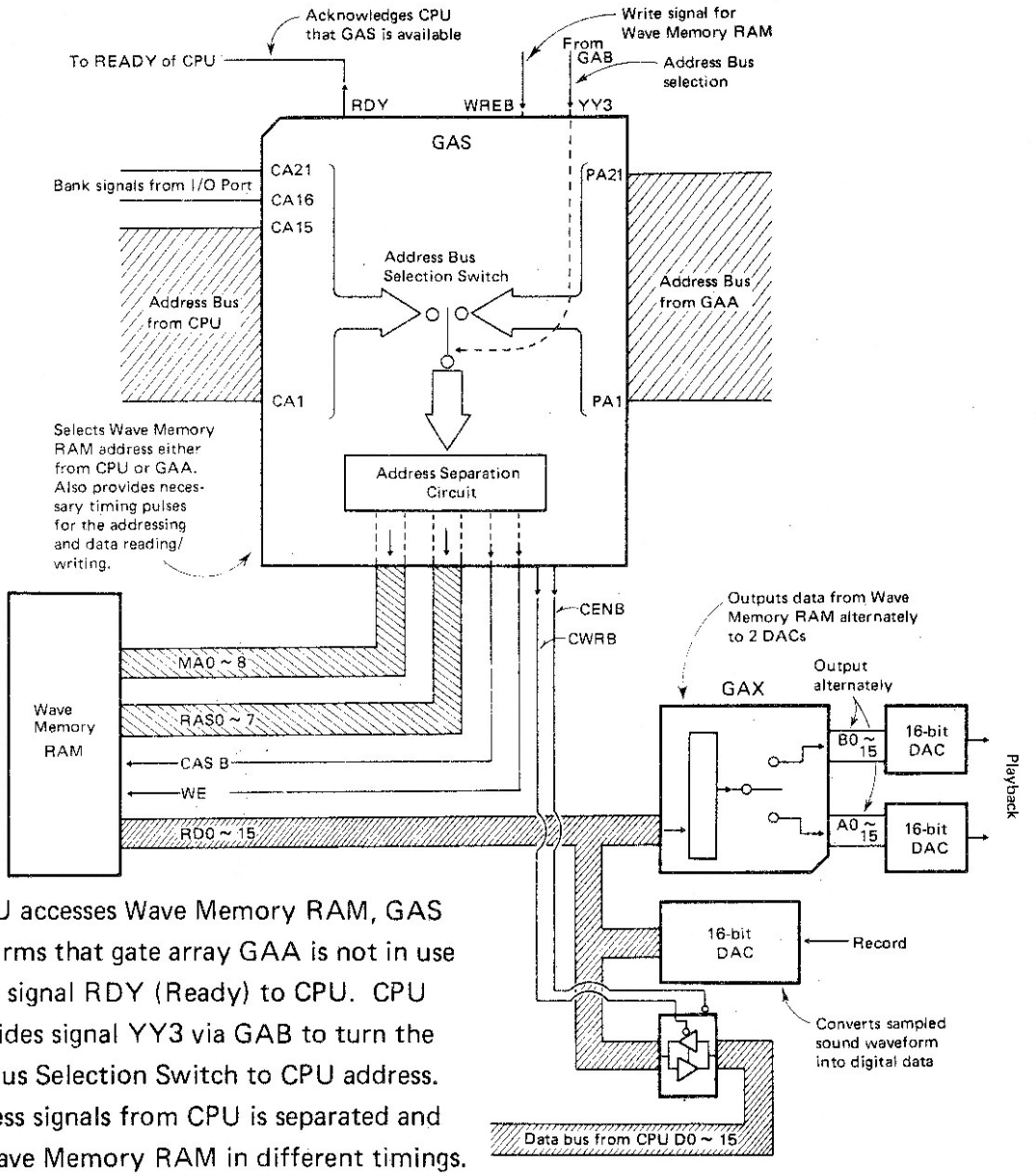
GAA and GAB also provide timing pulses for Sample/Hold Circuit.



18. GATE ARRAYS GAS & GAX

GAS selects Wave Memory RAM address either from CPU or GAA by turning Address Bus Selection Switch.

Also GAS provides necessary timing signals for the addressing.



When CPU accesses Wave Memory RAM, GAS first confirms that gate array GAA is not in use then send signal RDY (Ready) to CPU. CPU then provides signal YY3 via GAB to turn the Address Bus Selection Switch to CPU address. The address signals from CPU is separated and sent to Wave Memory RAM in different timings. Providing signals CENB and CWRW to the bidirectional buffer, GAS controls the direction of data flow.

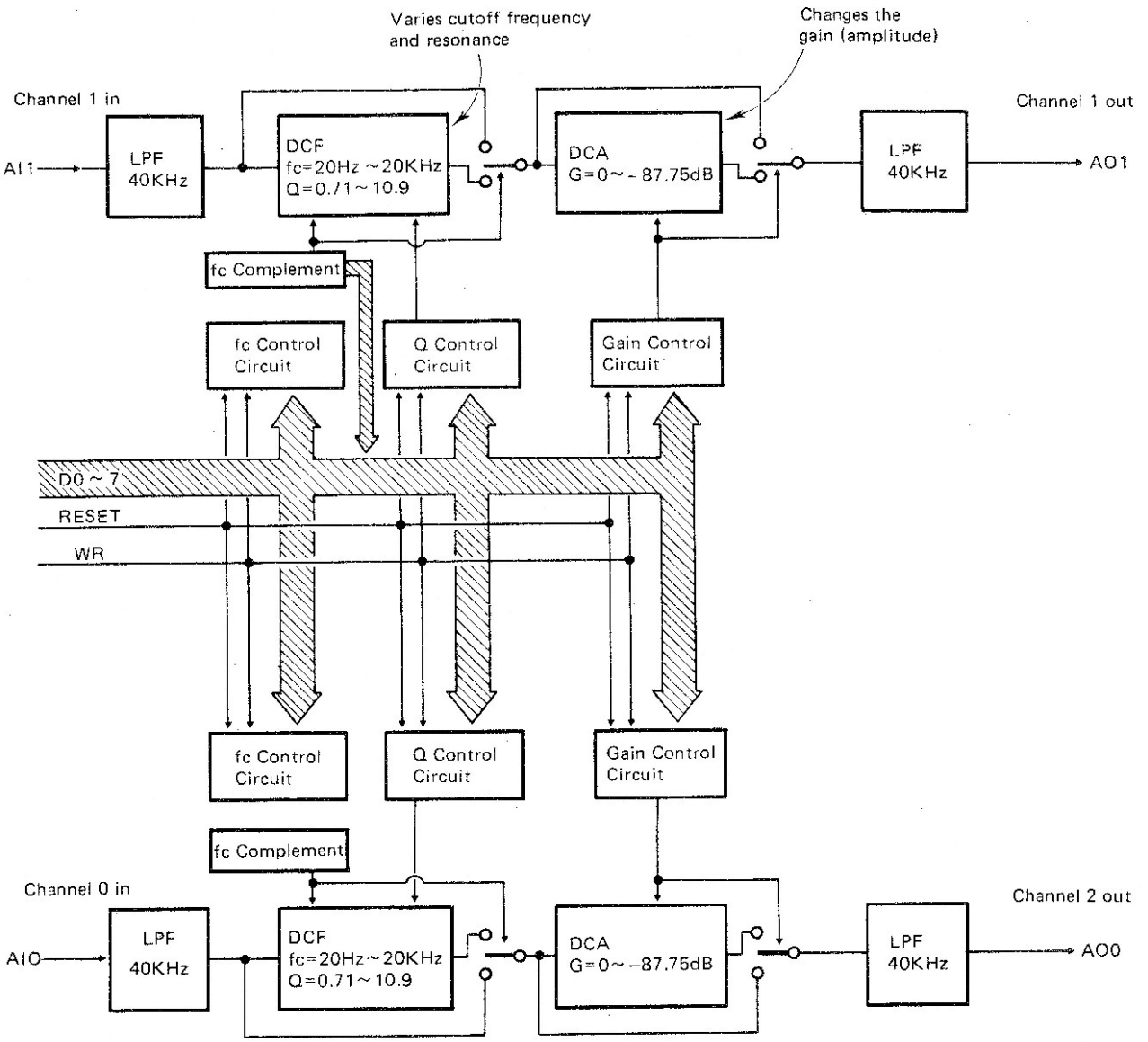
When sampling a sound, gate array GAA assigns Wave Memory RAM address.

Sampled sound is digitized in the 16-bit ADC (Analog to Digital Converter) and stored in the assigned address in Wave Memory RAM.

For playbacking the stored sound, GAA assigns Wave Memory RAM address and sends data from the Wave Memory RAM into gate array GAX.

GAX eliminates a harmonic noise contained in data signals and sends the noise free data to two 16-bit DACs (Digital to Analog Converters) alternately.

19. DCF (MB87186)

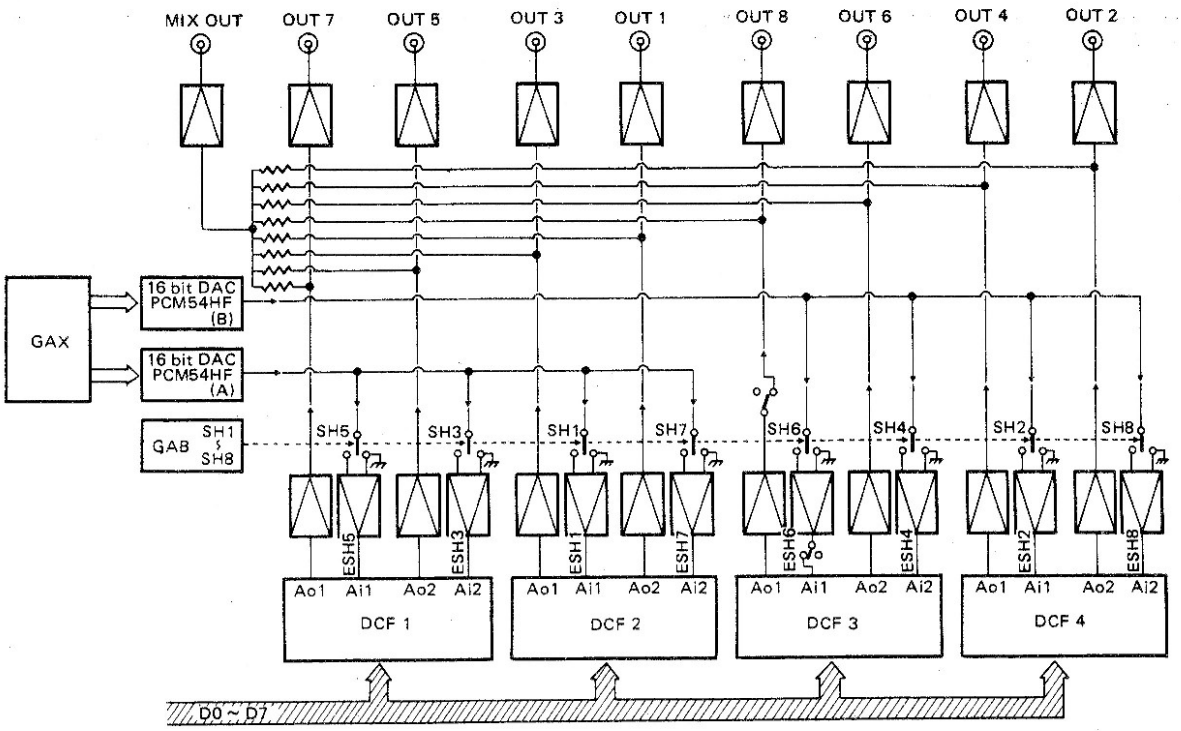


Block Diagram of MB87186

MB87186 contains two each of DCF (Digital Controlled Filter) and DCA (Digital Controlled Amplifier) which vary cutoff frequency, resonance, and amplitude of sound signals.

Pin No.	Terminal	In/Out	Function
1 ~ 8	D0 ~ D7	In	Digital data for cutoff frequency, resonance, and amplitude values
9	$\overline{WR}$	In	Data write signal (Low active)
10	$\overline{CE}$	In	Chip enable signal (Low active). Connected to the ground.
11	CHS	In	Channel selection signal. High level designates channel 1 while channel 2 is selected by being Low of this terminal.
12	F/A	In	Filter/Amp switching signal. When this terminal is High, signals of data bus become DCF control data and being Low makes them amplitude control data.
13	FC/Q	In	Cutoff frequency/Resonance selection signal. When terminal F/A (pin 12) and this terminal are High level, input data determines cutoff frequency in DCF. If this terminal is High while F/A is Low, upper 2 bits of the data bus become gain control data in DCA. While both F/A and FC/Q are Low, all the 8 bits of the data bus determines the amplitude value in DCA.
14	DG	–	Digital ground
15~7	–	–	Not used
18	OSC 1	In	3.58MHz clock pulse. Data are written in at the rising edge (_┌¯) of this clock pulse.
19	$\overline{RESET}$	In	Being Low of this terminal sets values of VCF and VCA as follows. Cutoff Frequency : 20 Hz Resonance : 0.71 Gain : – ∞ dB
20	VSS	–	-5V source
21	AI2	In	Source sound signal input for channel 2
22	$\overline{PD}$	In	Power down control terminal (not used in FZ-1)
23	AO2	Out	Filtered and amplified sound output of channel 2
24	AG	–	Ground source for the internal linear circuit
25	AO1	Out	Filtered and amplified sound output of channel 1
26	$\overline{TC}$	In	Not used (Connected to +5V)
27	AI1	In	Source sound signal input for channel 1
28	VDD	–	+5V source

20. PLAYBACK CIRCUIT



Receiving data from CPU, FDCs set cutoff frequency, resonance, and amplitude values. Sampled sound data stored in Wave Memory RAM enter 16-bit DACs PCM54HF (A) and (B) alternately via gate array GAX.

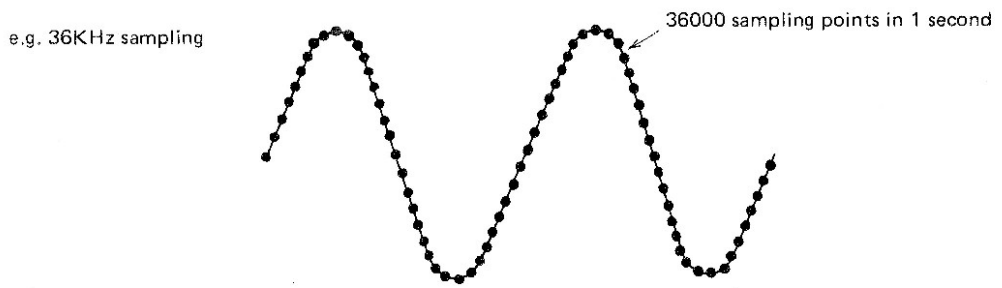
Since single output of a 16-bit DAC is 4-channel multiplex signal (four kinds of sounds are combined by time sharing), signals SH1 ~ SH8 from gate array GAB separate the multichannel signal into single sound signals.

Each sound is filtered and gain-controlled in a DCF and output to a parallel line out terminal via two op amps.

MIX OUT terminal outputs all the sound signals from OUT 1 to OUT 8 terminals.

SAMPLING

The FZ-1 is able to select three sampling frequencies 36KHz, 18KHz, and 9KHz and also be able to choose the recording gain of HIGH or LOW.

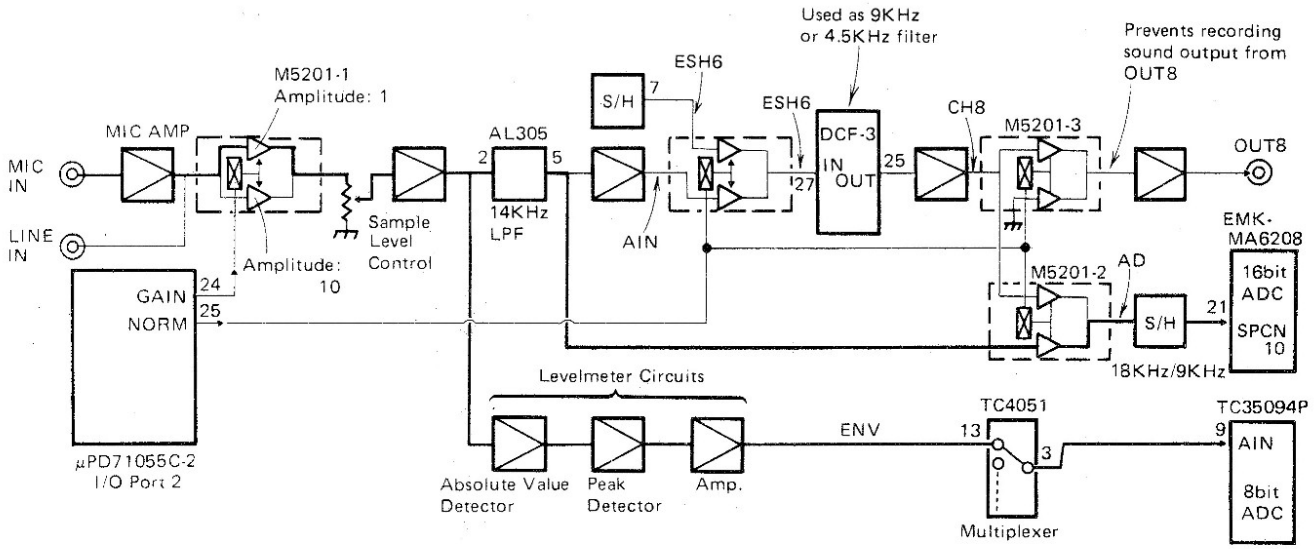


Playbacking a sound, double higher frequency of the maximum frequency of recording sound is necessary. Namely, if the maximum frequency of a recording sound is 5KHz, it is necessary to sample the sound with at least 10KHz sampling frequency.
Because a noise may be generated when the recording sound's frequency exceeds a half of the sampling frequency, FZ-1 passes the recording sound through a low-pass filter whose cutoff frequency is a half of the sampling frequency.

Sampling frequency : 36KHz —— Cutoff frequency of low-pass filter: 18 KHz
Sampling frequency : 18KHz —— Cutoff frequency of low-pass filter: 9 KHz
Sampling frequency : 9KHz —— Cutoff frequency of low-pass filter: 4.5 KHz

(1) Signal flow of 36 KHz sampling

- Gain: LOW

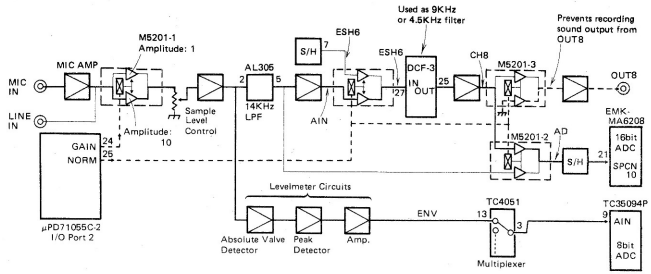


When recording a sound from MIC input, the input signal is amplified by the MIC Amp and if the input is from LINE IN, it directly enters a switching op amp M5201. M5201 contains two op amps whose amplitudes are 1 and 10.
Depends on the Sampling Level setting, the recording sound passes either one of the op amps. This switching of the op amps is made by the signal GAIN from I/O Port 2's pin 24.

After passing Sample Level Control VR and one op amp, the signal enters 14KHz low-pass filter. Although the cutoff frequency of the filter is 14KHz, it shuts the signal over 18KHz since the slope of the cutoff frequency response is gentle.

For displaying the sampling level on the LCD, the unfiltered sound signal passes Absolute Volume Detector which detects the mean value of the sound volume, Peak Detector that extracts the maximum sound level, and an amplifier. After then, the sound level signal passes Multiplexer TC4051, digitized in 8-bit ADC, and sent to the CPU as sound level data.

(2) Signal flow of 18KHz or 9KHz sampling (Sampling Gain: HIGH)



After passing 14KHz LPF and an amplifier, the recording sound signal enters a switching op amp M5201-2 in MA1M PC Board.

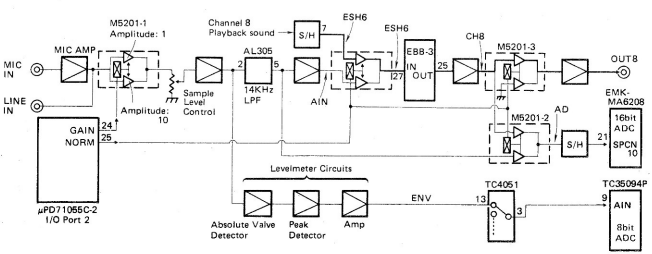
By signal NORM, the switching op amp sends the sound signal to DCF 3.

Although DCFs are normally used for filtering playback sounds, channel 1 of DCF 3 is also utilized to filter recording sounds.

Depends on the sampling frequency setting, CPU sends 9KHz or 4.5KHz cutoff data to DCF3. 9KHz or 4.5KHz filtered sound is provided to 16-bit ADC via an amplifier, M5201-2 in MA2M PCB, and S/H circuit.

Since channel 1 output of DCF 3 is connected to OUT 8 output jack, signal NORM also cuts the sound signal off in M5201-3 to prevent outputting the recording sound from OUT 8.

(3) Playback from OUT 8



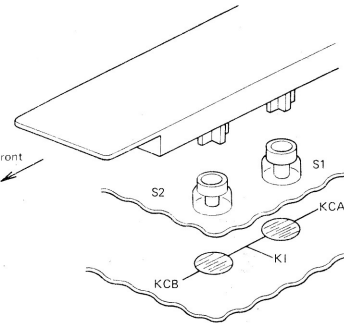
After recording of a sample sound, signal NORM turns switching op amp M5201-3 on so that OUT 8 is able to output playback sounds.

21. KEYBOARD

FZ-1 varies the sound volume in accordance with the key touch speed and depression strength.

21-1. Key Velocity Detection

Each key has two key contact switches S1 and S2.



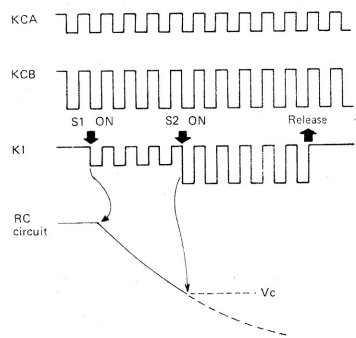
When a key is hit, S1 turns on first, then S2.

The interval time between turning on of S1 and S2 varies according to the touch speed of the key.

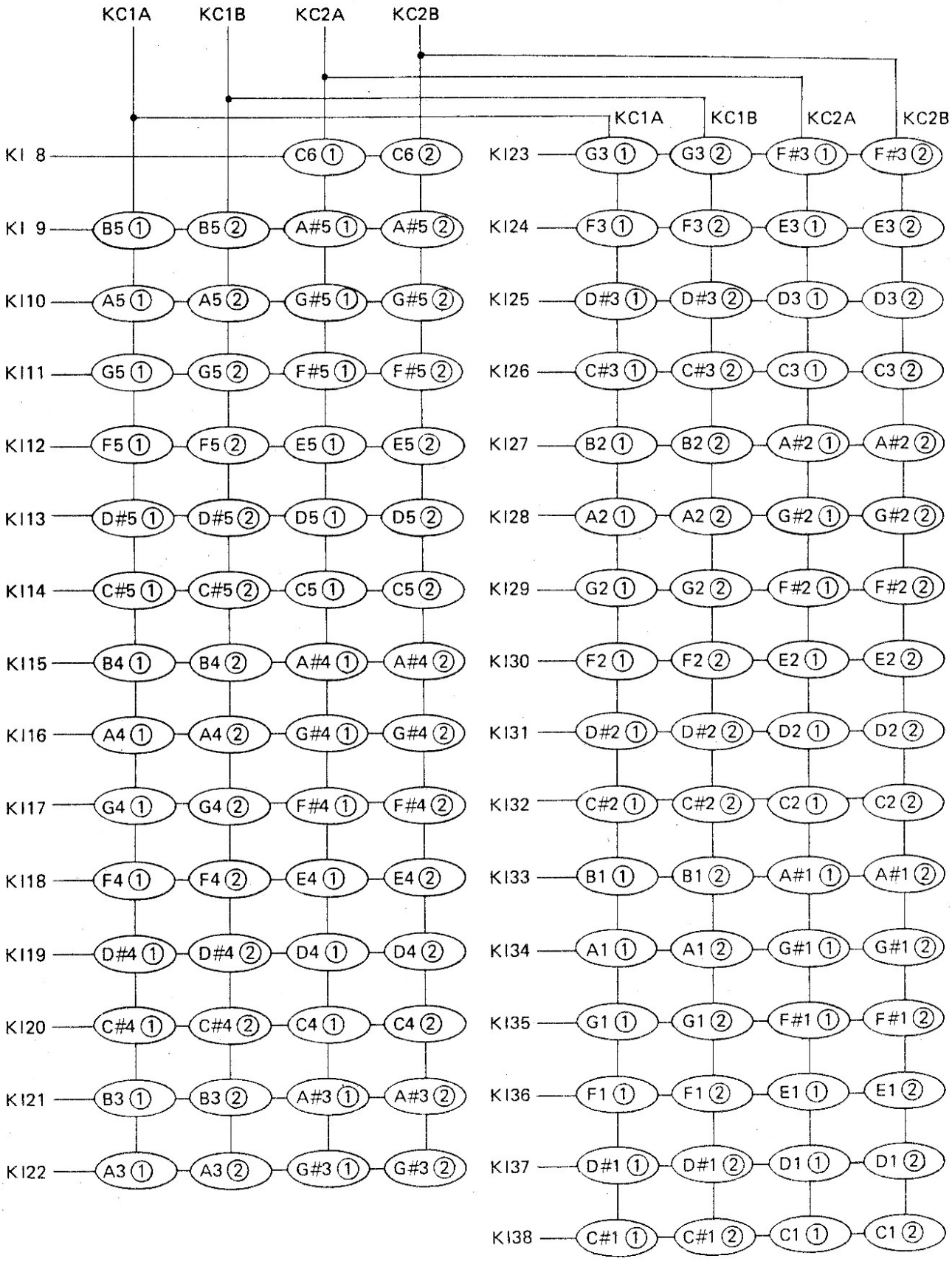
LSI MSM 6200 detects the time interval and determines the key touch speed.

Some RC (resistor and capacitor) integrating circuits are connected to the MSM6200 and when switch S1 turns on, the RC circuit starts to discharge. The discharging stops when S2 turns on.

The MSM 6200 also contains an ADC (Analog to Digital Converter) and changes the voltage Vc of the RC circuits into a 5-bit digital signal which is sent to the CPU as key entry and hitting speed data.



21-2. Key Matrix



21-3. Pin Functions of Velocity Controller (MSM6200)

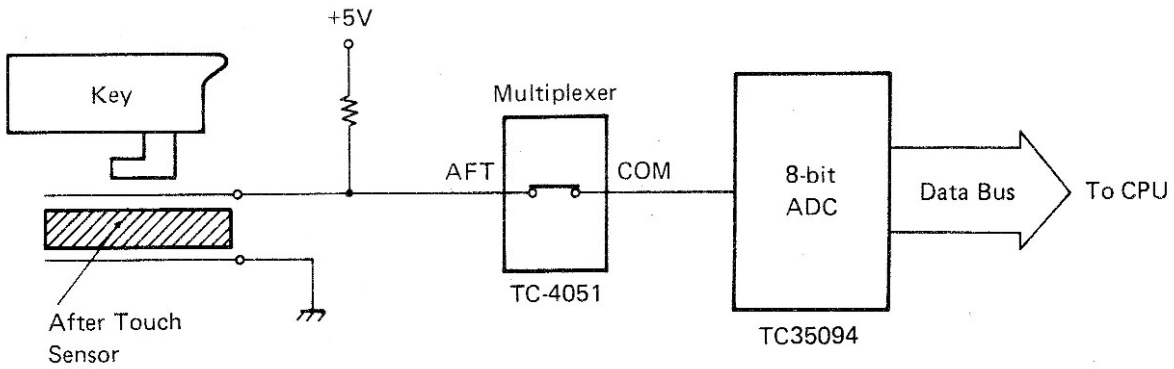
Pin No.	Terminal Name	In/Out	Function
1 ~ 6	IR6 ~ IC8	In/Out	External RC discharging circuit inputs and outputs.
10	REF		Reference voltage (+5V).
11	AG		Analog ground.
20	O1	Out	Interrupt request signal output. When LOW, MSM6200 interrupts the CPU.
25~28 29~32	O2 ~ O5 IO1 ~ IO4	Out In/Out	Upper 4-bit data bus. Lower 4-bit data bus. O2 O3 O4 O5 IO1 IO2 IO3 IO4 MSB LSB
34	I 2	In	ALE (Address Latch Enable) signal input. When HGIH, address in MSM6200 is assigned.
35	I 3	In	$\overline{WR}$ signal input. When LOW, data or address can be written in MSM6200.
36	I 4	In	$\overline{RD}$ signal input. When LOW, CPU reads data from MSM6200.
37	I 5	In	$\overline{CS}$ (chip select) signal input. When LOW, communications between the CPU and MSM6200 is possible.
39	I 10	In	Reset signal input. LOW: Active. At power on, receives a reset signal to initialize MSM6200's internal circuits.
40	VDD		+5 volt source.
43	PGI	In	Clock pulse (2.47 MHz) input.
45	VSS2		Ground (0 volt) source.
46	VSS1		+2.25 volt source.
47~50	KC2B~KC1A	Out	Key common signal outputs.
58~88	K8 ~ K38	In	Key input terminals.
91~100	IR1 ~ IC5	In/Out	External CR circuits inputs and outputs.

21-4. Pin Functions of Key Interface LSI (μPD8049HC)

Pin No.	Terminal Name	In/Out	Function
1	T0	In	Clock pulse input for data read/write.
2	XTAL1	In	8.96 MH clock pulse input.
4	$\overline{RESET}$	In	At power ON, the terminal stays LOW level for a while in order to initialize internal circuits.
6	$\overline{INT}$	In	Interrupt signal input from MSM6200.
8	$\overline{RD}$	Out	Read signal output. Key interface LSI reads data from MSM6200 when terminal is LOW.
10	$\overline{WR}$	Out	Write signal output. Key interface LSI writes data or address in MSM6200 when terminal is LOW.
11	ALE	Out	ALE (Address Latch Enable) signal output. Address in MSM6200 is assigned when HIGH level.

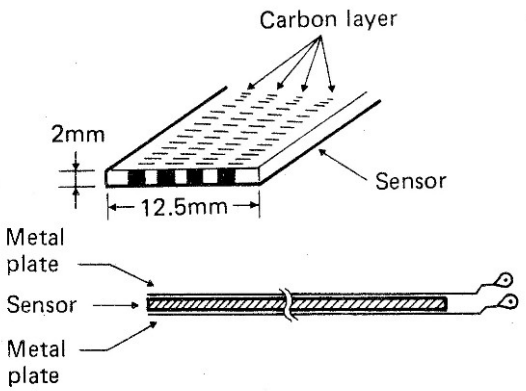
Pin No.	Terminal Name	In/Out	Function
12~19	DB0 ~ DB7	In/Out	Data bus (D0 ~ D7) between MSM6200.
20	Vss		Ground (0V) source.
26	VDD		+5V source.
27~34	P10 ~ P17	Out	Data bus (D0 ~ D7) between CPU.
36	P25 (CNT49)	In	Control signal input from CPU.
37	P26 (INT49)	Out	Interrupt signal output to CPU.
38	P27 (WR49)	Out	Timing pulse output for data read/write.
39	T1 ($\overline{TST}$)	In	Test signal input. Key Interface LSI does selfcheck of internal RAM/ROM at LOW.
40	VCC		+5V source.

21-5. After Touch Detection Circuit



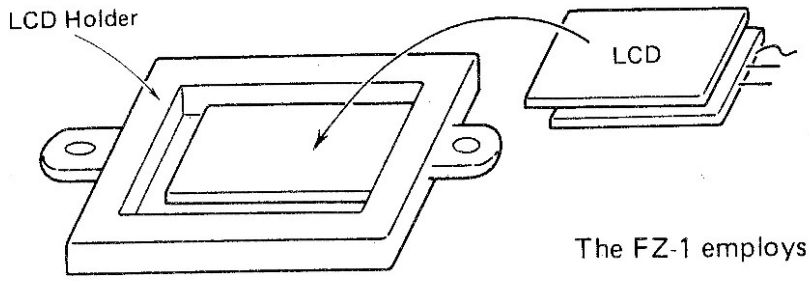
In accordance with the key pressure, the voltage level of signal AFT is varied.
When CPU detects the after touch strength, it passes signal AFT through Multiplexer.
Voltage value from the after touch sensor is digitized in 8-bit ADC and sent to CPU.

Note: Construction of after touch sensor



After touch sensor is a sheet of silicon rubber in which carbon particles are inlaid.
While no force is applied, the resistance between the both sides is infinity. However, when it is pressed hard, the density of the carbon becomes high causing its resistance to be as small as 10 ~ 30 ohms.
The silicon rubber is put between two thin metal plates.

22. LCD UNIT

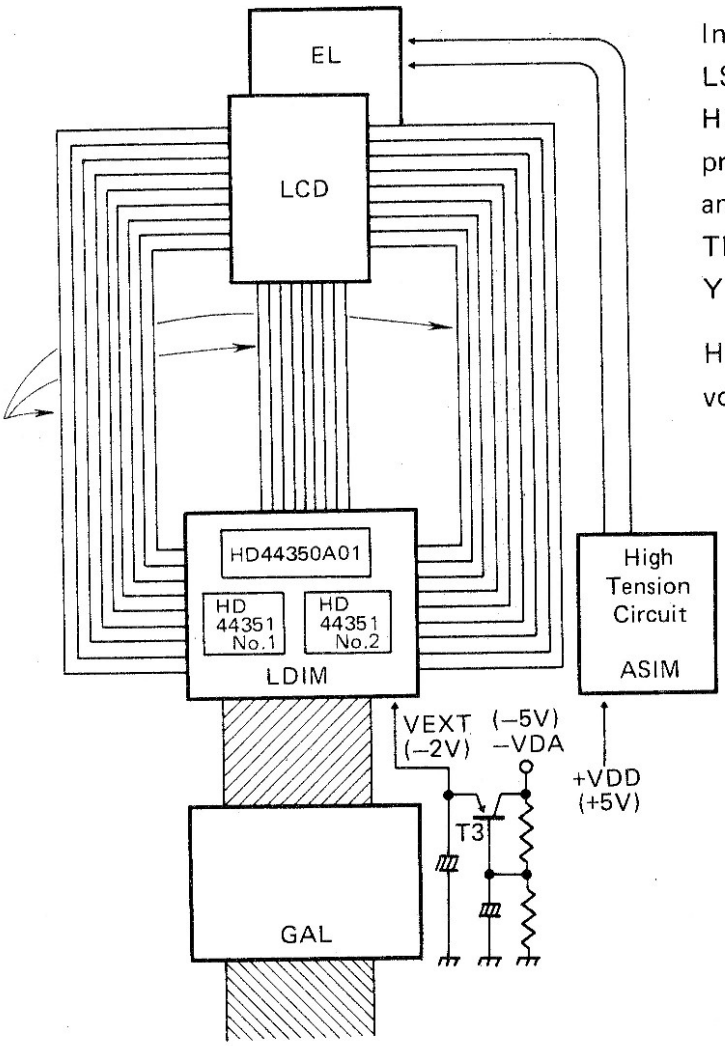


The FZ-1 employs 64 x 96 dots graphic LCD.

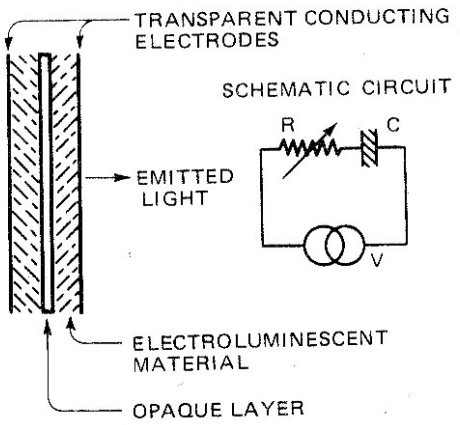
Gate array GAL converts the CPU data language into LCD Drivers' data word.

In the LCD Drive PCB, there are three control LSIs HD44350A01 and two HD44351s. HD44350A01 contains character generator and provides common signals X1 ~ X32, Z1 ~ Z16, and W1 ~ W16 for the LCD.
The two HD44351s generate LCD dot signals Y1 ~ Y80.

High Tension Circuit generates +90 to +100V voltage which is necessary for lighting EL.



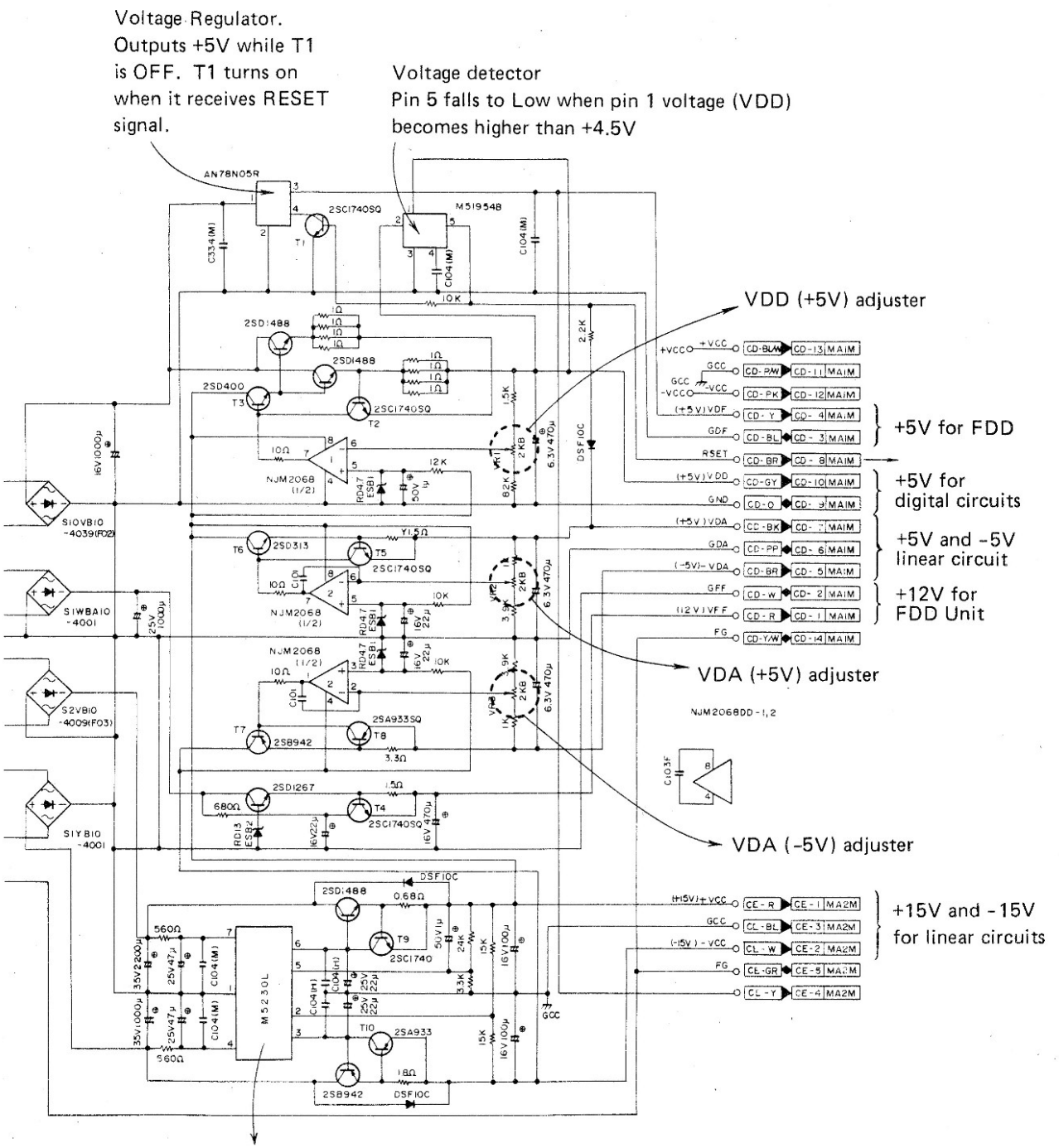
EL (Electroluminescent panel)



Electroluminescence principle. Incident radiation arriving from left passes through transparent electrodes to act on photoconductor (shaded area).

23. POWER SUPPLY CIRCUIT

This block generates voltages VDD (+5V for digital circuits), -VDD (-5V for digital circuits), VDA (+5V for linear circuits), -VDA (-5V for linear circuits), +VCC (+15V for linear circuits), -VCC (-15V for linear circuits), VDF (+5V for FDD Unit), VFF (+12V for FDD Unit), and Power ON RESET signal.



SELF DIAGNOSTIC PROGRAM

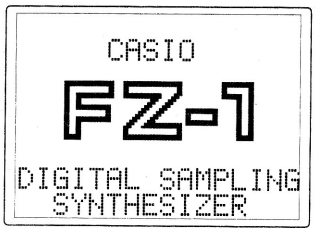
OUTLINE OF DIAGNOSTIC PROGRAM

FZ-1's each device can be checked by the built-in program or diagnostic floppy disc.

Devices to be Checked	Checking Method	Program Area
SYSTEM ROM	64K byte check sum	Automatically checked at Power ON
SYSTEM RAM		Automatically checked at Power ON
FDC	Physical read/write of certain track or sector of a floppy disc	Built-in Program
LCD	All the dots and the characters are displayed	Built-in Program
WAVE MEMORY RAM	Indicates a faulty RAM number	Diagnostic Floppy Disc
Switches LEDs Pedal Switch	By pressing the switches in order, functions of the switches and LEDs are checked.	Diagnostic Floppy Disc
Keys	Hit key's number, velocity, after touch values are indicated.	Diagnostic Floppy Disc
Pitch Bender Modulator Volume Pedal Main Volume	Indicates each device's set value	Diagnostic Floppy Disc

* Head cleaning and alignments (Cat's eye, burst, read level etc.) can be performed at FDC checking

SYSTEM ROM/RAM CHECK



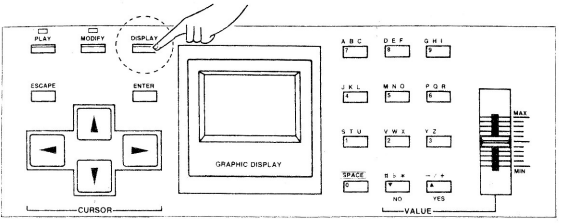
When System ROM and RAM function properly, the LCD indicates the figure shown on the left a few seconds after Power ON.

If System ROM or RAM is faulty, the LCD indicates so.

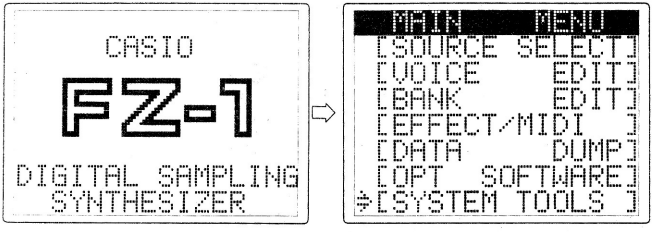
I BUILT-IN PROGRAM

1. BUILT-IN PROGRAM STARTING

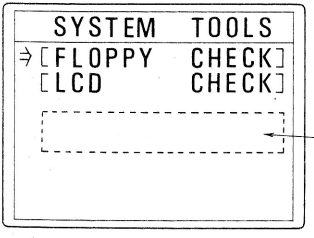
(1) Turn the power switch ON while pressing [DISPLAY] button.



(2) On the MAIN MENU, [SYSTEM TOOLS] is added.



(3) Moving down the cursor (⇒) by [▼] button, Select [SYSTEM TOOLS] then hit [ENTER] button.



(4) Now, either FDD Unit or LCD can be checked.

System ROM's version number will be shown here.

2. FDD UNIT CHECK

(1) Select [FLOPPY CHECK] in SYSTEM TOOLS menu then press [ENTER].

(2) Insert a floppy disc. (Do not use tone data disc or user's disc as the contents will be destroyed.)

(3) Select Read check or Write check by moving the cursor.

(4) Input logical value of checking sector, head, and track by ten key ([0] ~ [9]), [▲][▼] buttons, or VALUE slider.

☆ Conversion calculation of logical sector and actual sector, head, and track.

$$\begin{cases} \text{Sector} = (\text{Logical Sector}) \,\%8 + 1 & (1 \sim 8) \\ \text{Head} = (\text{Logical Sector}) \,\%16 \div 8 & (0 \sim 1) \\ \text{Track} = (\text{Logical Sector}) \div 16 & (0 \sim 79) \end{cases}$$

%8 means the reminder of Logical Sector/8.
(%8 of Logical Sector 100 is 4 as 100/8 is 12 (and) reminder 4.)

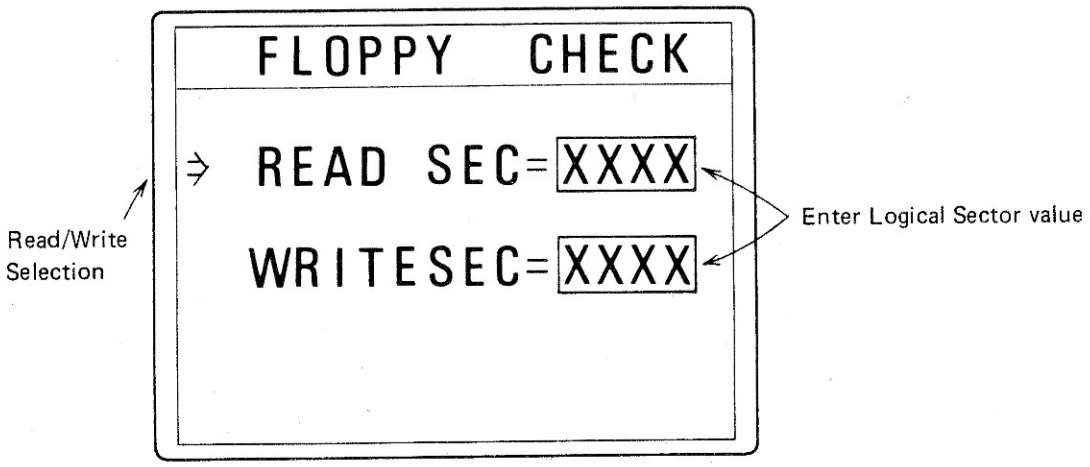
[Example] The last track and the last secor of the bottom side of adisc.

Sector : $\frac{1279}{8} = 159 + \frac{⑦}{8}$ Reminder ⟶ 7 + 1 = Sector 8

Head : $\frac{1279}{16} = 79 + \frac{⑮}{16}$ Reminder 15 ÷ 8 = 1.875 ⟶ Head 1 (bottom side)

Track : $\frac{1279}{16} = 79.9375$ ⟶ Track 79

Logical Sector : 1279



(5) After entering Logical Sector value, press ENTER button.

If the FDD Unit or FDC is mulfunction, the LCD indicates the following messages.

DATA ERROR	:	FDC is functioning but data has been changed.
FDC READ ERROR	:	FDC does not perform read operation properly.
FDC WRITE ERROR	:	FDC does not perform write operation properly.
DISC ERROR	:	FDD Unit does not output READY signal.

When FDC and FDD Unit function properly, the above messages will not be shown.

(6) Conversion Table of Logical Sector Value and Actual Sector, Track, Head

		Side 0 (Top)								Side 1 (Bottom)							
		0	Sector						8	0	Sector						8
0	Logical Sector	0000	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015
	Sector	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	Head	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Track	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Logical Sector	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	0039	0031
	Sector	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	Head	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Track	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Logical Sector	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047
	Sector	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	Head	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Track	Track	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Logical Sector	0048	0049	0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	0060	0061	0062	0063
	Sector	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	Head	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Track	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Logical Sector	0640	0641	0642	0643	0644	0645	0646	0647	0648	0649	0650	0651	0652	0653	0654	0655
	Sector	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	Head	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Track	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Logical Sector	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279
	Sector	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
79	Head	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Track	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79

(7) FDD Unit's head can be cleaned by the following method.

a. Insert a cleaning sheet.
b. Enter Logical Sector Value "0000" then press ENTER.
c. Enter Logical Sector Value "1271" then press ENTER.
   The head 0 moves to the most inner position.
d. Repeat the above procedure a few times.
e. Head 1 (Bottom side) is cleaned by entering Logical Sector Values "0008" and "1279" a few times.

(8) Press ESCAPE button continuously for escaping from this check mode.

3. FDD UNIT ADJUSTMENT

(1) Insert an alignment disc.

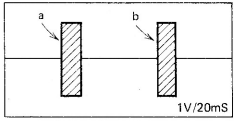
(2) Set Logical Sector Value of 0640 (for side 0) or 0648 (for side 1) in "READ SEC" of FLOPPY CHECK Menu.

(3) Perform Cat's Eye, Burst adjustments, and Azimuth confirmation.

Oscilloscope settings

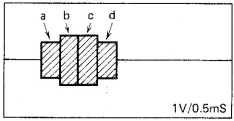
	RANGE	Trigger	Checkpoints
Channel 1	AC	+ or ⌐¬	Check pin T1
Channel 2	AC	- or ¬⌐	Check pin T2
External Channel	DC	+ or ⌐¬	Check pin IX

Cat's eye waveform
Sweep Time: 20mS
*Height of waves a and b should be same.



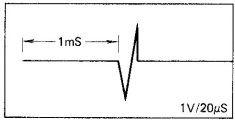
Cat's eye wave of "EPSON" alignment disc is square wave.

Azimuth waveform
Sweep Time: 0.5mS
*Confirm that height of a or d is lower than b or c.



- While reading an alignment disc, FZ-1's LCD indicates "FDC ERROR".
- After the alignments, perform the same procedures after seeking the head from track 0 to track 40, and from track 79 to track 40.

Burst waveform
Sweep Time: 20μS



(4) Zero Track Alignment

Oscilloscope settings

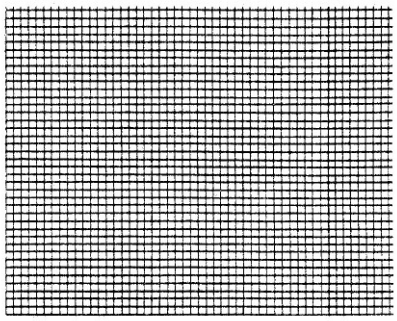
Channel	Range	Check points
Channel 1	DC	Check pin ZP
Channel 2	—	Not used
External Channel	DC	Check pin SP

Logical Sector Value	Voltage Level of Oscilloscope Screen
0000	HIGH
0016	HIGH
0032	LOW

4. LCD UNIT CHECK

(1) Select [LCD CHECK] in SYSTEM TOOLS Menu then press ENTER button.

(2) The LCD indicates all the dots.
Make sure that there is no missing dot.



(3) By pressing any one of the buttons, the LCD indicates the following characters.

■	⌟	□	×	÷	√	←	→	↑	↓	∞	ↄ	≠	≒	≤	≥
x	y	x̄	ȳ	x̂	ŷ	Δ	π	Σ	Ω	Γ	ʃ	³	−	¯	_
	!	"	#	$	%	&	'	(	)	*	+	,	−	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	¥	]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	

Confirm that all the characters are shown properly.

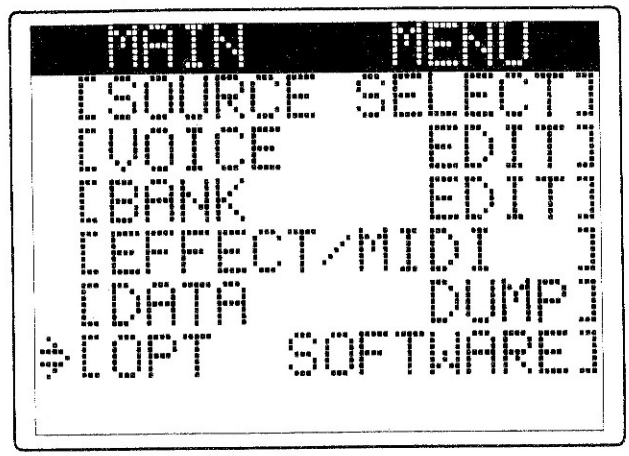
(4) The program finishes by hitting ESCAPE button.

1. STARTING OF DIAGNOSTIC PROGRAM

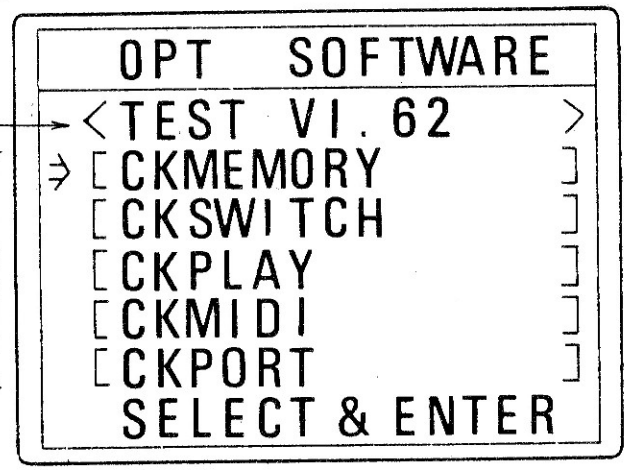
(1) Turn the power switch on.

(2) Insert the diagnostic disc.

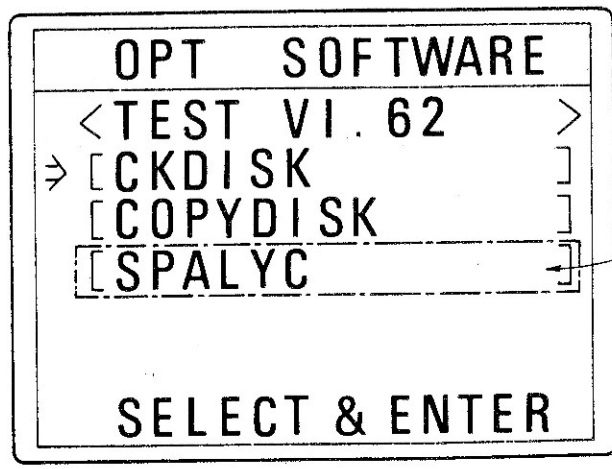
(3) In the Main Menu, select [OPT SOFTWARE] then press [ENTER].



(4) The LCD indicates OPT SOFTWARE Menu.

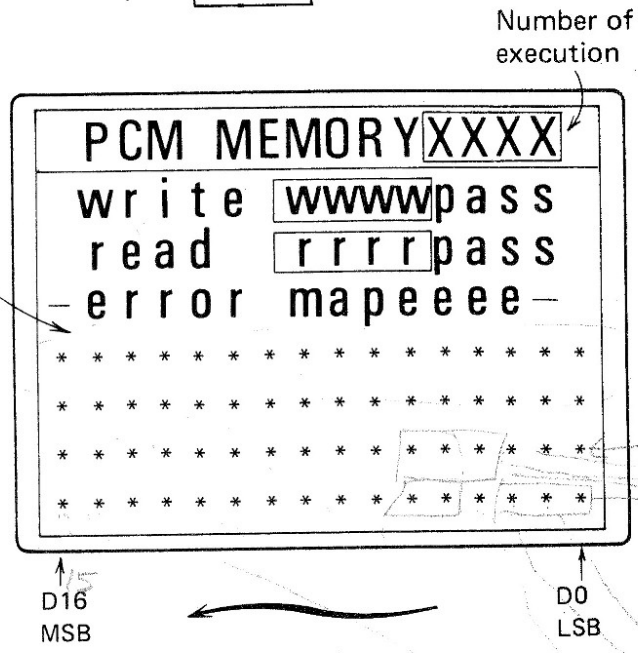


(5) Further pressing ▼ button from [CKPORT], the LCD shows the next page of OPT SOFTWARE Menu.



2. WAVE MEMORY RAM CHECK

(1) Select [CKMEMORY] in OPT SOFTWARE Menu then press ENTER button.



RAM position indicator.
Indicates faulty RAM by showing * mark.
* shows that RAM is proper.

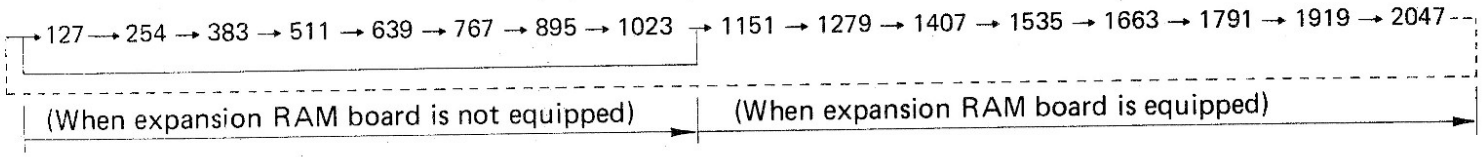
FZ-1's built-in RAM { Bank 0, Bank 1
Expansion RAM { Bank 2, Bank 3

The above figure indicates that RAM D0 of FZ-1's built-in RAM in Bank 0 is faulty.

Number in "wwww" counts up while writing data in the RAMs.

Number in "rrrr" counts up while reading data from the RAMs.

Reading and writing data is done by every 127K byte as shown below.

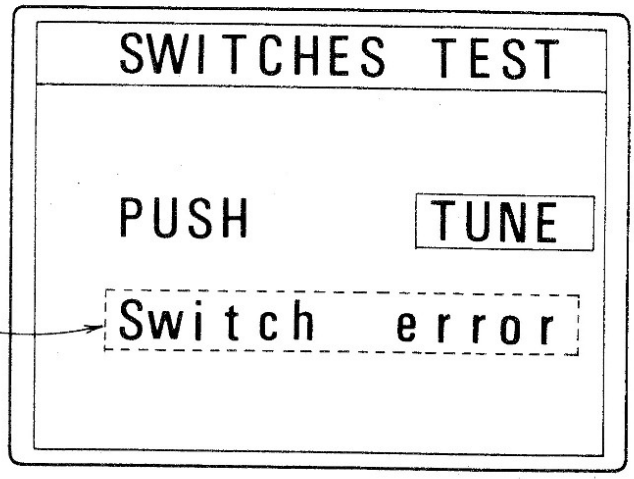


*When all the RAMs function properly, "eeee" in error map shows 0000 and all the RAM indicators are dots.
If one of the RAMs is faulty, the faulty address is shown in "eeee" and RAM position indicator displays the faulty RAM by * mark.

(2) Hitting of any button finishes the check program.

3. SWITCH CHECK

(1) Select [CKSWITCH] in OPT SOFTWARE Menu.



Indicates only when the switch is faulty

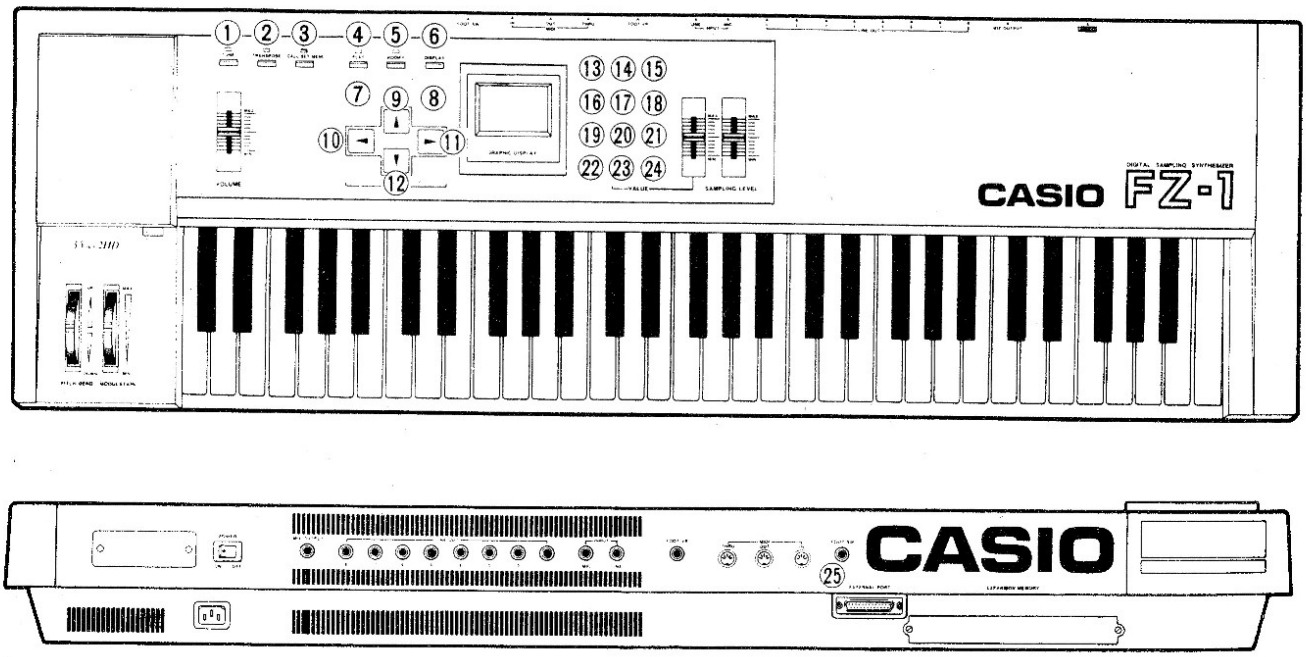
(2) Press all the buttons in order as indicated in the LCD.

(3) After checking of all the switches, connect a pedal switch and press it.

(4) If all the switches function properly, the LCD indicates "OK".

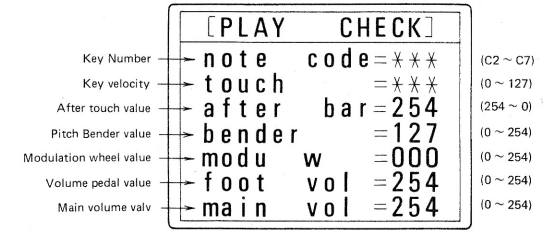
(5) The FZ-1 can be escaped from the program by pressing [ESCAPE] button after all the switch checking is completed.
The program cannot be released if the checking is not completed.

(6) Switch checking order



4. KEYS, SENSORS, AND VR CHECK

(1) Select [CK PLAY] in OPT SOFTWARE Menu then press ENTER.



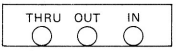
(2) Hitting each key or moving VRs, make sure that the corresponding value on the LCD varies.

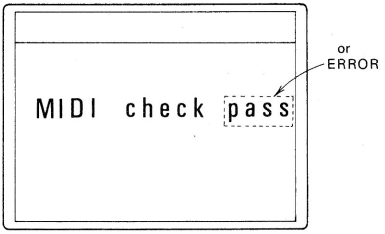
* Also make sure that bender value is about 127 when Pitch Bender is at the center position.

(3) ESCAPE button finishes the program.

5. MIDI CHECK

(1) Connect MIDI IN and OUT terminals by a MIDI cable.





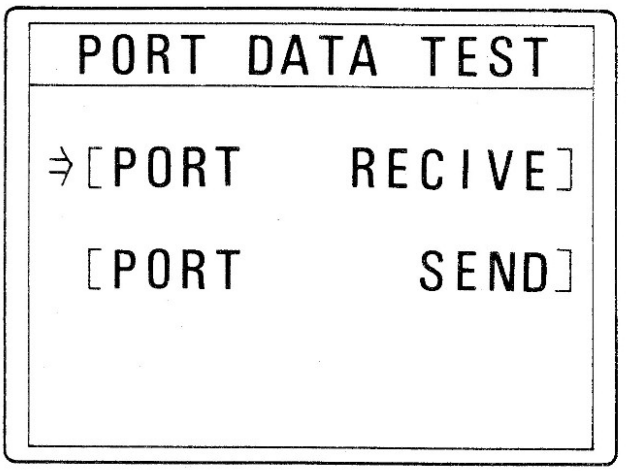
(2) Select [CK MIDI] in OPT SOFTWARE Menu then press ENTER.

(3) When the MIDI circuits are normal, the LCD indicates "MIDI check pass".
"MIDI check error" will be shown on the LCD if the MIDI circuit is faulty.

6. EXTERNAL PORT CHECK

(1) Connect a properly functioning FZ-1 and the FZ-1 which should be checked with a EXTERNAL PORT cable.

(2) Select [CK PORT] in OPT SOFTWARE Menu and press ENTER button.



(3) Select [PORT RECEIVE] on the test unit (The FZ-1 that should be checked) then press ENTER.
Assign [PORT SEND] on the other FZ-1 then hit ENTER.

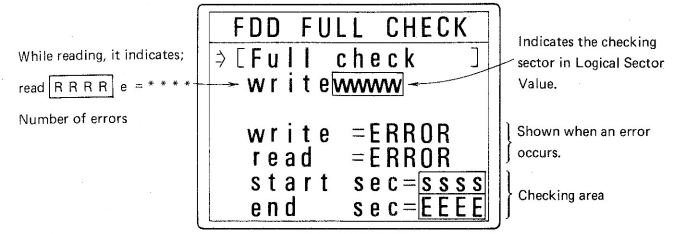
(4) The test unit indicates "executed OK" when External Circuit functions properly.
"PORT ERROR" or "TIME OUT" will be shown when External Circuit is malfunction.

(5) Perform the same test by setting [PORT SEND] on the test unit and [PORT RECEIVE] on the other FZ-1.

7. FDD READ/WRITE AGING TEST

(1) Select [CKDISC] in OPT SOFTWARE Menu and hit [ENTER] button.

(2) Insert an empty floppy disc.



(3) Moving the cursor at "start sec" by [▼] button, then enter the starting sector in Logical Sector Value.

(4) Set the Logical Sector Value of end sector after selecting "end sec".

(5) Move the cursor to [Full check] by [▲] button then press [ENTER].

(6) FDD Unit then repeats writing and reading data in the selected checking area and indicates "write = ERROR" or "read = ERROR" if an error occurs.

(7) If an error occurs, perform the followings.

a. Head cleaning
b. Replace the disc if errors always occur in the same sector.
c. FDD Unit alignment (Cat's eye, Burst alignments)

PARTS LIST

FZ-1

Notes:
1. Prices and specifications are subject to change without prior notice.
2. As for spare parts order and supply, refer to the "GUIDEBOOK for Spare Parts Supply", published separately.
3. The numbers in item column correspond to the same numbers in drawing.

Item	Code No.	Part Name	Specification	Q'ty	*	Unit Price N.R. Yen (¥) (FOB: JAPAN)	Rank
	1) M5336-MA1M PCB ASS'Y COMPLETE -0063709					60290	
	2002 1322	LSI	μPD71055C	2		680	A
☆	2009 1365	LSI	μPD72065C	1		1,010	A
	2010 0105	LSI	μPD8049HC-672	1		620	A
☆	2010 1946	LSI	μPD43256C-12L	2		1,280	A
☆	2010 2016	LSI	EHK-MA6208	1		2,240	A
☆	2010 2023	LSI	MB653121	1		1,600	A
☆	2010 2037	LSI	PCM54HP	2		800	A
☆	2010 2044	LSI	μPD65012C-046	1		540	A
☆	2010 2051	LSI	μPD65012G-074	1		650	A
☆	2010 2058	LSI	μPD65042G-052	1		1,920	A
☆	2010 2065	LSI	μPD65081G-012	1		3,600	A
☆	2010 2072	LSI	μPD70216G	1		3,280	A
☆	2010 2079	LSI	μPD71066CT	1		890	A
☆	2010 2352	LSI	FM-1	4		1,920	A
☆	2010 2359	LSI	MN41256-08	32		320	A
☆	2010 3087	LSI	μPD27C256AD-12FZ-1	1		1,080	A
☆	2010 3094	LSI	μPD27C256AD-12FZ-2	1		1,080	A
	2100 3786	C-MOSIC	TC40H004P	2		72	A
	2100 4029	C-MOSIC	TC4051BP	1		173	A
	2100 4162	MOS-IC	TC74HC00P	2		120	A
	2100 4464	C-MOSIC	TC74HC04P	5		120	A
	2100 4669	MOS-IC	TC74HC02P	1		80	A
	2100 4677	MOS-IC	TC74HC08P	1		80	A
	2100 4685	MOS-IC	TC74HC74P	2		120	A
	2100 4740	C-MOSIC	TC74HC32P	2		73	A
	2100 5053	MOS-IC	TC74HC154P	1		150	A
	2100 5088	C-MOSIC	TC74HC373P	3		180	A
	2100 5096	C-MOSIC	TC74HC27P	1		55	A
☆	2105 0343	C-MOSIC	TC74HC368P	1		120	A
☆	2105 0490	C-MOSIC	TC74HCT244P	2		180	A
☆	2105 0511	C-MOSIC	TC35094P	1		290	A
☆	2105 0553	C-MOSIC	TC74HC164P	2		120	A
☆	2105 0595	C-MOSIC	μPD4053BC	3		88	A
	2110 3756	Bipolar IC	SN74LS04N	1		66	A
	2111 2143	Bipolar IC	SN74LS14N	1		386	A
	2111 2283	Bipolar IC	SN74LS08N	1		126	A
	2111 2496	Bipolar IC	SN74LS174N	1		154	A

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	2111 2640	Bipolar IC	SN74LS38N	2		72	A
	2111 2852	Bipolar IC	SN74LS244N	1		403	A
	2111 2879	Bipolar IC	SN74LS245N	4		522	A
	2111 5215	Bipolar IC	SN74LS367AN	4		180	A
	2111 5291	Bipolar IC	SN74LS139N	1		184	A
	2111 5789	Bipolar IC	SN74LS368AN	1		88	A
	2113 0091	Bipolar IC	MC74F04N	3		75	A
	2114 0021	Monolythic IC	LA6462D	4		54	A
☆	2114 0224	Monolythic IC	M5201P	1		88	A
	2116 0007	OP amp	NJM082D	5		120	A
	2121 0013	OP amp	NJM4558DD	1		78	A
	2520 1337	Ceramic oscillator	CSA3.58MG	1		100	A
	2520 1469	Ceramic oscillator	CSA2.000MK	1		140	A
	2590 0007	Ceramic oscillator	CSA2.47MG	1		90	A
☆	2590 0182	Crystal oscillator	NR-18-13.824MHZ	1		150	A
☆	2590 0189	Ceramic oscillator	CSA8.96MT	1		73	A
☆	2590 0196	Crystal oscillator	NR-18-16MHZ	1		150	A
☆	2590 0203	Ceramic oscillator	CSA16.00MX040	1		100	A
☆	2725 0077	Module resistor	MS2228-F	2	10	25	B
	2730 0021	Module resistor	MS1038F	5	10	40	B
	2730 0023	Module resistor	MS1036F	3	10	29	B
	2760 2177	Semi-fixed resistor	V8K4-11B10K	2	10	23	B
☆	2831 0105	Mylar capacitor	AMZF-823K50	8	20	6	C
	3020 2147	Ferrite beads	BL02RN2-R62	35	10	15	C
	3025 0042	EMI filter	DST306-51B222M	17	10	27	C
	3500 3240	Pin assembly 7P	IL-G-7P-S3T2-E	1		20	X
	3500 3258	Pin assembly 7P	IL-G-13P-S3T2-E	1		31	X
	3500 3355	Pin assembly 7P	IL-G-3P-S3T2-E	1	10	7	X
	3500 3371	Connector	IL-G-2P-S3T2-E	1	20	5	C
	3500 3401	Connector 4P	IL-G-4P-S3T2-E	2		13	C
	3500 7075	Plate connector	5229-19CPB	1		80	B
	3500 7491	Plate connector	IL-G-14P-S3T2-E	1		70	B
	3500 7505	Plate connector	IL-G-6P-S3T2-E	1		41	B
☆	3501 1078	D sub connector	DBLC-J25SAF-10L6	1		210	C
☆	3501 1085	Header	3431-6002SCSC	1		140	X
☆	3501 1092	Header	J3595-5002SC	1		150	X
	3511 0933	PCB connector	5229-12CPB	1		45	B
	3540 4023	Pin assembly 20P	B20P-SHF-1AA	1		37	X

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	2200 4409	Transistor	2SA933-SQ-TP-T	2	10	14	A
	2220 1387	Transistor	2SC1740SQ-TP-T	1	10	13	A
	2301 0241	Diode	1SS254T-77-T	3	20	5	C
	2606 0098	Carbon film resistor	R-20-7.5K-J-T24-T	1	20	3	C
☆	2606 0196	Carbon film resistor	R-20-2.4K-J-T24-T	1	20	3	C
☆	2606 0490	Carbon film resistor	R-20-5.6-J-T24-T	1	20	3	C
☆	2606 0497	Carbon film resistor	R-20-3K-G-T24-T	1	20	3	C
	2617 0028	Carbon film resistor	R-20-100-J-T24-T	10	20	3	C
	2617 0044	Carbon film resistor	R-20-560-J-T24-T	1	20	3	C
	2617 0052	Carbon film resistor	R-20-1K-J-T24-T	17	20	3	C
	2617 0079	Carbon film resistor	R-20-3.3K-J-T24-T	17	20	3	C
	2617 0095	Carbon film resistor	R-20-10K-J-T24-T	18	20	3	C
	2617 0109	Carbon film resistor	R-20-33K-J-T24-T	9	20	3	C
	2617 0117	Carbon film resistor	R-20-47K-J-T24-T	3	20	3	C
	2617 0133	Carbon film resistor	R-20-82K-J-T24-T	1	20	3	C
	2617 0141	Carbon film resistor	R-20-100K-J-T24-T	1	20	3	C
	2617 0176	Carbon film resistor	R-20-1M-J-T24-T	3	20	3	C
	2617 0265	Carbon film resistor	R-20-10-J-T24-T	1	20	3	C
	2617 0271	Carbon film resistor	R-20-5.6K-J-T24-T	2	20	3	C
	2617 0297	Carbon film resistor	R-20-22K-J-T24-T	2	20	3	C
	2617 0335	Carbon film resistor	R-20-56-J-T24-T	1	20	3	C
	2617 0408	Carbon film resistor	R-20-6.8K-J-T24-T	1	20	3	C
	2617 0459	Carbon film resistor	R-20-27K-T24-T	2	20	3	C
	2617 0505	Carbon film resistor	R-20-33-J-T24-T	49	20	3	C
	2617 0877	Carbon film resistor	R-20-8.2K-J-T24-T	16	20	3	C
	2800 9070	Electrolytic capacitor	6.3RE2-47-T14-T	1	20	14	C
☆	2801 7196	Electrolytic capacitor	10RE2-33-T2-T	2	20	13	C
	2805 3142	Electrolytic capacitor	16RE2-10-T2-T	27	20	14	C
	2805 3169	Electrolytic capacitor	6.3RE2-47-T2-T	14	20	16	C
	2807 0276	Electrolytic capacitor	50RNBBP1-T2-T	8	10	33	C
	2807 1082	Electrolytic capacitor	16RE2-100-T2-T	1	10	27	C
	2813 0434	Semi-conductive capacitor	RT-B10TKYF224Z-T	31	10	20	B
☆	2813 0602	Ceramic capacitor	RT-HE40TKCH100F-T	1	20	7	C
☆	2813 0616	Semi-conductive capacitor	DD404SR182K25-T	1	20	6	C
	2818 0403	Ceramic capacitor	RT-HE60TKYB222K-T	1	10	3	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	83	10	3	C
	2818 2457	Ceramic capacitor	RT-HE50TKSL121J-T	1	10	5	C
	2818 3208	Ceramic capacitor	RT-HE50TKCH330J-T	4	10	4	C

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	2818 3224	Ceramic capacitor	RT-HE40TKCH150J-T	2	10	5	C
	2818 3241	Ceramic capacitor	RT-HE80TKCH101J-T	2	10	5	C
	2818 3275	Ceramic capacitor	RT-HE40TKCH220J-T	2	10	5	C
	2818 3283	Ceramic capacitor	RT-HE50TKCH300J-T	6	10	9	C
	2818 3321	Ceramic capacitor	RT-HE60TKCH470J-T	1	20	8	C
	2819 0450	Ceramic capacitor	RT-HE70TKSL221K-T	8	10	3	C
	2819 0531	Ceramic capacitor	RT-HE80TKSL331K-T	8	10	8	C
☆	2819 5079	Semi-conductive capacitor	DD405SR223K25-T	1	20	8	C
	2830 6229	Mylar capacitor	AMZV-104K50-T	8	10	13	C
	2830 6312	Mylar capacitor	AMZV-471K50-T	1	10	6	C
	2830 6550	Mylar capacitor	AMZV-182K50-T	1	10	11	C
☆	2831 0028	Mylar capacitor	AMZF-332K50	1	20	8	C
☆	4307 7250	Blank-PCB-M5336-MA1M	M11258-1	1		5,400	X
		2) M5336-MA2M PCB ASS'Y					
	2114 0021	Monolithic IC	LA6462D	6		54	A
☆	2114 0224	Monolithic IC	M5201P	3		88	A
	2121 0013	OP amp	NJM4558DD	2		78	A
	2210 5213	Transistor	2SB544E	1	10	26	A
	2230 3546	Transistor	2SD400E	2		23	A
☆	3013 0175	SB coil	STB-060	2		88	B
	3020 2147	Ferrite beads	BL02RN2-R62	9	10	15	C
	3025 0042	EMI filter	DST306-51B222M	7	10	27	C
☆	3025 0161	Filter	AL305	1		80	B
	3121 6007	Relay	G2VN-1071C	1		300	B
	3500 3371	Connector 2P	IL-G-2P-S3T2-E	1	20	5	C
	3500 3401	Connector 4P	IL-G-4P-S3T2-E	1		13	C
	3500 7610	Pin assembly 5P	IL-G-5P-S3T2-E	1	10	27	X
☆	3501 1015	13P connector M336	IL-13P-40-M336	1		60	X
	3612 0789	Jack (Line out)	YKB21-5010	10	10	60	B
☆	3613 0154	Jack (Mic)	HLJ4406-01-3030	1		180	B
	5430 0107	Nut	YKV11-0095	11	20	9	X
☆	6909 3350	Jack plate 336D	M310004-1	1		130	X
	2220 1387	Transistor	2SC1740SQ-TP-T	4	10	23	A
	2301 0241	Diode	1SS254T-77-T	7	20	5	C
☆	2606 0014	Carbon film resistor	R-20-15-J-T24-T	2	20	3	C
	2617 0028	Carbon film resistor	R-20-100-J-T24-T	5	20	3	C

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	2617 0052	Carbon film resistor	R-20-1K-J-T24-T	31	20	3	C
	2617 0079	Carbon film resistor	R-20-3.3K-J-T24-T	1	20	3	C
	2617 0087	Carbon film resistor	R-20-4.7K-J-T24-T	1	20	3	C
	2617 0095	Carbon film resistor	R-20-10K-J-T24-T	14	20	3	C
	2617 0109	Carbon film resistor	R-20-33K-J-T24-T	1	20	3	C
	2617 0117	Carbon film resistor	R-20-47K-J-T24-T	6	20	3	C
	2617 0125	Carbon film resistor	R-20-68K-J-T24-T	1	20	3	C
	2617 0141	Carbon film resistor	R-20-100K-J-T24-T	20	20	3	C
	2617 0203	Carbon film resistor	R-20-470K-J-T24-T	4	20	3	C
	2617 0214	Carbon film resistor	R-20-2.7K-J-T24-T	2	20	3	C
	2617 0265	Carbon film resistor	R-20-10-J-T24-T	10	20	3	C
	2617 0297	Carbon film resistor	R-20-22K-J-T24-T	17	20	3	C
	2617 0360	Carbon film resistor	R-20-1.5K-J-T24-T	1	20	3	C
☆	2617 0424	Carbon film resistor	R-20-820K-J-T24-T	1	20	3	C
	2617 0459	Carbon film resistor	R-20-27K-J-T24-T	1	20	3	C
☆	2617 0475	Carbon film resistor	R-20-50K-J-T24-T	2	20	3	C
	2617 0491	Carbon film resistor	R-20-330K-T24-T	1	20	3	C
	2617 0877	Carbon film resistor	R-20-8.2K-J-T24-T	1	20	3	C
	2800 9700	Electrolytic capacitor	6.3RE2-33-T14-T	1	20	14	C
☆	2801 7091	Electrolytic capacitor	6.3RE2-33-T2-T	2	20	13	C
	2805 3100	Electrolytic capacitor	16RE2-10-T14-T	2	20	14	C
	2805 3142	Electrolytic capacitor	16RE2-10-T2-T	4	20	14	C
	2807 0276	Electrolytic capacitor	50RNBBP1-T2-T	17	10	33	C
	2807 0535	Electrolytic capacitor	50RNBBP1-T14-T	2	10	33	C
	2807 0985	Electrolytic capacitor	16RE2-220-T2-T	2	20	30	C
	2807 1082	Electrolytic capacitor	16RE2-100-T2-T	3	10	27	C
	2818 0365	Ceramic capacitor	RT-HE50TKYB102K-T	3	10	3	C
	2818 0390	Ceramic capacitor	RT-HE40TKYB221K-T	1	10	4	C
	2818 1132	Ceramic capacitor	RT-HE40TKSL220K-T	1	10	5	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	24	10	3	C
	2819 0557	Ceramic capacitor	RT-HE50TKSL101K-T	2	10	6	C
	2830 6229	Mylar capacitor	AMZV-104K50-T	3	10	13	C
	2830 6237	Mylar capacitor	AMZV-102K50-T	1	10	6	C
	2830 6339	Mylar capacitor	AMZV-222K50-T	1	10	6	C
☆	4307 7230	Blank PCB-M5336-MA2M	M11230-1	1		320	X

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	3) M5336-AS1M PCB ASS'Y						
	2110 3756	Bipolar IC	SN74LS04N	1		66	A
	2230 1241	Transistor	2SD400-F	1		23	A
	2400 5062	Photo coupler	PC900	1		210	A
☆	3013 0175	SB coil	STB-060	6	5	88	B
	3025 0042	EMI filter	DST306-51B222M	8	10	27	C
	3500 3991	Pin assembly	IL-G-2P-S3L2-E	1	10	6	X
☆	3501 1043	7P connector M336	IL-7P-40-M336	1		120	X
	3612 0541	DIN jack	TCS4650-01-1211	3		100	B
	3612 0789	Jack	YKB21-5010	2	5	60	B
	3841 1217	Transformer	EL-M172A	1		310	B
	2220 1387	Transistor	2SC1740SQ-TP-T	1	10	13	A
	2301 0241	Diode	1SS254T-77-T	1	20	5	C
	2617 0036	Carbon film resistor	R-20-220-J-T24-T	5	20	3	C
	2617 0087	Carbon film resistor	R-20-4.7K-J-T24-T	1	20	3	C
	2617 0095	Carbon film resistor	R-20-10K-J-T24-T	1	20	3	C
	2617 0231	Carbon film resistor	R-20-270-J-T24-T	2	20	3	C
	2617 0265	Carbon film resistor	R-20-10-J-T24-T	1	20	3	C
	2617 0505	Carbon film resistor	R-20-33-J-T24-T	1	20	3	C
☆	2805 3207	Electrolytic capacitor	50RE2-4R7-T2-T	1	20	13	C
	2807 1015	Electrolytic capacitor	16RE2-47-T2-T	1	10	20	C
	2807 1104	Electrilytic capacitor	6.3RE2-100-T14-T	2	20	16	C
	2818 0446	Ceramic capacitor	RT-HE40TKYB101K-T	2	10	3	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	2	10	7	C
	2830 6270	Mylar capacitor	AMZV-223K50-T	1	10	7	C
☆	4307 7240	Blank PCB M5336-AS1M	M21640-1	1		170	X
	4) M5336-CN1M PCB ASS'Y						
	2301 0101	Diode	1S2473-T-77-T	12	20	8	C
	2320 9799	LED	LN266RPT-(TA)	5	10	36	B
	2614 0170	Carbon film resistor	R-20-330-J-T24-T	5	10	2	C
	3410 1728	Tact switch	EVQ-QS205K	12	10	20	B
☆	3725 0882	PC joiner M336B	CUJ-UL-19-200	1		160	C
☆	3725 0896	PC joiner M336C	JPSS00-11-120	1	10	44	C
	6215 1340	Joiner holder E92	E41909-2	1	10	9	X
☆	4307 7260	Blank PCB M5336-CN1M	M11231-1	1		220	X

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	5) M5336-CN2M PCB ASS'Y						
	2301 0101	Diode	1S2473-T-77-T	12	20	8	C
	3410 1728	Tact switch	EVQ-QS205K	12	20	20	B
☆	4307 7270	Blank PCB M5336-CN2M	M11231-2	1		100	X
	6) M5336-CN3 PCB ASS'Y						
	2600 2516	Carbon film resistor	R-20-100-J	2	20	5	C
☆	2765 0336	VR	S3018N-10KB-L15	1		85	B
☆	2765 0343	VR	S3018N-50KB-L15	1		85	B
☆	3501 1050	3P connector M336A	IL-3P-60-M336	1	5	58	X
☆	3501 1057	4P connector M336B	IL-4P-26-M336	1		110	X
☆	4307 7600	Blank PCB M5336-CN3	M32567-1	1		63	X
	7) M5336-CN4 PCB ASS'Y						
	2600 2516	Carbon film resistor (P)	R-25-100-J	1	20	5	C
☆	2765 0343	VR	S3018N-50KB-L15	1		85	B
☆	3501 1064	4P connector M336B	IL-4P-25-M336	1	5	60	X
☆	4307 7610	Blank PCB M5336-CN4	M32567-2	1		41	X
	8) M5336-CN5M PCB ASS'Y						
	3020 2147	Ferrite beads	BL02RN2-R62	2	10	15	C
☆	3501 1036	2P connector M336A	IL-2P-90-M336	1	10	49	X
	3612 0789	Jack	YKB21-5010	1	5	60	B
☆	2607 5021	Carbon film resistor	ELR50X4.7-J-T34V-T	2	20	5	C
☆	4307 7280	Blank PCB M5336-CN5	M11231-3	1		24	X
	9) M5336-PS1 PCB ASS'Y						
	2818 2601	Ceramic capacitor	DE7150FZ103PVA1	2	5	58	C
	3020 2104	Noise filter	TF2317C-601Y2R5	1		114	C
☆	3501 0917	Plate connector	B2P3-VH	1	10	23	B
	3640 2357	Plate fuse clip	UF-0033#01	2	10	4	C
	3670 1161	Receptacle	NC-174	1		59	C
	6901 5580	Receptacle fixing plate	M4850-1	1	10	18	X
	3631 2017	Fuse	MT4-1.5A	1	10	57	B

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	10) M5336PS2, 3 PCB ASS'Y						
☆	2114 0231	Monolithic IC	AN78M05R	1		120	A
☆	2114 0238	Monolithic IC	M5230L	1		110	A
☆	2114 0245	Monolithic IC	M51954BL	1		83	A
	2121 0072	Monolithic IC	NJM2068DD	1		80	A
	2230 1373	Transistor	2SD400E, F	1	10	34	A
	2230 3686	Transistor	2SD313E, F	1	10	48	A
☆	2251 0098	Transistor	2SB942Q, R	2		120	A
☆	2253 0077	Transistor	2SD1716Q, S	3		220	A
☆	2253 0084	Transistor	2SD1267Q, R	1		110	A
	2300 9200	Diode stack	S2VB10-4009 (F03)	1	10	95	B
☆	2390 0210	Diode	DSF10C-UB1-H	3	20	15	C
☆	2390 0217	Diode stack	S1WBA10-4001	1	5	63	B
☆	2390 0280	Diode stack	S10VB-4039 (F03)	1		290	B
☆	2390 0294	Diode stack	S1YB10-4001	1	5	65	B
☆	2605 0287	Metal film resistor	CRH100FH11-J-0.68	1		12	C
	2760 2207	Semi-fixed resistor	V8K4-11B2K	3	20	20	B
☆	2801 7224	Electrolytic capacitor	16RP2-10000	1		200	C
☆	2801 7231	Electrolytic capacitor	25RE2-1000	1	5	67	C
	2804 5816	Electrolytic capacitor	35RE2-2200	1		110	C
	2804 5859	Electrolytic capacitor	35RE2-1000	1	10	95	C
	2805 2201	Electrolytic capacitor	16RE2-470	1	10	37	C
☆	2831 0280	Mylar capacitor	AMZF-334K50	1		230	C
☆	3501 1022	14P connector M336A	IL-14P-60-M336	1		210	C
☆	3501 1029	5P connector	IL-5P-70-M336	1		110	C
	3640 2357	Plate fuse clip	UF-0033#01	8	10	4	C
	3631 0103	UL time lag fuse	UL-TSC-4A	1	10	38	B
	3631 0120	UL time lag fuse	UL-TSC-1.6A	1		44	B
	3631 0073	UL time lag fuse	UL-TSC 0.5A	2	10	35	B
☆	3719 0658	Parallel cable M336A	2468-3-216MM	3	20	28	X
	3750 1158	Heat sink	IC-1625-ST	3		75	X
☆	6909 3850	Heat sink L bracket	M32542-1	1		370	X
	2200 4409	Transistor	2SA933-SQ-TP-T	2	10	14	A
	2220 1387	Transistor	2SC1740SQ-TP-T	5	10	13	A
☆	2360 0378	Zener diode	RD13ESB2-T1-T	1	20	12	B
☆	2360 0385	Zener diode	RD4.7ESB1-T1-T	3	20	12	B
☆	2606 0315	Carbon film resistor	R-20-3.3-J-T24-T	1	20	3	C
☆	2606 0504	Carbon film resistor	R-20-24K-J-T24-T	1	20	3	C

Note: ☆ – New parts
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☆	2606 0539	Carbon film resistor	R-20-1.8-J-T24-T	1	20	3	C
☆	2607 5084	Carbon film resistor	ELR50X-1-J-T34V-T	8	20	3	C
☆	2607 5091	Carbon film resistor	ELR50X-1.5-J-T34VT	2	20	3	C
	2617 0028	Carbon film resistor	R-20-100-J-T24-T	1	20	3	C
	2617 0044	Carbon film resistor	R-20-560-J-T24-T	2	20	3	C
	2617 0052	Carbon film resistor	R-20-1K-J-T24-T	2	20	3	C
	2617 0061	Carbon film resistor	R-20-2.2K-J-T24-T	1	20	3	C
	2617 0079	Carbon film resistor	R-20-3.3K-J-T24-T	1	20	3	C
	2617 0095	Carbon film resistor	R-20-10K-J-T24-T	3	20	3	C
	2617 0238	Carbon film resistor	R-20-680-J-T24-T	1	20	3	C
	2617 0246	Carbon film resistor	R-20-12K-T24-T	1	20	3	C
	2617 0265	Carbon film resistor	R-20-10-J-T24-T	3	20	3	C
	2617 0289	Carbon film resistor	R-20-15K-J-T24-T	2	20	3	C
	2617 0360	Carbon film resistor	R-20-1.5K-J-T24-T	1	20	3	C
	2617 0378	Carbon film resistor	R-20-3.9K-J-T24-T	2	20	3	C
	2617 0877	Carbon film resistor	R-20-8.2K-J-T24-T	1	20	3	C
☆	2801 7203	Electrolytic capacitor	25RE2-22-T2-T	2	20	13	C
☆	2801 7210	Electrolytic capacitor	25RE2-47-T2-T	2	20	20	C
	2807 0993	Electrolytic capacitor	16RE2-22-T2-T	3	10	17	C
	2807 1023	Electrolytic capacitor	50RE2-1-T2-T	2	10	15	C
	2807 1040	Electrolytic capacitor	6.3RE2-470-T2-T	3	10	27	C
	2807 1082	Electrolytic capacitor	16RE2-100-T2-T	2	10	27	C
☆	2813 0623	Semi conductive capacitor	DD306F104Z12-T	2	20	9	C
	2818 0446	Ceramic capacitor	RT-HE40TKYB101K-T	2	10	3	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	2	10	3	C
	2830 6229	Mylar capacitor	AMZV-104K50-T	4	10	13	C
☆	4307 7290	Blank PCB M5336-PS2M	M11229-1	1		360	X
☆	4307 7300	Blank PCB M5336-PS3M	M11229-2	1		23	X
	11) M5336-LD1M PCB ASS'Y						
	2001 8143	LSI	HD44351	2		960	A
	2001 8151	LSI	HD44350A01	1		880	A
☆	3725 0875	PC joiner M336D	CUJ-UL-12-200	1		110	C
☆	6002 0248	Joiner holder G545	P4260-1	1	20	16	X
	2301 0241	Diode	1SS254T-77-T	2	20	5	C
	2617 0095	Carbon film resistor	R-20-10K-J-T24-T	1	20	3	C
	2617 0289	Carbon film resistor	R-20-15K-J-T24-T	1	20	3	C
	2617 0378	Carbon film resistor	R-20-3.9K-J-T24-T	4	20	3	C

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	2805 3100	Electrolytic capacitor	16RE2-10-T14-T	2	10	14	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	2	10	3	C
	2830 6229	Mylar capacitor	AMZV-104K50-T	5	10	13	C
☆	4307 7590	Blank PCB-M5336-LD1M	M21639-1	1		390	X
	12) M5177-KEYBOARD PCB ASS'Y						
	2004 0815	LSI	MSM6200GS-1L	1		2,080	A
	2300 1241	Diode	1S2075K-TD-T	94	10	4	C
	2301 0241	Diode	1SS254T-77-T	28	20	5	C
☆	2606 0049	Carbon film resistor	R-20-100K-G-T24-T	8	20	3	C
	2617 0028	Carbon film resistor	R-20-100-J-T24-T	1	20	3	C
	2617 0052	Carbon film resistor	R-20-1K-J-T24-T	1	20	3	C
	2617 0301	Carbon film resistor	R-20-56K-J-T24-T	2	20	3	C
	2805 3100	Electrolytic capacitor	16RE2-10-T14-T	2	10	14	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	2	10	3	C
	2830 6665	Mylar capacitor	AMZV-104J50-T	8	10	24	C
☆	3501 1127	20P connector M336	SHF-20-18-M336	1		270	C
	3721 0032	PC joiner M71A	PCJ-UV-19-90	1		130	C
	3721 0041	PC joiner M71B	PCJ-JVU-16-22	2		50	C
	6215 1340	Joiner holder	E41909-2	1	10	9	X
	6901 3860	Sponge J	M4630-7	1	10	7	X
	6905 6980	Parallel wire M177KY	M42591-1	1	20	16	X
	4307 2421	Blank PCB-M571-KY1M	M2822A-1	1		560	X
	4307 2441	Blank PCB-M571-KY3M	M2823A-1	1		560	X
	4307 4290	Blank PCB-M5177-KY2M	M21246-1	1		410	X
	13) UPPER CASE ASS'Y						
☆ 1	6909 3310	Key top set A	M32623*1	1		310	C
☆ 2	6909 3332	Key top 153B	M31624-139	4	10	35	C
☆ 3	6909 3340	Slide knob	M42716-3	3	20	23	C
☆17	6909 7600	LCD upper holder	M310056*1	1	5	63	C
☆ 4	6909 8890	Upper case sub ass'y	M32761*1	1		2,370	C
☆ 5	6909 8900	Insulation panel	M43349-1	1	10	29	C
☆ 6	6909 3370	Side board 336R	M11218-1	1		33	C
☆ 7	6909 3780	Console panel	M11217A-1	1		183	C
☆ 8	6909 3790	Display panel	M43168-1	1		320	C
☆ 9	3335 0567	LCD	LD-B8122J	1		710	A

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Item	Code No.	Part Name	Specification	Q'ty	*	Unit Price N.R. Yen (¥) (FOB: JAPAN)	Rank
☆10	6909 3390	Heat seal A	M32628-1	1		960	A
☆11	6909 3400	Heat seal B	M43226-1	1		590	A
☆12	6909 3410	Heat seal C	M43227-1	1		180	A
☆13	6909 3430	Insulation seal B	M43228-1	2	20	4	A
☆14	6909 3610	Insulation seal C	M43229-1	1	20	4	A
☆15	3301 0035	EL	EL-336	1		510	A
☆16	6909 3820	LCD lower holder	M310057*1	1	5	63	C
☆17	6909 8740	After touch detector	M32136*3	1		26	C
		14) SIDE BOARD ASS'Y					
18	6904 0360	Bender stopper	M41740-1	4	20	8	X
☆19	6909 3830	Side board 336L	M11219-1	1		360	X
☆20	3501 1113	34P connector M336A	7934-34P-18-M336	1		130	C
☆21	3501 1120	4P connector M336C	IL-4P-50-M336	1		130	C
☆22	6909 3840	FDD cover	M32541-1	1		320	C
23	2770 6843	VR	VM10W520A-50KB	2		190	B
☆	3501 1148	6P connector M336A	IL-6P-30-M336	1	5	90	C
24	6904 0420	Bender spring	M41737-1	1	50	18	C
25	6904 6120	Bender shassis 153	M42128-1	2		50	X
☆26	6905 1930	Bender knob 153	M31620-2	2	5	77	C
27	6911 5250	Bender shassis B	M41946-1	2	10	16	X
		15) KEYBOARD UNIT					
☆28	6903 7712	White key CF	M31269B-1	10		110	C
☆29	6903 7722	White key BE	M31271B-1	10		110	C
☆30	6903 7732	White key D	M31270B-1	5		110	C
☆31	6903 7742	White key G	M31272B-1	5		110	C
☆32	6903 7752	White key A	M31273B-1	5		110	C
☆33	6903 7762	White key S	M31274B-1	1		110	C
☆34	6903 7772	Black key	M31275B-1	25		90	C
☆35	6904 0551	Key stopper	M31279A-1	1		265	X
☆36	6907 4720	Upper case stopper	M32023-1	1		43	X
☆37	6909 6650	KB spring 336W (for white key)	M43283-1	36	20	4	C
☆38	6909 6660	KB spring 336B (for black key)	M43283-2	25	20	3	C
☆39	6909 6670	Weight 336W (for white key)	M43284-1	36	10	33	C
☆40	6909 6680	Weight 336B (for black key)	M43285-1	25	10	29	C
41	6903 7680	KB guide A	M31317-1	4		100	X
42	6903 7890	KB guide B	M31318-1	1			

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43	6904 0580	Tape A	M31460-1	4	20	21	
☆44	6904 0590	Tape B	M31461-1	1	20	21	
☆48	6904 0600	Black key seal	M31462-1	5	20	14	
☆45	6909 6690	KB chassis	M11295-1	1		1,110	
☆46	6909 6700	Rubber switch K	M32684-1	4		153	B
☆47	6909 6710	Rubber switch L	M32685-1	1		131	B
	16) LOWER CASE ASS'Y						
☆49	6821 2016	Guide B	S32415B-1	2		25	X
	6902 0900	PCB spacer 58	M41118-1	1	10	9	X
☆50	6909 3441	Lower case sub ass'y	M21680A*1	1		5,760	C
☆51	6909 3460	Heat sink 336A	M32543-1	1		750	X
☆52	6909 3470	Heat sink 336B	M32544-1	1		330	X
☆53	3501 1106	40P connector M336A	7930-40P-12-M336	1		530	C
☆54	6909 3600	Connector holder	M32627-1	1		120	C
55	3440 5255	Power switch	SDJIS	1		216	A
☆56	3501 1071	2P connector M336B	VHR-2P-45-M336	1	5	80	C
☆57	3012 0098	Transformer	TE-336-1M1	1		3,170	B
58	1012 0707	FDD unit☆	JU-386 (JU-384)	1		21,600	A
	17) OPTIONAL RAM BOARD MB-10						
☆	2010 2359	LSI	MN41256-08	32			A
	2100 4464	CMOS IC	TC74HC04P	3		120	A
☆	2113 0091	Bipolar IC	MC74F04N	4	5	75	A
	2730 0021	Module resistor	MS1038F	2	10	40	B
☆	5550 1408	PCB ejector	CBE-2P	2	5	88	X
	2617 0028	Carbon film resistor	R-20-100-J-T24-T	13	20	3	C
	2617 0505	Carbon film resistor	R-20-33-J-T24-T	30	20	3	C
	2805 3142	Electrolytic capacitor	16RE2-10-T2-T	4	20	14	C
	2807 1091	Electrolytic capacitor	6.3RE2-100-T2-T	1	20	18	C
☆	2813 0637	Semi-conductive capacitor	DD308F224Z12-T	32	20	12	C
	2818 2082	Ceramic capacitor	RT-HE70TKYF103Z-T	8	10	3	C
	2818 3208	Ceramic capacitor	RT-HE50TKCH330J-T	1	10	4	C
☆	4307 7440	Blank PCB-M381-MBM	M11262-1	1		1,470	X

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☆ FDD unit cannot be supplied by deducting from the spare parts allowance.

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Item	Code No.	Part Name	Specification	Q'ty	*	Unit Price N.R. Yen (¥) (FOB: JAPAN)	Rank
	18) FDD UNIT (Model: JU-386)						
	1. Electronic parts						
IC1	0007 4569	LSI	HA13421AMP	1		750	A
IC2	0007 4570	LSI	FQL00210B4	1		650	A
IC3	0007 4571	LSI	FQL00310B4	1		1,550	A
IC4	0007 4572	LSI	HA16651MP	1		1,550	A
IC5	0007 4573	IC	M301PC-A	1		550	A
Q2	0007 4588	Transistor	3SK144R-TW	1		80	A
Q3, 7, 8 9, 10, 11 13, 14	0007 4589	Transistor	UN2213-TX	8	10	30	A
Q12	0007 4590	Transistor	UN2211-TX	1		60	C
Q15	0007 4591	Transistor	UN2111-TX	1	10	30	C
D1	0007 4585	Diode array	DAN202KT-96	1	10	40	C
D2	0007 4586	Diode	DAP202KT-96	1	10	40	C
D3	0007 4587	Chip diode	MA159-TX	1		80	C
C11, 15	0007 4550	Ceramic capacitor	R23E105ZF	2		90	C
C18, 19	0007 4551	Electrolytic capacitor	ECEA1CKS100	2	10	30	C
C1, 12	0007 4577	Chip capacitor	FCC00020B401	2	10	30	C
C2	0007 4578	Chip capacitor	FCC00010B438	1	20	20	C
C3	0007 4579	Chip capacitor	FCC00010B456	1	10	30	C
C4, 5	0007 4580	Chip capacitor	FCC00030B420	2	20	20	C
C6, 7	0007 4581	Chip capacitor	FCC00010B458	2	10	30	C
C8	0007 4582	Chip capacitor	FCC00010B436	1	20	20	C
C9	0007 4583	Chip capacitor	FCC00010B442	1	20	20	C
C10, 17	0007 4584	Chip capacitor	FCC00150B400	2		80	C
IR1	0007 4552	Block resistor	RGLD9X102J	1	10	45	C
R	0007 4553	Chip resistor	MCR18EZHJ000	1	20	20	C
R4	0007 4554	Carbon film resistor	ERG1SJ271	1	20	20	C
R44	0007 4555	Chip resistor	MCR18EZHG822	1	20	20	C
R1, 2, 9	0007 4592	Chip resistor	MCR18EZHJ822	3	20	20	C
R3, 17	0007 4593	Chip resistor	MCR18EZHJ682	2	20	20	C
R7, 8	0007 4594	Chip resistor	MCR18EZHJ391	2	20	20	C
R11, 13	0007 4595	Chip resistor	MCR18EZHJ473	2	20	20	C
R12	0007 4596	Chip resistor	MCR18EZHJ621	1	20	20	C
R15, 33 34, 36 41, 42	0007 4597	Chip resistor	MCR18EZHJ391	6	20	20	C
R16, 18, 31	0007 4598	Chip resistor	MCR18EZHG393	3	20	20	C

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R19	0007 4599	Chip resistor	MCR18EZHG682	1	20	20	C
R20	0007 4600	Chip resistor	MCR18EZHG153	1	20	20	C
R29	0007 4610	Chip resistor	MCR18EZHJ181	1	20	20	C
R30	0007 4602	Chip resistor	MCR18EZHJ331	1	20	20	C
R32	0007 4603	Chip resistor	MCR18EZHJ472	1	20	20	C
R37, 38, 39 40	0007 4604	Chip resistor	MCR18EZHJ103	4	20	20	C
R35	0007 4605	Chip resistor	MCR18EZHJ105	1	20	20	C
X1	0007 4574	Oscillator	EF0FC4004A4	1		80	C
VR1	0007 4575	Variable resistor	EVMUGA00B24	1		80	B
T	0007 4576	Inverter	JPW-02A	1	20	20	C
L1, 2	0007 4563	Choke coil	FNC00030B432	2		80	C
L3, 4	0007 4564	L.F. coil	FNC00030B424	2		80	C
L5	0007 4565	Choke coil	FNC00030B428	1		80	C
L6	0007 4566	Choke coil	BL01RN1A62T5	1	20	20	C
L7	0007 4567	Choke coil	SN-3-2002	1		200	C
L8	0007 4568	Choke coil	ELEBD330KA	1	10	30	C
CN1	0007 4556	Connector	FCN-725P034	1		200	C
CN2	0007 4557	Connector	171826-4	1		90	C
CN3	0007 4606	Connector	FJC00150B4	1		120	C
CN4	0007 4558	Connector	4PS2L225EFK	1	10	30	C
CN5	0007 4559	Connector	B09-DR-S	1	10	40	C
CN6	0007 4607	Connector	ILS4PS2T2EF	1	10	30	C
CN7	0007 4560	Connector	A202001801	1		80	C
CN8	0007 4561	Connector	A051001801	1	10	30	C
P1,2,3,4 5,6	0007 4562	Connector	A020000805	6	20	20	C
		2. Mechanical parts					
1	0007 4608	Cover	YTF5E02050B3	1		180	C
2	0007 4609	Screw	XSB25 + 5FX	4	20	15	X
3	0007 4610	Front panel	YTF7K05590B3	1		180	C
4	0007 4611	Button	YTF6J01810B4	1	10	35	C
5	0007 4612	Lever	YTF4H01602B4	1	10	30	C
6	0007 4613	Lever	YTF4H01614B4	1	10	35	C
7	0007 4614	Screw	XSN2 + 5FX	2	20	15	X
8	0007 4615	FPC cramp	YTF2C03191B4	1	20	20	C
9	0007 4616	Holder ass'y	YTF7K06222B3	1		450	C
10	0007 4617	Spring	YTF4J01594B4	1	10	40	C

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11	0007 4618	Screw	XSN25 + B5FX	1	20	15	X
12	0007 4619	Screw	XSN25 + 5FX	2	20	15	X
13	0007 4620	Cramp (END)	YTF2C02781B4	1	20	20	C
14	0007 4621	Cramp (L)	YTF2C02792B4	1	10	30	C
16	0007 4622	Shaft (Long)	YTF4H01470B4	1		80	C
17	0007 4623	Shaft (Short)	YTF4H01480B4	1		60	C
18	0007 4624	Screw	YTF1E00411B4	2	20	15	C
19	0007 4625	Spring	YTF4J00861B4	2	10	35	C
20	0007 4626	Screw	YTF4J02190B4	1	20	20	X
21	0007 4627	Stopper A	YTF1K00441B4	1	20	15	C
22	0007 4628	Lever ass'y	YTF7K01853B4	1		300	C
23	0007 4629	Lever	YTUF384EJT	1		150	C
24	0007 4630	Stopper F	YTF1K00530B4	1	20	15	C
25	0007 4631	Stopper C	YTF1K00391B4	2	20	15	C
26	0007 4632	Stopper E	YTF1K00510B4	1	20	15	C
27	0007 4633	Roller	YTF4S00800B4	1	10	45	C
28	0007 4634	Roller	YTF4S01680B4	1	10	35	C
29	0007 4635	Washer	YTF1K00121B4	1	20	15	X
30	0007 4636	Washer B	YTF1K00363B4	1	20	15	X
31	0007 4637	Washer C	YTF1K00370B4	2	20	15	X
32	0007 4638	Limiter	YTF3D04830B4	1	20	20	C
33	0007 4639	Disk ditect ass'y	YTUF384DET	1		400	B
34	0007 4640	Sensor ass'y	YTUFS363TO	1		650	B
35	0007 4641	Step motor	YTFMD00653B4	1		2,700	A
36	0007 4642	Head ass'y	YTUF386HD	1		6,700	A
37	0007 4643	Steel belt ass'y	YTF7K01843B3	1		200	A
38	0007 4644	Screw	YTF1E00421B4	1	20	15	X
39	0007 4645	Screw	XYN2 + 3FN	1	20	15	X
40	0007 4646	Washer	LPW2-025	2	20	15	X
42	0007 4647	Bracket (R)	YTUF363BK-R3	1		100	C
43	0007 4648	Bracket (L)	YTUF363BK-L3	1		100	C
44	0007 4649	Collar	YTF2P03050B4	4	10	30	X
45	0007 4650	Spacer	YTF2P03460B4	4	10	30	X
46	0007 4651	Screw	XSB25 + 10FX	4	20	15	X
47	0007 4652	Insulation sheet	YTF2P03291B4	1	10	30	X
48	0007 4653	Control base ass'y	YTUF386PK-CN	1		4,150	X

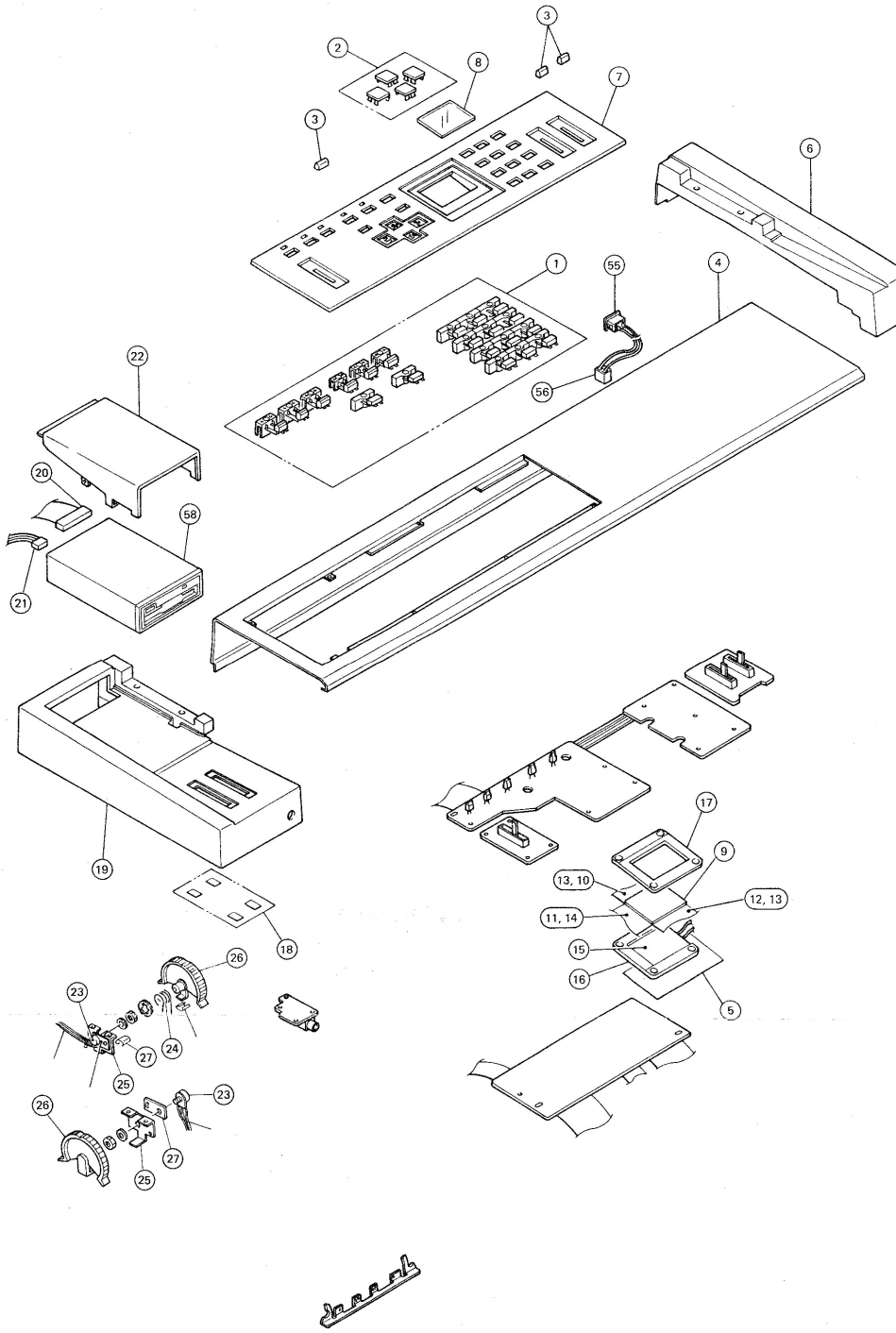
Note: ☆ – New parts
Q'ty – Quantity used per unit
* – Minimum order and supply quantity

Rank A: Essential
B: Stock recommended
C: Others
X: No stock recommended

Item	Code No.	Part Name	Specification	Q'ty	*	Unit Price N.R. Yen (¥) (FOB: JAPAN)	Rank
52	0007 4654	Base D Motor ass'y	YTUF386DM	1		5,150	A
53	0007 4655	Screw	YTF1E00600B4	2	20	15	X
56	0007 4656	Screw	YTF1E00540B4	2	10	20	X
58	0007 4657	Micro switch	D2ZP-101	1		140	A
59	0007 4658	LED	LN28RP	1		60	B
60	0007 4659	Screw	YTF1E00550B4	1	10	15	X
61	0007 4660	Dumper	3B23KL99999	1		160	C
62	0007 4661	Dumper angle	YTF2T05691B4	1		60	C
63	0007 4662	Screw	XSB2 + 4FX	2	10	15	X
64	0007 4663	Screw	XYN25 + 3FX	1	10	15	X
65	0007 4664	Cramp (R)	YTF2C05740B3	1		120	C
66	0007 4665	Head hanger	YTF4A02680B4	1		100	C
67	0007 4666	Shaft	YTF4H02691B4	1	10	40	C
68	0007 4667	Hanger spring	YTF4J02700B4	1	20	20	C
69	0007 4668	E Ring	TE-3	3	20	20	X

Note: ☆ – New parts
Q'ty – Quantity used per unit
* – Minimum order and supply quantity

Rank A: Essential
B: Stock recommended
C: Others
X: No stock recommended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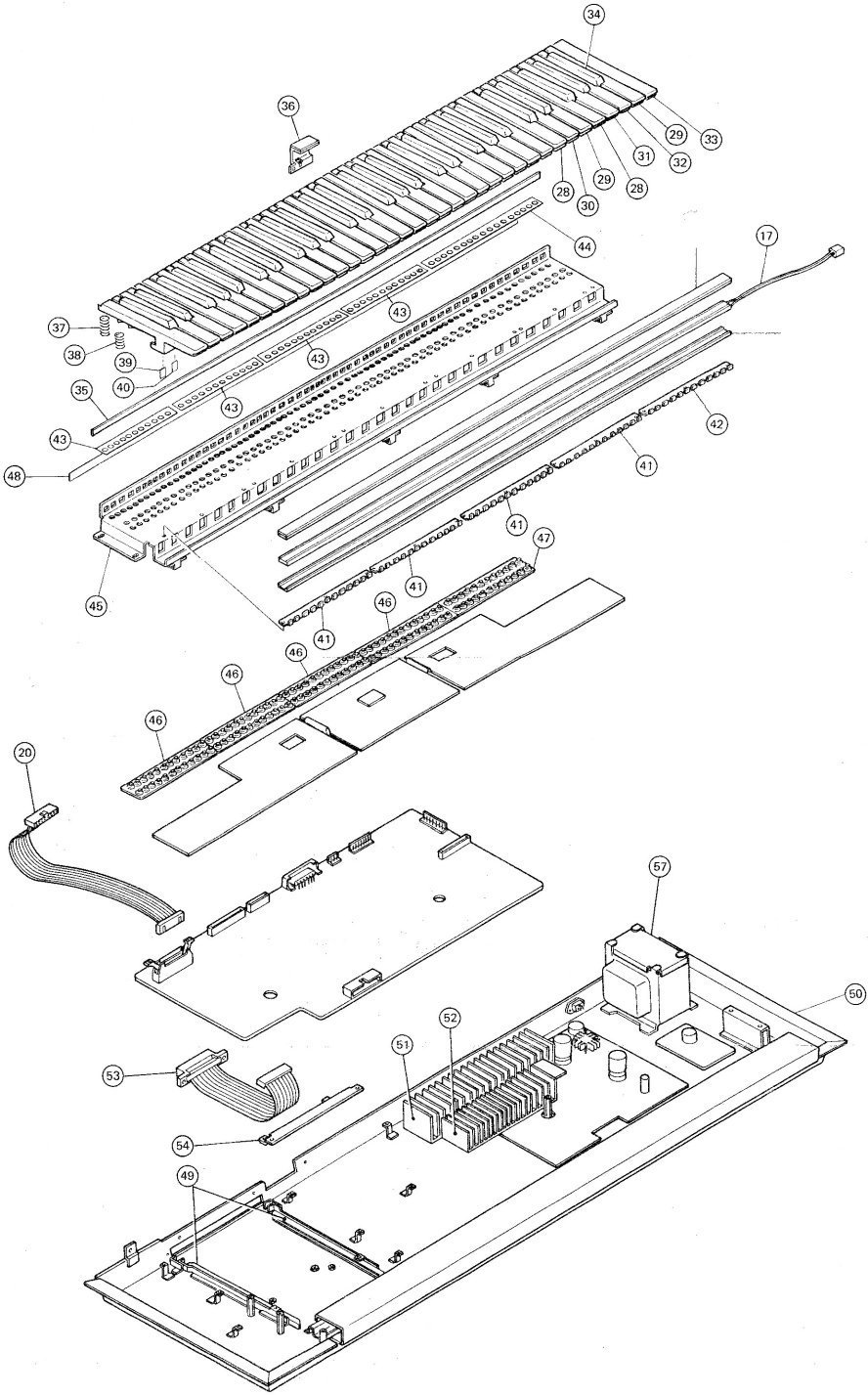
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ORDER NO. MSD861107100

Service Manual

Flexible Disk Storage Drive

3.5 Inch

JU-386

CONTENTS

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PART 1

PART 2

PART. 1

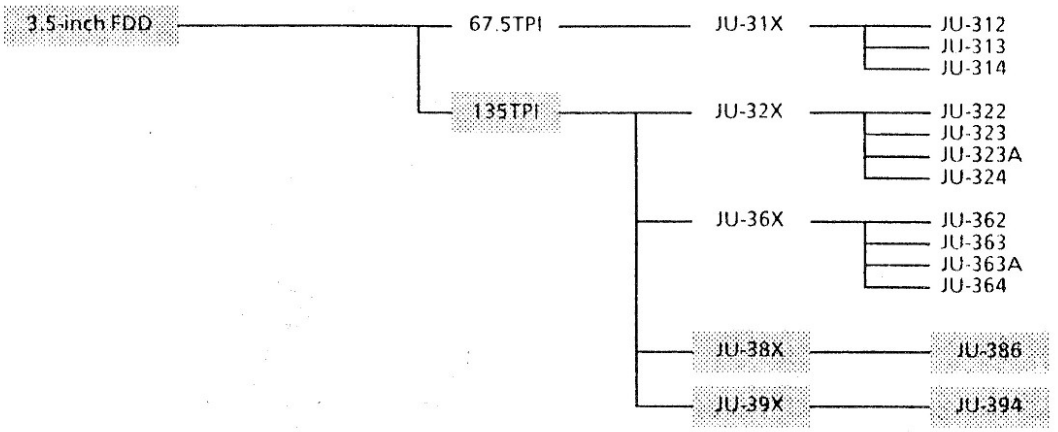
1. INTRODUCTION

This service manual consists of two parts. Part 1 covers maintenance description, adjustment procedures, and trouble analysis and Part 2 covers disassembly and reassembly procedures, parts list, and PCB circuits.
Part 1 encompasses maintenance instructions for all FDD. Refer to the highlighted applicable items, and perform maintenance work on the Floppy Disk Drive (FDD).

Note :
This service manual is prepared for maintenace of the Floppy Disk Drive.
Do not use this manual for judging pass or fail criteria in inspections.

2. MODELS AND MODEL NUMBERS

2.1 3.5-inch FDD Series



3. SPECIAL TOOLS

The following special tools are used for FDD maintenance.

TABLE 3.1

Tool		P / No.		Quantity
		JU-31X,32X,36X, JU-323A,363A	JU-38X JU-39X	
Exerciser		FDD-EXT-5	*←	1
Alignment Diskette	DAD	JU-01AA	817-384	1~2
	CE	817-363CE		
Data Diskette		2DD	2DD / 2HD	1~2
CMOS/TTL Adaptor		YTFDD-CN35	*←	1
Step Motor and Head Assy Mounting Jig		YTFDD-SB35	*←	1
Oscilloscope (50MHz)				1
Probe (10:1)				1
Frequency Counter				1

Note: *← : Stand for the same as left.
DAD : Dynamic Alignment Diskette
CE : Cats Eye

4. OUTLINE OF MAINTENANCE

- The following tools are required for maintenance of a Floppy Disk Drive.

4.1 Alignment Diskette

Alignment diskette is used for head actuator alignment and index sensor adjustment. Use the right diskette as shown in Table 3.1.

4.2 Exerciser

The exerciser enables you to make all adjustments and inspections necessary for an FDD. Its functions include the following:

(1) Seek increment or alternate tracks
(2) Read (but no data compare)
(3) Write 1F or 2F (All 0's or 1's)
(4) Recalibration to track 00

The exerciser has switches and indicators to execute a specified function.

5. DIAGNOSTIC PROCEDURES

5.1 Error Symptom Recognition

Errors that occur because of the wrong operating procedure, wrong programming, or use of a defective diskette, or soft errors due to external causes, such as contaminated air and random electrical noise, are often attributed to a drive failure.
Unless a visual inspection of the drive reveals an evident assembly fault or a defect, **always confirm errors with another good diskette, and another known good drive.**

5.2 Soft Error Detection and Correction

Soft errors are normally caused by the following:

(1) Contamination between read/write heads and diskette. This kind of contamination can be easily eliminated by the liner in the diskette. Contaminated heads can be cleaned by a general purpose non-abrasive head cleaning diskette. Please follow the suitable procedure provided with the cleaning diskette.
(2) Random electrical noise, normally a few microseconds or less.
(3) Small defects in written data and/or track not detected during write operation may cause soft errors during read.
(4) Faulty grounding of the drive or host system can also cause a soft error.
(5) Wrong motor speed is another cause of soft errors.

Take the following steps on the controller side to recover from the soft errors mentioned above.

(1) Read the track again ten times or until the data is recovered.
(2) If Step (1) above fails to recover the data, access the adjacent track. Then return the head to the original track.
(3) Repeat Step (1).
(4) Any error that cannot be corrected by the above procedure is irrecoverable.

5.3 Write Error

If an error occurs during write operation, it is usually detected during the next revolution by performing a read operation called write check. To correct an error, write again and repeat a write check operation. If the result is unsatisfactory after ten or more write operations, perform a read operation on another track to determine whether it is the diskette or the drive that is wrong. If an error persists, replace the diskette and repeat the above procedure. If the error still persists, consider the drive defective. If the error is corrected, dispose of the diskette as defective.

5.4 Read Error

Most read errors are soft errors. Data can be recovered by following the recovery procedure mentioned in 5.2.

5.5 Seek Error

(1) Stepper motor or stepper motor drive circuit is faulty.
(2) Faulty carriage
There are two ways of seek error recovery. One is to recalibrate to track 00 , and seek back to the original track. The other is to read the ID field, check the track number on which the head is located, and move the head away from it. And read it again.

5.6 Interchangeability Error

Data which is written by one drive may not be read by another. This error is called a Interchangeability error,which can be caused mostly by the following reason,which should be checked as follows.

(1) Head misalignment: Refer to Adjustments and Confirmation Item 9.5
(2) Head output too low: Refer to Adjustments and Confirmation Item 9.3
(3) Motor speed difference: Refer to Adjustments and Confirmation Item 9.1
(4) Format difference

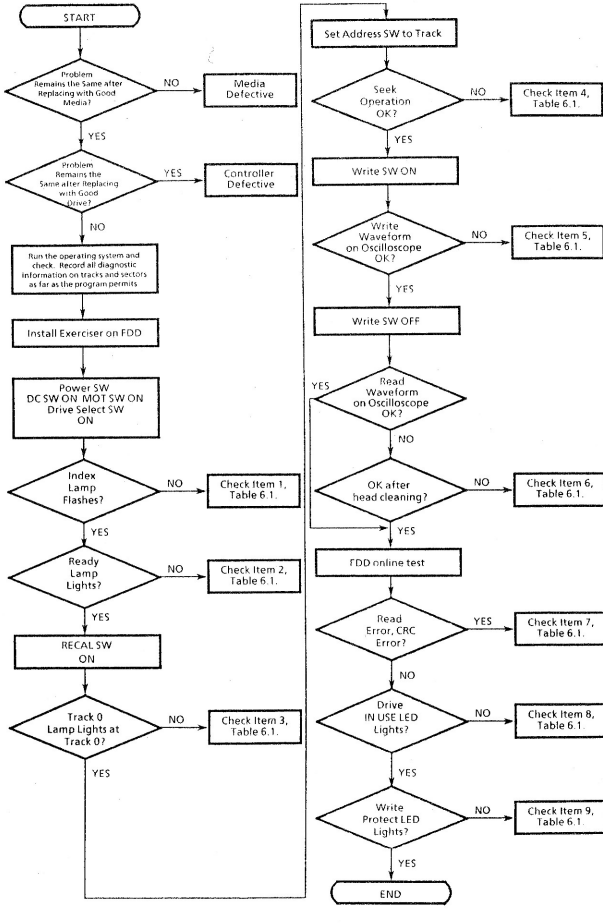
6. TROUBLE ANALYSIS

6.1 Trouble Analysis Procedure

FDD trouble may occur in any of the following nine forms.
(1) Index detection failure
(2) Not ready
(3) Track 0 undetectable
(4) No seek
(5) No write
(6) No read
(7) Read error
(8) IN USE LED won't light.
(9) Write protect undetectable
Check with the troubleshooting flowchart in 6.2

CAUTION:
Be sure to switch power off before removing an FDD or PCB from the operating system.

6.2 Trouble Shooting Flow Chart



6.3 Trouble Analysis Table

Table 6.1

Item	Trouble	NO	Cause	JU-3X3, 3X4,323A,363A 38X, 39X	JU-3X2
1	Index detection failure	1	DD motor control PCB	Replace DD motor, Base assembly	Replace DD motor assembly
		2	DD motor faulty		
		3	Index LED faulty	Replace DD motor, Base assembly	Replace
		4	Index detector faulty		
		5	PCB motor ON circuit	Repair	* ←
		6	PCB index detection circuit	Repair	* ←
2	Not ready	1	See Item 1.		
		2	PCB ready circuit	Repair	* ←
3	Track 0 detection failure	1	Track 00 assembly	Replace	* ←
		2	PCB track 0 detection failure	Repair	* ←
4	No seek	1	Stepper motor	Replace	* ←
		2	Guide shaft contamination or damaged	Replace	* ←
		3	PCB stepper driver circuit	Repair	* ←
5	No WRITE	1	See Item 1		
		2	Head disconnected	Replace	* ←
		3	Head shorted	Replace	* ←
		4	PCB write circuit	Repair	* ←
6	No READ	1	See Item 1.		
		2	See Item 5.		
		3	PCB read circuit	Repair	* ←
7	READ ERROR	1	See Item 1.		
		2	See Item 6.		
		3	Alignment	Adj.	* ←
		4	Azimuth	Unadjustable	* ←
		5	Burst	Unadjustable	Unadjustable
		6	Asymmetry	Adj.	
		7	Limiter	Adj.	Adj.
		8	Flag 0	Adj	* ←
		9	Index period	Replace DD motor, Base assembly	Replace
		10	PCB read circuit	Repair	* ←
8	IN USE LED won't light.	1	LED part	Replace	* ←
		2	PCB IN USE circuit	Repair	* ←
9	Write protect failure	1	Write protect part	Replace DD motor, Base assembly	Replace
		2	Write protect circuit	Repair	* ←

Note: * ←: Stand for the same as left.

7. PREVENTIVE MAINTENANCE

No preventive maintenance is necessary for any type of FDDs under normal conditions of use. However if it is determined that adjustments are necessary,the following must be done.

- **Adjustments** (Refer to table 8.1)

(1) Specify an applicable model from Table 8.1, and make a read/write head radial adjustment at a specified track.
(Sides 0,1)
(2) Make an index timing adjustment at a specified track. (Sides 0,1)
(3) Make an azimuth measurement at a specified track. (Sides 0,1)
CAUTION
Do not write when using alignment diskette. Check that write protect sensor is properly operating with a data diskette.

Note : Section 9 describes the adjustment procedures in detail.

8. MEASUREMENT ITEMS FOR EACH MODEL

Table 8.1

Item	Parameter	JU-31X		JU-32X,36X		JU-323A,363A	
		TRK	Value	TRK	Value	TRK	Value
1	Index period	20	200 ± 2 ms	40	200 ± 2 ms	40	200 ± 2 ms
2	Output level	39	140 mV or more	79	140 mV or more	79	80 mV or more
3	Radial Alignment	20	± 40 µm	40	± 35 µm	40	± 35 µm
	Reference (DAD)		(23% or more)		(29% or more)		(29% or more)
	Reference (CE by 817-363CE)		(36% or more)		(42% or more)		(42% or more)
4	Azimuth	20	± 18'	40	± 24'	40	± 24'
5	Index burst	20	3 ± 1.5 ms	40	3 ± 1.7 m s	40	3 ± 1.7 ms
6	Flag 0	From track 1 to track 2 and back	1:1	From track 1 to track 2 and back	1:1	From track 1 to track 2 and back	1:1
7	Limiter	– 1	Recalibrate and return to 0	– 1	Recalibrate and return to 0	– 1	Recalibrat e and return to 0
8	Asymmetry	39	≦600 ns	79	≦600 ns	79	≦700 ns

Table 8.1

Item	Parameter	JU-386		JU-394	
		TRK	Value	TRK	Value
1	Index period	40	(300rpm) 200 ± 2 ms (360rpm) 166.6 ± 1.7ms	40	200 ± 2 ms
2	Output level	79	140 mV or more	79	140 mV or more
3	Radial Alignment	40	± 35 μm	40	± 35 μm
	Reference (DAD)		(29% or more)		(29% or more)
	Reference (CE by 817-363CE)		(42% or more)		(42% or more)
4	Azimuth	40	± 18′	40	± 18′
5	Index burst	40	(300rpm) 3 ± 0.85ms (360rpm) 2.5 ± 0.85ms	40	3 ± 0.8 m s
6	Flag 0	From track 1 to track 2 and back	1:1	From track 1 to track 2 and back	1:1
7	Limiter	– 1	Recalibrate and return to 0	– 1	Recalibrate and return to 0
8	Asymmetry	79	(1MB) ≦ 700 ns (1.6MB) ≦ 350 ns	79	(2MB) ≦ 350 ns

9. ADJUSTMENTS AND VERIFICATIONS

9.1 Motor Speed Verification (Index Period)

(1) Insert a diskette, run the motor, and clamp. Refer to the index period column of Table 8.1 for the applicable model.
(2) Step to the specified track.
(3) Connect a frequency counter to the INDEX signal.
IX (INDEX)
(4) Check that the frequency counter readings meet the specifications in the table.

[Notes] : JU-386 only

(5) The motor speed in the MINI-MODE can be selected by setting short bars on pin post JP1 on the motor PCB. (The MAXI-MODE is 360 rpm)

MINI-MODE	JP1
300 rpm 250 kbps	Pins 1, 2: Short Pins 3, 4: Open
360 rpm 300 kbps	Pins 1 to 4: Open

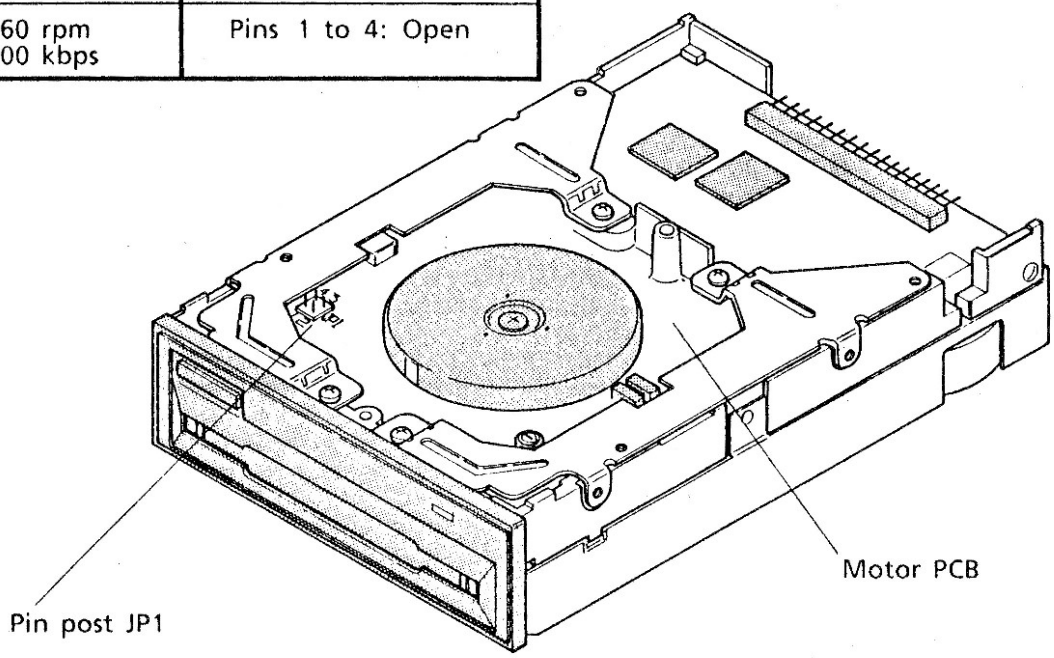


Fig. 9 Motor Speed Selection

9.2 Write Protect Verification

(1) Check that the exerciser's write protect lamp goes on and off as a media is inserted and removed as specified in the table below.

Media with write protect hole open : ON
Media with write protect hole closed : OFF

9.3 Head Output Verification

Use a new diskette if possible to identify head failure for this check.

(1) Insert a good diskette.
(2) Run the motor.
(3) Step to the track specified in the output level column of Table 8.1.
(4) Connect the oscilloscope probe as specified below.

CH1	:	T1
CH2	:	T2
EXT	:	IX (Index)

Invert channel 2 and select the Add mode.
Set vertical deflection to 10 mV/division and horizontal deflection to 20 ms/division.

(5) Write 2F (all ones) on the entire circumference.
(In case of a double-sided FDD, repeat it on sides 0 and 1 using SIDE SELECT.)
(6) Check that the average output level meets the specifications of **Table 8.1.** If it does not meet the specifications, refer to Item 7 of the Trouble Analysis Table.

9.4 Output Modulation Verification

Modulation: M is calculated by the following formula.

$$M(\%) = \frac{Vmax - Vmin}{Vmax + Vmin} \times 100$$

using the value obtained in 9.3, and check that the calculated value is 20% or less.

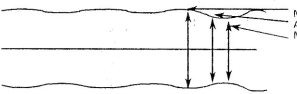


Fig. 9.1 Modulation

9.5 Radial Alignment Adjustment

Introduction
This adjustment is normally not necessary.
If the mounting screws for the stepper motor loosen, or if parts become defective, or if a compatibility error occurs, check and readjust according to the following procedure.
Steps (4) to (9) below should be performed regardless of the type, CE or DAD alignment diskette used. Use an alignment diskette suitable to the type of FDD to be adjusted according to table 3.1

(1) Insert an alignment diskette.
CAUTION:
Be sure to leave the alignment diskette under room conditions for 20 minutes before adjustment.
(2) Step to the track specified in the Radial alignment column of Table 8.1.
(3) Leave the oscilloscope in the same condition as mentioned in section 9.3.

- **Cats Eye System**

(4) Check the output waveforms for sides 0 and 1. They should appear as in **Fig. 9.2**.
(5) The two waveforms should appear in the amplitude ratio in the R/A ±42% or more.
(6) If the specified ratio is not satisfied, loosen the two mounting screws for the stepper motor.
(7) Move the stepper motor along the base by hand until the two waveforms assume approximately the same amplitude, and retighten the mounting screws. (See **Fig. 9.2**.)
(8) Step the head outward (track 0) and inward (track 40 or 79), and confirm that the adjustment has been completed.
(9) After the radial adjustment, be sure to confirm track 00 sensor adjustment **9.8** and carriage limiter **9.9**.

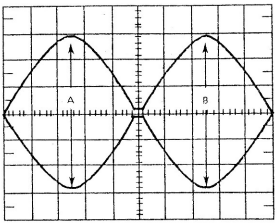


Fig. 9.2 Radial Alignment Waveforms (CATS EYE)

Note: Alignments on sides 0 and 1 are adjusted at the factory. If they are misaligned, adjust them to meet the specifications of Table 8.1.

- **DAD (Dynamic Alignment Diskette)**

(4) Watch the output waveforms for sides 0 and 1. They should appear as shown in **Fig. 9.3**.
(5) Measure the timing levels A1 to A4 and B1 to B4 in **Fig. 9.3**, and calculate the lobe ratio from the following formulas.

$\Sigma A > \Sigma B : \frac{\Sigma B}{\Sigma A} \times 100\%$ $\Sigma A < \Sigma B : \frac{\Sigma A}{\Sigma B} \times 100\%$

(6) The lobe ratio calculated by the above formulas should meet the specifications on item 3 of **Table 8.1.**
(7) If the above requirement is not met, loosen the two mounting screws for the stepper motor, adjust.
(8) Seek from track 0 to track 40 and from track 79 to track 40, and confirm that the adjustment has been completed.
(9) After the radial adjustment, be sure to confirm track 00 sensor adjustment **9.8** and head carriage limiter **9.9**.

Note: An alignment instrument for 3.5-inch FDDs permits accurate and easy adjustment because the lobe ratio is displayed on the instrument.

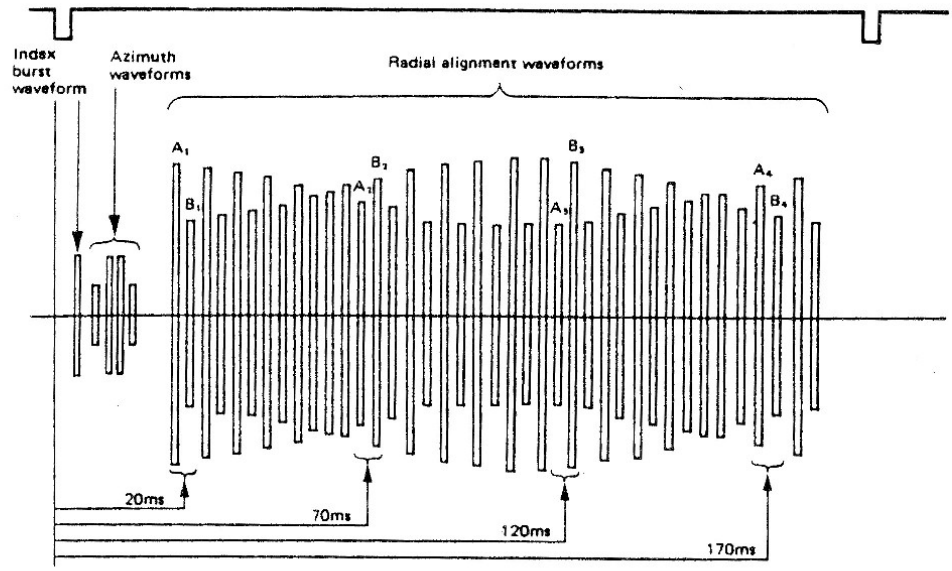
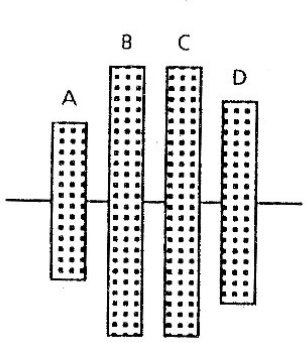


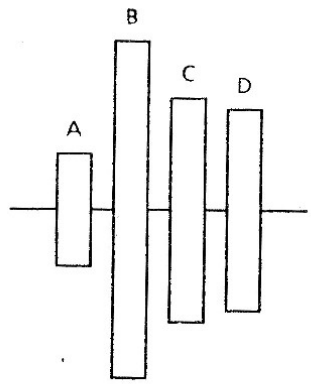
Fig. 9.3 Alignment Waveform (DAD)

9.6 Azimuth Verification

(1) Insert an alignment diskette. Seek to the track specified in the azimuth column of Table 8.1.
(2) Set the oscilloscope in the same conditions as in 8.3, and set horizontal deflection to 0.5 ms/division.
(3) Measure as shown below.
(4) Confirm that the measured value meets the specifications in the azimuth column of Table 8.1.

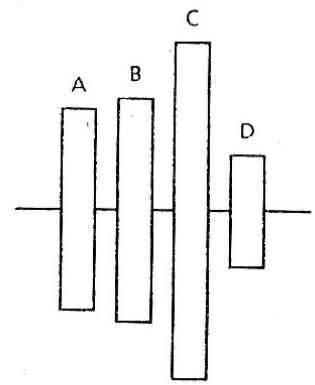


Azimuth 0' waveforms



Case of B>C

$$\text{Azimuth} = \frac{B - C}{B - D} \times (A)$$



Case of C>B

$$\text{Azimuth} = \frac{C - B}{C - A} \times (A)$$

(A) : CE→30'
DAD→15'

Fig. 9.4 Azimuth Waveforms

9.7 Index Burst Verification and Adjustment

(1) Insert an alignment diskette. Seek to the track specified in the I/B column of **Table 8.1**.
(2) Set the oscilloscope time base as follows:
1 ms/division
(3) Check that the time from oscilloscope start to the first data pulse meets the I/B specifications of Table 8.1. (DAD system)

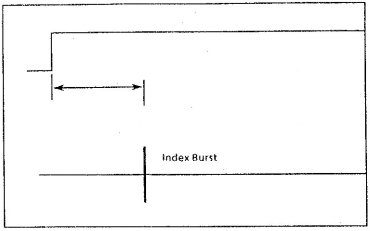


Fig. 9.5 Index Timing

(4) When the index burst is out of the specified range, adjust it so that it is within the specified range by turning the variable resistor on the motor PCB with a small minus screw driver.
In this case, keep the drive in the normal position. [The drive position shown in Fig.9.5.1 is no good (upside down).]
(5) Recheck the index burst.

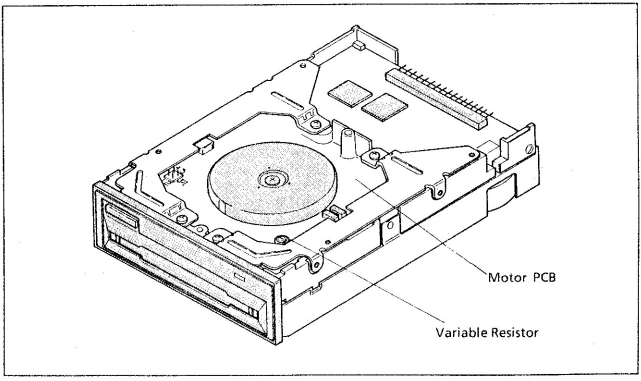


Fig. 9.5.1 I/B Adjustment

9.8 Track 00 Sensor Adjustment

(1) Set the oscilloscope as follows.
Set horizontal deflection to 1ms/division.

CH1 : ZP
EXT : SP

(2) Step between specified tracks at in the FLAG 0 item of Table 8.1 (Turn the seek delay switch on the exerciser to adjust 12 ms seek.)

(3) Loosen the track 0 sensor screw and adjust until the waveform on the oscilloscope appears as shown in Fig. **9.6**.

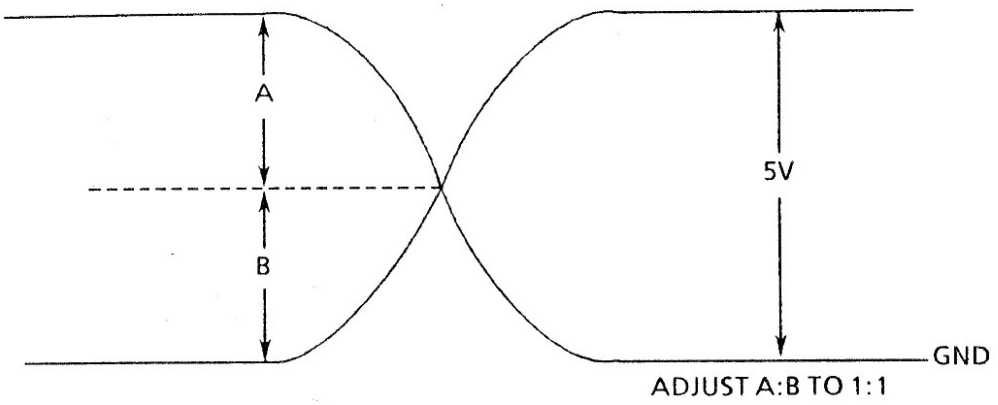


Fig. 9.6 Track 0 Waveform

9.9 Limiter Adjustment

(1) Seek to track 0.
(2) Write 2F data on track 0, and measure read level.
(3) Loosen the limiter mounting screw to free the limiter.
(4) Move the limiter until it just touches the head carriage on – 1 track, and retighten the limiter mounting screw securely.
(5) Check that, when the RECAL switch on the exerciser is pushed ON, the head returns to track 0and that the 2F output level is the same as that measured in Step (2).

9.10 Asymmetry Verification

(1) Insert a data diskette.
(2) Step to the track specified in the symmetry item of **Table 8.1**.
(3) Set the oscilloscope as follows:

CH1 : RD
CH2 : T1

(4) Write 1F.
(5) A read wave form is displayed on the oscilloscope as shown in **Fig. 9.7**.
(6) Confirm if it satisfies the value as shown in **Table 8.1**.

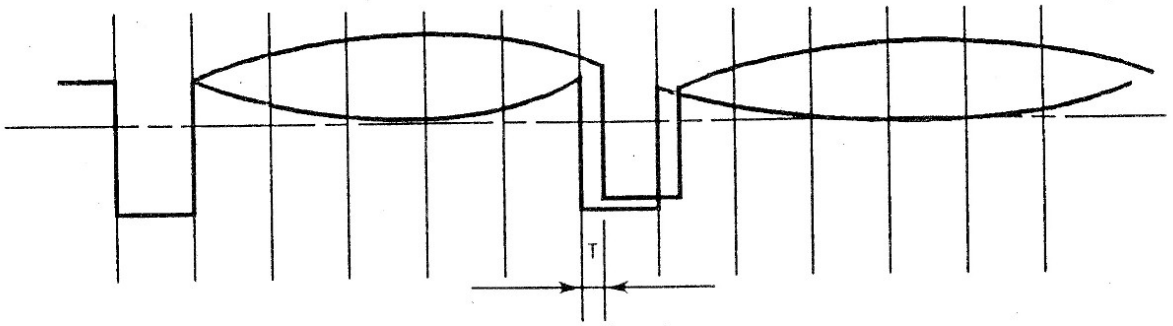


Fig. 9.7 Asymmetry Waveform

(Asymmetry Wave form might be reversed up-and-down from model to model.)

10. PANASONIC ALIGNMENT DISKETTE

3.5 inch Alignment Diskette

Table 10.1

TPI		P/N		Index Burst	Azimuth	Radial Alignment	MODEL
67.5	DAD	JU-01AA		20TRK	20TRK	20TRK	JU-31X
	CE	817-363CE					
135	DAD	JU-01AA		40TRK	40TRK	40TRK	JU-32X JU-36X JU-323A JU-363A
	CE	817-363CE					
135	DAD	817-384		40TRK	40TRK	40TRK	JU-38X JU-39X

PART. 2
11. DISASSEMBLY AND REASSEMBLY

11.1 Removing and Remounting the Front Panel

(1) Remove the two cover fastening screws and remove the cover.
(2) Remove the two front-panel fastening screws and remove the front panel.
(3) Remount them in the reverse order of the above.

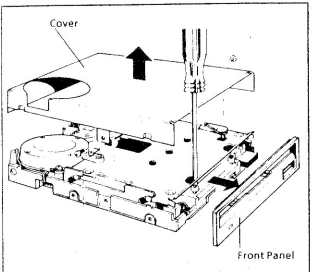


Fig. 11.1 Removing the Front Panel

11.2 Removing and Remounting the Holder Assembly

(1) Remove the front panel following the procedure in paragraph 11.1.
(2) Remove each lever fastening screw and remove the two levers.
(3) Lift the holder assembly by hand so that the edge of the holder assembly does not touch the lever assembly as shown in figure 11-2 and remove it by sliding it toward the front side. In this case, lift the side 1 of the head assembly by the thumb, otherwise it strikes side 0 due to the head retaining spring on the side 1 when it drops from the holder.
(4) Remount it in the reverse order of the above.
(5) Check the operation of the holder assembly after it has been remounted.
(6) Operation check of the holder assembly
   a) When mounting the two levers, temporarily fasten the fastening screws.
   b) Slide in and out the media several times and confirm that the movement is smooth.
   c) After properly tightening the two screws, reconfirm that the movement is smooth.

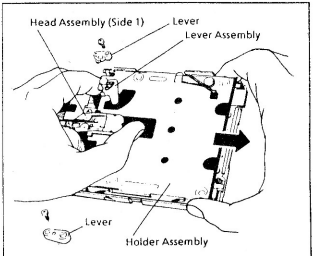


Fig. 11.2 Removing the Holder Assembly

11.3 Removing and Remounting the head Assembly and Step Motor

(1) Remove the holder assembly following the procedure in paragraph 11.2.
(2) Push up and remove the FPC clamp using such as tweezers.
(3) Pull up the FPC contact part inserted into the head connector J3 by picking it up with such as flat pens so as not to damage it.
(4) Remove the step motor cable connector from the J4 connector on the PCB.

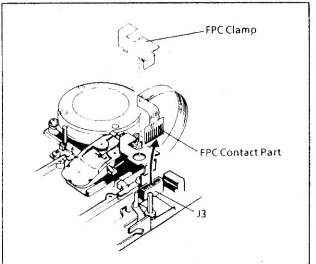


Fig. 11.3 Removing the Head Assembly and Step Motor

(5) Remove the set screw on the right-side clamp and remove the right-side clamp.

(6) Remove the set screw on the left-side clamp and remove the left-side clamp.
(7) Remove the set screw on the clamp end and remove the clamp end.
(8) Draw out the long and short shafts.

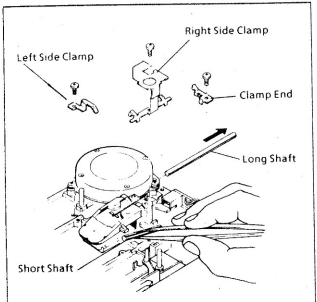


Fig. 11.4 Removing the Head Assembly

(9) Remove the two fastening on the step motor and remove the step motor by holding it by hand together with the head assembly.

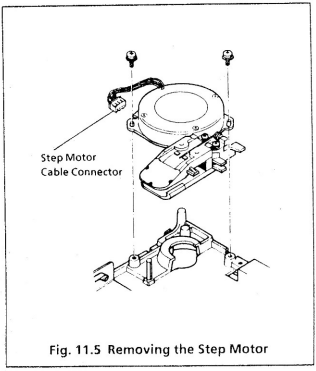


Fig. 11.5 Removing the Step Motor

(10)Remount them following the reverse procedure of the above steps (1) to (9).

When remounting the right-side clamp in step (5). remount it while pushing it in the arrow direction shown in figure 11-6. When remounting the right-side left-side clamps, replace them with new ones.

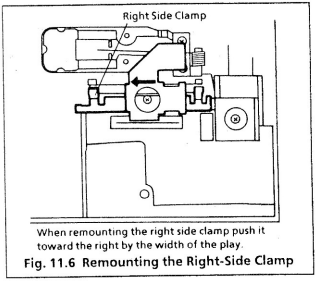


Fig. 11.6 Remounting the Right-Side Clamp

(11)After mounting the above, adjust the head alignment according to paragraph 9.5, adjust the track 00 sensor according to paragraph 9.8, and adjust the limiter according to paragraph 9.10.

11.4 Disassembly and Reassembly of the head Assembly and Step Motor

Disassembly

(1) Mount the head assembly and step motor on a fitting jig as shown in figure 11-7 and remove the steel-belt fastening screw on the step-motor capstan and the same on the carriage section.

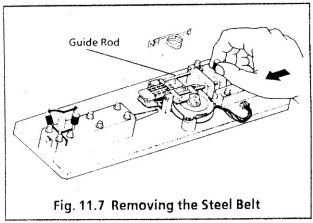


Fig. 11.7 Removing the Steel Belt

Reassembly

(1) Mount the step motor and head on the jig as shown in figure 11-8 and 11-9.
(2) Wind a new steel belt in the shape of alpha as shown in figure 11-9.

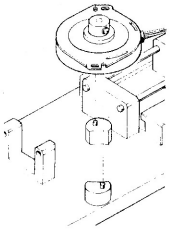


Fig. 11.8 Remounting the Step Motor

(3) Set the hook A of the steel belt to the carriage tab.
(4) Set the ring of the steel belt wound in the shape of alpha to the capstan.
(5) Insert the guide rod into the head carriage.
(6) Pull out the hook B of the steel belt with tweezers and set it to the tab on the jig. Set the tension handle in the arrow direction.

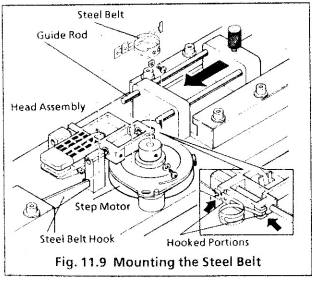


Fig. 11.9 Mounting the Steel Belt

(7) Retighten the capstan fastening screws and carriage section fastening screws. In this case check if the steel belt is bent or distorted and also alignment.
(8) Return the tension handle to the original position and unhook the steel belt.
(9) Check the smooth operation of the carriage by moving it back and forth.
(10) Pull out the guide rod.

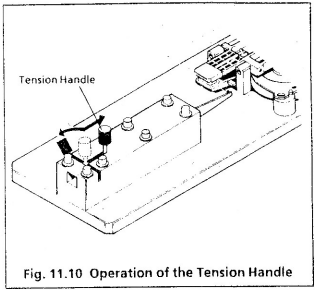


Fig. 11.10 Operation of the Tension Handle

(11)Cut the hook B with a nipper.

11.5 Removing and Remounting the PCB

(1) Remove each two screws on the right-side and left-side brackets and remove the right-side and left-side brackets.
(2) Remove connectors J3, J4, and J5, J6 from the PCB.
(3) Remove the two fastening screws on the PCB and remove the PCB.

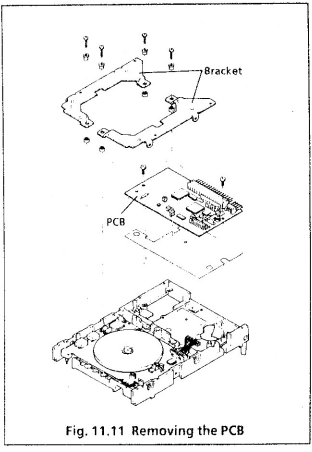


Fig. 11.11 Removing the PCB

(4) Remount it following the reverse order of steps (1) to (3).
Treat the J5 cable as shown in figure 11-12 when remounting the PCB. Set the PCB beneath the base as shown in the figure.

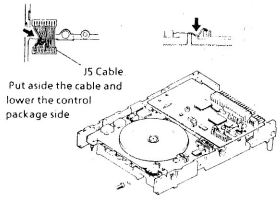


Fig. 11.12 Mounting the PCB

11.6 Removing and Remounting the Disk Detector Assembly

(1) Remove the holder assembly following the procedure in paragraph 2.
(2) Remove the right-side and left-side brackets.
(3) Remove the disk detector cable connector from the J3 terminal.
(4) Remove the disk detector fastening screws and remove disk detector.
(5) Remount it following the reverse order of steps (1) to (4).

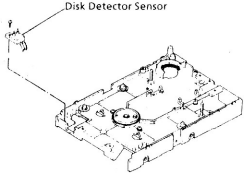


Fig. 11.13 Removing the Disk Detector Assembly

11.7 Removal and Remounting of the Track 0 Sensor Assembly

(1) Remove the cover
(2) Remove the cable connector from the J6 terminal.
(3) Remove the track sensor assembly fastening screws and remove the track sensor assembly.
(4) Remount it following the reverse order of steps (1) to (3).
(5) Adjust the track 00 sensor according to the procedure in paragraph 9.8 after remounting it.

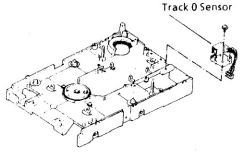


Fig. 11.14 Removing the Track 0 Sensor Assembly

11.8 Removing and Remounting the Damper Assembly

(1) Remove the two cover fastening screws and remove the cover.
(2) Remove the damper assembly fastening screw and remove the damper assembly.
(3) Remount the damper assembly in the reverse procedure of the above.

[Cautions for Remounting]

(4) Insert the angle the clamp right into the damper.
(5) Insert the damper angle beneath the trigger lever spring.

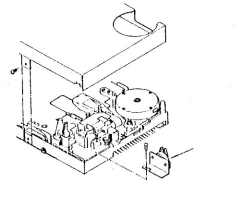


Fig. 11.15 Removing the Damper Assembly

11.9 Disassembling and Reassembling the Damper Assembly

(1) Remove the two screws and remove the damper from the damper angle bracket.
(2) Apply screw lock (Threebond 1401B) to the two screws and reassemble in the reverse procedure of step (1)

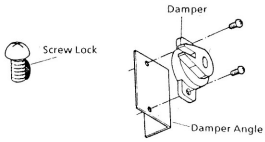


Fig. 11.16 Disassembling the Damper Assembly

11.10 Removing and Remounting the Clamp Right Assembly

(1) Remove the damper assembly according to the procedure in paragraph 11.8 .
(2) Remove the FPC clamp by lifting it slightly with tweezers.
(3) Remove the clamp right assembly fastening screw with care not to damage the FPC and remove the clamp right assembly.
(4) Remount the clamp right assembly in the reverse procedure of the above.

[Cautions for Remounting]

(5) Mount the clamp right assembly according to paragraph11.3.(10).
(6) Mount the clamp right assembly so that the head hanger section is mounted on the holder and comes beneath the head carriage arm section.

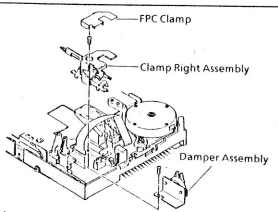


Fig. 11.7 Removing the Clamp Right Assembly

11.11 Disassembling and Reassembling the Clamp Right Assembly

(1) Remove a retaining ring on the hanger spring and remove the hanger spring from the shaft.
(2) Remove two retaining rings and pull out the shaft, then the head hanger can be removed from the clamp right.
(3) Reassemble the clamp right assembly in the reverse procedure of the above. In this case, be careful not to bend the shaft when remounting the retaining rings.

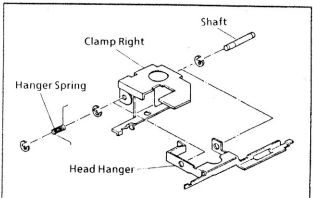
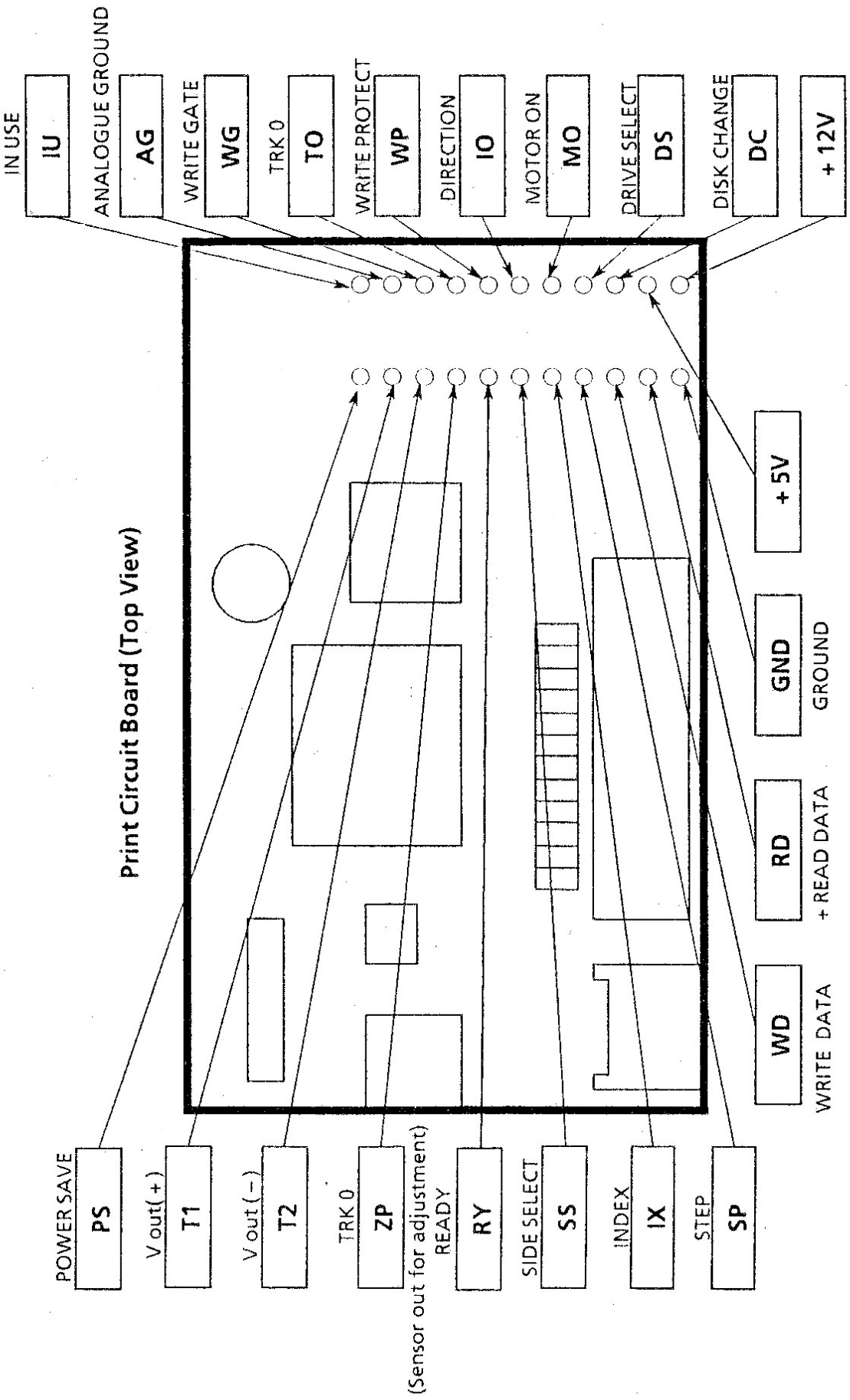
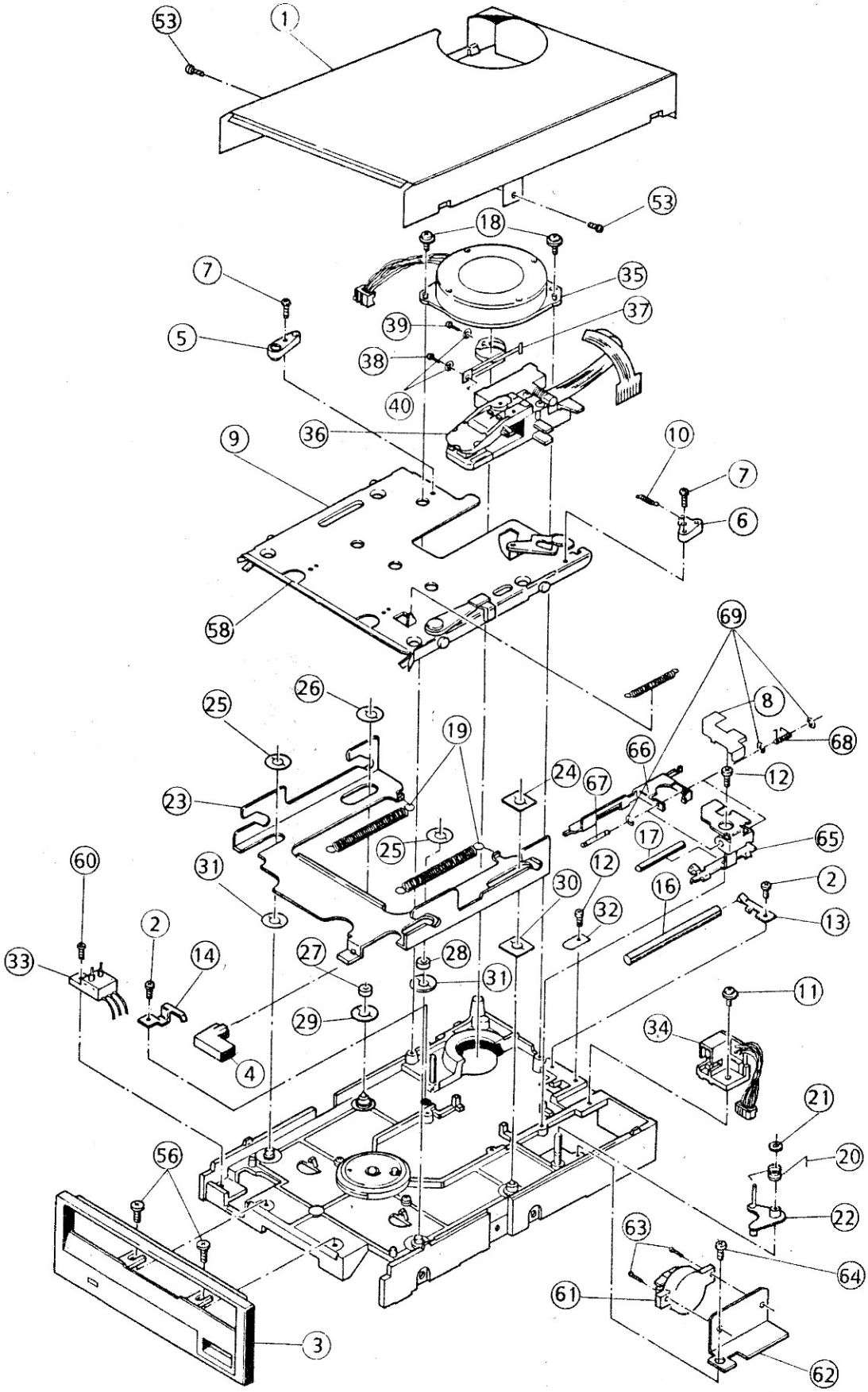


Fig. 11.18 Disassembing the Clamp Right Assembly

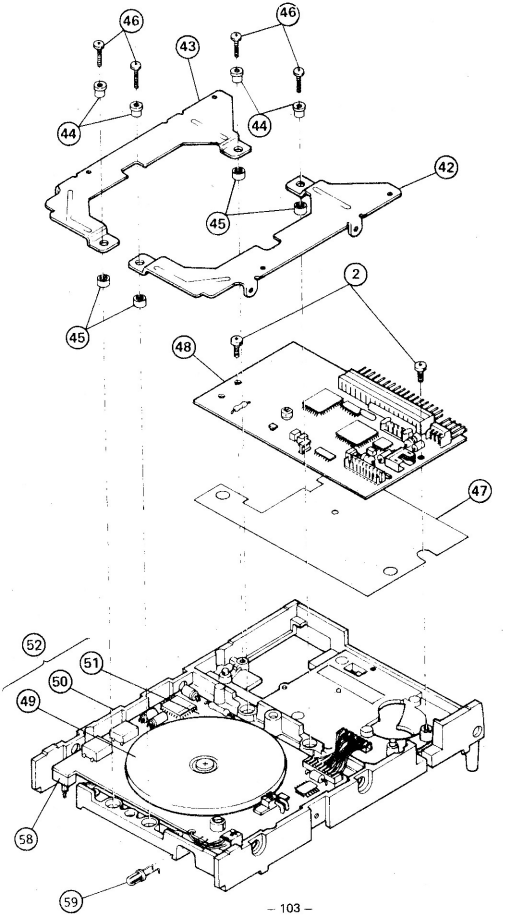
12. TEST POINTS



13. EXPLODED VIEW - 1



EXPLODED VIEW - 2



14. REPLACEMENT PARTS LIST

MODEL : JU - 386 - 01

Ref.No.	Part No.	Part Name & Description	Per Set (pcs.)	Recommend Service Parts per 1,000 Units
1	YTF5E02050B3	Cover	1	
2	XSB25 + 5FX	Screw (M2.5x5 Bind)	4	
3	YTF7K05590B3	Front Panel Assembly (Attached Shutter)	1	3
4	YTF6J01810B4	Button (For Eject)	1	3
5	YTF4H01602B4	Lever (For Holder Mounting)	1	
6	YTF4H01614B4	Lever (For Auto Shutter)	1	
7	XSN2 + 5FX	Screw (M2 x 5Pan Head)	2	
8	YTF2C03191B4	FPC Clamp	1	
9	YTF7K06222B3	Holder Assembly	1	
10	YTF4J01594B4	Spring (For Auto Shutter)	1	
11	XSN25 + B5FX	Screw (M2.5 x 5 Sems)	1	
12	XSN25 + 5FX	Screw (M2.5 x 5 Pan Head)	2	
13	YTF2C02781B4	Clamp (End)	1	
14	YTF2C02792B4	Clamp(Left)	1	
15	YTF4H01470B4	Shaft (Long)	1	
16	YTF4H01480B4	Shaft (Short)	1	
17	YTF1E00411B4	Screw (For Stepper Motor Mounting)	2	
18	YTF4J00861B4	Spring (For Eject Lever)	2	
19	YTF4J02190B4	Spring (For Trigger Lever)	1	
20	YTF1K00441B4	Stopper A	1	
21	YTF7K01853B4	Lever Assembly (Trigger)	1	
22	YTUF384EJT	Lever (For Eject,Attached Button)	1	
23	YTF1K00530B4	Stopper F	1	
24	YTF1K00391B4	Stopper C	2	
25	YTF1K00510B4	Stopper E	1	
26	YTF4S00800B4	Roller (For Eject)	1	
27	YTF4S01680B4	Roller (For Eject)	1	
28	YTF1K00121B4	Washer	1	
29	YTF1K00363B4	Washer B	1	
30	YTF1K00370B4	Washer C	2	
31	YTF3D04830B4	Limiter (TRKφ)	1	
32	YTUF384DET	Disk Detect Assembly	1	1
33	YTUFS363T0	Sensor Assembly (For TRKφ)	1	1
34*	YTFMD00653B4	Stepper Motor	1	2
35*	YTUF386HD	Head Assembly	1	2
36*	YTF7K01843B3	Steel Belt Assembly	1	
37*	YTF1E00421B4	Screw (For Steelbelt & Head Mounting)	1	
38*	XYN2 + 3FN	Screw (For Steelbelt & Pulley Mounting)	1	
39*	LPW2 – 025	Washer (For Steelbelt & Pulley Mounting)	2	
40*	YTUF363BK-R3	Bracket Assembly (Right)	1	
41	YTUF363BK-L3	Bracket Assembly(Left)	1	
42	YTF2P03050B4	Collar (For Bracket)	4	
43	YTF2P03460B4	Spacer (For Bracket)	4	
44	XSB25 + 10FX	Screw (For Bracket)	4	
45	YTF2P03291B4	Insulating Paper	1	
46	YTUF386PK-CN	Control Print Circuit Board Assembly	1	※ 1
47	YTUF386DM	Base D-Motor Assembly(49 + 50 + 51)	1	2
48	YTF1E00600B4	Screw (For Cover)	2	
49	YTF1E00540B4	Screw (For Front Panel)	2	
50	D2ZP-101	Micro Switch (On Motor PCB)	1	1
51	LN28RP	LED (On Motor PCB)	1	1
52	YTF1E00550B4	Screw (For Disk Detect Assembly)	1	
53	3B23KL99999	Damper	1	
54	YTF2105691B4	Damper Angle	1	
55	XSB2 + 4FX	Screw (M2 x 4 Bind)	2	
56	XYN25 + 3FX	Screw (M2.5 x 3 Sems)	1	
57	YTF2C05740B3	Clamp Right	1	
58	YTF4A02680B4	Head Hanger	1	
59	YTF4H02691B4	Shaft	1	
60	YTF4J02700B4	Hanger Spring	1	
61	TE-3	Retaining Ring	3	

Caution : 1. PCB Assembly is produced to order during the production period only.
2. When you order the aforementioned parts, be sure to specify "Part No." of the parts ordered.
3. When replacing the parts marked with *,steel belt assembly and steel belt fixing jigs are required.

REPLACEMENT PARTS LIST

MODEL : JU - 394 - 01

Ref.No.	Part No.	Part Name & Description	Per Set (pcs.)		Recommend Service Parts per 1,000 Units
1	YTF5E02050B3	Cover	1		
2	XSB25 + 5FX	Screw (M2.5x5 Bind)	4		
3	YTF7K05590B3	Front Panel Assembly (Attached Shutter)	1		3
4	YTF6J01810B4	Button (For Eject)	1		3
5	YTF4H01602B4	Lever (For Holder Mounting)	1		
6	YTF4H01614B4	Lever (For Auto Shutter)	1		
7	XSN2 + 5FX	Screw (M2 × 5Pan Head)	2		
8	YTF2C03191B4	FPC Clamp	1		
9	YTF7K06222B3	Holder Assembly	1		
10	YTF4J01594B4	Spring (For Auto Shutter)	1		
11	XSN25 + 85FX	Screw (M2.5 × 5 Sems)	1		
12	XSN25 + 5FX	Screw (M2.5 × 5 Pan Head)	2		
13	YTF2C02781B4	Clamp (End)	1		
14	YTF2C02792B4	Clamp(Left)	1		
15	YTF4H01470B4	Shaft (Long)	1		
16	YTF4H01480B4	Shaft (Short)	1		
17	YTF1E00411B4	Screw (For Stepper Motor Mounting)	2		
18	YTF4J00861B4	Spring (For Eject Lever)	2		
19	YTF4J02190B4	Spring (For Trigger Lever)	1		
20	YTF1K00441B4	Stopper A	1		
21	YTF7K01853B4	Lever Assembly (Trigger)	1		
22	YTUF384EJT	Lever (For Eject,Attached Button)	1		
23	YTF1K00530B4	Stopper F	1		
24	YTF1K00391B4	Stopper C	2		
25	YTF1K00510B4	Stopper E	1		
26	YTF4S00800B4	Roller (For Eject)	1		
27	YTF4S01680B4	Roller (For Eject)	1		
28	YTF1K00121B4	Washer	1		
29	YTF1K00363B4	Washer B	1		
30	YTF1K00370B4	Washer C	2		
31	YTF3D04830B4	Limiter (TRKφ)	1		
32	YTUF384DET	Disk Detect Assembly	1		1
33	YTUF5363T0	Sensor Assembly (For TRKφ)	1		1
34*	YTFMD00653B4	Stepper Motor	1		2
35*	YTUF394HD	Head Assembly	1		2
36*	YTF7K01843B3	Steel Belt Assembly	1		
37*	YTF1E00421B4	Screw (For Steelbelt & Head Mounting)	1		
38*	XYN2 + 3FN	Screw (For Steelbelt & Pulley Mounting)	1		
39*	LPW2 – 025	Washer (For Steelbelt & Pulley Mounting)	2		
40*	YTUF363BK-R3	Bracket Assembly (Right)	1		
41	YTUF363BK-L3	Bracket Assembly (Left)	1		
42	YTF2P03050B4	Collar (For Bracket)	4		
43	YTF2P03460B4	Spacer (For Bracket)	4		
44	XSB25 + 10FX	Screw (For Bracket)	4		
45	YTF2P03291B4	Insulating Paper	1		
46	YTUF394PK-CN	Control Print Circuit Board Assembly	1	※	1
47	YTUF394DM	Base D-Motor Assembly(49 + 50 + 51)	1		2
48	YTF1E00600B4	Screw (For Cover)	2		
49	YTF1E00540B4	Screw (For Front Panel)	2		
50	D2ZP-101	Micro Switch (On Motor PCB)	1		1
51	LN28RP	LED (On Motor PCB)	1		1
52	YTF1E00550B4	Screw (For Disk Detect Assembly)	1		
53	3B23KL99999	Damper	1		
54	YTF2T05691B4	Damper Angle	1		
55	XSB2 + 4FX	Screw (M2 × 4 Bind)	2		
56	XYN25 + 3FX	Screw (M2.5 × 3 Sems)	1		
57	YTF2C05740B3	Clamp Right	1		
58	YTF4A02680B4	Head Hanger	1		
59	YTF4H02691B4	Shaft	1		
60	YTF4J02700B4	Hanger Spring	1		
61	TE-3	Retaining Ring	3		

Caution : 1. PCB Assembly is produced to order during the production period only.
2. When you order the aforementioned parts, be sure to specify "Part No." of the parts ordered.
3. When replacing the parts marked with *,steel belt assembly and steel belt fixing jigs are required.

REPLACEMENT PARTS LIST OF PCB

MODEL : JU - 386 - 01

Component Side (Top)

Ref.No.	Part No.	Part Name & Description	Per Set (pcs.)	Recommend Service Parts per 1,000 Units
C11,15	R23E105ZF	Ceramic Capacitor	2	
C18,19	ECEA1CKS100	Electrolyte Capacitor	2	
IR1	RGLD9X102J	Block Resistor	1	
R	MCR18EZHJ000	Chip Resistor	1	
R4	ERG1SJ271	Metal Film Resistor	1	
R44	MCR18EZHG822	Chip Resistor	1	
CN1	FCN-725P034	Connector	1	
CN2	171826-4	Connector (Power)	1	
CN4	4PS2L225EFK	Connector	1	
CN5	B09-DR-S	Connector	1	
CN7	A2020001801	Connector	1	
CN8	A0510018O1	Connector	1	
P1,2,3,4,5,6	A020000805	Connector (Short Plug)	6	
L1,2	FNC00030B432	Choke Coil	2	
L3,4	FNC00030B424	Low-Frequency Coil	2	1
L5	FNC00030B428	Choke Coil	1	1
L6	BL01RN1A62T5	Choke Coil (Ferrite Beads)	1	1
L7	SN-3-2002	Choke Coil	1	1
L8	ELEBD330KA	Choke Coil	1	1
IC1	HA13421AMP	LSI	1	2
IC2	FQL00210B4	LSI	1	2
IC3	FQL00310B4	LSI	1	2
IC4	HA16651MP	LSI	1	2
IC5	M301PC-A	IC	1	2
X1	EFOFC4004A4	Resonator	1	1
VR1	EVMLJGA00B24	Variable Resistor	1	1
T	JPW-02A	Inverter	1	

Solder Side (Bottom)

Ref.No.	Part No.	Part Name & Description	Per Set (pcs.)	Recommend Service Parts per 1,000 Units
C1,12	FCC00020B401	Chip Capacitor	2	
C2	FCC00010B438	Chip Capacitor	1	
C3	FCC00010B456	Chip Capacitor	1	
C4,5	FCC00030B420	Chip Capacitor	2	
C6,7	FCC00010B458	Chip Capacitor	2	
C8	FCC00010B436	Chip Capacitor	1	
C9	FCC00010B442	Chip Capacitor	1	
C10,17	FCC00150B400	Chip Capacitor	2	
ID1	DAN202KT-96	Diode Array	1	2
D2	DAP202KT-96	Diode	1	2
D3	MA159-TX	Chip Diode	1	1
Q2	3SK144R-TW	Transistor	1	2
Q3,7,8,9,10,11,13,14	UN2213-TX	Transistor	8	2
Q12	UN2211-TX	Transistor	1	2
Q15	UN2111-TX	Transistor	1	2
R1,2,9	MCR18EZHJ822	Chip Resistor	3	
R3,17	MCR18EZHJ682	Chip Resistor	2	
R7,8	MCR18EZHJ391	Chip Resistor	2	
R11,13	MCR18EZHJ473	Chip Resistor	2	
R12	MCR18EZHJ621	Chip Resistor	1	
R15,33,34,36,41,42	MCR18EZHJ392	Chip Resistor	6	
R16,18,31	MCR18EZHG393	Chip Resistor	3	
R19	MCR18EZHG682	Chip Resistor	1	
R20	MCR18EZHG153	Chip Resistor	1	
R29	MCR18EZHJ181	Chip Resistor	1	
R30	MCR18EZHJ331	Chip Resistor	1	
R32	MCR18EZHJ472	Chip Resistor	1	
R37,38,39,40	MCR18EZHJ103	Chip Resistor	4	
R35	MCR18EZHJ105	Chip Resistor	1	
CN3	PJC0015084	Connector	1	
CN6	ILS4P52T2EF	Connector	1	

REPLACEMENT PARTS LIST OF PCB

MODEL : JU - 394 - 01

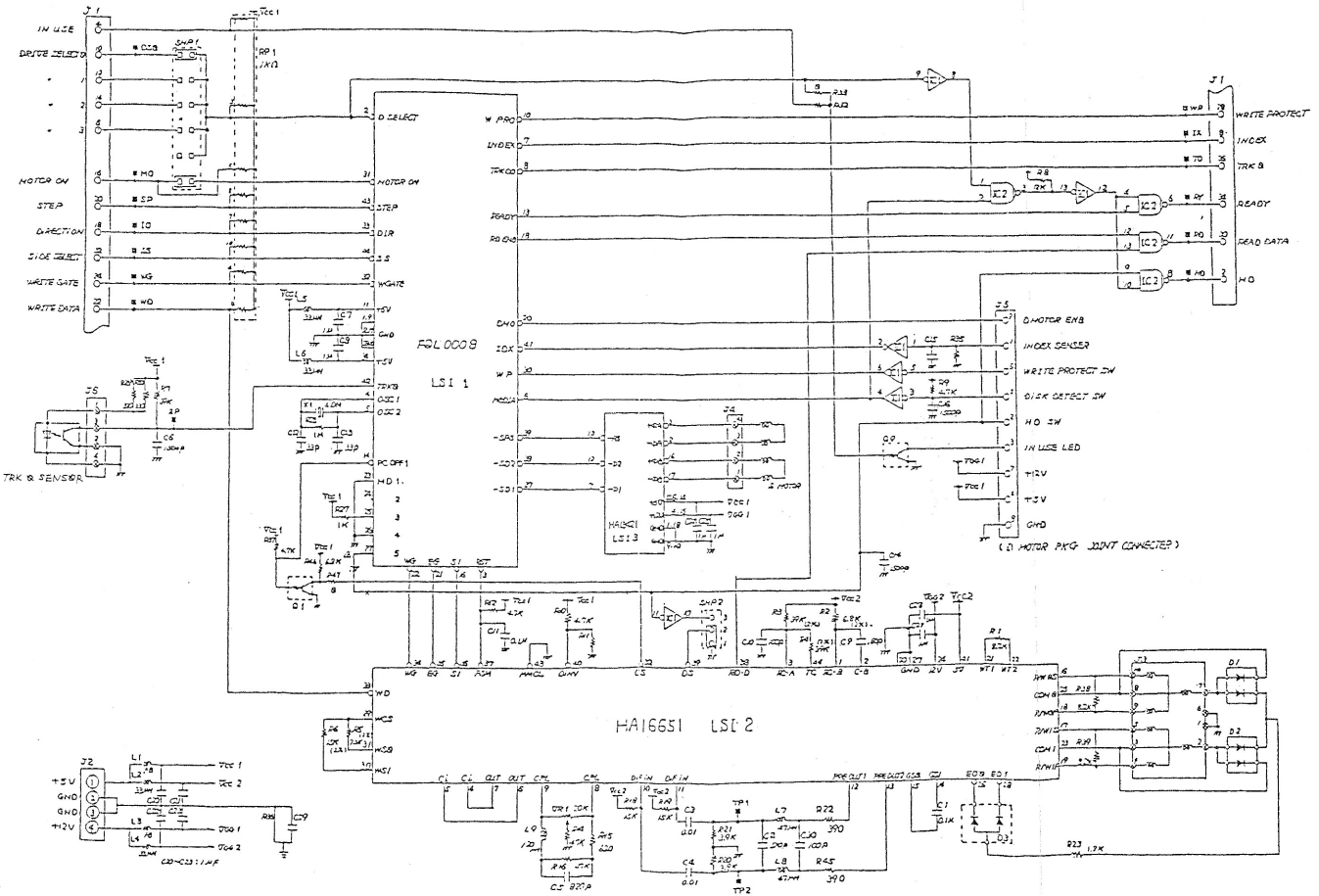
Component Side (Top)

Ref.No.	Part No.	Part Name & Description	Per Set (pcs.)	Recommend Service Parts per 1,000 Units
C11,15	R23E1052F	Ceramic Capacitor	2	
C18,19	ECEA1CKS100	Electrolyte Capacitor	2	
IR1	RGLD9X102J	Block Resistor	1	
R	MCR18EZHJ000	Chip Resistor	1	
R4	ERG1SJ271	Metal Film Resistor	1	
CN1	FCN-725P034	Connector	1	
CN2	171826-4	Connector (Power)	1	
CN4	4PS2L225EFK	Connector	1	
CN5	B09-DR-S	Connector	1	
CN7	A202001801	Connector	1	
CN8	A051001801	Connector	1	
P1,2,3,4,5,6	A020000805	Connector (Short Plug)	6	
L1,2	FNC00030B433	Choke Coil	2	
L3,4	FNC00030B424	Low-Frequency Coil	2	1
L5	FNC00030B428	Choke Coil	1	1
L6	BL01RN1A62T5	Choke Coil (Ferrite Beads)	1	1
L7	SN-3-2002	Choke Coil	1	1
L8	ELEBD330KA	Choke Coil	1	1
IC1	HA13421AMP	LSI	1	2
IC2	FQL00210B4	LSI	1	2
IC3	FQL00310B4	LSI	1	2
IC4	HA16651MP	LSI	1	2
IC5	M301PC	IC	1	2
X1	EFOFC4004A4	Resonator	1	1
VR1	EVMLJGA00B24	Variable Resistor	1	1
T1	JPW-02A	Inverter	1	

Solder Side (Bottom)

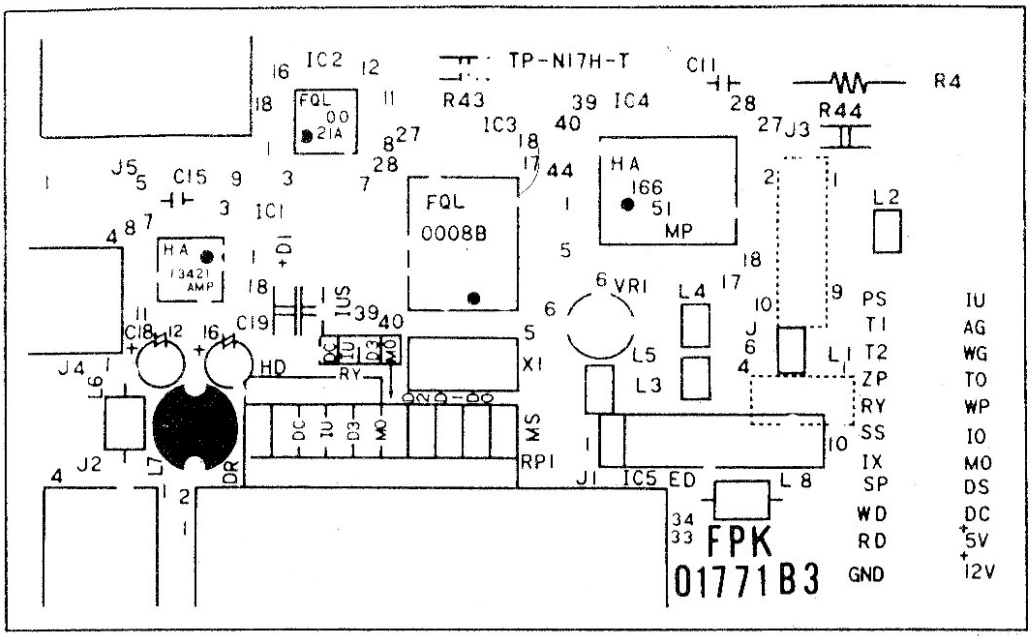
Ref.No.	Part No.	Part Name & Description	Per Set (pcs.)	Recommend Service Parts per 1,000 Units
C1,12	FCC00020B401	Chip Capacitor	2	
C2	FCC00010B438	Chip Capacitor	1	
C3	FCC00010B456	Chip Capacitor	1	
C4,5	FCC00030B420	Chip Capacitor	2	
C6,7	FCC00010B458	Chip Capacitor	2	
C8	FCC00010B436	Chip Capacitor	1	
C9	FCC00010B442	Chip Capacitor	1	
C10,17	FCC00150B400	Chip Capacitor	2	
CN3	FJC00150B4	Connector	1	
CN6	ILS4PS2T2EF	Connector	1	
ID1	DAN202KT-96	Diode Array	1	2
D2	DAP202KT-96	Diode	1	2
D3	MA159-TX	Chip Diode	1	1
Q1,3,7,8,9,10,11,13,14	UN2213-TX	Transistor	9	2
Q2	3SK144R-TW	Transistor	1	2
Q12	UN2211-TX	Transistor	1	2
R1,2,9	MCR18EZHJ822	Chip Resistor	3	
R3	MCR18EZHJ183	Chip Resistor	1	
R17	MCR18EZHJ682	Chip Resistor	1	
R7,8	MCR18EZHJ391	Chip Resistor	2	
R11,13	MCR18EZHJ473	Chip Resistor	2	
R12	MCR18EZHJ561	Chip Resistor	1	
R14,15,33,34,36,41,42	MCR18EZHJ392	Chip Resistor	7	
R16,18,31	MCR18EZHG393	Chip Resistor	3	
R19	MCR18EZHG822	Chip Resistor	1	
R20	MCR18EZHG153	Chip Resistor	1	
R29	MCR18EZHJ181	Chip Resistor	1	
R30	MCR18EZHJ331	Chip Resistor	1	
R32	MCR18EZHJ472	Chip Resistor	1	
R35	MCR18EZHJ105	Chip Resistor	1	
R37,38,39,40	MCR18EZHJ103	Chip Resistor	4	

15. SCHEMATIC DIAGRAM OF CONTROL BOARD [JU-384]

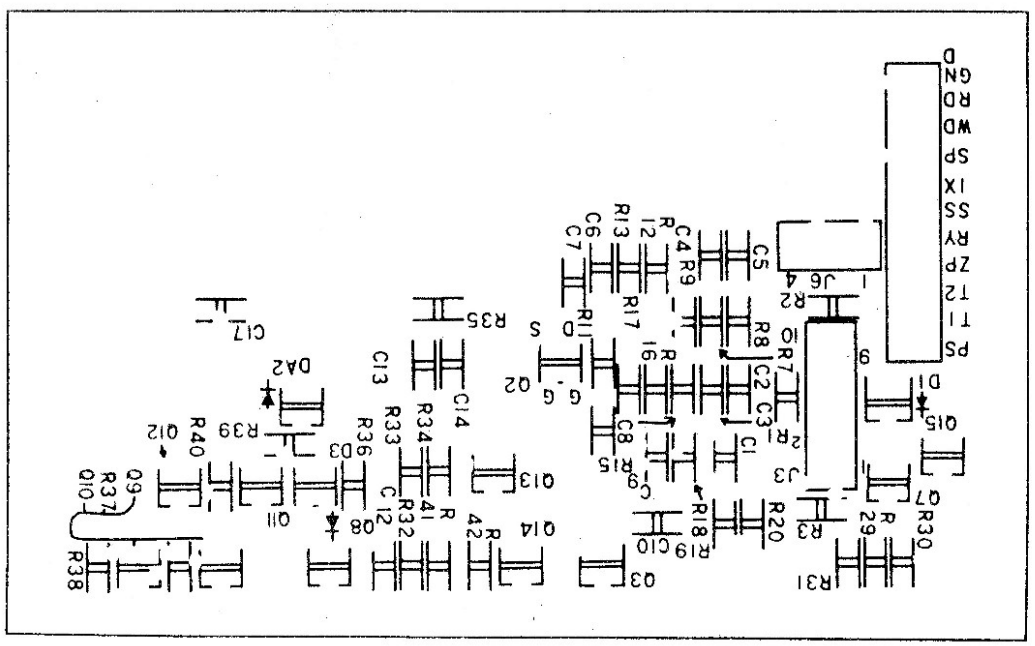


16. CIRCUIT BOARD [JU-386]

Component Side (TOP)

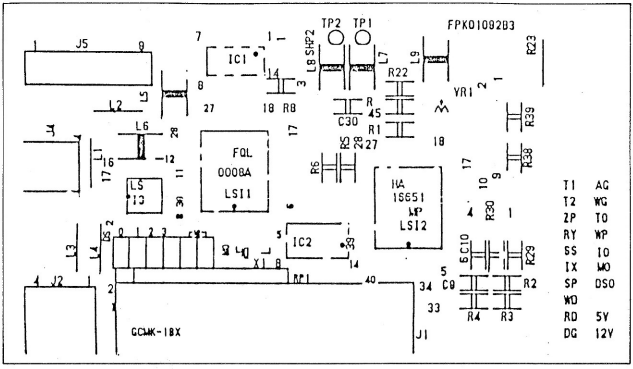


Solder Side (Bottom)

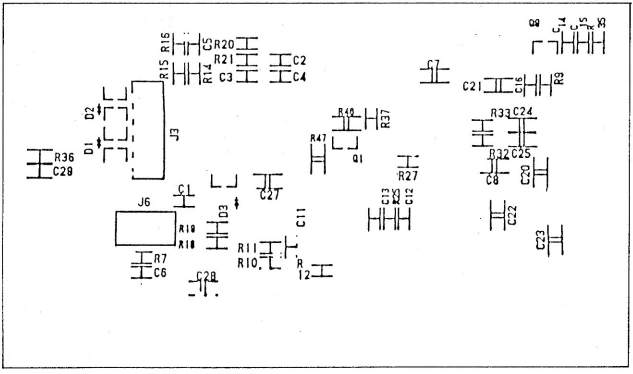


CIRCUIT BOARD [JU-384]

Component Side (TOP)



Solder Side (Bottom)



F2-1 SM. P1

1. SCHEMATIC DIAGRAM

1-1. PCBs M4191-MA1M and -CN2M