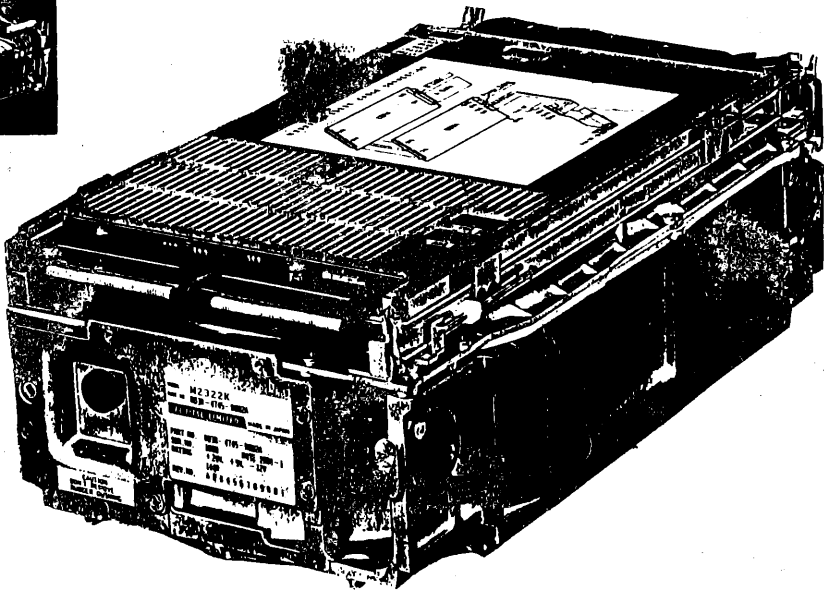


OEM MICRODISK DRIVES

M2321K M2322K

8-inch Winchester-type fixed disk drives
with 84- and 168-megabyte capacities
INSTALLATION GUIDE



FUJITSU

C O N T E N T S

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1. SPECIFICATION

1.1 Unit Specifications

The basic specification of the disk drive are as follows:

Table 1.1.1. Basic Specifications

Model	Specification	Storage Capacity
M2321K	B03B-4745-B001A	84M bytes
M2322K	B03B-4745-B002A	168M bytes

Physical Specifications

Table 1.1.2. Physical Specifications

Item	Conditions	Specifications
Dimension	Height	127mm (5.0")
	Width	216mm (8.5")
	Depth	380mm (15.0")
Weight*		13.6kg (301bs)
Temperature	Operating	5°C to 40°C (41°F to 140°F)
	Non-Operating	-40°C to 60°C (-40°F to 140°F)
	Gradient	Less than + 15°C/hour
Humidity	Operating	20% to 80% RH
	Non-operating	5% to 95% RH (Non-condensation)
Vibration resistance	Operating	Less than 0.2G (3 to 60Hz) (2 mins in both ways x 30-cycle sine wave)
	Non-operating	Less than 0.4G (3 to 60Hz) (2 mins in both ways x 30-cycle sine wave)
	Transporting and storing	Less than 3G (non-cyclic)
Altitude	Operating	Less than 3,000m (10,000 feet)
	Non-operating	Less than 12,000m (40,000 feet)
Dust		Less than 0.168 mg/m ³ (Stearic acid standard)

*Optional units are excluded.

Power Requirements

The M2312K and M2322K requires +5V, -12V and +24V DC voltages from an optional power supply or system power supply. Each load current required by the drive is shown in Table 1.1.3.

Table 1.1.3. DC Power Requirement

DC Voltage	Load Current (Basic)	Load Current(with Dual Port)
+5V ± 5%	3.5A	4.5A
-12V ± 5%	3.0A	4.0A
+24V ± 10%	3.6 Arms (Effective, typical)	
	7.2 Ao.p (Maximum)	
	4.6 Arms (POW ON; Effective typical)	

Note: The D.C. return lines must be made electrically common at the Power Supply when using other than the optional Fujitsu Power Supply. Failure to commonize these lines will result in premature failure of the spindle motor circuit.

1.2 CONFIGURATION

1.2.1 Fundamental Unit Configuration

Figure 1.2.1 shows the fundamental configuration of the unit; Figure 1.2.2. shows the block diagram.

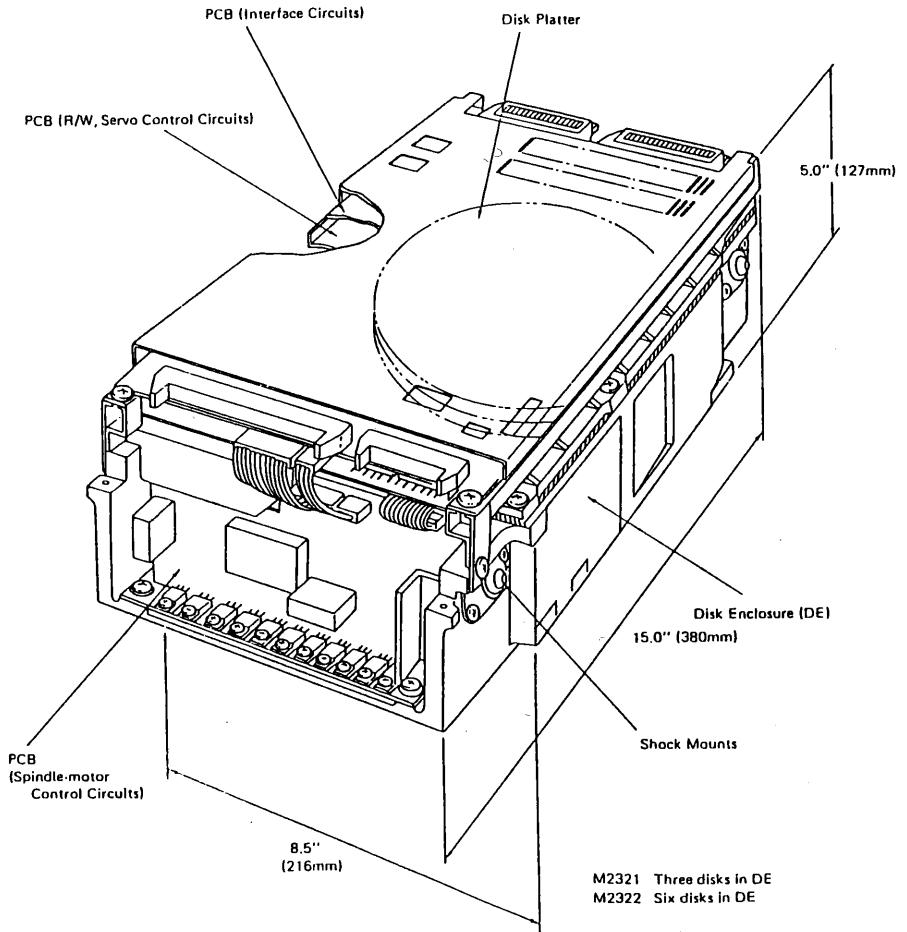


Figure 1.2.1. Fundamental Configuration

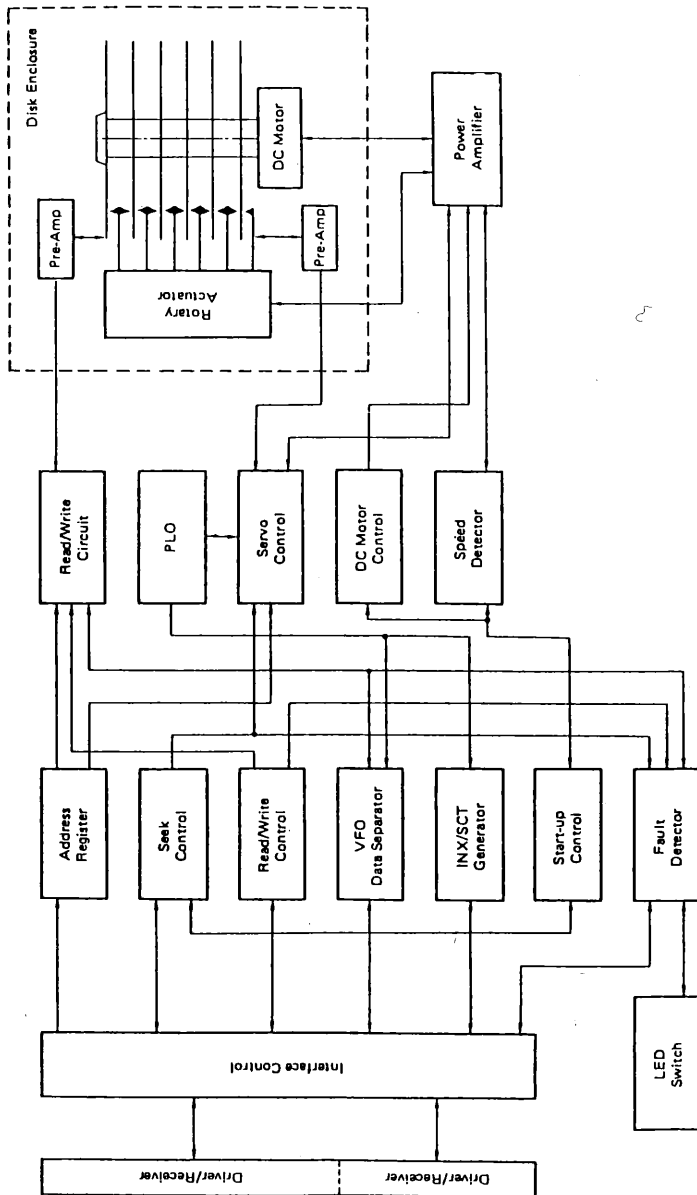
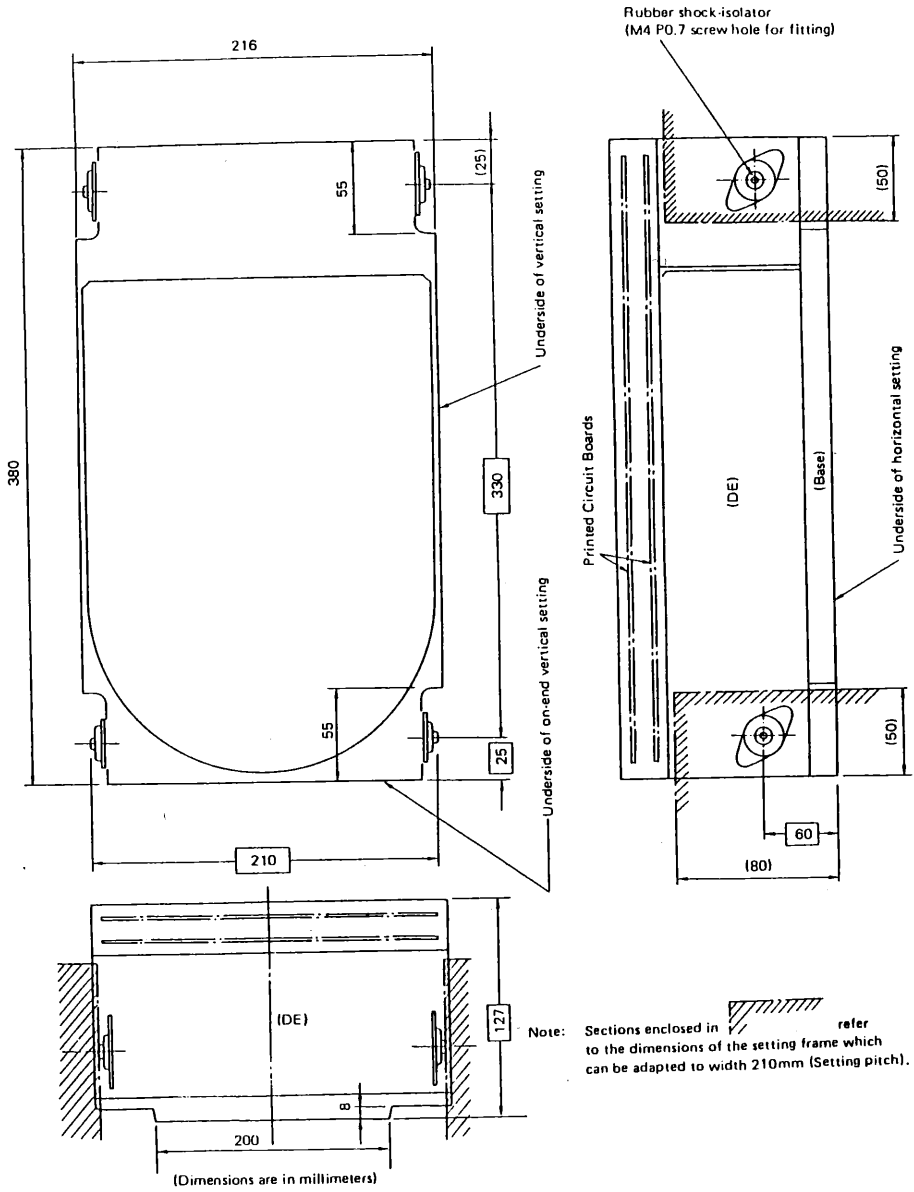


Figure 1.2.2. Block Diagram



1.2.3. Mounting Dimensions of the Unit

1.4 CABLING

1.4.1. Connectors on Unit Side

Figure 1.4.1. shows the mounting positions of the interface connectors on the drive side.

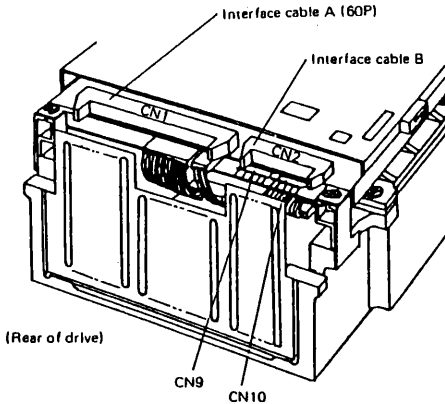


Figure 1.4.1. Mounting Positions of Connectors

Cables include an interface (A) cable 60P, an interface (B) cable 26P, and a power cable.

Refer to Section 1.5. for additional information on the power cable.

Power Cable Connection

The M232XK uses only DC power, Connector specification for the unit, recommended specifications for the cable, and pin assignment and voltages follows.

(1) Specification on the unit side

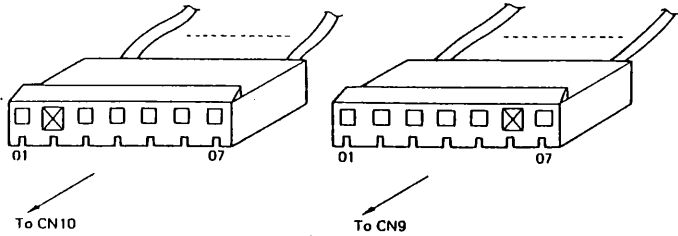
Header C63L-0820-0008 (2420-07 A-G manufactured by Molex Japan Co. Ltd.)
(7P) x 2 pieces

(2) Recommended specifications on the cable side

- Housing C63L-0820-0007 (2139-7 manufactured by Molex Japan Co. Ltd.)
(7P) x 2 pieces
- Contact C63L-0820-0002 (2478-GL manufactured by Molex Japan Co. Ltd.)
(12 pieces)
- Key C63L-0820-0001 (2560-1 manufactured by Molex Japan Co. Ltd.)
(2 pieces)

(3) Pin Assignment and voltages

Refer to Figure 1.5.1.



(CN10)		(CN9)
1	0V (-12V RTN)	1 +5V
2	(Key)	2 +5V
3	0V (-12V RTN)	3 0V (+24V RTN)
4	-12V	4 0V (+24V RTN)
5	-12V	5 +24V
6	0V (+5V RTN)	6 (Key)
7	0V (+5V RTN)	7 +24V

- Note: 1 Use ANG 18 as the cable material.
 2 The cable length must be less than 1.5m.
 3 All "0V" must be connected together at power supply outputs.

Figure 1.5.1. Pin Assignment and Voltages

If the power supply (option: B14L-5105-0100A) is used, the following power cable is provided, (refer to Figure 1.5.2.)

Specification: B660-0625-T327A or
 B660-1995-T041A (with DC Fan Unit)

Specify the length of the power cable as follows [for 50 cm (example)]:

B660-0625-T327A #L500R0
 Cable specification 500 x 10⁰ (mm)

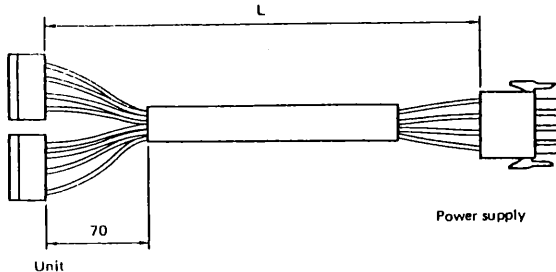


Figure 1.5.2. Power Cable (Specification: B660-0625-T327A)

1.6 19" Rack Mount Installation

A mounting-tray with brackets is available to install two drives, side by side in a 19" rack, three pitches. It can also accommodate the optional fan units and/or power supply units for each of the two drives.

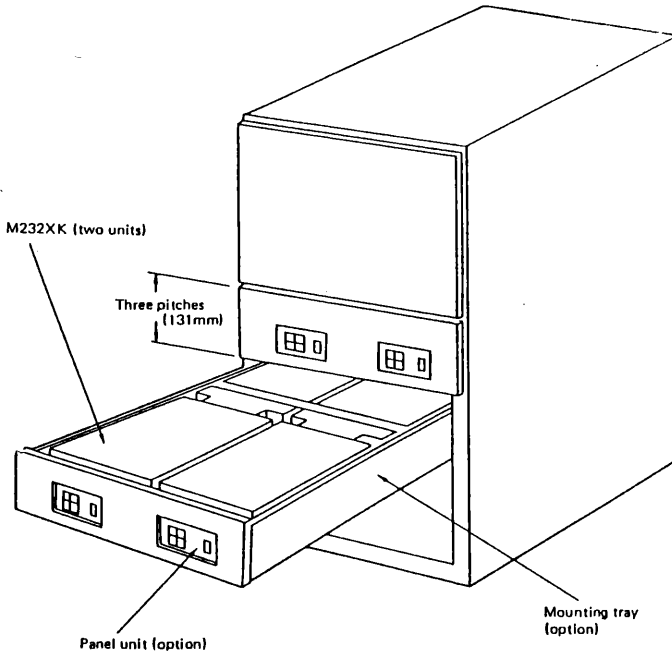
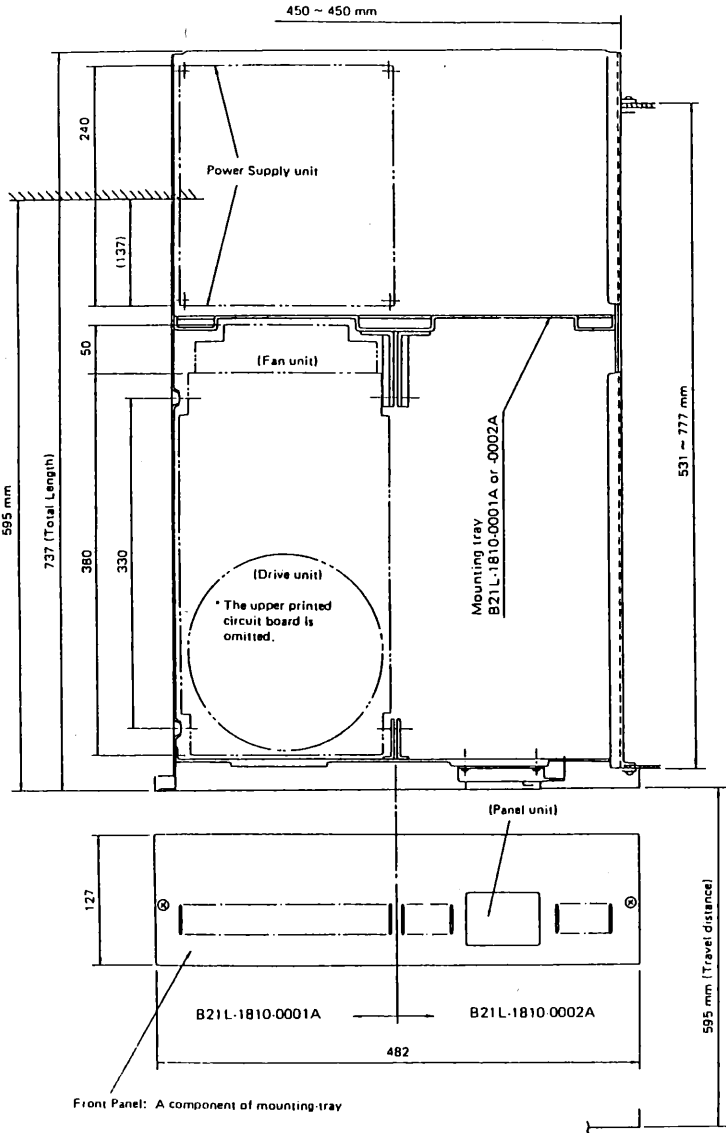


Figure 1.6.1. 19" Rack Mount Installation

The mounting-tray (inner frame) guided by brackets (outer frame) can be drawn out forward. (Travel distance is approximately 24").

The 19" rack mounting method is illustrated in Figure 1.6.1 and Figure 1.6.2 shows the appearance when the units are mounted using the mounting-tray and brackets.



Note: Mounting-tray (0001A) cannot accommodate the drive unit with Panel unit. In that case, 0002-type must be specified.

Figure 1.6.2. Mounting-Tray and Brackets

1.8 Power Supply

The optional power supply can be provided with the M232XK. The front view of the power supply is shown in Figure 1.8.1.

Main Line Switch

This switch controls application of site AC power to the power supply. Turning on the switch applies power to an optional fan unit and DC Power to the disk drive.

Indicators (LEDs)

(1) Power On LED

The Power On LED indicates that AC input is applied to the power supply.

(2) Power Alarm LED

The Power Alarm indicates the following malfunction has occurred on the power supply:

- . +5 VDC: Over-current, Over-voltage and Non-voltage
- . -12VDC: Over-current and Non-voltage
- . +24VDC: Over-current and Non-voltage
- . Over heat within the power supply

Device Alarm

The Device Alarm indicates that the thermal switch has to be closed on the optional fan.

(3) There are currently two types of PSU

- . B14L-5105-0100A UL + CSA approved
- . B14L-5105-0178A UL + CSA IEC 380 approved

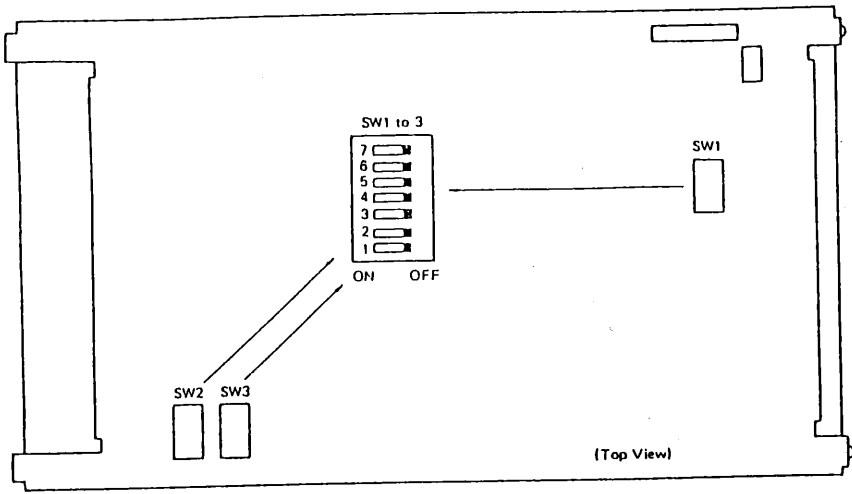


Figure 2.1.1. Mode Select Switch Location

2.1 Disk Addressing

Disk Logical Unit Number 0 to 7 is selected by SW1 at location E3 on the CZFM PCB assembly. Set the desired disk address with the three keys on SW1 using the binary code as shown in Table 2.1.1.

Table 2.1.1. Disk Addressing

Disk Address	Key 1 2 ¹	Key 2 2 ²	Key 3 2 ³
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

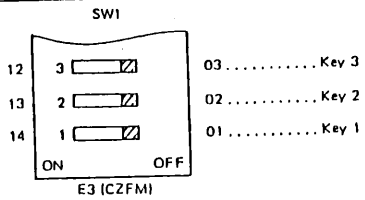


Figure 2.1.2. Disk Addressing

2.2 Sector Mode

The customer can select Hard Sector mode (1 to 128 sectors) or Variable Soft Sector mode, using Key 6 on SW1 at location E3 on the CZFM PCB assembly according to Table 2.2.1. as shown in Figure 2.2.1.

In the case of Hard Sector, the customer must set the number of sectors per disk revolution as described in Section 2.7. Setting the number of sectors per revolution is also available in the Variable Soft Sector mode.

Table 2.2.1. Sector Mode

Sector Mode	Key 6
Hard Sector	OFF
Variable Soft Sector	ON

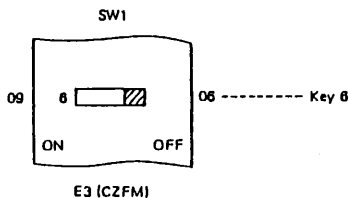


Figure 2.1.1. Sector Mode

2.3 Tag 4/5 Enable

The M232X provides optional Tag 4 and Tag 5 functions. The customer may disable or enable these optional functions using Key 5 on SW1 at location E3 on the CZFM PCB assembly. Refer to Figure 2.3.1. Disabling the Tag 4 and Tag 5 functions inhibits the receivers of Tag 4 and Tag 5 receivers on the interface.

Table 2.3.1. Tag 4/5 Enable

Tag 4/5	Key 5
Disable	OFF
Enable	ON

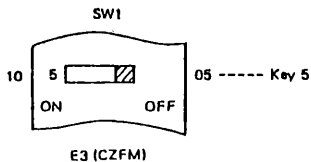


Figure 2.3.1. Tag 4/5 Enable

2.4 File Protect

When the customer desires to inhibit the write operation, the File Protect key may be set to the On position, using Key 7 on SW1 at location E3 on C3FM PCA assembly. Refer to Figure 2.4.1.

Table 2.4.1. File Protect

File Protect	Key 7
Enable writing	OFF
Disable writing	ON

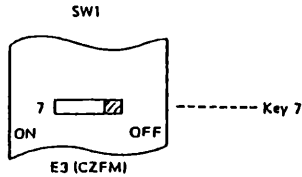


Figure 2.4.1. File Protect

2.5 Device Type (optional)

The device type, M2321K or M2322K, can be selected by setting key 4 on SW1.

Table 2.5.1. Device Type

Device Type	Key 4
M2321	OFF
M2322	ON

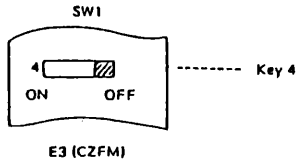


Figure 2.5.1. Device Type

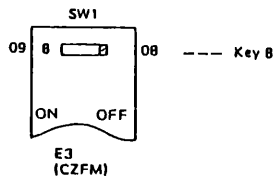
Note) Tag 4/5 feature must be enabled to obtain device type code.

2.6 Orientation

ON END INSTALLATION

Table 2.6.1. On-End Switch

Mount Mode	Key 8
On-end	ON
Other	OFF

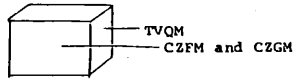
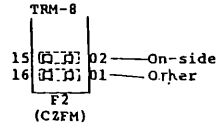


NOTE: TVQM PCB must be positioned at the top of the unit for correct installation.

2.6.1 On Side Installation

Table 2.6.2. On Side Switch

Mount Mode	TRM-8
On-side	02 - 15
Other	01 - 16



NOTE: This additional item was added in order to improve the margin against a "Write off Track" condition, and is only relevant to units with Revision B6 and upwards.

2.7 Sector Counting

Sector count configuration switches SW2 and SW3 are located at A26 and A24 respectively on the CZFM PCB assembly. Each key of SW2 and SW3 represents the binary powers of the Byte Clock as shown in Table 2.7.1.

Table 2.7.1. Sector Counting Keys

SW2 Key No.	Value	SW3 Key No.	Value
1	1	1	128
2	2	2	256
3	4	3	512
4	8	4	1024
5	16	5	2048
6	32	6	4096
7	64	7	8192

SW2 and SW3 keys must be set according to the number of bytes per sector. Knowing that the number of bytes possible on a track equals 20,480, any sectoring requirements from 1 to 128 sectors per track can be configured using the following formulas:

(1) Calculation based on Sectors/Track

EXAMPLE

(Calculations for 9 Sectors)

$$1) \frac{20,480}{\text{Number of Sectors}} = \text{Number of bytes per sector}$$

$$\frac{20,480}{9} = 2,275.555$$

- 2) If the above calculation results in a remainder, truncate the remainder and add one to the integer portion of "number of bytes per sector".

$$2,275 + 1 = 2,276$$

EXAMPLE

(Calculations for 9 Sectors)

- 3) Configure SW2 and SW3 to "number of bytes per sector" minus one to allow for sector counter reset clock.

$$2,276 - 1 = 2,275$$

$$2,275 = 2,048 + 128 + 64 + 32 + 2 + 1$$

<u>Keys must be "ON":</u>	Key 1	<u>5</u>	<u>1</u>	<u>7</u>	<u>6</u>	<u>2</u>	<u>1</u>
		SW3			SW2		

- 4) To determine how many bytes (if any) the last sector of each track will be short, multiply "number of bytes per sector" by "number of sectors" and subtract 20,480.

$$2,276 \times 9 = 20,484$$

$$- \underline{20,480}$$

Last sector short 4 bytes

(2) Calculation based on Bytes/Sector

Example: 583 Bytes/Sector

- 1) Calculate the value to be set = 16,384 - (Byte/Sector)
(Particular Value)
= 16,384 - 583
= 15,801

- 2) Select the keys must be OFF position referring to Table 3.7.7. after the following calculation

$$15,801 = 8,192 + 4,096 + 2,048 + 1,024 + 256 + 128 + 32 + 16 + 8 + 1$$

<u>Keys must be "OFF":</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>2</u>	<u>1</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>1</u>
			SW3					SW2		

- 3) Calculate the Sectors/Track

$$\text{Sectors/Track} = \frac{\text{Bytes/Track}}{\text{Bytes/Sector}}$$

$$= \frac{20,480}{583}$$

$$= 35,129$$

- 4) If the above calculation results in a remainder, truncate the remainder. The integer portion means actual sectors per track.

$$\text{Actual Sectors/Track} = 35$$

- 5) Calculate the number of the last sector (remainder).

$$\text{Last Sector Length} = 20,480 - (\text{Bytes/Sector}) \times (\text{Sectors/Track})$$

$$= 20,480 - 583 \times 35$$

$$= 75$$

Table 2.7.2. Sector Selection

Sector	SW2	SW3	Byte/Sector	Last Sector Shorter
	1234567	1234567		
1			20,480	0
2	1111111	1111001	10,240	0
3	0101010	1010110	6,827	-1
4	1111111	1110010	5,120	0
5	1111111	1111100	4,096	0
6	1010101	0101100	3,414	-4
7	1011011	0110100	2,926	-2
8	1111111	1100100	2,560	0
9	1100011	1000100	2,276	-4
10	1111111	1111000	2,048	0
11	1010001	0111000	1,862	-2
12	0101010	1011000	1,707	-4
13	1110010	0011000	1,576	-8
14	0110110	1101000	1,463	-2
15	1010101	0101000	1,366	-10
16	1111111	1001000	1,280	0
17	0010110	1001000	1,205	-5
18	1000111	0001000	1,138	-4
19	1010110	0001000	1,078	-2
20	1111111	1110000	1,024	0
21	1111001	1110000	976	-16
22	0100010	1110000	931	-2
23	0101111	0110000	891	-13
24	1010101	0110000	854	-16
25	1100110	0110000	820	-20
26	1100100	0110000	788	-8
27	0110111	1010000	759	-13
28	1101101	1010000	732	-16
29	0100001	1010000	707	-23
30	0101010	1010000	683	-10
31	0010100	1010000	661	-11
32	1111111	0010000	640	0
33	0011011	0010000	621	-13
34	0101101	0010000	603	-22
35	1001001	0010000	586	-30
36	0001110	0010000	569	-4
37	1001010	0010000	554	-18
38	0101100	0010000	539	-2
39	1011000	0010000	526	-34
40	1111111	1100000	512	0
41	1100111	1100000	500	-20
42	1110011	1100000	488	-16
43	0011101	1100000	477	-31
44	1000101	1100000	466	-24
45	1110001	1100000	456	-40
46	1011110	1100000	446	-36

Table 2.7.2. Sector Selection (continued)

Sector	SW2	SW3	Byte/Sector	Last Sector
	1234567	1234567		Shorter
47	1100110	1100000	436	-12
48	0101010	1100000	427	-16
49	1000010	1100000	418	-2
50	1001100	1100000	410	-20
51	1000100	1100000	402	-22
52	1001000	1100000	394	-8
53	0100000	1100000	387	-31
54	1101111	0100000	380	-40
55	0010111	0100000	373	-35
56	1011011	0100000	366	-16
57	1110011	0100000	360	-40
58	1000011	0100000	354	-52
59	1101101	0100000	348	-52
60	1010101	0100000	342	-40
61	1111001	0100000	336	-16
62	0101001	0100000	331	-42
63	1010001	0100000	326	-58
64	1111110	0100000	320	0
65	1101110	0100000	316	-60
66	0110110	0100000	311	-46
67	1000110	0100000	306	-22
68	1011010	0100000	302	-56
69	0001010	0100000	297	-13
70	0010010	0100000	293	-30
71	0000010	0100000	289	-39
72	0011100	0100000	285	-40
80	1111111	1000000	256	0
128	1111100	1000000	160	0

- Notes: 1. "1" indicates that the key is set to ON side
 2. "0" indicates that the key is set to OFF side
 3. The last sector is equal or shorter than nominal sector

3 FAULT ISOLATION

3.1 PCB Assembly

The unit contains fault display indicators (LED's) as shown in Figure 3.1.1. These are location on CZFM PCB.

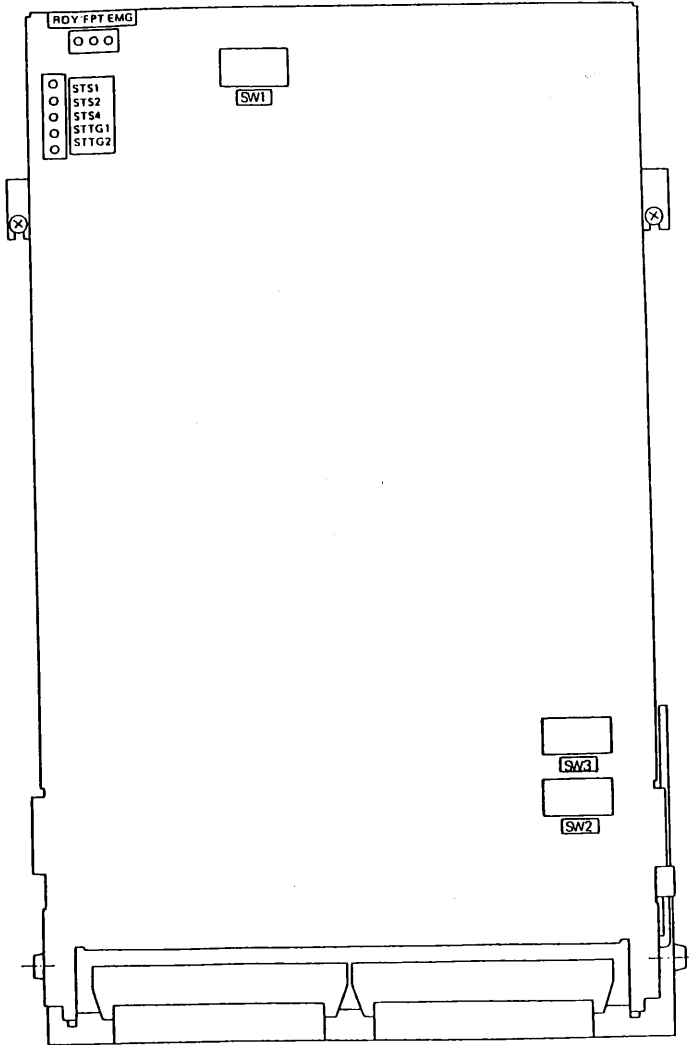


Figure 3.1.1. Fault Display Location on CZFM PCB

- (1) RDY (Ready) Indicator: Green
This RDY LED indicates that the initial seek has been performed or indicates the termination of a Seek or RTZ operation.
- (2) FPT (File Protect) Indicator: Orange
This LED indicates that writing is inhibited.
- (3) EMG (Emergency Retract) Indicator: Red
This LED indicates DC Motor Fault (DMFT) or VCM Heat (VCHHT) condition.
DMFT condition-----This LED is blinked on and off
VCHHT condition-----This LED is turned on
- (4) STS1 to 4, STTG1 and STTG2 (Status and Status Tag): Red
The two-bit binary coded Status Tag 1 and 2 LED's have the following conditions:

Status Tag 2	Status Tag 1	Condition
0	0	: Not Ready (Under the power-up sequence)
0	0 = 1	: Not Ready (Power-up Sequence Check)
0	1	: Fault
1	0	: Seek Error
1	1	: Normal Status

The Status Tag 00 has the highest priority and Status Tag 11 has the lowest priority.
Status 1, 2 and 4 LED's are defined by the above Status Tag LED's as shown in Table 3.1.1.

Table 3.1.1. Fault Indicator

Status	Status Tag		Status Bit			Code (Hex)	Fault or Normal Status	
	2	1	4	2	1		Designation	Condition
Not Ready	0	0	0	0	0	00	State 0	Power-on Reset Sequence.
			0	0	1	01	State 1	+24V Supply Sequence.
			0	1	1	03	State 3	Auto-lock Release Sequence.
			0	1	0	02	State 2	DC Motor Accelerate Sequence.
			1	1	0	06	State 6	Accelerate Complete Sequence.
			1	1	1	07	State 7	Initial Seek Sequence.
			1	0	1	05	State 5	Ready state but this state is not indicated.
Not Ready (Powerup Sequence Check)	0	0 1 1	0	0	1	0X	State 1	Indicates the condition to power up is not correct.
			0	1	1	0X	State 3	Indicates the actuator lock is not released.
			0	1	0	0X	State 2	Indicates the rotational speed is not to 94% (nominal) within the specified time.
			1	1	0	0X	State 6	Indicates the acceleration mode is not terminated within the specified time.
			1	1	1	0X	State 7	Indicates the initial seek is not terminated within the specified time or is terminated incompletely.
			1	0	1	0X	State 5	Indicates an abnormal current flows to winding of VCM or DC motor.

Table 3.1.1. Fault Indicator (continued)

Status	Status Tag		Status Bit			Code (Hex)	Fault or Normal Status	
	2	1	4	2	1		Designation	Condition
Fault	0	1	0	0	1	09	Control Check 1	Indicates a read/write command is issued during a busy condition.
			0	1	0	0A	Control Check 2	Indicates a write command is issued during a fault/check condition.
			0	1	1	0B	Write off-track	Indicates an off-track condition occurs during write operation.
			1	0	0	0C	Write Unsafe	Indicates a write operation cannot be performed due to a write circuit fault.
			1	0	1	0D	Write Protected	Indicates a write command is issued during File-protected status.
			1	1	0	0E	Read/Write Multi	Indicates multiple heads are selected during a read or write operation.
			1	1	1	0F	Emergency	Indicates over-load current flows on VCM or DC Motor.
Seek Error	1	0	0	0	1	11	RTZ Time-out	Indicates an RTZ operation is not terminated within the specified time.
			0	1	0	12	Seek Time-out	Indicates a Seek operation is not terminated within the specified time.
			0	1	1	13	Over-shoot	Indicates the head Over-shoots the target cylinder during settling time, or the head moves out during track following sequence in linear mode.
			1	0	0	14	Seek Guard Band	Indicates the guard band is detected during seek operation.
			1	0	1	15	Linear Mode Guard Band	Indicates the guard band is detected during linear mode.
			1	1	0	16	RTZ Outer Guard Band	Indicates the outer guard band is detected during RTZ operation.
			1	1	1	17	Illegal Cylinder	Indicates an illegal cylinder address (> 822) is issued by the controller.
Normal Status	1	1	0	0	1	19	Selected	Indicates the drive is selected by the controller.
			0	1	0	1A	Tag 4/5 Enabled	Indicates the optional tag 4/5 function is enabled by the key on the drive.
			1	0	0	1C	Hard Sector Mode	Indicates the sector mode is set to Hard Sector by the key on the drive.

3.2. Options

Optional items are presented in Table 3.2.1.

Table 3.2.1.

Item No.	Component name	Specification (Drawing No.)	Remarks
1-1	Fan unit	803B-4740-E002A	100/115/120V AC; 50/60 Hz
1-2	Fan unit	803B-4740-E003A	220/240V AC; 60 Hz 50Hz
1-3	Fan unit	803B-4740-E005A	+24V DC
2-1	Power supply unit	814L-5105-0100A	<ul style="list-style-type: none"> 100/115/120/220/240V AC. With connectors for feeding power to fan units and dual channel printed board unit.
3-1	Cable	8660-1065-T008A	Interface cable (A) 60P flat cable
3-2	Cable	8660-1065-T008A	Interface cable (B) 26P flat cable
3-3	Cable	8660-1865-T020A	Interface cable (A) for 2 units daisy chain
3-4	Cable	8660-1865-T030A	Interface cable (A) for 3 units daisy chain
3-5	Cable	8660-1865-T040A	Interface cable (A) for 4 units daisy chain
3-6	Cable	8660-1865-T050A	Interface cable (A) for 5 units daisy chain
3-7	Cable	8660-1865-T060A	Interface cable (A) for 6 daisy chain
3-8	Cable	8660-1865-T070A	Interface cable (A) for 7 units daisy chain
3-9	Cable	8660-1865-T080A	Interface cable (A) for 8 units daisy chain
4-1	Panel unit	803B-4590-E501A	Flat key type control panel board
5-1	Mounting tray	821L-1810-0001A	For mounting two units of 19-inch rack with 3 pitches (inside frame)
5-2	Mounting tray	821L-1810-0002A	For mounting two units of 19-inch rack with 3 pitches (inside frame), and the front panel has the windows for operating the panel unit.
6-1	Dual Channel	803B-4740-E401A	To be mounted on optional PSU.
6-2	Dual Channel	803B-4740-E402A	To be mounted on drive unit.
7-1	Power cable	8660-0625-T327A	Drive unit — power supply unit connecting
7-2	Power cable	8660-1995-T041A	Drive unit and DC (+24V) Fan unit-power supply unit connecting Cable.
8-1	Cable	8660-0625-T328A	E002A fan unit — power supply unit connecting
8-2	Cable	8660-0625-T355A	E003A fan unit connecting
9-1	Cable	8660-1995-T003A	E501A panel unit — drive unit connecting
10-1	Cable	8660-0625-T329A	Dual channel PCB assy. — Power supply unit connecting

Note: Items in the above table are optional and not fundamental components of this unit. These items must be ordered separately conforming to the above specifications as occasion demands.

NOTES

OEM MICRODISK DRIVES

FUNCTIONAL SPECIFICATIONS

		M2321K	M2322K
Storage capacity (unformatted)		84.27 megabytes	168.55 megabytes
Disks (8-inch)		3	6
Heads	Read/write	5	10
	Servo	1	1
Track capacity (unformatted)		20,480 bytes	
Tracks per cylinder		5	10
Cylinders		823	
Sectors	Fixed	2 or more (Max. 128)	
	Variable	Available	
Positioning time	Track-to-track	5 milliseconds	
	Average	20 milliseconds	
	Maximum	40 milliseconds	
Average latency time		8.3 milliseconds	
Rotational speed		3,600 rotations/minute	
Recording density		9,867 bits/inch	
Track density		683 tracks/inch	
Data transfer rate		1.2 megabytes/second	
Recording code		MFM (Modified Frequency Modulation)	
Interface code		NRZ (Non-Return-to-Zero)	
Interface		SMD (Storage Module Drive)	
Head positioning method		Servo-controlled track-following	
Start time		40 seconds (nominal)	
Stop time		Less than 40 seconds	
Options		Dual channel, A-cable, B-cable, DC power supply with AC input, cooling fan, mounting tray for standard 19-inch rack, operator panel	

PHYSICAL SPECIFICATIONS

		M2321K/M2322K
Power requirements		24VDC±10% 3.6A (effective, typical) 7.2A _{op} (maximum) 4.6A (power on, effective, typical) 5VDC±5%, 3.5A -12VDC±5%, 3A
Dimensions	Height	127mm (5.0in)
	Width	216mm (8.5in)
	Depth	380mm (15.0in)
Weight		14kg (31 lb)
Ambient temperature	Operating	5°C to 40°C (41°F to 104°F)
	Not operating	-40°C to 60°C (-40°F to 140°F)
	Gradient	Less than 15°C (27°F)/hour
Relative humidity	Operating	20% to 80% (non condensing)
	Not operating	5% to 95% (non condensing)
Vibration and shock resistance	Operating	Max. 0.2G (3Hz to 60Hz)
		Shock: max. 2G (10ms)
	Not operating	Max. 0.4G (3Hz to 60Hz)
		Shock: max. 3G (10ms)
Altitude	Operating	3,000 m (10,000 ft)
	Not operating	12,000 m (40,000 ft)

RELIABILITY SPECIFICATIONS

		M2321K/M2322K
Mean-time-between-failures (MTBF)		More than 10,000 power-on hours
Mean-time-to-repair (MTTR)		Less than 30 minutes
Component life		5 years
Error rates	Recoverable errors	10 per 10 ¹¹ bits read
	Unrecoverable errors	10 per 10 ¹⁴ bits read
	Seek errors	10 per 10 ⁴ seeks

Specifications are subject to change without notice. For the latest information, contact your local Fujitsu representative.
Fourth edition, April 1984

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Printed in Japan
OL1704-845S4